

FIELD GUIDE

ECOLOGICAL CLASSIFICATION SYSTEM

FOR THE NATIONAL FORESTS AND ADJACENT AREAS OF THE WEST GULF COASTAL PLAIN: 2nd APPROXIMATION



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2nd Approximation

Report submitted in fulfillment of an agreement between Stephen F. Austin State
University, The Nature Conservancy,
Kisatchie National Forest, and the National Forests and Grasslands in Texas,

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PREFACE

It has been nearly seven years since the release of the first version of the ecological classification system for the national forests and adjacent areas of the West Gulf Coastal Plain. During this time ecological classification has begun to be used as a tool in forest planning and management and pilot studies mapping landtype phases have occurred on limited portions of Kisatchie National Forest. We have indeed taken the first steps toward using a common language—that of ecological units, the LTA and the LTP—for describing, managing, and protecting the forest resources of the West Gulf Coastal Plain. In our current world of global warming, catastrophic storms and the setbacks and opportunities for forest management that result from them, where we are beginning to recognize that major cities can be threatened by the loss of the fragile wetlands that protect them, the central idea of ecological classification—that land management must take into account the intrinsic ecological characteristics of the particular area being used—is more pertinent than ever. As with the previous edition, a primary goal of this document is to focus the attention of as many natural resource professionals as possible on the ecosystems and natural processes on which we and all other species depend.

The field guide has undergone a number of revisions since its first release in 1999. Additional fieldwork and data collection has enabled us to extend geographic coverage to include both the area of the Caney Ranger District of Kisatchie National Forest in northern Louisiana and the Red River Alluvial Plain—which makes a great swath through the pine forests of western Louisiana where Kisatchie National Forest lies. Numerous photographs now provide examples of ecological units and important plant species. The text throughout the document has been thoroughly checked and extensively revised. Highlights of some of the changes include: Increased recognition in the descriptions of upland ecological units within the historic range of longleaf pine that an alternative mixed-forest plant community—dominant on many modern landscapes—develops on these sites in the absence of fire; incorporation of standard terminology derived from the US Army Corps of Engineers Wetland Delineation Manual to describe the hydrologic regime of all ecological units that experience any type of flooding or saturation of the soil; Changes in the names of certain wetland ecological units, for example “Regularly-Flooded Swamps”, to reflect the standardized hydrologic terminology; and the addition of new landtype phases for the Kisatchie Sandstone Hills and the Alluvial Floodplains and Terraces. We also attempted to relate the Texas Landtype Associations with those across the Sabine River in Louisiana, and to map the occurrence of Landtype Associations in Louisiana outside of Kisatchie National Forest lands. The results of this effort yielded some surprises; at least two Texas landtype associations, the Lignitic Uplands and the Clayey Uplands, extend across the Sabine River into Louisiana. The product, Figure 3-5, shows the LTAs in their geographic context and will hopefully serve as a starting point for refined description and mapping of Landtype Associations.

Although revised, this fieldguide is by no means final. As was the case with the first draft, it is intended to be a working document. Future changes may include expanding coverage to areas of the West Gulf Coastal Plain not near national forests, developing landtype phase-level maps, and continuing to refine the descriptions of landtype phases and other ecological units. As was the case with the first edition, we hope that this document will provide planners, foresters, and scientists with enhanced understanding of the local ecosystems with which they work and that they be able to use this information to improve their planning, management, or research and to better protect the health and integrity of our forests.

James Van Kley
Stephen F. Austin State University
February 2007

PREFACE TO THE FIRST EDITION

The development of the Ecological Classification System for the national forests of the West Gulf Coastal Plain marks a fundamental shift in the way we think about and manage our forest resources. In the past, different aspects of the forest, such as vegetation, wildlife, water, and soil, were often considered independently of each other. However, planning for multiple uses and management in an ecosystem context requires that we recognize the complexity and interconnectedness of all components that make up a forest. Our actions upon one component will have an effect on all the others. But identifying and describing ecosystems is an extremely difficult task, as we are attempting to mentally reduce intricate, multi-dimensional systems that we do not--and may never--completely comprehend, into simple, understandable categories. The Ecological Classification System is a first attempt to form one common language for describing, managing, and protecting the forest resources across the West Gulf Coastal Plain.

This field guide is designed to be a working document to aid resource planners, foresters, and biologists to better understand the ecosystems occurring on national forest lands and to integrate ecological information into their planning, management, and research activities. Many features are included in this field guide to assist in identifying and mapping lower level ecological land units, including a dichotomous key and descriptions of ecological types, descriptions of key plant species, a summary account of historical vegetation in the region, and regional maps showing geographic locations of higher level ecological units.

We are only just beginning to comprehend the web of interrelationships that make up an ecosystem. As future research brings additional knowledge to light, the Ecological Classification System will be modified and refined to reflect our increased understanding of these natural systems. It is hoped that this document will motivate all that are interested in protecting the health and biological diversity of our forests to focus attention, not just on one or a few species, but on the ecosystems and natural processes upon which these species, and we, depend.

Rick Turner
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July 1999

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CHAPTER 1

INTRODUCTION

PURPOSE

This field guide describes an ecological land classification system for national forests and adjacent lands on the West Gulf Coastal Plain of Texas and Louisiana. This classification is the result of the analysis of an extensive ecological data set obtained from sites in the national forests of the region. An ecological classification system classifies land into ecologically equivalent units on the basis of an integration of multiple components of the forest ecosystem including soils, physiography, and vegetation. A land classification based on these components reflects the influence of the environmental characteristics of a site and gives us information about its inherent ecological potential and types of living communities it will support. As part of a nationally recognized system of land classification, this ecological classification system will aid government agencies as well as private and industrial managers and other professionals in making informed management decisions on national forest lands as well as on adjacent lands not included in the national forest system.

An ecological classification is as useful to those wishing to effectively manage forest land for timber and other commodities as it is for those whose management goals include identifying habitats of rare species, managing for optimum biodiversity, quantifying trends in the health of forest communities, and planning for cultural and recreational uses. This classification system also facilitates research by enabling one to stratify the landscape into ecologically equivalent units for purposes of data collection and by serving as a model for data interpretation (Van Kley et al. 1995).

While this classification provides a good approximation of the ecological types for the region covered, it is part of an ongoing effort and is far from complete. Although this document represents refinement and expansion of previous work, additional research is necessary to extend the classification to portions of the western Gulf region that are not in the national forest system, to more completely reconstruct the presettlement vegetation patterns on the ecological units, and to understand the response of these units to various disturbances and management activities.

LEGISLATIVE BACKGROUND

In recent years, increasing and often conflicting demands have been placed on national forest lands. Legislation, including the National Environmental Policy Act of 1970, the Federal Land Policy and Management Act of 1976, and the National Forest Management Act of 1976, requires the management of federal lands through the use of structured ecological information in the decision-making process (Barnes et al. 1982). In 1992, the U. S. Forest Service adopted a policy of ecosystem management on the national forests and grasslands, and in research programs (McNab and Avers 1994). The policy of ecosystem management as applied to national forest lands specifically incorporates an ecological approach to land management planning. Management of ecosystems with all their components is best served by a multiple-factor classification based on ecological information and a means of mapping the landscape using the resulting classification. Therefore, the Forest Service developed the Ecological Classification System (ECS) for inventorying, describing, and mapping ecosystems at national, regional, landscape, and local scales. Cleland et al. (1994) defines an ecological classification system as a system, framework, or procedure for integrating basic resource factors to classify ecological types and inventory ecological units. The development of an ECS provides a framework in which one identifies ecosystems at varying levels of scale and where management requirements for particular ecosystems can be evaluated. Its implementation will facilitate the ecologically-based

management of forest lands by allowing the consideration of all aspects of the site, both biotic and abiotic, in the management planning process.

GEOGRAPHIC APPLICABILITY

The area this classification system covers includes the approximately 1.2 million acres of national forest lands in Texas and Louisiana as well as other adjacent public and private lands (Figure 1). Numerous Texas authors including Correll and Johnston (1979), Hatch et al. 1990, and Diggs et al. 2006 refer to the region containing these forests as the “Pineywoods”. Bailey (1994) divides eastern Texas and western Louisiana into the Middle Coastal Plain, Western Section of the Southeastern Mixed Forest Province, and the Coastal Plains and Flatwoods Section of the Outer Coastal Plain Province. These two sections correspond to the Upper West Gulf Coastal Plain and West Gulf Coastal Plain ecoregions respectively of The Nature Conservancy (1997). In this publication we refer to these ecoregions collectively as the West Gulf Coastal Plain.

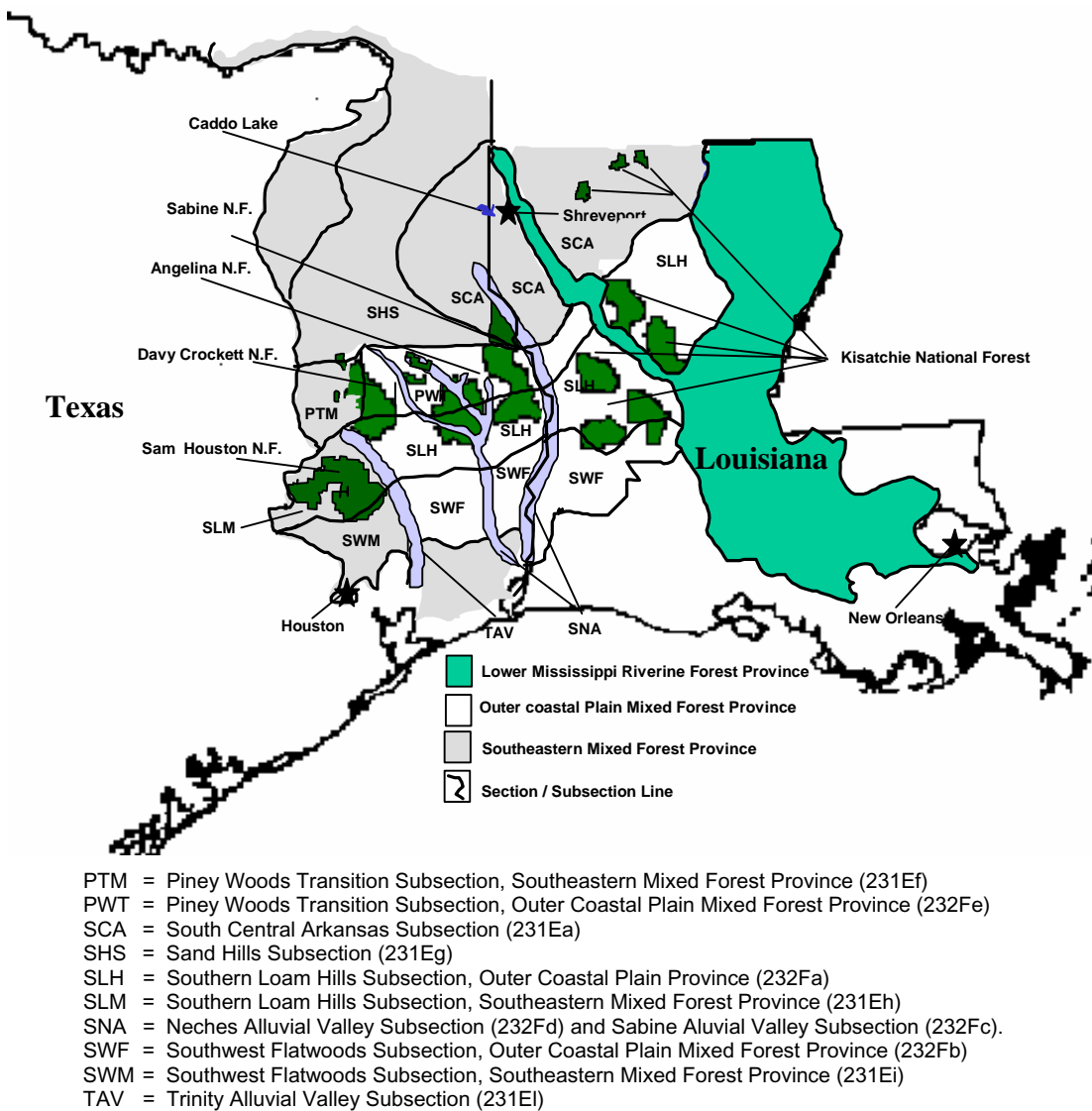


Figure 1.1 General locations of the national forests and the ecoregions in which they lie.

The field guide was developed from data collected from sites on the Angelina, Davy Crockett, Sabine, and Sam Houston national forests in Texas and from the Catahoula, Calcasieu, Kisatchie, Winn, and Caney Ranger Districts of Kisatchie National Forest in Louisiana. While there are differences, mainly associated with surface geology, between various forests on the West Gulf Coastal Plain, there are also many similarities in both plant community types and the types of sites on which they occur throughout the region. For example, the plant communities and associated sites described by Marks and Harcombe (1981) for the Big Thicket region of southeast Texas are remarkably similar to some of the ecological types described in this classification. One can therefore apply this classification in a more general way to lands outside the administrative boundaries of the national forests. For this reason we describe 19 generalized ecological types in Chapter 6 that occur on forested landscapes throughout much of the West Gulf Coastal Plain.

CHAPTER 2

OVERVIEW OF ECOLOGICAL CLASSIFICATION

INTRODUCTION

There is growing interest in finding ways to classify forests by their inherent ecological characteristics so that the whole system of physical, chemical, and biological factors of a site can be considered simultaneously when developing management strategies. In the past, forest land was classified in several ways: by land ownership or political boundaries, management history, current vegetation types, topography, soil characteristics, or other attributes. These classifications were usually based on only one aspect of the land resource. For example, classifications based on soils are widely used in forest inventory, but if their relationship to the vegetation or landform is unknown, they are not relevant to forest management. Transitory phenomenon such as current tree cover types form the basis for other classifications; these can quickly become obsolete due to logging, storms, fire, or natural succession.

Ecological classification is based primarily on the interactions between plants and their biotic and abiotic environment. Such classification serves to express in simplified terms the interrelationships between the components of an ecosystem, particularly vegetation, physiography, and soils. These three aspects of an ecosystem provide different but interrelated information for defining ecological land units. Physiography, or landform, influences microclimate, water drainage, and solar radiation, and it is also highly correlated with soil conditions. Soil properties such as texture, nutrient content, and moisture holding capacity are controlling factors affecting plant species composition and productivity. The vegetation on a site serves as a "phytometer", or a biological measurement system, that integrates environmental factors and gives them an ecological meaning (Barnes et al. 1982). These interrelationships are inherently complex, and effects of a particular environmental factor cannot be easily isolated and evaluated in natural systems. Complex mathematical techniques are required to summarize the redundancy of large data sets and reduce the effects of "noise", or random variation, so that meaningful ecological relationships can be distinguished.

In discussing ecological site classification, one should remember that there are often not sharp boundaries between adjacent plant communities in nature. Gleason (1926) proposed that each plant species responds individually to its environment. Whittaker (1967, 1978) showed by direct gradient analysis of vegetation along elevation gradients that different species have different, overlapping ranges and optimal points along a gradient; they do not necessarily covary together as discrete "communities". Classification of plant associations into discrete units is therefore somewhat artificial. Even so, similar land types often exhibit similar species composition and the presence of certain assemblages of species in a particular area can be used to make inferences regarding the environmental characteristics of that site. Determining what the relationships between site and vegetation are and what they mean can be a difficult task. However, several approaches to land classification based on ecological relationships have been developed.

HABITAT TYPING

In the United States, R. Daubenmire developed a method known as habitat typing in which sites are classified based on their climax or potential natural vegetation as determined by inventories of species in old-growth stands (Daubenmire and Daubenmire 1968). With this method, old-growth vegetation, particularly the ground layer, is believed to be the best indicator all of the intrinsic environmental properties of a site. After canopy closure, shade-intolerant herbs and shrubs soon disappear, but shade-tolerant species may remain indefinitely. (Daubenmire 1980). One makes inferences about the environmental potential of a site by looking at the species composition of the old-growth plant association. Once the successional stages leading to each climax community have been identified, one can also classify disturbed sites. Sites with the same actual or potential climax vegetation belong to the same habitat type. A major assumption of this method is that there is only one possible climax for a particular site. This is an oversimplification of the many successional pathways that may be possible (Whittaker 1953).

Habitat typing has been used extensively in the western U.S., but its application to ecosystems in the eastern and central United States is difficult because there, vegetation has undergone extensive human-caused modification (Cleland et al. 1994). Large-scale disturbance of forests obscures the relationships between vegetation and site-specific ecological factors by producing communities in which pioneer and ruderal species that are less site-specific predominate. Moreover, a considerable amount of the currently forested lands in the eastern and central United States have a history of agricultural use, which can modify the soil structure and reduce soil seed bank diversity for many years after abandonment (Matlack 1994). In addition to environmental variables, effects of past disturbance and other historical factors significantly influence species composition on these second growth stands. Very few forests which could be defined as old-growth are available for the study of climax vegetation. Also, the West Gulf Coastal Plain lacks the dramatic topographic relief that occurs in the western United States, so differences in communities are often more subtle, making it harder to identify ecosystem boundaries on the basis of vegetation alone.

MULTIPLE-FACTOR ECOLOGICAL CLASSIFICATION SYSTEMS

In 1926, G. A. Kraus initiated an approach to land classification based on multiple ecological factors in the German state of Baden-Württemberg. The methodology integrated physical and biological disciplines including geography, geology, climatology, soil science, plant sociology, palynology, and forest history (Spurr and Barnes 1980). This method, known as the Baden-Württemberg System, has been in use since about 1946. Major landscapes were divided into smaller subunits termed growth districts, and these units were in turn divided locally into site units that had particular combinations of biotic and abiotic site factors. Since many parts of Baden-Württemberg had been settled for over 2500 years, delineation of growth districts depended heavily on the natural forest vegetation as determined by historical records, pollen analysis, and ground vegetation.

Barnes et al. (1982) used plot data, field mapping, and multivariate analysis to implement a multiple-factor ecological land classification based on the Baden-Württemberg model for the Cyrus McCormick Experimental Forest in Michigan. Jones (1991) developed a landscape ecosystem classification model for the Piedmont and Upper Coastal Plain Provinces in South Carolina by means of multivariate analysis and recognition of relationships between soil, vegetation, and landform. Other local applications of multiple-factor ecological site classification have been developed for the Sylvania Recreation Area in Michigan (Spies and Barnes 1985), the Savannah River Plant in South Carolina (Van Lear and Jones 1987), the Shawnee Hills in Illinois (Fralish 1988), and the Kickapoo River watershed in southwestern Wisconsin (Hix 1988). Ecological classification systems have been successfully developed for several national forests in the central U.S., including Huron and Manistee National Forests in Michigan (Cleland et al. 1994), Hoosier National Forest in Indiana (Van Kley et al. 1995), Hiawatha National Forest in Michigan Kudray (2002), and Wayne National Forest in Ohio (Hix and Pearcy 1997).

VEGETATION STUDIES ON THE WEST GULF COASTAL PLAIN

There have been a number of studies of east Texas plant communities including descriptions of upland forests (Marietta 1979, Marietta and Nixon 1983, Ward 1984, Smeins and Hinton 1987, Ward and Nixon 1992), upland herbaceous communities (Marietta and Nixon 1984, George and Nixon 1990), mesic forests (Nixon et al. 1980), hillside seepage bogs (Nixon and Ward 1986), and bottomland forests (Nixon and Raines 1976, Nixon et al. 1977, Chambless and Nixon 1975). Nixon (1985, 2000) identified seven community types across a range of landscapes in east Texas, from river floodplains to dry upland areas. The Texas Natural Heritage Program surveyed and described significant occurrences of natural communities on the National Forests in Texas (Orzell 1990). Diamond et al. (1987) developed a framework for plant community classification in Texas. Nixon et al. (1987) described changes in woody vegetation composition and diversity in response to a topographic and soil gradient ranging from a creek bottom to an upland.

In Louisiana, MacRoberts and MacRoberts described the floristics and environmental characteristics of a number of rare community types in western Louisiana, including hillside seepage bogs (1990, 1991, 1992, 1993a), calcareous prairie remnants (1995), and sandstone outcrop communities (1993b). The Louisiana Natural Heritage Program surveyed and described high-quality remnants of natural communities within Kisatchie National Forest (Martin and Smith 1991, 1993, Grace and Smith 1995, Williams and Smith 1995).

Several landscape-wide studies exist from the Big Thicket area of southeast Texas which is located outside the current administrative boundaries of the national forests. Bridges and Orzell (1989) conducted a qualitative assessment of community types, where they identified and described four subtypes of upland longleaf pine woodlands and three subtypes of wetland longleaf pine communities. Marks and Harcombe (1981) used multivariate analysis to relate woody plant communities to environmental gradients. Compositional variation was correlated primarily to the percentage of sand in the surface soil (mainly interpreted as a gradient of available soil moisture) and secondarily to certain aspects of soil fertility. Harcombe et al. (1993) also used multivariate analysis to examine the major plant community types occurring in the longleaf pine region of the west Gulf Coastal Plain. Vegetation corresponded to a soil texture gradient which appeared to co-vary with soil depth and topography, both of which may influence soil moisture more strongly than soil texture alone. Other possible covariables with soil texture were nitrogen and phosphorus-availability and fire frequency.

These studies formed a good working first approximation for an ecological classification system. However, we desired that the ECS be based primarily on an independent, quantitative data set so that the results could be used to test and to compliment previous community descriptions and classifications (see Chapter 6 for discussions relating ecological types to communities previously described in the literature). Therefore, previous community-level classifications may not always have exact equivalents to the ecological types in the ECS hierarchy. Moreover, individual ecological types in the ECS can potentially support several of the previously-described natural communities depending on successional stages and management history. Several theses and publications provide detailed analyses and summaries of the data which generated this classification system, including Dehnisch, (1998), Mundorf (1998), Turner, (1999), Van Kley and Hine (1998), Van Kley (1999a), and Van Kley (1999b).

CHAPTER 3

CLASSIFICATION HIERARCHY

INTRODUCTION

The National Hierarchical Framework of Ecological Units, of which this classification system is a part, is a scientifically derived regionalization of ecosystems organized into units of decreasing orders of scale and exhibiting increasingly homogeneous characteristics from upper to lower levels (McNab and Avers 1994). Lower levels of the hierarchy are nested within higher levels (Table 3.1, Figure 3.1, Appendix E). Ecological units at the highest levels (domain, division, and province) are based largely on major patterns of climate and geomorphology. The West Gulf Coastal Plain lies entirely within the Humid Temperate Domain and the Subtropical Division but occurs across three provinces. Ecosystem units at a regional scale (section, subsection, and landtype association) are based on regional patterns of climate, geology, and broad-scale vegetation types. Bailey et al. (1994) and McNab and Avers (1994) describe the domains, divisions, provinces, and sections for the United States. Subsections are mapped and described for the eastern U.S. by Keys et al. (1995). Ecological units at these upper levels are used mainly for national and regional planning. Local levels of classification are based on local patterns of natural vegetation, soils, geology, and topography. They include in decreasing order of scale, the landtype association, landtype, and landtype phase.

Table 3.1. Hierarchical levels of the USDA Forest Service Ecological Classification and Inventory System (Forest Service Handbook 1909.21).

Level	Factors	Scale	Planning level
Province	Geomorphology, climate	Multi-State	National-Regional
Section	Geomorphology, climate, vegetation	1000's of square miles	Regional-Subregion
Subsection	Climate, geomorphology, vegetation	10's to 100's of square miles	Multi-Forest, State
Landtype Association (LTA)	Landforms, natural overstory communities, soil associations	10's to 1000's of acres	Forest
Landtype (LT)	Landform, natural vegetative communities, soils	10's to 100's of acres	Ranger District, Management Area, Opportunity Area
Landtype Phase (LTP)	Soils, landscape position, natural vegetative communities	1 to 10's of acres*	Project
Site	Soils, landscape position, natural vegetative community	Less than 1 acre	Individual site

*Upland LTPs are often larger (100's of acres) on many southeastern USA and Gulf coastal plain landscapes.

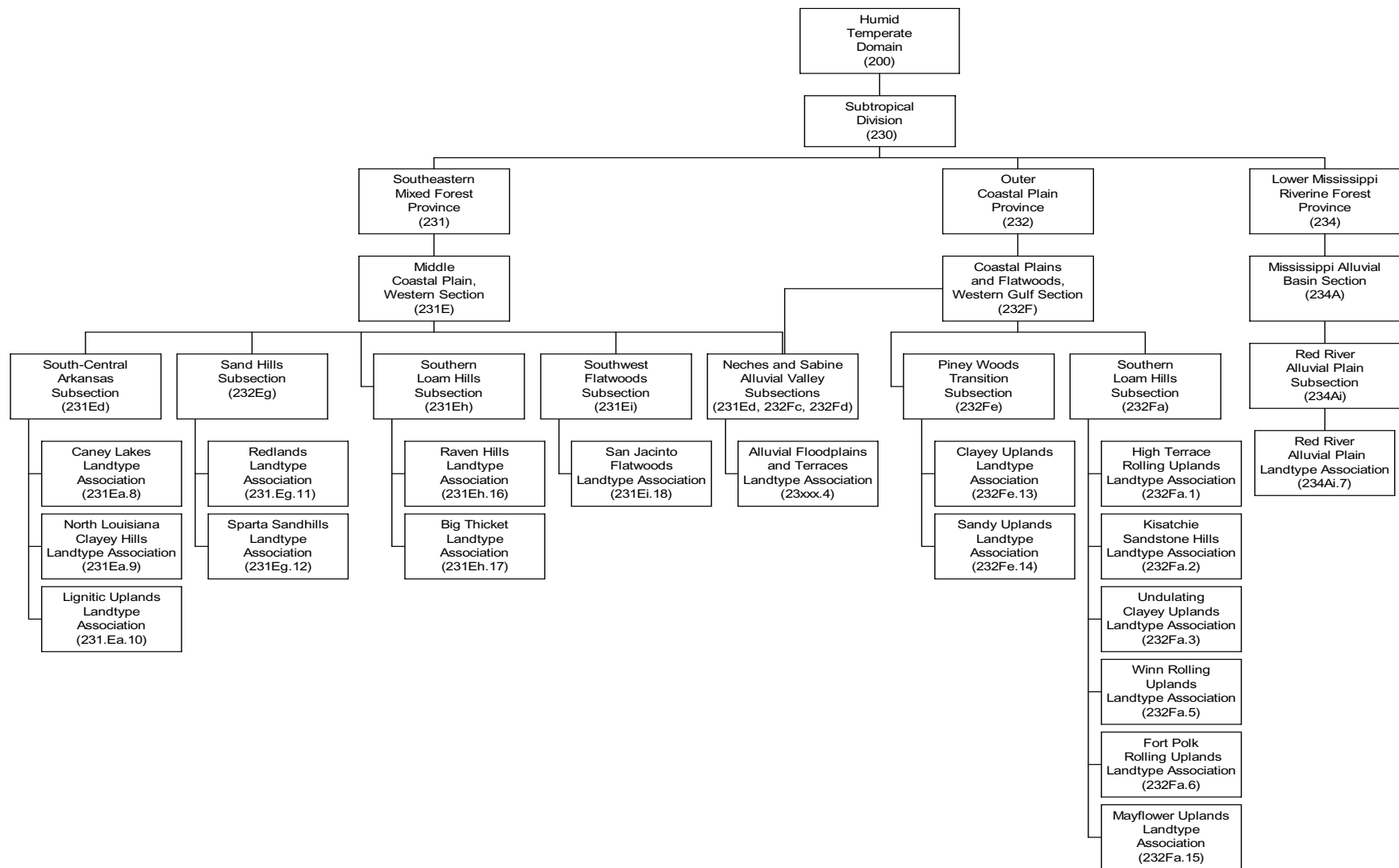


Figure 3.1. Hierarchical structure of ecoregions and subregions on the West Gulf Coastal Plain. See Appendix E for a listing of all landtype phases and higher ecological units covered in this guide in the context of the hierarchy.

A landtype association (LTA) is an area with broadly similar landform and soils. Sites from same landtype association tend to occur on closely related geological formations. Landtypes are subdivisions of LTAs with similar vegetation and soils and are often found in similar topographic positions. A landtype is usually an aggregation of several landtype phases. The landtype phase (LTP) is the basic unit of ecological land classification as well as the basic unit for local management and planning. It is a local ecosystem type with similar soils, physiography, and potential vegetation which occurs repeatedly across the landscape. Although the classification hierarchy is presented here as a nested system, it must be emphasized that very similar combinations of plant communities, soils, and topographic position occur throughout the West Gulf Coastal Plain. Most LTAs differ from others not in having totally unique sets of LTPs, but rather in patterns of abundance and distribution of the various LTPs across the landscape (particularly in the uplands). Appendix E lists all landtype phases and higher ecological units for the areas covered in this handbook in their hierarchical context.

PROVINCES

The National Forests in Texas and the Kisatchie National Forest occur across the transition zone between the Southeastern Mixed Forest Province and the Outer Coastal Plain Mixed Forest Province (Bailey et al. 1994, Keys et al., 1995). The predominant presettlement upland vegetation in the Southeastern Mixed Forest was probably mixed oak-hickory-pine forest, while longleaf pine woodlands dominated uplands on much of the Outer Coastal Plain Mixed Forest. Small portions of Kisatchie National Forest also occur on or adjacent to the Lower Mississippi Riverine Forest Province, which includes the Red River Alluvial Plain. There, bottomland hardwood communities dominate. They include pecan, oak-sweetgum and elm-ash-hackberry forests. Figures 1.1 and 3.2 show locations of province boundaries within the West Gulf Coastal Plain.

SECTIONS

The national forest lands of Texas and Louisiana lie within three sections: the Middle Coastal Plain, Western Section, which is within the Southeastern Mixed Forest Province; the Coastal Plains and Flatwoods, Western Gulf Section of the Outer Coastal Plain Mixed Forest Province; and the Mississippi Alluvial Basin Section of the Lower Mississippi Riverine Forest Province. We refer to these sections collectively as the West Gulf Coastal Plain in this field guide.

Middle Coastal Plain, Western Section (231E)

The western portion of Davy Crockett National Forest, all of Sam Houston National Forest, the northern half of Sabine National Forest, the northern tip of the Winn Ranger District, and all of the Caney Ranger District occur in the Middle Coastal Plain, Western Section of the Southeastern Mixed Forest Province (Figure 3.2). This section is largely north or west of the historic range of extensive longleaf pine-dominated woodlands. Historically, shortleaf pine or mixed pine-hardwood forests occupied most uplands while loblolly pine-hardwood forests occupied lower slopes and floodplains of minor streams.

Coastal Plains and Flatwoods, Western Gulf Section (232F)

Most of the remaining national forest uplands occur in the Coastal Plains and Flatwoods, Western Gulf Section of the Outer Coastal Plain Mixed Forest Province (Figure 3.2). Longleaf pine woodlands or savannas historically occupied uplands throughout much of the Section and loblolly pine-hardwood forests occupied lower slopes and floodplains of minor streams.

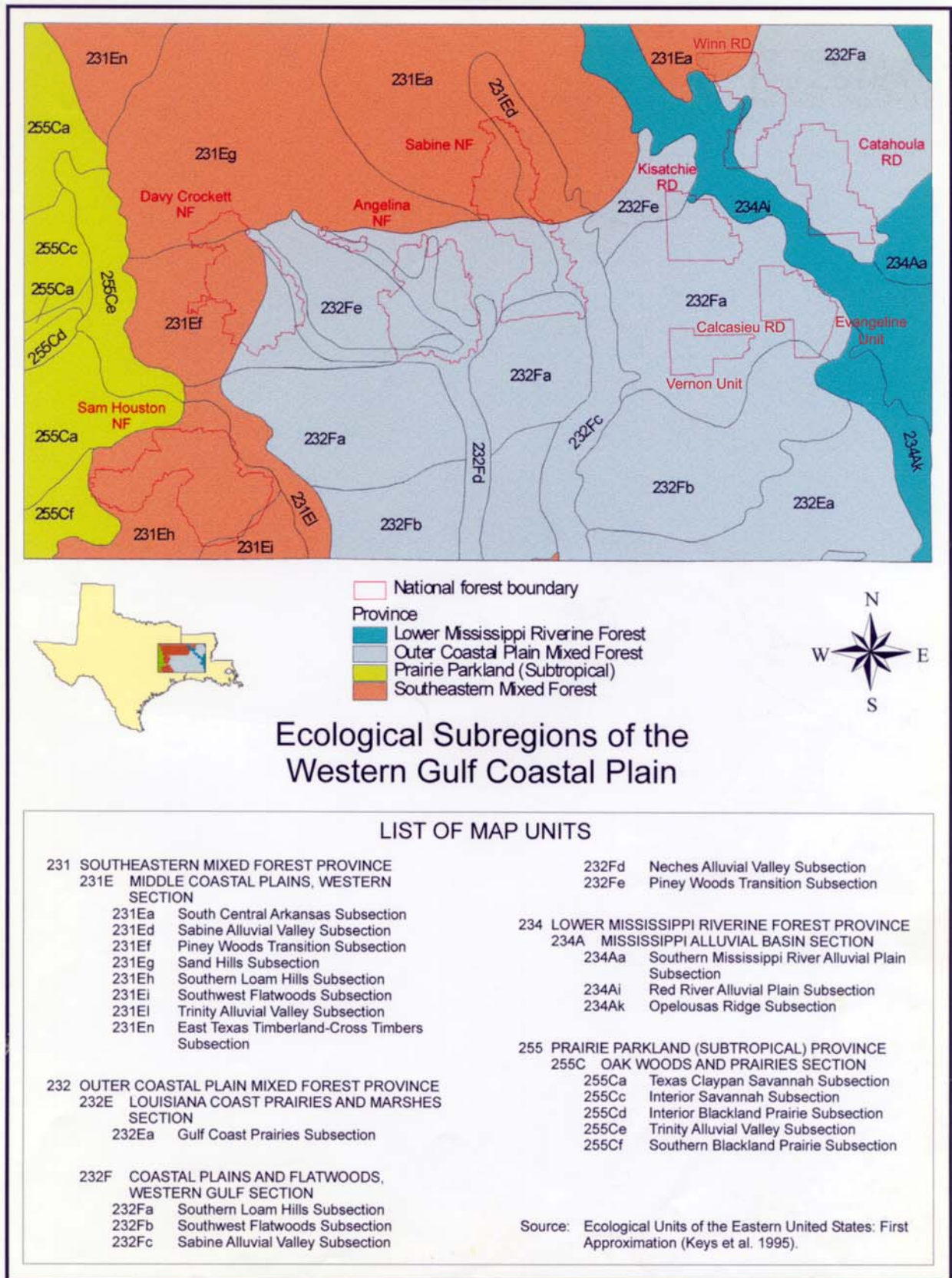


Figure 32. Map of national forest boundaries and their occurrence on the ecological subregions of the western Gulf coastal plain.

Mississippi Alluvial Basin Section (234A)

Vast bottomland hardwood forests, mesic areas with rich soils on extensive natural levee deposits, and swamps historically characterized this Section which is associated with the floodplain of the Mississippi River and its major tributaries such as the Red River. Small portions of Kisatchie National Forest as well as the cities of Alexandria and Bossier city, Louisiana, occur on the Red River Alluvial Plain which lies within this Section.

SUBSECTIONS

The subsections containing the majority of national forest lands are described below. Descriptions are derived from Keys et al. (1995). Locations of the subsections are shown in Figure 3.2. The large number of subsections containing national forest lands may be confusing for those initially trying to familiarize themselves with these national forests. However, it is helpful to realize that the bulk of the national forest lands lie in just four subsections: Most of Kisatchie National Forest is in the Southern Loam Hills Subsection of the Outer Coastal Plain (232Fa). Most of Angelina, the eastern half of Davy Crockett, and much of Sabine National Forest are in the Piney Woods Transition Subsection of the Outer Coastal Plain (232Fe). Sam Houston National Forest is mainly in the Southern Loam Hills Subsection of the Southeastern Mixed Forest (231Eh), and northern Sabine National Forest and the Caney Ranger District of Kisatchie National Forest are in the South Central Arkansas Subsection (231Ea). The remaining national forest lands are immediately adjacent to these subsections and are transitional to them or are on alluvial (river floodplain) subsections. Alluvial systems, for example the floodplain of the Dugdomona River in Winn Parish, Louisiana, that are not mapped as a separate subsection in Keys et al. (1995) are designated here as Landtype Associations within the upland Subsection that they pass through.

South Central Arkansas Subsection (231Ea)

This subsection is characterized by irregular plains and undulating uplands. Surface geology consists of Quaternary or Tertiary limonitic residuum, clayey fine to medium sand, and sandy clay residuum. Common soils are Hapludults, Glossaqualfs, and Fragiudalfs. It occurs across a large area from north-central Louisiana and south-central Arkansas to northeast Texas, and is bisected by part of the Red River Alluvial Plain Subsection in Louisiana. It is largely north and west of the natural range of longleaf pine. Potential natural vegetation includes shortleaf pine-mixed hardwood or loblolly pine-mixed hardwood forests. The northern part of Sabine National Forest, The Caney Ranger District of Kisatchie National Forest, and the northernmost edge of the Winn Ranger District of Kisatchie National Forest District are in this subsection.

Sabine Alluvial Valley Subsection of the Southeastern Mixed Forest (231Ed)

This subsection occupies the flat floodplains of the Sabine River valley and its major tributaries. Surface geology includes Holocene alluvial gravely sand and late Pleistocene alluvial sand and silt. Soils include Fluvaquents and Udifluvents. Landscapes are structured by periodic flooding and other hydrologic influences from the adjacent river. Reservoirs, for example the north part of Toledo Bend Reservoir, currently occupy large portions of this subsection. Potential vegetation includes various bottomland hardwood communities, such as green ash-American elm-hackberry and oak (willow, water, laurel, overcup)-sweetgum forests. Riparian areas on the northeastern edge of Sabine National Forest are in this subsection.

Piney Woods Transition Subsection of the Southeastern Mixed Forest (231Ef)

The Piney Woods Transition Subsection consists of irregular plains formed in Quaternary and Tertiary massive clay and limonitic sand decomposition residuum. Soils are mostly Paleudalfs. Potential vegetation includes shortleaf pine-oak (white oak, southern red oak, post oak, blackjack oak) and loblolly pine-oak (white oak, southern red oak, post oak) forests. Historically, longleaf pine woodlands were uncommon on uplands of the subsection which is largely west of the range of longleaf pine. The western portion of Davy Crockett National Forest occurs in this subsection, which is a westward extension of the Piney Woods Transition Subsection of the Outer Coastal Plain Mixed Forest Province (232Fe), the subsection that contains the core of the three northern Texas national forests.

Sand Hills Subsection (231Eg)

The Sand Hills are irregular plains and undulating uplands. Surface geology consists of middle Eocene fine sandy to silty clay decomposition residuum. Major soil taxa include Paleudults, Hapludults, and Kandudults. Potential upland vegetation includes shortleaf pine-oak (white oak, southern red oak, post oak, blackjack oak) and loblolly pine-oak (white oak, southern red oak, post oak) forests. The subsection occurs across a large portion of northeast Texas, including the northern edge of Davy Crockett National Forest and a small part of central Sabine National Forest. It includes the locally-known "redlands" belt and most of Nacogdoches County, Texas.

Southern Loam Hills Subsection of the Southeastern Mixed Forest (231Eh)

The Southern Loam Hills Subsection consists of irregular plains formed in Pleistocene alluvial pebble and gravel mixed with Tertiary massive clay decomposition residuum. Soils are primarily Paleudults. Potential vegetation includes forests of shortleaf pine or loblolly pine mixed with hardwoods. This subsection is a westward extension of the Southern Loam Hills Subsection (232Fa) of the Outer Coastal Plain Mixed Forest Province. However, it is largely west of the natural range of longleaf pine. All of Sam Houston National Forest except the extreme southeastern edge is in this subsection.

Southwest Flatwoods Subsection (231Ei)

Flat landscapes of Pleistocene-aged deposits characterize the Southwest Flatwoods Subsection. Since drainage patterns are commonly uncertain and poorly defined, soils are often poorly drained with a seasonally high water table. Extensive hardwood-dominated "flatwoods" forests characterized the presettlement landscape. The southeastern edge of Sam Houston National Forest is in the Southwest Flatwoods Subsection.

Trinity Alluvial Valley Subsection (231Ej)

The Trinity Alluvial Valley Subsection is associated with flat floodplains in the valleys of the Trinity River and its major tributaries. The floodplain is formed in Holocene alluvial sand, silt, clay, and gravel. Common soils include Haplaquolls and Haplaquepts. Most of these landscapes are structured by periodic flooding and other hydrologic influences from the adjacent river. Reservoirs, including Lake Livingston, currently occupy large portions of this subsection. Potential vegetation consists of bottomland hardwood communities, such as green ash-American elm-hackberry, cedar elm, and oak (willow oak, water oak, laurel oak)-sweetgum forests. This subsection is located just outside the eastern boundary of Sam Houston National Forest.

Southern Loam Hills Subsection of the Outer Coastal Plain (232Fa)

The Southern Loam Hills occur on irregular plains formed in Tertiary and Quaternary massive clay decomposition residuum, alluvial gravel, and sand. Upland soils include Paleudults and Kandiodults. This subsection contains the heart of the longleaf pine belt of the Western Gulf Coastal Plain. Human-related disturbances coupled with a lack of fire have caused many of the original longleaf pine woodlands to succeed to stands of loblolly pine, shortleaf pine, and mixed pine-hardwoods. Southern Angelina National Forest, extreme southern Sabine National Forest, and most of Kisatchie National Forest occur in this subsection.

Sabine Alluvial Valley of the Outer Coastal Plain (232Fc)

This subsection occupies the flat floodplains and terraces of the lower Sabine River and its major tributaries. Surface geology includes Holocene alluvial gravely sand and late Pleistocene alluvial sand and silt. Typical soils include Fluvaquents and Udifluvents. These landscapes are structured by periodic flooding and other hydrologic influences from the adjacent river. Reservoirs, including the south part of Toledo Bend Reservoir on the Texas-Louisiana border, currently cover large portions of this subsection. Potential vegetation includes various bottomland hardwood communities, such as green ash-American elm-hackberry and oak (willow oak, water oak, laurel oak)-sweetgum forests. The southeastern edge of Sabine National Forest occurs in this subsection.

Neches Alluvial Valley (232Fd)

This subsection occupies the flat floodplains and terraces of the lower Neches River and its major tributaries including the Angelina River. The floodplains formed in Holocene alluvial gravely sand and silt. Soils include Pelluderts and Haplaquepts. These landscapes are structured by periodic flooding and other hydrologic influences from the adjacent river. Despite large reservoirs such as Lake Sam Rayburn, significant areas of bottomland forest on national forest lands remain. Potential vegetation includes various bottomland hardwood communities, for example, green ash-American elm-hackberry and oak (willow oak, water oak, laurel oak)-sweetgum forests. Portions of Angelina and Davy Crockett National Forests occur in this subsection.

Piney Woods Transition Subsection of the Outer Coastal Plain (232Fe)

The Piney Woods Transition Subsection consists of irregular plains formed in Quaternary and Tertiary massive clay and limonitic sand decomposition residuum. Soils are mostly Paleudalfs. Potential vegetation includes shortleaf pine, loblolly pine, longleaf pine, and a mixture of oaks and other hardwoods. While longleaf pine woodlands historically dominated significant upland areas, this subsection represents the transition zone where longleaf pine communities were gradually replaced by shortleaf pine-mixed hardwood forests as one moved from south to north. The bulk of Angelina, Davy Crockett, and much of Sabine National Forest occur in this subsection.

Red River Alluvial Plain Subsection (234Ai)

This subsection, located within the Mississippi Alluvial Basin Section, is associated with the floodplain of the Red River and its major tributaries. Soils formed in Holocene natural levee silt and clay, and alluvial clay deposits. Common soils include Hapludolls, Fluvaquents, and Udifluvents. Potential vegetation includes oak (swamp chestnut oak, cherrybark oak, Shumard oak)-sweetgum and green ash-American elm-pecan-hackberry forests. Bald cypress swamps occur in inundated areas. Past and present flooding and other riverine processes are important in structuring natural communities on this landscape. Kisatchie National Forest lands on or adjacent to the Red River Alluvial Plain include the midwest and southwest edge of the Winn Ranger District, the northern

edge of the Kisatchie Ranger District, the southeast corner of the Catahoula Ranger District, and the northeast edge of the Calcasieu Ranger District. Much of the Alluvial Plain has been converted to agricultural and urban uses and limited national forest land actually lies on this subsection.

LANDTYPE ASSOCIATIONS

Landform and associated soil conditions are among the factors controlling ecological patterns and processes at the landtype association (LTA) level. Surface geology (which affects both landform and soil properties) and potential natural plant communities are the chief criteria used to designate and map LTAs.

At the beginning of the Tertiary Period (65 Million years ago), the region was covered by a shallow sea, an expanded Gulf of Mexico (Spearing 1991). Over time, the Gulf gradually retreated southward and the coastal plain was built up as a series of east-west oriented bands of sedimentary deposits (Dumble 1918). These geologic bands are variously of marine and continental origin as a result of multiple advances and retreats of the Gulf over this period (Sellards et al. 1932). Surfaces, which range in age from Paleocene (65 million years ago) to Eocene (56 million years ago), Oligocene (35 million years ago), Miocene (23 million years ago), Pleistocene (less than 1.6 million years ago), and Holocene (less than 10,000 years ago) become progressively younger and the landscape shows progressively less topographic relief as one travels southward toward the Gulf of Mexico (Bernard & LeBlanc 1965).

In Texas, geologic strata include (roughly from north to south) the Paleocene Wilcox group; the Eocene Carrizo, Reklaw, Queen City, Weches, Sparta, Cook Mountain, Yegua, Moodys Branch, Caddell, Manning, and Wellborn formations; the Oligocene Whitsett, and Nash Creek formations; the Miocene Catahoula and Fleming Formations; and the Pleistocene Willis and Lissie formations (Bureau of Economic Geology 1992, 1993). In Louisiana, geologic strata include the Paleocene Wilcox group; the Eocene Cane River, Sparta, Cook Mountain, and Cockfield formations; the Oligocene Jackson and Vicksburg groups; and the Miocene Catahoula formation and Lena and Carnahan Bayou members of the Fleming formation (Snead and McCulloh 1984). In addition, extensive Pleistocene and Holocene fluvial deposits occur along river floodplains and major stream drainages throughout the area.

The characteristic soils of the region are Ultisols, with most of these in the Udult suborder which is typical of gentle to moderate slopes on the coastal plain (Martin and Boyle 1993). In addition, Entisols (Fluvents) predominate along rivers and stream bottoms, and Alfisols, Vertisols, and Mollisols are found in some areas.

Angelina, Davy Crockett, Sabine and Sam Houston National Forests are located across ten landtype associations: the Lignitic Uplands, Redlands, Sparta Sandhills, Clayey Uplands, Sandy Uplands, Mayflower Uplands, Raven Hills, Big Thicket, San Jacinto Flatwoods, and Alluvial Floodplains and Terraces. Nine LTAs, including the High Terrace Rolling Uplands, Kisatchie Sandstone Hills, Undulating Clayey Uplands, Alluvial Floodplains and Terraces, Winn Rolling Uplands, Fort Polk Rolling Uplands, Caney Lakes Rolling Uplands, North Louisiana Clayey Hills, and Red River Alluvial Plain, occur on the Catahoula, Calcasieu, Kisatchie, Winn, and Caney Ranger Districts of Kisatchie National Forest. In addition, the Pineywoods transition Subsection and east Texas Clayey Uplands geology (232Fe.13) extend eastward across the northwest part of the Kisatchie District. The Wilcox geology of the Lignitic Uplands (231Ea.10) also covers a large area of northwestern Louisiana; however there it includes no national forest lands.

Figure 3.3 shows the location of landtype associations on Kisatchie National Forest and Figure 3.4 shows the LTAs on the National Forests in Texas and surrounding areas. Figure 3.5 shows the general locations of landtype associations throughout western Louisiana and how the Lignitic Uplands, Redlands, Clayey Uplands, and Mayflower Uplands of Texas interface with the Kisatchie LTAs. Descriptions of LTAs more detailed than those below may be found in the Revised Land and Resource Management Plan for the National Forests and Grasslands in Texas (USDA Forest Service 1996), and in the Draft Environmental Impact Statement for Kisatchie National Forest (USDA Forest Service 1997). LTAs are designated by both a name and a code. The code incorporates expressions representing the Subsection and higher hierarchical units containing the LTA, plus a final one or two digit number identifying the LTA. The final number

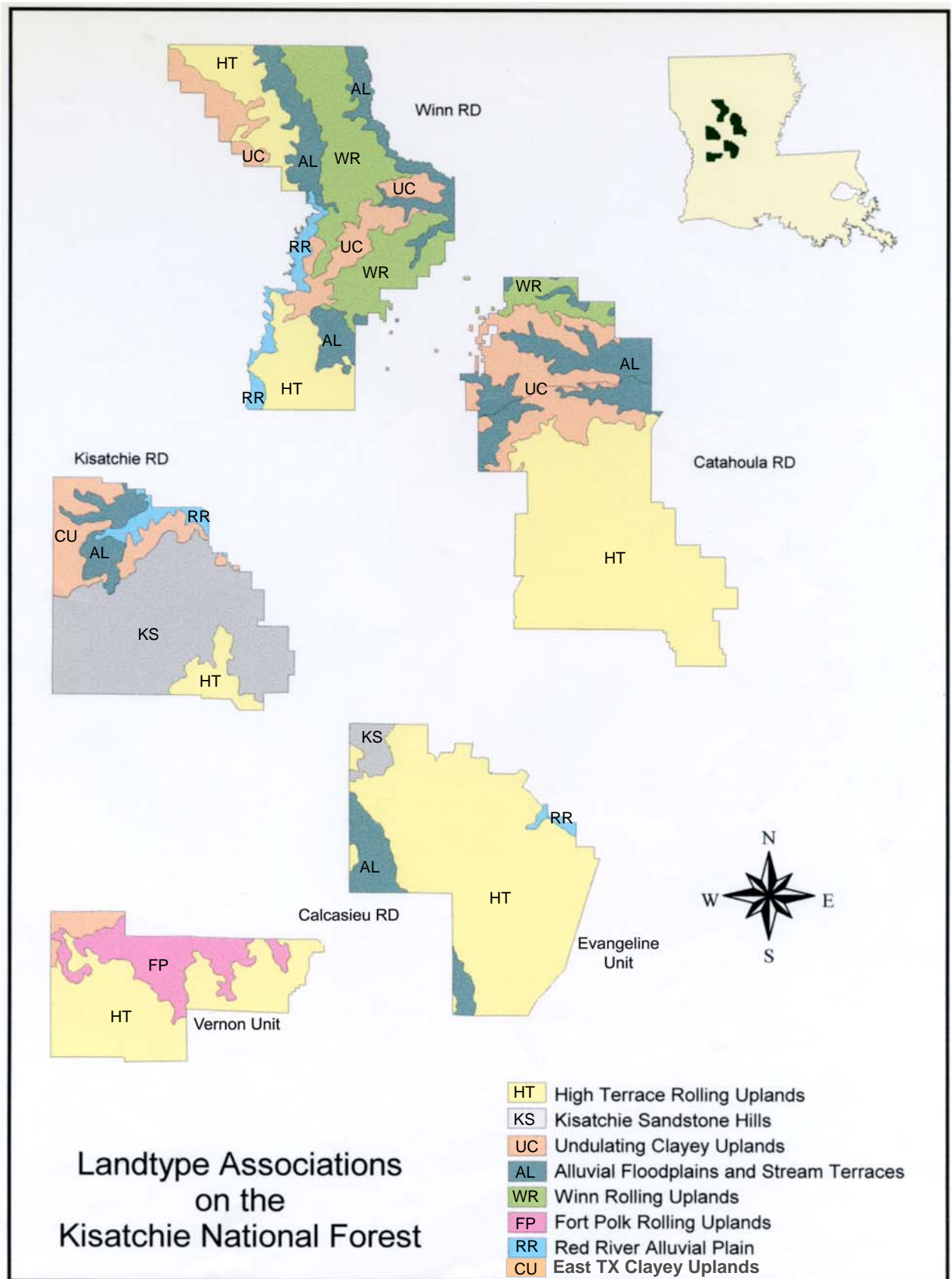


Figure 3.3 Landtype associations occurring within the boundaries of Kisatchie National Forest, Louisiana

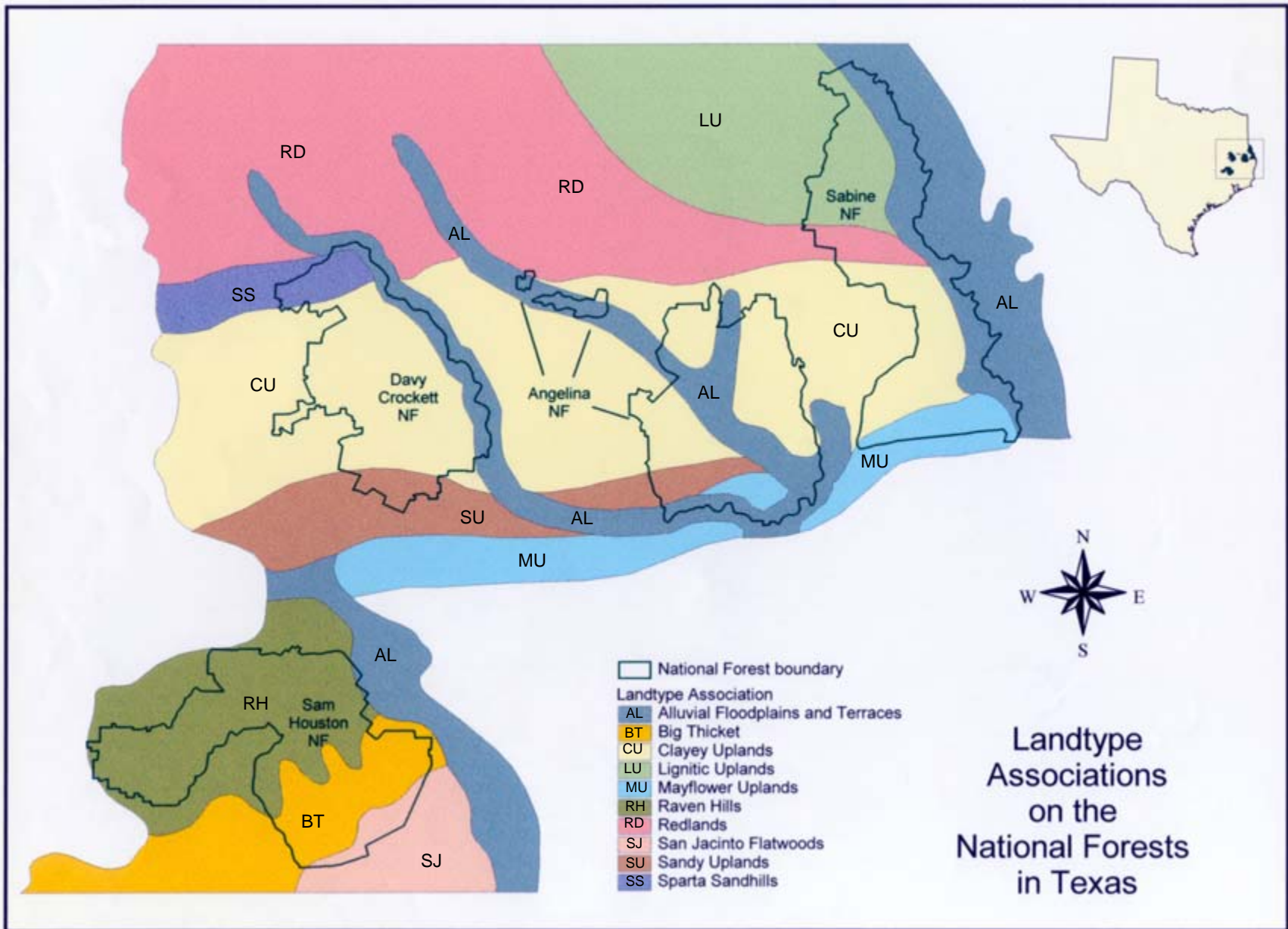


Figure 3.4. Landtype associations in or near the boundaries of the National Forests in Texas.

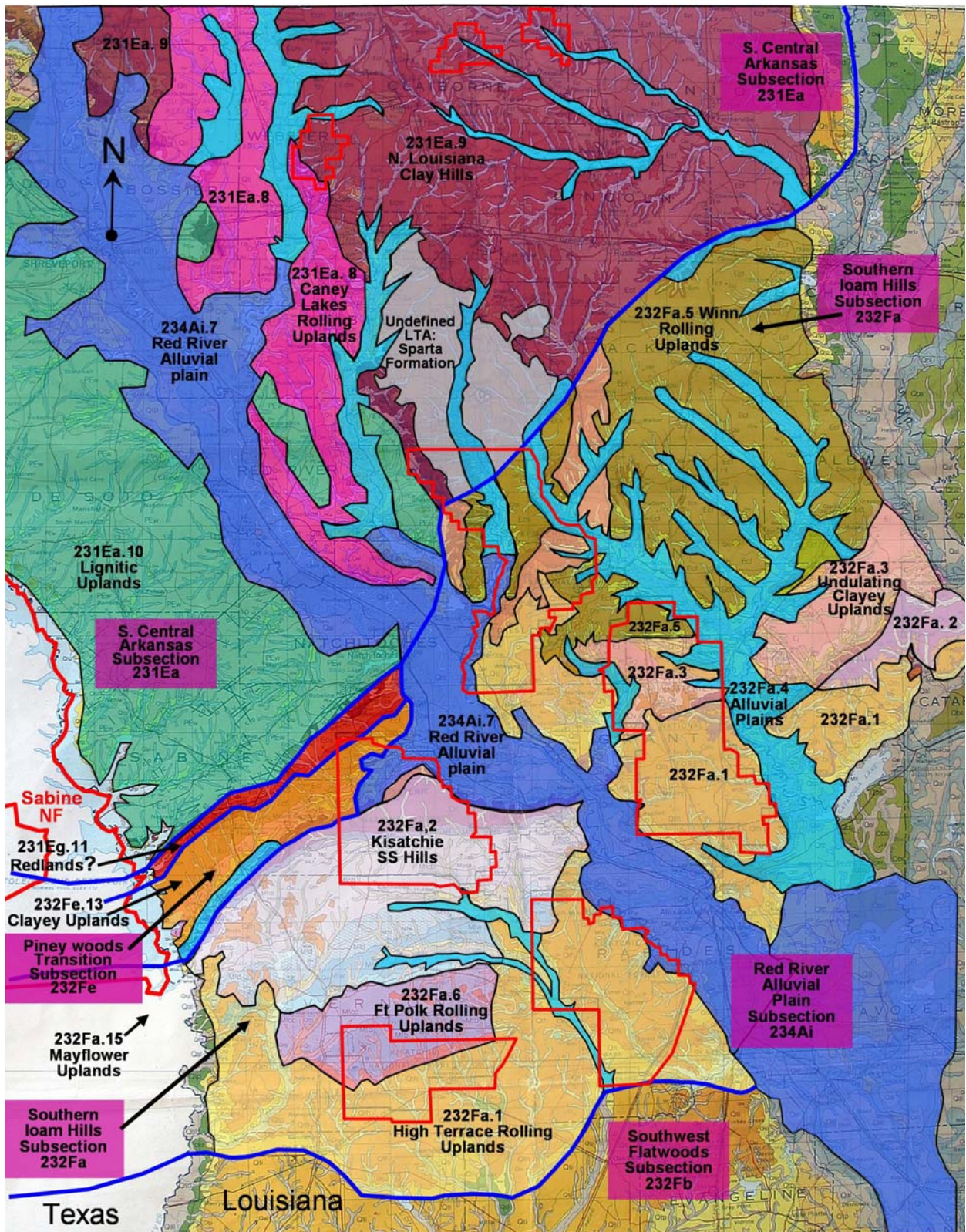


Figure 3.5 General location of Landtype associations occurring within Western Louisiana showing national forest boundaries (red— See Figure 3.3 for national forest unit names), and the interface between the Louisiana landtype associations and the Lignitic Uplands, Redlands, Clayey Uplands, and Mayflower Uplands which occur mainly in east Texas. LTA boundaries are based on surface geology as reported in Snead & McCulloh (1984) and may therefore differ in some cases from the geologic information in the Kisatchie National Forest database which forms the basis for Figure 3.3. Unlabeled light blue areas are Alluvial Floodplains & Terraces (232Fa.4 or 231Ea.4). Thick blue lines represent Subsection boundaries. The base map is modified from Snead & McCulloh (1984).

designating LTAs reflects an east-west numbering system previously in use on Kisatchie National Forest (See Appendix E for additional explanation of the coding system). LTAs are presented here and in subsequent chapters in order according to their sections and subsections in the classification hierarchy.

Caney Lakes Loamy Uplands Landtype Association (231Ea.8)

The Caney Lakes Loamy Uplands occur on Quaternary high (and intermediate) terrace deposits of sands, silts, clays, and gravel. The LTA lies mainly along the eastern side of the Red River in northern Louisiana, extending eastward to slightly east of Bayou Dorcheat. Geology and soils are very similar to those of the High Terrace Rolling Uplands (232Fa.1) of central Louisiana; however, the LTA is north of the natural range of longleaf pine. Presettlement upland vegetation consisted largely of shortleaf pine-oak-hickory communities although current stands are largely dominated by loblolly pine. The Caney Lakes Loamy Uplands include the southwestern one-third of the Caney Unit of the Caney Ranger District of Kisatchie National Forest. The town of Minden, LA, is largely located on this LTA.

North Louisiana Clayey Hills Landtype Association (231Ea.9)

The North Louisiana Clayey Hills occur on the Eocene-aged Cook Mountain and Cockfield formations in Northern Louisiana. These formations form a broad band across northern Louisiana extending from Bayou Dorcheat in the west nearly to the Ouachita River in the east. The Caney Ranger District, with the exception of the southwestern third of the Caney Unit, lies within this LTA. Soils formed in clayey and loamy sediments. Well-defined ridges and moderate side slopes characterize the rolling landscape. Natural upland vegetation consists of shortleaf pine-oak-hickory communities although most current stands are second-growth loblolly pine-sweetgum-oak mixed forests. LTA 232Ea.9 is outside of the natural range of longleaf pine. The towns of Homer and Ruston, LA, lie within this LTA.

Lignitic Uplands Landtype Association (231Ea.10)

The Lignitic Uplands occur on the Paleocene Wilcox group of formations, which consists of a heterogeneous series of sands and lignitic clays of continental and near-shore origin. Terrain is level to rolling. The dominant historical natural vegetation is believed to have been shortleaf pine-oak or loblolly pine-oak forest. Although natural fires were likely important historically in structuring upland vegetation, longleaf pine communities were probably restricted to isolated patches on dry uplands in this transitional LTA. The northern portion of Sabine National Forest is within this LTA. The Wilcox group continues northeast across the Sabine River and passes immediately to the north of the Kisatchie Ranger District. Across the Red River, it extends to the eastern boundary of the Winn Ranger District. The uplands surrounding Caddo Lake (including portions of Caddo Lake State Park) and much of the city of Shreveport, LA, also occur on this LTA.

Redlands Landtype Association (231Eg.11)

The Redlands occur on the Weches, Reklaw, Sparta, Carrizo, and Queen City formations. The Weches and Reklaw formations consist of rolling to steep hills on littoral and palustrine glauconite and clay, while areas of deep sand occur on Carrizo and Sparta geology. The dark red clay subsoils of several widespread soil series such as the Nacogdoches, Tarwick, and Alto, give this Landtype Association its name. Isolated rock outcrops and hilly terrain make this one of the more scenic LTAs in the West Gulf Coastal plain. Historically, shortleaf pine-oak communities occurred on many of the uplands and beech-white oak communities characterized the ravines and

lower slopes. There are also records of extensive upland hardwood (post oak and blackjack oak) communities, especially on clay soils. Rare herbaceous Weches glade communities occur in areas of thin soils where the Weches Formation is exposed. Small waterfalls and attractive ravines are found where streams flow across Weches and Reklaw sandstones or shales. The Sparta formation consists of continental and littoral fine-grained sand. Soils that formed on the Sparta typically have sandy topsoils with clayey subsoils and some areas probably supported longleaf pine communities in the past. The Carrizo and Queen City formations are gently rolling landscapes on continental sand deposits. Dry, excessively drained soils with oak woodlands on deep-sand, rare on most east Texas landscapes, are common on the Carrizo formation (for example, the Tonkawa Sands area north of Nacogdoches). Isolated dry longleaf pine-little bluestem communities occur on this formation in Sabine National Forest. While most of the Redlands occur outside of National Forest boundaries, public lands on this LTA include small portions of northern Angelina and central Sabine National Forests, as well as the upland portions of Stephen F. Austin Experimental Forest and adjacent Alazan Bayou Wildlife Management Area. A thin band of the Sparta Formation along with the Cane River formation (equivalent to the Weches and Reklaw formations) extends across the Sabine River into Louisiana (Figure 3.5). Its LTA designation is questionable because the Sand Hills Subsection narrows to a point in eastern Sabine National Forest and it is uncertain if it should be mapped eastward across the Sabine River. The city of Nacogdoches, Texas lies within the Redlands.

Sparta Sandhills Landtype Association (231Eg.12)

The Sparta Sandhills LTA occur on the Sparta formation west of the Neches River (areas to the east are included in the Redlands). The formation consists of continental and littoral fine-grained sand, commonly with a clayey subsoil, forming uneven rounded slopes. Vegetation is currently dominated by shortleaf pine-oak or loblolly pine-oak communities and the LTA is largely north and west of the range of longleaf pine, although isolated sites containing longleaf pine have been noted. Most of the Sparta Sandhills lies outside national forest lands, with the exception of small portions of northern Davy Crockett National Forest. The Sparta Sandhills occur near the western edge of the forests of the West Gulf Coastal Plain: The post oak savannas and Blackland prairies of the Oak woods and Prairies Section of the Prairie Parkland Province (255C) lie immediately across the Trinity River.

Raven Hills Landtype Association (231Eh.16)

The Raven Hills occur on the gently rolling to undulating terrain of the Fleming and Willis formations. The Fleming formation consists of Miocene calcareous clays, silt, and sandstone. The younger Willis formation occurs as topographically higher patches overlying Fleming clays and consists mainly of Pleistocene fluvial sand. Soils consist of loam to loamy sand over clay subsoil, and calcareous clay outcrops. On the Fleming formation, mixed hardwood-shortleaf-loblolly pine forests are dominant and small blackland prairie openings with herbaceous little bluestem-Indiangrass communities occur on outcrops of calcareous clays. The Willis sand-caps typically support shortleaf pine-post oak forests. The Raven Hills occupy most of the northern and western portions of Sam Houston National Forest. The Raven Hills mark the western edge of the forests of the West Gulf Coastal Plain—and of the entire southeastern US; the post oak savannas and Blackland prairies of the Oak woods and Prairies Section of the Prairie Parkland Province (255C) lie immediately westward.

Big Thicket Landtype Association (231Eh.17)

The Big Thicket LTA is found on broad, gentle slopes and well-defined drainages associated with the Willis formation. Within this LTA, the Willis formation occurs as a continuous band of Pliocene to upper Pleistocene fluvial sand and gravel. Soils generally consist of sandy loam to

loamy sand surface soil over sandy clay loam subsoil. Characteristic vegetation includes shortleaf pine-oak and loblolly pine-oak forests on the uplands, hardwood forest on lower slopes and minor stream bottoms, and sweetbay magnolia forested seep communities in groundwater seepage areas. This LTA occupies most of the southeastern portion of Sam Houston National Forest.

San Jacinto Flatwoods Landtype Association (231Ei.18)

The San Jacinto Flatwoods occur on broad, nearly featureless plains, shallow depressions, pimple mounds, and poorly defined drainages associated with the Lissie formation. The Lissie formation consists of Pleistocene flood deposits, fine textured sands, and non-fossilized organic detritus and plant remains. Soils are variably silty, loamy, or sandy, moderately well drained to poorly drained, and often have a seasonally high water table. Characteristic vegetation includes water oak-willow oak-blackgum forests on flat plains and loblolly pine-oak forests on slightly higher topographic positions. Wetland longleaf pine savannas which are known from similar settings to the east, may have occurred on this LTA historically but if so, none remain today. This LTA occurs on the southeastern edge of Sam Houston National Forest.

High Terrace Rolling Uplands Landtype Association (232Fa.1)

Rolling uplands and gently undulating upland flats dissected by narrow intermittent and perennial drainages characterize the High Terrace Rolling Uplands. They occur on Quaternary high terrace deposits of sands, silts, gravel, and clay associated with the Red River complex. Most soils are loamy with occasional areas of arenic soils. Longleaf pine-little bluestem communities dominated the presettlement uplands and were maintained by frequent natural growing season fires. This LTA still supports some of the most extensive remaining longleaf pine communities on the West Gulf Coastal Plain. Herb-dominated hillside seeps (bogs) are occasionally embedded in these longleaf pine communities. Mixed pine-broadleaf-deciduous forests are typical of the steeper lower slopes and the valleys of small and medium-sized streams. The southern edge of this LTA is an area of minimal topographic relief transitional to the Southwest flatwoods subsection (232 Fb) where limited areas of wetland pine savannas or "pine flatwoods" are found. The High Terrace Rolling Uplands include more Kisatchie National Forest lands than any other LTA, covering most of the Evangeline Unit of the Calcasieu Ranger District, the southern half of the Vernon Unit of the Calcasieu District, the southern four-fifths of the Catahoula District, and portions of the southern Winn District. The northwest corner of the Winn Ranger District transitions into the South Central Arkansas Subsection where, according to the Kisatchie National forest database (but shown as the Eocene Sparta Formation on the geological map of Snead and McCulloh 1984), a small area of High Terrace geology would be classified as LTA 231Ea.8-Caney Lakes Rolling Uplands.

Kisatchie Sandstone Hills Landtype Association (232Fa.2)

The Kisatchie Sandstone Hills occur on the Catahoula formation, which consists of sandstones, weathered beds of volcanic tuffs, and sandy clay beds. Also present are the Carnahan Bayou and Lena members of the Fleming formation, which contain sandstone, siltstone, and clay. This LTA is essentially an eastward extension of the Mayflower Uplands (232Fa.15). However, the extensive sand caps that occur on the Mayflower Uplands are less common and the terrain is steeper with more rock and Kisatchie clay outcrops. The land is hilly, with steep side slopes and narrow ridgetops. Steep topography makes the Kisatchie Sandstone Hills one of the region's more scenic areas. Presettlement vegetation on uplands included extensive longleaf pine-little bluestem woodlands maintained by natural growing season fires. Good examples remain on Kisatchie National Forest's Kisatchie Ranger District. Herb-dominated

hillside seeps (bogs) are occasionally embedded in these longleaf pine communities. Unusual glade communities of stunted longleaf pine on sandstone outcrops covered by thin clay also occur. Numerous small and medium-sized streams dissect the landscape. Mixed pine-broadleaf deciduous forests occupy the valleys of these streams and the adjacent steep lower slopes. On Kisatchie National Forest, this LTA occupies most of the Kisatchie Ranger District and a small area in the northwestern corner of the Evangeline Unit of the Calcasieu Ranger District.

Undulating Clayey Uplands Landtype Association (232Fa.3)

The Undulating Clayey Uplands occur on Tertiary (largely Eocene) surface geology primarily associated with the Vicksburg, Jackson, Cane River, and Cook Mountain formations. These formations generally consist of lignitic, sideritic, or glauconitic clays. Undulating uplands with gentle side slopes characterize the landscape. Presettlement upland vegetation was largely dominated by shortleaf pine-oak-hickory communities. Despite the proximity of this LTA to longleaf pine-dominated landscapes on the adjacent Winn Rolling Uplands (LTA 232Fa.5), relatively high soil nutrients, high plant-available moisture, and clayey, slowly permeable soils favored shortleaf pine and hardwoods over longleaf pine; however, natural fires were still important in structuring historical vegetation. The Tertiary uplands of west-central Louisiana are geologically complex; areas of this LTA often occur within close proximity to the Winn Rolling Uplands (LTA 232Fa.5), and Pleistocene High Terrace Uplands (LTA 232Fa.1) The Undulating Clayey Uplands occur on the Winn Ranger District in the center and along the northwestern edge of the District and on much of the northern third of the Catahoula District as well as on the extreme northwestern corner of the Vernon Unit of the Calcasieu District. Cook Mountain, Jackson, and Vicksburg geology along with the Cockfield formation also occurs on the northwestern corner of the Kisatchie District; however, here it occurs in the Pineywoods Transition Subsection (232Fe). Since this geology is equivalent to that of the east Texas Clayey Uplands to the west, this area would be most appropriately classified as Clayey Uplands (232Fe.13) even though it has been traditionally considered part of the Undulating Clayey uplands (see Figure 3.5) The northwest corner of the Winn District is on Cane River geology but is in the South Central Arkansas Subsection. This area, with similar soils, landform, and vegetation to the main LTA could be classified as LTA 231Ea.3 (Areas to the north with Cook Mountain and Cockfield geology belong to LTA 231Ea.9, the North Louisiana Clay Hills).

Winn Rolling Uplands Landtype Association (232Fa.5)

The Winn Rolling Uplands LTA is found on the Eocene-aged Cockfield and Sparta formations which consists of lignitic clays, silts, and sands. The landscape consists of undulating uplands with well-defined ridges and gentle side slopes. Soils are relatively low in nutrients, moderately permeable, and have moderate to high plant-available water. Presettlement uplands were largely dominated by longleaf pine communities which were maintained by frequent, low-intensity wildfires. The Tertiary uplands of west-central Louisiana are geologically complex; areas of Winn Rolling Uplands often occur within close proximity of the Undulating Clayey Uplands (LTA 232Fa.3), and Pleistocene High Terrace Uplands (LTA 232Fa.1). The Winn Rolling Uplands occur on much of the Winn Ranger District and along the northern edge of the Catahoula Ranger District of Kisatchie National Forest. The northwest corner of the Winn Ranger District is in the South Central Arkansas Subsection where this LTA, although with similar soils, landform, and vegetation to the main part could be designated as LTA 231Ea.5 since a separate LTA in that Subsection has not yet been defined for the Sparta Formation (See Figure 3.5). The Cockfield Formation (=Texas' Yegua formation), along with Cook Mountain, Jackson, and Vicksburg geology also occurs on the northwestern corner of the Kisatchie Ranger District; however, here it occurs in the Pineywoods Transition Subsection (232Fe). Since this geology is equivalent to that of the east Texas Clayey Uplands to the west, this area would be most appropriately classified as Clayey Uplands (232Fe.13).

Fort Polk Rolling Uplands Landtype Association (232Fa.6)

The Fort Polk Rolling Uplands occur mainly on the Blounts Creek member of the Fleming formation. These Tertiary (Miocene and Pliocene) deposits consist of silts, siltstone, and silty clays with extensive beds of sand. This LTA is similar to the High Terrace Rolling Uplands (LTA232Fa.1), although there are more areas with sandy soils and slopes tend to be steeper. As with the High Terrace Rolling Uplands, longleaf pine-little bluestem communities dominated the presettlement uplands and were maintained by frequent natural fires, often in the growing season. The LTA covers the northern portion of the Vernon Unit of the Calcasieu Ranger District of Kisatchie National Forest. The national forest lands of LTA 232Fa.6, most of which are in the military-use portion of the Vernon Unit, contain extensive longleaf pine communities on a scale seldom seen today.

Mayflower Uplands Landtype Association (232Fa.15)

The Mayflower Uplands are found in east Texas on the Miocene Catahoula formation, which consists of sandstones, weathered beds of volcanic tuffs, and sandy clays. Siltstone and mudstone are also common. Other geologic formations associated with this LTA include the Whitsett, Nash Creek, and Willis. Willis sand often forms a cap over the Catahoula formation. The landscape consists of gently rolling to steep hills, and soils are commonly loams or deep sands. Longleaf pine-little bluestem communities dominated the presettlement uplands and were maintained by natural growing season fires. Catahoula barrens, characterized by glades of stunted oaks and longleaf pine on sandstone and clay outcrops, are found within this LTA. The Mayflower Uplands are also noted for the occurrence of herb-dominated hillside seeps (bogs). Most of the Mayflower Uplands occur to the south of national forest lands, but this LTA is found on southern portions of Sabine and Angelina National Forests. The Mayflower Uplands may be considered a westward extension of the Kisatchie Sandstone Hills (232Fa.2), although sandy soils (Willis sand-caps) are more extensive in the Mayflower uplands.

Clayey Uplands Landtype Association (232Fe.13, 231Ef.13)

The Clayey Uplands LTA occurs on the Eocene Cook Mountain, Yegua, Yazoo, Moodys Branch, and Caddell formations. The Cook Mountain formation consists of marine and littoral clay and glauconite. The Yegua formation consists of continental and palustrine sand and sandy clay while the Yazoo, Moodys Branch, and Caddell formations consist of marine clay and glauconitic sands and marl. The landscape is gently rolling and soils often consist of loamy or sandy topsoils over clayey sub-layers. Clayey soils with only a few centimeters of loamy topsoil are common on the Cook Mountain formation. Presettlement vegetation was probably variable and included loblolly pine-oak, shortleaf pine-oak, and longleaf pine-little bluestem communities on uplands and beech-white oak communities on lower slopes and small stream bottoms. While the presettlement extent of longleaf pine communities in the Clayey Uplands has not yet been fully determined, relict longleaf pines and historical accounts suggest that longleaf pine was a dominant species, especially on the eastern portion of the LTA. Regardless of community type, however, natural fires would have been important in structuring most upland plant communities.

This LTA, one of the most extensive on the National Forests in Texas, includes the southern portion of Sabine, the northern three-quarters of Angelina, and much of Davy Crockett National Forests. A thin band of Clayey Uplands geology (mostly Cook Mountain and Cockfield=Yegua)--and the Pineywoods Transition Subsection--232Fe) extends eastward across the Sabine River into Louisiana where it crosses the northeast corner of the Kisatchie Ranger District of Kisatchie National Forest and terminates at the Red River south of Natchitoches, LA (See Figure 3.5).

The Clayey Uplands extend westward into western Davy Crockett National Forest and the Piney Woods Transition Subsection of the Southeastern Mixed Forest as the Western Clayey Uplands (231Ef.13) where they occur mainly on the Cook Mountain, Yegua, and Caddell formations and where geology and modern plant communities are very similar to the main portion

of the LTA (the principal difference being that longleaf pine was historically less common than for 232Fe.13). The Western Clayey Uplands are part of the western boundary of the forests of both the West Gulf Coastal Plain and the entire southeastern US: Immediately across the Trinity River (and the Trinity Alluvial Valley Subsection--255Ce), the landscape becomes more open and pines virtually disappear as one enters the post oak savannas and blackland prairies of the Oak Woods and Prairies Section of the Prairie Parkland Province (255C).

Sandy Uplands Landtype Association (232Fe.14)

The Sandy Uplands occur on the Eocene Manning and Wellborn formations. These formations consist of littoral sands and sandy clays on undulating to moderately sloping landscapes. This LTA is transitional between the Clayey Uplands to the north and the Mayflower Uplands to the south. Soils consist of loamy, somewhat poorly to moderately well drained surface soils over clay to sandy clay loam subsoils. The presettlement forest vegetation probably was dominated by longleaf pine woodland, but it contained more inclusions of other forest types than the adjacent Mayflower Uplands (232Fa.15). The LTA occupies a narrow band north of the Whitsett formation across the southern portions of the Angelina and Davy Crockett National Forests. Accounts of historical vegetation suggest the presence of numerous saline prairie openings on this LTA although there are currently no documented occurrences of such sites on national forest lands.

Red River Alluvial Plain Landtype Association (234Ai.7)

The Red River Alluvial Plain is associated with the lower (Louisiana) reaches of the Red River--by far the largest river in the region. It occurs on Holocene silt, clay, sand and gravel deposited on broad natural levees and on alluvial plains. Soils are well drained to somewhat poorly drained on levees, somewhat poorly to poorly drained on broad level flats and very poorly drained on backswamps and in old stream channels. Hydrology is the overriding environmental factor on this landscape; It is essential that the reader consult the hydrologic regimes on page 7-3 when reading descriptions or identifying phases for this landtype association.

Human activity during the past 150 years has greatly modified the landscape. The Red River Raft was a natural log jam that blocked much of the main channel of the river at the time of settlement. During this period, much of the river's flow occurred along outlet bayous and distributaries and large lakes formed as water backed up tributaries. Removal of the raft in the late 1800's drained most of these lakes. One such lake, Ferry or Caddo Lake located along the Texas-Louisiana boarder east of Shreveport, survived and is presently artificially maintained by a dam at Mooringsport, Louisiana (Barrett 1995, Van Kley & Hine 1998, Diggs et al. 2006). Construction of an extensive system of flood control levees and blockage of the river's distributaries and outlet bayous isolated the river from much of its floodplain and forced it to enlarge and down-cut its main channel so that the base level of the river is lower than formerly (Kerr et al. 1980). As a result of these changes, the fundamental ecological factors that determine vegetation on the modern landscape differ from those of presettlement times.

Presettlement vegetation consisted of baldcypress swamps in low areas and bottomland hardwood communities with species such as swamp chestnut oak, Shumard oak, cherrybark oak, green ash, sugarberry, pecan, and American elm on floodplain flats. Few traces remain of natural vegetation on the higher natural levees and broad, gentle levee slopes, but pecan and sugarberry were doubtless important components of those communities as they are in these places today.

The Red River Alluvial Plain boasts some of the best agricultural soils in Louisiana. Although it bisects Kisatchie National Forest, few National Forest lands are actually located on this Landtype Association. Nonetheless, lands, largely confined to the lower, wetter landtype phases, occur on four Ranger districts including Cunningham Brake on the Kisatchie Ranger District, Bayou Beouf Natural Research Area on the Calcasieu Ranger District, several small tracts on the Catahoula Ranger District, and sites along the eastern edge of the Winn Ranger District.

Alluvial Floodplain and Terrace Landtype Associations (23xxx.4)

These landtype associations represent the broad, nearly level floodplains and associated terraces of the numerous rivers and larger streams (excluding the Red River) that pass through the West Gulf Coastal Plain landscape. Soils developed in Holocene and Pleistocene alluvial clays, loams, and sands. Fluvaquents, Udifluvents and other alluvial soils are common on the active floodplains of these rivers. Similar floodplain Landtype Associations (231Ea.4, 231Ed.4, 232Ef.4, 231Eg.4, 231Eh.4, 231Ei.4, 232Ej.4, 232.Fa.4, 232.Fc.4, 232.Fd.4, and 232.Fe.4) lie within several Subsections and on several watersheds. They are considered together in this handbook. Major floodplains included in these LTAs are those of the Trinity River, Neches River, Angelina River, Sabine River, Calcasieu River, Dugdemona River, Kisatchie Bayou, Latt Creek, Little River, McKinny Creek, Nantachie Creek, Saline Bayou, and Cypress Bayou (associated with Caddo Lake in northeast Texas). The late Pleistocene Deweyville formation is also included.

Riparian processes such as flooding, erosion, deposition, down-cutting, and shifting of the watercourse have resulted in a rich array of landforms including terraces, natural levees, meander scrolls, point-bar deposits, oxbows, and backswamps on most floodplains. Several types of bottomland hardwood and swamp forests occur on these landforms, often in close proximity to each other due to subtle topographic variations and the substantial differences in the flooding regime that result from even small differences in elevation. Because hydrology so strongly affects bottomland vegetation, it is essential that the reader consult the hydrologic regimes on Pages 7-3 when reading descriptions or identifying landtype phases for these landtype associations. Throughout most of the range, important trees include water oak, willow oak, sweetgum, swamp chestnut oak, laurel oak, overcup oak, baldcypress, and water tupelo. Cedar elm and sugarberry become important in the western-most floodplains, for example 231Eh.4.

CHAPTER 4

HISTORICAL VEGETATION OF THE WEST GULF COASTAL PLAIN

INTRODUCTION

There is great scientific and conservation interest in historical vegetation. Land-use history is one of the pre-eminent factors determining the current distribution of plant communities across the landscape (Glitzenstein et al. 1990). Understanding the effects of historical changes on vegetation is a first step toward understanding and untangling the complex patterns of climate, soils, physiography, and disturbance on modern landscapes as well as predicting future changes due to management trends, climate change, or exotic species introductions.

Sources of Historic Evidence

Few published studies have quantitatively reconstructed historic vegetation within the West Gulf Coastal Plain due, in part, to inherent limitations of available historical data and vegetation reconstruction methodologies. Much of what is known has been interpreted from early published narrative descriptions in combination with detailed knowledge of existing relationships between vegetation, soils, and physiography (Brown 1944, Martin and Smith 1991, 1993, Grace and Smith 1995, Williams and Smith 1995), reconstructed from witness tree data (Delcourt 1976, Schafale and Harcombe 1983), or quantified using other documentary information sources (Evans 1997). Given the relatively small body of existing work there is a clear need for further study throughout the region.

A Changed and Changing Landscape

Although increasing evidence suggests that second growth-stands and old-growth remnants do not necessarily represent original or "presettlement" vegetation, most of the current natural vegetation types in the region are believed to have been present in some form on the historical landscape. However, the species composition of some of these vegetation types may have changed. For example, remnant prairies surviving in north west and central Louisiana apparently lack many of the species that once characterized these communities (MacRoberts and MacRoberts (1997a) and many bottomland hardwood forest communities have been altered by timber cutting and modification of hydrologic regimes due to reservoir construction, channel straightening, and bank stabilization (Frye 1987).

More striking however, are changes in the relative extent and distribution of particular vegetation types that have occurred. Among the most thoroughly documented changes is the dramatic decrease in aerial extent and distribution of longleaf pine communities the concurrent increase in mixed loblolly pine-hardwood forest acreage (Frost 1993, Landers et al. 1995, Outcalt 1997). Also well documented is the large-scale conversion of bottomland forests to other land uses (Frye 1987, Neal and Jemison 1990, Leipnik et al 1997). Recession of pine-oak forests at the margin of the region has also been noted (Wilson 1990).

HISTORICAL VEGETATION PATTERNS

Forested and woodland habitats overwhelmingly dominated the pre-European settlement to early settlement (c. 1870) landscape of the West Gulf Coastal Plain. The major forested habitats of the region included upland longleaf pine woodland, wet pine savanna (flatwoods), shortleaf pine-oak-

hickory forest, mixed hardwood-loblolly pine forest, and riparian or bottomland forest (Martin and Smith 1991, 1993, Grace and Smith 1995, Williams and Smith 1995, Evans 1997). Distribution of these forests and other community types, and the structural and compositional variations within them, were closely correlated with surface geology, soil conditions, landform, drainage, and relative exposure to natural disturbances, particularly fire and windstorms.

Longleaf Pine Communities

Longleaf pine communities in the West Gulf Coastal Plain formed the western terminus of “an unbroken forest of the same general character” which extended eastward to Virginia (Bray 1906). It has been estimated that as much as 92 million acres of the southeastern United States formerly supported longleaf pine communities (Frost 1993). Today, longleaf pine is a distinctive, but rarely dominant, element of vegetation in the West Gulf Coastal Plain, dominating stands only on roughly 3 percent of its former range (Frost 1993, Outcalt 1997).

Longleaf pine was among the most valuable economic resources in the region at the beginning of the 20th century and early descriptions documented the commercial importance of the species. For example, Bailey (1905) indicated that in Texas longleaf pine formed “miles of dense forest of the cleanest, most uniform, and symmetrical body of timber to be found on the continent.” Intensive logging began around 1880 as railroads and other logging technology moved into the region from the northern states. By the early 1900's, the majority of longleaf pine forests had been cut (Foster et al. 1917).

Longleaf pine communities were prevalent on presettlement uplands over much of the Coastal Plains and Flatwoods, Western Gulf Section (232F), diminishing toward the section's northern and western boundary (Figure 5.2). Longleaf pine communities were more limited on the Middle Coastal Plains, Western Section (231E), mainly occurring along its boundary with 232F. Wet longleaf pine savannas or flatwoods with a ground layer of grasses, sedges, and wetland forbs occurred on poorly-drained, nearly level topography covering large portions of the Southwest Flatwoods Subsection (232Fb) and limited areas in the southern part of the Southern Loam Hills Subsection (232Fa). Longleaf pine woodlands with a diverse ground layer of grasses, composites, and legumes were prevalent north of the wet pine savannas on drier, more topographically variable uplands in the Southern Loam Hills Subsection (232Fa) and in portions of the Pineywoods Transition Subsection (232Fe). Frequent surface fires burned through the grasses and fallen pine needles with an estimated return interval of 2 to 8 years depending on soil and fuel conditions (Christensen 1981). This controlled competing woody plants and maintained the open structure of these woodlands and savannas. Fires originated from aboriginal activity and from lightning strikes, often in the spring and summer. Early surveys of virgin forests in the region indicate that these communities were prevailingly uneven-aged, with the oldest and largest longleaf pines exceeding 400 years in age and with a diameter at breast height (dbh) to about 1 meter (Mohr 1896, Schwarz 1907, Chapman 1909).

Limited historical data make it difficult to assess the extent to which specific areas supported pure stands of longleaf pine as opposed to other forest types (usually mixed pines and hardwoods). No single publication appears to accurately portray the historical distribution of longleaf pine, particularly in transitional areas. Even maps produced during the original USDA forest inventory (Cruikshank and Eldredge 1939) have been shown to be incomplete (Evans 1997). Although the Kisatchie Wold, which includes the Catahoula geologic formation, represents the present-day inland limit of fairly continuous and widespread longleaf pine communities (Bridges and Orzell 1989), there is evidence for extensive longleaf pine acreage much further north than this boundary in both Louisiana (Lockett 1874, Martin and Smith 1991) and Texas (Evans 1997). For example, Sargent (1884) estimated almost 2 billion board feet of longleaf pine timber in Shelby County, Texas, an area where longleaf pine is currently uncommon.

The historical extent, if any, of longleaf pine in closed-canopied forests is unknown. However, mixed longleaf pine communities occurred historically on limited portions of the Piney Woods Transition Subsection (232Fe), and these communities may have been more closed-canopied than the woodlands and savannas to the south. Longleaf pine communities became increasingly fragmented and more often mixed with other species along the northern boundary of Subsection 232Fe.

Shortleaf Pine Communities

Shortleaf pine formerly occupied a greater area than either longleaf pine or loblolly pine in the West Gulf Coastal Plain but was much less extensive in Louisiana than in Texas (Mohr 1896). Shortleaf pine typically occurred with a suite of upland hardwood species (especially dry-site oaks and hickories) in both closed-canopy forests and open woodlands. These communities are often referred to as shortleaf pine-oak-hickory (Martin and Smith 1991, 1993, Grace and Smith 1995, Williams and Smith 1995). Gow (1904) referred to these forests as “high hammocks” and noted the “appearance differs totally from [longleaf] pine uplands, characterized by dense thickets of shortleaf pine seedlings, often stunted by shade of hardwoods under which they grow”. These forests were predominantly uneven-aged, with the oldest and largest shortleaf pines more than 200 years old and approaching 0.9 meter in diameter and the oldest and largest hardwoods probably over 200 years old and approaching a diameter of 1 meter. The occurrence of species-rich understories in northern Louisiana shortleaf pine woodlands may be indicative of the historical composition of woodland understories in the region (Carr et al. unpublished manuscript). Most virgin shortleaf pine forests in the region were logged by the early 1900's (Bray 1906, Foster et al 1917). Plantation forestry and fire suppression have resulted in the replacement of shortleaf pine with loblolly pine over much of the modern landscape.

Shortleaf pine-dominated woodlands were prevalent on uplands on the Middle Coastal Plains, Western Section (231E), extending northward into Arkansas and westward to the Oak Woods and Prairies Section (255C). Shortleaf pine communities were more limited in the longleaf pine-dominated Coastal Plains and Flatwoods Section (232F) and were often restricted to clayey uplands with shrink-swell soil properties. On both the Middle Coastal Plains and Coastal Plains and Flatwoods, closed-canopy forests with shortleaf pine were likely present in topographically isolated areas that experienced slightly lower fire frequency than adjacent uplands, as well as uplands with calcareous soil properties.

While shortleaf pine usually occurred in mixed stands, some evidence points to the limited existence of pure stands. Mohr (1896) described pure stands “extending over many hundreds of square miles with but little interruption”. Bray's (1906) description clearly contrasted logged areas where, “the shortleaf pine forms compact forests over many hundreds of square miles” with “the vastly greater area where pine is more or less diluted by hardwoods.” Similarly, Matoon (1915) noted the extensive occurrence of pure shortleaf pine on approximately 20 to 40 percent of its former range, although he also noted that a considerable portion of the pure stands of shortleaf pine was found in old fields formerly under cultivation.

Mixed Longleaf Pine-Shortleaf Pine Communities

Mixed longleaf pine forest types have usually been described at or near the range limits of longleaf pine (Loughbridge 1880, Cruikshank and Eldredge 1939, Frost 1993). For example, Mohr (1896) noted that forests of longleaf pine “toward their northern limit...gradually pass into a mixed growth of deciduous trees and shortleaf pine”. Evans (1997) documented historical evidence for a mixed longleaf pine-shortleaf pine community in eastern Texas within the interior longleaf range as mapped by Frost (1993), not on the range periphery. This supports the observation of Ware et al. (1993) that longleaf pine occurred in mixed stands prior to the logging era. Evans (1997) suggested that the occurrence of mixed longleaf pine forests was related more to local environmental factors or disturbance conditions than to broad climatic factors, or that the transition zone was broader than previously believed. However, Turner (1999) found through analysis of ecological data from geographically dispersed sites in eastern Texas that differences in longleaf pine and mixed longleaf pine-shortleaf pine communities are most highly correlated with regional climatic gradients on otherwise environmentally similar sites. This is consistent with Mohr's observation above concerning the gradual mixing of longleaf pine with shortleaf pine and hardwoods near its northern range limit.

Herbaceous seeps

Most examples of herbaceous seeps, also known as “bogs”, are small inclusionary communities embedded in longleaf pine-dominated landscapes within the Coastal Plains and Flatwoods, Western Section (232F). Herbaceous seeps lack a significant woody overstory, and they contain a diverse assemblage of herbaceous species including insectivorous pitcher plants (Nixon and Ward 1986, MacRoberts and MacRoberts 1990, 1991, 1992b, 1993b). Most herbaceous seeps occupied permanently flowing hillside seepage areas in habitats higher on the landscape but hydrologically similar to those of forested seeps. Frequent fire was essential to inhibit growth of trees and shrubs and maintain the floristically rich ground layer. High quality examples of this community type currently occur in Angelina National Forest in Texas and Kisatchie and National Forest in Louisiana.

Prairie Communities

Prairies, barrens, glades, and other small, soil-related, non-forested openings were widely scattered across the West Gulf Coastal Plain. This is evidenced, in part, by the many place names recording these unique areas, as well as some specific references to sites in historical literature (Jordan 1973, MacRoberts and MacRoberts 1997b). In addition, openings of various sizes were widely associated with longleaf pine communities (Chapman 1909). Several distinctive types of prairie openings can be inferred from soil-vegetation relationships and historical data.

Calcareous prairies were restricted to shrink-swell clay soils with high pH. MacRoberts and MacRoberts 1995, 1996). Calcareous prairies may be more likely to persist in an open condition than other types of herbaceous openings, but considerable declines have occurred through time (MacRoberts and MacRoberts 1997a, 1997b, 1997c). Examples are known to exist in Polk County, Texas and along the western boundary of the region, primarily in Walker County, Texas, almost all of which are in degraded condition. High quality examples are known from the Keiffer Prairie complex on Kisatchie National Forest and from Barksdale Air Force Base in northern Louisiana (Smith et al. 1989).

Saline prairies were non-forested openings that were probably maintained by the high salt content of the soil and by frequent fires. Historical occurrences have been reconstructed from General Land Office records in Angelina County, Texas and are also reported from Trinity County, Texas (U.S. Forest Service unpublished data). Loughbridge (1880) noted that a several hundred acre “saline” occurred in Van Zandt County, Texas as well as smaller examples in Smith County, Texas. Saline prairies also occurred in central and northwest Louisiana in Winn, Natchitoches, Red River, Caddo, and DeSoto Parishes (Louisiana Natural Heritage Program unpublished data). Distinct from saline prairies, salt flat communities occurred in the floodplains of certain rivers and small streams. An extant example is Drake’s Salt Flat on the Winn Ranger District (Louisiana Natural Heritage Program unpublished data).

Catahoula barrens are prairie openings associated with the Catahoula geologic formation in Texas. They contain a number of rare or disjunct prairie species in the ground layer (Marietta and Nixon 1984). Similar to the barrens and also associated with the Catahoula formation are the more rocky Kisatchie sandstone glades, which occur in Louisiana (MacRoberts and MacRoberts 1992a, 1993a, 1993c). Catahoula barrens may have occurred historically in Texas from the Sabine River west to Walker County.

Weches glades are calcareous prairie openings that occurred on the Weches geologic formation in eastern Texas. Their historic distribution is unknown, but they are currently found in San Augustine, Sabine, and Nacogdoches counties. They occur on rocky outcrops of the Weches formation, which consists of marine glauconitic clays and marl. The glauconite is impermeable to water, making soils wet and seepy for part of the year, but hard and dry during the summer. Weches glade communities support a unique herbaceous flora containing several specialized and endemic plants (George and Nixon 1990). Few intact Weches glades remain, and several have recently been lost due to land conversion and mining of glauconite for road surface material (The Nature Conservancy unpublished data).

Loughbridge (1880) described sandy prairies in Cherokee County, Texas. The name “brushy prairies” was also used in reference to the scrubby oak growth which apparently resulted from diminished burning of these communities. An example of a sandy prairie occurs along the southwest edge of the West Gulf Coastal Plain in northern Harris County, Texas (L.E. Brown personal communication).

Upland Hardwood Communities

There is considerable evidence that hardwoods were present on many upland pine-dominated landscapes (Harcombe et al. 1993, Martin and Smith 1993, Grace and Smith 1995, Williams and Smith 1995, Evans 1997). Additionally, upland hardwoods were particularly important in a distinctive geographic and ecological region known historically as the “redlands” or “oak-uplands” in both Texas (Roberts 1881, Gow 1904, Johnson 1931, Chambers 1941) and Louisiana (Hilgard 1884, Lockett 1874). Roberts (1881) considered the area to be the lower edge or extension of the “blackjack belt”, and Cruikshank and Eldredge (1939) believed the area exhibited the best development of the upland hardwood type in east Texas. Several authors recorded a scrubby hardwood forest of oaks (red oak, post oak, and blackjack oak), hickory, elm, and even a “thick coat of grass” (Roberts 1893). Much of this rather limited area was cultivated long ago due to the fertility of the loamy soils obliterating most evidence of original vegetation. Historical descriptions of this region in Louisiana noted shortleaf pine in association with a variety of hardwoods (Williams and Smith 1995).

Mixed Hardwood-Loblolly Pine Forests

Mixed hardwood-loblolly pine forests occurred most commonly on lower slopes, steep ravines, stream bottoms and terraces, and other areas protected from fire throughout the West Gulf Coastal Plain. This variable forest type included a diverse mixture of pines, hardwoods, and shrub species including loblolly pine, white oak, southern red oak, sweetgum, blackgum, water oak, and black cherry. This community type included most of the areas supporting American beech, southern magnolia, and American holly. Stands were predominantly uneven-aged, with the oldest and largest loblolly pines more than 150 years old and larger than 1.5 meters in diameter, and the oldest/largest hardwoods probably near 300 years old and approaching 1.2 meters in diameter (Louisiana Natural Heritage Program unpublished data).

Some authors have postulated that extensive areas were once dominated by American beech and other typical “climax” species such as southern magnolia (Delcourt and Delcourt 1974). However, recent historical studies on the West Gulf Coastal Plain have shown that this forest type was not often encountered on the landscape, which was heavily pine-dominated (Martin and Smith 1993, Grace and Smith 1995, Williams and Smith 1995). The best examples of American beech communities are found primarily on topographically isolated areas such as steep slopes and stream bottoms. Historical studies show little evidence of American beech-dominated forests in any other landscape position. Beech most often co-occurred with various, oaks, sweetgum, and either shortleaf or loblolly pine in the West Gulf Coastal Plain. American beech reaches the southwestern limit of its range west of the Trinity River, where it is uncommon and may have always been so (McLeod 1975).

There is some indication that mixed loblolly-hardwood pine communities dominated the upland landscape in the extreme southwestern portion of the West Gulf Coastal Plain, primarily in the Southern Loam Hills of the Southeastern Mixed Forest (231Eh) and Southwest Flatwoods (231Ei) Subsections. Mohr (1896) and Bray (1906) were among the first to publish brief descriptions of this spatially distinct loblolly pine-dominated region. No similar natural region has been described elsewhere in the West Gulf Coastal Plain or southeastern United States. This area covered approximately 6,000 to 7,000 square miles near the southwestern edge of the pine belt in San Jacinto, Montgomery, and Walker Counties, an area which generally corresponds with the location of Sam Houston National Forest. Some evidence suggests that parts of this region may have been synonymous with the “Big Thicket” where forests were described as quite

dense, even jungle-like, providing significant barriers to overland travel (Parks and Cory 1936). Pure pine stands were rather limited in extent in this region, often restricted to deep sand sites; more typically, "the half swampy flats [grew] a jungle of hardwood with some loblolly" (Zon 1904).

Forested Seeps

Headwaters of small streams adjacent to sandy uplands tended to be seepage fed, semi-permanently wet and often mucky, with strongly acidic substrates. The existence of this forested seep or "baygall" type was reconstructed by Schafale and Harcombe (1983) in Hardin County, Texas. Among the important species in these forests were sweetbay magnolia, swamp tupelo, and American holly with wild azalea, alder, and redbay in the understory. Studies of existing baygall habitats (Marks and Harcombe 1981, Nixon et al 1983, Matos and Rudolph 1985, Martin and Smith 1991) document similar vegetation today in most cases. Brooks et al. (1993) noted differences in this type based on geographic location; a northern type occurred primarily in the Middle Coastal Plains, Western Section (231E) while a southern occurred primarily in the Coastal Plains and Flatwoods, Western Gulf Section (232F).

Riparian Forests

This broadly-defined community type occurred throughout the West Gulf Coastal Plain in habitats ranging from upper and middle stream reaches to large river bottoms, as well as alluvial floodplains and sloughs. Mixed hardwood-pine forests were typical along small to intermediate streams, while bottomland hardwood forests and cypress swamps occurred more often along large stream and river bottoms. Species composition varied, mainly as a consequence of relative hydroperiod (shorter flooding intervals upstream, longer flooding intervals downstream), but also in response to variations in substrate. The percentage of sand, silt, acidic clay, calcareous clay, and organic matter in floodplain substrates varied greatly depending upon local geology and soils, and such variation significantly affected species composition.

Riparian forests invariably included a much more diverse number of overstory species than either shortleaf pine or longleaf pine communities. Upper and middle stream reaches on acidic substrates often supported loblolly pine, water oak, swamp chestnut oak, red maple, sweetgum, and blackgum. Other species, such as sweetleaf, American beech, tulip tree, and southern magnolia were of variable occurrence, in part, because they were not originally distributed throughout all portions of the West Gulf Coastal Plain. In contrast, upper and middle stream reaches on calcareous substrates supported Shumard oak, cherrybark oak, nutmeg hickory, pignut hickory, shagbark hickory, sugarberry, red mulberry, basswood, Florida maple, and other species.

Floodplain Forests and Swamps

As watershed size and floodplain width increased downstream, soils became more homogenized due to mixing of sediment derived from a variety of geologic and soil sources. Thus, differences in species composition tended to be minimal across larger stream bottoms; variations were determined more by hydroperiod than substrate variations (Martin and Smith 1991). Floodplain forests and swamps covered the wide, nearly level floodplains of most large streams and major rivers in the region. These forests were characterized mainly by a variety of flood-tolerant hardwoods. Common species included Nuttall oak, overcup oak, water hickory, laurel oak, willow oak, hackberry, green ash, and sweetgum, with dominance of a particular species often dependent on the frequency and duration of flooding events. On a nearly level floodplain, even minor differences in elevation could cause abrupt changes in vegetation due to the influence on flooding and drainage.

Bald cypress, often mixed with water tupelo or water elm, occupied the topographically lowest parts of the floodplain landscape such as regularly and semi-permanently flooded sloughs,

backswamps, and oxbows. Possibly the best expression of bald cypress communities was in the vicinity of Caddo Lake and the Red River Raft (Van Kley and Hine 1998).

During the last fifty years, many thousands of hectares of river floodplains have been inundated by reservoirs such as Toledo Bend, Sam Rayburn, and Conroe, eliminating the floodplain forests and swamps that formerly occupied these areas. Many more thousands of hectares have been converted to agricultural and other uses. On river systems that have not been cleared for agriculture or impounded for reservoirs, many modern floodplain forests appear to retain much of their indigenous composition and structural features, although most are not considered old-growth. Indeed, much of our inference about historical communities comes from relatively intact modern examples.

Marshes

Plant communities dominated by aquatic herbs occurred in limited areas of the West Gulf Coastal Plain, often associated with oxbow lakes and ponds. Flatwoods ponds with herbaceous aquatic vegetation were a common landscape feature in the San Jacinto Flatwoods landtype association (231Ei.18). Representative marsh species included emergent aquatics such as pickerelweed and marshmillet as well as rushes, flatsedges, caric sedges, and spikerushes. Open water species such as American white water lily, spatterdock, southern naiad, and duck meat, may also have been present.

Canebreaks

The historical occurrence of large, often treeless areas on river bottoms dominated by switchcane (*Arundinaria gigantea*) was documented in Louisiana (Platt and Brantley 1997, Brown 1944) as well as in Texas (Loughbridge 1880, Roberts 1881, Jordan 1974). For example, "cane bottoms" were described along the lowland stream bottoms in Angelina and Trinity counties, Texas, extending from one-quarter to one mile on each side of streams. Canebreaks are believed to have originated from abandonment of Indian agricultural fields and from Indian burning practices. Altered fire regimes in concert with grazing hastened destruction of this vegetation type (Platt and Brantley 1997). While small cane thickets are common on modern floodplains, this community type is believed to be extirpated in the West Gulf Coastal Plain.

Redcedar Forests

The occurrence and existence of eastern redcedar forests comes exclusively from the account of the 1806 Freeman and Custis Expedition in Louisiana. According to the interpretation by MacRoberts et al. (1997), forests of this type grew on both sides of the Red River, north of Shreveport in the Middle Coastal Plains, Western Section. The structure and composition of this type is unknown, and it is believed to no longer exist in the region.

HISTORICAL DISTURBANCE PATTERNS

The historical landscape, like the modern one, was a mosaic of different vegetation types, each responding to local patterns of soils, physiography, and disturbance. Alterations in the types and magnitude of disturbances account for most of the historical changes in West Gulf Coastal Plain vegetation. Widespread logging has assured that most modern forests are immature and relatively even-aged, with few trees more than 80 years old. By contrast, many historical upland longleaf pine communities were prevailingly uneven-aged, with the oldest and largest trees exceeding 400 years in age.

Fire was an important environmental factor in determining the structure and distribution of upland communities on the presettlement landscape, and alterations of the fire regime account for many of

the subsequent changes on the modern landscape. Fires originated as a result of Native American activities and from lightning strikes, which are most common in the region in the spring and summer. Once ignited, a fire could burn for many days across a large area of uplands. Steep slopes and stream bottoms were largely protected from fire since a fire moving into a bottom from an upland had to burn downhill away from its fuel source, allowing the development of mixed and hardwood-dominated forest communities in these locations.

Fires are estimated to have occurred in typical longleaf pine savanna and woodland habitat once every 1 to 5 years, or approximately 35 per century (Christensen 1981, Landers 1991). These fires inhibited the growth of fire-intolerant woody species and maintained the open woodland or savanna overstory characteristic of most longleaf pine communities. Hardwoods grow faster longleaf pine on less droughty, more nutrient-rich sites. Thus rich sites which historically supported longleaf-dominated woodlands were especially susceptible to replacement by other woody plants, resulting in the current concentration of longleaf pine on deep sand sites. Fire regimes must, necessarily, have been variable across the upland landscape. For example, the occurrence of mixed longleaf pine communities suggests longer fire-free periods than do pure longleaf pine communities (Frost 1993, Evans 1997). It is possible that larger, more contiguous areas of pure longleaf pine communities burned more frequently than smaller, isolated patches (Christensen 1981, Harcombe et al. 1993). Such differences in fire frequency could have resulted in greater total tree density and/or a reduced relative abundance of longleaf pine in smaller patches.

Sites historically dominated by shortleaf pine, loblolly pine, or hardwood species are indicative of lower fire frequencies than sites dominated by longleaf pine. Garren (1943) proposed a fire return interval of 8 to 10 years for mixed types, while Landers (1991) inferred a fire frequency of 10 per century for shortleaf pine. Martin and Smith (1993) estimated that a fire return interval of 5 to 15 years would perpetuate the mixed shortleaf pine-oak-hickory types described in historical accounts.

Fires were of limited importance on topographically isolated mesic lower slopes and ravines. Likewise, fire was not an important natural disturbance on stream bottoms and river floodplains (Wharton et al. 1982). Rather, flooding was the major natural disturbance in bottomland forests. Variations in the timing, duration, frequency, velocity, and depth of flood waters have significant effects in this habitat type (Van Kley and Hine 1998). Wind throw resulting from severe storms, tornadoes, and hurricanes, along with disease and insect outbreaks, were also important disturbances.

CHAPTER 5

METHODS

INTRODUCTION

Our chief objective was to describe local-level ecological units (landtypes and landtype phases) for the national forests of the West Gulf Coastal Plain. This goal was accomplished primarily through fieldwork where we sampled vegetation, soil, and physiography (=topography, slope, and landscape position) on 185 and 186 sites from the National Forests in Texas and Kisatchie National Forest, respectively. 18 additional sites from the Red River Alluvial Plain in Louisiana were sampled only for vegetation and physiography; published soil surveys were used to obtain soils information. Since we sampled few swamp communities on national forest lands, data collected from 30 swamp and bottomland stands at Caddo Lake in northeast Texas by Van Kley and Hine (1998) were also used. Analysis of these data formed the basis for the ecological types described in this handbook.

FIELD RECONNAISSANCE

The landscape was stratified into preliminary 'selection types' based on slope position and soil texture. Current administrative forest stands were then categorized by selection type, and a stratified random approach was used to select stands from each selection type so that we could generate a data set that was representative of a landscape's entire topographic range, from floodplains to dry ridgetops. In order to reduce the influence of historical factors on plant communities, only stands reasonably free of recent disturbance were approved for sampling. The Forest Service CISC (Continuous Inventory of Stand Conditions) database was used to locate stands with an overstory at least 60 years of age. Selected stands were assessed for suitability for sampling. Reasons for rejection included evidence of recent logging or grazing, excessive physiographic heterogeneity, a severely fragmented overstory due to natural disturbance (e.g. southern pine beetle, windthrow), or a history of long-term fire suppression in areas known historically to have had extensive longleaf pine communities. Exceptions were made for the higher-elevation portions of the Red River Alluvial Plain, where any fragment of natural or semi-natural vegetation was considered acceptable.

Plot design and inventory methodology followed that of Van Kley (1993), with some modifications (Turner 1999). A transect line was randomly established along the long axis of each selected forest stand. If a stand had a predominant slope gradient, the transect followed the elevation contour perpendicular to the slope. Four nested order-of-magnitude subplots were located at 20 m intervals along the transect. Each subplot included a 250 m² circular plot, a 100m² circular plot, a 10 m² square plot, and a 1 m² square plot. The centers of the circular plots and the southwest corners of the square plots originated at the subplot center point (Figure 5.1).

FIELD SAMPLING

Vegetation

All trees greater than 10 cm dbh in the 250 m² plot were identified and their diameter at breast height (dbh) measured. In the 100 m² plot, species and density was recorded for saplings and woody shrubs less than 10 cm dbh but greater than 1m in height. Estimated percentage coverage and ranked-order of occurrence levels were recorded for the ground layer (herbaceous species, vines, seedlings, and small shrubs) in the 1, 10, and 100 m² plots. In addition, uncommon and rare ground layer species were recorded within a 1000 m² rectangular search

area at each subplot (See Figure 5.1). The ranked order-occurrence scale is logarithmic and was determined by the nested plot in which the species was first encountered. Species encountered in the 1 m² plot were given an occurrence level of 5, those not found in the 1 m² plot but occurring in the 10 m² plot were given a level of 4, and those occurring only in the 100 m² plot were given a level 3. Species that did not occur within the nested plots but were found in the 1000 m² search area were given a rank of two if they were relatively common (more than one occurrence and even distribution) or a rank of one if they were rare (only one occurrence or one small clump). Percentage cover was also estimated for each ground layer species in the 10 m² plot.

A mean percentage cover and ranked order-occurrence value was calculated for each species from the four subplots for each site. The mean ranked order-occurrence value was the main measure of plant abundance used in subsequent data analysis, because it tended to be less subjective than estimations of coverage.

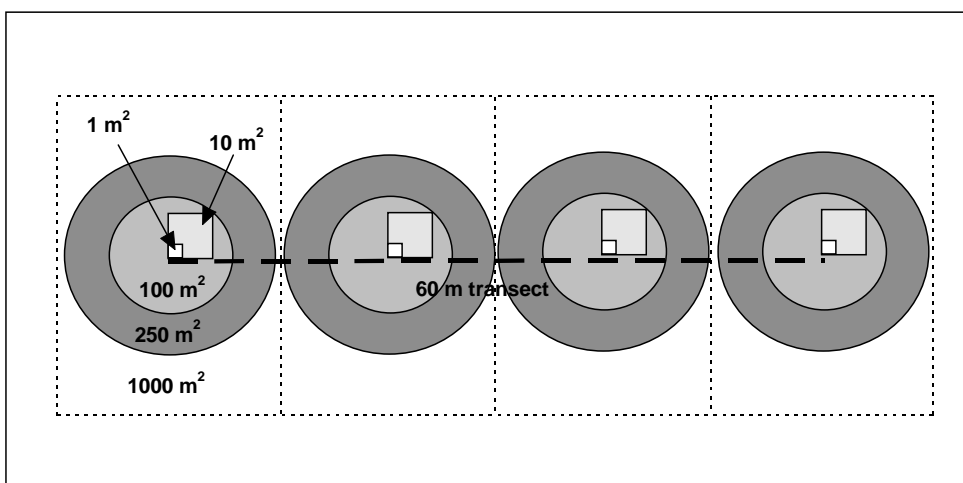


Figure 5.1. Layout of the transect and four subplots at each Ecological Classification sample site.

Soils

A soil pit, excavated to a depth of approximately 200 cm or until an impervious or root restricting layer was encountered, formed the basis for a soil profile description. Depth to identifiable soil horizon boundaries and either the parent material or a root restricting layer was measured. When encountered, the depth to the water table and the depth and color of drainage mottles was recorded. Soil pH, texture, color, and percent coarse fragments of each horizon were ascertained. A soil sample was collected from the topsoil at a depth of 10-15 cm for laboratory chemical and physical analysis of environmental soil parameters. Analyses included percent sand, silt, and clay, buffer capacity, salinity, and concentrations of the macronutrients listed by Salisbury and Ross (1978) as required by plants to be at least 1,000 µg/g of dry matter (excluding carbon, hydrogen, and oxygen). Additional soil auger cores were obtained along the transect and correlated with the soil pit profile. Local soil surveys (Boyd et al. 1998, Dolezel 1980, Dolezel 1988, Kerr et al. 1980, Kilpatrick et al. 1986, Kilpatrick et al. 1998, Kilpatrick & Henry 1989, Martin et al. 1990, McEwen, et al. 1988, and Neitsch 1982) were consulted for additional information.

Physiography

Physiographic measurements at each subplot on the transect included slope gradient, slope aspect, slope shape, and the relative vertical position of the plot with respect to the nearest downslope drainage and the nearest upslope ridgetop or upland. Other information obtained

included the distance to and type of the nearest water body, and elevation above mean sea level. When available, fire frequency data were also recorded. Geographic locations of plots were determined with a global positioning system (GPS), and plotted on USGS 7.5 minute topographic maps.

DATA ANALYSIS

Relating patterns of natural vegetation to natural environmental factors is the core of ecological classification; of the many possible soil and topographic factors, we desire to find the ones most strongly related to natural vegetation. Once these factors are selected, ecological types can be described and pre-existing information (soil and topographic maps or GIS databases) can be used to develop preliminary maps of ecological land units. With the exception of a few landtype associations (LTAs) such as the Fort Polk Rolling Uplands for which there were few samples and data were combined with an adjacent LTA, data collected for each landtype association were initially analyzed independently, resulting in multiple independent data sets.

The field data resulting from sampling were complex, consisting of many stands (samples), most with ranked-order occurrences for 30 or more species. In addition, values for a large number of soil and physiographic variables were associated with each sample stand. We used two types of multivariate analysis, classification and ordination, to summarize these data sets, identify patterns within them, and make them more understandable and interpretable. Two-Way Indicator Species Analysis (TWINSPAN) is a classification analysis which simultaneously groups sites into classes with similar species composition and species into groups which occur on similar sites (Hill 1979a). The product of TWINSPAN is an ordered two-way table which shows the classification of both sites and species. We used two ordination methods: Detrended Correspondence Analysis or DCA (Hill 1979b) and non-metric multidimensional scaling or NMS (McCune and Medford 1997). Both methods order or arrange samples on a graph on the basis of their species composition. Ordinations produce a scatter graph or ordination diagram in which sites with similar species composition are nearby on the graph and dissimilar sites are distant. We used the PC-ORD software (McCune and Medford 1999) for multivariate analysis. PC-ORD incorporates new strict convergence criteria and corrected rescaling algorithms into DCA and TWINSPAN, correcting the instability and sample order-dependence (Oksanen and Minchin 1997) of earlier versions.

Plant communities identified from the data set during analysis were subsequently related to the measured soil and physiographic variables in a variety of ways including intuitive interpretation, linear regression of soil, physiographic, and environmental factors with DCA or NMS ordination scores, and a technique called canonical correspondence analysis (CCA). CCA incorporates simultaneous ordination and regression of ordination scores on selected environmental variables, resulting in an ordination axis that is constrained to be a best linear combination of environmental factors (Ter Braak & Smilauer 2002).

EXAMPLES OF MULTIVARIATE ANALYSIS AND INTERPRETATION

Figure 5.2 shows an ordination of samples from one of the upland landtype associations, the High Terrace Rolling Uplands (Figure 3.5) which covers a large part of Kisatchie National Forest. Each point on the graph represents a sample stand. The arrangement of samples on the graph is on the basis of species composition; adjacent samples have similar species composition. The groups of samples represented by the numerals on the graph resulted from TWINSPAN classification. These groupings (which represented natural plant community types) formed the initial basis for classifying the sample sites into landtype phases and for summarizing their characteristics. The vegetation-based patterns detected by ordination and classification were subsequently interpreted in light of environmental factors. The first (horizontal) axis of the ordination graph is correlated with fire frequency and slope position: In other words, sites on the left side of the graph are frequently burned and occupy upland positions while sites on the

right side of the graph occur in stream bottoms and seldom burn. The vertical axis is mainly related to soil texture among upland sites; stands low on the graph tended to have sandier soils.

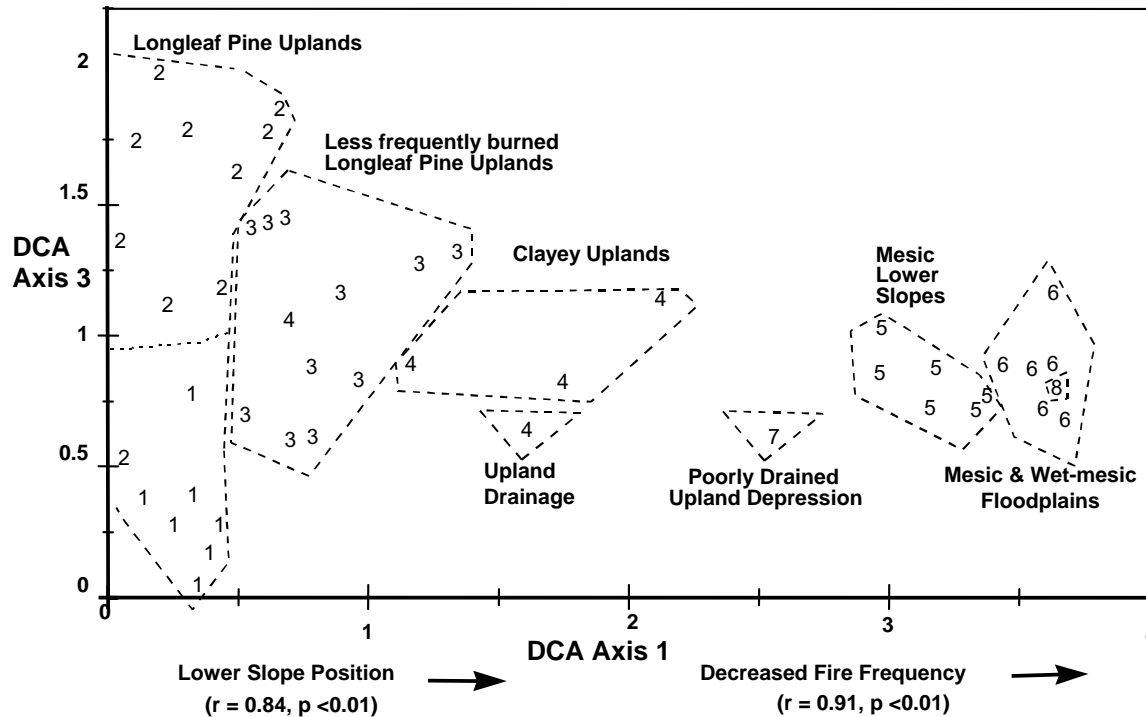


Figure 5.2. The first and third axis of a Detrended Correspondence Analysis (DCA) ordination of 47 stands based on mean occurrence rank of 342 ground layer species from the High Terrace Rolling Uplands in Kisatchie National Forest. The ordering of samples is based solely on plant species composition. This vegetation-based pattern is subsequently interpreted in light of environmental factors. Numerals represent clusters of sites derived from TWINSpan and lines enclosing groups of samples represent a community-type classification derived from both ordination and classification results.

Figure 5.3 shows a similar analysis from a lowland landscape, the Red River Alluvial Plain—the vast riparian system that bisects Kisatchie National Forest (Figure 3.5). As with Figure 5.2, the ordering of samples on the diagram, the result of an NMS ordination, is based on plant species composition. The lines around the groups of samples represent the TWINSpan classification results which formed the initial basis for classifying sites into landtypes and landtype phases. The first (horizontal) axis of the ordination corresponds to differences in flooding where less-flooded levee and alluvial flat sites have low (left side) scores and seasonally flooded and regularly flooded sites from swamps and the active outer floodplain have high scores. The second axis corresponds to a disturbance gradient with relatively undisturbed forested swamp and alluvial flat sites from Kisatchie National Forest lands plotted high on the ordination diagram and human-impacted high-elevation levee sites and sites from the active floodplain disturbed by both high-energy floodwaters and human activity appearing low on the diagram. Datasets from other landtype associations in this study were likewise analyzed and yielded similar results. Dehnisch (1998), Mundorf (1998), Turner (1999), Van Kley (1999a), and Van Kley (1999b) provide more detailed explanations of analysis and interpretation of these data. An ordination diagram of the combined samples from all the data sets showing the range of West Gulf Coastal Plain plant communities appears in Diggs et al (2006).

DESCRIPTION OF ECOLOGICAL TYPES

Patterns of indicator species, natural vegetation, and environmental factors observed from the data following multivariate analysis formed the basis of descriptions of the landtype phases that

occur within the national forests. Important environmental factors included topographic position, soil texture, and the hydrologic regime. Soil taxonomic classes and soil series were also identified for each landtype phase (Appendix F). Landtypes are essentially aggregates of landtype phases with broadly similar soil, landscape position, and vegetation. Landtypes were named for their general topographic position and gross soil texture, and landtype phases were named according to their dominant soil texture, moisture regime, landscape position, typical overstory species, and ground layer ecological species groups (Appendix A).

Species were classified into “ecological species groups” by multivariate analysis on the basis of the sites in which they occurred. Species with strong indicator value or preferences to particular ecological types were included in the ecological species groups. Appendix A lists and describes these species groups. These groups aid in the identification of ecological units where natural vegetation dominates. Soil and physiographic features are more useful for identifying ecological units for sites where natural vegetation is heavily disturbed or not present.

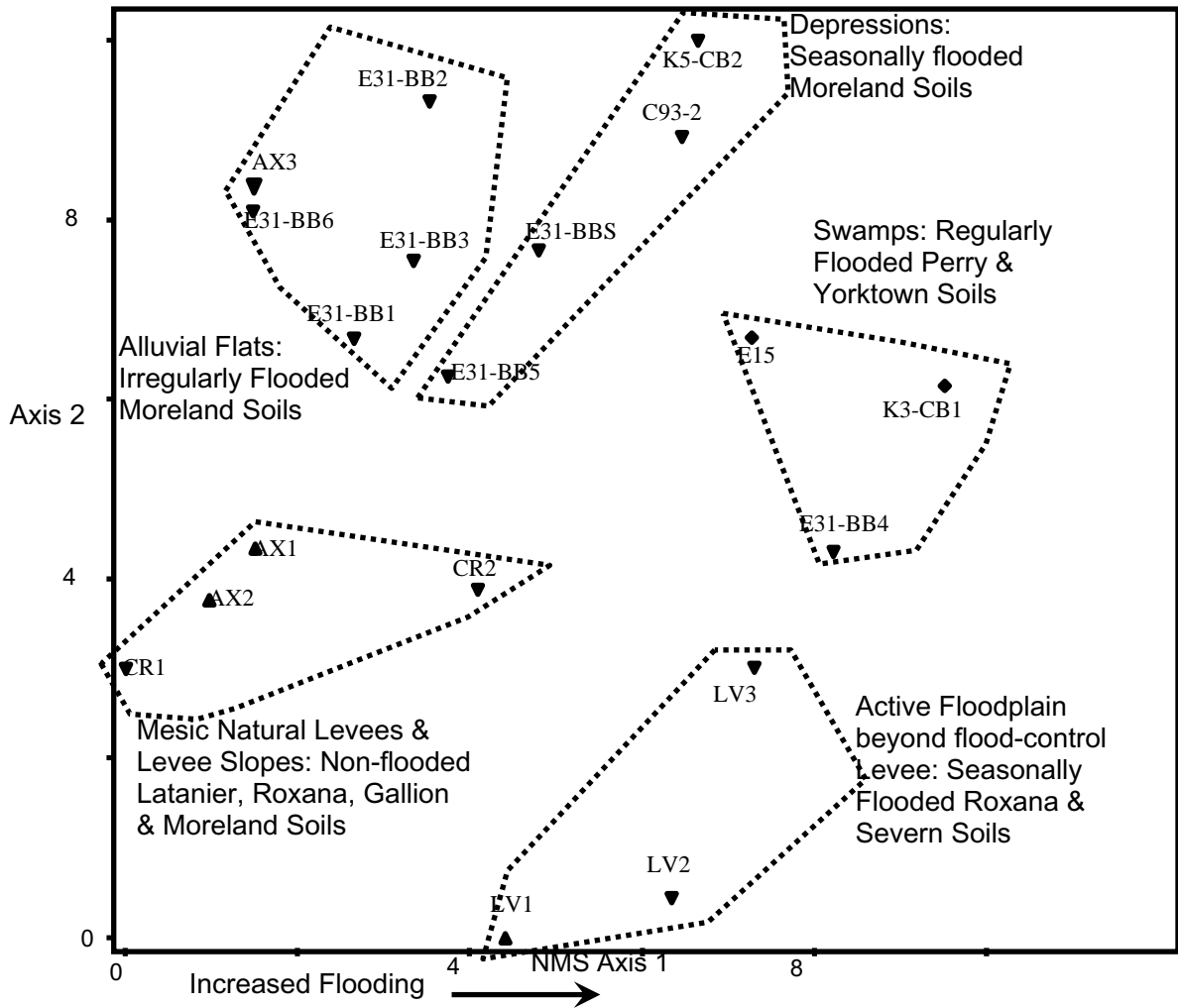


Figure 5.3. The first and second axis of a non-metric multidimensional scaling (NMS) ordination of 19 stands based on occurrence of 89 woody species from the Red River Alluvial Plain on and near Kisatchie National Forest. Labels represent names of individual sites and dotted-line polygons represent clusters of sites derived from TWINSpan which form the basis of a community-type classification and subsequent description of landtype phases.

CHAPTER 6

GENERAL ECOLOGICAL TYPES OF THE WEST GULF COASTAL PLAIN

During analysis, we noted that similar ecological types (landtypes and landtype phases) occurred across the different landtype associations. The chief difference between many LTAs appears to be the distribution of ecological units within them rather than the occurrence of unique ecological types. For example, mesic types are more widespread and better developed in the Redlands (231Eg.11) while dry and dry-mesic types are better developed in the High Terrace Rolling Uplands (232Fa.1). We therefore describe general ecological types--primarily at the landtype phase level--developed with data from all LTAs. These generalized types are largely applicable to all of the West Gulf Coastal Plain (although less so to the flatwoods and wet pine savanna landscapes of the extreme southern portion) and represent all but the most unusual ecological types. They are related to environmental factors that have been observed to be important to differences in natural vegetation throughout the region: topographic position, soil texture, hydrology, fire frequency, and soil nutrients. Portions of the following descriptions are modified from a chapter entitled "The Vegetation of the Pineywoods" that appears in the recently-published Volume I of the Illustrated Flora of East Texas (Van Kley *in* Diggs et al 2006).

The ecological species groups to which following narrative refers are described in Appendix A. Scientific names and selected photographs of woody plants appear in Appendix B, while photographs and descriptions of selected habitat indicator plants appear in Appendix C. Chapter 7 (Keys) defines terminology describing site attributes such as soil moisture, hydrology, fire frequency, plant abundance, soil reaction, slope gradient and soil nutrients. Photographic examples of these ecological types are found on pages 6-13--6-17.

THE THREE PRINCIPAL WEST GULF COASTAL PLAIN LANDSCAPES

Most natural West Gulf Coastal Plain habitats can be described as belonging to one of 3 main "Landscape systems" or "landscape types", which are essentially aggregations of closely related landtypes. **Pine-dominated uplands** typically occur on mid to upper slopes, ridgetops, or on broad, rolling upland interfluves. On most landscapes these occupy most of the land area. Pine-dominated uplands correspond to either the Sandy/Loamy Uplands or the Clayey Uplands Landtypes that occur in all of the LTAs described in Chapters 8-23 except the San Jacinto Flatwoods. Most natural plant communities are dominated either by pines or by a mixture of pines and deciduous trees.

Mesic slopes and stream bottoms include the Mesic Slopes and Terraces and Minor Stream Bottoms landtypes of chapters 8-23. They occur on mid and lower slopes, on higher, non-flooded terraces adjacent to streams and rivers, or in the valleys and ravines of the smallest streams. They typically enjoy higher soil moisture and nutrient levels than pine-dominated uplands, were historically sheltered from fire, and natural stands usually consist of deciduous hardwoods or of mixtures of hardwoods and scattered pines--typically loblolly pine. Of all West Gulf Coastal Plain habitat types, these forests show the closest floristic relationship to the deciduous forests of east-central and northeastern USA.

River floodplains, the third major landscape, are associated with the broad floodplains of the major rivers that flow through the West Gulf Coastal Plain. They include the various Terraces and Bottomland Ridges, Mesic Natural Levees and Levee Slopes, Active Outer Floodplains, Broad Alluvial Flats, River floodplains, and Floodplain Swamps landtypes of Chapters 24 and 25. Flood-tolerant deciduous hardwoods (many of which are the lowland oaks illustrated on p. B-6 in Appendix B) dominate most natural stands. Loblolly pine co-occurs with hardwoods on the highest terraces and bottomland ridges of most (non-Red River) floodplains while baldcypress often dominates the deepest swamps. In the subsequent discussion, Types 1-

9 belong to the pine-dominated uplands, types 9 and 10 belong to the mesic landscapes, type 11 is transitional, and types 12-18 are components of river floodplains.

ECOLOGICAL TYPE DESCRIPTIONS

1. Grossarenic Dry Uplands

Deep coarse sands, upland or ridge top topographic positions, and an open canopy of small, stunted trees characterize these sites. The excessively well drained sandy soils either have a very deep surface layer of sand, greater than 100cm thick, over a loamy subsoil (grossarenic soils) or are deep and sandy throughout the entire profile (Psamentic soils). They are rapidly permeable and have limited moisture holding capacity, so rainfall percolates downward quickly; hence they become droughty even during short rainless periods. Many areas were historically subject to frequent low-intensity surface fires, although the low productivity of the poor, droughty soils limits fuel buildup, especially on the highest, driest ridges. Even in the absence of fire, severe soil conditions tend to maintain an open forest canopy on many sites. Common canopy tree species include bluejack oak, sand post oak, blackjack oak, black hickory, longleaf pine (chiefly in the southern and eastern part of the region), and shortleaf pine. Common understory trees include sand post oak, bluejack oak, blackjack oak and sassafras. Woody shrubs are often sparse, especially on frequently burned sites. Typical shrubs include dwarf pawpaw, fragrant sumac, and October flower (*Polygonella polygama*). *Schizachyrium scoparium* (Little bluestem), *Pityopsis graminifolia* (narrowleaf silkgrass), and other plants from the *Schizachyrium* species group are important components of the often sparse ground cover. Plants from the *Tragia* species group such as *Yucca louisianensis* (yucca), *Tagia urticifolia* (noseburn), *Cnidoscolus texanus* (Texas bullnettle), and *Opuntia humifusa* (devil's tongue pricklypear) are indicators of these sites.

The droughtiest of all types, Grossarenic Dry Uplands are rare on most landscapes. Good examples occur on the Carrizo Formation north of Nacogdoches in the Tonkawa Springs area and in the San Augustine Sandhills and Matlock Hills of central Sabine National Forest (LTA 231Eg.11). Examples are also known from the Big Thicket (Ajilvsgi 1979), the fort Polk Rolling Uplands of Louisiana (232Fa.6), and the Mayflower Uplands in Texas (232Fa.15). Sometimes called "sandylands" they are equivalent to the "sandhill pine forests" of Marks & Harcombe (1981). The photograph is from Nacogdoches County, TX, near Camp Tonkawa Springs (LTP 231Eg.11.1.10).

2. Arenic Dry Uplands

"Arenic" is soil term describing a moderately deep sand layer 50-100cm in thickness occurring atop a loamy subsoil. In addition to the increased moisture holding capacity of the loamy subsoil, the sand may be finer grained or contain more silt and clay than that of Grassarenic Dry Uplands. Arenic Dry Uplands are relatively common on many West Gulf Coastal Plain landscapes where they occur on ridgetops, gentle to moderate convex upper slopes, and other uplands. The rather coarse-textured soils are excessively well drained; as a result, periods of drought are common during the warmer summer months. Historically, many sites, especially in the part of the region corresponding to the natural range of longleaf pine (Section 232F) were subject to a frequent or very frequent low intensity surface fires with fire return intervals as short as 1-3 years. Fires were fueled by pine needles and dry grasses ignited by lightning from summer thunderstorms or by man. Relatively common, Arenic Dry Uplands correspond in part to Nixon's (2000) rather broad "dry upland" category. We recognize two distinct natural plant communities on this ecological type depending on whether sites have burned regularly and whether they are within the geographic range of longleaf pine.

Arenic Longleaf Pine Uplands:

Longleaf pine dominates, forming a nearly pure stand. Understory trees in fire-maintained stands are widely scattered and consist mainly of longleaf pine saplings and occasional oaks (especially blackjack oak). Important shrubs include fragrant sumac, farkleberry, and flameleaf sumac. The rather open canopy tree allows enough light to reach the ground to support a species-rich, prairie-like ground layer of grasses, composites, and other sun-loving species. *Schizachyrium scoparium* (little bluestem) may be dominant. Other important species include *Pityopsis graminifolia* (narrowleaf silkgrass), *Solidago odora* (anisescented goldenrod), *Tephrosia virginica* (goats rue), various species of *Panicum* (panic grasses), and other members of the *Schizachyrium* species group. *Pteridium aquilinum* (bracken fern) is usually common and other members of the *Tragia* species group such as *Tragia urticifolia* (noseburn), *Cnidioscolus texanus* (Texas bullnettle), *Stylisma pickeringii* (Pickering's dawnflower), and *Berlandiera pumila* (soft greeneyes) may also be present.

Recurring fires keep shrubs and saplings sparse and maintain the grassy ground layer. With the exception of longleaf pine, whose seedlings are adapted to surviving fire, trees have difficulty establishing in regularly burned stands. Woody plants will increase on sites that do not experience regular burning. Rare on modern landscapes, these communities persist mainly on public lands in areas with prescribed burning programs. The best examples are found on the Calcasieu Ranger District of Kisatchie National Forest and on the southern portion of Angelina National Forest. The communities correspond in part with the "longleaf bluestem uplands" of Ajilvsgi (1979). The photograph is from Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 10, Stand 3, (LTP 232Fa.1.1.20).

Arenic Dry Mixed Pine-Hardwood Uplands:

These somewhat open to closed-canopy forests support a variety of tree species including shortleaf pine, post oak, blackjack oak, southern red oak, black hickory, sassafras, and black gum. Loblolly pine may also be present, but it is usually not as abundant as on less droughty sites. Various oak saplings, winged elm, sassafras, blackgum, and Mexican plum are common understory trees. Common shrubs include farkleberry, flameleaf sumac, dwarf pawpaw, and yaupon. Bracken fern, (*Pteridium aquilinum*), may be abundant in the ground layer. Other members of the *Tragia* species group may be present, but are usually not as abundant as for Grossarenic Dry Uplands. A variety of wide-ranging, common, taxa such as *Rubus* sp. (blackberry), *Smilax* sp. (Greenbriar), *Lespedeza virginica* (slender lespedeza) and other members of the *Callicarpa* species group commonly occur. Plants from the *Schizachyrium* species group may also be present. Formerly, these communities were usually limited to areas outside the range of longleaf pine and to locations where wildfires were limited by topographic features. They have greatly increased on modern landscapes at the expense of longleaf pine-dominated communities. The photograph is from Angelina National Forest, Compartment 14, Stand 3, (LTP 32Fe.13.1.20).

3. Loamy Dry-Mesic Uplands

This ecological type has sandy loam or loam surface soils with loam or clay loam subsoils. These soils are usually well-drained, moderately permeable and typically hold more moisture than those of Arenic Dry Uplands. Loamy Dry-Mesic Uplands are usually found on ridgetops, broad interfluvies, and gentle middle and upper slopes. They are equivalent to the least-droughty examples of the "dry uplands" of Nixon (2000), and "dry upland forests and savannas" of Harcombe et al. (1993). On most West Gulf Coastal Plain landscapes, they are the most widespread and extensive ecological type. Under presettlement conditions low intensity surface fires ignited by lightning or by humans burned through many stands as often as every 1-3 years. Fires were fueled by pine needles and dry grasses ignited by lightning from summer thunderstorms or by man. As with Arenic Uplands, there are two distinct natural plant communities that may develop on this ecological type depending on whether sites have had a history of regular fire and whether they are within the geographic range of longleaf pine.

Loamy Dry-Mesic Longleaf Pine Uplands:

These stands are open-canopied, nearly pure stands of longleaf pine usually with scattered individuals of blackjack oak and occasionally, blackgum. Understory trees are widely scattered, and consist mainly of longleaf pine saplings and an occasional blackjack oak or blackgum. The shrub layer is sparse and may include flameleaf sumac, yaupon, farkleberry, waxmyrtle, and American beautyberry. The sparse canopy allows enough light to reach the ground to support a dense, prairie-like ground layer of grasses, composites, and other sun-loving species. *Schizachyrium scoparium* (little bluestem) usually dominates the ground layer. Other important species include *Pityopsis graminifolia* (narrowleaf silkgrass), *Solidago odora* (anisescented goldenrod), *Tephrosia virginica* (goats rue), *Panicum virgatum* (switchgrass), and other members of the *Schizachyrium* species group. Occasionally, *Drosera brevifolia* and limited additional species from the *Drosera* species group may be present.

While longleaf pine seedlings are adapted to surviving fire, regular fire prevents seedlings of most other species from establishing. However, in the absence of regular fire a dense shrub layer rapidly forms and the site subsequently succeeds to a mixed closed-canopy forest. More favorable soil moisture and nutrient conditions allow fire-free stands to convert to mixed forests more quickly than for Arenic Longleaf Pine Uplands. Historically, Dry-Mesic Longleaf Pine communities, which correspond in part with the "longleaf bluestem uplands" of Ajilvsgi (1979), dominated large parts of the upland landscape across much of the West Gulf Coastal Plain (especially Section 232F, Coastal Plains and Flatwoods). They are now rare, persisting mainly on public lands in areas with prescribed burning programs. Limited stands persist in the southern portion of Angelina National Forest. Extensive areas can still be found on Kisatchie National Forest, especially on the Calcasieu and Kisatchie Ranger Districts. The photograph is from Kisatchie National Forest, Vernon Unit, Calcasieu RD, Compartment 14, Stand 1, (LTP 232Fa.1.1.30).

Loamy Dry-Mesic Mixed Pine-Hardwood Uplands

Loblolly pine is abundant but usually co-occurs with a mixture of broad-leaved deciduous trees including sweetgum, southern red oak, post oak, winged elm, black hickory, and mockernut hickory. Shortleaf pine may also be present, especially on sites of better natural quality, although human activities and lack of fire have favored loblolly pine and have reduced the occurrence of that species even in the northern and western LTAs where it was always an important component of Dry-Mesic Uplands. Flowering dogwood, redbud, eastern hophornbeam, winged elm, and red maple, are common understory trees. The shrub-layer is often dense. Common shrubs include yaupon, American beautyberry, farkleberry, and southern arrowwood. Woody vines, especially greenbriars (*Smilax* sp.) and summer grape (*Vitis aestivalis*) are common. A variety of species with a wide ecological range such as *Chasmanthium sessiliflorum* (narrow leaved wood oats), *Toxicodendron radicans* (poison ivy), *Parthenocissus quinquefolia* (Virginia creeper), and other species from the *Chasmanthium* and *Callicarpa* species groups dominate the ground layer.

Historically, mixed upland communities were usually limited to areas outside the range of longleaf pine and to locations where topographic features limited wildfires. They have greatly increased on modern landscapes at the expense of longleaf pine communities as a result of fire suppression and other post-settlement land use practices. The photograph is from Kisatchie National Forest, Caney Ranger District, Compartment 3, Stand 13 (LTP 231Ea.9.1.30).

4. Wet Herbaceous Seeps

Herbaceous Seeps typically occur on water-saturated, nutrient-poor, sandy soils on upland hillsides and the upper heads of small drainages where groundwater meets an impermeable layer (clay or rock) and seeps to the surface. The surrounding landscape usually consists of sandy, grossarenic or arenic soils, which have high infiltration and provide an ample water supply for the seeps. Typically embedded in longleaf pine communities (or in areas formerly dominated by longleaf pine), regular fires entering from the pyrogenic surrounding landscape inhibit the establishment of woody plants and prevent sites from succeeding to Forested Seep, or “baygall” communities.

Both large and understory-sized trees are usually limited to scattered longleaf pines and occasional sweetbay magnolia, blackgum, or red maple. Woody shrubs are kept sparse by fire, but can include wax-myrtle, evergreen bayberry, redbay, possumhaw, and poison sumac. Sedges, most from the genus *Rhynchospora* dominate the ground layer along with grasses (especially *Panicum* subgenus *Dichantherium*). In addition, a species-rich assemblage of forbs occurs, including carnivorous plants such as *Drosera brevifolia* (sundew), *Sarracenia alata* (pitcher plant), and *Pinguicula pumila* (small butterwort). Other common species include *Eriocaulon decangulare* (tenangle pipewort), *Sabatia gentianoides* (pinewoods rose gentian), *Helianthus angustifolius* (swamp sunflower), *Lycopodiella appressa* (southern appressed club-moss), *Sphagnum* spp. mosses, and other members of the *Drosera* species group. Rare and sensitive species sometimes found in herbaceous seeps include *Calopogon tuberosus* (grass pink), *Pogonia ophioglossoides* (snake’s mouth orchid), *Plantanthera integra* (yellow fringeless orchid), and *Rudbeckia scabrifolia* (bog coneflower).

Herbaceous seeps are rare as a result of both the loss of longleaf pine woodlands and associated fire and the lack of suitable soils and hydrology in many areas. Good examples remain in the southern portions of Angelina and Sabine National forests and on the Calcasieu, Kisatchie, and Catahoula Ranger Districts of Kisatchie National Forest. They are also known as “bogs (MacRoberts & MacRoberts 1991)”, “Pitcher plant bogs” (Nixon 2000), or “acid bogs” (Ajilvsgi 1979) even though little or no peat accumulates as is the case for true bogs. The photographs are from Angelina National Forest, Compartment 98 (LTP 232Fa.15.1.40).

5. Wet Pine Flatwoods (=Wet Pine Savannas)

These longleaf-pine communities are characteristic of poorly drained fine-sandy loams on the nearly flat topography found along the southern edge of the forested portions of the West Gulf Coastal Plain closest to the Gulf of Mexico. Pine flatwoods are most abundant in the Southwest Flatwoods Subsection (232Fb) which is largely south of the area covered in this guide. Limited examples also occur along the southern edge of the Southern Loam Hills Subsection (232Fa) in the extreme southerly portions of the Calcasieu and Catahoula Ranger Districts of Kisatchie National Forest.

Floristically, these sites have affinity to herbaceous seeps. Longleaf pine dominates the natural overstory; however, many of Kisatchie National Forest’s Pine Flatwoods have been planted to slash or loblolly pine. Unburned stands convert to a mixture of loblolly pine, blackgum, swamp tupelo, sweetgum, red maple, and sweetbay magnolia. The understory in fire-maintained stands is sparse, but includes blackgum, swamp tupelo, sweetgum, red maple, and sweetbay magnolia saplings. Common shrubs include waxmyrtle, gallberry holly, redbay, possumhaw, poison sumac, yaupon, and hazel alder. Unburned sites develop a dense growth of these species. Sedges (especially *Rhynchospora* and *Scleria* sp.) dominate the ground layer along with *Schizachyrium scoparium* (little bluestem). *Drosera brevifolia* (sundew) may be common along with other members of the *Drosera* species group, but *Sarracenia alata* (Pitcher plant), and *Sphagnum* mosses are less common than for Herbaceous Seeps (Harcombe et al. 1993).

Like all longleaf pine communities, these have become increasingly rare as in the absence of regular fires they have become overgrown with woody plants and converted to closed canopy forests. Also called “wetland pine savannas” (Marks & Harcombe 1981, Harcombe et al. 1993), “pine flatwoods”, and longleaf-blackgum savannahs” (Ajilvsgi 1979), examples occur in the Big

Thicket National Preserve (Ajilvski 1979, Marks & Harcombe, 1981) and in the southern portions of the Calcasieu and Catahoula Ranger Districts of Kisatchie National Forest.

6. Clayey Dry-Mesic Uplands

These sites occur on uplands on middle and upper slopes and ridges. Soils are clayey almost to the surface with only a very thin loamy topsoil. Often the clays have shrink-swell properties; the surface may exhibit small humps and depressions and trees are often crooked or stunted and may have root damage as a result of shrinking and swelling of clays. Soils may be saturated during wet periods due to slow percolation, but once dry, water infiltrates slowly and drought conditions occur. Runoff is usually high as a result low soil permeability.

Natural sites develop a mixed overstory of shortleaf pine, loblolly pine and deciduous trees including, post oak, blackjack oak, southern red oak, sweetgum, and blackgum. Documented historic occurrence of mature longleaf pine on some sites indicates that it occurred where frequent fire had a greater influence on community composition than the edaphic limitations of the site. Winged elm, red maple, eastern hophornbeam, and black cherry are common understory species. American beautyberry, yaupon, parsley hawthorn, and upland swamp privet are common shrubs. A variety of groundlayer species from the *Chasmanthium* and *Callicarpa* species groups occurs. Most of these are also common on other mesic and dry-mesic sites. *Trachelospermum difforme* (climbing dogbane), *Chasmanthium sessiliflorum* (sessile chasmanthium), and *Scleria oligantha* (littlehead nutrush) tend to be abundant.

Fine textured soils historically favored hardwoods over pines in most locations and many such sites were probably oak-dominated even in presettlement times. The "Redlands belt" near Nacogdoches is an example of such an area (Roberts 1881, Chambers 1941). On most landscapes these sites are rare, the clayey soil conditions occurring as isolated inclusions on an otherwise loamy or sandy landscape. The photograph is from Kisatchie National Forest, Caney Ranger District, Compartment 21, Stand 17 (LTP 231Ea.9.2.10).

7. Clayey Wet Upland Depressions

Upland Depressions usually occur in slight depressions or flats on broad, level to gently-sloping uplands with poorly-formed drainage patterns and often clayey, slowly permeable soils. They usually exist as isolated patches in most landscapes. A seasonally high water table develops near the surface most years, resulting in vegetation that more resembles that of river floodplains than that of the surrounding uplands.

The canopy, which is often somewhat scattered and open, mainly consists of willow oak, laurel oak, and green ash. Small mounds within the depression may have southern red oak and loblolly pine. Understory trees typically form dense thickets. Mayhaw and green ash are often particularly important. Others include Carolina ash, common persimmon, and bottomland post oak. Deciduous holly, yaupon, and common buttonbush are common shrubs. Herbaceous ground cover, largely from the *Justicia* and *Bignonia* species groups, is sparse because of saturated conditions and fluctuating water levels. Good examples of Upland Depressions occur in the northern part of Angelina National Forest, on parts of Davey Crocket National Forest, and the Calcasieu Ranger District of Kisatchie National Forest. The photograph is from Angelina National Forest (LTP 232Fe.13.2.20).

Marks & Harcombe (1981) describe a "flatland hardwood forest" that is equivalent to the Loamy Seasonally Wet Flatwoods landtype phase (231Ei.18.1.10) found in Sam Houston National Forest and to the "palmetto oak flats" of the Big Thicket (Ajilvski 1979). While floristically similar to Clayey Wet Upland Depressions, these communities are restricted to the southern part of the West Gulf Coastal Plain and the Southwest Flatwoods Subsections (231Ei and 232Fb) where they occur as large patches on the landscape in flat areas of uncertain drainage.

8. Prairies, Barrens, and Glades

Although forest vegetation develops in the absence of disturbance in most West Gulf Coastal Plain ecosystems, a variety of localized herbaceous-dominated communities where unusual soil properties inhibit woody plants exist in the region. Soils are often clayey or shallow to bedrock, and sometimes, calcareous.

Overstory trees are widely scattered or absent and small trees and shrubs are often restricted to scattered thickets or to the margins of the site. Herbaceous species not common in most natural Pineywoods habitats such *Dalea compacta* (compact prarieclover), *Callirhoe papaver* (winecup), *Bouteloua rigidistea* (Texas grama), *Eustoma russellianum* (showy prairie gentian), and *Euphorbia bicolor* (snow on the prairie) are present on some sites. Many of these species belong to the *Bigelovia*, *Callirhoe*, and *Dalea* species groups. Often, there are rare or sensitive species such as *Schoenolirion wrightii* (Texas sunnybell) which occurs on "barrens" (LTP 232Fa.15.2.30) associated with the Catahoula Formation in the southern Angelina National Forest (Marrietta & Nixon 1984).

"Prairies" on calcareous, clayey, shrink-swell soils occur in Sam Houston National Forest (LTP 231Eh.16.2.40), the Big Thicket (Ajilvsgi 1979), and Louisiana (MacRoberts & MacRoberts 1997a, see also descriptions of LTPs 232Fa.2.2.40 and 232Fa3.2.40, Chapters 17 & 18). Other types include sandstone glades (LTP 232Fa.2.2.30) associated with the Catahoula Formation (MacRoberts & MacRoberts 1993), and glades characteristic of outcrops of the Weches Formation where herb-dominated communities that include the rare white bladderpod (*Lesquerella pallida*) and Texas golden gladecress (*Leavenworthia texana*) occur on rocky Trawick soils between Nacogdoches and San Augustine, TX (George & Nixon 1990). No extant examples of "saline prairies" Loughbridge (1880) have been documented. The photograph is of a sandstone glade from Kisatchie National Forest, Kisatchie Ranger District (LTP 232Fa.2.2.30)

9. Mesic Slopes and Terraces

On lower slopes adjacent to rivers and streams, on steep slopes, and on the higher, inactive terraces of some rivers, there is a strong tendency for hardwood-dominated forests to develop in absence of logging and other disturbances. Steep slopes and proximity to streams historically protected these sites from fires, most of which would have had to burn downhill to reach them. Moreover, lower hydrologic position on the landscape results in more available soil moisture and nutrients than for uplands. In presettlement times, fire-sensitive species including loblolly pine and American holly were probably more restricted to these sites than they are today.

Natural stands develop a diverse mixture of loblolly pine and various deciduous hardwoods including southern red oak, white oak, blackgum, sweetgum, water oak, and American basswood. American beech and southern magnolia often establish on undisturbed sites. American holly, winged elm, Florida maple, flowering dogwood, eastern hop hornbeam eastern redbud, and red buckeye, are important understory trees, while American beauty berry, Carolina buckthorn, common sweetleaf, and maple-leaved viburnum are common shrubs. Most ground layer species are from the *Chasmanthium*, *Callicarpa*, *Mitchella*, and on some sites, the *Arisaema* species groups. *Chasmanthium sessiliflorum*, (long-leaf wood oats), *Parthenocissus quinquefolia* (Virginia creeper), *Mitchella repens* (Partridge berry), *Smilax pumila* (sarsparilla vine), and *Sanicula canadensis* (black snakeroot) are typical species. Vines such as *Vitis rotundifolia* (muscadine grape) commonly festoon the trees. Less frequent are "vernal herbs" – plants more typical of the deciduous forests of the Appalachians or the Midwestern USA: *Podophyllum peltatum* (mayapple), *Erythronium albidum* (white trout lily), *Arisaema triphyllum* (Jack in the pulpit), *Arisaema dracontium* (green dragon), and *Sanguinaria canadensis* (bloodroot).

For most Landtype Associations this guide recognizes two types of mesic slope communities (see, among others, Chapters 11 and 17): "Ordinary" Mesic Slopes and Terraces and Moist-Mesic Steep Slopes and Ravines. While the two are floristically similar, Mesic slopes are more widespread and tend to be dominated by white oak, loblolly pine, southern red oak, sweetgum, mockernut hickory, and members of the *Chasmanthium* and *Callicarpa* species groups and are transitional to Loamy Dry-Mesic Uplands. Moist-mesic sites are more sheltered and moist,

typically occurring lower or on longer, steeper slopes—often on the slopes of deep, tight, ravines—and the “mesic flora”—species such as American beech, southern magnolia, and members of the *Mitchella* and *Arisaema* species groups—are better developed. In reality, the two types form an intergrading continuum depending on factors such as moisture, nutrients, and protection from disturbance.

Preliminary observations also suggest the existence of a sandy-soil variant more likely to support high populations of *Mitchella repens*, *Smilax pumila*, *Fagus grandifolia*, *Magnolia grandiflora* and others; and a “rich-mesic” variant on nutrient rich clayey-loamy soils where “vernal herbs” such as *Podophyllum peltatum*, *Arisaema dracontium*, *Erythronium* spp. and *Polygonatum biflorum* (great Solomon’s seal), along with *Tilia americana* (American basswood) are more likely to occur. However, we have not yet documented these differences with quantitative data.

Of all Pineywoods forest types, Mesic slopes and Terraces form the closest affinity with the Eastern Deciduous Forests of the Appalachians, the Midwest, and the northeastern USA (Braun 1950, Blackwelder 2000). They are also known as “Mesic uplands” (Nixon 2000) “lower slope hardwood pine forests” (Marks & Harcombe 1981, and “beech-magnolia-loblolly slopes (Ajilvsgi 1979). The photograph is from Kisatchie National Forest, Caney Ranger District, Compartment 14, Stand 2 (LTP 231Ea9.3.10).

10. Mesic Stream Bottoms

On the narrow floodplains of small tributary streams, a mixed loblolly pine-broadleaved deciduous forest very similar to that of the adjacent Mesic Slopes develops. The associated streams usually have a deep, well-developed stream channel and a narrow, poorly developed floodplain, and drain only a small portion of the watershed. As a result, flooding is brief and intermittent.

Common trees include water oak, white oak, southern red oak, sweetgum, loblolly pine, American beech, and southern magnolia. Common understory trees include American holly, Florida maple, eastern hophornbeam, red buckeye, common pawpaw, and white fringetree while American beautyberry, southern arrowwood, deerberry, and common sweetleaf are typical shrubs. The *Mitchella* and *Arisaema* species groups are typically present in the ground layer. Occasionally, species characteristic of wetter sites such as *Quercus laurifolia* (laurel oak), *Boehmeria cylindrica* (false nettle), and especially *Carpinus caroliniana* (American hornbeam), also occur, especially in low areas or adjacent to the stream channel. These sites are also known as “mesic creek bottoms” (Nixon 2000), and “floodplain hardwood-pine forest” (Marks & Harcombe 1981). The photograph is from Kisatchie National Forest, Kisatchie Ranger District, compartment 38 (LTP 232.Fa.2.4.10).

11. Wet-Mesic Stream Bottoms

As one moves downstream from Mesic Stream Bottoms, streams become larger, floodplains wider and better developed, and flood frequency and duration longer. Often associated with third-order perennial streams, Wet-Mesic Stream Bottoms are transitional between Mesic Stream Bottoms and the Seasonally Flooded River Floodplains downstream. Flooding is irregular and is not severe enough to eliminate many mesic species but flood-tolerant species also occur; the flora is a rich mixture of both mesic and floodplain species.

The overstory consists of a diverse mixture of mesic and wet-site hardwood species such as water oak, white oak, willow oak, laurel oak, swamp chestnut oak, cherrybark oak, blackgum, sweetgum, river birch, American basswood, American elm, sugarberry, and Loblolly pine. Old-growth sites may also support American beech and southern magnolia. Baldcypress may be present along the immediate stream bank, especially on sandy soils. American holly, Florida maple, red maple American hornbeam, eastern hophornbeam, green ash, and river birch are typical understory trees. Common Shrubs include dwarf palmetto, Gulf sebastiana, parsley hawthorn, Elliott’s blueberry, smallflower blueberry, deciduous holly, American snowbell, and

southern arrowwood. Switchcane (*Arundinaria gigantea*) sometimes forms dense thickets or “canebreaks”. The *Bignonia* species group is common in the ground layer. Mesic species from the *Mitchella* and *Arisaema* species groups may also be present. Wetter areas may contain species from the *Justicia* group. The photograph is from Kisatchie National Forest, Caney Ranger District Compartment 15, Stand 12 (LTP 231Ea.9.4.20).

12. Wet Forested Seeps

A distinctive plant community develops where groundwater seepage occurs on lower hillsides, head slopes, and along small streams. Soils are usually deep gray sands that are Semipermanently to nearly permanently saturated. Surrounding uplands typically have sandy, grossarenic, or arenic soils which have rapid infiltration, low runoff, and provide an ample supply of groundwater.

Characteristic tree species include Sweetbay magnolia, swamp tupelo, and red maple. Saplings of red maple, sweetbay magnolia, and green ash are common in the understory. Typical shrubs and vines include evergreen bayberry, poison sumac, laurel-leaf greenbrier, possumhaw and redbay. *Rhododendron canescens* and other wild azalea species provide showy flowers in spring. *Woodwardia areolata* (netted chain fern) typically dominates the ground layer. Other groundcover species are *Osmunda regalis* (royal fern), *Osmunda cinamomea* (cinnamon fern), *Eleocharis microcarpa* (smallfruit spikesedge), and other members of the *Osmunda* species group. Patches of *Sphagnum* sp. mosses may be present. Rare species that one may find in Forested Seeps include *Spiranthes* sp. (Lady’s tresses) *Bartonia texana* (Texas screwstem), *Parnassia asarifolia* (kidney-leaf grass of Parnassus) and *Burmania biflora* (northern bluethread).

Also known as “baygalls” (Ajilvsgi 1979), “wetland baygall shrub thickets” (Marks and Harcombe 1981), and “wet creek bottoms” (Nixon 2000), their hydrology resembles that of Herbaceous Seeps, where soils are also saturated with low-nutrient spring-water that infiltrated through surrounding upland sands. However, Forested Seeps tend to be lower on the landscape, larger, and are not structured by regular fire. Brooks et al (1993) described a northern type which occurs primarily north of southern Angelina County, and a southern type which, among other differences, contains *Cyrilla racemiflora* (swamp titi). The photograph is from Naconechie Creek near Camp Tonkawa Springs, Nacogdoches County, Texas (LTP 231Eg.11.4.30).

13. Irregularly Flooded Mesic Terraces and Bottomland Ridges

On the higher and drier portions of the broad floodplains of rivers in places such as crowns of natural levees, meander scrolls, and other slightly elevated areas, a plant community similar to that found on Wet-Mesic Stream bottoms develops. Soils are formed in recent (Holocene) alluvium associated with major rivers and their direct tributaries. They are often sandy and are usually of coarser texture than soils on the rest of the floodplain because floodwaters deposit the coarse portion of their sediment load on the natural levees first when they overflow the riverbank and loose velocity (Mitsch & Gosselink 1993). Flooding is irregular, less frequent than for the adjacent lower portions of the floodplain.

The overstory consists of mesic and moderately flood-tolerant species such as loblolly pine, water oak, sweetgum, white oak, cherrybark oak, blackgum, willow oak, laurel oak, and southern red oak. Understory trees include saplings of green ash and red maple along with American hornbeam, American holly, winged elm, and flowering dogwood. Common shrubs include yaupon, American beautyberry, farkleberry, flowering dogwood, and rusty blackhaw. “Canebreaks”, thickets of *Arundinaria gigantea* (switch cane) are common especially on natural levees adjacent to the immediate riverbank. Ground Layer species composition can be quite variable, depending on micro-differences in elevation, soils, and local hydrologic conditions. Species from the *Bignonia*, *Callicarpa*, *Chasmanthium*, and *Mitchella* groups may be present. The photograph is of a natural levee along Cypress Bayou at Caddo Lake, Marion County, Texas (LTP 231Ea.4.1.30).

14. Seasonally Flooded River Floodplains

The most extensive ecological type on most bottomland landscapes are the broad, flat, main portions of the floodplains of major rivers. Soils, formed in recent (Holocene) alluvium, are generally loamy, silty, or clayey, the coarser particles usually having been deposited on the natural levees before floodwaters reach the main part of the floodplain. The sites are subject to seasonal flooding and are usually inundated for a significant portion (12.5-25%) of the growing season.

Natural forests are a rich mixture of flood-tolerant deciduous hardwoods which include willow oak, laurel oak, overcup oak, swamp chestnut oak, sweetgum, American elm, swamp tupelo, and red maple. Common understory trees include common persimmon and American hornbeam. Deciduous holly, American snowbell, mayhaw, and parsley hawthorn are common understory shrubs. Ground cover may be sparse, especially in the absence of openings in the normally dense canopy, but important species include *Boehmeria cylidrica* (false nettle), *Carex jorii* (cypress swamp sedge), *Rhynchospora corniculata* (beak sedge), and *Justicia ovata* (water willow) while *Saururus cernuus* (lizard tail), occurs in wetter areas. *Brunnichia ovata* (American buckwheat vine) is common as small, non-flowering individuals under the canopy, but may form dense tangles along with *Mikania scandens* (climbing hemp vine) in openings. Other species from the *Bignonia* and *Justicia* species groups may also be important. Seasonally Flooded River Floodplains correspond to the "Floodplain hardwood forests" of Marks & Harcombe (1981), "river bottom communities" of Nixon (2000), and sweetgum-oak floodplains of Ajilvsgi (1979). The photograph is from the floodplain of Saline Bayou in Kisatchie National Forest, Winn Ranger District, Compartment 27 (LTP 232Fa.4.2.10).

15. Seasonally to Nearly Regularly Flooded Low River Floodplains

These sites occur on areas of slightly lower elevation and in slight depressions on otherwise nearly level, broad, floodplains of major rivers. Because of slightly lower elevation, these sites flood more often than Seasonally Flooded River Floodplains (type 14). While still typically under a seasonally flooded hydrologic regime, flooding on these sites approaches regular flooding with durations of nearly 25% of a typical growing season. High water marks can usually be observed on tree trunks, usually 1 m or more above the ground. Soils, formed in recent (Holocene) alluvium, consist of poorly drained clays, sandy clays, silts, and clay loams. Soil textures will vary between watersheds, but they usually have a general pattern of the fine textures occurring on lower elevations within the floodplain.

Overcup oak is the most flood-tolerant of the bottomland oaks and it may form pure stands on these lower areas where flooding is more prevalent. Other highly flood-tolerant hardwoods that may be present include water hickory and water locust. Willow oak and laurel oak are sometimes present but are not abundant. Occasional baldcypress may occur, especially in wetter areas. Common understory trees include Carolina ash, red maple, and common persimmon. Occasionally, water elm may occur in wetter areas. Deciduous holly, eastern swampprivet, and Gulf sebastiania are common shrubs. Due to seasonal flooding and dense shade, herbaceous ground cover is usually sparse. Species from the *Justicia* group are the most common, and species from the *Bignonia* group may also be found. *Brunnichia ovata* (American buckwheat vine) may be abundant, particularly in openings. The photograph is from the floodplain of the Angelina River, Stephen F. Austin Experimental Forest, Nacogdoches, County, Texas (LTP 232Fd.4.2.20).

16. Regularly Flooded Swamps

These sites are associated with backswamps, sloughs, and old stream channels on some of the lower portions of the floodplains of major rivers and their direct tributaries. Formed in recent (Holocene) alluvium, Soils consist of very poorly drained deep clay, sandy clay, and clay loam. Sites are regularly flooded with inundation lasting for 25-75% of a typical growing season, or 3 to 8 months annually.

Nearly constant saturation of soils creates anoxic conditions that favor obligate and facultative wetland plants. Natural overstory is dominated by dense groves of water elm or Carolina ash. Bald cypress or water tupelo may form an emergent canopy. Black willow may also be common, especially on disturbed sites. Red maple occurs on slightly higher microsites. Overcup oak, water hickory, and Water locust occupy the transition zone between the swamp and the lower floodplain. Common understory species include Carolina ash and common persimmon. Eastern swampprivet and common buttonbush are the principal shrubs. Due to standing water much of the year, coverage of ground-rooted plants may be very sparse. Species from the *Justicia* species group are most common. Floating and submersed plants from the *Ceratophyllum* species group occur in deeper pools. The photograph is from Caddo Lake, Marion County, Texas (LTP 231Ea.4.3.10).

17. Semi-Permanently Flooded Deep Water Swamps

These swamps occur in the very lowest parts of the floodplains of major rivers in backswamps or sloughs. They are often associated with drowned river valleys or the remains of abandoned stream channels or oxbows. In addition to natural swamps, these ecosystems will develop in the impounded upper stream valleys, shallows, and protected shorelines of reservoirs. Numerous baldcypress swamps are currently developing in the backwaters of Sam Rayburn and Toledo Bend Reservoirs on Sabine and Angelina National Forests. A well-developed bald cypress swamp occurs on the upper portion of Corney Lake on the Caney Ranger District of Kisatchie National Forest.

The very poorly drained clay, sandy clay, and clay loam soils are only rarely exposed. A black layer of unconsolidated, partially decomposed organic matter may cover the surface of the mineral soil. Soil horizons are usually gray as a result of continual anoxia. These swamps have a Semipermanently to nearly permanently flooded hydrologic regime and are generally flooded for most or all (75-100%) of a typical growing season.

Baldcypress commonly dominates the overstory of natural stands. Water tupelo may also be abundant, especially in more disturbed stands. Water tupelo is common in Louisiana and southeastern Texas but becomes less so in northeastern Texas. Water elm may form a scattered subcanopy, especially in shallower swamps. Understory trees are rare, consisting mainly of occasional water tupelo or baldcypress saplings and persimmons growing on stumps and logs. shrubs are uncommon, primarily common buttonbush growing on stumps and logs. *Ceratophyllum demersum* (coontail), *Cabomba caroliniana* (fanwort), *Hydrilla verticillata* (hydrilla), *Lemna* spp.(duckweeds), *Spirodella* spp. (duck meat), *Wolffia columbiana* (water meal), and *Nuphar luteum* (yellow pond lily) and other members of the *Ceratophyllum* species group are among the floating and submersed plants that may grow in the shallow waters. Some sites are infested with dense mats of non-native *Eichhornia crassipes* (water hyacinth). Spanish moss (*Tillandsia usneoides*) often festoons the trees. *Triadenum walteri* (marsh St. John's-wort), *Boehmeria cylindrica* (false nettle), and occasionally other members of the *Justicia* species group grow on stumps and logs and in shallow areas. Marks & Harcombe (1981) describe riparian swamps as "cypress tupelo forest". The photograph is from Kisatchie National Forest, Caney Ranger District, Compartment 11, Stand 3 (LTP 231Ed.4.3.20).

18. Marshes

Marshes are non-forested wetlands dominated by herbaceous vegetation (Mitsch & Gosselink 1993). If left undisturbed, most West Gulf Coastal Plain wetlands would eventually succeed to

forest (swamps); many marshes are temporary communities on the Regularly Flooded and Semi-permanently Flooded Swamp ecological types resulting from human activities or from natural processes such as riverbank erosion and deposition, oxbow creation, beaver activity, and wind throw. Marsh vegetation is also common along the edges of the numerous artificial reservoirs in the region.

Many species are from the *Justicia* and *Ceratophyllum* species groups. Sedges (Cyperaceae) and grasses, for example *Zizaniopsis miliacea* (marsh millet) and *Leersia orizoides* (rice cutgrass), and rushes (*Juncus effusus*) tend to dominate areas of wet soil and shallow water. *Typha* spp. (cattail) may also form dense stands in shallow areas. *Cephalanthus occidentalis* (buttonbush) is an important shrub in most non-forested or partially shaded wetlands. Deeper areas support emergent plants such as *Sagittaria platyphylla* (delta arrowhead), while the deepest areas contain floating and submersed species including *Ludwigia peploides* (floating primrose willow), *Ceratophyllum demersum* (coontail), *Cabomba caroliniana* (fanwort) Lemnaceae spp (duckweeds), *Nelumbo lutea* (American lotus), and *Nuphar lutea* (yellow pond lily). *Hydrilla verticillata* (hydrilla), an invasive exotic species, dominates the shallows of many local reservoirs. The photograph is from a bay in Toledo Bend Reservoir, Sabine National Forest, Texas.

19. Human-Dominated Ecosystems

While this guide emphasizes the potential natural vegetation that develops on slightly disturbed and undisturbed sites, much of the West Gulf Coastal Plain is under varying degrees of human influence and vegetation may only partially or minimally reflect the potential natural plant communities for their ecosystem types as described above—although in the absence of continued disturbance sites may revert to their potential natural communities. The many forms of human land management have produced a wide array of human-dominated plant communities. Roadsides--maintained by mowing--often include a variety of planted wildflowers only occasionally encountered in natural local habitats such as *Oenothera speciosa* (Showy evening primrose), *Calirhoe papaver* (Poppy mallow), *Coreopsis lanceolata* (lance-leaved Coreopsis), and *Lupinus* spp (Bluebonnet). Cut-over forests, in the absence of silvicultural site-preparation and planting, develop a dense growth of perennial herbs such as *Solidago Canadensis* (Canadian goldenrod), vines and brambles including *Smilax* spp. (greenbriar) and *Rubus* spp. (blackberry), and residual or regenerating tree species-- especially *Pinus taeda* (loblolly pine) and *Liquidambar styraciflua* (sweetgum). Exotic grasses including *Paspallum notatum* (Bahia grass), *Cynodon dactylon* (Burmuda grass), and *Bromus catharticus* (Rescue grass) may dominate pastures. Even in natural areas, the virtual elimination of fire as an ecological force from many landscapes has profoundly affected the development of vegetation (see discussions of upland types in this and other chapters). Urban areas are characterized by a variety of vegetation, including patches of natural or semi-natural vegetation along boundaries (fences, roads, and property lines). Cultivated exotic species and native species often occurring on ecological types in which they would ordinarily not be found, characterize the portions of urban areas that have not been converted to roads, parking lots and buildings. Elsewhere, large areas of former river floodplains have been converted to artificial reservoirs where the exotic weed *Hydrilla verticillata* is abundant.



1. **Grossarenic Dry Uplands**, Nacogdoches County, TX, Near Camp Tonkawa Springs)



2a. **Arenic Longleaf Pine Uplands** (Kisatchie National Forest, Vernon Unit, Calcasieu RD, Compartment 10, Stand 3)



2b. **Arenic Dry Mixed Pine-Hardwood Uplands** (Angelina National Forest, Compartment 14, Stand 3)



3a. **Loamy Dry-Mesic Longleaf Pine Uplands** (Kisatchie National Forest, Vernon Unit, Calcasieu RD, Compartment 14, Stand 1)



3b. **Loamy Dry-Mesic Mixed Pine-Hardwood Uplands** (Kisatchie National Forest, Caney Ranger District, Compartment 3, Stand 13)



4. **Wet Herbaceous Seeps**, (Angelina National Forest, Compartment 98)



4. **Wet Herbaceous Seeps**, (Angelina National Forest, Compartment 98)



6. **Clayey Dry-Mesic Uplands**, (Kisatchie National Forest, Caney Ranger District, Compartment 21, Stand 17)



7. **Clayey Wet Upland Depressions** (Angelina National Forest, Compartment 13)



8. **Prairies, Barrens, and Glades: Sandstone Glades**, (Kisatchie National Forest, Kisatchie Ranger District)



9. **Mesic Lower Slopes and Terraces** (Kisatchie National Forest, Caney Ranger District, Compartment 14, Stand 2)



10. **Mesic Stream Bottoms** (Kisatchie National Forest, Kisatchie Ranger District, Compartment 36)



11. **Wet-Mesic Stream Bottoms** (Near Middle Fork of Bayou D'Arbonne, Kisatchie National Forest, Caney Ranger District Compartment 15, Stand 12)



12. **Wet Forested Seeps** (Naconechie Creek near Camp Tonkawa Springs, Nacogdoches County, Texas)



13. **Loamy Infrequently Flooded Mesic Terraces & Bottomland Ridges**, (Natural levee on riverbank of Cypress Bayou. Note presence of pines. Caddo Lake, Marion County, TX)



14. **Loamy/Clayey Seasonally Flooded River Floodplains**, (Near Saline Bayou. Kisatchie National Forest, Winn Ranger District, Compartment 27,)



15. **Loamy/Clayey Seasonally to Nearly Regularly Flooded Low River Floodplains** (Near Angelina River, Stephen F. Austin Experimental Forest, Nacogdoches, County, Texas,)



16. **Clayey Regularly Flooded Swamps** (Near Cypress Bayou, Caddo Lake, Marion County, Texas)



17. **Semi-Permanently Flooded Deep Water Swamps** Kisatchie National Forest, Caney Ranger District, Compartment 11, Stand 3)



18. **Marsh and Artificial Reservoir** (Toledo Bend Reservoir, Sabine National Forest, Texas)

CHAPTER 7

KEYS FOR THE IDENTIFICATION OF ECOLOGICAL UNITS

PURPOSE

The following dichotomous keys provide a tool for identifying the local ecosystem types (landtype associations, landtypes, or landtype phases) for the portions of the West Gulf Coastal Plain covered in this guide. They use readily-observed features of a site to aid in identifying and mapping ecological units. This chapter includes keys to the landtype associations, which will in turn guide readers to the appropriate keys to landtypes and landtype phases in subsequent chapters.

THE ECOLOGICAL UNITS

Landtype associations (LTAs), are based on regional geology and broad-scale vegetation patterns. Each LTA is in turn divided into landtypes which are based on major differences in topographic position, soils, and vegetation. Four landtypes are recognized for most upland West Gulf Coastal Plain LTAs: Sandy/loamy Uplands, Clayey Uplands, Mesic Lower Slopes, and the riparian areas of small streams. On the floodplains of local rivers, we recognize three landtypes: Terraces and Bottomland ridges, River Floodplains, and Swamps. The floodplain of the Red River includes four landtypes: The Active Outer Floodplain, Mesic Natural Levees and Levee Slopes, Alluvial Flats, and Swamps. Each landtype is further divided into landtype phases (LTPs) on the basis of additional differences in soils, topography, hydrology, and natural vegetation.

REQUIRED EQUIPMENT

Identifying ecological units requires only minimal equipment. A 7.5 minute USGS quadrangle map aids in determining a site's landscape position and other physiographic features. When using the Key to Landtype Associations, one should refer to a map showing the general location of the LTAs such the maps in Chapter 3 (Figures 3.3 and 3.4, and 3.5) of this field guide. A geologic map, Snead and McCulloh (1984) for Louisiana, Bureau of Economic Geology (1992 & 1993) for Texas, is extremely helpful for identifying Landtype Associations, especially outside of national forest boundaries. Where natural vegetation is present, the ability to identify common overstory and ground layer plants is important. A regional flora and a field guide to woody plants will facilitate identification (See Appendix C for a list of resources). In addition, Appendices B and C provide photographs and descriptions of important ecological indicator species. An image gallery of plants native to the region can be found at <http://www.fp.sfasu.edu/jamesvankley/>. A shovel, soil probe or auger capable of probing the upper 50 cm of the soil is essential to determine soil texture. A pH kit is required in the few cases for which soil reaction distinguishes between ecological types. A local soil survey (Boyd et al. 1998, Dolezel 1980, Dolezel 1988, Kerr et al. 1980, Kilpatrick et al. 1986, Kilpatrick et al. 1998, Kilpatrick & Henry 1989, Martin et al. 1990, McEwen, et al. 1988, and Neitsch 1982) provides useful maps and descriptions of the soils.

USING THE KEYS

A key provides a series of paired choices. Each pair of choices gives the reader two options. The reader reads the pair of choices, compares each option with the characteristics of the site being identified, and chooses the one which is most appropriate. Each choice points to another pair of choices, or in the case of the final choice, to another key or to an identification.

The process of identifying ecological units begins with the Key to Landtype Associations in this chapter. When identifying an ecological unit, one should begin with the first pair of choices (numbered 1a and 1b) in this key. After carefully reading both choices (“The site is on an upland/minor stream bottom” or “The site is on the floodplain of a major river”), select the option that best fits the site being identified. The selected option directs one to the next pair of choices, e.g. either to choice-pair 2a and 2b or to choice-pair 3a and 3b. After choosing, use the choice-pair number referred to in the chosen option to go to the next choice-pair and continue, again selecting the appropriate choice. Ultimately, the key will lead to a determination of the landtype association and refer one to the page with the appropriate key to landtype phases. For example, if one chooses option 2b in the LTA key, it will lead to the Key to Landtype Phases for the Alluvial Floodplains and Terraces Landtype Association in Chapter 25. Starting the new key with the first pair of choices, one likewise follows the Key to Landtype Phases to an identification of the appropriate landtype phase.

Once one makes a tentative identification, however, it is important to confirm the identification using the descriptions of the ecological units found in the chapter for the appropriate LTA. Avoid basing a determination on a small, unrepresentative microsite. Rather, consider a representative area of at least 0.4 hectare (1 acre) when making a determination. When determining soil texture, take several samples from different representative parts of the site.

Transitional types, inclusions, intergrades, and ambiguity are a normal part of the natural world. It is therefore important to carefully consider all available factors before making the choice that best fits. Ambiguity is common: Any classification is somewhat artificial because plant communities and the soil and physiographic factors on which they depend grade continuously into each other as one moves along ecological gradients. Additionally, vegetation on a site is also the result of disturbance and historical factors as well as ecological factors. For example, vegetation on a loamy, dry-mesic upland where natural fires have been suppressed will be quite different from that of a similar upland where frequent prescribed burning occurs.

The vegetation component in the keys was developed from samples of largely undisturbed stands that we believed to be the closest approximations of historical vegetation available on the modern landscape. On highly disturbed sites such as plantations or pastures, vegetation may not be a reliable indicator of the ecological potential of the site. Instead, one must rely on soil and topographic factors to identify the ecological type of such sites.

The keys to landtype phases found in subsequent chapters emphasize ecological species groups. These are groups of species which, according to multivariate analysis of the sample sites, tend to occur together on similar types of sites. The use of ecological species groups allows one to use a significant portion of the flora rather than one or two indicator species which may be absent for random or unknown reasons when identifying ecological types. Ecological species groups for the West Gulf Coastal Plain are described in Appendix A.

TERMINOLOGY USED IN THE KEYS AND DESCRIPTIONS

Plant Species Abundance

Rare	Only one to a few individuals occur in the site, or plants are restricted to one small area.
Infrequent	Individuals are scattered throughout the site, but some searching is necessary to find them in most places.
Common	Individuals occur throughout the site and minimal searching is necessary to find them.
Abundant	The species is dominant or nearly so within its stratum. Numerous individuals are readily apparent in most parts of the site.

Site Moisture Regime

Dry	Moisture availability is very limited during periods of low rainfall because of excessively well drained to well drained sandy soils and high topographic position.
Dry-mesic	Moisture availability is intermediate between dry and mesic sites. Soils are well drained and periods of moisture stress may occur, but they are not as severe as for dry sites.
Mesic	Intermediate position on a moisture gradient from dry to wet. Soils are well drained to somewhat poorly drained, and adequate moisture is available during most times of the year. Sites generally occupy low landscape positions but are intermittently or never flooded and are not associated with seeps or major floodplains.
Moist-mesic	Slightly higher moisture availability than on a mesic site, often because the site is protected from sun exposure on a steep north or east-facing slope or in a narrow ravine.
Wet-mesic	Transitional between a mesic and wet site. Soils are usually somewhat poorly drained and intermittent or irregular flooding is possible, but lengthy periods of inundation or saturation do not occur and flood-related anoxia in the soil is not severe enough to limit the site to only wetland-adapted plants.
Wet	Poorly drained soils associated with seeps and floodplains. Lengthy periods of saturation or flooding insure that only species adapted to saturated, anoxic soils will survive. Three types of wet sites have been observed: seeps, where the soils are semipermanently saturated but rarely flooded, floodplains which are irregularly or seasonally flooded, and swamps which are regularly or semipermanently flooded. See also the soil hydrologic regimes described below.

Soil Hydrologic Regime Adapted from the US Army Corps of Engineers Wetlands Delineation Manual (US Army Corps of Engineers 1987).

Hydrologic Zone	Name	Duration during growing season
I	Permanently inundated	100 percent
II	Semipermanently to nearly permanently Inundated or saturated	>75-100 percent
III	Regularly inundated or saturated	>25-75 percent
IV	Seasonally inundated or saturated	>12.5-25 percent
V	Irregularly inundated or saturated	>5-12.5 percent
VI	Intermittently or never inundated or saturated	<= 5 percent

Soil Drainage Class

Excessively drained	Water is removed from the soil very rapidly. Soils are commonly coarse-textured, rocky, or shallow. Redox depletions/ concentrations (mottles) do not occur.
Somewhat excessively drained	Water is removed from the soil rapidly. Soils are sandy and may be shallow or steep. Redox depletions/ concentrations (mottles) do not occur.
Well drained	Water is removed from the soil readily, but not rapidly. Water is available to plants throughout much of the growing season; root growth is not inhibited by wetness. Soils are commonly loamy. Redox depletions/ concentrations (mottles) usually do not occur.
Somewhat poorly drained	Water is removed slowly enough so that the soil is wet for significant periods during the growing season. Soils commonly have a slowly pervious layer or a high water table. Redox depletions/ concentrations (mottles) may be present in the subsoil.
Poorly drained	Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water may be present at the surface during the growing season. Soils commonly have a high water table, a slowly pervious layer, or groundwater seepage. Redox depletions/ concentrations (mottles) may be present throughout the soil
Very poorly drained	Water is removed so slowly that free water is present on the soil surface for much of the growing season. Soils are commonly level, in depressions, or ponded. Redox depletions/ concentrations (mottles) may be present throughout the soil profile.

Slope gradient

Nearly level	Less than 1 percent slope.
Very gentle	1 to 2 percent slope.
Gentle	2 to 5 percent slope.
Moderate	5 to 10 percent slope.
Moderately steep	10 to 15 percent slope.
Steep	15 to 20 percent slope.
Very steep	Greater than 20 percent slope.

Fire Probability (Frequency)

Very High (Very Frequent)	Average fire return interval between 1 and 3 years.
High (Frequent)	Average fire return interval between 3 and 5 years.
Moderate (Moderately Frequent)	Average fire return interval between 5 and 10 years.
Low (Infrequent)	Average fire return interval between 10 and 20 years.
Very Low (Very Infrequent)	Average fire return interval greater than 20 years

Soil Reaction (pH)

Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Soil nutrient levels (as represented by exchangeable calcium)

Very high	4000 ppm and higher
High	800 to 3999 ppm
Medium	400 to 799 ppm
Low	200 to 399 ppm
Very Low	Below 200 ppm

KEY TO LANDTYPE ASSOCIATIONS ON THE WEST GULF COASTAL PLAIN

1a. Floodplains or terraces of major rivers and their direct tributaries, including the Angelina River, Attoyac River, Ayish Bayou, Cypress Bayou, Neches River, Sabine River, San Jacinto River, Trinity River, and Winters Bayou in Texas, and the Calcasieu River, Dugdemona River, Kisatchie Bayou, Latt Creek, Little River, McKinny Creek, Nantachie Creek, Red River, and Saline Bayou in Louisiana..... 2

1b. Uplands or minor floodplains, terraces, or ravines associated with small tributary streams. 3

2a. Site associated with the floodplain of the Red River or its immediate tributaries 234Ai.7 Red River Alluvial Plain (Chapter 24)

2b. Site associated with the floodplain of a river other than the Red River. 23x.xx.4 Alluvial Floodplains and Terraces (Chapter 25)

3a. Geographical locations east of the Sabine River in Louisiana on lands in or near Kisatchie National Forest **excluding** the Wilcox group of geologic formations and Cook Mountain, Cockfield, Vicksburg, and Jackson group geology west of the Red River but east of the Sabine in the Pineywoods Transition Subsection (232Fe). 4

3b. Geographical locations west of the Sabine River in Texas on lands in or near Angelina, Davy Crockett, Sabine, or Sam Houston National Forests **or** if east of the Sabine, then on the Wilcox group of geologic formations or on Cook Mountain, Jackson group, Cockfield or Vicksburg geology west of the Red River in the Pineywoods Transition Subsection (232Fe). 10

4a. Sites located on High Terrace surface geology within or south of Winn Parish or on the Blounts Creek member of the Fleming formation. Locations are within the High Terrace Rolling Uplands or Fort Polk Rolling Uplands LTAs, including the Vernon Unit and southwest Evangeline unit of the Calcasieu District, the south-central Kisatchie District, south-central and north-central Winn District, or southern two-thirds of the Catahoula District. 5

4b. Sites located on the Cockfield formation, Sparta formation, Vicksburg group, Jackson group, Cane River formation, Cook Mountain formation, Catahoula formation, or on the Carnahan Bayou and Lena members of the Fleming formation, **or** on High Terrace geology within or north of Red River Parish. Locations include the Caney District, most of the Winn District, the northern one-third of the Catahoula District, and most of the Kisatchie District. 6

5a. Sites located on High Terrace surface geology within or south of Winn Parish, including the south Vernon Unit and southwest Evangeline unit of the Calcasieu District, south-central edge of the Kisatchie District, south-central and north-central Winn District, and the southern 2/3 of the Catahoula District. 232Fa.1 High Terrace Rolling Uplands (Chapter 16)

5b. Sites located on the Blounts Creek member of the Fleming formation including the northern portion of the Vernon Unit of the Calcasieu Ranger District and the Fort Polk area. 232Fa.6 Fort Polk Rolling Uplands (Chapter 20)

6a. Sites located in the South Central Arkansas Subsection (231Ea), north of Winn Parish, on the Cook Mountain or Cockfield geologic formations or on High Terrace geology within or north of Red River Parish. Includes the Caney Ranger District. 7

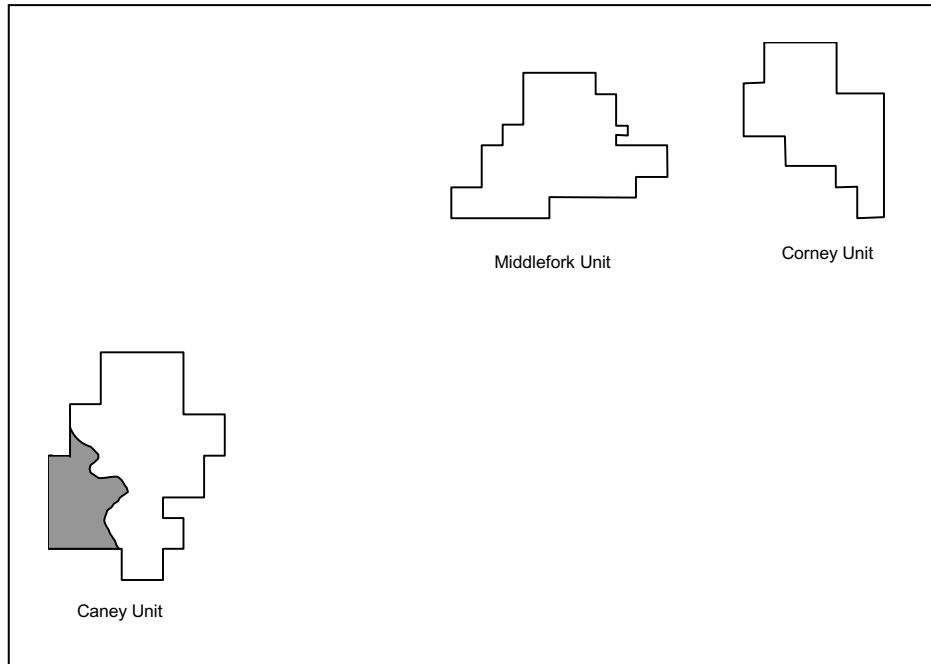
6b. Sites not located in the South Central Arkansas Subsection (231Ea) or if in South Central Arkansas Subsection, sites are within or south of Winn Parish. 8

7a.	Sites located on High Terrace geology including the southwest third of the Caney Unit of the Caney Ranger District.....	231Ea.8 Caney Lakes Undulating Uplands (Chapter 8)
7b.	Sites located on the Cook Mountain or Cockfield formations including the Corney Unit, Middlefork Unit and northeastern two thirds of the Caney Unit of the Caney Ranger District.	231Ea.9 North Louisiana Clayey Hills (Chapter 9)
8a.	Sites located on Catahoula surface geology, or the Carnahan Bayou and Lena members of the Fleming formation. Locations include the southern four-fifths of the Kisatchie District and the northwestern corner of the Evangeline unit of the Calcasieu District.....	232Fa.2 Kisatchie Sandstone Hills (Chapter 17)
8b.	Sites located on Vicksburg, Jackson group, Cockfield, Sparta, Cane River, or Cook Mountain geology. Locations include the Winn District and northern one-third of the Catahoula District.....	9
9a.	Surface geology includes the Vicksburg group, Jackson group, Cane River formation, or Cook Mountain formation. Soils are often clays or clay loams.....	232Fa.3 Undulating Clayey Uplands (Chapter 18)
9b.	Surface geology includes the Cockfield or Sparta formations. Soils tend to be sandy or loamy.....	232Fa.5 Winn Rolling Uplands (Chapter 19)
10a.	Sites located in the Middle Coastal Plains, Western Section (231E), including all of Sam Houston National Forest, the western half of Davy Crockett National Forest, the northern half of Sabine National Forest, and the extreme northern portion of Angelina National Forest.	11
10b.	Sites located in the Coastal Plains and Flatwoods, Western Section (232F), including the eastern half of Davy Crockett National Forest, all but the northernmost tip of Angelina National Forest, and the southern half of Sabine National Forest.	17
11a.	Sites located in the South Central Arkansas Subsection (231Ea), Pineywoods Transition Subsection (231Ef), or Sand Hills Subsection (231Eg). Includes the western part of Davy Crockett National Forest, portions of Compartments 1 and 2 of Angelina National Forest, and the central and northern portions of Sabine National Forest.....	12
11b.	Sites located in the Southern Loam Hills Subsection (231Eh) or Southwest Flatwoods Subsection (231Ei). Includes all of Sam Houston National Forest.....	15
12a.	Sites located in the South Central Arkansas Subsection (231Ea), on the Wilcox group of geologic formations. Includes the northern half of Sabine National Forest and extends eastward into Louisiana	231Ea.10 Lignitic Uplands (Chapter 10)
12b.	Sites not located in the South Central Arkansas Subsection	13
13a.	Sites located in the Sand Hills Subsection (231Eg). Includes Davy Crockett National Forest north of Hickory Creek, portions of Compartments 1 and 2 of Angelina National Forest, the city of Nacogdoches, and the central portion of Sabine National Forest.	14
13b.	Sites located in the Piney Woods Transition Subsection (231Ef), on the Cook Mountain, Yegua, or Caddell geologic formations. Includes most of the western half of Davy Crockett National Forest	232Ef.13 Western Clayey Uplands (Chapter 22)

- 14a. Sites located on the Weches, Reklaw, Queen City, or Carrizo geologic formations or on the Sparta formation east of the Neches River. Includes central Sabine National Forest, the extreme northern portion of Angelina National Forest, and the city of Nacogdoches.
.....231Eg.11 Redlands (Chapter 11)
- 14b. Sites located on the Sparta formation west of the Neches River. Includes Davy Crockett National Forest north of Hickory Creek.....231Eg.12 Sparta Sandhills (Chapter 12)
- 15a. Sites located in the Southern Loam Hills Subsection (231Eh) on the Fleming and Willis geologic formations. Includes all of Sam Houston National Forest except the extreme southeast portion16
- 15b. Sites located in the Southwest Flatwoods Subsection (231Ei), on the Lissie geologic formation. Includes the extreme southeast portion of Sam Houston National Forest.
.....231Ei.18 San Jacinto Flatwoods (Chapter 15)
- 16a. Sites located on the Fleming geologic formation, or on discontinuous patches or outliers of Willis deposits overlying the Fleming. Includes most of the northern and western portions of Sam Houston National Forest.....231Eh.16 Raven Hills (Chapter 13)
- 16b. Sites located on the area of continuous surface coverage of the Willis geologic formation. Includes the southeast portion of Sam Houston National Forest.
..... 231Eh.17 Big Thicket (Chapter 14)
- 17a. Sites located in the Southern Loam Hills Subsection (232Fa) on the Catahoula, Willis, Nash Creek, or Whitsett geologic formations. Includes the southernmost portions of Angelina and Sabine National Forests.....232Fa.15 Mayflower Uplands (Chapter 21)
- 17b. Sites located in the Pineywoods Transition Subsection (232Fe). Includes the northern three-quarters of Angelina National Forest, the eastern half of Davy Crockett National Forest, and most of the southern half of Sabine National Forest, and the northwest corner of the Kisatchie District of Kisatchie National Forest. 18
- 18a. Sites located on the Cook Mountain, Yegua, Yazoo, Moodys Branch, and Caddell geologic formations (= Cook Mountain, Cockfield, Jackson group, and Vicksburg group east of the Sabine River). Includes most of the northern two-thirds of Angelina National Forest, the eastern half of Davy Crockett National Forest, central and southern Sabine National Forest, and the northwest corner of the Kisatchie District of Kisatchie National Forest.....232Fe.13 Clayey Uplands (Chapter 22)
- 18b. Sites located on the Manning and Wellborn geologic formations. Includes portions of southern Angelina National Forest and southern Davy Crockett National Forest.....
.....232Fe.14 Sandy Uplands (Chapter 23)

CHAPTER 8

LTA 231Ea.8 CANEY LAKES LOAMY UPLANDS LANDTYPE ASSOCIATION



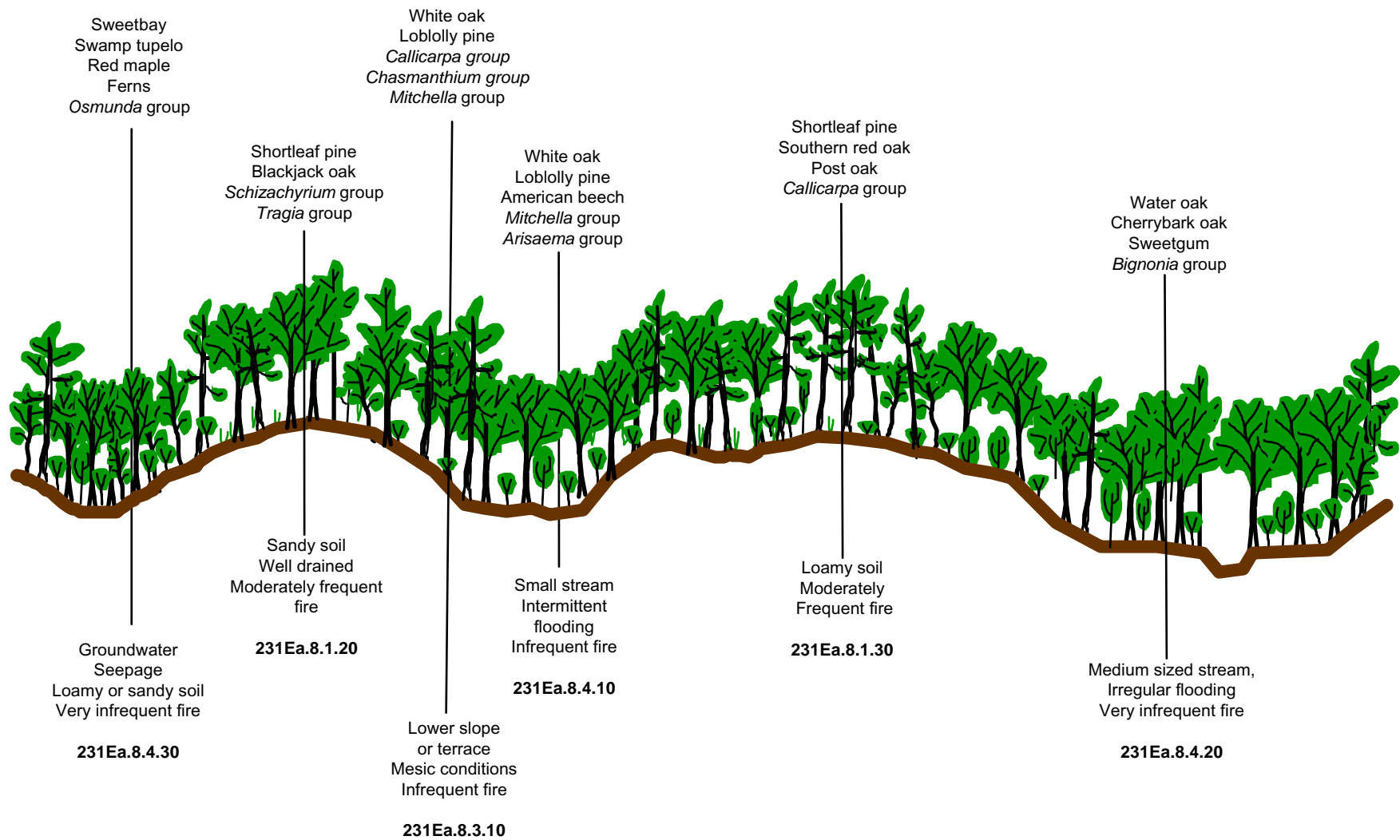


Figure 8.1 Landscape profile of ecosystems on the Caney Lakes Loamy Uplands Landtype Association .

231Ea.8 CANEY LAKES LOAMY UPLANDS LANDTYPE ASSOCIATION



Lower Caney Lake: Kisatchie NF, Caney Ranger District



231Ea.8.1.30: Shortleaf Pine-southern red oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands (Kisatchie NF, Caney Ranger District, Compartment 22, Stand 21)



231Ea.8.3.10: White Oak-American beech-Loblolly Pine/*Chasmanthium* Loamy Mesic Lower Slopes (Kisatchie NF, Caney Ranger District Compartment 22 Stand 14)



231Ea.8.4.10: Loblolly pine-white oak/ *Mitchella* Loamy Mesic Stream Bottoms (Kisatchie NF, Caney Ranger District Compartment 22, Stand 10)



231Ea.8.4.30: Sweetbay-Swamp Tupelo/ *Osmunda* Sandy Wet Forested Seeps (Kisatchie NF, Caney Ranger District Compartment 22, Stand 16)

KEY TO LANDTYPE PHASES

- 1a. Upper slopes, broad uplands, or ridgetops. Sites are typically pine-dominated..... 2
- 1b. Lower slopes, ravines, wet hillside seeps, stream terraces, or stream floodplains. Sites are typically deciduous hardwood-dominated. 3
- 2a. Soils arenic (sandy surface layer more than 50cm thick) or sandy throughout the profile, usually mapped as Boykin soils. The *Tragia* group may be present.
231Ea.8.1.20 Shortleaf Pine-
 Blackjack Oak/*Tragia* Sandy Dry Uplands
- 2b. Soils with a sandy or sandy loam topsoil that is less than 50cm thick and a loam or clay loam subsoil. Often mapped as Malbis, Ruston, or Smithdale soils. Species from the *Callicarpa* and *Chasmanthium* groups are abundant.
231Ea.8.1.30 Shortleaf Pine- southern Red oak/
Callicarpa-Chasmanthium Loamy Dry-Mesic Uplands
- 3a. Moderate to steep lower slopes, ravines or minor stream terraces. Species from the *Callicarpa*, *Chasmanthium* and *Mitchella* groups common but those from the *Bignonia* and *Justicia* groups rare or absent.
 231Ea.8.3.10 White Oak-American beech-Loblolly Pine/
Chasmanthium Loamy Mesic Lower Slopes
- 3b. Valleys and floodplains of small or medium-sized intermittent or perennial streams or areas of groundwater seepage. 4
- 4a. Constantly saturated groundwater seepage areas (baygalls) at the head of or adjacent to small streams. Deep, gray nearly permanently saturated sandy soils. Soils are consistent with the Osier series. Sweetbay magnolia, swamp tupelo, and red maple dominate the overstory. Possumhaw, early azalea, and Arkansas blueberry common in the understory. Members of the *Osmunda* group are common.
 231Ea.8.4.30 Sweetbay-Swamp Tupelo/
Osmunda Sandy Wet Forested Seeps
- 4b. Stream bottoms or floodplains without surface seepage of groundwater..... 5
- 5a. Small bottoms of intermittent or perennial streams with floodplains typically less than 100m wide. Flooding is intermittent and sites are generally flooded for less than 5% of the growing season. Soils commonly mapped as luka or Guyton soils or as the soil type of the adjacent uplands. Overstory includes water oak, sweetgum, loblolly pine, and often American beech. The *Chasmanthium*, *Callicarpa*, and *Mitchella* groups are common, but species from the *Bignonia* and *Justicia* groups are rare or absent.
231Ea.8.4.10 Water Oak/*Mitchella*
 Loamy Mesic Stream Bottoms
- 5b. Floodplains of medium-sized or large perennial streams with floodplains typically more than 100m wide. Flooding is irregular and sites are generally flooded for 5-12.5% of the growing season. Soils are commonly mapped as Guyton or luka. Flood tolerant species such as swamp chestnut oak, willow oak, American elm, and laurel oak are often present. Members of the *Bignonia* and *Justicia* groups are usually present.
 231Ea.8.4.20 Sweetgum-oak /*Bignonia*
 Loamy Wet-Mesic Stream Bottoms

LANDTYPE PHASE DESCRIPTIONS

231Ea.8.1 Sandy/ Loamy Uplands Landtype

231Ea.8.1.20 Shortleaf Pine-Blackjack Oak/*Tragia* Sandy Dry Uplands Landtype Phase

Geographic Range: Lies mainly along the eastern side of the Red River in northern Louisiana, extending eastward to roughly 5-8km east of Bayou Dorcheat. In Kisatchie National Forest, it includes the southwestern portion of the Caney Unit of the Caney Ranger District southwest of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Occurs on sandy Pleistocene high terrace deposits in northern Louisiana.

Landform: Occurs on middle and upper side slopes, broad uplands, and ridgetops. Most slopes are convex with a moderate to moderately steep gradient.

Soil Characteristics: Soils are loamy fine sands for at least the upper 50-100cm. The subsoil is generally loamy and reaction is slightly acid to very strongly acid and available nutrients are medium to low. Soils generally belong to the Boykin series and typically exist as isolated patches in areas of loamy Ruston, Smithdale, and Malbis soils.

Hydrology: Soils are well-drained, moderately permeable, and are subject to seasonal drought especially in late summer as a result of the limited water holding capacity of the sand. Occasionally, water may percolate to the surface in the heads of adjacent drainages resulting in forested seeps (231Ea.8.4.30).

Natural Disturbances and Processes: Under presettlement conditions, sites were subject to moderately frequent fires that may have helped maintain a somewhat open shortleaf pine-hardwood community. Drought stress may result in a more open forest and less ground vegetation than for loamy and clayey sites.

Ground Layer Species: Species from the *Tragia* group are often present. Plants from the *Callicarpa* group are usually common along with limited species from the Schizachyrium group including flowering spurge (*Euphorbia corollata*), Texas ironweed (*Vernonia texana*), and tapered rosette grass (*Dichanthelium acuminatum*).

Overstory Tree Species: Common trees include shortleaf pine, blackjack oak, post oak, and black hickory. When subject to repeated fire, the overstory develops into open woodland.

Understory Tree Species: Common understory trees include Mexican plum, white fringetree, sand post oak, gum bumelia, and sassafras.

Shrub Species: Common shrubs include sandhill plum, winged sumac, and farkleberry.

Similar LTPs: 231Ea.9.2.30 (loamy dry-mesic uplands) may have similar vegetation especially if subject to frequent fire, but species from the *Tragia* group are less common, soil moisture conditions are more favorable to plant growth, and soils consist of loamy topsoil over clay subsoil.

231Ea.8.1.30 Shortleaf Pine-southern red oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Lies mainly along the eastern side of the Red River in northern Louisiana, extending eastward to roughly 5-8km east of Bayou Dorcheat. In Kisatchie National Forest, it includes the southwestern portion of the Caney Unit of the Caney Ranger District southwest of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Occurs on loamy Pleistocene high terrace deposits in northern Louisiana.

Landform: Occurs on middle and upper slopes and broad, level to convex uplands on mid to upper slopes. Slope gradient is generally moderate to moderately steep. This is the dominant upland LTP on this landscape.

Soil Characteristics: Soils consist of loam or sandy loam surface soils, and a sandy clay loam or sandy loam subsoil. They are well drained to moderately well drained and moderately to moderately slowly permeable. They include the Malbis, Ruston, and Smithdale series. Nutrient levels are low and reaction is medium acid to strongly acid.

Hydrology: Soils are well drained or moderately well drained and moderately to moderately slowly permeable. Some surface runoff occurs and slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: Under natural conditions, periodic fires burned through these uplands, with the fire interval on a particular site influenced by topographic isolation and soil moisture. The historic fire return interval was probably moderately frequent.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups are abundant. On regularly burned sites, elements of the *Schizachyrium* group, especially flowering spurge (*Euphorbia corollata*), Texas ironweed (*Vernonia texana*), downy milkpea (*Galactia volubilis*) and tapered rosette grass (*Dichantheium acuminatum*) may be common although the dominant grasses of that group were never conspicuous on reference sites.

Overstory Tree Species: Shortleaf pine and southern red oak often dominate high natural-quality sites. Black hickory, post oak, blackjack oak, white oak, sweetgum, and blackgum are common. Loblolly pine and sweetgum typically dominate sites with a history of significant disturbance, long-term lack of fire, or agriculture. This LTP is outside the historic range of longleaf pine although this species was observed growing successfully in a recent plantation immediately north of the Caney Lakes.

Understory Tree Species: Black cherry, sassafras, flowering dogwood, red maple, white fringetree, and winged elm, along with saplings of overstory dominants comprise much of the understory.

Shrub Species: Common shrubs include, American beautyberry, southern arrowwood, maple leaf viburnum, rusty blackhaw, and winged sumac. Yaupon, while sometimes present, is less common than for equivalent LTPs to the south.

Similar LTPs: 231Ea.8.1.20 (sandy uplands) occupy a similar position (often slightly higher) on the landscape, may have similar vegetation but the upper 50cm of the soil is sandy and the *Tragia* group is often present. 231Ea.9.1.30 may occur adjacent to 231Ea.8.1.30 on similar landscape positions immediately to the east. Soils, however, formed on Tertiary geology, often have clayey subsoil, and belong to series such as Darley, Ruple, and Mahan.

231Ea.8.3 Mesic Slopes and Terraces Landtype

231Ea.8.3.10 White Oak-American beech-Loblolly Pine/*Chasmanthium* Loamy Mesic Lower Slopes Landtype Phase

Geographic Range: Lies mainly along the eastern side of the Red River in northern Louisiana, extending eastward to roughly 5-8km east of Bayou Dorcheat. In Kisatchie National Forest, it includes the southwestern portion of the Caney Unit of the Caney Ranger District southwest of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Occurs on loamy and sandy Pleistocene high terrace deposits in northern Louisiana.

Landform: Occurs on middle to lower slopes and small stream terraces, forming the transition zone between (usually) pine-dominated upper slopes and hardwood-dominated stream bottoms. Slope shape is linear to concave, and slope gradients are moderate to very steep.

Soil Characteristics: Occurs on a variety of soil types. Increased moisture and fire-protection resulting from low topographic position are more important than soil type in structuring vegetation. Common soils include Smithdale and Malbis. Cahaba soils may occur on small terraces above streams.

Hydrology: Low position on the hydrologic landscape, proximity to streams, and a sheltered moist microclimate result in soils with relatively high moisture availability and less stress on plants during drought. As a result, species requiring mesic conditions dominate. Sites are often dissected by small intermittent streams and drainages.

Natural Disturbances and Processes: Fire is infrequent on lower slopes and terraces. In an unusually dry period, fires that originate on uplands may burn down to a lower slope, where there may be sufficient fuel to carry a low-intensity surface fire. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Most species are from the *Callicarpa*, *Chasmanthium* and *Mitchella* groups. Species from the *Arisaema* group also may occur.

Overstory Tree Species: The primary overstory species are usually loblolly pine, white oak, mockernut hickory, southern red oak, and sweetgum. Other species that may be present include American beech, blackgum, water oak, cherrybark oak and black hickory.

Understory Tree Species: Common understory trees include eastern hophornbeam, white fringetree, flowering dogwood, red maple, Florida maple, and American holly.

Shrub Species: Common shrubs are American beautyberry, American witchhazel, maple leaf viburnum, Carolina buckthorn, and rusty blackhaw.

Similar LTPs: 231Ea.8.4.10 has similar vegetation but occurs on very gentle to moderate footslopes directly adjacent to small stream channels.

231Ea.8.4 Minor Stream Bottoms Landtype

231Ea.8.4.10 Loblolly pine-white oak/ *Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Lies mainly along the eastern side of the Red River in northern Louisiana, extending eastward to roughly 5-8km east of Bayou Dorcheat. In Kisatchie National Forest, it includes the southwestern portion of the Caney Unit of the Caney Ranger District southwest of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Occurs on recent alluvium and loamy and sandy Pleistocene high terrace deposits in northern Louisiana.

Landform: Occurs on toe slopes and small floodplains associated with small streams. Floodplain width is normally less than 100 meters. Slope shape is concave to linear, and slope gradients are gentle to very gentle.

Soil Characteristics: Soils are generally silt loams or fine sandy loams over heterogeneous parent material. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is medium acid to very strongly acid, and available nutrients range from high to low. Drainage mottles are common in the subsoil. Soils are usually mapped as either Guyton soils or as one of the adjacent upland soil types such as Malbis or Smithdale.

Hydrology: The streams associated with this landtype phase are small, often intermittent, and many do not have well-developed floodplains. Floodplain width is normally less than 100 meters. Stream gradients are relatively steep and upstream watersheds are small, so flooding occurs only intermittently, and generally lasts for <5% of the growing season. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire occurs infrequently on stream bottoms. Fires originating on adjacent uplands may burn to the edge of stream bottoms and restrict the encroachment of stream bottom vegetation onto the slopes. Erosion and deposition constantly change the course of stream channels. Stream banks can be undercut causing trees to fall. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa*, *Chasmanthoum*, and *Mitchella* groups are common. Favorable microsites may support members of the *Arisaema* group. Depressions and low areas may support species from the *Bignonia* and occasionally, *Justicia* groups. Christmas fern (*Polystichum acrostichoides*), and American strawberry-bush (*Euonymus americana*) are often present.

Overstory Tree Species: The primary overstory species are usually loblolly pine, American beech, white oak, southern red oak and sweetgum. Additional species may include, Blackgum, water oak, cherrybark oak, mockernut hickory, and red maple.

Understory Tree Species: Understory trees include eastern hophornbeam, American hornbeam, American holly, Florida maple, and flowering dogwood.

Shrub Species: American witchhazel, Carolina buckthorn, maple leaf viburnum, common sweetleaf, rusty blackhaw and American beautyberry are common.

Similar LTPs: 231Ea.8.4.20 also occurs on stream bottoms; however, the streams associated with those floodplains are generally larger, are subject to irregular flooding, and species from the *Bignonia* group are common.

231Ea.8.4.20 Sweetgum-oak/ *Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Lies mainly along the eastern side of the Red River in northern Louisiana, extending eastward to roughly 5-8km east of Bayou Dorcheat. In Kisatchie National Forest, it includes the southwestern portion of the Caney Unit of the Caney Ranger District southwest of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with medium-sized perennial stream valleys.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Floodplain width is normally greater than 100 meters. The slope shape is concave to linear, and slope gradients are nearly level to very gentle. Some sites have numerous small depressions, drainage channels, ridges, and mounds created as flood waters scour and deposit alluvial materials. A sandy, slightly elevated natural levee often exists immediately adjacent to the stream channel.

Soil Characteristics: Soils formed in silty, sandy, or loamy alluvial material. Because of scouring and new deposition from flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil is exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles occur throughout the soil profile. Soil reaction ranges from medium acid to very strongly acid, and available nutrients are low to medium. Soils generally belong to the luka or Guyton series.

Hydrology: The streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle, so an irregularly-flooded hydrologic regime occurs. Duration of flooding is generally for 5-12.5% of the growing season and increases with the size of the watershed.

Natural Disturbances and Processes: Fire occurs very infrequently on stream floodplains. Erosion and deposition constantly change the course of stream channels, undercutting banks and causing trees to lose soil anchorage and fall. Windstorms may uproot or damage overstory trees.

Ground Layer Species: A rich mixture of both mesic species (*Chasmanthium*, *Callicarpa*, and *Mitchella* groups) and wetland species (*Bignonia* and *Justicia* groups) occurs. Abundant species include muscadine grape (*Vitis rotundifolia*), poison ivy (*Toxicodendron radicans*), partridge berry (*Mitchella repens*), crossvine (*Bignonia capreolata*), slender woodoats (*Chasmanthium laxum*), virginia dayflower (*Commelina virginica*), and Louisiana sedge (*Carex louisianica*).

Overstory Tree Species: As with the groundlayer, a variety of both mesic and wetland species occurs. Sweetgum, cherrybark oak, water oak and swamp chestnut oak are important trees. Other common species include American elm, shagbark hickory, and swamp hickory. White oak, southern red oak, slippery elm, laurel oak, willow oak, and overcup oak are occasionally present. Scattered loblolly pines are typically present; these may grow to a very large size.

Understory Tree Species: American hornbeam and American holly are often abundant in the understory. Other species may include Florida maple, winged elm, and eastern hophornbeam, along with saplings of overstory trees such as red maple, sweetgum and swamp hickory.

Shrub Species: Switch cane may be abundant, especially on sandy natural levees and near stream banks. Others include deciduous holly, Elliott's blueberry, smallflower blueberry, and Carolina buckthorn.

Site Inclusions: Slight differences in elevation, often less than 1 meter, may cause a profound change in species composition. Small mounds may contain abundant species from the *Chasmanthium* and *Callicarpa* groups and are often occupied by large loblolly pines in old-growth sites. Likewise, lower areas provide habitat for wetland species such as those in the *Justicia* group and lack most mesic species.

Similar LTPs: 231Ea.8.4.10 is associated with stream bottoms, but the streams are smaller with narrow valleys and little or no floodplain, the *Chasmanthium* and *Callicarpa* groups are more common, and species from the *Bignonia* and *Justicia* groups are rare. Downstream, these site grade into Seasonally Flooded River Floodplains (231Ea.4.2.10).

231Ea.8.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Sandy Wet Forested Seeps Landtype Phase

Geographic Range: Lies mainly along the eastern side of the Red River in northern Louisiana, extending eastward to roughly 5-8km east of Bayou Dorcheat. In Kisatchie National Forest, it includes the southwestern portion of the Caney Unit of the Caney Ranger District southwest of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary. Williams & Smith (1995) do not recognize the presence of forested seeps from the Caney Ranger District. Nonetheless, one such site was sampled on the Caney Unit south of Upper Caney Lake. It provides the basis for the following description.

Geology: Formed in recent sandy alluvium and colluvium over sandy Pleistocene deposits. Sites are associated with drainage heads and small headwater streams.

Landform: Forested seeps occur in drainheads and along small headwater streams, where underground water flow exits a hillside as a seep. They may also be found downstream wherever seepage of underground water occurs. Stream channels are often poorly developed. Most of these sites are very small, less than 1 ha (2.5 acres). Adjacent uplands often have sandy or arenic soils such as the Boykin series.

Soil Characteristics: Soils are poorly drained sands or loamy fine sands that are continually wet. Nearly constant hypoxic conditions result in grey colors throughout the profile. Soil reaction is medium acid to extremely acid and available nutrients are very low. While such soils are not described on local soil surveys, probably owing to their rarity, they are consistent with the Osier series as described for Winn Parish.

Hydrology: Soils are very poorly drained but rapidly permeable. An impermeable subsurface layer such as sandstone, shale, or clay, along which groundwater flows, often lies below the soil and results in constant ground water seepage. Soils are rarely or never flooded but are saturated most of the year and have a semipermanently to nearly permanently saturated hydrologic regime.

Natural Disturbances and Processes: Fire is infrequent on wet forested seeps. Windstorms may uproot or damage trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species in the *Osmunda* group are abundant, especially netted chain fern (*Woodwardia areolata*), cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*). Jack-in-the-pulpit (*Arisaema triphyllum*) and certain other members of the *Arisaema* group may also be present on some sites. White-Edge Sedge (*Carex debilis*) is often abundant.

Overstory Tree Species: Sweetbay magnolia, swamp tupelo, red maple, and sweetgum dominate. Occasional water oak, swamp white oak, or green ash may also be found.

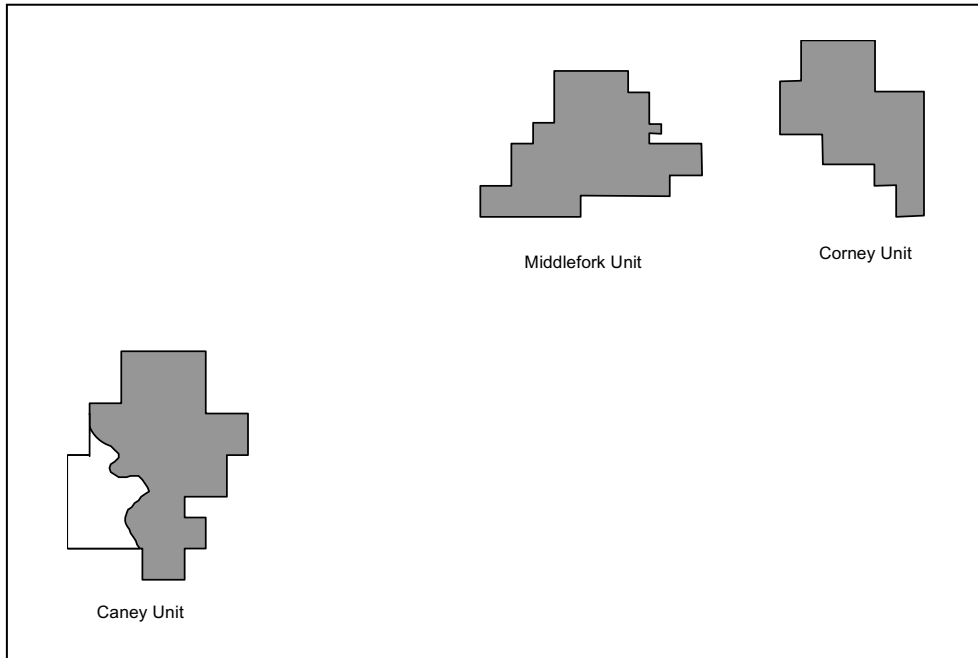
Understory Tree Species: The understory includes American holly and American hornbeam along with sweetbay magnolia and other saplings of overstory trees such as red maple, and green ash.

Shrub Species: Common shrubs include possumhaw, early azalea, Arkansas blueberry, Virginia sweetspire, and wax-myrtle. Northern spicebush (*Lindera benzoin*) may also occur.

Similar LTPs: No other LTPs closely resemble forested seeps. 231Ea.8.4.20 also occurs in wet areas but these are irregularly flooded stream bottom sites with well-developed floodplains which lack significant occurrences of the *Osmunda* Group.

CHAPTER 9

231Ea.9 NORTH LOUISIANA CLAYEY HILLS LANDTYPE ASSOCIATION



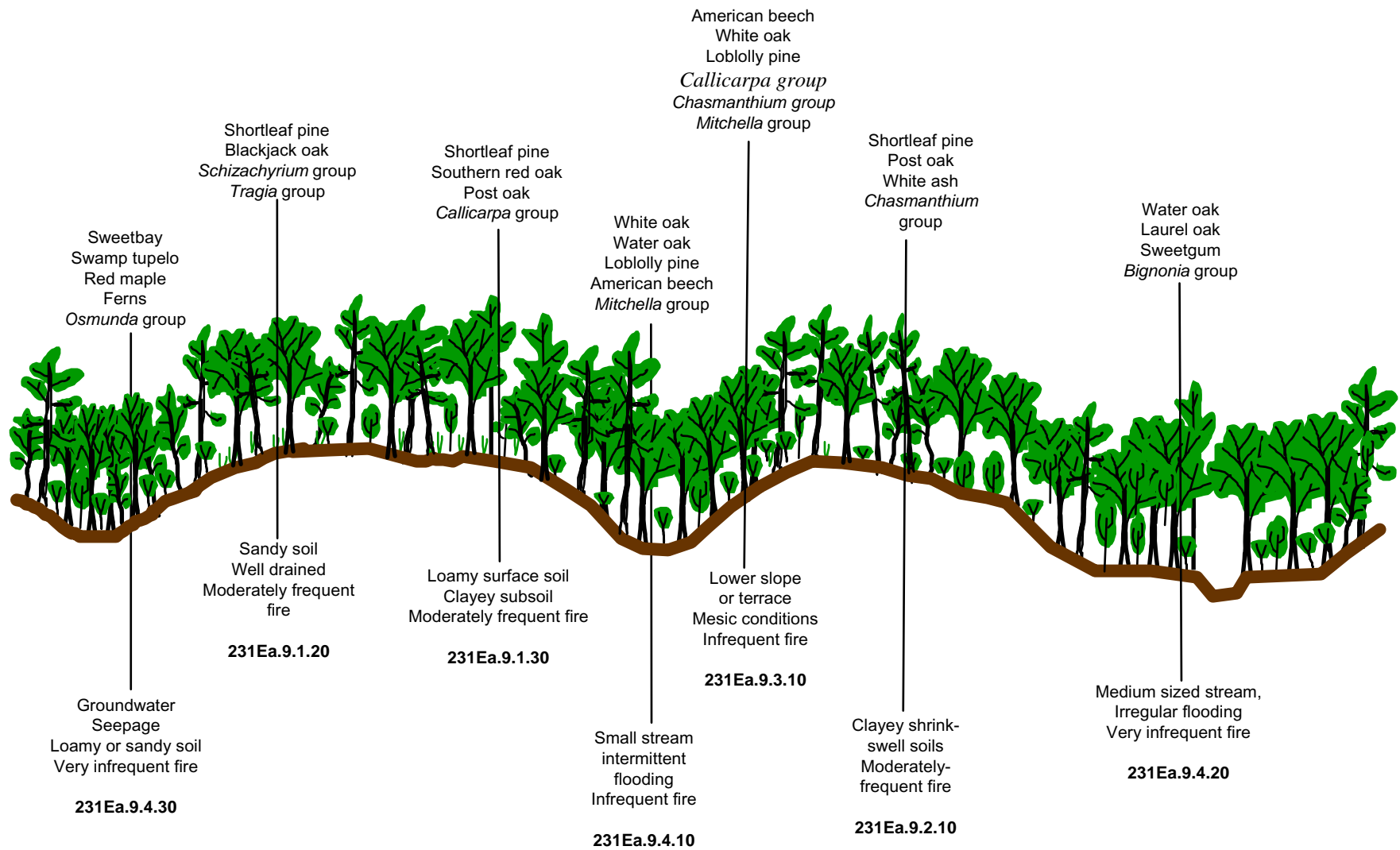


Figure 9.1 Landscape profile of ecosystems on the North Louisiana Clayey Hills Landtype Association .

231Ea.9 NORTH LOUISIANA CLAYEY HILLS LANDTYPE ASSOCIATION



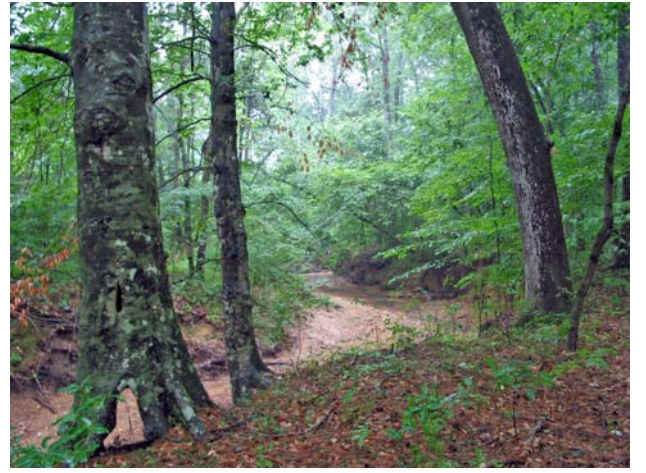
231Ea.9.1.30: Shortleaf Pine-southern red oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands (Kisatchie NF, Caney Ranger District, Compartment 21, Stand 9)



231Ea.9.2.10: Shortleaf Pine/*Chasmanthium* Clayey Dry-Mesic Uplands (Kisatchie NF, Caney Ranger District, Compartment 23, Stand 4)



231Ea.9.3.10: White Oak-American beech-Loblolly Pine/*Chasmanthium* Loamy Mesic Lower Slopes (Kisatchie NF, Caney Ranger District, Compartment 27, Stand 5)



231Ea.9.4.10: Water Oak/*Mitchella* Loamy Mesic Stream Bottoms (Kisatchie NF, Caney Ranger District, Compartment 28, Stand 4)



231Ea.9.4.20: Sweetgum-oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms (Kisatchie NF, Caney Ranger District Compartment 17, Stand 9)



231Ea.9.4.30 : Sweetbay-Swamp Tupelo/*Osmunda* Sandy Wet Forested Seeps (Kisatchie NF, Caney Ranger District, Compartment 19, Stand 18)

KEY TO LANDTYPE PHASES

- 1a. Upper slopes, broad uplands, or ridgetops. Sites are typically pine-dominated..... 2
- 1b. Lower slopes, ravines, wet hillside seeps, stream terraces, or stream floodplains. Sites are typically deciduous hardwood-dominated. 4
- 2a. Soils arenic (sandy surface layer more than 50cm thick) or sandy throughout the profile. Soils usually mapped as Flo or Wolfpen soils. The *Tragia* group may be present.
.....231Ea.9.1.20 Shortleaf Pine-Blackjack Oak/*Tragia* Sandy Dry Uplands
- 2b. Loamy or clayey soils, any sandy surface layer < 50cm thick. 3
- 3a. Soils either loamy throughout the profile or with a sandy loam, loamy sand, or gravelly surface layer that is more than 30 cm thick over clay subsoil. Often mapped as Darley, Ruple, Mahan, Bowie, Darbonne, or Angie soils. Species from the *Callicarpa* and *Chasmanthium* groups are abundant.
..... 231Ea.9.1.30 Shortleaf Pine-Southern Red oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands
- 3b. loamy surface soils less than 30 cm thick over clay subsoil. Soils are somewhat poorly drained and usually have shrink-swell properties. Drainage mottles may be present in the soil profile, and a perched water table may be present. Includes most areas mapped as Sacul and Eastwood soils. Species from the *Callicarpa* and *Chasmanthium* groups are abundant. 231Ea.9.2.10 Shortleaf Pine/*Chasmanthium* Clayey Dry-Mesic Uplands
- 4a. Moderate to steep Lower slopes and ravines or minor stream terraces. Species from the *Callicarpa*, *Chasmanthium* and *Mitchella* groups common but those from the *Bignonia* and *Justicia* groups rare or absent.
.....231Ea.9.3.10 White Oak-American Beech-Loblolly Pine/*Chasmanthium* Loamy Mesic Lower Slopes
- 4b. Valleys and floodplains of small or medium-sized intermittent or perennial streams or areas of groundwater seepage. 5
- 5a. Constantly saturated groundwater seepage areas (baygalls) at the head of or adjacent to small streams. Deep, gray nearly permanently saturated sandy loam soils. Soils are consistent with the Osier series. Sweetbay magnolia, swamp tupelo, and red maple dominate the overstory. Possumhaw, early azalea, and Arkansas blueberry common in the understory. Members of the *Osmunda* group are common.....
..... 231Ea.9.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Sandy Wet Forested Seeps
- 5b. Stream bottoms or floodplains without significant surface seepage of groundwater. 6

- 6a. Small bottoms of intermittent or perennial streams with floodplains typically less than 100m wide. Flooding is intermittent and sites are generally flooded for less than 5% of the growing season. Soils commonly mapped as luka soils or as the soil type of the adjacent uplands. Overstory includes water oak, sweetgum, loblolly pine, and often, American beech. The *Chasmanthium*, *Callicarpa*, and *Mitchella* groups are common, but species from the *Bignonia* and *Justicia* groups are rare or absent.....
.....231Ea.9.4.10 Water Oak/*Mitchella*
Loamy Mesic Stream Bottoms
- 6b. Floodplains of medium-sized or large perennial streams with floodplains typically more than 100m wide. Flooding is irregular or seasonal and sites are generally flooded for more than 5% of the growing season. Soils commonly mapped as Guyton or luka. Flood tolerant species such as swamp chestnut oak, willow oak, American elm, and laurel oak often present. Members of the *Bignonia* and *Justicia* groups usually present. 7
- 7a. Floodplains are largely irregularly flooded (flooded for < 12.5% of a typical growing season). Seasonally flooded (12.5-25% of season) areas exist as small, isolated areas in depressions. Members of the *Chasmanthium*, *Callicarpa*, and *Mitchella* groups are common. The Overstory is a variable mixture of mesic and flood tolerant species, but swamp white oak, Water oak, swamp hickory and Loblolly pine may be common.
..... 231Ea.9.4.20 Sweetgum-Oak /*Bignonia*
Loamy Wet-Mesic Stream Bottoms
- 7b. Floodplains are largely seasonally flooded (12.5-25% of a typical growing season) or if flooded less, exist on a landscape with a significant seasonally flooded component. Swampy areas with baldcypress may also occur. Restricted in Kisatchie National Forest's Caney Ranger District to the lowest and wettest parts of the floodplains of Corney Bayou and the Middle Fork of Bayou D'Arbonne. Seasonally flooded areas lack species from the *Chasmanthoum*, *Callicarpa*, and *Mitchella* groups, but the *Bignonia* and *Justicia* groups are common. Flood tolerant oaks (willow, laurel, and overcup) often dominate..... 231Ea.4 Alluvial Floodplains and Terraces
Landtype Association (See Chapter 25)

LANDTYPE PHASE DESCRIPTIONS

231Ea.9.1 Sandy/ Loamy Uplands Landtype

231Ea.9.1.20 Shortleaf Pine-Blackjack Oak/*Tragia* Sandy Dry Uplands Landtype Phase

Geographic Range: Spans much of Northern Louisiana extending from Bayou Dorcheat in the west nearly to the Ouachita River in the east. Includes most of the Caney Ranger District of Kisatchie National Forest; all of the Corney and Middlefork units and the Caney Unit northeast of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Occurs in sandy deposits on the Eocene-aged Cook Mountain and Cockfield formations of northern Louisiana.

Landform: Occurs on middle and upper side slopes, broad uplands, and ridgetops. Most slopes are convex with a moderate to moderately steep gradient.

Soil Characteristics: Soils, typically belonging to the Flo and Wolfpen series, are loamy fine sands or fine sands for at least the upper 50-100cm. The subsoil is also sandy in the case of the Flo series, but is loamy in Wolfpen soils. Soil reaction is medium acid to very strongly acid and available nutrients are low.

Hydrology: Soils are somewhat excessively well-drained and are subject to seasonal drought, especially in late summer. The sandy soil texture causes precipitation to percolate rapidly through the soil, so minimal surface runoff occurs. Occasionally, water may percolate to the surface in the heads of adjacent drainages as forested seeps (231Ea.9.4.30).

Natural Disturbances and Processes: Under presettlement conditions, sites were subject to moderately frequent fires that may have helped maintain a somewhat open shortleaf pine-hardwood community. Drought stress may also result in a more open forest and less ground vegetation than for loamy and clayey sites.

Ground Layer Species: Species from the *Tragia* group are often present. Plants from the *Callicarpa* group are usually common along with limited species from the Schizachyrium group including flowering spurge (*Euphorbia corollata*), Texas ironweed (*Vernonia texana*), and tapered rosette grass (*Dichanthelium acuminatum*).

Overstory Tree Species: Common trees are shortleaf pine, blackjack oak, post oak, and black hickory. When subject to occasional fire, the overstory develops into an open woodland.

Understory Tree Species: Common understory trees include, Mexican plum, white fringetree, gum bumelia, and sassafras.

Shrub Species: Common shrubs include sandhill plum, winged sumac, and farkleberry.

Similar LTPs: 231Ea.9.2.30 may have similar vegetation when subject to frequent fire, but species from the *Tragia* group are less common and soils consist of loamy topsoil over clay subsoil.

231Ea.9.1.30 Shortleaf Pine-Southern Red Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Spans much of Northern Louisiana extending from Bayou Dorcheat in the west nearly to the Ouachita River in the east. Includes most of the Caney Ranger District of Kisatchie National Forest; all of the Corney and Middlefork units and the Caney Unit northeast of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Formed in clayey and loamy deposits on the Eocene-aged Cook Mountain and Cockfield formations of northern Louisiana.

Landform: Occurs on middle and upper slopes and broad, level to convex uplands. Slope gradient is generally moderate to moderately steep but occasional steeply sloping areas occur, particularly in the southeast portion of the Caney Unit. This LTP is the dominant upland type in most areas.

Soil Characteristics: The topsoil is typically a loamy sand or sandy loam, often with a significant percentage of gravel or stones. The subsoil is clay loam, loam, sandy clay loam, or clay and often contains ironstone layers. The topsoil depth is always greater than 30cm when the upper horizons of the subsoil are clay. The uppermost subsoil horizons must be clay loam or coarser to belong to this LTP if the topsoil is less than 30cm deep. A variety of soil series are associated with this LTA, frequently Darley, Ruple, Mahan, Bowie, Darbonne, and Angie. Soils are typically strongly acid or very strongly acid.

Hydrology: Soils are well drained or moderately well drained but somewhat slowly permeable due to the clayey subsoils. Consequently, significant surface runoff occurs. Slopes are often dissected by small intermittent drainages. As a result of limited infiltration, forested seeps are not found on the heads of adjacent drainages.

Natural Disturbances and Processes: Under natural conditions, periodic fires burned through these uplands, with the fire interval on a particular site influenced by topographic isolation and soil moisture. The historic fire return interval was probably moderately frequent.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups are abundant. On regularly burned sites, elements of the *Schizachyrium* group, especially flowering spurge (*Euphorbia corollata*), Texas ironweed (*Vernonia texana*), downy milkpea (*Galactia volubilis*) and tapered rosette grass (*Dichanthelium acuminatum*) may be common although the dominant grasses of that group were never conspicuous on reference sites. Nettleleaf noseburn (*Tragia urticifolia*) may occur, but the rest of the *Tragia* group is rare. Indian-Physic (*Porteranthus stipulatus*), uncommon in most of the Kisatchie and Texas National Forests, is occasional on this LTP. Spiked Crested-Coralroot (*Hexalectris spicata*) an uncommon orchid was present on one reference site from the Corney Unit.

Overstory Tree Species: Shortleaf pine and southern red oak often dominate high natural-quality sites. Black hickory, post oak, blackjack oak, white oak, sweetgum, and blackgum are common. Loblolly pine and sweetgum typically dominate sites with a history of severe disturbance, long-term lack of fire, or agriculture. This LTP is outside the historic range of longleaf pine.

Understory Tree Species: Black cherry, flowering dogwood, red maple, winged elm, and occasional sassafras along with saplings of overstory dominants comprise much of the understory.

Shrub Species: Common shrubs include farkleberry, southern arrowwood, American beautyberry, winged sumac, and smallflower blueberry. Yaupon, while sometimes present, is less common than for equivalent LTPs to the south.

Similar LTPs: 231Ea.9.2.10 occupies a similar position (often slightly lower) on the landscape, may have similar vegetation but the clay subsoil is within 30 cm of the surface. 231Ea.9.1.20 occupies similar positions on the landscape but soils are sandy throughout and the *Tragia* group is present.

231Ea.9.2 Clayey Uplands Landtype

231Ea.9.2.10 Shortleaf Pine/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Spans much of Northern Louisiana extending from Bayou Dorcheat in the west nearly to the Ouachita River in the east. Includes most of the Caney Ranger District of Kisatchie National Forest; all of the Corney and Middlefork units and the Caney Unit northeast of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Formed in clayey deposits on the Eocene-aged Cook Mountain and Cockfield formations of northern Louisiana.

Landform: These sites occur on middle and upper slopes and on broad, level to convex uplands, generally slightly lower on the landscape than loamy uplands (231Ea.9.1.30). Slope gradients are moderate to moderately steep.

Soil Characteristics: Surface soil textures range from loamy sand and sandy loam to loam. However, a clay-textured subsoil is within 30cm of the surface. Most have shrink-swell properties. Nutrient levels are low and some have high levels of exchangeable aluminum. While these soils are classified as moderately well drained, drainage mottles are usually present in the subsoil, reflecting occasional water logging resulting from slow permeability. These soils belong primarily to the Sacul and Eastwood series.

Hydrology: Soils are moderately well drained but are slowly permeability and thus can experience occasional subsoil water logging. Soil moisture is usually higher than for loamy uplands (LTP 231Ea.9.1.30), but soils can become quite dry during prolonged drought at which time they are very resistant to rewetting. Slow permeability ensures significant surface runoff occurs and minimal groundwater recharge; forested seeps are not found on the heads of adjacent drainages. Slopes are often dissected by small intermittent drainages.

Natural Disturbances and Processes: historically, periodic fires burned through these uplands with the fire interval on a particular site influenced by topographic barriers, fuels, and soil moisture. The historic fire return interval was probably moderately frequent; these fires may have resulted in stands that were more open and had less woody understory than today. Shrink swell processes and resistance to rewetting following drought may also affect vegetation. Compared to loamy uplands, these sites are slightly more prone to convert to a loblolly pine-sweetgum community following disturbance in the absence of fire.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups are abundant. On regularly burned sites, elements of the *Schizachyrium* group, especially flowering spurge (*Euphorbia corollata*), Texas ironweed (*Vernonia texana*), downy milkpea (*Galactia volubilis*) and tapered rosette grass (*Dichantherium acuminatum*) may be common although the dominant grasses of that group were never conspicuous on reference sites. Strong groundlayer differences from loamy uplands were not observed on reference sites.

Overstory Tree Species: Shortleaf pine or loblolly pine and southern red oak dominate. Other common trees include blackjack oak, sweetgum, and blackgum.

Understory Tree Species: Black cherry, red maple, and winged elm along with saplings of oaks, sweetgum, and other overstory trees comprise much of the understory.

Shrub Species: American beautyberry dominates. Other common shrubs include farkleberry, winged sumac, and southern arrowwood. Yaupon, while sometimes present, is far less common than for equivalent LTPs to the south.

Similar LTPs: 231Ea.9.1.30 occupies a similar position on the landscape, but either the upper subsoil layer has a clay loam or loam texture or the clay subsoil is deeper than 30 cm below the surface.

231Ea.9.3 Mesic Slopes and Terraces Landtype

231Ea.9.3.10 White Oak-American beech-Loblolly Pine/*Chasmanthium* Loamy Mesic Lower Slopes Landtype Phase

Geographic Range: Spans much of Northern Louisiana extending from Bayou Dorcheat in the west nearly to the Ouachita River in the east. Includes most of the Caney Ranger District of Kisatchie National Forest; all of the Corney and Middlefork units and the Caney Unit northeast of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Formed in clayey, loamy, and sandy deposits of the Eocene-aged Cook Mountain and Cockfield formations of northern Louisiana.

Landform: Occurs on middle to lower slopes and on small stream terraces, forming the transition zone between (usually) pine-dominated upper slopes and hardwood-dominated stream bottoms. Slope shape is linear to concave, and slope gradients are moderate to very steep.

Soil Characteristics: Occurs on a variety of soil types. Increased moisture and fire-protection resulting from low topographic position are more important than soil type in structuring vegetation. Common soils include Sacul, Eastwood, Darley, and Mahan. Nutrient levels range from low to high and reaction is medium acid very strongly acid.

Hydrology: Low position on the hydrologic landscape, proximity to streams, and a mesic microclimate result in soils with a relatively high moisture availability. This moderates the effects of droughts. As a result, species requiring mesic conditions dominate. Sites are often dissected by small intermittent streams and drainages.

Natural Disturbances and Processes: Fire is infrequent on lower slopes and terraces. In an unusually dry period, fires that originate on uplands may burn down to a lower slope, where there may be sufficient fuel to carry a low-intensity surface fire. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Most species are from the *Callicarpa*, *Chasmanthium* and *Mitchella* groups. Species from the *Arisaema* group also may occur. Christmas fern (*Polystichum acrostichoides*), American strawberry-bush (*Euonymus Americana*) and naked-flower tick-trefoil (*Desmodium nudiflorum*) are often present.

Overstory Tree Species: The primary overstory species are usually loblolly pine, white oak, American beech, southern red oak, and sweetgum. Other species that may be present include blackgum, water oak, cherrybark oak, mockernut hickory, and swamp (pignut) hickory.

Understory Tree Species: Common understory trees include eastern hophornbeam, red maple, American holly, winged elm, and flowering dogwood.

Shrub Species: The dominant shrubs are usually American beautyberry and American witchhazel. Others important shrubs include common sweetleaf, common pawpaw, Carolina buckthorn, maple leaf viburnum, and rusty blackhaw.

Similar LTPs: 231Ea.9.4.10 has similar vegetation but occurs on the bottoms of small headwater streams and naked-flower tick-trefoil (*Desmodium nudiflorum*) is usually absent.

231Ea.9.4 Minor Stream Bottoms Landtype

231Ea.9.4.10 Water Oak/ *Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Spans much of Northern Louisiana extending from Bayou Dorcheat in the west nearly to the Ouachita River in the east. Includes most of the Caney Ranger District of Kisatchie National Forest; all of the Corney and Middlefork units and the Caney Unit northeast of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary.

Geology: Formed in Eocene-aged deposits of the Cook Mountain and Cockfield formations covered by a thin layer of recent (Holocene) alluvial sands and loams associated with small perennial and intermittent streams.

Landform: Occurs on toe slopes and small floodplains associated with small streams. Floodplain width is normally less than 100 meters. Slope shape is concave to linear, and slope gradients are gentle to very gentle.

Soil Characteristics: Soils are generally sandy loams over heterogeneous parent material. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is medium acid to very strongly acid and available nutrients range from high to low. Drainage mottles are common in the subsoil. Soils often belong to the luka series although Guyton, Ouachita, and Dela soils may occur. The Soil Survey maps many of the smaller stream valleys with the adjacent upland soil type, commonly Sacul, Darley, or Eastwood.

Hydrology: The streams associated with this landtype phase are small, often intermittent, and many do not have well-developed floodplains. Stream gradients are relatively steep and upstream watersheds are small, so flooding occurs only intermittently, and generally lasts for <5% of the growing season. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire occurs infrequently on stream bottoms. Fires originating on adjacent uplands may burn to the edge of stream bottoms and restrict the encroachment of stream bottom vegetation onto the slopes. Erosion and deposition constantly change the course of stream channels, undercutting banks and causing trees to fall. Windstorms may uproot or damage trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa*, *Chasmanthium*, and *Mitchella* groups are common. Favorable microsites may support members of the *Arisaema* group. Depressions and

low areas may support species from the *Bignonia* and occasionally, *Justicia* groups. Christmas fern (*Polystichum acrostichoides*.), and american strawberry-bush (*Euonymus Americana*) are often present.

Overstory Tree Species: The primary overstory species are usually loblolly pine, water oak, and sweetgum. A variety of additional species may be present including southern red oak, white oak, Blackgum, cherrybark oak, swamp (pignut) hickory, American beech, and red maple,

Understory Tree Species: Major understory trees include American hornbeam, eastern hophornbeam, American holly, and red maple. Winged elm, Florida maple, and flowering dogwood may also be common.

Shrub Species: American witchhazel and smallflower blueberry are common. Other species include sweetleaf, American beautyberry, common pawpaw, Carolina buckthorn, southern arrowwood, and Eliot's blueberry.

Similar LTPs: 231Ea.9.4.20 also occurs on stream bottoms; however, the streams associated with these floodplains are generally larger, are subject to irregular flooding, and species from the *Bignonia* group are common.

231Ea.9.4.20 Sweetgum-oak/ *Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Spans much of Northern Louisiana extending from Bayou Dorcheat in the west nearly to the Ouachita River in the east. Includes most of the Caney Ranger District of Kisatchie National Forest; all of the Corney and Middlefork units and the Caney Unit northeast of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary. In Kasitchie National Forest, many of these sites are associated with Corney Bayou, the Middle Fork of Bayou D'Arbonne, and their major tributaries.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with medium-sized perennial stream valleys.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Floodplain width is normally greater than 100 meters. The slope shape is concave to linear, and slope gradients are nearly level to very gentle. Some sites have numerous small depressions, drainage channels, ridges, and mounds created as flood waters scour and deposit alluvial materials. A sandy, slightly elevated natural levee often exists immediately adjacent to the stream channel.

Soil Characteristics: Soils formed in alluvial material consisting of sandy loam to loamy sand over heterogeneous parent material. Because of scouring and new deposition from flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil is exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles occur throughout the soil profile. Soil reaction ranges from medium acid to very strongly acid, and available nutrients are low to medium. Soils generally belong to the luka, Guyton, Ouachita, or Dela series.

Hydrology: The streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle, so an irregularly flooded hydrologic regime occurs. Duration of flooding is generally for 5-12.5% of the growing season and increases with the size of the watershed.

Natural Disturbances and Processes: Fire occurs very infrequently on stream floodplains. Erosion and deposition constantly change the course of stream channels, undercutting banks and causing trees to fall. Windstorms may also uproot or damage trees.

Ground Layer Species: A rich mixture of both mesic species (*Chasmanthium*, *Callicarpa*, and *Mitchella* groups) and wetland species (*Bignonia* and *Justicia* groups) occurs. Abundant species include Muscadine grape (*Vitis rotundifolia*), poison ivy (*Toxicodendron radicans*), partridge berry (*Mitchella repens*), crossvine (*Bignonia capreolata*), slender woodoats (*Chasmanthium laxum*), Virginia Dayflower (*Commelina virginica*), and Louisiana sedge (*Carex louisianica*).

Overstory Tree Species: As with the groundlayer, a variety of mesic and wetland species occurs. Sweetgum and a mixture of cherrybark oak, water oak and swamp chestnut oak dominate. Other common species include American elm, shagbark hickory, and swamp hickory. White oak, southern red oak, slippery elm, laurel oak, willow oak, and overcup oak are occasionally present. Scattered loblolly pines are typically present; these may grow to a very large size.

Understory Tree Species: American hornbeam and American holly are often abundant in the understory. Other species may include Florida maple, winged elm, and eastern hophornbeam, along with saplings of overstory trees such as red maple, sweetgum and swamp hickory.

Shrub Species: Switch cane may be abundant, especially on sandy natural levees and near stream banks. Others include occasional deciduous holly, Elliott's blueberry, smallflower blueberry, and Carolina buckthorn.

Site Inclusions: Slight differences in elevation, often less than 1 meter, may cause a profound change in species composition. Small mounds may contain abundant species from the *Chasmanthium* and *Callicarpa* groups and are often occupied by large loblolly pines in old-growth sites. Likewise, lower areas provide habitat for wetland species such as those in the *Justicia* group and lack most mesic species. Low wet, seasonally flooded or swampy areas too large to be considered inclusions should be interpreted to belong to LTA231Ea.4.

Similar LTPs: 231Ea.9.4.10 is associated with stream bottoms, but the streams are smaller, with narrow valleys and little or no floodplain, and the *Chasmanthium*, *Callicarpa* groups are more common and species from the *Bignonia* and *Justicia* groups are rare.

The classification of some portions of the floodplains of Corney Bayou and the Middle Fork of Bayou D'Arbonne is problematic as the size and hydrologic regimes of these floodplains where they pass through Kisatchie National Forest represent a transition from LTA231Ea.9 to major floodplains classified as LTA231Ea.4. Different portions of the floodplains will best fit one or the other Landtype association. In general, if seasonally flooded areas with no loblolly pine where bottomland (willow, laurel, and overcup) oaks dominate and species from the *Chasmanthium*, *Callicarpa*, and *Mitchella* species groups are rare exist as scattered small inclusions, sites are on LTA231Ea.9. If seasonally flooded communities of a hectare or more are widespread on the floodplain, they should be considered to belong to the Alluvial Floodplains and Terraces Landtype Association (LTA231Ea.4).

231Ea.9.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Sandy Wet Forested Seeps Landtype Phase

Geographic Range: Spans much of Northern Louisiana extending from Bayou Dorcheat in the west nearly to the Ouachita River in the east. Includes most of the Caney Ranger District of Kisatchie National Forest; all of the Corney and Middlefork units and the Caney Unit northeast of a line from where Highway 159 crosses the south boundary of the unit, across the middle portion of upper Caney Lake, to the point where Parish Road 16 crosses the Unit's west boundary. Williams & Smith (1995) do not recognize the presence of forested seeps from the Caney Ranger

District. Nonetheless, two such sites were located on the Middlefork unit. They provide the basis for the following description.

Geology: Formed in recent sandy alluvium and colluvium over Eocene-aged, deposits of the Cook Mountain and Cockfield formations and are associated with drainage heads and small headwater streams.

Landform: Forested seeps occur in drainheads and along small headwater streams, where underground water flow exits a hillside as a seep. They may also be found downstream wherever seepage of underground water occurs. Stream channels are often poorly developed. Most of these sites are very small, less than 1 ha (2.5 acres). Adjacent uplands usually have sandy soils.

Soil Characteristics: Soils are poorly drained sands or loamy fine sands that are continually wet. Nearly constant hypoxic conditions result in grey colors throughout the profile. Soil reaction is medium acid to extremely acid and available nutrients are very low. While such soils are not described in local soil surveys, probably owing to their rarity, they are consistent with the Osier series as described for Winn Parish.

Hydrology: Soils are very poorly drained but rapidly permeable. An impermeable subsurface layer such as sandstone, shale, or clay, along which groundwater flows, often lies below the soil and results in constant ground water seepage. Soils are rarely or never flooded but are saturated most of the year and have a semipermanently to nearly permanently saturated hydrologic regime.

Natural Disturbances and Processes: Fire is infrequent on wet forested seeps. Windstorms may uproot or damage trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Osmunda* group are abundant, especially netted chain fern (*Woodwardia areolata*), cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*). Jack-in-the-pulpit (*Arisaema triphyllum*) and certain other members of the *Arisaema* group may also be present on some sites. White-edge Sedge (*Carex debilis*) is often abundant.

Overstory Tree Species: Sweetbay magnolia, swamp tupelo, red maple, and sweetgum dominate. Occasional water oak, swamp white oak, or green ash may also be found.

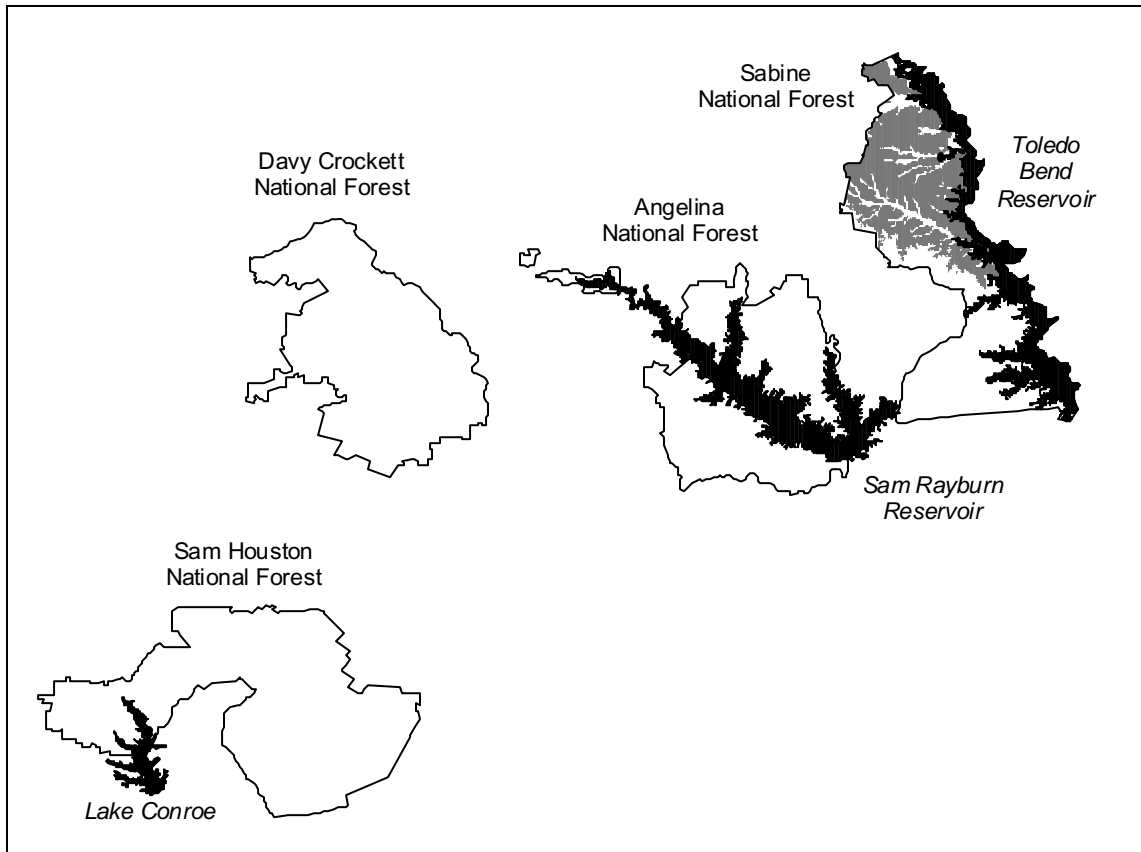
Understory Tree Species: The understory includes American holly and American hornbeam along with sweetbay magnolia and other saplings of overstory trees such as red maple, and green ash.

Shrub Species: Common shrubs include possumhaw, early azalea, and Arkansas blueberry. Virginia sweetspire, wax-myrtle, and northern spicebush (*Lindera benzoin*) may also occur.

Similar LTPs: No other LTPs closely resemble forested seeps. 231Ea.9.4.20 also occurs in wet areas but these are irregularly flooded stream bottom sites with well-developed floodplains which lack the *Osmunda* Group.

CHAPTER 10

231Ea.10 LIGNITIC UPLANDS LANDTYPE ASSOCIATION



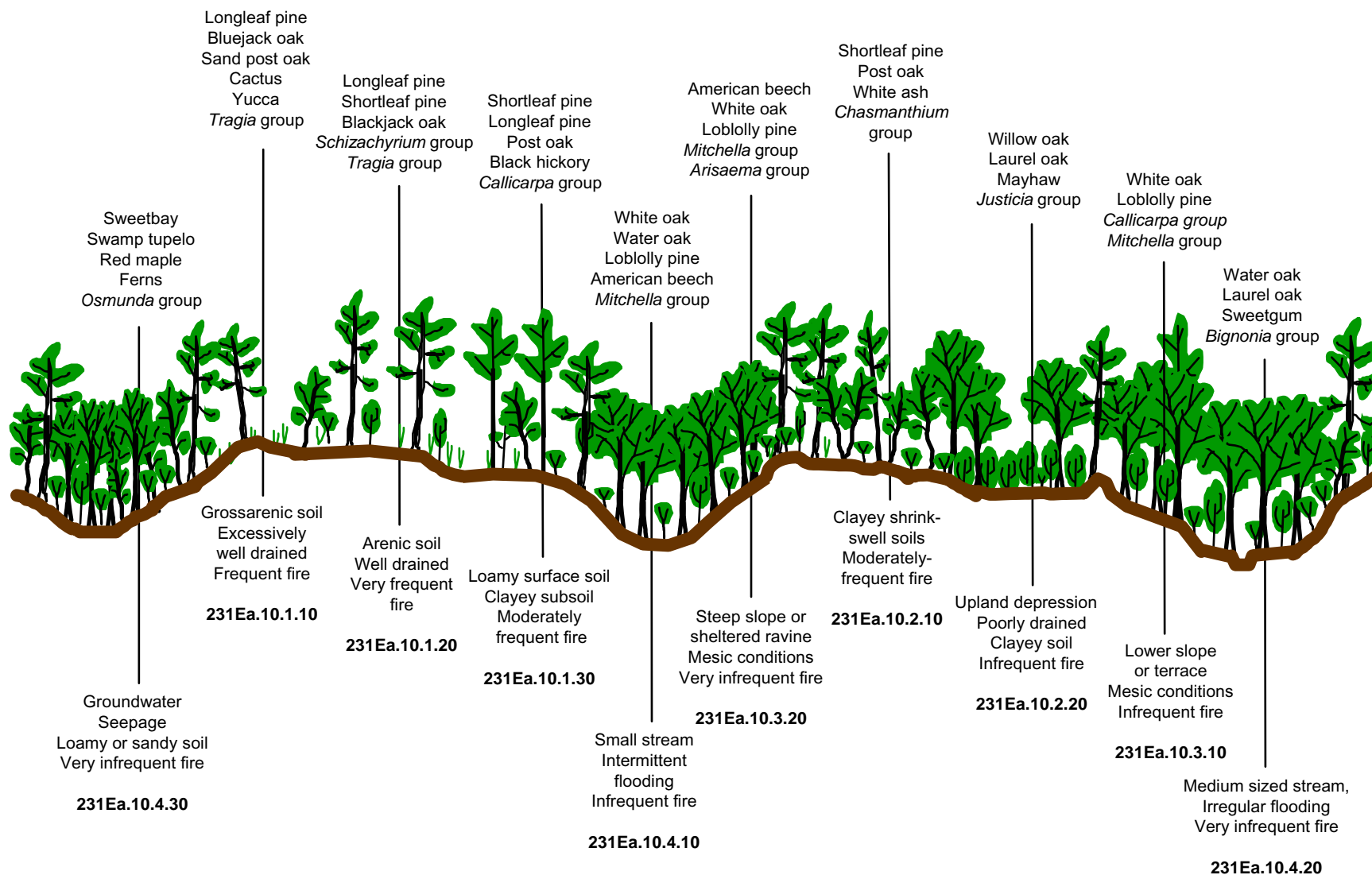


Figure 10.1 Landscape profile of ecosystems on the Lignitic Uplands Landtype Association.

231Ea.10 LIGNITIC UPLANDS LANDTYPE ASSOCIATION



231Ea.10.1.30: Shortleaf Pine-(Longleaf Pine)-Post Oak/*Callicarpa*-*Chasmanthium* Loamy Dry-Mesic Uplands (Sabine NF, Compartment 6, Stand 10)



231Ea.10.3.10: White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes & Terraces (Sabine NF, Compartment 2, Stand 9)



231Ea.10.3.20: American Beech-White Oak/*Mitchella* Loamy Moist-Mesic Steep Slopes & Ravines (Sabine NF, Compartment 51, Stand 15)



231Ea.10.4.10: White Oak-Water Oak/*Mitchella*-*Arisaema* Loamy Mesic Stream Bottoms (Sabine NF, Compartment 51)



231Ea.10.4.30: Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase (Sabine NF, Compartment 2, Stand 9)

KEY TO LANDTYPE PHASES

- 1a. Upper slopes, broad uplands, or ridgetops. Sites are typically pine-dominated..... 2
- 1b. Lower slopes, ravines, wet hillside seeps, poorly drained upland flats, stream terraces, or stream floodplains. Sites are typically deciduous hardwood-dominated. 5
- 2a. Soils sandy, arenic or grossarenic, the upper 50cm or greater having a sandy texture. ... 3
- 2b. Loamy or clayey soils, some portion of the upper 50cm not sandy..... 4
- 3a. Sandy or grossarenic, excessively drained soils with a sand or loamy sand surface layer at least 100cm thick. Includes Darco and Betis soils. Sites are on gentle to moderately steep upper slopes and ridgetops. The open woodland overstory may include longleaf pine, shortleaf pine, post oak, blackjack oak and bluejack oak. Species from the *Tragia* group are indicators, and the *Schizachyrium* group may also be common.....
231Ea.10.1.10 Shortleaf Pine-(Longleaf Pine)--Bluejack Oak/*Tragia*
 Grossarenic Dry Uplands
- 3b. Arenic, well drained to excessively drained soils with a sand or loamy sand surface layer 50-100cm thick. Includes Lilbert and Tenaha soils. Located on gently to moderately sloping upper slopes, broad uplands, and ridgetops. The stand is often an open woodland with a mixture of pines, blackjack oak, and post oak. On frequently burned sites, the *Schizachyrium* group is common. The *Tragia* group may be present but is less abundant than for 3a.....
231Ea.10.1.20 Shortleaf Pine-(Longleaf Pine)-Blackjack Oak/*Schizachyrium*
 Arenic Dry Uplands
- 4a. Sandy loam to clay loam surface soil greater than 30 cm thick, usually over clay subsoil. Soils are well drained to somewhat poorly drained. Soils mapped primarily as the Kirvin series. Overstory includes shortleaf pine, loblolly pine, post oak, southern red oak, and black hickory. The *Callicarpa* and *Chasmanthium* groups are common, the *Schizachyrium* group uncommon or absent.
231Ea.10.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium*
 Loamy Dry-Mesic Uplands
- 4b. Silt loam to clay loam or clay surface soil less than 30 cm thick over clay subsoil. Soils are moderately well drained to somewhat poorly drained and usually have shrink-swell properties and gilgai humps. Drainage mottles may be present in the soil profile, and a perched water table may be present. Includes the Eastwood series. Overstory a mixture of shortleaf pine, loblolly pine, and oaks. Abundant understory shrubs include yaupon, American beautyberry, and parsley hawthorn. The *Chasmanthium* group is abundant and the *Callicarpa* group is common.
 231Ea.10.2.10 Shortleaf Pine-Post Oak/*Chasmanthium*
 Clayey Dry-Mesic Uplands
- 5a. Lower slopes, terraces of minor streams, or slopes of steep ravines. 6
- 5b. Minor stream bottoms, floodplains, groundwater seeps, or poorly drained upland flats or depressions..... 7

- 6a. Gently to moderately sloping middle to lower side slopes or small terraces of minor streams. Soils well drained but with high available moisture. Soil textures variable. Drainage mottles may be present in the subsoil. Soils Include Attoyac, Bernaldo, Cuthbert, Eastwood, Keithville, Sawtown, and Rentzel. The overstory is a mixture of oaks, hickory, and pine, including white oak, southern red oak, mockernut hickory, loblolly pine, and shortleaf pine. The *Callicarpa* and *Chasmanthium* groups are abundant. American beech and the *Mitchella* group may be present.
231Ea.10.3.10 White Oak-Loblolly Pine/*Callicarpa*
 Loamy Mesic Lower Slopes and Terraces

- 6b. Slopes of steep ravines associated with minor stream drainages. Well drained sandy loam surface soils over clay or clay loam subsoils with high available moisture capacity. Gravel or cobbles may be present in the soils which often belong to the Cuthbert series. The overstory is dominated by hardwoods, particularly American beech, white oak, and southern magnolia. Loblolly pine may also be present. The *Mitchella* group is common and the *Arisaema* group may be present, especially near the stream.
 231Ea.10.3.20 American Beech-White Oak/*Mitchella*
 Loamy Moist-Mesic Steep Slopes and Ravines

- 7a. Poorly drained, nearly level, clayey upland flats and depressions. Soils have a clay loam surface over a clay subsoil with drainage mottles throughout the profile. Soils are saturated or flooded during winter and early spring most years. They Include the Guyton series or Guyton inclusions within Keithville-Sawtown terrace soils. The Overstory includes willow oak and laurel oak. Some sites may be dominated by mayhaw, green hawthorn, or Carolina ash. The ground layer is sparse, but the *Justicia* group is common.
 231Ea.10.2.20 Willow Oak/*Justicia*
 Clayey Wet Upland Depressions

- 7b. Groundwater seeps or floodplains of small, intermittent or perennial streams. 8

- 8a. Nearly constantly saturated groundwater seep areas (baygalls) at the head of or adjacent to small perennial streams. Soils have a deep gray, wet sand or sandy loam surface layer and are usually mapped as Rentzel or Tenaha. The overstory includes sweetbay, swamp tupelo, and red maple and the *Osmunda* group is abundant.
 231Ea.10.4.30 Sweetbay-Swamp Tupelo/*Osmunda*
 Loamy Wet Forested Seeps

- 8b. Stream bottoms or minor floodplains without extensive seepage of groundwater. 9

232Ea.10 Lignitic Uplands Landtype Association

- 9a. Valleys of small intermittent or perennial streams without well-developed floodplains. Flooding is intermittent and the floodplain is usually less than 100 m. wide. Soils are sandy loam to clay loam and drainage mottles may occur in the subsoil. Soils include the luka and Marietta series. The hardwood-dominated overstory includes white oak, water oak, and American beech. Loblolly and shortleaf pine are also present. Florida maple, and American holly occur in the understory. The *Mitchella* group is common, and the *Arisaema* group is locally common near stream banks.
..... 231Ea.10.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema*
Loamy Mesic Stream Bottoms
- 9b. Level to gently sloping, moderately wide floodplains of intermediate-sized perennial streams which typically flood irregularly (5-12.5% of growing season). Floodplain width is usually greater than 100 m. Soils are loamy sand to clay loam and drainage mottles are common throughout the soil profile. Soils often belong to the Nahatche series. The soil litter layer is usually thin or bare and the Overstory includes water oak, willow oak, laurel oak, swamp tupelo, and swamp chestnut oak. The *Bignonia* group is common, the *Mitchella* group present on slightly elevated mounds, and the *Justicia* group is present in wet depressions 231Ea.10.4.20 Willow Oak-Laurel Oak/*Bignonia*
Loamy Wet-Mesic Stream Bottoms

LANDTYPE PHASE DESCRIPTIONS

231Ea.10.1 Sandy/Loamy Uplands Landtype

231Ea.10.1.10 Shortleaf Pine-(Longleaf Pine)-Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest. The main occurrence on Sabine National Forest is in the Matlock Hills area near the boundary between the Lignitic Uplands and Redlands Landtype Associations.

Geology: Occurs on the Wilcox group and on outliers of the Carrizo formation. Terrain is gently to moderately rolling.

Landform: Occurs on ridgetops and associated convex middle and upper slopes. Slope gradients are gentle to moderately steep.

Soil Characteristics: Soils consist of a deep excessively drained loamy sand surface soil at least 100cm thick over coarse sand subsoil. The B horizon, if present, is often deeper than 200 cm from the surface. Soils are droughty and nutrient availability is very low. They include the Darco and Betis series.

Hydrology: The sandy soils are rapidly permeable and excessively drained, so rainfall percolates downward quickly; hence, long periods of drought occur.

Natural Disturbances and Processes: Presettlement stands experienced a frequent fire regime. Fires were fed by the accumulation of grasses and pine needles in the litter layer. Natural fires were usually ignited by lightning from thunderstorms during the growing season. High fire frequency prevents the accumulation of large amounts of fuel, so fires are generally limited to low-intensity surface fires.

Ground Layer Species: The ground layer is a diverse mixture of grasses, members of the sunflower (Asteraceae) family, and other sun-loving herbaceous species. Species from the *Schizachyrium* group are usually abundant and Little bluestem (*Schizachyrium scoparium*) may constitute the majority of ground cover. Species from the *Tragia* group are indicators. Significant patches of bare ground or areas covered by lichens (*Cladonia* and *Cladina* spp.) occur. Succulents such as eastern pricklypear (*Opuntia humifusa*) and Louisiana yucca (*Yucca louisianensis*) are present on most sites.

Overstory Tree Species: The stand is typically open woodland. Some high quality natural sites may include longleaf pine, especially near the southern edge of the LTA. Shortleaf pine occurs on many sites along with bluejack oak and post oak.

Understory Tree Species: Sand post oak and bluejack oak are common understory associates of longleaf pine. Blackjack oak and sassafras also occur in the understory.

Shrub Species: Shrubs include farkleberry, October flower (*Polygonella polygama*), dwarf pawpaw, and fragrant sumac.

Similar LTPs: 231Ea.10.1.20 occurs on ridgetops, but soils are usually arenic (the sandy layer less deep), the surface soil texture less coarse, and species from the *Tragia* group less abundant.

231Ea.10.1.20 Shortleaf Pine-(Longleaf Pine)-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest north of a line from State Highway 21 at Pendleton Bridge northwest to State Highway 147 at Patroon Bayou north of San Augustine.

Geology: Occurs on the Wilcox group and on outliers of the Carrizo formation. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper side slopes, broad uplands, and ridgetops. Slope shape is convex with gentle to moderate slopes.

Soil Characteristics: Soils are usually arenic (have a sandy surface layer 50-100cm thick) and consist of loamy fine sand surface soils over sandy loam subsoils. Depth to the subsoil is normally greater than 50 cm. Soil reaction is medium acid to strongly acid, and available nutrients are low. Soils are mapped as Lilbert and Tenaha series.

Hydrology: Sites are well-drained to excessively well-drained and are subject to seasonal drought, especially in late summer. The sandy soil texture causes precipitation to percolate rapidly through the soil, so little surface runoff occurs.

Natural Disturbances and Processes: In presettlement times frequent natural fires burned through these uplands with the fire interval on a particular site influenced by topographic barriers, fuel, and soil moisture. These fires inhibited the establishment of woody understory species and increased the tendency of these sites to form open woodlands. Many modern stands are denser and have more woody understory than historically as a result of lack of fire.

Ground Layer Species: Where the canopy is somewhat open, species from the *Schizachyrium* group are common to abundant. Species from the *Tragia* group may also be present. Species from the *Callicarpa* and *Chasmanthium* groups may become common on sites without regular burning.

Overstory Tree Species: Shortleaf pine, blackjack oak, post oak, southern red oak, black hickory, and in some stands, Longleaf pine, are the principal trees. Since this landtype phase occurs largely north of the range of longleaf pine, this species is absent on many sites but may have been more common historically.

Understory Tree Species: Sand post oak can be found in the understory as well as winged elm, sassafras, and Mexican plum.

Shrub Species: Common shrubs include farkleberry, winged sumac, dwarf pawpaw, and yaupon.

Site Inclusions: Small, mesic microsites may be found in slight depressions on broad, flat ridgetops. Species from the *Chasmanthium* and *Callicarpa* species groups are more abundant in these areas.

Similar LTPs: 231Ea.10.1.10 occurs on a similar landscape position, but it consists of very deep sandy soils and species from the *Tragia* group are more abundant.

231Ea.10.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest north of a line from State Highway 21 at Pendleton Bridge northwest to State Highway 147 at Patroon Bayou north of San Augustine.

Geology: Occurs on the Wilcox group. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper slopes and broad, level to convex uplands. Slope gradient is gentle to moderately steep.

Soil Characteristics: Soils have a sandy loam to clay loam surface horizon over clayey subsoil. The subsoil is generally more than 30 cm from the surface. Surface soils have moderately high nutrient content, soil reaction is medium to strongly acid, and drainage mottles may be present in the subsoil. Soils are often mapped as the Kirvin series.

Hydrology: Soils are moderately well drained to somewhat poorly drained. Slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: The presettlement natural fire return interval was probably moderately frequent. Historically, fire may have resulted in stands that were more open and had less woody understory than today.

Ground Layer Species: Species from the *Callicarpa* group are common to abundant as are members of the *Chasmanthium* group. On frequently burned sites, the *Schizachyrium* group may be common.

Overstory Tree Species: The overstory varies but usually consists of mixed pine and hardwood species. Shortleaf pine, loblolly pine, sweetgum, post oak, southern red oak, mockernut hickory and black hickory are important species. Longleaf pine occurs on some sites--particularly near the southern edge of the LTA, and may have been more common historically.

Understory Tree Species: Flowering dogwood, eastern hophornbeam, winged elm, red maple, deciduous holly, and southern arrowwood are common understory trees.

Shrub Species: Shrubs include yaupon, American beautyberry, and farkleberry.

Similar LTPs: 231Ea.10.2.10 occupies a similar position on the landscape but has more clay in the surface soil, a clayey subsoil within 30 cm of the surface, and species from the *Chasmanthium* group are more abundant. 231Ea.10.1.20 has arenic soils and the *Schizachyrium* group is usually important.

231Ea.10.2 Clayey Uplands Landtype

231Ea.10.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest north of a line from State Highway 21 at Pendleton Bridge northwest to State Highway 147 at Patroon Bayou north of San Augustine.

Geology: Occurs on the Wilcox group. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper slopes and broad, level to convex uplands. Slope gradient is gentle to moderately steep.

Soil Characteristics: Soils have high clay content, and most have vertic (shrink-swell) properties in the subsoil. This feature is sometimes manifested by small humps or gilgai resulting from churning of the soil through repeated expansion and contraction. Surface soil texture ranges from silt loam to clay loam and clay, and the clayey subsoil is generally within 30 cm of the surface. Surface soils have high nutrient availability and are medium to strongly acid. Drainage mottles are often present in the subsoil. Soils belong primarily to the Eastwood series.

Hydrology: Soils are moderately well drained to somewhat poorly-drained but are slowly permeability and thus can experience occasional subsoil water logging. Soil moisture is usually higher than for loamy uplands (LTP 231Ea.10.1.30), but soils can become quite dry during prolonged drought at which time they are very resistant to rewetting. Slopes are often dissected by small intermittent drainages.

Natural Disturbances and Processes: The presettlement natural fire return interval was probably moderately frequent. Historically, fire may have resulted in stands that were more open and had less woody understory than today. Shrink-swell properties also influence overstory composition and may limit the growth of pines and other deep-rooted species. Resistance of soils to rewetting may affect vegetation by prolonging drought.

Ground Layer Species: Species from the *Chasmanthium* group are dominant. Members of the *Callicarpa* group are common and some species from the *Schizachyrium* group, such as Texas ironweed (*Vernonia texana*) and little bluestem (*Schizachyrium scoparium*), may be locally common especially if stands burn regularly.

Overstory Tree Species: The overstory consists of mixed pine and hardwood species including shortleaf pine, post oak, and white ash. Geotrophic overstory species such as pines may be stunted and have noticeably crooked stems.

Understory Tree Species: Winged elm, red maple, and eastern hophornbeam are common understory species.

Shrub Species: Yaupon is the most abundant understory shrub. Other common species include American beautyberry, parsley hawthorn, upland swamp privet, and deciduous holly.

Similar LTPs: 231Ea10.1.30 occupies a similar position on the landscape but the subsoil, if clayey, is deeper than 30 cm below the surface.

231Ea.10.2.20 Willow Oak/*Justicia* Clayey Wet Upland Depressions Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest north of a line from State Highway 21 at Pendleton Bridge northwest to State Highway 147 at Patroon Bayou north of San Augustine.

Geology: Occurrences are local, usually in areas of thin windblown deposits over clayey sediments of the Wilcox group. Terrain is gently to moderately rolling.

Landform: Small depression areas on old terraces in upland positions. Slope gradient is nearly level. Areal extent of occurrences is usually no more than 20 ha.

Soil Characteristics: Soils are mapped areas of Guyton soils or unmapped Guyton inclusions within Keithville-Sawtown terrace soils. Surface soils are gray clay loam over gray clayey subsoil

that is within 15 cm of the surface. Red or brown mottles can occur throughout the soil profile. Soil reaction is strongly acid to extremely acid. Guyton soils become fluid when wet, contributing to windthrow of overstory species.

Hydrology: Soil permeability is very slow, and ponding usually occurs in the winter and spring of most years. Prolonged wetness creates anoxic conditions that limit the growth of upland species. The hydrologic regime is irregularly to seasonally saturated or flooded.

Natural Disturbances and Processes: Fire is infrequent, but during dry periods, fires originating on adjacent uplands may burn through a site. Shallow-rooted trees are subject to windthrow. Succession occurs mainly through individual tree mortality.

Ground Layer Species: Herbaceous ground cover is depauperate because of saturated conditions and fluctuating water levels. Species composition is quite similar to the floodplains of larger streams. Many species are from the *Justicia* group. Species from the *Bignonia* group may also be present.

Overstory Tree Species: Important trees include willow oak, green ash, and laurel oak. The canopy may be open with numerous gaps. Small mounds within the depression may support southern red oak and loblolly pine.

Understory Tree Species: Understory trees may form dense thickets. Some or all of the following species may be present: Mayhaw, carolina ash, green ash, common persimmon, and bottomland post oak.

Shrub Species: Shrubs are typically sparse, but may include deciduous holly, yaupon, and common buttonbush.

Similar LTPs: The vegetative composition of upland depressions is superficially similar to that of the floodplains of rivers (231Ea.4.2.10) but these depressions are on uplands and typically support fewer species.

231Ea.10.3 Mesic Slopes and Terraces Landtype

231Ea.10.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest north of a line from State Highway 21 at Pendleton Bridge northwest to State Highway 147 at Patroon Bayou north of San Augustine.

Geology: Occurs on the Wilcox group. Terrain is gently to moderately rolling.

Landform: Occurs on middle to lower slopes and on terraces above minor stream bottoms, forming the transition zone between (usually) pine-dominated upper slopes and hardwood-dominated stream bottoms. Slope shape is linear to concave, and slope gradients are very gentle to moderate.

Soil Characteristics: The higher soil moisture characteristic of lower slopes appears to influence the plant community more than soil texture which is highly variable. Surface soils have moderate nutrient content. Drainage mottles may be present in the subsoil. A variety of soil series occur including Attoyac, Bernaldo, Cuthbert, Eastwood, Keithville, Sawtown, and Rentzel.

Hydrology: Due to low position on the landscape, proximity to streams, and mesic microclimate, soils tend to have more moisture than uplands and the effects of droughts are less severe. As a result, species that require mesic conditions dominate Sites may be dissected by small intermittent streams and drainages.

Natural Disturbances and Processes: Fire is infrequent on lower slopes and terraces; even in presettlement times its influence was limited. In an unusually dry period, fires originating on uplands may burn down to a lower slope, where there may be sufficient fuel to carry a low-intensity surface fire. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups including sessile flowered woodoats (*Chasmanthium sessiliflorum*) and devil's grandmother (*Elephantopus tomentosus*), are abundant. The *Mitchella* group may be locally common especially on moist microsites. On sites with a mature, closed overstory canopy, the herbaceous cover may be sparse.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods and pines. Relative dominances of hardwood and pine species can vary greatly from site to site, but most sites with no recent large-scale disturbances will eventually be dominated by hardwoods. Dominant overstory trees include white oak, southern red oak, cherrybark oak, white ash, blackgum, sweetgum, mockernut hickory, bitternut hickory, and occasionally, American beech. Loblolly pine and shortleaf pine are also important trees in most stands.

Understory Tree Species: Common understory trees include red maple and sweetgum saplings as well as American holly, winged elm, eastern hophornbeam, and flowering dogwood.

Shrub Species: American beautyberry, parsley hawthorn, southern arrowwood, farkleberry, Carolina buckthorn, and yaupon are common shrubs.

Similar LTPs: 231Ea.10.3.20 occurs on moderately steep to very steep slopes and mesic ravines, and the *Mitchella* group is more abundant. 231Ea.10.4.10 occurs on very gentle to moderate footslopes directly adjacent to small stream channels, and both the *Mitchella* and *Arisaema* groups are usually present.

231Ea.10.3.20 American Beech-White Oak/*Mitchella* Loamy Moist-Mesic Steep Slopes and Ravines Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest north of a line from State Highway 21 at Pendleton Bridge northwest to State Highway 147 at Patroon Bayou north of San Augustine. On Sabine National Forest, it is found primarily in areas adjacent to Toledo Bend Reservoir and near the boundary between the Lignitic Uplands and Redlands Landtype Associations.

Geology: Occurs primarily on steep slopes and ravines that have cut into shales and sandstones of the Wilcox group.

Landform: Occupies moderately steep to very steep slopes or the sides of ravines that have cut into outcrops of erosion-resistant material such as shale or sandstone. The slopes are protected from direct sun for part of the day, moderating temperature extremes and reducing evapotranspiration. The position of sites on the slope varies widely, and some sites can occupy an entire slope.

Soil Characteristics: Soils have well-drained sandy loam surface soils over clay or clay loam subsoils. The surface soil is generally shallow and may contain gravel or cobble. Shale or sandstone outcrops may be present. Soil reaction is medium acid to strongly acid, and nutrient content is low. Soils are mapped primarily as Cuthbert series. Narrow mesic ridgetops within a ravine complex may contain arenic soils, such as the Libbert series.

Hydrology: Due to steep slopes and loamy soil texture, sites are well-drained. However, clayey subsoils absorb and retain moisture, and the protected ravines experience low evapotranspiration rates. This results in low moisture deficits. Sites are usually located immediately above a perennial stream or river.

Natural Disturbances and Processes: The steep, dissected topography results in a very low fire frequency. Slopes and ravines are topographically isolated from adjacent uplands, so it is difficult for fires to burn into them. Steep topography also provides a protective refuge from disturbances such as high winds and floods. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: The overstory canopy is usually dense, and herbaceous ground cover is sparse on the shaded forest floor. However, a diverse mixture of species is often found there. Species from the *Mitchella* group dominate the ground layer but the *Callicarpa* and *Chasmanthium* groups are also well represented. These sites provide habitat for many Appalachian and Eastern Broadleaf forest species that reach the southwestern limit of their range in eastern Texas, including slender trillium (*Trillium gracile*), bloodroot (*Sanguinaria canadensis*), Jack in the pulpit (*Arisaema triphyllum*), crippled crane fly (*Tipularia discolor*), and yellow lady's slipper (*Cypripedium kentuckiense*).

Overstory Tree Species: The overstory consists primarily of hardwoods, including American beech, white oak, southern magnolia, American basswood and mockernut hickory. Loblolly pine occurs in the overstory, individuals often attaining a large size, but is not dominant.

Understory Tree Species: Common species include Florida maple, red maple, eastern hophornbeam, and eastern redbud.

Shrub Species: Shrubs include white fringetree, mapleleaf viburnum, Carolina buckthorn, witch hazel, American strawberrybush, smallflower blueberry, and largecluster blueberry.

Site Inclusions: Groundwater seeps may occur on some sandstone or shale outcrops. Ferns, liverworts, and mosses grow in abundance near these seeps.

Similar LTPs: The species composition of 231Ea.10.4.10 is superficially similar, but it occurs at the bottom of slopes and in small floodplains adjacent to small streams.

231Ea.10.4 Minor Stream Bottoms Landtype

231Ea.10.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest north of a line from State Highway 21 at Pendleton Bridge northwest to State Highway 147 at Patroon Bayou north of San Augustine.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams overlying the Wilcox group associated with small perennial and intermittent stream valleys.

Landform: Occurs on toe slopes of narrow stream bottoms. The floodplain is often poorly developed, normally less than 100 meters wide. Slope shape is concave to linear, and slope gradients are gentle to very gentle.

Soil Characteristics: Soils are generally sandy loams over heterogeneous parent material or bedrock. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is medium acid to strongly acid, and available nutrients are medium to low. Drainage mottles are common in the subsoil. Soils include the Luka and Marietta series.

Hydrology: The streams associated with this landtype phase are small, often intermittent, and do not have well-developed floodplains. Stream gradients are relatively steep and upstream watersheds are small, so flooding only occurs intermittently. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire occurs infrequently on stream bottoms and has minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees to fall. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa*, *Chasmanthium* and *Mitchella* groups are important. Species from the *Arisaema* group may occur in favorable microsites.

Overstory Tree Species: The overstory is composed of a variety of hardwood and pine species including white oak, American beech, mockernut hickory, blackgum, American basswood, water oak, sweetgum, loblolly pine, and shortleaf pine. Southern magnolia may be present on some sites.

Understory Tree Species: Common understory trees include saplings of blackgum, mockernut hickory, and American basswood along with Florida maple, American holly, eastern hophornbeam, common pawpaw, and white fringetree.

Shrub Species: Shrubs include American beautyberry, southern arrowwood, and common sweetleaf.

Similar LTPs: 231Ea.10.4.20 occupies a similar landscape position; however, floodplains are better developed, sites are subject to irregular flooding, and the *Bignonia* group is important.

231Ea.10.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest north of a line from State Highway 21 at Pendleton Bridge northwest to State Highway 147 at Patroon Bayou north of San Augustine.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with perennial stream valleys.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Floodplain width is normally greater than 100 meters. Slope shape is concave to linear, and slope gradients are nearly level. Micro-topography may consist of numerous small depressions, drainage channels, and mounds created as the stream channel shifts and flood waters scour and deposit alluvial materials.

Soil Characteristics: Soils formed in alluvial material and consist of sandy loam to loamy sand over heterogeneous alluvial parent material or bedrock. Depth to the subsoil may be over 100 cm. Because of irregular flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil is exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles occur throughout the soil profile. Soil reaction ranges from moderately alkaline to very strongly acid, and available nutrients are low to medium. Soils are generally Entisols and are mapped primarily as the Nahatche series.

Hydrology: Streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle, so irregular flooding (5-12.5% of the growing season) occurs. Duration of flooding increases with the size of the watershed.

Natural Disturbances and Processes: Fire occurs very infrequently on stream floodplains and is a minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels. This may undercut banks and cause trees to fall. New deposits of alluvial material are in turn colonized by vegetation. Windstorms may uproot or damage overstory trees.

Ground Layer Species: A mixture of mesic and wet site species occurs. The *Bignonia* group, especially caric-sedges (*Carex* spp.) and rushes (*Juncus* spp.), typically dominates the ground layer. On slightly elevated mounds, species from the *Mitchella* and *Callicarpa* groups may dominate. Looseflower waterwillow (*Justicia ovata*) and other species from the *Justicia* group occur in wet depressions and drainage channels. On immediate stream banks and in saturated depressions, one may find ferns such as sensitive fern (*Onoclea sensibilis*), and common ladyfern (*Athyrium filix-femina*).

Overstory Tree Species: The overstory is typically a mixture of both mesic and flood-tolerant species including willow oak, laurel oak, blackgum, sweetgum, red maple, green ash, water oak, white oak, swamp chestnut oak, cherrybark oak, and Loblolly pine.

Understory Tree Species: Common species include American hornbeam along with saplings of red maple, river birch, and green ash.

Shrub Species: Shrub species include dwarf palmetto, Gulf sebastiana, parsley hawthorn, Elliott's blueberry, smallflower blueberry, and southern bayberry.

Site Inclusions: Slight differences in elevation, often less than 1 meter, may cause a profound change in species composition. Examples include pimple mounds, which may contain species from the *Chasmanthium* and *Callicarpa* groups. Likewise, wet depressions and channels provide habitat for obligate wetland species such as those in the *Justicia* group.

Similar LTPs: 231Ea.10.4.10 is also associated with stream bottoms, but the streams are smaller, with narrow valleys and little or no floodplain, and the *Mitchella*, and *Arisaema* groups are more common. Downstream, 231Ea.10.4.20 grades into Seasonally Flooded River Floodplains such as 231Ea.4.2.10 or 231Ed.4.2.10.

231Ea.10.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Located in northeast Texas and northwest Louisiana including the northern half of Sabine National Forest north of a line from State Highway 21 at Pendleton Bridge northwest to State Highway 147 at Patroon Bayou north of San Augustine.

Geology: Parent material includes sandy deposits of the Wilcox group and/or recent (Holocene) alluvial sands, silts, and loams.

Landform: Occurs on the floodplains of small, perennial streams or on headslopes of perennial or intermittent drainages, where underground water flow exits a hillside as a seep. It may also be found downstream, often on footslopes immediately above floodplains, wherever seepage of underground water occurs. Stream channels are often poorly developed.

Soil Characteristics: Soils are gray fine sands or loamy fine sands often over a slowly permeable subsoil and are poorly drained and continually wet. Soil reaction is medium acid to strongly acid and available nutrients are very low. Soils belong to the Naconiche or Osier series but are usually mapped as Rentzel and Tenaha soils near stream drainages.

Hydrology: Soils are very poorly drained. An impermeable subsurface layer, such as sandstone, shale, or clay, results in constant ground water seepage and a semipermanently to nearly permanently saturated hydrologic regime.

Natural Disturbances and Processes: Fire is very infrequent on wet forested seeps and fires that do burn through a forested seep are usually of a low-intensity since hardwood leaf litter is not very flammable. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species in the *Osmunda* group dominate. Netted chain fern (*Woodwardia areolata*) is often the principal ground cover. Other ferns, especially cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*) are also important. The *Arisaema* group may be present on portions of some sites.

Overstory Tree Species: Common overstory trees include sweetbay magnolia, swamp tupelo, red maple, and green ash. Water oak and loblolly pine may be found on mesic microsites.

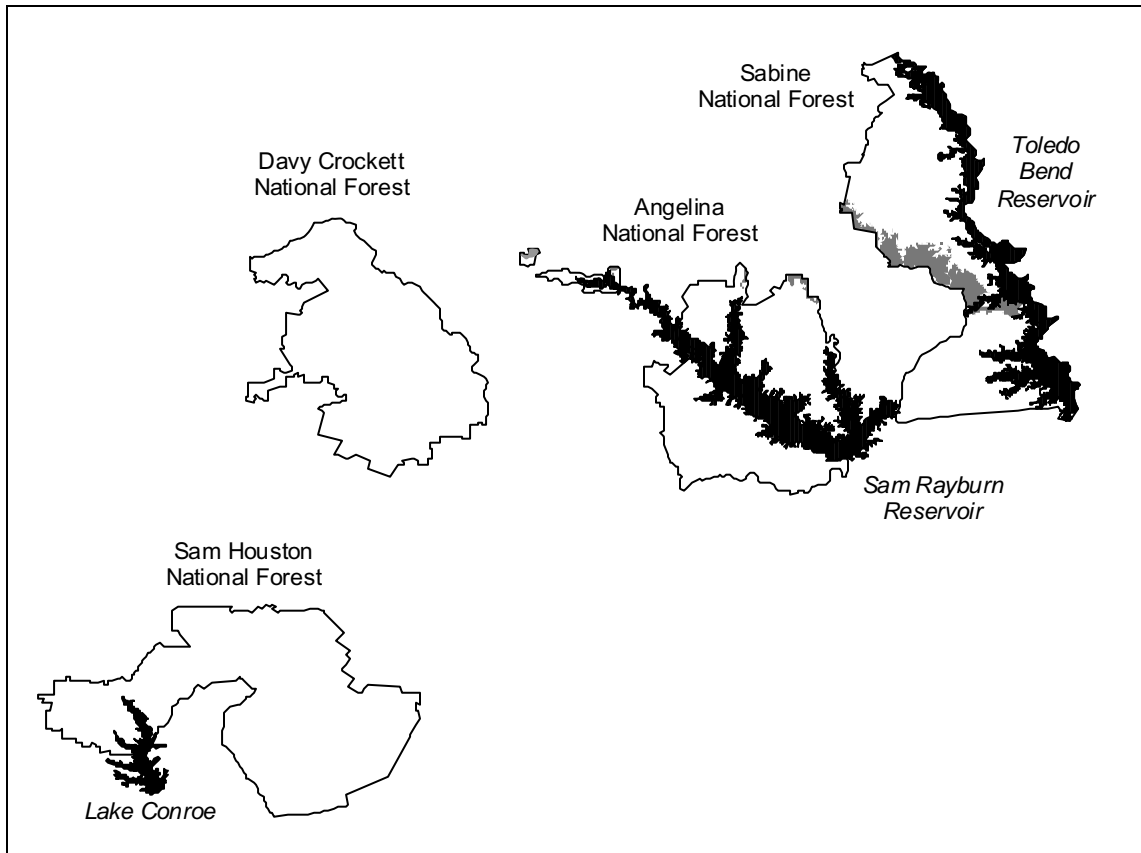
Understory Tree Species: Understory tree species include, redbay and red maple saplings.

Shrub Species: Shrubs include evergreen bayberry, early azalea, deciduous holly, and Arkansas blueberry. Poison sumac may also occur.

Similar LTPs: 231Ea.10.4.20, which occurs on well-developed floodplains where the *Bignonia* group is common, may have isolated saturated or seepy inclusions which support species from the *Osmunda* group.

CHAPTER 11

231Eg.11 REDLANDS LANDTYPE ASSOCIATION



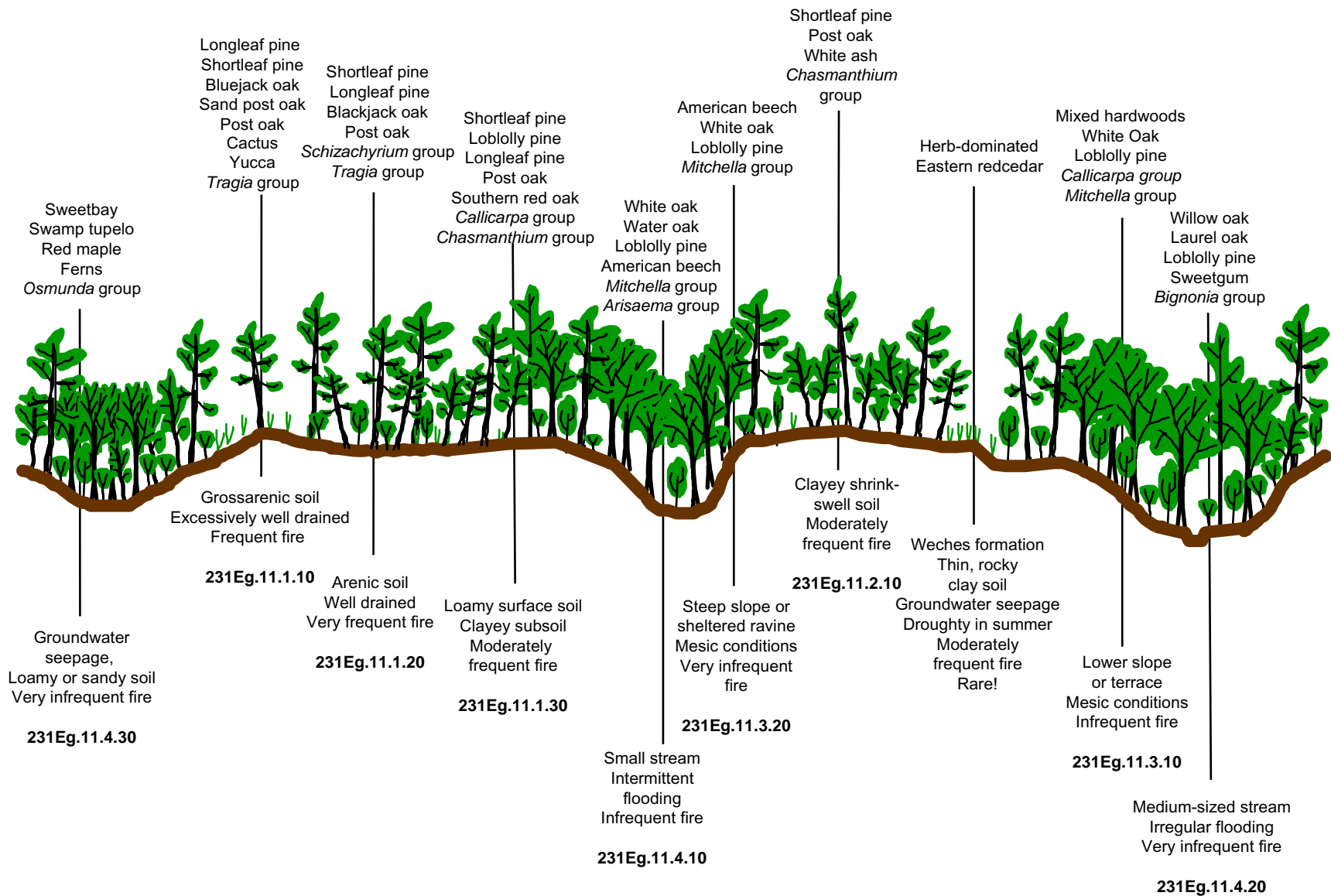


Figure 11.1 Landscape profile of ecosystems on the Redlands Landtype Association.

231Eg.11 REDLANDS LANDTYPE ASSOCIATION



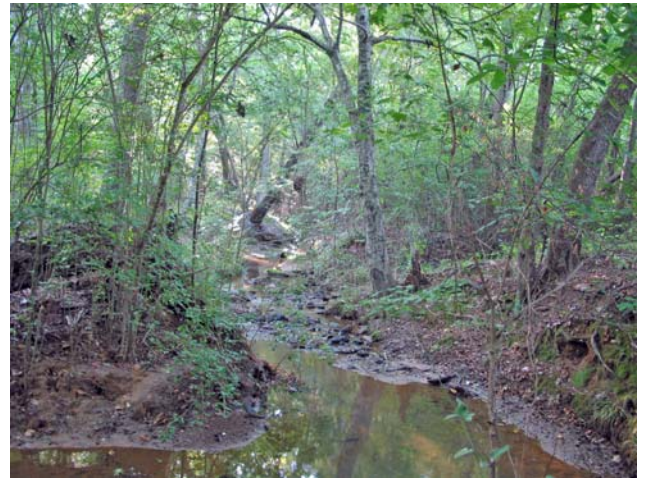
231Eg.11.1.10: Longleaf Pine-Bluejack Oak/*Tragia*
Grossarenic Dry Uplands (Sabine N.F, Compartment 52, Stand 97)



231Eg.11.2.10: Shortleaf Pine-Post Oak/*Chasmanthium*
Clayey Dry-Mesic Uplands (Near Nacogdoches, TX)



231Eg11.3.20: American Beech-White Oak/*Mitchella*
Moist-Mesic Steep Slopes & Ravines (Sabine N.F.,
Compartment 67, Stand 97)



231Eg.11.4.10: White Oak-Water Oak/*Mitchella-Arisaema*
Loamy Mesic Stream Bottoms (Nacogdoches, TX)



231Eg.11.4.20: Water Oak-Laurel Oak/*Bignonia* Loamy Wet-
Mesic Stream Bottoms (Near Lanana Creek, Nacogdoches,
TX)



231Eg.11.4.30: Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet
Forested Seeps (Nacogdoches Co., TX)

KEY TO LANDTYPE PHASES

- 1a. Upper slopes, broad uplands, or ridgetops. Sites are typically pine-dominated..... 2
- 1b. Lower slopes, ravines, poorly drained upland flats, hillside seeps, stream terraces, or floodplains. Sites are typically deciduous hardwood-dominated. 5
- 2a. Soils sandy, arenic or grossarenic, the upper 50cm or greater having a sand or loamy sand texture. 3
- 2b. Loamy or clayey soils, some portion of the upper 50cm not sand or loamy sand..... 4
- 3a. Sandy or grossarenic, excessively drained soils with a sand or loamy sand surface layer at least 100cm thick. Includes Tonkawa, Darco, and Betis soils. Sites are on gentle to moderately steep upper slopes and ridgetops. The open woodland overstory may include longleaf pine, shortleaf pine, and bluejack oak. Species from the *Tragia* group are indicators; the *Schizachyrium* group is also common.....
 231Eg.11.1.10 Shortleaf Pine-(Longleaf Pine)-Bluejack Oak/*Tragia*
 Grossarenic Dry Uplands
- 3b. Soils arenic, well drained to excessively drained, with a sand or loamy sand surface layer 50-100cm thick. Includes Lilbert and Tenaha soils. Sites are located on gently to moderately sloping upper slopes, broad uplands, and ridgetops. Stands are typically open woodlands with a mixture of pines, blackjack oak, and post oak. On frequently burned sites, longleaf pine may dominate. The *Schizachyrium* group is common, and the *Tragia* group is often present.
 231Eg.11.1.20 Shortleaf Pine-(Longleaf Pine)-Blackjack Oak/*Schizachyrium*
 Arenic Dry Uplands
- 4a. The sandy loam to clay loam surface soil is greater than 30 cm thick over clayey or loamy subsoil. Soils are well drained to somewhat poorly drained; mapped primarily as Kirvin soils. Overstory includes a varying mixture of shortleaf pine, loblolly pine, post oak, southern red oak, and hickories. The *Callicarpa* and *Chasmanthium* groups are common, the *Schizachyrium* group uncommon or absent.
 231Eg.11.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium*
 Loamy Dry-Mesic Uplands
- 4b. The silt loam to clay loam or clay surface soil is less than 30 cm thick over clay subsoil. Soils are moderately well drained to somewhat poorly drained. Drainage mottles may be present in the soil profile and a perched water table may be present. Soils Include Nacogdoches, Trawick and Sacul. Overstory is often a mixture of shortleaf pine and oaks. Abundant understory shrubs include yaupon, American beautyberry, and parsley hawthorn. The *Chasmanthium* group is dominant, the *Callicarpa* group also present.....
 231Eg.11.2.10 Shortleaf Pine-Post Oak/*Chasmanthium*
 Clayey Dry-Mesic Uplands
- 5a. Lower slopes, terraces of minor streams, or steep ravines..... 6
- 5b. Minor stream bottoms, floodplains, or groundwater seeps..... 7

- 6a. Gently to moderately sloping middle to lower side slopes or terraces above minor streams. Soils are well drained to somewhat poorly drained. Soil textures are variable. Subsoil drainage mottles may be present. Includes Attoyac, Bernaldo, Cuthbert, Kirvin, Nacogdoches, Trawick, Sacul, and Rentzel soils. Overstory is a diverse mixture of oaks, hickories, and pine, including white oak, southern red oak, mockernut hickory, loblolly pine, and shortleaf pine. The *Callicarpa* and *Chasmanthium* groups are abundant, the *Mitchella* group may be present.....
231Eg.11.3.10 White Oak-Loblolly Pine/*Callicarpa*
 Loamy Mesic Lower Slopes and Terraces
- 6b. Sites on the sides of steep ravines associated with minor stream drainages. Well drained sandy loam surface soils over clay or clay loam subsoils, usually with high moisture levels. Gravel or cobbles may be present in the solum. Outcrops of sandstone may be present. Includes Cuthbert and Trawick soils on steep slopes or ravines. Overstory is dominated by hardwoods, particularly American beech, white oak, and southern magnolia. Loblolly pine also occurs. The *Mitchella* group is common, the *Arisaema* group may be present
 231Eg.11.3.20 American Beech-White Oak/*Mitchella*
 Loamy Moist-Mesic Steep Slopes and Ravines
- 7a. Nearly constantly saturated groundwater seepage areas (baygalls) at the head of or adjacent to small perennial streams. Soils have a deep, wet, gray sand or sandy loam surface layer and include Osier and Rentzel soils. The overstory includes sweetbay, swamp tupelo, and red maple. Ferns are usually abundant in the understory; the *Osmunda* group is common..... 231Eg.11.4.30 Sweetbay-Swamp Tupelo/*Osmunda*
 Loamy Wet Forested Seeps
- 7b. Stream bottoms or floodplains without extensive groundwater seep areas. 8
- 8a. Small, intermittent or perennial stream bottoms without well-developed floodplains. Flooding is at most intermittent, and floodplain width is usually less than 100 m. Drainage mottles may occur in the subsoil. Includes luka and Marietta soils. Overstory is hardwood-dominated. White oak, water oak, American beech, American basswood, loblolly pine and shortleaf pine may be present. Florida maple and American holly occur in the understory. The *Mitchella* group is common, the *Arisaema* group locally common 231Eg.11.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema*
 Loamy Mesic Stream Bottoms
- 8b. Level to gently sloping, moderately wide floodplains of intermediate-sized perennial streams. Flooding occurs irregularly, and floodplain width is usually greater than 100 m. Soil litter layer is usually thin or bare. Drainage mottles are common throughout the soil profile. Includes Hannahatche, Tuscosso, luka, and Marietta soils. Overstory includes water oak, willow oak, laurel oak, swamp tupelo, and swamp chestnut oak. The *Bignonia* group is common; the *Mitchella* group occurs on slightly elevated areas; the *Justicia* group occurs in wet depressions. 231Eg.11.4.20 Water Oak-Laurel Oak/*Bignonia*
 Loamy Wet-Mesic Stream Bottoms

LANDTYPE PHASE DESCRIPTIONS

231Eg.11.1 Sandy/Loamy Uplands Landtype

231Eg.11.1.10 Shortleaf Pine-(Longleaf Pine)-Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase

Geographic Range: Found in the central part of the Texas Pineywoods including significant areas of northern San Augustine Nacogdoches Counties. Public lands include areas of central Sabine National Forest mainly in the San Augustine Sandhills and Matlock Hills areas. Good examples occur near Camp Tonkawa Springs in northern Nacogdoches County.

Geology: Restricted to deep, coarse-grained quartz sands of the Carrizo, Sparta, and rarely, Queen City formations.

Landform: Occurs on ridgetops and associated middle and upper slopes. Slope gradients are gentle to moderately steep. Terrain is gently to moderately rolling.

Soil Characteristics: Soils consist of a very deep excessively drained loamy sand surface soil at least 100cm deep over coarse sand subsoil. The B horizon, if present, is generally deeper than 200 cm from the surface. Soils are droughty and nutrient-poor. Includes Tonkawa, Darco, and Betis soils.

Hydrology: The sandy soils are rapidly permeable and excessively drained, so rainfall percolates downward quickly; hence, long periods of drought occur during the growing season.

Natural Disturbances and Processes: Presettlement stands were subject to a frequent fire regime. Fires were enhanced by the accumulation of pine needles and dry grasses in the litter layer. Natural fires are usually ignited by lightning from thunderstorms during the growing season. High fire frequency prevents the accumulation of large amounts of fuel, so fires were generally limited to low-intensity surface fires.

Ground Layer Species: The ground layer is diverse mixture that includes grasses and members of the sunflower (*Asteraceae*) family. Species from the *Tragia* group are indicators. Significant patches of bare ground or areas covered by lichens (*Cladonia* and *Cladina* spp.) occur. Devils tongue pricklypear (*Opuntia humifusa*) and Louisiana yucca (*Yucca louisianensis*) are usually present. Also common are species from the *Schizachyrium* group. Little bluestem (*Schizachyrium scoparium*) may constitute the majority of ground cover.

Overstory Tree Species: The overstory typically forms an open woodland and some presettlement stands (in the southeast portion of the LTA) were dominated by longleaf pine. Shortleaf pine occurs in varying amounts on most sites along with bluejack oak, other upland oaks, and black hickory.

Understory Tree Species: Sand post oak, sassafras and stunted or sapling bluejack oak and blackjack oak are common.

Shrub Species: On frequently burned sites, the shrub layer is not dense. Typical shrubs include dwarf pawpaw, fragrant sumac, farkleberry, and October flower (*Polygonella polygama*).

Site Inclusions: On very dry, isolated ridgetops with deep sands, extremely xeric conditions may restrict the establishment and growth of pine and an oak-dominated community may develop.

Similar LTPs: 231Eg.11.1.20 also occurs on sandy ridgetops and uplands, but soils are usually arenic (the sandy topsoil is less deep), the surface soil texture less coarse, and species from the *Tragia* group less common.

231Eg.11.1.20 Shortleaf Pine-(Longleaf Pine)-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

Geographic Range: Found in the central part of the Texas Pineywoods including northern San Augustine County, much of Nacogdoches County, and a large area to its north and west. Public lands include central Sabine National Forest mainly in the San Augustine Sandhills and Matlock Hills areas and extreme northern Angelina National Forest (Compartments 1 and 2).

Geology: Restricted to coarse-grained quartz sands of the Carrizo, Queen City, and Sparta formations.

Landform: Occurs on middle and upper side slopes, broad uplands, and ridgetops. Slope shape is convex with gentle to moderate gradients. Terrain is gently to moderately rolling.

Soil Characteristics: Soils are usually arenic and consist of deep loamy fine sand surface soils over sandy loam subsoils. Depth to the subsoil is normally 50-100 cm. Soil reaction is medium acid to strongly acid and available nutrients are low. Soils are mapped as Lilbert, Lovelady, and Tenaha series.

Hydrology: Soils are well-drained to excessively drained and subject to drought, especially in late summer. The sandy soil texture causes precipitation to percolate rapidly through the soil, so little surface runoff occurs.

Natural Disturbances and Processes: Under presettlement conditions, growing season fires burned frequently through these uplands with the fire interval on a particular site influenced by topographic barriers and soil moisture. Fire inhibits the establishment of woody understory and maintains a more open stand. Most modern stands are denser and have more woody understory as a result of reduced burning.

Ground Layer Species: Where the canopy is somewhat open, species from the *Schizachyrium* group are common to abundant. Species from the *Tragia* group may also be present. Species from the *Callicarpa* and *Chasmanthium* groups may become common on sites without regular burning.

Overstory Tree Species: Shortleaf pine, blackjack oak, post oak, southern red oak, black hickory, and in some stands in the southeastern portion of the LTA, Longleaf pine, are the principal trees. Since this landtype phase occurs largely north of the range of longleaf pine, this species is absent on many sites but may have been more common historically.

Understory Tree Species: Sand post oak can be found in the understory, as well as winged elm, sassafras, and Mexican plum.

Shrub Species: Common shrubs include farkleberry, winged sumac, dwarf pawpaw, and yaupon.

Similar LTPs: 231Eg.11.1.10 occurs on a similar landscape position, but it consists of very deep sandy soils and is more abundant in species from the *Tragia* group.

231Eg.11.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Found in the central part of the Texas Pineywoods including northern San Augustine County, much of Nacogdoches County, and a large area to its north and west. Public lands include central Sabine National Forest mainly in the San Augustine Sandhills and Matlock Hills areas and extreme northern Angelina National Forest (Compartments 1 and 2). This LTA is widespread throughout its range.

Geology: Widespread on the Carrizo, Reklaw, Queen City, and Sparta formations.

Landform: Occurs on middle and upper slopes and broad, nearly level uplands. Slope gradient is gentle to moderately steep and terrain is gently to moderately rolling.

Soil Characteristics: Profiles are characterized by sandy loam to clay loam surface soil over a clayey or clay loam subsoil. The subsoil is generally greater than 30 cm from the surface. Surface soils have moderately high nutrient content. Soil reaction is medium to strongly acid, and drainage mottles may be present in the subsoil. Soils are often mapped as Kirvin soils.

Hydrology: Soils are moderately well drained to somewhat poorly drained. Slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: Under natural conditions, periodic fires burn through these uplands, with the fire interval on a particular site influenced by topographic barriers, fuels, and soil moisture. The historic fire return interval was probably moderately frequent.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups are common to abundant. On frequently burned, open sites, the *Schizachyrium* group may be common.

Overstory Tree Species: The overstory varies but usually consists of mixed pine and hardwood species. Shortleaf pine, loblolly pine, sweetgum, post oak, southern red oak, mockernut hickory, and black hickory are important species. Longleaf pine occurs on some sites in the southeastern portion of the LTA, and may have been more common historically.

Understory Tree Species: Flowering dogwood, eastern hophornbeam, winged elm, and red maple are common in the understory.

Shrub Species: Shrubs include yaupon, American beautyberry, southern arrowwood and farkleberry.

Similar LTPs: 231Eg.11.2.10 occupies a similar position on the landscape, but has more clay in the surface soil, a clayey subsoil is usually within 30 cm of the surface, and species from the *Chasmanthium* group are more abundant. 231Eg.11.1.20 has arenic soils and the *Schizachyrium* group is often present.

231Eg.11.2 Clayey Uplands Landtype

231Eg.11.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Found in the central part of the Texas Pineywoods including northern San Augustine County, much of Nacogdoches County, and a large area to its north and west. Public

lands include central Sabine National Forest mainly in the San Augustine Sandhills and Matlock Hills areas and extreme northern Angelina National Forest (Compartments 1 and 2). This LTA is common in and around the city of Nacogdoches, Texas.

Geology: Occurs on the Weches and Reklaw formations.

Landform: Located on middle and upper side slopes and broad uplands. Slope gradient is gentle to moderately steep. Terrain is gently to moderately rolling.

Soil Characteristics: Soils have a high clay content, and soils from the Sacul series have vertic (shrink-swell) properties in the subsoil (Shrink-swell is limited in the kaolinitic Nacogdoches and Trawick soils). Surface soil textures range from silt loam to clay loam and clay, and a clayey subsoil is generally within 30 cm of the soil surface. Surface soils have a high nutrient content and are neutral to strongly acid. Drainage mottles are often present in the subsoil. Soils mainly belong to the Nacogdoches, Trawick, and Sacul series. Some areas of Trawick soils are shallow with underlying partially weathered glauconite at or near the surface ("Weches glades").

Hydrology: Soils are moderately well drained to somewhat poorly drained and may be highly erodable on exposed slopes. Slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: The historic fire interval was probably moderately frequent. Shrink-swell properties of some (Sacul) soils influence overstory composition and may limit the growth of pines. Forest stands are subject to windthrow, storm damage, and single-tree mortality.

Ground Layer Species: Species from the *Chasmanthium* group are dominant. Members of the *Callicarpa* group are also common, and certain species from the *Schizachyrium* group, such as Texas ironweed (*Vernonia texana*) and little bluestem (*Schizachyrium scoparium*), may be locally common.

Overstory Tree Species: The overstory consists of mixed pine and hardwood species. Shortleaf pine, loblolly pine, post oak, southern red oak and sugarberry are, among others, important trees. Historical evidence suggested that these sites have always had a significant hardwood component.

Understory Tree Species: Winged elm, red maple saplings, and eastern hophornbeam are common understory species.

Shrub Species: Common shrubs include yaupon, American beautyberry, parsley hawthorn, upland swampprivet, and various wild blueberry (*Vaccinium*) species. Carolina laurelcherry (*Prunus caroliniana*) is locally abundant.

Site Inclusions: On thin (less than 15 cm), rocky Trawick soils, the historic vegetation may have been herb-dominated glade communities, similar to examples found today (called "Weches Glades") in San Augustine and Nacogdoches County. These critically endangered glades are habitat for several rare or disjunct prairie species in east Texas, including white bladderpod (*Lesquerella pallida*) and Texas golden gladecress (*Leavenworthia texana*). Most known areas are on private land and are threatened by glauconite mining.

Similar LTPs: 231Eg11.1.30 occupies a similar position on the landscape, but the surface soil is less clayey and the subsoil is usually more than 30 cm below the surface.

231Eg.11.3 Mesic Slopes and Terraces Landtype

231Eg.11.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Found in the central part of the Texas Pineywoods including northern San Augustine County, much of Nacogdoches County, and a large area to its north and west. Public lands include central Sabine National Forest mainly in the San Augustine Sandhills and Matlock Hills areas and extreme northern Angelina National Forest (Compartments 1 and 2).

Geology: Occurs on the Carrizo, Reklaw, Queen City, Weches, and Sparta formations.

Landform: Occurs on middle to lower slopes and on terraces above minor streams, forming the transition zone between (usually pine-dominated) upper slopes and stream bottoms. Slope shape is linear to concave, and slope gradients are very gentle to moderate.

Soil Characteristics: The higher soil moisture typical of lower slopes appears to influence the plant community more than soil texture, which ranges widely. Surface soils have moderate nutrient content. Drainage mottles may be present in the subsoil. This landtype phase occurs on a variety of soil types including Attoyac, Bernaldo, Cuthbert, Kirvin, Nacogdoches, Trawick, Sacul, and Rentzel.

Hydrology: Low position on the landscape, proximity to streams, and mesic microclimate result in higher soil moisture, which moderates the effects of drought. As a result, species that require mesic conditions are dominant. Sites may be dissected by small intermittent streams and drainages.

Natural Disturbances and Processes: Fire is infrequent on lower slopes and terraces and fires that do burn down to the lower slope are usually very low intensity; even historically fire was a minor force. Windthrow, storm damage, and single-tree mortality are important disturbances.

Ground Layer Species: Several species groups may be represented on a given site. Species from the *Callicarpa* group are abundant as are many species from the *Chasmanthium* group, such as sessile flowered woodoats (*Chasmanthium sessiliflorum*) and devil's grandmother (*Elephantopus tomentosus*). The *Mitchella* group may be common especially on moist microsites. On sites with a mature, closed overstory canopy, the herbaceous ground cover may be sparse.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods and pines. Relative dominances of hardwood and pine species can vary greatly from site to site, but most sites with no recent large-scale disturbances will eventually be dominated by hardwoods. Dominant overstory trees include white oak, southern red oak, cherrybark oak, white ash, blackgum, sweetgum, mockernut hickory, and bitternut hickory. Loblolly pine and shortleaf pine are also present in the overstory. Sugarberry occurs widely in the Redlands and is common on clayey (Nacogdoches-Trawick soils) mesic sites.

Understory Tree Species: Common understory trees include red maple and sweetgum saplings as well as American holly, winged elm, eastern hophornbeam, and flowering dogwood.

Shrub Species: American beautyberry, parsley hawthorn, southern arrowwood, farkleberry, Carolina buckthorn, red buckeye, and yaupon are common shrubs. Carolina laurel cherry is locally abundant, especially in the Nacogdoches area.

Similar LTPs: 231Eg.11.3.20 occurs on moderately steep to very steep slopes and ravines and the *Mitchella* group is more widespread.

231Eg11.3.20 American Beech-White Oak-*Mitchella* Loamy Moist-Mesic Steep Slopes and Ravines Landtype Phase

Geographic Range: Found in the central part of the Texas Pineywoods including northern San Augustine County, much of Nacogdoches County, and a large area to its north and west. Public lands include central Sabine National Forest mainly in the San Augustine Sandhills and Matlock Hills areas and extreme northern Angelina National Forest (Compartments 1 and 2). Several good examples of this LTA occur in the Nacogdoches area.

Geology: Occurs primarily on steep slopes and ravines that have been cut into shales and sandstones of the Weches and Reklaw formations.

Landform: Occupies moderately steep to very steep slopes or the sides of ravines that have been cut into outcrops of erosion-resistant material such as shale or sandstone. The slopes are protected from direct sun for part of the day, moderating temperature extremes and reducing evapotranspiration. Topographic position varies widely, and some sites can occupy an entire slope. Exposed rock outcrops, rare in most of eastern Texas, are a common sight on this landtype phase.

Soil Characteristics: Soils have well-drained sandy loam surface soils over clay or clay loam subsoils. The surface soil is generally shallow and may contain gravel or cobble. Shale or sandstone outcrops may be present. Soil reaction is medium acid to strongly acid, and nutrient content is low. Soils are mapped primarily as Cuthbert or Trawick. Narrow mesic ridgetops within a ravine complex may contain arenic soils, such as the Lilbert series.

Hydrology: Due to the steep slopes and loamy soil texture, sites are well-drained. However, the clayey subsoils absorb and retain moisture, and along with low evapotranspiration rates on the protected ravines, result in low moisture deficits. This landtype phase is usually located immediately above a perennial or intermittent stream.

Natural Disturbances and Processes: Historic fire frequency was very low. These steep slopes and ravines are topographically isolated from adjacent uplands, so it was difficult for fires to burn down into them. Steep topography also forms a protective refuge from disturbances such as high winds and floods. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: The overstory is usually dense, and herbaceous ground cover is scattered on the shaded forest floor. However, a diverse assemblage of species is present. Species from the *Mitchella* and *Arisaema* groups are an important component of the ground cover along with more widespread species from the *Callicarpa* and *Chasmanthium* groups. These sites provide habitat for many Appalachian and eastern deciduous forest species that reach the southwestern limit of their range in eastern Texas, including slender trillium (*Trillium gracile*), bloodroot (*Sanguinaria canadensis*), Jack in the pulpit (*Arisaema triphyllum*), crippled crane fly (*Tipularia discolor*), and yellow lady's slipper (*Cypripedium kentuckiense*). Beechdrops (*Epifagus virginiana*) may be common on sites where American beech occurs.

Overstory Tree Species: The overstory is dominated primarily by hardwoods, including American beech, white oak, southern magnolia, American basswood and mockernut hickory. Loblolly pine occurs in the overstory but is not dominant.

Understory Tree Species: Common understory trees include Florida maple, white fringetree, eastern redbud, eastern hophornbeam, red buckeye, and saplings of red maple and green ash.

Shrub Species: Shrubs include, mapleleaf viburnum, Carolina buckthorn, American witchhazel, American strawberrybush, smallflower blueberry, and largecluster blueberry.

Site Inclusions: Groundwater seeps may occur on some sandstone or shale outcrops. Ferns, liverworts, and mosses grow in abundance near these seeps and on the moist rocks.

Similar LTPs: 231Eg.11.3.20 occurs on very gentle to moderate lower slopes and terraces. LTP 231Eg.11.4.10 occurs on footslopes directly adjacent to small stream channels.

231Eg.11.4 Minor Stream Bottoms Landtype

231Eg.11.4.10 White Oak-Water Oak/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Found in the central part of the Texas Pineywoods including northern San Augustine County, much of Nacogdoches County, and a large area to its north and west. Public lands include central Sabine National Forest mainly in the San Augustine Sandhills and Matlock Hills areas and extreme northern Angelina National Forest (Compartments 1 and 2).

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with valleys of small perennial and intermittent streams.

Landform: Occurs on foot slopes of narrow stream bottoms. Slope shape is concave to linear, and slope gradients are gentle to very gentle. Floodplains are poorly developed, normally less than 100 meters wide.

Soil Characteristics: Soils are generally sandy loams over heterogeneous parent material or bedrock. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is medium acid to strongly acid, and available nutrients are low. Drainage mottles are common in the subsoil. Soils include the luka, and Marietta series.

Hydrology: The streams associated with this landtype phase are small, often intermittent, and do not have well-developed floodplains. Stream gradients are relatively steep and upstream watersheds are small, so flooding only occurs intermittently. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire occurs infrequently on stream bottoms and usually has only a minor impact on vegetation. Erosion and deposition constantly change the course of stream channels--undercutting banks and causing trees to fall. Windstorms may uproot or damage trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Mitchella* group are common to abundant. On immediate banks of the stream channel and in rich, moist microsites, species from the *Arisaema* group may be common. Widespread species from the *Chasmanthium* and *Callicarpa* groups are also present.

Overstory Tree Species: The overstory is composed of a variety of hardwood and pine species including white oak, American beech, American basswood, water oak, willow oak, sweetgum, loblolly pine, and shortleaf pine. Southern magnolia may be present on some sites.

Understory Tree Species: Common understory trees include saplings of blackgum, mockernut hickory and American basswood, along with American holly, Florida maple, eastern hophornbeam, red buckeye, common pawpaw, and white fringetree.

Shrub Species: Shrubs include American beautyberry, southern arrowwood, and common sweetleaf.

Similar LTPs: 231Eg11.4.20 occupies a similar landscape position on small stream bottoms. However, 231Eg.11.4.20 occurs along somewhat larger streams with a floodplain at least 100m wide that is subject to irregular flooding, and the *Bignonia* group is common

231Eg.11.4.20 Water Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Found in the central part of the Texas Pineywoods including northern San Augustine County, much of Nacogdoches County, and a large area to its north and west. Public lands include central Sabine National Forest mainly in the San Augustine Sandhills and Matlock Hills areas and extreme northern Angelina National Forest (Compartments 1 and 2). Examples include the floodplain of Lananna Creek in Nacogdoches.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with perennial stream valleys.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Floodplain width is normally greater than 100 meters. Slope shape is concave to linear, and slope gradients are nearly level. Topography of some sites consists of numerous small depressions, drainage channels, and mounds created as stream channels shift and flood waters scour and deposit alluvial materials.

Soil Characteristics: Soils formed in sandy loam to loamy sand alluvial material lying over heterogeneous parent material or bedrock. Depth to the subsoil may be over 100 cm. Because of irregular flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil is exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles occur throughout the soil profile. Soil reaction ranges from moderately alkaline to very strongly acid, and available nutrients are low to medium. Soils are mapped primarily as Hannahatche, Tuscosso, luka, and Marietta soils.

Hydrology: Streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle, so irregular flooding occurs. Duration of flooding (generally 5-12.5% of a growing season) increases with the size of the watershed.

Natural Disturbances and Processes: Fire is very infrequent on stream floodplains. Erosion and deposition constantly changes the course of stream channels, undercutting banks and causing trees to fall while new deposits of alluvial material are colonized by vegetation. Windstorms may also uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Bignonia* group dominate the ground layer, including caric-sedges (*Carex* spp.) and rushes (*Juncus* spp.). On slightly elevated areas, species from the *Mitchella* and *Callicarpa* groups may be important. Looseflower waterwillow (*Justicia ovata*) may occur in wet depressions and drainage channels. On immediate stream banks and the edges of saturated depressions, ferns such as sensitive fern (*Onoclea sensibilis*), and common ladyfern (*Athyrium filix-femina*), are often present.

Overstory Tree Species: The overstory is dominated by a mixture of mesic and wet-site hardwood species including water oak, willow oak, laurel oak, blackgum, sweetgum, swamp chestnut oak, cherrybark oak, American basswood, and sugarberry. Loblolly pine also occurs in the overstory.

Understory Tree Species: Common understory species include American hornbeam along with saplings of red maple and green ash.

Shrub Species: Shrubs include dwarf palmetto, Gulf sebastiana, parsley hawthorn, Elliott's blueberry, smallflower blueberry, and evergreen bayberry. Chinese privet (*Ligustrum sinense*) is a problematic invader in some sites, particularly in the Nacogdoches area.

Site Inclusions: Slight differences in elevation, sometimes less than 1 meter, may cause a profound change in species composition. Examples include pimple mounds, which may contain species more characteristic of mesic lower slopes than floodplains. Likewise, wet depressions and channels provide habitat for obligate wetland species. These inclusions tend to be very small, isolated occurrences.

Similar LTPs: 231Eg.11.4.10 is associated with stream bottoms, but the streams are smaller, with narrow valleys and little or no floodplain, and the *Mitchella* and *Arisaema* groups are common. Downstream, 231Eg.11.4.20 grades into Seasonally Flooded River Floodplains such as 231Eg.4.2.10; 231Ed4.2.10; or 232Fd.4.2.10.

231Eg.11.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Found in the central part of the Texas Pineywoods including northern San Augustine County, much of Nacogdoches County, and a large area to its north and west. Public lands include central Sabine National Forest mainly in the San Augustine Sandhills and Matlock Hills areas and extreme northern Angelina National Forest (Compartments 1 and 2). Naconehie Creek near Camp Tonkawa Springs where it crosses County Road 1086 is a premier example.

Geology: Parent material includes recent (Holocene) alluvial sands or sands associated with the Sparta or Carrizo Formations.

Landform: Occurs on the floodplains of small, perennial streams or on headslopes of perennial or intermittent drainages, where underground water flow exits a hillside as a seep. It may also be found downstream, often on footslopes immediately above floodplains, wherever seepage of underground water occurs. Stream channels are often poorly developed.

Soil Characteristics: Soils are generally deep, gray, fine sands or loamy fine sands often over a slowly permeable subsoil and are very poorly drained and continually wet. Soil reaction is medium acid to strongly acid and available nutrients are very low. Soils are often mapped as Rentzel soils but are generally more consistent with the Naconiche or Osier series. Soils of surrounding areas are predominantly sandy; high infiltration increases groundwater recharge.

Hydrology: Soils are very poorly drained. An impermeable subsurface layer, such as sandstone, shale, or clay or a low hydrologic position results in constant ground water seepage that keeps the soil saturated most of the year (a semipermanently to nearly permanently saturated hydrologic regime).

Natural Disturbances and Processes: Fire is very infrequent on wet forested seeps. Fires that do burn through a forested seep are only low-intensity surface fires that affect vegetation minimally since hardwood leaf litter is not very flammable. Wind-throw of shallow-rooted trees is an important disturbance.

Ground Layer Species: Species in the *Osmunda* group dominate. Netted chain fern (*Woodwardia areolata*) is often the principal ground cover. Other ferns, especially cinnamon fern

(*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*) are also important. The *Arisaema* group may also be present on portions of some sites.

Overstory Tree Species: Common overstory trees include sweetbay magnolia, swamp tupelo, and red maple. Water oak and loblolly pine may also be found on mesic microsites.

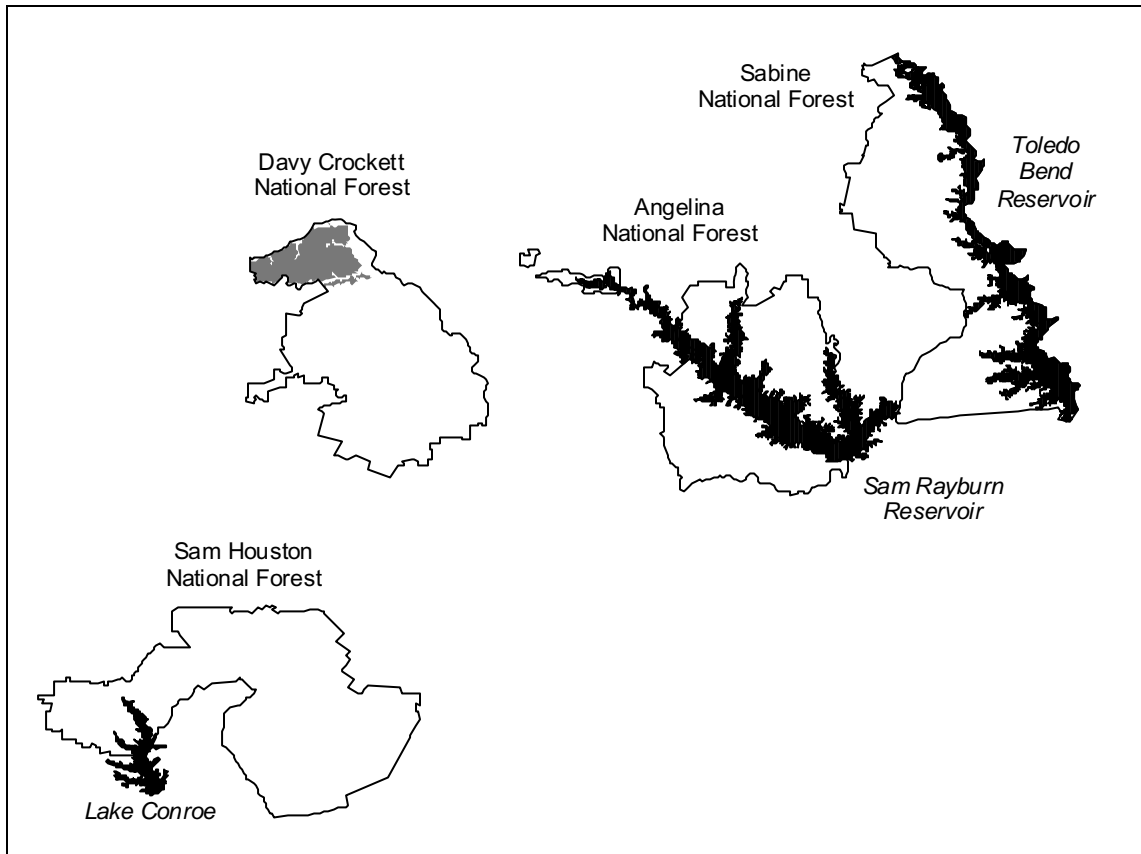
Understory Tree Species: Understory tree species include, redbay and red maple saplings.

Shrub Species: Shrub species include early azalea, and Arkansas blueberry, deciduous holly, and possumhaw. Poison sumac is infrequent on some sites.

Similar LTPs: 231Eg.11.4.20 which occurs on well-developed floodplains where the *Bignonia* group is common may have isolated saturated or seepy inclusions which support species from the *Osmunda* group. Small seepage areas with species from the *Osmunda* group may also be associated with rock outcrops on 231Eg.3.20 (Steep Slopes and Ravines).

CHAPTER 12

231Eg.12 SPARTA SANDHILLS LANDTYPE ASSOCIATION



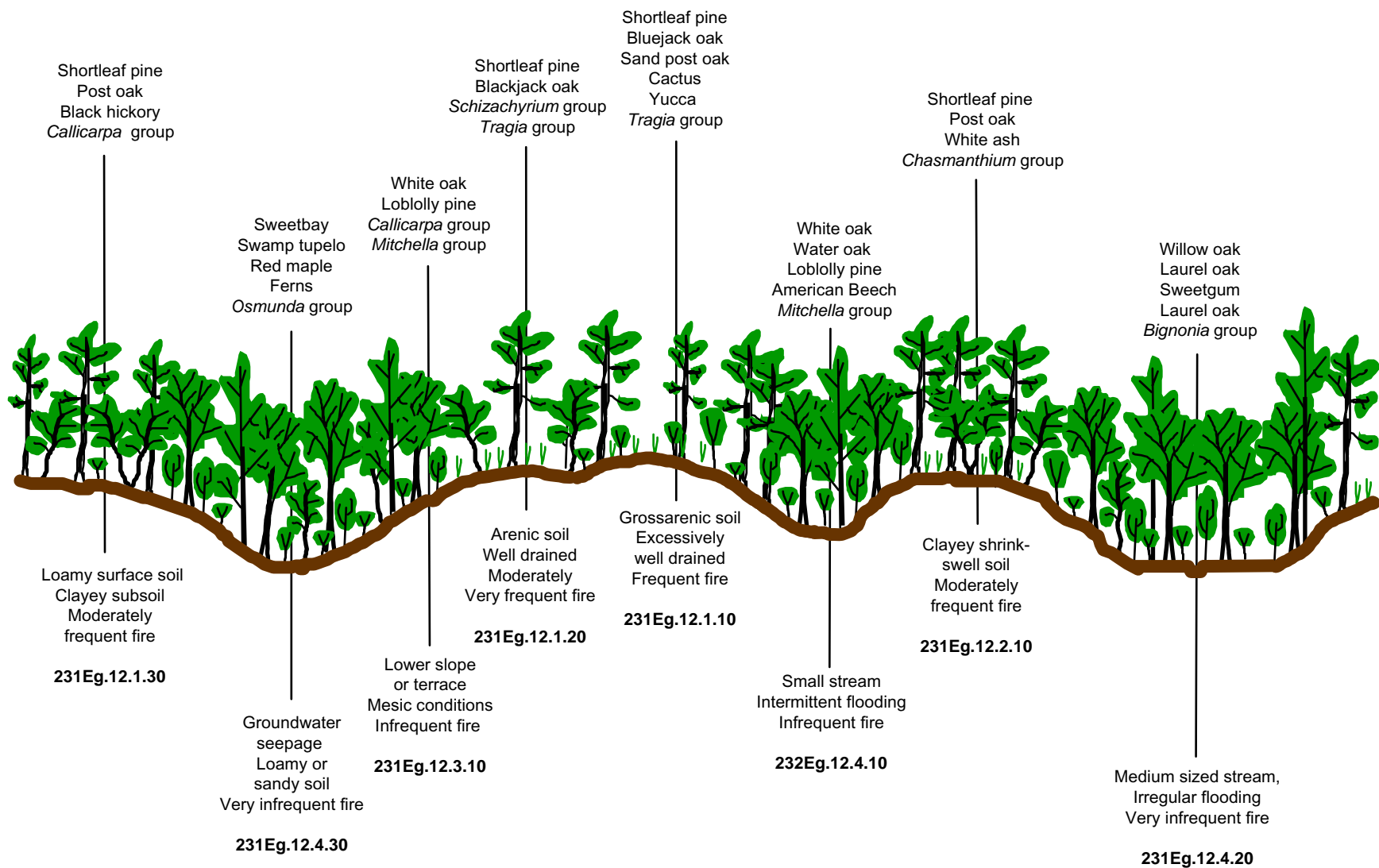


Figure 12.1 Landscape profile of ecosystems on the Sparta Sandhills Landtype Association.

231Eg.12 SPARTA SANDHILLS LANDTYPE ASSOCIATION



231Eg.12.1.10: Shortleaf Pine-Bluejack Oak/*Tragia*
Grossarenic Dry Uplands (Davy Crockett N.F, Compartment 10)



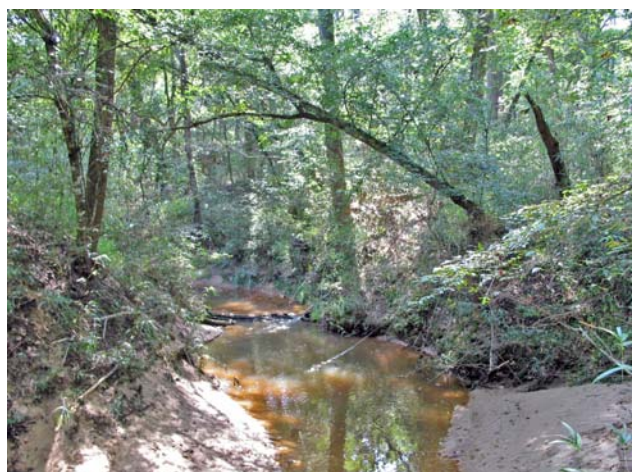
231Eg.12.1.20: Shortleaf Pine-Blackjack Oak/*Schizachyrium*
Arenic Dry Uplands (Davy Crockett N.F, Compartment 1, Stand 9)



231Eg.12.1.30: Shortleaf Pine-Post Oak/*Callicarpa*-
Chasmanthium Loamy Dry-Mesic Uplands (Davy Crockett N.F, Compartment 10, Stand 81)



231Eg.12.4.10: White Oak-Water Oak/*Mitchella*-*Arisaema*
Loamy Mesic Stream Bottoms (Davy Crockett N.F, Compartment 1)



231Eg.12.4.20: Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms (Davy Crockett N.F, Compartment 1)



231Eg.12.4.30: Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps (Davy Crockett N.F, Compartment 1)

KEY TO LANDTYPE PHASES

- 1a. Upper slopes, broad uplands, or ridgetops. Sites are typically pine-dominated..... 2
- 1b. Lower slopes, ravines, wet hillside seeps, stream terraces, or floodplains. Sites are typically deciduous hardwood-dominated..... 5
- 2a. Soils sandy, arenic or grossarenic, the upper 50cm or greater having a texture of sand or loamy sand..... 3
- 2b. Loamy or clayey soils, some portion of the upper 50cm not sandy..... 4
- 3a. Sandy or grossarenic, excessively drained soils with a sand or loamy sand surface layer at least 100cm thick. Includes Tonkawa, Darco, and Betis soils. Sites are on gentle to moderately steep upper slopes and ridgetops. The open woodland overstory may include longleaf pine, shortleaf pine, and bluejack oak. Species from the *Tragia* group are indicators; the *Schizachyrium* group is also common.....
231Eg.12.1.10 Shortleaf Pine-Bluejack Oak/*Tragia*
 Grossarenic Dry Uplands
- 3b. Arenic, well drained to excessively drained soils with a sand or loamy sand surface layer 50-100cm thick. Includes Lilbert, Lovelady, and Tenaha soils. Located on gently to moderately sloping upper slopes, broad uplands, and ridgetops. The stand is often an open woodland with a mixture of pines, blackjack oak, and post oak. On frequently burned sites, the *Schizachyrium* group is common. The *Tragia* group may be present but is less abundant than for 3a.....
231Eg.12.1.20 Shortleaf Pine-Blackjack Oak/*Schizachyrium*
 Arenic Dry Uplands
- 4a. Sandy loam to clay loam surface soil is greater than 30 cm thick over clay or clay loam subsoil; soil well drained to somewhat poorly drained. Soils are mapped as Diboll, Fuller, Kirvin, and Latex. Overstory includes shortleaf pine, loblolly pine, post oak, southern red oak, and black hickory. The *Callicarpa* and *Chasmanthium* groups are common but the *Schizachyrium* group is rare or absent.
231Eg.12.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium*
 Loamy Dry-Mesic Uplands
- 4b. Silt loam to clay loam or clay surface soil is less than 30 cm thick over clay subsoil. Soils are moderately well drained to somewhat poorly drained and may have shrink-swell properties and gilgai humps. Drainage mottles may be present in the soil profile, and a perched water table may be present. Includes Eastwood, Nacogdoches, and Trawick soils. Overstory is a mixture of shortleaf pine and oaks. Understory includes yaupon, American beautyberry, and parsley hawthorn. The *Chasmanthium* group dominates; the *Callicarpa* group is also common.
 231Eg.12.2.10 Shortleaf Pine-Post Oak/*Chasmanthium*
 Clayey Dry-Mesic Uplands

- 5a. Gently to moderately sloping middle to lower side slopes and small terraces associated with minor streams. Soils well drained but usually with a high moisture content. Soil textures are variable; drainage mottles may be present in the subsoil. Includes Attoyac, Bernaldo, Cuthbert, Eastwood, Keithville, Sawtown, and Rentzel soils. Overstory a diverse mixture of oaks, hickory, and pine, including white oak, southern red oak, mockernut hickory, loblolly pine, and shortleaf pine. The *Callicarpa* group is abundant; the *Mitchella* group may be present.....
231Eg.12.3.10 White Oak-Loblolly Pine/*Callicarpa*
 Loamy Mesic Lower Slopes and Terraces

- 5b. Minor stream bottoms, floodplains, and groundwater seeps..... 6

- 6a. Nearly permanently saturated groundwater seepage areas (baygalls) at the head of or adjacent to small perennial streams. Soils have a deep, wet, gray sand or sandy loam surface layer and are usually mapped as Rentzel and Tenaha soils. The overstory includes sweetbay, swamp tupelo, and red maple. Ferns are usually abundant in the understory; the *Osmunda* group is common.....
 231Eg.12.4.30 Sweetbay-Swamp Tupelo/*Osmunda*
 Loamy Wet Forested Seeps

- 6b. Stream bottoms or floodplains without extensive surface seepage of groundwater. 7

- 7a. Small, intermittent or perennial stream bottoms without well-developed floodplains. Flooding is intermittent and of short duration, and floodplain width is usually less than 100 m. Drainage mottles may occur in the subsoil. Soils include lula, lulus, and Marietta. Overstory is hardwood-dominated and may include white oak, water oak, and American beech. Loblolly and shortleaf pine also present. Florida maple, American holly, and American basswood occur in the understory. The *Mitchella* group is common, and the *Arisaema* group is locally common near stream banks.
 231Eg.12.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema*
 Loamy Mesic Stream Bottoms

- 7b. Level to gently sloping floodplains of intermediate-sized perennial streams. Flooding occurs irregularly, and floodplain width is usually greater than 100 m. Soil litter layer is usually thin or bare and drainage mottles are common throughout the soil profile. Soils include the Nahatche and Laneville series. Overstory includes water oak, willow oak, laurel oak, swamp tupelo, and swamp chestnut oak. The *Bignonia* group is common; The *Mitchella* group occurs in slightly elevated areas and the *Justicia* group occurs in wet depressions..... 231Eg.12.4.20 Willow Oak-Laurel Oak/*Bignonia*
 Loamy Wet-Mesic Stream Bottoms

LANDTYPE PHASE DESCRIPTIONS

231Eg.12.1 Sandy/Loamy Uplands Landtype

231Eg.12.1.10 Shortleaf Pine-Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase

Geographic Range: Located west of the Neches River in east Texas within the Sand Hills Subsection (231Eg). It includes the northern edge of Davy Crockett National Forest, north of Hickory Creek and west of the Neches River valley.

Geology: Restricted to deep, coarse-grained quartz sands of the Sparta formation. Terrain is gently to moderately rolling.

Landform: Occurs on ridgetops and associated convex middle and upper slopes. Slope gradients are moderately steep.

Soil Characteristics: Soils consist of a very deep excessively drained loamy sand surface soil at least 100cm thick over coarse sand subsoil. The B horizon, if present, is generally deeper than 200 cm from the surface. Soils are droughty and nutrient-poor. They include Darco, Tonkawa, and Betis soils.

Hydrology: The sandy soils are rapidly permeable and excessively drained, so rainfall quickly percolates downward; hence, long periods of drought occur during the growing season.

Natural Disturbances and Processes: Presettlement stands were subject to a frequent fire regime resulting from natural fires ignited by lightning from thunderstorms during the growing season.

Ground Layer Species: The ground layer is diverse mixture that includes many grasses and members of the sunflower (Asteraceae) family. Species from the *Tragia* group are indicators. Significant patches of bare ground or areas covered by lichens (*Cladonia* and *Cladina* spp.) occur. Devils tongue pricklypear (*Opuntia humifusa*) and Louisiana yucca (*Yucca louisianensis*) are usually present. Species from the *Schizachyrium* group are usually common. Little bluestem (*Schizachyrium scoparium*) may constitute the majority of ground cover.

Overstory Tree Species: The overstory is typically forms an open woodland. Shortleaf pine, post oak, black hickory, and bluejack oak are the major species.

Understory Tree Species: Sand post oak, sassafras, and stunted or sapling bluejack oak and blackjack oak are common.

Shrub Species: On frequently burned sites shrubs are not dense. Common species include dwarf pawpaw, farkleberry, and fragrant sumac.

Similar LTPs: 231Eg.12.1.20 also occurs on uplands and ridgetops, but soils are usually arenic (the sandy topsoil is less deep), the surface soil texture less coarse, and species from the *Tragia* group less common.

231Eg.12.1.20 Shortleaf Pine-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

Geographic Range: Located west of the Neches River in east Texas within the Sand Hills Subsection (231Eg). It includes the northern edge of Davy Crockett National Forest, north of Hickory Creek and west of the Neches River valley.

Geology: Occurs on deep, coarse-grained quartz sands of the Sparta formation. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper side slopes, broad uplands, and ridgetops. Slope shape is convex with gentle to moderate gradients.

Soil Characteristics: Soils are usually arenic and consist of loamy fine sand surface soils 50-100cm thick over sandy loam subsoils. Soil reaction is medium acid to strongly acid, and available nutrients are low. Soils are mapped as Lilbert, Lovelady, and Tenaha.

Hydrology: This landtype phase is well-drained to excessively drained and is subject to drought, especially in late summer. The sandy soil texture causes precipitation to percolate rapidly through the soil, so little surface runoff occurs.

Natural Disturbances and Processes: Under presettlement conditions, growing season fires burned frequently through these uplands with the fire interval on a particular site influenced by topographic barriers and soil moisture. Fire inhibits the establishment of woody understory and maintains a more open stand. Most modern stands are denser and have more woody understory as a result of reduced burning.

Ground Layer Species: Where the canopy is somewhat open, species from the *Schizachyrium* group are common to abundant. Species from the *Tragia* group may also be present. Species from the *Callicarpa* and *Chasmanthium* groups become common on sites without regular burning.

Overstory Tree Species: Shortleaf pine, blackjack oak, post oak, southern red oak, and black hickory are the major species..

Understory Tree Species: Sand post oak can be found in the understory, as well as winged elm, sassafras, and Mexican plum.

Shrub Species: Common species include farkleberry, winged sumac, dwarf pawpaw, and yaupon.

Similar LTPs: 231Eg.12.1.10 occurs on a similar landscape position, but it consists of very deep sandy soils and is more abundant in species from the *Tragia* group.

231Eg.12.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Located west of the Neches River in east Texas within the Sand Hills Subsection (231Eg). It includes the northern edge of Davy Crockett National Forest, north of Hickory Creek and west of the Neches River valley.

Geology: Occurs on the Sparta formation. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper slopes and broad, nearly level uplands. Slope gradient is gentle to moderately steep.

Soil Characteristics: Soils are typically sandy loam to clay loam over a clayey subsoil. The subsoil is generally greater than 30 cm from the soil surface. Surface soils have moderately high nutrient content. Soil reaction is medium to very strongly acid, and drainage mottles may be present in the subsoil. Soils are mapped as Kirvin and Latex.

Hydrology: Soils are moderately well drained to somewhat poorly drained. Slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: Historically, periodic fires burned through these uplands with the fire interval on a particular site influenced by topographic barriers, fuels, and soil moisture. The historic fire return interval was probably moderately frequent.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* group dominate.

Overstory Tree Species: The overstory varies but usually consists of mixed pine and hardwood species. Shortleaf pine, loblolly pine, sweetgum, post oak, southern red oak, and black hickory are important species.

Understory Tree Species: Flowering dogwood, eastern hophornbeam, winged elm, and red maple saplings are common.

Shrub Species: Shrubs include yaupon, American beautyberry, farkleberry, deciduous holly, and southern arrowwood.

Similar LTPs: 231Eg.12.2.10 occupies a similar position on the landscape, but has much higher clay content in the surface soil, the clayey subsoil is usually within 30 cm of the surface, and species from the *Chasmanthium* group are more abundant.

231Eg.12.2 Clayey Uplands Landtype

231Eg.12.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Located west of the Neches River in east Texas within the Sand Hills Subsection (231Eg). It includes the northern edge of Davy Crockett National Forest, north of Hickory Creek and west of the Neches River valley.

Geology: Occurs locally on inclusions within areas of the Sparta formation on exposed outcrops of the older Weches formation or on isolated inclusions of the younger Cook Mountain formation. Terrain is gently to moderately rolling.

Landform: Located on middle and upper side slopes and broad uplands. Slope gradient is gentle to moderately steep.

Soil Characteristics: Soils have a high clay content, and some (Eastwood, etc.) have vertic (shrink-swell) properties in the subsoil. Surface soil textures ranges from silt loam, to clay loam, to clay, and the clayey subsoil is generally within 30 cm of the soil surface. Surface soils are have a high nutrient content and range from neutral to strongly acid. Drainage mottles are often present in the subsoil. Soils are mapped as Eastwood, Nacogdoches, and Trawick.

Hydrology: Soils are moderately well drained to somewhat poorly drained and may be highly erodable on exposed slopes. Slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: The historic natural fire interval was probably moderately frequent. Shrink-swell properties on some soils may influence overstory composition and possibly limit the growth of pines and other deep-rooted species.

Ground Layer Species: Species from the *Chasmanthium* group dominate and members of the *Callicarpa* group are common. Certain species from the *Schizachyrium* group, such as Texas ironweed (*Vernonia texana*) and little bluestem (*Schizachyrium scoparium*), may be locally common.

Overstory Tree Species: The overstory consists of mixed pine and hardwood species. Shortleaf pine, post oak, and white ash are dominant tree species. Sugarberry may also be present.

Understory Tree Species: Winged elm, red maple, and eastern hophornbeam are common understory species.

Shrub Species: Common shrubs include yaupon, American beautyberry, parsley hawthorn, upland swampprivet, and deciduous holly.

Similar LTPs: 231Eg.12.1.30 is more widespread and occupies a similar position on the landscape, but the surface soil is loamy and the subsoil, if clayey, is usually more than 30 cm below the surface.

231Eg.12.3 Mesic Slopes and Terraces Landtype

231Eg.12.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located west of the Neches River in east Texas within the Sand Hills Subsection (231Eg). It includes the northern edge of Davy Crockett National Forest, north of Hickory Creek and west of the Neches River valley.

Geology: Occurs on the Sparta formation. Terrain is gently to moderately rolling.

Landform: Occurs on middle to lower slopes and on terraces above minor streams forming the transition zone between (usually) pine-dominated upper slopes and hardwood-dominated stream bottoms. Slope shape is linear to concave, and slope gradients are very gentle to moderate.

Soil Characteristics: The higher soil moisture typical of lower slopes appears to influence the plant community more than soil texture, which ranges widely. Surface soils have moderate nutrient content. Drainage mottles may be present in the subsoil. Common soils include Attoyac, Bernaldo, Lovelady, Cuthbert, Eastwood, Keithville, Sawtown, and Rentzel.

Hydrology: Low position on the landscape, proximity to streams, and mesic microclimate, result in higher soil moisture, which moderates the effects of drought. As a result, species that require mesic conditions are dominant. Sites may be dissected by small intermittent streams and drainages.

Natural Disturbances and Processes: Fire is infrequent on lower slopes and terraces and typically has a minor effect on vegetation. In an unusually dry period, fires that originate on uplands may burn down to a lower slope, where there may be sufficient fuel to carry a low-intensity surface fire. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Several species groups may be represented on a given site. Species from the *Callicarpa* and *Chasmanthium* groups including sessile flowered woodoats (*Chasmanthium sessiliflorum*) and devil's grandmother (*Elephantopus tomentosus*) are abundant. The *Mitchella* group may be locally common on moist microsites. On sites with a mature, closed overstory canopy, the herbaceous ground cover may be sparse.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods and pines. Relative dominances of hardwood and pine species can vary greatly from site to site, but most sites with no recent large-scale disturbances will eventually be dominated by hardwoods. Important trees include white oak, southern red oak, cherrybark oak, white ash, blackgum, sweetgum, mockernut hickory, and bitternut hickory. Loblolly pine and shortleaf pine are also present in most stands.

Understory Tree Species: Common understory trees include red maple saplings, American holly, winged elm, eastern hophornbeam, and flowering dogwood.

Shrub Species: American beautyberry, parsley hawthorn, southern arrowwood, farkleberry, Carolina buckthorn and yaupon are common.

Similar LTPs: 231Eg.12.4.10 occurs on toeslopes directly adjacent to small stream channels, and both the *Mitchella* and *Arisaema* groups are usually present.

231Eg.12.4 Minor Stream Bottoms Landtype

231Eg.12.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located west of the Neches River in east Texas within the Sand Hills Subsection (231Eg). It includes the northern edge of Davy Crockett National Forest, north of Hickory Creek and west of the Neches River valley.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with valleys of small perennial and intermittent streams.

Landform: Occurs on toeslopes of narrow stream bottoms, Slope shape is linear to concave, and slope gradients are gentle to very gentle. Floodplains are poorly developed, their width less than 100 meters.

Soil Characteristics: Soils are generally sandy loams over heterogeneous parent material or bedrock. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is medium acid to strongly acid, and available nutrients are low. Drainage mottles are common in the subsoil. Includes the luka, lulus, and Marietta series.

Hydrology: The streams associated with this landtype phase are small, often intermittent, and do not have well-developed floodplains. Stream gradients are relatively steep and upstream watersheds are small, so flooding occurs at most, intermittently. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire occurs infrequently on stream bottoms and has minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels, undercut banks, and cause trees to fall. Windstorms may also uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Mitchella* group are common to abundant. On immediate banks of the stream channel, species from the *Arisaema* group may be common. Widespread species from the *Chasmanthium* and *Callicarpa* groups also occur.

Overstory Tree Species: The overstory is composed of a variety of hardwood and pine species including white oak, American beech, water oak, sweetgum, blackgum, American basswood, mockernut hickory, loblolly pine, and shortleaf pine. Southern magnolia may be present on some sites.

Understory Tree Species: Common species include Florida maple, American holly, eastern hophornbeam, common pawpaw, and white fringetree.

Shrub Species: The shrub layer includes American beautyberry, southern arrowwood, and common sweetleaf.

Similar LTPs: 231Eg.12.4.20 occupies a similar landscape position but occurs on larger stream bottoms that are subject to irregular flooding where the *Bignonia* group is common.

231Eg.12.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located west of the Neches River in east Texas within the Sand Hills Subsection (231Eg). It includes the northern edge of Davy Crockett National Forest, north of Hickory Creek and west of the Neches River valley.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with perennial stream valleys.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Floodplain width is normally greater than 100 meters. Slope shape is concave to linear, and slope gradients are nearly level. Topography of some sites consists of numerous small depressions, drainage channels, and mounds created as stream channels shift and flood waters scour and deposit alluvial materials.

Soil Characteristics: Soils formed in alluvial material and consist of sandy loam to loamy sand over heterogeneous alluvial parent material or bedrock. Depth to the subsoil may be over 100 cm. Because of flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil is exposed. In low areas and old stream channels soils may be constantly saturated. Drainage mottles occur throughout the soil profile. Soil reaction ranges from moderately alkaline to very strongly acid, and available nutrients are low to medium. Soils are generally Entisols and are mapped primarily as the Nahatche and Laneville series.

Hydrology: The streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle, so irregular flooding occurs. Duration of flooding increases with the size of the watershed.

Natural Disturbances and Processes: Fire occurs very infrequently on floodplains and is a minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels, and can undercut banks and cause trees to fall while new deposits of alluvial material are colonized by vegetation. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Bignonia* group dominate, including several species of *Carex* and *Juncus*. On slightly elevated areas, species from the *Mitchella* and *Callicarpa* groups may be common. Looseflower waterwillow (*Justicia ovata*) may occur in wet depressions and drainage channels. On immediate stream banks and at the edges of wet depressions, ferns such as common ladyfern (*Athyrium filix-femina*), and sensitive fern (*Onoclea sensibilis*), are often abundant.

Overstory Tree Species: The overstory is dominated by a mixture of mesic and flood tolerant hardwood species including willow oak, laurel oak, blackgum, sweetgum, water oak, white oak, American basswood, swamp chestnut oak, and cherrybark oak. Loblolly pine also occurs in the overstory where it can attain a large size.

Understory Tree Species: Common understory species include American hornbeam and saplings of red maple, river birch, American basswood and green ash.

Shrub Species: Shrub species include dwarf palmetto, Gulf sebastiania, parsley hawthorn, Elliott's blueberry, smallflower blueberry, and evergreen bayberry.

Site Inclusions: Slight differences in elevation, sometimes less than 1 meter, may cause a profound change in species composition. Examples include pimple mounds, which may contain species more characteristic of mesic lower slopes than of floodplains. Likewise, wet depressions and channels provide habitat for obligate wetland species.

Similar LTPs: 231Eg.12.4.10 is associated with stream bottoms, but the streams are smaller, with narrow valleys and little or no floodplain, and the *Mitchella* and *Arisaema* groups are common. Downstream, 231Eg.12.4.20 grades into 231Eg.4.2.10—Seasonally Flooded River Floodplains.

231Eg.12.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Located west of the Neches River in east Texas within the Sand Hills Subsection (231Eg). It includes the northern edge of Davy Crockett National Forest, north of Hickory Creek and west of the Neches River valley.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with perennial stream valleys and/or sandy sediments of the Sparta formaton.

Landform: Occurs on the floodplains of small, perennial streams or on headslopes of perennial or intermittent drainages where underground water flow exits a hillside as a seep. It may also be found downstream, often on footslopes immediately above floodplains, wherever seepage of underground water occurs. Stream channels are often poorly developed.

Soil Characteristics: : Soils are gray fine sands or loamy fine sands often over a slowly permeable subsoil and are poorly drained and continually wet. Soil reaction is medium acid to strongly acid and available nutrients are very low. Soils are mapped primarily as Rentzel and Tenaha but are generally more consistent with the Naconiche or Osier series.

Hydrology: Soils are very poorly drained. An impermeable subsurface layer, such as sandstone, shale, or clay, results in constant ground water seepage and a semipermanently to nearly permanently saturated hydrologic regime.

Natural Disturbances and Processes: Fire is very infrequent on wet forested seeps. Windthrow and individual tree mortality are important disturbances.

Ground Layer Species: Species in the *Osmunda* group dominate. Netted chain fern (*Woodwardia areolata*) is often the principal ground cover. Other ferns, especially cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*) are also important. The *Arisaema* group may be present on portions of some sites.

Overstory Tree Species: Common trees include sweetbay magnolia, swamp tupelo and red maple. Water oak, sweetgum, and loblolly pine may also be found on more mesic microsites.

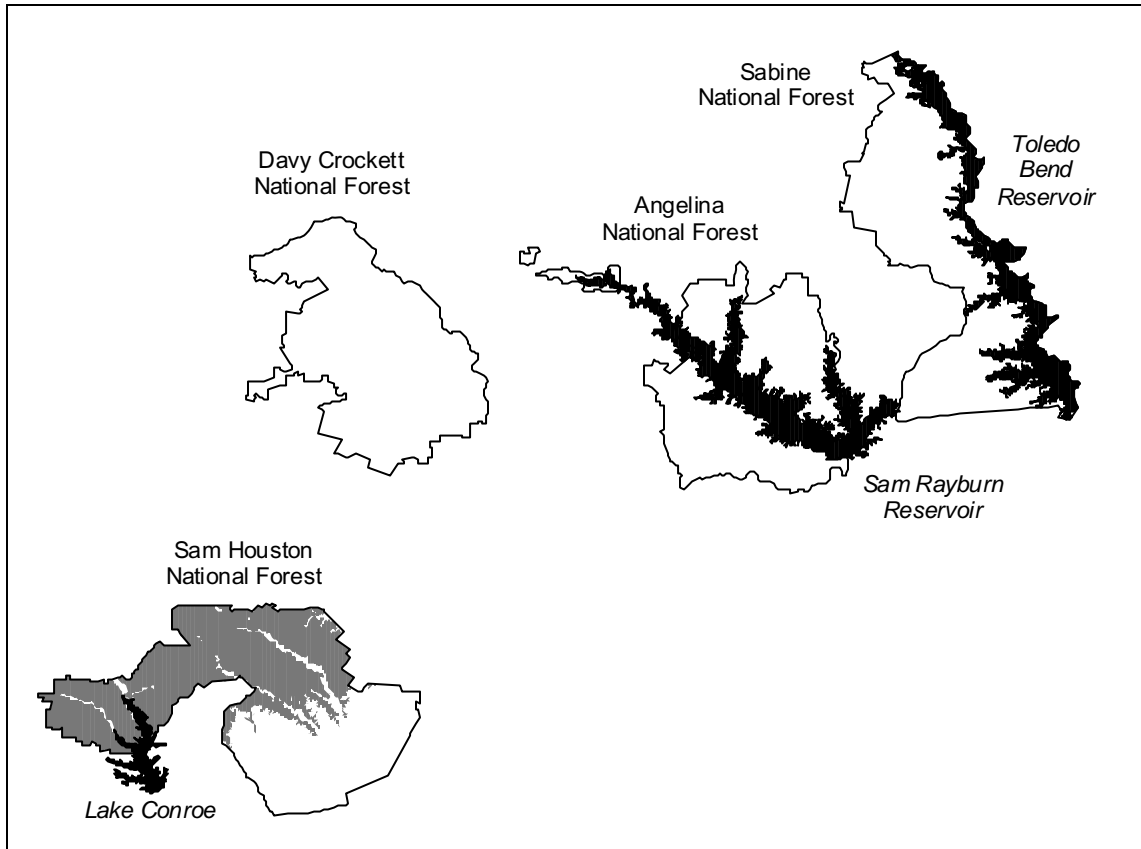
Understory Tree Species: Understory tree species include deciduous holly, redbay, and saplings of red maple and green ash

Shrub Species: Shrub species include evergreen bayberry, early azalea, and Arkansas blueberry.

Similar LTPs: 231Eg.12.4.20 occurs on irregularly flooded stream bottom sites with well-developed floodplains, the *Bignonia* group is common, and wet seepage areas with the *Osmunda* species group are restricted to isolated inclusions.

CHAPTER 13

231Eh.16 RAVEN HILLS LANDTYPE ASSOCIATION



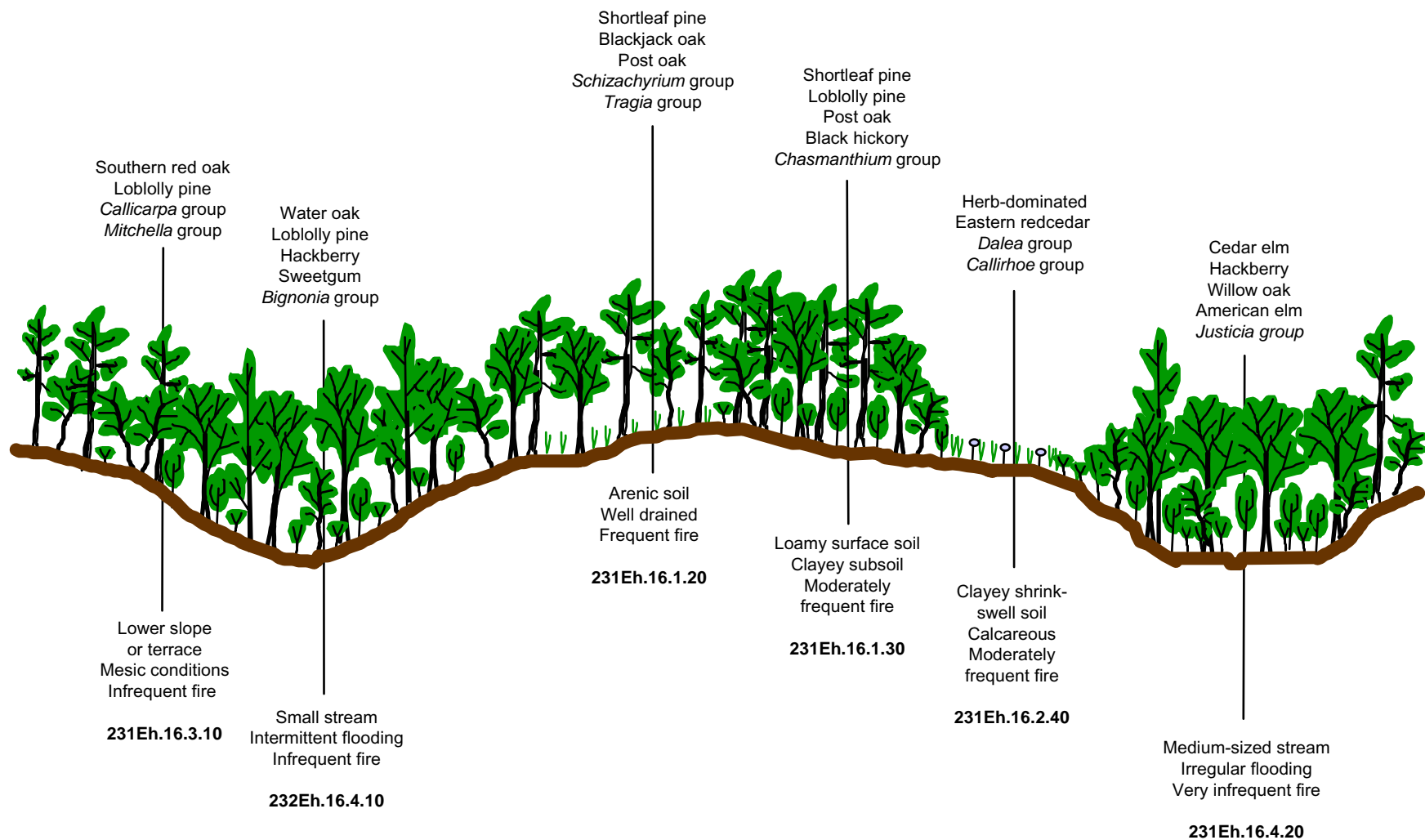


Figure 13.1 Landscape profile of ecosystems on the Raven Hills Landtype Association.

231Eh.16 RAVEN HILLS LANDTYPE ASSOCIATION



231Eh.16.1.30: Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Slopes & Uplands (Sam Houston N.F. Compartment 75, Stand 19)



231Eh.16.2.40: *Dalea* Herbaceous Dry Clayey Prairies (Sam Houston N.F. Compartment 60, Stand 10)



231Eg.16.2.40 "Transitional forest" adjacent to Prairie (Sam Houston N.F. Compartment 60)



231Eh.16.3.10: Loblolly Pine-Southern Red Oak/*Callicarpa* Loamy Mesic Lower Slopes & Terraces (Sam Houston N.F. Compartment 46, Stand 9)



231Eh.16.4.10: Water Oak-Loblolly Pine/*Bignonia-Arisaema* Loamy Mesic Stream Bottoms (Sam Houston N.F. Compartment 60)



231Eh.16.4.20: Cedar Elm-Hackberry/*Justicia* Loamy Wet-Mesic Stream Bottoms (Sam Houston N.F. Compartment 46, Stand 9)

KEY TO LANDTYPE PHASES

- 1a. Upper slopes, undulating uplands, or ridgetops. Sites (except prairies) are typically pine-dominated..... 2
- 1b. Lower slopes, ravines, groundwater seeps, stream terraces, or floodplains. Sites are typically deciduous hardwood-dominated. 4
- 2a. Sandy or loamy soils..... 3
- 2b. Clayey soils with a clayey surface and subsurface and no B horizon. Soils usually have shrink-swell properties and gilgai microtopography. Calcium carbonate concretions may be present in the soil profile. Soils include the Ferris and Houston Black series. Sites are naturally-formed forest openings where large trees are absent. The *Dalea* group is common and the *Callirhoe* group also present.
 231Eh.16.2.40 *Dalea* Clayey Dry Blackland Prairies
- 3a. Soils sandy, arenic or grossarenic, well drained to moderately well drained, the upper 50cm or greater having a sand or loamy sand texture, commonly mapped as Depcor or Gunter. Natural overstory includes shortleaf pine, blackjack oak, and post oak. The *Schizachyrium* group is common; the *Tragia* group may be present.
 231Eh.16.1.20 Shortleaf Pine-Blackjack Oak/*Schizachyrium*
 Arenic Dry Uplands
- 3b. Soils moderately well drained to somewhat poorly drained with a sandy loam to clay loam surface soil usually overlying a clayey or loamy subsoil. Soil series include Annona, Depcor, and Huntsburg. Natural overstory includes loblolly pine, shortleaf pine, post oak, southern red oak, and black hickory. The *Chasmanthium* and *Callicarpa* groups are common and the *Schizachyrium* group uncommon or absent.
 231Eh.16.1.30 Loblolly Pine-Post Oak/*Callicarpa-Chasmanthium*
 Loamy Dry-Mesic Slopes and Uplands
- 4a. Middle to lower side slopes and small terraces above minor streams. Soil textures vary but soils are generally moist. Drainage mottles may be present in the subsoil. Soils include Gunter, Annona, Depcor, Landman, and Huntsburg. Natural overstory is a variable mixture of oaks, hickories, and pines. The *Chasmanthium* and *Callicarpa* groups are common and the *Mitchella* group is often present.....
 231Eh.16.3.10 Loblolly Pine-Southern Red Oak/*Callicarpa*
 Loamy Mesic Lower Slopes and Terraces
- 4b. Minor stream bottoms, riparian areas, and floodplains..... 5

- 5a. Bottoms of small intermittent or perennial streams without well-developed floodplains. Flooding is intermittent and floodplains are not wider than 100m. Drainage mottles may occur in the subsoil. Soils include Gowker and Kaufman. Natural overstory contains water oak, white oak, and loblolly pine. The *Mitchella* and *Bignonia* groups are common, and the *Arisaema* group is locally common near stream banks.
.....231Eh.16.4.10 Water Oak-Loblolly Pine/*Bignonia-Arisaema*
Loamy Mesic Stream Bottoms

- 5b. Nearly level to gently sloping, moderately wide floodplains of intermediate-sized perennial streams. Floodplains are wider than 100m and irregular flooding occurs. The soil litter layer is usually thin or bare and drainage mottles are common throughout the soil profile. Soils include Kanebrake and Gladewater. Natural overstory includes cedar elm, hackberry, willow oak, and American elm. The *Justicia* group is common and the *Mitchella* group present only on slightly elevated ridges or mounds.
..... 231Eh.16.4.20 Cedar Elm-Hackberry/*Justicia*
Loamy Wet-Mesic Stream Bottoms

LANDTYPE PHASE DESCRIPTIONS

231Eh.16.1 Sandy/Loamy Uplands Landtype

231Eh.16.1.20 Shortleaf Pine-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including the northern and western portions of Sam Houston National Forest, generally north of State Highway 150 and north and west of Lake Conroe.

Geology: Occurs on discontinuous outcrops of the sandy Willis formation that overlie the clayey Fleming formation. Terrain is gently to moderately rolling.

Landform: Occurs on broad uplands, ridgetops, and upper slopes. Slope shape is convex with gentle to moderate gradients.

Soil Characteristics: Soils consist of a deep, arenic or grossarenic loamy sand surface layer at least 50cm thick over sandy clay loam subsoil. Soil reaction is slightly acid to very strongly acid. The subsoil may contain a layer of plinthite or siliceous gravel. The subsoil is often deeper than 100 cm from the surface. Soils are mapped as Depcor or Gunter.

Hydrology: The sandy surface soil is rapidly permeable and well drained to moderately well drained, and tends to become droughty during the growing season. However, a perched water table may be present in winter and spring.

Natural Disturbances and Processes: Under presettlement conditions, frequent natural fires burned through these uplands during the growing season, with the fire interval on a particular site influenced by topographic barriers, fuels, and soil moisture. Frequent fire inhibits the establishment of woody species and maintains an open woodland.

Ground Layer Species: Species from the *Schizachyrium* group are common to abundant. Some species from the *Tragia* group may also be present. The *Callicarpa* and *Chasmanthium* groups become more common on unburned stands.

Overstory Tree Species: Under a frequent fire regime, the overstory is an open woodland. Shortleaf pine, blackjack oak, and post oak are the dominant species; southern red oak and black hickory are common associates. Without fire, the canopy becomes more closed and the woody understory more dense.

Understory Tree Species: Species include sand post oak, winged elm, sassafras, and black cherry.

Shrub Species: Common shrubs include American beautyberry, yaupon, Carolina buckthorn, and wax-myrtle.

Similar LTPs: 231Eh.16.1.30 occurs on uplands, but the surface soil is loamy and the *Callicarpa* and *Chasmanthium* groups are more common.

231Eh.16.1.30 Loblolly pine-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Slopes and Uplands Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including the northern and western portions of Sam Houston National Forest, generally north of State Highway 150 and north and west of Lake Conroe.

Geology: Occurs on the Fleming and Willis formations. Terrain is gently to moderately rolling.

Landform: Occurs on side slopes, broad uplands, and ridgetops generally at midslope or higher. Slope shape is convex and slopes are gentle to moderate.

Soil Characteristics: Soils consist of sandy loam to clay loam surface soils over clayey a subsoil. Depth to the subsoil is normally greater than 30 cm. Soils are medium to slightly acid, and nutrient availability is medium to high. Soils are mapped as Annona, Depcor, Huntsburg, or similar series.

Hydrology: Soils are moderately well drained to somewhat poorly drained and have medium available water capacity. Precipitation permeates the soil moderately slowly.

Natural Disturbances and Processes: Historically, moderately frequent fires burned through these uplands, with the fire interval influenced by topographic barriers, fuels, and soil moisture.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups are common to abundant. Species from the *Schizachyrium* group may be found on some sites.

Overstory Tree Species: The overstory is highly variable but usually consists of mixed pine and hardwood species. Loblolly pine, shortleaf pine, post oak, and black hickory are dominant species. Blackgum, sweetgum, and southern red oak may also be common. Historical literature indicates that even in the presettlement forest loblolly pine was important or dominant on these sites (See Chapter 4).

Understory Tree Species: Flowering dogwood, winged elm, and white fringetree are common.

Shrub Species: Shrubs include yaupon, American beautyberry, and upland swampprivet.

Similar LTPs: 231Eh.16.1.20 has arenic soils with a sand surface layer at least 50cm deep.

231Eh.16.2 Clayey Uplands Landtype

231Eh.16.2.40 *Dalea* Herbaceous Dry Clayey Prairies Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including the northern and western portions of Sam Houston National Forest, generally north of State Highway 150 and north and west of Lake Conroe.

Geology: Occurs exclusively on outcrops of the Fleming formation. Terrain is gently sloping to rolling.

Landform: Occurs on middle and upper slopes and broad uplands. Slope gradient is nearly level to gently sloping. Size of prairie openings is generally less than 40 ha.

Soil Characteristics: Soils are clayey, calcareous "blackland prairie" soils, which have shrink-swell (vertic) properties in the subsoil. This is manifested on some sites by small humps or gilgai

resulting from churning of the soil through repeated expansion and contraction. Soil texture is clay to the surface with no B horizon. Surface soils generally have high nutrient content and are dark gray, dark grayish brown, or black. Surface soil reaction is moderately alkaline. Calcium carbonate concretions are often present throughout the soil profile. Soils are classified as the Ferris and Houston Black series.

Hydrology: Soils are moderately well drained, and permeability is rapid when the soil is dry and cracked (water runs into the cracks) but very slow when wet. Once dry soils resist rewetting, thus prolonging drought. Soils may be highly erodable.

Natural Disturbances and Processes: The historic natural fire interval was moderately frequent to frequent. Droughtiness and the shrink-swell properties of the soil along with fires limit the growth of woody species.

Ground Layer Species: Species from the *Dalea* group are abundant. Members of the *Callirhoe* group may be locally common. Species from the *Schizachyrium* group are also present.

Overstory Tree Species: Large trees are generally absent on these sites.

Understory Tree Species: Understory-sized trees are limited to occasional post oak, loblolly pine, and eastern redcedar. They may increase in density as they invade sites that are no longer regularly burned.

Shrub Species: Shrubs are sparse but may include littlehip hawthorn, cockspur hawthorn, and gum bumelia.

Similar LTPs: Blackland prairies lack a woody overstory, support a prairie-like herb layer, and have unique edaphic qualities that easily distinguish them from the surrounding forested communities. However, a transitional forest on clayey soils that includes some prairie species may occur adjacent to prairies and potentially could be described in the future as an additional "Clayey upland" LTP (See chapter 18, LTP 232Fa.3.2.10 for a possible analog).

231Eh.16.3 Mesic Slopes and Terraces Landtype

231Eh.16.3.10 Loblolly Pine-Southern Red Oak/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including the northern and western portions of Sam Houston National Forest, generally north of State Highway 150 and north and west of Lake Conroe.

Geology: Occurs on the Fleming and Willis formations. Terrain is gently to moderately rolling.

Landform: Occurs on middle to lower slopes and terraces, at the transition zone between upper slopes and stream bottoms. Slope shape is linear to concave, and slope gradients are very gentle to moderate.

Soil Characteristics: The higher soil moisture that occurs on lower slopes appears to influence the plant community more than soil type; Texture varies widely. Surface soils have moderate to high nutrient content, surface soil reaction is slightly acid to strongly acid, and drainage mottles may be present in the subsoil. Soils include Gunter, Annona, Depcor, Landman, Huntsburg and similar series. Some clayey Ferris soils near stream bottoms may also be included in this landtype phase.

Hydrology: Due to the low position on the landscape, proximity to streams, and mesic microclimate, soils tend to remain relatively moist throughout most growing seasons, moderating the effects of drought. As a result, species that require mesic conditions dominate. Sites may be dissected by small intermittent streams and drainages.

Natural Disturbances and Processes: Even historically, fire was infrequent on lower slopes and terraces. In unusually dry periods, fires that originate on uplands may burn down to a lower slope where there may be sufficient fuel to carry a low-intensity surface fire, but such fires minimally affect vegetation. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups such as sessile flowered woodoats (*Chasmanthium sessiliflorum*) and devil's grandmother (*Elephantopus tomentosus*), are abundant. The *Mitchella* group may be locally common on moist microsites. On sites with a mature, closed overstory canopy, herbaceous cover may be sparse.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods and pines. Important trees include southern red oak, cherrybark oak, white ash, blackgum, mockernut hickory, bitternut hickory, Loblolly pine and shortleaf pine. White oak may occur on some sites.

Understory Tree Species: Common understory trees include winged elm, white fringetree, eastern hophornbeam, and flowering dogwood. American hornbeam may be present on the lowest parts of slopes and on terraces.

Shrub Species: American beautyberry, yaupon, dwarf palmetto, and upland swampprivet are common shrub species.

Similar LTPs: 231Eh.16.4.10 has similar mesic conditions, but it occurs on stream bottoms, and both the *Mitchella* and *Arisaema* groups are usually present.

231Eh.16.4 Minor Stream Bottoms Landtype

231Eh.16.4.10 Water Oak-Loblolly Pine/*Bignonia-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including the northern and western portions of Sam Houston National Forest, generally north of State Highway 150 and north and west of Lake Conroe.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with valleys of small perennial and intermittent streams.

Landform: Occurs on toe slopes and small floodplains associated with small streams. Floodplains are poorly developed and floodplain width is normally less than 100 meters. Slope shape is concave to linear, and slope gradients are gentle to very gentle.

Soil Characteristics: Soils are generally clay loam over clay, heterogeneous parent material, or bedrock. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is slightly acid to medium acid, and available nutrients range widely from low to high. Drainage mottles are common in the subsoil. Soils include Include Gowker and Kaufman.

Hydrology: The streams associated with this landtype phase are small, and they do not have well-developed floodplains. Stream gradients are relatively steep and upstream watershed is

small, so flooding occurs only intermittently. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Historically as well as now, fire only occurred infrequently on stream bottoms and had minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees fall. Windstorms may uproot or damage trees; succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Bignonia* group are common to abundant and the *Chasmanthium*, *Callicarpa* and *Mitchella* groups are also usually present. On immediate banks of the stream channel, and other favorable microsites, species from the *Arisaema* group may occur.

Overstory Tree Species: Important species include sweetgum, sugarberry, water oak, white ash, cedar elm, and loblolly pine.

Understory Tree Species: Common species include eastern hophornbeam and winged elm. Roughleaf dogwood is less common but present on some sites.

Shrub Species: The shrub layer includes dwarf palmetto, upland swampprivet, and littlehip hawthorn.

Special Conditions: The *Bignonia* group is usually not as abundant on analogous LTPs from other landtype associations as it is here.

Similar LTPs: 231Eh.16.4.20 occupies a similar landscape position, but it occurs on broader stream bottoms that flood irregularly, and the *Justicia* group is common.

231Eh.16.4.20 Cedar Elm-Hackberry/*Justicia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including the northern and western portions of Sam Houston National Forest, generally north of State Highway 150 and north and west of Lake Conroe.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with valleys of perennial streams.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Floodplain width is normally greater than 100 meters. Slope shape is concave to linear, and slope gradient is very gentle to nearly level. Microtopography on some sites consists of numerous small depressions, drainage channels, and mounds created as stream channels shift and flood waters scour and deposit alluvial materials.

Soil Characteristics: Soils formed in alluvial material and consist of loams and clays over heterogeneous alluvial parent material or bedrock. Because of irregular flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil will be exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles occur throughout the soil profile. Soil reaction is mildly alkaline to slightly acid, and available nutrients range from low to high. Soils are mapped as Kanebreak and Gladewater.

Hydrology: The streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle, so irregular flooding occurs. Duration of flooding increases with the size of the watershed.

Natural Disturbances and Processes: Fire occurs very infrequently on stream floodplains and is generally a minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees to lose soil anchorage and fall. At the same time, new deposits of alluvial material are colonized by vegetation. Windstorms may uproot or damage overstory trees.

Ground Layer Species: The *Justicia* group is common. Species from the *Bignonia* group also occur. On slightly elevated areas, species from the *Mitchella*, *Callicarpa*, and *Chasmanthium* groups may be common.

Overstory Tree Species: The overstory contains a mixture of hardwood species including cedar elm, hackberry (=sugarberry), willow oak, cherrybark oak, American elm, nutmeg hickory, green ash, and water hickory. Loblolly pine is only a minor component of the overstory.

Understory Tree Species: Common persimmon is often abundant.

Shrub Species: Shrub species include green hawthorn, dwarf palmetto, deciduous holly, and upland swampprivet.

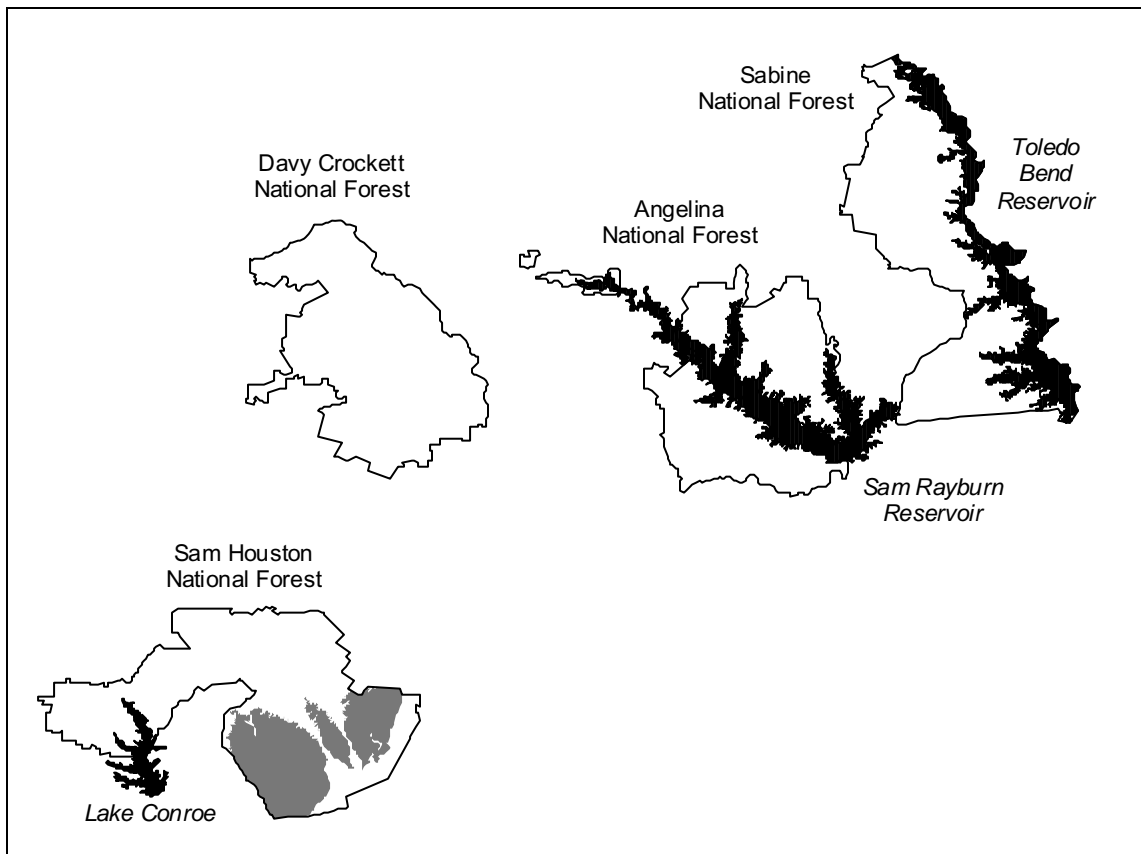
Site Inclusions: Slight differences in elevation, less than 1 meter, may cause a profound change in species composition. Examples include pimple mounds, which may contain species from the *Chasmanthium* and *Callicarpa* groups. These inclusions tend to be small, isolated occurrences.

Special Conditions: The *Justicia* group is usually not as abundant and *Bignonia* is more abundant on most analogous LTPs from other landtype associations.

Similar LTPs: 231Eh.16.4.10 is associated with stream bottoms, but the streams are smaller with narrow valleys and little or no floodplain, and the *Bignonia* and *Arisaema* groups are common. Downstream, 231Eh.16.4.20 grades into Seasonally Flooded River Floodplains such as 231Ei.4.2.10.

CHAPTER 14

231Eh.17 BIG THICKET LANDTYPE ASSOCIATION



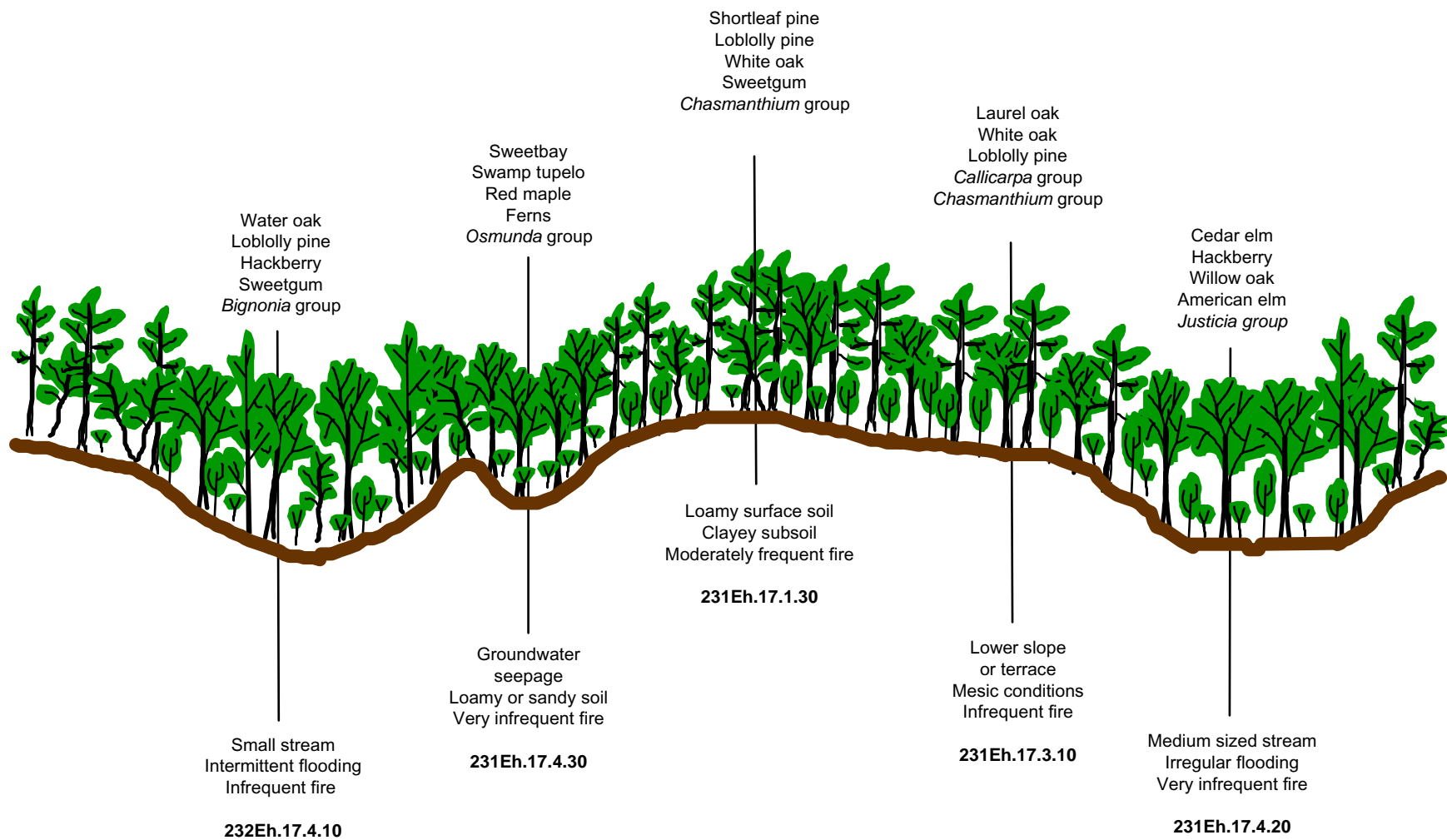


Figure 14.1 Landscape profile of ecosystems on the Big Thicket Landtype Association.

231Eh.17 BIG THICKET LANDTYPE ASSOCIATION



231Eh.17.1.30 Shortleaf Pine-White Oak/*Callicarpa-Chasmanthium* Sandy/Loamy Dry-Mesic Slopes & Uplands (Sam Houston N.F. Compartment 93, Stand 27)



231Eh.17.1.30 Shortleaf Pine-White Oak/*Callicarpa-Chasmanthium* Sandy/Loamy Dry-Mesic Slopes & Uplands (Sam Houston N.F. Compartment 98)



231Eh.17.1.30 Shortleaf Pine-White Oak/*Callicarpa-Chasmanthium* Sandy/Loamy Dry-Mesic Slopes & Uplands, Open pine woodland on reclaimed mine (Sam Houston N.F. Compartment 98)



231Eh.17.3.10: Laurel Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes & Terraces, Lower slope, (Sam Houston N.F. Compartment 106, Stand 1)



231Eh.17.4.10: Water Oak-Loblolly Pine/*Bignonia-Arisaema* Loamy Mesic Stream Bottoms (Sam Houston N.F. Compartment 106, Stand 1)



231Eh.17.4.30: Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps (Sam Houston N.F. Compartment 98, Stand 23)

KEY TO LANDTYPE PHASES

- 1a. Upper slopes, broad uplands, and ridgetops with moderately well drained to well drained loamy sand to sandy loam surface soils. Soils often mapped as Boykin, Doucette, and Pinetucky. Natural overstory is dominated by shortleaf pine, loblolly pine, blackjack oak, and post oak. The *Chasmanthium* and *Callicarpa* species groups are common.
 231Eh.17.1.30 Loblolly Pine-White Oak/*Callicarpa-Chasmanthium*
 Sandy/Loamy Dry-Mesic Slopes and Uplands

- 1b. Lower slopes, groundwater seeps, stream bottoms, terraces, or floodplains. 2

- 2a. Gently to moderately sloping middle to lower side slopes or small stream terraces above minor streams. Soils are typically well-drained but moist. Drainage mottles may be present in the subsoil. Soils include Dallardsville, Kirbyville, Pinetucky, or similar series. Natural overstory is a mixture of oaks, hickories, and pines; the *Callicarpa* species group is common and the *Mitchella* group may be present.
 231Eh.17.3.10 Laurel Oak-Loblolly Pine/*Callicarpa* Loamy
 Mesic Lower Slopes and Terraces Landtype Phase

- 2b. Minor stream bottoms, floodplains or extensive groundwater seep areas 3

- 3a. Constantly saturated groundwater seepage areas (baygalls) at the head of or in the bottoms of and adjacent to small perennial streams. Deep, gray, wet sandy loam surface soils over loam subsoils are mapped as Pluck, Kian, or similar series. Natural overstory is dominated by sweetbay magnolia, swamp tupelo, and redbay. Gallberry holly is usually present in the understory. The *Osmunda* group is common.
 231Eh.17.4.30 Sweetbay-Swamp Tupelo/*Osmunda*
 Loamy Wet Forested Seeps

- 3b. Stream bottoms with few or no areas of groundwater seepage. The *Osmunda* group is rare or absent. 4

- 4a. Gentle to moderately sloping toeslopes of narrow stream bottoms without well-developed floodplains. Floodplain width is less than 100m. Drainage mottles may occur in the subsoil. Soils include Gowker and Kaufman. Natural overstory includes water oak, white oak, and loblolly pine. The *Bignonia* group is common, and the *Arisaema* group is locally common near stream banks.
 231Eh.17.4.10 Water Oak-Loblolly Pine/*Bignonia-Arisaema*
 Loamy Mesic Stream Bottoms

- 4b. Nearly level, moderately wide floodplains of intermediate-sized perennial streams. Irregular flooding occurs and old stream channels and depressions may be constantly saturated. The soil litter layer is usually thin or bare and drainage mottles are common throughout the soil profile. Soils include the Kanebrake and Gladewater series. Natural overstory includes cedar elm, hackberry, willow oak, and American elm. The *Justicia* group is common, the *Bignonia* group is present, and the *Mitchella* group occurs on slightly elevated ridges or mounds. 231Eh.17.4.20 Cedar Elm-Hackberry/*Justicia*
 Loamy Wet-Mesic Stream Bottoms

LANDTYPE PHASE DESCRIPTIONS

231Eh.17.1 Sandy/Loamy Uplands

231Eh.17.1.30 Loblolly Pine-White Oak/*Callicarpa-Chasmanthium* Sandy/Loamy Dry-Mesic Slopes and Uplands

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including southeastern portion of Sam Houston National Forest, south of State Highway 150 and north of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Occurs on the Willis formation, which consists mostly of coarse-textured, fluvial sands. Terrain is gently rolling.

Landform: Occurs on middle and upper side slopes, broad uplands, and ridgetops. Slope shape is convex with gentle to moderate slopes.

Soil Characteristics: Soils consist of loamy fine sand to fine sandy loam surface soils over sandy clay loam subsoils. Depth to the subsoil is normally greater than 30 cm and in some soils a sandy surface layer is thick enough to classify the soil as being arenic. Surface soil reaction is medium acid to strongly acid, and available nutrients are medium to high. Soils are mapped as Boykin, Doucette, or Pinetucky.

Hydrology: Soils range from moderately well-drained to well-drained and most have medium available water capacity. Soil permeability is moderate to moderately slow. Some of the sandier soils may be rapidly permeable and have the potential to experience prolonged drought.

Natural Disturbances and Processes: Historically, periodic fires burned through these uplands, with the fire interval influenced by topographic barriers, fuels, and soil texture. The historic fire return interval was probably moderately frequent. Drought can be a significant stress especially on the sandier soils.

Ground Layer Species: Species from the *Chasmanthium* and *Callicarpa* groups are common.

Overstory Tree Species: The overstory consists of mixed pine and hardwood species. Loblolly pine and shortleaf pine are the dominant pines, with shortleaf pine being more common on sandier sites. Common hardwood species include white oak, sweetgum, post oak, southern red oak, and black hickory. Historical literature indicates that even in the presettlement forest loblolly pine was important or dominant on these sites (See Chapter 4).

Understory Tree Species: Flowering dogwood, black cherry, and redbay are common understory species.

Shrub Species: Shrubs include yaupon, mapleleaf viburnum, dwarf pawpaw, and American beautyberry.

Similar LTPs: 231Eh.17.3.10 occurs on loamy soils at lower slope positions, on sites with higher soil moisture levels and a more mesic forest community.

231Eh.17.3 Mesic Slopes and Terraces Landtype

231Eh.17.3.10 Laurel Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including southeastern portion of Sam Houston National Forest, south of State Highway 150 and north of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Occurs on the Willis formation, which consists mostly of coarse-textured, fluvialite sands. Terrain is gently rolling.

Landform: Occurs on middle to lower slopes and terraces, at the transition zone between dry-mesic upper slopes and moist to wet stream bottoms. Finer soil textures and hydrologically lower slopes retain more soil moisture than the uplands. Slope shape is concave to linear, and slope gradient is gentle to moderate.

Soil Characteristics: Soils are variable. The higher soil moisture typical of lower slopes appears to influence the plant community more than soil type. Textures vary from loamy sand to sandy loam, loam, and silt loam at the surface and subsoil is loamy or clayey. Depth to the subsoil is generally more than 100 cm. Surface soils have very low to medium nutrient content. Surface soil reaction is medium acid to extremely acid. Drainage mottles are present in the subsoil. Soils include Dallardsville, Kirbyville, and Pinetucky series.

Hydrology: Due to the low position on the landscape, proximity to streams, and mesic microclimate, soils tend to be moister than the surrounding uplands, and the effects of droughts are more moderate. As a result, species that prefer mesic conditions dominate. Sites may be dissected by small intermittent streams and drainages.

Natural Disturbances and Processes: Fire is infrequent on lower slopes and terraces. In an unusually dry period, fires that originate on uplands may burn down to a lower slope, where there may be sufficient fuel to carry a low-intensity surface fire. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa* group are abundant. Species from the *Chasmanthium* group, such as sessile flowered woodoats (*Chasmanthium sessiliflorum*) and devil's grandmother (*Elephantopus tomentosus*), may also be common. The *Mitchella* group may be locally common on moist microsites. On sites with a mature, closed overstory canopy, herbaceous cover may be sparse.

Overstory Tree Species: The overstory contains a mixture of hardwoods and pines. Relative dominances of hardwood and pine species can vary greatly from site to site, but most sites with no recent large-scale disturbances will eventually be dominated by hardwoods. Important trees include laurel oak, white oak, southern red oak, cherrybark oak, sweetgum, white ash, blackgum, mockernut hickory, and bitternut hickory. Loblolly pine and shortleaf pine are also important components of the overstory. American beech occasionally occurs; it is at the extreme southwestern limit of its natural range on this LTA.

Understory Tree Species: Common understory trees include red maple saplings, American holly, winged elm, American hornbeam, eastern hophornbeam, and flowering dogwood.

Shrub Species: Southern arrowwood, farkleberry, common sweetleaf, and yaupon are common.

Similar LTPs: 231Eh.17.1.30 occurs on loamy soils, but is found at a higher slope position on the landscape and the soils are droughtier. 231Eh.17.4.10 has similar mesic conditions, but it occurs on stream bottoms and the *Bignonia* and *Arisaema* groups are usually present.

231Eh.17.4 Minor Stream Bottoms Landtype

231Eh.17.4.10 Water Oak-Loblolly Pine/*Bignonia*-*Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including southeastern portion of Sam Houston National Forest, south of State Highway 150 and north of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with valleys of perennial and intermittent streams.

Landform: Occurs on toeslopes and floodplains of narrow stream bottoms. Floodplains are poorly developed, generally less than 100m wide. Slope shape is concave to linear, and slope gradients are gentle to very gentle.

Soil Characteristics: Soils are generally clay loam over clay, heterogeneous parent material, or bedrock. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is slightly acid to medium acid, and available nutrients range from low to high. Drainage mottles are common in the subsoil. Soils include the Gowker and Kaufman series.

Hydrology: The streams associated with this landtype phase are small, often intermittent and do not have well-developed floodplains. Stream gradients are relatively steep and upstream watersheds are small, so flooding only occurs intermittently. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire occurs infrequently on stream bottoms. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees fall. Windstorms may also uproot or damage overstory trees; succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Bignonia* and *Mitchella* groups are common to abundant. On immediate banks of the stream channel and in other favorable microsites, species from the *Arisaema* group may also be present.

Overstory Tree Species: The dominant overstory species include sweetgum, hackberry, water oak, white ash, and loblolly pine. American beech occasionally occurs; it is at the southwestern limit of its natural range on this LTA.

Understory Tree Species: Common understory trees include eastern hophornbeam and winged elm. Roughleaf dogwood is less common but present on some sites.

Shrub Species: The shrub layer includes dwarf palmetto, upland swampprivet, and pasture haw.

Similar LTPs: 231Eh.17.4.20 occupies a similar landscape position but it occurs on broader stream bottoms that flood irregularly and the *Justicia* group is common.

231Eh.17.4.20 Cedar Elm-Hackberry/*Justicia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including southeastern portion of Sam Houston National Forest, south of State Highway 150 and north of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with valleys of medium-sized perennial streams.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Floodplain width is normally greater than 100 meters. The slope shape is concave to linear, and slope gradient is very gentle to nearly level. Microtopography on some sites consists of numerous small depressions, drainage channels, and mounds created as stream channels shift and flood waters scour and deposit alluvial materials.

Soil Characteristics: Soils are alluvial material consisting of loams and clays over heterogeneous alluvial parent material or bedrock. Because of flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil will be exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles occur throughout the soil profile. Soil reaction is mildly alkaline to slightly acid, and available nutrients range from low to high. Soils are mapped as Kanebreak and Gladewater.

Hydrology: Streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle, so irregular flooding occurs. Duration of flooding increases with the size of the watershed.

Natural Disturbances and Processes: Fire occurs very infrequently on stream floodplains and has minimal effect on vegetation. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees to fall. At the same time, new deposits of alluvial material are colonized by vegetation. Windstorms may also uproot or damage overstory trees.

Ground Layer Species: The *Justicia* group is common as are members of the *Bignonia* group. On slightly elevated mounds, species from the *Mitchella* and *Callicarpa* groups may dominate.

Overstory Tree Species: The overstory contains a diverse mixture of hardwood species including cedar elm, hackberry, willow oak, cherrybark oak, American elm, nutmeg hickory, green ash, and water hickory. Loblolly pine is a minor component of the overstory.

Understory Tree Species: Green ash saplings and common persimmon are common.

Shrub Species: Shrub species include green hawthorn, dwarf palmetto, deciduous holly, and upland swampprivet.

Site Inclusions: Slight differences in elevation, less than 1 meter, result in profound differences in species composition. Examples include pimple mounds, which may contain species more characteristic of mesic lower slopes than floodplains. Likewise, wet depressions and channels provide habitat for obligate wetland species.

Special Conditions: The *Justicia* group is usually not as abundant and *Bignonia* is more abundant on most analogous LTPs from other landtype associations.

Similar LTPs: 231Eh.17.4.10 is associated with stream bottoms, but the streams are smaller with narrow valleys and little or no floodplain, and the *Arisaema* group is common. Downstream, 231Eh.17.4.20 grades into Seasonally Flooded River Floodplains such as 231Eh.4.2.10.

231Eh.17.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including southeastern portion of Sam Houston National Forest, south of State Highway 150 and north of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Occurs on the Willis formation, which consists mostly of coarse-textured, fluvial sands. Terrain is gently rolling.

Landform: Occurs on the floodplains of small, perennial streams and on headslopes of perennial or intermittent drainages where underground water flow exits a hillside as a seep or spring. It may also be found downstream wherever seepage of underground water occurs. Stream channels are shallow and poorly developed.

Soil Characteristics: Soils are generally deep, gray, loamy fine sand over a loam or clay loam subsoil and are very poorly drained and saturated most of the time. Soil reaction is medium acid to strongly acid and available nutrients are very low. Soils are mapped primarily as Pluck and Kian series.

Hydrology: Soils are very poorly drained. An impermeable subsurface layer, such as sandstone, shale, or clay, results in ground water seepage that keeps the soil saturated most of the year (a semipermanently to nearly permanently saturated hydrologic regime). Some sites near larger streams are subject to intermittent flooding.

Natural Disturbances and Processes: Fire is very infrequent on wet forested seeps and has minimal influence on vegetation. Wind throw and individual tree mortality are important disturbances.

Ground Layer Species: Species from the *Osmunda* group are abundant, especially ferns such as netted chain fern (*Woodwardia areolata*), cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*). The *Arisaema* group may be present in areas of some sites.

Overstory Tree Species: Common overstory trees include sweetbay magnolia, red maple, southern magnolia, and swamp tupelo. White oak, swamp chestnut oak, and loblolly pine may also be found on more mesic microsites.

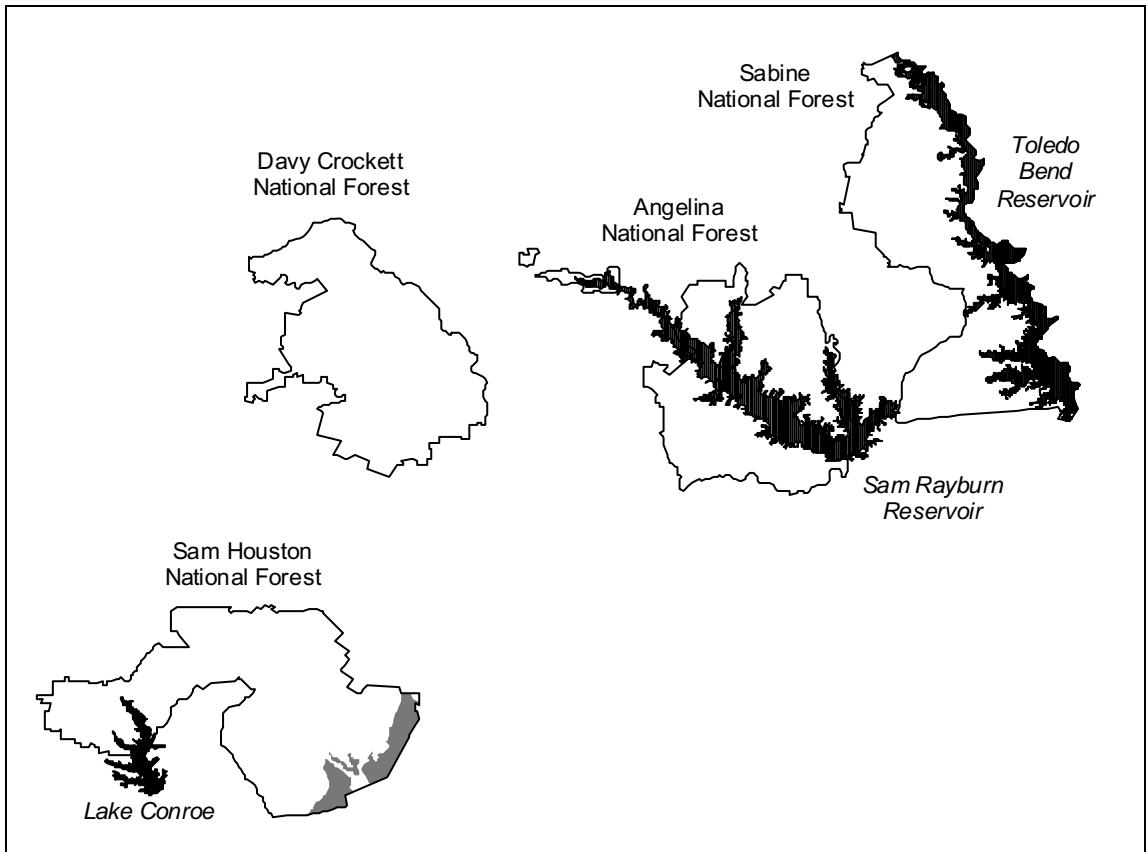
Understory Tree Species: Species include littlehip hawthorn, redbay, American holly, and red maple saplings.

Shrub Species: Shrub species include gallberry holly, evergreen bayberry, early azalea, and southern arrowwood.

Similar LTPs: 231Eh.17.4.20 occurs on loamy, irregularly flooded stream bottoms with well-developed floodplains, and the *Bignonia* and *Justicia* groups are common. While small areas of seepage with some species from the *Osmunda* group may occur, they are not common or widespread.

CHAPTER 15

231Ei.18 SAN JACINTO FLATWOODS LANDTYPE ASSOCIATION



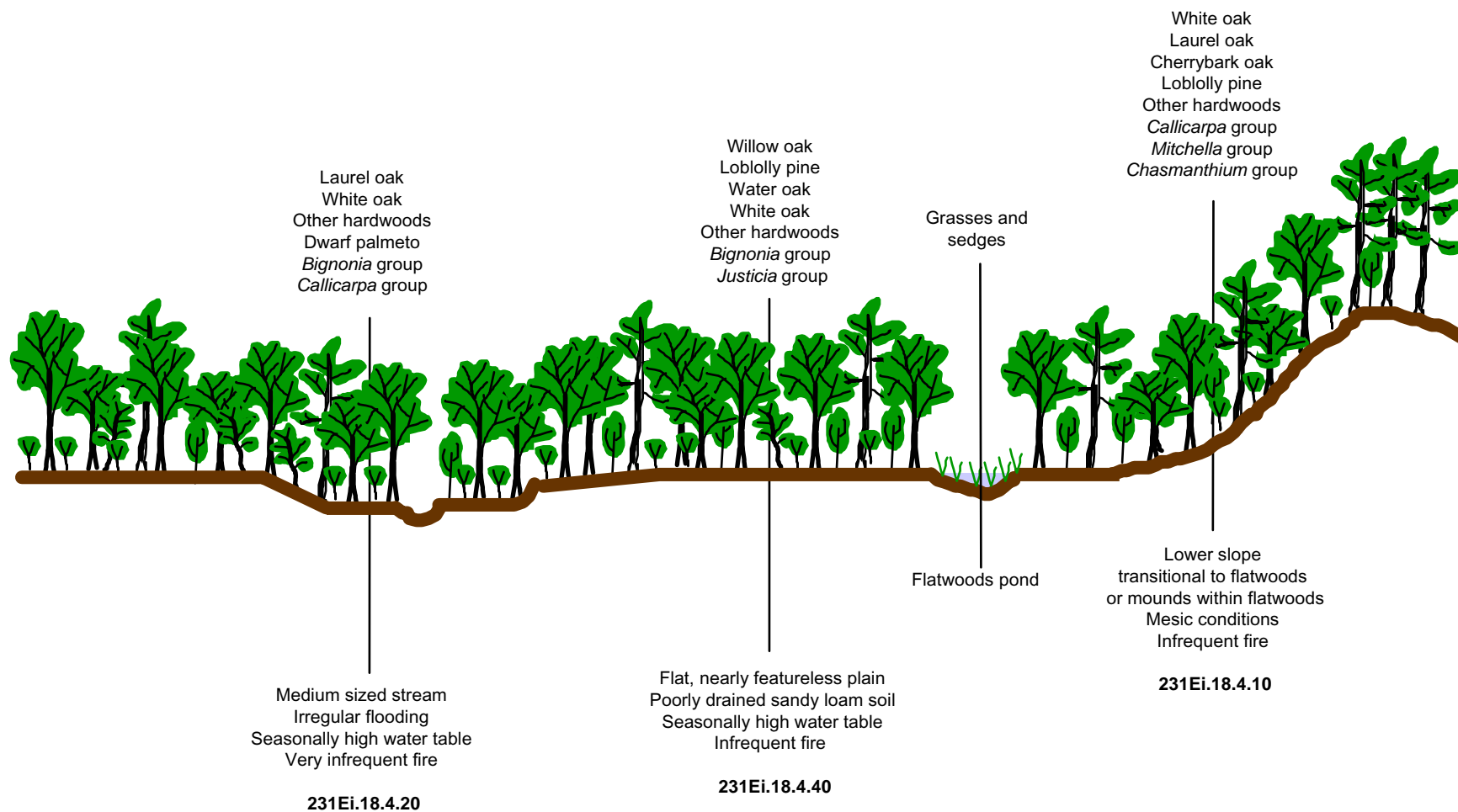


Figure 15.1 Landscape profile of ecosystems on the San Jacinto Flatwoods Landtype Association.

231Ei.18 SAN JACINTO FLATWOODS LANDTYPE ASSOCIATION



231Ei.18.4.40: Willow Oak-Loblolly Pine/*Justicia-Bignonia* Loamy Seasonally Wet Flatwoods (right & front), with pimple mound area (left rear), Sam Houston N.F. Compartment 108, Stand 4.



231Ei.18.3.10: White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes, Mounds, & Terraces, Gentle lower slope, (Sam Houston N.F. Compartment 108, Stand 4)



231Ei.18.3.10: White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes, mounds, and Terraces, Pimple mound in flatwoods area, (Sam Houston N.F., Compartment 108, Stand 4)



231Ei.18.4.40: Willow Oak-Loblolly Pine/*Justicia-Bignonia* Loamy Seasonally Wet Flatwoods, (Both photos: Sam Houston N.F. Compartment 108, Stand 4)

KEY TO LANDTYPE PHASES

- 1a. Nearly level, almost featureless plains (flatwoods) with poorly-defined drainage patterns. Soils are deep, poorly drained sandy loams to sandy clay loams. Drainage mottles are present in the subsoil. Soils are saturated or ponded in winter and spring, but tend to become droughty in summer. Soils Include Kirbyville and Pluck. Natural overstory includes willow oak, loblolly pine, swamp chestnut oak, red maple, sweetbay magnolia, and swamp tupelo. The *Justicia* and *Bignonia* groups are common.
..... 231Ei.18.1.50 Willow Oak-Loblolly Pine/*Justicia-Bignonia*
Loamy Seasonally Wet Flatwoods

- 1b. Sites are **either** irregularly flooded stream floodplains **or** slopes, terraces, and pimple mounds that occur on or adjacent to nearly level, flatwoods plains. 2

- 2a. Loamy slopes, terraces, and pimple mounds that occur on or adjacent to nearly level, almost featureless plains (flatwoods), or adjacent to bottoms of minor streams. Soils are variable, ranging from loamy sand to silt loam over loamy or clayey subsoil. Soils Include Dallardsville, Kirbyville, and Pinetucky. Flooding is absent or intermittent due to the slightly higher elevation above the flatwoods. Natural overstory contains a diverse mixture of hardwoods mixed with pine, including white oak, laurel oak, American beech, southern magnolia, loblolly pine, and shortleaf pine. The *Callicarpa* group is common and the *Mitchella* group may be present. 231Ei.18.3.10 White Oak-Loblolly Pine/*Callicarpa*
Loamy Mesic Lower Slopes, Mounds and Terraces

- 2a. Nearly level to gently sloping, moderately wide floodplains of intermediate-sized streams. Irregular flooding occurs, and old stream channels and depressions may be nearly permanently saturated. Soils are loamy sand to sandy loam over heterogeneous parent material. Drainage mottles are common throughout the soil profile. Soils Include Hatliff, Pluck, and Kian. Natural overstory includes water oak, cherrybark oak, southern magnolia, and sweetgum. The *Bignonia* group is common; the *Mitchella* group is present on slightly elevated areas; the *Justicia* group is present in wet depressions.
..... 231Ei.18.4.20 Water Oak-Southern Magnolia/*Bignonia*
Loamy Wet-Mesic Stream Bottoms

DESCRIPTIONS OF LANDTYPE PHASES

231Ei.1.1 Sandy/Loamy Uplands Landtype

231Ei.18.1.50 Willow Oak-Loblolly Pine/*Justicia-Bignonia* Loamy Seasonally Wet Flatwoods Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including the extreme southeastern portion of Sam Houston National Forest, south and east of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Occurs on the Lissie formation, which is characterized by fine-textured sands, nearly featureless plains, and streams with broad, shallow valleys. Terrain is level to very gently undulating.

Landform: Occurs on nearly level to very gently sloping, broad plains with poorly-defined drainage patterns. Flatwoods may cover extensive acreages. Much of the landscape exhibits undulating microtopography, indicated by the presence of flatwoods ponds and pimple mounds.

Soil Characteristics: Soils have a deep, somewhat poorly drained, moderately permeable sandy loam surface soil over sandy clay loam subsoil. Drainage mottles occur in the subsoil. A seasonal water table occurs near the surface in winter and spring, but soils may become droughty during the summer and fall. Surface soil reaction is neutral to strongly acid, and nutrient content is moderate. Soils include the Kirbyville and Pluck series.

Hydrology: The nearly level topography and lack of well-defined drainages results in soils that are seasonally saturated, with areas of ponding especially in winter and spring. However, during the summer and fall, the moderately permeable surface soils tend to become droughty. Prolonged saturation of soils creates anoxic conditions that favor obligate wetland species. Slight elevation differences (<1m) associated with the undulating microtopography greatly influence plant species composition.

Natural Disturbances and Processes: Seasonally high water tables alternating with periods of drought are the primary influences on this landtype phase. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics. The historical importance of fire on this landscape has not been fully determined although fire occurred frequently on longleaf pine-dominated flatwoods to the east in southeast Texas and southwest Louisiana.

Ground Layer Species: Species from the *Justicia* and *Bignonia* groups are common with the *Justicia* group dominant in moist depressions and around the edges of flatwoods ponds, and the *Bignonia* group occupying areas with slightly better drainage.

Overstory Tree Species: The overstory is dominated by willow oak, laurel oak, and loblolly pine, with water oak, white oak, green ash, and Swamp chestnut oak as associates. Red maple, sweetbay magnolia, and swamp tupelo are abundant in wetter depressions.

Understory Tree Species: Common species include green ash saplings and American holly.

Shrub Species: Common buttonbush, southern arrowwood, yaupon, wax-myrtle, and Gulf sebastiana are common species.

Site Inclusions: Within this landtype phase, a range of microsite types may be found, including herb-dominated flatwoods ponds and pimple mounds with mesic hardwood-pine communities. Larger mounds are classified as 231Ei.18.3.10.

Similar LTPs: 231Ei.18.4.20 floods irregularly and occurs on small stream bottoms, and the *Callicarpa* group is common. Mesic site inclusions (small mounds) within the flatwoods may resemble 231Ei.18.3.10.

Special Conditions: Large areas of flatwoods in southeastern Texas were once supported longleaf pine communities, although it is not known how far west of the Trinity River that these communities extended.

231Ei.18.3 Mesic Slopes and Terraces Landtype

231Ei.18.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes, Mounds, and Terraces Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods Including the extreme southeastern portion of Sam Houston National Forest, south and east of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Occurs on the Lissie formation which is characterized by fine-textured sands, nearly featureless plains, and streams with broad, shallow valleys. Terrain is level to gently undulating.

Landform: Occurs on gentle slopes and terraces and on pimple mounds that occur in or adjacent to flatwoods. Slope shape is concave to linear, except for pimple mounds, which are convex. Slope gradients are nearly level to gentle.

Soil Characteristics: Soils are variable. Textures range from loamy sand to sandy loam, loam, to silt loam over a loamy or clayey subsoil. Surface soils have very low to moderate nutrient content. Surface soil reaction is neutral to medium acid. Drainage mottles are present in the subsoil. Soils include Dallardsville, Kirbyville, Pinetucky, and similar soils.

Hydrology: Due to the low relief and proximity to flatwoods and streams, soils tend to remain moist, moderating the effects of droughts. The slightly higher elevation, often only a few meters, above the surrounding plain reduces the effects of flooding. As a result, species that are adapted to mesic site conditions dominate.

Natural Disturbances and Processes: Fire is infrequent. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups are common. The *Mitchella* group is an important indicator for these sites. On sites with a mature, closed overstory canopy, the herbaceous cover may be sparse.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods and pines. Important overstory trees include white oak, laurel oak, southern red oak, cherrybark oak, water oak, sweetgum, white ash, red maple, blackgum, mockernut hickory, and bitternut hickory. Loblolly pine and shortleaf pine are also important trees. American beech and southern magnolia occur on some sites and these species may have been more common historically.

Understory Tree Species: Common species include American holly, winged elm, American hornbeam, eastern hophornbeam, and flowering dogwood.

Shrub Species: Southern arrowwood, farkleberry, common sweetleaf, and yaupon are common.

Similar LTPs: 231Ei.18.4.20 occurs on stream bottoms and has wetter soils.

231Ei.18.4 Minor Stream Bottoms Landtype

231Ei.18.4.20 Water Oak-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods including the extreme southeastern portion of Sam Houston National Forest, south and east of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Occurs on recent (Holocene) alluvial sands, silts, and loams associated with the floodplains of second- and third-order perennial streams.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Slope shape is concave to linear, and slope gradients are nearly level to very gentle. Microtopography on some sites consists of numerous small depressions, drainage channels, and mounds.

Soil Characteristics: Soils are developed from loamy alluvial material washed from the upstream Willis and Fleming formations. They are generally moderately well drained to poorly drained, and permeability is moderate to moderately rapid. Surface soil reaction is neutral to strongly acid. A seasonal water table is near the surface in winter and spring. Drainage mottles occur throughout the soil profile. Soils include Hatliff, Pluck, and Kian series.

Hydrology: The streams associated with this landtype phase drain a moderately large watershed, so irregular flooding can occur. In addition, a seasonally high water table can develop near the surface during the winter and spring.

Natural Disturbances and Processes: Fire is very infrequent on stream floodplains. Erosion and deposition constantly change the course of stream channels and can undercut banks and cause trees to fall. At the same time, new deposits of alluvial material are colonized by vegetation.

Ground Layer Species: Species from the *Bignonia* group are common. Species from the *Callicarpa* and *Mitchella* groups may be present on some sites.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods along with pine. Important overstory trees include laurel oak and white oak, southern red oak, cherrybark oak, water oak, sweetgum, white ash, blackgum, mockernut hickory, and bitternut hickory. Loblolly pine is also an important component of the overstory. American beech and southern magnolia occur on some sites, and these species may have been more common historically.

Understory Tree Species: Common species include Carolina laurelcherry, American hornbeam, and winged elm.

Shrub Species: Shrubs include dwarf palmetto, American beautyberry, two-wing silverbell, and yaupon.

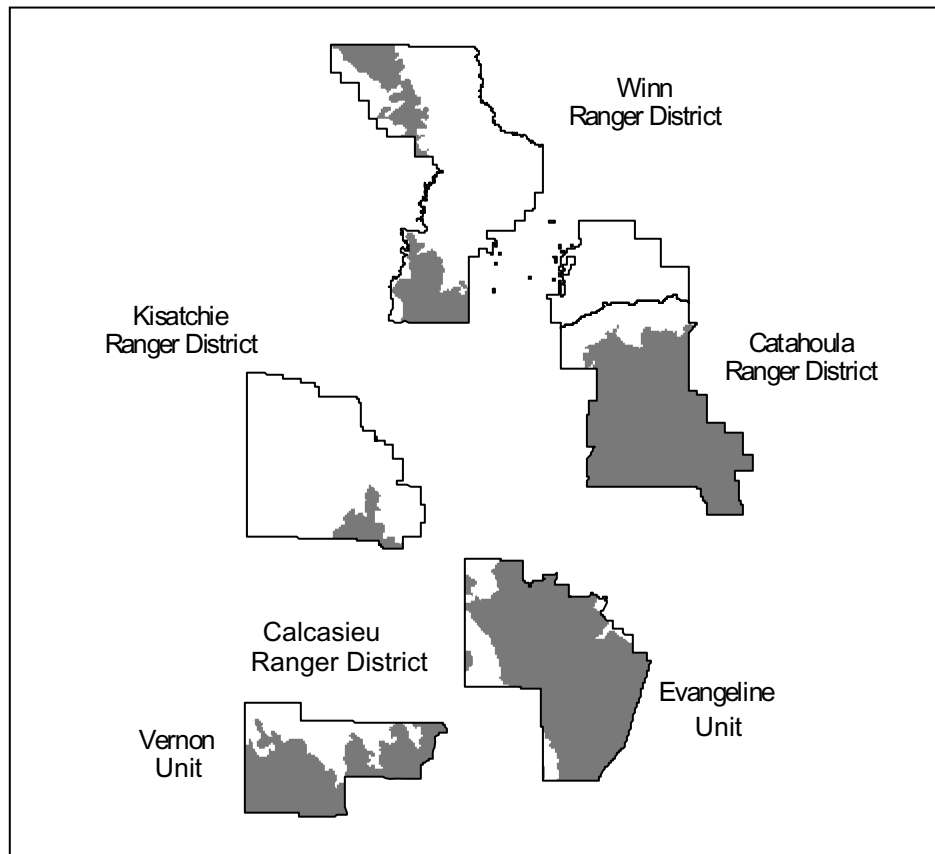
231Ei.18 San Jacinto Flatwoods Landtype Association

Site Inclusions: Slight differences in elevation, less than 1 meter, may have a profound influence on species composition. Small ridges and mounds may contain species more characteristic of mesic lower slopes while wet depressions and channels provide habitat for obligate wetland species.

Similar LTPs: 231Ei.18.1.50 may also experience wet soils or flooding but occurs on broad, nearly level plains (flatwoods), and the *Justicia* group is more common.

CHAPTER 16

232Fa.1 HIGH TERRACE ROLLING UPLANDS LANDTYPE ASSOCIATION



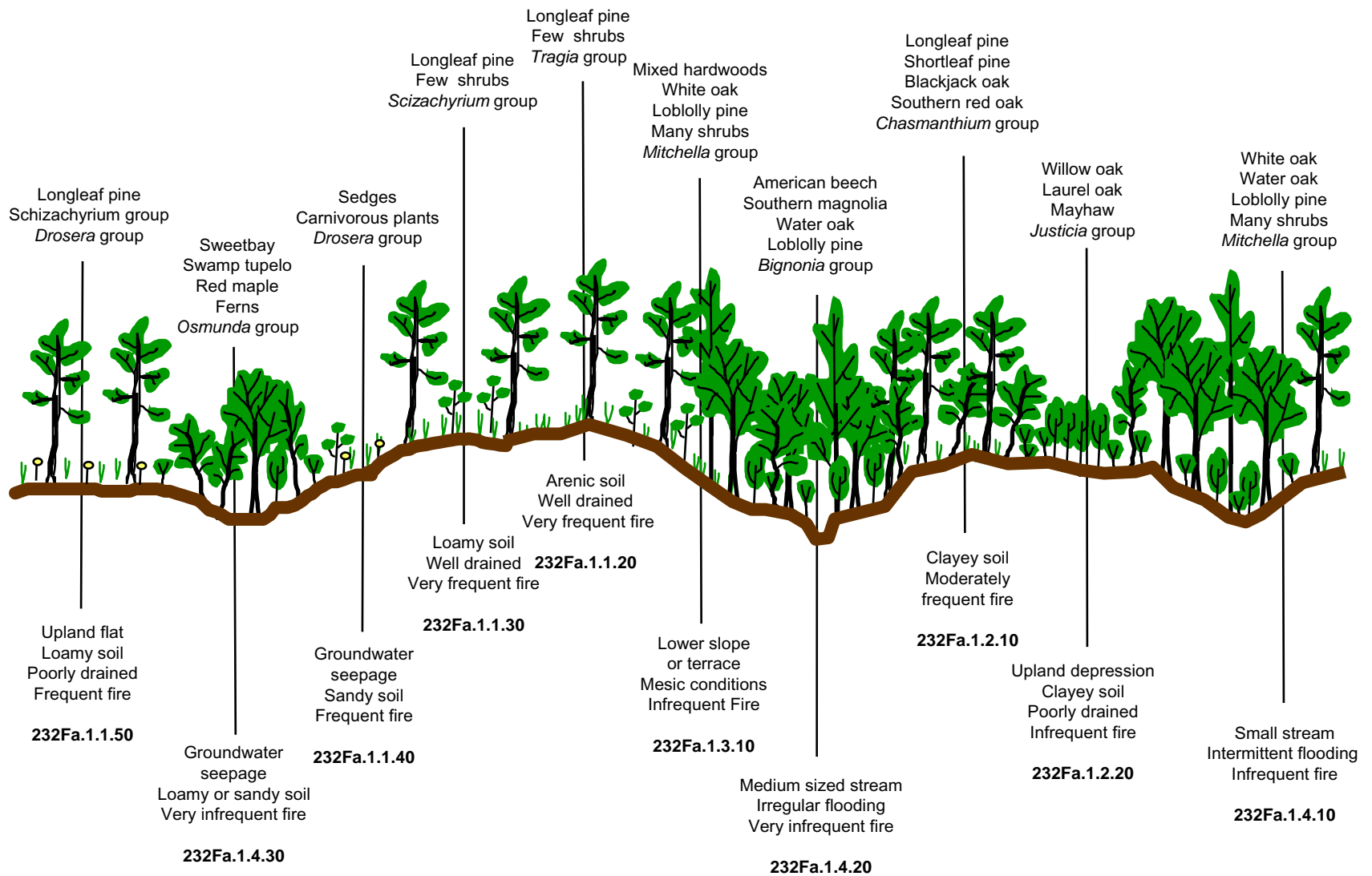


Figure 16.1 Landscape profile of ecosystems on the High Terrace Rolling Uplands Landtype Association.

232Fa.1 HIGH TERRACE ROLLING UPLANDS LANDTYPE ASSOCIATION



232Fa.1.1.20: Longleaf Pine/*Tragia* Arenic Dry Uplands (Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 25, Stand 5)



232Fa.1.1.30: Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase (Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 15, Stand 8)



232Fa.1.1.40: Longleaf Pine/*Drosera* Sandy Wet Herbaceous Seeps (Kisatchie NF, Vernon Unit, Calcasieu R.D. Compartment 32, "Cooter's Bog")



232Fa.1.3.10: White Oak-Loblolly Pine/*Callicarpa* Loamy/Sandy Mesic Lower Slopes and Terraces (Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 13, Stand 27)



232Fa.1.4.20: American Beech-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms (Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 20, Stand 23, along whisky Chitto Creek)



232Fa.1.4.30: Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps (Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 13, Stand 10)

KEY TO LANDTYPE PHASES

- 1a. Upland topographic positions: Middle to upper slopes, undulating uplands, ridgetops, or poorly drained upland flats. Sites (except 232Fa1.2.20) are typically pine-dominated.2
- 1b. Lower slopes, ravines, poorly drained upland flats, hillside seeps, stream terraces, or floodplains. Sites are typically deciduous hardwood-dominated. 7
- 2a. Well drained, somewhat excessively well drained, or excessively well drained soils. Soil surface layer with loam or coarser texture and soils typically considered loamy, sandy, arenic, or grossarenic. 3
- 2b. Poorly drained to somewhat poorly drained sandy, loamy or clayey soils **or** well drained soils with a clay or clay loam surface layer..... 4
- 3a. Well drained to excessively well drained sandy or arenic soils with a sandy surface layer at least 50cm thick. Includes Betis, Briley, and Boykin soils and sandier intergrades of Ruston and Smithdale soils. Longleaf pine is dominant in natural stands and the *Tragia* species group is common in addition to the *Schizachyrium* group. The *Callicarpa* and *Chasmanthium* groups slowly colonize unburned sites.....
 232Fa.1.1.20 Longleaf Pine/*Tragia*
 Sandy Dry Uplands
- 3b. Well drained loamy soils, with at least part of the upper 50cm not sandy. Includes Malbis, loamier Ruston and Smithdale intergrades, and occasionally, Beauregard soils. Longleaf pine is dominant in natural stands and the *Schizachyrium* species group is common but the *Tragia* group is rare or absent. The *Callicarpa* and *Chasmanthium* groups rapidly colonize unburned sites. 232Fa.1.1.30 Longleaf Pine/*Schizachyrium*
 Loamy Dry-Mesic Uplands
- 4a. Poorly drained or somewhat poorly drained soils with sandy or loamy surface textures on broad flat pine-dominated uplands with minimal topographic relief in the southern portion of the region **or** wet sandy soils in areas with localized hillside groundwater seepages. .. 5
- 4b. Slowly permeable clay loam soils of flat areas or slight depressions on broad hardwood-dominated uplands, **or** clay and clay loam soils on sloping uplands. Soils may be poorly drained but usually not constantly wet as a result of groundwater seepage. 6
- 5a. Sandy or sandy loam soils often with an impermeable subsurface layer. Soils are constantly wet as a result of groundwater seepage. Sites generally cover less than 1 ha. Natural sites are herb-dominated open areas where the *Drosera* and *Osmunda* species groups are present.....232Fa.1.1.40 Longleaf Pine/*Drosera*
 Sandy Wet Herbaceous Seeps
- 5b. Broad, flat uplands with little or no topographic relief found only in the extreme southern portion of the LTA. Soils are acid, nutrient-poor, poorly drained, loamy fine sands and silt loams, often mapped as Beauregard soils. Natural stands are dominated by longleaf pine but many modern stands are planted with slash pine. Both the *Schizachyrium* and *Drosera* groups are present.232Fa.1.1.50 Longleaf Pine/*Schizachyrium*-*Drosera*
 Fine-Sandy Wet Flatwoods.

232Fa.1 High Terrace Rolling Uplands Landtype Association

- 6a. Slowly permeable, poorly drained clay loam soils of flat areas or slight depressions on broad level uplands. Soils include the Caddo series. Natural overstory includes willow oak, water oak, and other species more commonly associated with river floodplains. The *Justicia* species group is common 232Fa.1.2.20 Willow Oak/*Justicia*
Clayey Wet Upland Depressions
- 6b. Well drained to somewhat poorly drained clays or clay loams on moderate to gentle side slopes and ridgetops, generally mapped as Gore soils. Sites are usually 2 ha or smaller. Natural overstory is dominated by a mixture of blackjack oak, post oak, and longleaf pine. The *Callicarpa*, *Chasmanthium*, and *Schizachyrium* species groups are common.
..... 232Fa.1.2.10 Blackjack Oak-Longleaf Pine/*Chasmanthium*
Clayey/Loamy Dry-Mesic Uplands
- 7a. Lower slopes, ravines, or small terraces, often immediately above stream bottoms. Natural overstory a mixture of loblolly pine and broadleaf deciduous hardwoods.....
..... 232Fa.1.3.10 White Oak-Loblolly Pine/*Callicarpa*
Loamy/Sandy Mesic Lower Slopes and Terraces
- 7b. Minor stream bottoms, floodplains, or groundwater seepage areas associated with head slopes or streams. 8
- 8a. Groundwater seepage areas on headslopes or on/ adjacent to floodplains of small intermittent or perennial streams. Soils are deep gray sands nearly permanently wet from groundwater seepage. Intermittent flooding may occur on sites adjacent to larger streams. Natural overstory includes sweetbay magnolia, swamp tupelo, and red maple. The *Osmunda* species group is common.
..... 232Fa.1.4.30 Sweetbay-Swamp Tupelo/*Osmunda*
Loamy Wet Forested Seeps.
- 8b. Floodplains or valleys of small and medium sized streams. Sites may be subject to intermittent or irregular flooding, but groundwater seepage areas are small and rare. 9
- 9a. Small, intermittent or perennial stream bottoms. The floodplain is poorly-developed; usually less than 100 m wide and flooding is intermittent. Natural overstory is dominated by mesic hardwoods and loblolly pine. The *Mitchella*, *Callicarpa*, and *Chasmanthium* species groups are common; the *Bignonia* group is infrequent or rare.....
..... 232Fa.1.4.10 White Oak-Loblolly Pine/*Mitchella*
Loamy Mesic Stream Bottoms
- 9b. Floodplains of medium-sized perennial streams. The well-developed floodplain is more than 100 m wide and irregular flooding occurs. Natural overstory consists of both mesic and flood-tolerant hardwoods and occasional loblolly pine. While members of the *Mitchella*, *Callicarpa*, and *Chasmanthium* species groups may occur, the *Bignonia* species group is abundant.
..... 232Fa.1.4.20 American Beech-Southern Magnolia/*Bignonia*
Loamy Wet-Mesic Stream Bottoms.

DESCRIPTIONS OF LANDTYPE PHASES

232Fa.1.1 Sandy/Loamy Uplands Landtype

232Fa.1.1.20 Longleaf Pine/*Tragia* Arenic Dry Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It includes most of the Calcasieu Ranger District, the southern two thirds of the Catahoula Ranger District and portions of the Winn and Kisatchie Ranger Districts of Kisatchie National Forest.

Geology: Occurs on sandy High Terrace deposits including those associated with the Red River complex.

Landform: Occurs on ridgetops and gentle to moderate, convex upper slopes.

Soil Characteristics: Soils are deep sands (more than 50cm thick) over loamy subsoil. They are well drained to excessively well drained, droughty, low in nutrients, and rapidly permeable. Reaction is strongly acid to very strongly acid and soils include the Betis, Briley, and Boykin series as well as the sandier variants of soils mapped as Ruston and Smithdale.

Hydrology: Soils are coarse-textured, excessively well drained, and tend to dry quickly. Periods of drought are common especially during the warmer summer months.

Natural Disturbances and Processes: Under presettlement conditions stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and a moderately dense woody understory develops and eventually shades out much of the grassy ground layer. While many modern stands no longer experience regular fire, large areas of Kisatchie National Forest burn regularly and still support longleaf pine communities.

Ground Layer Species: The ground layer of regularly burned stands includes a diverse assemblage of grasses and herbs from the *Schizachyrium* and *Tragia* groups. While *Schizachyrium scoparium* (little bluestem) is dominant, species from the *Tragia* group are diagnostic. On unburned sites, the *Chasmanthium* and *Callicarpa* groups become established.

Overstory Tree Species: Regularly burned stands are open longleaf pine woodlands but may also include occasional blackjack oak. Unburned stands will develop a mixture of oaks, pines, and hickories. Dry, isolated ridgetops where productivity is very low may not produce enough fuel to carry fires and will support an open oak woodland of blackjack oak, post oak, bluejack oak, and black hickory.

Understory Tree Species: Understory in fire-maintained stands is sparse and consists mainly of longleaf pine saplings and occasional oaks. Woody understory—sassafras, saplings of upland oaks and occasionally, sweetgum, will increase on sites that do not experience regular burning.

Shrub Species: Shrubs are widely scattered on frequently burned sites but increase if burning ceases. Typical shrubs include fragrant sumac, farkleberry, and flameleaf sumac.

Site Inclusions: Upland drainages with more mesic conditions may occur. Localized areas of deep sands and extremely draughty soils may occur, especially on summits and ridgetops, where growth and survival of longleaf pine and the *Schizachyrium* species group are limited but Louisiana yucca (*Yucca louisianensis*) and eastern prickly pear (*Opuntia humifusa*) are common.

Similar LTPs: 232Fa.1.1.30 occurs on similar landscape positions but soils are loamier, sites have more herbaceous cover, there is greater tendency for shrubs and hardwoods to establish on unburned sites, and the *Tragia* species group is uncommon.

232Fa.1.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It includes most of the Calcasieu Ranger District, the southern two thirds of the Catahoula Ranger District and portions of the Winn and Kisatchie Ranger Districts of Kisatchie National Forest.

Geology: Stands occur on Quaternary loamy High Terrace deposits including those associated with the Red River complex.

Landform: Usually found on ridgetops, gentle to moderate middle and upper slopes, and undulating uplands. It is the most widespread and extensive landtype phase on the landscape.

Soil Characteristics: Soils have loam or sandy loam surface layers, are well-drained and moderately permeable. They include Malbis, Ruston, Smithdale and occasionally, Beauregard soils. Nutrient levels are low and reaction is strongly acid.

Hydrology: Soils are usually well-drained, moderately permeable, and have moderate available moisture. Drought stress occurs occasionally when there are long periods of low rainfall during the growing season.

Natural Disturbances and Processes: Under presettlement conditions most stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and rapidly (over a period of 1-2 decades) develop a dense woody understory which shades out the grassy ground layer. Once this happens it is very difficult to control woody understory, restore the grassy ground layer, and cause a stand to revert back to longleaf pine woodland even with frequent prescribed fire. While many modern stands no longer experience regular fire and have become loblolly pine, slash pine, or mixed pine-deciduous forests, large areas of Kisatchie National Forest burn regularly and still support longleaf pine communities.

Ground Layer Species: *Schizachyrium scoparium* typically dominates the ground layer of fire-maintained stands. Other species include a diverse assemblage of sun-loving grasses, composites, legumes and other members of the *Schizachyrium* group. On unburned sites the *Callicarpa* and *Chasmanthium* species groups become abundant.

Overstory Tree Species: Regularly-burned stands are open longleaf pine-dominated woodlands that also include occasional blackjack oak, blackgum, or post oak. Unburned stands develop a closed-canopy forest with a mixture of oaks, pines, hickories, sweetgum and other hardwoods.

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Understory Tree Species: Understory in fire-maintained longleaf pine woodlands is sparse and consists mainly of longleaf pine saplings and occasional blackjack oak or blackgum. Unburned stands rapidly develop a dense midstory of sweetgum and other young hardwoods that shades out the species-rich herbaceous layer.

Shrub Species: Shrubs are widely scattered on frequently burned sites but increase dramatically if burning ceases. Common shrubs include flameleaf sumac, yaupon, farkleberry, waxmyrtle, and American beautyberry.

Site Inclusions: Drainages commonly dissect sites. These drainages typically support more hardwoods, shrubs, and species from the *Callicarpa* and *Chasmanthium* groups than adjacent areas. Downstream, these drainages transition into Mesic Stream Bottoms (232Fa.4.10). Drier, sandier microsites similar to 232Fa.1.1.20 may also be found. Herbaceous seeps (232Fa.1.1.40) may be embedded within the longleaf pine community.

Similar LTPs: 232Fa.1.1.20 has sandier surface soils, less dense herbaceous cover, greater occurrence of the *Tragia* species group, and a less pronounced tendency to develop dense woody understory on unburned stands.

232Fa.1.1.40 *Drosera* Sandy Wet Herbaceous Seeps Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It includes most of the Calcasieu Ranger District, the southern two thirds of the Catahoula Ranger District and portions of the Winn and Kisatchie Ranger Districts of Kisatchie National Forest.

Geology: Occurs on High Terrace deposits including those associated with the Red River complex. Sites occur in localized areas where an impermeable subsurface layer reaches the surface, usually in areas where surrounding soils are highly permeable sands with high rates of infiltration and groundwater recharge.

Landform: Occurs in uplands on gentle side slopes or heads of drainages. Most sites are small, generally covering less than one hectare; however, they provide unique habitat and their species composition is strikingly different from the surrounding uplands.

Soil Characteristics: Soils are gray, sandy, very poorly drained, nutrient levels are very low, and reaction is very strongly acid. The surface remains wet year round and there is usually an impermeable sub-surface layer. Soils belong to the Osier series.

Hydrology: Water originating from rainfall on upper slopes rapidly permeates the surrounding sandy soils and flows laterally along impermeable subsurface layers until it reaches the surface. Water flow is slow and constant, resulting in saturated soil conditions for most of the year (a semipermanently saturated hydrologic regime). Seeps often form the head of small streams that become better developed as one moves downslope.

Natural Disturbances and Processes: Historically, frequent, low-intensity surface fires sweeping through the surrounding longleaf pine-dominated landscape burned through the embedded seeps. These fires inhibited woody plants and maintained an open, herbaceous-dominated community. In the absence of fire, a site may succeed to a forested seep or "baygall" community similar that found on 232Fa.1.4.30. Most surviving herbaceous seeps still burn regularly.

Ground Layer Species: Sedges--especially beakrush (*Rhynchospora* sp.) dominate the diverse ground layer. Yellow pitcher plant (*Sarracenia alata*) and Sand-Swamp Whitetop (*Rhynchospora*

latifolia) are showy and conspicuous on many sites. Species from the *Drosera* and *Osmunda* species groups are common. Seeps may also contain rare or sensitive species such as tuberous grasspink (*Calopogon tuberosus*), yellow fringeless orchid (*Platanthera integra*), Snake-mouth orchid (*Pogonia ophioglossoides*), and roughleaf yelloweyed grass (*Xyris scabrifolia*).

Overstory Tree Species: Overstory-sized trees are rare, limited to occasional stunted longleaf pine, swamp tupelo, and sweetbay magnolia. Unburned stands may succeed to a forested seep (baygall) community dominated by sweetbay magnolia, red maple, and swamp tupelo.

Understory Tree Species: Woody understory in fire-maintained seeps is sparse but will increase if burning ceases. Common species include redbay and saplings of longleaf pine, red maple, sweetbay magnolia and swamp tupelo.

Shrub Species: Limited in size and density on regularly burned sites, shrubs include southern bayberry, gallberry holly, possumhaw, laurel greenbriar, and hazel alder.

Similar LTPs: 232Fa.1.4.30 (wet forested seeps) are often continuous downstream with herbaceous seeps and also have species from the *Osmunda* group. In the absence of fire, herbaceous seeps may succeed to a forested seep community.

Special conditions: In presttlement times herbaceous seeps were maintained as open herb-dominated sites by the fires that burned into them from surrounding longleaf pine woodlands. Herbaceous seeps have become increasingly rare on the modern landscape as they succeed to forested seep communities and lose most of their herbaceous species due to lack of fire. Herbaceous seeps have also been called “bogs”, “pitcher plant seeps” or “seepage bogs”.

232Fa.1.1.50 Longleaf Pine/Schizachyrium-Drosera Fine-Sandy Wet Flatwoods Landtype Phase

Geographic Range: Found in the southern parts of the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana on limited, extreme southerly portions of the Vernon and Evangeline units of the Calcasieu Ranger District, and the Catahoula Ranger District. Pine flatwoods are more typical of the Southwest Flatwoods Subsection (232Fb) and are found in areas transitional to that Subsection.

Geology: Occurs on intermediate Pleistocene terraces.

Landform: Occurs on broad, flat or very gently undulating uplands with little or no topographic relief and poorly-defined drainage patterns.

Soil Characteristics: Soils are poorly-drained fine sandy loams or silt loams. Soils are strongly acid and low in nutrients and are often mapped as the Beauregard series.

Hydrology: Flat land without well-defined drainages and slowly permeable soils ensures that soils are seasonally saturated, especially in winter and early spring.

Natural Disturbances and Processes: Under presettlement conditions most stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and develop a dense woody understory of species otherwise found on forested seeps (232Fa.1.4.30), which shades out the herbaceous ground layer.

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Ground Layer Species: The ground layer in fire-maintained stands is diverse including upland species from the *Schizachyrium* species group as well as members of the *Drosera* species group. Flora on wetter microsites closely resembles herbaceous seeps (232Fa.1.1.40).

Overstory Tree Species: Natural overstory is dominated by longleaf pine; however, many local flatwoods have been planted to slash or loblolly pine. Some of these are still burned and have a relatively natural understory. Unburned stands develop overstories of loblolly pine, swamp tupelo, sweetgum, red maple, and sweetbay magnolia. Over a very long period of fire-free succession, hardwood-dominated flatwoods forests resembling those currently found on LTP 231Ei.18.1.50 in the San Jacinto Flatwoods of Texas may develop.

Understory Tree Species: The understory in fire-maintained stands is sparse, but many stands today contain abundant saplings of, swamp tupelo, sweetgum, red maple, redbay, and sweetbay magnolia.

Shrub Species: Common shrubs include waxmyrtle, gallberry holly, possumhaw, poison sumac, yaupon, and hazel alder. Unburned sites will develop a dense growth of these species.

Similar LTPs: Herbaceous seeps (232Fa.1.1.40) are floristically similar but there, species from the *Schizachyrium* group are less abundant and those from the *Drosera* group are more so. Herbaceous seeps are also smaller in size, occur imbedded in a rolling upland landscape, and lack significant overstory trees.

232Fa.1.2 Clayey Uplands Landtype

232Fa.1.2.10 Blackjack Oak-Longleaf Pine/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It includes most of the Calcasieu Ranger District, the southern two thirds of the Catahoula Ranger District and portions of the Winn and Kisatchie Ranger Districts of Kisatchie National Forest.

Geology: Found on clayey high terrace deposits. Sites are relatively rare, often occurring as small patches of fine-textured soils on a loamy or sandy landscape.

Landform: Occur on gently sloping middle and upper slopes. Sites are usually isolated patches on the landscape surrounded by loamy longleaf pine uplands (LTP 232Fa1.30).

Soil Characteristics: Soils are generally clay-loam or clay at the surface with subsoils sometimes exceeding 70% clay. Soils belong to the Gore series. Nutrient levels are low to medium and reaction is strongly acid.

Hydrology: Soils are fine textured, moderately well drained, but very slowly permeable. Surface runoff is greater than for adjacent sandy and loamy soils.

Natural Disturbances and Processes: While not as favorable to longleaf pine as the surrounding uplands with coarser-textured soils, these sites were historically affected by the frequent fires that swept through adjacent longleaf pine-dominated landscapes.

Ground Layer Species: The ground layer is not as dense or species-rich as on adjacent loamy longleaf pine woodlands. Major species include flowering spurge (*Euphorbia corollata*), coneflower (*Rudbeckia hirta*), whiteleaf mountain mint (*Pycnanthemum albescens*), common boneset (*Eupatorium perfoliatum*), greenbrier (*Smilax glauca*), long-leaf woodoats

(*Chasmanthium sessiliflorum*), and other members of the *Chasmanthium species* group. While certain members of the *Schizachyrium species* group may be present, they are less common than on longleaf pine-dominated uplands.

Overstory Tree Species: The overstory is usually a mixture of longleaf, shortleaf, and loblolly pines, along with blackjack oak, southern red oak, post oak, and white oak.

Understory Tree Species: The understory is sparse on frequently burned sites. Species include saplings of post oak, loblolly pine, longleaf pine, and southern red oak.

Shrub Species: Common species include farkleberry, deerberry, and American beautyberry. Shrubs increase in density and size on unburned sites.

Similar LTPs: This LTP contains elements of both longleaf pine woodlands (232Fa.1.1.20) and mesic mixed pine-hardwood forest sites (232Fa.1.3.10), but is readily distinguished by the upland slope position and clayey soils.

232Fa.1.2.20 Willow Oak/*Justicia* Clayey Wet Upland Depressions Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It includes most of the Calcasieu Ranger District, the southern two thirds of the Catahoula Ranger District and portions of the Winn and Kisatchie Ranger Districts of Kisatchie National Forest.

Geology: Occurs on clayey and loamy High Terrace deposits including those associated with the Red River complex.

Landform: Sites are on slowly permeable, poorly-drained clayey soils on broad flat areas or in slight depressions on uplands with little topographic relief. Depressions may be associated with ancient oxbows or stream channels associated with High Terrace geology.

Soil Characteristics: Soils have a loamy surface layer over silty clay subsoil. Nutrient levels are medium and soils are mapped as Caddo, Guyton, or Frizzell.

Hydrology: Soils are fine-textured, slowly permeable, and poorly drained. A seasonally high water table occurs near the surface in most years resulting in seasonal saturation of the soil.

Natural Disturbances and Processes: The hardwood vegetation that develops on these sites is not conducive to fire and fire probabilities are low. Wind throw and mortality of individual trees are important disturbances. Periodic anoxia and other stresses associated with saturated soils as well drought during dry periods also affects species composition.

Ground Layer Species: Species characteristic of wet sites, including some members of the *Justicia* and *Bignonia* species groups are common.

Overstory Tree Species: Sites are dominated by bottomland and moist-site species such as willow oak, green ash, cherrybark oak, water oak, water hickory, and blackgum. Scattered loblolly pine may also be present.

Understory Tree Species: Species include winged elm and saplings of willow oak, water oak, and blackgum.

Shrub Species: Shrubs are often widely scattered. Common species include Louisiana blackberry, deciduous holly and American beautyberry.

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Similar LTPs: Vegetation on this LTP is most similar to the oak-dominated bottomland communities found on river floodplains (Landtype Association 232Fa.4); however, it is not associated with an active floodplain and is not affected by periodic river overflow. Flat, wet uplands with sandy or loamy-textured soils (232Fa.1.1.50) may support pine flatwoods communities if they burn frequently.

232Fa.1.3 Mesic Slopes and Terraces Landtype

232Fa.1.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy/Sandy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It includes most of the Calcasieu Ranger District, the southern two thirds of the Catahoula Ranger District and portions of the Winn and Kisatchie Ranger Districts of Kisatchie National Forest.

Geology: Occurs on loamy and sandy Pleistocene high terrace deposits including those associated with the Red River complex.

Landform: Occurs on middle to lower slopes and on small stream terraces, forming the transition zone between (usually pine-dominated) upper slopes and stream bottoms. Slope shape is linear to concave, and slope gradients are moderately steep.

Soil Characteristics: This LTP occurs on a variety of soil types although surface soil textures are often sandy loams. Increased soil moisture resulting from low topographic position and historically, topographic isolation from fire are more important than soil type in structuring vegetation on this LTP. Soils include Betis, Briley, Malbis, Ruston, and Smithdale. Nutrient availability is generally low to medium.

Hydrology: Soils are well drained or somewhat poorly drained, and are typically moister than uplands because of their lower hydrological position on the landscape. Those associated with minor stream terraces may have seasonally high water tables and occasional saturated conditions in the subsoil. Sites are often dissected by small drainages.

Natural Disturbances and Processes: Moderately steep slopes and topographic isolation from uplands by the adjacent stream valleys reduced the occurrence and limited the impact of presettlement fires--resulting in low fire probability. However, on heavily burned landscapes such as portions of the Calcasieu Ranger District of Kisatchie National Forest, repeated fires have reduced the extent of the mesic zone and shifted it lower on the slope than on less frequently burned landscapes. Within mesic forests, wind throw and individual tree mortality are the major disturbances.

Ground Layer Species: Members of the *Callicarpa*, *Chasmanthium*, and *Mitchella* species groups are common.

Overstory Tree Species: Important trees include white oak, southern red oak, post oak, sweetgum, loblolly pine, and shortleaf pine. American beech and southern Magnolia may occur on some sites.

Understory Tree Species: Species include saplings of sweetgum, white oak, American beech, and southern magnolia, along with American holly and flowering dogwood.

Shrub Species: Shrubs include American witchhazel, deerberry, and American beautyberry.

Similar LTPs: 232Fa.1.4.10 (mesic creek bottoms) are floristically similar. However they occur on minor stream bottoms, not slopes, and American beech and southern magnolia are more common.

232Fa.1.4 Minor Stream Bottoms Landtype

232Fa.1.4.10 White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It includes most of the Calcasieu Ranger District, the southern two thirds of the Catahoula Ranger District and portions of the Winn and Kisatchie Ranger Districts of Kisatchie National Forest.

Geology: Occurs on recent (Holocene) alluvial sands, silts, and loams associated with perennial and intermittent streams.

Landform: Occurs in the valleys of small, usually intermittent streams. Floodplains are often poorly developed and are generally less than 100m wide.

Soil Characteristics: Loamy, alluvial soils are generally mapped as the Guyton complex. Nutrient availability is medium to high and reaction is medium acid to strongly acid.

Hydrology: Streams are small and do not have well-developed floodplains. Stream gradients are steep, and upstream watersheds are small so flooding occurs only intermittently during periods of extremely high water flow and typically lasts less than 5% of the growing season. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire occurs infrequently on stream bottoms. Fires on adjacent uplands may burn to the edge of stream bottoms and restrict the encroachment of stream bottom vegetation onto the slopes. Erosion and deposition constantly change the course of stream channels and can undercut banks and cause trees to fall. Succession occurs mainly through individual tree mortality.

Ground Layer Species: Members of the *Chasmanthium*, *Mitchella*, and *Arisaema* species groups are found. Occasionally, species from the *Bignonia* and *Justicia* species groups occur in wetter inclusions.

Overstory Tree Species: Trees include loblolly pine, white oak, blackgum, and sweetgum. American beech and southern magnolia also occur--particularly on sites with a long history of minimal disturbance.

Understory Tree Species: Species include saplings of sweetgum, white oak, American beech and southern magnolia along with American holly, flowering dogwood, and Florida maple.

Shrub Species: Shrubs include deerberry, yaupon, and American beautyberry.

Site Inclusions: Slightly lower, wetter areas contain species from the *Bignonia* and *Justicia* species groups. Small, localized seeps with species from the *Osmunda* species group may also occur.

Similar LTPs: 232Fa.1.4.20 (wet-mesic stream bottoms) is similar, but occurs downstream on larger, better-developed floodplains where members of the *Justicia* group and flood-tolerant oaks are common. Under conditions of frequent fire in a longleaf pine-dominated landscape, the uppermost reaches of small streams may burn through frequently enough to support longleaf pine communities. These “upland drains” are considered to be inclusions in longleaf pine uplands.

232Fa.1.4.20 American Beech-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It includes most of the Calcasieu Ranger District, the southern two thirds of the Catahoula Ranger District and portions of the Winn and Kisatchie Ranger Districts of Kisatchie National Forest.

Geology: This LTP occurs on recent (Holocene) loamy alluvium associated with the valleys of perennial streams. These streams may pick up and deposit material across multiple geologic formations.

Landform: Occurs on the floodplains of medium-sized, perennial, streams. Floodplains are well developed, typically more than 100m wide. Microtopography consists of numerous small depressions, drainage channels, and mounds created as stream channels shift and flood waters scour and deposit alluvial materials. Slope gradient is nearly level.

Soil Characteristics: Occurs on loamy alluvial soils. Nutrient availability is medium to high and reaction ranges from weakly acid to very strongly acid. Soils are generally mapped as the Guyton complex. Because of irregular flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and mineral soil is often exposed. Drainage mottles typically occur throughout the soil profile. In low areas and old stream channels, soils may be constantly saturated.

Hydrology: Streams associated with this landtype phase drain a moderately large watershed, and stream gradients are gentle so irregular flooding occurs. Flood duration, typically 5-12.5% of the growing season, increases with the size of the watershed and distance downstream.

Natural Disturbances and Processes: Fire occurs very infrequently on these floodplains. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees to fall. At the same time, new deposits of alluvial material are colonized by vegetation. Windthrow is also a significant natural disturbance.

Ground Layer Species: Members of the *Mitchella*, *Arisaema*, and *Bignonia*, species groups may be found. Members of the *Justicia* group are found in wet microsites.

Overstory Tree Species: The overstory includes a mixture of both mesic and flood-tolerant species including loblolly pine, water oak, willow oak, laurel oak, white oak, American beech, red maple, and southern magnolia.

Understory Tree Species: Species include saplings of sweetgum, white oak, American beech, and southern magnolia along with American Holly, American hornbeam, and eastern hophornbeam.

Shrub Species: Shrubs include American snowbell and southern arrowwood.

Site Inclusions: Slightly lower, wetter areas may contain wetland species (the *Justicia* group) while localized areas of groundwater seepage support species from the *Osmunda* group.

Similar LTPs: LTP 232Fa.1.4.10 (mesic stream bottoms) have similar vegetation but occur on smaller often intermittent streams and lack bottomland oaks and the *Justicia* group.

232Fa.1.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It includes most of the Calcasieu Ranger District, the southern two thirds of the Catahoula Ranger District and portions of the Winn and Kisatchie Ranger Districts of Kisatchie National Forest.

Geology: Occurs on High Terrace deposits or on recent (Holocene) loamy and sandy alluvium.

Landform: Occurs on the floodplains of small, perennial streams or on headslopes of perennial or intermittent drainages where there is seepage of ground water, especially in areas where surrounding soils are highly permeable sands with high water infiltration rates. Stream channels are shallow and poorly developed.

Soil Characteristics: Soils are very poorly drained, gray, loamy sands or sandy loams that are nearly continually saturated. Nutrient availability is very low and reaction is medium acid to strongly acid. Soils of adjacent uplands are often sandy soils with high infiltration rates. Soils belong to the Osier series.

Hydrology: Water originating from rainfall on adjacent uplands permeates the soils and flows laterally along impermeable subsurface layers until it reaches the surface. Water flow is slow and constant, resulting in saturated soil conditions for most of the year (a Semipermanently saturated hydrologic regime). Some streamside sites may flood intermittently.

Natural Disturbances and Processes: Topographic isolation from uplands and wet conditions limit the impact of fires, which are very infrequent. Windthrow and individual tree mortality are important disturbances.

Ground Layer Species: Species in the *Osmunda* group dominate. Netted chain fern (*Woodwardia areolata*) is often the principal ground cover. Other ferns, especially cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*) are also important. The *Arisaema* and *Mitchella* groups may be present on portions of some sites.

Overstory Tree Species: The overstory is a mixture of swamp tupelo, sweetbay, red maple, and water oak.

Understory Tree Species: Species include saplings of red maple, sweetbay, and swamp tupelo along with redbay.

Shrub Species: Species include evergreen bayberry, hazel alder, Virginia sweetspire, mountain azalea, possumhaw, gallberry holly, deciduous holly and southern arrow wood.

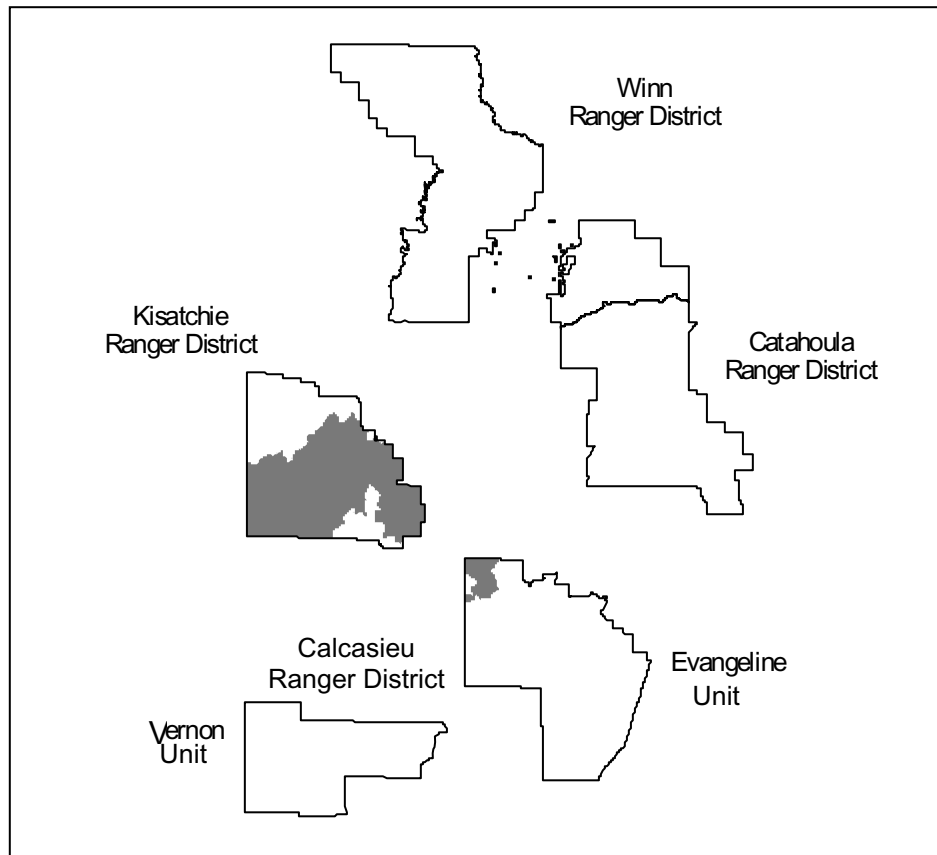
Similar LTPs: 232Fa.1.4.20 (wet mesic stream bottoms) may occasionally have areas of seepage with species from the *Osmunda* group but these are small, isolated inclusions. The sweetbay-swamp tupelo community can also occur higher on the landscape on minor drainages and headslope ravines, especially when fire is not present. Upslope, seepage communities tend

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to become more open and shrubby as the effects of upland fires become more pronounced. Herbaceous seeps (232Fa.1.1.40) have similar hydrology but generally occur high on the landscape, are open and herb-dominated, and include the *Drosera* species group.

CHAPTER 17

232Fa.2 KISATCHIE SANDSTONE HILLS LANDTYPE ASSOCIATION



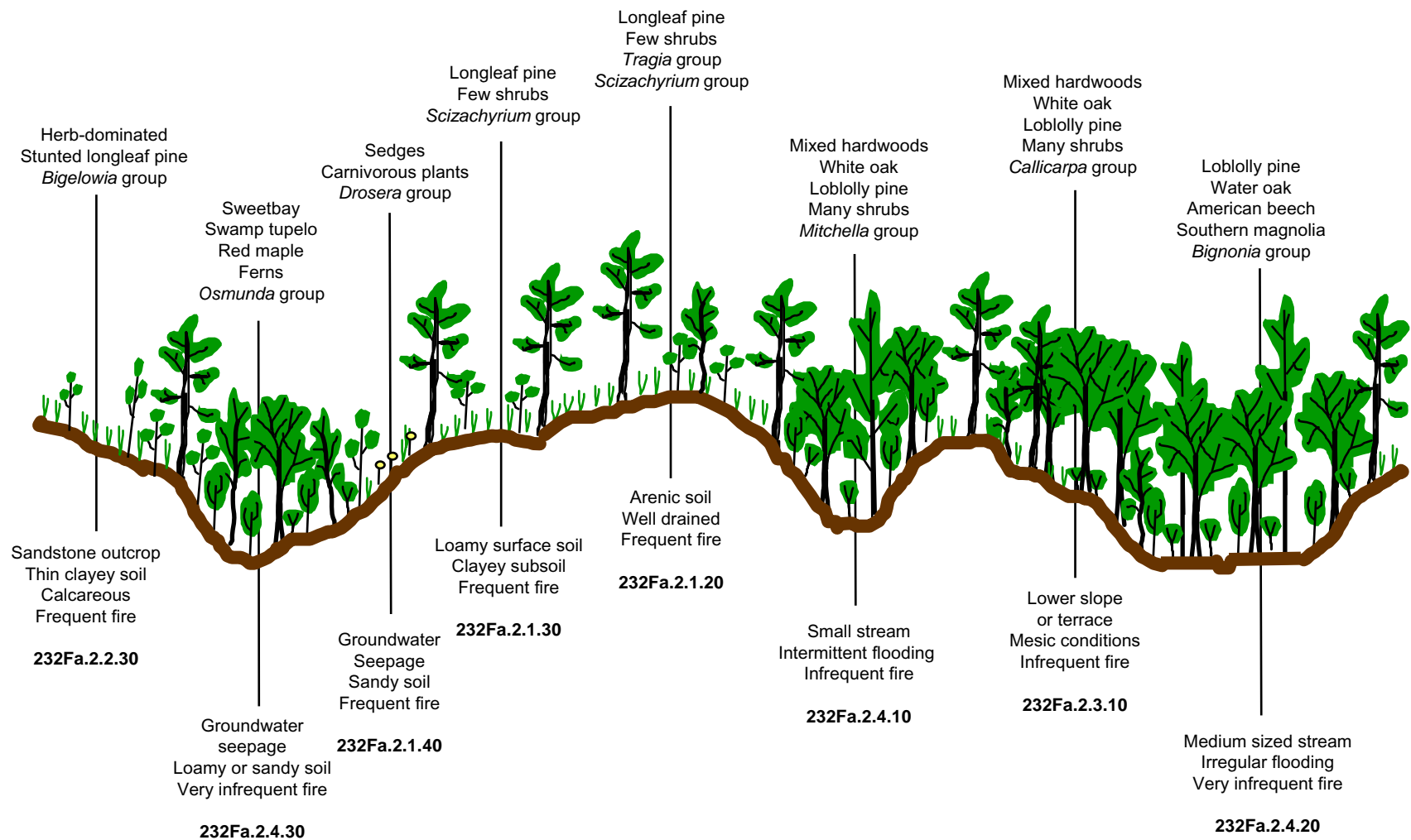


Figure 17.1 Landscape profile of ecosystems on the Kisatchie Sandstone Hills Landtype Association.

232Fa.2 KISATCHIE SANDSTONE HILLS LANDTYPE ASSOCIATION



232Fa.2.1.20: Longleaf Pine/*Tragia Arenic* Dry Uplands
Kisatchie NF, Kisatchie RD, (Compartment 11, Stand 30)



232Fa.2.1.30: Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic
Uplands (Kisatchie NF, Kisatchie RD, Compartment 34)



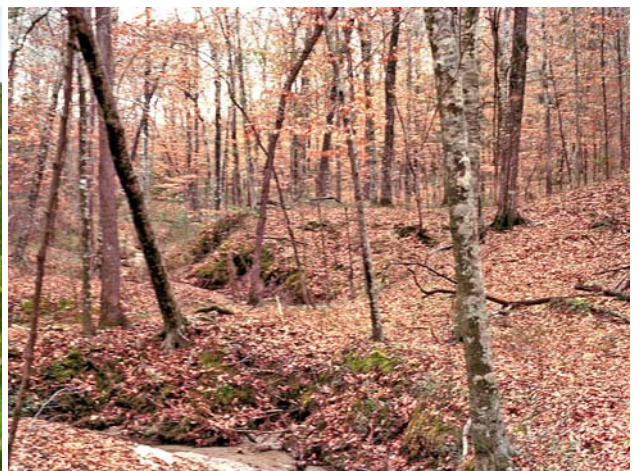
232Fa.2.1.40: *Drosera* Sandy Wet Herbaceous Seeps
(Kisatchie NF, Kisatchie RD, Compartment 43, Stand 9)



232Fa.2.2.30: Longleaf Pine/*Bigelovia* Clayey Dry Sandstone
Glades (Kisatchie NF, Kisatchie RD, Compartment 36, Stand 23)



32Fa.2.2.40: *Schizachyrium-Dalea* Clayey Dry-Mesic
Calcareous Prairies (Kisatchie NF, Kisatchie RD, Compartment 38)



232Fa.2.3.10: White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic
Lower Slopes & Terraces (right); 232Fa.2.4.10: White Oak-
Loblolly Pine/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms
(left & center). (Kisatchie NF, Kisatchie RD, Comp. 70, Stand 4)

KEY TO LANDTYPE PHASES

- 1a. Middle to upper slopes, undulating uplands, ridgetops, or small upland groundwater seepage areas; sites are typically pine-dominated..... 2
- 1b. Lower or middle slopes, stream valleys, floodplains, deep ravines or groundwater seepage areas on headslopes; sites are typically deciduous hardwood-dominated..... 7
- 2a. Well-drained to excessively well drained sandy or arenic soils with a sand or loamy sand surface layer at least 50cm thick. Soils commonly mapped as Betis. Natural overstory of longleaf pine. Both the *Tragia* and *Schizachyrium* species groups are common 232Fa.2.1.20 Longleaf Pine/*Tragia*
Arenic Dry Uplands
- 2b. Loamy, clayey, or very thin soils; at least a portion of the upper 50cm is not sandy. **Or** if sandy, soils constantly wet from groundwater seepage. 3
- 3a. Well-drained loamy soils, including Malbis soils, and many non-eroded Kisatchie soils. If the subsoil is clayey, the soil has a well-developed loamy surface layer >30cm thick. Longleaf pine dominates the overstory of frequently-burned natural stands. The *Schizachyrium* species group is common but the *Tragia* group is rare or absent..... 232Fa.2.1.30 Longleaf Pine/*Schizachyrium*
Loamy Dry-Mesic Uplands
- 3b. Soils clayey to within 30cm or less of the surface, deep or shallow to bedrock **or** constantly wet sandy or loamy soils associated with upland groundwater seep areas where the *Drosera* species group is common. 4
- 4a. Deep, wet, gray sandy or sandy loam soils over an impermeable subsurface layer; associated with areas of groundwater seepage. Overstory is typically sparse or absent; the *Drosera* and *Osmunda* species groups are common. Yellow pitcher plant (*Sarracenia alata*) may be conspicuous. 232Fa.2.1.40 *Drosera* Sandy
Wet Herbaceous Seeps
- 4b. Soils clayey nearly to the surface with no groundwater seepage. Species from *Drosera* and *Osmunda* species groups are rare or absent. 5
- 5a. Deep, clayey, non-calcareous soils that under natural conditions are associated with a well-developed overstory. Soils often mapped as Bellwood, Sacul and occasionally, Kisatchie. Fire-maintained stands are often open woodlands with longleaf pine. The *Schizachyrium*, *Callicarpa*, and *Chasmanthium* species groups dominate; however, members of the *Callirhoe*, *Dalea*, and *Bigelovia* species groups are not present 232Fa.2.2.10 Longleaf Pine/*Schizachyrium*
Clayey Dry-Mesic Uplands
- 5b. Soils are clayey, **either** shallow to bedrock **or** dark-colored, deep and calcareous, associated in both cases with forest openings. Species from at least one of the *Callirhoe*, *Dalea*, or *Bigelovia* species groups occur. Sites are generally small, typically covering less than 1ha..... 6

- 6a. Shallow, clayey soils in areas of sandstone outcrops. Soils are mapped as eroded Kisatchie series. Trees are widely scattered, stunted longleaf pines or shortleaf pines and the *Bigelowia* species group is common. 232Fa.2.2.30 Longleaf Pine/*Bigelowia* Clayey Dry Calcareous Sandstone Glades
- 6b. Deep, dark-colored calcareous clayey soils with widely scattered, stunted longleaf pines on regularly burned sites and white ash, hawthorns, shortleaf pine, and eastern red cedar on unburned sites. Species from the *Callirhoe* and *Dalea* groups are often present especially on burned sites. 232Fa.2.2.40 *Schizachyrium-Dalea* Clayey Dry-Mesic Calcareous Prairies
- 7a. Middle to lower slopes, terraces above small streams, and ravines. 8
- 7b. Minor stream bottoms, floodplains, or areas of groundwater seepage on head slopes or in small stream valleys..... 9
- 8a. Steep slopes more than 100 m long often with northerly or easterly aspect or tight, deep, ravines. Sites often adjacent to a major river valley. Natural overstory includes abundant American beech and white oak and the *Mitchella* and *Arisaema* species groups are common..232Fa.2.3.20 American Beech-White Oak/*Mitchella* Loamy Moist-Mesic Steep Slopes and Ravines
- 8b. Moderate lower slopes, often adjacent to minor stream bottoms or on small terraces immediately above small streams. Natural overstory is a mixture of loblolly pine and deciduous hardwoods. The *Mitchella* group is present but not as abundant as for 8a. These sites are typically more common and widespread on the landscape than 8a..... 232Fa.2.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces
- 9a. Valleys of minor streams or headslopes where soils are saturated due to groundwater seepage. Stream channels are poorly developed, and intermittent flooding may occur on some streamside sites. Natural overstory is dominated by sweetbay magnolia, blackgum, and red maple and the *Osmunda* species group is common. 232Fa.2.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Wet Forested Seeps.
- 9b. Floodplains or valleys of minor to medium-sized streams. Sites may be subject to intermittent or irregular flooding, but saturated ground water seepage areas and the *Osmunda* species group are rare. 10
- 10a. Bottoms of small, intermittent or perennial headwater streams. The floodplain is poorly developed, usually much less than 100 m wide. Natural overstory is dominated by mesic hardwoods and loblolly pine; the *Mitchella*, *Arisaema*, and *Chasmanthium* species groups are common, but the *Bignonia* group is infrequent..... 232Fa.4.10 White Oak-Loblolly Pine/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms.
- 10b. Floodplains of medium-sized perennial streams. Floodplains are well developed and generally more than 100 m wide. Natural overstory is dominated by both mesic and flood-tolerant hardwoods including American beech, southern magnolia, water oak, willow oak, and laurel oak along with occasional loblolly pine. The *Bignonia* group is common in addition to the *Mitchella*, *Arisaema*, and *Chasmanthium* groups. 232Fa.2.4.20 American Beech-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms.

DESCRIPTIONS OF LANDTYPES AND LANDTYPE PHASES:

232Fa.2.1 Sandy/Loamy Uplands Landtype

232Fa.2.1.20 Longleaf Pine/*Tragia* Arenic Dry Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: Occurs on Miocene sandstones and siltstones associated with the Catahoula Formation and the Carnahan Bayou and Lena members of the Fleming Formation.

Landform: Located on middle and upper slopes, broad uplands, and ridgetops. Slope shape is convex with moderately steep slopes.

Soil Characteristics: Soils are well drained to excessively well-drained with a sand or loamy sand surface layer 50-100cm thick over loamy subsoil. Nutrient levels are very low, soil reaction is strongly acid to very strongly acid, and soils typically belong to the Betis and Briley series.

Hydrology: Soils are coarse-textured, well drained to excessively well drained, highly permeable and have low water holding capacity. They are subject to drought during periods of low rainfall especially in the summer.

Natural Disturbances and Processes: Under presettlement conditions stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and a moderately dense woody understory develops and eventually shades out much of the grassy ground layer. While many modern stands no longer experience regular fire, large areas of Kisatchie National Forest burn regularly and still support longleaf pine communities.

Ground Layer Species: The ground layer of regularly burned stands includes a diverse assemblage of grasses and herbs from the *Schizachyrium* and *Tragia* groups. While *Schizachyrium scoparium* (little bluestem) is dominant, species from the *Tragia* group are diagnostic. On unburned sites, the *Chasmanthium* and *Callicarpa* groups become established.

Overstory Tree Species: Regularly burned stands are open longleaf pine woodlands but may also include occasional blackjack oak. Unburned stands will develop a mixture of oaks, pines, and hickories. Dry, isolated ridgetops where productivity is very low may not produce enough fuel to carry fires and will support an open oak woodland of blackjack oak, post oak, bluejack oak, and black hickory.

Understory Tree Species: Understory in fire-maintained stands is sparse and consists mainly of longleaf pine saplings and occasional oaks. Woody understory—sassafras, saplings of upland oaks, blackgum, and occasionally, sweetgum, will increase on sites that do not experience regular burning.

Shrub Species: Shrubs are widely scattered on frequently burned sites but unburned sites develop a dense shrub layer. Common species include farkleberry, flameleaf sumac, dwarf pawpaw, wax-myrtle, and yaupon.

Site Inclusions: Seeps (232Fa.2.1.40) are often associated with areas of sandy soils because rainfall tends to percolate through these permeable soils and recharge groundwater rather than run off on the surface. Localized areas of extremely deep dry sands may occur, especially on summits and ridgetops where droughty soils limit the growth of longleaf pine and the *Schizachyrium* group but eastern prickly pear (*Opuntia humifusa*) and Gulf Coast yucca (*Yucca louisianensis*) are common.

Similar LTPs: LTP 232Fa.2.1.30 is similar, but herbaceous cover is denser, the tendency for shrubs and hardwoods to develop in the absence of fire is stronger, members of the *Tragia* species group are less common, and soils are loams over clayey subsoils.

232Fa.2.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: This LTP occurs on Miocene sandstones and siltstones associated with the Catahoula Formation and the Carnahan Bayou and Lena members of the Fleming Formation.

Landform: This LTP is the most widespread on the landscape, occurring on moderately sloping middle to upper slopes and ridgetops.

Soil Characteristics: Surface soils are sandy loams or sandy clay loams and are typically more than 30cm deep. Subsoil textures are loamy or clayey. Nutrient levels are very low and reaction is strongly acid. While this LTP occurs on a variety of soil types, it is often associated with Malbis soils. Sites may also occur on certain soils mapped as Kisatchie.

Hydrology: Soils are loamy-textured at the surface and well drained or moderately well drained. Soils with loamy subsoil such as Malbis are moderately permeable while soils with clayey subsoil such as Kisatchie are slowly permeable.

Natural Disturbances and Processes: Under presettlement conditions most stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed-canopy forest and rapidly (over a period of 1-2 decades) develop a dense woody understory which shades out the grassy ground layer. Once this happens it is very difficult to control woody understory, restore the grassy ground layer, and cause a stand to revert back to longleaf pine woodland even with frequent prescribed fire. While many modern stands no longer experience regular fire and have become loblolly pine, slash pine, or mixed pine-deciduous forests, large areas of Kisatchie National Forest burn regularly and still support longleaf pine communities. Excellent examples exist in the Kisatchie Ranger District.

Ground Layer Species: *Schizachyrium scoparium* and other species from the *Schizachyrium* species group dominate regularly burned sites. Widely-occurring species from the *Callicarpa* and *Chasmanthium* groups will dominate sites which experience little or no fire.

Overstory Tree Species: Regularly burned stands are open longleaf pine-dominated woodlands that also include occasional blackjack oak, blackgum, or post oak. Unburned stands develop a closed-canopy forest with a mixture of oaks, pines, hickories, sweetgum and other hardwoods.

Understory Tree Species: Understory in fire-maintained longleaf pine woodlands is sparse and consists mainly of longleaf pine saplings and occasional blackjack oak or blackgum. Unburned stands rapidly develop a dense midstory of sweetgum and other young hardwoods that shades out the species-rich herbaceous layer.

Shrub Species: While shrubs are widely scattered on sites with a long history of frequent fire, less frequently burned sites tend to produce a dense shrub layer. Important species include flameleaf sumac, yaupon, blueberry species, waxmyrtle, and American beautyberry.

Site Inclusions: Small drainages may regularly burn through and are dominated by a grassy herbaceous layer. Larger drainages may burn less frequently and be dominated by shrub thickets and hardwoods. Drainages are continuous downhill with 232Fa.2.4.10--Mesic stream bottoms. Drier, sandier inclusions, similar to LTP 232Fa.1.20, may also be present. Herbaceous seeps (232Fa.2.1.40) may be embedded in upland longleaf pine communities. Sandstone outcrops associated with eroded Kisatchie soils (232Fa.2.2.30) are also scattered across the landscape.

Similar LTPs: 232Fa.2.1.20 (Dry Arenic Uplands) also occur on upper side slopes and ridgetops but have sandy soils and species from the *Tragia* group. 232Fa.2.2.10 (Dry-mesic Clayey Uplands) have a sandy or loamy topsoil that is <30cm thick over clay.

232Fa.2.1.40 *Drosera* Sandy Wet Herbaceous Seeps Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: Occurs on Miocene sandstones and siltstones, especially the Catahoula Formation.

Landform: Occurs in uplands on side slopes or heads of drainages. Most sites are small, generally covering less than one hectare; however, they provide unique habitat and their species composition is strikingly different from the surrounding uplands.

Soil Characteristics: Soils are very poorly drained and have a deep gray loamy sand surface layer. The surface remains wet year-round, and there is an impermeable sub-surface layer (often sandstone or siltstone from the Catahoula Formation). Nutrient levels are low or very low and reaction is very strongly acid. Soils are mapped as the surrounding non-wetland soils but are consistent with the Naconiche or Osier series.

Hydrology: Precipitation originating on upper slopes rapidly permeates the sandy soils of the surrounding landscape and flows laterally along an impermeable subsurface layer until it exits the hillside. Water flow is usually slow and constant, resulting in saturated soil conditions most of the year (a semipermanently to nearly permanently saturated hydrologic regime). Seeps often form the head of small streams that become better developed as one moves downslope.

Natural Disturbances and Processes: Historically, frequent, low-intensity surface fires sweeping through the surrounding longleaf pine-dominated landscape burned through the embedded seeps. These fires inhibited woody plants and maintained an open, herbaceous-dominated community. In the absence of fire, a site may succeed to a forested seep or "baygall" community similar that found on 232Fa.2.4.30. Most surviving herbaceous seeps still burn regularly.

Ground Layer Species: The species-rich ground layer is often dominated by beakrushes (*Rhynchospora* spp.). Toothache grass (*Ctenium aromaticum*), yellow trumpets (*Sarracenia alata*), and other members of the *Drosera* species group are common. Plants from the *Osmunda*

group may also be present. Seeps may contain rare or sensitive species such as tuberous grasspink (*Calopogon tuberosus*), yellow fringeless orchid (*Platanthera integra*), Snake-mouth orchid (*Pogonia ophioglossoides*), and roughleaf yelloweyed grass (*Xyris scabrifolia*).

Overstory Tree Species: Trees are usually limited to scattered, stunted, longleaf pine, blackgum, and sweetbay magnolia. Unburned stands may succeed to a forested seep community dominated by sweetbay magnolia, red maple, and swamp tupelo.

Understory Tree Species: Understory in fire-maintained seeps is sparse and consists mainly of longleaf pine saplings, occasional redbay, and saplings of red maple, sweetbay magnolia or swamp tupelo. Understory becomes dense on unburned sites.

Shrub Species: Shrubs include wax-myrtle, evergreen bayberry, gallberry holly, poison sumac, possumhaw, laurel greenbriar, and hazel alder. Unburned sites will develop a dense growth of these species.

Similar LTPs: Herbaceous seeps have hydrologic and floristic similarities (especially with respect to woody species and the *Osmunda* group) with forested seeps (LTP 232Fa.2.4.30); however, forested seeps typically occur lower on the landscape on headslopes or in stream valleys and lack the *Drosera* group. Forested seeps are often continuous downstream from herbaceous seeps.

Special conditions: In presttlement times herbaceous seeps were maintained as open herb-dominated sites by the fires that burned into them from surrounding longleaf pine woodlands. Herbaceous seeps have become increasingly rare on the modern landscape as they succeed to forested seep communities and lose most of their herbaceous species due to lack of fire. Herbaceous seeps have also been called “bogs”, “pitcher plant seeps” or “seepage bogs”.

232Fa.2.2 Clayey Uplands Landtype

232Fa.2.2.10 Longleaf Pine/*Schizachyrium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: This LTP occurs on Miocene sandstones, siltstones and clays associated with the Catahoula Formation and the Carnahan Bayou and Lena members of the Fleming Formation.

Landform: Sites occur on moderately sloping middle to upper slopes and ridgetops.

Soil Characteristics: Soils consist of a clay or sandy clay loam surface layer over clay subsoil. The subsoil is within 30 (usually 10) cm of the surface. Soil reaction is moderately acid to very strongly acid. Soils usually belong to the Bellwood and Sacul series but also include variants of the Kisatchie series.

Hydrology: The clayey subsoil is somewhat poorly drained to moderately well drained, and slowly permeable. Soils can become droughty during the growing season and resist rewetting, thereby extending periods of drought.

Natural Disturbances and Processes: Historically, frequent to very frequent, low-intensity surface fires burned through these uplands during the growing season. Repeated fire inhibits the establishment of woody understory species and maintains an open overstory. Many modern stands no longer burn and have developed a dense understory of shrubs and small trees.

Ground Layer Species: The *Schizachyrium* group is dominant on repeatedly-burned sites. Species from the *Callicarpa* and *Chasmanthium* groups are also common, especially on sites that experience little or no fire.

Overstory Tree Species: The overstory usually forms an open woodland on frequently burned sites with longleaf pine dominant along with post oak and blackjack oak. Unburned sites contain a mixture of hardwoods and pines, especially post oak, shortleaf pine, and loblolly pine. Hardwoods are generally more common, even on repeatedly-burned sites, than on loamy dry-mesic uplands.

Understory Tree Species: Understory trees are usually sparse on fire-maintained sites. Common species include saplings of post oak, blackgum and sweetgum. Eastern red cedar may occur in openings on unburned sites. Understory density increases on sites that experience little or no fire.

Shrub Species: Shrubs and small trees are sparse in the understory of fire-maintained sites. Common species include wax-myrtle, parsley hawthorn, farkleberry, American beautyberry, and yaupon. A dense understory of these species typically develops on unburned sites.

Similar LTPs: 232Fa.2.1.30 (Loamy Dry-Mesic Uplands) are on similar landscape positions but have a loamy subsoil or a sandy/loamy topsoil that is more than 30cm thick to clay. 232Fa.2.2.40 (Calcareous Prairies) have clayey soils but are calcareous, soils are dark in color, and sites are commonly herb-dominated openings.

232Fa.2.2.30 Longleaf Pine/*Bigelowia* Clayey Dry Sandstone Glades Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: Occurs on Miocene sandstones, siltstones, and clays associated with the Catahoula formation in localized areas of very thin soils and sandstone or siltstone outcrop.

Landform: Usually found on thin, eroded soils of upper slopes where sandstone outcrops at the surface. Terrain is slightly rolling to steep. Slope gradient for the reference sites is variable--moderately steep on some side slopes to nearly level on ridgetops. Outcrops are small, usually less than 1 hectare, but contain vegetation strikingly different from the adjacent landscape.

Soil Characteristics: Sites are on thin clay-loam and clay soils over sandstone. Pavement-like outcrops of sandstone and mudstone occur within the sites. Surface soils are generally clays, clay loams, and sandy clay loams and are mapped as Kisatchie (eroded) soils. Nutrient levels (especially calcium and magnesium) tend to be high. Reaction is strongly acid.

Hydrology: Soils are fine textured, slowly permeable, and moderately well drained. The shallowness of these soils subjects vegetation to moisture stress.

Natural Disturbances and Processes: While these sites are not as densely vegetated with fire-carrying ground cover as the surrounding uplands, this LTP was influenced by the frequent, low-intensity fires that swept the adjacent longleaf pine-dominated landscape prior to settlement.

Ground Layer Species: Patches of ground layer vegetation are interspersed with areas of exposed rock. Plant density is much lower than in the adjacent longleaf pine communities. The

flora consists of members of the *Schizachyrium* and *Bigelowia* groups including Nuttall's rayless goldenrod (*Bigelowia nuttallii*) and rare species such as sunbright (*Talinum parviflorum*), Texas sunnyside (*Schoenilirion wrightii*), Mead's sedge (*Carex meadii*), and sand spikemoss (*Selaginella arenicola*). MacRoberts and MacRoberts (1993a) describe in detail the floristic composition of these communities.

Overstory Tree Species: Overstory, essentially absent, is composed of widely scattered stunted longleaf or shortleaf pine.

Understory Tree Species: Understory is very sparse, usually containing only a few stunted pine saplings.

Shrub Species: Shrubs are few, but farkleberry and yaupon are present.

Similar LTPs: This LTP contains floristic elements of other longleaf pine communities, but is otherwise unique. MacRoberts and MacRoberts (1993) report the occurrence of superficially similar but floristically distinct calcareous sandstone glades; however, none were sampled during this study. 232Fa.2.2.40 (Calcareous Prairies) also occurs in natural openings but has very different soils (deep clays) and flora.

232Fa.2.2.40 *Schizachyrium-Dalea* Clayey Dry-Mesic Calcareous Prairies Landtype Phase.

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: Occurs on Miocene sandstones, siltstones, and clays associated with the Catahoula formation.

Landform: Uncommon on moderately-sloping middle to upper slopes and ridgetops. Most sites are less than 1 hectare in size.

Soil Characteristics: Soils are generally mapped as Bellwood, but are calcareous to near the surface and are a dark clay and more closely resemble the Morse series. Soils experience marked shrink-swell on wetting and drying. Cracks are evident in dry soils and slickensides are prominent in the subsoil.

Hydrology: Soils are fine textured, (very) slowly permeable, and moderately well drained. Extremely clayey soils impose a variety of stresses on plants. Slow permeability may result in saturated conditions and hypoxia during wet periods but soils become droughty during dry periods because clays bind much of their moisture so tightly that it is not available to plants. Once dry, clays resist rewetting thereby extending drought periods.

Natural Disturbances and Processes: Frequent low-intensity fires swept these sites during presettlement times, inhibiting woody plants, and encouraging grassland vegetation. Many modern sites contain significant shrubs and small trees, especially thickets of white ash, hawthorn (*Crataegus* spp.) and eastern red cedar as a result of changes to the fire regime. However, soil properties probably limit growth of large trees even in the absence of fire: The shrinking, swelling and cracking characteristic of these clays can disrupt root systems-- especially those of large woody plants and trees.

Ground Layer Species: These sites support a calciphile flora which includes species from the *Callirhoe*, *Dalea*, and *Schizachyrium* species groups. Tall gayfeather (*Liatris aspera*),

compassplant (*Silphium laciniatum*), shiny goldenrod (*Solidago nitida*), Button eryngo (*Eryngium yuccifolium*) and Alabama supplejack (*Berchemia scandens*) are often present. Long-Leaf Wood-Oats (*Chasmanthium sessiflorum*) and *Berchemia* become abundant on sites that do not burn regularly.

Overstory Tree Species: Overstory is largely absent from most sites and even older trees are usually small and stunted. Scattered longleaf pines characterize burned sites while white ash, eastern red cedar, and shortleaf pine may occasionally reach tree size on unburned sites.

Understory Tree Species: Small trees include stunted longleaf pine, blackjack oak, eastern red cedar (on unburned sites), and white fringetree.

Shrub Species: Shrubs often form thickets or clumps along the edges and within the prairie, especially on less-burned sites. Common species include Cockspur hawthorn, parsley hawthorn, eastern baccharis, yaupon, Alabama supplejack, and muscadine grape.

Similar LTPs: The ecological unit on Kisatchie National Forest that most closely resembles this LTP is the clayey calcareous prairies from the Undulating Clayey Uplands (232Fa.3.2.40) of the Winn and Catahoula Ranger Districts--although there the soil color is not as dark. Locally, Sandstone Glades (232Fa.2.2.30) are also largely open treeless area, but are shallow to sandstone, include species from the *Bigelovia* Group, and lack species from the Callirhoe and *Dalea* Groups.

232Fa.2.3 Mesic Slopes and Terraces Landtype

232Fa.2.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: Occurs on Miocene sandstones, siltstones, and clays associated with the Catahoula Formation and the Carnahan Bayou and Lena members of the Fleming Formation.

Landform: Occurs on middle and lower slopes adjacent to the floodplains of streams and rivers or on other mesic areas historically topographically isolated from fires on nearby uplands. Slopes are generally moderately steep.

Soil Characteristics: Occurs on a variety of soil types, often with sandy loam or loam surface textures. Increased moisture resulting from low topographic position and topographic isolation from wildfires are more important than soil type in structuring vegetation on this LTP. Nutrient levels are generally medium to high.

Hydrology: Soils are well drained or somewhat poorly drained, and are typically moister than those of uplands because of their lower hydrological position on the landscape. Those associated with minor stream terraces may have seasonally high water tables and occasional saturated conditions in the subsoil. Sites are often dissected by small drainages.

Natural Disturbances and Processes: Steeper slopes and topographic isolation from uplands by the adjacent stream valleys assured that presettlement fires were infrequent. Fires that did penetrate the hardwood forests typical of this LTP were less intense than the upland fires carried by the flammable litter of longleaf pine; fire typically had minimal influence on vegetation. Wind throw and individual tree mortality were and are probably the most important natural disturbances.

Ground Layer Species: Members of the *Callicarpa*, *Chasmanthium*, and *Mitchella* species groups are common.

Overstory Tree Species: The overstory is dominated by a variable mixture of pines and deciduous hardwoods. Common species include sweetgum, white oak, southern red oak, post oak, cherrybark oak, white ash, blackgum, mockernut hickory, bitternut hickory, loblolly pine, and shortleaf pine. While American beech and southern magnolia were rare in the overstory of the reference sites, they were often present in the understory.

Understory Tree Species: The understory layer is well developed and includes sweetgum, white oak, American beech, and southern magnolia saplings along with winged elm, flowering dogwood, and American holly.

Shrub Species: Common species include American witchhazel, deerberry, American beautyberry, and yaupon.

Similar LTPs: 232Fa.2.4.10 (mesic stream bottoms) are floristically similar but occur on floodplains and beech and southern magnolia are more common.

232Fa.2.3.20 American Beech-White Oak/*Mitchella* Loamy Moist-Mesic Steep Slopes and Ravines Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: Occurs on Miocene sandstones, siltstones and clays associated with the Catahoula Formation and the Carnahan Bayou and Lena members of the Fleming Formation.

Landform: Occurs on long, steep side slopes or in deep, tight, ravines bordering the alluvial valleys of large streams or the Red River. Slopes are steep or very steep; slopes steeper than 40% are possible. Slope shape is generally convex and slopes are dissected by numerous drainages. Steep topography protects most areas from solar radiation and reduces evapotranspiration. Sites with southerly or southwesterly aspects will be hotter and drier than sites with an easterly or northeasterly aspect.

Soil Characteristics: Soils are sandy clay loams over clay subsoil and often belong to the Sacul series, but other soils may also occur. Topographic features are the overriding factor. Nutrient availability is medium to high.

Hydrology: Slope gradients are steep, but soils are somewhat poorly drained because of slow permeability. The clayey subsoils retain moisture and surface runoff is rapid.

Natural Disturbances and Processes: Fires are very infrequent on steep slopes due to topographic isolation from uplands by adjacent floodplains and the tendency for fires not to burn downhill well. Individual tree mortality and windthrow are the main disturbances in natural stands.

Ground Layer Species: Species from the *Mitchella*, *Arisaema*, and *Bignonia* species groups are common. Undisturbed examples of This LTP are an important habitat for many shade-tolerant forest floor herbs such as bloodroot (*Sanguinaria canadensis*), King Solomon's-Seal (*Polygonatum biflorum*), Slender trillium (*Trillium gracile*), crippled crane-fly (*Tipularia discolor*),

and white trout lily (*Erythronium albidum*) which are characteristic of the central Appalachian mountains and the eastern deciduous forests but are uncommon on the West Gulf Coastal Plain. Beechdrops (*Epifagus virginiana*) is common on sites where American beech occurs.

Overstory Tree Species: Overstory is a diverse mixture of mesic hardwoods. Important species include American beech, Southern magnolia, white oak, water oak, southern red oak, American basswood, sweetgum, and blackgum. Loblolly pine may also be present.

Understory Tree Species: Common species are red maple saplings, American beech saplings, American holly, American hornbeam, eastern hophornbeam, and flowering dogwood.

Shrub Species: A variety of shrubs occur, including Elliott blueberry, common pawpaw, and southern arrowwood.

Site Inclusions: Numerous drainages dissect these steep, long slopes. This LTP may also contain seepage areas at the terminus of underground water flow across an impermeable layer of sandstone or siltstone--where species from the *Osmunda* group are present.

Similar LTPs: The more common 232Fa.2.3.10 has a similar community composition, but occurs on shorter, less steep slopes and is less rich in species such as American beech, jack-in-the-pulpit, cross-vine, and other members of the *Arisaema*, and *Bignonia* species groups.

232Fa.2.4 Loamy Stream Bottoms and Minor Terraces Landtype

232Fa.2.4.10 White Oak-loblolly Pine/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: Occurs on Miocene sandstones and siltstones or on recent loamy alluvium.

Landform: Sites occur in the valleys of minor intermittent or perennial headwater streams. They do not have well-developed floodplains; floodplain width is less than 100m.

Soil Characteristics: Soils formed in Holocene alluvium. They are variable in texture, but generally loamy. Nutrient availability is moderate to high and surface soil reaction is medium acid to strongly acid. Soils are generally mapped as the Guyton complex.

Hydrology: The streams associated with this landtype phase are small headwater streams which do not have well-developed floodplains. Stream gradients are moderate or steep and upstream watershed relatively small, so flooding occurs intermittently during periods of extremely high water flow and typically lasts less than 5% of the growing season. Depth to the water table is variable, but at times may be near the surface of the somewhat poorly drained soils.

Natural Disturbances and Processes: Topographic isolation from uplands assured that presettlement fires were infrequent or very infrequent. Also, fires that penetrate the hardwood forests typical of mesic stream bottoms are less intense than the upland fires carried by the flammable litter of longleaf pine. Erosion and deposition constantly change the course of stream channels undercutting banks and causing trees to fall. Windthrow and individual tree mortality are also important natural disturbances.

Ground Layer Species: Members of the *Callicarpa*, *Chasmanthium*, *Mitchella*, and *Arisaema* species groups are common.

Overstory Tree Species: The overstory is a mixture of loblolly pine and hardwoods such as white oak, blackgum, and sweetgum. American beech and southern magnolia occur on some sites.

Understory Tree Species: Understory is well developed and includes saplings of white oak, American beech, and southern magnolia along with flowering dogwood, Florida maple, and American holly.

Shrub Species: Species include deerberry, yaupon, and American beautyberry,

Site Inclusions: Species from the *Bignonia* and *Justicia* groups occur in slightly wetter microsites such as depressions and old stream channels.

Similar LTPs: This LTP occurs upstream from and is similar to wet-mesic stream bottoms (LTP 232Fa.2.4.20). However, streams are smaller and the valleys are narrower and more ravine-like than for wet-mesic stream bottoms. Members of the wetter *Justicia* species group, common in wet portions of wet-mesic stream bottoms, are uncommon in this LTP.

232Fa.2.4.20 American Beech-Southern Magnolia/*Mitchella* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: This LTP occurs on recent loamy alluvium.

Landform: Occurs on the floodplains medium-sized perennial streams. Floodplains are well-developed, generally exceeding 100 m in width. Gradients are gentle to nearly level. Microtopography on some sites consists of numerous small depressions, drainage channels, and mounds created as stream channels shift and flood waters scour and deposit alluvial materials.

Soil Characteristics: Soils are loams, sandy loams or loamy sands over heterogeneous alluvial parent material or bedrock. Nutrient levels are medium. Because of irregular flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil will be exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles can occur throughout the soil profile. Soils are generally mapped as the Guyton complex

Hydrology: Streams associated with this landtype phase drain a moderately large watershed, so irregular flooding occurs. Duration of flooding, typically 5-12.5% of the growing season, increases with the size of the watershed. Soils are somewhat poorly drained, or poorly drained.

Natural Disturbances and Processes: Irregular flooding occurs; however, flood duration is not as long as for major river valleys which may flood >12.5% of the growing season. Fire is very infrequent on stream floodplains and has minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees to fall. At the same time, new deposits of alluvial material are colonized by vegetation. Windthrow and individual tree mortality are also important natural disturbances.

Ground Layer Species: Members of the *Bignonia*, *Arisaema*, *Justicia*, and *Mitchella*, species groups are common. In low, saturated depressions, ferns such as sensitive fern (*Onoclea sensibilis*) may occur.

Overstory Tree Species: The overstory is a mixture of mesic and flood-tolerant species including loblolly pine, white oak, sweetgum, water oak, American beech, southern magnolia, red maple, laurel oak, willow oak, and swamp chestnut oak.

Understory Tree Species: Species include saplings of sweetgum, white oak, American beech, blackgum, and southern magnolia in addition to American hornbeam and eastern hophornbeam.

Shrub Species: Species include American beautyberry and southern arrow-wood.

Site Inclusions: Slightly lower, wetter areas contain microsites that support obligate wetland species. Localized seepage areas with the *Osmunda* group may occur, especially where the lower slope meets the valley.

Similar LTPs: This LTP occurs down stream from and is similar to mesic stream bottoms (232Fa.2.4.10). However, streams are larger, usually perennial, and the floodplain is broader, flatter, and better developed and the *Bignonia* and *Justicia* groups, which occur infrequently in mesic stream bottoms, are common in this LTP. Downstream, these sites grade into Seasonally Flooded River Floodplains (232Fx.4.2.10)

232Fa.2.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including most of the Kisatchie Ranger District and the northwest corner of the Evangeline Unit of the Calcasieu Ranger District of Kisatchie National Forest.

Geology: This LTP occurs on Miocene sandstones and siltstones including the Catahoula Formation or on recent (Holocene) loamy and sandy alluvium.

Landform: Occurs on the floodplains of small, perennial streams or on headslopes of perennial or intermittent drainages, where underground water flow exits as a seep. It may also be found downstream wherever seepage of underground water occurs. Stream channels are shallow and poorly developed.

Soil Characteristics: Deep, gray loamy sand soils are nearly continually saturated. Nutrient availability is very low and soil reaction is medium acid to strongly acid. Soils are consistent with the Osier or Naconechee series.

Hydrology: Soils are very poorly drained. Groundwater seepage, often as a result of water flowing along an impermeable subsurface layer, results in nearly constantly wet conditions (a semipermanently saturated hydrologic regime) Stream bottom sites may also be subject to intermittent flooding.

Natural Disturbances and Processes: Fire is very infrequent on forested seeps and has minimal influence on vegetation. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species in the *Osmunda* group dominate. Netted chain fern (*Woodwardia areolata*) is often the principal ground cover. Other ferns, especially cinnamon fern

(*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*) are also important. The *Arisaema* group may also be present on portions of some sites.

Overstory Tree Species: Important trees include sweetbay magnolia, swamp tupelo, red maple, and swamp tupelo. Loblolly pine, laurel oak, and sweetgum may also be present in more mesic areas.

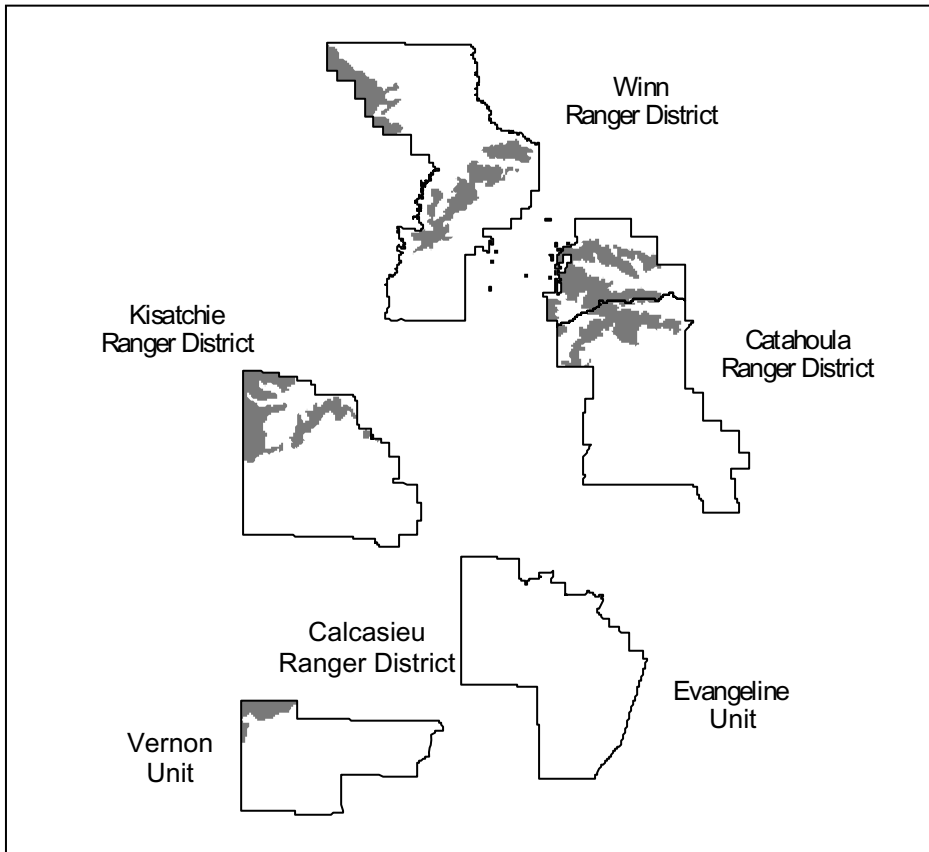
Understory Tree Species: Species include saplings of red maple, sweetbay magnolia, and swamp tupelo along with redbay.

Shrub Species: Common species include evergreen bayberry, hazel alder, Virginia sweetspire, mountain azalea, deciduous holly, and southern arrow wood.

Similar LTPs: 232Fa2.4.20 which occurs on well-developed floodplains where the *Bignonia* group is common, may have isolated saturated or seepy inclusions which support species from the *Osmunda* group. Upland herbaceous seeps (232Fa2.1.30) also have groundwater seepage, but are generally herb-dominated forest openings and include species from the *Drosera* species group.

CHAPTER 18

232Fa.3 UNDULATING CLAYEY UPLANDS LANDTYPE ASSOCIATION



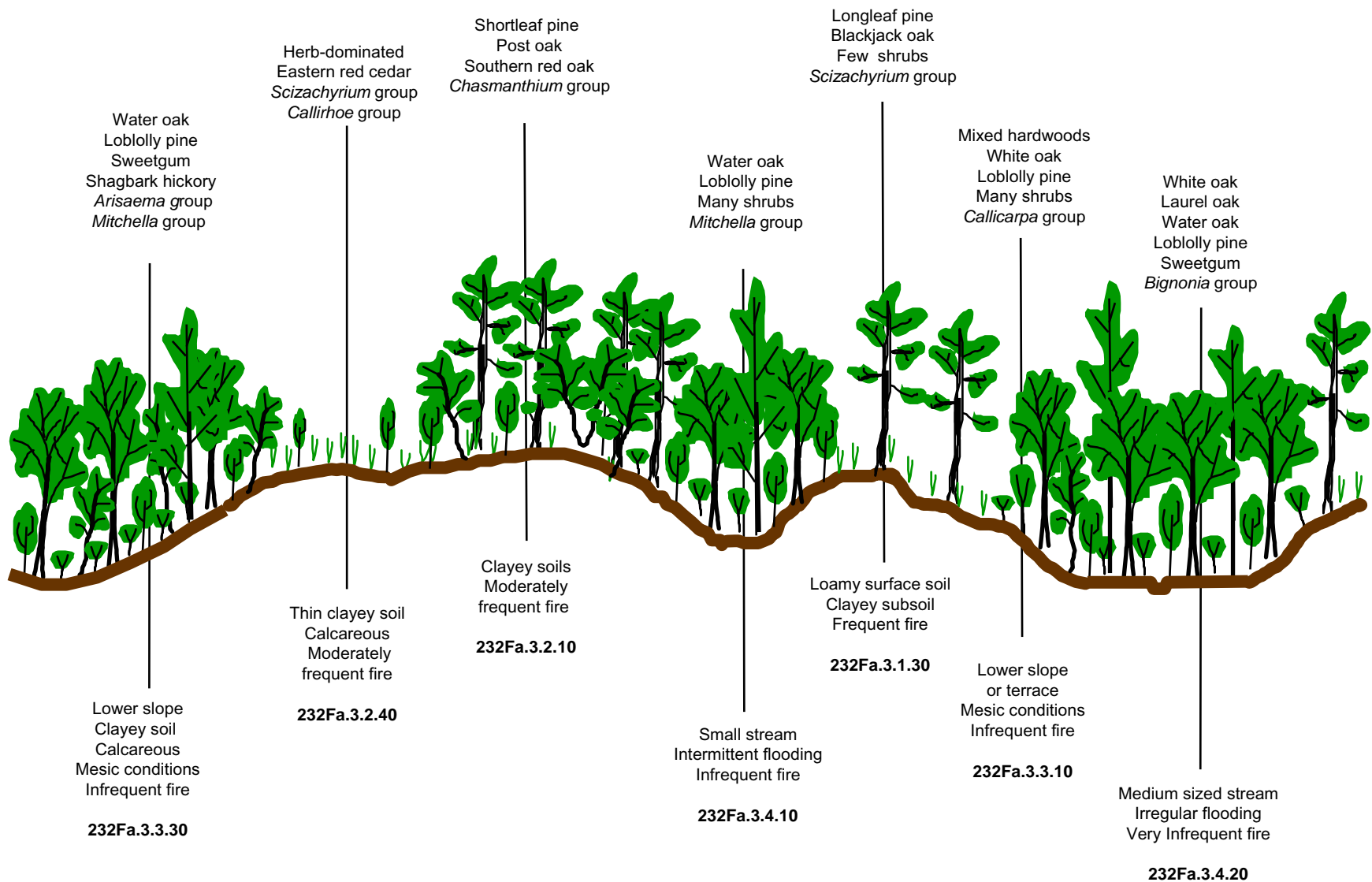


Figure 18.1 Landscape profile of ecosystems on the Undulating Clayey Uplands Landtype Association.

232Fa.3 UNDULATING CLAYEY UPLANDS LANDTYPE ASSOCIATION



232Fa.3.2.10: Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands (Kisatchie NF, Winn RD, Compartment 49, Stand 31)



232Fa.3.2.40: *Schizachyrium-Callirhoe* Clayey Dry-Mesic Calcareous Prairies (Kisatchie NF, Winn RD, Compartment 44, Stand 2)



232Fa.3.2.40: *Schizachyrium-Callirhoe* Clayey Dry-Mesic Calcareous Prairies (Kisatchie NF, Winn RD, "Carpenter Road Prairie" Compartment 58)



232Fa.3.3.10: White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes & Terraces (Kisatchie NF, Winn RD, Compartment 17, Stand 3)



232Fa.3.3.30: Water Oak-Loblolly Pine/*Arisaema* Clayey Mesic Calcareous Lower Slopes (Kisatchie NF, Winn RD, Compartment 44)



232Fa.3.4.10: White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms (Kisatchie NF, Winn RD, Compartment 17, Stand 3)

KEY TO LANDTYPE PHASES

- 1a. Upland topographic positions: Middle to upper slopes, undulating uplands, or ridgetops. Sites (except prairies) are typically pine-dominated.2
- 1b. Lower slopes, ravines, valleys, floodplains, and terraces above small streams. Sites are typically deciduous hardwood-dominated..... 4
- 2a. Well drained loamy soils associated with the Jackson formation. Natural presettlement stands were dominated by longleaf pine and the *Schizachyrium* group is common on repeatedly burned stands 232Fa.3.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands
- 2b. Clayey or clay loam soil textures, except for the top 30cm, which may be loamy. Soils may be calcareous. Longleaf pine is uncommon, even historically..... 3
- 3a. Acid to moderately calcareous clays associated with a variety of geologic formations. Soils Include Bellwood, Vaiden, and Sacul. Surface soil pH does not exceed 6.0. and a loamy surface soil up to 30 cm deep is usually present. An overstory of large trees such as shortleaf pine, post oak, and southern red oak is present on natural sites. Dominant ground layer species are from the *Callicarpa* and *Chasmanthium species groups* 232Fa.3.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands
- 3b. Stiff calcareous clays associated exclusively with the Cook Mountain and Jackson formations and mapped as Keiffer soils. Surface soil pH is greater than 6.0, often exceeding 8.0 and the loamy surface soil is generally less than 15 cm thick. Natural sites are open prairies lacking an overstory of large trees; scattered hawthorn thickets are present. Dominant ground layer species are from the *Schizachyrium* and *Callirhoe* species groups..... 232Fa.3.2.40 *Schizachyrium-Callirhoe* Clayey Dry-Mesic Calcareous Prairies
- 4a. Middle and lower side slopes, terraces, and ravines..... 5
- 4b. Minor stream bottoms or floodplains..... 6
- 5a. Soils have a loamy to sandy surface layer and are not clayey or strongly calcareous. They belong to the Cahaba, Glenmora, Guyton, and similar series. Species from the *Callicarpa*, *Chasmanthium* and *Mitchella* groups are common. Members of the *Bignonia* group may also be present.232Fa.3.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces
- 5b. Soils are stiff calcareous clays associated exclusively with the Cook Mountain and Jackson formations. They are usually mapped as Vaiden soils and surface soil pH exceeds 6.0. Natural overstory is dominated by loblolly pine and mixed hardwoods and the *Arisaema* & *Mitchella* species groups are present. American strawberrybush (*Euonymus americanus*), potato vine (*Ipomoea pandurata*), dwarf plametto (*Sabal minor*), milkvine (*Matlea gonocarpus*) littlehead nutrush (*Scleria oligantha*), and crownbeard (*Verbesina helianthoides*) are often present. Paw paw is common in the shrub layer. These sites are relatively rare. ..232Fa.3.3.30 Water Oak-Loblolly Pine/*Arisaema* Clayey Calcareous Mesic Lower Slopes

232Fa.3 Undulating Clayey Uplands Landtype Association

- 6a. Sites are in the valleys of small headwater Intermittent or perennial streams. The floodplain is poorly developed, usually much less than 100 m wide. Natural overstory is dominated by mesic hardwoods and loblolly pine. The *Mitchella*, *Arisaema*, *Callicarpa*, and *Chasmanthium* species groups are common but the *Bignonia* group is uncommon. ...
.....232Fa.3.4.10 White Oak-Loblolly Pine/*Mitchella*
Loamy Mesic Stream Bottoms

- 6b. Sites are on floodplains of medium sized, perennial streams. Floodplains are usually more than 100 m wide. Natural overstory includes both mesic and flood-tolerant species such as willow oak, laurel oak, water oak, and loblolly pine. The *Mitchella*, *Arisaema*, *Chasmanthium* and *Bignonia* species groups are common. Species from the *Justicia* group may be present in wet areas.232Fa.3.4.20 White Oak-Laurel Oak/*Bignonia*
Loamy Wet-Mesic Stream Bottoms

DESCRIPTIONS OF LANDTYPES AND LANDTYPE PHASES:

232Fa.3.1 Sandy/Loamy Uplands Landtype

232Fa.3.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including the central Winn Ranger District and the northern portion of the Catahoula Ranger District of Kisatchie National Forest. These sites are rare in the Undulating Clayey Uplands.

Geology: Loamy upland sites historically dominated by longleaf pine and associated with the Jackson group.

Landform: Occurs on ridgetops, broad uplands, and gentle upper slopes.

Soil Characteristics: Occurs on well drained, moderately permeable loamy-textured soils, commonly associated with the Malbis or Savannah series. Nutrient levels are low and reaction is strongly acid.

Hydrology: Soils are usually well-drained, moderately permeable, and have moderate available moisture. Drought stress occurs occasionally when there are long periods of low rainfall during the growing season.

Natural Disturbances and Processes: Under presettlement conditions most stands experienced frequent fires. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Since longleaf pine communities and the soils that supported them were not continuous across this landscape, their degree of isolation would influence fire frequency. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and rapidly (over a period of 1-2 decades) develop a dense woody understory which shades out the grassy ground layer. Once this happens it is very difficult to control woody understory, restore the grassy ground layer, and cause a stand to revert back to longleaf pine woodland even with frequent prescribed fire. While many modern stands no longer experience regular fire and have become loblolly pine, slash pine, or mixed pine-deciduous forests, large areas of Kisatchie National Forest (most on other LTAs) burn regularly and still support longleaf pine communities.

Ground Layer Species: *Schizachyrium scoparium* dominates the ground layer of fire-maintained stands and other members of the *Schizachyrium* group are common. The *Callicarpa* and *Chasmanthium* groups quickly become abundant on unburned sites.

Overstory Tree Species: The overstory of repeatedly-burned stands is dominated by longleaf pine, but sometimes also includes blackjack oak, and post oak. Unburned stands develop a mixture of species including post oak, blackjack oak, southern red oak, hickory, shortleaf pine, loblolly pine, and relict longleaf pine.

Understory Tree Species: Understory in regularly burned stands is sparse. Common species include longleaf pine saplings, various oak saplings, and blackgum. Unburned stands rapidly develop a dense midstory of sweetgum and other hardwoods that excludes the species-rich herbaceous layer.

Shrub Species: Shrubs are scattered on regularly burned stands. Common species include flameleaf sumac, yaupon, farkleberry, southern bayberry, and American beautyberry. The tendency for a dense shrub layer to develop is strong in the absence of regular fire.

Site Inclusions: Drainages that support more hardwoods, shrubs, and species from the *Callicarpa* and *Chasmanthium* groups than adjacent areas may dissect sites. Herbaceous seeps, which are often embedded in longleaf pine-dominated uplands on other landscapes, are rare or absent on the Undulating Clayey Uplands.

Similar LTPs: The geology of the Winn and Catahoula Ranger Districts is complex; three landtype associations often occur in close proximity to each other. Areas of High Terrace geology with Malbis, Ruston, or Smithdale soils (232Fa.1.1.30) or loamy soils formed on the Cockfield and Sparta Formations (232Fa.5.1.30) support similar vegetation.

232Fa.3.2 Clayey Uplands Landtype

232Fa.3.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including the central Winn Ranger District and the northern portion of the Catahoula Ranger District of Kisatchie National Forest.

Geology: Occurs mainly on the Cook Mountain formation and the Jackson, and Vicksburg groups.

Landform: Occurs on broad, gentle slopes and broad uplands in slightly rolling terrain.

Soil Characteristics: Soils are clayey; surface soil textures are often sandy clay loam, loam, or clay but a subsurface horizon with a texture of clay or silty clay is generally within 30cm of the soil surface. Clays are vertic; they have a high shrink-swell potential. Nutrient availability is medium to high and reaction in the surface soil is strongly acid. Drainage mottles are often present throughout the soil profile. Soils are commonly mapped as Vaiden or Bellwood.

Hydrology: Due to high clay content, infiltration is slow and saturation occasionally occurs in the subsoil. Once dry, soils resist rewetting thereby extending drought periods. Runoff is rapid and surface erosion may be high on slopes. Small intermittent drainages may be present in the site.

Natural Disturbances and Processes: Under natural conditions, sites are subject to moderately frequent fire. However, the clay soils discourage the establishment of longleaf pine and the presettlement fire frequency and intensity was probably not as high as for longleaf pine uplands where fires were fueled by highly flammable longleaf needles.

Ground Layer Species: Dominant species are from the *Callicarpa* and *Chasmanthium* groups. Other common species include Virginia Dutchmans pipe (*Aristolochia serpentaria*), saw greenbrier (*Smilax bona-nox*), and littlehead nutrush (*Scleria oligantha*). Some species from the *Schizachyrium* group may occur, but are much less abundant than for longleaf pine-dominated uplands.

Overstory Tree Species: The overstory consists of mixed pine and hardwood species, especially shortleaf pine, post oak and southern red oak. Pines may be stunted and have noticeably crooked stems

232Fa.3 Undulating Clayey Uplands Landtype Association

Understory Tree Species: A variable mixture of species occurs including saplings of blackjack oak, post oak, and red maple along with flowering dogwood, fringe tree, and winged elm.

Shrub Species: Common species include yaupon, American beautyberry, parsley hawthorn, and farkleberry.

Site Inclusions: Calcareous forest or calcareous prairies may form in outcrops of calcareous clays.

Similar LTPs: Mesic calcareous forests (232Fa.3.3.30) may have clayey soils, but are calcareous and rich in herbs from the *Mitchella* and *Bignonia* groups. Calcareous prairies (232Fa.3.2.40) have clayey soils and occupy a similar position on the landscape, but soils are extremely calcareous and natural sites are open and lack large trees.

232Fa.3.2.40 *Schizachyrium-Callirhoe* Clayey Dry-Mesic Calcareous Prairies Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including the central Winn Ranger District and the northern portion of the Catahoula Ranger District of Kisatchie National Forest.

Geology: Occurs mainly on the Cook Mountain formation and the Jackson group.

Landform: Occurs on gentle to moderate slopes where there are outcrops of strongly calcareous clays associated with Cook Mountain and Jackson geology. Individual occurrences are small, generally less than 8 hectares.

Soil Characteristics: Soils are stiff calcareous clays that create severe conditions that inhibit colonization by tree species. Surface soils are thin (less than 12 cm deep) and have silt loam or silty clay loam textures. The subsoil consists of stiff montmorillonitic clays which have a high shrink-swell potential. Nutrient levels are very high and reaction is moderately alkaline, reflecting the calcareous character of the soils. Soils belong to the Keiffer series.

Hydrology: Due to high clay content, infiltration is slow and surface erosion may be high on slopes. Extremely clayey soils impose a variety of stresses on plants. They can be waterlogged and hypoxic during wet periods but droughty during dry periods because clays bind much of their moisture so tightly that it is not available to plants. Once dry, clays resist rewetting thereby extending drought periods.

Natural Disturbances and Processes: Under natural conditions, sites were subject to moderately frequent fire. Since prairies are usually embedded in clayey shortleaf pine-oak dominated forests (232Fa.3.2.10), presettlement fire frequency was probably not as high as for longleaf pine uplands. Natural stresses associated with the clay soils also tend to keep the prairies in a non-forested state. The shrinking, swelling and cracking characteristic of these clays can disrupt root systems-- especially those of large woody plants and trees. In the long term absence of fire, sites may slowly succeed to a scrubby woodland and then to a calcareous forest.

Ground Layer Species: A species-rich, largely herbaceous ground layer includes the *Schizachyrium* group along with members of the *Callirhoe* group which includes taxa not usually seen in local forest communities.

Overstory Tree Species: Overstory-sized trees are largely absent from natural prairies. Occasional stunted loblolly pine, sweetgum, white ash, and others may occur.

Understory Tree Species: Individuals are widely scattered and can include white ash, sweetgum, eastern redcedar, and Mexican plum.

Shrub Species: Shrubs often form thickets or clumps along the edges and occur scattered throughout the prairie. Hawthorns, including cockspur hawthorn are common. Other common species include eastern baccharis, Yaupon, roughleaf dogwood, greenbriars, and blackberry.

Similar LTPs: Clayey uplands (232Fa.3.2.10), have clayey soils and may also be associated with the Cook Mountain and Jackson geological formations, but they are not as calcareous and will be forested under natural conditions. Mesic calcareous forests (232Fa.3.3.30) have calcareous clay soils, but are generally found on lower landscape positions, are naturally forested, and contain a rich mixture of shade-tolerant herbs. Most similar are clayey prairies from other regions of the West Gulf Coastal Plain: 232Fa.2.2.40 and 231Eh.16.2.40.

232Fa.3.3 Mesic Slopes and Terraces Landtype

232Fa.3.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including the central Winn Ranger District and the northern portion of the Catahoula Ranger District of Kisatchie National Forest.

Geology: Occurs on Eocene deposits associated with Cane River, Cook Mountain, Jackson, and Vicksburg geology.

Landform: Occurs on moderately sloping lower slopes adjacent to the floodplains of small streams, on terraces above minor stream bottoms, or on other mesic areas that were historically protected from fire.

Soil Characteristics: Occurs on a variety of soil types although soils commonly belong to the Glenmora and Cahaba series. Increased moisture and protection from fire resulting from low topographic position are more important than soil type in structuring vegetation. Nutrient levels are medium to high and reaction is strongly acid to medium acid.

Hydrology: Most soils are medium-textured, well drained, and contain more plant-available moisture than the uplands because of their lower topographic position on the landscape. Those on terraces may have seasonally high water tables and occasional saturated conditions in the subsoil.

Natural Disturbances and Processes: Topographic isolation from uplands resulted in infrequent presettlement fires. Also, fires that penetrate these hardwood forests are less intense and less harmful to fire-tender species than the upland fires carried by the flammable litter of longleaf pine. Though the influence of fire is on vegetation minimal, windthrow and individual tree mortality are important disturbances.

Ground Layer Species: The *Callicarpa*, *Chasmanthium*, and *Mitchella* groups are common. Crossvine (*Bignonia capreolata*), a member of the *Bignonia* group is common, but the rest of the group is not.

Overstory Tree Species: Important species include sweetgum, white oak, southern red oak, and loblolly pine. American beech is also present in some sites.

232Fa.3 Undulating Clayey Uplands Landtype Association

Understory Tree Species: Species include saplings of sweetgum, white oak, American beech, and southern Magnolia along with American holly, flowering dogwood, American hornbeam, eastern hophornbeam, and Florida maple.

Shrub Species: Species include yaupon, American beautyberry, American witchhazel and several species of wild blueberry,

Similar LTPs: Mesic calcareous forest (232Fa.3. 3.30) is similar but found on calcareous soils and members of the *Mitchella* and *Arisaema* species groups are more common. Mesic stream bottoms (232Fa.3. 4.10) are similar, but occur on poorly-developed floodplains of small streams, not on slopes and terraces.

232Fa.3.3.30 Water Oak-Loblolly Pine/*Arisaema* Clayey Mesic Calcareous Lower Slopes Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including the central Winn Ranger District and the northern portion of the Catahoula Ranger District of Kisatchie National Forest.

Geology: Occurs on Eocene marine and littoral glauconite and clay deposits associated with Cook Mountain and Jackson geology. This LTP is rare, associated only with localized calcareous clay outcrops.

Landform: Sites are on moderately sloping lower slopes adjacent to the floodplains of rivers and streams. They often occur downslope from calcareous prairies (232Fa.3. 2.40).

Soil Characteristics: Soils occur in localized areas where calcareous clays outcrop in a landscape otherwise characterized by acidic clays. Soils have clay and silty clay textures throughout the profile and are mapped as the Vaiden series. Nutrient levels are very high and reaction in the surface soil is medium acid to slightly acid (pH in lower horizons will be higher). Because of low topographic position, these clays are generally kept moist and shrink-swell cycles are minimized.

Hydrology: Soils are clayey and slowly permeable, runoff is high, and there is potential for erosion. Small intermittent drainages are often present. Soils contain more plant-available moisture than the uplands because of their relatively lower topographic position on the landscape.

Natural Disturbances and Processes: Low topographic position and isolation from uplands protected sites from presettlement fires, which were infrequent had limited influence on vegetation. Despite soil similarities with calcareous prairies (232Fa.3. 2.40), lower topographic position and more moisture minimizes stresses associated with drought and the magnitude shrink-swell cycles, thereby favoring forest vegetation.

Ground Layer Species: Virginia creeper (*Parthenocissus quinquefolia*) and poison ivy (*Toxicodendron radicans*) often dominate. Other members of the *Chasmanthium*, *Mitchella* and *Arisaema* species groups are common. Other characteristic species include strawberrybush (*Euonymus americanus*), potato vine (*Ipomoea pandurata*), dwarf palmetto (*Sabal minor*), littlehead nutrush (*Scleria oligantha*), and crownbeard (*Verbesina helianthoides*).

Overstory Tree Species: Overstory includes loblolly pine, water oak, sweetgum, green ash, bitternut hickory, winged elm, shagbark hickory, and red mulberry.

Understory Tree Species: Common species include eastern hophornbeam, flowering dogwood, eastern redbud, and saplings of water oak, bitternut hickory, and shagbark hickory.

Shrub Species: Common pawpaw is abundant. Hawthorns (especially parsley hawthorn and cockspur hawthorn) are also common.

Similar LTPs: 232Fa.3.2.40 (calcareous prairies) also has calcareous soils but is non-forested and usually occurs on higher topographic positions where soil conditions and wet-dry fluctuations are more extreme. Calcareous mesic slopes may be embedded in a larger area of mesic slopes and terraces (LTP 232Fa.3.3.10) which occur on acid clays or loamy soils.

232Fa.3.4 Minor Stream Bottoms Landtype

232Fa.3.4.10 White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including the central Winn Ranger District and the northern portion of the Catahoula Ranger District of Kisatchie National Forest.

Geology: Occurs on recent loamy and sandy alluvium derived from Eocene deposits associated with Cane River, Cook Mountain, Jackson, and Vicksburg geology.

Landform: Occurs in the valleys of minor, often intermittent streams. Floodplains are poorly developed, generally less than 100m wide.

Soil Characteristics: Occurs primarily on alluvial soils mapped as the Guyton complex. Surface soils are sandy or loamy, nutrient availability is generally low to medium and reaction is medium acid to strongly acid.

Hydrology: The streams associated with this landtype phase are small headwater streams and do not have well-developed floodplains. Stream gradients are steep and upstream watersheds are small, so flooding is intermittent (<5% of the growing season) and only during periods of extremely high water flow. Soils may have seasonally high water tables and periodic saturated conditions in the subsoil.

Natural Disturbances and Processes: Topographic isolation from uplands resulted in infrequent presettlement fires. Fires that did penetrate these hardwood forests are less intense and less harmful to fire-tender species than the upland fires carried by the flammable litter of pine needles. Though the influence of fire is on vegetation minimal, windthrow and individual tree mortality are important disturbances.

Ground Layer Species: Members of the *Chasmanthium*, *Callicarpa*, and *Mitchella* species groups are common.

Overstory Tree Species: Overstory includes sweetgum, white oak, southern red oak, loblolly pine, and occasionally, American beech. Southern magnolia is not typically found in the overstory of modern stands, but is often common as an understory tree and may reach canopy size as stands mature.

Understory Tree Species: Understory trees include sweetgum, white oak, American beech, and southern magnolia saplings as well as American holly, flowering dogwood, American hornbeam, eastern hophornbeam and Florida maple.

232Fa.3 Undulating Clayey Uplands Landtype Association

Shrub Species: Species include yaupon, American beautyberry, American witchhazel, several blueberry species, and American snowbell.

Site Inclusions: Slightly lower, wetter areas contain species from the *Bignonia* species group.

Similar LTPs: 232Fa.3.4.20 wet-mesic stream bottoms are similar but occur downstream on larger better-developed floodplains. Members of the *Bignonia* and *Justicia* species groups are more common on these wetter sites.

232Fa.3.4.20 White Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana including the central Winn Ranger District and the northern portion of the Catahoula Ranger District of Kisatchie National Forest.

Geology: Occurs on recent (Holocene) loamy alluvium.

Landform: Sites are on the floodplains of medium sized perennial streams. Floodplains are well-developed, usually exceeding 100 m in width. Microtopography is variable as a result of old stream channels, levees, sandbars and other alluvial deposits. Slopes are nearly level.

Soil Characteristics: Occurs on loamy alluvial soils. Nutrient availability is low to medium. Because of frequent seasonal flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil will be exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles can occur throughout the soil profile. Soils belong to the Guyton complex.

Hydrology: Soils range from somewhat poorly drained to poorly drained depending on the microtopography of the floodplain. The streams associated with this landtype phase drain a moderately large watershed, so irregular flooding occurs. Duration of flooding (typically 5 -12.5 % of the growing season) increases with the size of the watershed.

Natural Disturbances and Processes: Fire is very infrequent on stream floodplains and has minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees fall while new deposits of alluvial material are colonized by vegetation. Windthrow and individual tree mortality are also important natural disturbances.

Ground Layer Species: Members of the *Arisaema*, *Mitchella*, and *Bignonia* species groups are common. Members of the *Justicia* group occur in wet depressions and drainage channels.

Overstory Tree Species: The overstory of the reference sites includes a mixture of bottomland hardwood and mesic species including loblolly pine, white oak, sweetgum, laurel oak, water oak, willow oak, green ash, and red maple.

Understory Tree Species: Understory trees include American hornbeam and American holly along with saplings of sweetgum, white oak, beech, blackgum, and southern magnolia.

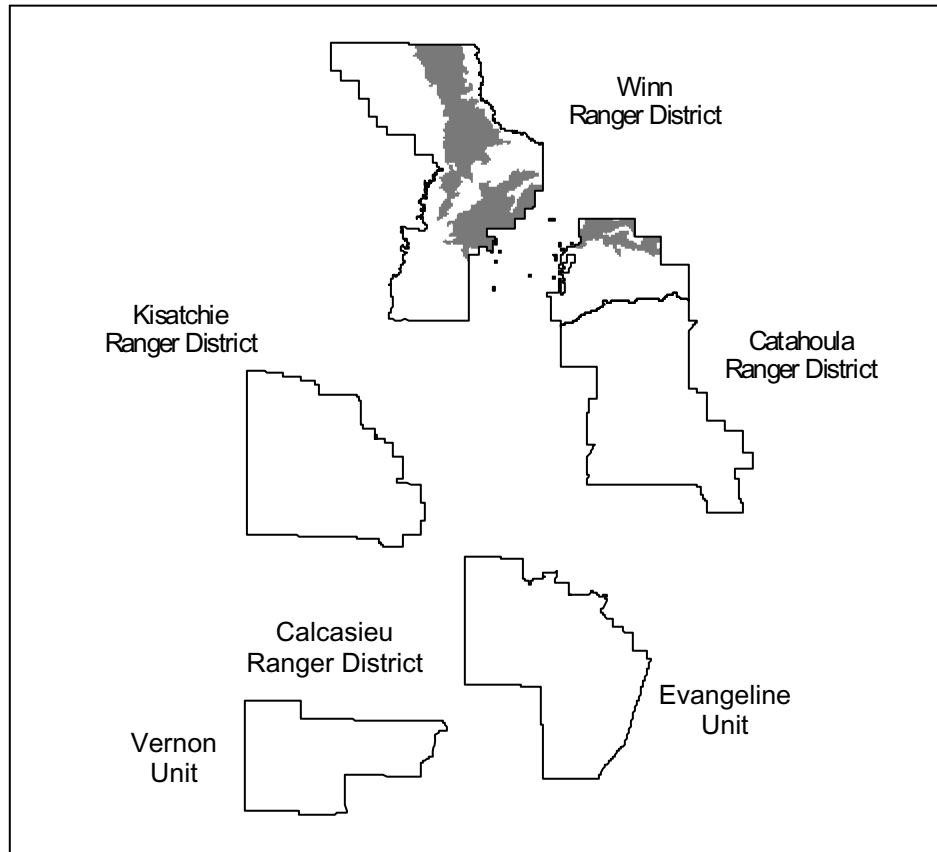
Shrub Species: Common species include, hawthorn, American beautyberry, Alabama supplejack, and southern arrowwood.

Site Inclusions: Slightly lower, wetter areas contain microsites that support obligate wetland species. Localized seepage areas with members of the *Osmunda* group may occur, especially at the base of the slope.

Similar LTPs: 232Fa.3.4.10 occurs upstream where streams are smaller, often intermittent, and floodplains are less developed.

CHAPTER 19

232Fa.5 WINN ROLLING UPLANDS LANDTYPE ASSOCIATION



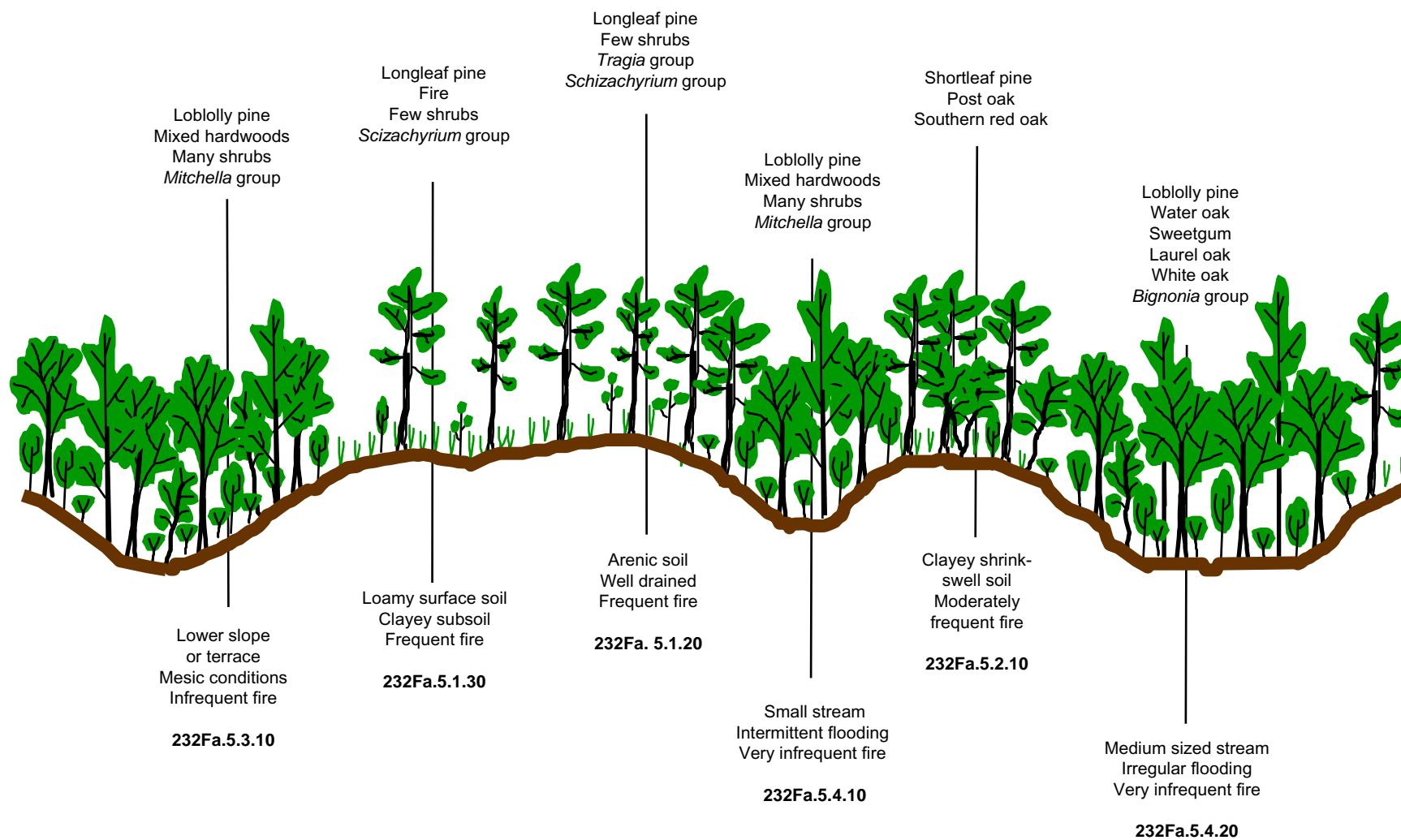


Figure 19.1 Landscape profile of ecosystems on the Winn Rolling Uplands Landtype Association.

232Fa.5 WINN ROLLING UPLANDS LANDTYPE ASSOCIATION



232Fa.5.1.30: Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands (Above and below, Kisatchie NF, Winn RD, Compartment 23, Stand 15)



232Fa.5.1.20: Longleaf Pine/*Tragia Arenic* Dry Uplands Landtype (Kisatchie NF, Winn RD, Compartment 1, Stand 19)



232Fa.5.3.10: White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces (Kisatchie NF, Winn RD, Compartment 24, Stand 6)



232Fa.5.4.10: White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms (Kisatchie NF, Winn RD, Compartment 24, Stand 6)

KEY TO LANDTYPE PHASES

- 1a. Upland topographic positions: Middle to upper slopes, undulating uplands, or ridgetops. Sites are typically pine-dominated.2
- 1b. Lower slopes, ravines, valleys, floodplains, and terraces above small streams. Sites are typically deciduous hardwood-dominated. 4
- 2a. Well drained to excessively well drained sandy soils, a surface layer with sand or loamy sand textures at least 50cm deep. Soils are commonly mapped as Betis or Boykin. Natural overstory includes longleaf pine, blackjack oak, and post oak. Both the *Tragia* and *Schizachyrium* species groups are common.
 232Fa.5.1.20 Longleaf Pine/*Tragia* Arenic Dry Uplands.
- 2b. Well drained to somewhat poorly drained loamy or clayey soils, at least a portion of the upper 50cm is not sandy The *Tragia* species group is rare or absent. 3
- 3a. Well-drained loamy soils typically belonging to Savannah, Malbis, or similar series. If the subsoil is clayey, the topsoil is 30cm or more deep and has a sandy or loamy texture. Presettlement overstory was dominated by longleaf pine and modern unburned stands may be a mixture of pines and upland hardwoods. The *Schizachyrium* group is common on repeatedly-burned stands; the *Callicarpa* and *Chasmanthium* groups may also be common on many stands 232Fa.5.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands.
- 3b. Soils are clays or clay loams and often belong to the Sacul soil series. The surface layer, if loamy or sandy, is less than 30cm deep over clayey subsoil. Overstory of both presettlement and natural modern stands was/is dominated by shortleaf pine, post oak, and southern red oak 232Fa.5.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands.
- 4a. Lower slopes, sides of steep ravines, or terraces adjacent to minor stream bottoms. The *Chasmanthium*, *Callicarpa*, and *Mitchella* species groups are common.
 232Fa.5.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces.
- 4b. Minor stream bottoms or floodplains, sites not on uplands, slopes or terraces 5
- 5a. Bottoms of small, intermittent or perennial headwater streams. The floodplain is poorly developed, usually much less than 100 m wide. Natural overstory includes mesic hardwoods such as white oak, American beech, southern red oak, and loblolly pine. The *Mitchella*, *Callicarpa*, and *Chasmanthium* species groups are common but the *Bignonia* group is infrequent. 232Fa.5.4.10 White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms.
- 5b. Well-developed floodplains of medium-sized perennial streams. Floodplains are more than 100 m wide. Natural overstory includes both mesic and flood-tolerant species and may include willow oak, laurel oak, water oak, white oak and loblolly pine. The *Bignonia* species group is common along with the *Chasmanthium*, *Mitchella*, and *Arisaema* groups. The *Justicia* group may be present in wet areas.
 232Fa.5.4.20 White Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms.

DESCRIPTIONS OF LANDTYPES AND LANDTYPE PHASES:

232Fa.5.1 Sandy/Loamy Uplands Landtype

232Fa.5.1.20 Longleaf Pine/*Tragia* Arenic Dry Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) of West-Central Louisiana. On Kisatchie National Forest it includes large areas of the northeast and east-central Winn Ranger District and the northern portion of the Catahoula Ranger District.

Geology: Occurs on continental and littoral fine-grained sands associated with the Sparta formation. Terrain often forms rolling, uneven rounded slopes.

Landform: Occurs on ridgetops and upper slopes. Sites are moderately sloping.

Soil Characteristics: Soils have a deep, sandy surface layer at least 50cm thick over loamy subsoils. Soils are well drained to excessively well drained and rapidly permeable and are often mapped as Betis and Boykin. Reaction ranges from medium acid to very strongly acid and Nutrient levels are low or very low.

Hydrology: Soils are sandy, excessively well drained, rapidly permeable, and are susceptible to drought, especially during the summer months. Many sites also occur on high topographic positions, enhancing drought-producing conditions.

Natural Disturbances and Processes: Under presettlement conditions stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and a moderately dense woody understory develops and eventually shades out much of the grassy ground layer. While many modern stands no longer experience regular fire, large areas of Kisatchie National Forest, (especially on LTAs 232Fa.1, 232Fa.2, and 2232Fa.6) burn regularly and still support longleaf pine communities.

Ground Layer Species: The ground layer of regularly burned stands includes a diverse assemblage of grasses and herbs from the *Schizachyrium* and *Tragia* groups. While *Schizachyrium scoparium* (little bluestem) is dominant, species from the *Tragia* group are diagnostic. On unburned sites, the *Chasmanthium* and *Callicarpa* groups become established.

Overstory Tree Species: Regularly burned stands are open longleaf pine woodlands but may also include occasional blackjack oak. Unburned stands will develop a mixture of oaks, pines, and hickories. Dry, isolated ridgetops where productivity is very low may not produce enough fuel to carry fires and will support an open oak woodland of blackjack oak, post oak, bluejack oak, and black hickory.

Understory Tree Species: Understory consists mainly of longleaf pine saplings and occasional oaks. Woody understory—sassafras, saplings of upland oaks and occasionally, sweetgum, will increase on sites that do not experience regular burning. Bluejack oak may occur in drier areas.

Shrub Species: Shrubs are widely scattered on frequently burned sites but increase if burning ceases. Typical shrubs include flameleaf sumac, fragrant sumac, and farkleberry. The tendency for shrubs to develop is less strong than on loamier soils.

Site Inclusions: Localized areas of extremely xeric sandylands may be found, especially on summits and ridge tops where droughty soils limit the growth of longleaf pine, but scrubby post oak, bluejack oak, eastern prickly pear (*Opuntia humifusa*) and Louisiana yucca (*Yucca louisianensis*) are common.

Similar LTPs: 232Fa.5.1.30 (loamy longleaf pine uplands) is similar but soils are not as sandy, herbaceous cover is denser, the tendency for shrubs and hardwoods to develop in absence of fire is more pronounced, and members of the *Tragia* species group are uncommon. Areas of High Terrace geology with similar soils and vegetation (232a.1.1.20) are also found on the Winn and Catahoula Ranger districts.

232Fa.5.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) of West-Central Louisiana. On Kisatchie National Forest it includes large areas of the northeast and east-central Winn Ranger District and the northern portion of the Catahoula Ranger District.

Geology: Associated with loamy soils formed from the Eocene-aged Cockfield and Sparta Formations.

Landform: Occurs on ridgetops, broad uplands, and gentle upper slopes.

Soil Characteristics: Soils are well drained, moderately permeable, loamy, and are often mapped as Malbis or Savannah. Nutrient levels are low and reaction is strongly acid.

Hydrology: Soils are usually well-drained, moderately permeable, and have moderate available moisture. Drought stress occurs occasionally when there are long periods of low rainfall during the growing season.

Natural Disturbances and Processes: Under presettlement conditions most stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and rapidly (over a period of 1-2 decades) develop a dense woody understory which shades out the grassy ground layer. Once this happens it is very difficult to control woody understory, restore the grassy ground layer, and cause a stand to revert back to longleaf pine woodland even with frequent prescribed fire. While many modern stands no longer experience regular fire and have become loblolly pine, slash pine, or mixed pine-deciduous forests, large areas of Kisatchie National Forest (especially on LTAs 232Fa.1, 232Fa.2, and 232Fa.6) burn regularly and still support longleaf pine communities.

Ground Layer Species: *Schizachyrium scoparium* typically dominates the ground layer of fire-maintained stands. Other species include a diverse assemblage of sun-loving grasses, composites, legumes and other members of the *Schizachyrium* group. On unburned sites the *Callicarpa* and *Chasmanthium* species groups become abundant.

Overstory Tree Species: Regularly-burned stands are open longleaf pine-dominated woodlands that also include occasional blackjack oak, blackgum, or post oak. Unburned or converted stands are usually dominated by loblolly or shortleaf pine and have a dense woody understory. Such sites are no longer pyrogenic and will not respond to fire as readily as longleaf pine woodlands.

Understory Tree Species: The understory in fire-maintained longleaf pine communities is sparse and consists mainly of longleaf pine saplings and occasional oaks and blackgums. Unburned stands rapidly develop a dense midstory of various hardwoods that excludes the species-rich herbaceous layer.

Shrub Species: Shrubs are widely scattered on frequently burned sites but increase dramatically if burning ceases. Common shrubs include flameleaf sumac, yaupon, southern bayberry, and American Beautyberry. The tendency for hardwood sprouts and woody shrubs to develop is strong in the absence of regular fire.

Site Inclusions: Small drainages commonly dissect sites. Drier, sandier inclusions (LTP 232Fa.5.1.10), may also be found. Hillside herbaceous seeps (bogs), often embedded in longleaf pine-dominated uplands on other landscapes, are extremely rare or absent in LTA 232Fa.5.

Similar LTPs: 232Fa.5.1.20 (arenic dry uplands) are similar but herbaceous cover is more sparse, the tendency for shrubs and hardwoods to develop is less pronounced, soils are sandier, and members of the *Tragia* ecological species group are more common. The geology of the Winn and Catahoula Ranger Districts and surrounding areas is complex. Areas of High Terrace geology with Malbis, Ruston, or Smithdale soils (232Fa.1.1.30) supporting similar vegetation are also found nearby.

232Fa.5.2 Clayey Uplands Landtype

232Fa.5.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) of West-Central Louisiana. On Kisatchie National Forest it includes large areas of the northeast and east-central Winn Ranger District and the northern portion of the Catahoula Ranger District.

Geology: Uncommon on the Winn Rolling Uplands where it is associated with the Cockfield Formation.

Landform: Occurs on broad, gentle slopes and broad uplands in slightly rolling terrain.

Soil Characteristics: Soils are clayey; surface textures are generally sandy clay loam, loam, or clay, but a subsurface horizon with a texture of clay or silty clay is generally within 30 cm of the soil surface. Clays are vertic; They have high shrink-swell potential. Nutrient availability in the surface soil varies from medium to high and reaction is strongly acid. Soils typically belong to the Sacul series.

Hydrology: Due to high clay content, percolation is often slow and periodic saturation exists in the subsoil. Following drought, dry soils resist rewetting. Runoff is rapid and surface erosion may be high on slopes. Many sites are dissected by small intermittent drainages.

Natural Disturbances and Processes: Under presttlement conditions, sites were subject to moderately frequent fire. However the clay soils discourage the establishment of longleaf pine, and the fire frequency and intensity was probably not as high as for longleaf pine-dominated uplands where fires were fueled by highly flammable longleaf pine needles.

Ground Layer Species: Dominant species are from the *Callicarpa* and *Chasmanthium* groups. Other common species include Virginia Dutchman's pipe (*Aristolochia serpentaria*), saw greenbriar (*Smilax bona-nox*), and littlehead nutrush (*Scleria oligantha*). Some species from the

232Fa.5 Winn Rolling Uplands Landtype Association

Schizachyrium group may occur, but are much less abundant than for longleaf pine-dominated uplands.

Overstory Tree Species: The overstory consists of mixed pine and hardwood species--especially shortleaf pine, post oak and southern red oak. Overstory trees may be stunted and have noticeably crooked stems.

Understory Tree Species: A variable mixture of species occurs. Saplings of blackjack oak, red maple, and post oak are common along with flowering dogwood, winged elm and white fringetree.

Shrub Species: Common species include Yaupon, American beautyberry, parsley hawthorn, and farkleberry.

Similar LTPs: A similar LTP (232Fa.3.2.10) occurs nearby on the Undulating Clayey Uplands Landtype Association, where it is much more common than 232Fa.5.2.10

232Fa.5.3 Mesic Slopes and Terraces Landtype

232Fa.5.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) of West-Central Louisiana. On Kisatchie National Forest it includes large areas of the northeast and east-central Winn Ranger District and the northern portion of the Catahoula Ranger District.

Geology: Occurs on Eocene deposits associated with the Sparta and Cockfield formations.

Landform: Occurs on moderately sloping lower slopes adjacent to the floodplains of small streams or on terraces above stream bottoms.

Soil Characteristics: Sites occur on a variety of soil types although Glenmora and Cahaba soils were frequently encountered in the reference sites. Increased soil moisture resulting from low topographic position and historically, topographic isolation from fire are more important than soil type in structuring vegetation on this LTP. Nutrient availability ranges from medium to high and reaction is strongly acid to medium acid.

Hydrology: While most soils are medium-textured and well drained they contain more moisture than the uplands because of their relatively lower hydrological position on the landscape. Those associated with minor stream terraces may have seasonally high water tables and occasional saturated conditions in the subsoil. Sites are often dissected by small drainages.

Natural Disturbances and Processes: Steeper slopes and topographic isolation from uplands by the adjacent stream valleys protected sites from presettlement fires; fire was infrequent and its influence of fire on vegetation minimal. Windthrow and individual tree mortality are important natural disturbances.

Ground Layer Species: Members of the *Callicarpa*, *Chasmanthium*, and to a lesser extent, *Mitchella* groups are common.

Overstory Tree Species: Typical trees include sweetgum, white oak, southern red oak, and loblolly pine. American beech is also present on some sites.

Understory Tree Species: Species include saplings of sweetgum, white oak, American beech, and southern magnolia, along with American holly, flowering dogwood, American hornbeam, eastern hop-hornbeam, and Florida maple.

Shrub Species: Species include yaupon, American beautyberry, American witchhazel, and several blueberry species.

Similar LTPs: Mesic creek bottoms (232Fa.5.4.10) are similar, but occur in minor stream valleys on poorly-developed floodplains, not on slopes and terraces.

232Fa.5.4 Minor Stream Bottoms Landtype

232Fa.5.4.10 White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) of West-Central Louisiana. On Kisatchie National Forest it includes large areas of the northeast and east-central Winn Ranger District and the northern portion of the Catahoula Ranger District.

Geology: Occurs on recent loamy and sandy alluvium derived from Eocene deposits associated with the Sparta and Cockfield formations.

Landform: Occurs in the valleys of minor, first or second-order, intermittent or perennial headwater streams. Floodplains are poorly developed and less than 100m wide.

Soil Characteristics: Occurs primarily on alluvial soils. Surface soils are sandy or loamy. Mean exchangeable calcium is generally low to medium and reaction is medium acid to strongly acid. Soils belong to the Guyton complex.

Hydrology: Streams associated with this landtype phase are small and do not have well-developed floodplains. Stream gradients are steep and upstream watershed small, so flooding occurs intermittently and only during periods of extremely high water flow. Soils may have seasonally high water tables and periodic saturated conditions in the subsoil.

Natural Disturbances and Processes: Topographic isolation from uplands resulted in infrequent presettlement fires. Fires that do penetrate these hardwood forests are less intense and less harmful to fire-tender species than the upland fires carried by the flammable litter of longleaf pine. Though the influence of fire is on vegetation minimal, windthrow and individual tree mortality are important disturbances.

Ground Layer Species: Members of the *Callicarpa*, *Chasmanthium*, *Arisaema*, and *Mitchella* species groups are common.

Overstory Tree Species: Overstory includes sweetgum, white oak, southern red oak, loblolly pine, and occasionally American beech. Southern magnolia is not common in the overstory of modern stands, but often occurs as an understory tree and may reach canopy size as stands mature.

Understory Tree Species: Understory trees include saplings of sweetgum, white oak, American beech, and southern magnolia, along with American holly, flowering dogwood, American hornbeam, eastern hophornbeam, and Florida maple.

Shrub Species: Species include yaupon, American beautyberry, American witchhazel, wild blueberry species, and American snowbell.

Site Inclusions: Slightly lower, wetter areas contain species from the *Bignonia* and *Justicia* species groups.

Similar LTPs: LTP 232Fa.5.4.20 (wet-mesic stream bottoms) are similar but occur downstream on larger, better-developed floodplains. Members of the *Bignonia* and *Justicia* species groups are common in these wetter sites.

232Fa.5.4.20 White Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) of West-Central Louisiana. On Kisatchie National Forest it includes large areas of the northeast and east-central Winn Ranger District and the northern portion of the Catahoula Ranger District.

Geology: Occurs on recent (Holocene) loamy alluvium.

Landform: Occurs on the floodplains medium sized perennial streams. Floodplains are well-developed, usually exceeding 100 m in width. Microtopography is variable as a result of old stream channels, levees, sandbars and other alluvial deposits. Slopes are nearly level.

Soil Characteristics: Occurs on loamy alluvial soils. Nutrient levels are low to medium. Because of frequent seasonal flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil will be exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles can occur throughout the soil profile. Soils belong to the Guyton complex.

Hydrology: Soils range from somewhat poorly-drained to poorly drained depending on the micro-topography of the floodplain. Streams associated with this landtype phase drain a moderately large watershed, so irregular flooding occurs. Duration of flooding (typically 5-12.5% of the growing season) increases with the size of the watershed.

Natural Disturbances and Processes: Fire is very infrequent on floodplains. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees fall. At the same time, new deposits of alluvial material are colonized by vegetation. Windthrow and individual tree mortality are also important natural disturbances.

Ground Layer Species: Members of the *Bignonia*, *Mitchella*, and *Arisaema* species groups are common. Members of the *Justicia* group may occur in wet depressions and drainage channels.

Overstory Tree Species: The overstory includes a mixture of flood-tolerant and mesic species including loblolly pine, white oak, sweetgum, laurel oak, water oak, willow oak, green ash, and red maple.

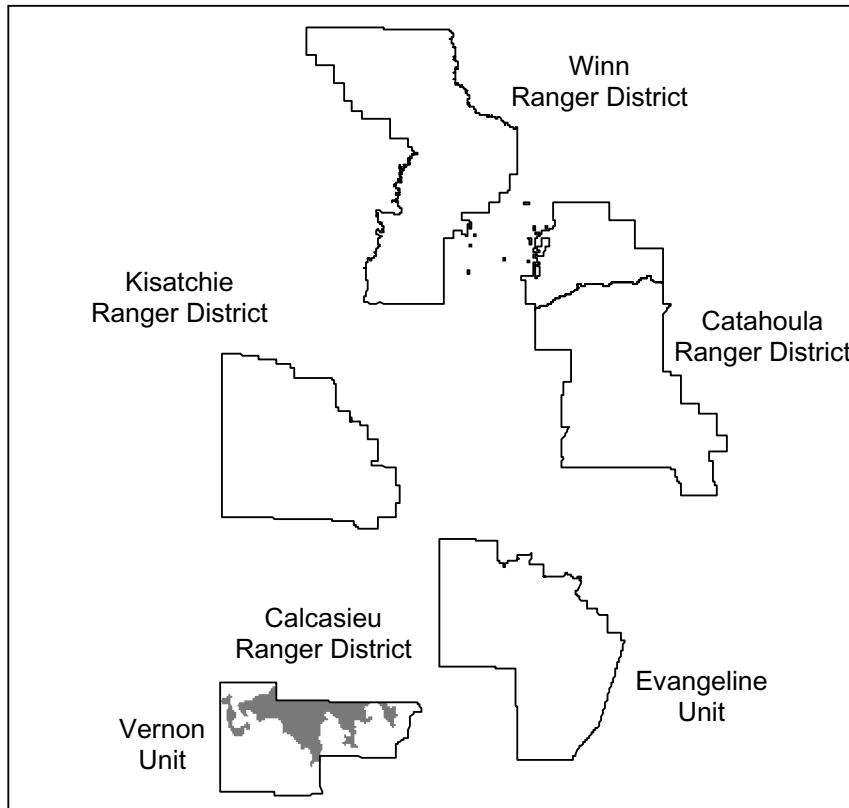
Understory Tree Species: Understory trees include abundant American hornbeam along with American holly and saplings of sweetgum, white oak, American beech, blackgum, and southern magnolia.

Shrub Species: Common species include hawthorn, American beautyberry, Alabama supplejack, and southern arrowwood.

Similar LTPs: 232Fa.5.4.10 (mesic stream bottoms) occurs upstream where streams are smaller, often intermittent, and where members of the *Bignonia* and *Justicia* species groups are infrequent.

CHAPTER 20

232Fa.6 FORT POLK ROLLING UPLANDS LANDTYPE ASSOCIATION



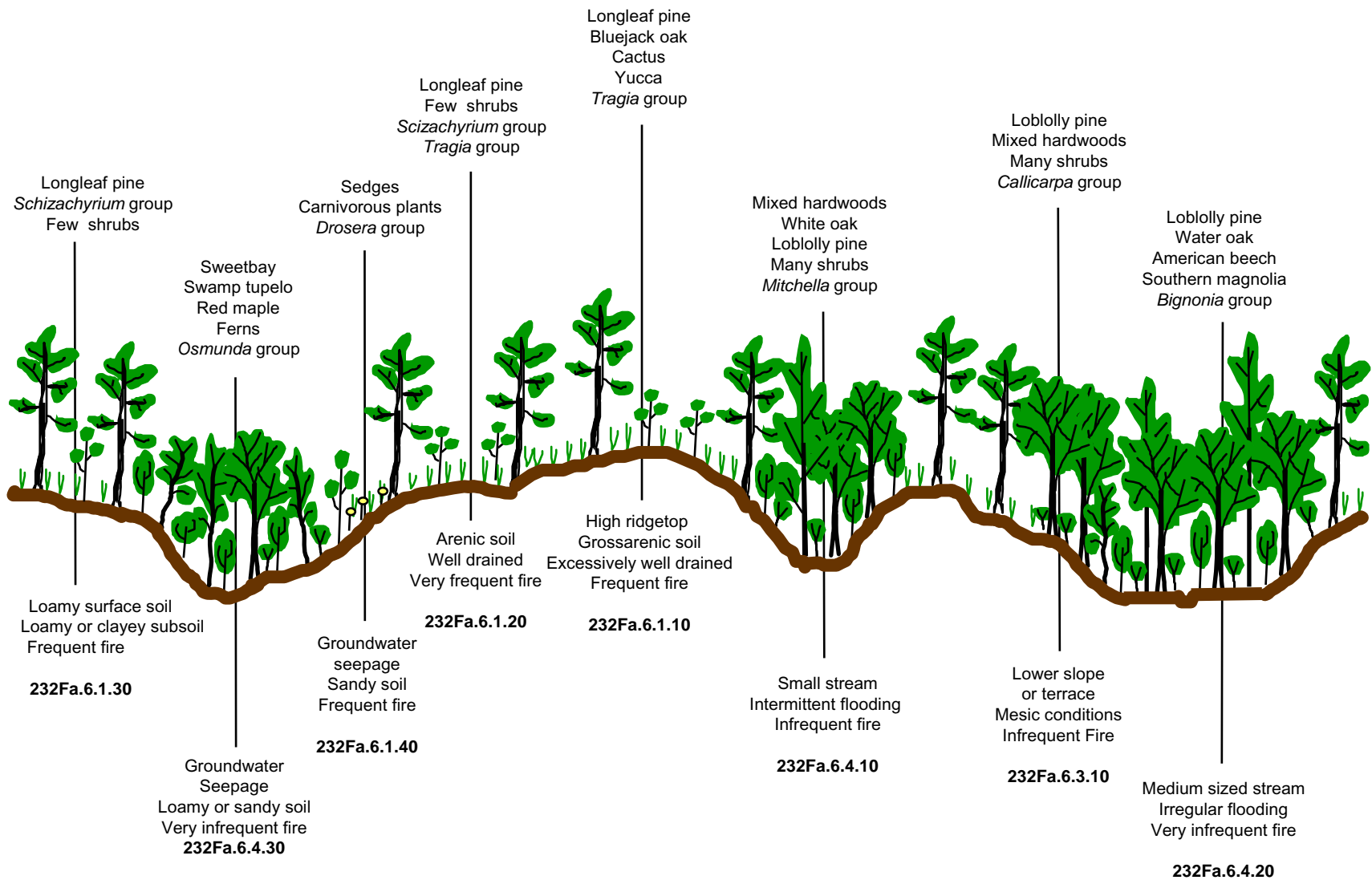


Figure 20.1 Landscape profile of ecosystems on the Fort Polk Rolling Uplands Landtype Association.

232Fa.6 FORT POLK ROLLING UPLANDS LANDTYPE ASSOCIATION



232Fa.6.1.10: Longleaf Pine-Bluejack Oak/*Tragia* Grossarenic Dry Uplands (Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 254)



232Fa.6.1.20: Longleaf Pine/*Schizachyrium-Tragia* Arenic Dry Uplands (Vernon Parish, Near Ft. Polk)



232Fa.6.1.20: Longleaf Pine/*Schizachyrium-Tragia* Arenic Dry Uplands (Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 254)



232Fa.6.1.30: Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands (Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 250)



232Fa.6.4.20: American Beech-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms (both photos: Kisatchie NF, Vernon Unit, Calcasieu RD, Compartment 259)

KEY TO LANDTYPE PHASES

- 1a. Upland topographic positions: Middle to upper slopes, undulating uplands, or ridgetops. Sites are typically pine-dominated.2
- 1b. Lower slopes, ravines, valleys, floodplains, and terraces above small streams. Sites are typically deciduous hardwood-dominated. 5
- 2a. well drained, somewhat excessively well drained, or excessively well drained soils. Soil surface layer with loam or coarser texture and soils typically considered loamy, sandy, arenic, or grossarenic. 3
- 2b. Sandy or sandy loam soils often with an impermeable subsurface layer. Soils are constantly wet as a result of groundwater seepage. Sites generally cover less than 1 ha. Natural sites are herb-dominated open areas where the *Drosera* and *Osmunda* species groups are present.232Fa.6.1.40 *Drosera*
Sandy Wet Herbaceous Seeps.
- 3a. Well drained to excessively well drained sandy soils, a surface layer with sand or loamy sand textures at least 50cm thick. Includes Betis, Briley, and Boykin soils, and sandier intergrades of Ruston and Smithdale soils. Natural overstory is dominated by longleaf pine and both The *Tragia* and *Schizachyrium* species groups are common. 4
- 3b. Well drained loamy soils, at least part of the upper 50cm not sandy. Includes Malbis soils and loamy intergrades of Ruston and Smithdale soils. Natural overstory is dominated by longleaf pine. While the *Schizachyrium* species group is common, the *Tragia* group is rare or absent.....232Fa.6.1.30 Longleaf Pine/*Schizachyrium*
Loamy Dry-Mesic Uplands.
- 4a. Excessively well drained grossarenic soils, the sandy surface layer 100cm or more thick. Bluejack oak may be present. Sites are usually small, commonly located on a narrow ridgetops or convex upper slopes. Yucca and prickly pear cactus are usually present and The *Tragia* species group is common.....232Fa.6.1.10 Longleaf Pine-Bluejack Oak/*Tragia*
Grossarenic Dry Ridgetops.
- 4b. Well drained to excessively well drained arenic soils, the sandy surface layer 50-100cm thick. Sites typically occupy relatively large areas. Bluejack oak is rare, the *Tragia* species group is present but less common than for 4a, and the *Schizachyrium* species group dominates. 232Fa.6.1.20 Longleaf Pine/*Schizachyrium*-*Tragia*
Arenic Dry Uplands.
- 5a. Lower slopes often adjacent to minor stream bottoms, sides of ravines, or small terraces immediately above small stream valleys. Natural overstory a mixture of loblolly pine and deciduous hardwoods. The *Chasmanthium* and *Mitchella* species groups are common. ...
.....232Fa.6.3.10 White Oak-Loblolly Pine/*Callicarpa*
Loamy Mesic Lower Slopes and Terraces
- 5b. Minor stream bottoms, floodplains, or groundwater seep areas associated with head slopes or streams..... 6

- 6a. Groundwater seepage areas on headslopes or on or adjacent to floodplains of small intermittent or perennial streams. Soils are deep gray sands nearly permanently wet from groundwater seepage. Intermittent flooding may occur on sites adjacent to larger streams. Natural overstory includes sweetbay magnolia, swamp tupelo, and red maple. The *Osmunda* species group is common.
.....232Fa.6.4.30 Sweetbay-Swamp Tupelo/*Osmunda*
Loamy Wet Forested Seeps.
- 6b. Floodplains or valleys of small to medium sized streams. Sites may be subject to intermittent or irregular flooding, but groundwater seepage areas are small and rare. 7
- 7a. Small, intermittent or perennial stream bottoms. The floodplain is poorly-developed; usually less than 100 m wide and flooding is intermittent. Natural overstory is dominated by mesic hardwoods and loblolly pine. The *Mitchella*, *Callicarpa*, and *Chasmanthium* species groups are common; the *Bignonia* group is infrequent or rare.....
.....232Fa.6.4.10 White Oak-Loblolly Pine/*Mitchella*
Loamy Mesic Stream Bottoms
- 7b. Floodplains of medium-sized perennial streams. The well-developed floodplain is more than 100 m wide and irregular flooding occurs. Natural overstory consists of both mesic and flood-tolerant hardwoods and occasional loblolly pine. While members of the *Mitchella*, *Callicarpa*, and *Chasmanthium* species groups may occur, the *Bignonia* species group is abundant.
..... 232Fa.6.4.20 American Beech-Southern Magnolia/*Bignonia*
Loamy Wet-Mesic Stream Bottoms.

DESCRIPTIONS OF LANDTYPE PHASES:

232Fa.6.1 Sandy/Loamy Uplands Landtype

232Fa.6.1.10 Longleaf Pine-Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It is found mainly on the northern (military-use) portion of the Vernon Unit of the Calcasieu Ranger District of Kisatchie National Forest as well as on much of Fort Polk.

Geology: Associated with the Blounts Creek member of the Fleming Formation.

Landform: Occurs on the highest, narrowest portions of ridgetops and associated convex upper slopes. Slopes are moderate to moderately steep. Sites are usually isolated and small.

Soil Characteristics: Soils consist of very deep, excessively drained loamy sand over sandy loam subsoil. The subsoil is generally greater than 100 cm from the surface. Nutrient availability is very low. Soils are typically mapped as Betis, Briley, or Boykin.

Hydrology: The sandy soils are rapidly permeable, and rainfall percolates downward quickly; hence, long periods of drought occur.

Natural Disturbances and Processes: Under presettlement conditions stands experienced frequent low intensity surface fires fueled by dry grasses and longleaf pine needles which were ignited by lightning from summer thunderstorms or by man. Fires may not have been as frequent or as intense as for the surrounding less droughty uplands because sparse vegetation limited fuel loads. Fire inhibits the establishment of most woody species and favors longleaf pine. Unburned sites tend to develop a denser woody understory although extreme soil conditions alone may be enough to maintain a somewhat open site. While many modern stands no longer experience regular fire, large areas of Kisatchie National Forest and Fort Polk burn regularly and still support longleaf pine communities.

Ground Layer Species: Species from the *Tragia* species group, including Louisiana yucca (*Yucca louisianensis*) and eastern prickly pear (*Opuntia humifusa*), are common. Little bluestem (*Schizachyrium scoparium*) and other species from the *Schizachyrium* group, while present, are less abundant than for surrounding less-droughty sites. Little bluestem (*Schizachyrium scoparium*) may constitute the majority of ground cover. Significant patches of bare ground or areas covered by lichens (*Cladonia* and *Cladina* spp.) are also present.

Overstory Tree Species: The overstory is an open woodland where a mixture of longleaf pine, bluejack oak, sand post oak, black hickory, and blackjack oak dominates.

Understory Tree Species: The woody understory is sparse on frequently burned sites. Species may include sassafras and saplings of longleaf pine and the overstory oaks.

Shrub Species: On frequently burned sites, shrubs are widely scattered. Common shrubs include Louisiana yucca, orangegrass (*Hypericum gentianoides*), St. Andrews cross (*Hypericum hypericoides*), and farkleberry.

Site Inclusions: On very dry, isolated ridgetops with deep sands, extremely xeric conditions may restrict the establishment and growth of longleaf pine and the *Schizachyrium* group. These areas, which have very low productivity, may not produce enough fuel to carry fires and will support an open oak woodland of blackjack oak, post oak, bluejack oak, and black hickory. Since precipitation rapidly infiltrates into the sandy soils of these sites resulting in significant

groundwater recharge, herbaceous seeps may be embedded in or adjacent to this landtype phase.

Similar LTPs: 232Fa.6.1.20 occurs on similar upland landscape positions, but the sandy surface soil is not as deep, the *Schizachyrium* group is more dominant, and the *Tragia* group, while typically present, is less common.

232Fa.6.1.20 Longleaf Pine/*Schizachyrium*-*Tragia* Arenic Dry Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It is found mainly on the northern (military-use) portion of the Vernon Unit of the Calcasieu Ranger District of Kisatchie National Forest as well as on much of Fort Polk.

Geology: Associated with the Blounts Creek member of the Fleming Formation.

Landform: Occurs on ridgetops and gentle to moderate, convex upper slopes.

Soil Characteristics: Soils are deep sands, 50-100cm thick, over a loamy subsoil. They are well drained to excessively well drained, droughty, low in nutrients, and rapidly permeable. Reaction is strongly acid to very strongly acid and soils include The Betis, Briley, and Boykin series as well as the sandier variants of soils mapped as the Ruston and Smithdale series.

Hydrology: Soils are coarse-textured and excessively well drained. Periods of drought are common during the warmer summer months.

Natural Disturbances and Processes: Under presettlement conditions stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and a moderately dense woody understory develops and eventually shades out much of the grassy ground layer. While many modern stands no longer experience regular fire, large areas of Kisatchie National Forest and Fort Polk burn regularly and still support longleaf pine communities.

Ground Layer Species: The ground layer is dominated by Little bluestem (*Schizachyrium scoparium*) and other species from the *Schizachyrium* group. Species from the *Tragia* group, while diagnostic, are less abundant than for Grossarenic uplands (232Fa.6.1.10). On unburned sites, the *Chasmanthium* and *Callicarpa* groups become established.

Overstory Tree Species: Regularly burned stands are open longleaf pine woodlands but may also include occasional blackjack oak or post oak. Unburned stands will develop a mixture of oaks, pines, and hickories.

Understory Tree Species: Understory in fire-maintained stands is sparse and consists mainly of longleaf pine saplings and occasional oaks. Woody understory—sassafras, saplings of upland oaks and occasionally, sweetgum, will increase on sites that do not experience regular burning.

Shrub Species: Shrubs are scattered on frequently burned sites but increase if burning ceases. Important species include fragrant sumac, farkleberry, and flameleaf sumac.

Site Inclusions: Since precipitation rapidly infiltrates into the sandy soils of these sites resulting in significant groundwater recharge, herbaceous seeps may be embedded in or adjacent to this landtype phase.

Similar LTPs: 232Fa.6.1.30 occurs on similar landscape positions but soils are loamier, sites have more herbaceous cover, there is a greater tendency to develop shrubs and hardwoods on unburned sites, and the *Tragia* species group is uncommon.

232Fa.6.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It is found mainly on the northern (military-use) portion of the Vernon Unit of the Calcasieu Ranger District of Kisatchie National Forest as well as on much of Fort Polk.

Geology: Found on the Blounts Creek member of the Fleming Formation.

Landform: Usually found on ridgetops and gentle middle and upper slopes.

Soil Characteristics: Soils consist of loam or sandy loam surface soils and are well-drained and moderately permeable. They include the Malbis, Ruston, Smithdale and occasionally Beauregard series. Nutrient levels are low and reaction is strongly acid.

Hydrology: Soils are medium-textured and mostly well-drained and have moderate infiltration rates. They are less droughty than the coarser-textured upland soils.

Natural Disturbances and Processes: Under presettlement conditions most stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and rapidly (over a period of 1-2 decades) develop a dense woody understory which shades out the grassy ground layer. Once this happens it is very difficult to control woody understory, restore the grassy ground layer, and cause a stand to revert back to longleaf pine woodland even with frequent prescribed fire. While many modern stands no longer experience regular fire and have become loblolly pine, slash pine, or mixed pine-deciduous forests, large areas of Kisatchie National Forest burn regularly and still support longleaf pine

Ground Layer Species: *Schizachyrium scoparium* typically dominates the ground layer of fire-maintained stands. Other species include a diverse assemblage of sun-loving grasses, composites, legumes and other members of the *Schizachyrium* group. On unburned sites the *Callicarpa* and *Chasmanthium* species groups become abundant.

Overstory Tree Species: Regularly burned stands are open longleaf pine woodlands but may also include occasional blackjack oak, blackgum, or post oak. Unburned stands develop a closed-canopy forest with a mixture of oaks, pines, hickories, sweetgum and other hardwoods.

Understory Tree Species: Understory in fire-maintained longleaf pine woodlands is sparse and consists mainly of longleaf pine saplings and occasional blackjack oak or blackgum. Unburned stands rapidly develop a dense midstory of sweetgum and other young hardwoods that shades out much of the species-rich herbaceous layer.

Shrub Species: Shrubs are widely scattered on frequently burned sites but increase dramatically if burning ceases. Common shrubs include flameleaf sumac, yaupon, farkleberry, waxmyrtle, and American beautyberry.

Site Inclusions: Drainages commonly dissect sites. These drainages typically support more hardwoods, shrubs, and species from the *Callicarpa* and *Chasmanthium* groups than adjacent

areas. Downstream, these drainages transition into Mesic Stream Bottoms (232Fa.4.10). Drier, sandier microsites similar to 232Fa.1.1.20 may also be found. Herbaceous seeps (232Fa.1.1.40) may be embedded within the longleaf pine community.

Similar LTPs: 232Fa.6.1.20 has sandier surface soils, less dense herbaceous cover, greater occurrence of the *Tragia* species group, and a less pronounced tendency to develop dense woody understory on unburned stands.

232Fa.6.1.40 *Drosera* Sandy Wet Herbaceous Seeps Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It is found mainly on the northern (military-use) portion of the Vernon Unit of the Calcasieu Ranger District of Kisatchie National Forest as well as on much of Fort Polk.

Geology: Found on Tertiary deposits (the Blounts Creek member of the Fleming formation) where an impermeable subsurface layer reaches the surface, usually in areas where surrounding soils are highly permeable sands with high rates of infiltration and groundwater recharge.

Landform: Occurs on gentle side slopes. Most sites are small, generally covering less than one hectare. However, they provide a unique habitat and species composition that is strikingly different from the surrounding uplands. These sites are sometimes called “bogs”.

Soil Characteristics: Soils are gray, sandy, very poorly drained, low in nutrients, and reaction is very strongly acid. The surface remains wet year round and there is usually an impermeable subsurface layer. Soils belong to the Osier series.

Hydrology: Water originating from rainfall on upper slopes rapidly permeates the surrounding sandy soils and flows laterally along impermeable subsurface layers until it reaches the surface. Water flow is slow and constant, resulting in saturated soil conditions for most of the year (a Semipermanently saturated hydrologic regime). Seeps often form the head of small streams that become better developed as one moves downslope.

Natural Disturbances and Processes: Historically, frequent, low-intensity surface fires sweeping through the surrounding longleaf pine-dominated landscape burned through the embedded seeps. These fires inhibited woody plants and maintained an open, herbaceous-dominated community. In the absence of fire, a site may succeed to a forested seep or “baygall” community similar that found on 232Fa.6.4.30. Most surviving herbaceous seeps still burn regularly.

Ground Layer Species: Sedges—especially beakrush (*Rhynchospora* sp.) dominate the diverse ground layer. Yellow pitcher plant (*Sarracenia alata*) and Sand-Swamp Whitetop (*Rhynchospora latifolia*) are showy and conspicuous on many sites. Species from the *Drosera* and *Osmunda* species groups are common. Seeps may also contain rare or sensitive species such as tuberous grasspink (*Calopogon tuberosus*), yellow fringeless orchid (*Platanthera integra*), Snake-mouth orchid (*Pogonia ophioglossoides*), and roughleaf yelloweyed grass (*Xyris scabrifolia*).

Overstory Tree Species: Overstory-sized trees are rare, limited to occasional stunted longleaf pine, blackgum, and sweetbay magnolia. Unburned stands may succeed to a forested seep dominated by sweetbay magnolia, red maple, and swamp tupelo.

Understory Tree Species: Understory in fire-maintained seeps is sparse but will increase if burning ceases. Common species include redbay and saplings of longleaf pine, red maple, sweetbay magnolia and swamp tupelo.

Shrub Species: Limited in size and density on regularly burned sites, species include waxmyrtle, gallberry holly, possumhaw, laurel greenbriar, and hazel alder.

Similar LTPs: 232Fa.6.4.30 30 (wet forested seeps) are often continuous downstream from herbaceous seeps and also have species from the *Osmunda* group. In the absence of fire, herbaceous seeps may succeed to a forested seep community.

Special conditions: In presttlement times herbaceous seeps were maintained as open herb-dominated sites by the fires that burned into them from surrounding longleaf pine woodlands. Herbaceous seeps have become increasingly rare on the modern landscape as they succeed to forested seep communities and lose most of their herbaceous species due to lack of fire. Herbaceous seeps have also been called “bogs”, “pitcher plant seeps” or “seepage bogs”.

232Fa.6.3 Mesic Slopes and Terraces Landtype

232Fa.6.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana. It is found mainly on the northern (military-use) portion of the Vernon Unit of the Calcasieu Ranger District of Kisatchie National forest as well as on much of Fort Polk.

Geology: Sites are associated with the Blounts Creek member of the Fleming Formation.

Landform: Sites occur on middle to lower slopes and on small stream terraces, forming the transition zone between (usually pine-dominated) upper slopes and stream bottoms. Slope shape is linear to concave, and slope gradients are moderately steep to steep.

Soil Characteristics: This LTP occurs on a variety of coarse to medium-textured soil types. Increased soil moisture resulting from low topographic position and historically, topographic isolation from fire are more important than soil type in structuring vegetation on this LTP.

Hydrology: Soils are well drained, but contain more plant-available moisture than uplands because of their lower hydrological position on the landscape. Those associated with minor stream terraces may have seasonally high water tables and occasional saturated conditions in the subsoil. Sites are often dissected by small drainages.

Natural Disturbances and Processes: Moderately steep slopes and topographic isolation from uplands by the adjacent stream valleys reduced the occurrence and limited the impact of presettlement fires--resulting in low fire probability. However, on heavily burned landscapes such as portions of Fort Polk and the Calcasieu Ranger District of Kisatchie National Forest, repeated fires have reduced the extent of the mesic zone and shifted it lower on the slope than on less frequently burned landscapes. Within mesic forests, wind throw and individual tree mortality are the major disturbances.

Ground Layer Species: Members of the *Callicarpa*, *Chasmanthium*, and *Mitchella* species groups are common.

Overstory Tree Species: Important trees include white oak, southern red oak, post oak, sweetgum, loblolly pine, and shortleaf pine. American beech and southern Magnolia may occur on some sites.

Understory Tree Species: Understory trees include saplings of sweetgum, white oak, American beech, and southern magnolia, along with American holly and flowering dogwood.

Shrub Species: Species include American witchhazel, deerberry, and American beautyberry.

Similar LTPs: 232Fa.6.4.10 (mesic stream bottoms) are floristically similar. However they occur on stream bottoms, not slopes, and American beech and southern magnolia are more common.

232Fa.6.4 Minor Stream Bottoms Landtype

232Fa.6.4.10 White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana mainly on the northern (military-use) portion of the Vernon Unit of the Calcasieu Ranger District of Kisatchie National Forest as well as on much of Fort Polk.

Geology: Occurs on recent (Holocene) alluvial sands, silts, and loams associated with perennial and intermittent streams.

Landform: Occurs in the valleys of minor, often intermittent, headwater streams. Floodplains are poorly developed and usually much less than 100 m wide.

Soil Characteristics: Loamy, alluvial soils are generally mapped as the Guyton complex. Nutrient availability is medium to high and reaction is medium acid to strongly acid.

Hydrology: Streams are small and do not have well-developed floodplains. Stream gradients are steep, and upstream watershed is small so flooding occurs only intermittently during periods extremely high water flow and typically lasts less <5% of the growing season. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire is very infrequent on stream bottoms. However, frequent fires on adjacent uplands may burn to the edge of stream bottoms and restrict the encroachment of stream bottom vegetation onto the slopes. Erosion and deposition constantly change the course of stream channels and can undercut banks and cause trees to fall. Succession occurs mainly through individual tree mortality.

Ground Layer Species: Members of the *Chasmanthium*, *Mitchella*, and *Arisaema*, species groups are found. Occasionally species from the *Bignonia*, and *Justicia* species groups may be found in localized wet inclusions.

Overstory Tree Species: Trees include loblolly pine, white oak, blackgum, and sweetgum. American beech and southern magnolia also occur--particularly on sites with a long history of minimal disturbance.

Understory Tree Species: Understory trees include saplings of sweetgum, white oak, American beech, and southern magnolia, along with American holly, flowering dogwood, and Florida maple.

Shrub Species: Common species include deerberry, yaupon, and American beautyberry.

Similar LTPs: 232Fa.6.4.20 (wet-mesic stream bottoms) is similar, but occurs downstream on larger, better-developed floodplains where members of the *Justicia* group and flood-tolerant oaks are common. Under conditions of frequent fire in a longleaf pine-dominated landscape, the uppermost reaches of small streams may burn through frequently enough to support longleaf

pine communities. These “upland drains” are considered to be inclusions in longleaf pine uplands.

232Fa.6.4.20 American Beech-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana mainly on the northern (military-use) portion of the Vernon Unit of the Calcasieu Ranger District of Kisatchie National Forest as well as on much of Fort Polk.

Geology: Occurs on recent (Holocene) loamy alluvium.

Landform: Sites occur on the floodplains of medium sized, perennial streams. Floodplains are well developed, generally exceeding 100m in width. Microtopography consists of numerous small depressions, drainage channels, and mounds created as stream channels shift and flood waters scour and deposit alluvial materials. Slope gradient is nearly level.

Soil Characteristics: Occurs on loamy alluvial soils. Nutrient levels are medium, reaction ranges from weakly acid to very strongly acid, and soils belong to the Guyton complex. Because of irregular flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and mineral soil is often exposed. In low areas and old stream channels, soils may often be saturated. Drainage mottles can occur throughout the soil profile.

Hydrology: Streams associated with this landtype phase drain a moderately large watershed, and stream gradients are gentle so irregular flooding occurs. Flood duration, typically 5-12.5% of the growing season, increases with the size of the watershed and distance downstream.

Natural Disturbances and Processes: Fire occurs very infrequently on these floodplains. Erosion and deposition constantly change the course of stream channels. This can undercut banks and cause trees to fall. At the same time, new deposits of alluvial material are colonized by vegetation. Windthrow is also a significant natural disturbance.

Ground Layer Species: Members of the *Mitchella*, *Arisaema*, and *Bignonia* species groups are common. The *Justicia* group may be found in wet microsites.

Overstory Tree Species: The overstory includes a mixture of both mesic and flood-tolerant species including loblolly pine, water oak, willow oak, laurel oak, white oak, American beech, red maple, and southern magnolia.

Understory Tree Species: Understory trees include saplings of sweetgum, white oak, beech, and southern magnolia, along with American holly eastern hophornbeam, and American hornbeam.

Shrub Species: American snowbell and southern arrowwood are common.

Site Inclusions: Slightly lower, wetter areas may contain wetland species (the *Justicia* group) while localized areas of groundwater seepage support species from the *Osmunda* group.

Similar LTPs: LTP 232Fa.6.4.10 (mesic stream bottoms) may contain similar vegetation but occur on smaller headwater streams and generally lack bottomland oaks and the *Justicia* group.

232Fa.6.4.30 Sweetbay-Swamp Tupelo/Osmunda Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Located in the Southern Loam Hills Subsection (232Fa) in West-Central Louisiana mainly on the northern (military-use) portion of the Vernon Unit of the Calcasieu Ranger District of Kisatchie National Forest as well as on much of Fort Polk.

Geology: Occurs on the Blounts Creek member of the Fleming formation or on loamy and sandy recent alluvium.

Landform: Occurs on the floodplains of small, perennial streams or on headslopes of perennial or intermittent drainages where seepage of ground water occurs, especially in areas where surrounding soils are highly permeable sands with high water infiltration rates. Stream channels are shallow and poorly developed.

Soil Characteristics: Soils are very poorly drained, gray, loamy sands or sandy loams that are nearly continually saturated. Nutrient availability is very low and reaction is medium acid to strongly acid. Soils of adjacent uplands are often sandy soils with high infiltration rates. Soils belong to the Osier or Naconiche series.

Hydrology: Water originating from rainfall on adjacent uplands permeates the soils and flows laterally along impermeable subsurface layers until it reaches the surface. Water flow is slow and constant, resulting in saturated soil conditions for most of the year (a Semipermanently saturated hydrologic regime). Some streamside sites may flood intermittently.

Natural Disturbances and Processes: Topographic isolation from uplands and wet conditions limit the impact of fires, which are very infrequent. Windthrow and individual tree mortality are important disturbances.

Ground Layer Species: Species in the *Osmunda* group dominate. Netted chain fern (*Woodwardia areolata*) is often the principal ground cover. Other ferns, especially cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*) are also important. The *Arisaema* and *Mitchella* groups may be present on portions of some sites.

Overstory Tree Species: The overstory is a mixture of swamp tupelo, sweetbay magnolia, red maple, and water oak.

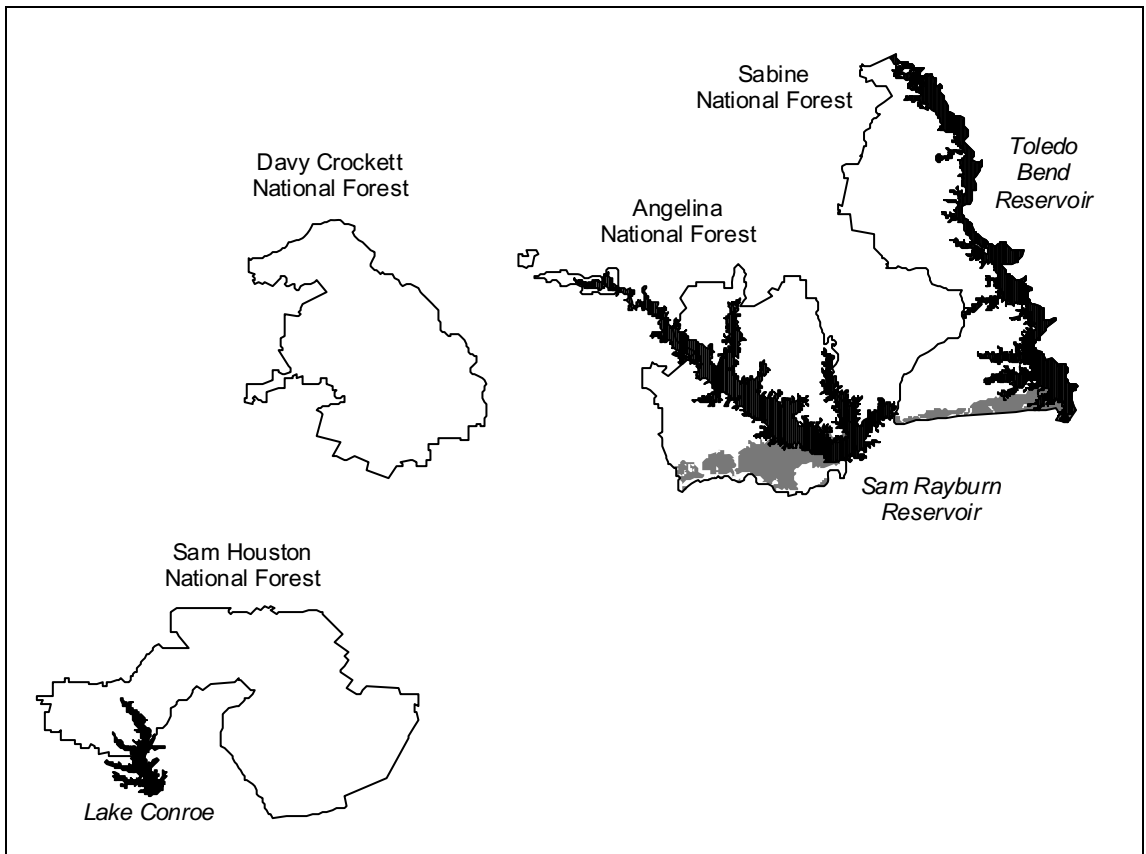
Understory Tree Species: Species include saplings of red maple, sweetbay magnolia, and swamp tupelo in addition to redbay.

Shrub Species: Species include evergreen bayberry, hazel alder, Virginia sweetspire, mountain azalea, possumhaw, gallberry holly, deciduous holly and southern arrow wood.

Similar LTPs: 232Fa.6.4.20 (wet mesic stream bottoms) may occasionally have areas of seepage with species from the *Osmunda* group but these are small, isolated inclusions. The sweetbay-swamp tupelo community can also occur higher on the landscape on minor drainages and headslope ravines, especially when fire is not present. Upslope, seepage communities tend to become more open and shrubby as the effects of upland fires become more pronounced. Herbaceous seeps (232Fa.1.1.40) have similar hydrology but generally occur high on the landscape, are open and herb-dominated, and include the *Drosera* species group.

CHAPTER 21

232Fa.15 MAYFLOWER UPLANDS LANDTYPE ASSOCIATION



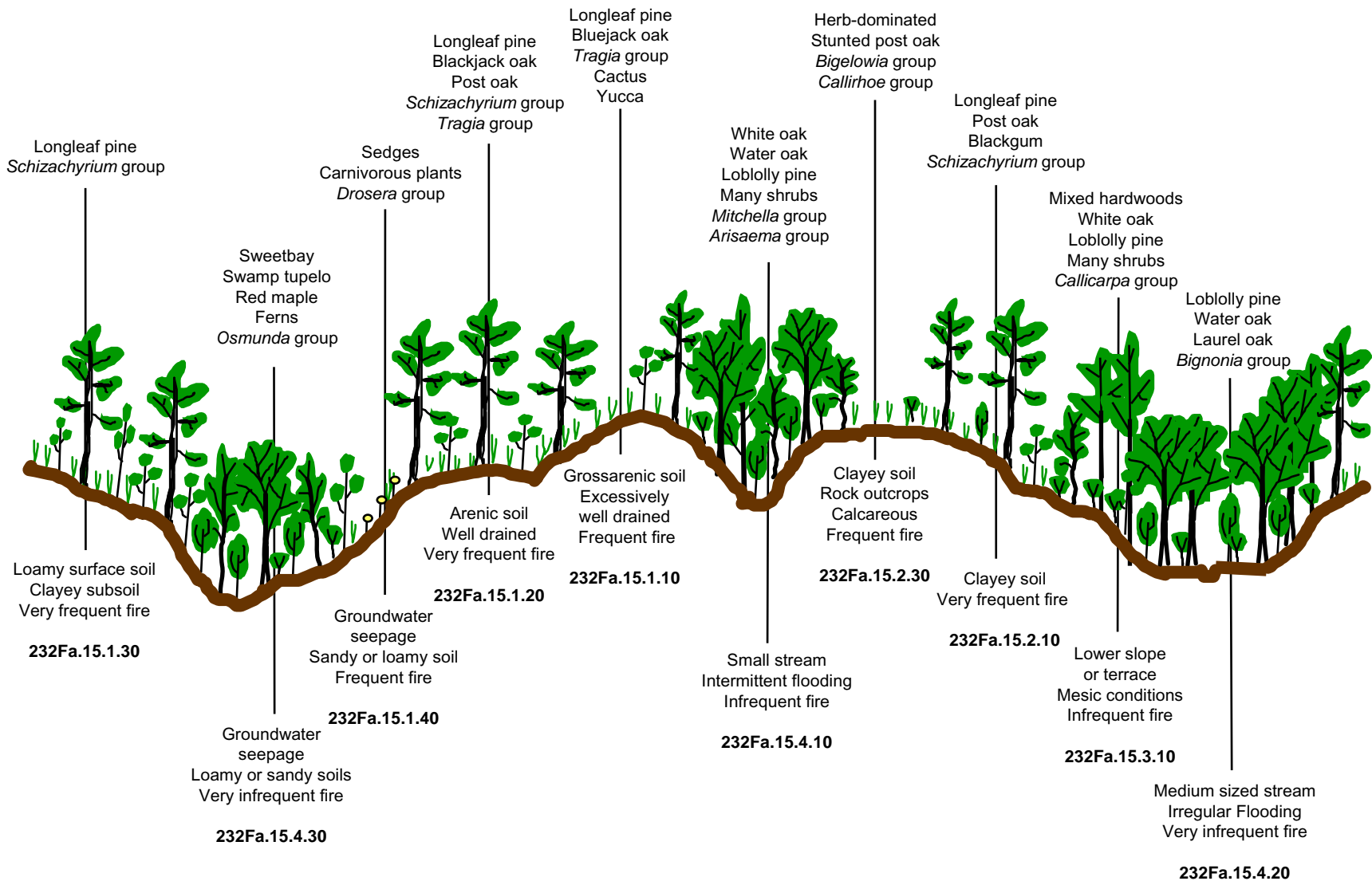


Figure 21.1 Landscape profile of ecosystems on the Mayflower Uplands Landtype Association.

232Fa.15 MAYFLOWER UPLANDS LANDTYPE ASSOCIATION



232Fa.15.1.10: Longleaf Pine-Bluejack Oak/*Tragia*
Grossarenic Dry Uplands (Angelina N.F. Compartment 92)



232Fa.15.1.20: Longleaf Pine-Blackjack Oak/*Schizachyrium*
Arenic Dry Uplands (Angelina N.F. Compartment 92)



232Fa.15.1.40: *Drosera* Sandy/Loamy Wet Herbaceous Seeps
(Angelina N.F. Compartment 92)



232Fa.15.1.40: *Drosera* Sandy/Loamy Wet Herbaceous Seeps
(Angelina N.F. Compartment 92)



232Fa.15.2.30: *Bigelovia-Callirhoe* Clayey Dry-Mesic
Catahoula Barrens (Angelina N.F. Compartment 84)



32Fa.15.4.10: White Oak-Water Oak/*Mitchella-Arisaema*
Loamy Mesic Stream Bottoms (Angelina N.F. Compartment 89)

KEY TO LANDTYPE PHASES

- 1a. Upper or middle slopes, undulating uplands, ridgetops, or small upland groundwater seepage areas; sites are typically pine-dominated. If lower than midslope, then sites are open pine-dominated woodlands. 2
- 1b. Lower or middle slopes, stream valleys, floodplains, deep ravines, or groundwater seepage areas on headslopes; sites are typically deciduous hardwood-dominated. 7
- 2a. well drained or excessively well drained sandy, arenic, or grossarenic soils, the upper 50cm or more with a texture of sand or loamy sand..... 3
- 2b. Loamy, clayey, or very thin soils; at least a portion of the upper 50cm is not sandy. **Or** if sandy, soils constantly wet from groundwater seepage. 4
- 3a. Uplands and narrow ridgetops with convex slopes. Soils are deep, sandy, or Grossarenic with a sandy surface layer at least 100cm thick and are commonly mapped as Tehran. Soils are excessively well drained and subject to frequent and prolonged drought. Overstory is often an open woodland of longleaf pine, blackjack oak, blackjack oak, and post oak. The *Tragia* and *Schizachyrium* groups are common.
232Fa.15.1.10 Longleaf Pine-Bluejack Oak/*Tragia*
 Grossarenic Dry Uplands
- 3b. Gentle to moderate upper slopes, broad uplands, and ridgetops. Arenic, well drained to excessively well drained soils with a sandy surface layer 50-100cm thick. Soils are often mapped as Letney and Stringtown. Regularly burned stands support an open woodland of longleaf pine, blackjack oak, and post oak. The *Schizachyrium* group is abundant; the *Tragia* group while often present, is less common than for 3a232Fa.15.1.20
 Longleaf Pine-Blackjack Oak/*Schizachyrium*
 Arenic Dry Slopes and Uplands
- 4a. Moderately well drained to somewhat poorly drained loamy soils (sandy loam surface soil greater than 25 cm thick over sandy clay loam or clayey subsoil) on gently to moderately sloping upper, middle, and occasionally, lower side slopes in some case extending down to the stream. Perched water table may be present in winter and spring. Soils Include Nikful, Corrigan, and Rayburn. Overstory of fire-maintained stands is dominated by longleaf pine, with some blackjack oak and post oak. Red maple and blackgum often occur in the understory; the *Schizachyrium* group is common and sundew, *Drosera brevifolia* may be present. The *Callicarpa* and *Chasmanthium* groups are common on unburned sites.
232Fa.15.1.30 Longleaf Pine/*Schizachyrium*-*Drosera*
 Loamy Dry-Mesic Uplands
- 4b. Soils clayey to within 25cm or less of the surface, deep or shallow to bedrock **or** constantly wet sandy or loamy soils associated with groundwater seep areas where the *Drosera* species group is common. 5
- 5a. Deep, wet, gray sandy or sandy loam soils over an impermeable subsurface layer; associated with areas of groundwater seepage. Overstory is typically sparse or absent; the *Drosera* and *Osmunda* species groups are common. Yellow pitcher plant (*Sarracenia alata*) may be conspicuous.
 232Fa.15.1.40 *Drosera* Sandy/Loamy Wet Herbaceous Seeps
- 5b. Clayey soils, deep or shallow to sandstone or siltstone. Soils are not constantly wet due to groundwater seepage and the *Drosera* and *Osmunda* groups are rare or absent. 6

- 6a. Deep, moderately to very strongly acid clayey soils mapped as Kisatchie, Browndell, or Corrigan. Outcrops of tuffaceous siltstone or sandstone may be present. Soils are moderately well drained to somewhat poorly drained and usually have shrink-swell properties and gilgai microtopography. Loam or sandy clay surface layers are less than 25 cm thick and subsoil is clay. Regularly burned sites develop into open woodlands with longleaf pine, post oak, and blackjack oak. The *Schizachyrium* and *Chasmanthium* groups are common; occasionally some members of the *Drosera* group may be present.232Fa.15.2.10 Longleaf Pine/*Schizachyrium*
Clayey Dry-Mesic Uplands
- 6b. Shallow, slightly acid to alkaline, clay loam to clay soils formed from tuffaceous sandstones or siltstones of the Catahoula formation. Soils are very slowly permeable and somewhat poorly drained. Outcrops of sandstone or siltstone may be present. Soils are mapped as Browndell-Rock outcrop and Kisatchie. Overstory trees are absent except for scattered thickets of post oak. The *Bigelowia* and *Callirhoe* groups are common in open areas, the *Chasmanthium* group in oak thickets.232Fa.15.2.30 *Bigelowia-Callirhoe*
Clayey Dry-Mesic Catahoula Barrens
- 7a. Constantly wet or saturated groundwater seepage areas (baygalls) at the head of, adjacent to, or within the floodplains of small perennial streams. Soils are grey sandy loams over loam subsoil and are mapped as Corrigan or Koury. Overstory includes sweetbay, swamp tupelo, red maple, and redbay. Gallberry holly is usually present in the understory and the *Osmunda* species group is common.232Fa.15.4.30 Sweetbay-Swamp Tupelo/*Osmunda*
Loamy Wet Forested Seeps ...
- 7b. Lower slopes, stream bottoms, terraces, or floodplains. Soils are not constantly wet or saturated; the *Osmunda* species group is rare or absent. 8
- 8a. Gently to moderately sloping middle or lower side slopes or small terraces above stream bottoms. Deciduous hardwood and mixed pine-hardwood forests occur under natural conditions. The *Callicarpa* and *Chasmanthium* species groups are abundant and the *Mitchella* group is usually present.232Fa.15.3.10 White Oak-Loblolly Pine/*Callicarpa*
Loamy Mesic Lower Slopes and Terraces
- 8b. Riparian areas or floodplains of intermittent or perennial streams. 9
- 9a. Small, intermittent or perennial stream bottoms without well-developed floodplains. Flooding is intermittent and floodplains are usually less than 100 m wide. Soils are Commonly mapped as luka, lulus, Bessner, and Marietta. Overstory includes white oak, water oak, American beech, American basswood, Loblolly pine, and shortleaf pine. Florida maple and American holly occur in the understory. The *Mitchella* group is common, and *Arisaema* group occurs locally, but the *Bignonia* group is less common than for 9b. 232Fa.15.4.10 White Oak-Water Oak/*Mitchella-Arisaema*
Loamy Mesic Stream Bottoms
- 9b. Level to gently sloping, moderately wide floodplains of intermediate-sized perennial streams. Flooding occurs irregularly, and floodplains are more than 100 m wide. The soil litter layer is usually thin or absent and drainage mottles are common throughout the profile. Soils Include Mantachee and Ozias. Overstory is a mixture of mesic and flood-tolerant species such as water oak, white oak, American beech, willow oak, laurel oak, blackgum, and swamp chestnut oak. The *Bignonia* group is common in addition to the *Mitchella* group. The *Justicia* group is present in wetter depressions.232Fa.15.4.20 Willow Oak-Laurel Oak/*Bignonia*
Loamy Wet-Mesic Stream Bottoms

LANDTYPE PHASE DESCRIPTIONS

232Fa.15.1 Sandy/Loamy Uplands Landtype

232Fa.15.1.10 Longleaf Pine-Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Occurs on deep sands on the Catahoula, Whitsett, and Nash Creek Formations. It also occurs on outliers of the Willis formation.

Landform: Occurs on uplands, ridgetops, and associated convex middle and upper slopes. Slope gradients are moderate to steep.

Soil Characteristics: Soils consist of a very deep excessively well drained loamy sand surface soil over coarse sand subsoil. The B horizon, if present, is generally deeper than 100 cm from the surface. Soils are droughty and nutrient-poor. They are mapped primarily as Tehran soils.

Hydrology: The sandy soils are rapidly permeable and excessively well drained, so rainfall percolates downward quickly. Long periods of drought occur during the warmer months.

Natural Disturbances and Processes: Under presettlement conditions stands experienced frequent low intensity surface fires fueled by dry grasses and longleaf pine needles which were ignited by lightning from summer thunderstorms or by man. Fires may not have been as frequent or as intense as for the surrounding less droughty uplands because sparse vegetation limited fuel loads. Fire inhibits the establishment of most woody species and favors longleaf pine. Unburned sites tend to develop denser woody understory although extreme soil conditions alone may be enough to maintain a somewhat open site.

Ground Layer Species: Species from the *Tragia* species group, including Louisiana yucca (*Yucca louisianensis*) and eastern prickly pear (*Opuntia humifusa*), are common. Species from the *Schizachyrium* group, while common, are less abundant than for surrounding less-droughty sites. Little bluestem (*Schizachyrium scoparium*) may constitute the majority of ground cover. Significant patches of bare ground or areas covered by lichens (*Cladonia* and *Cladina* spp.) are also present

Overstory Tree Species: The overstory is an open woodland where a mixture of longleaf pine, bluejack oak, post oak, black hickory, and blackjack oak dominates.

Understory Tree Species: Sand post oak, stunted or sapling bluejack oak, and sassafras are common.

Shrub Species: On frequently burned sites, shrubs are widely scattered. Common species include Louisiana yucca, farkleberry, dwarf pawpaw, and fragrant sumac.

Site Inclusions: On very dry, isolated ridgetops with deep sands, extremely xeric conditions may restrict the establishment and growth of longleaf pine and the *Schizachyrium* group. These areas, which have very low productivity, may not produce enough fuel to carry fires and will support an open oak woodland of blackjack oak, post oak, bluejack oak, and black hickory. Since precipitation rapidly infiltrates into the sandy soils of these sites resulting in significant

groundwater recharge, herbaceous seeps may be embedded in or adjacent to this landtype phase.

Similar LTPs: 232Fa.15.1.20 occurs on similar upland landscape positions but the sandy surface soil is not as deep, the *Schizachyrium* group is more dominant, and the *Tragia* group, while typically present, is less common.

232Fa.15.1.20 Longleaf Pine-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Occurs on the Catahoula, Whitsett, and Nash Creek Formations. It also occurs on outliers of the Willis formation.

Landform: Located on middle and upper slopes, broad uplands, and ridgetops. Slope shape is convex with moderately steep slopes. Due to the openness of the overstory, sites with a south or west slope aspect may have a somewhat hotter, drier microclimate than those sites with a north or east aspect.

Soil Characteristics: Soils are well drained to excessively well drained and have a loamy sand surface layer 50-100cm thick over sandy clay loam subsoil. Nutrient availability is very low, Soil reaction is strongly acid to very strongly acid, and soils are usually mapped as Letney, Stringtown, or similar series.

Hydrology: Soils are coarse-textured, well drained to excessively well drained, highly permeable and have low water holding capacity. They are subject to drought during periods of low rainfall especially in the summer.

Natural Disturbances and Processes: Under presettlement conditions stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and a moderately dense woody understory develops and eventually shades out much of the grassy ground layer. While most modern stands no longer experience regular fire, limited areas on Angelina National Forest (mostly in the "Longleaf Ridge" area) burn regularly and still support longleaf pine communities.

Ground Layer Species: The ground layer is dominated by Little bluestem (*Schizachyrium scoparium*) and other species from the *Schizachyrium* group. Species from the *Tragia* group, while diagnostic, are less abundant than for Grossarenic uplands (232Fa.15.1.10). On unburned sites, the *Chasmanthium* and *Callicarpa* groups become established.

Overstory Tree Species: Regularly burned stands are open woodlands dominated by longleaf pine. Blackjack oak and post oak are common hardwood associates. Unburned sites develop varying mixtures of hardwoods and shortleaf, loblolly and longleaf pine.

Understory Tree Species: Understory in fire-maintained stands is sparse and consists mainly of longleaf pine saplings and occasional oaks. Woody understory—sassafras, saplings of upland oaks, blackgum, and occasionally, sweetgum, will increase on sites that do not experience regular burning.

Shrub Species: Shrubs are widely scattered on frequently burned sites but unburned sites develop a dense shrub layer. Common species include farkleberry, flameleaf sumac, dwarf pawpaw, wax-myrtle, and yaupon.

Similar LTPs: 232Fa.15.1.10 occurs on a similar landscape position, but has very deep sandy soils and species from the *Tragia* group are more abundant.

232Fa.15.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Occurs on the Catahoula, Whitsett, and Nash Creek formations.

Landform: Found on upper, middle and lower gentle to moderate slopes, often lower on the landscape than Arenic Dry Uplands.

Soil Characteristics: Soils consist of sandy loams over sandy clay loam or clay subsoil. Soils are moderately well to somewhat poorly drained, and a perched water table may be present during winter or spring. They are mapped as Nikful, Corrigan, and Rayburn soils.

Hydrology: Loamy soils and often lower slope position result in higher moisture retention, seasonally perched water tables, and shorter drought periods. This LTP as described from the reference site samples is slightly “wetter” than equivalent LTPs from other landtype associations such as 232Fa.2.1.30.

Natural Disturbances and Processes: Under presettlement conditions most stands experienced frequent or very frequent fire with natural fire return intervals as short as 1-3 years. These fires were low intensity surface fires fueled by dry grasses and longleaf pine needles. They were ignited by lightning from summer thunderstorms or by man. Fire inhibits the establishment of most woody species and favors longleaf pine. When burning ceases these stands begin to succeed to closed canopy forest and rapidly (over a period of 1-2 decades) develop a dense woody understory which shades out the grassy ground layer. Once this happens it is very difficult to control woody understory, restore the grassy ground layer, and cause a stand to revert back to longleaf pine woodland even with frequent prescribed fire. While many modern stands no longer experience regular fire and have become mixed pine-deciduous forests, limited areas on Angelina National Forest (mostly in the “Longleaf Ridge” area) burn regularly and still support longleaf pine communities.

Ground Layer Species: Species from the *Schizachyrium* are common to abundant and *Schizachyrium scoparium* usually dominates. Certain species from the *Drosera* group especially dwarf sundew (*Drosera brevifolia*) may be present on some sites; however, most species in that group including yellow pitcher plant (*Sarracenia alata*) are restricted to herbaceous seeps and do not occur here. On unburned sites, the *Chasmanthium* and *Callicarpa* groups dominate.

Overstory Tree Species: Longleaf pine dominates the overstory of regularly-burned stands. Occasional blackjack oak or post oak may also occur. Unburned stands develop a closed-canopy forest with a mixture of oaks, pines, hickories, sweetgum and other hardwoods.

Understory Tree Species: Understory trees are sparse on frequently burned sites and consist mainly of longleaf pine saplings and occasional blackjack oak or blackgum. Unburned stands rapidly develop a dense midstory of sweetgum and other young hardwoods such as red maple and flowering dogwood that shade out the species-rich herbaceous layer.

Shrub Species: Shrubs are sparse on frequently burned sites. Species include wax-myrtle, farkleberry, and littlehip hawthorn. American beautyberry rapidly becomes abundant on unburned sites.

Site Inclusions: Herbaceous seeps may occur as small inclusions where sandstone or siltstone outcrops at or near the surface, causing groundwater to exit a hillside as surface flow.

Similar LTPs: 232Fa.15.1.20 (Dry Arenic uplands) occurs on upper side slopes and ridgetops but has sandy soils and species from the *Tragia* group.

Special Conditions: Since this landtype phase has a more favorable environment for mesic species than Arenic Dry Uplands, encroachment of these species occurs rapidly if fire is excluded. This LTP as described from the reference site samples is slightly “wetter” than equivalent LTPs from other landtype associations such as 232Fa.2.1.30.

232Fa.15.1.40 *Drosera* Sandy/Loamy Wet Herbaceous Seeps Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Sites usually occur where the younger, sandier Willis formation overlies the Catahoula formation. They may also occur on the Eocene-aged Whitsett and the Nash Creek formations, which are similar to the Catahoula.

Landform: Occurs in uplands on side slopes or heads of drainages. Most sites are small, generally covering less than one hectare; however, they provide unique habitat and their species composition is strikingly different from the surrounding uplands.

Soil Characteristics: Soils consist of very poorly drained, deep, gray, loamy sand over an impermeable layer of clay, sandstone, or siltstone. The surface remains wet year round and nutrient availability, especially nitrogen, is usually very low. Soil reaction is very strongly acid. Soils are mapped as the surrounding non-wetland soils but are more similar to the Naconiche or Osier series.

Hydrology: Precipitation originating on upper slopes rapidly permeates the sandy soils of the surrounding landscape and flows laterally along an impermeable subsurface layer until it exits the hillside. Water flow is usually slow and constant, resulting in saturated soil conditions most of the year (a semipermanently to nearly permanently saturated hydrologic regime). Seeps often form the head of small streams that become better developed as one moves downslope.

Natural Disturbances and Processes: Historically, frequent, low-intensity surface fires sweeping through the surrounding longleaf pine-dominated landscape burned through the embedded seeps. These fires inhibited woody plants and maintained an open, herbaceous-dominated community. In the absence of fire, a site may succeed to a forested seep or “baygall” community similar that found on 232Fa.15.4.30. Most surviving herbaceous seeps still burn regularly.

Ground Layer Species: The herbaceous community is species-rich and species from the *Drosera* group are abundant. Yellow pitcher plant (*Sarracenia alata*) occurs exclusively on herbaceous seeps, although it may not be found at every site. Sphagnum moss (*Sphagnum* spp.), dwarf sundew (*Drosera brevifolia*), and clubmoss (*Lycopodiella* spp.) are common and beakrushes (*Rhynchospora* spp.) may be the dominant ground cover. Species from the

232Fa.15 Mayflower Uplands Landtype Association

Osmunda group may also occur. Several sensitive species are found in herbaceous seeps, including roughleaf coneflower (*Rudbeckia scabrifolia*), tuberous grasspink (*Calopogon tuberosus*), yellow fringeless orchid (*Platanthera integra*), and roughleaf yelloweyed grass (*Xyris scabrifolia*).

Overstory Tree Species: Trees are typically restricted to scattered individuals of longleaf pine, sweetbay magnolia, red maple, or swamp tupelo. Unburned stands may succeed to a forested seep community dominated by sweetbay magnolia, red maple, and swamp tupelo.

Understory Tree Species: Understory trees are sparse on regularly burned seeps. Common species include redbay and saplings of sweetbay magnolia, swamp tupelo, and longleaf pine. Understory becomes dense on unburned sites.

Shrub Species: Shrubs in fire-maintained seeps are sparse but include wax-myrtle, evergreen bayberry, gallberry holly, poison sumac, possumhaw, laurel greenbriar, and hazel alder. Shrubs form dense thickets on unburned seeps.

Similar LTPs: Herbaceous seeps have hydrologic and floristic similarities (especially with respect to woody species and the *Osmunda* group) with forested seeps (LTP 232Fa.15.4.30); however, forested seeps typically occur lower on the landscape on headslopes or in stream valleys and lack the *Drosera* group. Forested seeps are often continuous downstream from herbaceous seeps.

Special conditions: In presttlement times herbaceous seeps were maintained as open herb-dominated sites by the fires that burned into them from surrounding longleaf pine woodlands. Herbaceous seeps have become increasingly rare on the modern landscape as they succeed to forested seep communities and lose most of their herbaceous species due to lack of fire. Herbaceous seeps have also been called “bogs”, “pitcher plant seeps” or “seepage bogs”.

232Fa.15.2 Clayey Uplands Landtype

232Fa.15.2.10 Longleaf Pine/*Schizachyrium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Occurs on the Catahoula, Whitsett, and Nash Creek formations. Terrain is gently rolling to steep.

Landform: Landform includes middle and upper slopes and broad undulating uplands. Slope shape is linear or convex with moderate to steep slopes.

Soil Characteristics: Soils consist of a clay loam or sandy clay loam surface layer over a clay subsoil which is within 30cm (usually within 10 cm) of the surface. In some places the soil is very thin over mudstone or the tuffaceous sandstone parent material which may occasionally outcrop at the surface. Available nutrients are very high and soil reaction is moderately acid to very strongly acid. Soils are mapped as Kisatchie, Browndell, and Corrigan.

Hydrology: The clayey subsoil is somewhat poorly drained to moderately well drained, and slowly permeable. Once dry, soils resist rewetting thereby extending drought periods.

Natural Disturbances and Processes: In presettlement times, frequent to very frequent, low-intensity surface fires burned through these uplands during the growing season, with the fire

interval on a particular site influenced by topographic isolation and soil moisture. Repeated fire inhibits the establishment of woody understory species and maintains an open overstory canopy. Many modern stands no longer burn and have developed a dense understory of shrubs and small trees.

Ground Layer Species: On fire-maintained sites, the *Schizachyrium* group is dominant, and some species from the *Chasmanthium* and *Callicarpa* groups may also be present. The *Casmanthium* and *Callicarpa* groups dominate unburned sites. Patches of vegetation may be interspersed with areas of exposed sandstone or siltstone.

Overstory Tree Species: Overstory is usually sparse, with longleaf pine and varying amounts of post oak and blackjack oak the dominant species. Hardwoods such as post oak, blackjack oak, and black hickory, along with some longleaf pine, shortleaf pine, or loblolly pine will dominate unburned sites. Hardwoods are generally more common, even on repeatedly-burned sites, than on loamy or arenic dry-mesic uplands.

Understory Tree Species: Small trees are usually sparse on fire-maintained sites. Common species include saplings of post oak, blackgum and sweetgum along with white fringetree. Eastern red cedar may occur in openings on unburned sites. Understory density increases on sites that experience little or no fire.

Shrub Species: Shrubs are sparse in the understory of fire-maintained sites. Common species include wax-myrtle, parsley hawthorn, and yaupon. A dense understory of these species typically develops on unburned sites.

Similar LTPs: This landtype phase may be transitional to 232Fa.15.2.30, which occurs on shallow, clayey Browndell-Rock outcrop soils or Kisatchie soils, lacks a well-developed overstory, and has strikingly different ground layer species composition. 232Fa.15.1.30 also occurs on uplands, but has well drained loamy soils.

232Fa.15.2.30 *Bigelowia-Callirhoe* Clayey Dry-Mesic Catahoula Barrens Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Occurs exclusively on the Catahoula formation. Terrain is slightly rolling to steep.

Landform: Barrens are usually found on upper slopes and ridgetops on thin soils or where sandstone outcrops at the surface. Slope gradients are nearly level to moderate. Areal extents range from less than 1 to over 100 ha.

Soil Characteristics: Occurs on clay-loam and clay soils formed from tuffaceous sandstone or siltstone. Soils contain montmorillinitic clays, so they shrink and swell with changes in moisture content. Pavement-like outcrops of sandstone and mudstone can occur on some sites. Surface soils are slightly acid to alkaline, and nutrient availability is very high. Soils are mapped as Browndell-Rock Outcrop and Kisatchie. Soils are subject to severe compaction and erosion if disturbed.

Hydrology: Soils are very slowly permeable and somewhat poorly drained. Soils may be saturated during the winter and early spring, but they become hard and dry during summer droughts and once dry, resist rewetting. Doughtiness, shallow rooting depth, and aluminum toxicity cause severe stress to woody vegetation.

Natural Disturbances and Processes: While these sites do not burn as easily as the surrounding uplands, the frequent, low-intensity fires that burned the adjacent longleaf pine-dominated landscape would often sweep through these small openings in the forest. Repeated fires, in combination with unique edaphic properties, limit woody vegetation. Currently, many of the adjacent woodlands (LTP 232Fa.15.2.10) are oak-dominated and fire is rare on many sites.

Ground Layer Species: The ground layer is strikingly different from the more common loamy or arenic longleaf pine uplands. The *Bigelowia* group is abundant, and members of the *Callirhoe* group may also be common. Ground cover under scattered oak thickets and surrounding oak woodlands is dominated by the *Chasmanthium* group (frequent fire would stimulate the *Schizachyrium* group). Several sensitive species, including Texas sunnyside (*Schoenilirion wrightii*), Navasota ladies tresses (*Spiranthes parksii*), and slender gayfeather (*Liatris tenuis*), occur on this landtype phase.

Overstory Tree Species: Well-developed overstory is usually absent except for small, scattered thickets of post oak, black hickory, and blackjack oak.

Understory Tree Species: Understory trees are mainly restricted to oak thickets and include saplings of post oak, blackjack oak, sweetgum, and white ash along with white fringetree. Eastern redcedar may occur on unburned sites.

Shrub Species: Shrubs are generally restricted to scattered thickets and to the edges of the barrens opening. Species include yaupon, parsley hawthorn, cockspur hawthorn, and eastern baccharis. Shrubs and small trees will gradually encroach if fire is eliminated.

Site Inclusions: Small oak thickets are scattered throughout most sites. Surrounding the open barrens are woodlands (232Fa.15.2.10) dominated by hardwoods such as post oak and black hickory, along with some longleaf or loblolly pine.

Similar LTPs: 232Fa.15.2.10 occurs on clayey soils, but has a woodland overstory of longleaf pine and/or oaks, and the *Bigelowia* group is rare or absent.

232Fa.15.3 Mesic Slopes and Terraces Landtype

232Fa.15.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Occurs on the Catahoula, Whitsett, and Nash Creek formations. Terrain is gently rolling to steep.

Landform: Occurs on middle to lower slopes and on terraces above small streams. Slope shape is linear to concave, and slope gradients are moderate to very gentle.

Soil Characteristics: This LTP occurs on a variety of soil types. Increased soil moisture resulting from low topographic position and historically, topographic isolation from fire are more important than soil type in structuring vegetation on this LTP. Textures range from loamy sand to sandy loam, loam, and silt loam over loamy or clayey subsoil. Surface soils have moderate nutrient content and drainage mottles may be present in the subsoil. Soils include Attoyac, Alazan, Bernaldo, Bessner, Cuthbert, Eastwood, Keithville, Lovelady, Sawlit, Sawtown, and Rentzel.

Hydrology: Soils are well drained or somewhat poorly drained, and are typically moister than uplands because of their lower hydrological position on the landscape. Those associated with minor stream terraces may have seasonally high water tables and occasional saturated conditions in the subsoil. Sites are often dissected by small drainages.

Natural Disturbances and Processes: Fires are infrequent on lower slopes and terraces their influence on vegetation is usually minimal. In an unusually dry period, fires that originate on uplands may burn down to a lower slope, where there may be sufficient fuel to carry a low-intensity surface fire. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups such as sessile flowered woodoats (*Chasmanthium sessiliflorum*) and devil's grandmother (*Elephantopus tomentosus*) are abundant and the *Mitchella* group may be locally common. On sites with a mature, closed overstory canopy, herbaceous cover may be sparse.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods and pines. Relative dominances of hardwood and pine species can vary greatly from site to site, but most sites with no recent large-scale disturbances will eventually be dominated by hardwoods. Important trees include white oak, southern red oak, cherrybark oak, white ash, blackgum, mockernut hickory, bitternut hickory, loblolly pine, and shortleaf pine. American beech and southern magnolia are also present on some sites.

Understory Tree Species: Common understory trees include saplings of red maple and sweetgum along with American holly, winged elm, eastern hophornbeam, and flowering dogwood.

Shrub Species: American beautyberry, parsley hawthorn, southern arrowwood, farkleberry, Carolina buckthorn, and yaupon are common shrubs.

Similar LTPs: 232Fe.15.4.10 occurs on gentle toeslopes and poorly developed floodplains directly adjacent to small streams and both the *Mitchella* and *Arisaema* groups are usually present.

232Fa.15.4 Minor Stream Bottoms Landtype

232Fa.15.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with perennial and intermittent stream valleys.

Landform: Occurs on toeslopes and poorly developed floodplains of narrow stream bottoms. Floodplains are less than 100m wide, slope shape is concave to linear, and slope gradients are gentle to very gentle.

Soil Characteristics: Soils are generally sandy loams over heterogeneous parent material or bedrock. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is

medium acid to strongly acid, and available nutrients are low to medium. Drainage mottles are common in the subsoil. Soils are often mapped as luka, lulus, Bessner, and Marietta.

Hydrology: Streams associated with this landtype phase are small and they do not have well-developed floodplains. Stream gradients are relatively steep and upstream watershed is small, so flooding only occurs intermittently. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire is infrequent on stream bottoms and has minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels, undercutting banks and causing trees to fall. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa*, *Chasmanthium*, and *Mitchella* groups are common to abundant. On favorable microsites species from the *Arisaema* group may be present.

Overstory Tree Species: The overstory is composed of a variety of hardwood and pine species including white oak, southern red oak, American beech, water oak, mockernut hickory, loblolly pine, southern magnolia, sweetgum, shortleaf pine, and longleaf pine.

Understory Tree Species: Common species include Florida maple, American holly, eastern hophornbeam, common pawpaw, and white fringetree along with saplings of blackgum, mockernut hickory and American basswood.

Shrub Species: The shrub layer includes American beautyberry, southern arrowwood, and common sweetleaf.

Similar LTPs: 232Fa15.4.20 occupies a similar landscape position on stream bottoms. However, the streams have well-developed floodplains, are subject to irregular flooding, and the *Bignonia* group is common.

232Fa.15.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with perennial stream valleys.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Floodplain width is normally greater than 100 meters. Slope shape is concave to linear, and slope gradients are nearly level. Microtopography on some sites consists of numerous small depressions, drainage channels, and mounds created as stream channels shift and flood waters scour and deposit alluvial materials.

Soil Characteristics: Soils formed in alluvial material and consist of sandy loam to loamy sand over heterogeneous alluvial parent material. Depth to the subsoil may be over 100 cm. Because of flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface and on some areas mineral soil is exposed. In low areas and old stream channels, soils may be semipermanently saturated. Drainage mottles occur throughout the soil profile. Soil reaction

ranges from moderately alkaline to very strongly acid, and available nutrients are low to medium. Soils are generally Entisols and are usually mapped as the Mantachee and Ozias series.

Hydrology: The streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle, so irregular flooding occurs. Duration of flooding, typically 5-12.5% of the growing season, increases with the size of the watershed.

Natural Disturbances and Processes: Fire occurs very infrequently on stream floodplains and has minimal influence on vegetation. Erosion and deposition constantly change the course of stream channels, undercutting stream banks and causing trees fall. At the same time, new deposits of alluvial material are colonized by vegetation. Windstorms may also uproot or damage overstory trees.

Ground Layer Species: Species from the *Bignonia* group dominate the ground layer, including caric-sedges (*Carex* spp.), rushes (*Juncus coriaceus*), and crossvine. On slightly elevated mounds, species from the *Mitchella* and *Callicarpa* groups are important. Members of the *Arisaema* group may also occur. Looseflower waterwillow (*Justicia ovata*) may occur in wet depressions and drainage channels. On immediate stream banks and saturated depressions, ferns such as netted sensitive fern (*Onoclea sensibilis*) and common ladyfern (*Athyrium filix-femina*) are often common.

Overstory Tree Species: Overstory includes a mixture of mesic and flood-tolerant species including willow oak, laurel oak, blackgum, sweetgum, water oak, swamp chestnut oak, cherrybark oak, white oak, and Loblolly pine.

Understory Tree Species: Common species include red maple, green ash, and American basswood saplings along with American hornbeam and river birch.

Shrub Species: Shrubs include dwarf palmetto, gulf sebastiana, parsley hawthorn, Elliott's blueberry, and smallflower blueberry.

Site Inclusions: Slight differences in elevation, sometimes less than 1 meter, may mean a profound change in species composition. Examples include pimple mounds, which may contain species more characteristic of mesic lower slopes than floodplains. Likewise, small, wet depressions and channels provide habitat for obligate wetland species.

Similar LTPs: 232Fa.15.4.10 is associated with stream bottoms, but the streams are smaller with narrow valleys and little or no floodplain, and the *Mitchella* group is common. Downstream, sites grade into Seasonally Flooded River Floodplains such as 232Fd.4.2.10.

232Fa.15.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Located in southeast Texas including the southern portion of Angelina National Forest south of Caney Creek Recreation Area and the southern portion of Sabine National Forest south of a line from Brookeland east to Willow Oak Recreation Area.

Geology: Includes the Catahoula, Whitsett, and Nash Creek formations or recent (Holocene) alluvial sands associated with perennial stream valleys.

Landform: Occurs on the floodplains of small, perennial streams or on headslopes of small drainages, where underground water flow exits a hillside as a seep. Stream channels are often poorly developed.

Soil Characteristics: Soils are generally deep gray loamy fine sands and are poorly drained and continually wet. Soil reaction is medium acid to strongly acid and available nutrients are very low. Soils are mapped primarily as Corrigan and Koury but are more consistent with the Osier or Naconiche series.

Hydrology: Soils are very poorly drained. Continual ground water seepage results in a semipermanently to nearly permanently saturated hydrologic regime. Some sites near larger streams are also subject to intermittent flooding.

Natural Disturbances and Processes: Fire is very infrequent on forested seeps and has minimal influence on vegetation. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species in the *Osmunda* group dominate. Netted chain fern (*Woodwardia areolata*) is often the principal ground cover. Other ferns, especially cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*) are also important. The *Arisaema* group may also be present on portions of some sites.

Overstory Tree Species: Common trees include sweetbay magnolia, swamp tupelo, and red maple. Water oak and loblolly pine may also be found on mesic microsites.

Understory Tree Species: Species include saplings of red maple and green ash along with redbay.

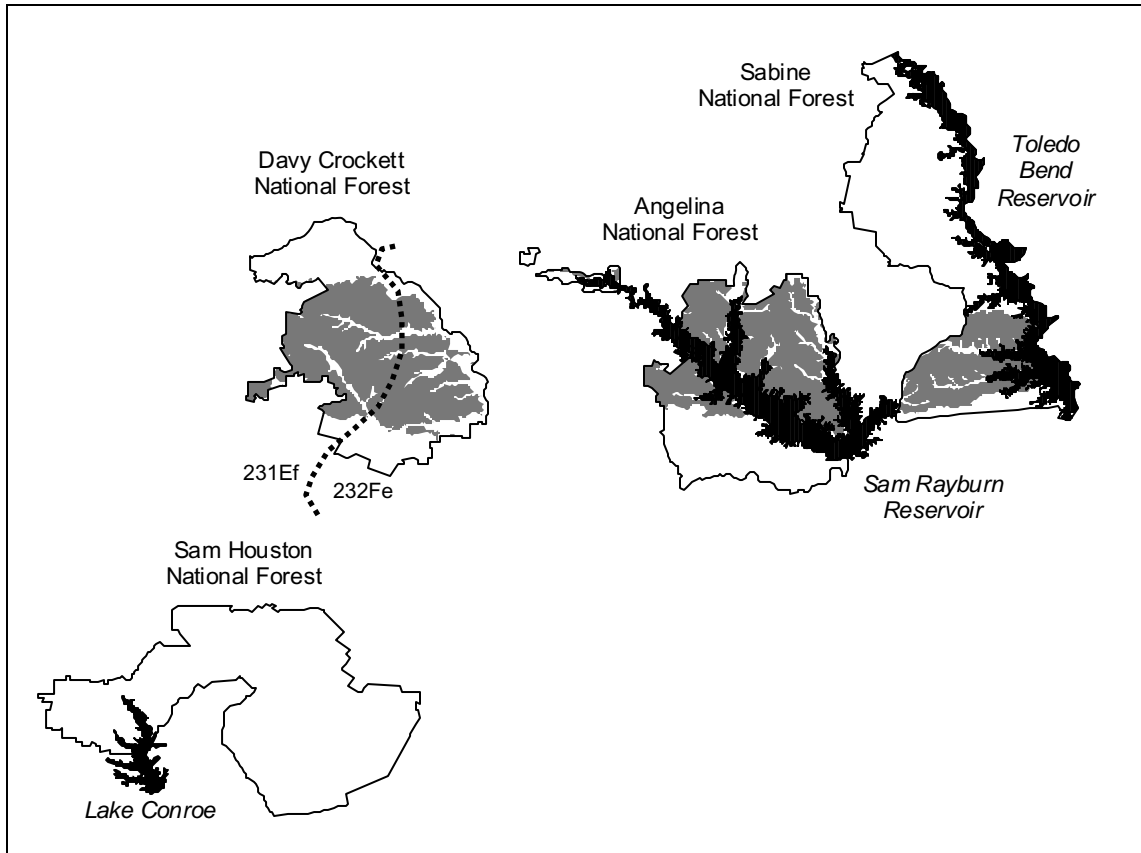
Shrub Species: Shrubs include evergreen bayberry, early azalea, Arkansas blueberry, deciduous holly, gallberry holly, and occasionally, poison sumac. Laurel greenbriar is a characteristic woody vine.

Site Inclusions: Slightly higher, more mesic microsites contain species from the *Mitchella* and *Arisaema* groups.

Similar LTPs: 232Fa.15.4.20 which occurs on well-developed floodplains where the *Bignonia* group is common may have isolated saturated or seepy inclusions which support species from the *Osmunda* group.

CHAPTER 22

232Fe.13 (231Ef.13) CLAYEY UPLANDS LANDTYPE ASSOCIATION



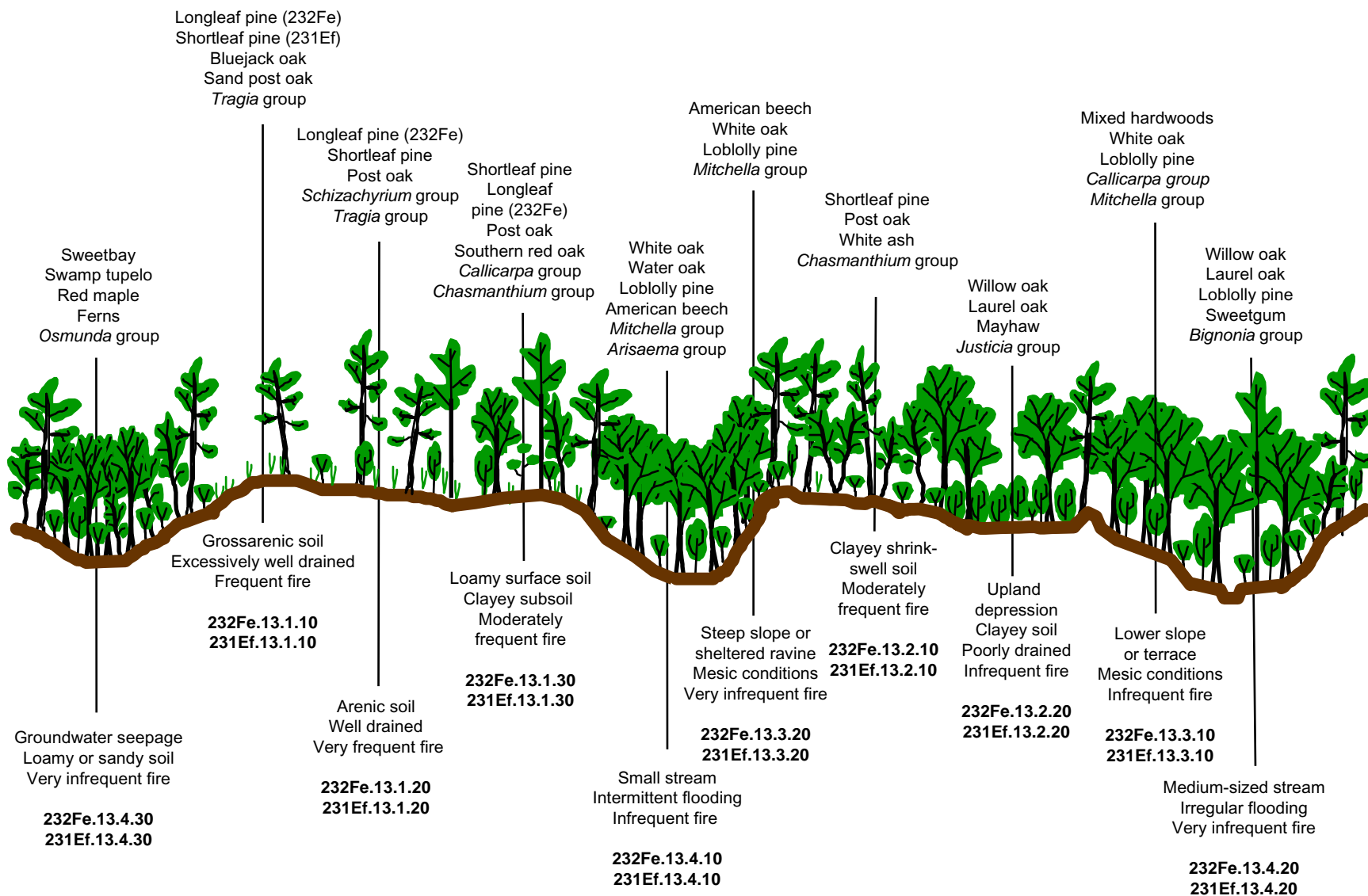


Figure 22.1 Landscape profile of ecosystems on the Clayey Uplands Landtype Association.

232Fe.13 (231Ef.13) CLAYEY UPLANDS LANDTYPE ASSOCIATION



232Fe (231Ef).13.1.20: Shortleaf Pine (Longleaf Pine)-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands (Angelina N.F. Compartment 14, Stand 90)



232Fe (231Ef).13.1.30: Shortleaf Pine-(Longleaf Pine)-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands (Angelina N.F. Compartment 2, Stand 3)



232Fe (231Ef).13.2.10: Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands (Angelina N.F. Compartment 3, Stand 5)



232Fe.13 (231Ef).2.20: Willow Oak/*Justicia* Clayey Wet Upland Depressions (Angelina N.F. Compartment 13)



232Fe (231Ef).13.4.10: White Oak-Water Oak/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms (Angelina N.F. Compartment 2, Stand 2)



232Fe (231Ef).13.4.30: Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps (Angelina N.F. Compartment 16, Stand 12)

KEY TO LANDTYPE PHASES

Because of their close similarity on the modern landscape both the western (231Ef) and eastern (232Fe) portions of the Clayey Uplands are included together in the following keys and descriptions.

- 1a. Upper slopes, broad uplands, or ridgetops. Sites are typically pine-dominated..... 2
- 1b. Lower slopes, ravines, poorly drained upland flats, groundwater seeps, stream terraces, or floodplains. Sites are typically deciduous hardwood-dominated. 5
- 2a. Soils sandy, arenic or grossarenic, the upper 50cm or greater having a sandy texture. ... 3
- 2b. Loamy or clayey soils, some portion of the upper 50cm not sandy..... 4
- 3a. Deep sand or grossarenic excessively drained soils on gentle to moderately steep upper slopes and ridgetops. The sandy surface layer is at least 100cm thick. Soils are subject to frequent and prolonged drought. Includes Darco and Betis soils. Stands are typically open woodlands of shortleaf pine or longleaf pine and bluejack oak. Species from the *Tragia* group are indicators and the *Schizachyrium* group may also be common.
.....232Fe (231Ef).13.1.10 Shortleaf pine (Longleaf Pine)-Bluejack Oak/*Tragia*
Grossarenic Dry Uplands
- 3b. Sandy, arenic, well drained to excessively drained soils with a 50-100cm thick sandy surface layer located on gently to moderately sloping upper slopes, broad uplands, and ridgetops. Includes the Lovelady soil series. Overstory may include shortleaf pine, longleaf pine, blackjack oak, and post oak. Frequently burned sites in the eastern part of the LTA may develop into longleaf pine woodlands. The *Schizachyrium* group is often common, but The *Tragia* group, is less abundant than for 3a.
..... 232Fe (231Ef).13.1.20 Shortleaf Pine (Longleaf Pine)-Blackjack Oak/*Schizachyrium*
Arenic Dry Uplands
- 4a. Sandy loam to clay loam surface soil greater than 30 cm thick over a well drained to somewhat poorly drained clay or loamy subsoil. Primarily Diboll, Fuller, Latex, Keltys, Kurth, and Kirvin soils. Overstory includes shortleaf pine, loblolly pine, post oak, southern red oak, and black hickory. Longleaf pine may occur on some sites in the eastern portion of the LTA. The *Callicarpa* and *Chasmanthium* groups are common but the *Schizachyrium* group is often uncommon or absent.....
232Fe (231Ef).13.1.30 Shortleaf Pine-(Longleaf Pine)-Post Oak/*Callicarpa-Chasmanthium*
Loamy Dry-Mesic Uplands
- 4b. Silt loam to clay loam or clay surface soil less than 30 cm thick over a clay subsoil. Soils are moderately well drained to somewhat poorly drained and usually have shrink-swell properties and gilgai humps. Drainage mottles may be present in the soil profile and a perched water table may be present. Includes the Eastwood, Etoile, Herty, Lacerda, Moswell, Rosenwall, and Sacul series. Overstory is a mixture of shortleaf pine and post oak. Longleaf is pine uncommon or absent. Understory shrubs are abundant and include yaupon, American beautyberry, and parsley hawthorn. The *Chasmanthium* group is abundant; the *Callicarpa* group is also present.
..... 232Fe (231Ef).13.2.10. Shortleaf Pine-Post Oak/*Chasmanthium*
Clayey Dry-Mesic Uplands
- 5a. Lower slopes, minor stream terraces, or steep ravines..... 6
- 5b. Minor stream bottoms, floodplains, groundwater seeps, or poorly drained upland flats. ... 7

- 6a. Gently to moderately sloping middle to lower side slopes and small terraces above minor streams. Soils are well drained but usually moist. Soil textures are variable. Drainage mottles may be present in the subsoil. Soils include Attoyac, Alazan, Bernaldo, Bessner, Cuthbert, Eastwood, Keithville, Lovelady, Sawlit, Sawtown, and Rentzel. Overstory is a diverse mixture of oaks, hickory, and pine, including white oak, southern red oak, mockernut hickory, loblolly pine, and shortleaf pine. The *Callicarpa* group is abundant and the *Mitchella* group may be present.....
232Fe (231Ef).13.3.10 White Oak-Loblolly Pine/*Callicarpa*
 Loamy Mesic Lower Slopes and Terraces

- 6b. Sides of steep ravines associated with minor stream drainages. Well drained but usually moist sandy loam surface soils over clay or clay loam subsoils. Gravel or cobbles may be present in the solum. Soils Include Cuthbert soils on steep slopes or ravines. Overstory dominated by hardwoods, particularly American beech, white oak, and often southern magnolia. Loblolly pine also occurs. The *Mitchella* group is common and the *Arisaema* group may be present
232Fe (231Ef).13.3.20 American Beech-White Oak/*Mitchella*
 Loamy Moist-Mesic Steep Slopes and Ravines

- 7a. Poorly drained, nearly level, clayey upland flats and depressions. Soils have a clay loam surface soil over clay subsoil, with drainage mottles throughout the profile. Soils are saturated or flooded during winter and early spring most years. Soils include Guyton, Guyton-Sawtown, or unmapped Guyton inclusions within Keithville-Sawtown terrace soils. Overstory includes willow oak, green ash, and laurel oak. Some sites have dense thickets of mayhaw, green hawthorn, or Carolina ash. The ground layer is sparse, and the *Justicia* group common.....232Fe (231Ef).13.2.20 Willow Oak/*Justicia*
 Clayey Wet Upland Depressions

- 7b. Groundwater seeps, riparian areas, or floodplains of perennial streams..... 8

- 8a. Nearly permanently saturated groundwater seepage areas (baygalls) at the head of or within the bottoms of small perennial streams. Soils have a deep, gray, wet loamy sand or sandy loam surface and are often mapped as Rentzel, Lovelady, and Tenaha soils. Overstory is dominated by sweetbay, swamp tupelo, and redbay. The *Osmunda* group is common.232Fe (231Ef).13.4.30 Sweetbay-Swamp Tupelo/*Osmunda*
 Loamy Wet Forested Seeps

- 8b. Stream bottoms or floodplains without extensive seepage of groundwater. 9

- 9a. Small, intermittent or perennial stream bottoms without well-developed floodplains. Flooding is intermittent and floodplain width is usually less than 100 m. Drainage mottles may occur in the subsoil. Soils Include the luka, lulus, Bessner, and Marietta series. Overstory is hardwood-dominated, and includes white oak, water oak, American beech, American basswood, loblolly pine and other mesic species. Florida maple and American holly occur in the understory. The *Mitchella* group is common and the *Arisaema* group is locally common in more moist areas.
..... 232Fe (231Ef).13.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema*
Loamy Mesic Stream Bottoms

- 9b. Level to gently sloping moderately wide floodplains of intermediate-sized perennial streams. Flooding occurs irregularly, and floodplain width is usually greater than 100 m. The soil litter layer is usually thin or bare. Drainage mottles are common throughout the soil profile. Soils Include Laneville, Nahatche, Ozias, and Pophers. Overstory includes willow oak, water oak, laurel oak, swamp tupelo, and swamp chestnut oak in addition to mesic species such as white oak and loblolly pine. The *Bignonia* group is common. The *Mitchella* group is present on slightly elevated areas and the *Justicia* group is present in wet depressions 232Fe (231Ef).13.4.20 Willow Oak-Laurel Oak/*Bignonia*
Loamy Moist-Mesic Stream Bottoms

LANDTYPE PHASE DESCRIPTIONS (232Fe.13 & 231Ef.13)

232Fe (231Ef).13.1 Sandy/Loamy Uplands Landtype

232Fe (231Ef).13.1.10 Shortleaf Pine (Longleaf Pine)-Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Occurs locally on areas of the Yegua formation containing deep sand deposits. Terrain is gently to moderately rolling.

Landform: Occurs on ridgetops and associated convex middle and upper slopes. Slope gradients are gentle to moderately steep.

Soil Characteristics: Soils consist of a deep excessively drained loamy sand surface soil at least 100cm thick over a coarse sand subsoil. The B horizon, if present, is generally deeper than 100cm from the surface. Soils are droughty and nutrient availability is very low. They include Darco and Betis soils.

Hydrology: The sandy soils are rapidly permeable and excessively drained, so rainfall percolates downward quickly; hence, long periods of drought occur.

Natural Disturbances and Processes: Historically, sites were subject to a frequent fire regime. Natural fires are usually ignited by lightning from thunderstorms during the growing season. On some sites, low productivity due to poor soils may limit fuel accumulation and reduce fire intensity.

Ground Layer Species: The ground layer includes a diverse mix of sun-loving species, particularly grasses and members of the sunflower (Asteraceae) family. Species from the *Tragia* group including erect pricklypear (*Opuntia stricta*) and Louisiana yucca (*Yucca louisianensis*) are indicators. Significant patches of bare ground or areas covered by lichens (*Cladonia* and *Cladina* spp.) occur. Species from the *Schizachyrium* group are also common and little bluestem (*Schizachyrium scoparium*) may constitute the much of the ground cover.

Overstory Tree Species: The open woodland overstory includes a mixture of shortleaf pine, bluejack oak, blackjack oak, post oak and black hickory. Longleaf pine is abundant on some sites in the eastern portion of the LTA.

Understory Tree Species: Sand post oak and bluejack oak saplings are common in the understory along with small Blackjack oaks and sassafras.

Shrub Species: Common shrubs include farkleberry, dwarf pawpaw, and fragrant sumac. On frequently burned sites, shrubs are uncommon.

Similar LTPs: 232Fe (231Ef).13.1.20 also occurs on sandy ridgetops and uplands, but soils are usually arenic (the sandy topsoil is less deep), the surface soil texture less coarse, and species from the *Tragia* group less common.

232Fe (231Ef).13.1.20 Shortleaf Pine (Longleaf Pine)-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Occurs locally on areas of the Yegua formation containing deep sand deposits. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper side slopes, broad uplands, and ridgetops. Slope shape is convex with gentle to moderate slopes.

Soil Characteristics: Soils are usually arenic and consist of deep loamy fine sand surface soils over sandy loam subsoils. Depth to the subsoil is normally 50-100 cm. Soil reaction is medium acid to strongly acid and available nutrients are low. Soils are often mapped as Lovelady.

Hydrology: Sites are well-drained to excessively well-drained and are subject to seasonal drought, especially in late summer. Sandy soil texture causes precipitation to percolate rapidly through the soil, so little surface runoff occurs.

Natural Disturbances and Processes: Historically, frequent natural fires burned through these uplands during the growing season, with the fire interval on a particular site influenced by topographic barriers, fuels, and soil moisture. On sites that are frequently burned, fire inhibits establishment of woody understory species and maintains open woodland.

Ground Layer Species: Species from the *Schizachyrium* group are common to abundant especially on sites maintained with prescribed burning. Species from the *Tragia* group may also be present. On unburned sites species from the *Chasmanthium* and *Callicarpa* groups become common.

Overstory Tree Species: Under a frequent fire regime, the overstory is typically open woodland. Longleaf pine (in the eastern section), shortleaf pine, blackjack oak, and post oak are the dominant overstory species. Since this landtype phase occurs on the northern edge of the range of longleaf pine, this species may be absent on sites even in the eastern section, but it was more common historically than it is now. Southern red oak and black hickory are common hardwood associates.

Understory Tree Species: Sand post oak can be found in the understory, as well as winged elm, sassafras, and Mexican plum.

Shrub Species: Important shrubs include flameleaf sumac, farkleberry, dwarf pawpaw, yaupon, and American beautyberry. Shrubs become more common on unburned sites.

Site Inclusions: Small mesic depressions may be found on broad, flat ridgetops where species from the *Chasmanthium* and *Callicarpa* species are more abundant.

Similar LTPs: 232Fe (231Ef).13.1.10 occurs on a similar landscape position, but it consists of very deep sandy soils and species from the *Tragia* group are more abundant.

**232Fe (231Ef)13.1.30 Shortleaf Pine-(Longleaf Pine)-Post Oak/*Callicarpa-Chasmanthium*
Loamy Dry-Mesic Uplands Landtype Phase**

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Occurs on the Cook Mountain, Yegua, Caddell, Moodys Branch, and Yazoo formations. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper slopes and broad, level to convex uplands, usually at midslope or higher. Slope gradient is gentle to moderately steep.

Soil Characteristics: Soils have a sandy loam to clay loam surface layer over clay or clay loam subsoil. The subsoil is usually deeper than 30 cm from the surface. Surface soils have medium to medium-high nutrient content. Soil reaction is medium to strongly acid and drainage mottles may be present in the subsoil. Soils are mapped as Diboll, Fuller, Latex, Keltys, Kurth, and Kirvin. Diboll and Fuller soils have a high salt and aluminum concentration in the siltstone parent material, which can accumulate in the surface soil due to crayfish activity and fluctuation of the water table when overstory trees are removed.

Hydrology: Soils are moderately well drained to somewhat poorly drained. Slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: Historically, periodic fires burned through these uplands with the fire interval on a particular site influenced by topographic barriers, fuels, and soil moisture. The historic fire return interval was probably moderately frequent.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups are common to abundant. On frequently burned sites, the *Schizachyrium* group may be common. High salt concentration in the surface soil following removal of vegetative cover may significantly affect species composition in sites with Diboll and Fuller soils.

Overstory Tree Species: The overstory is highly variable but on most modern stands usually consists of mixed pine and hardwood species. Shortleaf pine, loblolly pine, sweetgum, post oak, southern red oak, mockernut hickory and black hickory are typical species. Longleaf pine occurs on some sites, and may have been more common historically. Longleaf pine becomes less common from east to west, and is largely absent in the Western Clayey Uplands (231Ef.13) on the western Davy Crockett National Forest.

Understory Tree Species: Flowering dogwood, redbud, eastern hophornbeam, winged elm, and red maple saplings, are common.

Shrub Species: Shrubs include yaupon, American beautyberry, farkleberry, deciduous holly, and southern arrowwood.

Similar LTPs: 232Fe (231Ef).13.2.10 occupies a similar position on the landscape, but has a more clay in the surface soil and clayey subsoil is usually within 30 cm of the surface.

Special Conditions: Some sites with Diboll and Fuller soils may have historically supported herb-dominated saline prairies that have been replaced by forest vegetation due to plantation forestry and suppression of fire. For information on saline prairies, see Chapter 4. Extant

examples of these communities were not observed during ecological classification fieldwork although there are reports of sites on private lands.

232Fe (231Ef).13.2 Clayey Uplands Landtype

232Fe (231Ef).13.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Occurs on the Cook Mountain, Yegua, Caddell, Moodys Branch, and Yazoo formations. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper side slopes and broad uplands usually at midslope or higher. Slope gradient is gentle to moderately steep.

Soil Characteristics: Soils have high clay content and most have vertic (shrink-swell) properties in the subsoil. This feature is sometimes manifested by small humps or gilga resulting from churning of the soil through repeated expansion and contraction. Surface textures range from silt loam to clay loam and clay, and the clay subsoil is generally within 30 cm of the soil surface. Surface soils have a high nutrient content and are medium to strongly acid. Drainage mottles are often present in the subsoil. Soils commonly belong to the Eastwood, Etoile, Herty, Lacerda, Moswell, Rosenwall, and Sacul series.

Hydrology: Soils are moderately well drained to somewhat poorly-drained and may be highly erodable on exposed slopes. Slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: Historically, the natural fire interval was probably moderately frequent. Shrink-swell properties influence overstory composition and may possibly limit the growth of pines and other deep-rooted species.

Ground Layer Species: Species from the *Chasmanthium* group dominate. Members of the *Callicarpa* group are also common, and some species from the *Schizachyrium* group, such as Texas ironweed (*Vernonia texana*) and little bluestem (*Schizachyrium scoparium*), may be locally common.

Overstory Tree Species: The overstory consists of mixed pine and hardwood species including Shortleaf pine, post oak, and white ash. Documented historic occurrence of mature longleaf pine on some sites of the east side of the LTA indicates that it occurred where frequent fire had a greater influence on community composition than the edaphic limitations of the site. Geotrophic overstory species such as pines may be stunted and have noticeably crooked stems.

Understory Tree Species: Winged elm, red maple saplings, and eastern hophornbeam are common understory species.

Shrub Species: Yaupon is the most abundant understory shrub. Other common shrubs include American beautyberry, parsley hawthorn, upland swampprivet, and deciduous holly.

Similar LTPs: 232Fe (231Ef).13.1.30 occupies a similar position on the landscape, but the surface soil is less clayey and the subsoil, if clay, is usually deeper than 30 cm below the surface.

232Fe (231Ef).13.2.20 Willow Oak/*Justicia* Clayey Wet Upland Depressions Landtype Phase

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Occurs on the Cook Mountain, Yegua, Caddell, Moodys Branch, and Yazoo formations. Occurrences are local, usually in areas of thin windblown deposits over the more clayey sediments of underlying formations.

Landform: Small depression areas on old terraces in upland positions. Slope gradient is nearly level. Areal extent of occurrences is usually no more than 20 ha.

Soil Characteristics: Soils are mapped areas of Guyton and Guyton-Sawtown soils or unmapped Guyton inclusions within Keithville-Sawtown terrace soils. Surface soils are gray clay loam over gray clayey subsoil that is within 15 cm of the surface. Red or brown drainage mottles can occur throughout the soil profile. Soil reaction is strongly acid to extremely acid. Guyton soils become fluid when wet, contributing to windthrow of overstory species.

Hydrology: Soil permeability is very slow, and ponding occurs irregularly or seasonally in the winter and spring of most years. Prolonged wetness creates anoxic conditions that limit upland species.

Natural Disturbances and Processes: Fire is infrequent, but during periods of drought, fires originating on adjacent uplands may burn through a site. Shallow-rooted trees are subject to windthrow. Succession occurs mainly through individual tree mortality.

Ground Layer Species: Herbaceous ground cover is sparse because of saturated conditions and fluctuating water levels. Species composition is quite similar to the floodplains of larger streams. Most species are from the *Justicia* group. Species from the *Bignonia* group may also be present.

Overstory Tree Species: Dominant overstory trees include willow oak, green ash, and laurel oak. The overstory canopy may be discontinuous. Small mounds within the depression may have southern red oak and loblolly pine.

Understory Tree Species: Understory trees may form dense thickets. Some or all of the following species may be present: Carolina ash, green ash, mayhaw, common persimmon, and bottomland post oak.

Shrub Species: Shrubs are usually not abundant but may include deciduous holly, yaupon, and common buttonbush.

Similar LTPs: The vegetative composition of upland depressions is superficially similar to that of the floodplains of larger streams (232Fc.4.2.10). The differentiating characteristics of this landtype phase are its upland landscape position and paucity of species.

232Fe (231Ef).13.3 Mesic Slopes and Terraces Landtype

232Fe (231Ef).13.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Occurs on the Cook Mountain, Yegua, Caddell, Moodys Branch, and Yazoo formations. Terrain is gently to moderately rolling.

Landform: Occurs on middle to lower slopes and on terraces above small streams, forming the transition zone between (usually pine-dominated) upper slopes and hardwood-dominated stream bottoms. Slope shape is linear to concave, and slope gradients are very gentle to moderate.

Soil Characteristics: Soil textures vary; the greater soil moisture that is common on lower slopes appears to influence the plant community more texture. Surface typically soils have a medium nutrient content and drainage mottles may be present in the subsoil. Soils include Attoyac, Alazan, Bernaldo, Bessner, Cuthbert, Eastwood, Keithville, Lovelady, Sawlit, Sawtown, and Rentzel.

Hydrology: Due to the low position on the landscape, proximity to streams, and mesic microclimate, soils tend to have more moisture than adjacent uplands. This moderates the effects of droughts; species that require more mesic conditions dominate. Sites are often dissected by small intermittent drainages.

Natural Disturbances and Processes: Even historically, fire was infrequent on lower slopes and terraces and had minimal influence on vegetation. In an unusually dry period, fires that originate on uplands may burn down to a lower slope, where there may be sufficient fuel to carry a low-intensity surface fire. Most natural disturbance and succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups dominate. The *Mitchella* group may be locally common especially on moist microsites. On sites with a mature, closed overstory canopy, herbaceous cover may be sparse.

Overstory Tree Species: Overstory contains a mixture of hardwoods and pines. Relative dominances of hardwood and pine species can vary greatly from site to site, but most sites with no recent large-scale disturbances will eventually be dominated by hardwoods. Important trees include white oak, southern red oak, cherrybark oak, white ash, blackgum, mockernut hickory, and bitternut hickory. Loblolly pine and shortleaf pine are also important.

Understory Tree Species: Common species include red maple and sweetgum saplings, American holly, winged elm, eastern hophornbeam, and flowering dogwood.

Shrub Species: American beautyberry, Carolina buckthorn, parsley hawthorn, southern arrowwood, farkleberry, and yaupon are common shrubs.

Similar LTPs: 232Fe (231Ef).13.3.20 occurs on moderately steep to very steep slopes and sides of ravines, and the *Mitchella* group is more important. 232Fe (231Ef).13.4.10 occurs directly adjacent to small streams and both the *Mitchella* and *Arisaema* groups are usually present.

232Fe (231Ef).13.3.20 American Beech-White Oak/*Mitchella* Loamy Moist-Mesic Steep Slopes and Ravines Landtype Phase

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Occurs primarily on steep slopes and the sides of tight ravines that have been cut into shales and sandstones of the Cook Mountain, Yegua, Caddell, Moodys Branch, and Yazoo formations. Terrain is gently to moderately rolling.

Landform: Occupies moderately steep to very steep slopes or ravines that have been cut into outcrops of erosion-resistant material such as shale or sandstone. Sites are sheltered from direct sun for part of the day, moderating temperature extremes and reducing evapotranspiration.

Soil Characteristics: Soils generally have well-drained sandy loam surface soils over clay or clay subsoils. The surface soil is generally shallow and may contain gravel or cobble. Shale or sandstone outcrops may be present. Soil reaction is medium acid to strongly acid, and nutrient content is low to medium. Soils are mapped primarily as the Cuthbert series. Narrow mesic ridgetops within a ravine complex may have arenic soils, such as the Lilbert series.

Hydrology: Due to the steep slopes and loamy soil texture, sites are well-drained. However, clayey subsoils absorb and retain moisture, and low evapotranspiration rates on the protected ravines result in low moisture deficits. This landtype phase usually occurs relatively low on the landscape and is typically located immediately above a perennial stream or river.

Natural Disturbances and Processes: Steep, dissected topography results in very low fire frequency. These slopes and ravines are topographically isolated from adjacent uplands, so it is difficult for fires to burn into them. The steep topography also forms a protective refuge from disturbances such as high winds and floods. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: The overstory is usually dense, and herbaceous ground cover is sparse on the shaded forest floor. A diverse assemblage of species from the *Callicarpa*, *Chasmanthium*, *Mitchella*, and *Arisaema* groups are present in the ground layer. These sites provide habitat for many Appalachian and eastern deciduous forest species that reach the southwestern limit of their range in eastern Texas including slender trillium (*Trillium gracile*), bloodroot (*Sanguinaria canadensis*), Jack in the pulpit (*Arisaema triphyllum*), crippled crane-fly (*Tipularia discolor*), and yellow lady's slipper (*Cypripedium kentuckiense*).

Overstory Tree Species: The overstory is dominated primarily by hardwoods such as American beech, white oak, southern magnolia, American basswood, and mockernut hickory. Loblolly pine occurs in the overstory but is not dominant.

Understory Tree Species: Common species include Florida maple, red maple saplings, eastern hophornbeam, green ash, white fringetree, and eastern redbud.

Shrub Species: Shrubs include mapleleaf viburnum, Carolina buckthorn, American witchhazel, American strawberrybush, smallflower blueberry, and largecluster blueberry.

Site Inclusions: Small groundwater seeps may occur on some sandstone or shale outcrops. Ferns, liverworts, and mosses grow in abundance near these seeps.

Similar LTPs: The species composition of 231Fe (231Ef).13.4.10 is superficially similar, but it occurs on more moderate slopes and species from the *Arisaema* and *Mitchella* species groups are not as abundant.

232Fe (231Ef).13.4 Minor Stream Bottoms Landtype

232Fe (231Ef).13.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with small, perennial and intermittent stream valleys.

Landform: Occurs on toe slopes of narrow stream bottoms. Floodplains are poorly developed, generally less than 100m wide. Slopes are concave to linear and slope gradients are gentle to very gentle.

Soil Characteristics: Soils are generally sandy loams over heterogeneous parent material or bedrock. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is medium acid to strongly acid, and available nutrients are low to medium. Drainage mottles are common in the subsoil. Includes the luka, lulus, Bessner, and Marietta series.

Hydrology: Streams associated with this landtype phase are small, often intermittent, and do not have well-developed floodplains. Stream gradients are relatively steep and the upstream watershed small so flooding occurs only intermittently. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire occurs infrequently on stream bottoms and is a minimal influence on natural vegetation. Erosion and deposition constantly change the course of stream channels, undercutting banks and causing trees to fall. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Mitchella* group are common to abundant. On immediate banks of the stream channel, species from the *Arisaema* group may be present.

Overstory Tree Species: Overstory consists of a mixture of hardwood and pine species including white oak, American beech, water oak, sweetgum, American basswood, loblolly pine, and shortleaf pine. Southern magnolia may be present on some sites.

Understory Tree Species: Common species include blackgum and mockernut hickory saplings, Florida maple, American holly, eastern hophornbeam, common pawpaw, and white fringetree.

Shrub Species: Shrubs include American beautyberry, southern arrowwood, and common sweetleaf.

Similar LTPs: 232Fe (231Ef).13.4.20 occupies a similar landscape position on small stream bottoms but floodplains are larger, sites experience irregular flooding, and the *Bignonia* group is important.

232Fe (231Ef).13.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with perennial stream valleys.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized streams. Floodplain width is normally greater than 100 meters. Slope shape is concave to linear, and slope gradients are nearly level. Microtopography on some sites consists of numerous small depressions, drainage channels, and mounds created as stream channels shift and flood waters scour and deposit alluvial materials.

Soil Characteristics: Soils are of alluvial material consisting of sandy loam to loamy sand over heterogeneous alluvial parent material or bedrock. Depth to the subsoil may be over 100 cm. Because of flooding and rapid decomposition, little leaf litter accumulates on the soil surface and on some areas mineral soil is exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles occur throughout the soil profile in most areas. Soil reaction ranges from moderately alkaline to very strongly acid, and available nutrients are low to high. Soils are generally Entisols and are mapped as the Laneville, Nahatche, Ozias, and Pophers series.

Hydrology: The perennial streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle so irregular flooding occurs. Duration of flooding increases with the size of the watershed.

Natural Disturbances and Processes: Fire occurs very infrequently on stream floodplains. Erosion and deposition constantly change the course of stream channels and can undercut banks and cause trees to fall while new deposits of alluvial material are colonized by vegetation. Windstorms may uproot or damage overstory trees.

Ground Layer Species: Species from the *Bignonia* group are important in the ground layer. These include caric-sedges (*Carex* spp.) and rushes (*Juncus* spp.). On slightly elevated mounds, species from the *Mitchella*, *Chasmanthium*, and *Callicarpa* groups may be common. Looseflower waterwillow (*Justicia ovata*) and the *Justicia* group may occur in wet depressions and drainage channels. On immediate stream banks and at the edges of saturated depressions, ferns such as sensitive fern (*Onoclea sensibilis*) and common ladyfern (*Athyrium filix-femina*) may be abundant.

Overstory Tree Species: The overstory is a mixture of both mesic and flood-tolerant hardwood species including willow oak, laurel oak, blackgum, sweetgum, water oak, American basswood, swamp chestnut oak, white oak, and cherrybark oak. Loblolly pine also occurs and American beech and southern magnolia may be present on some sites.

Understory Tree Species: Common species include red maple, river birch, and green ash saplings along with American hornbeam.

Shrub Species: Shrubs include dwarf palmetto, Gulf sebastiana, parsley hawthorn, Elliott's blueberry, smallflower blueberry, and evergreen bayberry.

Site Inclusions: Slight differences in elevation, sometimes less than 1 meter, may cause a profound change in species composition. Examples include pimple mounds, which may contain species from the *Chasmanthium* and *Callicarpa* groups. Likewise, wet depressions and channels provide habitat for obligate wetland species such as those in the *Justicia* group. Scattered areas of seepage with some species from the *Osmunda* group may also occur. These inclusions tend to be small, isolated occurrences.

Similar LTPs: 232Fe (231Ef).13.4.10 is associated with stream bottoms, but the streams are smaller, with narrow valleys and little or no floodplain, and the *Mitchella* and *Arisaema* groups are more common and the *Bignonia* group less so. Downstream, sites grade into 232Fd.4.2.10 or 232Fc.4.2.10—Seasonally Flooded River Floodplains.

232Fe (231Ef).13.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Occurs in a broad band across the Texas Pineywoods. On Davy Crockett National Forest it occurs generally south of Hickory Creek and north of a line from Alabama Creek west to US Highway 287 north of Groveton. On Angelina National Forest it occurs north of a line running east from Zavalla to Ayish Bayou on Sam Rayburn Reservoir. On Sabine National Forest it includes the area north of a line running east from Brookeland to Fairmount, and south of a line from Gaucho Bayou to Sabinetown. A small area extends eastward into Louisiana to include the northern tip of the Kisatchie Ranger District of Kisatchie National Forest.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with small perennial streams or deposits of the Cook Mountain, Yegua, Caddell, Moodys Branch, and Yazoo formations.

Landform: Occurs on the floodplains of small, perennial streams or on headslopes of perennial or intermittent drainages, where underground water flow exits a hillside as a seep. It may also be found downstream, often on footslopes immediately above floodplains, wherever seepage of underground water occurs. Stream channels are often poorly developed.

Soil Characteristics: Soils are generally deep, gray, loamy fine sand over sandy clay loam subsoil and are poorly drained and continually wet. Soil reaction is medium acid to strongly acid and available nutrients are very low. Soils are mapped primarily as Rentzel, Lovelady, and Tenaha near stream drainages but in fact are often consistent with the Naconiche or Osier series.

Hydrology: Soils are very poorly drained. Impermeable subsurface layers, such as sandstone, shale, or clay, or other factors resulting in constant ground water seepage produce a semipermanently to nearly permanently saturated hydrologic regime.

Natural Disturbances and Processes: Fire is very infrequent on wet forested seeps and typically has minimal influence on vegetation. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species in the *Osmunda* group dominate. Netted chain fern (*Woodwardia areolata*) is often the principal ground cover. Other ferns, especially cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*) are also important. The *Arisaema* group may be present on portions of some sites.

Overstory Tree Species: Common overstory trees include sweetbay magnolia, swamp tupelo, and red maple. Water oak and sweetgum may also be found on more mesic microsites.

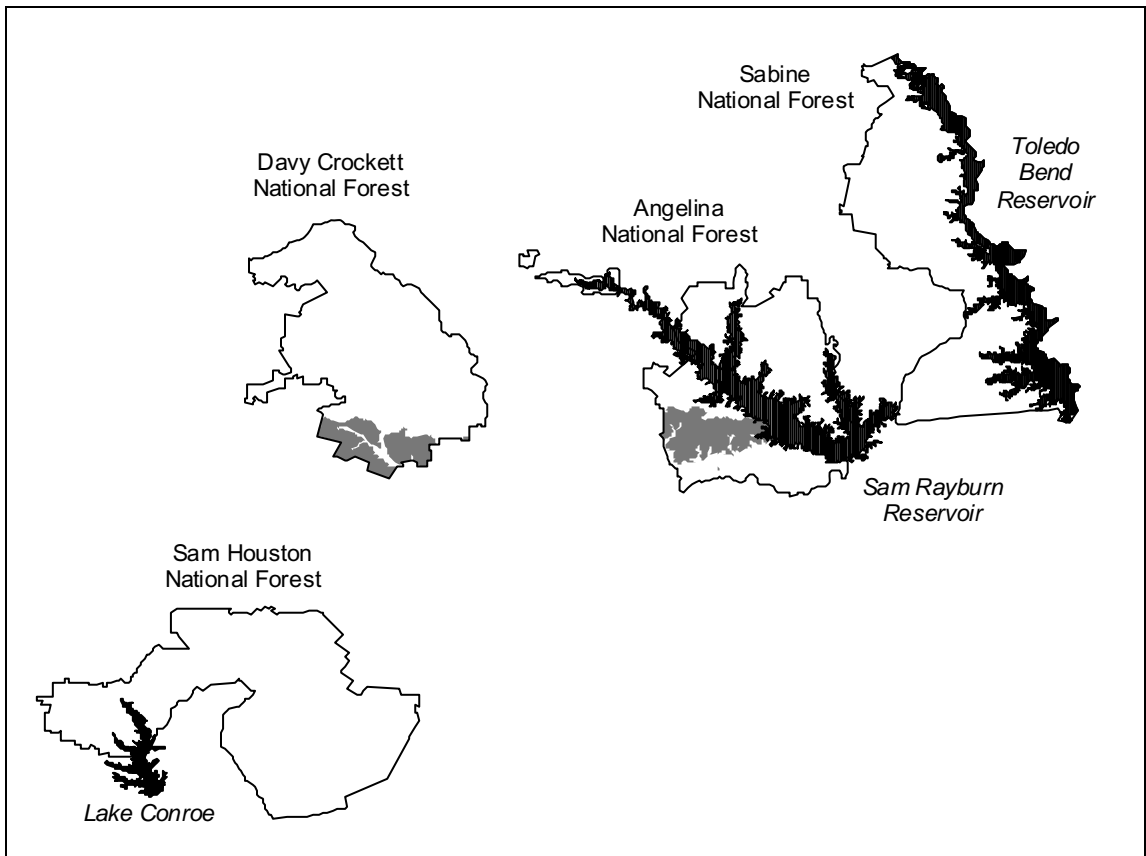
Understory Tree Species: Understory trees include red maple and green ash saplings, and occasionally redbay, especially in the southern portion of the LTA.

Shrub Species: Shrubs include evergreen bayberry, early azalea, deciduous holly, and Arkansas blueberry. Laurel greenbriar is a characteristic woody vine.

Similar LTPs: 232Fe (231Ef).13.4.20 occurs on loamy, irregularly flooded stream bottoms with well-developed floodplains, where the *Bignonia* group is common and small, scattered areas of seepage with some species from the *Osmunda* group may occur.

CHAPTER 23

232Fe.14 SANDY UPLANDS LANDTYPE ASSOCIATION



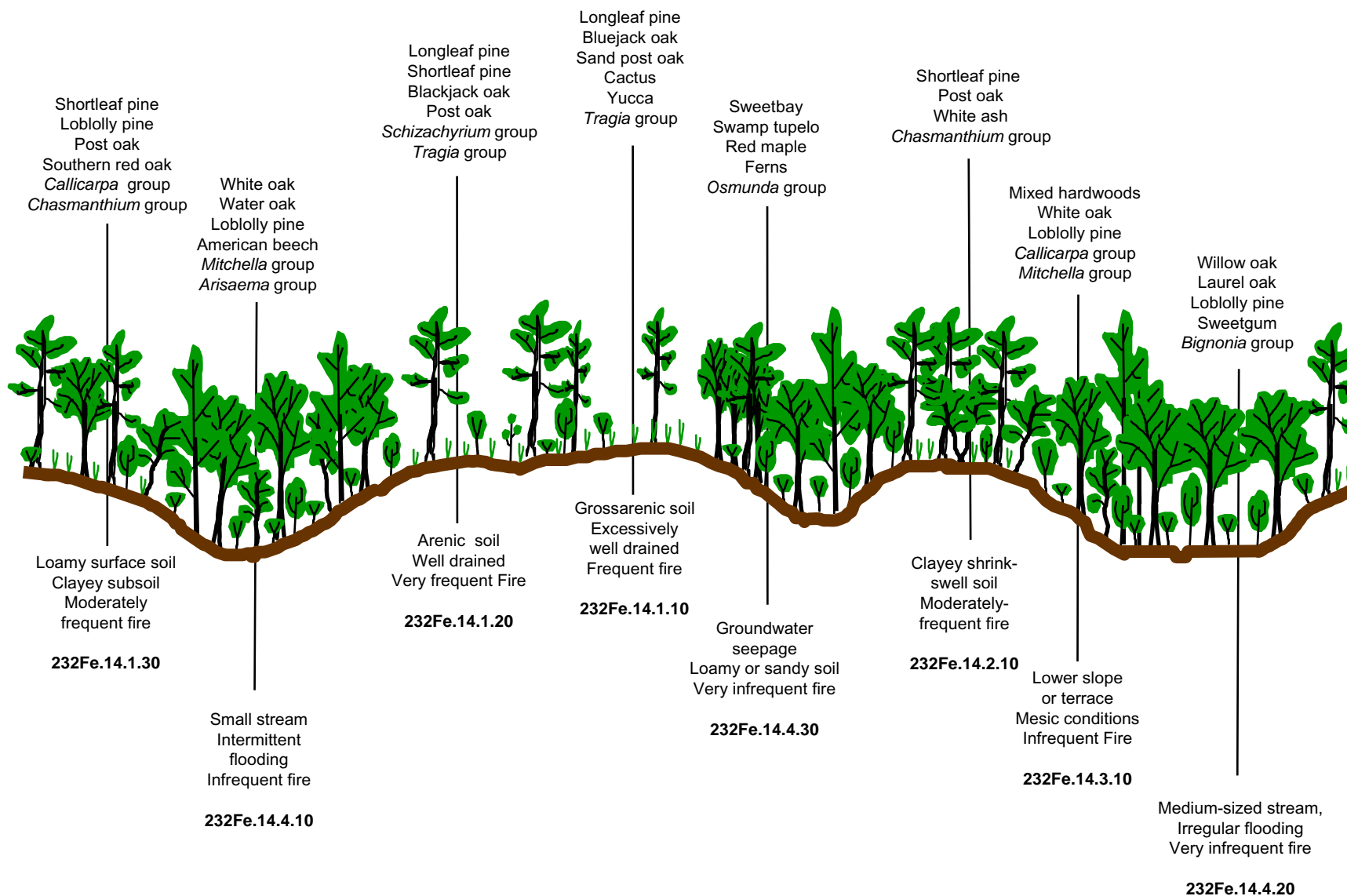


Figure 23.1 Landscape profile of ecosystems on the Sandy Uplands Landtype Association.

232Fe.14 SANDY UPLANDS LANDTYPE ASSOCIATION



232Fe.14.1.30: Shortleaf Pine-(Longleaf Pine)-Post Oak/
Callicarpa-Chasmanthium Loamy Dry-Mesic Uplands (Davey
Crockett N.F. Compartment 87, Stand 16)



232Fe.14.1.30: Shortleaf Pine-(Longleaf Pine)-Post Oak/
Callicarpa-Chasmanthium Loamy Dry-Mesic Uplands (Davey
Crockett N.F. Compartment 91, Stand 18)



Relict longleaf pine in 232Fe.14.1.30: Shortleaf Pine-(Longleaf
Pine)-Post Oak/ *Callicarpa-Chasmanthium* Loamy Dry-Mesic
Uplands:, (Davey Crockett N.F. Compartment 91, Stand 18)



232Fe.14.4.20: Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-
Mesic Stream Bottoms (Davey Crockett N.F. Compartment 91)



232Fe.14.4.20: Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-
Mesic Stream Bottoms (Davey Crockett N.F. Compartment 91)

KEY TO LANDTYPE PHASES

- 1a. Upper slopes, broad uplands, or ridgetops. Sites are typically pine-dominated. 2
- 1b. Lower slopes, groundwater seeps, stream terraces, or floodplains. Sites are typically deciduous hardwood-dominated.....5
- 2a. Soils sandy, arenic or grossarenic, the upper 50cm or greater having a sandy texture. ... 3
- 2b. Loamy or clayey soils, some portion of the upper 50cm not sandy..... 4
- 3a. Sandy or grossarenic, excessively drained soils with a sandy surface layer at least 100cm thick on gently to moderately steep upper slopes and ridgetops. Includes Darco and Betis soils. Open woodland overstory dominated by longleaf pine and/or shortleaf pine and bluejack oak. Species from the *Tragia* group are indicators; the *Schizachyrium* group is also common.....232Fe.14.1.10 Longleaf Pine-Bluejack Oak/*Tragia*
Grossarenic Dry Uplands
- 3b. Sandy, arenic, well drained to excessively drained soils with a sandy surface layer 50-100cm thick located on gently to moderately sloping upper slopes, broad uplands, and ridgetops. Includes Lovelady and Tenaha soils. Overstory is a mixture of shortleaf pine, longleaf pine, blackjack oak, and post oak. On frequently burned sites, longleaf pine may dominate. The *Schizachyrium* group is often common, the *Tragia* group less common than for 3a.
..... 232Fe.14.1.20 Longleaf Pine-(Shortleaf Pine)-Blackjack Oak/*Schizachyrium*
Arenic Dry Uplands
- 4a. Sandy loam to clay loam surface soil greater than 30 cm thick over clayey or loamy subsoil. The well drained to somewhat poorly drained soils are usually mapped as Diboll, Fuller, Latex, Keltys, Kurth, and Kirvin. Overstory includes shortleaf pine, post oak, southern red oak, and black hickory. Longleaf pine may also occur on some sites. The *Callicarpa* and *Chasmanthium* groups are common; the *Schizachyrium* is group common only on sites with a long history of regular burning.....
..... 232Fe.14.1.30 Shortleaf Pine-(Longleaf Pine)-Post Oak/*Callicarpa-Chasmanthium*
Loamy Dry-Mesic Uplands
- 4b. Silt loam to clay loam or clay surface soil less than 30 cm thick over clay subsoil. Soils are moderately well drained to somewhat poorly drained and usually have shrink-swell properties and gilgai humps. Drainage mottles may be present, and a perched water table may occur. Soils include Eastwood, Etoile, Herty, Lacerda, Moswell, Rosenwall, and Sacul. Overstory is a mixture of shortleaf pine and post oak, with abundant understory shrubs, including yaupon, American beautyberry, and parsley hawthorn. The *Chasmanthium* group is abundant, the *Callicarpa* group also present.....
..... 232Fe.14.2.10 Shortleaf Pine-Post Oak/*Chasmanthium*
Clayey Dry-Mesic Uplands

- 5a. Gently to moderately sloping middle to lower side slopes and small terraces associated with minor streams. Soils well drained but usually moist. Soils Include Attoyac, Alazan, Bernaldo, Bessner, Cuthbert, Eastwood, Keithville, Lovelady, Sawlit, Sawtown, and Rentzel. Overstory is a mixture of oaks, hickory, and pine, including white oak, southern red oak, mockernut hickory, loblolly pine, and shortleaf pine. The *Callicarpa* and *Chasmanthium* groups are abundant; the *Mitchella* group may also be present.
232Fe.14.3.10 White Oak-Loblolly Pine/*Callicarpa*
 Loamy Mesic Lower Slopes and Terraces
- 5b. Stream bottoms, floodplains, or groundwater seepage areas at the head of or adjacent to small perennial streams. 6
- 6a. Nearly continually saturated groundwater seepage areas (baygalls) at the head of or adjacent to small perennial streams. Surface soils are deep, gray, wet loamy sand or sandy loam. Soils are often mapped as Rentzel, Lovelady, or Tenaha. Overstory consists of sweetbay magnolia, swamp tupelo, red maple, and redbay. Gallberry holly may be present in the understory. The *Osmunda* group is abundant.
232Fe.14.4.30 Sweetbay-Swamp Tupelo/*Osmunda*
 Loamy Wet Forested Seeps
- 6b. Stream bottoms or floodplains without significant groundwater seepage. 7
- 7a. Bottoms of small, intermittent or perennial streams without well-developed floodplains. Flooding is intermittent, and floodplain width is usually less than 100 m. Drainage mottles may occur in the subsoil. Soils Include luka, lulus, Bessner, and Marietta. Overstory is hardwood-dominated and may include white oak, water oak, American basswood, American beech, loblolly pine, and shortleaf pine. Florida maple and American holly occur in the understory. The *Mitchella* group is common and the *Arisaema* group occurs locally especially near stream banks.
 232Fe.14.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema*
 Loamy Mesic Stream Bottoms
- 7b. Well-developed floodplains of intermediate-sized perennial streams. Flooding occurs irregularly and floodplain width is usually greater than 100 m. The soil litter layer is usually thin or bare and drainage mottles are common throughout the profile. Soils include Laneville, Nahatche, Ozias, and Pophers. Overstory is a mixture of flood-tolerant and mesic species such as water oak, white oak, willow oak, laurel oak, swamp tupelo, swamp chestnut oak and loblolly pine. The *Bignonia* group is common; the *Mitchella* group is present on slightly elevated ridges; the *Justicia* group is present in wet depressions. 232Fe.14.4.20 Willow Oak-Laurel Oak/*Bignonia*
 Loamy Wet-Mesic Stream Bottoms

LANDTYPE PHASE DESCRIPTIONS

232Fe.14.1 Sandy/Loamy Uplands Landtype

232Fe.14.1.10 Longleaf Pine-Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase

Geographic Range: Forms a narrow band across portions of the south-central part of the Texas Pineywoods. Public lands include Angelina National Forest north of the boundary between Angelina and Jasper counties, and south of a line running generally west from Caney Creek Recreation Area to Zavalla as well as Davy Crockett National Forest generally south of a line running from Alabama Creek west to US Highway 287 north of Groveton.

Geology: Occurs on the Manning and Wellborn formations. Terrain is gently to moderately rolling.

Landform: Occurs on ridgetops and associated convex middle and upper slopes. Slope gradients are gentle to moderately steep.

Soil Characteristics: Soils consist of very deep excessively drained sand or loamy sand surface soil at least 100cm thick over coarse sandy subsoil. The B horizon, if present, is generally deeper than 200 cm from the surface. Soils are droughty and nutrient availability is very low. Soils include Darco and Betis.

Hydrology: The sandy soils are rapidly permeable and excessively well drained so rainfall percolates downward quickly; hence, long periods of drought occur.

Natural Disturbances and Processes: Historically, most stands were subject to a regime of frequent low-intensity surface fires. Fires, fueled by accumulated longleaf pine needles and grasses in the litter layer were usually ignited by lightning from thunderstorms during the growing season. On some sites, low productivity due to poor soils may limit fuel accumulation and reduce fire intensity.

Ground Layer Species: The ground layer includes a diverse mix of sun-loving species, particularly grasses and members of the sunflower (Asteraceae) family. Species from the *Tragia* group including erect pricklypear (*Opuntia stricta*) and Louisiana yucca (*Yucca louisianensis*) are indicators. Significant patches of bare ground or areas covered by lichens (*Cladonia* and *Cladina* spp.) occur. Species from the *Schizachyrium* group are also common and little bluestem (*Schizachyrium scoparium*) may constitute the much of the ground cover.

Overstory Tree Species: Historically, longleaf pine dominated the open woodland overstory. Currently, stands include varying amounts of longleaf pine, Shortleaf pine, bluejack oak, blackjack oak, and post oak. On very dry, isolated ridgetops, extremely droughty conditions combined with topographic isolation from fire ignition sources may limit longleaf pine establishment. Oaks dominated these areas even prior to settlement.

Understory Tree Species: Sassafras, sand post oak and stunted or sapling bluejack oak and blackjack oak are common.

Shrub Species: Common shrubs include farkleberry, dwarf pawpaw, and fragrant sumac.

Site Inclusions: On very dry, isolated ridgetops with deep sands, extremely xeric conditions may restrict the establishment and growth of longleaf pine. As a result of limited fuels, Fire frequency (even historically) may be low enough to favor post oak, blackjack oak, and bluejack oak, resulting in hardwood inclusions in a pine-dominated landscape.

Similar LTPs: 232Fe.14.1.20 also occurs on ridgetops and upper slopes, but soils are usually arenic (the sand layer not as deep) and species from the *Tragia* group is less common.

232Fe.14.1.20 Longleaf Pine-(Shortleaf Pine)-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

Geographic Range: Forms a narrow band across portions of the south-central part of the Texas Pineywoods. Public lands include Angelina National Forest north of the boundary between Angelina and Jasper counties, and south of a line running generally west from Caney Creek Recreation Area to Zavalla as well as Davy Crockett National Forest generally south of a line running from Alabama Creek west to US Highway 287 north of Groveton.

Geology: Occurs on the Manning and Wellborn formations. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper side slopes, broad uplands, and ridgetops. Slope shape is convex with gentle to moderate slopes.

Soil Characteristics: Soils are usually arenic and consist of loamy fine sand surface soils over sandy loam subsoils. Depth to the subsoil is normally 50-100cm. Soil reaction is medium acid to strongly acid and available nutrients are low. Soils are often mapped as the Lovelady series.

Hydrology: Sites are well-drained to excessively-drained and are subject to drought, especially in late summer. The sandy soil texture causes precipitation to percolate rapidly through the soil; little surface runoff occurs.

Natural Disturbances and Processes: Historically, natural fires burned frequently through these uplands during the growing season, with the fire interval on a particular site influenced by topographic barriers, fuels, and soil moisture. Fires inhibited the establishment of woody understory species and maintained an open woodland.

Ground Layer Species: Species from the *Schizachyrium* group are common to abundant, especially on fire-maintained stands. The *Tragia* group may also be present. The *Callicarpa* and *Chasmanthium* usually become established on unburned sites.

Overstory Tree Species: Under a frequent fire regime, the overstory is usually open woodland. Longleaf pine, shortleaf pine, blackjack oak, and post oak are the major overstory species. Longleaf pine was most likely dominant historically on most sites. Southern red oak and black hickory are common hardwood associates.

Understory Tree Species: Sand post oak, winged elm, sassafras, and Mexican plum can be found. Typically, the understory is denser on unburned sites than those with regular fire.

Shrub Species: On frequently burned sites, shrubs sparse while unburned sites develop a thick shrub layer. Common shrubs include farkleberry, winged sumac, dwarf pawpaw, wax-myrtle, and yaupon.

Site Inclusions: Small, mesic microsites may be found in depressions on broad, flat ridgetops. Species from the *Chasmanthium* and *Callicarpa* species groups may be more abundant on these sites.

Similar LTPs: 232Fe.14.1.10 occurs on a similar landscape position, but has very deep sandy soils and more species from the *Tragia* group.

232Fe.14.1.30 Shortleaf Pine-(Longleaf Pine)-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

Geographic Range: Forms a narrow band across portions of the south-central part of the Texas Pineywoods. Public lands include Angelina National Forest north of the boundary between Angelina and Jasper counties, and south of a line running generally west from Caney Creek Recreation Area to Zavalla as well as Davy Crockett National Forest generally south of a line running from Alabama Creek west to US Highway 287 north of Groveton.

Geology: Occurs on the Manning and Wellborn formations. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper slopes and broad, slightly concave to convex uplands. Slope gradient is gentle to moderately steep.

Soil Characteristics: Soils have a sandy loam to clay loam surface soil over clayey subsoil. The subsoil is usually deeper than 30 cm from the soil surface. Surface soils have medium nutrient levels. Soil reaction is medium to strongly acid, and drainage mottles may be present in the subsoil. Soils are mapped as the Diboll, Fuller, Latex, Keltys, Kurth, and Kirvin. Diboll and Fuller soils have high salt and aluminum concentrations in the siltstone parent material, which can accumulate in the surface soil due to crayfish activity and fluctuation of the water table when vegetative cover is removed. Historically some of these areas may have been herb-dominated saline prairies.

Hydrology: Soils are moderately well drained to somewhat poorly drained. Slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: Historically, periodic fires burned through these uplands, with the fire interval on a particular site influenced by topographic barriers, fuels, and soil moisture. The historic fire return interval was probably moderately frequent.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups are common to abundant. On frequently burned sites, the *Schizachyrium* group may become common. Salt accumulation in the surface soil following removal of vegetative cover may result in significantly altered species composition. Historically, this in combination with fire may have resulted in the development of herb-dominated saline prairies on some sites.

Overstory Tree Species: The overstory varies but usually consists of mixed pine and hardwood species. Shortleaf pine, loblolly pine, sweetgum, post oak, southern red oak, and black hickory are dominant species. Longleaf pine occurs on some sites, and was almost certainly more common historically. Longleaf pine becomes less common from east to west.

Understory Tree Species: Flowering dogwood, eastern hophornbeam, winged elm, and red maple saplings are typical.

Shrub Species: Shrubs include yaupon, American beautyberry, deciduous holly, southern arrowwood and farkleberry.

Similar LTPs: 232Fe.14.2.10 occupies a similar position on the landscape, but has more clay in the surface soil, and the clayey subsoil usually within 30 cm of the surface.

Special Conditions: Diboll and Fuller soils may have historically supported herb-dominated saline prairies that have been replaced by forest vegetation due to land conversion, fire suppression, and plantation forestry. Although there are references to such sites in the historical literature and reports of them occurring on timber company lands, extant examples of these

communities were not observed during ecological classification fieldwork. For information on historic saline prairies, see Chapter 4.

232Fe.14.2 Clayey Uplands Landtype

232Fe.14.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

Geographic Range: Forms a narrow band across portions of the south-central part of the Texas Pineywoods. Public lands include Angelina National Forest north of the boundary between Angelina and Jasper counties, and south of a line running generally west from Caney Creek Recreation Area to Zavalla as well as Davy Crockett National Forest generally south of a line running from Alabama Creek west to US Highway 287 north of Groveton.

Geology: Occurs on the Manning and Wellborn formations. Terrain is gently to moderately rolling.

Landform: Occurs on middle and upper side slopes and broad uplands between. Slope gradient is gentle to moderately steep.

Soil Characteristics: Soils have high clay content, and most have vertic (shrink-swell) properties in the subsoil. This feature is sometimes manifested by small humps or gilgai about 2-5 cm high resulting from churning of the soil through repeated expansion and contraction. Surface soil textures range from silt loam to clay loam and clay, and the clay subsoil is generally within 30 cm of the soil surface. Surface soils have a high nutrient content and are medium to strongly acid. Drainage mottles are often present in the subsoil. Soils are mapped as Eastwood, Etoile, Herty, Lacerda, Moswell, Rosenwall, and Sacul.

Hydrology: Soils are moderately well-drained to somewhat poorly-drained and the potential for erosion is significant on exposed slopes. Slopes may be dissected by small intermittent drainages.

Natural Disturbances and Processes: The historic natural fire interval was probably moderately frequent. Shrink-swell properties influence overstory composition and may possibly limit the growth of pines and other deep-rooted species.

Ground Layer Species: Species from the *Chasmanthium* group dominate. Members of the *Callicarpa* group are also common, and some species from the *Schizachyrium* group, such as Texas ironweed (*Vernonia texana*) and little bluestem (*Schizachyrium scoparium*), may be locally common.

Overstory Tree Species: The overstory consists of mixed pine and hardwood species. Shortleaf pine, post oak, and white ash are important tree species. Documented historic occurrence of mature longleaf pine on some sites indicates that it occurred where frequent fire had a greater influence on community composition than the edaphic limitations of the site. Geotrophic overstory species such as pines may be stunted and have noticeably crooked stems.

Understory Tree Species: Winged elm, red maple, and eastern hophornbeam are common understory trees.

Shrub Species: Yaupon is the most abundant understory shrub. Other common shrubs include American beautyberry, parsley hawthorn, upland swampprivet, and deciduous holly.

Similar LTPs: 232Fe.14.1.30 occupies a similar position on the landscape, but the surface soil is loamier, and clay subsoil, if present, is deeper than 30 cm below the surface.

232Fe.14.3 Mesic Slopes and Terraces Landtype

232Fe.14.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

Geographic Range: Forms a narrow band across portions of the south-central part of the Texas Pineywoods. Public lands include Angelina National Forest north of the boundary between Angelina and Jasper counties, and south of a line running generally west from Caney Creek Recreation Area to Zavalla as well as Davy Crockett National Forest generally south of a line running from Alabama Creek west to US Highway 287 north of Groveton.

Geology: Occurs on the Manning and Wellborn formations. Terrain is gently to moderately rolling.

Landform: Occurs on middle to lower slopes and terraces often immediately above stream bottoms. Slope shape is linear to concave, and slope gradients are very gentle to moderate.

Soil Characteristics: The increased soil moisture that is common on lower slopes appears to influence the plant community more than soil texture. Surface textures range from loamy sand to sandy loam, loam, and silt loam over a loamy or clayey subsoil. Surface soils have medium nutrient levels. Drainage mottles may be present in the subsoil. Soil series include Attoyac, Alazan, Bernaldo, Bessner, Cuthbert, Eastwood, Keithville, Lovelady, Sawlit, Sawtown, and Rentzel.

Hydrology: Due to the low position on the landscape, proximity to streams, and mesic microclimate, soils tend to have higher moisture levels than surrounding uplands, which moderates the effects of periodic droughts. As a result, species that require more mesic conditions dominate. Sites are often dissected by small intermittent streams and drainages.

Natural Disturbances and Processes: Fire is infrequent on lower slopes and terraces. In an unusually dry period, fires that originate on uplands may burn down to a lower slope, where there may be sufficient fuel to carry a low-intensity surface fire. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa* group are abundant. Species from the *Chasmanthium* group, such as sessile flowered woodoats (*Chasmanthium sessiliflorum*) and devil's grandmother (*Elephantopus tomentosus*), may also be common. The *Mitchella* group may be locally common on moist microsites. On sites with a mature, closed overstory canopy, herbaceous cover may be sparse.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods and pines. Relative dominances of hardwood and pine species can vary greatly from site to site, but most sites with no recent large-scale disturbances will eventually become hardwood-dominated. Important overstory trees include white oak, southern red oak, cherrybark oak, white ash, blackgum, mockernut hickory, bitternut hickory, loblolly pine and shortleaf pine.

Understory Tree Species: Common understory trees include red maple, American holly, winged elm, sweetgum, eastern hophornbeam, and flowering dogwood.

Shrub Species: American beautyberry, parsley hawthorn, southern arrowwood, farkleberry, Carolina buckthorn, and yaupon are common shrub species.

Similar LTPs: 232Fe.14.4.10, while floristically similar, occurs on toeslopes directly adjacent to small stream channels, and both the *Mitchella* and *Arisaema* groups are usually present.

232Fe.14.4 Minor Stream Bottoms Landtype

232Fe.14.4.10 White Oak-Water Oak/*Mitchella*-*Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

Geographic Range: Forms a narrow band across portions of the south-central part of the Texas Pineywoods. Public lands include Angelina National Forest north of the boundary between Angelina and Jasper counties, and south of a line running generally west from Caney Creek Recreation Area to Zavalla as well as Davy Crockett National Forest generally south of a line running from Alabama Creek west to US Highway 287 north of Groveton.

Geology: Parent material includes recent (Holocene) alluvial sands, silts, and loams associated with valleys of small perennial and intermittent streams.

Landform: Occurs on toe slopes of narrow stream bottoms, adjacent to the stream channel. Floodplains are often poorly developed and floodplain width is normally less than 100 meters. Slope shape is concave to linear and slope gradients are gentle to very gentle.

Soil Characteristics: Soils are generally sandy loams over heterogeneous parent material or bedrock. Depth to the subsoil is variable and may be over 100 cm. Surface soil reaction is medium acid to strongly acid, and available nutrients are low to medium. Drainage mottles are common in the subsoil. Includes luka, lulus, Bessner, and Marietta soils.

Hydrology: The streams associated with this landtype phase are small, often intermittent, and do not have well-developed floodplains. Stream gradients are relatively steep and the upstream watershed is small, so flooding occurs only intermittently. Depth to the water table is variable, but at times may be within 30 cm of the soil surface.

Natural Disturbances and Processes: Fire occurs infrequently on stream bottoms. Fires originating on adjacent uplands may burn to the edge of stream bottoms and restrict the encroachment of stream bottom vegetation onto the slopes. Erosion and deposition constantly change the course of stream channels and can undercut banks and cause trees to lose soil anchorage and fall. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Mitchella* group are common to abundant. On immediate banks of the stream channel, species from the *Arisaema* group may be present.

Overstory Tree Species: The overstory is composed of a variety of hardwood and pine species including white oak, American beech, water oak, willow oak, sweetgum, loblolly pine, and shortleaf pine. Southern magnolia may be present on some sites.

Understory Tree Species: Common understory trees include Florida maple, blackgum, mockernut hickory, American holly, eastern hophornbeam, American basswood, common pawpaw, and white fringetree.

Shrub Species: The shrub layer includes American beautyberry, southern arrowwood, and common sweetleaf.

Similar LTPs: 232Fe.14.4.20 occupies a similar landscape position but on the floodplains of larger streams that are subject to irregular flooding and where the *Bignonia* group is abundant.

232Fe.14.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Forms a narrow band across portions of the south-central part of the Texas Pineywoods. Public lands include Angelina National Forest north of the boundary between Angelina and Jasper counties, and south of a line running generally west from Caney Creek Recreation Area to Zavalla as well as Davy Crockett National Forest generally south of a line running from Alabama Creek west to US Highway 287 north of Groveton.

Geology: Occurs on the Manning and Wellborn formations. Terrain is gently to moderately rolling.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Floodplain width is normally greater than 100 meters. The landform is concave to linear, and nearly level. Microtopography on some sites consists of numerous small depressions, drainage channels, and mounds created as flood waters scour and deposit alluvial materials.

Soil Characteristics: Soils formed in alluvial material consisting of sandy loam to loamy sand over heterogeneous alluvial parent material or bedrock. Depth to the subsoil may be over 100 cm. Because of frequent seasonal flooding and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and on some areas mineral soil is exposed. In low areas and old stream channels, soils may be constantly saturated. Drainage mottles occur throughout the soil profile. Soil reaction ranges from moderately alkaline to very strongly acid, and available nutrients are low to medium. Soils are generally Entisols and are mapped as the Laneville, Nahatche, Ozias, and Pophers series.

Hydrology: Streams associated with this landtype phase drain a relatively large watershed and stream gradients are gentle, so irregular flooding occurs. Duration of flooding increases with the size of the watershed.

Natural Disturbances and Processes: Fire occurs very infrequently on stream floodplains. Erosion and deposition constantly change the course of stream channels and can undercut banks and cause trees to lose soil anchorage and fall. Windstorms may uproot or damage overstory trees. New deposits of alluvial material are colonized by vegetation.

Ground Layer Species: Species from the *Bignonia* group dominate the ground layer, including caric-sedges (*Carex* spp.) and rushes (*Juncus* spp.). On slightly elevated mounds, species from the *Mitchella* and *Callicarpa* groups may be important. Looseflower waterwillow (*Justicia ovata*) may occur in wet depressions and drainage channels. On immediate stream banks and the edges of saturated depressions, ferns such as sensitive fern (*Onoclea sensibilis*) and common ladyfern (*Athyrium filix-femina*) are often abundant.

Overstory Tree Species: The overstory is dominated by a mixture of hardwood species including willow oak, laurel oak, blackgum, sweetgum, water oak, swamp chestnut oak, and cherrybark oak. Loblolly pine may also be an important component of some stands.

Understory Tree Species: Common understory species include saplings of red maple, American basswood, river birch, and green ash along with American hornbeam.

Shrub Species: Shrubs include dwarf palmetto, gulf sebastiana, parsley hawthorn, Elliott's blueberry, smallflower blueberry, and evergreen bayberry.

Site Inclusions: Slight differences in elevation, sometimes less than 1 meter, may cause a profound change in species composition. Examples include pimple mounds, which may contain species more characteristic of mesic lower slopes than floodplains. Likewise, wet depressions and channels provide habitat for obligate wetland species.

Similar LTPs: 232Fe.14.4.10 is associated with stream bottoms, but the streams are smaller with narrow valleys and little or no floodplain, and the *Mitchella* group is more common. Downstream, wet-mesic floodplains grade into Seasonally Flooded River Floodplains such as 232Fd.4.2.10.

232Fe.14.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

Geographic Range: Forms a narrow band across portions of the south-central part of the Texas Pineywoods. Public lands include Angelina National Forest north of the boundary between Angelina and Jasper counties, and south of a line running generally west from Caney Creek Recreation Area to Zavalla as well as Davy Crockett National Forest generally south of a line running from Alabama Creek west to US Highway 287 north of Groveton.

Geology: Occurs on the Manning and Wellborn formations. Terrain is gently to moderately rolling.

Landform: Occurs on the floodplains of small, perennial streams or on headslopes of perennial or intermittent drainages where underground water flow exits a hillside as a seep. It may also be found downstream wherever seepage of underground water occurs. Stream channels are often poorly developed.

Soil Characteristics: Soils are generally loamy fine sand over a sandy clay loam subsoil and are poorly drained and continually wet. Soil reaction is medium acid to strongly acid and available nutrients are very low. Soils are often consistent with the Naconiche or Osier series but are usually mapped as Rentzel, Lovelady, and Tenaha soils near stream drainages.

Hydrology: An impermeable subsurface layer such as sandstone, shale, or clay, results in soils that are rarely or never flooded but are saturated most of the year and have a semipermanently to nearly permanently saturated hydrologic regime.

Natural Disturbances and Processes: Fire is very infrequent on wet forested seeps and typically has minimal influence on vegetation. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species in the *Osmunda* group dominate. Netted chain fern (*Woodwardia areolata*) is often the principal ground cover. Other ferns, especially cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*) are also important. The *Arisaema* group may be present on portions of some sites.

Overstory Tree Species: Common overstory trees include sweetbay magnolia, swamp tupelo, red maple, and redbay. Water oak and sweetgum may also be found on more mesic microsites.

Understory Tree Species: Understory trees include red maple and green ash saplings along with redbay.

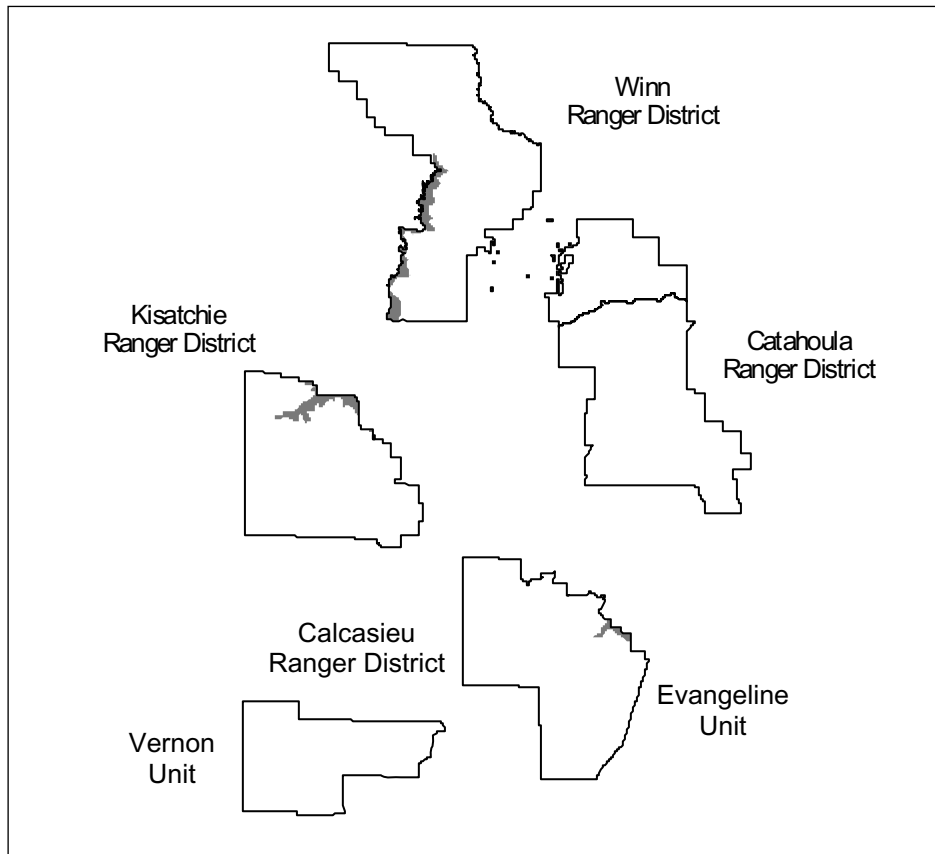
232Fe.14 Sandy Uplands Landtype Association

Shrub Species: Shrubs include evergreen bayberry, early azalea, Arkansas blueberry, deciduous holly, gallberry holly, and occasionally, poison sumac.

Similar LTPs: 232Fe.14.4.20 occurs on loamy, irregularly flooded stream bottoms with well-developed floodplains where isolated areas of seepage with the *Osmuda* group may occur.

CHAPTER 24

234Ai.7 RED RIVER ALLUVIAL PLAIN LANDTYPE ASSOCIATION



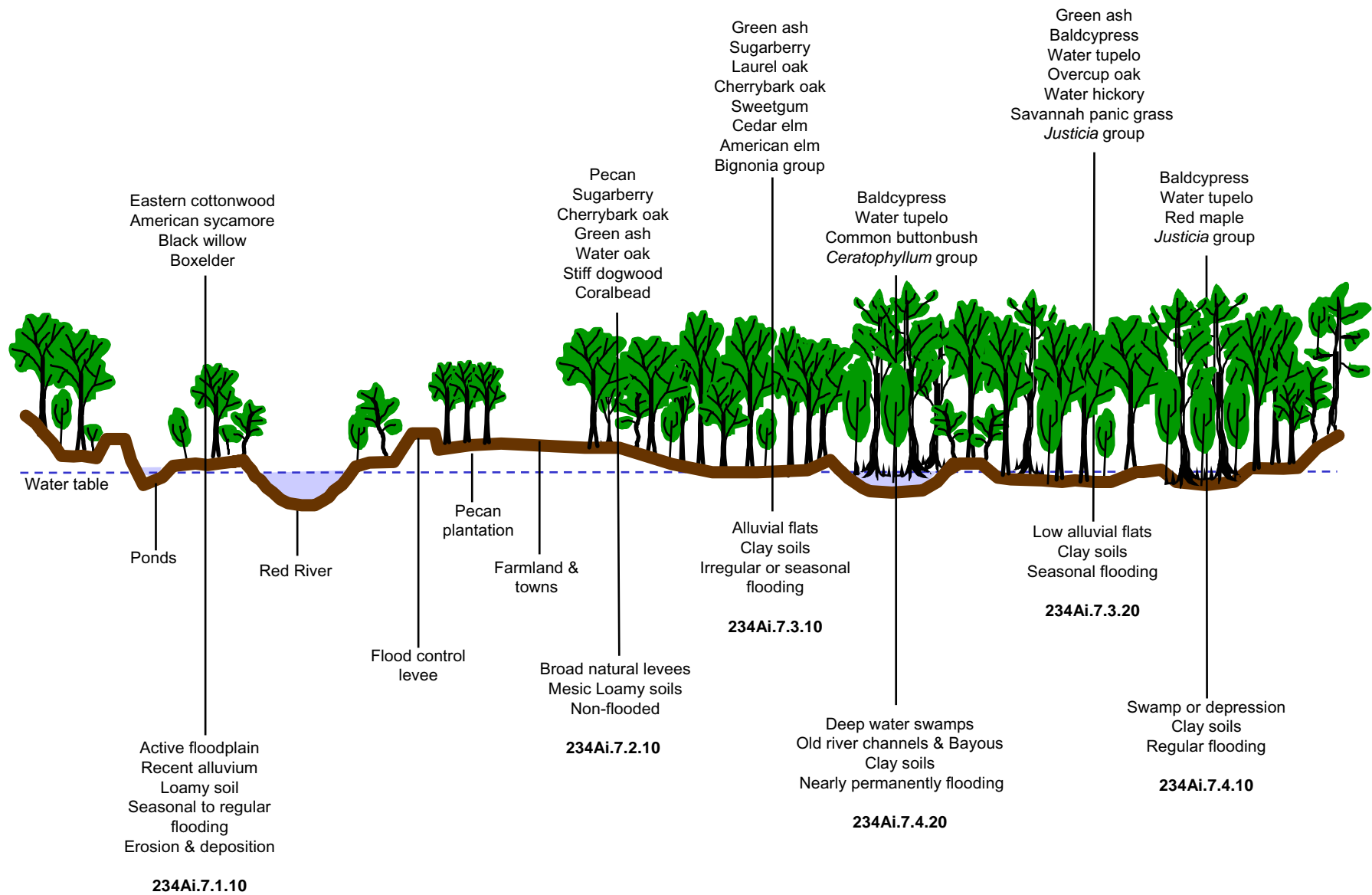


Figure 24.1 Landscape profile of ecosystems on the Red River Alluvial Plain Landtype Association.

234Ai.7 RED RIVER ALLUVIAL PLAIN LANDTYPE ASSOCIATION



234Ai.7.1.10 Eastern cottonwood-American sycamore /*Cornus foemina* Sandy/Loamy Seasonally Flooded Active Floodplains. Water (center) is Red River (Natchitoches Parish, near Natchitoches, LA)



234Ai.7.2.10: Pecan-Sugarberry /*Parthenocissus* Loamy Mesic Natural Levees & gentle levee slopes (Grant Parish, near Alexandria, LA)



234Ai.7.3.10: Green ash/ *Ilex decidua* Clayey/ Loamy Irregularly/ Seasonally Flooded Alluvial Flats (Bayou Boeuf Natural Research Area, Kisatchie N.F. Evangeline Unit, Calcasieu RD, Compartment 31)



234Ai.7.3.10: Green ash/ *Ilex decidua* Clayey/ Loamy Irregularly/ Seasonally Flooded Alluvial Flats (Farmland on Moreland Clay with Bayou Boeuf Natural Research Area, Kisatchie N.F., in background)



234Ai.7.3.20: Green ash-Baldcypress/ *Phanopyrum gymnocarpon* Clayey Seasonally Flooded Low Alluvial Flats & Depressions (Cunningham Brake, Kisatchie N.F. Kisatchie R.D. Compartment 3)



234Ai.7.4.10: Water tupelo-Baldcypress /*Justicia* Clayey Regularly Flooded Swamps (Cunningham Brake, Kisatchie N.F. Kisatchie R.D. Compartment 3)

KEY TO LANDTYPE PHASES

Note: Refer to the Hydrologic Regimes described in Chapter 7 when using this key.

- 1a. Sites are adjacent to the Red River and located outside the flood control levee system and are subject to flooding, erosion, deposition, and reworking of soil by waters of the Red River.234Ai.7.1.10 Eastern cottonwood-American sycamore /*Cornus foemina* Sandy-Loamy Seasonally Flooded Active Floodplains
- 1b. Sites are not immediately adjacent to the Red River and are protected from flooding by the Red River by the flood control levee system. Lower areas may be subject to flooding or ponding from local streams & bayous..... 2
- 2a. Natural levees, gentle, broad, levee slopes, and other high areas on the alluvial plain that are intermittently (< 5% of growing season) or never flooded: They are usually associated with loamy Roxana, Norwood, and similar soils. Pecan is often abundant. 234Ai.7.2.10 Pecan-Sugarberry /*Parthenocissus Loamy Mesic* Natural Levees and gentle levee slopes
- 2b. Lower portions of the alluvial plain that typically flood for more than 5% of the growing season. They are usually associated with clay or clay loam soils such as Moreland, Latanier, Perry or Yorktown. Pecan is less abundant than for 2a. 3
- 3a. Broad, nearly level seasonally or irregularly flooded alluvial plains and depressions that are usually inundated < 25% of the growing season. Natural sites are dominated by green ash, sugarberry, flood-tolerant oaks, sweetgum, and other bottomland hardwood species. Baldcypress and water tupelo are absent or occur merely as components of a mixed stand..... 4
- 3b. Regularly flooded or semi-permanently to nearly permanently flooded swamps with standing water present for >25% of the growing season. Natural overstory is dominated by water tupelo or baldcypress. 5
- 4a. Nearly level, irregularly flooded to seasonally flooded floodplains. Soils are poorly drained Moreland or Latanier clays or clay loams. Green ash, sugarberry, and other hardwoods form the overstory. *Carex* spp. are abundant in the understory. Water tupelo and baldcypress are rare or absent. Savannah panic grass may be present but is not dominant. Members of both the *Bignonia* and *Justicia* groups are common..... 234Ai.7.3.10 Green ash/ *Ilex decidua* Clayey-Loamy Irregularly-Seasonally Flooded Alluvial Flats
- 4b. Seasonally to nearly regularly flooded lower portions of the floodplain, often in slight depressions, old stream channels, or oxbows. Soils are poorly drained Perry or Moreland clays. Lower and wetter than 4a, natural overstory usually includes some baldcypress or water tupelo. Overcup oak and water hickory may be abundant. Savannah panic grass (*Phanopyrum gymnocarpon*) may dominate the ground layer. Members of the *Justicia* species group are common but plants from the *Bignonia* group are restricted to higher microsities 234Ai.7.3.20 Green ash-Baldcypress/ *Phanopyrum gymnocarpon* Clayey Seasonally Flooded Low Alluvial Flats and Depressions

234Ai.7 The Red River Alluvial Plain Landtype Association

- 5a. Regularly flooded swamps in depressions, abandoned stream channels, or oxbows. The very poorly drained clayey Perry or Yorktown soils are flooded for 25-75% of a typical growing season. They are often exposed during dry periods, especially in late summer. Water depth is usually shallow, 50 cm or less. Natural stands are commonly dominated by baldcypress and water tupelo. The *Justicia* species group is common, especially on higher microsites. 234Ai.7.4.10 Water tupelo-Baldcypress /*Justicia*
Clayey Regularly Flooded Swamps

- 5b. Deep, semipermanently to nearly permanently inundated depressions or swamps, usually associated with an abandoned stream channel, drowned floodplain area, or oxbow. Soils are very poorly drained and are inundated for 75%-100% of the growing season. Natural overstory is dominated by baldcypress and/or water tupelo. Floating and submersed aquatic plants from the *Ceratophyllum* species group are common. Species from the *Justicia* group occur only on exposed stumps, logs, and mounds
..... 234Ai.7.4.20 Baldcypress-Water tupelo /*Ceratophyllum*
Semi-Permanently Flooded Swamps

LANDTYPE PHASE DESCRIPTIONS

234Ai.7.1 Active Outer Floodplain Landtype

234Ai.7.1.10 Eastern cottonwood-American sycamore /*Cornus foemina* Sandy-Loamy Seasonally Flooded Active Floodplains Landtype Phase.

Geographic Range: Located on the active floodplain of the lower (Louisiana) reaches of the Red River outside the flood-control levee system.

Geology: Occurs on recent (Holocene) alluvium associated with natural levees, sand bars, point bar deposits, and other areas within the active floodplain of the Red River.

Landform: Includes active natural levees and low sandbars adjacent to the Red River. Landforms are often narrow and linear in shape and are bounded by the river on one side and the flood control levee on the other. Sites are subject to flooding and may experience scouring, erosion, bank cutting, and deposition of sediments resulting from high-velocity flood waters.

Soil Characteristics: Soils consist of well drained very fine sandy loams. They largely belong to the Severn and Roxana series. Isolated areas of lower, clayey (Moreland) soils may also occur. Reaction is neutral to moderately alkaline and the Severn soils are calcareous below a depth of 25cm. Soils are fertile and nutrient levels are high.

Hydrology: The loamy to sandy surface soil is well drained, but the proximity to the Red River results in a seasonally inundated to regularly inundated hydrologic regime on most sites.

Natural Disturbances and Processes: Sites may be subject the reworking of sediments as a result of stream bank erosion or natural alterations of the stream course. As long as the substrate remains stable, most disturbances in the overstory are through individual tree mortality or wind damage during storms. Flooding results in both the removal and deposition of soil material. Fire is not a common disturbance.

Ground Layer Species: Species composition can be quite variable, depending on slight differences in elevation, soils, and hydrologic conditions. Virginia creeper (*Parthenocissus quinquefolia*) and pepper vine (*Ampelopsis arborea*) are common. In areas recently disturbed or scoured by flood action, giant ragweed (*Ambrosia trifida*) and goldenrod (*Solidago Canadensis*) abound.

Overstory Tree Species: The overstory consists of a variety of hardwoods, especially pioneer species such as American sycamore, eastern cottonwood, boxelder, and black willow. Pecan, sugarberry, sweetgum, slippery elm, and water oak may also occur, especially on older, more stable areas. River birch, common in similar situations on the floodplains smaller local rivers, was not observed on the reference sites.

Understory Tree Species: True understory-specialist tree species are rare, but persimmon and boxelder are frequently present as small trees.

Shrub Species: Stiff dogwood is abundant.

Site Inclusions: The ELTP is rather broadly defined. Slight differences in elevation correspond to marked changes in species composition. Examples include isolated low, poorly drained areas with Moreland soils. There are also numerous ponds from which fill was removed to construct the levee system where *Typha latifolia*, *Rhynchospora corniculata*, *Eichornia crassipes*, and members of the *Ceratophyllum* group abound. In future revisions, these areas may be described as separate LTPs.

Similar LTPs: Mesic Natural Levees (234Ai.7.2.10) also occur on well drained soils and have some of the same species, but they are protected from the Red River by the flood control levee system.

234Ai.7.2 Mesic Natural Levees and gentle levee slopes Landtype

234Ai.7.2.10 Pecan-Sugarberry / *Parthenocissus* Loamy Mesic Natural Levees and gentle levee slopes Landtype Phase

Geographic Range: Located on the floodplain of the lower (Louisiana) reaches of the Red River.

Geology: Occurs on recent (Holocene) alluvium associated with natural levees, adjacent intermediate-elevation very gentle levee slopes, and other intermediate to high-elevation areas within the floodplain of the Red River.

Landform: Occurs on high and intermediate-elevation portions of the Red River floodplain including natural levees and adjacent, imperceptible, very gentle levee slopes associated with the Red River and its old channels and distributaries such as Bayou Latanier. Sites are commonly adjacent and parallel to the Red river or to abandoned stream channels and have coarser textured soils than the lower alluvial flats. Landforms, while often linear in shape, are considerably larger and broader than equivalent areas on the smaller floodplains of local rivers and account for a significant proportion of the total landscape. Slope gradient is gentle, very gentle, or nearly level. Higher topographic positions combined with fertile soils have resulted in the establishment of many towns, farms, and plantations on these landforms. For example, the city of Alexandria, LA, lies largely within this ELTP as do the historic Cane River plantations.

Soil Characteristics: Soils are usually well drained to somewhat poorly drained fine sandy loams, silt loams, or clay loams. Reaction ranges from slightly acid to moderately alkaline, and nutrient levels are generally high. Many of these soils, for example Norwood and Roxana soils, are among the most desirable agricultural soils on the West Gulf Coastal Plain. Consequently, most of this ELTP is currently under agriculture. Roxana, Gallion, and Norwood soils dominate; however, Armistead, Caspiana, and higher-drier areas of Latanier and Moreland soils also occur.

Hydrology: Sites are relatively high on the landscape and the high water table level for most soils is generally more than 122cm from the surface. Historically, flooding was rare, associated with extreme weather, and lasted on average less than 5% of the growing season (an intermittently to never inundated hydrologic regime). Currently, flood control levees exclude flooding and any inundation would be the result of catastrophic events.

Natural Disturbances and Processes: Wind throw and individual tree mortality are the major disturbances. Fire is very infrequent but not unknown on major floodplains. Distance from the immediate vicinity of the river limits stream bank erosion; however, historically, large areas were reworked as the river made major shifts in its course (for example the shift that resulted in the abandonment of the Cane River in the 1830's).

Ground Layer Species: A wide variety of mesophytic, nutrient-loving species occurs. Since undisturbed understories are rare as a result of extensive agriculture, reference sites were confined to fencerows and roadsides; a model for fully natural ground layer vegetation has not yet been formed. On most wooded sites, peppervine (*Ampelopsis arborea*), Virginia creeper (*Parthenocissus quinquefolia*), greenbriar (*Smilax* spp.), Carolina coralbead (*Cocculus Carolinus*), Poison ivy (*Toxicodendron radicans*), and black snakeroot (*Sanicula Canadensis*) are common.

Overstory Tree Species: Pecan and sugarberry dominate. Other common trees include cherrybark oak, green ash, water oak, sweetgum, and members of the *Carya* group such as honey locust, and eastern cottonwood. Pines, with the exception of occasional planted individuals, are absent.

Understory Tree Species: Red mulberry, common persimmon, and osage orange are common.

Shrub Species: Stiff dogwood is widespread. Woody vines such as wild grape (*Vitis* spp.) and Alabama supplejack (*Berchemia scandens*) are common.

Site Inclusions: Areas of slightly lower, somewhat poorly drained clayey soils occur (for example Latanier or Moreland soils), but still have an intermittently or never inundated hydrologic regime. These areas could potentially be described as an additional LTP (234Ai.7.2.20).

Similar LTPs: Well drained (Roxana) soils are also common on the Active Outer Floodplain (234Ai.7.1.10). However these areas flood seasonally, are subject to riverbank erosion, and tend to have more pioneer species such as black willow, eastern cottonwood, and boxelder. Many of the same tree species are found on Alluvial Flats (234Ai.7.3.10) however these sites may flood and soils are generally more clayey.

234Ai.7.3 Broad Alluvial Flats Landtype

234Ai.7.3.10 Green ash/ *Ilex decidua* Clayey-Loamy Irregularly-Seasonally Flooded Alluvial Flats Landtype Phase

Geographic Range: Located on the floodplain of the lower (Louisiana) reaches of the Red River. Many of the Red River Alluvial Plain's National Forest lands including most of Bayou Boeuf Research Natural Area are within this LTP.

Geology: Occurs on recent (Holocene) alluvial silts and clays associated with the Red River and its abandoned channels and distributaries.

Landform: Occurs on the broad, medium to low-elevation, nearly level or gently sloping alluvial plains of the Red River. Despite flooding hazards, many of these sites have been artificially drained and are in agriculture.

Soil Characteristics: Soils are poorly drained, very slowly permeable clays or silty clay loams. The Moreland series is predominant, but Latanier soils also occur. Soils have high natural fertility and reaction is neutral to moderately alkaline. Soils are hard and deeply cracked when dry and have a high shrink-swell potential.

Hydrology: While largely isolated from the main channel of the Red River, these areas flood as a result of overflow of local bayous and streams, primarily in the winter and early spring months. Lower areas are seasonally flooded while higher sites or those distant from a stream or Bayou are irregularly flooded: Flooded conditions may persist for 5-25% of the growing season. In addition, a perched water table often develops 30-91cm below the surface in the winter months. Prolonged submersion of soils creates anoxic conditions that favor obligate and facultative wetland species.

Natural Disturbances and Processes: Flooding occurs irregularly to seasonally and flood duration is long enough to exclude many mesophytic species. Fire is very infrequent on the alluvial plain. Extensive wind damage can occur in storms because most bottomland tree species

are shallow-rooted and susceptible to windthrow. Deposition of alluvium provides new soil that can be colonized by vegetation.

Ground Layer Species: *Carex* species, (especially Cherokee sedge--*C. cherokeensis*--and Louisiana sedge--*C. Louisianica*) and the grasses Indian woodoats (*Chasmanthium latifolium*) and slender woodoats (*C. laxum*) may dominate. Other common species include peppervine (*Ampelopsis arborea*), greenbriar (*Smilax* spp.), and Poison ivy (*Toxicodendron radicans*) along with members of the *Bignonia* species group. Virginia dayflower (*Commelina virginica*) Savanna panic grass (*Phanopyrum gymnocarpon*), and false nettle (*Boehmeria cylindrica*) occur in wetter areas.

Overstory Tree Species: Green ash and sugarberry dominate. Cherrybark oak, laurel oak, water oak, American elm, cedar elm, and sweetgum may also be common. Sites may also support pecan, water hickory, overcup oak, and other flood-tolerant hardwoods.

Understory Tree Species: Common understory species include green ash saplings, common persimmon, and American hornbeam.

Shrub Species: Common species include deciduous holly and green hawthorn (*Crataegus viridis*). Dwarf palmetto forms dense thickets in some stands.

Site Inclusions: Within this landtype phase, a range of soil and topographic microsite inclusions may be found ranging from small depressions, vernal pools and small sloughs to low mesic rises.

Similar LTPs: Some areas of Mesic Natural Levees and gentle levee slopes (234A1.67.2.10) have clayey Moreland or Latanier or soils but they have an intermittently or never inundated hydrologic regime and pecan is more abundant. Clayey Seasonally flooded Low alluvial Flats (234Ai.7.3.20) have some of the same species, but they are lower, flood more often, are transitional to swamps, and support occasional swamp species such as baldcypress.

234Ai.7.3.20 Green ash-Baldcypress/ *Phanopyrum gymnocarpon* Clayey Seasonally Flooded Low Alluvial Flats and Depressions Landtype Phase

Geographic Range: Located on the floodplain of the lower (Louisiana) reaches of the Red River. National Forest lands from this LTP include portions of Cuningham Brake (Kisatchie RD) and Bayou Boeuf Research Natural Area (Calcasieu RD).

Geology: Occurs on recent (Holocene) alluvial clays associated with the Red River and its abandoned channels and distributaries.

Landform: Occurs on low, nearly level alluvial plains and in slight depressions. Because of its lower elevation, this landtype phase is more susceptible to flooding than 234Ai.7.3.10.

Soil Characteristics: Soils are poorly drained, very slowly permeable clays. The Moreland series is predominant, but Perry soils also occur. Soils have high to medium natural fertility and reaction is medium acid to moderately alkaline.

Hydrology: While largely isolated from the main channel of the Red River, these areas flood as a result of overflow from local bayous and drainages primarily in the winter and early spring months. While the hydrologic regime generally falls within seasonally-flooded (12.5-25% of the growing season), actual flood durations tend to be in the mid-to-high portion of this range. High water marks are readily visible on the trees, often at a height of >1m from the ground. Prolonged submersion of soils creates anoxic conditions that favor obligate and facultative wetland species.

Natural Disturbances and Processes: Flooding occurs seasonally and flood duration is long enough to completely exclude mesophytic species. Fire is very infrequent on the Alluvial Plain. Most bottomland tree species are shallow-rooted and prone to tip-over during windstorms although baldcypress is much less likely to tip over than hardwood species. Deposition of alluvium provides new soil that can be colonized by vegetation.

Ground Layer Species: Savanna panic grass (*Phanopyrum gymnocarpon*) often dominates. Species from the *Justicia* group may also be common.

Overstory Tree Species: Green ash is abundant, usually mixed with baldcypress and/ or water tupelo. Red maple, water hickory, laurel oak, and overcup oak may also occur.

Understory Tree Species: Species may include Green ash saplings, red maple, American hornbeam, common persimmon, and occasionally, water elm.

Shrub Species: Understory is usually sparse, but may include switch cane, Virginia sweetspire, eastern swampprivet, and Gulf sebastiania.

Similar LTPs: Clayey/ Loamy Irregularly/ seasonally Flooded Alluvial Flats (234Ai.7.3.10) have some of the same species, but they are higher, flood for shorter durations, are more species-rich, have less *Phanopyrum gymnocarpon* in the groundlayer, and lack swamp species such as baldcypress.

234Ai.7.4 Floodplain Swamps Landtype

234Ai.7.4.10 Water tupelo-Baldcypress /*Justicia* Clayey Regularly Flooded Swamps Landtype Phase

Geographic Range: Located on the floodplain of the lower (Louisiana) reaches of the Red River. National Forest lands from this LTP include much of Cuningham Brake (Kisatchie RD).

Geology: Occurs on recent (Holocene) alluvial clays associated with the Red River and its abandoned channels and distributaries.

Landform: Occurs in backswamps or sloughs associated with the Red River alluvial Plain. Backswamps are often the remains of abandoned stream channels or oxbows. They may cover an area from one to tens of hectares.

Soil Characteristics: Soils consist of very poorly drained clay soils from the Perry and Yorktown series that are usually flooded for 3 to 8 months annually. Saturated conditions may occur year-round. Soil profiles are often gray as a result of anoxia. Nutrient levels range from medium to high and reaction ranges from medium acid in the upper profile to moderately alkaline in the subsoil.

Hydrology: Sites are in depressions and old stream channels occupying some of the lowest positions on the landscape. Experiencing a regularly-flooded hydrologic regime, they are typically flooded for 25-75% of the growing season. Nearly year-round soil saturation creates anoxic conditions that favor obligate and facultative wetland species.

Natural Disturbances and Processes: Flooding occurs regularly, depositing new sediments. Fire is very infrequent on river floodplains. Extensive wind damage can occur in storms, although secondary root systems associated with knees enable baldcypress to resist windthrow much better than broad-leaved bottomland species. Beavers may fell or damage trees in and around sloughs and swamps.

Ground Layer Species: Terrestrial ground cover on swamps, where water stands much of the year, tends to be very sparse. Savannah panic grass (*Phanopyrum gymnocarpon*) and species from the *Justicia* species group are common on slightly higher areas. Floating and submersed members of the *Ceratophyllum* species group occur in deeper pools.

Overstory Tree Species: Water tupelo, baldcypress, or a mixture of the two along with an occasional red maple, overcup oak, or green ash dominate the rather dense canopy of natural stands. Water elm occurs sporadically on some sites but is not nearly as common as on swamps associated with many of the smaller regional rivers.

Understory Tree Species: Understories are sparse but may include occasional red maple sapling, green ash sapling, or water elm.

Shrub Species: Shrubs are sparse but may include common buttonbush, Virginia sweetspire, common persimmon, and eastern swampprivet.

Similar LTPs: Deep water swamps (234Ai.7.4.20) occur in nearly permanently inundated areas, and the forest canopy is typically more open.

234Ai.7.4.20 Baldcypress-Water tupelo /*Ceratophyllum* Clayey Semi-Permanently Flooded Swamps Landtype Phase

Geographic Range: Located on the floodplain of the lower (Louisiana) reaches of the Red River.

Geology: Occurs on recent (Holocene) alluvial clays associated with the Red river.

Landform: Occurs in backswamps or sloughs associated on the lowest portions of the Red River Alluvial Plain often on abandoned stream channels or oxbows.

Soil Characteristics: Soils consist of very poorly drained clay soils from the Perry and Yorktown series that are usually flooded year round. Soil profiles are often gray as a result of anoxia. Nutrient levels range from medium to high and reaction ranges from medium acid in the upper profile to moderately alkaline in the subsoil.

Hydrology: Sites have a semipermanently to nearly permanently inundated hydrologic regime, are flooded for 75-100% of the growing season, and are exposed only during the driest weather. Inundation favors floating and submersed aquatic plants. Swamp communities may develop on impounded stream valleys, shallows, and shorelines of reservoirs in addition to natural sites as a result of similar hydrologic conditions. These sites were more common historically as a result of impoundments associated with the Red River Raft (See p. 3-18).

Natural Disturbances and Processes: Although baldcypress can survive under permanently flooded conditions for several centuries, periods of soil exposure are necessary for seedling establishment, limiting its ability to colonize some deep water areas. Extensive wind damage can occur in storms, although secondary root systems associated with knees make baldcypress more resistant to windthrow than most other bottomland species. Beavers may fell or damage trees in and around constantly flooded sloughs and swamps. Fire is very infrequent in deep water swamps.

Ground Layer Species: Floating and submerged aquatic plants from the *Ceratophyllum* species group dominate. Species from the *Justicia* group may occur around the edges of the swamp, in localized shallow areas, and on exposed stumps and logs. Water hyacinth (*Eichornia crassipes*) an invasive exotic species, may be abundant in some areas.

Overstory Tree Species: The overstory of natural stands is dominated by baldcypress. Water tupelo may also be abundant, especially in more disturbed stands. Stands are typically much more open and park-like than swamps from LTP 234Ai.7.4.10.

Understory Tree Species: Understory trees are widely scattered, consisting mainly of occasional water tupelo or baldcypress saplings. Occasional Water elm, red maple or green ash may occur in shallower areas.

Shrub Species: Shrubs are widely scattered, consisting primarily of common buttonbush growing on stumps and logs.

Site Inclusions: Treeless open areas dominated by floating and submersed plants occur. Aquatic ecosystems that have few vascular plants characterize the deepest areas.

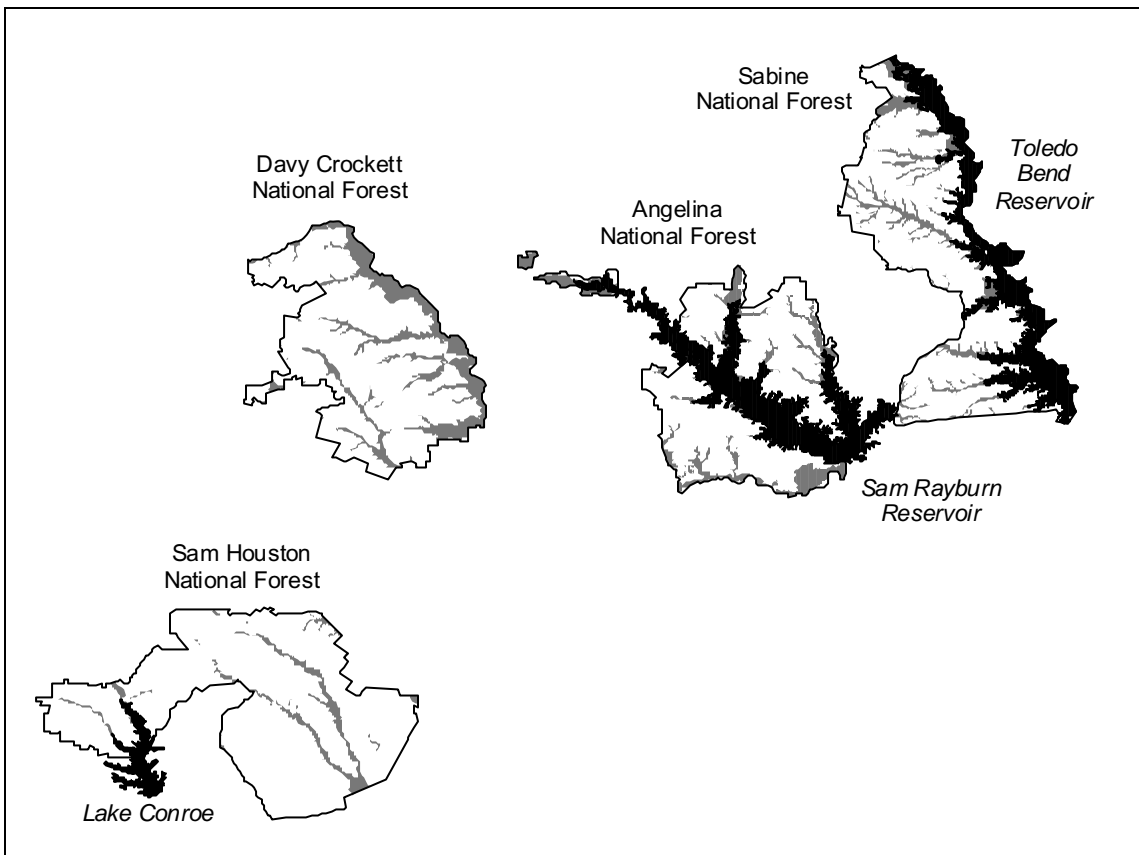
Similar LTPs: Regularly inundated swamps (234Ai.7.4.11) are usually not flooded year-round, and have a more dense and varied overstory. A major Texas swamp landscape associated with the upper reaches of Caddo Lake, a surviving Red River Raft lake, has been tentatively classified as belonging to LTA231Ea.4 due to geographic distance from the main floodplain of the Red River and modern-day hydrologic isolation from the Red.

CHAPTER 25

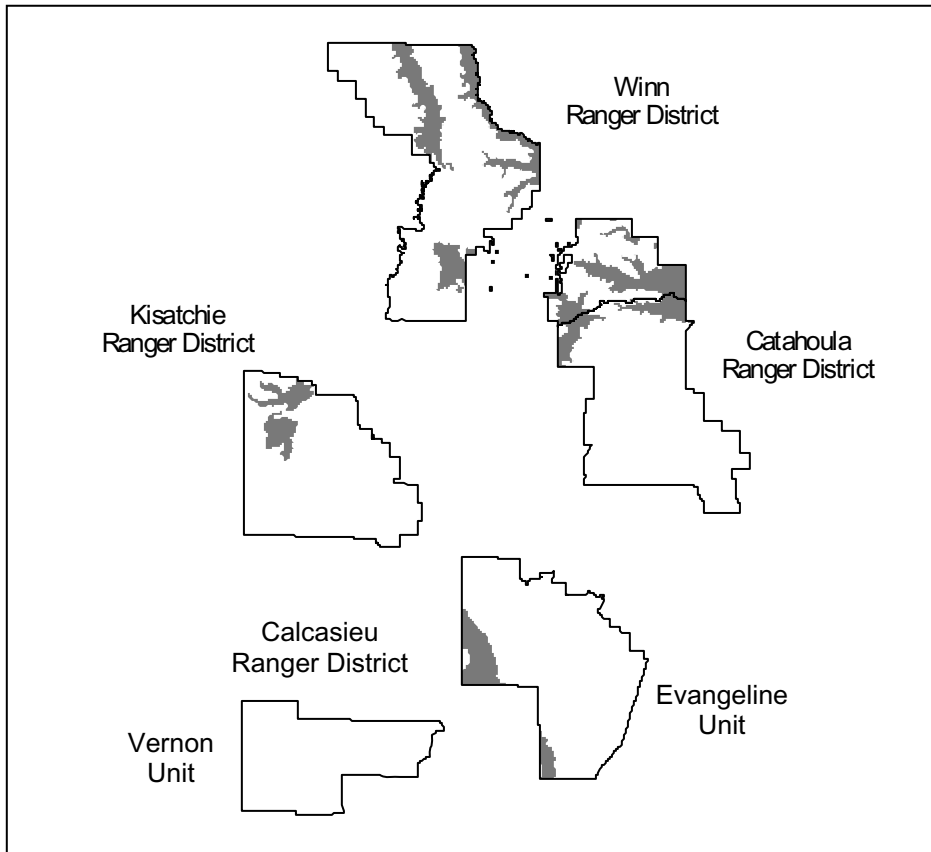
23xxx.4 ALLUVIAL FLOODPLAINS AND TERRACES LANDTYPE ASSOCIATIONS

(Includes 231Ea.4, 231Ed.4, 232Ef.4, 231Eg.4, 231Eh.4, 231Ei.4, 232Ej.4, 232.Fa.4, 232.Fc.4, 232.Fd.4, and 232.Fe.4).

ALLUVIAL FLOODPLAINS AND TERRACES – NATIONAL FORESTS IN TEXAS



ALLUVIAL FLOODPLAINS AND TERRACES – KISATCHIE NATIONAL FOREST



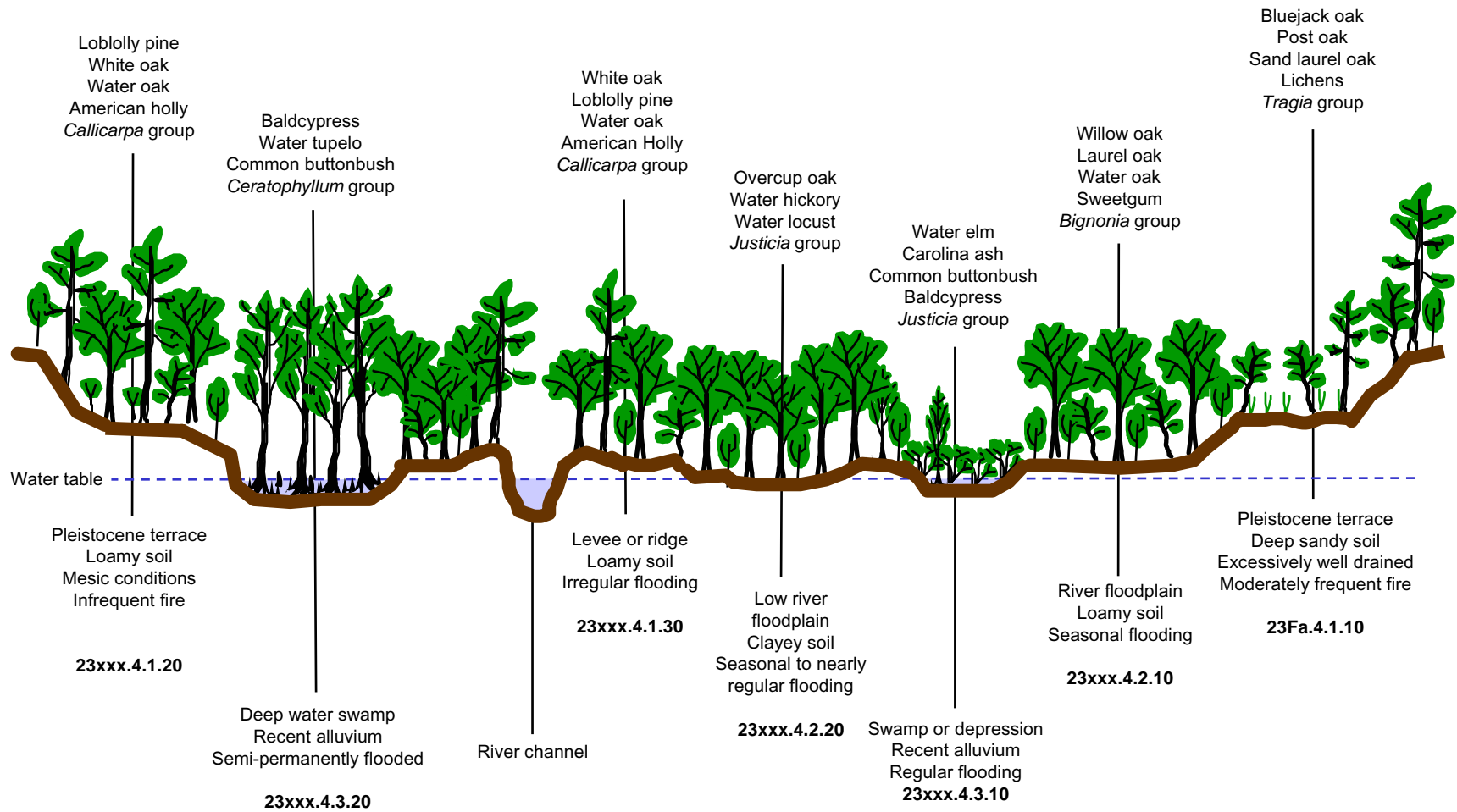


Figure 25.1 Landscape profile of ecosystems on the Alluvial Bottoms and Terraces Landtype Association.

23xxx.4 ALLUVIAL FLOODPLAINS AND TERRACES LANDTYPE ASSOCIATION



232Fa.4.1.10: Bluejack Oak/*Tragia* Sandy Dry River Terraces Landtype Phase (Kisatchie N.F., Winn RD, Compartment 26, Stand 2, near Saline Bayou)



232Fd.4.2.10: Willow Oak-Laurel Oak/*Bignonia* Loamy/Clayey Seasonally Flooded River Floodplains (SFA Experimental Forest, Nacogdoches Co. Texas, near Angelina River)



232Fd.4.2.20: Overcup Oak/*Justicia* Clayey/Loamy Seasonally to Nearly Regularly Flooded Low River Floodplains (Angelina N.F. Compartment 111, near Angelina River)



232Fa.4.2.30: *Panicum-Distichlis* Irregularly/ Seasonally Flooded Saline Flats (Winn Parish, LA, near Dugdemona River)



232Fd.4.3.10: Water elm/*Justicia* Clayey Regularly Flooded Swamps (Angelina N.F. Compartment 111, near Angelina River)



231Ea.4.3.20: Baldcypress/*Ceratophyllum* Semi-Permanently Flooded Swamps (Caddo Lake, Marion Co. Texas, near Cypress Bayou)

KEY TO LANDTYPE PHASES

Note: Refer to the Hydrologic Regimes described in Chapter 7 when using this key.

- 1a. Sites are on natural levees, Pleistocene terraces, or other elevated areas associated with river floodplains. Soils are generally loams, sandy loams, or sands. They are irregularly, intermittently, or never flooded..... 2
- 1b. Sites are on floodplain alluvial flats, low terraces, depressions, or swamps. Soils are generally clay loam to clay and are seasonally, regularly, or semi-permanently flooded....4
- 2a. Sites are on Pleistocene-aged terraces adjacent to and above the active floodplain and are intermittently or never flooded 3
- 2b. Sites are on natural levees or low ridges within the active floodplain and are irregularly or intermittently flooded.....23xxx.4.1.30 Loblolly Pine-White Oak/*Callicarpa*
Loamy Irregularly Flooded Levees and Bottomland Ridges
- 3a. Soils are deep, excessively well drained sands on terraces (the Prairie Terrace formation) adjacent to Louisiana’s Saline Bayou. Overstory includes post oak, bluejack oak, and sand laurel oak. Pricklypear (*Opuntia humifosa*) and little bluestem (*Schizachyrium scoparium*) are present in the ground layer along with other members of the *Tragia* and *Schizachyrium* species groups. 232Fa.4.1.10 Bluejack Oak/*Tragia*
Sandy Dry River Terraces
- 3b. Soils are moderately well drained to somewhat poorly drained with textures that range from sandy loam to sandy clay loam. Natural overstory includes a mixture of mesic and bottomland species which may include southern red oak, white oak, water oak, willow oak, blackgum, American beech, sweetgum, and loblolly pine. The *Callicarpa*, *Chasmanthium*, *Mitchella*, and *Bignonia*, species groups may be common.
.....23xxx.4.1.20 Loblolly Pine-White Oak/*Callicarpa*
Loamy Mesic Terraces
- 4a. Sites are on broad, nearly level seasonally or irregularly flooded floodplains or low terraces. Natural sites are dominated by oaks and other bottomland deciduous hardwoods or are rare open saline areas dominated by herbaceous plants. Baldcypress and water elm are rare or absent..... 5
- 4b. Sites are regularly flooded or semi-permanently to nearly permanently flooded swamps. Water stands on the ground for 25-100% of the growing season and natural overstory is dominated by water elm, Carolina ash, water tupelo, or baldcypress. 7
- 5a. Sites are natural openings on rare saline flats with few large trees, predominantly herbaceous vegetation, and extensive areas of bare ground. They are associated with the Brimstone soil series and are restricted to isolated areas along Louisiana’s Saline Bayou and Dugdomona River..... 232Fa.4.2.30 *Panicum-Distichlis*
Seasonally Flooded Saline Flats
- 5b. Natural stands are forested with a mixture of flood-tolerant bottomland deciduous hardwood species. They occupy significant portions of most floodplains throughout the region and occur on a variety of soil types. 6

23xxx.4 Alluvial Floodplains and Terraces Landtype Association

- 6a. Sites are nearly level, seasonally flooded floodplains. They are often the most extensive LTP on the landscape. Soils are poorly drained sandy loams, silt loams, and clay loams. Natural overstory includes a mixture of moderately flood-tolerant species including willow oak, laurel oak, swamp chestnut oak, water oak, blackgum, and sweetgum. Both the *Bignonia* and *Justicia* species groups are common.
..... 23xxx.4.2.10 Willow Oak-Laurel Oak/*Bignonia*
Loamy/Clayey Seasonally Flooded River Floodplains
- 6b. Sites are seasonally to nearly regularly flooded lower portions of the floodplain, often in slight depressions, old stream channels, or old oxbows. Soils are poorly drained clays, sandy clays, and clay loams and are slightly lower and wetter than for 5a. Natural overstory is usually dominated by overcup oak. Carolina ash, water hickory, and water locust may also occur. The *Justicia* species group is common but the *Bignonia* group is rare. 23xxx.4.2.20 Overcup Oak/*Justicia*
Clayey/Loamy Seasonally Flooded Low River Floodplains
- 7a. Sites are regularly flooded swamps, depressions, abandoned stream channels, or old oxbows that are often exposed during dry periods, especially in late summer. Water depth is usually shallow, 50 cm or less. Soils are very poorly drained clays, sandy clays, or clay loams that are flooded for 25-75% of a typical growing season. Natural stands commonly have a dense sub-canopy of water elm or Carolina ash and the *Justicia* species group is common 23xxx.4.3.10 Water Elm/*Justicia*
Clayey Regularly Flooded Swamps
- 7b. Sites are deep, semipermanently to nearly permanently flooded depressions or swamps, usually associated with abandoned stream channels, drowned floodplains, or oxbows. Soils are deep, very poorly drained clays, sandy clays, or clay loams that are only exposed during the most extreme droughts. Baldcypress and/or water tupelo dominate natural overstory. Floating and submersed aquatic plants from the *Ceratophyllum* species group are common. Rooted species such as those from the *Justicia* group are restricted to exposed stumps, logs, and mounds.....
..... 23xxx.4.3.20 Baldcypress/*Ceratophyllum*
Semi-Permanently Flooded Swamps

DESCRIPTIONS OF LANDTYPE PHASES:

23xxx.4.1 Terraces and Bottomland Ridges Landtype

232Fa.4.1.10 Bluejack Oak/*Tragia* Sandy Dry River Terraces Landtype Phase

Geographic Range: Known primarily from sites on floodplain of Saline Bayou in Winn Parish, LA, including occurrences in the Winn Ranger District of Kisatchie National Forest. This landtype phase may have also occurred historically in east Texas.

Geology: Occurs on the Prairie Terrace formation which is composed of Pleistocene sandy alluvium. Known sites are associated with the Saline Bayou floodplain.

Landform: Occurs on nearly level, wide terraces situated topographically above the active floodplains of major rivers and their direct tributaries. Terrain may be flat or slightly undulating with depressions and low ridges, or gently sloping.

Soil Characteristics: Soils consist of deep, excessively well drained sands over a loamy fine sand subsoil. Soil properties produce dry-site conditions on a topographic position usually occupied by mesic hardwood forests. Soils are mapped as Bienville loamy fine sand. Nutrient availability is low.

Hydrology: The deep sandy soils are rapidly permeable and rainfall percolates downward quickly; hence, despite low topographic position, soils dry rapidly and long periods of drought may occur. Since these terraces are located well above the active river floodplain, they are generally not affected by flooding.

Natural Disturbances and Processes: Under natural conditions, this landtype phase may be subject to moderately frequent fires originating in nearby uplands. However, topographic isolation from uplands by mesic lower slope forests may have reduced their frequency.

Ground Layer Species: Little bluestem (*Schizachyrium scoparium*), eastern prickly pear (*Opuntia humifosa*), tapered rosette grass (*Dichantherium acuminatum*), and Texas bullnettle (*Cnidoscolus texana*) are abundant in natural stands. Other members of the *Schizachyrium* and *Tragia* groups may also occur. Members of the *Callicarpa* and *Chasmanthium* groups may also be present. Ground cover is sparse; much of the surface is bare ground or covered by lichens, especially *Cladonia* spp.

Overstory Tree Species: The canopy is usually open and trees are often stunted and small. Scattered larger trees include shortleaf pine, loblolly pine, and post oak. Historically, longleaf pine may have been an important overstory species, but no relict trees have been observed.

Understory Tree Species: Most sites have a rather dense subcanopy of scrubby bluejack oak, post oak, and sand laurel oak.

Shrub Species: Dominant shrubs include St. Andrews cross, yaupon, and farkleberry.

Similar LTPs: Loamy mesic terraces (23xxx.4.1.20) also occur on Pleistocene terraces but they have loamy soils and support a mesic hardwood-pine community. Plant communities similar to sandy dry river terraces also occur on deep sands on upland landscapes (see 232Fa.5.1.20 arenic dry uplands).

23xxx.4.1.20 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Terraces Landtype Phase.

Geographic Range: Located adjacent to floodplains of major rivers and their direct tributaries, including the Angelina River, Attoyac River, Ayish Bayou, Cypress Bayou, Neches River, Sabine River, San Jacinto River, Trinity River, and Winters Bayou in Texas, and the Calcasieu River, Corney Bayou, the Dugdemona River, Kisatchie Bayou, Latt Creek, the Little River, McKinny Creek, Nantachie Creek, and Saline Bayou in Louisiana.

Geology: Occurs on low Pleistocene river terraces, consisting of continental sand, silt and gravel deposited by major rivers during glacial melting.

Landform: Occurs on nearly level to gently sloping, wide terraces situated topographically above the active floodplains of major rivers and their direct tributaries. Terrain may be flat or slightly undulating with depressions and low ridges.

Soil Characteristics: Soils are moderately well drained to poorly drained and consist of a sandy loam to sandy clay loam surface soil over clay loam to sandy clay loam subsoil. Reaction is medium acid and nutrient availability is low to medium. Soils are commonly mapped as Alazan, Attoyac, Bernaldo, Sawtown, Sawlit, Keithville, Darden, or Guyton.

Hydrology: Terraces contain little topographic relief, so runoff is slow and soils tend to be somewhat poorly drained. In addition, their low position on the landscape results in a water table that is relatively close to the surface. Therefore, the lower soil horizons may be frequently saturated. However, most terraces are at a high enough topographic position that they are seldom affected by flooding from adjacent river floodplains.

Natural Disturbances and Processes: Fire is infrequent on Pleistocene terraces and has minimal influence on vegetation. Most disturbances are through individual tree mortality or windthrow from storms.

Ground Layer Species: The *Callicarpa* group is common on mesic terraces, but species composition can be quite variable, depending on microsite differences in elevation, soils, and hydrologic conditions. Species from the *Bignonia*, *Chasmanthium*, *Callicarpa*, and *Mitchella* groups may occur.

Overstory Tree Species: The overstory consists of a variety of hardwoods, including southern red oak, white oak, water oak, willow oak, blackgum, American beech, and sweetgum, along with loblolly pine and shortleaf pine. Southern magnolia may also occur; it becomes more common on the southern portion of the West Gulf Coastal Plain.

Understory Tree Species: Common species include saplings of green ash, red maple, and southern magnolia along with American holly, flowering dogwood and winged elm.

Shrub Species: Common shrubs include yaupon, American beautyberry, farkleberry, and rusty blackhaw.

Site Inclusions: Wetter areas in small depressions may contain species from the *Justicia* species group. Seepage areas with species from the *Osmunda* group may occur along the upland edge of a site.

Similar LTPs: Infrequently flooded levees and bottomland ridges (23xxx.4.1.30) are floristically similar but occur on elevated portions of the active floodplain and may be exposed to intermittent or irregular flooding. Similar plant communities may also be found in upland landscapes on the floodplains of small streams.

23xxx.4.1.30 White Oak-Loblolly Pine/*Callicarpa* Loamy Irregularly Flooded Levees and Bottomland Ridges Landtype Phase.

Geographic Range: Located on the floodplains of major rivers and their direct tributaries, including the Angelina River, Attoyac River, Ayish Bayou, Cypress Bayou, Neches River, Sabine River, San Jacinto River, Trinity River, and Winters Bayou in Texas, and the Calcasieu River, Corney Bayou, the Dugdemona River, Kisatchie Bayou, Latt Creek, the Little River, McKinny Creek, Nantachie Creek, and Saline Bayou in Louisiana.

Geology: Occurs on recent (Holocene) alluvium associated with natural levees, point bar deposits, and other high areas within the active floodplain of major rivers or their direct tributaries.

Landform: Occurs on higher parts of the active floodplain such as natural levees, meander scrolls, and point bars. Landforms are often narrow and linear in shape and are surrounded by topographically lower portions of the floodplain. Natural levees are commonly found immediately adjacent and parallel to active or abandoned stream channels and consist of the coarser sands and gravel that are the first materials to drop out of suspension as flood water velocity slows. The difference in elevation between this landtype phase and adjacent, wetter landforms may be as small as 1 m or less. Slope gradient is gentle or very gentle.

Soil Characteristics: Soils consist of a somewhat poorly drained or poorly drained sandy loam or sandy clay loam surface soil over clay loam or sandy clay loam subsoil. Reaction is strongly acid, and nutrient levels are variable, ranging from low to high. Sites occur as elevated inclusions in areas mapped as floodplain soils such as the luka and Marietta series.

Hydrology: The loamy to sandy surface soil is somewhat poorly drained, and the low position on the landscape results in a water table that is relatively close to the surface. Lower soil horizons may be subject to seasonal saturation, as evidenced by drainage mottles. In addition, these sites have intermittently or irregularly flooded hydrologic regimes and may flood briefly during high water events.

Natural Disturbances and Processes: Fire is very infrequent on major floodplains. Sites may be subject the reworking of sediments as a result of stream bank erosion or natural alterations of the stream course. As long as the substrate remains stable, most overstory disturbances are through individual tree mortality or wind damage during storms. Flooding results in both the removal and deposition of soil material. Flood duration is generally not long enough to exclude mesic species such as loblolly pine, American holly, and white oak.

Ground Layer Species: Species composition can be quite variable, depending on microsite differences in elevation, soils, and local hydrologic conditions. Species from the *Bignonia*, *Chasmanthium*, and *Mitchella* groups are common.

Overstory Tree Species: The overstory consists of a variety of both mesic and flood-tolerant hardwoods, including southern red oak, white oak, water oak, cherrybark oak, willow oak, laurel oak, blackgum, American beech, and sweetgum, along with loblolly pine.

Understory Tree Species: Understory species include saplings of green ash, red maple, and southern magnolia along with American holly, winged elm, and flowering dogwood.

Shrub Species: Common shrubs include yaupon, American beautyberry, farkleberry, rusty blackhaw, and on some sites, dwarf palmetto.

23xxx.4 Alluvial Floodplains and Terraces Landtype Association

Similar LTPs: Mesic terraces (23xxx.4.1.20) are floristically similar but occur on terraces above the active floodplain and do not flood. Similar plant communities are also found in upland landscapes on the floodplains of small streams.

23xxx.4.2 River Floodplains Landtype.

23xxx.4.2.10 Willow Oak-Laurel Oak/*Bignonia* Loamy/Clayey Seasonally Flooded River Floodplains Landtype Phase

Geographic Range: Located on the floodplains of major rivers and their direct tributaries, including the Angelina River, Attoyac River, Ayish Bayou, Cypress Bayou, Neches River, Sabine River, San Jacinto River, Trinity River, and Winters Bayou in Texas, and the Calcasieu River, Corney Bayou, the Dugdemona River, Kisatchie Bayou, Latt Creek, the Little River, McKinny Creek, Nantachie Creek, and Saline Bayou in Louisiana.

Geology: Occurs on recent (Holocene) alluvial sands, silts, and loams associated with major rivers and their direct tributaries.

Landform: Occurs on nearly level floodplains of major rivers. This is the most widespread landtype phase on most floodplain landscapes. Floodplains are large, often with a width of one to five kilometers. While most sites are nearly level, microtopography in some areas consists of numerous small ridges, swales, mounds and depressions created as river channels change course and flood waters scour and deposit alluvial material. Larger areas (greater than 1 hectare) of slightly higher or lower ground will belong to a different landtype phase.

Soil Characteristics: Soils generally consist of poorly drained sandy loams, silt loams and clay loams over a sandy clay loam, clay, or loamy sand subsoil. The surface soil tends to be shallow (< 10 cm), and drainage mottles can occur throughout the soil profile. Because of scouring by floodwaters and rapid decomposition rates, very little leaf litter accumulates on the soil surface and some areas will be bare. Reaction is generally strongly acid to medium acid, and nutrient levels are usually medium to high. Soils include Guyton, Iuka, Marietta, and similar series.

Hydrology: Rivers associated with this landtype phase drain large regional watersheds and are subject to seasonal flooding. Floods may last for several weeks or more, commonly for 12.5-25% of the growing season. Prolonged submersion of soils creates anoxic conditions that favor obligate and facultative wetland species. High water marks are evident on tree trunks, but generally do not occur more than 1 m above the ground.

Natural Disturbances and Processes: Flood duration is long enough to exclude mesophytic species such as loblolly pine, American holly, and white oak. Fire is very infrequent on river floodplains and has minimal effect on vegetation. Extensive wind damage can occur in storms, because most bottomland tree species are shallow-rooted and vulnerable to windthrow. Erosion and deposition constantly change the course of river channels and can undercut banks and cause trees to fall. At the same time, deposition of alluvium provides new soil that can be colonized by vegetation.

Ground Layer Species: Herbaceous ground cover may be sparse as a result of repeated flooding, scouring, and dense shade. Species from the *Bignonia* and *Justicia* species groups are common.

Overstory Tree Species: The overstory includes a variety of flood-tolerant hardwood species including willow oak, laurel oak, overcup oak, American elm, swamp chestnut oak, bottomland post oak, sweetgum, and swamp tupelo. Cedar elm is common on some floodplains in the western portion of the region such as those in or near Sam Houston National Forest.

Understory Tree Species: Common understory species include green ash saplings, common persimmon, and American hornbeam.

Shrub Species: Common species include deciduous holly, mayhaw, and parsley hawthorn.

Site Inclusions: Within this landtype phase, a range of soil and topographic microsites may be found; ranging from vernal pools and small sloughs to mesic low mounds capable of supporting loblolly pine.

Similar LTPs: Infrequently flooded levees and bottomland ridges (23xxx.4.1.30) also occur on river floodplains, but elevations are slightly higher and flooding less frequent. Seasonally flooded low river floodplains (23xxx.4.2.20) occur in slightly lower and wetter areas.

23xxx.4.2.20 Overcup Oak/*Justicia* Clayey/Loamy Seasonally to Nearly Regularly Flooded Low River Floodplains Landtype Phase

Geographic Range: Located on the floodplains of major rivers and their direct tributaries, including the Angelina River, Attoyac River, Ayish Bayou, Cypress Bayou, Neches River, Sabine River, San Jacinto River, Trinity River, and Winters Bayou in Texas, and the Calcasieu River, Corney Bayou, the Dugdemona River, Kisatchie Bayou, Latt Creek, the Little River, McKinny Creek, Nantachie Creek, and Saline Bayou in Louisiana.

Geology: Occurs on recent (Holocene) alluvial silts, loams and clays associated with floodplains of major rivers and their direct tributaries.

Landform: Occurs on areas of slightly lower elevation and in slight depressions on otherwise nearly level, wide floodplains of major rivers. Floodplains are large, often with a width of one to five kilometers. Because of slightly lower elevation, this landtype phase floods often and for long durations.

Soil Characteristics: Soils consist of poorly drained clays, sandy clays, and clay loams. Soil textures will vary between watersheds, but they have a general pattern of the finer textures occurring on lower elevations within the floodplain. Drainage mottles occur throughout the soil profile, and soil horizons exhibit gray coloration that is characteristic of anoxic soil conditions. Because of scouring by floodwaters and rapid decomposition rates, very little leaf litter accumulates on the soil surface, and some areas will be bare soil. Soil reaction ranges from strongly acid to medium acid and nutrient levels vary from medium to high. Soils include Mantachee, Nahatche, Ozias, Tuscoso, and similar series.

Hydrology: Rivers associated with this landtype phase drain large, regional watersheds and sites are seasonally to nearly regularly flooded. Flooding can occur during any time of the year when there is significant rainfall over the watershed. Floods may last for nearly 25% of the growing season. Prolonged submersion of soils creates anoxic conditions that favor species adapted to wetland conditions. High water marks can usually be observed on tree trunks, usually more than 1 m above the ground.

Natural Disturbances and Processes: Prolonged flooding excludes all mesophytic species and many moderately flood-tolerant taxa such as willow oak and the *Bignonia* species group. Rivers carry large amounts of sediment during flood periods, which is deposited as flow velocity decreases. These sediments may be scoured by a subsequent flood and redeposited downstream. Fire is very infrequent on stream floodplains and has minimal influence on vegetation. Extensive wind throw damage can occur in storms; the combination of very wet soils and large, shallow-rooted trees makes this LTP especially vulnerable. Observations following hurricane Rita on the floodplain of the Angelina River in Nacogdoches County, TX, indicated

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substantially more wind damage on this LTP than on either the seasonally-flooded floodplains above or the swamps below.

Ground Layer Species: Herbaceous ground cover is usually sparse as a result of flooding and dense shade. Species from the *Justicia* group are common and species from the *Bignonia* group may be found on slightly elevated microsites.

Overstory Tree Species: Overstory is dominated by overcup oak and other highly flood-tolerant deciduous hardwoods such as water hickory, and water locust. Willow oak and laurel oak occasionally occur, but are never abundant. Occasional baldcypress may occur, especially in wetter areas.

Understory Tree Species: Common species include American elm saplings, green ash saplings, Carolina ash, red maple, and common persimmon. Occasionally, water elm may occur in wet areas.

Shrub Species: Deciduous holly, eastern swampprivet, and Gulf sebastiana are common.

Site Inclusions: Within this landtype phase, a range of soil and topographic microsites may be found ranging from vernal pools and sloughs to low mounds that support the *Bignonia* species group.

Similar LTPs: Seasonally flooded river floodplains (23xxx.4.2.10) also occur along major rivers, but sites are slightly higher and they flood for shorter durations.

232Fa.4.2.30 *Panicum-Distichlis* Irregularly/ Seasonally Flooded Saline Flats Landtype Phase

Geographic Range: Localized on the floodplains or low terraces of Louisiana's Saline Bayou and Dugdemona River.

Geology: Occurs on loamy Pleistocene-aged sediments associated with Saline Bayou, the Dugdemona River, and their direct tributaries.

Landform: Occurs on broad, nearly level low terraces and floodplains of Saline Bayou and the Dugdemona River.

Soil Characteristics: Soils are poorly drained, slowly permeable silt loams or very fine sandy loams with a silt loam or silty clay loam subsoil. The subsoil (natric horizon), which is exposed or near the surface in the best-developed examples of the LTP, has a high sodium content. Reaction is typically moderately acid in the topsoil and moderately or strongly alkaline in the subsoil. Soils are a grayish color throughout with yellowish brown mottles. They belong to the Brimstone soil series, although some sites are mapped (erroneously) as Guyton soils in the Soil Survey. Native Americans and early European settlers extracted salt from these areas.

Hydrology: Flooding from the nearby river results in an irregularly to seasonally inundated hydrologic regime (flooded for 5-25% of most growing seasons).

Natural Disturbances and Processes: Flood duration is long enough to exclude most mesophytic species. Fire is very infrequent due to moist conditions and extensive areas of open ground. Saline soils severely limit growth for most species.

Ground Layer Species: Vegetation is sparse and extensive areas of bare ground occur. Switchgrass (*Panicum virgatum*), coastal salt grass (*Distichlis spicata*), beaked panic grass

(*Panicum anceps*), and spikerushes (*Eleocharis spp.*) are common. Other species frequently encountered include Gulf swampweed (*Hygrophylla lacustris*), lance-leaf ragweed (*Ambrosia bidentata*), freshwater cordgrass (*Spartina pectinata*), herb-of-grace (*Bacopa monnieri*), marsh fimbry (*Fimbristylis castanea*), marsh millet (*Zizaniopsis miliacea*), crimson-eyed rose mallow (*Hibiscus moscheutos*), and American buckwheatvine (*Brunnichia ovata*). Bermuda grass (*Cynodon dactylon*) has invaded many areas, but is not dominant. Typically, vegetation is very sparse in the center of a salt spot; often only scattered *Distichlis* and *Cynodon*. Coverage and species richness increase near the edge of the saline area. Overall, the flora is a mixture of salt-tolerant, largely coastal species (*Distichlis*, *Fimbristylis*) and plants that frequent recently-formed alluvial areas (sandbars, mudbars, mudflats, etc.) such as *Hibiscus* and *Brunnichia*.

Overstory Tree Species: There is no overstory directly on the saline flats. At the edges, willow oak, overcup oak, green ash, baldcypress, and swamp tupelo are common. Loblolly pine is common on slight raised “islands” and along higher edges.

Understory Tree Species: There is no woody understory directly on the salt flats. On the edge, the most common small trees are water elm and green ash saplings.

Shrub Species: Groundsel tree (*Baccharis halimifolia*) occurs sporadically throughout the salt flats. Along the edges, deciduous holly, mayhaw, common buttonbush, swamp privet, southern bayberry, and dwarf palmetto are common.

Similar LTPs: No other LTP closely resemble Saline Flats. As one moves away from these areas and their exposed natric horizons, the adjacent ecotypes typically are Mesic Terraces (232Fa 4.1.20) or Seasonally Flooded River Floodplains (232Fa.4.2.10)

23xxx.4.3 Floodplain Swamps Landtype

23xxx.4.3.10 Water elm/*Justicia* Clayey Regularly Flooded Swamps Landtype Phase

Geographic Range: Located on the floodplains of major rivers and their direct tributaries, including the Angelina River, Attoyac River, Ayish Bayou, Cypress Bayou, Neches River, Sabine River, San Jacinto River, Trinity River, and Winters Bayou in Texas, and the Calcasieu River, Corney Bayou, the Dugdemona River, Kisatchie Bayou, Latt Creek, the Little River, McKinny Creek, Nantachie Creek, and Saline Bayou in Louisiana.

Geology: Occurs on recent (Holocene) alluvium associated with major rivers and their direct tributaries.

Landform: Sites occur in backswamps or sloughs associated with the floodplains of major rivers. They are associated with depressions and low areas on the floodplain, often the remains of abandoned stream channels or oxbows. Sites typically cover an area from one to tens of hectares.

Soil Characteristics: Soils consist of very poorly drained deep clay, sandy clay, and clay loam soils that are regularly flooded. Saturated conditions may occur year-round and soil profiles are often gray as a result of persistent anoxia. Nutrient levels range from medium to high. Soils include Angelina, Mantachee, and Pophers.

Hydrology: Sites occupy some of the lowest positions on the landscape. Having a regularly flooded hydrologic regime, they are usually flooded for as much time as they are exposed: 25-75% of the growing season, or 3 to 8 months annually. Nearly constant saturation of soils creates anoxic conditions that favor obligate and facultative wetland species.

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Natural Disturbances and Processes: Inundation excludes all but the most flood-tolerant species. Overflow from the river may scour depressions and deposit new sediment. Fire is very infrequent in swamps. Wind damage can occur in storms, but is usually not as severe as on higher portions of the floodplain because although swamp species are shallow rooted, water elm and Carolina ash are low in stature and baldcypress is resistant to wind throw as a result of secondary root systems associated with knees. Beavers may fell or damage trees in and around sloughs and swamps.

Ground Layer Species: As a result of standing water for much of the year, coverage of ground rooted plants in swamps may be very sparse. Species from the *Justicia* species group are most common. Floating and submersed members of the *Ceratophyllum* species group occur in deeper pools.

Overstory Tree Species: Natural overstory is dominated by dense groves of water elm or Carolina ash. Bald cypress or water tupelo may form an emergent canopy. Black willow may be present, especially on edges and disturbed sites. Red maple occurs on slightly higher microsites. Overcup oak, water hickory, Water locust, and sweetgum occupy the transition zone between the swamp and the low floodplain.

Understory Tree Species: Common species include Carolina ash water elm, and common persimmon.

Shrub Species: Shrubs include eastern swampprivet and common buttonbush.

Similar LTPs: Deep water swamps (23xxx.4.3.20) occur in nearly permanently inundated areas where water elm is rare or absent.

Special Conditions: The transition between the overcup-oak dominated lower floodplain and water elm, ash, or baldcypress-dominated swamps is often very abrupt. Swamps are relatively uncommon in some watersheds, but are frequent in the Neches/Angelina floodplains of eastern Texas.

23xxx.4.3.20 Baldcypress/*Ceratophyllum* Semi-Permanently Flooded Swamps Landtype Phase

Note: Only one reference site from Kisatchie National Forest was sampled. Additional information comes from the "freshwater delta" region of Caddo Lake (LTA 231Ea.4) near Cypress Bayou on the Texas-Louisiana border (Van Kley and Hine 1998).

Geographic Range: Located on the floodplains of major rivers and their direct tributaries, including the Angelina River, Attoyac River, Ayish Bayou, Cypress Bayou, Neches River, Sabine River, San Jacinto River, Trinity River, and Winters Bayou in Texas; and the Calcasieu River, Corney Bayou, the Dugdemona River, Kisatchie Bayou, Latt Creek, the Little River, McKinny Creek, Nantachie Creek, and Saline Bayou in Louisiana.

Geology: Occurs on recent (Holocene) alluvium associated with major rivers and their direct tributaries.

Landform: Sites occur in backswamps or sloughs associated with the floodplains of major rivers. These swamps are often drowned river valleys or the remains of abandoned stream channels or oxbows. They may cover an area from one to several hundred hectares. Caddo Lake, the drowned floodplain of Cypress Bayou located on the Texas-Louisiana border, includes one of the most extensive swamp landscapes in the portion of the West Gulf Coastal Plain covered in this guide. In addition to natural swamps, swamp ecosystems will develop in the impounded upper

stream valleys and protected shallows of reservoirs. Numerous baldcypress swamps are currently developing in the backwaters of Sam Rayburn and Toledo Bend Reservoirs. A well developed bald cypress swamp occurs on the upper portion of Corney Lake on the Caney Ranger District of Kisatchie National Forest.

Soil Characteristics: Soils consist of deep, very poorly drained clays, sandy clays, and clay loams. A black layer of unconsolidated, partially decomposed organic matter may cover the surface of the mineral soil. Sites are continuously flooded for most years and saturated conditions occur year-round. Soil horizons are usually gray as a result of continuous anoxia.

Hydrology: Sites are semipermanently to nearly permanently flooded (75% -100% of the growing season). Most areas are exposed only during the most extreme droughts. Long term Inundation favors floating and submersed aquatic plants.

Natural Disturbances and Processes: Baldcypress trees can survive under permanently flooded conditions for many centuries, but they require periods of soil exposure for seedling establishment; colonization of waters deeper than 2m is rare. Wind damage can occur although baldcypress is more resistant to wind throw than most other bottomland species as a result of secondary root systems associated with its knees. Beavers may fell or damage trees in and around swamps. Fire is very infrequent in deep water swamps, although fire scars and charcoal have been observed on some mature bald cypress at Caddo Lake.

Ground Layer Species: Floating and submerged aquatic plants from the *Ceratophyllum* species group dominate. Species from the *Justicia* group may occur around the edges of the swamp, in localized shallow areas, and on exposed stumps and logs. Water hyacinth (*Eichornia crassipes*) an invasive exotic species, has become abundant in the Caddo Lake area in recent years. Giant salvinia (*Salvinia molesta*) is now known from several locations and has the potential to become a serious pest in local swamps and waterways.

Overstory Tree Species: The overstory of natural stands is dominated by baldcypress. Water tupelo may also be abundant, especially in more disturbed stands. Water tupelo is common in Louisiana and southeastern Texas but uncommon in northeastern Texas.

Understory Tree Species: Water elm may form a scattered subcanopy, especially in shallower swamps. Other understory trees are rare, consisting mainly of occasional water tupelo or baldcypress saplings.

Shrub Species: Shrubs are widely scattered, consisting primarily of common buttonbush growing on stumps and logs.

Site Inclusions: Areas with shallow water may have thickets of water elm and Carolina ash that resemble 232xxx.4.3.10. Treeless openings (marshes) may occur. Aquatic ecosystems that have few vascular plants may occur in the deepest areas.

Similar LTPs: Regularly flooded swamps (23xxx.4.3.10) are usually not inundated year-round and soils are usually exposed for at least 25% of the growing season. Swamp communities may develop in the backwaters of artificial impoundments on the floodplains of small and medium sized streams (on upland landtype associations) in addition to river floodplains.

Special Conditions: Generally, semi-permanently flooded swamps are more common in Louisiana than in Texas.

APPENDIX A

ECOLOGICAL SPECIES GROUPS

Ecological species groups are groups of species identified during multivariate analysis to be important in distinguishing between the typical natural plant communities of different landtypes and landtype phases. These species are abundant enough to occur consistently within an ecological type but they are specialized enough to be present in some ecotypes and absent or markedly less abundant in others. Ecological species groups are most useful in identifying ecological land units on relatively undisturbed sites that have vegetation approximating potential natural or presettlement communities. Physical features such as soil texture and slope position may be more useful to identify ecotypes on sites that are severely disturbed or in which natural processes have been seriously altered. Using ecological species groups to distinguish plant communities has the advantage of using a large part of the flora to delineate communities rather than a single "indicator" species which may not always be present on all ecologically similar sites. Nomenclature follows Kartesz (1999) and the USDA Natural Resources Conservation Service (2006). Groups are named after a representative species that has both a high frequency of occurrence on the natural communities of the characteristic ecological units and a high fidelity to those units. The habitats listed as being typical of each species group are the names for the generalized ecological units in Chapter 6 unless otherwise specifically referenced.

TRAGIA GROUP

Habitat: Grossarenic dry uplands and arenic dry uplands.

<i>Berlandiera pumila</i>	soft greeneyes
<i>Cnidoscolus texanus</i>	Texas bullnettle
<i>Commelina erecta</i>	whitemouth dayflower
<i>Galactia erecta</i>	erect milkpea
<i>Opuntia humifusa</i>	Devils tongue (eastern) pricklypear
<i>Palafoxia hookeriana</i>	sand palofox
<i>Polygonella polygama</i>	October flower
<i>Pteridium aquilinum</i>	bracken fern
<i>Quercus incana</i>	bluejack oak
<i>Rhus aromatica</i>	fragrant sumac
<i>Rhynchosia reniformis</i>	dollarleaf
<i>Rudbeckia hirta</i>	blackeyed Susan
<i>Silphium spp.</i>	rosinweed
<i>Stylisma pickeringii</i>	Pickering's dawnflower
<i>Stillingia sylvatica</i>	queensdelight
<i>Tradescantia reverchonii</i>	Reverchon's spiderwort
<i>Tragia smallii</i>	Small's noseburn
<i>Tragia urens</i>	wavyleaf noseburn
<i>Tragia urticifolia</i>	nettleleaf noseburn
<i>Yucca louisianensis</i>	Louisiana yucca

SCHIZACHYRIUM GROUP

Habitat: Grossarenic dry uplands, arenic dry uplands, loamy dry-mesic uplands, and prairies, barrens, & glades. Especially common in longleaf pine communities and other open natural grassland sites.

<i>Andropogon gerardii</i>	big bluestem
<i>Andropogon ternarius</i>	splitbeard bluestem
<i>Andropogon virginicus</i>	broomsedge bluestem
<i>Aristida</i> spp.	threeawn
<i>Baptisia bracteata</i>	longbract wild indigo
<i>Baptisia nuttalliana</i>	Nuttall's wild indigo
<i>Ceanothus americanus</i>	New Jersey tea
<i>Centrosema virginianum</i>	spurred butterfly pea
<i>Croton argyranthemus</i>	healing croton
<i>Dichanthelium aciculare</i>	needleleaf rosette grass
<i>Dichanthelium acuminatum</i>	tapered rosette grass
<i>Dichanthelium commutatum</i>	variable panicgrass
<i>Dichanthelium oligosanthes</i>	Heller's rosette grass
<i>Echinacea pallida</i>	pale purple coneflower
<i>Eupatorium mohrii</i>	Mohr's thoroughwort
<i>Euphorbia corollata</i>	flowering spurge
<i>Euthamia leptoccephala</i>	bushy goldentop
<i>Galactia volubilis</i>	downy milkpea
<i>Ionactis linariifolius</i>	flax-leaf ankle-aster
<i>Liatris</i> spp.	gayfeather
<i>Mimosa quadrivalvis</i> (sensu lato)	sensitive briar
<i>Panicum virgatum</i>	switchgrass
<i>Pinus palustris</i>	longleaf pine
<i>Pityopsis graminifolia</i>	narrowleaf silkgrass
<i>Quercus marilandica</i>	blackjack oak
<i>Schizachyrium scoparium</i>	little bluestem
<i>Solidago odora</i>	anisescented goldenrod
<i>Stylosanthes biflora</i>	sidebeak pencilflower
<i>Symphiotrichum lateriflorum</i> (sy=Aster l.)	calico aster
<i>Symphiotrichum patens</i> (sy=Aster p.)	late purple aster
<i>Tephrosia onobrychoides</i>	multibloom hoarypea
<i>Tephrosia virginiana</i>	Virginia tephrosia
<i>Vaccinium arboreum</i>	farkleberry
<i>Vernonia texana</i>	Texas ironweed

BIGELOWIA GROUP

Habitat: Clayey calcareous sandstone glades (232Fa.2.2.30) and Catahoula barrens (232Fa.15.2.30).

<i>Bigelovia nuttallii</i>	Nuttall's rayless goldenrod
<i>Croton michauxii</i>	Michaux's croton
<i>Liatris squarrosa</i>	scaly gayfeather
<i>Linum medium</i>	stiff yellow flax
<i>Scleria ciliata</i>	fringed nutrush
<i>Scleria pauciflora</i>	fewflower nutrush
<i>Schoenilirion wrightii</i>	Texas sunnybell
<i>Selaginella arenicola</i>	sand spikemoss
<i>Talinum parviflorum</i>	sunbright

CALLIRHOE GROUP

Habitat: Clayey calcareous prairies (32Fa.2.2.40, 232Fa.3.2.40) blackland prairies (231Eh.16.2.40), and Catahoula barrens (232Fa.15.2.30)..

<i>Baccharis halimifolia</i>	eastern baccharis
<i>Callirhoe papaver</i>	woodland poppymallow
<i>Dalea candida</i>	slender white prairieclover
<i>Gaillardia aestivalis</i>	lanceleaf blanketflower
<i>Neptunia lutea</i>	yellow puff
<i>Nutallanthus canadensis</i>	Canada toadflax
<i>Prunella vulgaris</i>	common selfheal
<i>Sabatia campestris</i>	Texas star
<i>Salvia lyrata</i>	lyreleaf sage
<i>Silphium laciniatum</i>	compassplant
<i>Solidago nitida</i>	shiny goldenrod
<i>Verbesina helianthoides</i>	gravelweed

DALEA GROUP

Habitat: Principally Clayey blackland prairies (231Eh.16.2.40). Certain species may also occur on other prairie types (32Fa.2.2.40, 232Fa.3.2.40, & 232Fa.15.2.30).

<i>Acacia angustissima</i>	prairie acacia
<i>Bothriochloa laguroides</i>	silver bluestem
<i>Bouteloua rigidiseta</i>	Texas grama
<i>Croton monanthogynus</i>	prairie tea
<i>Dalea compacta</i>	compact prairieclover
<i>Dalea multiflora</i>	roundhead prairieclover
<i>Dichanthelium depauperatum</i>	starved panicgrass
<i>Euphorbia bicolor</i>	snow on the prairie
<i>Eustoma exaltatum</i>	showy prairiegentian
<i>Grindelia lanceolata</i>	narrowleaf gumweed
<i>Helianthus maximiliani</i>	Maximilian sunflower
<i>Indigofera miniata</i>	coastal indigo
<i>Iva angustifolia</i>	narrowleaf marshelder
<i>Onosmodium molle</i>	smooth onosmodium
<i>Paspalum pubiflorum</i>	hairyseed paspalum
<i>Rudbeckia missouriensis</i>	Missouri orange coneflower
<i>Strophostyles leiosperma</i>	slickseed fuzzybean
<i>Verbena xutha</i>	gulf vervain

DROSERA GROUP

Habitat: Wet herbaceous seeps ("bogs"), and sandy wet longleaf pine flatwoods (see 232Fa.1.1.50).

<i>Aletris aurea</i>	golden colicroot
<i>Ctenium aromaticum</i>	toothache grass
<i>Drosera brevifolia</i>	dwarf sundew
<i>Eriocaulon decangulare</i>	tenangle pipewort
<i>Eryngium integrifolium</i>	blueflower eryngo
<i>Eupatorium lancifolium</i>	lanceleaf thoroughwort
<i>Eupatorium rotundifolium</i>	roundleaf thoroughwort
<i>Helianthus angustifolius</i>	swamp sunflower
<i>Lycopodiella appressa</i>	Southern Appressed Club-Moss

<i>Linum rigidum</i>	stiffstem flax
<i>Pinguicula pumila</i>	Small Butterwort
<i>Ptilimnium capillaceum</i>	herbwilliam
<i>Rhexia mariana</i>	Maryland meadowbeauty
<i>Rhynchospora</i> spp.	rhynchospora
<i>Rhynchospora latifolia</i>	sand-swamp whitetop
<i>Rhynchospora macra</i>	large beak sedge
<i>Sabatia gentianoides</i>	pinewoods rosegentian
<i>Sarracenia alata</i>	yellow trumpets (yellow pitcher plant)
<i>Xyris</i> spp.	yellow-eyed-grass

CALLICARPA GROUP

Habitat: Widely occurring, especially common on loamy dry-mesic uplands, mesic slopes & terraces, and mesic stream bottoms.

<i>Callicarpa americana</i>	American beautyberry
<i>Carya alba</i>	mockernut hickory
<i>Chionanthus virginicus</i>	white fringetree
<i>Clitoria mariana</i>	Atlantic pigeonwings
<i>Hypericum hypericoides</i>	St. Andrew's-cross
<i>Lespedeza virginica</i>	slender lespedeza
<i>Oxalis dilleni</i>	Dillen's oxalis
<i>Pinus echinata</i>	shortleaf pine
<i>Rhus copallinum</i>	flameleaf sumac (winged sumac)
<i>Rhynchosia difformis</i>	double-form snout-bean
<i>Rubus argutus</i>	saw tooth (Louisiana) blackberry
<i>Sassafras albidum</i>	sassafras
<i>Scleria oligantha</i>	little-head nut-rush
<i>Smilax smallii</i>	lance leaf greenbrier
<i>Smilax bona-nox</i>	saw greenbrier
<i>Viburnum rufidulum</i>	rusty blackhaw
<i>Vitis aestivalis</i>	summer grape

CHASMANTHIUM GROUP

Habitat: Widely occurring on loamy dry-mesic uplands, mesic slopes & terraces, mesic stream bottoms, wet-mesic stream bottoms, and irregularly flooded mesic terraces & bottomland ridges.

<i>Chasmanthium sessiliflorum</i>	long-leaf wood-oats
<i>Elephantopus tomentosus</i>	devil's grandmother
<i>Forestiera ligustrina</i>	upland swampprivet
<i>Galium pilosum</i>	hairy bedstraw
<i>Gelsemium sempervirens</i>	evening trumpetflower
<i>Ilex vomitoria</i>	yaupon
<i>Liquidambar styraciflua</i>	sweetgum
<i>Parthenocissus quinquefolia</i>	Virginia creeper
<i>Phryma leptostachya</i>	American lopseed
<i>Pinus taeda</i>	loblolly pine
<i>Quercus falcata</i>	southern red oak
<i>Scutellaria ovata</i>	heartleaf skullcap
<i>Smilax glauca</i>	cat greenbrier
<i>Toxicodendron radicans</i>	eastern poison ivy
<i>Ulmus alata</i>	winged elm
<i>Vaccinium virgatum</i>	smallflower blueberry
<i>Vitis rotundifolia</i>	muscadine grape

MITCHELLA GROUP

Habitat: Mesic slopes & terraces, moist-mesic steep slopes & ravines (231Eg11.3.20 and equivalent "3.20" LTPs), mesic stream bottoms, wet-mesic stream bottoms, and irregularly flooded mesic terraces & bottomland ridges.

<i>Acer barbatum</i>	Florida maple
<i>Aristolochia serpentaria</i>	Virginia snakeroot
<i>Asplenium platyneuron</i>	ebony spleenwort
<i>Botrychium virginianum</i>	rattlesnake fern
<i>Cocculus carolinianus</i>	Carolina coralbead
<i>Dioscorea quaternata</i>	fourleaf yam
<i>Epifagus virginiana</i>	Beechdrops
<i>Fagus grandifolia</i>	American beech
<i>Frangula caroliniana</i>	Carolina buckthorn
<i>Galium obtusum</i>	bluntleaf bedstraw
<i>Ilex opaca</i>	American holly
<i>Magnolia grandiflora</i>	southern magnolia
<i>Matlea gonocarpus</i>	angularfruit milkvine
<i>Mitchella repens</i>	partridgeberry
<i>Nyssa sylvatica</i>	blackgum
<i>Ostrya virginiana</i>	eastern hophornbeam
<i>Polystichum acrostichoides</i>	Christmas fern
<i>Podophyllum peltatum</i>	mayapple
<i>Quercus alba</i>	white oak
<i>Quercus nigra</i>	water oak
<i>Sanicula canadensis</i>	Canadian blacksnakeroot
<i>Smilax pumila</i>	sarsaparilla vine
<i>Symplocos tinctoria</i>	common sweetleaf
<i>Viburnum acerifolium</i>	mapleleaf viburnum
<i>Viburnum dentatum</i>	southern arrowwood

ARISAEMA GROUP

Habitat: Moist-mesic steep slopes and ravines (231Eg11.3.20 and equivalent "3.20" LTPs), mesic stream bottoms, and wet-mesic stream bottoms.

<i>Arisaema dracontium</i>	green dragon
<i>Arisaema triphyllum</i>	Jack in the pulpit
<i>Asimina triloba</i>	common pawpaw
<i>Carya ovata</i>	shagbark hickory
<i>Erythronium albidum</i>	white trout lily
<i>Erythronium rostratum</i>	yellow trout lily
<i>Galium circaezans</i>	licorice bedstraw
<i>Halesia diptera</i>	twowing silverbell
<i>Hamamelis virginiana</i>	American witchhazel
<i>Lonicera sempervirens</i>	trumpet honeysuckle
<i>Nemophila aphylla</i>	small-flower-baby-blue-eyes
<i>Polygonatum biflorum</i>	King Solomon's-Seal
<i>Sanguinaria canadensis</i>	bloodroot
<i>Tilia americana</i>	Carolina basswood
<i>Tipularia discolor</i>	crippled crane-fly
<i>Trillium gracile</i>	slender trillium
<i>Trillium recurvatum</i>	bloody-butcher
<i>Viola palmata</i>	early blue violet

CARYA GROUP

Habitat: Various high-nutrient riparian and mesic habitats but particularly abundant on the Red River Alluvial Plain.

<i>Acer negundo</i>	boxelder
<i>Carya illinoensis</i>	pecan
<i>Celtis laevigata</i>	sugarberry (hackberry)
<i>Cornus foemina</i>	stiff dogwood
<i>Gleditsia triacanthos</i>	honey locust
<i>Maclura pomifera</i>	Osage orange
<i>Platanus occidentalis</i>	eastern cottonwood
<i>Quercus pagoda</i>	Cherry-bark oak

OSMUNDA GROUP

Habitat: Primarily forested seeps (baygalls). Some species also occur in herbaceous seeps.

<i>Acer rubrum</i>	red maple
<i>Apteria aphylla</i>	nodding nixie
<i>Photinia pyrifolia</i>	red chokecherry
<i>Eleocharis microcarpa</i>	smallfruit spikesedge
<i>Eleocharis tortilis</i>	twisted Spike-Rush
<i>Magnolia virginiana</i>	sweetbay
<i>Morella caroliniensis</i>	evergreen bayberry
<i>Osmunda cinnamomea</i>	cinnamon fern
<i>Osmunda regalis</i>	royal fern
<i>Persea borbonia</i>	redbay
<i>Plantanthera clavelata</i>	green woodland orchid
<i>Rhododendron canescens</i>	mountain azalea
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Sphagnum spp.</i>	sphagnum
<i>Viburnum nudum</i>	possumhaw
<i>Woodwardia areolata</i>	netted chainfern

BIGNONIA GROUP

Habitat: Wet mesic stream bottoms, irregularly flooded mesic terraces & bottomland ridges, and seasonally flooded river floodplains.

<i>Arundinaria gigantea</i>	switch cane
<i>Betula nigra</i>	river birch
<i>Bignonia capreolata</i>	crossvine
<i>Campsis radicans</i>	trumpet creeper
<i>Carex abscondita</i>	thicket sedge
<i>Carex amphibola</i>	eastern narrowleaf sedge
<i>Carex debilis</i>	white edge sedge
<i>Carex flaccosperma</i>	thinfruit sedge
<i>Carex lurida</i>	shallow sedge
<i>Carex tribuloides</i>	blunt broom sedge
<i>Carpinus caroliniana</i>	American hornbeam
<i>Chasmanthium latifolium</i>	Indian woodoats

<i>Chasmanthium laxum</i>	slender woodoats
<i>Cornus drummondii</i>	roughleaf dogwood
<i>Elephantopus carolinianus</i>	Carolina elephantsfoot
<i>Fraxinus pennsylvanica</i>	green ash
<i>Juncus coriaceous</i>	leathery rush
<i>Morus rubra</i>	red mulberry
<i>Sabal minor</i>	dwarf palmetto
<i>Sanicula odorata</i>	cluster sanicula
<i>Stenanthium gramineum</i>	eastern featherbells
<i>Yeatesia viridiflora</i>	yellow bractspike

JUSTICIA GROUP

Habitat: Seasonally flooded river floodplains, seasonally to nearly regularly flooded low river floodplains, regularly flooded swamps, and clayey wet upland depressions.

<i>Boehmeria cylindrica</i>	smallspike false nettle
<i>Brunnichia ovata</i>	American buckwheatvine
<i>Bidens aristosa</i>	bearded beggarticks
<i>Carex cherokeensis</i>	Cherokee sedge
<i>Carex frankii</i>	Frank's sedge
<i>Carex intumescens</i>	greater bladder sedge
<i>Carex jorii</i>	cypress swamp sedge
<i>Carex louisianica</i>	Louisiana sedge
<i>Commelina diffusa</i>	climbing dayflower
<i>Commelina virginica</i>	Virginia dayflower
<i>Diospyros virginiana</i>	common persimmon
<i>Echinodorus cordifolius</i>	creeping burrhead
<i>Elymus virginicus</i>	Virginia wildrye
<i>Fraxinus caroliniana</i>	Carolina ash
<i>Juncus repens</i>	lesser creeping rush
<i>Juncus effuses</i>	lamp rush
<i>Justicia ovata</i>	looseflower waterwillow
<i>Mikania scandens</i>	climbing hempvine
<i>Phanopyrum gymnocarpon</i>	Savannah panic grass
<i>Polygonum punctatum</i>	dotted smartweed
<i>Polygonum hydropiperoides</i>	swamp smartweed
<i>Quercus lyrata</i>	overcup oak
<i>Quercus phellos</i>	willow oak
<i>Rhynchospora corniculata</i>	Short-bristle horned beak sedge
<i>Sagittaria platyphylla</i>	delta arrowhead
<i>Saururus cernuus</i>	lizard's tail
<i>Salix nigra</i>	black willow
<i>Styrax americana</i>	American snowbell
<i>Triadenum walteri</i>	greater marsh St. Johnswort

CERATOPHYLLUM GROUP

Habitat: Semi-permanently flooded deepwater swamps, marshes, and shallow ponds.

<i>Azolla caroliniana</i>	Carolina mosquitofern
<i>Cabomba caroliniana</i>	Carolina fanwort
<i>Cephalanthus occidentalis</i>	common buttonbush
<i>Ceratophyllum demersum</i>	coon's tail
<i>Eichhornia crassipes</i>	common Water-Hyacinth
<i>Hydrilla verticillata</i>	Water-Thyme
<i>Hydrolea uniflora</i>	ovate false fiddleleaf
<i>Lemna valdiviana</i>	Pale Duckweed
<i>Limnobium spongia</i>	American spongeplant
<i>Ludwigia peploides</i>	floating Primrose-Willow
<i>Myriophyllum aquaticum</i>	parrot's-Feather
<i>Nuphar lutea</i>	yellow pondlily
<i>Nyssa aquatica</i>	water tupelo
<i>Proserpinaca palustris</i>	marsh Mermaidweed
<i>Planera aquatica</i>	water elm (Planertree)
<i>Spirodela polyrrhiza</i>	common Duckmeat
<i>Spirodela punctata</i>	dotted duckweed
<i>Taxodium distichum</i>	baldcypress
<i>Wolffia columbiana</i>	Columbian watermeal

APPENDIX B

IMPORTANT WOODY PLANT SPECIES

See the photographic plates (Pages B-4--B-7) for images of selected important trees. The ecotypes named in the captions are the generalized types of Chapter 6.

Common Name	Scientific Name
Alabama supplejack	<i>Berchemia scandens</i>
American basswood	<i>Tilia americana</i>
American beautyberry	<i>Callicarpa americana</i>
American beech	<i>Fagus grandifolia</i>
American elm	<i>Ulmus americana</i>
American holly	<i>Ilex opaca</i>
American hornbeam	<i>Carpinus caroliniana</i>
American snowbell	<i>Styrax americanus</i>
American strawberrybush	<i>Euonymus americana</i>
American witchhazel	<i>Hamamelis virginiana</i>
Arkansas blueberry	<i>Vaccinium fuscatum</i>
baldcypress	<i>Taxodium distichum</i>
bitternut hickory	<i>Carya cordiformis</i>
black cherry	<i>Prunus serotina</i>
black hickory	<i>Carya texana</i>
blackgum	<i>Nyssa sylvatica</i>
blackjack oak	<i>Quercus marilandica</i>
bluejack oak	<i>Quercus incana</i>
bottomland post oak	<i>Quercus similis</i>
boxelder	<i>Acer negundo</i>
Carolina ash	<i>Fraxinus caroliniana</i>
Carolina buckthorn	<i>Frangula caroliniana</i>
Carolina laurelcherry	<i>Prunus caroliniana</i>
cedar elm	<i>Ulmus crassifolia</i>
cherrybark oak	<i>Quercus pagoda</i>
cockspur hawthorn	<i>Crataegus crus-galli</i>
common buttonbush	<i>Cephalanthus occidentalis</i>
common pawpaw	<i>Asimina triloba</i>
common persimmon	<i>Diospyros virginiana</i>
common sweetleaf	<i>Symplocos tinctoria</i>
deciduous holly	<i>Ilex decidua</i>
deerberry	<i>Vaccinium stamineum</i>
dwarf palmetto	<i>Sabal minor</i>
dwarf pawpaw	<i>Asimina parviflora</i>
early azalea	<i>Rhododendron prinophyllum</i>
eastern baccharis	<i>Baccharis halimifolia</i>
eastern cottonwood	<i>Platanus occidentalis</i>
eastern hophornbeam	<i>Ostrya virginiana</i>
eastern redbud	<i>Cercis canadensis</i>
eastern redcedar	<i>Juniperus virginiana</i>
eastern swampprivet	<i>Forestiera acuminata</i>
Elliott's blueberry	<i>Vaccinium elliotii</i>
evergreen bayberry (wax-myrtle)	<i>Morella caroliniensis</i>
farkleberry	<i>Vaccinium arboreum</i>
Flameleaf sumac (Winged sumac)	<i>Rhus copallinum</i>

Florida maple
flowering dogwood
fragrant sumac
green ash
green hawthorn
Gulf sebastiana
gum bumelia
hackberry (sugarberry)
hazel alder
honey locust
large gallberry
largecluster (smallflower) blueberry
laurel greenbrier
laurel oak
littlehip hawthorn
loblolly pine
longleaf pine
Louisiana blackberry
mapleleaf viburnum
mayhaw
Mexican plum
mockernut hickory
mountain azalea
nutmeg hickory
osage orange
overcup oak
parsley hawthorn
pecan
poison sumac
possumhaw
post oak
red maple
redbay
red buckeye
river birch
roughleaf dogwood
rusty blackhaw
sand laurel (Darlington's) oak
sandhill plum
sand post oak
sassafras
shagbark hickory
shortleaf pine
Shumard oak
smallflower blueberry
southern arrowwood
southern magnolia
southern red oak
St. Andrews cross
stiff dogwood
sugarberry (hackberry)
swamp chestnut oak
swamp pignut Hickory
swamp tupelo

Acer barbatum
Cornus florida
Rhus aromatica
Fraxinus pennsylvanica
Crataegus viridis
Sebastiania fruticosa
Sideroxylon lanuginosum
Celtis laevigata
Alnus serrulata
Gleditsia triacanthos
Ilex coriacea
Vaccinium virgatum
Smilax laurifolia
Quercus laurifolia
Crataegus spathulata
Pinus taeda
Pinus palustris
Rubus argutus
Viburnum acerifolium
Crataegus opaca
Prunus mexicana
Carya alba
Rhododendron canescens
Carya myristiciformis
Maclura pomifera
Quercus lyrata
Crataegus marshallii
Carya illinoensis
Toxicodendron vernix
Viburnum nudum
Quercus stellata
Acer rubrum
Persea borbonia
Aesculus pavia
Betula nigra
Cornus drummondii
Viburnum rufidulum
Quercus hemisphaerica
Prunus angustifolia
Quercus margarettiae
Sassafras albidum
Carya ovata
Pinus echinata
Quercus shumardii
Vaccinium virgatum
Viburnum dentatum
Magnolia grandiflora
Quercus falcata
Hypericum hypericoides
Cornus foemina
Celtis laevigata
Quercus michauxii
Carya glabra v. hirsuta
Nyssa biflora

sweetbay	<i>Magnolia virginiana</i>
sweetgum	<i>Liquidambar styraciflua</i>
twowing silverbell	<i>Halesia diptera</i>
upland swampprivet	<i>Forestiera ligustrina</i>
Virginia sweetspire	<i>Itea virginica</i>
water elm	<i>Planera aquatica</i>
water hickory	<i>Carya aquatica</i>
water locust	<i>Gleditsia aquatica</i>
water oak	<i>Quercus nigra</i>
water tupelo	<i>Nyssa aquatica</i>
wax-myrtle (evergreen bayberry)	<i>Morella cerifera</i>
white ash	<i>Fraxinus americana</i>
white fringetree	<i>Chionanthus virginicus</i>
white oak	<i>Quercus alba</i>
willow oak	<i>Quercus phellos</i>
winged elm	<i>Ulmus alata</i>
yaupon	<i>Ilex vomitoria</i>

NATIVE CONIFERS



Loblolly pine (*Pinus taeda*). **Habitat:** Widely occurring. Especially common on loamy dry-mesic uplands, mesic slopes & terraces, mesic stream bottoms, and wet mesic stream bottoms.



Longleaf pine (*Pinus palustris*). **Habitat:** Occurs on a wide range of uplands but is fire-dependant. Forms pure stands on sites subject to a long-term regime of low-intensity surface fires every 3-5 years.



Shortleaf pine (*Pinus echinata*). **Habitat:** Grossarenic dry uplands, arenic dry uplands, loamy and clayey dry-mesic uplands.



Baldcypress (*Taxodium distichum*) **Habitat:** Semi-permanently flooded deep water swamps, regularly flooded swamps, shallow ponds, and occasionally, along stream banks.



Eastern red cedar (*Juniperus virginiana*) **Habitat:** A variety of upland sites including arenic dry uplands, dry-mesic uplands, and calcareous upland sites. A shade intolerant tree, it grows along edges, in openings, and often colonizes abandoned fields and disturbed areas. It does not tolerate fire.

UPLAND OAKS



Bluejack oak (*Quercus incana*) **Habitat:** Grossarenic dry uplands and arenic dry uplands.



Post oak (*Quercus stellata*) **Habitat:** Grossarenic dry uplands, arenic dry uplands, loamy dry-mesic uplands, and clayey dry-mesic uplands. Occasionally also on mesic sites.



Blackjack oak (*Quercus marilandica*) **Habitat:** Grossarenic dry uplands, arenic dry uplands, and clayey dry-mesic uplands. A minor component of most upland longleaf pine communities where it may also be found on loamy dry-mesic uplands.



Southern red oak (*Quercus falcata*) **Habitat:** Arenic dry uplands, loamy dry-mesic uplands, mesic slopes & terraces, mesic stream bottoms, wet-mesic stream bottoms, and irregularly flooded mesic terraces & bottomland ridges.



White oak (*Quercus alba*) **Habitat:** Mesic slopes & terraces, mesic stream bottoms, wet-mesic stream bottoms, and irregularly flooded mesic terraces & bottomland ridges.

LOWLAND OAKS



Water oak (*Quercus nigra*) **Habitat:** Mesic slopes & terraces, mesic stream bottoms, wet-mesic stream bottoms, and irregularly flooded mesic terraces & bottomland ridges. Occasionally also on seasonally flooded river floodplains.



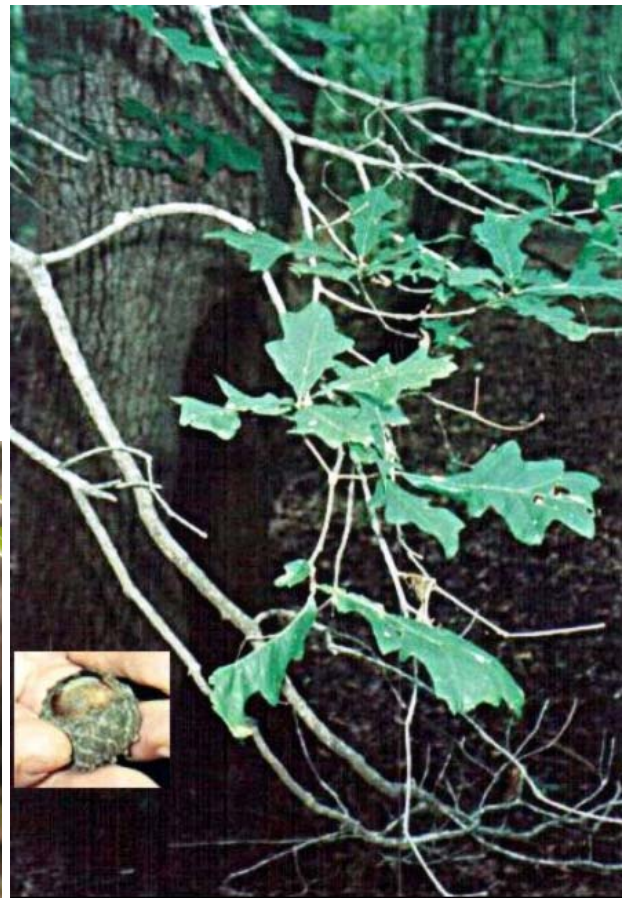
Cherrybark oak (*Quercus pagoda*) **Habitat:** Wet-mesic stream bottoms and irregularly flooded mesic terraces & bottomland ridges. Less common on seasonally flooded river floodplains.



Willow oak (*Quercus phellos*) **Habitat:** Mainly on seasonally flooded river floodplains and clayey wet upland depressions. Also on wet-mesic stream bottoms and irregularly flooded mesic terraces & bottomland ridges.



Laurel oak (*Quercus laurifolia*) **Habitat:** Mainly on seasonally flooded river floodplains. Also on wet-mesic stream bottoms and irregularly flooded mesic terraces & bottomland ridges.



Overcup oak (*Quercus laurifolia*) **Habitat:** Seasonally flooded river floodplains and seasonally flooded low river floodplains. This is the most flood-tolerant of the bottomland oaks.

OTHER DECIDUOUS TREES



Sweetgum (*Liquidambar styraciflua*) **Habitat:** Very widespread. Arenic dry uplands, dry-mesic loamy and clayey uplands, mesic slopes & terraces, mesic stream bottoms, wet-mesic stream bottoms, irregularly flooded mesic terraces & bottomland ridges, and seasonally flooded river floodplains.



Winged elm (*Ulmus alata*) **Habitat:** Chiefly on dry-mesic and mesic sites where it grows as a sub-canopy tree.



Mockernut hickory (*Carya alba*) **Habitat:** Widespread on dry mesic sites, mesic slopes & terraces, and mesic stream bottoms.



Sweetbay (*Magnolia virginiana*) **Habitat:** Forested seeps. Scattered individuals may also occur on herbaceous seeps.



American beech (*Fagus grandifolia*) **Habitat:** Particularly important on mesic slopes & terraces (especially steep, sheltered slopes and ravines) and mesic stream bottoms. Also wet-mesic stream bottoms. Most abundant on sites that have remained undisturbed for a long period.



Southern magnolia (*Magnolia grandiflora*) **Habitat:** Particularly important on mesic slopes & terraces (especially steep, sheltered slopes and ravines) and mesic stream bottoms. Also wet-mesic stream bottoms. Most abundant on sites that have remained undisturbed for a long period.

APPENDIX C

DESCRIPTIONS OF KEY PLANT SPECIES

We include these descriptions as an aid to identifying selected species referred to in this field guide. Limitations of space prevent us from providing a description of each member of each ecological species group; it was necessary to select from among them. At least two representative species from each ecological species group are included. We describe only understory or ground layer species because descriptions of overstory trees such as longleaf pine, loblolly pine, sweetgum, or blackjack oak are readily available in illustrated field guides such as Nixon (1985). For photographs and habitat ranges of principal tree species, however, see appendix B. Useful guides to the region's flora include Diggs et al. (1999), which while somewhat out of range, is helpful for identifying dicot plants. Diggs et al (2006) is invaluable for identifying ferns, gymnosperms, and monocots. Correll and Johnston (1979) is an additional resource. Godfrey and Wooten (1979, 1981) provide illustrated keys for wetland species. Illustrated field guides to local wildflowers include Brown (1972), Ajilvsgi (1979), and Tull and Miller (1991). An image gallery of plants native to the region can be found at <http://www.fp.sfasu.edu/jamesvankley/>. Nomenclature follows Kartesz (1999) and USDA Natural Resources Conservation Service (2006).

KEY PLANT SPECIES LIST

Scientific Name	Common Name
<i>Andropogon ternarius</i>	splitbeard bluestem
<i>Arisaema triphyllum</i>	Jack in the pulpit
<i>Bigelovia nuttallii</i>	Nuttall's rayless goldenrod
<i>Bignonia capreolata</i>	crossvine
<i>Boehmeria cylindrica</i>	smallspike false nettle
<i>Brunnichia ovata</i>	American buckwheatvine
<i>Cabomba caroliniana</i>	fanwort
<i>Callicarpa americana</i>	American beautyberry
<i>Callirhoe papaver</i>	woodland poppymallow
<i>Carex jorii</i>	cypress swamp sedge
<i>Centrosema virginianum</i>	spurred butterflypea
<i>Cephalanthus occidentalis</i>	common buttonbush
<i>Chasmanthium laxum</i>	slender woodoats
<i>Chasmanthium sessiliflorum</i>	sessile flowered chasmanthium
<i>Cnidocolus texanus</i>	Texas bullnettle
<i>Croton argyranthemus</i>	healing croton
<i>Ctenium aromaticum</i>	toothache grass
<i>Dalea candida</i>	slender white prairieclover
<i>Drosera brevifolia</i>	dwarf sundew
<i>Elephantopus carolinianus</i>	Carolina elephantsfoot
<i>Gelsemium sempervirens</i>	evening trumpet flower
<i>Hamamelis virginiana</i>	American witchhazel
<i>Ilex vomitoria</i>	yaupon
<i>Justicia ovata</i>	looseflower waterwillow
<i>Mitchella repens</i>	partridgeberry
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Opuntia stricta</i>	erect pricklypear
<i>Osmunda cinnamomea</i>	cinnamon fern
<i>Osmunda regalis</i>	royal fern
<i>Parthenocissus quinquefolia</i>	Virginina creeper

<i>Persea borbonia</i>	redbay
<i>Pityopsis graminifolia</i>	narrowleaf silkgrass
<i>Rhus copallinum</i>	flameleaf sumac
<i>Sabal minor</i>	dwarf palmetto
<i>Sanicula canadensis</i>	Canadian blacksnakeroot
<i>Saracennia alata</i>	yellow trumpets
<i>Saururus cernuus</i>	lizards tail
<i>Schizachyrium scoparium</i>	little bluestem
<i>Smilax pumila</i>	sarsaparilla vine
<i>Solidago odora</i>	anisescented goldenrod
<i>Spiradela punctata</i>	spotted duckweed
<i>Stillingia sylvatica</i>	queensdelight
<i>Stylosanthes biflora</i>	sidebeak pencilflower
<i>Styrax americana</i>	American snowbell
<i>Tephrosia virginiana</i>	Virginia tephrosia
<i>Toxicodendron radicans</i>	eastern poison ivy
<i>Tragia urens</i>	wavyleaf noseburn
<i>Vaccinium arboreum</i>	farkleberry
<i>Viburnum dentatum</i>	southern arrowwood
<i>Viburnum nudum</i>	possumhaw
<i>Vitis rotundifolia</i>	muscadine
<i>Woodwardia areolata</i>	netted chainfern
<i>Xyris spp.</i>	yellow-eyed-grass
<i>Yucca louisianensis</i>	Louisiana yucca

KEY PLANT SPECIES DESCRIPTIONS

***Andropogon ternarius* Michx.**
Splitbeard bluestem

Species Group: *Schizachyrium*

Family: Poaceae

A perennial grass up to 1.5 meters tall. Leaves are up to 0.4 cm wide and 30 cm long. Flowers are arranged in tiny spikelets to 0.6 cm long on a much branched, leafy inflorescence. Blooms in late summer and fall. Old stems are persistent, turning a distinctive reddish brown. Several other species in the genera *Andropogon* and *Schizachyrium* have a roughly similar appearance.

***Arisaema triphyllum* (L.) Schott.**
Jack in the pulpit

Species Group: *Arisaema*

Arum Family: Araceae

An erect, soft perennial herb up to 40 cm tall. There are usually two leaves, the bases of their petioles sheathing the stem. Leaves are compound, divided into three leaflets. Flowers are tiny, numerous, arranged in a fleshy spike which is surrounded by a reddish-green, leafy bract. Fruits form a cluster of bright red berries. Blooms in summer.

***Bigelowia nuttallii* L.C. Anders.**
Nuttall's rayless goldenrod

Species Group: *Bigelowia*

Sunflower Family: Asteraceae

A perennial herb usually less than 80 cm tall. Leaves are narrow, to 12 cm long and 0.3 cm wide. The yellow, disk-shaped flowers are arranged in small heads with ray flowers absent. Heads are arranged in a distinctive flat-topped inflorescence. Fruit is a dry achene. Blooms in fall.

***Bignonia capreolata* L.**
Crossvine

Species Group: *Bignonia*

Catalpa Family: Bignoniaceae

A perennial vine with opposite, compound leaves. Each leaf consists of only 2 lance-shaped leaflets and a tendril. Leaflets are roughly 16 cm long and 4 cm wide. Flowers are funnel-shaped, red-orange, up to 5 cm long, usually occurring high in the forest canopy. The fruit is a narrow capsule, 10 to 17 cm long. Blooms in spring.

***Boehmeria cylindrica* (L.) Sw.**
Smallspike false nettle

Species Group: *Justicia*

Nettle Family: Urticaceae

A perennial herb of wet places, with opposite, toothed, egg-shaped leaves up to 15 cm long and 8 cm wide. Flowers are greenish, about 2 mm wide, occurring in spike-like clusters at the bases of the leaves. The fruit is an achene to 1.5 mm wide. Blooms from summer to fall.

KEY PLANT SPECIES (A-B)



Andropogon ternarius Michx. (Splitbeard bluestem)
Grass Family: Poaceae
Species Group: *Schizachyrium*



Arisaema triphyllum (L.) Schott. (Jack in the pulpit)
Arum Family: Araceae
Species Group: *Arisaema*



Bigelovia nuttallii L.C. Anders. (Nuttall's rayless goldenrod)
Sunflower Family: Asteraceae
Species Group: *Bigelovia*



(Above) ***Bignonia capreolata*** L. (Crossvine)
Catalpa Family: Bignoniaceae
Species Group: *Bignonia*



(Left) ***Boehmeria cylindrica*** (L.) Sw. (Smallspike false nettle)
Nettle family: Urticaceae
Species Group: *Justicia*

***Brunnichia ovata* (Walt.) Shinners**
American buckwheatvine

Species Group: *Justicia*

Knotweed Family: Polygonaceae

A perennial vine with alternate egg-shaped (ovate) leaves to about 15 cm long and 8cm wide with pointed (acute) tips and blunt (obtuse to truncate) bases. Flowers are about 3 cm long, greenish. fruits are 3-sided elongate achenes, in clusters, turning brown. Blooms in spring or early summer.

***Cabomba caroliniana* Gray**
Carolina fanwort

Species Group: *Ceratophyllum*

Waterlily Family: Nymphaeaceae

A submerged, delicate, aquatic perennial herb with opposite fan-shaped leaves that are finely dissected into narrow segments. Leaves are up to 8 cm long and 6 cm wide. Flowers are white, to 1.2 cm long, extending above the surface of the water. The fruit is 3-seeded and indihescent. Blooms in spring or early summer.

***Callicarpa americana* L.**
American beautyberry

Species Group: *Callicarpa*

Vervain Family: Verbenaceae

A shrub with opposite, simple, toothed leaves about 22 cm long and 12 cm wide. Twigs are tan colored. Flowers are white to pink, in clusters at the base of leaves. The fruit is a showy cluster of bright purple or pink globe-shaped drupes. Blooms from summer to late fall.

***Callirhoe papaver* (Cav.) Gray.**
Woodland poppymallow

Species Group: *Callirhoe*

Mallow Family: Malvaceae

A perennial herb to 60 cm tall from a woody root. Leaves have prominent stipules, and are alternate, to 1.3 cm long and 0.6 cm wide. The blade is deeply divided into 3-5 curved, lance-shaped segments. Flowers are to 4 cm long, showy, red to dark wine-colored, with 5 petals. The filaments of anthers are united to form a short column around the style. Blooms from spring to early summer.

***Carex jorii* Bailey**
Cypress swamp sedge

Species Group: *Justicia*

Sedge Family: Cyperaceae

A perennial with a 3-angled stem and grass-like leaves to 90 cm high. The fruit is an achene enclosed in a sac (perigynium). Flowers and fruits are arranged in spikelets up to 5 cm long. Pistillate and staminate flowers are in separate spikelets, with the staminate spikelet uppermost. Blooms in summer and fall.

KEY PLANT SPECIES (B-C)



Brunnichia ovata (Walt.) Shinnery (American buckwheatvine)
Knotweed Family: Polygonaceae
Species Group: *Justicia*



Cabomba caroliniana Gray (Carolina fanwort)
Waterlily Family: Nymphaeaceae
Species Group: *Ceratophyllum*



Callicarpa americana L. (American beautyberry)
Vervain Family: Verbenaceae
Species Group: *Callicarpa*



Callirhoe papaver (Cav.) Gray. (Woodland poppymallow)
Species Group: *Callirhoe*
Mallow family: Malvaceae



Carex jorii Bailey (Cypress swamp sedge)
Sedge Family: Cyperaceae
Species Group: *Justicia*

***Centrosema virginianum* (L.) Benth.**
Spurred butterflypea

Species Group: *Schizachyrium*

Legume Family: Fabaceae

A perennial herbaceous vine with alternate compound leaves divided into 3 leaflets, each up to 7 cm long. The flower is large, showy, purplish to pink, to 3.5 cm long, irregular in symmetry, with a conspicuous “banner” petal. The fruit is a legume to 12 cm long. Blooms from spring to fall.

***Cephalanthus occidentalis* L.**
Common buttonbush

Species Group: *Ceratophyllum*

Madder Family: Rubiaceae

A shrub of wet areas, often growing in seasonally standing water. Leaves are whorled or opposite, elliptic, with a pointed tip, up to 16 cm long and 8cm wide. Flowers are white, tiny, 5 to 9 mm long, arranged in showy, spherical heads 2.5 cm in diameter. The fruit is a spherical cluster of capsules. Blooms in spring and early summer.

***Chasmanthium laxum* (L.) Yates**
Slender woodoats

Species Group: *Bignonia*

Grass Family: Poaceae

A slender, perennial grass up to 1 m tall. Spikelets are wedge-shaped, mostly sessile, arranged in a slender, spike-like inflorescence. Individual spikelets are up to 0.9 cm long. The flowering stem is slender, usually less than 0.2 cm wide. Leaves are up to 30 cm long and 0.6 cm wide. The leaf sheath is essentially hairless. Blooms in summer and fall.

***Chasmanthium sessiliflorum* (Poir) Yates**
Sessile flowered chasmanthium

Species Group: *Chasmanthium*

Grass Family: Poaceae

A slender, perennial grass up to 1m tall. Spikelets are wedge-shaped, mostly sessile, arranged in a slender, spike-like inflorescence. Individual spikelets are up to 0.9 cm long. The flowering stem is slender but usually more than 0.2 cm wide. Leaves are as long as 40 cm and 1 cm wide. The leaf sheath is pubescent (covered with hairs). Blooms in summer.

***Cnidoscolus texanus* (Muell. Arg.) Small**
Texas bullnettle

Species Group: *Tragia*

Spurge Family: Euphorbiaceae

A robust, sprawling perennial herb with a large, deep, woody taproot and milky sap. Leaves are alternate, simple, palmately lobed, up to 15 cm long. The plant is covered with conspicuous stinging hairs which irritate the skin on contact. Flowers are white, four-lobed, trumpet-shaped, about 4 cm wide. The fruit is a 3-part capsule which contains edible seeds. Blooms from late spring to fall.

KEY PLANT SPECIES (C)



Centrosema virginianum (L.) Benth. (Spurred butterflypea)
Legume Family: Fabaceae
Species Group: *Schizachyrium*



Cephalanthus occidentalis L. (Common buttonbush)
Madder Family: Rubiaceae
Species Group: *Ceratophyllum*



Cnidoscolus texanus (Muell. Arg.) Small (Texas bullnettle)
Spurge Family: Euphorbiaceae
Species Group: *Tragia*



Chasmanthium sessiliflorum (Poir) Yates (Sessile flowered chasmanthium)
Grass Family: Poaceae
Species Group: *Chasmanthium*



Chasmanthium laxum (L.) Yates (Slender woodoats)
Grass Family: Poaceae
Species Group: *Bignonia*

***Croton argyranthemus* Michx.**
Healing croton

Species Group: *Schizachyrium*

Spurge Family: Euphorbiaceae

A perennial herb to 40 cm tall. Leaves are alternate, to 5 cm long and 2 cm wide. Leaves are silvery-scaly, brightest on the under surface. Flowers are inconspicuous, to 0.6 cm long. The fruit is a 3-seeded capsule about 5 mm long. Blooms in summer and fall.

Ctenium aromaticum
Toothache grass

Species Group: *Drosera*

Grass Family: Poaceae

A tufted, aromatic, perennial grass with stems to 1.2 m tall. Leaf blades are to 40 cm long, 0.1 to 0.5 mm wide, often rolled inward at the margin. The distinctive inflorescence consists of sessile spikelets in two rows all on one side of the curved main axis. Rare west of the Sabine River.

***Dalea multiflora* (Nutt.) Shinnery**
White prairieclover

Species Group: *Dalea*

Legume Family: Fabaceae

A perennial herb up to 60 cm tall, leaves pinnately compound, leaflets to 1.3 cm long and 0.2 cm wide, linear or narrowly oblanceolate. Flowers are irregular, white, and small, to 0.3 cm long in a more or less globose inflorescence. The fruit is a legume to 0.4 cm long. Blooms in June and July. Similar species include *D. compacta* (purple flowers) and *D. candida* (white flowers in elongate inflorescences, spring-blooming).

***Drosera brevifolia* Pursh.**
Dwarf sundew

Species Group: *Drosera*

Sundew Family: Droseraceae

A diminutive perennial herb, with a basal cluster (rosette) of round leaves up to 8 mm long and wide. Leaves are covered with reddish, sticky glandular hairs which trap small insects to supplement the plant's nutrition. Flowers are small, pink, and solitary on a leafless stalk about 10 cm tall. Blooms in spring and early summer.

***Elephantopus carolinianus* Raeusch.**
Carolina elephantsfoot

Species Group: *Bignonia*

Sunflower Family: Asteraceae

A perennial herb to 80 cm tall. Leaves are large, alternate, up to 22 cm long and 11 cm wide, often broadest toward the tip. Flowers are small, pinkish-white to blue, up to 1.2 cm long, arranged in small heads. Heads have disk flowers only. Blooms in late summer and fall.

KEY PLANT SPECIES (C-E)



Croton argyranthemus Michx. (Healing croton)
Spurge Family: Euphorbiaceae
Species Group: *Schizachyrium*



Ctenium aromaticum (Toothache grass)
Grass Family: Poaceae
Species Group: *Drosera*



Drosera brevifolia Pursh. (Dwarf sundew)
Sundew Family: Droseraceae
Species Group: *Drosera*



Dalea multiflora Wild. (white prairieclover)
Legume Family: Fabaceae
Species Group: *Dalea*



Elephantopus carolinianus Raeusch. (Carolina elephantsfoot)
Sunflower Family: Asteraceae
Species Group: *Bignonia*

***Gelsemium sempervirens* St. Hil.**
Evening trumpet flower

Species Group: *Chasmanthium*

Logania Family: Loganiaceae

A perennial vine with opposite, narrow, sharp-pointed, lance-shaped leaves. Leaves are roughly 6 cm long and 2 cm wide. Flowers are yellow, showy, trumpet-shaped, about 4 cm long. The fruit is a capsule, about 1.6 cm long. Blooms in spring.

***Hamamelis virginiana* L.**
American witchhazel

Species Group: *Arisaema*

Witchhazel Family: Hamamelidaceae

A shrub with alternate, oval leaves up to 15 cm long and 8 cm wide with wavy margins. Flowers are yellow, with four thin, strap-like petals. The fruit is a globe-shaped, woody capsule to 3 cm in diameter. Blooms in late fall, often after leaves drop.

***Ilex vomitoria* Ait.**
Yaupon

Species Group: *Chasmanthium*

Holly Family: Aquifoliaceae

A shrub or small tree to 8 m tall. Leaves are small, thick, leathery, alternate, simple, persistent in winter, roughly 5 cm long and 3 cm wide. Leaf margins are toothed. Flowers are small, white, from the base of the leaves. The fruit is a red, fleshy drupe roughly 6 mm in diameter. Blooms in spring.

***Justicia ovata* (Walt.) Lindau**
Looseflower waterwillow

Species Group: *Justicia*

Acanthus Family: Acanthaceae

A perennial herb with an underground stem. Leaves are opposite, lance-shaped, up to 10 cm long and 3 cm wide. Flowers are purple, strongly 2-lipped, and 1.2 cm long. The fruit is a capsule. Blooms in spring and early summer.

***Mitchella repens* L.**
Partridgeberry

Species Group: *Mitchella*

Madder Family: Rubiaceae

A small trailing evergreen herb with opposite, round, glossy leaves up to 2 cm long and wide. Flowers are white, trumpet-shaped, about 1 cm long, with a four-lobed corolla. Flowers occur in pairs on a short stalk. The fruit is a bright red, round, fleshy, edible drupe about 0.6 cm in diameter. Blooms in spring and early summer.

KEY PLANT SPECIES (G-M)



Gelsemium sempervirens St. Hil. (Evening trumpet flower)
Logania Family: Loganiaceae
Species Group: *Chasmanthium*



Hamamelis virginiana L. (American witchhazel)
Witchhazel Family: Hamamelidaceae
Species Group: *Arisaema*



Ilex vomitoria Ait. (Yaupon)
Holly Family: Aquifoliaceae
Species Group: *Chasmanthium*



Justicia ovata (Walt.) Lindau (Looseflower waterwillow)
Acanthus Family: Acanthaceae
Species Group: *Justicia*



(Above left & right) ***Mitchella repens*** L. Partridgeberry
Madder Family: Rubiaceae
Species Group: *Mitchella*

***Morella Caroliniensis* (P. Mill.) Small** (SY=*Myrica heterophylla* Raf.) Species Group: *Osmunda*
Evergreen bayberry

Waxmyrtle Family: Myricaceae

A fragrant shrub of seepage wetlands, to 3 m tall. Leaves are alternate, evergreen, up to 12 cm long and 4 cm wide. Margins are entire or toothed on the upper half of the leaf. Flowers are minute, arranged in tiny catkins. Fruits are globe-shaped, dark, hard, 4 mm in diameter, with a waxy coating. A similar species is the much more wide-ranging *M. cerifera* L. which has smaller leaves and leaf under-surfaces which are covered with yellow resinous glands. Blooms in spring.

***Opuntia humifusa* (Raf.) Raf.**
Devil's tongue pricklypear

Species Group: *Tragia*

Cactus Family: Cactaceae

A sprawling, clump-forming plant with succulent stems flattened into "pads". Spines are absent, but each bud is associated with a tuft of small, barbed bristles which easily detach and irritate the skin. Leaves are small, scale-like, and fall off early in the growing season. Flowers are yellow, showy, about 6cm long. The fruit is a purplish berry which is edible when peeled. Blooms in spring.

***Osmunda cinnamomea* L.**
Cinnamon fern

Species Group: *Osmunda*

Cinnamon Fern Family: Osmundaceae

A fern with large, erect, once-pinnately compound fronds (leaves) up to 1.5 m tall. Leaves are dimorphic, the inner leaves fertile, erect, and densely covered with cinnamon-colored hairs and tiny sporangia, the outer leaves are sterile and spreading.

***Osmunda regalis* L.**
Royal fern

Species Group: *Osmunda*

Cinnamon Fern Family: Osmundaceae

A fern with large, erect, twice-pinnately compound fronds (leaves). Fronds can be up to 1.8 m tall, (but most local specimens not quite as tall as *O. cinnamomea*). The upper pinnae (leaflets) of some leaves are fertile, densely covered with tiny sporangia.

***Parthenocissus quinquefolia* (L.) Planch**
Virginia creeper

Species Group: *Callicarpa*

Grape Family: Vitaceae

A woody vine with opposite, palmately compound leaves, usually with 5 leaflets. Leaflets are 2.5 to 15 cm long and toothed. Small greenish flowers mature into a cluster of blue-black, succulent, poisonous berries, 5 to 7 mm diameter. Blooms in spring and early summer.

KEY PLANT SPECIES (M-O)



Morella Caroliniensis (P. Mill.) Small (Evergreen bayberry)
Species Group: *Osmunda*
Waxmyrtle Family: Myricaceae



Opuntia humifusa (Raf.) Raf. (Devil's tongue pricklypear)
Cactus Family: Cactaceae
Species Group: *Tragia*



Parthenocissus quinquefolia (L.) Planch (Virginia creeper)
Grape Family: Vitaceae
Species Group: *Callicarpa*



Osmunda cinnamomea L. (Cinnamon fern)
Cinnamon Fern Family: Osmundaceae.
Species Group: *Osmunda*



Osmunda regalis L. (Royal fern)
Cinnamon Fern Family: Osmundaceae
Species Group: *Osmunda*

***Persea borbonia* (L.) Spreng.
Redbay**

Species Group: *Osmunda*

Laurel Family: Lauraceae

A shrub or tree of seepage wetlands, to 20 m tall. Leaves are simple, alternate, up to 12 cm long and 6 cm wide, aromatic when crushed, often thinly pubescent on the lower surface. Flowers are about 0.5 cm long. The fruit is a round, fleshy drupe about 1 cm long.

***Pityopsis graminifolia* (Michx.) Nutt.
Narrowleaf silkgrass**

Species Group: *Schizachyrium*

Sunflower Family: Asteraceae

An herb with long, narrow, grasslike, parallel-veined leaves up to 25 cm long and 1.2 cm wide, covered with fine, silky hairs. Flowers are yellow, arranged in heads to 2.5 cm in diameter with disk flowers in the center and ray flowers around the outside. Blooms in late summer and fall.

***Rhus copallinum* L.
Flameleaf sumac**

Species Group: *Callicarpa*

Sumac Family: Anacardiaceae

A shrub or small tree to 10 m tall. Leaves are alternate, pinnately compound, with the main axis (rachis) of the leaf winged. Leaflets are lance-shaped, roughly 9 cm long and 4 cm wide. Flowers are tiny, clustered, and greenish-white. Fruits are about 0.4 cm in diameter, with red glandular hairs. Blooms in spring and summer.

***Sabal minor* (Jacq.) Pers.
Dwarf palmetto**

Species Group: *Bignonia*

Palm Family: Arecaceae

A low-growing, essentially trunkless palm. Leaves are large, stiff, palmately divided and fan-shaped, up to 2 m long. Flowers are small, to 0.5 cm long, numerous, arranged in a large panicle up to 3m tall. Fruits are black and globe-shaped.

***Sanicula canadensis* L.
Canadian blacksnakeroot**

Species Group: *Mitchella*

Parsley Family: Apiaceae

A perennial herb, less than 1 m tall. Leaves are alternate, palmately divided, with the base of the petiole sheathing the stem. Flowers are small, white, and in dense clusters. Fruits are usually in clusters of 3 each covered with hooked bristles.

KEY PLANT SPECIES (P-S)



Persea borbonia (L.) Spreng. (Redbay)
 Laurel Family: Lauraceae
 Species Group: *Osmunda*



Pityopsis graminifolia (Michx.) Nutt. (Narrowleaf silkgrass)
 Sunflower Family: Asteraceae
 Species Group: *Schizachyrium*



Rhus copallinum L. (Flameleaf sumac)
 Sumac Family: Anacardiaceae.
 Species Group: *Callicarpa*



Sanicula canadensis L. (Canadian blacksnakeroot)
 Parsley Family: Apiaceae
 Species Group: *Mitchella*



Sabal minor (Jacq.) Pers. (Dwarf palmetto)
 Palm Family: Arecaceae
 Species Group: *Bignonia*

***Sarracenia alata* Wood**
Yellow trumpets (pitcher plant)

Species Group: *Drosera*

Pitcher Plant Family: Sarraceniaceae

A perennial herb with basal leaves modified into yellow-green trumpet-shaped pitchers up to 70 cm tall with inconspicuous reddish veins. The leaves trap small insects in a pool of water and enzymes inside the pitcher to supplement the plant's nutrition. Flowers are solitary, greenish-yellow, to 6 cm long, and drooping. The fruit is a capsule. Blooms in spring.

***Saururus cernuus* L.**
Lizards tail

Species Group: *Justicia*

Lizards Tail Family: Saururaceae

A perennial herb of wet places, up to 90 cm tall. Leaves are alternate, heart-shaped, to 11 cm long and 5 cm wide. Flowers are small, white, in an elongate curved terminal raceme which resembles a lizard's tail. The fruit is a fleshy capsule. Blooms in spring and early summer.

***Schizachyrium scoparium* (Michx) Nash**
Little bluestem

Species Group: *Schizachyrium*

Grass Family: Poaceae

A perennial grass up to 1.5 m tall. Leaves are 0.3 to 0.6 cm wide. Flowers are in tiny spikelets to 0.8 cm long on a much branched, leafy inflorescence. The stalks bearing the spikelets within the inflorescence are hairy. Old stems are persistent, turning a distinctive reddish brown. This species is often dominant on native grasslands. Several other species in the genera *Andropogon* and *Schizachyrium* have a roughly similar appearance. Blooms in summer and fall.

***Smilax pumila* Walt.**
Sarsaparilla vine

Species Group: *Arisaema*

Greenbier Family: Smilacaceae

An herbaceous vine with alternate, simple leaves. Leaves are up to 10 cm long and 7 cm wide. Stems and lower leaf surfaces are hairy but lack the prickles that are typical of most *Smilax* species. Flowers are small, roughly 0.3 cm long and the fruit is a red berry, about 0.7 cm long. Blooms in fall.

***Solidago odora* Ait.**
Anisescented goldenrod

Species Group: *Schizachyrium*

Sunflower Family: Asteraceae

A perennial herb to 1.6 m tall with alternate leaves to 11 cm long and 3 cm wide. The leaves are fragrant, with (entire), hairless margins. Flowers are yellow, arranged in small heads with both disk flowers and ray flowers. Ray flowers are up to 0.6 cm long. The fruit an achene. Blooms in late summer and fall.

KEY PLANT SPECIES (S)



Sarracenia alata Wood (Yellow trumpets, pitcher plant)
Pitcher Plant Family: Sarraceniaceae
Species Group: *Drosera*



Smilax pumila Walt. (Sarsaparilla vine)
Greenbriar Family: Smilacaceae
Species Group: *Arisaema*



Solidago odora Ait. (Anisescented goldenrod)
Sunflower Family: Asteraceae
Species Group: *Schizachyrium*



Saururus cernuus L. (Lizards tail)
Lizards Tail Family: Saururaceae
Species Group: *Justicia*



Schizachyrium scoparium (Michx) Nash (Little bluestem)
Grass Family: Poaceae
Species Group: *Schizachyrium*

***Spirodela punctata* (Meyer) Thomps.
Spotted duckweed**

Species Group: *Ceratophyllum*

Duckweed Family: Lemnaceae

Minute, floating aquatic plants with simplified, stemless structure, often forming a solid cover over the surface of calm, shallow water. The solitary leaf (thallus) is less than 5 mm long, with two or more tiny rootlets attached to the underside. Flowers are minute and rarely observed. It often grows mixed with other species from the family Lemnaceae (*Lemna* spp., *Spirodela polyrrhiza* (L.) Schleid., *Wolffia* spp., & *Wolffiella* spp.) along with with mosquito fern (*Azolla caroliniana* Willd.--the reddish-brown plants in the photo).

***Stillingia sylvatica* Garden ex. L.
Queensdelight**

Species Group: *Tragia*

Spurge Family: Euphorbiaceae

An erect perennial herb with milky sap and one to several stems from a woody base. Leaves are alternate, short-petioled, and lance-shaped, to 8cm long. Leaf margins have small, sharp teeth. Tiny yellowish flowers occur in terminal spikes at the tip of each branch. The fruit is a distinctly 3-lobed capsule. Blooms in spring and early summer.

***Stylosanthes biflora* (L.) B.S.P.
Sidebeak pencilflower**

Species Group: *Schizachyrium*

Legume Family: Fabaceae

A small, bushy-branched, perennial herb to 60 cm tall. Leaves are alternate, compound, and divided into 3 leaflets. Leaflets are pubescent, to 2 cm long and 0.5 cm wide. Flowers are yellow, about 5 to 10 mm long, with irregular lobes. The fruit a legume that divides into 2 sections (= loment). Blooms from spring to fall.

***Styrax americana* Lam.
American snowbell**

Species Group: *Justicia*

Storax Family: Styracaceae

A shrub or small tree to 6 m tall. Leaves are alternate, elliptic to oval shaped, toothed, up to 14 cm long and 6 cm wide. A second bud (superposed bud) occurs above the primary axillary bud at the base of each leaf. Flowers are white, showy, drooping, about 1.5 cm long. The fruit is a globe-shaped capsule, about 1 cm long.

***Tephrosia virginiana* (L.) Pers.
Virginia tephrosia**

Species Group: *Schizachyrium*

Legume Family: Fabaceae

A perennial herb to 70 cm tall, with a deep, woody rootstock. Leaves are pinnately compound with 15 to 25 leaflets. Leaflets are elliptic, up to 3 cm long and 1 cm wide. The plant is covered with a silvery pubescence. Flowers are pale yellow, pinkish, or white, up to 2.1 cm long, with irregular lobes. The fruit is a legume, nearly straight, 35-55 mm long and 4-6 mm wide. Blooms in spring and early summer.

KEY PLANT SPECIES (S-T)



Spirodela punctata (Meyer) Thomps. (Spotted duckweed)
Duckweed Family: Lemnaceae
Species Group: *Ceratophyllum*



Stylosanthes biflora (L.) B.S.P. (Sidebeak pencilflower)
Legume Family: Fabaceae
Species Group: *Schizachyrium*



Tephrosia virginiana (L.) Pers. (Virginia tephrosia)
Legume Family: Fabaceae
Species Group: *Schizachyrium*



Stillingia sylvatica Garden ex. L. (Queen's delight)
Spurge Family: Euphorbiaceae
Species Group: *Tragia*



Styrax americana Lam. (American snowbell)
Storax Family: Styracaceae
Species Group: *Justicia*

***Toxicodendron radicans* (L.) Kuntze**
Eastern poison ivy

Species Group: *Callicarpa*

Sumac Family: Anacardiaceae

A woody vine, groundcover, or small shrub. Leaves are alternate, compound, with three, irregularly lobed leaflets to 30 cm long and 15 cm wide. Each leaflet has a distinct stalk (petiolule). Flowers are whitish or cream-colored. The fruit is cream-colored, fleshy, about 0.6 cm in diameter, and occurs in clusters. Contact with this plant causes an itchy skin rash in most people. Blooms in spring and summer.

***Tragia urticifolia* Michx.**
Nettle-leaf noseburn

Species Group: *Tragia*

Spurge Family: Euphorbiaceae

A perennial herb to 65 cm tall. Leaves are alternate, egg-shaped to lance-shaped, to 7 cm long and 3 cm wide, with toothed margins, and a heart-shaped base. Flowers are minute, to 2.2 mm long. The fruit is a 3-lobed capsule, up to 6 mm long. The plant has small, stinging hairs which may irritate sensitive areas of skin. Similar species include *Tragia urens* L. and *T. smallii*. Shinnery. Blooms in spring and summer.

***Vaccinium arboreum* Marsh.**
Farkleberry

Species Group: *Schizachyrium*

Heath Family: Ericaceae

A Shrub or small tree to 8 m tall. Leaves are alternate, egg-shaped, glossy, leathery, to 7 cm long and 4 cm wide, and essentially evergreen. Leaf margins are entire (not toothed or lobed). The flowers are white or cream-colored, urn-shaped, and about 5 mm long. The fruit is a reddish-black edible berry up to 1 cm in diameter with hard, stone-like seeds. Blooms in spring.

***Viburnum dentatum* L.**
Southern arrowwood

Species Group: *Mitchella*

Honeysuckle Family: Caprifoliaceae

A shrub or small tree to 5 m tall. Leaves are simple, opposite, egg-shaped, to 8 cm long and 4 cm wide. Leaf margins have coarse triangular teeth. Flowers are white, 5 to 8 mm wide, in large clusters. The fruit is a fleshy, blue-black drupe, about 8 mm in diameter. Blooms in spring and early summer.

***Viburnum nudum* L.**
Possumhaw

Species Group: *Osmunda*

Honeysuckle Family: Caprifoliaceae

A shrub to 5 m tall. Leaves are simple, opposite, somewhat leathery, to 12 cm long and 4 cm broad, with entire (untoothed) margins and a shiny upper surface. Flowers are white, about 5 mm wide, and arranged in a large cluster. The fruit is a fleshy blue-black drupe about 8 mm in diameter. Blooms in spring and early summer.

KEY PLANT SPECIES (T-V)



Toxicodendron radicans (L.) Kuntze (Eastern poison ivy)
Sumac Family: Anacardiaceae
Species Group: *Callicarpa*



Tragia urticifolia Michx. (Nettle-leaf noseburn)
Spurge Family: Euphorbiaceae
Species Group: *Tragia*



Vaccinium arboreum Marsh. (Farkleberry)
Heath Family: Ericaceae
Species Group: *Schizachyrium*



Viburnum dentatum L. (Southern arrowwood)
Honeysuckle Family: Caprifoliaceae
Species Group: *Mitchella*



Viburnum nudum L. (Possumhaw)
Honeysuckle Family: Caprifoliaceae
Species Group: *Osmunda*

***Vitis rotundifolia* Michx.**
Muscadine grape

Species Group: *Callicarpa*

Family: Vitaceae

A large woody vine with smooth bark and prominent aerial roots. Leaves are alternate, simple, round to heart-shaped, unlobed, toothed, and about 14 cm long and 10 cm wide. A tendril occurs opposite each leaf at each node. Flowers are small, white, and in clusters. The fruit is a dark purple edible berry, 12 to 25 mm in diameter. Several similar species (for example *V. aestivalis*) also occur.

***Woodwardia areolata* (L.) T. Moore**
Netted chainfern

Species Group: *Osmunda*

Chain Fern Family: Blechnaceae

A Fern to 1 m tall, forming extensive, dense colonies from underground rhizomes. Fronds are dark green, somewhat leathery, and divided into pinnae which alternate along the main axis of the leaf. The pinnae of the fertile fronds are strap-like, with sporangia located in the in-rolled margins.

***Xyris* L.**
***Xyris*, yellow-eyed-grass**

Species Group: *Drosera*

Yellow-eyed-grass Family: Xyridaceae

This genus contains at least 13 similar species of slender, basal-leaved, grasslike perennial herbs. Numerous flowers are born in spikes at the tip of leafless flowering stalks to 0.5 m tall. Close-packed brown scales cover the spike. Only a few yellow flowers protrude from the scales at any time. Flowers are usually open for only a few hours. The fruit is a capsule containing many tiny seeds. Blooms in summer.

***Yucca louisianensis* Trel.**
Louisiana yucca

Species Group: *Tragia*

Agave Family: Agavaceae

A low, unbranched shrub to 2 m tall. Leaves are numerous, basal, spirally arranged, flaccid, linear, with white margins, to 60 cm long and 4 cm wide. Flowers are creamy white, showy, numerous, to 6 cm long, arranged in a large panicle. The fruit is a capsule, up to 5 cm long. Blooms in spring and early summer.

KEY PLANT SPECIES (V-Y)



***Vitis rotundifolia* Michx. (Muscadine)**

Family: Vitaceae

Species Group: *Callicarpa*



***Woodwardia areolata* (L.) T. Moore (Netted chainfern)**

Chain Fern Family: Blechnaceae

Species Group: *Osmunda*



***Yucca louisianensis* Trel. (Louisiana yucca)**

Agave Family: Agavaceae

Species Group: *Tragia*



***Xyris* L. (Xyris, yellow eyed grass)**

Yelloweyed Grass Family: Xyridaceae

Species Group: *Drosera*

APPENDIX D

CLIMATE SUMMARY

Climate represents the prevailing weather patterns in a region. It is usually described in terms of average temperature, precipitation, evaporation rates, and wind. Table C.1 summarizes climatic data for selected counties and parishes in which the National Forests in Texas and the Kisatchie National Forest occur. Louisiana and eastern Texas have a humid, subtropical climate characterized by hot, humid summers and mild winters with occasional periods of frost and negligible snowfall (Larkin and Bomar 1983). Precipitation occurs year-round, but most falls in winter and spring. In summer and early fall, occasional droughts occur. Summer precipitation usually takes place in the form of afternoon thunderstorms. Lightning from these storms ignited the fires that burned through the pine-dominated woodlands typical of the presettlement landscape for much of the area.

Across the national forests of the West Gulf Coastal Plain, there is an average precipitation gradient of approximately fifteen inches (38.1 cm) between the low average on the western edge of Davy Crockett National Forest in Texas and the high average on the eastern edge of the area in central Louisiana (the Calcasieu Ranger District—Evangeline unit and the Catahoula Ranger District of Kisatchie National forest). Mean annual precipitation increases from 42 inches (107cm) in Houston County, TX to 44 inches (112 cm) in Angelina County to 50 inches (127 cm) in Sabine County. In Louisiana, precipitation continues to increase eastward with 50 inches (127cm) for Natchitoches Parish, 57 inches (145 cm) for Rapides Parish and 58 inches (147 cm) for Grant Parish. Evaporation rates, as expressed by Average Gross Lake Surface Evaporation Rates, decrease from west to east, reflecting the more humid climate and increased influence of the Gulf of Mexico further east (Table D.1). Generally, the climate will be slightly more moist and drought conditions slightly less likely in Kisatchie National Forest than in the National Forests of Texas.

Average temperatures decrease slightly as one moves northward. This gradient is part of the continent-wide gradient from the humid-subtropical climate adjacent to the Gulf of Mexico to the frigid climate in polar Canada. Within the study area, mean annual temperatures rise from 65 °F (18.3 °C) in Shelby County to 67 °F (19.4 °C) in Walker County, while the average annual low temperature is 53 °F (11.7 °C) in Shelby County and is 56 °F (13.3 °C) in Walker County. The average low temperature for January, the coldest month, is 38.5 °F (3.6 °C) in Walker County, and is 34 °F (1.1 °C) in Shelby County. The average monthly high temperature for August, the warmest month, is 93 °F (33.9 °C) for Shelby County, 93.5 °F (34.2 °C) for Angelina and San Augustine counties, and 95 °F (35 °C) for Walker County. In Louisiana, the average annual temperature is 65.5 °F (18.6 °C) in Grant Parish, 67 °F (19.4 °C) in Natchitoches Parish, and 66° F (18.9 °C) in Rapids Parish. Freezing temperatures occur only one year in ten after March 31 in Rapides Parish, after March 26 in Natchitoches Parish, and after March 29 in Grant Parish.

Table D.1. Climatic summary for the Texas and Kisatchie National forests. Counties or parishes are listed in order from west to east. Data are derived from Larkin and Bomar (1983), Martin et al. (1990), Kilpatrick et al. (1986), and Kerr et al. (1980).

County /Parish ¹	Forest ²	Mean annual precipitation	Mean annual evaporation ³	Mean annual temperature		Mean annual high temperature		Mean annual low temperature	
		in. (cm)	in. (cm)	°F	(°C)	°F	(°C)	°F	(°C)
Walker	SH	44 (112)	52 (132)	67	(19.4)	79.5	(26.4)	56	(13.3)
Houston	DC	42 (107)	50 (127)	66	(18.9)	77.5	(25.3)	55	(12.8)
Trinity	DC	44 (112)	50 (127)	66.5	(19.2)	78	(25.6)	55.5	(13.1)
Angelina	AN	44 (112)	47 (119)	66	(18.9)	78	(26.5)	55	(12.8)
San Augustine	AN,SA	48 (122)	45 (114)	66	(18.9)	77.5	(25.3)	54.5	(12.5)
Shelby	SA	50 (127)	45 (114)	65	(18.3)	77	(25.0)	52.5	(11.4)
Sabine	SA	52 (132)	44 (112)	65.5	(18.6)	77.5	(25.3)	53	(11.70)
Nachitoches	KS	50 (127)	NA	67	(19.4)	79	(26.1)	54.5	(12.5)
Grant	CA	57 (145)	NA	65.5	(18.6)	77.2	(25.1)	54	(12.2)
Rapides	EV	58 (147)	48 (122)	66	(18.9)	77	(25.0)	55	(12.8)

1. Counties or parishes are listed in order from west to east.
2. SH = Sam Houston National Forest, DC = Davy Crockett National Forest, AN = Angelina National Forest, SA = Sabine National Forest, KS = Kisatchie District, CA = Catahoula District, EV = Evangeline Unit, Calcasieu, District.
3. Average gross lake surface evaporation rate.

APPENDIX E

HIERARCHICAL LIST OF ECOLOGICAL MAP UNITS

The aim of the following list of ecological map units covered by this classification is to connect the lower (local) and higher levels of the Ecological Classification System hierarchy. Names and alphanumeric codes for the high-level ecoregions (domain, province section and subsection) are those of Bailey et al. (1994) and Keys et al. (1995). The lower-level ecological units (landtype associations, landtypes, and landtype phases) were derived from the results of local research (see chapter 4) and are each assigned a name and a unique identifying code. An example of the coding and naming system for ecological units is provided below.

Landtype associations are numbered by their general occurrence from east to west across the West Gulf Coastal Plain. These numbers are an extension of a system previously in use on Kisatchie National Forest. The landtypes within each LTA are assigned single-digit numbers. Within each landtype, landtype phases are assigned two-digit numbers (The two-digit number allows for future addition of LTPs based on subsequent research).

The unique code for a particular landtype phase incorporates the symbols or numbers for all the ecological units at all of the hierarchical levels in which it is nested. For example, a site from Kisatchie National Forest north of Minden, LA, within the Southeastern Mixed Forest Province (code number =231), which is in turn located within the South Central Arkansas Subsection (231Ea), and the North Louisiana Clayey Hills Landtype Association (LTA 9--or to use the whole code, 231Ea.9), on the Sandy/Loamy Uplands Landtype (LT 1, or 231Ea.9.1), identified as the "Shortleaf Pine-Southern Red Oak /*Callicarpa*-*Chasmanthium* Loamy Dry-Mesic Uplands" Landtype Phase (1.30) would be given the following code and name:

231Ea.9.1.30 Shortleaf Pine-Southern Red Oak /*Callicarpa*-*Chasmanthium* Loamy
Dry-Mesic Uplands Landtype Phase

Using this naming convention, each ecological unit within the ECS hierarchy can be quickly identified and described, and its location within the hierarchy can be determined by referring to the following list of ecological map units.

Note: because of their widespread occurrence across most subsections on the West Gulf Coastal Plain, the various Alluvial Floodplains and Terraces Landtype Associations are placed at the end of the hierarchical list of landtypes and landtype phases. Since there is strong similarity in soils, hydrology, and vegetation across the different watersheds, they are treated together as an "LTA complex". The variable portions of the code for this LTA are designated with an "x" to be substituted with the appropriate subsection number.

ECOREGIONS, SUBREGIONS, AND LANDTYPE ASSOCIATIONS

- 200 Humid Temperate Domain
- 230 Subtropical Division
- 231 Southeastern Mixed Forest Province
- 231E Middle Coastal Plains, Western Section
 - 231Ea South Central Arkansas Subsection
 - 231Ea.4 Alluvial Floodplains and Terraces Landtype Association
 - 231Ea.8 Caney Lakes Loamy Uplands Landtype Association
 - 231Ea.9 North Louisiana Clayey Hills Landtype Association
 - 231Ea.10 Lignitic Uplands Landtype Association
 - 231Ed Sabine Alluvial Valley Subsection
 - 231Ed.4 Alluvial Floodplains and Terraces Landtype Association
 - 231Ef Piney Woods Transition Subsection
 - 231Ef.13 Western Clayey Uplands Landtype Association
 - 231Eg Sand Hills Subsection
 - 231Eg.4 Alluvial Floodplains and Terraces Landtype Association
 - 231Eg.11 Redlands Landtype Association
 - 231Eg.12 Sparta Sandhills Landtype Association
 - 231Eh Southern Loam Hills Subsection
 - 231Eh.4 Alluvial Floodplains and Terraces Landtype Association
 - 231Eh.16 Raven Hills Landtype Association
 - 231Eh.17 Big Thicket Landtype Association
 - 231Ei Southwest Flatwoods Subsection
 - 231Ei.18 San Jacinto Flatwoods Landtype Association
- 232 Outer Coastal Plain Mixed Forest Province
- 232F Coastal Plains and Flatwoods, Western Gulf Section
 - 232Fa Southern Loam Hills Subsection
 - 232Fa.1 High Terrace Rolling Uplands Landtype Association
 - 232Fa.2 Kisatchie Sandstone Hills Landtype Association
 - 232Fa.3 Undulating Clayey Uplands Landtype Association
 - 232Fa.4 Alluvial Floodplains and Terraces Landtype Association
 - 232Fa.5 Winn Rolling Uplands Landtype Association
 - 232Fa.6 Fort Polk Rolling Uplands Landtype Association
 - 232Fa.15 Mayflower Uplands Landtype Association

232Fc Sabine Alluvial Valley Subsection

232Fc.4 Alluvial Floodplains and Terraces Landtype Association

232Fd Neches Alluvial Valley Subsection

232Fd.4 Alluvial Floodplains and Terraces Landtype Association

232Fe Piney Woods Transition Subsection

232Fe.4 Alluvial Floodplains and Terraces Landtype Association

232Fe.13 Clayey Uplands Landtype Association

232Fe.14 Sandy Uplands Landtype Association

234 Lower Mississippi Riverine Forest Province

234A Mississippi Alluvial Basin Section

234Ai Red River Alluvial Plain Subsection

234Ai.7 Red River Alluvial Plain Landtype Association

LANDTYPES AND LANDTYPE PHASES

231Ea.8 Caney Lakes Loamy Uplands Landtype Association

231Ea.8.1 Sandy/Loamy Uplands Landtype

231Ea.8.1.20 Shortleaf Pine-Blackjack Oak/*Tragia* Sandy Dry Uplands Landtype Phase

231Ea.8.1.30 Shortleaf Pine-Southern red oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

231Ea.8.3 Mesic Slopes and Terraces Landtype

231Ea.8.3.10 White Oak-American beech-Loblolly Pine/*Chasmanthium* Loamy Mesic Lower Slopes Landtype Phase

231Ea.8.4 Minor Stream Bottoms Landtype

231Ea.8.4.10 Loblolly pine-white oak/ *Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

231Ea.8.4.20 Sweetgum-oak/ *Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

231Ea.8.4.30 Sweetbay-Swamp Tupelo/*Osmunda* sandy Wet Forested Seeps Landtype Phase

231Ea.9 North Louisiana Clayey Hills Landtype Association

231Ea.9.1 Sandy/Loamy Uplands Landtype

231Ea.9.1.20 Shortleaf Pine-Blackjack Oak/*Tragia* Sandy Dry Uplands Landtype Phase

231Ea.9.1.30 Shortleaf Pine-Southern Red Oak /*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

231Ea.9.2 Clayey Uplands Landtype

231Ea.9.2.10 Shortleaf Pine/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

231Ea.9.3 Mesic Slopes and Terraces Landtype

231Ea.9.3.10 White Oak- American beech-Loblolly Pine/ *Chasmanthium* Loamy Mesic Lower Slopes Landtype Phase

231Ea.9.4 Minor Stream Bottoms Landtype

231Ea.9.4.10 Water Oak/*Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

231Ea.9.4.20 Sweetgum-oak Loamy Wet-Mesic Stream Bottoms Landtype Phase

231Ea.9.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

231Ea.10 Lignitic Uplands Landtype Association

231Ea.10.1 Sandy/Loamy Uplands Landtype

- 231Ea.10.1.10 Shortleaf Pine-(Longleaf Pine) -Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase
- 231Ea.10.1.20 Shortleaf Pine-(Longleaf Pine)-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase
- 231Ea.10.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

231Ea.10.2 Clayey Uplands Landtype

- 231Ea.10.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase
- 231Ea.10.2.20 Willow Oak/*Justicia* Clayey Wet Upland Depressions Landtype Phase

231Ea.10.3 Mesic Slopes and Terraces Landtype

- 231Ea.10.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase
- 231Ea.10.3.20 American Beech-White Oak/*Mitchella* Loamy Moist-Mesic Steep Slopes and Ravines Landtype Phase

231Ea.10.4 Minor Stream Bottoms Landtype

- 231Ea.10.4.10 White Oak-Water Oak/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms
- 231Ea.10.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase
- 231Ea.10.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

231Ef.13 Western Clayey Uplands Landtype Association

232Ef.13.1 Sandy/Loamy Uplands Landtype

- 232Ef.13.1.10 Shortleaf Pine-Blackjack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase
- 232Ef.13.1.20 Shortleaf Pine-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase
- 232Ef.13.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

232Ef.13.2 Clayey Uplands Landtype

- 232Ef.13.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Uplands Landtype Phase
- 232Ef.13.2.20 Willow Oak/*Justicia* Clayey Wet Upland Depressions Landtype Phase

232Ef.13.3 Mesic Lower Slopes and Terraces Landtype

- 232Ef.13.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

232Ef.13.3.20 American Beech-White Oak/*Mitchella* Loamy Moist-Mesic Steep Slopes and Ravines Landtype Phase

232Ef.13.4 Minor Stream Bottoms Landtype

232Ef.13.4.10 White Oak-Water Oak/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

232Ef.13.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

232Ef.13.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

231Eg.11 Redlands Landtype Association

231Eg.11.1 Sandy/Loamy Uplands Landtype

231Eg.11.1.10 Shortleaf Pine-(Longleaf Pine)-Bluejack Oak/*Tragia* Sandy Grossarenic Dry Uplands Landtype Phase

231Eg.11.1.20 Shortleaf Pine-(Longleaf Pine)-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

231Eg.11.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

231Eg.11.2 Clayey Uplands Landtype

231Eg.11.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

231Eg.11.3 Mesic Slopes and Terraces Landtype

231Eg.11.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

231Eg.11.3.20 American Beech-White Oak/*Mitchella* Loamy Moist-Mesic Steep Slopes and Ravines Landtype Phase

231Eg.11.4 Minor Stream Bottoms Landtype

231Eg.11.4.10 White Oak-Water Oak/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

231Eg.11.4.20 Water Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

231Eg.11.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Seeps Landtype Phase

231Eg.12 Sparta SandHills Landtype Association

231Eg.12.1 Sandy/Loamy Uplands Landtype

231Eg.12.1.10 Shortleaf Pine-Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase

231Eg.12.1.20 Shortleaf Pine-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

231Eg.12.1.30 Shortleaf Pine-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

231Eg.12.2 Clayey Uplands Landtype

231Eg.12.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

231Eg.12.3 Mesic Slopes and Terraces Landtype

231Eg.12.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

231Eg.12.4 Minor Stream Bottoms Landtype

231Eg.12.4.10 White Oak-Water Oak/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

231Eg.12.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

231Eg.12.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Forested Seeps Landtype Phase

231Eh.16 Raven Hills Landtype Association

231Eh.16.1 Sandy/Loamy Uplands Landtype

231Eh.16.1.20 Shortleaf Pine-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase

231Eh.16.1.30 Loblolly Pine-Post Oak/*Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

231Eh.16.2 Clayey Uplands Landtype

231Eh.16.2.40 *Dalea* Clayey Dry Blackland Prairies Landtype Phase

231Eh.16.3 Mesic Slopes and Terraces Landtype

231Eh.16.3.10 Loblolly Pine-Southern Red Oak/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

231Eh.16.4 Minor Stream Bottoms Landtype

231Eh.16.4.10 Water Oak-Loblolly Pine/*Bignonia-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase

231Eh.16.4.20 Cedar Elm-Hackberry/*Justicia* Loamy Wet-Mesic Stream Bottoms

231Eh.17 Big Thicket Landtype Association

231Eh.17.1 Sandy/Loamy Uplands Landtype

231Eh.17.1.30 Loblolly Pine-Pine-White Oak/*Callicarpa-Chasmanthium* Sandy/Loamy Dry-Mesic Uplands Landtype Phase

231Eh.17.3 Mesic Slopes and Terraces Landtype

231Eh.17.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

231Eh.17.4 Minor Stream Bottoms Landtype

- 231Eh.17.4.10 Water Oak-Loblolly Pine/*Bignonia-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase
- 231Eh.17.4.20 Cedar Elm-Hackberry/*Justicia* Loamy Wet-Mesic Stream Bottoms Landtype Phase
- 231Eh.17.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

231Eh.18 San Jacinto Flatwoods Landtype Association

231Eh.18.1 Sandy/Loamy Uplands Landtype

- 231Eh.18.1.50 Willow Oak-Loblolly Pine/*Justicia* Loamy Seasonally Wet Flatwoods Landtype Phase

231Eh.18.3 Mesic Slopes and Terraces Landtype

- 231Eh.18.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes, Mounds, and Terraces Landtype Phase

231Eh.18.4 Minor Stream Bottoms Landtype

- 231Eh.18.4.10 Water Oak-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

232Fa.1 High Terrace Rolling Uplands Landtype Association

232Fa.1.1 Sandy/Loamy Uplands Landtype

- 232Fa.1.1.20 Longleaf Pine/*Tragia* Arenic Dry Uplands Landtype Phase
- 232Fa.1.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Slopes and Uplands Landtype Phase
- 232Fa.1.1.40 *Drosera* Sandy Wet Herbaceous Seeps Landtype Phase
- 232Fa.1.1.50 Longleaf Pine/*Schizachyrium-Drosera* Fine-Sandy Wet Flatwoods Landtype Phase

232Fa.1.2 Clayey Uplands Landtype

- 232Fa.1.2.10 Blackjack Oak-Longleaf Pine/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase
- 232Fa.1.2.20 Willow Oak/*Justicia* Clayey Wet Upland Depressions Landtype Phase

232Fa.1.3 Mesic Slopes and Terraces Landtype

- 232Fa.1.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy/Sandy Mesic Lower Slopes and Terraces Landtype Phase

232Fa.1.4 Minor Stream Bottoms Landtype

- 232Fa.1.4.10 White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms Landtype Phase
- 232Fa.1.4.20 American Beech-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

232Fa.1.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps
Landtype Phase

232Fa.2 Kisatchie Sandstone Hills Landtype Association

232Fa.2.1 Sandy/Loamy Uplands Landtype

232Fa.2.1.20 Longleaf Pine/*Tragia* Arenic Dry Uplands Landtype Phase

232Fa.2.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype
Phase

232Fa.2.1.40 *Drosera* Sandy Wet Herbaceous Seeps Landtype Phase

232Fa.2.2 Clayey Uplands Landtype

232Fa.2.2.10 Longleaf Pine/*Schizachyrium* Clayey Dry-Mesic Uplands Landtype
Phase

232Fa.2.2.30 Longleaf Pine/*Bigelowia* Clayey Dry Sandstone Glades Landtype
Phase

232Fa.2.2.40 *Schizachyrium-Dalea* Clayey Dry-Mesic Calcareous Prairies
Landtype Phase

232Fa.2.3 Mesic Slopes and Terraces Landtype

232Fa.2.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy/Sandy Mesic Slopes
Landtype Phase

232Fa.2.3.20 American Beech-White Oak/*Arisaema* Loamy Moist-Mesic Steep
Slopes and Ravines Landtype Phase

232Fa.2.4 Minor Stream Bottoms Landtype

232Fa.2.4.10 White Oak-Loblolly Pine/*Mitchella-Arisaema* Loamy Mesic Stream
Bottoms Landtype Phase

232Fa.2.4.20 American Beech-Southern Magnolia/*Bignonia* Loamy Wet-Mesic
Stream Bottoms Landtype Phase

232Fa.2.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps
Landtype Phase

232Fa.3 Undulating Clayey Uplands Landtype Association

232Fa.3.1 Sandy/Loamy Uplands Landtype

232Fa.3.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype
Phase

232Fa.3.2 Clayey Uplands Landtype

232Fa.3.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands
Landtype Phase

232Fa.3.2.40 *Schizachyrium-Callirhoe* Clayey Dry-Mesic Calcareous Prairies
Landtype Phase

232Fa.3.3 Mesic Slopes and Terraces Landtype

232Fa.3.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and
Terraces Landtype Phase

232Fa.3.3.30 Water Oak-Loblolly Pine/*Arisaema* Clayey Mesic Calcareous Lower Slopes Landtype Phase

232Fa.3.4 Minor Stream Bottoms Landtype

232Fa.3.4.10 White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

232Fa.3.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

232Fa.5 Winn Rolling Uplands Landtype Association

232Fa.5.1 Sandy/Loamy Uplands Landtype

232Fa.5.1.20 Longleaf Pine/*Tragia* Arenic Dry Uplands Landtype Phase

232Fa.5.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase

232Fa.5.2 Clayey Uplands Landtype

232Fa.5.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

232Fa.5.3 Mesic Slopes and Terraces Landtype

232Fa.5.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy/Sandy Mesic Lower Slopes and Terraces Landtype Phase

232Fa.5.4 Minor Stream Bottoms Landtype

232Fa.5.4.10 White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Creek Bottoms Landtype Phase

232Fa.5.4.20 White Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

232Fa.6 Fort Polk Rolling Uplands Landtype Association

232Fa.6.1 Sandy/Loamy Uplands Landtype

232Fa.6.1.10 Longleaf Pine/Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase

232Fa.6.1.20 Longleaf Pine/*Tragia* Arenic Dry Uplands Landtype Phase

232Fa.6.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase

232Fa.6.1.40 *Drosera* Sandy Wet Herbaceous Seeps Landtype Phase

232Fa.6.3 Mesic Slopes and Terraces Landtype

232Fa.6.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy/Sandy Mesic Lower Slopes and Terraces Landtype Phase

232Fa.6.4 Minor Stream Bottoms Landtype

232Fa.6.4.10 White Oak-Loblolly Pine/*Mitchella* Loamy Mesic Stream Bottoms Landtype Phase

- 232Fa.6.4.20 American Beech-Southern Magnolia/*Bignonia* Wet-Mesic Stream Bottoms Landtype Phase
- 232Fa.6.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

232Fa.15 Mayflower Uplands Landtype Association

232Fa.15.1 Sandy/Loamy Uplands Landtype

- 232Fa.15.1.10 Longleaf Pine-Bluejack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase
- 232Fa.15.1.20 Longleaf Pine-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase
- 232Fa.15.1.30 Longleaf Pine/*Schizachyrium* Loamy Dry-Mesic Uplands Landtype Phase
- 232Fa.15.1.40 *Drosera* Sandy/Loamy Wet Herbaceous Seeps Landtype Phase

232Fa.15.2 Clayey Uplands Landtype

- 232Fa.15.2.10 Longleaf Pine/*Schizachyrium* Clayey Dry-Mesic Uplands Landtype Phase
- 232Fa.15.2.30 *Schizachyrium-Bigelowia* Clayey Dry-Mesic Catahoula Barrens Landtype Phase

232Fa.15.3 Mesic Slopes and Terraces Landtype

- 232Fa.15.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

232Fa.15.4 Minor Stream Bottoms Landtype

- 232Fa.15.4.10 White Oak-Water Oak/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase
- 232Fa.15.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase
- 232Fa.15.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Stream Bottoms Landtype Phase

232Fe.13 Clayey Uplands Landtype Association

232Fe.13.1 Sandy/Loamy Uplands Landtype

- 232Fe.13.1.10 Shortleaf Pine (Longleaf Pine)-Blackjack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase
- 232Fe.13.1.20 Shortleaf Pine (Longleaf Pine)--Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase
- 232Fe.13.1.30 Shortleaf Pine-(Longleaf Pine)-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

232Fe.13.2 Clayey Uplands Landtype

- 232Fe.13.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Uplands Landtype Phase
- 232Fe.13.2.20 Willow Oak/*Justicia* Clayey Wet Upland Depressions Landtype Phase

232Fe.13.3 Mesic Slopes and Terraces Landtype

- 232Fe.13.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase
- 232Fe.13.3.20 American Beech-White Oak/*Mitchella* Loamy Moist-Mesic Steep Slopes and Ravines Landtype Phase

232Fe.13.4 Minor Stream Bottoms Landtype

- 232Fe.13.4.10 White Oak-Water Oak/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms Landtype Phase
- 232Fe.13.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase
- 232Fe.13.4.30 Sweetbay-Swamp Tupelo/*Osmunda* Loamy Wet Forested Seeps Landtype Phase

232Fe.14 Sandy Uplands Landtype Association

232Fe.14.1 Sandy/Loamy Uplands Landtype

- 232Fe.14.1.10 Longleaf Pine-Blackjack Oak/*Tragia* Grossarenic Dry Uplands Landtype Phase
- 232Fe.14.1.20 Longleaf Pine-(Shortleaf Pine)-Blackjack Oak/*Schizachyrium* Arenic Dry Uplands Landtype Phase
- 232Fe.14.1.30 Shortleaf Pine-(Longleaf Pine)-Post Oak/*Callicarpa-Chasmanthium* Loamy Dry-Mesic Uplands Landtype Phase

232Fe.14.2 Clayey Uplands Landtype

- 232Fe.14.2.10 Shortleaf Pine-Post Oak/*Chasmanthium* Clayey Dry-Mesic Uplands Landtype Phase

232Fe.14.3 Mesic Slopes and Terraces Landtype

- 232Fe.14.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces Landtype Phase

232Fe.14.4 Minor Stream Bottoms Landtype

- 232Fe.14.4.10 White Oak-Water Oak/*Mitchella-Arisaema* Loamy Mesic Stream Bottoms
- 232Fe.14.4.20 Willow Oak-Laurel Oak/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

234Ai.7 Red River Alluvial Plain Landtype Association

234Ai.7.1 Active Outer Floodplain Landtype

- 234Ai.7.1.10 Eastern cottonwood-American sycamore /*Cornus foemina* Sandy-Loamy Seasonally Flooded Active Floodplains Landtype Phase

234Ai.7.2 Mesic Natural Levees and gentle levee slopes Landtype

- 234Ai.7.2.10 Pecan-Sugarberry /*Parthenocissus* Loamy Mesic Natural Levees and gentle levee slopes Landtype Phase

- 234Ai.7.3 Broad Alluvial Flats Landtype
 - 234Ai.7.3.10 Green ash/ *Ilex decidua* Clayey-Loamy Irregularly-Seasonally Flooded Alluvial Flats Landtype Phase
 - 234Ai.7.3.20 Green ash-Baldcypress/ *Phanopyrum gymnocarpon* Clayey Seasonally Flooded Low Alluvial Flats & Depressions Landtype Phase
- 234Ai.7.4 Floodplain Swamps Landtype
 - 234Ai.7.4.10 Water tupelo-Baldcypress /*Justicia* Clayey Regularly Flooded Swamps Landtype Phase
 - 234Ai.7.4.20 Baldcypress-Water tupelo /*Ceratophyllum* Clayey Semi-Permanently Flooded Swamps Landtype Phase
- 23xxx.4 Alluvial Floodplains and Terraces Landtype Association**
 - 23xxx.4.1 Terraces and Bottomland Ridges Landtype
 - 23xxx.4.1.10 Bluejack Oak/*Tragia* Sandy Dry River Terraces Landtype Phase
 - 23xxx.4.1.20 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Terraces Landtype Phase
 - 23xxx.4.1.30 White Oak-Loblolly Pine/*Callicarpa* Loamy Infrequently Flooded Levees and Bottomland Ridges Landtype Phase
 - 23xxx.4.2 River Floodplains Landtype
 - 23xxx.4.2.10 Willow Oak-Laurel Oak/*Bignonia* Loamy/Clayey Seasonally Flooded River Floodplains Landtype Phase
 - 23xxx.4.2.20 Overcup Oak/*Justicia* Clayey/Loamy Seasonally to nearly Regularly Flooded Low River Floodplains Landtype Phase
 - 232Fa.4.2.30 *Panicum-Distichlis* Irregularly/ Seasonally Flooded Saline Flats Landtype Phase
 - 23xxx.4.3 Floodplain Swamps Landtype
 - 23xxx.4.3.10 Water Elm/*Justicia* Clayey Regularly Flooded Swamps Landtype Phase
 - 23xxx.4.3.20 Baldcypress/*Ceratophyllum* Clayey Semi-Permanently Flooded Swamps Landtype Phase

APPENDIX F

SOIL LIST AND CLASSIFICATION

SOILS COMMONLY ENCOUNTERED ON KISATCHIE NATIONAL FOREST

Soil Series	Soil Taxonomic Family
Anacoco	Fine, montmorillonitic, thermic Vertic Albaqualfs
Angie	Clayey, mixed, thermic, Aquic Paleudults
Armistead	Fine-silty, mixed, thermic, Aquic Argiudolls
Bellwood	Very fine, montmorillonitic thermic Aquentic Chromuderts
Beauregard	Fine-silty, siliceous, thermic Plinthaquic Paleudults
Betis	Sandy, siliceous, thermic Psammentic Paleudults
Bienville	Sandy, siliceous, thermic Psammentic Paleudalfts
Bowie	Fine-loamy, siliceous, thermic Plinthic Paleudults
Boykin	Loamy, siliceous, thermic Arenic Paleudults
Briley	Loamy, siliceous, thermic Arenic Paleudults
Brimstone	Fine-silty siliceous, thermic Glossic Natraqualfs
Caddo	Fine-silty, siliceous, thermic Typic Glossaqualfs
Cahaba	Fine-loamy, siliceous, thermic Typic Hapludults
Caspiana	Fine-silty, mixed, thermic Typic Argiudolls
Darbonne	Fine-loamy, siliceous, thermic Typic Paleudalfts
Darden	Thermic, coated, Typic Quartzipsamments
Darley	Clayey, kaolinitic, thermic Typic hapludults
Dela	Coarse-loamy, siliceous, nonacid, thermic Typic Udifluvents
Eastwood	Fine, montmorillonitic, thermic Vertic Hapludalfts
Flo	Sandy, siliceous, thermic Psammentic Paleudalfts
Frizzell	Coarse silty, siliceous, thermic Glossaquic Hapludalfts
Gallion	Fine-silty, mixed, thermic Typic Hapludalfts
Glenmora	Fine-loamy, siliceous, thermic Glossaquic Paleudalfts
Gore	Fine, Mixed thermic, Vertic Paleudalfts
Guyton	Fine-silty, Siliceous, Thermic Typic Glossaqualfs
Harleston	Coarse-loamy, siliceous, thermic Aquic Paleudults
Iuka	Coarse-loamy, siliceous, acid, thermic Aquic Udifluvents
Keiffer	Fine-silty, carbonatic, thermic Rendollic Eutrochrepts
Kisatchie	Fine, montmorillonitic, thermic Typic Hapludalfts
Latanier	Clayey over loamy, mixed, thermic Vertic Hapludolls
Mahan	Clayey, kaolinitic, thermic Typic hapludults
Malbis	Fine-loamy, siliceous, thermic Plinthic Paleudults
McLaurin	Coarse-loamy, siliceous, thermic Typic Paleudults
Metcaff	Fine-silty, siliceous, thermic Aquic Glossudalfts
Moreland	Fine, mixed, thermic Vertic Hapludolls
Morse	fine, mixed thermic Entic Chromuderts
Naconiche	Sandy, siliceous, thermic Cumulic Humaquepts
Norwood	Fine-silty mixed (calcareous), thermic Typic Udifluvents
Ouachita	Fine-silty, siliceous, thermic Fluventic Dystrochrepts
Osier	Siliceous, thermic Typic Psammaquents
Perry	Very fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts
Roxana	Coarse-silty mixed, nonacid, thermic Typic Udifluvents
Ruple	Clayey, oxidic, thermic Typic Rhodudults
Ruston	Fine-loamy, siliceous, Thermic Typic Paleudults
Sacul	Clayey, mixed, thermic, Aquic Hapludults
Savannah	Fine-loamy, siliceous thermic, Typic Fragiudults

Severn	Coarse-silty mixed (calcareous), thermic Typic Udifluvents
Smithdale	Fine-loamy, siliceous, thermic Typic Paleudults
Sumpter	Fine-silty, carbonatic, thermic Rendollic Eutrochrepts
Vaiden	Very fine, montmorillonitic, thermic Vertic Hapludalfs
Wolfpen	Loamy, siliceous, thermic Arenic Paleudalfs
Yorktown	Very fine, montmorillonitic, nonacid, thermic Typic Fluvaquents

SOILS COMMONLY ENCOUNTERED ON THE NATIONAL FORESTS IN TEXAS

Soil Series	Soil Taxonomic Family
Alazan	Fine-loamy, siliceous, thermic Aquic Glossudalfs
Annona	Fine, montmorillonitic, thermic Vertic Paleudalfs
Attoyac	Fine-loamy, siliceous, thermic Typic Paleudalfs
Bernaldo	Fine-loamy, siliceous, thermic Glocic Paleudalfs
Besner	Coarse-loamy, siliceous, thermic Glossic Paleudalfs
Betis	Sandy, siliceous, thermic Psammentic Paleudults
Boykin	Loamy, siliceous, thermic Arenic Paleudults
Browndell	Clayey, montmorillonitic, thermic, shallow Albaquic Hapludalfs
Corrigan	Fine, montmorillonitic, thermic Typic Albaqualfs
Cuthbert	Clayey, mixed, thermic Typic Hapludults
Dallardsville	Coarse-loamy, siliceous, thermic Aquic Paleudults
Darco	Loamy, siliceous, thermic Grossarenic Paleudults
Depcor	Loamy, siliceous, thermic Arenic Paleudalfs
Diboll	Fine-silty, siliceous, thermic Albic Glossic Natraqualfs
Doucette	Loamy, siliceous, thermic Arenic Plinthic Paleudults
Eastwood	Fine, montmorillonitic, thermic Vertic Hapludalfs
Etoile	Fine, montmorillonitic, thermic Vertic Hapludalfs
Ferris	Fine, montmorillonitic, thermic Udorthentic Chromusterts
Fuller	Fine-loamy, siliceous, thermic Albic Glossic Natraqualfs
Gladewater	Fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts
Gowker	Fine-loamy, mixed, thermic Cumulic Hapludolls
Gunter	Loamy, siliceous, thermic Grossarenic Plinthic Paleudults
Guyton	Fine-silty, siliceous, thermic Typic Glossaqualfs
Hannahatchee	Fine-loamy, mixed, thermic Dystric Fluventic Eutrochrepts
Hatliff	Coarse-loamy, mixed, nonacid, thermic Aquic Udifluvents
Herty	Fine, montmorillonitic, thermic Vertic Albaqualfs
Houston Black	Fine, montmorillonitic, thermic Udic Pellusterts
Huntsburg	Fine, mixed, thermic Plinthaquic Paleudalfs
luka	Coarse-loamy, siliceous, acid, thermic Aquic Udifluvents
lulus	Coarse-loamy, siliceous, thermic Fluventic Dystrochrepts
Kanebreak	Fine-loamy, mixed, thermic Cumulic Haplaquolls
Kaufmann	Very-fine, montmorillonitic, thermic Typic Pelluderts
Keithville	Fine-silty, siliceous, thermic Glossic Paleudalfs
Keltys	Coarse-loamy, siliceous, thermic Aquic Glossudalfs
Kian	Coarse-loamy, siliceous, nonacid, thermic Aeris Fluvaquents
Kirbyville	Fine-loamy, siliceous, thermic Plinthaquic Paleudults
Kirvin	Clayey, mixed, thermic Typic Hapludults
Kisatchie	Fine, montmorillonitic, thermic Typic Hapludalfs
Koury	Coarse-silty, siliceous, thermic Fluvaquentic Dystrochrepts
Kurth	Fine-loamy, siliceous, thermic Aquic Glossudalfs
Lacerda	Very-fine, montmorillonitic, thermic Aquentic Chromuderts
Landman	Loamy, siliceous, thermic Grossarenic Paleudalfs
Laneville	Fine-silty, siliceous, thermic Fluvaquentic Eutrochrepts
Latex	Fine-loamy, siliceous, thermic Glossic Paleudalfs
Letney	Loamy, siliceous, thermic Arenic Paleudults
Lilbert	Loamy, siliceous, thermic Arenic Plinthic Paleudults
Lovelady	Loamy, mixed, thermic Arenic Glossudalfs
Mantachie	Fine-loamy, siliceous, acid, thermic Aeris Fluvaquents
Marietta	Fine-loamy, siliceous, thermic Fluvaquentic Eutrochrepts
Moswell	Very-fine, montmorillonitic, thermic Vertic Hapludalfs
Nacogdoches	Fine, kaolinitic, thermic Rhodic Paleudalfs
Naconiche	Sandy, siliceous, thermic Cumulic Humaquepts

Nahatche	Fine-loamy, siliceous, thermic Aeric Fluvaquents
Nikful	Fine, montmorillonitic, thermic Aquultic Hapludalfs
Osier	Siliceous, thermic Typic Psammaquents
Ozias	Fine, montmorillonitic, acid, thermic Aeric Fluvaquents
Pinetucky	Fine-loamy, siliceous, thermic Plinthic Paleudults
Pluck	Fine-loamy, siliceous, nonacid, thermic Typic Fluvaquents
Pophers	Fine-silty, siliceous, acid, thermic Aeric Fluvaquents
Rayburn	Fine, montmorillonitic, thermic Vertic Hapludalfs
Rentzel	Loamy, siliceous, thermic Arenic Plinthaquic Paleudults
Rosenwall	Clayey, mixed, thermic Aquic Hapludults
Sacul	Clayey, mixed, thermic Aquic Hapludults
Sawlit	Fine-loamy, siliceous, thermic Aquic Glossudalfs
Sawtown	Fine-silty, siliceous, thermic Glossic Paleudalfs
Stringtown	Fine-loamy, siliceous, thermic Typic Hapludults
Tehran	Loamy, siliceous, thermic Grossarenic Paleudults
Tenaha	Loamy, siliceous, thermic Arenic Hapludults
Tonkawa	Thermic, coated Typic Quartzipsamments
Trawick	Fine, kaolinitic, thermic Mollic Hapludalfs

APPENDIX G

GLOSSARY

Abiotic Non-living (environmental) components or processes of an ecosystem.

Alluvium Unconsolidated material, including gravel, sand, silt or clay, transported and deposited by streams.

Anoxic Condition, particularly in saturated or flooded soils, in which molecular oxygen is absent.

Arenic A predominantly sandy surface soil between 50 cm and 100 cm thick.

Aspect The compass direction that a particular slope or landform faces.

Biotic Living components or processes of an ecosystem.

Bottomland Landscapes closely associated with stream or river floodplains or riparian areas, generally located on low river terraces, floodplains, swamps, and other low topographic positions.

Bulk density The mass of dry soil per unit volume, expressed as a ratio of the specific gravity of a volume of soil, including air space, to an equal volume of water.

Calcareous soil Soils containing sufficient amounts of calcium carbonate to give it alkaline properties and a high pH.

Clay Soil particles that are less than 0.002 mm in diameter.

Climax A plant community which has reach a stage in vegetation development (succession) where there is no longer significant change in species composition over time. When mortality occurs, recruitment is from the same pool of species currently dominating the sites. May occur in old-growth stands. See old-growth forest.

Diversity A scale-dependent measure of both the species-richness and species-heterogeneity of a community.

Drainage mottles See Mottling.

Ecological species group An assemblage of plant species whose collective presence or absence on a site is used to identify the ecological type to which that site belongs.

Ecological type A defined category of land with a unique combination of natural vegetation, soil properties, landform characteristics, and management responses.

Ecological unit A mapped portion of the landscape composed of one or more ecological types.

Ecosystem A complex of living organisms, considered together with their environment, that is isolated mentally for the purpose of study. Includes living and nonliving components of the environment.

Evapotranspiration Combined loss of water from an area by evaporation from the soil surface and by transpiration from plants.

Floodplain Nearly level land located adjacent to a stream or river, composed of sediments deposited during periods of high water flow and subject to periodic flooding.

Fluvium Sedimentary materials transported and deposited by a river or stream.

Foot slope An inclined slope of gentle gradient at the base of a hill, usually transitional from a steeper side slope to a stream bottom or floodplain.

Forb An herbaceous plant which is not a grass, sedge, or rush.

Forest A dense stand of trees with a closed canopy. Little sunlight penetrates to the ground layer which is usually dominated by shade-tolerant herbs and woody plants.

Gap-phase succession Colonization of small openings in a forest created by the death of one or more overstory trees by shade-tolerant tree species.

Geotropic Tree growth that is oriented with respect to the force of gravity.

Gilgai Small depressions and mounds caused by expansion and contraction of soils with a substantial clay component that shrinks and swells with changes in moisture content.

Glei Characteristic gray color or mottling of soils due to reduction of iron in saturated conditions.

Gradient A gradual, measurable change in an environmental factor or community composition.

Graminoid A grass-like herbaceous plant belonging to the grass, sedge, or rush family

Grossarenic A predominantly sandy surface soil greater than 100 cm thick.

Ground layer The aggregation of herbaceous and small woody plant species that dominate the ground cover of a particular site.

Head slope A slope located at the beginning of a drainage or valley.

Herb An annual, biennial, or perennial non-woody plant.

Historical vegetation Vegetation historically present in the region prior to widespread European settlement and alteration. Vegetation occurring during the time period extending from earliest published descriptions into the early twentieth century when vestiges of natural communities still persisted, including significant acreage of virgin longleaf pine forests. See Presettlement vegetation.

Hydroperiod The seasonal pattern of saturation and drying or flooding and exposure of the soil in a wetland. A wetland's "hydrologic signature".

Hydrophytic vegetation Plants adapted to surviving in wetlands where soils are saturated or flooded for a significant part of the growing season. They may grow wholly or partly submerged in water.

Loam A soil textural class that has moderate amounts of sand, silt, and clay particles. An ideal medium for growth of vegetation due to nutrient content, moisture holding capacity, and soil aeration.

Mesic A habitat that has an ample supply of soil moisture and nutrients and in which extreme variations in the availability of moisture and nutrients does not occur. Mesic environments seldom flood and the effects of drought are mild.

Mesophytic vegetation Plants requiring abundant soil water and relatively humid atmosphere.

Microsite A small, atypical inclusion within a larger site, usually a result of minor variations in elevation, slope, drainage, or other environmental factors.

Microtopography Minor variations in elevation, slope gradient, or slope aspect within an otherwise topographically homogeneous site.

Mottling Relatively insoluble spots or blotches of different color or shades of color interspersed with the dominant color of the soil matrix, formed by the alternate wetting and drying of periodically flooded soils.

Old-growth forest A forest at equilibrium with its environment and disturbance regime, usually dominated by a self-perpetuating community of late-successional species and related structural attributes. The species composition and structural attributes of old growth forests varies by forest type, climate, site conditions, and disturbance regime. See "Climax"

Parent material Unconsolidated, more or less chemically weathered mineral or organic matter from which soils are developed by soil-forming processes (equivalent to the soil C horizon).

Physiography The description or study of landform characteristics and origins.

Potential natural vegetation The predicted late-successional plant community that will occupy a site if human-related disturbance is removed.

Presettlement vegetation The actual or estimated composition and distribution of species or community types before European settlement. See historical vegetation.

Pyrogenic Having a high potential for flammability.

Ravine A narrow, steep-sided valley typically created by erosion of a resistant substrate by running water.

Ridgetop The narrow summit of a raised, elongated hill or interstream divide.

Riparian A terrestrial ecosystem located adjacent to and influenced by a stream or river. It is often characterized by wetland vegetation, soils, and hydrology.

Sand Soil particles that are between 0.05 and 2 mm in diameter.

Savanna An herb-dominated community (grassland) with widely scattered trees. In the West Gulf Coastal Plain, it is often used in the context of longleaf pine wetlands (wet pine savannas) or flatwoods.

Shoulder slope A convex slope of gentle gradient near the summit of a hill, usually transitional from a steeper side slope to a ridgetop or upland.

Side Slope A slope that is situated between a ridge or upland flat and a stream bottom or lowland flat.

Silt Soil particles that are between 0.002 and 0.05 mm in diameter.

Slope gradient A measure of the deviation of a surface angle from horizontal, expressed as a percentage or in degrees.

Slope position The relative position of a site with respect to the nearest downslope stream bottom or wetland and the nearest upslope ridgetop or upland flat. May be expressed as a percentage.

Soil horizon A layer of soil approximately parallel to the soil surface, distinguishable from adjacent layers by certain physical, chemical, or biological characteristics.

Soil series A group of soils that are similar in the composition, thickness, or arrangement of all major profile characteristics. These are the basic classification units used in soil surveys.

Solum The weathered active portion of the soil profile, usually including the A, E, and B horizons.

Subsoil The deeper horizons of the soil profile, usually consisting of a B horizon, which is a zone of accumulation and/or alteration of materials leached from upper horizons, and a C horizon, which is parent material little affected by soil forming processes.

Surface soil Soil layers above the B horizon, usually consisting of the A horizon, which is a dark color and contains a large amount of organic matter, and the E horizon, which is lighter in color and from which organic matter and smaller soil particles are leached..

Terrace A level plain usually located adjacent to and above the active floodplain or channel of a stream or river.

Upland Landscapes generally located on slopes, tops of ridges and broad flats of high topographic position, and usually not closely associated with major stream floodplains or riparian areas.

Water table The depth below the soil surface at which the upper surface of groundwater or saturated soil is encountered.

Watershed A region or area drained by a particular body of water.

Woodland An open-canopied, low-density stand of trees such that significant sunlight penetrates to the ground layer which is dominated by grasses and other herbaceous plants. Similar to savannas but with a higher tree density. In the West Gulf Coastal Plain, it usually refers to well drained longleaf pine uplands rather than wet flatwoods.

Xeric Extremely dry conditions, particularly relating to soil moisture. This definition differs from the Soil Taxonomy definition, which refers to summer dry/winter wet (Mediterranean) conditions.

Xerophytic vegetation Plants adapted to arid habitats.

APPENDIX H

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