

WETLAND HABITATS of the ALABAMA COASTAL ZONE

PREPARED BY:
ALABAMA MARINE ENVIRONMENTAL
SCIENCES CONSORTIUM
for the
ALABAMA COASTAL
AREA BOARD



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ALABAMA COASTAL AREA BOARD
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EXECUTIVE SUMMARY

The following inventory provides a baseline of extent and composition of wetland habitats as natural resources of the Alabama Coastal Zone. The inventory includes all areas within the Coastal Zone (10-foot contour south of the Battleship Parkway (Hwy. 90).

Habitats examined include swamps (forested wetlands), marshes and submersed grassbeds in coastal waters. Both black and white and color infra-red photography taken in September and October, 1979, were used to delineate habitat boundaries and to calculate acreage of coverage by each habitat. Plant community descriptions of all habitat types and locations of submersed grassbeds were determined in 1980 by extensive field surveys.

Wetland distributions and types are portrayed on U.S. Geological Survey topographic maps. Eighteen 7½ quadrangles (1:24,000) and two 15' quadrangles (1:62,500) were used to obtain coverage of the area.

Five types of swamp habitats were identified reflecting differences in amount and duration of flooding, drainage, disturbance and proximity to saline waters. A total of 51,282 acres (20,513 hectares) of swamps were mapped (Summary Table A). This represents about 75% of all wetlands in the study area. Largest single expanses are located in the Grand Bay Swamp (Maps 6, 11 and 14) and the Lillian Swamp (Map 20).

Both freshwater and salt/brackish marshes are indicated, though the latter has been more extensively surveyed in a previous CAB study (Sapp et al, 1976). Approximately 14,638 acres (5,855 hectares) of marshland are delineated, located primarily in the lower Mobile River Delta (Maps 1 and 2) and along Mississippi Sound (Maps 6, 7, 9, 10, 11, 12 and 13).

Submersed grassbeds were found to be of only limited distribution in the study area. Only 4% of the total wetland acreage mapped is contributed by the 2,763 acres (1,105 hectares) of this habitat type. One marine species, shoal grass (*Halodule wrightii*) was found in Alabama waters. Nineteen freshwater species comprise the diverse communities within freshwaters. However, tape grass (*Vallisneria americana*) and Eurasian milfoil (*Myriophyllum spicatum*) are by far the dominant freshwater species. Widgeon grass (*Ruppia maritima*) was the only species found in brackish waters.

Though little documentation of past grassbed conditions exist, it is apparent that some areas of coastal Alabama have experienced a decline in the extent of grassbed coverage. It is not possible to quantify the loss due to lack of historical data. Changes in species composition in the area of the lower Mobile River Delta are documented in the inventory. The primary cause appears to be an invasion of watermilfoil which has excluded species more valuable as waterfowl food.

A total of 68,683 acres (27,473 hectares) of wetlands are found within the Alabama Coastal Zone. Of these about 60% are located in Baldwin County and the remainder in Mobile County (Summary Table B).

Summary Table A. Distribution of Wetland Habitats of the Alabama Coastal Zone, South of the Battleship Parkway, 1980.

Atlas Code No.	Quadrangle	Total Marsh	Total Grassbeds	Total Swamp
1	Mobile	170 (68)*	173.14 (69.26)*	99 (40)*
2	Bridgehead	857 (343)	1381.28 (552.51)	114 (46)
3	Hollingers Island	697 (279)	11.5 (4.6)	2146 (858)
4	Theodore	62 (25)	62.3 (24.92)	940 (376)
5	Belle Fontaine	196 (78)	10.35 (4.14)	849 (340)
6	Coden	408 (163)	19.55 (7.82)	1836 (735)
7	Little Dauphin Island	318 (127)	21.61 (8.64)	534 (235)
8	Fort Morgan	21 (8)	—0— —0—	195 (78)
9	Heron Bay	4986 (1994)	37.01 (14.80)	2478 (991)
10	Fort Morgan N.W.	240 (96)	95.74 (38.30)	—0— —0—
11	Grand Bay	1509 (603)	181.88 (72.75)	2839 (1136)
12	Isle Aux Herbes	609 (244)	12.65 (5.06)	—0— —0—
13	Petit Bois Pass	474 (189)	194.39 (77.76)	—0— —0—
14	Kreole	997 (399)	—0— —0—	1131 (453)
15	Daphne	—0— —0—	21.98 (8.79)	198 (79)
16	Point Clear	89 (36)	3.68 (1.47)	1986 (795)
17	Weeks Bay	177 (711)	42.3 (16.92)	14427 (5771)
18	Foley	837 (355)	99.58 (39.83)	14807 (5923)
19	Perdido Bay	38 (15)	339.62 (135.85)	344 (137)
20	Lillian	356 (142)	54.66 (21.86)	6360 (2544)
TOTAL		14638 (5855)	2763.22 (1105.28)	51282 (20513)

*170 = Acres
(68) = Hectares

Summary Table B. Total Acreage of Submersed Grassbeds, Marshes, and Swamps in the Coastal Zone of Alabama, South of the Battleship Parkway, 1980.

HABITATS				
County	Grassbeds	Marsh	Swamp	Total Wetland Acreage
Mobile	820 (328)*	10,686 (4,274)	13,047 (5,219)	24,553 (9,821)
Baldwin	1,943 (777)	3,952 (1,581)	38,235 (15,294)	44,131 (17,652)
Total Coastal Zone	2,763 (1,105)	14,638 (5,855)	51,282 (20,513)	68,683 (27,473)

*820 = acres
(328) = hectares

CAB BOARD MEMBERS

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

INTRODUCTION

HABITATS EXAMINED

METHODOLOGY

FINDINGS

REFERENCES CITED

APPENDIX A. Wetlands Habitats Included (As Classified in Cowardin et al., 1979) with Corresponding Atlas Types Indicated.

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

APPENDIX C. List of Interviews Concerning Wetland Grassbed Occurrence.

ATLAS LEGEND

ATLAS

WETLAND HABITATS OF THE ALABAMA COASTAL AREA

Part II. An Inventory of Wetland Habitats South of The Battleship Parkway	
PREPARED FOR THE ALABAMA COASTAL AREA BOARD BY ALABAMA MARINE ENVIRONMENTAL SCIENCES CONSORTIUM	
Principle Investigators	
Judy P. Stout, University of South Alabama Dauphin Island Sea Lab	
Michel G. Lelong, University of South Alabama	
With Contributions By	
John L. Borom, Faulkner State Junior College	
Hugh M. Dowling, Research Associate, Dauphin Island Sea Lab	
Maureen T. Powers, Research Assistant, University of South Alabama	
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	PAGE
LIST OF TABLES	1
LIST OF FIGURES	1
ACKNOWLEDGEMENTS	1
INTRODUCTION	1
HABITATS EXAMINED	1
Marshes	
Swamps	
Submersed Grassbeds	
METHODOLOGY	1
Photo Sources	
Photo Interpretation and Field Verification	
Map Preparation	
Area Measurements	2
Limitations	
FINDINGS	2
Forested Wetlands — Swamps	
Bay; Tupelo; Cypress Swamp (Atlas Type VI)	
Moist Pine Forest (Type IV)	
Moist Pine Savannah, Bog (Type V)	
Upland Longleaf Pine-Oak Forest (Type VIIA)	
Maritime Pine-Oak Woodland (Type VIIB)	
Geographic Distribution	
Emergent Wetlands — Marshes	
Freshwater Marshes (Type III)	
Saline and Brackish Marshes (Type I)	
Shrub Zone (Type II)	
Geographic Distribution	
Submersed Grassbeds	
Marine/Brackish Freshwater	
Species Distribution and Occurrence	
Comparison with Past Conditions	3
Miscellaneous Habitats	4
Beach and/or Foredune (Type VIII)	
Stable Dune Ridge Complex (Type IX)	
REFERENCES CITED	4
APPENDIX A. Wetlands Habitats Included (As Classified in Cowardin et al., 1979) with Corresponding Atlas Types Indicated.	5
APPENDIX B. Checklist of the Dominant Plants of Emergent and Forested Wetlands of Coastal Alabama.	5
APPENDIX C. List of Interviews Concerning Wetland Grassbed Occurrence.	7
ATLAS LEGEND	7
ATLAS	9

LIST OF TABLES

1. Photo Sources.
2. Alphabetic Index to Quadrangle Numerical Designations and Atlas Map Numbers.
3. Summary of Geographic Distribution of Wetland Habitats in the Alabama Coastal Zone, South of the Battleship Parkway, 1980.
4. Total Acreage of Submersed Grassbeds, Marshes, and Swamps in the Costal Zone of Alabama, South of the Battleship Parkway, 1980.
5. Characteristics and Occurrence of Submersed Aquatics in the Alabama Coastal Zone.
6. Four Dominant Submersed Species with Contributions of Each to Total Submersed Beds.

LIST OF FIGURES

1. Distribution of Submersed Grassbeds of the Lower Mobile River Delta, After Lueth, 1968.
2. Distribution of Submersed Grassbeds of the Lower Mobile River Delta, After Baldwin, 1957.
3. Distribution of Submersed Grassbeds of the Lower Mobile River Delta, From 1980 Inventory.
4. General Historic Distribution of Submersed Grassbeds of Coastal Alabama, as Determined by 1980 Interviews.
5. Atlas Map Locations and Numerical Designations.

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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, 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) south of the Highway 90 causeway. The Geological Survey of Alabama, in co-operation with the Marine Environmental Sciences Consortium, has prepared a detailed survey of salt and brackish marsh species within the study area (Sapp, Cameron and Stout, 1976). That study should be consulted for information concerning salt and brackish marshes. Habitats north of the causeway will be addressed in a subsequent document.

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 nonsoil 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 the 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 (6m) 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 (6m).

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 grassbed's habitat is included in the Fish and Wildlife class "Aquatic Bed." (See Appendix A.)

METHODOLOGY

PHOTO SOURCES

For the purpose of habitat boundary delineation, two aerial photographic missions were utilized, one color infrared and one black and white. Pertinent information about each is presented in Table 1.

Table 1. Photo Sources.						
Agency	Mission	Film Type	Date	Image Scale	Image	Flight Lines
Nat'l Aeronautics & Space Admin.	JSC 411, Proj. 0839	CIR	10/79	1:13,000	38" x 38" Positive Print	4, 7, 12
U.S. Corps of Engineers, Mobile Dist.	Post Hurricane Frederic, Mobile & Baldwin Cos., AL, SAM-21	B&W	9/15, 9/22 & 9/23 1979	1:12,000	9" x 9" Contact Print	476, 479 480, 481, 482

PHOTO INTERPRETATION AND FIELD VERIFICATION

The ten foot contour was delineated on all photo sources 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 eighty-five (85) 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, oyster beds, 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. In addition, the study area was examined from low altitudes in single engine airplanes to locate beds. 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. Concurrent with vegetation sampling, water temperature, salinity and depth, and substrate descriptions were recorded. 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 base maps. Eighteen 7½' quadrangles (1:24,000) and two 15' quadrangles (1:62,500) were used to obtain coverage of the area (See Table 2). 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.

Table 2. Alphabetic Index to Quadrangle Numerical Designations and Atlas Map Numbers.				
Name	Atlas Map	Name	Atlas Map	
Belle Fontaine	5	Isle aux Herbes	12	
Bridgehead	2	Kreole	14	
Coden	6	Lillian	20	
Daphne	15	Little Dauphin Island	7	
Foley (15')	18	Mobile	1	
Fort Morgan	8	Perdido Bay	19	
Fort Morgan NW	10	Petit Bois Pass	13	
Grand Bay	11	Point Clear	16	
Heron Bay	9	Theodore	4	
Hollingers Island	3	Weeks Bay (15')	17	

AREA MEASUREMENTS

Areal measurements of each habitat type were prepared on both photographs and base maps. Measurements were made using a K & E Planimeter (Model 620002, 99% accuracy) and random dot sheets (97% accuracy). Total areas were calculated for each habitat type and each quadrangle, and expressed in acres and hectares.

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.

FINDINGS

FORESTED WETLANDS-SWAMPS

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

1. dominant plant species;
2. density/openness of tree cover; and
3. moisture levels.

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; Tupelo; Cypress Swamp (Atlas Type VI)

Most rivers and streams and many of the bays in our area are bordered by forested wetlands. 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 tree (*Liriodendron tulipifera*) may also occur there. White cedar (*Chamaecyparis thyoides*) becomes increasingly more common in swamps along upper reaches of streams, especially in Baldwin County.

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*).

Moist Pine Forest, (Type IV)

Another common type of forested wetland in the region is the moist pineline, 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, Bog (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.), meadow beauties (*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.

Upland Longleaf Pine — Oak Forest (Type VII A)

The natural vegetation of the upland area throughout the region consists primarily of an open pine forest intermixed with oaks and other hardwoods.

This upland pine-oak forest includes much of the remaining native vegetation in our two coastal counties, outside of the Mobile-Tensaw River Delta. It is usually found above the ten foot contour but extends occasionally below this line, often intergrading with pinelands along streams and ponds.

Inland, longleaf pine (*Pinus palustris*) is the common species in this forest and hardwoods such as southern red oak (*Quercus falcata*), laurel oak (*Q. hemispherica*), turkey oak (*A. laevis*), sand post oak (*Q. margaretta*), flowering dogwood (*Cornus florida*), and persimmon (*Diospyros virginiana*) are often associates with it and may largely replace it if fire is prevented.

A diversity of shrubs usually grow under the tree canopy of these upland woods including winged sumac (*Rhus copallina*), sparkleberry (*Vaccinium arboreum*) and other blueberries (*Vaccinium elliotii*, *V. myrsinites*), and huckleberries (*Gaylussacia dumosa*). The ground layer of vegetation is generally dense because of the relatively open canopy and consists of a great diversity of herbaceous plants belonging primarily to the grass, legume and sunflower families. Some of the dominant grasses are *Sporobolus junceus* (dropseed grass), *Andropogon tener* and other broomsedges, *Eragrostis spectabilis* and *E. refracta* (love grasses), *Sorghastrum elliotii* (Indian grass), *Aristida stricta* and other three awn grasses.Common legumes growing there are butterfly pea (*Centrosema virginianum* and *Clitoria mariana*), *Crotalaria angulata* and other rattleboxes, numerous beggars ticks (*Desmodium* spp.) and lespedezas (*Lepedeza* spp.), sensitive briar (*Schrankia microphylla*), hoary peas such as *Tephrosia florida*, and milk peas including *Galactia erecta*.

Frequent herbs of this community belonging to the sunflower family include *Coreopsis major*, *Tetragonotheca helianthoides*, *Trilisa odoratissima* (deer-tongue) *Vernonia angustifolia* (Ironweed), numerous species of *Aster* and *Liatris*, and goldenrods such as *Solidago odora*.

Other conspicuous herbs in this upland pine-oak forest are whitish basil (*Pycnanthemum incanum*), scarlet basil (*Calamintha coccinea*), and blue sage (*Salvia azurea*), of the mint family, as well as spurge nettle (*Cnidocolus stimulosus*), flowering spurge (*Euphorbia corollata*), and queen's delight (*Stillingia sylvatica*) of the spurge family.

Maritime Pine-Oak Woodland (Type VII B)

Along the Coast, the upland pine-oak community is modified, consisting of fewer plants adapted to the more rigorous growing conditions, such as coarse white sand and salt spray. Longleaf pine is replaced by slash pine (*Pinus elliotii*) and sand pine (*P. clausa*). The most common oaks are the scrubby live oaks (*Quercus virginiana* var *maritima*) and myrtle oak (*Q. myrtifolia*). Rosemary (*Ceratiola ericoides*), seaside balm (*Conradina canescens*), and seaside goldenrod (*Chrysoma pauciflosculosa*) are other common woody plants of this community. Typical herbaceous plants are sand milkweed (*Asclepias humistrata*), *Heterotheca subaxillaris* (golden aster), *Helianthemum arenicola* (rock rose), the dune evening primrose (*Oenothera humifusa*), slender jointweed (*Polygonella gracilis*), October-flower (*P. polygama*), and whitlow-wort (*Siphonychia corymbosa*).

Geographic Distribution

Distribution of forested wetland types are shown by quadrangle in Table 3. Those quadrangles with coverage restricted to barrier islands or marsh islands (maps 10, 12, 13) were the only ones lacking forested wetlands. The largest continuous expanses were found in the Grand Bay Swamp (Maps 6, 11, 14) and the Lillian Swamp (Map 20), together comprising approximately 25% of the total area of this habitat mapped. Significant coverage by forested wetland types was also found along the shores of Weeks Bay and Wolf Bay and the Bon Secour, Fish and Magnolia Rivers (Maps 17, 18)

A total of 51,282 acres (20,513 hectares) of forested wetlands were mapped. This represents about 75% of all wetlands in the study area (Table 4).

EMERGENT WETLANDS — MARSHES

Within the study area, two marsh types, freshwater and salt/brackish; and a transitional shrub zone were identified. Dominant species are listed in Appendix B.

Freshwater Marshes (Type III)

Fresh-water marshes occur frequently in the area under consideration, particularly in the upper reaches of streams and along the open borders of bays and ponds. Sedges, grasses and rushes are typically the dominant vegetation of those marshes, including reed (*Phragmites australis*), switch grass (*Panicum virgatum*), torpedo grass (*P. repens*), wild rice (*Zizania aquatica* and *Zizaniopsis miliacea*), and saw grass (*Cladium jamaicense*) as well as numerous species of beak rushes (*Rhynchospora* spp.), spike rushes (*Eleocharis* spp.) umbrella sedges (*Cyperus* spp.), and rushes (*Juncus* spp.). Occasionally other plants such as alligator weed (*Alternanthera philoxeroides*), arrow-head (*Sagittaria falcata* and *S. latifolia*) or cattails (*Typha latifolia*) are the dominant vegetation. Other plants commonly encountered in freshwater marshes of our region are beggars ticks, especially *Bidens mitis*, pennyworts (*Hydrocotyle* spp.), numerous species of false loosestripe (*Ludwigia*), climbing hempweed (*Mikania scandens*), golden club (*Orontium aquaticum*), arrow-arum (*Peltandra virginica*), cowbane (*Oxypolis filiformis*) bishop weed, (*Ptilimnium capillaceum*), marsh fleabane (*Pluchea* spp.), pickerelweed (*Pontederia cordata*), and lizard's tail (*Saururus cernuus*).

Scattered shrubs and small trees may be found in these marshes or a more definite "shrub zone" may occur on slightly higher adjacent grounds. The following woody plants may be represented: button bush (*Cephalanthus occidentalis*), wax myrtle *Myrica cerifera*, elderberry (*Sambucus canadensis*), black willow saplings (*Salix nigra*), St. John's-wort (*Hypericum* spp.) and coffee weed (*Sesbania exaltata*).

Saline and Brackish Marshes (Type I)

Shorelines flooded by tidal saline or brackish waters, support marshes dominated by salt tolerant herbs and grass-like plants. The marshes occur as narrow shoreline fringes in lower Mobile Bay, Perdido Bay and tidal mouths of tributary rivers. Broader expanses of marshland were mapped along the more protected shores of Mississippi Sound and the leeward shores of barrier islands and

spits. The black needlerush (*Juncus roemerianus*) is by far the most abundant species, dominating marshes throughout the range of salinity observed.

Two species of cordgrass, *Spartina alterniflora* and *S. cynosuroides*, are locally abundant in the intertidal zone of saline and brackish marshes, respectively. Other frequent species of the saline marsh are salt grass (*Distichlis spicata*), saltmeadow cordgrass (*Spartina patens*), salt marsh aster (*Aster tenuifolius*), marsh gerardia (*Agalinis maritima*) and sea lavender (*Limonium nashii*). Depressions within the saline marsh are often found and high salinity, due to evaporation of trapped seawater, prevents the survival of species other than true halophytes. These areas, called salt flats, are sparcely vegetated, usually by succulents such as glasswort (*Salicornia* spp.), sea-bite (*Suaeda linearis*) and *Batis maritima*.

Within the less saline, brackish marshes a greater diversity of species occurs. Of the saline marsh species, only needlerush and saltmeadow cordgrass are found frequently in the brackish environment. Common brackish species include cattails (*Typha* spp.), spike rush (*Eleocharis* spp.), reed (*Phragmites australis*), bullrushes (*Scirpus* spp.) and sawgrass (*Cladium jamaicense*).

It should be noted that saline and brackish marshes were extensively inventoried and the results reported in a previous study (Sapp, et al 1975). For a more thorough discussion of this habitat, the reader should consult the previous document. In addition, the status of this wetland type as a living resource was summarized in the Mobile Bay Symposium of 1979 (Stout, 1979), in which a comprehensive bibliography is provided.

Shrub Zone (Type II)

A distinct shrub community is usually associated with marsh habitats and occurs on scattered topographic rises within the marsh or as a narrow transitional zone between the marsh and forested habitats. Frequent species include sea myrtle (*Baccharis halimifolia*), marsh elder (*Iua frutescens*), sea oxeye (*Borrichia frutescens*), and yaupon (*Ilex vomitoria*) in brackish to saline conditions and the addition of wax myrtle (*Myrica cerifera*), *Sesbania* spp., swamp bay (*Persea palustris*) and swamp tupelo (*Nyssa sylvatica* var. *biflora*) in fresher marshes.

Geographic Distribution

Approximately 14,638 acres (5,855 hectares) of emergent marshes were located by the inventory. Marshes were found throughout the study area, but were most expansive in the lower Mobile River Delta, and along Mississippi Sound, encompassing over 70% of the total coverage by this wetland type.

SUBMERSED GRASSBEDS

Submersed grassbeds were found to be of only limited distribution in the study area. Within the open estuarine water of Mobile Bay, Perdido Bay and Mississippi Sound, the occurrence of grassbeds were restricted to relatively quiet waters along shorelines. Due to high turbidity conditions and subsequent reduction of available light, beds were found only in shallow waters less than 2 meters deep, most in 50 cm or less. In upper Mobile Bay, along U.S. Highway 90, beds were so shallow that large portions were emergent during the winter months.

Table 3. Summary of Geographic Distribution of Wetland Habitats in the Alabama Coastal Zone, South of Battleship Parkway, 1980.

COMMUNITIES (ACRES)																			
Atlas Code No.	Quadrangle	Ruppia	Ruppia/Vallisneria	Ruppia/Myriophyllum	Ruppia/mixed	Vallisneria	Vallisneria/Ruppia	Vallisneria/Myriophyllum	Vallisneria/mixed	Halodule	Myriophyllum	Myriophyllum/mixed	Hydrochloa	Hydrochloa/mixed	Isocapsa/mixed	Other	Total Marsh	Total Grassbeds	Total Swamp
1	Mobile					3.22		0.92	169.0								173.14 (68)*	173.14 (69.26)*	99 (40)*
2	Bridgehead					46.89			434.04		221.96	678.39					857 (343)	1381.28 (552.31)	114 (46)
3	Hollingers Island	5.98									0.92	1.84	0.92				697 (279)	11.50 (4.60)	2146 (858)
4	Theodore															62.3	62 (25)	62.30 (24.92)	940 (376)
5	Belle Fontaine				6.44			0.46	0.23		3.22						196 (78)	10.35 (4.11)	849 (340)
6	Coden	2.53				1.61						9.43			2.76	3.22	408 (163)	19.55 (7.82)	1856 (735)
7	Little Dauphin Island	19.31								0.92	1.38						318 (127)	21.61 (8.64)	534 (235)
8	Fort Morgan																21 (8)	—0—	195 (78)
9	Heron Bay	13.56		0.92							22.53						4986 (1994)	37.01 (14.80)	2478 (991)
10	Fort Morgan N.W.									95.74							240 (96)	95.74 (38.30)	—0—
11	Grand Bay	181.88															1509 (603)	181.88 (72.75)	2839 (1136)
12	Isle Aux Herbes	12.65															609 (244)	12.65 (5.06)	—0—
13	Petit Bois Pass									194.39							474 (189)	194.39 (77.76)	—0—
14	Kreole																997 (399)	—0—	1131 (453)
15	Daphne					14.18		1.15			0.46	5.89					—0—	21.98 (8.79)	198 (79)
16	Point Clear						3.22	0.46									89 (36)	3.68 (1.47)	1986 (795)
17	Weeks Bay	25.43								0.46		12.29		2.9	1.22		177 (711)	42.50 (16.92)	14427 (5771)
18	Foley	24.09	0.82	3.26						71.41							837 (355)	99.58 (39.83)	14807 (5923)
19	Perdido Bay						46.52			293.10							38 (15)	339.62 (135.85)	344 (137)
20	Lillian	5.71				19.17								29.78			356 (142)	54.66 (21.86)	6360 (2544)
	TOTAL	291.14	0.82	4.18	6.44	85.37	49.74	2.99	603.27	656.02	250.47	707.84	0.92	32.68	3.89	67.36	14638 (5855)	2763.22 (1105.28)	51282 (20513)

*170 = Acres
(68) = Hectares

With the exception of shoal grass (*Halodule wrightii*) submersed species were growing in soft, muddy substrate. Shoal grass was found on hard sand bottoms.

Marine/Brackish

Salinity of the water varied from 0% to 2.2% over the study area. Community composition was significantly effected by salinity. The only true marine species located was *Halodule* in the south end of Perdido Bay and along the leeward shore of the western end of Dauphin Island. *Halodule* was found only in single species beds. In a similar inventory in Mississippi waters, Eleuterius (1971) describes the abundance and distribution of this plant and three additional species; turtle grass (*Thalassia testudinum*), manatee grass (*Cymodocea filiformis*), and *Halophila engelmannii*, not found in Alabama.

Freshwater

Along the shores of less saline, brackish waters of Mississippi Sound, the mouths of the bays and the mouths of tributary rivers discharging into the bays were found monospecific beds of widgeon grass (*Ruppia maritima*). This species exhibits a tolerance to a broad range of salinity conditions and was the most ubiquitous of submersed species observed, though not the most abundant.

Of the twenty-one submersed species identified, the remaining nineteen occurred in mixed communities of various species composition, in quiet freshwaters of the area, (ie. upper Mobile and Perdido Bays and tributary rivers). Two species, tape grass (*Vallisneria americana*) and Eurasian milfoil (*Myriophyllum spicatum*) dominated the freshwater beds, though the beds were frequently a mixture of several species. The most extensive of freshwater beds were found in the shallow flats just south of U.S. Highway 90 in Mobile Bay.

Species Distribution and Occurrence

A total of 2,763 acres (1,105 hectares) of submersed vegetation were mapped in the inventory (Table 3). This represents only 4% of the total wetland acreage described (Table 4). Twenty-one species were frequently encountered and are characterized in Table 5 along with several floating-leaved and emergent species. It should be noted that growth patterns and environmental conditions described represent only observations of this study.

Table 4. Total Acreage of Submersed Grassbeds, Marshes, and Swamps in the Coastal Zone of Alabama, South of the Battleship Parkway, 1980.

HABITATS				
County	Grassbeds	Marsh	Swamp	Total Wetland Acreage
Mobile	820 (328)*	10,686 (4,274)	13,047 (5,219)	24,553 (9,821)
Baldwin	1,943 (777)	3,952 (1,581)	38,235 (15,294)	44,131 (17,652)
Total Coastal Zone	2,763 (1,105)	14,638 (5,855)	51,282 (20,513)	68,683 (27,473)

*820 = acres
(328) = hectares

Table 5. Characteristics and Occurrence of Submersed Aquatics in The Alabama Coastal Zone.

SPECIES (Common Name)	DESCRIPTION ¹	OCCURRENCE	GROWTH PATTERN	ENVIRONMENTAL ² CONDITIONS	VALUE ³	DISTRIBUTION (See Table 1 for Numerical Index)
FRESHWATER HABITATS						
<i>Bacopa caroliniana</i> (Lemon Bacopa)	Rooted or floating herb; 103 cm tall; leaves fleshy, opposite, ovate, up to 2.8 cm long and 15 mm wide; stems pubescent; coolla blue; plant aromatic — leaves and stems lemon scented when crushed.	In sluggish, freshwater streams, and swamp margins.	Flowering observed June-August; flowering stems breaking loose, forming floating mats; vegetative portions providing a dense bottom covering.	Salinity-0 Water depth-1.5-2 Substrate-soft mud, sand	Consumed by waterfowl	17, 20
<i>Cabomba caroliniana</i> (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, petlate; corolla white with yellow spots at base.	In sluggish, acidic, freshwater streams.	Collected in flower late August.	Salinity-0 Water depth-1-1.5 Substrate-soft mud	Consumed by waterfowl, fish	17
<i>Callitriche heterophylla</i> (Water Starwort)	Herbaceous aquatic with both floating and submersed leaves; floating leaves opposite, spatulate, obovate, up to 3 cm long and 4 cm wide; Submersed leaves opposite, linear, up to 3 cm long.	Shallow margins of fresh and brackish marshes, slow moving streams and pools.	Flowers and fruits observed April-May. An ephemeral species, by early August plants had disappeared from previously vegetated area.	Salinity-0 Water Depth-0.5-1.5 Substrate-mud	Consumed by ducks.	5, 6, 4
<i>Ceratophyllum demersum</i> (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.	Still or slow moving waters, margins of fresh and brackish marshes.	Not observed in flower or fruit. Vegetatively, may form dense bottom carpet.	Salinity-0-5 Water depth-0.3-2.0 Substrate-Soft mud	Consumed by waterfowl, shorebirds, fish. May crowd out other plants.	5, 4, 17, 3
Characeae <i>Nitella</i> , <i>Chara</i> , <i>Tolypella</i> (Muskgrasses, Stoneworts)	Macroscopic, submersed 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 (<i>Chara</i>), forked (<i>Nitella</i>) or monopodial (<i>Tolypella</i>).	Margins of fresh and brackish marshes, sluggish streams, creeks, estuaries.	May form extensive bottom mats beneath other aquatic plants.	Salinity-0-4 Water depth-0.5-1.5 Substrate-soft mud	Consumed by fish, waterfowl.	1, 2, 4, 5, 17
<i>Egeria densa</i> (Waterweed, Ditchmoss)	Submersed, perennial aquatic with dichotomously branched stems; leaves opposite or in whorls of 3-6, linear, up to 2.5 cm long and 3 mm wide; leaves very bright green, serrulate, sessile.	Slow moving freshwater streams.	Flowering species collected in late August. Vegetatively, plants may form dense bottom mats.	Salinity-0 Water depth-1-1.5 Substrate-soft mud	May hinder boat traffic.	17
<i>Hydrochloa caroliniensis</i> (Watergrass)	Submersed, weak-stemmed, freely branching herb; leaves flat, up to 5 cm long and 4 mm wide.	Slow moving streams, lake and headwaters of rivers.	Did not observe in flower. Where water is shallow, may completely cover bottom.	Salinity-0, Water depth-1-1.5 Substrate-soft mud		3, 4, 17, 20
<i>Mayaca fluviatilis</i> (Bogmoss)	Emersed or submersed, moss-like perennial; leaves alternate, spiralled, sessile, narrowly linear up to 14 mm long and 1 mm wide.	Freshwater streams, ponds or lakes.	Collected in flower late May; may form dense bottom mats in shallow water.	Salinity-0, Water depth-less than 1.0 Substrate-soft mud		6, 20
<i>Myriophyllum heterophyllum</i> (Variable Watermilfoil)	Perennial aquatic with whorled leaves; both emersed and submersed leaf types present; submersed leaves up to 6 cm long and 3 cm wide with 7-10 pairs of leaflets; emersed leaves lanceolate-elliptic, up to 25 mm long and 6 mm wide.	Margins of fresh and brackish marshes, sluggish streams.	First observed in late April. Collected in flower and fruit between mid May and late August. Submersed and emersed leaves presents.	Salinity-0-5 Depth-1.5-2.0 Substrate-mud	Consumed by mallards.	3, 5, 17
<i>Myriophyllum spicatum</i> (Eurasian Watermilfoil)	Rhizomatous, branching perennial herb; leaves whorled, pinnately divided, 14-21 pairs of leaflets; leaflets approximately 1.8 cm long; Flowers axillary.	Margins of fresh and brackish marshes, ponds, lakes, steams, tidal creeks, estuaries.	Flowering and fruiting species collected in late June.	Salinity-0-11 Water depth-0.1-2.0 Substrate-mud, sand.	Consumed by waterfowl. May out-compete some valuable waterfowl food plants. May hinder outboard travel.	1, 2, 3, 5, 7, 9, 17, 18
<i>Najas quadrilupensis</i> (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.	Margins of fresh and brackish marshes, rivers, streams.	Observed from early June-August. Collected in flower and fruit during June, otherwise only vegetative plants observed.	Salinity-0-10 Water depth-0.6-2.0 Substrate-soft mud.	Consumed by waterfowl, fish. May hinder outboard travel.	1, 2, 3, 9, 17
<i>Nuphar luteum</i> (Spatter-Dock, Cow-Lilly, Yellow Pond Lily)	Rhizomatous, aquatic perennial with submersed or emersed leaves; leaves suborbicular to lanceolate, 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.	Collected in flower and fruit August-September; where present, occurs fairly regularly along stream margins disappearing at depths greater than 1.5m.	Salinity-0 Water depth-1.1-5 Substrate-silty sand.		3, 4, 20
<i>Nymphaea odorata</i> (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.	Shallow margins of freshwater lakes, ponds and acid waters.	Collected in flower and fruit August-September.	Salinity-0 Water depth-1.0 Substrate-mud	Consumed by wildfowl, mammals.	3, 4, 20
<i>Nymphoides aquatica</i> (Big Floating Heart)	Rhizomatous, aquatic perennial with floating leaves suborbicular with cordate bases, up to 20 cm long, upper leaf surface green, purple beneath.	Freshwater stream margins, ponds, lakes.	Observed from August-September. Collected in flower early August.	Salinity-0 Water depth-1.0 Substrate-mud		4, 20
<i>Potamogeton crispus</i> (Curly Pondweed)	Rhizomatous, herbaceous aquatic with submersed leaves; leaves linear oblong, up to 10 cm long and 10 mm wide, undulate, sessile, with conspicuously toothmargins.	Margins of fresh to brackish marshes.	Collected in flower and fruit mid-June.	Salinity-4 Water depth-0.3-0.6 Substrate-sandy mud.	Consumed by ducks, fish.	1, 2
<i>Potamogeton diversifolius</i> (Snailseed Pondweed)	Rhizomatous perennial aquatic with submersed and floating leaves; floating leaves ovate, up to 6 cm long and 15 mm wide, stipulate; submersed leaves linear up to 8 cm long and 0.8 mm wide, stipule fused to leaf base.	Sluggish freshwater streams, quiet waters.	Collected in flower and fruit late August.	Salinity-0 Water depth-1-1.5 Substrate-Soft mud	Consumed by wildfowl.	17,
<i>Potamogeton pusillus</i> (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.	Shallow margins of fresh to brackish marshes, of shallow portions of estuaries.	Observed from late April to late September. Flowers and fruits from late April-May.	Salinity-0-4 Water depth-0.3-1.5 Substrate-sandy mud.	Consumed by fish.	2, 3, 5
<i>Utricularia</i> sp. (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.	Only one community of flowering plants observed (<i>Utricularia biflora</i>) in all other locations only vegetative plants observed. May form dense floating mats along shallow, protected portions of creeks.	Salinity-0 Water depth-to 1.0 Substrate-soft mud.	Consumed by fish.	4, 6, 17
<i>Vallisneria americana</i> (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.	Margins of fresh and brackish marshes, streams, estuaries.	Observed from mid-April to late October. Flowering and fruiting from late May to late October.	Salinity-0-11 Water depth-0.3-2.0 Substrate-sandy mud.	Consumed by fish, waterfowl, shore birds, muskrat.	1, 2, 5 17
<i>Zannichellia palustris</i> (Horned Pondweed)	Rhizomatous, perennial aquatic with freely branching stems; leaves opposite, linear, up to 6 cm long and 0.8 mm wide, stipules sheathing.	Rivers, streams, margins of fresh and brackish marshes, shallow portions of estuaries.	Observed from late February to mid-July. Flowering and fruiting from late February to mid-July. Found in abundance early in the growing season with population drastically decreasing by mid-summer.	Salinity-0-10 Water depth-0.2-1.5 Substrate-soft mud.	Consumed by waterfowl, fish. May hinder boat traffic.	1, 4, 5, 9, 17
BRACKISH HABITATS						
<i>Ruppia maritima</i> (Ditch Grass, Widgeon Grass)	Rhizomatous, branching aquatic perennial; leaves alternate, narrowly linear submersed, up to 10 cm long and 6 mm wide, basally sheathed; flowers perfect, enclosed within leaf sheath during anthesis, afterwards exerted on coiled peduncle.	Tidal creeks, rivers, bays, protected areas (coves, creek mouth, behind oyster reefs).	Observed from mid-April to late September. Flowering and fruiting from late April to late September. Plants quite variable, range of size variation from 2-3 cm tall to at least 20 cm.	Salinity-0-20 Water depth-0.1-2.0 (plants may be completely exposed at low tide). Substrate-mud.	Consumed by waterfowl, shorebirds and fish.	3, 5, 6, 7, 9, 11, 12, 17, 18, 19, 20
MARINE HABITATS						
<i>Halodule wrightii</i> (Shoal Grass)	Rhizomatous, marine perennial with flat, linear, basally-sheathed leaves ; leaves up to 1.5 mm wide; leaf apex characteristically 3-toothed, with one large central and two lateral points; staminate and pistillate flowers borne within sheathes of branches above rhizome.	Marine waters, typically very clear, sandy substrate. In one location, found in association with a small amount of <i>Ruppia maritima</i> but otherwise occurring in pure stands.	Plants observed from late July to late September. Only vegetative stands of <i>Halodule</i> were observed during this study.	Salinity-8-22; following spring floods, salinity 0%. Water depth-0.2-1.5 Substrate-sand.		7, 8, 10, 13, 17, 18

¹Description after Radford, et al. 1968, and Godfrey and Wooten. 1979.
²Salinity in parts per thousand; Depth in meters.
³Uses after Stevenson and Confer. 1978, and Fassett. 1990.

Grassbeds were dominated by four species previously mentioned as shown in Table 6.

Table 6. Four Dominant Submersed Species with Contributions of Each to Total Submersed Beds.

SPECIES	COMMUNITIES			
	Pure	Mixed	TOTAL	% OF ALL
<i>Halodule wrightii</i>	656* (262)	—0—	656 (262)	24
<i>Ruppia maritima</i>	291 (116)	11 (5)	302 (121)	11
<i>Vallisneria americana</i>	85 (34)	656 (262)	741 (297)	27
<i>Myriophyllum spicatum</i>	250 (100)	708 (283)	958 (383)	35
*656 = acres (262) = hectares				

Comparison With Past Conditions

Prior to the current inventory, no comprehensive survey of submersed aquatics of coastal Alabama had been completed. Alabama Department of Conservation and Natural Resources studies have been oriented toward waterfowl, encompassing the lower delta only. Baldwin (1957) and Lueth (1968) prepared rapid assessments of submersed vegetation in the Mobile Delta and northern portions of Mobile Bay for wildlife and waterfowl management planning. Baldwin compared his findings to those of Lueth, whose field work was actually done in the late 1940's, and found an extension of tape grass (*Vallisneria americana*) beds of approximately one mile further south in the intervening ten years (Figs. 1 & 2). He predicted a continued increase in the coverage of this species as natural shoaling created favorable water depths to the south. Although distribution of wideongrass (*Ruppia maritima*) was not determined, he predicted an increase in this species with shoaling in high salinity waters. However, Borom (1975) found a great reduction in coverage, especially along the eastern bayshore. Once extensive submersed beds were found to exist only as small patches. Personal communications with knowledgeable local citizens confirm the decline and disappearance. Accompanying the decline in submersed vegetation have been reports of declines in sport and commercial fish and invertebrate species associated with the vegetation. In addition, an invasion of Eurasian milfoil (*Myriophyllum spicatum*) has been noted in the upper bay (Borom, 1979; Powell, 1979). Figure 3 is the same area; indicating submersed communities as they existed during the 1980 survey. Several significant changes have taken place since Baldwin (Fig. 2) Community diversity has decreased, in some areas to single species beds. Eurasian milfoil (*Myriophyllum spicatum*) has become the predominant species for greater than 50% of the beds, but was not observed in the area by previous workers. Notable areas of invasion are lower Chocolate Bay, Bay John, and D'Olive Bay. This species is considered a "pest" plant by waterfowl managers and boaters. The Mobile District, U.S. Army Corps of Engineers is planning a pilot program of chemical eradication of this species under their Aquatic Plant Control Program. It appears that if left alone, milfoil will ultimately take over this entire area.

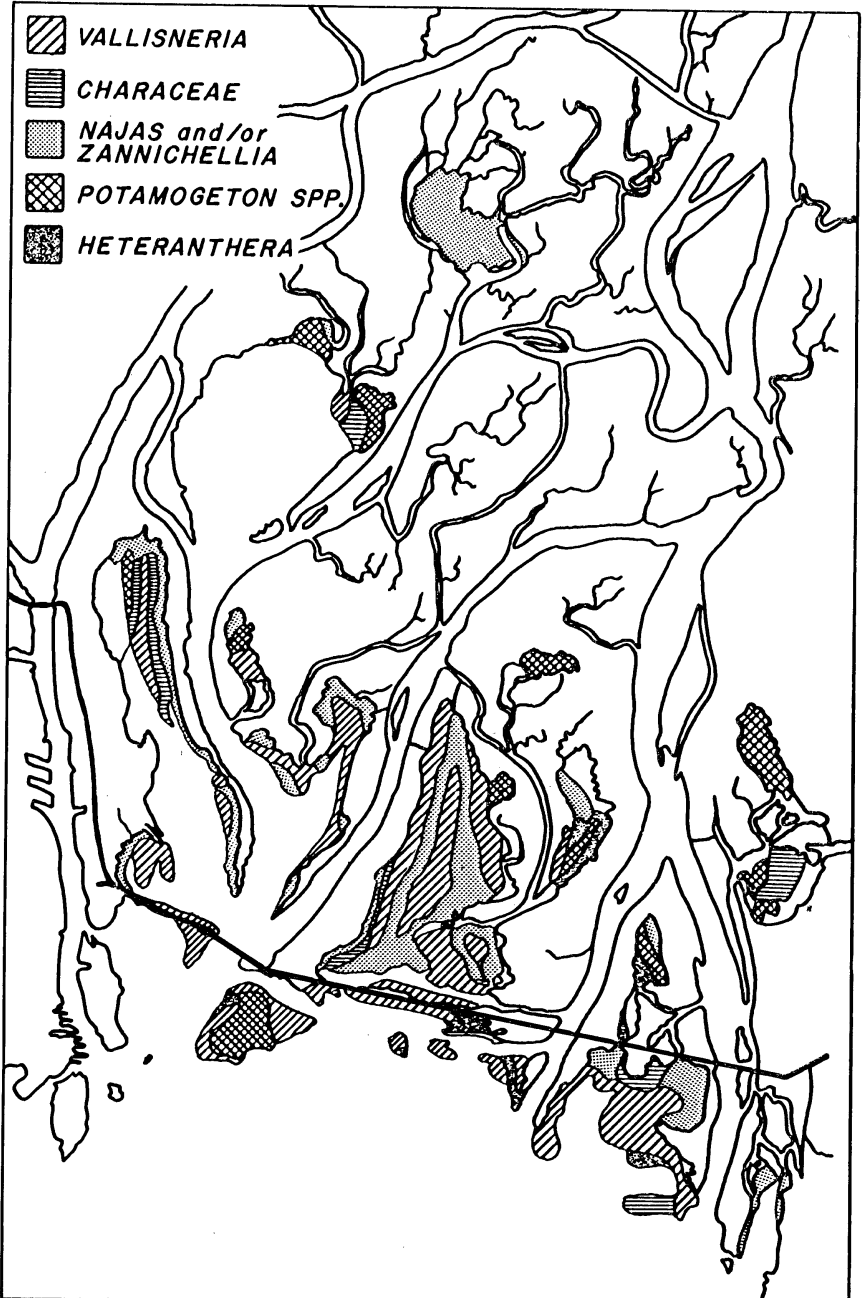


Figure 1. Distribution of Submersed Grassbeds of the Lower Mobile River Delta, After Lueth, 1968.

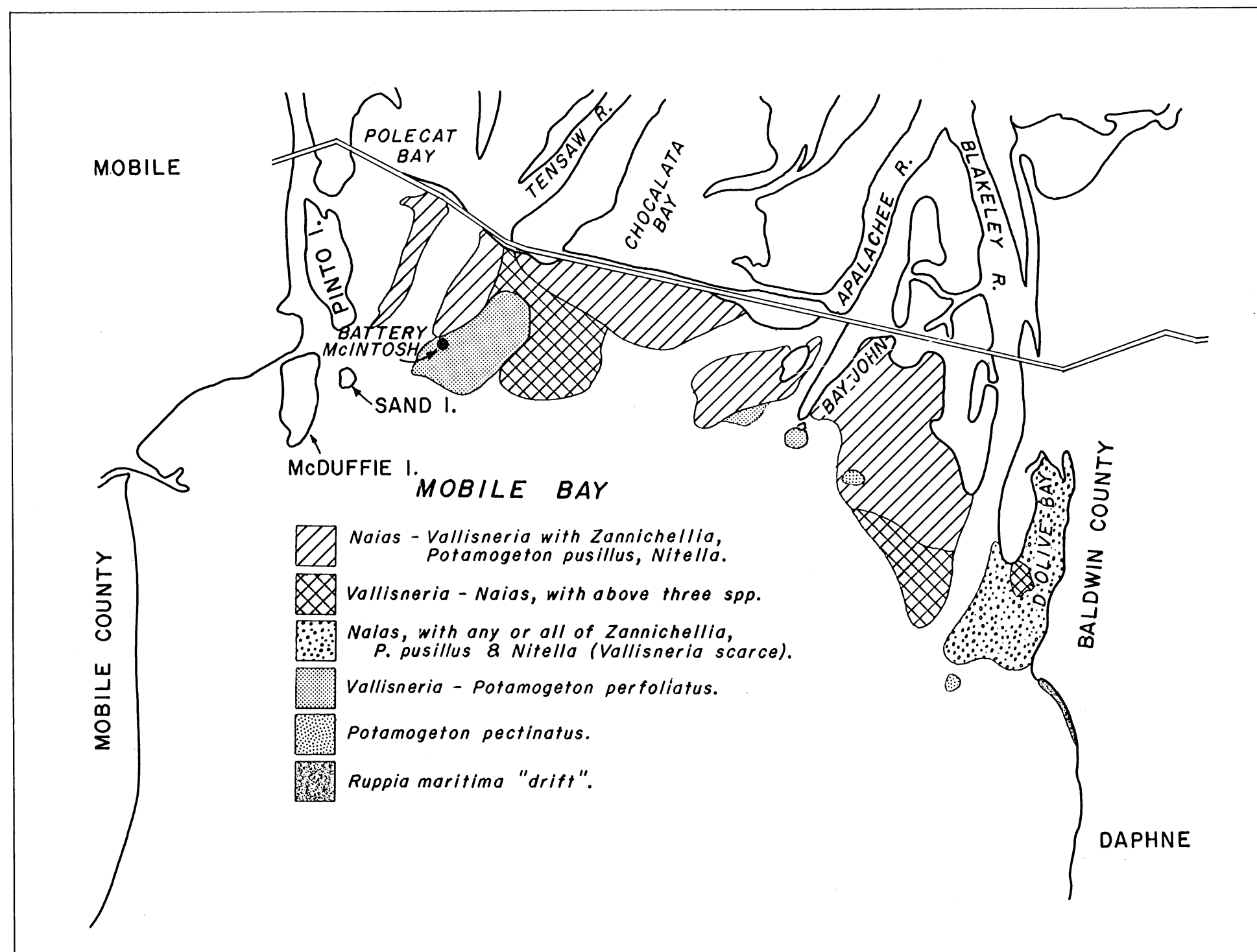


Figure 2. Distribution of Submersed Grassbeds of the Lower Mobile River Delta, after Baldwin, 1957.

Changes in aerial coverage by submersed beds has also occurred. Channel dredging and filling between Pinto Pass and Battery McIntosh along the causeway have resulted in the complete loss of submersed vegetation in that area. Some loss can be seen along both sides of the Blakeley Bar and in D'Olive Bay. This is probably due to increased turbidity from shoreline development. A shift in bed locations in lower Chocolata Bay has probably not resulted in any net change in acreage. It is not possible to quantify the changes in species distribution or coverage since boundary determinations and map scales of earlier reports were of undetermined accuracy. Surveys by Lueth (1968) and Baldwin (1957) were accomplished without photography to assist in boundary delineations. Plant inventories of these studies were only a minor portion of the study scope and thus did not include seasonal variations or complete geographic coverage in the field. The slightest errors in grassbed delineations, as portrayed on the small

maps of each report, would result in large errors in acreage determinations made from the maps. Thus, specific acreage comparisons with the current situation would be misleading and should not be attempted.

Local residents were interviewed during the study period to get an idea of historical bed distributions in geographic areas not reported in the literature. Interviews included working biologists, commercial and sport fishermen and longtime residents of the coastal shores. The results are generally portrayed in Figure 4. This figure also indicates the sample locations of Borom (1975) and the location of *Halodule wrightii* reported by Crance (1971) in Mississippi Sound. By comparison with the atlas maps, losses have taken place along both shores of Mobile Bay and lower Perdido Bay. These losses cannot be quantified, nor is there information as to why they have occurred. Interviewees are listed in Appendix C.

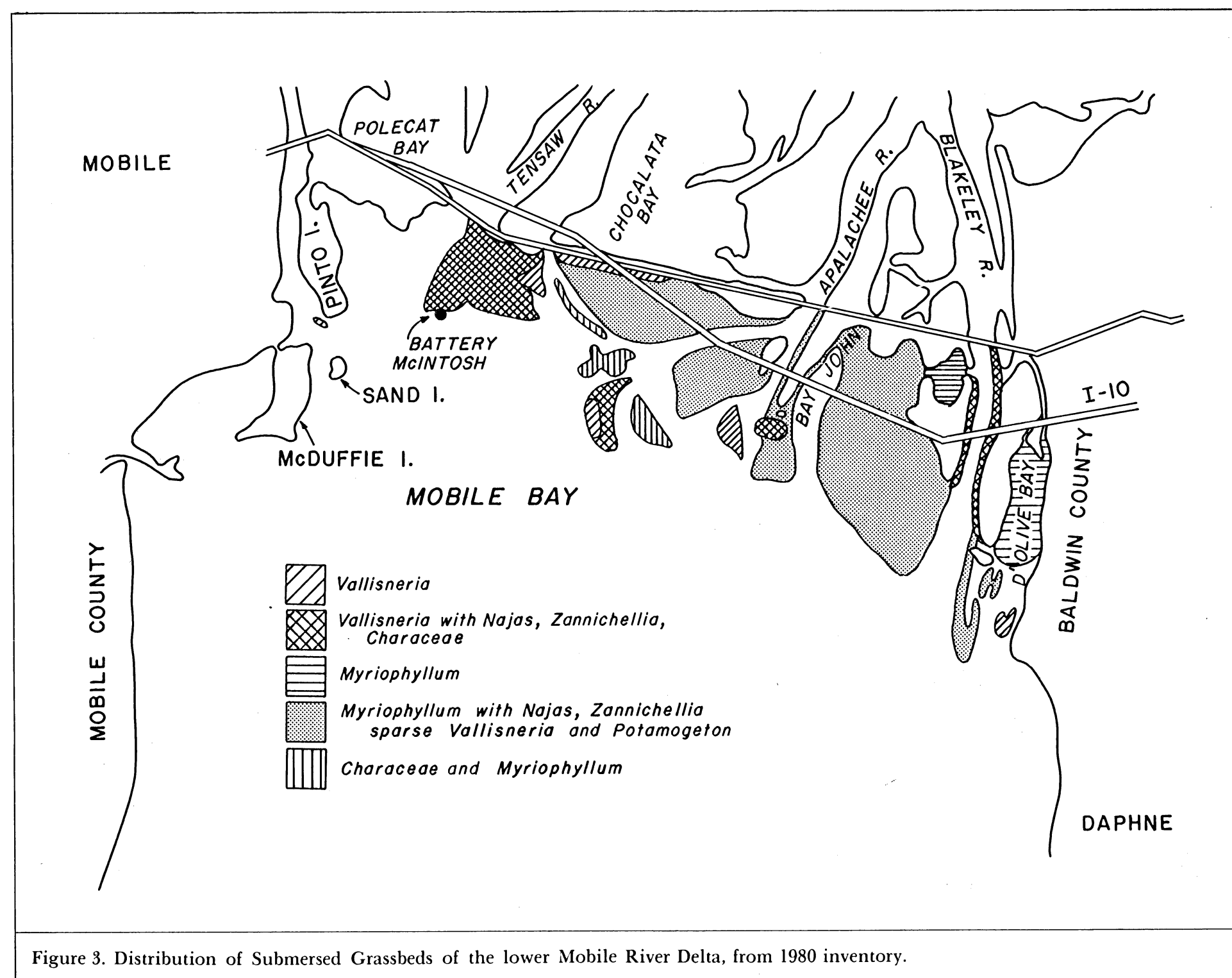


Figure 3. Distribution of Submersed Grassbeds of the lower Mobile River Delta, from 1980 inventory.

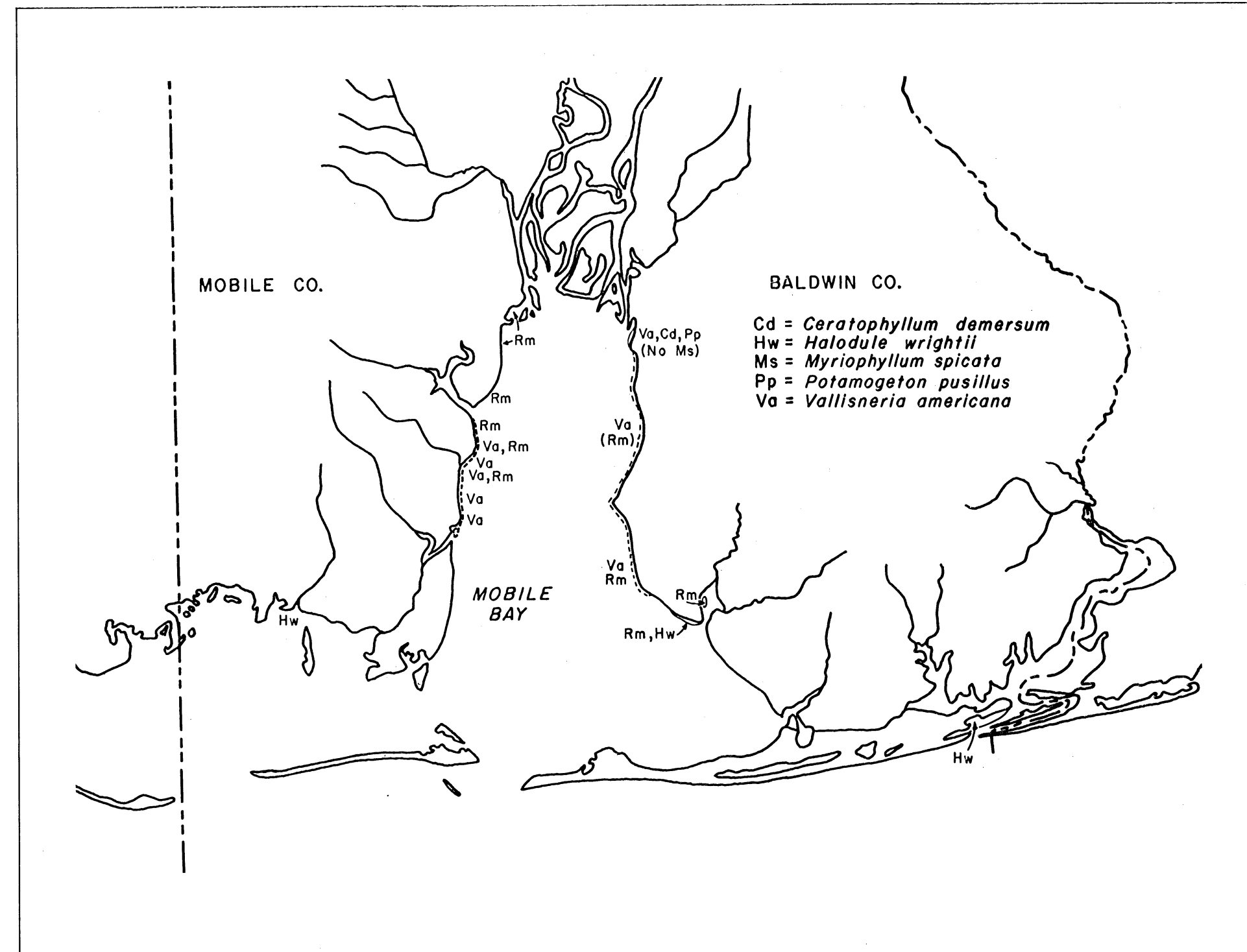


Figure 4. General Historic Distribution of Submersed Grassbeds of Coastal Alabama, as Determined by 1980 Interviews.

MISCELLANEOUS HABITATS

Beach and/or Foredunes (Type VIII)

Vegetation of the more exposed areas along the beach and the foredunes consists primarily of a few semi-succulent plants such as sea rocket (*Cakile harperi*), beach morning glory (*Ipomoea stolonifera*), seaside purslane (*Sesuvium portulacastrum*), dune elder (*Iva imbricata*) as well as a few species of grasses tolerant of salt-spray such as sea oats (*Uniola paniculata*), bitter panic grass (*Panicum amarum*), and seaside beardgrass (*Andropogon maritimus*).

In addition to the extensive sandy beaches along the Gulf of Mexico, narrow strips of sandy shores frequently occur on the borders of the numerous bays in the region, particularly along Perdido Bay, Wolf Bay, Bon Secour Bay and the shores of Mobile Bay. The scant vegetation on those narrow beaches depends largely on the salinity of adjacent waters. It is fairly similar to the vegetation of maritime beaches near the Gulf, including plants such as *Hydrocotyle bonariensis* and beach morning glory near the Gulf. Further north and inland, sandy shores are often dominated by plants such as giant cane (*Phragmites australis*), torpedo grass (*Panicum repens*), and golden aster (*Heterotheca subaxillaris*). Landward, those sandy areas usually grade into brackish or freshwater marshes, swamp forests or pine savannahs.

Stable Dune Ridge Complex (Type IX)

Inland of the beach and foredune system of the Fort Morgan Peninsula and Gulf Shores are found a series of parallel stable dune ridges with wet swales in the topographic depressions between each pair of ridges. This creates a diversity of environments in a greatly compressed area. It is not possible at the atlas scale to discriminate between the habitats found within the complex.

The inter-dune depressions support species of Type III, the Freshwater Marsh. The marsh species intergrade with Type VI, swamp species, where soils remain saturated and large bands of swamp vegetation may be found. As the elevation increases and soil moisture decreases on the dune ridges, species of the Maritime Pine-Oak Woodland predominate. The pattern of dune ridge, slope, depression is repeated across most of the width of the peninsula as is the pattern of associated plant communities.

AUTHOR'S NOTE:

Since completion of the Inventory in December, 1980, subsequent field work revealed the occurrence of an additional marine species, Turtle Grass (*Thalassia testudinum*) in Old River east of the mouth of Perdido Bay. Small patches were found amongst extensive beds of *Halodule* indicated in the atlas. Though not shown in either the atlas or in species accounts, the occurrence of *Thalassia* in Alabama waters should be noted.

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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 Intertidal	Aquatic Bed	Rooted Vasc.	Grassbeds
		Aquatic Bed	Rooted Vasc.	Grassbeds
Riverine	Tidal	Emergent Wetland		I & By Spp.
		<6m) Scrub-Shrub Wetland		II
	Lower Perennial	>6m) Forested Wetland		IV, V, VI
Palustrine	Tidal	Aquatic Bed		Grassbeds
		Emergent Wetland		By Species
	Upper Perennial	Aquatic Bed		Grassbeds
		Emergent Wetland		By Species

APPENDIX B

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

Type I. Saline and Brackish Marsh

Herbaceous Plants (Except Grasses & Grass-Like Plants)

Acnida cuspidata (Water Hemp)
Agalinis maritima (Marsh Gerardia)
Alternanthera philoxeroides (Alligator Weed)
Aster tenuifolius (Salt Marsh Aster)
Bacopa monnieri (Coastal Water-Hyssop)
Boltonia asteroides
Cynanchum palustre
Hibiscus moscheutos (Marsh Mallow)
Ipomoea sagittata (Marsh Morning Glory)
Kosteletzkya virginica (Salt Marsh Mallow)
Lilaeopsis chinensis
Limonium nashii (Sea Lavender)
Lythrum lineare (Salt Marsh Loosestrife)
Pluchea camphorata, *P. purpurascens* (Marsh Fleabane)
Sabatia stellaris (Rose-Gentian)
Sagittaria falcata
Salicornia bigelovii; *S. virginica* (Glasswort)
Sesuvium maritimum (Marsh Purslane)
Solidago sempervirens (Seaside Goldenrod)
Suaeda linearis (Sea-Bite)
Typha domingensis; *T. latifolia* (Cattail)
Vigna luteola (Cow pea)

Grasses, Sedges and Rushes

Cladium jamaicense (Saw Grass)
Cyperus odoratus; *C. virens* (Umbrella Sedge)
Distichlis spicata (Salt Grass)
Echinochloa walteri
Eleocharis cellulosa; *E. parvula* (Spike Rush)
Fimbristylis castanea (Saltmarsh Fimbristylis)
Fuirena scirpoides
Juncus roemerianus (Needle Rush)
Panicum repens (Torpedo Grass)
P. virgatum (Switch Grass)
Paspalum distichum
Phragmites australis (Reed)
Scirpus americanus (American Bulrush)
S. californicus (Giant Bulrush)
S. olneyi (Olney Bulrush)
S. robustus (Saltmarsh Bulrush)
S. validus (Soft Stem Bulrush)
Setaria geniculata (Foxtail Grass)
Spartina alterniflora (Smooth Cordgrass)
S. cynosuroides (Big Cordgrass)
S. patens (Marsh-Hay Cordgrass)
S. spartinae (Gulf Cordgrass)

Type II. Shrub Zone

Amorpha fruticosa (Lead Plant)
Baccharis halimifolia (Sea Myrtle)
Borrichia frutescens (Sea Oxeye)
Eryngium yuccifolium (Eryngo)
Ilex vomitoria (Yaupon)
Iva frutescens (Marsh Elder)
Myrica cerifera (Wax Myrtle)
Nyssa sylvatica var. *biflora* (Swamp Tupelo)
Persea palustris (Swamp Bay)
Phragmites australis (Reed)
Pluchea purpurascens (Marsh Fleabane)
Serenoa repens (Saw Palmetto)
Sesbania exaltata (Coffee Weed)
Sesbania punicea (Rattle Box)
Sesbania vesicaria (Bladder Pod)
Solidago sempervirens (Seaside Goldenrod)

Type III. Fresh Water Marsh

Woody Plants

Baccharis halimifolia (Groundsel-Bush; Sea Myrtle)
Cephalanthus occidentalis (Buttonbush)
Hibiscus moscheutos (Marsh Mallow)
Ilex vomitoria (Yaupon)
Myrica cerifera (Wax Myrtle)
Phragmites australis (Reed)
Salix nigra (Black Willow)
Sambucus canadensis (Elderberry)
Sesbania exaltata (Coffee Weed)
Sesbania punicea (Rattlebox)
Sesbania vesicaria (Bladder Pod)

Herbaceous Plants (Except Grasses, and Grass-Like Plants)

Alternanthera philoxeroides (Alligator Weed)
Aster dumosus; *A. umbellatus* . . . (Asters)
Bidens mitis; *B. laevis* (Beggars-Tick)
Boehmeria cylindrica (False Nettle)
Centella asiatica (Centella)
Colocasia esculenta (Elephants' Ear)
Eupatorium capillifolium (Dog Fennel)
Eupatorium coelestinum (Mist Flower)
Eupatorium fistulosum (Joe Pye Weed)
Eupatorium serotinum (Fall Thoroughwort)
Galium tinctorium (Bedstraw)
Helianthus angustifolius (Narrow-Leaf Sunflower)
Hydrocotyle bonariensis; *H. umbellata* (Pennywort)
Hymenocallis occidentalis (Spider Lily)
Hypericum mutilum; *H. virginicum* (St. John's Wort)
Iris virginica (Blue Flag)
Ludwigia alternifolia; *L. leptocarpa* (False Loose Strife)
L. palustris (False Loose Strife)
Lycopus rubellus (Bugleweed)
Mikania scandens (Climbing Hempweed)
Orontium aquaticum (Golden Club)
Oxypolis filiformis (Cowbane)
Peltandra virginica (Arrow Arum)
Pluchea camphorata (Camphor Weed)
Polygonum hydropiperoides; *P. punctatum* (Smart Weed)
Pontederia cordata (Pickerel Weed)
Ptilimnium capillaceum (Bishop Weed)
Sagittaria falcata, *S. latifolia* (Arrow Head)
Saururus cernuus (Lizard's Tail)
Typha latifolia (Cattail)
Xyris iridifolia (Yellow-Eyed Grass)

Grasses, and Grass-Like Plants

Andropogon glomeratus (Bushy Beardgrass)
Carex glaucescens, *C. lurida* (Sedge)
Cladium jamaicense (Saw Grass)
Cyperus erythrorhizos; *C. haspan* (Umbrella Sedge)
C. strigosus; *C. virens*
Eleocharis flavescens; *E. microcarpa* (Spike Rush)
E. obtusa; *E. tuberculosa*
Fimbristylis autumnalis; *F. miliacea*
Fuirena scirpoides; *F. squarrosa* (Umbrella Grass)
Juncus biflorus; *J. effusus* (Rush)
J. elliptioides; *J. scirpoides*
Leersia oryzoides (Rice Cutgrass)
Panicum repens (Torpedo Grass)
Panicum rigidulum; *P. scoparium* (Panic Grass)
Panicum virgatum (Switch Grass)
Rhynchospora corniculata (Beak Rush)
R. macrostachya
Sacciolepis striata
Scirpus americanus (Three-Square Bulrush)
Scirpus californicus (Giant Bulrush)
Scirpus cyperinus (Marsh Bulrush)
Scirpus validus (Great Bulrush)
Spartina cynosuroides (Big Cordgrass)
Zizania aquatica (Wildrice)
Zizaniopsis miliacea (Southern Wildrice)

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 elliptii (Slash Pine)
Pinus palustris (Longleaf Pine)
Rhododendron viscosum var. *serrulatum* (Swamp Azalea)
Rhus vernix (Poison Sumac)
Smilax laurifolia (Green Briar)
Serenoa repens (Saw Palmetto)
Taxodium distichum var. *nutans* (Pond Cypress)
Vaccinium elliptioides; *V. fuscatum* (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 cymosa; *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)
Anthraenantia rufa
Aristida affinis; *A. virgata* (Three-Awn Grass)
Ctenium aromaticum (Toothache Grass)
Dichromena latifolia (White-Top Sedge)
Eleocharis microcarpa; *E. tuberculosa* (Spike Rush)
Erianthes giganteus (Plume Grass)
Fuirena squarrosa; *F. scirpoides* (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 VI. Bay Forest and Adjacent Mesic Wood

Trees

Acer rubrum (Red Maple)
Chamaecyparis thyoides (White Cedar)
Gordonia lasianthus (Loblolly Bay)
Liriodendron tulipifera (Tulip Tree)
Magnolia grandiflora (Southern Magnolia)
Nyssa sylvatica var. *biflora* (Swamp Tupelo)
Osmanthus americana (Devilwood)
Persea palustris (Swamp Bay)
Pinus elliptioides (Slash Pine)
Quercus hemisphaerica (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 (Pepper Bush)
Cliftonia monophylla (Black 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)
Orontium aquaticum (Golden Club)
Osmunda cinnamomea (Cinnamon Fern)
O. regalis (Royal Fern)
Peltandra virginica (Arrow-Arum)
Polygonum punctatum (Smartweed)
Rhynchospora miliacea (Beak Rush)
Thelypteris normalis (Widespread Maiden Fern)
Woodwardia areolata (Netvein Chain Fern)
Xyris iridifolia (Yellow-Eyed Grass)

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. elliptioides (Slash Pine)
Quercus falcata (Southern Magnolia)
Q. hemisphaerica (Laurel Oak)
Q. incana (Blue-Jack Oak)
Q. laevis (Turkey Oak)
Q. margareta (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 (Green Briar)
Vaccinium arboreum (Sparkleberry)
V. elliptioides, *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)
Cnidioscolus 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)
Lupinus diffusus (Sandhill Lupine)
Penstemon australis (Beard Tongue)
Phlox pilosa (Phlox)
Pycnanthemum incanum (Whitish Basil)
Salvia azurea (Blue Sage)
Schrankia microphylla (Sensitive Briar)
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 elliptioides (Indian Grass)
Sporobolus junceus (Dropseed Grass)

Type VIII. Beach and Dune Complex

Woody Plants (Trees and Shrubs)

Ceratiola ericoides (Rosemary)
Chrysoma pauciflosculosa (Seaside Goldenrod)
Conradina canescens (Seaside Balm)
Iva imbricata (Dune Elder)
Pinus clausa (Sand Pine)
P. elliptioides (Slash Pine)
Quercus myrtifolia (Myrtle Oak)
Q. virginiana var. *maritima* (Live Oak)
Serenoa repens (Saw Palmetto)

Herbaceous Plants

Andropogon maritimus (Seaside Beard Grass)
Asclepias humistrata (Sand Milkweed)
Cakile harperi (Sea Rocket)
Cenchrus tribuloides (Sand Bur)
Helianthemum arenicola (Sand Rock-Rose)
Heterotheca subaxillaris (Golden Aster)
Hydrocotyle bonariensis (Pennywort)
Ipomoea stolonifera (Beach Morning Glory)
Oenothera humifusa (Dune Evening Primrose)
Panicum amarum (Bitter Panic Grass)
P. repens (Torpedo Grass)
Phragmites australis (Reed)
Physalis angustifolia (Ground Cherry)
Polygonella gracilis (Slender Jountweed)
Sesuvium portulacastrum (Seaside Purslane)
Siphonichia corymbosa (Whitlow Wort)
Sporobolus virginicus (Dropseed Grass)
Uniola paniculata (Sea Oats)

APPENDIX C

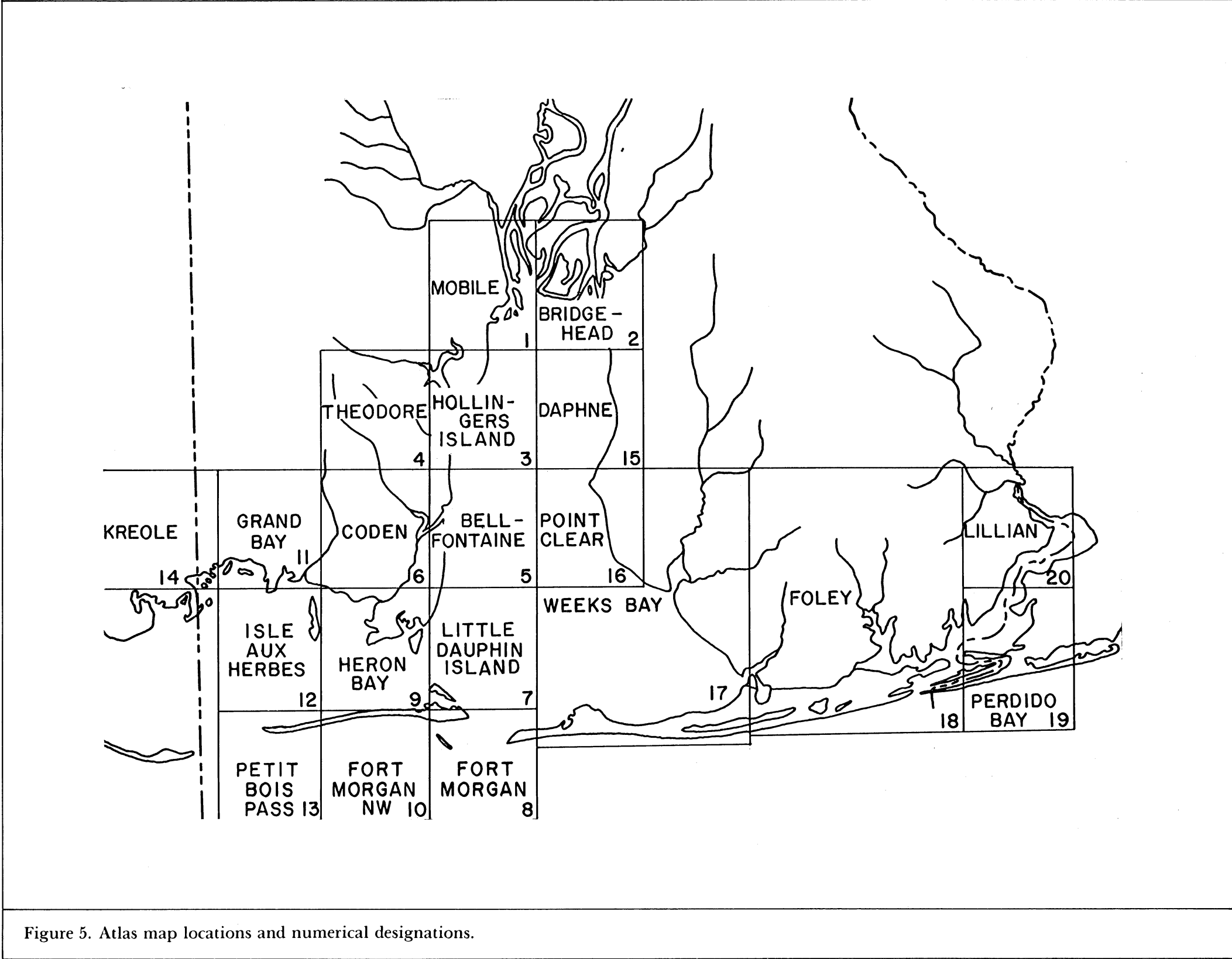
LIST OF INTERVIEWS
CONCERNING WETLAND GRASSBED OCCURRENCE

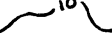

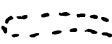

R. E. Adger — East Shore
Ralph Atkins — Deer River
Don Bland — General
B. F. Borom — Mobile Bay
John Dorland — Cotton Bayou
Alfred Falck — Fly Creek S. to Fairhope Pier
Norman Foster — Arlington — Dog River
Steve Heath — General
Chris Jeffery — Grand Bay Swamp
Leo Keller — Yacht Club to Davis Bar
George Marston — East Shore
Joy Morril — Lower Perdido Bay
Richard Murray — East Shore
James Sanca — East Shore
Julian Stewart — General
Lois Gayle Walker — Lower Perdido Bay
J. M. Weldon — East Shore
Bill Zundell — East Shore

-NOTES-

ATLAS

MAP INDEX	
Name	Atlas Map
Belle Fontaine	5
Bridgehead	2
Coden	6
Daphne	15
Foley (15')	18
Fort Morgan	8
Fort Morgan NW	10
Grand Bay	11
Heron Bay	9
Hollingers Island	3
Isle aux Herbes	12
Kreole	14
Lillian	20
Little Dauphin Island	7
Mobile	1
Perdido Bay	19
Petit Bois Pass	13
Point Clear	16
Theodore	4
Weeks Bay (15')	17



ATLAS LEGEND		
Submersed Grassbed Species		
B.c.	Bacopa caroliniana	
B.m.	Bacopa monnieri	
C.c.	Cabomba caroliniana	
C.h.	Callitriche heterophylla	
C.d.	Ceratophyllum demersum	
Chr.	Characeae	
E.d.	Egeria densa	
H.w.	Halodule wrightii	
H.d.	Heteranthera dubia	
H.c.	Hydrochloa carolinensis	
L.c.	Lilaeopsis chinensis	
M.f.	Mayaca fluviatilis	
M.u.	Micranthemum umbrosum	
M.b.	Myriophyllum brasiliense	
M.h.	Myriophyllum heterophyllum	
M.s.	Myriophyllum spicatum	
N.g.	Najas guadalupensis	
N.l.	Nuphar luteum	
N.o.	Nymphaea odorata	
N.a.	Nymphoides aquatica	
P.c.	Potamogeton crispus	
P.d.	Potamogeton diversifolius	
P.ill.	Potamogeton illinoensis	
P.n.	Potamogeton nodosus	
P.pect.	Potamogeton pectinatus	
P.perf.	Potamogeton perfoliatus	
P.p.	Potamogeton pusillus	
R.m.	Ruppia maritima	
S.s.	Sagittaria subulata	
Utric.	Utricularia spp.	
V.a.	Vallisneria americana	
Z.p.	Zannichellia palustris	
Marsh and Swamp Types		
I.	Saline and Brackish Marsh	
II.	Shrub Zone	
III.	Fresh Water Marsh	
IV.	Moist Pine Forest	
V.	Moist Pine Savannah, Grass-Sedge Bog	
VI.	Swamp — (Bay; Tupelo; Cypress)	
VII.	A. Upland Pine-Oak Woodland B. Maritime Pine-Oak Woodland	
VIII.	Beach and Foredunes	
IX.	Stable Dune Ridge Complex	
Marsh Species		
Ap	Alternanthera philoxeroides	
C	Cladium jamaicense	
Gv	Glottidium vesicarium	
P	Phragmites australis	
Pc	Pontederia cordata	
Pr	Panicum repens	
Pu	Peltandra virginica	
Samer	Scirpus americanus	
Sag	Sagittaria falcata	
Sl	Sagittaria latifolia	
T	Typha spp.	
Val	Scirpus validus	
Z	Zizania aquatica	
 = 10 foot contour		
 = wetland boundary, continuous coverage		
 = wetland boundary, discontinuous coverage		
 = location of marginal wetland, too small to provide boundaries		