

EVERGLADES
1994 Annual Report



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

1994 Everglades Annual Report

Florida's Everglades is the largest subtropical wetland in the United States and a unique resource for south Florida. Everglades National Park, established in 1947, is designated an International Biosphere Reserve, an Outstanding Florida Water, and a United Nations World Heritage Site. The Arthur R. Marshall Loxahatchee National Wildlife Refuge, established in 1951, is designated an Outstanding Florida Water and as Critical Habitat for the endangered Snail Kite. The "River of Grass" contains a diversity of plants and wildlife not found anywhere else in the United States.

For more than a century, man altered the ecosystem to provide for the development of a growing population and to protect against deadly hurricanes and droughts. In fact, due to water management efforts supported by citizens, the state, and federal government, Florida today has one of the most robust economies in the nation. In the last 25 years, however, a greater appreciation of 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 as a result of 100 years of change — challenges that are being addressed through innovative and cooperative programs. Phosphorus-enriched agricultural stormwater runoff is upsetting the ecosystem's delicate natural balance. Changes in the quantity, distribution and timing of freshwater; infestation of non-native plants; and mercury contamination are other threats. Florida Bay — at the southern end of the system — is experiencing algal blooms, seagrass

die-offs, decreased populations of sea animals, and increased salinity levels.

The Everglades Forever Act passed by the Florida Legislature in 1994 outlines hallmark programs to restore significant portions of the Everglades and improve freshwater flows to Florida Bay. This annual progress report covers efforts toward these goals for the past year ending Sept. 30, 1994. It 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, and the Florida Department of Environmental Protection.

The South Florida Water Management District developed this report in coordination with the following federal and state agencies: Arthur R. Marshall Loxahatchee National Wildlife Refuge, Everglades National Park, South Florida Ecosystem Restoration Task Force, United States Army Corps of Engineers and Florida Department of Environmental Protection.



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Cover Photo: Great Blue Heron, Everglades National Park (Photo by Gene Li)



Abbreviations

Act	_____	1994 Everglades Forever Act
Department	_____	Florida Department of Environmental Protection
District	_____	South Florida Water Management District
Loxahatchee Refuge	_____	Arthur R. Marshall Loxahatchee National Wildlife Refuge
Park	_____	Everglades National Park
BMP	_____	Best Management Practice
C&SF	_____	Central and Southern Florida Project
EAA	_____	Everglades Agricultural Area
ENR	_____	Everglades Nutrient Removal Project
STA	_____	Stormwater Treatment Area
USEPA	_____	United States Environmental Protection Agency



FLORIDA'S EVERGLADES FOREVER Act sets into action a plan to restore a significant portion of the remaining Everglades ecosystem through a program of construction projects, research and regulation. Its general goal is to implement comprehensive and innovative solutions to issues of water quality, water quantity, hydropattern, and the

The Act calls on numerous state and federal agencies to coordinate efforts to carry out the Everglades Program. The majority of the work is the responsibility of the South Florida Water Management District, which is taking the leadership role in the overall implementation of the Act. The Florida Department of Envi-

ronmental Protection is extensively involved in the program and is jointly responsible for more than half of the projects.

EVERGLADES PROGRAM MANAGEMENT

In April, the District's Everglades Program Office was created to initiate District-wide management and coordination of the implementation of the Act. Presently, the District is evaluating the most effective agency organization to ensure implementation success. Within the Department, the Office of Water Policy will coordinate the agency's implementation of the Everglades Program. The mission of the Everglades Program management will entail the following:

- ▼ Develop and implement a comprehensive and consistent management system for facilitating the implementation of the Everglades Program.
- ▼ Provide program-level coordination to support management and staff within the participating agencies, their governing bodies, and other governmental agencies.

COORDINATION

Successful implementation of the Everglades Program will depend heavily on effective coordination within and among participating agencies. District staff members are establishing coordination and communications protocol with the United States Army Corps of Engineers, United States Fish and Wildlife Service, Florida Department of Transportation, and numerous other agencies. Since April 1994, the Everglades Program Office has held interagency workshops to aid in the development of a comprehensive and consistent plan to implement the Everglades Program.

Introduction

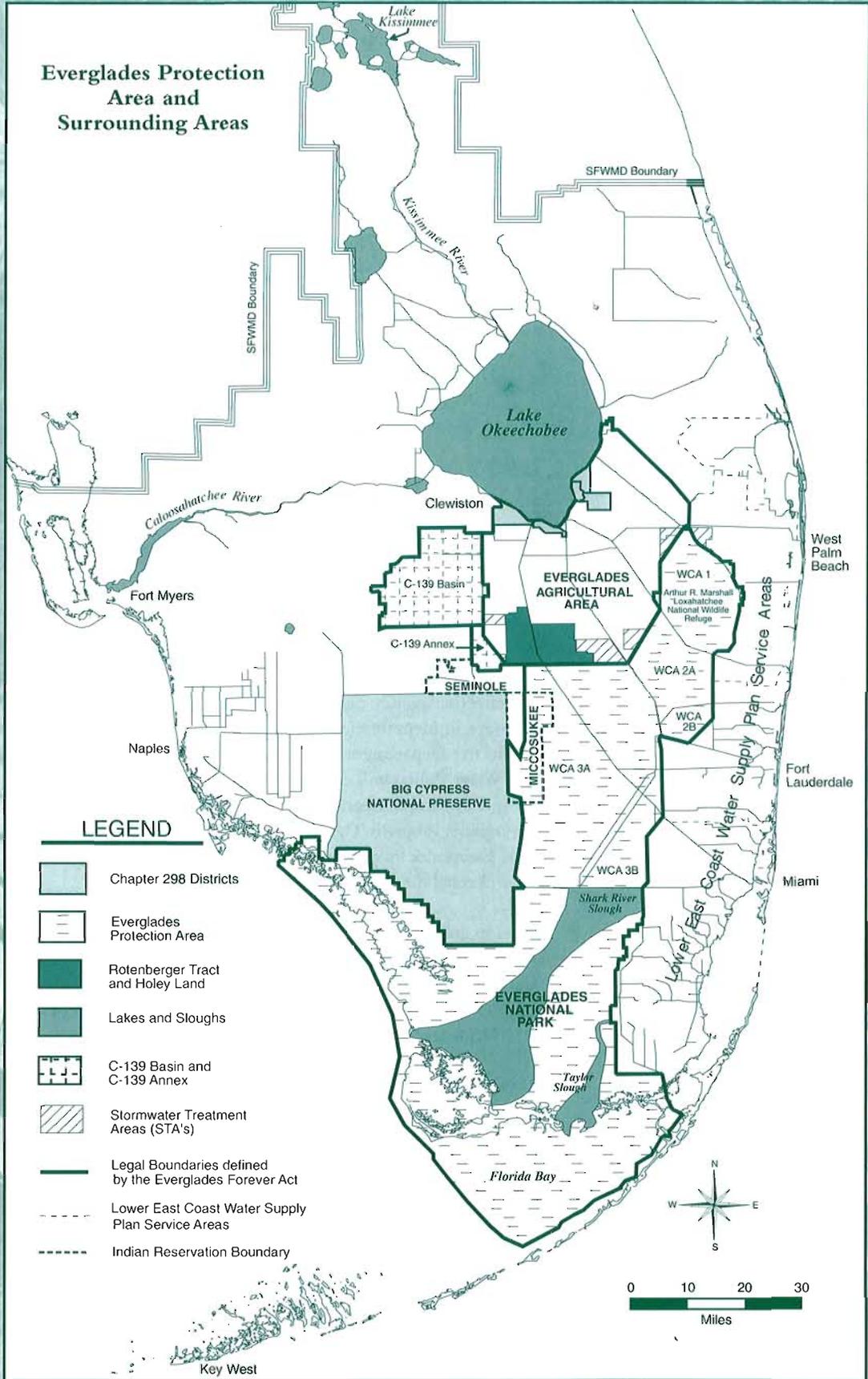
invasion of exotic species which face the ecosystem. The overall restoration and cleanup effort described in the Act is known as the "Everglades Program."

EVERGLADES PROTECTION AREA

The area identified for restoration in the Act is comprised of Water Conservation Areas 1, 2A, 2B, 3A and 3B in western Palm Beach, Broward and Dade counties, the Arthur R. Marshall Loxahatchee National Wildlife Refuge, and Everglades National Park. This region is known as the "Everglades Protection Area" in the legislation.

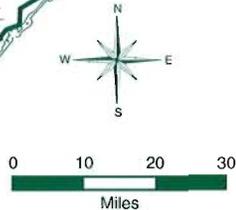
Florida's Everglades Forever Act sets into action a plan to restore a significant portion of the remaining Everglades ecosystem through a program of construction projects, research and regulation.

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



Key West

Successful
Implementation of the
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participating agencies.

The District continues to keep local governments and the public apprised of Everglades restoration. Staff members routinely meet with local government officials and citizen groups; publications and news

releases are distributed to citizens and the news media; and Everglades issues are discussed at nearly all Governing Board meetings. In a special effort to inform the public about the fiscal year 1994-95 budget — which included Everglades programs — seven public forums were held in August and September throughout the District's 16-county region to explain the proposed budget, which was subsequently adopted in late September.

EVERGLADES PROGRAM ORGANIZATION

Fifty-five projects have been delineated from the Act, grouped into eight program elements. In September 1994, the District and Department jointly released the draft *Everglades Program Implementation: Program Management Plan* outlining objectives, activities and estimated completion dates for each of the 55 projects. This document was widely circulated for state and federal review in the fall

and has been very favorably received. It is expected to be updated annually. The federal government is preparing a companion document through its South Florida Ecosystem Restoration Task Force to detail responsibilities of the federal agencies. This annual progress report provides a very general overview of the program for the past fiscal year ending Sept. 30, 1994.



THIS PAST YEAR COULD BE CONSIDERED a turning point in the effort to restore the Everglades, with state and federal initiatives occurring on parallel tracks. A few of the more prominent efforts follow:

On the national level, a task force established in 1993 to coordinate federal ecosystem management programs released a draft

report in 1994 through a working group. The South Florida Ecosystem Restoration Task Force is comprised of assistant secretaries of the federal departments which have a hand in managing the Everglades: Interior, Commerce, Army, Justice, Agriculture, and the Environmental Protection Agency. The Task Force established the Florida Working Group which is composed of 11 Florida-based agency heads. The Working Group released a draft integrated report in August. The report makes recommendations for improving federal efforts toward ecosystem restoration in the Everglades. Another key federal effort is the Central and Southern Florida Project review study, which is an examination of south Florida's massive "plumbing system" to see where improvements can be made to benefit the environment and other water users. The Corps of Engineers is

overseeing this major initiative anticipated to take many years, and was expected to release a reconnaissance report in November, 1994. On the state level, in March 1994 the Governor's Commission for a Sustainable South Florida was created to recommend ways in which the south Florida ecosystem, including the Everglades, and a healthy south Florida economy can co-exist and be mutually supportive. In May, Governor Chiles signed the landmark Everglades Forever Act into law, which outlines long-range plans to restore

significant portions of the Everglades ecosystem and improve freshwater flows to Florida Bay.

Perhaps one of the most important achievements of 1994 was the spirit of cooperation shown by District, state and federal governments. Two Project Cooperation Agreements for greater Everglades ecosystem restoration were signed: one for Kissimmee River restoration at the headwaters of the ecosystem, and another for modified water deliveries to the Park and Florida Bay at the southernmost tip. To implement the Everglades Forever Act, the District and Department have worked together intensively since the signing ceremony at Everglades National Park to develop a joint program management plan.

While many complex and parallel efforts are occurring simultaneously for Everglades restoration, this report deals specifically with the Everglades Forever Act. A number of components of the Act, however, will dovetail with other state and federal initiatives. A few accomplishments regarding imple-

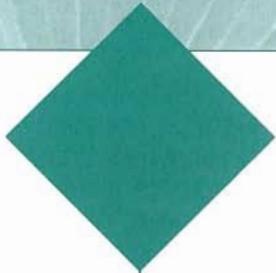
mentation of the Act in 1994 are highlighted, with more detail provided in the following pages:

- ▼ The District and Department jointly developed and issued the draft *Everglades Program Implementation: Program Management Plan*;
- ▼ The nearly 4,000-acre Everglades Nutrient Removal Project — the largest constructed wetland of its kind in the world today — began operation;
- ▼ Conceptual design of the Everglades Construction Project was completed and preliminary design initiated;
- ▼ The District closed on the purchase of four parcels in STA 3/4 totaling approximately 10,000 acres, and completed negotiations for a 280-acre parcel in STA 1-East;
- ▼ The District, Department, South Florida Ecosystem Restoration Task Force Working Group, and Corps of Engineers began discussions to define federal participation in the Everglades Construction Project;
- ▼ The Florida Ecosystem Restoration Working Group released its draft 1994 annual report. Together, this document and the *Everglades Program Implementation: Program Management Plan* represent the beginning of a detailed state and federal coordinated strategy to implement the Everglades Program;

1994 Highlights

- ▼ Everglades Agricultural Area growers continued to implement on-farm Best Management Practices, with water quality monitoring from May 1, 1992 to April 30, 1993 showing a 44 percent reduction in total phosphorus from the EAA, compared with the 1978-88 baseline period;
- ▼ Rulemaking procedures to quantify the amount of make-up water needed for EAA Best Management Practices were initiated;
- ▼ Rule development was initiated for a regulatory program for the C-139 Basin;
- ▼ Rule development was initiated to define interim minimum flows and levels for most of the Everglades Protection Area;
- ▼ The federal government was formally requested to reevaluate Lake Okeechobee's regulation schedule to facilitate the Everglades Protection Area hydropattern restoration;
- ▼ Research was initiated to determine the Everglades phosphorus and other nutrient threshold levels;
- ▼ The District submitted permit applications for the Everglades Construction Project and non-Everglades Construction Project structures to the state for the Everglades Program, as required by the Act;
- ▼ The District funded the construction of a tower in the Everglades Nutrient Removal Project to sample for atmospheric deposition of mercury, and continued to support other state and federal efforts to identify the source of this element;
- ▼ The second edition of a statewide melaleuca management plan was released;
- ▼ Tax rolls were approved for the agricultural privilege tax for EAA and C-139 basin landowners;
- ▼ The District developed an accounting system to separately track all expenses directly related to Act implementation;
- ▼ The District, Corps of Engineers and Park began analyzing technical changes to increase the quantities of water flowing into Taylor Slough and Florida Bay to up to 800 cubic feet per second;
- ▼ The District and Florida Department of Transportation began discussions with the federal government to obtain **Alligator Alley toll revenues** for projects described in the Act;
- ▼ Efforts to acquire 1,843 acres of land in southern Dade County for Taylor Slough and Florida Bay restoration were initiated;
- ▼ The 10,450-acre area comprised of the Frog Pond and L-31 End Transition Lands (Rocky Glades) was added to the state Conservation and Recreation Lands Program as part of the East Everglades CARL Project;
- ▼ The District and Corps of Engineers signed a Project Cooperation Agreement for the Modified Water Deliveries Project to provide a more natural water delivery system to the Park;
- ▼ The District, Corps and Park completed the design of modifications to the C-111 basin to restore natural hydrologic conditions in Taylor Slough and Florida Bay, with the C-111 GRR approved in July 1994; and
- ▼ The District submitted a permit application to the Corps for construction of the Everglades Construction Project, under section 404 of the Clean Water Act.





Program Elements

▼▼▼▼▼ **Everglades Construction Project**

The cornerstone of the Act is the development of six huge constructed wetlands, identified in the legislation as “Stormwater Treatment Areas,” or STAs. These STAs

are strategically placed between the Everglades and agricultural fields to reduce phosphorus and other nutrients in agricultural stormwater runoff before discharge to the ecosystem. The STAs will act in combination with on-farm Best Management

Practices to begin to reduce nutrients to an amount that will not harm the Everglades. The STAs — along with structural modifications to the District’s canal system — will also be used to improve the timing and flow of freshwater to the Everglades Protection Area.

Known as the “Everglades Construction Project,” this portion of the Act will work in concert with other program elements to provide a sound basis for the state’s long-term cleanup and restoration objectives for the ecosystem. Taking a decade to design and construct, the Everglades Construction Project will become one of the nation’s largest public works projects for environmental restoration.

STORMWATER TREATMENT AREAS

These large-scale wetland treatment systems will remove phosphorus and other nutrients through natural biological processes. Agricultural runoff is entering the Everglades untreated and is upsetting the ecosystem’s natural balance. Proliferation of cattail, displacing native flora and fauna, is one visible symptom of this problem. In combination with BMPs, the wetland treatment systems will reduce phosphorus and other nutrients in water entering the Everglades. The STAs were originally described in earlier cleanup plans proposed for the Everglades, and were selected by the Florida Legislature as the preferred cleanup method outlined in the Act.

Constructed wetlands have been in use around the world for more than 20 years to treat wastewater, but have never been built on a scale this large. The six STAs described in the Act have an effective treatment area of 40,473 acres, treating runoff from a total tributary area of 769,479 acres.

Stormwater runoff from the two agricultural basins contributing the greatest amount of phosphorus to the Everglades will be treated in the STAs: the Everglades Agricultural Area and C-139 Basin. The EAA is the site of extensive sugar cane and vegetable farming, and produces about 45 percent of the phosphorus load discharged to the Everglades. The C-139 Basin in Hendry County contributes about 7 percent of the phosphorus through cattle-grazing and citrus operations. Minor amounts of urban runoff also will

be treated in the STAs. Other benefits provided by the STAs include improved water supply and hydro-pattern for the Everglades, reduction of harmful freshwater discharges to coastal estuaries, flood control benefits for urban Palm Beach County, and water supply benefits for urban and agricultural uses.

The constructed wetlands range in effective size from 812 to 16,480 acres. They will be built on former EAA farmland that must be purchased or is already in public ownership. The 4,720-acre Brown's Farm Wildlife Management Area and a very small portion of Loxahatchee Refuge are the only publicly-owned areas which remain in relatively natural condition to be used for the STAs, and these will be mitigated on a 2:1 basis. In this case, mitigation will involve the purchase of similar relatively pristine lands elsewhere in exchange for the use of the natural areas.

Development of the STAs involves land acquisition, design, construction and modification of structural components, establishment of wetland vegetation, and installation of scientific research and monitoring equipment. The District is currently conducting preliminary design of the Everglades Construction Project, a process scheduled for completion in mid-1995. At that time, detailed design will begin. The STAs will be completed on a staggered basis between 1997 and 2005 as legislated by the Act, and will begin discharging treated water to the Everglades after an initial start-up phase. The District and Department are committed to completing all six STAs on schedule as required by the Act.

The STAs, in combination with the BMPs, will reduce phosphorus inflows from the EAA to the Everglades Protection Area to an average concentration of 50 ppb. The Act requires research and monitoring take place to determine the phosphorus amount which will not cause an imbalance in the Everglades flora and fauna.

Taking a decade to design and construct, the Everglades Construction Project will become one of the nation's largest public works projects for environmental restoration.

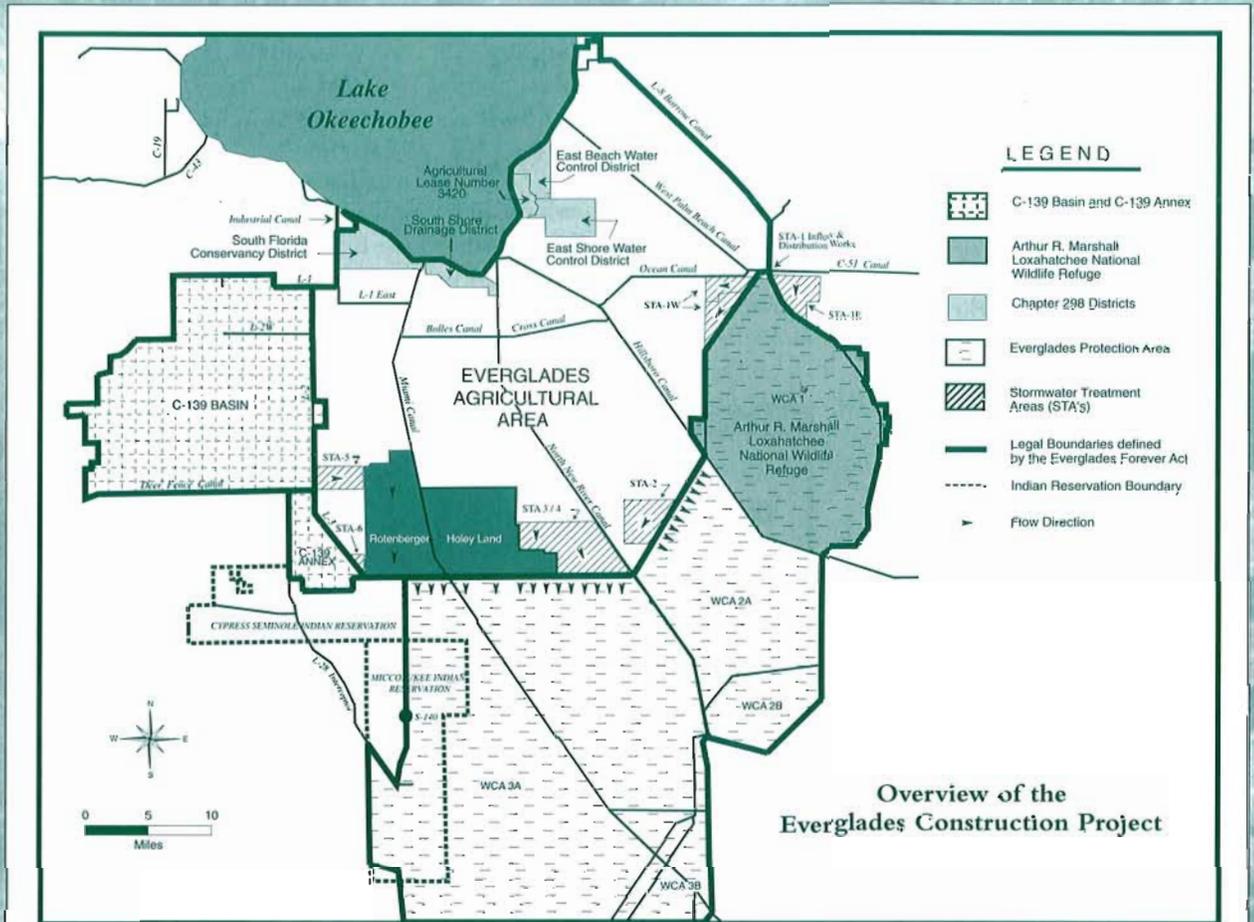
Should this numeric standard be lower than 50 ppb, research will identify refinements to the STAs and BMPs or additional technologies to meet these water quality standards. Should no standard be adopted, the phosphorus level for waters entering the Everglades Protection Area will become 10 ppb, according to the Act.

Everglades Nutrient Removal Project

The District began operation of a prototype STA late this summer. Encompassing nearly 4,000 acres of former agricultural fields, the Everglades Nutrient Removal Project is presently the world's largest constructed wetland designed to treat stormwater runoff. The project will serve the dual purpose of starting the phosphorus-removal process, and providing design, operation and management experience to be applied to the larger STAs. When fully operational, the ENR Project should remove up to 75 percent of the phosphorus present in EAA runoff diverted through the project, with a long-term average phosphorus concentration in the effluent entering the Loxahatchee Refuge of less than 50 ppb. It eventually will be included as the lower half of the 6,670-acre STA 1-West.

The ENR Project is located on state-owned land adjacent to the Loxahatchee Refuge in Palm Beach County. Design was initiated in 1988, with construction begun in 1991 and completed in late 1993. Its constructed wetlands consist of two vegetated parallel treatment tracks, each consisting of two separate treatment cells: one for bulk phosphorus removal followed by one for additional "polishing." Structural elements include pump stations, a perimeter levee, interior levees to separate the treatment cells, research test cells, a seepage collection canal to minimize impacts to adjacent property, a 2.1-mile inflow supply canal, and a discharge canal to the Loxahatchee Refuge.





Through much of 1994, the project was holding water on site during a "start-up" phase in which marsh vegetation was established, operating permits sought, operational parameters fine-tuned, and research and monitoring equipment installed. In August 1994, after receiving interim authority to operate, the District began discharging water from the project to the Loxahatchee Refuge. The District is now monitoring its operation for the purpose of optimizing phosphorus load reductions.

OTHER COMPONENTS

The Everglades Construction Project contains a number of other features to benefit the ecosystem — in addition to nutrient reduction — which follow:

Rotenberger and Holey Land Water Supply

The Everglades Construction Project will improve the water supply to several Everglades remnant areas. Runoff from the C-139 Basin will be treated in STA 5, and after cleansing, discharged to the 29,000-acre Rotenberger Tract. Runoff from Southern Division Ranch Unit 2 United States Sugar Corporation will be routed to STA 6. Water supplied to the L-4

Borrow Canal from STA 6 and the Rotenberger Tract shall provide water supply and hydropattern benefits to the 34,300-acre Holey Land Wildlife Management Area, the Big Cypress Seminole Indian Reservation, the Miccosukee Indian Reservation, Water Conservation Area 3 and local landowners.

Reestablishing Sheetflow

The Everglades Construction Project includes three projects to reestablish sheetflow along approximately 19 miles of the Water Conservation Areas. Sheetflow will

be improved through structural and operational modifications to the C&SF Project to ensure a more uniform overland flow, and by increasing the freshwater flow to the STAs for treatment and delivery to the Everglades. Seminole and Miccosukee Indian land holdings in the Everglades also will benefit from sheetflow improvements.

298 Districts Improvements

The EAA includes four Chapter 298 drainage districts and the state lease No. 3420 area (also known as Closter Farms) which currently discharge runoff to Lake Okeechobee. These five basins encompass approximately 32,000 acres along the south and east shores of Lake Okeechobee, and are situated primarily in Palm Beach County. Improvements to their conveyance systems will result in the redirection of not less than 80 percent of their stormwater flows from Lake Okeechobee to STA 1-West, STA 2, or STA 3/4.

The Act requires these drainage districts develop water conveyance systems to re-route not less than 80 percent of their runoff south to STAs so that treated water is ultimately discharged to the Everglades. These conveyance systems will be constructed in coordination with the STAs, and will be in operation within 60 days of completion of the appropriate STA. This will improve the Everglades ecosystem by contributing additional treated water for hydropattern restoration. As an additional benefit, water quality

along the southeast rim of Lake Okeechobee will be improved through the diversion of these discharges.

L-8 and C-51 Basin Improvements

Some non-EAA areas of Palm Beach County also will benefit from the construction program.

The L-8 Basin is a 171-square-mile area of Palm Beach County (with 2 miles in Martin County) consisting primarily of the Dupuis Reserve and the J.W. Corbett Wildlife Management Area. Water from this relatively pristine area will be re-directed northwest to Lake Okeechobee to improve water supply to the

The constructed wetlands range in effective size from 812 to 16,480 acres.

greater Everglades ecosystem, and reduce localized flooding.

The 164-square-mile C-51 Basin in Palm Beach County will benefit from both the Everglades Construction Project and C-51 West Project currently being designed by the Corps of Engineers as part of the C&SF Project. More usable water will be stored in the system and less will go to tide where it can upset the salinity balance of Lake Worth. The C-51 West Project is being revised to incorporate design requirements of the Everglades Construction

Project to avoid redundant design efforts and costly rework. This is being accomplished through a cost-sharing effort that will provide flood protection to this urban area and treated water to the Everglades Protection Area through STA 1-East.

OTHER ISSUES

The District moved forward in 1994 with the following efforts related to the Everglades Construction Project:

Land Acquisition

Land acquisition activities in support of Everglades restoration continued. Of approximately 44,500 acres needed in total for the construction project, 14,160 are now under public ownership. Some 30,000 acres remain to be acquired. In 1994, the District closed on the purchase of four parcels in STA 3/4 totaling approximately 10,000 acres and completed negotiations for a 280-acre parcel in STA 1-East. Negotiations with several other landowners were initiated and the District anticipates these negotiations will result in agreements to purchase during fiscal year 1995. Pre-acquisition activities for the STAs continued, including the identification of record title holders and preliminary map drafting for STA 1-East and the relocated STA 5.

Mitigation Lands

Identification of mitigation lands to be acquired started in 1994. The District has set a target date of Sept. 30, 1995 for final identification of these lands. Acquisition of mitigation lands is intended to compensate the public for the loss of Brown's Farm and

STORMWATER TREATMENT AREAS — CONSTRUCTION SUMMARY												
	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY2005
STA 1-East	■	■				■	■	■	■			
STA 1-West	■	■	■	■	■	■						
STA 2	■	■	■	■	■	■						
STA 3/4	■	■					■	■	■	■		
STA 5	■	■	■	■	■	■				■	■	
STA 6	■	■	■	■	■							
LEGEND	■ Task Progress to Date		■ Preliminary Design			■ Detail Design		■ Construction				

the northern tip of the Loxahatchee Refuge for the construction project.

Hiring of Displaced Workers

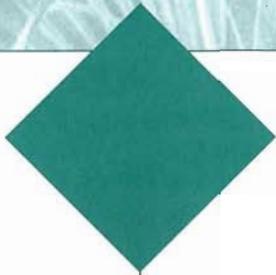
Farm workers displaced due to the Everglades Construction Project will be given preference by the District for employment opportunities consistent with their skills, associated with the construction and operation of the STAs. The District is currently evaluating issues such as the number of workers affected, when they would become available, procedures and policy involved in offering employment preference, and the possibility of using state employment services to assist in this effort.

Public Use of STAs for Recreation

Public access and recreation within the STAs is required to the extent that such activities do not interfere with restoration objectives. The District is evaluating potential recreational uses of the STAs and has established a staff-level review team for this. Potential impacts to the primary water quality function of the STAs are being evaluated.

Improved Technology

The legislation concluded that STAs and BMPs are currently the best available technology to reduce nutrients in stormwater runoff. Should superior technology be identified in coming years, the Act allows the District to modify its state permit for the project. An extensive review of other technologies was conducted by the District in 1993. In addition, the legislation requires the Department and the District to conduct research and monitoring to identify superior technologies which could be used to optimize STA performance. ♦



Hydropattern Restoration

The full range of hydrologic parameters for a particular area is known as “hydropattern,” which includes depth of water, duration of inundation, and timing and distribution of freshwater flows. Hydropattern encompasses the more commonly-used word, “hydroperiod,” which is the seasonal pattern of the water level. For example, the full range of water flows through the Shark River Slough is its hydropattern. However, the annual duration of surface water inundation for one location within the slough is its hydroperiod. The Act specifically calls for a number of programs to begin restoring the Everglades hydroperiod, which broadly fall into the categories of construction and of research and planning. Collectively, these programs will improve the greater Everglades ecosystem hydropattern.

The natural quantity, distribution, and timing of flows into and within the Everglades has been greatly changed due to development efforts and government programs in south Florida during the past century. A key objective of the Act is the restoration of historical patterns of freshwater flows, including improved timing and quantity, to the greatest extent practicable.

Historically, freshwater which nourished the Everglades began its journey hundreds of miles north in the upper Kissimmee chain of lakes. Water from the central Florida region collected in this basin and slowly snaked its way south in the winding Kissimmee River, eventually reaching Lake Okeechobee. At times, water overflowed Lake Okeechobee’s south-

ern marsh banks to nourish the Everglades wetlands south of the lake. Together with rainfall, this water gently filtered through the Everglades and eventually exited via coastal estuaries into the Atlantic Ocean, Florida Bay, and the Gulf of Mexico.

During the summer, Florida’s torrential rainstorms would fill the Everglades wetlands to their deepest levels. Water levels would then recede during the drier winter months. This annual rise and fall, which was irregular in its magnitude and timing, continued unchanged for thousands of years.

The delivery, amount and timing of this essential flow was permanently changed by south Florida development efforts. The regional system of canals, pump stations and levees today routes water for flood control, water supply and water management purposes, often at the expense of the Everglades. Today, the diminished “River of Grass” receives much less water than it did historically, with deliveries often occurring at the wrong times, in the wrong places, and in the wrong amounts.

Changes in timing and flow of water have caused impacts throughout the ecosystem, with the decline of wading bird populations and an increase in non-native plant species two examples of these impacts. While the system of canals has allowed the prosperous development of south Florida, it has increased seepage out of the Everglades and reduced coastal groundwater levels and groundwater storage.

STRUCTURAL AND OPERATIONAL CHANGES

The construction program addresses hydropattern through structural and operational improvements. Overall, the District is required to increase water supply to the Everglades Protection Area by an average annual increase of 28 percent over the baseline years of 1979-88. Water currently discharged to tide, and drainage from special districts that ring Lake Okeechobee, will be re-routed south for treatment in the STAs and subsequent discharge to the Everglades Protection Area. This benefits the Everglades by providing additional amounts of treated freshwater, and provides a secondary value of reducing the harmful effects of freshwater to coastal estuaries.

The Act also requires that all water lost to the EAA from the BMP program — as growers will retain more water on-site for nutrient-reduction programs — will be replaced. The District is developing a model to quantify the amount of water that is to be replaced, and began rule development in 1994 for implementation of this model.

RESEARCH AND PLANNING

While the construction program begins to address the Everglades hydropattern needs, the true water supply requirements of the ecosystem are not yet known.

A key objective of the Act is the restoration of historical patterns of freshwater flows, including improved timing and quantity, to the greatest extent practicable.

For the Everglades hydropattern to be restored, scientists must understand how much water the system needs and when deliveries should be made to mimic historic conditions. Long-range plans can then be developed to meet those needs. The District has an extensive planning effort under way to begin answering these questions, an activity which is tied to the development of the Lower East Coast Regional Water Supply Plan.

Lower East Coast Regional Water Supply Plan

A critical component to help south Florida manage its rapid growth is effective water supply planning. The District is preparing long-range plans for watershed areas within its 16-county region. These comprehensive documents provide recommendations and

strategies to guide District and local government decisions for the protection of freshwater resources through the year 2010.

In 1995, the District is scheduled to accept the Lower East Coast Regional Water Supply Plan, which addresses the Everglades and the urbanized southeast coast. While District staff have made projections of the future water supply needs for urban and agricultural users, they do not have an accurate picture of the water supply needs for the environment — in particular the Everglades. This is important because the goal of the plans is to provide water to the environment *first*, then to the urban and agricultural sectors. It is important to gain understanding of how the human community depends on the environment for many quality of life parameters.

An intensive 18-month effort began in mid-1994 to develop a better understanding of the Everglades hydropattern, which can then be incorporated into the Lower East Coast Regional Water Supply Plan. In August, a 22-member scientific advisory panel met for a three-day symposium to estimate initial hydropattern for the Park and conservation areas. The advisory panel reached consensus that a computer model known as the Natural System Model (Version 4.1) is today's best available estimate to be used as the initial restoration target for the Everglades.

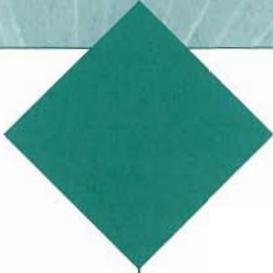
As a follow-up to the panel's work in 1994, a symposium will be held in spring 1995 to identify additional research needed in this area. Then, with a clearer understanding of the research and information available, a long-range program will be devised to predict hydropattern needs and develop water supply programs to meet those needs. This information will eventually be incorporated into future updates of the Lower East Coast Regional Water Supply Plan, with programs developed to meet those needs.

Other Efforts

A number of other efforts are under way as well to benefit hydropattern. These include adopting minimum flows and levels for the Everglades, with rulemaking initiated in 1994; requesting that the federal government include a review of regulatory releases in its evaluation of the Lake Okechobee regulation schedule to facilitate releases of water and hydropattern improvements in the Everglades; refining the operation of the STAs to maximize hydropattern restoration; and seeking Congressional amendment of the Central and Southern Florida Project to include water quality protection, hydropattern restoration, and environmental enhancement as authorized purposes. The

current federal review study of the C&SF Project will also benefit Everglades hydropattern as ecosystem restoration — including the Everglades and Florida Bay — is the top priority of that effort.

The District has requested the Corps to evaluate the feasibility of improving the Bolles and Cross Canals that provide east-west connections to the Miami, North New River and Hillsboro canals. Such canal improvements could potentially benefit the functioning of the STAs and BMPs, in addition to reducing flood damages in the EAA. ♦



Research and Monitoring

Research and monitoring is essential to ensure that relevant and current information is available to decision-makers to assure a sustainable Everglades ecosystem. Wise adaptive management of the remaining Everglades requires tracking the success of ecosystem restoration efforts through monitoring and development of an understanding of the ecosystem function through applied research. 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.

Research and monitoring projects will be carried out by the District and Department for this purpose. Both long- and short-term projects will evaluate Everglades ecology at scales ranging from laboratory studies using mesocosms at discrete sites, to analyses of field monitoring transect data at multiple sites separated by many miles. Data from these projects will be constantly analyzed to evaluate and revise the design of the programs.

Three focal areas are integrated within the research and monitoring projects: describing existing water quality in Everglades Protection Area and tributary waters and effectiveness of existing water quality standards in protecting

those waters; evaluating ecological and hydrological needs of the Everglades Protection Area, and; optimizing effectiveness of on-farm BMPs, optimizing the design and operation of STAs, and evaluating alternative treatment technologies for improving water quality.

EXISTING WATER QUALITY

Through several joint District/Department projects, extensive data will be analyzed to describe water quality in the Everglades Protection Area and tributary waters, and programs will be developed to acquire any additional data necessary to achieve this purpose. The Department and District will employ all means practicable to complete additional monitoring for this purpose by Dec. 31, 1998, and must complete it no later than Dec. 31, 2001. As a part of this process, the District and Department will also conduct research and monitoring to numerically interpret for phosphorus the Class III narrative nutrient criterion, and to evaluate the existing water quality standards applicable to the Everglades Protection Area and EAA canals. This research must also be completed by Dec. 31, 2001.

As a part of the phosphorus criterion research, the Department and District have already initiated an extensive peer-reviewed monitoring and research program along the nutrient gradient in Water Conservation Area 2A. Data from sampling of water quality, algae, macrophytes and other indicators of ecological health at multiple stations in this area are being evaluated to provide a clearer picture of

environmental changes in the Everglades associated with nutrient enrichment, particularly with respect to a phosphorus threshold above which ecological imbalances of aquatic flora or fauna occur. These data will be evaluated along with data from laboratory, greenhouse, other field studies, and data from other researchers, to provide information for the Department to use in establishing a numeric phosphorus criterion in the Everglades Protection Area.

Programs to evaluate water quality standards for the Everglades Protection Area and EAA canals will focus on defining relationships between waters discharged to and the resulting water quality in the Everglades Protection Area. The Department's evaluation will include antidegradation standards and classifications of EAA canals, and will recognize the designated uses of these canals (recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife) as well as existing beneficial uses, which include flood control, conveyance of water for urban and agricultural water supply, Everglades hydropattern restoration, conveyance of water to the STAs, and navigation.

ECOLOGICAL AND HYDROLOGICAL NEEDS

The Everglades Forever Act requires the District and Department to implement a research and monitoring program to evaluate the ecological and hydrologic needs of the Everglades Protection Area, including the minimum

The Department and District are evaluating the effectiveness of agricultural on-farm BMPs and regional STAs in improving water entering the Everglades through a series of existing and planned programs and projects.

flows and levels. The Department and District must employ all means practicable to complete this research by Dec. 31, 2001. This requirement is being met through coordination with the Lower East Coast Regional Water Supply planning process, development of the South Florida Regional Simulation Model, and field and laboratory studies as identified in the *Everglades Program Implementation: Program Management Plan*.

EFFECTIVENESS OF BMPs AND STAs

The Department and District are evaluating the effectiveness of agricultural on-farm BMPs and regional STAs in improving water entering the Everglades through a series of existing and planned programs and projects. Data from these programs and projects will be analyzed by Oct. 31, 1995. Based on this evaluation, the District and Department will initiate additional research and monitoring by 1996 to support strategies to improve performance of BMPs in cooperation with EAA landowners and to optimize the design and operation of the STAs and evaluate alternative treatment technologies. Water quality monitoring in the ENR Project was initiated in 1994 to support this project.

ENR Research

A research program has been started in the ENR Project which will provide information to refine the design and operation of STAs. Frequent monitoring of water quality at numerous stations throughout the ENR Project will allow the District to track the performance of the project in improving water quality as marsh plant and algal communities mature and as water levels fluctuate within the project. Everglades researchers at the District are developing a wetlands water quality model to predict the movement and fate of phosphorus through the STAs and through Everglades Protection Area marshes. This model will project phosphorus removal efficiency of the STAs under various management and operational scenarios.

Data collected from the ENR Project and other District projects will be used to calibrate and verify the model.

Starting with a 1993 baseline map, ENR Project vegetation dynamics will be tracked quarterly using low altitude, infrared aerial photography. On-going measurements of water movement through vegetation and from evaporation will be used to improve hydrological models of the ENR Project and the greater Everglades system.

Also at the ENR, a series of experiments has been initiated to monitor the response of attached algae and microbes to the addition of nutrients associated with STA treatment of stormwater. Set within the ENR Project, these studies will determine the movement of phosphorus from soils, surface water and plants, and how enrichment may alter nutrient removal by a marsh system.

OTHER COMPONENTS

In addition to the three focal areas, other components of the comprehensive Everglades research and monitoring program include:

Landscape Models

Computer-based landscape models are integrative tools to bridge gaps between research elements. One component of this program is a redesign of the South Florida Water Management Model (SFWMM), a major tool in analyzing water quantity management alternatives. The new regional simulation model — the South Florida Regional Simulation Model — will take advantage of

current computer technology and geographic information systems data to evaluate regional water management options with greater realism and speed. It was agreed that the District's Natural System Model (version 4.1), which is essentially a SFWMM with all struc-

allow a realistic appraisal of various management options through simulations of long periods of time, and will assist the District and other agencies greatly in evaluating trade-offs among water quantity, quality, timing and distribution objectives for the Everglades. Modeling efforts will complement other research and monitoring studies on hydropattern. Collectively, the combination of modeling, monitoring and research will provide information for estimating the hydrological needs of the system.

Mercury Monitoring and Research

High levels of mercury have been found in fish and other wildlife in the Everglades. As a consequence, the Florida Department of Health and Rehabilitative Services issued fish consumption advisories banning consumption of several species and sharply restricting others. The Florida Game and Fresh Water Fish Commission continues to monitor mercury in the Florida panther and in the raccoons that are the pathway for mercury from the aquatic food chain to the panther. However, sources of mercury to the Everglades and reasons for the unusual severity of the problem are still unknown. The Department has organized a state-federal-private Mercury Research Program to identify sources and other contributors to the problem. Participants include the District, USEPA, US Geological Survey, US Fish and Wildlife Service, and the utility industry.

**The Florida
Atmospheric
Mercury Study is
designed to measure
mercury deposition at
nine sites around
Florida to determine the
severity of atmospheric
influences on Florida
waterbodies.**

tures and canals removed, will be used to provide initial estimates of hydropatterns required to restore the Everglades.

To address ecological issues, the Everglades Landscape Model is an ambitious modeling effort being conducted by the District. This model divides the system into 10,000 cells, each containing ecological models to simulate Everglades hydrologic, nutrient, and ecological dynamics with interconnections to neighboring cells. When fully operational, it will

Many possible sources of mercury contamination in the Everglades exist. These include atmospheric deposition from emissions sources outside the Everglades, and the effects of drainage, soil disturbance and hydroperiod alteration within the system.

Potential atmospheric sources include combustion (burning of fossil fuels principally coal, and municipal and medical waste incineration), metals mining and smelting, and the use and disposal of mercury in commercial products. The Florida Atmospheric Mercury Study is designed to measure mercury deposition at nine sites around Florida to determine the severity of atmospheric influences on Florida waterbodies. Seven sites are in south Florida including one funded by the District in the ENR Project. The Department and USEPA have conducted two small studies of mercury in the urban area of Broward County and plan an intensive field study in 1995 to determine the potential contribution of urban sources to mercury air concentrations in south Florida.

Mercury may also enter the Everglades through surface water. Waterborne sources may include release from the limestone formations underlying the Everglades, peat decomposition, and crop burning in the EAA with subsequent runoff to nearby canals. To determine the magnitude of this

potential source, the USEPA with District assistance is monitoring mercury levels in water leaving the EAA at a number of points in the District's primary canal system. Research is also ongoing to determine if changes in the Everglades water flows or hydropattern may affect the generation of methylmercury, the most toxic form that accumulates in aquatic life and the wildlife that feeds on aquatic life.

The District is committed to assist the Department and the USEPA in research to quantify the transport, transformation, and accumulation of mercury in the Everglades. Together with mass balance budgets for each of the Everglades compartments, the District intends to develop mathematical models of the interrelationships between mercury, species, other parameters and water quality. These models will be used to evaluate the effect of various source control and water management strategies on the mercury problem in the Everglades.

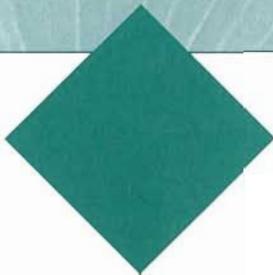
Aquatic Ecology Research Laboratory

To support Everglades research and monitoring, an Aquatic Ecology Research Laboratory has been established at Florida Atlantic University in Boca Raton. This shared facility will allow District scientists to collaborate with university faculty and students on research projects to manage the Everglades system, while giving students an opportunity to learn the ecology of this complex ecosystem. A Memorandum of Understanding established the lab and provides a framework for funding cooperative research projects at FAU, with 10 joint studies planned for 1995.

Annual Reports

Progress and results of these multiple research and monitoring activities will be presented in annual, peer-reviewed reports to the Governor, President of the Senate, and Speaker of the House of Representatives for their review. These will be prepared in coordination with the Department, and will commence with an interim report due Jan. 1, 1999. Beginning Jan. 1, 2000, annual peer-reviewed reports will be submitted. In addition to including current research and monitoring efforts, these reports will identify water quality parameters in addition to phosphorus which exceed state standards or are causing or contributing to adverse impacts to the Everglades. ♦





Regulation

The Act requires the Department or District to establish discharge limits in permits for discharges into the EAA canals and the Everglades Protection Area necessary to prevent an imbalance in the natural populations of aquatic flora or fauna in the Everglades Protection Area and provide a net improvement in areas already impacted. By Dec. 31, 2006, all permits will require implementation of additional water quality measures to ensure that no discharge shall cause or contribute to any violation of water quality standards within the Everglades Protection Area. To meet these goals, several programs are currently under way and others are planned:

PHOSPHORUS CRITERION

By Dec. 31, 2001, the Department shall file a notice of rulemaking to establish a phosphorus criterion in the Everglades Protection Area. If the Department has not already adopted a criterion by rule by Dec. 31, 2003, by law the phosphorus criterion will be set at 10 ppb for the Everglades. In developing the phosphorus criterion, the Department shall also consider the minimum flows and levels for the Everglades Protection Area and the District's Lower East Coast Regional Water Supply Plan.

EVERGLADES AGRICULTURAL AREA

The EAA is a fertile region south of Lake Okeechobee containing approximately 470,000 acres of sugar cane, 60,000 harvested acres of vegetables, and 5,000 acres of rice. Its 45 percent contribution of the phosphorus-enriched stormwater to the Everglades is the largest, single source of this nutrient to the ecosystem. Smaller amounts come from other agricultural and urban basins, and from rainfall. The District regulatory program (Chapter 40E-63, FAC) to reduce phosphorus load in the EAA has been under way for two years, and is contained in the Act. The EAA Regulatory Program requires a minimum 25 percent reduction of phosphorus in stormwater runoff from the EAA basin to the Everglades Protection Area. The District completed rulemaking for the program in 1992, and 100 percent of the EAA landowners have now been permitted under this program.

This regulatory program requires the development of on-site BMPs to reduce phosphorus load leaving growers' property. Soil testing, fertilizer application directly to the crop root zone, longer drainage retention, sediment controls, and innovative crop location are some examples of BMPs used by growers. Non-agricultural users also must implement BMPs if they discharge into a District canal. Growers are implementing and fine-tuning their BMPs and District staff are conducting site visits to individual farms to inspect the BMPs. Land users have until Jan. 1, 1995 to fully implement their phosphorus-reduction programs.

This program is unique in that its goal is to achieve a 25 percent

reduction in phosphorus from the entire 553,000-acre basin — not for each individual farm. The District will determine if this reduction has occurred by comparing phosphorus discharges for future 12-month annual average periods with a base 10-year period of record from 1978 to 1988. The first 12-month compliance determination period will be for May 1, 1995 through April 30, 1996.

The EAA Regulatory Program requires a minimum 25 percent reduction of phosphorus in stormwater runoff from the EAA basin to the Everglades Protection Area.

Phosphorus amounts will be measured at five District structures discharging from the southern boundaries of the EAA into the Everglades.

If an overall phosphorus reduction of 25 percent (relative to the baseline year) has not occurred, the District will then begin examining practices of individual growers and other land users to see

where additional reductions can be achieved. Both the agricultural industry and Department and District staff are optimistic that the targeted 25 percent reduction will be achieved. Preliminary basin monitoring in 1994 has shown percent reductions (relative to the baseline year) of 17, 41, 44 and 16 total phosphorus loads from the EAA to the Everglades over the past four years, respectively. Financial incentive credits from an Everglades Agricultural Privilege Tax are available under the Everglades Forever Act for growers who exceed the 25 percent minimum.

Approximately 40 percent of the growers have chosen an option available in the program called "early baseline." They must demonstrate a phosphorus reduction rate of 25 percent at the farm level if the overall basin average does not meet the 25 percent reduction. These growers need not make additional BMP changes if they can show 25 percent reductions have been met at their individual farms. Early baseline permittees began providing water quality monitoring data to the District in 1993.

C-139 BASIN

The District will implement via rulemaking a similar BMP regulatory program in the C-139 Basin. The C-139 Basin is a 168,437-acre basin in Hendry County contributing phosphorus load to the Everglades. This rural area is primarily used as pasture land for cattle grazing, with increasing amounts of land being converted to citrus production. Landowners within the C-139 Basin shall not collectively exceed

the historic annual average phosphorus loading, based proportionately on historic basin rainfall recorded from Oct. 1, 1978 to Sept. 30, 1988. Rulemaking began in 1994 and is expected to be completed in early 1995.

LAKE OKEECHOBEE DRAINAGE DISTRICTS

The Act requires that the discharges of four 298 districts and the state lease No. 3420 (Closter Farms) located south of Lake Okeechobee be subject to requirements similar to the EAA Regulatory Program. The 298 districts and Closter Farms, which currently discharge stormwater runoff directly to the lake, will be required to implement phosphorus reduction BMPs similar to those currently being implemented in the EAA. They will also be required to divert the majority of their discharges to the appropriate STA within 60 days of completion of that STA.

OTHER TRIBUTARIES

Regulatory programs may be required for other tributary areas which discharge to the Everglades Protection Area. These areas include three basins south of the C-139 which comprise the lower "Western Basins" area of Hendry and Collier counties including Seminole and Miccosukee reservations, and a small number of urban lower east coast areas which back-pump into the Everglades Protection Area. The combined Western Basins contribute approximately 11 percent of the phosphorus load entering the Everglades Protection Area while urban areas

contribute approximately 5 percent. Rainfall contributes the remaining 40 percent of total phosphorus load to the Everglades Protection Area. Rulemaking for regulatory programs for these basins is expected to begin in 1995 and 1996.

ADDITIONAL WATER QUALITY PARAMETERS

The 40E-63 regulatory program currently addresses only phosphorus. The Act requires that all water quality parameters be addressed through BMPs. Prior to the expiration of the permits in 1997, and for each subsequent five-year permit term, the District will amend rules governing water quality of discharges to the Everglades Protection Area. Amendments will include a comprehensive program of research, testing and implementation of BMPs that will address all water quality standards within the EAA and Everglades Protection Area. This requirement will apply to regulatory programs for the EAA (including Closter Farms and the 298 districts) and the C-139 Basin.

Through the EAA Environmental Protection District or otherwise, landowners shall sponsor a program of BMP research. Consistent with the water quality

The Act requires that all water quality parameters be addressed through BMPs.

monitoring program, EAA landowners shall 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.

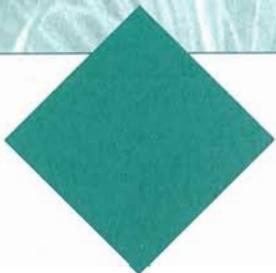
DISTRICT PERMITS

The Department is charged by the Legislature to regulate water quality within Florida. As a result, the Act requires the District to apply for several state permits for the Everglades Program. On May 31, the District submitted a permit application for the construction, operation and maintenance of the Everglades Construction Project. On Sept. 29, the District submitted a permit application to operate and maintain structures within the control of the District which discharge into, within, or from the Everglades Protection Area and are not included in the Everglades Construction Project. By December 31, 2006, the Department and the District must ensure that all water discharged to the Everglades Protection Area achieve water quality standards.

Federal Permits

The District will comply with all federal regulations which apply to the Everglades Project. During 1994, the agency explored the range of permits and other regulatory processes that would be required.

In late 1993, the Environmental Protection Agency informed the District that a National Pollution Discharge Elimination System permit was required for the ENR Project. In 1994, the District submitted an application to the USEPA for this permit, and a notice of intent to issue the permit was subsequently issued. However, a number of challenges were filed against the District's NPDES permit and these must be resolved before the final permit can be issued. In the interim, the District began operation of the ENR pursuant to the order of a USEPA judge. ♦



▲▲▲▲▲ **Exotic Species Control**

The Act directs the District to establish a program to coordinate with federal, state and other governmental entities to control the expansion and facilitate the removal of exotic species, giving high priority to species affecting the largest areal extent within the Everglades Protection Area. The District has an active exotic species control program, so the Act enhanced already on-going activities. A brief explanation of the District's exotic species control efforts, focusing largely on melaleuca, follow:

MELALEUCA

In the past four years melaleuca eradication has become a significant component of the District's Everglades restoration program. Known for its paper-like bark and allergy-causing flowers, melaleuca was originally imported from Australia and has no natural enemies in Florida. As a result, it flourishes in south Florida and has invaded more than 500,000 acres.

District studies show that once introduced the tree will completely take over an area within 30 years, replacing native flora and fauna and becoming the dominant plant species. Concentrations range from scattered trees to solid stands in the most serious cases. Infestations occur in Lake Okeechobee's marsh, Water Conservation Areas, Big Cypress National Preserve, and east of the Park.

In November 1990 the agency launched a major effort to eradicate the tree within the historic Everglades. In the past four years \$4.8 million has been spent by the District to fight melaleuca infestations. Approximately half this amount has come from outside sources such as Florida Power & Light mitigation funds and state cost-sharing programs, with the District providing the rest. Since 1991, a cooperative agreement between the District and the US Fish and Wildlife Service has provided for a cost-sharing program of melaleuca removal at the Loxahatchee Refuge.

A hard species to eradicate, melaleuca is killed by herbicide injection followed by manual pulling of seedlings. In Everglades areas not covered by the District eradication program, the agency is financially supporting efforts of other government agencies.

The second edition of the *Melaleuca Management Plan for Florida*, produced in cooperation with the Exotic Pest Plant Council, was released July 7. This 88-page document outlines strategies for its integrated control. The updated version includes technological and operational advances in the control of melaleuca since the first report was released in 1990.

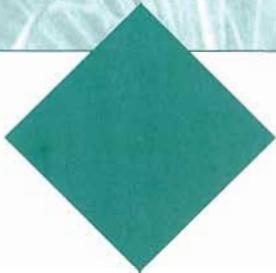
Community involvement is an essential part of melaleuca control. In the past several years, the District has sponsored several melaleuca "clean-sweep" operations in which volunteers pull seedlings in the Water Conservation Areas. The Everglades Restoration Movement, a non-profit volunteer organization based in Broward County, has organized melaleuca seedling pulls on a regular basis in Water Conservation Area 2B.

Until several years ago melaleuca was spreading at a rapid rate in historic Everglades areas. Through this intensive effort, its expansion is under control but eradication is at least a decade away. Total eradication will be accomplished only when more effective removal methods are in use, such as biological controls now under examination, and additional cost-sharing funds are available to the District.

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BRAZILIAN PEPPER

This year the District began a cost-share program with the Department to fund an overseas exploration for insects which attack Brazilian pepper. The project is being directed by the University of Florida's Entomology Department, Institute of Food and Agricultural Sciences. ♦



Funding

A dedicated source of funding is essential to carry out Everglades and Florida Bay restoration programs. The Everglades Construction Project alone is one of the largest public works efforts in the nation for environmental restoration, estimated to cost approximately \$685 million over 20 years. Other Act components to be funded include the comprehensive research and monitoring program, Frog Pond land acquisition for Florida Bay restoration, and further elements requiring District, state or federal support.

The Act directs the District to separately account for all monies used to fund the Everglades Construction Project. To meet these requirements the District recently developed an accounting system to include all costs directly attributed to the Act. This accounting system was implemented on Oct. 1, 1994.

Multiple funding sources are contemplated for the Everglades Program, with a brief description of each provided:

AD VALOREM TAXES

The Act gives the District the authority to levy ad valorem taxes of up to 0.1 mill within the Okeechobee Basin for design, construction and acquisition of the Everglades Construction Project. As required by the Act, this will be the sole direct contribution of ad valorem taxes expended on the construction project. The District initially levied 0.1 mill for this purpose in 1993 — an amount projected to be \$21.8 million. The first 0.1 mill levy since passage of the Act is for the upcoming 1994-95 fiscal year, and is estimated at approximately \$23 million.

AGRICULTURAL PRIVILEGE TAXES

To fund Everglades restoration programs, the Act imposed an annual agricultural tax for the privilege of conducting an agricultural trade or business within the EAA and C-139 basins. The agricultural privilege tax applies to agricultural property within these basins in Palm Beach and Hendry counties. The tax will be collected through county tax notices mailed to property owners in November of each year. The District certified the first agricultural privilege tax rolls in September 1994, and will do so each year by Sept. 15. Taxes will be collected based on a per acre charge. A base amount has been established from 1994 through 2013 to fund design and construction projects. After that period, the per acre tax drops significantly.

EAA Agricultural Privilege Tax

The EAA base agricultural privilege tax ranges from a minimum of \$24.89 per acre in 1994 and increases to \$35 in 2006. The first agricultural privilege tax will be collected for the 1994-95 fiscal year, and is projected to generate approximately \$11.8 million. The legislation encourages the use of on-farm BMPs to reduce phosphorus load leaving the EAA. It also includes financial incentives for BMP performance that exceeds the 25 percent basin requirement, or which reduces phosphorus load to 50 ppb. The EAA incentive credits will not reduce the agricultural privilege tax below the \$24.89 per acre minimum. In the year 2014 and thereafter, the EAA base tax will be reduced to \$10 per acre to pay for operation and maintenance costs.

C-139 Basin Agricultural Privilege Tax

The C-139 Basin will pay a total of \$654,656 annually through the year 2013. The per acre charge will be computed by dividing that amount by the number of agricultural acres within the basin. This tax will decrease to \$1.80 per acre after November 2013. The Act does not provide for either increases in the base tax level or phosphorus-reduction incentive credits for C-139 Basin properties.

VEGETABLE ACREAGE

The Act recognizes that vegetable farming is subject to both volatile market conditions and to crop loss from freezes, floods and droughts. It provides for setting the privilege tax for appropriately qualified vegetable acreage at the minimum tax without eligibility for incentive credits. If the Governor, President, or United States Department of Agriculture declares a state of emergency or disaster due to natural conditions, payment of the agricultural privilege tax will be deferred one year.

ALLIGATOR ALLEY TOLL REVENUES

The Act includes the legislative finding that Alligator Alley, designated as State Highway 84 and federal 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 appropriate, and in the public interest, to establish a system of tolls for Alligator Alley to produce financial resources to help restore the natural values lost by the highway's construction.

Toll use 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; water conveyance projects which enable more water resources to reach Florida Bay to replenish marine estuary functions; engineering design plans for wastewater treatment facilities for Florida Keys marine waters; and highway redesign to improve sheet flow of water across the southern Everglades.

In the fall of 1994, District and State Department of Transportation officials were seeking federal authorization to redirect the use of Alligator Alley toll revenues for these projects. It is estimated that this could provide approximately \$60 million before the year 2005.

PRESERVATION 2000

The Act provides that P-2000 funds received by the District may be used for acquisition of lands for the Everglades Construction Project. The 1993 Statement of Principles allocates \$33 million of P-2000 funds for land acquisition for the Everglades Project. Through fiscal year 1994, the District has committed approximately \$21.7 million of these funds for proposed land acquisition projects, with the remainder expected to be committed in 1995.

SWIM FUNDS

It is anticipated that Surface Water Improvement and Management program funds will be utilized by the District, consistent with Department guidelines, to finance many of the research and monitoring projects required by the Act.

FPL MITIGATION FUNDS

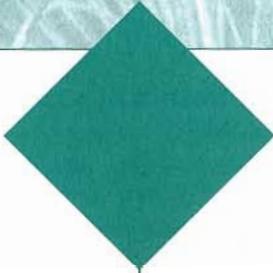
Approximately \$10 million has been allocated in fiscal year 1994-95 for STA land acquisition from the original \$28 million transferred from Florida Power and Light as mitigation for impacts caused by the new Levee-Midway transmission line under construction in 1994. In future years an additional \$4 million of these funds will be earmarked for the Everglades Construction Project, bringing the total to \$14 million.

FEDERAL FUNDS

In concert with the 1993 Statement of Principles, it is anticipated that the federal government will contribute approximately \$87 million for C-51 West and STA 1-East. Federal funding details will be resolved during development of the Project Cooperation Agreement for C-51 West and STA 1-East, expected to occur in 1995. There are also potential federal funds available for the Water Conservation Areas 2 and 3 hydropattern restoration through the 1986 Water Resources Development Act.

SPECIAL ASSESSMENTS

Provisions within the Act authorize the District to create, if the need arises, alone or in cooperation with counties, municipalities, and special districts, one or more stormwater management benefit areas and levy special assessments to fund stormwater management systems. No such special assessments have been identified to date. ♦



Florida Bay Emergency Interim Plan

Restoring the Everglades also means restoring Florida Bay. Within the Act are directives for the District to begin restoring this shallow estuary at the southernmost tip of Florida's peninsula. Like the Everglades, Florida Bay's survival depends on receiving more freshwater, of sufficient quality at the appropriate time as needed to restore the delicate ecological balance that nature once sustained.

The legislation calls for the District, with assistance from state and federal agencies, to implement an emergency interim plan to optimize the quantity, timing, distribution and quality of freshwater into Taylor Slough, which empties into Florida Bay. By improving the quality and restoring the hydro pattern of water flowing through the natural slough, rather than flood control canals or other direct routes, natural salinity levels in Florida Bay may be restored while improving the Everglades ecology. Attaining salinity levels closer to estimated historic conditions is considered a key element in resolving many of the bay's environmental problems.

The emergency interim plan also directs the District to acquire the western three sections of the Frog Pond by eminent domain. The Frog Pond consists of 5,200 acres located in southern Dade County, and is sought after for increased water storage. The western three sections comprise 1,843 acres. The District has aggressively pursued the fulfillment of the legislation's requirements. This includes development of a technical

plan to control seepage and maximize flow, and a detailed, multi-faceted strategy for land acquisition. In addition to the requirements of the Act, the District has been developing programs to enhance Florida Bay for several years, with some key efforts which follow:

TAYLOR SLOUGH DEMONSTRATION PROJECT

For more than a year, the District, the Corps of Engineers and Park have been working together to increase Taylor Slough's headwater flow up to 500 cubic feet per second, in an effort known as the Taylor Slough Demonstration Project. The Act specifies flow be increased by up to 800 cfs to even further enhance freshwater flow to Florida Bay. As a result, the agencies in late 1994 were analyzing technical changes to optimize the quantities of water flowing into Taylor Slough and the bay.

RESEARCH PROGRAM

The District has developed a collaborative research program for Florida Bay. Research primarily is focusing on the effect of freshwater on the ecology of the bay, particularly in the transition zone (in the northern sections of the bay) where there is a fresh and saltwater interface. The District's research program also includes monitoring water quality, studying upstream hydrologic interactions and understanding the impact of bay sediments. Furthermore, the District, in collaboration with the United States Geological Survey and the University of Miami, has begun to

study both sediment cores and corals from the bay in order to determine historical ecological conditions in the bay.

While the District has focused its Florida Bay restoration mission on freshwater interfaces within the bay, it recognizes that other factors affect the bay's health. Therefore, in 1995 the District will begin to expand its research scope, with collaborative research aimed at studying the relationships between Florida Bay and adjoining areas. In particular, an intensified seagrass research program, as a joint venture with the Florida Keys National Marine Sanctuary, is an important transitional step to this broader mission.

Also, vital collaborations with the Corps of Engineers, Park and the United States Geological Survey will help expand the agencies' understanding of upstream hydrology and its impact on the bay. The major component of this hydrology study is extended modeling focusing on the area immediately upstream of Florida Bay. The USGS expansion of its Mod Branch model will assist the agencies to determine how much of the increased flows upstream actually reach the bay. This information is needed in order to better comprehend the effects of freshwater impacts on Florida Bay and is essential for effective implementation of the emergency interim plan.

C-111/GRR

During the past year, the District was a partner with the Corps of Engineers in developing the C-111 General Re-evaluation Report. This significant effort, designed to reconfigure water flows in the Taylor Slough/Rocky Glades area, was a massive collaborative effort among the Corps of Engineers and other government agencies to find a way to significantly improve the hydropattern of this critical area.

The Corps of Engineers approved the GRR in June and was looking toward an October 1994 start date for detailed design studies. Actual construction will begin in 1996 and be completed by 2001. This marks the first time in more than 10 years that agreement has been reached on how to reconfigure this portion of the C&SF Project.

BAY WATCH PROGRAM

Last year, the District and other government agencies initiated a contract with the Nature Conservancy to use local volunteers to monitor the size, extent and movement of algae blooms in Florida Bay. The District is the primary sponsor of Florida Bay Watch, with support provided by the federal government and others. During 1994, volunteers from the Florida Keys and Dade County accompanied Department scientists in monthly overflight activities which have formed the basis for the first significant data base of information regarding the bay's algae blooms. District participation in the Bay Watch program will continue in 1995 and expand into more research of causal factors for algae blooms which may be negatively impacting bay fish and shellfish.

EMINENT SCIENTIST PANEL

In August 1993, an eminent scientist panel convened to evaluate potential causes of algae blooms in Florida Bay. A report detailing its findings was published in October 1993 and has become the basis of the interagency, cooperative research plan for the bay. The eminent scientist panel evaluated current technical information and established priorities and criteria for future research. This review will help ensure the District and other agencies are supporting the proper type and amount of research necessary to better monitor the health of the bay.

TEAMWORK

Overall, the key to the success of the District's Florida Bay program has been in the building of relationships with other government agencies, nonprofit organizations and concerned citizens. A critical factor in the building of these relationships has been effective communication and team interactions between District staff and others involved with Florida Bay. Effective teamwork will continue to be key to District efforts, as it moves from the planning and organizing phase into a more action-oriented phase during the next two years. ♦



THE DISTRICT MAINTAINS AN EXTENSIVE monitoring network and database on surface water quality and quantity in the Everglades Protection Area and tributary waters. The network's programs encompass a wide variety of ecosystems, land uses and hydrologic systems. Monitoring points include lakes, rivers, canals, wet-

Summary of Water Conditions

lands, dairies and estuaries. Water quality parameters measured include dissolved oxygen, pH, specific conductance, temperature, nutrients, cations, anions, metals, pesticides and degradation products. This section summarizes significant water quality and quantity issues in the EAA, Water Conservation Areas, Park and Florida Bay.

RAINFALL

Total average yearly rainfall for the Everglades Protection Area from June 1, 1993 to May 31, 1994 was 49.87 inches, compared with a normal average yearly rainfall of 52.66 inches. Therefore, during this period the Everglades Protection Area received 95 percent of the average annual rainfall.

DISCHARGE

More water was discharged through the District's structures to the Everglades Protection Area from June 1, 1993 to May 31, 1994 than the historic average. While rainfall was slightly below normal, three very high rainfall months bolstered discharge amounts. These months were October 1993 and January and April 1994, in which rainfall was 151, 300 and 154 percent of the monthly average, respectively. The Water Conservation Areas received 20, 35, and 81 percent more discharge on a mean daily basis than the daily historic average.

The Park, Shark River Slough and Florida Bay also received above-normal discharges.

PHOSPHORUS

The goal of the District regulatory program contained in Chapter 40E-63 is to reduce by 25 percent the total phosphorus load — adjusted to hydrologic conditions — discharged from the Everglades Agricultural Area relative to the historical phosphorus loadings between 1979-1988. According to District Rule 40E-63.145, FAC, compliance in the EAA is determined as of April 30, 1996, and annually thereafter. Compared to the historical average, in 1994 below average phosphorus amounts were released from the five main structures which discharge to the Everglades Protection Area. Although compliance with the rule is not mandated until 1996, substantial progress is being made.

In addition, the 1991 settlement of the U.S. lawsuit requires that phosphorus interim limits and

levels be achieved for the Park and Loxahatchee Refuge. Under the settlement agreement, the interim and long-term limits and levels must be achieved by July 1, 1997 and July 1, 2002, respectively. Initial evaluations of data from the Refuge show that both the interim and long-term phosphorus concentration levels are currently being met ahead of schedule. The flow-weighted mean concentration limits for Shark River Slough, which have steadily decreased since 1990, show substantial progress being made towards achieving the settlement-imposed deadlines.

Several new or expanded efforts have been undertaken to better measure phosphorus inputs and determine nutrient threshold levels. The District has initiated a plan, developed through coordination with the Everglades Technical Oversight Committee, to determine nutrient threshold levels that do not cause an imbalance of Everglades flora or fauna. The District has also embarked upon expanded monitoring programs in the interior marshes of the Water Conservation Areas and in the ENR Project.

PESTICIDES

Pesticides have been monitored in surface water and sediments throughout the District's 16-county area for more than a decade. From the more than 60 pesticides analyzed at 27 sites at least quarterly, only about 1 percent of the residues were above measurable levels. The majority of detections in water are herbicides, such as atrazine and 2,4-D, which are widely used by both agriculture and the District. In a few

instances Department water quality criteria for Class III recreational waters were exceeded.

Although the insecticide endosulfan has been found with some regularity near the Park, the water actually entering the Park has so far been free of endosulfan. Pesticides were measured in the sediments of about 1 percent of the samples collected, with the majority of residues being DDT degradation products. Concentrations of these residues have been decreasing because DDT was banned in 1973 by the USEPA. Future monitoring will emphasize improving analysis techniques to measure pesticides at the lower concentrations regulated by the Class III criteria.

MERCURY

The District is working cooperatively with state and federal agencies to monitor mercury concentrations in the Everglades. The USEPA has developed an ambient monitoring program in the Everglades Protection Area to define the nature and extent of the mercury problem. The District is assisting the federal government by collecting water samples at its major pump stations. The Florida Atmospheric Mercury Study will assess the role of atmospheric deposition on mercury input to Florida's environment.

Several new or expanded efforts have been undertaken to better measure phosphorus inputs and determine nutrient threshold levels.

District personnel are developing a mercury monitoring program at the ENR Project. Measurements from the ENR Project taken over the first three months of operation showed a detectable decrease in total mercury and a significant decrease in methylmercury between the inflow and outflow. Whether this trend will continue will be revealed by the routine monitoring required by state and federal permits.

OTHER WATER QUALITY PARAMETERS

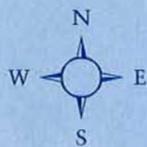
The Department and the District are in the process of evaluating the status of the EAA canals, the Everglades Protection Area and tributary waters, for compliance with Class III numeric water quality criteria.

FLORIDA BAY SALINITY AND CHLOROPHYLL

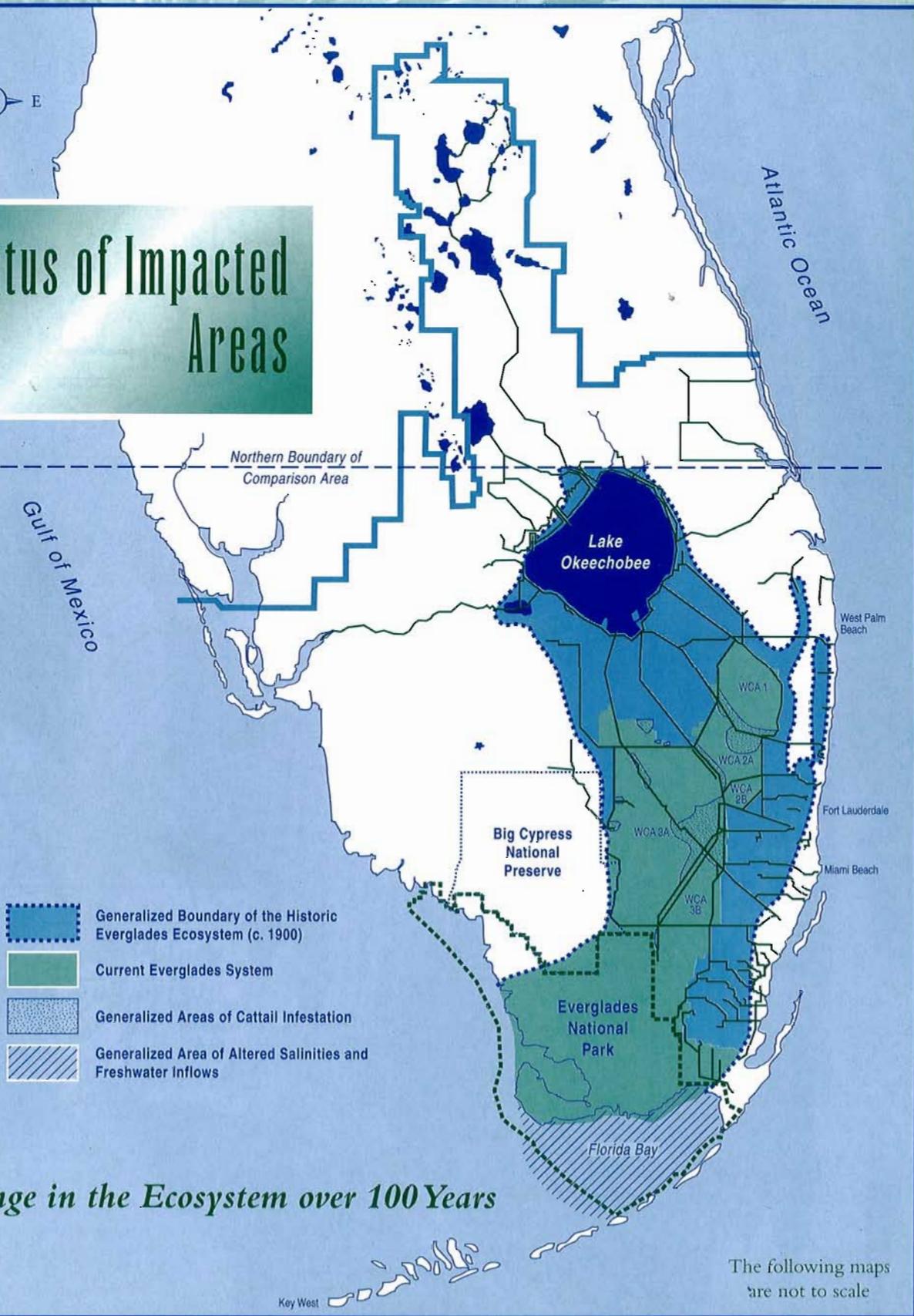
Salinity, chlorophyll *a*, turbidity and total phosphorus concentrations are measured periodically in Florida Bay to assess water quality. Salinity in excess of 35 parts per thousand (the same level as Gulf of Mexico water) has been recorded in Florida Bay and is thought to be caused by evaporation and lack of freshwater for dilution. Florida Bay salinity levels for the last three years have shown no clear trends.

High chlorophyll *a* concentrations are indicative of algae blooms. Since late 1992, the area near the center of the bay has experienced increased chlorophyll *a* concentrations and algae blooms. Turbidity and total phosphorus levels are highest near shore just east of Flamingo and, in general, overlap the area of high chlorophyll *a*. Monitoring efforts in Florida Bay have been intensified with new sites and additional parameters monitored to document the present conditions and the effects of future management practices.





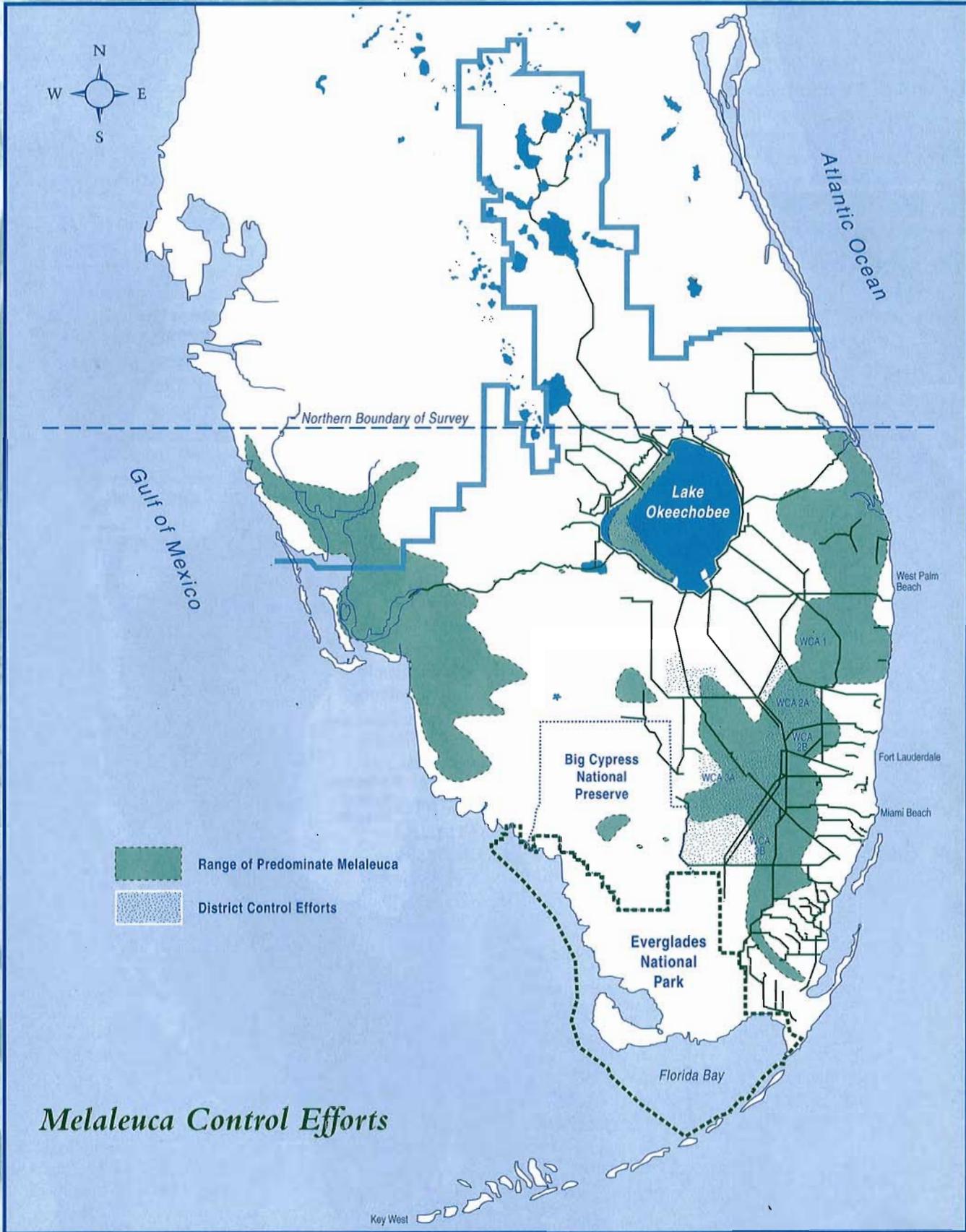
Status of Impacted Areas

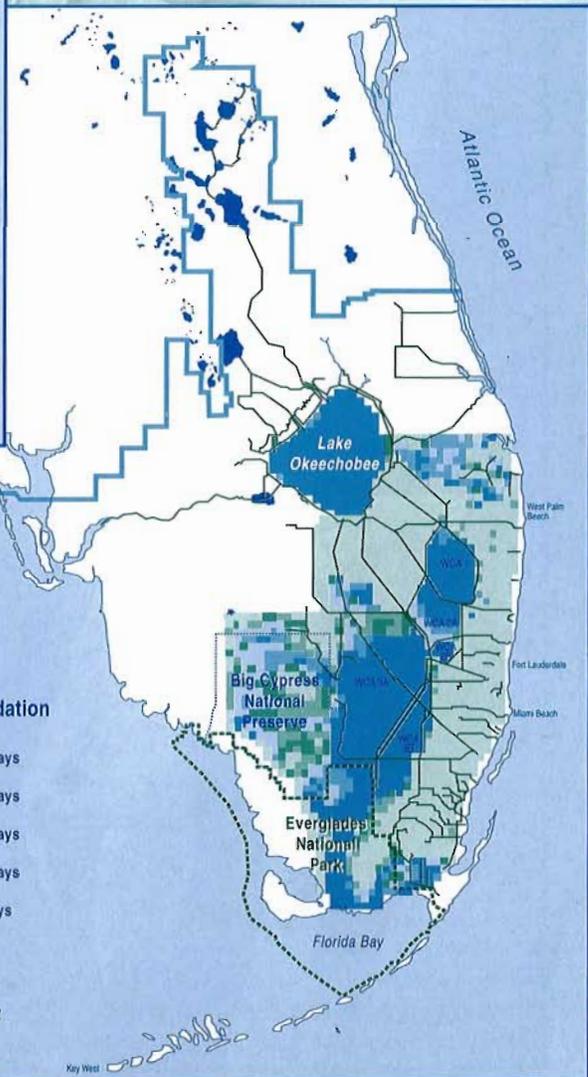
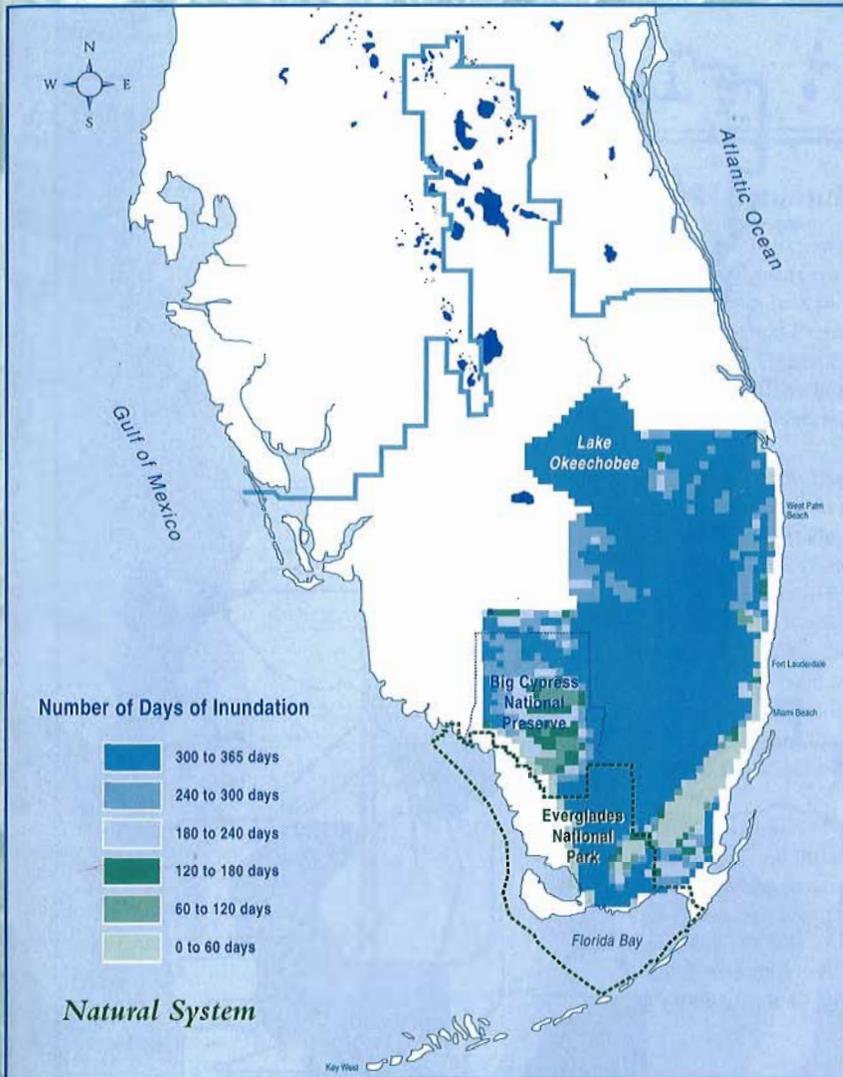


- Generalized Boundary of the Historic Everglades Ecosystem (c. 1900)
- Current Everglades System
- Generalized Areas of Cattail Infestation
- Generalized Area of Altered Salinities and Freshwater Inflows

Change in the Ecosystem over 100 Years

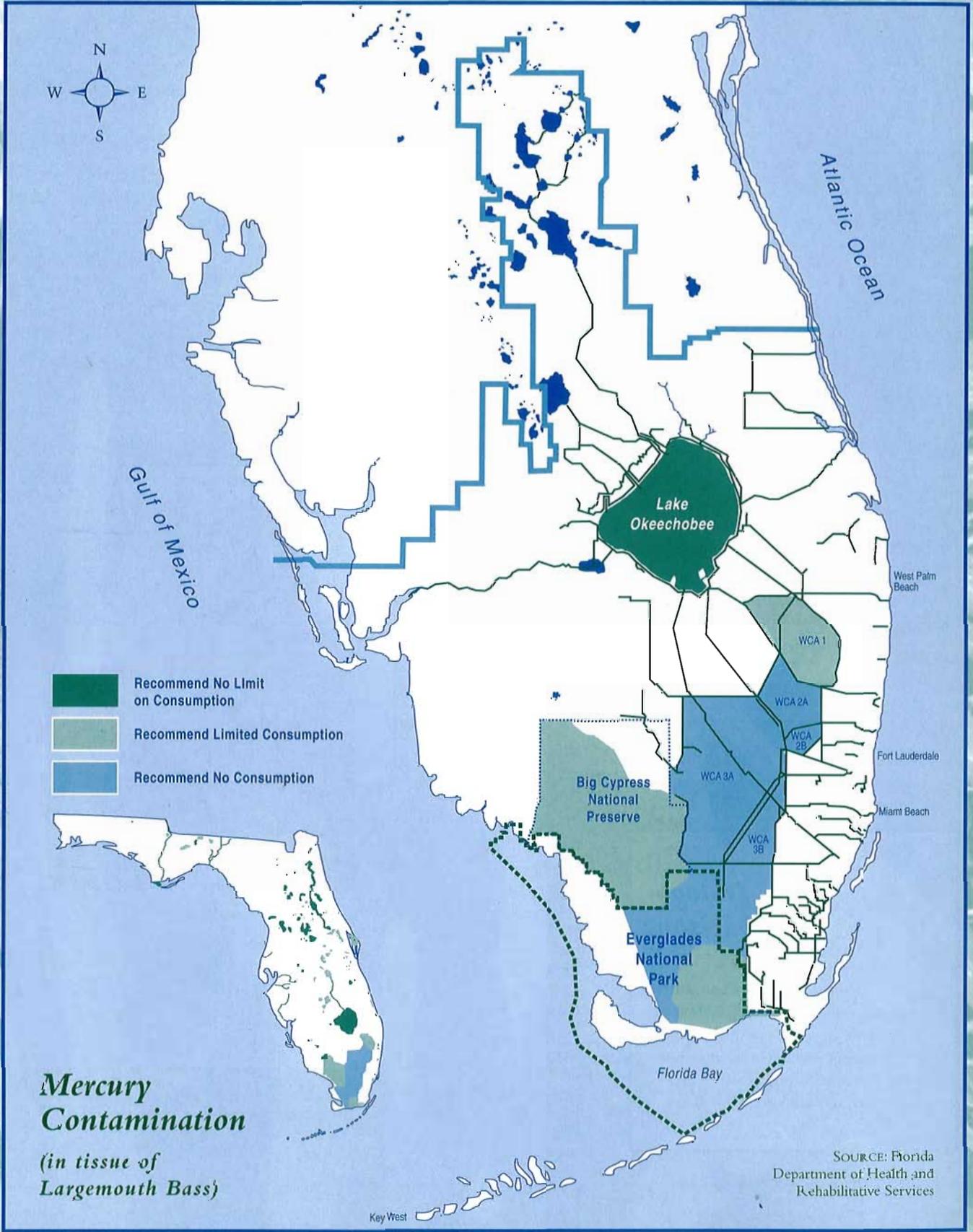
The following maps are not to scale





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.



Mercury Contamination
(in tissue of Largemouth Bass)

SOURCE: Florida Department of Health and Rehabilitative Services

Acknowledgements



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