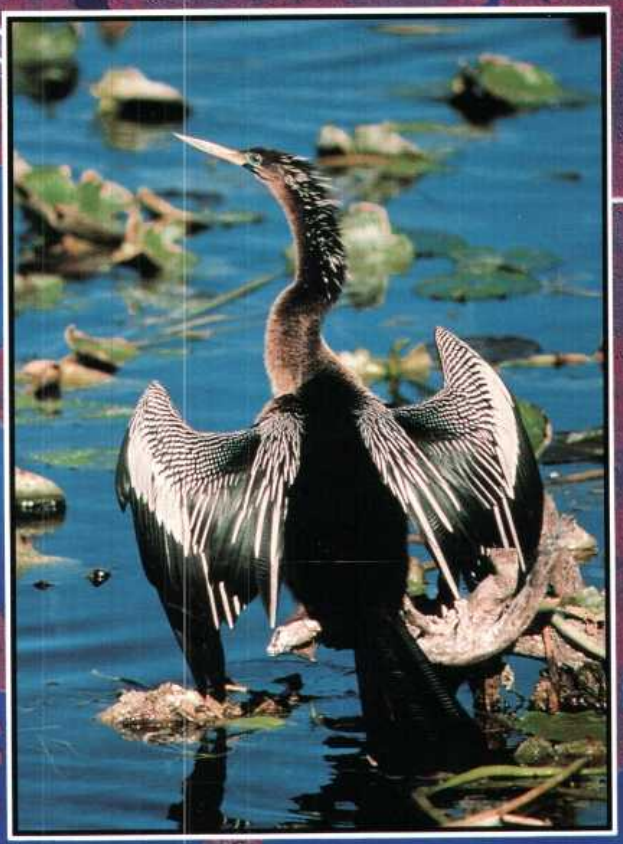
Florida Wetlands

STATUS AND TRENDS, 1970's TO 1980's



Great Egret W. METZEN

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ACKNOWLEDGMENTS

Special thanks for contributing to various parts of this study are given to H. Ross Pywell and Tom Dahl, U. S. Fish and Wildlife Service.

Many individuals from Martel Laboratories, Inc. were responsible for photo interpretation, map production, and change analysis. Principal among these is Keith Patterson. The work of all of them is greatly appreciated.

Funding support from the U. S. Army Corps of Engineers is gratefully acknowledged.

Cover photograph: Color infrared aerial view of area south of Naples, showing dredge and fill development of Marco Island and nearby islands

Front Cover Inset: Anhinga
T. CAWLEY

Back Cover Inset: Aerial view of Marco Island
S. FLA. WATER MGMT. DIST.

U.S. Fish and Wildlife Service
Southeast Region
Atlanta, Georgia

Florida Wetlands

STATUS AND TRENDS, 1970's TO 1980's

by W. E. Frayer and J.M. Hefner

September, 1991

T. KUNNEKE

Myakka River State Park
PALUSTRINE EMERGENT

Highlights

Florida encompasses an area of 39.5 million acres, including offshore areas involved in this study. Total acreage of wetlands and deepwater habitats in the mid-1970's was 15,821,700 acres, and in the mid-1980's it was 15,584,600 acres. The loss between the mid-1970's and mid-1980's represents an average annual net loss of 23,710 acres.

There were 11,298,600 acres of wetlands in the mid-1970's and 11,038,300 acres in the mid-1980's, a net loss of 260,300 acres. Average annual net loss was 26,030 acres. Almost all of the loss was the result of conversion of wetlands to agriculture (175,100 acres) and urban and other forms of development (66,000 acres).

Agricultural lands increased by 528,500 acres. This resulted in a net loss of wetlands as well as thousands of acres originally not classed as wetlands or deepwater habitats.

Urban and other forms of development accounted for 2,522,100 acres in the mid-1970's. In the mid-1980's they accounted for 3,073,700 acres, a net gain of 551,600 acres. Most of this increase involved lands not originally classed as wetlands or deepwater habitats.

Suwannee River
RIVERINE SYSTEM

W. METZEN

Contents

Myakka River State Park
PALUSTRINE EMERGENT

P. REED

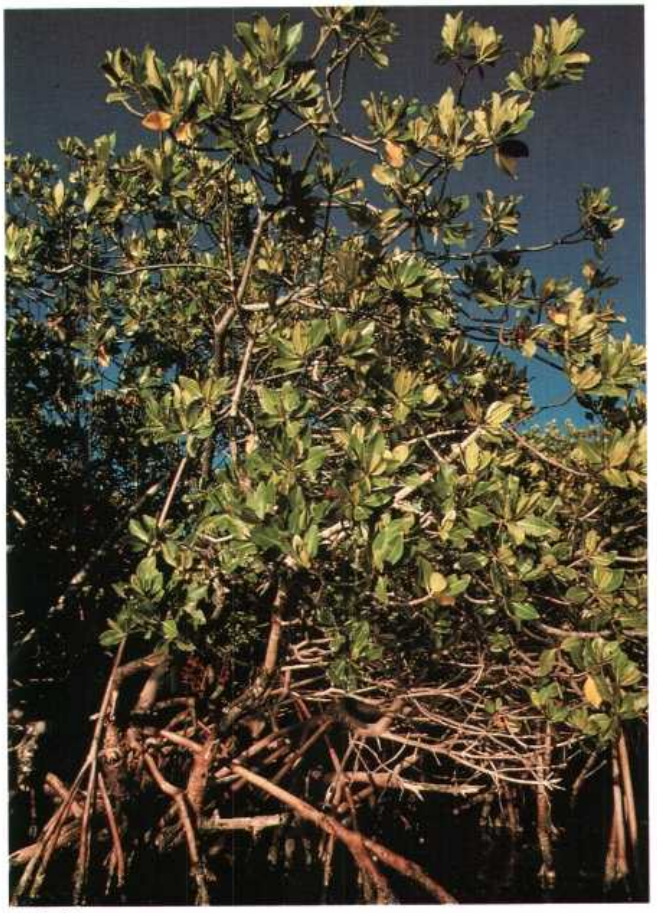
CHAPTER ONE

Introduction

The United States Fish and Wildlife Service has major responsibility for the protection and management of migratory and endangered fish and wildlife and their habitats. Of particular concern are wetlands and associated deepwater habitats. Since 1974 the U. S. Fish and Wildlife Service, through its National Wetlands Inventory Project, has inventoried the nation's wetlands. The purpose is to develop and disseminate comprehensive data concerning the characteristics and extent of wetlands.

Results of a National Wetlands Inventory study of wetland gains and losses between the 1950's and 1970's were published by Frayer et al. (1983) and Tiner (1984). Of the wetlands at the time of settlement in the area now comprising the 48 contiguous states, only 46 percent remained in the mid-1970's. Between the mid-1950's and mid-1970's, there was a loss of about 11 million acres of wetlands. During the same period, approximately two million acres of wetlands were created. This 20-year net loss of nine million acres equates to an average annual net loss of 458,000 acres of wetlands.

The statistical design used in the national trend study can be used with intensified sampling to obtain reliable estimates for individual states or other selected geographical areas. This approach was used to evaluate wetland trends in Florida from the mid-1950's to mid-1970's (Hefner 1986). The current report presents results of a study of wetland trends in Florida for the 10-year period from 1974 to 1984. While it provides estimates of losses, gains and current status of Florida's wetlands and deepwater habitats, it does not provide information on their quality.



W. METZEN

P. REED

left: Collier County
ESTUARINE INTERTIDAL EMERGENT

right: Red Mangroves
ESTUARINE INTERTIDAL FORESTED AND SCRUB/SHRUB

CHAPTER TWO

Historical Background

Since statehood in 1845, Florida's story has been one of man's battle against water. This long struggle was chronicled in detail by Blake (1980). With abundant and seasonally concentrated rainfall and an extremely flat terrain, as much as two-thirds of the state consisted of marshes, swamps, or other areas that were inundated periodically. Therefore, especially in peninsular Florida, preparation of the landscape for agricultural or residential development meant draining and filling of wetlands.

Large-scale drainage projects began in 1881 when Hamilton Diston purchased four million acres of south Florida for 25 cents an acre. Although Diston's drainage and navigation improvement activities were only partially successful, they called attention to the area, leading to a population influx.

Man's assault on wetlands reached its peak during the decades following World War II. Florida's population mushroomed during this period. From 1960 to 1970, the population increased by 35 percent. By 1970, people were migrating to Florida at the rate of over 5,000 new arrivals per week. Much of this increase was directed toward south Florida, making the southeast coast the nation's fastest growing population center (Wade et al. 1980).

From the 1950's to 1970's, wetlands were destroyed at an average annual rate of 72,000 acres (Hefner 1986). With the dual pressures of providing living space for new arrivals and cropland for the production of winter vegetables, sugar cane, and cattle pastures, the Everglades was among the hardest hit areas. Long-term drainage reduced the 3,600 square-mile wetland area by 65 percent (Kushlan 1986). North of Lake Okeechobee, channelization of the Kissimmee River destroyed 70 to 80 percent of the basin's 40,600 acres of wetlands and degraded much of the remaining river marshes. Along the border of Everglades National Park in Collier County, a single development project called Golden Gate Estates attempted drainage of a 173-square-mile subdivision almost entirely located in wetlands. Over 180 miles of canals were dug, 813 miles of roads constructed, and 50,000 lots were sold worldwide. At the same time, just south of Naples, a large resort complex was being built on Marco Island. Approximately 5,300 acres of mangroves and uplands were converted to finger-canal subdivisions. During the period of massive construction from 1962 to 1973, 2,508 acres of mangroves were destroyed in Collier County (Patterson 1986).

Wetland loss was not limited to south Florida. For example, over a 50-year period in northeast Florida, 62 percent of the 289,200 acres of wetlands in the St. Johns River floodplain were ditched, drained, and diked for pasture and crop production (Fernald and Patton 1984). In 1972, a single large agricultural corporation began diking and draining 12,000 acres of forested wetlands in the Apalachicola River floodplain for pasture and soybean and rice growing. Elsewhere, 81 percent of the seagrasses and 44 percent of the mangroves in Tampa Bay were destroyed (Durako et al. 1988). In addition, mangroves had been reduced by 86 percent and seagrasses by 30 percent in the Indian River Estuary (Durako et al. 1988).

By the 1970's, wetlands losses were felt throughout Florida and attitudes toward their protection were changing. Wildlife populations had decreased, water quality had been degraded, and water supplies for urban and agricultural usage were stressed. Fisheries were declining, especially among wetland-dependent species like spotted seatrout and shrimp (Durako et al. 1988). South Florida's wading bird population

left: Weeki Wachee River
RIVERINE SYSTEM

P. REED

(herons, egrets, ibises) decreased by 95 percent, down from an estimated 1,500,000 birds in 1935 to 70,000 birds in 1972 (Crowder 1974). Drainage of the floodplain and channelization of the Kissimmee River resulted in a 93 percent reduction in waterfowl usage, and bald eagle nesting declined by 74 percent (Perrin 1986). By the early 1980's, in south Florida, 75 species of plants and animals were endangered and another 103 were threatened with extinction (Gleason 1984). Many like the Florida panther, Everglades snail kite, and wood stork required wetland habitat.

Saltwater contamination of underground aquifers occurred as wetlands on the surface were destroyed and withdrawals were increased (Fernald and Patton 1984). With the loss of the water cleansing capabilities of the wetlands along the Kissimmee River and expanded agricultural activity, Lake Okeechobee became noticeably eutrophic. The water quality of formerly crystal-clear lakes and rivers declined as urban run-off increased and subdivision lot owners removed emergent shoreline wetlands to "improve" their properties. Subsequently, lakes and rivers became murky, noxious vegetation like hydrilla and water hyacinth grew, and fish kills became commonplace.

Large-scale wetland destruction was also implicated in the disruption of normal rainfall patterns and a resultant long-term drought throughout the St. Johns River basin (Barada 1982). Loss of the water-storage capability of wetlands and the placement of subdivisions in floodplains caused increasing frustration as new residents experienced recurring flooding of their properties. Organic soils formed naturally in the wetlands of the Everglades were lost at a rate of one inch per year from subsidence due to drainage. In some areas, over five feet of soil disappeared (Stephens 1984).

Growing recognition and concern over an array of environmental problems resulted in passage of significant legislation during the 1970's. Between 1969 and 1977, at least six Federal environmental statutes, including the National Environmental Policy Act, the Endangered Species Act, and the Clean Water Act, were passed. Florida passed a large additional body of state legislation that also improved wetland management. The environmental movement in Florida gained ground during this time period. Opposition mounted by environmental action groups helped to block the construction of the Cross-Florida Barge Canal and a regional jetport in the Big Cypress Swamp. Also in the 1970's, the state began to actively purchase valuable wetlands through programs such as the Environmentally Endangered Lands Program, the Conservation and Recreational Lands Act, and later the Save Our Rivers Program operated by the water management districts. In 1983, Governor Bob Graham announced a broad-based multi-million dollar program to restore the ecology of the Everglades. In 1984, Florida passed the Warren S. Henderson Wetlands Protection Act, which increased Department of Environmental Regulation jurisdiction over wetlands.

S. FLA. WATER MGMT. DIST.

CHAPTER THREE

Classification System

The definitions, classifications and categories of wetlands and deepwater habitats used are those described by Cowardin et al. (1979). In general terms, wetland is land where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Technically, wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one or more of the following three attributes: 1) at least periodically, the land supports predominantly hydrophytes; 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year. Common terms used to describe various Florida wetlands include marshes, swamps, bogs, small ponds, sloughs, river overflows, mud flats, and wet prairies.

Deepwater habitats consist of certain permanently flooded lands. In saltwater areas, the separation between wetland and deepwater habitat coincides with the elevation of the extreme low water of spring tide. In other areas, the separation is at a depth of two meters (6.6 feet) below low water. This is the maximum depth in which emergent plants normally grow. Common names used for Florida deepwater habitats include bays, lakes, and reservoirs.

Within the classification structure that follows, wetlands and deepwater habitats are grouped according to systems. A system consists of environments of similar hydrological, geomorphological, chemical, and biological influences. Each system is further divided by the driving ecological force, such as ebb and flow of tide, and by substrate material and flooding regimes, or on vegetative life form. Groupings of categories were made to accommodate special interests of the study and the detail to which aerial photography could be interpreted.

NATL. PARK SERVICE

left: Kissimmee River
RIVERINE AND PALUSTRINE SYSTEMS

right: Everglades
PALUSTRINE EMERGENT

The *marine system* extends from the outer edge of the continental shelf to the high water of spring tides or to the boundary of other systems as defined later. *Marine subtidal* includes that portion that is continuously submerged. Because of relatively small expected change in this portion, it was not included in the study. *Marine intertidal* includes areas in which the substrate is exposed and flooded by tides, including the associated splash zone.

The *estuarine system* consists of deepwater tidal habitats and adjacent tidal wetlands which are usually semi-enclosed by land, but have open, partially obstructed, or sporadic access to the open ocean and in which ocean water is at least occasionally diluted by fresh water runoff from the land. Offshore areas with typically estuarine plants and animals, such as mangroves and oysters, are also included. *Estuarine subtidal* is that portion that is continuously submerged (considered deepwater habitat), while *estuarine intertidal* is the portion exposed and flooded by tides, including the splash zone. For the purposes of this study, estuarine intertidal wetlands were separated into the following groups: *Nonvegetated*, which includes *unconsolidated shore* and *aquatic beds* (i. e. seagrasses); and *vegetated*, which includes *emergent*, and *forested and scrub/shrub. Emergent* contains primarily those erect, rooted herbaceous plants typically found in wet environments. *Forested* is characterized by the presence of trees, and *scrub/shrub* includes areas dominated by shrubs and small or stunted trees.

Loggerhead Key
MARINE INTERTIDAL

P. REED

The *lacustrine system* includes wetlands (littoral) and deepwater habitats (limnetic) situated in topographic depressions or dammed river channels. Each area must exceed 20 acres or be deeper than 6.6 feet or have an active wave-formed or bedrock shoreline feature. Lacustrine areas are grouped together as deepwater habitats in this study.

The *riverine system* includes wetlands and deepwater habitats contained within a channel. For this study riverine subsystems (tidal, lower perennial, upper perennial, and intermittent) were grouped together as deepwater habitats.

The *palustrine system* includes all nontidal wetlands not included within any of the other four systems and does not include any deepwater habitats. For this study, palustrine wetlands are divided into the following groups: *nonvegetated*, which includes *unconsolidated shore*, *unconsolidated bottoms* (primarily ponds), and *aquatic beds*; and *vegetated*, which includes *emergent*, *forested*, and *scrub/shrub*. Definitions are the same as those for estuarine wetlands.

White water lilies
PALUSTRINE AQUATIC BED

J. CARROLL

All remaining surface area (area not classed as wetland or deepwater habitat) was placed in three categories. These are *agriculture*, *urban*, and *other*. These correspond to classes described by Anderson et al. (1979) at their Classification Level I. *Other* includes Anderson's Level I classes of forest land, rangeland, and barren land, as well as lands that had been drained and cleared of vegetation but had not been put to identifiable use.

This briefly describes the classification used in this study. It is difficult to differentiate the categories further without introducing highly technical terms. More detailed discussions, exact definitions, and fuller descriptions are presented by Cowardin et al. (1979) and Anderson et al. (1976).

Everglades agricultural area
AGRICULTURE

C STORRS

CHAPTER FOUR

Survey Procedures

The objectives of the study were to develop statistical estimates for categories of wetlands and deepwater habitats for the mid-1970's, the mid-1980's, and the change for the period.

A stratified random sampling design was used with three strata being formed by the two physical subdivisions described by E. H. Hammond (1970) and a specially developed *coastal stratum* encompassing most of the marine and estuarine categories used in the study. The two strata described by Hammond are the *Gulf-Atlantic Rolling Plains* and the *Gulf-Atlantic Coastal Flats.* Sample units had been allocated to strata in a previous study (Frayer et al. 1983) in proportion to expected amounts of wetlands and deepwater habitats as estimated by U. S. Fish and Wildlife Service personnel. The total number of sample units used in this study was 644.

Each sample unit is a four-square mile area, two miles on each side. The units had been plotted on U. S. Geological Survey topographic maps for the previous study. Also, 1:40,000 scale black and white aerial photography along with some color infrared photography had been obtained for the mid-1970's. The majority of this photography was taken in the years 1972 through 1977 (mean of 1974). The mid-1980's aerial photography consisted of 1:58,000 scale color infrared transparencies taken primarily in 1983 through 1985 (mean of 1984).

The mid-1980's photography was interpreted and annotated in accordance with the classification system described earlier and with procedures developed by the U. S. Fish and Wildlife Service's National Wetlands Inventory Project. The results were compared with the mid-1970's photography, and changes in classification were annotated. Both the recent classification and the classification for the mid-1970's were recorded for each change. If a change was human-induced, that was recorded also.

J. HEFNER

Apalachicola National Forest
PALUSTRINE EMERGENT

CHAPTER FIVE

Results

The intent of this study was to examine wetland change that occurred from the mid-1970's to the mid-1980's. The average years of the photography are 1974 and 1984, with an average interval of 10 years. Thus, the results should be interpreted in terms of a 10-year interval.

Results for the categories discussed in the classification system are given in Table 1 of the Appendix. Several of the individual categories in Table 1 were grouped based on physical, chemical, and biological similarities and are shown in Table 2 of the Appendix. Groupings in Table 2 include the following:

Wetlands and deepwater habitats includes all marine, estuarine, palustrine, riverine, and lacustrine classifications.

Wetlands includes marine, estuarine, and palustrine wetlands.

Estuarine wetlands includes all estuarine categories except estuarine subtidal (a deepwater habitat).

Nonvegetated and *vegetated* wetlands were defined earlier for both the estuarine and palustrine systems.

Palustrine wetlands includes all palustrine categories.

Deepwater habitats includes estuarine subtidal, riverine, and lacustrine habitats.

Other categories, listed singly as in Table 1, include *agriculture*, *urban*, and *other*.

Status and trends results presented in the remainder of this section are based on information found in Tables 1 and 2.

P. REED

Myakka River State Park
PALUSTRINE FORESTED

Near Suwannee River
PALUSTRINE AQUATIC BED

W. METZEN

J. HEFNER

Peace River, DeSoto County
PALUSTRINE FORESTED

TRENDS IN WETLANDS AND DEEPWATER HABITATS

The mid-1970's estimate of wetlands and deepwater habitats is 15,821,700 acres. The mid-1980's estimate is 15,584,600 acres, a net loss of 237,100 acres. This is an average annual net loss of 23,710 acres of wetlands and deepwater habitats through the study period. Virtually all of the net loss is attributable to conversion to agriculture and urban expansion.

TRENDS IN WETLANDS

The mid-1970's and mid-1980's estimates of wetlands are 11,298,600 acres and 11,038,300 acres, respectively. This is a net loss of 260,300 acres, or an average annual net loss of 26,030 acres. The vast majority of the loss was to agriculture, urban expansion and other forms of development.

Marine Intertidal Wetlands

No significant changes occurred in marine intertidal wetlands during the period.

Estuarine Wetlands

Some loss in estuarine wetlands was experienced, with 2,800 acres consumed by urbanization. Of this total, 2,700 acres were previously estuarine vegetated wetlands.

Black Needlerush Marsh, Hernando County
ESTUARINE INTERTIDAL EMERGENT

P. REED

P. REED

Brooker Creek Park, Pinellas County
PALUSTRINE FORESTED

Palustrine Wetlands
The mid-1970's and mid-1980's estimates of palustrine wetlands are 9,902,200 acres and 9,644,800 acres, respectively. This is a net loss of 257,400 acres for the period, or an average annual net loss of 25,740 acres.

Palustrine Nonvegetated Wetlands
Palustrine nonvegetated wetlands increased by 32,400 acres. Most of this increase was in palustrine unconsolidated bottoms (primarily ponds).

Palustrine Vegetated Wetlands
There was a net loss of 289,800 acres of palustrine vegetated wetlands during the study period. Even in the category that did not show a net loss (palustrine scrub/shrub), there were some significant individual losses as explained later.

Palustrine Emergent Wetlands
A net loss of 110,000 acres of palustrine emergent wetlands occurred during the period. The largest category of change was 107,900 acres converted to agriculture.

Palustrine Forested Wetlands
There was a net loss of 184,100 acres of palustrine forested wetlands. Some large changes were to other wetland categories, primarily palustrine emergent and palustrine scrub/shrub. However, 39,200 acres were converted by urbanization, and another 43,600 acres are now classed as non-wetlands.

Palustrine Scrub/Shrub Wetlands
There was no apparent overall net loss of palustrine scrub/shrub wetlands. However, there were some significant losses that were offset by gains of a different nature. The significant losses included conversion of 58,000 acres to agriculture and 11,500 acres to urbanization. The gains came primarily from other palustrine vegetated categories.

Marion County
PALUSTRINE SCRUB/SHRUB

J. HEFNER

S. FLA. WATER MGMT. DIST.

Miami
URBAN

DEEPWATER HABITATS
The mid-1970's and mid-1980's estimates of deepwater habitats are 4,523,100 and 4,546,300 acres, respectively. Of this net increase of 23,200 acres, 22,400 acres were due to increases in the lacustrine category (lakes and reservoirs).

AGRICULTURAL AREA
Agricultural area increased from 7,016,100 acres in the mid-1970's to 7,544,600 acres in the mid-1980's. This increase of 528,500 acres resulted primarily from the following changes:

- 175,100 acres of palustrine wetlands to agriculture
- 643,600 acres of non-wetlands to agriculture

- 15,100 acres of agriculture to wetlands
- 125,000 acres of agriculture to urban
- 150,100 acres of agriculture to non-wetlands, non-urban

URBAN AREA
Urban area expanded by 551,600 acres. As expected, a large portion (362,300 acres) came from areas not classed as wetlands, deepwater habitats, or agriculture. However, 125,000 acres were converted from agriculture and 66,000 acres were converted from wetlands.

CHAPTER SIX

Discussion

By the mid-1970's, attitudes toward wetlands were changing. The general public became increasingly familiar with a growing body of knowledge on the value of wetlands — especially estuarine wetlands — developed largely from research conducted in the 1950's and 1960's. Perhaps more importantly, the effects of rampant wetland destruction of the previous decades were felt throughout Florida. Clean surface water and groundwater were becoming less abundant, and fish and wildlife resources important to many Floridians were in decline.

Federal legislation was passed in response to a growing national concern for the environment. Section 404 of the Clean Water Act, though not specifically a wetlands protection statute, greatly enhanced the roles of the Army Corps of Engineers and the Environmental Protection Agency in protecting wetlands. A variety of state legislation has given the Departments of Environmental Protection and Natural Resources, regional water management districts, and the counties greater stewardship responsibilities for wetlands.

Although the fight to protect wetlands continues, recent advances are particularly encouraging. Wetland conservation is changing from a reactive process to a more proactive effort. Wetlands are being purchased, restored, constructed, and attempts are being made to mitigate unavoidable losses.

During the 1980's, land purchases by both the Federal and state governments have put thousands of fragile wetland acres in public ownership. The Fish and Wildlife Service added nearly 250,000 acres, most of which were wetlands, to the National Wildlife Refuge System in Florida. The National Park Service has been authorized to acquire 107,600 acres in the East Everglades and 146,000 acres in Big Cypress Swamp. The U.S. Forest Service is purchasing 60,000 to 90,000 acres of Pin Hook Swamp linking Osceola National Forest and Okefenokee Swamp.

P. REED

left: Smooth Cordgrass
ESTUARINE INTERTIDAL EMERGENT

W. METZEN

right: Citrus County
ESTUARINE INTERTIDAL EMERGENT

J. HEFNER

Manatee County
PALUSTRINE EMERGENT

Florida has made a concerted effort to buy important wetland tracts. State land purchased during the 1980's exceeded a million acres, over half of which were wetlands. The purchase of over 300,000 acres in the Everglades is in progress. Purchases of an additional 1.2 million acres, over 60 percent of which are wetlands, are under consideration.

Efforts are underway to restore important wetland areas. Most notable are restoration of the Kissimmee River and associated marshes and the restoration and reconstruction of the St. Johns River marshes. Both projects are of tremendous magnitude, requiring not only engineering measures but also large-scale land acquisition. The extent and cost of these projects necessitates cooperative action between both state and Federal governments. In addition, marshes are being built in the Everglades agricultural area to store water for irrigation and to remove agricultural pollutants. In Orange County and the City of Orlando, wetlands have been designed and created to act as tertiary wastewater treatment facilities. Throughout Florida, wetlands have been constructed for incorporation into livestock waste management systems.

State programs requiring permits for activities that impact wetlands are stronger here than in any other southeastern state. These programs are occasionally bolstered by the permit requirements of water management districts and of some counties. In cases where permits are granted and wetland losses are unavoidable, mitigation requirements are increasingly common. Mitigation often takes the form of creating wetlands similar to those that were lost, restoring nearby wetlands, or intensively managing existing wetlands to increase their functional values.

During the 1970's and 1980's, the rates at which Florida's wetlands were lost lessened considerably. Public and political recognition of Florida's wetlands is growing, and fiscal and human resources at all levels of government have been committed to their conservation. With these positive signs, an analysis of Florida's wetland trends in the 1990's should be even more encouraging.

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Appendix

Estimates produced include acreages with associated standard errors. Many estimates are not considered reliable enough to recommend their use for making decisions. An indication is given of the reliability of each estimated acreage in the summary tables included in this appendix. The standard error of each entry expressed as a percentage of the entry (SE%) is given in parentheses. Reliability can be stated generally as "we are 68 percent confident that the true value is within the interval constructed by adding to and subtracting from the entry the SE%/100 times the entry." For example, if an entry is one million acres and the SE% is 20, then we are 68 percent confident that the true value is between 800,000 and 1,200,000 acres. An equivalent statement for 95 percent confidence can be made by adding and subtracting twice the amount to and from the entry.

Therefore, a large SE% indicates low reliability, if any, in the estimate. In fact, if the SE% is 100 or greater, we cannot even say that we are 68 percent confident that the true value is not zero.

This discussion on reliability is meant to aid in interpretation of the study results. It was expected that only certain estimates would be precise enough to be meaningful. However, all entries are included in the summary tables for additivity and ease of comparison.

Estimates for the mid-1970's, the mid-1980's and change during the period were produced for categories described in Chapter Two. These estimates are summarized in Table 1 of the Appendix. Totals for columns are estimates of total acreage by category for the mid-1980's. Row totals (the extreme right column) are estimates of total acreage by category for the mid-1970's. Entries are interpreted as in the following examples (all from the ninth row or column of Table 1):

- 2,716,300 acres classified as palustrine emergent in the mid-1970's were again classified palustrine emergent in the mid-1980's.
- 107,900 acres classified as palustrine emergent in the mid-1970's had changed to agriculture by the mid-1980's.
- 32,400 acres classified as palustrine scrub/shrub in the mid-1970's had changed to palustrine emergent by the mid-1980's.
- The estimate of palustrine emergent area in the mid-1970's is 2,975,500 acres.
- The estimate of palustrine emergent area in the mid-1980's is 2,865,500 acres.
- The estimate of net change in palustrine emergent area between the mid-1970's and the mid-1980's is –110,000 acres.

P. REED

left: Hernando County
PALUSTRINE FORESTED

TABLE 1 Area, in thousands of acres, by surface area classification.

CURRENT

Sampling error, in percent, is given in parentheses below estimate.

• Standard error of estimate is equal to or larger than estimate.

ORIGINAL CLASSIFICATIONS			ALL WETLANDS							
				ESTUARINE INTERTIDAL						
			MARINE INTERTIDAL	UNCONSOLIDATED SHORE	AQUATIC BEDS	EMERGENT	FORESTED & SCRUB/SHRUB	UNCONSOLIDATED SHORE	UNCONSOLIDATED BOTTOMS	
ALL WETLANDS	MARINE INTERTIDAL		34.3 (37.2)	<0.1	0	0	0			
	ESTUARINE INTERTIDAL	UNCONSOLIDATED SHORE	0	191.5 (16.4)	0.4 (70.4)	0.3 (64.0)	1.4 (59.3)			
		AQUATIC BEDS	0	6.8 (92.1)	203.6 (25.0)	0	<0.1			
		EMERGENT	0	0.1 (50.4)	0	283.0 (18.8)	4.1 (34.0)			
		FORESTED & SCRUB/SHRUB	<0.1	0.1 (90.0)	0	2.7 (90.5)	661.8 (14.4)			
	PALUSTRINE	UNCONSOLIDATED SHORE	<0.1					1.4 (35.6)	0.5 (50.0)	
		UNCONSOLIDATED BOTTOMS						0.1 (98.3)	101.5 (9.9)	
		AQUATIC BEDS						0	1.1 (42.4)	
		EMERGENT						<0.1	10.3 (15.5)	
		FORESTED						0.1 (60.0)	5.2 (23.4)	
		SCRUB/SHRUB						<0.1	1.8 (20.1)	
DEEPWATER HABITATS		ESTUARINE SUBTIDAL	0	0.6 (58.9)	0.3 (90.4)	1.7 (73.4)	0.2 (80.6)	0.1 (96.9)	0	
		RIVERINE	0	0	0	0	0	0	0	
		LACUSTRINE	0	0	0	0	0	0.2 (96.7)	0.4 (67.1)	
AGRICULTURE			0	0	0	0	0.3 (98.2)	0.3 (55.2)	6.1 (31.5)	
URBAN			0	0.1 (83.7)	0	0	0	0	1.2 (33.1)	
OTHER			<0.1	<0.1	0	0	0.2 (74.2)	1.4 (42.1)	12.6 (18.2)	
TOTAL SURFACE AREA			34.3 (37.1)	199.2 (16.0)	204.3 (24.9)	287.7 (18.9)	668.0 (14.2)	3.6 (24.5)	140.7 (8.6)	
CHANGE			-1.1 (51.9)	5.1 •	-6.2 •	0.1 •	-0.8 •	-1.0 •	31.5 (14.7)	

CLASSIFICATIONS

PALUSTRINE				DEEPWATER HABITATS						
AQUATIC BEDS	EMERGENT	FORESTED	SCRUB/SHRUB	ESTUARINE SUBTIDAL	RIVERINE	LACUSTRINE	AGRICULTURE	URBAN	OTHER	TOTAL SURFACE AREA
				0	0	0	0	0	1.1 (51.4)	35.4 (36.2)
				0.3 (43.7)	0	0	0	0.1 (97.3)	0.1 (83.0)	194.1 (16.3)
<0.1				0.1 (96.5)	0	0	0	0	0	210.5 (24.4)
				0.2 (50.2)	0	0	0	0.2 (63.3)	0	287.6 (18.5)
				0.7 (57.5)	0	0	0	2.5 (57.3)	1.0 (65.5)	668.8 (14.2)
0.1 (74.1)	0.5 (69.6)	0	0.7 (75.9)	<0.1	0	0.9 (97.0)	<0.1	0.1 (84.6)	0.4 (69.7)	4.6 (30.4)
0.9 (34.9)	1.8 (31.5)	<0.1	0.5 (47.0)	0.1 (96.9)	0.1 (98.0)	1.8 (44.8)	0.5 (83.6)	0.9 (44.5)	1.0 (41.8)	109.2 (10.0)
17.6 (18.2)	0.3 (59.0)	0	<0.1	0	0	0.4 (98.5)	0	<0.1	0.2 (74.1)	19.6 (17.2)
1.1 (40.0)	2716.3 (10.2)	2.9 (45.2)	96.3 (53.2)	<0.1	0.8 (56.5)	10.6 (27.2)	107.9 (29.2)	11.5 (30.6)	17.8 (28.5)	2975.5 (9.6)
0.4 (50.4)	85.4 (21.4)	5378.2 (5.1)	82.7 (20.1)	0	0.3 (58.3)	2.2 (46.2)	8.7 (40.4)	39.2 (33.0)	32.4 (33.7)	5634.8 (5.1)
0.2 (47.6)	32.4 (26.9)	65.4 (25.5)	979.6 (12.3)	0	0.7 (68.1)	2.4 (40.6)	58.0 (57.5)	11.5 (45.2)	6.5 (28.1)	1158.5 (11.8)
0	0	0	0	2726.7 (5.1)	0	0	0	0.2 (88.3)	0.2 (72.9)	2730.0 (5.1)
0	0.7 (54.5)	0	0.2 (98.5)	0	137.6 (32.8)	0	<0.1	0	0	138.5 (32.6)
0.3 (98.0)	12.3 (39.6)	0.2 (66.5)	<0.1	0	0	1637.8 (17.1)	0	0.1 (97.3)	3.3 (88.1)	1654.6 (16.9)
0.6 (75.5)	6.6 (32.1)	0.3 (92.5)	0.9 (51.5)	0	0	1.3 (56.6)	6725.9 (5.8)	125.0 (25.5)	148.8 (17.9)	7016.1 (5.6)
<0.1	0.1 (50.0)	0.1 (98.4)	0.1 (97.8)	0.1 (90.6)	0	0.3 (91.3)	0	2520.1 (10.8)	0	2522.1 (10.8)
0.3 (45.4)	9.1 (44.6)	3.6 (71.7)	1.8 (50.6)	0.8 (46.5)	0.8 (71.3)	19.3 (36.5)	643.6 (14.9)	362.3 (15.3)	13047.5 (3.3)	14103.3 (3.0)
21.5 (15.8)	2865.5 (9.6)	5450.7 (5.1)	1162.8 (11.8)	2729.0 (5.1)	140.3 (32.2)	1677.0 (16.7)	7544.6 (5.5)	3073.7 (10.0)	13260.3 (3.2)	39463.2 (0)
1.9 (45.8)	-110.0 (59.7)	-184.1 (19.7)	4.3 •	-1.0 •	1.8 (69.3)	22.4 (40.3)	528.5 (23.1)	551.6 (14.5)	-843.0 (13.5)	0 (0)

TABLE 2 Area, in thousands of acres, by selected surface area groups.

Sampling error, in percent, is given in parentheses below estimate.

• Standard error of estimate is equal to or larger than estimate.

CURRENT

ORIGINAL CLASSIFICATIONS			WETLANDS					
				ESTUARINE INTERTIDAL			PALUSTRINE	
			MARINE INTERTIDAL	NON-VEGETATED	VEGETATED	ESTUARINE WETLANDS	NON-VEGETATED	VEGETATED
WETLANDS	MARINE INTERTIDAL		34.3 (37.2)	<0.1	0	<0.1	0	0
	ESTUARINE INTERTIDAL	NONVEGETATED	0	402.3 (15.3)	1.7 (53.7)		0	0
		VEGETATED	<0.1	0.2 (55.0)	951.6 (11.5)		<0.1	0
	ESTUARINE WETLANDS		<0.1			1355.8 (9.0)	<0.1	0
	PALUSTRINE	NONVEGETATED	0	0	<0.1	<0.1	123.2 (9.0)	3.8 (29.5)
		VEGETATED	0	<0.1	0	<0.1	19.1 (12.8)	9439.2 (4.2)
	PALUSTRINE WETLANDS		0	<0.1	<0.1	<0.1		
ALL WETLANDS								
DEEPWATER HABITATS			0	0.9 (50.8)	1.9 (68.1)	2.8 (50.0)	1.0 (63.0)	13.4 (37.0)
WETLANDS AND DEEPWATER HABITATS								
AGRICULTURE			0	0	0.3 (98.2)	0.3 (98.2)	7.0 (29.2)	7.8 (29.2)
URBAN			0	0.1 (83.7)	0	0.1 (83.7)	1.2 (32.3)	0.3 (50.1)
OTHER			<0.1	<0.1	0.2 (74.2)	0.2 (75.9)	14.3 (17.4)	14.5 (34.8)
TOTAL SURFACE AREA			34.3 (37.1)	403.5 (15.2)	955.7 (11.5)	1359.2 (9.0)	165.8 (8.0)	9479.0 (4.1)
CHANGE			-1.1 (51.9)	-1.1 •	-0.7 •	-1.8 •	32.4 (15.2)	-289.8 (18.7)

Florida Wetlands, 1970's to 1980's

CLASSIFICATIONS

PALUSTRINE WETLANDS	ALL WETLANDS	DEEPWATER HABITATS	WETLANDS AND DEEPWATER HABITATS	AGRICULTURE	URBAN	OTHER	TOTAL SURFACE AREA
0		0		0	0	1.1 (51.4)	35.4 (36.2)
0		0.4 (39.7)		0	0.1 (97.3)	0.1 (83.0)	404.6 (15.2)
<0.1		0.9 (46.5)		0	2.7 (52.7)	1.0 (65.5)	956.4 (11.5)
<0.1		1.3 (42.0)		0	2.8 (51.4)	1.1 (62.4)	1361.0 (8.9)
		3.3 (42.0)		0.5 (76.8)	1.0 (42.6)	1.6 (40.0)	133.4 (9.3)
		17.0 (20.4)		174.6 (28.2)	62.2 (26.1)	56.7 (22.2)	9768.8 (4.1)
9585.3 (4.1)		20.3 (19.9)		175.1 (28.1)	63.2 (25.8)	58.3 (21.9)	9902.2 (4.0)
	10975.4 (3.7)	21.6 (18.8)		175.1 (28.1)	66.0 (24.8)	60.5 (21.1)	11298.6 (3.7)
14.4 (36.1)	17.2 (31.3)	4502.1 (6.8)		<0.1	0.3 (69.0)	3.5 (84.2)	4523.1 (6.8)
			15516.3 (2.8)	175.1 (28.1)	66.3 (24.7)	64.0 (21.0)	15821.7 (2.7)
14.8 (21.8)	15.1 (21.5)	1.3 (56.6)	16.4 (20.8)	6725.9 (5.8)	125.0 (25.5)	148.8 (17.9)	7016.1 (5.6)
1.5 (29.1)	1.6 (27.9)	0.4 (78.6)	2.0 (27.9)	0	2520.1 (10.8)	0	2522.1 (10.8)
28.8 (20.9)	29.0 (20.7)	20.9 (33.8)	49.9 (22.7)	643.6 (14.9)	362.3 (15.3)	13047.5 (3.3)	14103.3 (3.0)
9644.8 (4.1)	11038.3 (3.7)	4546.3 (6.8)	15584.6 (2.7)	7544.6 (5.5)	3073.7 (10.0)	13260.3 (3.2)	39463.2 (0)
-257.4 (20.8)	-260.3 (20.6)	23.2 (39.5)	-237.1 (22.6)	528.5 (23.1)	551.6 (14.5)	-843.0 (13.5)	0 (0)

NATL PARK SERVICE

Wetland recreation, Everglades National Park