

INTERIM REPORT

January 1 - December 31, 1981

WETLAND HABITATS OF THE

ALABAMA COASTAL AREA

PART III

An Inventory of Wetland Habitats of
The Mobile - Tensaw River Delta

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APPENDIX B. Checklist of the Dominant Plants of Emergent and Forested Wetlands of Coastal Alabama

ATLAS LEGEND

ATLAS

Related Documents

- Sapp, D.C., M.L. Cameron, J.P. Stout 1976. Alabama Coastal Marsh Inventory. Alabama Geological Survey, Unique Rept. No. ALA-ADO-X996-CZM-11. (Part I of this Wetland's Atlas series).
- Stout, J.P. and M.J. Lelong 1981. Wetland Habitats of the Alabama Coastal Area. Part II. An Inventory of Wetland Habitats South of the Cochrane Causeway. Ala. Coast.-Area Bd., Tech. Publ. CAB-81-01.
- Stout, J.P., H.M. Dowling and M.T. Powers 1982. An inventory of land use within the Lower Mobile-Tensaw River Delta, 1981. Alabama Coastal Area Board, Completion Report, Contract No. CAB-81-02 Amendment,
- U.S. Department of Interior 1979. Study of Alternatives: Mobile-Tensaw River Bottomlands/Alabama. National Park Service, July, 1979.

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INTRODUCTION

Recognizing the increasing pressures upon our nations coastal resources and the far-reaching impacts of activities within our coastal areas, Congress passed the Coastal Zone Management Act which was signed into law by the President in 1972 (P.L. 92-583) and amended in 1976 (P.L. 94-370). The act provided funds for coastal states to develop and implement their own coastal management programs on a voluntary basis.

The 1976 Regular Session of the Alabama Legislature passed Act Number 534, designating the Coastal Area Board as the agency to develop and implement a management plan for coastal Alabama. The state management plan received Federal approval in 1979 and is currently proceeding with the implementation phase.

The Alabama legislation requires that certain elements be included in the state's coastal management program. Included among those elements are:

- a. Identification of all of the state's coastal resources; and
- b. Evaluation of these resources in terms of the quality, quantity and capability for use both now and in the future.

Pursuant to this mandate, the Alabama Coastal Management Program addresses specific resource elements for further assessment and management. Included as primary natural resources for consideration are wetlands and submersed grassbeds (Alabama Coastal Area Board, 1979). The purpose of this inventory is thus to determine the extent and composition of these resources as a baseline for preservation and development planning. Three broad habitat types are examined: a) marshes, b) Swamps-shrub and forested, and c) submersed grassbeds. These are defined and described below. These resources were inventoried within the boundaries of the Alabama Coastal Zone (at or below the 10-foot contour) in the Mobile-Tensaw River Delta.

The Mobile-Tensaw River Delta comprises approximately 70,000 acres of wetland habitats ranging from submersed "grassbeds" to deep swamps. The Delta extends from the confluence of the Tombigbee and Alabama Rivers, at its northern end, approximately 45 miles southward to the head of Mobile Bay. At its southern extreme the Delta drains through four rivers (Mobile, Tensaw, Blakeley, Appalache) over an east to west expanse of approximately 8 miles. Both limited access and size have enabled the area to retain its basic natural integrity. The Delta was designated a national natural landmark, in 1974, as the "Mobile-Tensaw River

Bottomlands in Alabama". Four sites within the Delta are also listed on the National Register of Historic Places.

The imminent completion of the Tennessee-Tombigbee Waterway along the western delta, recent petroleum discoveries within delta wetlands and increasing population and industrial growth along the upland margins, require adequate assessment of this national and local resource for utilization planning and management.

This interim report addresses only the lower portion of the Delta, south of an east-west line passing through Hurricane, Baldwin County. The final report will include the entire Delta and will be presented in map format.

HABITATS EXAMINED

Three habitats, each considered a "wetland", were examined for the inventory. The most recent proposed classification of wetland habitats by the U.S. Fish and Wildlife Service defines wetlands as:

"...lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water...must have one or more of the following three attributes: (1) at least periodically, the land supports predominately hydrophytes; (2) the substrate is predominately undrained hydric soils; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year." (Cowardin et al., 1979, p. 3).

The Coastal Area Board further defines "wetlands" for management purposes as:

"...those areas saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." (Coastal Area Board, 1979 b., p. 42).

Included within the broad category "wetlands", are habitats commonly called marshes, grassbeds, swamps, bogs, pocosins and others with local names. Regardless of the nomenclature, each of these areas function to perform several important roles within the ecosystem. Each supports a unique floral and faunal community of which many component species are endemic to the particular habitat. A significant portion of the listed endangered and/or threatened species of a geographic area require a wetland habitat for their survival. In addition, wetland areas may provide critical habitat for transient species during some portion of their lives, i.e. nesting sites, nursery areas and breeding grounds.

Wetlands have the capacity to store large quantities of water and thus serve as both recharge sites to surrounding areas and as natural flood control features. Those wetlands adjacent to coastal shorelines also serve as storm buffers when absorbing and slowing storm-driven floodwaters.

Rooted wetland plants hold substrates against transport by moving waters. Erosion is thus reduced and turbidity levels minimized.

The food web role of different wetland types varies, but in all cases they provide essential nutrients in the form of detritus and dissolved organics. In many cases, the food web impact of a wetland is complex and extends beyond the immediate habitat into adjacent ecosystems.

Though Cowardin, et al. (1979), of U.S. Fish & Wildlife, set forth a classification scheme for wetland habitats, the detailed hierarchy has not been applied in this study. Field testing of the wetlands classification was being initiated by the U.S. Fish and Wildlife Service at the time the Alabama inventory began and an applied classification had not yet been developed. Habitat designations appearing in this document may be converted to corresponding Fish and Wildlife categories using the information in Appendices A and B of this report.

MARSHES

Marshes are wetlands characterized by erect, rooted, herbaceous plants. The vegetation is usually dominated by perennial species. Marshes appear as wet grasslands occurring as extensive meadows, fringing margins of shorelines or isolated patches within other habitat types. The plant community is unique to the marsh and may generally be typified for any geographic area. Community composition will vary depending upon the nature of the water - its salinity, its depth, daily and annual cycles of flooding and drought, and other edaphic factors. Marshes are usually spoken of as freshwater, brackish or saline, reflecting the significant influence of salinity on species occurrence. (Saline and brackish marshes of the study area and many freshwater marshes were surveyed in a previous inventory and the results are not duplicated here, although their locations are indicated Sapp, et al., 1979 .) The U.S. Fish and Wildlife wetlands classification system includes marshes in its class "Emergent Wetland". (See Appendix A.)

SWAMPS

Wetlands with a canopy dominated by woody vegetation, shrubs or trees, are categorized as swamps. Understory species may be a combination of woody and herbaceous forms, but the outstanding vegetal feature is the canopy community. Swamps are located along estuarine and freshwater shorelines and in topographic depressions of inland areas. This wetland type may be divided into two categories:

- 1) shrub wetland - dominated by woody vegetation less than 20 feet (6 m) tall, consisting of shrubs, young trees or trees and shrubs stunted

- by environmental conditions, and
- 2) forested wetlands-dominated by woody vegetation taller than 20 feet (6 m).

These two categories correspond to U.S. Fish and Wildlife classes "Scrub-Shrub Wetland" and "Forested Wetland". (See Appendix A.)

SUBMERSED GRASSBEDS

Habitats supporting rooted vegetation that are not normally emergent at low water, but remain covered by water, are designated submersed grassbeds. Plant species present are diverse, but require surface water for optimum growth and reproduction. Grassbeds may be monotypic in species composition or mixed, with two or more species occurring. Water salinity, clarity and depth are important environmental factors affecting community composition, though substrate types also play a role. The submersed grassbeds' habitat is included in the Fish and Wildlife class "Aquatic Bed." (See Appendix A.)

METHODOLOGY

PHOTO SOURCES

Color infra-red photographs with a scale of 1:15,000 were utilized for boundary delineation, data recording, and acreage determinations (NASA Mission JSC 411, Project 0839, October, 1979).

PHOTO INTERPRETATION AND FIELD VERIFICATION

The ten foot contour was delineated on photos based upon the most recent U.S. Geological Survey topographic map of each area inventoried. For terrestrial wetland types (i.e. marshes and swamps) transects were delineated to traverse all signature differences on each frame of the imagery. Each transect was inspected by boat or walking for verification of habitat types. A list of species and individual dominance was prepared for each transect. Approximately fifty (50) percent of the study area was field-checked for terrestrial wetland types.

Difficulties were encountered in identifying reliable signatures for submersed grassbeds. Minimal depth penetration of the photography prevented location of possible beds in waters deeper than 1.0-2.0 meters. In many areas, mud flats, accumulations of organic detritus and other shallow bottom features projected signatures indistinguishable from submersed grassbeds. Therefore 100% of the study area was field inspected to locate and identify grassbeds. All

shorelines were surveyed from high water to water depths of 2.0 meters. During clear water conditions, grasses could be located visually. When turbidity was high, bottoms were surveyed along transects using drag rakes to locate bed boundaries. Bed dimensions were determined and transferred to topographic field maps. Grasses were hand collected for species determination and community descriptions. Notes were made on phenophase events for each species collected, including growth, flowering, fruiting and senescence.

MAP PREPARATION

U.S. Geological Survey topographic quadrangles on mylar were utilized as basemaps. Four 7½' quadrangles (1:24,000) were used to obtain coverage of the area (See Table 1). Black-line renderings of black, blue and red map overlays were included in the base maps. Information was transferred from photographs and field notes to topographic maps for atlas presentation.

AREA MEASUREMENTS

Areal measurements of each habitat type were prepared on both photographs and base maps. Measurements were made using a K & E Polar Planimeter (Model 620002, 99% accuracy). Total areas were calculated for each habitat type and each quadrangle, and expressed in acres and hectares (2.47 acres or 100 m x 100 m).

LIMITATIONS

In general, areas smaller than one acre could not be portrayed at either atlas scale and have, therefore, not been included in this report. Consequently, submersed grassbeds with patchy, rather than continuous occurrence, have been outlined with broken line boundaries, since individual patches could not be delineated. In addition, continuous, narrow bands of vegetation, too narrow for the atlas scale, have been indicated by a single solid line instead of an enclosed area.

Table 1. Index to Quadrangle Maps of
The Lower Mobile-Tensaw River Delta

QUADRANGLE	MAP NUMBER
Bridgehead	2
Chickasaw	4
Hurricane	3
Mobile	1

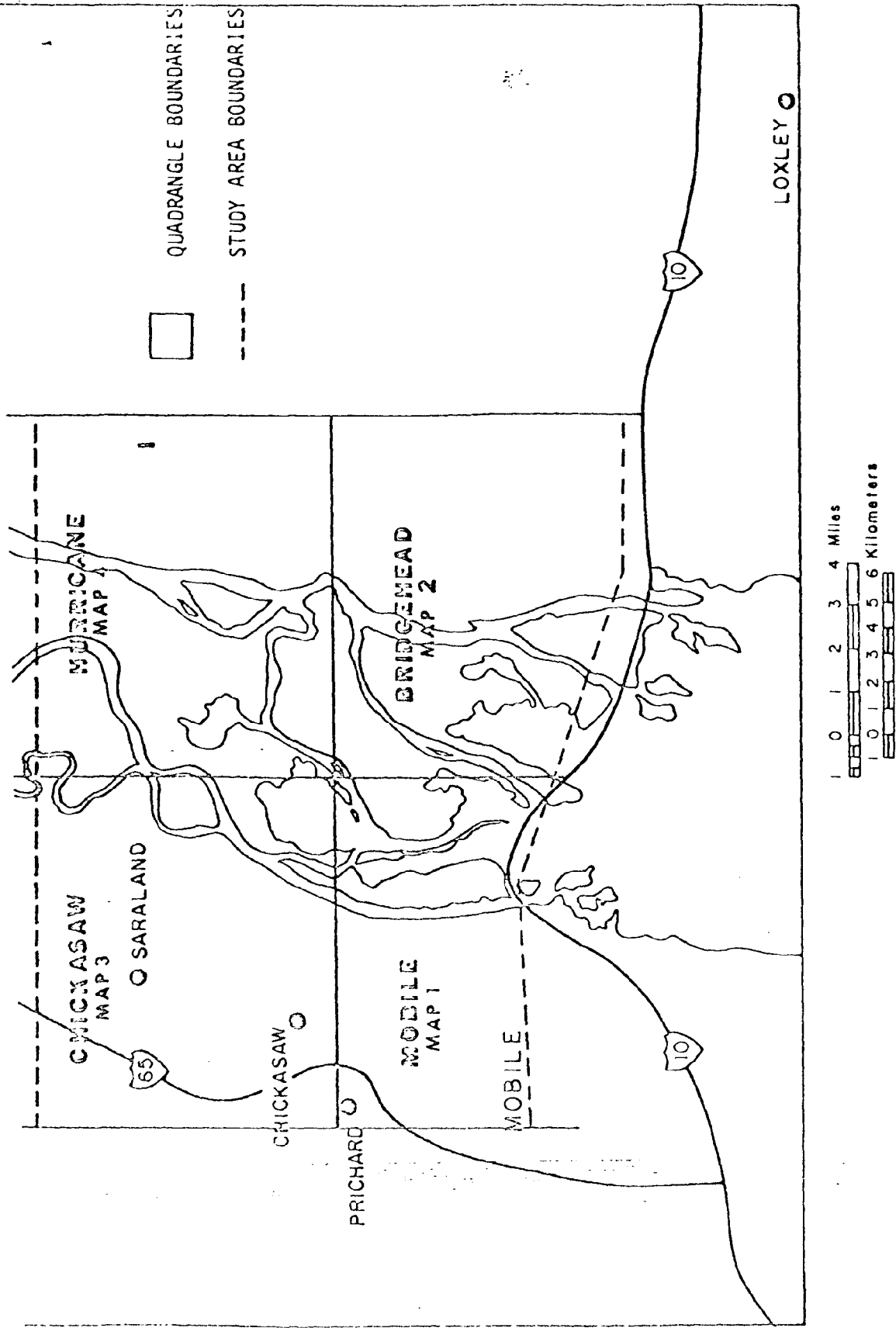


Figure 1. Location of Study Site and Boundaries of Atlas Maps.

FINDINGS

Approximately 32,626 acres (13,594 hectares) of wetland habitats were mapped within the Lower Delta. Distribution within the various types of wetlands is summarized in Table 2.

FORESTED WETLANDS-SWAMPS

Dense and extensive swamps occur along and between the major rivers and their tributaries throughout the Mobile-Tensaw Delta. The vegetation of these swamps varies, depending primarily on the frequency, depth and duration of flooding. Interactions between water level factors and soil characteristics may enhance or overshadow the impacts of flooding alone.

Four distinct habitats were identified as swamp types within the coastal zone. Criteria for separating these habitats include:

1. dominant plant species (canopy and understory);
2. density/openness of tree cover; and
3. flooding patterns.

Descriptions of these types, as they occur in the study area, follow. Checklists of the dominant species of each are provided in Appendix B.

Bay Forest (Atlas Type VI)

Bay forest occur on sandy acidic soils bordering streams and rivers. The vegetation of these swamps vary depending partly on the amount and duration of flooding. If flooding is extensive, pond cypress (Taxodium distichum var. nutans) and swamp tupelo (Nyssa sylvatica var. biflora) may dominate the canopy. Usually, under moderate flooding the dominant trees are sweet bay (Magnolia virginiana). Red maple (Acer rubrum), swamp tupelo; swamp bay (Persea palustris), and tulip

TABLE 2. SUMMARY OF THE WETLAND
HABITATS OF THE LOWER MOBILE-TENSAW
RIVER DELTA, 1981

HABITAT TYPE	COVERAGE	
	ACRES	HECTARES
Alluvial Swamp (X)	18,533	(7,722)
Bay Forest (VI)	1,901	(759)
Freshwater Marshes (III)		
High Marsh (B)	6,235	(2,524)
Low Marsh (A)	4,248	(1,719)
Moist Pine Forest (IV)	404	(168)
Moist Pine Savannah (V)	60	(24)
Aquatic Beds	3,696	(1,496)
Spoil	529	(214)
Upland (Below the 10' Contour)	715	(290)
TOTAL	32,626	(13,594)

tree (Liriodendron tulipifera) may also occur there. White cedar (Chamaecyparis thyoides) becomes increasingly more common in swamps along upper reaches of streams.

Few plants grow under the dense shade of those trees; among these are such shrubs as Virginia willow (Itea virginica), star anise (Illicium floridanum), and fetterbush (Leucothoe axillaris). Netted chain fern (Woodwardia areolata) and cinnamon fern (Osmunda cinnamomea) are among the few shade tolerant herbs growing there.

The more open borders of these swampy woods may be covered by dense thickets of swamp cyrilla (Cyrilla racemiflora), black titi (Cliftonia monophylla), and large gallberry (Ilex coriacea). Wax myrtle (Myrica cerifera) and yaupon (Ilex vomitoria) also grow in this habitat and are especially common along brackish waters.

The transition zone between these forested wetlands and upland pine-oak forests may support growth of plants adapted to somewhat better drained condition such as water oak (Quercus nigra), laurel oak (Q. laurifolia), sweetgum (Liquidambar styraciflua), southern magnolia (Magnolia grandiflora), and devilwood (Osmanthus americana).

Alluvial Swamps (Type X)

Areas of low relief, subjected to only short periods of seasonal inundation may support a mixture of relatively flood tolerant species including swamp tupelo (Nyssa sylvatica var. biflora), red maple (Acer rubrum var. rubrum and var. drummondii), green ash (Fraxinus pennsylvanica), pumpkin ash (F. profunda), swamp cottonwood (Populus heterophylla) and overcup oak (Quercus lyrata) as well as the extremely flood tolerant bald cypress (Taxodium distichum) and water tupelo (Nyssa aquatica).

Numerous shade tolerant species may occupy the shrub and ground layers including Virginia willow (Itea virginica), winterberry (Ilex verticillata), dwarf palmetto (Sabal minor), Hypericum walteri, water hemlock (Cicuta maculata), ladies tresses orchid (Spiranthes odorata), panic grass (Panicum gymnocarpon), rice cut grasses (Leersia lenticularis and L. virginica), Justicia ovata, swamp milkweed (Asclepias perennis), false nettle (Boehmeria virginica) and the day flower (Commelina virginica).

Openings in the canopy of these swamps allow plants which occur predominantly in adjacent marshes to grow there. Examples are arrow arum (Peltandra virginica), pickerel weed (Pontederia cordata), Ludwigia glandulosa, L. decurrens and L. leptocarpa.

Moist Pine Forest (Type IV)

Another common type of forested wetland in the region is the moist pineland, prevalent in areas of low relief and poor drainage between streams. It often forms a more or less extensive strip between floodplain swamps and upland pine-oak forest. Despite its apparent monotony, the vegetation of moist pinelands is diverse and rich in species. The most common tree is the slash pine (Pinus elliotii) although longleaf pine can also grow there. The understory may be very dense, especially if fire has been prevented, consisting largely of gallberry (Ilex glabra), wax myrtle (Myrica cerifera), saw palmetto (Serenoa repens), St. John's-worts, such as Hypericum fasciculatum, and occasional sweet bay, swamp bay and swamp tupelo.

Moist Pine Savannah (Type V)

This habitat type is similar to the moist pine forest with an overstory of slash or longleaf pines. However, the tree canopy is much more open and

the understory more herbaceous than shrubby. The vegetation of this habitat reflects clearing of the dominant trees and shrubs, usually by recurrent burning. A great diversity of sedges, grasses and other herbaceous plants grow in the open, sunny understory of these moist pinelands. Possibly the most colorful and unusual plants in this habitat are insectivorous plants such as the pitcher plants (Sarracenia spp.), sundews (Drosera spp.) and butterworts (Pinguicula spp.). Other attractive and conspicuous herbs of this community include pipewort (Eriocaulon decangulare), redroot (Lachnanthes tinctoria), golden crest (Lophiola americana), milkworts (Polygala spp.), meadowbeauties (Rhexia spp.), yellow-eyed grasses (Xyris spp.), ladies' tresses orchids (Spiranthes spp.), fringed orchids (Habenaria spp.), the rose crested orchids (Pogonia ophioglossoides), and the uncommon rosebud orchid (Cleistes divaricata). Numerous plants of the moist pinelands are included in the list of endangered and threatened plants of the state.

Geographic Distribution of Forested Wetlands

Distribution of forested wetland types are summarized by quadrangle in Table 3. Types IV and V, the Moist Pine Forest and Moist Pine Savannah, are restricted to topographic rises within the interior of the Delta and the margins approaching the 10-foot contour.

Consequently, their contribution to the total acreage is minor (1.3%). However, the two swamp types (VI and X) are the primary cover vegetation of the Lower Delta, representing 18,533 acres or 56.2% of Delta wetlands. Swamps exhibit an increased predominance on a north to south gradient, probably indicative of relative age of the emergent communities.

EMERGENT WETLANDS-MARSHES

Within the study area only freshwater marshes are found, but may be divided into low marsh and high marsh. Subdivisions reflect both elevation and consequent impact in changing water levels.

Low Marsh (Type IIIA)

Low marshes are found occupying shallow flats in the large bays and on the gently sloping shores of slower moving water courses. This zone is frequently flooded but not on a regular, predictable schedule. Though the vegetation is emergent (partially above water) at all times, the roots and lower leaves and stems are covered by water on both a seasonal basis and, along the Cochrane causeway, on a tidally influenced basis.

Sedges, grasses and rushes are often the dominant vegetation of these marshes, including panic grass (Panicum gymnocarpon), wild rice (Zizania aquatica and Zizaniopsis miliacea), and saw grass (Cladium jamaicense), as well as numerous species of beak rushes (Rynchospora spp.), spike rushes (Eleocharis spp.), umbrella sedges (Cyperus spp.), and rushes (Juncus spp.) Occasionally other plants such as alligator weed (Alternanthera philoxeroides), arrowhead (Sagittaria falcata and S. latifolia) or cattails (Typha latifolia and T. domingensis) are the dominant vegetation. Other plants commonly encountered in the low marsh are pennyworts (Hydrocotyle spp.), numerous species of false loosestrife (Ludwigia spp.), golden club (Orontium aquaticum), arrow arum (Peltandra virginica), swamp lily (Crinum americanum), marsh fleabane (Pluchea odorata), pickerelweed (Pontederia cordata) and lizard's tail (Saururus cernuus).

Scattered shrubs and individual small trees may be found in these marshes on slightly higher spots or ridges. The following may be represented: buttonbush (Cephalanthus occidentalis), swamp tupelo (Nyssa sylvatica var. biflora), swamp dogwood (Cornus stricta) and bald cypress (Taxodium distichum).

High Marsh (Type IIIB)

As accretion of sediments continues in the low marsh the elevation rises slightly and the marsh becomes dominated by less flood-tolerant herbaceous species. This high marsh may occur as a continuous zone between the low marsh and higher forested wetlands, as isolated patches of higher ground within the low marsh or may represent the dominant marsh type on more stable, steeper shorelines. As in the low marsh, dominant vegetation is often grasses or sedges including common reed (Phragmites australis), cordgrass (Spartina cynosuroides and S. patens), switch grass (Panicum virgatum) and Carex hyalinolepis. Frequently occurring herbs are marsh fleabane (Pluchea spp.), climbing hempweed (Mikania scandens), beggar's tick (Bidens spp.), morning glory (Ipomea sagittata) and royal fern (Osmunda regalis).

Trees and shrubs are much more frequent in the high than the low marsh reflecting the longer exposure periods experienced due to the higher elevation. A variety of woody species may be observed, including wax myrtle (Myrica cerifera), elderberry (Sambucus canadensis), bastard indigo (Amorpha fruticosa), marsh mallows (Hibiscus militaris and Kosteletzkya virginica), black willow (Salix nigra), yaupon (Ilex vomitoria) and sea myrtle (Baccharis halimifolia).

Geographic Distribution of Freshwater Marshes

Freshwater marshes occupy large expanses of the southernmost, younger portion of the Delta. In addition, marshes may be found along margins of creeks and rivers upon recently emergent bottoms. Marshes are the dominant wetland habitat of the Mobile and Bridgehead quadrangles (Table 3, Maps 1 and 2) and represent 28.9% (10,483 acres) of study area total wetland acreage.

SUBMERGED GRASSBEDS

Submerged grassbeds are found in the shallow flats of bays, small tributaries and in pockets along the margins of the larger rivers. Twenty-four species of submerged plants were identified and are characterized in Table 5. Most beds were represented by mixed communities, usually, however, exhibiting strong dominance by one or several species (Tables 6 and 7). Four species, Eurasian milfoil (Myriophyllum spicatum), bushy pond weed (Najas guadalupensis), charophytes (not identified to species) and slender pondweed (Potamogeton pusillus) occurred most frequently and cover the majority of the acreage mapped. Of these four species, Eurasian milfoil, is the most abundant.

Myriophyllum spicatum is an introduced, not native, species and is considered a "pest species" or "obnoxious weed" in the United States. Its lush and complex growth form overshadows and outcompetes other more desirable waterfowl food species (see Table 8). In addition, boaters find it almost impossible to navigate for any distance through beds of milfoil without choking the motor. Baldwin (1957) identified this species as a significant problem during a 1956 inventory of waterfowl habitats in the delta. Figure 2 illustrates the increase in coverage of this species

TABLE 3. ACREAGES OF EMERGENT WETLAND COMMUNITIES OF THE LOWER MOBILE-TENSAW RIVER DELTA, 1981, BY TOPOGRAPHIC QUADRANGLE (SEE TABLE 1 FOR INDEX), ACRES (HECTARES).

TOPO	ALLUVIAL SWAMP (X)	BAY FOREST (VI)	MOIST PINE FOREST (IV)	MOIST PINE SAVANNAH (V)	UPLAND (VIIA)	FRESHWATER MARSHES HIGH (IIIB)	LOW (IIIA)	SPOIL	TOTALS
Hurricane	12,593.1 (5,096.43)					866.5 (350.51)	943.1 (381.67)	162.7 (65.84)	14,565.4 (6,068.9)
Bridgehead	1,210.7 (490.16)	736.0 (297.98)				3,909.4 (1,582.1)	2,225.8 (900.78)	97.5 (39.46)	8,179.4 (3,408.1)
Mobile	159.1 (64.39)					830.9 (39.05)	706.1 (285.76)	236.6 (95.75)	1,932.7 (805.3)
Chickasaw	4,570.3 (1,849.60)	1,165.2 (471.74)	403.5 (168.1)	60.0 (24.28)	715.3 (289.48)	628.2 (254.23)	372.9 (150.91)	32.6 (13.19)	7,948.0 (3,311.7)
TOTALS	18,533.2 (7,722.2)	1,901.2 (769.72)	403.5 (168.1)	60.0 (24.28)	715.3 (289.48)	6,235.0 (2,524.29)	4,247.9 (1,719.13)	529.4 (214.25)	32,625.5 (13,594.0)

TABLE 4. . ACREAGES OF EMERGENT WETLAND COMMUNITIES OF THE LOWER MOBILE-TENSAW RIVER DELTA, 1981, BY PHOTO, ACRES (HECTARES).

PHOTOS	ALLUVIAL SWAMP (X)	DAY FOREST (VI)	MOIST PINE FOREST (IV)	MOIST PINE SAVANNAH (V)	UPLAND (VIIA)	FRESHWATER MARSHES HIGH (IIIB)	LOW (IIIA)	SPOIL	TOTALS
211	6,219.2 (2,531.21)	1,165.2 (471.74)	403.5 (168.1)	60.0 (24.28)	715.3 289.48	888.1 (359.41)	973.6 (394.02)	32.6 (13.19)	10,457.5 (4,357.3)
171	6,333.7 (2,563.25)					151.4 (61.30)	215.1 (87.05)		6,700.2 (2,791.1)
170	5,655.5 (2,329.25)					2,325.8 (941.25)	1,676.2 (678.36)	162.7 (65.84)	9,920.2 (4,133.4)
213	161.5 (24.89)					1,071.4 (433.60)	385.9 (156.17)	236.6 (95.75)	1,855.4 (773.11)
168	53.3	736.0 (297.98)				1,798.3 (727.78)	997.1 (403.53)	97.5 (39.46)	3,692.2 (1,538.4)
TOTALS	18,533.2 (7,722.2)	1,901.2 (769.72)	403.5 (168.1)	60.0 (23.28)	715.3 (289.48)	6,235.0 (2,524.29)	4,247.9 (1,719.13)	529.4 (214.25)	32,625.5 (13,594.0)

TABLE 5. CHARACTERISTICS AND OCCURRENCE OF SUBMERSED AQUATICS IN
THE LOWER MOBILE-TENSAW RIVER DELTA.

SPECIES (common Name)	DESCRIPTION	OCCURRENCE
<u>Azolla caroliniana</u> - Az (Mosquito fern)	Free floating fern, plants green to dark red, 1 cm wide, often in dense mats. Leaves in two rows, the upper on the water surface, the lower submersed and slightly larger. Spores borne on the lower leaf lobes.	Dead-end canals.
<u>Cabomba caroliniana</u> - Cc (Fanwort)	Perennial herb with submersed and when in flower, floating leaves; submersed leaves opposite or whorled, dichotomously dissected into linear leaflets; floating leaves alternate, linear-elliptic, peltate; corolla white with yellow spots at base.	Creeks, (esp. upper portions) bayous (esp. abundant in small creek N. of Chuckfee Bay)
<u>Ceratophyllum demersum</u> - Cd (Coontail, Hornwort)	Herbaceous aquatic; stems usually much branched, leaves whorled with 9-10 leaves/whorl, dissected; leaflets up to 3 cm long with distinct marginal serrations.	Creeks, bays, rivers, bayous

TABLE 5. CHARACTERISTICS AND OCCURRENCE OF SUBMERSED AQUATICS IN
THE LOWER MOBILE-TENSAW RIVER DELTA.

SPECIES (common Name)	DESCRIPTION	OCCURRENCE
<u>Charophytes</u> - CHR (Muskgrasses, stoneworts)	Macroscopic, submerged algae with upright green stems; main axis branched, divided into alternating long and short internodes from which arise whorls of branchlets. Generic distinctions may be made on the basis of the structure of the branchlets - simple (Chara), forked (Nitella) or monopodial (Tolypella).	Bays, creeks, rivers, bayous
<u>Eichhornia crassipes</u> - Ec (Water-hyacinth)	Aquatic herb with rosettes of leaves, free-floating or stranded in mud. Leaves ovate, petioles usually spongy-inflated. Inflorescence spicate, flowers few. Perianth blue with yellow streaks, 2-lipped, showy. Fruit an ellipsoid capsule.	Sluggish creeks, dead end canals, log jams and bayous.
<u>Heteranthera dubia</u> - Hd (Water star-grass)	Submersed aquatic with sessile, linear leaves. Flowers solitary, exerted from a terminal spathe. Perianth lobes yellow, linear fruit a capsule.	Bays, creeks, rivers bayous.
<u>Hydrochola caroliniensis</u> - Hc (Watergrass)	Submersed, weak-stemmed, freely branching herb; leaves flat, up to 5 cm long and 4 mm wide.	Slow moving streams, lakes and headwaters of rivers.

TABLE 5. CHARACTERISTICS AND OCCURRENCE OF SUBMERSED AQUATICS IN
THE LOWER MOBILE-TENSAW RIVER DELTA.

SPECIES (common Name)	DESCRIPTION	OCCURRENCE
<u>Myriophyllum spicatum</u> - Ms (Eurasian Watermilfoil)	Rhizomatous, branching perennial herb; leaves whorled, pinnately divided, 14-21 pairs of leaflets; leaflets approximately 1.8 cm long; Flowers axillary.	Creeks, bays, rivers esp. Chacaloache Bay, Big Bateau Bay, Bay Minette Basin & Bay, Delvan Bay, Bay Grass
<u>Najas guadalupensis</u> - Ng (Common Water Nymph, Bushy Pond Weed)	Submersed aquatic herb with slender branching stems; leaves opposite, linear, simple, up to 2 cm long and 1.5 mm wide, leaf margins finely serrulate, bases sheathed; flowers axillary, sessile.	Bays, creeks, rivers, bayous. Appears most abundant in shallow waters (.5m or less) esp. Chuckfee Bay, Justin's Bay, Little Bay John
<u>Najas minor</u> - Mi (Yellow-lotus)	Bushy-branched, submersed annual. Leaves opposite, stiff, with coarsely spinulose teeth, usually recurved. Flowers axillary; staminate and pistillate flowers. Fruit a greenish achene.	Gravine Island Bay was the only site where this species was encountered
<u>Nelumbo lutea</u> - Nel	Rhizomatous perennial with emergent, alternate leaves. Leaves orbicular, entire, peltate; some floating, some emergent; petioles to 1 meter or more long. Flowers solitary on long peduncles. Perianth parts numerous, yellow; sepals grading into petals. Fruit acorn-like; imbedded in an obconic, flat-topped receptacle.	Creeks, bays, rivers. Greatest abundance along Tensaw River.

TABLE 5. CHARACTERISTICS AND OCCURRENCE OF SUBMERSED AQUATICS IN
THE LOWER MOBILE-TENSAW RIVER DELTA.

SPECIES (common Name)	DESCRIPTION	OCCURRENCE
<u>Nuphar luteum</u> - N1 (Spatter-Dock, Cow-Lily, Yellow Pond Lily)	Rhizomatous, aquatic perennial with sub- mersed or emersed leaves; leaves sub- orbicular to lan- ceolate, up to 5 dm long and 3 dm wide; flowers axillary, yellow or sometimes with reddish tinge.	Margins of fresh water streams, lakes, ponds, protected coves of rivers.
<u>Nymphaea mexicana</u> - Nm (Yellow Water-Lily)	Perennial aquatic herb with floating leaves. Leaves ovate - oval to orbicular, entire, green above, purple below. Flowers floating, sepals 4, green; petals numerous, bright yellow. Fruit berry-like, many seeded.	Big Bay John.
<u>Nymphaea odorata</u> - No (White Water-Lily, Pond Lily)	Rhizomatous, perennial aquatic with floating leaves; leaves entire, suborbicular, up to 3 dm wide, bases notched to petiole, leaf purple below; flowers floating.	Creeks, bays, bayous
<u>Nymphoides aquatica</u> - Ha (Big Floating Heart)	Rhizomatous, aquatic perennial with floating leaves suborbicular with cordate bases, up to 20 cm long, upper leaf sur- face green, purple be- neath.	Freshwater stream margins, ponds, lakes.

TABLE 5. CHARACTERISTICS AND OCCURRENCE OF SUBMERSED AQUATICS IN
THE LOWER MOBILE-TENSAW RIVER DELTA.

SPECIES (common Name)	DESCRIPTION	OCCURRENCE
<u>Potamogeton crispus</u> - Pc (Curly Pondweed)	Rhizomatous, herbaceous aquatic with submersed leaves; leaves linear oblong, up to 10 cm long and 10 mm wide, undulate, sessile, with conspicuously toothed margins.	Creeks, shallow bay margins, rivers
<u>Potamogeton illinoensis</u> - Pill	Rhizomatous perennial with both submersed and floating leaves. Submersed leaves thin, translucent, often arcuate, elliptic to linear. Floating leaves elliptic or ovate ending in a blunt mucro. Spike of 8-15 whorls of flowers. Fruits greenish, obovate, suborbicular or ovate.	Major river courses, especially Tensaw River.
<u>Potamogeton nodosus</u> - Ph	Perennial aquatic herb with floating and submersed leaves. Submersed leaves linear or lanceolate. Floating leaves elliptic, long petioled. Spike of 10-17 whorls of flowers. Fruit brownish or reddish, obovate.	Rivers, creeks, bayous.

TABLE 5. CHARACTERISTICS AND OCCURRENCE OF SUBMERSED AQUATICS IN
THE LOWER MOBILE-TENSAW RIVER DELTA.

SPECIES (common Name)	DESCRIPTION	OCCURRENCE
<u>Potamogeton pectinatus</u> - Ppect	Rhizomatous perennial herb. Leaves all submersed, linear - filiform, appearing to originate at the top of the sheath. Spikes conspicuously interrupted by 2-4 unequal, remote whorls of flowers. Fruits obliquely obovate.	Major river courses.
<u>Potamogeton perfoliatus</u> <u>var. bupleuroides</u> - Pperf	Submersed rhizomatous herb. Leaves widely ovate, cordate at base and clasping, margins often undulating. Spikes short-cylindric, with 2-8 whorls of flowers. Fruits light brown or tan; obovate.	Major river courses.
<u>Potamogeton pusillus</u> - Pp (Slender Pondweed)	Perennial aquatic herb with freely branched stems; leaves submersed, linear, up to 7 cm long and 3 mm wide. Usually with two small, translucent glands at base, leaf free from stipule.	Creeks, rivers, bayous, bays
<u>Utricularia</u> sp. - Utric. (Bladderwort)	Aquatic or terrestrial herbs with alternate or whorled leaves; leaves dissected or very fine, linear; insect trapping bladders borne on the leaves; Scapes elongate flowers; white, yellow or purple.	Sluggish waters- heads of freshwater streams protected coves along rivers.

TABLE 5. CHARACTERISTICS AND OCCURRENCE OF SUBMERSED AQUATICS IN
THE LOWER MOBILE-TENSAW RIVER DELTA.

SPECIES (common Name)	DESCRIPTION	OCCURRENCE
<u>Vallisneria americana</u> - Va (Tapegrass, Eelgrass)	Stoloniferous, perennial aquatic; leaves elongate, linear, ribbon like, up to 6 dm long and 10 mm wide; leaf margins serrulate; Both staminate and pistillate flowers; free floating at anthesis.	Bays, creeks, rivers
<u>Zannichellia palustris</u> - Zp (Horned Pondweed)	Rhizomatous, perennial aquatic with freely branching stems; leaves opposite, linear, up to 6 cm long and 0.8 mm wide, stipules sheathing.	Creeks, shallow bays, rivers, bayous

*Descriptions after Radford, et al, 1968 and Godfrey and Wooten, 1979.

TABLE 6 . OCCURRENCE AND SPECIES COMPOSITION OF AQUATIC BEDS IN THE BAYS OF THE LOWER MOBILE RIVER DELTA, 1981. FOR SPECIES ABBREVIATIONS SEE TABLE 5 .

BAY	QUAD	TRANSECT NUMBER	DATE VISITED	SPECIES PRESENT	COMMENTS
Bay Grass	M	188	9/10/81	Ms	Ms matted over with <u>Cladophora</u> CHR = <u>Nitella</u> sp.
Bay Minette	B		6/19/81	Ms, CHR, Ng, Nl	
Bay Minette Basin	B	089	6/19/81	Ms, CHR, Ng	Extensive beds of Ms with small amount of <u>Nitella</u> sp.
Big Bateau Bay	B	067 069	6/5/81 6/5/81	Ms Ms, Hd	only small amount of Hd present
Big Bay John	H	193	9/10/81	Ms, Ng	
Chacalooche Bay	B	121	7/7/81	Ms*, Ng*, Va*, Pp*	Ms growing in water up to 1½ m along shallow margins of Bay, Ng is dominant.
		122	7/7/81	Va, Ms, Ng	Ng increases in abundance where water is shallow.
Chuckfee Bay	H	084 107 108	6/15/81 6/26/81 6/26/81	Ng, Pp Ng, Pp, CHR, Cd Ng, Pp, CHR, Cd, Ms	Upper Chuckfee Bay CHR = <u>Nitella</u> sp. only 1 plant of Ms found CHR = <u>Nitella</u> sp.
Deivan Bay	B	117 118	7/7/81 7/7/81	Ms Ms	soft mud- growing in band paralleling shoreline in water up to 1½ m, <u>Cladophora</u> mats cover Ms
		119	7/7/81	Ms*	Ms Covered with <u>Cladophora</u>
Gravine Island Bay	H	163	8/18/81	CHR, Ng, Cd, Mi	CHR = <u>Chara zeylandica</u> Bay almost completely filled in with vegetation
Justin's Bay	B	133	7/8/81	Ng, Pp, Ms, CHR	Bay very shallow < 1 m deep almost completely filled in with Ng, other spec occur in much lesser abundance
		134	7/8/81	Ng, Ms, Pp, CHR	CHR = <u>Nitella</u> sp. CHR = <u>Nitella</u> sp. - shift in subdominance

TABLE . OCCURRENCE AND SPECIES COMPOSITION OF AQUATIC BEDS IN THE BAYS OF THE
LOWER MOBILE RIVER DELTA, 1981. FOR SPECIES ABBREVIATIONS SEE TABLE .
(CONTINUED)

BAY	QUAD	TRANSECT NUMBER	DATE VISITED	SPECIES PRESENT	COMMENTS
Little Bateau Bay	B	077B	6/10/81	Ng, Zp, Ms, Pp, CHR, Ne1	<u>Nelumbo</u> found 8/24/81
Little Bay John	B	190	9/10/81	Ng, Pp, Cd, Ms	
Polecat Bay	M	182	9/1/81	Ng	Thick mat of <u>Cladophora</u>

* Found in flower.

TABLE 7 . OCCURRENCE AND SPECIES COMPOSITION OF AQUATIC BEDS IN WATERCOURSES OF THE
LOWER MOBILE RIVER DELTA, 1981. FOR SPECIES ABBREVIATIONS SEE TABLE 5 .

WATERCOURSE	QUAD	DATE VISITED	TRANSECT NUMBER	SPECIES PRESENT	COMMENTS
All Day Bayou	H	6/30/81	109	Hd, Va, Cd, Pp, Ng	N1 along shoreline Ec in very small amount
Alligator Bayou	H	7/10/81	136	N1, Ec	
Bay Grass Creek	M	9/10/81	188	Ms, Va	Narrow band along creek banks
Bay Minette Creek	B	6/19/81	090	CHR, Ng, Ne1, No, Na, Pn, N1, Ms	Near mouth-west of 239 Bridge CHR= Nitella sp.
		6/19/81	091	Hc*	=1.5 m-water depth
		6/19/81	092	Hc, Na, CHR, N1	small Bay east of Bridge CHR= Nitella sp.
		6/22/81	098	Utric*, Mh, Cc*, Cd	Lower Bay Minette Creek
		6/22/81	094	Na, Hc, Utric	Mid portion of creek - both sides.
		6/22/81	097	Utric, Hc, Mh	Lower Bay Minette Creek
		6/22/81	095	Na, No	Upper Bay Minette Creek-
		6/22/81	096	Na, No, Utric	1.5 m water depth
Big Bateau Bay Creek	B	8/24/81	172	Ms, Va	Upper Bay Minette Creek
					Ms especially abundant in upper reaches, Va = equal in abundance to Ms in lower reaches
Big Bay John Creek	H&B	4/28/81	051	Chr, Pc, Zp, Ms, Ng, Cd, Nm(*9/10)	aquatic beds line shore from mouth of creek to Bay CHR= Nitella sp.
		4/28	052	Ms, Nm(*9/10), Ng, Zp, CHR	East of Bay CHR= Chara sp.
		4/28	053A	Ms, CHR, Ng, Zp, Nm(*9/10)	Lower Portion of Creek - just above Bay CHR = Chara sp.
		4/28	053B	Cc, Ms, Ng, Zp, Pp, Nm(*9/10), Ne1	Upper portion of creek - above Bay "
		9/10	194	Ms, Ng, Nm*, Va, Cd	Creek leading into Big Bay John-compare with 051
		9/10	195	Ms, Ng, Cc, Cd, Hd, Va, Nm*, Ne1	Creek above Big Bay John- compare with 053A&B

TABLE 7 . OCCURRENCE AND SPECIES COMPOSITION OF AQUATIC BEDS IN WATERCOURSES OF THE
LOWER MOBILE RIVER DELTA, 1981. FOR SPECIES ABBREVIATIONS SEE TABLE 5.
(CONTINUED)

WATERCOURSE	QUAD	DATE VISITED	TRANSECT NUMBER	SPECIES PRESENT	COMMENTS
Big Bayou Canot	C	7/10/81	138	Nl, Ec	creek with no name off of Bayou Canot Nl occurs in discontinuous band becoming more abundant near head of creek where water is shallower- Ec in very small amount Log jams above RR-beds fairly continuous along both banks- sporadic in occurrence where log jams are absent.
Big Gravine Creek	H	8/18/81	164	CHR, Ng, Cd, Nl	Aquatics almost completely fill in creek - occur along banks of marsh and swamp CHR = <u>Chara</u> <u>zeylandica</u>
Black Creek	C	9/17/81	197	CHR, Utric., Ng, No	Along creek margins in upper portions CHR= <u>Nitella</u> & <u>Chara</u> spp.
Byrnes Lake	H	5/22/81	060	Nl*	Discontinuous band along creek margins on both sides - 3-4 m in width most abundant near mouth of stream-as you travel upstream, tree branches shade shallow waters and Nl is absent
Cattfish Bayou	C	7/21/81	159	Nl, Utric	Especially abundant in upper reaches CHR= <u>Nitella</u> & <u>Chara</u> spp.
Chicory Bayou	H	6/15/81	080	Ng, CHR, Pp, Zp, Cd	Upper and near Chuckfee Bay CHR= <u>Nitella</u> sp.
		6/30/81	111	CHR, Ng	Lower end above Grand Bay
Chuckfee Bay creek parallel to west bank	H	6/15/81	081	Ng, Pp, Cc, CHR, Hd, Nel, Zp	Submerged vegetation on both sides of creek CHR= <u>Nitella</u> sp.

TABLE 7 . OCCURRENCE AND SPECIES COMPOSITION OF AQUATIC BEDS IN WATER COURSES OF THE
LOWER MOBILE RIVER DELTA, 1981. FOR SPECIES ABBREVIATIONS SEE TABLE 5 .
(CONTINUED)

WATERCOURSE	QUAD	DATE VISITED	TRANSECT NUMBER	SPECIES PRESENT	COMMENTS
Conway Creek	B	8/24/81	168	Ms, Va, Ng	discontinuous beds along low marsh areas
		8/24/81	173	Ms, Ng, Va, Hd, Nel.	Ms very abundant, Ng closest to creek banks, Va - mixed with Ms in deeper waters, NI - 1 bed
Cutoff Creek	B	5/27/81	062	CHR, Zp, Ng, Cd, Ms	-Soft mud CHR = <u>Chara</u> sp.
Franklin Bayou	H	7/10/81	141	NI, Ng, Utric.	Scattered bands along shore
Hurricane Bayou	H	7/10/81	135	NI*	discontinuous band.
Irving's Lake	H	6/26/81	100	CHR, Ng, Cd	CHR = <u>Chara</u> & <u>Nitella</u> spp.
Justin's Bay Creek	B	7/8/81	132	Ng, Va, Pp, Ms, Hd	forms discontinuous band along shore
Little Bateau Bay Creek	B	8/24/81	169	Ng, Va, Ms, Pp, Cd, Hd	Cd & Ng - especially abundant in upper reaches Va - confined to deepest waters in middle of creek Ms - abundant along marsh in lower half of creek Pp - mixed with Ng Hd - in very small amounts Occurs in protected pockets along creek banks - rapid water movement through creek Scattered beds, rapid water flow Ms especially abundant in upper reaches
Little Bay John Creek	M	5/29/81 9/10/81	066? 189	Pc, Ms, Va, Ng Va, Ms, Cd	
Little Briar Creek	H	7/13/81	140	NI	Discontinuous band along creek margins - a few large beds within creek center (1 m deep)

TABLE 7. OCCURRENCE AND SPECIES COMPOSITION OF AQUATIC BEDS IN WATERCOURSES OF THE
LOWER MOBILE RIVER DELTA, 1981. FOR SPECIES ABBREVIATIONS SEE TABLE 5.
(CONTINUED)

WATERCOURSE	QUAD	DATE VISITED	TRANSECT NUMBER	SPECIES PRESENT	COMMENTS
Louis Bayou	C	6/30/81	113	CHR, Ng	CHR = Chara & Nitella spp. abundant in front of low ma Creek almost completely fill in with aquatics
Lower Crab Creek	M	8/19/81	166	CHR, Ng, Cd, Nl	Lower Creek Upper Creek Off of Mallard Fork Cc especially abundant in uppe reaches
Mallard Fork	H	9/22/81 9/22/81 9/22/81	201 202 203	Ng, Pp, Cd, Nel, Hd Ng, Va, Nel, Cd Ng, Cd, Cc*, Va, Hd, Pp.	
McVay's Lake	H	7/21/81	157	Nl, Ec, CHR, Utric	CHR= Chara zeylandica
Mike's Creek	H	7/13/81	145	Nl, Ec	Nl- Sporadic in lower reach abundant in upper Ec- Small amount, where log block creek.
Mudhole Creek	B	6/9/81	076	CHR, Zp, Ng, Hd, Ms, Va, Cd	CHR= Nitella sp. Very small amounts of Ms. V
Oak Bayou	H	6/26/81 6/26/81	102 103	No*, Hd*, CHR, NG No, CHR	CHR= Nitella sp. CHR= Nitella sp - found below floating leaves of Nymphaea odorata
Oak Leaf Bayou	H	6/26/81 6/26/81	104 105	CHR, Ng, Ng, Cc, Pp	CHR= Nitella & Chara spp.
One Mile Bayou	H	7/13/81	150	Ng, CHR, Cd	CHR= Nitella & Chara spp.
Pass Picada	B	6/9/81	072	Va*, Ms, Ng, Zp*	Va band ~ 5 m wide
Railroad Creek	H	9/29/81	209	Nl*	
Sand Bayou	H	6/26/81	106	Ng, CHR	CHR= Nitella sp.
Sardine Pass	B	7/8/81	131	Ng, Pp, Ms, Hd	Along banks
Stauter Creek	H	6/30/81	110	Ng, CHR, Cd	Growing in bands, usually i front of low marsh CHR= Chara braunii
Storm Creek	H	6/26/81	099	CHR, Ng, Cd	CHR= Nitella & Chara spp.

TABLE 7 . OCCURRENCE AND SPECIES COMPOSITION OF AQUATIC BEDS IN WATERCOURSES OF THE
LOWER MOBILE RIVER DELTA, 1981. FOR SPECIES ABBREVIATIONS SEE TABLE 5 .
(CONTINUED)

WATERCOURSE	QUAD	DATE VISITED	TRANSECT NUMBER	SPECIES PRESENT	COMMENTS
Three Mile Bayou	H&B	7/6/81	153	Ng, Cd, Cc, Hd, Va, CHR, Pp, Ec	CHR= Nitella & Chara spp. Ng- especially abundant in upper reaches Ec- 1 plant
Totes Creek	H	9/22/81 9/22/81 9/22/81	204 205 206	Ng, Cd, Cc, Hd, Va, CHR, No, Ec Cd, Ng, Va Va, Ng, Cd, Ms	
Williams Creek	H	7/10/81	137A	Ng, CHR, Cd, Utric, N1	SAV's completely fill in creel in upper reaches CHR= Nitella Chara braunii.
Wood's Creek	H	6/15/81 6/15/81 6/15/81	082 083 084	Va, Ms, Ng, Cc, Hd, Cd Cc* Va, Ng, Pp	Branch to west off of lower creek Upper-completely fills in creek Lower Creek
Yancey Bay	B	6/19/81	087	Ng, Pp, CHR, Ms, Hd	
Yellow Flycreek	M	8/19/81	167	Ng, Ms, Va, Hd, Pp, Cd, Cc, Pc	Canal completely filled in with SAV's

* Found in flower

TABLE 8. RELATIVE ABUNDANCE OF DELTA SUBMERGED AQUATICS IN DESCENDING ORDER OF ABUNDANCE, 1956. (After Baldwin, 1957).

COMMON NAME	SCIENTIFIC NAME	SYNONYMY - LUETH
Bushy Pondweed	* <u>Naias guadalupensis</u>	Southern Naiad
Wild Celery	* <u>Vallisneria spiralis</u>	-
Narrow-leaved Pondweed	* <u>Potamogeton pusillus</u> type	<u>P. foliosus</u>
*Water Stargrass	<u>Heteranthera dubia</u>	-
Muskgrasses	* <u>Nitella</u> spp.	Characeae
Horned Pondweed	* <u>Zannichellia palustris</u>	-
*Ribbon-leaf pondweed	<u>Potamogeton robbinsii</u>	<u>P. epihydrus</u>
Longleaf Pondweed	<u>Potamogeton nodosus</u>	(<u>P. fluitans</u> , Small?)
Coontail	<u>Ceratophyllum demersum</u>	-
*Watermilfoil	<u>Myriophyllum</u> sp.	Marestail
*Fanwort	<u>Cabomba caroliniana</u>	-

*Desireable waterfowl food.

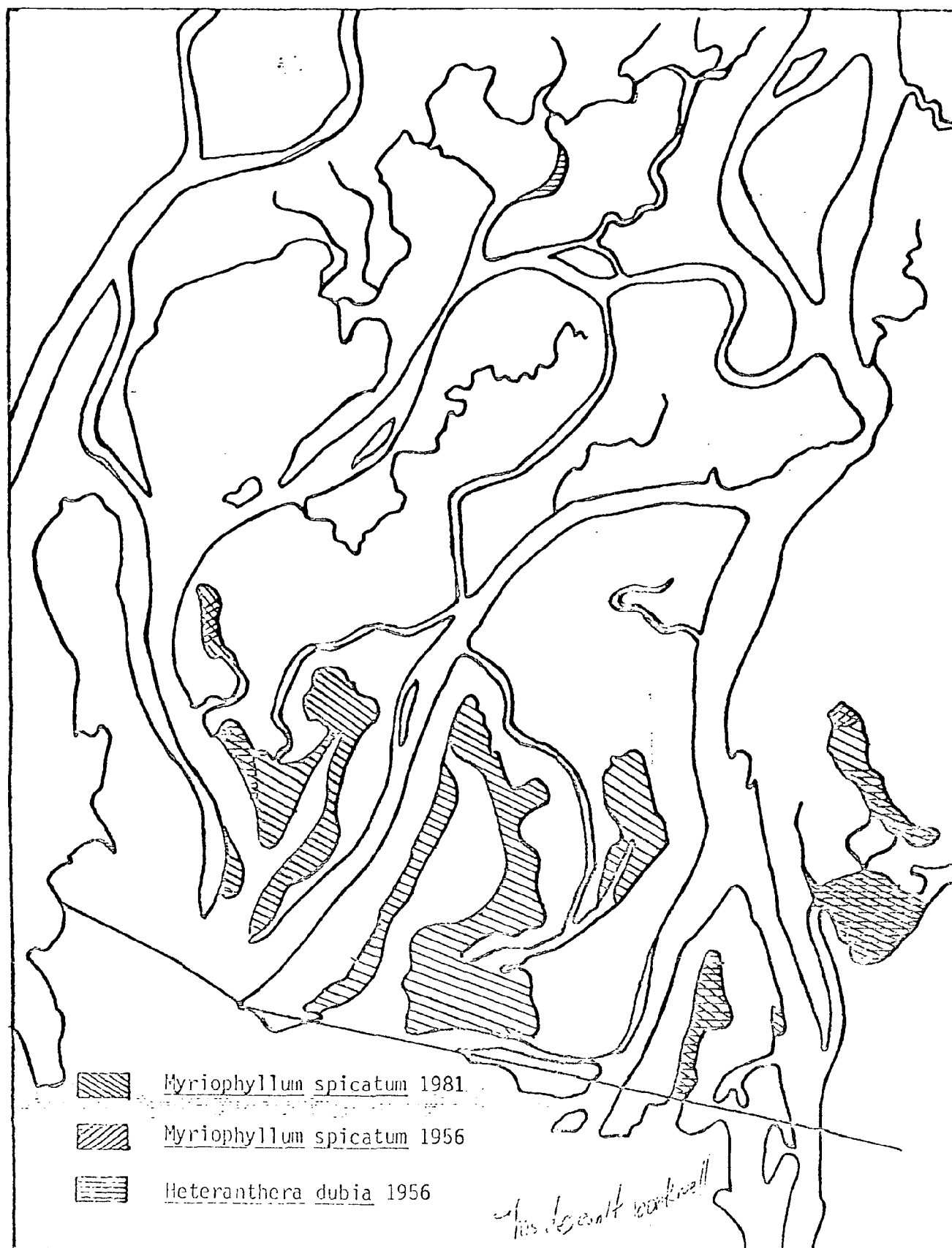


Figure 2. Locations of Obnoxious Aquatic Plant Species in the Lower Mobile-Tensaw River Delta, 1956 and 1981.

Table 9. MAJOR INFESTATIONS OF OBNOXIOUS SUBMERSED AQUATIC PLANTS IN MOBILE DELTA, 1979.
(From Powell, 1979).

Name of Area	% Infestation	Acreage Affected	Species
<u>Appalachee River</u>	-----	85-90 acres	<u>Myriophyllum spicatum</u> L.
<u>Blakeley River</u>	-----	40 acres	<u>Myriophyllum spicatum</u> L.
<u>Tensaw River (Lower)</u>	-----	25-30 acres	<u>Myriophyllum spicatum</u> L.
<u>Spanish River</u>	-----	50 acres	<u>Myriophyllum spicatum</u> L.
<u>Raft River</u>	-----	10 acres	<u>Myriophyllum spicatum</u> L.
<u>Bay Minette</u>	60%	288 acres	<u>Myriophyllum spicatum</u> L.
<u>Bay Minnette Basin</u>	85%	204 acres	<u>Myriophyllum spicatum</u> L.
<u>Bay Grass</u>	85%	81 acres	<u>Myriophyllum spicatum</u> L.
<u>Big Bateau</u>	80%	260 acres	<u>Myriophyllum spicatum</u> L.
<u>Big Bay John</u>	85%	-----	<u>Myriophyllum spicatum</u> L.
<u>Chocalata</u>	55%	995 acres	<u>Myriophyllum spicatum</u> L.
<u>Delvan</u>	55%	649 acres	<u>Myriophyllum spicatum</u> L.
<u>Yancy Bay</u>	45%	-----	<u>Myriophyllum spicatum</u> L.

between 1956 and 1981. An earlier study by Lueth in 1947 did not indicate the occurrence of "pest species" (Leuth, 1963) (Figure 3).

The current magnitude of the problem is being addressed by the Mobile District Corps of Engineers, Aquatic Weed Control Program. Powell (1979) identified problem areas similar to this study (Table 9) and a program of selective spraying has been initiated to open boat channels through beds of milfoil in small harbors and major fishing areas.

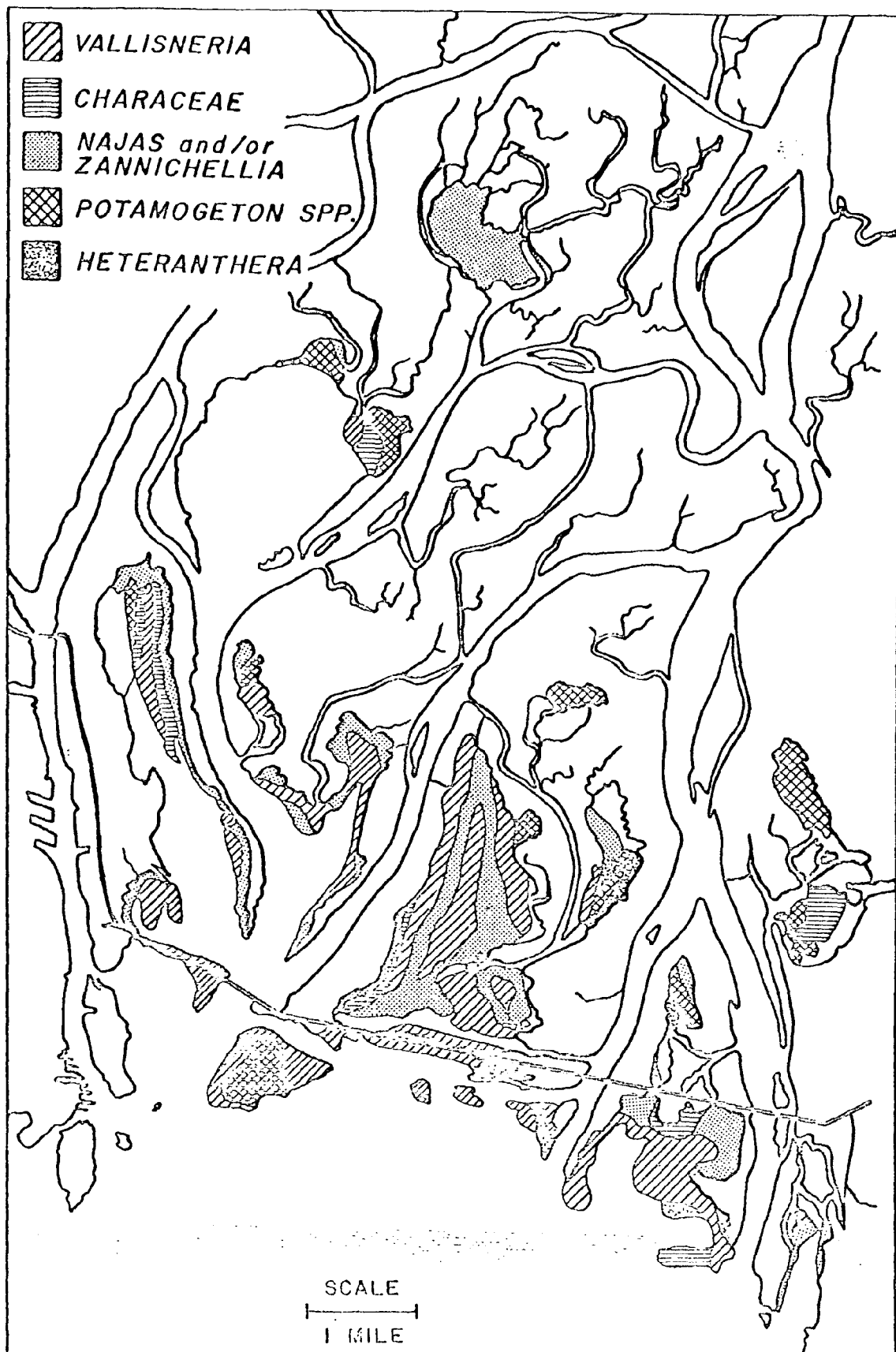
Geographic Distribution of Grassbeds

Approximately 3,696 acres (1,497 hectares) of submerged vegetation were located in the Lower Delta (Table 10). The most extensive coverage is in the large shallow bays (Chacaloochee Bay, Big Bateau Bay, Justin's Bay, Bay Minette, Delvan Bay and Little Bateau Bay) of the Bridgehead quadrangle (3,075 acres). These bays are being steadily filled by sedimentation and provide ideal habitat for submerged vegetation.

Table 10. AERIAL COVERAGE OF SUBMERGED AQUATIC VEGETATION (SAV) IN THE LOWER MOBILE-TENSAW RIVER DELTA, 1981, BY TOPOGRAPHIC QUADRANGLE (SEE TABLE 1 FOR MAP INDEX). ACRES (HECTARES).

QUADRANGLE	COVERAGE	
Bridgehead	3,075	(1,245)
Hurricane	343	(139)
Mobile	278	(113)
TOTAL	3,696	(1,497)

Figure 3. Distribution of Submersed Grassbeds of the Lower
Mobile-Tensaw River Delta, After Lueth, 1968.



The large rivers of the study area are too deep and fast moving for the establishment of submerged species. However, quiet bends, where velocities slow and sedimentation occurs, may support small patches of aquatic plants. Small tributary rivers and creeks often are lined by a marginal band of submersed vegetation. The map scale of the inventory does not allow accurate portrayal of these beds and the total acreage figures are consequently underestimates which do not include the narrow marginal beds.

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APPENDIX A

Wetlands Habitats Included (As classified in Cowardin et al., 1979)
With Corresponding Atlas Types Indicated.

FISH AND WILDLIFE SERVICE DESIGNATION			ATLAS DESIGNATION
Estuarine	Subtidal	Aquatic Bed	Grassbeds
	Intertidal	Aquatic Bed	Grassbeds
		Emergent Wetland	III A&B
	($<6m$)	Forested Wetland	IV,V,VI,X
Riverine	Tidal	Aquatic Bed	Grassbeds
		Emergent Wetland	III A&B
	Lower Perennial	Aquatic Bed	Grassbeds
	Upper Perennial	Emergent Wetland	III A&B
Palustrine		Aquatic Bed	Grassbeds
		Emergent Wetland	III A&B
		Forested Wetland	IV, V, VI, X

APPENDIX B

CHECKLIST OF THE DOMINANT PLANTS OF EMERGENT
AND FORESTED WETLANDS OF COASTAL ALABAMA

Type III A. Low Marsh

Trees and Shrubs (occasional)

Cephalanthus occidentalis (Buttonbush)
Cornus stricta (Swamp Dogwood)
Fraxinus caroliniana (Water Ash)
Nyssa sylvatica var. biflora (Swamp tupelo)
Taxodium distichum (Bald Cypress)

Herbs

Acnida cuspidata (Water Hemp)
Alternanthera philoxeroides (Alligator Weed)
Asclepias lanceolata (Milkweed)
Aster tenuifolius
Bacopa monnieri
Bidens laevis; B. mitis (Beggars tick)
Boltonia asteroides
Cicuta maculata (Water Hemlock)
Crinum americanum (Swamp Lily)
Galium tinctorium (Bedstraw)
Hydrocotyle bonariensis; H. umbellata (Pennywort)
Hymenocallis occidentalis (Spider Lily)
Iris virginica
Justicia americana (Water Willow)
Lilaeopsis chinensis
Ludwigia glandulosa; L. leptocarpa...
Lythrum lineare (Loose Strife)
Orontium aquaticum (Golden Club)
Peltandra virginica (Arrow Arum)
Pluchea odorata (Marsh Fleabane)
Polygonum hydropiperoides; P. punctatum (Smartweed)
Pontederia cordata (Pickereel Weed)
Ptilimnium capillaceum (Bishop Weed)
Sagittaria falcata
Sagittaria latifolia (Arrowhead)
Saururus cernuus (Lizard's Tail)
Sium suave (Water Parsnip)
Sphenoclea zeylanica (Chicken Spike)
Typha domingensis; T. latifolia (Cat Tail)

Grasses and Sedges

Carex alata, C. glaucescens
Carex hyalinolepis
Cladium jamaicense (Saw Grass)
Cyperus filicinus; C. haspan (Umbrella Sedge)
Cyperus odoratus; C. virens
Distichlis spicata
Echinochloa crus-galli; E. walteri (Water Grass)
Eleocharis elongata; E. equisetoides (Spikerush)
Eleocharis quadrangulata; E. obtusa
Juncus effusus (Soft Rush)
Juncus roemerianus (Needle Rush)
Leersia hexandra; L. oryzoides (Cut Grass)
Panicum dichotomiflorum (Fall Panic Grass)
Panicum hemitomon (Maidencane)
Rhynchospora corniculata (Beak Rush)
Sacciolepis striata
Scirpus americanus (Three-square-Bulrush)
Scirpus californicus (Giant Bulrush)
Scirpus robustus (Salt Marsh Bulrush)
Scirpus validus (Soft-stem Bulrush)
Zizania aquatica (Wild Rice)
Zizaniopsis miliacea (Southern Wild Rice)

Type III B. High Marsh

Trees, Shrubs and Woody Vines (scattered)

Amorpha fruticosa (Bastard Indigo)
Baccharis halimifolia (Sea Myrtle)
Hibiscus militaris (Marsh Mallow)
Hibiscus moscheutos
Ilex vomitoria (Yaupon)
Kosteletzkya virginica (Seashore Marsh Mallow)
Myrica cerifera (Wax Myrtle)
Salix nigra (Black willow)
Sambucus canadensis (Elderberry)
Sesbania macrocarpa
Sesbania vesicaria (Bladder Pod)
Wisteria frutescens

Herbs (Including Grasses and Sedges)

Andropogon virginicus (Broomsedge)
Bidens mitis; B. frondosa (Beggars Tick)
Calystegia sepium (Hedge Bindweed)
Carex hyalinolepis
Eupatorium serotinum (Fall Boneset)
Euthamia minor (Flat Top Goldenrod)
Helenium autumnale (Sneeze Weed)
Ipomoea sagittata (Morning Glory)
Mikania scandens (Climbing Hempweed)
Osmunda regalis (Royal Fern)
Panicum repens (Torpedo Grass)
Panicum virgatum (Switch Grass)
Phragmites australis (Common Reed)
Pluchea camphorata; P. odorata (Marsh Fleabane)
Solidago sempervirens (Seaside Goldenrod)
Spartina cynosuroides (Big Cordgrass)
Spartina patens (Saltmeadow Cordgrass)
Teucrium canadense (Germander)
Thelypteris palustris (Marsh Fern)
Vigna luteola

Type VI. Bay Forest

Trees

Acer rubrum (Red maple)
Chamaecyparis thyoides (White Cedar)
Gordonia lasianthus (Loblolly Bay)
Liriodendron tulipifera (Tulip Tree)
Magnolia grandiflora (Southern Magnolia)
Magnolia virginiana (Sweet Bay Magnolia)
Nyssa sylvatica var. biflora (Swamp Tupelo)
Osmanthus americana (Devilwood)
Persea palustris (Swamp Bay)
Pinus elliotii (Slash Pine)
Quercus laurifolia (Laurel Oak)
Q. nigra (Water Oak)
Salix nigra (Black Willow)
Taxodium distichum var. nutans (Pond Cypress)

Shrubs and Vines

Alnus serrulata (Hazel Alder)
Arundinaria gigantea (Cane)
Clethra alnifolia (Peper Bush)
Cliftonia monophylla (Black Titi)
Cyrilla racemiflora (Titi)
Decumaria barbara (Climbing Hydrangea)
Ilex coriacea (Large Gallberry)
Ilex vomitoria (Yaupon)
Illicium floridanum (Star Anise)
Itea virginica (Virginia Willow)
Leucothoe axillaris (Fetterbush)
Lyonia lucida (Fetterbush)
Myrica cerifera (Wax Myrtle)
Smilax glauca (Green Briar)
S. laurifolia (Green Briar)
Viburnum nudum (Possum-Haw Viburnum)
Vitis rotundifolia (Muscadine)

Herbaceous Plants

Carex glaucescens (Sedge)
Eleocharis flavescens... (Spike Rush)
Gratiola virginiana (Hedge Hyssop)
Hypericum mutilum (St. John's Wort)
H. virginicum
Juncus debilis; J. diffusissimus... (Rush)
Leersia virginica (Rice cutgrass)
Lindernia dubia (False pimpernel)
Lycopus rubellus (Water Horehound)
Oxotium aquaticum (Golden Club)
Osmunda cinnamomea (Cinnamon Fern)
O. regalis (Royal Fern)

Bay Forest
(Continued)

Peltandra virginica (Arrow-Arum)
Polygonum punctatum (Smartweed)
Rhynchospora miliacea (Beak Rush)
Thelypteris normalis (Widespread Maiden Fern)
Woodwardia areolata (Net Vein Chain Fern)
Xyris iridifolia (Yellow-Eyed Grass)

Type X. Alluvial Swamp

Trees

Acer rubrum var. drummondii - (Red Maple)
Carya aquatica (Water Hickory)
Diospyros virginiana (Persimmon)
Fraxinus caroliniana (Water Ash)
Fraxinus pennsylvanica (Green Ash)
Fraxinus profunda (Pumpkin Ash)
Ilex opaca (American Holly)
Liquidambar styraciflua (Sweetgum)
Magnolia virginiana (Sweet Bay)
Nyssa aquatica (Water Tupelo)
Nyssa sylvatica var. biflora (Swamp Tupelo)
Persea palustris (Swamp Bay)
Platanus occidentalis (Sycamore)
Populus deltoides (Cottonwood)
Populus heterophylla (Swamp Cottonwood)
Quercus laurifolia (Laurel Oak)
Q. nigra (Water Oak)
Salix nigra (Black Willow)
Taxodium distichum (Bald Cypress)
Ulmus americana (American elm)

Shrubs

Cephalanthus occidentalis (Buttonbush)
Cornus stricta (Swamp Dogwood)
Ilex verticillata (Winterberry)
Ilex vomitoria (Yaupon)
Itea virginica (Virginia willow)
Myrica cerifera (Wax myrtle)
Sabal minor (Dwarf Palmetto)
Styrax americana (Snow Bell)

Woody Vines

Ampelopsis arborea (Pepervine)
Anisostichus capreolata (Cross Vine)
Berchemia scandens (Pattan Vine)
Brunnichia cirrhosa (Ladies' eardrops)
Campsis radicans (Trumpet creeper)
Smilax laurifolia (Greenbriar)
S. rotundifolia
Toxicodendron radicans (Posion Ivy)
Vitis cinerea; V. vulpina (Grape)
V. rotundifolia (Muscadine)
Wisteria frutescens (Wisteria)

Herbs

Asclepias perennis (Swamp Milkweed)
Boehmeria cylindrica (False nettle)
Cicuta maculata
Commelina virginica (Dayflower)
Cynoctonum mitreola (Miterwort)
Dracocephalum virginianum (Dragonhead)
Eupatorium coelestinum (Mist Flower)
Gratiola virginiana
Hibiscus militaris
Hypericum walteri (St. John's Wort)
Justicia ovata
Lobelia cardinalis (Cardinal Flower)
Ludwigia alternifolia, L. glandulosa
Lycopus rubellus
Mikania scandens (Climbing Hempweed)
Onoclea sensibilis (Sensitive Fern)
Osmunda regalis (Royal Fern)
Polygonum hydropiperoides; P. punctatum (Smartweed)
Sabatia calycina
Samolus parviflorus
Saururus cernuus (Lizard's Tail)
Senecio glabellus (Butterweed)
Spilanthes americana var. repens
Spiranthes cernua var. odorata (Fragrant Ladies' Tresses)
Vernonia altissima (Giant ironweed)

Grasses and Sedges

Arundinaria gigantea (Cane)
Carex alata; C. gigantea
Carex intumescens; C. louisianica....
Chasmanthium latifolium
Leersia lenticularis, L. virginica (Cut Grass)
Leersia oryzoides (Rice Cut Grass)
Panicum gymnocarpon (Panic Grass)
P. rigidulum
Phynchospora corniculata, R. miliacea...(Beak Rush)

Types IV & V. Pine Savannah (Pocosin, Low Pineland, Bog)

Woody Plants (Trees, Shrubs and Vines)

Aronia arbutifolia (Red Chokeberry)
Arundinaria gigantea (Cane)
Clethra alnifolia (Pepperbush)
Cliftonia monophylla (Black Titi)
Cyrilla racemiflora (Swamp Cyrilla)
Hypericum cistifolium; H. brachyphyllum (St. John's Wort)
H. fasciculatum; H. myrtifolia
Ilex coriacea (Large Gallberry)
Ilex glabra (Gallberry)
Ilex cassine (Dahoon)
Lyonia lucida (Fetterbush)
Magnolia virginiana (Sweet Bay)
Myrica cerifera (Wax myrtle)
Nyssa sylvatica var. Biflora (Swamp Tupelo)
Persea palustris (Swamp Bay)
Pinus elliotii (Slash Pine)
Pinus palustris (Longleaf Pine)
Rhododendron viscosum var. Serrulatum (Swamp Azalea)
Rhus vernix (Poison Sumac)
Smilax laurifolia (Greenbriar)
Serenoa repens (Saw Palmetto)
Taxodium distichum var. Nutans (Pond Cypress)
Vaccinium elliotii; V. fuscum (Blueberry)

Herbaceous Plants (Except Grasses and Grass-Like Plants)

Aletris aurea; A. farinosa (Colic Root)
Asclepias lanceolata; A. longifolia (Milkweed)
Balduina uniflora
Calopogon pulchellus (Grass Pink Orchid)
Chondrophora nudata (Rayless Goldenrod)
Cleistes divaricata (Rosebud Orchid)
Drosera brevifolia; D. filiformis (Sundew)
Eriocaulon decangulare (Pipewort)
Habenaria blephariglottis (White Fringe Orchid)
Lachnanthes caroliniana (Red-Root)
Lobelia glandulosa; L. puberula (Lobelia)
Lophiola americana (Golden Crest)
Lycopodium alopecuroides; L. carolinianum (Clubmoss)
Pinguicula lutea; P. planifolia (Butterwort)
Pogonia ophioglossoides (Rose-Crested Orchid)
Polygala brevifolia; P. cruciata (Milkwort)
Polygala cyrillata; P. ramosa (Yellow Milkwort)
Rhexia alifanum; R. lutea (Meadow Beauty)
Sabatia brevifolia; S. macrophylla (Rose Gentian)
Sarracenia alata; S. flava (Yellow Pitcher Plant)
S. leucophylla (Purple Pitcher Plant)
S. psittacina (Parrot Pitcher Plant)
S. purpurea; S. rubra (Red Pitcher Plant)
Scutellaria integrifolia (Rough Skullcap)

Spiranthes praecox; S. vernalis (Ladies Tresses Orchid)
Tofieldia racemosa (False Asphodel)
Utricularia cornuta; U. juncea (Bladderwort)
Xyris caroliniana; X. difformis (Yellow Eyed Grass)

Grasses and Grass-Like Plants

Andropogon virginicus (Broom Sedge)
Anthaenanthia rufa
Aristida affinis; A. virgata (Three-Awn Grass)
Ctenium aromaticum (Toothache Grass)
Dichromena latifolia (White-Top Sedge)
Eleocharis microcarpa; E. tuberculosa (Spike Rush)
Erianthus giganteus (Plume Grass)
Fuirena squarrosa; F. scirpoidea (Umbrella Grass)
Muhlenbergia expansa (Muhly Grass)
Panicum consanguineum; P. ensifolium (Panic Grass)
P. spretum; P. scabriusculum
Rhynchospora chapmanii; R. ciliaris (Beak Rush)
R. glomerata; R. plumosa; R. pusilla
Scleria ciliata; S. reticularis (Nut Rush)

Type VII. Upland Pine-Oak Forest

Woody Plants (Trees, Shrubs and Vines)

Carya tomentosa (Mockernut Hickory)
Castanea pumila (Chinkapin)
Ceratiola ericoides (Rosemary)
Conradina canescens (Seaside Balm)
Cornus florida (Flowering Dogwood)
Diospyros virginiana (Persimmon)
Gaylussacia dumosa (Dwarf Huckleberry)
Gelsemium sempervirens (Yellow Jessamine)
Ilex vomitoria (Yaupon)
Magnolia grandiflora (Southern Magnolia)
Pinus clausa (Sand Pine)
Pinus palustris (Longleaf Pine)
P. elliotii (Slash Pine)
Quercus falcata (Southern Red Oak).
Q. hemisphaerica (Laurel Oak)
Q. incana (Blue-Jack Oak)
Q. laevis (Turkey Oak)
Q. margaretta (Sand Post Oak)
Q. myrtifolia (Myrtle Oak)
Q. virginiana (Live Oak)
Q. virginiana var. maritima (Dwarf Live Oak)
Rhus copallina (Winged Sumac)
Sassafras albidum (Sassafras)
Serenoa repens (Saw Palmetto)
Smilax auriculata (Greenbriar)
Vaccinium arboreum (Sparkleberry)
V. elliotii, V. myrsinites (Blueberry)

Herbaceous Plants (Except Grasses and Grass-Like Plants)

Agalinis purpurea; A. setacea (Purple foxglove)
Asclepias humistrata (Sand Milkweed)
A. tuberosa (Butterfly Weed)
Aster adnatus; A. linariifolius (Aster)
Calamintha coccinea (Red Basil)
Centrosema virginianum (Butterfly Pea)
Clitoria mariana (Butterfly Pea)
Cnidoscolus stimulosus (Spurge Nettle)
Coreopsis major
Crotalaria angulata; C. purshii (Rattlebox)
Desmodium laevigatum; D. viridiflorum (Beggar's Ticks)
Euphorbia corollata (Flowering spurge)
Gaillardia aestivalis (Gaillardia)
Galactia erecta; G. yulubilis (Milk Pea)
Lespedeza stuevei; L. virginica (Lespedeza)
Liatris elegans; L. graminifolia (Blazing Star)
Lucinus diffusus (Sandhill Lupine)
Penstemon australis (Beard tongue)
Phlox pilosa (Phlox)

Pycnanthemum incanum (Whitish Basil)
Salvia azurea (Blue Sage)
Schrankia microphylla (Sensitive Brier)
Solidago odora (Goldenrod)
Stillingia sylvatica (Queen's Delight)
Tephrosia florida; T. chrysophylla (Hoary Pea)
Tetragonotheca helianthoides (False Sunflower)
Trilissa odoratissima (Deer Tongue)
Vernonia angustifolia (Narrow-Leaf Ironweed)

Grass and Grass-Like Plants

Andropogon tener
Aristida lanosa; A. purpurascens (Three-Awn Grass)
Cyperus globulosus; C. retrorsus (Umbrella Sedge)
Danthonia sericea (Oat Grass)
Eragrostis refracta; E. spectabilis (Love Grass)
Gymnopogon ambiguus (Windmill Grass)
Panicum aciculare; P. angustifolium (Panic Grass)
Rhynchospora megalocarpa (Beak Rush)
Scleria triglomerata (Nut Rush)
Sorghastrum elliotii (Indian Grass)
Sporobolus junceus (Dropseed Grass)

ATLAS LEGEND

Submersed Grassbed Species

Az	<i>Azolla caroliniana</i>	Nm	<i>Nymphaea mexicana</i>
Cc	<i>Cabomba caroliniana</i>	No	<i>Nymphaea odorata</i>
Cd	<i>Ceratophyllum demersum</i>	Na	<i>Nymphoides aquatica</i>
Chr	Charophytes	Pc	<i>Potamogeton crispus</i>
Ec	<i>Eichhornia crassipes</i>	Pill	<i>Potamogeton illinoensis</i>
Hd	<i>Heteranthera dubia</i>	Pn	<i>Potamogeton nodosus</i>
Hc	<i>Hydrochloa caroliniensis</i>	Ppect	<i>Potamogeton pectinatus</i>
Ms	<i>Myriophyllum spicatum</i>	Pperf	<i>Potamogeton perfoliatus</i>
Ng	<i>Najas guadalupensis</i>	Pp	<i>Potamogeton pusillus</i>
Mi	<i>Najas minor</i>	Utric	<i>Utricularia</i> spp
Nel	<i>Nelumbo lutea</i>	Va	<i>Vallisneria americana</i>
Nl	<i>Nuphar luteum</i>	Zp	<i>Zannichellia palustris</i>

Marsh and Swamp Types

- III. Fresh Water Marsh A. Low Marsh B. High Marsh
- IV. Moist Pine Forest
- V. Moist Pine Savannah
- VI. Bay Forest.
- VII. A. Upland Pine-Oak Woodland
- X. Alluvial Swamp

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