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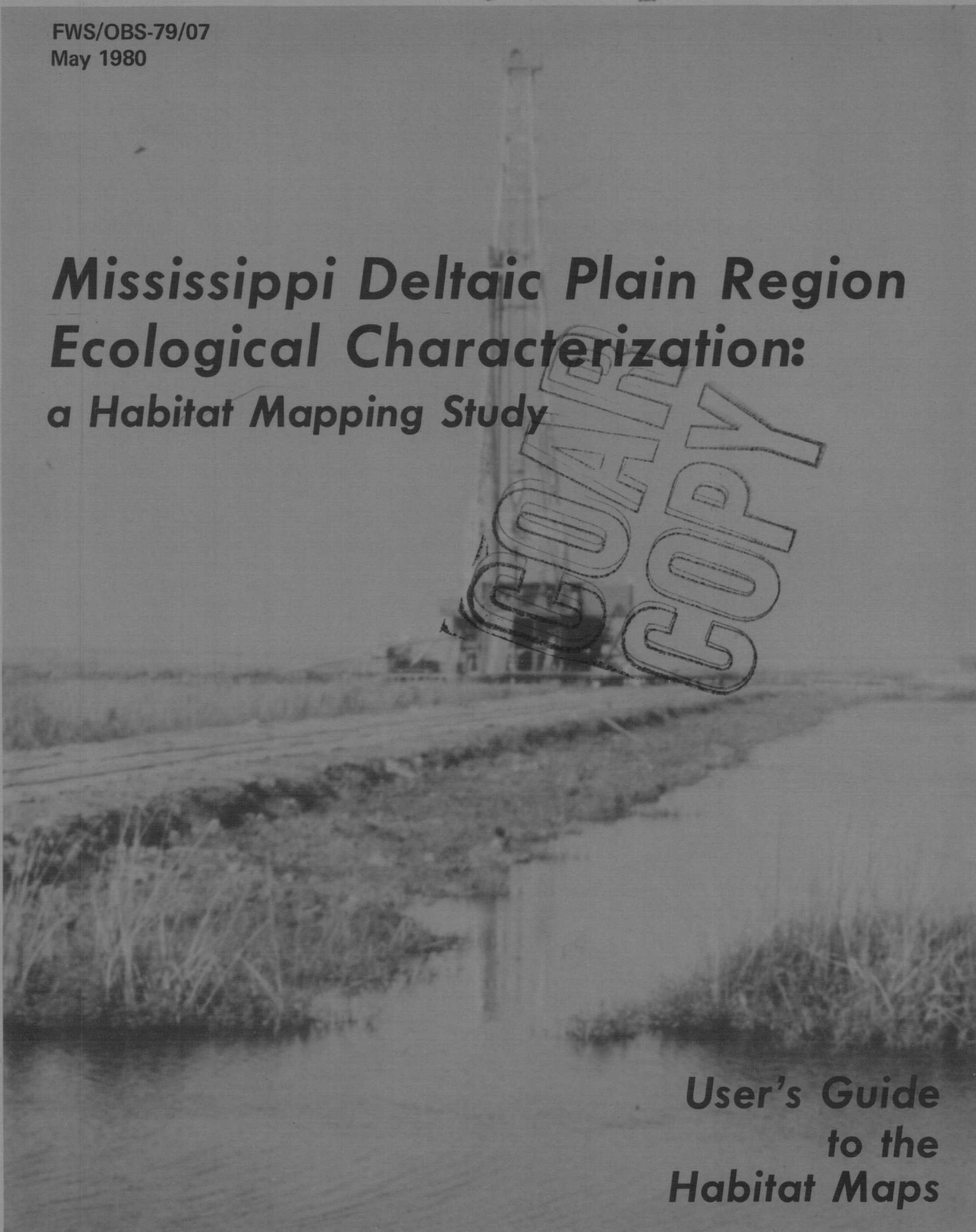
May 1980



Mississippi Deltaic Plain Region Ecological Characterization:
a Habitat Mapping Study

User's Guide to the Habitat Maps

BUREAU OF LAND MANAGEMENT
FISH AND WILDLIFE SERVICE

U.S. Department of the Interior

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FWS/OBS-79/07
May 1980

MISSISSIPPI DELTAIC PLAIN REGION ECOLOGICAL CHARACTERIZATION: A HABITAT MAPPING STUDY

A USER'S GUIDE TO THE HABITAT MAPS

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Office of Biological Services
Fish and Wildlife Service
U.S. Department of the Interior

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PREFACE

The purpose of the Missisippi Deltaic Plain Region Ecological Characterization Study is to compile existing information from the biological, physical and social sciences for the study region. The habitat maps and this User's Guide constitute a part of this characterization study. Decisionmakers, among others, may use this report for coastal planning and management. This is one of a series of characterizations of coastal ecosystems that will be produced by the U.S. Fish and Wildlife Service. Additional studies include the Chenier Plain of Louisiana and Texas, the sea islands of Georgia and South Carolina, the rocky coast of Maine, the coast of northern and central California, the Pacific Northwest (Oregon and Washington), and the Texas barrier islands.

This project was conducted under Contract FWS 14-16-0009-78-093. Funding was provided by the Bureau of Land Management and U.S. Fish and Wildlife Service. Results of this study are to be used in planning for Outer Continental Shelf oil and gas development.

The 464 habitat maps for 1955 and 1978, which were produced under this contract may be examined in the offices of the National Coastal Ecosystems Team. A sample copy of one of the habitat maps, reduced by 58%, follows this page.

Any questions regarding the habitat maps, the User's Guide, and the areal measurement of habitats should be directed to:

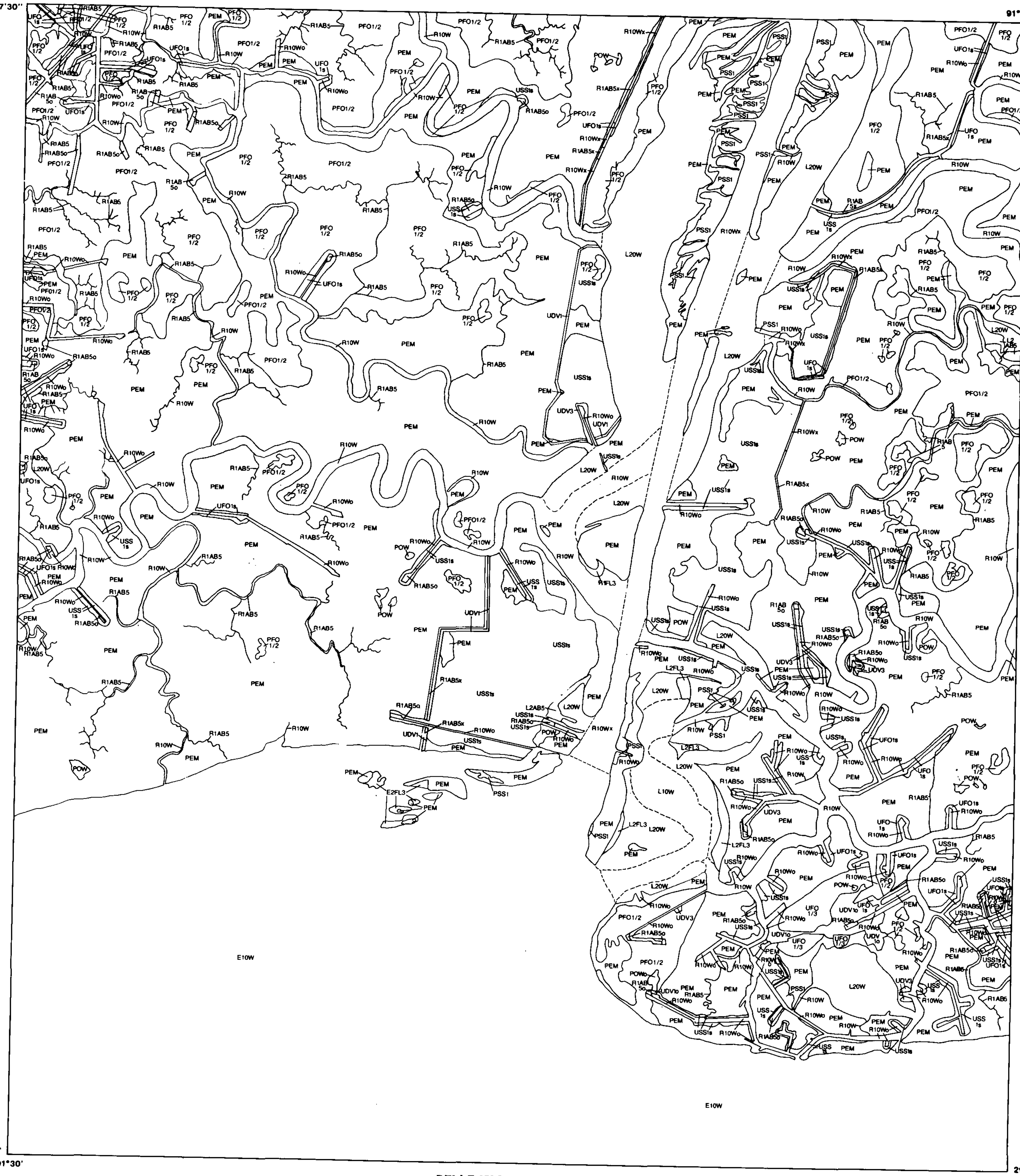
Information Transfer Specialist
National Coastal Ecosystems Team
U.S. Fish and Wildlife Service
NASA/Slidell Computer Complex
1010 Gause Boulevard
Slidell, Louisiana 70458

The habitat maps should be cited:

Wicker, K.M. et al. 1980. The Mississippi Deltaic Plain Region habitat mapping study. 464 maps. U.S. Fish and Wildlife Service, Office of Biological Services. FWS/OBS-79/07.

The User's Guide to the Habitat Maps should be cited:

Wicker, K.M. 1980. Mississippi Deltaic Plain Region ecological characterization: a habitat mapping study. A user's guide to the habitat maps. U.S. Fish and Wildlife Service, Office of Biological Services. FWS/OBS-79/07.



BELLE ISLE, LA. 1978

MISSISSIPPI DELTAIC PLAIN REGION HABITAT MAP

HABITAT MAP SYMBOLS

SYSTEM AND SUBSYSTEM

***SYSTEM**
*subsystem

M MARINE
1 subtidal
2 intertidal

E ESTUARINE
1 subtidal
2 intertidal

P PALUSTRINE
— no subsystem

R RIVERINE
1 tidal
2 lower perennial
3 upper perennial
4 intermittent

L LACUSTRINE
1 limnetic
2 littoral

U UPLAND
— no subsystem

CLASS AND SUBCLASS

***CLASS**
*subclass

AB AQUATIC BED
1 submergent algal
2 submergent vascular
3 submergent moss
4 floating-leaved
5 floating
6 unknown submergent
7 unknown surface

BB BEACH/BAR
1 cobble/gravel
2 sand/shell

EM EMERGENT
1 persistent
2 nonpersistent
3 narrow-leaved nonpersistent
4 broad-leaved nonpersistent
5 narrow-leaved persistent
6 broad-leaved persistent

FL FLAT
1 cobble/gravel
2 sand/shell
3 mud
4 organic
5 vegetated pioneer
6 vegetated non-pioneer

FO FORESTED
1 broad-leaved deciduous
2 needle-leaved deciduous
3 broad-leaved evergreen
4 needle-leaved evergreen
5 dead
6 deciduous
7 evergreen

OW OPEN WATER
unknown bottom

RF REEF
1 coral
2 mollusc
3 worm

RS ROCKY SHORE
1 bedrock
2 boulder
3 vegetated non-pioneer

SB STREAM BED
1 cobble/gravel
2 sand
3 mud
4 organic

SS SCRUB/SHRUB
1 broad-leaved deciduous
2 needle-leaved deciduous
3 broad-leaved evergreen
4 needle-leaved evergreen
5 dead
6 deciduous
7 evergreen

UB UNCONSOLIDATED BOTTOM
1 cobble/gravel
2 sand
3 mud
4 organic

DV DEVELOPED
1 urban/residential/commercial/industrial
2 agriculture/pasture/modified grasslands
3 unvegetated land/spoil/disposal sites

GR GRASSLANDS

WATER REGIME MODIFERS

NONTIDAL
A temporary
B saturated
C seasonal
D seasonal/well-drained
E seasonal/saturated
F semipermanent
G intermittently exposed
H permanent
J intermittently flooded

NONTIDAL COMBINED
Z intermittently exposed/permanent (G, H above)
W intermittently flooded/temporary (J, A above)
Y saturated semipermanent/all seasonals (B, C, D, E, F above)

TIDAL
L subtidal
M irregularly exposed
N regular
P irregular
R seasonal
S temporary
T semipermanent
V permanent

NONTIDAL AND TIDAL
U unknown
K artificial

WATER CHEMISTRY MODIFERS

COASTAL HALINITY MODIFER
1 hyperhaline
2 euhaline
3 mixohaline (brackish)
4 polyhaline
5 mesohaline
6 oligohaline
— fresh

INLAND SALINITY MODIFER
7 hypersaline
8 eusaline
9 mixosaline
— fresh

pH FRESH WATER MODIFER
a acid
t circumneutral
l alkaline

OTHER MODIFIERS

SPECIAL MODIFERS
b beaver
d partially drained/ditched
f farmed
e reclaimed wetland
h diked/impounded
r artificial
s spoil
x excavated
o oil/gas/mineral
t tidal
p beach

SOIL MODIFERS
g organic
n mineral

prepared for: **BUREAU OF LAND MANAGEMENT AND FISH AND WILDLIFE SERVICE**
BIOLOGICAL SERVICES PROGRAM
U.S. DEPARTMENT OF THE INTERIOR
FWS/OBS — 79/07
FEBRUARY 1980

prepared by: **COASTAL ENVIRONMENTS, INC.**
1260 MAIN STREET
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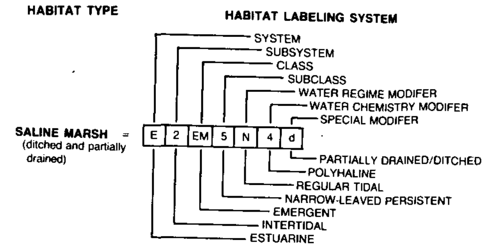
Explanation of Habitat Map Symbols:



Boundary Legend:

COASTAL ZONE:
LOUISIANA ACT 361 (State and Local Coastal Resources Management Act of 1978)
MISSISSIPPI 15 FT CONTOUR
OFFSHORE STATE-FEDERAL DEMARCATION LINE

HYDROLOGIC UNITS

STATE

PARISH/COUNTY

MARSH ZONES:
1950s SALINE/BRACKISH
1978 SALINE/BRACKISH/INTERMEDIATE/FRESH

Special Note:

This habitat map series of the Mississippi Deltaic Plain Region covers two time periods: the mid 1950s and late 1970s. These maps are designed to be used with USGS topographic series maps, 7.5-minute quadrangles (1:24,000 scale) and orthophotoquads. The inland extent of the coastal zone for Louisiana is that which was established by Legislative Act 361 and is the 15-foot contour for Mississippi. The offshore boundary is the State-Federal demarcation line. The seven hydrologic units in this map series are similar to those shown in Chabreck (1972) but are drawn to approximate the actual hydrologic basin divide.

This document was prepared by monoscopic analysis of high altitude aerial photographs at scales of 1:20,000 and 1:24,000 as well as other sources of information. Habitats were identified on the photographs based on vegetation, visible hydrology, and geography in general accordance with Classification of Wetlands and Deep Water Habitats of the United States (An Operational Draft) Cowardin et al. 1977. Wetland designations may differ in some cases from those of National Wetland Inventory due to different mapping conventions and different qualities of photography used. Where necessary, new habitat categories were added to label non-wetland areas and to designate man-made habitats. The aerial photographs typically reflect conditions during the specific year and season when they were taken. In addition, there is a margin of error inherent in the use of the aerial photographs. Thus, a detailed, on-the-ground and historical analysis of a single site may result in a revision of the wetland boundaries established through photographic interpretation. Also, some small wetlands and those obscured by dense forest cover may not be included on this document.

Federal, State and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner from that used in this study. There is no attempt, in either the design or products of this study, to define the limits of proprietary jurisdiction of any Federal, State or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, State or local agencies concerning specific agency regulatory programs and proprietary jurisdictions that may affect such activities.

Major Habitat Map Sources:

NASA, Flight Request #0754 (Landers, EPA). October 8, 9, 10, 15, 1978. Color infrared, uncontrolled prints, 1:24,000.

Petroleum Information Corporation (Ammann). 1955-1956, 1958. Black and white, controlled mosaics, 1:24,000. San Antonio.

Petroleum Information Corporation (Ammann). 1951-1952. Black and white, uncontrolled prints, 1:20,000.

Tobin Research, Inc. 1955-1956, 1958. Black and white controlled mosaics, 1:24,000. San Antonio.

U.S. Army Corps of Engineers, Mobile District. 1976. Black and white, uncontrolled prints, 1:24,000.

U.S. Department of Agriculture, Soil Conservation Service. 1951, 1952, 1953. Black and white, uncontrolled prints, 1:20,000.

SCALE 1:24,000
0 1 2 km
0 1 mi
0 2000 ft

ACKNOWLEDGEMENTS

The User's Guide to the Mississippi Deltaic Plain Region Habitat Maps is to be used in conjunction with the habitat maps to explain the habitat classification system and the procedures involved in map preparation. We thank the many people who contributed to the mapping project, directing specific phases, interpreting aerial photographs, measuring habitat areas, drafting the camera-ready maps, and reviewing interpreted habitats.

Daily supervision of the progress of photo interpretation and measurement of habitat areas was performed by Frank A. Perkins during the initial phase of the project. Later, Klaus J. Meyer-Arendt assumed this position, which he held until the project was completed. Photo interperetation and planimetering were performed by the following persons: Michael Buchart, Todd Davidson, Michele DeRouen, Frank Gable, Keith Guillot, Jeff Hildebrand, Tim Knight, Bryan McWilliams, Greg Morgan, David O'Brien, Steven Paes, W. David Pattison, Sherry White Perkins, Robert Strader, Mark Tesson, and Chris Willis.

Preparation of the final, camera-ready copies of the habitat maps was supervised by Susan Prinz, John Snead and Christopher Airriess. Drafting was done by the following persons: Henry Alinger, Richard Ballantyne, Cynthia Cash, Eileen Denny, Barry Landry, Karin Martin, April Phillips, Lee Ann Puckett, Steve Reynolds, Ted Richardson, Julie Shambaugh, Cynthia Strobel, Anita Verdun, Rip Weaver, Ann Wright, and David Wright.

That portion of the project involving the training of the people who planimetered the habitat maps and the compilation and proofing of the habitat area measurement data was performed by Douglas O'Connor, who was also responsible for quality control during the planimetering process. Johannes van Beek aided in the formulation of the planimetering procedures and the tabulation of the areal measurements.

Field reconnaissance to verify the aerial photo interpretation of selected areas was undertaken by Donny Davis and Gary J. Irish. Suzanne Nair of the U.S. Fish and Wildlife Serive, Division of Ecological Services, Annapolis, Maryland, assisted in field checking.

Draft habitat maps were sent to the following persons for review: Robert H. Chabreck, Professor, School of Forestry and Wildlife Management, Louisiana State University, Baton Rouge, Louisiana; David Frugé, Senior Field Biologist, U.S. Fish and Wildlife Service, Division of Ecological Services, Lafayette, Louisiana; John Hefner, Regional Coordinator, National Wetland Inventory, U.S. Fish and Wildlife Service, Atlanta, Georgia; Lynn Loftin, Ecosystems, Incorporated, 234 Loyola Avenue, New Orleans, Louisiana; Glen N. Montz, Botanist, U.S. Army Corps of Engineers, New Orleans, Louisiana; and Porter B. Reed, Biologist, National Wetland Inventory, U.S. Fish and Wildlife Service, St. Petersburg, Florida.

In the course of this project, the following people were consulted for information on specific topics: Pat O'Neil, U.S. Geological Survey/EROS, NSTL Station, Mississippi; Hank Svehlak, National Cartographic Information Center, NSTL Station, Mississippi; Joyce Nelson, Geoscience Map Library, Louisiana State University, Baton Rouge, Louisiana; Cornell Ladner and Larry Lewis, Bureau of Marine Resources, Long Beach, Mississippi; James M. Coleman, Director of the Coastal Studies Institute, Louisiana State University, Baton Rouge, Louisiana, Joel Lindsey and John Glenn, Louisiana Department of Transportation and Development, Baton Rouge, Louisiana; Gary Shelton, Environmental Protection Agency, Las Vegas, Nevada; and Robert M. Rogers, Bureau of Land Management, New Orleans, Louisiana.

Many of the illustrations appearing in the User's Guide were prepared by Curtis Latiolais and John Snead. Susan Pendergraft edited the User's Guide and Susan Baugh, Darlene Marsh, and Elizabeth Saba typed the manuscript.

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INTRODUCTION

The Mississippi Deltaic Plain Region habitat mapping project identifies and measures habitats in the study area and illustrates change over a given period of time. Two sets of habitat maps, one for the mid-1950s and one for the late 1970s, were constructed and the habitat areas for each period were measured using an electronic digitizer (Numonics 1224). The habitat areas for each time period were tabulated by county/parish, state, and hydrologic unit in order to facilitate comparisons of habitat area change in these regional units (Figure 1).

The study area is located in the coastal region of southeastern Louisiana and southern Mississippi (Figure 1). The inland boundary for Louisiana is the Coastal Zone Management line established by Act 361 of the Louisiana State Legislature (1978) (Figure 1; Appendix 1). The inland boundary for Mississippi is the 15 ft contour line, considered by the U.S. Army Corps of Engineers (USACE) (personal communication, 1978, Joe Hutton, USACE, Mobile District) to be the inland extent of the 100-year flood. The offshore boundary is the 3 mi State-Federal demarcation line (U.S. Department of Interior [USDI], Bureau of Land Management [BLM] n.d.) (Figure 1). In Mississippi, the study area encompasses all of the coastal zone between the Alabama and Louisiana state borders. In Louisiana, the western extent of the study area is terminated at the western border of hydrologic unit 7 (see Figure 1). The entire area is divided into seven hydrologic units similar to those designated by Chabreck et al. (1968) and Chabreck (1972), but in this study the boundary lines are more clearly defined by topographic features such as natural and artificial levees which represent definite water drainage divides (Appendix 2). All of coastal Mississippi constitutes Unit 1 while Louisiana is segmented into the remaining six units. In some instances, the hydrologic boundaries shifted between the 1950s and the 1970s because of channel erosion, new channel dredging, or replacement of levees.

The two time periods selected for study, mid-1950s and late 1970s, constitute periods for which there is complete, high quality, aerial photography of the study area (Appendix 3). For convenience, throughout this report the terms 1950s and 1978 will be used to indicate the dates of the two sets of habitat maps. However, the exact date or dates of photographs utilized for photo interpretation appears on the individual habitat maps in Appendix 3.

All of the 1950s photographic coverage consisted of black and white, large-scale aerial photographs. The majority of these photographs are controlled mosaics (1:24,000) taken in 1955, 1956, and 1958 (Petroleum Information Corp. 1956; Tobin Research, Inc. 1955/56, 1958). The remaining 1950s coverage consisted of black and white prints at 1:20,000 (U.S. Department of Ariculture, Soil Conservation Service, 1951-1953). Approximately three-fourths of the study area was photographed in color infrared (CIR) by National Aeronautics and Space Administration (NASA) in October 1978. This CIR photography was uncontrolled and not quad-centered. Prints at a scale of 1:24,000 were used for photo interpretation. Habitat interpretation of the remainder of the study area, the eastern half of Mississippi, was obtained from uncontrolled, not quad-centered, black and white prints (1:24,000) flown in 1976 and 1977 (USACE 1976-77).

The 1955 period was chosen for habitat interpretation because good quality, complete aerial coverage was available and habitat changes related to oil and gas activities were just beginning to intensify in the coastal zone. The 1978 period was chosen because this was the latest period for which complete coverage was available to provide the

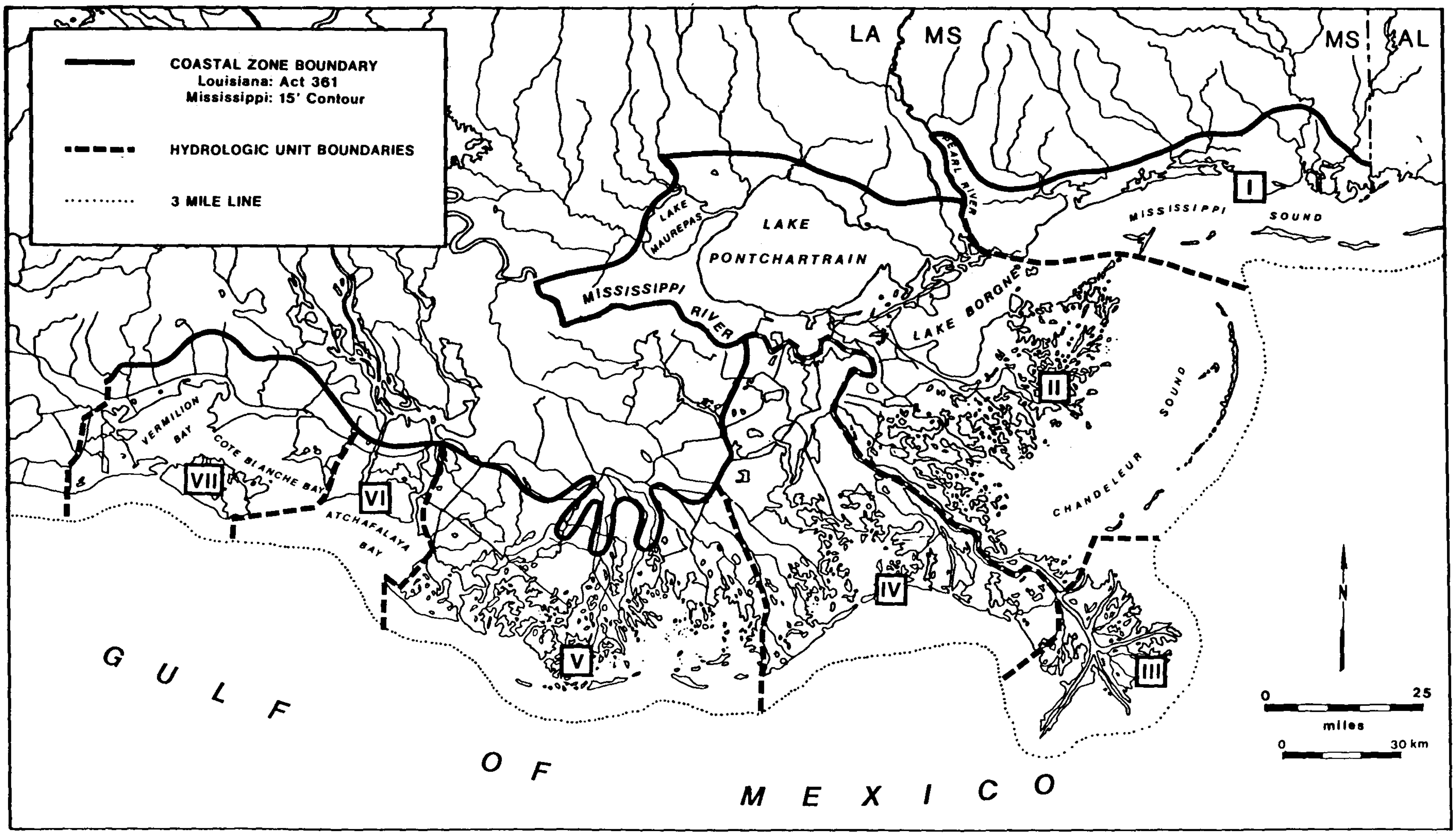

Figure 1. Location of the Mississippi Deltaic Plain Region study area. (Note that hydrologic unit 3 includes that portion of the Mississippi River between the crests of the east and west bank protection levees, and that the coastal zone boundary in Mississippi follows the 15 ft contour line and is only drawn approximately on this map.)

most up-to-date information on the extent of the coastal habitats.

The habitat maps were constructed at a scale of 1:24,000 for two primary reasons. First, this is a convenient scale for mapping habitats and generating information useful in coastal habitat and land use evaluation, planning, and management. Second, the land area within the entire study area has already been mapped by the United States Geological Survey (USGS) at this scale in the form of topographic maps, orthophoto maps, or orthophotoquads (Appendix 3) which were available as base maps.

There is a total of 272 topographic-sized habitat maps at a scale of 1:24,000 covering the study area (Figure 2; Appendix 3). Of this total, 232 show land and 40 depict open water. The open water habitat maps were constructed to show the study area out to the 3 mi State-Federal demarcation line. They contain state, parish, county, and hydrologic unit boundaries where necessary. Wherever USGS included a small land mass outside the 7.5 minute boundary of their topographic map, a habitat map was constructed for this land mass for the purpose of this study. It was labeled north, east, south, or west of the original USGS topographic map according to the side from which the land mass extended.

For convenience in filing and retrieving the large numbers of maps and photographs used in this project, each 7.5 minute map was assigned a number and letter (Figure 2; Appendix 3). All photographs were also labeled with one or more letter-number combinations according to how many different 7.5 minute map areas were present on the photograph. The location of the 7.5 minute maps, their alphanumeric label, hydrologic unit, state, coastal zone, 3 mi, and county/parish boundaries were illustrated on a 1:250,000 master map. With this method, it was easy to discern boundary data and position of individual areas within the study area and to quickly locate the maps and relevant photographs. In the case of the photographs which were not quad-centered, individual flight lines for each mission were transposed onto a labeled topographic map grid (Figure 3). The individual photo frames and frame numbers were shown on the grid, making it easy to determine which photographs covered a particular topographic map unit.

CLASSIFICATION OF HABITAT TYPES

SOURCE AND EXTENT OF CLASSIFICATION SYSTEM

The method for identifying and labeling habitats within the study area was adapted from the U.S. Fish and Wildlife Service's (FWS) Classification of Wetlands and Deep-Water Habitats of the United States (Cowardin et al. 1979) and modified by the National Wetland Inventory of the U.S. Fish and Wildlife Service (FWS n.d.). This classification system is based on a hierarchical structure composed of: (1) system and subsystem, (2) class and subclass, and (3) modifiers (water regime, water chemistry, soil, and special) (Appendix 4). Because this particular project included mapping of non-wetland habitat types, the classification system was modified to include a non-wetland, upland system (U) and a developed class (DV) (Appendix 4). Numerical modifiers were added to these class labels to indicate urban-industrial-residential (1), agriculture-pasture-grasslands (2), and unvegetated, non-wetlands (i.e.,spoil, cleared areas) (3) (Appendix 4).

Other modifiers were added to the existing classification system to more clearly define habitats peculiar to coastal Louisiana and Mississippi. These include reclaimed wetlands under cultivation (e), oil/gas/mineral-related habitats (o), and estuarine tidal channels (t). A complete identification of all habitat labels used in this mapping project is included in the Glossary (Appendix 5).

One advantage of this system of habitat classification is that it permits labeling of a habitat in varying degrees of detail according to the data

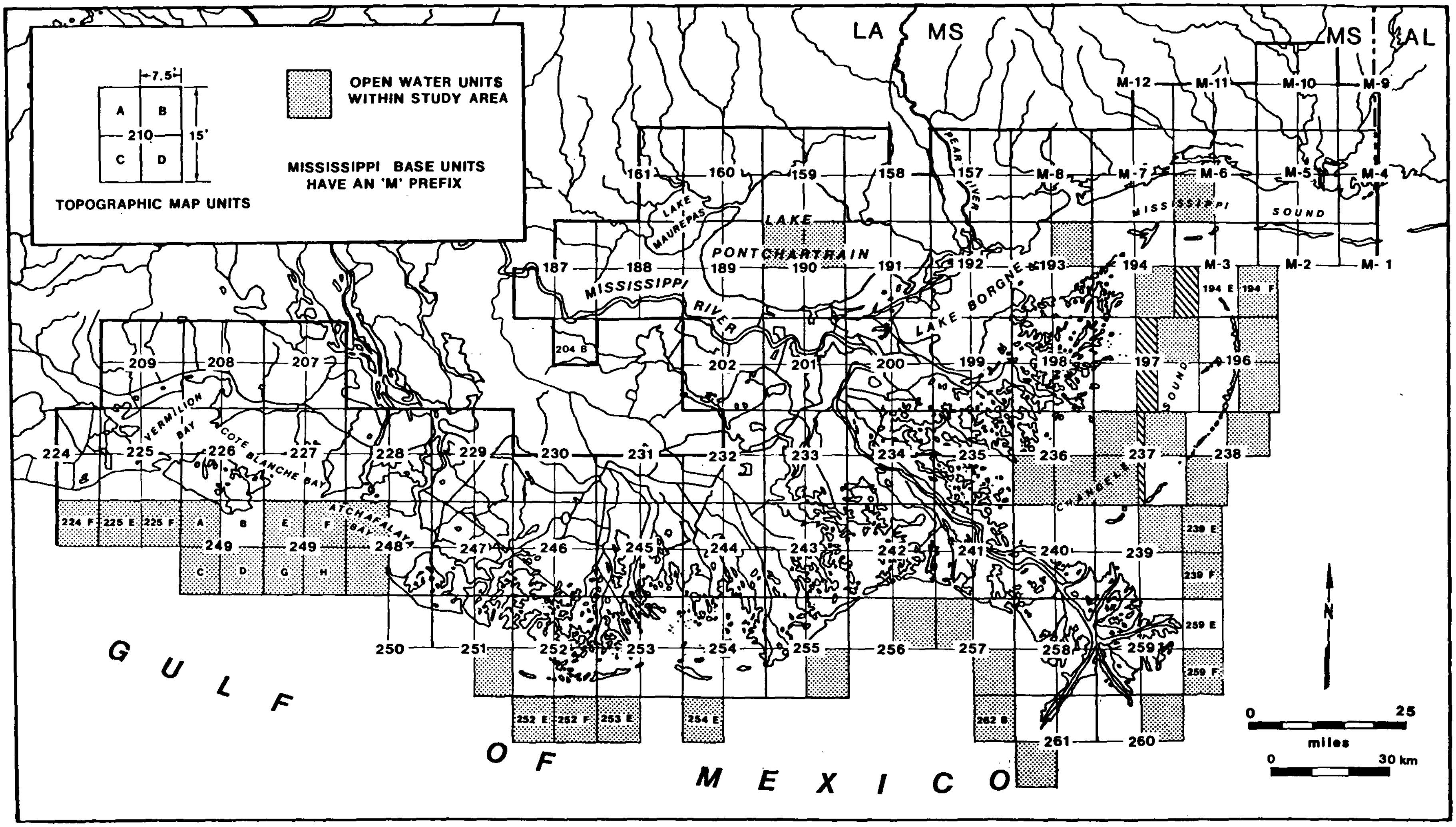

Figure 2. Location of topographic map units interpreted and measured within the study area. (See Appendix 3 for a complete listing of topographic map names and numbers. There are no maps for the crosshatched areas.)

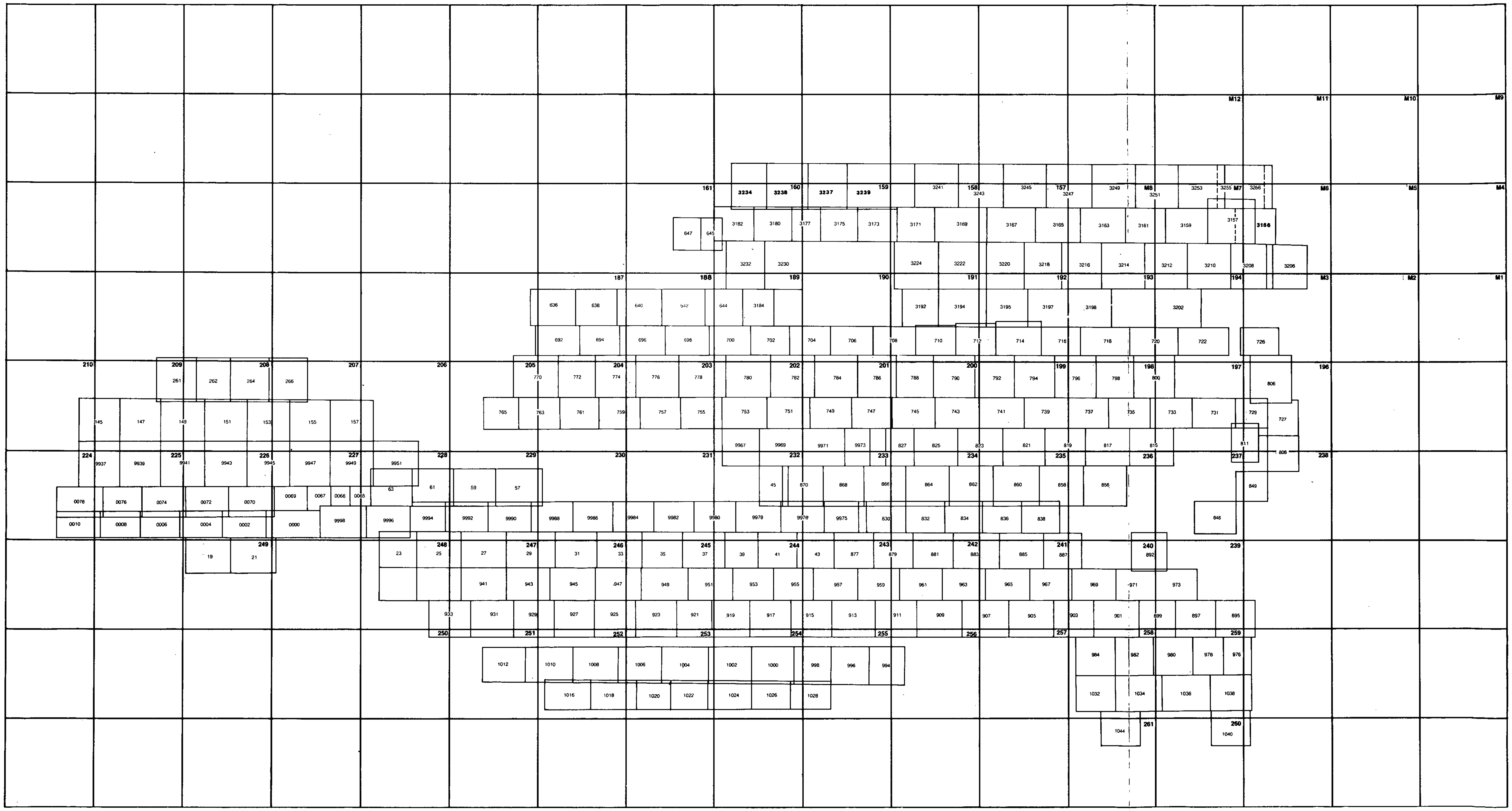

Figure 3. Location of 1978 color infrared photographs with regard to USGS 15 minute topographic maps. Each large block represents four 7.5 minute maps. The bold face numbers represent code numbers for the USGS topographic maps (see Appendix 3 for the map names); the numbers inside the small blocks are the frame numbers for 1978 (NASA 1978).

base available for the major systems within the study area. For example, a non-fresh marsh can be labeled simply as E2EM (Figure 4). If the vegetation is known to be narrow-leaved persistent, such as smooth cordgrass (Spartina alterniflora), add a "5". If the wetland is regularly flooded by tidal processes, this can be shown by attaching an "N". When the salinity is known, a coastal salinity modifier is added. In the case of a saline marsh,"4" signifies a polyhaline regime with salinities ranging from 18 ppt to 30 ppt (Cowardin et al. 1979). Finally, if the natural marsh environment has been altered by ditching and partial draining, this condition can be noted by using a special modifer "d".

MAPPING CONSTRAINTS

There were a number of constraints involved in mapping habitats within the Mississippi Deltaic Plain Region in the 1950s and 1978. There was a lack of statewide, detailed (to the subclass and water modifier level) habitat information both for specific time periods and individual habitats. In general, the data on specific marsh types, water regimes, and water chemistry were less detailed for the 1950s than for 1978. For both time periods there were more specific data, such as maps, available on vegetation distribution than on water chemistry and water regimes. Furthermore, there were more mappable data available for the Louisiana coastal zone during both time periods than for Mississippi.

Habitat maps are not identical in detail to USGS topographic maps because their primary purpose is to illustrate the extent of habitats important for fish and wildlife interests. For example, many industrial sites, roads, and housing clusters were interpreted as a single habitat because they function as a non-wildlife habitat and there was no purpose in separating them. Some features, such as canals, could not be discerned from aerial photographs because of their small size or the fact that they were hidden by vegetation. The USGS topographic maps were not always useful in locating these features because they were of varying dates and not always temporally consistent with the photographs.

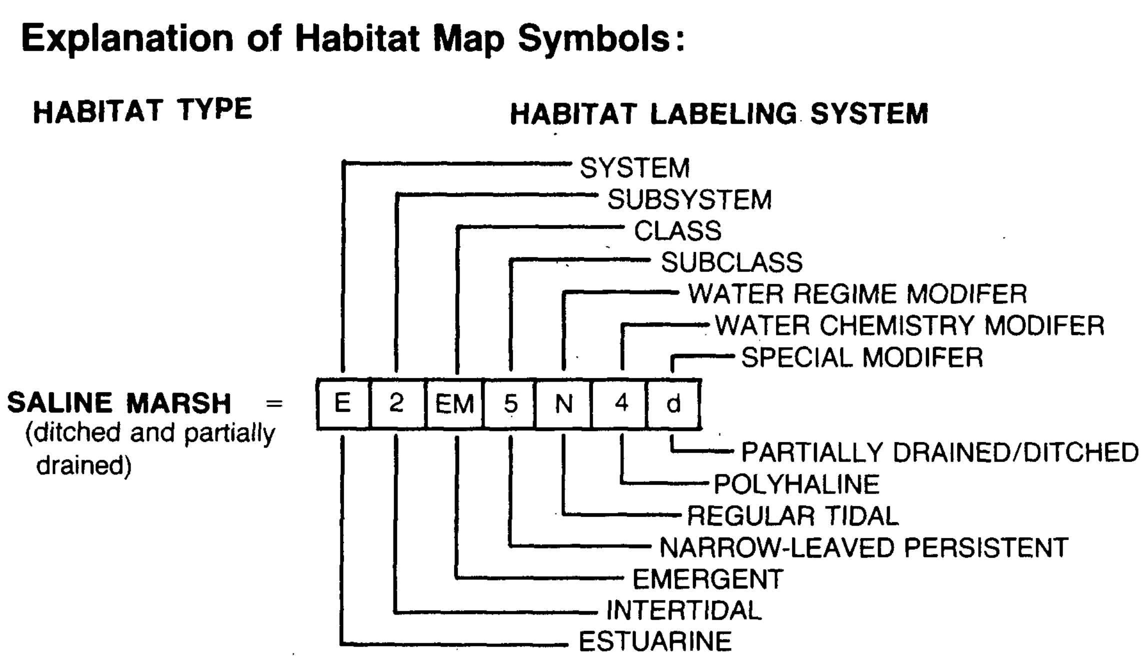

Figure 4. An example of habitat labeling (Cowardin et al. 1979; FWS n.d.).

Aerial photographs were used as the basis for habitat interpretation on the 1950s and 1978 maps. However, other information sources, such as topical maps, topographic maps, published reports, and field reconnaissance, were essential for detailed habitat identification, especially on the subclass and modifier levels. An understanding of the past and present, natural and man-made forms and processes characteristic of the Mississippi Deltaic Plain Region was also essential to habitat identification. In this region, morphology closely governs the vegetation associations which characterize and distinguish individual habitats. An understanding of local hydrologic processes also facilitates aquatic and marine habitat identification even where scientific data are inadequate or absent. Familiarity with land use practices within the Mississippi Deltaic Plain Region is necessary for identification of habitats that have been modified by man.

In identifying mappable categories on aerial photographs, it is advisable to approach the task in a systematic manner, beginning with what is obvious and capable of being outlined and proceeding to collateral information for details on classification and labeling. Within the Mississippi Deltaic Plain Region, all mappable features fit into one of four major categories: aquatic, vegetated, unvegetated with structures, and unvegetated without structures.

Labeling aquatic habitats requires a knowledge of salinity and tidal influences, water body size, depth, and origin. Much of this kind of information must be acquired from collateral sources such as topical maps and reports. The identification of vegetated habitats requires a familiarity with plant morphology or species type. Where vegetated habitats occur in wetland areas (e.g., ponds, lakes, embayments, rivers) a knowledge of the water regime is essential.

Nonvegetated habitats exhibiting no structures are classified primarily through geomorphic associations, i.e., the feature's appearance as a beach, flat, reef, or unconsolidated bottom and the material composition available in a particular area such as sand, shell, mud, boulders, organic matter, etc. Again, the placement of these classes and subclasses into the larger system and subsystem requires the identification of water bodies with which they are commonly associated.

Nonvegetated habitats exhibiting structures are easily identified to system, subsystem, and class level because of their obvious man-made appearances. Field reconnaissance and topographic maps are useful in identifying the type of man-made feature, but for the purpose of this study, no modifiers, with the exception of petroleum-related activities, were used.

AERIAL PHOTOGRAPHIC INTERPRETATION

Habitat maps can be made from aerial photographs by identifying, categorizing, and outlining the information contained within the photographs. The amount of data that can be obtained from a photograph depends upon the interpreter's ability, familiarity with the landscape shown in the photograph, the scale and resolution of the photograph, and the type of photograph (color infrared, black and white, color, etc.). Certain keys, or signatures, on photographs can be used alone or in combination to identify the habitats that are to be mapped. Some important keys in air photo interpretation are: color, tone, texture, shape, size, pattern, site (location), association, and shadow (Ray 1960, Avery 1969, Reeves et al. 1974). Examples of habitats located in the Mississippi Deltaic Plain Region and their key characteristics are listed in Table 1.

In this particular project, the resolution or sharpness of the features on the photographs used for interpretation was very good and the habitats to be delineated were, in almost all instances, clearly shown. All of the color infrared and most of the black and white photographs were at a large scale. Most were 1:24,000, but about one-third of the

Table 1. Characteristics of habitats that can be discerned on aerial photographs.

HABITAT	Examples of Signatures Present on Aerial Photographs					
	Color (Color Infrared)	Tone (Black and White)	Shape	Association/Site	Size	Texture
Water:						
Ponds/Pits	Dk blue-lt blue	Near black-lt grey	Round, linear, rectangular, irregular	Natural, construction, mining, farms	< 20 ac	Smooth
Lakes	Dk blue-lt blue	Near black-lt grey	Round, irregular	Natural	> 20 ac	Smooth
Impoundments	Dk blue-lt blue	Near black-lt grey	Irregular	Reservoirs, dams	Varies	Smooth
Embayments	Dk blue-lt blue	Near black-lt grey	Irregular	Open water	Varies	Smooth
Gulf	Dk blue-lt blue	Near black-lt grey	Irregular	Open water	Very large	Smooth
Rivers:						
Lower Perennial	Dk blue-lt blue	Near black-lt grey	Linear	Floodplains, natural levees	Varies	Smooth
Tidal	Dk blue-lt blue	Near black-lt grey	Broadens from head to mouth	Coast	Varies	Smooth
Estuarine	Dk blue-lt blue	Near black-lt grey	Broadens from head to mouth	Coast	Varies	Smooth
Canals:						
Pipeline	Dk blue-lt blue	Near black-lt grey	Linear	Spoil, oil industry	@40 ft wide	Smooth
Rig Cut	Dk blue-lt blue	Near black-lt grey	Linear with rectangular end	Spoil, oil industry	@70 ft wide	Smooth
Drainage	Dk blue-lt blue	Near black-lt grey	Linear	Spoil, wetlands	@10-50 ft wide	Smooth
Navigation	Dk blue-lt blue	Near black-lt grey	Linear	Spoil, coast	@40-500 ft wide	Smooth
Logging	Dk blue-lt blue	Near black-lt grey	Linear, radial	Spoil, swamps	@20-70 ft wide	Smooth
Vegetation:						
Trees	Red, purple	Dk grey, mottled	Irregular	Swamps, uplands	>20 ft height	Medium-course
Shrubs	Red	Dk grey	Irregular	Coast, disturbed areas	<20 ft height	Fine-medium
Grasses/Herbs:						
Dunes	Pink	Lt grey	Linear	Beach dunes	1 in-4 ft	Fine
Pasture/Agriculture	Red, pink	Dk grey-lt grey	Polygonal Rectangular	Farms	1 in-12 ft	Fine
Emergent	Red, pink, orange, brown	Lt grey, mottled	Irregular	Wetlands, coast	1 in-12 ft	Fine-medium
Floating Aquatics	Red, pink, lt brown	Medium grey	Linear to irregular	Freshwater bodies	.5 in-4 ft	Fine
Submerged Vascular	Lt pink, cream, white	Lt grey	Irregular	Shallow water	1 ft-6 ft	Fine
Submerged Algal	Lt pink, cream, white	Lt grey	Irregular	Shallow water	<1 in	Fine
Development: No Structures						
Bare material (Spoil)	White	Lt grey-white	Polygonal Linear Irregular	Oil industry, mining, construction	Variable	Smooth-Fine
Beach	White	White	Linear	Wave action, open water, shoreline	Variable	Smooth-Fine
Flat:						
Sand/Shell	White	White	Linear, patchy	Wave-worked shoreline	Variable	Smooth-Fine
Mud/Organic	Grey-grey/green	Lt grey	Linear, patchy	Protected shoreline	Variable	Smooth-Fine
Unconsolidated Bottom	Lt blue	Lt grey	Irregular	Water bottoms	Variable	Rippled
Reef	White	White	Linear	Oyster grounds	Variable	Medium
Development: With Structures						
Urban Industrial	White	Lt grey-white	Polygonal Rectangular	Development	Variable	Smooth-medium
Roads	White	White	Linear	Development	@50-300 ft wide	Smooth
Protection Levees	White, red	Lt grey-white	Linear	Flooding rivers, hurricane surge zone	@10-235 ft wide	Smooth-Fine
Cleared Right-of-Ways	Reddish-brownish	Lt-Medium grey	Linear	Roads, utilities, pipelines	@50 ft wide	Fine
Jetty	Grey	Medium grey	Linear	Shoreline	@20 ft wide	Medium

frames taken in the 1950s and covering eastern Mississippi and the barrier islands were 1:20,000. Because it is possible to discern considerable detail on photographs with high quality resolution at this large scale, the mapping process had to be selective and many readily discernable features (e.g., individual houses and roads) were grouped into larger mapping categories. This grouping was done partly because of the restrictions on the time allotted to interpret and draft the final maps. In some cases, mapping in greater detail was not essential to the scope of the project and perhaps would have been detrimental because it would have resulted in confusion when comparisons in habitats over time were made.

AQUATIC HABITATS

Identification on Aerial Photographs

Water bodies are easily recognized on CIR imagery by their blue to blue-green color and smooth texture. Color also indicates turbidity, with dark blue indicating clear water and turbid water being lighter blue-green to coffee-colored. The shade or tone on black and white imagery also varies from very dark to very light, darkest when the water is clear and lightest when it is very turbid.

The type of water body (i.e., pond, pit, lake, embayment, river, canal) is distinguishable primarily by shape and size, and secondarily by association (site) and pattern. In the FWS classification system (Cowardin et al. 1979), freshwater systems are called ponds if they are less than 8 ha (20 ac) in area, and lakes if they are more than 8 ha (20 ac) in area. Rivers are natural drainage systems that extend from inland regions to the coast and possess various drainage patterns, i.e., dendritic, radial, meandering, or anastomosing (Figure 5). Rivers are classified as intermittent, tidal or nontidal (lower perennial) when fresh. When non-fresh, all drainage patterns are classified tidally influenced estuarine. Embayments are considerably larger than lakes, are estuarine, and usually open directly into the Gulf of Mexico. In coastal Louisiana, embayments often consist of eroded interdistributary lakes and interconnected tidal channels. The Gulf of Mexico is located seaward of the barrier island complex of Louisiana and Mississippi. The Gulf is labeled variously as estuarine or marine depending upon the salinity as influenced by Mississippi and Atchafalaya River discharge.

Canals are easily distinguished from natural drainage channels by their straight, parallel banks and regular, repetitive patterns. Logging canals are the narrowest and are located in swamps or at the site of previous logging activities. The canal pattern varies according to the type of logging activity. A common pattern in coastal Louisiana consists of radial canals situated on a longer, wider canal (Figure 6). Rig cuts are identified by their approximately 46 m (150 ft) wide rectangular water body often containing drilling equipment at the end of a canal which is approximately 21 m (70 ft) wide when first dredged (Davis 1972). A rig cut may be a single short canal off a natural channel or one of many interconnecting canals (Figure 6). Pipelines, whether for oil or gas, are narrower than rig cuts, about 12 m (40 ft) wide when dredged (Barrett 1970). They run in straight lines from a few kilometers to hundreds of kilometers, and when they change direction they possess a curved rather than right-angled bend (see Figure 6). Another common canal type in coastal Louisiana and Mississippi is the borrow pit situated adjacent to a protection levee or road embankment. Often these canals are as wide as the associated levee and embankment (see Figure 6).

Classification to Habitat Type

Water bodies are the easiest features to locate on air photos but are among the most difficult to classify with the FWS system. Water bodies can fall under any one of five systems depending first upon their salinity and secondarily upon their size and shape (Figure 7, Table 2).

In the Mississippi Deltaic Plain Region, salinity is highly variable

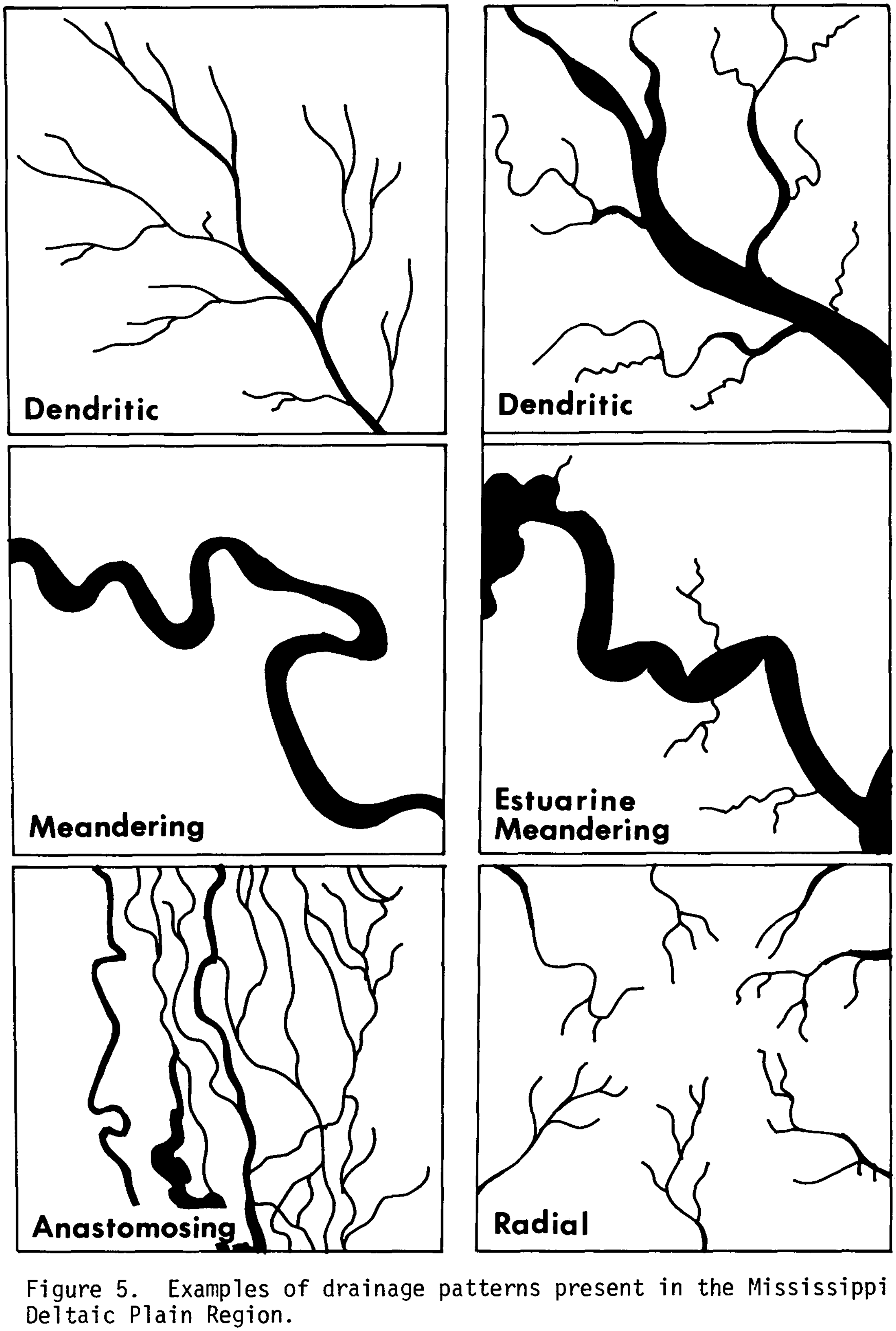

Figure 5. Examples of drainage patterns present in the Mississippi Deltaic Plain Region.

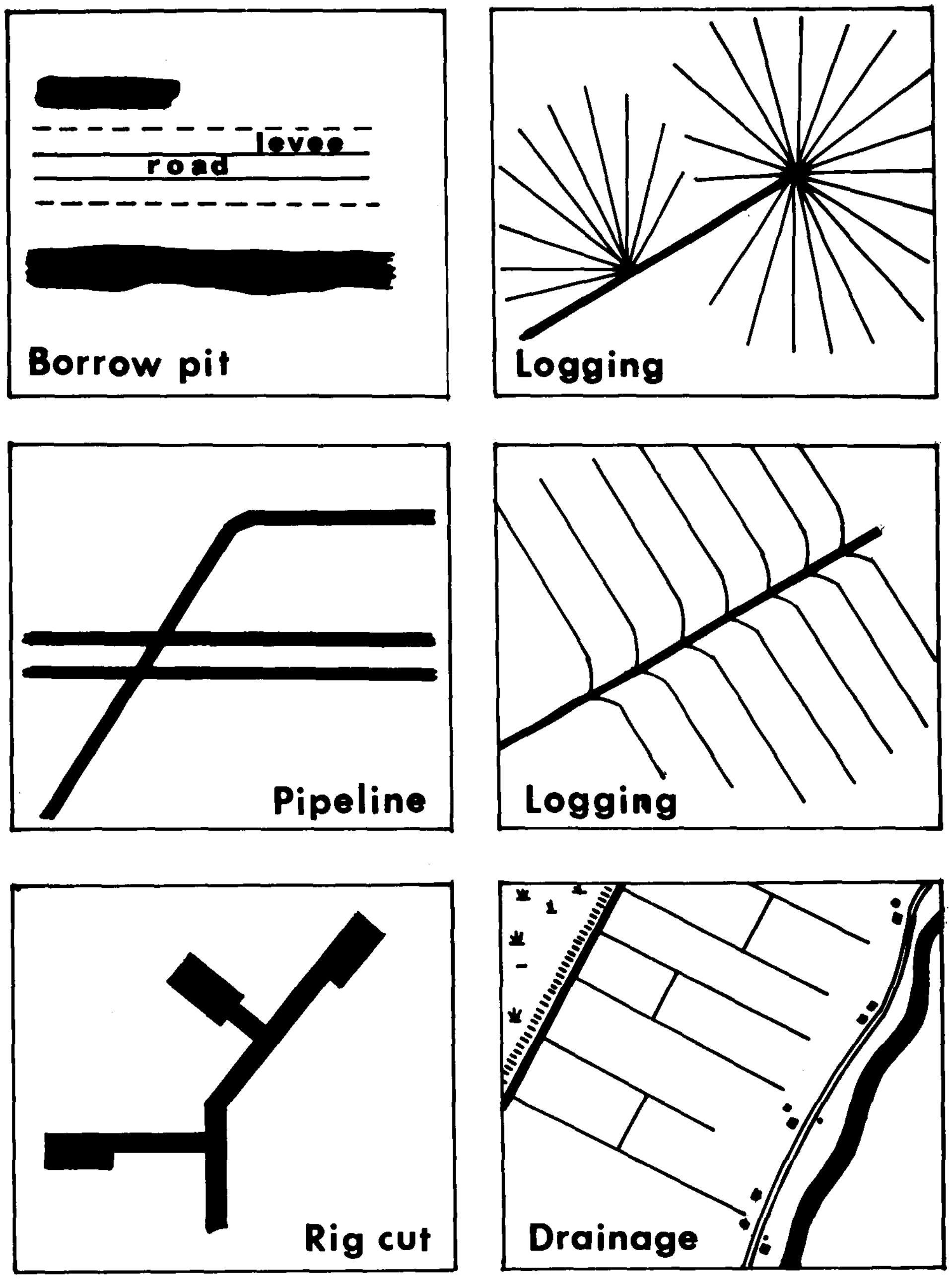

Figure 6. Characteristic shapes of canals common in the Mississippi Deltaic Plain Region (Wicker 1975).

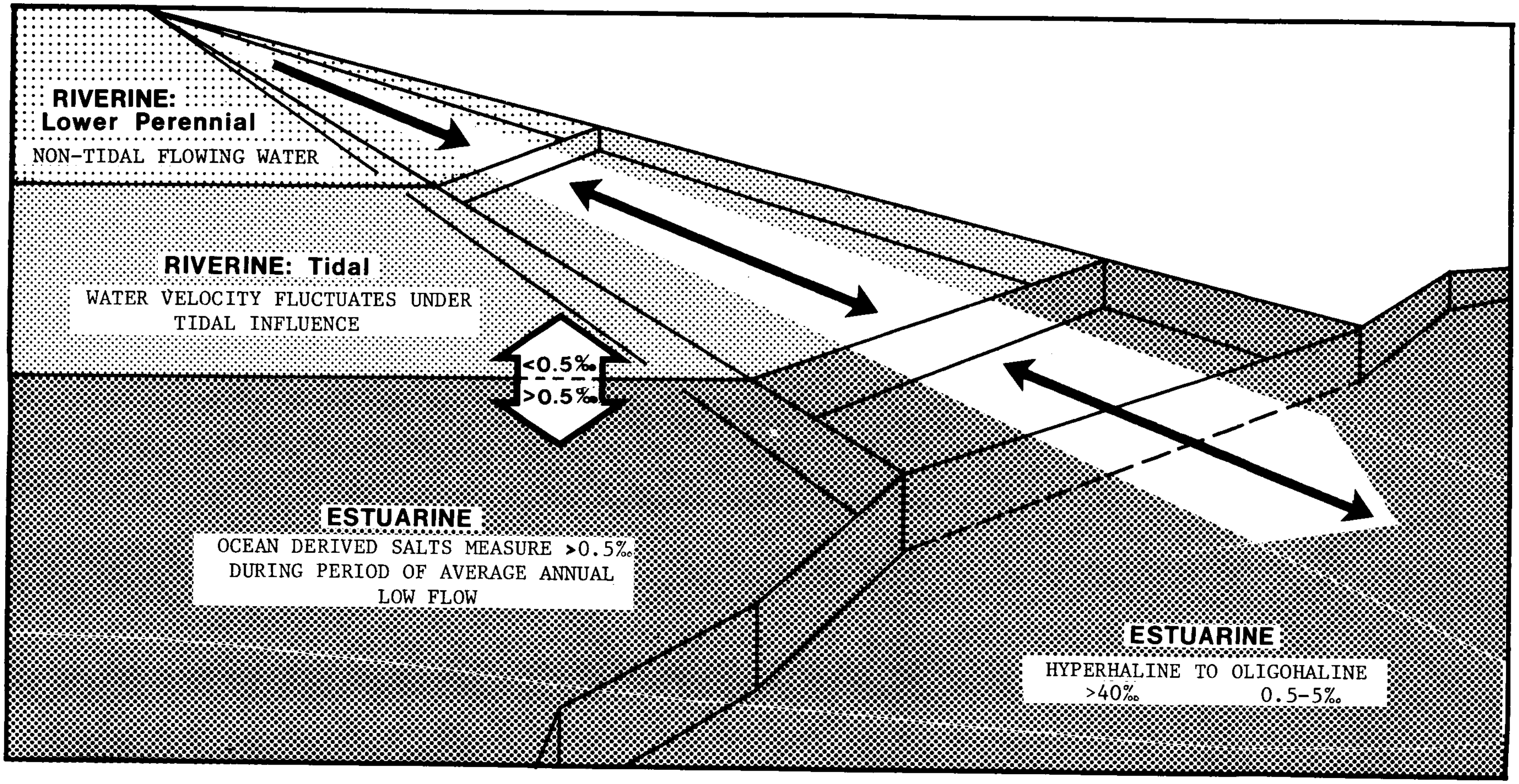

Figure 7. Schematic diagram illustrating differences among riverine, riverine tidal and estuarine reaches of a channel.

Table 2. Size, shape, and salinity characteristics of aquatic systems.

System	Salinity	Size	Shape
Marine	>30 ppt	NA	Open Gulf
Estuarine	>0.5 ppt* to 30 ppt	NA	Irregular/Channelized
Palustrine	<0.5 ppt	<20 ac (8 ha)	Irregular
Lacustrine	<0.5 ppt	>20 ac (8 ha)	Irregular
Riverine	<0.5 ppt	NA	Channelized

*During the period of average annual low flow (Cowardin et al. 1979).

daily, seasonally, yearly, and throughout the water column because of climatic factors and variations in discharge from major rivers such as the Mississippi, Atchafalaya, Pearl, and Pascagoula. Isohaline maps range from the very general (Chabreck 1972) to very specific, showing surface and mid-depth salinity values for individual months (Gagliano et al. 1970a; C. K. Eleuterius 1976, 1979; Christmas and Eleuterius 1973), but because of the great variations in the location of isohaline boundaries during different months, these maps have limited value in habitat mapping.

In addition to salinity data, information on tidal influence is necessary in determining the break between tidal and lower perennial systems within channelized bodies of water. The only available information on tidal influence is a "tidal effects" map (Mississippi Marine Resources Council [MMRC] 1977) showing 16 sites where tidal influence was documented and 13 locations where tidal influence did not exist (Figure 8).

Therefore, in view of the lack of sufficient map data to fully delineate salinity and tidal parameters within the study area, a combination of sources was used to estimate habitat boundaries on the 1950s and 1978 maps. For purposes of this study, it was assumed that all channels within the marsh not cut off from normal circulation by dams and artificial levees were subject to tidal influence (either astronomical or meteorological) because of the low-lying, undifferentiated nature of the wetland topography. Channels originating within swamps that were less than 5 ft in elevation were also designated as being tidally influenced because it was assumed that water levels in these normally sluggish bayous would rise and fall under the influence of tides rather than be unidirectional in response to drainage basin discharge. Channels that extended into upland areas such as natural levees and terraces above the 5 ft contour were determined to be lower perennial where flow was continuous, and intermittent where flow ceased during some periods of the year. In Mississippi, tidal influence was extrapolated from the information contained on the tidal effects map (MMRC 1977) (Figure 8).

For the 1950s habitat map series, the break between estuarine and freshwater systems was determined by plotting the average of mid-depth salinities (when available) for the years 1947 through 1961 at 52 stations in coastal Louisiana (Gagliano et al. 1970b) (see Figure 8; Appendix 6). Those channels downstream of the points showing average salinities greater than 0.5 ppt were considered estuarine while those upstream were labeled as riverine tidal, riverine lower perennial, or riverine

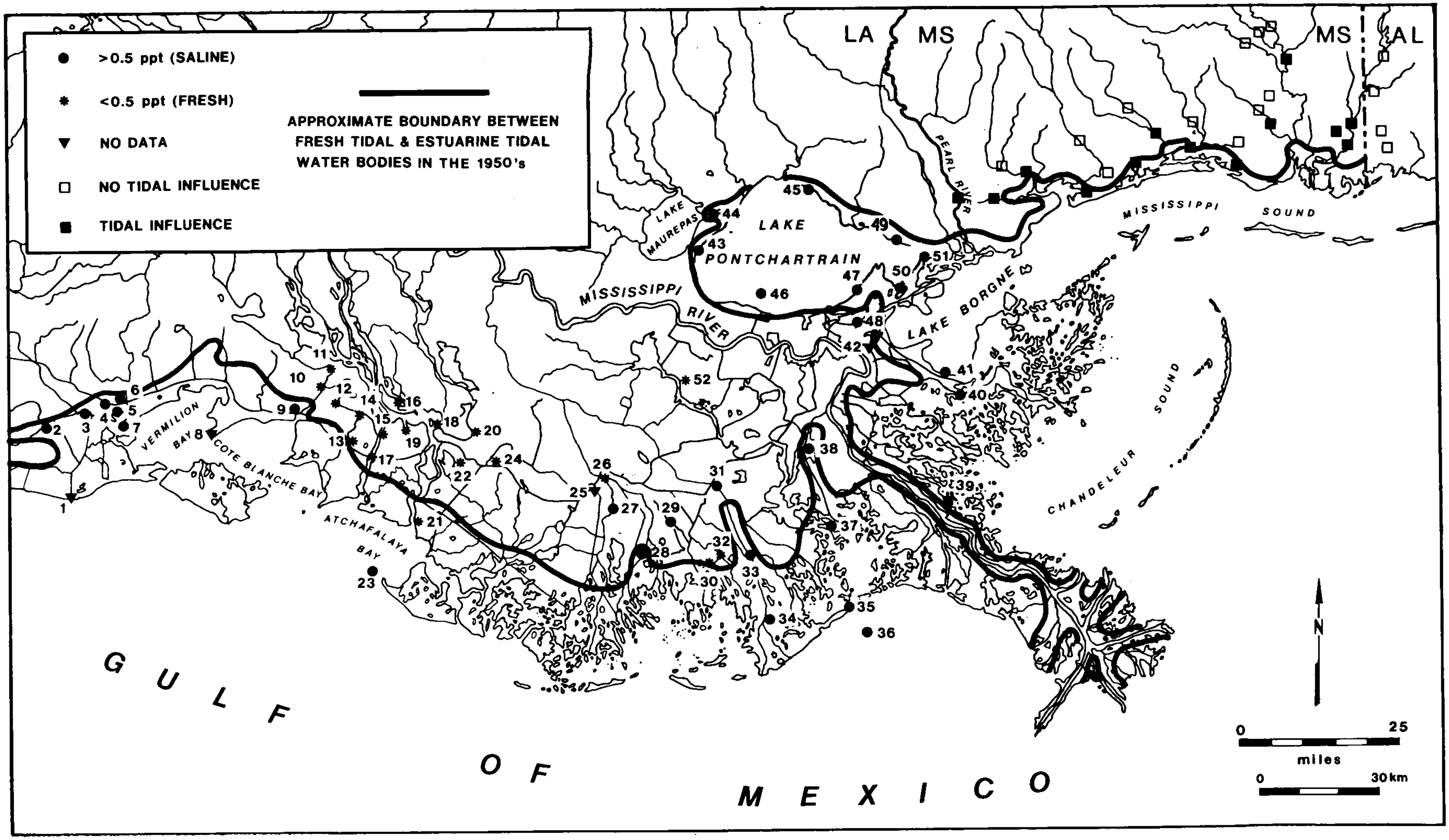

Figure 8. Location of USACE salinity stations and the approximate boundary between fresh tidal and estuarine tidal water bodies in the Mississippi Deltaic Plain Region in the 1950s (Gagliano et al. 1970b, MMRC 1977).

intermittent. Enclosed water bodies located in fresh marshes were labeled as fresh, but some channels penetrating into fresh wetland areas were labeled as estuarine if they were large or channelized and connected to water bodies that were estuarine according to the plotted salinity readings. This method of labeling relied heavily on extrapolation from known salinity readings and an understanding of water movement, especially saltwater wedges and mixing during periods of low precipitation and run-off within the coastal wetlands. The approximate location of the division between estuarine and fresh water bodies in the 1950s is illustrated in Figure 8.

For the 1978 habitat map series, the location of fresh, intermediate, brackish, and saline marshes was better defined than in the 1950s series. Because marshes develop in response to salinity regimes, it can be assumed that intermediate, brackish, and saline marshes experience salinities greater than 0.5 ppt during periods of low flow. Therefore, all water bodies within these three marsh types are labeled as estuarine and only those in freshwater marshes and swamps are considered fresh (palustrine and lacustrine) or riverine (tidal or lower perennial).

Data on the distribution of marsh types in Mississippi in the 1950s were obtained by extrapolating from information contained in the U.S. Department of the Interior (USDI), FWS Wetlands of Mississippi map (1955a) and the Mississippi marshlands map compiled by Eleuterius in 1968 (Eleuterius 1973). All water bodies within the non-fresh marshes were labeled estuarine. For 1978, those water bodies within the intermediate, brackish, and estuarine marshes were labeled estuarine while those in the fresh marshes and swamps were called riverine tidal. Unlike the situation in Louisiana, there is little change in the location of the estuarine and freshwater boundaries in Mississippi between the 1950s and 1978. This is due primarily to the lack of canal dredging in Mississippi, a process which allows saline Gulf waters to penetrate into interior fresh marshes.

The delineation of marine-estuarine boundary in both the states is difficult because of the major seasonal shift in the 30 ppt isohaline boundary in response to riverine discharge. For all but the lowest discharge periods (late summer and early fall), the 30 ppt isohaline line in coastal Louisiana falls gulfward of the coastline and barrier islands because of the high freshwater discharge from the Mississippi and Atchafalaya Rivers. Therefore, all waters within the study area for hydrologic units 3 through 7 were labeled estuarine (see Figure 1; Appendix 2). Only those waters gulfward of the Chandeleur Islands and Mississippi barrier islands located in units 1 and 2 were labeled marine (Appendix 2).

Summary of Habitat Types and Identifying Characteristics

There are 22 water-related habitats identified in the Mississippi Deltaic Plain Region. These habitats were classified through a systematic process, beginning with their appearance on air photos, proceeding to a measurement of their size, an analysis of their shape and consultation with collateral sources to determine salinity, water regime, and origin or function. The defining characteristics of these aquatic habitats are illustrated in Table 3.

VEGETATED HABITATS

Identification on Aerial Photographs

Unlike aquatic habitats and unvegetated environments with and without structures, vegetated habitats are recognized because of their fine to coarse texture and their light to dark and/or mottled tones (Figure 9). The categories of vegetated habitats include: shrubs, trees, marsh, agriculture/pasture, cleared right-of-ways, floating aquatics, and submerged aquatics. Variations in height of vegetation are often visible because of shadows cast, but the exact height can only be determined by stereoscopic analysis. For the purpose of this study, distinctions among marsh grasses, trees, and shrubs were made on

Table 3. Water-related habitats and their defining characteristics

SYMBOL	DEFINITION/ NAME	SIZE/DEPTH				SHAPE		SALINITY			WATER REGIME			ORIGIN			
		<20 ac	>20 ac	>6 ft	<6 ft	Linear	Nonlinear	Fresh	Estuarine	Marine	Tidal	Lower Perennial	Intermittent	Excavated	Oil/Gas	Impounded	Natural
M10W	Gulf						●			●	●						●
POW	Pond	●				●	●	●									●
POWx	Pond, pit	●				●	●	●						●			
POWh	Impoundment	●				●	●	●								●	
L10W	Lake		●	●			●	●									●
L20W	Lake		●		●		●	●									●
L20Wx	Lake		●		●		●	●						●			
L20Wh	Lake		●		●		●	●								●	
L20Wo	Lake		●		●		●	●							●		
R10W	River					●		●			●						●
R10Wx	Canal					●		●			●			●			
R10Wo	Canal					●		●			●				●		
R20W	River					●		●				●					●
R20Wx	Canal					●		●				●		●			
R20Wo	Canal					●		●				●			●		
R40W	Intermittent river					●		●					●				●
R40Wx	Intermittent canal					●		●					●	●			
E10W	Embayment						●		●								
E10Wo	Canal, rig cut					●			●						●		
E10Wx	Canal					●			●					●			
E10Wh	Impoundment						●		●							●	
E10Wt	Tidal channel					●			●		●						●

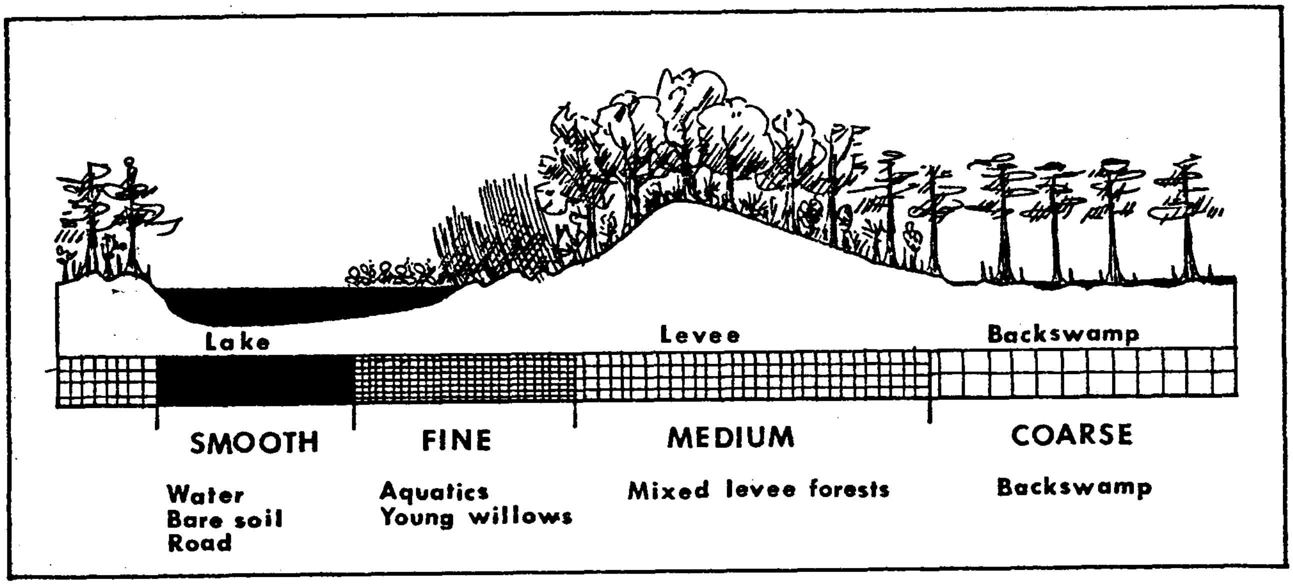

Figure 9. Relationship between photographic texture and specific vegetation associations (Wicker 1975).

the basis of monoscopic interpretation of the air photo with reference to topographic and topical maps. The difficulty which arose in distinguishing between trees (over 6 m [20 ft] high) and shrubs (under 6 m [20 ft] high) was resolved on the basis of field reconnaissance and an understanding of where shrubs were most likely to occur (e.g., on newly accreted lands and spoil banks).

Photographic signatures for vegetation vary because of differences in vegetation type, age, vigor, season, man-made influences, quality of photographs, and variations in photograph processing. On CIR photographs, green vegetation appears in various shades of red and purple, ranging from light pink through bright red to deep maroon and purple. Light green vegetation, such as smooth cordgrass (Spartina alterniflora) and duckweed (Lemna spp.), appears pinkish while darker green vegetation, such as live oak (Quercus virginiana), pine (Pinus spp.), and mangroves (Avicennia germinans), is dark red. Water hyacinths (Eichhornia crassipes) have a bright red appearance and cypress (Taxodium distichum) are pinkish purple. Dead vegetation appears in various shades of brown, yellow and orange on CIR photography. Usually light-colored, dead material such as dry marsh grass is light brown to yellowish orange. Dead aquatic and algal mats are light brown to almost white. In mixed stands of vegetation, the color signature consists of a mottled pattern of various shades of pinks, reds, and purples. Color, however, should not be used as the sole criterion in distinguishing among vegetation species because there is a great deal of variation in color that can be attributed to differences in film and processing quality, atmospheric and ground conditions at the time of the filming, and condition of the vegetation at time of filming.

On black and white photographs, vegetation possesses tones ranging from dark grey for dark green species to very light grey for light green vegetation. Pure stands of vegetation (such as pine, giant bulrush [Scirpus californicus], roseau cane [Phragmites australis], hyacinths, and willow [Salix nigra]) generally have a uniform tone ranging from dark to light grey. Mixed vegetation stands (such as mixed levee and terrace hardwoods, cypress-tupelogum swamps, freshwater and intermediate marshes, and bottomland hardwoods) have a mottled tone consisting of various shades of grey.

Texture varies also depending upon the type of vegetation present (Figure 9, Table 1). Homogeneous stands of vegetation (e.g., duckweed and water hyacinth mats, young willows, and agricultural crops and pasture) have a fine texture. Dense stands of mixed vegetation, such as mixed levee and terrace hardwoods and healthy cypress-tupelogum swamps, are generally medium-textured. This coarseness is caused by variations in tree height, density, and crown shape as well as differences in vegetation tones. For example, mature live oaks have very conspicuous round crowns while cypress have irregular, somewhat star-shaped crowns and the crowns of pines are star-shaped (Avery 1969). The coarsest texture is associated with less dense vegetation stands such as overly mature, deep-water willow swamps and stressed, deep-water cypress-tupelogum swamps. Vegetation density is sparse under these conditions and spaces between the trees often appear light in tone and smooth in texture because of light reflecting from either dense aquatic mats or shallow, standing water.

In general, the shorter, more homogeneous stands of vegetation have a fine texture while the taller, more mixed stands have a medium-to-coarse texture. Stands of shrubs are less than 6 m (20 ft) and have a texture intermediate between fine and medium depending upon their height and homogeneity.

Classification to Habitat Type and Species Composition

The classification of vegetated habitats requires a knowledge of the following vegetation association characteristics:

(1) species morphology (i.e., tree, shrub, grass, etc.)
(2) species composition (i.e., broad-leaved deciduous, broad-leaved evergreen, needle-leaved evergreen, etc.)
(3) elevation of vegetation substrate with regard to water levels and hydroperiod (i.e., backswamp, marsh, intertidal flat, etc.)
(4) soil and water salinity (i.e., fresh, intermediate, brackish, saline).

This mapping of vegetated habitats has the largest number of habitat types because vegetated habitats occur in all five systems of the classification scheme and most of the classes (Appendix 4). Identification and classification of vegetated habitats can only be done accurately from aerial photography when collateral information, such as field checking or existing vegetation maps and reports, is utilized. Within the Mississippi Deltaic Plain Region, there is a close correlation between vegetation associations that can be seen on aerial photographs in terms of class and subclass, and topographic features (physiographic regions and units) that can be viewed in terms of system and subsystem.

Physiographic maps covering the Mississippi Deltaic Plain Region have been prepared by numerous authors including Aberdeen (1953), Kolb and van Lopik (1966), Frazier and Osanik (1969), and Gagliano and van Beek (1970). Among the regional vegetation maps are those of Winters and Ward (1934), Faulks (1938), Brown (1945), O'Neil (1949), Chabreck et al. (1968), U.S. Department of Agriculture (USDA), Forest Service (FS), (1969), Eleuterius (1973), USACE (1973), and Chabreck and Linscombe (1978). Comparison of a map of major physiographic regions and units (Figure 10) with one of major vegetation associations (Figure 11) illustrates the relationship existing between vegetation and landform (Figure 12).

The Mississippi Deltaic Plain Region consists of older, elevated Pleistocene deposits on the Pleistocene Terrace, Recent alluvial deposits within the Deltaic Plain, and marine and Pleistocene outwash materials along the Mississippi coast. Virtually all habitats on the Pleistocene Terrace fall within the upland system. It should be noted that where there are floodplains along streams on the Terrace above the 5 ft contour, these habitats are considered to be palustrine because of poor drainage. These areas can include any or all of the four major forest subclasses (F01, 2, 3, 4; Appendix 5), and only field checking can accurately verify

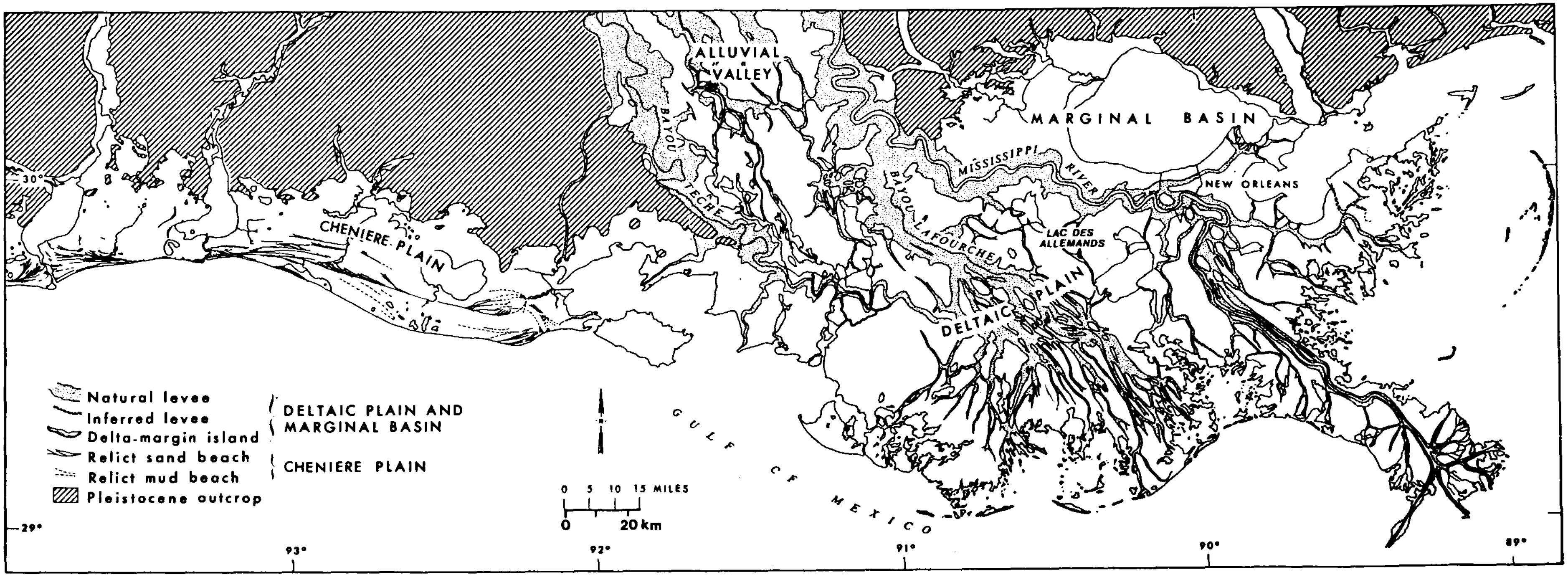

Figure 10. Major physiographic regions in coastal Louisiana and Mississippi (Gagliano and van Beek 1970).

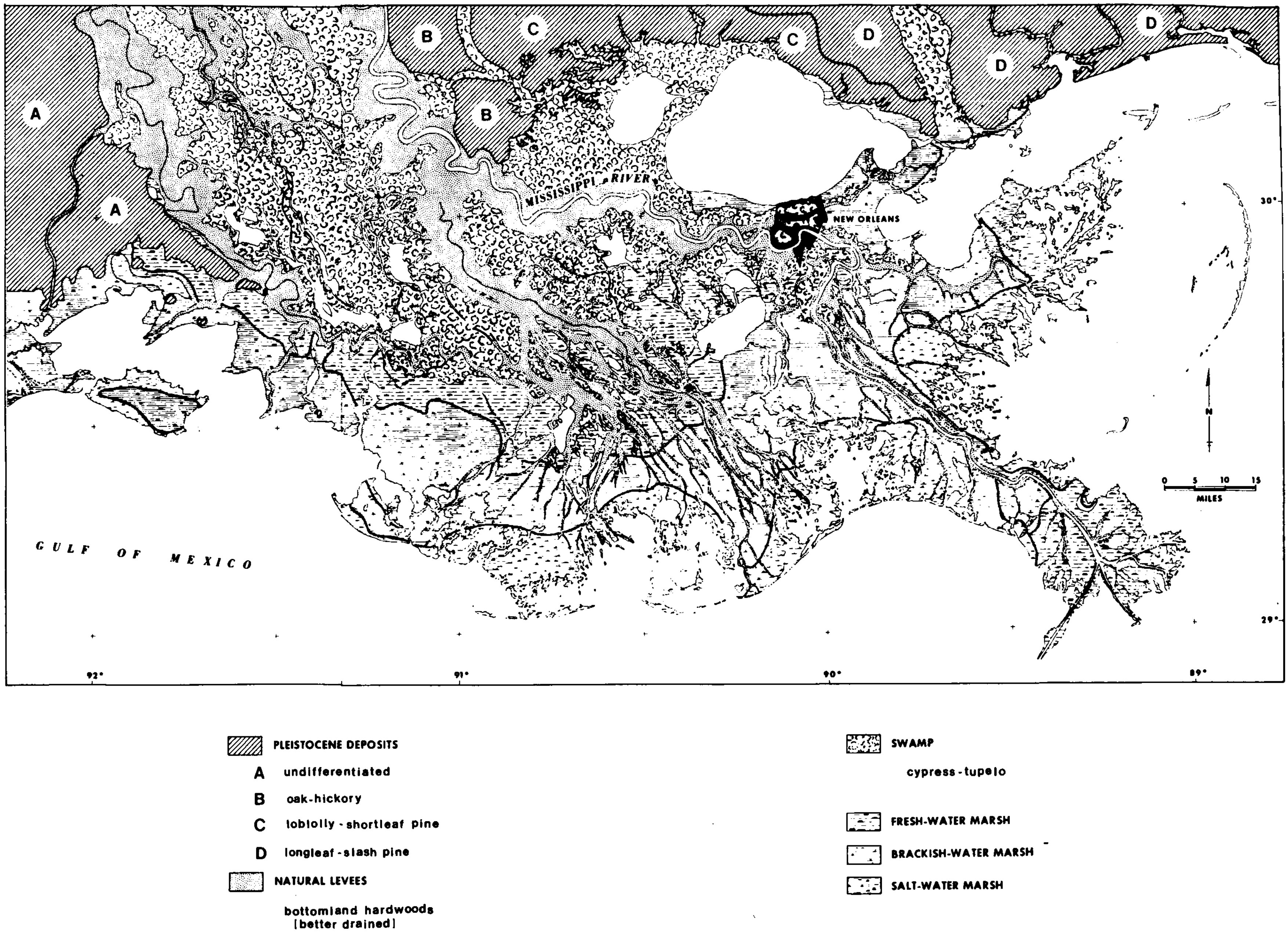

Figure 11. Major vegetation associations in the Mississippi Deltaic Plain Region (USDA, FS 1969; adapted from Gagliano and van Beek 1970).

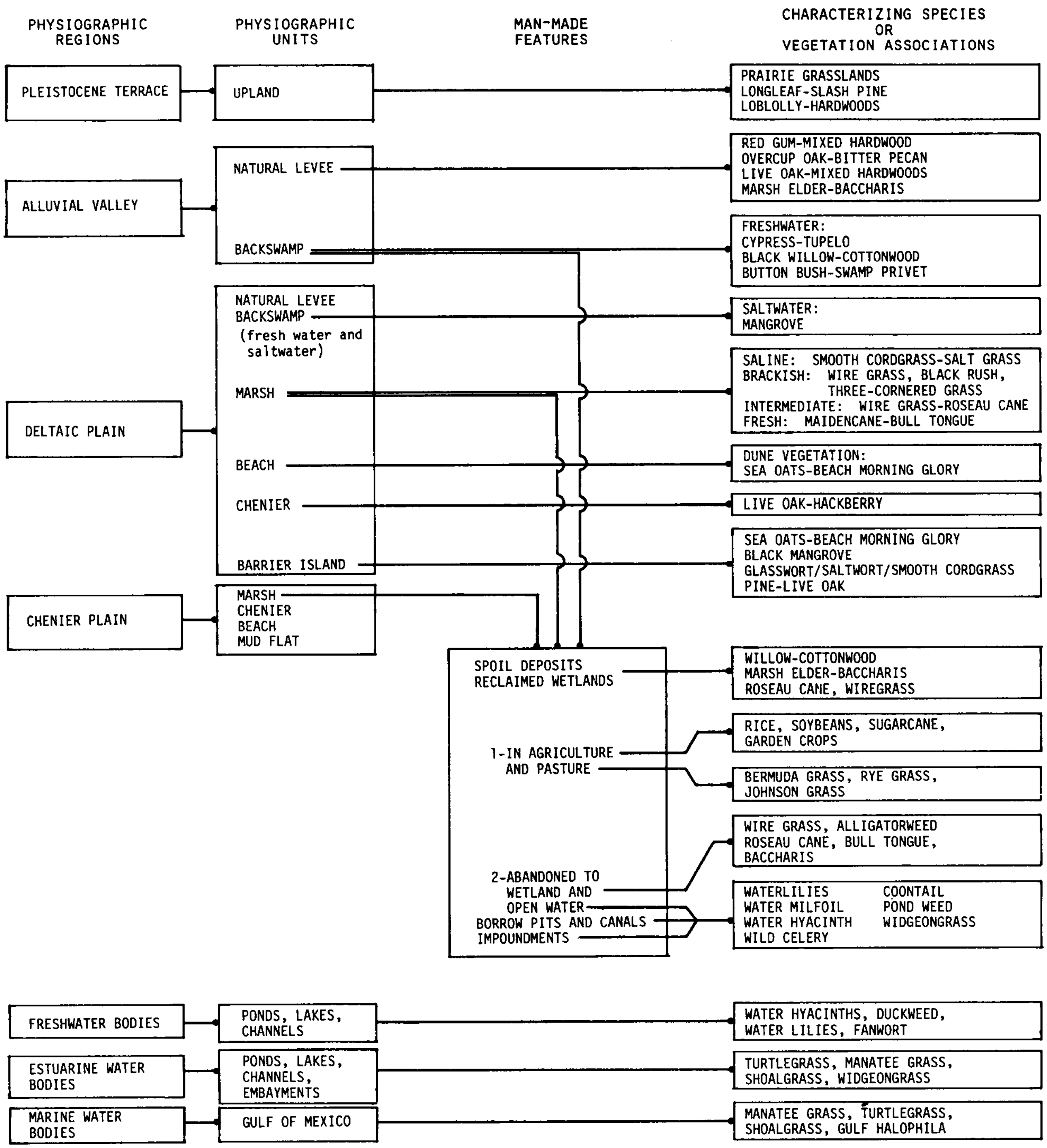

Figure 12. Relationships among physiographic regions, physiographic units, man-made features, and major vegetation associations in the Mississippi Deltaic Plain Region.

identification of these forests from aerial photography.

The Recent sediments within the Deltaic Plain of Louisiana can be divided into five major physiographic units: (1) natural levees, (2) backswamp, (3) marsh, (4) beaches and barrier islands, and (5) abandoned beach ridges (cheniers). For the purpose of systems classification, the natural levees above 5 ft in elevation are considered to be upland (U) while those below 5 ft are called wetland (P: Palustrine). Backswamps and marshes can be either freshwater wetlands (P: Palustrine) or nonfresh wetlands (E: Estuarine, M: Marine). The vegetated dunes on beaches, barrier islands and cheniers are considered to be upland when they are above 5 ft in elevation.

A knowledge of the species composition of the major vegetation associations within the Mississippi Deltaic Plain Region is essential for classification of a habitat to the subclass level. Species information is sometimes apparent on aerial photographs, but in most instances it must be obtained or verified from collateral sources. In those instances where the vegetation of a particular site was not field checked, information on the vegetation species was obtained from vegetation maps and reports. For example, the Pleistocene or Prairie Terrace west of the Mississippi River (see Figure 11) within the study area was historically a treeless region consisting of prairie grasslands with trees primarily confined to poorly drained depressions along streams and on ridges (see Figure 12; Appendix 7)(Brown 1945). At present, virtually all of this area that is not developed is being used as either cropland (especially rice) or pasture.

That portion of the study area included within the Pleistocene or Upland Terrace east of the Mississippi River (see Figure 11) is divided into two major tree regions, loblolly-shortleaf pine (Pinus taeda-Pinus echinata) and longleaf-slash pine (Pinus palustris-Pinus elliottii) which provide the basis for class and subclass identification (USDA, FS 1969) (see Figure 11; Appendix 7). (Note: "the nomenclature applied to slash pine has been a source of confusion for the past 100 years. Two distinct botanical species have been recognized and distinguished: Caribbean pine [Pinus elliottii Engelm], in the southeastern United States" [Fowells 1965: 462]. Brown (1945) had earlier described this entire area as a longleaf pine region and noted the vegetation associations peculiar to certain drainage and land use characteristics (see Appendix 7 for species list). While much of this area within the study region is being managed for pine production, cropland, and pasture, it is also experiencing a very rapid rate of commercial and residential development along the newly constructed I-10 interstate highway system.

The entire forested portion of the Alluvial Valley is classified variously as Bottomland Hardwoods and Cypress Region (Brown 1945) or an Oak-Gum-Cypress (Quercus spp.- Nyssa spp./Liquidambar sp.-Taxodium spp.) forest type (USDA, FS 1969) (see Figure 11). The Oak-Hickory association is often considered the climax association and baldcypress swamps the subclimax because cypress swamps are maintained almost indefinitely in a"subfinal stage of succession by edaphic and physiographic conditions" (Fowells 1965: 675). Where the swamps have been leveed, drained, cleared and then abandoned to natural processes of revegetation, as in the case of abandoned farmlands along the swamp-levee ecotone, species of the Oak-Hickory association invade the former swamp sites and suppress re-establishment of cypress swamps.

Numerous, smaller mappable vegetation associations exist within this region in response to various hydrologic regimes. The higher, better-drained natural levees support red gum (Liquidambar styraciflua)-mixed hardwoods, while the lower natural levees are characterized by an overcup oak-bitter pecan (Quercus lyrata-Carya aquatica) association (Winters and Ward 1934, Brown 1945) (Appendix 7). The natural levees in the lower coastal plain south of the latitude of

Baton Rouge, Louisiana, are distinguished by live oak (Quercus virginiana) and other mixed hardwoods (Penfound and Howard 1940, Brown 1945) (Appendix 7). The lower-lying natural levees that extend into the marsh and mark the location of ancient Mississippi River courses are characterized by a predominance of live oak on the higher elevations and eastern baccharis (Baccharis halimifolia) on the lower elevations (Brown 1945) (Appendix 7).

Spoil banks often have vegetation associations quite different from the rest of the environment in which they are located (Appendix 7). A recent study found that large, elevated spoil banks "contain terrestrial, upland plant species which are succeeding toward a bottomland hardwood forest" (Monte 1978: xvi). In areas where the spoil banks subside to former marsh levels, the successional process toward bottomland hardwood forest is reversed and marsh species reclaim the former spoil sites. Eastern baccharis, a common shrub along channel and lake banks in the marsh, often remains for extended periods of time to mark the former spoil deposits (Brown 1945, Spindler and Noble 1974).

A swamp is "a woody community occurring in an area where the soil is usually saturated or covered with surface water for one or more months of the growing season" (Penfound 1952:415) (Table 4). Extensive, low-lying swamps in the Mississippi Deltaic Plain Region occur in the freshwater interdistributary backswamp basins in the Alluvial Valley and Deltaic Plain. Those wetlands having the longest hydroperiod consist almost entirely of southern cypress or baldcypress-tupelogum (Taxodium distichum-Nyssa aquatica) and swamp gum-pond cypress (Nyssa biflora-Taxodium ascendens) and are considered deep-water swamps (Penfound 1952) (Note: In more recent literature Taxodium ascedens is listed as Taxodium distichum var. nutans). These species frequently occur in the same area but are usually grouped in pure, even-aged stands (Mattoon 1915). Pure stands of tupelogum are considered to be a result of the selective cutting of baldcypress in the region (Putnam 1951). In some areas where clear cutting was extensive and canals and spoil banks impounded and water levels raised, as in the Atchafalaya Basin, cypress have failed to revegetate and these areas have become deep-water willow (Salix nigra) and/or buttonbush-swamp privet (Cephalanthus occidentalis-Forestiera acuminata) swamps (Wicker 1975).

Shallow-water swamps have saturated soils or experience seasonal flooding (Penfound 1952). They frequently occur between deep-water cypress-tupelogum swamps and upland mesic forests and along freshwater bodies with fluctuating water levels (Penfound 1952). Distinct plant associations are often characteristic of specific hydrologic regimes, edaphic factors, and silting patterns as illustrated in Figures 13-16 (Appendix 7). Point bars and newly accreted islands in freshwater areas experiencing constant scouring and reworking of sediments are almost always pioneered predominantly by pure stands of willows (Salix nigra and Salix interior).

Mangroves represent the only saline swamp community in the Mississippi Deltaic Plain Region. They rarely become taller than medium height shrubs (1.5-3 m, 5-10 ft) because of the freezes which decimate them every few years. Mangroves are not shown on the 1950s habitat map series because of the lack of existing maps showing their distribution and because their appearance on black and white photos is not always obvious. The distribution of mangroves is mapped on the 1978 series because of their obvious photographic signatures on CIR which include dark red color and medium texture. Another identifying characteristic is their location along tidal channel banks and saline marsh shorelines. Locations of mangroves on the 1974 and 1978 CIR transparencies, 1978 CIR photographs, and topographic maps were also compared prior to final mapping. The distribution of mangroves was verified by Lynn Loftin (personal communication 1979, Tulane University, New Orleans, Louisiana).

A marsh, like a swamp, constitutes an "area where the soil is usually saturated or covered with surface water for one or more months of the growing

Table 4. List of major types of southern swamps (Penfound 1952).

FRESH WATER SWAMPS

Deep Swamps: fresh water, woody communities, with surface water throughout most or all of the growing season.

a. Southern cypress-tupelo gum (*Taxodium distichum*-*Nyssa aquatica*)
b. Swamp gum-pond cypress (*Nyssa biflora*-*Taxodium ascendens*)

Shallow Swamps: fresh water, transitional woody communities, the soil of which is inundated for only short periods during the growing season.

a. Black willow-sandbar willow (*Salix nigra*-*Salix interior*)
b. Buttonball-dogwood-willow (*Cephalanthus*-*Svida*-*Salix*)
c. Overcup oak-water hickory (*Quercus lyrata*-*Hicoria aquatica*)
d. Hackberry-elm-ash (*Celtis*-*Ulmus*-*Fraxinus*)
e. Maple-red gum- oak (*Rufacer*-*Liquidambar*-*Quercus*)
f. Alder-birch (*Alnus*-*Betula*)

Peaty Swamps: oxylic, peat-forming, sclerophyllous woody communities, with surface water only during a part of the growing season.

a. Red bay-sweet bay (*Tamala pubescens*-*Magnolia virginiana*)
b. Pond pine-slash pine (*Pinus serotina*-*Pinus caribaea*)
c. Southern white cedar (*Chamaecyparis thyoides*)
d. Evergreen shrub swamp (*Ilex*-*Cyrilla*-*Zenobia*)

SALTWATER SWAMPS

Saltwater swamps: woody plant communities in brackish or saline habitats.

a. Mangrove swamps (usually with surface water)
Red mangrove (*Rhizophora mangle*)
Black mangrove (*Avicennia nitida*)

b. Transitional communities (usually without surface water)
Button wood (*Conocarpus erecta*)
Buckbrush-marsh elder (*Baccharis*-*Iva*)

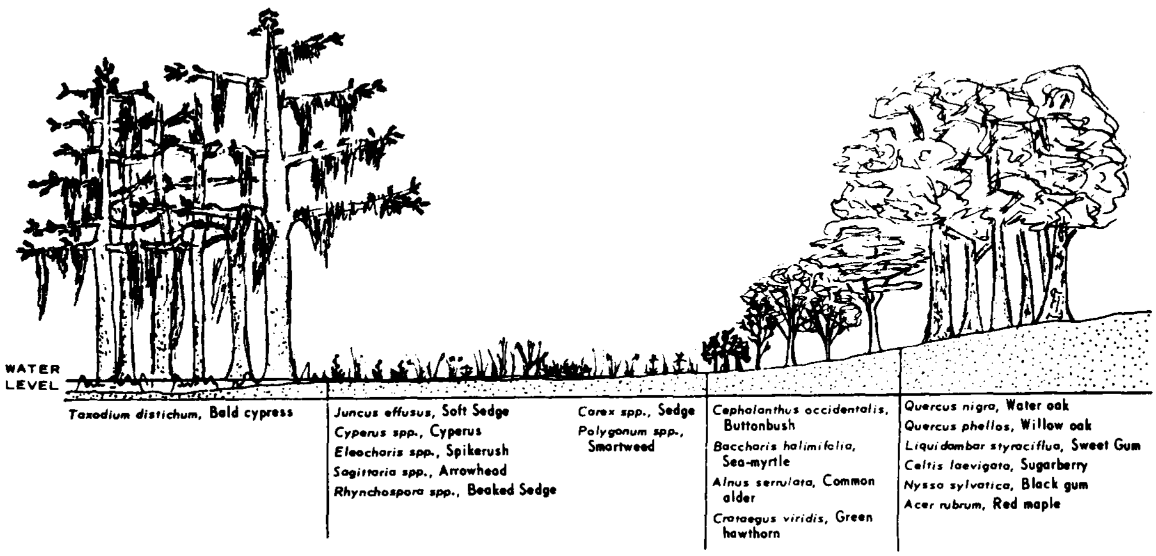

Figure 13. Transition from swamp to wet meadow into bottomland hardwoods (Environmental Laboratory 1978).

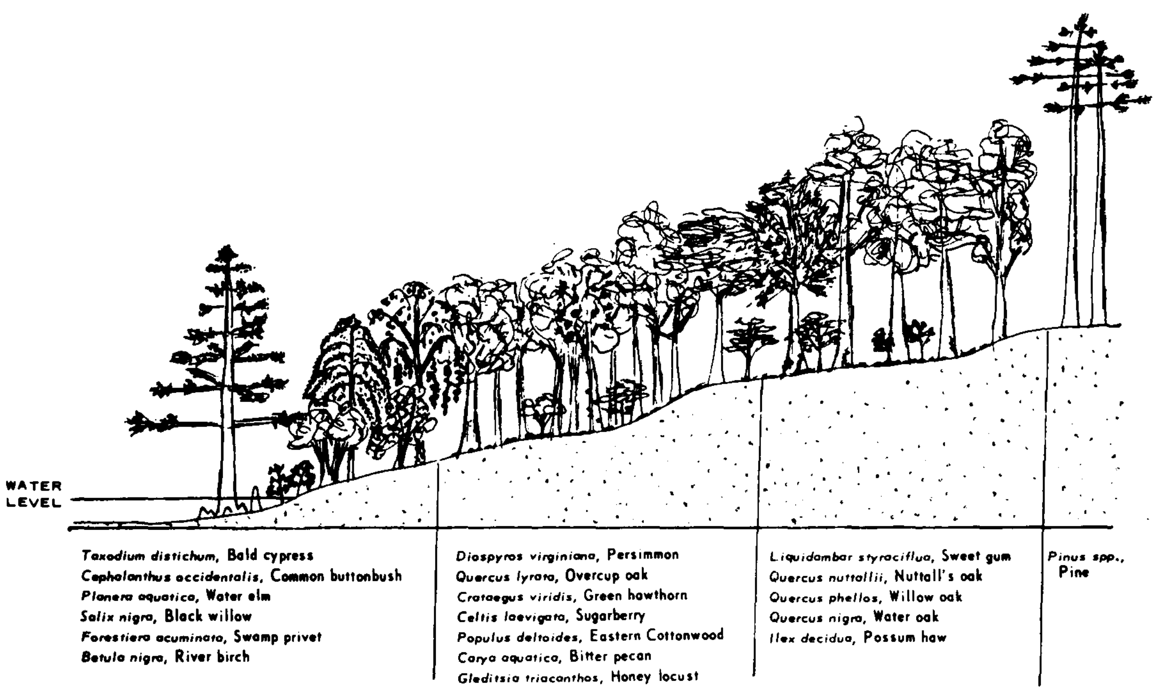

Figure 14. Transition from riparian swamp through first- and second-bottoms into upland (Environmental Laboratory 1978).

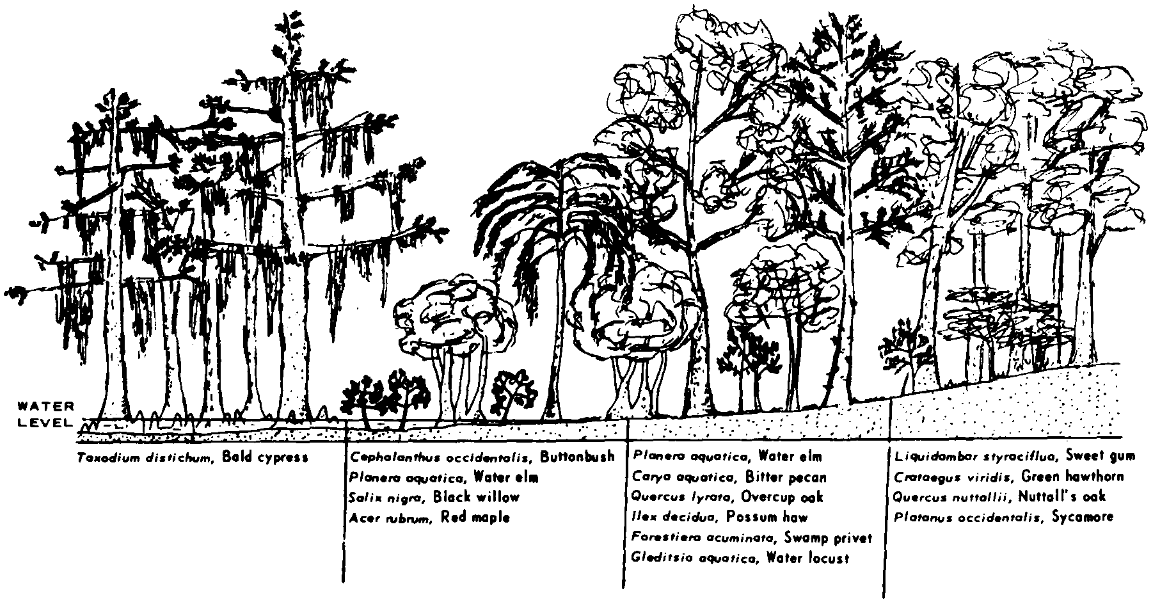

Figure 15. Transition from swamp through bottomland hardwoods complex in the northern portion of the Mississippi Deltaic Plain Region (Environmental Laboratory 1978).

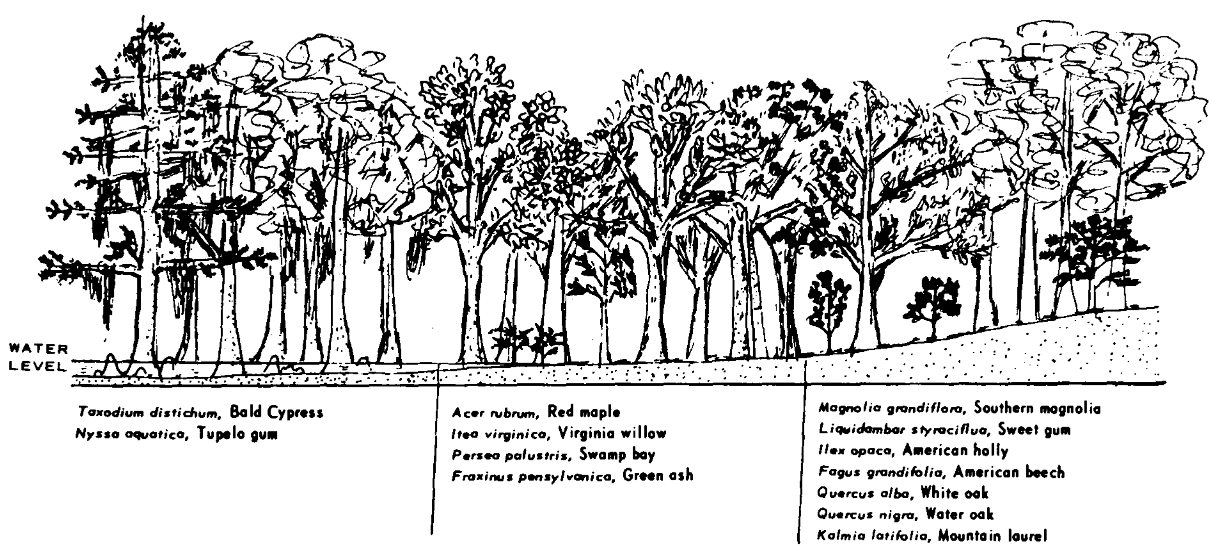

Figure 16. Transition from swamp through bottomland hardwoods complex into upland in the southern portion of the Mississippi Deltaic Plain Region (Environmental Laboratory 1978).

season" (Penfound 1952:415). Unlike a swamp, a marsh consists of a grass-sedge-rush rather than a woody community. There are four major marsh types recognized within the Mississippi Deltaic Plain Region: fresh, intermediate, brackish, and saline. The major species characterizing each marsh type are:

Saline:
- Spartina alterniflora (smooth cordgrass/oystergrass)
- Distichlis spicata (saltgrass)
- Juncus roemerianus (black rush)
- Spartina patens (wiregrass)

Brackish:
- Spartina patens (wiregrass)
- Distichlis spicata (saltgrass)

Intermediate:
- Spartina patens (wiregrass)
- Phragmites communis (roseau cane) (Note: Phragmites communis has been changed to Phragmites australis) (Gosselink et al. 1977:13).
- Sagittaria falcata (bulltongue)

Fresh:
- Panicum hemitomon (maidencane)
- Sagittaria falcata (bulltongue)
- Eleocharis sp.(spikerush)
- Alternanthera philoxeroides (alligator-weed) (Chabreck 1972)

There is a wide range of salinity values given for each marsh type (Table 5), and different authors list different species compositions for individual marsh types (Appendix 7). The major variations involve the intermediate marsh type which is a transition marsh usually situated between fresh and brackish marshes and containing species characteristic of fresh marshes and brackish to saline marshes. The distribution of this marsh type today is in the vicinity of what was formerly mapped as a floating freshwater marsh or flotant (O'Neil 1949, Kolb and van Lopik 1966) (Figure 17). This category was included with the fresh marsh type on the 1950s habitat map series.

In addition, individual marsh types within the Mississippi Deltaic Plain Region may show variations in dominant species in different locations and the variations may change with time. This is well illustrated by the fact that many of the saline marshes of Mississippi are dominated by black rush while those of Louisiana show a predominance of oystergrass. The fresh marshes of the Upper Barataria Basin, Louisiana, are predominantly maidencane while those that existed in St. Bernard Parish in the late 1950s were largely sawgrass (Cladium jamaicense) (O'Neil 1949, Lemaire 1960). In this latter area, major vegetation changes have occurred as a result of the construction of the Mississippi River-Gulf Outlet and are well-documented in several studies (Lemaire 1960, Texas A&M Research Foundation 1960, Valentine 1968, Coastal Environments, Inc., ongoing research 1979).

The major source of data for mapping the boundary between fresh and nonfresh marshes on the 1950s habitat map series for Louisiana was O'Neil's Vegetation Types of the Louisiana Marshes (1949). Because his mapping categories were not the same as Chabreck's (Chabreck et al. 1968, Chabreck and Linscombe 1978) (Table 6), the 1950s map series only includes fresh and nonfresh marsh types (Figure 18). A saline-brackish marsh boundary was transferred from O'Neil's map (1949) to the 1950s habitat maps with some slight modifications based on the appearance of the marsh on the aerial photographs and published reports about specific areas. Because this was such a generalized boundary, no area measurements of the brackish and saline marshes were made individually. (See Table 6 for the relationship between O'Neil's [1949] marsh categories and Chabreck's [Chabreck et al. 1968, Chabreck and Linscombe 1978] which were the basis for the 1978 marsh boundaries on the habitat maps [Figure 19]). The primary source for marsh distribution in Mississippi

Table 5. Comparison of salinity ranges for fresh, intermediate, brackish, and saline marshes provided by different authors. ([a]Montz 1976, [b]Cowardin et al. 1979, [c]USACE 1974)

Marsh Type	Salininity Range I[a]	Salinity Range II[b]	Salinity Range III[c]
Fresh	0 - 1 ppt	<0.5 ppt	0 - 5 ppt
Intermediate	1 - 8 ppt	0.5 - 5 ppt	5 - 10 ppt
Brackish	8 - 18 ppt	5 - 18 ppt	10 - 20 ppt
Saline	18+ ppt	18 - 30 ppt	>20 ppt

was Eleuterius (1973). Eleuterius'(1973) marsh boundaries were modified in several instances, however, before the data were transferred to the 1978 habitat map series when field checking indicated changes were necessary. The 1978 and 1950s marsh distribution in Mississippi is virtually identical because the Mississippi marshes have not undergone changes as a result of saltwater intrusion as extensively as has been the case in Louisiana.

The barrier islands of Louisiana and Mississippi are subject to constant reworking by wind and wave action and all vegetation is exposed to salt spray. The barrier islands of Louisiana are generally lower in elevation than those of Mississippi. The Gulfward side of the Louisiana barrier islands consists of wide sand or sand and shell beaches. The foredunes are generally less than 3 m (10 ft) in elevation and support salt-tolerant species such as sea oats (Uniola paniculata) and beach morning glory (Ipomoea pescaprae) (Environmental Laboratory 1978). Some of the larger barrier islands, such as Grand Isle, have live oak forests growing on relic sand ridges and salt marshes dominated by smooth cordgrass and saltgrass on the bayward side of the island. Many of the barrier islands have black mangrove (Avicennia germinans) growing on the bayward marsh fringes and along the tidal channels. The shallow, estuarine waters bayward of the islands contain submerged aquatics such as shoalgrass (Halodule beaudettei), widgeongrass (Ruppia maritima), gulf halophila (Halophila engelmannii), turtle grass (Thalassia testudinum), and manateegrass (Cymodocea filiformis) (Montz 1977). For a listing of species associated with specific barrier islands see Appendix 7.

Portions of the larger barrier islands of Mississippi Sound, such as Cat Island and Horn Island, have remained fairly stable over a long period of time and some have relic beach ridges over 9 m (30 ft) in elevation (L. N. Eleuterius 1979). A recent study by L. N. Eleuterius (1979) of two of Mississippi's barrier islands, Horn and Petit Bois, identified six vegetational units and the plant species commonly associated with each unit (Table 7).

Identification of emergent shrub and tree habitats on the 1950s and 1978 map series was made initially on the basis of photographic signatures. The subclass designations were then assigned on the basis of personal communication (J. Coleman 1979, Louisiana State University, Baton Rouge; R. H. Chabreck 1979, Louisiana State University, Baton Rouge) and published reports and maps (Lloyd and Tracey 1901; Penfound and O'Neill 1934; Lemaire 1960; Richmond 1962, 1968; Miller and Jones 1967; L. N. Eleuterius 1973, 1979; Gould and Ewan

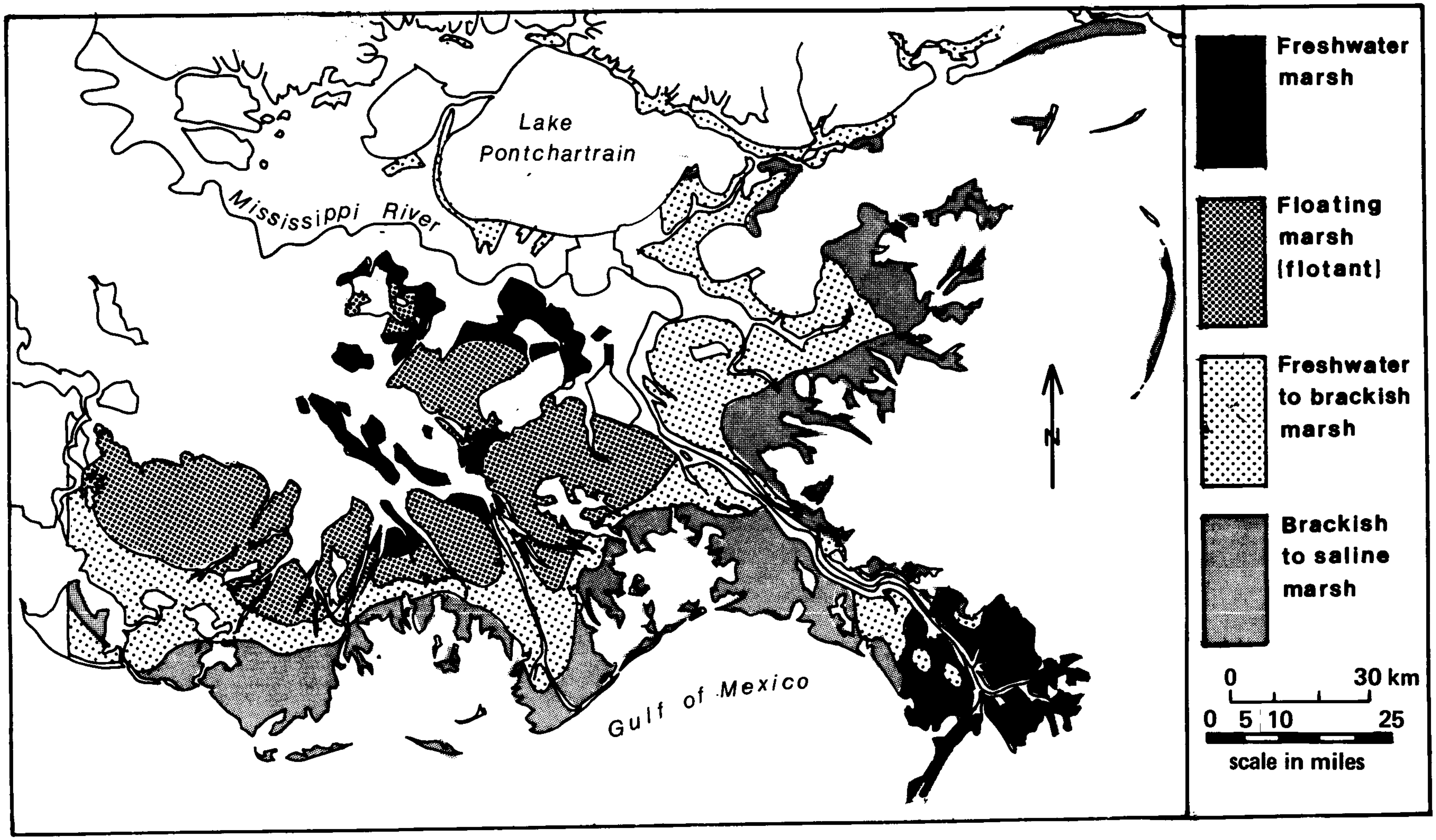

Figure 17. Distribution of fresh, brackish, and saline marsh deposits in the Mississippi Deltaic Plain Region (adapted from Kolb and van Lopik 1966).

Table 6. Derivation of marsh types for the 1950s and 1978 Mississippi Deltaic Plain Region Habitat Map Series.

1949 Designation	1950s Designation	1978 Designation
Habitats mapped in Louisiana by O'Neil (1949)	Habitats on the 1950s Mississippi Deltaic Plain Region Map Series (after O'Neil 1949)	Habitats on the 1978 Mississippi Deltaic Plain Region Map Series (after Chabreck & Linscombe 1978 & Eleuterius 1973)
Fresh water marsh	Fresh marsh	Fresh marsh
Floating fresh water marsh	Fresh marsh	Fresh marsh
Floating three-cornered grass marsh	Fresh marsh	Fresh marsh
Intermediate marsh[a]	Non-fresh marsh	Intermediate marsh
Saw grass marsh[b]	Non-fresh marsh	Intermediate marsh
Brackish three-cornered grass marsh[c]	Non-fresh marsh	Brackish marsh
Leafy three-cornered or coco marsh	Non-fresh marsh	Brackish marsh
Excessively drained salt marsh	Non-fresh marsh	Saline marsh
Sea rim	Non-fresh beach/dune	Saline beach/dune

[a]These were broadly drawn, narrow marshes fringing the levees in St. Bernard, Plaquemines, St. Charles, and Orleans parishes. On the 1950s habitat map series, these areas were labeled as fresh or non-fresh according to their appearances on the aerial photographs and collateral information.

[b]This was a broadly drawn, narrow marsh category fringing the levees in St. Bernard Parish. On the 1950s habitat map series it was mapped as fresh because it contained low salinity to fresh water marsh species according to O'Neil (1949).

[c]A large area near Lafitte, Louisiana, was mapped as a fresh marsh on the 1950s habitat map series because of its appearance as a fresh marsh area on the aerial photographs and its location within the larger fresh marsh zone. O'Neil (1949), however, had mapped it as a brackish three-cornered grass marsh.

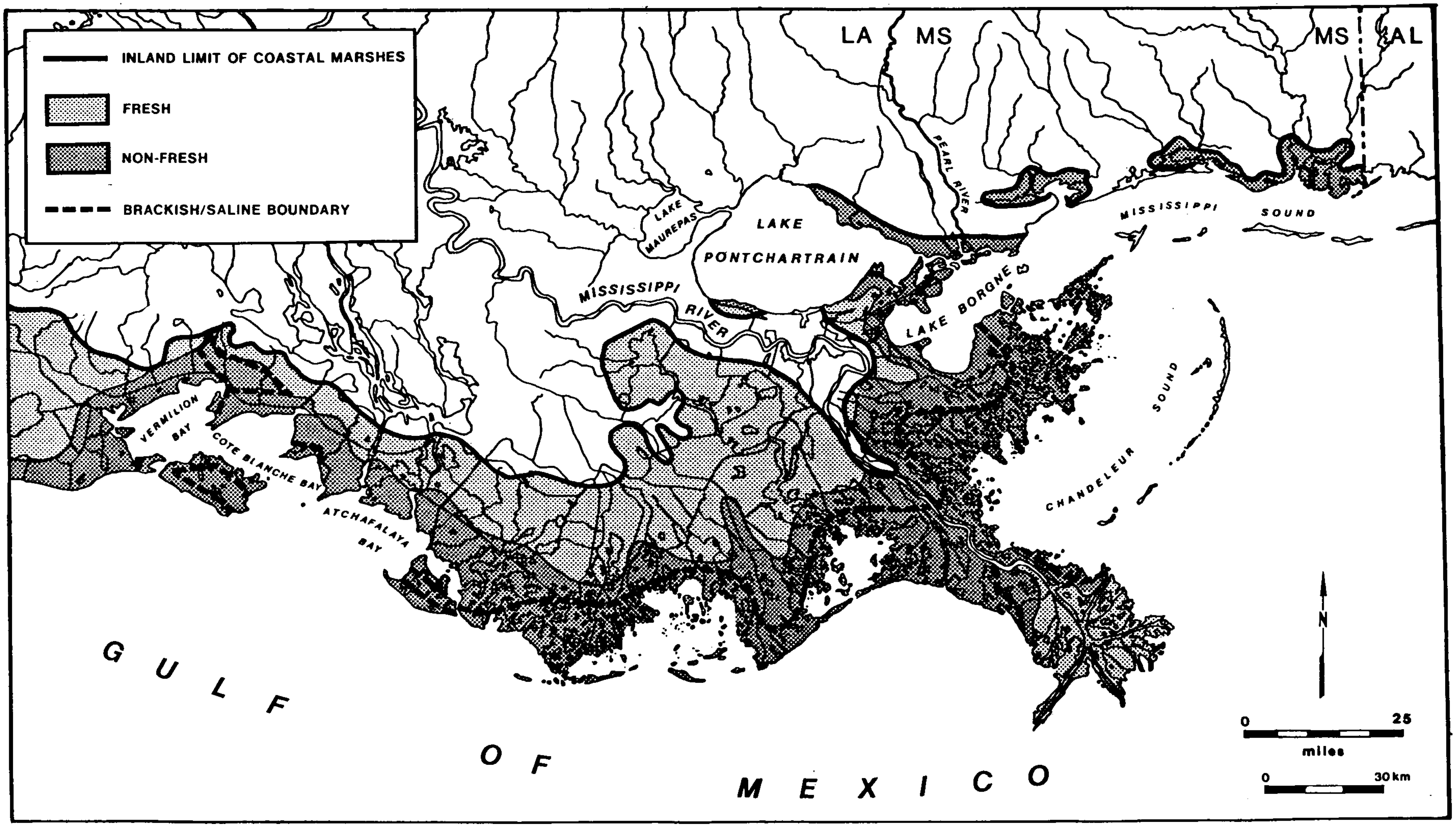

Figure 18. Approximate boundaries of fresh and non-fresh marshes in the Mississippi Deltaic Plain Region in the 1950s. The marsh types on the barrier islands and the fresh marshes in Mississippi are not shown because of their small area (O'Neil 1949; Eleuterius 1973; USDI, FWS 1955a, 1955b).

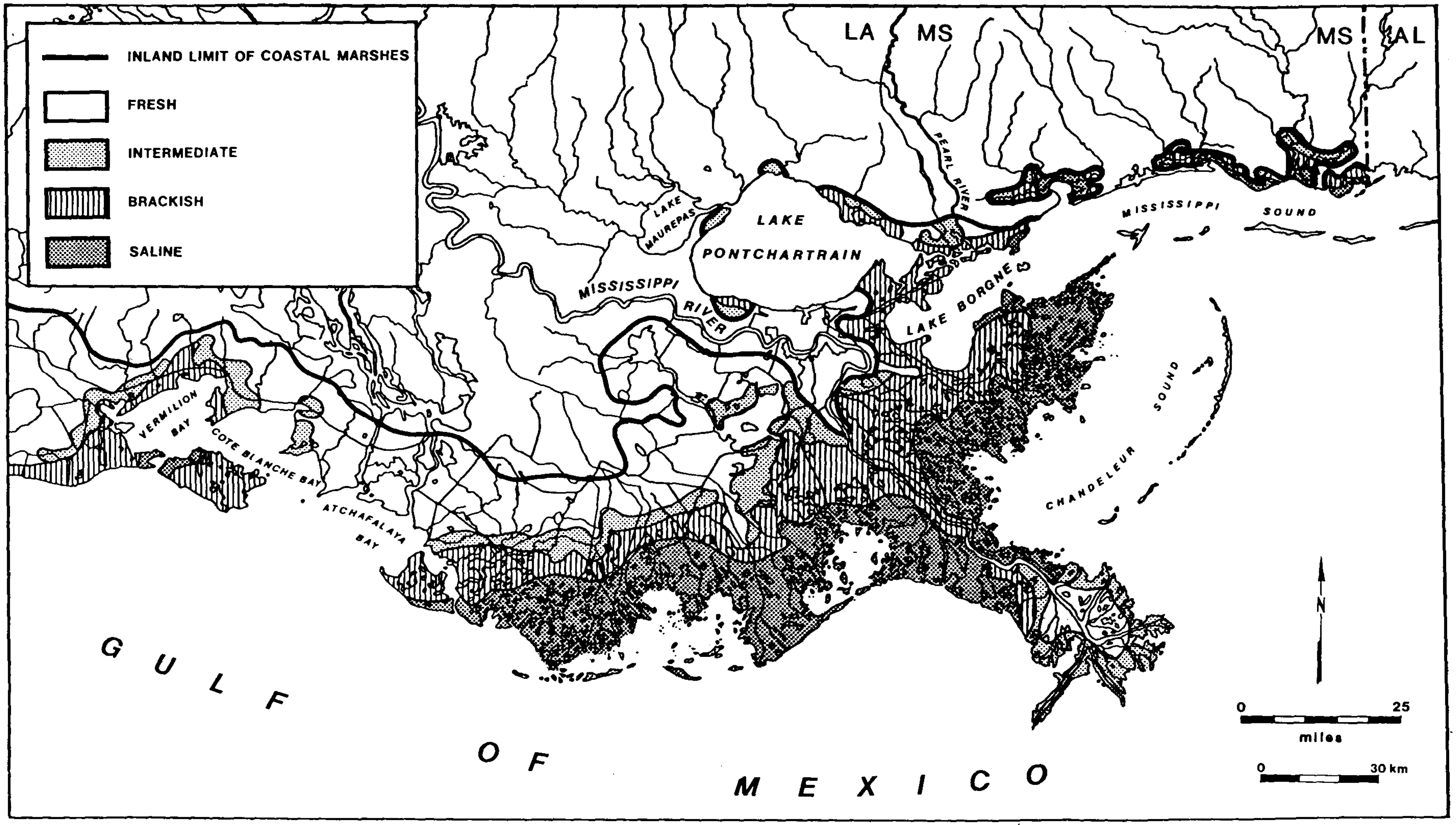

Figure 19. Approximate boundaries of fresh, intermediate, brackish, and saline marsh types in the the Mississippi Deltaic Plain Region in 1978. The marsh types on the barrier islands and the fresh marshes in Mississippi are not shown because of their small area (Chabreck and Linscombe 1978, Eleuterius 1973).

Table 7. Major vegetational units and associated species present on Horn and Petit Bois Islands, Mississippi (Eleuterius 1979).

Vegetational Unit	Vegetation Species
Beach dune	Beach morning glory (*Ipomoea stolonifera*) Sea oats (*Uniola paniculata*) Bluestem (*Andropogon maritimus*) Dog tooth grass (*Panicum repens*)
Relic dunes	Live oak (*Quercus geminata*) Yaupon (*Ilex vomitoria*) Golden rod (*Solidago pauciflosculosa*)
Woodland	Slash pine (*Pinus elliottii*) Live oak (*Quercus geminata*) Umbrella-grass (*Fuirena scirpoidea*) Wax myrtle (*Myrica cerifera*)
Meadow or high marsh	Umbrella-grass (*Fuirena scirpoidea*) Dog tooth grass (*Panicum repens*) Broomsedge bluestem (*Andropogon virginicus*)
Tidal or freshwater marsh	Wire grass (*Spartina patens*) Black rush (*Juncus roemerianus*) Roseau cane (*Phragmites communis*)* Cattail (*Typha angustifolia*)
Pond or lagoon	Widgeongrass (*Ruppia maritima*) Wild celery (*Vallisneria americana*) Stonewort (*Chara* sp.) Cattail (*Typha* spp.)

*Now called *Phragmites australis*

1975; Montz 1976) (see Appendix 7 for selected species lists). While the areal extent of the vegetation habitats changed between the 1950s and 1978 in some cases because of major storms, species composition within the habitat types did not change significantly.

Submerged aquatic plants in the Mississippi Deltaic Plain Region are generally confined to water depths of less than 6 ft and are not usually visible on aerial photographs. Floating and floating-leaved aquatics are highly visible on CIR photos and slightly less so on black and white images. Floating aquatics are characteristic of fresh surface waters, but can be found in tidally influenced estuarine waters where they have been flushed by flood waters or strong offshore winds. In smaller water bodies, such as ponds and bayous, they often cover the entire surface of the water body. Because most floating aquatics in the Mississippi Deltaic Plain Region die and sink below the surface during winter freezes, they are usually visible only on late spring through mid-fall imagery.

The distribution of both submerged and floating plants is subject to constant change in response to predation, disease, storms, human eradication, and, in some instances, altered salinity regimes. For a listing of species commonly found in fresh and fresh to slightly brackish waters see Appendix 7.

The distribution of all submerged and floating aquatics throughout the entire Mississippi Deltaic Plain Region has not been mapped. Selected studies have been done in Lake Pontchartrain (Montz n.d.), Lake Theriot (Montz, ongoing research 1979), Avoca Island (USACE 1976), and Lake Boeuf (Montz, ongoing research 1979). Montz (ongoing research 1979) is presently preparing a study on the distribution of submerged vegetation in coastal Louisiana. L. N. Eleuterius (1979) has recently mapped the distribution of submerged vegetation near Horn and Petit Bois Islands, Mississippi, and earlier reported on submerged vegetation in Mississippi Sound after Hurricane Camille (Eleuterius and Miller 1976). Submerged vegetation located bayward of larger islands in the Louisiana and Mississippi barrier island complex are listed in Appendix 7. Where maps of the sumberged aquatics were available, information was transferred to the 1978 Mississippi Deltaic Plain Region habitat maps (L.N. Eleuterius 1973, 1979; Montz, ongoing research 1979). Floating aquatics, such as water hyacinths and duckweed, were mapped on the 1978 series directly from the CIR photographs on the basis of their high visibility in terms of bright red color, smooth texture, and association with fresh water bodies. Because of their extensive distribution in freshwater areas, much of their mapped distribution is confined to clearly defined channels and larger ponds and lakes. It was not considered feasible to map floating aquatics in the interstices of freshwater marshes. Floating aquatics were not mapped on the 1950s map series because their distribution was not as highly visible on black and white photography and identification could not always be certain.

Summary of Habitat Types and Identifying Characteristics

Fifty vegetated habitats occurring in five systems and six classes were discerned within the Mississippi Deltaic Plain Region. Some habitats were natural and others influenced by actions of man. A list of these habitats showing their map symbols and identifying characteristics is illustrated in Table 8. For a more detailed description of each of these habitats see Appendix 5 where the habitats are listed by their alphanumeric symbols. A schematic diagram of the labeling methodology used in this study is illustrated in Figure 20 which shows a cross section of the topography and associated vegetation from the Mississippi River to the Gulf of Mexico.

Within the lower-lying reaches of the coastal zone, especially where natural levees extend into the marshes, vegetated habitats above 5 ft in elevation as contoured on USGS topographic maps are considered uplands (Figure 20). In most instances, these habitat types contain broad-leaved deciduous (F01) and

Table 8. Vegetated habitats and their defining characteristics (BD-LV DEC = Broad-leaved Deciduous; ND-LV DEC = Needle-leaved Deciduous; BD-LV EV = Broad-leaved Evergreen; ND-LV EV - Needle-leaved Evergreen).

SYMBOL	DEFINITION/NAME	LEAF STRUCTURE									VEG HEIGHT		HYDROLOGIC AND SALINITY CHARACTERISTICS									ORIGIN	
		BD-LV DEC	ND-LV DEC	BD-LV EV	ND-LV EV	DEAD	SUBMERGED ALGAL	SUBMERGED VASCULAR	FLOATING	NA-LV PERSISTENT	>20 ft	<20 ft	ESTUARINE REG. TIDAL	ESTUARINE IRREG. TIDAL	ESTUARINE SUBTIDAL	RIVERINE TIDAL	RIVERINE LOW. PERENNIAL	LACUSTRINE <6 ft, >20 ac	PALUSTRINE <20 ac	PALUSTRINE WET	UPLAND NONFLOODED	NATURAL	MAN-INFLUENCED
PSS1	SHRUBS	●										●								●		●	●
PSS1/3	SHRUBS	●		●								●								●		●	●
PSS1/2	SHRUBS	●	●									●								●		●	●
PFO1	TREES	●									●									●		●	
PFO1/2	TREES	●	●								●									●		●	
PFO1/3	TREES	●		●							●									●		●	
PFO1/2/3	TREES	●	●	●							●									●		●	
PFO2/4	TREES		●		●						●									●		●	
PFO1/3/4	TREES	●		●	●						●									●		●	
PFO3/4	TREES			●	●						●									●		●	
PAB2	SUBMERGED AQUATICS							●				●							●			●	
PAB5	FLOATING AQUATICS								●			●							●			●	
PEM	FRESH MARSH									●		●								●		●	
PEMd	FRESH MARSH, DITCHED									●		●								●			●
PDV	CLEARED RIGHT-OF-WAY											●								●			●
L2AB	AQUATIC BED											●						●				●	
L2AB2	SUBMERGED AQUATICS							●				●						●				●	
L2AB5	FLOATING AQUATICS								●			●						●				●	
R1AB2	SUBMERGED AQUATICS							●				●				●						●	
R1AB5	FLOATING AQUATICS								●			●				●						●	
R2AB5	FLOATING AQUATICS								●			●					●					●	
E2SS3	SHRUBS: MANGROVES			●								●										●	
E2EM	NONFRESH MARSH									●		●	●	●								●	
E2EMd	NONFRESH MARSH, DITCHED									●		●	●	●									●
E2EM5N4s	SALINE MARSH, MAN-MADE									●		●	●										●
E2EM5N4	SALINE MARSH									●		●	●									●	
E2EM5N4d	SALINE MARSH, DITCHED									●		●	●										●
E2EM5P5	BRACKISH MARSH									●		●		●								●	
E2EM5P5d	BRACKISH MARSH, DITCHED									●		●		●									●
E2EM5P6	INTERMEDIATE MARSH									●		●		●								●	
E2EM5P6d	INTERMEDIATE MARSH, DITCHED									●		●		●									●
E1AB	AQUATIC BED											●			●							●	
E1AB1	SUBMERGED AQUATICS						●					●			●							●	
E1AB1/2	SUBMERGED AQUATICS						●	●				●			●							●	
E1AB2	SUBMERGED AQUATICS							●				●			●							●	
E1AB5	FLOATING AQUATICS								●			●			●							●	
USS1s	SPOIL W/SHRUBS	●										●									●		●
USS1/3s	SPOIL W/SHRUBS	●		●								●									●		●
USS1/3	SHRUBS	●		●								●									●	●	
UFO1s	SPOIL W/TREES	●									●										●	●	
UFO1/3	TREES	●		●							●										●	●	
UFO1/3/4	TREES	●		●	●						●										●	●	
UFO3/4	TREES			●	●						●										●	●	
UFO3/4s	SPOIL W/TREES			●	●						●										●		●
UFO3	TREES			●							●										●	●	
UFO4	TREES				●						●										●	●	
UDV2	AGRICULTURE/ GRASSLAND											●									●		●
UDV2e	RECLAIMED AGRI./GRASS.											●									●		●
UDV	CLEARED RIGHT-OF-WAY											●									●		●
UGRp	BEACH DUNE GRASS											●									●		●

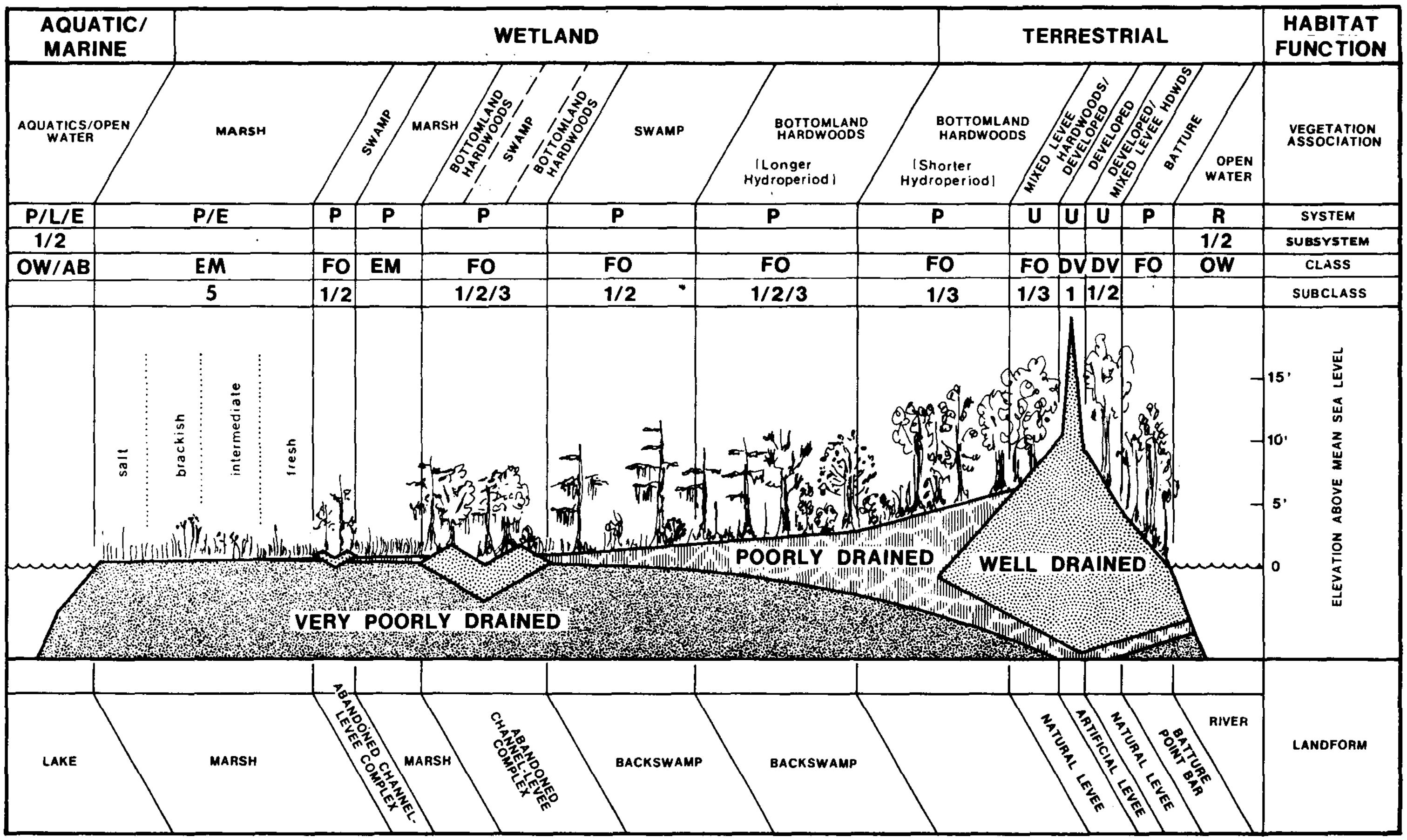

Figure 20. Relationship of habitat and vegetation associations to landforms in the Mississippi Deltaic Plain Region. (Note: as the levees subside, their normally better-drained silty clays are exposed to longer hydroperiods and their mixed levee forest associations are replaced by bottomland hardwood and swamp associations.)

broad-leaved evergreen (FO3) tree species. Those areas below 5 ft in elevation but possessing a green, non-swamp pattern on topographic maps are considered to be wetlands (mostly bottomland hardwood forest) with broad-leaved deciduous and broad-leaved evergreen trees (PFO1/3). In some instances, this ecotone between the deep-water swamps and better-drained bottomland hardwoods also contains numerous cypress (needle-leaved deciduous: FO2) and the area is labeled PFO1/2/3. Occasionally natural levees have subsided into the marsh leaving only one or two narrow, parallel stands of trees along the formerly emergent vegetation-clogged channels. Where these areas contain a mixture of levee and swamp vegetation that is too small to delineate separately, the entire unit is considered a mixed wetland (PFO1/2/3). If only the cypress/tupelogum stand remains as evidence of the former levee, the habitat is labeled PFO1/2. The batture, or that area located between the natural levee and the river, is subject to constant reworking by the river. Vegetation is usually confined to broad-leaved deciduous shrubs and trees, and the vegetation morphology governed by the frequency of disturbance.

The deep-water cypress and/or tupelogum swamps are shown on USGS topographic maps with a green swamp pattern and they invariably occur below the 5 ft contour. Because it was difficult to distinguish pure stands of cypress or tupelogum within mixed cypress-tupelogum swamps from our aerial photography without field checking, no attempt was made to map these stands individually.

Major flood and hurricane protection levees are usually vegetated by short grasses and herbs and have a shell road running along the crest and/or along the inside base of the levee. In this study, the total levee complex is labeled as upland developed urban-industrial (UDV1). Agricultural areas, regardless of their elevation, are considered as upland developed agriculture/pasture (UDV2). If collateral data indicate that these are reclaimed marshlands, these areas are identified by the modifier "e" (Figure 21). Marshes are usually less than 5 ft in elevation and appear white with a marsh pattern on USGS topographic maps. They are classified as consisting of fresh water (Palustrine: P) or non-fresh water (Estuarine: E) with emergent (EM) vegetation.

UNVEGETATED HABITATS WITHOUT STRUCTURES

Unvegetated habitats containing no structures are small, geomorphic features such as beaches, flats, reefs, and unconsolidated bottoms. In the Mississippi Deltaic Plain Region, the beaches are primarily sand and/or shell and occur along the land-water interface where wave action has reworked the sediments. Shell beaches can result from storms and waves washing shells onto the shore or from wave-working of Indian shell middens. The flats usually consist of mud and/or organic material. Mud flats occur in relatively protected still water areas, while mud and organic flats are often the result of wave erosion of the marsh and creation of a wave-cut terrace. Flats are usually visible on photographs only during periods of low water. Reefs are usually oyster shell (Crassostrea virginica). Those labeled on the habitat maps represent only the reefs that are visible from the photographs and usually indicate low water conditions. The unconsolidated bottoms are sand, mud, and/or organic material. They are found almost exclusively adjacent to the barrier islands.

Sand and shell materials appear smooth-textured and white on both the CIR and black and white photographs. The mud and organic materials appear smooth-textured and light to medium grey on black and white photographs and greenish-grey on CIR imagery. Unconsolidated bottoms are delineated near the barrier islands, usually only on the 1950s black and white photographs, where their rippled subsurface shows through the shallow and relatively clear estuarine waters.

There are 15 major unvegetated habitats without structures (Table 9). The majority of these habitats are natural geomorphic features but one, (UDV3), is the result of man-related activities involving land fill, land clearing, or

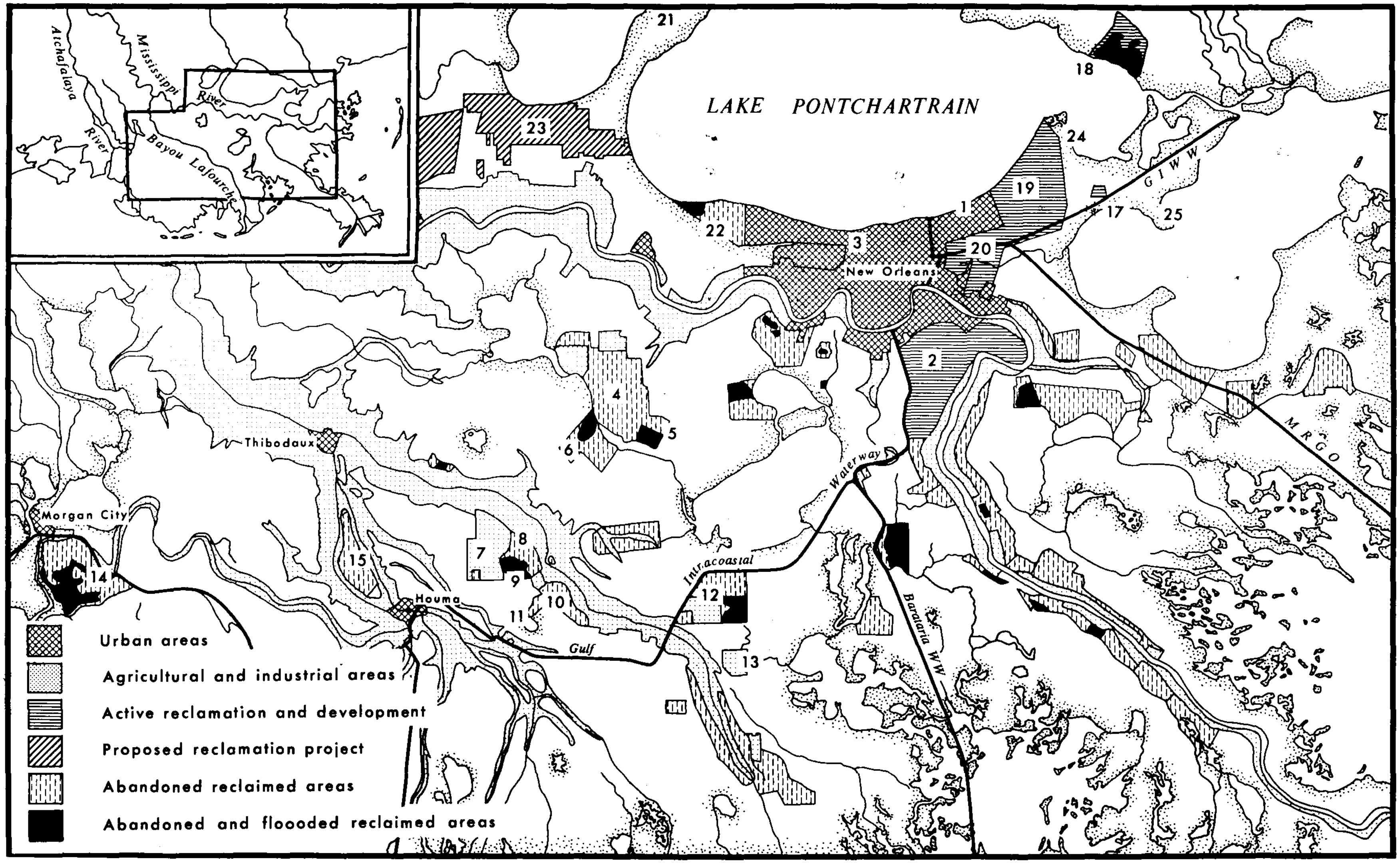

Figure 21. Location of active and abandoned reclamation sites within the Mississippi Deltaic Plain Region of Louisiana (Gagliano 1972).

Table 9. Unvegetated habitats without structures and their defining characteristics.

		SIZE				SHAPE		SALINITY			WATER REGIME			COMPOSITION				ORIGIN	
SYMBOL	DEFINITION/NAME	>20 ac	<20 ac	>6 ft	<6 ft	Linear	Nonlinear	Fresh	Estuarine	Marine	Tidal	Lower Perennial	Intermittent	Sand	Shell	Mud	Organic	Natural	Man-Made
M2BB2	BEACH						●			●	●			●	●			●	●
PFL2	FLAT		●				●	●						●	●			●	
L2FL3	FLAT	●			●		●	●								●	●	●	
L2FL3/4	FLAT	●			●		●	●								●	●	●	
R1FL3	FLAT					●		●			●					●		●	
R1BB2	BEACH					●		●			●			●	●			●	
R2FL	FLAT					●		●				●						●	
R2FL2	FLAT					●		●				●		●	●			●	
R2BB2	BEACH					●		●				●		●	●			●	
E1UB2	UNCONSOLIDATED BOTTOM						●		●		●			●				●	
E2UB3/4	UNCONSOLIDATED BOTTOM						●		●		●					●	●	●	
E2FL3	FLAT						●		●		●					●		●	
E2BB2	BEACH						●		●		●			●	●			●	
E2RF2	REEF						●		●		●				●			●	
UDV3	UNVEGETATED GROUND					●	●												●

the deposition of dredged material. In wetland areas, this material is elevated in relation to the surrounding environment and is often intended for later development. For this reason, such areas are grouped into one major category as upland, developed, unvegetated spoil/landfill (UDV3). These areas appear on both black and white and CIR photographs as white, smooth-textured features. They are distinguished from beaches because of their association with human activities such as dredging and construction.

UNVEGETATED HABITATS WITH STRUCTURES

Unvegetated areas with structures represent the smallest number of mapped habitats (Table 10). All of these habitats are man-made and man-controlled. While jetties may have attached flora, their purpose is to serve as control structures for water flow and wave action and the vegetation is not visible on the imagery. Most of the jetties within the study area are perpendicular to the shoreline, as along the Mississippi coast, or extensions of the lower Mississippi River delta distributaries, and consist of imported boulders. In most cases, jetties that are visible as thin lines on air photos are also labeled on topographic maps.

No attempt was made to distinguish among urban, industrial, commercial, and residential habitats in this study. All developed habitats were grouped under the category upland developed urban-industrial, (UDV1). Many individual features such as housing clusters were often grouped together with roads and levees and labeled as one habitat type. Conspicuous levee systems, such as the Mississippi River protection levees, are usually outlined separately but still labeled UDV1. Some industrial sites related to mineral industries, such as oil tank farms, were given a modifier "o" to distinguish them from other developed areas. These sites were identified only with the aid of air photos and topographic maps, and some mineral-related developments may have been omitted in the absence of collateral information.

MEASUREMENT OF HABITAT AREA

The paper draft maps from which the inked camera-ready mylar habitat maps were produced also served as the cartographic base from which habitat areas were measured. Planimetric data were generated by a Numonics Corporation Model 1224 electronic digitizer. This unit contains an optical pick-up system which detects linear changes in two dimensions and translates this information into curvilinear and areal values. It is used to determine the length of lines and the area of planes at a desired scale. Two methods are available for measuring areas with a digitizer: continuously, by tracing around or along the figure; or point to point, by identifying only two end points of a line or the corners of a straight-sided polygon. This machine has the capacity to accumulate individual observations for the measurement of discontinuous related figures and can be programmed to register values at the scale selected.

Table 10. Unvegetated habitats with structures and their defining characteristics.

SYMBOL	DEFINITION/NAME	SHAPE		WATER REGIME		ORIGIN	
		Linear	Irregular	Fresh Tidal	Estuarine Tidal	Natural	Man-Made
R1RS2r	JETTY	●		●			●
E2RS2r	JETTY	●			●		●
UDV1	URBAN-INDUSTRIAL PROTECTION LEVEES ROADS-RAILROADS	●	●				●
UDV1o	OIL INDUSTRY		●				●

Calculations other than those mentioned above were performed with a desktop calculator. All initial measurements were recorded on a digitizer worksheet (Figure 22). As one individual manipulated the digitizer arm and noted the measurements, an assistant recorded the areal values on the worksheet. The assistant also color-coded a blue-line copy of the habitat map to indicate which habitats had been measured.

MEASUREMENT PROCEDURES AND COMPILATION OF DATA

The procedure used in measuring habitat areas is as follows:

1. The scaling factors were programmed into the digitizer and the resulting performance was checked against a standard.

2. The total area of the draft map was determined by averaging three point-to-point measurements of the vertices of the map border.

3. This figure was then divided by the USGS stable-base area value for the appropriate 7.5 minute quadrangle (Appendix 8) and the resulting proportionality constant was recorded on the digitizer worksheet.

4. If the study area within the coastal zone covered only a portion of the total map area, that portion which was within the study area was measured continuously (Figure 23). Any fixed sub-division created by county/parish or hydrologic unit boundaries was broken out in the same manner.

5. Primary areas of habitat types (e.g., fresh marsh [PEM]) were measured from which all other labeled areas (usually smaller areas such as ponds [POW]) within them were subtracted.

6. Secondary areas of habitat types were then traced. If tracts belonging to a single habitat label were discontinuous, the accumulator feature was used to combine individual observations into a single value. Habitats of one type, entirely contained within a second type, could be subtracted from the second type by tracing in a counter-clockwise direction to yield negative areal values.

7. The length of linear geographic features such as canals, roads, small streams, spoil, and levees were measured and multiplied by the feature's standard width. These standard widths were obtained from collateral data sources.

8. After the area of each of the habitat types had been measured and recorded, the habitat outline was colored on the blue-line draft map (e.g., water bodies were coded blue, forests were coded green).

9. After each draft habitat map had been measured and the areal information recorded on the worksheet, the map location was crossed off a master topographic index map used to monitor the digitizing process.

10. The areal information was transferred from the worksheet to a final tally sheet (Figure 24) which was designed to show the data by habitat type and subdivision (i.e., parish/ county, state, and hydrologic unit). Each subdivision contains two columns for each habitat type (i.e., digitized area and stable base area). The areal value obtained from measuring the habitat map was shown in the column labeled "digitized area." The corresponding "stable base area" was obtained by multiplying the digitized area by the proportionality constant (see 3 above). Each of these calculations was performed twice to check mathematical accuracy.

DIGITIZER WORKSHEET FWS 78-26

Primary Area	Label	Secondary Areas	Labels	Secondary Area Totals	Labels

CEI # __________

Hyd. Unit __________

Parish/ State __________

Date Digitized __________

Digitizer Initials __________

Sheet ___ of ___

MAP AREA TOTALS:

A) POINT TO POINT __________

B) STABLE BASE __________

C) DIGITZED AREA __________

D) MULTIPLER __________

REMARKS:

Figure 22. Example of the worksheet used in initial compilation of habitat areas.

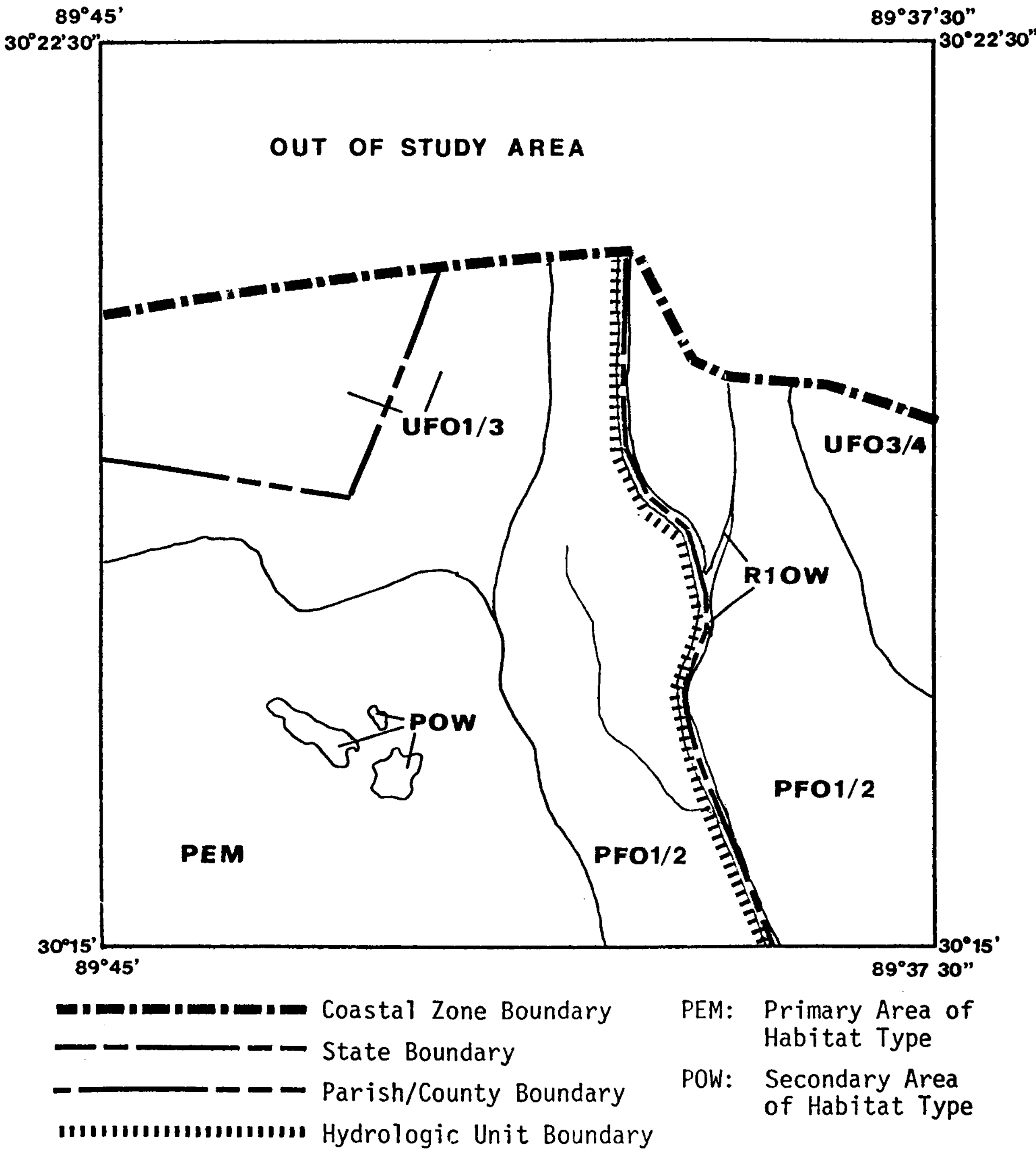

Figure 23. A diagram of a habitat map containing a coastal zone boundary, a parish/county boundary, a state boundary, and primary and secondary areas of habitat type.

FINAL TALLY SHEET

Topographic Map ______________________ CEI Map No. ________________

Map Date ______________________ Photo Source ________________

Sheet ________ of ________ Photo Date ________________

Habitat Label	State ______ Parish ______ H. Unit ______		State ______ Parish ______ H. Unit ______		State ______ Parish ______ H. Unit ______		Habitat Area Totals
	Digitized Area	Stable Base Area	Digitized Area	Stable Base Area	Digitized Area	Stable Base Area	
Unit/Parish Totals							Map Totals 1) 2)

Digitizer ______________________ Date ______________________

Time to complete ________________

Figure 24. Example of final tally sheet used in compiling habitat area measurements.

FINAL PRODUCT

The final product consists of two sets of habitat areal measurements: one for the 1950s habitat map series and the other for the 1978 series. Each set consists of 272 final tally sheets depicting 232 (7.5 minute) named habitat map units and 40 (7.5 minute) open water units contained within the study area.

The scale of individual draft maps varied slightly from the stable base USGS 7.5 minute topographic map measurements provided by USGS (H.C. Meaux, personal communication, 1979, USGS, Rolla, Missouri) (Appendix 8). In order to adjust all measured habitat areas to a stable base value, the areal measurements were multiplied by a proportionality constant when the total topographic map area was within the coastal zone and if there was only one parish/county, one state, and one hydrologic unit on the topographic map.

When habitat subdivisions of a habitat map area (i.e., parish/state area, hydrologic unit area, or coastal zone area less than 7.5 minutes) were compared for the 1950s and 1978, the total area of each subdivision was usually unequal. In the case of the hydrologic units, this was due to a shift in the hydrologic unit boundary attributable to new channel dredging or levee realignment.

HABITAT MAPPING AND AREAL MEASUREMENT

There are many potential sources of error inherent in all habitat mapping. In the MDPR Habitat Mapping Study, the following should be considered in the evaluation, manipulation and use of the maps:

1. In this study, the Vegetative Type Map of the Louisiana Coastal Marshes of Chabreck (1978) was used as collateral information to separate marsh types in some instances. Chabreck's data were in draft at the beginning of the Habitat Mapping Study in 1978. The lines delineating the marsh types from Chabreck's draft map, which is at a scale of 1:380,160, were transferred to USGS topographic maps at 1:24,000 scale before any photointerpretation was begun. When the separation between marsh types on Chabreck's map could be corroborated from the color infrared, Chabreck's data were used to define the separation.

2. Color infrared photography was used for 1978 and black and white photography was used for the 1950's.

3. The mapping process utilized paper base maps and tissue tracing paper, both of which are subject to distortion.

4. The color infrared photography was not quadcentered, and in some cases as many as 9 photographs were pieced together to make up a habitat map corresponding to a single 1:24,000 topographic sheet (see p. 5).

5. In spite of careful checking of both draft and camera-ready maps by FWS and the contractor, there may still be some errors on some of the maps (e.g. unlabeled polygons, unclosed polygons).

While these mapping problems exist, they are common to all projects of this type. The NCET is confident that these habitat maps will prove useful for many purposes, not the least of which is to provide reasonably accurate measurements of areal extent of wide-ranging and often inaccessible habitats for the first time.

APPENDIX 1

THE LOUISIANA COASTAL ZONE MANAGEMENT BOUNDARY AS DEFINED IN STATE AND LOCAL COASTAL RESOURCES MANAGEMENT ACT OF 1978

(parentheses added for clarity)

213.4 Coastal zone boundary

A. The seaward boundary of the coastal zone of Louisiana shall be the seaward limit of the state of Louisiana as determined by law.

B. The interstate boundaries of the coastal zone shall be the boundary separating Louisiana from Texas on the west and the boundary separating Louisiana from Mississippi on the east, as each is determined by law.

C. The inland boundary of the coastal zone shall generally be a line beginning at the intersection of the northern line of the Intracoastal Canal and the Louisiana/Texas boundary, thence proceeding easterly along the northern bank of the Intracoastal Canal to Highway 82, thence northeasterly along (the north side of) Highway 82 to Highway 690, thence easterly along (the north side of) Highway 690 to Highway 330, thence northeasterly along (the north and west side of) Highway 330 to Highway 14, thence easterly along (the north side of) Highway 14 to Highway 90, thence southeasterly along (the north side of) Highway 90 (the new alignment) to Highway 85, thence northeasterly along Highway 85 to Highway 90 (the old alignment), thence easterly along Highway 90 to the intersection of Highway 90 and the eastern bank of the Atchafalaya River at Morgan City, thence southerly along the eastern bank of the Atchafalaya River to the northern bank of the Gulf Intracoastal Waterway, thence proceeding southeasterly along the northern bank of the Gulf Intracoastal Waterway to the vicinity of the Bayou du Large Ridge, thence proceeding southerly (approximately) along the (5 ft contour of the) western edge of the Bayou du Large Ridge to the intersection of the Falgout Canal to the eastern edge of the Bayou du Large Ridge, thence proceeding northerly along the (5 ft contour of the) eastern edge of the Bayou du Large Ridge to the vicinity of Crozier, thence proceeding easterly (along the north side of the Ashland Canal south to the St. Louis Canal) to the western edge of the Grand Caillou Ridge, thence proceeding southerly (approximately) along the (5 ft contour of the) western edge of the Grand Caillou Ridge to the vicinity of Dulac (Falgout Canal), thence proceeding easterly (approximatly along the 5 ft contour) to the eastern edge of the Grand Caillou Ridge, thence proceeding northerly (approximately) along the (5 ft contour of the) eastern edge of the Grand Caillou Ridge to the northern bank of the St. Louis Canal, thence proceeding easterly along the northern bank of the St. Louis Canal to the western edge of the Petit Caillou Ridge, thence proceeding southerly (approximately) along the (5 ft contour of the) western edge of the Petit Caillou Ridge to the vicinity of Chauvin, thence proceeding easterly (along the north side of the canal) to Highway 55, thence proceeding northerly along (the east side of) Highway 55 to its intersection with Highway 665, thence easterly along (the north side) of Highway 665 to Bayou Point au Chien, thence northerly along (the 5 ft contour of the west bank of) Bayou Point au Chien to Highway 55, thence northerly along (the west side of) Highway 55 to Highway 24, thence easterly along (the north side of) Highway 24 to Highway 308, thence northerly along (the north side of) Highway 308 to a point of intersection with the northern bank of the Gulf Intracoastal Waterway, thence northeasterly along the northern bank of the Gulf Intracoastal Waterway to a point of intersection with Canal Tisamond Foret, thence proceeding northeasterly along the northern bank of the Canal Tisamond Foret to a point of intersection with a line one hundred yards inland from the mean high tide line of Lake Salvador, thence proceeding northerly along the line one hundred yards inland from the mean high tide of Lake Salvador to a point of intersection with the western bank of Bayou Des Allemands, thence proceeding northerly along the western bank of Bayou Des Allemands to a point nearest the intersection of the northern boundary of the Salvador Wildlife Management Area and the eastern bank of Bayou Des Allemands, thence proceeding northeasterly across Bayou Des Allemands, and along the northern-most boundary of the Salvador Wildlife Management Area to the northeast corner of the Salvador Wildlife Management Area, thence proceeding due east to a point of intersection with the boundary separating St. Charles and Jefferson Parishes, thence proceeding northerly along the St. Charles/Jefferson Parish boundary to a point of intersection with the Mississippi River, thence proceeding in an upstream direction along the centerline of the Mississippi River to a point of intersection with the boundary separating St. James and Ascension Parishes, thence proceeding northeasterly along the St. James/Ascension Parish boundary to a point of intersection with the boundary separating St. James and St. John the Baptist Parishes, thence proceeding northerly along the Ascension/St. John the Baptist Parish boundary to a point of intersection with the boundary separating St. John the Baptist and Livingston Parishes, thence proceeding easterly along the Livingston/St.John the Baptist Parish boundary to a point of intersection with a line 100 yards inland from the mean high tide of the western shore of Lake Maurepas, thence proceeding northerly and easterly along the line 100 yards inland from the mean high tide of the western shore of Lake Maurepas to a point of intersection with the boundaries of Tangipahoa and Livingston Parishes, thence proceeding northerly along the Livingston-Tangipahoa Parish line to a point of intersection with Interstate Highway 12, thence proceeding easterly along (the north side of) Interstate Highway 12 to a point of intersection with Interstate Highway 10, thence proceeding easterly along (the north side of) Interstate Highway 10 to a point of intersection with the boundary separating Louisiana and Mississippi.

D. Within 180 days of the enactment of this Part, the secretary shall adopt a fully delineated inland boundary in accordance with the provisions of Subsection C, which boundary shall not depart appreciably from the boundary delineated therein, provided that the secretary shall be authorized to amend the boundary as may be appropriate to follow the corporate limits of any municipality divided by the boundary. The boundary, as adopted, shall be clearly marked on large-scale maps or charts, official copies of which shall be available for public inspection in the offices of the secretary, the Louisiana Coastal Commission, the Coastal Management Section, and each local government in the coastal zone.

APPENDIX 2

DEFINITION OF THE SEVEN HYDROLOGIC UNITS IN THE MISSISSIPPI DELTAIC PLAIN REGION STUDY AREA

The hydrologic units 1 through 7 correspond closely to those of Chabreck et al.(1968), but they have been refined to reflect the actual drainage basin divides more precisely. When habitat areas were measured and a hydrologic boundary fell in the middle of the habitat unit, as along the crest of a natural or artificial levee,the habitat unit was equally divided, with half the area assigned to each hydrologic unit. All units have as their inland, or northern, boundary either the Coastal Zone Mangement (CZM) Boundary in Louisiana or the 15 ft contour line in Mississippi. A brief description of these units follows:

HYDROLOGIC UNIT 1

The eastern boundary of hydrologic unit 1 is the Mississippi-Alabama border. The western boundary is the Louisiana-Mississippi border. Unit 1 includes all land in the coastal zone below 15 ft in elevation, Mississippi Sound barrier islands, and open water within the jurisdiction of the State of Mississippi (Figure 1).

HYDROLOGIC UNIT 2

The eastern boundary of hydrologic unit 2 is the Mississippi-Louisiana state boundary. The western boundary is the crest of the eastern artificial protection levee of the Mississippi River extending from near Donaldsonville southeastward to Baptiste Collette Bayou. Unit 2 extends northeastward along the north shore of Baptiste Collette Bayou to West Point of Breton Island. From West Point, it extends east to the 3 mile offshore boundary. This unit includes the Pontchartrain basin, Breton Sound, Chandeleur Sound and the Chandeleur Islands.

HYDROLOGIC UNIT 3

Hydrologic unit 3 includes the area between the Lower Mississippi River and the present active delta. The eastern boundary extends from near Donaldsonville southeastward along the crest of the east Mississippi River artificial protection levee to Baptiste Collette Bayou. From there, it extends along the north bank of the Bayou to West Point, Breton Island, then east to the 3 mile offshore limit. The western border is the center of the Mississippi River protection levee to Venice. From Venice, Unit 3 extends southwestward along the northern bank of Red Pass offshore to the 3 mile boundary. All of the delta south of Venice from Red Pass and Baptiste Collette Bayou to the 3 mile limit is included in unit 3.

HYDROLOGIC UNIT 4

The eastern border of unit 4 is the crest of the West Mississippi River protection levee between the St. Charles-Jefferson parish line and Venice. The southern boundary extends from the north bank of Red Pass to the 3 mile boundary. The western boundary of this unit is the west bank of Bayou Lafourche to Leeville. From Leeville, unit 4 continues south along the west bank of Bayou Lafourche to the Gulf then directly south to the 3 mile limit. This unit includes the Barataria Basin and Bay and the marsh lands in the western middle delta north of Venice.

HYDROLOGIC UNIT 5

The eastern boundary of unit 5 is the west bank of Bayou Lafourche. The western boundary extends south of Morgan City, along the east bank and protection levee of the lower Atchafalaya River. South of Avoca Island cut-off, the western border hugs the east shore of Atchafalaya Bay to Point au Fer. From Point au Fer, the boundary extends directly south to the 3 mile boundary. This unit includes most of the coastal marshlands of Terrebonne Parish.

HYDROLOGIC UNIT 6

Hydrologic unit 6 includes the Lower Atchafalaya Basin below Bayou Teche and Atchafalaya Bay. Its eastern boundary extends along the east bank and protection levee of the lower Atchafalaya River south of Morgan City to Avoca Island cut-off, then follows the shoreline to Point au Fer at which point it drops directly south to the 3 mile limit. The western border extends from Bayou Sale (community) along the east bank protection levee of Bayou Sale to the town of Burns. From Burns, the border hugs the shoreline of East Cote Blanche Bay to Point Chevreuil. From Point Chevreuil, unit 6 extends southwest to South Point then hugs the shore of Marsh Island to Mound Point. From Mound Point, the border drops directly south to the 3 mile offshore boundary.

HYDROLOGIC UNIT 7

Hydrologic unit 7 includes Marsh Island, Vermilion, East and West Cote Blanche Bays, the marshes bordering these bays, as well as small expanses of Prairie Terrace north of the marshes. The eastern border is the east protection levee of Bayou Sale, the east shore of East Cote Blanche Bay, and a line extending from Point Chevreuil to South Point along the southeast shore of Marsh Island to Mound Point. The western boundary extends south from the juncture of the CZM boundary and LA Highway 82 to Esther, then west along LA 82 to the Hebert Canal. The boundary follows Hebert Canal to the Intracoastal Waterway then extends southwest to Schooner Bayou. From Schooner Bayou, it goes southwest along Belle Isle Canal to Freshwater Bayou-Freshwater Canal to the Gulf of Mexico and then drops directly southward to the 3 mile offshore limit.

APPENDIX 3

LIST OF USGS 7.5 MINUTE TOPOGRAPHIC MAP NAMES, CEI NUMBERS, AERIAL PHOTOGRAPHIC SOURCES AND DATES OF COVERAGE FOR THE MISSISSIPPI DELTAIC PLAIN REGION STUDY AREA

C.E.I. NO.	TOPOGRAPHIC MAP NAME	1950s PHOTO SOURCE	1950s PHOTO DATE	1970s PHOTO SOURCE	1970s PHOTO DATE
M1A	PETIT BOIS ISLAND, MS-AL	USDA	1951	USACE	1976/77
M2A	HORN ISLAND WEST, MS	USDA	1951	USACE	1976/77
M2B	HORN ISLAND, MS	USDA	1951	USACE	1976/77
M3A	SHIP ISLAND, MS	USDA	1951	USACE	1976/77
M3B	DOG KEYS PASS, MS	USDA	1951	USACE	1976/77
M4A	KREOLE, MS-AL	USDA	1952/53	USACE	1976/77
M4C	GRAND BAY SW, MS-AL	USDA	1952	USACE	1976/77
M5A	PASCAGOULA NW, MS	USDA	1952/53	USACE	1976/77
M5B	PASCAGOULA NE, MS	USDA	1951/52	USACE	1976/77
M5C	PASCAGOULA SW, MS	USDA	1951	USACE	1976/77
M5D	PASCAGOULA SE, MS	USDA	1952	USACE	1976/77
M6A	BILOXI, MS	AMMANN	1951	NASA	1978
M6B	OCEAN SPRINGS, MS	AMMANN	1952	USACE	1976/77
M6C	OPEN WATER, MS	-	-	-	-
M6D	DEER ISLAND, MS	AMMANN	1952	NASA	1978
M7A	GULFPORT NW, MS	TOBIN	1958	NASA	1978
M7B	GULFPORT NE, MS	TOBIN	1958	NASA	1978
M7C	PASS CHRISTIAN, MS	TOBIN	1958	NASA	1978
M7D	GULFPORT SE, MS	TOBIN	1958	NASA	1978
M8A	KILN, MS	TOBIN	1958	NASA	1978
M8B	VIDALIA, MS	TOBIN	1958	NASA	1978
M8C	WAVELAND, MS	AMMANN	1951	NASA	1978
M8D	BAY ST. LOUIS, MS	TOBIN	1958	NASA	1978
M9C	HURLEY SW, AL	USDA	1952/53	USACE	1976/77
M10A	VANCLEAVE NW, MS	USDA	1952/53	NASA	1978
M10B	VANCLEAVE NE, MS	USDA	1952/53	NASA	1978
M10C	VANCLEAVE SW, MS	USDA	1952/53	USACE	1976/77
M10D	VANCLEAVE SE, MS	USDA	1952/53	USACE	1976/77
M11C	VESTRY SW, MS	AMMANN	1951	NASA	1978
M11D	VESTRY SE, MS	AMMANN	1951	NASA	1978
M12D	MCHENRY SE, MS	AMMANN	1951	NASA	1978
157A	NICHOLSON, LA-MS	AMMANN	1956	NASA	1978
157B	DEAD TIGER CREEK, MS	AMMANN	1956	NASA	1978
157C	HAASWOOD, LA-MS	AMMANN	1956	NASA	1978
157D	LOGTOWN, LA	AMMANN	1956	NASA	1978
158A	ST. TAMMANY, LA	TOBIN	1958	NASA	1978
158C	LACOMBE, LA	AMMANN	1956	NASA	1978
158D	SLIDELL, LA	AMMANN	1956	NASA	1978
159A	MADISONVILLE, LA	AMMANN	1956	NASA	1978
159B	COVINGTON, LA	AMMANN	1956	NASA	1978
159C	COVINGTON SW, LA	AMMANN	1956	NASA	1978
159D	MANDEVILLE, LA	AMMANN	1956	NASA	1978
160A	PONCHATOULA, LA	AMMANN	1956	NASA	1978
160B	PONCHATOULA NE, LA	AMMANN	1956	NASA	1978
160C	MANCHAC, LA	AMMANN	1956	NASA	1978
160D	PONCHATOULA SE, LA	AMMANN	1956	NASA	1978
161B	SPRINGFIELD, LA	AMMANN	1956	NASA	1978
161D	KILLIAN, LA	AMMANN	1956	NASA	1978
187B	SORRENTO, LA	AMMANN	1956	NASA	1978
187C	DONALDSONVILLE, LA	AMMANN	1956	NASA	1978
187D	CONVENT, LA	AMMANN	1956	NASA	1978
188A	MOUNT AIRY NW, LA	AMMANN	1956	NASA	1978
188B	MOUNT AIRY NE, LA	AMMANN	1956	NASA	1978
188C	LUTCHER, LA	AMMANN	1956	NASA	1978
188D	RESERVE, LA	AMMANN	1956	NASA	1978
189A	RUDDOCK, LA	AMMANN	1956	NASA	1978
189B	BONNET CARRE NE, LA	AMMANN	1956	NASA	1978
189C	LAPLACE, LA	AMMANN	1956	NASA	1978
189D	LABRANCHE, LA	AMMANN	1956	NASA	1978
190A	OPEN WATER, LA	-	-	-	-
190B	SPANISH FORT NE, LA	AMMANN	1956	NASA	1978
190C	INDIAN BEACH, LA	AMMANN	1956	NASA	1978
190D	SPANISH FORT SE, LA	AMMANN	1956	NASA	1978
191A	SOUTH POINT, LA	AMMANN	1956	NASA	1978
191B	NORTH SHORE, LA	AMMANN	1956	NASA	1978
191C	LITTLE WOODS, LA	AMMANN	1956	NASA	1978
191D	CHEF MENTEUR, LA	AMMANN	1956	NASA	1978
192A	RIGOLETS, LA	AMMANN	1956	NASA	1978
192B	ENGLISH LOOKOUT, LA-MS	AMMANN	1956	NASA	1978
192C	ALLIGATOR POINT, LA	AMMANN	1956	NASA	1978
192D	FALSE MOUTH BAYOU, LA	AMMANN	1956	NASA	1978
193A	GRAND ISLAND PASS, MS	AMMANN	1956	NASA	1978
193B	OPEN WATER, LA	-	-	-	-
193C	MALHEUREUX POINT, LA	AMMANN	1956	NASA	1978
193D	THREE MILE BAY, LA	AMMANN	1956	NASA	1978
194A	ISLE AU PITRE, LA-MS	AMMANN	1956	NASA	1978
194B	CAT ISLAND, LA-MS	AMMANN	1956	NASA	1978
194C	DOOR POINT, LA	AMMANN	1956	NASA	1978
194D	OPEN WATER, LA	-	-	-	-
194E	EAST CHANDELEUR LIGHT, LA	AMMANN	1952	NASA	1978
194F	OPEN WATER, LA	-	-	-	-
196A	NORTH ISLANDS, LA	AMMANN	1952	NASA	1978
196B	OPEN WATER, LA	-	-	-	-
196C	NEW HARBOR ISLANDS, LA	AMMANN	1952	NASA	1978
196D	OPEN WATER, LA	-	-	-	-
197A	MITCHELL KEY, LA	AMMANN	1956	NASA	1978
197B	OPEN WATER, LA	-	-	-	-
197C	SOUTH OF MITCHELL KEY, LA	AMMANN	1956	NASA	1978
197D	FREE MASON ISLAND, LA	AMMANN	1956	NASA	1978
198A	LAKE EUGENIE, LA	AMMANN	1956	NASA	1978
198B	OAK MOUND BAYOU, LA	AMMANN	1956	NASA	1978
198C	LAKE ELOI, LA	AMMANN	1956	NASA	1978
198D	MORGAN HARBOR, LA	AMMANN	1956	NASA	1978

C.E.I. NO.	TOPOGRAPHIC MAP NAME	1950s PHOTO SOURCE	1950s PHOTO DATE	1970s PHOTO SOURCE	1970s PHOTO DATE
199A	PROCTOR POINT, LA	AMMANN	1956	NASA	1978
199B	POINT AUX MARCHETTES, LA	AMMANN	1956	NASA	1978
199C	YSCLOSKEY, LA	AMMANN	1956	NASA	1978
199D	LENA LAGOON, LA	AMMANN	1956	NASA	1978
200A	CHALMETTE, LA	AMMANN	1956	NASA	1978
200B	MARTELLO CASTLE, LA	AMMANN	1956	NASA	1978
200C	BELLE CHASSE, LA	AMMANN	1956	NASA	1978
200D	DELACROIX, LA	AMMANN	1956	NASA	1978
201A	NEW ORLEANS WEST, LA	AMMANN	1956	NASA	1978
201B	NEW ORLEANS EAST, LA	AMMANN	1956	NASA	1978
201C	LAKE CATAOUATCHE EAST, LA	AMMANN	1956	NASA	1978
201D	BERTRANDVILLE, LA	AMMANN	1956	NASA	1978
202A	HAHNVILLE, LA	AMMANN	1956	NASA	1978
202B	LULING, LA	AMMANN	1956	NASA	1978
202D	LAKE CATAOUATCHE WEST, LA	AMMANN	1956	NASA	1978
204B	LAGAN, LA	AMMANN	1956	NASA	1978
206C	CENTERVILLE, LA	TOBIN	1956	NASA	1978
207A	JEANERETTE, LA	TOBIN	1955	NASA	1978
207B	CHARENTON, LA	TOBIN	1955	NASA	1978
207C	KEMPER, LA	TOBIN	1955	NASA	1978
207D	FRANKLIN, LA	TOBIN	1955	NASA	1978
208A	DELCAMBRE, LA	TOBIN	1955	NASA	1978
208B	NEW IBERIA SOUTH, LA	TOBIN	1955	NASA	1978
208C	TIGRE LAGOON, LA	TOBIN	1955	NASA	1978
208D	WEEKS, LA	TOBIN	1955	NASA	1978
209A	ABBEVILLE WEST, LA	TOBIN	1955	NASA	1978
209B	ABBEVILLE EAST, LA	TOBIN	1955	NASA	1978
209C	INTRACOASTAL CITY, LA	TOBIN	1955	NASA	1978
209D	HEBERT, LAKE, LA	TOBIN	1955	NASA	1978
224B	PECAN ISLAND NE, LA	TOBIN	1955	NASA	1978
224D	PECAN ISLAND SE, LA	TOBIN	1955	NASA	1978
224F	OPEN WATER, LA	-	-	-	-
225A	CHENIERE AU TIGRE NW, LA	TOBIN	1955	NASA	1978
225B	CHENIERE AU TIGRE NE, LA	TOBIN	1955	NASA	1978
225C	CHENIERE AU TIGRE SW, LA	TOBIN	1955	NASA	1978
225D	CHENIERE AU TIGRE SE, LA	TOBIN	1955	NASA	1978
225E	OPEN WATER, LA	-	-	-	-
225F	OPEN WATER. LA	-	-	-	-
226A	CYPREMORT POINT, LA	TOBIN	1955	NASA	1978
226B	HAMMOCK LAKE, LA	TOBIN	1955	NASA	1978
226C	BAYOU LUCIEN, LA	TOBIN	1955/56	NASA	1978
226D	BAYOU BLANC, LA	TOBIN	1955/56	NASA	1978
227A	MARONE POINT, LA	TOBIN	1955/56	NASA	1978
227B	ELLERSLIE, LA	TOBIN	1955/56	NASA	1978
227C	LAKE POINT, LA	TOBIN	1955/56	NASA	1978
227D	POINT CHEVREUIL, LA	TOBIN	1955/56	NASA	1978
228A	NORTH BEND, LA	TOBIN	1955	NASA	1978
228B	PATTERSON, LA	TOBIN	1955/56	NASA	1978
228C	BELLE ISLE, LA	TOBIN	1955/56	NASA	1978
228D	LAKE SALVE, LA	TOBIN	1955/56	NASA	1978
229A	MORGAN CITY, LA	AMMANN	1956	NASA	1978
229B	AMELIA, LA	AMMAN	1956	NASA	1978
229C	MORGAN CITY SW, LA	AMMANN	1956	NASA	1978
229D	MORGAN CITY SE, LA	AMMANN	1956	NASA	1978
230C	BAYOU COCODRIE, LA	AMMANN	1956	NASA	1978
230D	HUMPHREYS, LA	AMMANN	1956	NASA	1978
231C	HOUMA, LA	AMMANN	1956	NASA	1978
231D	BOURG, LA	AMMANN	1956	NASA	1978
232B	CATAHOULA BAY, LA	AMMANN	1956	NASA	1978
232C	LAROSE, LA	AMMANN	1956	NASA	1978
232D	CUT OFF, LA	AMMANN	1956	NASA	1978
233A	BARATARIA, LA	AMMANN	1956	NASA	1978
233B	LAFITTE, LA	AMMANN	1956	NASA	1978
233C	BAY L'OURS, LA	AMMANN	1956	NASA	1978
233D	THREE BAYOU BAY, LA	AMMANN	1956	NASA	1978
234A	PHOENIX, LA	AMMANN	1956	NASA	1978
234B	LAKE BATOLA, LA	AMMANN	1956	NASA	1978
234C	LAKE LAURIER, LA	AMMANN	1956	NASA	1978
234D	POINTE A LA HACHE, LA	AMMANN	1956	NASA	1978
235A	LAKE CUATRO CABALLO, LA	AMMANN	1956	NASA	1978
235B	BLACK BAY NORTH, LA	AMMANN	1956	NASA	1978
235C	HAPPY JACK, LA	AMMANN	1956	NASA	1978
235D	BLACK BAY SOUTH, LA	AMMANN	1956	NASA	1978
236A	LAKE ATHANASIO, LA	AMMANN	1956	NASA	1978
236B	POINT CHICOT, LA	AMMANN	1956	NASA	1978
236C	SOUTH OF LAKE ATHANASIO, LA	-	-	-	-
236D	OPEN WATER, LA	-	-	-	-
237A	OPEN WATER, LA	-	-	-	-
237B	NORTH OF GRAND GROSIER ISLANDS, LA	-	-	-	-
237C	OPEN WATER, LA	-	-	-	-
237D	GRAND GROSIER ISLANDS, LA	AMMANN	1956	NASA	1978
238A	STAKE ISLANDS, LA	AMMANN	1956	NASA	1978
238B	OPEN WATER, LA	-	-	-	-
238C	OPEN WATER, LA	-	-	-	-
239A	BRETON ISLANDS, LA	AMMANN	1956	NASA	1978
239B	OPEN WATER, LA	-	-	-	-
239C	MAIN PASS, LA	AMMANN	1956	NASA	1978
239D	BRETON ISLANDS SE, LA	AMMANN	1956	NASA	1978

C.E.I. NO.	TOPOGRAPHIC MAP NAME	1950s PHOTO SOURCE	1950s PHOTO DATE	1970s PHOTO SOURCE	1970s PHOTO DATE
239E	OPEN WATER, LA	-	-	-	-
239F	OPEN WATER, LA	-	-	-	-
240A	COQUILLE POINT, LA	AMMANN	1956	NASA	1978
240B	TAYLOR PASS, LA	AMMANN	1956	NASA	1978
240C	TRIUMPH, LA	AMMANN	1956	NASA	1978
240D	VENICE, LA	AMMANN	1956	NASA	1978
241A	PORT SULPHUR, LA	AMMANN	1956	NASA	1978
241B	EMPIRE, LA	AMMANN	1956	NASA	1978
241C	BASTIAN BAY, LA	AMMANN	1956	NASA	1978
241D	BURAS, LA	AMMANN	1956	NASA	1978
242A	WILKINSON BAY, LA	AMMANN	1956	NASA	1978
242B	BAY BATISTE, LA	AMMANN	1956	NASA	1976
242C	BARATARIA PASS, LA	AMMANN	1956	NASA	1978
242D	BAY RONQUILLE, LA	AMMANN	1956	NASA	1978
243A	GOLDEN MEADOW FARMS, LA	AMMANN	1956	NASA	1978
243B	BAY DOSGRIS, LA	AMMANN	1956	NASA	1978
243C	MINK BAYOU, LA	AMMANN	1956	NASA	1978
243D	BAY TAMBOUR, LA	AMMANN	1956	NASA	1978
244A	LAKE BULLY CAMP, LA	AMMANN	1956	NASA	1978
244B	GOLDEN MEADOW, LA	AMMANN	1956	NASA	1978
244C	LAKE FELICITY, LA	AMMANN	1956	NASA	1978
244D	BAY COURANT, LA	AMMANN	1956	NASA	1978
245A	DULAC, LA	AMMANN	1956	NASA	1978
245B	MONTEGUT, LA	AMMANN	1956	NASA	1978
245C	LAKE QUITMAN, LA	AMMANN	1956	NASA	1978
245D	LAKE TAMBOUR, LA	AMMANN	1956	NASA	1978
246A	LAKE PENCHANT, LA	AMMANN	1956	NASA	1978
246B	LAKE THERIOT, LA	AMMANN	1956	NASA	1978
246C	LAKE MECHANT, LA	AMMANN	1956	NASA	1978
246D	BAYOU SAUVEUR, LA	AMMANN	1956	NASA	1978
247A	PLUMB BAYOU, LA	AMMANN	1956	NASA	1978
247B	CARENCRO BAYOU, LA	AMMANN	1956	NASA	1978
247C	FOUR LEAGUE BAY, LA	AMMANN	1956	NASA	1978
247D	LOST LAKE, LA	AMMANN	1956	NASA	1978
248A	OPEN WATER, LA	-	-	-	-
248B	POINT AU FER NE, LA	TOBIN	1955/56	NASA	1978
248C	EUGENE ISLAND, LA	TOBIN	1955/56	NASA	1978
248D	POINT AU FER, LA	TOBIN	1955/56	NASA	1978
249A	OPEN WATER, LA	-	-	-	-
249B	MOUND POINT, LA	TOBIN	1955/56	NASA	1978
249C	OPEN WATER, LA	-	-	-	-
249D	OPEN WATER, LA	-	-	-	-
249E	OPEN WATER, LA	-	-	-	-
249F	OPEN WATER, LA	-	-	-	-
249G	OPEN WATER, LA	-	-	-	-
249H	OPEN WATER, LA	-	-	-	-
250B	SOUTH OF POINT AU FER, LA	TOBIN	1955/56	NASA	1978
251A	OYSTER BAYOU, LA	AMMANN	1956	NASA	1978
251B	EAST BAY JUNOP, LA	AMMANN	1956	NASA	1978
251D	OPEN WATER, LA	-	-	-	-
252A	GRAND BAYOU DU LARGE, LA	AMMANN	1956	NASA	1978
252B	DOG LAKE, LA	AMMANN	1956	NASA	1978
252C	WESTERN ISLES DERNIERES, LA	AMMANN	1956	NASA	1978
252D	CENTRAL ISLES DERNIERES, LA	AMMANN	1956	NASA	1978
252E	OPEN WATER, LA	-	-	-	-
252F	OPEN WATER, LA	-	-	-	-
253A	COCODRIE, LA	AMMANN	1956	NASA	1978
253B	LAKE LA GRAISSE, LA	AMMANN	1956	NASA	1978
253C	EASTERN ISLES DERNIERES, LA	AMMANN	1956	NASA	1978
253D	CAT ISLAND PASS, LA	AMMANN	1956	NASA	1978
253E	OPEN WATER, LA	-	-	-	-
254A	JACKO BAY, LA	AMMANN	1956	NASA	1978
254B	PELICAN PASS, LA	AMMANN	1956	NASA	1978
254C	TIMBALIER ISLAND, LA	AMMANN	1956	NASA	1978
254D	CALUMET ISLAND, LA	AMMANN	1956	NASA	1978
254E	OPEN WATER, LA	-	-	-	-
255A	LEEVILLE, LA	AMMANN	1956	NASA	1978
255B	CAMINADA, LA	AMMANN	1956	NASA	1978
255C	BELLE PASS, LA	AMMANN	1956	NASA	1978
255D	OPEN WATER, LA	-	-	-	-
256A	GRAND ISLE, LA	AMMANN	1956	NASA	1978
256B	OPEN WATER, LA	AMMANN	1956	NASA	1978
257A	OPEN WATER, LA	AMMANN	1956	NASA	1978
257B	BAY COQUETTE, LA	AMMANN	1956	NASA	1978
257D	OPEN WATER, LA	-	-	-	-
258A	PASS TANTE PHINE, LA	AMMANN	1956	NASA	1978
258B	PILOTTOWN, LA	AMMANN	1956	NASA	1978
258C	PASS DU BOIS, LA	AMMANN	1956	NASA	1978
258D	DIXON BAY, LA	AMMANN	1956	NASA	1978
259A	PASS A LOUTRE NW, LA	AMMANN	1956	NASA	1978
259B	PASS A LOUTRE NE, LA	AMMANN	1956	NASA	1978
259C	SOUTH PASS, LA	AMMANN	1956	NASA	1978
259D	GARDEN ISLAND PASS, LA	AMMANN	1956	NASA	1978
259E	EAST OF PASS A LOUTRE NE, LA	AMMANN	1956	NASA	1978
259F	OPEN WATER, LA	-	-	-	-
260A	SOUTH OF SOUTH PASS, LA	AMMANN	1956	NASA	1978
260B	OPEN WATER, LA	-	-	-	-
261A	BURRWOOD BAYOU WEST, LA	AMMANN	1956	NASA	1978
261B	BURRWOOD BAYOU EAST, LA	AMMANN	1956	NASA	1978
261C	OPEN WATER, LA	-	-	-	-
262B	OPEN WATER, LA	-	-	-	-

APPENDIX 4

HIERARCHIAL STRUCTURE OF HABITAT CLASSIFICATION SYSTEM USED IN MAPPING THE MISSISSIPPI DELTAIC PLAIN REGION

HABITAT MAP SYMBOLS

SYSTEM AND SUBSYSTEM

***SYSTEM**
* subsystem

M MARINE
1 subtidal
2 intertidal

E ESTUARINE
1 subtidal
2 intertidal

P PALUSTRINE
— no subsystem

R RIVERINE
1 tidal
2 lower perennial
3 upper perennial
4 intermittent

L LACUSTRINE
1 limnetic
2 littoral

U UPLAND
— no subsystem

CLASS AND SUBCLASS

***CLASS**
*subclass

AB AQUATIC BED
1 submergent algal
2 submergent vascular
3 submergent moss
4 floating-leaved
5 floating
6 unknown submergent
7 unknown surface

BB BEACH/BAR
1 cobble/gravel
2 sand/shell

EM EMERGENT
1 persistent
2 nonpersistent
3 narrow-leaved nonpersistent
4 broad-leaved nonpersistent
5 narrow-leaved persistent
6 broad-leaved persistent

FL FLAT
1 cobble/gravel
2 sand/shell
3 mud
4 organic
5 vegetated pioneer
6 vegetated non-pioneer

FO FORESTED
1 broad-leaved deciduous
2 needle-leaved deciduous
3 broad-leaved evergreen
4 needle-leaved evergreen
5 dead
6 deciduous
7 evergreen

OW OPEN WATER
unknown bottom

RF REEF
1 coral
2 mollusc
3 worm

RS ROCKY SHORE
1 bedrock
2 boulder
3 vegetated non-pioneer

SB STREAM BED
1 cobble/gravel
2 sand
3 mud
4 organic

SS SCRUB/SHRUB
1 broad-leaved deciduous
2 needle-leaved deciduous
3 broad-leaved evergreen
4 needle-leaved evergreen
5 dead
6 deciduous
7 evergreen

UB UNCONSOLIDATED BOTTOM
1 cobble/gravel
2 sand
3 mud
4 organic

DV DEVELOPED
1 urban/residential/commercial/industrial
2 agriculture/pasture/modified grasslands
3 unvegetated land/spoil/disposal sites

GR GRASSLANDS

WATER REGIME MODIFIERS

NONTIDAL
A temporary
B saturated
C seasonal
D seasonal/well-drained
E seasonal/saturated
F semipermanent
G intermittently exposed
H permanent
J intermittently flooded

NONTIDAL COMBINED
Z intermittently exposed/permanent (G, H above)
W intermittently flooded/temporary (J, A above)
Y saturated semipermanent/all seasonals (B, C, D, E, F above)

TIDAL
L subtidal
M irregularly exposed
N regular
P irregular
R seasonal
S temporary
T semipermanent
V permanent

NONTIDAL AND TIDAL
U unknown
K artificial

WATER CHEMISTRY MODIFIERS

COASTAL HALINITY MODIFIER
1 hyperhaline
2 euhaline
3 mixohaline (brackish)
4 polyhaline
5 mesohaline
6 oligohaline
— fresh

INLAND SALINITY MODIFIER
7 hypersaline
8 eusaline
9 mixosaline
— fresh

pH FRESH WATER MODIFIER
a acid
t circumneutral
I alkaline

OTHER MODIFIERS

SPECIAL MODIFIERS
b beaver
d partially drained/ditched
f farmed
e reclaimed wetland
h diked/impounded
r artificial
s spoil
x excavated
o oil/gas/mineral
t tidal
p beach

SOIL MODIFIERS
g organic
n mineral

APPENDIX 5

GLOSSARY OF HABITAT LABELS

MARINE

M1OW: Marine Subtidal Open Water

Open water bodies with high wave energy and salinities exceeding 30 ppt. Because of the influence of freshwater discharges from the Mississippi, Pearl, Atchafalaya, and other rivers, the only marine habitats labeled in the Mississippi Deltaic Plain Region are located south and east of the Mississippi and Louisiana barrier islands.

M2BB2: Marine Intertidal Beach/ Bar Sand/Shell

Wave reworked sand and shell materials on the Gulfward side of the Mississippi and Louisiana barrier islands. Sand dunes on the barrier islands that are below 5 ft in elevation and have little or no vegetation are also classified as beach.

M1UB2: Marine Subtidal Unconsolidated Bottom Sand

Sandy, shallow water unvegetated flats, wash-over fans, and bars on the bayward side of the barrier islands.

ESTUARINE

E1OW: Estuarine Subtidal Open Water

A nonchannelized embayment, pond, lake, etc., having salinities which can fluctuate greatly in response to the freshwater inputs or high evaporation rates. Generally, the salinity is more than 0.5 ppt and less than 30 ppt. Because of the large discharges of fresh water into the coastal and nearshore regions of the Mississippi Deltaic Plain Region, all offshore waters except those south and east of the Mississippi barrier and Louisiana Chandeleur Islands are labeled estuarine. Water bodies located in nonfresh marshes are also labeled estuarine.

E1OWt: Estuarine Subtidal Open Water Tidal

A naturally channelized body of water having a salinity of 0.5 ppt or greater during the period of average annual low flow; a tidal channel or abandoned distributary channel.

E1OWx: Estuarine Subtidal Open Water Excavated

An excavated estuarine water body (e.g. lake, pond, borrow pit, canal, marina) constructed and utilized for purposes other than oil and gas activities.

E1OWh: Estuarine Subtidal Open Water Impounded/Diked

An artificially leveed and impounded body of water having a salinity above 0.5 ppt. Abandoned reclamation sites that have become flooded are also labeled as being artificially impounded in order to distinguish them from natural water bodies.

E1OWo: Estuarine Subtidal Open Water Oil/Gas/Minerals

An excavated or impounded estuarine water body constructed and utilized by oil-, gas-, or sulphur-related industries (e.g., brine discharge pits, rig cuts, pipeline canals).

E2EM: Estuarine Intertidal Emergent Vegetation

A wet grassland vegetated by salt-tolerant species. This label is used on the 1950s habitat maps to designate all non-fresh marshes (saline, brackish, and intermediate) because there are no adequate data to designate individual marsh types. This category is sometimes interspersed with open water bodies that are too small, discontinuous, and numerous to be individually delineated.

E2EMd: Estuarine Intertidal Emergent Vegetation Partially Drained/Ditched

A non-freshwater marsh that has been ditched and partially drained but which still supports non-fresh wetland flora.

E2EM5N4: Estuarine Intertidal Emergent Vegetation Narrow-leaved Persistent Regular Tidal Regime Polyhaline

A saline marsh commonly containing the narrow-leaved persistent species oystergrass (Spartina alterniflora), black rush (Juncus roemerianus), batis (Batis maritima), and saltgrass (Distichlis spicata) (Chabreck and Linscombe 1978).

E2EM5N4d: Estuarine Intertidal Emergent Narrow-leaved Persistent Vegetation Regular Tidal Regime Polyhaline Partially Drained/Ditched

A saline marsh that has been ditched and partially drained or is in the process of being drained, but which still supports saline marsh vegetation.

E2EM5N4s: Estuarine Intertidal Emergent Narrow-leaved Persistent Vegetation Regular Tidal Regime Polyhaline Spoil

A saline marsh that has developed on spoil deposited in an estuarine water body. This habitat is common in Mississippi, particularly near Pascagoula.

E2EM5P5: Estuarine Intertidal Emergent Vegetation Narrow-leaved Persistent Irregular Tidal Regime Mesohaline

A brackish marsh commonly containing narrow-leaved persistent species: wiregrass (Spartina patens), three-cornered grass (Scirpus olneyi), and coco (Scirpus robustus) (Chabreck and Linscombe 1978).

E2EM5P5d: Estuarine Intertidal Emergent Vegetation Narrow-leaved Persistent Irregular Tidal Regime Mesholine Partially Drained/ Ditched

A brackish marsh that has been ditched and partially drained, or is in the process of being drained but still supports the wetland flora.

E2EM5P6: Estuarine Intertidal Emergent Vegetation Narrow-leaved Persistent Irregular Tidal Regime Oligohaline

An intermediate marsh that commonly contains bulltongue (Sagittaria sp.), cattail (Typha sp.), sawgrass (Cladium jamaicense), roseau cane (Phragmites australis),bullwhip (Scirpus californicus) and wild millet (Echinochloa walteri) (Chabreck and Linscombe 1978).

E2EM5P6d: Estuarine Intertidal Emergent Vegetation Narrow-leaved Persistent Irregular Tidal Regime Oligohaline Partially Drained/ Ditched

An intermediate marsh that has been ditched and partially drained or is in the process of being drained but still supports wetland flora.

E1AB: Estuarine Subtidal Aquatic Bed

A submerged aquatic bed of unkown species composition in an estuarine water body.

E1AB1: Estuarine Subtidal Aquatic Bed Submergent Algal Vegetation

Submerged algal vegetation in an estuarine water body. The location of these beds was obtained from Montz (1979, ongoing research) and L. N. Eleuterius (1973, 1979).

E1AB2: Estuarine Subtidal Aquatic Bed Submergent Vascular Vegetation

Submerged vascular vegetation in an estuarine water body. The location of these beds was obtained from Montz (1979, ongoing research) and L. N. Eleuterius (1973, 1979).

E1AB1/2: Estuarine Subtidal Aquatic Bed Submergent Algal/Submergent Vascular Vegetation

An intermixture of submerged algal and submerged vascular vegetation in an estuarine water body. The location of these beds was obtained from Montz (1979, ongoing research) and L. N. Eleuterius (1973, 1979).

E1AB5: Estuarine Subtidal Aquatic Bed Floating

Floating aquatic mats are usually water hyacinths (_Eichhornia crassipes_) that have been flushed out of freshwater environments into low salinity estuarine water bodies. They can persist for a short period of time until increased salinities kill them.

E2FL: Estuarine Intertidal Flat

An unvegetated geologic deposit of unknown composition in a low energy, estuarine environment.

E2FL2: Estuarine Intertidal Flat Sand/Shell

Unvegetated sand and/or shell deposits in estuarine areas with low wave and tidal energy regimes. Frequently, these are wash-over fans behind barrier islands.

E2FL3: Estuarine Intertidal Flat Mud

Unvegetated mud deposits in estuarine areas with low wave and tidal energy regimes. These are common in protected, broken marsh environments and on the perimeter of the lower Mississippi River Delta.

E2FL3/4: Estuarine Intertidal Flat Mud/Organic

Unvegetated organic and mud deposits in estuarine areas with low wave and tidal energy regimes. They are commonly found in broken marsh areas subject to shallow water flooding such as the perimeter of the Lower Mississippi River Delta and the deteriorating former fresh and intermediate marsh areas experiencing increased salinities.

E1UB2: Estuarine Subtidal Unconsolidated Bottom Sand

Unconsolidated and unvegetated sand deposits in shallow estuarine waters. They are commonly associated with shifting barrier islands.

E2UB3/4: Estuarine Intertidal Unconsolidated Bottom Mud/Organic

Wave cut terraces in unvegetated, organic and mud deposits along eroding estuarine marsh shorelines.

E2RF2: Estuarine Intertidal Reef Mollusc

Irregularly shaped deposits of living and/or dead oysters in estuarine environments. The greatest concentration of reefs occurs south of Marsh Island, in Southwest Pass (Vermilion Parish) and west of Point au Fer, Louisiana.

E2BB2: Estuarine Intertidal Beach Sand/Shell

Wave reworked sand and/or shell material along a land-water interface in an estuarine environment.

E2RS2r: Estuarine Intertidal Rocky Shore Boulder Artificial

Man-made deposits of boulders used in the construction of rip-rap bulkheads and jetties.

E2SS3: Estuarine Intertidal Scrub/Shrub Broad-leaved Evergreen

Black mangroves (*Avicennia germinans*) are the only salinity tolerant trees in coastal Louisiana, but they rarely reach more than 3 m (10 ft) in height and are therefore classified as shrubs. They occur most commonly along the Louisiana coast between Terrebonne Bay and Red Fish Pass, and along the Chandeleur Islands.

LACUSTRINE

L1OW: Lacustrine Limnetic Open Water

A large, deep body of fresh water with an area greater than 8 ha (20 ac) and a depth greater than 6 ft. Only those lakes with the 6 ft contour line shown on USGS topographic maps were so labeled.

L2OW: Lacustrine Littoral Open Water

A large, shallow body of fresh water with an area greater than 8 ha (20 ac) and a depth less than 6 ft. Virtually all lakes in the Mississippi Deltaic Plain Region are shallow and appear on USGS topographic maps as being less than 6 ft deep. Their shallowness is also documented in Barrett (1970).

L2OWx: Lacustrine Littoral Open Water Excavated

A large, shallow body of fresh water that was created by artificial excavation. These are most commonly irregularly shaped borrow pits in coastal Louisiana and Mississippi. Some large gravel and sand mining pits, especially in Mississippi, are also labeled L2OWx.

L2OWh: Lacustrine Littoral Open Water Diked/Impounded

A large, shallow body of fresh water that has been artificially impounded by means of damming or diking. Large, abandoned and flooded reclamation sites in freshwater areas of coastal Louisiana were labeled as impounded to indicate their artificial, rather than natural, origin.

L2OWo: Lacustrine Littoral Open Water Oil/Gas/Mineral

A large, shallow body of fresh water that was constructed either by impoundment or excavation for use in the oil, gas, sulphur, or other mineral industries.

L2AB: Lacustrine Littoral Aquatic Bed

Mats of aquatic vegetation in large shallow bodies of fresh water. This label is used where it is not possible to distinguish between vegetated flats, submerged or floating aquatics. This habitat type is most common in formerly fresh environments experiencing saltwater intrusion.

L2AB2: Lacustrine Littoral Aquatic Bed Submergent Vascular

Submerged vascular flora located in large shallow bodies of fresh water. The location of the few submerged aquatic habitats that are designated in Louisiana were obtained from Montz (1979, ongoing research).

L2AB5: Lacustrine, Littoral Aquatic Bed Floating

Floating aquatic mats usually water hyacinths or duckweed, present on large shallow bodies of fresh water. Their location frequently shifts in relation to wind direction and flooding currents, and in winter these mats die and sink below the surface.

L2FL3: Lacustrine Littoral Flat Mud

Expanses of unvegetated mud deposits along the shore or in shallow portions of large freshwater lakes.

L2FL3/4: Lacustrine Littoral Flat Mud/Organic

Expanses of unvegetated mud and organic deposits along the shore or in shallow portions of large freshwater lakes.

PALUSTRINE

POW: Palustrine Open Water

A nonchannelized, naturally occurring body of fresh water less than 8 ha (20 ac) in area; a pond.

POWx: Palustrine Open Water Excavated

An artificially excavated, nonchannelized body of fresh water less than 8 ha (20 ac) in area, including farm ponds, borrow pits, and ponds left from mining operations.

POWh: Palustrine Open Water Diked/Impounded

An artificially impounded, nonchannelized body of fresh water less than 8 ha (20 ac) in area. This includes dammed farm ponds and small reservoirs. In coastal Louisiana, diked but abandoned and flooded reclamation sites in freshwater areas are also labeled POWh.

PAB2: Palustrine Aquatic Bed Submerged Vascular

Submerged vascular flora located in a small, freshwater body.

PAB5: Palustrine Aquatic Bed Floating

A floating aquatic mat, frequently water hyacinths or duckweed, in a small, freshwater body.

PAB5o: Palustrine Aquatic Bed Floating Oil/Gas/Mineral

A floating aquatic mat in an artificially created pond used by the oil, gas, or mineral industry.

PFL2: Palustrine Flat Sand/Shell

A deposit of sand and/or shell in a shallow, still water area of a small body of fresh water.

PEM: Palustrine Emergent Vegetation

A freshwater marsh dominated by such species as maidencane (Panicum hemitomon), pennywort (Hydrocotyle sp.), pickerelweed (Pontederia cordata), alligatorweed (Alternanthera philoxeroides), and bulltongue (Sagittaria sp.) (Chabreck and Linscombe 1978). Because the coastal marshes contain a mixture of broad-leaved and narrow-leaved persistent vegetation no subclass was assigned to this marsh type on the habitat maps.

PEMd: Palustrine Emergent Vegetation Partially Drained/Ditched

A former freshwater marsh that has been ditched and partially drained or is in the process of being drained but which still supports wetland flora.

PSS1: Palustrine Scrub/Shrub Broad-leaved Deciduous

A freshwater wetland dominated by broad-leaved deciduous scrubs and shrubs. Habitats commonly include pioneering willows and cottonwoods (Populus deltoides) on recently accreted battures, and in partially drained freshwater marshes. Marshes being invaded by eastern baccharis (Baccharis halimifolia), hackberry (Celtis laevigata), buttonbush (Cephalanthus occidentalis), and palmetto (Sabal minor) are also labeled PSS1. No attempt was made to distingish between naturally occurring scrub/shrub wetlands and reclaimed wetlands being pioneered by shrubs.

PSS1/2: Palustrine Scrub/Shrub Broad-leaved Deciduous/Needle-leaved Deciduous

The freshwater wetlands dominated by broad-leaved and needle-leaved deciduous scrubs and shrubs. This includes shrubs as well as saplings (young trees less than 6 m [20 ft] high). This particular classification is most common in the lower Mississippi River Delta where young willows and cypress less than 6 m (20 ft) high are pioneer species on newly accreted lands. PSS1/2 also includes some partially drained wetlands. Because of the difficulty in distinguishing between naturally occurring and partially drained wetlands with shrubs no distinction was made between the two habitat types of different origin but similar species composition.

PSS1/3: Palustrine Scrub/Shrub Broad-leaved Deciduous/Broad-leaved Evergreen

A freshwater wetland dominated by broad-leaved deciduous and broad-leaved evergreen scrubs and shrubs. These can be both natural and partially drained wetlands. Common species include eastern baccharis, young willows, wax myrtle (Myrica cerifera), and palmetto. No attempt was made to discern the difference between natural and drained wetlands containing shrubs.

PFO1: Palustrine Forested Broad-leaved Deciduous

A broad-leaved, deciduous forest in a freshwater wetland environment. This includes battures containing willows and cottonwood and bottomland hardwood forest habitats subject to frequent flooding. In Louisiana, these habitats are usually below the 5 ft contour. Exceptions are the bottomland hardwoods on the upper Pearl River floodplain and small areas of the upper Pascagoula River floodplain in Mississippi, which are often above 5 ft in elevation but are wetlands because of poor drainage.

PFO1/2: Palustrine Forested Broad-leaved Deciduous/Needle-leaved Deciduous

A deep-water swamp containing mostly broad-leaved deciduous and needle-leaved deciduous trees. Most areas so labeled on the habitat maps contain cypress (Taxodium distichum) and tupelogum (Nyssa aquatica). Swamps in the interdistributary basins of the Mississippi River and the Pearl, Pascagoula, and Escatawpa rivers of Mississippi are dominated by these species. Aquatic beds and emergents may characterize the understory.

PFO1/3: Palustrine Forested Broad-leaved Deciduous/Broad-leaved Evergreen

Wetland forests dominated by broad-leaved deciduous and broad-leaved evergreen trees. These areas, while below 5 ft in elevation, are better drained than backswamps and are commonly found on subsiding natural levees and between wetter bottomland hardwoods and drier mixed levee and upland forests. Common species in such environments include live oak (Quercus virginiana), sweetgum (Liquidambar styraciflua), magnolia (Magnolia sp.), and hackberry (Celtis laevigata). Large cut-over areas of Devil's Swamp, Mississippi, which contain maple (Acer rubrum) and swamp bay (Persea palustris) are labeled PFO1/3.

PFO1/2/3: Palustrine Forested Broad-leaved Deciduous/Needle-leaved Deciduous/Broad-leaved Evergreen

A wetland forest containing a mixture of broad-leaved and needle-leaved deciduous and broad-leaved evergreen trees. Frequently such bottomland hardwood forests are transition zones between the deep-water backswamp and the better drained mixed levee and upland hardwoods. Common species in these forests are cypress, tupelogum, red maple, green ash (Fraxinus pennsylvanica var. lanceolata), and live oak.

PF03/4: Palustrine Forested Broad-leaved Evergreen/Needle-leaved Evergreen

Live oak and pine (Pinus sp.) forests bordering the marshes, rivers, and lakes north of Lake Pontchartrain, Louisiana, and in Mississippi. These areas are wetlands because of poor drainage resulting from their location within floodplains which may be above 5 ft in elevation.

PF01/3/4: Palustrine Forested Broad-leaved Deciduous/Broad-leaved Evergreen/Needle-leaved Evergreen

In the study area, these poorly drained forested wetlands are confined primarily to the Louisiana coastal zone north of Lake Pontchartrain and to Mississippi. On USGS topographic maps, they appear as green-colored swamp patterns along narrow streams in upland areas. The common species are bottomland hardwood trees such as the live oak, maple, and green ash, as well as pines.

PF02/4: Palustrine Forested Needle-leaved Deciduous/Needle-leaved Evergreen

More common in the study area in Mississippi than in Louisiana, these forested wetlands are characterized by baldcypress, pond cypress (Taxodium distichum var. nutans). They are found on sandy soils having a high water table and poor drainage.

PDV: Palustrine Developed

A cleared, regularly maintained, and usually linear right-of-way through a wetland forest or scrub/shrub habitat. These areas usually contain emergents, aquatic beds, or early successional stages of the climax habitat that has been removed.

RIVERINE

R1OW: Riverine Subtidal Open Water

Fresh water, contained within a natural channel, which is influenced by tidal action.

R1OWx: Riverine Subtidal Open Water Excavated

Fresh water, contained within an excavated channel, which is influenced by tidal action. These channels are often used for navigation or drainage.

R1OWo: Riverine Subtidal Open Water Oil/Gas/Mineral

Fresh water, contained within an excavated channel, which is influenced by tidal action. Such canals are constructed and utilized by oil, gas, sulphur, and other mineral-related industries to convey the pipelines or drilling equipment.

R2OW: Riverine Lower Perennial Open Water

Permanent, non-tidal fresh water, contained within a natural channel.

R2OWx: Riverine Lower Perennial Open Water Excavated

Permanent, non-tidal fresh water, contained within an excavated channel. These channels are used for navigation or drainage.

R2OWo: Riverine Lower Perennial Open Water Oil/Gas/Mineral

Permanent, non-tidal fresh water, contained within an excavated channel. Such canals are constructed and utilized by oil, gas, sulphur, and other mineral-related industries to convey the pipelines and drilling equipment.

R4OW: Riverine Intermittent Open Water

Infrequently flowing fresh water, contained within a natural channel.This habitat type is located only in the upper reaches of tributary streams especially on the Pleistocene Terrace north of Lake Pontchartrain.

R4OWx: Riverine Intermittent Open Water Excavated

Infrequently flowing fresh water, contained within an excavated channel. These are usually channelized natural waterways or drainage canals, most of which are located on the Pleistocene Terrace north of Lake Pontchartrain.

R1FL: Riverine Tidal Flat

A flat of unknown composition located in tidally influenced, fresh water contained within a natural channel.

R1FL3: Riverine Tidal Flat Mud

A mud flat located in tidally influenced, fresh water contained within a natural channel.

R1BB2: Riverine Tidal Beach/Bar Sand/Shell

A sand and/or shell bar in tidally influenced, permanently flowing fresh water contained within a natural channel.

R2BB2: Riverine Lower Perennial Beach/Bar Sand/Shell

A sand and/or shell bar in permanently flowing fresh water contained within a natural channel.

R1RS2r: Riverine Tidal Rocky Shore Boulder Artificial

A man-made, rocky shore composed of boulders in tidally influenced fresh water contained within a natural channel; a jetty.

R1AB2: Riverine Tidal Aquatic Bed Submerged Vascular

A submerged vascular vegetation bed such as widgeongrass (Ruppia maritima) growing in tidally influenced fresh water contained within a natural channel.

R1AB5: Riverine Tidal Aquatic Bed Floating

A floating aquatic bed, usually water hyacinth or duckweed, in tidally influenced fresh water contained within a natural channel.

R1AB5o: Riverine Tidal Aquatic Bed Vegetation Oil/Gas/Mineral

A floating aquatic bed, usually water hyacinth or duckweed, in tidally influenced fresh water contained within a channel excavated by the mineral industry.

R1AB5x: Riverine Tidal Aquatic Bed Floating Excavated

A floating aquatic bed, usually water hyacinth or duckweed, in tidally influenced fresh water contained within an excavated channel.

R2AB5: Riverine Lower Perennial Aquatic Bed Floating

A floating aquatic bed, usually water hyacinth or duckweed, in permanent, nontidal fresh water contained within a natural channel.

R2AB5o: Riverine Lower Perennial Aquatic Bed Floating Oil/Gas/Mineral

A floating aquatic bed, usually water hyacinth or duckweed, in permanent, nontidal fresh water contained within a channel excavated by the mineral industry.

R2AB5x: Riverine Lower Perennial Aquatic Bed Floating Excavated

A floating aquatic bed, usually water hyacinth or duckweed, in permanent, nontidal fresh water contained within an excavated channel.

UPLAND

UDV1: Upland Developed Urban/Residential/Commercial/Industrial

Residential, commercial, urban, and industrial developments on an upland site or in areas protected from flooding by levees and drainage canals.

UDV1o: Upland Developed Commercial/Industrial Oil/Gas/Mineral

Industrial development associated with the mineral industry. This habitat type includes drilling complexes onshore and some refining sites.

UDV2: Upland Developed Agriculture/Pasture/Modified Grasslands

Non-wetland areas being cultivated for crops, maintained as pasture, or left as grasslands. In Mississippi, some of the grasslands may be seasonally wet. While some cultivated sites may be subject to seasonal flooding, they are not considered wetland habitats because non-wetland species composition is maintained through management.

UDV2e: Upland Developed Agriculture/Pasture/Modified Grasslands Reclaimed Wetland

Louisiana and, to a lesser extent, Mississippi have areas of former wet grasslands that have been diked, ditched, drained and put into cultivation, pasture, or non-wet grasslands. Usually pumping and active management must be maintained to prevent such areas from converting to wetlands. The rice fields in the western portion of the study area that are reclaimed wetlands are labeled UDV2e, while those on naturally occurring non-wetlands are labeled UDV2. Reclaimed bottomland hardwoods and swamps are not designated as UDV2e.

UDV3: Upland Developed Unvegetated Land/Spoil/Disposal Sites

Regardless of elevation, areas that have been altered and cleared of vegetation through disposal of spoil or non-liquid waste materials or cleared for various reasons, including mining, are labeled UDV3. Natural plant succession on such sites is often interrupted because of constant disturbance. Some low-lying, reworked, unvegetated shell middens in the marsh may also be labeled UDV3.

UDV: Upland Developed

A relatively narrow, cleared, regularly maintained, usually linear, right-of-way through an upland, forested, or scrub/shrub habitat. Such areas are vegetated, but frequent maintenance prohibits establishment of climax vegetation.

USS1: Upland Scrub/Shrub Broad-leaved Deciduous

Well-drained, formerly cleared uplands or recently drained wetlands that have been invaded by broad-leaved deciduous scrubs and shrubs. On naturally occurring upland sites, these are mixed hardwoods, while in former wetlands willow, hackberry, and Chinese tallow (Sapium sebiferum) are the more common invaders.

USS1/3: Upland Scrub/Shrub Broad-leaved Deciduous/Broad-leaved Evergreen

Well-drained,formerly cleared upland or recently drained wetlands that have been invaded by broad-leaved deciduous and broad-leaved evergreen species. On natural uplands these are mixed hardwoods, including live oak and wax myrtle. On drained wetlands, the more common invaders are willow, hackberry, Chinese tallow, and wax myrtle.

USS1s: Upland Scrub/Shrub Broad-leaved Deciduous Spoil

Spoil deposits of varying elevation that are better drained than the surrounding wetlands and which commonly support young willows and shrubs such as iva (Iva frutescens) and eastern baccharis. Often the more recently vegetated spoil deposits are labeled USS1s and the more mature deposits that had remained elevated are labeled USS1/3s to indicate their greater species diversity, especially the invasion of broad-leaved evergreen species such as wax myrtle.

USS1/3s: Upland Scrub/Shrub Broad-leaved Deciduous/Broad-leaved Evergreen Spoil

Spoil deposits of varying elevation that are better drained than the surrounding wetlands and which commonly support young willows, iva, baccharis, wax myrtle, and sometimes yaupon (Ilex vomitoria). Usually such spoil deposits in saline environments have a variety of scrubs/shrubs, herbs, and grasses.

UFO1s: Upland Forested Broad-leaved Deciduous Spoil

All spoil deposits of varying elevation which are vegetated by broad-leaved deciduous trees. Willow, Chinese tallow, and hackberry are common species on such better drained man-made sites. Upland, mixed levee hardwoods can be the climax species on spoil deposits that remain elevated (Monte 1978).

UFO1/3: Upland Forested Broad-leaved Deciduous/Broad-leaved Evergreen

Elevated, better drained sites on natural levees and terraces that support broad-leaved deciduous and broad-leaved evergreen trees. On USGS topographic maps, such sites are shown to be above 5 ft in elevation and are colored green but without a swamp pattern. The common species of mixed hardwoods are oaks, pecans and hickories (<u>Carya</u> spp.). This category may include some temporarily flooded wetlands.

UF03: Upland Forested Broad-leaved Evergreen

Well-drained upland sites, usually above 5 ft in elevation on USGS topographic maps, which support broad-leaved evergreen trees. Such areas are often dominated by live oak and include cheniers (abandoned beach ridges) and Indian middens.

UF01/3/4: Upland Forested Broad-leaved Deciduous/Broad-leaved Evergreen/Needle-leaved Evergreen

Well-drained upland sites on the Pleistocene Terrace which are vegetated by a mixture of broad-leaved deciduous, broad-leaved evergreen, and needle-leaved evergreen trees (e.g., mixed upland hardwoods and pines).

UF03/4: Upland Forested Broad-leaved Evergreen/Needle-leaved Evergreen

Well-drained upland sites on the Pleistocene Terrace vegetated by a mixture of broad-leaved deciduous and needle-leaved evergreen trees (e.g., primarily live oak and pines).

UF03/4s: Upland Forested Broad-leaved Evergreen/Needle-leaved Evergreen Spoil

Spoil deposits in upland areas on the Pleistocene Terrace which are vegetated by live oaks, magnolias (<u>Magnolia grandiflora</u>), and pines. These deposits are frequently the result of canal or major highway construction projects.

UF04: Upland Forested Needle-leaved Evergreen

Broad expanses of natural and cultivated stands of pine on the well-drained upland sites of the Pleistocene Terrace north of Lake Pontchartrain and in Mississippi.

UGRp: Upland Grasslands Beach Dunes

Vegetated beach dunes above 5 ft in elevation, located primarily on the barrier islands.

APPENDIX 6

SALINITY DATA USED IN LOCATING BOUNDARY BETWEEN ESTUARINE AND FRESHWATER AQUATIC HABITATS ON THE 1950s MAP SERIES

STATION NO.	STATION NAME AND LOCATION	MID DEPTH CHLORINITIES: MEAN VALUE FOR THE YEAR															AVERAGE	AVERAGE
		1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	CHLORINITY	SALINITY
1	Fresh Water Bayou Locks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.d.	n.d.
2	White Lake Old Inland Waterway	-	2.03	1.24	0.76	1.06	0.57	0.20	0.25	-	-	-	-	-	0.86	0.29	0.81	1.45*
	Vermilion Bay																	
3	Schooner Bayou Control Structure (West)	0.64	1.64	1.27	0.86	1.28	1.35	0.44	1.86	0.30	1.09	0.52	0.26	0.35	0.55	0.33	0.92	1.63*
4	Vermilion Lock (West)	-	-	-	-	-	-	0.35	2.48	0.29	1.91	0.22	0.25	0.27	0.63	0.26	0.74	1.35*
5	Vermilion Lock (East)	-	-	-	-	-	-	0.54	1.42	-	-	-	-	-	-	-	0.98	1.81*
6	At Vermilion River	-	1.97	0.27	0.37	0.99	1.45	0.45	1.09	-	-	-	-	-	-	-	0.94	1.72*
7	Little Bay	-	2.94	0.45	0.47	1.47	2.54	0.96	2.44	-	-	-	-	-	-	-	1.61	2.89*
8	Cypremort Point	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.d.	n.d.
	Lower Atchafalaya Basin and Outlets																	
9	Mud Lake at Gulf Intracoastal Waterway	0.57	0.40	0.25	0.07	0.06	0.36	0.22	0.70	0.28	0.45	0.12	-	-	-	-	0.32	0.54*
10	Charenton Drainage and Navigation Canal at S.P.R.R. Bridge	0.15	0.57	0.25	0.09	0.10	0.39	0.35	0.42	0.17	0.51	0.22	0.09	0.12	0.13	0.09	0.24	0.45
	Bayou Teche																	
11	Charenton	-	-	-	-	-	-	-	-	-	-	0.26	0.11	0.12	0.12	0.10	0.14	0.27
12	Verdunville	-	-	-	-	-	-	-	-	-	-	0.05	0.04	0.07	0.07	0.06	0.06	0.09
	Bayou Sale																	
13	North Bend	0.06	0.08	0.07	0.05	0.05	0.06	0.09	0.28	0.13	0.10	-	-	-	-	-	0.10	0.18
	Bayou Teche																	
14	Franklin	-	-	-	-	-	-	-	-	-	-	0.07	0.04	0.08	0.07	0.06	0.06	0.09
	Lower Atchafalaya Basin and Outlets																	
15	Wax Lake Outlet at Chalmet Floodgates	-	-	-	0.05	0.05	0.05	0.06	0.07	0.08	0.07	0.05	0.04	0.07	-	-	0.06	0.11
16	Six Mile Lake at Cypress Island	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.05	-	-	-	-	0.57	0.09
17	Wax Lake Outlet at Gulf Intracoastal Waterway	0.05	0.05	0.05	0.05	0.05	0.06	0.07	0.09	0.08	0.07	0.05	-	-	-	-	0.06	0.09
18	Berwick Bay at Morgan City	-	0.05	0.05	0.05	0.05	0.05	0.06	0.08	0.08	0.07	0.05	0.04	0.08	0.08	0.05	0.06	0.09
	Bayou Teche																	
19	Patterson	-	0.06	0.06	0.05	0.05	0.05	0.05	0.08	0.07	0.06	0.05	0.04	0.07	0.08	0.07	0.06	0.09
	Bayou Boeuf																	
20	Amelia	-	-	-	-	-	-	-	-	0.11	0.10	0.09	0.07	0.10	0.12	0.09	0.097	0.18
	Lower Atchafalaya Basin and Outlets																	
21	Lower Atchafalaya River at Shell Island Pass	-	0.10	0.05	0.04	0.05	0.06	0.08	0.12	0.08	0.08	0.06	-	-	-	-	0.07	0.09
	Bayou Chene																	
22	Bayou Black Settlement	-	0.06	0.07	0.06	0.07	0.08	0.08	-	-	-	-	-	-	-	-	0.07	0.09
	Lower Atchafalaya Basin and Outlets																	
23	Atchafalaya Bay at Eugene Island	-	5.21	3.04	1.32	0.94	2.53	3.13	4.54	2.75	3.15	1.02	-	-	-	-	2.75	4.97*
	Bayou Boeuf																	
24	Bayou Chene	-	-	-	-	-	-	-	0.09	-	-	-	-	-	-	-	0.09	0.18
	Houma Navigation Canal																	
25	Near Crozier	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.d.	n.d.
	Bayou Terrebonne																	
26	Houma	-	0.08	0.05	0.07	0.08	0.08	0.10	0.28	0.11	0.11	0.10	0.08	0.12	-	-	0.11	0.18
	Bayou Grand Caillou																	
27	Near Dulac	-	0.56	0.20	0.75	0.23	1.13	1.22	1.14	0.68	0.55	0.47	0.19	0.52	0.38	0.79	0.63	1.17*
	Bayou Petite Caillou																	
28	Boudreaux Canal	-	2.59	1.34	2.73	2.03	4.07	3.80	5.36	3.92	2.90	2.48	1.71	2.40	3.66	1.81	2.91	5.24*
	Bayou Pointe au Chien																	
29	Cutoff Canal	-	-	-	-	-	-	-	-	-	-	3.30	2.90	3.42	6.53	3.33	3.89	7.05*
	Bayou Blue																	
30	Gulf Oil Field, Slip #3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.d.	n.d.
	Bayou Lafourche																	
31	La Rose	-	-	-	0.23	0.12	0.39	0.34	0.75	0.20	0.26	0.13	0.17	0.35	0.25	0.22	0.28	0.54*
	Bayou Blue																	
32	Gulf Oil Field, Slip #2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.d.	n.d.
	Bayou Lafourche																	
33	Golden Meadow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.91	0.91	1.63*
34	Leeville	-	-	-	-	-	-	-	-	-	8.49	6.65	5.48	6.02	8.31	5.61	6.76	12.19*
	Barataria Bay																	
35	Grand Terre	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.20	10.20	18.43*
	Gulf of Mexico																	
36	Freeport Sulphur Co. Platform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.d.	n.d.
	Barataria Bay																	
37	Manila Village	-	-	-	-	-	-	-	-	-	7.74	5.92	4.82	5.74	7.30	3.80	5.88	10.66*

STATION NO.	STATION NAME AND LOCATION	MID DEPTH CHLORINITIES: MEAN VALUE FOR THE YEAR															AVERAGE CHLORINITY	AVERAGE SALINITY
		1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961		
	Bayou Barataria																	
38	Lafitte	-	-	-	-	-	-	-	-	0.84	0.82	0.55	0.42	0.66	0.86	0.69	0.69	1.26*
	Mississippi River																	
39	Port Sulfur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.d.	n.d.
	Mississippi River Gulf Outlet and Vicinity																	
40	Bayou La Loutre at Hopedale	-	-	-	-	-	-	-	-	-	6.66	4.85	3.05	3.01	3.51	3.27	4.05	7.32*
41	Bayou Ycloskey at Shell Beach	-	2.71	1.58	2.47	3.26	4.90	3.57	4.40	4.75	4.44	4.19	2.32	2.28	2.18	-	3.31	5.96*
42	Violet Canal at Violet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.d.	n.d.
	Lake Pontchatrain																	
43	Frenier Beach	0.90	0.71	0.40	0.43	-	-	-	-	-	-	-	-	-	-	-	0.61	1.08*
	Lake Maurepas																	
44	Pass Manchac, U.S. Highway 51	-	-	-	-	0.46	1.12	0.51	1.01	1.10	1.08	1.25	0.34	0.20	0.29	0.14	0.68	1.26*
	Lake Pontchartrain																	
	Greater N.O. Expressway Bridge at North Bascule	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.32	0.32	0.54*
46	Greater N.O. Expressway Bridge at South Bascule	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.47	0.47	0.81*
47	Little Woods	1.35	1.16	0.73	1.16	0.73	2.86	2.17	2.51	2.99	3.00	2.88	2.29	0.92	1.11	0.82	1.71	3.07*
	Mississippi River Gulf Outlet and Vicinity																	
48	Gulf Intracoastal Waterway at Paris Road Bridge	-	1.48	0.71	1.16	1.77	2.85	2.10	2.60	2.86	2.90	2.71	1.34	1.01	1.32	1.06	1.84	3.34*
	Lake Pontchartrain																	
49	North Shore at U.S. Highway 1	-	-	-	-	-	-	-	-	-	-	3.26	1.22	1.30	1.76	0.92	1.69	3.07*
50	Chef Menteur at U.S. Highway 90 Bridge	-	-	-	-	-	-	-	-	-	-	3.37	1.70	1.47	1.97	1.17	1.94	3.52*
51	Rigolets at U.S. Highway 90 Bridge	-	-	-	-	-	-	-	-	-	-	3.83	1.66	1.77	2.42	1.24	2.18	3.97*
	Bayou Gauche																	
52	Near Paradis	-	-	-	-	-	-	-	-	-	-	0.13	0.09	0.10	0.24	0.09	0.13	0.27

*Stations considered to be estuarine for habitat mapping purposes on 1950s map series.

APPENDIX 7

VEGETATION ASSOCIATIONS CHARACTERISTIC OF MAJOR PHYSIOGRAPHIC UNITS IN THE MISSISSIPPI DELTAIC PLAIN REGION

Physiographic Unit	Vegetation Association/Species
Uplands - Terrestrial Vegetation	
I. Prairie Terrace (West of Mississippi River)	
a) better-drained	a) agricultural crops such as rice and soybeans pasture prairie grasslands
b) poorly drained depressions (Brown 1945)	b) red maple (Acer rubrum) green ash (Fraxinus pennsylvanica var. lanceolata) water oak (Quercus nigra) winged elm (Ulmus alata) red gum (Liquidambar styraciflua) willow oak (Quercus phellos) swamp black gum (Nyssa sylvatica) baldcypress (Taxodium distichum)
c) along streams and on ridges (Brown 1945)	c) water elm (Planera aquatica) cherrybark oak (Quercus pagoda) loblolly pine (Pinus taeda) post oak (Quercus stellata) green ash (Fraxinus pennsylvanica var. lanceolata) American elm (Ulmus americana) red gum (Liquidambar styraciflua) shagbark hickory (Carya ovata) cow oak (Quercus prinus) hawthorn (Crataegus sp.)
d) on pimple mounds and sandy ridges (Brown 1945)	d) longleaf pine (Pinus palustris) live oak (Quercus virginiana) black gum (Nyssa sylvatica)
II. Upland Terrace (East of Mississippi River)	
a) uplands: cleared	a) agricultural crops such as soybeans, sweet potatoes pasture
b) uplands: uncleared (USDA,FS 1969; Brown 1945)	b) longleaf-slash pine: longleaf pine (Pinus palustris) slash pine (Pinus elloittii) shortleaf pine (Pinus echinata) spruce pine (Pinus glabra)
c) uplands (USDA,FS 1969)	c) loblolly pine - hardwoods: loblolly pine (Pinus taeda) shortleaf pine (Pinus echinata) oaks (Quercus spp.) hickory (Carya spp.) red gum (Liquidambar styraciflua)
d) in sloughs and on poorly drained flatwood soils (Brown 1945)	d) pond cypress (Taxodium distichum var. nutans) swamp black gum (Nyssa sylvatica) magnolia (Magnolia spp.) water oak (Quercus nigra) obtusa oak (Quercus obtusa) swamp red maple (Acer rubrum var. drummondii) green ash (Fraxinus pennsylvanica var. lanceolata) red gum (Liquidambar styraciflua)
e) "scrub oak" woods: cleared and/or burned areas (Brown 1945)	e) southern red oak (Quercus falcata) post oak (Quercus stellata) blackjack oak (Quercus marilandica) willow oak (Quercus phellos) treeless grasslands

Physiographic Unit	Vegetation Association/Species
Uplands - Terrestrial Vegetation (Continued).	
III. Natural Levee	
a) higher natural levees (Brown 1945) (Penfound & Howard 1940)	a) red gum - mixed hardwoods: red gum (Liquidambar styraciflua) cherrybark oak (Quercus falcata var. pagadaefolia) cow oak (Quercus prinus) nutall oak (Quercus nuttallii) Shumard oak (Quercus shumardii) water oak (Quercus nigra) honeylocust (Gleditsia triacanthos) American elm (Ulmus americana) winged elm (Ulmus alata) pecan (Carya sp.) persimmon (Diospyros virginiana)
b) lower natural levees (Brown 1945)	b) overcup oak - bitter pecan: overcup oak (Quercus lyrata) bitter pecan (Carya aquatica) red gum (Liquidambar styraciflua) persimmon (Diospyros virginiana) hackberry (Celtis laevigata) cherrybark oak (Quercus falcata var. pagadaefolia)
c) natural levees below Baton Rouge (Brown 1945)	c) live oak - mixed hardwoods: water oak (Quercus nigra) live oak (Quercus virginiana) hackberry (Celtis laevigata) American elm (Ulmus americana) honeylocust (Gleditsia triacanthos) hawthorn (Crataegus sp.)
d) natural levees, spoil banks, and ridges in marshes (vegetation ranked from highest to lowest elevation) (Brown 1945)	d) live oak (Quercus virginiana) tooth-ache tree (Zanthoxylum clava-herculis) hackberry (Celtis laevigata) hawthorn (Crataegus sp.) opopanax (Acacia farnesiana) marsh elder (Iva frutescens) eastern baccharis (Baccharis halimifolia)
IV. Cheniers	
a) abandoned beach ridges (Palmisano 1970)	a) live oak - mixed hardwoods: live oak (Quercus virginiana) hackberry (Celtis laevigata) American elm (Ulmus americana) swamp maple (Acer rubrum var. drummondii) cypress (Taxodium distichum) water locust (Gleditsia aquatica) tooth-ache tree (Zanthoxylum clava-herculis) persimmon (Diospyros virginiana) water oak (Quercus nigra) salt cedar (Tamarix gallica) (planted)

Physiographic Unit	Vegetation Association/Species
Wetlands Vegetation	
V. Barrier Islands	
a) Relic dunes (Louisiana & Mississippi)	a) live oak: stunted (Quercus geminata) yaupon (Ilex vomitoria)
b) Woodland (Mississippi) (L. N. Eleuterius 1979)	b) slash pine (Pinus elliottii) live oak: stunted (Quercus geminata) wax myrtle (Myrica cerifera)
VI. Backswamp: Wetlands	
a) deep water swamp (Penfound 1952) (Winters & Ward 1934)	a) cypress - tupelo gum: baldcypress (Taxodium distichum) tupelogum (Nyssa aquatica)
b) swamp - bottomland hardwoods (Brown 1945, Environmental Laboratory 1978)	b) cypress - bottomland hardwoods: baldcypress (Taxodium distichum) tupelogum (Nyssa aquatica) swamp red maple (Acer rubrum var. drummondii) water ash (Fraxinus caroliniana) pumpkin ash (Fraxinus profunda) Virginiana willow (Itea virginica) buttonbush (Cephalanthus occidentalis) swamp-privet (Forestiera acuminata) water locust (Gleditsia aquatica) water elm (Planera aquatica) swamp blackgum (Nyssa sylvatica var. biflora)
c) Lac Des Allemands baldcypress - tupelo swamp	c) baldcypress (Taxodium distichum) water tupelo (Nyssa aquatica) drummond red maple (Acer rubrum var. drummondii) pumpkin ash (Fraxinus tomentosa) buttonbush (Cephalanthus occidentalis) hackberry (Celtis laevigata) black willow (Salix nigra) Carolina ash (Fraxinus caroliniana) snowbell (Styrax americana)
VII. Batture - Frontlands	
a) mixed hardwoods (Brown 1945)	a) willow - mixed hardwoods: black willow (Salix nigra) cottonwood (Populus deltoides) American sycamore (Platanus occidentalis) red gum (Liquidambar styraciflua) hackberry (Celtis laevigata) swamp-privet (Forestiera acuminata) honeylocust (Gleditsia triacanthos) water locust (Gleditsia aquatica)
VIII. Bottomland Hardwoods	
a) Poorly drained (Brown 1945)	a) overcup oak (Quercus lyrata) bitter pecan (Carya aquatica) green ash (Fraxinus pennsylvanica var. lanceolata) black willow (Salix nigra) water oak (Quercus nigra) hawthorns (Crataegus sp.)
b) Lac Des Allemands bottomland hardwood forest (Conner and Day 1976)	b) drummond red maple (Acer rubrum var. drummondii) water tupelo (Nyssa aquatica) boxelder (Acer negundo) boxelder (Populus heterophylla) baldcypress (Taxodium distichum) swamp dogwood (Cornus drummondii) black willow (Salix nigra) American elm (Ulmus americana) shagbark hickory (Carya ovata) pumpkin ash (Fraxinus tomentosa) water oak (Quercus nigra) hackberry (Celtis laevigata) persimmon (Diospyros virginiana) deciduous holly (Ilex decidua) bitternut hickory (Carya cordiformis) Shumard red oak (Quercus shummardii) sweetgum (Liquidambar styraciflua) swamp-privet (Forestiera acuminata) Nuttall oak (Quercus nuttallii) swamp bay persea (Persea palustris) snowbell (Styrax americana) laurel oak (Quercus laurifolia) elderberry (Sambucus canadensis)
IX. Marshes: Saline	
a) Louisiana (Chabrack 1972)	a) smooth cordgrass (Spartina alterniflora) saltgrass (Distichlis spicata) blackrush (Juncus roemerianus) wiregrass (Spartina patens)
b) Mississippi (Eleuterius 1973)	b) blackrush (Juncus roemerianus) smooth cordgrass (Spartina alterniflora) hogcane (Spartina cynosuroides) wiregrass (Spartina patens) three-cornered grass (Scirpus olneyi)
Marshes: Brackish	
a) Louisiana (Chabreck 1972)	a) wiregrass (Spartina patens) saltgrass (Distichlis spicata)
b) Mississippi (Eleuterius 1973)	b) hogcane (Spartina cynosuroides) smooth cordgrass (Spartina alterniflora) blackrush (Juncus roemerianus) wiregrass (Spartina patens)
Marshes: Intermediate	
a) Louisiana (Chabreck 1972)	a) wiregrass (Spartina patens) roseau cane (Phragmites australis) bulltongue (Sagittaria falcata)
b) Mississippi (Eleuterius 1973)	b) roseau cane (Phragmites australis) softstem bulrush (Scirpus validus) sawgrass (Cladium jamaicense) duck-potato (Sagittaria latifolia)
Marshes: Fresh	
a) Louisiana (Chabreck 1972)	a) maidencane (Panicum hemitomon) bulltongue (Sagittaria falcata) spikerush (Eleocharis sp.) alligatorweed (Alternanthera philoxeroides)
b) Mississippi (Eleuterius 1973)	b) gulf spikerush (Eleocharis cellulosa) blunt spikerush (Eleocharis obtusa) swamp lily (Crinum americanum) lizards tail (Saururus cernuus) duck-potato (Sagittaria latifolia) southern-blue flag (Iris virginica)
X. Salt Flats in Mississippi	
a) saline marsh (Eleuterius 1973)	a) saltgrass (Distichlis spicata) bigelow glasswort (Salicornia bigelovii) sea-blite (Suaeda linearis) saltwort (Batis maritima)

Physiographic Unit	Vegetation Association/Species
	Aquatic Vegetation
XI. Floating and Submerged Aquatics: Fresh Water	
a) lakes, ponds, rivers with no swift currents (Lemaire 1960)	a) water-lilies (Nymphaea odorata) water-lilies (Nuphar luteum) water-lilies (Nymphoides sp.) bladderwort (Utricularia sp.) watermilfoil (Myriophyllum sp.) mermaidweed (Proserpinaca sp.) watershield (Brasenia schreberi) fanwort (Cabomba caroliniana) water hyacinth (Eichhornia crassipes) duckweed (Lemna spp.) duckweed (Pontederia cordata)
b) species in Lake Boeuf near Raceland (Montz, ongoing research, 1979)	b) common frog's-bit (Limnobium spongia) bladderwort (Utricularia sp.) water-lettuce (Pistia stratiotes) fanwort (Cabomba caroliniana) bushy pondweed (Najas quadalupensis) coontail (Ceratophyllum demersum) planch (Egeria densa) pondweed (Potamogentun pusillus) water-lilies (Nymphaea mexicana)
XII. Submerged Aquatics: Fresh to Slightly Brackish	
a) lakes, ponds, rivers with no swift currents (ranked from more salt tolerant to less salt tolerant) species present in Lake Pontchartrain (Montz 1976)	a) widgeongrass (Ruppia maritima) horned pondweed (Zannichellia palustris) wild celery (Vallisneria americana) bushy pondweed (Najas quadalupensis) coontail (Ceratophyllum demersum) pondweed (Pontamogeton pusillus) watermilfoil (Myriophyllum sp.)
b) species present in Lake Theriot near Houma (Montz, ongoing research, 1979)	b) Florida elodea (Hydrilla verticillata) watermilfoil (Myrophyllum spicata) wild celery (Vallisneria americana) bushy pondweed (Najas quadalupensis) coontail (Ceratophyllum demersum)
XIII. Submerged Aquatics and Algae: Brackish to Marine	
a) Isle Dernieres, Louisiana (Montz 1977)	a) sea lettuce (Ulva sp.) green algae (Enteromorpha sp.) red algae (Polysiphonia sp.)
b) Chandeleur Islands, Louisiana (Montz 1977)	b) gulf halophila (Halophila engelmannii) turtlegrass (Thalassia testudinum) manateegrass (Cymodocea filiformis) algae found on turtlegrass: Penicillus sp. Caulerpa sp. Digenea sp. Gracilaria sp. Padina sp. Udotea sp.
c) Timbalier Island, Louisiana (Montz 1977)	c) shoalgrass (Halodule beaudettei) widgeongrass (Ruppia maritima)
d) Mississippi Barrier Islands (Eleuterius 1973)	d) shoalgrass (Halodule beaudettei) gulf halophila (Halophila engelmanii) turtlegrass (Thalassia testudinum) manateegrass (Cymodocea filiformis)

APPENDIX 8

LIST OF TOPOGRAPHIC MAPS AND THEIR STABLE BASE AREAS

C.E.I. NO.	TOPOGRAPHIC MAP NAME	ACRES	HECTARES
M1A	PETIT BOIS ISLAND, MS-AL	41,222	16,694
M2A	HORN ISLAND WEST, MS	41,222	16,694
M2B	HORN ISLAND, MS	41,222	16,694
M3A	SHIP ISLAND, MS	41,222	16,694
M3B	DOG KEYS PASS, MS	41,222	16,694
M4A	KREOLE, MS-AL	41,118	16,652
M4C	GRAND BAY SW, MS-AL	41,170	16,674
M5A	PASCAGOULA NW, MS	41,118	16,652
M5B	PASCAGOULA NE, MS	41,118	16,652
M5C	PASCAGOULA SW, MS	41,170	16,674
M5D	PASCAGOULA SE, MS	41,170	16,674
M6A	BILOXI, MS	41,118	16,652
M6B	OCEAN SPRINGS, MS	41,118	16,652
M6C	OPEN WATER, MS	41,170	16,674
M6D	DEER ISLAND, MS	41,170	16,674
M7A	GULFPORT NW, MS	41,118	16,652
M7B	GULFPORT NE, MS	41,118	16,652
M7C	PASS CHRISTIAN, MS	41,170	16,674
M7D	GULFPORT SE, MS	41,170	16,674
M8A	KILN, MS	41,118	16,652
M8B	VIDALIA, MS	41,118	16,652
M8C	WAVELAND, MS	41,170	16,674
M8D	BAY ST. LOUIS, MS	41,170	16,674
M9C	HURLEY SW, AL	41,063	16,630
M10A	VANCLEAVE NW, MS	41,011	16,609
M10B	VANCLEAVE NE, MS	41,011	16,609
M10C	VANCLEAVE SW, MS	41,063	16,630
M10D	VANCLEAVE SE, MS	41,063	16,630
M11C	VESTRY SW, MS	41,063	16,630
M11D	VESTRY SE, MS	41,063	16,630
M12D	MCHENRY SE, MS	41,063	16,630
157A	NICHOLSON, LA-MS	41,118	16,652
157B	DEAD TIGER CREEK, MS	41,118	16,652
157C	HAASWOOD, LA-MS	41,170	16,674
157D	LOGTOWN, LA	41,170	16,674
158A	ST. TAMMANY, LA	41,118	16,652
158C	LACOMBE, LA	41,170	16,674
158D	SLIDELL, LA	41,170	16,674
159A	MADISONVILLE, LA	41,118	16,652
159B	COVINGTON, LA	41,118	16,652
159C	COVINGTON SW, LA	41,170	16,674
159D	MANDEVILLE, LA	41,118	16,652
160A	PONCHATOULA, LA	41,118	16,652
160B	PONCHATOULA NE, LA	41,118	16,652
160C	MANCHAC, LA	41,170	16,674
160D	PONCHATOULA SE, LA	41,170	16,674
161B	SPRINGFIELD, LA	41,118	16,652
161D	KILLIAN, LA	41,170	16,674
187B	SORRENTO, LA	41,222	16,694
187C	DONALDSONVILLE, LA	41,272	16,715
187D	CONVENT, LA	41,272	16,715
188A	MOUNT AIRY NW, LA	41,222	16,694
188B	MOUNT AIRY NE, LA	41,222	16,694
188C	LUTCHER, LA	41,272	16,715
188D	RESERVE, LA	41,272	16,715
189A	RUDDOCK, LA	41,222	16,694
189B	BONNET CARRE NE, LA	41,222	16,694
189C	LAPLACE, LA	41,272	16,715
189D	LABRANCHE, LA	41,272	16,715
190A	OPEN WATER, LA	41,222	16,694
190B	SPANISH FORT NE, LA	41,222	16,694
190C	INDIAN BEACH, LA	41,272	16,715
190D	SPANISH FORT SE, LA	41,272	16,715
191A	SOUTH POINT, LA	41,222	16,694
191B	NORTH SHORE, LA	41,222	16,694
191C	LITTLE WOODS, LA	41,272	16,715
191D	CHEF MENTEUR, LA	41,272	16,715
192A	RIGOLETS, LA	41,222	16,694
192B	ENGLISH LOOKOUT, LA-MS	41,222	16,694
192C	ALLIGATOR POINT, LA	41,272	16,715
192D	FALSE MOUTH BAYOU, LA	41,272	16,715
193A	GRAND ISLAND PASS, MS	41,222	16,694
193B	OPEN WATER, LA	41,222	16,694
193C	MALHEUREUX POINT, LA	41,272	16,715
193D	THREE MILE BAY, LA	41,272	16,715
194A	ISLE AU PITRE, MS	41,222	16,694
194B	CAT ISLAND, LA-MS	41,222	16,694
194C	DOOR POINT, LA	41,272	16,715
194D	OPEN WATER, LA	41,272	16,715
194E	EAST CHANDELEUR LIGHT, LA	41,272	16,715
194F	OPEN WATER, LA	41,272	16,715
196A	NORTH ISLANDS, LA	41,317	16,733
196B	OPEN WATER, LA	41,317	16,733
196C	NEW HARBOR ISLANDS, LA	41,369	16,754
196D	OPEN WATER, LA	41,369	16,754
197A	MITCHELL KEY, LA	41,317	16,733
197B	OPEN WATER, LA	41,317	16,733
197C	SOUTH OF MITCHELL KEY, LA	41,369	16,754
197D	FREE MASON ISLAND, LA	41,369	16,754
198A	LAKE EUGENIE, LA	41,317	16,733
198B	OAK MOUND BAYOU, LA	41,317	16,733
198C	LAKE ELOI, LA	41,369	16,754
198D	MORGAN HARBOR, LA	41,369	16,754
199A	PROCTOR POINT, LA	41,317	16,733
199B	POINT AUX MARCHETTES, LA	41,317	16,733
199C	YSCLOSKEY, LA	41,369	16,754
199D	LENA LAGOON, LA	41,369	16,754
200A	CHALMETTE, LA	41,317	16,733
200B	MARTELLO CASTLE, LA	41,317	16,733
200C	BELLE CHASSE, LA	41,369	16,754
200D	DELACROIX, LA	41,369	16,754
201A	NEW ORLEANS WEST, LA	41,317	16,733
201B	NEW ORLEANS EAST, LA	41,317	16,733
201C	LAKE CATAOUATCHE EAST, LA	41,369	16,754
201D	BERTRANDVILLE, LA	41,369	16,754
202A	HAHNVILLE, LA	41,317	16,733
202B	LULING, LA	41,317	16,733
202D	LAKE CATAOUATCHE WEST, LA	41,369	16,754
204B	LAGAN, LA	41,317	16,733
206C	CENTERVILLE, LA	41,369	16,754
207A	JEANERETTE, LA	41,317	16,733
207B	CHARENTON, LA	41,317	16,733
207C	KEMPER, LA	41,369	16,754
207D	FRANKLIN, LA	41,369	16,754
208A	DELCAMBRE, LA	41,317	16,733
208B	NEW IBERIA SOUTH, LA	41,317	16,733
208C	TIGRE LAGOON, LA	41,369	16,754
208D	WEEKS, LA	41,369	16,754
209A	ABBEVILLE WEST, LA	41,317	16,733
209B	ABBEVILLE EAST, LA	41,317	16,733
209C	INTRACOASTAL CITY, LA	41,369	16,754
209D	HEBERT LAKE, LA	41,369	16,754
224B	PECAN ISLAND NE, LA	41,422	16,776
224D	PECAN ISLAND SE, LA	41,472	16,796
224F	OPEN WATER, LA	41,524	16,817
225A	CHENIERE AU TIGRE NW, LA	41,422	16,776
225B	CHENIERE AU TIGRE NE, LA	41,422	16,776
225C	CHENIERE AU TIGRE SW, LA	41,472	16,796
225D	CHENIERE AU TIGRE SE, LA	41,472	16,796
225E	OPEN WATER, LA	41,524	16,817
225F	OPEN WATER, LA	41,524	16,817
226A	CYPREMORT POINT, LA	41,422	16,776
226B	HAMMOCK LAKE, LA	41,422	16,776
226C	BAYOU LUCIEN, LA	41,472	16,796
226D	BAYOU BLANC, LA	41,472	16,796
227A	MARONE POINT, LA	41,422	16,776
227B	ELLERSLIE, LA	41,422	16,776
227C	LAKE POINT, LA	41,472	16,796
227D	POINT CHEVREUIL, LA	41,472	16,796
228A	NORTH BEND, LA	41,422	16,776
228B	PATTERSON, LA	41,422	16,776
228C	BELLE ISLE, LA	41,472	16,796

C.E.I. NO.	TOPOGRAPHIC MAP NAME	ACRES	HECTARES
228D	LAKE SALVE, LA	41,472	16,796
229A	MORGAN CITY, LA	41,422	16,776
229B	AMELIA, LA	41,422	16,776
229C	MORGAN CITY SW, LA	41,472	16,796
229D	MORGAN CITY SE, LA	41,472	16,796
230C	BAYOU COCODRIE, LA	41,472	16,796
230D	HUMPHREYS, LA	41,472	16,796
231C	HOUMA, LA	41,472	16,796
231D	BOURG, LA	41,472	16,796
232B	CATAHOULA BAY, LA	41,422	16,776
232C	LAROSE, LA	41,472	16,796
232D	CUT OFF, LA	41,472	16,796
233A	BARATARIA, LA	41,422	16,776
233B	LAFITTE, LA	41,422	16,776
233C	BAY L'OURS, LA	41,472	16,796
233D	THREE BAYOU BAY, LA	41,472	16,796
234A	PHOENIX, LA	41,422	16,776
234B	LAKE BATOLA, LA	41,422	16,776
234C	LAKE LAURIER, LA	41,472	16,796
234D	POINTE A LA HACHE, LA	41,472	16,796
235A	LAKE CUATRO CABALLO, LA	41,422	16,776
235B	BLACK BAY NORTH, LA	41,422	16,776
235C	HAPPY JACK, LA	41,472	16,796
235D	BLACK BAY SOUTH, LA	41,472	16,796
236A	LAKE ATHANASIO, LA	41,422	16,776
236B	POINT CHICOT, LA	41,422	16,776
236C	SOUTH OF LAKE ATHANASIO, LA	41,472	16,796
236D	OPEN WATER, LA	41,472	16,796
237A	OPEN WATER, LA	41,422	16,776
237B	NORTH OF GRAND GROSIER ISLANDS, LA	41,422	16,776
237C	OPEN WATER, LA	41,472	16,796
237D	GRAND GROSIER ISLANDS, LA	41,472	16,796
238A	STAKE ISLANDS, LA	41,422	16,776
238B	OPEN WATER, LA	41,422	16,776
238C	OPEN WATER, LA	41,472	16,796
239A	BRETON ISLANDS, LA	41,524	16,817
239B	OPEN WATER, LA	41,524	16,817
239C	MAIN PASS, LA	41,574	16,837
239D	BRETON ISLANDS SE, LA	41,574	16,837
239E	OPEN WATER, LA	41,524	16,817
239F	OPEN WATER, LA	41,574	16,837
240A	COQUILLE POINT, LA	41,524	16,817
240B	TAYLOR PASS, LA	41,524	16,817
240C	TRIUMPH, LA	41,574	16,837
240D	VENICE, LA	41,574	16,837
241A	PORT SULPHUR, LA	41,524	16,817
241B	EMPIRE, LA	41,524	16,817
241C	BASTIAN BAY, LA	41,574	16,837
241D	BURAS, LA	41,574	16,837
242A	WILKINSON BAY, LA	41,524	16,817
242B	BAY BATISTE, LA	41,524	16,817
242C	BARATARIA PASS, LA	41,574	16,837
242D	BAY RONQUILLE, LA	41,574	16,837
243A	GOLDEN MEADOW FARMS, LA	41,524	16,817
243B	BAY DOSGRIS, LA	41,524	16,817
243C	MINK BAYOU, LA	41,574	16,837
243D	BAY TAMBOUR, LA	41,574	16,837
244A	LAKE BULLY CAMP, LA	41,524	16,817
244B	GOLDEN MEADOW, LA	41,524	16,817
244C	LAKE FELICITY, LA	41,574	16,837
244D	BAY COURANT, LA	41,574	16,837
245A	DULAC, LA	41,524	16,817
245B	MONTEGUT, LA	41,524	16,817
245C	LAKE QUITMAN, LA	41,574	16,837
245D	LAKE TAMBOUR, LA	41,574	16,837
246A	LAKE PENCHANT, LA	41,524	16,817
246B	LAKE THERIOT, LA	41,524	16,817
246C	LAKE MECHANT, LA	41,574	16,837
246D	BAYOU SAUVEUR, LA	41,574	16,837
247A	PLUMB BAYOU	41,524	16,817
247B	CARENCRO BAYOU, LA	41,524	16,817
247C	FOUR LEAGUE BAY, LA	41,574	16,837
247D	LOST LAKE, LA	41,574	16,837
248A	OPEN WATER, LA	41,524	16,817
248B	POINT AU FER NE, LA	41,524	16,817
248C	EUGENE ISLAND, LA	41,574	16,837
248D	POINT AU FER, LA	41,574	16,837
249A	OPEN WATER, LA	41,524	16,817
249B	MOUND POINT, LA	41,524	16,817
249C	OPEN WATER, LA	41,574	16,837
249D	OPEN WATER, LA	41,574	16,837
249E	OPEN WATER, LA	41,524	16,817
249F	OPEN WATER, LA	41,524	16,817
249G	OPEN WATER, LA	41,574	16,837
249H	OPEN WATER, LA	41,574	16,837
250B	SOUTH OF POINT AU FER, LA	41,624	16,858
251A	OYSTER BAYOU, LA	41,624	16,858
251B	EAST BAY JUNOP, LA	41,624	16,858
251D	OPEN WATER, LA	41,674	16,878
252A	GRAND BAYOU DU LARGE, LA	41,624	16,858
252B	DOG LAKE, LA	41,624	16,858
252C	WESTERN ISLES DERNIERES, LA	41,674	16,878
252D	CENTRAL ISLES DERNIERES, LA	41,674	16,878
252E	OPEN WATER, LA	41,717	16,895
252F	OPEN WATER, LA	41,717	16,895

C.E.I. NO.	TOPOGRAPHIC MAP NAME	ACRES	HECTARES
253A	COCODRIE, LA	41,624	16,858
253B	LAKE LA GRAISSE, LA	41,624	16,858
253C	EASTERN ISLES DERNIERES, LA	41,674	16,878
253D	CAT ISLAND PASS, LA	41,674	16,878
253E	OPEN WATER, LA	41,717	16,895
254A	JACKO BAY, LA	41,624	16,858
254B	PELICAN PASS, LA	41,624	16,858
254C	TIMBALIER ISLAND, LA	41,674	16,878
254D	CALUMET ISLAND, LA	41,674	16,878
254E	OPEN WATER, LA	41,717	16,895
255A	LEEVILLE, LA	41,624	16,858
255B	CAMINADA PASS, LA	41,624	16,858
255C	BELLE PASS, LA	41,674	16,878
255D	OPEN WATER, LA	41,674	16,878
256A	GRAND ISLE, LA	41,624	16,858
256B	OPEN WATER, LA	41,624	16,858
257A	OPEN WATER, LA	41,624	16,858
257B	BAY COQUETTE, LA	41,624	16,858
257D	OPEN WATER, LA	41,674	16,878
258A	PASS TANTE PHINE, LA	41,624	16,858
258B	PILOTTOWN, LA	41,624	16,858
258C	PASS DU BOIS, LA	41,674	16,878
258D	DIXON BAY, LA	41,674	16,878
259A	PASS A LOUTRE NW, LA	41,624	16,858
259B	PASS A LOUTRE NE, LA	41,624	16,858
259C	SOUTH PASS, LA	41,674	16,878
259D	GARDEN ISLAND PASS, LA	41,674	16,878
259E	EAST OF PASS A LOUTRE NE, LA	41,624	16,858
259F	OPEN WATER, LA	41,674	16,878
260A	SOUTH OF SOUTH PASS, LA	41,717	16,895
260B	OPEN WATER, LA	41,717	16,895
261A	BURRWOOD BAYOU WEST, LA	41,717	16,895
261B	BURRWOOD BAYOU EAST, LA	41,717	16,895
261C	OPEN WATER, LA	no data	no data
262B	OPEN WATER, LA	no data	no data

APPENDIX 9

HABITAT ACREAGE TOTALS FOR 1950's, 1978 and AREAL CHANGE

Robert R. Ader
National Coastal Ecosystems Team

The habitat maps for the Mississippi Deltaic Plain Region Ecological Characterization were planimetered by Coastal Environment, Inc., Baton Rouge, Louisiana. All planimetered habitat types were keypunched as separate records for each parish/county, each 1:24,000 topographic base map area, and each hydrologic unit, for ease of data manipulation. The planimetered figures were input into MANAGE, a computerized interactive data base management system, by the National Coastal Ecosystems Team. MANAGE was utilized by NCET to retrieve acreages of selected habitats for various geographical areas. This process was completed using identical habitat types and geographical areas for the 1950's series and the 1978 series. Habitat acreages were compared between these decades and a third set of acreages indicating net change between the decades was calculated. All retrieved data were rounded to the nearest 500 acres to minimize potential errors. As a result of this rounding factor, areal change figures may not correspond exactly to the change indicated in Tables 1 and 2.

The total acreage figures for the 1950's and 1978 habitat maps were compared by computer with MANAGE. In cases where a discrepancy of over 200 acres existed between the two decades, acreages of all polygons on particular topographic maps were retotaled and the conversion from the planimetered area to the stable base area was recalculated. These recalculated figures were verified with original data sheets and the individual maps were reviewed.

NCET has found some errors in the planimeter data, however, these errors have been corrected and NCET is confident that these acreage figures are reasonably accurate measurements. In order to provide additional quality control for the computer data base, NCET is taking additional steps to insure internal consistancy and accuracy of the data.

It should also be noted that the habitat types listed in Tables 1, 2, and 3 are only selected examples and that additional habitat types may be retrieved from the data base.

TABLE 1

SELECTED 1950's MDPR HABITAT ACREAGE TOTALS

Geographic Unit	Estuarine			Lacustrine	Palustrine			Riverine	Upland		
	OW	EM	SS	OW	OW	EM	FO	OW	DV	FO	SS
Jackson	138,500	36,500	0	*	*	2,500	52,000	3,500	43,500	22,000	500
Hancock	50,500	21,000	0	*	*	4,000	17,000	1,000	23,500	34,000	0
Harrison	178,500	9,000	0	*	*	*	5,500	500	14,000	10,500	*
Assumption	0	0	0	0	0	*	*	*	0	0	0
Iberia	227,500	94,000	0	*	*	14,000	7,500	500	39,500	2,500	*
Jefferson	218,500	16,500	0	12,000	1,000	98,500	40,500	6,500	43,500	1,000	1,000
Lafourche	237,500	134,500	0	12,500	*	165,000	20,000	2,000	18,000	2,000	2,000
Livingston	0	0	0	31,500	0	0	1,500	*	0	*	0
Orleans	98,000	55,500	0	*	*	7,500	12,000	4,500	38,000	2,000	*
Plaquemine	1,020,500	318,500	*	21,000	1,500	194,000	27,000	53,500	36,500	*	3,500
St. Bernard	998,500	225,500	0	*	*	20,000	24,500	2,000	13,000	*	*
St. Charles	34,000	6,500	0	35,000	*	39,000	21,500	4,000	9,500	500	500
St. James	0	0	0	*	*	0	43,500	4,000	23,000	1,000	2,000
St. John	39,000	0	0	24,000	*	6,500	71,500	3,500	18,500	1,000	*
St. Mary	335,000	87,000	0	8,500	*	37,500	89,500	11,500	50,000	3,500	3,500
St. Tammany	173,000	27,000	0	0	*	20,000	33,000	2,500	37,500	40,000	*
Tangipahoa	4,000	0	0	2,500	*	7,000	71,000	2,000	18,000	32,000	0
Terrebonne	516,500	303,500	0	4,500	500	275,500	48,000	6,500	10,500	*	3,000
Vermilion	126,500	94,500	0	0	*	8,500	7,500	*	20,500	1,000	500
Hydro 1	367,500	66,500	0	500	*	6,500	74,000	5,000	81,000	66,500	500
Hydro 2	1,836,000	471,000	*	59,000	1,000	91,000	278,000	9,500	184,000	76,000	3,000
Hydro 3	428,000	0	0	18,000	1,500	134,000	10,500	69,000	7,000	0	*
Hydro 4	441,000	269,000	0	61,000	1,500	263,500	65,000	5,500	58,000	4,000	4,500
Hydro 5	630,500	347,500	0	10,000	500	349,000	63,500	6,500	17,000	1,000	3,500
Hydro 6	253,000	40,000	0	3,500	*	24,500	42,500	11,500	3,000	*	2,500
Hydro 7	430,500	235,500	0	*	*	30,500	58,500	2,000	108,500	5,500	2,000

* = Less than 500 acres
All acreages greater than 500 are rounded to the nearest 500th acre.

TABLE 2

SELECTED 1978 MDPR HABITAT ACREAGE TOTALS

Geographic	Estuarine			Lacustrine	Palustrine			Riverine	Upland		
Unit	OW	EM	SS	OW	OW	EM	FO	OW	DV	FO	SS
Jackson	137,500	34,000	0	1,000	500	2,000	52,500	3,500	38,000	30,000	*
Hancock	52,500	22,000	0	*	*	1,500	18,000	1,000	21,500	35,500	*
Harrison	183,500	8,000	0	*	*	*	5,500	*	13,500	10,500	*
Assumption	0	0	0	0	0	0	*	*	0	0	0
Iberia	234,500	92,500	0	*	*	10,500	5,500	500	41,000	3,500	500
Jefferson	246,500	70,500	*	2,500	*	18,500	28,500	6,500	58,000	3,000	3,000
Lafourche	297,500	212,500	2,000	*	1,000	23,500	15,000	1,500	28,500	1,500	8,500
Livingston	32,000	0	0	0	0	0	1,500	*	*	*	*
Orleans	104,500	43,000	0	500	*	1,500	8,000	4,000	48,000	1,000	2,000
Plaquemine	1,149,000	289,000	1,000	48,000	1,000	45,500	24,000	51,000	48,500	1,000	16,000
St. Bernard	1,025,000	214,500	*	*	*	*	10,000	2,000	16,000	*	14,000
St. Charles	75,000	20,000	0	3,000	*	17,000	18,000	3,000	9,000	1,500	1,000
St. James	0	0	0	*	*	*	43,000	4,000	23,500	3,000	*
St. John	64,000	6,500	0	500	*	4,500	63,500	3,000	19,500	500	500
St. Mary	321,500	19,500	*	13,000	1,500	96,500	91,000	18,500	53,000	4,500	5,000
St. Tammany	175,500	32,000	0	1,000	500	13,500	20,500	2,000	37,500	50,500	*
Tangipahoa	17,000	0	0	*	*	12,500	55,000	1,500	19,000	30,500	*
Terrebonne	601,000	299,000	4,000	20,000	5,500	156,500	40,000	13,500	11,500	1,000	10,000
Vermilion	118,000	86,500	0	*	*	4,500	6,500	500	23,500	1,500	1,500
Hydro 1	373,500	63,500	0	1,000	1,000	3,500	75,500	5,000	73,000	76,000	*
Hydro 2	1,988,000	433,000	500	2,500	2,000	36,000	220,000	7,000	200,000	86,000	22,000
Hydro 3	464,500	26,500	*	47,500	1,000	40,500	8,500	66,000	9,000	*	6,000
Hydro 4	596,000	358,000	1,500	5,000	*	48,000	48,000	5,000	87,000	6,000	14,500
Hydro 5	736,500	370,500	5,500	27,500	6,500	171,500	53,500	11,500	24,000	1,500	14,000
Hydro 6	243,500	0	*	4,000	500	59,000	44,500	18,500	4,500	1,000	4,000
Hydro 7	441,000	199,000	0	2,000	1,000	50,000	55,500	3,500	112,000	8,000	2,500

* = Less than 500 acres
All acreages greater than 500 are rounded to the nearest 500th acre.

TABLE 3

SELECTED 1950's-1978 MDPR HABITAT ACREAGE CHANGE

Geographic Unit	Estuarine			Lacustrine	Palustrine			Riverine	Upland		
	OW	EM	SS	OW	OW	EM	FO	OW	DV	FO	SS
Jackson	-1,000	-2,500	0	500	*	-*	500	-*	-6,000	7,500	-*
Hancock	2,000	500	0	*	*	-2,500	1,000	-*	-1,500	2,000	*
Harrison	5,000	-1,000	0	-*	*	-*	-*	-*	-*	-*	*
Assumption	0	0	0	0	0	-*	-*	*	0	0	0
Iberia	6,500	-1,500	0	*	*	-3,500	-2,000	-*	1,500	1,000	*
Jefferson	28,000	54,000	*	-9,500	-1,000	-80,000	-12,000	*	14,500	1,500	2,000
Lafourche	60,500	77,500	2,000	-12,000	500	-141,500	-5,000	-*	11,000	-*	5,500
Livingston	32,000	0	0	-31,500	0	0	-*	-*	*	-*	*
Orleans	6,500	-12,500	0	*	*	-6,000	-4,000	-500	9,500	-1,000	2,000
Plaquemine	128,000	-29,500	1,000	27,000	-*	-148,000	-3,500	-3,000	12,000	500	12,500
St. Bernard	26,500	-11,000	*	-*	-*	-20,000	-14,000	-*	-3,500	-*	14,000
St. Charles	41,000	13,500	0	-32,500	*	-22,500	-3,000	-1,000	-500	500	*
St. James	0	0	0	*	*	*	-*	*	*	1,500	-1,500
St. John	25,500	6,500	0	-23,500	*	-2,000	-8,000	-*	500	*	500
St. Mary	-13,500	-67,500	*	4,000	1,500	59,000	1,500	7,000	2,500	1,000	2,000
St. Tammany	2,500	5,000	0	1,000	500	-6,000	-12,500	-500	-*	10,500	*
Tangipahoa	13,000	0	0	-2,500	*	5,500	-16,000	-500	1,000	-1,000	*
Terrebonne	85,000	-4,500	4,000	15,500	5,000	-119,500	-8,000	7,000	1,000	500	7,500
Vermilion	9,000	-8,000	0	*	*	-4,000	-1,000	*	2,500	500	*
Hydro 1	6,000	-2,500	0	500	*	-3,000	1,500	-*	-8,000	9,000	-*
Hydro 2	152,000	-38,000	*	-56,500	1,000	-55,000	-58,500	-2,500	15,500	10,500	18,500
Hydro 3	36,500	26,500	*	29,500	-*	-93,500	-1,500	-3,000	2,000	*	5,500
Hydro 4	155,000	88,500	1,500	-56,000	-1,000	-215,500	-17,000	-*	29,500	2,000	10,000
Hydro 5	106,000	23,000	5,500	17,500	6,000	-177,500	-10,000	5,500	7,000	*	10,500
Hydro 6	-10,000	-40,000	*	*	*	34,500	2,000	7,000	1,500	500	2,000
Hydro 7	10,500	-37,000	0	2,000	1,000	19,500	-3,000	1,500	3,500	2,500	500

* = Increase of less than 500 acres
-* = Decrease of less than 500 acres
All acreages greater than 500 are rounded to the nearest 500th acre.

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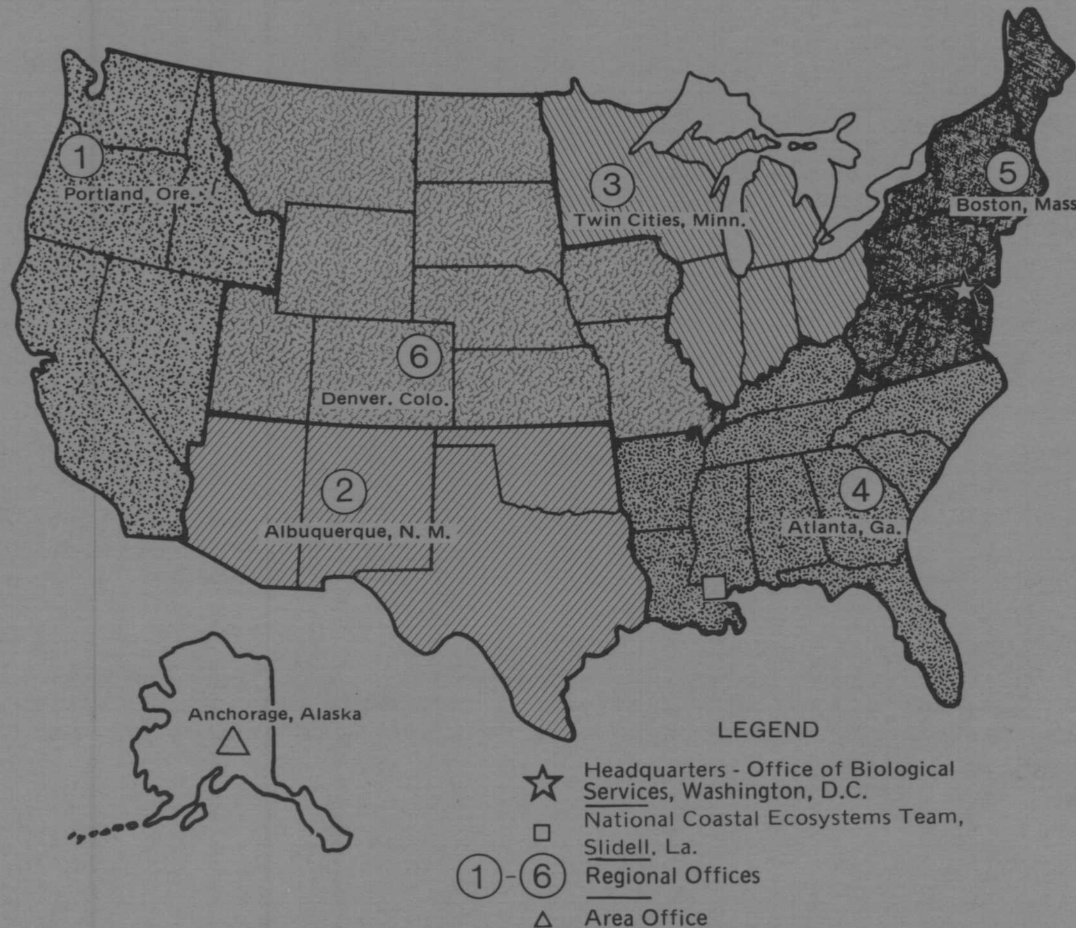

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