APALACHICOLA
National Estuarine Research Reserve

Management Plan
1998-2003

DEPARTMENT OF ENVIRONMENTAL PROTECTION
FLORIDA

Department of Environmental Protection

Lawton Chiles
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Virginia B. Wetherell
Secretary

July 23, 1998

Ellen Stere
Department of Environmental Protection
Division of Marine Resources
3900 Commonwealth Blvd. M.S. 235
Tallahassee, FL 32399

Dear Ms. Stere:

Re: Apalachicola National Estuarine Research Reserve (21,490 acres)
Lease No. 3862, Franklin County

On July 23, 1998, the Land Acquisition and Management Advisory Council approved the management plan for Apalachicola National Estuarine Research Reserve subject to the modifications requested by staff on June 9, 1998. The revised plan, submitted and received on July 29, **1998, is approved** by the Office of Environmental Services, acting as agent for the Board of Trustees of the Internal Improvement Trust Fund. Pursuant to Section 253.034, Florida Statutes, and Chapter 18-2, Florida Administrative Code, the plan's five year update will be due on July 29, **2003**.

Approval of this item does not waive the authority or jurisdiction of any governmental entity that may have an interest in this project. Implementation of any upland activities proposed by this item may require a permit or other authorization from federal and state agencies having regulatory jurisdiction over those particular activities. Please forward copies of all permits to this office upon issuance.

Sincerely,

Delmas T. Barber

Delmas T. Barber
Office of Environmental Services
Division of State Lands

DTB/kpg

Apalachicola National Estuarine Research Reserve

Management Plan

1998-2003

Preparation and publication of this document was funded under Award # NA770R0412 from the Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration.

Prepared by
The Apalachicola National Estuarine Research Reserve
Florida Department of Environmental Protection

Table of Contents

CHAPTER 1 ..... **1**

LAND MANAGEMENT PLAN EXECUTIVE SUMMARY 1

CHAPTER 2 ..... **3**

INTRODUCTION 3

I. Introduction *3*

II. The National Estuarine Research Reserve System: Need for a National Program *3*

A. The Coastal Zone Management Act 3

B. National Estuarine Research Reserve System Mission 4

C. Goals of the National Estuarine Research Reserve System 6

D. NERR System Administrative Framework 6

E. Biogeographic Regions 7

F. Reserve Designation and Operation 7

G. Reserve Management Planning 8

H. NERRS National Programs 8

I. NERRS Strategic Plan 9

III. Apalachicola National Estuarine Research Reserve (ANERR) *10*

A. Legal Description and Acreage 10

B. Degree of Title Held by the Board, Including Reservations and Encumbrances 12

C. Facilities And Structures 12

D. Statement of Alternative or Multiple Use 13

IV. ANERR Purpose and Scope of Plan *15*

CHAPTER 3 ..... **17**

THE RESERVE ENVIRONMENT 17

I. Introduction *17*

II. General Description *17*

A. Regional Perspective 17

B. Climate 19

C. Physiography and Geology 19

D. Mineral Resources 21

E. Soils 21

F. Hydrology 22

G. Major Subunits of the Reserve 23

H. Surface Water Classification 27

III. Habitats of ANERR *29*

A. Barrier Island System 29

B. Apalachicola Bay System 33

C. Apalachicola River System 41

D. Apalachicola River Floodplain System 44

E. Upland System 49

F. Flora and Fauna 52

CHAPTER 4 54

RESEARCH AND MONITORING 54

I. Introduction 54

II. Goals 54

A. National Research Goals of the NERR System 54

B. ANERR Goals 54

III. Objectives 54

IV. Federal Funding Priorities 55

V. History of Research in the Apalachicola Bay System 57

VI. Research Facilities and Programs 60

A. ANERR Facilities and Equipment 60

B. Other Area Research Programs 61

VII. Research and Monitoring Program 66

A. National System Guidelines: Phased Monitoring Plan 66

B. SWMP Implementation 68

C. ANERR Research Program 69

D. ANERR Monitoring Program 70

VIII. Implementation of the Research and Monitoring Program 73

A. Strategies 74

B. Research and Monitoring Program Guidelines 75

IX. Research and Monitoring Program Accomplishments To-Date 77

A. Stabilize and increase funding for the research program by: 77

B. Develop the facilities, infrastructure and basic equipment necessary to attract high quality outside researchers and promote research within the Reserve by: 77

C. Initiate the comprehensive monitoring program by: 78

D. Increase the number of research projects, both by staff and outside investigators, occurring within the Reserve as well as increasing the visibility of ANERR and the NOAA/NERRS programs nationwide by: 78

E. Increase the visibility of the Reserve and the NOAA/NERRS program, both locally and statewide by: 79

CHAPTER 5 80

ENVIRONMENTAL EDUCATION 80

I. Introduction 80

II. Goals 80

A. Public Awareness and Appreciation 81

B. Public Action 81

III. Objectives 81

IV. Policies and Guidelines for Education 81

V. Educational Resources 82

A. Field Resources 82

B. Personnel 83

C. Existing Facilities 84

D. Educational Equipment 84

E. Printed Materials 85

F. Portable Exhibit 85

G. News Media 86

VI. Implementation Strategy 86

A. Education Program Themes 86
B. General Project Selection Criteria 86
C. Target Audiences for Education Programs 87
D. Existing Educational Services and Programs 87
E. Potential Expansion for ANERR Education Activities 93
VII. Other Area Programs 97
A. St. Vincent National Wildlife Refuge Visitor Center 97
B. Northwest Florida Water Management District (NWFWMD) 98
C. 4-H Programs 98
D. Florida State University (FSU) Marine Laboratory 98
E. St. Marks National Wildlife Refuge 98
F. St. George Island State Park 98
G. Sea Explorers 98
H. Boy Scouts/Girl Scouts 99
I. Gulf Coast Community College 99

CHAPTER 6 100

MANAGEMENT OF AQUATIC RESOURCES 100
I. Introduction 100
II. Maintenance, enhancement, and conservation of the renewable marine fishery resources of the Reserve 100
III. Navigation and associated maintenance activity impacts on water quality and aquatic habitats of the river and bay system 104
IV. Maintenance of adequate freshwater inflows and maintenance and improvement of water quality in the Apalachicola River and Bay system 107
V. Local development and land use changes and their impacts on aquatic and natural resources within the Apalachicola Bay system 109
VI. Interagency coordination of activities that may affect the natural resources or water quality within the Reserve 111
VII. Research and Monitoring and Education 111

CHAPTER 7 113

RESOURCE MANAGEMENT 113
I. Introduction 113
II. Land Acquisition and Boundary Expansion 113
A. Boundary Expansion 113
B. Land Acquisition 114
C. Second Category Acquisitions 116
III. In-boundary Non-Reserve Management Coordination 117
A. Specific Tract Management For Non-Reserve Lands 117
B. Non-Reserve Tract Management And Coordination 120
IV. Influencing Resourcement Management Decisions On Privately-Owned Land With Potential Reserve Land Impacts 121
A. Policies 122
B. Other Coordinative Efforts With State And Federal Agencies 123
V. Resource Management on Reserve Lands 125
A. Specific Tract Management 125
B. Natural Community Descriptions 130
VI. Fire Policy and Procedure 142
A. Prescribed Fire 142

B. Implementing Prescribed Fire Program....142
C. Wildfire Policy....144
VII. Exotics....144
A. Exotic Plants....145
B. Exotic Animals....146
VIII. Cultural Resources....147
A. History....147
B. Conservation and Research Activities....148
C. Sites....149
D. Protection....152
IX. Recreational Uses....153
A. Recreational Fishing....153
B. Hunting....155
C. Hiking....155
D. Camping....156
E. Canoeing and Kayaking....156
F. Other Recreational Use....156
G. Recreational Use Facility Development....157
X. Reforestation....157
XI. Hydrologic Restoration....158
A. Wood or four-wheel drive roads:....158
B. Stabilized roads:....158
C. Foot paths:....159
D. Man-made Ponds:....159
E. Drainage ditches:....159
F. Plowlines:....159
G. Borrow pits:....159
XII. Resource Protection Activity....160
A. Protection Without Law Enforcement Authority....160
B. Houseboats....160
C. Illegal Collection/Poaching....161
D. Education and Protection Activities....161
E. Illegal Dumping, Litter Control and Vandalism....162
XIII. Priority Schedule For Resource Management Activities....163
A. Priority Management Activities....163
B. Non-Priority Management Activities....163
C. Resource Management Cost Estimates....163
D. Non-Priority Projects and Cost Estimates....164
XIV. Potential Revenue Generation....164

CHAPTER 8....165

PROGRAM ADMINISTRATION....165
I. Introduction....165
II. Administrative Goals....165
A. Goal....165
B. Objectives....165
C. Administrative Organization....166
D. Reserve Advisory Management Board....167
E. Reserve Staff....167
F. Five-Year Staff Requirements....168
G. Reserve Facilities....168

H. Management Plan Review 170
I. Citizen Support Organization 170

REFERENCES 173

Table of Tables

TABLE 1: Soils of Franklin County (1994 – USDA Soil Conservation Service)..... 22
TABLE 2: Distribution and area (in acres) of major bodies of water within ANERR boundaries, with areas of oysters, grassbeds, and contiguous marshes (modified from Livingston, 1984).. 36
TABLE 3: Forest Types and Acreage of the Lower Apalachicola River Floodplain (modified from Leitman, 1983)..... 48
TABLE 4: Existing ANERR Educational Activities 88
TABLE 5: Potential Expansion for ANERR Education Activities..... 94
TABLE 6: Franklin County Land Use 110
TABLE 7: ANERR Boundary Expansion Lands..... 115
TABLE 8: Five Year Staff Requirements 171

Table of Figures

FIGURE 1: The National Estuarine Research Reserve System 5
FIGURE 2: Boundaries of the Apalachicola National Estuarine Research Reserve 11
FIGURE 3: The Apalachicola-Chattahoochee-Flint River Basin 14
FIGURE 4: Major Features of the Apalachicola Estuary 18
FIGURE 5: Physiography of the Apalachicola River Valley 20
FIGURE 6: Average Monthly Flows of the Apalachicola River at Chattahoochee 24
FIGURE 7: Surface Water Classifications Within the Apalachicola Reserve 28
FIGURE 8: Major Plant Communities of Cape St. George Island 32
FIGURE 9: Major Oyster Bars of the Apalachicola Reserve 35
FIGURE 10: Submerged Vegetation of the Apalachicola Estuary 37
FIGURE 11: Bottom Sediment of the Apalachicola Estuary 39
FIGURE 12: Emergent Aquatic Vegetation Distribution of the Apalachicola Estuary 40
FIGURE 13: Distribution of Shoreline Habitats on the Apalachicola River and Major Distributaries 42
FIGURE 14: Distribution of Floodplain Habitats on the Apalachicola River 46
FIGURE 15: Natural Vegetation of the Apalachicola Basin 51
FIGURE 16: Shellfish Harvesting Area Classification 102
FIGURE 17: Authorized Navigation Projects in Apalachicola Reserve 105
FIGURE 18: Subunits and Facilities of the Apalachicola National Estuarine Research Reserve 127
FIGURE 19: Typical Profiles of Habitats of Cape St. George Island (DNR 1983) 137
FIGURE 20: Archaeological sites In The Lower Apalachicola Basin 150
FIGURE 21: Adjacent Recreational Opportunities 154
FIGURE 22: ANERR Organizational Chart 169

CHAPTER 1

LAND MANAGEMENT PLAN EXECUTIVE SUMMARY

Lead Agency: FDEP/Division of Marine Resources/Bureau of Coastal and Aquatic Managed Areas (CAMA)

Common Name of Property: Apalachicola National Estuarine Research Reserve (ANERR)

Location: Franklin County

Acreage: Total: 246,766 (21,490 under lease to CAMA. Remainder under secondary management responsibility.)

Acreage Breakdown: Land Cover Classification	**Total Acreage**	**CAMA Lease**
Open Water	135,680	0
Floodplain	93,812	16,449
Barrier Islands	14,758	2,525
Saltmarsh	2,316	2,316
Sandpine	200	200

Lease/Management Agreement No.: 3862 for lead role management

Use: Single X
Multiple

Management Responsibility/Agency Responsibility

DEP/GFC	lead/secondary	21,490 acres
GFC/DEP	lead/secondary	41,751
NWFWMD/DEP	lead/secondary	35,487
USFWS/DEP	lead/secondary	12,358

Designated Land Use: Conservation/Preservation

Sublease(s): None

Encumbrances: C.O.E. right-of-way - USCG lighthouse

Type Acquisition: Fee Title

Unique Features: Natural Gulf Coastal Plain - Pleistocene Marine Sands

Archaeological/Historical: Occupied by humans over 10,000 years – rich pre-history from Deptford forward.

Management Needs: Research, Education and Resource Management

Acquisition Needs/Acreage: CARL acres: 30,000

Surplus Lands/Acreage: N/A

Public Involvement: Advisory Group Pursuant to CS/CS/HBs 1119 and 1577 -Public Workshop

DO NOT WRITE BELOW THIS LINE (FOR DIVISION OF STATE LANDS USE ONLY)

LMAC Approval Date: _____

BTIITF Approval Date: _____

Comments: _____

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CHAPTER 2

INTRODUCTION

I. Introduction

National Estuarine Research Reserves have been established to provide opportunities for long-term estuarine research and monitoring, estuarine education and interpretation, resource management and to provide a basis for more informed coastal management decisions. The Apalachicola National Estuarine Research Reserve is the largest of 25 sites designated as Reserves by the National Oceanic and Atmospheric Administration (NOAA) (FIGURE 1). NOAA requirements include the preparation of a management plan as outlined in the ***National Estuarine Research Reserve Program Regulations*** (15 CFR Part 921). These regulations ensure that Reserve management programs are consistent with the goals, objectives and policies of the National Estuarine Research Reserve System.

II. The National Estuarine Research Reserve System: Need for a National Program

A. The Coastal Zone Management Act

In 1972, Congress passed the Coastal Zone Management Act (CZMA). In the CZMA, and in subsequent reauthorization, Congress officially recognizes that resources of the coastal zone are of national significance, and are rapidly disappearing. The CZMA also recognizes the interrelationships between uplands and tidelands. The "coastal zone" was defined in the Act as including all uplands "to the extent necessary to control shorelands." A portion of the 1990 reauthorization of the CZMA states:

"The increasing and competing demands upon the lands and waters of our coastal zone...have resulted in the loss of living marine resources, wildlife, nutrient-rich areas, permanent and adverse changes to ecological systems, decreasing open space for public use and shoreline erosion."

"The habitat areas of the coastal zone, and the fish, shellfish, other living marine resources, and wildlife therein, are ecologically fragile and consequently extremely vulnerable to destruction by man's alteration."

In recognition of these growing problems, the CZMA established a national goal:

"...to preserve, protect, develop, and where possible, to restore and enhance the resources of the Nation's coastal zone for this and succeeding generations."

The CZMA also recognized that coastal waters are significantly affected by land uses:

"Land uses in the coastal zone, and the uses of adjacent lands which drain into the coastal zone, may significantly affect the quality of coastal waters and habitats, and efforts to control coastal water pollution from land use activities must be improved."

Under the CZMA, coastal states receive grant money to develop and administer plans for coastal management. The CZMA also authorizes the provision of federal technical assistance to support states' coastal zone management planning and plan implementation. A NOAA approved coastal management plan gives states some control over federal actions affecting the states coastal zone. Known as the "Federal consistency", this control includes actions proposed by a federal agency or which require federal approval or permits.

B. National Estuarine Research Reserve System Mission

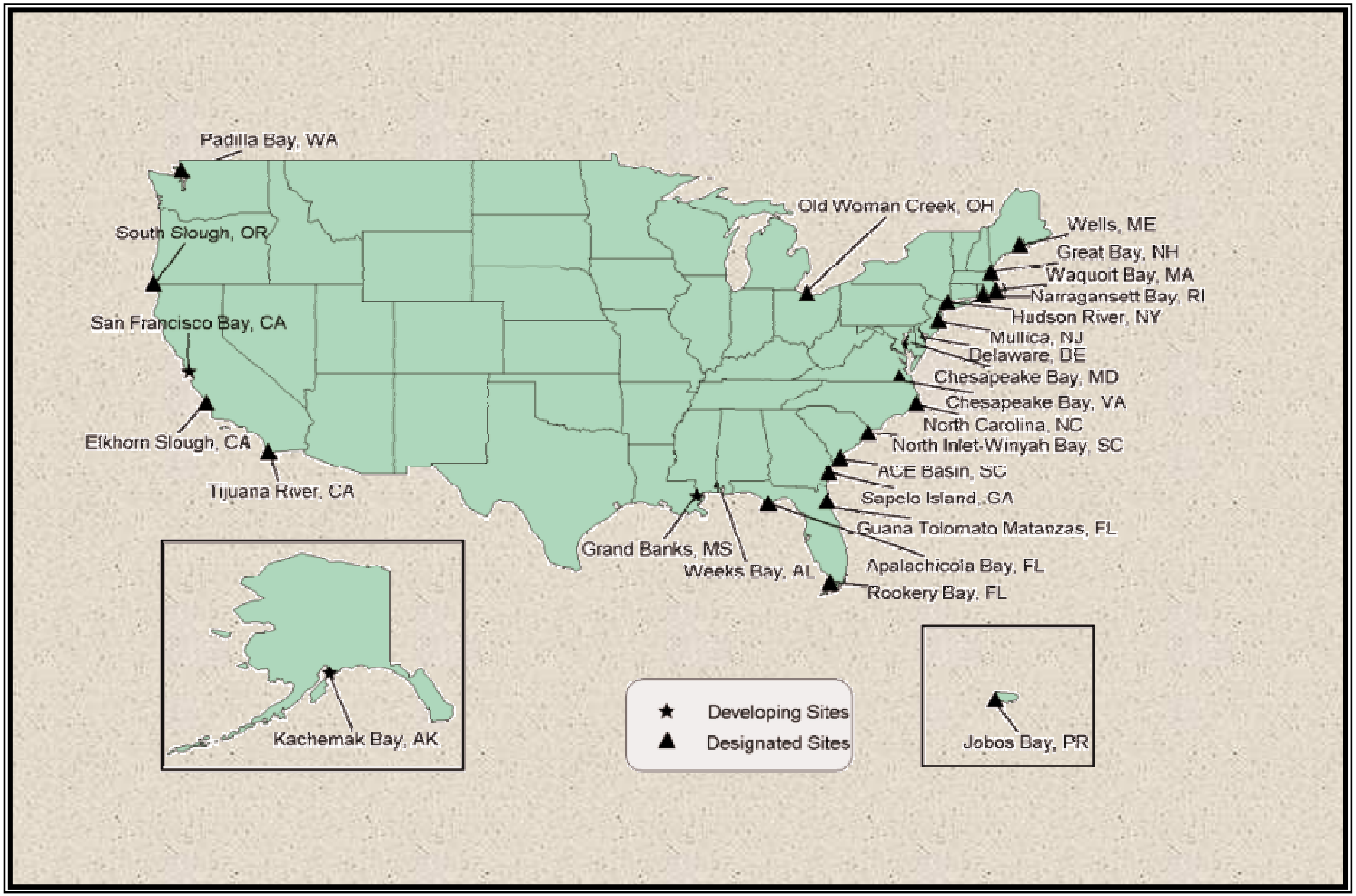
Section 315 of the CZMA of 1972, as amended, establishes the National Estuarine Research Reserve System. Under the system, healthy estuarine ecosystems which typify different regions of the U.S. are designated and managed as sites for long-term research, and used as a base for estuarine education and interpretation programs. The system also provides a framework through which research results and techniques for estuarine education and interpretation can be shared throughout the region and across the nation.

As stated in the Coastal Zone Management Act, the National Estuarine Research Reserve System has the following mission:

> The establishment and management, through Federal-state cooperation, of a national system of Estuarine Research Reserves representative of the various regions and estuarine types in the United States. Estuarine Research Reserves are established to provide opportunities for long-term research, education, and interpretation.

Prior to establishment of the NERR system, scientific understanding of estuarine processes was increasing slowly and without national coordination. There was no ready mechanism for the detection and measurement of local, regional, or national trends in estuarine conditions. Resource managers, governments, and the public did not always have access to information about the significance and ecology of their estuaries, could not assess the full impact of past activities, and could not readily anticipate the damaging effects of proposed management and development policies. NERR System research and education can help to fill those gaps in knowledge, and guide estuarine management for sustained support of commercial and recreational fisheries, tourism, aquaculture, and other activities.

FIGURE 1: The National Estuarine Research Reserve System



C. Goals of the National Estuarine Research Reserve System

The goals of the NERR system are established by Federal Regulation, 15 C.F.R. Part 921.1 (b):

- Ensure a stable environment for research through long-term protection of National Estuarine Research Reserve resources
- Address coastal management issues identified as significant through coordinated estuarine research within the System
- Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation
- Promote federal, state, public and private use of one or more Reserves within the System when such entities conduct estuarine research; and
- Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

D. NERR System Administrative Framework

A state and the Federal Government jointly operate each NERR. The Sanctuaries and Reserves Division (SRD) represent the federal interest of the National Oceanic and Atmospheric Administration (NOAA). NOAA's mission includes management of the nation's coastal resources, and promotion of global stewardship of the world's oceans and atmosphere through science and service. SRD coordinates the NERR system nationally and administers federal grant funds to individual Reserves.

The NERRS is intended to operate as a federal/state partnership. Although the management of a reserve, including development of site specific policies, is a state's responsibility, NOAA provides overall system policies and guidelines, cooperates with and assists the states, and reviews state programs regularly. The purpose of the NOAA review is to ensure that a state is complying with federal NERR goals, approved work plans, and reserve management plans. The primary mechanisms used by NOAA to review state programs, as well as NOAA responsibilities pertaining to reviews, include the following:

NOAA staff, in particular the program specialist for a state's reserve, communicates directly and regularly with state reserve staff. Communication builds a level of trust between federal and state staff, and familiarizes both NOAA and state personnel with reserve management procedures and policies. This cooperative approach is needed for a reserve to be successful. Both oral and written communications are necessary, and site visits are advisable.

Another mechanism available to NOAA is its reserve-funding program. NOAA provides different categories of grant funding to a reserve, and for each grant, quarterly progress reports and a final report are required. NOAA personnel carefully review the grant reports and associated communications to ensure compliance with program policies and specific grant conditions.

The site designation process is also a primary avenue through which NOAA reviews actions. A state's site nomination must be assessed and endorsed by NOAA prior to formally beginning the designation process. As part of this preliminary stage, NOAA evaluates the site selection and public participation process. When the DMP and DEIS have been completed they must also be approved by NOAA before the final versions of each document are written. NOAA staff has the responsibility of working with the state to select and designate national estuarine reserve sites.

Pursuant to CZMA enabling legislation (Sections 312 and 315), NOAA must conduct performance evaluations of the operation and management of each reserve while federal financial assistance continues. If deficiencies in the operation or types of research conducted at a reserve are found, NOAA may withdraw financial assistance from the reserve until remedies are in place. National Estuarine Research Reserve designation can be withdrawn by NOAA when a reserve is found to be deficient and fails to correct deficiencies within a reasonable time.

The state interest is usually represented through one or more state agencies, typically agencies charged with environmental, wildlife or coastal management responsibilities. States usually administer Reserve personnel and day-to-day Reserve management.

E. Biogeographic Regions

NOAA has identified 11 distinct biogeographic regions and 29 subregions in the U.S., each of which contains several types of estuarine ecosystems (see 15 C.F.R. Part 921, for NERR typology system). When complete, the NERR System will contain examples of estuarine hydrologic and biological types characteristic of each biogeographic region. Each reserve will be responsible for conducting research and providing educational and interpretive services that are applicable to its region. As of December 1996, the NERR System contained twenty-one reserves, with six more in development (Figure1).

F. Reserve Designation and Operation

Under Federal law (16 U.S.C. ß 1461), a state can nominate an estuarine ecosystem for Research Reserve status so long as the site meets the following conditions:

- the area is representative of its biogeographic region, is suitable for long-term research and contributes to the biogeographical and typological balance of the System

- the law of the coastal State provides long-term protection for the proposed Reserve's resources to ensure a stable environment for research

- designation of the site as a Reserve will serve to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation

- the coastal State has complied with the requirements of any regulations issued by the Secretary [of Commerce]

Reserve boundaries must include an adequate portion of the key land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation.

If the proposed site is accepted into the NERR system, it is eligible for NOAA financial assistance on a cost-share basis with the state. The state exercises administrative and management control, consistent with its obligations to NOAA, as outlined in a Memorandum of Understanding (MOU). A Reserve may apply to SRD for funds to help support operations, research, monitoring, education/interpretation, development projects, facility construction, and acquisition.

G. Reserve Management Planning

Every Reserve is required by Federal Regulation to have a NOAA-approved management plan. The plan must describe the Reserve's goals, objectives, and management issues, and must identify the Reserve's intended strategies or actions for research, education/interpretation, public access, construction, acquisition, and resource preservation, restoration and manipulation. Staff roles in each of these areas must also be addressed.

A new Reserve's initial plan, and any major proposed changes to a plan, are made available for public comment at national and local levels before receiving NOAA's final approval.

H. NERRS National Programs

The two major elements of the NERR System are (1) research on estuarine habitats and processes, and (2) education and interpretation of estuarine habitats.

1. NERRS Research and Monitoring Program

The NERRS research and monitoring program is designed to facilitate and coordinate scientific understanding of estuarine systems, and to establish and regularly monitor the baseline conditions of estuaries in the NERR System. In creating the NERRS Congress indicated that research priorities, objectives, and methodologies should be nationally coordinated for the broadest application of research results and maximum use of the system. The NERR System has developed a strategic plan to address both research and monitoring activities on a national scale.

The NERRS research and monitoring programs are intended to generate and supply information to state and local governments, including wildlife management and land use permitting agencies, and to other entities involved in coastal management. Coastal governments and policy-makers should be able to use research results and implications to make land use and port management decisions, to gauge the effects of past activities, and to restore estuarine habitat. Other researchers should have access to a database that describes estuarine conditions on a variety of geographic and temporal scales.

2. NERRS Education, Interpretation and Outreach Program

The NERR Education, Interpretation and Outreach program represents a national network interpreting and disseminating information about and appreciation of estuarine processes. The program also supports development of new techniques and approaches to estuarine education, interpretation and outreach. A primary goal of the Education Program is to facilitate the link between the results of research, the translation of those results and those individual groups that effect the future of coastal resources. Programs and techniques developed by one Reserve may be shared with other Reserves and other educators and interpreters through the NERR System.

Each Reserve may develop an education and interpretation plan tailored to its site and region, and to its region's educational system. The NERR System also provides a national strategic plan to guide program development at individual Reserves.

I. NERRS Strategic Plan

Partners in the NERRS -- OCRM and the individual reserves --will incorporate into their planning and implementation, the 1995 document titled, "A Strategic Plan for the National Estuarine Research Reserve System: A State and Federal Partnership," or its successor. The strategic plan lists the NERRS mission and five goals. The Mission of the NERRS is as follows:

"The National Estuarine Research Reserve System is a protected areas network of federal, state, and community partnerships which serve to promote informed management of the Nation's estuarine and coastal habitats through linked programs of stewardship, public education, and scientific understanding."

The system's five goals are:

1. Representative Protected Areas

   Establish, manage, and maintain a national network of protected areas representing the diverse biogeographic and typological estuarine ecosystems of the United States.

2. Partnership

   Mobilize federal, state, and community resources to mutually define and achieve coastal protection and management of goals and objectives.

3. Informed Management And Stewardship

   Operate the NERRS as a national program contributing to informed, integrated management of the Nation's coastal ecosystems.

4. Scientific Understanding Through Research

   Design and implement a comprehensive program of scientific research to address coastal management issues and their fundamental underlying processes.

5. Education

   Design and implement a comprehensive program of education and interpretation based on solid scientific principles to strengthen the understanding, appreciation, and stewardship of estuaries, coastal habitats, and associated watersheds.

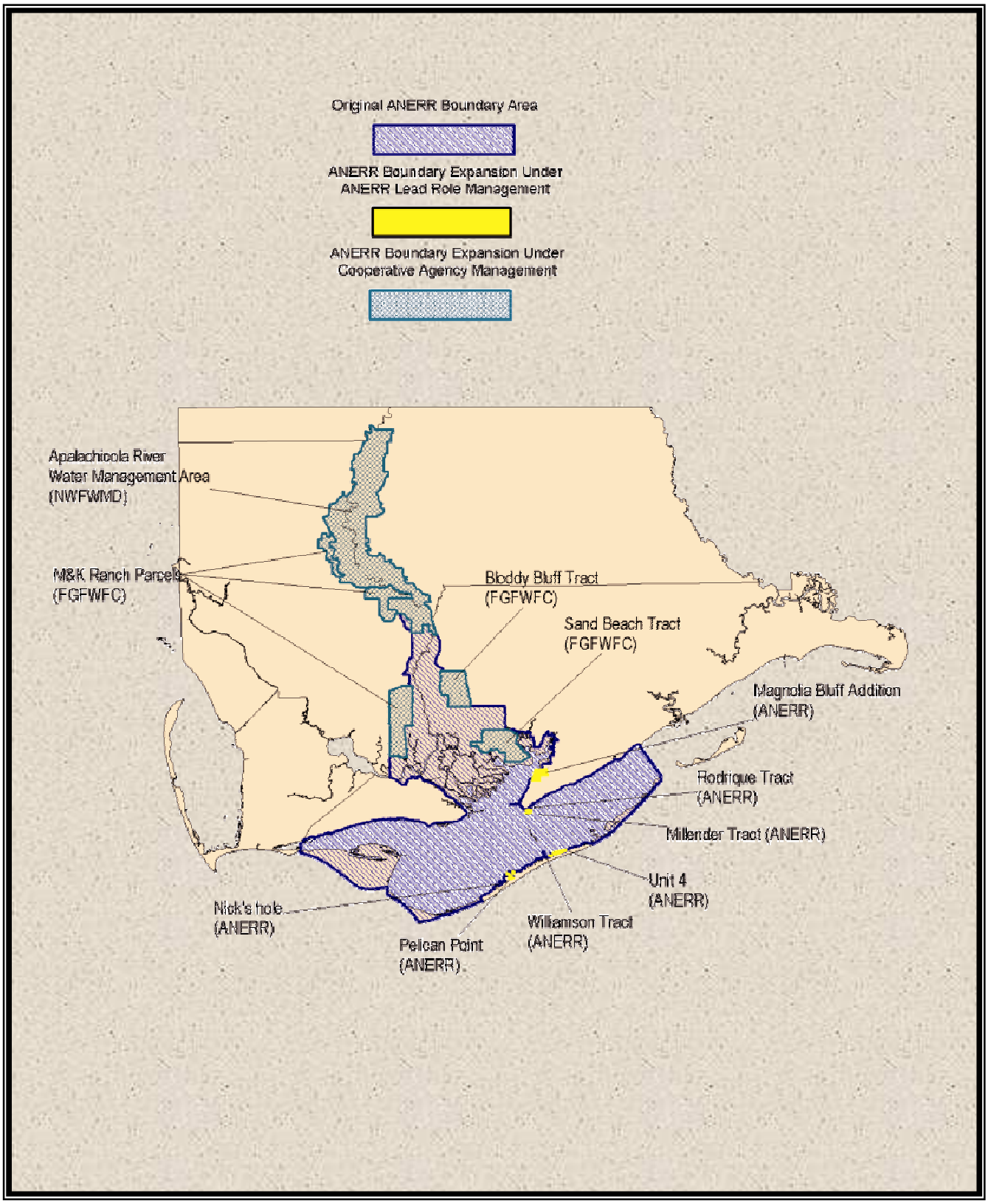
III. Apalachicola National Estuarine Research Reserve (ANERR)

The Apalachicola National Estuarine Research Reserve (FIGURE 2) designated in 1979, is located in Franklin County in the Florida panhandle.

A. Legal Description and Acreage

The Apalachicola National Estuarine Research Reserve managed lands consist of isolated tracts separated by roads, residential developments, natural barriers and open waters.

FIGURE 2: Boundaries of the Apalachicola National Estuarine Research Reserve



The Reserve managed lands are located in all or portions of Section 12, Township 10 South, Range 9 West; Sections 7, 16, 17, 18, 21, 22, 23, 24 and 13, Township 10 South, Range 8 West; Sections 17, 18, Township 10 South, Range 7 West; Section 2, Township 10 South, Range West; Section 35, Township 9 South, Range 7 West; Section 31, Township 9 South, Range 6 West; Sections 20, 21, 28, 29, Township 10 South, Range 7 West; Section 6, Township 9 South, Range 6 West; Section 1, Township 9 South, Range 7 West; Section 36, Township 8 South, Range 8 West; Sections 3-22, 27-31, Township 8 South, Range 7 West; Sections 4-9, 17-19, Township 8 South, Range 6 West; and Sections 32-33, Township 7 South, Range 6 West.

B. Degree of Title Held by the Board, Including Reservations and Encumbrances

The Board of Trustees of the Internal Improvement Trust Fund (Board) holds fee simple title to all lands within the Reserve boundary, which are managed by CAMA.

C. Facilities And Structures

The Reserve has two headquarters facilities. The education/visitor center is located near Scipio Creek on 7th Street in the city of Apalachicola. The facility, named the Robert L. Howell Building, was dedicated in April 1984. The second facility, housing research, administration and maintenance staff, is located on the east side of Apalachicola Bay at 350 Carroll Street in the town of Eastpoint. This facility has 4,000 square feet of office space, a 1,000 square foot laboratory and 3,000 square feet of maintenance area. Each facility and specific information about each is listed below and referenced on Figure 18 in this document.

- Eastpoint Office Facility: 8,000 square foot office building with lab and maintenance shop. Includes office of Environmental Administrator, Research and Resource Management sections, and Aquatic Preserve Manager. It also houses offices and equipment for FMRI. Currently it includes a 1,600 square foot equipment shelter.

- Apalachicola Visitor Center: 3,000 square foot center includes 77-person auditorium, marine habitat displays, and houses the Reserve education section. The center includes a 400 square foot special project production lab and 800 square foot shop/storage building.

- Marshall House: 2,100 square foot historic building used primarily for Reserve staff work base on Cape St. George and housing for overnight research and education activities.

- Cape St. George Lighthouse: Historic abandoned U.S. Coast Guard lighthouse and remnants of lighthouse keeper residence and outbuildings.

- Weather shelter: Newly constructed wooden open-air shelter with bench seating for visitors and organized groups.

The second largest of the 25 existing national estuarine research reserves, the Reserve encompasses approximately 246,000 acres, most (135,680 acres) of which are state-owned submerged lands. During the past five years, ANERR has undergone a boundary expansion of over 53,000 acres. (See section on land acquisition for details).

The Reserve includes the bay with its associated tidal creeks, marshes and bayous, portions of the Apalachicola River and its floodplain (north to river mile 52) upland areas and portions of the offshore barrier islands.

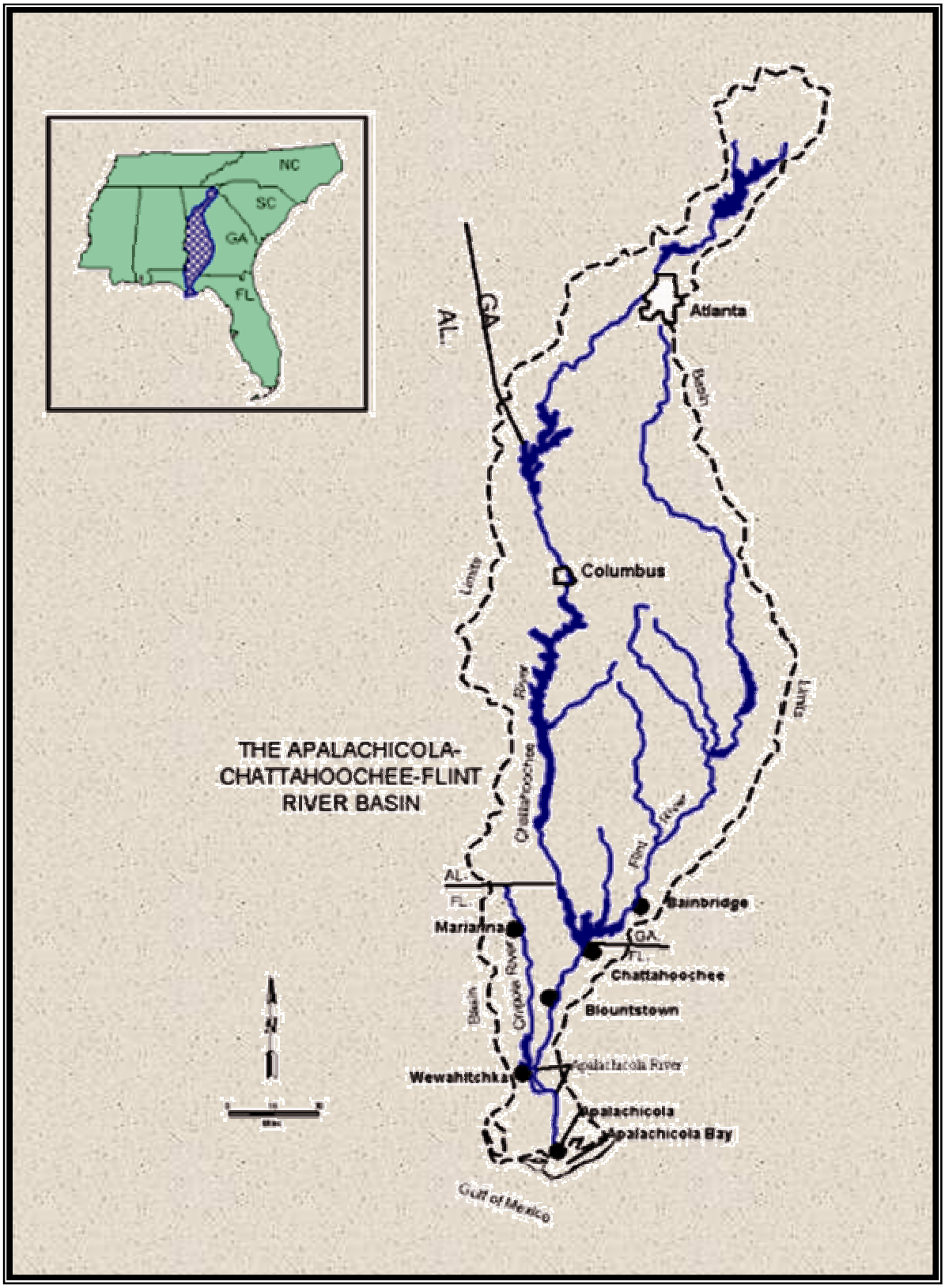
The Apalachicola National Estuarine Research Reserve is one of the more complex Reserves in the national system, with regard to management and protection activities. The Reserve consists of several independently managed subunits, supports a variety of recreational and commercial activities, and is affected by land and water use policies in three states.

One of the unique features of this Reserve is the extensive multiple agency involvement in the area. Various upland regions within the Reserve boundaries were previously acquired by federal and state agencies for a variety of different purposes. St. Vincent Island (12,358 acres) is a national wildlife refuge; Cape St. George (2,300 acres) was acquired as a state reserve, and is now a subunit of ANERR; the eastern tip of St. George Island (1,883 acres) is a state park; and 28,685 acres of Apalachicola River floodplain were purchased under the state’s Environmentally Endangered Lands acquisition program for preservation purposes. The Northwest Florida Water Management District and the Florida Game and Fresh Water Fish Commission have added 35,487 and 17,521 acres respectively, of forested floodplain to the Reserve. Some privately owned land is also within the boundaries of the Reserve.

D. Statement of Alternative or Multiple Use

ANERR properties were acquired specifically for the protection and conservation for the Reserve's aquatic resources. As such, the properties are not intended for multiple use. The close proximity of the properties to the aquatic resource precludes any degree of development, which could negatively impact aquatic resources. Public access to the properties will be provided to the degree that the environmental integrity of the natural communities there are not compromised or degraded.

FIGURE 3: The Apalachicola-Chattahoochee-Flint River Basin



Uses within the Reserve include recreational pursuits such as camping, recreational fishing, hunting and nature appreciation, as well as, commercial activities such as fishing, waterborne navigation and beekeeping.

One of the most productive estuarine systems in North America, Apalachicola Bay receives waters from a drainage basin which extends into Alabama and Georgia (FIGURE 3). Thus, the Bay is susceptible to factors affecting the Chattahoochee and the Flint River systems, as well as, those affecting Florida's Apalachicola River.

The estuarine Reserve designation enhances resource-oriented research, education and recreation activities, the integration of research and education programs, the integration of education and resource oriented outdoor recreation, and the integration of research information into resource management decisions.

The overall goal of the Reserve is resource protection through research and monitoring, education and resource management. The objectives are to promote research and education programs and coordinate management activities among all involved agencies and groups to ensure that the Apalachicola estuary sustains or improves current productivity. This is accomplished through four programs: 1) research and monitoring; 2) education; 3) resource management; and 4) administration.

IV. ANERR Purpose and Scope of Plan

A management plan that defines goals and objectives, strategies to meet these goals, and program and facilities needs for a specific time period is a key element in an effective resource management program. The management plan for ANERR is a forward-looking document that describes a course of action by which the Reserve is managed for a period of at least five years. This plan describes the resource, defines attainable goals and objectives, identifies significant resource issues, and describes the priority programs and strategies necessary to support the primary goal of resource protection through research and monitoring, education and resource management.

Resource management efforts at ANERR consist of research and monitoring, education, habitat restoration, inter-agency coordination, acquisition, resource management, and resource protection programs. Operational support includes funding, staff, facilities, and equipment provided by the Florida Department of Environmental Protection (DEP), NOAA, the Franklin County Board of County Commissioners, and a citizen support group, Friends of the Reserve (F.O.R.).

This plan is written within the context of anticipated additional funding and staff for Reserve management and operations (from DEP and NOAA) and is based on evaluations of current and anticipated resource management issues. It should be recognized that variability in funding, as well as, the potential for new issues arising, are significant factors that may affect implementation of specific strategies described

in this plan. However, the scope of this plan represents an aggressive, achievable program that will ensure the expanded protection and conservation of Reserve resources. This plan addresses the lands under direct management authority of ANERR, as well as, lands within the Reserve but with another entity with lead management role. Goals and objectives, resource issues, and strategies for the management of the Reserve will be applicable to all lands described in the plan.

Lastly, the plan provides an important source of information to the public, legislators, and local officials. Enhanced public awareness and understanding of estuarine systems and management issues will support the Reserve's goals and objectives. Informed decisions affecting coastal resources made by legislators and local officials and supported by an active and involved public, will help to ensure the continued protection and preservation of estuarine systems.

CHAPTER 3

THE RESERVE ENVIRONMENT

I. Introduction

The Apalachicola National Estuarine Research Reserve (ANERR) encompasses approximately 246,000 acres of land and water. Included within the Reserve's boundaries are two barrier islands and a portion of a third, the lower 52 miles of the Apalachicola River and its associated floodplain, portions of adjoining uplands, and the Apalachicola Bay system (Figure 2).

II. General Description

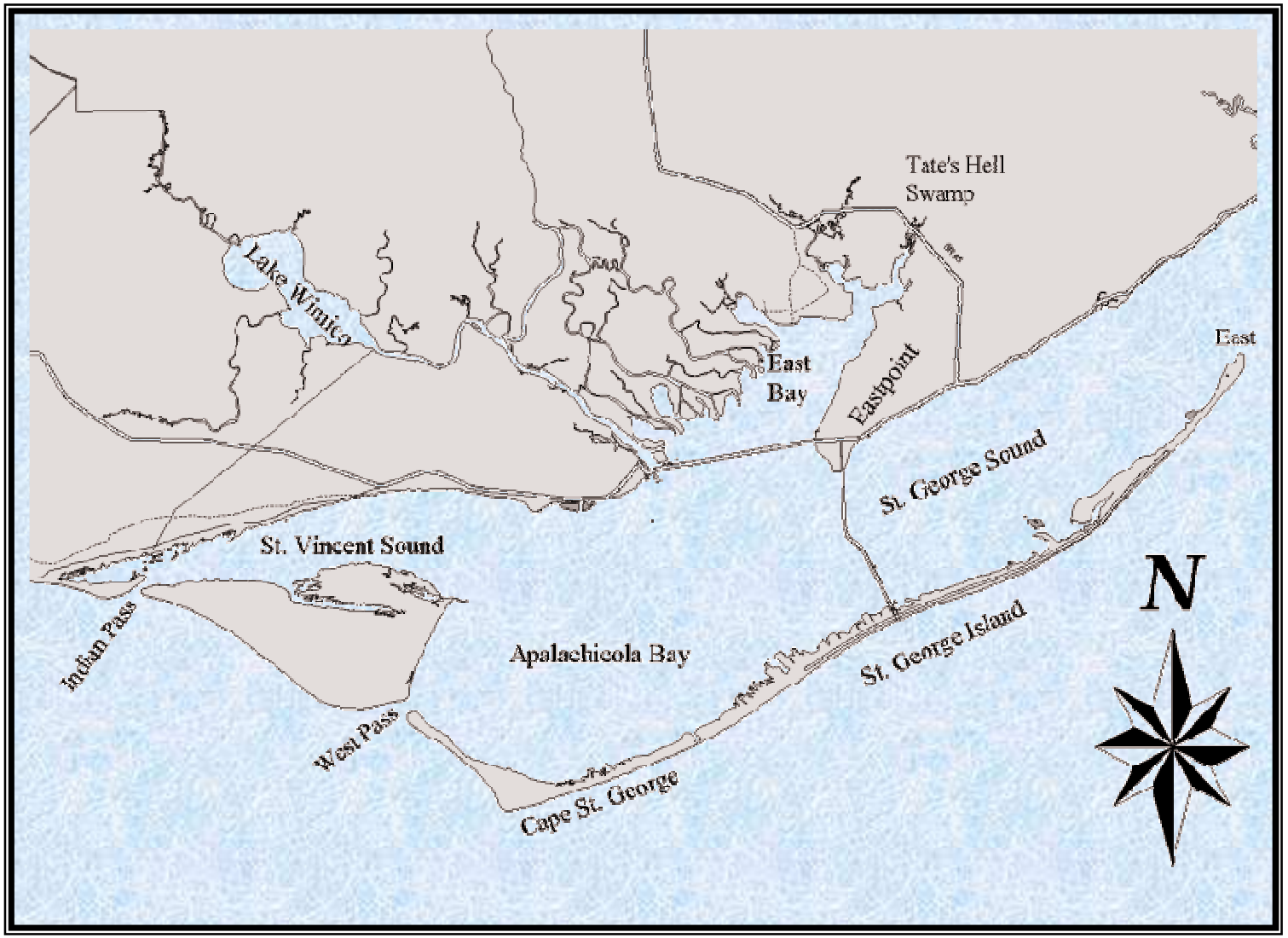
A. Regional Perspective

The Apalachicola River basin is only part of the larger Apalachicola-Chattahoochee-Flint River system. The ACF basin covers the north-central and southwestern part of Georgia, the southeastern part of Alabama, and the central part of the Florida panhandle. It drains an area covering approximately 19,600 square miles (Figure 3). The Chattahoochee River flows 436 miles from its source in the Blue Ridge Mountains of northern Georgia, drains a land area of 8,650 square miles, and has 13 dams located on the river. The Flint River flows 350 miles from its source south of Atlanta, drains a land area of 8,494 square miles, and has 2 dams affecting stream flow. The Apalachicola River is formed by the confluence of the Chattahoochee and Flint Rivers, flows 107 miles to Apalachicola Bay, and drains a land area of approximately 2,400 square miles (USACOE, 1978).

Through geological, chemical, physical and biological interactions, the Apalachicola River and Bay drainage basin has evolved a river with the largest flow, the most extensive forested floodplain, and the most productive estuary in Florida (Figure 4) The Apalachicola NERR is located in Franklin and Gulf Counties, on the northwest coast of Florida, in one of the least populated coastal areas in the state.

Public lands included within the Reserve are the St. Vincent Island National Wildlife Refuge, St. George Island State Park, Apalachicola River Wildlife and Environmental Area, Apalachicola River Water Management Area, and Cape St. George Island. The Reserve's offices are located within the city of Apalachicola at the Scipio Creek Marina on Seventh Street and off North Bayshore Drive in Eastpoint. Highway 98 provides the only access to Apalachicola and Eastpoint, either eastward from Panama City or westward from Crawfordville.

FIGURE 4: Major Features of the Apalachicola Estuary



B. Climate

The ANERR experiences a mild, subtropical climate due to its latitude (29 degrees) and the stabilizing effects of adjacent Gulf of Mexico waters (Bradley, 1972). Mean temperatures range from the 40's Fahrenheit in January to the 80's in July (Fernald, 1981). Seasonal and annual temperatures vary greatly, ranging from the upper 90's in the summer to the lower 20's in the winter.

Average annual rainfall ranges from 52 to 60 inches within the Reserve boundaries (Jordan, 1984). Peak rainfall periods occur primarily during the summer with a secondary peak in early spring. Apalachicola experiences approximately 73 days of thunderstorms annually, three-quarters of these occurring between June and September (Jordan, 1973). Low rainfall periods occur primarily in the fall and mid-spring.

Prevailing winds are typically from a southerly direction during the spring and summer and from a northerly direction during the fall and winter months. Local winds, however, may change abruptly due to thunderstorms and the movement of fronts through the area.

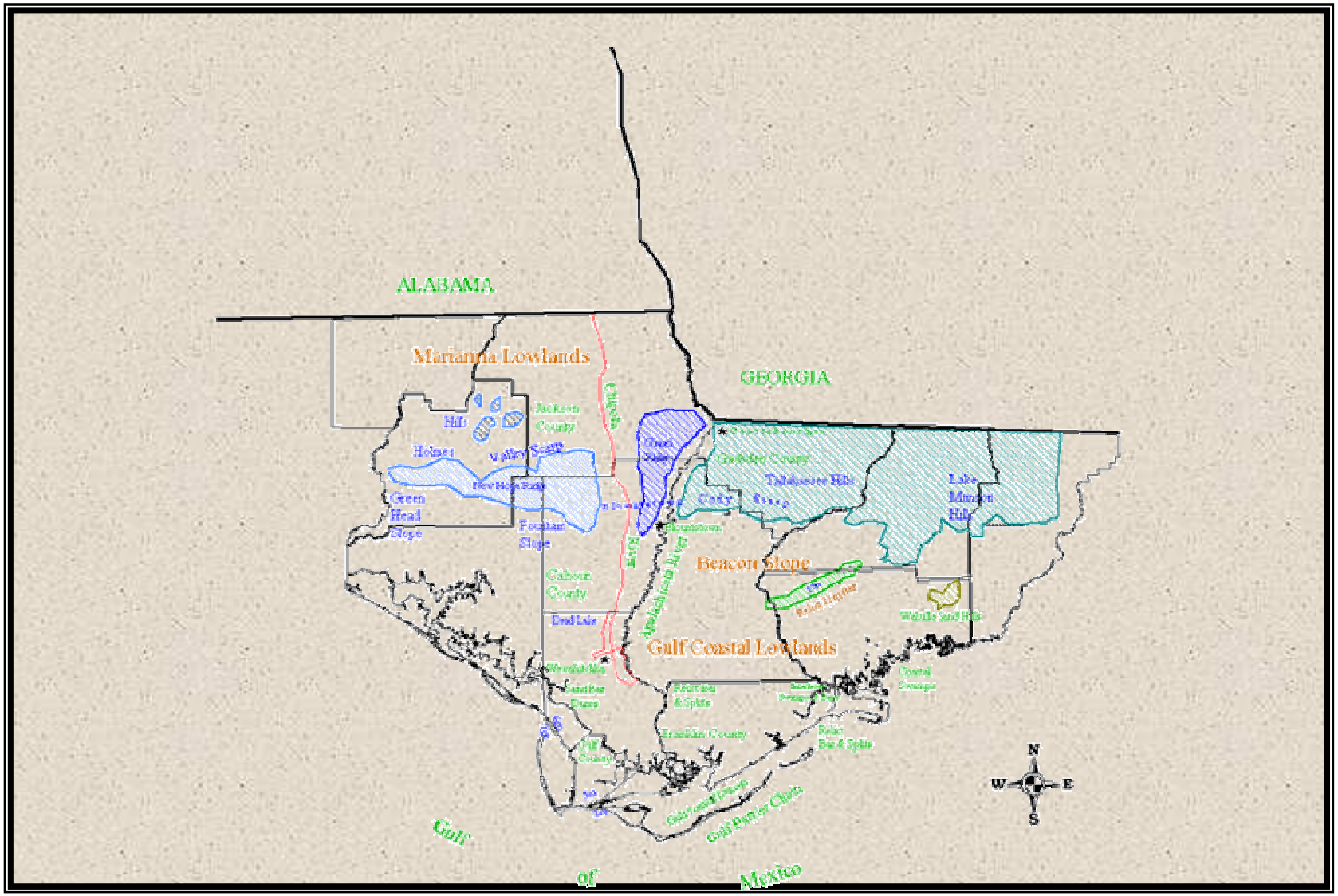
C. Physiography and Geology

The Reserve lies completely within the Gulf Coastal Lowlands physiographic province, which is characterized by low elevations and poor drainage (Figure 5). Numerous relict bars and dunes are associated with this province, indicating historic fluctuations in sea level (USACOE, 1978; Clewell, 1986).

The Apalachicola Embayment is the major structural feature that dominates the geology of the Reserve and river system. This feature represents a downfallen block of land that is a relatively shallow basin between the Ocala and Chattahoochee uplifts (Schmidt, 1984).

The Gulf Coastal Lowlands are characterized by Pleistocene marine sands near the river mouth and Pliocene sands to the north (Alt and Brooks, 1965). The large cusp of the entire Apalachicola coast is believed to have been built out by the Apalachicola River during the late Tertiary and Quaternary periods and has subsequently been modified by waves and longshore drift. The present structure of the bay system is considered to be less than 10,000 years old and the general outline of the bay has been stable over the last 5,000 years, except for the southward migration of the delta into the estuary. The present barrier island chain formation is thought to have occurred approximately 5,000 years ago when sea level reached its modern position (Tanner, 1983).

FIGURE 5: Physiography of the Apalachicola River Valley



At this time, little quartz sand is being supplied to the bay by the river system (Kofoed, 1961; Stapor, 1973), which is probably a result of dams on the upper river systems. The majority of the sand-sized sediment load that is supplied is being deposited in the delta, which has been prograding approximately 3 feet per year since 1892 (Donoghue, pers. comm.). In-filling rates for the bay system have been estimated to range from less than 1 mm/year to over 17 mm/year depending on location (Isphording, 1985; Donoghue, pers. comm.). The distribution of current bottom sediment types in Apalachicola Bay is shown in Figure 11.

D. Mineral Resources

There are no known commercially viable mineral resources on Reserve lands. The lithological log for well #W11425, near the Rodrique Tract (Figure 18) indicates the Intracoastal Formation (limestone) is reached at a depth of 110 feet. This overburden presumably makes mining uneconomical.

Two test wells within five miles of Reserve lands were both plugged and abandoned as dry wells. Neither oil nor gas has ever been produced in the area.

E. Soils

Franklin County and much of the Gulf of Mexico coastal region soils are derived from beach deposits, river alluvium, or marine terrace deposits. Twelve soil associations have been identified in Franklin County that range from deep, excessively drained soils to very poorly drained soils with water tables above the surface (USDA, 1994). Approximately 90 percent of the land area is dominated by soil associations that are poorly suited or unsuitable for development and septic tank use (TABLE 1). These soil conditions pose major limitations for development in much of Franklin County (Franklin County Comprehensive Plan, 1990).

Throughout the county, the soil is generally uniform with the color patterns reflecting drainage conditions (dark soils for poor drainage and light colors for areas of good drainage) (Moony and Patrick, 1915). The Scranton-Rutlege Association is the predominant general soil type in the county, comprising approximately 26 percent of the land area. The Apalachicola floodplain and coastal and delta marshes are predominantly comprised of the Chowan-Brickyard-Wehadkee and Bohicket-Tisonia-Dirego Associations. St. Lucie-Kureb-Riminini and Lakeland Associations are found predominantly along the coastal areas while Plummer-Rutledge and Leon-Chipley-Plummer Associations are found in the interior of the county (USDA, 1994).

TABLE 1: Soils of Franklin County (1994 – USDA Soil Conservation Service)

Soil Association	Percent of County	Suitability for Development	Agriculture
Albany-Blanton-Stilson	2	Mod. to Well	Moderate
Kershaw-Ortega-Ridgewood	3	Moderate	Poor
Plummer-Surrency-Pelham	15	Poor	Moderate
Mandarin-Resota-Leon	5	Moderate	Moderate
Leon-Scranton-Lynnhaven	17	Poor	Moderate
Scranton-Rutlege	26	Poor	Poor
Pamlico-Pickney-Maurepas	3	Poor to Unsuitable	Poor
Bohicket-Tisonia-Direго	5	Unsuitable	Unsuitable
Meadowbrook-Tooles-Harbeson	9	Poor	Mod. To Poor
Pickney-Pamlico-Dorovan	4	Poor	Poor
Chowan-Brickyard-Wehadkee	6	Unsuitable	Unsuitable
Corolla-Duckston-Newhan	5	Poor	Poor

F. Hydrology

The Apalachicola River can be classified as a large alluvial river. It is the only river in Florida that has its origins in the Piedmont and Southern Appalachians. Characteristics of alluvial rivers include a heavy sediment load, turbid water, large watersheds, sustained periods of high flow, and substantial annual flooding. Upstream rainfall has a much greater influence on river flows than Florida rainfall because the majority of the ACF basin is in Georgia and Alabama (Meeter et al., 1979; Leitman et al., 1983). However, flows in the lower river can be substantially increased by Florida rainfall during periods of low flow because of inflow from the Chipola River, a spring fed river and the Apalachicola's major tributary. The lower Apalachicola River, within the Reserve, is tidally influenced and is characterized by long straight reaches with few bends.

The mean annual discharge of the river is approximately 25,000 cubic feet per second (cfs) at the Sumatra gage, 21 miles upriver, which includes the discharge of the Chipola River. Minimum and maximum flows average 9,300 cfs and 200,000 cfs, respectively, although yearly flows vary considerably (USACOE, 1978). Low flows occur in summer and fall while highest flows occur in winter and spring (Figure 6). McNulty et al. (1972) estimate that the Apalachicola River discharge accounts for 35 percent of the total fresh water runoff from the west coast of Florida.

Apalachicola Bay is in an area of transition between the semi-diurnal tides of southwestern Florida and the diurnal tides of northwestern Florida. Its tides are, therefore, classified as mixed, which accounts for the number of tides, ranging from one to five daily. The normal tidal range in the bay is one to two feet with a maximum range of three feet (Dawson, 1955; Gorsline, 1963).

Strong winds can modify water movement to the point of obscuring tidal effects. Strong winds may also thoroughly mix the shallow water of the bay, but winds of lesser velocity affect only the surface layer, resulting in stratification of the water column (Estabrook, 1973).

Water currents in the bay system are due primarily to the astronomical tides, but are strongly affected by the direction and speed of prevailing winds, riverflow, and the physical structure of the bay (Dawson, 1955). Net movement of water is from the east to the west. The more saline gulf water enters through St. George Sound and moves west mixing with the fresher water in East Bay and Apalachicola Bay and eventually moves back out to the Gulf through Sike's Cut, West Pass, and Indian Pass (Ingle and Dawson, 1953; Conner et al., 1982). In the bay, water velocities rarely exceed 1.5 feet per second, but velocities of 10 feet per second are common in the passes. Roughly 700,000 cubic feet of water per second leaves the bay system at maximum velocity during ebb flow (Gorsline, 1963).

Recent modeling efforts (Huang and Jones, 1997) and statistical analysis of long-term continuous data collections (Nui et al., 1998) have provided more details on low flow conditions in the river and potential effects on bay salinities due to changes in environmental parameters such as riverflow, local rainfall, wind speed and direction, and water level.

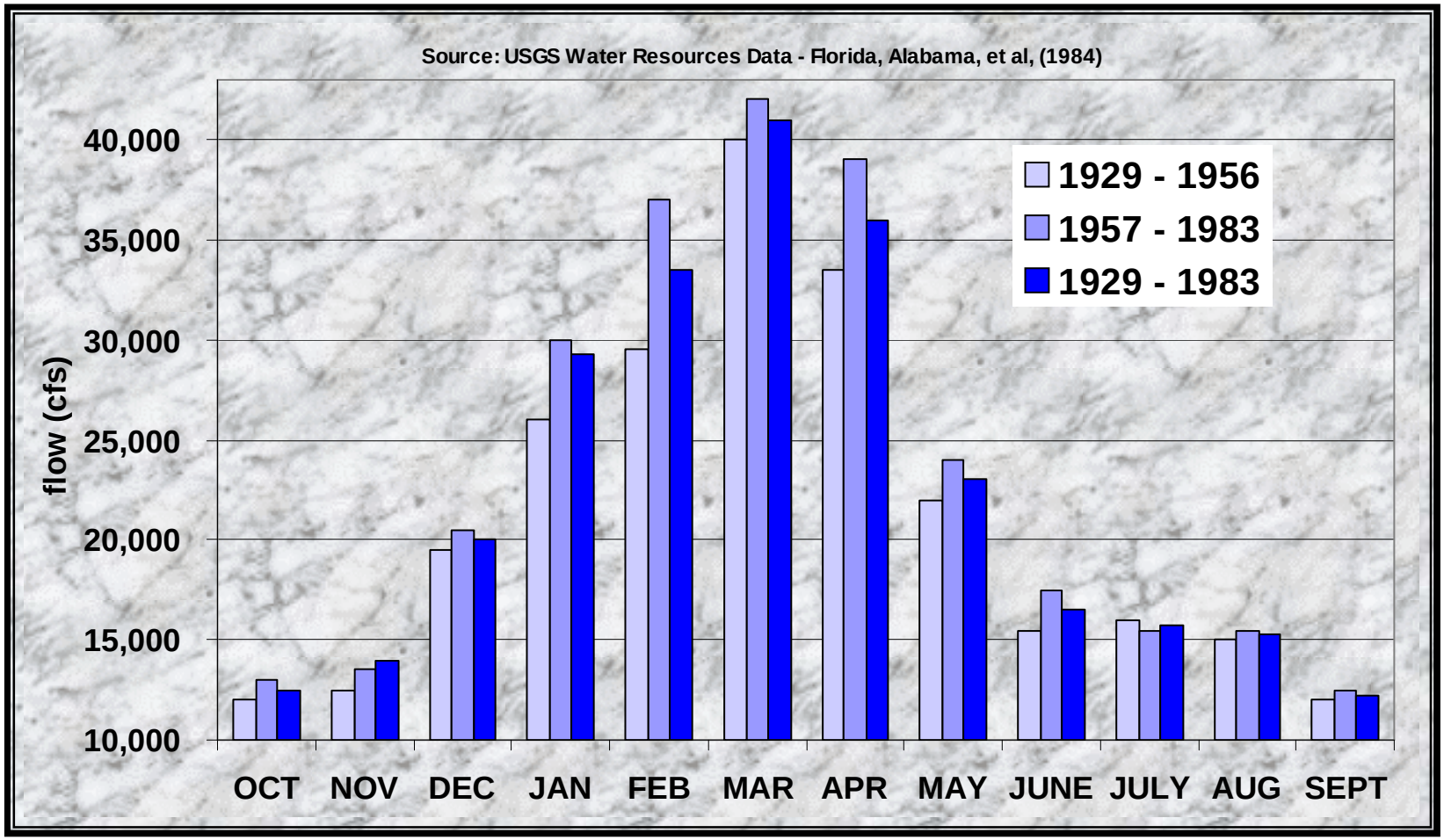
G. Major Subunits of the Reserve

1. Cape St. George Island

Cape St. George Island was acquired by the State of Florida in 1977 through the Environmentally Endangered Lands (EEL) Program of Florida's Conservation Act of 1972. This purchase was made in order to protect the Island from development and to contribute to the protection of Apalachicola Bay. The entire island except the footpad and surrounding area of the de-designated Cape St. George Lighthouse, is now under management authority of the ANERR. The remaining 0.8 acres of land, under U.S. Coast Guard ownership will eventually be transferred to ANERR and the State of Florida for management.

The Cape consists of approximately 2,300 acres at mean high tide with an additional 400 acres of perimeter tidal marshlands and lower beach areas, which are inundated by high tidal waters. The Marshall House, built by former owners, still stands on the bay side of the island and is used for research and education field trips sponsored by the Reserve.

FIGURE 6: Average Monthly Flows of the Apalachicola River at Chattahoochee
1929 to 1984



Disturbance to the island has been minimal. Various Indian cultures occupied the island for hundreds of years. Pottery shards dating from A.D. 750 to 1450 are occasionally found on portions of the island. Turpentine operations occurred from 1910-1916 and again from 1950-1956. Many of the pine trees on the island are cat-faced from these operations. The greatest disturbance on Cape St. George Island did not occur until the mid-1960's. At this time, it was used for amphibious military training operations. Heavy equipment was used to cut roads and flatten some of the dune ridges (FDNR, 1985).

2. Apalachicola River Wildlife and Environmental Area

The Apalachicola River Wildlife and Environmental Area (ARWEA), located in Franklin and Gulf Counties, consists of 55,652 acres purchased by the State of Florida under the EEL Program and the Conservation and Recreational Lands (CARL) Program. The ARWEA is publicly owned by the Trustees of the Internal Improvement Trust Fund. However, it is co-managed by three agencies: the Florida Game and Fresh Water Fish Commission (GFC), Florida Division of Forestry, and the Florida Division of Historical Resources, although GFC has lead management authority.

The ARWEA lies mostly within the Apalachicola River floodplain and extends from the mouth of the Apalachicola River to the northern tip of Forbes Island. The major habitat of the area is floodplain swamp dominated by tupelo and cypress. Fresh water marshes predominate in the lower floodplain as elevations decrease in the river delta (FGFWFC, 1986). New property added within the last 5 years also includes large areas of pinelands, primarily wet to mesic flatwoods, shrub and brushland, and hardwood hammock areas.

3. Apalachicola River Water Management Area

The Apalachicola River Water Management Area, which straddles the middle Apalachicola River in southwestern Liberty County and northeastern Gulf County, consists of 35,487 acres of mostly floodplain forest. Bought under the Save Our Rivers Program and managed by the Northwest Florida Water Management District (NWFWMD), it has recently been added to the Reserve's boundary through a MOU between the NWFWMD and ANERR/DEP.

The property borders several major tributaries (Chipola River, Florida River, River Styx, Kennedy Creek, and Brothers River) as well as 31 miles of the Apalachicola River. The floodplain forest includes mixed hardwoods, tupelo-cypress, and tupelo-cypress with mixed hardwoods associations, which are primarily dependent on relatively small

changes in elevation for their differences. It is managed by the NWFWMD primarily for flood storage, reforestration and recreation.

4. St. Vincent National Wildlife Refuge (NWR)

St. Vincent Island, acquired by the U.S. Fish and Wildlife Service in 1968, is a protected national wildlife refuge. Prior to 1968, St. Vincent Island was privately owned and used primarily as a private hunting and fishing preserve. In addition to St. Vincent Island, which covers 12,358 acres, the refuge includes an 86-acre mainland tract as well as a 45-acre island within St. Joseph Bay (USFWS, 1983a). However, only St. Vincent Island is included within the Reserve's boundaries.

Plant communities of St. Vincent Island are more diverse and complex than those found on St. George and Cape St. George islands. These vary from beach and berm, dune, tidal marsh, dense saw palmetto areas, fresh water marshes and ponds, cabbage palm and magnolia hammocks, oak hammocks, pine flatwoods, and scrub oak ridges.

St. Vincent NWR also has a greater diversity of wildlife utilizing its resources. A few of the species supported by the island are white-tail deer, sambar deer, feral hogs, wild turkeys, bald eagles, ospreys, raccoons, opossum, gopher tortoises, and alligators. The beaches of the refuge are important for nesting shorebirds and loggerhead sea turtles. Introduced indigo snakes inhabit gopher tortoise burrows in the inner dunes. Red wolves have been re-introduced to the island since 1990 as part of the USFWS captive-breeding program. The island also supports resident and migratory species of shorebirds, water birds, wading birds, gulls, terns, and ducks (USFWS, 1986c).

5. St. George Island State Park

Dr. Julian G. Bruce St. George Island State Park occupies 1,883 acres at the eastern end of St. George Island in Franklin County. The park contains more than 9 miles of undeveloped beaches and dunes as well as a similar area of bayshore habitat. Slash pine and scrub oak habitats dominate the interior portion of the island, and low flatwoods, sandy coves, and salt marshes are found along the bayshore.

Historically, minimal alteration of the natural systems in the park has occurred. The pines were turpentined during the early and middle 1900's. The principle alteration has been grading and filling for roads on the backside of the primary dune system. The dunes have also been subject to some impact from vehicles. Jeep trails can be seen in the pine woods and in large open areas. Since the completion of the causeway in 1965, the major activity by visitors has been the use of the beaches for recreation. Public activities in the park include picnicking,

hiking, camping, primitive/backpack camping, swimming, and fishing (FDNR, 1985a).

H. Surface Water Classification

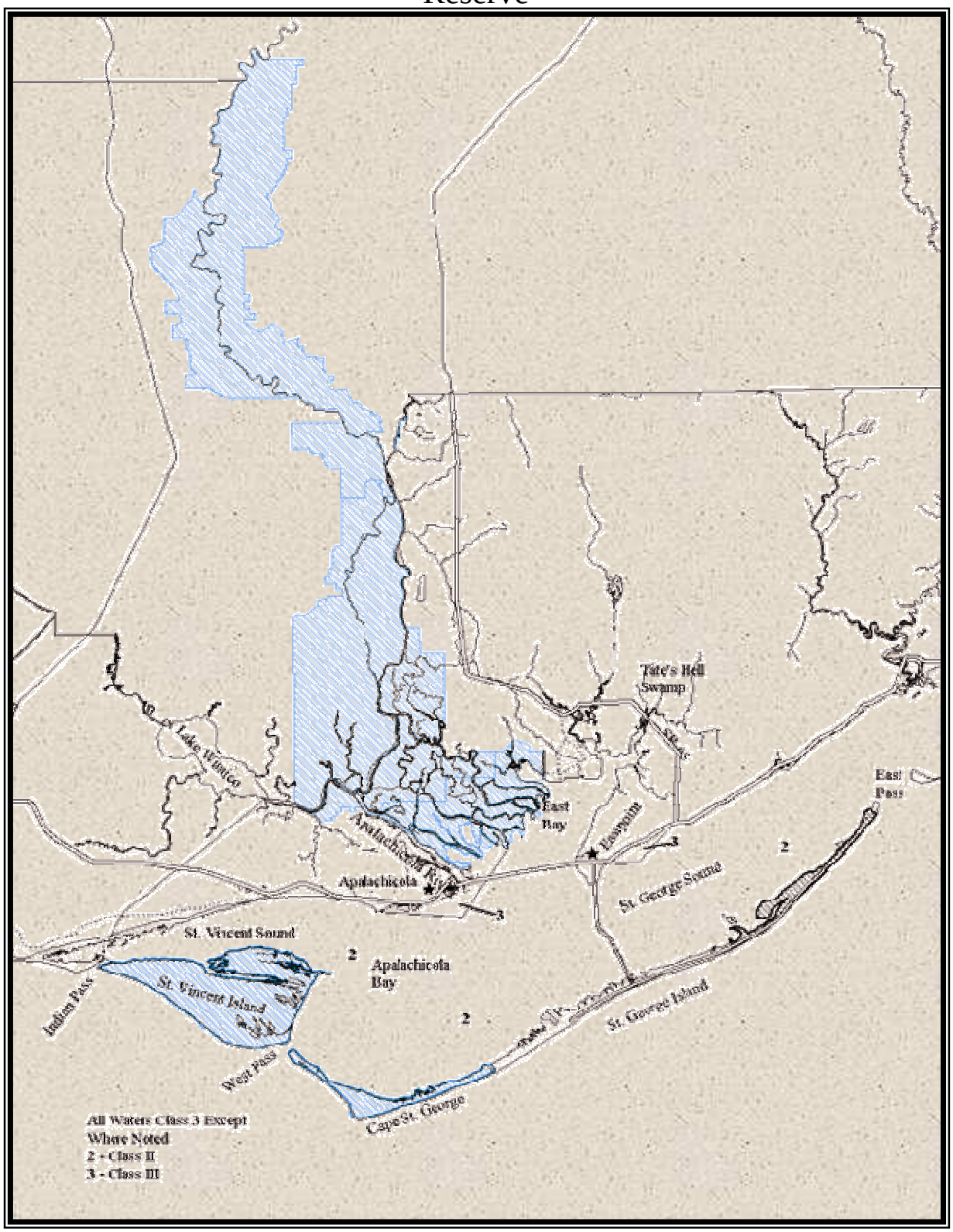
All surface waters of the State have been classified by the Florida Department of Environmental Protection (DEP) according to their designated use. Five classes have been designated with water quality criteria designed to maintain the minimum conditions necessary to assure the suitability of water for its designated use (DER, 1985). In the Apalachicola Reserve two of the five classes of water are present and include:

Class II	Shellfish Propagation or Harvesting
Class III	Recreation, Propagation and Maintenance of Healthy, Well-balanced Population of Fish and Wildlife.

Each of these classes has specific water quality standards for parameters such as bacterial levels, metals, pesticides and herbicides, dissolved oxygen and turbidity, etc., designed to protect and maintain the use of the water body. The degree of protection is variable with Class I waters having the most stringent standards and Class V waters the least. All surface waters of the State are classified as Class III waters except those specifically described in Chapter 17-3.161, F.A.C.

Class II waters, those used for shellfish propagation or harvesting, include the majority of the brackish water areas in the estuary (Figure 7). The entire bay system from Alligator Harbor through St. George Sound, Apalachicola Bay, East Bay and tributaries, St. Vincent Sound, and Indian Lagoon are Class II waters with the exception of a two-mile radius near Apalachicola and the area north of the Eastpoint Breakwater. These two areas have been closed to shellfishing for years due to pollution from the city of Apalachicola and runoff from Eastpoint. Class II water standards are more stringent concerning bacteriological quality than any other class due to the fact that shellfish, (i.e. oysters and clams) that are consumed uncooked by man can concentrate pathogens in quantities significantly higher than the surrounding waters. The Florida DEP maintains a lab in Apalachicola and conducts surveys to determine water quality in shellfish waters. All Class II waters are additionally classified by DEP as approved, conditionally approved, or prohibited based upon these surveys. As conditions change, areas are closed or opened based on bacterial surveys and major rainfall events which increase bacterial levels due to runoff (DEP, 1997).

FIGURE 7: Surface Water Classifications Within the Apalachicola Reserve



All other waters in the Apalachicola Reserve, which include the river and all its tributaries and distributaries, and the two areas in the bay mentioned above are Class III waters. Class III water standards are less stringent than the other two classes but are intended to protect recreation and the propagation and maintenance of a healthy well-balanced population of fish and wildlife (DER, 1985).

Another important designation used by DEP is that of "Outstanding Florida Water" (OFW). All waters, both fresh and saltwater within the Reserve are designated as OFW's. These waters are afforded special protection by the State due to their high quality, recreational or ecological significance, or their location within state- or federally- owned lands. This designation is intended to preserve the ambient water quality at the time of designation and not allow any degradation. Stringent standards are applied regarding proposed alterations or potentially damaging activities planned for these waters.

III. Habitats of ANERR

The Reserve includes barrier island, estuarine, riverine, floodplain and upland environments which are closely interrelated and influenced by each other (Figure 4). To understand how each component functions, it is necessary to understand all the various parts of the system and the habitats that make this system unique. Common names of plants and animals found in the Reserve are used throughout the text; however, a detailed listing of both common and scientific names can be found in Appendix 1 and 2. Specific information on natural communities and threatened and endangered plant and animal species is included as appendix 12.

A. Barrier Island System

A well developed barrier island complex, composed of four islands: St. Vincent, Cape St. George, St. George, and Dog Island lies roughly parallel to the mainland. Part or all of these islands are located within the Reserve, except Dog Island which lies to the east of Reserve boundaries.

St. Vincent Island, a National Wildlife Refuge, is triangular in shape, approximately 9 miles long and 4 miles wide. It is somewhat atypical of the barrier islands found along the northeast Gulf of Mexico coast. Instead of a simple beach and dune structure, a highly complex topographic and physiographic system of ridges and swales, many of which are truncated to form ponds and sloughs, can be found (Thompson, 1970; Miller et al., 1980).

A variety of xeric communities, such as scrub oak and live oak, are found on the island ridges. Interspersed between these ridges are xeric to hydric communities consisting of pine flatwoods, hammocks, marshes, ponds, and sloughs (Edmiston and Tuck, 1987). The interspersion of flatwoods and hardwoods as well as abundant fresh water on the island provides a habitat more favorable for wildlife than any of the other barrier islands in the system.

Dominant habitats on the 12,358 acre island include: slash pine flatwoods (4,700 acres) with various combinations of gallberry, fetterbush, cabbage palm, saw palmetto, magnolia, and grasses; tidal marshes (2,900 acres) vegetated primarily with black needlerush, smooth cordgrass, and saltgrass; scrub and hardwood hammocks (2,200 acres) vegetated primarily with various combinations of myrtle oak, live oak, sand live oak, Chapman oak, rosemary, cabbage palm, saw palmetto, and grasses; and freshwater marshes and ponds (1,700 acres) vegetated primarily with sawgrass and cattail (Thompson, 1970).

Cape St. George Island, owned by the State of Florida and managed by the Reserve, is approximately 9 miles long and varies from 1/4 mile to 1 mile wide. The 2,300 acre island is a coastal dune/dune flat/washover barrier formation (Figure 8) of recent geologic origin. The eastern and western sections of the island are narrow terraces subject to occasional overwash by storm surges. The most recent major episode occurred in 1985 when three hurricanes impacted the northeast Gulf of Mexico coastline. The island was affected by some overwash from storm surges during Hurricane Opal in 1995, but experienced less damage than the earlier storms.

Beaches are semiterrestrial habitats that are subject to constant high energy forces of wind and wave action. Vegetation is sparse. Annual plants commonly found in this zone include sea-rocket, sea purslane, Russian thistle, and the seaside spurge.

The relatively undisturbed miles of Gulf beach and dunes of the barrier islands provide essential habitats for a number of endangered and rare birds. Beaches provide nesting sites for species such as the threatened least tern, royal tern, sandwich tern, as well as black skimmers and American oystercatchers, also Species of Special Concern. All of these plus the Caspian tern, and the Eastern brown pelican, a Species of Special Concern, use sand spits and beach bars for loafing and roosting (FDNR, 1983; Livingston et al., 1975). The threatened Southeastern snowy plovers and least terns are present on St. George and Cape St. George. Snowy plovers require expansive open, dry, sandy beaches for breeding, and both dry and tidal sand flats for foraging. They are the only Florida bird species which feeds and breeds on open, dry sandy beaches. Least terns also nest here but feed in nearby waters. The numbers occurring in Franklin County have declined sharply with human exploitation of the beaches (Livingston et al., 1975). The beaches and berms of the barrier islands are also used in the summer as some of the most important rookery grounds for the threatened Atlantic loggerhead turtle (FDNR, 1983).

Primary dunes or the foredunes are the first dunes on the seaward side of the islands. They provide protection for the other dune ridges and plant communities that lie behind them. Because dunes are subject to daily exposure of salt spray and sandblast, and the major shifts and wash down of storm surges, they are considered to be harsh environments. This dune system is

unstable and constantly being altered, and therefore does not provide a permanent or continuous barrier to storm surges (FDNR, 1983).

The predominant plant found in the dune plant community is the sea oat. They are very effective in building and stabilizing dunes. Sea oats provide food for the red-winged blackbird and other species of birds. Other plants of the dune community include the railroad vine, beach morning glory, evening primrose, bluestem, and sand coco-grass (FDNR, 1983; White, 1977; Livingston et al., 1975). The roots and rhizomes of dune vegetation help to bind the sand and thereby stabilize the land.

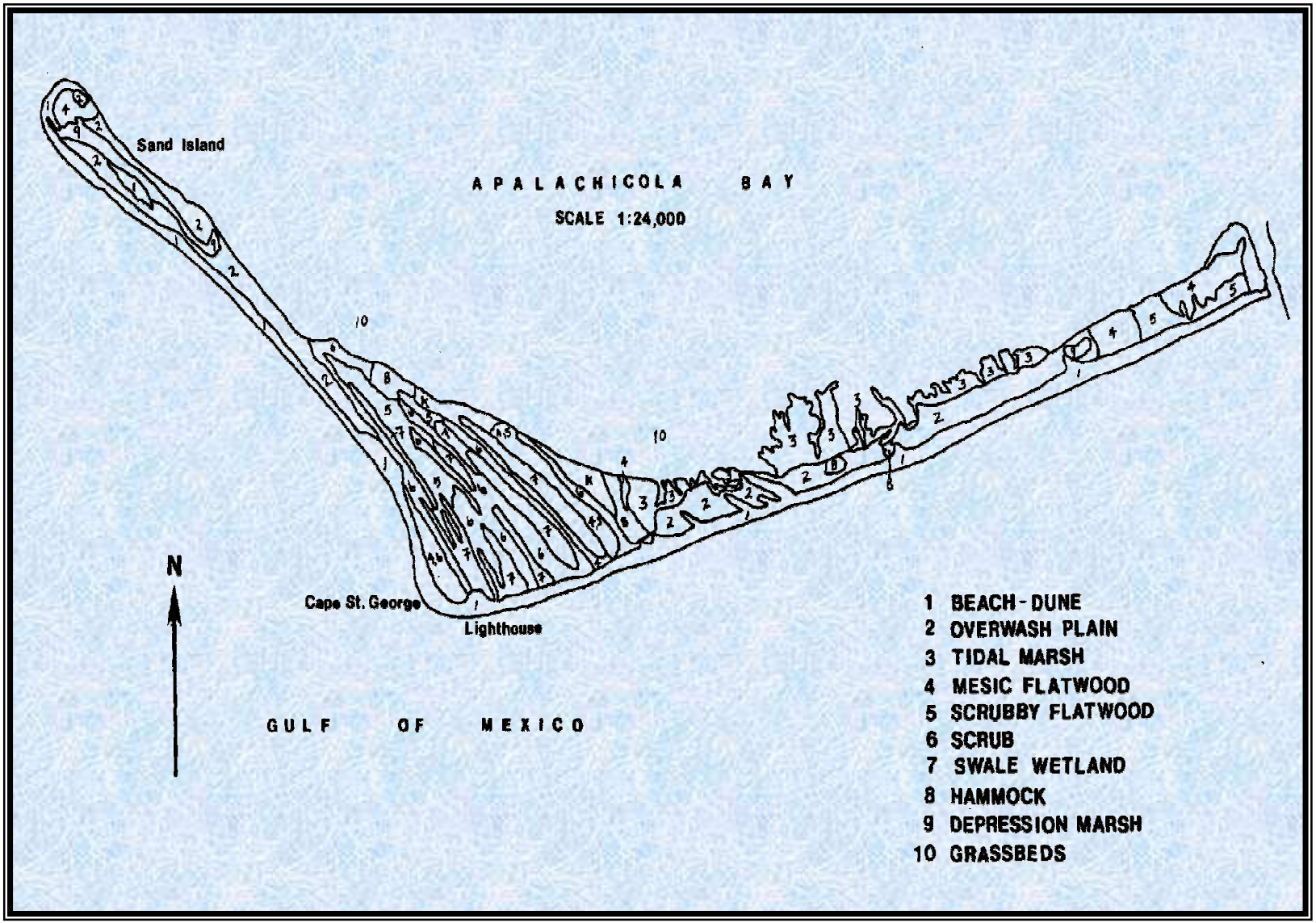
In areas where water has ceased to wash through, a stabilized coastal dune strand has developed (for example, some areas of Cape St. George). Overwash in this stabilized strand is restricted to the foredune zone, although all of the other stresses (salt spray, etc.) still exist. Dunes of the stabilized strand are larger than those of the overwash dune field and tend to align in a continuous ridge form. With the stabilizing of the seaward ridge, succession is allowed to proceed behind the dune with scrub thickets replacing grasslands (FDNR, 1983).

Behind the primary dune is usually a wide, relatively flat sandy plain, containing some small windblown dunes. This interdunal zone is mostly devoid of larger woody plants found in more established scrub areas towards the interior of the island. Plant species of this zone include saw palmetto, yaupon, wax-myrtle, salt-myrtle, goldenrod, marsh elder, and saltmeadow cordgrass (White, 1977).

Behind the dune system a zone of more dense vegetation can be found. The understory vegetation of this zone includes mostly scrub species with a few scattered slash pines occurring. This scrub community is generally found on higher, well-drained sites corresponding to old dune ridges (White, 1977) and is excellent for stabilizing dunes. Dominant plant species found in this zone are saw palmetto, rosemary, buckthorn, staggerbush, Chapman oak, myrtle oak, sand live oak, and live oak. Various herbs, lichens and grasses often cover the open areas (Livingston et al., 1975).

Slash pine scrub grades into a broad vegetation zone with a more dense cover of slash pine and an understory consisting of scrub species. This slash pine-scrub community generally occupies flat ground on drier sites. Saw palmetto tends to form much broader patches (Livingston et al., 1975). Myrtle oak and sand live oak also form large patches as they do in the scrub on dunes. Chapman oak and rosemary are present but are not as common as in the dune scrub communities. The open areas located in the slash pine-scrub communities are covered with herbs, grasses, lichens or low, semi-woody species such as bottlebrush threeawn, beakrush, October-flower, and St. John’s-wort.

FIGURE 8: Major Plant Communities of Cape St. George Island



The dominant habitats on the eastern and western sections of the Cape are overwash zones and grassland communities, which are adapted to shifting sands, excessive evapotranspiration, lack of nutrients, and salt spray. Vegetative cover consists primarily of saltmeadow cordgrass, love grass, Gulf muhly, broomsedge, finger grass, and a variety of other important associates. Mesic and scrubby flatwoods are located at either end of the island vegetated primarily with slash pine and associates such as gallberry, fetterbush, and saw palmetto. Most of the tidal marsh is located bayward of the overwash zone on the eastern section of the island and is dominated by black needlerush and smooth cordgrass. The central, wider part of Cape St. George Island is dominated by slash pine flatwoods, scrub, and small swale wetlands (FDNR, 1983).

St. George Island, approximately 20 miles long and averaging less than one-third of a mile wide, has been sparsely settled in the past but is now being developed more rapidly. This is the only barrier island within the Reserve with a bridge connecting it to the mainland. It consists of approximately 7,340 acres of land and an additional 1,200 acres of marsh. The eastern end, covering 1,883 acres, is within the boundaries of the Reserve because of its designation as a state park. The rest of the island, with the exception of a few parcels owned by the state, and within the ANERR boundary, is privately owned and outside of ANERR boundaries. On the gulf side of the island is a narrow band of beaches and low-lying sand dunes that grade into mixed woodland grass, palmetto, and bayside marshes (Livingston et al., 1975).

Scrub, flatwoods, tidal marshes, and freshwater habitats on the islands provide feeding and resting areas for important resident and migratory bird species such as the peregrine falcon, southeastern American kestrel, southern bald eagle, osprey, great egret, snowy egret, tricolored heron, and black-crowned night heron. Wildlife found on these barrier islands include American alligators, white-tailed deer, red wolves (currently being bred on St. Vincent Island), water moccasins, eastern glass lizards, and the southern toads.

B. Apalachicola Bay System

The Apalachicola Bay system is a wide, shallow estuary that covers an area of approximately 210 square miles behind a chain of barrier islands (Gorsline, 1963). Its primary source of fresh water is the Apalachicola River. The estuarine system may be divided into four sections based on both natural bathymetry and man-made structural alterations; East Bay, St. Vincent Sound, Apalachicola Bay, and St. George Sound (Figure 4). Average depth in these bays ranges from 3 feet, in East Bay, to 9 feet, in Apalachicola Bay, with maximum depths up to 20 feet occurring toward the barrier islands (Dawson, 1955; Gorsline, 1963).

The overall high water quality of the Apalachicola Estuary (Livingston, 1983), with the combined effects of seasonal flooding, nutrient and detrital transport,

and the variable salinity regime, provide ideal living conditions for estuarine biota and result in a highly productive system. The Apalachicola Bay system is comparable to, or higher than, other Gulf estuaries in nutrient and detrital transport from the river and floodplain, and in phytoplankton productivity (Estabrook, 1973; Elder and Mattraw, 1982). It is also comparable to other Gulf estuaries in its zooplankton production (Edmiston, 1979) and bay anchovy abundance (Sheridan and Livingston, 1979). Commercial fishing is the lifeblood of the local economy. For many years, the bay has supported the largest oyster industry in Florida, as well as an extensive shrimp, crab, and commercial fishing industry.

Major estuarine habitats found within the Reserve include oyster bars, submerged vegetation, tidal flats, soft sediment, tidal marshes, and open water habitats (Edmiston and Tuck, 1987). Oyster bars cover over 10,600 acres of submerged bottom within the Reserve boundaries (Figure 9). The American oyster is the dominant component on the bars which cover approximately 10 percent of Reserve bay bottom (Table 2). Because of the abundance of cavities and food and the optimal conditions on the bars, they provide a significant habitat for a variety of organisms. Although the oyster-associated community varies somewhat due to variable salinity regimes, important associates include oyster predators such as southern oyster drills, stone crabs, blue crabs, crown conchs, flatworms, and boring clams. Other organisms which inhabit oyster bars include mussels, mud crabs, flat crabs, blennies, toadfish, gastropods, and many other transitory organisms that are commercially important species (Menzel et al., 1966).

The submerged vegetation found in the Apalachicola Bay system includes fresh water, brackish, and marine species (Figure 10). Their distribution is confined to the shallow perimeters of the system (Livingston, 1980; CSA, 1985) because of high turbidity, which limits the depth of the photic zone. Submerged vegetation covers approximately 7 percent of Reserve bay bottom (Table 2), with the majority of it located in regions of high salinity and low turbidity. The shallow bayside regions of Cape St. George, St. George, and the mainland areas of St. George Sound support the largest assemblages of true seagrasses (Figure 10), with shoal grass the dominant species. Turtle-grass and manatee-grass are also found in deeper, higher salinity waters in the eastern reaches of the system. Widgeon-grass and tapegrass are found near the mouth of the river and in the upper reaches of the bay.

FIGURE 9: Major Oyster Bars of the Apalachicola Reserve

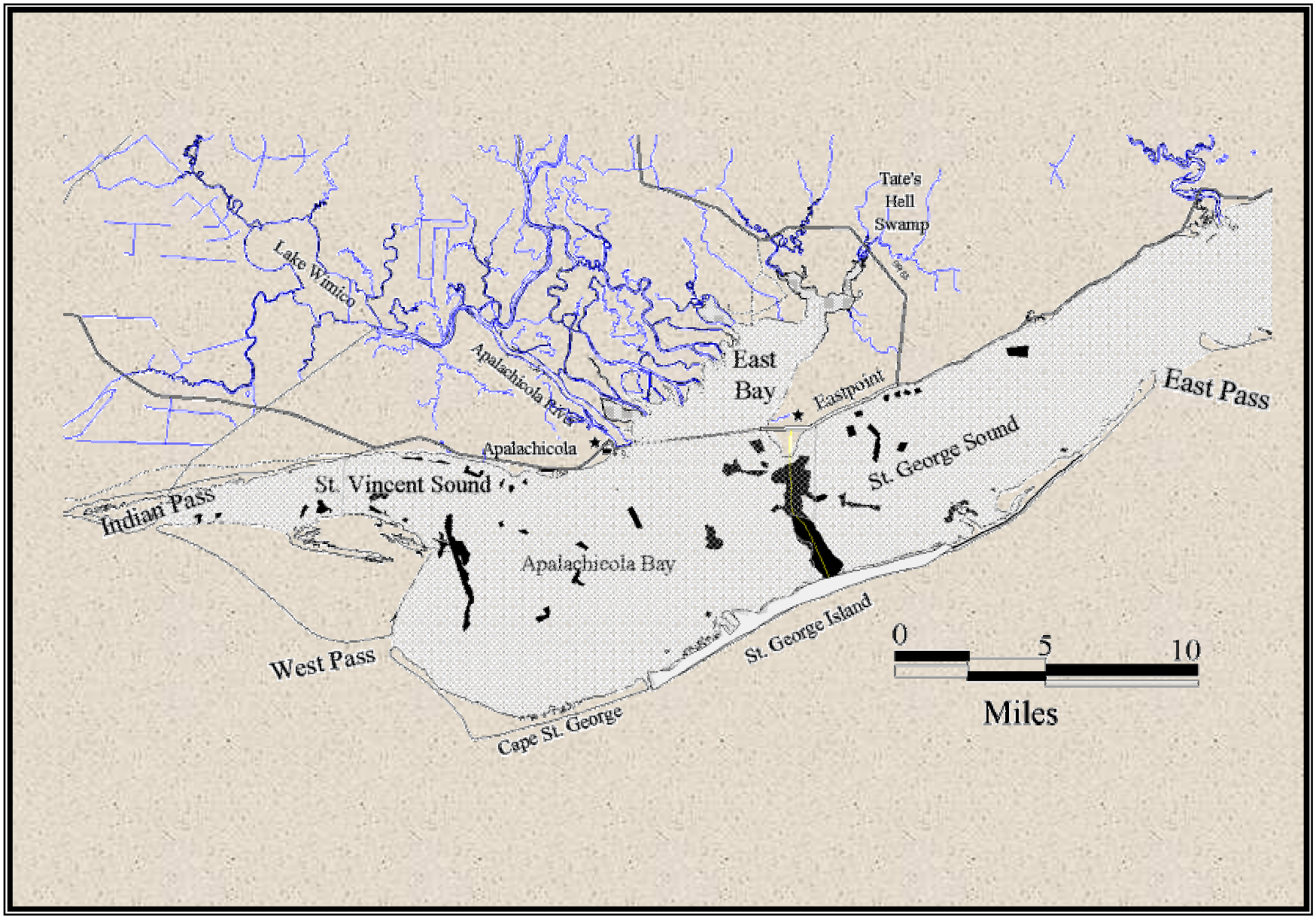


TABLE 2: Distribution and area (in acres) of major bodies of water within ANERR boundaries, with areas of oysters, grassbeds, and contiguous marshes (modified from Livingston, 1984).

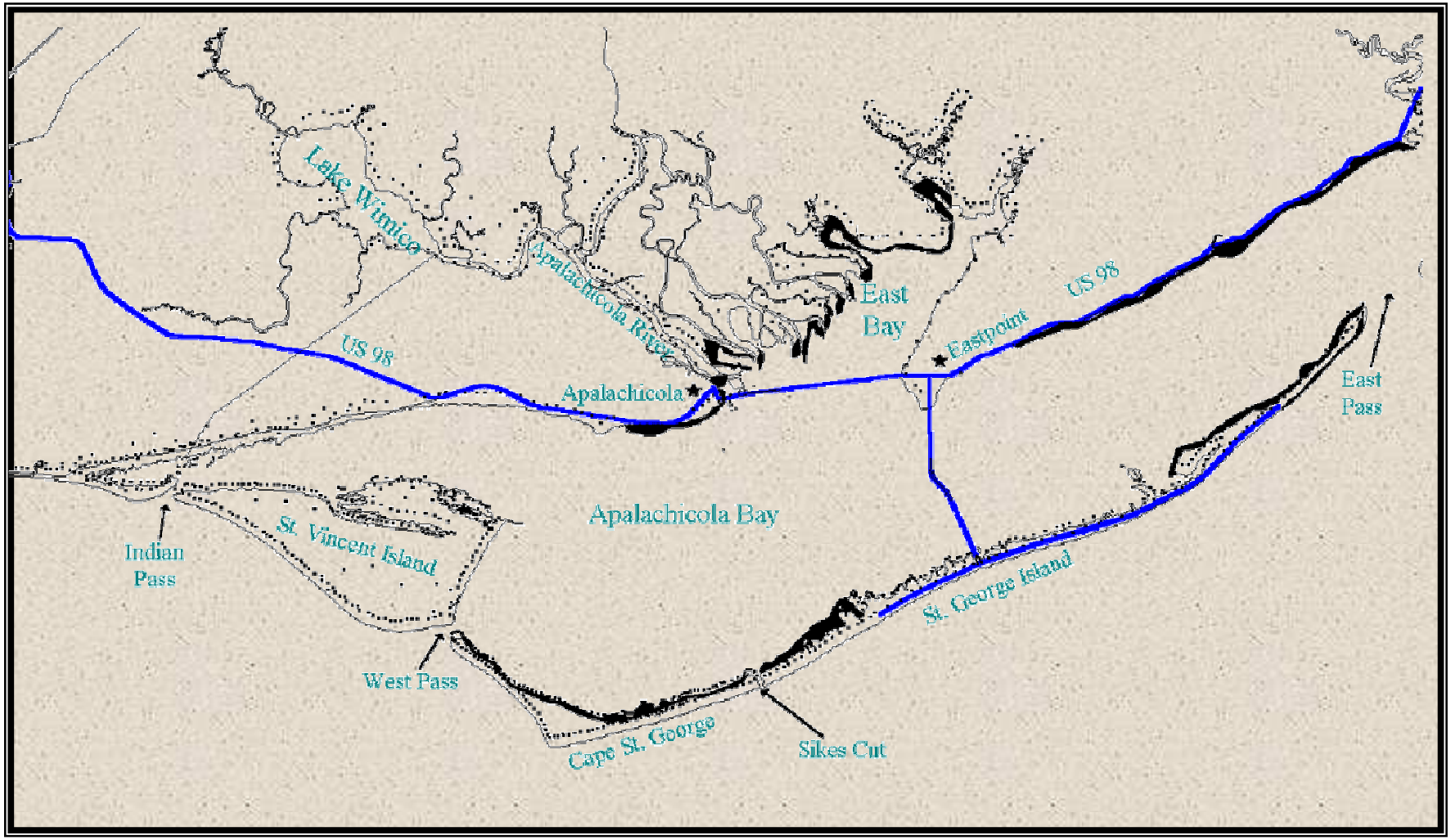
Water Body	Area	Oysters	Grassbeds	Marshes
St. Vincent Sound	13,683	2,708	unknown	4,463
Apalachicola Bay	51,771	4,096	2,778	1,737
East Bay	9,832	165	3,541	11,377
St. George Sound (West)	36,425	3,677	1,542	1,857
Total	111,711	10,646	7,861	19,434
Percent of total water area	100	10	7	17

Eurasian watermilfoil, an exotic species, has become a problem in many of the small bays in the northern area of East Bay in the last 10 years, covering up to 90 percent of the bay bottoms and extending along the river channels into East Bay itself (Livingston, 1980; CSA, 1985). The hurricanes of 1985 uprooted and destroyed most of this noxious aquatic plant. It has become re-established and is spreading along with hydrilla, another exotic aquatic plant, in the lower river distributaries. Hurricane Opal in 1995 also uprooted and significantly reduced the distribution and density of these two species.

The largest benthic habitat type found in the Apalachicola Bay system is soft sediment, comprising approximately 70 percent of the estuarine area (Livingston, 1984). Its composition varies considerably depending on location in the bay (Figure 11). Many of the commercially important benthic invertebrates are harvested from this habitat. Shrimp and blue crabs are not restricted to this environment but feed and burrow extensively here when they leave the protection of the marshes. Atlantic croaker, spot, speckled trout, and many other dominant fish in the system feed extensively in this habitat.

Tidal marshes found within the boundaries of the Reserve include fresh water, brackish, and salt marshes and cover approximately 17 percent of the total aquatic area (Table 2). The most extensive marsh systems are found in East Bay, along the lower reaches of the Apalachicola River, and in the Big Bayou portion of St. Vincent Island (Figure 12). An extensive system of tidal creeks and bayous extends northward thereby increasing the shoreline area and regions suitable for marsh development. The marshes here support predominantly fresh to brackish water vegetation consisting primarily of sawgrass, cattails, and bullrushes. The dominant species found in the higher salinity regions behind St. Vincent, St. George and, Cape St. George Island, and in St. George Sound are black needlerush, cordgrasses, and saltgrass (Livingston, 1984). A myriad of estuarine organisms also use the marsh habitat as either a nursery ground, a breeding area, or a feeding zone.

FIGURE 10: Submerged Vegetation of the Apalachicola Estuary
(Livingston, 1983)



Plants associated with marshes must contend with rapid changes in environmental conditions, which restrict the number of species found in these habitats. Because of stressful conditions, salt marshes typically exhibit low plant diversity and in many instances consist of one or two species, with black needlerush and cordgrass dominating in this area. Occupying a vertical gradient of approximately 3-5 feet, the vegetation is not organized into integrated communities but, instead, the species occur in zones defined by salinity, tides, and the soil moisture regime. Brackish marsh habitats are usually not as stressful as salt marshes, and, therefore, the number of species found is usually greater (Clewell, 1986). The paucity of species is usually offset by the extremely dense concentrations of those present. Brackish marsh vegetation is also more variable spatially than salt marshes due to the differing salinity regimes encountered as the distance from the estuary increases. Eventually, the brackish marsh vegetation is replaced by less tolerant species and becomes a fresh water marsh when salinities average less than 0.5 ppt. (parts per thousand). Sawgrass is the predominant species although bullrushes, cattails, big cordgrass, softrush, and giant cutgrass are also present in the fresh water areas of the river and distributaries.

Animals associated with marsh systems must also withstand the rapid changes in environmental conditions. Since only about 10 percent of vascular plant material produced in the marsh is consumed directly by herbivores (Heard, 1982), most organisms found in the marsh are predators and detritivores. Because of the importance of this habitat as a nursery area, organisms are typically grouped into permanent and transitory categories. Permanent residents include invertebrates such as insects, polychaete worms, amphipods, mollusks, larger crustaceans, and other omnivorous groups which play an important role in the breakdown of organic matter. Year-round residents also include mammals such as muskrats, and birds such as the clapper rail and great blue heron. Transitory residents include such species as blue crabs, penaeid shrimp, anchovies, largemouth bass, striped mullet, spotted and sand seatrout, and lepomids (Livingston, 1984). These and other important estuarine organisms use the marsh habitat as a nursery ground, breeding area, or feeding zone. The summer and fall in Apalachicola Bay are the most critical periods when the marsh is used as a nursery area.

The marsh is also important to wildlife such as river otters, raccoons, alligators, and turtles. Transitory birds in marshes comprise one of the larger herbivorous groups and are also significant top carnivores in the system. Northeastern Gulf of Mexico marshes support summer nesting species, migrants, casual feeders, and summer visitors (Stout, 1984). Birds of prey that utilize the marsh system include hawks, owls, ospreys, and bald eagles which not only feed on fish but also small rodents found in the marsh.

FIGURE 11: Bottom Sediment of the Apalachicola Estuary

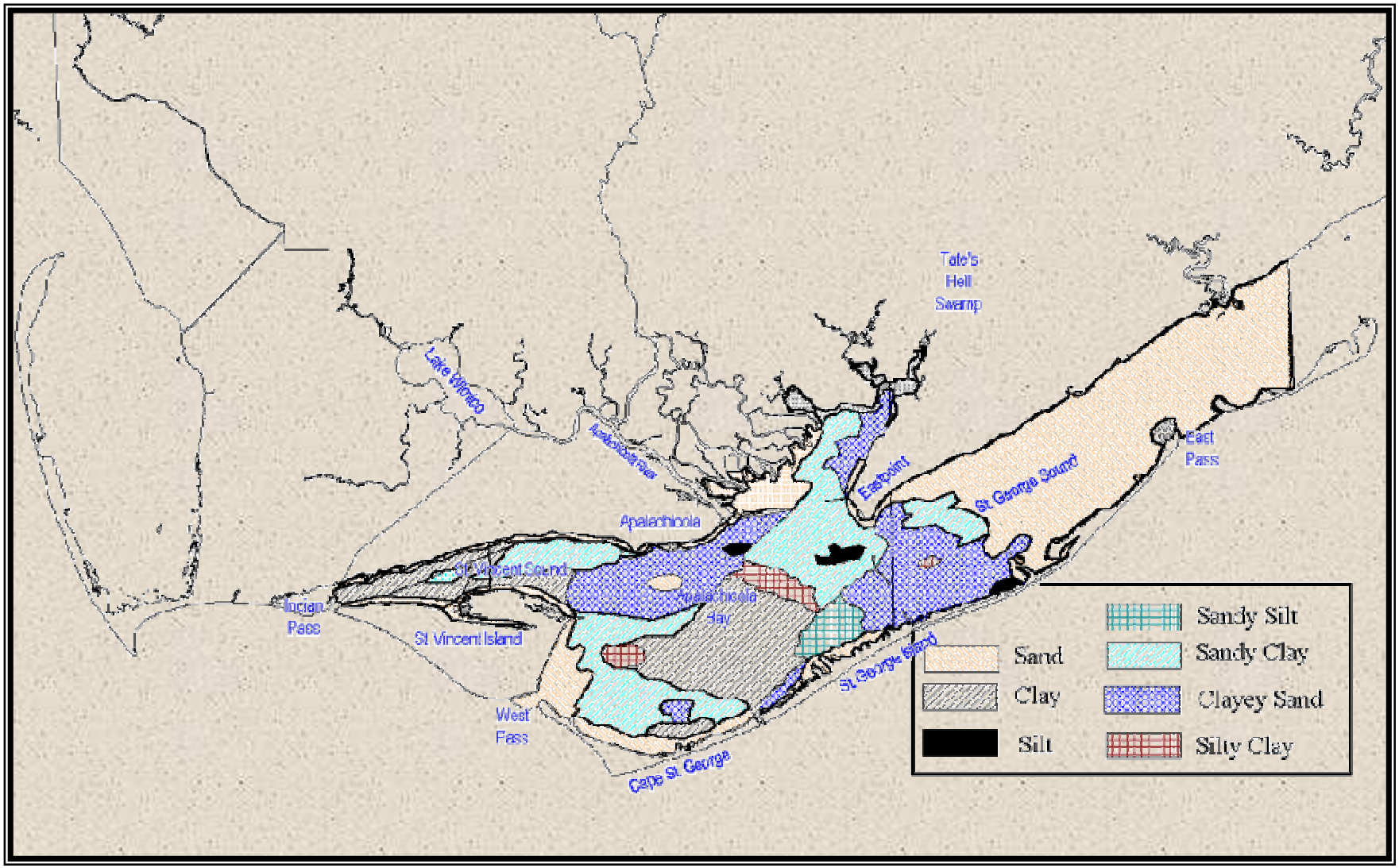
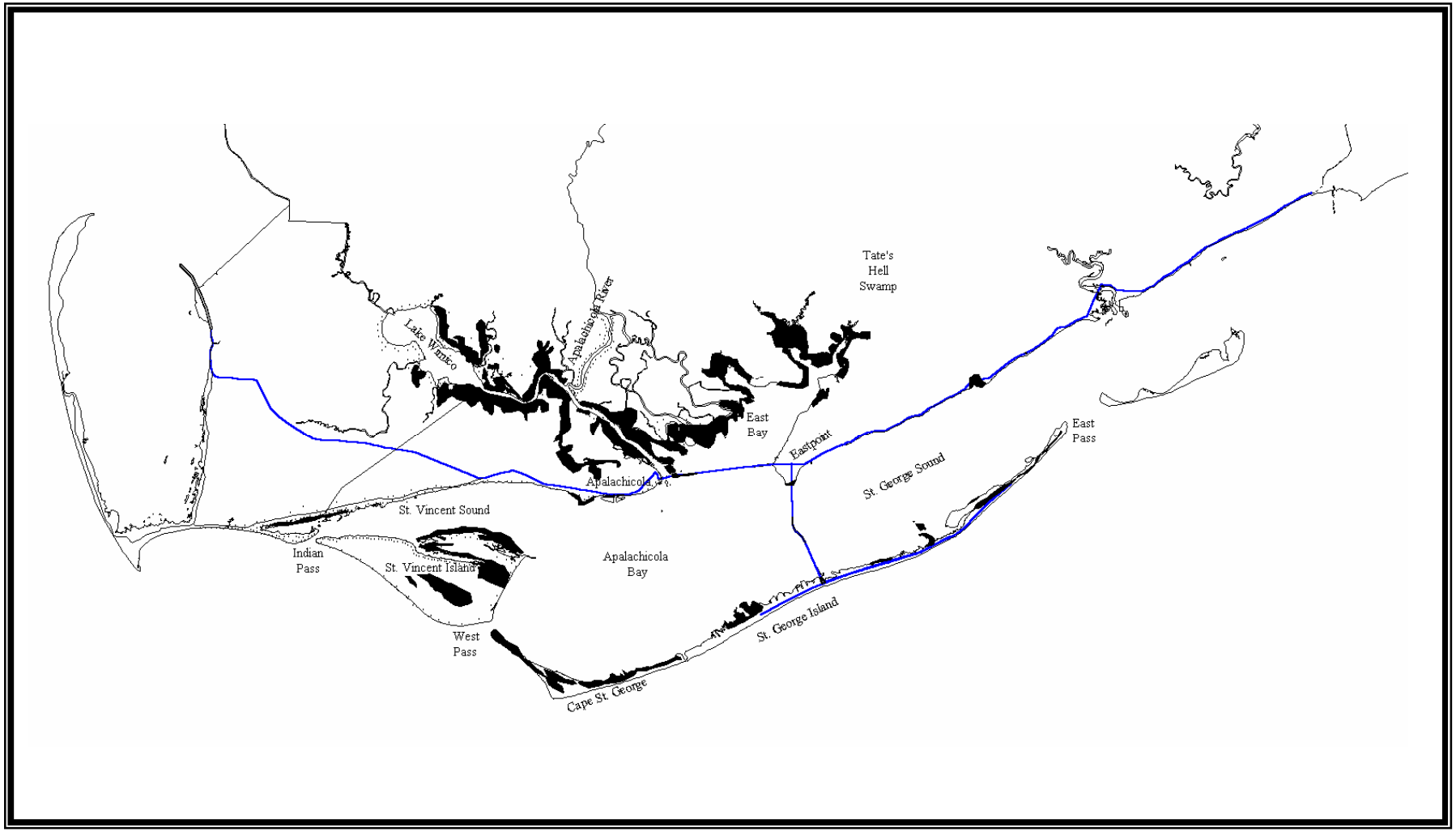


FIGURE 12: Emergent Aquatic Vegetation Distribution of the Apalachicola Estuary

(Livingston, 1983)



The simplest habitat to physically define and one of the most difficult to measure is the open water. Organisms associated with this habitat include planktonic and nektonic forms. The major component of the nekton in Apalachicola Bay is dominated by estuarine dependent fish. Menzel and Cake (1969) estimated that three-fourths of the commercial catch in Franklin County is dependent on the estuarine habitat and condition of the bay. Important commercial finfish from the Reserve include mullet, spotted seatrout, flounder, spot, croaker, and redfish, which is now a recreational species only (FDNR, 1985).

C. Apalachicola River System

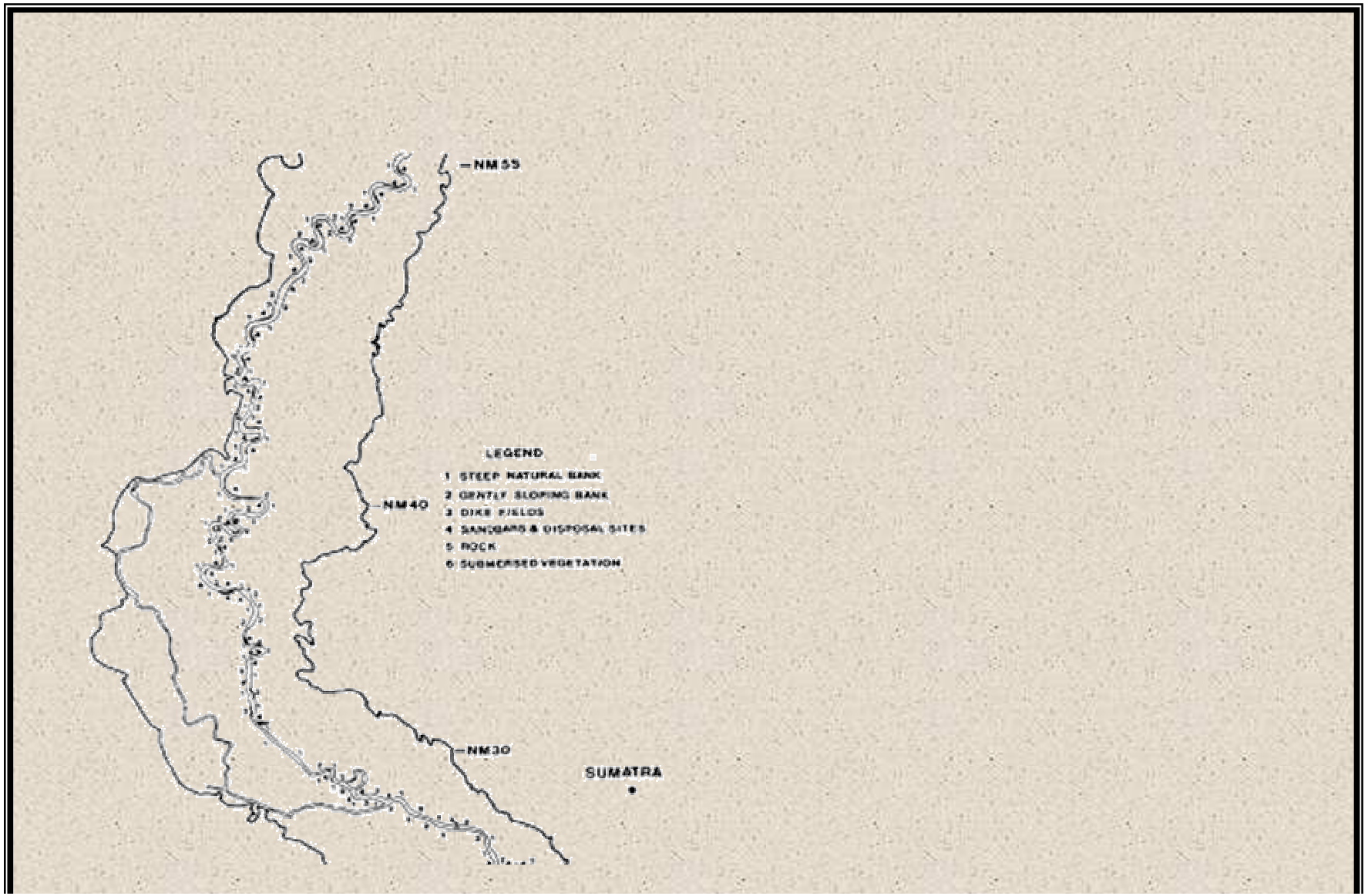
The Apalachicola River is the largest in Florida and ranks 21st in the United States in terms of flow, as well as being one of the last remaining undammed large rivers left in the country. The importance of the Apalachicola River to the productivity of the bay cannot be overemphasized. Numerous studies relating the productivity of the bay to the river's nutrients (Mattraw and Elder, 1980, 1983), floodplain litter and detritus (Livingston, 1981; Elder and Cairns, 1982; Elder and Mattraw, 1983), and flow (Maristany, 1981; Alabama et al., 1984) have been published.

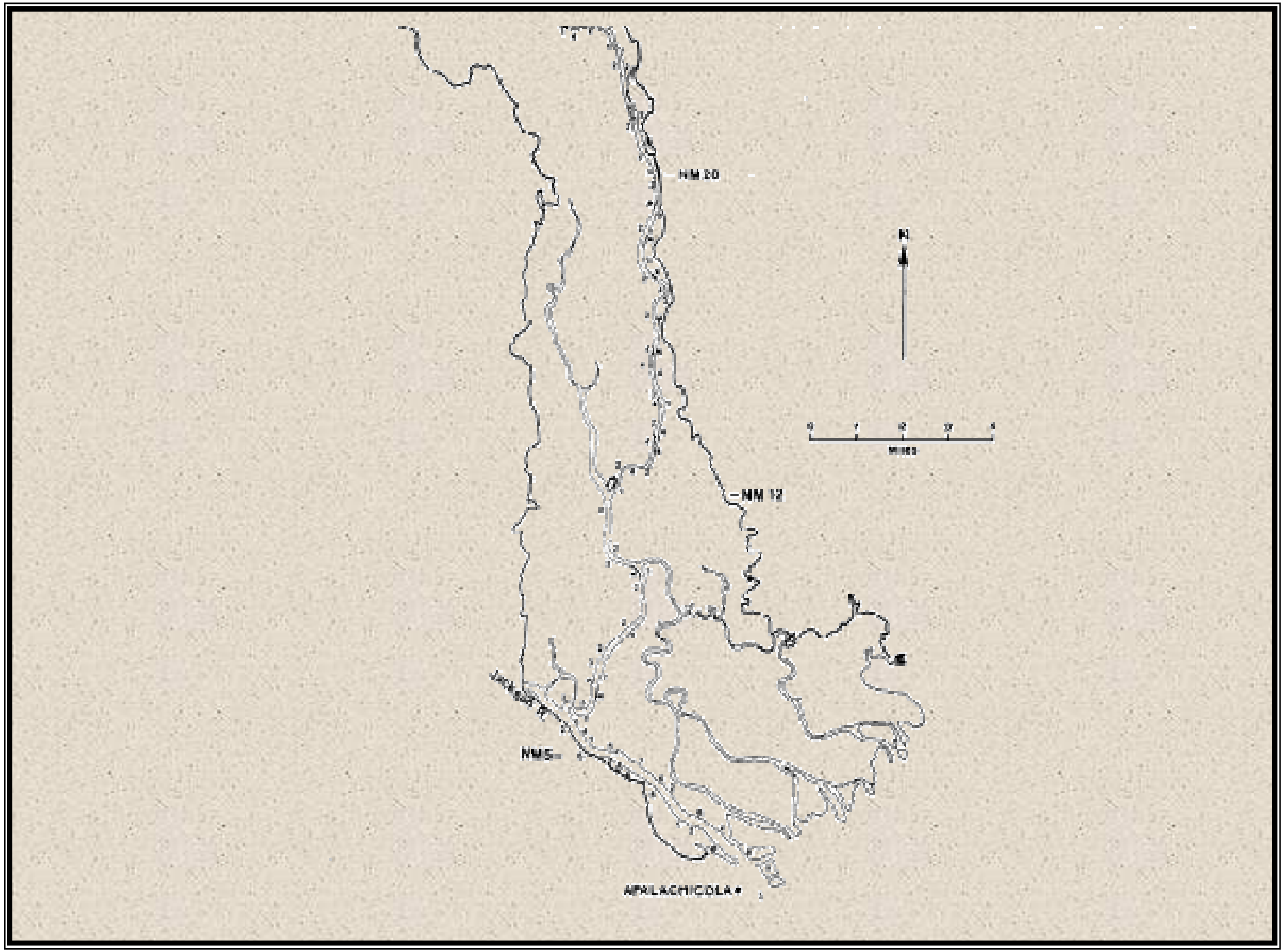
The lower 52 miles of the river are also a part of the Reserve, as are most of the distributaries which branch off the lower portion of the river and empty into East Bay (Figure 13). The middle and lower river (river mile 78 to river mile 0) flows through lowlands with a maximum land elevation less than 100 feet, and is characterized by a floodplain which varies from two to five miles wide (Leitman et al., 1983).

Six distinctive shoreline habitat types have been located within the Apalachicola River along its entire 215 mile shoreline (Ager et al., 1984). These have been catalogued and divided into steep natural bank, gently sloping natural bank, dike field, sandbar, rock, and submersed vegetation. All of these habitat types except rock are found in the middle and lower river sections within the Reserve (Figure 13). Mid-river habitat, which accounts for a significant portion of the riverine habitat, is less well known but the substrate generally consists of clam shells, clay, detritus, or sand, depending on location (USFWS, 1986; Ager et al., 1987).

Steep natural bank and gently sloping natural bank predominate in the middle and lower river (Figure 13). The substrate in this habitat is a mixture of clay, mud, and fine sand, and typically contains overhanging trees with many snags and submerged logs. Water depth varies from greater than six feet with a slope greater than 45 degrees to water depths generally less than 4 feet with a slope less than 45 degrees. Species commonly found in this habitat include bluegill, blacktail shiner, redbreast sunfish, largemouth bass, redear sunfish, and spotted sunfish. This habitat ranks second in the number of fish caught (catch per unit effort-CPUE) in the middle and lower river (Ager et al., 1984, 1985).

FIGURE 13: Distribution of Shoreline Habitats on the Apalachicola River and Major Distributaries
(modified from Ager et al, 1984)




NM 20
N
NM 12
NM5
APALACHICOLA

Submersed vegetation habitat is only found in the lower six miles of the river, but it accounts for over 10 percent of the habitat in the lower river (Figure 13). The vegetation characteristic of this habitat is tapegrass and is usually found in bands 10 to 100 feet wide parallel to the shoreline. Water depth is shallow and few snags or overhanging vegetation are present. Species commonly found in this habitat include largemouth bass, bluegill, American eel, redear sunfish, striped mullet, eastern chain pickerel, spotted sunfish, and numerous other estuarine fish. This habitat appears to be important to the largemouth bass in the lower river as evidenced by the second highest catch rate in the river (Ager et al., 1984, 1985).

The sandbar habitat found in the river consists of two types, the natural sandbar, of which few still exist, and the dredged material disposal sites used by the U.S. Army Corps of (USACOE) as part of the authorized navigation project on the river. Approximately 23 percent of the middle and lower river shoreline consists of this habitat type (Figure 13). This habitat is characterized by shallow water less than four feet, the absence of snags, and an unstable, shifting sand substrate. Species commonly found in this habitat include blacktail shiner, striped mullet, redbreast sunfish, weed shiner, and threadfin shad. The sandbar habitat is the least productive habitat in the river, especially for gamefish species (Ager et al., 1984).

The dike fields form an artificial habitat constructed by the USACOE for navigation purposes. Each field usually consists of three to five individual dikes, constructed perpendicular to the shoreline and made of wood pilings or rock. There are only four dike fields in the middle and lower river accounting for less than one percent of the shoreline habitat. Because of the large number of snags usually associated with these dike fields and the cover and food they provide, they rank first in catch rate on the river and third in number of gamefish (Ager et al., 1984).

D. Apalachicola River Floodplain System

The floodplain of the Apalachicola River is the largest in Florida and one of the larger floodplains on the Gulf Coast. It encompasses approximately fifteen percent of the river's drainage area in Florida, about 144,000 acres (Wharton et al., 1977; Elder and Cairns, 1982). The lower river floodplain, within the Reserve, ranges from two to four and one-half miles across (Leitman et al., 1983).

The natural riverbank levees vary from two to eight feet higher than the surrounding floodplain and average 50 to 150 feet wide. Water level fluctuations throughout the year range from seven feet at Sumatra, river mile 22, to approximately four feet at Apalachicola (Leitman, 1983; Leitman et al., 1983).

FIGURE 14: Distribution of Floodplain Habitats on the Apalachicola River

(modified from Leitman, 1983)

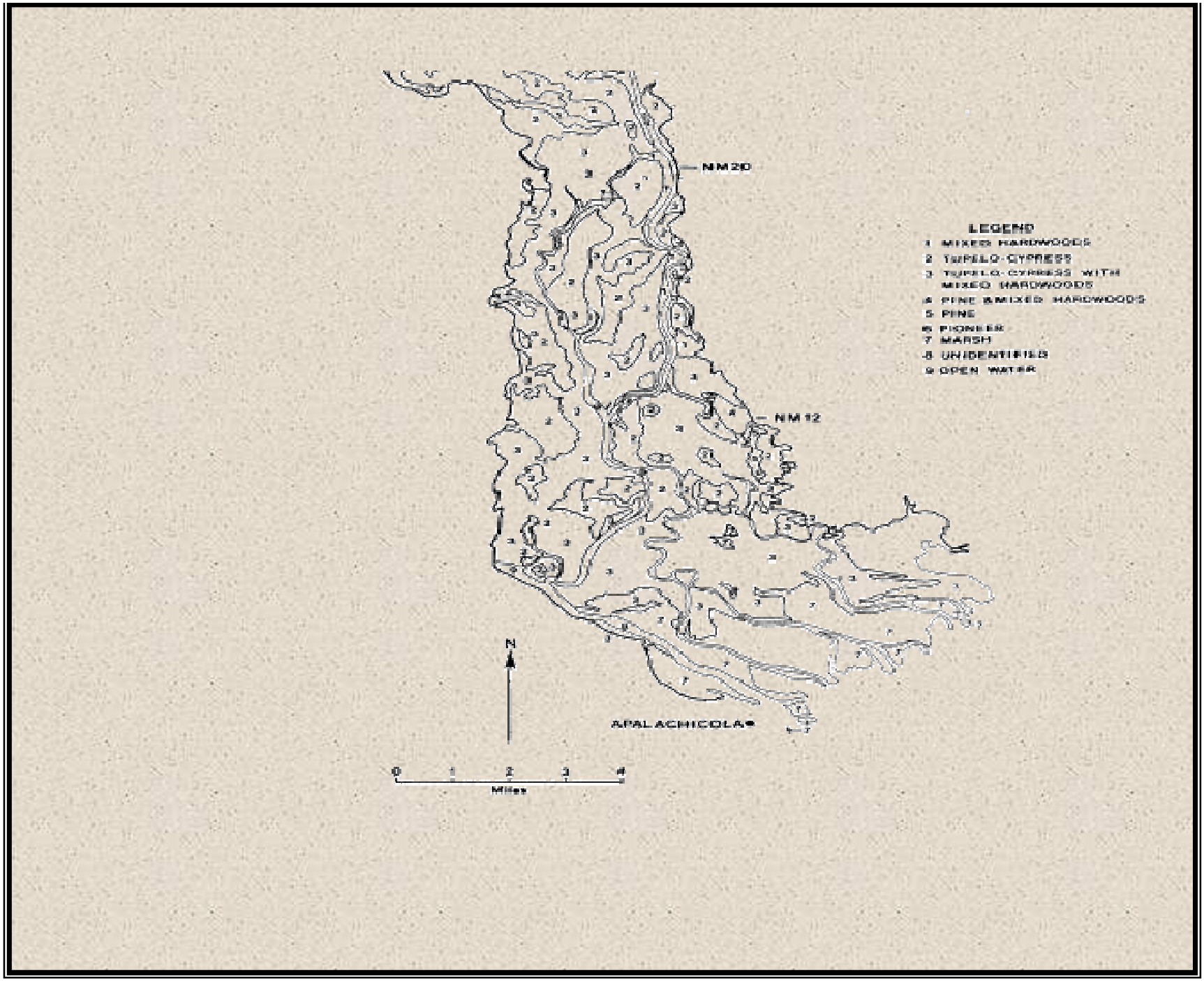

NM 20
NM 12
LEGEND
1 MIXED HARDWOODS
2 TUPELO-CYPRESS
3 TUPELO-CYPRESS WITH MIXED HARDWOODS
4 PINE & MIXED HARDWOODS
5 PINE
6 PIONEER
7 MARSH
8 UNIDENTIFIED
9 OPEN WATER
N
APALACHICOLA
0 1 2 3 4
Miles

TABLE 3: Forest Types and Acreage of the Lower Apalachicola River Floodplain (modified from Leitman, 1983).

Name	Predominant Species	Associated Species	Lower River (to mouth distance: 42 miles)
Pine	Loblolly pine and other pines	Sweetgum, sugarberry, water oak, possumhaw, American hornbeam	204
Pine and mixed hardwoods	Sweetgum, sugarberry, water oak, loblolly pine	American hornbeam, possumhaw, diamond-leaf oak, green ash	628
Mixed hardwoods	Water hickory, sweetgum, overcup oak, green ash, sugarberry	Diamond-leaf oak, water oak, American elm, possumhaw, red maple	17,618
Tupelo-Cypress with mixed hardwoods	Water tupelo, ogeechee tupelo, bald cypress, swamp tupelo, Carolina ash, planer tree	Overcup oak, pumpkin ash, red maple, water hickory, American elm, green ash, diamond-leaf oak, sweetbay	31,030
Tupelo-cypress	Water tupelo, bald cypress, ogeechee tupelo, swamp tupelo	Carolina ash, planer tree, pumpkin ash, sweetbay	16,996
Pioneer	Black Willow	American sycamore, birch, green ash	19
Marsh	Sawgrass, bullrushes, cattail	Big cordgrass, softrush, giant cutrush	9,030
Open water			4,810
Unidentified			176
Total			80,553

Six forest types and several other categories have been identified on the Apalachicola River floodplain (Figure 14) using color infrared photographs and cruise transect data (Leitman, 1983; Leitman et al., 1983). The dominant and associated species found with them are the distinguishing characteristics used to separate these types (Table 3). Compared to the upper river, the lower 42 miles of the river floodplain are dominated by wet-site species with fewer pine and mixed hardwood types.

The tupelo-cypress with mixed hardwoods forest type dominates the lower river covering 38 percent of the floodplain (Figure 14). Occupying low flats, sloughs, and hummocky areas which provide small variations in elevations, this is mostly a wet-site forest. Areas occupied by this forest type are inundated or saturated from 50 percent (hummocks) to 100 percent (sloughs and pools) of the year. The tupelo-cypress forest type, which covers 21

percent of the lower river floodplain (Table 3), is found in areas where the soil is poorly drained, such as backswamps and low flats. Areas in which this forest type is found usually have heavy clay soils which are inundated more than 50 percent of the year and saturated continuously (Leitman, 1983; Leitman et al., 1983).

Mixed hardwood forest type covers 22 percent of the lower 42 miles of the floodplain but is primarily found in the upper twenty miles of this section. Predominant species are water hickory, sweetgum, overcup oak, green ash, and sugarberry. All these species are usually associated with levees, terraces, and areas that are inundated only about five to 30 percent of the year. The mixed hardwood forest and tupelo-cypress with mixed hardwoods association, which are normally referred to as bottomland hardwoods, combined make up approximately 60 percent of the lower 42 miles of floodplain, almost all of which are managed by other agencies, but are included within Reserve boundaries.

Marsh, which is restricted to the lower ten miles of the river, covers 11 percent of the lower river floodplain. The marsh actually covers almost 100 percent of the last several miles of floodplain, occupying most of the lower river birds-foot delta (Figure 14). Open water accounts for most of the remaining habitat of the lower river floodplain (Leitman, 1983; Leitman et al., 1983).

Floodplains in the southeastern United States are in many instances the last refuge for rare and endangered flora and fauna (Gatewood and Hartman, 1977). Clewell (1977) lists sixteen species of plants only found in Florida on the Apalachicola River floodplain. Other data indicate that at least 22 species of threatened or endangered plants have been found in the floodplain (Clewell, 1977, 1986; Gholson, 1985; ANERR, 1986; FGFWFC, 1990). The floodplain forest has also been cited as being the most important wildlife habitat in northwest Florida (Gatewood and Hartman, 1977). Four species of amphibians and reptiles, four species of mammals, and eleven species of birds have been listed as Threatened, Endangered, or Species of Special Concern (See Appendix 1a & 1b) from the Apalachicola River floodplain (Means, 1977; Stevenson, 1977; FGFWFC, 1982; Edmiston and Tuck, 1987; FGFWFC,1990).

E. Upland System

Very few uplands are within Reserve boundaries except for the barrier island uplands. The two primary upland habitats on the mainland within Reserve boundaries are sand pine scrub and pine flatwoods, both of which are located in the northern and eastern portions of East Bay (Figure 15). Because of the limited amount of literature on these communities, habitat descriptions are somewhat generic.

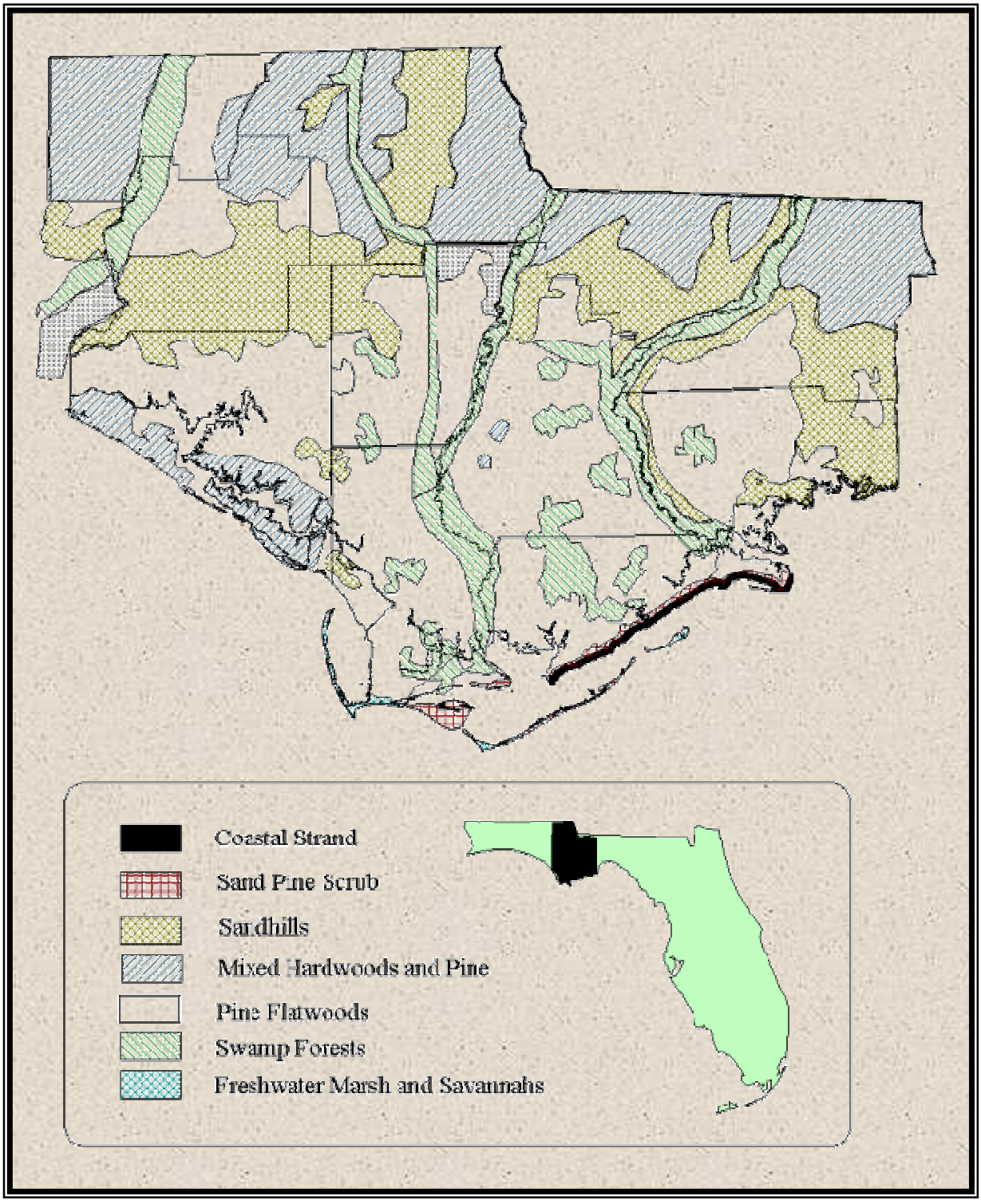
Approximately 400 acres of sand pine scrub exist on the eastern side of East Bay. Within Franklin County, scrub occurs on dune and beach ridges near the coast with small isolated stands existing inland on relic shorelines. A dense stand of sand pine forms the overstory while the understory is usually limited to myrtle oak, sand live oak, and rosemary. There is usually little or no herbaceous ground cover and little or no organic matter in the upper soils (Clewell, 1986).

Pine flatwoods dominate the narrow band of uplands north of East Bay (Figure 15). Most of these flatwoods are on privately owned tracts included within Reserve boundaries. Pine flatwoods are mesophytic communities characterized by one or more species of pine as the dominant tree species. Mesic flatwoods are the most widespread community in Florida comprising 30-50 percent of the uplands (FNAI, 1986), and occur most frequently in areas with flat topography (marine terraces) (Monk, 1968). Flatwoods are abundant and widespread throughout the panhandle and are particularly common in the Coastal Lowlands (Clewell, 1986). Wet flatwoods or boggy flatwoods are particularly characteristic of the Tate's Hell region of Franklin County (Clewell, 1986).

Slash pine usually dominate pine flatwoods in this area. The slash pine-scrub community usually grades into pine flatwoods which tend to occur on poorly drained or wet sites. The major associates include a dense understory of fetterbush, saw palmetto, gallberry, maleberry, and large-flowered staggerbush (Cape St. George). Palmettos form a more dense cover than in the scrub communities. Minor associates include sundew, St. John's-wort, mint, blueberry, and huckleberry. Pine flatwoods bordering salt marshes take on a tall understory of live oaks and occasional cedars and cabbage palms (FDNR, 1983). Pine flatwoods are also referred to as pine savannahs, low flatwoods, mesic flatwoods, wet flatwoods, pine barrens, slash pine flatwoods, longleaf pine flatwoods, or pond pine flatwoods.

Slash pine flatwoods dominate poorly drained sites and occur in low spots surrounded by longleaf pine flatwoods, around flatwoods ponds, in narrow belts around the edges of bayheads or swamps, and over rather extensive areas of wet soils marked by the presence of pitcher plants or crayfish burrows (Hubble et al., 1956). The more acidic, poorly drained sites are dominated by pond pine flatwoods. They occur in extremely flat areas, always at a slightly lower level than bordering areas of longleaf pine flatwoods. Pond pine flatwoods are stressed by an excess of water and tend to have the lowest diversity of the three flatwoods communities (McDiarmid, 1978). Pond pines are usually scattered, with large areas of fetterbush. Herbaceous vegetation is scarce (Hubble et al., 1956).

FIGURE 15: Natural Vegetation of the Apalachicola Basin



The soils of flatwoods are moderately to poorly drained. They consist of acidic sands, with a moderate amount of organic matter in the upper few centimeters, and generally overlying an organic hardpan at depths of 1-3 feet (Harper, 1914; Hubbell et al., 1956; Snedaker and Lugo, 1972). This hardpan reduces the percolation of water below and above its surface. During the rainy season, water may stand in these areas, and in the dry season plant roots may have trouble penetrating the hardpan layer. Pine flatwoods are associated with and grade into wet flatwoods, scrubby flatwoods, dry prairies, titi swamps, bayheads, and sandhills.

Flatwoods, depending on successional stage and management activities, generally have a high diversity of wildlife populations. Not only are flatwood communities important for wildlife, but the ecotones, or boundaries between flatwoods and associated communities are used extensively by various animals. Flatwoods and ecotones surrounding them provide an extensive source of wildlife food, nesting and escape cover. Animals characteristic of flatwood communities include black bear, white-tailed deer, raccoon, bobcat, fox, opossum, striped skunk, cotton rat, cotton mouse, black racer, pine warbler, red-shouldered hawk, southeastern kestrel, oak toad and chorus frog.

F. Flora and Fauna

The Reserve and surrounding drainage basin contain barrier islands, as well as estuarine, riverine, floodplain, and upland environments. The myriad of habitats found within these environments support a wide range of plant and animal species. A complete inventory of species mentioned in the text and threatened and endangered species found in the Apalachicola Reserve, can be found in Appendix 1 & 2.

More than 1,300 plant species have been identified within the Apalachicola drainage basin with 103 of them listed as threatened or endangered. Also, the largest stand of tupelo trees in the world is found in the lower Apalachicola River floodplain (ANERR, 1990).

The Apalachicola River drainage basin contains more than 40 species of amphibians and 80 species of reptiles. This is the highest diversity of these animal groups in the United States and Canada. Among these many species are the southern dusky salamander, the gopher frog, Barbour’s map turtle, which is endemic to the Apalachicola River, Atlantic loggerhead turtle, Apalachicola kingsnake, and eastern indigo snake (ANERR, 1990a).

Mammals also abound within the Reserve. More than 50 species, including the threatened Florida black bear, the endangered West Indian manatee, the Indiana bat, and the gray bat are found in the Apalachicola Basin (ANERR, 1990b).

The Reserve and surrounding drainage basin are among the most important bird habitats in the southeastern United States. This area lies on the eastern fringe of the Mississippi Flyway, thus receiving large numbers of birds from both the Midwest and Atlantic Seaboard during migratory periods. The list totals more than 300 species with 22 designated as Endangered, Threatened or Species of Special Concern by the Florida Game and Fresh Water Fish Commission (ANERR, 1990).

CHAPTER 4

RESEARCH AND MONITORING

I. Introduction

A research and monitoring program is an essential element in any successful effort to manage and protect complex environments such as estuarine ecosystems. The Apalachicola National Estuarine Research Reserve; because of its size, the diversity of species and habitats present, and its ownership patterns; represents a difficult task. Therefore, it is especially important for the Reserve to have a research and monitoring program that addresses all the management issues and concerns that affect the Apalachicola Bay system.

II. Goals

A. National Research Goals of the NERR System

Research policy at Apalachicola NERR is designed to fulfill the NERR System goals as defined in the NERR program regulations. These include:

- Address coastal management issues identified as significant through coordinated estuarine research within the System;
- Promote Federal, state, public and private use of one or more Reserves within the System when such entities conduct estuarine research; and
- Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

B. ANERR Goals

The overall goal of the ANERR research and monitoring program, working within the national goals is:

> To promote, engage in, and coordinate research and monitoring to provide information that promotes understanding, protection, and enhancement of the natural resources of the Apalachicola River and Bay system, as well as other estuaries nationwide.

III. Objectives

Objectives that address Reserve resource management issues and facilitate the accomplishment of this goal include:

- Develop and maintain an easily accessible on-site library of scientific reference materials relevant to the Apalachicola system and natural resource management issues;

- Develop and maintain a computerized database of all pertinent information collected within and adjacent to the Reserve for use in long-term and interdisciplinary research and monitoring efforts;

- Develop field and laboratory facilities, including housing facilities, and provide a basic level of scientific equipment and sampling gear necessary to attract and support research and monitoring studies;

- Design and carry out a comprehensive monitoring program to enable the Reserve to determine baseline changes in the status of the lower Apalachicola River and Bay system over long-term periods;

- Promote research and monitoring efforts within the Reserve through the development of agreements with other entities within DEP, other research organizations and universities, and other state and federal agencies;

- Establish priority topics for research, actively solicit researchers to develop projects to address these topics, and conduct in-house research to address these topics;

- Seek alternative funding sources for research projects, especially those that deal with high priority management related issues that are of critical interest to the Apalachicola Reserve;

- Develop a Reprint and Technical Report Series through the Reserve to promote research within the Reserve and to increase communication of research results to the scientific community and the general public;

- Actively provide research information necessary for sound natural resource management to federal, state, and local decision-makers so that their planning decisions are based on scientific information, thereby protecting the resources of the Reserve.

IV. Federal Funding Priorities

SRD research funds are used to support management-related projects than will: enhance scientific understanding of Reserve environments; provide information needed by Reserve managers and coastal decision makers; and improve public awareness and understanding of estuaries and estuarine management issues. Research projects must be oriented to specific reserves. The primary research objective for the NERRS is: the study of the causes and effects of natural and anthropogenically-induced change in the ecology of estuarine and estuarine-like ecosystems. All research designed through SRD should be designed to provide information of

significant value to the development and implementation of resource management policy governing the U.S. coastal waters.

SRD has identified four aspects of estuarine ecological change which are to receive particular emphasis:

- Nonpoint source pollution
- Habitat restoration
- Biodiversity and invasive species
- Sustaining resources within estuarine ecosystems.

SRD is a significant source of research funding for both independent and NERR staff researchers. SRD regulations specify the purposes for which research funds are to be used:

- support management-related research that will enhance scientific understanding of the Reserve ecosystem,
- provide information needed by Reserve managers and coastal ecosystem policy-makers, and
- improve public awareness and understanding of estuarine ecosystems and estuarine management issues.

SRD encourages coordinated research among Reserves and other scientists by preferentially funding research proposals on specific estuarine topics which it has identified as national priorities. This unified approach promotes the exchange of research findings among Reserves, state and federal agencies, and members of the academic research community.

Research funding priorities for the NERR System were first established in 1984, when a group of leading scientists convened to evaluate the status of estuarine knowledge. The group identified a diverse set of estuarine issues which were to receive top priority for research funding. These included: (a) sediment management, (c) nutrients and chemical inputs, (d) coupling primary and secondary productivity, and (e) fishery habitat requirements.

The NERRS research program was re-evaluated in 1991, in 1994, and again in 1996. Beginning in FY97, SRD began funding a competitive Graduate Fellowship Program in the NERRS. The graduate fellowship program is intended to produce high quality research in the Reserves focused on improving coastal zone management while providing graduate students with hands-on experience in conducting ecological monitoring. This fellowship provides graduate students with funding for one to three years to conduct their own research projects and provides training in ecological monitoring. Research projects must address coastal management issues identified as

having regional or national significance and be conducted at least partially within one or more designated NERRS sites.

As part of the ecological monitoring education program, students will be asked to provide up to fifteen hours per week of assistance to the Reserve. This program will be designed with the on-site staff and may include on-site monitoring or research assistance or performing additional sampling or analyses for the Reserve; this training may take place throughout the school year or may be concentrated during a specific season. Students will be encouraged, but not required, to incorporate these training activities into their own research programs.

V. History of Research in the Apalachicola Bay System

The first published research efforts in Apalachicola Bay began in 1896 with a survey of the oyster beds by Lt. Franklin Swift, of the U.S. Navy, for the U.S. Commission of Fish and Fisheries (Swift, 1897). This survey provided estimates of the location, size, and productivity of oyster beds as well as the location of areas suitable for the planting of oysters. This effort was repeated twenty years later with similar yet more detailed results (Danglade, 1916).

The first published botanical reports on the area now within Reserve boundaries include surveys of St. Vincent Island (McAtee, 1913), the lower Apalachicola River floodplain (Harper, 1911; Kurz, 1938), and the Florida panhandle (Harper, 1914; Kurz, 1942). Recent botanical research in the lower Apalachicola River has concentrated on the forested floodplain (Hubbell et al., 1956; Clewell, 1977; Leitman et al., 1983; Leitman, 1984; Gholson, 1985; Anderson, 1988), and its importance to the bay's food web (Sheridan and Livingston, 1979; Livingston, 1981). Analysis of habitats in the lower river and bay system have shown the extent and distribution of both emergent and submerged vegetation (Livingston, 1980, 1984; Leitman, 1984; Continental Shelf Associates, Inc., 1985) as well as its importance to benthic fauna (Alvis, 1971; Sheridan and Livingston, 1983). In the only large scale habitat alteration experiment (less than 5 acres) within the Reserve, to-date, an emergent brackish water marsh was created from dredge spoil material by Kruczynski et al. (1978).

Phytoplankton (Estabrook, 1973; Myers, 1977; Myers and Iverson, 1977) and zooplankton dynamics (Blanchet, 1979, Edmiston, 1979; Marcus, 1990) have been briefly investigated. Microbial research has focused mainly on coliform or pathogenic bacteria (McPhearson, 1973; USEPA, 1981; Blake and Roderick, 1983; Hood et al., 1983; FDNR et al., 1984; DePaola et al., 1984; Thompson et al., 1984; FDER, 1985; Williams and LaRock, 1985; Elder, 1986), and food web dynamics (Bechtold, 1976; Morrison, 1980; Morrison et al., 1977; Morrison et al., 1977a; White, 1983; White and Livingston, 1979; White et al., 1979, 1980; Smith et al., 1982).

The majority of the biological research in the bay has been related to benthic invertebrate and fish population dynamics. Studies have been conducted on shrimp (Ingle, 1956), blue crabs (Laughlin, 1976, 1979, 1982; Laughlin et al., 1978;

Oesterling and Evink, 1977), oysters (Ruge, 1897; Ingle and Dawson, 1950, 1952, 1953; Ingle, 1951; Dawson, 1955a; Menzel et al., 1958, 1966; Rockwood and Mazek, 1977; Menzel, 1983; Hood et al., 1981, 1983a; Andree, 1983; Blake and Roderick, 1984; Berrigan, 1986; Thompson et al., 1990), and finfish (Miles, 1951; Buckley, 1973; Livingston, 1974, 1976, 1977, 1978, 1981; Livingston et al., 1976, 1977; Sheridan, 1978, 1978a, 1979; Laughlin and Livingston, 1982; Woodsum and Livingston, 1985; Murphy and Taylor, 1989). Research on benthic macrofauna (Moore, 1898; Menzel, 1956; Menzel and Cake, 1969; Mahoney, 1982; Mahoney and Livingston, 1982), benthic infauna (Sheridan and Livingston, 1979; McLane, 1980; McLane et al., 1976), and aquaculture, primarily related to the economics of the oyster industry are numerous and varied (Rockwood, 1973; Whitfield, 1973, 1974, 1977; Whitfield and Beaumariage, 1977; Futch, 1983; Ingle, 1983; Otwell, 1983; Prochaska and Mulkey, 1983; Ednoff, 1984).

Investigations on fresh water organisms in the lower Apalachicola River, within the boundaries of the Reserve, have concentrated primarily on fish species and their distribution (Yerger, 1977; USFWS, 1977, 1980, 1983; Crateau et al., 1981; Bass, 1983; Ager et al., 1982, 1984, 1985, 1985a; Wooley, 1982; Wooley and Crateau, 1983, 1984, 1985) and molluscan fauna (Heard, 1964, 1977).

The physiography of the basin has been described by Puri and Vernon (1964). Geologic studies in the system have included investigations of the sedimentary environments (Cooke, 1945; Tanner, 1959, 1983; Van Andel and Poole, 1960; Kofoed, 1961; Kofoed and Gorsline, 1963; Barackman, 1964; Schnable, 1966; Isphording, 1985), history and evolution of the barrier islands (Tanner, 1975; Schnable, 1984; Schnable and Goodell, 1968; Schade, 1985; Donoghue, 1987), heavy mineral concentrating processes and sediment budget (Stapor, 1973, 1977; Donoghue, 1988; Donoghue, 1992; Donoghue and Tanner, 1990; Donoghue and Greenfield, 1991; Donoghue and Cooper, 1993; Donoghue and White, 1995), and neogene stratigraphy and geologic history of the bay (Schmidt, 1984).

General descriptions of the hydrography of the bay system have been done before (Ingle and Dawson, 1953; Dawson, 1955) and after the creation of Sike's Cut (Gorsline, 1963; Livingston et al., 1974; Christensen, 1983). The hydrology of the Apalachicola River has also been investigated due to its importance to the bay (Meeter et al., 1979; Maristany, 1981; USGS, 1981; Leitman et al., 1983; Alabama et al., 1984; Raney et al., 1985a). Several two-dimensional circulation models of the bay have been performed with varying results (Graham et al., 1979; Hill and Graham, 1980; Vansant, 1980; Conner et al., 1982; Raney and Youngblood, 1983; Raney et al., 1985b). The effects of man-made Bob Sike's Cut on the hydrodynamics and salinity of the bay have also been studied, with mixed opinions on overall impacts (Zeh, 1979; Mehta and Zeh, 1980; USACOE, 1982; Raney and Vin, 1986).

Additional studies on the potential effects of upstream water diversions on the productivity of the bay have been the focal point for most studies during the last five years due to the proposed water reallocation issue (Chanton, 1997; Light et al., 1997, Iverson et al., 1997; Huang and Jones, 1997; Livingston et al., 1997; Livingston,

1997; Livingston et al., 1998; Wilber, 1992; Wilber, 1994; Lewis et al., 1998; Niu et al., 1998).

The physical, chemical, and biological impacts of maintenance dredging and spoil disposal for the Gulf Intracoastal Waterway (Ingle, 1952; Water and Air Research, 1975; Saucier et al., 1978; Schubel et al., 1978; Taylor, 1978; USACOE, 1976, 1981; Livingston, 1984a; Leitman et al., 1986), the Apalachicola River Navigation Channel (USACOE, 1976, 1978, 1979, 1979a, 1980, 1981, 1984; Clewell and McAninch, 1977; Eichholz et al., 1979; Ager et al., 1982, 1984, 1985; Redmond, 1982; Allen, 1983; Vittor and Associates, Inc., 1985; Gholson, 1985), and various other permitted channels within the Reserve boundaries have also been assessed, due to the controversial nature of these projects (USACOE, 1974, 1979, 1982; Livingston, 1983; Raney et al., 1983; Geoscience, 1984).

Water quality parameters and nutrient chemistry have been monitored in the river (Cairns, 1981; FDE, 1982; FDER, 1982, 1984, Jackman and Hand, 1982, 1984; Elder and Cairns, 1982; Mattraw and Elder, 1980, 1983; University of Georgia, 1984), and the bay system (Estabrook, 1973; Myers, 1977; Myers and Iverson, 1977; Livingston and Duncan, 1979; Meeter et al., 1979; Livingston, 1981, 1983, 1983a). Contaminant studies of sediments (Livingston, 1983a, 1984a; Ryan et al., 1984; Geoscience, 1984; FDER, 1986), organisms (Elder and Mattraw, 1984; Winger et al., 1984), and the water column (Jackman and Hand, 1982, 1984; Livingston, 1983a) in both the river and bay have shown signs of pollution, but for the most part the system remains fairly uncontaminated.

Several authors have compiled and synthesized the above cited information into resource inventories or atlases. These include “Resource Atlas of the Apalachicola Estuary” (Livingston, 1983), “The Ecology of the Apalachicola Bay System: An Estuarine Profile” (Livingston, 1984), “Resource Inventory of the Apalachicola River and Bay Drainage Basin” (Edmiston and Tuck, 1987), and “Natural Resource Inventory: Apalachicola-Chattahoochee-Flint River Basin” (USFWS, 1987). These publications address habitats, natural resources, threatened and endangered species, hydrology of the river and bay, water quality, estuarine population and food web dynamics, and management concerns and should be examined by the interested reader for more detailed information about the Apalachicola Bay system and Reserve environment.

All of the above cited research has been accomplished by outside investigators either on their own or with the logistical assistance of Reserve staff. In the summer of 1990, a Research Coordinator position was established by the State of Florida to develop a research and monitoring program. The research staff currently includes the Coordinator and two research assistants, who work together to conduct, assist, and promote research within the Reserve.

VI. Research Facilities and Programs

A. ANERR Facilities and Equipment

The Apalachicola Reserve provides two office facilities, a main laboratory, and a field station for researchers wishing to study in the Apalachicola Bay system. The main lab consists of approximately 900 square feet at the Eastpoint facility which serves as the Reserve's headquarters, housing the research and administrative sections. This lab is outfitted with standard equipment such as a fume hood, lab benches, emergency eyewash/shower station, and assorted glassware. Other equipment currently available includes a digital balance, pH meter, centrifuge, drying oven, muffle furnace, turbidity meter, dissolved oxygen meter, refractometer, Hydrolab Datasonde 3 dataloggers, Reichert dissecting microscopes, and a Reichert Microstar IV compound microscope with slide and video capabilities.

The Education section has its headquarters at the Howell Building in Apalachicola, which also houses a 100-seat capacity auditorium and interpretative center for visitors. This facility is equipped for slide and video presentations and provides space for the Reserve's monthly guest lecture series. These lectures are recorded on video and incorporated into the Reserve's audio/video library which is available to the public.

A stand alone greenhouse houses the Reserve's Estuarine Walk, which is primarily an educational display. This display includes a 1,500 gallon fresh water tank with fresh water marsh, a 1,500 gallon brackish water tank with salt marsh, and a 2,500 gallon full strength salt water tank, complete with representative species. This facility is available to researchers that may need holding facilities or other unique needs. The Reserve also has several small aquaria ranging in capacity from twenty to 125 gallons.

The Marshall House Field Station, located on Cape St. George Island, is a 2,100 square foot house available to researchers studying the many unique aspects of barrier islands. The house was built in the mid-1940's and was included in the purchase of the island by the state in 1977 and, although somewhat primitive, it can accommodate up to fifteen people for research field trips. The house was equipped in 1997 with solar power which provides adequate lighting and a water supply. The house also has a gas stove. For transportation on the island, four-wheel and six-wheel all terrain vehicles are available when accompanied by Reserve staff.

Because of the size and inaccessibility of many areas, research in the Reserve usually requires the use of boats. The Reserve currently has five vessels available for research, an 18.5-foot Wahoo with a 150 hp. outboard, a 17-foot Carolina Skiff with a 60 h.p. outboard for use in extremely shallow water, a 22-foot C-Hawk powered by a 200 hp. outboard, a 29-foot C-Hawk with cabin, powered by twin 225 h.p. outboards, for offshore or rough water use,

and a 34-foot landing craft for transporting vehicles and heavy equipment. All vessels are outfitted with VHF marine radios and complete safety equipment. A depth machine, GPS navigational units, and a radar machine are also available and can be used on the larger boats.

Field sampling gear available at the Reserve includes two 2.5 liter Nisken water sampling bottles, a Wildco Ponar grab sampler, YSI dissolved oxygen and salinity meters, plankton nets, otter trawl net, dip nets, seines, and secchi disc.

Another valuable tool available for researchers and the general public at the Reserve is the research library located at the Eastpoint facility. The ANERR library consists of over 4,800 publications pertaining to research and monitoring studies conducted within the Reserve and other related topics which are organized using a computerized bibliographic indexing system called ProCite. This software package provides a powerful and highly flexible filing system for the ever-expanding library.

A variety of Dell computers are available for data storage and management. Software available includes Microsoft Word, Microsoft EXCEL, MapInfo, and ArcView.

B. Other Area Research Programs

One of the primary objectives of the research program is to promote research within and adjacent to the Reserve by outside investigators from universities, government agencies, and private institutions. The benefits of encouraging outside investigators include high quality research, broad and varied levels of expertise, an interdisciplinary approach, potential use of graduate students from universities, and a wide range of funding sources that are not available through NOAA or DEP sources.

Agencies, universities, and institutions that have been highly involved in research and monitoring in the past or present within the Reserve include:

1. Florida State University, Tallahassee, and its Marine Laboratory, Franklin County

   Florida State University (FSU) is a major research institution which has marine and aquatic programs through the departments of Oceanography, Meteorology, Geophysical Fluid Dynamics, Geology, Biology, Chemistry, Physics, Engineering, and Economics. Professors from these departments have been involved in most of the research that has occurred within the Apalachicola River and Bay system in the past, and many are still currently involved in projects within the Reserve. The FSU Marine Laboratory, located approximately 35 miles from the Reserve's headquarters, has also been involved in research within the Reserve and maintains an important communication link

with the Reserve. The Reserve has also recently entered into a MOU with the Southeast Fisheries Science Center and the FSU/NOAA Institute for Fishery Resource Ecology to work together on mutually beneficial fisheries projects.

2. Florida Agricultural & Mechanical University, Tallahassee

   The Florida A&M University (FAMU) Biology Department has conducted several marsh-related research projects within Apalachicola Bay. Reserve staff jointly taught a graduate-level Marine Biology course in Apalachicola, for local teachers and have held courtesy faculty appointments with FAMU.

3. University of South Florida, Tampa

   The University of South Florida Anthropology Department has been involved in numerous archaeological projects within the Reserve and Basin for the last eight to ten years. Yearly digs continue as the number and variety of archaeological sites discovered within the Reserve continue to increase.

4. Harbor Branch Oceanographic Institute, Fort Pierce

   Harbor Branch Oceanographic Institute (HBOI), a private research facility maintained an oyster aquaculture operation within the Reserve, developing oyster farming techniques and training local shellfish harvesters. The project closed down in 1993, although Reserve staff still work with them and others on aquaculture issues.

5. Florida Marine Research Institute (FMRI), Eastpoint and St. Petersburg

   Cooperative agreements exist between ANERR and FMRI to cooperate on research related to Apalachicola Bay. In addition, an FMRI Fisheries Independent Monitoring program has been set up at Reserve headquarters with FMRI staff to begin monitoring in Apalachicola Bay. Research staff are in the process of setting up joint programs to assist each other in this aspect of monitoring.

6. Shellfish Environmental Assessment Section (SEAS) of the Florida Department of Environmental Protection

   SEAS and the Reserve share data collected within the system and have coordinated on monitoring potential water quality impacts from development adjacent to canals on St. George Island. Staff from both labs have also worked with EPA on a joint oyster research project and are continuing to coordinate on coliform pollution in the bay as it relates to nonpoint sources and oyster harvesting closures.

7. Bureau of Invasive Plant Management, Florida Department of Environmental Protection, Tallahassee

   This state entity is responsible for aquatic plant management, especially the control of exotic plants, which has become a serious problem in many parts of Florida. The Reserve continues to work on minimizing the spread of exotics in the Reserve. Potential future projects include the use of biological controls on these species rather than the normal application of herbicides, which is currently against Franklin County's recommendations

8. U.S. Fish and Wildlife Service (FWS); Division of Ecological Services and Division of Fishery Services, Panama City; and St. Vincent National Wildlife Refuge (NWR), Franklin County

   The Division of Fishery Services has several research and management oriented programs in which the Reserve participates. The Reserve has provided logistical support for their radio-tracking and monitoring of the sturgeon population in the river, as well as their striped bass stocking and monitoring program. The Reserve provides technical input to the Division of Ecological Services on dredge and fill permit applications and other habitat alteration proposals that might impact resources within the Apalachicola Basin. St. Vincent NWR and the Reserve coordinate on research activities that occur in or adjacent to the Refuge and provide logistical and technical support to each other whenever needed. The latest joint project between FWS and the Reserve involves the release of two red wolves onto Cape St. George Island. The release of these two historic predators helps FWS increase the number of release sites and will assist the Reserve in its predator control program related to protection of sea turtle nests.

9. U.S. Environmental Protection Agency (EPA), Environmental Research Laboratory Sabine Island, Gulf Breeze

   The EPA has been involved in a joint research project with the Reserve and the Shellfish Environmental Assessment Section of FDEP on immunology, pathology, and histology of oysters from oyster bars in the bay. This project, although winding down, has been going on for six years.

10. National Marine Fisheries Service; Southeast Fisheries Science Center, Panama City Laboratory; and Southeast Regional Office of the Habitat Conservation Division

    The Reserve has worked with the Habitat Conservation Division for years on habitat alteration permits and projects that occur within the Apalachicola Basin. The Reserve has also recently entered into a MOU with the Southeast Fisheries Science Center and the

FSU/NOAA Institute for Fishery Resource Ecology to work together on mutually beneficial fisheries projects.

11. Florida Game and Fresh Water Fish Commission (FGFWFC); Tallahassee, Panama City, Midway, and Howard's Creek Offices

The Reserve has worked jointly with FGFWFC staff on fish and wildlife inventories, threatened and endangered species protection, habitat alteration analysis, prescribed burning, and wildlife management plans in the past. This close relationship between the two agencies will continue in the future, to the benefit of both programs.

12. University of Florida Sea Grant Program, Apalachicola

The Reserve continues to work with the Sea Grant program as well as serving on their Marine Advisory Committee. Two oyster symposia have been jointly sponsored by the two agencies, one of which was published as a Sea Grant Report (SGR-57, 1983). The agent has also used the Reserve's meeting facility to conduct an education program for oyster processors on the Food and Drug Administration's new seafood inspection program known as HACCP (Hazard Analysis Critical Control Point).

13. Northwest Florida Water Management District (NWFWMD), Havana

The NWFWMD is a major landowner within the boundaries of the Reserve and has become more active in the Apalachicola Basin since 1988. The Reserve is a member of the Technical Advisory Committee and the Technical Working Group on Apalachicola issues and works closely with biologists, engineers, and planners from the NWFWMD. The Reserve also sits on a Water Allocation Committee to determine future needs for the system as part of a three state planning committee.

The Reserve and the NWFWMD have just finished working with outside investigators and research staff on nutrient inputs to the system, primary and secondary production coupling, primary productivity in the bay, and the development of a hydrodynamic model, to help determine fresh water needs of the system. Reserve staff also assist and provide input to the NWFWMD on their efforts to restore historical sheet flow patterns in Tate's Hell State Forest.

14. Florida Department of Health (HRS), Tallahassee and Apalachicola Offices

The Reserve has assisted HRS in water quality monitoring of stormwater outfalls and drainage ditches adjacent to the bay, to determine areas with malfunctioning or inadequate sewage collection systems around the city of Apalachicola. The Reserve also provides

logistical and technical support to HRS on septic tanks, their proximity to wetlands, and potential water quality impacts.

15. U.S. Geological Survey (USGS), Tallahassee

The USGS is responsible for monitoring flow on the Apalachicola River and maintains three gauging stations on the river located at Chattahoochee, Blountstown, and Sumatra. USGS also does quarterly water quality monitoring on the upper river, data which the Reserve will be including in its database. In the past, USGS has done significant studies on the river system concerning nutrient inputs to the system and the influence of river-stage on tree species in the floodplain. Reserve staff also assisted in the National Water Quality Assessment Program (NAWQA) undertaken on the ACF Basin.

16. Florida Division of Forestry (DOF), Carrabelle

The Florida Division of Forestry has become a major landowner within Franklin County and the local drainage basin affecting the East Bay area of the Reserve. They currently own over 80,000 acres locally, which have been incorporated into the Tate's Hell State Forest. Reserve staff are members of the land management advisory board and provide input on other matters related to their lands that impact Reserve waters.

17. Franklin County Board of County Commissioners and its Planning Office, Apalachicola

Reserve staff work with planning office staff on permits, grants, and monitoring plans for large-scale developments, especially at the behest of the County Commission which continually seeks input on environmental matters from Reserve staff. In particular, research staff have written monitoring plans for developments which have been incorporated into state and local permits in order to detect contaminants from these sites over the long-term.

18. Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), University of New Hampshire/NOAA

The new CICEET cooperative institute should be a major player dealing with research within Apalachicola NERR as well as all the NERRS. The Reserve currently has eleven proposals from outside researchers being reviewed for funding to work within ANERR. This new source of funding and the emphasis on contaminants and new technologies will be instrumental in helping ANERR manage its estuarine habitats more effectively.

19. Other Institutions and Agencies

The research staff are also involved with many other agencies and universities on research and monitoring projects as well as oil spill planning, land development regulations, resource inventories, listed species management, and other projects such as local science fairs, advisory committees, and planning committees. These entities include the Florida Department of Transportation, Florida Coastal Management Program, Apalachee Regional Planning Council, Department of Community Affairs, U.S. Coast Guard, U.S. Army Corps of Engineers (USCOE), City of Apalachicola, NOAA/SRD, University of Florida, Auburn University, as well as all of the above mentioned agencies.

VII. Research and Monitoring Program

The management issues were developed based on the uses of and threats to the natural resources of the riverine and estuarine system. These issues were then utilized to identify specific research and monitoring priorities applicable to the Apalachicola National Estuarine Research Reserve and its mandate of resource protection through research and monitoring. Many of these priorities also apply nationwide to many of the other reserves in the system.

A. National System Guidelines: Phased Monitoring Plan

In order to establish an efficient resource monitoring program, it is essential to have a good understanding of the resources that made reserve designation so important and the issues and problems that affect these resources. To help meet these needs, the Sanctuaries and Reserves Division of NOAA established a Phased Monitoring Program for the NERRS. The goal of this approach is to assist all reserves in the establishment of on-site resource monitoring programs which include at least some elements comparable throughout the national system.

It is the policy of the ANERR to follow the Phased Monitoring plan initiated by SRD in 1989, and as outlined in the NERRS Regulations and Strategic Plan.

The phased approach is divided into three distinct phases:

- Phase I: Environmental Characterization, including studies necessary for inventory and comprehensive site descriptions. Phase I helps Reserve management gain a better understanding of the resources within their particular Reserve. This includes descriptions of the hydrology, geology, water chemistry/quality, biological resources, the problems and issues confronting the Reserve environment, etc.

Depending on the site, this approach may require literature research, field research, or a combination of the two.

- Phase II: Site Profile, to include a synthesis of data and information. Phase II provides an overall picture of the Reserve in terms of its resources, issues, management constraints, and research needs. This profile should also contain a high quality map of the Reserve and be in a format similar to the estuarine profiles published by the U.S. Fish and Wildlife Service.

- Phase III: Implementation of a systematic long-term monitoring program to focus on selected parameters. This phase begins only after the Reserve has completed the first two phases. The first two stages help Reserve management pinpoint the most important resources to be monitored and address the scientific aspects of monitoring. It is important to note that monitoring programs are not meant to monitor all resources at a given site, rather they are meant to monitor those parameters deemed essential to provide information necessary to make the "best and most informed" management decisions.

In support of Phase III, the NERRS and NOAA developed the System-Wide Monitoring Program (SWMP) in 1994 that focuses on three different ecosystem characteristics:

- Abiotic Parameters: Each Reserve will monitor a uniform suite of physical and chemical processes that either impact or reflect the health of estuarine ecosystems. These will include: basic water quality indicators, atmospheric conditions, and specific processes such as tidal and ground water flow and contaminants.

- Biodiversity: Across the NERR System, each site will monitor two fundamental features of their respective estuarine ecosystems: (i) basic community structure in major estuarine habitat types (e.g. uplands, emergent wetlands, benthos, etc.); and (ii) population trends of important "target species" including those of commercial, recreational, or conservation significance (e.g. SAV, marsh plants, wading birds, endangered species, etc.).

- Land Use Patterns: In recognition of the profound influence of land and water use on estuarine resources, the NERRS monitoring program will compile existing and new data on major patterns of habitat classification and use within NERRS watersheds. Data will be gathered from a variety of state and Federal sources, including NOAA. Data will be updated periodically and used to detect and track significant changes in watershed use and its impacts on Reserve resources.

Information generated by the NERRS monitoring system will be compiled electronically at a central data management "hub", and will be available to all Reserves, CZM programs, OCRM and other users. Each Reserve will have constant electronic access to all system-wide data and summary statistics on environmental trends at the national, regional or site-specific levels.

B. SWMP Implementation

Year One involved designing the program and procuring two YSI dataloggers for each site to begin the initial stage of monitoring abiotic factors. The establishment of two stations in each Reserve continuously monitoring (every thirty minutes) conductivity, salinity, temperature, pH, dissolved oxygen, turbidity, and water level plus other parameters provides important baseline data for other studies and researchers as well as being useful stand alone information. The establishment of a Central Data Management Office (CDMO), located at the Baruch Marine Station in South Carolina, to coordinate and store data and encourage national dissemination was an integral part of the first year program.

Year Two involved the addition of at least one more datalogger per site (two in most instances), telemetry equipment at nine sites (not including ANERR), and the acquisition of a weather station for each NERR site.

Year Three priorities (1997/1998) included maintenance of the existing data collection effort, which includes the deployment of three dataloggers, as well as the collection of weather data. A modified monitoring plan that addresses specific coastal issues that are important locally as well as nationally is also being developed by each site as well as continuation of specific research and monitoring programs at each site. Those sites that have the manpower to expand the national effort will also begin to monitor one of the following three components of the agreed upon program:

- Sediment Contaminants
- Nutrients
- Habitat Change

Additional phases (both II & III) are currently being designed and funding and manpower sought for expansion of the program.

In addition, to help support the SWMP program and increase research in each Reserve, the old competitive research program funded by SRD was modified in 1996 into the Graduate Research Fellowship (GRF) program. The GRF program funds two graduate fellowships at $16,500 each to do their research within Reserve boundaries. In 1997, 36 fellowships were funded nationwide, with two being funded at ANERR. The fellowships are provided “to support

management-related research projects that will enhance scientific understanding of Reserve ecosystems, provide information needed by Reserve management and coastal management decision-makers, and improve public awareness and understanding of estuarine ecosytems and estuarine management issues." The fellowships also offer hands-on training in ecological monitoring and coastal zone management.

The newest component at the national level which will further strengthen the viability and visibility of the NERR research and monitoring program is the Cooperative Institute for Coastal and Estuarine Environmental Technology, CICEET, established at the University of New Hampshire in partnership with NOAA. This institute will be directly involved in funding research and monitoring programs within the NERRS, especially that related to contaminants and utilizing innovative techniques and new technology.

C. ANERR Research Program

The Apalachicola Reserve has also developed research priorities so that they are more applicable to the specific management issues that currently confront the Apalachicola Reserve. These priorities are utilized by the Reserve to help guide the research program and also focus outside researchers on appropriate and applicable project ideas. These priority research topics include:

- Population changes, habitat and food requirements, environmental factors, recruitment, predation, and mortality of ecologically, recreational and commercially important species of the Apalachicola River and Bay system;

- Examination of the morphology and hydrology of the river and bay system and identification of the variables that are important forcing functions in the system;

- Effects of historic, current and proposed upstream water reductions and uses on the hydrodynamics and natural resources of the Apalachicola River and Bay system;

- Assessment of the effects of man-made alterations such as Sike's Cut, causeway bridges, dredge and spoil activities, shoreline stabilization, and development activities on the hydrodynamics, sediment regime, contaminant loading, and natural resources of the Apalachicola River and Bay system;

- Assessment of the role of marshes and seagrass beds in nutrient cycling, estuarine productivity, and as nursery areas for important commercial and noncommercial species of the Apalachicola Basin;

- Ecology of and development of conservation strategies for threatened and endangered species found within the boundaries of ANERR;

- Assessment of the importance of upstream activities, local stormwater runoff, and marine activities on the nutrient and contaminant loading of the bay system;

- Continued identification and cataloging of plants and animals as well as habitat delineation in the Apalachicola River and Bay Basin;

- Cultural and economic implications of past, present, and future uses of the natural resources of the system;

- Effects of resource management decisions on the natural resources of the Apalachicola Bay system;

- Importance of the forested floodplain as habitat, food source, refuge, and transportation corridor for plants and fish and wildlife species.

One of the primary objectives of the research program is to promote research within and adjacent to the Reserve by outside investigators from universities, government agencies, and private institutions. The benefits of encouraging outside investigators include high quality research, broad and varied levels of expertise, an interdisciplinary approach, potential use of graduate students from universities, and a wide range of funding sources that are not available through NOAA or DEP sources.

All eleven of these research priorities are related to and depend upon the development of a comprehensive monitoring program. This monitoring program, melded with a successful outside researcher program, will allow the Reserve to address all of the resource management issues currently confronting it.

D. ANERR Monitoring Program

Although a substantial amount of research has occurred within the Reserve, there is currently no long-term program that is measuring baseline information on a wide variety of parameters in Apalachicola Bay. At a time when more information is needed, especially long-term data, to determine the impacts of proposed alterations to the system, less information is being collected. This absence of baseline monitoring leaves a large gap which must be filled by the development of a monitoring program by the Reserve. Specific components of the Apalachicola Reserve's long-term monitoring program include:

Hydrographic data collection and analysis: Almost all previous research has involved discrete measurements of physical parameters on a biweekly or monthly basis. In order to relate future fresh water

inflow modifications to biotic changes in the bay, from a management perspective, it is necessary to begin time-series data collection for some of the more important physical parameters. A number of permanent monitoring stations will be established within the Reserve. Dataloggers, which allow continuous in-situ measurement of parameters such as temperature, salinity, pH, turbidity, water level, dissolved oxygen, and other factors will be deployed in at least three of these stations. The data from these will be retrieved on a biweekly to monthly basis. The remaining stations will be sampled for similar parameters as well as light penetration, at least quarterly, over an entire tidal cycle, for comparison with the data collected by the dataloggers. Depending upon conditions in the bay and alterations in the drainage basin, several of the dataloggers may be moved to other stations throughout the year, although at least one will be permanently left as a control in the same location throughout the monitoring program.

Other locations in the lower river and bay will be monitored routinely throughout the year in order to determine how accurately the permanent stations represent the physical conditions within the bay. In addition to these measurements, daily tidal conditions, river stage and flow data will be retrieved, and stored in the database. This information will come from NOAA, which has a station in Apalachicola, and the U.S. Geological Survey, which has flow gauges on the Apalachicola River. The establishment and maintenance of gauging stations to determine freshwater input throughout the lower river distributaries and other drainage's will be pursued either through funding opportunities or cooperative agreements with the USGS.

Meteorological data: Meteorological data such as rainfall, wind speed and direction, relative humidity, air temperature, solar radiation, and barometric pressure will be collected from the NWFWMD weather station on the St. George Island causeway as well as the ANERR weather station, when it is deployed, and input into the database.

Water quality data: Water quality parameters such as nitrates, nitrites, ammonium, phosphates, pH, and turbidity will be sampled, monthly to start, from the permanent stations established in the bay. Samples will be taken over an entire tidal cycle during this quarterly sampling. A river station will also be sampled, above the St. Marks distributary, to determine riverine input of nutrients. Suspended sediment load and percent organics will also be measured during this sampling trip. Additional analysis will be added as funds become available.

Sediment characterization: During the first year of the monitoring program an analysis of the bottom sediments from appropriate locations in the bay will be conducted. This characterization will

include grain size analysis, sedimentation rate, nutrients, and percent organics of the surface sediments. This characterization will be repeated as needed but at least every three years. Funding or cooperative agreements will be sought to analyze contaminants such as heavy metals, herbicides, pesticides, and polyaromatic hydrocarbons in estuarine sediments at least every five years. Since this cannot be accomplished utilizing Reserve staff or equipment, this component can only be undertaken by utilizing outside grants, monitoring grant funds or establishing cooperative agreements with other agencies for the analysis. Locations to be sampled for contaminants include the permanent stations, as well as, nearshore areas that are adjacent to existing or proposed development and large fresh water inputs.

Habitat monitoring: Aerial surveys, satellite mapping, and on-site ground surveys will be performed over the entire Reserve area every five years. These surveys will be designed to determine changes in the amount and condition of all upland, wetland, and submerged habitats in the Reserve. These surveys will also include areas adjacent to the boundaries of the Reserve to analyze potential impacts on the Reserve's natural resources and habitats. A GIS system currently being developed will be instrumental in accomplishing this aspect of the monitoring program. In addition, development patterns adjacent to Reserve boundaries will be monitored in order predict and detect potential degradation to Reserve lands and waters due to habitat loss and alteration.

Biological data: Sampling and analyzing biological information can be the most time consuming aspect of any monitoring program. Monitoring of the biological community by the Reserve should not substitute for independent research on important management questions by outside investigators. Therefore, the monitoring program should be tailored toward characterizing important constituents rather than determining the status of all organisms in the system. Biological monitoring should be done in association with ongoing research activities and, therefore, may be more flexible and subject to change than the other components of the program.

Similar information, however, must be collected over the long-term in order to determine changes in the condition of the biotic components. Phytoplankton pigments will be sampled at the permanent stations monthly, along with water quality parameters. Because of the large amount of existing fish and benthic macrofaunal data collected in the bay during the 1970's and early 1980's, reoccupation of some of these stations utilizing the same nets and methodology provides the best opportunity to monitor changes in the bay over the long-term. Otter trawls for fish and benthic macrofaunal identification will be taken at appropriate permanent stations monthly as well as some of the older

fixed stations sampled historically. Organisms will be identified to species, but major emphasis will be given to dominant, ecologically important, and important recreational and commercial species. Length/weight relationships as well as age determinations will be done on appropriate species as needed. In fauna monitoring will be added as funds and staff become available.

At least two stations each will be established in salt and brackish water marshes in the system and sampled annually during the growing season. Biomass, density, species, and important associated organisms (to be determined) will be analyzed. Sampling of these wetlands is not intended as a research project but merely to determine gross changes in the status of these habitats. In conjunction with DEP's Bureau of Invasive Plant Management, staff will also conduct annual surveys to document the spread of noxious exotic plant species within Reserve waters.

Listed species data: Long-term monitoring projects will be set up to monitor population trends for appropriate state and federally listed species found within the Reserve, either permanent species or important seasonal and migratory species. Species will be chosen based on their listing, susceptibility to impacts due to habitat alteration, availability of long-term data, and manpower required to monitor them. Management plans for appropriate species will be developed and implemented to protect, conserve, and increase the viability of these species within and adjacent to Reserve boundaries.

All information collected and analyzed during the monitoring program will be available to individual researchers for utilization in their research projects. Data will be kept in an easily retrievable database file. Monthly, seasonal, and annual analyses of the data will be available to researchers, decision-makers, school groups, and the general public. Additional stations, parameters, and projects will be added as new management concerns arise and as staff time and equipment become available. Some monitoring may be accomplished utilizing volunteers and educational groups, which will be organized by the Reserve's Education Coordinator. The monitoring program will be re-evaluated periodically in order to incorporate management concerns, new priorities, current research, and the latest scientific advances.

VIII. Implementation of the Research and Monitoring Program

Implementation of the research and monitoring program will be accomplished through the development of strategies and guidelines designed to provide program direction and a method of determining progress. These strategies and guidelines will be reviewed periodically to update and modify them based on progress and management concerns.

A. Strategies

Both short and long term strategies have been developed to help guide the program and help determine progress.

1. Short-term Strategies

Short-term strategies are those that have been identified that existing staff can accomplish with current funding commitments by the end of 1998. All the short-term strategies listed in the 1993 Management Plan have been accomplished with the exception of the first two listed below. Current short-term strategies include:

- Enact a comprehensive Quality Assurance/Quality Control (QA/QC) plan that ensures all analytical methods are valid and that long-term comparability is achieved;

- Enact a data management and analysis plan that ensures monitoring results are quickly entered into the Reserve's database and properly documented and archived;

- Provide housing for visiting researchers and interns on-site in order to increase research by outside investigators and provide training opportunities to interns interested in pursuing natural resource management careers.

2. Long-term Strategies

Long-term strategies are those which require increased funding levels or cannot be accomplished within the next one to two years. All the long-term strategies listed in the 1993 Management Plan have been accomplished with the exception of the first four listed below, although progress has been made on all four. Current long-term strategies or tasks include:

- Reorganizing and expanding the Reserve's database and analysis of pertinent historical data on the Apalachicola Bay system;

- Initiation of all phases of the comprehensive monitoring program, including field sampling, data analysis, and publication of the first set of results;

- Development of a Geographic Information System that contains habitats, soils, sediments, ownership patterns, transportation corridors, topography and bathymetry, land cover and land use, county zoning patterns, and future land use maps;

- Establishment of a Reprint and Technical Report Series by the Reserve for the dissemination of important research results;

B. Research and Monitoring Program Guidelines

Administration of the research program at the Reserve is directed by the Research Coordinator, with assistance from the Reserve Manager, and in consultation with the outside researchers, appropriate NOAA/SRD staff, DEP's Bureau of Coastal and Aquatic Managed Areas, and other interested parties. The Research Coordinator will set up ad hoc committees as needed to review Graduate Research Fellowship proposals, advise the Reserve of new techniques and technologies, and make recommendations on management strategies, etc. These committees will be only be set up as needed and will be short-lived. Membership will vary based on the issue addressed or type of research reviewed. An outside researcher will also be a permanent member of the newly formatted Reserve Advisory Management Board. The Research Coordinator will primarily rely on a continuous dialogue with outside researchers and agency staff as well as input from private citizens and government officials.

Research opportunities within ANERR are available to any qualified scientist without regard to manner or source of funding. However, both the Research Coordinator and the researcher are expected to follow certain guidelines designed to promote the open dissemination of research results and maintain high quality research, especially research related to current management issues. In order to attract and maintain a high quality research program, the Reserve strives to:

- Maintain an up-to-date and easily accessible library containing not only specific information about Reserve habitats and environmental data, but about estuarine research in general and also research occurring in other reserves;

- Maintain a computerized database of pertinent information collected within and adjacent to the Reserve;

- Maintain field and laboratory facilities that provide a basic level of equipment necessary to attract and support high quality research;

- Maintain a comprehensive monitoring program that provides researchers with baseline information and also enables the Reserve to measure changes in the system over both short and long-term periods;

- Disseminate information not only about NOAA funding opportunities but also alternative sources of grants to interested researchers;

- Provide information to interested researchers that will help in the preparation of grant proposals, reviewing and editing grant proposals, and providing recommendations to NOAA on appropriate projects;

- Provide open lines of communication between researchers, decision-makers, and the general public about current and proposed projects;

- Actively recruit researchers from agencies and public and private institutions to work in the Apalachicola basin, especially on resource management-related projects that address current issues of concern;

- Assist researchers whose projects are consistent with the objectives of the Reserve in obtaining necessary permits that may be required from state and federal agencies prior to beginning their project;

- Maintain an active high-quality research program utilizing in-house staff to address issues and publish and disseminate information concerning results from that research.

Prospective researchers are strongly encouraged to visit the Reserve and discuss their proposed projects with the Reserve Manager and Research Coordinator. Individual researchers, especially those requesting technical or logistical assistance from the Reserve, are expected to:

- Provide a copy of their proposal or project description to the Research Coordinator for his information and files;

- Fill out a Researcher Information Sheet, which details locations, types of samples taken, and assistance requested from the Reserve;

- Show evidence of obtaining all necessary permits or permission from managing agencies, where appropriate, including permission to cross privately owned land if necessary. Areas disturbed by research activities must be restored to their original appearance, or as close as reasonably possible;

- Provide any specialized equipment necessary to carry out their research, unless arrangements have been made in advance to utilize Reserve equipment;

- Return all equipment borrowed from the Reserve in clean, working order;

- Provide the Research Coordinator with a final report, raw data if appropriate, and any appropriate publications for the Reserve library at the end of the project. If the project lasts more than one year the

researcher should provide an annual report to the Reserve, which can be a copy of the researcher's annual report to their funding agency;

- Provide a one-hour guest lecture, during or after completion of their project, to discuss and inform the general public about their project and how it relates to the Reserve and the management of its natural resources.

- Acknowledge the Reserve in all publications and presentations.

Projects that are well designed and address the priority research topics will be recommended for NOAA funding and will be actively supported by the Reserve both logistically, and when seeking funding.

IX. Research and Monitoring Program Accomplishments To-Date

Since the last management plan was approved in 1993, the Reserve's research and monitoring program has made significant strides toward accomplishing goals, objectives and strategies outlined in the old plan and has significantly increased the visibility, professionalism, and respectability of the program. Accomplishments since the last management plan was approved include, but are not limited to the following:

A. Stabilize and increase funding for the research program by:

- Securing an additional state-funded research assistant position in 1995, bringing the research and monitoring section staffing up to three state-supported positions; and

- Securing additional grant funds from EPA's Near Coastal Waters Program, EPA's Gulf of Mexico Program, NOAA, DEP's Bureau of Protected Species Management, and NOAA/ESDIM, and the Florida Coastal Management Program to promote and carry out research and monitoring programs.

B. Develop the facilities, infrastructure and basic equipment necessary to attract high quality outside researchers and promote research within the Reserve by:

- Providing an easily accessible on-site library of over 4,800 references utilizing ProCite, a computerized bibliographic referencing system;

- Providing a newly constructed fully stocked laboratory with basic equipment such as fume hood, drying oven, gravity convection furnace, spectrophotometer, centrifuge, vacuum pumps, filtration manifolds, and dissecting and compound microscopes;

- Providing basic field and sampling equipment such as boats, 4-wheel drive vehicles, discrete water samplers, coring devices, water quality

monitoring equipment, current meters, trawls, plankton nets, survey gear, animal traps, and other miscellaneous sampling equipment;

- Establishing cooperative agreements with other agencies and universities such as those involving the USFWS/St. Vincent NWR and the NOAA/NMFS-FSU Institute for Fishery Resource Ecology;

- Establishing a mailing list to keep outside researchers informed of grant opportunities, fellowship opportunities and other information concerning the Reserve and its research program; and

- Developing and distributing a "Research Opportunities" brochure to attract outside investigators and increase the visibility of and knowledge of the Reserve and its programs.

C. Initiate the comprehensive monitoring program by:

- Deploying four dataloggers at three locations throughout the Reserve to collect continuous information on salinity, temperature, dissolved oxygen, pH, water level, and turbidity for over six years;

- Establishing one weather station five years ago with another agency and deploying a SWMP I weather station in 1998 to collect continuous meteorological information;

- Contracting for a sediment characterization study in 1993 that provided priority pollutant identification, grain size analysis, organics, excess nutrients, and sedimentation rates at eight stations in the bay;

- Setting up a program to monitor and protect listed species within the Reserve including sea turtles, colonial migratory birds such as black skimmers and least terns, bald eagles, West Indian manatees, and red wolves (re-introduction program);

- Establishing two sediment erosion tables in brackish marshes in cooperation with the Florida Geological Survey to determine if the marshes are sinking or growing; and

- Beginning work on developing a GIS system utilizing ArcView, through a grant from NOAA, to monitor habitat change.

D. Increase the number of research projects, both by staff and outside investigators, occurring within the Reserve as well as increasing the visibility of ANERR and the NOAA/NERRS programs nationwide by:

- Being heavily involved at the national level on developing the SWMP I program;

- Publishing papers related to research and monitoring programs within ANERR;

- Providing technical and logistical support to myriad outside investigators from FSU, UF, Auburn, State University of New York, Texas A&M, LSU, NOAA, NMFS, USFWS, NWFWMD, DEP, FGFWFC, University of Maine, EPA, University of Indiana, Vanderbuilt University, University of Georgia, Georgia Tech, FAMU, USGS, University of South Florida, and Georgia Southwestern College;

- Making presentations on Reserve research at national meetings such as Coastal Zone 95, Gulf of Mexico Symposium, 17th & 18th Annual International Sea Turtle Symposiums, NOAA/DC Office, as well as numerous presentations at universities and state and local agencies;

- Serving on national committees such as the CDMO Oversite Committee, NOAA/NOS Monitoring Integration Committee, SWMP Brochure Publications Committee, National Education Committee, Weather Station Committee, etc., as well as being National Research Representative.

E. Increase the visibility of the Reserve and the NOAA/NERRS program, both locally and statewide by:

- Utilizing data collected by research staff and outside investigators to educate the surrounding community about the natural resources of the area and the threats to the health of the system and its productivity;

- Working with local and state agencies and being involved in a myriad of committees addressing issues such as land management, science education, wetland restoration, water allocation, water quality, local development, and listed species protection;

- Working with the education section on posters, presentations and the "Research in the Reserve" field days;

- Providing technical input and monitoring plans to the Franklin County Board of County Commissioners concerning development projects and potential impacts to the bay system

CHAPTER 5

ENVIRONMENTAL EDUCATION

I. Introduction

The human dimension is an integral component of resource and ecosystem management. Successful management programs understand the importance of this human dimension in assessing resource management problems and developing meaningful solutions based on these assessments. Education and outreach are tools managers can use to address the human dimensions of resource issues. Combined with research, regulations, and habitat management, education and outreach provide a comprehensive approach to resource protection.

Education and outreach efforts need to go beyond providing information to resource users. Information alone may not have sufficient impact to protect the resource in question. For long-term change in user's behavior, education strategies need to combine action with knowledge and attitudes. Research is needed to identify who is contributing to the misuse of the resource or habitat and why. Once these questions are answered, education efforts can be developed to address the specific target audience regarding the resource management issue.

In addition to achieving management goals, the benefits of incorporating education and outreach into resource management plans include greater cooperation amongst the parties involved, long-term behavior change of users leading to long-term resource protection, and conflict prevention.

The National Estuarine Research Reserve System was created in 1972, as part of the CZMA, to increase the ability to responsibly manage estuarine ecosystems. A critical aspect of this mandate for the NERRS is the education, interpretation, and outreach component. In part, a reserve must "...serve to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation." (CZMA § 315(b)(2)(C)). Within the NERRS, each Reserve is responsible for developing and implementing a program that links education to scientific research and stewardship. Each Reserve's education program functions independently, but all have commonalties with other education programs in the NERRS.

The Apalachicola National Estuarine Research Reserve, through its education programs, is dedicated to developing an attitude of stewardship regarding the resources of the Apalachicola River and Bay systems.

II. Goals

The overall goals of the NERRS education program are to provide the crucial linkage between research and coastal management -- translating the monitoring and ongoing

research at the sites to appropriate audiences in ways that can be understood and applied by decision-makers, professionals, and members of the public -- and developing education programs that address resource management goals and objectives. The specific goals of the ANERR as they relate to education are:

A. Public Awareness and Appreciation

To develop public understanding of the estuarine, wetland, terrestrial and fresh and salt water habitats and to link these habitats as functional parts of a dynamic ecosystem.

To develop a sense of public responsibility for environmental conditions and instill a new ethic of resource protection and conservation.

B. Public Action

To motivate the public to alter personal activities and beliefs, play an active role in community activities, and take part in decisions affecting their natural resources by providing them with the information necessary to evaluate problems and opportunities and to make corrective actions.

III. Objectives

By relating primary education goals to the Reserve's resource management issues, six general objectives have been written. The objectives, which apply to all audiences, are:

A. Audiences that impact Reserve resources will receive informational and educational materials supporting the goals of the Reserve;
B. Audiences participating in Reserve educational programs will learn about the Reserve's economic, biological, recreational, educational, cultural and intrinsic values;
C. Reserve educational programs will provide first-hand field experiences with the natural systems of the Reserve;
D. Audiences participating in Reserve educational programs will receive instruction about personal involvement and responsibility for maintenance of the Reserve's natural systems;
E. Audiences participating in Reserve educational programs will learn the purposes and benefits of environmental regulations;
F. Reserve educational programs will disseminate Reserve research data and develop educational themes on research topics and management concerns.

IV. Policies and Guidelines for Education

Education policy at the Apalachicola NERR is designed to fulfill the guiding principles for designing and implementing an education program as defined in the NERRS Strategic Plan. These principles are to:

- Develop education programs that will further the goals of the System;
- Target a culturally diverse audience of educators and students, environmental professionals, coastal resource decision-makers, and resource users;
- Function as a "system of sites" to nationally coordinate estuarine education efforts;
- Develop NERRS as resource centers specializing in estuarine and watershed education -- taking into account the diversity of differences of each reserve site;
- Capitalize on NERRS' ability to directly link education, research, stewardship, resource management, and restoration;
- Ensure education priorities are based on program evaluation results -- continually assess education programs and implement changes as necessary;
- Encourage NERR education coordinators to be active participants in the education community.

In addition to these guiding principles, "NERR Education: A Field Perspective" lists the following series of more specific education objectives for reserves:

- Develop and operate as a system of sites;
- Link education programs with research, management, and stewardship;
- Develop programs that encourage citizen stewardship of estuaries;
- Develop reserves as resource centers that address coastal issues of global, national, regional, state and local significance;
- Maintain a cadre of professional environmental educators in NERRS; and
- Evaluate program quality and program cost effectiveness. Program effectiveness is measured as it relates to education objectives and resource management goals.

V. Educational Resources

A. Field Resources

Reserve boundaries contain many habitats, including floodplain forests, river swamps, salt marshes, fresh water rivers and lakes, estuaries, barrier islands, dunes and beaches. The primary field resources utilized by the Reserve are:

1. **Cape St. George Island** is a classic gulf coast barrier island used for day and overnight field trips. Primary field activities include: seining, barrier island ecology and geology presentations, plankton studies, flora and fauna studies, and beach and dune ecology. Access is by boat.

2. **St. George Island State Park** is utilized most often as a site for one-day field experiences, due to automobile access and close proximity to Reserve headquarters. Topics are similar to those mentioned for Cape St. George Island.

3. **St. Vincent National Wildlife Refuge** is the third barrier island within the Reserve. It has been used little because access is by boat only and it is farther than Cape St. George Island.

4. **Apalachicola River** is utilized for boat field trips to study floodplain forests, watershed ecology and impacts of humans on the environment.

5. **Apalachicola Bay** is available for boat field trips and studies of estuarine systems.

6. **St. Joseph Peninsula State Park** provides another coastal ecosystem study area but is not used as often as St. George Island because it is farther from the Reserve headquarters.

7. **Fort Gadsden Historic Site** is utilized to illustrate early European influence in the local area. It is accessible by boat or automobile.

B. Personnel

The following personnel play a role in implementing the education program of the Reserve.

1. **The Education Coordinator** has the responsibility to design, coordinate and implement education programs; train education assistants and write educational materials to be used in Reserve programs. This person also conducts educational programming and provides input to the Reserve Advisory Management Board.

2. **Environmental Specialist** I aides the coordinator with the tasks stated above but concentrates in the areas of educational exhibit maintenance and development, and conducting programs.

3. **Information Specialist I** aides the coordinator with the tasks stated above but concentrates in the area of conducting programs.

4. **Publication Production Specialist II** designs and produces the Reserve's newsletter, as well as brochures, posters, or any other printed materials. This person also works with programs, exhibit developments, and the Reserve's photographic resources.

5. **Secretary/Receptionist** provides assistance in operating the Reserve's visitor center, assisting the Education Coordinator with administrative tasks, and general communication needs. This is currently a temporary position and needs to be made permanent.

6. **Maintenance Staff** provide logistical support for field trips and office operations. This is currently a temporary position and needs to be made permanent.

7. **Volunteers** are periodically used in various components of the education program, such as field trips and presentations.

8. **Research Staff** assist with presentation of various educational programs related to work they are conducting.

9. **The Reserve Manager** is involved in educational presentations and field trips as well as overseeing the entire education program.

10. **Administrative Support** is provided by the Administration section at the Eastpoint facility.

11. **Computer Technician** provides educational program support.

C. Existing Facilities

1. **The Marshall House Field Station**, located on Cape St. George Island, is used for overnight field trips with groups of fifteen or less.

2. **The Robert L. Howell Building** has a 100 seat auditorium for group presentations, a specimen collection and wet lab space for groups up to fifteen, one large teaching room, and one room maintained as office space for volunteers.

3. **The Modular Office Building** serves as office space for education staff.

4. **The Estuarine Walk Building** is a 28' by 40', greenhouse-type structure that houses various aquatic and terrestrial tanks simulating three major habitats within the Reserve. The habitats include fresh, salt and brackish water simulations.

The Reserve has other facilities that serve both education and research functions. These are described in detail in the Research and Monitoring section of this plan.

D. Educational Equipment

1. Laboratory Equipment

The education program has access to laboratory equipment as outlined in the Research and Monitoring section of this plan under "Existing Research Facilities."

2. Audio/Visual Equipment

The education program is supported by audio/visual equipment including a video editing system, two video cameras with 1/2 inch and limited 3/4 inch capabilities, a computer editing system, a film/video processor, several slide projectors, a large-screen video monitor and a VCR player, two 35 mm cameras and assorted lenses.

3. Sampling Equipment

Sampling equipment available to the education program includes seine nets, a small otter trawl, plankton nets, dissolved oxygen meter, pH meter, salinity meter, Ponar benthic grab, dip nets, Secchi discs, an increment borer and water column samplers.

4. Computer Hardware and Software

Computer hardware available to support educational programs includes a scanner, a laser printer, a color printer and several personal computer units. Desktop publishing software packages available include Pagemaker, Corel Draw, Adobe Photo shop and Illustrator, Paint Brush, Power Point, Microsoft Word and Microsoft Excel.

5. Vehicles

Education staff share vehicles with other Reserve staff. Available vehicles include a seven passenger van, four-wheel drive pickup, four-wheel drive flat bed truck, four-wheel ATV (on island) and the boats as described in the Research and Monitoring section of this plan.

6. Educational Books, Slide Programs and Videos

The Reserve headquarters building houses a rapidly growing collection of natural resource books (over 100), slide programs (8), videos (over 60), and scientific reprints (over 4,800) that are available for public use.

E. Printed Materials

Printed materials currently available for distribution include three educational curricula, the ANERR site brochure, bird checklist, mollusk checklist, mammal checklist, reptile and amphibian checklist, fish checklist, posters, back issues of the Reserve's newsletter, and other site brochures for units within the Reserve. The Reserve also serves as a distribution point for a wide assortment of natural resource publications provided by other groups.

F. Portable Exhibit

The Reserve maintains two portable displays that are used during various educational events each year.

G. News Media

Local and regional news media serve as avenues for advertisement of Reserve activities including cultural events, guest lectures, educational efforts and community involvement opportunities.

VI. Implementation Strategy

Although an estuary is defined as the area where salt and fresh water mix, the productivity of the estuary is dependent upon its functional relationship with many other habitats. Thus, attempts to protect the Apalachicola Estuary must be linked to consideration of the nutrient supply role of the floodplain, the nutrient transport role of river floods, the nursery role of coastal marshes and the mixing and fresh water retention role of the barrier islands.

A. Education Program Themes

Education programs at the Reserve are focused around six primary general education themes. These themes serve to address the six Reserve educational objectives addressed in Section III. Individual projects are also designed to relate to pertinent research program priorities, which help to bridge the gap between research findings and public actions based on those findings. These themes, as do the objectives, apply to all target audiences.

1. **Orientation to ANERR**: includes orientation messages defining the Reserve boundaries, its purpose, function, and significance. Roles of local, state, and federal entities are addressed.
2. **Living and Natural Resources**: includes information about flora and fauna found in aquatic and terrestrial habitats of the Reserve.
3. **Estuarine Processes**: includes information about hydrologic, geologic, and biological processes of significance to the Reserve and their interactions within the estuarine system.
4. **Resource Uses**: includes historical and archaeological information of man's activities in the Reserve from prehistoric times to the present.
5. **Resource Management**: includes resource management information describing management philosophies, issues, and techniques. Also positive actions in which people can participate.
6. **Economic Importance of Natural Resources**: includes information about the economic influence of commercial and recreational use of marine resources on the local economy.

B. General Project Selection Criteria

To be considered for implementation a project must meet some basic criteria. After an education project or activity is deemed necessary for accomplishment of stated objectives and goals, an education action plan will be developed to include; scope of the project, target audiences, main messages, message

vehicles, time line for implementation and evaluation methods. An education project must :

- Fall within one of the stated educational themes;
- Meet at least one of the stated educational objectives;
- Ultimately serve to accomplish the Reserve's educational goals, thus the overall mission.

C. Target Audiences for Education Programs

The primary audiences for ANERR's educational programs will be those affecting the resources on any level, whether it be political, socioeconomic or direct resource impacts. The following is a list of important audiences.

1. Unscheduled visitors to headquarters
2. School based audiences (university students, K-12 students, educators)
3. Youth leaders
4. Youth groups
5. Recreational users (boaters, fishermen, hunters, nature watchers, associations)
6. Commercial users (oystermen, charter boats, fishermen, shrimpers, processing facilities, seafood dealers)
7. Landowners within watershed
8. Policy makers (local, regional, state, federal) Tourists
9. Tourists
10. Conservation-minded groups and individuals
11. Senior citizens
12. Volunteers
13. Media
14. Local community

D. Existing Educational Services and Programs

This section will detail programs already in place at the Reserve. Table 4 summarizes activities and relates them to stated objectives and target audiences. These activities have also been priority ranked. Appendix 2 details rank scores for all activities and methods used.

This ranking procedure has been used for both existing and proposed expansion activities in the education program. It provides some general direction in evaluating the importance of various activities. It is not, however, an edict or exact blueprint for the program. Changes in staff and other resources will require periodic reevaluation of activity priorities.

1. Field Trips

The Reserve promotes, to schools and other interested groups, the opportunity for field trips in the Reserve. Reserve staff provide orientation information to trip leaders prior to the beginning of

scheduled field trips. Trips are available to all levels of students, kindergarten through adult. These trips range from a few hours to a few days and make use of the river, swamps, marshes, bay, and barrier island habitats.

2. Estuarine Walk Program

Existing interpretive activities and materials will be expanded for the Estuarine Walk, a project funded through a grant from NOAA. This habitat simulation project was initiated to meet a growing demand for brief field trips and an increase in walk-in visitors. Salt, fresh and brackish water systems house native plants and animals for observation by the public, and structured field trip groups.

3. Newsletter Publication

The "Oystercatcher" is published and distributed four times per year. It provides updates on education and research activities, reports on issues related to ANERR and provides information on upcoming events. The mailing list for this newsletter is approximately 500 individuals or organizations.

4. Publication Production

The Reserve develops and distributes publications to communicate and promote the goals and themes of the Reserve. Publications serve to communicate research opportunities, research findings, education activities, and natural resource information. Publications include brochures, posters, fact sheets, annually up-dated audio-visual lending library list, and research papers. Distribution of the publications is through mailings, placement in local businesses, and in answer to requests. Much of the production and layout for camera-ready copy is done in-house with desk-top publishing equipment. The recent addition of a Publication Production Specialist to the education staff will facilitate more publication production in the future. The Reserve also stocks and disseminates much printed material from other sources related to safe boating, recreational fishing and many other topics.

TABLE 4: Existing ANERR Educational Activities

*Priority	Existing Services/Programs(1)	Potential Objectives (2)	Target Audiences (3)
1	Field Trips	B,C,D,F	2,4,10,12,14
2	Estuarine Walk Program	A,B,C,F	1,2,4,9,14
2	Newsletter	A,B,D,E,F	All
2	Publication Production	A,B,D,E,F	All
2	Traveling Exhibit	A,B,D	2,10
2	Revised ANERR Brochure	A,B,F	All

*Priority	Existing Services/Programs(1)	Potential Objectives (2)	Target Audiences (3)
2	Coastal Mgmt. Workshops	D,E,F	5-8
3	Project Estuary	A,B,D,F	2-4,14
3	Estuarine Pathways	A,B,D,F	2-4,14
3	Media Relations Program	A,B,D,E	2-14
3	Presentations	B,D,E,F	2-5,10,14
3	Guest Lecture Series	A,B,D,E,F	2,7,8,10-14
3	A-V Publication Services	A,B,D,E,F	All
3	Treasure Chest Program	A,B,D,F	2,4
3	Field Trip Curricula	A-D,F	2-4
3	ANERR Poster	A,B,D,F	2,3,5-8,10,13
3	Shell Teaching Collection	B,F	1,2,4,9,14
3	Teacher Packets	A,B,D,F	2,3,14
4	Teacher Education	All	2,14
5	Citizen Support Group	All	1,2,10,12,14
5	Volunteer Program	All	1,2,4,10,12-14
5	Cultural Events	A,B,D,E,F	1,2,5-11,13,14
5	Art and Science Exhibitions	B,D	1,4,9,11,14
5	Flora and Fauna Guides	A,B,C,F	1,3,5,9,10,14
6	University Classes	B-F	2,12,14

* See Appendix 2 for ranking procedure.
(1) See chapter text for descriptions (Section VI.D)
(2) See chapter text for list of objectives (Section III)
(3) See chapter text for list of target audiences (Section VI.C)

5. Traveling Exhibit

A traveling exhibit, designed to provide information about the Reserve, has been produced. It is loaned to educational institutions upon request and displayed at special functions such as fairs and conferences. Content of the exhibit is based on the location, purpose, and educational resources of the Reserve.

6. Revised ANERR Brochure

An updated, four-color brochure has been completed to publicize the Reserve System and ANERR. It will be distributed through many environmental education outlets in Florida.

7. Coastal Management Workshops

A series of workshops at the Reserve for coastal management decision-makers is conducted to help them understand the magnitude of problems facing, and benefits derived from, the natural resources of which we are stewards. Invited speakers cover such topics as coastal

development and management, wetland policy, and other natural resource issues.

8. Project Estuary

Project Estuary is a four-lesson curriculum unit developed by Reserve staff featuring the Apalachicola River and Bay estuarine system. All materials necessary for teaching Project Estuary have been distributed to each middle and high school in an eight county area surrounding ANERR. Materials include pre- and post-tests, teachers' guides, student worksheets, slides, cassette tape, and overhead transparencies. Training workshops are provided by Reserve staff to instruct teachers in the implementation of Project Estuary.

9. Estuarine Pathways

Estuarine Pathways is an elementary activity series featuring the major habitats of the Apalachicola estuarine system. The activities notebook, entitled ESTUARINE HABITATS, contains six units, each covering a separate major habitat. The habitats covered are the pine forest, hardwood swamp, river, estuary, salt marsh, and beach. This program is designed to increase student awareness by providing students with introductory knowledge concerning estuarine habitats. The units include information about food chains, common plants and animals, arts and crafts activities, language arts activities, social studies activities, science lab activities, games, songs, suggested readings and references. Training workshops are provided by Reserve staff to instruct teachers in the implementation of Estuarine Pathways.

10. Media Relations Program

Media relations are promoted by the Reserve. Periodic news releases from ANERR on research and educational events, as well as information of environmental issues, are provided to area newspapers, radio and TV stations.

11. Presentations

Presentations about estuarine processes, habitats, flora, fauna, and the natural history of the area are developed as requested by outside groups. Reserve staff members make the presentations to groups visiting the Reserve and also in school classrooms, to community organizations and coastal decision-makers.

12. Guest Lecture Series

The Reserve promotes the use of its facilities for quarterly guest lectures. Lectures held at the Reserve are based on research findings and educational themes of ANERR. Lectures are prepared and

presented by Reserve staff, local and visiting scientists, state and federal agency personnel and local citizens. Scientists conducting research within the Reserve are strongly encouraged to provide lectures on their work.

13. Audio/Visual and Educational Publication Services

Slide and video programs are available for presentation to scheduled groups by Reserve staff members. Programs include site specific information as well as information pertaining to a wide range of natural resource topics. The Reserve also has the in-house capability to produce audio-visual programs on video or slides. A library of audio-visual programs is available at the Reserve for loan to education personnel and students. A list of available materials is updated and mailed to schools and universities each September. In addition, publications and research documents are available for on-site use.

14. Treasure Chest Program

Several "treasure chests" containing artifacts and other hands-on materials related to specific aspects of the Reserve have been produced. The treasure chests are loaned to local schools upon request. Contents of treasure chests may include artifacts, reference materials or preserved native estuarine and marine specimens. Each chest includes a list of the contents and suggested instructional lessons. A list of available treasure chests and instructions for scheduling is provided to local schools each September. Current treasure chest topics include birds, crustaceans and echinoderms, fish, insects, marine and land mammals, molluscs, plants, and reptiles and amphibians.

15. Field Trip Curricula

Reserve staff currently conduct a wide range of field trips, to a variety of locations, with a diversity of groups. In order to more efficiently utilize staff time and resources, standardized field sessions have been developed on selected topics for various age groups. This will aid newer staff and volunteers in presenting important ecological concepts in an organized and targeted approach. Topics will be developed around the six presented in the "Implementation Strategy" section of this document.

16. ANERR Poster

A new Reserve poster has been developed on the flip-side of the new ANERR brochure. This dual purpose publication is something that people will want to keep.

17. Shell Teaching Collection

The Reserve has amassed a tremendous collection of molluscan shells. These have been catalogued and organized into a teaching collection. The collection may be used on a regular basis to teach such topics as morphology, adaptation, and classification.

18. Teacher Packets

To maximize efficiency and information retention for Reserve field trips, pre- and post-visit information and activities have been developed as part of the field and lab curricula. These may also be given out to walk-in visitors interested in learning more about the Reserve's resources.

19. Teacher Education

The Reserve offers occasional workshops designed to familiarize teachers with the Reserve, promote the value of using the Reserve and its natural resources for instructional purposes and provide instruction to the teachers on estuarine ecology. These programs provide in-service opportunities for teachers who need to renew their teaching certificate. The Reserve offers teacher education lectures, field studies, and laboratory experiences based on the educational themes of the Reserve. Information on the natural resources is provided to teachers for classroom use.

20. Citizen Support Organization

The Reserve promotes and provides assistance to a non-profit citizen support organization, "Friends of the Reserve" (FOR). This organization supports the Reserve's goals and programs, raises funds, secures volunteers, sponsors special events, accepts donations for Reserve programs, aids staff in implementing the Reserve's management plan, and reviews and comments on environmental issues. Volunteers for special research projects are drawn from this group. Researchers using ANERR facilities are made aware that volunteer help is available for routine tasks and they are encouraged to utilize it as a means of contributing to public education.

21. Volunteer Program

ANERR staff coordinates a volunteer program at the Reserve. Volunteers are recruited and trained to fulfill specific tasks identified by Reserve staff. The volunteer program is coordinated with activities of the citizen support organization and participates in annual events such as the Florida Seafood Festival, beach cleanups, turtle nest patrols and Earth Day events.

22. Cultural Events

Educational messages are presented through periodic cultural events held at the Reserve. Activities have included art exhibitions and open house at the headquarters. Reserve staff conduct an education exhibit in the Florida Seafood Festival held in Apalachicola each November. The education exhibit targets the general public and is operated by ANERR staff and volunteers. The exhibit is designed to increase public awareness about estuaries and includes hands-on materials, the ANERR traveling exhibit, public information brochures and a touch-feel tank. The Education staff is also responsible for coordinating all other educational exhibits at the festival.

23. Art and Science Exhibitions

The Reserve encourages local schools to provide student artwork and science projects to be exhibited at the Reserve office building. Consideration for exhibiting projects is given to those which relate to the educational themes of the Reserve or those which are reviewed and selected for submission to the Reserve by a school district or university representative.

24. Flora and Fauna Guides

Guides pertaining to the plants and animals of the Reserve are beneficial for a pre-visit orientation packet. They are also useful to students seeking local information for school projects. To date, guides have been completed for birds, mollusks, fish, reptiles and amphibians, and mammals.

25. University Classes

The Reserve has offered its facilities in cooperation with two state universities. In conjunction with Florida A & M University, a graduate level marine biology course was offered. The class met two hours every week for lectures and every other weekend for field studies.

In conjunction with Florida State University, a two-day field study class has been offered on barrier island ecology.

E. Potential Expansion for ANERR Education Activities

While Reserve education activities are numerous and varied, potential for initiating new programs and expanding or updating existing programs still exists. Table 5 summarizes potential expansion activities and relates them to stated objectives and target audiences. The activities are also priority ranked. Details of ranking procedure and individual scores may be found in Appendix 2. As mentioned earlier, this is not an exact blueprint for future activities. Activity priorities will and should change, depending on a number of factors including funding, public demand, new resource issues, etc.

1. New Indoor Interpretive Facilities

Additional interpretive displays and information at Reserve headquarters will make the facility more useful for short-time field trips and walk-in visitors. Projects to address will include professional signage, aquarium facilities and habitat displays.

2. New Outdoor Interpretive Facilities

Development of outdoor facilities at Reserve headquarters would also service groups with limited time. These facilities could include wetland boardwalks, trails, observation platforms and outdoor classrooms. There is also a need for trail and trail guide development for sites away from the immediate headquarters, that are utilized for longer field trips such as a river floodplain trail, marsh trail, beach trail, upland communities trail, etc. Self-guided trails will be developed as time and resources permit.

TABLE 5: Potential Expansion for ANERR Education Activities

*Priority	Expansion Activities (1)	Potential Objectives (2)	Target Audiences (3)
1	New Indoor Interp. Facilities	A,B,F	1-4,9,10,14
1	New Outdoor Interp. Facilities	A,B,C,F	1-4,9,10,14
2	Resource Action Booklet	A,B,D,E,F	1-8,10,11,14
2	ANERR Slide/Video Program	A,B,D,F	1-4,8-10
2	Annual Research in the Reserve	A,B,C,E,F	2,5,6,8,10,12-14
2	Education Library	A,B,D,E,F	1-4,12
3	Other Classroom Curricula	A,B,D,E,F	2-4,14
3	Lab Curricula	A-C,D,F	2-4
3	Annual Press Day	A,B,D,F	13
3	Fishing Tournament	A-E	5,9,10,14
3	Boater's Guide	A,B,D,E	1,5-8,9,14
3	Reserve Coloring Book	A,B	2-4,9,14
3	Reserve in the Community	A,B,D	All
4	Additional Staff	B,C	2-4,10-12,14
4	Summer Science Camp	A-D,F	2-4,14
4	Canoe Trail Guide	A-C	1,3,5,9,10,14
5	University Intern Program	B,F	All
5	Education Center Dorms	A,B,D-F	All

* See Appendix 2 for ranking procedure.
(1) See chapter text for description (Section VI.E)
(2) See chapter text for list of objectives (Section III)
(3) See chapter text for list of target audiences (Section VI.C)

3. Resource Action Booklet

   A publication highlighting the management issues of the Reserve, along with suggested, achievable actions that people can be involved in, will be an important component of the Reserve's program. It will be directly targeted at policy makers and local resource users.

4. ANERR Slide/Video Program

   A comprehensive, professional quality slide program about the ANERR, its purpose and resources is needed as an orientation tool. It will be synchronized to run automatically with a taped script and then transferred to video for broader application.

5. Annual Research in the Reserve Event

   An annual event to feature activities of the Research Program with a chance for local people to learn about the Reserve's importance in the research community. This would also provide an opportunity for people to meet staff, see exhibits and hear presentations about current research.

6. Education Library

   Computerization of the existing inventory of educational publications, videos and slide programs will facilitate their access to the public. Additional resources could be added easily and printing up-to-date lists of holdings will be greatly simplified.

7. Other Classroom Curricula

   In addition to Project Estuary and Estuarine Pathways, Reserve staff may be involved in and distributing topically oriented, supplementary curricula to K-12 schools. These materials should be fairly short, concise units based on individual topics of concern to the Reserve and the schools. These materials can be distributed during periodic teacher training workshops at the Reserve.

8. Lab Curricula

   Just as with field trip activities, standardized lab activities need to be planned for various topics, aimed at specific age groups. This is an important step in maintaining control and insuring the quality of our existing services.

9. Annual Press Day

   An Annual Press Day conducted at the Reserve to educate the media on several facets of the Reserve's programs will increase the Reserve's

profile in the community. Press packets, field trips and guest speakers will be components of this activity.

10. Educational Youth Fishing Tournament

A local fishing tournament, sponsored by the Reserve, would afford visibility for the Reserve in the community. It would also provide an opportunity to disseminate information regarding ethical and biologically sound fishing practices.

11. Boater's Guide

A boater's guide for the Apalachicola Bay Region would be well received. There is a high demand for this type of information from out of town visitors.

12. Reserve Coloring Book

Activity oriented publications, such as coloring books, are extremely popular with school based programs and visitors to the Reserve. With a minimal amount of descriptive text, an education benefit can be derived.

13. Reserve in the Community

A week-long community involvement project would raise the profile of the Reserve among local citizens. A series of activities and events directly targeted to the local community would increase support for the Reserve and its programs. One possible activity could include Reserve staff and volunteers restoring a disturbed site to natural conditions.

14. Additional Staff Needs

The acquisition of a half-time position for volunteer coordination would greatly enhance the Reserve's capacity for education programs. This individual would be responsible for volunteer training and coordination. This would free existing staff for more education programming. There is also a need to create permanent positions for current temporary staff that fill the needs for a visitor center receptionist and maintenance person.

15. Summer Science Camps

This activity would provide an intensive, residential education experience for a selected target audience. The program would last from one to two weeks and cover a broad spectrum of marine and estuarine topics. It would probably target middle or high school students.

16. Canoe Trail Guide

Many opportunities exist within the Reserve for canoeing or kayaking. A guide for such activities would increase the Reserve's profile in the community and provide educational information about the resources to people who enjoy these low impact activities. Guides would be targeted at outdoor recreation associations and their affiliates.

17. University Intern Program

An intern program would provide opportunities for college students to gain natural resources education experience while earning college credit. Interns would provide a variety of services for ANERR.

18. Education Center and Dormitories

An education center, apart from the Reserve offices, has been proposed. Federal funds are potentially available if matching state funds can be secured. The center would provide expanded opportunity for interpretive and educational activities. The center would also provide dormitory space for visiting educators, researchers, interns and students.

19. Evaluation/Updating

Each year Reserve staff meet with selected public information and education professionals and the Reserve Advisory Management Board to assess progress during the past year. The product of this meeting is a brief progress report with recommendations for program enhancement.

VII. Other Area Programs

There are a multitude of marine, riverine or estuarine information and education programs in the state of Florida. Only a few, however, service similar topics in the same region as the Reserve. Following, is a summary of other programs that compliment the Reserve's activities.

A. St. Vincent National Wildlife Refuge Visitor Center

The U.S. Fish and Wildlife Service is responsible for management on St. Vincent Island, which falls within the boundaries of the Reserve. This is a boat-access-only site that is utilized for fishing, hunting, hiking and wildlife observation. Public tours are provided in spring and fall. The site is also utilized by researchers. Other than a small visitor center in Apalachicola, with a few exhibits, there is no formal education program or education staff.

B. Northwest Florida Water Management District (NWFWMD)

The NWFWMD produces and distributes a curriculum entitled, "Waterways-Exploring Northwest Florida's Water Resources." The materials are targeted at middle school students in the District's 16 counties and include five lessons. They are: (1) Water is our most vital resource, (II) Our wetlands, lakes, and rivers, (III) The water we use, (IV) Water management issues in Florida, (V) Water resources of the local area.

C. 4-H Programs

Local 4-H groups are encouraged to utilize the resources of the Reserve in addition to their activity booklets. Local groups have made use of Reserve resources to prepare for the statewide marine ecology judging event.

D. Florida State University (FSU) Marine Laboratory

The FSU Marine Laboratory at Turkey Point is located approximately 35 miles east of the Reserve headquarters. The lab hosts a marine biology program targeted at middle school students in the Panhandle region. It is titled, Saturday at the Sea (SATS). The SATS program covers two primary habitats; salt marshes and seagrass beds. Students are involved in organism collecting and studying during a 6.5 hour program.

E. St. Marks National Wildlife Refuge

The visitor center for St. Marks is located approximately 65 miles east of the Reserve headquarters. Educational programs at the Refuge target a wide range of audiences and cover topics related to the local habitats. Volunteers play an important role in providing education programs. The visitor center has several exhibits for study. An "Educator's Guide" has been developed with pre and post-visit activities for students. Suggested activities cover topics including fresh water wetlands, salt water wetlands, vertebrates, insects and human impact.

F. St. George Island State Park

State park staff conduct barrier island interpretive programs for park visitors on a seasonal basis.

G. Sea Explorers

This high adventure program introduces youth to many aspects of natural resource management. The Reserve has worked to provide educational programs to Sea Explorer groups in the local area.

H. Boy Scouts/Girl Scouts

The Reserve has been cooperatively involved in many programs with Boy Scouts and Girl Scouts. Some of the activities include educational programs at large Camporee events, weekend trips in the Reserve, coastal cleanups and other special projects.

I. Gulf Coast Community College

Educational programs are conducted on a regular basis with groups from Gulf Coast Community College. These involve Elder Hostel Groups as well as student groups. The Reserve has also participated in a summer program for gifted or high achieving students through a state grant administered by the college.

CHAPTER 6

MANAGEMENT OF AQUATIC RESOURCES

I. Introduction

The Apalachicola Bay area and Franklin County depend to a considerable degree on a rather narrow economic base that revolves around natural resources, especially the aquatic environment of the region. Employment in the area is primarily dependent on products from the aquatic resource base, timber production, and tourist expenditures (Colberg et al., 1968). Over 65 percent of the Franklin County work force is employed by the commercial fishing industry and the recreational fishing industry is increasing significantly. Because fishing is primarily an "export" industry, practically all sales are outside the region (Prochaska and Mulkey, 1983). This generates additional income and purchases, both direct and indirect, which have been estimated to be worth over $67 million by the year 2000 (Colberg et al., 1968).

Both upland and aquatic resources of the Apalachicola National Estuarine Research Reserve provide a wide variety of uses, which in turn, present management problems both from a natural resource standpoint as well as a water quality problem. The increase in tourism in the area and the concomitant increase in the need for support facilities as well as increased use of open water areas also presents new management problems for the Reserve. Since the Reserve has no law enforcement capability and is not the entity that makes or enforces rules on the open water areas or adjacent private lands, these problems are compounded and must be dealt with through coordination and interagency agreements. Major issues that affect aquatic resources and water quality within the Reserve are included below.

II. Maintenance, enhancement, and conservation of the renewable marine fishery resources of the Reserve

The Reserve encourages compatible uses of the natural resources. Commercial and recreational fishing activities such as shrimping, oystering, fishing, and crabbing are of vital importance to the local economy. These activities will continue to be supported by the Reserve as long as the resource is managed in such a manner to provide for optimum sustained benefits to the resource and the people of the state. The harvest of renewable resources is one of the most productive and least threatening activities to the health of the estuary, provided species are not overfished, either by increased fishing pressure or inappropriate gear usage.

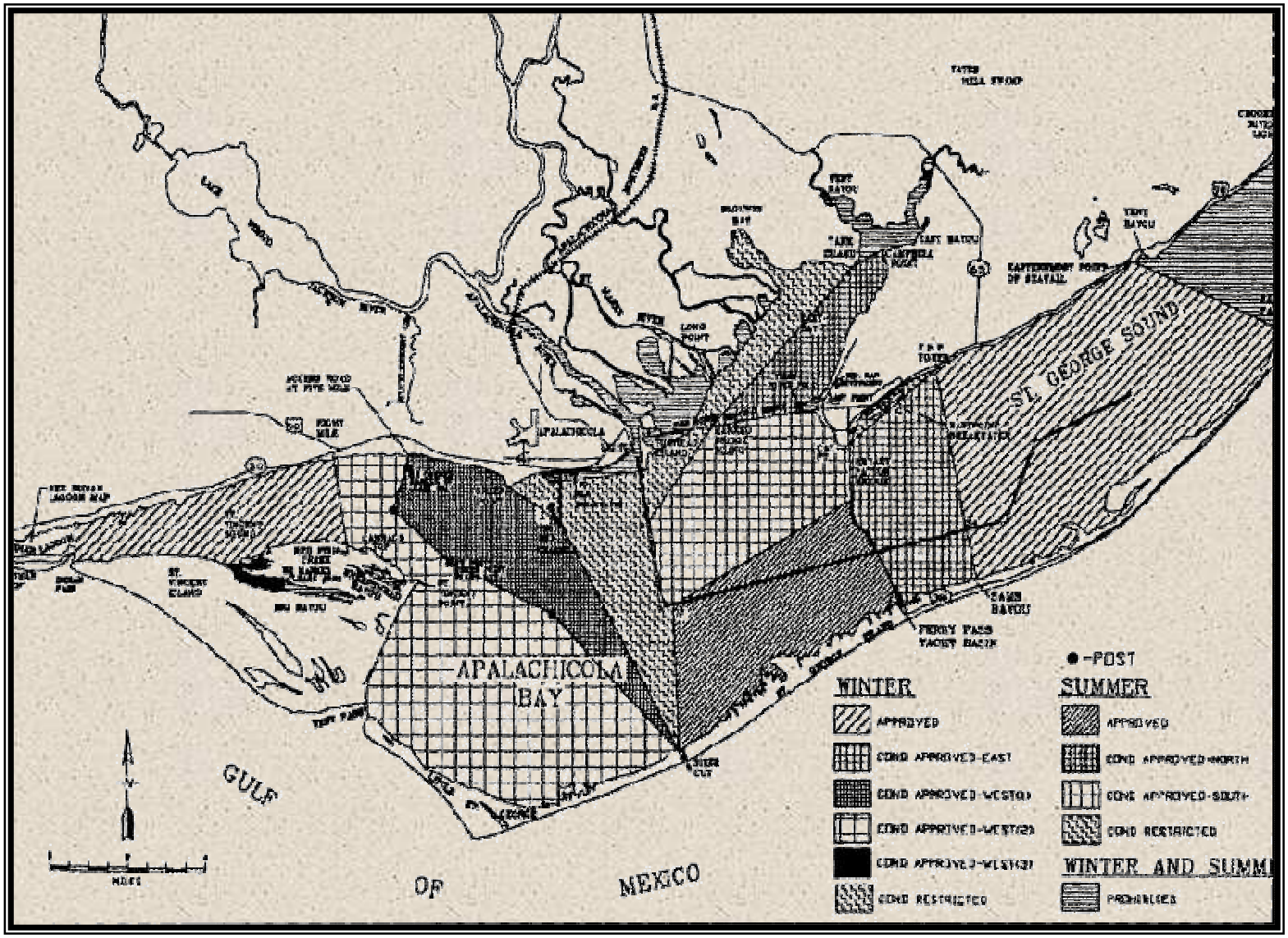
The Apalachicola Bay system is a highly productive lagoon/barrier island complex that typically yields $12 to $16 million in commercial dockside seafood landings annually (FDNR, 1986). Commercial fishing has been the most important economic activity occurring within the bay, dating back to the early 1900's. Currently between 60 and 85 percent of the local people make a living either directly or indirectly from the fishing industry (Rockwood and Leitman, 1977). Species commercially harvested

in the Apalachicola Estuary are both diverse and substantial and, as with most natural resources, have considerable annual variation in landings. Species harvested include oysters, shrimp, blue crabs, and finfish, as well as freshwater catfish and eels.

Commercially, the American oyster is the most important invertebrate in the estuary. Approximately 90 percent of the oysters harvested in Florida come from Apalachicola Bay. Historically, revenue from this industry has accounted for nearly half of Franklin County's income (Whitfield and Beaumariage, 1977). Production on commercial oyster bars has been estimated at between 400 to 1,200 bushels/acre/year (Ednoff, 1984; Berrigan, pers. comm.). Because of relatively mild temperatures in the area, oyster growth is continuous throughout the year and has been estimated to be among the fastest in the United States. Harvestable oysters, those larger than 3 inches, have been produced from spat in as little as 39 weeks. The spawning season is also one of the longest in the United States (Ingle and Dawson, 1952). The oyster industry has been the subject of much concern and debate involving overharvesting, regulations, methods of harvesting, bay closings, and private vs public ownership of the resource for many years (Ingersoll, 1887; Swift, 1898; Moore, 1898; Ruge, 1898; Higgins, 1937; Whitfield, 1973; Andree, 1983; Berrigan, 1987) and the debate continues unabated. Since 1960, between 400 and 700 tongers/catchers (oystermen who harvest oysters using long handled oyster tongs) have harvested oysters annually (Colberg and Windham, 1965; Rockwood et al., 1973; Whitfield, 1973; Prochaska and Mulkey, 1983; National Marine Fisheries Service, 1982-1988). The numbers vary considerably due to the variability in the quantity and quality of the oyster stock. Management of the oyster fishery, including bag limits, closure of oyster bars, coliform monitoring, and setting oyster harvest areas (Figure 16) is the responsibility of DEP's Bureau of Marine Resources Regulation and Development, as well as the Florida Marine Fisheries Commission.

While the oyster fishery employs more people, the shrimp fishery is worth more in terms of dockside value. Three species of penaeid shrimp (white shrimp, pink shrimp, and brown shrimp) are ecologically and economically important to the area. These three species combined represent between one-third to one-half of the dollar value of all seafood landings in Franklin County (Cato and Prochaska, 1977). Shrimp landings include both bay and offshore harvests and may be underestimated due to boats from other areas offloading local shrimp elsewhere. The primary concern with the shrimp fishery deals with the "by-catch" problem (non-commercial species killed and thrown overboard) and the harvest of small shrimp which have not had a chance to enter the breeding population. Turtle excluder devices (TEDS) required by the NMFS have addressed listed species concerns offshore and by catch reduction devices (BRDS), are currently being developed. The other main issues deal with minimum size, closed areas, and the timing of opening and closing certain parts of the bay. Passage of a constitutional amendment limiting marine net fishing in 1995 reduced the size of nets that could be used in inshore waters to nets less than 500 square feet of mesh area. Shrimp regulations are set by the Florida Marine Fisheries Commission.

FIGURE 16: Shellfish Harvesting Area Classification



The blue crab fishery, although substantially smaller than oysters or shrimp, is the third most abundant invertebrate species harvested. More than one million pounds are landed commercially each year. The main issues facing the blue crab industry deal with commercial versus recreational catch, regulations concerning the minimum size, and the prohibition against keeping “sponge crabs,” (females with eggs). Crab regulations are set by the Florida Marine Fisheries Commission.

Estuarine-dependent fish have dominated the finfish fishery in Apalachicola Bay. Menzel and Cake (1969) estimated that historically three-fourths of the commercial catch in Franklin County has been dependent on the estuarine habitats and condition of Apalachicola Bay. These species include true estuarine forms, those that use the estuary during part of their life cycle for feeding and nursery grounds; migratory forms; and fresh and salt water forms which enter the estuary when conditions are appropriate. The passage of the constitutional amendment limiting marine net fishing in 1995 eliminated gill-netting in the State of Florida. With the re-classification of redfish and speckled seatrout as gamefish and restricted species in the early 1990s, the commercial finfish fishery within the Reserve has been reduced significantly. Mullet, which was the largest catch in terms of pounds landed, can now only be harvested with a hand-thrown cast net, or other legal device.

An increasing industry in Franklin County has become the recreational fishery, either by individual fishermen or an increasing number of guide/charter boats that operate in the area. Data on recreational catches are sparse and subject to errors but the Apalachicola Bay area continues to attract an ever increasing number of recreational fishermen. Finfish fishery concerns deal with increased fishing pressure, recreational versus commercial catch, and the size of species allowed and bag limits of various species. Fishery regulations, both recreational and commercial, are set by the Florida Marine Fisheries Commission. Increasing recreational fishing also leads to an increase in docks, boat ramps, and marinas which usually impact fish habitat.

The Reserve in the past has been the focal point for meetings concerning commercial regulations, both state and federal, to inform fishermen of the rules and provide the opportunity for fishermen and regulators to discuss these issues in a public forum. The Reserve has also coordinated and provided information at public meetings, ad hoc committees, and local and state government hearings on fishery regulations. With the increasing emphasis on recreational fishing the Reserve will be redefining its role, both educational, monitoring, and management related to recreational fishing, catch and release, size limits, disposal of monofilament, littering, etc., to deal with these important issues.

New strategies devised to deal with recreational and commercial fishing issues include:

- setting up a program to work with recreational fishing guides to determine fishing pressure, catch rates, species targeted and caught within the Reserve, information needs, and problems caused or encountered, both economically and environmentally;

- working with the Florida Marine Research Institute's Fisheries Independent Monitoring Program, now co-located with ANERR, on juvenile and adult populations of important recreational species;

- working with the new Institute for Fishery Resource Ecology, a partnership between Florida State University and the National Marine Fisheries Service, which the Reserve just signed a cooperative agreement with, to address marine and coastal resource issues;

- setting up a new trawling program designed to collect and compare information on current finfish and benthic macroinvertebrate populations, structure, and diversity to historical data to detect and determine changes to the ecology of the Apalachicola Bay system; and

- working with the education program at ANERR to help develop brochures that address important fisheries related issues and regulations that affect Reserve waters.

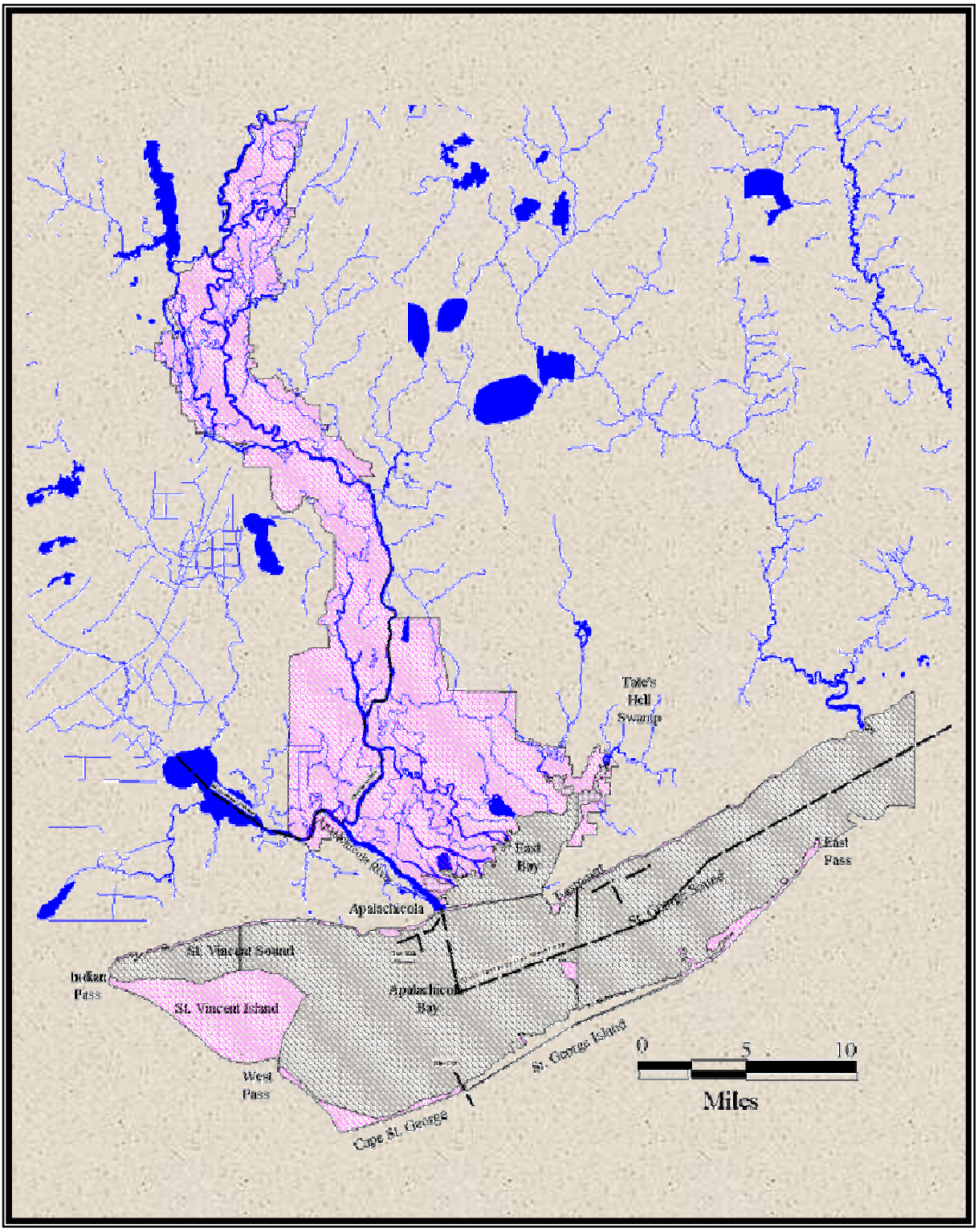
Meanwhile, the Reserve will continue to coordinate with all the agencies, private groups, government officials, and private citizens involved in these issues as it has in the past.

III. Navigation and associated maintenance activity impacts on water quality and aquatic habitats of the river and bay system

Several federal navigation projects pass through Reserve boundaries (Figure 17). The ACF River navigation project begins at the John Gorrie Bridge and extends up the Apalachicola River through Lake Seminole, up the Chattahoochee River to Columbus, Georgia, and up the Flint River to Bainbridge, Georgia. The project is authorized to have a 9 foot deep by 100 foot wide channel, and the principal commodities shipped on the river include fertilizers, petroleum products, basic chemical products, and agricultural products. Project depth is maintained by a series of upstream dams and a considerable amount of annual dredging in the Apalachicola River portion of the project.

The Gulf Intracoastal Waterway (GIWW) navigation project also traverses the Reserve, beginning at the Reserve's eastern boundary in St. George Sound, extending west through Apalachicola Bay, turning north near Sike's Cut and running to the John Gorrie Bridge (Figure 17). The GIWW enables traffic on the ACF to travel all the way to Texas. However, since the ACF project is a spur off the GIWW and their intersection is at the Jackson River, north of the bay, most traffic down from the ACF does not traverse the bay but heads westward through Lake Wimico. The GIWW is a twelve foot deep by 125 foot wide channel that must be dredged annually and provides access to the bay for a variety of commercial and fishing interests. Principal commodities shipped on this project across Apalachicola Bay include petroleum products, phosphate rock, asphalt, tar and pitches, and sodium hydroxide (USACOE, 1986).

FIGURE 17: Authorized Navigation Projects in Apalachicola Reserve



Several other smaller federally authorized projects are also located within the Reserve including Two Mile Channel, Sike's Cut Channel, Eastpoint Channel, and the Scipio Creek Channel (Figure 17). Two Mile and Eastpoint Channels are used predominantly by oyster boats, small shrimp boats, and small recreational craft. The channels require maintenance dredging every five to ten years. The Sike's Cut or St. George Island Channel is used predominantly as an access channel to the Gulf of Mexico by larger shrimp boats and pleasure craft and requires maintenance dredging every two to five years. Scipio Creek Channel is used as an access channel to the Scipio Creek boat basin, a commercial marina for small shrimp boats, net boats, and offshore fishing boats. Scipio Creek requires maintenance dredging every ten to fifteen years.

Important issues facing the system from navigation activities in the river and bay can be divided into two main categories: those directly related to the movement of traffic along the authorized navigation channels, i.e. barge traffic, and those caused by maintenance of these channels, i.e. dredging, spoil disposal, dam construction, and shoreline stabilization projects. Although barge traffic is relatively light, compared to most systems, the primary concern related to this traffic is water quality impacts. The Florida Department of Environmental Protection, with input from the Reserve, has drawn up a general contingency plan for the Apalachicola River in the event of an oil or chemical spill on the river (FDEP, 1989).

Activities associated with creating and maintaining the authorized channel in the river has caused greater environmental damage than the traffic itself to date. In the Apalachicola River system a reduction in productivity of the fish population has been documented. This has been caused by the physical destruction of natural riverine habitats from a combination of dredging, spoil disposal, rock removal, and the creation of Lake Seminole (Seaman, 1985). Anadromous fish such as the Gulf of Mexico sturgeon and striped bass have been impacted significantly by the construction of the Jim Woodruff Lock and Dam in 1957. Dredge and spoil activities have affected every type of habitat in the river. Approximately 25 miles of natural shoreline have been converted to less productive sand bars by within bank disposal of dredge material. Past dredging practices, no longer approved, also resulted in the destruction of floodplain habitat due to hydroperiod changes and suffocation of vegetation by sand.

Spoil disposal in the bay has resulted in the loss of submerged habitat, by island creation; increased contaminant levels in the dredged channels, due to silt and clay accumulation; and the destruction of benthic communities, due to open water spoiling of dredge material. The construction of Sike's Cut in the 1950's, through St. George Island, is probably the most controversial activity associated with navigation channels. Although it provides easy access for the larger gulf shrimp boats and recreation vessels, oystermen and many scientists feel that it has altered the historic salinity regime in the bay and decreased the productivity of the oyster fishery in Apalachicola Bay.

The Reserve in the past has coordinated with the USACOE, NWFWMD, FDEP, FGFWFC, USFWS, NMFS, Franklin County, and DCA on navigation issues through meetings, permit reviews, joint consultations, and field inspections. Through these efforts, a joint project creating a dredge spoil island in the bay was undertaken in 1995. This project, a compromise between state and federal agencies, allowed the USACOE much needed disposal area in the bay and allowed the Reserve to minimize loss of aquatic habitat while providing important nesting habitat for migratory listed species.

New strategies devised to deal with navigation and channel maintenance issues include:

- continuing to monitor the newly created island and making alterations to it through coordination with the USACOE and FGFWFC to increase its effectiveness as a rookery for listed bird species;

- working with the USACOE on beneficial uses of dredge spoil material to reduce the amount disposed of within the riverine and estuarine habitats;

- working with all agencies involved, local, state, and federal, on permit issues, water quality impacts, and mitigation issues;

- monitoring physical parameters in the bay to help determine the impacts of Sikes Cut on the estuarine habitats; and

- working with the Northwest Florida Water Management District and FSU to further define the three dimensional hydrodynamic model and ecological model of Apalachicola Bay to help determine impacts from human alterations.

The Reserve will also continue to coordinate with all the agencies, private groups, government officials, and private citizens involved in navigation issues as it has in the past.

IV. Maintenance of adequate freshwater inflows and maintenance and improvement of water quality in the Apalachicola River and Bay system

Water quality in the river and bay is very good overall, with the exception of a few nearshore areas associated with boat basins, urban stormwater runoff, canals, and shellfish processing facility wash water (Hand et al., 1996). Most of Apalachicola Bay is designated as Class II Shellfish Propagation or Harvesting Waters. This designation has some of the most stringent water quality standards in the state of Florida. These standards, particularly coliform criteria, are strict because oysters are preferred “raw on the half-shell” by most seafood consumers.

The most serious local threats to the water quality in the bay are associated with nonpoint sources from the more urbanized areas in the basin and increased development on St. George Island. Untreated stormwater runoff from the city of

Apalachicola, Eastpoint, and St. George Island represents the local threat within the boundaries of the Reserve. Most local municipal sewage plants have recently upgraded their systems or removed them as point sources to the bay. Therefore, these previous contamination sources have been reduced. Increased septic tank drainage, development, silvicultural activities, and marina development also pose potential threats to the water quality in the bay. The Reserve assisted Franklin County in 1994 in its development and passage of an ordinance that created a buffer around the bay from septic tanks. The two most important parts of the ordinance prohibit septic tanks within 150 feet of mean high water and limit residential development to aerobic systems anywhere on St. George Island. The benefit of this ordinance is that aerobic systems require a maintenance contract (twice a year inspection), while typical septic tanks require no maintenance or inspection. Other local threats to water quality include increasing boating impacts, including jet skis, and marina development.

Water quality issues associated with the river are primarily related to upstream urbanization (primarily Atlanta), increased agricultural activities, stormwater runoff, navigational activities, and discharges from Alabama and Georgia. The interstate nature of the basin allows pollutant loading from sources in other states to enter Florida with the state having no jurisdiction over these discharges (NWFWMD, 1990).

The largest upstream threat to the system involves upstream diversion of water by interests in Georgia. Increased urbanization, with its concomitant increase in water needs, and increased agricultural groundwater withdrawals from the upstream aquifer pose a serious concern for the health of the Apalachicola Bay system. Agricultural withdrawals in Georgia and Alabama have been increasing in recent years, although no accurate estimates of how much water is utilized are available. Studies have shown that during low flow periods and heavy agricultural withdrawals, water actually flows from the Chattahoochee River into the groundwater because of this increased pumping (USACOE, 1988).

In 1989, the U.S. Army Corps of Engineers Mobile District, proposed reallocating approximately 237,000 acre-feet of water from Lake Lanier, the largest reservoir on the system, for the growing needs of the City of Atlanta (USACOE, 1989). The States of Alabama and Florida sued in federal court to halt this reallocation, citing failure to determine impacts on the downstream users, required by National Environmental Policy Act. Numerous other cities and industries downstream also have additional needs and have been investigating further withdrawals from the Flint and Chattahoochee rivers. A tri-state compact was signed by the three states in 1998, after over five years of studies, to jointly develop water allocation formulas for the ACF.

The Reserve has been involved and will continue to be involved in the design of the studies, data collection, assistance with outside studies, and the review of information. Research staff also sit on the Water Allocation Committee that is helping to develop Florida’s water allocation formula. New strategies devised to deal with maintenance of freshwater inflows and water quality issues include:

- working with the Northwest District DEP staff to monitor coliform concentrations in the river and bay and determine “hot spots” and sources of contamination and devise methods to reduce runoff and nonpoint sources;

- working with Florida State University on projects to monitor and determine effects of on-site sewage disposal systems, both septic tanks and aerobic systems, on St. George Island;

- monitoring physical parameters at 4 stations in the bay to determine the effects of various flow regimes and help define historic flows and impacts in the bay; and

- working with the Northwest Florida Water Management District and FSU to further define the 3D hydrodynamic model and ecological model of Apalachicola Bay to help determine affects of reduced flows on biota in the bay.

V. Local development and land use changes and their impacts on aquatic and natural resources within the Apalachicola Bay system

Land use characteristics influence runoff patterns, types of pollutants, water quality and quantity, and virtually all aspects of riverine and river-dominated estuarine systems. The Apalachicola River and Bay drainage basin encompasses 3,102 square miles (Edmiston and Tuck, 1987). Forest land accounts for over half of this area, comprising almost 55 percent of the total basin. Approximately 78 percent is evergreen forests, much of which is slash pine plantations used in silviculture operations.

Franklin County is predominantly rural with 93 percent of the total county area of 348,800 acres zoned either forestry conservation, forestry agriculture, preservation, recreation, or submerged bottomlands (Table 6). In 1987, the population of Franklin County was estimated at 8,538, which ranks it 63rd among Florida’s 67 counties. Franklin County has a relatively sparse population density of 15.7 persons per square mile (Franklin County, 1991). The major land use on much of the land surrounding the Reserve has historically been forestry operations, predominantly pine plantations. Much of the land, away from the coast and outside the Reserve boundaries is currently owned by the State (Tate's Hell State Forest) or timber companies.

Population and residential development in Franklin and Gulf Counties are relatively sparse. The only municipalities within these counties near the Reserve include Apalachicola, Carrabelle, Port St. Joe, and Wewahitchka. The combined population of these four cities is less than 15,000 (University of Florida, 1988). The Big Bend region, including the Apalachicola Bay system, remains one of the last relatively undeveloped coastal areas in Florida.

Most new development in Florida is concentrated along the coast. Although the county and basin are relatively undeveloped, there is considerable development

pressure in the area, especially in the coastal zone. High density developments and associated marinas are currently planned for St. George Island and along the waterfront areas of the mainland surrounding the bay.

The Reserve has coordinated with the Florida Department of Community Affairs, the State Land Planning Agency, the Franklin County Planning and Building Office, the Franklin County Board of County Commissioners, and other local, state, and federal agencies on development issues, land use changes, marina development, and other issues that affect nonpoint source runoff in the area. The Reserve has also been involved in lot surveys, design of monitoring plans for developments, providing expertise to the County on proposed impacts from development and ordinances, critical shoreline area designation, purchase of sensitive lands by the County, and listed species impacts. Reserve staff will continue to provide this type of expertise and additional assistance as required.

TABLE 6: Franklin County Land Use

LAND USE	TOTAL ACRES	PERCENTAGE OF COUNTY	VACANT ACREAGE
Incorporated Areas	1,760	5	---
Residential	16,071	4.7	10,000
Commercial	840	.2	40
Industrial	1,325	.4	200
Public Facilities	560	.2	100
Recreation	1,894	.5	NA
Conservation	40,608	11.6	NA
Agricultural	265,347	76.0	NA
Water	20,395	5.9	NA
TOTAL	348,800	100.0	

New strategies for the future deal primarily with:

- increased efforts to educate local citizens and county officials about ways to protect natural and cultural resources;
- identifying and working more closely with local organizations involved in resource protection issues;
- continuing and expanding coordination efforts with other agencies, both state and federal; and
- identifying important, unique, and endangered habitats that should be protected through either through acquisition, zoning, or protective covenants.

Staff have also recently become involved in ordinance development to protect listed species with the Franklin County officials and will continue to be a part of this process.

VI. Interagency coordination of activities that may affect the natural resources or water quality within the Reserve

Local, state, and federal agencies that have management or coordination authority over areas within or adjacent to the Reserve include the City of Apalachicola, Franklin County, Florida Department of Environmental Protection, Florida Marine Fisheries Commission, Florida Department of Community Affairs, Florida Game and Fresh Water Fish Commission, Florida Division of Forestry, Florida Division of Historical Resources, Apalachee Regional Planning Council, Northwest Florida Water Management District, Governor and Cabinet of Florida, National Marine Fisheries Service, U.S. Fish and Wildlife Service, USCOE, U.S. Environmental Protection Agency, and the National Oceanic and Atmospheric Administration. Coordination of goals, statutory authority, regulations, and management schemes with all these different agencies is critical to the success of the Reserve.

The Reserve does not have staff or authority for enforcement. In lieu of enforcement authority, the Reserve works with the Franklin County Sheriff's Office, Florida Marine Patrol, Florida Park Patrol, Florida Game and Fresh Water Fish Commission Wildlife Officers and the U.S. Fish and Wildlife Service enforcement officers. All these entities have vested authority within the Reserve. The role of the Reserve staff in enforcement has been and will continue to be coordination, environmental impact assessment and testimony and education. Rules governing Aquatic Preserves apply to the Apalachicola Bay Aquatic Preserve which is totally contained within ANERR boundaries (Figure 21).

VII. Research and Monitoring and Education

The Reserve is utilized extensively for research and monitoring and educational programs at all levels, from elementary school to post-doctoral work. The purpose of the Reserve's education program is to provide information about estuarine ecosystems and associated resource protection. The education program provides its audiences with a variety of methods to learn about estuarine ecology in a natural setting. On-site education opportunities include hands-on exhibits, cultural experiences, an audio/visual lending library, slide and audio/visual presentations, a guest lecture series, interpretive field trips and hikes into river, bay, and barrier island habitats, teacher workshops, and oystermen certification training. Off-site education opportunities include classroom curriculum materials (such as Estuarine Pathways and Project Estuary, developed by the Reserve), traveling displays, slide and audio/visual presentations, and publications such as newsletters and brochures.

The research program at the Reserve is patterned after the national program in that it emphasizes research that will enhance our understanding of estuarine environments, and provides useful information for making resource management decisions. Research and monitoring projects conducted in the Reserve in the past have focused on aerial distribution of vegetation, correlation of floodplain detritus to productivity of the bay, oyster growth and productivity, seasonality of finfish populations, erosion and accretion of sediments on barrier islands, heavy mineral deposition on barrier

islands, phytoplankton and zooplankton population dynamics, archaeological surveys, red drum population dynamics, colonial bird nesting site preference, riverine fishery productivity relationships with riverine habitat and man-made alterations, benthic invertebrate population dynamics, effects of upstream water diversions on bay salinities, environmentally safe methods of shoreline protection, nonpoint source impacts, especially on-site disposal systems, sport fish catch rates and age and growth relationships, protection of all listed species within the Reserve, and commercial oyster aquaculture.

Providing information to the appropriate citizens, coastal decision-makers, government agencies, and rule-making entities is by far the best way to ultimately protect the Reserve's resources. This is the function of the Reserve's research and monitoring, education, and resource management programs. Strategies to accomplish these tasks are outlined in the individual chapters that describe these programs

CHAPTER 7

RESOURCE MANAGEMENT

I. Introduction

The Apalachicola NERR's role in resource management is diverse due to the wide range of landowner activities and managing agencies within the boundary.

Those publicly owned lands not under direct management by the Reserve are addressed by the individual agencies' Land Management Plans (F.S. 253.034). The Reserve provides review and comment to those plans. Private landowners have access to Reserve staff and other appropriate management agencies for assistance in determining their land management practices.

All facets of Resource Management by the Reserve shall be guided by the primary goal of providing protection, conservation, restoration and enhancement of habitats within the Reserve, as well as those outside Reserve boundaries which may impact Reserve communities.

Key elements to success in this program include an active acquisition program, appropriate management of publicly owned lands, coordination among myriad local, state and federal programs that affect the Reserve, and coordination of the research, education and resource management programs within the Reserve.

II. Land Acquisition and Boundary Expansion

ANERR, encompassing approximately 246,000 acres, is by far the largest NERR in the national system. However, over half (135,680 acres) is submerged lands and a significant, high quality upland, buffer must exist to adequately protect such an important aquatic resource. Public ownership of the lands directly associated with the estuarine system facilitates efforts to protect the resources. Loss of these lands to development would, in addition to degrading the resources, impair the usefulness of the Reserve as an ecological research and environmental education facility and would decrease the quality and quantity of recreational and commercial fishing opportunities.

It is a goal of the ANERR to protect the natural resources of the Apalachicola Bay system through the acquisition of environmentally important lands and the expansion of the Reserve boundary.

A. Boundary Expansion

One specific objective is to expand the boundaries of the Reserve to include newly purchased lands and other environmentally sensitive tracts that are needed to protect the natural resources of the Reserve. (See Table 7).

Florida has been aggressive and supportive in the areas of land acquisition and the protection of the resources of the Apalachicola River watershed. Lands have been acquired within the boundaries of ANERR. Lands have also been acquired adjacent to and will affect ANERR resources. In the interest of ecosystem management, DEP has expanded an existing MOU, established a new one and received additional lead-role management responsibilities.

As a necessary action in ANERR's final evaluation findings (section 312 of the CZMA), NOAA states "ANERR must submit the required documentation to NOAA for all parcels not identified in the original environmental impact statement and management plan for formal inclusion into the ANERR boundary."

Criteria for setting boundaries are contained in NERRS regulations (Title 15 of the Code of Federal Regulations 921). The main factor in delineating Reserve boundaries is a determination that the site's boundaries encompass an adequate portion of key land and water areas of the natural system to approximate an ecological unit and to assure effective conservation. Table 7 lists the lands requested for inclusion into ANERR boundaries.

B. Land Acquisition

A second objective of the ANERR is to complete the acquisition of the remaining environmentally sensitive tracts of privately owned land that still exist within and adjacent to Reserve boundaries.

Ongoing acquisition of tracts within the Reserve is primarily the responsibility of the DEP, Division of State Lands. Reserve staff are directly involved with land acquisition staff and assist in the development of an overall plan, on-site visits, delineating areas on aerial photographs, project assessments and clarifying environmental issues.

Inholdings designated for acquisition within the Reserve boundaries remain in private ownership. These lands surround the upper reaches of East Bay and include primarily estuarine and fresh water tidal marsh, wet prairie, floodplain forest as well as minor amounts of wet and mesic flatwoods. These lands were included in the original boundary maps for the Reserve in 1979 and have been slated for acquisition since the inception of the program. However, due to unwilling sellers, the lack of eminent domain authority and lack of pursuit by the state these lands still remain in private ownership. These inholdings are listed for purchase through the Conservation and Recreational Lands (CARL) program of the State of Florida. Reserve staff continue to support and press for their purchase through state and federal channels, both through existing land buying programs and grant requests.

Priority lands that the Reserve have identified include two categories: those that have been included on the CARL list by the State of Florida and those not on the list but which are being pursued through other agencies or avenues.

Property that affects the Reserve and is currently being considered for purchase utilizing CARL funds include:

1. The original Catpoint project design called for the acquisition of 115 acres along the mainland in Eastpoint, near the St. George Island Bridge. Two parcels, the Rodrique tract (58.87 acres) and the Millender tract (34.80 acres), have been purchased leaving approximately 28 acres still in private ownership. It is vegetated primarily with marine tidal marsh, wet flatwoods and maritime hammock. This area is important because it drains into the most productive oyster bar in the Apalachicola system.

2. The Apalachicola River CARL project includes three separate tracts along the upper river:

    a. The Gadsden Glades tract, consisting of approximately 1,912 acres on the east side of the Apalachicola River, comprises much of the known Florida occurrence of upland glade natural community, as well as seepage slope and upland pine forest. Upland glade and seepage slope are considered to be among the rarest and most endangered natural communities in Florida.

TABLE 7: ANERR Boundary Expansion Lands

Lead Management Agency	Name of Parcel	Acreage
GFC	M & K (3 parcels)	8,793
GFC	Bloody Bluff Tract	3,466
GFC	Sand Beach	5,262
NWFWMD	Apalachicola River WMA	35,487
Subtotal		53,008
Lead Role Management		
DEP	Unit 4	75
DEP	Millender Tract	34.8
DEP	Rodrique Tract	58.87
DEP	Williamson Tract	1
DEP	Nick's Hole	47.72
DEP	Pelican Point	2
DEP	Magnolia Bluff Addition	200
Subtotal		419.39
Total		53,427.39

    b. The Aspalaga Landing tract, just downstream from Gadsden Glades, encompasses approximately 800 acres of seepage slope

and slope forests and has been recognized as an important botanical site for over 150 years. Numerous threatened and endangered plants and animals occupy both of these sites.

c. The Atkins tract, farther downstream on the west side of the river, encompasses approximately 3,210 acres of high quality floodplain forest and sandhills. Numerous endangered wildlife species are found in this area as are a large number of archaeological sites.

3. The East Hole tract, located on the bayside of St. George Island, is considered another important drainage into Apalachicola Bay. It covers approximately 25 acres including marine tidal marsh, mesic flatwoods and scrub.

4. The city of Apalachicola bayfront consists of all undeveloped bayfront lots between Battery Park and Lafayette Park. Most of the area is marine tidal marsh, consisting of black needlerush and smooth cordgrass. Of the seven blocks in this area only three remain undeveloped and available for acquisition. Because of this recent development, the Reserve has recommended deletion of this parcel from the CARL list.

C. Second Category Acquisitions

It is an objective of the ANERR to acquire the second category of priority acquisition projects identified by the Reserve including lands within the Apalachicola River and Bay drainage basin that are environmentally sensitive or possess unique habitats. These lands include:

1. The Apalachicola River floodplain area encompasses approximately 45,000 acres, north of NWFWMD lands and south of the Jim Woodruff Dam (Number 1 Acquisition Priority of the NWFWMD).

2. Additional M & K Ranch properties, north and west of the Reserve, are adjacent to the Apalachicola National Forest and the proposed NFWMD acquisition (approximately 15,000 acres).

3. A narrow strip of St. Joe Paper Company property, south of US Highway 98, runs west from the city of Apalachicola to the Gulf County line (approximately 1,500 acres) and includes approximately twelve miles of bayfront along St. Vincent Sound. This property includes important mesic flatwoods, maritime hammock, estuarine tidal marsh and basin marsh. If this property were developed, runoff and septic tank leachate could impact many of the oyster bars in St. Vincent Sound.

Reserve staff have been involved in nominating and supporting purchase of these parcels for several years. Staff have acted as guides for acquisition

agents, provided natural resource inventories, solicited public and private support and requested funds through granting agencies for acquisition of these parcels and will continue to do so.

III. In-boundary Non-Reserve Management Coordination

It is a goal of the ANERR to protect the natural resources of the Apalachicola River and Bay drainage basin through appropriate management of public lands located within the Reserve boundary even if they are not managed by the Reserve.

A. Specific Tract Management For Non-Reserve Lands

A specific objective to support the above referenced overall management goal is to coordinate activities and provide input on management plans for all public lands that are not managed by the Reserve for the protection and enhancement of natural communities.

Three large parcels of land within the boundaries of the Reserve are leased and managed by other state and federal agencies. Although the Reserve does not have direct management authority over these areas, an Administrative Agreement has been signed between the DEP and these managing agencies that provides for coordination and input from Reserve staff in advance on management plans, policy changes, permit applications, prescribed burns, timber harvesting and work activities that may affect the environmental quality of the Reserve (See Administration Agreements, Appendix 3).

The four tracts, their management agencies and management schemes are:

1. St. Vincent Island National Wildlife Refuge (NWR)

Management of St. Vincent NWR is by the U.S. Fish and Wildlife Service (FWS). Access to the refuge is by water and visitors provide their own boats. No transportation facilities are available. Public use on the island includes salt or freshwater fishing, hiking, wildlife observation, photography and shelling. Some fourteen miles of beaches along the south and east shores of the refuge and approximately 80 miles of inland trails are open to daytime public use. Primitive camping and open fires are allowed only at designated areas during managed hunts. Managed hunts for white-tailed and Sambar deer, feral hogs and turkeys are held annually at specified times. A special permit from the refuge is required for these hunts (FWS, 1986c).

Current management is directed by the following mission statement: "to manage and preserve the natural barrier island and associated native plant and animal communities." Management of upland habitats is accomplished primarily through the proper use of fire, both prescribed and naturally occurring. Wetland habitats are managed on a

limited basis through water level manipulation and control of vegetation.

Public use management is guided by a primitive use concept; only limited accommodations are available and motorized vehicles and equipment are not permitted. As a result, wildlife-wildlands oriented opportunities have been emphasized. With the exception of managed hunts all public use is daylight hours only.

The 86 acre mainland tract, located in Franklin County, consists of tidal marsh and slash pine forest. The refuge headquarters was located on this site until November 21, 1985, when Hurricane Kate ruined the office trailer, and other associated buildings. The headquarters was then temporarily located in an old restaurant one-half mile west of Apalachicola, Florida. The headquarters currently is located next to the Scipio Creek Boat Basin in the city owned Harbour Master House.

Reserve staff review and comment on National Wildlife Refuge Management Plans. Reserve staff coordinate education and research trips on St. Vincent Island with Refuge staff. Reserve staff have also assisted the Refuge with endangered species concerns and permit applications adjacent to Refuge boundaries that impact the resources of the Refuge and the Reserve. The Memorandum of Agreement between the two agencies appears to be working well and no changes are recommended at this time. Reserve staff have recommended the addition of an annual on-site meeting to discuss planned management activities scheduled for the upcoming year, similar to that utilized with the Florida Game and Fresh Water Fish Commission (GFC) on their property.

2. Apalachicola River Wildlife and Environmental Area (ARWEA)

The GFC is the lead managing agency. Current management of the ARWEA consists of maintaining boundary lines and establishing and enforcing regulations for use of the area. Management programs on the ARWEA that have been conducted in the past or are proposed for the future include prescribed burning, water level management directed towards restoring natural water regimes, wildlife management consisting of regulating fishing and hunting, resolving nuisance bear problems, natural inventory and recreation (GFC, 1997).

Reserve staff have a close working relationship with the on-site biologist/manager of the ARWEA in order to coordinate activities and share natural resource information. Reserve staff have participated in a controlled burn on this property and have reviewed and commented on annual management plans for the area. The GFC biologist/manager and Reserve staff have agreed to provide work plans for review by

each agency and have agreed to meet on-site annually to coordinate planned management activities for the upcoming year. No changes to the Memorandum of Agreement are proposed at this time as it appears to be working well.

3. Dr. Julian G. Bruce St. George Island State Park

DEP, Division of Recreation and Parks is the managing agency for this state park located on St. George Island. Since both the Reserve and the state park are within the same state agency, coordination of appropriate activities is relatively easy. State parks are established primarily to preserve and maintain a natural setting of exceptional quality, while permitting a full program of compatible recreational activities.

Reserve staff and state park staff assist each other in educational and research activities within the confines of the state park. The state park makes space available for Reserve sponsored education trips as well as providing equipment for research projects within or near the park. Staff of the Reserve also provide educational and research information for park programs. No changes in the coordination activities between the Reserve and the state park are recommended at this time.

4. Apalachicola River Water Management Area

The Apalachicola River Water Management Area (WMA) consists of 35,487 acres of floodplain forest managed by the NWFWMD. Bought under the Save Our Rivers Program in 1985, this parcel was purchased primarily for water management, water supply and the conservation and protection of water resources. This tract is located in the middle river floodplain of the Apalachicola River and borders the ANF to the east and the Reserve to the south (Figure 4).

The management philosophy for this land focuses on providing for water resources protection, a diversity of ecosystems, compatible recreational use, wildlife habitat restoration and enhancement, and the continuation, where possible, of local and traditional land and water resource uses (NWFWMD, 1989). Approximately 1,300 permits are sold annually for a variety of uses including fishing, hunting, camping and nature activities. Communities found within this parcel include bottomland forests and floodplain forests.

Reserve staff are members of the Land Management Assistance Committee, set up by the NWFWMD, to provide technical expertise and comment on management plans for this parcel. Reserve education and research sections work with WMA staff on programs involving environmental education and natural resource issues on the river

system. The NWFWMD and the DEP have entered into an administrative agreement placing this parcel in the ANERR boundary.

B. Non-Reserve Tract Management And Coordination

A specific objective for achieving ANERR's non-reserve tract management goals is to coordinate activities and provide input on management plans for all public lands outside the Reserve boundaries, that impact Reserve resources, for protection and enhancement of natural habitats and communities.

There are several large publicly owned tracts of land either contiguous to or near the Reserve. Although the Reserve has no management authority on these lands, Reserve staff provide comments on plans and maintain contacts with the management entities involved. Reserve staff review management plans, comment on policy changes and coordinate on activities that may impact the natural resources of the Reserve. These tracts include:

1. Apalachicola National Forest

The Apalachicola National Forest (ANF) is located in Franklin, Liberty, Wakulla and Leon Counties with the majority of it being in Liberty County. ANF consists of approximately 557,400 acres which are administered by the U.S. Forest Service (USFS). Over 80 percent of the land within the national forest is federally owned. Most of the private lands within the forest are small homesites, farm lands or timber lands. Because of its location and size, it is probably the most diverse management area in the region (Gatewood and Hartman, 1977).

The majority of the forest is in multiple-use management. Hunting is a part of this management, along with prescribed burning, timber management, dove fields, bee leases, population surveys, deer track counts and management of red-cockaded woodpecker colonies. ANF is also a wildlife management area (Apalachicola Wildlife Management Area), co-managed with GFC. It provides habitats for a variety of important game species such as white-tailed deer, black bear, squirrel and turkey. Red-cockaded woodpecker colonies are located in many of the mature longleaf pine sandhills. The USFS is responsible for providing and protecting existing habitat for this endangered species (USDA, 1975).

ANF recreational opportunities include swimming, boating, picnicking and camping at developed facilities, and hunting and fishing in designated areas.

2. Edward Ball Wildlife Management Area

The Edward Ball Wildlife Management Area consists of 65,025 acres in Gulf County (Figure 4) and is privately owned by St. Joe Paper Company. Lake Wimico, northwest of the Reserve, is within the boundaries of the management area. Major communities include wet flatwoods and floodplain swamps. GFC conducts prescribed burns using a 5-7 year rotation. Old road beds are planted with bahia grass, fertilized, mowed and maintained primarily for turkey and quail (T. Breault, pers comm).

3. Fort Gadsden Special Feature Site

Fort Gadsden is a historical, special feature site consisting of 78 acres in the lower river. Fort Gadsden is contiguous with the Reserve and may be considered for future inclusion in the Reserve boundary expansion proposal. This site borders the eastern side of the Apalachicola River. Communities found within this area include bottomland forests, floodplain swamp and mesic and hydric flatwoods. The USFS, Apalachicola National Forest is the managing agency for this special feature site.

The Reserve uses the Fort Gadsden site periodically for education field trips and interacts with ANF staff when necessary. A good working relationship exists between both offices.

4. M-K Ranch Lands

In 1980, the owners of the M-K Ranch, a 33,000-acre cattle ranch, ditched and diked approximately 10,000 acres of the Apalachicola River floodplain without obtaining any permits. A total of 162 violations (13 creeks, 150 drainage canals) were found by the Environmental Protection Agency and USCOE. In an out-of-court settlement, the ranch was required to restore hydrologic patterns to approximately 8,000 acres. This was accomplished by the efforts of M-K and several state agencies. In addition to the restoration project, M-K negotiated the sale of approximately 9,000 acres to the state and donated an additional 3,000 acres . These lands are managed by the GFC. The Administrative Agreement between GFC and DEP has been amended to include the M-K lands. They are now offered for NOAA's approval for inclusion.

IV. Influencing Resource Management Decisions On Privately-Owned Land With Potential Reserve Land Impacts

It is a goal of the ANERR to protect the natural resources of the Apalachicola River and Bay drainage by influencing resource management decisions on private lands which may impact environments of the Reserve.

One specific objective to meet that goal requires that staff provide input and information to all local, regional, state and federal agencies that have regulatory authority over activities that may impact Reserve resources.

Locally, Franklin County's Board of County Commissioners, Planning and Zoning Commission and Planning Office and the City of Apalachicola Commissioners all make decisions that can impact Reserve waters and uplands. These decisions include issuing land clearing and construction permits, adopting land-use and zoning ordinances, issuing variances from adopted ordinances, deciding on such varied issues as aquaculture leases, high density development issues and recommending for or against land purchases by state and federal authorities.

A. Policies

The Reserve has recognized the importance of these local governing bodies to the protection of the unique resources of the area and has instituted the following policies to enhance cooperation and input into local decisions:

- Administration Agreements have been signed, between the former Florida Department of Natural Resources (now DEP) and four local government bodies; the cities of Apalachicola and Carrabelle, Franklin County Commission and the Eastpoint Water and Sewer District; outlining the responsibilities of the Reserve and the cooperators to the agreement (Appendix 3).
- A member of the Franklin County Board of County Commissioners serves on the Reserve Advisory Management Board. This allows local governmental input and provides the Commission information about activities ongoing at the Reserve.
- The Franklin County Planner and the Research Coordinator discuss actions taken by the County Planning and Zoning Committee, monthly, prior to these actions being approved by the County Commission. This allows the Reserve to present its opinions, either to the planner or in the Commission meeting if it has concerns about a planned activity and its impact on resources of the area.
- Since the area was designated an Area of Critical State Concern by the State of Florida, Reserve staff have reviewed, commented on and in some instances helped write, all ordinances passed by Franklin County and the cities of Apalachicola and Carrabelle. The designation is lifted for the county except for the city limits of Apalachicola and Carrabelle. The Reserve has set up working arrangements and continues to exert influence on these decisions.
- The Reserve has also reviewed the Comprehensive Planning documents from Franklin County and the city of Apalachicola and intends to continue reviewing any proposed changes to these documents in the future.

B. Other Coordinative Efforts With State And Federal Agencies

The largest area within the Reserve is state-owned submerged land or open water, which accounts for approximately 135,680 acres. Management of this area, as well as private land in and around the Reserve, is actually based more on the regulatory authority divided among numerous agencies and government entities. Various divisions within DEP, which include the Reserve, the Aquatic Preserves Program, Shellfish Environmental Assessment Section (SEAS) and State Lands are all involved in providing input into regulatory programs that affect these areas. The following sections are also part of DEP: Florida Marine Fisheries Commission regulates commercial and recreational harvest of fishery resources in state waters and has regulatory authority over Reserve waters; the Florida Marine Patrol (FMP), which is an enforcement agency for these rules; and the Northwest Regulatory District which regulates dredge and fill activities, point and nonpoint pollution sources.

Other state agencies which have regulatory or comment authority include: the GFC, regulates hunting and fresh water fishing, threatened and endangered species, and comments on habitat alteration permits; the Florida Division of Forestry, which manages land in the county and is responsible for controlling wildland fires and for permitting prescribed fires; the FDEP, which regulates septic tanks; the Northwest Florida Water Management District, which regulates water wells and water quantity; the Department of Community Affairs, which oversees the Area of Critical State Concern program and the Local Comprehensive Planning Act; and the Apalachee Regional Planning Council, which provides planning expertise to area counties.

Recognizing the myriad state and regional agencies involved in regulatory matters, the Reserve has instituted the following policies or agreements with other agencies in order to be kept informed of and provide input on activities that may impact Reserve resources:

1. Within DEP, the Reserve interacts with and provides input to the Aquatic Preserve Program on any permits within or adjacent to Reserve waters. Staff provide technical and logistical assistance to the Aquatic Preserve Manager. The Aquatic Preserve Manager is housed with ANERR staff and is supervised by the Reserve Manager.

2. Within DEP, the Reserve has several joint programs with the SEAS to monitor septic tank leachate from St. George Island and collect oyster samples for histological and physiological information. The Reserve provides and receives logistical assistance from SEAS when necessary.

3. The Reserve is notified by other divisions within DEP on issues that may affect the Apalachicola River and Bay so that our comments can be integrated into official responses from the agency. In the past, these issues have included navigation channel maintenance concerns, comprehensive plan input, land development regulations, threatened and endangered species concerns and monitoring, land acquisition plans, fisheries management issues, oyster licensing courses and habitat restoration issues.

4. Administration Agreements were signed between the former Department of Natural Resources and the Department of Environmental Regulation (now DEP) and the following state and regional agencies; Florida Game and Fresh Water Fish Commission (GFC), Department of Community Affairs (DCA), Department of Transportation (DOT), Division of Forestry (DOF), Apalachee Regional Planning Council (ARPC), the former Department of Health and Rehabilitative Services (HRS), now Department of Children and Family Services and Division of Historical Resources (DHR) and a new agreement with the Northwest Florida Waste Management District has been signed; outlining the responsibilities of the Reserve and these agencies (Appendix 3).

Communication between these agencies or their predecessors varies from excellent to almost nonexistent. In order to improve communication, cooperation and coordination, the Reserve recommends an annual meeting with appropriate representatives from each agency to discuss regulatory programs and projects that may impact resources of the Reserve.

Federal agencies that have regulatory or comment authority in the area include the USCOE, which regulates dredge and fill activities and is responsible for maintaining navigation projects; the U.S. Fish and Wildlife Service (USFWS), which manages the St. Vincent NWR, regulates threatened and endangered species, and also comments on dredge and fill activities and habitat management plans; the U.S. Environmental Protection Agency (EPA), which is involved in myriad wetland and coastal issues in the panhandle; and the National Marine Fisheries Service, which interacts with other agencies on habitat and fishery issues. The Reserve also works with the U.S. Geological Service on water management and water quality issues on the ACF River system. Current coordination is on their National Water Quality Assessment Program (NAWQA) of the ACF River basin.

An Administration Agreement currently exists between the USFWS and the former Department of Natural Resources (now DEP) concerning land management responsibilities and coordination of activities on St. Vincent NWR. Most coordination with federal agencies on activities other than land management are done through the central office in Tallahassee and are currently working fine.

V. Resource Management on Reserve Lands

It is a goal of the ANERR to provide appropriate resource management activity on Reserve managed lands.

A. Specific Tract Management

The specific objective to support that goal requires ANERR to provide parcel specific guidelines for select Reserve managed lands. Those lands and the guidelines for each are outlined below.

1. Cape St. George Island

Cape St. George Island is included within the boundaries of and is under direct management of the Reserve (Figure 18). Wildlife on the 2,300 acre island is fairly depauperate. Raccoons are the most common mammal found on the island. Feral hogs, gray squirrels and cotton rats are also present in fewer numbers. There are few species but large numbers of amphibians and reptiles on the Cape. The Cape is very important for spring and fall migrations of birds because it provides a rest stop, particularly for neo-tropical trans-gulf migrants. More importantly, the Cape provides important nesting areas for threatened species such as Loggerhead sea turtles, Snowy plovers, bald eagles and Species of Special Concern such as American oystercatchers.

The acquisition of Cape St. George was approved by the Governor and Cabinet for the following purposes:

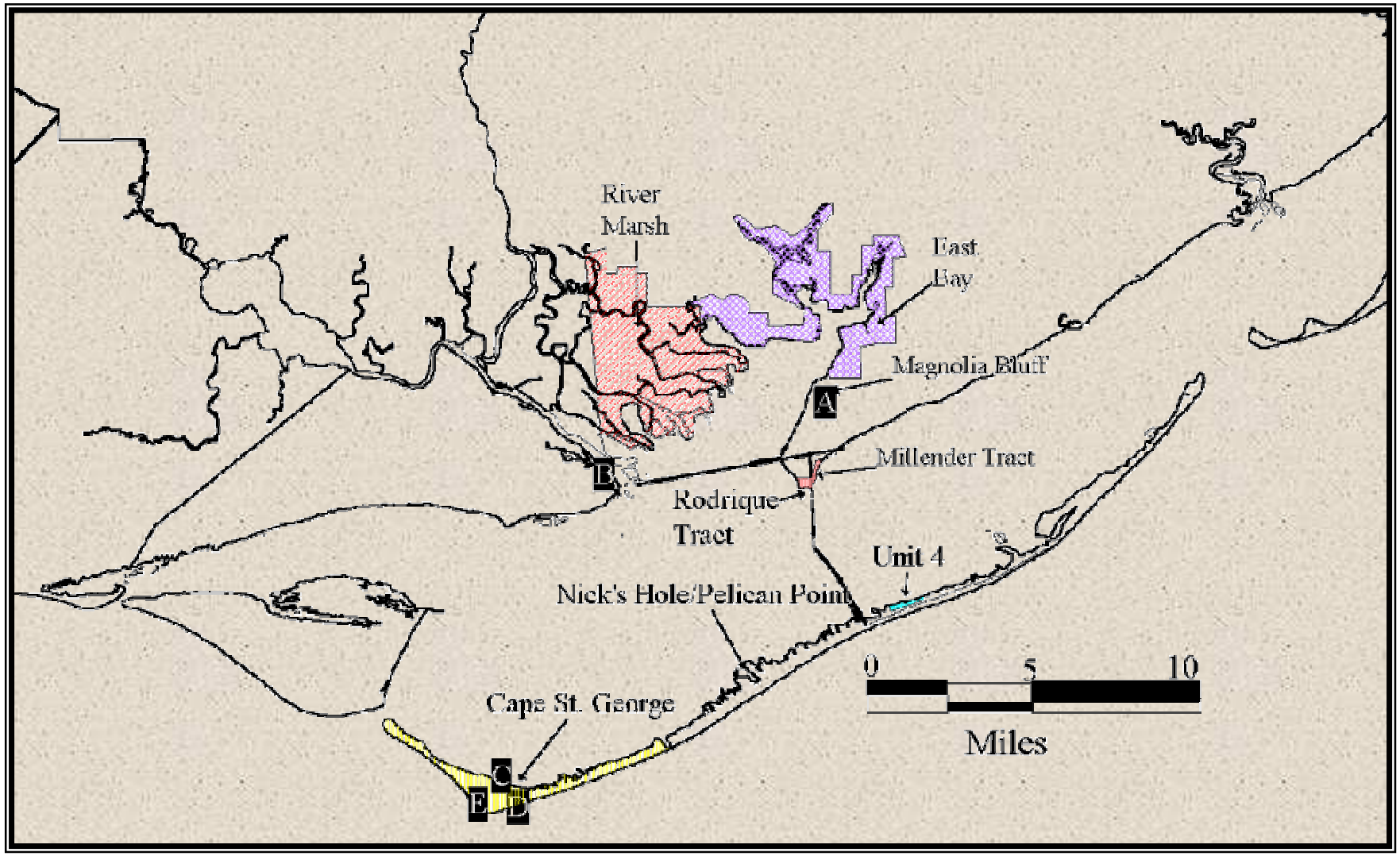
- Preservation of a natural barrier island ecosystem
- Protection of the unpolluted Apalachicola estuary
- Preservation of the cultural and historical resources on the island
- Maintenance of a natural, non-structural storm barrier to protect the mainland

Because of these special conditions of use, management emphasis on the Cape is on natural systems management, such as maintaining native communities, protection of threatened and endangered plants and animals, and control of exotic plants and animals. Recreational uses are encouraged so long as they are compatible with perpetuating the environmental values of the resources. Activities allowed on the island include research and education field trips, hiking, primitive camping, nature study, swimming, shelling and fishing.

In order to ensure that public uses of Cape St. George resources remain compatible with the purposes listed above, as well as the research and education goals of the Reserve, ANERR has established the following management policies and regulations for the island:

- Non-consumptive public use of the Cape's resources is encouraged provided that such activities are in compliance with local, state and federal laws; are compatible with the four purposes for which the Cape was purchased; and do not interfere with or impact ANERR management, research or education projects.
- Primitive camping is encouraged at designated sites at West Pass and Sike's Cut.
- Fires are permitted at primitive camping areas only, with the exception of approved management, research or education projects. Campfires within the primitive camping areas must be built safely to prevent their spreading and must be extinguished prior to abandonment.
- No garbage, refuse or litter of any kind shall be left behind on the island.
- Digging in, defacing or removal of any cultural or historical resource is prohibited (F.S. 267.13). Proposals for conducting archaeological studies on the Cape must be coordinated with and approved by the Reserve Manager and the Florida Division of Historical Resources (F.S. 267 and F.A.C. 1A-32).
- Fishing is permitted in all waters both on and surrounding the Cape. All fishing activities must comply with all rules and regulations applicable to fresh and salt waters of the state of Florida.
- Removal of, destruction of or damage to any vegetation or wildlife species on Cape St. George Island is prohibited unless part of an approved management, research or education project. Introduction of live plants or animals onto the Cape is prohibited unless part of an approved management, research or education project.
- No prescribed burn zones are identified for the Cape. Prescribed burning practices will be utilized only around man-made structures to prevent their loss in the event of a wildfire.
- Use of the Marshall House facilities or other state equipment is limited to approved management, research or education projects.
- Plants and animals that present a threat to natural or cultural resources on the Cape or to threatened and endangered species will be either controlled or removed from the island. Species in particular to be controlled include feral hogs, coyotes and raccoons, which present a threat to loggerhead sea turtle nests and ground nesting birds on the island.

FIGURE 18: Subunits and Facilities of the Apalachicola National Estuarine Research Reserve



- No dogs or other domestic pets of any kind are allowed on Cape St. George Island without the consent of the Reserve Manager. Registered guide/companion animals are permitted in all areas in which their owners are permitted.
- The use of off-road vehicles is strictly prohibited unless part of an approved management, research or education project.
- Alcoholic beverages are prohibited on any Reserve sponsored management, research or education trip.
- Firearms and hunting, except as authorized for predator or exotic species control by the Reserve Manager, are prohibited.
- Additional rules and regulations, determined by monitoring, research and management projects may be instituted by the Reserve Manager as necessary to protect the resources and natural communities on Cape St. George Island.

2. Rodrique Tract

This small (58.87 acres) tract on Catpoint (Figure 18) was purchased to protect the most productive oyster bar in Apalachicola Bay from upland pollution sources. It will be managed for restoration and maintenance of natural communities. Recreation use will be limited to pedestrian access for nature appreciation and shoreline fishing. Existing unimproved roads (except those necessary for ingress-egress of outparcels) will be abandoned and revegetated. No facilities will be provided with the possible exception of future boundary fencing and necessary signing. Reserve staff will continue to work with acquisition programs to purchase outparcels in the Catpoint area.

3. Millender Tract

This small (34.80 acres) tract on Catpoint (Figure 18) was also purchased to protect the most productive oyster bar in Apalachicola Bay from upland pollution sources. It will be managed for restoration and maintenance of natural communities. Recreation use will be limited to pedestrian access for nature appreciation and shoreline fishing. Existing unimproved roads (except those necessary for ingress-egress of outparcels) will be abandoned and revegetated. No facilities will be provided with the possible exception of future boundary fencing and necessary signage. Reserve staff will continue to work with acquisition programs to purchase outparcels in the Catpoint area.

4. Unit 4

This parcel on St. George Island (Figure 18) is an 86-acre tract purchased from the Trust for Public Lands (TPL). Surveys indicated that 11 acres of the tract were sovereign lands. TPL was paid for the remaining 75 acres. Prior to purchase by TPL, the area was platted and scheduled for development. The primary reason for purchase was as an upland buffer to protect East Hole oyster bar, the second most productive bar in the Apalachicola Estuary. Unit 4 has been impacted by numerous platted roads, random hiking trails, disturbed areas created by recreational users, manmade borrow-pits and canals dug during earlier development phases. The area has been used extensively as an illegal dump for household garbage and construction debris. To reduce the illegal dumping activity, vehicle gates have been installed across county roads at areas of continuous state ownership. These gates do not restrict public foot traffic access. These roads are in the process of being donated to the State by Franklin County and have been temporarily closed under county authority.

Proposed long term use of the area includes public swimming, salt and freshwater fishing and hiking trails.

5. Williamson Tract

This parcel includes five lots on the bay side of St. George Island (Figure 18) donated to the State and assigned to ANERR for management. Although county records list the total area at 1.6 acres, approximately half is submerged due to erosion. A county maintained road is the southern boundary for this property. The main management concern on this tract of land is erosion. Because of this, the Reserve applied for and received a grant from the EPA, Near Coastal Waters Program for a Shoreline Stabilization Demonstration Project. This project, begun in October, 1992, called for building an offshore rip-rap breakwater in front of part of this parcel and creation of a Spartina marsh behind it. Monitoring of the marsh behind the structure, an adjacent marsh outside of the structure, and shoreline changes behind and adjacent to the breakwater is ongoing. A brochure, Protecting Coastal Property, describing the costs, design and benefits of this type of erosion control structure compared with more traditional methods such as seawalls was produced. Erosion control to prevent the total loss of this tract of land is the only management scheme planned for this parcel of land.

6. Other Parcels

Specific guidelines will be developed after assessment and inventory of the resources is complete for other parcels including Nick's Hole, Pelican Point, East Bay and Magnolia Bluff properties.

B. Natural Community Descriptions

It is an objective of the ANERR to provide Descriptions of Natural Communities Occurring on Reserve Managed Lands.

The system of classifying natural areas employed in this chapter was developed by the Florida Natural Areas Inventory (FNAI). The premise of this system is that physical factors, such as climate, geology, soils, hydrology and fire frequency generally determine the species composition on an area and that areas which are similar with respect to these factors will tend to have natural communities with similar species composition. Obvious differences in species composition can occur, despite similar physical conditions. In other instances, physical factors are substantially different, yet the species compositions are quite similar. For example, coastal strand and scrub -- two components with similar species compositions -- generally have quite different climatic environments.

Seven major natural communities represent most of the vegetative cover on lands within the Reserve. A thorough assessment of Reserve lands will identify and map other community types so that site specific protection/restoration/management tools can be recommended.

BEACH DUNE - (synonyms: sand dunes, pioneer zone, upper beach, sea oats zone, coastal strand). Beach dune is characterized as a wind-deposited, foredune and wave-deposited upper beach that is sparsely to densely vegetated with pioneer species, especially sea oats. Other typical pioneer species include beach cordgrass, sand spur, dune or bitter panic grass, railroad vine, beach morning glory, seashore paspalum, beach elder, dune sunflower, sea purslane, and sea rocket. Typical animals include ghost crab, six-lined racerunner, kestrel, red-winged blackbird, savannah sparrow, beach mouse and raccoon. Beach dune, especially along its ecotone with the unvegetated beach, is also the primary nesting habitat for numerous shorebirds and marine turtles, including many rare and endangered species.

Beach dune communities are found along shorelines subject to high energy waves which deposit sand-sized grains to form the open beach. Onshore winds move the sand grains inland until slowed by an obstacle, usually plant stems, causing the grains to drop. As the plants grow upward and burial continues, a foredune is built. Dune height is largely determined by the strength and the directional constancy of winds and by the growth habits of dune-forming plants. As a cape or barrier island grows seaward, new beaches are deposited seaward of the old one and a characteristic ridge and swale topography develops.

Beach dunes are very dynamic communities and mobile environments. The wind continually moves the sand inland from the beach until trapped by vegetation. Beach dunes are subject to drastic topographic alterations during

winter storms and hurricanes. Taking the brunt of storm surge, intact beach dunes are essential for protection of inland biological communities.

The soils of beach dunes are composed of sands that are similar to those washed onto the adjacent beach, except that the wind selectively lifts out the smaller sand particles, blows them inshore, and deposits them around plant stems. These deep siliceous or calcareous sands drain rapidly, creating decidedly xeric conditions.

Beach dunes occur in an extremely harsh environment. The dune vegetation must be able to tolerate loose, dry, unstable, nutrient poor soils, as well as exposure to wind, salt spray, sand abrasion, intense sunlight, and storms. Thus, dune species have evolved several morphological adaptations to survive in this harsh environment. Many of them root easily from fragments washed ashore in storm debris, or they produce large floating seeds that can be transported by ocean currents. Some have thickened cuticles and succulent foliage to better retain water and to reduce the effects of salt spray and sand abrasion. Some spread by subterranean or surface runners that creep across the barren sands. Many readily re-root from higher up their stems when buried by blowing sand and consequently develop a matted or wiry root system. Some have become so dependent on the dune habitat that they lose vigor without shifting sands constantly stimulating them to send out new shoots and re-root. These characteristics are the primary reasons for their unique ability to stabilize aeolian sand into nearly static beach dunes.

In spite of their ability to withstand the harsh maritime environment, plants of the beach dunes are extremely vulnerable to human impacts. A footpath or off-road vehicle trail over the beach dunes can damage the vegetation, giving wind and water the leverage needed to begin erosional processes. A gap, or blowout, forms and continually widens until it is slowly revegetated and stabilized. The sand from the gap moves inland, and rapidly buries vegetation, destabilizing the beach dunes and often disturbing adjacent communities. When a storm ensues, the unvegetated gap allows storm surges easy access to these communities for further disruption. Because of their vulnerability, beach dunes require protection from trampling (i.e., boardwalks for beach access) and off-road vehicles. Coastal developments which affect the sand sources that are necessary for beach dune replenishment should be strongly discouraged.

Within the Reserve, beach dunes are found on the gulfside shoreline of Cape St. George. Major storm events in recent years have impacted beach dunes by overwash and beachfront erosion. The Cape is accessible by boat only, so there is little human impact from visitors.

Management of the beach dune community will include discouraging either pedestrian or vehicular intrusion into the zone and monitoring for feral swine or other impact concurrent with other Reserve activity.

As the Cape is managed under a natural fire regime, no prescribed burning is planned for this community. If, however, the beach dune is found to support a lightning ignited fire, no attempt at suppression will be made unless visitor safety or facility protection dictates.

Following catastrophic storm events, some overwashed or denuded areas may be re-planted and have sand fencing erected to prevent further wind driven erosion. Old travel roads or trails not necessary for visitor or staff ingress-egress from the bay side of the Cape to the gulf beach shall be abandoned and replanted with native vegetation. Management of beach dune will comply with DEP Standard Resource Management Procedure No.3, Sand Dune Management.

MESIC FLATWOODS - (synonyms: pine flatwoods, pine savannahs, pine barrens). Mesic flatwoods are characterized as an open canopy forest of widely spaced pine trees with little or no understory but a dense ground cover of herbs and shrubs. Several variations of mesic flatwoods are recognized, the most common associations being longleaf pine, wiregrass, runner oak and slash pine, gallberry, and saw palmetto. Other typical plants include: St. Johns-wort, dwarf huckleberry, fetterbush, dwarf wax myrtle, stagger bush, blueberry, gopher apple, tar flower, bog buttons, blackroot, false foxglove, white-topped aster, yellow-eyed grass and cutthroat grass. Typical animals of mesic flatwoods include: oak toad, little grass frog, narrowmouth toad, black racer, red rat snake, southeastern kestrel, brown-headed nuthatch, pine warbler, Bachman's sparrow, cotton rat, cotton mouse, black bear, raccoon, gray fox, bobcat and white-tailed deer.

Mesic flatwoods occur on relatively flat, moderately to poorly drained terrain. The soils typically consist of one to three feet of acidic sands generally overlying an organic hardpan or clayey subsoil. The hardpan substantially reduces the percolation of water below and above its surface. During the rainy seasons, water frequently stands on the hardpan's surface and briefly inundates much of the flatwoods; while during the drier seasons, ground water is unobtainable for many plants whose roots fail to penetrate the hardpan. Thus, many plants are under the stress of water saturation during the wet seasons and under the stress of dehydration during the dry seasons.

Another important physical factor in mesic flatwoods is fire, which probably occurred every one to eight years during pre-columbian times. Nearly all plants and animals inhabiting this community are adapted to periodic fires; several species depend on fire for their continued existence. Without relatively frequent fires, mesic flatwoods succeed into hardwood-dominated forests whose closed canopy can essentially eliminate the ground cover herbs and shrubs. Additionally, the dense layer of litter that accumulates on unburned sites can eliminate the reproduction of pine which require a mineral soil substrate for proper germination. Thus, the integrity of the mesic flatwoods community is dependent on periodic fires. However, fires that are too frequent

or too hot would eliminate pine recruitment and eventually transform mesic flatwoods into dry prairie.

Mesic flatwoods are closely associated with and often grade into wet flatwoods, dry prairie or scrubby flatwoods. The differences between these communities are generally related to minor topographic changes. Wet flatwoods occupy the lower wetter areas, while scrubby flatwoods occupy the higher drier areas.

Mesic flatwoods are the most widespread biological community in Florida, occupying an estimated 30 to 50 percent of the state's uplands. However, very few undisturbed areas of mesic flatwoods exist because of habitat mismanagement and silvicultural, agricultural or residential development. Mesic flatwoods are often fairly resilient and with proper management they can generally be restored.

On Reserve lands, mesic flatwoods are known to occur on Cape St. George, the Rodrique Tract, Unit 4, Nick's Hole, Magnolia Bluff Tract and on East Bay properties.(Figure 18) The exact coverage in acres is not known. As the Cape is managed under a natural fire regime, no prescribed burning is planned for this community which will be managed as in "Beach Dune."

Prescribed fire will be the primary management activity in this community on Reserve lands. Specific application of prescribed fire will be determined after individual parcels and burns zones have been established and assessed.

Changes in natural hydrology due to placement of roads, trails, ditches, plow lines or other disturbance, will be restored by; disking and returning plow lines to grade, removing or placing culverts on roads, plugging or filling ditches and recontouring or opening dikes or artificial berms. All restored areas denuded of vegetation will either be replanted or allowed to revegetate.

SCRUB - (synonyms: sand pine scrub, Florida scrub, sand scrub, rosemary scrub, oak scrub). Scrub occurs in many forms, but is often characterized as a closed to open canopy forest of sand pines with dense clumps or vast thickets of scrub oaks and other shrubs dominating the understory. The ground cover is generally very sparse, being dominated by ground lichens or, rarely, herbs. Open patches of barren sand are common. Where the overstory of sand pines is widely scattered or absent altogether, the understory and barren sands are exposed to more intense sunlight. Typical plants include sand pine, sand live oak, myrtle oak, Chapman's oak, scrub oak, saw palmetto, rosemary, rusty lyonia, ground lichens, scrub hickory, scrub palmetto, hog plum, silk bay, beak rush, milk peas and stagger bush. Typical animals include red widow spider, scrub wolf spider, oak toad, Florida scrub lizard, blue-tailed mole skink, sand skink, six-lined racerunner, coachwhip, ground dove, loggerhead shrike, yellow-rumped warbler, rufous-sided towhee, Florida mouse and spotted skunk.

Scrub occurs on sand ridges along former shorelines. Some of the sand ridges originated as wind-deposited dunes, others as wave-washed sand bars. Some scrub soils are composed of well-washed, deep sands that are brilliant white at the surface; some scrubs occur on yellow sands. The loose sands drain rapidly, creating very xeric conditions for which the plants appear to have evolved several water conservation strategies.

Scrub is essentially a fire maintained community. Ground vegetation is extremely sparse and leaf fall is minimal, thus reducing the chance of frequent ground fires. As the sand pines mature, however, they retain most of their branches and build up large fuel supplies in their crowns. When a fire does occur, this fuel supply, in combination with the resinous needles and high stand density, ensures a hot, fast burning fire. Such fires allow for the regeneration of the scrub community which might otherwise succeed to xeric hammock. The minerals in the vegetation are deposited on the bare sand as ashes, and the heat of the fire generally facilitates the release of pine seeds. As discerned from the life histories of the dominant plants, scrub probably burns catastrophically once every 20 to 80 years or longer.

Scrub is associated with and often grades into sandhill, scrubby flatwoods, coastal strand, and xeric hammock. Some xeric hammocks are advanced successional stages of scrub, making intermediate stages difficult to classify. Scrub occurs almost exclusively in Florida, although coastal scrubs extend into adjacent Alabama and Georgia.

Because scrub occurs on high dry ground and is not an aesthetically pleasing habitat, at least to the uninitiated, this ecosystem and its many endangered and threatened species are rapidly being lost to development. Scrub is also readily damaged by off-road vehicle traffic or even foot traffic, which destroys the delicate ground cover and allows the loose sand to erode. Ground lichens may require 50 years or more to recover.

On Reserve lands, scrub community is known to occur on Cape St. George, Unit 4 and the Magnolia Bluff Tract. On Cape St. George, the community occurs on sand ridges that occur as part of the relic dune ridge and swale topography (Figure 19). The exact acreage of coverage on Reserve lands is not known.

Although listed as a typical plant in scrub, sand pine, Pinusclausavar. immuginata (Choctawhatchee sand pine), is virtually absent from Cape St. George scrub with only a few individuals observed on the island. Sand pine is abundant in the scrub on the Magnolia Bluff Tract. As the Cape is managed under a natural fire regime, no prescribed burning is planned for this community which will be managed as in "Beach Dune."

Prescribed fire will be the primary resource management activity in scrub on Reserve lands, although storm events, especially hurricanes, appear to have a

more significant effect on scrub in the Florida panhandle (FDEP, 1996). Limiting further disturbance to scrub ground cover is a priority due to it's fragile nature. This will be accomplished by abandoning unnecessary roads and trails, and allowing natural revegetation to occur. Any disturbance to natural hydrology will be addressed similarly to those in "Mesic Flatwoods."

BOTTOMLAND FOREST - (synonyms: bottomland hardwoods, river bottom, stream bottom, lowland hardwood forest, mesic hammock). Bottomland forest is characterized as a low-lying, closed-canopy forest of tall, straight trees with either a dense shrubby understory and a little ground cover or an open understory and ground cover of ferns, herbs, and grasses. Typical plants include water oak, live oak, red maple, sweetgum, loblolly pine, white cedar, cabbage palm, diamond-leaf oak, southern magnolia, loblolly bay, swamp tupelo, spruce pine, American beech, dahoon holly, wax myrtle, swamp dogwood, Florida elm, stiffcornel dogwood and American hornbeam. Typical animals include marbled salamander, mole salamander, three-lined salamander, slimy salamander, five-lined skink, ringneck snake, gray rat snake, eastern king snake, cottonmouth, wood duck, red-tailed hawk, turkey, yellow-billed cuckoo, screech-owl, great-horned owl, ruby-throated hummingbird, acadian flycatcher, pileated woodpecker, hermit thrush, cedar waxwing, yellow-throated warbler, opossum, gray squirrel, flying squirrel, raccoon, mink, gray fox, bobcat and white-tailed deer.

Bottomland forest occurs on low-lying flatlands that usually border streams with distinct banks, such that water rarely overflows the stream channel to inundate the forest. They also occur in scattered low spots in basins and depressions that are rarely inundated, which allows typical upland species to survive. Soils are generally a mixture of clay and organic materials. The water table is high, but bottomland forests are inundated only during extreme floods or exceptionally heavy rains (i.e., not annually). Tree density and species diversity are relatively high. The canopy is dense and closed, except during winter in areas where deciduous trees predominate. Thus, air movement and light penetration are generally low, making the humidity high and relatively constant. Because of these characteristics, bottomland forests rarely burn.

Bottomland forest is a very stable community that requires a hundred years or more to mature. In some cases, it is an advanced successional stage of a bog community. Bottomland forest may be extremely difficult to distinguish from floodplain forest or hydric hammock. They can generally be separated during periods of typical high water, when the latter two communities would be inundated, while bottomland forest would not. Bottomland forest is often associated with and grades into floodplain forest, hydric hammock, mesic flatwoods, upland mixed forest, upland hardwood forest, slope forest, maritime hammock, baygall or wet flatwoods. There may be much species overlap among these communities.

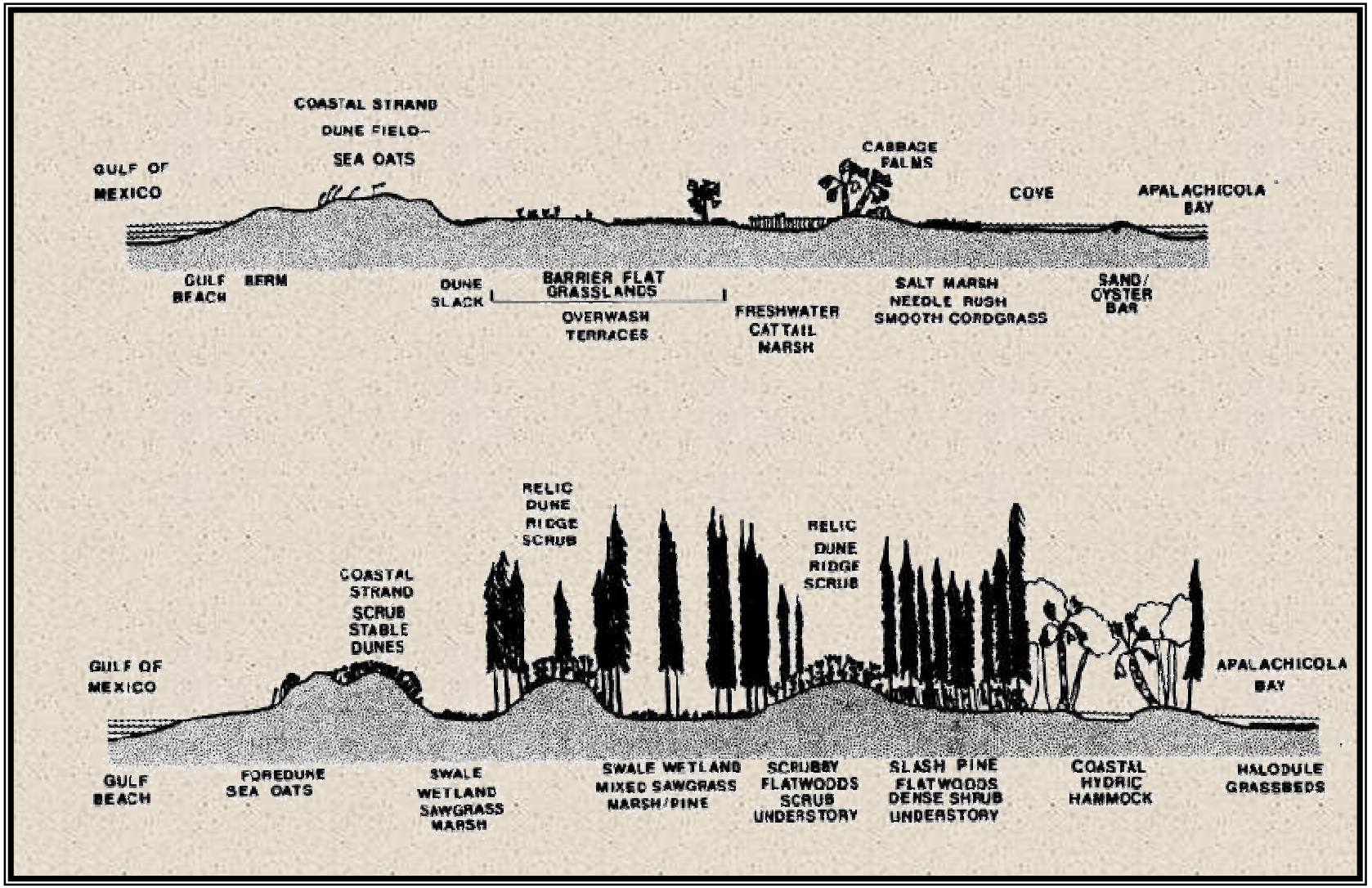
Bottomland forests are widespread throughout the Coastal Plain but are less extensive in Florida than elsewhere. Nearly all bottomland forests have suffered from timbering operations, which frequently leave long-lasting scars from soil disturbance. Their location on substrates that occasionally are inundated or saturated make bottomland forests generally unsuitable for development.

Bottomland forest occurs on Reserve lands adjacent to and interspersed in the Apalachicola River floodplain. Management of bottomland forest on Reserve managed lands will include activity to restore natural hydrology, control erosion and exotic species removal and monitoring. The extent of exotic infestation and hydrologic disruption is unknown. Accurate acreage of Bottomland Forest occurring on Reserve lands is not known.

FLOODPLAIN FOREST - (synonyms: bottomland hardwoods, seasonally flooded basins or flats, oak-gum-cypress, elm-ash-cottonwood, second bottom, levee forest, river terrace, river ridge). Floodplain forests are hardwood forests that occur on drier soils at slight elevations within floodplains, such as on levees, ridges and terraces, and are usually flooded for a portion of the growing season. Floodplain forests are largely restricted to the alluvial rivers of the panhandle. The dominant trees are generally mixed mesophytic hardwoods, such as overcup oak, water hickory, diamond-leaf oak and swamp chestnut oak. The understory may be open and park-like or dense and nearly impenetrable. Other typical plants include bluestem palmetto, willow oak, green ash, Florida elm, sweetgum, hackberry, water oak, American hornbeam, tulip poplar, coastal plain willow, black willow, eastern cottonwood, swamp cottonwood, river birch, red ample, silver maple, box elder, American sycamore, catalpa, sweetbay magnolia, hawthorn, swamp azalea, pink azalea, gulf sebastiana, lanceleaf greenbrier, poison ivy, peppervine, rattanvine, indigo bush, white grass, plume grass, redtop panicum, caric sedges, silverbells, crossvine, American wisteria and wood grass.

Floodplain forests harbor a diverse array of animals including both temporary residents and permanent residents. Typical animals include marbled salamander, mole salamander, two-toed amphiuma, Alabama waterdog, Southern dusky salamander, two-lined salamander, three-lined salamander, dwarf salamander, slimy salamander, rusty mud salamander, sirens, southern toad, cricket frog, bird-voiced treefrog, gray treefrog, bullfrog, river frog, Southern leopard frog, alligator, river cooter, stinkpot, Southeastern five-lined skink, broadhead skink, mud snake, rainbow snake, redbelly watersnake, brown water snake, glossy crayfish snake, black swamp snake, cottonmouth, yellow-crowned night-heron, wood duck, Mississippi kite, swallowtail kite, red-shouldered hawk, woodcock, barred owl, chimney swift, hairy

FIGURE 19: Typical Profiles of Habitats of Cape St. George Island (DNR 1983)



woodpecker, pileated woodpecker, Acadian flycatcher, Carolina wren, veery, white-eyed vireo, red-eyed vireo, parula warbler, prothonotary warbler, Swainson's warbler, hooded warbler, cardinal, towhee, opossum, southeastern shrew, short-tailed shrew, beaver, wood rat, rice rat, cotton mouse, golden mouse, bear and raccoon.

Soils of floodplain forests are variable mixtures of sand, organics and alluvials, which are often distinctly layered. Hydroperiod is the primary physical feature of floodplain forests, which are inundated by flood waters nearly every year for 2 percent to 50 percent of the growing season. The organic material accumulating on the floodplain forest floor is picked up during floods and redistributed in the flood plain or is washed downriver to provide a critical source of minerals and nutrients for downstream ecosystems, in particular estuarine systems. These floods also replenish soil minerals through deposition on the floodplain. Floodplain forests usually do not have standing water in the dry season.

Floodplain forests are often associated with and grade into floodplain swamp, bottomland forest, baygall or slope forest. The species composition is frequently similar to that of hydric hammock and bottomland forest communities.

The maintenance of natural hydrologic regimes is critical to the health of Floodplain forests and to the downstream systems with which they are connected. Species composition and the functional relationships throughout a river system are negatively impacted by hydrological alterations such as artificial impoundments, river diversion projects, pesticide use, forest clearcutting, or intensive agriculture.

On Reserve lands, floodplain forest occurs in the lower Apalachicola River floodplain. Management of floodplain forest on Reserve managed lands will include activity to restore natural hydrology, control erosion, and exotic species removal and monitoring. The extent of exotic infestation and hydrologic disruption is unknown. Accurate acreage of floodplain forest occurring on Reserve lands is unknown.

WET FLATWOODS - (synonyms: low flatwoods, moist pine barren, hydric flatwoods, pond-pine flatwoods, pocosin, cabbage palm/pine savannah or flatwoods). Wet flatwoods are characterized as relatively open-canopy forests of scattered pine trees or cabbage palms with either thick shrubby understory and very sparse ground cover or a sparse understory and a dense ground cover of hydrophytic herbs and shrubs. Several variations exist between these extremes. Typical plants include pond pine, slash pine, sweetbay, spikerush, beakrush, sedges, dwarf wax myrtle, gallberry, titi, saw palmetto, creeping beggarweed, deer tongue, gay feather, greenbrier, bluestem and pitcher plants. Typical animals include oak toad, cricket frog, chorus frog, black racer, yellow rat snake, diamondback rattlesnake, pygmy rattlesnake, red-shouldered

hawk, bobwhite, opossum, cottontail rabbit, cotton rat, cotton mouse, raccoon, striped skunk, bobcat and white-tailed deer.

Wet flatwoods occur on relatively flat, poorly drained terrain. The soils typically consist of one to three feet of acidic sands generally overlying an organic hardpan or clay layer. Cabbage palm flatwoods tend to occur on more circumneutral sands (pH 6.0 - 7.5) underlain by marl or shell beds. The hardpan substantially reduces the percolation of water below and above its surface. During the rainy season, water frequently stands on the surface, inundating the flatwoods for one or more months per year. During the drier seasons, ground water is less accessible for many plants whose roots fail to penetrate the hardpan. Thus, many plants are under the stress of water saturation during the wet seasons and under the stress of dehydration during the dry seasons.

Another important physical factor in wet flatwoods is fire. Natural fires probably occurred every three to ten years during pre-columbian times. Nearly all plants and animals inhabiting this community are adapted to periodic fires and several species depend on fires for their continued existence. Without relatively frequent fires, wet flatwoods succeed into hardwood dominated forests whose closed canopy would essentially eliminate the ground cover herbs and shrubs. In fact, much of the variation in community structure is probably associated with fire frequency. Thus, the longer the period of time since the last fire, the more developed will be the understory shrubs. If the understory is allowed to grow for too long, the accumulation of needle drape and the height of flammable understory shrubs will increase the probability of a catastrophic canopy fire.

Wet flatwoods are closely associated with and often grade into hydric hammock, mesic flatwoods, wet prairie or basin swamp. Wet flatwoods may also grade into dome swamp or strand swamp but the absence of a wet prairie ecotone suggests that the hydrology has been disturbed.

Although wet flatwoods may have been an abundant biological community of the coastal plain at one time, examples with an intact overstory and understory, without exotics and with the potential for future maintenance by fire are rare. They are relatively resilient to overstory damage but recover poorly when the ground cover or hydrology has been disturbed. Wet flatwoods are vulnerable to disruptions of fire and hydrological regimes. Wet flatwoods occur generally in conjunction with mesic flatwoods on Reserve lands.

Prescribed fire will be the primary management activity in this community on Reserve lands. Specific application of prescribed fire will be determined after individual parcels and burns zones have been established and assessed. Changes in natural hydrology due to placement of roads, trails, ditches, plow lines or other disturbances will be restored by; disking and returning plow

lines to grade, removing or placing culverts on roads, plugging or filling ditches, and recontouring or opening dikes or artificial berms. All restored areas denuded of vegetation will either be replanted or allowed to revegetate naturally.

ESTUARINE AND MARINE TIDAL MARSH - (synonyms: saltmarsh, brackish marsh, coastal wetlands, coastal marshes, tidal wetlands). Marine and estuarine tidal marshes are floral based natural communities generally characterized as expanses of grasses, rushes and sedges along coastlines of low wave-energy and river mouths. They are most abundant and most extensive in Florida north of the normal freeze line, being largely displaced by and interspersed among tidal swamps below this line. Black needlerush and smooth cordgrass are indicator species which usually form dense, uniform stands. The stands may be arranged in well-defined zones according to tide levels or may grade subtly over a broad area, with elevation as the primary determining factor. In the upper reaches of river mouths, where estuarine tidal marsh begins to blend with freshwater tidal swamp and marsh, sawgrass may occur in dense stands. Sawgrass is the least salt tolerant of these tidal marsh species. Other typical plants include saltgrass, saltmeadow cordgrass (marsh hay), gulf cordgrass, soft rush and other rushes, salt myrtle, marsh elder, saltwort, sea oxeye, cattail, big cordgrass, bulrushes, seashore dropseed, seashore paspalum, shoregrass, glassworts, seablight, seaside heliotrope, saltmarsh boltonia and marsh fleabane. Typical animals include marsh snail, periwinkle, mud snail, spiders, fiddler crab, marsh crab, green crab, isopods, amphipods, diamondback terrapin, saltmarsh snake, wading birds, waterfowl, osprey, rails, marsh wren, seaside sparrow, muskrat and raccoon.

Fishes frequently found in this community include blacktip shark, lemon shark, bonnet-head shark, hammerhead shark, southern stingray, yellow spotted ray, tarpon, ladyfish, bonefish, menhaden, sardines, anchovy, catfish, needlefish, killifish, bluefish, blue runner, lookdown, permit, snapper, grunts, sheepshead, porgies, pinfish, seatrout, red drum, mullet, barracuda, blenny, goby, trigger fish, filefish and puffers.

Tidal marsh soils are generally very poorly drained muck or sandy clay loams with substantial organic components and often a high sulfur content. The elevation of tidal marshes range from just below sea level to slightly above sea level with vegetation occupying the intertidal and supratidal zones. The frequently high density of plant stems and roots effectively traps sediments derived from upland runoff or from littoral and storm currents. The decaying, dead marsh plants and the transported detritus which the living plants trap, accumulate to form peat deposits. Together, these accretion processes may build land.

Tidal marsh plants live under conditions which would stress most plants. High salt content in the soil, poor soil aeration, frequent submersion and exposure, intense sunlight and occasional fires make the tidal marsh community

inhospitable to most plants and require a wide tolerance limit for its inhabitants. The landward extent of tidal marsh along the shoreline is directly related to the degree of bottom slope; the more gradual the slope the broader the community band. Typical zonation in this community includes smooth cordgrass in the deeper edges, grading to salt tolerant plants such as black needlerush that withstand less inundation.

Tidal fluctuation is the most important ecological factor in tidal marsh communities, cycling nutrients and allowing marine and estuarine fauna access to the marsh. This exchange helps to make tidal marsh one of the most biologically productive natural communities in the world. In fact, primary productivity in tidal marshes surpasses that of most intensive agricultural practices. The former operates at no cost because of free energy subsidies from tides, while the latter requires costly energy subsidies in the form of fuels, chemicals and labor. A myriad of invertebrates and fish, including most of the commercially and recreationally important species such as shrimp, blue crab, oysters, sharks, grouper, snapper and mullet, also use tidal marshes throughout part or all of their life cycles.

Tidal marshes are also extremely important because of their storm buffering capacity and their pollutant filtering actions. The dense roots and stems hold the unstabilized soils together, reducing the impact of the storm wave surge. The plants, animals and soils filter, absorb and neutralize many pollutants before they can reach adjacent marine and estuarine communities. These factors make tidal marshes extremely valuable as a natural community.

Adverse impacts of urban development of tidal marshes include degradation of water quality, filling of marshes, increased erosion and other alterations such as bulkheading and beach renourishment. The most attractive coastal areas for development activities frequently are the most ecologically fragile and are extremely vulnerable to development of any kind. Offshore pollution in the form of oil spills and various forms of litter jettisoned from shipping traffic also impact tidal marsh.

On Reserve lands, tidal marsh occurs most abundantly in East Bay and the lower reaches of the Apalachicola River (Figure 12). The community also occurs along the bay shoreline on Cape St. George Island, Unit 4, the Millender and Rodrique tracts, Nick's Hole, the Williamson tract and the Magnolia Bluff property (Figure 18). It is the most widely distributed community type occurring on Reserve lands. The exact acreage of coverage is unknown.

Prescribed fire will be the primary resource management activity in tidal marsh on Reserve lands. Particular emphasis will be given to soil moisture levels to prevent ground fires and associated smoke problems, to avoid killing species stands by destroying root structure and to limit invasion by exotics. Study plots to monitor plant response to varying season and fuel factors may

be established by the Reserve Research section to gather data and help determine the most beneficial condition for burning marsh on Reserve lands.

Hydrologic restoration by filling in or plugging ditches and recontouring flow impediments will be undertaken.

Close monitoring for exotic species infestation, the occurrence and effects of pollutants and accumulation of waterborne debris will be long-term activities.

VI. Fire Policy and Procedure

A. Prescribed Fire

Natural communities within ANERR, including scrub, wet flatwoods, marshes and mesic flatwoods are adapted to and/or dependent on fire to maintain species composition and diversity. Vast pre-columbian Florida landscapes lacked the fragmentation caused by highways, canals, trails and other development. As a result, lightning induced or aboriginal set fires were able to burn continuously across uninterrupted community types restricted only by natural firebreaks such as wet communities or waterways (Myers and Ewel 1991).

The fragmentation of these pyrogenic communities and suppression of natural fire has resulted in changes to plant species composition and diversity. These changes include high vegetation fuel load, suppression induced succession and development of near mono-culture areas of woody species (e.g. pine with palmetto understory or titi fringed wetlands).

Objectives

The primary objectives of prescribed burning on Reserve lands are:

- Restore and maintain pyrogenic communities
- Restore and maintain natural communities for listed plant and animal species
- Promote natural diversity in pyrogenic communities
- Reestablish lightning season burn regime
- Reduce the potential for detrimental effects of catastrophic wildfires, e.g. impacted air quality, loss of soils through erosion, liability associated with smoke management, loss of habitat diversity; and
- Maintain ecotones or transitional zones between community types.

B. Implementing Prescribed Fire Program

1. Establish Parcel (Unit) Boundaries

Using surveys, deed and lease information, establish property bounds and ownership/management authority. Determine if parcels' (units')

common boundaries are with other managing agencies or private landowners.

Where applicable, establish agreements with adjacent land managers for cooperative burn activities. Conduct burns cooperatively where the application of fire meets the goal of prescribed fire on ANERR lands.

Where necessary, establish perimeter boundary firebreaks to meet Department standards (DEP 910) for wildfire containment and prescribed fire execution.

2. Inventory Parcel Resources

Inventory and assess natural communities within each parcel (unit). Assess possible impacts to known cultural sites on Reserve lands. Pre-burn installation of soft firelines may be necessary to protect sites within pyrogenic communities. Determine desired fire regime for each community.

Using existing roads, trails and natural firebreaks, establish burn zones for the unit. Where practical use a "soft-line" firebreak method if existing firebreaks are not adequate. The use of a foam suppressant is also acceptable.

3. Develop Prescriptions for Each Zone

Prepare prescriptions per requirement of F.S. 590.026, Prescribed Fire Burning Act 1990, using ANERR burn forms: "Burn Plan/Prescription", "Burn Procedures/Day of Burn" and "Burn Evaluation" (Appendix 4)

4. Conduct Pre-burn Conference(s)

Confer with DOF, GFC and NWFWMD annually to discuss burn strategies, notification procedures and the feasibility of cooperative burns. Review burn prescriptions with DOF forestry area supervisor.

5. Conduct Burns

Small acreage easily controlled burns may be conducted directly using Reserve staff and equipment. Once the parameters of unit burns are established, cooperative agency assistance or contracting with DOF or private contractors may be warranted.

6. Evaluation of Prescribed and Natural Fires

An important component of prescribed burn programs and natural fire policies is the evaluation of such fires on the communities involved. Typically, evaluation will be conducted after the post-burn growing

season to determine overstory mortality and herbaceous plant response. Shortly after burns, Reserve staff will conduct a walk through to see if cultural sites were exposed by the fire activity or whether there were readily observable impacts to listed species, water quality, boundary fencing and whether new ingress points have been created by the burn. Conservation or protection activities will be based on site specific requirements. Monitoring programs may be set up on parcels to evaluate long term impacts of fire exclusion, season of burn, fuel characteristics, etc.

C. Wildfire Policy

Upon discovery, unplanned fires occurring on Reserve lands shall be assessed to determine fire behavior. This assessment shall be conducted by DOF and Reserve staff.

If weather conditions warrant and the fire is determined to be beneficial in meeting Reserve burn objectives, appropriate action will be taken to obtain a burn permit from DOF. Reserve staff would remain on-site and monitor or otherwise manipulate the fire behavior to meet burn objectives. Should the fire be determined to have a potentially detrimental impact on the natural community, produce unacceptable levels or behavior of smoke or have any potential for escape from the desired burn area, efforts toward suppression will be taken.

Any fire suppression activity should be taken using the least impactive method feasible. Use of backfiring, natural fire breaks, water/foam and "soft" firebreaks shall be preferred over plow lines or disking. In all cases, where the threat of injury or death, loss of property or liability to the State of Florida exists, immediate suppression by any means is acceptable. DOF personnel will be made aware of cultural site locations whenever possible to minimize degradation of the resource.

VII. Exotics

Exotic species are those that did not evolve as part of Florida's natural flora and fauna, and have been introduced to the state from other areas of the United States or foreign countries.

In its native range, each species has naturally occurring predators, disease or other environmental factors which keep the population in balance. When a species is introduced into an area lacking those natural controls, it may exercise proliferation to a level displacing native species and degrading natural communities. Some species are able to survive without excessive proliferation and pose little threat to natural communities. Those species which colonize and spread rapidly require immediate control and will receive the highest priority for removal or elimination. Control methods may include manual/mechanical removal, physical controls, trapping or

herbicides in combination or alone. Education of community residents regarding the impacts of invasive non-natives can assist the Reserve in controlling immigration from adjacent lands.

A. Exotic Plants

Among exotic plant species, Chinese tallow (Sapium sebiforum), wild taro (Colocasia esculenta) and Japanese climbing fern (Lygodium japonicum) have the greatest potential for impacting Reserve managed lands. Control of other invasives will be implemented as Reserve staff encounters and delimitate species distribution using methodology ***from The Control of Non-native Plants in Natural Areas of Florida*** (Langeland and Stocker 1998).

1. Chinese tallow or popcorn tree is a native of Asia, occurring at the same latitudes as the southeast United States. Described as a small to medium sized tree: new growth occurs as early as February; flowering from March through May, fruit are three-lobed with one seed in each lobe, seeds are covered with vegetable tallow (white waxy coating). Chinese tallow may invade wetlands, lakes and river margins, as well as disturbed or undisturbed uplands. (Jubinsky, 1993) The extent of Chinese tallow infestation on Reserve managed lands is unknown. Upon discovery, Chinese tallow on Reserve lands will be treated per recommendations from an appropriate section of DEP or the Florida Department of Agriculture and Consumer Services (DACS). Control methods may include basal and stump herbicide treatment or manual removal (Langeland, 1997). Follow up treatment and monitoring will be conducted to insure any re-growth is treated.

2. Wild taro is a native of the Pacific Islands and can occur as an emergent or terrestrial plant. Described as a medium to large leafed plant with arrowhead-shaped, velvety green, dark, water repellent leaves to two feet long. Wild taro leaves are peltate, the leaf stem attaching near the middle of the underside of the leaf. Leaf stems may grow to 4 feet tall. Flowers occur in small finger-like spikes protected by boat-like spathes.

   The extent of Wild taro infestation on Reserve managed lands is unknown.

   Upon discovery, Wild taro plants on Reserve managed lands will be treated per recommendations from DEP or DACS. This may include manual or mechanical removal.

3. Japanese climbing fern was introduced into Florida from Asia in 1932, as a foliage plant. It has since invaded floodplains and other shady wetlands in Florida. The Japanese climbing fern can reproduce quickly and has the ability to climb to a height of 9 meters in trees. Once established in trees, the fern provides a fuel path for fire to reach the canopies. This poses a threat to normally fire-excluded floodplain tree species (DEP Resource Mgt. Notes 1993).

   The plant occurs in the floodplain of the Apalachicola River north of Reserve managed lands. The extent of Japanese climbing fern infestation on Reserve managed lands is unknown. Upon discovery of Japanese climbing fern on Reserve managed land, plants will be treated per recommendations from DEP or DACS.

   Control methods may include fire, manual removal, flooding (where feasible) or herbicide application. Ferns should be severed at or below ground level after initial herbicide applications. Follow up treatment and monitoring will be conducted to insure re-growth is treated.

B. Exotic Animals

Exotic animals introduced into and domesticated or free-ranging feral animals which establish themselves in natural areas frequently exert unsustainable pressure on listed species populations. Nuisance behavior by natives may also call for management activities on a case-by-case basis. Control methods vary by species and the degree of impact on natural and facility resources. These methods may include special hunts, exclusion, trapping for relocation or disposal, use of firearms and/or coordination with state or federal agencies experienced in solving such situations.

Among exotic species, feral swine (Sus scrofa scrofa) has the greatest potential for impacting Reserve managed lands. Feral swine descended from the wild boar (Sus scrofa) of Europe and were introduced to Florida by early Spanish explorers. Feral swine are the most prolific large mammal in the United States. A sow can produce two litters per year with an average birth rate of five piglets per litter. These animals are extremely destructive when rooting in the damp soils of natural communities and pose a serious threat to rare and endangered plants. They compete for food against native animals such as deer, turkeys, squirrels and wood ducks. These omnivorous predators prey on small mammals, ground nesting birds, snakes and salamanders. They also root up and eat the eggs of endangered sea turtles (DEP 1996).

Feral swine are known to exist on Cape St. George in small numbers as evidenced by their tracks. Reserve staff have recorded feral swine depredation of sea turtle nests in years past. During the previous two nesting seasons, only six of 210 turtle nests were impacted by feral swine. Current depredation percentages do not indicate a need for control measures at this time.

Feral swine impact on other Reserve managed lands will be assessed to determine the need for population control. If control measures are warranted, Reserve staff will adhere to the guidelines established by Division of Marine Resources, CAMA Resource Management Policy (RMP) #1, ***Nuisance and Exotic Animals***, and (RMP) #2, ***Feral Swine Removal***. Whenever possible feral swine removal efforts will utilize special hunts administered by the GFC. This method of removal allows for timely area specific control, greater public enjoyment of Reserve managed land and is cost-effective.

Following the initial assessment of feral swine impact, Reserve managed lands will be monitored regularly for signs of new activity.

Coyote populations have expanded throughout Florida in the past few years. These off-site predators may play a significant role in decreases in populations of listed species. Control of their populations is warranted when the degree of depredation to sea turtle nests or other listed species is unacceptable. Control methods currently in use within the Reserve follow the guidelines outlined in (RMP) #3, ***Coyote Control***.

Nuisance and exotic animals, individual animals whose actions create special management problems, foreign species as well as free-ranging domesticated and feral animals, will be controlled where feasible following the guidelines established by (RMP)# 1, ***Nuisance and Exotic Animals***.

VIII. Cultural Resources

A. History

The Apalachicola River Valley is believed to have been occupied by humans for over 10,000 years (Dunbar and Waller, 1983) and is believed to have been an ideal environment for large prehistoric human populations comprised of small hunting groups, farming people or aquatic species-based hunter-gatherers. Paleo-indian through Mississippian cultural sites are represented, as are historic settlements, structures and occupational sites (White, 1994).

The Archaic cultural period (8000-1000 B.C.) is slightly better known than the earlier Paleo-indian period of habitation in the Apalachicola River Valley. Several middle to late Archaic sites have been found in the region (Bullen, 1950; Kurjack, 1975; Huscher, 1964; and White, 1986 and 1994). The type of tools used during this period indicates an increasing reliance on smaller game animals. Human populations became more sedentary by 1000 B.C., engaging in hunting and foraging, as well as the beginnings of plant cultivation (White et al. 1992).

The next cultural period, known as the Woodland, lasted from 1000 B.C. to 1000 A.D. The hunter-gathering lifestyle was changing to more dependence on cultivated plants and settlements were becoming more permanent (White et

al., 1992). In Northwest Florida, the early Woodland adaptation is known as the Deptford Period. Deptford components, normally associated with coastal swamps and estuaries (Milanich and Fairbanks, 1980), have been located at numerous inland sites in the region (Bullen, 1950; Huscher, 1964; White, 1986). One site in particular on the Apalachicola River suggests more than an occasional occupation with the Deptford component extending several hundred meters along the riverbank. Deptford components are also prevalent at estuarine shell mounds (White, 1986).

The Middle Woodland stage, known as the Swift Creek-Early Weeden Island Culture, spread to the basin by 200 A.D. and lasted until about A.D. 1000. Numerous Weeden Island sites, with multiple burial mounds and extensive middens, have been investigated in the central river valley (Bullen, 1950; Kelly, 1950; Huscher, 1964, 1971; and White, 1981). In response to constant diffusion of culture traits from Mississippian people, the Weeden Island Culture gave way to the Fort. Walton Culture, which can be dated at A.D. 1000 to 1600. Fort Walton societies had evolved into true chiefdoms, complex political systems with temple mound - village settlements based on maize agriculture.

These Fort. Walton populations were the first to have contact with Spanish explorers, who organized a chain of missions from 1670 to 1685 (Jones, 1973). By the mid-seventeenth century, native cultures were disrupted and populations had declined severely, mostly because of the introduction of European disease (Hennefield and White, 1986).

B. Conservation and Research Activities

The Apalachicola River and Bay Drainage Basin, which includes the Reserve, contains over 100 archaeological sites and numerous historic structure. Dredge-and-fill activities and shoreline erosion associated with coastal navigation projects pose a threat to some of these cultural resources. Likewise, silvicultural practices, such as streamside cutting and clearcutting, cause erosional problems which disturb site integrity. Staff review and comment on permit applications adjacent to or within the Reserve. In addition, staff work with other agencies on best management practices to minimize site disturbance.

Several systematic intensive surveys have been accomplished or are ongoing within the boundaries of the Reserve. An archaeological study funded by the Department of State, Division of Historical Resources (DHR) investigated the impact of record 1994 flooding on 24 newly located and 67 previously located sites within the Apalachicola River Drainage Basin (White, 1996). Several sites exposed by flooding, hurricane-generated wave action or coastal erosion were surveyed within the Reserve. Reserve staff assisted in the logistics required for this survey and helped record sites and conducted educational programs in conjunction with this survey.

The general locations of known cultural sites within the boundaries of the Reserve can be seen in Figure 20. However, this probably represents only a small percentage of all the archaeological sites that may be present in the area (N. White, per comm.).

C. Sites

The following sites are the recorded archaeological and historical sites for Cape St. George Island (White 1996).

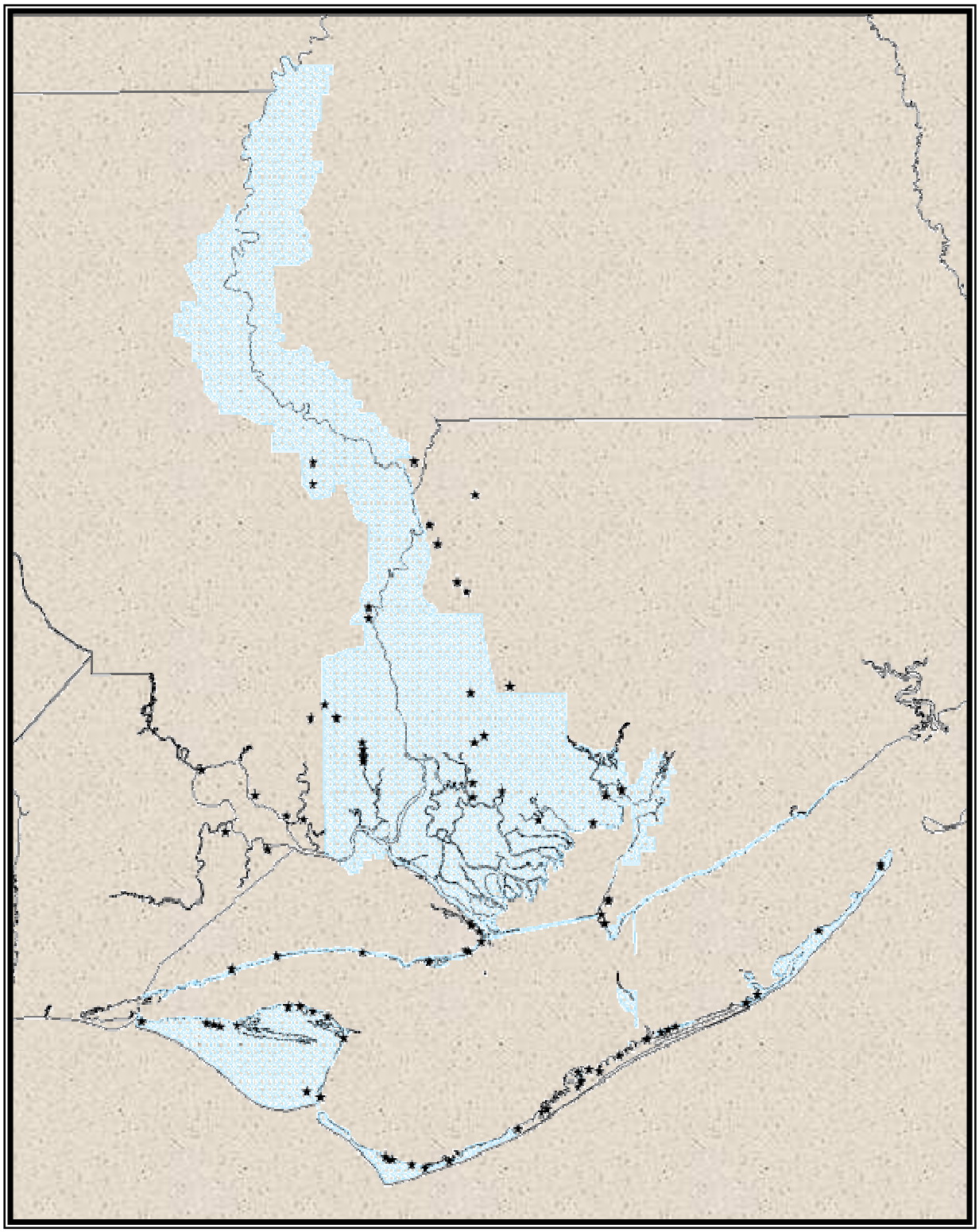
8FR69, currently, the 1852 Cape St. George Lighthouse site lies within an 0.8 acre outparcel on the Cape, under the jurisdiction of the U.S. Coast Guard. The Reserve has pursued the listing of the structure as surplus federal real property for acquisition and possible restoration.

The recently formed Cape St. George Lighthouse Society was formed after Hurricane Opal's wave generated erosion resulted in the listing of the brick lighthouse. They have raised more than $100,000 in donations in an attempt to finance recovery efforts for the lighthouse.

8FR747, lighthouse keeper's house and outbuildings which are in various stages of destruction from past storm events. A single-story wood frame house was built for the caretaker in 1880 and several small outbuildings including a generator building, an oil building, a storeroom, a stable, a privy, several underground cisterns and a pump house were built between 1890 and 1939. In 1961 many of these structures were destroyed in a fire. Only the lighthouse tower, the walls of a brick storage building, the caretaker's house and an adjacent storage building remained standing. The latter two structures collapsed during Hurricane Opal in October, 1995. A pile of debris marks the location of a collapsed storage shed near the lighthouse keeper's house and the remnants of a Coast Guard helipad are visible to the west of the tower.

A Phase I Environmental Audit conducted by DEP's Site Investigation Section (Phillips et al., 1995) prior to acquisition recommends non-hazardous waste disposal of lead contaminated soil takes place in the area adjacent to the lighthouse keeper's house. A certified monitor should be on-site during this cleanup process and DHR will need to be consulted prior to contracting this out or to Reserve staff implementing the cleanup. Further lead analysis and excavation should continue until lead concentrations fall below 500 mg/kg. As sands are relocated by winds or storm events, removal of exposed battery/casing shards will be conducted by Reserve staff in conjunction with other activities.

FIGURE 20: Archaeological sites In The Lower Apalachicola Basin



8FR804, Hendrix #1, Fort Walton midden, a bayshore late prehistoric site probably representing repeated, intermittent occupations -- likely for shellfish collecting (A.D. 1000-1500).

8FR748, the Government dock, a 19th - 20th Century restored standing structure of historical interest. This dock is currently used by Reserve staff for ingress/egress and by recreational visitors to the Cape.

8FR749, the Turpentine Camp, early 20th Century standing structures (houses and other buildings) and probably archaeological remains. This has great potential for documentation of a poorly represented segment of society for this period. Emphasis should be placed on obtaining funding for a survey.

8FR745, Hendrix #2, prehistoric occupation, dating to possibly late Weeden Island or Fort Walton.

8FR24, Cape St. George Island Site No. 2 or St. George West, late Fort Walton Midden, recorded by Glenn T. Allen in 1952. This site has been heavily eroded since its discovery.

8FR746, Pilot's Cove, Prehistoric Shell Midden, time period unrecorded.

8FR857, Cape St. George Shipwreck, a post-1830s seagoing vessel discovered in late winter-early spring by Reserve staff. The possible identity of the approximately 100 foot ship has been researched but so far no record correlates with this time period. At the time of initial investigation (July 21, 1996) less than fifteen feet of the wreck was visible. One plank located perhaps one quarter mile farther west was brought to the Reserve for curation. Earlier, Reserve personnel recovered a sample of the metal pins. The wreck was videotaped and photographed. A later visit revealed that 43 feet of the wreck was exposed following a July 1996 storm. More photographic evidence was taken and samples were removed by underwater archaeologist Roger Smith for inspection.

Reserve staff will stress education and preservation of the vessel concurrent with other duties to try and prevent people from removing pieces of it whenever possible. Though the island is remote and accessible by boat only, many visitors put in there so the potential for vandalism exists. The wave action along this high energy coastline may destroy it quickly unless another storm buries it again.

A comprehensive field survey has not been done so most recorded sites are probably those located in more accessible locations, areas attractive to visitors or visited by Reserve staff in conjunction with research projects. In addition to the above recorded sites, three others of historic interest are known to exist including an 1843 gravestone at the west end of the Cape, a historic

stormhouse and a possible extension of FR27 listed as being on the west end of St. George Island across the artificially created Sike's Cut.

No sites are currently identified for the Magnolia Bluff, Rodrique and Millender Tracts in Eastpoint or for Unit 4 on St. George Island.(Figure 18) Nick's Hole on St. George Island has one identified site in the Florida Master Site File (information not available at the time of writing).

If the remaining Reserve properties, Pelican Point, Williamson, East Bay and Lower Apalachicola River are not surveyed as part of ongoing research, Reserve staff will, upon discovery or informant information abide by the guidelines in the ***Management Procedures For Archaeological And Historical Properties on State-owned or Controlled Land*** (Revised August, 1995) by DHR (Appendix 5).

D. Protection

An assessment of and delineation of known/suspected sites will be undertaken to prioritize sites for survey/information recovery. The majority of sites appear to be adjacent to shorelines (fresh or salt water) and are being degraded by flooding or coastal erosion. Some sites have been or will be nominated to the ***National Register of Historic Places***. Other sites need to have GIS locations documented and site file forms submitted to DHR. A list of real and potential threats to historical resources should be developed to assist in prioritizing sites for research requests and to implement protection or recover plans for them. Techniques for halting or slowing bank/shore erosion will not normally be considered in natural coastal shoreline areas.

Reserve staff includes one archaeological monitor, certified by DHR. Staff training will include site conservation and salvage using criteria acceptable to DHR in order to protect known sites and to document newly discovered sites. Cultural site physical changes from flooding, vandalism and natural disasters will be documented whenever possible.

Florida Statutes, Chapters 872 and 267, which affect land management decisions for Reserve lands, are on file. All projects involving land clearing ground disturbing activities, new construction, renovations or alterations involving or that may involve historic structures will require review of the DHR Compliance Review Checklist. DHR will be contacted to see if review is required when proposed ground disturbances are minimal or if the project involves routine maintenance of a historic structure. Rules found in the Florida Administrative Code (1A-44 and 1a-32) will guide Reserve activities when unmarked human burials are discovered or when submitting/evaluating archaeological research requests.

Management action will include notifying the appropriate law enforcement personnel, impact assessment and testimony in the event looting is noted on Reserve lands.

IX. Recreational Uses

The environment within the Reserve boundaries and on Reserve managed land (Figure 21) provides a wide variety of outdoor resource based recreational opportunities. Although the Reserve does not coordinate recreation, it is an important activity within the Reserve. These include; boat and shoreline saltwater fishing, boat and shoreline fresh water fishing, hunting, hiking, camping, nature study and birding, canoeing and kayaking, boating, shelling, beach activities, swimming, and nature photography.

Maximum non-impactive, public recreation on Reserve lands is encouraged for a variety of reasons including; instilling a sense of ownership and appreciation for the lands, contributing to individual and social well being, benefiting as an informal educational tool, promoting family values, providing economic benefit to the local economy through ecotoursism and making good use of publicly owned lands.

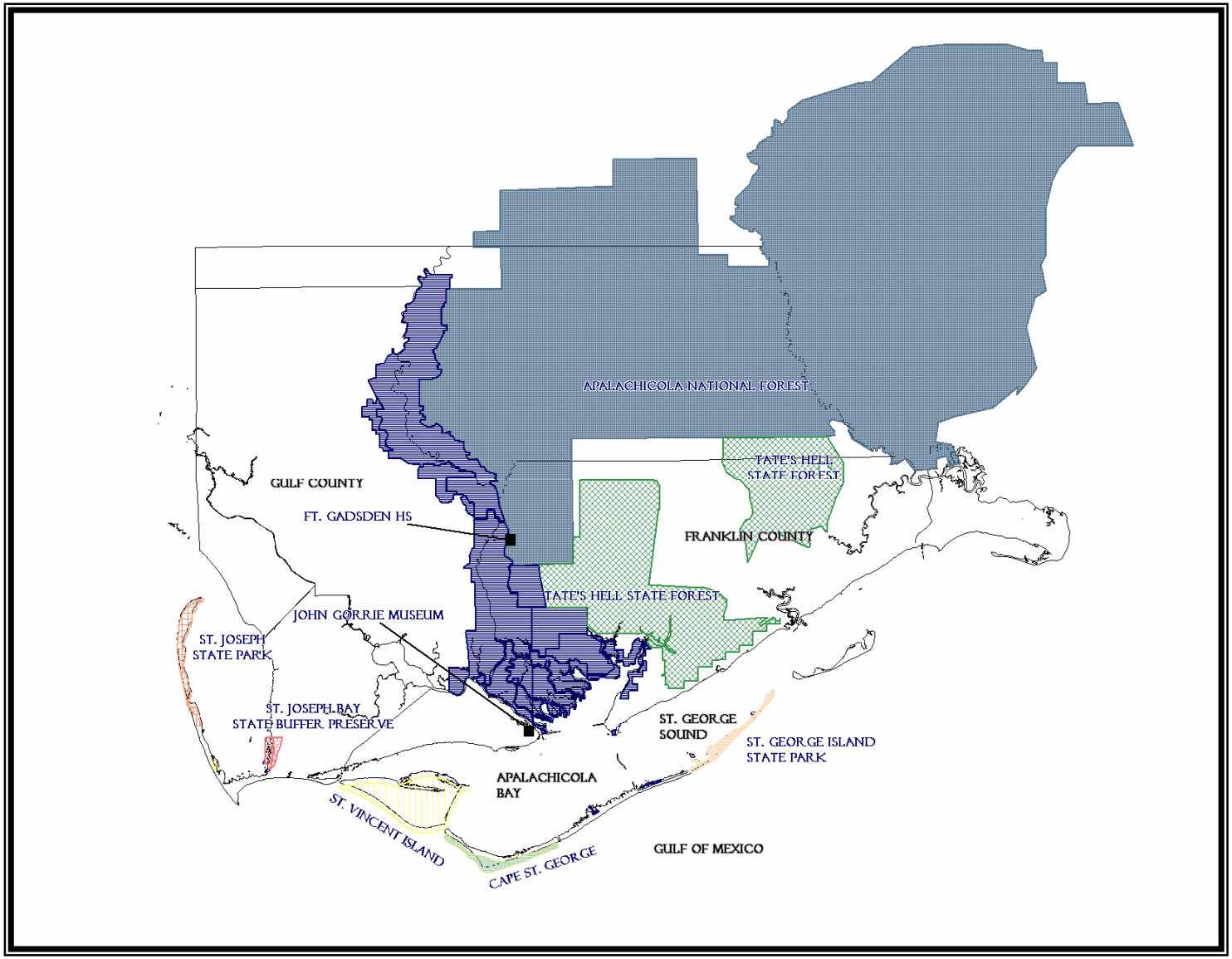
Areas within or adjacent to the Reserve boundaries providing recreational opportunities, which are not managed by the Reserve, include: St. Vincent NWR, St. George Island State Park, Apalachicola NF, Fort Gadsden Special Feature Site, Apalachicola WEA, Edward Ball WMA, G.U. Parker WMA and NFWMD, Save Our Rivers lands north of the Reserve. These areas offer hunting opportunities, recreational fishing, hiking, camping, boat launch facilities, nature study, swimming, historic interpretation, beach activities, shelling, boating and picnicking facilities.

Access to many points in the Reserve is only by boat as approximately two thirds of the acreage is submerged bottomlands and roads do not exist in many floodplain areas. As with many other coastal and aquatic based areas, increased use leads to additional pressures on the resource, which normally leads to degradation of the resource. DEP's ***Outdoor Recreation in Florida - 1994*** report on the quantitative needs for resources and facilities by planning regions indicates no such need projected for facilities servicing salt water areas through the year 2000 but does indicate a projected demand for fresh water (non-boat) facilities and a small increase in bicycle trails.

A. Recreational Fishing

Recreational fishing is enjoyed in the Apalachicola River, Apalachicola Bay, the barrier island beaches, at the passes between the barrier islands and in various smaller water bodies within the Reserve boundaries.

FIGURE 21: Adjacent Recreational Opportunities



Fresh water species taken include bass, bream and other panfish and catfish. Salt water species include flounder, redfish, trout, pompano, tarpon and mackerel. Fishing methods include traditional hook and line, cast netting, gigging and spearfishing, with traditional hook and line being the most popular. Recent local trends show an increase in interest in salt water fly-fishing. Articles in national fishing publications concerning the quality of Apalachicola Bay fisheries have resulted in an increasing guide service industry.

Management of recreational fishing activity is through enforcement of fresh and salt water fishing regulation by GFC and Florida Marine Patrol.

B. Hunting

Hunting is a popular activity in the floodplain areas along the Apalachicola River, although there is no way to determine the extent of hunt activity or harvest. The cooperative agreement between the GFC and DEP prohibits the lower Apalachicola area as a Type I Wildlife Management Area which would require a Management Area Permit issued by FGFWFC to hunt those lands. Only a regular state hunting license is required. Other hunting opportunities exist in GFC managed hunt areas, timber company lands, Tate's Hell State Forest, Apalachicola NF, St. Vincent NWR, NWFWMD lands and private hunt leases.

Management of hunting activities is through enforcement of rules by GFC and on St. Vincent NWR, by Refuge staff. Hunting information publications are available through the appropriate agency office.

C. Hiking

Within the Reserve boundaries, hiking opportunities exist on St. George Island State Park, St. Vincent NWR and to the north, the Apalachicola NF, in the form of established hiking trails. Regionally, 245.4 miles of hiking trails are provided by local, state and federal governments and private landowners.

Hiking opportunities exist on many Reserve managed lands, in the form of existing wood roads and hunt trails. The notable exception would be the extensive marsh systems throughout the Reserve. In those areas deemed fragile, prone to erosion, or otherwise unsuited to foot traffic, measures will be taken to discourage use through fencing, signage or road and trail closure. Unused roads and trails will either be allowed to revegetate naturally or will be replanted with native species.

D. Camping

Within the Reserve area, established camping facilities exist at St. George Island State Park (sixty improved sites), and three private campgrounds in Franklin County.

Primitive camp facilities exist on Cape St. George, St. Vincent NWR during hunting season, and the state park. In addition, improved and primitive camp facilities are available in Apalachicola NF to the north.

On Cape St. George, primitive camping is encouraged at sites on the east and west ends of the island. Campfires are permitted within the camp area. As no routine trash removal is performed on the island, primitive campers are encouraged to remove all items transported in and practice "no impact" camping.

E. Canoeing and Kayaking

The aquatic environmental of the Reserve provides excellent opportunity for use of paddle craft. The use of sport kayaks by barrier island recreational users is evidenced by paddle craft rental and sea kayak trip vendors initiating new businesses there.

The bay environment, lower river marshes, numerous tidal creeks and freshwater streams and the Apalachicola River corridor are ideal for canoe and sea kayak use. As evidenced by DEP's Office of Greenways and Trails brochure Canoe Trails, paddle sports is a well accepted recreational user activity.

In coordination with other applicable management agencies the potential for establishing overnight paddle trips, along the river corridor and originating north of or within Reserve boundaries, will be explored. If feasible, trip information guides including camping, route and safety information will be developed. Local vendor input will be solicited for partnership formation and possible benefit to the local economy.

Day trip paddle opportunities exist in the form of creeks feeding the river corridors and East Bay areas. Many areas of the bay are readily accessible for trips of short duration as well. Development of paddle craft access information and local feature maps in the form of brochures will be developed and made available.

F. Other Recreational Use

Nature study and birding, shelling, beach activities, swimming, and nature photography all occur within the Reserve boundaries and on Reserve managed lands. On Reserve managed lands, swimming occurs in the Gulf waters

adjacent to Cape St. George. The beach and waters there are infrequently monitored for hazards to swimmers and beach users.

Informational brochures available for recreational users include; bird checklist and guide, shell checklist and guide, and brochures for mammals, amphibians, and fishes. The Reserve staff is generally available to recreational users regarding species identification and appropriate viewing locations.

For further information regarding information available to recreational users and nature enthusiasts, see the plan section for Education.

G. Recreational Use Facility Development

As outdoor recreation use increases in popularity on Reserve lands, the need for minimal sanitary and convenience facilities is becoming increasingly apparent.

DEP, Division of Recreation and Parks, has developed a basic amenities package or start-up kit to provide a basic level of recreational enhancement on DEP managed lands. These packages were developed specifically to provide ready amenities to properties having public access, but no facilities. The basic amenity package provides for a prefabricated unisex restroom, a prefabricated weather shelter, an interpretive kiosk and stabilized parking as necessary.

The use of this type package or similar application will meet the need of providing sanitary facilities on Reserve managed lands, are more easily built than conventionally planned facilities and are cost effective. Also, the construction techniques facilitate placement of these improvements in remote locations.

An assessment will be made to determine which areas may benefit from such amenities. One such area for consideration is the primitive camp location on Cape St. George. Other facility development considerations include the establishment of hiking trails and freshwater fishing platforms on suitable lands under Reserve management. The basic amenities package may be used in whole or part in conjunction with other development.

X. Reforestation

Natural areas throughout the state have been degraded by changes in hydrology, fire exclusion, dense plantings of single-species forest products and other changes brought about by rapid population growth. Although purchased primarily to protect aquatic resources, a secondary role for Reserve uplands is the management of listed species and protection of habitat diversity. Restoration through reforestation and related habitat recovery tools can reestablish much of the diversity lacking on Reserve buffers and upland communities.

On Reserve properties in East Bay, where a pine plantation exists, an evaluation will be made to determine whether timber harvesting or stand density reduction is the preferred method of habitat recovery. Some properties have not yet been evaluated to determine if reforestation is desirable. Revegetation of beach dune is addressed under the discussion of that community type. Other areas to be evaluated for reforestation efforts are existing woods roads which are deemed unnecessary or detrimental to management of Reserve lands. Such roads may be allowed to revegetate naturally or they may undergo rehabilitation through planting.

The following guidelines established in Resource Management Procedure (RMP) #6, ***Pine Density Reduction for Restoration***, RMP #7 ***Timber Removal Specifications***, RMP #8 ***Reforestation***, and RMP #9 ***Mowing for Plant Community Restoration*** will be used when lands are determined to need a form of reforestation in order to reestablish species diversity or to improve degraded habitat. Typically these guidelines address management tools proven to be cost-effective and which mimic natural processes. They are often a prelude to the introduction of prescribed fire and can improve fire safety. Removal of off-site hardwoods through the use of RMP #5 ***Girdling for Hardwood Control***, may be warranted in pyrogenic communities which have experienced fire exclusion. The use of fire is often ineffective against established invaders.

XI. Hydrologic Restoration

Hydrologic disturbances may affect natural communities in several ways including changes to natural community species and composition, loss of soils through erosion, providing vectors for exotic species infestation and degrading the aesthetic value of a scenic vista.

Hydrologic disturbances may occur on Reserve lands in the following forms, and require listed action for restoration.

A. Wood or four-wheel drive roads:

Wood roads will be assessed for their disruption of natural hydrology. On a schedule prioritized by disruptive effect, roads considered unnecessary to reserve lands management will be abandoned and removed and either be replanted with native species or allowed to revegetate naturally. Roads left intact for management reasons may be retro-fitted with culverts or other flow restoring mechanism.

B. Stabilized roads:

Stabilized roads, those with limestone or other compacted fill material as a road base will follow the same schedule for removal as woods roads. Fill removed may be used for other Reserve management purposes or sold to offset program costs.

C. Foot paths:

Foot paths not incorporated into designated hiking trails will be closed through signage and fencing. In most cases, the degree of disturbance from footpaths allows the path to revegetate naturally. Cover vegetation may need to be planted to hide trail entrances.

D. Man-made Ponds:

Ideally, man-made ponds would be filled and natural vegetation restored to the site. In some cases, disturbance to adjacent natural areas as a result of restoration efforts will be more detrimental than no restoration. This could be in the form of erosion and siltation of nearby wetlands or other impact. Further disturbance to the ponds may also increase the vector for exotic species infestation. In those instances, Reserve staff may determine that the ponds be managed as fresh water lakes.

E. Drainage ditches:

Drainage ditches, especially those installed to lower water levels in natural wetlands, will receive priority for restoration. Ditches may either be filled or plugged, or a combination of the two.

F. Plowlines:

Plowlines cut for wildfire control and left intact with no re-working, both channelize water and interrupt sheet flow. Plowlines will be assessed to determine their detrimental effect before re-working. Due to plowlines being installed simply to control fire, and not following any hydrologic scheme or contour, restoration efforts may be more disruptive than no action.

G. Borrow pits:

Borrow pits are those areas excavated to provide fill or dumpsites in remote areas. Borrow pits used for dump areas may be particularly damaging to ground water quality. Borrow pits will be filled and either replanted with native species or allowed to revegetate naturally. Borrow pits on Unit 4 will be maintained intact for freshwater fishing. In all cases of hydrologic restoration involving further soil disturbance, follow-up monitoring to determine hydrologic effect, soil erosion, and possible exotic species infestation, will be a continuing effort. The extent of hydrologic disturbance on Reserve lands is undetermined.

XII. Resource Protection Activity

A. Protection Without Law Enforcement Authority

The goal of ANERR is resource protection through research, interpretation and education. The Reserve has no law enforcement staff or authority for enforcement. In lieu of enforcement authority, the Reserve has established Administrative Agreements with the U.S. Fish and Wildlife Service, Apalachee Regional Planning Council, Franklin County Board of County Commission, Division of Forestry, Department of Commerce, Department of State, the cities of Apalachicola and Carrabelle and the Eastpoint Water and Sewer Districts. All these entities have vested authority within the Reserve as do law enforcement personnel of the Florida Game and Fresh Water Fish Commission, Florida Marine Patrol, Florida Park Patrol and U.S. Coast Guard. The roles of Reserve staff in enforcement are coordination, requests for enforcement, environmental assessment and testimony.

B. Houseboats

The Reserve lands along East Bay abut expansive stands of grasses, rushes and sedges within low wave-energy areas or along river mouths. The dense roots and stems make access from adjacent upland communities quite difficult and the lack of roads ending nearby make mooring unattractive. Barrier island Gulf beaches have high-energy shorelines and bayshore tracts are generally adjacent to shallow inlets inhospitable to long term stays by houseboats. The combination of a lack of access by land and shallow water combine to reduce the incidence of this type of encroachment on Reserve managed lands.

Other agencies which manage lands within the Reserve boundary deal with the issue of houseboat moorings in different ways. GFC has not yet addressed this issue according to their Wildlife section. WEA lands managed by the NWWMD do have guidelines but no permitting for houseboats along their banks. Adjacent uplands may not be used for storage or the construction of portable or permanent fixtures. There are signs along the river bank stating the above and WMD personnel enforce the procedures as violations are discovered. The USCOE apparently prohibits only the mooring of boats in the channel or on Corps regulatory markers, pilings or structures. Reserve staff feel the potential for pollutants entering the estuary system through houseboat sewage discharge warrants curtailing of this activity.

In order to develop consistent permitting or rules, a task force of land management agencies within Reserve boundaries will be initiated with law enforcement agency personnel as contributors to the discussion. None of the agencies contacted while researching this situation felt that there were high incidences of abuse or overuse.

C. Illegal Collection/Poaching

The illegal "taking" of biota, e.g., harming, killing, harassing, collection or destruction of habitat, on Reserve lands is anticipated. The extent of impacts to flora and fauna remain largely unknown. Because of the diversity of communities found within ANERR boundaries illegal collecting/poaching activities may cover a broad range of species. As Franklin County and the surrounding region experience increasing tourism and population growth, degradation of the resources used by such development and higher usage is expected.

Local and state law enforcement agencies will be advised of Reserve upland properties and these property boundaries will be posted after demarcation. GFC officers are aware of illegal collecting activities which concentrate on herpetological species for the pet/collector trade industries and game poaching activities.

Of special concern to Reserve personnel is the protection of listed species. Illegal "taking" of listed species receives priority attention over game and non-listed species. Collection of rare plants for the native plant industry may also be a source of concern.

D. Education and Protection Activities

- The following activities by Reserve staff serve to educate and protect critical habitat and species:
- Several methods are used to inform the public about sea turtle nesting activity and to educate visitors on the appearance of crawls and nests. Reserve staff and volunteers routinely monitor nesting beaches within Franklin County, educational materials are distributed to reduce nesting mortality due to lighting conflicts and signs are posted siting protective covenants.
- Protection and monitoring of local bird nesting colonies represents a primary objective of Reserve personnel since colonial shorebirds have been know to abandon sites due to human or mammalian presence. Bird nesting signs, speed limit reduction and a multi-agency cooperative effort to use dredge spoil to build a new nesting island are some of the techniques used by Reserve staff to reduce human and adventitious species impacts (Edmiston et al unpub.).
- Reserve staff have researched and documented marine mammal activity within and adjacent to Reserve boundaries for several years and this information may form the basis for establishing Manatee Foraging Zones in East Bay and the development of educational programs aimed at reducing dolphin-human encounters in coastal waters.

E. Illegal Dumping, Litter Control and Vandalism

The remote location of Reserve lands and easy access afforded by numerous woods roads in some areas, have resulted in quantities of garbage and trash being illegally dumped. In addition, the shorelines of Reserve lands accumulate quantities of debris from recreational boaters and commercial enterprises. Occasional visitors to accessible sites on Reserve lands often leave behind litter in the form of picnic debris, fishing line and other material.

To curtail the use of Unit 4 roads and lands being used as an illegal dump site, barrier gates have been installed at most vehicle access points to the unit. These roads, in the process of being abandoned by Franklin County and absorbed into Reserve lands, have been closed under authority of the County. Pedestrian access remains available. Clean up activity has been initiated by Reserve staff and will continue until the dump sites are cleared. Monitoring will insure dumping is minimized.

Similar action will be taken on other Reserve lands as individual situations warrant. As dumping on publicly owned land is a violation of F.S. 403.413, Florida Litter Law, appropriate law enforcement agencies will be informed whenever illegal dumping occurs on Reserve lands.

Most litter occurring on Reserve lands is water-borne and has washed ashore on Reserve shorelines. Annually, statewide public participation for marine litter removal is conducted by the Center for Marine Conservation. Hundreds of pounds of litter are removed from Reserve shorelines by these volunteers. In addition to removing accumulated litter, volunteers help gather data regarding the types, amounts and origins of marine litter.

In those areas where continued public access and use results in litter accumulation, the feasibility of installing trash drops or covered and animal-proofed litter barrels will be assessed. Where necessary, trash drops will be installed and routinely emptied by Reserve staff. The trash drops will be of a design similar to those used by state parks for their visitor use areas.

Educational displays interpreting the environmental effects of litter will be developed and installed in those areas of relatively high use and litter accumulation.

Instances of vandalism will be reported to the appropriate law enforcement agency as it occurs or is discovered. Efforts will be made to repair or remove evidence of vandalism to avoid the appearance of disrepair of facilities or disregard for the resource. This will serve to reduce further acts of vandalism.

XIII. Priority Schedule For Resource Management Activities

Management activities for this plan will be ongoing. Static baseline data, such as boundary locations and acreage of community type once captured will be intermittent activities. Incidences of priority change are expected and are dependent on immediate and permanent impact to the resource.

A. Priority Management Activities

- Prescribed Fire Program
- Exotic Species Program
- Illegal Dump Removal
- Public Accessibility Enhancement
- Natural Resource Inventory and Monitoring
- Cultural Resource Inventory and Monitoring

B. Non-Priority Management Activities

- Natural Area Restoration
- Hydrologic Restoration

C. Resource Management Cost Estimates

Cost estimates listed include neither FTE salaries nor OPS funding. Upon discovery of more, or less, severe resource management needs, these figures are subject to change. Estimations are annualized.

1. Prescribed Fire Program - includes initial boundary fire line preparation, fire and line clearing equipment maintenance, conducting prescription burns, annual interior and boundary fire line maintenance, pre-burn preparation, effects monitoring, expendable supplies and continuing training of staff. Survey and fencing will be included as deemed necessary jointly with boundary fire lien preparation. Cost effectiveness of this program may be enhanced by conducting cooperative burns with other local land managers, utilizing D.O.F. services or contract burning with other agencies or private vendors. Sale of timber from line clearing operations may supplement funding. Estimated: $50,000.00

2. Exotic Species Control Program - includes continual inspection of lands, initial removal or treatment of isolated occurrences, long term projects for more severe infestations, occurrence mapping and follow-up monitoring. Cost effectiveness may be enhanced by utilizing private vendors for contract removal, and use of local inmate programs. Estimated: $3,000.00

3. Illegal Dump Removal - includes landfill fees and costs associated with removal and transporting with heavy equipment. Cost effectiveness may be enhanced through sale of recyclable materials and use of local inmate work programs. Estimated: $5,000.00

4. Public Accessibility Enhancement - addresses basic public access to lands in the form of established parking areas, signage and trails. May include development of rudimentary weather shelters, displays and trail associated boardwalks. Cost effectiveness may be enhanced by utilizing volunteer individuals, groups or organizations for trail layout, blazes and trimming. Inmate work groups may be used for seasonal trail maintenance. Estimated: $20,000.00

5. Natural Resource Inventory and Monitoring - includes GPS data collection and mapping of community boundaries, wetlands and shorelines. Also includes additional maps and files, expendable supplies and photos. Cost effectiveness may be enhanced through volunteer or student participation in data collection. Estimated: $1,000.00

6. External Resource Inventory and Monitoring - may include professional survey of specified tracts for site inclusions into master site file at DR, GPS mapping and monitoring while conducting other resource management activities. Cost effectiveness will be enhanced with assistance from university study programs. Estimated: $2,000.00

D. Non-Priority Projects and Cost Estimates

1. Natural Area Restoration - potentially includes pine plantation restoration and clear-cut area restoration as both occur on Reserve managed lands. Cost may be mitigated using reforestation funds available through DOF Use of inmate labor during replanting programs may also be utilized. Estimated: $2,000.00

2. Hydrologic Restoration - unknown until complete lands disturbance assessment is made.

XIV. Potential Revenue Generation

Reserve lands are generally located on or near aquatic resources, have no existing facilities, are jurisdictional wetlands and serve well as buffers in a natural state. Pine plantations are known to exist on some East Bay (Figure 18) property and may be harvested for revenue when mature.

CHAPTER 8

PROGRAM ADMINISTRATION

I. Introduction

Reserve Administration is designed to provide information and coordinate the activities of all cooperating management entities in the area. These include the seventeen local, state and federal government agencies listed in Appendix 6. Reserve administration is conducted cooperatively by the National Oceanic and Atmospheric Administration and the Florida Department of Environmental Protection. Other agencies with lead management roles within the Reserve include the U.S. Fish and Wildlife Service, the Florida Game and Fresh Water Fish Commission and the Northwest Florida Water Management District. Interagency cooperative management efforts are coordinated by DEP through administrative agreements which recognize the role of each agency and provide for advance notification of management planning and activities. (Copies of relevant agreements are provided in Appendix 3 of this plan.) Memoranda of Understanding are vital to establishing expectations between agencies for long term management.

Appendix 7 (Lease No. 3862) assigns lead role management authority of Cape St. George Island and other small parcels to ANERR. Copies of legal descriptions associated with this lease are available for review at ANERR headquarters and at the Bureau of Coastal and Aquatic Managed Areas in Tallahassee, Florida. Substantial amounts of additional assignments in the East Bay portion of the Reserve will be part of an update to Lease No. 3862.

II. Administrative Goals

A. Goal

The goal of Reserve administration is to establish the administrative framework and support to provide for the effective implementation of the research, education and resource management programs.

B. Objectives

1. Supervise and administer Reserve programs and maintain facilities.
2. Comply with all legal rules, contracts, agreements and regulations.
3. Maintain all records needed for operating, budgeting, planning and purchasing.
4. Communicate and coordinate with all entities involved in research, education, commercial and recreational utilization or management within the Reserve.

5. Establish an Advisory Board composed of representatives from entities involved in research, education, resource utilization and resource management within the Reserve.

6. Provide for the revision of the management plan at least every five years.

7. Promulgate administration agreements between the Department of Environmental Protection and other involved agencies which recognize roles and promote program cooperation.

C. Administrative Organization

The Reserve is administered by the Florida DEP in cooperation with the National Oceanic and Atmospheric Administration/Office of Coastal Resource Management/Sanctuaries and Reserve Division (NOAA/OCRM/SRD) through recognition and implementation of the policies and guidelines of each of these agencies. Executive authority for Reserve administration and management ultimately lies with the Governor and Cabinet acting through the Secretary of the DEP. NOAA's Sanctuaries and Reserves Division also provides administrative input and guidance to DEP. Additional administrative authority over the various units within the Reserve has been delegated by the Governor and Cabinet, sitting as head of the Trustees of the Internal Improvement Trust Fund, to the DEP's Division of Marine Resources, Bureau of Coastal and Aquatic Managed Areas in accordance with their role as "landlord" of state owned lands. Active management of some of these units is subcontracted to other state agencies with approval from the Governor and Cabinet.

The role of the DEP is to develop policies concerning operation of the Reserve, consistent with state law (e.g. Chapter 258, Florida Statutes, and all appropriate administr2tive code references to the DEP), Section 315 of the Coastal Zone Management Act of 1972, as amended, and NOAA regulations. Policies implemented through the Reserve Management Plan are developed by the DEP with advisory input from the Reserve Advisory Management Board subject to approval by NOAA's Sanctuaries and Reserves Division. Proposed policy changes to the Reserve Management Plan are developed, as needed, by DEP and NOAA with input from the Reserve Management Board.

The legislature adopted rules to establish regional management review teams whose mission is to evaluate the extent to which existing management plans provide sufficient protection to threatened or endangered species. The 1993 ANERR Management Plan was reviewed by such a team and those review comments are represented in Appendix 9. Staff response to those comments and the subsequent plan revisions are identified in Appendix 10.

The Florida Game and Fresh Water Fish Commission, the Northwest Florida Water Management District, the U.S. Fish and Wildlife Service and the

Florida Department of Environmental Protection have lead role management authority within the Reserve. The Florida Division of Forestry has support management authority over state owned lands within the Reserve. Coordination and enhancement of communication among those with management interest in the Reserve is accomplished at the staff level through the Reserve Manager.

D. Reserve Advisory Management Board

The role of the Reserve Advisory Management Board (RAMB) is to assist the Department by providing recommendations on matters concerning the education, research, resource utilization (commercial or recreational), resource management and program coordination. The charter for that board is found in Appendix 8.

The ten seats on the RAMB are comprised of five voting members appointed by the Franklin County Board of County Commission and five state and federal representatives. County representatives represent the following groups: the Commercial Seafood Industry, Franklin County School System (two seats), the Franklin County Commission, and Recreational Fishing. Five members representing state, federal and local government have voting privileges and are represented by the following groups: the University of Florida Sea Grant Extension Program, the Florida Game and Fresh Water Fish Commission, the Northwest Florida Water Management District; a Research Scientist; and the U.S. Fish and Wildlife Service.

E. Reserve Staff

The Reserve staff are employed by the Department of Environmental Protection. The present Reserve staff includes a Reserve Manager, an Operation Management Consultant, and Administrative Assistant II, a Staff Assistant; a Research Coordinator with two Research Assistants; an Education Coordinator with an Education Assistant, a Publication Production Specialist and an Information Specialist; a Resource Manager with a Parks Service Specialist and a Marine Mechanic. Maintenance and additional clerical help are currently conducted with temporary employees (Figure 22).

Seven of the present 14 positions at the Reserve have administrative or administrative support duties. Reserve staff are divided into six sections; Office of the Manager, Administration, Research, Education, Resource Management, and Maintenance and Support. The Office of the Manager is staffed by the Manager and the Staff Assistant. This office is responsible for developing and directing implementation of policies relative to management of the Reserve and has substantial influence on the Coast Zone Management Policies of the region and the state. The Administration Section is headed by the Operations and Management Consultant and staffed with the Administrative Assistant II. This section serves the key role in budget

preparation and monitoring, develops and maintains office policy and procedures and supervises clerical staff. It also serves a goods service procurement role, prepares bid specifications and obligates the Reserve through contract procedures.

The Research Section is headed by an Environmental Specialist III position. The incumbent develops, implements and evaluates estuarine research and monitoring programs within the Reserve, including the solicitation of funding. The incumbent also assists the Reserve Manager in evaluating environmental and other management problems.

The Education Section is headed by an Environmental Specialist III. The incumbent develops, implements, and evaluates environmental education programs in regional school systems at all grade levels including adult education. The incumbent also assists the Reserve Manager in evaluating environmental and other management problems and developing solutions.

The Resource Management Section is also headed by an Environmental Specialist III. This newly created position is responsible for the management of Reserve uplands. Activities include preparation of unit burn plans, conducting prescribed burns, opening Reserve lands to the public through trails and signage and cleaning up old dump areas.

The Maintenance and Support Section is presently headed by a temporary employee. The incumbent reviews, analyzes and supervises operational activities to ensure operational objectives, facility and equipment needs and related problems at the Reserve are identified and resolved. Converting this position to a permanent position is a priority activity for the Reserve.

F. Five-Year Staff Requirements

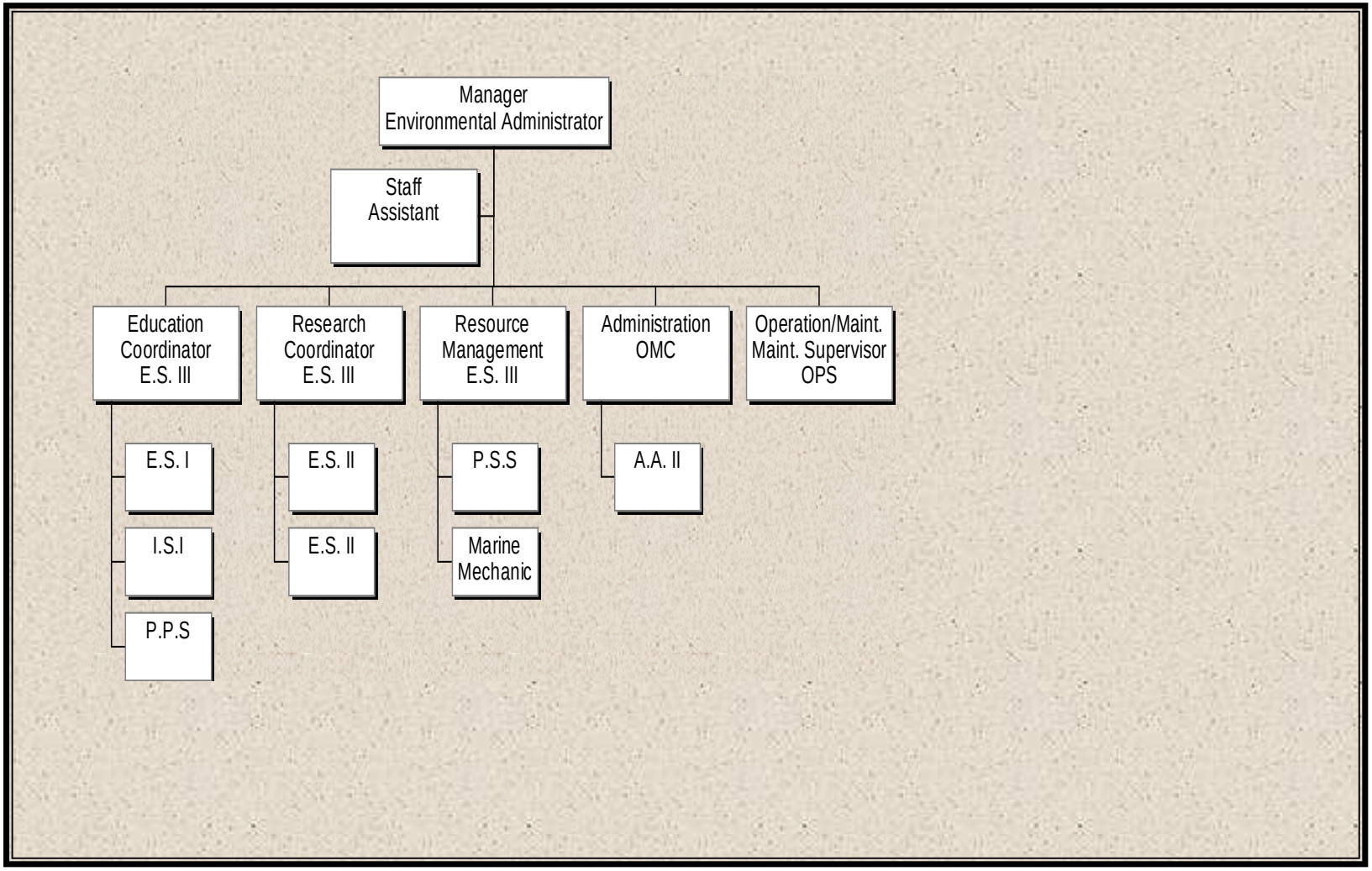
All full time staff at ANERR are now state funded positions. Several staff were originally funded by NOAA grants, then picked up by the State following grant termination.

Additional staff must be secured to accomplish the goals set out in this plan. New positions determined to be essential for comprehensive program implementation are listed in Table 8.

G. Reserve Facilities

The 3,300 square foot Reserve headquarters facility, which became operational in March, 1984, has been converted into a teaching and visitor facility. The facility has a teaching laboratory, a 100 person seating capacity auditorium and the office and conference room have been converted to display areas. A 1,056 square foot modular office (the old research office) now houses the education staff.

FIGURE 22: ANERR Organizational Chart



A new 8,000 square foot complex built with NOAA matching grant funds has been constructed on the east side of Apalachicola Bay. The new facility has 4,000 square feet of office space, a 1,000 square foot laboratory and 3,000 square feet of maintenance shop. Administrative, research, resource management and maintenance staff have been re-located to the new facility.

A field station (2,100 square foot house) on Cape St. George is used by visiting scientists, teachers and students. Funding through a NOAA matching grant for the purchase of a modern facility is anticipated in FY 1998. This facility will be a visiting scientist dormitory. Detailed programmatic uses of these facilities and specific equipment can be found in the research and education section of this plan.

H. Management Plan Review

To ensure that the objectives and associated procedures are relevant to achieving the specified goals, the Apalachicola National Estuarine Research Reserve Management Plan will be reviewed and revised as necessary at least every five years. The review is conducted by the Department of Environmental Protection. A report on the review is submitted to the Reserve Advisory Management Board and the National Oceanic and Atmospheric Administration for review and comment.

I. Citizen Support Organization

ANERR promotes and provides assistance to a non-profit citizen support organization, “Friends of the Reserve” (FOR). The organization supports the Reserve’s goals and programs, raises funds, secures volunteers, sponsors special events, accepts donations for Reserve programs, aids staff in implementing the Reserve’s management plan, and reviews and comments on environmental issues. Volunteers for special research projects are drawn from this group and students recruited from local high schools. Researchers using ANERR facilities are made aware that volunteer help is available for routine tasks and they are encouraged to utilize them as a means of contributing to public education.

TABLE 8: Five Year Staff Requirements

	Area of Need	Position Level
Education	Educational Program Implementation	2 Resource Teachers (ESII)
	Volunteer Coordinator	1 Coordinator (ESII)
	Clerical and Secretarial	1 Secretary Specialist
Research	Research Assistant	ES II
	Secretarial/Librarian	1 Secretary Specialist
	Sample Analysis	1 Laboratory Technician
Operations and Technical Assistance	Licensed Vessel Operator	1 Marine Captain
	Facilities Up-keep	1 Maintenance Supervisor
		1 Custodian
		1 Maintenance Mechanic
Resource Management	Recreational Facility Maintenance	1 Park Ranger
	Uplands Resource Monitoring and Management	1 Biological Scientist II

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APPENDIX 1: LISTED SPECIES WITHIN AND ADJACENT TO THE APALACHICOLA NATIONAL ESTUARINE RESEARCH RESERVE

LISTED SPECIES WITHIN AND ADJACENT TO THE APALACHICOLA NATIONAL ESTUARINE RESEARCH RESERVE

Plants	FDA	FWS	
Baneberry, Doll's eyes	E		Actaea pachylpoda
Wild (=Southern, Canadian) Columbine	E		Aquilegia canadensis
Sicklepod	E		Arabis canadensis
Dutchman's pipevine, Pipevine	E		Aristolochia tomentosa
Apalachicola (=green) milkweed	T		Asclepias viridula
Pinewoods aster	E		Aster spinulosus
Apalachicola wild indigo	E		Baptisia megacarpa
Gopherwood buckthorn	E		Bumelia lycioides
Thorne's buckthorn	E		Bumelia thornei
Poppy mallow	E		Callirhoe papaver
Bearded grass pink	T		Calopogon barbatus
Sweetshrub	E		Calycanthus floridus
Baltzell's sedge	T		Carex baltzelli
Rosebud orchid, Spreading pogonia	T		Cleistes divaricata
Apalachicola (=panhandle) rosemary	E	E	Conradina glabra
Pagoda dogwood	E		Cornus alternifolia
Few-flowered croomia	E		Croomia pauciflora
Honewort	E		Cryptotaenia canadensis
Carolina larkspur	E		Delphinium carolinianum
Trailing arbutus	E		Epigaea repens
Dogtooth lily, Dimpled dogtooth-violet	E		Erythronium umbilicatum
Telephus spurge	E	T	Euphorbia telephioides
Wiregrass gentian	E		Gentiana pennelliana
Downy rattlesnake orchid	E		Goodyera pubescens
Harper's beauty	E	E	Harperocallis flava
Liverleaf	E		Hepatica nobilis
Heartleaf	T		Hexastylis arifolia
Green violet	E		Hybanthus concolor
Wild hydrangea	E		Hydrangea arborescens
Smooth-barked St. John's-wort	E		Hypericum lissophloeus
Florida anise	T		Ilicium floridanum
Thick-leaved (=lrg-flowered) water willow	E		Justicia crassifolia
Mountain laurel	T		Kalmia latifolia
Florida corkwood	T		Leitneria floridana
Godfrey's gayfeather, Godfrey's blazing star	E		Liatris provincialis
Catesby's lily, Southern red lily	T		Lilium catesbaei
West's flax	E		Linum westii
Cardinal flower	T		Lobelia cardinalis
Gulfcoast (=panhandle) lupine	T		Lupinus westianus
Curtiss' loosestrife	E		Lythrum curtissii
White birds-in-a-nest	E	T	Macbridea alba

Ashe's magnolia	E		Magnolia ashei
Pyramidal magnolia	E		Magnolia pyramidata
Green adder's-mouth	E		Malaxis unifolia
Crabapple	T		Malus angustifolia
Alabama milkweed, Alabama anglepod	E		Matela alabamensis
Baldwin's milkweed, Baldwin's anglepod	E		Matela baldwyniana
Yellow-flowered anglepod	E		Matela flavidula
Florida milkweed, Panhandle anglepod	E		Matela floridana
Anglepod	T		Matela gonocarpos
Indian cucumber-root	E		Medeola virginiana
Florida beargrass	T		Nolina atopocarpa
Shell mound prickly pear cactus	T		Opuntia stricta
Giant waterdropwort	E		Oxypolis greenmanii
Coastal (=Carolina) grass-of-parnassus	E		Parnassia caroliniana
Grass-of-parnassus	E		Parnassia grandifolia
Hairy fever tree	T		Pinckneya bracteata
Godfrey's (=panhandle) butterwort	E	T	Pinguicula ionantha
Yellow flowered butterwort	T		Pinguicula lutea
Chapman's (=swamp) butterwort	T		Pinguicula planifolia
Panhandle (=Florida) golden aster	E		Pityopsis flexuosa
Large white-fringed orchid	T		Platanthera blephariglottis
Golden (=crested) fringed orchid	T		Platanthera cristata
Southern tubercled orchid, Gypsy-spikes	T		Platanthera flava
Southern yellow fringeless orchid, Orange rein-orchid	E		Platanthera integra
Snowy orchid, Bog torch	T		Platanthera nivea
Rose pogonia	T		Pogonia ophioglossoides
Large-leaved jointweed	T		Polygonella macrophylla
Apalachicola (=small-flowered) meadow beauty	E		Rhexia parviflora
Florida flame (=orange) azalea	E		Rhododendron austrinum
Night-flowering wild petunia	E		Ruellia noctiflora
White-top pitcher plant	E		Sarracenia leucophylla
Parrot pitcher-plant	T		Sarracenia psittacina
Bay star vine	E		Schisandra coccinea
Florida skullcap, Helmet-flowers	E	T	Scutellaria floridana
Fringed campion, Fringed catchfly	E	E	Silene polypetala
Oval ladies' tresses	E		Spiranthes ovalis
Shade betony	E		Stachys crenata
Bladdernut	E		Staphylea trifolia
Silky camellia	E		Stewartia malacodendron
Florida yew	E		Taxus floridana
Florida torreya, Stinking cedar	E	E	Torreya taxifolia
Lance-leaved wakerobin	E		Trillium lancifolium
Wood's false hellebore	E		Veratrum woodii
Chapman's crownbeard	T		Verbesina chapmanii
Yellowroot	E		Xanthorhiza simplicissima
Kral's (=karst pond) yellow-eyed grass	E		Xyris longisepala
Harper's (=harsh-leaf) yellow-eyed grass	T		Xyris scabrifolia
Prickly ash, Toothache tree	E		Zanthoxylum americanum
Treat's zephyr lily	T		Zephyranthes treatiae

Amphibians			
	GFC	FWS	
Salamanders			
Georgia blind salamander	SSC		Haideotriton wallacei
Frogs			
Gopher (=crawfish) frog	SSC		Rana capito

Reptiles			
	GFC	FWS	
Turtles			
Atlantic loggerhead turtle	T	T	Caretta caretta
Atlantic green turtle	E	E	Chelonia mydas mydas
Leatherback (=leathery) turtle	E	E	Dermochelys coriacea
Gopher turtle	SSC		Gopherus polyphemus
Barbour's map (=sawback) turtle	SSC		Graptemys barbouri
Atlantic ridley turtle	E	E	Lepidochelys kempi
Alligator snapping turtle	SSC		Macroclemys temmincki
Suwannee cooter	SSC		Pseudemys concinna suwanniensis
Crocodilians			
	GFC	FWS	
American alligator	SSC	T	Alligator mississippiensis
Snakes			
	GFC	FWS	
Eastern indigo snake	T	T	Drymarchon corais couperi
Florida pine snake	SSC		Pituophis melanoleucus mugitus

Birds			
	GFC	FWS	
Wakulla seaside sparrow	SSC		Ammodramus maritimus juncicolus
Limpkin	SSC		Aramus guarauna
Ivory-billed woodpecker	E	E	Campephilus principalis
Southeastern snowy plover	T		Charadrius alexandrinus tenuirostris
Piping plover	T	T	Charadrius melodus
Marian's marsh wren	SSC		Cistothorus palustris marianae
Little blue heron	SSC		Egretta caerulea
Reddish egret	SSC		Egretta rufescens
Snowy egret	SSC		Egretta thula
Tricolored (=Louisiana) heron	SSC		Egretta tricolor

White ibis	SSC		Eudocimus albus
Arctic peregrine falcon	E	E	Falco peregrinus tundrius
Southeastern American kestrel	T		Falco sparverius paulus
Florida sandhill crane	T		Grus canadensis pratensis
American oystercatcher	SSC		Haematopus palliatus
Bald eagle	T	T	Haliaeetus leucocephalus
Wood stork	E	E	Mycteria americana
Brown pelican	SSC		Pelecanus occidentalis
Red-cockaded woodpecker	T	E	Picoides borealis
Black skimmer	SSC		Rynchops niger
Least tern	T		Sterna antillarum
Bachman's warbler	E	E	Vermivora bachmanii
Fish	GFC	FWS	
Gulf Sturgeon	SSC	T	Acipenser oxyrhynchus desotoi
Shoal bass, Chipola bass	SSC		Micropterus notius sp. cf coosae
Mammals	GFC	FWS	
Red wolf		E	Canis rufus
Florida panther	E	E	Felis concolor coryi
Gray bat	E	E	Myotis grisescens
Indiana bat	E	E	Myotis sodalis
Florida mouse	SSC		Podomys floridanus
West Indian (=Florida) manatee	E	E	Trichechus manatus latirostris
Florida black bear	T		Ursus americanus floridanus

* Note: These listings represent the species' current state and/or federal designations as an endangered (E), threatened (T), or species of special concern (SSC). These listings are taken from the 1997 official lists published by the Florida Game and Fresh Water Fish Commission.

APPENDIX 2: FLORA AND FAUNA OF THE APALACHICOLA NATIONAL ESTUARINE RESEARCH RESERVE

FLORA AND FAUNA OF THE APALACHICOLA NATIONAL ESTUARINE RESEARCH RESERVE

Plants	
Red Maple	Acer rubrum
Broomstraw	Andropogon elliottii
Broomsedge	Andropogon virginicus
Broomsedge	Andropogon virginicus var. glaucus
Bottlebrush Threeawn	Aristida spiciformis
River birch	Betula nigra
Gopherwood buckthorn (E)	Bumelia lycioides
Thorne's buckthorn (E)	Bumelia thornei
Sea rocket	Cakile constricta.
Northern sea rocket	Cakile edentula
American horn beam, Blue-beech, Ironwood	Carpinus caroliniana
Water hickory	Carya aquatica
Sugarberry, Hackberry	Celtis laevigata
Florida rosemary	Ceratiola ericoides
Seaside spurge	Chamaesyce polypgonifolia
Fingergrass	Chloris glauca
Fingergrass	Chloris petraea
Bush goldenrod	Chrysoma pauciflosculosa
Sawgrass	Cladium jamaicense
Black titi	Cliftonia monophylla
Scrub rosemary	Conradina canescens
Apalachicola (=panhandle) rosemary (E)	Conradina glabra
Sand coco-grass, Nutgrass	Cyperus rotundus
Titi, Leatherwood	Cyrilla racemiflora
Titi, Leatherwood	Cyrilla racemiflora var. parvifolia
Saltgrass	Distichlis spicata
Dwarf sundew	Drosera brevifolia
Common Pink sundew	Drosera capillaris
Thalia lovegrass,	Eragrosti atrovirens
Bahia lovegrass	Eragrostis bahiensis
Elliott lovegrass	Eragrostis elliottii
Pond lovegrass	Eragrostis glomerata
Bigtop lovegrass	Eragrostis hirsuta
Teal lovegrass	Eragrostis hypnoides
Tufted lovegrass, Carolina lovegrass	Eragrostis pectinacea
Indian lovegrass	Eragrostis pilosa
Coastal lovegrass	Eragrostis refracta
Red lovegrass	Eragrostis secundiflora sp. oxylepis
Purple lovegrass, tumble-grass	Eragrostis spectabilis
Carolina ash, pop ash	Fraxinus caroliniana
Green ash	Fraxinus pennsylvanica
Pumpkin ash	Fraxinus profunda
Dwarf huckleberry	Gaylussacia dumosa

Hydrilla	Hydrilla verticillata
Cluster-leaf St. Johns-wort	Hypericum cistifolium
St. Johns-wort	Hypericum frondosum
Bedstraw St. Johns-wort	Hypericum galioides
Smooth-barked St. Johns-wort (E)	Hypericum lissophloeus
St. Johns-wort	Hypericum microsepalum
St. Johns-wort	Hypericum nitidum
St. Johns-wort	Hypericum reductum
St. Johns-wort	Hypericum tetrapetalum
Large gallberry, Sweet gallberry	Ilex coriacea
Possum haw	Ilex decidua
Gallberry	Ilex glabra
Yaupon	Ilex vomitoria
Beach morning-glory	Ipomoea imperati
Railroad vine	Ipomoea pes-caprae
Marsh elder	Iva frutescens
Soft rush	Juncus effusus
Needlerush, Black rush	Juncus roemerianus
Saltgrass, Bearded spangletop	Leptochloa fascicularis
Fetterbush	Leucothoe racemosa
Sweetgum	Liquidambar styraciflua
Staggerbush, Rusty Lyonia	Lyonia ferruginea
Staggerbush	Lyonia fruticosa.
Maleberry	Lyonia ligustrina
Fetterbush, Shiny Lyonia	Lyonia lucida
Large flowered staggerbush	Lyonia mariana.
Sweetbay	Magnolia virginiana
Gulf muhly, Hairgrass, Hairawn muhly	Muhlenbergia capillaris
Wax myrtle, Southern bayberry	Myrica cerifera
Eurasian water milfoil	Myriophyllum heterophyllum
Water tupelo	Nyssa aquatica
Swamp tupelo, Blackgum	Nyssa biflora
Ogeechee tupelo, Ogeechee-lime	Nyssa ogeche
Weedy evening-primrose	Oenothera. biennis
Seaside evening-primrose	Oenothera humifusa
Cut-leaved evening-primrose	Oenothera laciniata
Slash pine	Pinus elliottii
Pond pine	Pinus semolina
Loblolly pine	Pinus taeda
Planer tree, Water elm	Planera aquatica
American Sycamore	Platanus occidentalis
October-flower	Polygonella polygama
Swamp cottonwood	Populus heterophylla
Chapman oak	Quercus chapmanii
Sand live oak, Scrub oak	Quercus geminata
Diamond-leaf oak	Quercus laurifolia
Overcup oak	Quercus lyrata
Myrtle oak	Quercus myrtifolia

Water oak	Quercus nigra
Live oak	Quercus virginiana
Buckthorn	Rhamnus caroliniana
Swamp honeysuckle	Rhododendron serrulatum
Beakrush	Rhynchospora megalocarpa
Widgeon-grass	Ruppia maritima
Bluestem, Dwarf palmetto	Sabal minor
Cabbage palm	Sabal palmetto
Buckthorn	Sageretia minutiflora
Black willow	Salix nigra
Russian thistle, Saltwort	Salsola kali
	Schizachyrium maritimum
Little bluestem	Schizachyrium scoparium
Saw palmetto	Serenoa repens
Sea purslane	Sesuvium maritimum
Sea purslane	Sesuvium portulacastrum
Bluestem goldenrod	Solidago caesia
Tall goldenrod	Solidago canadensis
Chapman's goldenrod	Solidago chapmannii
Goldenrod	Solidago fistulosa
Sweet goldenrod	Solidago odora
Seaside goldenrod	Solidago sempervirens
Seaside goldenrod	Solidago sempervirens var. mexicana
Smooth cordgrass, Salt marsh cordgrass	Spartina alterniflora
Big cordgrass	Spartina cynosuroides
Saltmeadow cordgrass, Marshhay	Spartina patens
Manatee-grass	Syringodium filliforme
Baldcypress	Taxodium distichum
Turtle grass	Thalassia testudinum
Marsh St. Johns wort	Triadenum virginicum
Marsh St. Johns wort	Triadenum walteri
Common cattail	Typha latifolia
American elm	Ulmus americana
Sea oats	Uniola paniculata
Highbush blueberry	Vaccinium corymbosum
Blueberry	Vaccinium darrowii
Shiny blueberry	Vaccinium myrsinites
Tapegrass (eelgrass), Water-celery	Vallisneria americana
Giant cutgrass, Water millet, Southern wild rice	Zizaniopsis miliacea
Amphibians	
Salamanders	
Dusky salamander	Desmognathus Fuscus
Frogs	
Oak toad	Bufo quercicus
Southern toad	Bufo terrestris

Southern chorus frog	Psuedacris nigrita
Ornate chorus frog	Pseudacris ornata
Upland chorus frog	Pseudacris triseriata feriarum
Gopher (=crawfish) frog (SSC)	Rana capito
Reptiles	
Turtles	
Atlantic loggerhead turtle (T)	Caretta caretta
Gopher turtle (SSC)	Gopherus polyphemus
Barbour's map (=sawback) turtle (SSC)	Graptemys barbouri
Crocodilians	
American alligator (SSC)	Alligator mississippiensis
Lizards	
Eastern glass lizard	Ophisaurus ventralis
Snakes	
Cottonmouth, Water moccasin	Agkistrodon piscivorus
Florida cottonmouth, Water moccasin	Agkistrodon piscivorus conanti
Black racer	Coluber constrictor
Brownchin racer	Coluber constrictor helvigularis
Southern black racer	Coluber constrictor priapus
Eastern indigo snake (T)	Drymarchon corais couperi
Apalachicola kingsnake	Lampropeltis getulus n
Birds	
Red-winged blackbird	Agelaius phoeniceus
Great blue heron	Ardea herodias
Red-shouldered hawk	Buteo lineatus
Great egret	Casmerodius albus
Southeastern snowy plover (T)	Charadrius alexandrinus tenuirostris
Piping plover (T)	Charadrius melodus
Pine warbler	Dendroica pinus
Snowy egret (SSC)	Egretta thula
Tricolored (=Louisiana) heron (SSC)	Egretta tricolor
American kestrel	Falco sparverius
Southeastern American kestrel (T)	Falco sparverius paulus
Arctic peregrine falcon (E)	Falco peregrinus tundrius
American oystercatcher (SSC)	Haematopus palliatus
Bald eagle (T)	Haliaeetus leucocephalus
Wild turkey	Meleagris gallopavo
Black-crowned night-heron	Nycticorax nycticorax
Osprey	Pandion haliaetus
Brown pelican (SSC)	Pelecanus occidentalis
Clapper rail	Rallus longirostris
Florida clapper rail	Rallus longirostris scotti

Black skimmer (SSC)	Rynchops niger
Caspian tern	Sterna caspia
Royal tern	Sterna maxima
Sandwich tern	Sterna sandvicensis
Least tern (T)	Sterna antillarum
Fish	
Gulf Sturgeon (SSC)	Acipenseroxyrhynchus desotoi
Bay anchovy	Anchoa mitchilli
American eel	Anguilla rostrata
Gulf menhaden	Brevoortia patronus
Sand seatrout	Cynoscion arenarius
Spotted seatrout	Cynoscion nebulosus
Threadfin shad	Dorosoma petenense
Chain pickerel	Esox niger
White catfish	Ictalurus catus
Channel catfish	Ictalurus punctatus
Spot	Leiostomus xanthurus
Redbreast sunfish	Lepomis auritus
Bluegill	Lepomis macrochirus
Redear sunfish	Lepomis microlophus
Spotted sunfish	Lepomis punctatus
Atlantic croaker	Micropogonias undulatus
Shoal bass, Chipola bass (SSC)	Micropterus notius *sp. cf* coosae
Largemouth bass	Micropterus salmoides
Striped bass	Morone saxatilis
Striped mullet	Mugil cephalus
Bluestripe shiner	Notropis callitaenia
Weed shiner	Notropis texanus
Blacktail shiner	Notropis venustus
Gulf toadfish	Opsanus beta
Gulf flounder	Paralichthys albigutta
Southern flounder	Paralichthys lethostigma
Red drum, Redfish	Sciaenops ocellatus
Florida pompano	Trachinotus carolinus
Macroinvertebrates	
Crustaceans	
Blue crab	Callinectes sapidus
Stone crab	Menippe mercenaria
Mud crab	Neopanope texana
Brown shrimp	Penaeus aztecus
Pink shrimp	Penaeus duorarum
White shrimp	Penaeus setiferus
Flat crab	Petrolisthes armatus
Molluscs	

Mussel	Brachidontes spp.
American oyster	Crassostrea virginica
Boring clam	Martesia smithi
Crown conch	Melongena corona
Southern oyster drill	Thais haemastoma
Miscellaneous	
Flatworm (oyster leech)	Stylochus frontalis
Mammals	
Red wolf (E)	Canis rufus
American beaver	Castor canadensis
Sambar deer	Cervus unicolor
Opossum	Didelphis virginiana
River otter	Lutra canadensis
Bobcat	Lynx rufus
Striped Skunk	Mephitis mephitis
Gray bat (E)	Myoti grisescens
Indiana bat (E)	Myoti sodalis
Round-tailed muskrat	Neofiber alleni
White-tailed deer	Odocoileus virginianus
Cotton mouse	Peromyscus gossypinus
Raccoon	Procyon lotor
Hispid cotton rat	Sigmodon hispidus
Feral pig	Sus scrofa
West Indian (=Florida) manatee (E)	Trichechus manatus latirostris
Common gray fox	Urocyon cinereoargenteus
Florida black bear (T)	Ursus americanus floridanus
Red fox	Vulpes vulpes

* Note: The listings in parentheses represent the species' current state designation as an endangered (E), threatened (T), or species of special concern (SSC). These listings are taken from the 1997 official lists published by the Florida Game and Fresh Water Fish Commission. The listing for the red wolf is indicative of its current federal designation since it is not presently a state-listed species.

APPENDIX 3: RANKING SYSTEM AND DETAILED RANK SCORES FOR ANERR EDUCATIONAL ACTIVITIES (EXISTING AND POTENTIAL EXPANSION)

RANKING SYSTEM AND DETAILED RANK SCORES FOR ANERR EDUCATIONAL ACTIVITIES (EXISTING AND POTENTIAL EXPANSION)

Evaluating Parameter		Score Range	
1.	Relation to ANERR Education Goals and Objectives	1	Weak Relationship
		3	Moderate Relationship
		5	Strong Relationship
2.	Public Demand for Activity	1	Low Public Demand
		3	Moderate Public Demand
		5	High Public Demand
3.	Feasibility of Project with Existing or Potential Staff and Money Resources	1	Difficult to Accomplish
		3	Moderately Difficult
		5	Easy to Accomplish

Existing Activities	Parameter Score			Total Rank Score
	1	2	3	
Field Trips	5	5	5	15
Estuarine Walk Program	5	3	5	13
Newsletter	5	3	5	13
Publication Production	5	5	3	13
Traveling Exhibit	5	3	5	13
Revised ANERR Brochure	5	5	3	13
Coastal Mgmt. Workshops	5	3	5	13
Project Estuary	5	1	5	11
Estuarine Pathways	5	1	5	11
Media Relations Program	5	1	5	11
Presentations	5	3	3	11
Guest Lecture Series	3	3	5	11
A-V and Publication Services	5	3	3	11
Treasure Chest Program	5	.1	5	11
Field Trip Curriculum	5	3	3	11
ANERR Poster	3	5	3	11
Shelf Teaching Collection	3	3	5	11
Teacher Packets	3		5	11
Teacher Education	5	1	3	9
Citizen Support Group	3	1	3	7
Volunteer Program	5	1	1	7
Cultural Events	3	1	3	7
Art and Science Exhibitions	3	1	3	7
Flora and Fauna Guides	1	3	3	7
University Classes	3	1	1	5

Existing Activities	Parameter Score			Total Rank Score
Proposed Expansion Activities				
New Indoor Interp. Facilities	5	5		13
New Outdoor Interp. Facilities	5	5	3	13
Resource Action Booklet	5	3	3	11
ANERR Slide/Video Program	5	3	3	11

Proposed Expansion Activities				
Annual Research in the Reserve	3	3	5	11
Education Library	3	3	5	11
Other Classroom Curricula	5	1	3	9
Lab Curricula	5	1	3	9
Annual Press Day	3	1	5	9
Fishing Tournament	3	3	3	9
Boater's Guide	1	5	3	9
Reserve Coloring Book	3	3	3	9
Reserve in the Community	3	3	3	9
Additional Staff	5	1	1	7
Summer Science Camp	3	3	1	7
Canoe Trail Guide	1	3	3	7
University Intern Program	3	1	1	5
Education Center Dorms	3	1	1	5

Note:Each activity was ranked independently based on these thr

APPENDIX 4: ADMINISTRATION AGREEMENT FOR THE APALACHICOLA NATIONAL ESTUARINE RESEARCH RESERVE

APPENDIX 5: PRESCRIBED FIRE FORMS

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE RESOURCES
BUREAU OF COASTAL AND AQUATIC MANAGED AREAS

Annual Prescribed Fire Management Survey

Area	(1) Total Fire-Type Acreage	(2) Burn Acreage Planned for 4/15-8/31	9/1-4/14-	(3) Acreage Burned In out of Prescription		(4) Arson or Lightning Acreage	(5) Total Acres Prescription - Burned 4/15-8/31	9/1-4/14*	(6) Acreage Burned Out of Boundaries
DISTRICT TOTALS:									
COMBINED TOTALS:									

Out-of-Prescription Fires:

Area	Date(s)	Acres/Details

Lighting or Arson Fires:

Area.	Date(s)	Acres/Details

Acreage Burned Out of Park Boundaries:

Area	Date(s)	Acres/Details

Column Instructions:

1.) Include fire-type acreage as of January 1. Adjust annually only as needed, including intended zone expansions.
2.) Include all acres planned in the calendar year, although acres legitimately added or withdrawn mid-year should be included or not included as appropriate.
3.) Out of Prescription burn acres are meant to be unintentional in-park escapes or intentional burns conducted without a completed prescription (detail required)
4.) Include all acres burned that were not related to prescribed burns (detail required). Include "let burn" acres resulting from unintentional or off-site fire starts.
5.) Include all acres from staff-initiated burns (not off-site fires entering the park or "let burn" acres). Columns 3 and 5 should have the same Combined Total acreage. Columns 4 plus 5 should reflect the total park acreage that burned
6.) Include acres inadvertently burned outside of park boundaries (detail required)

These columns represent the lightning/.non-lightning seasons; the latter season includes early and late months of the calendar year.

Prescribed burning is not recommended between September 1 and October 31 to avoid pine kills and to avoid entering non-growing season without ground cover

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF COASTAL & AQUATIC MANAGED AREAS

BURN UNIT PLAN/PRESCRIPTION

Preserve _____ County _____
Unit _____ Sec ____ Twn ____ Ran ____
Burn zone(s): _____ Acres to burn _____
Burn window/dates _____ Last date unit burned _____

Unit description (include biological community types, dominant plant species, approx. % woody versus herbaceous growth, average fuel height of understory, average canopy height of overstory, "fuel model"):

Maps must be attached: (1) Burn unit map showing location of all control lines, safe zones, areas of special concern (structures), water sources, and proposed ignition pattern. (2) Map showing desired wind direction and smoke screening information.

Resource management objectives (measurable) _____

Personnel required with assigned positions/responsibility _____

Equipment required _____

Smoke screening system: passed _____ failed _____ (attach map plotting winds and identifying smoke sensitive areas)

Smoke sensitive areas _____

Fire break/site preparation _____

Special precautions (cultural resources, sensitive areas, high flammability, endangered spp.)

Photo point description _____

Intended firing plan _____

Contingency plan _____

People to notify prior to burn _____

WEATHER/FIRE, BEHAVIOR FACTORS

	Preferred	**Actual (fill out day of burn)**
temperature	_____min_____max	_____min_____max
relative humidity	_____min_____max	_____min_____max
20' winds(direction/speed)	dir_____min/max_____	dir_____min/max_____
transport winds(direction/speed)	dir_____min/max_____	dir_____min/max_____
min. mixing height	_____	_____
dispersion index	day_____night_____	day_____ _____
fine fuel moisture	_____	night_____
drought index	_____	_____
days since last 1/2" rain	_____	_____
flame length	_____	_____
rate of spread	_____	_____
starting/ignition time	_____	_____

Prescription prepared by _____date_____

Prescription approved by _____date_____

FILL OUT DAY OF BURN:

Date of burn _____

Pre-burn conference (date/time/participants) _____

Burn Manager (print) _____(sign)_____DOF cert.# _____

This form requests all information required by Ch. 5 1-2. Rural Open Burning.

CAMA 8/22/99

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF COASTAL & AQUATIC MANAGED AREAS

DAY OF BURN PROCEDURES

Unit _____ Date of burn _____
Burn zones(s) _____ Evaluation due _____
Acres planned to burn _____ Acres actually burned _____

Personnel Contacted

Agency	Name/date/time called	Help/attendance invited?
DOF Landowner # _____		
DOF Authorization# _____		

Attach:
1. **Burn zone map** indicating firing pattern used with numbered arrows & cross hatch burned areas;
2. **"Fire Weather Forecast (Today, Tonight, Tomorrow) Sheet"**
3. **"Weather, Fine Fuel Moisture & Fire Behavior Data Sheet"**
4. **Diagram of crew positions/members and equipment**
5. **"Pre-Burn Checklist & Crew Briefing Sheet"**
6. Remember to fill out **"Actual Weather"** column on **Prescription**

Time started/ignition _____ Time ended (mop-up complete) _____
Smoke dispersal problems _____

Deviations from plan/prescription _____

Problems & general observations _____

Burn Manager (print) _____ (sign) _____ DOF cert.# _____

REMEMBER TO CHECK BURN UNIT TONIGHT & TOMORROW FOR FLARE-UPS

CAMA 8/22/99

FIRE MANAGEMENT INCIDENT REPORT

Type of incident: escaped prescribed burn / wildfire

Date or occurrence: _____

Time of occurrence: _____

Time occurrence initially reported to DOF [Bureau Fire Manager]: _____

Location: Preserve: _____

County: _____

Section: _____ Township: _____ Range: _____

Description of the nature of the incident and source of the problem:

_____

_____

_____

_____

_____

_____

Description of the type and extent of injury, or damage:

_____

_____

_____

_____

_____

_____

List individuals who responded to the incident (e.g. sheriff, fire officials, DOF staff, medical personnel, CAMA staff, cooperators):

List individuals who responded to the incident (e.g. sheriff, fire officials, DOF staff, medical personnel, CAMA staff, cooperators):

Name	Address	Phone	Agency

Additional Comments:

_____

_____

_____

_____

_____

_____ _____ _____

Name Position Date

.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF COASTAL & AQUATIC MANAGED AREAS

POST BURN EVALUATION

Unit _____ Evaluation date _____
Burn Zone(s) _____ Date of burn _____

State burn objectives and if they were met. _____

Attach copy of **Day-of-Burn/Burn Unit Map,** indicate observations and photo points on map. Sketch pattern of any hardwood (H) and pine (P) overstory kill; describe and comment on reasons for tree kill. _____

General description of understory height changes, species composition changes, shrub top kill or reduction, blooming responses, regeneration, etc. _____

Discuss any vegetation changes attributed to firing technique(s) or weather influences before, during, or after the burn. _____

Wildlife and plant observations _____

Photo plot location _____

Prepared by _____ Title _____

ATTACH TO BURN PLAN/PRESCRIPTION AND ASSOCIATED DOCUMENTS

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF COASTAL & AOUATIC MANAGED AREAS

PRE-BURN CHECKLIST AND CREW BRIEFING

Fire Unit_____ Dat _____

A PRIOR TO CREW

_____ Fire Unit is as described in
_____ Required fire lanes
_____ Permits obtained. Give Permit #'s:
_____ Official and neighbor notifications
_____ Required equipment is on-site and
_____ Planned ignition and containment methods are
_____ appropriate.
_____ List of emergency phone numbers are in each

B CREW

_____ Each crew member has a burn unit
_____ map.
_____ Fire Unit size and boundaries
_____ Purpose of
_____ Anticipated fire and smoke
_____ behavior.
_____ Review organization of crew and assignments.
_____ Review methods of ignition, holding, mop-up,
_____ communications.
_____ Location of vehicles, keys, and nearest
_____ Location of back-up equipment, supplies,
_____ and water.
_____ Review all contingencies including escape
_____ routes.

C PRIOR TO

_____ Weather and fuel conditions are within
_____ prescriptions.
_____ Weather forecast, obtained within two hours of
_____ Crew members have required protective
_____ clothing.
_____ Crew members have matches.

D BEFORE LEAVING BURN

_____ Mop-up completed as described in
_____ prescription.

E NOTE (on back) ANY MODIFICATIONS

Burn Manager:_____ Date:_____

Location of Fire _____ Page _____ of _____ for this FIRE.

WEATHER, FINE FUEL MOISTURE & FIRE BEHAVIOR
(Recording frequency required by Fire Boss)

Observer(s) _____ Date (s) _____ _____ **Recording Frequency (Circle) Half Hour Hourly**

Time	Dry Bulb	Wet Bulb	R. H.	Wind Speed Range	Wind Speed Ave.	Wind Direct	Cloud Type	State of WX	One Hour Fuel	Fire Dir.	COMMENTS (*)

CODE

CLOUD TYPE =

0 - Cumulonimbus (Thunderhead)
1 - Cumulus (Cauliflower)
2 - Alto Cumulus (Sheepbacks)
3 - Cirrus (High Feathery)

STATE OF THE WEATHER = (WX)

0 - Clear (less than 10% Cloud Cover)
1 - Scattered (10 - 50% Cloud Cover)
2 - Broken (60 - 90% Cloud Cover)
3 - Overcast (> 90% Cloud Cover)
4 - Foggy
5 - Raining
6 - Snowing or Sleeting
7 - Showering
8 - Thunderstorm in Progress
9 - Thunderstorm in Progress

FIRE DIRECTION

B - Backing
H - Heading
F - Flank
SF - Spotfires
SH - Striphead

COMMENTS (*)

INCLUDE NOTATION OF:

Smoke Movement and Spotovers

APPENDIX 6: Management Procedures for Archaeological and Historical Sites and Properties on State – Owned or controlled Lands

MANAGEMENT PROCEDURES FOR ARCHAEOLOGICAL AND HISTORICAL SITES AND PROPERTIES ON STATE - OWNED OR CONTROLLED LANDS

(Revised August, 1995)

A. GENERAL DISCUSSION

Archaeological and historic sites are defined collectively in 267.021(3), F.S., as "historic properties" or "historic resources." They have several essential characteristics that must be recognized in a management program.

First of all, they are a finite and non-renewable resource. Once destroyed, presently existing resources, including buildings, other structures, shipwreck remains, archaeological sites and other objects of antiquity, cannot be renewed or revived. Today, sites in the State of Florida are being destroyed by all kinds of land development, inappropriate land management practices, erosion, looting, and to a minor extent even by well-intentioned professional scientific research (e.g., archaeological excavation). Measures must be taken to ensure that some of these resources will be preserved for future study and appreciation.

Secondly, sites are unique because individually they represent the tangible remains of events that occurred at a specific time and place.

Thirdly, while sites uniquely reflect localized events, these events and the origin of particular sites are related to conditions and events in other times and places. Sites can be understood properly only in relation to their natural surroundings and the activities of inhabitants of other sites. Managers must be aware of this "systemic" character of historic and archaeological sites. Also, it should be recognized that archaeological sites are time capsules for more than cultural history; they preserve traces of past biotic communities, climate, and other elements of the environment that may be of interest to other scientific disciplines.

Finally, the significance of sites, particularly archaeological ones, derives not only from the individual artifacts within them, but equally from the spatial arrangement of those artifacts in both horizontal and vertical planes. When archaeologists excavate, they recover, not merely objects, but also a record of the positions of these objects in relation to one another and their containing matrix (e.g., soil strata). Much information is sacrificed if the so-called "context" of archaeological objects is destroyed or not recovered, and this is what archaeologists are most concerned about when a site is threatened with destruction or damage. The artifacts themselves can be recovered even after a site is heavily disturbed, but the context -- the vertical and horizontal relationships -- cannot. Historic structures also contain a wealth of cultural (socio-economic) data that can be lost if historically sensitive maintenance, restoration or rehabilitation procedures are not implemented, or if they are demolished or extensively altered without appropriate documentation. Lastly, it should not be forgotten that historic structures often have associated potentially significant historic archaeological features that must be considered in land management decisions.

B. STATUTORY AUTHORITY

Chapter 253, Florida Statutes ("State Lands") directs the preparation of "single-use" or "multiple use" land management plans for all state-owned lands and state-owned sovereignty submerged lands. In this document, 253.034(4), F.S., specifically requires that "all management plans, whether for single-use or multiple-use properties, shall specifically describe how the managing agency plans to identify, locate, protect and preserve, or otherwise use fragile non-renewable resources, such as archaeological and historic sites, as well as other fragile resources..."

Chapter 267, Florida Statutes is the primary historic preservation authority of the state. The importance of protecting and interpreting archaeological and historic sites is recognized in 267.061(1)(a), F.S.:

The rich and unique heritage of historic properties in this state, representing more than 10,000 years of human presence, is an important legacy to be valued and conserved for present and future generations. The destruction of these nonrenewable historic resources will engender a significant loss to the state's quality of life, economy, and cultural environment. It is therefore declared to be state policy to:

1. Provide leadership in the preservation of the state's historic resources; [and]

2. Administer state-owned or state-controlled historic resources in a spirit of stewardship and trusteeship;...

Responsibilities of the Division of Historical Resources in the Department of State pursuant to 267.061(3), F.S., include the following:

1. Cooperate with federal and state agencies, local Governments, and private organizations and individuals to direct and conduct a comprehensive statewide survey of historic resources and to maintain an inventory of such responses.

2. Develop a comprehensive statewide historic preservation plan.

3. Identify and nominate eligible properties to the National Register of Historic Places and otherwise administer applications for listing properties in the National Register of Historic Places.

4. Cooperate with federal and state agencies, local governments, and organizations and individuals to ensure that historic resources are taken into consideration at all levels of planning and development.

5. Advise and assist, as appropriate, federal and state agencies and local governments in carrying out their historic preservation responsibilities and programs.

6. Carry out on behalf of the state the programs of the National Historic Preservation Act of 1966, as amended, and to establish, maintain, and administer a state historic preservation program meeting the requirements of an approved program and fulfilling the responsibilities of state historic preservation programs as provided in subsection 101(b) of that act.

7. Take such other actions necessary or appropriate to locate, acquire, protect, preserve, operate, interpret, and promote the location, acquisition, protection, preservation, operation, and interpretation of historic resources to foster an appreciation of Florida history and culture. Prior to the acquisition, preservation, interpretation, or operation of a historic property by a state agency, the Division shall be provided a reasonable opportunity to review and comment on the proposed undertaking and shall determine that there exists historic authenticity and a feasible means of providing for the preservation, interpretation and operation of such property.

8. Establish professional standards for the preservation, exclusive of acquisition, of historic resources in state ownership or control.

9. Establish guidelines for state agency responsibilities under subsection (2).

Responsibilities of other state agencies of the executive branch, pursuant to 267.061(2), F.S., include:

1. Each state agency of the executive branch having direct or indirect jurisdiction over a proposed state or state-assisted undertaking shall, in accordance with state policy and

prior to the approval of expenditure of any state funds on the undertaking, consider the effect of the undertaking on any historic property that is included in, or eligible for inclusion in, the National Register of Historic Places. Each such agency shall afford the division a reasonable opportunity to comment with regard to such an undertaking.

2. Each state agency of the executive branch shall initiate measures in consultation with the division to assure that where, as a result of state action or assistance carried out by such agency, a historic property is to be demolished or substantially altered in a way that adversely affects the character, form, integrity, or other qualities that contribute to [the] historical, architectural, or archaeological value of the property, timely steps are taken to determine that no feasible and prudent alternative to the proposed demolition or alteration exists, and, where no such alternative is determined to exist, to assure that timely steps are taken either to avoid or mitigate the adverse effects, or to undertake an appropriate archaeological salvage excavation or other recovery action to document the property as it existed prior to demolition or alteration.

3. In consultation with the division [of Historical Resources], each state agency of the executive branch shall establish a program to locate, inventory, and evaluate all historic properties under the agency's ownership or control that appear to qualify for the National Register. Each such agency shall exercise caution to assure that any such historic property is not inadvertently transferred, sold, demolished, substantially altered, or allowed to deteriorate significantly.

4. Each state agency of the executive branch shall assume responsibility for the preservation of historic resources that are owned or controlled by such agency. Prior to acquiring, constructing, or leasing buildings for the purpose of carrying out agency responsibilities, the agency shall use, to the maximum extent feasible, historic properties available to the agency. Each agency shall undertake, consistent with preservation of such properties, the mission of the agency, and the professional standards established pursuant to paragraph (3)(k), any preservation actions necessary to carry out the intent of this paragraph.

5. Each state agency of the executive branch, in seeking to acquire additional space through new construction or lease, shall give preference to the acquisition or use of historic properties when such acquisition or use is determined to be feasible and prudent compared with available alternatives. The acquisition or use of historic properties is considered feasible and prudent if the cost of purchase or lease, the cost of rehabilitation, remodeling, or altering the building to meet compliance standards and the agency's needs, and the projected costs of maintaining the building and providing utilities and other services is less than or equal to the same costs for available alternatives. The agency shall request the division to assist in determining if the acquisition or use of a historic property is feasible and prudent. Within 60 days after making a determination that additional space is needed, the agency shall request the division to assist in identifying buildings within the appropriate geographic area that are historic properties suitable for acquisition or lease by the agency, whether or not such properties are in need of repair, alteration, or addition.

6. Consistent with the agency's mission and authority, all state agencies of the executive branch shall carry out agency programs and projects, including those under which any state assistance is provided, in a manner which is generally sensitive to the preservation of historic properties and shall give consideration to programs and projects which will further the purposes of this section.

Section 267.12 authorizes the Division to establish procedures for the granting of research permits for archaeological and historic site survey or excavation on state-owned or controlled lands, while Section 267.13 establishes penalties for the conduct of such work without first obtaining written permission from the Division of Historical Resources. The Rules of the Department of State, Division of Historical

Resources, for research permits for archaeological sites of significance are contained in Chapter 1A-32, F.A.C.

Another Florida Statute affecting land management decisions is Chapter 872, F.S. Section 872.02, F.S., pertains to marked gravesites, regardless of age. Many state-owned properties contain old family and other cemeteries with tombstones, crypts, etc. Section 872.05, F.S., pertains to unmarked human burial sites, including prehistoric and historic Indian burial sites. Unauthorized disturbance of both marked and unmarked human burial site is a felony.

C. MANAGEMENT POLICY

The choice of a management policy for archaeological and historic sites within state-owned or controlled land obviously depends upon a detailed evaluation of the characteristics and conditions of the individual sites and groups of sites within those tracts. This includes an interpretation of the significance (or potential significance) of these sites, in terms of social and political factors, as well as environmental factors. Furthermore, for historic structures architectural significance must be considered, as well as any associated historic landscapes.

Sites on privately owned lands are especially vulnerable to destruction, since often times the economic incentives for preservation are low compared to other uses of the land areas involved. Hence, sites in public ownership have a magnified importance, since they are the ones with the best chance of survival over the long run. This is particularly true of sites that are state-owned or controlled, where the basis of management is to provide for land uses that are minimally destructive of resource values.

It should be noted that while many archaeological and historical sites are already recorded within state-owned or controlled-lands, the majority of the uplands areas and nearly all of the inundated areas have not been surveyed to locate and assess the significance of such resources. The known sites are, thus, only an incomplete sample of the actual resources - i.e., the number, density, distribution, age, character and condition of archaeological and historic sites - on these tracts. Unfortunately, the lack of specific knowledge of the actual resources prevents formulation of any sort of detailed management or use plan involving decisions about the relative historic value of individual sites. For this reason, a generalized policy of conservation is recommended until the resources have been better addressed.

The generalized management policy recommended by the Division of Historical Resources includes the following:

1. State land managers shall coordinate all planned activities involving known archaeological or historic sites or potential site areas closely with the Division of Historical Resources in order to prevent any kind of disturbance to significant archaeological or historic sites that may exist on the tract. Under 267.061(1)(b), F.S., the Division of Historical Resources is vested with title to archaeological and historic resources abandoned on state lands and is responsible for administration and protection of such resources. The Division will cooperate with the land manager in the management of these resources. Furthermore, provisions of 267.061(2) and 267.13, F.S., combined with those in 267.061(3) and 253.034(4), F.S., require that other managing (or permitting) agencies coordinate their plans with the Division of Historical Resources at a sufficiently early stage to preclude inadvertent damage or destruction to known or potentially occurring, presently unknown archaeological and historic sites. The provisions pertaining to human burial sites must also be followed by state land managers when such remains are known or suspected to be present (see 872.02 and 872.05, F.S., and 1A-44, F.A.C.)

2. Since the actual resources are so poorly known, the potential impact of the managing agency's activities on historic archaeological sites may not be immediately apparent.

Special field survey for such sites may be required to identify the potential endangerment as a result of particular management or permitting activities. The Division may perform surveys, as its resources permit, to aid the planning of other state agencies in their management activities, but outside archaeological consultants may have to be retained by the managing agency. This would be especially necessary in the cases of activities contemplating ground disturbance over large areas and unexpected occurrences. It should be noted, however, that in most instances Division staff's knowledge of known and expected site distribution is such that actual field surveys may not be necessary, and the project may be reviewed by submitting a project location map (preferably a 7.5 minute U.S.G.S. Quadrangle map or portion thereof) and project descriptive data, including detailed construction plans. To avoid delays, Division staff should be contacted to discuss specific project documentation review needs.

3. In the case of known significant sites, which may be affected by proposed project activities, the managing agency will generally be expected to alter proposed management or development plans, as necessary, or else make special provisions to minimize or mitigate damage to such sites.

4. If in the course of management activities, or as a result of development or the permitting of dredge activities (see 403.918(2)(6)a, F.S.), it is determined that valuable historic or archaeological sites will be damaged or destroyed, the Division reserves the right, pursuant to 267.061(1)(b), F.S., to require salvage measures to mitigate the destructive impact of such activities to such sites. Such salvage measures would be accomplished before the Division would grant permission for destruction of the affected site areas. The funding needed to implement salvage measures would be the responsibility of the managing agency planning the site destructive activity. Mitigation of historic structures at a minimum involves the preparation of measured drawings and documentary photographs. Mitigation of archaeological resources involves the excavation, analysis and reporting of the project findings and must be planned to occur sufficiently in advance to avoid project construction delays. If these services are to be contracted by the state agency, the selected consultant will need to obtain an Archaeological Research Permit from the Division of Historical Resources, Bureau of Archaeological Research (see 267.12, F.S. and Rules 1A-32 and 1A-46 F.A.C.).

5. For the near future, excavation of non-endangered (i.e., sites not being lost to erosion or development) archaeological site is discouraged. There are many endangered sites in Florida (on both private and public lands) in need of excavation because of the threat of development or other factors. Those within state-owned or controlled lands should be left undisturbed for the present - with particular attention devoted to preventing site looting by "treasure hunters". On the other hand, the archaeological and historic survey of these tracts is encouraged in order to build an inventory of the resources present, and to assess their scientific research potential and historic or architectural significance.

6. The cooperation of land managers in reporting sites to the Division that their field personnel may discover is encouraged. The Division will help inform field personnel from other resource managing agencies about the characteristics and appearance of sites. The Division has initiated a cultural resource management training program to help accomplish this. Upon request the Division will also provide to other agencies archaeological and historical summaries of the known and potentially occurring resources so that information may be incorporated into management plans and public awareness programs (See Management Implementation).

7. Any discovery of instances of looting or unauthorized destruction of sites must be reported to the agent for the Board of Trustees of the Internal Improvement Trust Fund and the Division so that appropriate action may be initiated. When human burial sites are involved, the provisions of 872.02 and 872.05, F. S. and Rule 1A-44, F.A.C., as

applicable, must also be followed. Any state agent with law enforcement authority observing individuals or groups clearly and incontrovertibly vandalizing, looting or destroying archaeological or historic sites within state-owned or controlled lands without demonstrable permission from the Division will make arrests and detain those individuals or groups under the provisions of 267.13, 901.15, and 901.21, F.S., and related statutory authority pertaining to such illegal activities on state - owned or controlled lands. County Sheriffs' officers are urged to assist in efforts to stop and/or prevent site looting and destruction.

In addition to the above management policy for archaeological and historic sites on state-owned land, special attention shall be given to those properties listed in the National Register of Historic Places and other significant buildings. The Division recommends that the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (Revised 1990) be followed for such sites.

The following general standards apply to all treatments undertaken on historically significant properties.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alterations of features and spaces that characterize a property shall be avoided.

3. Each property shall be recognized as a physical record of its time, place and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved.

6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

8. Significant archaeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

9. New additions, exterior alterations, or related new construction shall not destroy materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired. (see Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings [Revised 19901).

Divisions of Historical Resources staff are available for technical assistance for any of the above listed topics. It is encouraged that such assistance be sought as early as possible in the project planning.

D. MANAGEMENT IMPLEMENTATION

As noted earlier, 253.034(4), F.S., states that "all management plans, whether for single-use or multiple-use properties, shall specifically describe how the managing agency plans to identify, locate, protect and preserve, or otherwise use fragile non-renewable resources, such as archaeological and historic sites..." The following guidelines should help to fulfill that requirement.

1. All land managing agencies should contact the Division and send U.S.G.S. 7.5 minute quadrangle maps outlining the boundaries of their various properties.
2. The Division will in turn identify site locations on those maps and provide descriptions for known archaeological and historical sites to the managing agency.
3. Further, the Division may also identify on the maps areas of high archaeological and historic site location probability within the subject tract. These are only probability zones, and sites may be found outside of these areas. Therefore, actual ground inspections of project areas may still be necessary.
4. The Division will send archaeological field recording forms and historic structure field recording forms to representatives of the agency to facilitate the recording of information on such resources.
5. Land managers will update information on recorded sites and properties.
6. Land managers will supply the Division with new information as it becomes available on previously unrecorded sites that their staff locate. The following details the kind of information the Division wishes to obtain for any new sites or structures that the land managers may report:

A. Historic Sites

(1) Type of structure (dwelling, church, factory, etc.).

(2) Known or estimated age or construction date for each structure and addition.

(3) Location of building (identify location on a map of the property, and building placement, i.e., detached, row, etc.).

(4) General Characteristics: (include photographs if possible) overall shape of plan (rectangle, "L "T" "H" "U", etc.); number of stories; number of vertical divisions of bays; construction materials (brick, frame, stone, etc.); wall finish (kind of bond, coursing, shingle, etc.); roof shape.

(5) Specific features including location, number and appearance of:

(a) Important decorative elements;

(b) Interior features contributing to the character of the building;

(c) Number, type, and location of outbuildings, as well as date(s) of construction;

(d) Notation if property has been moved;

(e) Notation of known alterations to building.

B. <u>Archaeological Site</u>s

(1) Site location (written narrative and mapped location).

(2) Cultural affiliation and period.

(3) Site type (midden, burial mound, artifact scatter, building rubble, etc.).

(4) Threats to site (deterioration, vandalism, etc.).

(5) Site size (acreage, square meters, etc.).

(6) Artifacts observed on ground surface (pottery, bone, glass, etc.).

(7) Description of surrounding environment.

7. No land disturbing activities should be undertaken in areas of known archaeological or historic sites or areas of high site probability without prior review by the Division early in the project planning.

8. Ground disturbing activities may proceed elsewhere but land managers should stop disturbance in the immediate vicinity of artifact finds and notifies the Division if previously unknown archaeological or historic remains are uncovered. The provisions of Chapter 872, F.S., must be followed when human remains are encountered.

9. Excavation and collection of archaeological and historic sites on state lands without a permit from the Division are a violation of state law and shall be reported to a law enforcement officer. The use of metal detectors to search for historic artifacts shall be prohibited on state lands except when authorized in a 1A-32, F.A.C., research permit from the Division.

10. Interpretation and visitation which will increase public understanding and enjoyment of archaeological and historic sites without site destruction or vandalism is strongly encouraged.

11. Development of interpretive programs including trails, signage, kiosks, and exhibits is encouraged and should be coordinated with the Division.

12. Artifacts found or collected on state lands are by law the property of the Division. Land managers shall contact the Division whenever such material is found so that arrangements may be made for recording and conservation. This material, if taken to Tallahassee, can be returned for public display on a long term loan.

E. ADMINISTERING AGENCY

Questions relating to the treatment of archaeological and historic resources on state lands may be directed to:

Compliance Review Section
Bureau of Historic
Preservation
Division of Historical
Resources
R.A. Gray Building
500 South Bronough Street
Tallahassee, Florida
32399-0250

Contact Person:

Susan M. Harp
Historic Preservation Planner
Telephone (904) 487-2333
Suncom 277-2333
FAX (904) 922-0496

APPENDIX 7: FEDERAL, STATE, AND LOCAL AGENCIES WITH AUTHORITY IN ANERR

Federal, State and Local Agencies with Authority in ANERR

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	(NOAA)
Department of Environmental Protection	(DEP)
U.S. Army Corps of Engineers	(COE)
Environmental Protection Agency	(ERA)
Department of Community Affairs	(DCA)
Marine Fisheries Commission	(MFC)
Northwest Florida Water Management District	(NWFWMD)
Department of Health (formerly HRS)	(DOH)
Florida Game and Fresh Water Fish Commission	(FGFWFC)
U.S. Fish and Wildlife Service	(FWS)
Division of Forestry	(DOF)
Apalachee Regional Planning Council	(ARPC)
National Marine Fisheries Service	(NMFS)
Division of Historical Resources	(DOHS)
Franklin County	
City of Apalachicola	
City of Carrabelle	

APPENDIX 8: LEASE AGREEMENT

APPENDIX 9: APALACHICOLA NATIONAL ESTUARINE RESEARCH RESERVE MANAGEMENT ADVISORY BOARD CHARTER

APALACHICOLA NATIONAL ESTUARINE RESEARCH RESERVE MANAGEMENT ADVISORY BOARD CHARTER

ARTICLE I - NAME OF ORGANIZATION

The name of the organization shall be the Apalachicola National Estuarine Research Reserve Management Advisory Board (hereinafter referred to as the Board).

ARTICLE II - PURPOSE

The purpose of the Board shall be to:

(1) Assist the Department of Environmental Protection (hereinafter referred to as the Department) in an advisory capacity by providing non-binding policy recommendations to the Department on matters affecting the environmental education, scientific research, and resource management programs of the Apalachicola National Estuarine Research Reserve (hereinafter referred to as the Reserve), which are consistent with the mission, goals and objectives of the National Estuarine Research Reserve Program as specified in 15 CFR Part 921 and the provisions of Section 315 of the Coastal Zone Management Act of 1972; and,

(2) Review and make recommendations to the Department on all proposals for amendments or modifications to the Reserve Management Plan; and,

(3) Assist the Department in maintaining effective interagency coordination and communication among federal, state, and local governmental agencies and the public on all issues regarding the management of the Reserve; and,

(4) Support funding to provide for land acquisition, facilities development and maintenance, scientific research, environmental monitoring, environmental education, equipment purchases, general operations expenses, and any other purpose necessary for the effective functioning of the Reserve.

(5) Elect chairman and vice-chairman of the Board and membership of special subcommittees.

ARTICLE III - MEMBERSHIP

The Board shall consist of ten members as follows:

Five members appointed by the Franklin County Commission shall have voting privileges and shall represent the following groups:

(1) Commercial Seafood
(2) Franklin County School System (2 seats)
(3) Franklin County Commission
(4) Recreational Fishing

Five members representing state, federal, and local government shall have voting privileges and shall be represented by the following groups:

(1) Florida Game and Fresh Water Fish Commission
(2) Florida Sea Grant Extension

(3) Northwest Florida Water Management District
(4) Research Scientist
(5) U.S. Fish and Wildlife Service

ARTICLE IV - OFFICERS

There shall be the following officers;

(1) Chairman - The chairman shall be the chief officer of the Board and shall:

Perform the duties set forth by this charter or inherent to the office, or prescribed by the Board; and

Preside at meetings of the Board.

(2) Vice-Chairman - The Vice-Chairman shall:

Perform all duties of the Chairman during the absence or disability of the Chairman or in the event of a vacancy in that office. When serving as Chairman, the Vice Chairman shall exercise all powers of that office; and,

Perform such other duties prescribed by the Chairman or the Board.

The Chairman and Vice-Chairman shall be Board members, appointed by the Board.

(3) Secretary - Department staff shall be the custodian of the records of the Board, and shall prepare and maintain the official membership directory of the Board, prepare and disseminate the official minutes of all meetings of the Board, and advertise and prepare the agenda for all regular and special meetings.

ARTICLE V - ELECTIONS AND TERMS OF OFFICE

Nominations by Board members and elections for the offices of Chairman and Vice Chairman shall be held at the first quarterly meeting of each calendar year. Officers shall be

elected by a majority vote of the Board. Elected officers shall serve a term of one year and shall assume office immediately upon election. Officers may serve more than one consecutive term.

Officers may be removed from office by majority vote of the Board.

ARTICLE VI - COMPENSATION

Officers and Board members shall serve without compensation other than that which is provided by the organizations they represent.

ARTICLE VII - VOTING

Each member shall be entitled to one vote. There shall be no voting by proxy.

ARTICLE VIII - COMMITTEES

The Board may establish any subcommittees that it deems necessary.

ARTICLE IX - MEETINGS

Regular meetings of the Board shall be held on the second Thursday of the second month of each calendar quarter. Written notice of each quarterly meeting, including the scheduled time, location, agenda and minutes of the previous meeting, shall be distributed to each Board member in advance by the Reserve Manager.

Special meetings of the Board may be called by the Chairman, by a majority vote of the Board members, or by the Reserve Manager. Written notice shall be given at least seven (7) days in advance, and the time and location of the meeting shall be determined by the

Chairman. Written notice of each regular or special meeting shall be advertised in the

Florida Administrative Weekly publication as required by Florida Statutes.

ARTICLE X - QUORUM

A quorum for any meeting shall consist of a majority of the Board members. All questions shall be resolved by a majority vote of a quorum of Board members.

ARTICLE XI - PARLIAMENTARY AUTHORITY

The Parliamentary Authority of the Board shall be Roberts' Rules of Order, latest edition.

This charter for the Apalachicola National Estuarine Research Reserve Management Advisory Board is hereby established and adopted by the Florida Department of Environmental Protection.

_____

Virginia B. Wetherell,

Secretary FDEP

_____

Date

APPENDIX 10: LAND MANAGEMENT REVIEW OF APALACHICOLA BAY ACQUISITIONS, FRANKLIN COUNTY (LEASE NO. 3862): SEPTEMBER 26, 1997

Prepared by Division of State Lands Staff

Robert Clark, Environmental Administrator
William Howell, OMCM
Amy Knight, Planner

October 20, 1997

APPENDIX 11: DISCUSSION OF MANAGEMENT REVIEW TEAM COMMENTS

Discussion of Management Review Team Comments

On September 26, 1997, a Management Review Team conducted a resource management audit of the Apalachicola National Estuarine Research Reserve. The report from the review is contained in Appendix XX. The following are responses to checklist items receiving low scores on the Management Review Checklist, as well as responses to the consensus recommendations of the Management Review Team.

Checklist results

I.A.1.a.	Beach Dune	This community should be described and its management addressed in the plan.
	Reserve Response:	Beach dune community description and its management appears in Chapter 7, Section W.B. of the revised Management plan.
I.A.1.b.	Scrub	This community should be described and its management addressed in the plan.
	Reserve Response:	Beach dune community description and its management appears in Chapter 7, Section IV.B. of the revised management plan.
I.A.1.c.	Wet Flatwoods	This community should be described and its management addressed in the plan.
	Reserve Response:	Beach dune community description and its management appears in Chapter 7, Section IV& of the revised management plan.
I.A.1.d.	Gum-Cypress	This community should be described and its management addressed in the plan.
	Reserve Response:	Beach dune community description and its management appears in Chapter 7, Section W.B. of the revised management plan.
I.A.1.e.	Bottomland Hard-wood Forest	This community should be described and its management addressed in the plan.

	Reserve Response:	Beach dune community description and its management appears in Chapter 7, Section W.B. of the revised management plan.
I.A.1.f.	Tidal Marsh	This community should be described and its management Addressed in the plan.
	Reserve Response:	Beach dune community description and its management Appears in Chapter 7, Section IV.B. of the revised Management plan.
I.A.1.g.	Mesic Flatwoods	This community should be described and its management Addressed in the plan.
	Reserve Response:	Beach dune community description and its management Appears in Chapter 7, Section IV.B. of the revised Management plan.
III.A.1.	Bum Quality	Burning program contribution to natural community Maintenance or restoration should be addressed in plan.
	Reserve Response:	Subject item is addressed in Chapter 7, Section IV.C. of the Revised management plan.
III.B.1.	Reforestation	Reforestation needs and program should be addressed in in plan.
	Reserve Response:	Subject item is addressed in Chapter 7, Section IV.G. of the Revised management plan.
III.C.1.a.	Feral Hogs	Problem of feral hogs should be identified and control Measures addressed in plan.
	Reserve Response:	Subject item is addressed in Chapter 7, Section IV.D.2.a. of the revised management plan.
III.C.2.a.	Chinese Tallow	Problem of Chinese Tallow should be identified and control measures addressed in plan.
	Reserve Response:	Subject item is addressed in Chapter 7, Section IV.D.1.a. of the revised management plan.

III.C.2.b.	Elephant-ear	Problem of Elephant-ear should be identified and control measures addressed in plan.
	Reserve Response:	Subject item is addressed in Chapter 7, Section IV.D.1.b. of the revised management plan.
III.D.1.d.	Roads & Firelines	Hydrological problems associated with roads should be identified and management addressed in plan
	Reserve Response:	Subject item is addressed in Chapter 7, Section IV.H. 1-2. of the revised management plan.
III.E.1.a.	Animal Poaching	Problem of animal poaching should be identified and control measures addressed in plan.
	Reserve Response:	Subject item is addressed in Chapter 7, Section IVI of the revised management plan.
III.F.2.	Vandalism	Problem of vandalism should be identified and control measures addressed in plan.
	Reserve Response:	Subject item is addressed in Chapter 7, Section IV.E and 1. of the revised management plan.
III.H.1.a.	Trash Cans	Need/adequacy of waste facilities should be addressed in plan.
	Reserve Response:	Subject item is addressed in Chapter 7, Section IVY. of the revised management plan.
III.H.1b.	Toilets	Need/adequacy of sanitary facilities should be addressed in plan.
	Reserve Response:	Subject item is addressed in Chapter 7, Section INO. of the revised management plan.
IV.B.1.	Houseboats and facilities	Houseboats permanently tied up to state lands constitute a private use of public lands, which is inconsistent with the purposes for which the property was acquired. Additional management actions should be taken.
	Reserve Response:	Subject item is addressed in Chapter 7, Section IVI of the revised management plan.

Recommendation to the Managing Agency

1. Because foal hogs are destroying sea turtle nests, the team recommended that limited hunting Or hogs be allowed on Cape St. George

- Reserve disagrees: Possible impacts to the Bad Wolf Captive Breeding Program from hunters and gun fire dictate that no hunting be allowed at this time on Cape St. George Island. Also, sea turtle nest depredation by feral hogs for the past two seasons has been minimal. GFC coordinated hunts on this and other Reserve lands as part of feral hog removal activity, will be considered in the future.

2. Due to the problems of poaching and dumping, the team recommended that the Game and Freshwater Fish Commission provide more enforcement to the lower Apalachicola River managed areas.

   - Reserve agrees, addressed in Chapter 7, Section I.

3. Access to Unit 4 on St. George Island and to the Eastpoint properties needs to be restricted to curtail dumping and poaching.

   - Reserve agrees, addressed in Chapter 7, Section I

4. Management of the floating houses needs to be addressed by the multiple agencies involved. The team recommended a task force be set up to review the issues involved.

   - Reserve agrees, addressed in Chapter 7, Section I.

APPENDIX 12: Florida Natural Areas Inventory – Managed Area Tracking Record