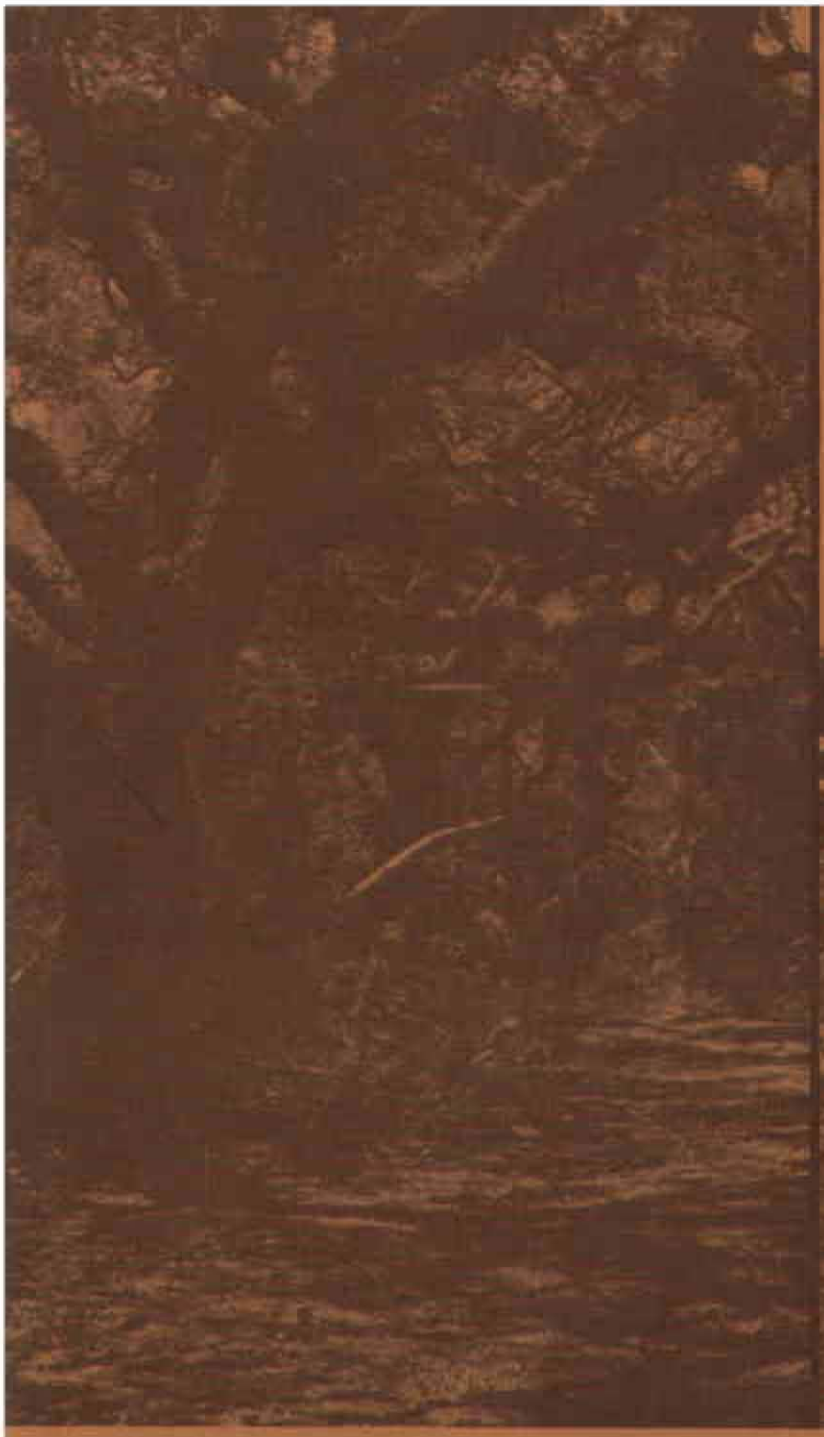

FLORIDA Environmentally Endangered Lands Plan

FLORIDA ENVIRONMENTALLY ENDANGERED LANDS PLAN

Adopted on February 17, 1975, by the Governor and Cabinet of the State of Florida, sitting as the Executive Board of the Department of Natural Resources

Prepared by the
FLORIDA DEPARTMENT OF NATURAL RESOURCES
Division of Recreation and Parks
Bureau of Plans, Programs, and Services

STATE OF FLORIDA

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DEFINITION OF

ENVIRONMENTALLY ENDANGERED LAND

An environmentally endangered land is any land area and related water resources that may be determined to contain naturally occurring and relatively unaltered flora, fauna, or geologic conditions and whose interdependent biophysical components, including historical and archaeological resources, might be essentially preserved intact by acquisition. In addition:

(1) The area must be of sufficient size to materially contribute in some substantial measure to the overall natural environmental well-being of a large area or region; or

(2) The area must contain flora, fauna, or geologic resources characteristic of the original domain of Florida and that these be unique to, or otherwise scarce within, the region or larger geographical area; or

(3) The area, whatever its size or the condition of its resources, must be capable, if preserved by acquisition, of providing significant protection to natural resources of recognized regional or statewide importance.

There must also be some reasonable likelihood that the area's related natural and cultural resources will be subjected to some activity of man that might result in their substantial and irretrievable loss.

ACKNOWLEDGEMENTS

A number of persons, both within and outside of state government, have been instrumental in the development of the Environmentally Endangered Lands Plan and in the administration of the program. Special recognition is accorded the members serving on the three committees established to assist the Department of Natural Resources in the development of the Environmentally Endangered Lands Plan and in the selection of endangered lands.

INTERAGENCY ADVISORY COMMITTEE

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Other individuals who have made important contributions to the Environmentally Endangered Lands Plan and Program are James Hartwell, consulting hydrologist; Vernon Keys, Florida Division of Health; Dr. Robert Livingston, Florida State University; Dr. Jordan Louviere, Florida State University; Dr. Durbin Tabb, Tropical BioIndustries Development Company; and Earl VanAtta, Florida Division of State Planning.

Special thanks are extended to the Florida Committee on Rare and Endangered Plants and Ani-

mals, which gave permission to use the list of endangered species found in Appendix D.

The plan was prepared by the staff of the Division of Recreation and Parks under the guidance of Ney Landrum, Director; Don Duden, former Chief of the Bureau of Planning and Grants; and Jim Pearce, Chief of the Bureau of Plans, Programs, and Services. The principal writer was R. Paul Darst III, Environmental Specialist, with editing by Jim Pearce and Paul Darst. Sylvia Worth prepared the maps and did the typesetting. Judi Walker did most of the typing.

The bulk of the credit for administering the program goes to John Squire, David Roddenberry, and Major Jim Stevenson – ably supported by Carol Netterville, Lounett Palmer, Larry Skinner, Bonnie Tripoli, Gordon Woodley, and many others who have devoted long and tedious hours to the task of working up supporting data required to process hundreds of EEL projects. Field inspections have been capably performed by park naturalists Ken Alvarez, Tom Francis, Joe Kenner, Dick Roberts, and Don Younker, and, on occasion, by other qualified field biologists. Negotiations have been capably handled by David Buchanan, Gene Langston, Charles Smith, Doug Strickland, and Al Tolius – assisted by Christine Breen and Janis Oswald. Dr. William Jernigan has conducted the required public meetings.

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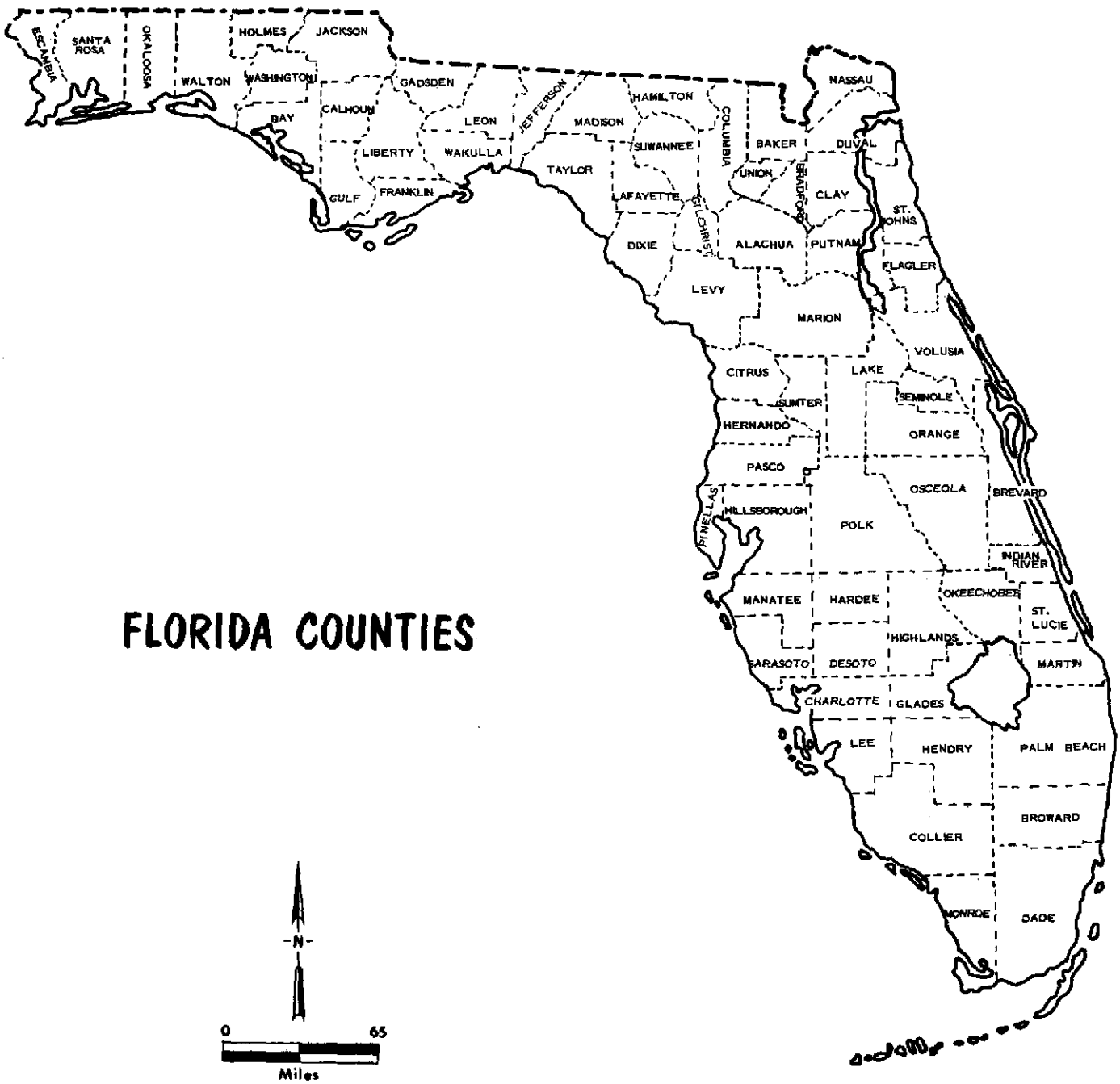


FLORIDA COUNTIES

Chapter I

INTRODUCTION

OBJECTIVES

In 1972 the Florida Legislature passed the Land Conservation Act (Chapter 259, Florida Statutes), which had as its purpose the conservation and protection of environmentally unique and irreplaceable lands. Later that year Florida voters approved a bond issue of $240 million for state capital projects, of which $40 million was for outdoor recreation lands and $200 million was for environmentally endangered lands.

The Florida Environmentally Endangered Lands Plan (EEL Plan) was prepared in compliance with the directive of the Land Conservation Act of 1972. It is a planning tool that establishes policy in the form of criteria and guidelines to assist the Executive Board of the Department of Natural Resources and subsidiary decision-making bodies in achieving conservation and protection of environmentally endangered lands in Florida by means of land acquisition. The program to conserve and protect these lands is known as the Environmentally Endangered Lands Program (EEL Program). The Plan is to be used as a guide, which in conjunction with sound judgment will ensure the wisest expenditure of large sums of public money.

SCOPE

The EEL Plan is based upon an analysis of available information on the ecological resources of the state and upon an examination of the pressures now affecting or expected in the future to affect those resources adversely. It proceeds through an analysis of Florida's natural resources toward the ultimate establishment of general priorities for the acquisition of environmentally endangered lands. The EEL Plan has, essentially, three basic parts. The first (Chapter II and Appendix D) describes the environment of Florida in terms of its characteristic natural systems. The second (Chapter III) describes the impact of human activities upon the natural environment. It also discusses existing laws and regulations from the standpoint of their ability to protect the environment from those activities. Information presented in these two parts is essential to the development of the third part (Chapter IV), which establishes priorities in the form of criteria and guidelines to assist in the selection of those land and water areas most important to the Florida environment.

LIMITATIONS

The primary limitations of the Plan derive from the scarcity of pertinent information on the state's environment. Significant informational gaps at the time of plan preparation included the following: (1) no comprehensive water use plan for the state; (2) lack of suitable information on the distribution, needs, and vulnerabilities of the state's natural systems and their component plant and animal species; (3) absence of an official mapped inventory of state-owned lands (now available); and (4) no detailed soils maps for over half of the sixty-seven counties.

Because of this inadequate date base, the Plan necessarily relies, in part, on generalizations and on extrapolations from information gained through studies of defined areas around the state. Several of the informational gaps mentioned above

are being filled. When this is done, a more accurate and useful EEL Plan can be prepared.

Factors limiting both the preparation and the effective implementation of the Plan include: (1) Differences between the potential of existing environmental laws and regulations and their actual performance make it difficult to rely on the theoretical ability of these control measures to protect natural resources. Also, the potential of some important new environmental control measures has not yet been tested fully in court. (2) The lack of eminent domain power to implement land acquisition under this program precludes the specific identification and priority listing of endangered lands, since speculative pressures on lands so identified would prevent their ultimate acquisition without severely depleting the funds available for the program.

Chapter II

THE FLORIDA ENVIRONMENT

BIOPHYSICAL SETTING

Climate

Florida lies wholly in the temperate zone, yet its climate, particularly in the lower peninsula, is subtropical with wet, humid summers and relatively dry and cool winters. The influence of the waters of the Gulf of Mexico on the west and the Atlantic Ocean on the east tends to moderate extremes of heat and cold. The warming influence of the north-flowing Gulf Stream and the prevailing wind from the southeast make for a higher temperature in winter than is characteristic of an inland climate in the same latitude. Rainfall is strongly seasonal, with up to one-half of the annual total falling in the four months from June to September. The annual average rainfall for the state is fifty-three inches, but it fluctuates widely from year to year.

Size and Shape

The total area of Florida is 58,560 square miles, including 4,424 square miles of open water. Its shape is such that no point is more than sixty miles from the sea. Florida's shape also accounts for its long coastline, 472 miles on the Atlantic Ocean and 674 on the Gulf of Mexico (not counting islands).

Geology

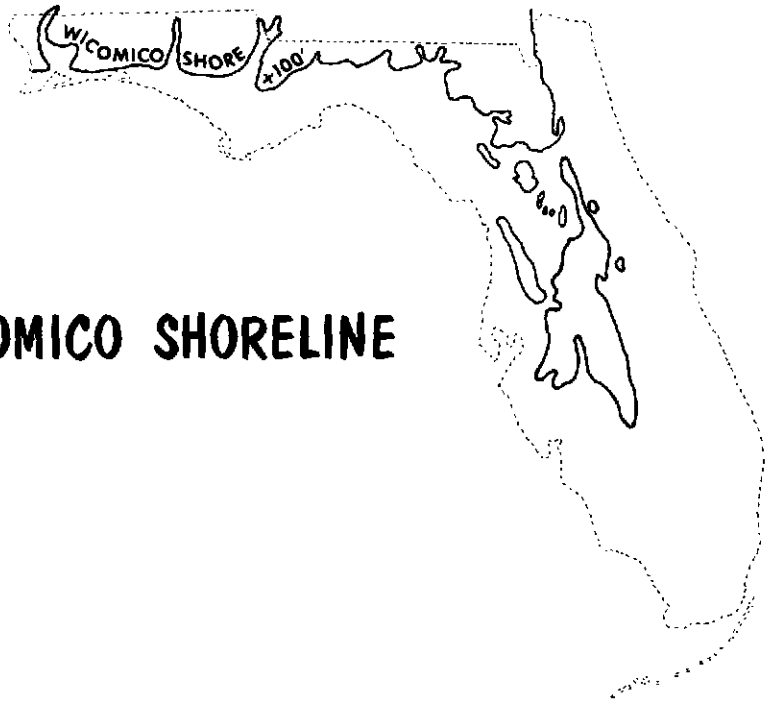
The State of Florida occupies only about half of a larger geographic unit, the Floridan Plateau, which in turn is part of the North American continent. The Plateau is a partly submerged platform nearly 500 miles long and from 250 to 400 miles wide. It separates the deep waters of the Atlantic Ocean from the deep waters of the Gulf of Mexico. The submerged portions of the Plateau are called the continental shelf; they extend out to a depth of about three hundred feet. The Plateau consists of a core of metamorphic rocks buried under a layer of sedimentary rocks (chiefly limestone) that varies in thickness from a little less than a mile to upwards of four miles. It has very few earthquakes and is one of the most stable sections of the earth's crust. The Plateau has been in existence for millions of years, during which time it has been alternately dry land and shallow sea. During the ancient inundations by higher sea levels (caused by melting of the polar ice caps), a number of different shorelines were formed. Several of these are still recognizable in Florida. They range from 8 to 270 feet above present sea level. Map No. 1 shows two of these shorelines. Most of Florida last emerged from the seas in the past one million years, which makes it, geologically, a very young state.

Physiography

Five physiographic regions are commonly identified in Florida. They are the Western Highlands, the Marianna Lowlands, the Tallahassee Hills, the Central Highlands and the Coastal Lowlands (see Map No. 2).

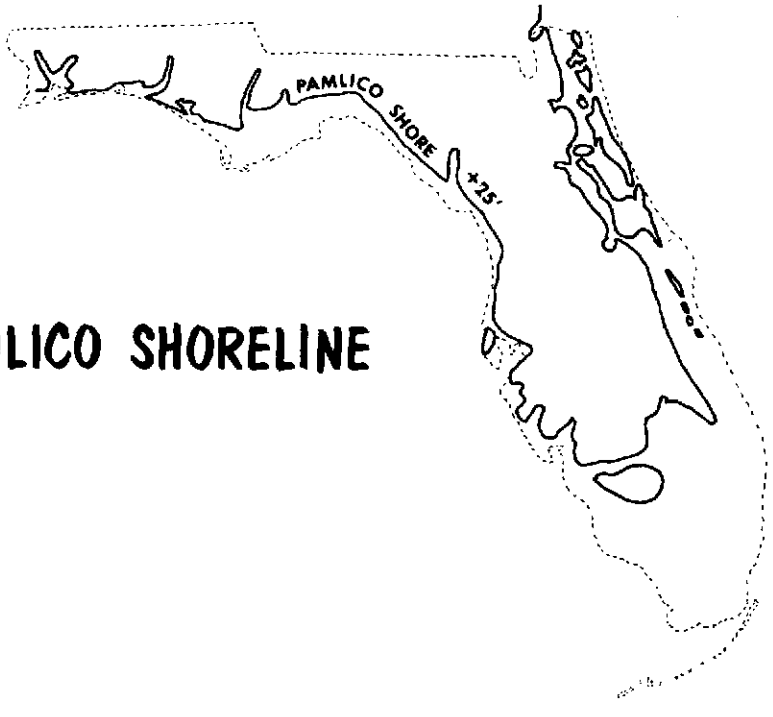
The Western Highlands includes most of the Florida panhandle between the Perdido and the Apalachicola Rivers, north of the Coastal Lowlands. It is a plateau, sloping southward, hilly in the northern part, and trenched by narrow, steep-walled stream valleys. The higher hills in the northern part are over three hundred feet high and

Map No. 1



WICOMICO SHORELINE

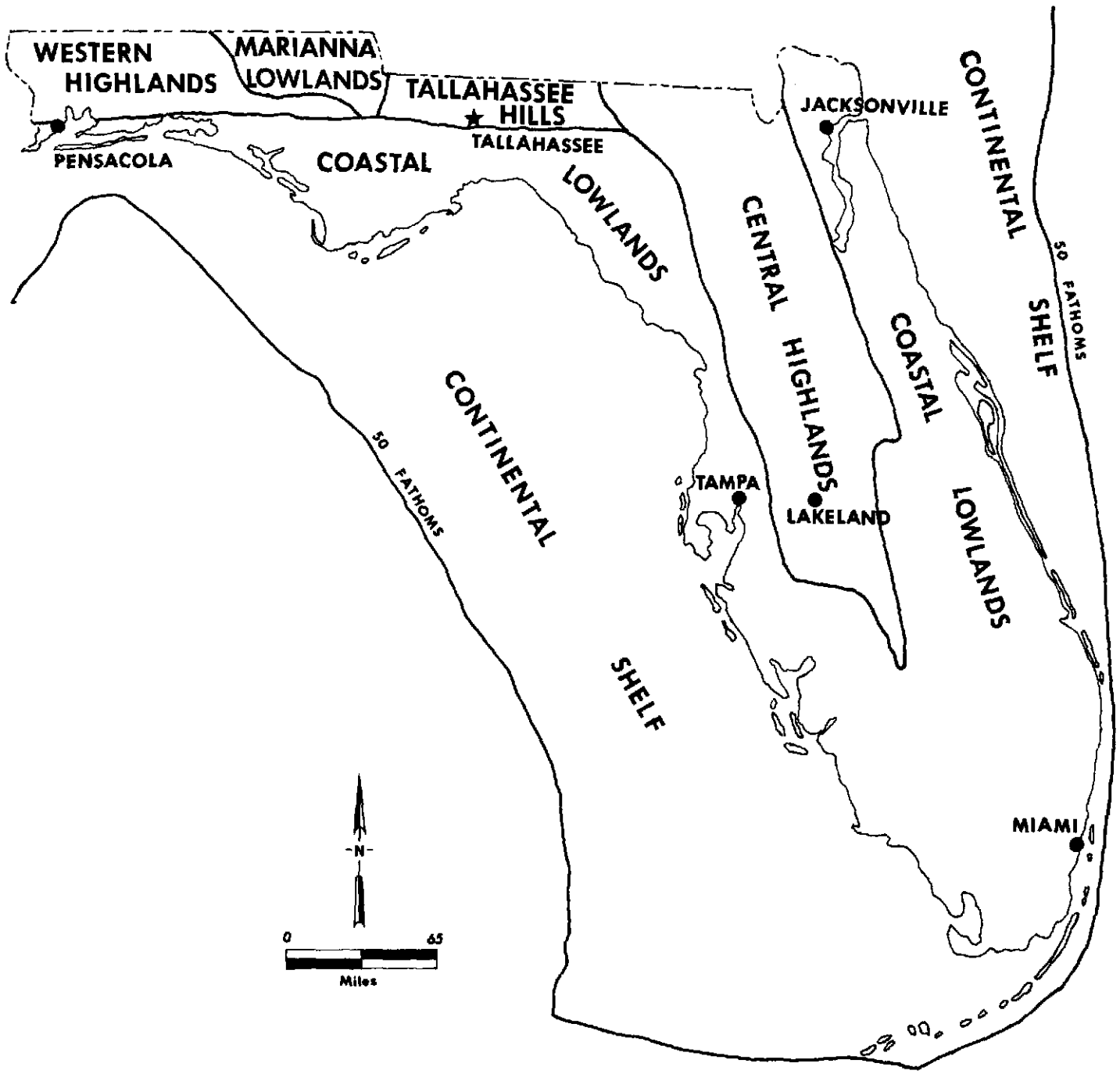
Adapted From: Geological Bulletin No. 17, Bureau of Geology, Department of Natural Resources.



PAMLICO SHORELINE

Map No. 2

PHYSIOGRAPHIC REGIONS OF FLORIDA



Adapted From: Geological Bulletin No. 17, Bureau of Geology, Department of Natural Resources.

include the highest measured elevation (345 feet) in the state.

The Marianna Lowlands, west of the Apalachicola River in Jackson, Washington and Holmes Counties, is a low, rolling, hill and sinkhole region, with numerous small lakes. Its southern and western limits are marked by a rise to the Western Highlands. The rise is due to the increasing thickness of sand covering the limestones, which lie near the surface in the Marianna Lowlands.

The Tallahassee Hills region, north of the Coastal Lowlands, stretches from the Apalachicola River to the northern Withlacoochee River. It is approximately twenty-five miles wide and one hundred miles long and is characterized by long, gentle slopes with rounded summits, except for western Gadsden County, which consists of a nearly level plain about three hundred feet high.

The Central Highlands region reaches from the Tallahassee Hills and the Okefenokee Swamp in the north almost to Lake Okeechobee in the south. Its length is about 250 miles; the width tapers from sixty miles wide in the northern two-thirds of its length down to a blunt point at the southern boundary.

Much of the northern part (above Gainesville) is a nearly level plain about 150 feet above sea level. Between Gainesville and Pasco County the western part of the Central Highlands consists of hills and hollows interspersed with broad, low plains. This sub-region ranges in altitude from two hundred feet to less than forty feet above sea level. Adjoining this sub-region to the east and extending southward beyond it to the end of the Central Highlands is the sub-region known as the Lake Region. It is characterized by numerous lakes and high hills – up to 325 feet above sea level.

The Coastal Lowlands form the entire coastline, including the Florida Keys, and reach inland as much as sixty miles at some points. Their inner edge generally lies at the one hundred foot contour line. These lowlands were, in recent geologic times, marine terraces (sea floors) during three or more successive inundations by higher seas. This is a flat region, except where old dune ridges occur or where the surface has been modified by erosion and underground solution.

The Gulf coast has the appearance of a drowned coastline – one that is sinking into the sea – whereas the east coast has the appearance of an emergent coastline – one that is rising from the sea.

Hydrology

More than four thousand square miles of Florida is covered by water. This includes 5,815 lakes larger than ten acres. Most of these lakes were probably created through solution and subsequent collapse of the underlying limestone. Some of the larger lakes – Lake Okeechobee, for example – were originally depressions on ancient sea floors created by the inundations mentioned earlier.

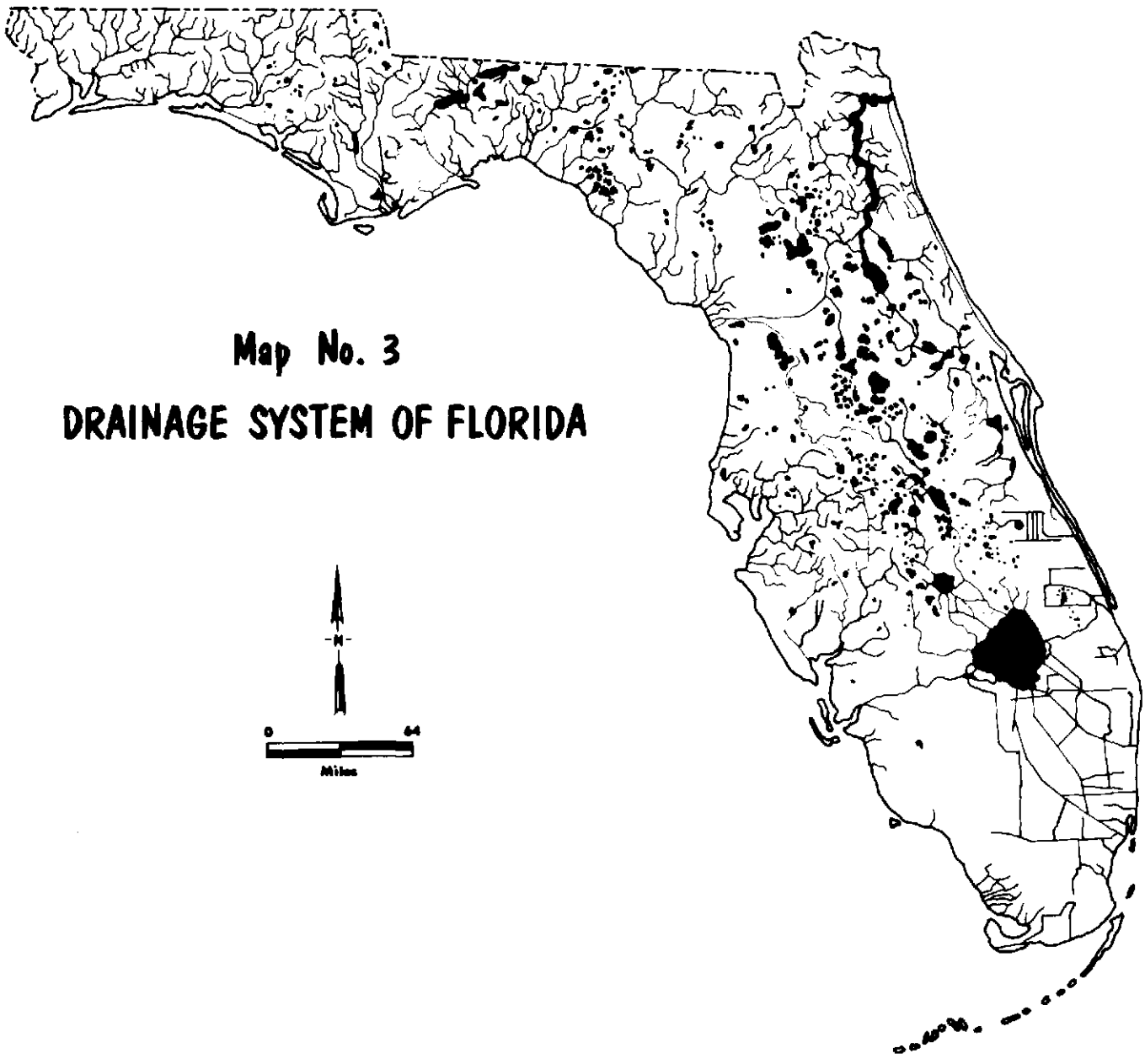
Most of the defined river systems in Florida are in the northern half of the state (see Map No. 3). South Florida, geologically younger as well as flatter than north Florida, has few such defined river systems. Much of its original drainage (prior to development of the present canal system) was through broad, shallow channels, such as the Fakahatchee Strand.

A considerable amount of drainage in Florida goes into and through the underlying limestone rock. This is possible because the soluble limestone dissolves through time to form caverns, cavities, and other solution features. The many solution features plus the natural porosity of all but the oldest Florida limestones enable the limestone layers to hold large quantities of ground water. Such underground water-bearing formations are called aquifers. Aquifers discharge to the surface through seeps and springs, of which there are twenty-two of the first magnitude (a flow of more than one hundred cubic feet of water per second) in Florida, plus numerous smaller ones.

Florida has 1,146 miles of coastline (excluding islands), with state jurisdiction extending out three miles into the Atlantic and nine miles into the Gulf. Between the continental shelf waters and the inland fresh waters are sheltered coastal waters generally referred to as estuaries. Estuaries are among Florida's most biologically productive waters. They are vital to the state's commercial and sports fisheries. One indication of this is the National Marine Fisheries Service's estimate that 85% of the commercial fishery catch in south Florida is dependent on the estuaries there.

Soils

Soil is the product of the interaction of several different factors, including parent material,



Map No. 3

DRAINAGE SYSTEM OF FLORIDA

topography, drainage, time, climate and vegetation.

Florida soils are predominantly sandy, derived from deep marine sands that were transported by currents and wave action and deposited on the Floridan Plateau during ancient inundations by higher seas. Other materials forming Florida soils, either as admixtures to sand or by themselves, are: clay, present in loamy soils of the panhandle and in poorly drained soils throughout the state; marl (a calcareous deposit), found in south Florida, especially near the coast; shell, which sometimes occurs in thick beds in coastal counties; limestone, which outcrops at various locations throughout the state, especially in Collier, Broward, Dade and Monroe Counties; and muck and peat (organic soils), which occur in scattered small locations throughout Florida and over large areas of the Everglades, the Lake Okeechobee floodplain and the upper St. Johns River floodplain.

Most Florida soils are young and are poor in natural productivity. This is somewhat compensated for by the climate, which allows a long growing season. The deep sandy soils of present-day and ancient sand dunes are particularly low in plant nutrients, and tend to be excessively drained as well. In general, topography and soil texture determine drainage; thus upland soils are usually well drained, and lowland soils are poorly drained with seasonally high water tables. Both extremes of drainage characteristics present difficult conditions for plant growth.

Soil is vital to both natural and agricultural systems. It is the site of decomposition of organic materials, a process that returns mineral elements to the soil where they can again be used by plants. The soil is the substrate and the source of water and nutrients for plants, and it is inhabited by great numbers of animals.

Unfortunately, much of this valuable resource is being lost. The productive soils of the panhandle are endangered by erosion. Muck and peat soils, when their water levels are drawn down to allow agriculture, are oxidized by exposure to atmospheric oxygen, resulting in subsidence and eventual loss. These organic soils are also susceptible to destruction by fire.

Flora and Fauna

The flora of an area is a product of the interaction of the soil, water, temperature, light, atmospheric, fire and biotic factors. Rainfall, soil moisture and fire are particularly important in Florida, as may be seen in the separate discussions of environmental systems in Appendix D. Variation within each of the factors produces an infinite number of different environments and different vegetative responses to them. These responses do tend, however, to fall within several recognizable groups, or plant communities, which contain characteristic though variable assemblages of plant species.

The fauna of an area is also dependent on many factors, the most obvious one being vegetation. Each plant community has a characteristic animal community; the combination of the two is termed a biological community. (An ecosystem, or environmental system, is simply a biological community and its non-living environment.) Several communities are named for their more abundant, or dominant, species – usually a plant. The following communities are shown on Map No. 4 and described in Table No. 1 and in Appendix D.

Upland Communities
- coastal strand
- sand pine scrub
- sandhill
- mixed hardwood and pine
- hammock
- tropical hammock
- flatwoods
- dry prairie

Wetland Communities
- scrub cypress
- swamp forest
- cypress swamp
- freshwater marsh and wet prairie
- mangrove swamp
- salt marsh

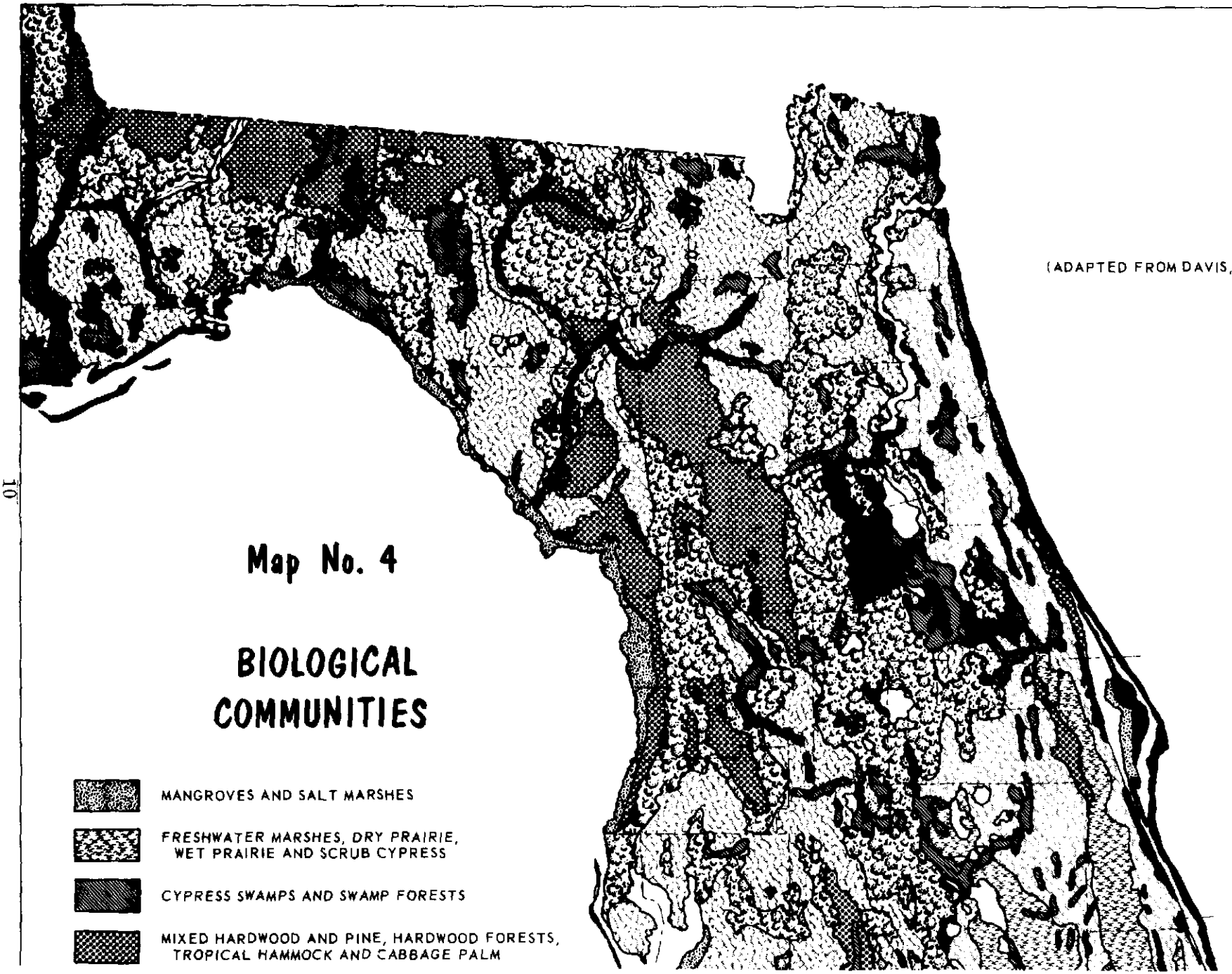
Submerged Land or Aquatic Communities

A few of these communities – sand pine scrub, tropical hammock, scrub cypress and mangrove swamp – are rare or absent in the rest of the

Table 1

BIOLOGICAL COMMUNITIES

COMMUNITY	LOCATION	TYPICAL PLANTS	TYPICAL ANIMALS
coastal strand	sand & shell beaches & dunes along both coasts	sea oats, railroad vine, seagrape, scrub oaks, yucca	beach mice, gulls, terns, shorebirds, sea turtles, crabs
sand pine scrub	relict sand dunes along the coast & inland	sand pine, scrub oaks, saw palmetto, rosemary, lichens	Fla. mouse, scrub jay, blackracer, sand skink
sandhill	older relict dunes, esp. along Fla.'s central ridge	longleaf pine, turkey oak, wiregrass	fox squirrel, towhee, pine snake, gopher tortoise, fence lizard
mixed hardwood and pine	uplands in the Florida panhandle	beech, magnolia, dogwood, loblolly & shortleaf pines	deer, grey squirrel, woodpeckers, barred owl
hammock	uplands in peninsular Fla. also along both coasts	magnolia, laurel oak, live oak, hickories, red bay	as above
tropical hammock	Fla. Keys, Everglades, south Florida coasts	strangler fig, gumbo-limbo, pigeon plum, Jamaica dogwood	Key Largo woodrat, cotton mouse, white-crowned pigeon
flatwoods	flat, poorly-drained areas	longleaf, slash, & pond pines, gallberry, fetterbush	cottontail, cotton rat, red-tailed hawk, great horned owl
dry prairie	low, level areas N. & W. of Lake Okeechobee	saw palmetto, wiregrass, carpet grasses, blueberry	caracara, burrowing owl, sandhill crane
scrub cypress	frequently flooded rock & marl soils of so. Fla.	pond cypress, sawgrass, beakrushes, air plants	raccoon, wood stork, alligator
swamp forest	floodplains & seasonally flooded basins	blackgum, water tupelo, pop ash, red maple, buttonbush	otter, red-shouldered hawk, wood duck, pileated woodpecker
cypress swamp	as above	bald-cypress, pond cypress, willow, wax myrtle, red maple	otter, alligator, snakes, salamanders
freshwater marsh and wet prairie	as above	sawgrass, pickerelweed, cattails, spikerushes, bulrush	Fla. round-tailed muskrat, egrets, everglade kite, waterfowl
mangrove swamp	low energy coastlines in south Florida	red, black, & white mangroves, buttonwood, pickleweed	osprey, pelican, roseate spoonbill, crocodile, crabs
salt marsh	low energy coastlines in north Florida	cordgrasses, black rush, salt grass, sea ox-eye	seaside sparrows, rails, marsh periwinkle, crabs
aquatic or submerged land	fresh waters & inshore salt waters	seagrasses, eelgrass, spatterdock, water lilly,	manatee, waterfowl, turtles, amphibians, fish, invertebrates



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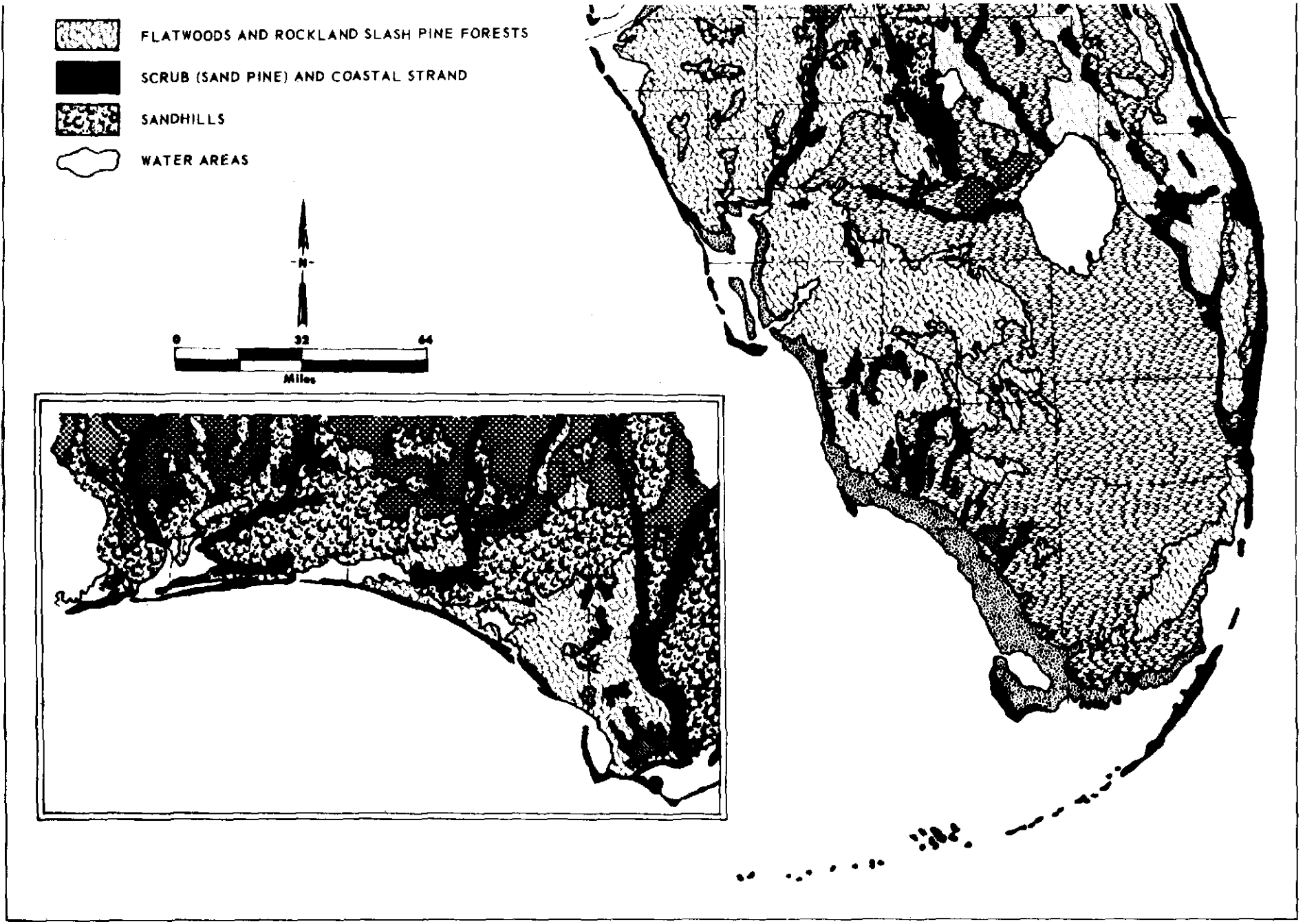

FLATWOODS AND ROCKLAND SLASH PINE FORESTS
SCRUB (SAND PINE) AND COASTAL STRAND
SANDHILLS
WATER AREAS
N
0
32
64
Miles

United States. A number of Florida's plant and animal species are also rare or absent in the rest of the country. Among them are the royal palm, mahogany tree, lignum vitae tree, bonefish, crocodile, short-tailed hawk and Florida mouse.

Florida has a diversity of flora and fauna, owing to the presence of both North American and Caribbean biota. The fossil record indicates that Florida's fauna was even more impressive in the late Pleistocene Age (a geologic period extending from 20,000 years ago back to 200,000 years ago), rivaling in richness that of the big game region of Africa at the beginning of this century. Species present then included lions, sabertooth tigers, mammoths, horses, camels and giant armadillos.

The flora and fauna of Florida are valuable resources, even beyond the direct economic values contributed by commercial fishing, tree harvesting and tourist attraction. Vegetation has the following environmental values: conversion of solar energy into plant growth, utilization of carbon dioxide and production of oxygen, absorption of wastes and maintenance of water quality, providing food and habitat for animals, moderation of climate (including storms), building of soil and prevention of soil erosion, sustaining outdoor recreation, and serving as the object of aesthetic appreciation.

The animal community plays a major role in the workings of Florida ecosystems and functions in many ways to maintain the complexity and stability of the system's interactions. The loss of certain species reduces the numbers and types of interactions and may reduce the ecological value of that system. A well known example of the influence of animals on the ecosystem is the alligator wallow hole, which holds water during dry periods. Other functions performed by the animal community include: redistribution and recycling of nutrients; serving as indicators of the general health of the environment; propogation of vegetation; serving as the object of hunting, fishing, bird-watching and related forms of outdoor recreation; and providing aesthetic experiences.

DESCRIPTION OF FLORIDA'S ENVIRONMENTAL SYSTEMS IN APPENDIX D

Appendix D describes in more detail Florida's environmental systems and hydrology. It is based upon the Florida Game and Fresh Water Fish Commission's "Survey of the Wildlife Values of Florida's Plant Communities", which in turn is based upon the classification of Florida's natural communities developed by John H. Davis.

The description of each system begins with a brief introduction giving the general location or geologic background of that system. This is followed by sections on the plant community and the animal community, which describe the types of organisms found in that system and mention a few of the characteristic species. The section on ecology describes how the system works and tells which factors are most critical to that working (this is important to an understanding of the system's vulnerability). A section on value includes biological, commercial and aesthetic values. The last two sections are on vulnerability and endangerment.

Vulnerability means the susceptibility of a system to degradation caused by man's activities, whether directly on the system or remote. Each system described is assigned an estimate of its vulnerability (high, moderate or low). The estimate is not precise and is intended only as a guide.

Endangerment refers to the potential for actual destruction or degradation of the system by man's activities. This section also begins with a simple estimate (high, moderate or low) of the system's endangerment. This estimate is less precise than the vulnerability estimate simply because of the difficulty of making accurate predictions of man's activities.

Chapter III

PROBLEMS AND REGULATIONS

INTRODUCTION

Detailed information on environmental systems is essential to a plan to conserve and protect environmentally endangered lands, but is, by itself, insufficient guidance. As the name of the Environmentally Endangered Lands Program suggests, it is also necessary to understand how and why and to what degree Florida's environmental systems are endangered. The evaluation of land for acquisition under this program depends on an understanding of environmental value, vulnerability and endangerment. Therefore, this chapter discusses the basic causes of environmental degradation, specific activities endangering natural systems and existing measures for control of those activities.

This discussion is also necessary in order to place the EEL Program in context with other environmental protection programs. By itself the EEL Program can do little for protection of the environment. It is unlikely that the total land area ultimately acquired will account for as much as 1% of the state. It is obvious that most environmental protection must be achieved through regulation rather than through acquisition. Close coordination between acquisition and regulatory programs will enable maximum effectiveness in protection of the environment; therefore, such coordination shall be an objective of the EEL Program.

The acquisition program concerns itself with protection of lands and environmental values that are not adequately protected by existing regulations. Ordinarily, lands subject to strong regulatory power will not be acquired. There are, however, other considerations: one is that strong regulations do not always protect land or water areas they are capable of protecting, i.e. even strong regulations must be applied and enforced in order to be effective. Another is that some regulatory measures have not yet been fully tested – either in practical application or in the courts.

The choice between acquisition or regulation (in situations where regulations are applicable) is really a question of the degree of protection needed to achieve the desired environmental protection purpose. As an example, existing regulatory power is probably capable, if exercised, of protecting most of the environmental values of an estuary; however, it may not always be able to maintain water quality at the very high level required of commercial shellfishing waters. There are also different degrees of protection afforded by public ownership, depending on the kind of land management employed. The most preservation-oriented kinds of public land management are employed by national or state wilderness areas, preserves and parks.

Problems specific, or nearly so, to particular natural systems are discussed in Appendix D. Discussion in this chapter deals with broader, more general problems. Because of the mission of the EEL Program, this discussion of problems centers on those that are attributable to man's activities and, insofar as can be determined, on those that are capable of amelioration through acquisition.

The section on regulations, following the section on problems, is a description of the more significant federal and state environmental protection programs. Local (county, city, etc.) environmental control measures are described only as they relate to or are required by federal or state programs. Local measures are omitted because they are so

varied and numerous, not because they are of little consequence. Indeed, subdivision regulations may offer the best opportunity for reducing adverse environmental impacts. Local land use plans, zoning and building codes also have potential for environmental protection. Add those components of federal and state programs assigned to local governments, and it is apparent that local responsibility for protection of the environment is considerable. Unfortunately, that large responsibility is not matched by an equally large accomplishment.

In Florida, local government's power to exercise land use control and regulation comes from the State. Until passage of Section 163-II, Florida Statutes (F.S.), in 1969, the State had never given all of its cities and counties, by general legislation, the authority to plan and to implement plans by exercising the land use controls of zoning, subdivision regulation and building code authority. Even now, fully one-third of Florida's counties do not exercise any kind of land use control. This is unfortunate, because the State has been moving to strengthen the ability of local government to regulate development. The 1973 Legislature strengthened land sales controls by requiring developers to conform to local subdivision regulations. This legislation is a giant step forward, but its effectiveness depends on local regulations, which are completely lacking in much of the state. A partial answer to the lack of local regulations was provided by the Legislature in 1972 with the passage of the Environmental Land and Water Management Act (Chapter 380, F.S.). This act specifies a procedure for adoption of local development controls in certain areas designated by the Governor and Cabinet (see pages 33-34 for more details).

Most local governments are lagging behind the pace set by recent state and federal legislation, and until they catch up environmental protection will not be as strong as it could be.

ENVIRONMENTAL PROBLEMS

General Problems

An awareness of the problems confronting the environment is essential to the successful operation of the EEL Program; after all, if the environment were not endangered there would be no need to spend 200 million dollars to acquire land. (An environmental problem, as used herein, is a condition or set of conditions that cause or contribute to the degradation and destruction of natural systems.) The intent of the EEL Program is to protect and preserve – through acquisition – land and water areas that are both environmentally significant and endangered. And, as mentioned earlier, the endangerment must be the kind that public acquisition (and reasonable management) can effectively counter. Thus, it is of some importance to inquire into the basic causes of environmental problems, to determine which, if any, could be mitigated by public acquisition.

Causes and effects mingle, exchange roles (an effect may itself be the cause of another effect, and so on), and are generally difficult to sort out in a way that leads back to the more elemental causes. Even if the basic causes are discerned, by their very nature they are difficult, if not impossible, to correct. An acquisition program will not correct them; however, it can help to mitigate their many damaging effects. Also, it is important to be aware of basic causes when formulating plans and programs to counter their effects.

The basic causes of Florida's environmental degradation could be described in many ways and at several levels. This Plan considers two basic causes: (1) insufficient regard by man for the worth and the fragility of natural systems; and (2) the rapid population growth of Florida, which is exacerbated by the general lack of governmental planning and coordination.

Insufficient regard for natural systems is demonstrated by both their misuse – for example, the filling-in of wetlands for residential development – and their under-utilization – if carefully controlled, certain wetlands (note – not those wetlands associated with shellfish-producing waters) could be used to supplement tertiary waste treatment facilities.

Natural systems have acquired some value recently, primarily because of their increasing scarcity – an economic principle applicable to most things. The Federal Government has officially recognized the value of natural systems in the passage of recent legislation, especially the National Environmental Policy Act of 1969, which established environmental protection and restoration as

national policy. Recent Florida legislation (including the Land Conservation Act) has echoed this theme. This increase in perceived value has, however, been consistently out-paced by the speculative rise in Florida real estate prices. The EEL Program can have only a small feedback effect on the attitudes of people towards natural systems, even though, as mentioned, it owes its existence to a change in those attitudes. It certainly can, and will, ameliorate some of the environmentally damaging effects of a long-standing general disregard for natural systems.

Florida has been experiencing a remarkable rate of population increase. The following figures display this fact dramatically:

Year	Population
1820 (earliest census)	34,730
1880	269,493
1940	1,897,414
1960	4,951,560
1970	6,789,443
1975	8,412,200 (estimated)
1982	10,000,000 (estimated)

Also see Appendix B for population figures by counties. In addition to permanent residents, an estimated 25.5 million tourists stayed twenty-four hours or more in Florida in 1973, providing an impact upon natural resources probably equivalent to having one million additional permanent residents. Not only has the population increased, but so has the average inhabitant's energy consumption, water consumption, waste generation and overall effect on the environment. The effective average density in the state is now about 150 persons per square mile. Such a density, coupled with the considerable impact each person has upon the environment, may have serious consequences for the health of the state's natural systems, especially since there is so little effective planning for, and coordination of, the numerous individual actions affecting natural systems. Florida's environment could much more easily tolerate its present and future populations if balanced state and regional comprehensive plans were executed, adopted and implemented.

The Florida State Comprehensive Planning Act of 1972 requires the Division of State Planning (Department of Administration) to prepare a state comprehensive plan for the guidance of the social, economic and physical growth of the state. Recent state and federal legislation has also emphasized the planning component (see section on regulations). The Florida Legislature has even addressed the question of growth itself in their adoption, in 1974, of a Policy on Growth.

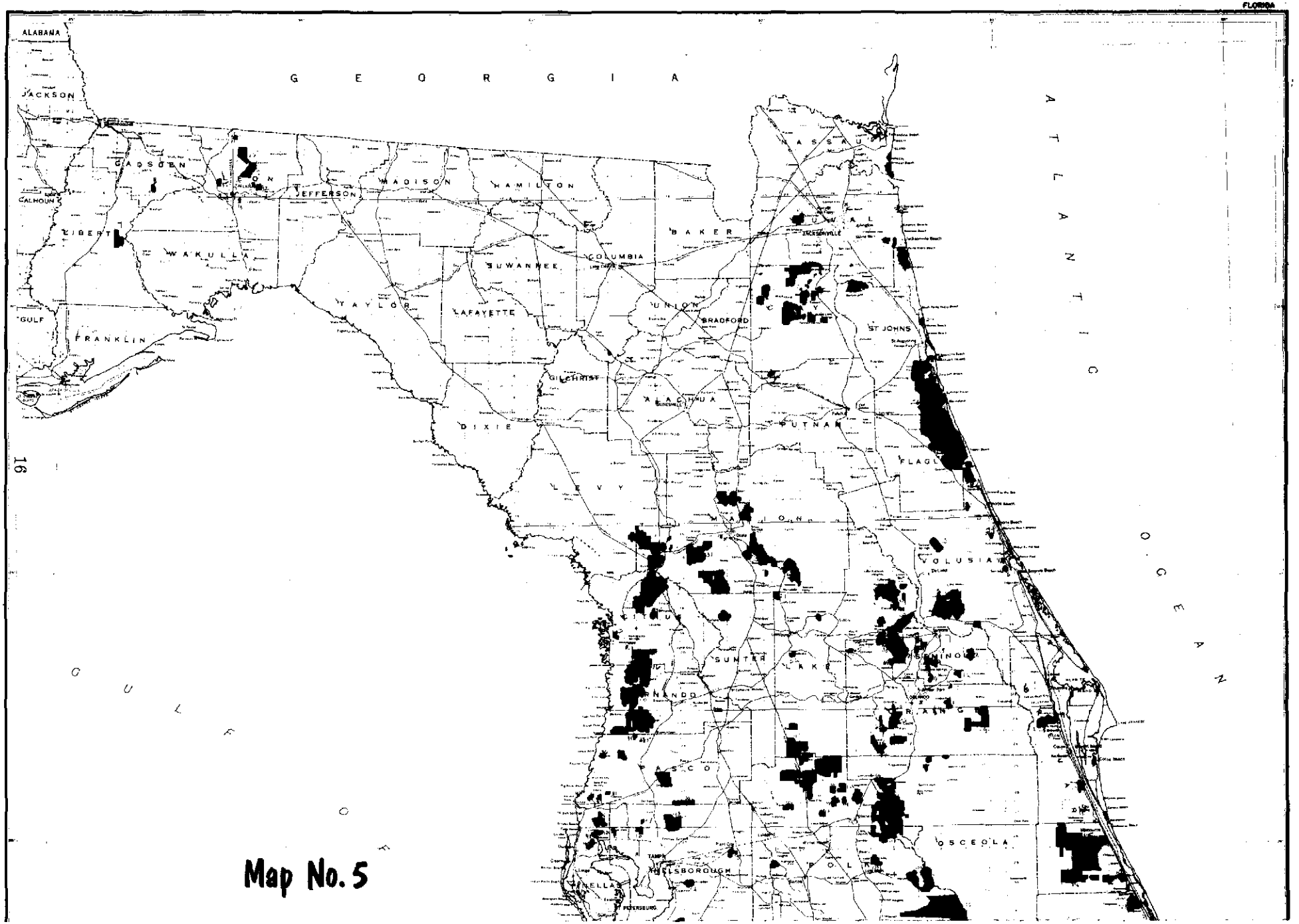
The EEL Program will not, of course, solve the problem of unplanned growth; however, it can counter some of the unwelcome effects of growth. By acquiring vital environmental resources, it will supplement regulatory programs and contribute to the overall effectiveness of state and federal environmental protection efforts.

Specific Problems

What changes have taken place in Florida's natural systems? What, for instance, would a man from the last century notice, if he were somehow transported to present-day Florida? If he were an alert observer, and if he traversed much of the state, he would probably notice the following (leaving aside the changes in technology and culture):

(1) Florida's population is much greater than it was. There are more and larger towns and cities. Numerous large subdivisions, some with roads and canals, but few houses, sprawl across great areas of land. Vast areas are under cultivation for crops or are planted with pine trees. Roads, railroads and power lines are now so widely distributed that nowhere in the state would the transported observer be more than a good day's hike away from at least one of them. With all of this development he would notice a corresponding, if exaggerated, decrease in the extent and health of the state's natural systems. Farms, towns and cities have replaced upland forests on a large scale. Even more surprising to the nineteenth century man, however, would be the replacement of mangrove swamps and other wetlands by cities, subdivisions and other forms of development. He might interpret such building in flood-prone areas and the extensive use of air conditioning as indications of twentieth century man's independence of, and indifference to, nature.

(2) The man from the last century would notice other things about present urban areas. Noise


ALABAMA
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MADISON
HAMILTON
SUWANNEE
COLUMBIA
BAKER
NASSAU
DUVAL
JACKSONVILLE
ST JOHNS
BRADFORD
UNION
TAYLOR
LAFAYETTE
GULF
FRANKLIN
GILCHRIST
ALACHUA
DIXIE
PUTNAM
FLAGLER
LEVY
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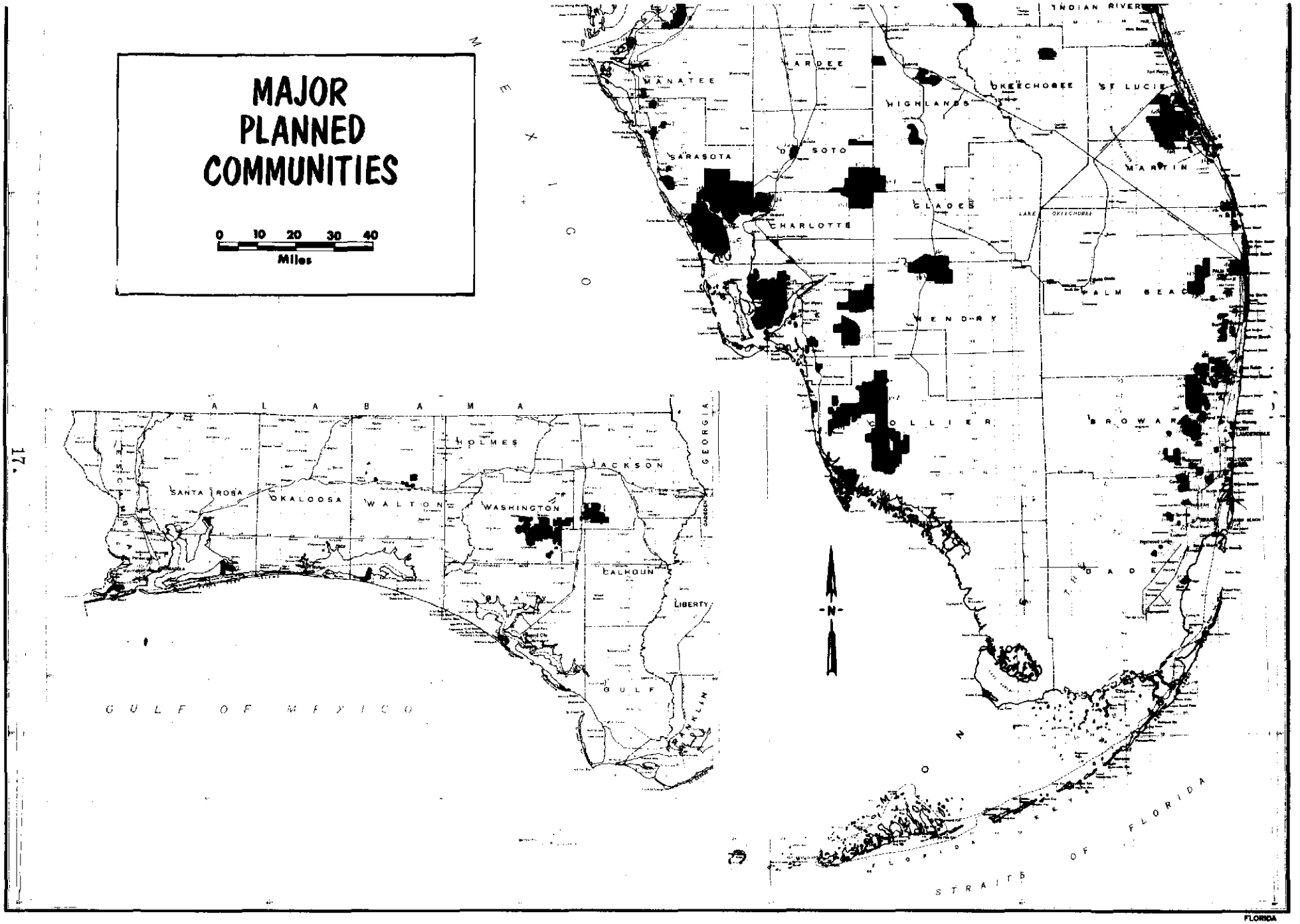
HILLSBOROUGH
PINELLAS
ST PETERSBURG
TAMPA

Map No. 5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GLADES
LAKE OKEECHOBEE
PALM BEACH
HENDRY
COLLIER
BROWARD
DADE
FLORIDA KEYS
STRAITS OF FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
ALABAMA
GEORGIA
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
HOLMES
WASHINGTON
JACKSON
CALHOUN
LIBERTY
GULF
FRANKLIN
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levels are high, and noise itself is widespread. Skies are often hazy, especially above large cities. Water from streams and lakes near urban areas is often unsafe to drink, and, in a few areas, unsafe to swim in. Some lakes and ponds he might have caught fish in are now algae-rich and marshy. Streams draining urban areas fill up quickly after a rain and cause flooding downstream, sometimes in developed floodplains. He might be surprised to learn that parts of Florida now suffer from too little water. Coastal wells that once gave drinking water may now give salty water.

(3) The observer from the last century would certainly notice that Florida's fabled fish and wildlife populations, though still good by comparison with other urbanized states, have declined markedly since his time. If he were a keen observer, he would observe that some species he knew are now either missing or rare, and that there are a number of new plants and animals in the state.

(4) He would notice that beaches, in general, have eroded since his time, and he might observe that other types of shorelines, as well as upland areas, have also eroded appreciably.

Thus, if the hypothetical man were a keen observer, he would probably notice almost all of the environmental problems common to this day. After some reflection, he might understand that the great increase in population had something to do with the changes he observed, but some of the more immediate causes would be harder for him to discern. Cause and effect in the environment is still incompletely known, although environmental sciences have made considerable progress.

Following are more complete discussions of the foregoing problems and their probable causes. This is not a complete description of environmental problems; rather, it is a brief and general overview from the perspective of the EEL Program.

Replacement

Vast areas of the natural environment have been replaced by one or another of man's developments. Development, as used herein, means the carrying out of any building or mining operation or the making of any material change in the use or appearance of any structure or land and the dividing of land into parcels. It includes conversion of land for agricultural purposes. It can refer either to the act of developing or to the result of development.

Residential developments are the most conspicuous usurpers of the natural environment. Florida's high growth rate is reflected in the pace of new development. Until recently, most residential developments took place on the outskirts of existing cities. Now, large developments often take place in areas that are not particularly close to an existing city (see Map No. 5). Some of these are planned new communities, and some are only large, speculative land sales operations that thrive on the interstate land sales market. The former often employ some environmental planning in an effort to be compatible with the natural landscape. Large land sales operations, if they do any land preparation at all, may clear off the vegetation, lay out road grids, and put in drainage canals (often far in advance of any residential construction). Industries, power plants, airports and shopping centers are other large land-consuming developments. Roads, power lines, canals and their right-of-ways also consume large areas of land and displace natural communities.

Other developments are extractive in nature, rather than consumptive; that is, they use the land as a producer rather than as a place, or site. These developments include mines, farms, pine plantations, citrus groves and pastures. Mines extract a non-replenishable resource, and therefore can be considered temporary uses of land, though the period of use may last many years.

The kind of mining done in Florida is typically surface mining, primarily seeking phosphate, but also limestone, peat, sand, gravel, rutile, and other materials. Surface mining necessarily eliminates the overlying natural communities. Since its beginning in Florida in 1888, phosphate mining has consumed 150,000 acres of land. The state and federal governments have encouraged the phosphate companies to begin reclamation programs on their old, non-productive mines; however, it is usually not feasible to restore the land surface to a condition even approximating the original.

Farming, ranching, citrus growing and commercial forestry are usually considered replenishable land uses. It is obvious that farms and citrus groves replace the original natural communities. They occupy large areas; farms account for 14.8 million acres, citrus groves 864,000 acres. At one time, ranching and lumbering operations utilized

but did not replace – at least, not intentionally – natural communities. Today, however, the search for efficiency in cattle raising and tree farming often leads to replacement of natural pasture (dry prairie, flatwoods) by improved pasture and replacement of natural woods by pine plantations. Approximately three million acres have been converted to planted pines since 1930. Almost ten million acres are used for pasture, a growing percentage of which is in improved pasture. Such replacements are, indeed, more efficient at producing milk, beef and paper; unfortunately they are much less efficient at producing the diversity of wildlife associated with the natural community.

The typical site for most development is upland; nevertheless, wetlands and even submerged lands have been drained and filled to provide suitable sites for houses, industries and agricultural operations. Other submerged lands have been dredged to provide fill material. The replacement of wetlands and submerged lands is less common today than it was before the passage of the bulkhead law in 1957 (Section 253.122, F.S.; also see page 25.

Simple replacement is not the only effect development has on natural systems; developments and their attendant roads and power lines break up large, productive natural systems into small, incomplete fragments. Developments may also have serious effects on air quality, water quality and erosion.

Development is inevitable in Florida. It would be foolish to think that the new environmental protection laws or legislative growth policies will prevent further development; they will not. What they may accomplish is the institution of a new accounting system for developments, one that considers the worth of the natural systems existing on and adjacent to the site of a proposed development. Site planning that attempts to preserve environmental values can go far in mitigating the harmful effects of development, as can suitable management of existing developments – wildlife management in pine plantations, for example. See the section on regulations for applicable regulatory programs, particularly pages 33-34.

Pollution

Pollution – whether noise, air or water pollution – is one of the most serious problems confronting natural systems. It is directly related to the construction and operation of developments.

Noise pollution is widespread. It occurs not only in cities, but along roads, railways and air travel routes. It is carried into woods, marshes and bodies of water by recreational vehicles and motorboats.

Air pollution is not a major problem in Florida yet, at least in comparison with other urban states. This is probably because of Florida's flat terrain, prevailing winds and relative scarcity of heavy industry. There was, however, a recent (1973) air pollution alert in Pinellas and Hillsborough Counties. The heavy influx of new residents and their cars and the new fossil fuel power plants that will be built to provide additional energy could send air quality down unless the new pollution control laws and regulations are effectively implemented.

Problems of water quality and quantity pose a more serious endangerment. Florida has an abundance of water, yet some urban areas and natural systems suffer from chronic shortages. For the urban areas the problem is not usually one of insufficient water, but of insufficient drinking-quality water.

Natural systems, too, are degraded by poor-quality water. Many bodies of water in Florida are experiencing an acceleration of the natural process of eutrophication (the process whereby a body of water gradually fills in, suffers a reduction in dissolved oxygen, and eventually becomes a marsh or swamp) primarily because of an increase in the amount of nutrients they receive, especially phosphorous and nitrogen. (Artificial stabilization of a lake's water level also contributes to eutrophication.) Most of the man-added nutrient load enters receiving waters in storm water runoff and in municipal sewage. Municipal sewage has various other contaminants, depending on the level of waste treatment employed. More than 50% of Florida's shellfishing waters have been closed to commercial harvesting because of the presence in those waters of fecal bacteria from municipal waste discharges or from septic tanks located too near the water. Even offshore waters are endangered by pollution, both from outflows of polluted inland water and from ocean outfalls for waste disposal.

Industrial waste discharges, which may contain particulate matter, noxious chemicals, and toxic substances, often degrade water quality in

the receiving bodies. Misapplication of pesticides occasionally has severe consequences for aquatic ecosystems. Urban runoff typically contains levels of inorganic nutrients and certain other pollutants exceeding those encountered in secondary-treated sewage effluent; little wonder that surface waters near urban areas are rarely fit for drinking (except in controlled reservoirs).

Thermal addition is the name given the discharge of hot water from electrical power plants and some industries into receiving waters. It poses a serious potential problem in Florida; however, the Florida Department of Pollution Control has worked with utility companies to control the problem thus far.

Excessive silting and turbidity generated by dredge and fill operations harm aquatic ecosystems by burying coral reefs, other sessile organisms, and spawning areas and by reducing the amount of sunlight reaching underwater vegetation, thus limiting it to shallow waters. Runoff from uplands also contributes to turbidity.

The foregoing account applied to surface waters, but ground water quality is also endangered. The primary endangerment is encroachment by sea water into coastal aquifers. This occurs when there is an insufficient head elevation of fresh water to hold back the heavier sea water. The numerous canals in south Florida aid this encroachment by allowing sea water to move upstream and then seep down into the underlying aquifer. Water management districts are beginning to require salinity control structures in canals to combat such movement.

Drainage wells, which convey excess water and wastes underground, are potential sources of contamination, as are solid waste disposal sites. Harmful substances from such sites could seep down into underlying aquifers.

As may be apparent, problems of water quality are often related to problems of water quantity. The primary quantity problem from man's perspective is that the natural distribution of water and rainfall does not coincide with the place and time of man's needs. For instance, man congregates along the coast, where water supplies are often small and endangered by seawater encroachment. Man's demand for water is not affected, though his supply is, by periods of low rainfall and recharge. Withdrawal of water often exceeds natural recharge. Adding to the problem is the decrease in recharge near urban areas. Impermeable surfaces such as pavement and roofs prevent rainfall from entering the ground, and drainage canals convey runoff to the sea, so that the opportunity for recharge is reduced. To satisfy growing demand for water, urban areas must establish wells in new locations, build reservoirs or tap rivers. Unfortunately, all of this is going on without the benefit of a comprehensive statewide water use plan.

The primary water quantity problem from the standpoint of natural systems is the alteration by man of natural water distribution patterns. For example, drainage canals and channelized streams usually move fresh water to estuaries more rapidly than natural drainage systems, thereby stressing estuarine ecosystems that are adapted to more gradual inflows. Conversely, canals and impoundments sometimes divert fresh water flows, leaving estuaries with insufficient fresh water and too-high salinities. The productivity of an estuary, especially its nursery function, suffers from such drastic alterations of the natural fresh water inflow. Alteration of natural water flows endangers not only estuarine ecosystems, but also downstream river or lake ecosystems, wetlands, and even offshore waters to some extent. The Everglades is frequently in the news for having too little water and too much fire. This happened to some extent even before the settlement of south Florida, but the situation has worsened since that time. Conversely, large areas of wetlands in impoundments and flood detention areas have been stressed by too much water.

Decline of Fish and Wildlife

The abundance of fish and wildlife has undoubtedly declined from what it was in the last century. Several species have been extirpated in Florida, among them the red wolf, plains bison, passenger pigeon and Carolina parakeet. Many species are now listed as rare and endangered, including the bald eagle, brown pelican and Florida panther (numerous plant species are also rare and endangered – the royal palm is a notable example). The primary cause of the decline in numbers and species of animals is the degradation and reduc- of the natural systems that provide suitable habitat. A few natural systems have been drastically reduced, and with them the component plant and animal species.

The major causes of this reduction and degradation have already been listed in the previous sections on replacement and pollution. The following situations also deserve mention:

(1) At least a few species (bald eagle, brown pelican) appear to be endangered by the presence of DDT and related pesticides in the ecosystem

(2) Collectors may be a serious threat to certain species, especially orchids and reef corals

(3) Poaching drastically reduced the state's alligator population before effective laws were passed against the sale of alligator hides

(4) Motorboats operating in shallow waters sometimes damage seagrass beds growing there

(5) Off-road vehicles disturb marshes and other natural systems they travel through

The introduction and subsequent proliferation of several exotic species of plants and animals is having a negative effect on native plants, animals and ecosystems. The successful exotic species out-compete native species and thus affect whole ecosystems. Of course, only a relative few of the thousands of introduced horticultural plants, tropical fish and house pets ever escape the garden, aquarium or cage and proliferate on their own. Most people know that pigs, dogs and domestic cats often run wild in the woods, and some know that the black rat, house mouse, starling and house sparrow are not native species; however, several of the more harmful exotics have received little attention. Three exotic trees – melaleuca, Brazilian pepper and Australian pine – are spreading through south Florida at an alarming rate. These trees replace native plants, but do not provide equivalent food or habitat for wildlife. There are several troublesome exotic plants in the state's fresh waters, too – water hyacinth, hydrilla, Eurasian water milfoil and Brazilian elodea. These plants grow so vigorously that they reduce water circulation and impede navigation and fishing. A few escaped aquarium fish have shown an unfortunate ability to multiply in south Florida waters. The most serious threats to native fish are the blue tilapia, black acara and walking catfish. On land, sixty-four different species of exotic animals have been recorded in south Florida. Generally, these have not been so harmful as the aforementioned, although the Mediterranean fruit fly and a few other alien insects have been serious pests. The monk parakeet and the white-winged parakeet are potential hazards to fruit growers.

Erosion

Beach erosion is a serious problem in Florida, largely because so much development has occurred on and near beaches. Other significant types of erosion in Florida are upland soil erosion and bank or shore (non-beach) erosion.

Soil erosion is usually greatly increased (a little occurs naturally) by removal of plant cover, which typically occurs during development. Even after construction is completed, erosion on the site remains at a much higher rate than before development. Erosion is also increased in an area of active use by off-road vehicles.

Bank erosion is increased by the wave action of boat wakes. Erosion of salt marsh, mangrove and mud or silt shorelines is sometimes increased by boat wakes, but is normally determined by wave action, sea level and sediment supply.

Effectiveness of Acquisition

Of the foregoing problems, the EEL Program of acquisition will generally be most effective against the replacement of natural systems by developments. Pollution, alteration of water flows, erosion and the decline of fish and wildlife are problems that often extend beyond discrete parcels of land and would not ordinarily be solved by acquisition of discrete parcels. However, acquisition coordinated with a regulatory program may be effective against these problems.

Overview of Regulatory Power

As mentioned earlier, regulatory measures will constitute the principal means of achieving environmental protection. Although preservation-minded public ownership is generally the most effective means of environmental protection, it can only protect a small portion of all the land and water in the state.

Review of current state and federal regulatory measures indicates that their potential for environmental protection is considerable – for certain types of land and for certain protection purposes. The effectiveness of these measures is limited by:

(1) insufficient agency personnel to adequately monitor violations, review plans, etc.;

(2) problems with funding, administration and legal questions prevent many programs from achieving full operational status; and

(3) general lack of public awareness and, in some cases, acceptance of new programs.

Regulatory protection is effective, or potentially so, for tidal and navigable waters and the lands beneath them. Lands above mean or ordinary high water have less protection. However, a recent federal court decision (U.S. vs Holland et al.) extended federal authority to supra-tidal lands and to non-navigable waters. Also, the Florida Environmental Land and Water Management Act (Chapter 380, F.S.) applies, selectively, to all land and water in the state. The U.S. Environmental Protection Agency, the Florida Department of Natural Resources, the Florida Department of Pollution Control and the Florida Board of Trustees of the Internal Improvement Trust Fund all have policies favoring protection of wetlands above and below mean high water. And there is some regulatory control over activities on uplands which affect surface or underground water supplies. Generally, though, regulatory power is limited in its ability to restrict the uses made of private property, especially upland property. Local regulations – subdivision open space requirements, tree ordinances, and so forth – appear to have more potential for preservation of environmentally significant upland areas than do most state or federal regulatory measures. New regulatory concepts, such as transfer of development rights, which may provide more environmental protection without infringing on private property rights, are being investigated.

The following descriptions are of the major state and federal environmental laws and the regulatory programs established under them. The listing is by no means comprehensive, but it does contain the most significant environmental protection programs. There is some overlap between the various programs; however, the current trend is toward consolidation both at the state and federal levels. The regulatory programs are grouped in this manner:

(A) programs with general authority over navigable and tidal waters and the lands beneath them –

1) U.S. Army Corps of Engineers regulatory program (pages 23-24)

2) Florida Board of Trustees regulatory program (pages 24-25)

(B) programs aimed at controlling air and water pollution –

1) Federal Water Pollution Control Act (pages 25-27)

2) Clean Air Act (page 27)

3) Florida Air and Water Pollution Control Act (pages 27-29)

(C) programs for management of water supply –

1) Florida Water Resources Act of 1972 (pages 29-30)

(D) programs of environmental policy, planning and management –

1) National Environmental Policy Act (pages 30-32)

2) Coastal Zone Management Act of 1972 (pages 32-33)

3) Florida Environmental Land and Water Management Act of 1972 (pages 33-34)

4) Florida State Comprehensive Planning Act of 1972 (pages 34-35)

(E) programs of beach erosion control –

1) The Beach and Shore Preservation Act (pages 35-36)

(F) programs for protection of flora and fauna –

1) Endangered Species Act of 1973 (page 36)

2) Game and Fresh Water Fish Commission regulatory program (pages 36-37)

(G) programs for protection of cultural resources –

1) Florida Archives and History Act (page 37)

SPECIFIC REGULATORY PROGRAMS

(A-1) U.S. ARMY CORPS OF ENGINEERS REGULATORY PROGRAM

Pertinent Acts

Rivers and Harbors Act of 1899 (33 U.S. Code, Sections 401, 403, 404, 406-417)

Federal Water Pollution Control Act (33 U.S. Code, Section 1141 et seq.)

Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S. Code, Section 1401 et seq.)

Fish and Wildlife Coordination Act of 1958 (16 U.S. Code, Section 661-666c)

Responsible Agency

These laws form the basis of the environmental regulatory program of the U.S. Army Corps of Engineers (Corps). The Corps works with and is assisted by state agencies – the Board of Trustees of the Internal Improvement Trust Fund, the Department of Pollution Control, the Game and Fresh Water Fish Commission and the Department of Natural Resources – and other federal agencies – the Department of the Interior, the Department of Commerce, the Environmental Protection Agency (EPA) and the U.S. Coast Guard.

Area of Jurisdiction

The Corps has regulatory authority over all navigable waters of the U.S., from mean high water to the outer limits of the continental shelf, and over lands below mean high water (in tidal areas) or ordinary high water (in navigable, non-tidal waterways). Navigability of waters is defined by the courts. It has been extended to include waters capable of carrying commerce (1874 court decision), waters historically used to carry commerce even if not now capable (1921 court decision), and waters that could, by reasonable improvements, be made navigable (1940 court decision). Current regulations of the Corps define navigable waters as those that are presently, or have been in the past, or may be in the future susceptible for use for purposes of interstate or foreign commerce. In 1974 a federal court interpreted navigable waters to include all waters of the U.S., for the purposes of the Federal Water Pollution Control Act as amended (FWPCA). This most recent interpretation does not apply to the Rivers and Harbors Act.

Purpose

Section 10 of the Rivers and Harbors Act makes it illegal to fill, excavate, or alter the course, condition, or capacity of waters within the boundaries of navigable waterways without authorization from the Corps. This establishes the permitting program of the Corps for work proposed in navigable waters.

Section 404 of the 1972 FWPCA authorizes the Corps to issue permits, after notice and opportunity for public hearing, for the discharge of dredged or fill material into navigable waters at specified disposal sites. The selection of disposal sites will be in accordance with guidelines developed by EPA in conjunction with the Corps.

The 1972 Marine Protection, Research and Sanctuaries Act is intended in part to protect ocean waters from pollutants dumped by vessels. The Corps regulates, through a permitting program, the deposition of dredge spoil in the oceans. EPA limits or prohibits dumping of other harmful wastes in the oceans.

The Fish and Wildlife Coordination Act, the National Environmental Policy Act and Executive Order no. 11574 require the Corps to consider the effect on fish and wildlife in the issuance of permits for work in navigable waters and to consult with federal and state environmental agencies on permit applications. A recent court decision (Zabel vs Tabb, 1970) upheld the right of the Corps to deny a permit application on the basis of its damaging effect on fish and wildlife.

Program

The Corps regulates, through permitting programs, all work in navigable waters, including construction of pilings, docks and marinas; canal

dredging; disposal of spoil; and transportation of spoil to the ocean or gulf for dumping. Applications for Corps permits are reviewed by appropriate federal, state and local agencies. The Corps presently issues permits only after the proposed work has been certified by the Department of Pollution Control, pursuant to Section 401 of the 1972 FWPCA if applicable. If the project is of sufficient size and impact, an environmental impact statement may be required. In evaluating an application, the Corps considers the effect of the project on fish and wildlife values, water quality and supply, and the environment in general, as well as its effect on navigation, flood damage prevention and economics. An application may be denied if the project would have a damaging effect on the environment.

When notified of unauthorized work, the Corps is to immediately issue a cease-and-desist order before investigating further. They will no longer accept after-the-fact permit applications in tidal areas or in non-tidal areas that have been administratively classed as navigable waters of the United States until a determination has been made on what legal action, if any, will be taken with respect to the unauthorized activity.

(A-2)
FLORIDA BOARD OF TRUSTEES REGULATORY PROGRAM

Pertinent Act

Internal Improvement Trust Fund (Chapter 253, Florida Statutes)

Responsible Agency

The Board of Trustees of the Internal Improvement Trust Fund (Trustees) is the primary administering agency. The Governor and the Cabinet sit as the Board of Trustees. The Department of Natural Resources, the Florida Game and Fresh Water Fish Commission, and the Department of Pollution Control prepare hydrological, biological and other scientific reports for the Trustees staff as needed.

Area of Jurisdiction

The Trustees have jurisdiction over all sovereignty lands and waters and, with certain exceptions as noted in chapter 253, F.S., hold the title to all lands owned by the State.

In 1820 the Territory of Florida passed from Spain to the United States, which became the owner of all of Florida except for such land grants as had been made by Spain to private persons. When Florida became a State in 1845 it acquired sovereignty (ownership) over the lands under tidal and navigable waters (fresh and salt). At the same time, the federal government granted to Florida for public school purposes the sixteenth section in every township of the state, except for those already disposed of. Also, Florida received 500,000 acres of land for purposes of internal improvement. In 1850, through the Federal Swamp Land Grant Act, the State received title to all of its unsold swamp and overflowed lands. This grant amounted to about 20.5 million acres. In all, Florida received title to about 22.5 million acres of its total 34 million acres of land. The remainder is represented by Spanish and U.S. land grants and by federally owned lands in Florida.

The Board of Internal Improvement, later known as the Board of Trustees of the Internal Improvement Trust Fund, was created by the Florida Legislature in 1851 to secure, classify and dispose of public lands. To date, the Trustees have disposed of about 20.5 million acres of the land deeded to them under federal land acts. They have retained most of the sovereignty lands (lands under tidal and navigable waters), though they did sell 475,000 acres of these submerged lands. The Trustees have recently phased out land sales. Any future sales must be in the public interest, and the Trustees are required to consider the extent to which such sales would negatively affect wildlife, fish, shellfish, marine habitats, beaches and shores, and other natural resources.

The Trustees also hold title to any other lands that have accrued to the State, or may hereafter accrue, from any source whatsoever, with certain exceptions as noted in the statute. There exists, however, some uncertainty concerning (1) the location of state ownership boundaries, especially in wetlands, and (2) the navigability (judicial definition) of a number of bodies of water.

Purpose

The Trustees are charged with the acquisition, administration, management, control, supervision, conservation, protection and disposition of all state lands and products on, beneath and above

state lands. They also exercise jurisdiction over navigable and tidal waters.

Program

The Trustees have the power to approve or reject bulkhead lines located by county or municipal governments. The bulkhead line represents the line beyond which no filling to create land will be allowed. Both the location of the bulkhead line by county or municipal government and the review of it by the Trustees are based on, among other things, a consideration of the effect of the line upon the natural systems in the area. The line is now usually set at mean high water; formerly it was often set well out into the water. Bulkhead lines are not set on the open waters of the Atlantic and Gulf, but must be set on all other coastal and inland sovereignty waters before filling below mean or ordinary high water may occur.

Such filling also requires a permit from the Trustees. They have authority over any construction below mean or ordinary high water in navigable or tidal waters. Any person wishing to perform construction work in sovereignty waters must apply to the Trustees for a permit (and to the U.S. Army Corps of Engineers). The approval of the local government is also necessary.

The Trustees issue four kinds of permits:

(1) Dredge and fill permit

(2) State construction permit

(3) Marina license

(4) Artificial fishing reef permit

The first two are of most importance for environmental protection. Applications for dredge and fill or state construction projects must be accompanied by biological reports prepared by the Department of Natural Resources or the Game and Fresh Water Fish Commission, unless the projects are below a certain size. The minimum size is five thousand cubic yards and five thousand dollars in total labor and material cost, unless the project is in an area of environmental significance – generally an area with submerged or intertidal vegetation – in which case the project may not exceed five hundred cubic yards in size. Based on the expected impact of the project on the adjacent ecosystem and on other considerations that relate to the public benefit, the Trustees staff may recommend approval, modification or denial of the application to the Board, which makes the final decision. The Department of Pollution Control and other state environmental agencies act in advisory capacities to the Trustees staff. Recent Board decisions have generally disapproved permit applications that entail a significant adverse effect on aquatic and intertidal ecosystems.

The Board of Trustees, the appropriate local government, or any aggrieved person has the power to enforce the provisions of Chapter 253 by appropriate suit in equity.

A system of State Aquatic Preserves was established in 1969 by Resolution 69-11 of the Board of Trustees. Aquatic Preserves include only lands or water bottoms owned by the State. They are all coastal except for Lake Jackson. The intent of the Resolution was to ensure the perpetual protection, preservation and public enjoyment of certain specific areas of exceptional quality and value by setting them aside forever. Aquatic Preserves receive regulatory protection in accordance with this intent. Because they are considered sanctuaries they may not be disturbed by a federally approved transportation project unless there is no feasible and prudent alternative and unless the project is shaped to minimize harm to the environment (section 4f of the Department of Transportation Act of 1966). Specific legislation prohibits the sale of submerged land in three Preserves (Biscayne Bay, Pinellas County waters and Estero Bay). Of course, present Board practice is to prohibit such sales anywhere. The Trustees staff is currently (1974) preparing a set of rules detailing permitted activities and alterations in Aquatic Preserves.

(B-1)
FEDERAL WATER POLLUTION CONTROL ACT AND AMENDMENTS OF 1972
(Title 33 U.S. Code, Section 1251 et seq.)

Responsible Agency

The U.S. Environmental Protection Agency (EPA) is the primary administering agency. The U.S. Army Corps of Engineers and the U.S. Coast Guard are assisting agencies. The Florida Department of Pollution Control (DPC) administers cer-

tain provisions of the law and will assume administration of others in the near future.

Area of Jurisdiction

Jurisdiction is over navigable waters of the U.S.; however, "navigable waters" is defined broadly as all the waters of the U.S. in a geographic sense. Therefore, this law is not limited to navigable waters as traditionally defined. In a recent decision (U.S. vs Holland et al) the U.S. District Court at Tampa held that provisions of the FWPCA as amended in 1972 applied to non-navigable mosquito canals and to supra-tidal (infrequently flooded) lands.

One section of the new law is particularly important to the State of Florida. Section 404 prohibits the discharge of dredged or fill material into waters of the United States without a permit from the U.S. Army Corps of Engineers. EPA is authorized to prohibit the issuance of such permits when it is determined that the project would have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), and wildlife or recreation areas. Jurisdiction includes all tributaries and all wetlands both above and below mean high water.

Purpose

The law aims to restore and maintain the chemical, physical and biological integrity of the nation's waters. As national goals to achieve this objective, the law calls for eliminating pollutant discharges altogether by 1985 and, whenever attainable in the interim, achieving water quality suitable for protection and propagation of fish, shellfish and wildlife by 1983. The law does not, however, actually mandate attainment of these goals except for categories of non-municipal dischargers for whom attainment is technologically and economically feasible.

Program

In brief, the new law extends federal-state regulation to all waters of the U.S., requires specific effluent standards for individual facilities (point sources) to be implemented through permits, makes mandatory the use of the best available demonstrated technology in new facilities, authorizes stringent federal standards or prohibitions for toxic discharges, strengthens and streamlines federal enforcement procedures, authorizes large fines, permits citizens to bring legal actions to enforce its requirements and strengthens the federal grant program for municipal treatment plants while working toward self-sufficient financing of treatment plants once the current backlog of needs has been met.

A major theme of the new law is a strong role for the federal government. Implementation is to be largely carried out by the states (Florida, in this case), but most of their actions are subject to extensive federal guidelines and backup enforcement authority.

The essence of the EPA strategy in achieving the goals of the legislation is to focus on pollution problems whose solutions will produce the biggest improvement in water quality and for which implementation is feasible now. These problems are usually major point sources such as municipal sewage treatment plants or industrial discharges.

The dominant influence in shaping the new law was the recognition that basing compliance and enforcement efforts on a case-by-case judgment of a particular facility's impact on ambient water quality is both scientifically and administratively difficult. To minimize the difficulties in relating discharges to ambient water quality, the new law requires minimum effluent limitations for each category of discharger, based on technological and economic feasibility, regardless of receiving water requirements; however, if water quality standards of receiving waters cannot be achieved by imposition of standard effluent limitations alone, stricter standards may be imposed.

The basic regulatory requirement is that point source dischargers must obtain a permit specifying allowable amounts and constituents of effluent and a schedule for achieving compliance. Until Florida's permitting program (to be administered by DPC) is approved by EPA, the latter will administer the program, known as the National Pollutant Discharge Elimination System (NPDES). The NPDES and Section 404 of the law supplant regulatory efforts carried out under the Refuse Act of 1899 (Section 13 of the Rivers and Harbors Act of 1899). The FWPCA also sets certain water quality standards for interstate waters according to their use.

The law sets deadlines for achievement of certain levels of waste treatment by major point sources. By 1977, municipal plants must provide secondary treatment and industrial facilities must use the best practicable technology currently available. By 1983, municipal plants must provide the best practicable waste treatment technology and industries must make reasonable further progress toward the goal of eliminating the discharge of pollutants.

EPA must publish a list of toxic pollutants and effluent limitations or prohibitions for them. Spills of toxic pollutants are now subject to the same regulatory framework -- for prevention and federal cleanup costs -- that previously existed only for oil spills.

The law requires Florida to develop a comprehensive and continuing planning process for water quality management. Plans must include not only the point source controls but also controls for diffuse land runoff and other non-point sources. DPC is currently preparing water quality plans for all thirteen major river basins in Florida. The scheduled completion date is 1 July 1975.

Because treatment of municipal wastes is crucial to attaining clean water, a major provision of the FWPCA is an expanded federal grant program to help construct municipal plants. Construction of these plants is presently one of the largest federal public works programs.

EPA has administrative and judicial authority to enforce the law. Point sources of pollutants had until December 1974 to obtain a permit. Private citizens may also seek relief against a polluter for violating an effluent limitation or an administrative order.

(B-2)
CLEAN AIR ACT AND AMENDMENTS OF 1970
(42 U.S. Code, Section 1857 et seq.)

Responsible Agency

EPA is the administering agency. The Florida Department of Pollution Control implements much of the Act.

Area of Jurisdiction

The atmosphere of the United States.

Purpose

In essence, the Act requires achievement of national standards of ambient air quality to protect public health by 1975. EPA must establish national air quality standards as well as national standards for significant new pollution sources and for all facilities emitting hazardous substances. It also establishes a framework for the states to set emission standards for existing sources in order to achieve the national air quality standards. The state implementation plans are subject to federal approval.

Program

The Act specifies major reductions in new car emissions by 1975 and 1976. EPA has set national air quality standards for six major air pollutants, including carbon monoxide and sulfur oxides, and it has established emission standards, based upon best available control technology, for fossil fuel power plants, cement plants and similar sources of pollution. EPA has the power under the Act to require transportation planning for areas so hard hit by automobile pollution that federal emission limits on new motor vehicles and state controls on stationary source emissions are unable, by themselves, to reduce total emissions sufficiently to meet ambient air quality standards.

Portions of the Act are similar to Chapter 403, Florida Statutes, and are implemented by the Department of Pollution Control.

(B-3)
FLORIDA
AIR AND WATER POLLUTION CONTROL ACT
(Chapter 403: Part I, Florida Statutes)

Responsible Agency

The Florida Department of Pollution Control (DPC) is the administering agency. It may utilize the facilities and personnel of other state agencies, including the Division of Health of the Department of Health and Rehabilitative Services, as necessary to carry out the provisions of the Act.

DPC is also the implementing agency at the state level for the FWPCA and for the Federal Clean Air Act.

Area of Jurisdiction

Air and waters of the state. Waters include rivers, streams, lakes, impoundments, springs and all other waters or bodies of water, whether fresh, brackish, saline, tidal, surface or underground. Waters owned entirely by a private person, however, are included only in regard to possible discharge on other land or water.

Purpose

The Act declares it to be public policy of the State of Florida to conserve the waters of the state and to maintain and improve the quality thereof for public water supplies, for the propagation of wildlife, fish, and other aquatic life, and for domestic, agricultural, industrial, recreational and other beneficial uses. Also, it shall be state policy to provide that no wastes be discharged into any waters of the state without first being given the degree of treatment necessary to protect those beneficial uses.

The Act declares it to be the public policy of the State to achieve and maintain such levels of air quality as will protect human health and, to the greatest degree practicable, prevent injury to plant and animal life and property and foster the comfort of the people.

Program

Much of this program is similar to that of the FWPCA or the Federal Clean Air Act; however, the emphasis here is strictly on the duties of the DPC (or lower level agencies). This Act is intended to be consistent with the two federal acts.

DPC has the power and the duty to control and prohibit pollution of air and water in accordance with the Act. In order to carry out the intent of the Act, DPC is authorized to develop long-range plans for air and water quality control, adopt rules and regulations pertaining to pollution control and exercise and enforce those rules and regulations.

DPC has developed a permitting program (not the NPDES of the FWPCA) for discharge of wastes into the waters of the state. Any person intending to discharge treated or untreated waste into waters of the state must apply to DPC for a permit. If DPC finds that the proposed discharge will reduce the quality of the receiving waters below the classification established for them, it will refuse to issue a permit. If otherwise, DPC may issue a permit if the circumstances clearly are in the public interest. Chapter 17-3 of the *Rules of the Department of Pollution Control* states that the policy inherent in these standards shall be to protect water quality existing at the time these water quality standards were adopted or to upgrade water quality within the state. In administering this policy, high quality receiving waters will be protected by requiring, as a part of the initial project design, the best practicable waste treatment available under existing technology. DPC will periodically review Class IV and V (the two lowest water quality classes – see page) waters with the intention of upgrading their classifications when conditions permit. Permits are also required before use of an existing drainage well, or construction of a new one, for the purpose of removing surface waters or waste waters.

Any industrial wastes are to be effectively treated by the best available technology. All discharges from domestic waste treatment plants will achieve at least 90 percent treatment; industrial effluent will be equivalent to the best domestic plant effluent. Advanced waste treatment may be required by DPC, if circumstances warrant it. For instance, sanitary waste must receive advanced waste treatment before it may be discharged into these bodies of water: Old Tampa Bay, Tampa Bay, Hillsborough Bay, Boca Ciega Bay, St. Joseph Sound, Clearwater Bay, Sarasota Bay, Little Sarasota Bay, Roberts Bay, Lemon Bay and Punta Gorda Bay.

DPC has specified (in *Rules*, 17-3) minimum criteria applicable to all waters of the state. The waters are to be free from settleable, floating, deleterious and toxic substances, and there are specified minimum levels for chemicals, turbidity and thermal discharges.

The Department has classified waters of the state according to their usage, as follows:

Class I – public water supplies

Class II – shellfish harvesting

Class III – recreation, propagation and management of fish and wildlife

Class IV – agricultural and industrial water supply

Class V – navigation, utility and industrial use

These classes all have separate standards of water quality that must be maintained. Classes I and II must meet the most stringent standards. Next is Class III, then Class IV, and finally Class V, which has the lowest standards. Class II waters must also be approved by the Division of Health before commercial shellfish harvesting can take place.

Chapter 17-2, *Rules*, establishes ambient air quality standards and emission standards. As with water quality, it is the policy of DPC to protect or upgrade the air quality existing at the time these standards were adopted. This includes non-degradation of areas of superior air quality. Best available technology should be used to reduce air pollution. Both new and existing sources of air pollution must comply with Chapter 17-2. Standards of allowable emission levels are given. Complex sources of air pollution – such as new roads, large shopping centers or other facilities that concentrate a large number of automobiles – must apply to DPC for a permit, provided they exceed a certain size or rate of traffic. Ambient air quality standards are specified. DPC has administrative and judicial authority to enforce provisions of the Act.

Sections 403.501 to 403.515, F.S., are known as the Florida Electrical Power Plant Siting Law. The intent of this law is to ensure:

> that the location and operation of electrical power plants will produce minimal adverse effects on human health, the environment, the ecology of the land and its wildlife, and the ecology of state waters and their aquatic life.

Electrical utilities will submit ten-year site plans to the Division of State Planning, which, after review by concerned environmental agencies, will approve or disapprove the plans. DPC has approval authority and decides whether to approve, modify or deny certification for each individual power plant site and units thereon.

The Division of Health has certain responsibilities relating to those of DPC. It monitors and certifies waters as approved or closed for commercial shellfish harvesting; also, it must approve any water supply system serving more than twenty-five inhabitants.

(C-1)
FLORIDA WATER RESOURCES ACT OF 1972
(Chapter 373, Florida Statutes)

Responsible Agency

The Legislature designated the Department of Natural Resources as the responsible agency with discretion to delegate appropriate powers to five regional water management districts. This delegation should be to the greatest extent practicable.

Area of Jurisdiction

All waters in the state are subject to regulation under this Act unless specifically exempted by general law or special act. "All waters" means any and all water on or beneath the surface of the ground or in the atmosphere, including natural or artificial watercourses, lakes, ponds, diffused surface water, and water percolating, standing, or flowing beneath the surface of the ground, as well as all coastal waters within the state's jurisdiction.

All regulations or orders affecting the waters of the state, except with respect to water quality, that may be enforced by a state or local agency must be filed with the Department.

Purpose

The waters in the state are among its most important resources. The purpose of this Act is to conserve and control such waters in order to realize their full beneficial use. The Act further declares it to be the policy of the Legislature to provide for the management of water and related land resources; to promote the conservation, development and proper utilization of surface and ground water; to prevent damage from floods, soil erosion and excessive drainage; to preserve natural resources, including fish and wildlife; to develop and regulate water management structures as necessary; and to otherwise promote the health, safety and welfare of the people of Florida.

Program

As mentioned, the Act encourages delegation of powers by the Department to regional water management districts. It establishes and delineates the boundaries of five districts, which together encompass all of the state. These five are (see Map

No. 6) the Northwest Florida, the Suwannee River, the St. John's River, the Southwest Florida and the South Florida (presently known as the Central and Southern Florida Flood Control District) Water Management Districts. The last two districts have been operating for a number of years, but the three newly created ones are presently being staffed.

The Department and the districts are required to prepare a state water use plan. Among other things, the plan will consider maximum reasonable-beneficial use of water; economic development of water resources; control of waters for purposes of environmental protection, drainage, flood control and water storage; quantity of water available; prevention of wasteful use; and preservation of water quality. The plan will establish minimum flows for all watercourses of a district, which will be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the district. The plan will also establish minimum water levels, which will be the level of ground water and the level of surface water at which further withdrawals would be significantly harmful to the water resources or natural systems of the district. The plan will give careful consideration to the protection of fish and wildlife, and the Department may restrict future uses on designated bodies of water which may be inconsistent with these objectives. The Department foresees completion of the water use plan by the end of Fiscal Year 1980.

A district may implement any measure necessary to replenish the ground water of that district. These measures may include the purchase of water, exchange of water, injection of water underground and construction of necessary structures.

The Department, or the districts, may implement a program for issuance of permits authorizing consumptive uses of water. If such a program is implemented, no person may make any withdrawal, diversion, impoundment, or consumptive use of water without obtaining a permit, except that no permit is required for domestic consumption of water by individuals.

The Department, or the districts, is required to adopt and administer regulations governing the location, construction, repair and abandonment of water wells. In any area where the Department judges it necessary in order to protect ground water resources, it may require that permission be obtained before the construction, repair or abandonment of any water well.

Except for agricultural operations and other specified exemptions, no person may construct or alter any dam or impoundment designed to divert or impound waters exceeding certain specified areas without first obtaining a permit from the Department or the district. For this and the other permitting programs of the Act, the Department and the districts have enforcement powers that include criminal prosecution and civil injunctive relief.

The districts may acquire real property as needed for flood control, water storage, other water management, and preservation of wetlands, streams and lakes. Eminent domain may be used to acquire real property for flood control and water storage.

The Department is authorized by the Act to carry out necessary studies of water resources, including the identification of those areas of the state where sea water intrusion endangers ground water supplies. A salt water barrier line is to be established, including the construction of works to prevent sea water intrusion in coastal streams.

To summarize: the Act establishes five regional water management districts under the Department of Natural Resources; it requires preparation of a state water use plan that takes environmental protection into consideration; and it authorizes permitting programs to regulate water use, so that the general purposes of the Act may be carried out. Enactment of the Water Resources Act has been slowed by insufficient funding and by the time necessary to establish the authorized plans and procedures. Also, certain problems are caused by the separation of water quantity management (Department of Natural Resources) from water quality management (Department of Pollution Control).

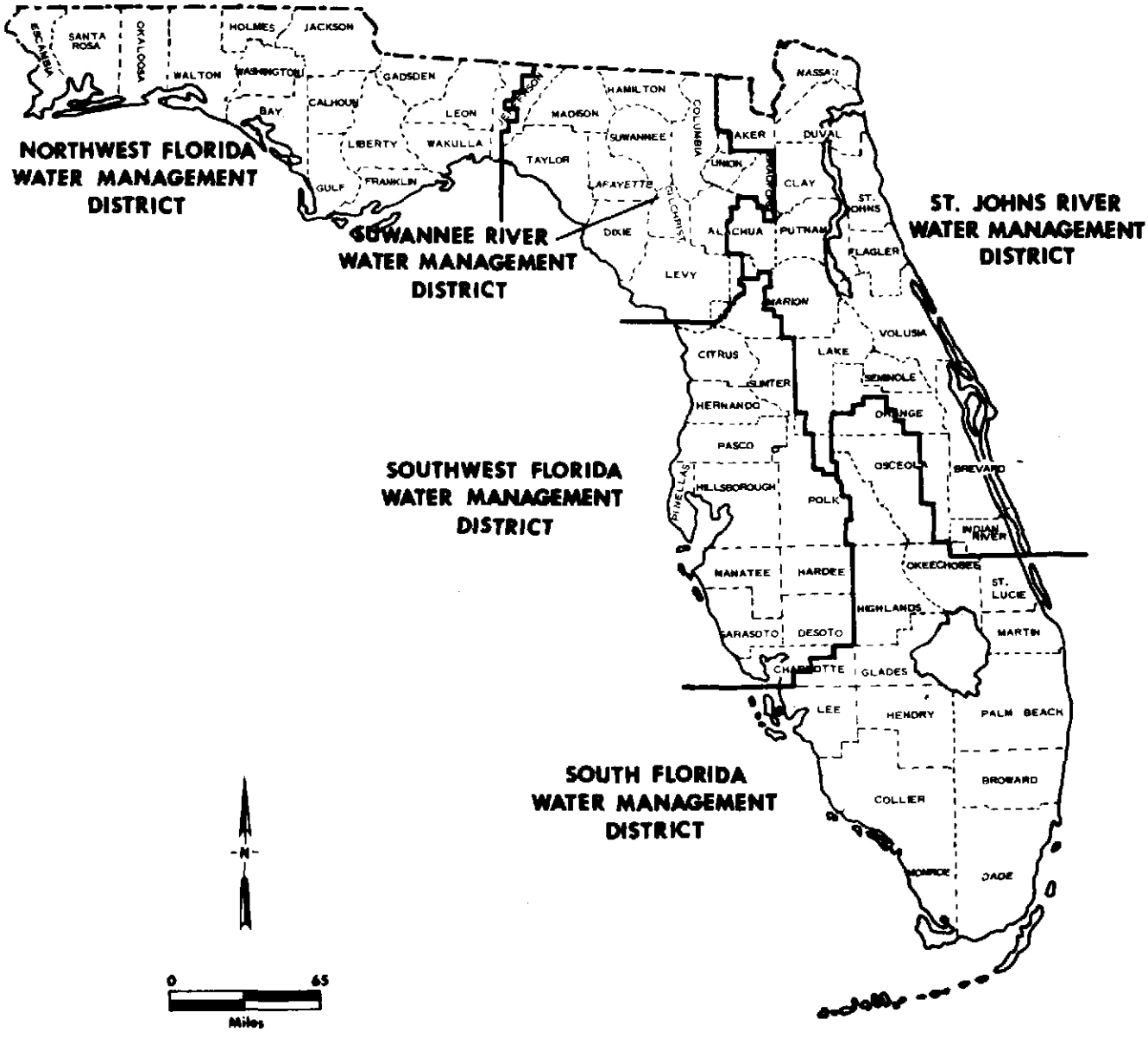
(D-1)
NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
(42 U.S. Code, Sections 4332, 4344)

Responsible Agency

The U.S. Environmental Protection Agency is the lead agency, but many federal, state and local agencies are involved with the operation of NEPA. State, regional and area-wide clearinghouses, composed of various agencies with environmental responsibilities, participate in NEPA-directed reviews of proposed actions. Florida has fifteen of these clearinghouses.

Map No. 6

WATER MANAGEMENT DISTRICTS



Source: Division of Interior Resources, Department of Natural Resources.

Area of Jurisdiction

All federally assisted programs that would significantly affect the quality of the human environment are subject to the provisions of NEPA.

Purpose

NEPA establishes environmental protection and restoration as a national policy and goal. It requires federal agencies to interpret their traditional mandates in the light of this policy, and it establishes an action-forcing mechanism under which federal agencies must prepare and circulate for comment analyses of the environmental impacts of their actions. It also encourages coordination and cooperation between federal, state and local government agencies.

Program

The Council on Environmental Quality, created by NEPA, has promulgated a new set of guidelines for environmental impact statements. Environmental considerations are now to be taken into account from the beginning of the decision-making process, and draft impact statements are to be prepared and circulated as early as possible. Federal agencies must evaluate the findings of their impact statements, together with economic and other considerations, and use all practical means to minimize undesirable environmental consequences. The new guidelines explicitly require agencies to discuss the secondary environmental impacts of their actions, particularly on population concentration and growth.

State, regional and metropolitan area government agencies review federal impact statements through the clearinghouse process. Before taking any action the project agency must consider all of the comments made during review of its impact statement.

(D-2)
COASTAL ZONE MANAGEMENT ACT OF OF 1972
(Title 16 U.S. Code, Sections 1451 et seq.)

Responsible Agency

The National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce is the designated federal agency. The Florida Coastal Coordinating Council (FCCC) is responsible for developing the State's coastal zone management plan. The Division of State Planning, Department of Administration, is responsible for implementing the management plan.

Jurisdiction

The coastal zone of the state, as defined in the FCCC's *Florida Coastal Zone Management Atlas*, is the jurisdictional area.

Purpose

The purpose of the Act is to encourage the states to undertake comprehensive planning and management in the coastal zone.

Program

The federal government provides matching grants to the states for development of coastal zone management programs. The states are also eligible for matching grants for administering their management programs, provided the programs meet criteria established by NOAA. In general terms, the management program should include:

(1) the boundaries of the state's coastal zone;

(2) a process pursuant to which permissible land and water uses that have a significant impact on coastal waters are defined;

(3) criteria for and designation of geographic areas in the coastal zone of special concern to the State;

(4) identification of the means by which the State shall exert control over land and water use in its coastal zone;

(5) designation of priority uses within specific geographic areas in the coastal zone; and

(6) description of the organizational structure proposed to implement the management program.

Once the state management program is approved, all federal and state projects affecting the coastal zone must be consistent, to the maximum extent feasible, with the state program.

Florida applied to NOAA and received a grant to assist in developing a coastal zone management program. The FCCC, in cooperation with the Division of State Planning and the regional planning councils, is currently preparing the state program (completion date is 1977).

One part of the Act establishes an estuarine sanctuaries program. This program provides grants to the states on a matching basis for acquisition, development and operation of estuarine sanctuaries for purposes of research and education.

A somewhat similar program was established by the Marine Protection, Research, and Sanctuaries Act of 1972 (Title 33 U.S.C., Section 1401 et seq.). It, however, is a regulatory program rather than one of acquisition. Also, marine sanctuaries have a broader purpose and may be established in order to preserve or restore estuaries for their ecological, recreational or aesthetic values. Once a marine sanctuary is designated, activities requiring a permit, license or other authorization will be allowed there only after the Secretary of Commerce has certified that the activity is consistent with the purposes for which the sanctuary was established.

(D-3)
FLORIDA ENVIRONMENTAL LAND AND WATER MANAGEMENT ACT OF 1972
(Chapter 380, Florida Statutes)

Responsible Agency

The Division of State Planning in the Florida Department of Administration is the agency responsible for implementing Chapter 380. The Governor and Cabinet, acting as the Administration Commission or as the Florida Land and Water Adjudicatory Commission, are responsible for designation of Areas of Critical State Concern (ACSCs), for most rule making, and for administrative appeals under the Act. The Act also bestows some powers and responsibilities upon regional planning agencies and local governments. Regional planning agencies, in conjunction with the development-permitting authority of local governments, are required to review certain large-scale developments qualifying as Developments of Regional Impact (DRIs).

Area of Jurisdiction

The Act is applicable anywhere in the state, subject to several restrictions, including the following:

(1) An ACSC may be designated only for: (a) an area containing or having a significant impact upon environmental, historical or archaeological resources of regional or statewide importance; (b) an area significantly affected by, or having a significant effect upon, an existing or proposed major public facility or other area of major public investment; (c) a proposed area of major development potential, which may include the proposed site of a new community, designated in a state land development plan.

(2) The Administration Commission may not designate a land area to be an ACSC if such action would subject more than 5% of the land of the state to supervision under the Act. The Big Cypress ACSC was specifically exempted from this provision by the Big Cypress Conservation Act of 1973 (Section 380.055, F.S.).

(3) Review of DRIs is based on a list of guidelines and standards adopted by the Administration Commission and approved by the Florida Legislature, in which twelve specific types of development to be reviewed are defined.

(4) For the purposes of the Act, certain activities, such as agriculture, are not considered to be development and therefore are exempt from its provisions.

Purpose

In order to protect the natural resources and environment of the state it is necessary to adequately plan for and guide growth and development within the state. To accomplish this, it is necessary that state government establish land and water management policies to guide and coordinate local decisions relating to growth and development, and that such state policies should so far as possible be implemented by local governments through existing processes for the guidance of growth and development.

Program

The Act establishes the ACSC program and the DRI evaluation process. Operational status for the ACSC program was dependent upon passage of the $240 million bond issue for the EEL program – an indication that the two programs were intended to complement each other.

The Division of State Planning recommends specific land or water areas to the Administration Commission for designation as ACSCs. The Division must specify the boundary of the proposed ACSC, give reasons favoring ACSC designation and recommend specific principles for guiding the development of the area. If the Commission does designate the area as an ACSC and adopts the principles for guiding development, then the local government having jurisdiction in the area may either submit to the Division its existing land development regulations or adopt and submit new regulations within six months of the date of designation. If the local regulations are in accordance with the development principles adopted by the Commission, the Division will by rule approve them. If they are not in accordance, the Division will prepare and recommend its own ACSC regulations to the Commission. However the regulations are prepared and adopted, they are administered by the local government, with the Division having power of review. Thenceforward, all development (as defined in the Act) in the ACSC will be subject to the adopted regulations.

A DRI is generally defined as any development that, because of its character, magnitude or location, would have a substantial effect upon the health, safety or welfare of citizens of more than one county. The Rules of the Department of Administration contain a more detailed definition of DRIs. The developer initially submits a DRI application to the local government having jurisdiction, to the appropriate regional planning agency and to the Division. After completion of a statutory preapplication process, the local government sets a public hearing on the DRI. The regional planning agency then must submit a report to the local government on the regional impact of the proposed development. In preparing the report the agency must consider the impact of the development on the region's environment, natural resources, economy, public facilities, public transportation, housing, etc. In considering whether the development should be approved, denied or approved with conditions, the local government is to consider whether and to what extent:

(1) the development unreasonably interferes with the achievement of the objectives of an adopted state land development plan applicable to the area;

(2) the development is consistent with local land development regulations; and

(3) the development is consistent with the report and recommendations of the regional planning agency.

If the development is in an ACSC, it must comply with land development regulations adopted through that process.

Appeals by the State, the regional planning council or the developer – of development orders adopted pursuant to Chapter 380 – are reviewed by the Florida Land and Water Adjudicatory Commission.

(D-4)
FLORIDA
STATE COMPREHENSIVE PLANNING ACT OF 1972
(Chapter 23, Florida Statutes)

Responsible Agency

The Division of State Planning is to prepare and revise as necessary the state comprehensive plan. It will consider the plans and studies of federal, state, regional and local agencies.

Area of Jurisdiction

State of Florida.

Purpose

The state comprehensive plan will, when completed, provide long-range guidance for the orderly social, economic and physical growth of the state by setting forth goals, objectives and policies.

Program

The Division will:

(1) prepare and revise as necessary the state comprehensive plan;

(2) assist in preparation of the annual executive budget and legislative program of the Governor;

(3) coordinate planning among federal, state and local levels of government;

(4) coordinate all state agency planning activities, including economy, social welfare, agriculture, industrial development, water resources, pollution, fish and wildlife, etc.;

(5) prepare interim plans or studies necessary or useful in the preparation or revision of the state comprehensive plan;

(6) serve as the state planning and development clearinghouse and designate regional and area-wide clearinghouses;

(7) make basic demographic, geographic and economic data and projections available to all agencies concerned with development within the state; and

(8) prepare an annual development program that will present – by functional area of governmental operation – the agencies involved, the types of services provided, the existing service needs and problems in priority order, and the defined strategies for meeting those needs and problems.

(E-1)
THE BEACH AND SHORE PRESERVATION ACT
(Chapter 161, Florida Statutes)

Responsible Agency

The Florida Department of Natural Resources is the implementing agency.

Area of Jurisdiction

The Act applies to tidal shorelines of the state. The section of the Act empowering the establishment of coastal construction setback lines applies only to sand and shell beaches fronting the Atlantic Ocean and the Gulf of Mexico.

Purpose

Since beach erosion is a serious menace to the economy and general welfare of the people of this state, it is in the public interest to provide for beach nourishment and erosion control programs, to regulate coastal construction, and to establish setback lines along beaches, seaward of which construction may not occur without special authorization.

Program

The Department requires that a permit be obtained prior to commencement of work on any coastal construction or reconstruction undertaken upon sovereignty lands of the State of Florida (below the mean high water line of any body of tidal water within the limits of the State of Florida). Coastal construction or reconstruction is defined as any work or activity that is likely to have a material physical effect on existing coastal conditions or natural shore processes. All construction and physical activity undertaken specifically for shore protection purposes must have a permit, as must all other structures and physical activity that by their nature and design might have similar effects. Such structures and physical activity include groins, jetties, moles, breakwaters, sea walls, revetments, causeways and artificial nourishment or other deposition or removal of beach material. Docks and similar structures are also included if of a solid or highly impermeable design.

The Act also requires the Department to establish coastal construction setback lines in all coastal counties, based upon natural processes. These lines, seaward of which no construction may be attempted (without a variance from the Department), are usually set no closer to the sea than the midpoint of the first dune or dune ridge. The State is currently adopting setback lines in all coastal counties. Until a setback line is set in a county, all new construction must be no closer to the sea than fifty feet landward of the beginning of the natural and continuous zone of vegetation that spreads inland. The Department may grant variances of the setback line. Objecting owners are granted a review of the setback line upon written request to the Department. In turn, the decision of the Department is subject to judicial review. Violations of the setback line are classified as a public nui-

sance and will be removed at the expense of the owner.

The Department is also charged with coordinating beach restoration and erosion control projects throughout the state.

(F-1)
THE ENDANGERED SPECIES ACT OF 1973
(Title 16 U.S. Code, Section 668aa-668cc-6)

Responsible Agency

The primary implementing agency is the U.S. Fish and Wildlife Service of the Department of the Interior. The U.S. Departments of Commerce and Agriculture have certain responsibilities under the Act. The U.S. Coast Guard helps in the enforcement of the Act.

Area of Jurisdiction

Endangered or threatened species of animals and plants of the United States are covered by the provisions of this Act.

Purpose

The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered or threatened species, and to take the appropriate steps to achieve the purposes of specified international treaties and conventions.

Program

The Department of the Interior, on the basis of the best scientific and commercial data available, prepares and publishes a list of endangered or threatened species. An endangered species is defined as any species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as any species that is likely to become an endangered species within the foreseeable future.

The Act requires the Department to establish and implement a program to conserve endangered or threatened species of animals and plants. The Act recognizes the necessity of preserving the habitat of an endangered or threatened species in order to preserve the species; consequently, it authorizes the Department to acquire land for that purpose. Funds for such acquisition must come from the Land and Water Conservation Fund, since there is no special program funding. Prior to acquisition of land the Service must develop a recovery program for the particular endangered or threatened species.

The Department may enter into cooperative agreements with states, other federal agencies and (through the President) foreign countries in order to carry out the provisions of the Act.

The Act makes it unlawful for any person subject to the jurisdiction of the United States to:

(1) import any endangered animal or plant species into, or export any such species from, the United States;

(2) take any such species within the United States or its territorial waters; and

(3) possess, sell, deliver, carry, transport or ship any such species.

The Department may grant certain exemptions, as for species held in captivity for purposes not contrary to this Act.

Violators of the provisions of this Act are subject to civil penalties and criminal prosecution. Citizens may commence civil suits to enjoin violations of provisions of the Act or to compel application of provisions of the Act.

(F-2)
FLORIDA GAME AND FRESH WATER FISH COMMISSION REGULATORY PROGRAM

Pertinent Acts

Florida Constitution, Article IV, Section 9

Game and Fresh Water Fish Statute (Chapter 372, Florida Statutes)

Responsible Agency

The Florida Game and Fresh Water Fish Commission is the primary implementing agency. The Department of Natural Resources is responsible for Section 372.925, F.S.

Area of Jurisdiction

Wild animal life and freshwater aquatic life of the state are under the jurisdiction of the Commission.

Purpose

The Commission exercises the non-judicial powers of the State in protecting and conserving wildlife and freshwater aquatic life.

Program

The Commission protects native wildlife and freshwater aquatic life of the state. Among the measures it employs are the following:

(1) Protection of game animals and game fish through licensing, closed seasons and certain other restrictions;

(2) Prohibition of molesting, taking and sale of protected non-game species;

(3) Control, through permitting requirements, of the importation and release of exotic freshwater fish and land animals; and

(4) Prohibition of any person or firm from causing the entry of deleterious substances into the fresh running waters of the state in quantities sufficient to injure or kill fish in such waters.

Also, the Commission cooperates with the Department of Natural Resources in carrying out control programs aimed at noxious aquatic weeds. The Commission has authority to enforce, by criminal prosecution, all laws and regulations relating to wildlife and freshwater aquatic life.

Also applying to plants is Section 865.06, F.S., which makes it unlawful for any person to willfully pick, pull up, injure or destroy certain species of trees, shrubs, vines, flowers, ferns and mosses growing upon private or public land without first obtaining permission from the landowner or the superintendent of the public land. No specific agency is named to administer this section.

It is obvious from a reading of this chapter that several regulatory programs are concerned with management of the state's natural resources. The overlapping authorities and responsibilities of the agencies involved detract from optimum management.

(G-1)
FLORIDA ARCHIVES AND HISTORY ACT
(Chapter 267, Florida Statutes)

Responsible Agency

The Division of Archives, History and Records Management of the Florida Department of State is the responsible agency.

Area of Jurisdiction

The Division has title to all treasure trove, artifacts and such objects having intrinsic historical or archaeological value which have been abandoned on State-owned lands. The Division also has jurisdiction over designated state archaeological landmarks and landmark zones.

Purpose

The Act declares it to be state policy to protect and preserve historical sites and properties, buildings, artifacts, treasure trove and objects of antiquity that have scientific or historical value or are of interest to the public.

Program

Among other tasks, the Division is responsible for locating, acquiring and preserving historic sites and properties etc. It is also responsible for, and has developed, a statewide historic preservation plan. The Division may, with the consent of the landowner, designate a significant archaeological site or group of sites as a "state archaeological landmark" or "state archaeological landmark zone." Once an area is so designated, no person may conduct field investigations there without first obtaining permission from the Division.

Chapter IV

GUIDELINES FOR THE PRESERVATION OF ENVIRONMENTALLY ENDANGERED LANDS

INTRODUCTION

This chapter discusses policy directives for the EEL Program, and from these develops criteria and guidelines to assist decision-making bodies in the acquisition of environmentally endangered lands. The criteria and guidelines ultimately presented in this Plan shall be used to evaluate the many endangered land proposals submitted to the Department of Natural Resources by agencies, organizations and individuals. They shall also be used to actively seek out desirable acquisition areas. Secondary uses will be to assist and inform governmental agencies, elected officials, organizations and interested individuals about the Environmentally Endangered Lands Program.

POLICY BACKGROUND

In recent years a great concern with the quality of Florida's natural environment has developed among citizens of the state and their elected officials. This concern has ultimately been recognized through various legislative actions:

(1) Article II, Section 7 of the Florida Constitution

(2) Amendments to the Internal Improvement Trust Fund Statute (Chapter 253, F.S.)

(3) The Florida Air and Water Pollution Control Act (Chapter 403, F.S.)

(4) The Florida Archives and History Act (Chapter 267, F.S.)

(5) An Act Creating the Coastal Coordinating Council (Section 370.0211, F.S.)

(6) The Florida Water Resources Act of 1972 (Chapter 373, F.S.)

(7) The Florida State Comprehensive Planning Act of 1972 (Chapter 23, F.S.)

(8) The Florida Environmental Land and Water Management Act of 1972 (Chapter 380, F.S.)

(9) The Land Conservation Act of 1972 (Chapter 259, F.S.)

(10) The Concurrent Resolution Adopting a Policy on Growth for the State of Florida, adopted by the Florida House and Senate (1974)

The most fundamental policy guidance for all state programs concerned with the natural environment is contained in Article II, Section 7 of the Florida Constitution, which states:

> It shall be the policy of the state to conserve and protect its natural resources and scenic beauty. Adequate provision shall be made by law for the abatement of air and water pollution and of excessive and unnecessary noise.

Prior to the adoption in 1968 of the revised Florida Constitution, the Florida Legislature had expressed concern for the natural environment in the passage of the 1957 amendments to Chapter 253, F.S. (the Internal Improvement Trust Fund), which provide for the setting of a bulkhead line by counties and cities, with approval power reserved to the Board of Trustees. Other amendments to Chapter 253, F.S., require that a biological survey

be conducted in an area before the Board of Trustees shall permit any dredging or filling there, and provide that such dredging or filling shall not be permitted if it would cause sufficient destruction of natural systems as to harm the public interest.

The Florida Air and Water Pollution Control Act (Chapter 403, F.S.), passed in 1967, recognizes the problem of pollution and makes direct statements of legislative policy toward the natural environment. The Act declares that pollution of air and water is a menace to public health and welfare and is harmful to wildlife, fish and other aquatic life. The Act also declares it to be the public policy of the State to maintain and improve levels of air and water quality so as to protect human health and well-being and to preserve plant and animal life and propagation.

The Florida Archives and History Act (Chapter 267, F.S.), passed in 1967, makes it state policy to:

> . . . protect and preserve historic sites and properties, buildings, artifacts, treasure trove, and objects of antiquity which have scientific or historical value or are of interest to the public . . .

The Act creating the Coastal Coordinating Council (Section 370.0211, F.S.), passed in 1970, clearly states that the environmental aspects of Florida's coastal areas have attracted large numbers of permanent residents and tourists, and that this same concentration of people and their requirements have had a serious impact on the natural surroundings and have even become a threat to the health and general welfare of the citizens of the state.

The Florida Water Resources Act of 1972 (Chapter 373, F.S.) declares that the waters of the state are among its basic resources and that heretofore they have not been conserved or controlled so as to realize their full beneficial use. Further, it is the policy of the Legislature to provide for the management of land and water resources and to preserve natural resources, fish and wildlife.

The Florida State Comprehensive Planning Act of 1972 (Chapter 23, F.S.) requires the preparation of a state comprehensive plan to provide long-range guidance for the orderly social, economic and physical growth of the state by setting forth goals, objectives and policies. The state comprehensive plan will consider the plans of other state agencies. Thus, the EEL Plan should be considered and incorporated as a component of the state comprehensive plan.

The Florida Environmental Land and Water Management Act of 1972 recognizes that in order to protect the natural resources and environment of the state it is essential to adequately plan for and guide growth and development within the state. To accomplish this, the State will establish land and water management policies to guide and coordinate local decisions relating to growth and development, and that such state policies should so far as possible be implemented by local governments through existing processes for the guidance of growth and development. Further discussion of the relevance of this Act to the EEL Program is on pages —

In 1974, the Legislature passed a concurrent resolution adopting a policy on growth for the State of Florida. In it, the Legislature recognizes that growth is the most compelling force shaping quality of life for Florida's citizens and that there is a need for a state policy on growth. The Legislature therefore resolves that it is the policy of the State that government shall help its citizens maintain and enrich the quality of life in Florida. In this pursuit it shall seek to provide a good physical and moral environment for all its citizens. The resolution specifically states that Florida's natural heritage shall be preserved. In line with that directive, the State shall develop a coordinated, statewide plan for the quality, supply and use of water; it shall implement a land management program that will maintain the integrity of Florida's wetlands; and it shall be responsible for acquiring environmentally endangered lands.

Taken together, the foregoing legislative expressions demonstrate a clear intent by the people of Florida and their elected representatives to achieve a quality environment.

The Land Conservation Act is only one of a number of programs and policies to improve environmental quality in Florida. It focuses upon the acquisition of sufficient interest in land to preserve valuable and irreplaceable natural resources.

Basic policy guidance for implementation of the EEL Program and formulation of the EEL Plan comes from five principal sources:

(1) The Land Conservation Act of 1972 (Chapter 259, F.S.)

(2) The Preliminary Policy Statement adopted by the Governor and Cabinet on 6 September 1972.

(3) Interim Guidelines for Implementing Florida's Environmentally Endangered Lands Program (adopted by the Governor and Cabinet on 5 June 1973)

(4) The Big Cypress Conservation Act of 1973 (Section 380.055, F.S.)

(5) The 5 June 1973 Resolution of the Governor and Cabinet relating to the Green Swamp and other vital freshwater recharge areas of the state

THE LAND CONSERVATION ACT OF 1972

The Act clearly states that its intent is to conserve and protect

> . . . environmentally unique and irreplaceable lands as valued ecological resources of this state . . .

The Act also:

(1) suggests that emphasis be given the ecological significance of land areas and their related water resources;

(2) cites the importance of submerged lands, inland and coastal waters, marshes, and wilderness areas;

(3) recognizes that the direct or indirect source of endangerment to lands is that which results primarily from development activities; and

(4) charges the Executive Board of the Department of Natural Resources with the responsibility for preparation and continued maintenence of a comprehensive plan to conserve and protect environmentally endangered lands.

PRELIMINARY POLICY STATEMENT
Adopted by the Governor and Cabinet on 6 September 1972

The Preliminary Policy Statement, as affirmed by the Executive Board of the Department of Natural Resources, declared that the EEL Plan would provide a sound philosophical, factual and procedural basis for determining the most urgently needed lands and establishing relative priorities among them. The establishment of complete and detailed criteria and guidelines was to be an integral part of the preparation of the EEL Plan.

The Statement gave this specific policy guidance:

(1) All funds will be used for acquisition of a suitable interest in land (including water areas and related resources), except in unusual cases where expenditures for capital improvement will result in the creation of public benefits comparable to those afforded through the acquisition of new public lands

(2) The EEL Plan will give full consideration to the extent to which environmental impairment can best be prevented or controlled through acquisition of a suitable interest in land

(3) The EEL Plan will give full consideration to the priorities for acquisition of environmentally endangered lands, in terms of types of land, geographical area and environmental protection purposes to be served

(4) Funds will be used only for those projects that are clearly and fully justified by the EEL Plan

(5) Priority of consideration will be given to those projects proposed for funding to assist in the implementation of the Environmental Land and Water Management Act (Chapter 380, F.S.), as recommended by the Department of Administration

The Preliminary Policy Statement also stressed the need for flexibility in the selection

and identification of individual projects. This requirement exists because the EEL Program does not have the power of eminent domain (except in the Big Cypress Area of Critical State Concern). The lack of eminent domain also accounts for the requirement, stated in item (3), that priorities for acquisition be expressed in terms of types of land, geographical area, and environmental protection purposes, instead of expressing priorities in terms of specific, clearly identifiable land acquisition boundaries. The latter course is obviously not practical in Florida in light of the highly speculative real estate market that exists. Publication of a priority listing of specific projects would call attention to those lands before negotiations could begin and would tend to stimulate speculation with consequent escalation of land prices.

The authors of Chapters 380 and 259, F.S., realized that the major part of the effort to maintain and improve environmental quality in Florida must be achieved through sound planning and effective regulation; however, it was recognized that since these measures alone would not protect all of the state's valued ecological resources, it would be necessary to provide a program of land acquisition. Though perhaps not stated explicitly in the Land Conservation Act itself, the Preliminary Policy Statement makes the intent clear that, as noted in item (5), the program established by the Act should work closely with regulatory programs, especially Chapter 380, F.S. Therefore, the EEL Program shall acquire only those lands whose environmental values are not adequately protected through the application of existing regulatory power, and it shall work closely with planning and regulatory programs in order to preserve valued ecological resources and secure environmental quality.

There are, however, inherent problems associated with reliance upon regulatory measures to protect environmental values. Though existing laws and regulations are theoretically capable of providing considerable protection to the environment, effective administration of these controls often suffers from insufficient funds and personnel. Thus, while publicly owned lands and waters are, in most cases, effectively protected against degradation, it is difficult at the present time to specify which lands in private ownership are adequately protected by existing controls and which are not.

It is also true that control measures capable of protecting most of the environmental values of an ecosystem may not be capable of protecting the most fragile environmental values. The effectiveness of existing controls, therefore, depends on their application and exercise and on the particular environmental protection purpose(s) to be achieved.

Additionally, there is the difficulty of coordination between the different programs of environmental protection. Each program and each administering agency has its own procedures, methodology and time constraints. The Department of Natural Resources, competing in a highly speculative market for choice lands, in most instances literally cannot afford to mark time in the EEL Program. The Department of Administration, on the other hand, must proceed with careful and time-consuming application of its responsibilities under Chapter 380, F.S.

INTERIM GUIDELINES FOR IMPLEMENTING FLORIDA'S ENVIRONMENTALLY ENDANGERED LANDS PROGRAM
Adopted 5 June 1973

The *Interim Guidelines* were formulated, presented to the public for comment and finally recommended to the Executive Board of the Department of Natural Resources, which adopted them on 5 June 1973. From then until the EEL Plan was adopted on 17 February 1975, the *Interim Guidelines* embodied the significant proportion of existing policy guidance for implementing the acquisition of endangered lands. This Plan represents an expansion and further refinement of the *Interim Guidelines,* which served the program well while they were in effect.

The *Interim Guidelines* addressed Florida's environmental systems in a more general way than does this Plan. The *Interim Guidelines* used the term "key elements" in describing environmental systems. The key elements were then applied to four major criteria: ecological value, vulnerability, endangerment and "generally excluded" types of land areas.

From the *Interim Guidelines,* and from their substantial application to practical situations in

which hundreds of thousands of acres of various types of land throughout the state were examined, a general definition emerged of what constitutes an environmentally endangered land:

An environmentally endangered land is any land area and related water resources that may be determined to contain naturally occurring and relatively unaltered flora, fauna, or geologic conditions and whose interdependent biophysical components, including historical and archaeological resources, might be essentially preserved intact by acquisition. In addition:

(1) the area must be of sufficient size to materially contribute in some substantial measure to the overall natural environmental well-being of a large area or region; or

(2) the area must contain flora, fauna, or geologic resources characteristic of the original domain of Florida and that these be unique to, or otherwise scarce within, the region or larger geographical area; or

(3) the area, whatever its size or the condition of its resources, must be capable, if preserved by acquisition, of providing significant protection to natural resources of recognized regional or statewide importance.

There must also be some reasonable likelihood that the area's related natural and cultural resources will be subjected to some activity of man that might result in their substantial and irretrievable loss. Finally, three important additional criteria that must be satisfied are:

(1) It shall be thoroughly justified in accordance with the comprehensive plan to conserve and protect environmentally endangered lands;

(2) No part of the area should be subject to protection by existing regulatory measures that, in themselves, would be sufficiently strong to preclude expected destructive land practices that would result in substantial and irretrievable losses; and

(3) Only those privately owned real property interests necessary for the conduct of expected destructive land practices shall be eligible for acquisition.

THE BIG CYPRESS CONSERVATION ACT OF 1973

The Big Cypress Conservation Act of 1973 directs the Governor and Cabinet to set aside from the proceeds of the bonds authorized by the Land Conservation Act forty million dollars for acquisition within the proposed Big Cypress National Preserve. The Act applies only to the Big Cypress area, but the environmental values emphasized as being in need of protection are subject as well to statewide emphasis.

> In making such acquisition, the Governor and Cabinet shall give priority to those land and water areas within the area proposed as the . . . [Big Cypress National Preserve , which are essential to the integrity of the environment, the destruction of which would cause irreparable damage to the Everglades National Park, the estuarine fisheries of south Florida, or the underlying fresh water aquifer.

THE 5 JUNE 1973 RESOLUTION OF THE GOVERNOR AND CABINET RELATING TO THE GREEN SWAMP AND OTHER VITAL FRESHWATER RECHARGE AREAS OF THE STATE

This Resolution, which in part addressed the issue of environmentally endangered lands, directed all state environmental agencies to expedite:

A. Specific identification of the most environmentally sensitive wetlands areas of the State with respect to sources of fresh water supplies such as the Green Swamp, other aquifer re-charging wetlands and spring-fed river watersheds; as well as estuarine shellfish-producing areas;

B. Specific recommendations as to which of these areas not now in public ownership can be most expeditiously protected under existing law and regulations (Wilderness areas, Conservation areas, Wild and Scenic River designations, etc.); and with regard to other environmentally sensitive areas –

C. Prompt submission of a list of priorities for acquisition of at least the "vital core" areas of crucial wetlands so that the State

will be able to protect its people from willful, wanton and irresponsible misuse of irreplaceable elements of land and water essential to our economy, health, and even survival.

CRITERIA AND GUIDELINES

Initial guidance for establishment of priorities in terms of types of land, geographical area, and environmental protection purposes to be served by acquisition is derived from several of the foregoing policy directives. The Land Conservation Act, the Big Cypress Conservation Act, the Resolution of the Governor and Cabinet on the Green Swamp, and the *Interim Guidelines* are the chief sources for this purpose. In addition to these, the Department of Natural Resources researched and solicited a wide range of technical information and guidance to help in further refining the establishment of priorities. This information was gleaned from state and federal environmental agencies, from planning agencies throughout the state and from experts on Florida's environment. In addition, the Department surveyed environmental agencies of the other forty-nine states for information on their progress in identifying and acquiring environmentally endangered lands.

Various methods, some of them rather intricate, have been used by others to derive such priorities. Basically, all of these methods, especially the intricate ones, require detailed environmental data and the application of critical judgment by experts. The lack of a comprehensive environmental inventory of Florida severely restricts the use of intricate methodologies. The priorities derived and set forth in the Plan, therefore, reflect a consensus of all the official policy guidance, technical information, and scientific opinion that could be brought to bear on the question. It should be emphasized, however, that any such consensus is open to valid criticism and that the consensus could and should change as knowledge and understanding of Florida's natural systems increases and as environmental land use controls change.

Priority Categories

The criteria and guidelines are presented in the form of six priority categories of land areas and eleven general considerations. The priority categories are (not in order of rank):

- Lands of critical importance to supplies of fresh water for domestic use and natural systems
- Freshwater and saltwater wetlands
- Unique and outstanding natural areas
- Natural ocean and gulf beach systems
- Areas that protect or enhance the environmental values of significant natural resources
- Wilderness areas

Detailed discussions of these categories are presented in Appendix C.

There is obviously considerable overlap between the six categories. A wetland could also be a wilderness, or a given parcel of land could contain a wetland in one part and a beach in another. Nevertheless, the categories are sufficiently distinct in concept to warrant separate treatment.

The listing of categories is not meant to imply rank or any order of acquisition; rather, it is intended that areas representing the best combination of the values inherent in the six categories be given priority. This should not exclude those areas that have overriding importance in one category. As an example, a truly unique natural area might have little significance when considered under the other categories, but would certainly be deserving of preservation because of its uniqueness. The detailed discussions of the six categories (Appendix C) set forth criteria enabling the selection of the most environmentally valuable areas within each category.

The EEL Program, therefore, shall give highest priority for acquisition to (1) areas representing the best combination of values inherent in the six categories and (2) areas having overriding significance in any single category.

Additional criteria are developed in the general considerations that follow.

General Considerations

There are eleven general considerations that shall apply to all potential land acquisitions under this program:

Number One

Priority consideration shall be given to those projects proposed for funding to assist in the implementation of Chapter 380, F.S. (The Environmental Land and Water Management Act).

Number Two

The availability of the land for acquisition by the State will obviously determine whether a certain parcel of land, if judged worthy of acquisition on the basis of its environmental value and its endangerment, will actually be purchased. The State cannot be sure of acquiring land that it wants because the EEL Program does not have the power of eminent domain (except for the Big Cypress Area of Critical State Concern). It is of little worth, therefore, for this Plan to specify exactly where and when parcels of land are to be acquired because there is no assurance that those parcels could be successfully acquired.

The EEL Program shall follow the long-standing policy of the Department of Natural Resources, which is to pay no more than appraised value for a piece of land. Considering the speculative pressures to which Florida land is subject, the EEL Program's lack of eminent domain, and the difficulty of putting a price on the environmental values of land, the policy of paying only the appraised value is still the wisest approach.

As to relative cost, it should be obvious that with two parcels of equal environmental value, the more inexpensive one shall be preferred. In the more common situation of two or more parcels of land with different prices and different environmental values, no formula that relates the two variables can be given. The various decision-making bodies established for administration of the EEL Program must exercise their best judgment in these and, indeed, in all cases.

In some instances, it may be advantageous for the State to make use of non-profit land acquisition foundations in acquiring land at a reduced cost. The potential of these foundations to aid the EEL Program will be considered in each case.

Number Three

The EEL Program shall seek the minimum degree of title necessary to insure the desired environmental protection. The minimum degree could be fee simple, some sort of easement or purchase of the development rights. Two factors, however, work against less-than-fee acquisition. One is the probable demand of the public for recreational use of EEL acquisitions. Full recreational use of land usually requires fee simple public ownership of that land. The other factor is the likelihood that the cost of less-than-fee acquisition would be close to or as much as the fee simple. Recent experience by other public agencies, both federal and state, supports this contention. Situations may arise, however, in which some form of less-than-fee acquisition would be most effective, and these possibilities will be explored thoroughly.

Number Four

Another very important consideration is a compound one of how vulnerable a parcel of land is and how endangered it is by man's activities.

Vulnerability means the susceptibility of a system to degradation caused by man's activities, whether directly upon the system or remote to it. These activities include residential development, highway construction, pedestrian and off-road vehicular traffic, air pollution, farming, damming, channelization, introduction of alien plants and animals, and a host of others. Vulnerability varies from one natural system to another, but it is important to note that no natural system is invulnerable to man's activities.

Endangerment refers to the potential for actual destruction or degradation of the system by man's activities. The terms endangerment and vulnerability are closely related, and, indeed, vulnerability can only be adequately expressed if the endangerment is specified. It is possible to describe a system as generally low in vulnerability, that is, not susceptible to degradation from most of man's activities, but high in endangerment because an activity to which it is vulnerable is likely to occur within the system.

Other things being equal, the more endangered parcel should be purchased first. This consideration is especially important as regards timing of purchases. There is no easy way to predict endangerment; nor can a justifiable formula be given which would precisely combine endangerment and environmental value into an overall priority ranking. If available, accurate and specific information on development plans for a parcel of land is more

valuable than county or regional growth projections. Without information on specific planned development activities the evaluation of endangerment cannot be precise; it requires a common sense evaluation of all available information. Generally, however, undeveloped land in a high growth area is more endangered than similar land in a low growth area.

A determination shall also be made of the extent to which local, state and federal regulatory measures could realistically be applied to achieve the identified environmental protection objectives.

Number Five

The environmental protection purposes achieved through the EEL Program should be of regional or statewide importance. Environmental protection purposes deemed to be of local significance only should be considered under local or other acquisition or regulatory programs. In general, the environmental values of small parcels of land are of little more than local significance, though exceptions may occur.

Number Six

The EEL Program shall endeavor to acquire lands in a natural, essentially undisturbed condition. It is true that most disturbed areas will, if the disturbing activity is removed, return to a natural condition after a period of time. This period of time varies according to the seriousness of the disturbance and the natural successional stage to be restored. As an example, the succession from a clear cut area to a mature hardwood hammock could take well over a hundred years. Also, a return to pre-existing conditions is by no means guaranteed. Therefore, the EEL Program will normally seek out those lands currently possessing outstanding natural qualities. The following kinds of land areas are not in a natural condition and shall generally not be considered to have environmental value:

- Areas excessively developed for residential, commercial, industrial or public service uses
- Agricultural lands, improved pastures and pine plantations
- Man-made lakes, canals, impoundments or filled lands
- Areas severely infested with exotic plants or animals
- Other areas whose natural characteristics have been excessively degraded or altered by man's activities

These foregoing conditions, however, shall not necessarily preclude the acquisition of such lands under this program if it is shown that their acquisition will best serve the purpose of protecting other areas that are determined to be valued ecological resources. Areas whose natural characteristics are now being excessively degraded by man's activities are generally undesirable acquisitions under this program unless such acquisitions will prevent further degradation by saving a substantial proportion of the area's remaining natural qualities.

Number Seven

Whenever possible, an EEL acquisition should comprise a sufficiently large area to enable effective management and protection of the resources of regional or statewide significance. It is difficult, and perhaps unwise, to arbitrarily select an acreage figure that divides large from small. A tract that provides a wilderness quality should be considered large. The federal wilderness program uses five thousand acres as a suggested minimum size for wilderness area candidates. On the other hand, the Florida Game and Fresh Water Fish Commission generally considers twenty thousand acres to be a minimum size for successful management of large game animals. The concept of what is large also depends on the type of natural system: one hundred acres of tropical hammock is relatively large, but one hundred acres of dry prairie is relatively small.

Large areas have several advantages over smaller ones:

(a) They are more likely to be self-sustaining and less likely to require intensive management in order to maintain their environmental values

(b) They support larger, more diverse and more stable populations of plants and animals (as an indication of carrying capacity, natural systems sustain only from one-half to eight deer per square mile, depending on the system)

(c) If EEL acquisitions are opened to some form of public recreation, as will probably be the case with the majority of them, then a large area will accommodate more uses—hunting, camping, hiking, etc.

(d) They are usually less expensive per acre than smaller tracts of comparable land

Finally, large, undisturbed tracts of land are rarer than small, undisturbed tracts. Their unbroken expanse represents an environmental quality that disappears forever when they are subdivided.

Number Eight

Effective management and protection of an EEL acquisition depends not only on the size of an acquisition area but also on its configuration and on the surrounding land uses. For every acquisition, the EEL Program shall endeavor to secure the configuration that most efficiently achieves the desired environmental protection purposes. The existing and potential effects of surrounding land uses on the environmental values of the EEL acquisition must be carefully investigated.

Number Nine

A determination shall be made as to the feasibility of attaining the level of management necessary to achieve the desired environmental protection purposes. This consideration is closely related, of course, to the previous considerations. In most situations, a complete natural system is easier to manage than a portion of a natural system. The EEL Program shall try to acquire as complete a natural system as possible (realizing that no defined natural system is ever completely self-sustaining).

Number Ten

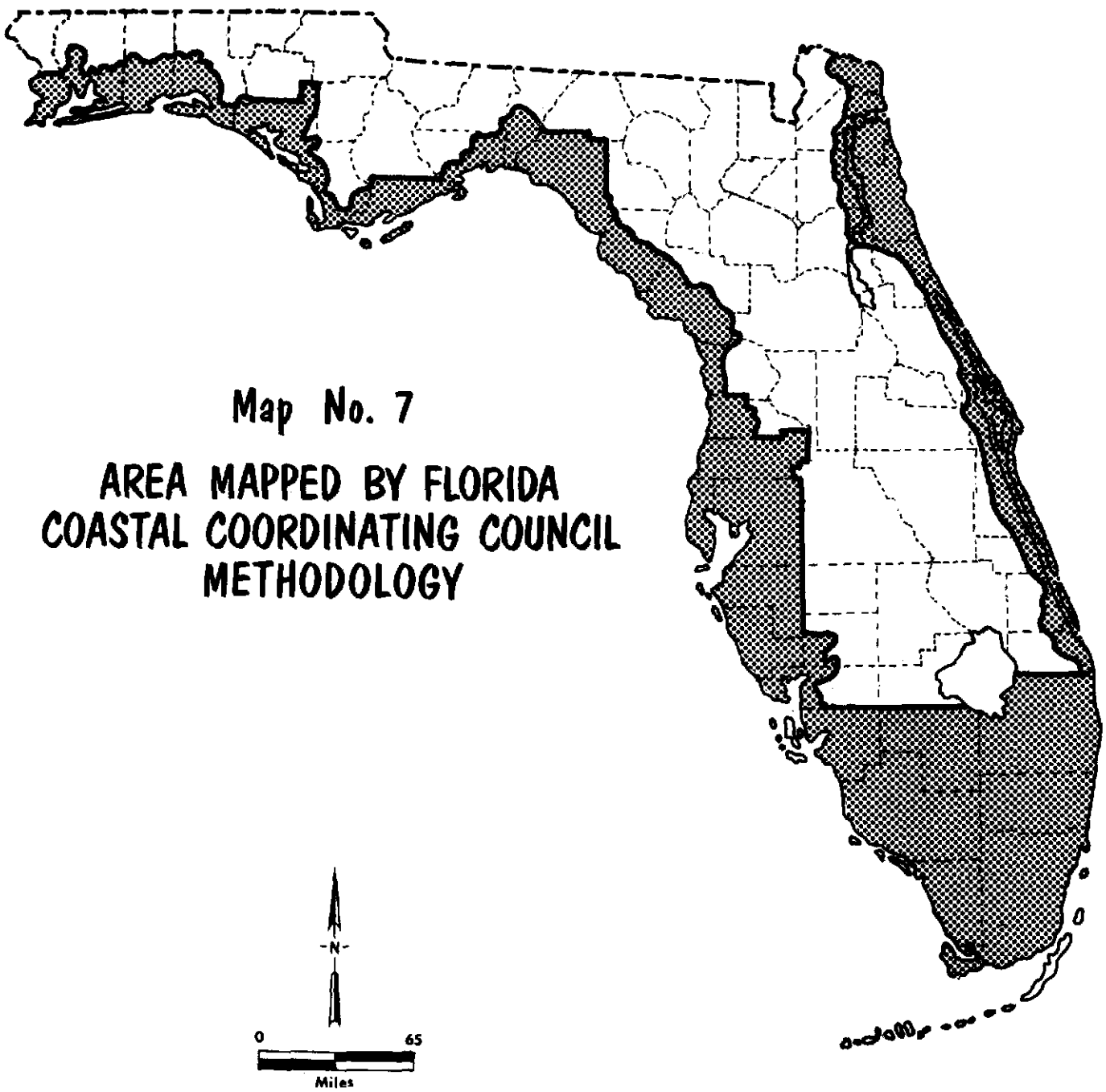
The EEL Program shall consider evidence of support for the protection of an area by local or regional agencies, the general public or organized groups. Significant under this consideration is the willingness of local or regional agencies to participate in the management of a potential EEL acquisition.

Number Eleven

One of the aims of the EEL Program is to obtain and use the best available environmental information. The scarcity of useful statewide technical data on the environment was a major obstacle in the preparation of the Plan. It was often necessary to use information that was not statewide in coverage. One noteworthy source of information is the Florida Coastal Coordinating Council, which has done a considerable amount of mapping of land and water areas and has classified them on the basis of their environmental value and suitability for development. Three classes were used: preservation (suggested no development), conservation (suitable for possible development with careful controls), and development (suitable for intensive development). As of this writing (1974), this mapping has not been done for the entire state, but it has been done for the entire coastal zone and for all of Monroe, Dade, Broward, Palm Beach, Collier, Hendry, Lee, Sarasota, Manatee, Hillsborough, Pinellas and Pasco Counties (see Map No. 7). Areas classified as preservation should receive consideration for acquisition through the EEL Program; however, the preservation class comprises about one-fifth of the total area in the coastal zone and is not, therefore, sufficiently selective by itself to satisfy the requirements of this program.

Summary

Potential acquisition areas shall be evaluated and compared using the six priority categories and the general considerations just discussed. Potential acquisition areas include the hundreds of proposals submitted to the Department of Natural Resources as well as those desirable acquisition areas that the Department may assemble. The areas that best represent the values emphasized in the Plan shall have highest priority for acquisition. No formula is given for final selection of lands, nor could one be justified on the basis of existing information. The decision-making bodies in the EEL Program, ending with the Governor and Cabinet, must exercise their best judgment in the final selection of areas for acquisition.


Map No. 7
AREA MAPPED BY FLORIDA
COASTAL COORDINATING COUNCIL
METHODOLOGY
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65
Miles

Chapter V

ADMINISTRATION

ORGANIZATION

In order to carry out the policies discussed in Chapter IV, the Department of Natural Resources called upon a number of agencies of state government and a panel of experts on environmental and planning-related matters to assist in formulating this document and in administering the review and evaluation of proposed acquisition projects. Figure a. describes the organizational structure for administering the EEL Program. This interagency and interdisciplinary approach brings the best available technical expertise on environmental matters to bear on the decision process for each proposed purchase and provides the bulk of technical information required to develop and maintain this comprehensive Plan.

PROCESSING STEPS

Initiation

The Department accepts proposals for the acquisition of environmentally endangered lands from any source and sees that each proposal is given due consideration. Proposals received are reviewed and acknowledged. If sufficient information is available the proposal is processed; if not, additional information is requested from the sponsor of the proposal. The Department maintains a catalog of environmentally endangered lands proposals, which contains the information received for each proposal.

Screening

The Department rigidly screens all proposals (see Figure b) to select the most likely candidates for the program. Screening is necessary because staffing limitations make it impossible to field inspect all proposed properties, and a field inspection is required on each property before submission to the Interagency Planning Committee (IPC) for evaluation as to its possible qualification under the program.

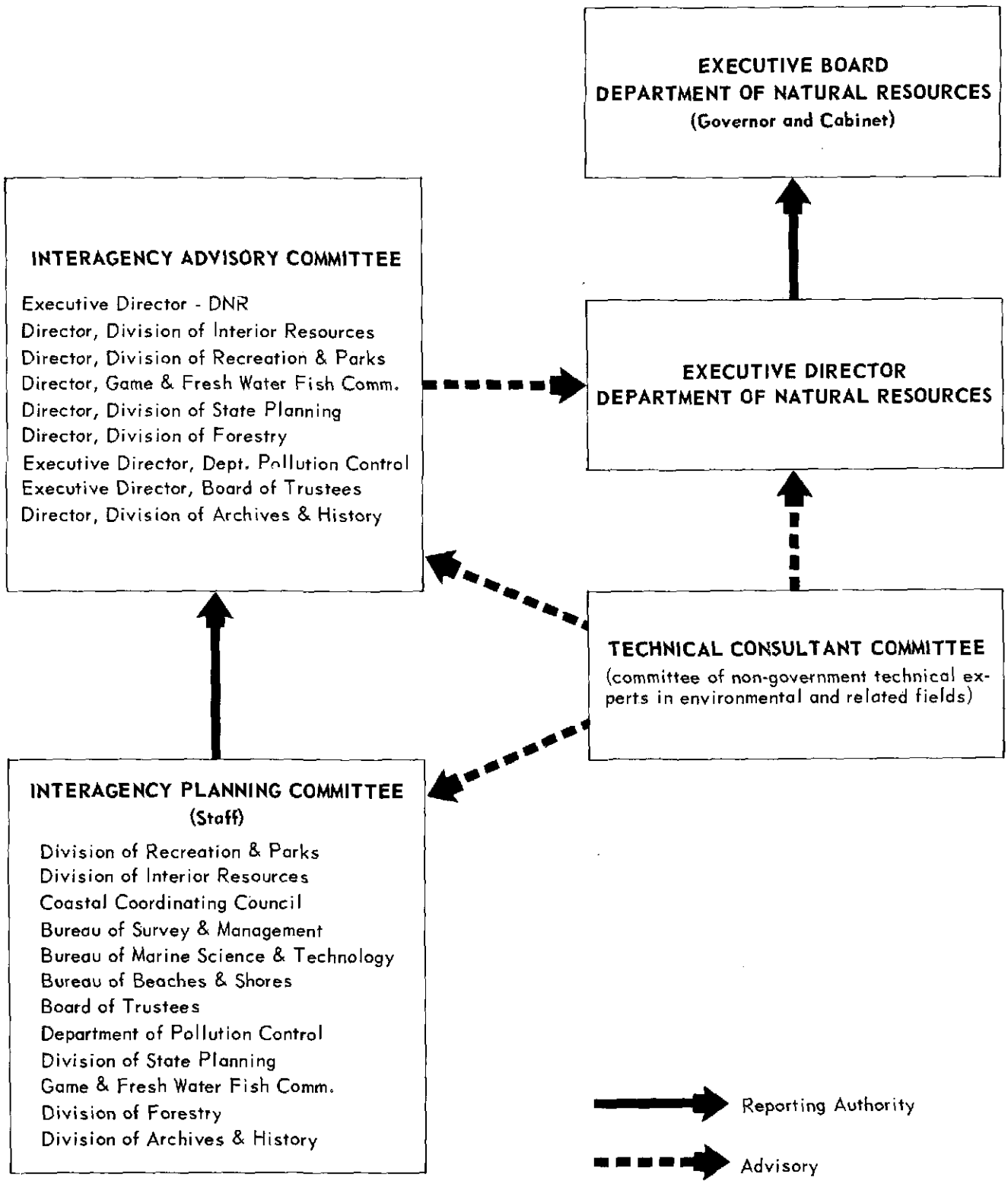
In the screening process, the Department groups proposals on the basis of apparent suitability under the EEL Plan, likely availability and feasibility. Proposals for which there is insufficient information to allow assignment to a group are deferred until needed information is obtained. Proposals judged to be suitable, available, and feasible are scheduled for on-site inspection.

In order for expeditious processing of active projects to the Interagency Planning Committee to be accomplished, projects with little apparent likelihood of meeting minimum criteria are not assigned to one of the active groups nor are they indefinitely deferred for lack of information. Instead, they are recommended to the Interagency Planning Committee for definite deferral. The Committee's concurrence is regarded as giving deferred status for a six-month period of time or until information favoring active status has been received or the Committee has removed its deferral.

The Department contacts all owners or designated representatives of active proposals being considered for field inspection and requests permission to enter such properties for an on-site inspection. The Department then notifies the Technical Consultant Committee (TCC) of the names, lo-

Figure a.

ORGANIZATION CHART
ENVIRONMENTALLY ENDANGERED LANDS PROGRAM



cation, and other available pertinent information on the proposals to be inspected and solicits their input.

Once all of the pre-inspection coordination has been completed, the proposal is scheduled for field inspection and the inspection packet is provided to the Department field inspector.

Field Inspection

The Department field inspector completes any last minute coordination required to gain access to the subject property. He then conducts the inspection, collects the required data, and submits a narrative report with color slides and a land use/vegetation map.

The narrative report describes and assesses the following: natural characteristics and general terrain features of the property; location; historical and archaeological features; encroachments; water quality; and any evidence of rare or endangered species of plants and animals. The report includes a more general assessment of the area immediately surrounding the proposed acquisition area, assesses land uses and management practices, and gives the field inspector's opinion on ecological value of the area.

The Department researches local land use, regulations, zoning, and future land use plans and includes this information in the final inspection report, which is then reproduced.

IPC Evaluation

The Department presents a verbal inspection report with visual aids on each inspected proposal and attempts to answer pertinent questions from the Interagency Planning Committee.

The Committee members have two weeks from time of presentation to review and analyze the inspection report. They consider and comment on all factors expressed in the EEL Plan, but determine qualification based on ecological value and property vulnerability.

The Committee members discuss and vote on each proposal presented to them, and they assign each qualified project to one of three categories expressing relative ecological value and vulnerability (Category I – high, II – moderate and III – low). Non-qualified proposals are returned to the file, where no action other than notification of the major proponent is taken unless new information is produced to change their status to Active again.

Priority Assignment

The Department assigns all qualified projects to one of three working priority groups, considering the following factors in making this assignment: IPC ecological value and vulnerability categories, TCC comments, endangerment, indicated availability, indicated economics, ownership patterns and location. These assignments are submitted to the Interagency Advisory Committee (IAC) for periodic review and confirmation.

Working priority group one contains projects deemed to be of highest quality, group two contains the best alternate projects, and group three contains all remaining qualified projects. A project may be assigned to group one only if it is judged superior, on the basis of the factors noted above, to all group two and three projects.

Negotiation

The Department opens preliminary negotiations only on working priority group one projects. If terms appear suitable or negotiable, the Department obtains two independent appraisals to use as fair market value information for final negotiations. If the negotiations are unsuccessful, the project is dropped from working priority group one to one of the other priority groups depending on an analysis of all pertinent information. Non-negotiable projects are returned to the file. If the negotiations are considered successful by the Department, the project is presented to the IAC for evaluation following the required public meeting.

Public Meeting

The Department holds a public meeting on each project being negotiated, soon after the appraisals are ordered, to present the project to the public and solicit public sentiment about the proposed acquisition.

IAC Evaluation

The Department prepares an Interagency Advisory Committee agenda item and presents each project that has been successfully negotiated or on which the negotiations have reached some definite state. This verbal presentation with

visual aids includes a cost and acreage analysis.

The IAC members consider the total project, including ecological value, vulnerability, endangerment, economics, and practical aspects, and recommend either for or against purchase to the Executive Director of the Department of Natural Resources. Projects not recommended for purchase are returned to the file.

Executive Board Action

The Department staff prepares the agenda item for the Governor and Cabinet and furnishes additional information as requested.

The Governor and Cabinet (the Executive Board of the Department of Natural Resources) consider the total project and either authorize purchase of the project, at the same time approving a recommended management plan and designating a management agency, or reject the project. Rejected projects are returned to the file.

Acquisition

The Department completes the acquisition on projects authorized for purchase by the Governor and Cabinet, with title being taken in the name of the Board of Trustees of the Internal Improvement Trust Fund.

Disposition

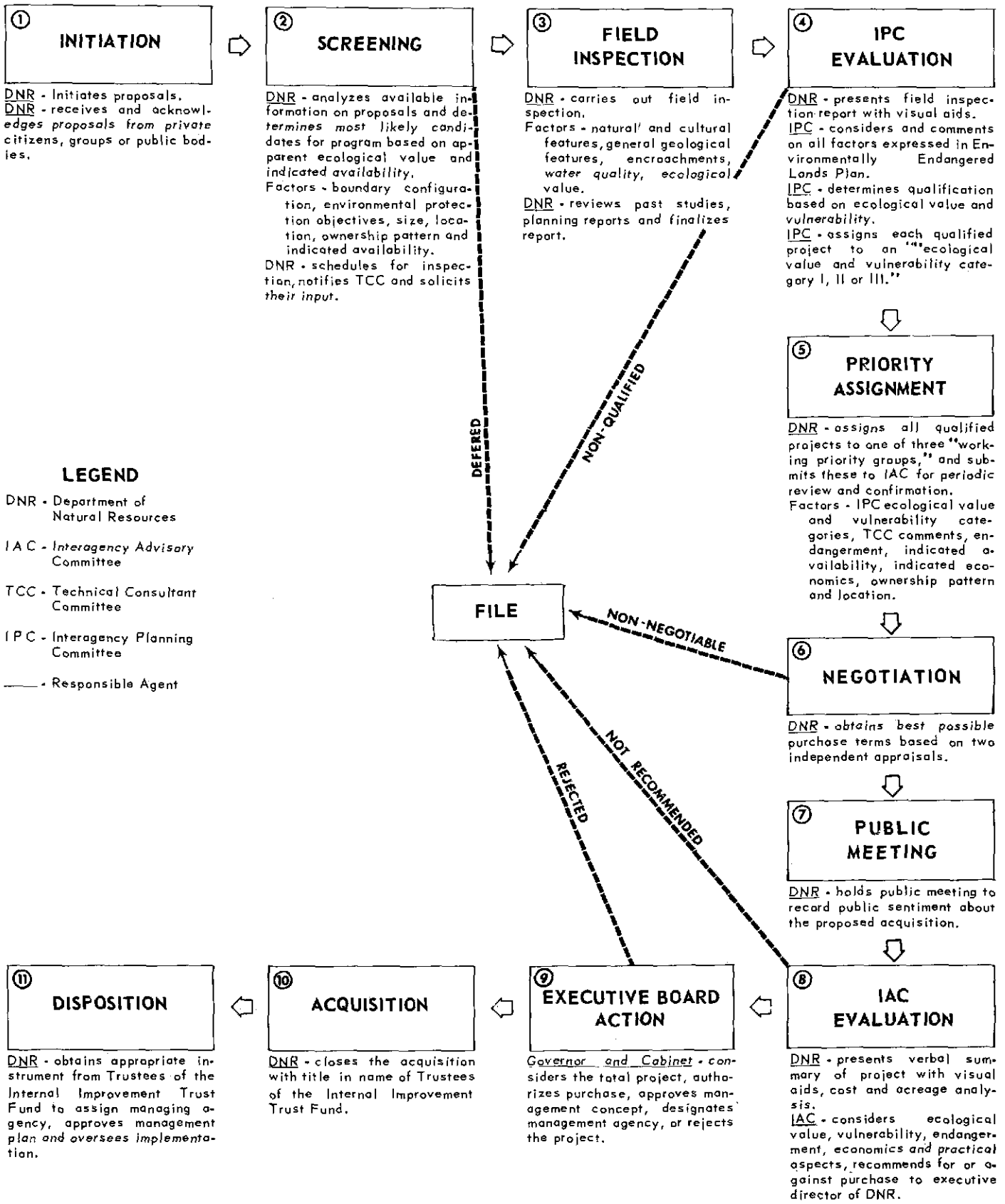
The Department obtains the appropriate legal instrument to transfer jurisdiction of the project lands to the management agency designated by the Governor and Cabinet. The Department approves the specific management plan, as developed by the management agency, and oversees its implementation.

Summary

These procedures have evolved through a process of initiation, use, and modification as the Department has gained experience in the processing of large numbers of proposals under the Environmentally Endangered Lands Program. They may seem cumbersome, but given the large number of proposals, limited staff, and large sums of money involved, these procedures offer an effective method of assuring that projects of high quality and need are acquired, while providing maximum public exposure for the whole process.

Figure b.

PROJECT PROCESSING STEPS
ENVIRONMENTALLY ENDANGERED LANDS PROGRAM



Chapter VI

SUMMARY

Florida has a rich, diverse and unusual natural environment. The climate and the abundance of sun and water contribute to the high production of organic material characteristic of many Florida ecosystems. The state's location is responsible for its diverse flora and fauna, which contain elements of both the North American biota and the Caribbean biota. Florida is one of the wettest states in the Union, with wetlands covering an estimated 25 to 35% of its land area (depending on the definition of wetlands).

Preservation of this environment is vital to all Floridians. The environment is usually thought of in terms of outdoor recreation – fishing, hunting, camping, bird watching, etc. Lately, a quality environment is often mentioned as being instrumental in achieving quality of life – an abstract term hard to measure but easy to experience – for the state's citizens. Though not always realized, a healthy environment is critically important to the maintenance of supplies of potable drinking water, to the availability and price of seafood, and to the vast Florida tourism industry, to name but a few important facets of Florida life.

Today, however, Florida's environment is beset by many problems. It is diminishing in extent, diversity and vigor. Two fundamental causes of environmental degradation are: (1) an insufficient appreciation by society of the values and fragility of natural systems; and (2) the tremendous and unanticipated (from the standpoint of environmental planning) increase in Florida's population. To counter this environmental degradation, both the State of Florida and the federal government have established environmental protection programs. One of these is the Environmentally Endangered Lands Program, which was established by the Land Conservation Act of 1972 (Chapter 259, Florida Statutes). The EEL Program goes one step beyond regulatory programs in that it is designed to protect the environment through acquisition of vital ecological resources. The $200 million funding approved for this program truly represents a dramatic commitment by the people of Florida to the preservation of their environment.

This comprehensive Plan has been developed to direct the EEL Program. It replaces the *Interim Guidelines for Implementing Florida's Environmentally Endangered Lands Program*. Basic policy guidance for the Plan derives from the Land Conservation Act and other relevant public documents. This guidance, together with the best available information on the values, vulnerability, and endangerment of Florida's natural systems, enables the construction of a set of criteria to assist the EEL Program in securing those land and water areas of greatest importance to the integrity of Florida's natural environment and the well-being of its people.

The criteria established in the Plan are presented in the form of six priority categories of land and eleven general considerations.
The categories are as follows:

- Lands of critical importance to supplies of fresh water for domestic use and natural systems
- Freshwater and saltwater wetlands
- Unique and outstanding natural areas
- Natural ocean and gulf beach systems
- Areas that protect or enhance the environ-

mental values of significant natural resources

- Wilderness areas

These categories overlap in their application to lands; however, it is important and useful to discuss and emphasize the values inherent in each category. Two principles shall guide the use of the priority categories: (1) those lands shall be selected that possess the best combination of the environmental values inherent in each category; and (2) in evaluating the combination of values, special consideration shall be given to those lands of greatest significance within their respective categories. That is, a remarkable and unique natural area shall receive a high priority for acquisition (if necessary in order to preserve it) even if it has little significance under the other categories. The Plan discusses each category separately in Appendix C.

The general considerations are as follows:

(1) The EEL Program shall give priority of consideration to those projects proposed for funding to assist in the implementation of the Florida Environmental Land and Water Management Act of 1972 (Chapter 380, Florida Statutes)

(2) Because the EEL Program does not have the power of eminent domain, the availability and cost of land is an important consideration

(3) The EEL Program shall seek the minimum degree of acquisition necessary in order to achieve the desired environmental protection purpose

(4) The EEL Program shall give priority to the most vulnerable and endangered lands, other considerations being equal

(5) The EEL Program shall give priority to those natural resources deemed to be of state-wide or regional importance, ahead of those only of local importance

(6) The EEL Program shall give priority to lands in an essentially undisturbed condition

(7) The EEL Program shall give priority to areas of sufficient size to permit effective management and protection of the natural resource

(8) The EEL Program shall give priority to areas of proper configuration to permit effective management and protection of the natural resource

(9) The EEL Program shall consider the kind of management necessary to achieve the desired environmental protection purposes

(10) The EEL Program shall consider evidence of cooperation on a project by local or regional agencies, organizations and the public

(11) The EEL Program shall consider priorities for protection developed by previous studies, especially the classification derived by the Florida Coastal Coordinating Council

These considerations apply to all potential acquisition areas. In using these general considerations and the priority categories, judgment by the decision-making bodies of the EEL Program is still the critical factor in the selection process.

The EEL Program shall make every effort to apply these criteria to all the proposed acquisition areas sent to the Department of Natural Resources by governmental agencies, organizations and individuals. The EEL Program will also employ the criteria to actively seek out, from all the land and water areas of the state, the most desirable acquisitions.

Chapter VII

RECOMMENDATIONS FOR FURTHER ACTION

During the period of EEL Plan formulation a number of problems were encountered that severely limit effective comprehensive environmental planning and EEL Program operation. This section presents recommendations for actions that might be taken to eliminate or reduce the adverse effects of these problem areas. Many more recommendations could be made; however, the discussion to follow contains only those felt to be at once important, directly related to the EEL Program, and capable of implementation. Specific recommendations are in bold type.

–1–

The fundamental problem in developing a comprehensive plan and program for the acquisition of environmentally endangered lands is selection of lands for acquisition. The selection process formulated in the Plan and employed in the program should reflect the official state position as to which lands are most important to the State of Florida. Such policy should be contained in a state comprehensive plan. The State Comprehensive Plan, however, does not yet exist. Therefore, the EEL Plan had to derive the necessary basic policy guidance from statements in several different official documents. **It is recommended . . . that the State Comprehensive Plan be executed as soon as possible and that it establish, based upon specific legislative guidance, definite policies on growth and on land use.**

–2–

The quality of the land selection process can be no better than the quality of available technical data on the state's environment. A great deal of information on the environment does exist, it is true. Unfortunately, much of it is out of date, not applicable to the entire state, or not otherwise applicable to a land acquisition program. (Having said this, it must be noted that the relevance of recent environmental research to present-day environmental problems is encouraging.) **It is recommended . . . that the State carry out and encourage environmental research that would be directly applicable to environmental protection programs, including the EEL Program. A mechanism should be established that would disseminate the results of such research to the relevant agencies. Monitoring of all environmental parameters should be maintained after base line data are obtained. A comprehensive inventory of Florida's natural resources should be carried out.**

–3–

The EEL Program is one part of the overall state effort to protect its environment. In particular, it was designed to work closely with the programs established under Chapter 380, Florida Statutes. Despite the presence of other state environmental agencies on the decision-making bodies of the EEL Program, coordination with other environmental protection programs has proved difficult. In large part this is caused by the inherent nature and constraints of the different programs and their implementing agencies. **It is recommended . . . that the Department of Natural Resources, the Department of Administration, and other agencies charged with environmental protection responsibilities continue to strive for better coordinative mechanisms between their existing environmental protection programs. It is further**

recommended that the roles, responsibilities and purposes of the state's several environmental programs be legislatively redefined so as to avoid overlap and gaps and to facilitate coordination among them. To accomplish this it may be necessary to effect a realignment or consolidation of state environmental agencies.

–4–

Another problem with the overall state environmental protection effort is the difference between potential effectiveness of existing regulatory powers and their actual effectiveness in the field. This factor has presented problems to formulation of this plan because it is very difficult to rely, absolutely, on existing regulatory powers to protect important natural resources. At the same time, it is unwise and inefficient (from an overall perspective) to protect, through acquisition, areas that should and could be protected through exercise of regulatory power. It is recommended . . . that the monitoring and enforcement arms of state agencies charged with environmental protection responsibilities be reinforced by greater funding and staffing to more effectively carry out their responsibilities.

–5–

The lack of eminent domain power for the Department of Natural Resources in acquiring endangered lands under Chapter 259, F.S., results in:

- acquisition only of available lands when areas in greater need of environmental protection through acquisition may never be acquired;
- inability to lend forceful direction to the acquisition program limits the usefulness of this plan document;
- pressure to acquire properties at highly inflated prices, rather than fair market value, limits the overall scope and effectiveness of this program; and
- a danger exists when the State has to enter into partial purchases of large areas because there is no real assurance that final acquisition of the entire area may in fact be possible.

It is recommended . . . that Chapter 259, F.S., be amended to grant the Department of Natural Recources eminent domain power for acquisition of fee title, or any lesser interest deemed suitable, in all endangered lands and related water resources envisioned by the chapter.

–6–

Operation of the EEL Program has been slowed on occasion by the difficulty of establishing the extent, if any, of state ownership in an area proposed for acquisition under this program. This is especially true in wetland areas. It is recommended . . . that the State take all steps necessary to expedite the settlement of pending litigation over private and public landowner boundaries; and complete, and maintain in an up-to-date status, maps and legal descriptions of all publicly owned lands in the state.

Appendix A

CHAPTER 259, FLORIDA STATUTES

LAND CONSERVATION ACT OF 1972

*259.01 Short title. – This chapter shall be known and may be cited as the "Land Conservation Act of 1972."

History. – §1, ch. 72.300

*Note. – §1, ch. 72.300 provided that this section will take effect only upon approval by the electorate, at the general election to be held in November 1972, of the bond issues authorized by §259.02.

*259.02 Authority; full faith and credit bonds. – Pursuant to the provisions of §11(a) of Art. VII of the state constitution and §215.59, the issuance of state bonds pledging the full faith and credit of the state in the principal amount, including any refinancing, not to exceed two hundred million dollars for state capital projects for environmentally endangered lands and forty million dollars for state capital projects for outdoor recreation lands is hereby authorized, subject to the provisions of §§259.01-259.06.

History. – §1, ch. 72.300.

*Note. – See note following §259.01.

*259.03 Definitions. – The following terms and phrases when used in §§259.01-259.06 shall have the meaning ascribed to them in this section, except where the context clearly indicates a different meaning:

(1) "State capital projects for environmentally endangered lands" means a state capital project, as required by §11(a) of Art. VII of the state constitution, which shall have as its purpose the conservation and protection of environmentally unique and irreplaceable lands as valued ecological resources of this state, including without limitation:

(a) Those areas of ecological significance the development of which by private or public works would cause the deterioration of submerged lands, inland or coastal waters, marshes, or wilderness areas essential to the environmental integrity of the area or of adjacent areas:

(b) Those areas which, in the judgment of the game and fresh water fish commission, department of natural resources, or department of pollution control, the development of which would require a remedial public works project to limit or correct environmental damage; or

(c) Any beaches or beach areas within the state which have been eroded or destroyed by natural forces or which are threatened, or potentially threatened, by erosion or destruction by natural forces.

(2) "State capital project for outdoor recreation lands" means a state capital project, as required by §11(a) of Art. VII of the state constitution, which shall be for the purposes set out in chapter 375.

(3) "Board" means the governor and cabinet, as the head of the department of natural resources.

(4) "Division" means the division of bond finance of the department of general services.

History. – §1, ch. 72.300.

*Note. – See note following §259.01.

*259.04 Board; powers and duties. –

(1) For state capital projects for environmentally endangered lands:

(a) The board is given the responsibility, authority, and power to develop and execute a comprehensive plan to conserve and protect environmentally endangered lands in this state. This plan shall be kept current through continual reevaluation and revision.

(b) The board may enter into contracts with the government of the United States or any agency or instrumentality thereof; the state or any county, municipality, district authority, or political subdivision; or any private corporation, partnership, association; or person providing for or relating to the conservation or protection of certain lands in accomplishing the purposes of §§259.01-259.06.

(c) The board is authorized to acquire lands, water areas and related resources. The board is authorized to enter into contracts for purchase and to purchase the fee or any lesser interest sufficient to meet the purposes of §§259.01-259.06 of any environmentally endangered lands or outdoor recreation lands.

(2) For state capital projects for outdoor recreation lands, the provisions of chapter 375 shall apply.

History. – §1, ch. 72.300.

*Note. – See note following §259.01.

*259.05 Issuance of bonds. –

(1) Upon request of the board, by appropriate resolution, the division of bond finance from time to time, subject to the debt limitation provided herein, may issue bonds pledging the full faith and credit of the state as shall be necessary to provide sufficient funds to achieve the purposes set out in such request.

(2) The issuance of such bonds to finance state capital projects for environmentally endangered lands or outdoor recreation lands is authorized in the manner, and subject to the limitations, provided by the state bond act, except as otherwise expressly provided herein.

History. – §1, ch. 72.300.

*Note. – See note following §259.01.

*259.06 Construction. – The provisions of §§259.01-259.06 shall be liberally construed in a manner to accomplish the purposes thereof.

History. – §1, ch. 72.300.

*Note. – See note following §259.01.

259.07 Public Meetings. – The department of natural resources before making recommendations to the board for the purchase of any environmentally endangered land shall hold a public meeting on the proposed purchase of such land in the county where a major portion of such land is situated. Notice at least thirty (30) days in advance of such public meeting shall be published in a newspaper of general circulation in the area where such land is located indicating the date, time and place of such public meeting. A report of the public meeting shall be submitted to the board along with the recommendation for purchase of such land.

History.–§1, ch. 74-59.

Appendix B

ESTIMATED POPULATIONS OF FLORIDA COUNTIES, 1974-1980

Southeast Population

County	1974	1980	1974-1980 Gain
Dade	1,402,900	1,571,000	168,100
Broward	810,800	985,700	174,900
Palm Beach	449,400	543,000	93,600
St. Lucie	65,400	80,000	14,600
Monroe	57,200	59,900	2,700
Collier	55,600	80,000	24,400
Indian River	45,600	55,300	9,700
Martin	39,100	50,200	11,100
Hendry	15,300	18,500	3,200
Okeechobee	15,600	19,800	4,200
Glades	4,400	5,000	600
Total	2,961,300	3,468,400	507,100

Central Population

County	1974	1980	1974-1980 Gain
Orange	426,700	525,000	98,300
Brevard	249,400	281,600	32,200
Volusia	202,000	240,000	38,000
Seminole	134,200	173,900	39,700
Marion	87,200	102,100	14,900
Lake	82,000	94,300	12,300
Osceola	37,900	52,400	14,500
Flagler	5,900	7,800	1,900
Total	1,225,300	1,477,100	251,800

Southwest Population

County	1974	1980	1974-1980 Gain
Pinellas	647,800	744,600	96,800
Hillsborough	582,000	651,900	69,900
Polk	267,800	320,700	52,900
Sarasota	155,800	186,800	31,000
Lee	144,000	196,300	52,300
Manatee	111,600	133,600	22,000
Pasco	120,000	177,300	57,300
Highlands	40,500	47,800	7,300
Charlotte	38,700	56,500	17,800
Citrus	33,500	48,800	15,300
Hernando	28,500	37,500	9,000
Sumter	19,500	22,800	3,300
Hardee	17,600	20,100	2,500
DeSoto	16,600	19,200	2,600
Total	2,223,900	2,663,900	440,000

Northeast Population

County	1974	1980	1974-1980 Gain
Duval	570,100	661,100	91,000
Alachua	124,500	147,500	23,000
Putnam	41,600	45,700	4,100
Clay	43,900	52,900	9,000
St. Johns	37,300	43,200	5,900
Columbia	27,500	30,000	2,500
Nassau	23,700	26,500	2,800
Suwannee	16,700	17,000	300
Bradford	15,400	16,600	1,200
Levy	14,300	16,100	1,800
Baker	11,600	14,000	2,400
Union	9,000	10,000	1,000
Hamilton	8,100	8,300	200
Dixie	6,000	6,600	600
Gilchrist	4,200	4,800	600
Lafayette	3,100	3,300	200
Total	957,000	1,103,600	146,600

Northwest Population			
County	1974	1980	1974-1980 Gain
Escambia	221,800	243,000	21,200
Leon	128,400	152,900	24,500
Okaloosa	98,100	111,700	13,600
Bay	86,700	95,200	8,500
Gadsden	39,100	40,500	1,400
Santa Rosa	46,000	52,200	6,200
Jackson	38,400	39,900	1,500
Walton	17,200	18,000	800
Taylor	14,300	14,900	600
Madison	14,200	14,600	400
Washington	13,200	15,900	2,700
Holmes	12,000	12,600	600
Gulf	10,600	11,200	600
Jefferson	9,200	9,600	400
Calhoun	7,900	8,200	300
Franklin	7,600	8,000	400
Wakulla	7,800	9,200	1,400
Liberty	3,800	4,000	200
Total	776,300	861,600	85,300
STATE TOTAL	**8,143,800**	**9,574,600**	**1,430,800**

Source: Division of Population Studies,
Bureau of Economic and Business Research
University of Florida, Gainesville, Florida

Appendix C

DISCUSSION OF PRIORITY CATEGORIES

INTRODUCTION

The next six sections are separate discussions of the six priority categories. The primary objective in each section is to assist EEL Program administrators in selecting from all the lands falling within the purview of a given category those that are the most valuable from the perspective of the EEL Program. Of course, the general considerations discussed in Chapter IV must also be applied in the selection process.

As stated earlier, it is unwise to precisely describe the locations of acquisition areas, because of the lack of eminent domain for this program and the real estate speculation rampant in Florida. Therefore, the discussions to follow will simply specify the types of land considered most valuable. These types of land shall have top priority within each category.

LANDS OF CRITICAL IMPORTANCE TO SUPPLIES OF FRESH WATER FOR DOMESTIC USE AND NATURAL SYSTEMS

Definition

In a modern civilization, water has many uses – drinking, washing, carrying and diluting sewage, industrial processes, cooling thermoelectric plants, irrigation, etc. Water withdrawn for use by the public – the first three uses above – is defined as domestic use. Water supplies for natural systems means simply the maintenance of historical water patterns in a given area. The supplies for both natural and man-made systems are in lakes, rivers and aquifers (see Table No. 2).

Importance

The quality and quantity of water supplies are of paramount importance to the associated man-made and natural systems. The amount, distribution, pattern of delivery and quality of water in an area are very important in determining both the type(s) of system that occurs in an area – whether, for instance, an area supports flatwoods, prairie or marsh – and the condition, or health, of the system(s), especially if it is a wetland or aquatic system. The same factors are vital to human life and endeavor.

Existing Protection

The importance placed upon having a dependable supply of potable water is reflected in the number of regulations and regulatory agencies – federal, state, regional and local – that are concerned with protecting public water supplies. There are, however, a few significant gaps in the protection of the overall water supply which are pertinent to the EEL Program. These are: (1) the general lack of regulatory protection for lands, such as freshwater marshes and swamps and good recharge areas, that have a direct or indirect effect on water availability and quality; and (2) the lack of planning and protection for the water needs of natural systems. It should be noted, however, that execution and enforcement of the provisions of the Flori-

da Water Resources Act of 1972 (see pages 29-30) could close these gaps.

Priority Lands

Lands directly or indirectly affecting water availability and quality may be divided into two classes: (1) those that affect ground water supplies; and (2) those that affect surface water supplies. The physical relationship between ground and surface water means that there is some overlap between the two classes; nevertheless, the division is convenient for discussion.

Lands Important to Ground Water Supplies

It is difficult to select out land areas that are especially valuable to ground water supplies. It is, of course, true that areas with high recharge rates contribute more water to ground water supplies than do areas with low recharge rates. The overall situation is more complicated than a simple consideration of recharge rates, however. Ground and surface waters throughout the state are properly considered as belonging to one vast, interrelated hydrologic system.

Three functions that relate to ground water availability can be described: (1) recharge, (2) storage, and (3) discharge (discharge is not necessarily to the surface in the immediate area; it may also involve lateral subsurface movement of ground water to distant points of discharge). It is obvious that areas with high recharge rates must be accompanied either by points of great discharge from the underlying aquifer or by a great and continuing increase in storage of water in the aquifer. The latter condition only occurs when an aquifer has been depleted, either through heavy withdrawals or because of a drought. Usually, therefore, high recharge is accompanied by high discharge, with little change in storage. The Florida Keys present an extreme example: recharge rates are very high, discharge to the surrounding salt water is very high, and there is very little storage. Thus, there is very little ground water in the Keys, despite the high recharge rates.

Another sort of example is provided by the major potentiometric highs of the state – the Green Swamp, Alachua-Putnam, Volusia and Pasco highs. These highs represent aquifers that have large volumes of water in storage, but generally little recharge or discharge. Despite their low recharge rates, they are valuable natural resources because of their large storage. Except where aquifer permeability is poor, withdrawals from these highs cause an increase in local recharge, which tends to maintain storage levels. In such cases, reasonable withdrawal does not significantly lower or deplete a potentiometric high.

Thus, it is difficult to prescribe the land areas that should be acquired on the basis of their importance to ground water supplies. It is possible, however, to list two kinds of areas that shall be considered important under the EEL Program: (1) recharge areas of demonstrated importance to public water supplies or to significant environmental systems; and (2) land above potentiometric highs, especially those with favorable permeability characteristics.

Table 2

SOURCES OF PUBLIC WATER SUPPLY FOR 138 FLORIDA MUNICIPALITIES, 1970 (TOTAL POPULATION 4,317,794)

Source	Pumpage (in million gallons per day)	As a % of total statewide use
Ground water (aquifers)		
Biscayne	305	42.0
Floridan	277	38.2
Sand and gravel	21	2.8
Shallow sand	20	2.8
Other	12	1.6
Total ground water	635	87.4
Surface water		
Rivers	55	7.6
Lakes	31	4.3
Reservoirs	4	0.6
Other	1	0.1
Total surface water	91	12.6
State total, all sources		
138 municipalities	726	
all municipalities	883	

Source: U.S. Geological Survey and the Florida Department of Natural Resources

Among all the lands considered in this program, what priority should areas important to ground water supplies have for acquisition? They are undeniably important in maintaining public water supplies and supplying certain environmental systems; however, there are several points to be made against the straightforward acquisition of these areas. One is the difficulty of delineating areas for acquisition on the basis of their recharge capability. The aquifer recharge map (Map No. 8) does delineate, in a general way, areas where considerable recharge to underlying aquifers probably occurs, but a time-consuming hydrological investigation is necessary to positively confirm this probability for a specific parcel of land. It is easier to delineate a potentiometric high, though a hydrological investigation is also required to establish the permeability of the aquifer. There are relatively few discrete parcels of land whose hydrology and geology are well enough known to justify acquisition on the basis of their importance to public water supplies or significant environmental systems.

To safeguard and maintain ground water supplies solely through acquisition of surface areas would entail the acquisition of very large areas of land. Theoretical calculations indicate, for instance, that a city of 100,000 people would require at least 15,000 acres of recharge area to maintain their ground water supplies. This calculation does not consider the needs of environmental systems or the need, if the city is on the coast, of retarding sea water encroachment. Consequently, this figure should be considered a minimum.

This brings up a final point—the necessity for acquisition. Acquisition is not necessary to preserve natural recharge. Farm lands, planted pine plantations, residential lawns and any other land that is not paved over or covered with buildings may serve as recharge areas. Considerable recharge takes place even in a Florida city, though not as much as occurred there before the city was built. Cities typically have large areas of impermeable surfaces and storm water drainage systems (storm sewers and sometimes canals), which combine to greatly increase runoff of rainfall and thereby greatly decrease recharge. Municipal drainage systems can, however, be designed so as to lessen this negative effect on recharge. Also, local comprehensive plans and regulations that take into account the need to preserve good recharge areas can substitute, at least partially, for acquisition. Regional water management districts are empowered to plan for, adopt regulations to insure, and, if necessary, acquire land in order to preserve the quantity and quality of ground water supplies. The EEL Program should act to preserve essential recharge areas and potentiometric highs only after efforts by local, regional and state water management agencies prove ineffective and only in accordance with local and regional water management plans.

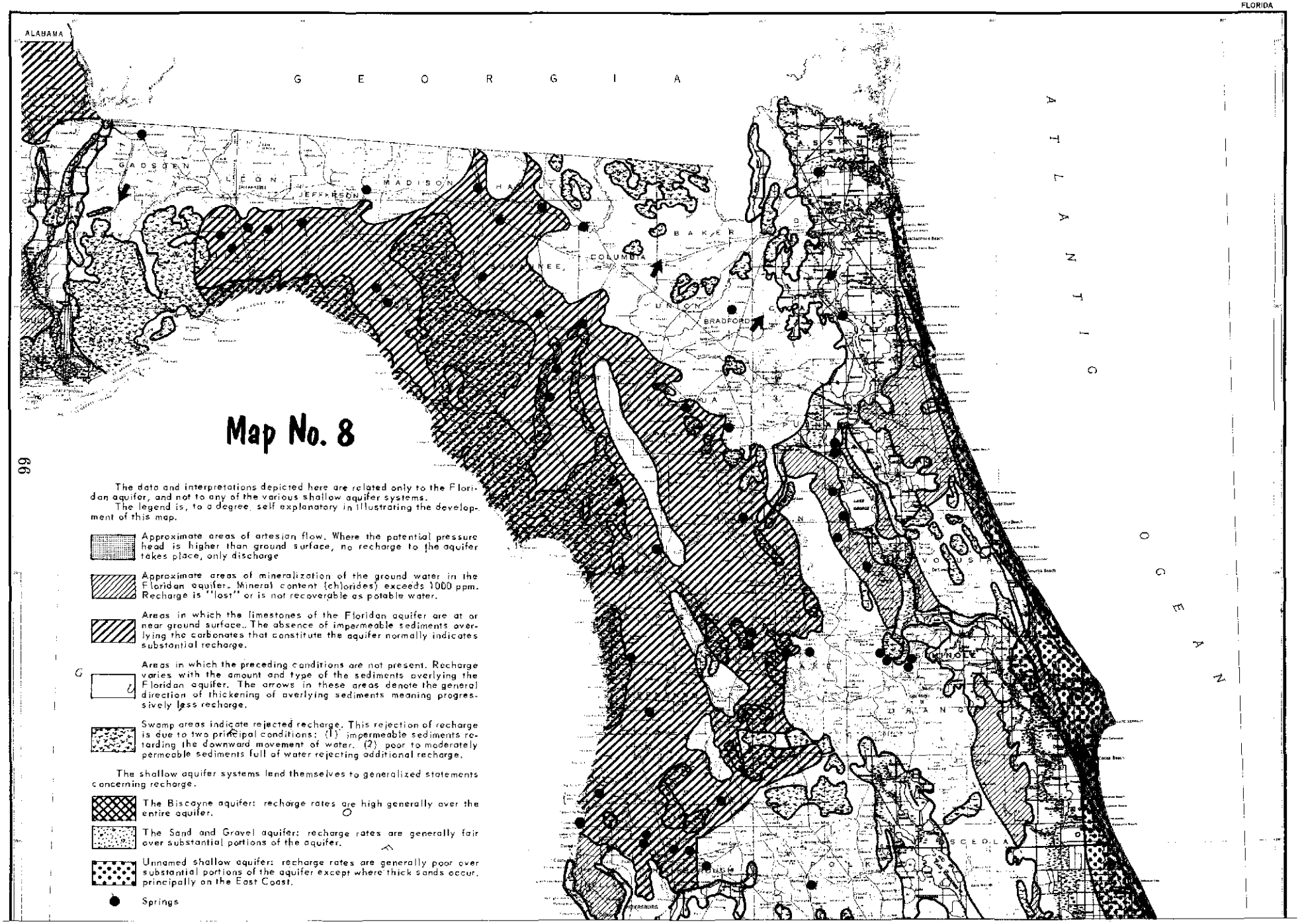
Lands Important to Surface Water Supplies

There are two basic and closely related aspects of surface water supplies: one is quality of water and the other is quantity of water. Protection of water quality has received more attention from lawmakers, partly because Florida (as a whole) has an abundance of water. Lately, however, the tremendous increase in domestic water consumption, caused by Florida's population growth, and the realization of the importance of water flow to wetland and aquatic ecosystems have directed attention to the maintenance of adequate quantities and flows of surface water.

The pertinent questions to ask about lands important to surface water supplies are: (1) what lands, if developed, would have the most effect upon surface waters, from both the quality and quantity standpoints; (2) what surface waters are most important; and (3) what lands, then, should receive priority for acquisition through the EEL Program.

A general answer to question (1) is that those lands most intimately associated with surface waters would, if developed without regard for natural systems, have the most damaging effects upon the quality and quantity of associated surface waters. These intimately associated lands are those that are covered by water continuously (submerged lands), daily (intertidal wetlands), or irregularly (floodplain and supra-tidal wetlands). Uplands, by way of rainwater runoff, also affect surface water supplies, but to a lesser degree than the aforementioned lands. Submerged lands and wetlands are important to surface waters not only because of the negative effects usually accompanying their development, but also because their vegetation contributes to water quality by absorbing pollutants.

A significant example pointing up the relationship between floodplain wetlands and public water



Map No. 8

The data and interpretations depicted here are related only to the Floridan aquifer, and not to any of the various shallow aquifer systems.

The legend is, to a degree, self explanatory in illustrating the development of this map.

Approximate areas of artesian flow. Where the potential pressure head is higher than ground surface, no recharge to the aquifer takes place, only discharge

Approximate areas of mineralization of the ground water in the Floridan aquifer. Mineral content (chlorides) exceeds 1000 ppm. Recharge is "lost" or is not recoverable as potable water.

Areas in which the limestones of the Floridan aquifer are at or near ground surface. The absence of impermeable sediments overlying the carbonates that constitute the aquifer normally indicates substantial recharge.

Areas in which the preceding conditions are not present. Recharge varies with the amount and type of the sediments overlying the Floridan aquifer. The arrows in these areas denote the general direction of thickening of overlying sediments meaning progressively less recharge.

Swamp areas indicate rejected recharge. This rejection of recharge is due to two principal conditions: (1) impermeable sediments retarding the downward movement of water. (2) poor to moderately permeable sediments full of water rejecting additional recharge.

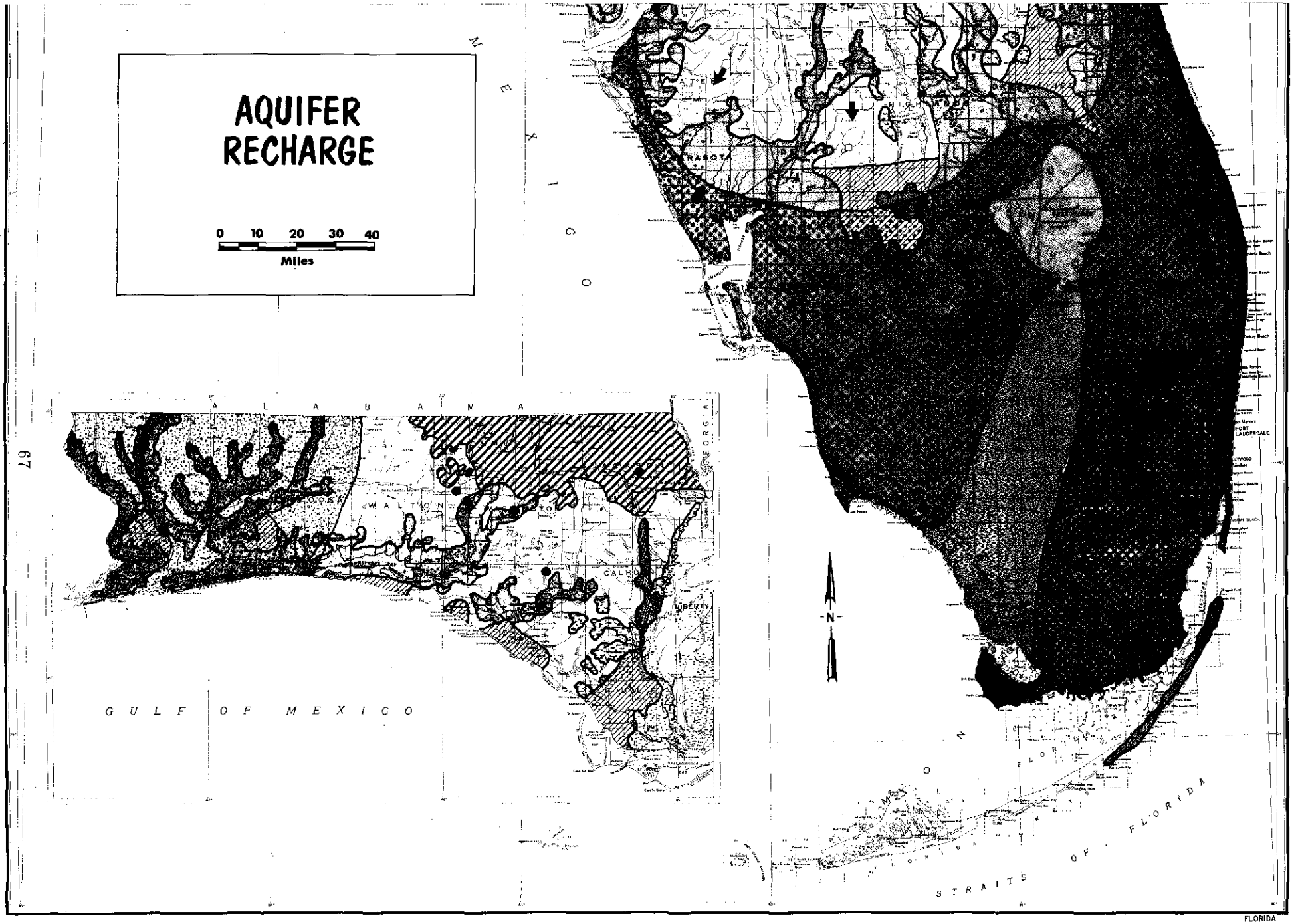
The shallow aquifer systems lend themselves to generalized statements concerning recharge.

The Biscayne aquifer: recharge rates are high generally over the entire aquifer.

The Sand and Gravel aquifer: recharge rates are generally fair over substantial portions of the aquifer.

Unnamed shallow aquifer: recharge rates are generally poor over substantial portions of the aquifer except where thick sands occur, principally on the East Coast.

Springs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67
FLORIDA

supplies is the effect of the channelization of the Kissimmee River on the water supply of south Florida. As a consequence of channelization, the area of river marsh was reduced from 45,000 acres to 8,000 acres, and the length of the river was greatly reduced. The resulting straight channel is much more efficient at moving water than the meandering natural river was. Rain falling in the northern end of the Kissimmee drainage basin now gets to Lake Okeechobee much faster and with a greater peak flow. The new configuration of the Kissimmee waterway has created three situations harmful to the water supply of south Florida: (a) channelization and the concomitant drainage have opened up the watershed to development, thus increasing the pollution load; (b) the great reduction of floodplain marsh and swamp has likewise greatly reduced the absorption of pollutants formerly carried on by those wetlands; and (c) pollutants reach Lake Okeechobee much faster than formerly. These situations may well result in an accelerated eutrophication of Lake Okeechobee with an associated decline in water quality. Lake Okeechobee water goes south, east and west in canals. Water in the canals recharges the shallow aquifers of south Florida and helps maintain a sufficient fresh water head to prevent sea water encroachment into aquifers. Thus, there is a connection between water quality in Lake Okeechobee and water quality in aquifers supplying south Florida communities. Water quality in Lake Okeechobee is, of course, also very important to the lake's associated wetland and aquatic ecosystmes. It is also important to natural systems further south. For example, the Everglades National Park receives, by law, a fixed minimum amount of water from a storage system that extends from the park's northern boundary to Lake Okeechobee.

Question (2), what surface waters are most important, is difficult to answer satisfactorily. Any list of important waters must, however, include these general classes of surface waters: (a) rivers and lakes used as municipal water supply sources (see Table No. 3); (b) lakes and rivers of good water quality which could serve as water supply sources in the future (see Table No. 4); and

Table 3

SURFACE WATER SOURCES AND FLORIDA MUNICIPALITIES SUPPLIED, 1970

Source	Municipality	Percent of total demand supplied
Deer Point Reservoir	Panama City	100
Chipola River	Port St. Joe	100
Quincy Creek	Quincy	90
Hillsborough River	Tampa	100
Lake Washington (St. Johns River)	Melbourne & Eau Gallie	100
Manatee River	Palmetto	100
Braden River	Bradenton	100
Lake Sierra	Lake Placid	100
Shell Creek	Punta Gorda	100
Lake Okeechobee	Belle Glade	100
	Clewiston	100
	Okeechobee	100
	Pahokee	100
Caloosahatchee River	Ft. Myers	30
	Ft. Myers suburbs	100
Lake Mangonia & Clear Lake	West Palm Beach, Palm Beach & South Palm Beach	100
Myakka-Hatchee River	North Port Charlotte	100
Fordham Waterway	Port Charlotte	92

Source: U.S. Geological Survey and Florida Department of Natural Resources

Table 4

WATER QUALITY CLASSIFICATIONS: FLORIDA DEPARTMENT OF POLLUTION CONTROL

A. Class I – Public Water Supply (these waters must meet the strictest criteria of water quality)

St. Johns River, lakes and tributaries (Brevard and Indian River Counties)
Quincy Creek (Gadsden County)
Holman Branch (Gadsden County)
Hillsborough River (Hillsborough County)
Cow House Creek (Hillsborough County)
Manatee River
Ainger Creek (Charlotte County)
Big Slough Canal (Sarasota County)
Myakka River
Horse Creek (Desoto County)
Prairie Creek (Desoto County and Charlotte County
Alligator Creek (Charlotte County)
Shell Creek (Charlotte County)
Caloosahatchee River
abandoned rock pit (Broward County)
M-Canal (Palm Beach County)
Lake Mangonia (Palm Beach County)
Clear Lake (Palm Beach County)
Canal C-18 (Palm Beach County)
Lake Okeechobee
Mosquito Creek (Gadsden County)
Econfina Creek (Washington County) and *Deer Point Impoundment*
Bayou George and Creek (Bay County)
Bear Creek (Bay County)
Big Cedar Creek (Bay County)

B. Class III, special listing (not public water supply, but these waters also must meet strict criteria of water quality)

Shoal River	Choctawhatchee River	Chipola River	St. Marks River
Yellow River	Chattahoochee River	Ochlockonee River	Wacissa River
Blackwater River	Apalachicola River	Wakulla River	Aucilla River
Perdido River			

C. In 1973, the Department released a tentative list of waters of naturally high and pure water quality; however, these waters must meet only the regular Class III criteria, unless they are also designated Class I or Class III special listing.

St. Marys River (Above highway 17)	Prairie Creek	Blackwater River	Wacissa River
Nassau River	Horse Creek	Juniper Creek	Aucilla River
Santa Fe River	Charlie Bowlegs Creek	Sweetwater Creek	Dunn's Creek (Putnam County)
St. Marks River	Myakka River	Big Cold Water Creek	Fisheating Creek
Wakulla River	Fakahatchee Strand	Yellow River	Loxahatchee River
Sopchoppy River	Cypress Creek	Suwannee River	Ichetucknee River
Rainbow River	Apalachicola River	Chipola River	Ochlockonee River
Shell Creek	Perdido River		

Source: Florida Department of Pollution Control

(c) large rivers and lakes and fresh water supplies to large estuaries, whose unaltered water quality and quantity are vital to their associated large – consequently significant – aquatic and wetland ecosystems (see Category B).

The answer to question (3), what lands should receive priority for acquisition, is not simply the combination of answers (1) and (2). Many lands that would be highly rated by such a combination are subject to strong regulatory protection. Protected lands include primarily those below mean or ordinary high water in tidal and navigable waters (see pages 23-25) and, to some extent, supra-tidal lands and lands below non-navigable waters (see pages 25-27). Full implementation of the Florida Water Resources Act of 1972 (pages 29-30) and the Federal Water Pollution Control Act (pages 25-27) would extend regulatory control over virtually all land development and management practices that can be shown to significantly affect the quality or quantity of Florida's surface waters. Though there are few lands important to surface waters which cannot be controlled under existing regulatory powers, real-life circumstances, as well as special environmental protection objectives, may indicate acquisition as the only effective measure.

Summary

In those instances where public acquisition of land is essential to the maintenance of fresh water supplies for domestic consumptive use or for significant natural resources, and where no other agency is able to protect those lands, the EEL Program shall give such land high priority for acquisition. There are, however, few lands known to meet those two criteria. Application and enforcement of existing regulatory powers – federal, state, regional or local – are sufficient in most cases to protect vital water resources.

FRESHWATER AND SALTWATER WETLANDS

Definition

Wetlands are natural communities occurring in areas where the soil is usually saturated or covered with surface water for one or more months of each year. Wetlands include scrub cypress forests, wet prairies, freshwater marshes, hardwood swamps, cypress swamps, salt marshes and mangrove swamps (see Map No. 9, Wetlands). Shallow submerged lands are also included in this priority category though they are considered separately from wetlands in Appendix D. Swamps are characterized by woody vegetation (trees and shrubs) and marshes by herbaceous vegetation (grasses, sedges, rushes and broad-leaved hydrophytes). In fresh water, swamps are typically correlated with sites subject to fluctuating water level, and marshes with sites having stable water levels (marshes in some Florida rivers are exceptions to this generalization).

Another division of wetlands is by flow-through of water, a functional distinction since flow-through relates directly to turnover of nutrients and wastes in the natural system. Low (intertidal) salt marshes and low, or fringing, mangrove swamps are regularly flooded once or twice a day, depending on their geographical location. Higher salt marshes and mangrove swamps receive only an irregular flow-through from above average tides. River floodplain swamps and marshes receive an irregular flow-through from flooding rivers.

Importance

From the standpoint of benefit to society, wetlands are probably Florida's most valuable natural systems. A recent report, "The Value of the Tidal Marsh" by Gosselink, Odum, and Pope, placed the value of regularly flooded salt marsh as high as $4,150 per acre per year. This was done by applying a conversion factor to the marsh's production of biological material (plants and animals). Not only are wetlands biologically productive, but they also serve as habitat for fish and wildlife; as nursery areas for finfish, shellfish and crustaceans; as buffers against waves, storms and floods; and as filtration systems that absorb nutrients and pollutants from the water, thereby purifying the water and, if the wetland is on the coast, preventing the loss of nutrients to the open sea.

Existing Protection

As with the other priority categories, the first step in selecting from all the wetlands those best

qualified for acquisition under the EEL Program is to remove from consideration all lands that are adequately protected under existing laws and regulations. Wetlands in public ownership (the strongest form of protection) include state and national parks, forests, etc. (see Map No. 17, Public Lands), and state sovereignty lands. Since 1900, however, Florida has sold to private parties 475,000 acres of its sovereignty lands under tidal or navigable waters. Therefore, it cannot be assumed that all land below mean high water belongs to the State.

State and federal regulatory powers provide a secondary means of protection. With proper enforcement these powers can be quite effective; unfortunately, they cannot always be relied upon to protect the environmental values of a given wetland. For every parcel of land considered for acquisition, decision-making bodies within the EEL Program shall exercise their best judgment as to the likelihood that exercise of existing regulatory powers will achieve the desired environmental protection purposes.

Priority Lands

At the outset, it should be realized that it is not the type of wetland (unless it is rare – see next priority category) but the environmental values present in a wetland that are of prime importance. It is true that each type of wetland has a characteristic set of environmental values; yet, sufficient variation occurs in that relationship to make unsuitable the straightforward prescription, at this point, of a priority list of types of wetlands. It is first necessary to develop a list of important environmental values possessed by wetlands. Second, the wetlands that best express the separate values are specified. The information from steps one and two is then combined in a summary that lists, in a general way, the types of wetlands most valuable to Florida and most deserving of acquisition.

A list of important wetland functions, with estimates of economic value, is provided by the report ("The Value of the Tidal Marsh") mentioned earlier. Salt marsh functions were ranked in the following order of decreasing value:

(1) Total productivity, or life support value

(2) Potential for waste treatment

(3) Potential for aquaculture

(4) Commercial and sport fishing, and hunting

For other functions of the salt marsh – storm and wave buffering, providing wildlife habitat – a dollar valuation has yet to be calculated.

This list is also applicable to other wetland systems, though the order of functions may vary according to the system. The important points about the list are:

(1) The other values on the list are all dependent on the first value, productivity;

(2) The potential of certain wetlands for waste treatment or for aquaculture (finfish, shellfish or crustacean farms) is great; and

(3) All of these functions cannot be maximized at any one time in any one marsh because they would interfere with each other; e.g., a marsh used as a waste treatment facility probably could not also serve as an oyster farm.

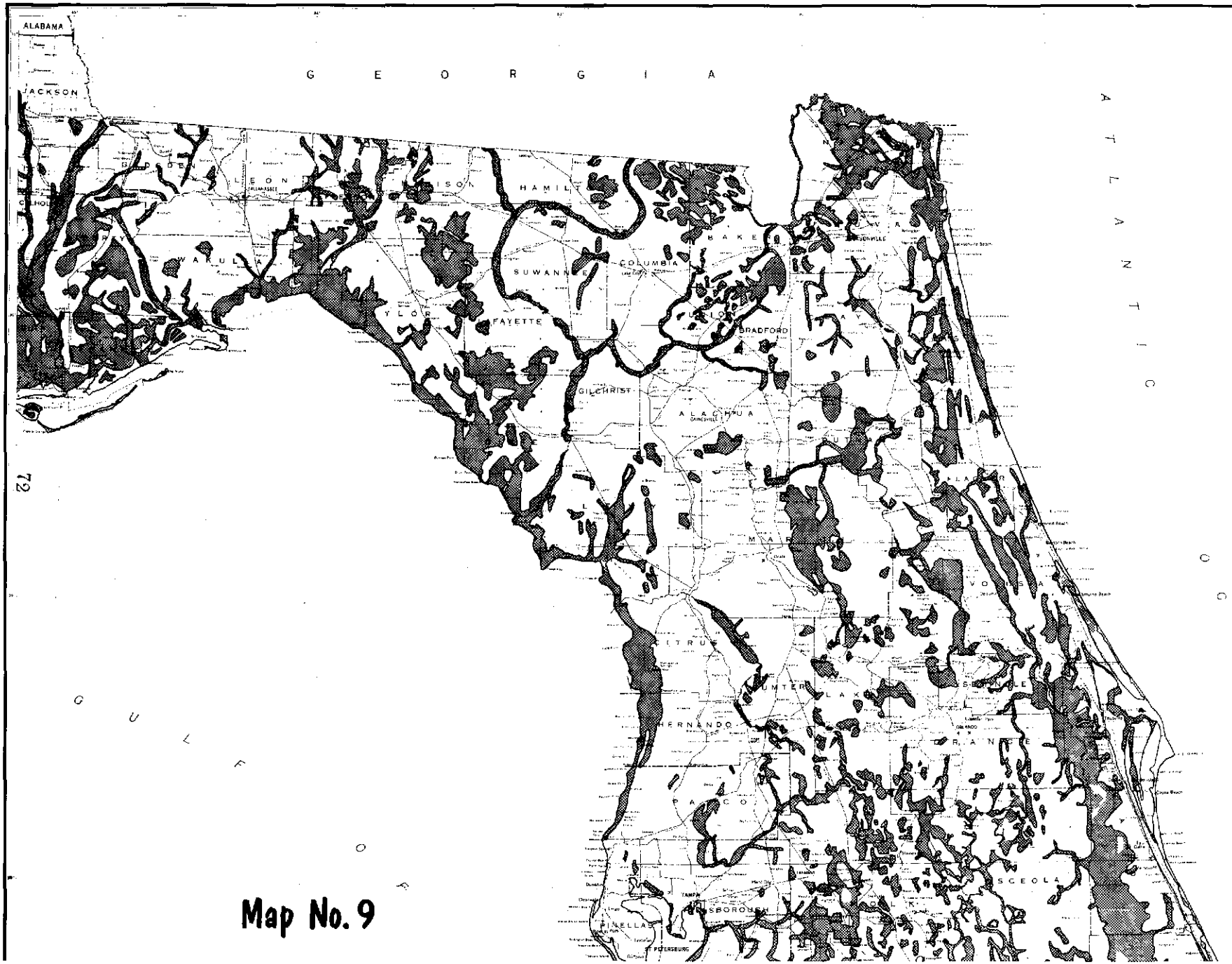
Productivity is generally the most important function of wetlands and is discussed first. Because of the variation among wetlands, their other functions are discussed separately but not assigned a relative importance.

Productivity

In terms of yearly growth of biological material, certain of Florida's wetlands are among the most productive lands in the world. Productivity is the result of many different factors whose relationships are complex and not well enough understood to be able to predict the location of the most productive wetlands around the state.

Three factors are known to be particularly important:

(1) Water quality should be good, especially the maintenance of an adequate level of dissolved oxygen. The presence or introduction of large amounts of decaying organic material – raw sewage, for example – lowers the level of dissolved oxygen. The Florida Department of Pollution Control has classified Florida's inland and coastal waters according to several parameters of water quality, including dissolved oxygen level. Classes I, II and III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BRADFORD
GILCHRIST
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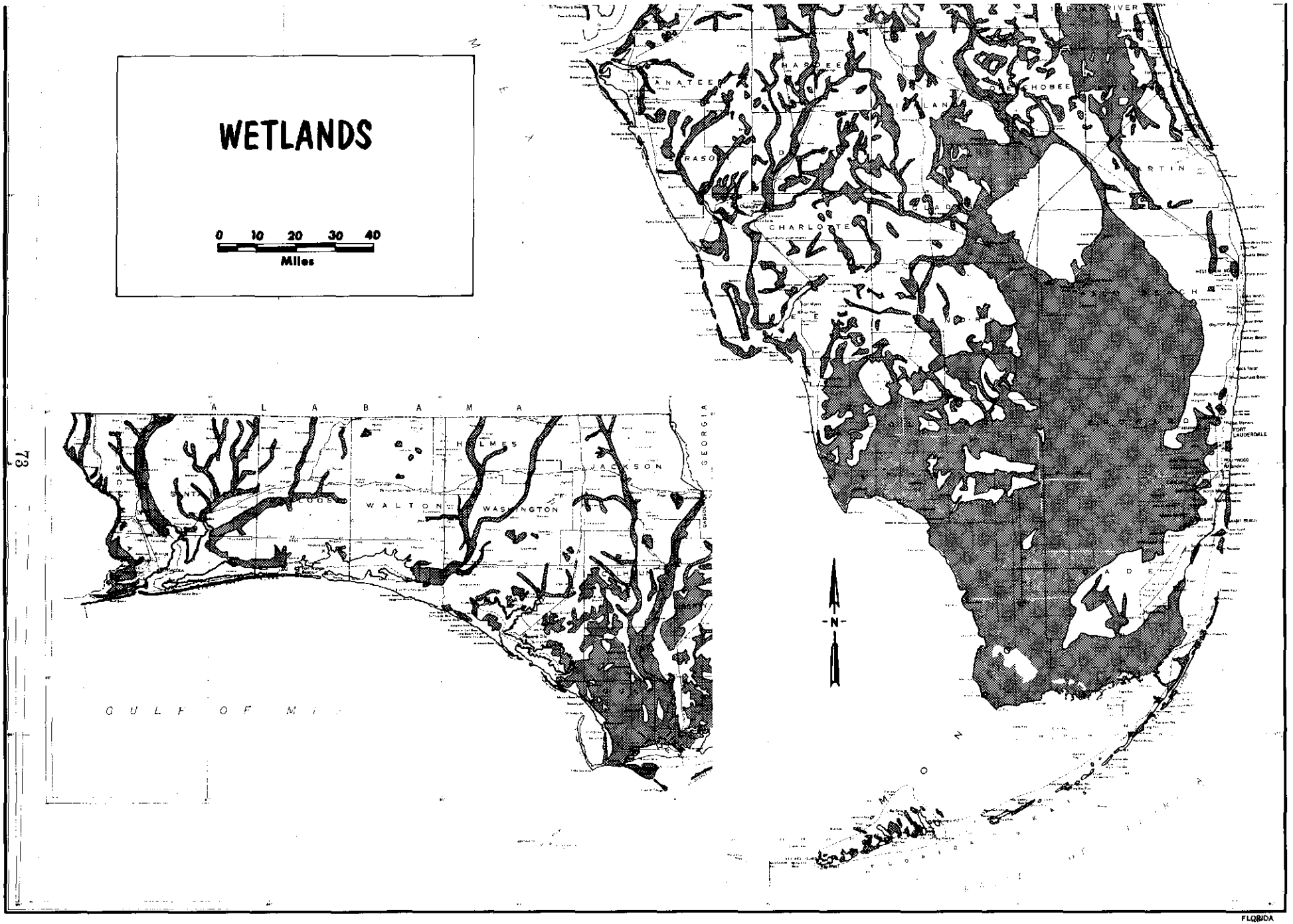
Map No. 9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designate waters of good quality; Classes IV and V designate waters of lower quality (see Map No. 10, Water Quality of Coastal and Inland Waters, and Table No. 3). The EEL Program shall give priority among wetlands to those adjacent to Class I, II and III waters. The Program shall not acquire wetlands adjacent to Class IV and V waters, except under extenuating circumstances. The Florida Department of Health and Rehabilitative Services certifies and maps those coastal waters that are approved for commercial shellfishing (see Map No. 11, Commercial Shellfishing Zones). Because of the Department's intolerance of wastes, especially fecal, when certifying commercial shellfishing zones, the approved areas represent high quality water. The Department's listing of approved areas is not, however, a comprehensive guide to pure coastal waters, because it contains only waters with marketable shellfish. Bearing this limitation in mind, the EEL Program shall give priority among coastal wetlands to those adjacent to approved commercial shellfishing waters.

(2) As a rule, wetlands that are frequently flushed by water are more productive than ones that are not. The flushing brings in nutrients and takes out detritus and other wastes. The detritus, in turn, fuels adjacent aquatic ecosystems. Frequently flushed systems include salt marsh, fringing mangrove swamps, and freshwater swamps and marshes along rivers, sloughs, and lakes subject to frequent fluctuation of water level. Infrequently flushed wetlands that occupy a large area, such as the floodplain swamps of the Apalachicola River, provide valuable detrital inputs to adjacent aquatic ecosystems during floods or above average tides.

(3) The substrate upon which the wetland community grows is also thought to be a determinant of productivity. The relationship of substrate to productivity is much better known for upland areas, however, than it is for wetlands. Information available on productivity in freshwater swamps suggests this order of productivity: 1 – black river bottom silts; 2 – muck swamps; 3 – red river bottom clays; 4 – bottom lands of loams, sandy loams, and sands; and 5 – sandy branch bottoms. An increased depth of soil also seems to favor productivity.

Productivity in itself is not always valuable. Water hyacinth, Brazilian elodea, and other exotic aquatic weeds grow vigorously in many of Florida's fresh waters; however, their production is not well utilized by natural systems or man and is often undesirable in eutrophic bodies of water. Other information relating to productivity is found in the next discussion.

Habitat for fish and wildlife

The high productivity of many wetland systems is responsible for the large numbers of animals that forage, breed, mature and live in these systems and the adjacent waters. In addition, there are several pieces of information relating to the habitat value of wetland systems and adjacent waters, as follows:

(1) Estuaries with a salt concentration maintained between ten and thirty parts per thousand parts of water are most efficient for finfish, shellfish and crustacean production. The optimum salinity varies, of course, for different estuaries and different species. Oysters, for example, do best in salinities of ten to twenty-two parts per thousand.

(2) The only meaningful statewide data on productivity of wetlands and their adjacent waters are the figures compiled by the Florida Department of Natural Resources in cooperation with the National Marine Fisheries Service on the annual commercial catches of finfish, shellfish and crustaceans from specific bodies of water (coastal and inland) and from offshore zones (see Map No. 12, Value of the Commercial Fishery in Florida Waters). These figures relate directly to the productivity of the wetland communities adjacent to and contiguous with the bodies of water. The relation is less direct the further removed the wetland community is from the

body of water, but it still exists – even for offshore waters. Indeed, the National Marine Fisheries Service has recently estimated that 85 percent of the total marine catch in south Florida is dependent on the estuaries there. In 1972 (the latest year for which complete data are available), the top five bodies of water, in terms of value of catch at dockside, were Lake George, Apalachicola Bay, Indian River, Pine Island Sound and Biscayne Bay. Some productive areas do not show well in these figures, perhaps because they are too shallow for commercial fishing, or their production is reflected in the catch from the adjacent offshore zone, or they are underfished.

(3) The Florida Game and Fresh Water Fish Commission recently completed a qualitative survey of the wildlife values of Florida's plant communities. For each of the major watersheds in the state the Commission estimated the wildlife value, scarcity within the watershed, and endangerment of the different plant communities. Then they established, for each watershed, a priority ranking of plant communities indicating those most deserving of protection (see Table No. 5, Priority Natural Communities).

In addition to the survey, the Commission developed a list of some of the outstanding wildlife areas in the state (Map No. 14). Most of these areas contain wetlands.

(4) A study completed by the U.S. Fish and Wildlife Service in 1954 (no similar study has been done since then) identified the following as the best waterfowl areas in Florida (not in order of rank):

(a) Lakes and marshes of the Tallahassee Hills

(b) Coastal marshes near St. Marks

(c) Levy Prairie region east of Gainesville

(d) Freshwater marshes of the St. Johns River

(e) Freshwater marshes of the Kissimmee River

(f) North and west shores of Lake Okeechobee

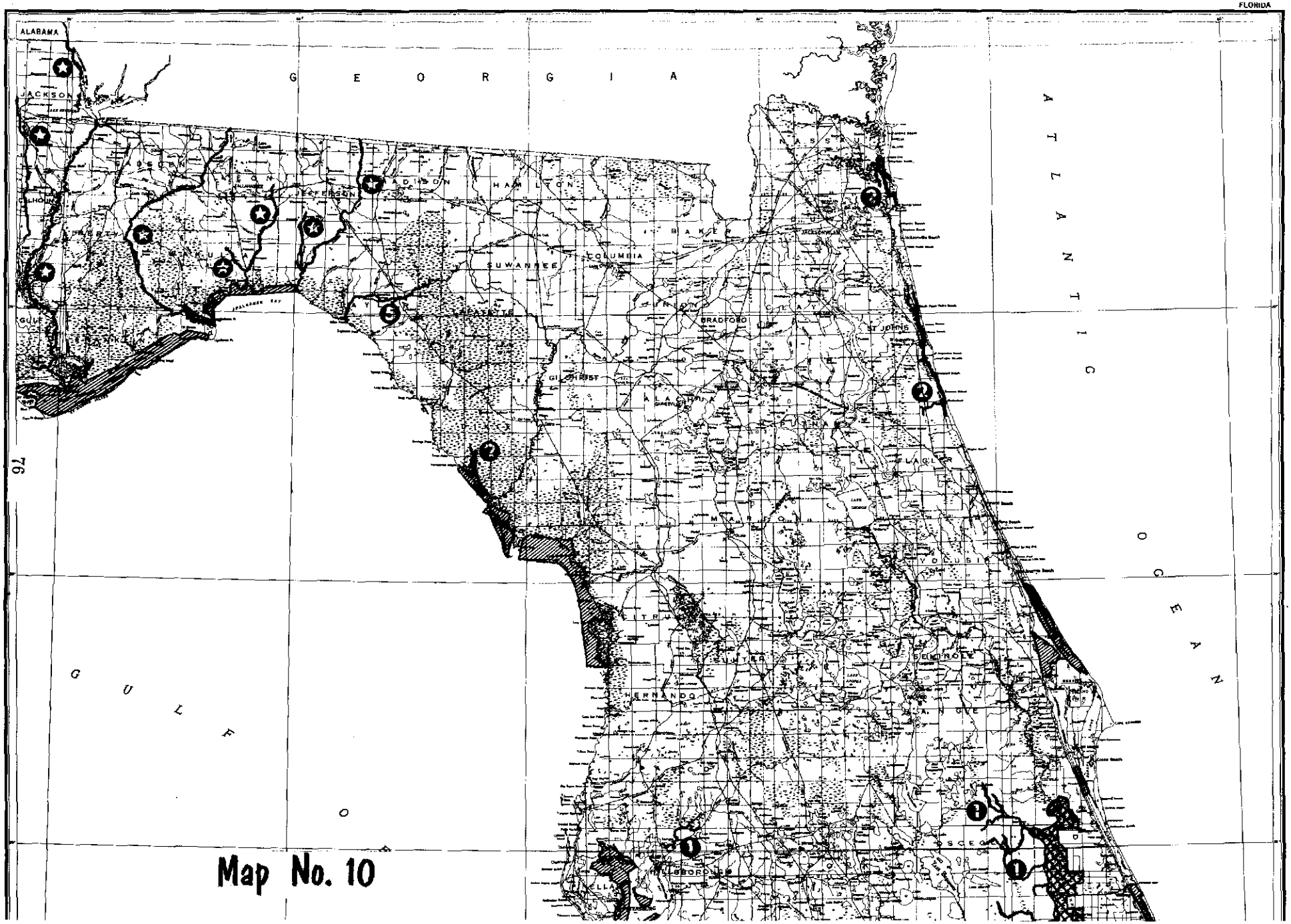
(g) St. Martin's Keys

(h) Indian River Lagoon and other shallow widgeongrass shoals on both coasts

The report suggested that the shallow widgeongrass shoals were probably the most valuable wetlands habitat in the state from an overall fish and wildlife standpoint. Since its channelization, of course, the Kissimmee River's considerable waterfowl population has virtually disappeared. Other changes have probably occurred in the twenty years since the report appeared; unfortunately, Florida has no program for monitoring the effects of changes in natural systems.

(5) A few other factors are important to the wildlife value of wetlands. Wetlands with a diversity of vegetation usually support a greater variety of wildlife than wetlands dominated by one or two species of plants. This is because the interfaces, or ecotones, between different types of vegetation usually harbor a greater diversity and abundance of wildlife than do any of the vegetative types themselves (this is also true for upland communities).

Wetlands are transition zones between uplands and bodies of water. To maximize the value of a wetland, it is necessary that the adjacent upland and the adjacent body of water be in a healthy condition. Otherwise, the normal relationship and contribution of a wetland to adjacent natural systems is lessened. In such a case, even a wetland in good condition would not have its full environmental value because of the lessening of this contribution. This line of reasoning also places more value on wetlands that have a stronger relationship with other natural systems. Thus a swamp along a river has a relationship to adjacent uplands and to downstream systems, whereas a pond swamp has basically only a relationship with adjacent uplands.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HAMILTON
SUWANNEE
COLUMBIA
BAKER
UNION
BRADFORD
ST JOHNS
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HERNANDO
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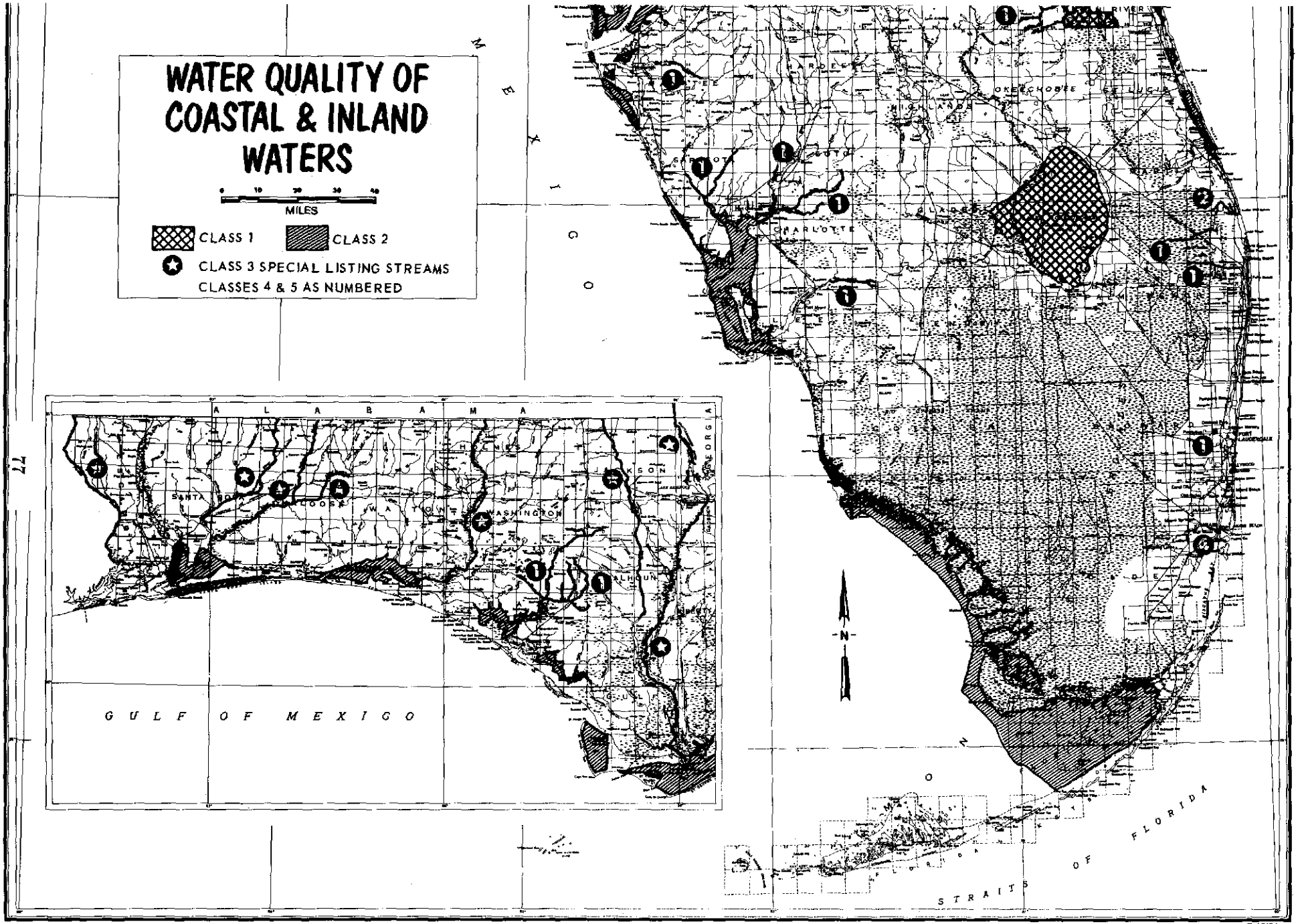
Map No. 10


WATER QUALITY OF COASTAL & INLAND WATERS
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CLASS 2
CLASS 3 SPECIAL LISTING STREAMS
CLASSES 4 & 5 AS NUMBERED
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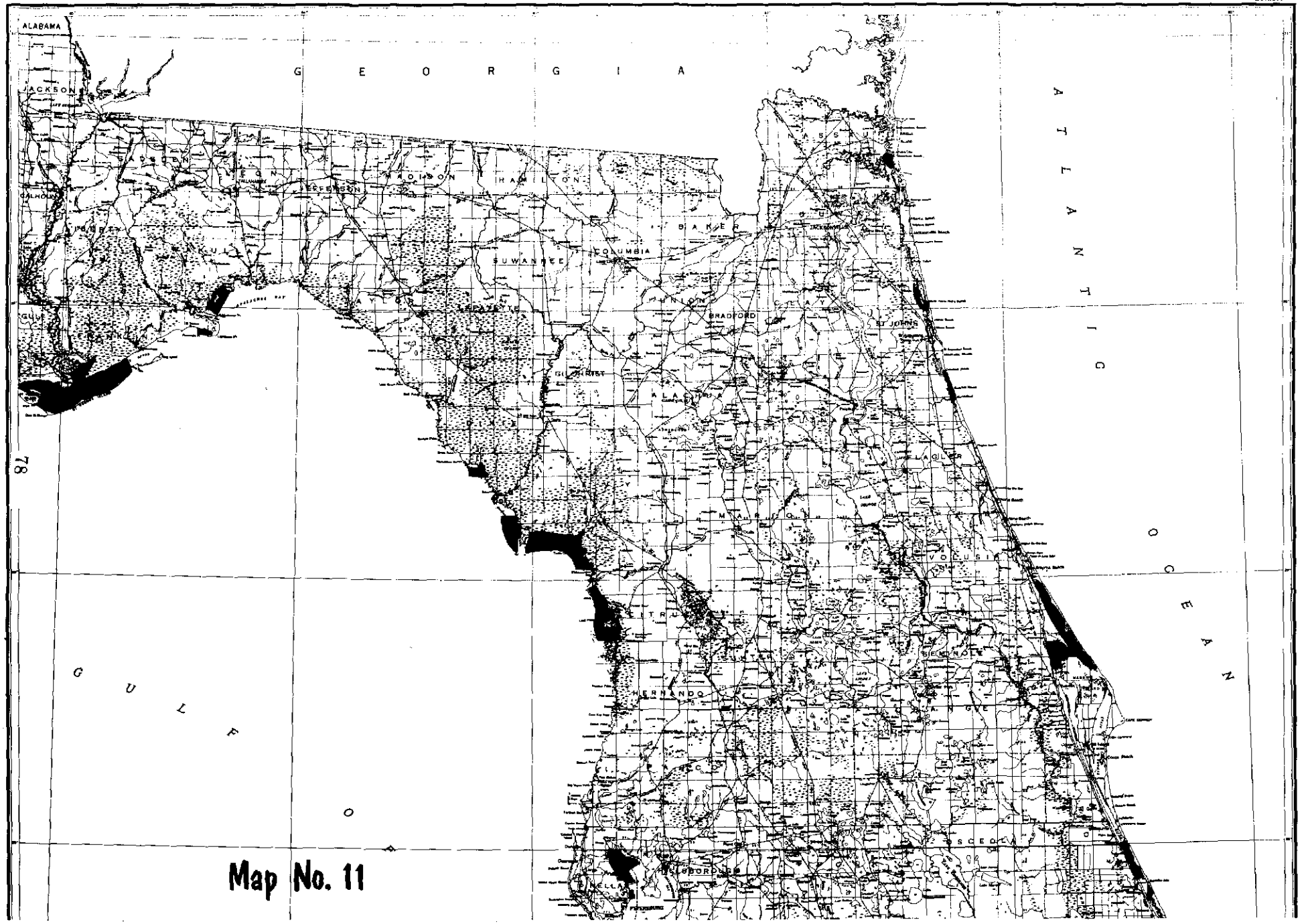
ALABAMA
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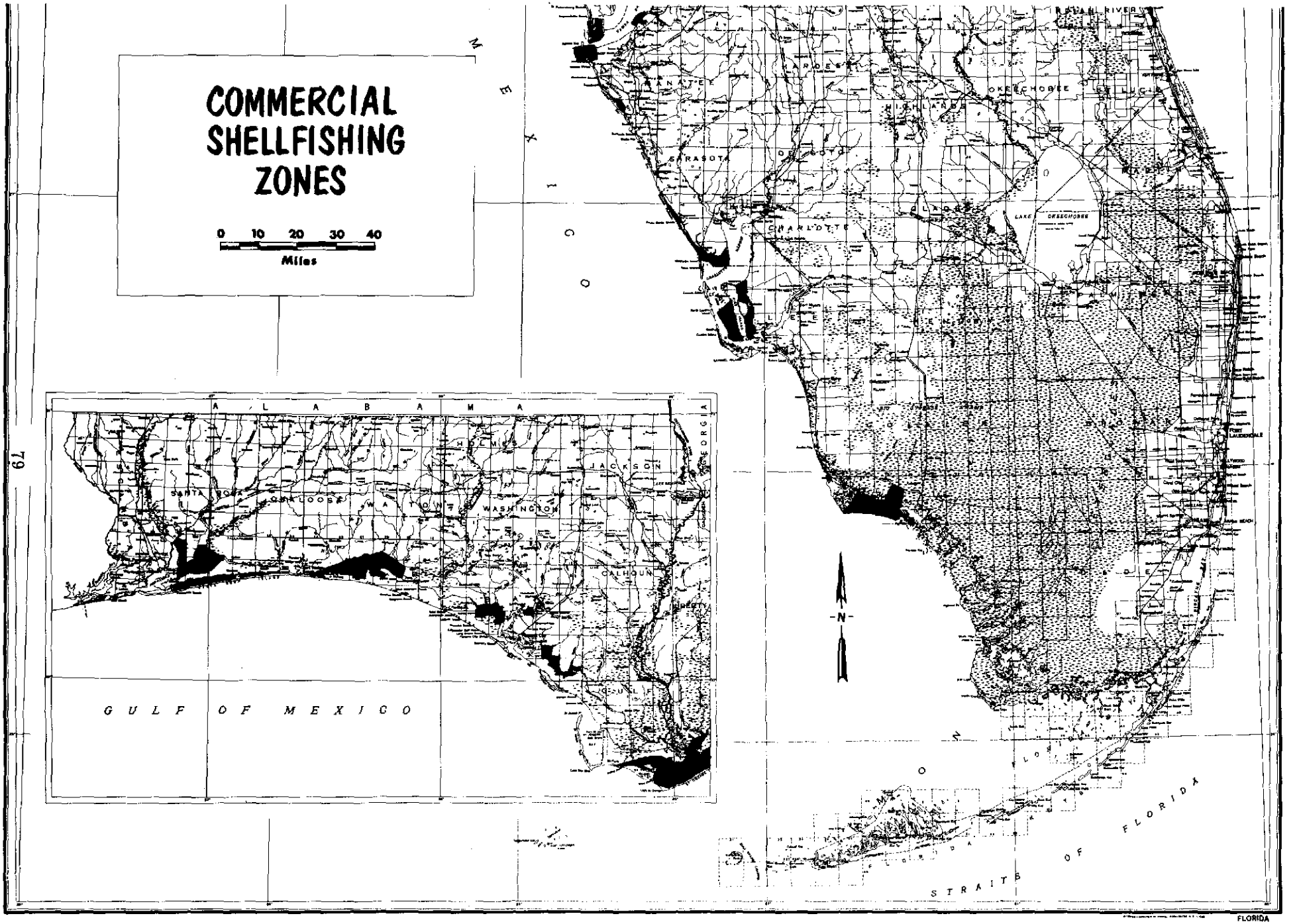
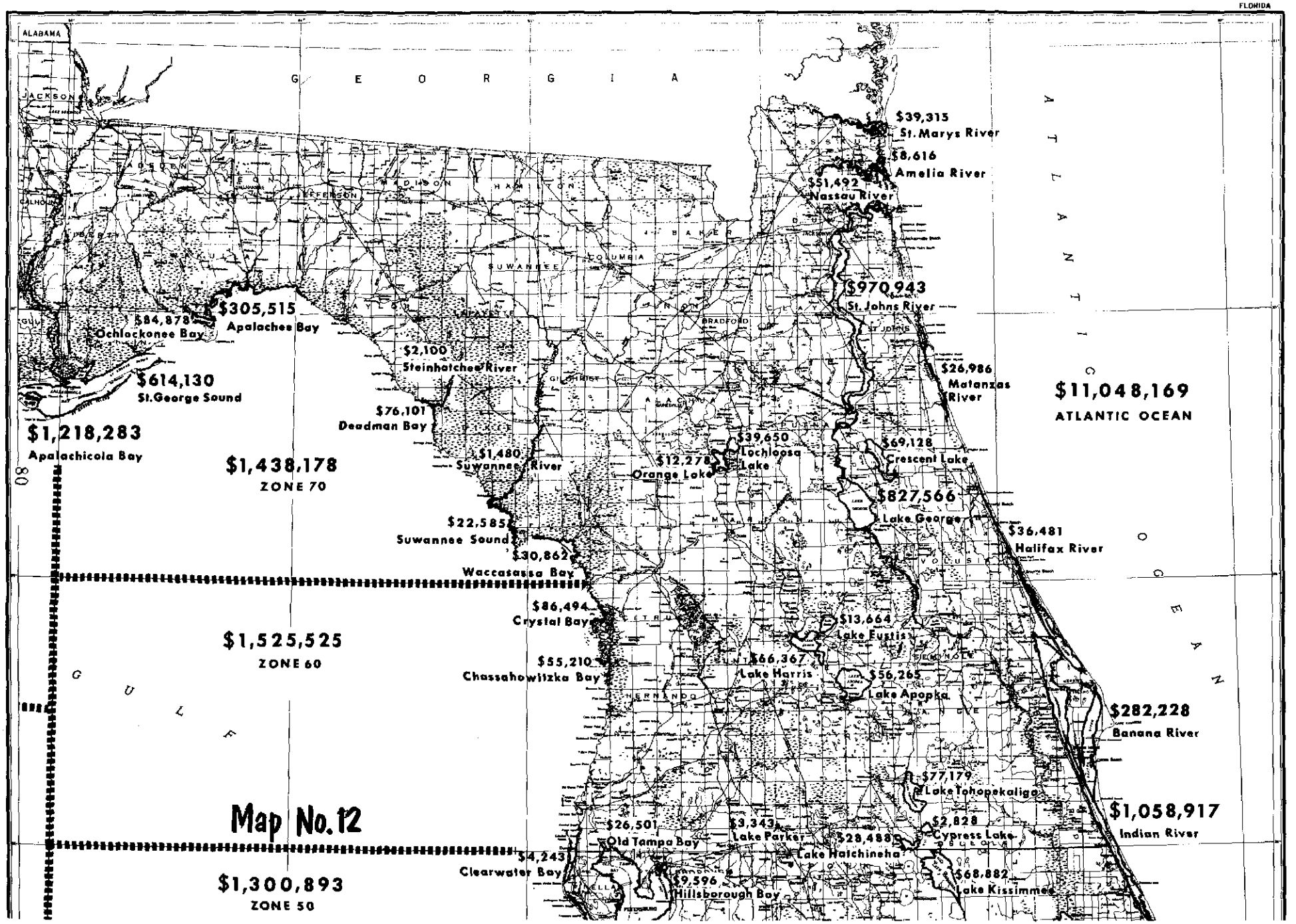
ATLANTIC OCEAN
GULF OF MEXICO
JACKSON
CALHOUN
GULF
FRANKLIN
LIBERTY
HAMILTON
SUWANNEE
COLUMBIA
BAKER
NASSAU
DUVAL
ST JOHNS
BRADFORD
GILCHRIST
ALACHUA
LAFAYETTE
MARION
VOLUSIA
SEMINOLE
ORANGE
HERNANDO
PASCO
HILLSBOROUGH
82
28

Map No. 11


COMMERCIAL
SHELLFISHING
ZONES
0 10 20 30 40
Miles
M E X I C O
G U L F O F M E X I C O
A L A B A M A
SANTA ROSA
OKALOOSA
WALTON
WASHINGTON
JACKSON
CALHOUN
GULF
GEORGIA
MANATEE
SARASOTA
CHARLOTTE
LAKE OKEECHOBEE
HIGHLANDS
GLADES
HENDRY
COLLIER
MONROE
DADE
BROWARD
PALM BEACH
FLORIDA BAY
S T R A I T S O F F L O R I D A
N
79
FLORIDA


ALABAMA
GEORGIA
ATLANTIC OCEAN
GULF
$39,315
St. Marys River
$8,616
Amelia River
$51,492
Nassau River
$970,943
St. Johns River
$26,986
Matanzas River
$11,048,169
ATLANTIC OCEAN
$305,515
Apalachee Bay
$84,878
Ochlockonee Bay
$2,100
Steinhatchee River
$614,130
St. George Sound
$76,101
Deadman Bay
$1,218,283
Apalachicola Bay
$1,480
Suwannee River
$1,438,178
ZONE 70
$12,278
Orange Lake
$39,650
Lochloosa Lake
$69,128
Crescent Lake
$827,566
Lake George
$36,481
Halifax River
$22,585
Suwannee Sound
$30,862
Waccasassa Bay
$86,494
Crystal Bay
$1,525,525
ZONE 60
$13,664
Lake Eustis
$55,210
Chassahowitzka Bay
$66,367
Lake Harris
$56,265
Lake Apopka
$282,228
Banana River
$77,179
Lake Tohopekaliga
$1,058,917
Indian River
$26,501
Old Tampa Bay
$3,343
Lake Parker
$28,488
Lake Hatchineha
$2,828
Cypress Lake
$4,243
Clearwater Bay
$9,596
Hillsborough Bay
$68,882
Lake Kissimmee
$1,300,893
ZONE 50
Map No. 12

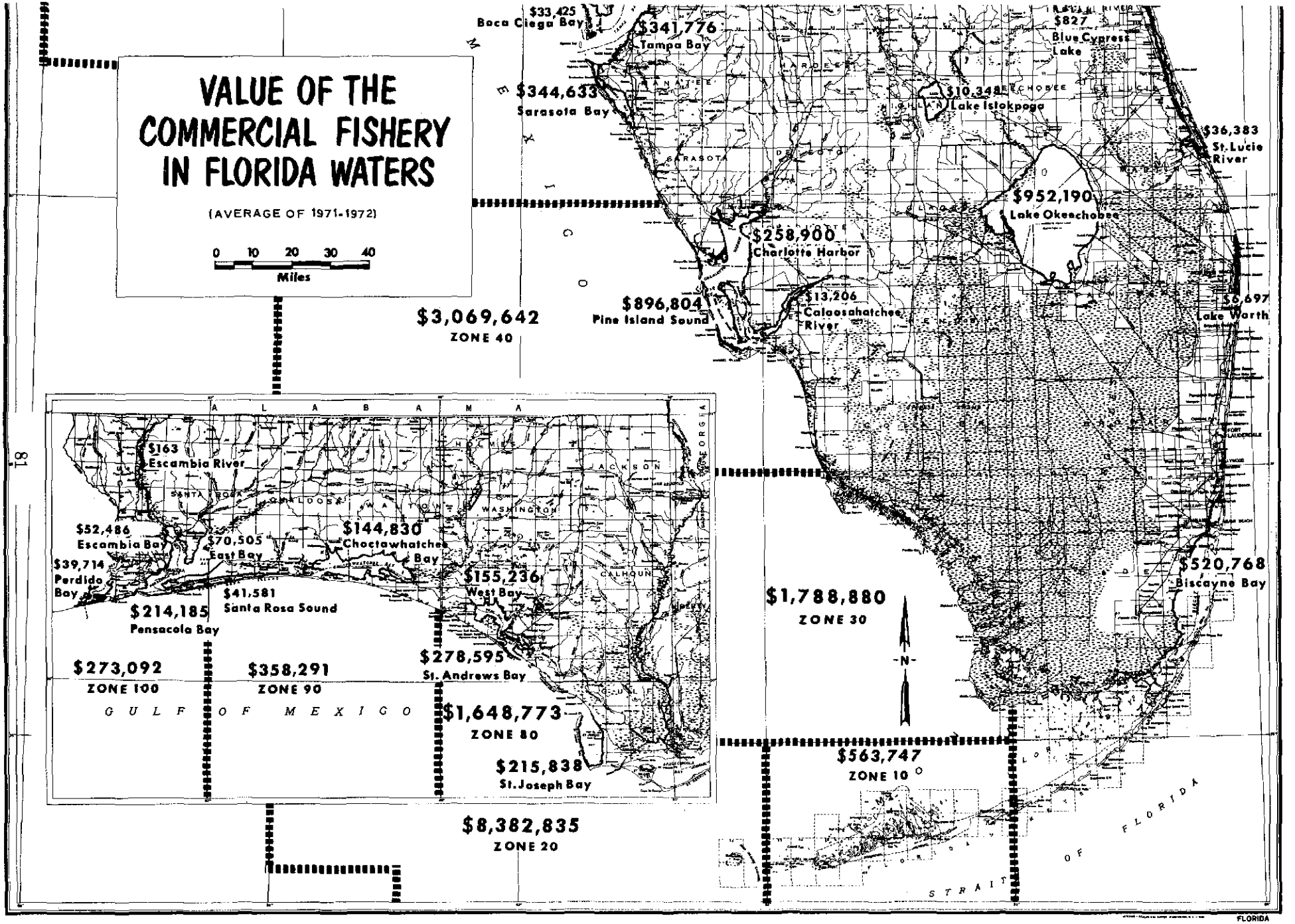

VALUE OF THE COMMERCIAL FISHERY IN FLORIDA WATERS
(AVERAGE OF 1971-1972)
0 10 20 30 40
Miles
$33,425
Boca Ciega Bay
$341,776
Tampa Bay
$344,633
Sarasota Bay
$827
Blue Cypress Lake
$10,348
Lake Istokpoga
$36,383
St. Lucie River
$952,190
Lake Okeechobee
$258,900
Charlotte Harbor
$13,206
Caloosahatchee River
$896,804
Pine Island Sound
$6,697
Lake Worth
$3,069,642
ZONE 40
$520,768
Biscayne Bay
$1,788,880
ZONE 30
$563,747
ZONE 10
$163
Escambia River
$52,486
Escambia Bay
$70,505
East Bay
$144,830
Choctawhatchee Bay
$39,714
Perdido Bay
$155,236
West Bay
$41,581
Santa Rosa Sound
$214,185
Pensacola Bay
$273,092
ZONE 100
$358,291
ZONE 90
$278,595
St. Andrews Bay
$1,648,773
ZONE 80
$215,838
St. Joseph Bay
$8,382,835
ZONE 20
GULF OF MEXICO
STRAIT OF FLORIDA
FLORIDA

Table 5

PRIORITY NATURAL COMMUNITIES

Watershed	1st Priority Community	2nd Priority Community
Panhandle	*swamp forest* mixed hardwood-pine	*freshwater marsh*
Big Bend	mixed hardwood-pine hardwood hammock	*freshwater marsh* sandhills
Suwannee- Waccasassa	*swamp forest* hardwood hammock	sand pine scrub sandhills
St. Johns River	*wet prairie* *freshwater marsh*	*cypress swamp* *swamp forest* hardwood hammock
Peace, Withlacoochee, Hillsborough Rivers	*cypress swamp* *swamp forest* *wet prairie* hardwood hammock	*freshwater marsh* sandhills dry prairie
Kissimmee River	*wet prairie* dry prairie sand pine scrub	*swamp forest* *freshwater marsh* sandhills
Caloosahatchee River	*swamp forest* *wet prairie* dry prairie	*cypress swamp* *freshwater marsh* hardwood hammock
Big Cypress	*cypress swamp* *swamp forest*	*freshwater marsh* tropical hammock sand pine scrub
Everglades	*freshwater marsh* tropical hammock	*cypress swamp* *swamp forest* *wet prairie*
Florida Keys	tropical hammock	

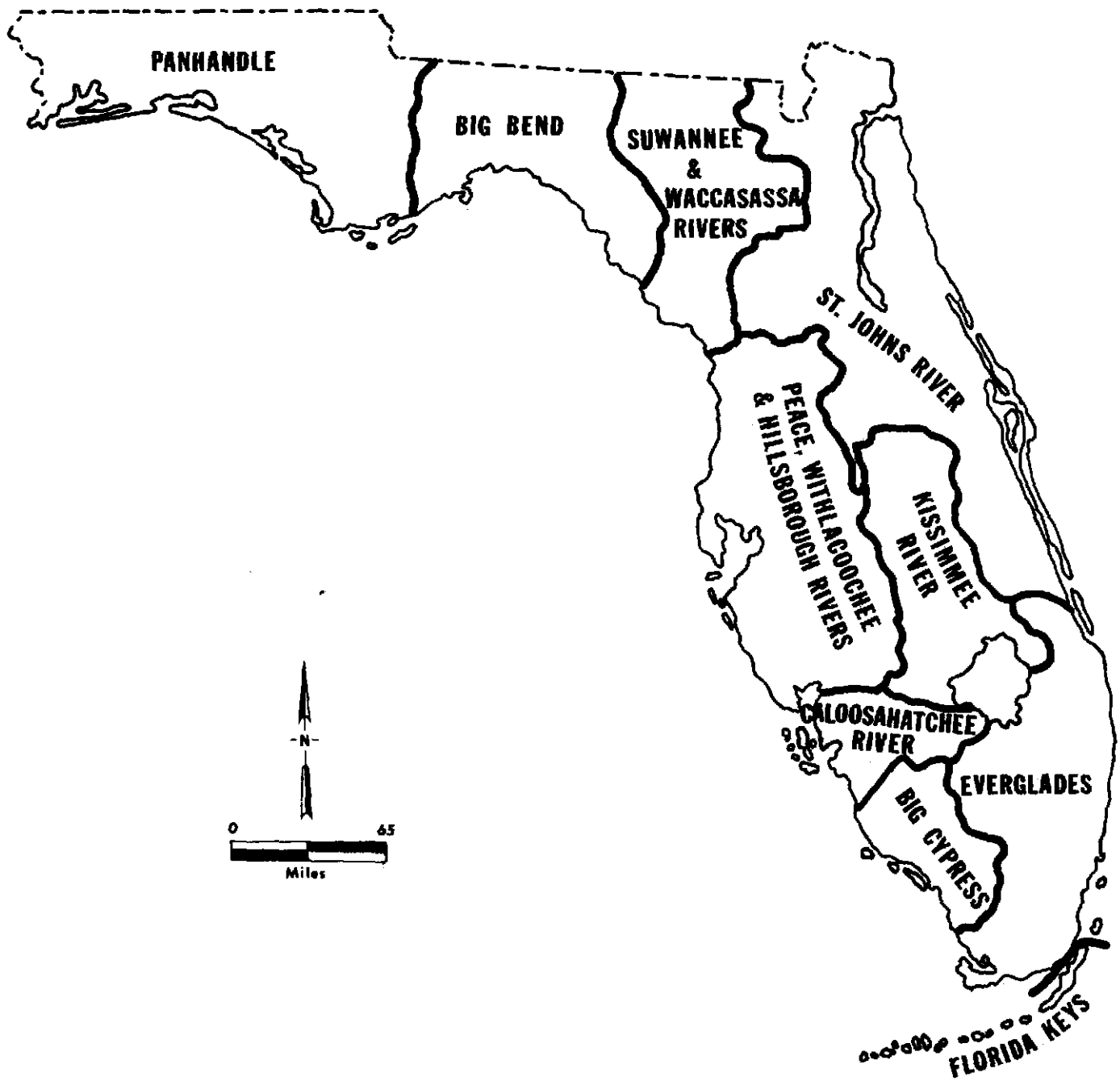
(Wetlands are in italics)

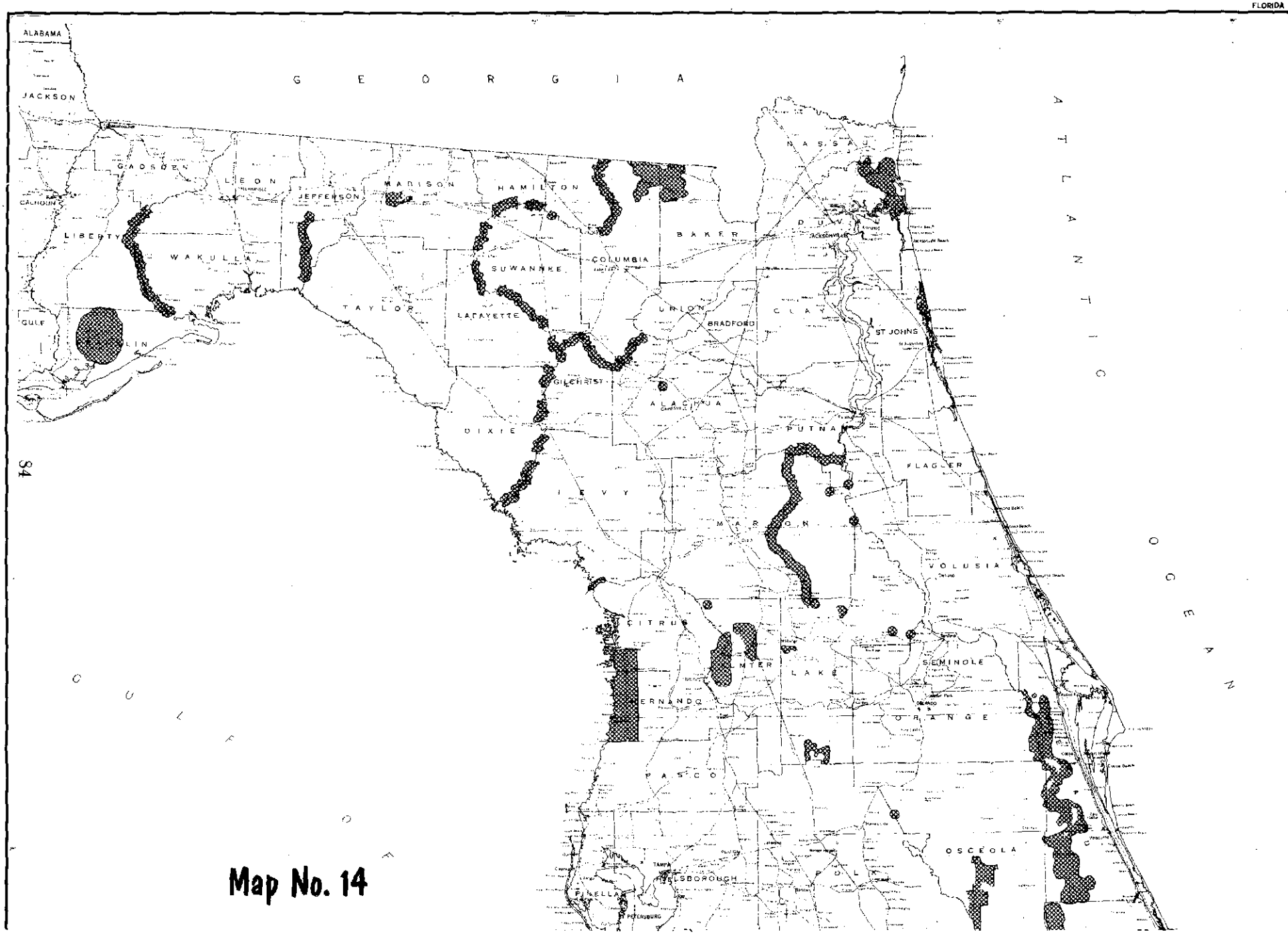
Source: Florida Game and Fresh Water Fish Commission

These communities are the same as described in Table No. 1 and Appendix D and as depicted on Map No. 4. See Map No. 13 for configuration of watersheds

Map No. 13

Watersheds Used in the Florida Game & Freshwater Fish Commission Survey of Priority Communities




ALABAMA
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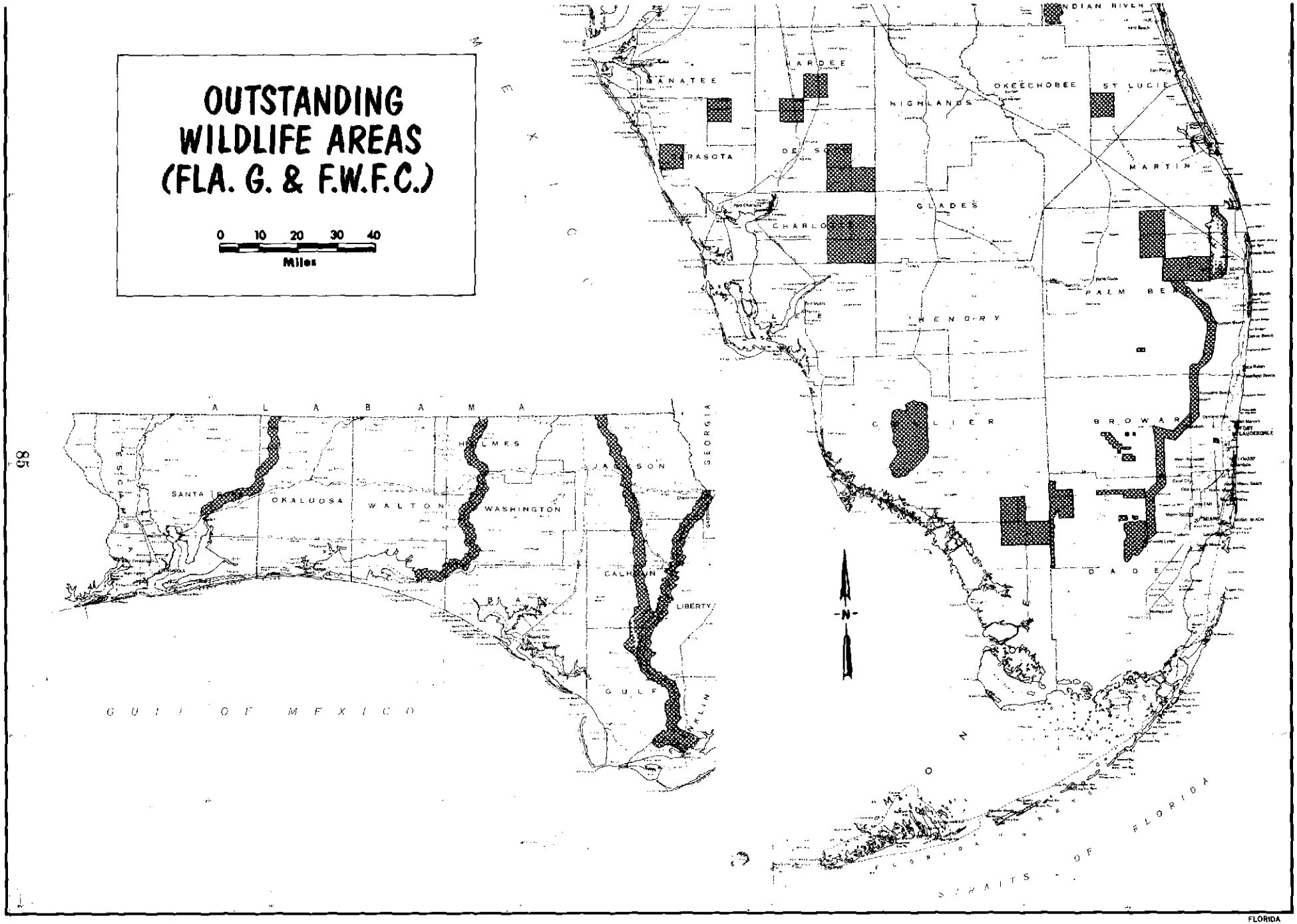
JACKSON
GADSDEN
LEON
JEFFERSON
MADISON
HAMILTON
CALHOUN
LIBERTY
WAKULLA
SUWANNEE
COLUMBIA
BAKER
NASSAU
DUVAL
JACKSONVILLE
TAYLOR
LAFAYETTE
UNION
BRADFORD
CLAY
ST JOHNS
GULF
GILCHRIST
ALACHUA
DIXIE
PUTNAM
FLAGLER
LEVY
MARION
VOLUSIA
CITRUS
SUMTER
LAKE
SEMINOLE
HERNANDO
ORANGE
PASCO
OSCEOLA
TAMPA
HILLSBOROUGH
PINELLAS
ST PETERSBURG
ATLANTIC
OCEAN
GULF
OF
MEXICO

84

Map No. 14


OUTSTANDING
WILDLIFE AREAS
(FLA. G. & F.W.F.C.)
0 10 20 30 40
Miles
ALABAMA
GEORGIA
SANTA ROSA
OKALOOSA
WALTON
HOLMES
WASHINGTON
JACKSON
CALHOUN
LIBERTY
GULF
GULF OF MEXICO
MANATEE
HARDEE
SARASOTA
DESOTO
HIGHLANDS
OKEECHOBEE
ST LUCIE
INDIAN RIVER
MARTIN
GLADES
CHARLOTTE
HENDRY
COLLIER
PALM BEACH
BROWARD
DADE
N
FLORIDA BAY
FLORIDA KEYS
STRAITS OF FLORIDA

Potential for waste treatment

The Gosselink report estimated that one acre of regularly flooded salt marsh could perform $2,500 worth of tertiary level waste treatment each year. Similar estimates have been made for freshwater swamp and marsh. Tertiary treatment is the removal of inorganic nutrients, especially phosphorous as orthophosphate, and nitrogen as nitrate, nitrite and ammonia. Wetland systems are not really effective in secondary treatment because they are so naturally high in organic sediments that introduction of large amounts of organic matter, or sewage, reduces the levels of dissolved oxygen too much; however, secondary treatment is not as expensive for man to accomplish as tertiary treatment. Unfortunately, use of a wetland for tertiary waste treatment would preclude certain other uses, especially shellfish harvesting (shellfish are specifically mentioned rather than fish or crustaceans because shellfish are often eaten raw, and because they are less mobile, thus less able to leave a contaminated area). Therefore, careful planning and adequate safeguards are necessary before exercising this capability of wetlands. Wetlands associated with existing and potential shellfishing waters should not be used for tertiary waste treatment.

The criteria for selection of wetlands that best perform this service are simple:

(1) The wetland should be adjacent to or downstream from the secondary sewage treatment plant or other source of wastes;

(2) The wetlands should receive flowing waters from the source of wastes;

(3) The wetland should be in good condition with adjacent waters having adequate levels of dissolved oxygen; and

(4) The wetland should be of sufficient size to adequately treat the amount of waste it receives.

Flood storage and storm buffer

Large, low wetlands located between an urban population and coastal waters or between an urban population and a large river or lake are valuable protection against flooding.

Aquaculture

The Florida Department of Natural Resources estimated that the value of an estuary for extensive oyster culture is up to $3,200 per acre per year. Adjacent and upstream marshes and swamps contribute significantly to this productivity. The Gosselink report, for instance, estimated that the value of regularly flooded salt marsh to intensive oyster culture in adjacent waters could be as high as $900 per acre per year. Comparable figures could probably be calculated for other types of wetlands.

Such intensive oyster culture is possible only in flowing water systems where the organic production of a large area passes across oyster rafts and the feces of the concentrated oyster population are carried away. Moderately intensive aquaculture of oyster, clams, shrimp, and salt and freshwater fish can be practiced in several systems. All aquaculture, especially shellfish culture, requires good quality water, maintenance of which is aided by adjacent wetlands. Aquaculture has been mentioned last because at present it is really only beginning and is usually a private enterprise. The intensive farming of Florida's waters may become much more important in the future. Thus, it behooves the State to preserve those elements, such as wetlands, that make aquaculture possible.

Summary

It is difficult to distinguish between Florida's wetlands on the basis of environmental value; nevertheless, it is necessary to do so to some extent so that the EEL Program can be most efficient in terms of environmental value preserved per dollar of bond money spent. This also applies to other classes of land, but selection methods are especially important in this case because wetlands constitute 25 to 35 percent of the area of the entire state. The criteria given in this section will justify a limited selection of wetlands for superior environmental values. Documentation is available for productivity of wetlands, quality of associated waters, and value as wildlife habitat. In general, the most environmentally valuable wetlands are those that are associated with waters of superior quality and that are subject to frequent flow-through of waters. The combination of environmental value and

endangerment will describe those wetlands most desirable for acquisition by the State.

UNIQUE AND OUTSTANDING NATURAL AREAS

Definition

Natural areas are here defined as lands and waters containing assemblages of native flora and fauna. They are relatively undisturbed by man, though of course virtually all land in Florida has been disturbed to some extent. Unique and outstanding, as used herein, are related terms. A few areas in the state, because of their distinctive flora, fauna, topography, or geology, can rightfully be termed unique. Some of these areas are unique in the state, and a few are not duplicated in the country or world. Other areas, though they could not rightfully be termed unique, are outstanding examples of a particular natural system or type of land. The category of unique and outstanding natural areas contains lands that could also be described as wetlands, wilderness areas, lands critical to fresh water supplies, and so forth.

Florida was endowed with one of the most abundant and varied assemblages of plant and animal life to be found anywhere in the world. Despite the state's frantic pace of development it still has an outstanding biota.

Northern Florida has a flora and fauna typical of the southern coastal plain region of North America, plus a number of species typical of the Appalachian Piedmont. South Florida, too, has numerous coastal plain species, but in addition it has many plants and animals typical of the West Indies. Because of past geologic events, a moderate climate, and the partial isolation of the peninsula from the rest of the continent, Florida has a number of relict and endemic species. Some of these plants and animals, now completely or mostly restricted to Florida, show relationships to other species in the southwestern United States, Mexico, Central America and South America.

Regrettably, many of Florida's unusual species and assemblages of species are disappearing from the state and from the world. The Florida red wolf, Carolina parakeet, and an unknown number of other species have already disappeared forever. More will disappear in spite of sincere efforts to save them by public and private organizations. At the moment, many rare and endangered species are protected from shooting or capture by state and federal legislation. The alligator is an example of a species that has benefited from a ban on its hunting; its population has rebounded vigorously from dangerously low numbers. Today, the alligator and other endangered species need a new kind of protection from a new danger – the loss of their habitat. If all the wetlands in Florida were drained, the alligator would disappear without a shot being fired. This loss of habitat is the gravest threat to most of Florida's endangered species – the Florida panther, bald eagle, black bear and numerous others. Preservation of their habitats is essential to their survival.

Importance

The Land Conservation Act of 1972 specifies:

> 'State capital projects for environmentally endangered lands' means a State capital project . . . which shall have as its purpose the conservation and protection of environmentally unique and irreplaceable lands as valued ecological resources of this State . . .

The protection of natural areas is the protection of Florida's natural biological communities, their component plant and animal species, and also non-living natural features. Such protection preserves:

(1) Rare and endangered plants, animals and biological communities.

(2) Research areas – scientists do a great deal of research in natural areas. The amount of research left to do is enormous and important. Existing knowledge of the environment is inadequate to support many environmental management decisions. In fact, the EEL Program suffers from this same lack of knowledge.

(3) Reservoirs of genetic material – it is impossible to predict what new uses could be made of native plants and animals. Numerous drugs have been obtained from plants and animals. Wild relatives of domesticated species are potentially valua-

able as sources of genes with which to improve the domesticated species.

(4) Educational experiences – students at all levels visit "outdoor classrooms" to learn about nature.

(5) Recreation – natural areas are well suited to many types of outdoor recreation such as hiking, camping, fishing, hunting and nature study.

(6) Quality of life – a recent study into ecological land planning suggested that at least half the land should be left in a natural condition so as to maximize reciprocal benefits for both man-made and natural systems.

Existing Protection

Many natural areas are preserved in national and state parks, monuments, preserves and refuges. Other public lands – national and state forests, military bases, etc. – are not preservation-oriented and may not provide permanent protection. There are federal and state wilderness programs to select from public lands those parcels most suitable for preservation; however, these programs are just beginning. The Florida Division of Recreation and Parks has begun work on a program for registration of natural features in Florida, which will certify and describe outstanding and unique biological and geological features of the state. Inclusion of private land in this program is voluntary; thus, no long-term protection is insured.

If a natural area is a wetland or is important to public water supplies it may have some protection on that account. Even so, the degree of protection may not be sufficient to keep it undisturbed. Acquisition of the fee simple title is usually necessary to ensure that an undisturbed natural area will remain that way.

Federal and state legislation protects a number of rare and endangered species from shooting and capture. As mentioned before, this approach is necessary but ultimately insufficient to insure the survival of these species. Recognizing this, the Federal Endangered Species Act of 1973, which repealed the Endangered Species Conservation Act of 1969, includes a provision directing the Secretary of the Interior to establish and implement a program to conserve rare and endangered fish or wildlife by means of land acquisition; however, there is no special funding for this program.

One difficulty with the protection of rare and endangered plants, animals, and natural communities is the lack of information as to which species are really endangered, how they are endangered, what regions of the state and what biological communities are critical to their survival, and so on. To try to provide this information, the Florida Committee on Rare and Endangered Plants and Animals was established through the efforts of the Florida Audubon Society and Florida Defenders of the Environment. The Committee is mainly composed of scientists from universities, private research or educational organizations, and state and federal environmental agencies (see Appendix D for the Committee's listing of rare and endangered species).

Priority Lands/Summary

Areas Representative of a Type of Biological Community Not Already Protected

One goal of the program to preserve environmentally unique and irreplaceable lands shall be to preserve at least a remnant of each of Florida's distinctive biological communities. Especially valuable are those that, in the United States, are found only in Florida. Those communities and subcommunities that are rapidly disappearing are in most urgent need of protection. These include custard apple swamps, coastal hammock and tropical hammocks.

The lack of an environmental inventory of Florida's natural resources precludes any comprehensive listing of those biological communities not represented in public ownership. Besides the communities already listed, others known to be inadequately represented in preservation-oriented state or federal ownership are the Kissimmee dry prairie (also found west of Lake Okeechobee) and the wet savannas, or pitcher plant (an insectivorous plant) bogs, of the Florida panhandle.

The Florida Game and Fresh Water Fish Commission's "Survey of the Wildlife Values of Florida's Plant Communities" will be useful in determining, for each major watershed, which biological communities should have the highest priority for

protection, based on the scarcity, endangerment, and wildlife values of each (see Table No. 5).

Certain regions of Florida, through geological or biological circumstance, have distinctive assemblages of plants and animals. (See Map No. 15, Regions with Distinctive Plant and Animal Communities, for locations of these regions.) Several of them have names familiar to Floridians: the Florida Keys, the Everglades, the Ten Thousand Islands, the Big Cypress Swamp, the Kissimmee Prairie, the Big Scrub and the Gulf Hammock country. Unfortunately, not all of these have adequate portions preserved in public ownership. (An adequate portion is one that with reasonable management could essentially maintain the characteristic natural systems of the region.) The EEL Program shall attempt to secure adequate portions of those distinctive regions that are unrepresented in public preservation ownership.

Condition of Site

Although this is included among the general considerations stated earlier in Chapter IV, it is restated here because lack of disturbance is a particularly important quality of a natural area. The better the condition of a site, the greater its value for biological research. In order to preserve the least disturbed sites, it will generally be necessary to acquire fee title in them.

Presence of Rare and Endangered Species

The list of rare and endangered species has grown so long (see Appendix D) that almost any acquisition the State makes will help some species. Acquisition of the more natural areas, however, will be more effective in protecting rare and endangered species. Bird rookeries and areas of seasonal concentration of fish and wildlife are particularly important to the preservation of native fauna.

Other Desirable Attributes

Aside from beaches and other major land forms, geologic features are not mentioned in the Land Conservation Act. Nevertheless, significant or unusual geologic features should be considered desirable attributes of EEL acquisitions. Florida is not renowned for its geologic features, but it does have numerous springs, caves, sink holes, rock outcroppings and fossil beds.

Historical and archaeological sites are not mentioned in the Act, but they too are worthy of preservation and shall be considered desirable attributes of EEL acquisitions. Florida's recorded history extends back to 1513, when Ponce de Leon officially discovered and named it. Long before this, perhaps as long as ten thousand years, Indians had been living in Florida. Numerous burial mounds, shell mounds and other sites attest to the long habitation of the state by man.

NATURAL OCEAN AND GULF BEACH SYSTEMS

Definition

This category comprises Atlantic and Gulf beaches and dunes composed of sand, shell and rock. The EEL Program logically must concern itself with natural, dynamic beach systems because they offer more environmental value than beach systems altered by the presence of fixed structures – buildings, roads, groins, jetties, sea walls, etc. Such structures interfere with the natural sand transport process involving beach and dune.

Importance

Beach systems absorb wave energy, act as dikes against storm swell and provide habitat for plants and animals. Beaches are undoubtedly Florida's most popular recreation areas for tourists and residents. Thus, they are very important assets to the state, both environmentally and economically.

Existing Protection

Unless previously conveyed to private parties, that portion of beach below the mean high water line is sovereignty land and belongs to the State. However, very little beach backshore and dune system is in public ownership.

A form of protection is afforded some parts of the dune system by the beach and dune protection regulations discussed in Chapter III. These regulations are capable, if enforced, of protecting much of the environmental value of beaches. They do

Map No. 15

REGIONS WITH DISTINCTIVE PLANT AND ANIMAL COMMUNITIES

not, however, protect back dunes and the rest of the coastal strand, and they do not give the public the right of access to the beach. Finally, it should be emphasized that neither regulations nor acquisition will prevent naturally occurring beach erosion.

Priority Lands/Summary

The following criteria shall be used to determine which beach systems will have priority for acquisition:

(1) The beach system should be essentially free of developments such as groins, sea walls, roads, and other fixed structures, and it should have an intact natural dune system with natural vegetation.

(2) If feasible, proposed acquisitions should include adjacent upland areas of predominantly dune vegetation and characteristics, including older dune systems further inland.

(3) The beach system should not be undergoing serious erosion (see Map No. 16, Seriously Eroded Beaches). This criterion is particularly significant for proposed acquisitions that either are not deep enough (distance from sea to inland property boundary) to allow an easy accommodation to natural erosion or that contain fixed structures which would interfere with accommodation.

(4) The coastal strand should be deep enough (from sea to bay or lagoon) over the length of the proposed acquisition to preclude the possibility of storms opening inlets or carrying away large segments of the strand.

AREAS THAT PROTECT OR ENHANCE THE ENVIRONMETAL VALUE OF SIGNIFICANT NATURAL RESOURCES

Definition

These are areas that may or may not have significant environmental values of their own, but are nevertheless important because of their impact upon adjacent or remote resources of major environmental significance. Two examples are:

(1) the dependence of portions of the Biscayne aquifer on water recharge from flood control canals; and

(2) the dependence of the Apalachicola Bay ecosystem on leaf litter from the forests of the Apalachicola River floodplain.

The significant natural resources could be in public or private ownership; however, it is more logical to acquire land to protect a significant area that is secure from development than it is to acquire land to protect a significant area that is not secure from development, which applies to most privately owned land.

Importance

The environmental importance of these areas depends predominantly on three determinations:

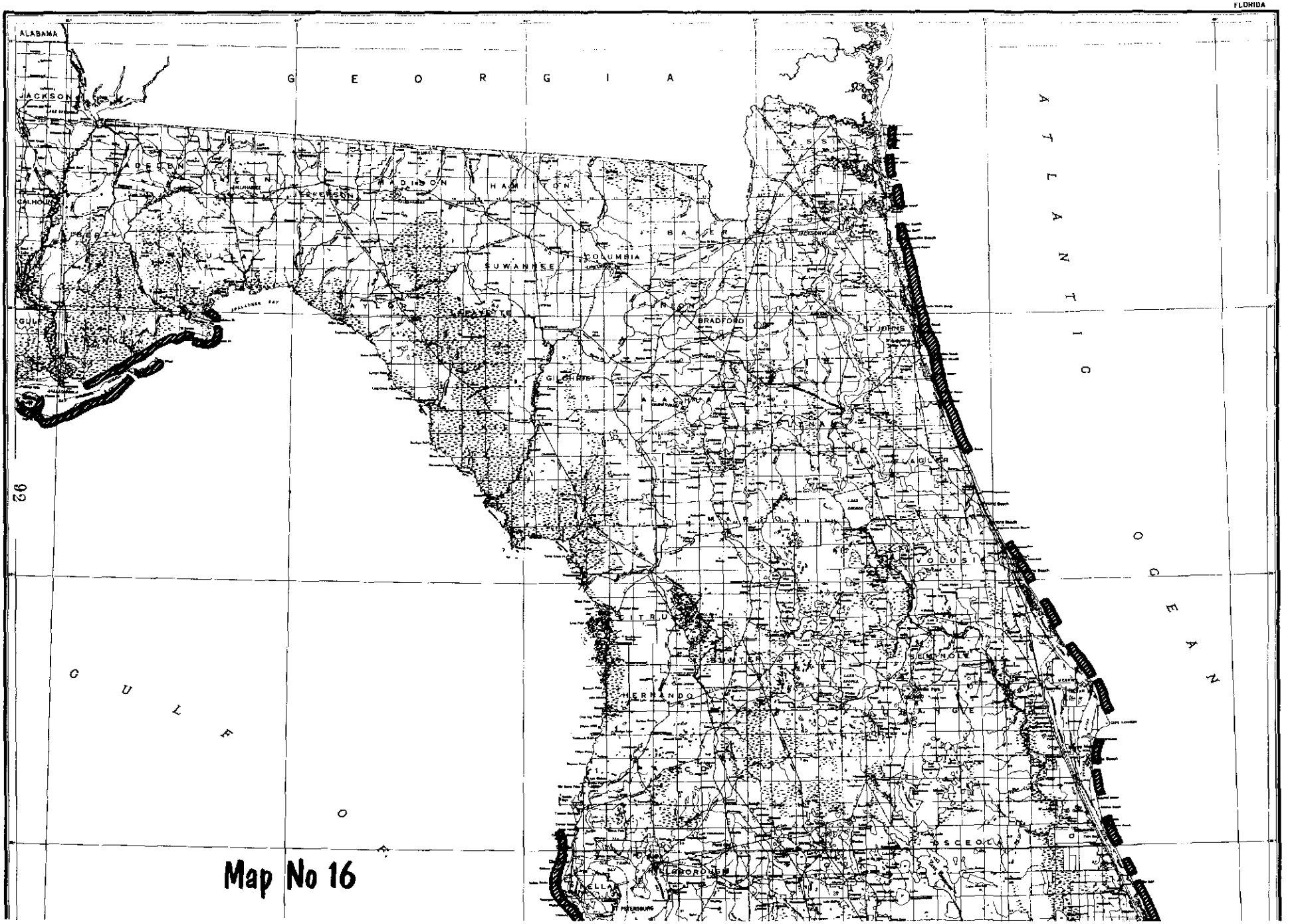
(1) How valuable is the natural resource to be protected?

(2) How critical to the significant natural resource is the subject area?

(3) How environmentally valuable is the subject area itself?

Existing Protection

A land in this category is subject to protective regulations according to its own particular nature. If, for example, a given area is below mean or ordinary high water in navigable waters, then it is subject to regulations governing such lands. There is no additional protection for an area that is considered a member of this category, except as the relationship between the area and a significant natural resource is perceived and given consideration in the application of the appropriate (if any) regulatory power. Actually, lands in this category, if protected from degradation, are themselves a form of protection for significant natural resources. Acquisition under the provisions of this category can only be justified when the exercise of appropriate regulations would not accomplish the desired protection objectives.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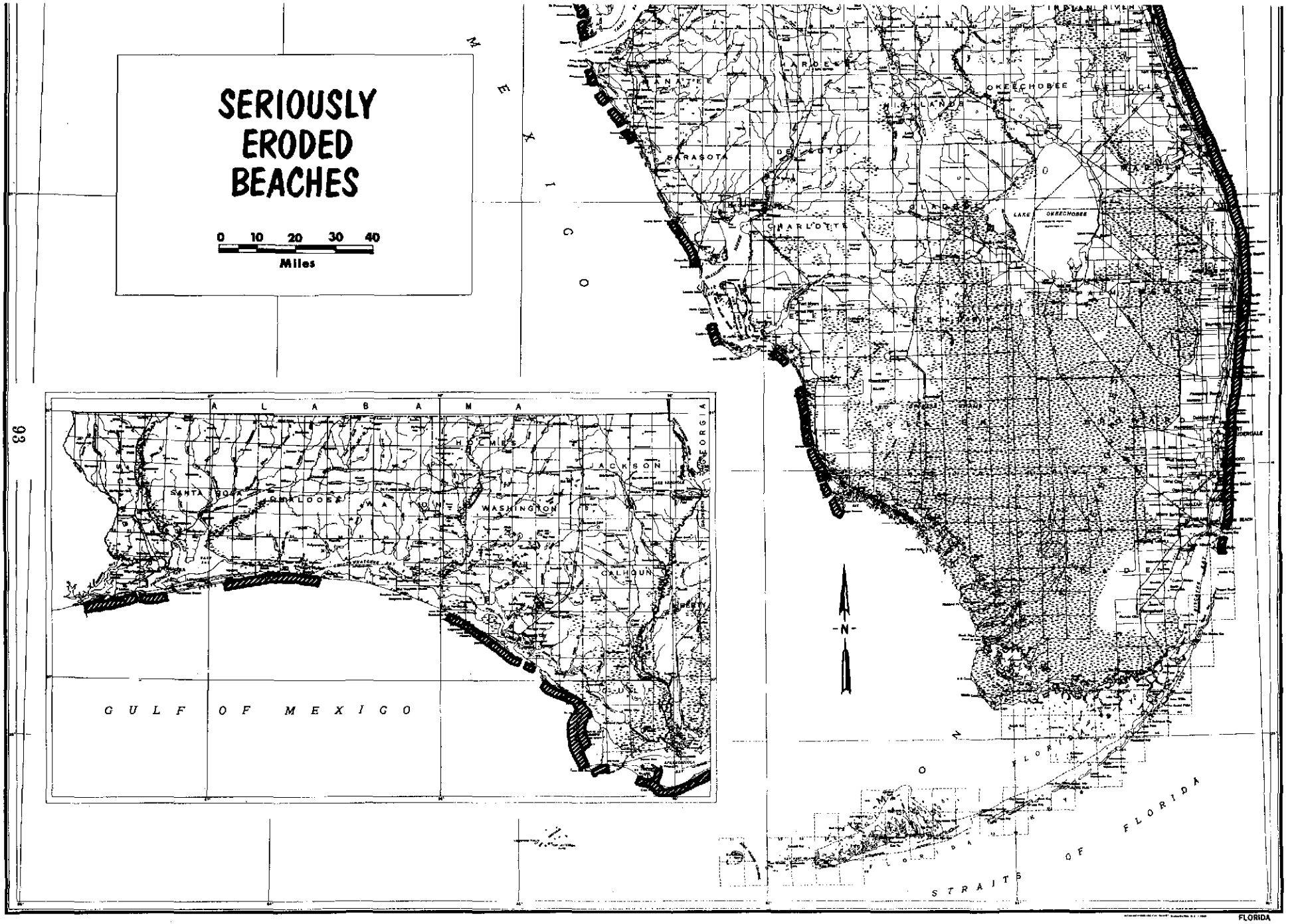
GEORGIA
ATLANTIC OCEAN
GULF OF MEXICO
JACKSON
CALHOUN
GULF
WASHINGTON
HOLMES
JEFFERSON
MADISON
HAMILTON
SUWANNEE
COLUMBIA
BAKER
LAFAYETTE
GILCHRIST
BRADFORD
ALACHUA
PUTNAM
MARION
HERNANDO
PASCO
HILLSBOROUGH
PINELLAS
ST PETERSBURG
92
26

Map No 16


SERIOUSLY
ERODED
BEACHES
0 10 20 30 40
Miles
M E X I C O
A L A B A M A
G U L F O F M E X I C O
S T R A I T S O F F L O R I D A
FLORIDA

Priority Lands/Summary

Thorough analyses of the acquisitions needed to optimize environmental values of significant natural resources have rarely been made, though a few situations, such as the Everglades National Park, are well known. Where such analyses have been made, the recommended acquisitions shall be considered priority lands within this category.

Where such analyses do not exist, priority shall be determined by consideration of these points:

(1) The natural resources to be protected or enhanced should be in some form of protective ownership (see Map No. 17, Public Lands)

(2) Acquisition can only be justified where the exercise of appropriate regulations would not accomplish the desired protection or enhancement objectives

(3) The more important the natural resources to be protected, the higher the priority of an acquisition that would contribute to its protection or enhancement

(4) The greater the degree of protection or enhancement that would be bestowed upon a significant natural resource by the acquisition of an adjacent or remote land area, the higher the priority of that area

Attention should also be given to situations where it may be feasible, by acquiring an intervening parcel of land, to connect up separate parcels in protective ownership to form one larger parcel. As discussed under general considerations, large parcels have several advantages over small ones, one of which is the possibility of preserving a wilderness area.

WILDERNESS AREAS

Definition

Wilderness is a perceived quality; as such it is not capable of precise definition. A wilderness area may, however, be generally defined as any unsettled, uncultivated area left in its natural condition. The word, wilderness, connotes wildness, considerable size and remoteness. In fact, one quick, though crude, way to locate these areas is to map all the land five or more miles from a road (see Map No. 18, Roadless Areas). The Federal Wilderness Act of 1964, in its definition of wilderness, described the size of a wilderness area as follows:

> . . . has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition . . .

Importance

Wilderness areas are, in essence, large natural areas; consequently, they have the same values that were attributed to natural areas (see section on Unique and Outstanding Natural Areas). The typically large size of wilderness areas permits the preservation of large ecosystems, which in turn support large, wide-ranging animals, such as the Florida panther. Wilderness areas have recreational value beyond that of smaller natural areas. As Aldo Leopold, a prominent conservationist of the first half of the twentieth century, stated:

> Public wilderness areas are, first of all, a means of perpetuating . . . the more virile and primitive skills in pioneering travel and subsistence.

Existing Protection

Map No. 19, depicting roadless areas in North America, shows how few such areas remain in the eastern United States. Some of these have been penetrated by new roads since the map was prepared. Wilderness is rapidly disappearing everywhere under the pressure of a growing population. In Florida, as elsewhere, only those large areas already in public ownership, such as the Everglades National Park, or those that may soon be acquired will stand much chance of retaining any wilderness character.

There is no regulatory power that, in lieu of acquisition, could preserve wilderness areas; they must be acquired and managed for preservation. The Federal Wilderness Act (Public Law 99-577) aims

to create wilderness areas within existing federal lands. The Florida Division of Recreation and Parks has, in like manner, designated wilderness areas within existing state parks. Section 258.18 of the Florida Statutes states the intent of the Florida Legislature with regard to wilderness areas:

> It is the legislative intent to establish a state wilderness system consisting of designated wilderness areas which shall be set aside in permanent preserves, forever off-limits to incompatible human activity. These areas shall be dedicated in perpetuity as wilderness areas and shall be managed in such a way as to protect and enhance their basic natural qualities for public enjoyment and utilization as reminders of the natural conditions that preceded man.

The program to establish a State Wilderness System has been assigned to the Board of Trustees of the Internal Improvement Trust Fund. It is not a vigorous acquisition program and thus far has designated only a few areas. Certain of the acquisitions through the EEL Program may be suitable for inclusion in this system.

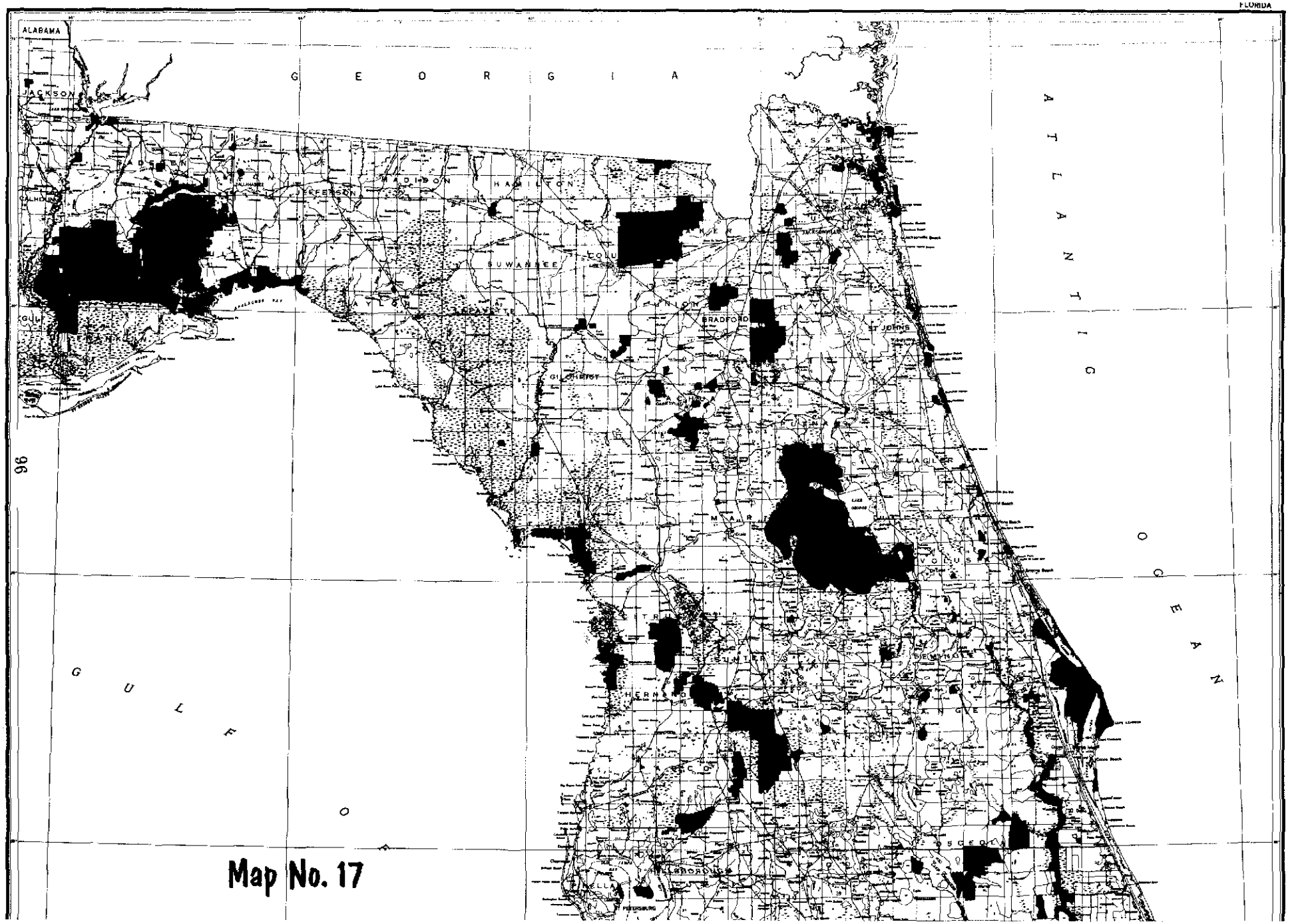
Priority Lands/Summary

For purposes of this program, wilderness areas are defined as large, undisturbed and remote. Therefore, the criteria for selection of priority lands within this category shall be:

(1) Preference should be given to large areas of several thousand or more contiguous acres, except where smaller areas are judged of sufficient size to make practicable their preservation and use in an unimpaired condition (an island is a good example).

(2) Areas undisturbed by man's activities are preferred. Disturbance of an area by man is roughly related to the accessibility, or, conversely, the remoteness, of that area. The map of roadless areas will serve as a guide to remote areas; it does not, however, indicate the condition of those areas.

One hundred years ago, when farming, ranching, and lumbering had altered much of north Florida, south Florida was still a vast wilderness. Today, the largest relatively undisturbed areas – namely, the Everglades and the Big Cypress Swamp – are still in south Florida; however, the slower population growth of north Florida has allowed a few wilderness areas to persist there. The opportunity to preserve wilderness areas will not last long.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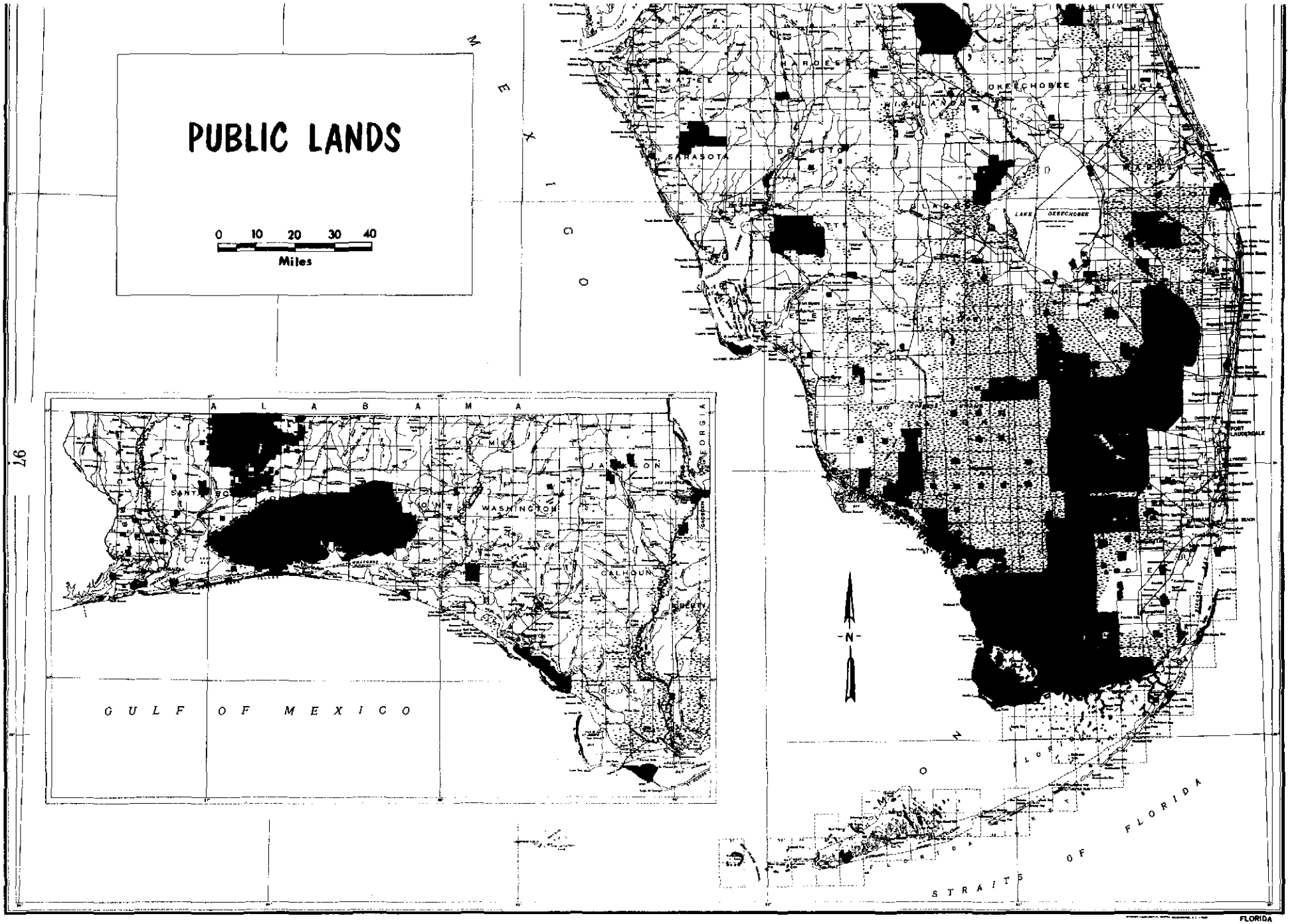
GEORGIA
ATLANTIC OCEAN
GULF OF MEXICO
JACKSON
WASHINGTON
HAMILTON
SUWANNEE
BRADFORD
ST JOHNS
FLAGLER
MARION
HERNANDO
SUMTER
96

Map No. 17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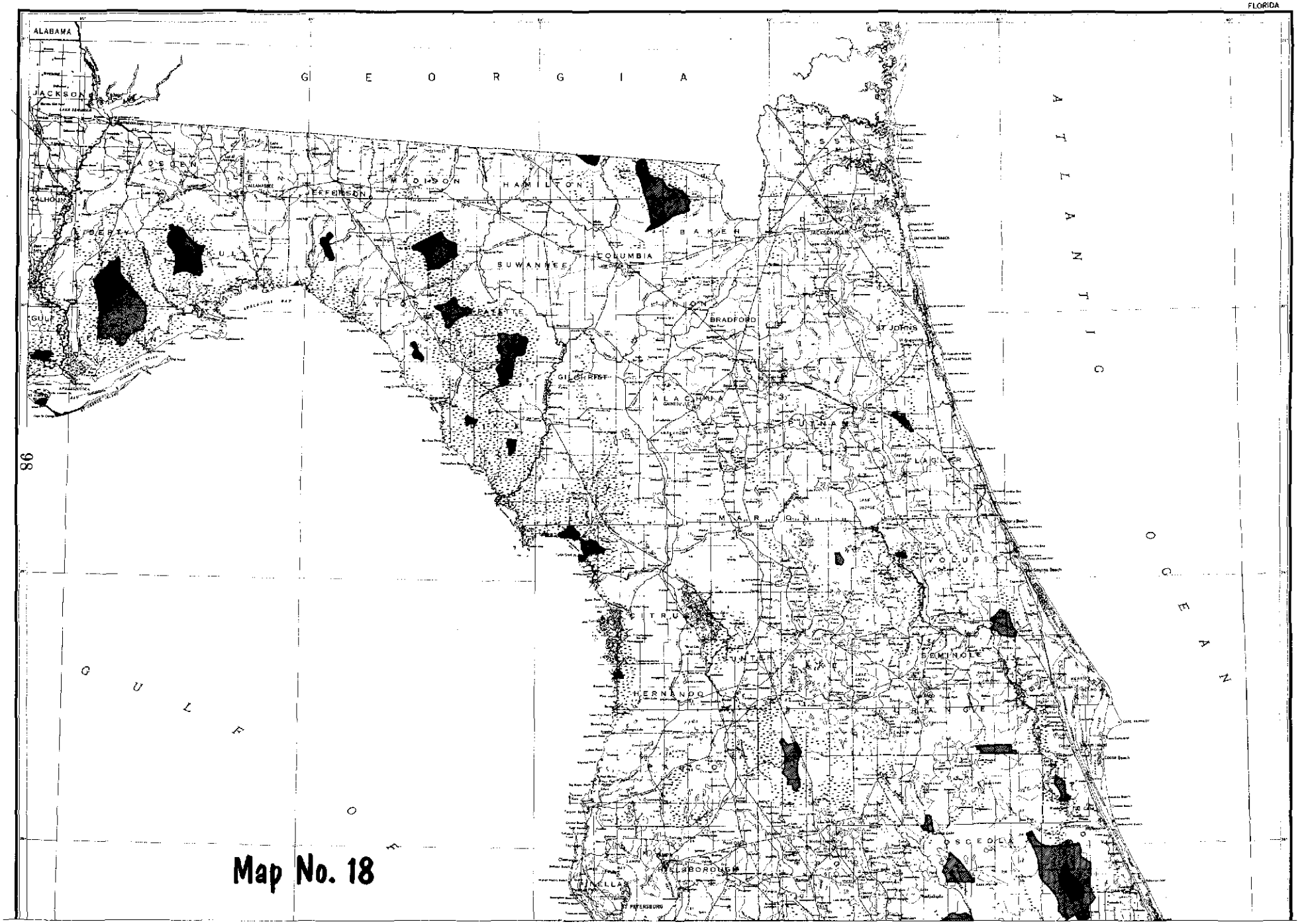
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CALHOUN
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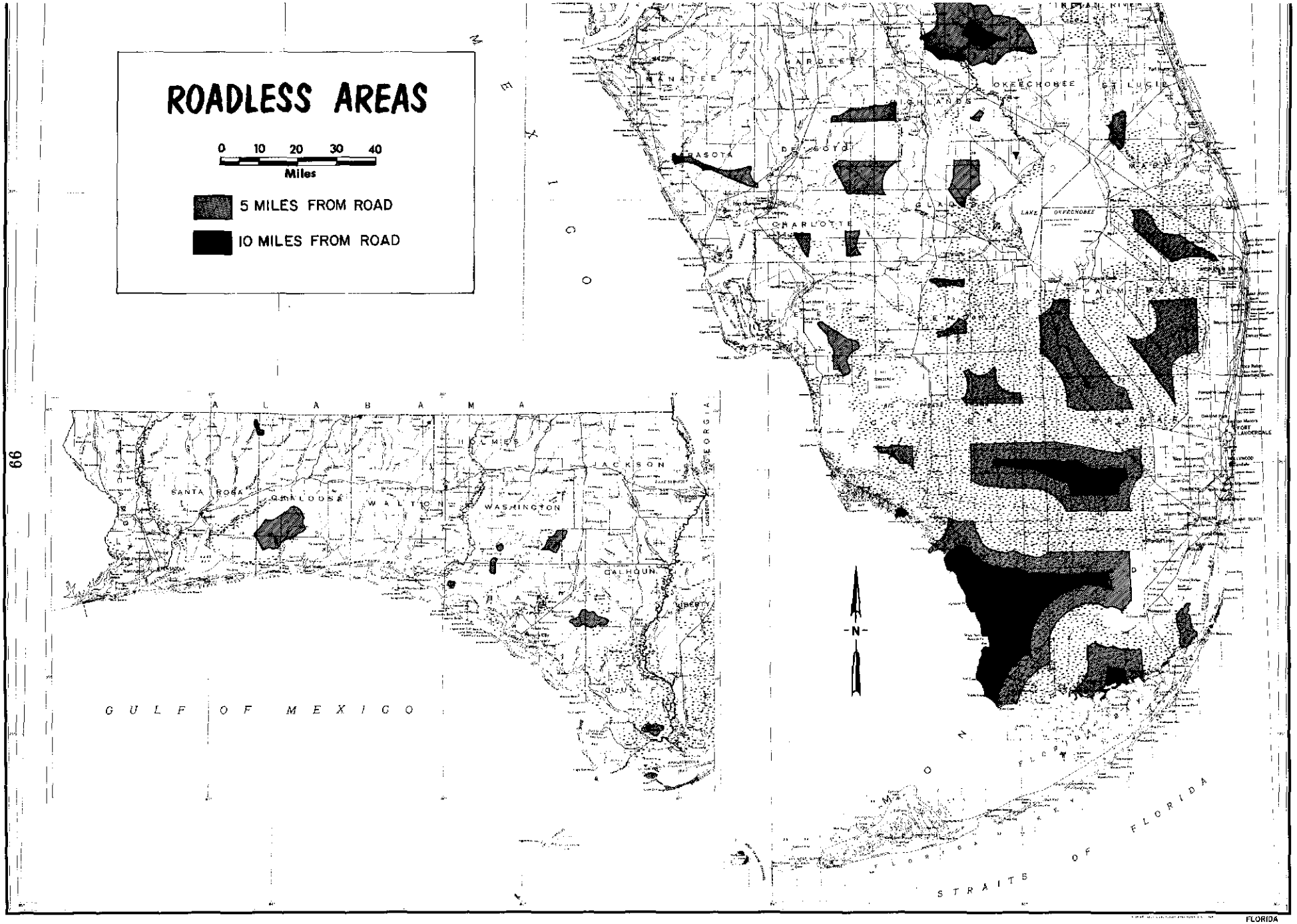
JEFFERSON
MADISON
HAMILTON
SUWANNEE
COLUMBIA
BAKER
UNION
BRADFORD
ST JOHNS
DUVAL
JACKSONVILLE
GILCHRIST
ALACHUA
PUTNAM
FLAGLER
MARION
VOLUSIA
CITRUS
SUMTER
LAKE
SEMINOLE
HERNANDO
ORANGE
OSCEOLA
PINELLAS
ST PETERSBURG
98

Map No. 18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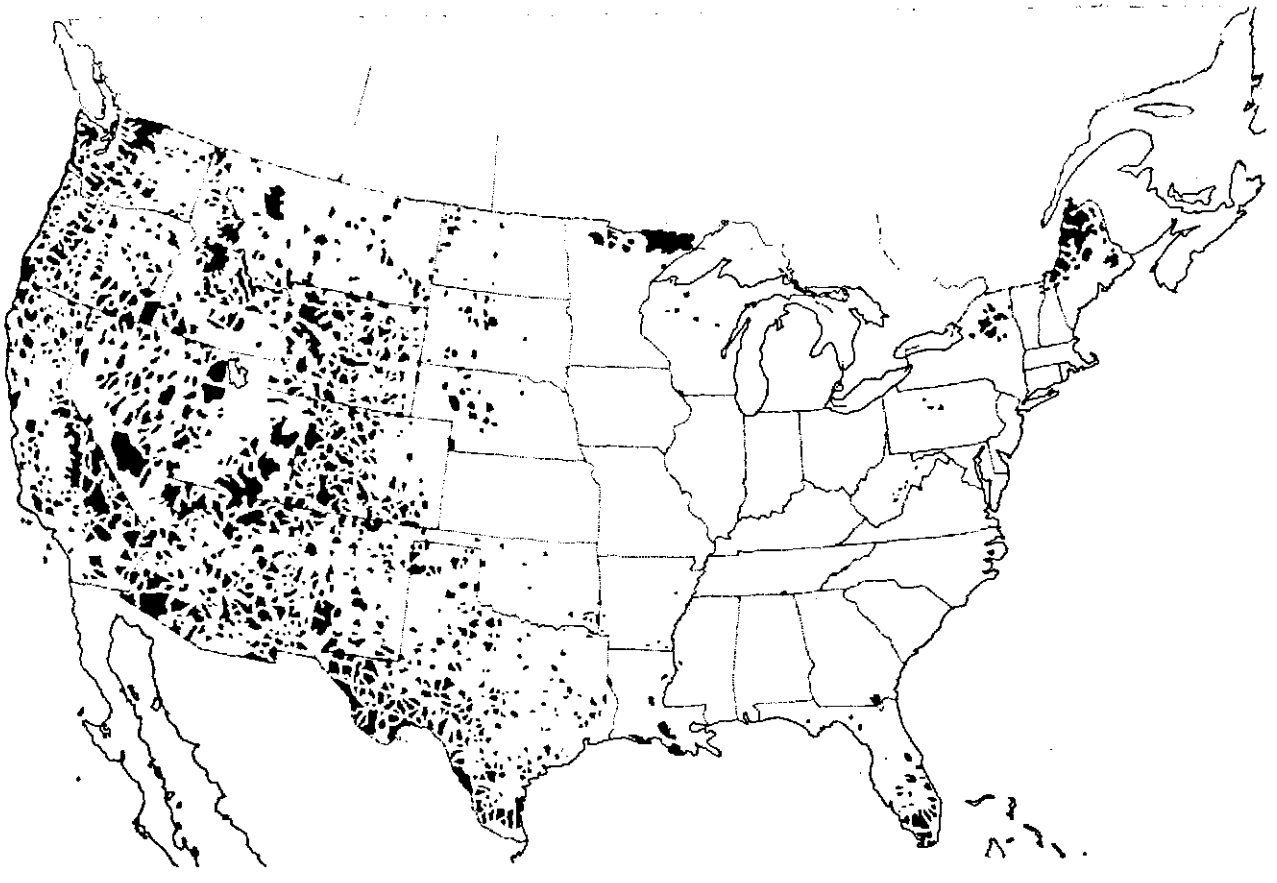
10 MILES FROM ROAD
GULF OF MEXICO
STRAITS OF FLORIDA
ATLANTIC OCEAN
ALABAMA
GEORGIA
SANTA ROSA
OKALOOSA
WALTON
WASHINGTON
HOLMES
JACKSON
CALHOUN
LIBERTY
GULF
HARDEE
MANATEE
SARASOTA
DESOTO
CHARLOTTE
OKEECHOBEE
ST LUCIE
LAKE OKEECHOBEE
PALM BEACH
BROWARD
FORT LAUDERDALE
HOLLYWOOD
MIAMI BEACH
FLORIDA KEYS
N
66

FLORIDA

Map No. 19

REMAINING WILDERNESS IN THE LOWER 48 STATES

Areas in black are more than 5 miles from the nearest railroad, highway or navigable waterway.



From: Tunnard, C. and B. Pushkarev. 1963. *Man-made America: Chaos or Control.* New Haven: Yale University Press, p. 29.

Appendix D

DESCRIPTION OF FLORIDA'S ENVIRONMENTAL SYSTEMS

INTRODUCTION

This appendix to the Environmentally Endangered Lands Plan describes Florida's environmental systems, based upon the Florida Game and Fresh Water Fish Commission's "Survey of the Wildlife Values of Florida's Plant Communities", which in turn is based upon the classification of Florida's natural communities developed by John H. Davis. The classification used herein contains fifteen environmental systems. In addition, there is a discussion of the state's hydrology and a list of Florida's rare and endangered species.

The description of each system begins with a brief introduction giving the general location or geologic background of that system. This is followed by sections on the plant community and the animal community, which describe the types of organisms found in that system and mention a few of the characteristic species. The section on ecology describes how the system works and tells which factors are most critical to that working (this is important to an understanding of the system's vulnerability). The section on value includes biological, commercial and aesthetic values. The last two sections are on vulnerability and endangerment.

Vulnerability means the susceptibility of a system to degradation caused by man's activities, whether nearby or remote. These activities include residential development, highway construction, pedestrian traffic, off-road vehicular use, air pollution, damming, farming, channelization, introduction of alien plants and animals, and a host of others. Vulnerability varies from one natural system to another, but it is important to note that no natural system is invulnerable to man's activities. Each system described is assigned an estimate of its vulnerability (high, moderate or low). The estimate is not precise and is intended only as a guide.

Endangerment refers to the potential for actual destruction or degradation of the system by man's activities. The terms endangerment and vulnerability are closely related, and, indeed, vulnerability can only be adequately expressed if the endangerment is specified. It is possible to describe a system as generally low in vulnerability, that is, not susceptible to degradation from most of man's activities, but high in endangerment because an activity to which it is vulnerable is likely to occur within the system. This section begins with a simple estimate (high, moderate or low) of the system's endangerment. This estimate is less precise than the vulnerability estimate simply because of the difficulty of making accurate predictions of man's activities.

UPLANDS

COASTAL STRAND
(Map No. 20)

Introduction

The coastal strand consists of sand and shell beaches, dunes and their associated zoned vegetation. This vegetation is most commonly associated with shorelines subject to high energy waves, but it may also be found bordering some bays and sounds. Beaches constitute approximately 13 percent of the total shoreline in Florida's coastal zone.

Vegetation

The vegetation of the beaches and foredunes is characterized by pioneer plants able both to establish themselves in the shifting sand and to tolerate salt spray. Some common examples are sea oats, sea purslane and railroad vine. Behind the foredunes, where conditions are somewhat more stable, typical plants encountered are saw palmetto, seagrape, wax myrtle and scrub oaks. The vegetation tends to change from grassy to woody as it progresses from the foredunes to the more salt spray-protected backdunes. The vegetation of these backdunes is often very like the sand pine scrub (see next system) found inland on old dunes.

Animals

The beach itself hosts a variety of shorebirds, terns, and gulls, which feed on fish and on invertebrates found in the sand and rocks. Some of these birds also nest on the beach. Sea turtles use isolated beaches for egg laying. Raccoons and beach mice are among the few mammals frequenting the beach. The latter is represented on several Florida beach systems by endemic subspecies.

In the scrub vegetation behind the foredunes more typical food chains occur with various species of insects, rats, mice, and birds supporting bobcats, foxes, skunks, and predatory birds such as the American kestrel.

Ecology

Strand communities expend a considerable portion of their energy budget in adapting to the severe stresses of shifting sands, a highly saline environment, and high winds. In some instances, salt spray plays a role similar to fire in other ecosystems by retarding succession indefinitely at a grass or shrub state.

Because these plants are so highly specialized to withstand these natural stresses, they are highly sensitive to stresses not found in their natural environment. The effect of trampling or crushing is severe, and even light use of the vegetated areas may degrade them.

Value

Beaches, dunes and their associated vegetation are important in absorbing and moderating the influence of waves and wind on coastal areas. Of all the natural recreational resources of the state, beaches are the most in demand by the public. Wildlife values are also high and can coexist with recreational use under suitable management.

Vulnerability (High)

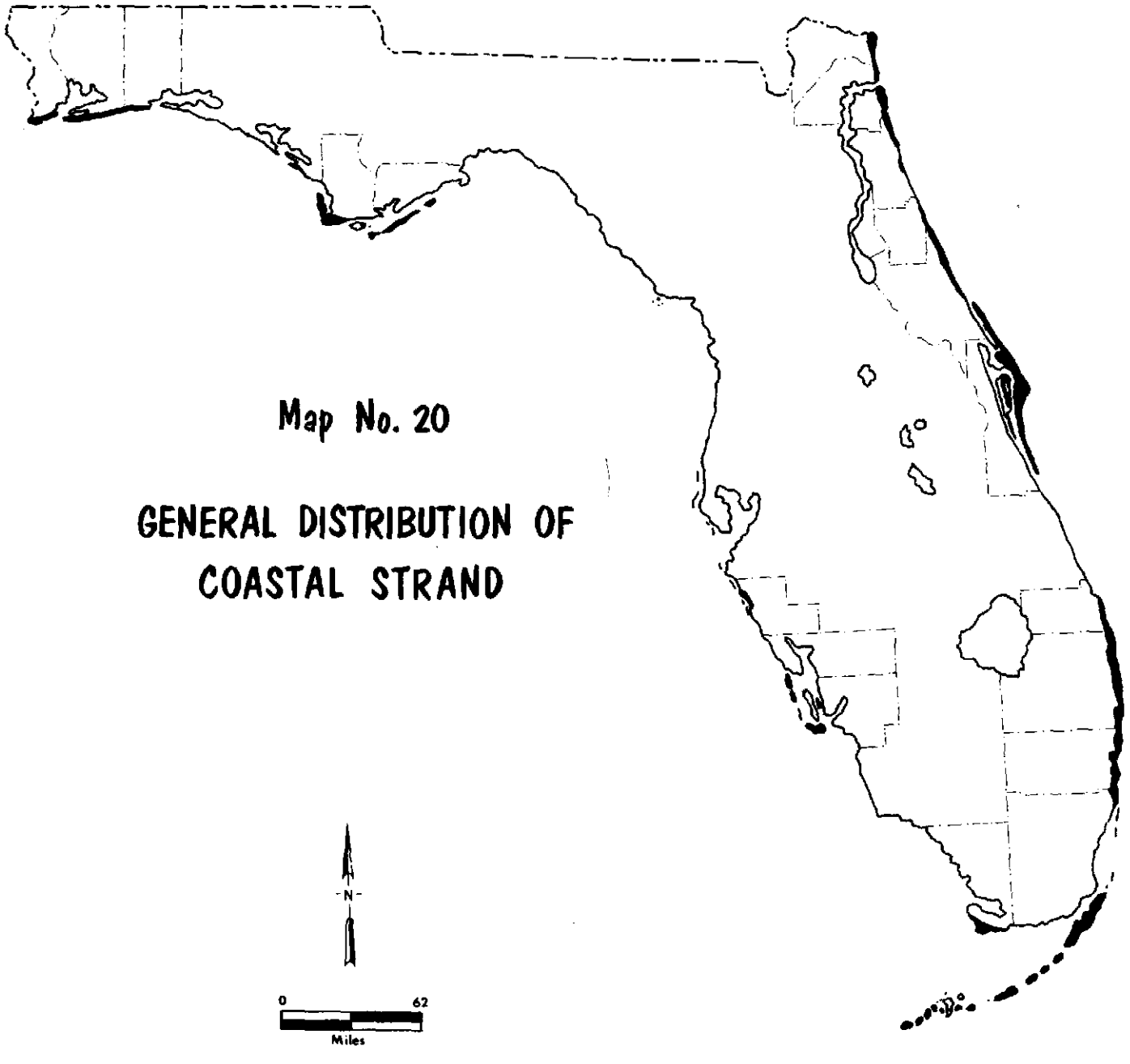
The coastal strand is a dynamic system, advancing into the sea and receding from it according to the influences of winds, waves, currents and changes in sea level (sea level has apparently been slowly rising over the last hundred years). These agents transport sand from offshore bar to beach to dune, and back again. They also move it up and down the coast (longshore drift), causing erosion of one beach and accretion of another. Man's interference with this sand transport system, whether accidental or intentional, can have a great effect on beaches and dunes. The most important effect is the onset or acceleration of beach erosion. Inlets and jetties act as barriers to longshore drift and starve downdrift (down-current) beaches of their normal sand supply. Groins, if they are effective in decreasing erosion on the beach updrift (up-current) from them, will increase erosion on the beaches downdrift from them. The leveling or stabilization of dunes to provide suitable sites for development often removes this sand from the transport system, thus denying the beach a portion of its sand reserves. The basic conflict is between the dynamic beach and dune system and the static, man-made system of buildings and roads.

Except for interference with the sand transport system, the sand beach itself is almost immune to man's activities. Foredune plants, however, are extremely sensitive to the effects of four-wheel drive vehicles, motorcycles, and even foot traffic and must be protected from nearly all direct use. Backdunes are not quite so sensitive and will support light use.

Endangerment (High)

Florida is awakening to the need to protect this valuable natural system. The Florida Beach and Shore Preservation Act requires the Department of Natural Resources to establish coastal construction setback lines in all coastal counties, based upon natural processes. The Act also requires the Department to regulate construction undertaken for shore protection purposes.

(ADAPTED FROM DAVIS, 1967)



Even with the protective regulations described above, it must be admitted that any undeveloped beach and dune system in private ownership should be considered highly endangered. Such areas are in great demand as locations for hotels, motels and residential areas (especially the new high-rise condominiums). Approximately 35 percent of Florida's beaches are presently developed, 35 percent are undeveloped but privately owned, and 30 percent are undeveloped and publicly owned (not all of this is open to the public).

SAND PINE SCRUB
(Map No. 21)

Introduction

Several periods of the earth's long history are known to have had higher sea levels than the present one (see Map No. 1). During those periods the coastline of Florida was inland, sometimes many miles, from its present location. Sand dunes formed along these ancient shorelines have persisted down to the present. These excessively drained relict dunes are the natural sites of the sand pine scrub, or scrub, community.

One exception to this theory of genesis is the Big Scrub of the Ocala National Forest. Covering an area thirty-five miles long by fifteen miles wide, it is the largest sand pine scrub forest found anywhere. It occurs on ancient dunes, but these dunes were apparently not formed near an ancient sea. Instead, they may have formed during a dry period of the earth's history when that part of Florida resembled a small Sahara Desert.

Except for a tiny area of sand pine scrub in southeast Alabama, this community is found only in Florida.

Vegetation

This community is typically two-layered, with sand pine occupying the top layer and various oaks and other shrubs making up a thick understory. Herbaceous ground cover is very sparse or absent, and large areas of white to gray sand normally occur throughout the scrub community. Understory plants include myrtle oak, sand-live oak, Chapman's oak, Rosemary and gopher-apple.

Animals

Most of the animals are adapted to high temperatures and a scarcity of water. Typical animals include the gopher frog, scrub lizard, sand skink, black racer, Florida mouse and scrub jay.

Ecology

The sand pine scrub is essentially a fire-based community. Its fire regime, however, differs greatly from those of the flatwoods and sandhills (see later). Ground cover is extremely sparse and leaf fall is minimal, thus reducing the chance of the frequent ground fires so important in the sandhill community. As the sand pines mature, however, they retain most of their branches, thereby building up large fuel supplies in the crowns. The thick understory vegetation and these retained branches provide ready pathways to the highly combustible crown. When a fire does occur (every twenty to forty years) this fuel supply, in combination with the sand pine's relatively low resistance to fire and the high stand density, assure a hot, fast burning fire. In 1935, one such fire consumed 35,000 acres of scrub in four hours.

Such fires allow for regeneration of the sand pine community, which would otherwise pass into a xeric hammock. This type of fire regeneration usually results in even aged stands of trees. The Ocala variety of sand pine (dominant in the peninsula) is so adapted to fire regeneration that heat (as from a fire) is needed to open its cones.

Value

This community, with its deep, loose sand, is typically a valuable aquifer recharge area. It is of considerable scientific value because of its endemic species of wildlife, its unique ecology, and the example it presents of ecosystem response to heat stress.

Vulnerability (Moderate)

The scrub is vulnerable to erosion and root damage caused by foot and mechanized traffic. The most important consideration, however, is maintenance of the fire schedule (or perhaps duplication by management actions such as clear cutting).

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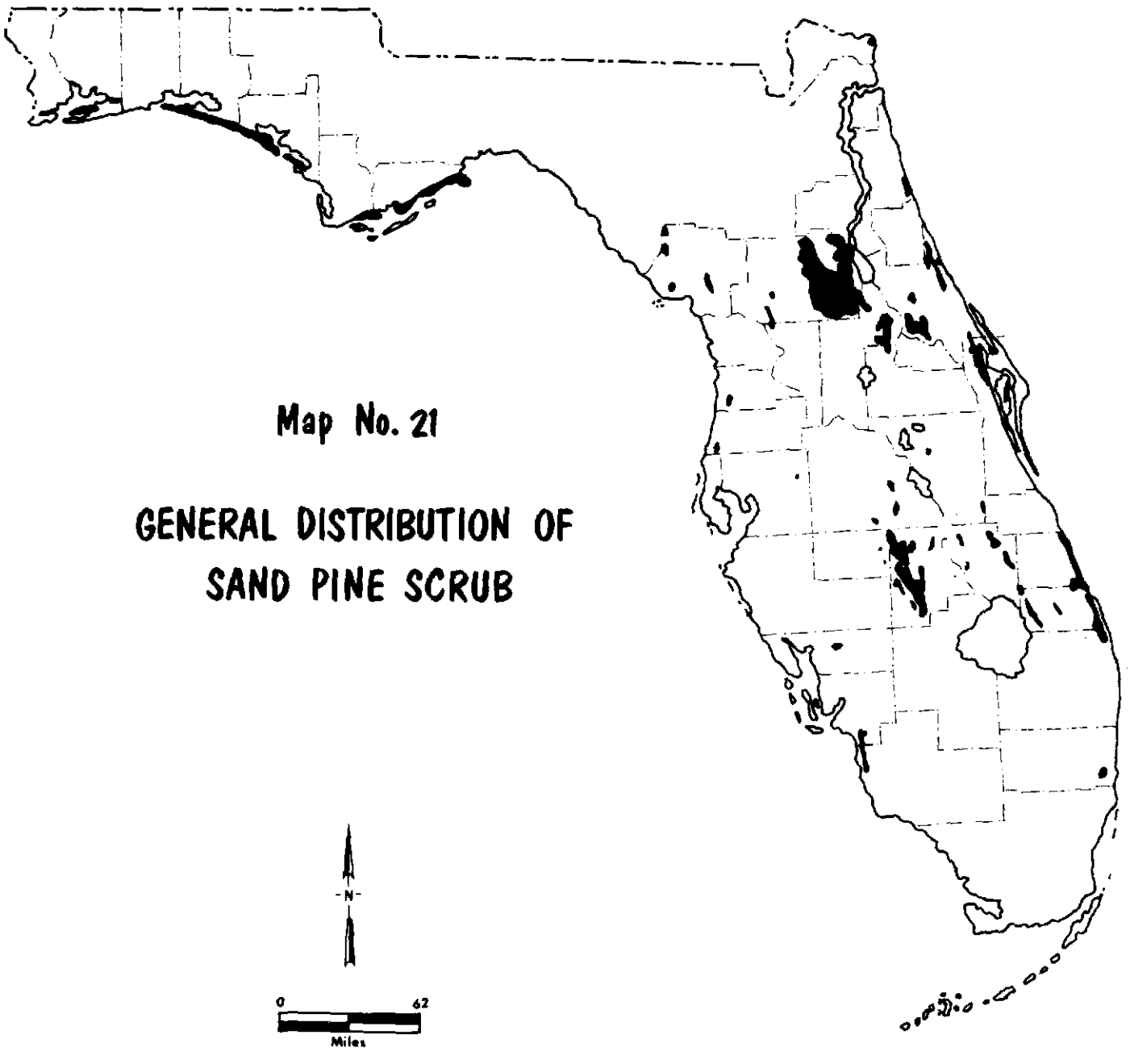


Map No. 21

GENERAL DISTRIBUTION OF SAND PINE SCRUB

Endangerment (High)

The largest single scrub community in the state occurs in the Ocala National Forest, as stated earlier. Controversy exists as to whether present management practices in the National Forest are suited to the continuation of this community; nevertheless, scrub within the National Forest is less endangered than scrub outside the National Forest. Scrub communities outside are rapidly being lost to real estate development because of their ideal, well-drained upland situation. Indeed, the Atlantic coastal ridge from Ft. Lauderdale north to beyond West Plam Beach, once the site of a scrub community, has been almost completely developed. A similar situation exists at other locations near the coast. In central Florida these areas are often cleared and planted to citrus or converted to improved pasture. Scrub outside the Ocala National Forest and other publicly owned lands should be considered highly endangered.

SANDHILL COMMUNITY
(Longleaf Pine-Turkey Oak Association)
(Map No. 22)

Introduction

Sandhill communities occur on well-drained, white to yellowish sands. The sands are usually deep and relatively sterile, but contain more organic matter than the sands of the sand pine scrub community.

Vegetation

Because of the harsh conditions (poor soil, low moisture and fire) this community has a low tree diversity. Longleaf pines form a scattered (thirty to one hundred trees per acre) overstory in mature natural stands. In many cases today, xeric oaks such as turkey oak and southern red oak form the overstory after the logging of the pines and the elimination of periodic fires. In natural stands the oaks form a relatively open understory, and herbaceous plants such as wiregrass and yellow foxglove provide fairly complete ground cover.

Animals

Many of the animals found in this community are burrowers as an adaptation against high temperatures and water loss. Indigo snakes, gopher tortoises, fence lizards, ground doves, bobwhites, rufous-sided towhees, fox squirrels and pocket gophers are typical vertebrates of the sandhill community. The rare red-cockaded woodpecker inhabits old trees in mature sandhill communities.

Ecology

Fire is the dominant factor in the ecology of this community. The interrelationships of the sandhill vegetation, particularly the longleaf pine-wiregrass relationship, are dependent on frequent (every two to five years) ground fires. Longleaf pine is very sensitive to hardwood competition. Wiregrass plays a role in preventing the germination of hardwood seeds and in insuring that there is sufficient fuel buildup on the floor of the community to carry a fire over large areas.

After fire, heat and drought are the dominant influences on the sandhill community with many plants expending considerable portions of their energy budget to adapt to these factors.

The burrowing habits of many of the animals play a significant role in recycling the easily leached nutrients to the surface. Without these animals additional nutrients would be lost from this system and added to others (ponds, for instance).

Value

Almost all rainfall in this community goes directly into the underlying aquifer. There is little runoff to the sea and minimal evaporation, because of the rapid percolation of the rainfall through the sand.

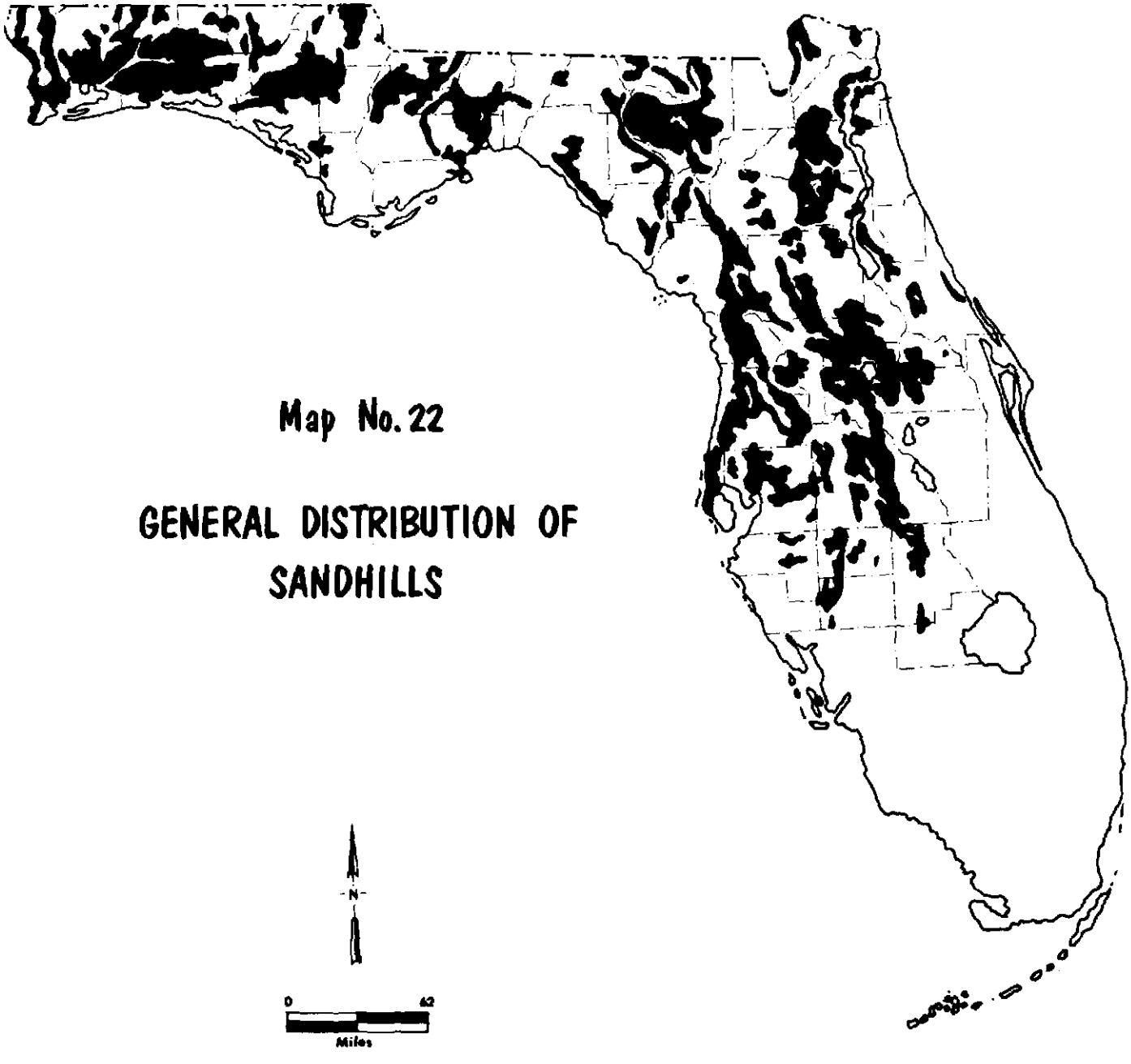
Recreational value is low except to a relatively small number of people who enjoy hunting or observing some of the more visible wildlife.

Vulnerability (Moderate)

Elimination of fire over a long period of time is a major means of changing this community by allowing succession to a xeric hammock.

A significant feature of the sandhill community, which greatly increases its sensitivity, is the apparent inability of wiregrass, a key plant in

(ADAPTED FROM DAVIS, 1967)



Map No. 22

GENERAL DISTRIBUTION OF SANDHILLS

sandhill ecology, to withstand disturbance. Once removed from an area, wiregrass will not return for at least one hundred years and may never return.

Longleaf pine is sensitive to livestock depredation. One hog can decimate one acre of fully stocked seedling pines in a day, and cattle frequently damage first year trees.

Endangerment (High)

Almost all of this community south of the frost line has been converted to citrus production, and large areas in the northern sections of the state are being converted to improved pasture, pine plantations, and other forms of agriculture.

Many sandhills in the panhandle, formerly occupied by longleaf pine and xerophytic oaks, are being planted to sand pine, particularly where these sands are more than ten feet deep. Sand pine can be planted in rough, undisturbed wiregrass and will come up through the oak overstory. On the other hand, reestablishment of longleaf, following its removal by cutting, either by planting or direct seeding has never been very successful.

In all areas developers are rapidly taking advantage of these high, well-drained sites for construction of housing developments. The agricultural and urban developments may result in greatly increased erosion and movement of nutrients into ponds, thereby increasing their rate of eutrophication.

MIXED HARDWOOD AND PINE
(Map No. 23)

Introduction

The mixed hardwood and pine community is the southern-most extension of the southern Piedmont mixed hardwood forest. It occurs on the clay soils of the northern panhandle.

Vegetation

Younger growth may be primarily pine with shortleaf and loblolly pines predominant, but as succession continues various hardwoods become dominant. The natural climax vegetation of this area is an American beech-Southern magnolia-Florida maple association with numerous other hardwoods present. The understory includes young overstory plants plus dogwood, red mulberry, hophornbeam, American hornbeam and redbud.

Animals

The types of animals vary with the successional stage of the forest. Such rapidly reproducing, broadly adapted species as cottontails and bobwhites are typical early succession animals; whereas more narrowly adapted species such as woodpeckers, moles and woodcock are typical of more mature systems. Other characteristic animals include the barred owl, pileated woodpecker, red-bellied woodpecker, white-tailed deer, gray squirrel, shrews, gray fox and cotton mouse.

Ecology

These forests occur where temperature, water and nutrient conditions are all moderate. There appears to be no dominant stress factor in this community. Much of the energy of the vegetation is expended in competition for water, sunlight and nutrients. In the mature system very little of these elements go unused because of the intricate mosaic of plants, which captures most of the sunlight and effectively recycles nutrients through the system.

Fire, which can retard succession and maintain the system in the pine state, is rare in mature communities, enabling many fire-intolerant plants to become dominant.

Value

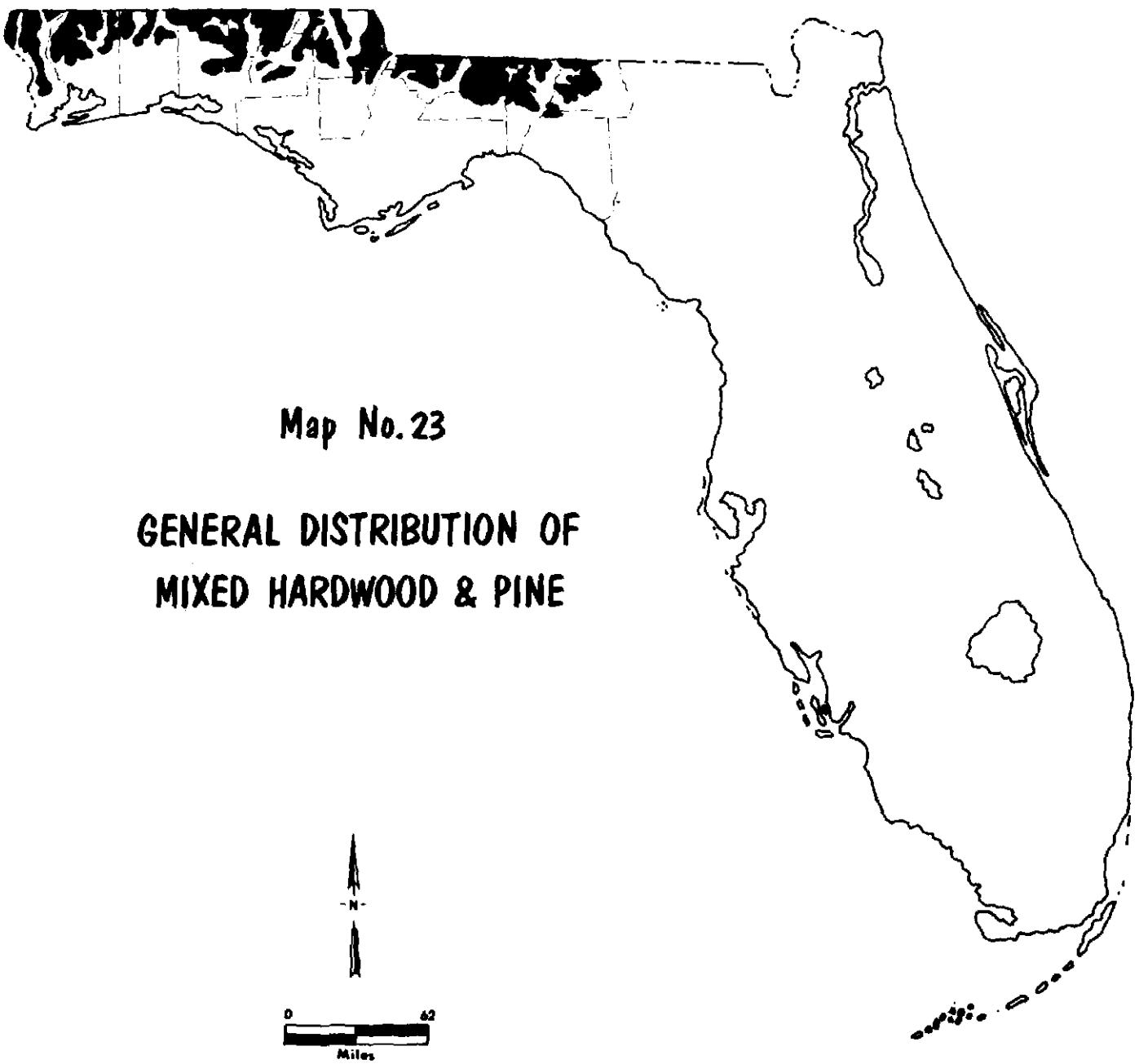
Aquifer recharge is somewhat limited by the low permeability of the clayey soil, which causes appreciable runoff to surface waters. Wildlife values are exceptionally high, especially where different successional stages are adjacent to each other.

This community is important in flood control on a watershed basis. The vegetation and ground litter lessen peaks in rainfall to yield a relatively steady water flow in streams draining the watershed.

Vulnerability (Low)

Once established, a hardwood community will survive considerable disturbance. Fire is usually possible only during periods of extreme drought,

(ADAPTED FROM DAVIS, 1967)



since the community itself is relatively fire-resistant. If a fire does occur, recovery of hardwood stands is usually vigorous. Unfortunately, fire-damaged trees are often attacked by disease organisms. Many hollow and broken hardwoods are the result of rot introduced after a fire. The otherwise low sensitivity to disturbance is largely due to the complexity and diversity of the climax vegetation and the excellent conditions for rapid plant growth.

Endangerment (High)

The flat to rolling uplands that make up most of the coastal plain region of the southeastern United States are good agricultural lands. The acreage presently available in Florida for occupancy by mature hardwood forests is not great; most is either under cultivation or has been retained at the pine stage of succession. These upland areas are also desirable for residential development.

HAMMOCKS
(Map No. 24)

Introduction

Hammock is a Florida term for a cluster of broad-leaved trees, often evergreen and usually growing on relatively rich soil. The hammock community is similar in many respects to the mixed hardwood and pine of the panhandle. It is the climax vegetation of most areas of central and peninsular Florida, whereas the mixed hardwood and pine community is the climax community of the panhandle area. Central Florida hammocks occur on fairly rich sandy soils rather than the clay of the panhandle community and are best expressed in areas where limestone is near the surface. Hammocks can be further classified on the basis of vegetation into upland hammocks, coastal hammocks, and live oak-cabbage palm hammocks, the latter occurring largely as inclusions in other communities.

Vegetation

Hammocks are similar to the mixed hardwood and pine of the panhandle with regard to vegetation, but lack the shortleaf pine, American beech and other more northern vegetation. Characteristic trees of central Florida hammocks are Southern magnolia, laurel oak and American holly. Live oak-cabbage palm hammocks are dominated by those two species.

Animals and Ecology

These categories are basically the same as for the mixed hardwood and pine of the panhandle. Characteristic animals include the spadefoot toad, tufted titmouse, great crested flycatcher, golden mouse, wood rat and flying squirrel.

Value

Similar to that of the mixed hardwood and pine of the panhandle.

Vulnerability (Low)

The relatively rich soil contributes to a fast recovery of this community after disturbances. Once removed, however, the replacement of a mature forest, with its large old trees, takes many years.

Endangerment (High)

Agriculture, lumbering of mature hardwoods, the continuing extention of slash pine monoculture, and urbanization are making serious inroads into the few remaining hammocks. There are very few sizable areas of this community left in Florida.

TROPICAL HAMMOCKS

Introduction

Tropical and semi-tropical hammocks are found on many of the tree islands in the Everglades and on many of the Florida Keys. Although the only truly tropical hammocks occur in the Keys, this category also includes those hammocks that contain some temperate-zone plants, but are primarily tropical. Remnants of these occur north to Palm Beach on the east coast and Sarasota on the west coast.

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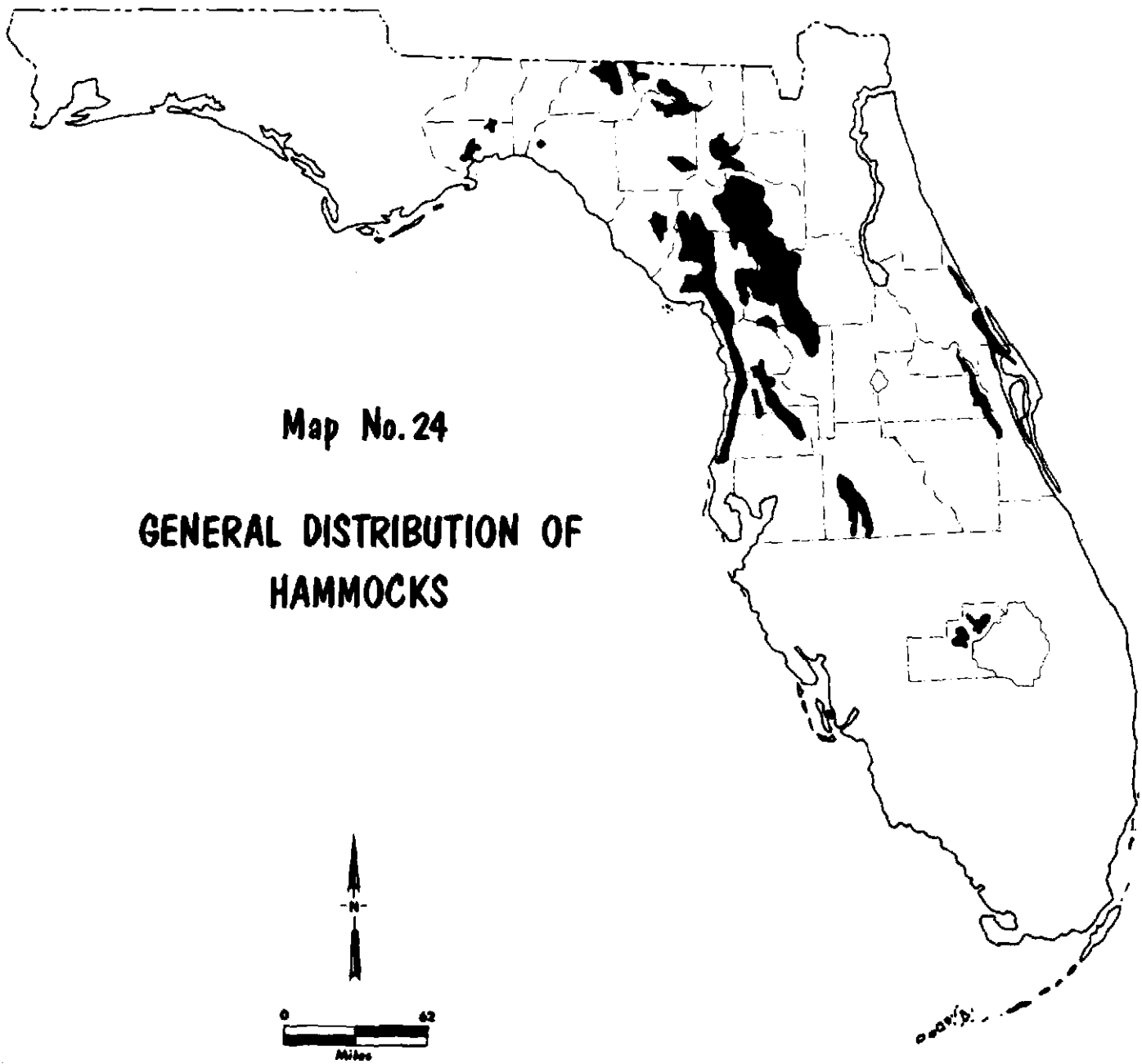


Map No. 24

GENERAL DISTRIBUTION OF HAMMOCKS

Vegetation

Tropical hammocks typically have very high plant diversity, containing over thirty-five species of trees and almost sixty-five species of shrubs and small trees. Typical tropical trees are the strangler fig, gumbo-limbo, mastic, bustic, lancewood, the ironwoods, poisonwood, pigeon plum and Jamaica dogwood. Vines, air plants and ferns are often abundant. Hammocks in the Florida Keys contain a number of plants that are extremely rare in the United States, including mahogany, lignum vitae, thatch palms and manchineel.

Animals

Tropical hammocks are extremely important to several species of wildlife in southern Florida, including the cotton mouse, woodrat, grey squirrel and marsh rabbit. The Key Largo woodrat and the Key Largo cotton mouse are endemic to Key Largo hammocks. The white-crowned pigeon depends almost exclusively on the few remaining tropical hammocks for its food supply.

Ecology

The tropical hammock is the successional climax for much of southernmost Florida; that is, this forest would eventually cover all but the wettest areas of this region given enough time, enough freedom from man's disturbances, and the absence of fire. Because of frequent fires it is largely confined to islands or slightly wetter areas, but may invade drier areas if fire is absent for any length of time. Its high plant diversity and efficient recycling of available nutrients are important to the success of this system at maturity.

Value

This community is valuable for its rarity, if nothing else. The high plant diversity and the rare tropical plants make this community valuable for biological research. The dense growth of these forests, before they were cleared for development, was probably important in moderating hurricane winds in the upper Keys. These forests are aesthetically pleasing, though often inaccessible to the casual stroller because of the high density of the plants.

Vulnerability (Moderate)

This community has the stability of most upland communities of high diversity; however, severe fire can completely destroy it.

Endangerment (High)

Few, if any, plant communities are as endangered as the tropical hammock. The last remnants of this unique system are being bulldozed to make way for condominiums, trailer parks and subdivisions. There are few land use controls that even delay its destruction; thus there is little hope of salvaging much of this community.

PINE FLATWOODS
(Map No. 25)

Introduction

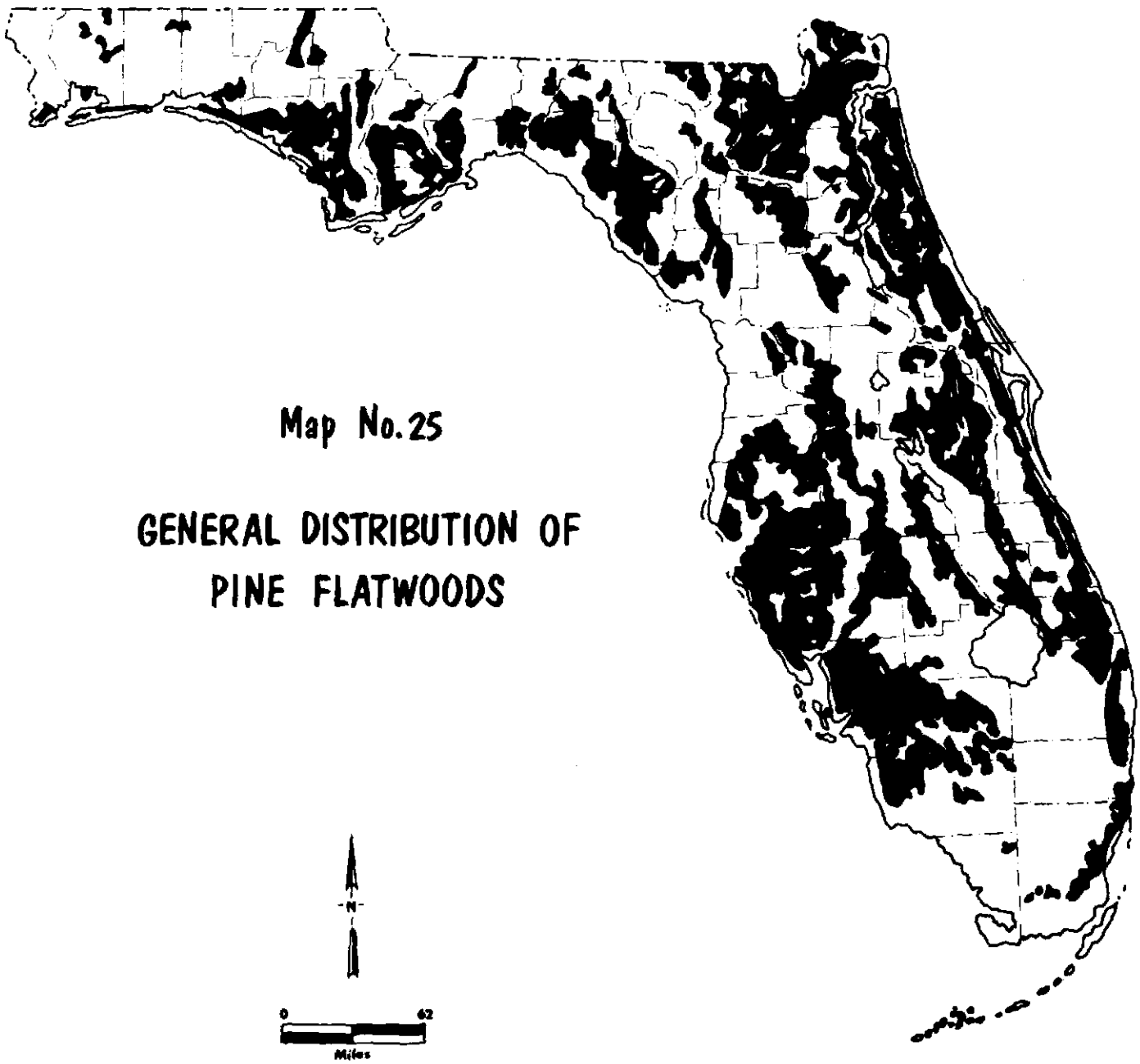
Flatwoods are the most abundant community in Florida. Before 1900 they covered half the state. Most flatwoods occur on the level areas, or terraces, between ancient shorelines. These areas were covered by shallow seas at different times during the earth's history, and layers of sand were deposited at those times. These poorly drained marine sands were deposited in different ways and have been sorted and weathered differently, partially accounting for the different types of flatwoods.

The soils of flatwoods are characterized by an acidic organic hardpan, one to three feet beneath the surface, which reduces percolation of water downward (during rains) and upward and also impedes root penetration during droughts. Though the soil is basically sandy, there is usually a moderate amount of organic matter in the top few inches.

Vegetation

There are three main types of flatwoods in Florida. Longleaf pine flatwoods are found on better drained sites and are characterized by having the longleaf pine as the dominant overstory tree. Slash pines compose the dominant overstory in the second type of flatwoods, which are usually in areas of intermediate wetness. Pond pines pre-

(ADAPTED FROM DAVIS, 1967)



Map No. 25

GENERAL DISTRIBUTION OF PINE FLATWOODS

dominate in the last type of flatwoods and typically occur in the more poorly drained areas. In addition to these three types, there is a variety of slash pine forest occurring on the rocklands of Dade, Monroe and Collier counties.

Flatwoods have a low diversity of tree species. Though understory shrubs and trees vary among the three major types of flatwoods, many plants are common to all flatwoods communities. Common understory plants include wiregrass, saw palmetto, wax-myrtle, gallberry and fetterbush. This community is usually sprinkled with cypress domes, bayheads or small titi swamps.

Animals

Flatwoods may have a fairly numerous and diverse animal population. The larger animals, such as deer, bear, bobcat, raccoon, and gray fox, are most commonly found along or near ecotones, or boundaries, between the flatwoods and the associated hammocks, cypress heads, bayheads, titi swamps and open areas. These inclusions provide good nest or den sites, cover and food at critical times of the year.

Other typical animals of the flatwoods include the black racer (snake), brown-headed nuthatch, Bachman's warbler, rufous-sided towhee, fox squirrel, cotton rat and cottontail.

Ecology

Fire and water are the two main determinants in the ecology of flatwoods. Slash pine flatwoods are subject to the least moisture stress of the three flatwoods types and have the highest species diversity. Fire is instrumental in reducing competition from hardwoods, but it generally does not occur often enough to kill the young, fire-sensitive slash pines.

Longleaf pine flatwoods are stressed by a relative lack of water, which reduces the plant diversity. Fire is very important in hardwood suppression and, in nature, occurs every few years. The longleaf pine is particularly well adapted to fire and is immune to ground fires at almost all stages of growth. In fact, successful natural regeneration of longleaf pine is dependent on fire to provide a suitable seedbed for germination and to control brown spot disease, which causes heavy seedling mortality.

Pond pine flatwoods are so stressed by excess water that they have the lowest diversity of the three communities. Fire is still important, and occurs at approximately fifteen to twenty year intervals. As in the other flatwoods it reduces hardwood competition.

Value

The naturally high net productivity of flatwoods, particularly slash pine flatwoods, is relatively easy for man to put to use producing cellulose. Wildlife value can range from high to low, depending on management actions. Flatwoods, because of the great areas they occupy, are important in providing buffer areas between the constantly growing urban areas.

Vulnerability (Low)

Flatwoods are fairly resilient ecosystems, but alteration of fire or water patterns can drastically change their species composition. Removal of fire results in succession to different types of hardwood communities, depending on the water stresses of a particular site.

Endangerment (Low)

Because of the vast area they cover (30 to 50 percent of the state), their natural resiliency, and their desirability as a renewable source of wood, their endangerment is not high when compared with other systems. Intensive management for pulp production, however, does endanger the flatwoods community. Large areas of longleaf pine flatwoods have been converted to slash pine plantations by lumbering off the longleaf pine and reseeding or replanting with slash pine. Intensification of the management of flatwoods for cellulose can cause major changes in this community. Loss of plant diversity and associated wildlife populations is presently occurring because of the destruction and subsequent planting to pine of the hammocks, stream margins and higher edges of swamps interspersed through many flatwoods.

New drainage techniques and fertilizer programs allow conversion of flatwoods to improved pasture, truck crops and even citrus orchards. Residential and other developments are consuming increasingly large areas of flatwoods.

DRY PRAIRIES
(Map No. 26)

Introduction

Dry prairies are vast, treeless plains. They often form an intermediate community between wet, grassy areas and upland forests. The largest areas of dry prairie occur north and west of Lake Okeechobee.

Vegetation

This community is dominated by many species of grasses including wiregrass, broom sedges and several different carpet grasses. Saw palmetto is the most common shrub over large areas with fetterbush, staggerbush and blueberry common locally. A number of sedges and herbs are also found in the dry prairie. Interspersed throughout large areas are small bayheads, cypress domes and cabbage palm-live oak hammocks.

Animals

Dry prairies often have abundant wildlife populations, particularly along ecotones associated with the other communities mentioned under vegetation. Characteristic birds include the caracara, sandhill crane, meadowlark and burrowing owl. The cotton rat, bobcat and raccoon are representative animals.

Ecology

Relatively little research has been published on the ecology of dry prairies. They have often been compared to flatwoods minus the trees, and the similar vegetative ground cover would seem to support this notion.

Value

Large areas of dry prairie are used for cattle grazing. Their moderately high wildlife values offer good recreational opportunities, namely hunting and bird watching. The caracara, sandhill crane, and burrowing owl, all rare, are relatively dependent on this community.

Vulnerability (Low)

Dry prairies are similar to flatwoods in vulnerability. Over-grazing with frequent fire causes the gradual replacement of wiregrass by carpet grass, which contains less nutritive value for grazing animals.

Endangerment (High)

Large expanses of dry prairie have been converted to improved pasture. More recently, large residential developments have begun to encroach on the prairies north and west of Lake Okeechobee.

WETLANDS

SCRUB CYPRESS
(Map No. 27)

Introduction

Scrub cypress areas are found on frequently flooded rock and marl soils in south Florida. The largest areas occur in eastern Collier County and northern Monroe County.

Vegetation

Scrub cypress forests resemble marshes with dwarfed pond cypress scattered throughout. Much of the vegetation is similar to that of marshes, with scattered sawgrass, beakrushes, St. John's wort and wax-myrtle commonly occurring. Air plants are often abundant on the cypress trees, and there are occasional orchids.

Animals

The poor soil and lack of nutrients that are responsible for the relatively sparse plant life also account for a fairly scattered wildlife population. Wood storks, occasional roseate spoonbills and the omnipresent alligator may be encountered, along with deer, bobcat and panther.

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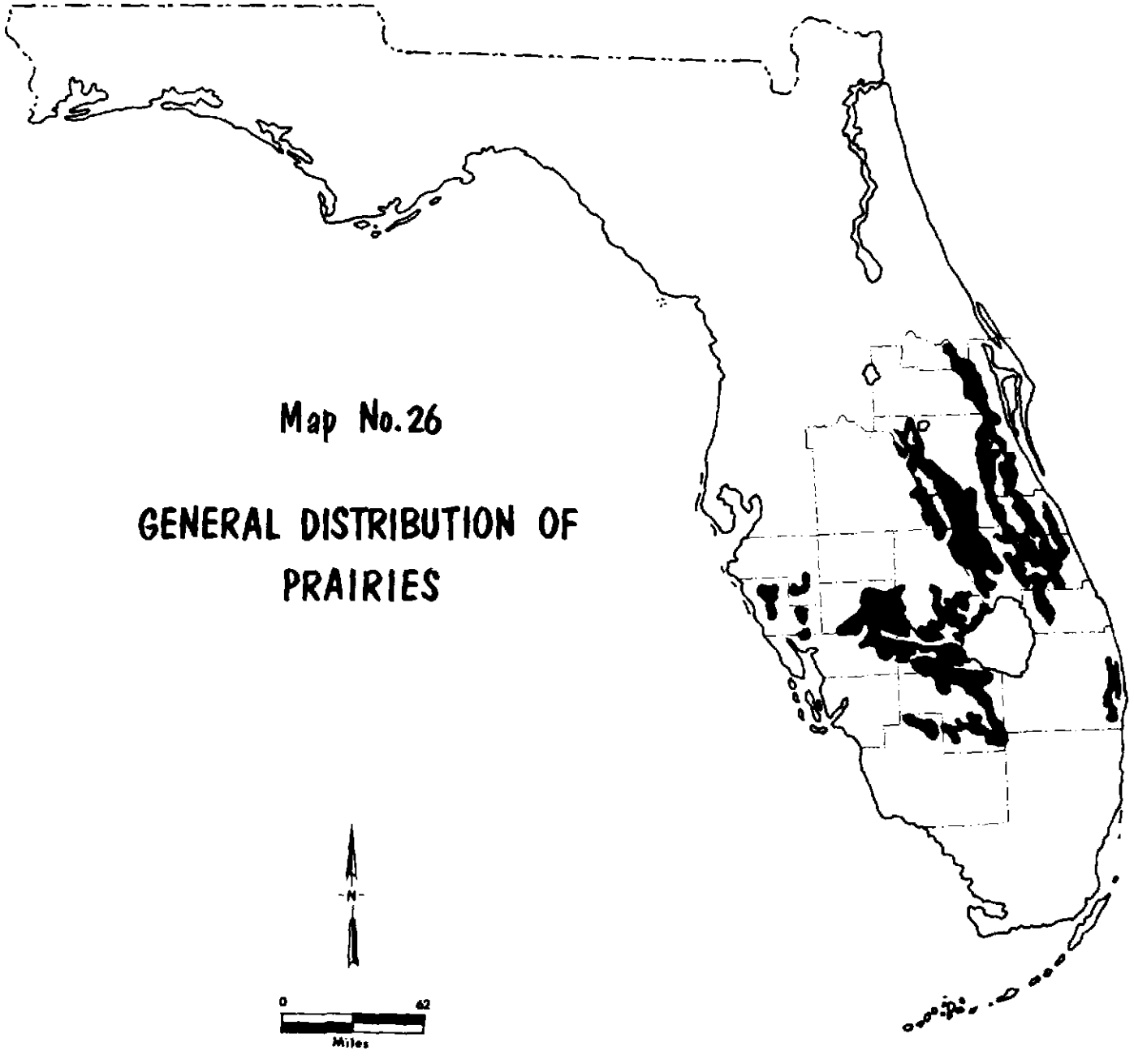

Map No. 26

GENERAL DISTRIBUTION OF PRAIRIES

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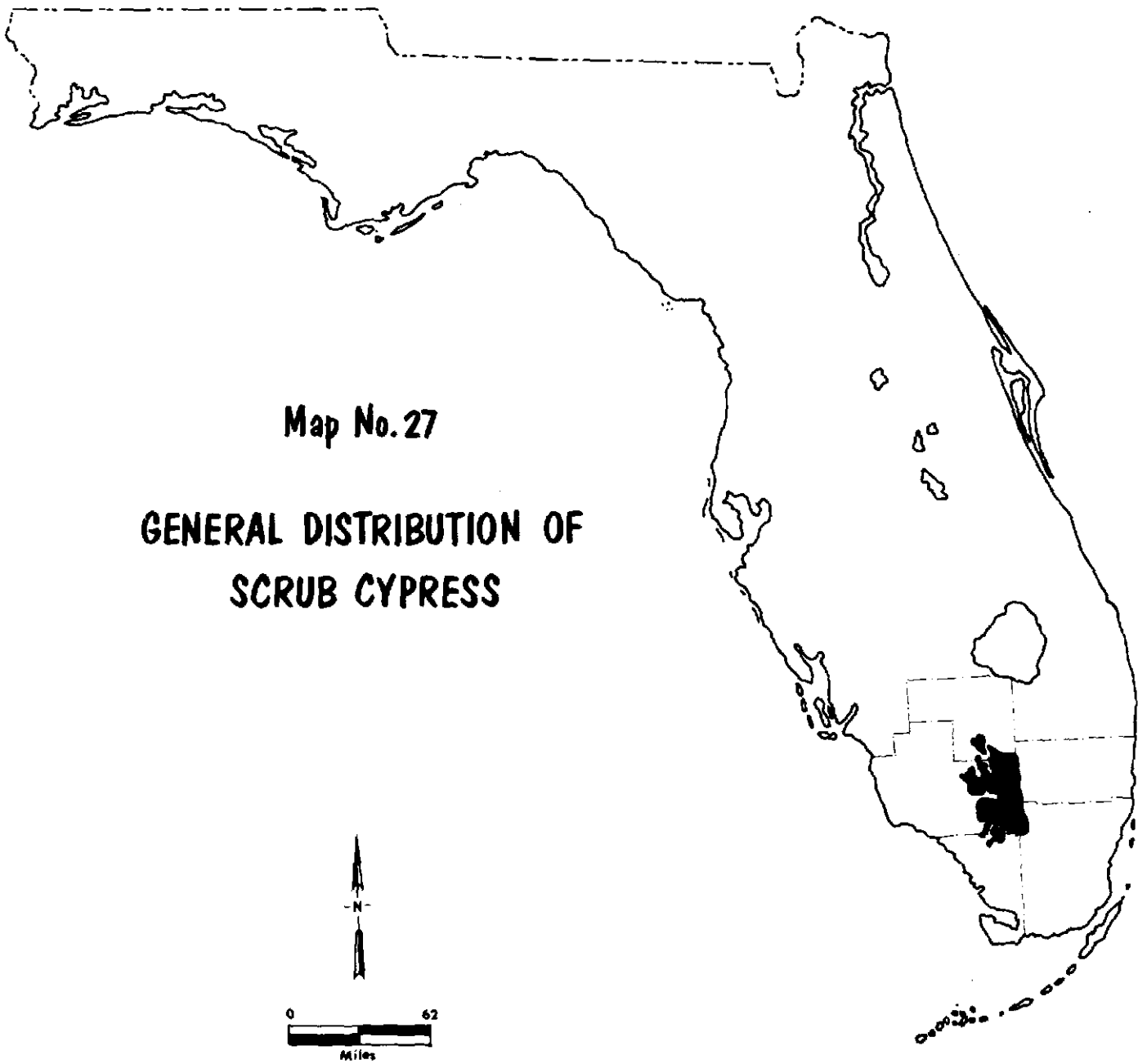

Map No. 27

GENERAL DISTRIBUTION OF SCRUB CYPRESS

Ecology

The lack of nutrients is probably the limiting factor for both plant and wildlife abundance and diversity. In addition, the seasonal extremes in water levels provide stresses which may further reduce plant diversity.

Value

The scrub cypress, like the sand pine scrub and tropical hammock, is found in this country only in Florida. It has a moderately low wildlife population. Wildlife values are higher near the cypress heads and bayheads that are interspersed through this area.

Vulnerability (High)

Changes in water schedules could cause widespread changes in this community. An increase in nutrients could also change plant distribution and significantly affect the ecology of the scrub cypress forests.

Endangerment (High)

Continuing development around scrub cypress areas, which would be stimulated if the proposed south Florida jetport were constructed nearby, may change water quality and quantity enough to endanger significant portions of this plant community.

SWAMP FORESTS
(Map No. 28)

Introduction

Deciduous hardwood swamps are found bordering rivers and in basins where the forest floor is saturated or submerged during part of the year. Other terms for this community are floodplain forest, hydric hammock and river swamp.

Vegetation

This community is characterized by large hardwoods such as blackgum, water tupelo, pop ash, red maple, sweetgum, water oak and water hickory. Other typical overstory trees are bald cypress and cabbage palm. Understory trees include buttonbush, dahoon, wax-myrtle, American hornbeam and elderberry. A high percentage of plants, particularly the overstory trees, are deciduous in mixed hardwood swamps. Swamp forest productivity and species mixtures are determined to a large degree by the kind and condition of alluvial soil deposits.

Animals

River swamps provide habitat for a wide variety of animals, among them many of our rare species. If the ivory-billed woodpecker still exists in this state, as some ornithologists suspect, it probably inhabits large swamp forests. Other swamp denizens are the bobcat, deer, turkey, gray squirrel, otter, pileated woodpecker, wood duck, and numerous songbirds, turtles and snakes.

Ecology

The periodic flooding of the river swamps is a dominant factor in the operation of the system. These floods provide pulsed subsidies of nutrients to the system. The periodic flooding and drying is essential to the system, with new communities taking over if the land is either drained or flooded for long periods of time.

Diversity of animal species is fairly high because of the varied microhabitats (old logs, backwaters, oxbows, deep water) and the availability of nutrients. All animals, however, must be able to withstand or avoid the periodic stresses imposed by high water. Gross productivity is high and comparable to salt marshes in many ways.

Value

The river swamp is important in maintaining both water quantity and water quality. It provides natural storage of flood waters and has a damping effect on peak flood stage in the associated rivers.

River swamp systems are believed to act as giant filters screening out organic and inorganic wastes from the rivers. It is estimated that six miles of river swamp is capable of treating the sewage of a city of fifty thousand persons. The large air-to-water interface available for oxygen diffusion, the slow meandering of the river, and the turbulence caused by logs and other obstructions all play a part in this capability. River swamps

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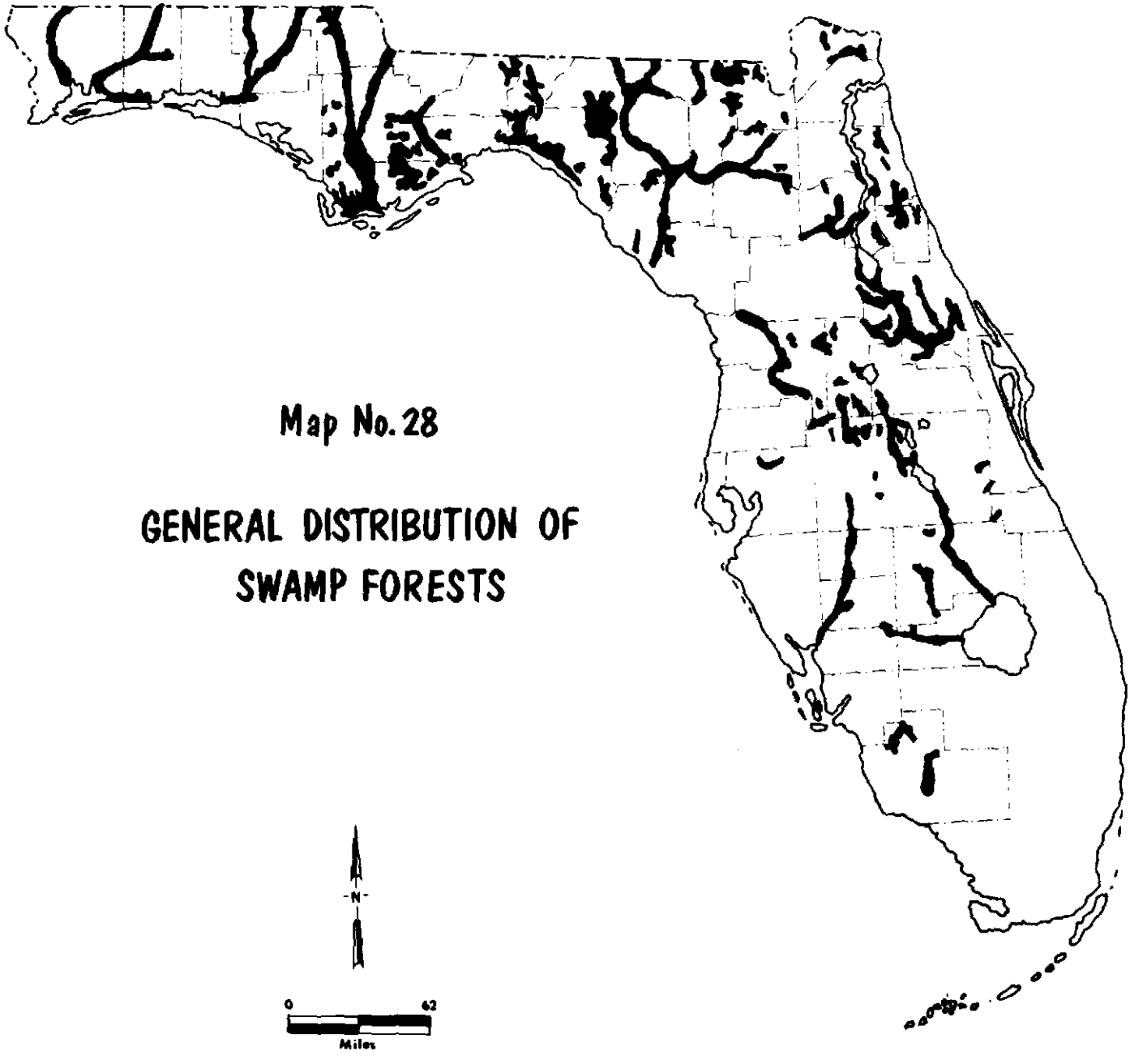

Map No. 28

GENERAL DISTRIBUTION OF SWAMP FORESTS

contribute detritus to fuel downstream aquatic ecosystems, including estuaries.

Wildlife and wilderness values are very high in river swamps, which are frequently close to urban areas badly in need of these values. Swamps may serve as travel lanes for wildlife when the nearby uplands are developed.

Vulnerability (High)

An entire river swamp system may be destroyed by localized activities such as channelization or damming. Once the periodic inundations are stopped or the water table is lowered, the system cannot survive. If the basic water cycle is maintained, then the hardwood swamp is fairly tolerant of disturbances.

Endangerment (High)

Drainage and channelization projects threaten large numbers of smaller river swamps. This effect has been felt more severely in Georgia and the Carolinas, but Florida is certainly not immune to pressures to "reclaim the land." Small watershed projects are continually being proposed throughout the state. Large projects such as the proposed Florida Barge Canal or the proposed new dams along the Apalachicola River would destroy thousands of acres of this ecosystem at a time. Desnagging of creeks and streams is a small scale activity that interrupts the normal operation of the river swamp and may result in increased water flow, less turbulence, and loss of fish and wildlife habitat. Present lumbering practice in swamps is to take the larger, more marketable trees. This practice is harmful in the long run to both the ecological and the commercial timber values of a swamp. These communities are not prime sites for residential development, though they are more likely to be developed than are cypress swamps in deeper water.

CYPRESS SWAMPS
(Map No. 29)

Introduction

Cypress swamps are usually located along river or lake margins or interspersed through other communities such as flatwoods or dry prairies. In addition, they also occur along shallow drainage systems known as sloughs or strands. These swamps have water at or above ground level for a considerable portion of the year.

Plants

The bald-cypress is the dominant tree along lake and stream margins and is often the only plant which occurs in significant numbers in these locations. The pond cypress occurs in cypress heads and domes, which are typically interspersed through flatwoods and prairies. Trees often found with cypress include blackgum, red maple, willow, pop ash, pond pine and slash pine. The overall tree diversity of cypress heads is relatively low; that of strands and stream margin forests is somewhat higher. Smaller plants include wax-myrtle, buttonbush, various ferns, poison ivy, greenbrier and numerous air plants. Arrowhead, pickerelweed, sawgrass, and other marsh plants are often found in areas of open water within cypress swamps.

Animals

The deeper cypress swamps have rather limited populations of wildlife, but aquatic animals such as salamanders, water snakes, alligator and otter may be abundant. Shallower, seasonally flooded areas such as cypress heads are extremely important as refuge areas for deer and other large animals.

Ecology

Cypress live in an environment severely stressed by the submerged or saturated condition of the soil. Fire is a stress factor in the drier cypress heads and domes. Both of these stress factors are also important in reducing competition and preventing the community from advancing to one dominated by evergreen hardwood trees (a bayhead).

The experts are not at all sure what conditions favor productivity in cypress swamps. Most are agreed that water stagnation, water duration and soil depth play important roles. In Florida, cypress stands are generally most productive on the better alluvial floodplain soils and least productive on sand, rock, and shallow, mucky, perched pond areas. As soil depth increases in muck ponds,

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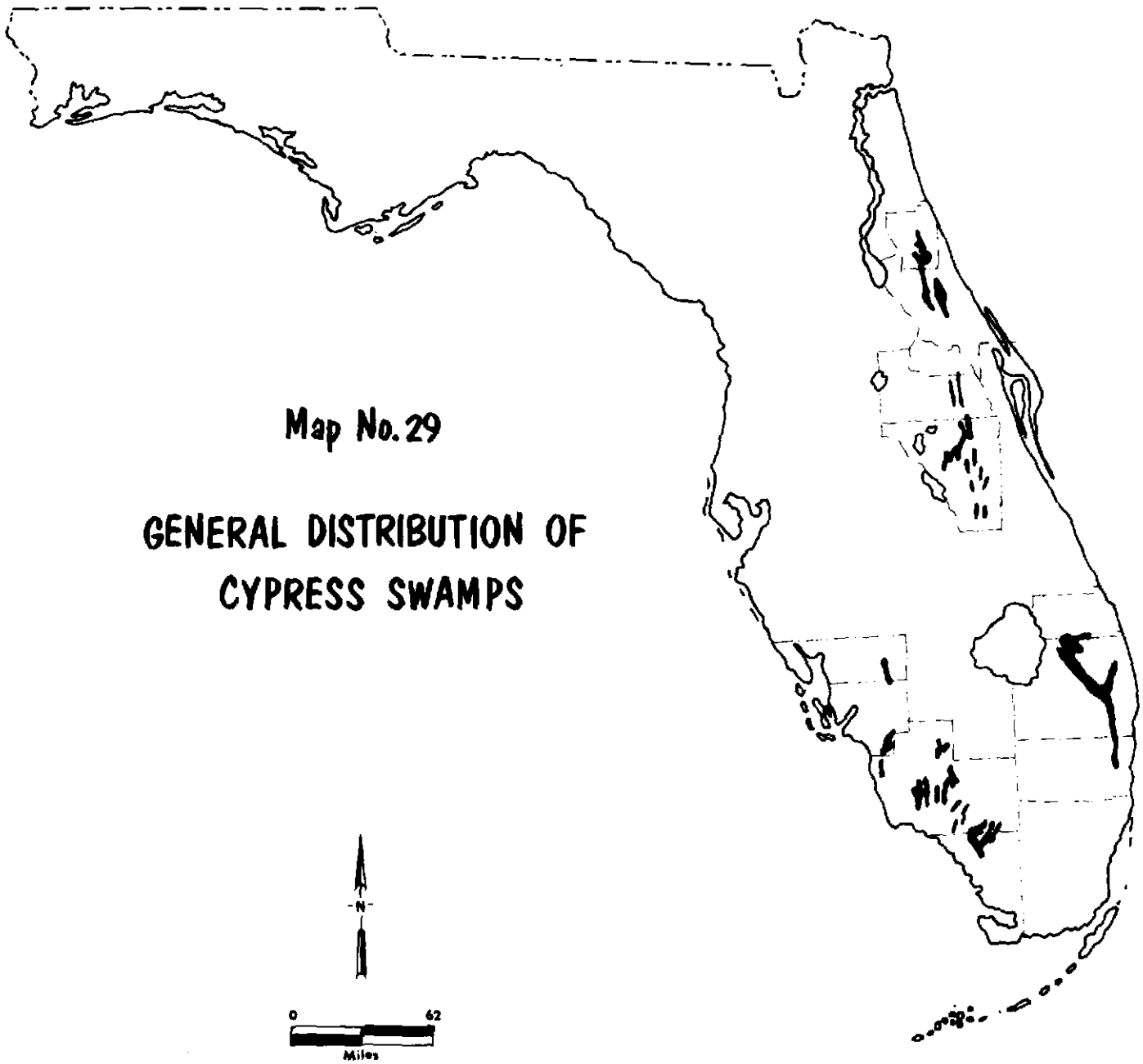

Map No. 29

GENERAL DISTRIBUTION OF CYPRESS SWAMPS

so does cypress growth rate (an apparent reason for the domed effect of cypress ponds in central Florida). Stagnant water depresses growth – particularly if it remains during the growing season. Water is essential in the germination of cypress seeds. A soil saturated and covered with water provides natural stratification for the seed and is necessary for good germination. To insure development of seedlings after germination, however, the water must recede to permit their tops to develop above water level. Therefore, fluctuating water levels are essential to continued natural regeneration of cypress.

Value

Relatively little is known about the values of cypress swamps other than their value as wildlife habitat. Wading birds, ospreys and (occasionally) eagles nest in cypress trees. Like hardwood swamps, cypress swamps absorb nutrients from the water and function as natural waste treatment plants.

Vulnerability (Moderate to High)

Cypress swamps along rivers are susceptible to widespread changes of water level schedules caused by damming or channelization. Many Florida lakes have had their water levels stabilized, which will probably diminish the long term reproduction of cypress trees around those lakes. Recent public awareness of the need for lake drawdowns could lead to a return to quasi-natural water fluctuations that would avert the potential reproduction problem. Cypress heads are usually isolated from each other, so the disruption of one by drainage does not necessarily affect neighboring areas.

Endangerment (Low)

Cypress heads are sometimes drained in order to increase pine tree production and to create more year-round pasturage, but it is not known if these losses are significant. Development of the deeper swamps is difficult and is not the threat that it is to dryer lands. Commercial lumbering poses a similar problem to that noted under hardwood swamps, even though commercial harvest of cypress trees is exceeded eight-fold by the net reproduction. Cypress swamps are endangered indirectly by improper development of adjacent uplands.

FRESHWATER MARSHES AND WET PRAIRIES
(Map No. 30)

Introduction

Freshwater marshes can be considered to be any grass-sedge-rush community occurring in an area where the soil is usually saturated or covered with surface water for two or more months during the year. This category usually does not include submerged or floating plants. Wet prairies are characterized by less water and more grasses than marshes and usually have fewer of the tall emergents such as bulrushes. This category also includes the wet to dry marshes and prairies found on marl areas in south Florida.

Vegetation

Upwards of 15 different types of marshes and wet prairies have been described in Florida. These include the following: sawgrass marshes; flag marshes dominated by pickerelweed, arrowhead, fire flag and other non-grass herbs; cattail marshes; spike-rush marshes; bulrush marshes; maidencane prairies; grass, rush and sedge prairies; and switch grass prairies dominated by taller grasses. Any single marsh may have different sections composed of these major types, and there is almost complete intergradation between the types.

Animals

Marshes and wet prairies are very productive of wildlife. Many rare and endangered species depend heavily on this habitat; the everglade kite, wood stork, Cape Sable seaside sparrow, sandhill crane, alligator, Florida round-tailed muskrat, and Everglades mink all are found in this habitat. So, too, are many wading birds and waterfowl (wintering and resident), numerous frogs and other amphibians, various turtles and the otter.

Ecology

Water level fluctuation and fire, the two major ecosystem managers of Florida, are also important in the maintenance of marshes and wet prairies. As a rule, the relative importance of water level fluc-

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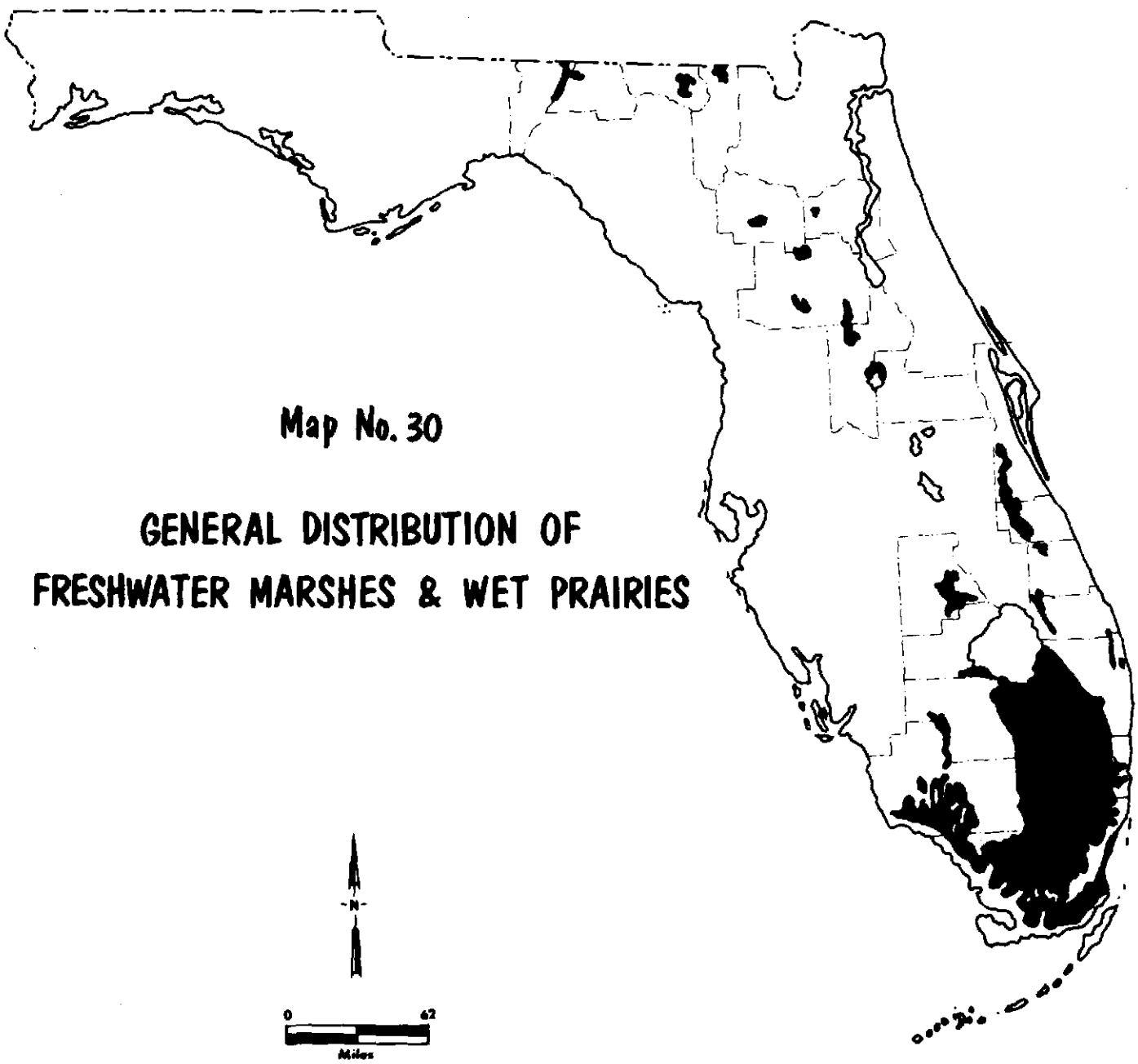

Map No. 30

GENERAL DISTRIBUTION OF FRESHWATER MARSHES & WET PRAIRIES

tuation and fire varies with the type of community. In wet prairies, fire is the dominant factor since the ground may be dry for extended periods of time. Marshes are less susceptible to fire, but it is still an important factor.

Value

Depending on their siting, marshes may act as filtration systems to protect rivers and lakes from eutrophication caused by nutrient-rich upland runoff. Marshes disrupt water flow, allowing the nutrient-rich sediments to sink to the bottom and be incorporated into plant material through the process of photosynthesis. By photosynthesis alone, fifteen hundred acres of marshland is theoretically capable of storing all of the nitrogen and about 25 percent of the phosphorus from the sewage of a city of 62,000 persons. Heavy metals, too, are filtered out. Wet prairies tend to receive their water supply primarily from immediate rainfall, so that their filtration function is less important. Large marshes are important in damping peaks in water flow so that intense flood peaks are avoided. Conversely, water is retained by the organic marsh soils during drought periods.

As mentioned above, marshes and prairies are very productive of wildlife. One advantage of marsh wildlife, from a human viewpoint, is that it is often highly visible and readily identified.

Vulnerability (High)

Marshes are dependent on certain patterns of water level fluctuation and fire occurrence. The exclusion of fire or high water levels permits succession to a woody community. Prolonged inundation or prolonged lowering of the water table both upset the delicate interactions that are important to the high productivity and diversity of the marsh.

Marshes and wet prairies are susceptible to disturbance from intensive recreational uses. Recreational vehicles, especially half-tracks, appear to be destructive in some south Florida marshes. Different kinds of plant communities often become established in areas of heavy recreational vehicle use.

Endangerment (High)

Many of Florida's major marsh systems have been destroyed or seriously degraded. Various drainage projects have seriously damaged the vast Everglades, the Kissimmee River marshes, the Lake Istokpoga marsh, and the marshes of the upper St. Johns River, often to reclaim the land for agricultural interests. Numerous smaller marshes and prairies have also been drained and converted to muck farms or improved pasture.

MANGROVE SWAMPS
(Map No. 31)

Introduction

Mangrove swamps occur along shorelines not subject to strong wave action, from Hernando County south on the Gulf coast and from Volusia County south on the Atlantic. Mangrove swamps are best developed in the Ten Thousand Islands region of southwest Florida.

Vegetation

The major producers in mangrove swamps are the three mangrove species: red mangrove, black mangrove and white mangrove. Throughout their range the red mangrove tends to be the dominant species, with black and white mangroves occurring in various mixtures. Whereas there is no ubiquitous zonation pattern, there are apparent differences in the species composition and gross structure of the mangrove swamps, which appear to be strongly related to the periodicity of inundation by tides and by seasonal terrestrial runoff.

Other plants commonly found in mangrove swamps include saltwort, glasswort and a variety of salt marsh species. Buttonwood trees occur just above the reach of salt water.

Animals

The mangroves provide habitat for a number of rare and endangered species including the black-whiskered vireo, mangrove cuckoo, osprey, bald eagle, reddish egret, roseate spoonbill, great white heron and crocodile. Wading birds are common on the surrounding mudflats, and manatee live in the adjacent estuaries.

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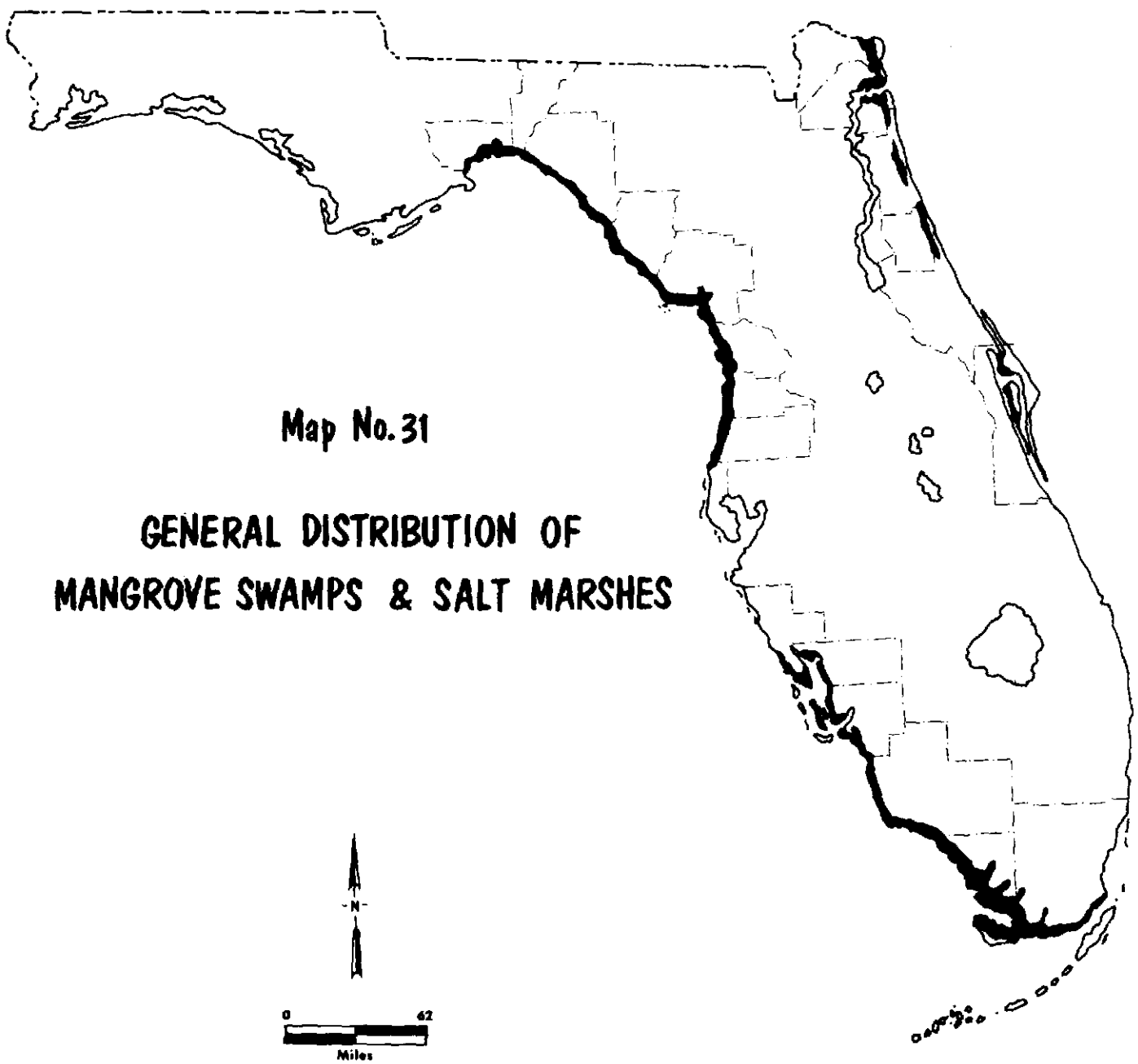

Ecology

The mangrove community, a detritus (litter)-based system, is often the driving force behind the productivity of bordering estuaries. Leaf fall from the mangroves (up to 85 percent of all detritus in some systems) provides food or substrate for countless organisms ranging from bacteria to large fish such as the striped mullet. Detritus-feeding organisms in turn support much of the estuarine animal community including such gamefish as snook, tarpon and spotted seatrout.

Value

Mangroves, by their detrital contribution, support much of the sport and commercial fishery (finfish, shellfish and crustaceans) in adjacent waters. Mangroves are of value in stabilizing shorelines and in moderating the influence of storms. Wildlife value is very high (see **Animals** section).

Vulnerability (Moderate)

Local activities do not affect the mangrove system so readily as they do more sensitive systems, such as a hardwood swamp. Silt from nearby dredging, however, may greatly reduce the diversity in this system. Temperature increases and pollution from distant sources may seriously affect mangrove communities, although more study is necessary to confirm this. A recent study suggests that water-borne nutrient supply from the uplands is important to maintenance of a normal rate of growth for mangroves. Coastal canals that bypass the indirect flow of water from the uplands through the mangroves to the estuary are therefore harmful to mangrove growth and estuarine productivity. A lessened flow of water also means less ability to flush pollutants.

Endangerment (Moderate)

Much of the waterfront development in south Florida was built upon filled mangrove swamps. This kind of destruction is still going on, though at a slower pace because of recent state and federal regulations (see Chapter III in the Plan). Fortunately, large areas of mangrove swamp are preserved in Everglades National Park.

SALT MARSHES
(Map No. 31)

Introduction

Salt marshes occur on low wave-energy shorelines north of the range of the mangroves and interspersed with the mangroves in many areas of south Florida. Salt marshes also extend up into tidal rivers.

Vegetation

Many salt marshes are dominated by one plant, usually cordgrass or black rush. The species existing in any one area usually depends on the degree of inundation by tides and the salinity of the water. Salt marshes often blend in gradually with freshwater marshes, forming a transition zone of saltwater and freshwater plants.

Animals

Salt marshes harbor large numbers of invertebrates which are fed upon by many of the higher animals of the marsh and estuary. Bird life is particularly numerous in and around salt marshes. Rails, egrets, gulls, terns and seaside sparrows are some relatively common birds that depend for food, either directly or indirectly, on the marsh. The diamondback terrapin, salt marsh snake, mink, otter and raccoon are other characteristic animals.

Ecology

Salt marshes are similar to mangrove systems in their ecology. The tides are a major factor in the high productivity, providing free food delivery and waste removal to those organisms adapted to take advantage of this subsidy. This allows the system to concentrate much of its energy in producing plant and animal material and results in high productivity.

As in the mangrove system, detritus is a major source of energy for the invertebrates at the bottom of the salt marsh food chains.

Value

Salt marshes are similar to mangrove swamps in having significant environmental values.

Vulnerability (Moderate)

Large salt marshes are usually little affected by small, localized disruptions; but heavy siltation from dredging and filling, other forms of water pollution, and altering the tidal flow of an area can have a significant impact on large areas of salt marsh (see also the discussion under Mangrove Swamps).

Endangerment (Moderate)

Sizable acreages of salt marsh are in federal ownership at St. Marks and Chassahowitzka National Wildlife Refuges. There is also state and federal regulatory protection applicable to coastal wetlands (including salt marshes and mangrove swamps) that occur below mean high water in navigable waters. Coastal wetlands above the mean high water line have recently come under state and federal regulatory jurisdiction, but until the strength and applicability of the regulatory power is determined, these areas should be regarded as endangered by on-site development. Coastal wetlands below mean high water, though less endangered by on-site development, are nevertheless endangered indirectly by development of adjacent upland areas.

SUBMERGED LANDS

Introduction

This term includes several different ecosystems, all of which occur under water. The water could be the Atlantic Ocean, the Suwannee River or a farm pond. These systems are coastal and inland, vegetated and unvegetated. They include reefs and beach foreshores. At their shallow, landward limits they merge with marshes and swamps.

Vegetation

Submerged lands are vegetated except where the depth and turbidity of the overlying water column limit the penetration of light, or where strong currents prevent the establishment of roots, or where the water is badly polluted. In salt water the vegetation consists of numerous algae and a few species of seagrasses. There is more variety in fresh water; native submerged plants such as eelgrass, coontail, pondweed, and fanwort are often abundant as are the exotic weeds – hydrilla, Eurasian water milfoil, Brazilian elodea and water hyacinth. Numerous emergent plants, including fragrant water lily, American lotus, and watershield, as well as a variety of marsh plants, are also encountered in fresh waters.

Animals

In both fresh and salt water, plants provide food, cover, and attachment sites for small crustaceans, shellfish, other invertebrates and fish. Plants and these smaller animals provide food for the larger ones, which include fish, amphibians, reptiles, waterfowl, wading birds and aquatic mammals such as the otter and the manatee.

Reefs, especially the living coral reefs in the Florida Keys, are very productive biologically. Even the absence of vegetation or reefs is not evidence of poor biological productivity; some of the most productive inshore areas of Florida's northeast coast are virtually unvegetated (except for microscopic plants).

Ecology

The controlling factors here are different from those of the preceding natural systems. The amount of sunlight reaching submerged plants depends on the depth and clarity of the water column. The strength of the water flow and the nature of substrate determines whether or not plants and sessile animals can attach to the bottom. In some ways submerged lands are like swamps and marshes: the submerged vegetation contributes to either a grazing or a detritus-based system, and the circulation of water brings in nutrients. In communities lacking submerged vegetation the primary energy source is either detritus from other systems or sunlight, which is used by microscopic plants.

Value

Most of the important species in Florida's commercial and sport fishery spend at least a portion of their lives in the shallow inland and coastal waters. Many species, among them oyster, crabs, seatrout, and pompano, spend most of their lives there.

The beach foreshore and, to a lesser degree, other shallow submerged lands absorb wave energy and thus moderate the effects of wind and tide.

Vulnerability (Moderate to High)

The value of these ecosystems is dependent on their overlying water quality. Dredging and associated activities, in addition to direct habitat destruction, increase turbidity and so decrease the amount of sunlight penetrating the water column. The aquatic flora and fauna are sensitive to biological and chemical water pollution, as well as to particulate pollution. Coral reefs seem to be particularly sensitive. Oysters, though they may not be damaged by biological water pollution, will be placed off-limits to taking by commercial fishermen if the concentration of fecal bacteria in the water exceeds a very low, specified level. Changes in the natural flow regime, water temperature, or salinity can also disrupt and change the biological community.

Endangerment (Moderate)

The most obvious and direct danger to submerged lands is their degradation and elimination by dredging and filling. Since the adoption of a stricter attitude by state and federal agencies toward such dredging and filling, this endangerment has been reduced. Pollution from upland sources is probably the more critical endangerment now.

WATER SYSTEM

Introduction

The water system is intimately related to the environmental systems discussed previously, but has characteristics of its own that warrant a separate discussion (and format). The previous sections describing environmental systems have pointed out the importance of water in those systems. Though vitally important to terrestrial ecosystems, it is even more important to aquatic ecosystems because for them it is the medium in which plants and animals live, move, find food and obtain dissolved oxygen and other gases. The most important uses of water, from a human perspective, are for consumptive needs such as drinking, other domestic uses and agriculture.

The water supply of the earth, whether it is on or below the surface, has its origin in precipitation. Of the precipitation that reaches the ground, part is returned to the atmosphere by evapotranspiration (the loss of water through evaporation and through plant transpiration); part remains above ground and is stored temporarily in lakes, ponds, and swamps, or moves to the sea as streamflow; and part enters the ground, some to replenish the soil moisture and some to enter the saturated zone and recharge ground water supplies. Ground water moves in the aquifers (ground water reservoirs), under the influence of gravity, toward areas of discharge such as streams, lakes,. springs, wells and the sea.

Rivers

Most of Florida is flat or gently sloping; consequently, water moves slowly to the sea. The original drainage (prior to canalization for purposes of flood control and drainage) of south Florida, aside from a few defined rivers, was a sluggish flow through broad, shallow channels such as the Fakahatchee Strand, the Okaloacoochee Slough, and the Everglades. This is the primitive surface drainage of a geologically young and flat land. Further north, where the land is both older and more rolling, the surface drainage consists of defined river systems, including the two largest rivers in the state (in volume of flow), the Apalachicola and the Suwannee.

Lakes

Lakes are an important element of the state's hydrology. There are 5,815 lakes larger than ten acres. Altogether Florida's lakes total more than two and one-quarter million acres. The central part of the state, sometimes called the Lakes Region, contains the largest number of lakes (see Map No. 3, Drainage System of Florida). Most of the lakes in the state were probably created by solution of the underlying limestone with subsequent collapse and depression of the land surface. Some of the larger lakes, Okeechobee, for example, were originally depressions on the floor of the higher seas of interglacial periods. Most of Florida's lakes are

water table lakes, that is, their surface levels closely follow the nearby water table (ground water level). Other lakes have a relatively impermeable layer underneath them that prevents the water from leaking downward. These "perched" lakes may have surface levels above the local water table.

The shallow, marsh and swamp-fringed lakes and rivers of Florida are very productive biologically. The state's warm temperatures and long growing season contribute to this productivity. These same factors also make these water bodies susceptible to accelerated eutrophication if they receive above-normal additions of nutrients, which might be provided by sewage, fertilizer runoff, or fish kills.

A considerable volume of water is stored in Florida's lakes; however, the other uses of lakes – recreation, flood control, fish and wildlife propagation, and, especially, residential lakefront development – interfere with the optimum utilization of lakes for domestic water supply.

Aquifers

Many areas of Florida have more subsurface drainage than surface drainage. As noted in the introduction, that portion of rainfall that is not lost via evapotranspiration or runoff enters the ground. This water percolates downward until it reaches the water table, whereupon it may either: (1) move laterally through sand, shell, gravel, or other unconsolidated material and reach a lake, river, or swamp; or (2) continue downward into the underlying limestone and then move laterally through caverns, holes, and pores in the limestone to eventually discharge through artesian springs and seepage areas.

The first kind of drainage takes place in the non-artesian aquifer. (An aquifer is defined as an underground water-bearing formation that can transmit water.) Non-artesian aquifers are not confined by an impervious layer of clay or marl, and their water surface – the water table – is free to rise and fall.

The second kind of drainage takes place in the artesian aquifer, which is saturated with water and confined or semi-confined by a relatively impermeable overlying layer of clay or marl. Its water surface is not free to rise and fall, but is constrained by the overlying bed. The water in an artesian aquifer is under pressure that causes it, where the confining layer is penetrated by a well shaft or a natural opening, to rise above the top of the aquifer. The level to which water would rise in tightly cased wells that penetrate an artesian aquifer is called the potentiometric surface (see Map No. 8, Aquifer Recharge, for areas where the potentiometric surface is above ground level). Florida's large springs are the results of natural openings to the surface in artesian aquifers whose potentiometric surface is above ground level.

The principal importance of an aquifer, artesian or non-artesian, lies in its ability to store and transmit water. Aside from the vast quantity of surface water used by thermoelectric power plants, aquifers supply most of the water used in Florida. This includes public supply, industry, irrigation and other agricultural uses. Because water in aquifers remains at a constant temperature (approximately equal to the annual average surface temperature) all year through, it is sometimes used for air conditioning during the hot summer months. Ground water also prevents encroachment of sea water inland, unless it is depleted by heavy withdrawals or prolonged drought. Subsurface drainage into lakes, rivers, and swamps supplies those environmental systems with necessary water.

The phenomenon of water percolating down to fill non-artesian and artesian aquifers is termed recharge. Recharge is a function of both the land surface and rainfall. The importance of the recharge function of a given land area is dependent on the ability of that recharge to naturally maintain underlying aquifers at a level that will allow them to continue supplying the water requirements of associated environmental systems and any identified human uses.

The rate at which recharge occurs depends on the rate and frequency of rainfall, the permeability of surface and subsurface materials, the topography of the land, and the difference in elevation between the surface water level and the potentiometric surface at that site. The first two surface conditions affect the amounts of rainfall lost to evapotranspiration and runoff; consequently, they also affect the amount of rainfall entering the ground. The last condition, difference in elevation, also affects the amount of rainfall entering the ground because it, along with the permeability of the overlying layer, controls the rate of movement of water into the artesian aquifer. For example, in an area where the potentiometric surface is higher than

ground level, no recharge to an artesian aquifer takes place; in fact, the tendency would be for artesian water, because it is under greater pressure than the water above it, to seep upward through the confining layer (depending on its permeability).

Conditions favoring maximum recharge are as follows:

(1) The surface materials must be sufficiently permeable to absorb the heaviest rainfall without surface runoff

(2) The permeable surface material must be thick enough to store the water from a prolonged rain without the water table rising to the root zone

(3) The vertical hydraulic gradient between the water table and the confined potentiometric surface and the vertical hydraulic conductivity of any confining beds between the water table and the aquifer must be sufficient to move all available water (that is, rainfall minus evapotranspiration) to the aquifer

(4) The transmissivity of the aquifer must be sufficient to move the water from the receiving area

It is of interest to note whether the best recharge areas have been described and located. Such a description has been made for the Floridan aquifer, the largest artesian aquifer in the state, in the map of aquifer recharge (Map No. 8). This map is, however, only an approximation and should not be relied upon for precise full-scale identification of good recharge areas. Also, it does not apply to other aquifers.

As a field guide – subject to the constraints of the aquifer recharge map – the best recharge areas are deep sand hills and ridges and areas of karst or micro-karst topography (karst refers to regions of uneven topography in which most or all of the drainage is through underground channels and other solution features in the underlying limestones). In some regions sinkhole lakes provide most of the recharge to the artesian aquifer. Wetlands, though often mentioned in connection with aquifer recharge, are usually poor recharge areas. They can be separated into four groups on the basis of recharge capability:

(1) Discharge areas (negative recharge)

(2) Perched areas (an impermeable substratum keeps these areas wet and prevents recharge)

(3) Low permeability areas (some seepage to the aquifer, but these are not efficient recharge areas)

(4) Good permeability areas (these areas have a good hydraulic connection with the underlying aquifer, but may not recharge well because the potentiometric surface is high. Recharge can be increased by lowering the potentiometric surface of the aquifer, but this could lower the water level in the wetland and adversely affect the ecosystem there)

The Floridan aquifer is the largest artesian aquifer in the state. The porous limestones of this aquifer underlie all of Florida and parts of Alabama, Georgia and South Carolina. In Florida it contains an estimated eight hundred cubic miles of water, or a little over one trillion gallons of water. This is obviously a very large and important water resource. Not all of this water is potable; some of it is mineralized and unsuitable for drinking, though it can be used for irrigation or cooling. Also, it may become economical to desalinize this water in regions where local supplies of potable water are being exhausted. Those portions of the Floridan aquifer that contain water of good quality and have high potentiometric surfaces are very valuable natural resources. The four most important highs, or areas with a high potentiometric surface, are the Green Swamp high, the Alachua-Bradford-Clay high, the Volusia high and the Pasco high.

Besides the Floridan, there are three other important aquifers in Florida (see Map No. 8):

(1) The Biscayne aquifer, a non-artesian aquifer, is the primary water supply for southeast Florida. It has high recharge rates and is one of the most productive aquifers in the world.

(2) Unnamed shallow aquifers supply water to southwest Florida and to most of the east coast north of Palm Beach County. Except for regions of thick sand and shell deposits on the east coast, recharge rates to this non-artesian aquifer are low.

(3) The sand and gravel aquifer that supplies water to west Florida has generally fair recharge rates over most of its area.

Coastal Waters

At one "end" of the cyclic water system is the sea (the Atlantic Ocean or the Gulf of Mexico). Water eventually flows, seeps, or falls into the sea. Water that falls can enter coastal waters directly, but flowing waters usually first pass through a transition zone between fresh and salt waters. These transition zones are generally termed estuaries.

An estuary is defined as a semi-enclosed body of coastal water which has a free connection to the open sea and within which sea water is measurably diluted with fresh water derived from land drainage. Most of Florida's bays and lagoons meet this requirement, at least in part.

Some Florida estuaries, including such west coast bays as Charlotte Harbor, Tampa Bay, and Escambia Bay, are drowned river valleys. Those valleys were formed long ago, when the sea level was much lower than it is now. Other estuaries, particularly on the east coast, were formed by the emergence of land relative to sea level; Lake Worth and the Indian River presumably arose in this way.

Since estuaries are transition zones between fresh water and salt water, their salinities are usually intermediate, though circumstances sometimes allow the salinity levels in certain estuaries, northern Florida Bay for example, to reach sea strength (thirty-five to forty parts of salt per thousand parts of water) or above.

Estuaries and their associated wetlands are very productive for aquatic life. This productivity depends on fresh water inflow and on detrital contributions from associated wetlands, both adjacent (salt marsh, mangrove swamp) and upstream (freshwater swamps and marshes). The National Marine Fisheries Service estimates that 85 percent of the commercial marine catch in south Florida is dependent on estuaries. A similar figure probably holds for the state as a whole. Many commercially valuable species, notably the oyster, are harvested in estuaries; however, estuaries may be even more valuable as nursery areas for numerous species of fish, shellfish, and crustaceans caught offshore as adults.

Offshore waters up to three miles from the Atlantic coast and three leagues (nine miles) into the Gulf are under Florida's jurisdiction. For most of the state's coastline, particularly on the west coast, these waters are relatively shallow; the southeast coast, though, is near the outer edge of the continental shelf, and there the water deepens quickly (up to five hundred feet deep three miles offshore).

The coastal waters, inshore and offshore, are the most biologically productive parts of the ocean and gulf. The deeper water beyond the continental shelf has, in fact, been described as a biological desert. The continental shelf waters are very much influenced by mainland flows of fresh water, which may – depending on prevailing winds, currents and on the fresh water flow's characteristics – remain on the shelf a surprisingly long time before completely dispersing into deeper waters.

RARE AND ENDANGERED SPECIES OF FLORIDA

Background

This listing of Florida's rare and endangered plants and animals is provided through the courtesy of the Florida Committee on Rare and Endangered Plants and Animals.

The committee was formed in 1973 under the sponsorship of the Florida Audubon Society and the Florida Defenders of the Environment. It in-

cludes many leading biologists and environmentalists. The honorary co-chairmen of the committee are Governor Reuben O'D. Askew and Assistant Secretary Nathaniel P. Reed of the U.S. Department of the Interior.

Besides listing Florida's rare and endangered plants and animals, the committee has three other objectives:

(1) to compile the most up-to-date information on life history and ecology for all of the listed forms;

(2) to develop recommendations to governmental and private agencies for perpetuating rare and endangered forms; and

(3) to encourage further research on rare and endangered forms in order to provide a sound basis for their management.

Categories Used in the Inventory of Rare and Endangered Plants and Animals in Florida

The inventory includes species, subspecies, and unique local populations of plants and animals native to Florida whose continued existence in the state is threatened to a significant degree or which, because of rarity or other causes, have a likelihood of becoming threatened if present trends continue.

Categories designating the status of the organisms included in the lists are defined below. In the case of species or subspecies whose ranges extend beyond the borders of the state, the category to which the form is assigned is based on the status of its population in Florida.

Endangered. Plants or animals in imminent danger of extinction or extirpation if the deleterious factors affecting them continue to operate. These are forms whose numbers have already been reduced to such a critically low level or whose habitat has been so drastically reduced or degraded that immediate action is required to prevent their loss.

Threatened. Forms believed likely to become endangered in the near future if the causal factors now at work continue to operate. Included in this category are taxa in which most or all populations are decreasing because of overexploitation or environmental disturbance; taxa whose populations have been heavily depleted by adverse factors and, though not actually endangered, are still in critical condition; and taxa that may still be relatively abundant but are under threat from serious adverse factors throughout their range.

Rare. Species, subspecies, or unique local populations that, though not presently endangered or threatened as defined above, are potentially at risk because they are only found within a restricted geographic region or habitat or are thinly scattered over a more extensive range. They may be insular or otherwise isolated forms or relict forms with wider distribution.

Species of Special Concern. Forms that do not clearly fit into any of the foregoing categories yet which warrant special attention. Included are forms that, although presently relatively abundant, are particularly vulnerable to certain types of exploitation or environmental modifications and have experienced long-term population decline and forms whose status in Florida may have significant impact on endangered or threatened species elsewhere.

Status Undetermined. Species, subspecies, or local populations that are suspected of falling in one of the above categories but for which the available data are not adequate to provide the basis for a decision.

Recently Extirpated. Species or subspecies that have disappeared from Florida since 1600 but still exist elsewhere.

Recently Extinct. Species or subspecies that have disappeared from the state since 1600 through extinction.

Endangered

Tamarindillo . . . . . *Acacia choriophylla*
Rue-anemone . . . . . *Anemonella thalictroides*
Auricled Spleenwort . . . . . *Asplenium auritum*
Dwarf Spleenwort . . . . . *Asplenium pumilum*
Bird's-nest Spleenwort . . . . . *Asplenium serratum*
Sink-hole Fern . . . . . *Blechnum occidentale*
Narrow Strap Fern . . . . . *Campyloneurum angustifolium*
Nodding Catopsis . . . . . *Catopsis nutans*
Spiney Hackberry . . . . . *Celtis pallida*
Spurred Neottia . . . . . *Centrogenium setaceum*
Tree Cactus . . . . . *Cereus robinii*
Pygmy Fringe-tree . . . . . *Chionanthus pygmaeus*
Pagoda Dogwood . . . . . *Cornus alternifolia*
Croomia . . . . . *Croomia pauciflora*
Honewort . . . . . *Cryptotaenia canadensis*
Cupania . . . . . *Cupania glabra*
Cuplet Fern . . . . . *Dennstaedtia bipinnata*
Dollar Orchid . . . . . *Encyclia boothiana*
Wild Cotton . . . . . *Gossypium hirsutum*
Fuch's Bromeliad . . . . . *Guzmania monostachia*
Harper's Beauty . . . . . *Harperocallis flava*
Highlands Scrub Hypericum . . . . . *Hypericum cumulicola*
Krug's Holly . . . . . *Ilex krugiana*
Hidden Orchid . . . . . *Maxillaria crassifolia*
Hand Fern . . . . . *Ophioglossum palmatum*
Giant Water-dropwort . . . . . *Oxypolis greenmanii*
Allegheny-spurge . . . . . *Pachysandra procumbens*
Lewton's Polygala . . . . . *Polygala lewtonii*
Large-leaved Jointweed . . . . . *Polygonella macrophylla*
Scrub Plum . . . . . *Prunus geniculata*
Beach-star . . . . . *Remirea maritima*
Miccosukee Gooseberry . . . . . *Ribes echinellum*
Bladder-nut . . . . . *Staphylea trifolia*
Pride-of-Big-Pine . . . . . *Strumpfia maritima*
Hattie Bauer Halberd Fern . . . . . *Tectaria coriandrifolia*
Florida Torreya . . . . . *Torreya taxifolia*
Young-palm Orchid . . . . . *Tropidia polystachya*
Cedar Elm . . . . . *Ulmus crassifolia*
Halberd-leaved Yellow Violet . . . . . *Viola hastata*
Yellowheart . . . . . *Zanthoxylum flavum*

Threatened

Curtis Milkweed . . . . . *Asclepias curtissii*
Hairy Wild-indigo . . . . . *Baptisia hirsuta*
Prickly-apple . . . . . *Cereus gracilis*
Satinleaf . . . . . *Chrysophyllum oliviforme*
Cruise's Golden-aster . . . . . *Chrysopsis cruiseana*
Silver Palm . . . . . *Coccothrinax argentata*
Climbing Dayflower . . . . . *Commelina gigas*
Okeechobee Gourd . . . . . *Cucurbita okeechobeensis*
Cow-horn Orchid . . . . . *Cyrtopodium punctatum*
Night-scent Orchid . . . . . *Epidendrum nocturnum*
Golden-creeper . . . . . *Ernodea littoralis*
Sanibel Lovegrass . . . . . *Eragrostis tracyi*
Wiregrass Gentian . . . . . *Gentiana pennelliana*
Lignum-vitae . . . . . *Guaiacum sanctum*
Manchineel . . . . . *Hippomane mancinella*
Dancing-lady Orchid . . . . . *Oncidium variegatum*
Mahogany Mistletoe . . . . . *Phoradendron rubrum*
Needle Palm . . . . . *Rhapidophyllum hystrix*
Orange Azalea . . . . . *Rhododendron austrinum*
White-top Pitcherplant . . . . . *Sarracenia leucophylla*
Jackson-vine . . . . . *Smilax smallii*
Silky Camellia . . . . . *Stewartia malacodendron*
Florida Thatch Palm . . . . . *Thrinax floridana*
Brittle Thatch Palm . . . . . *Thrinax microcarpa*
Twisted Air-plant . . . . . *Tillandsia flexuosa*
Fussy-wuzzy Air-plant . . . . . *Tillandsia pruinosa*
Sea Lavender . . . . . *Tournefortia gnaphalodes*
Worm-vine Orchid . . . . . *Vanilla barbellata*
Coontie . . . . . *Zamia integrifolia*

Rare

Golden Leather Fern . . . . . *Acrostichum aureum*
Baneberry . . . . . *Actaea pachypoda*
Venus'-hair Fern . . . . . *Adiantum capillus-veneris*
Fragrant Maidenhair Fern . . . . . *Adiantum melanoleucum*
Columbine . . . . . *Aquilegia canadensis*
Slender Spleenwort . . . . . *Asplenium dentatum*
Apalachicola Wild-indigo . . . . . *Baptisia megacarpa*
Grape-fern . . . . . *Botrychium lunarioides*
Flyr's Nemesis . . . . . *Brickellia cordifolia*
Buckthorn . . . . . *Bumelia lycioides*
Fahkahatchee Burmannia . . . . . *Burmannia flava*
Poppy Mallow . . . . . *Callirhoe papaver*
Big Pine Pigeon-pea . . . . . *Cassia keyensis*
Dune Lily-thorn . . . . . *Catesbaea parviflora*
West Indies Catopsis . . . . . *Catopsis berteroniana*
Green-and-gold . . . . . *Chrysogonum virginianum*
Pigeon-wing . . . . . *Clitoria fragrans*
Panhandle Rosemary . . . . . *Conradina glabra*
Wild-comfrey . . . . . *Cynoglossum virginianum*
Rugel's Pawpaw . . . . . *Deeringothamnus rugelii*
Toothwort . . . . . *Dentaria laciniata*
Leatherwood . . . . . *Dirca palustris*
Water Sundew . . . . . *Drosera intermedia*
Trailing-arbutus . . . . . *Epigaea repens*
Scrub Buckwheat . . . . . *Eriogonum floridanum*
Dimpled Dogtooth-violet . . . . . *Erythronium umbilicatum*
Hartwrightia . . . . . *Hartwrightia floridana*
Liverleaf . . . . . *Hepatica americana*
Heartleaf . . . . . *Hexastylis arifolia*
Wild Hydrangea . . . . . *Hydrangea arborescens*
Edison's Ascyrum . . . . . *Hypericum edisonianum*
Smooth-barked St. Johns-wort . . . . . *Hypericum lissophloeus*
False Rue-anemone . . . . . *Isopyrum biternatum*
Coville's Rush . . . . . *Juncus gymnocarpus*

Mountain-laurel . . . . . *Kalmia latifolia*
Corkwood . . . . . *Leitneria floridana*
Godfrey's Blazing-star . . . . . *Liatris provincialis*
Panhandle Lily . . . . . *Lilium iridollae*
West's Flax . . . . . *Linum westii*
Pond-spice . . . . . *Litsea aestivalis*
Panhandle Lupine . . . . . *Lupinus westianus*
White Birds-in-a-nest . . . . . *Macbridea alba*
Ashe's Magnolia . . . . . *Magnolia ashei*
Cucumber-tree . . . . . *Magnolia cordata*
Green adder's-mouth . . . . . *Malaxis unifolia*
Barbara's-buttons . . . . . *Marshallia obovata*
Indian Cucumber-root . . . . . *Medeola virginiana*
Fall-flowering Ixia . . . . . *Nemastylis floridana*
Florida Beargrass . . . . . *Nolina atopocarpa*
Ribbon Fern . . . . . *Paltonium lanceolatum*
Grass-of-Parnassus . . . . . *Parnassia grandifolia*
Spoon-flower . . . . . *Peltandra sagittifolia*
Everglades Peperomia . . . . . *Peperomia obtusifolia*
Pine-wood Dainties . . . . . *Phyllanthus liebmannianus*
Fever-tree . . . . . *Pinckneya bracteata*
May-apple . . . . . *Podophyllum peltatum*
Mexican Tearthumb . . . . . *Polygonum meisnerianum*
Buccaneer Palm . . . . . *Pseudophoenix sargentii*
Panhandle Meadow-beauty . . . . . *Rhexia salicifolia*
Chapman's Rhododendron . . . . . *Rhododendron chapmanii*
Florida Royal Palm . . . . . *Roystonea elata*
St. John's-susan . . . . . *Rudbeckia nitida*
Florida Willow . . . . . *Salix floridana*
Red-flowered Pitcherplant . . . . . *Sarracenia rubra*
Schisandra . . . . . *Schisandra glabra*
Tropical Curly-grass . . . . . *Schizaea germanii*
Bartram's Ixia . . . . . *Sphenostigma coelestinum*
Pink-root . . . . . *Spigelia loganioides*
Florida Yew . . . . . *Taxus floridana*
Reflexed Wake-robin . . . . . *Trillium lancifolium*
Florida Merrybells . . . . . *Uvularia floridana*
False Hellebore . . . . . *Veratrum woodii*
Ocala Vetch . . . . . *Vicia ocalensis*
Kral's Yellow-eyed-grass . . . . . *Xyris longisepala*

Recently Extirpated

San Felasco Spleenwort . . . . . *Asplenium monanthes*
Spider Orchid . . . . . *Brassia caudata*
American Chestnut . . . . . *Castanea dentata*
Balsam-apple . . . . . *Clusia flava*
Beaked Spikerush . . . . . *Eleocharis rostellata*
Turk's-cap Lily . . . . . *Lilium superbum*
Water-clover . . . . . *Marsilea mucronata*
Coot Bay Dancing-lady . . . . . *Oncidium carthagenense*
Ginseng . . . . . *Panax quinquefolius*
Mistletoe Cactus . . . . . *Rhipsalis baccifera*
Edward's Maiden Fern . . . . . *Thelypteris macilenta*

FRESHWATER AND MARINE INVERTEBRATE ANIMALS

Freshwater Invertebrates

Endangered

Squirrel Chimney Cave Shrimp . . . . . *Palaemonetes cummingi*
Palm Spring Cave Crayfish . . . . . *Procambarus acherontis*
Enterprise Spring Snail . . . . . *Cincinnatia monroensis*

Threatened

Gopher Sink Cave Crayfish . . . . . *Procambarus orcinus*
Oolitic Limestone Cave Crayfish . . . . . *Procambarus milleri*
Wacissa Blue Spring Cave Crayfish . . . . . *Procambarus horsti*
Simm's Sink Cave Crayfish . . . . . *Procambarus* (new species)
Alexander Springs Cave Crayfish . . . . . *Procambarus* (undescribed species)
Gum Cave Crayfish . . . . . *Procambarus lucifugus lucifugus*
Loose Coiled Snail . . . . . *Aphaostracon chalarogyrus*
Sulfur Spring Aphaostracon . . . . . *Aphaostracon theiocrenetus*
Blue Spring Aphaostracon . . . . . *Aphaostracon asthenes*
Wekiwa Spring Aphaostracon . . . . . *Aphaostracon monas*

Rare

McLane's Cave Crayfish . . . . . *Troglocambarus maclanei*
Hobb's Cave Amphipod . . . . . *Crangonyx hobbsi*
Pallid Cave Crayfish . . . . . *Procambarus pallidus*
Dougherty Plain Cave Crayfish . . . . . *Cambarus cryptodytes*
Hog Sink Cave Crayfish . . . . . *Procambarus lucifugus alachua*

Species of Special Concern

Fenney Springs Aphaostracon . . . . *Aphaeostracon xynoelictus*
Thick Shelled Aphaostracon . . . . . *Aphaostracon pycnus*
Sand Grain Snail . . . . . *Cincinnatia mica*

Status Undetermined

Hobb's Cave Isopod . . . . . *Ascellus hobbsi*

Marine Invertebrates

Endangered

The following corals are considered endangered on all unprotected parts of the Florida Reef Tract, that is, outside Biscayne National Monument, Pennekamp Coral Reef State Park and the Dry Tortugas National Park.

Elkhorn Coral . . . . . *Acropora palmata*
Staghorn Coral . . . . . *Acropora cervicornis*
Staghorn Coral . . . . . *Acropora prolifera*
Pillar Coral. . . . . *Dendrogyra cylindrus*
Large Flower Coral . . . . . *Mussa angulosa*
Flower Coral . . . . . *Eusmilia fastigiata*
Lettuce Coral. . . . . *Agaricia agaricites*
Starlet Coral . . . . . *Siderastrea* (species)
Brain Coral . . . . . *Diploria clivosa*
Brain Coral. . . . . *Diploria labyrinthiformis*
Brain Coral. . . . . *Diploria strigosa*
Small Star Coral . . . . . *Montastrea annularis*
Large Star Coral . . . . . *Montastrea cavernoso*
Brain Coral. . . . . *Meandrina meandrites*

Threatened

Mangrove Crab . . . . . *Goniopsis cruentata*
Mangrove Crab . . . . . *Aratus pisonii*

Rare

Atlantic Goeduck . . . . . *Panopea bitruncata*

Status Undetermined

Benedict's Wharf Crab . . . . *Sesarma (Holometopus) benedicti*

INSECTS AND OTHER TERRESTRIAL INVERTEBRATES

Phylum Mollusca

Threatened

Florida Tree Snail. . . . . *Liguus fasciatus*

Phylum Arthropoda
Classes Crustacea and Arachnida

Endangered

Koch's Giant Tailless Whipscorpion . . . *Tarantula fuscimana*
Woodrat Nest Sowbug. . . . . *Venezillo sp.*

Threatened

Rosemary Wolf Spider. . . . . *Lycosa ericeticola*

Species of Special Concern

Red-legged Purse-web Spider . . . . . *Atypus bicolor*
Abott's Purse-web Spider. . . . . *Atypus abotti*
Florida Trap-door Spider. . . . . *Umidia* (undescribed species)
Florida Cyclocosmia
Spider . . . . . *Cyclocosmia* (undescribed species)

Class Insecta

Endangered

Hogtown Creek Dragonfly . . . . . *Cordulegaster sayi*
Turtle Mound Firefly . . . . . *Photuris* (undescribed species)
Schaus' Swallowtail
(butterfly) . . . . . *Papilio arsitodemus ponceanus*
Olive Hairstreak (butterfly) . . . . *Mitoura gryneus sweadneri*

Threatened

Mayfly. . . . . *Pseudiron meridionalis*
Mayfly . . . . . *Homoeoneuria dolani*
Mayfly. . . . . *Dolania americana*
Yucatan Katydid . . . . . *Phrixa maya*
Key Largo Wood Cricket. . . . . *Gryllus* (undescribed species)
Keys Short-winged Conehead
(grasshopper) . . . . . *Belocephalus sleighti*
Big Pine Key Conehead
(grasshopper) . . . . . *Belocephalus micanopi*
Everglades Firefly *Photuris brunnipennis floridana*
Scarab Beetle. . . . . *Copris gopheri*
Scarab Beetle . . . . . *Onthophagus polyphemi polyphemi*
Scarab Beetle . . . . . *Onthophagus polyphemi sparsesetosus*
Scarab Beetle . . . . . *Aphodius troglodytes*
Scarab Beetle . . . . . *Onthophagus aciculatulus*
Scarab Beetle . . . . . *Copris howdeni*
Scarab Beetle . . . . . *Aphodius aegrotus*

Scarab Beetle . . . . . *Aphodius haldemani*
Scarab Beetle . . . . . *Ataenius waltherhorni*
Scarab Beetle . . . . . *Ataenius brevicollis*
Scarab Beetle . . . . . *Ataenius saramari*
Scarab Beetle . . . . . *Peltotrupes profundus*
Scarab Beetle . . . . . *Peltotrupes youngi*
Scarab Beetle . . . . . *Mycotrupes pedester*
Scarab Beetle . . . . . *Acanthocerus aeneus*
Scarab Beetle . . . . . *Hypotrichia spissipes*
Scarab Beetle . . . . . *Polyphylla pubescens*
Scarab Beetle . . . . . *Phyllophaga youngi*
Scarab Beetle . . . . . *Gronacarus autumnalis*
Scarab Beetle . . . . . *Gronacarus multispinosus*
Scarab Beetle . . . . . *Anomala exigua*
Scarab Beetle . . . . . *Rutela formosa*
Scarab Beetle. . . . . *Cremastocheilus squamulosus*
Scarab Beetle . . . . . *Trigonopeltastes floridana*
Caddisfly . . . . . *Chimarra florida*
Caddisfly. . . . . *Cernotina truncona*
Caddisfly. . . . . *Cheumatopsyche burski*
Caddisfly . . . . . *Cheumatopsyche petersi*
Caddisfly . . . . . *Macronema carolina*
Caddisfly. . . . . *Diplectrona modesta*
Caddisfly . . . . . *Hydroptila berneri*
Caddisfly . . . . . *Banksiola concatenata*
Caddisfly . . . . . *Micrasema sp.* (undescribed)
Caddisfly. . . . . *Anisocentropus pyraloides*
Caddisfly . . . . . *Leptocella tavara*
Caddisfly . . . . . *Athripsodes protonephus*
Caddisfly . . . . . *Triaenodes furcella*
Caddisfly . . . . . *Triaenodes florida*
Caddisfly . . . . . *Oecetis daytona*
Caddisfly . . . . . *Oecetis porteri*
Caddisfly . . . . . *Molanna blenda*
Caddisfly . . . . . *Agarodes libalis*
Caddisfly . . . . . *Agarodes ziczac*
Caddisfly . . . . . *Psioltreta frontalis*
Atala Butterfly . . . . . *Eumaeus atala florida*
Bahaman Swallowtail
(butterfly) . . . . . *Papilio andraemon bonhotei*
Chironomid Midges . . . . . *Nilothauma spp.*
Syrphid Fly . . . . . *Baccha parvicornis*
Syrphid Fly . . . . . *Mercurymyia jactator*
Syrphid Fly . . . . . *Mixogaster delongi*

Rare

Horse Fly. . . . . *Merycomyia brunnea*
Horse Fly . . . . . *Asaphomyia* (undescribed species)
Horse Fly . . . . . *Anacimas geropogon*
Horse Fly. . . . . *Anacimas limbellatus*
Horse Fly. . . . . *Hamatabanus annularis*
Horse Fly . . . . . *Hamatabanus sexfasciatus*
Horse Fly . . . . . *Stenotabanus (Aegialomyia) magnicallus*
Horse Fly . . . . . *Stenotabanus daedalus*
Horse Fly . . . . . *Tabanus cayensis*
Horse Fly. . . . . *Tabanus fairchildi*
Horse Fly . . . . . *Tabanus quirinus*
Horse Fly. . . . . *Tabanus kisliuki*
Deer Fly . . . . . *Chrysops amazon hubbelli*
Deer Fly . . . . . *Chrysops cincticornis nigropterus*
Deer Fly . . . . . *Chrysops (Liochrysops) hyalinus*
Deer Fly . . . . . *Chrysops nigribimbo*
Deer Fly . . . . . *Chrysops tidwelli*

FISHES

The present list, with one exception, excludes a number of reef or reef-associated species known in Florida from only a few records or specimens. This has been done because these species are known from other localities in the Bahamas and West Indies and their apparent rarity may actually be a normal population level or reflect peculiarities of life history or other factors that make them less susceptible to collecting. To include such forms would result in an unwieldly list which would tend to obscure those forms whose status is known to be critical.

Endangered

River Redhorse . . . . . *Moxostoma carinatum*
Key silverside . . . . . *Menidia conchorum*
Crystal Darter . . . . . *Ammocrypta asprella*
Southern Tesselated
Darter. . . . . *Etheostoma olmstedi maculaticeps*

Threatened

Atlantic Sturgeon. . . . . *Acipenser oxyrhynchus*
Speckled Chub. . . . . *Hypopsis aestivalis*
Bluestripe Shiner. . . . . *Notropis callitaenia*
Cypress Minnow . . . . . *Hybognathus hayi*
Greyfin Redhorse . . . . . *Moxostoma* (undescribed species)
Southern Gulf *Fundulus grandis saguanus*
Killifish. . . . . (may be a distinct species)
Saltmarsh Minnow. . . . . *Fundulus jenkinsi*
Southern Longnose
Killifish. . . . . *Fundulus similis* (undescribed subspecies)
cf Rainwater Killifish . . . . . *Lucania* cf *parva* (taxonomic status uncertain, a geographically isolated and

morphologically different population of the Florida Keys)

Lake Eustis Pupfish . . . . . *Cyprinodon hubbsi*

cf Sheepshead Minnow . . *Cyprinodon* cf *variegatus* (taxonomic status uncertain, a geographically isolated and morphologically different population of the Florida Keys)

Rivulus . . . . . *Rivulus marmoratus*

cf Sailfin Molly . . . . *Poecilia* cf *latipinna* (taxonomic status uncertain, a geographically isolated and morphologically different population of the Florida Keys)

Mangrove Mosquitofish . . . . . *Gambusia rhizophorae*

Shoal Bass . . . . . *Micropterus* (undescribed species)

Stargazing Darter . . . . . *Percina uranidea*

Harlequin Darter . . . . . *Etheostoma histrio*

Okaloosa Darter . . . . . *Etheostoma okaloosae*

Goldstripe Darter . . . . . *Etheostoma parvipinne*

Cypress Darter . . . . . *Etheostoma proeliare*

Key Blenny . . . . . *Starksia starcki*

Spottail Goby . . . . . *Gobionellus stigmaturus*

Rare

Sea Lamprey . . . . . *Petromyzon marinus*

Shortnose Sturgeon . . . . . *Acipenser brevirostrum*

Eastern Mudminnow . . . . . *Umbra pygmaea*

Ohoopee Shiner . . . . . *Notropis leedsi*

Bandfin Shiner . . . . . *Notropis zonistius*

Snail Bullhead . . . . . *Ictalurus brunneus*

Spotted Bullhead . . . . . *Ictalurus serracanthus*

Opossum Pipefish . . . . . *Oostethus lineatus*

Mountain Mullet . . . . . *Agonostomus monticola*

Suwannee Bass . . . . . *Micropterus notius*

Blackbanded Sunfish . . . . . *Enneacanthus chaetodon*

Mud Sunfish . . . . . *Acantharchus pomotis*

Striped Croaker . . . . . *Bairdiella sanctaeluciae*

River Goby . . . . . *Awaous tajasica*

Species of Special Concern

Bluenose Shiner . . . . . *Notropis welaka*

Dusky Shiner . . . . . *Notropis cummingsae*

Recently Extinct

Blackmouth Shiner . . . . . *Notropis* (undescribed species)

AMPHIBIANS AND REPTILES

This list treats all native terrestrial, freshwater and marine species known from the state that fall into one of the designated categories.

Amphibians

Endangered

Pine Barrens Treefrog . . . . . *Hyla andersoni*

Threatened

Florida Gopher Frog . . . . . *Rana areolata aesopus*

Rare

Striped Newt . . . . . *Notophthalmus perstriatus*

One-toed Amphiuma . . . . . *Amphiuma pholeter*

Appalachian Seal Salamander . . . . . *Desmognathus monticola monticola*

Georgia Blind Salamander . . . . . *Haideotriton wallacei*

Four-toed Salamander . . . . . *Hemidactylium scutatum*

Many-lined Salamander . . . . . *Stereochilus marginatus*

Carpenter Frog . . . . . *Rana virgatipes*

Status Undetermined

Gulf Hammock Dwarf Siren . . . . . *Pseudobranchus striatus lustricolus*

Reptiles

Endangered

Atlantic Green Turtle . . . . . *Chelonia mydas mydas*

Atlantic Hawksbill . . . . . *Eretmochelys imbricata imbricata*

Atlantic Ridley . . . . . *Lepidochelys kempi*

Atlantic Salt Marsh Snake . . . . . *Natrix fasciata taeniata*

Short-tailed Snake . . . . . *Stilosoma extenuatum*

Threatened

American Crocodile . . . . . *Crocodylus acutus*

Key Mud Turtle . . . . . *Kinosternon baurii baurii*

Suwannee Cooter . . . . . *Chrysemys concinna suwanniensis*
Gopher Tortoise . . . . . *Gopherus polyphemus*
Atlantic Loggerhead . . . . . *Caretta caretta caretta*
Florida Keys Mole Skink . . . . . *Eumeces egregius egregius*
Sand Skink . . . . . *Neoseps reynoldsi*
Big Pine Key Ringneck Snake . . *Diadophis punctatus acricus*
Rosy Rat Snake . . . . . *Elaphe guttata guttata*
Florida Brown Snake . . . . . *Storeria dekayi victa*
Miami Black-headed Snake . . . . . *Tantilla oolitica*
Florida Ribbon Snake . . . . . *Thamnophis sauritus sackeni*

Rare

Spotted Turtle . . . . . *Clemmys guttata*
Barbour's Map Turtle . . . . . *Graptemys barbouri*
Alabama Map Turtle . . . . . *Graptemys pulchra*
Smooth Softshell . . . . . *Trionys muticus*
Atlantic Leatherback Turtle . . . . . *Dermochelys coriacea*
Florida Scrub Lizard . . . . . *Sceloporus woodi*
Cedar Key Mole Skink . . . . . *Eumeces egregius insularis*
Blue-tailed Mole Skink . . . . . *Eumeces egregius lividus*
Mole Snake . . . . . *Lampropeltis calligaster rhombomaculata*
Apalachicola Kingsnake . . . . . *Lampropeltis getulus goini*
Gulf Salt Marsh Snake . . . . . *Natrix fasciata clarki*
Southern Copperhead . . . . . *Agkistrodon contortrix contortrix*

Species of Special Concern

American Alligator . . . . . *Alligator mississippiensis*
Eastern Indigo Snake . . . . . *Drymarchon corais couperi*

Status Undetermined

Alligator Snapping Turtle . . . . . *Macroclemys temmincki*
Mangrove Terrapin . . . . . *Malachlemys terrapin rhizophorarum*
Alabama Red-bellied Turtle . . . . . *Chrysemys alabamensis*
Southern Coal Skink . . . . . *Eumeces anthracinus pluvialis*

BIRDS

Endangered

Wood Stork . . . . . *Mycteria americana*
Florida Everglade Kite . . . . *Rostrhamus sociabilis plumbeus*
Peregrine Falcon . . . . . *Falco peregrinus*
Snowy Plover . . . . . *Charadrius alexandrinus tenuirostris*
Ivory-billed Woodpecker . . . . . *Campephilus principalis*
Red-cockaded Woodpecker . . *Dendrocopus borealis hylonomus*
Bachman's Warbler . . . . . *Vermivora bachmanii*
Kirtlands's Warbler . . . . . *Dendroica kirtlandii*
Florida Grasshopper
Sparrow . . . . . *Ammodramus savannarum floridanus*
Dusky Seaside Sparrow . . . . *Ammospiza maritima nigrescens*
Cape Sable Seaside Sparrow . . *Ammospiza maritima mirabilis*

Threatened

Brown Pelican . . . . . *Pelecanus occidentalis carolinensis*
Magnificent Frigatebird . . . . *Fregata magnificens rothschildi*
Southern Bald
Eagle . . . . . *Haliaeetus leucocephalus leucocephalus*
Osprey . . . . . *Pandion haliaetus carolinensis*
Southeastern Kestrel . . . . . *Falco sparverius paulus*
Audubon's Caracara . . . . . *Caracara cheriway auduboni*
Florida Sandhill Crane . . . . . *Grus canadensis pratensis*
American Oystercatcher . . . . . *Haematopus palliatus*
Roseate Tern . . . . . *Sterna dougallii*
Least Tern . . . . . *Sterna albifrons*
White-crowned Pigeon . . . . . *Columba leucocephala*
Florida Scrub Jay . . . *Aphelocoma coerulescens coerulescens*
*Louisiana Seaside Sparrow . . . . *Ammospiza maritima fisheri*

Rare

Reddish Egret . . . . . *Dichromanassa rufescens*
Roseate Spoonbill . . . . . *Ajaia ajaja*
White-tailed Kite . . . . . *Elanus caeruleus majusculus*
Short-tailed Hawk . . . . . *Buteo brachyurus*
Mangrove Cuckoo . . . . . *Coccyzus minor*
Antillean Nighthawk . . . . . *Chordeiles minor vivinus*
Black-whiskered Vireo . . . . . *Vireo altiloquus*
Cuban Yellow Warbler . . . . . *Dendroica petechia gundlachi*
*Louisiana Waterthrush . . . . . *Seiurus motacilla*
*American Redstart . . . . . *Setophaga ruticilla ruticilla*
Wakulla Seaside Sparrow . . . . *Ammospiza maritima juncicola*

Species of Special Concern

Great White Heron . . . . . *Ardea herodius occidentalis*
Little Blue Heron . . . . . *Florida caerulea*
Great Egret . . . . . *Casmerodius albus*
Snowy Egret . . . . . *Egretta thula*
Louisiana Heron . . . . . *Hydranassa tricolor*
Black-crowned Night Heron . . . . . *Nycticorax nycticorax*
Yellow-crowned Night Heron . . . . . *Nyctanassa violacea*
Least Bittern . . . . . *Ixobrychus exilis*
White Ibis . . . . . *Eudocimus albus*
Cooper's Hawk . . . . . *Accipiter cooperii*
American Avocet . . . . . *Recurvirostra americana*
Sooty Tern . . . . . *Sterna fuscata*
Royal Tern . . . . . *Thalasseus maximus*
Sandwich Tern . . . . . *Thalasseus sandvicensis*
Caspian Tern . . . . . *Hydroprogne caspia*

Noddy Tern . . . . . *Anous stolidus*
Black Skimmer . . . . . *Rhynchops niger*
Burrowing Owl . . . . . *Speotyto cunicularia floridana*
Hairy Woodpecker . . . . . *Dendrocopus villosus audubonii*
White-breasted Nuthatch . . . . *Sitta carolinensis carolinensis*
Marian's Marsh Wren . . . . . *Telmatodytes palustris marianae*
Worthington's Marsh Wren . . . *Telmatodytes palustris griseus*
Worm-eating Warbler . . . . . *Helmitheros vermivorus*
Florida Prairie Warbler . . . . . *Dendroica discolor paludicola*
Scott's Seaside Sparrow . . . . *Ammospiza maritima peninsulae*

Status Undetermined

Merlin . . . . . *Falco columbarius*
Florida Clapper Rail . . . . . *Rallus longirostris scottii*
Mangrove Clapper Rail . . . . . *Rallus longirostris insularum*
Black Rail . . . . . *Laterallus jamaicensis*
Stoddard's Yellow-throated
Warbler . . . . . *Dendroica dominica stoddardi*
Smyrna Seaside Sparrow . . . . . *Ammospiza maritima pelonota*

Recently Extirpated

Whooping Crane . . . . . *Grus americana*
Key West Quail-Dove . . . . . *Geotrygon chrysia*
Zenaida Dove . . . . . *Zenaida aurita zenaida*

Recently Extinct

Carolina Parakeet . . . . . *Conuropsis carolinensis*
Passenger Pigeon . . . . . *Ectopistes migratorius*

* Peripheral breeding population

MAMMALS

This list treats land mammals, including the manatee and seals, and cetaceans separately. Because whales and dolphins are for the most part pelagic and wide-ranging, their status is best treated on a broader geographic scale than the territorial waters of a given state or country. Furthermore, records of many of the whales and dolphins known from Florida waters are based on strandings of dead or dying individuals or fortuitous sightings and may not accurately reflect the true population status of these species off our coasts.

Land Mammals

Endangered

Gray Bat . . . . . *Myotis grisescens*
Indiana Bat . . . . . *Myotis sodalis*
Mangrove Fox Squirrel . . . . . *Sciurus niger avicennia*
Goff's Pocket Gopher . . . . . *Geomys pinetis goffi*
Cudjoe Key
Rice Rat . . . . *Oryzomys* (undescribed species or subspecies)
Pallid Beach Mouse . . . . *Peromyscus polionotus decoloratus*
Key Largo Cotton
Mouse . . . . . *Peromyscus gossypinus allapaticola*
Key Largo Woodrat . . . . . *Neotoma floridana smalli*
Florida Panther . . . . . *Felis concolor coryi*
Key Deer . . . . . *Odocoileus virginianus clavium*

Threatened

Sherman's Fox Squirrel . . . . . *Sciurus niger shermani*
Choctawhatchee Beach
Mouse . . . . . *Peromyscus polionotus allophrys*
Perdido Bay Beach
Mouse . . . . . *Peromyscus polionotus trissyllepsis*
Florida Mouse . . . . . *Peromyscus floridanus*
Lower Keys Cotton Rat . . . . . *Sigmodon hispidus exsputus*
Florida Black Bear . . . . . *Ursus americanus floridanus*
Key Vaca Raccoon . . . . . *Procyon lotor auspicatus*
Everglades Mink . . . . . *Mustela vison evergladensis*
Manatee . . . . . *Trichechus manatus latirostris*

Rare

Southeastern Shrew . . . . . *Sorex longirostris longirostris*
Homossassa Shrew . . . . . *Sorex longirostris eionis*
Keen's Bat . . . . . *Myotis keenii septentrionalis*
Big Brown Bat . . . . . *Eptesicus fuscus*
Hoary Bat . . . . . *Lasiurus cinereus cinereus*
Southeastern Big-eared Bat . . . . . *Plecotus rafinesquii*
Eastern Chipmunk . . . . . *Tamias striatus*
Southeastern Weasel . . . . . *Mustela frenata olivacea*
Florida Weasel . . . . . *Mustela frenata peninsulae*
Florida Mink . . . . . *Mustela vison lutensis*
Southern Mink . . . . . *Mustela vison mink*

Species of Special Concern

Round-tailed Muskrat . . . . . *Neofiber alleni*

Status Undetermined

Sherman's Short-tailed Shrew . . . *Blarina brevicauda shermani*
Florida Mastiff Bat . . . . . *Eumops glaucinus floridanus*
Pine Island Rice Rat . . . . . *Oryzomys palustris planirostris*
Anastasia Island Cotton
Mouse . . . . . *Peromyscus gossypinus anastasae*
Captiva Island Cotton Rat . . . *Sigmodon hispidus insulicola*

Recently Extirpated

Gray Wolf . . . . . *Canis lupus lycaon*
Plains Bison . . . . . *Bison bison bison*

Recently Extinct

Florida Red Wolf . . . . . *Canis rufus floridanus*
West Indian Seal . . . . . *Monachus tropicalis*

Cetaceans

Endangered – on an international basis

Black Right Whale . . . . . *Eubalaena glacialis*
Sei Whale . . . . . *Balaenoptera borealis*
Fin Whale . . . . . *Balaenoptera physalus*
Humpback Whale . . . . . *Megaptera novaeangliae*
Sperm Whale . . . . . *Physeter catodon*

Rare – in Florida waters

Minke Whale . . . . . *Balaenoptera acutorostrata*
Bryde's Whale . . . . . *Balaenoptera edeni*
Rough-toothed Dolphin . . . . . *Steno bredanensis*
Risso's Dolphin . . . . . *Grampus griseus*
Spinner Dolphin . . . . . *Stenella* cf. *longirostris*
Bridled Dolphin . . . . . *Stenella* cf. *frontalis*
Striped Dolphin . . . . . *Stenella coeruleoalba*
Unidentified species . . . . . *Stenella sp.*

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