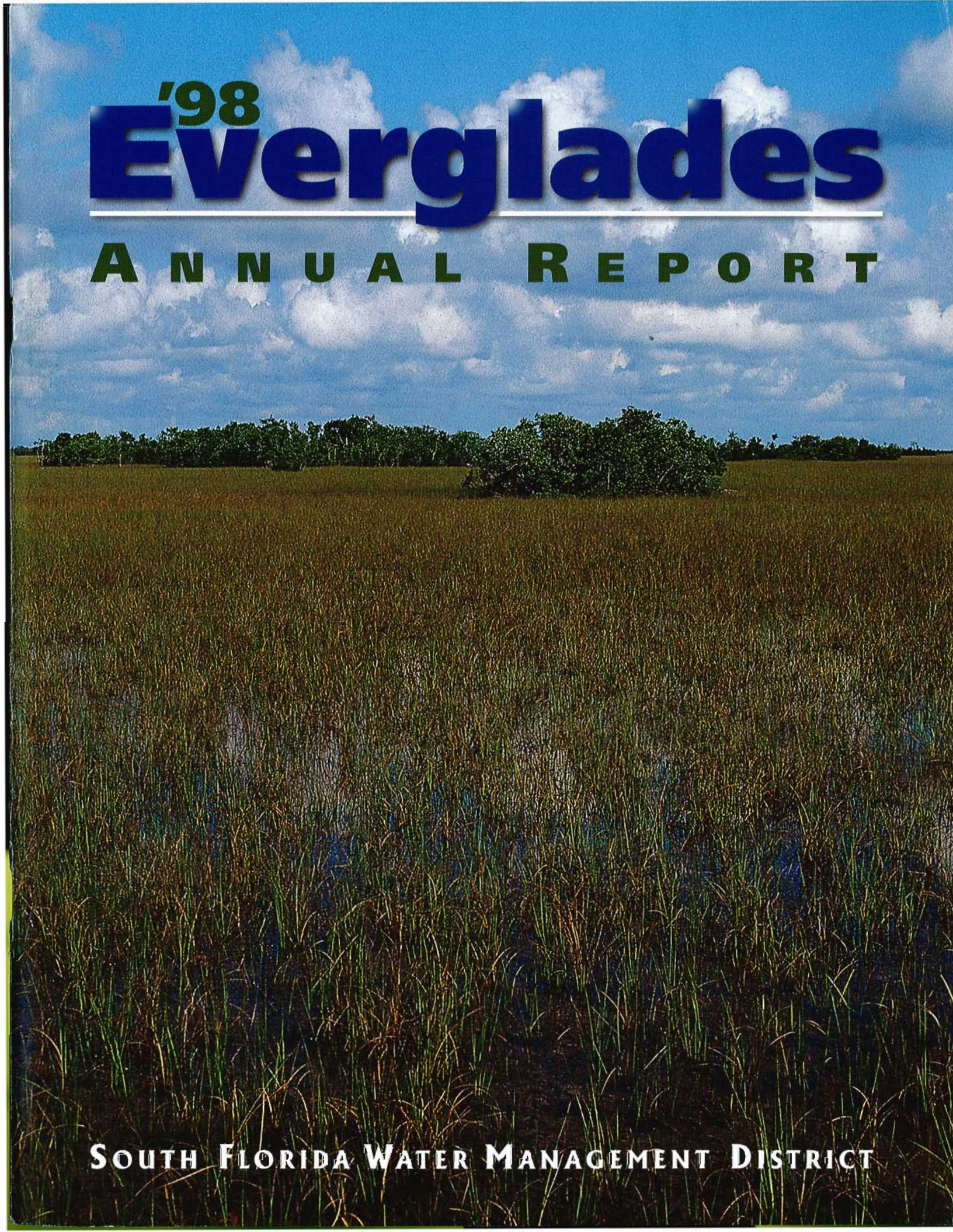


'98 Everglades

Annual Report

South Florida Water Management District

The front cover of this report shows a sawgrass prairie and tree island during the wet season in Everglades National Park. The back cover shows a sunset in Everglades National Park.

ACKNOWLEDGEMENTS

Recognition is extended to the following District staff members who contributed to the development of this report: Timothy Bechtel, Maria Bennett, Michael J. Chimney, Quan Dong, Larry Fink, Tom Fontaine, Gary Goforth, Susan Gray, Yvonne Gsteiger, Steven Hill, Nenad Iricanin, Kimberly Jacobs, Tom Kozier, Francois Laroche, Victor Lopez, Dean Mades, Paul McCormick, Agnes R. McLean, Chris McVoy, ShiLi Miao, Murray G. Miller, Cheol Mo, Susan Newman, Susan Olson, Richard Pfeuffer, Ramesh Reddy, Garth Redfield, Keith Rizzardi, Barry Rosen, David Rudnick, Ken Rutchey, Mike Slayton, Fred H. Sklar, Rene Smith, Dave Swift, Tom Teets, Sharon Trost, Stuart Van Horn, Randy Van Zee, Paul Whalen, Carolyn Williams and Yegang Wu.

This document is published by the South Florida Water Management District. Ellen Underwood of the Office of Government and Public Affairs served as primary editor. The Visual Communications Division provided design, photography and printing, with Cheri Craft serving as graphic designer.

1998 Everglades Annual Report

Florida's Everglades is the largest wetland and subtropical wilderness in the United States, and is a unique ecological resource. It is comprised of Everglades National Park and three water conservation areas. The Park, established in 1947, is designated an International Biosphere Reserve, an Outstanding Florida Water, and a United Nations World Heritage Site. The most northern water conservation area includes the Arthur R. Marshall Loxahatchee National Wildlife Refuge. The Refuge, established in 1951, is designated an Outstanding Florida Water and Critical Habitat for the endangered snail kite. Another 720,000 acres of Everglades habitat lies between the Park and Refuge in the Water Conservation Areas 2 and 3. The River of Grass contains a unique diversity of plants and wildlife not found anywhere else.

For more than a century, man altered the ecosystem to provide for the development of a growing population, for agriculture, and to protect against deadly hurricanes and droughts. In fact, water management efforts supported by citizens, the state, and federal government helped make Florida one of the fastest-growing states in the nation. In the last 30 years, however, a greater appreciation for the value of natural ecosystems has evolved. A better understanding of environmental resources has shown that impacts to even a small part of the system can have widespread repercussions.

Today, the Everglades faces critical challenges from more than 100 years of change. Phosphorus-enriched stormwater runoff from agriculture and urban sources is disrupting the ecosystem's native populations of plants and animals. Other threats include changes in the quantity, distribution and timing of fresh water; infestation of non-native plants; mercury accumulation in Everglades' fish, birds and mammals; and a reduction in the size of the ecosystem. Drainage and fragmentation of the system, including construction and operation of the Central & Southern Florida Project, have altered water conditions in the Everglades which is adversely affecting native flora and fauna. At the south end, Florida Bay is experiencing algal blooms, seagrass die-offs and elevated salinity levels.

The Everglades Forever Act passed by the Florida Legislature in 1994 establishes a comprehensive program to begin to restore significant portions of the remnant Everglades. This annual progress report covers efforts toward these goals during the 12 months ending September 30, 1998. It is the eighth annual report and is presented to the Governor, the Speaker of the House of Representatives, the Minority Leader of the House of Representatives, the President of the Senate, the Minority Leader of the Senate, the Florida Department of Environmental Protection, and the Joint Legislative Committee on Everglades Oversight.

This report is developed in coordination with the Florida Department of Environmental Protection, the Arthur R. Marshall Loxahatchee National Wildlife Refuge, Everglades National Park, the U. S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and the South Florida Ecosystem Restoration Task Force.

1998 Everglades Annual Report

* *This report includes the final version of the findings and implications which were distributed in the January 1, 1999* Everglades Interim Report.

Note to Readers:

1994 Everglades Forever Act. This report was originally created to provide an annual update of the 1991 Everglades Protection Act. It was updated three years later to address the subsequent 1994 Everglades Forever Act (Ch. 94-115, Laws of Florida; now contained in section 373.4592, F.S.). Information on the implementation of the Everglades Forever Act is found throughout this report. Starting this year, the *Everglades Annual Report* also summarizes the research and monitoring findings from the *Everglades Interim Report*, a peer-reviewed document also required by the Everglades Forever Act. This summary is included as the appendix of this document.

1997 Everglades Oversight Act. In 1997, a new law was created calling for expanded Everglades oversight, which among other things, requires that the South Florida Water Management District report on construction and funding issues. Implementation of this Act is covered in the Everglades Construction Project and Managing Fiscal Resources sections of this report. The Everglades Oversight Act (Ch. 97-258, Laws of Florida) also calls for the District to report on plans, permits, land acquisition agreements, modifications, and the overall status of the Everglades Forever Act. These have been embodied into this report.

Introduction

Florida's Everglades Forever Act (Act) outlines a comprehensive plan to restore a significant portion of the remaining Everglades ecosystem through land acquisition, construction, research and regulation. The general goal is to improve water quality; hydropattern (timing, flow, amount and distribution of water); and prevent the spread of exotic species. The overall restoration and cleanup effort described in the Act is known as the "Everglades Program."

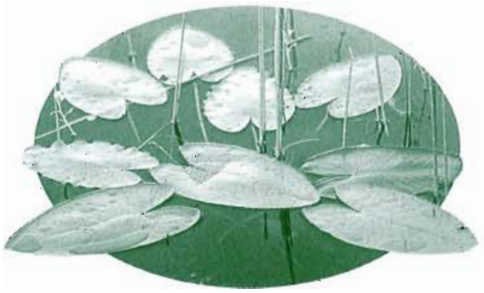
"Everglades Protection Area" Outlined. As part of the greater south Florida ecosystem, the area identified for restoration is comprised of Water Conservation Areas 1, 2A, 2B, 3A and 3B in western Palm Beach, Broward and Miami-Dade counties; the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge); and Everglades National Park (Park). Together, this region is known as the "Everglades Protection Area."

Interagency Cooperation Key to Success. While the South Florida Water Management District (District) has most of the responsibility to carry out the Act's mandates, successful implementation of the Everglades Program depends on effective coordination among participating agencies. The Act directs the District and the Florida Department of Environmental Protection (DEP) to work together to fulfill project goals. The Act also directs the District to pursue some goals through cooperative arrangements with the federal government, notably, the U.S. Army Corps of Engineers (Corps of Engineers). In addition, other state and federal agencies have a support role in implementing Everglades Program projects.

Communication of Issues. Communication of Everglades issues to local governments and citizens is essential. District staff regularly meet with government officials, citizen groups and media; distribute publications and news releases; and discuss Everglades issues at Governing Board and numerous other publicized meetings and workshops.

Florida Bay Restoration Included. Provisions addressing Florida Bay restoration and the Emergency Interim Plan requiring increased fresh water flows to the bay were included in the same legislation (Ch. 94-115, Laws of Florida), but a separate statutory section (section 373.4593, F.S.). A discussion of Florida Bay is included in this report for several reasons. First, 80% of Florida Bay is included in the Everglades Protection Area described in the Act. Second, hydropattern and pollution reduction are part of the Act for the portion of Florida Bay contained within the Everglades Protection Area. Third, both systems are ecologically intertwined, and changes to the Everglades ecosystem affect Florida Bay.

Central & Southern Florida Project Restudy Also Included. The federal government also has a role in protecting the Everglades through the Central & Southern Florida (C&SF) Project. A plan to modernize the 50-year-old regional water management system is being developed in a Comprehensive Review Study of the C&SF Project, which is known as the "Restudy." One of the Restudy's main goals is further restoration of the greater Everglades ecosystem. Programs outlined in the Restudy will coordinate with ongoing cleanup efforts described in the Act. A discussion of the Restudy is included for that reason.



Everglades Restoration Timelin

'47 — ***River of Grass*** by Marjory Stoneman Douglas first draws attention to the plight of the Everglades.

'47 — Everglades National Park is dedicated.

'49 — C&SF Project developed and implementation starts in response to widespread flooding in south Florida.

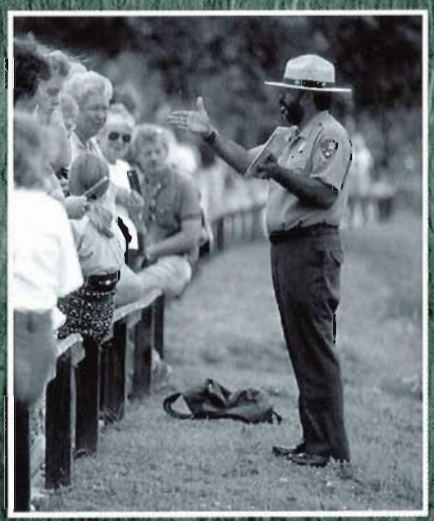
1970's — Environmental movement gains momentum. Early Everglades restoration studies and research programs begin.

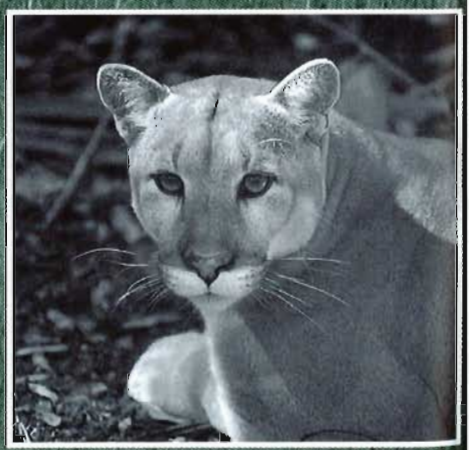
1983 — Governor Graham launches the Save Our Everglades Program. The program's goal is that by the year 2000, the ecosystem will look and function more like it did in 1900 than 1983. Much progress has been made from the Kissimmee River headwaters to Big Cypress National Preserve, and work continues.

1987 — First cleanup plan for the Everglades is created under the new state Surface Water Improvement and Management Act.

1988 — Design begins on the Everglades Nutrient Removal Project, a prototype manmade wetland to remove phosphorus from waters entering the Everglades.

1988 — National attention is focused on the Everglades when the federal government sues the District and state for failing to enforce state water quality standards.





1991

State and federal government enter into a settlement agreement, which is incorporated into a judicial consent decree. The Florida Legislature passes the Everglades Protection Act, giving the District authority in several areas to move forward with cleanup components. However, more than 35 lawsuits are filed against various aspects of Everglades cleanup, stalling its implementation.

1993

Key parties involved in Everglades restoration embark on a year-long mediation effort to resolve differences. A technical plan and "Statement of Principles" are developed. Despite best efforts, mediation stalls in late 1993.

1994

Florida Legislature passes the most comprehensive restoration plan ever. The Everglades Forever Act builds on previous efforts and adds new elements, including reliable funding mechanisms, hydropattern restoration goals and extensive research-based restoration initiatives. This Act replaces all previous efforts, and is being implemented today.

1995

The Everglades Nutrient Removal Project begins operation.

Experimental marsh is considered a huge success, exceeding expectations for phosphorus removal.

1997

Construction of Stormwater Treatment Area-6, the first of six manmade wetlands to clean up stormwater entering the Everglades, is completed and the treatment area begins operation in December.

1998

Construction advances on three other treatment wetlands; the Everglades Stormwater Program is launched to ensure discharges to the Everglades meet water quality goals in accordance with the Act and its permitting requirements; and the *Everglades Interim Report* is released, summarizing the ecology, hydrology and water conditions of the Everglades.

Highlights

Much progress was made this year to restore and protect the Everglades, with the District continuing to aggressively implement the Act's many components. By the end of fiscal year 1998, the District had spent or committed more than $244 million on the Everglades Construction Project, including more than $138 million in construction. Research continued to develop supplemental technologies to reduce phosphorus load even further in waters entering the Everglades. Growers in the Everglades Agricultural Area (EAA) continued programs to reduce phosphorus leaving that basin. Scientists determined the likely primary source of mercury to the Everglades; progress was made on numerous other fronts to restore the Everglades; and the District released the *Everglades Interim Report* to support decision-making for projects described in the Act. Some highlights follow, with more information provided later in this report.

Everglades Construction Project

- The first treatment wetland began operation in December 1997. Stormwater Treatment Area (STA) 6 has since been discharging stormwater with phosphorus amounts averaging less than 30 parts per billion (ppb) — well below the 50 ppb interim target required by the Act.
- Construction advanced on three other wetlands: STA-1 West, STA-2 and STA-5.
- The Everglades Nutrient Removal (ENR) Project removed more than 63 metric tons of phosphorus in its first four years of operation, including 12 metric tons in 1998.

Regulatory and Stormwater Programs

- Best Management Practices (BMPs) in the EAA continue to be successful, removing an estimated 80 metric tons of phosphorus that would have otherwise entered the Everglades. Total phosphorus load discharged from the EAA was reduced by 55% for the last three years (1996 to 1998), adjusted for hydrologic variability, relative to the 1979-88 base period.
- The District initiated the Everglades Stormwater Program to ensure that water quality goals are met at all structures that the District controls that pump water into, through, or from the Everglades Protection Area.

Research and Monitoring

- Three years of research in Water Conservation Area 2A has produced results to use to develop a numeric phosphorus standard. Similar research will be completed for Water Conservation Area 1 in 1999.

Control of Exotic Species

- The District killed all melaleuca trees and removed seedlings from Water Conservation Area 3B, and the part of 3A south of Alligator Alley. The District continued its battle against the pest tree using the Australian weevil as a biological control, as well.

Hydropattern Restoration

- The District continued to make progress towards establishing minimum flows and levels for the Biscayne aquifer, Lake Okeechobee, and the Everglades. The Governing Board accepted a draft document for establishment of minimum water level criteria in July 1998, with an independent panel issuing a final peer-review report of the document in September 1998.

Florida Bay Restoration

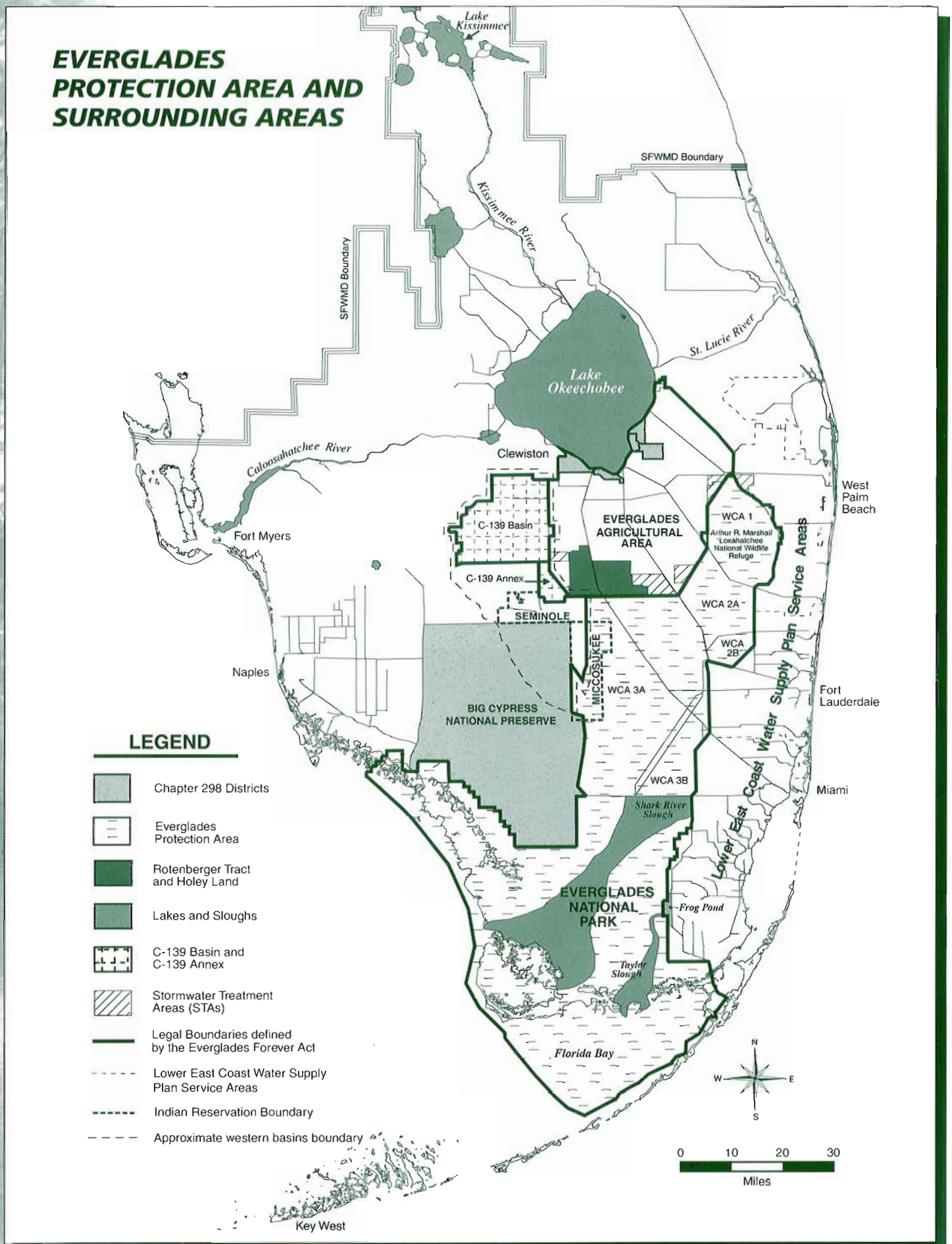
- Research on historical salinity of the bay confirmed the average salinity to the bay increased after 1910, and that salinity variability also decreased.
- Construction on one pump and two gravity stations was completed to allow more water to flow into northeast Shark River Slough.
- Work began to replace a bridge over Taylor Slough near the Park's south entrance to improve flows southward.

Everglades Litigation

- In *USA v. SFWMD*, federal District Court Judge William Hoeveler denied a motion to invalidate the Everglades Forever Act, upholding the legislation and approving proposed changes to the 1992 Consent Decree which established the basic framework for Everglades restoration.
- However, in *Miccosukee Tribe of Indians v. U.S. Environmental Protection Agency* (EPA), federal District Court Judge Edward Davis ruled that the Everglades Forever Act represented a change in state water quality standards pursuant to the federal Clean Water Act. As a result, the Act may be referred back to EPA for further review, although the decision may be appealed.

White Pelicans in Florida Bay.

EVERGLADES PROTECTION AREA AND SURROUNDING AREAS



LEGEND

- Chapter 298 Districts
- Everglades Protection Area
- Rotenberger Tract and Holey Land
- Lakes and Sloughs
- C-139 Basin and C-139 Annex
- Stormwater Treatment Areas (STAs)
- Legal Boundaries defined by the Everglades Forever Act
- Lower East Coast Water Supply Plan Service Areas
- Indian Reservation Boundary
- Approximate western basins boundary

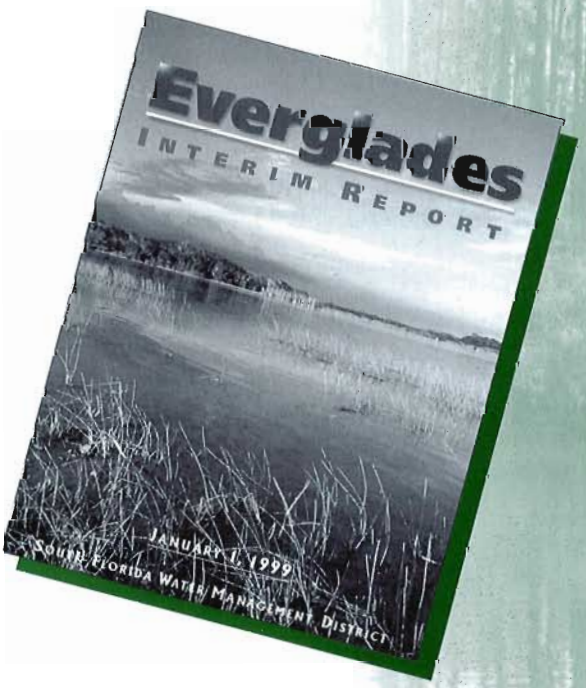
Everglades Interim Report

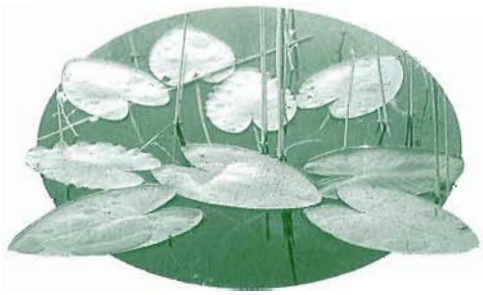
The District compiled a major report – the *Everglades Interim Report* – in December 1998 summarizing the available data and findings as of July 1, 1998 relating to requirements of the Everglades Forever Act. The District and DEP will use the report to make decisions affecting implementation of the Everglades Construction Project, including STA-3/4, and other related restoration projects. In addition, the information will support multiple permits including the Corps of Engineers Section 404 permit, DEP permits for the Everglades Construction Project, and the permit for structures not included in the Everglades Construction Project.

The report was developed through a four-step review and revision process. Drafts were distributed to the public, the District's Governing Board, and a scientific peer-review panel in September 1998. This intensive peer-review guided authors as they revised chapters into the final draft, which was then submitted to the District's Governing Board for acceptance in mid-November. In this interim report, authors were required to analyze information that was available as of July 1, 1998, and interpretable by standard scientific norms. It must be recognized that the vast majority of information-generating projects are still in progress. Thus, all chapters are truly *interim* in nature.

The extensive report includes major findings for the Everglades Protection Area regarding 1) water quality, 2) ecological needs, 3) hydrological needs, 4) effectiveness of best management practices in the EAA, 5) performance of STAs, 6) the mercury problem, 7) supplemental technology research, 8) the Lower East Coast Water Supply Plan, 9) the C&SF Project Restudy, 10) the Everglades Stormwater Program, and 11) the integrated plan to achieve water quality goals by December 2006.

The report's major findings and preliminary implications are included as the appendix to this report. Full copies are available by contacting the District or accessing our web site: www.sfwmd.gov.





Restoration Program Components

Everglades Construction Project

The Everglades Construction Project contains 18 elements. The primary components are six Stormwater Treatment Areas, referred to as STAs. These STAs are large constructed wetlands that will receive nearly 1.4 million acre-feet per year of stormwater runoff from the EAA, adjacent watersheds, and regulatory releases from Lake Okeechobee. (One acre-foot is 325,828 gallons.) These STAs will treat incoming water through naturally-occurring biological and physical processes to remove phosphorus down to an interim long-term average annual level of 50 ppb. The STAs will comprise a total area of approximately 47,655 acres, with a total effective treatment area of approximately 42,000 acres. Treated water discharged from the STAs will be directed to the Everglades Protection Area to improve water flow, timing, quantity and quality. Additional treatment may be required in the future, before discharge to the Everglades.

Much Progress Made in 1998.

Whether measured in tons of phosphorus removed, tons of construction material excavated, or millions of dollars expended for restoration, the Everglades Construction Project made significant progress this past year. Operation of a treatment area began in December 1997, construction commenced on three others, the ENR Project completed its fourth year of operation, and all construction progress now can be followed on-line.

Prototype Wetland Completes Fourth Year.

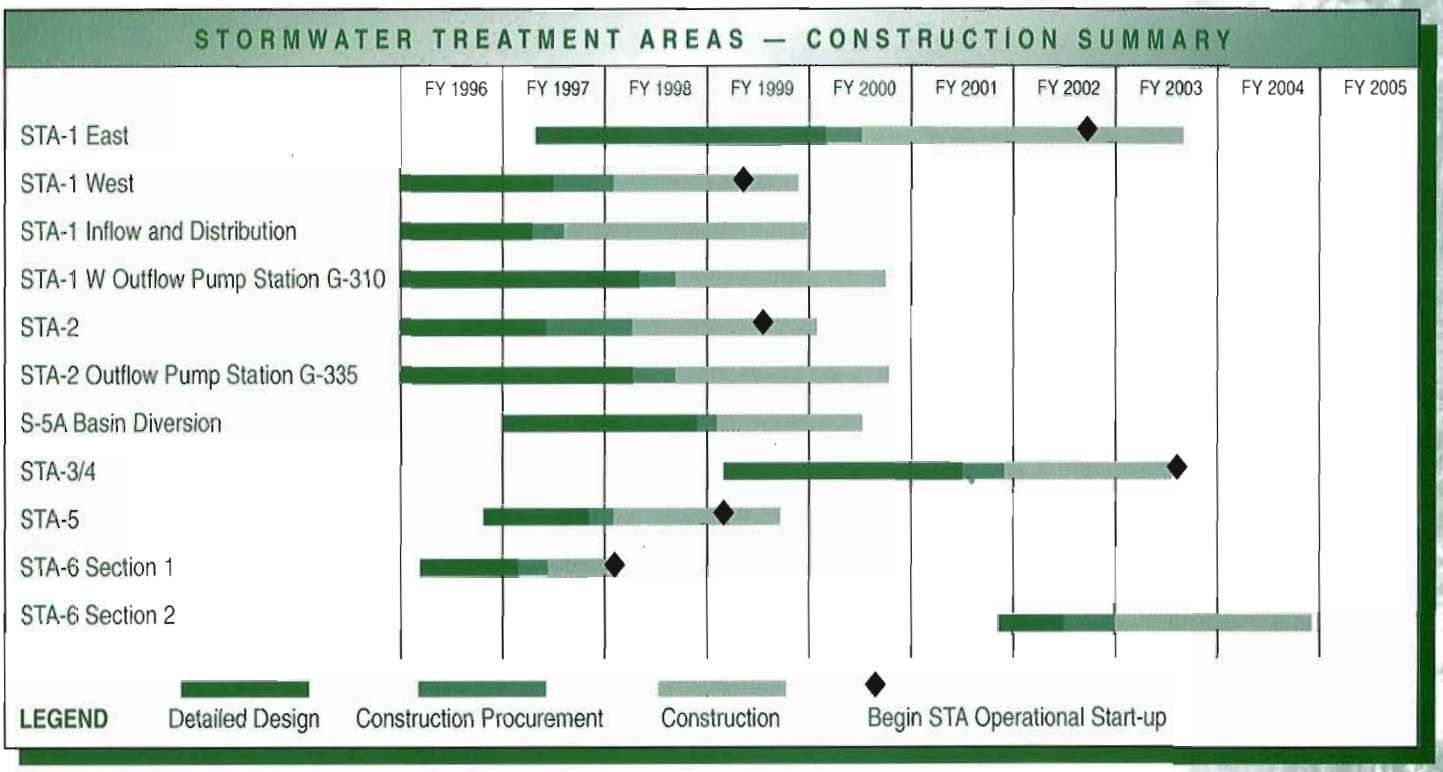
Since 1994, the District has been operating a prototype STA known as the ENR Project. Encompassing nearly 4,000 acres of former agricultural fields, the ENR Project is the nation's largest constructed wetland designed to treat agricultural runoff. The project's purposes are to 1) reduce phosphorus in stormwater entering the Refuge, 2) provide design, operation and management experience necessary for larger-scale application of this wetland treatment science, and 3) investigate enhanced nutrient-removal technology.

Phosphorus loads have been reduced by a long-term average of 82%. The long-term flow-weighted outflow concentration was 22 ppb of phosphorus as of October 1998 – well below the 50 ppb average the project was designed to achieve. ("Load" refers to the amount of a substance which flows to an area over a specified period of time. "Concentration" refers to the amount of a substance dissolved in a volume of water.) Reductions in mercury load were also documented. In the summer of 1998, the District completed modifications to 30 large test cells within the project to be used to conduct experiments to better understand the role of water depth, flow rate, and other factors affecting the wetland's performance. The ENR eventually will be incorporated into STA-1 West.

Progress Made on STAs.

A brief description of the progress of each STA follows:

- **STA-1 East.** The Act directs the District to participate with the federal government, specifically the Corps of Engineers, to design and construct STA-1 East. The Corps was authorized to begin this work through the 1996 federal Water Resources Development Act. Additional federal legislation in 1997 allowed the District to be reimbursed approximately $21 million for land acquisition on behalf of the federal government for STA-1 East. It is anticipated that the U.S. Department of Interior will fund the remaining land acquisition for the project. The District and Corps are negotiating a project cooperation agreement defining the responsibilities of each agency during the projects' remaining design, construction and operational phases. The Corps is actively completing detailed design for STA-1 East. The initial construction contract for the pump stations' machinery was advertised in the fall of 1998. Contract award is scheduled for early 1999, subject to approval of the project cooperation agreement and project design memorandum. It also should be noted that cost estimates rose from $146 million to a preliminary estimate of $211 million. The reasons include 1) more refined cost estimates for the pump stations, 2) the addition of a 725-acre flow distribution cell, 3) additional levee construction to accommodate existing power line tower foundations, and 4) additional construction supervision and administration costs.



NOTE: Dates are estimates based on the best available information as of December 1998. The STA operational start-up begins the initial flooding of soil to encourage plant growth and soil phosphorus stabilization.

- **STA-1 West.** Construction of STA-1 West began in May 1997, and progressed well throughout 1998. Cost estimates developed in November 1998 for construction of the inflow, distribution and interior works totaled approximately $85.5 million. Draft operating permits pursuant to the Everglades Forever Act and federal Clean Water Act were issued July 17, and a public workshop was held August 24. Substantial input from the public and other agencies triggered further permit discussions, and a revised permit is expected to be issued in early 1999. Start-up operations are scheduled to begin in 1999. When complete, STA-1 West will have a treatment area of 6,670 acres and treat more than 140,000 acre-feet of phosphorus-enriched water per year.
- **STA-2.** Construction of this wetland began in January 1998. Cost estimates for construction of the interior works and seepage stations totaled $100.6 million. Design of the final project component – the S-6 diversion works – was completed in late 1998, and the construction contract is scheduled to begin in early 1999. When complete, STA-2 will have a treatment area of 6,430 acres and treat about 175,000 acre-feet per year.
- **STA-3/4.** Award of the detailed design contract for STA-3/4 occurred in December 1998. Detailed design is scheduled to be completed in early 2001. The estimated cost of this project is $177.1 million. When complete, STA-3/4 will have a treatment area of 16,480 acres and treat about 600,000 acre-feet per year.
- **STA-5.** Construction of the interior works was completed in December 1998. Completion of the project's discharge canal is scheduled for June 1999, coinciding with the anticipated receipt of the regulatory authority to begin flow-through discharges. The November 1998 construction estimate was $37.8 million. Construction on pump stations and facilities designed to move cleaner water to northwest Water Conservation Area 3A and to the Seminole Indian reservation began in September 1998, and is scheduled to be complete a year later. Start-up operations are scheduled to begin in January 1999. When complete, STA-5 will have a treatment area of 4,118 acres and treat 80,000 to 100,000 acre-feet per year.
- **STA-6.** Treated discharges from the 870-acre Section 1 of STA-6 began on December 9, 1997 after a five-week start-up period. The cost to construct Section 1 was $3.3 million. The project is operating better than expected, with phosphorus concentrations in the outflow averaged below 30 ppb through September 1998 – below the outflow target of 50 ppb.

Contracts Awarded for Pump Stations.

Contracts have been awarded for the engines, equipment and facilities construction for the STA-1 West

Status of Everglades Permits

Project	Permit	Status	Comments
STA-1W	Corps of Engineers construction permit	Active	Seeking modifications
	Everglades Forever Act construction, operation and maintenance permit	DEP issued draft permit July 17, 1998	Final permit issuance pending resolution of third party concerns
	NPDES operating permit	DEP issued draft permit July 17, 1998	Final permit issuance pending resolution of third party concerns
	DEP dewatering permit	Active	Construction under way
STA-2	Corps of Engineers construction permit	Active	Seeking modifications per August 6, 1997 letter
	Everglades Forever Act construction, operation and maintenance permit	Pending	DEP resolving STA-1W permit third party concerns prior to issuance of draft STA-2 permit
	NPDES operating permit	Pending	DEP resolving STA-1W permit third party concerns prior to issuance of draft STA-2 permit
	DEP dewatering	Active	Construction under way
STA-5	Corps of Engineers construction permit	Active	Seeking modifications per August 6, 1997 letter
	Everglades Forever Act construction, operation and maintenance permit	Pending	DEP resolving STA-1W permit third party concerns prior to issuance of draft STA-5 permit
	NPDES operating permit	Pending	DEP resolving STA-1W permit third party concerns prior to issuance of draft STA-5 permit
	DEP dewatering	Active	Construction under way
STA-6 Section 1	Corps of Engineers construction permit	Construction complete on STA 6 Section 1	
	Everglades Forever Act construction, operation and maintenance permit	Active	Annual report due in March 1999
STA-3/4	Corps of Engineers construction permit	None yet	Will obtain concurrent with design
	DEP dewatering	None yet	Will obtain concurrent with design
	Everglades Forever Act construction, operation and maintenance permit	None yet	Will obtain concurrent with construction
	NPDES operating permit	None yet	Will obtain concurrent with construction
Non-ECP structures	DEP non-ECP permit	Issued in April 1998	Third-party appeal in progress; implementation of permit conditions being managed by the District's Everglades Stormwater Program.

and STA-2 outflow pump stations. The two-year construction and installation period began in July 1998. Should the permits authorize the STAs to discharge prior to completion of these pump stations, a combination of existing pumps (e.g. the ENR outflow pump at STA-1 West) and temporary pumps will be utilized to begin flow-through discharges.

STAs Schedules and Cashflow Refined.

A key financial principal for the Everglades Construction Project has been to maintain a "pay-as-you-go" financing. Several schedule refinements were made in June 1998 to eliminate the need for short-term borrowing. In addition, a comprehensive review of revenue and expense estimates resulted in modifications to the Everglades Construction Project cashflow.

The revised schedules add fiscal year 2006 to the construction period for some components that do not affect STA start-up dates or statutory completion dates. The current schedules result in a $30.1 million balance

at the end of fiscal year 2014 that could be applied to future years' operation and maintenance. The November 1998 estimate for capital costs through 2006 totaled $681.6 million. The addition of $114.5 million for operation and maintenance costs through 2014 (not including operation and maintenance costs for non-STAs) brings the total cost estimate to $796.1 million. These estimates include project contingencies of $41.6 million.

Potential Delays Due to Permitting.

While substantial progress has been made on engineering and construction of the STAs, permitting of the facilities has proved very difficult. After three years of permit discussions involving the District, DEP and the EPA, the DEP issued a draft operating permit for STA-1 West in July 1998. That document was intended to meet the requirements of the state Everglades Forever Act, and federal Clean Water Act for a National Pollutant Discharge Elimination System permit. However, objections filed by EPA and the Department of Justice in August 1998 delayed the issuance of the proposed permit, and negotiations continue.

Critical issues discussed during the negotiations have included the length of the compliance schedule to be included in the permit; the long-term water quality standards and effluent limits for the Everglades and the STA discharges; and the Clean Water Act's anti-backsliding prohibitions. Once the federal objections are resolved and the proposed permit is issued, administrative challenges of the permits could last more than a year. Unfortunately, since the STAs cannot operate prior to obtaining all necessary permits, STA operation may be delayed due to factors outside the control of the District.

Improving Overland Flow.

In addition to cleaner water, Everglades restoration also requires improved overland flow. The term for the timing, flow, amount and distribution of water within the ecosystem is "hydropattern." The Everglades Construction Project contains a number of structural elements to improve hydropattern which are described below:

- A more natural hydropattern in Water Conservation Areas 2A and 3A will be achieved through structural and operational modifications. Water from STA-2 will be used to restore the sheetflow across 7.5 miles of northwest Water Conservation Area 2A. Water from STA-3/4 will be used to improve overland flow across 8 miles of northern Water Conservation Area 3A.
- Water supply and hydropattern restoration benefits will be provided to the Big Cypress Seminole Indian Reservation, Water Conservation Area 3A and local landowners through distribution of treated water from STAs 5 and 6. STA-5 will receive stormwater runoff from the northern C-139 basin in Hendry County. STA-6 will receive water from an 11,200-acre basin in southwest Palm Beach County and the balance of the C-139 basin.
- Water control facilities will be constructed and modified to restore hydropattern of the 29,000-acre Rotenberger Wildlife Management Area. The Division of State Lands within the DEP is acquiring the approximately 3,000 remaining acres of inholdings in Rotenberger, land that is now in private ownership, as partial mitigation for the use of the 4,676-acre Brown's Farm. The District will purchase the remaining mitigation acres for the use of Brown's Farm and other similar public lands incorporated into the STAs.

Reducing Phosphorus Loads to Lake Okeechobee.

The Act also contains components to improve Lake Okeechobee's water quality. Today, phosphorus-laden stormwater runoff combined with agricultural and urban sources discharges directly to Lake Okeechobee from adjacent water control districts (which are known as the four Ch. 298 water control districts and the state of Florida agricultural lease number 3420, or Closter Farms). These drainage areas will complete conveyance system modifications to redirect up to 80% of their runoff to the District's primary canal system for subsequent treatment by three STAs: 1 West, 2, and 3/4. Additionally, control structures will be built or modified to redirect runoff from the relatively pristine northern L-8 basin watershed into Lake Okeechobee.

Hutcheon Engineers completed design of the Closter Farms diversion project in early 1998. Land acquisition and preliminary construction is under way. The project is scheduled to be completed within 60 days of the completion of STA-2. Progress on the East Beach and East Shore Water Control diversion projects by Hutcheon's consulting firm has been slowed due to projected cost overruns. The design is being reviewed and refined to incorporate cost-saving improvements and additional funding sources may be needed.

In addition to the planned structural modifications, these five drainage areas also are required to reduce phosphorus load leaving their property by implementing BMPs (farming techniques to reduce phosphorus), which are in operation and are resulting in a 10-ton annual reduction in phosphorus load. These efforts will both improve the lake's local water quality and send additional treated water south to the Everglades.

District Acquires 79% of Land Needed for Project.

Approximately 47,655 acres are needed to build the STAs and for hydropattern improvements. As of September 30, 1998, the District had acquired 37,700 acres – or 79% of the total acres needed,

Wildlife enjoy the impoundment of water in a cell in the ENR Project in western Palm Beach County.

leaving 9,955 acres remaining to be acquired. The District acquired 3,780 acres for the project in fiscal year 1998. Since the Act's passage in 1994, the District has acquired nearly 34,000 acres of land – with the ENR Project the only parcel required for the project that was under public ownership at that time.

Active negotiations continue with landowners in STA-1 East. A 900-acre parcel within STA-1 East was acquired from the Federal Deposit Insurance Corporation in 1998 and eminent domain proceedings have been instituted for 870 acres where voluntary land acquisition could not be negotiated.

Including Women and Minority Businesses.

In keeping with District policy to enhance diversity within its procurement practices, the District has actively sought Minority/Women Owned Business Enterprises (M/WBE) to participate in the Everglades Construction Project. An M/WBE Contracting Rule has been in effect since October 1, 1996 to strengthen participation efforts. Special outreach efforts include hosting forums for contractors; participating in workshops, symposiums, trade and exhibit shows; and development of a web site and related software.

Participation goals vary based on project opportunities and M/WBE availability. Of the Everglades construction contracts awarded with subcontractor goals, M/WBE participation was 22% in 1998. This represents a 6% increase from the previous fiscal year. Everglades Construction Project awards to M/WBE firms increased from $6.8 million in fiscal year 1997 or $16.3% of the total awards, to $23.8 million in fiscal year 1998 or 18% of the total awards.

Displaced Workers to be Hired.

The Act requires that the District give preferential consideration to hire agricultural workers displaced due to the Everglades Construction Project. The Governing Board adopted a policy for this program, and Job Service of Florida offices in Belle Glade and West Palm Beach have agreed to screen applicants. Few workers, however, had been displaced through 1998 due to the Everglades Project.

Web Page Launched.

In March 1998, the District introduced a web page for the Everglades Construction Project that contains construction updates, photographs, cost estimates, revenue projections, current schedules and other useful project information. The web site address is http://www.sfwmd.gov/org/erd/ecp/3_ecp.html.

STATUS OF LAND ACQUISITION*

STA	Acres		
	Required	Acquired	Remaining
STA-1 East	6,566	4,638	1,928
STA-1 West	7,379	7,379	0
STA-2	7,796	7,796	0
STA-3/4	17,944	11,403	6,541
STA-5	5,462	5,462	0
STA-6	2,508	1,022	1,486
TOTAL	47,655	37,700	9,955

* through September 30, 1998

Regulatory and Stormwater Programs

An effective regulatory program is essential to protect the Everglades. The Act outlines a comprehensive program to assure that by December 31, 2006, all state water quality standards are met in all parts of the Everglades Protection Area. For areas that are already impacted, the Act requires a net improvement to be provided. To meet this ambitious goal, the District has started a number of regulatory efforts.

Best Management Practices in EAA.

The EAA is a fertile region south of Lake Okeechobee which was historically part of the Everglades. Many years ago, local, state and federal governmental agencies drained this land to encourage agricultural development in its rich muck soils. After a series of hurricanes flooded the region in the 1940s, the C&SF Project was designed to provide water supply and flood control for this area. Agricultural development ensued, and today the EAA is one of the most productive agricultural regions of the state with 505,000 acres in use. Of this, 82% is sugar cane, 9% vegetables, 6% sod, 2% livestock, and 1% rice and other crops.

While the EAA is an important economic resource to south Florida, it is also the largest single source of phosphorus to the Everglades, providing 44% of the historic load during the 1979-88 baseline period. Farming practices, water management, fertilizer application and existing conditions contribute to this nutrient movement, which ultimately leaves the basin in stormwater runoff.

The 1991 Settlement Agreement and 1991 Everglades Protection Act require the District develop a regulatory program to reduce phosphorus loads leaving the basin by 25% compared with the 10-year baseline period. This program relies on the implementation of BMPs, and has been under way for three years. BMPs are farming practices designed to reduce nutrients leaving the basin as a whole. The three basic BMP techniques involve water detention, fertilizer application and sediment control. Growers are using other effective ways to reduce phosphorus as well. All EAA entities – including non-agricultural users such as cities and businesses – must receive a District permit showing that they have a BMP plan.

The BMP program for the EAA was developed over a number of years, with input from growers and other local residents taken at public workshops and meetings. The District completed rulemaking in 1992, and today all EAA landowners have a District permit. The goal is to achieve a collective 25% phosphorus reduction for the entire basin – not for each individual farm. The District determines if this reduction has occurred by comparing phosphorus discharges from 12-month periods with the base 10-year period of record. Phosphorus amounts are measured at 15 District structures surrounding the EAA. Financial incentives are provided to growers who exceed the 25% minimum. District staff routinely visit EAA growers to verify implementation of these farming practices, with site visits conducted covering 427,542 acres.

The Act provides farmers several methods to determine whether they have met phosphorus reduction goals. Approximately 45% of the growers have chosen an option called "early baseline." They must demonstrate a phosphorus reduction rate of 25% at the farm level if the overall basin average does not meet the required minimum. These growers need not make additional BMP changes if they can show 25% reductions have been met at their individual farms. Early baseline permittees began providing water quality monitoring data to the District in 1993. However, since the EAA basin has already achieved the 25% reduction criteria, the early baseline option has not been exercised.

In 1998, the District released its third annual report on this BMP program. The report covers the water year from May 1, 1997 to April 30, 1998, and includes information about permitting and post permit compliance. Phosphorus load in runoff from the EAA declined by 55% in the first three years of monitoring from 1996 to 1998 relative to the 1979-88 baseline period and adjusted for hydrologic variability. Although it is too early to predict long-term reductions in phosphorus to the Everglades which may result from BMPs, initial results are very encouraging. Experience and information gained on performance of existing BMPs, and additional research and implementation efforts, could facilitate further load reductions.

Regulating the C-139 Basin.

The District is developing a monitoring program for the C-139 basin, however the goal is for phosphorus load leaving the basin not to exceed the historic average. This 163,000-acre basin contributed 5% of the phosphorus load to the Everglades during the 10-year baseline period of record. Today it is a rural area primarily used as pasture for cattle grazing, with increasing amounts being converted for citrus and sugar cane production. Landowners collectively cannot exceed the annual average phosphorus loading observed from the period of record when the basin rule is completed. The basin average will be adjusted yearly based upon rainfall, so a direct comparison with the historic period can be made. Final program development is expected in 1999.

Addressing All Water Quality Issues.

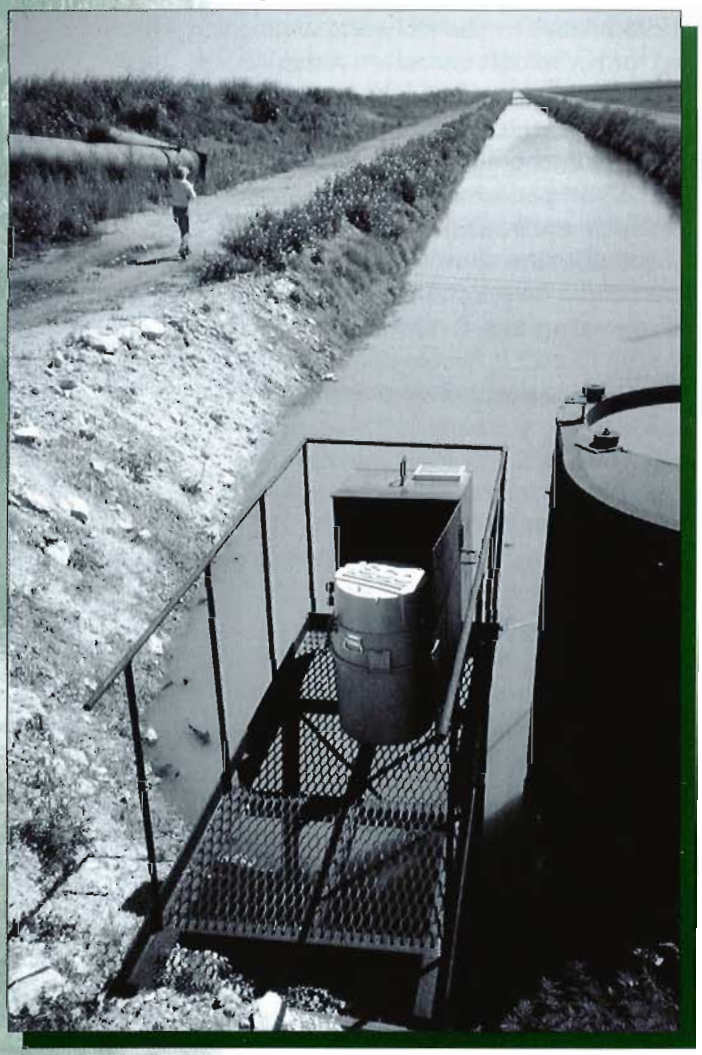
The Act requires that all applicable water quality parameters be addressed through the combination of STAs and BMPs. In September 1996, the District amended rules 40E-61 and 40E-63 (Florida Administrative

Code) to require the Environmental Protection District – a special taxing district in the EAA – to sponsor a BMP research program for other water quality parameters including phosphorus (dissolved and particulate), specific conductance (chlorides), and the herbicides atrazine and ametryn. The amended rules were the result of several well attended public meetings held in 1996. The BMP research program, defined by a scope-of-work approved by the District, was initiated in August 1997. The research program is designed to field-test BMPs in a sufficient number of representative sites in the EAA to reflect soil and crop types and other factors that influence BMP design and effectiveness. If additional water quality parameters are identified as needing improvement, appropriate regulatory programs can be considered.

Obtaining Other Permits.

Not only will the District develop and oversee regulatory programs for Everglades restoration, but it also must obtain state and federal permits for its own cleanup efforts. Some are required by the Act, and others by federal law. In 1998, the District obtained a permit to operate and maintain discharge structures within the control of the District which discharge into, within, and from the Everglades Protection Area and were not included in the Act permit application for the Everglades Construction Project. The permit included schedules and strategies for restoring the Everglades, and a comprehensive monitoring program for structures located throughout the Everglades. Although the Miccosukee Indians and Friends of the Everglades challenged the issuance of the permit, an administrative law judge ruled that the permit complied with Florida law. The Tribe and Friends then appealed the decision, but the permit was upheld by Florida's 3rd District Court of Appeal as meeting the requirements of the Act.

Landowners implement their own water quality monitoring as part of the Everglades BMP Regulatory Program.



Everglades Stormwater Program Launched in 1998.

While the Everglades Construction Project, including the STAs and BMPs, receive most of the attention, the "Non-ECP" permit and Everglades Stormwater Program are emerging as equally important components of the long-term efforts to restore the Everglades.

The Non-ECP Permit. In April 1998, after a lengthy period of complex litigation with the Miccosukee Tribe and Friends of the Everglades, the District received its permit for structures discharging into, within, or from the Everglades Protection Area that are operated, maintained and within the control of the District, but not included in the Everglades Construction Project. This permit, known as the Non-Everglades Construction Project or "Non-ECP" permit, authorized numerous schedules and strategies to meet water quality standards in the Everglades to the maximum extent practicable, pursuant to the Act Section 373.4592(9)(k) and (1), F.S. The District has begun implementing activities through the Everglades Stormwater Program.

Comprehensive Water Quality Monitoring. Since the Stormwater Program is responsible for administration of the Non-ECP permit, Everglades Stormwater Program staff will work cooperatively with many people and departments within the District to ensure that the District uses its best efforts to implement all the programs the Non-ECP permit identifies and authorizes. For example, with the District's Water Resources Department will help to ensure that the comprehensive water quality monitoring program created by the Non-ECP permit is completed. Annual reports will synthesize that data, measuring the progress the District makes each year towards achieving compliance with all water quality standards.

Focusing on Discharges Into the Everglades. The primary focus of Everglades Stormwater Program staff will be on the structures which send waters into the Everglades Protection Area. Logically, by improving

Sediment coring in the Everglades reveals the nutrient amount in the sample. This analysis is part of the overall research in support of the threshold determination.

waters being directed into the Everglades, the waters at the interior "within" structures and waters flowing out of the Everglades through the "from" structures will be improved. Four major initiatives are already under way to improve water quality at some of the "into" structures.

- ***The Regulation Action Strategy.*** First, the District has begun implementing a Regulatory Action Strategy. This strategy evaluates water quality at all discharge points in basins discharging into the Everglades. Where water quality concerns are identified, the District will conduct additional monitoring at upstream locations, until sources of the water quality problems are found. At that point, the District may exercise its existing regulatory authority through its permitting program. New permits may be required, or existing permits may be modified, to ensure that water quality standards are met.
- ***The ACME Basin Pilot Program.*** Second, the Everglades Stormwater Program has begun a pilot project in western Palm Beach County to address water quality concerns at structures discharging into the Refuge. District staff have been working with officials and citizens from the ACME basin, which includes the City of Wellington, to develop additional methods to meet water quality standards. Eventually, additional water quality treatment facilities may be constructed in these areas adjacent to the Everglades. Funding sources for this program will, of course, need to be identified. The stormwater assessment program created by the Act would allow a special assessment on property based upon the stormwater treatment benefits received, and is an available funding mechanism requiring further consideration. However, success with the Regulatory Action Strategy through individual permit enforcement could reduce the need for such large-scale solutions and expenses.
- ***Water Quality Improvement Measures in the C-11 Basin.*** Third, Everglades Stormwater Program and other District staff, in conjunction with the Corps of Engineers, are working on improving water quality in the C-11 west basin, located in western Broward County near the S-9 structure. Through the construction of an additional control structure, and the implementation of BMPs in the region, the District intends to ensure that water quality standards are met before waters are discharged into the Everglades. As with the ACME basin, this region may be substantially affected by the Regulatory Action Strategy and the stormwater assessment program.
- ***The South Dade Region and the S-332D Structure.*** Finally, the District is working with the Corps of Engineers on the completion of the S-332D structure in south Miami-Dade County. That structure will discharge waters into the Park, potentially providing flood control benefits to regional landowners while also providing water supply benefits to the Park. Based upon existing scientific data, District staff have concluded that the new structure will have no adverse impacts upon water quality of the region. Phosphorus levels in the region are quite low, averaging approximately 10 ppb, and past concerns related to pesticides have dissipated as a result of aggressive educational efforts. Nevertheless, the structure will need to be added to the Non-ECP permit as a structure discharging into the Everglades, and the Everglades Stormwater Program will continue to evaluate water quality conditions near the structure to ensure that operation of the facility does not adversely impact the Everglades.

Research and Monitoring

Research and monitoring are essential activities to ensure that relevant and current information is available to decision-makers to protect and restore the Everglades ecosystem. The Act requires research and monitoring to evaluate the effectiveness of restoration efforts in improving water quality, hydropattern, and other key aspects of ecosystem health. Seven focal areas are integrated within the research and monitoring projects:

1. Describing Existing Water Quality. Water quality data in the Everglades and tributaries have been synthesized, checked to assure quality, and compared against the existing state water quality standards. A report describing the results of these analyses issued in 1995 revealed several areas of concern where state criteria were exceeded. In the Everglades, values exceeding the state criteria were found for dissolved oxygen levels and specific conductance. In EAA canals, dissolved oxygen was frequently lower than state criteria, and specific conductance was less often a concern. Ammonia was problematic in some EAA basins and the herbicide atrazine was a concern for all of the basins for which data were available. Continuing cooperative data analysis between the DEP and District will determine causes of these problems, whether they are naturally occurring, and whether additional research and monitoring is necessary.

2. Understanding Ecological and Hydrological Needs. The Act requires the District and DEP to implement a research and monitoring program to evaluate the ecological and hydrological needs of the Everglades Protection Area. The DEP and District will complete this research by December 31, 2001. This requirement is being met, in part, through coordination with the Lower East Coast (LEC) Regional Water Supply Plan and Restudy efforts.

Water quality sample collection includes the use of electronic multiparameter instruments for recording physical measurements. such as temperature, pH, specific conductance and dissolved oxygen.

Modeling and experimental research also play a large role in evaluating the ecological and hydrological needs of the Everglades. In the area of computer modeling, the District is developing and utilizing six models that simulate the response of the natural system to water and nutrient management decisions. In the area of field research, the District is conducting wading bird, vegetation, tree island and other research projects to better define ideal conditions in the Everglades and evaluate how well management actions are achieving them. In 1997, the District began a cooperative botanical research program with Florida Atlantic University (FAU) in Boca Raton. Greenhouse studies at FAU have shown that cattail out-competes sawgrass under conditions of elevated nutrients and altered hydropattern.

3. Conducting Nutrient-Threshold Research and Establishing a Phosphorus Criterion. The Act requires the District and DEP conduct research to provide a numeric interpretation for phosphorus of the narrative standard of "no imbalance" nutrient levels for flora and fauna of the Everglades. By no later than December 31, 2001, the DEP is required to file a notice of rulemaking to establish a numeric phosphorus criterion in the Everglades Protection Area. If the DEP has not adopted a criterion within two years from after that date, by law the criterion will be set at 10 ppb total phosphorus.

An extensive peer-reviewed monitoring and research program has been under way in Water Conservation Area 2A for more than three years, and in the Refuge for more than two years. Research in 2A has produced information for use in development of a numeric phosphorus standard. Similar research will be completed for the Refuge in 1999 and additional studies are being conducted at the FAU botanical research complex.

4. Optimizing STA Performance and Developing Supplemental Technologies. The Act requires the District to determine ways to optimize phosphorus removal in the STAs, and to investigate new technologies to remove phosphorus. The District's STA Optimization Research and Monitoring Program is an important part of the overall research effort. During the past year, the District's research program in the ENR Project continued to provide information that will be used to refine the design and operation of the STAs. Frequent monitoring of water quality at numerous stations throughout the project has enabled the District to track its performance in improving water quality as plant and algal communities mature and water levels fluctuate within the project.

Supplemental Technology Research. The Act establishes both interim and long-term water quality goals to ultimately achieve restoration and protection of the Everglades Protection Area. While the Act does not specifically designate two distinct implementation phases, it recognizes that additional measures may or may not be required to achieve compliance with long-term water quality standards. The District has designated the program designed to achieve the interim goal as "Phase 1" and has designated the long-term program as "Phase 2." Phase 1 encompasses those activities now under way to reduce phosphorus concentrations to approximately 50 parts per billion, and includes the Everglades Construction Project and EAA best management practices. The goal of Phase 2 is to combine point-source, basin-level and regional solutions in a system-wide approach to ensure that all waters discharged to the Everglades Protection Area meet water quality goals by December 31, 2006.

With respect to nutrients, the Phase 2 goal is to reduce nutrient discharges to levels that do not cause an imbalance in natural populations of aquatic flora or fauna. Because the phosphorus-removal goals which are ultimately established pursuant to the Act may be lower than the STAs can achieve alone, the District, in conjunction with the DEP and Everglades Protection District, is developing and evaluating alternative treatment strategies for reducing phosphorus levels to meet a planning goal of 10 ppb for total phosphorus. Supplemental technologies, as they were originally described in the Act, are envisioned to work with or in place of the STAs, to meet the final phosphorus target. However, the best combination of treatment technologies to meet the phosphorus concentration goal may also include enhanced BMPs, as well as STAs and supplemental technologies.

All candidate treatment technologies are being evaluated against the same criteria, which include the following: load reductions; discharge concentration reductions; water quantity, distribution, and timing; compliance with water quality standards; compatibility of treated water with the balance of natural populations of aquatic flora or fauna in the Everglades; cost-effectiveness; and schedules for implementation. Other evaluation criteria may include, but are not limited to technical feasibility, possible adverse environmental impacts, local acceptability, and marsh readiness of the effluent. All supplemental technologies must be applicable at the basin scale; i.e. they must be able to treat the runoff generated within an EAA watershed basin during storm events. Work that is currently under way will provide information on phosphorus removal performance, estimated costs, and compatibility with Everglades flora and fauna for all of the candidate supplemental technologies.

Nine Technologies Being Investigated. More than 24 water quality treatment technologies were screened in a desktop evaluation in 1996. The District originally proposed to investigate five of the most promising. These original five are wetlands, managed wetlands, chemical addition/direct filtration, low intensity chemical dosing, and submerged aquatic vegetation/limerock. However, special condition 7 of the Corps of Engineers Section 404 permit for construction of the STAs in Phase 1 lists nine technologies to be investigated. In addition to the five listed above, the Section 404 permit requires the District to conduct research on chemical addition/dissolved air-flotation, chemical addition/high-rate settling, microfiltration, and periphyton-based STAs. Research on these technologies began in 1997 with the microfiltration conducted by DEP, low intensity chemical dosing conducted by the Everglades Protection District and combined chemical treatment/solids separation studies conducted by the District. In 1998, the District, through its contractors, began work on the submerged aquatic vegetation/limerock and periphyton-based STA research programs, with work scheduled to begin on managed wetlands by the end of 1998. It is clear from this schedule that information on the most promising supplemental technologies will not be available in time to be incorporated into the design of STA-3/4. It is also clear that the deadline for the water quality strategy required by the Corps' Section 404 permit (January 1, 2001) may be difficult to meet.

Information on the potential implementation costs for Phase 2 was not available as of late 1998. Preliminary cost estimates and benefits for some of these technologies were developed in the desktop evaluation. However, the assumptions used to develop

Juvenile alligator in Everglades National Park.

District staff check an auto sampler, which measures nutrient loading in Florida Bay.

these cost estimates have, in many cases, proved incorrect. Based on the results of the microfiltration project and early results from the chemical treatment project, the cost to implement these particular alternative treatment technologies are much higher than originally projected in 1996.

Combination of Approaches. District staff will evaluate the performance results from BMPs and STAs, as well as the results of the research and demonstration projects for supplemental technologies and STA optimization, as the information becomes available. This information will be used to begin the selection of the most promising combination of technologies to meet the final phosphorus standard, and will be included in a water quality plan required by the Act by December 31, 2003. The ultimate combination of approaches will also need to consider the site-specific conditions that will potentially affect the successful implementation and performance of the combined treatment technologies.

5. Documenting Ecological Changes from Restoration Activities. Three programs are documenting ecological changes taking place as a result of restoration activities. First, a mapping program to detect changes in vegetation is under way. Several comparison maps using color infrared aerial photography for Water Conservation Area 2A have been completed, and show significant expansion of cattail acreage. A set of maps is also under way for Water Conservation Area 3A.Second, field monitoring will show trends in water quality, biota and sediment erosion resulting from restoration activities. Third, ongoing surveys of wading birds and their food web also will aid in evaluating effects of restoration efforts.

6. Understanding Mercury. Everglades sport fish have the highest average concentration of mercury in Florida. Human health advisories remain in effect for a number of sport fish species throughout the Everglades, Big Cypress, and eastern Florida Bay. Anglers must release, rather than eat, their catch. Federal and Florida water law protects the designated uses of a waterbody, including sport fishing and wildlife. Because of these elevated mercury levels, other Everglades animals are also exposed to potential harm.

Standards May Not be Adequate. Despite these mercury problems, data collected by the EPA from 1993 to 1997 indicate that the Florida Class III water quality standard for total mercury is not being exceeded in the Everglades canals and marshes. District canal monitoring from 1997 to 1998 reaffirms concentrations below the Class III standard. When viewed in the context of the high levels accumulating in Everglades wildlife, this suggests that the Class III mercury standard may not be adequate to protect human health. The Act calls for the DEP to re-evaluate the water quality standards for mercury. The DEP has the state lead on mercury issues, and has concluded that the existing Class III water quality standard is not fully protective of the use of the Everglades as a sport fishery. DEP is now supporting studies to fill the data gaps that preclude the development of a more protective mercury standard at this time.

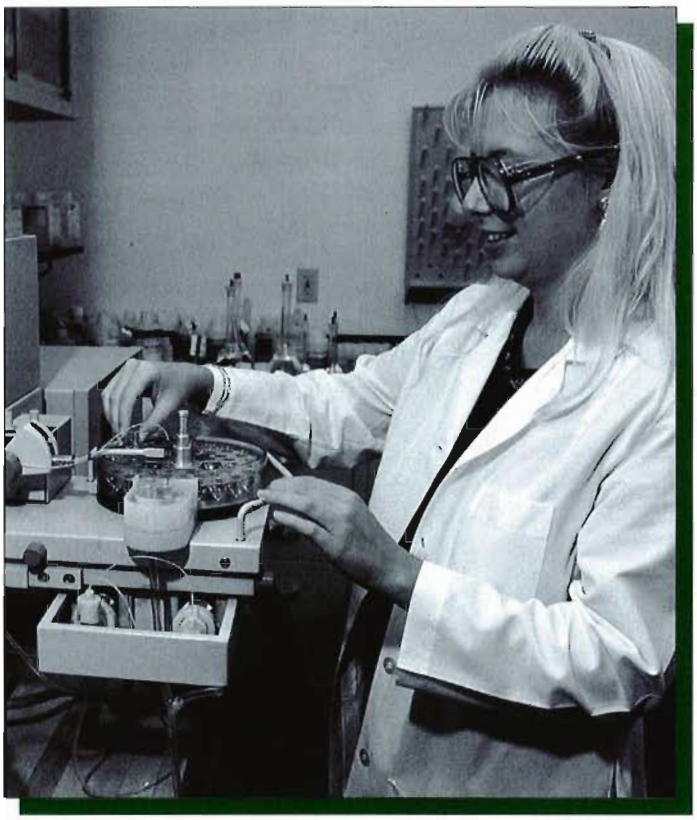
Mercury Inputs Have Increased Five-Fold Since late 1800s. Results of a University of Florida study co-funded by the District, DEP, and U.S. Geological Survey indicate that the mercury deposition rate to the Everglades has increased about five-fold since the late 1800s. The study concluded that the Everglades is an unnaturally contaminated system. Some old mercury buried in soils can be recycled back into the ecosystem by natural processes, while new mercury is being supplied to the Everglades in stormwater runoff; groundwater discharge; and atmospheric deposition from rain, dust, or reactive gas. The relative contributions of old and new mercury to the Everglades mercury problem are under investigation.

Atmospheric Deposition Likely Source of Most Mercury. Florida State University and Texas A&M studies co-funded by the District, DEP, EPA and the

electric power industry from 1993 to 1996 demonstrated that atmospheric deposition to the Everglades is roughly double the rate to that of rural Wisconsin and accounted for more than 95% of the new mercury supplied each year. This project was known as the Florida Atmospheric Mercury Study. The District and DEP have concluded that atmospheric deposition is the predominant input of new mercury to the Everglades. Samples collected at eight EAA canal sites from 1994 to 1997 by the District for EPA Region 4 demonstrated that EAA runoff is not a significant source of new mercury to the Everglades.

Construction Project Not Considered Large Source of Mercury to the Everglades. Based on four years of ENR Project studies, the STAs are likely to remove between 50% and 75% of the mercury load in EAA runoff, which should provide an ample margin of safety in the risk estimates. The District and DEP believe that the weight of evidence continues to support the overall conclusion that the benefits of phosphorus reduction will outweigh any mercury detriments, in the unlikely event that any detriments occur at all. However, the influence of excess phosphate and sulfate in EAA runoff in the Everglades and on the mercury cycle remains under active investigation. Continued mercury monitoring of the STAs, the District structures, and the interior marshes under federal and state permits will provide on-going corroboration that this overall conclusion remains valid.

Analysis of water quality samples for metals using an Atomic Absorption Spectrometer.



The Everglades Restoration Strategy. For the short-term, DEP has issued permits to Everglades Construction Project and other structures discharging into, within, or from the Everglades Protection Area to ensure the protection of downstream water quality relative to the existing mercury standard. However, the adequacy of the standard is undergoing review by the EPA and DEP. For the long-term, the District recommends that local and global reductions in mercury air emissions be considered an essential component of any strategy for fostering the recovery of the Everglades from its mercury problem and for protecting it from future mercury problems. However, additional understanding of mercury in the Everglades may provide a means to mitigate local mercury problems, through the manipulation of water quantity and/or quality.

Multi-Agency Program. Mercury monitoring, research, modeling and assessment studies have been coordinated through the multi-agency South Florida Mercury Science Program. This unique partnership of federal, state, and local agencies; academic and private research institutions; and the electric power industry has allowed researchers to advance their understanding of the Everglades mercury program with greater breadth, depth, and speed than could be accomplished by the DEP and District alone. Annual workshops and peer-reviewed publications have facilitated the transfer of information from scientists to resource managers.

7. Developing an Integrated Plan and Annual Reports. In 1996, the District developed an Integrated Plan outlining the many efforts under way to achieve Everglades water quality goals by December 31, 2006. The plan summarizes collaborative efforts of private landowners, federal and state agencies, the District, and other stakeholders to accomplish Everglades restoration goals. Components of the plan will include the Everglades Construction Project, the Everglades Stormwater Program, the Restudy, the Water Preserve Areas along the southeast coast, BMPs, supplemental technologies, and any additional efforts necessary to achieve water quality standards in the Everglades Protection Area. This process began this year with the *Interim Report* completed in late 1998. Beginning January 1, 2000, peer-reviewed reports will be submitted annually. These reports will include current research and monitoring efforts, and will identify water quality parameters in addition to phosphorus which exceed state standards or are causing or contributing to adverse effects in the Everglades.

Cutting and chipping melaleuca for an alternative fuel source.

Brazilian pepper in bloom.

Control of Exotic Species

Florida is home to hundreds of exotic plant species, with at least 25% of all plant and tree species in the state being non-native introductions. Some new arrivals pose no threat, but others are wreaking havoc on natural areas. Melaleuca, Brazilian pepper, hydrilla, water hyacinth and others have become entrenched and are costing millions to keep in check. Non-native pest plants are one of the largest environmental threats to Florida, and are infesting portions of the greater Everglades ecosystem. Exotic plants degrade the natural environment, interfere with flood control and recreation, and cause other problems.

The Act directs the District to establish a program to control the expansion of and to remove unwanted exotic plants from the Everglades Protection Area, giving highest priority to species affecting the largest area. The Act requires the District to coordinate its efforts with federal, state and governmental entities. The District has considered exotic species control a priority for years, so the Act enhances on-going efforts.

Melaleuca Most Widespread Unwanted Plant.

Melaleuca *(M. quinquenervia)* covers the largest area within the Everglades, infesting thousands of acres. It is very persistent and hard to eradicate. Largest infestations occur in portions of the water conservation areas.

The District launched an aggressive melaleuca control program in 1990. The primary control method is manual herbicide application – a time-consuming and expensive process. However, a number of promising alternative control methods are under development and are being fine-tuned. In 1998, the District completed melaleuca treatment in Water Conservation Area 3A north of Alligator Alley. Ground crews manually treated 50,000 trees with herbicide and removed more than 150,000 seedlings within 200,000 acres – both of which are extremely time-consuming and labor-intensive efforts. The District also supports U.S. Department of Agriculture research for insects for melaleuca control, including the melaleuca weevil and the BP sawfly. The Refuge has an ongoing melaleuca treatment program supported by $100,000 from the U.S. Fish and Wildlife Service and $75,000 of District funds provided annually since 1991. The Park is controlling melaleuca within its borders, with the most serious infestations located near Taylor Slough. The District has been providing $60,000 in cost-sharing funds to the Park annually since 1993.

It appears District efforts, supported by those of other governments and private agencies, have turned the tide on its expansion. Melaleuca has been completely cleared from Water Conservation Area 3B, and the part of Water Conservation Area 3A south of Alligator Alley. Now these areas are under maintenance control to

prevent future infestation. Today, its range is no longer increasing and is even being reduced. With the use of new biological controls, the District expects to further decrease its infestation.

The leaf weevil *Oxyops vitiosa Pascoe*, a natural enemy of melaleuca in Australia, was released during the spring of 1997 to control this tree. By June 1998, more than 1,550 adults and 6,700 larvae were released at 13 sites in six counties in the Everglades. Colonies established at nine sites. Requirements for successful establishment also were determined. District technicians found that cutting melaleuca trees stimulates new growth, which encourages build-up of the weevil populations. Conditioning sites in this manner should facilitate further establishment. Additional biological control agents are being developed and should be available during the next few years.

Brazilian Pepper Poses Great Threat.

Brazilian pepper has infested approximately 100,000 acres of the Park. Like melaleuca, it will form a dense stand – or virtually impenetrable barrier – if allowed to spread. The primary removal methods are herbicide application, burning and flooding. The District and DEP are providing $150,000 to co-sponsor research with the University of Florida for biological control with insects from its native range. Two species have been imported for research and are in quarantine in Gainesville. Research has been completed for the first Brazilian pepper biocontrol, the BP sawfly. Final approvals for general release are expected in 1999.

Vines Threaten.

A multitude of invasive vine species plague south Florida. Particularly alarming is the Old World climbing fern *(Lygodium)*. This species appears to be rapidly expanding its range in south Florida's wetlands. Old World climbing fern threatens Everglades tree islands and the region's cypress forests. Certain portions of the Refuge are heavily infested. The District, in cooperation with the University of Florida Center for Aquatic and Invasive Plants, is continuing the search for current control technologies for this vine. An overseas search for potential insect controls was also initiated this year.

Other Unwanted Species Identified Each Year.

Many other plants pose threats in Florida, although none are as widespread or well-known as hydrilla or melaleuca. In fact, many potential threats are sold commercially. The Australian carrotwood tree for example, has only been in Florida since 1980. It is already invading many coastal natural areas, including mangrove communities. Early detection and treatment before they cover hundreds of thousands of acres is essential in winning the war with exotic species. The District works closely with groups including the Florida Exotic Pest Plant Council to identify potential pest plants throughout the state. The Florida Department of Agriculture and Consumer Services is studying this plant to determine if it should be added to the state's noxious weed list to prohibit further sale and cultivation.

Aquatic Exotics Less Prevalent, but Still a Problem.

Aquatic and submerged exotic weeds present a larger problem in central Florida and Lake Okeechobee, but are being watched carefully in the Everglades. Today hydrilla, water hyacinth and water lettuce are largely confined to canals in the Everglades, and the District keeps their spread in check. Primary control methods are herbicide application and mechanical harvesting. However, floating and submerged waterweeds are a threat, and their spread is being carefully monitored.

Harvesting aquatic plants in St. Lucie County. The low machine is designed to go under bridges.

The correct timing, amount, quantity and quality of fresh water is essential to a healthy Everglades.

Hydropattern Restoration

Historically, the fresh water that nourished the Everglades began its journey hundreds of miles north in the Upper Kissimmee Chain of Lakes and moved slowly south through the winding Kissimmee River to Lake Okeechobee. Water periodically overflowed the swampy banks to nourish the vast Everglades wetlands south of the lake. Florida's summer rains and occasional hurricanes filled the Everglades wetlands from June to October. Water then receded during the drier winter and spring months. This seasonal cycle varied considerably from year to year in its extent, depth and timing.

This natural cycle of water delivery was permanently changed by development in south Florida. The regional system of canals, pump stations and levees was built to regulate the natural cycle by lowering water levels, providing capacity to capture and discharge excess flood water, and creating reservoirs to store water for use during dry periods. Today, with manmade water deliveries, many parts of the Everglades receive too much or too little water in the wrong places and at the wrong times.

Changes in the timing and flow of water has caused problems throughout the ecosystem. Wading bird populations have declined, non-native plants and trees have spread, and other undesirable effects in plant and animal communities have occurred. Coastal groundwater levels and underground storage has declined, and flows out of the Everglades have greatly increased. During very dry years, such as 1989 and 1990, muck soils of the Everglades dry out and burn over large areas. During very wet years, such as 1994 and 1998, extreme high water levels threaten terrestrial animals, nesting birds, and tree islands.

Delivery of natural water flows through the Everglades is critical for its restoration. The term "hydropattern" refers to the depth, duration of flooding, timing and distribution of freshwater flow. The Act identifies the need for programs that will restore Everglades hydropatterns. These programs fall broadly into the categories of structural and operational improvements, planning, and updating the region's water management system.

Structural and Operational Changes Improve Water Flow.

The Everglades Construction Project includes structural and operational improvements to address hydropattern restoration. Water from Lake Okeechobee, some stormwater runoff, and water from special drainage districts will be routed south for treatment in STAs and eventual discharge to the Everglades. These actions will provide more capacity to control extreme rainfall events, allow more fresh water to flow into Everglades

during dry periods, and reduce the harmful effects of excess freshwater discharges to estuaries.

The Act requires that water lost within the EAA, due to implementation of the BMPs, be replaced for flow into the Everglades. These planned deliveries are already occurring.

Lower East Coast Plan Will Guide Decision-Making.

Water supply planning is essential for restoring hydropatterns, as well as other long-term goals such as providing an adequate water supply. As part of the District's requirement to engage in regional water supply planning, the District is preparing plans for the watershed areas within its 16-county region to guide District and local government decisions for the protection and development of freshwater resources through the year 2020. The LEC Regional Water Supply Plan, to be finalized in April 2000, will include recommendations to restore the Everglades' hydropattern for the next 20 years.

In March 1998, the District approved the Interim LEC Plan identifying actions to enhance water supplies for urban, agricultural and natural systems prior to April 1, 2000. The plan also identifies local basin planning and other analytical programs which need to be initiated before the year 2000 to support the LEC 2020 Plan development, the Restudy, and other efforts.

With regard to natural systems, the LEC Interim Plan recognizes that the remaining Everglades should be managed as a whole, not as individual sub-components of the regional system. Attempts to improve hydropatterns and provide rainfall-driven deliveries to one area of the Everglades should not negatively impact another area of the system. Potential impacts on other areas and users must be assessed before implementation of any new rainfall-driven delivery formula. The LEC Interim Plan lays out a schedule to develop minimum flows and levels for the Everglades and two other areas.

Minimum Flows and Levels to be Established.

In July 1998, the District Governing Board was presented with a draft document developed by District staff entitled proposed *Minimum Water Level Criteria for Lake Okeechobee, the Everglades and the Biscayne Aquifer within the SFWMD.*

This document represents the District's first step towards establishing minimum levels for the remaining Everglades, which includes the water conservation areas, Holeyland and Rotenberger wildlife management areas, and freshwater regions of the Park. The document was peer-reviewed by an independent scientific panel, which issued its final report in September 1998. Recommendations to incorporate the peer-review findings will be presented to the Governing Board in January 1999, along with policy implications. The criteria contained in the final report will then be used in developing a prevention and recovery strategy in the regional water supply planning process. Rule development related to minimum flows and levels is expected to begin in 1999.

Lake Okeechobee Schedule to be Reviewed.

In 1994, the District requested that the federal government review the timing, location and quantities of regulatory water releases as part of its evaluation of alternative Lake Okeechobee water level schedules. The intent is to facilitate releases of water for hydropattern improvements in the Everglades and improve management of Lake Okeechobee. The District also recommended that the study be based on the same computer models as are being used in the LEC Interim Plan and that the study include alternative schedules developed by the District. An agreement initiating this study was finalized in 1995 and the Corps of Engineers began a review of the Lake Okeechobee water level schedule. The Corps is expected to complete a draft Environmental Impact Statement in January 1999, with a final Environmental Impact Statement released in May and approved in August 1999.

This major structure (S-354) on the Miami Canal is used to make water supply and regulatory releases for Lake Okeechobee.

Central & Southern Florida Project Restudy

The Comprehensive Review Study – or Restudy – is an examination of the multi-purpose C&SF Project to develop modifications to the project to improve the sustainability of south Florida. This project will build on the Everglades Forever Act's foundation of Everglades restoration. The feasibility report for modifying the C&SF Project resulting from the Restudy will identify options that are fully consistent with and will further the ecosystem restoration purposes of the Act, while continuing to provide for other authorized purposes of the C&SF Project. These options include efforts such as water resource construction projects and operational changes. The Restudy met a major milestone this year with the release of a draft recommended plan October 13, 1998.

Too Much Water Sent to Sea.

Drainage works in south Florida to provide flood control have resulted in the loss of roughly 6 million acre-feet of water storage (2 trillion gallons) – half of which comes from Lake Okeechobee. In the urbanized lower east coast, approximately 2 million acre-feet of fresh water (660 billion gallons) is now discharged directly to tide on an annual basis from canals and urban drainage systems, causing adverse impacts to coastal estuaries. While this drainage provides flood control, water lost to tide is not available for use during the dry season. The decrease in storage capacity of the south Florida and Everglades ecosystem has resulted in insufficient and improper timing of water deliveries to meet the needs of the Everglades, Florida Bay, Caloosahatchee and St. Lucie rivers and estuaries, Lake Worth Lagoon estuary, Biscayne Bay, and urban and agriculture areas.

Draft Plan Released in October 1998.

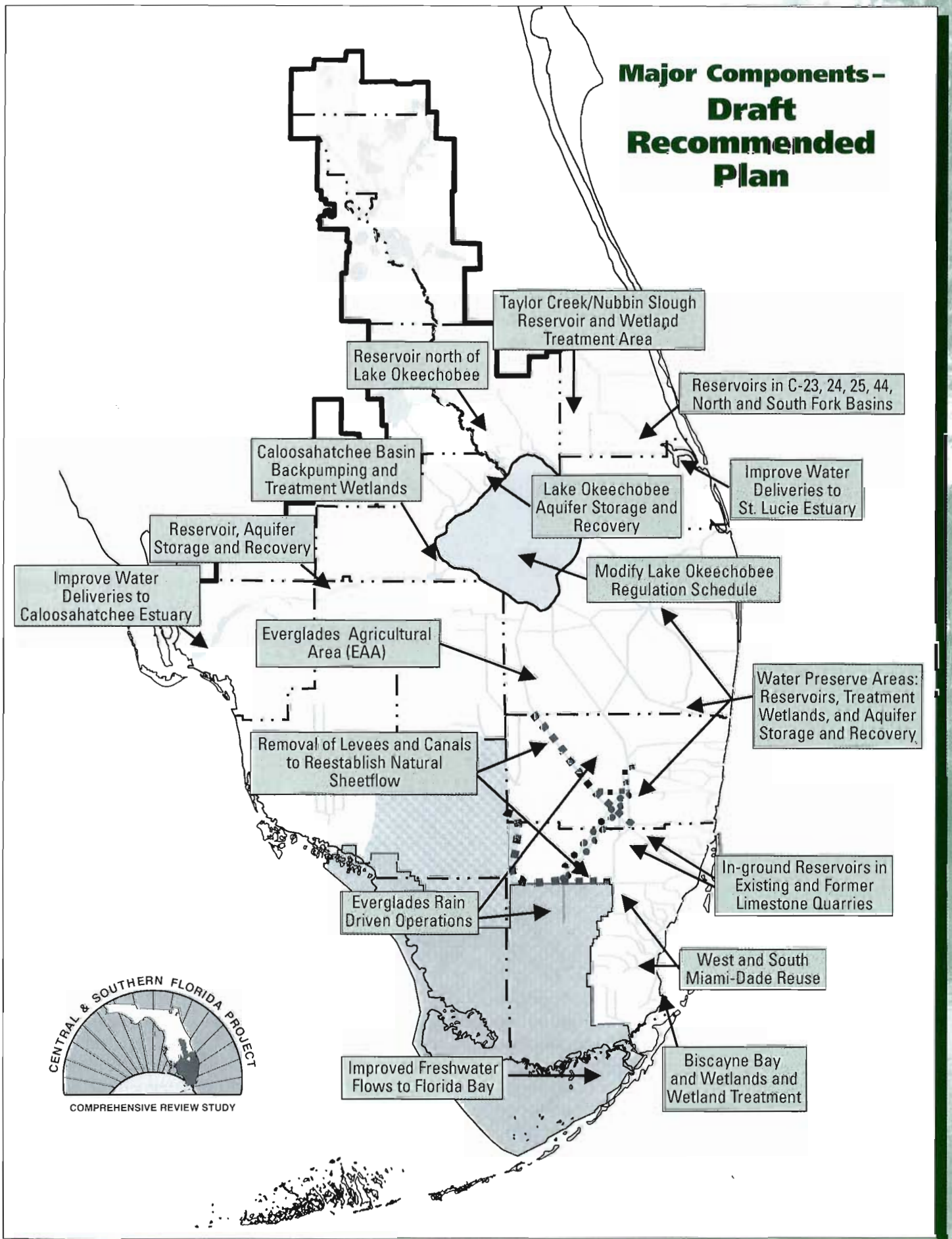
Congress directed the Corps of Engineers to comprehensively review the C&SF Project to determine whether project modifications will enhance the environment, and meet urban water supply and aquifer protection objectives served by this project. The District acts as local sponsor of the C&SF Project. The Restudy Team selected an initial draft plan – containing 50 components or project features – in June. The team formulated, evaluated and compared alternative plans to existing (1995) and future (2050) base conditions. The 2050 base is a projection of hydrologic conditions in the study area without the Restudy implemented. For planning and modeling purposes, the Everglades Program – including the Everglades Construction Project and appropriate supplemental treatment technologies – is assumed to be implemented in the 2050 base condition.

A recommended draft plan was released October 13, 1998. A series of 11 public meetings to take comment was held in November and early December in south Florida. A final meeting was held December 8 in Washington, D.C. Also, the Restudy plans have been posted on the Internet for electronic review and comment. The multi-agency Restudy Team continued reviewing a number of alternative plans and scenarios to modify the C&SF Project through January 1999. An Integrated Feasibility Report and Programmatic Environmental Impact Statement detailing recommendations to meet the project's objectives will be submitted to Congress on July 1, 1999.

Increasing Water Storage.

A primary objective of the Restudy is to create additional regional water storage to increase the volume available and optimize the timing of water delivered to the Everglades Protection Area. This objective is consistent with the 28% average annual increase to the protection area contained in the Act. At the time this objective was formulated, the operating premise was that "more was better," without emphasis on the timing of water deliveries. The 19% increase recommended in the draft plan – to be achieved concurrent with other measures – will greatly enhance hydrologic conditions in the Everglades. Restudy analyses have indicated significantly improved hydroperiods in the water conservation areas and Park, with less than the 28% inflow from the Everglades Construction Project. The Restudy will identify any modifications of the existing construction project design/operations necessary to ensure that the performance of the C&SF Project will not be adversely affected by subsequent implementation of Restudy components.

District Executive Director Sam Poole supports Vice President Al Gore as he announces the release of the Restudy recommended draft plan in West Palm Beach on October 13.


Major Components–
Draft
Recommended
Plan
Taylor Creek/Nubbin Slough Reservoir and Wetland Treatment Area
Reservoir north of Lake Okeechobee
Reservoirs in C-23, 24, 25, 44, North and South Fork Basins
Caloosahatchee Basin Backpumping and Treatment Wetlands
Improve Water Deliveries to St. Lucie Estuary
Lake Okeechobee Aquifer Storage and Recovery
Reservoir, Aquifer Storage and Recovery
Modify Lake Okeechobee Regulation Schedule
Improve Water Deliveries to Caloosahatchee Estuary
Everglades Agricultural Area (EAA)
Water Preserve Areas: Reservoirs, Treatment Wetlands, and Aquifer Storage and Recovery
Removal of Levees and Canals to Reestablish Natural Sheetflow
In-ground Reservoirs in Existing and Former Limestone Quarries
Everglades Rain Driven Operations
West and South Miami-Dade Reuse
Improved Freshwater Flows to Florida Bay
Biscayne Bay and Wetlands and Wetland Treatment
CENTRAL & SOUTHERN FLORIDA PROJECT
COMPREHENSIVE REVIEW STUDY

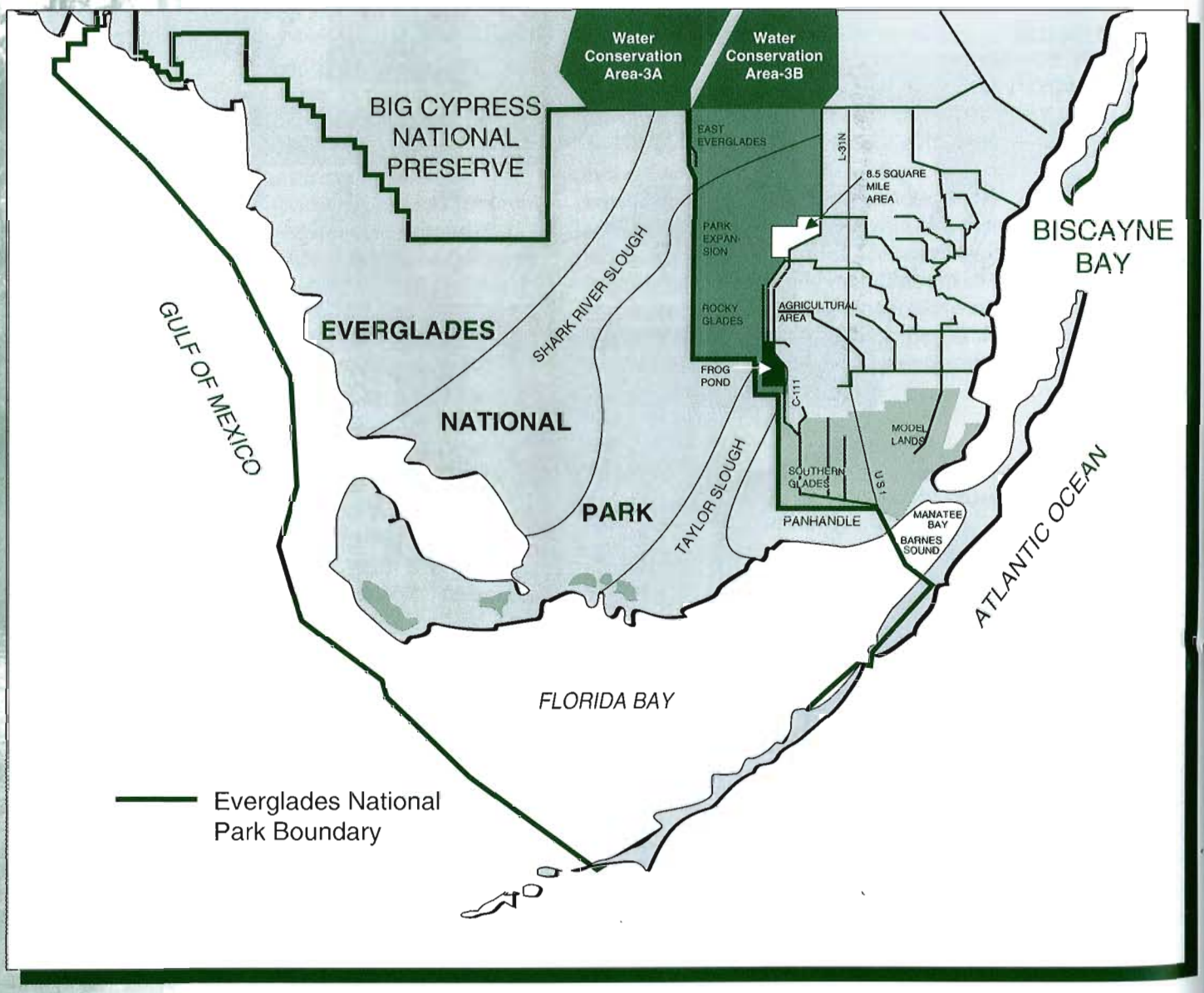
Florida Bay and Southern Everglades Restoration

Located between the Florida mainland and Florida Keys, Florida Bay is the Everglades watershed's largest estuarine system. Historically, this subtropical estuary was noted for clear water, lush seagrass beds and outstanding fishing, but has shown marked deterioration. Widespread mortality of seagrass, turbid water associated with this die-off, large and sustained phytoplankton blooms, and a decline in the commercial and recreational fisheries yield are among the problems. Hypotheses to explain the deterioration suggest that altered hydropattern, excess nutrient loading, changed circulation patterns, and lack of hurricane-induced mixing all may play a role. The District's program for Florida Bay involves research and monitoring, modeling, major upstream restoration projects, and working cooperatively with private organizations and other agencies.

Research Will Define Restoration Goals.

It is assumed that a cause of Florida Bay's apparent decline is the decrease in freshwater inputs to the bay, which has occurred over the past 50 years. Florida Bay receives water as overland flow from the southern Everglades wetlands and prairies, and approximately 20 creeks and other tributaries that flow into the bay. In order to effectively "restore" the environmental and ecological characteristics of Florida Bay, environmental managers must have a sound, quantitative understanding of 1) the historic characteristics (salinity and environmental) and variability of the bay, 2) the extent to which current characteristics differ from historic characteristics, and 3) the mechanisms that caused these changes and control the nature of the ecosystem.

Several studies of Florida Bay and adjacent wetlands of Taylor Slough and the C-111 basin neared completion in 1998. Two studies have shown that significant changes in salinity conditions occurred when the Flagler



Railway was built to connect the Florida Keys, and later, when the C&SF Project was constructed. Compared to salinity conditions prior to 1910, the salinity has become higher and less variable. A study of the history of the adjacent wetlands has found that saltwaters have intruded further inland since the construction of the C&SF Project. The Florida Bay Program Management Committee convened a peer-reviewed workshop of all ongoing research of Florida Bay this year. A synthesis of available information was being compiled in late 1998.

Water Quality and Biological Monitoring Document Status and Trends.

Monitoring is essential to evaluate the status of Florida Bay and its watershed and the response of these ecosystems to upstream restoration projects. The District continues to support the Florida Bay Water Quality Monitoring Network, which keeps track of the status and trends of salinity, nutrients, and algal bloom conditions in the bay. District staff members are also monitoring water quality, periphyton, and plants in the southern Everglades. The ecology of these wetlands is directly affected by changing water management and, in turn, these wetlands affect the quantity and quality of water that reaches Florida Bay.

Transition Zone Focus of Research Projects.

Attention has been and continues to be directed to geographic areas that are likely to be affected by water management actions. To that end, the District's Florida Bay research focus is on the northern bay and the mangrove-dominated salinity transition zone between the Everglades and the bay. This region is where the greatest range of salinities is found, and where direct and indirect effects of salinity change are most evident. These changes affect the availability of nutrients, productivity, habitat structure, and food web dynamics of the region. Partly because the salinity transition zone is a nursery for many important fish species, and a feeding and breeding ground for wading bird populations, this region is of great social and economic importance. It is likely that this region will undergo dramatic changes from the programs mandated by the Everglades Forever and Florida Bay Restoration Acts.

The District's research complements monitoring efforts by helping scientists not only describe how the ecosystem is changing, but also why these changes are occurring. Combined with District computer models, staff can then predict the effects of future water management actions. Recent research results indicate that the seagrass species along the Florida Bay coast are strongly influenced by salinity changes. Thus hydrological restoration projects are also likely to restore the bay's seagrass community, a central component of the bay ecosystem. Results to date indicate that the increasing freshwater flow to the bay is not likely to harm the bay by increasing inputs of phosphorus. However, increasing freshwater flow will probably also increase inputs of nitrogen. The baywide effects of such an increase are the subject of research by the Florida Bay interagency research program – a cooperative effort by the District and other state and federal agencies to understand why ecological changes have occurred in the bay and how the bay's environmental management can be improved.

Cooperative Research Projects Under Way.

Cooperative research projects are designed to determine the effect of changing the quantity, quality, timing and distribution of freshwater flow on nutrient cycles, as well as submerged plant and fish communities. These cooperative projects continue to be conducted by the University of Florida, Florida International University, Louisiana State University, the U.S. Geological Survey, and District, DEP and Park researchers. Gathered information has begun to be synthesized into computer models to predict the consequences of water management alternatives on the region, both in terms of water quantity and quality. This is being done with the help of the Corps of Engineers' Waterways Experiment Station in Vicksburg, Mississippi.

Upstream Projects Essential to Bay's Health.

In 1993, the situation with Florida Bay reached crisis level. It was at that time that a realization of the importance of this portion of the ecosystem combined with an urgency to start expediting the two major ecosystem restoration projects that had been on the books for a number of years. Those two efforts, the C-111 South Dade and Modified Water Deliveries to the Everglades National Park projects, are intended to restore the natural hydrologic function of the two principal sources of fresh water for Florida Bay. These are Shark River Slough and Taylor Slough. To that end, construction on the three pump stations begun last year has now been completed. They are S-332D that puts more fresh water into Taylor Slough, and S-355A&B that will move fresh water from Water Conservation Area 3B into northeast Shark River Slough. All these structures were going through the permitting process in 1998, and will likely be operating in 1999, bringing additional flexibility in achieving the needed hydrologic improvements.

Since its inception in 1993, the Florida Bay Science Program has virtually eliminated many of the original hypotheses surrounding the decline of the estuary. What remains are the essential questions of impacts of hydrological changes and variations in nutrient cycling. The next phase for Florida Bay managers is to incorporate what has been learned into the next round of credible improvement projects for the areas upstream of the

bay. What is clear is that upstream impacts can make (or break) how effectively Florida Bay can flourish as an important part of the ecosystem. What is equally clear is that changes in flow regimes must take into account all critical attributes: not just water quantity, but also quality, timing and distribution.

C-111 South Dade Project. Initiated in 1994, this project is on track to be an integral element in the restoration of Florida Bay. In addition to the S-332D pump station, at least two additional pump stations will be operated to minimize seepage losses along the L-31N canal and optimize flood protection to agricultural lands to the east. This two-fold approach (with about a 1-mile buffer of land between the Park and lands in active agriculture in southern Miami-Dade County) allows for restoration with a minimum of disturbance to populated areas. Restoration of foraging habitat for wading birds began last year, with the completion of removal of spoil mounds along the lower C-111 canal. In addition, work began in late 1998 to replace the bridge over Taylor Slough. The current bridge, approximately 3/4-mile past the southern entrance gate to the Park, impedes the slough's flow across the Park Road. A wider, higher bridge will eliminate that bottleneck, allowing for improved flows southward. Recent studies by the U.S. Geological Survey show 70% of Florida Bay flows originating from Taylor Slough and into Trout Creek. For this reason, restoration of more natural flow by bridge replacement is another critical element in the overall restoration plan.

Modified Water Deliveries Project. The Modified Water Deliveries Project is an effort to restore hydropatterns associated with northeast Shark River Slough. This is important for the upstream ecosystem of the Park, as well as for flow restoration to Florida Bay. The predecessor to the modified water project is the Experimental Program of Water Deliveries to Everglades National Park. This was a testing regimen administered by the Corps of Engineers, Park, and District to test the best possible hydrologic plan for restoration. It has gone through seven iterations, and is set to expire in the year 2000.

The Experimental Program will be modified due to impacts to the endangered Cape Sable Seaside Sparrow during the nesting season of 1998. The Park, Corps and District – in consultation with the U.S. Fish & Wildlife Service – are now devising a revision to the Experimental Program that will be accompanied by an Environmental Impact Statement, to be complete in late 1999. The objective is to assist the Fish & Wildlife Service in finding a Reasonable and Prudent Alternative to allow the agencies to continue with the Experimental Program. If the partners cannot agree on the RPA, then the Experimental Program would end and the operational regime for moving water into the Park would revert to the authorized criteria prior to the Experimental Program. This could have serious impacts to the ecology of the Park. Therefore, the agencies are using all due diligence to devise the RPA.

Protecting the Cape Sable Seaside Sparrow. Conflict arose early in 1998 regarding "El Nino"-generated water levels in Water Conservation Area 3A, 3B, and western Shark River Slough. The conflict was caused by concerns over the Cape Sable Seaside Sparrow, a small passerine with a critical sub-population located in western Shark River Slough. While unusual dry season rains threatened the nesting of this important indicator species for the Everglades, the Corps of Engineers and the District were faced with a difficult dilemma. Ideally, waters would be sent into Shark River Slough to benefit the Park, but that option was precluded due to potential impacts on landowners in the 8.5 Square Mile Area, a developed area in south Miami-Dade County built west of the flood control system.

The District and Corps had to choose between either closing the S-12 structures, which would have damaged the tree islands in Water Conservation Area 3A, or keeping those structures open and thereby preventing the sparrow from nesting. As such, the relative impact to the sparrow was weighed against the impact to tree islands and other birds. Although both options had negative consequences, the Corps decided to keep the S-12's closed. Relieve was sought using the South Dade Conveyance System to move floodwaters south towards Taylor Slough and Florida Bay, and impacts to the 8.5 Square Mile Area landowners near eastern Everglades National Park were avoided.

Although initial estimates concluded that the sparrow had an excellent breeding year, subsequent data has created some disagreement over the status of the sparrow and the benefits of the efforts to protect it from El Nino waters. Bird survey data collected in 1999 should provide a better understanding of the status of the sparrow, and the results of the 1998 efforts taken on its behalf. The sparrow emergency and its fallout reinforce the importance of continued monitoring of all aspects of the Everglades ecosystem.

Hurricane Georges' Impacts Florida Bay.

On September 25, Hurricane Georges passed by the western boundary of Florida Bay on its northward course toward the Gulf of Mexico. Winds of about 100 miles per hour were recorded near Marathon. The impact on Florida Bay is of great interest because no major hurricane has hit the bay since 1965. Scientists have hypothesized that this lack of hurricanes has allowed sediments and nutrients to accumulate in the bay and thus is partly responsible for ecological problems in Florida Bay. Hurricane Georges provided a test of this hypothesis.

In response to the hurricane, researchers from many agencies and universities, including the District, were on the water within two days of the hurricane's passing. These scientists observed that Georges stirred up the bay's sediments and ripped up some seagrass beds. Quantitative information on the effects of the hurricane on the bay's sediments, seagrass, and water quality should be available in 1999 to help the District understand the importance of storms on the bay's ecology.

8.5 Square Mile Area Buyout Approved.

Although this occurred after the 1997-98 fiscal year, it is worth noting that the District's Governing Board unanimously approved acquisition of the 8.5 Square Mile Area on Nov. 11. Acquiring this land is key to restoring proper water flows through northeast Shark River Slough. Implementation of the Board's action will depend on the federal government and Miami-Dade County paying their share of the costs to acquire this land before closing.

Managing Fiscal Resources

A dedicated funding source is essential to carry out Everglades and Florida Bay protection and restoration programs. The Everglades Construction Project is one of the largest public works projects in the nation for environmental restoration, currently estimated to cost more than $796 million over 20 years. Restoration activities for Florida Bay will require millions of additional dollars and take years to implement.

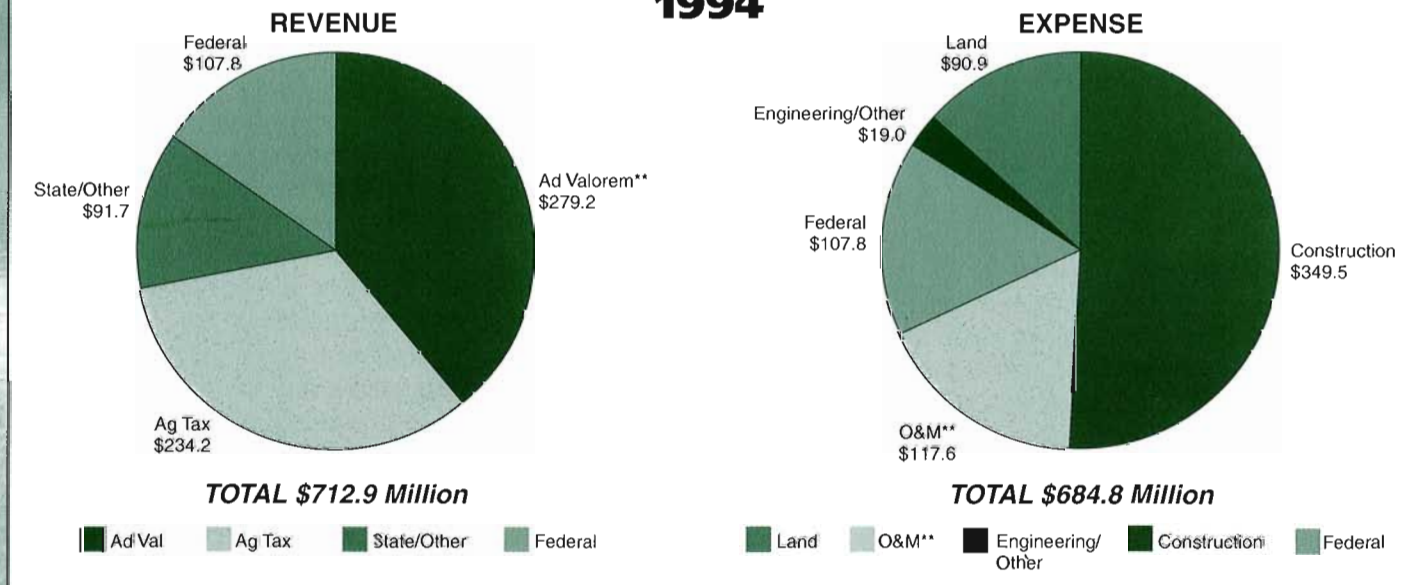
Everglades Trust Fund Created.

The Act directed the District to separately account for all monies used to fund the Everglades Construction Project. In November 1996, the citizens of Florida voted in favor of a constitutionally-created Everglades Trust Fund. The legislation passed in 1997 (Ch. 97-258, Laws of Florida) references the Everglades Trust Fund and requires specific identified funds to be placed in it. This fund, which strengthened Everglades oversight, will be used to account for all revenues and expenses associated with the Everglades Construction Project. The District has developed a proposed format for reporting financial information in a clear and concise manner. The Joint Legislative Committee on Everglades Oversight has approved the format the District uses when submitting its quarterly expenditure reports to the Governor, the Legislature, and the public. Multiple funding sources are contemplated for the Everglades Program:

Ad Valorem Taxes Provide $26.1 Million in Fiscal Year 1998.

The Act gives the District the authority to levy ad valorem taxes of up to 0.1 mill within the Okeechobee basin for design, acquisition, and construction of the Everglades Construction Project. As required by the Act, this will be the sole direct contribution of ad valorem taxes for the construction project. For fiscal year 1997-98, ad valorem tax revenue was $26.1 million.

Original Project Estimates 1994



***excludes operating millage and expense for non-STA O&M*

Agricultural Privilege Taxes Established for EAA and C-139 Basins.

To fund the first phase of the Everglades restoration program, the Act imposes an annual tax for the privilege of conducting an agricultural trade or business within the EAA and C-139 basins. The Act specifies that the annual per acre tax be collected through the normal county tax collection process.

EAA Agricultural Privilege Tax Raises $11.5 million in Fiscal Year '98.

The EAA agricultural privilege tax ranges from a minimum of $24.89 per acre from 1994 to 1997 to a potential maximum of $35 per acre from 2006 to 2013. Actual agricultural privilege taxes for fiscal year 1998 totaled $11.5 million. After the year 2013, the tax rate will decrease to $10 per acre for maintenance and operation of the STAs.

The amount of taxes collected each year is reduced by early payment discounts provided by each county. These discounts can range from 1% to 4% depending on the timeliness of the payment. County processing/ collection fees and commissions further reduce the amount of revenue available to fund the Everglades Construction Project.

The Act includes financial incentives in the form of not increasing tax rates for phosphorus load reductions that exceed the 25% EAA basin requirement. It also provides individual growers' incentive credits for meeting phosphorus load or phosphorus concentration reduction targets. Incentive credits will not reduce the agricultural privilege tax below the $24.89 per acre minimum.

EAA Vegetable Acreage.

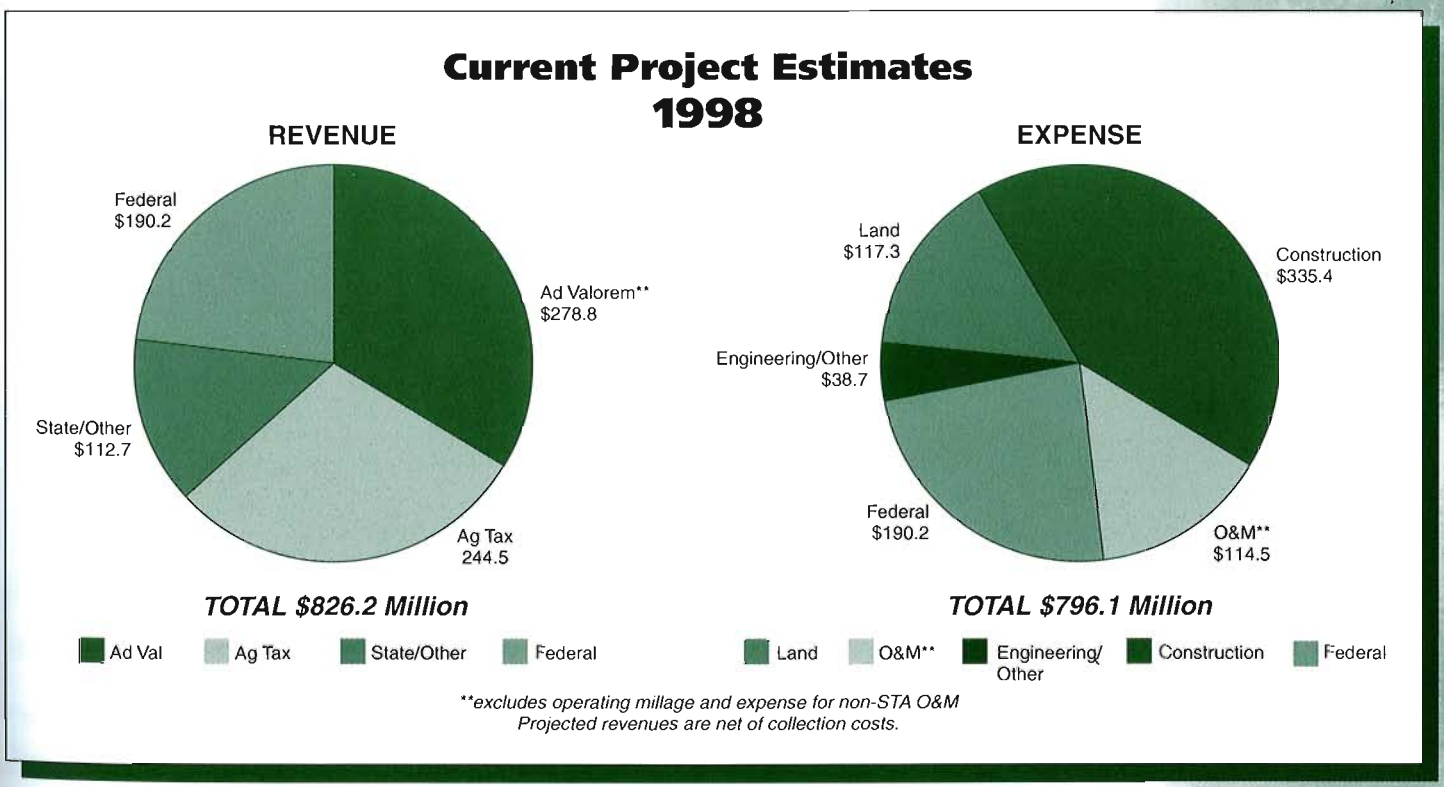
The Act recognizes that vegetable farming is subject to both volatile market conditions and to crop loss from freezes, floods and droughts. If the Governor, President, or U.S. Department of Agriculture declares a state of emergency or disaster due to natural conditions, payment of agricultural privilege tax will be deferred one year. Since 1994, when the tax went into effect, this provision has been applied once, in 1997.

C-139 Basin Agricultural Privilege Tax Raises $622,679 in Fiscal Year 1998.

As specified in the Act, for the 20-year period between 1994 and 2013, the total amount of tax to be assessed annually will not exceed $654,656. Beginning in 2014, the tax will be assessed at $1.80 per acre. The Governing Board certified the C-139 basin agricultural privilege tax for 1997-98 at $4.38 per acre, resulting in revenues of $622,679 in fiscal year 1998. The amount paid by an individual property owner may change from year to year depending in the number of acres within the C-139 basin classified as agricultural.

Alligator Alley Toll Revenues Could Provide $27 Million.

The Act includes the legislative finding that Alligator Alley, designated as State Highway 84 and U.S. Interstate Highway 75, contributed to the alteration of



water flows in the Everglades and affected ecological patterns of the historic southern Everglades. The Legislature determined that it is in the public interest to establish a system of tolls for Alligator Alley to raise money to help restore the natural values lost by the highway's construction.

Toll revenue must be split equally between the Everglades and Florida Bay. Projects that qualify for these funds include the Everglades Construction Project; land acquisition to move STA-3/4 out of the Toe-of-the-Boot (an Everglades remnant area in the Holeyland Tract at the south end of the EAA); water conveyance projects which enable more water resources to reach Florida Bay; engineering design plans for wastewater treatment facilities for Florida Bay marine waters; and highway redesign to improve sheetflow of water across the southern Everglades.

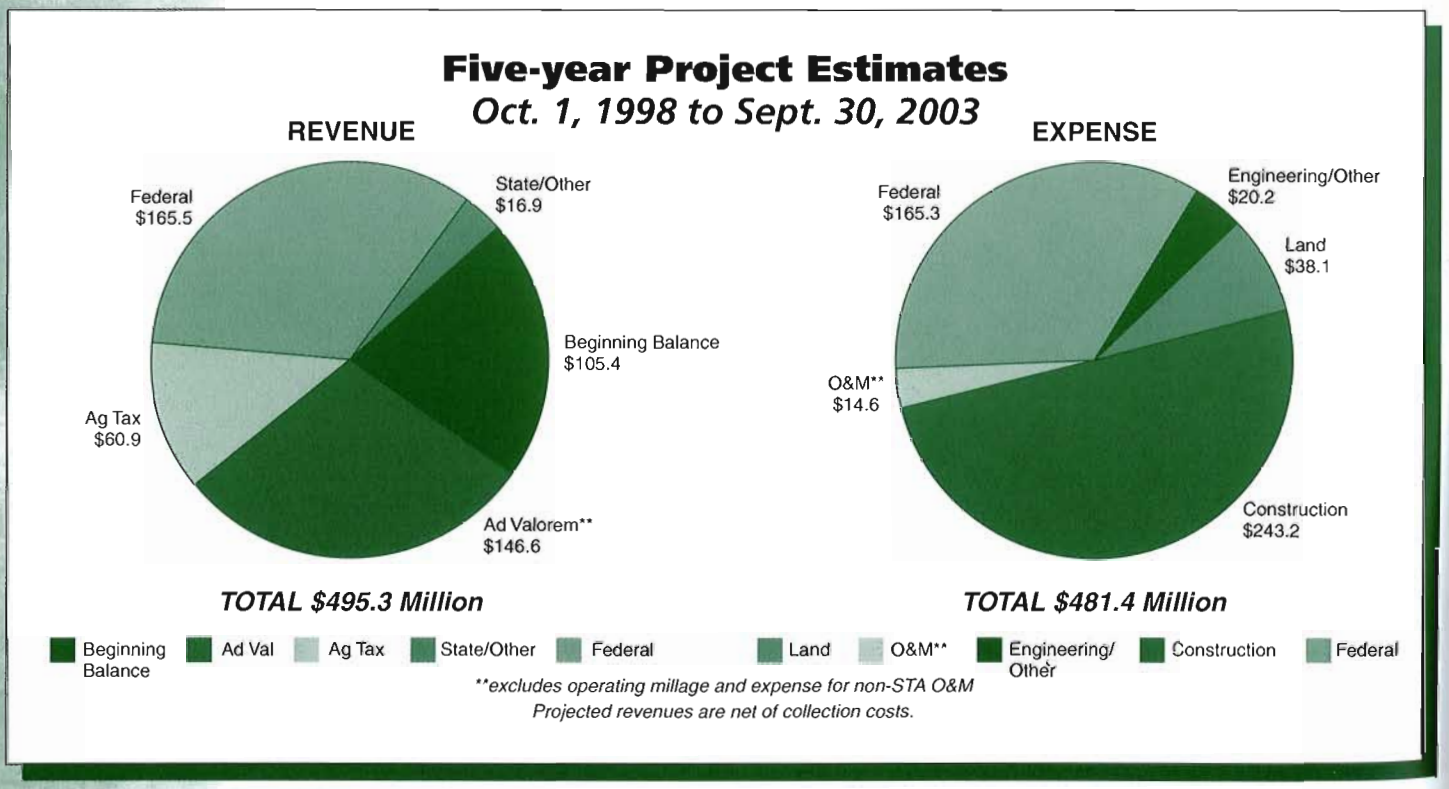
In 1996, the District and Florida Department of Transportation received federal authorization to re-direct use of Alligator Alley tolls for these projects. The Department of Transportation and District entered into a Memorandum of Understanding in 1997 setting out the basis for depositing the funds in the Everglades Trust Fund. This was quickly followed with the transfer and deposit of $17 million in excess toll moneys representing the first transfer. These funds were allocated based on the Act requirements. As such, these funds were split equally, at $8.5 million each, between the Everglades construction and Florida Bay projects. In fiscal year 1998, an additional $2,125,000 was received from the Florida Department of Transportation, which was also split equally between both projects.

Project Estimates and Cashflow Updated for Phase 1.

Project estimates and cashflow underwent further review and validation in fiscal year 1998. Current cashflow estimates continue to reflect a balanced position at the conclusion of Phase 1 in fiscal year 2006. Current estimates reflect adjustments made based on schedule optimization and refinements to previous cost estimates. In addition, as construction contracts have been awarded this information has replaced estimates of both cost and construction periods. The current estimates add fiscal year 2006 to the construction period for some components that do not affect STA start-up dates or statutory completion dates.

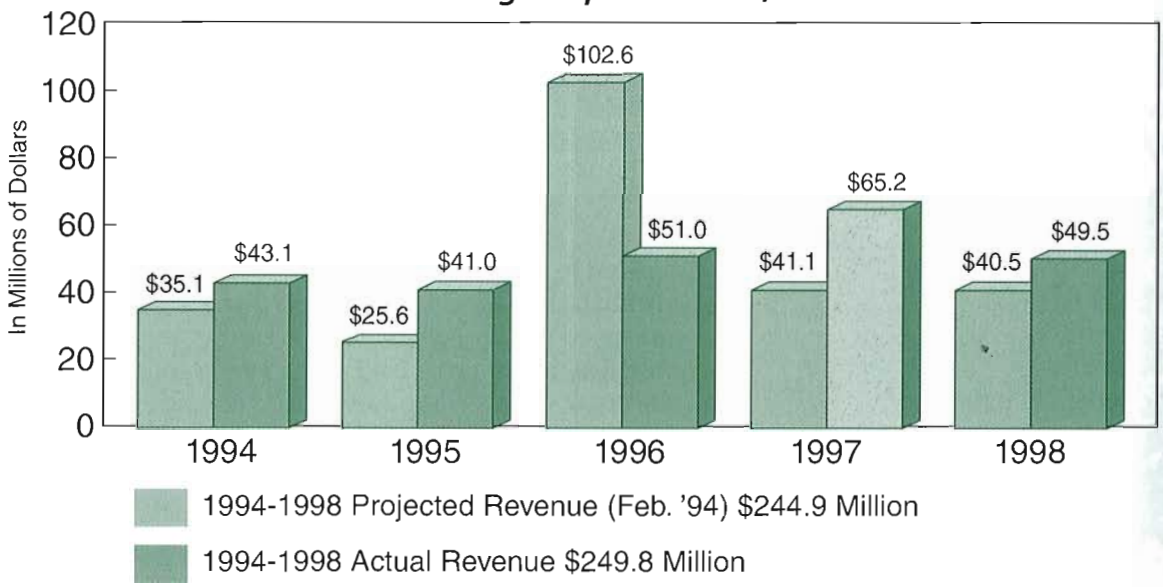
Amendment 5.

Another constitutional amendment which passed in November 1996 also involves a funding issue. Amendment 5 makes those in the Everglades Agricultural Area who cause water pollution in the EAA and the Everglades Protection Area primarily responsible for paying costs of abating that pollution. In an advisory opinion to the Governor, the Florida Supreme Court in 1997 interpreted this to mean that those who are responsible for pollution in the EAA must pay "their share of the costs of abating the pollution attributable to them," and that "primarily responsible" should not be given limited meanings such as "entirely" or "substantially" or "more than half." The Court also concluded "the voters expected the Legislature to enact supplementary legislation to make [Amendment 5] effective."



Actual vs. Projected Revenue

Through September 30, 1998



Amendment 5 was the basis of a taxpayer challenge in Barley v. SFWMD. In October 1998, 9th Circuit Court Judge Lawrence Kirkwood dismissed the case, ruling that the Everglades Forever Act, as a pre-existing statute consistent with Amendment 5, would remain in effect unless repealed by the Florida Legislature.

Federal Government to Provide Funding.

Both the President and Congress have been extremely supportive of Everglades restoration. Much federal interest and support has been directed towards Everglades restoration. The Water Resources Development Act of 1996 provides cost-sharing funding for some programs related to Everglades restoration. In particular, the act authorizes the Corps of Engineers to move ahead with C-51/STA-1 East, C-111 land acquisition, construction and water quality improvement projects, and the Restudy.

Preservation 2000 Provided up to $33 Million.

Up to $33 million of P-2000 funds was re-directed for land acquisition for the Everglades Construction Project through fiscal year 1997. In fiscal year 1998, the District implemented the expenditure of these funds for land acquisition. The District committed approximately $9.5 million for proposed land acquisition projects with the balance expended in 1997.

FPL Mitigation Funds Used.

Funding anticipated for the Everglades Construction Project in the Act included $14 million in Florida Power & Light mitigation funds. In fiscal year 1997 the District used the balance of these funds ($12.9 million) to meet Everglades Construction Project requirements. No additional funds will be obtained from this source.

Unfunded Act Mandates Total $78 Million.

In addition to the Everglades Construction Project, the Act requires significant research, regulatory program development and implementation, exotic species control and other activities, totaling approximately $78 million through the year 2014. No funding source was designated for any activities beyond land acquisition, design and construction of the Everglades Construction Project. Therefore, the District is relying almost exclusively on ad valorem funds to cover these mandates.

Water Conditions

The Everglades Protection Area is divided into four regions for the purposes of describing water quality conditions, as required by the Act. The regions are the Refuge, Water Conservation Areas 2 and 3, and the Park. The period of record of the data analyzed was from October 1, 1978 through April 30, 1998. The data were divided into a baseline period (October 1, 1978 through September 30, 1988) and into individual recent water years (1990 through 1998). This division was made to determine if any water quality improvement trends were evident during the 1990s when compared to the baseline period.

In each region water quality sampling stations were classified as sources of stormwater inflow or interior sites. Data sets were created for each water quality constituent sampled at inflow structures and interior sites during the baseline period and the recent water years. Each data set summarized the number of samples, basic statistical parameters and excursions from numerical water quality criteria. (An excursion is a situation in which a criterion is exceeded according to state water quality standards, but may not be a violation.)

The overall status of compliance with water quality criteria in the Everglades Protection Area as of April 1998 was determined by 1) performing an analysis of excursions of constituents with Class III numeric criteria and also, for pesticides, excursions of aquatic invertebrate toxicity limits; 2) using plots to define changes in constituent levels in water years 1990 to 1998 compared to the baseline period; and 3) documenting changes in total phosphorus and total nitrogen loads and changes in other constituent concentrations between the Everglades Protection Area regions compared to the baseline period.

Excursion Analysis.

The following definitions of excursion categories were developed to rank the severity of water quality constituent excursions in the EPA:

Dissolved oxygen was placed in Category A because of the high excursion percent in all Everglades Protection Area regions at both the inflow and interior sites. Specific conductance was assigned to Category A at all inflow sources and in the Refuge rim canal and to Category B at all interior sites. Alkalinity and pH were placed in Category A in the interior marshes of the Refuge. Unionized ammonia, pH and turbidity were assigned to Category B in the inflows to the Refuge, in the Refuge rim canal, and at the inflow and interior sites in Water Conservation Areas 2 and 3, and the Park. Phosphorus was placed in Category A in all regions except for the Park and interior marshes of the Refuge, where it was placed in Category B. Four pesticides were assigned to Category A. Endosulfan was detected above its numeric criterion seven times and the toxicity limits for aquatic invertebrates were exceeded one time each by three pesticides: chlorpyrifos ethyl, ethion and parathion methyl.

Significant Trends.

At the inflow structures to the Refuge, significant improvement trends were found for specific conductance, alkalinity and total phosphorus. There were no significant trends in the rim canal. At the interior sites improvement trends for total phosphorus and iron occurred, but there was a worsening trend for dissolved oxygen. At the Water Conservation Area 2 inflow structures total nitrogen and total iron had improvement trends while only total iron showed an improvement trend at the interior sites. At Water Conservation Area 3 inflow sites there were no significant trends, but turbidity, total phosphorus, nitrogen and iron all had improvement trends at interior sites. The Park had improvement trends in phosphorus and nitrogen at the inflow structures. There were no significant trends at any interior sites.

Load and Concentration Changes.

The changes in phosphorus and nitrogen loads and in median concentrations and changes in median concentrations or values of the other constituents that had excursions were analyzed following the water flow from north to south through the Everglades. When comparing the phosphorus loads discharged into the Everglades between the baseline and recent water years, it appears that the Refuge is the only region to have received a higher phosphorus load during the recent years. This should change as loads delivered to the Refuge are expected to fall as the Everglades Construction Project is completed. Nitrogen loads

have increased slightly in Water Conservation Area 3 and the Park in the recent water years. Both the phosphorus and nitrogen load data show that the Refuge and conservation areas have been removing phosphorus and nitrogen as the water flows to the south. The phosphorus and nitrogen median concentration data also indicate the assimilation capacity of the marshes in Water Conservation Areas 2 and 3.

Anticipated Improvements.

The positive changes in water quality within the Everglades Protection Area are just beginning. There have been reductions in phosphorus entering the Everglades from the EAA through implementation of BMPs. The ENR Project demonstrated the effectiveness of STA technology by retaining an average of 82% of the inflow phosphorus load from 1995 to 1998. This retention reduced the total phosphorus load discharged to the Refuge by an average of 15% over the same time period. The Everglades Stormwater Program will improve water quality in the drainage basins other than the EAA that discharge into the Everglades Protection Area through monitoring and regulatory action programs.

The STAs will have the biggest impact on reducing phosphorus and to a lesser extent nitrogen. There will also be water quality improvements in specific conductance, turbidity and unionized ammonia in the EAA waters treated in the STAs. It is also expected that low dissolved oxygen concentrations in EAA canals will be improved when passed through the STAs. The relationship between excessive nutrients, alteration of natural aquatic plant, microbial and animal communities and dissolved oxygen levels lower than natural background conditions is well known. The continuous dissolved oxygen data from nutrient gradient studies in the Refuge and Water Conservation Area 2 indicate how the marsh systems may respond as nutrient levels continue to be lowered by BMPs and STAs.

Recommendations for Modifying Class III Criteria.

While many of the water quality problems are substantive and require specific restoration programs, some problems can be rectified by adopting more appropriate water quality criteria. Specifically, dissolved oxygen in un-impacted areas of the Everglades and alkalinity and pH in the Refuge marshes have excursions in natural areas. Evidence is presented suggesting that the current criteria are not representative of natural conditions, i.e. inappropriate criteria are being used to define as excursions naturally occurring variations in water quality.

Rainfall and Water Flow.

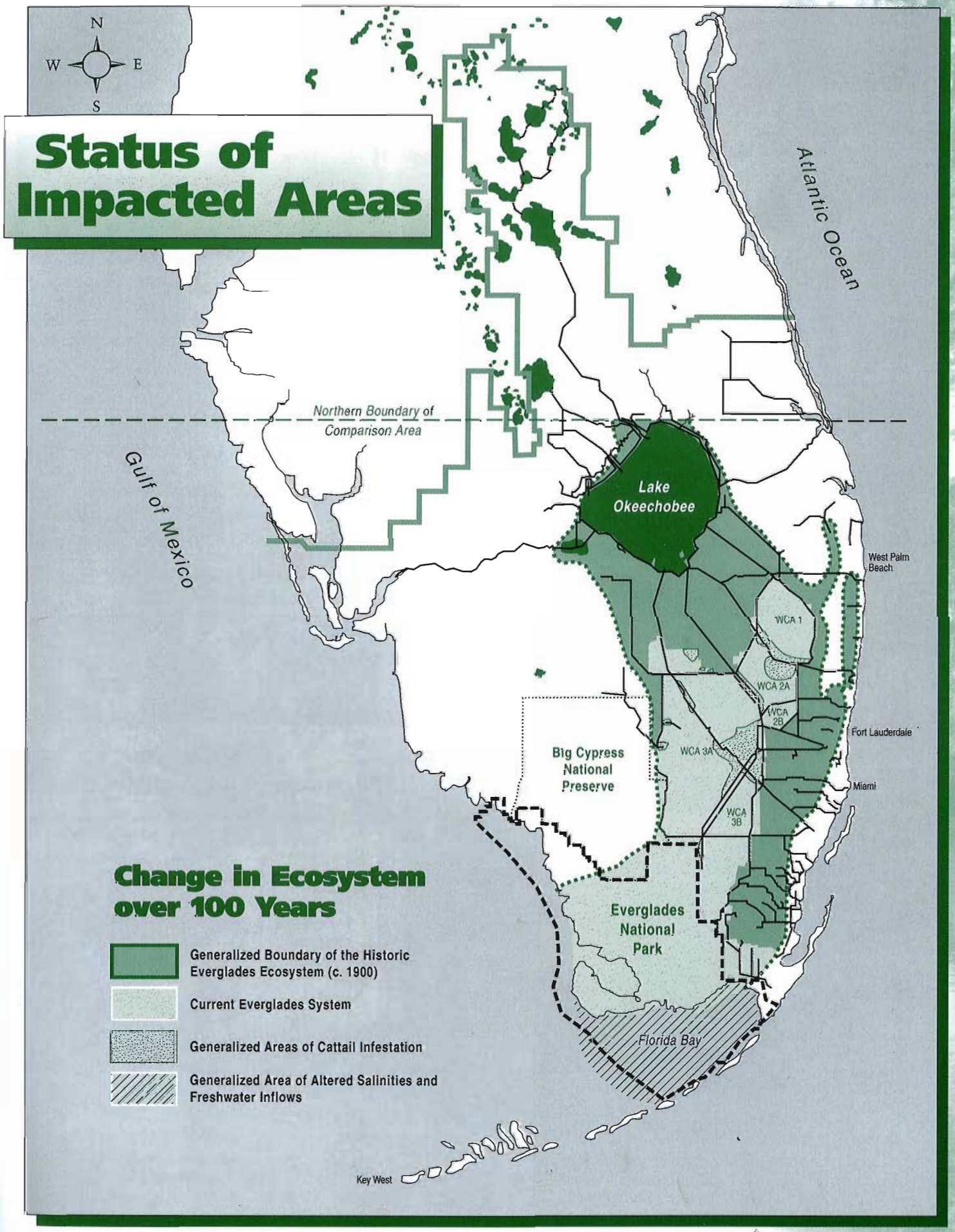
"El Nino"-generated rains were noticeable in the Everglades this past year. Rainfall from June 1, 1997 to May 31, 1998 was nearly 56 inches or 6% higher than the historic average of 52 inches. Compared to last year, rainfall is 12 inches higher for the reporting period. The amount of water discharged through the District's structures to the Everglades was proportional to the amount of rainfall reported. Overall, inflows reported to the water conservation areas for the present reporting period averaged 19% higher than last year. Inflows to the Park were 57% higher than average inflows. For more information on the results of the water quality analysis, please refer to the Water Quality Chapter in the *Everglades Interim Report.*

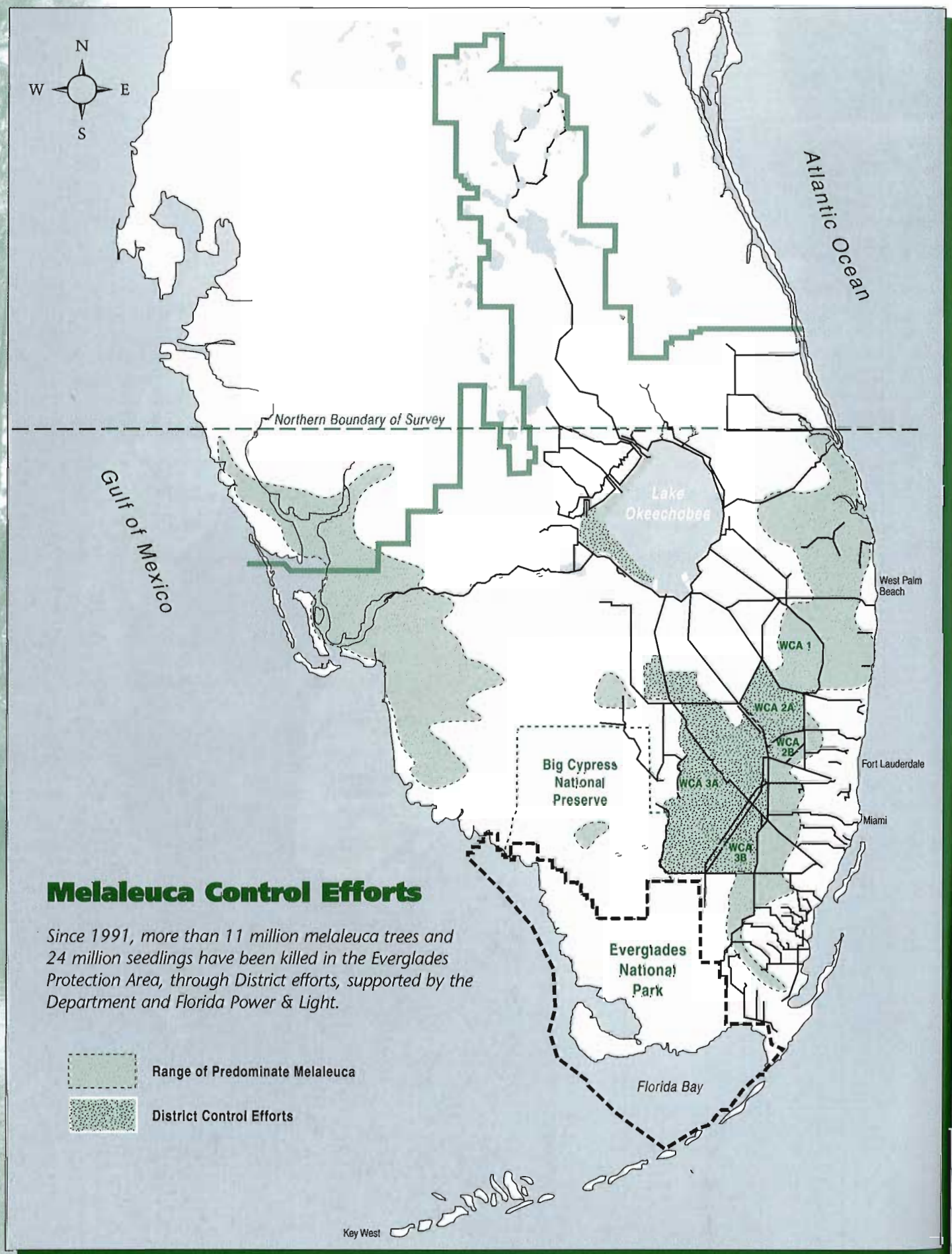
Excursion Category	Class III Waters	Pesticides	Total Phosphorus
Category A	> 5% excursions	Class III criterion and/or toxicity levels exceeded	> 50 ppb
Category B	up to 5% excursions	> Practical Quantitation Limit	≥ 10 ppb
Category C	> Method Detection Limit but no excursions	≥ Practical Quantitation Limit	< 10 ppb

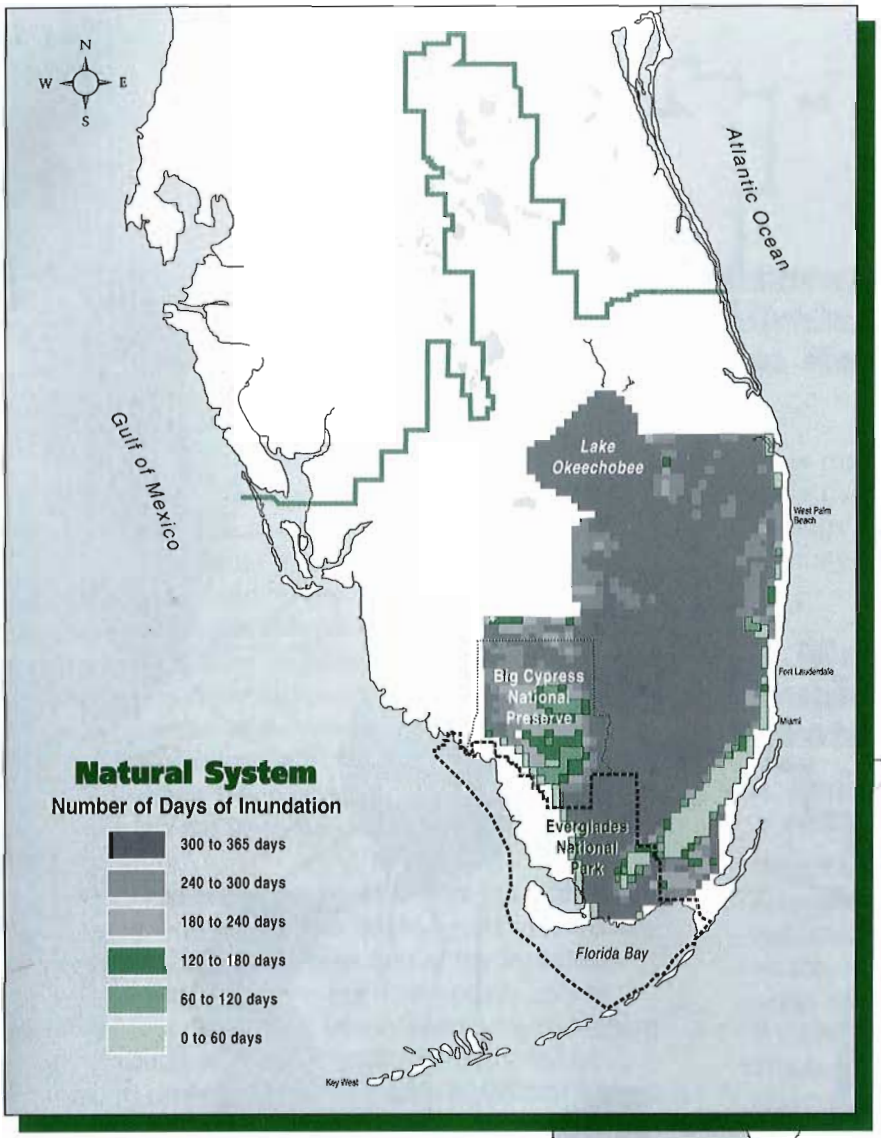
Abbreviations

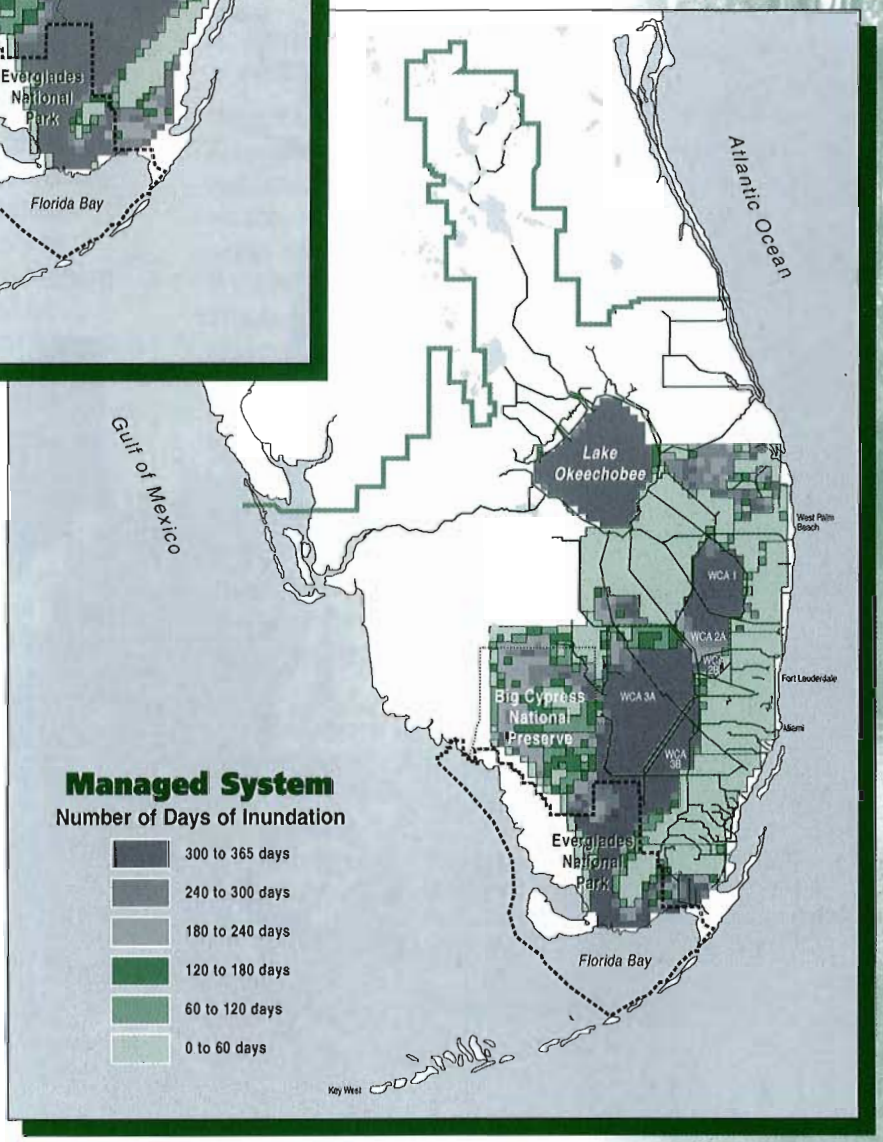
Act ..... 1994 Everglades Forever Act
Corps of Engineers ..... U.S. Army Corps of Engineers
District ..... South Florida Water Management District
Park ..... Everglades National Park
Refuge ..... Arthur R. Marshall Loxahatchee National Wildlife Refuge
Restudy ..... C&SF Project Comprehensive Review Study

BMP ..... Best Management Practice
C&SF ..... Central & Southern Florida
DEP ..... Department of Environmental Protection
EAA ..... Everglades Agricultural Area
ENR ..... Everglades Nutrient Removal
EPA ..... Environmental Protection Agency
F.S. ..... Florida Statute
FAU ..... Florida Atlantic University
LEC ..... Lower East Coast
M/WBE ..... Minority/Woman Owned Business Enterprises
O&M ..... Operation and Maintenance
Non-ECP ..... Non-Everglades Construction Project
ppb ..... parts per billion
SFWMD ..... South Florida Water Management District
STA ..... Stormwater Treatment Area


N
W
E
S
Status of Impacted Areas
Atlantic Ocean
Northern Boundary of Comparison Area
Gulf of Mexico
Lake Okeechobee
West Palm Beach
WCA 1
WCA 2A
WCA 2B
WCA 3A
WCA 3B
Fort Lauderdale
Miami
Big Cypress National Preserve
Everglades National Park
Florida Bay
Key West
Change in Ecosystem over 100 Years
Generalized Boundary of the Historic Everglades Ecosystem (c. 1900)
Current Everglades System
Generalized Areas of Cattail Infestation
Generalized Area of Altered Salinities and Freshwater Inflows


N
W
E
S
Atlantic Ocean
Northern Boundary of Survey
Gulf of Mexico
Lake Okeechobee
West Palm Beach
WCA 1
WCA 2A
WCA 2B
Fort Lauderdale
Big Cypress National Preserve
WCA 3A
Miami
WCA 3B
Everglades National Park
Florida Bay
Key West
Melaleuca Control Efforts
Since 1991, more than 11 million melaleuca trees and 24 million seedlings have been killed in the Everglades Protection Area, through District efforts, supported by the Department and Florida Power & Light.
Range of Predominate Melaleuca
District Control Efforts

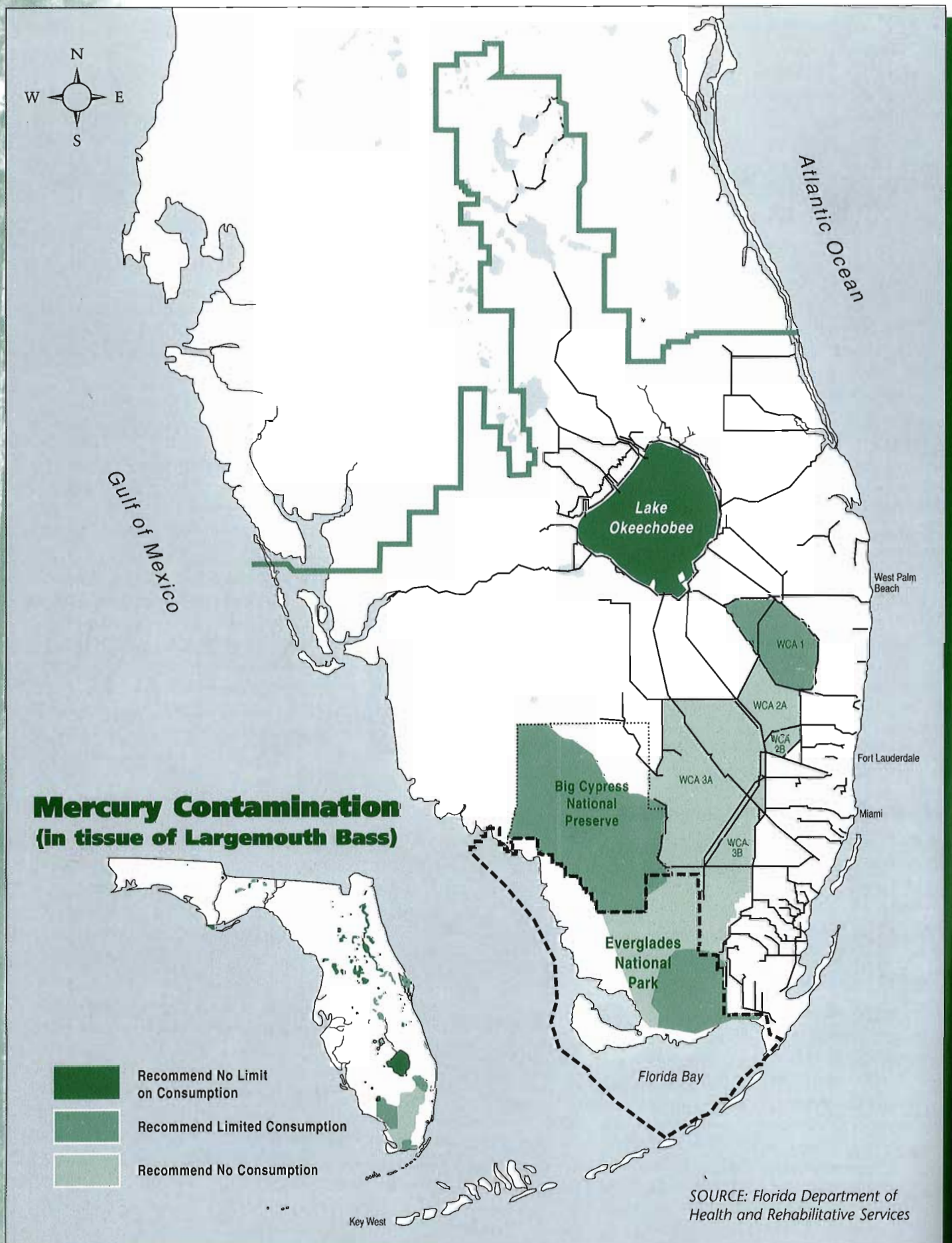




Hydrology Comparison

Shown above — a computer simulation of the "natural" system as it could have existed historically.

On the right — the managed system today. Both maps reflect water levels of 1986, an "average" rainfall year.


N
W
E
S
Atlantic Ocean
Gulf of Mexico
Lake Okeechobee
West Palm Beach
WCA 1
WCA 2A
WCA 2B
Fort Lauderdale
Big Cypress National Preserve
WCA 3A
Miami
WCA 3B
Everglades National Park
Florida Bay
Key West
Mercury Contamination
(in tissue of Largemouth Bass)
Recommend No Limit on Consumption
Recommend Limited Consumption
Recommend No Consumption
SOURCE: Florida Department of Health and Rehabilitative Services

Appendix*

Major Findings and Preliminary Implications of the Everglades Interim Report

In complying with the requirements of Section 373.4592(4)(d)5, F.S., this *Everglades Interim Report* summarizes all data and findings available as of July 1, 1998 from Everglades research and monitoring. The Report "shall be used by the Florida Department of Environmental Protection (DEP) and the District in making any decisions regarding the implementation of the Everglades Construction Project (ECP) subsequent to the completion of the interim report." Also in accordance with the direction in the Act, "the construction of STA-3/4 shall not be commenced until 90 days after the interim report has been submitted to the Governor and the Legislature".

The 1994 **Everglades Forever Act** establishes both interim and long-term water quality goals to ultimately achieve restoration and protection of the Everglades Protection Area. While the Act does not specifically designate two distinct implementation phases, it recognizes that additional measures may or may not be required to achieve compliance with long-term water quality standards. For purposes of this document the District has designated the program designed to achieve the interim goal as "**Phase 1**" and has designated the long-term program as "**Phase 2.**" Phase 1 encompasses those activities currently underway to reduce phosphorus concentrations to approximately 50 parts per billion (ppb), and includes the Everglades Construction Project and Everglades Agricultural Area Best Management Practices. The goal of Phase 2 is to combine point-source, basin-level and regional solutions in a system-wide approach to ensure that all waters discharged to the Everglades Protection Area meet water quality standards by December 31, 2006. With respect to nutrients, the Phase 2 goal is to reduce nutrient discharges to levels that do not cause an imbalance in natural populations of aquatic flora or fauna.

Major findings derived from information provided in this Interim Report are summarized below. Immediately following each set of findings are **preliminary implications** for subsequent implementation decisions, including those affecting the ECP. Most of these major findings are supported by information in more than one chapter of this Report. Chapter-specific findings are listed in the individual chapters under a separate heading.

I. Major Findings on Water Quality in the Everglades Protection Area

A. Reducing phosphorus remains a critical restoration goal.

Phosphorus levels entering the Everglades Protection Area remain a critical concern. Peer-reviewed research indicates significant changes in native Everglades flora and fauna within Water Conservation Area 2A begin to occur at average water column phosphorus concentrations between 10 and 20 parts per billion *(Chapter 3)*. The Environmental Regulatory Commission is ultimately responsible for determining if these changes constitute an imbalance.

B. Current efforts are reducing phosphorus.

Implementation of Best Management Practices, the Everglades Nutrient Removal Project and the Everglades Construction Project have reduced phosphorus in waters entering the Everglades Protection Area from the Everglades Agricultural Area, although not to the levels anticipated for Phase 2 *(Chapters 3, 4, 5 & 6)*.

Preliminary Implication 1. Further phosphorus reductions are needed. By focusing on phosphorus reduction strategies, the Everglades Construction Project is addressing the most critical water quality parameter for restoring the Everglades ecosystem. In accordance with the Everglades Forever Act and in conjunction with agricultural Best Management Practices, the Stormwater Treatment Areas (STAs) are being designed and constructed to achieve the interim target of 50 ppb. STAs and supplemental technologies are also being evaluated for their potential application to inflows from other

* *This report includes the final version of the findings and implications which were distributed in the January 1,* 1999 Everglades Interim Report.

Everglades Protection Area tributaries, such as the Western Basins and the lower East Coast.

Preliminary Implication 2. STA-3/4 is critical to achieve long-term phosphorus reduction goals. As the largest treatment area of the Everglades Construction Project, STA-3/4 is necessary to achieve both the interim phosphorus target of 50 ppb and the long-term restoration goals of the Everglades Forever Act. The design of STA-3/4 is scheduled to begin in January 1999, and the District intends to begin construction as soon as possible upon completion of design in 2001.

Preliminary Implication 3. The phosphorus water quality standard will influence Phase 2 decisions. DEP's numerical interpretation of the State's narrative standard for phosphorus will provide the basis for determining whether Phase 1 achieves compliance with water quality standards. If Phase 1 is insufficient, the revised water quality standard will influence the final design targets for Phase 2.

C. Everglades water quality generally meets standards.

With a limited number of exceptions, water quality in the Everglades Protection Area is in compliance with existing State water quality standards and numeric criteria *(Chapter 4)*.

D. Excursions from some water quality criteria do occur.

For dissolved oxygen and specific conductance, numerous excursions from State water quality criteria have occurred in the Everglades Protection Area. Infrequent excursions have occurred for a limited number of other parameters *(Chapter 4)*. Existing numeric water quality criteria for dissolved oxygen, pH and alkalinity are not always appropriate for waters of the Everglades Protection Area *(Chapter 4)*.

Preliminary Implication 4. Revised Water Quality Standards may be needed for parameters in addition to phosphorus. The DEP should consider revising the State Class III water quality criterion for dissolved oxygen to recognize cyclical fluctuations in concentrations and naturally occurring lower concentrations in marshes, such as the unimpacted Everglades. Other appropriate changes should be considered for the pH and alkalinity water quality criteria.

E. Mercury is a critical Everglades water quality concern.

Although the State Class III numeric water quality criterion for mercury has not been exceeded, mercury levels in fish from the Everglades Protection Area have impaired the use of the resource as a sport fishery and represent a potential threat to fish-eating wildlife *(Chapter 7)*.

Preliminary Implication 5. Revised Water Quality Criterion is needed for mercury. The DEP should consider revising the State Class III numeric water quality criterion for mercury. The current criterion has not ensured the protection of all present and future uses of the resource or the propagation of healthy, well-balanced populations of fish and wildlife.

F. Stormwater is a relatively small source of mercury.

Atmospheric deposition represents more than 95% of new mercury delivered to the Everglades Protection Area each year. Stormwater runoff from the Everglades Agricultural Area is not a significant source of new mercury to the Everglades as a whole, but may make a significant contribution to areas immediately downstream of District structures *(Chapter 7)*.

Preliminary Implication 6. More information on mercury is needed. Mercury monitoring and research programs should continue among federal, State and local agencies and other organizations to further identify atmospheric sources, better understand processes influencing bioaccumulation in fish and track the response of the ecosystem to any reductions in local air emissions. Resolving the mercury problem in the Everglades will require an evaluation of local and background sources of mercury in atmospheric deposition, and an examination of the potential to control factors affecting mercury accumulation in the food web.

Preliminary Implication 7. The Everglades Construction Project is unlikely to increase mercury risks. Based on three years of Everglades Nutrient Removal Project data, the STAs are anticipated to reduce mercury loads in treated stormwater by 50 to 75%. This reduction should benefit areas immediately downstream of District structures in the northern Everglades. In addition, based upon an ecological risk analysis, the STA's are unlikely to cause or contribute to a new mercury problem by changing downstream water quality or quantity.

II. Major Findings on the Ecological Needs of the Everglades Protection Area

A. Phosphorus has major impacts on Everglades flora and fauna.

Excess phosphorus in runoff, altered hydrology and reduction in the original size of Everglades marshes have adversely affected the ecology of the Everglades Protection Area. Phosphorus has been shown to be the primary nutrient limiting productivity in the Everglades and is a major determinant of the ecological structure and function of the system *(Chapter 3)*. Stormwater runoff has increased phosphorus availability in soil and

water, leading to altered habitats and associated changes in wildlife abundance. Effects of excess phosphorus have been documented on a wide range of biological communities, including periphyton (attached algae) and emergent aquatic plants (Chapters 2 & 3). Since plant communities form the basis of Everglades food webs and habitat structure, phosphorus impacts to vegetation will have major consequences for ecosystem functions and values (Chapters 2 & 3).

B. Phosphorus research provides a foundation for rulemaking.

State, federal and other research activities are underway to provide the information needed to establish a numeric criterion for phosphorus in the waters of the Everglades Protection Area (Chapters 2 & 3). Phosphorus threshold studies in Water Conservation Area 2A indicate that shifts in algal species begin to occur at about 10 ppb and other ecological changes are evident between 10 and 20 ppb. Cattails can outcompete other natural vegetation over time under enriched phosphorus conditions. Sufficient data to establish a numeric interpretation of the phosphorus criterion for Water Conservation Areas 1 and 2A, and Everglades National Park should be available by Act deadlines. Establishment of a numeric phosphorus standard for Water Conservation Area 3A may require using data from other areas of the Everglades Protection Area unless site-specific information becomes available. Chapter 12 summarizes the sequence of steps needed to achieve compliance with water quality standards by 2006, including the numeric interpretation of the phosphorus criterion.

C. Models predict impacts of phosphorus discharges on the Everglades.

At this time, numeric relationships between the phosphorus in waters discharged to the Everglades Protection Area and the resulting phosphorus levels in the Everglades Protection Area have not been established by the DEP, as required by the Act. However, the Everglades Water Quality Model, which predicts the impact of phosphorus discharges on Everglades water quality, has been developed by the District to assist DEP in this effort (Chapter 3).

Preliminary Implication 1. Establishing discharge limits is vital to Phase 2 decisions. The relationship between phosphorus discharges to the Everglades Protection Area and resulting phosphorus levels in the Everglades needs to be defined prior to determining the optimal mix of solutions for Phase 2. Final plans for implementing Phase 2 solutions must be completed by December 31, 2003, and this relationship should be established as soon as possible to allow sufficient time for planning, design and construction.

Preliminary Implication 2. Phosphorus compliance methodology will influence Phase 2 decisions. The method of measuring compliance with the numeric phosphorus criterion remains to be determined. Evaluating compliance requires not only the establishment of a numeric criterion, but also an understanding of relationships between water discharged to the Everglades Protection Area and the resulting water quality. Concurrent with finalizing the compliance methodology, basin-specific discharge limits for phosphorus can be developed. Until this compliance methodology is developed, the District will continue to use 10 ppb in the Phase 2 planning documents that will be developed no later than December 31, 2003. If the final discharge limits are significantly different from 10 ppb, the optimal Phase 2 solutions may be altered, which could result in significant cost and other differences.

D. Everglades recovery will not be immediate.

Modeling results suggest that cattail in Water Conservation Area 2A may continue to expand for some time after implementation of the Everglades Construction Project because of phosphorus stored in soils. However, phosphorus reductions through the Everglades Construction Project will ultimately facilitate long-term restoration of impacted areas (Chapters 2 & 3).

Preliminary Implication 3. Active management of cattail could accelerate recovery. Research should be conducted to determine the time necessary for the Everglades Protection Area to recover, and management options to accelerate that recovery should be explored. Research is required to identify management practices that can reduce cattail expansion by reducing vegetation (e.g., controlled burning, herbicides, etc.), by creating hydrologic patterns that favor desirable vegetation and by reducing phosphorus availability in contaminated sediments.

Preliminary Implication 4. Post-project tracking is needed. After implementing Phase 1 and 2 of the Everglades Program, long-term monitoring of water quality and ecosystem status in the Everglades Protection Area must be conducted to document the effects of phosphorus reductions.

III. Major Findings on the Hydrological Needs of the Everglades Protection Area

A. Improving Everglades hydrology remains a critical restoration goal.

The hydrology of the Everglades Protection Area has been altered fundamentally in quantity, timing, depth and duration (Chapter 2).

B. Increased water volumes and revised distribution of inflows are needed to reestablish natural patterns.

Performance measures for system hydrology have been established in the C&SF Restudy using the Natural Systems Model *(Chapters 2 & 10)*. The alternative presently recommended by the Restudy shows a 19% increase in the volume of water directed to the Everglades compared to the 1979 to 1988 base period.

C. The present design of Everglades Construction Project will help to reestablish natural patterns in the Everglades.

The Everglades Construction Project has been designed to restore more natural quantity, timing, depth and duration for water in the Everglades Protection Area *(Chapters 2 & 10)*.

Preliminary Implication 1. The Everglades Forever Act hydropattern restoration concept is appropriate. Based on current information, the present design for hydropattern restoration in the Everglades Protection Area appears to be appropriate. Information from the C&SF Restudy and Lower East Coast Water Supply Plan can be used to refine the discharge locations and volumes from STA-3/4. In addition, adaptive management (monitoring and refinement) should be used when re-wetting Everglades soils that have been excessively dried out.

Preliminary Implication 2. The Act hydropattern goals will be re-evaluated. In concert with the Restudy, Phase 2 of Everglades Construction Project implementation should be designed to achieve the hydrologic performance targets of the Everglades Protection Area; accordingly, the target of 28% increase in flows to the Everglades mentioned in the Act may need to be refined.

IV. Major Findings on Everglades Agricultural Area, Best Management Practices

A. Best Management Practices have reduced phosphorus loads.

Implementation of Best Management Practices within the Everglades Agricultural Area has resulted in phosphorus load reductions that have surpassed the load reduction targets in the Act. The cumulative load of total phosphorus discharged from the Everglades Agricultural Area over the last three years was 55% lower than the load that would have occurred without BMPs (based on calculations considering hydrologic variability) *(Chapter 5)*.

B Existing BMPs may produce further phosphorus reductions.

Through continuing research, monitoring and refinement of Best Management Practices, further sustainable reductions in phosphorus load and concentration from the Everglades Agricultural Area are probable (Chapter 5). Information gained from the Best Management Practices Program in the Everglades Agricultural Area is being considered for application to other tributaries that discharge into the Everglades Protection Area *(Chapters 11 & 12)*.

Preliminary Implication 1. Refined BMPs may play a more important role in the final mix of STAs, supplemental technologies and BMPs used to achieve compliance with water quality standards than was apparent when the Act was developed in 1994. If proven cost-effective, additional BMPs could be implemented to reduce the overall costs and scale of Phase 2 of the Everglades Construction Project.

V. Major Findings on the Performance of Stormwater Treatment Areas

A. The Everglades Nutrient Removal Project has been highly effective at removing phosphorus.

The Everglades Nutrient Removal Project is exceeding its performance objectives in terms of phosphorus concentration and load reduction. During the first four years of operation, the Project outflow concentrations have averaged 22 ppb and load reductions have exceeded 82% *(Chapters 4 & 6)*. Also, all weekly phosphorus measurements (with one exception) at the outflow of STA-6 were below the required 50 ppb interim project goal during the first seven months of operation *(Chapter 6)*. These reductions in phosphorus loading have occurred during the early stages of Stormwater Treatment Area operation, and they may not be representative of future long-term performance.

Preliminary Implication 1. The Everglades Nutrient Removal Project performance supports Everglades Construction Project assumptions. Evidence to date supports the basic assumptions and design parameters used in planning the STAs, and they are expected to achieve the goals of the Act. The design and construction of STA-3/4 and STA 1 East should continue to utilize the basic assumptions and design parameters for phosphorus removal as contemplated in the 1994 Act.

VI. Major Findings on Supplemental Technology Research

A. Supplemental technology research continues.

Eight projects are underway to identify supplemental technologies that can be used in combination with STAs and BMPs to reduce stormwater phosphorus concentrations to comply with State water quality standards. Candidate technologies include chemical and wetland treatment systems. The research projects on supplemental technologies will be completed by June 2001, at a cost of approximately 10 million dollars *(Chapter 8).*

B. Supplemental technologies may have local and regional applications.

Some of the supplemental technologies that are being examined for use in conjunction with Stormwater Treatment Areas may have potential for treatment of on-farm hot-spots, as well as other regional applications *(Chapter 8).*

Preliminary Implication 1. Completion of supplemental technology research is needed for Phase 2 decisions. The ultimate Phase 2 solution will be a combination of STAs augmented by enhanced Best Management Practices, supplemental technologies as needed and/or additional regulatory programs to achieve and maintain compliance with long-term water quality standards. Completion of supplemental technology research is in the critical path for determining and implementing Phase 2 solutions by December 31, 2006. Completion of this research before the December 31, 2001, deadline may be difficult because biological research inherently requires one or more growing seasons to evaluate performance. The District may be required to make recommendations on Phase 2 based on incomplete science and engineering information, which carries associated environmental and economic risks *(see Chapter 12).*

Preliminary Implication 2. Supplemental technology may not be available for incorporation into STA-3/4. Since STA-3/4 must be completed by October 1, 2003, final design is anticipated to begin in January 1999, and construction is scheduled to begin in 2001. Since the results from supplemental technologies, BMPs and STA research will likely not be available until the end of 2001, and no funding has been appropriated, it appears unlikely that Phase 2 technologies will be included in the initial design of STA-3/ 4.

C. Initial estimates of supplemental technology costs may have been underestimated.

The preliminary cost estimates for supplemental technologies from a 1996 report appear to be unrealistically low. These initial cost estimates were based on a literature search and not on tests with the actual waters to be treated. Current research with chemical treatment of local agricultural stormwater suggests that actual costs may be upwards of 150% higher than initial estimates. Revised costs for all of the supplemental technologies under investigation will be available upon completion of each of the supplemental technology demonstration projects *(Chapter 8).*

VII. Major Findings on the Lower East Coast Water Supply Plan

A. The interim LEC Water Supply Plan identifies critical projects.

The Interim LEC Plan (March, 1997 draft) identifies a program of improvements that can proceed in a short time frame and without Federal cost-sharing. Most note-worthy for the Everglades Protection Area are establishment of minimum flows and levels, and the development of rainfall-driven operation schedules for the Water Conservation Areas *(Chapter 9).*

B. The final LEC Water Supply Plan will be influenced by the Restudy.

The LEC Plan is deemed an interim plan and will be coordinated with the C&SF Restudy's recommended program as approved at the State and federal level. A final LEC Plan will be completed by April 2000 *(Chapter 9).*

Preliminary Implication 1. The LEC Water Supply Plan could impact Phase 2 decisions. Information available at this time supports continuation of the current design of the Everglades Construction Project. District staff will continue to synchronize the LEC Water Supply Plan with Phase 2 implementation, as appropriate.

VIII. Major Findings on the C&SF Restudy

A. The Restudy is a significantly larger project than the Everglades Construction Project.

The Restudy is an interagency effort with a significantly larger geographic scale than the Everglades Construction Project (18,000 sq. mi.). The Restudy also uses a different planning timeframe (2050) than the Everglades Construction Project (2006) *(Chapters 10 & 12).* The current planning level cost estimate for implementing the Restudy is approximately $7.8 billion *(Chapter 10).*

B. Continued implementation of the Restudy depends upon the federal government authorization.

A recommended plan for the Restudy which includes a component for a sustainable Everglades ecosystem is scheduled to be delivered to Congress in July 1999 *(Chapter 10)*.

Preliminary Implication 1. Restudy implementation will remain synchronized with the LEC Water Supply Plan and the Everglades Construction Project. Information available at this time supports continuation of the current design of the ECP. Restudy staff will continue to synchronize the Restudy with the LEC Water Supply Plan and the Everglades Construction Project.

Preliminary Implication 2. Restudy results are not available in time to be incorporated into Phase 1 of the Everglades Construction Project. Interim and final results from the Restudy may be integrated into STA-3/4 design and Phase 2 implementation activities subject to funding and timing constraints. However, if STA-3/4 is to be completed in accordance with existing schedules, design and construction cannot be delayed until after the State and federal approval and appropriation process is completed for the Restudy.

IX. Major Findings on the Everglades Stormwater Program

A. The Everglades Stormwater Program identified schedules and strategies for complying with water quality standards to the maximum extent practicable.

In April 1998 DEP issued a permit (called the Non-ECP permit) to the District authorizing continued operation of the structures that a) were within the District's control, b) discharged waters into, within or from the Everglades Protection Area, and c) were not included in the Everglades Construction Project. This Non-ECP Permit requires the District to adhere to schedules and strategies for achieving and maintaining water quality standards to the maximum extent practicable *(Chapter 11)*. The permit, which was upheld by Florida's Third District Court of Appeals, is being administered by the District's Everglades Stormwater Program.

B. The Everglades Stormwater Program monitors and improves water quality in regions not affected by the Everglades Construction Project.

The District's Everglades Stormwater Program *(Chapter 11)* includes a comprehensive monitoring program that will measure the progress of the programs contained in the permit towards achieving water quality standards. Monitoring results will be included in the annual Regulatory Action Report as required in Specific Condition #8 of the Non-ECP permit.

C. The Non-ECP permit also authorizes a Regulatory Action Strategy.

This strategy will apply to all basins discharging into the Everglades Protection Area that are not addressed by the Everglades Construction Project. The Regulatory Action Strategy consists of a ten-step approach to: a) determine areas of water quality concerns within each contributing drainage basin; b) identify potential sources of those concerns; and c) propose corrective actions where needed. *(Chapter 11)*.

Preliminary Implication 1. The success of the Everglades Stormwater Program is linked to ongoing research efforts. The District's ongoing research programs, including supplemental technology and BMP research, may assist the Everglades Stormwater Program efforts to achieve compliance with water quality standards by December 31, 2006 for all structures discharging into the Everglades.

X. Major Findings on the Integrated Plan to Achieve Water Quality Goals by December 2006

A. The long-term water quality goal of the Everglades restoration is compliance with all water quality standards by December 31, 2006.

The long-term water quality goal of the Everglades restoration program is to combine point-source, basin-level and regional solutions in a system-wide approach to ensure that all waters discharged to the Everglades Protection Area meet water quality goals by December 31, 2006 *(Chapter 12)*. Concurrent with the implementation of Phase 1, the District and other groups are conducting research related to water quality *(Chapters 2–8)*, ecosystem-wide planning *(Chapters 9 & 10)*, and regulatory programs *(Chapters 5 & 11)* to ensure a sound foundation for science- based decision-making for Phase 2 *(Chapter 12)*.

B. Long-term solutions require the synthesis of many activities.

A tremendous amount of research, data analyses, rule-making, planning and basin-specific evaluations must be completed and integrated in a relatively short time to enable the design, land acquisition, permitting and construction of Phase 2 solutions by December 31, 2006. At least eighteen (18) activities, some in parallel, some in sequence, must be completed in a timely

manner in order to determine, fund and implement the optimal combination of enhanced BMPs, STAs, supplemental technologies and/or additional regulatory programs by December 31, 2006 *(Chapters 11 & 12)*.

C. The Everglades Forever Act establishes interim steps to achieve long-term restoration goals.

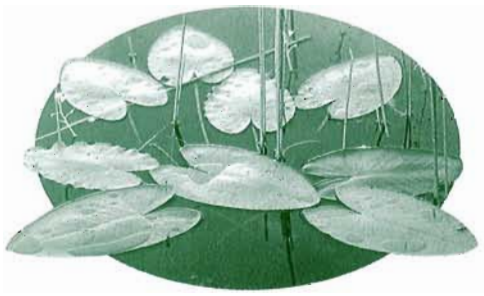
The Act requires implementation of additional measures to achieve and maintain compliance with water quality standards by December 31, 2006. The Act also requires submittal of a plan by December 31, 2003 of proposed changes to the Everglades Construction Project designed to achieve Phase 2 solutions *(Chapter 12)*. In contrast with the Act requirements, the Corps of Engineers construction permit for the Everglades Construction Project requires submittal, by January 1, 1999, of a preliminary draft strategy for achieving compliance with State water quality standards by December 31, 2006. A draft and final strategy is due by January 1, 2000, and January 1, 2001, respectively. Finally, the Corps permit for the Everglades Construction Project requires that best efforts be made in implementing additional water quality measures for STA-2 within four years of first discharge. This date is more than 3 years before deadline in the Act *(Chapter 12)*.

Preliminary Implication 1. Restoration timelines are aggressive and ambitious. Considering the number and complexities of research, regulatory and potential construction activities required to achieve the long-term water quality goals, the December 31, 2006 time frame established by the Everglades Forever Act is very ambitious. Delays in the timely completion of these activities, many of which are outside the control of the District, may result in unintended delays of the long-term water quality objectives of the Everglades, despite the best efforts of the District. The District may be required to make recommendations on Phase 2 based on incomplete science and engineering information, which carries associated environmental and economic risks.

Preliminary Implication 2. The Long Term Compliance Permit(s) must provide more detail on efforts needed to comply with water quality standards. The Non-ECP permit and the Everglades Construction Project permits will be modified in 2003, when the District must submit detailed plans to achieve compliance with all water quality standards in the Everglades Protection Area by December 31, 2006.

Preliminary Implication 3. No funding is available for Phase 2. To date, no funding for Phase 2 design, acquisition, construction or operation has been identified. Funding must be identified by December 31, 2003 as part of the long-term compliance permit requirements.

Preliminary Implication 4. Corps' 404 permit conditions are more ambitious than the EFA. The District is making a concerted effort to comply with the Corps permit condition that accelerates timeframes in the Everglades Forever Act. Potential obstacles include insufficient information on: water quality criteria, STA optimization, BMP enhancements, supplemental technologies, and hydrologic needs of the Everglades; lack of funding; and insufficient time for design, acquisition, permitting, construction and operation of additional measures.



South Florida Water Management District

3301 Gun Club Road • West Palm Beach, FL 33406-3089
Mailing Address: P.O. Box 24680
West Palm Beach, FL 33416-4680
(561) 686-8800 • FL WATS 1-800-432-2045
www.sfwmd.gov