THE RARE AND SENSITIVE NATURAL WETLAND PLANT COMMUNITIES OF INTERIOR LOUISIANA

Louisiana Natural Heritage Program
Louisiana Department of Wildlife & Fisheries

Latimore Smith
Baton Rouge, Louisiana
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Introduction

This document reports on the rare and sensitive natural wetland plant communities of Louisiana lying north of the legislated coastal zone. In general, the communities described here are indigenous to areas north of U.S. Interstate Highways 10 and 12, although examples of some are found south of those roadways in southeastern and southwestern Louisiana.

The natural plant communities here described are a subset of all communities delineated state-wide by the Louisiana Natural Heritage Program (LNHP), Louisiana Department of Wildlife and Fisheries. Communities in this group are considered rare and sensitive, and represent interior wetland types of Louisiana that are naturally very restricted in their distribution (e.g., wet saline prairie), or formerly-extensive wetland habitats that have undergone severe reductions in land occupance in this century (e.g., longleaf pine flatwood savannah). In most cases, these communities are floristically rich and, as a group, support numerous state-rare plant species currently monitored by LNHP.

Natural wetlands are defined as those indigenous settings on hydric soils that are dominated by native hydrophytic vegetation, and that exhibit clear evidence of wetland hydrology (e.g., frequent flooding and/or extended periods of surface soil saturation in the growing season).

For each wetland community described, the following information is provided: community name, rarity rank, synonyms (if applicable), general description, physiographic setting (geology, soils, topography), characteristic vegetation, range by parish, and threats to the community. Rarity ranking (state ranks, global ranks) as used here is a standardized system devised by The Nature Conservancy for rating the relative scarcity or commonness of species and plant communities. It is employed by all Natural Heritage Programs nation-wide. For plant communities, these ranks are defined as follows: S1 = high quality examples extremely rare in the state ("critically imperiled" in the state), S2 = very rare in state ("imperiled"), S3 = rare in state; G1 = high quality examples extremely rare throughout its global range ("critically imperiled" globally), G2 = very rare globally ("imperiled"), G3 = rare globally. A rank followed by "Q" indicates there is a question about the distinctiveness of the community; a rank followed by "?" indicates there is uncertainty about the rank or the rank is unassigned.

The geologic units identified for each wetland community are derived from Snead and

McCulloh (1984). Plant identification follows principally Godfrey and Wooten (1979, 1981), but also Correl and Johnston (1970); plant nomenclature follows Kartesz (1994).

This report does not present in detail certain interior wetland communities that have been tentatively identified by LNHP (or identified by others as indicated), and that may be unique, rare or sensitive naturally-occurring wetland habitats in Louisiana. This group includes:

Interior salt flat - extensive flat, barren-like areas associated with salty spots near streams in central Louisiana.

Interior saline soil marsh - small, often-flooded shallow depressions, typically dominated by sedges; within wet saline prairies in central Louisiana.

Pond cypress swamp/savannah - wetlands with pond cypress (*Taxodium ascendens*) as the only tree species, either densely-stocked or scattered; in far eastern Florida Parishes.

Fleming calcareous seep - small-scale seepages on calcareous strata in central Louisiana.

Calcareous oak-hickory high bottomland forest - pure hardwood forest dominated by a unique assemblage of oaks and hickories, on calcareous clays in broad "high floodplains" of intermediate streams in northeast Louisiana.

Upland depressional swamp - small-scale, often circular depressional wetlands dominated by wet-site hardwoods (laurel oak, *Quercus laurifolia*, often dominant); on Pleistocene terraces in southwest Louisiana.

Wet hardwood flatwoods (includes “flatwood depression forest”, McInnis and Martin 1995) - small-scale, bottomland-like wetland forests in a non-riverine setting, dominated by species more typical of large bottomlands (e.g., overcup oak, *Q. lyrata*; american elm, *Ulmus americana*); currently known from flatwoods of northwest Louisiana and southwestern Florida Parishes.

It should be pointed out that very high quality examples of wetland communities not generally considered rare/sensitive as a type, can be as rare/sensitive as any of the types reported on herein. As an example, true old-growth forested wetlands of any type are exceedingly scarce and justifiably deserve the designation of rare and sensitive. Similarly, very large (> 5000 acres), contiguous blocks of mature, relatively natural wetland forest are extremely rare in the state.

A number of interior wetland communities historically reported to be present in the state appear to have been extirpated. This group includes:

"Canebrakes" - areas of pure switch cane (*Arundinaria gigantea*) on natural levees of intermediate to large streams state-wide. Pure canebrakes may have also existed in places in the flatwoods of southeast Louisiana. Natural levee canebrakes could well have been created by aboriginal inhabitants.

"Mississippi Terrace prairies" - areas of native grassland, mainly on the Macon Ridge in northeast Louisiana. Some of these could have been wetland types, particularly those that may have arisen on saline soils.

"Spicewood ponds" - reported by land surveyors of the mid-1800's to be common on parts of the Macon Ridge in northeast Louisiana. These were quite possibly a primary locale for pondberry (*Lindera melissifolia*), a very rare shrub, historically known from the state.

"Lowland red cedar groves" - groves of red cedar were reported to be common in the early 1800's in the Red River floodplain of northwest Louisiana (Flores 1984 [Freeman and Custis 1806]).

Obviously, should any of these types be "re-discovered", they would certainly be considered rare and sensitive.

As stated, this report addresses the rare/sensitive natural wetland plant communities currently recognized by LNHP. There are quite possibly rare community types (or even not-so-rare) in the state that have not yet been recognized and described. [Although much progress has been made in the recognition of indigenous plant communities by LNHP, natural community classification remains a problematic undertaking. Consensus guidelines and methodologies for the conceptualization and classification of communities are still in the formative stages, and thus, the current classification scheme for communities is unstable.] Examples of natural plant communities that were not recognized in Louisiana before 1990 include saline prairies and western longleaf pine flatwood savannah - saline variant, both "discovered" and documented by LNHP in recent years. Much of the progress in community classification represents an on-going accumulation and synthesis of information on native plant distribution and its relationships to surface geologies, soil types/conditions and their distributions, hydrologic patterns and regimes, and natural and anthropogenic disturbances. Natural community classification is a dynamic process and additional types will undoubtedly be delineated for Louisiana as time goes on.

Flatwoods Pond

Rarity rank: S1G2Q

General Description:

Flatwoods ponds are relatively small, natural depressional wetlands embedded within current or historic longleaf pine flatwoods/savannahs of western Louisiana. They are believed to occupy swales and depressions remaining from ancient Pleistocene stream channels, and are often linear in shape, although circular and elliptic ponds are common. Flatwoods ponds range from much less than one acre, up to about 30 or 40 acres in size, averaging perhaps 1 to 5 acres. In general, small ponds are relatively shallow, while larger ponds are deeper. They may range from just a few inches deep relative to surrounding pine flats, to 5 or so feet deep in deeper/larger ponds.

In the great majority of cases, flatwoods ponds are treeless, being vegetated by a variety of obligate and facultative wetland herbaceous species, mainly tall sedges and grasses. Deep ponds may rarely include areas of open water in their deepest parts. Trees, mainly swamp black gum (*Nyssa biflora*) often appearing stunted, may be present in deeper, more frequently flooded, and therefore less fire-exposed parts of ponds. Longleaf pine (*Pinus palustris*) is rarely present in ponds due to its intolerance to flooding in the seedling stage. Larger, deeper ponds often have the aspect of a pocket of fresh marsh surrounded by pine lands, and are typically dominated by maiden-cane (*Panicum hemitomon*).

The hydrologic regime of these ponds is characterized by a fluctuating water level, usually flooded in late fall/winter/early spring and often dry in summer. Due to water level fluctuation, there are distinct zones of species evident along the hydrologic/topographic gradient from the shallow pond edge toward the deeper center. Species appear to sort out according to their relative tolerance or competitive adaptations to flooding and saturated soil conditions.

This natural plant community was historically maintained by frequent lightning-generated fires that, every few years, swept the longleaf pine flats in which flatwoods ponds are embedded. Such fires would burn through the ponds during the late spring/summer dry season, the season estimated to have incurred the highest frequency of lightning fires. Among other effects, these fires killed back encroaching shrubs and trees and rejuvenated the herbaceous ground cover. Without fires today, these sites would eventually succeed into closed mixed forests.

Physiographic Setting:

Geology: Best developed on the Pleistocene prairie terraces of southwest Louisiana, but also present on the Pleistocene intermediate terraces and Pleistocene high terraces of southwest, west and central Louisiana. Possibly present within longleaf pine flatwoods on the Tertiary - Fleming formation.

Soils: Hydric, usually strongly acidic, typically nutrient-poor silt loams. Guyton is the typical soil series mapped for these ponds.

Topography: In circular, elliptic or linear depressions within western longleaf pine flatwoods/savannahs.

Vegetation:

Floristic composition is highly variable from one pond to another and within a pond, depending principally on pond depth. Shallow flatwoods ponds are quite similar to the adjacent longleaf pine flatwood savannahs in composition, being only marginally wetter than that community, but generally are not as rich in species as savannahs.

Native herbaceous species that usually characterize shallow ponds or edges of deeper ponds include (Bridges 1988, Bridges and Orzell 1989, LNHP 1986-1996, Sorrie 1996):

Andropogon glomeratus var. glaucopsis
Andropogon mohrii
Aristida palustris (= A. affinis)
Arnoglossum (Cacalia) ovatum
Centella erecta (formerly considered C. asiatica)
Coreopsis linifolia
Dichanthelium longiligulatum
Eleocharis microcarpa
Eleocharis tuberculosa
Eriocaulon decangulare
Euthamia leptocephala
Fuirena bushii
Gratiola brevifolia
Helenium drummondii
Hypericum brachyphyllum
Hypericum galioides
Hyptis alata
Juncus vallidus
Lobelia flaccidifolia
Lycopodiella (Lycopodium) appressa
Panicum virgatum
Platanthera nivea
Pluchea rosea
Polygala ramosa
Proserpinaca pectinata
Rhexia lutea

Rhynchospora elliottii
Rhynchospora gracilenta
Rhynchospora perplexa
Sabatia campanulata
Scleria georgiana
Stylisma aquatica
Rhynchospora filifolia
Rhynchospora (Dichromena) latifolia
Rhynchospora rariflora
Saccharum (Erianthus) giganteum
Scleria muhlenbergii
Xyris louisianica

Deep ponds are characterized by a variable mix of herbs, including:

Amsonia glaberrima
Carex glaucescens
Dichanthelium scabriusculum
Eleocharis quadrangulata
Gratiola brevifolia
Hydrolea ovata
Juncus polycephalus
Ludwigia pilosa
Lycopus rubellus
Panicum hemitomon
Proserpinaca palustris
Rhexia virginica
Rhynchospora corniculata
Sagittaria graminea
Spiranthes laciniata
Xyris fimbriata
Bacopa caroliniana
Carex verrucosa
Eleocharis equisetoides
Eriocaulon compressum
Hibiscus moscheutos ssp. lasiocarpus
Juncus effusus
Leersia hexandra
Ludwigia sphaerocarpa
Oxypolis filiformis
Panicum virgatum
Proserpinaca pectinata
Rhynchospora cephalantha
Rudbeckia nitida var. texana
Scleria baldwinii
Tripsacum dactyloides
Xyris laxifolia var. iridifolia

The largest, deepest ponds are often marsh-like and greatly dominated by *Panicum hemitomon*, with a variety of herbs typical of deep ponds intermixed (see above).

Woody plants that may be present include:

Nyssa biflora (in deepest part of ponds, often appearing stunted)
Acer rubrum
Cephalanthus occidentalis
Styrax americanus
Morella cerifera

Range by Parish:

Allen, Beauregard, Calcasieu, Evangeline?, Jefferson Davis, Rapides, Vernon.

Threats:

Major threats include the following:

* Lack of appropriate burning (frequency, season)

* Alterations to the surrounding landscape that increase or decrease surface water draining into ponds

* Contamination by chemical agents (e.g., fertilizer, herbicides) used in adjacent agroforests and agricultural fields.

* Physical damage incurred from timber harvest and planting practices (e.g., soil compaction, rutting, bedding)

Hillside Seepage Bog

Rarity rank: Eastern: S2G2; Western: S2G2G3

Synonyms: Pitcher plant bog, herbaceous bog, bog, hillside seep, hillside bog

General Description:

Hillside seepage bogs are open, mostly treeless, herb-dominated natural wetlands of hilly, sandy uplands of the east and west Gulf coastal plain in Louisiana. They arise on slopes, on saturated, strongly acidic and nutrient-poor substrates. They usually are continuously wet from seepage and water is often conspicuously seeping from various places on the hillside within the bog. Hillside seepage bogs are variable in size but are most often less than 1 acre, and may rarely exceed 10 acres. The herbaceous groundcover is dense, continuous and floristically rich. It is dominated by sedges, grasses and grass-like plants, and many kinds of unusual forbs, including pitcher-plants (*Sarracenia* spp.) and a variety of orchid species. Patches of shrubs are often present within bogs and are called "seepage slope shrub thickets."

Two major types of bogs are recognized in Louisiana, eastern hillside seepage bog (east of the Mississippi River in the east Gulf coastal plain) and western hillside seepage bog (west of the Mississippi River in the west Gulf coastal plain). The two are virtually identical in topographic/hydrologic setting and functional dynamics, but differ significantly in composition.

Because hillside bogs are embedded in what are now or historically were longleaf pine forests, they are fire-driven systems. They evolved with frequent growing-season fire events. Among other things, frequent fire deters invasion by shrubs and trees and stimulates growth, flowering and seed production by indigenous bog herbs.

Hillside bogs are integrated hydrologically with surrounding habitats (Platt *et al*. 1990). Water seeping out at the bog surface originates from upslope rainfall that percolates through the soil and moves along a sloping gradient created by an impermeable layer (*e.g*., clay, sandstone, siltstone). The flow of water is directed by hydraulic conductivity and soil porosity until it reaches the surface at a point where depth to the impermeable layer is very shallow. Surface soil characteristics determine the degree to which water percolates through the soil. Water infiltration into a soil generally increases as the percentage of sand and soil depth increases.

The size of the recharge area or watershed is important. Since the impermeable layer is the

remnant of an old erosional surface, drainages and divides may still be present but covered by more recent geological deposits. The general slope and drainage pattern of this old erosional surface may bear no resemblance to present-day topography and actually defining any bog's watershed boundaries would be quite complicated. One of the few generalizations that can be stated with certainty is that water feeding a hillside seep must come from positions topographically higher than the seep itself.

The degree to which a bog remains wet throughout the year depends on the size of the watershed, the soil infiltration rate upslope, the rate of saturated flow in the soil, the topographic position of the bog, the bog's water storage capacity, and the rate of water leaving the bog from evapo-transpiration and through surface and sub-surface flow. In general, the greater the infiltration rate of the watershed soils and the water holding capacity of bog soils, the smaller recharge area needed to maintain seepage throughout dry periods of the year.

There are different kinds of hillside bogs arising primarily as a result of different seepage regimes. They range from seasonally moist areas along slopes with relatively few bog-associated species, to bogs that are continually wet throughout the year and support a large array of bog-associated species. Often much variation in moisture regime can be observed from one place to another within a bog. The degree of development of a seep in a given area will be primarily dependent on five major characteristics that influence landscape hydrology: 1) upslope surface and subsurface soil characteristics which govern soil infiltration and saturated flow rates, 2) size of the recharge area, 3) vegetation present in both recharge and seepage areas, 4) local topography, and 5) depth, gradient and extent of the underlying impermeable layer (Platt *et al*. 1990).

Physiographic Setting:

Geology: Known from the following geologic units:

Pleistocene intermediate terraces (southwest LA only)
Pleistocene high terraces (east and west bogs)
Tertiary - Fleming formation (west only)
Tertiary - Catahoula formation (west only)
Tertiary - Sparta formation (west only)

Soils: Bogs develop on continually saturated (or usually so), very strongly acidic (pH ca. 4.5

- 5.5) and generally nutrient-poor fine sandy loams or loamy fine sands with relatively high organic matter content. The soils may occasionally be shallow peaty mucks. Soil series names have generally not been assigned to bogs due to the naturally very limited acreage in the state, although some larger bogs in western Louisiana have been mapped as Osier series.

Hillside bogs form exclusively in sandy to very sandy, acidic uplands historically dominated by longleaf pine.

Topography: On slopes in gently rolling to quite hilly terrain. May be found on upper slopes, but more commonly on mid- and lower slopes.

Vegetation:

Hillside seepage bogs are rich in herbaceous plant species, primarily grasses and grass-like plants (graminoids), although a large variety of forbs is present. There appears to be a distinct relationship between the number of species present and bog size (MacRoberts and MacRoberts 1992, 1993); more than 100 plant species may be found in a relatively large bog (MacRoberts and MacRoberts 1988). Many species are restricted to this habitat and closely allied longleaf pine flatwood savannahs.

Hillside seepage bogs and longleaf pine flatwood savannahs are very similar floristically. Species restricted to bogs appear to be those that require continually saturated substrates typical of the best developed bogs; savannahs characteristically "dry-out" for periods during the growing season.

In the floristic lists below, those species known from eastern bogs and not from western bogs are indicated by * before the name; those known from western bogs and not from eastern bogs are indicated by ** before the name.

Characteristic graminoids include (LNHP 1986-1996, MacRoberts 1988, 1992, 1993):

Andropogon gyrans var. stenophyllus
Aristida purpurascens var. virgata (= A. virgata)
Ctenium aromaticum
Dichanthelium dichotomum var. ensifolium
Eleocharis tortilis
Fuirena pumila
Juncus marginatus
Anthaenantia rufa
Carex glaucescens
Dichanthelium acuminatum
Dichanthelium scabriusculum
Eleocharis tuberculosa
Fuirena squarrosa
Juncus scirpoides

Juncus trigonocarpus
Panicum rigidulum
Panicum virgatum
Rhynchospora elliottii
Rhynchospora (Dichromena) latifolia
Rhynchospora oligantha
Rhynchospora plumosa
**Rhynchospora stenophylla (state-rare)*
***Scleria georgiana*
Scleria pauciflora
Muhlenbergia capillaris var. trichopodes (expansa)
Paspalum floridanum
Rhynchospora gracilenta
***Rhynchospora macra (rare)*
Rhynchospora oligantha
Rhynchospora rariflora
Scleria ciliata
Scleria muhlenbergii
Tridens ambiguus

Other characteristic herbs include:

Agalinis obtusifolia
**Aletris lutea*
Aster dumosus
Bartonia paniculata
Burmannia capitata
Centella erecta (formerly considered C. asiatica)
Coreopsis linifolia
Erigeron vernus
***Eriocaulon texense*
Eupatorium leucolepis
Helenium drummondii
**Helianthus heterophyllus*
Hypericum cistifolium
Hypericum setosum
Lachnocaulon anceps
Liatris pycnostachya
Linum medium
**Lophiola aurea (state-rare)*
Ludwigia pilosa
Lycopodiella appressa
**Macranthera flammea (state-rare)*
***Marshallia graminifolia var. cynanthera (ssp. tenuifolia)*
Oxypolis filiformis
***Pinguicula pumila*
Platanthera integra (state-rare)
Polygala cruciata
***Ptilimnium costatum*
Rhexia lutea
Aletris aurea
Arnoglossum (Cacalia) ovatum
Aster umbellatus
Bigelowia nudata
Calopogon tuberosus
Chaptalia tomentosa
Drosera brevifolia
Eriocaulon decangulare
Eryngium integrifolium
Gratiola pilosa
Helianthus angustifolius
Hypericum brachyphyllum
Hypericum hypericoides
**Lachnanthes caroliniana (state-rare)*
Lachnovaulon digynum (state-rare)
**Lilium catesbaei (state-rare)*
**Lobelia brevifolia*
Ludwigia hirtella
Lycopodiella (Lycopodium) alopecuroides
Lycopodiella caroliniana var. caroliniana
**Pinguicula lutea (state-rare)*
Platanthera ciliaris
Pogonia opioglossoides
Polygala ramosa
Rhexia alifanus
Rhexia petiolata

***Rudbeckia scabrifolia (state-rare)*
Sarracenia alata
***Schoenolirion croceum*
Sisyrhynchium atlanticum
**Tofieldia racemosa (state-rare)*
Utricularia subulata
Viola primulifolia
Xyris baldwiniana
***Xyris drummondii (state-rare)*
Sabatia gentianoides
**Sarracenia psittacina (state-rare)*
Scutellaria integrifolia
Sphagnum spp.
Utricularia juncea
Viola lanceolata
Xyris ambigua
Xyris difformis v. curtissii
***Xyris scabrifolia (state-rare)*

The following native woody plants readily invade bogs (except the pines) and will come to dominate them without fire:

Acer rubrum
Cyrilla racemiflora
Ilex glabra
Magnolia virginiana
Nyssa biflora
Pinus elliottii (native in southeast LA)
Pinus taeda
Smilax laurifolia
Viburnum nudum
Aronia arbutifolia
Ilex coriacea
Itea virginica
Morella heterophylla
Persea borbonia
Pinus palustris
Rhus vernix
Vaccinium fuscatum

Range by Parish:

Eastern hillside seepage bog - St. Tammany and Washington parishes.

Western hillside seepage bog - Beauregard, Bienville ?, Calcasieu, Natchitoches, Sabine and Vernon parishes.

In Louisiana, hillside bogs are most common in Vernon and Natchitoches parishes where there are hundreds of bogs, many (or most) of which are on Kisatchie National Forest and Fort Polk Military Reservation.

Threats:

Major threats include:

* Lack of frequent, properly-timed fires.

* Alteration of ground-water regimes that maintain bog seepage. Bog seepage rates can be affected by the stocking density of trees upslope from the bog.

* Mechanical damage from any machinery, including Off-road vehicles.

* Chemical pollution (e.g., herbicides, fertilizers) from adjacent managed lands.

* Livestock damage from cattle, hogs and horses. Hog rooting has been a severe problem at times in bogs on Kisatchie National Forest.

* Excessive foot traffic by visitors.

Wet Coastal Prairie

Rarity rank: S1G2Q

Synonyms: Great southwest prairie, cajun prairie, bluestem-sacahuista prairie, marais, platin, coulee

General Description:

Wet coastal prairie, now virtually extirpated in the state, historically was found in a natural mosaic with mesic (non-wetland) coastal prairie to form the once extensive coastal prairies of southwestern Louisiana. Wet coastal prairie occupied the broad low flats, drainage swales (called "coulees") and small shallow seasonally-flooded areas (often called "marais" and "platins") that interdigitated with the slightly higher broad, convex flats of mesic (non-wetland) coastal prairie. This landscape was bisected by "gallery forests" along small permanent streams that divided the prairie into "coves."

Essentially all of the prairie has long been completely altered from its native condition, mainly for agriculture, but early accounts state that these areas were essentially treeless and supported luxuriant prairie (e.g., Lockett 1874). The prairies unquestionably sustained a rich variety of wetland grasses, sedges, rushes and forbs.

Marais and platins deserve special mention as unique, small, often rain-flooded wetlands of the coastal prairies. Once quite numerous, particularly in the eastern prairie (Kniffen 1968), they typically ranged in size from less than an acre, up to several acres. Newton (1987) has described marais as a boggy, swampy tract of land up to 10 acres in size that becomes an irregular pond after rains, and described platins as roundish ponds about 100 feet in diameter. Taylor (1956) stated that such depressions ranged from 1 to 2 feet deep, had quite steep sides, and were essentially level-bottomed. The origin of platins (in the sense of Newton) remains a mystery (some believe old buffalo or cattle wallows), while marais ponds may represent incompletely-filled relict stream channels. A few examples of these small seasonal ponds dominated by herbaceous plants still remain, although the floristic complement is no doubt highly altered. The great majority have been eliminated or most of the very few that remain have been overtaken by thickets of Chinese tallow tree (*Sapium sebiferum*).

Fire probably played a major role in maintaining wet coastal prairie, although edaphic

conditions were a primary factor as well in preventing trees from "taking the prairie".

Physiographic Setting:

Geology: Present on the Pleistocene prairie terraces of southwest Louisiana

Soils: Hydric, strongly acid to slightly alkaline, mainly silt loams and silty clay loams. Some soil types are Frost silt loam, Judice silty clay loam, Kinder silt loam, Midland silt loam, Midland silty clay loam, Morey silt loam and Mowata silt loam.
Marais/Platins appear too small to have been assigned soil types. They may be found as inclusions in areas mapped as hydric or non-hydric soil types.

Topography: On small to broad level and depressional flats, in long narrow swales and depressions, in small irregular swales (marais), and in small rounded depressions (platins) within the historic broad expanse of coastal prairie.

Vegetation:

Extremely few examples of wet coastal prairie remain and practically no historical literature records of the vegetation were made. However, a review of heliophytic herbaceous wetland vegetation thought to be native to the region, combined with the few floristic studies made of remnant native "prairie" patches in the area (e.g., Allen 1988, LNHP 1986-1996) can provide a good estimate of the characteristic vegetation of wet coastal prairie. Grasses and grass-like plants (graminoids) most likely dominated.

It must be noted that the north-central and north-western coastal prairie vegetation is very much like that of the adjacent longleaf pine flatwood savannahs. The coastal prairie grades gradually on its northern edge into the longleaf pine flatwoods section, the two types sharing most herbaceous species in common in the transitional area. In like manner, it must be further noted that the far southern coastal prairie vegetation is very much like that of the adjacent firm fresh marshes of the chenier plain.

Some characteristic graminoids include:

Alopecurus carolinianus
Andropogon gerardii
Axonopus fissifolius (=A. affinis)
Axonopus furcatus
Bothriochloa laguroides ssp. torreyana
Bothriochloa longipaniculata
Carex cherokeensis
Carex frankii
Carex intumescens
Carex meadii

Carex reniformis
Carex vulpinoidea
Cladium mariscus ssp. jamaicense
Coelorachis rugosa
Cyperus articulatus
Cyperus brevifolius
Cyperus erythrorhizos
Cyperus haspan
Cyperus oxylepis
Cyperus strigosus
Cyperus virens
Dichanthelium scoparium
Echinochloa walteri
Eleocharis macrostachya
Eleocharis microcarpa
Eleocharis montana
Eleocharis obtusa
Eleocharis quadrangulata
Eragrostis campestris (elliottii)
Fimbristylis autumnalis
Fimbristylis caroliniana
Fimbristylis dichotoma
Fimbristylis miliacea
Fimbristylis puberula
Fimbristylis tomentosa
Juncus brachycarpus
Juncus effusus
Juncus marginatus
Juncus nodatus
Juncus polycephalus
Juncus validus
Leersia hexandra
Panicum dichotomiflorum
Panicum hemitomon
Panicum rigidulum
Panicum virgatum
Paspalum dissectum
Paspalum floridanum
Paspalum lividum
Paspalum plicatulum
Rhynchospora cauduca
Rhynchospora (Dichromena) colorata
Rhynchospora corniculata
Rhynchospora globularis
Rhynchospora glomerata
Rhynchospora. macrostachya
Rhynchospora (Psilocarya) nitens (state-rare)
Saccharum (Erianthus) giganteum
Scleria ciliata
Sorghastrum nutans
Tridens strictus
Tripsacum dactyloides
Zizaniopsis miliacea

Other characteristic herbs include:

Arnoglossum (Cacalia) ovatum
Boltonia asteroides
Bacopa rotundifolia
Callitriche heterophylla
Centella erecta (formerly considered C. asiatica)
Eryngium yuccifolium
Euthamia leptocephala
Gratiola virginiana
Hibiscus moscheutos ssp. lasiocarpus
Hydrolea ovata
Hygrophila lacustris
Hymenocallis liriosome
Hypericum crux-andrae
Hypericum nudiflorum
Hyptis alata
Justicia ovata
Ludwigia peploides
Phyla nodiflora
Pluchea camphorata
Polygonum hydropiperoides
Pontederia cordata
Proserpinaca palustris
Ptilimnium capillaceum
Rudbeckia nitida var. texana
Solidago sempervirens
Spilanthes americana
Typha latifolia
Xyris laxifolia var. iridifolia

Range by Parish:

The coastal prairie was historically one large, essentially contiguous region of southwest Louisiana. It occupied the greater parts of Acadia, Evangeline, Lafayette and Jefferson Davis parishes. It extended into Allen, Calcasieu, Cameron, Iberia, St. Landry, St. Martin and Vermilion parishes.

Threats:

This wetland community has essentially been extirpated. A very few highly degraded platins were known to remain at the time of this report, embedded within agricultural fields or surrounded by human development. A very few areas of mostly native prairie vegetation remain along railroad rights-of-way (and very rarely in more isolated locales), which in low places are dominated by native wetland plants.

Major threats include:

* Conversion to agriculture.

* Contamination by chemical agents (e.g., fertilizer, herbicides) used in adjacent agricultural fields or applied in roadside/railside maintenance.

* Excessive grazing

* Altered hydrology

* Invasion by naturalized exotic plants

* Lack of appropriate fire

Wet Saline Prairie

Rarity rank: S1G1

General Description:

Wet saline prairie is a natural, mostly treeless wetland currently known from a few scattered sites in central and northwestern Louisiana. Typically only a few acres in size, they arise on low flat terraces subject to regular flooding adjacent to or near small to intermediate streams. In aspect, these prairies are usually a mosaic of variably dense herbaceous vegetation (thick to thin), with interspersed bare soil areas. Shrubs are intermixed to a greater or lesser degree, and may in places approach what has been tentatively termed "saline shrub thickets". Wet saline prairies usually grade upslope into mesic or dry saline prairies.

The plant community of wet saline prairies has been produced mainly by extreme and unusual soil characteristics. The soils have high levels of exchangeable sodium and (at times) magnesium in the sub-soil and near surface horizons that have created extreme conditions for plant growth. Such conditions include relatively high alkalinity, very poor movement of water and air in the soil, resistance to wetting that can induce draughty conditions, resistance to drying once saturated, and a sodic horizon in the subsoil (occasionally very near or at the surface) that acts much like a dense clay hardpan and is very resistant to root penetration. The soil contains relatively high levels of certain water-soluble salts that are injurious to plants and may produce alkali chlorosis and mortality. The soils are naturally low in fertility.

The plant community is dominated by halophytic (salt-tolerant) forbs, grasses and grass-like plants and shrubs; scattered trees may be present. It appears that shrubs may increase in prevalence in response to increased wetness (and possible associated edaphic conditions), and in places may form "saline shrub thickets". Small, often-flooded shallow depressions within wet saline prairies are typically dominated by sedges and have been tentatively referred to as "interior saline soil marsh". It appears that frequent deep flooding on stream-side flats on salty soils creates a mostly barren feature called "interior salt flat" (LNHP 1988).

Physiographic Setting:

Geology: Currently known from stream-side or near-stream terraces within the floodplain of

small to intermediate streams, within the following geologic units:

Tertiary - Cockfield formation
Tertiary - Wilcox group
Pleistocene prairie terraces (?)
Holocene alluvium (?)

Soils: Arise exclusively on silt loam Glossic Natraqualfs. The two major characteristic soils are Bonn silt loam and Brimstone silt loam.

Topography: On essentially flat terraces near or adjacent to small to intermediate streams.

Vegetation:

Characteristic herbaceous vegetation includes (LNHP 1986-1996):

Aster subulatus
Atriplex pentandra
Bacopa monnieri
Bacopa rotundifolia
Carex glaucescens
Chasmanthium latifolium
Distichlis spicata
Eleocharis spp.
Fimbristylis castanea
Heliotropium curassivicum
Hibiscus moscheutos ssp. lasiocarpus
Iris brevicaulis
Iva angustifolia
Juncus spp.
Ludwigia spp.
Lythrum lineare
Panicum virgatum
Phyla nodiflora
Pluchea camphorata
Polygonum aviculare
Proserpinaca pectinata
Rhynchospora corniculata
Solidago sempervirens
Spartina pectinata (state-rare)
Tradescantia occidentalis
Tridens strictus

Characteristic trees (nearby or very scattered in prairie), shrubs and vines include:

Ampelopsis arborea
Baccharis halimifolia (often the major shrub)
Berchemia scandens
Cephalanthus occidentalis
Crataegus berberifolia
Crataegus brachyacantha
Crataegus viridis
Fraxinus caroliniana
Morella cerifera
Pinus taeda
Quercus lyrata
Quercus nigra
Quercus phellos
Quercus_similis
Ulmus crassifolia
Sabal minor
Sideroxylon (Bumelia) lanuginosum
Smilax walteri

Range by Parish:

Currently known to occur in Caddo, Red River and Winn parishes. Suspected to occur in Caldwell and DeSoto parishes.

Threats:

Major threats include:

* Attempted conversion to pine plantations and associated mechanical disturbance.
* Disturbance from off-road vehicles.
* Severe and progressive erosion after mechanical disturbance.
* Mechanical disturbance during timber harvests in adjacent timberlands (machine crossing, log-loading areas).
* Chemical pollution (herbicides, fertilizers) from adjacent agroforest operations.

Longleaf Pine Flatwood Savannah

Rarity rank: Eastern: S1G1?; Western: S1S2G2Q; [Western - saline variant: S1G1]

Synonyms: Pine savannah, grass-sedge bog, pitcher-plant prairie, pitcher-plant meadow, pitcher-plant bog, herbaceous bog, flatwood bog

General Description:

Longleaf pine flatwood savannahs (pine savannahs) are floristically rich, herb-dominated wetlands, that are naturally sparsely stocked with longleaf pine (*Pinus palustris*). They historically dominated the Gulf coastal plain flatwood regions of southeast and southwest Louisiana. The term "savannah" is classically used to describe expansive herb-dominated areas with scattered trees.

Pine savannahs are found naturally on broad "flats" in an interdigitated mosaic with mesic to dry-mesic (non-wetland) longleaf pine flatwoods, savannahs occupying the poorly drained and seasonally saturated/flooded depressional areas and low flats, while the non-wetland flatwoods occupy the better drained slight rises, low ridges and "pimple mounds" (only southwest Louisiana). Pine savannahs are subject to a highly fluctuating water table, from surface saturation/shallow flooding in late fall/winter/early spring to growing-season droughtiness.

Two major types of pine savannah are recognized in Louisiana: eastern longleaf pine flatwood savannah (east of the Mississippi River in the east Gulf coastal plain) and western longleaf pine flatwood savannah (west of the Mississippi River in the west Gulf coastal plain). The two are quite similar in topographic, hydrologic and edaphic setting, and in functional dynamics, but differ somewhat in topographic relationships and in species composition. In relatively unaltered landscapes in southeast Louisiana, pine savannahs are commonly associated with mesic pine flatwoods intermingled on slight rises and low ridges, and typically grade down slope to slash pine-pond cypress/hardwood forest, bayhead swamp and/or "small stream forest" (LNHP 1988). Many western pine savannahs are characterized by scattered pimple mounds (with mesic to dry-mesic pine flatwoods), typically have embedded flatwoods ponds in deeper depressions and swales, and grade down slope to mixed hardwood-loblolly forest and small stream forest.

Low tree density in pine savannahs is probably attributable to a number of site and soil characteristics, among them: 1) longleaf regeneration is impeded by frequent floods that preclude seedling establishment in low areas subject to regular flooding or long periods of standing water, 2)

high water tables and heavy subsoils inhibit deep root development, thereby encouraging shallow rooting of longleaf, making it more prone to wind-throw, and 3) wet flatlands are not the ideal environment for longleaf and trees growing there are probably under stress, making them more susceptible to insect or disease attack.

For the most part, savannah remnants seen today are relatively limited in size compared to the broad expanses that once existed, and have undergone dramatic structural changes. Prior to alteration by human activities of the last 100 years or so, the original habitat was a very open "forest" (canopy cover averaged much less than 50%), with the scattered trees almost exclusively longleaf pine. Few shrubs and hardwoods were encountered, except in wetter depressional acid swamps (e.g., slash pine-pond cypress/hardwood forest and bayhead swamp) and along creek bottoms that bisected the flatwoods region. Today, most of the few remaining examples of pine savannah have been invaded to a greater or lesser degree by "off-site" shrubs, pines and hardwoods and have been burned insufficiently or out of season. Others are often poorly stocked with longleaf pine.

While fire, soil conditions and a seasonally high water table work in concert to control community structure in longleaf pine flatwood savannahs, fire is arguably the critical element in their maintenance. All of the species indigenous to pine savannahs have evolved over millennia within a regime of frequent (once every 1 to 4 years, or so) lightning-season surface fires and most depend of fire for perpetuation in their natural habitat. Among other things, fire stimulates flowering and fruit/seed production of savannah herbs and pyrophytic shrubs, deters invasion by fire-intolerant woody vegetation, and exposes mineral soil for seedlings of indigenous herbs and longleaf pine to become established. In the absence of frequent burning, pine savannahs quickly succeed into shrub/tree thickets, and sun-loving herbs are reduced and most are eventually eliminated without fire.

Physiographic Setting:

Geology: Predominantly found on the broad Pleistocene prairie terraces of the outer coastal plain of southeast and southwest Louisiana. Also arise in western Louisiana on:

Pleistocene intermediate terraces ("tableland" variant)
Pleistocene high terraces

Tertiary - Fleming formation ("Tertiary flatwoods" variant)

Soils: Hydric, very strongly acidic (rarely on alkaline/sodic), nutrient-poor fine sandy loams and silt loams, low in organic matter. The soils may be underlain by an impeding layer, are slowly permeable and water runs off the surface slowly. The water table is at or near the surface most of the year. Some common soils are:

Eastern pine savannahs - Myatt fine sandy loam, Guyton silt loam, Stough fine sandy loam

Western pine savannahs - Caddo silt loam, Guyton silt loam, Kinder silt loam, Brimstone silt loam (supports "saline" variant).

Topography: On low flats and in depressional areas in the pine flatwoods.

Vegetation:

Pine savannahs support a rich variety of plant species. The community is most often dominated by numerous types of grasses and sedges, but is noted by many for its interesting collection of insectivorous plants and showy orchids, lilies and others, and for its very high floristic diversity. Many of the plants known from pine savannahs are restricted to this habitat or closely-allied hillside bogs.

Longleaf pine flatwood savannahs and hillside seepage bogs are very similar floristically. Species restricted to bogs appear to be those that require continually saturated substrates typical of the best developed bogs; savannahs characteristically "dry-out" for periods during the growing season.

In the floristic lists below, species known from eastern pine savannahs and not from western pine savannahs are indicated by * before the name; those known from western pine savannahs and not from eastern pine savannahs are indicated by ** before the name. Species restricted to western pine savannah - saline variant are indicated by *** before the name.

Characteristic graminoids include (Bridges 1988, Bridges and Orzell 1989, LNHP 1986-1996, Sorrie 1996):

Agrostis perennans
Andropogon mohrii
Anthaenantia rufa
Aristida purpurascens var. virgata (= A. virgata)
Coelorachis tessellata
Dichanthelium leucothrix
Dichanthelium scabriusculum
Dichanthelium latifolia
Eleocharis tuberculosa
Fuirena breviseta
Fuirena squarrosa
Juncus scirpoides
****Muhlenbergia capillaris var. capillaris*
Panicum rigidulum
Panicum virgatum
Paspalum praecox
**Rhynchospora compressa (state-rare)*
Rhynchospora elliottii
Rhynchospora oligantha
Rhynchospora rariflora
Scleria ciliata
Scleria muhlenbergii
Tridens ambiguus
Andropogon glomeratus var. glaucopsis
Andropogon gyrans var. stenophyllus
Aristida purpurascens var. purpurascens
Carex glaucescens
Ctenium aromaticum
Dichanthelium dichotomum var. ensifolium
****Rhynchospora (Dichromena) colorata*
Eleocharis microcarpa
Eragrostis campestris (elliottii)
Fuirena bushii
Juncus marginatus
Juncus trigonocarpus
Muhlenbergia capillaris var. trichopodes (= M. expansa)
Paspalum floridanum
**Rhynchospora chapmanii (state-rare)*
Rhynchospora corniculata
Rhynchospora gracilenta
Rhynchospora plumosa
Saccharum (Erianthus) giganteum
***Scleria georgiana*
Scleria pauciflora

Other characteristic herbs include:

Agalinis obtusifolia
**Aletris lutea*
Asclepias lanceolata
Aster dumosus
Bartonia paniculata
Calopogon tuberosus
Centella erecta (formerly considered C. asiatica)
Chaptalia tomentosa
Coreopsis linifolia
Erigeron vernus
Eryngium integrifolium
Eupatorium leucolepis
**Gelsemium rankinii (fire-adapted ?woody vine)*
Helenium drummondii
Aletris aurea
Arnoglossum (Cacalia) ovatum
Asclepias longifolia
**Balduina uniflora*
Bigelowia nudata
**Carphephorus pseudoliatris*
****Chaetopappa asteroides (state-rare)*
**Cleistes bifaria (divaricata) (state-rare)*
Drosera brevifolia
Eriocaulon_decangulare
****Evolvulus sericeus*
**Gaylussacia mosieri (fire-adapted shrub)*
Gratiola pilosa
** Helenium vernale*

Helianthus angustifolius
Hypericum brachyphyllum
Hypericum hypericoides
Hypoxis hirsuta (rigida)
**Lachnanthes caroliniana (state-rare)*
Liatris pycnostachya
Linum medium
***Lobelia flaccidifolia*
**Lophiola aurea (state-rare)*
Ludwigia pilosa
Lycopodiella appressa
***Marshallia graminifolia var. cynanthera (ssp. tenuifolia)*
Oxypolis filiformis
***Pinguicula pumila*
Platanthera integra (state-rare)
Pogonia opioglossoides
Polygala ramosa
Rhexia alifanus
R. petiolata
****Sabatia dodecandra var. foliosa (state-rare)*
Sarracenia alata
Scutellaria integrifolia
****Spartina spartinae*
Spiranthes longilabris
****Sporobolus silveanus (state-rare; dominant grass in saline variant)*
**Solidago fistulosa*
***Stylisma aquatica*
Utricularia juncea
Vernonia gigantea ssp. gigantea
Viola primulifolia

** Helianthus heterophyllus*
Hypericum cistifolium
Hypericum setosum
Hyptis alata
Lachnocaulon anceps
**Liatris spicata*
**Lobelia brevifolia*
**Lobelia floridana*
Ludwigia hirtella
Lycopodiella (Lycopodium) alopecuroides
Lycopodiella caroliniana var. caroliniana

**Pinguicula lutea (state-rare)*
Platanthera ciliaris
Pingulicula nivea (more common in west LA)
Polygala cruciata
***Ptilimnium costatum*
Rhexia lutea
Sabatia campanulata
Sabatia gentianoides
**Sarracenia psittacina (state-rare)*
Sisyrhynchium atlanticum
Sphagnum spp.
****Sporobolus pyramidatus*

**Stokesia laevis*
**Tofieldia racemosa (state-rare)*
Utriculania subulata
Viola lanceolata
Xyris ambigua

The following native woody plants invade pine savannahs and will come to dominate them without fire:

Acer rubrum
Cyrilla racemiflora
Magnolia virginiana
Nyssa biflora
Pinus palustris
Quercus laurifolia
Smilax laurifolia

Aronia arbutifolia
Ilex glabra
Morella cerifera
Pinus elliottii (native in southeast LA)
Pinus taeda
Quercus nigra

Range by Parish:

Eastern longleaf pine flatwood savannah - Tangipahoa, St. Tammany, and Washington parishes; historic in eastern Livingston Parish.

Western longleaf pine flatwood savannah - Allen, Beauregard, Calcasieu, Evangeline, Grant, Jefferson Davis, Rapides, Natchitoches, Sabine ?, and Vernon parishes.

Threats:

Major threats include:

* Lack of appropriate burning (frequency, season)

* Alterations to the surrounding landscape that increase or decrease surface water draining into savannahs

* Alterations to ground-water hydrologic patterns

* Contamination by chemical agents (e.g., fertilizer, herbicides) used in adjacent agroforests and agricultural fields.

* Physical damage incurred from timber harvest and planting practices (e.g., soil compaction, rutting, bedding)

* Conversion to loblolly or slash pine plantations

* Residential and commercial development

Slash Pine-Pondcypress/Hardwood Forest

Rarity rank: S2S3 [three global types: G2?,G2G3,&G3?]

General Description:

This natural wetland forest type is restricted to the wet acidic flatwoods of the far eastern Florida Parishes. In relatively unaltered landscapes, it exists in a mosaic with longleaf pine flatwoods (non-wetland), longleaf pine flatwood savannahs (wetland) and bayhead swamps. In most cases, this community is present in a hydrologic/topographic transitional zone from higher, "dryer" wet longleaf pine flatwood savannahs to lower, wetter bayhead swamps. It may also be present on broad flats that were historically partially protected from frequent surface fires (burning in nearby longleaf areas) by an encircling, protective barrier of non-pyrogenic bayhead swamps. Surface soils are typically saturated for much of the year and shallow water may be present in the late fall/winter/early spring and after rains in the growing season.

The community may naturally vary considerably in structure and somewhat in composition from one place to another, apparently as a consequence of minor variations in topography, soil conditions, and hydrologic and fire regimes (LNHP 1986-1996, Teague et al. 1995). Often, in perhaps its wettest and/or least fire-frequented position, the community has a mostly closed canopy dominated by slash pine (*Pinus elliottii*) and pondcypress (*Taxodium ascendens*), with swamp black gum (*Nyssa biflora*) and sweetbay (*Magnolia virginiana*) as primary associates. Here, there typically is minimal herbaceous undergrowth, but switch cane (*Arundinaria gigantea*) can form dense thickets, and usually there are many acidophilic wetland shrubs. Scattered, depauperate specimens of herbs more typical of sunny wet pine savannahs (e.g., yellow pitcher-plant, *Sarracenia alata*) may be observed. Pond cypress may dominate in somewhat topographically lower positions (minor depressions) that may be included here.

Infrequently, perhaps in its driest, most fire-frequented position, quite open versions of the community have been observed, with scattered slash pine and pondcypress, and no hardwoods. Here, there is a dense, rich swath of herbaceous plants, similar to that of longleaf pine flatwood savannahs. While this "savannah" type may be natural, the functional mechanisms that would produce it are unclear at this time. If natural, it probably involves a close interplay of hydrologic and fire regimes, and possibly soil conditions.

Slash pine-pondcypress/hardwood forest evolved with recurrent lightning-season ground fires and regular light surface fire appears critical in maintaining the community. Both slash pine and pondcypress are fire-adapted species and can survive fires once they attain a certain size; however, neither is as fire resistant as longleaf pine. The natural fire return interval of this community is difficult to estimate but is tentatively reckoned to have varied on the average between 5 and 20 years, a frequency that would periodically allow for the regeneration of slash pine and pondcypress, and associated hardwoods during the longer fire return intervals. Such a frequency would as well preclude complete dominance of the site by hardwoods.

Physiographic Setting:

Geology: Present on the Pleistocene prairie terraces of the far eastern Florida Parishes.

Soils: Hydric, typically very strongly acidic and nutrient poor silt loams and fine sandy loams. Two principal soils are Myatt fine sandy loam and Guyton silt loam.

Topography: Low, essentially level and slightly depressional areas; often at the ecotone between wet longleaf pine flatwood savannah and bayhead swamp.

Vegetation:

The community is variable in composition, mainly in response to hydrologic setting (wetter vs. dryer) and degree of canopy closure and consequent shading. Wetter versions are very similar floristically to bayhead swamp.

Characteristic trees and shrubs include (LNHP 1986-1996, Penfound and Watkins 1937):

Acer rubrum
Aronia arbutifolia
Cyrilla racemiflora
Gaylussacia mosieri
Ilex coriacea
Ilex glabra
Ilex opaca
Itea virginica
Liquidambar styraciflua
Lyonia lucida
Magnolia virginiana
Morella cerifera
Morella heterophylla
Nyssa biflora
Persea borbonia
Pinus elliottii

Quercus laurifolia
Quercus nigra
Taxodium ascendens
Viburnum nudum

Characteristic understory plants often include:

Andropogon mohrii
Anthaenantia rufa
Aristida purpurascens var. virgata (= A. virgata)
Arundinaria gigantea
Carex glaucescens
Centella erecta (formerly C. asiatica)
Chaptalia tomentosa
Dichanthelium leucothrix
Dichanthelium scabriusculum
Eragrostis refracta
Erigeron vernus
Eriocaulon compressum
Gelsemium rankinii
Hypericum galioides
Ludwigia pilosa
Lycopodiella (Lycopodium) alopecuroides
Osmunda cinnamomea
Osmunda regalis
Panicum verrucosum
Panicum virgatum
Proserpinaca pectinata
Rhynchospora gracilenta
Rynchospora inexpansa
Toxicodendron (Rhus) radicans ssp. radicans
Saccharum (Erianthus) giganteum
Sarracenia alata
Sphagnum spp.
Viola primulifolia
Woodwardia areolata
Xyris fimbriata

Range by Parish:

Predominantly in south and eastern St. Tammany Parish, but also possible in far eastern Washington Parish and in southeastern Tangipahoa Parish.

Threats:

Major threats include:

* Intensive logging and/or conversion to loblolly or slash pine plantations

* Altered hydrologic patterns (surface drainage and near surface ground-water)

* Lack of appropriate fire

* Chemical pollution (e.g., herbicides, fertilizers) from adjacent agroforests.

Bayhead Swamp

Rarity rank: S3 [three global types:G2G3,G2?,&G3?]

Synonyms: Baygall, reed brake, acid seep forest, spring-head, green-head

General Description:

Bayhead swamps are typically densely stocked, often-flooded forested wetlands that develop in broad, shallow drains and relatively deep depressional areas in flatwoods, and in the upper reaches of creeks in sandy, acidic uplands across much of the state. They are probably most common in the eastern flatwoods of the Florida Parishes and the sandy uplands of western Louisiana. They are seasonally to semi-permanently saturated or flooded.

The overstory is typically characterized by a closed to almost closed canopy. The midstory is often densely stocked with various shrubs, many of which are evergreen, and there is often an abundance of ferns, except in the lowest, often-flooded depressions where little herb cover is present, other than *Sphagnum* spp., which can form thick mats. These forests naturally vary from a few acres up to more than 100 acres in size.

In the southeastern flatwoods, bayhead swamps occupy generally the lowest positions on the landscape, other than the principal permanent streams that drain the area. They are found just down the topographic gradient from slash pine-pond cypress/hardwood forest. Bayhead swamps appear to be naturally very uncommon in the flatwoods of southwest Louisiana.

Outside of the flatwoods, bayhead swamps most typically result from the geological and hydrological characteristics of stream headwaters in sandy coastal plain hills. In such areas, relatively little rain water runs off the uplands, rather most penetrates the soil and eventually seeps into the floodplain along the valley wall. This results in constant, relatively high rates of discharge. The stream is unable to incise a single distinct channel at its head, and instead becomes a series of braided channels, with the entire floodplain usually saturated to inundated. However, bayhead-type plant assemblages can arise in depressions within acidic flat terraces/floodplains otherwise occupied by better-drained mixed hardwood/loblolly pine forest and/or small stream forest.

The highly acidic nature of the soils combined with the abundance of organic muck that accumulates on the swamp floor often produces a "blackwater" (actually tea-colored water) condition in streams associated with Bayhead Swamps. Bayhead swamps usually grade into small

stream forests downstream as the stream channel becomes better defined, and at this transition area there is an interesting mix of species from each natural community.

Fire probably played a minor role in bayhead swamps because of its topographic position, usually wet nature, and general lack of appropriate fuels to carry a fire. However, fires may have occurred during exceedingly dry periods in broader bayheads, or may have been fairly frequent in narrow bayhead drains. Switch cane (*Arundinaria gigantea*), a highly combustible woody grass, can form dense thickets in bayheads (particularly at their edges, hence the old name "reed brake"), and may have played a key role in the fire dynamics of this community, especially in narrower bayhead drains.

Small-scale hillside communities similar in composition to bayhead swamp, arising on seepage areas in sandy, acidic, upland mixed pine-hardwood forests, have been classified as "forested seeps" (formerly "wooded seep", in part; LNHP 1988).

Physiographic Setting:

Geology: Known from the following geologic units in Louisiana:

Pleistocene prairie terraces (mainly in southeast Louisiana)
Pleistocene intermediate terraces
Pleistocene high terraces
Tertiary - Fleming formation
Tertiary - Catahoula formation
Tertiary - Cockfield formation
Tertiary - Sparta formation
Tertiary - Wilcox group

Soils: Deep, very poorly drained, very strongly acid loamy fine sand, fine sandy loam or silt loam, with relatively high organic matter content. Available water capacity is high, surface runoff is very slow to ponded. Inherent fertility is low. The surface layer remains wet or flooded mostly year round. Some typical soils are Myatt fine sandy loam, Guyton silt loam and Osier loamy fine sand.

Topography: In the eastern flatwoods, bayhead swamps occupy generally the lowest positions on the landscape, other than the principal permanent streams that drain the area. Here, they are in narrow to broad, shallow drains and in isolated, relatively deep depressions.

In the sandy, acidic hilly uplands of west, central and northwest Louisiana, they arise in the upper reaches of creeks. Bayhead-like communities may occupy depressions in the floodplains of small to intermediate streams in western Louisiana.

Vegetation:

The overstory is usually dominated by sweetbay (*Magnolia virginiana*) and/or swamp blackgum (*Nyssa biflora*). In southeast Louisiana, laurel oak (*Quercus laurifolia*, "obtusa" form) is often a principal overstory associate. Other characteristic overstory species include (LNHP 1986-1996):

Acer rubrum
Liquidambar styraciflua
Magnolia grandiflora (central Louisiana)
Pinus elliottii (eastern Florida Parishes)
Taxodium ascendens (occasional, far eastern Florida Parishes)
Ilex opaca
Liriodendron tulipifera (southeast Louisiana)
Quercus nigra
Taxodium distichum (occasional; western, central, northwest Louisiana)

Characteristic shrubs and vines include:

Alnus serrulata
Clethra alnifolia (mainly southeast LA)
Decumaria barbara
Ilex coriacea
Ilex verticillata
Leucothoe axillaris (southeast LA)
Lyonia lucida
Morella heterophylla
Persea borbonia
Rhododendron viscosum (southeast LA)
Smilax laurifolia
Toxicodendron (Rhus) radicans ssp. radicans
Viburnum nudum
Aronia arbutifolia
Cyrilla racemiflora (southeast, southwest LA)
Gelsemium rankinii (southeast LA)
Ilex glabra (mainly southeast LA)
Itea virginica
Leuopthoe racemosa
Morella cerifera
Osmanthus americanus (southeast LA)
Rhododendron oblongifolium (west LA)
Rhus vernix
Styrax americanus
Vaccinium fuscatum

Some characteristic herbs include:

Apteria aphylla
Boehmeria cylindrica
Carex folliculata
Carex intumescens
Carex joorii
Arundinaria gigantea (woody grass)
Carex atlantica
Carex glaucescens
Carex leptalea
Carex venusta (southeast LA)

Chasmanthium laxum var. laxum
Chasmanthium ornithorhynchum (state-rare; southeast LA)
Cyperus virens
Lycopus virginicus
Onoclea sensibilis
Osmunda cinnamomea
Osmunda regalis
Platanthera clavellata
Platanthera cristata
Platanthera flava
Rhynchospora miliacea
Saururus cernuus
Sphagnum spp.
Woodwardia areolata
Woodwardia virginica

Range by Parish:

Known or suspected from the following parishes:

Allen
Beauregard
Bienville
Bossier
Caddo
Caldwell?
Catahoula
Claiborne
DeSoto
Grant
Jackson
LaSalle?
Lincoln
Natchitoches
Ouachita?
Rapides
Red River?
Sabine
St. Helena
St. Tammany
Tangipahoa
Vernon
Washington
Webster
Winn

Threats:

* Physical damage incurred from intensive logging and/or attempted conversion to loblolly or slash pine plantations

* Land management that alters indigenous hydrologic patterns (surface drainage and near surface ground-water)

* Chemical contamination (e.g., herbicides, fertilizers) from adjacent agroforests.

Wet Spruce Pine-Hardwood Flatwoods Forest

Rarity rank: S1G1G2

General Description:

Wet spruce pine-hardwood flatwoods forest is a natural mixed wetland forest community indigenous to the flatwoods of the western Florida Parishes in southeast Louisiana. These forests occupy poorly drained flats, depressional areas and small drainage-ways (sometimes called "slashes") that lie in a mosaic with higher, non-wetland areas. Such higher areas support a mesic spruce pine-hardwood flatwoods forest.

Although very similar to some versions of wet mixed hardwood-loblolly forest (LNHP 1988), this forest community is distinguished by the prevalence of spruce pine (*Pinus glabra*) over loblolly pine (*Pinus taeda*), although loblolly is usually present at some level. Hardwoods usually dominate the forest, but spruce pine can dominate areas within the stand.

The range of the community lies immediately west of the eastern longleaf pine flatwoods region of southeast Louisiana. Undetermined factors, most probably edaphic, acted to preclude longleaf pine (*Pinus palustris*) from these flatwoods, although longleaf pine occupies similar hydrologic settings immediately to the east. One explanation may be soil nutrient regime. It appears that the soils supporting wet spruce pine-hardwood forest are significantly higher in nutrient levels (exchangeable cations) than those historically supporting longleaf pine communities.

The forest in mature condition typically has a dense canopy, consequent heavy shading, and usually very little herbaceous vegetation. Dwarf palmetto (*Sabal minor*) is often an understory dominant. Live oak (*Quercus virginiana*) may be a minor native component of this forest community.

Fire was probably historically very rare in this wetland community as the component plant species are generally not fire adapted and fuel conditions are not conducive to fire.

Physiographic Setting:

Geology: Present on the Pleistocene prairie terraces in the southwestern portion of the Florida Parishes in southeast Louisiana.

Soils: Hydric, acidic silt loams. Common soil series are Encrow, Gilbert and Springfield.

Topography: On broad, low flats, in small to large depressional areas, and along small intermittent ill-defined drainages ("slashes").

Vegetation:

Among the characteristic native tree, shrub and vine species are (LNHP 1986-1996):

Acer rubrum
Ampelopsis arborea
Berchemia scandens
Brunnichia cirrhosa
Campsis radicans
Carya glabra
Cephalanthus occidentalis
Cornus foemina
Crataegus opaca
Crataegus viridis
Diospyros virginiana
Fraxinus caroliniana
Fraxinus pennsylvanica
Ilex decidua
Ilex opaca
Itea virginica
Liquidambar styraciflua
Magnolia grandiflora
Morella cerifera
Nyssa biflora
Nyssa sylvatica
Pinus glabra
Pinus taeda
Quercus laurifolia
Quercus michauxii
Quercus nigra
Quercus pagoda
Quercus phellos
Quercus virginiana?
Toxicodendron (Rhus) radicans ssp. radicans
Salix nigra
Sambucus canadensis
Smilax glauca
Smilax rotundifolia
Styrax americanus
Viburnum dentatum
Vitis rotundifolia

Characteristic native understory species include:

Arundinaria gigantea
Boehmeria cylindrica
Carex spp.
Chasmanthium latifolium
Chasmanthium laxum var. laxum
Chasmanthium laxum var. sessiliflorum
Cyperus spp.
Gratiola virginiana
Hygrophila lacustris
Hypericum spp.
Juncus spp.
Justicia ovata
Ludwigia spp.
Lycopus rubellus
Lycopus virginicus
Lysimachia radicans
Onoclea sensibilis
Osmunda regalis
Phanopyrum (Panicum) gymnocarpon
Polygonum spp.
Rhynchospora spp.
Sabatia calycina

Saccharum (Erianthus) giganteum
Saururus cernuus
Scirpus cyperinus
Scirpus spp.
Solidago gigantea
Thelypteris palustris
Triadenum walteri
Vernonia gigantea ssp. gigantea
Woodwardia areolata

Range by Parish:

Confined largely to southern Livingston Parish, but also in adjacent East Baton Rouge and possibly Ascension Parish.

Threats:

Mature, high-quality stands of this forest community are very rare today. Most have been converted to loblolly pine plantations.

The current greatest threat to existing mature forests of this type is intensive timbering. Other major threats include:

* Altered hydrology
* Invasion by naturalized exotic plants
* Residential and commercial development

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