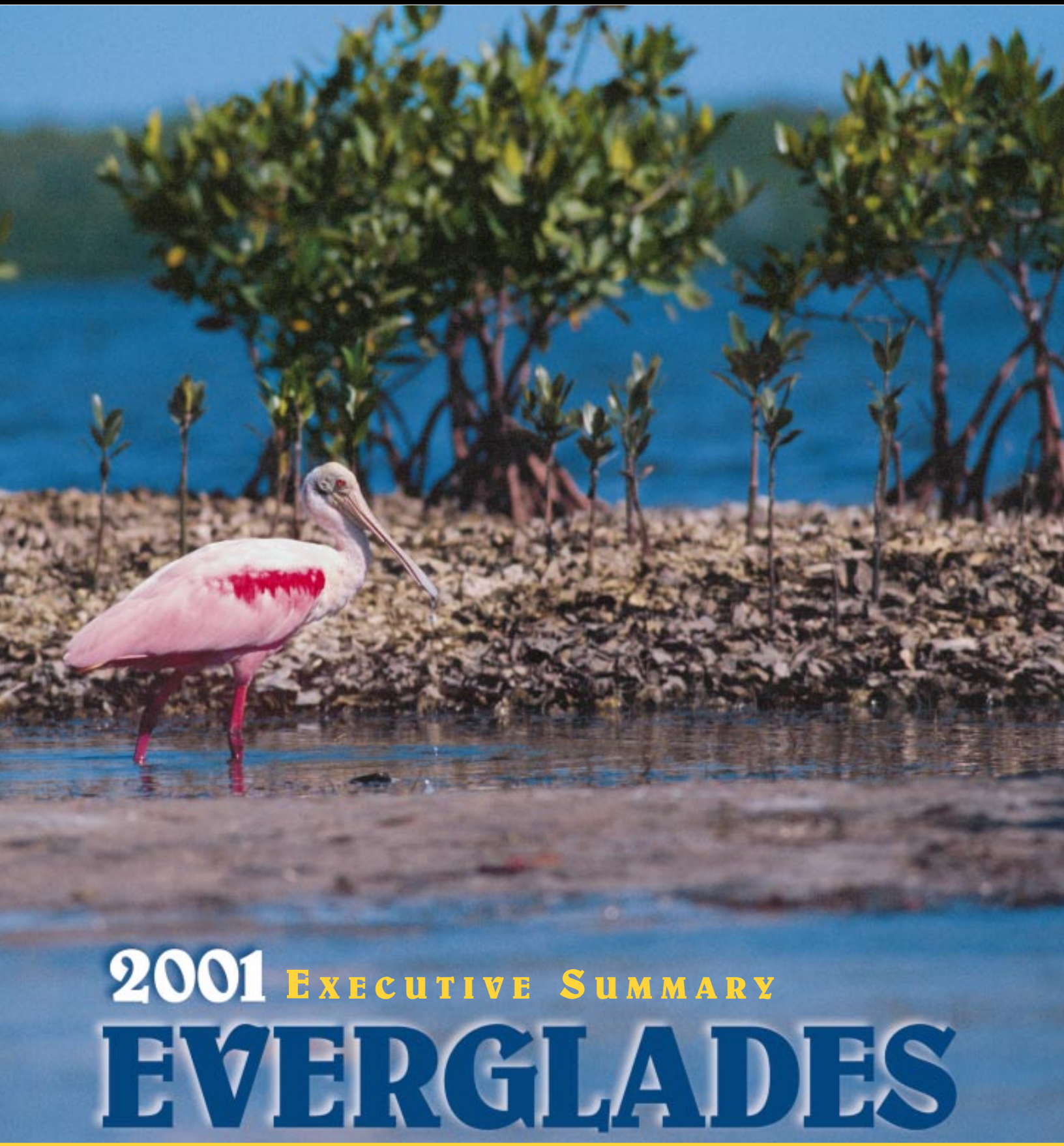
SOUTH FLORIDA WATER MANAGEMENT DISTRICT



2001 Executive Summary

EVERGLADES

Consolidated Report

January 1, 2001

On behalf of the South Florida Water Management District and the Florida Department of Environmental Protection, we are pleased to present the 2001 Everglades Consolidated Report. The Report is the product of a year-long cooperative effort by our agencies to comply with our reporting obligations under the Everglades Forever Act and other state and federal laws.

To ensure that the Report summarizes the best science available, rigorous internal review and external expert "peer review" guided its development. Having gone through this critical review process, we are confident that our data and findings will be of great value in making wise and timely decisions about the Everglades Construction Project and other restoration activities.

This year's Report relays good news for America's Everglades. The Everglades restoration programs are on schedule. Stormwater Treatment Areas are removing phosphorus beyond expectations from water moving southward into the Everglades Protection Area. The scientific underpinning for Everglades restoration efforts is strong, as is public support.

Continued implementation of long-term water quality strategies requires integration of many research, planning, regulatory and construction activities. Considering the number and complexity of these activities required to meet our water quality goals, the six-year time frame mandated by the Everglades Forever Act is very ambitious. Timely funding and completion of all these activities are crucial to meeting the Act's established 2006 deadline.

The Comprehensive Everglades Restoration Plan (CERP), formerly known as the Restudy, began as a bold vision for revitalizing natural areas and making more clean water available to farms and cities. Our agencies, along with state and federal governments, now have a shared priority to realize this vision through the federal Water Resources Development Act.

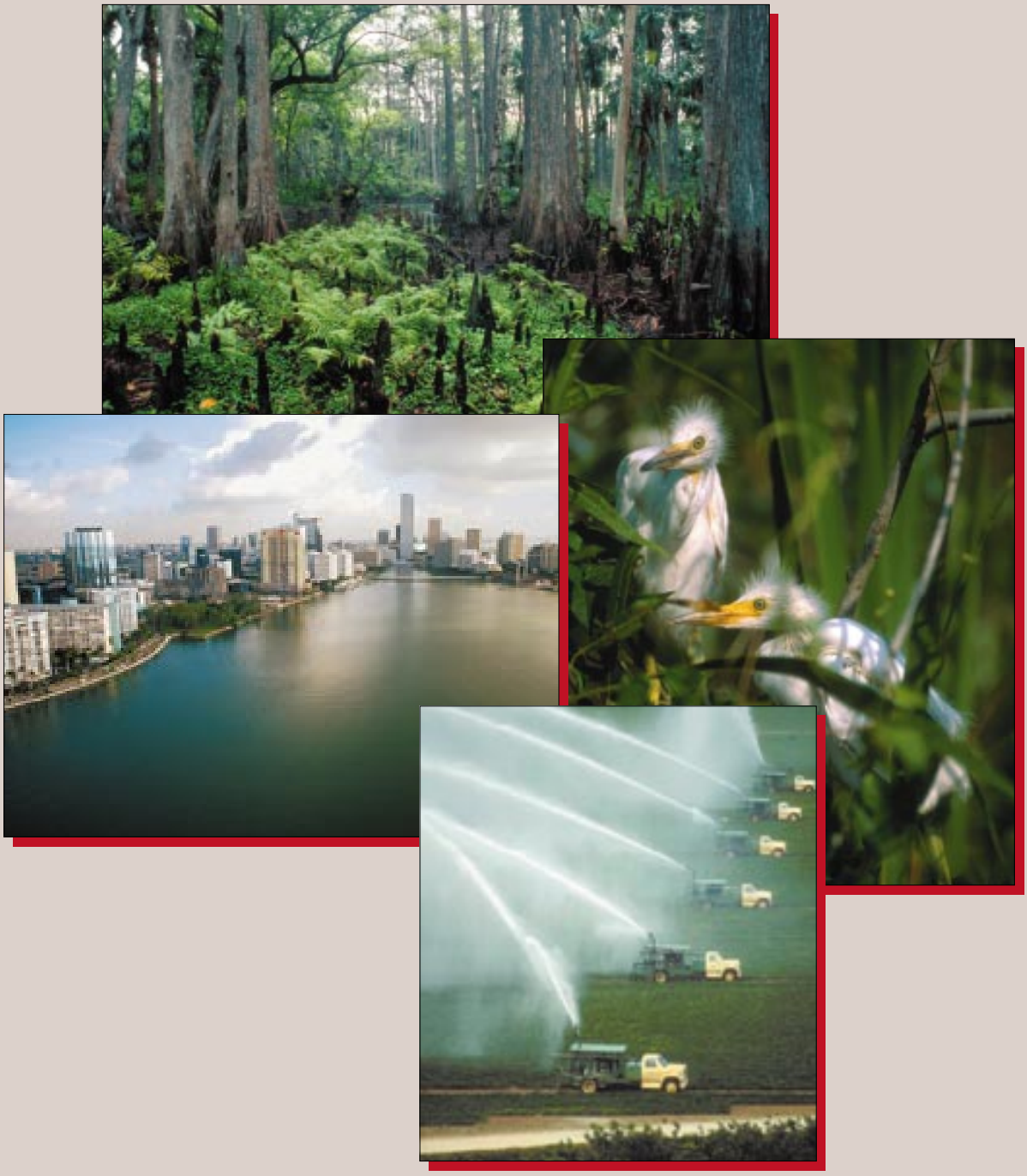
This year, we present the *2001 Everglades Consolidated Report* in a new format. This publication is the Report's Executive Summary that contains highlights of current Everglades data and findings. Attached to the back cover of this document is a compact disc containing the entire Report with more than 2,000 pages of data, findings, discussions and references in support of Everglades preservation and management. We encourage you to review the Report and anticipate that you will find it informative and useful.

Frank R. Finch, P.E.
Executive Director
South Florida Water Management District

David B. Struhs
Secretary
Florida Department of Environmental Protection

Beginning January 1, 2000, the District and the Department shall annually issue a peer-reviewed report regarding the research and monitoring program that summarizes all data and findings. The Department shall provide copies of the report to the Governor, the President of the Senate, and the Speaker of the House of Representatives. The report shall identify water quality parameters, in addition to phosphorus, which exceed state water quality standards or are causing or contributing to adverse impacts in the Everglades Protection Area.

—The Everglades Forever Act of 1994



2001 Everglades Consolidated Report
The Bottom Line

Water Quality in the Everglades Protection Area

- Evaluation of deviations (excursions) from water quality criteria by the Florida Department of Environmental Protection (the Department) indicates that Everglades water quality generally meets state numeric criteria.
- Stormwater Treatment Areas and agricultural Best Management Practices have reduced phosphorus concentrations leaving the Everglades Agricultural Area. However, further reductions of phosphorus inputs to the Everglades remain a critical restoration goal.
- The Department has developed a draft Site Specific Alternative Criterion for dissolved oxygen for the Everglades Protection Area. Use of this criterion resulted in an 80 percent reduction in stations being identified as a concern for dissolved oxygen.
- Mercury entering the Everglades Protection Area from the air and mercury emissions in Florida were reduced greatly since 1990 to the benefit of the Everglades. Research and monitoring will continue particularly to investigate the relationship between sulfur and mercury bioaccumulation.
- Ongoing cooperative efforts between the South Florida Water Managements District's Everglades Stormwater Program and local governments are developing water quality improvement plans for tributary basins to the Everglades Protection Area.

Ecological and Hydrological Needs of the Everglades Protection Area

- Evaluation of data from the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Water Conservation Area 1) and Water Conservation Area 2A indicates that the Everglades Forever Act default total phosphorus criterion of 10 parts per billion (ppb) would be protective of the natural flora and fauna in both areas without being overly protective or below the natural background levels.
- New understanding of how nutrients and water levels affect cattail and sawgrass stands will help to guide management and restoration of the Everglades.
- Deep water followed by a steep water recession (dry-down) is thought to have contributed to a 42 percent increase in the number of wading bird nests in the Everglades compared to last year.

Performance of Best Management Practices and Stormwater Treatment Areas

- For the fifth consecutive year, Best Management Practices have reduced phosphorus loads from the Everglades Agricultural Area to a greater extent (55 percent) than is required by the Everglades Forever Act (25 percent).
- The performance of Stormwater Treatment Areas continues to demonstrate that wetland treatment is effective at removing phosphorus to concentrations less than one-half of the interim limit (50 ppb) in the Everglades Forever Act.
- Currently operating Stormwater Treatment Areas (STA-1W, STA-6) continue to perform very well in removing mercury from stormwater and are very unlikely to produce unacceptable mercury risks downstream in the Everglades Protection Area.

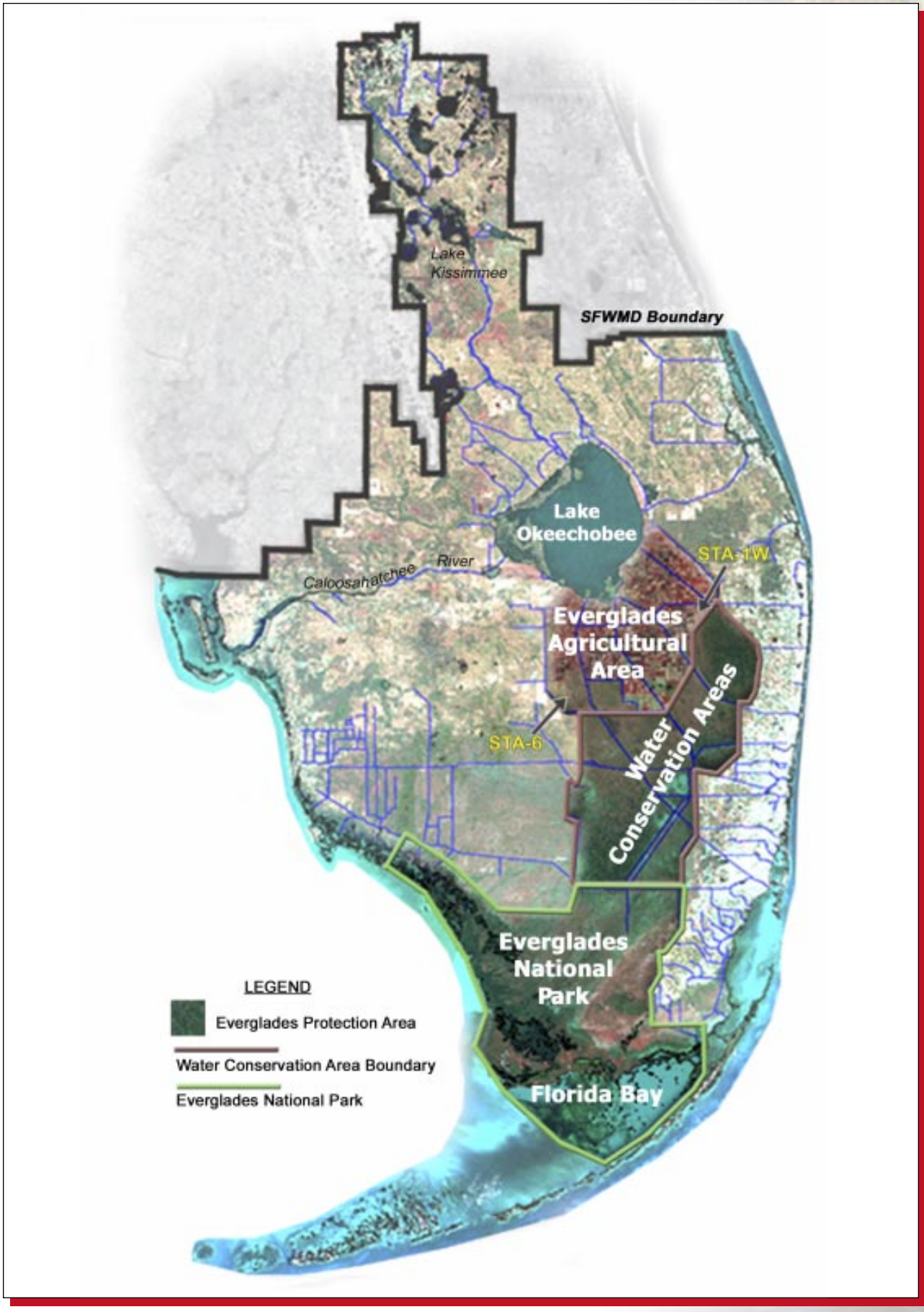
Advanced Treatment Technologies

- Short-term research in small-scale systems indicates that Periphyton-based Stormwater Treatment Areas can achieve average outflow total phosphorus concentrations of 20 ppb or less.
- Investigations in small-scale systems and observations in field-scale systems indicate that Submerged Aquatic Vegetation can achieve average outflow total phosphorus concentrations of 15 to 20 ppb.
- In small-scale experiments, chemical treatment produced outflow phosphorus concentrations of less than 10 ppb, and may be applicable to smaller urban basins where land availability is limited. Further investigation for full-scale implementation is warranted.
- Before the role of Advanced Treatment Technologies is determined, some uncertainties must be resolved, regarding hydrologic pulsing, water depths, construction, sustainability and effectiveness on urban stormwater.

Comprehensive Everglades Restoration Plan (CERP)

- The CERP includes over 60 components of which approximately 80 percent are sponsored jointly with the District. The Everglades Restoration Investment Act, passed by the Florida Legislature in May 2000, provides over $2 billion to implement the plan.
- The Design Agreement signed in May 2000, covers approximately $712 million worth of design work on six pilot projects and 56 co-sponsored components spanning 38 years and cost-shared equally by the District and the U.S. Army Corps of Engineers.

Major Everglades Areas



CHAPTER 1

Introduction to the 2001 Everglades Consolidated Report

The *2001 Everglades Consolidated Report* combines many reporting requirements into a single document. These include:

- Two annual reports required by the Everglades Forever Act
- Information required by the Joint Legislative Committee on Everglades Oversight
- Several state and federal reports required by permits from the U.S. Army Corps of Engineers and Florida Department of Environmental Protection (Department) for the Stormwater Treatment Areas and for areas under the Everglades Stormwater Program

The consolidation of these many related reporting requirements into one document provides technical information and status reports relating to all the major programs in the Everglades Protection Area.

Programs

- The Everglades Construction Project, as mandated by the Everglades Forever Act, is composed of six Stormwater Treatment Areas. These constructed wetlands cover 47,000 acres and will treat nearly 1.4 million acre-feet per year of stormwater runoff from the Everglades Agricultural Area and other sources. The wetlands will direct the treated water to the Everglades Protection Area to improve water flow, timing, quantity and quality.
- Upstream of the Stormwater Treatment Areas, the Everglades Best Management Practices Regulatory Program works in close cooperation with the agricultural industry to implement a program of farming practices to reduce the load of phosphorus moving southward from the Everglades Agricultural Area into the Everglades Protection Area.
- In basins contributing to the Everglades Protection Area outside the Everglades Construction Project, the Everglades Stormwater Program supports strategies based on monitoring, assessment and regulation to ensure compliance with state water quality standards by December 31, 2006.
- This Report also provides information that directly supports the far-reaching Comprehensive Everglades Restoration Plan (CERP). This long-term plan for restoring, protecting and preserving the South Florida Everglades ecosystem includes over 60 components and six pilot projects. The District has agreed to be the local sponsor for the pilot projects and for over 80 percent of the components in close partnership with the U.S. Corps of Engineers. The Florida Legislature passed the Everglades Restoration Investment Act in May 2000, committing over $2 billion as the state's share for the first decade of CERP implementation. The state-federal partnership was solidified when the 106th Congress passed "Restoring the Everglades, an American Legacy Act," demonstrating a historic commitment to the Everglades ecosystem.

Extraordinary progress has been made in restoring the Everglades through a combination of Stormwater Treatment Areas, Best Management Practices, and comprehensive regulatory and planning efforts. Remaining uncertainties, however, may inhibit efforts to achieve mandated compliance with all water quality standards by 2006.

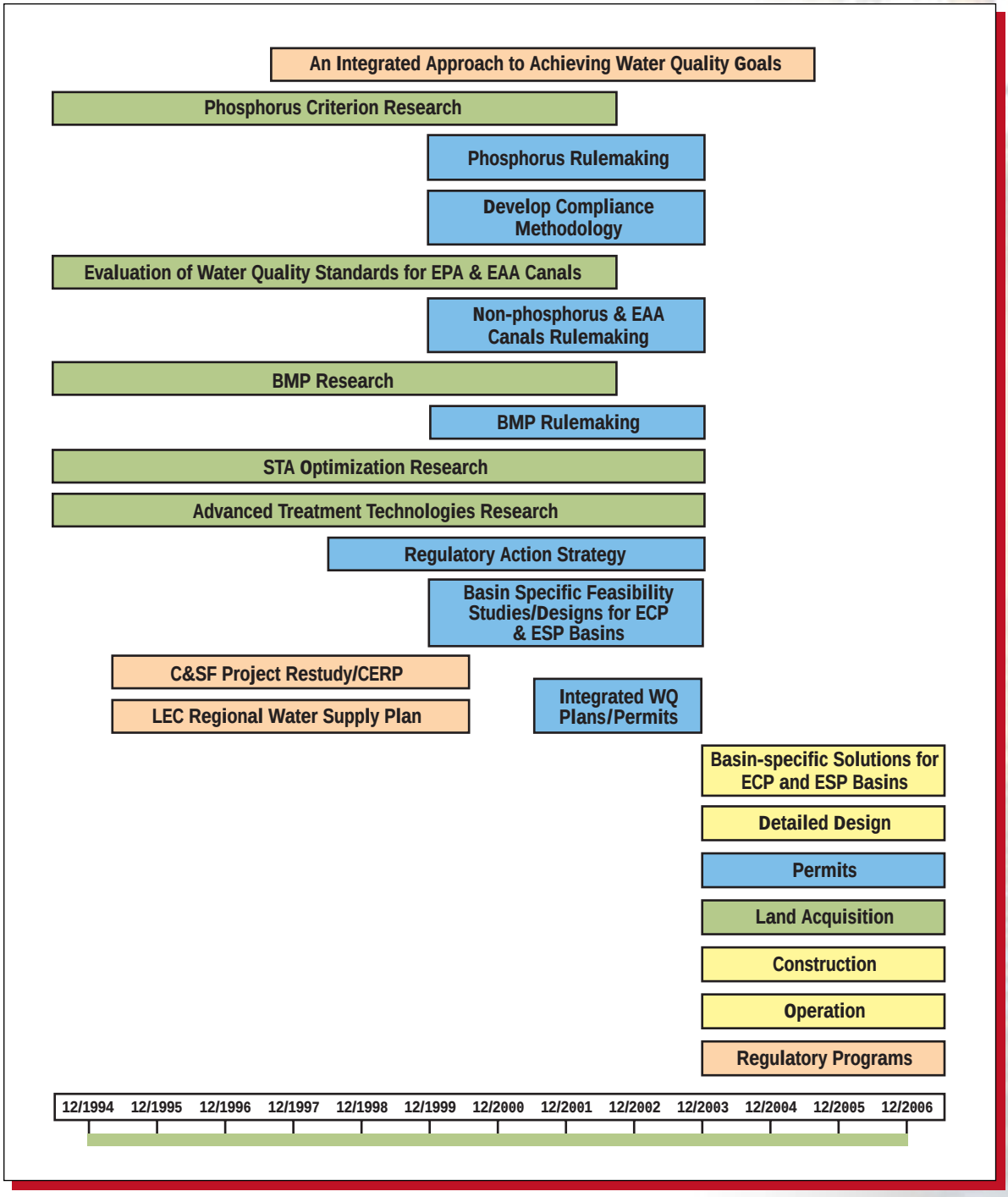
Other topics addressed in the *2001 Everglades Consolidated Report* include Everglades hydrology, land acquisition, fiscal management, mercury concerns, the *Lower East Coast Water Supply Plan* and exotic species management. While this Executive Summary is self-standing, it is merely a summary of the larger reports and appendices that underwent a series of public workshops and scientific peer review in September 2000. The final product reflects the authors' changes in response to the input of the public and peer review panel.

At a cost in excess of $700 million, the Everglades restoration efforts undertaken by the District and the Department are highly ambitious. Since 1994, over $60 million has been invested in just the Everglades-based research described in the *Report* – including research on improving agricultural Best Management Practices, optimizing performance of the Stormwater Treatment Areas, establishing a numeric state water quality criterion for phosphorus, and

implementing Advanced Treatment Technologies capable of achieving phosphorus levels as low as 10 ppb.

While tremendous progress is being made, significant uncertainties remain that may prevent the District from achieving the mandate in the Everglades Forever Act to achieve compliance with all water quality standards by December 31, 2006. Among these uncertainties are the establishment of a numeric phosphorus criterion, the complete evaluation of Advanced Treatment Technologies, the integration of ongoing programs with the CERP, the optimization of solutions in each basin and the identification of funding sources.

Ultimately, the *2001 Everglades Consolidated Report* and all the research it describes will contribute to the development of basin-specific solutions for all the areas discharging into the Everglades. Many years from now, this *Report*, as well as all previous and future reports, will provide a comprehensive resource on the evolution and success of the Everglades restoration.



CHAPTER 2

Hydrologic Needs: Effects of Hydrology on the Everglades

Everglades hydrology, and its linkage to plants, soils and wildlife are relationships that have been studied through experiments, field monitoring, historical analysis and integration through scientific modeling.

This Water Year's hydrology (May 1, 1999-April 30, 2000) was dominated by Hurricane Irene (October 15, 1999) and by a general lack of rain the rest of the year. Rainfall for Water Year 2000 averaged 3 to 5 inches below normal. Hurricane Irene created a cascade of high water that moved southward through the Everglades system and persisted well into the dry season. In fact, without Hurricane Irene, the dry season might have led to fires and habitat destruction in Water Conservation Area 3.

An Interim Structural and Operational Plan (ISOP) was implemented to prevent the high water of Hurricane Irene from entering Everglades National Park and disrupting the nesting success of the Cape Sable Seaside Sparrow. The western-most sparrow population requires water levels less than 6.0 feet for 60 consecutive days between March 1 and July 15. In spite of actions prescribed by the plan, two rainfall events temporarily increased water levels and briefly disrupted the dry-out period. Other sparrow subpopulations had an opportunity for a successful nesting, and the number of wading bird nests throughout the interior Everglades increased 42 percent, compared to last year. Conventional wisdom suggests that such nesting success in wading birds occurs after several very dry years. However, the increased nesting this year followed several very wet years.

We are using our improved understanding of Everglades landscape patterns and water flow to guide the restoration of South Florida. An analysis of pre-drainage patterns of water flow suggests that overflow from Lake Okeechobee to the Everglades was more common than previously thought. Evaluation of the historic custard apple swamp occurring around the southern rim of Lake Okeechobee revealed that mineral soils and relative elevation are important to this forested habitat. Without these conditions and proximity to foraging areas for wading birds, proposals to foster the growth of custard apple swamps, or other similar habitats, in new areas during Everglades restoration are unlikely to be successful or beneficial.

Patterns in the landscape of the historic Everglades suggest that the pre-drainage landscape was shaped into subtle ridges and sloughs, important to wildlife and movement of water southward. Analysis of these landscape features suggests two pathways for water flow through the ecosystem: the eastern flow path draining southeastward into the Atlantic Ocean and a western flow path draining southwestward through Shark Slough into the Gulf of Mexico. Evidence for these flow patterns also suggests a long, continuous downstream movement of water through the Everglades. Manmade structures have altered these flow pathways, and may be causing the gradual

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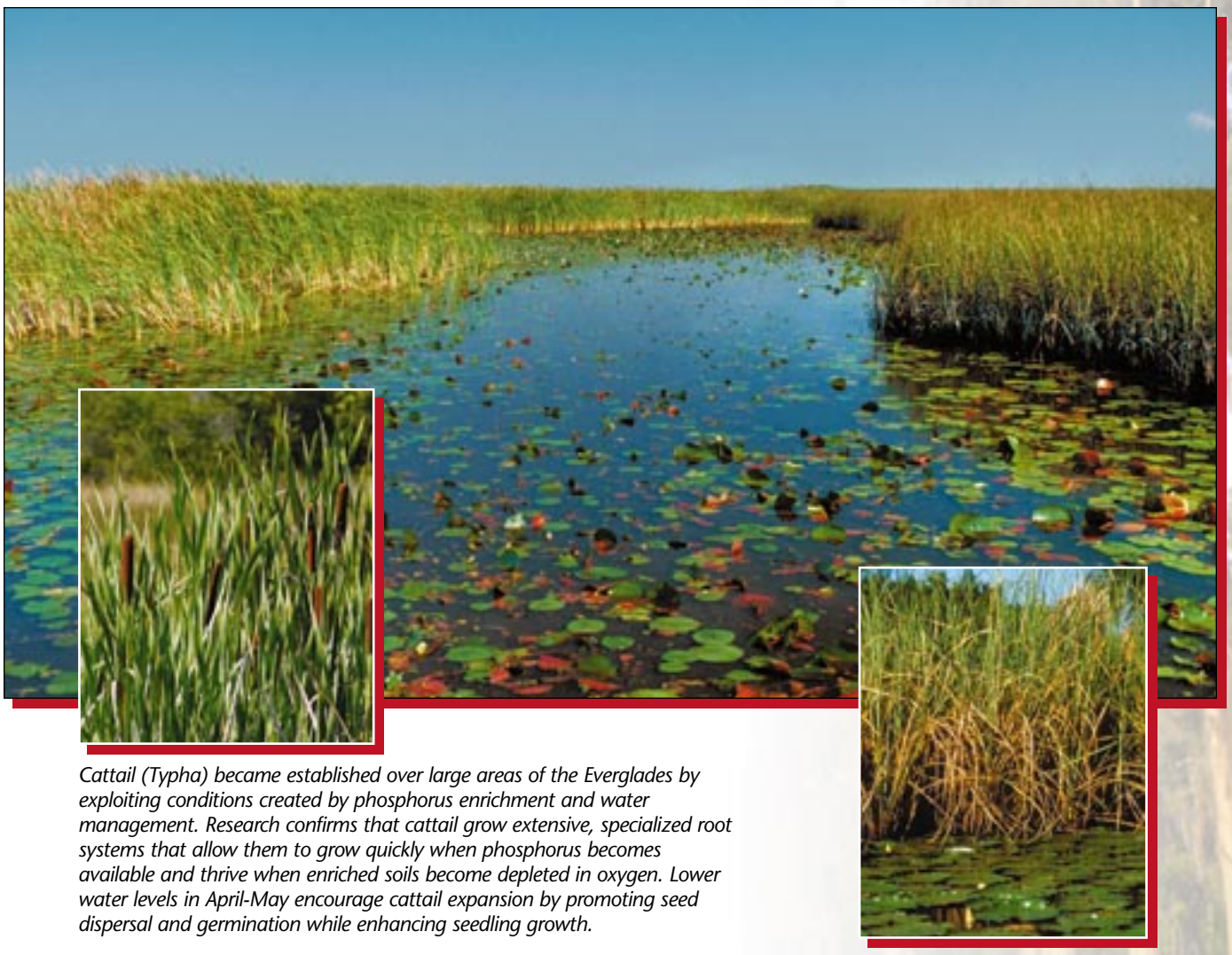


Cattail (Typha) became established over large areas of the Everglades by exploiting conditions created by phosphorus enrichment and water management. Research confirms that cattail grow extensive, specialized root systems that allow them to grow quickly when phosphorus becomes available and thrive when enriched soils become depleted in oxygen. Lower water levels in April-May encourage cattail expansion by promoting seed dispersal and germination while enhancing seedling growth.

Sawgrass (Cladium) covers large areas of the pristine Everglades landscape. Sawgrass is not as well adapted to high nutrient environments with low soil oxygen levels as is cattail. Sawgrass is quite resistant to muck fires and is able to use nutrients efficiently in areas where phosphorus concentrations are naturally low. Its seed dispersal occurs in July-August, and high water levels during this period due to water management may limit seed germination and seedling growth.

loss of the ridge and slough pattern exhibited in the historic Everglades. Ongoing assessment of landscape patterns will be an important aspect of Everglades restoration.

This year marks the conclusion of several research projects on the ability of cattail to invade the remnant Everglades. Cattail can survive and likely displace sawgrass under high water conditions because cattail can pump air down into their roots to compensate for low oxygen concentrations. However, this pumping ability comes at an energetic cost and requires additional phosphorus. These findings help explain why cattail invades the landscape so successfully under conditions of higher water levels and nutrient subsidies from fire, soil compaction or stormwater enrichment.

Progress toward understanding submersed aquatic vegetation in Florida Bay was also made this year. It was previously thought that as Everglades restoration progressed, increased freshwater flow to Florida Bay might stress *Thalassia* seagrass (turtlegrass) beds by lowering salinity. However, healthy populations of *Thalassia* have been found in areas of maximum Everglades freshwater inflows, despite periodic low salinity and inflow of dark, tannin-colored waters that can reduce light levels in Florida Bay.

CHAPTER

3 Ecological Effects of Phosphorus Enrichment in the Everglades

Nutrient inflows into the Everglades, and particularly phosphorus, have been responsible for many of the changes to the ecology of the Everglades. Therefore, reducing this "phosphorus enrichment" is the primary goal of the Everglades restoration efforts. Stormwater Treatment Areas reduce phosphorus through vegetative uptake and soil storage. Agricultural Best Management Practices lower phosphorus through improved on-farm water management techniques and controlled fertilizer application. However, restoration of the Everglades requires the establishment of a restoration objective, specifically, the establishment of a numeric water quality criterion for phosphorus that prevents an imbalance in Everglades flora or fauna.

The Everglades Forever Act requires the Department to establish such a criterion by rulemaking. If the Department does not adopt a numeric phosphorus criterion by December 31, 2003, the Everglades Forever Act establishes a default criterion of 10 ppb.

The Department has conducted extensive evaluations of data collected by the District and Duke University Wetlands Center. Evaluations of these data by the Department suggest that a criterion derived from these data may not be statistically differentiable from the 10 ppb default criterion or other criterion values from further research.

The Everglades Forever Act also specifies that the Department's phosphorus criterion cannot be below natural conditions while taking into account spatial and temporal variability. The Miccosukee Tribe of Indians of Florida has already adopted a standard of 10 ppb on certain tribal lands, and that standard has been approved by the U.S. Environmental Protection Agency.

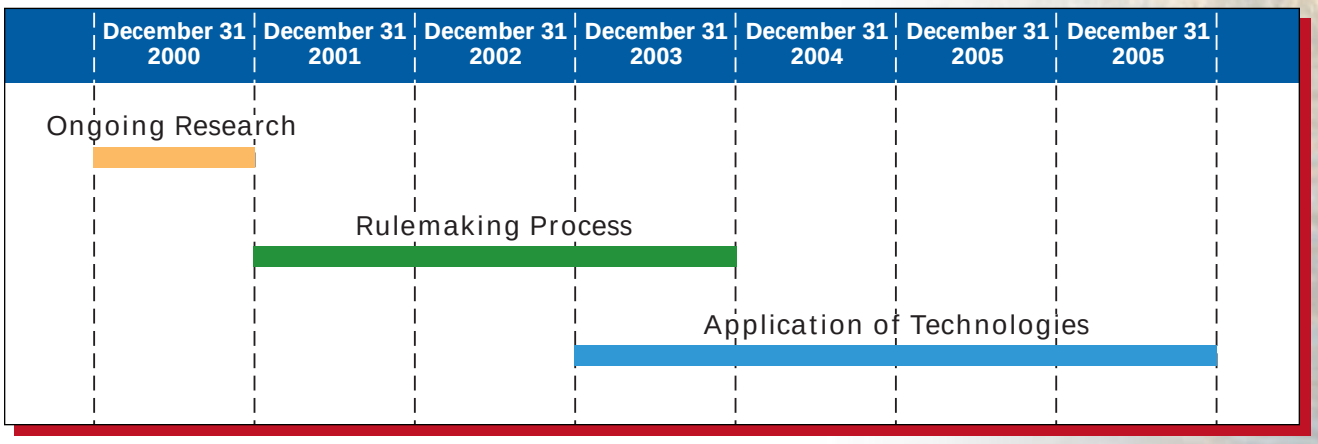
Extensive research in support of the Department's rulemaking effort has already been conducted by the District, Florida International University, and the Duke University Wetlands Center (DUWC). At this time, the Department has analyzed only the District and DUWC experimental data and reports for work conducted in the Arthur R. Marshall Loxahatchee National Wildlife Refuge and Water Conservation Area 2. Although Florida International University's research is ongoing, no written conclusions or significant data on the phosphorus threshold research have been provided.

The Department has conducted extensive evaluations of data collected by the District and DUWC. Evaluations of these data by the Department suggest that a criterion derived from these data may not be statistically differentiable from the 10 ppb default criterion or other criterion values from further research.

The DUWC evaluated the effect of introduced nutrients in an experimental flume study in Water Conservation Area 2A. The DUWC researchers concluded that the phosphorus criterion should fall in the range of 17 to 22 ppb. However, based on the Department's review of the DUWC work, this range appears to be biased high and is not sufficiently protective of the Everglades flora or fauna. The peer review panel for this Report noted that the DUWC experimental approach was no less scientifically valid than the District's, but concurred with the Department's findings regarding the DUWC conclusions. The peer review panel also noted that the DUWC researchers' interpretations of the data were not consistent with the mandates of the Everglades Forever Act.

The environmentally friendly, green Advanced Treatment Technologies are expected to be able to achieve phosphorus concentrations approaching 20 ppb. In areas of the Everglades currently receiving elevated levels of phosphorus in this range, concentrations decline rapidly after the point of discharge because of biological uptake and chemical sorption processes. The use of the green Advanced Treatment Technologies to achieve phosphorus concentrations slightly above the numeric criterion will need to be balanced against forcing the use of chemical treatment to achieve "end-of-pipe" compliance. The use of green technologies may also require the Department to allow a small zone on the marsh periphery where the phosphorus levels are slightly enriched. A thorough evaluation of the Advanced Treatment Technology research currently being conducted will be needed before a final decision can be made.

The network of canals, levees and pump stations throughout South Florida has improved flood control and water supply, allowing development and agriculture, but has also restricted the natural flow of water through the Everglades.



CHAPTER

4 Status of Water Quality Criteria Compliance in the Everglades Protection Area

During Water Year 2000, the South Florida Water Management District (District) and the Florida Department of Environmental Protection (Department) continued comprehensive monitoring programs in the Everglades. In addition to reporting on water quality conditions in the Everglades Protection Area, this year's *Everglades Consolidated Report* includes an evaluation of water quality parameters not meeting Class III criteria during Water Year 2000. The *Report* also provides a discussion of the factors contributing to excursions from applicable water quality criteria and an evaluation of the natural background conditions where existing standards are not appropriate for the unique environment in the Everglades marshes.

Inflow phosphorus concentrations were similar to historic periods (1978-1998) in the Everglades Protection Area, with the exception of Water Conservation Area 3, where inflow concentrations were slightly higher during Water Year 2000 (May 1, 1999 through April 30, 2000). Overall, inflow phosphorus concentrations decreased from north to south with the highest concentrations entering the Arthur R. Marshall Loxahatchee National Wildlife Refuge (median = 68 ppb) and the lowest flowing into the Everglades National Park (median = 8 ppb). Similar to previous periods, median interior marsh concentrations were low for Water Year 2000. Median phosphorus concentrations in the interior marshes ranged from 5 to 13 ppb, depending on area, with the lowest levels being observed in Everglades National Park. The map on the following page summarizes flow-weighted phosphorus (ppb) concentrations moving into, out of and within the Everglades Protection Area for Water Year 2000.

The vast majority of water quality data collected in the EPA was found to meet Class III water quality standards.

Analysis of the Water Year 2000 data reveals that constituent excursions vary greatly for different regions of the Everglades Protection Area. Most importantly, the vast majority of water quality data collected in the Everglades Protection Area meets Class III water quality standards.

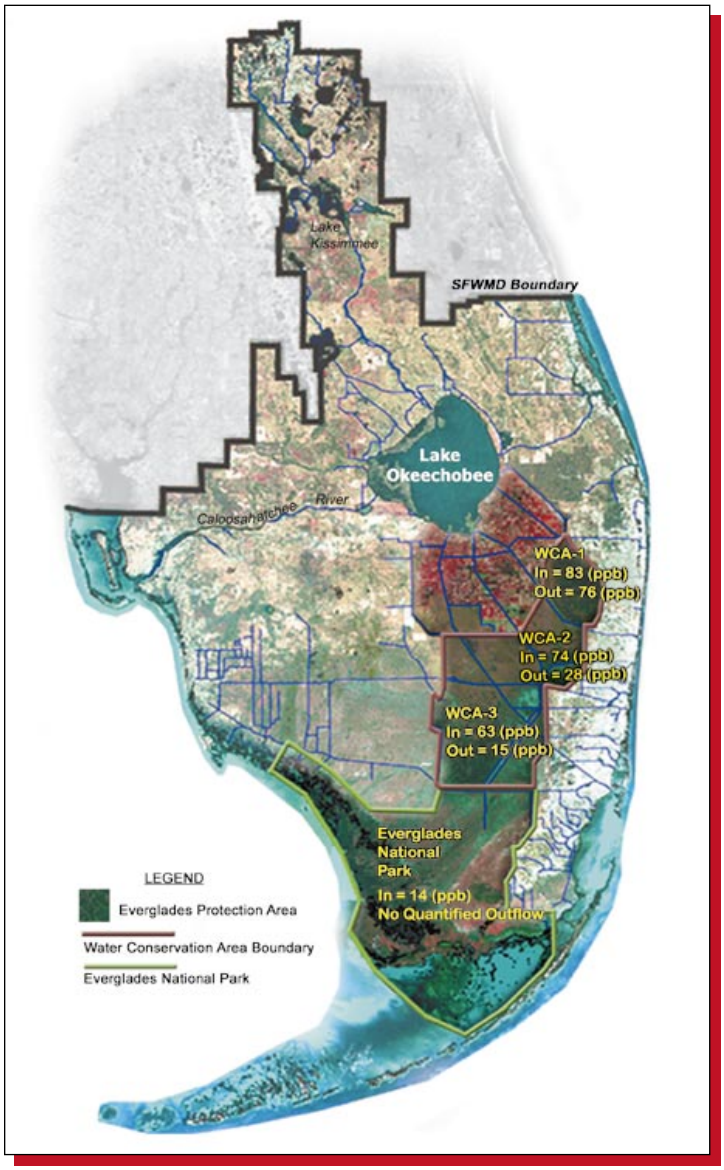
Excursions were reported for eight parameters, including dissolved oxygen, alkalinity, conductivity, iron, pH, turbidity, lead and un-ionized ammonia. The pesticides DDT, DDE, DDD, endosulfan and diazinon each exhibited a single exceedance of either Class III criteria or chronic toxicity values.

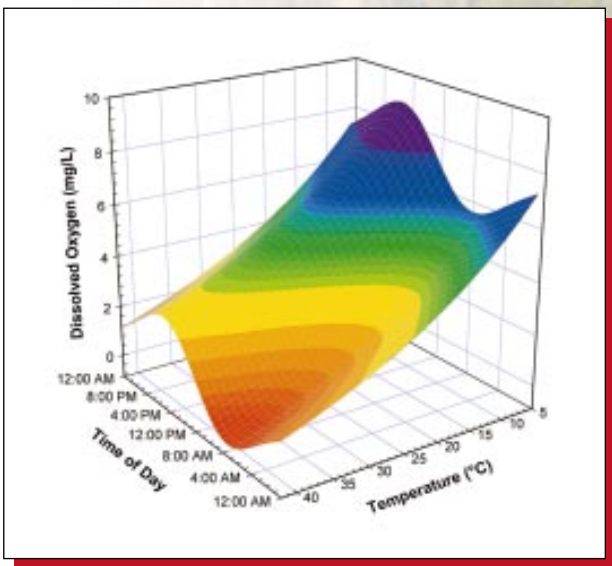
Reviewing contributory factors reveals that the majority of dissolved oxygen, pH and alkalinity excursions are the result of natural conditions within the marsh. The Department recognizes these conditions to be natural characteristics of the Everglades Protection Area, and does not consider these excursions to be violations of state standards. The Department, with assistance from the District, intends to continue the evaluation of background water quality in the Everglades Protection Area to determine if current standards for these parameters are appropriate for the Everglades marshes.

Additionally, excursion rates for several other parameters (e.g., conductivity, turbidity, iron and lead) are likely influenced by factors including: groundwater infiltration, construction, pumping activities and sample contamination. These parameters will continue to be monitored to determine whether these excursions represent natural or unabatable human-induced conditions or if the excursions require corrective action.

In recognition of natural background conditions, the Department has developed a proposed Site Specific Alternative Criterion (SSAC) for dissolved oxygen in the Everglades. Dissolved oxygen is subject to significant daily and seasonal fluctuations. Application of the proposed SSAC to Water Year 2000 data substantially reduced the excursion rate in all regions of the Everglades Protection Area and provided a more accurate differentiation of the sites exhibiting naturally low dissolved oxygen regimes from those that have been adversely impacted with respect to dissolved oxygen. The Department's proposed approach was complimented by the

Total Inflow and Outflow of Phosphorus Concentrations for Water Year 2000





A graphical representation of the proposed Site Specific Alternative Criterion for Everglades dissolved oxygen is shown above. The criterion considers the important influences of time of day and temperature on the biological, chemical, and physical processes, such as photosynthesis (oxygen production) and respiration (oxygen consumption), which regulate dissolved oxygen levels in the marsh.

scientific peer review panel for the *2001 Everglades Consolidated Report.* Final adoption of the proposed SSAC will require further peer review, public notice, hearing and approval by the Secretary of the Department.

Overall, water quality conditions determined within the Everglades Protection Area for Water Year 2000 were similar to those observed during Water Year 1999 and the 1978-1998 historic period. Since many of the observed Class III excursions can be attributed to natural marsh conditions, they do not represent an ecologic threat to the Everglades. However, based on the comments from the peer review panel for the *2001 Everglades Consolidated Report,* the District and Department anticipate a more detailed analysis of sulfur and its relationship to mercury accumulation in the Everglades as a part of the Department's ongoing mercury program.

Stormwater Treatment Areas (STA) 1 West and 6 have been in operation for at least one year. Both STAs have performed very well at removing phosphorus from stormwater, while maintaining outflow concentrations less than inflows for other water quality constituents. They are in compliance with their operating permits for total phosphorus reductions. Average phosphorus concentrations in treated water flowing into the Everglades Protection Area from the STAs have been consistently less than one-half the 50 ppb concentration for which the STAs were designed.

CHAPTER 5

Effectiveness of Agricultural Best Management Practices

Agricultural Best Management Practices (BMPs) are farming practices for managing water, nutrients and sediments that balance water quality improvements and agricultural productivity. A basin-wide program of Best Management Practices is required by the Everglades Forever Act to control phosphorus export from the Everglades Agricultural Area to the Everglades Protection Area. The goal is to reduce the amount of phosphorus (load) entering the Everglades Protection Area from the Everglades Agricultural Area by at least 25 percent. This Everglades Best Management Practice Regulatory Program was fully implemented in 1995 and is one of the cornerstones to the restoration of the Everglades.

Agricultural Best Management Practices, in use or being studied, are outlined in the table opposite. These Best Management Practices are proven to be effective overall in the field at reducing phosphorus loads. Each category of Best Management Practices works in unique ways to reduce phosphorus export. Water management Best Management Practices seek to reduce the volume of discharges and the concentration of phosphorus in discharged water. Practices to manage nutrients and sediments are designed to address water quality through reducing phosphorus levels both in dissolved form and as particles, respectively. Best Management Practice plans allow each landowner to integrate these practices to best match site-specific conditions.

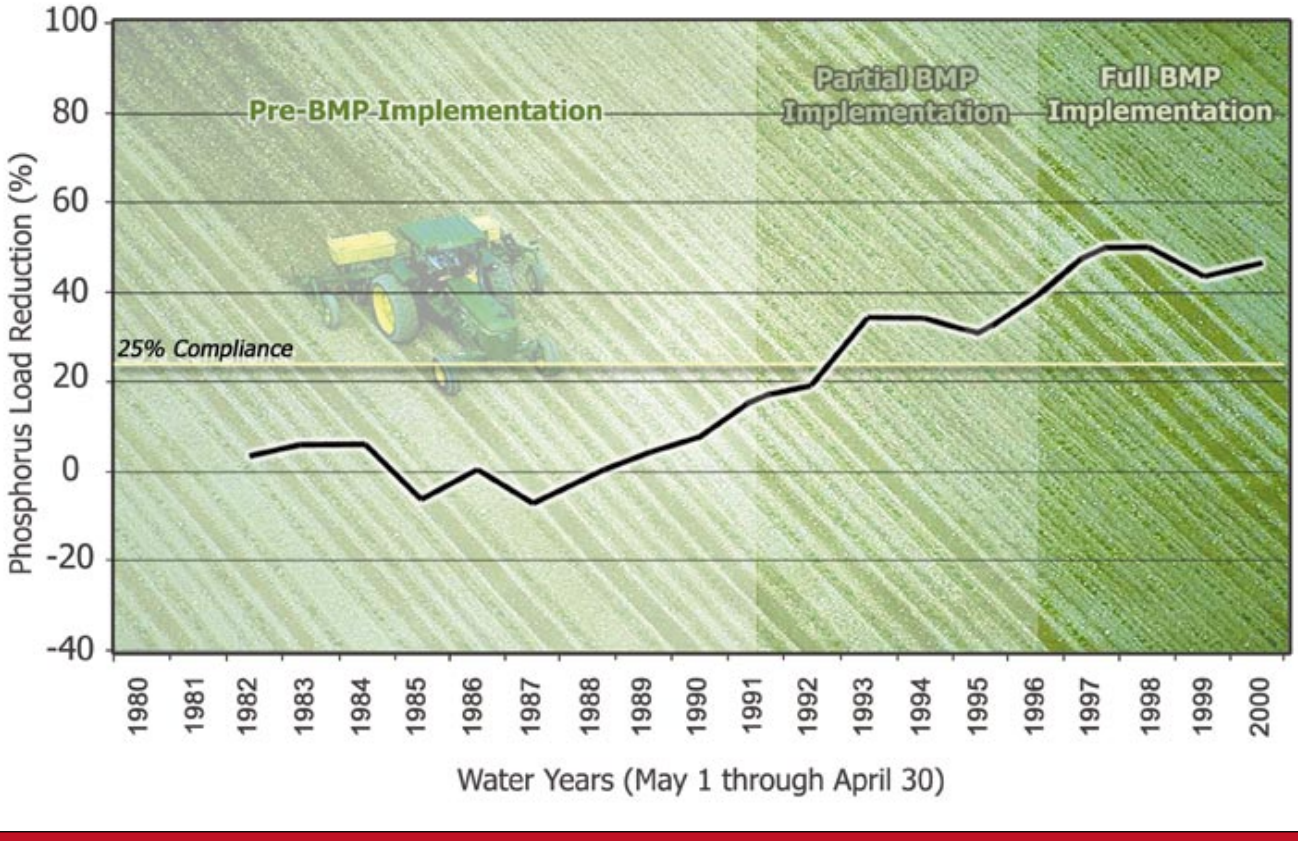
During the past five years, annual total phosphorus load reduction in the Everglades Agricultural Area averaged 54 percent, exceeding the 25 percent reduction goal.

During the past five years, annual phosphorus load reduction in the Everglades Agricultural Area averaged 54 percent, exceeding the 25 percent reduction goal of the Everglades Forever Act. During the same 5-year period, phosphorus concentrations averaged 108 ppb, down substantially from the 12-year pre-Best Management Practice average of 173 ppb. The reduction in farms generally follows the basin trend, but varies significantly between farms and years.

Phosphorus attached to decaying vegetation and other particles accounts for about 50 to 80 percent of the total phosphorus leaving Everglades Agricultural Area farms. The export of particle-borne phosphorus is generally associated with large rainfall events that tend to occur 3 to 10 times a year in the Everglades Agricultural Area. Based on these findings, information on new or refined sediment control Best Management Practices for such events should be useful in controlling particulate phosphorus discharge and may further reduce phosphorus loads from the basin as a whole.

Other efforts may also contribute to additional reductions in phosphorus loads from the Everglades Agricultural Area. Updated Best Management Practice manuals, seminars and field demonstrations will provide Everglades Agricultural Area growers with useful information on new and existing Best Management Practices. Integration of Best Management Practices for managing water, nutrients and sediment for each farm should be optimized according to site-specific conditions, including crop rotation and drainage patterns to achieve more uniform phosphorus load reductions across the Everglades Agricultural Area.

Best Management Practices implemented in the Everglades Agricultural Area have been, and continue to be, effective in reducing total phosphorus loads and concentrations, as shown in the graph opposite. Additional reduction is possible with effective Best Management Practice research, education and implementation.



Compliance conditions became effective in 1996 when Best Management Practices were fully implemented. During this period, the Everglades Agricultural Area has met the 25 percent total phosphorus reduction criteria, as required by Rule 40E-63.

Selected Agricultural Best Management Practices in the Everglades Agricultural Area

Category	Best Management Practice
Water Management BMPs	Water table control through improved drainage and irrigation schedules Improved water control devices, such as booster pumps and culvert with risers On-farm storage or recycling of excess water or water laden with phosphorus
Nutrient Management BMPs	Fertilization based on calibrated soil test or other factors Fertilizer application control for better use efficiency Fertilizer spill prevention
Sediment Control BMPs	Erosion control on fields and ditch/canal banks Sediment control in ditches/canals Aquatic weed control in canals

CHAPTER 6

Optimization Research for the Stormwater Treatment Areas

Stormwater Treatment Areas (STAs) are large, constructed wetlands that remove pollutants from stormwater runoff. While the removal mechanisms include both biological and chemical processes, the long-term removal mechanism is storage as partially decomposed organic material.

Four STAs, totaling over 12,000 acres, have been completed and are operational. STA-1 West has been operational since August 1994, with the recent addition of almost 3,000 acres in March 1999; STA-2 began startup operation in June 1999; STA-5 began startup operation in January 1999; and STA-6 began startup operation in October 1997. Working in conjunction with the Everglades Agricultural Area Best Management Practices, the STAs were designed to achieve an average outflow concentration of 50 ppb, the interim goal established by the 1994 Everglades Forever Act. They are performing better than this interim target. Concurrent with the construction of the STAs, the District has investigated ways to further enhance the nutrient removal of the STAs. Research into optimizing performance of the STAs continues and includes analysis of the performance of the full-scale STAs, experiments in the 0.2-hectare test cells within STA-1W, and evaluation of data from other wetland systems.

The 1,545-ha (3,819-acre) Everglades Nutrient Removal Project (ENRP) began operation in 1994, and was incorporated into STA-1W with the addition of the 1,156-ha (2,855-acre) Cell 5 in March 1999. Flow patterns in the ENRP were altered to allow the STA to handle pulse flows. Because construction activities temporarily disrupted data collection, performance data are available only for Treatment Cells 2, 3 and 4 this year. Phosphorus retention relative to incoming levels continues at 46, 25, and 54 percent, respectively. Overall, STA-1W has performed very well at removing phosphorus from stormwater in compliance with its permit.

Differences in phosphorus removal were observed between the flow-ways within STA-1W. Ongoing research is attempting to determine how this difference in performance could be related to differences in vegetation, water retention time, water depth and/or seepage into the cell.

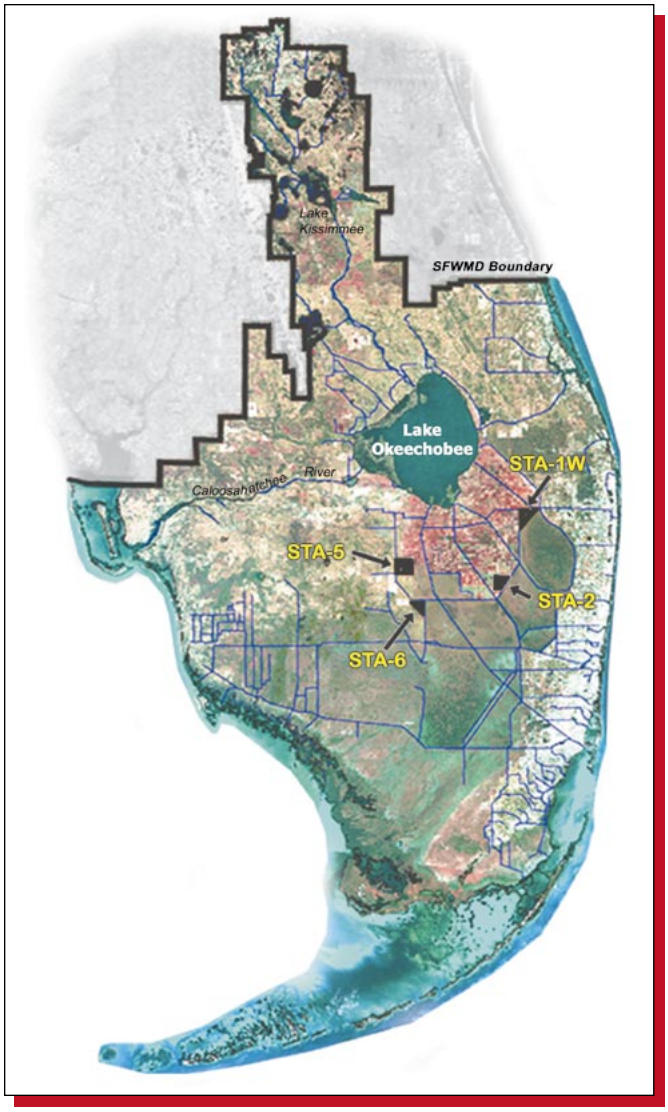
Flow pattern tests in Treatment Cell 4 revealed that a significant portion of incoming water did not have full contact with the vegetation, and therefore, did not receive full treatment. A series of earthen plugs, installed to improve distribution of flows across the marsh, is expected to further improve performance. Follow-up tests in 2001 will determine their success, while other studies determine the reasons for the strong performance of this treatment cell.

Experiments in test cells are underway to determine how phosphorus retention within an STA is influenced by the amount of water passing through (hydraulic loading rates) and water depth. Preliminary results indicate that high hydraulic loading rates compromise outflow phosphorus concentrations.

Mesocosm experiments are underway to develop guidance about reflooding STAs after periods of dry-out. Preliminary results indicate that reflooding releases phosphorus into the water, but this release is temporary. Tanks with planted vegetation released less phosphorus than those without vegetation.

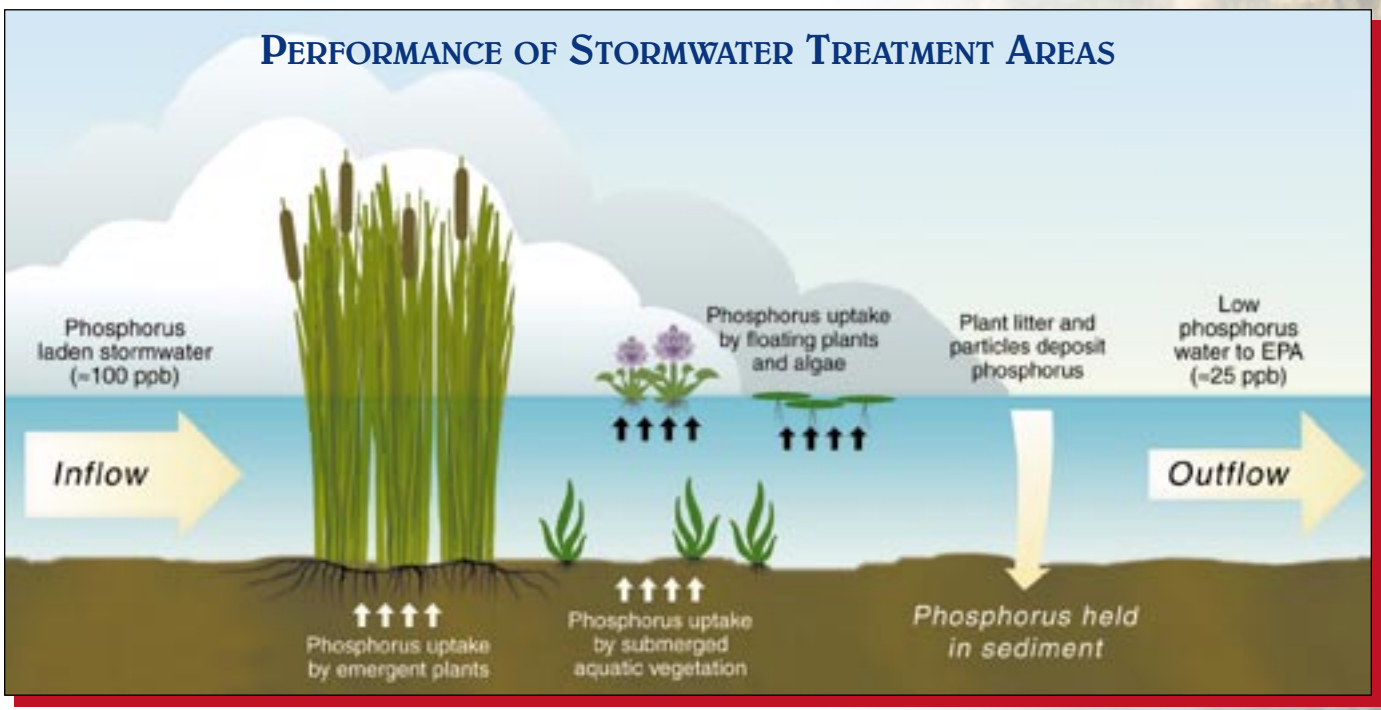
The Stormwater Treatment Areas (STAs) are performing better than the interim target set by the Everglades Forever Act. Research is underway to further optimize the nutrient removal performance of the STAs.

Storage Treatment Areas



Preliminary experimental results in mesocosms indicate that reflooding releases nutrients into the water column, but this release is temporary.

Performance of Stormwater Treatment Areas



CHAPTER 7

The Everglades Mercury Problem

The accumulation of mercury in fish is a problem in the Everglades. Since 1989, the Florida Department of Health has recommended limited consumption of several species of sport fish because of risk to consumers. The high levels present in fish could also be toxic to fish-eating wildlife species.

The form of mercury found in fish and fish-eating animals, methylmercury, is not like the elemental form in thermometers or the inorganic mercury salts in seed treatments. Methylmercury is primarily produced by bacteria naturally present in the sediment where oxygen is absent and a sulfur compound, sulfate, is present.

The sulfate-reducing bacteria take up inorganic mercury and manufacture methylmercury as a byproduct of the normal life processes. Methylmercury in water or food is readily absorbed into living tissue, by the process of bioaccumulation, much faster than it is released. This results in the buildup of concentrations in larger fish to levels millions of times higher than the surrounding water. Methylmercury in animals and humans can be toxic to the brain, liver, kidney and immune system, and can have adverse effects on egg and fetus development in exposed mothers.

Marsh fires and dry periods increase the production of methylmercury and can worsen the mercury problem, at least locally over the short term. Also, lower sulfur concentrations tend to promote methylmercury production, while higher sulfur levels tend to inhibit production.

Atmospheric sources are the primary source of mercury to the Everglades; the relative role of nearby sources versus long distance transport remains the subject of intense study.

A better understanding of the role played by sulfur, in mercury accumulation at sites with different levels of nutrient enrichment, will permit agencies to evaluate the potential for minimizing the mercury problem through the management of water and its constituents.

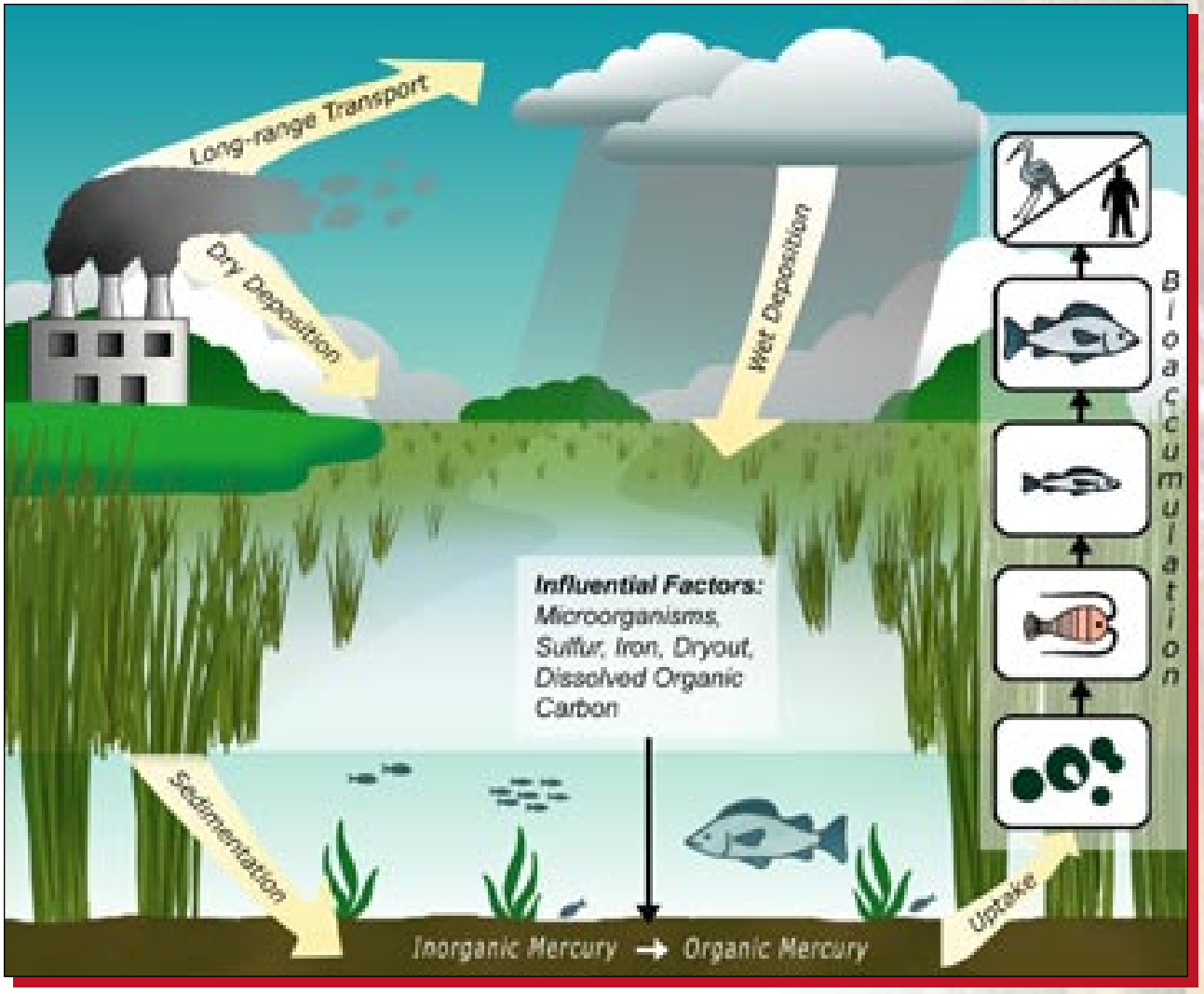
The fact that methylmercury bioaccumulation is influenced by many factors questions the utility of a mercury water quality criterion expressed as a single surface water concentration. The current Florida water quality criterion of 12 nanograms per liter for mercury in water is of limited utility since fish consumption advisories have proven to be necessary for waters meeting the state criterion.

Resolving other complexities of mercury science and to provide management-relevant information on the mercury problem are the objectives of a private-public consortium of state and federal agencies, utility interests and others known as the South Florida Mercury Science Program. Within the last eight years, this program has sponsored a broad array of studies to develop a sound scientific understanding and to provide information needed to evaluate potential solutions.

The past five years of mercury compliance monitoring of the Stormwater Treatment Areas showed a positive impact on the downstream mercury problem. Based on these data, the elevated concentrations of methylmercury observed in water and fish during Stormwater Treatment Area startup tend to be relatively short-lived and are not expected to represent an immediate threat to the fish-eating wildlife attracted to them. Some increases in fish mercury levels in the Water Conservation Areas were recorded in 1999, but additional monitoring data are needed to interpret these changes in an appropriate ecological context. Mercury monitoring of the Advanced Treatment Technologies has not revealed substantially elevated levels of inorganic mercury or methylmercury in outflow water or solid residues.

Source controls have the greatest likelihood for reducing the mercury problem by decreasing the delivery of atmospheric mercury to the Everglades. Findings from computer models and environmental monitoring both suggest that control of air sources of mercury can have positive benefits for the Everglades Protection Area. Elimination of mercury from commercial and industrial uses has already reduced mercury emissions from municipal waste incinerators and other sources in South Florida. Monitoring over the last decade suggests that these lower emissions are producing a corresponding

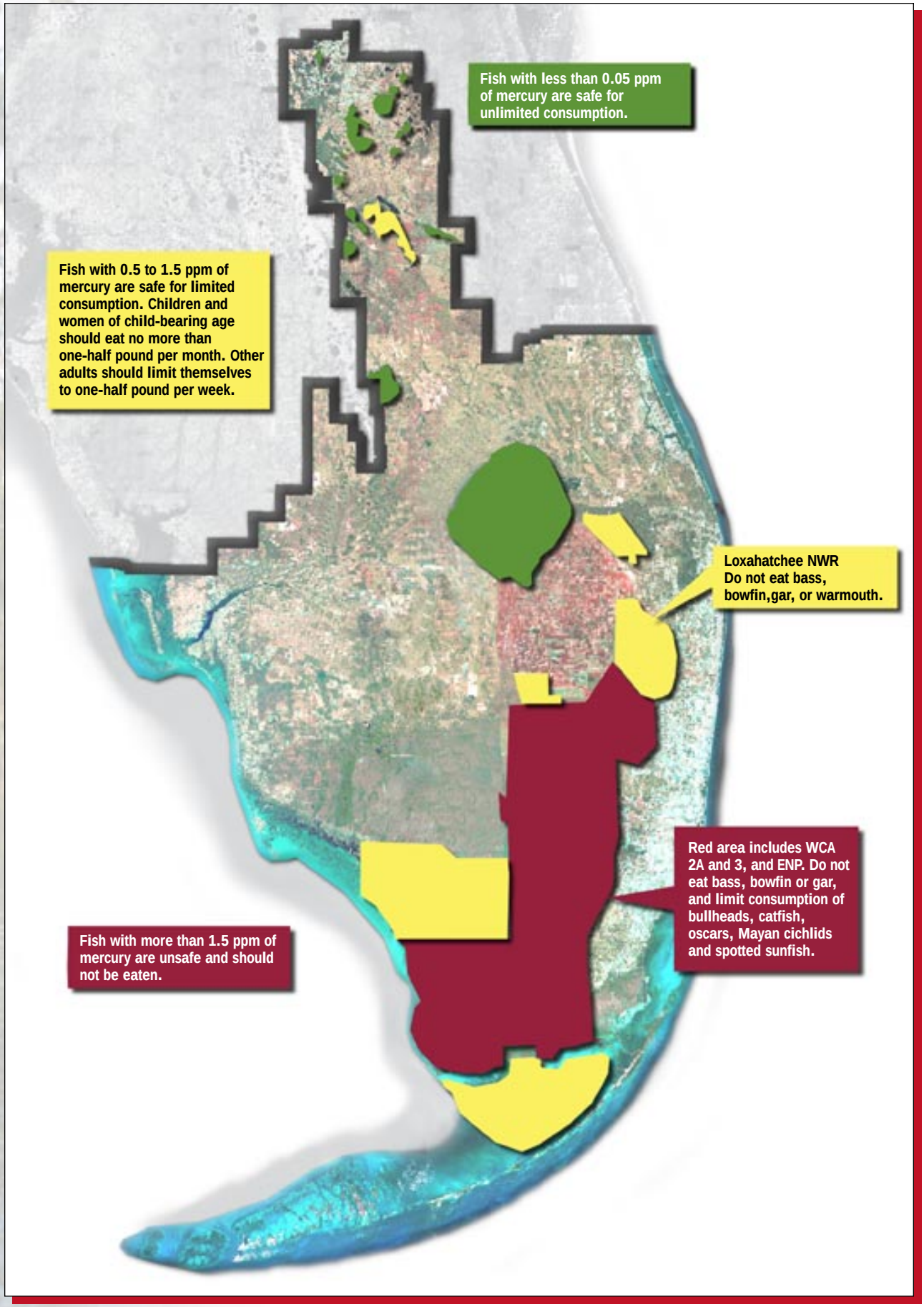
The Everglades Mercury Cycle



reduction in Everglades fish and wading birds. A mathematical model, developed under the Mercury Science Program, relates fish mercury levels to the amount impinging on the Everglades. The model shows that control of mercury emissions could significantly alleviate the overall Everglades mercury problem within a decade or two. If control of local emissions is not sufficient, it may be possible to reduce the mercury problem through management of water quality and quantity. This second approach is to make environmental conditions less favorable for the production of methylmercury. Management of marsh fire frequency, hydrologic patterns and water constituents, such as sulfur, may provide means for such mitigation. With either approach, less methylmercury would be available, making the accumulation of toxic amounts in fish and wildlife less likely.

A better understanding of the role played by sulfur in mercury bioaccumulation at sites with different levels of nutrient enrichment will permit agencies to evaluate the potential for minimizing the mercury problem through the management of water and its constituents.

Mercury Fish Consumption Advisories in Florida



CHAPTER 8

Advanced Treatment Technologies for Treating Stormwater Discharges into the Everglades Protection Area

The South Florida Water Management District (District) continues research on promising Advanced Treatment Technologies for the removal of phosphorus from stormwater discharging to the Everglades. This research is also specified in the U.S. Army Corps of Engineers 404 Permit for the Everglades Construction Project. Interim efforts of the Everglades Construction Project are centered on land acquisition, design and construction of six Stormwater Treatment Areas. Long-term efforts of the Everglades Construction Project are focused on identifying, demonstrating and implementing advanced treatment technologies to achieve the long-term criterion to be set by the Florida Department of Environmental Protection (Department) through its rulemaking process.

Advanced Treatment Technologies being evaluated include three wetland-based systems, four chemical treatment technologies using four types of solids removal, and one technology combining chemical and wetland treatment. Shown on page 21 are four of these technologies and how they work to remove phosphorus. Because the phosphorus removal criteria have not been established, the District has been using the Everglades Forever Act default of 10 ppb for evaluating Advanced Treatment Technologies. Through the continuation and completion of the Advanced Treatment Technology projects, the District will obtain information on the costs, benefits and potential environmental impacts associated with each technology.

Long-term implementation (design and construction of Advanced Treatment Technologies) will, of necessity, overlap the development of the integrated water quality plan. Long-term implementation will be contingent on the optimal combination of Best Management Practices, Stormwater Treatment Areas and Advanced Treatment Technologies. The ultimate combination of approaches will need to consider the site-specific conditions that will potentially affect the successful implementation and performance, necessitating additional site-specific feasibility studies. Funding sources for the long-term implementation have not yet been defined.

One-half acre test cells in STA-1W used for research on Advanced Treatment Technologies

Preliminary results from small-scale periphyton-based Stormwater Treatment Area research show monthly mean experimental outflow total phosphorus concentrations of 13-20 parts per billion.

During 1998-99, average outflow total phosphorus concentrations from the submerged aquatic vegetation-dominated STA-1W Cell 4 was 14 ppb.

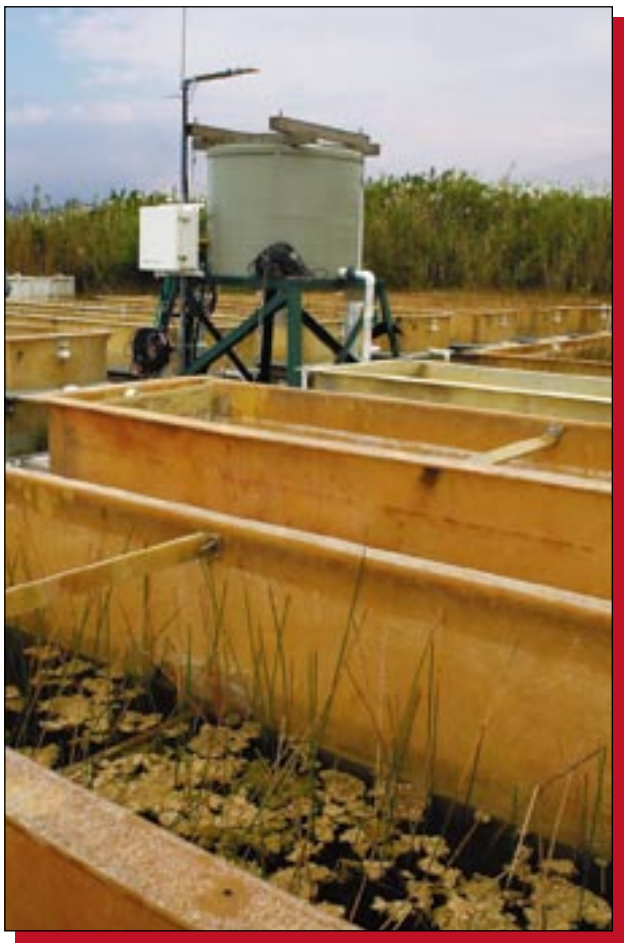
Findings 2000

Periphyton is a community of algae and bacteria attached to surfaces that take up the phosphorus from the water. Preliminary results from Periphyton-based Stormwater Treatment Areas (PSTAs) at mesocosm and test cell levels indicate that a periphyton community can be established and sustained in post-Stormwater Treatment Area water. Early results from ongoing research show monthly mean experimental outflow total phosphorus concentrations of 13-20 ppb at both the test cells and mesocosm levels.

Submerged aquatic vegetation colonization is possible in large-scale treatment wetlands created from farmfields. Operation of STA-1W Cell 4, a submerged aquatic vegetation-dominated cell, suggests that a stable submerged aquatic vegetation community can persist longer than four years with relatively little long-term vegetation management. During 1998-99, average outflow total phosphorus concentrations from STA-1W Cell 4 were 14 ppb. Experimental mean outflow total phosphorus concentrations of 15 ppb were achieved from small-scale (tank) systems.

A short-duration, small-scale test indicates that chemical treatment can achieve effluent of less than 10 ppb. The principal unit processes used in achieving these results were chemical coagulation, flocculation and inclined plate enhanced clarification. Although not envisioned for use in the Everglades Agricultural Area, chemical treatment may be applicable to smaller urban basins where land availability is limited. Continued investigation for full-scale implementation is necessary for optimization of the treatment process, the management of residuals and the evaluation of effluent marsh readiness.

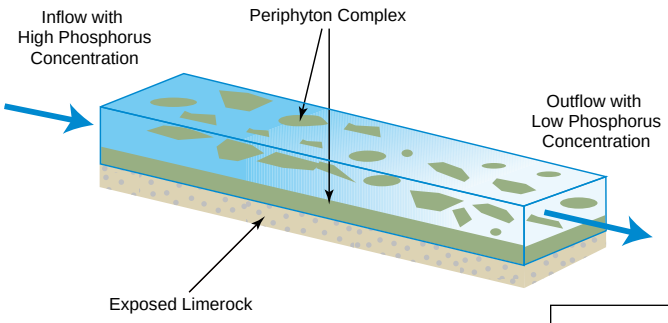
Prior to determining the role of Advanced Treatment Technologies in long-term solutions, key uncertainties need to be resolved: influence of hydrologic pulsing, critical water depths, constructability, sustainability of performance, and treatment effectiveness for non-Everglades Agricultural Area waters.



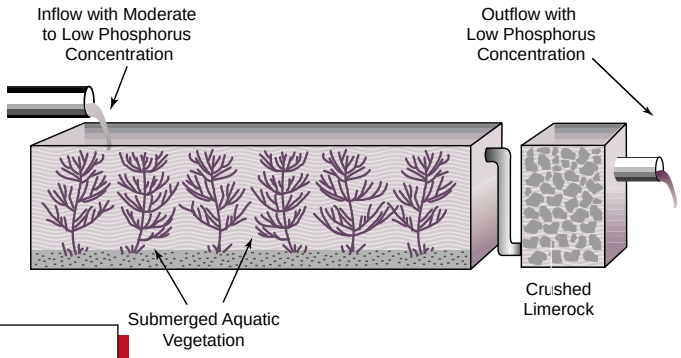
Periphyton-based Stormwater Treatment Area (PSTA) pilot project

Advanced Treatment Technologies

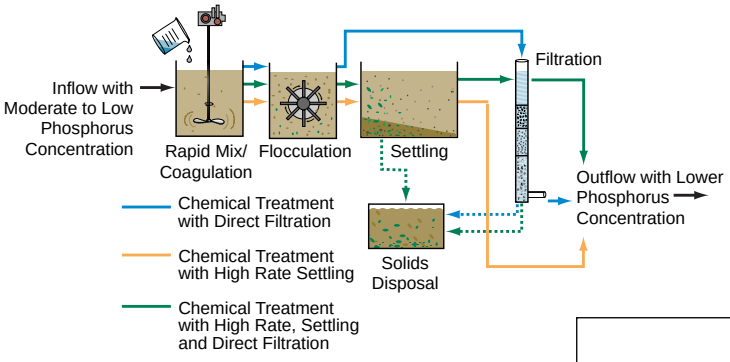
Periphyton-based Stormwater Treatment Area (PSTA)



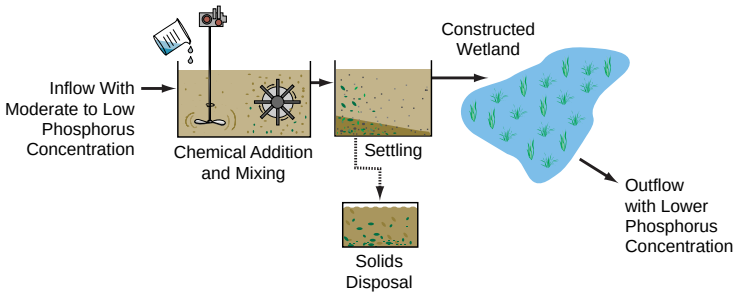
Submerged Aquatic Vegetation and Limerock



Chemical Treatment Followed by Solids Separation



Managed Wetlands



CHAPTER

9

Summary of the Lower East Coast Regional Water Supply Plan

The Lower East Coast Regional Water Supply Plan (LEC Plan), approved in May 2000, provides a blueprint to help meet the water resource needs of a rapidly growing South Florida between now and 2020. This planning process helped reach the consensus of a broad based group of federal, state and local entities, including Everglades National Park, and will be instrumental in providing and protecting environmental water supplies crucial for Everglades restoration over the next 20 years.

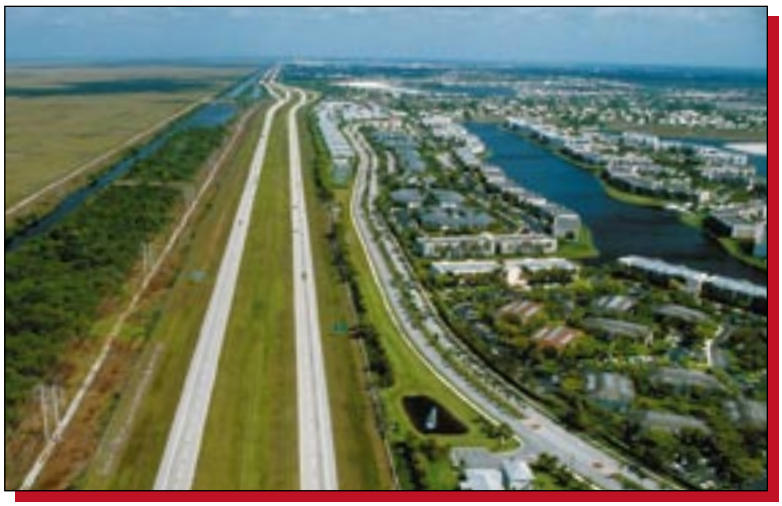
Technical analyses of this area's future water needs and the availability of water supplies indicate that extensive actions are required to ensure that a sustainable water supply is available to fulfill future urban, agricultural and natural systems water needs. The LEC Plan contains 46 recommendations and projects, which must be implemented on schedule, or the region will face a significant increase in the risk of water shortages and environmental decline. Proposed implementation costs identified in the Plan include $893.4 million in cost-share for the federal Comprehensive Everglades Restoration Plan (CERP) and $29.1 million in regional water supply initiatives over the next five years.

Consensus is reflected in the LEC Plan that environmental water supplies made available from implementation of CERP would be protected under specific Florida laws, primarily water reservations to protect fish and wildlife, and minimum flows and levels. In addition, through water shortage and consumptive use permitting rule amendments, the availability of water for consumptive users would be defined, consistent with the minimum flows and levels and water reservations.

Along with the water reservations, the District will be developing rainfall driven formulas designating the timing and quantity of water deliveries necessary to achieve Everglades restoration. These environmental water supplies will be reserved in phases to reflect the incremental benefits in implementing the CERP projects. Operational protocol for the regional system will also be developed, for both interim and long-term phases, ensuring that the structural projects in the CERP will be operated for their designated purposes.

The timely development of water supplies, necessary to meet both human and environmental water supply needs, is crucial to the success of both the CERP and LEC Plan implementation. This process is outlined in the LEC Plan with timetables for implementation of each CERP component and LEC component, funding estimates, and estimates of water supply benefits to both the environment and consumptive users.

The table on the top right, from the LEC Plan, identifies the water bodies where reservations will be adopted, the basis upon which the reservations of water will be derived, and the targeted operation dates for water resource development projects providing for reservation water supplies. Specific cost projections for the next 5-year and 20-year increments to implement these projects are also identified in the bottom table.



Projects Providing Water Supplies Associated with MFL Recovery Plans and Water Reservations

Water Body	Basis of Reservation	Water Supply Development Projects	Year Project Becomes Operational
Everglades National Park	Rainfall driven/ Stage formula	Everglades Construction Project	2005
		MOD Water	2005
		C-111	2005
		L-31 Seepage Management Without Barrier	2010
		WCA-3A and 3B Seepage Management	2010
		WCA 3A Decompartmentalization Phase I	2010
		WCA-3A Decompartmentalization Phase II	2020
		Miami/Dade Reuse	2020
		Lake Belt Central	2020
WCAs and Everglades National Park	Rainfall driven/ Stage formula	EAA Reservoir	2010
		EAA Storage North	2010
		EAA Storage South	2015
		Taylor Creek Reservoir	2010
		Lake Okeechobee Aquifer Storage and 2015 Recovery (ASR)	2015
		Lake Okeechobee ASR	2020
		North Lake Okeechobee Reservoir	2015
St. Lucie Estuary	Salinity envelope criteria	C-44 Reservoir	2010
Caloosahatchee Estuary	Salinity envelope criteria	C-43 Reservoir	2010
		C-43 Aquifer Storage and Recovery (ASR)	2015
Stormwater Treatment Areas[1]	Six-inch minimum depth	Lake Okeechobee Storage	2005
Loxahatchee River	Salinity envelope criteria	Southern L8 Reservoir	2015
		West Palm Beach Water Catchment Area ASR	2015
Biscayne Bay Florida Bay	Salinity envelope criteria	Degrade L-29, New S-336B and S-338 Structures	2010
		Miami-Dade Reuse, South	2020
		Central Lake Belt Storage Area	2020
		North Lake Belt Storage Area	2020

1. MFL criteria are not applicable to this water body.

Summary of Water Resource Development Project Costs

Category	Recommendation Number	Five-Year Cost (FY2001-FY2005)	20-Year Cost[2] (FY2001-FY2020)
Ongoing Projects from LEC Interim Plan	1 - 11	$19,509,000	$33,789,000
Other Federal, State, and District Projects	12 - 16	$4,245,000	$4,245,000
CERP Projects	17 - 30	$893,417,000	$3,352,116,000
Operational Recommendations	31 - 33	$750,000	$750,000
Consumptive Use Permitting and Resource Protection Projects	34 - 40	$1,920,000	$1,920,000
Other Water Resource Development Projects	41 - 46	$2,650,000	$2,650,000
TOTAL		**$922,491,000**	**$3,395,470,000**

2. 20-year costs may be updated in the 2005 Update to the LEC Plan.

CHAPTER 10

Comprehensive Everglades Restoration Plan

The Comprehensive Everglades Restoration Plan (CERP) serves as the framework and guide for the restoration, protection and preservation of the water resources of the central and southern Florida ecosystem. The Plan also provides for other water-related needs of the region, such as water supply and flood protection. The Plan includes a series of over 68 major components that involve either structural or operational changes to modify the existing Central and Southern Florida Project–irrigation, flood control and drainage systems built by the U.S. Army Corps of Engineers a half century ago. The plan components will increase storage and water supply for the natural system, as well as for urban and agricultural needs. The goals are to restore the quantity, quality, timing and distribution of water.

The Comprehensive Everglades Restoration Plan will increase storage and water supply for the natural system, as well as for residents, wildlife and farms in Central and Southern Florida.

CERP is part of a broad Everglades restoration bill, which was codified as the Water Resources Development Act. The total cost of the project is estimated at $7.8 billion, with the State of Florida and the federal government each contributing half.

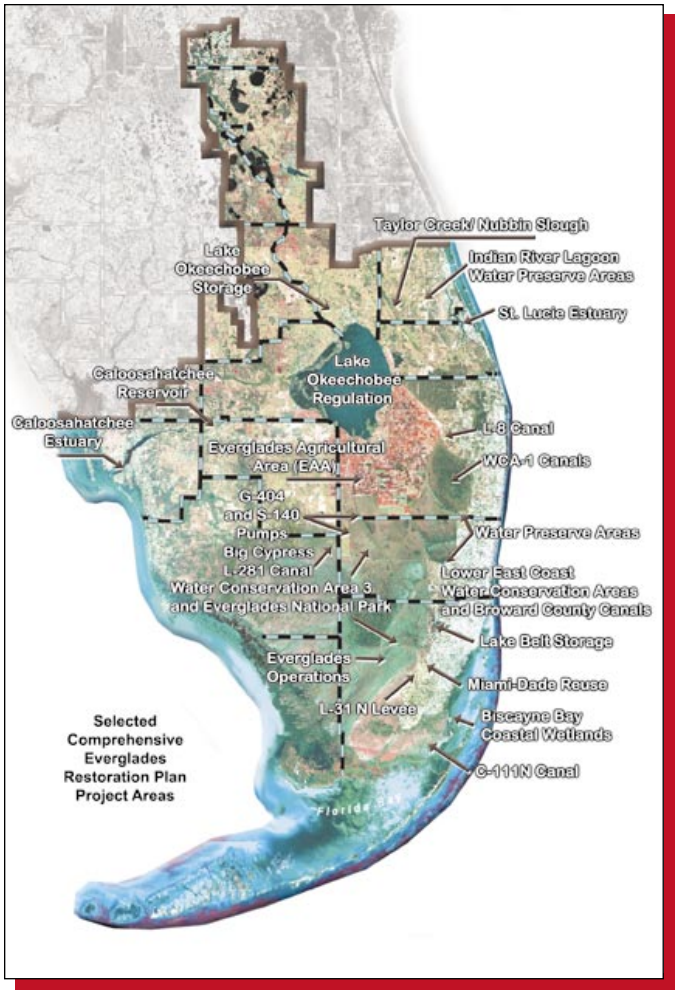
A Design Agreement signed in May 2000 by the U.S Army Corps of Engineers and the District covers the pre-construction engineering and design phase of project implementation of the CERP. The agreement spans a period of 38 years, at an estimated cost of $712 million, to be cost-shared equally between the District and the Corps.

The first product required by the Design Agreement is the Master Program Management Plan. Signed in August 2000 by the Corps and the District, the Master Plan is the framework and process that will be used for managing and monitoring implementation of the Comprehensive Plan. The document gives the two agencies a common understanding of business practices and protocols to be applied during the implementation of the Comprehensive Plan.

The Comprehensive Plan is divided into program-level and project-level activities. Program-level activities are defined as any work efforts that span multiple projects and system-wide issues.

CERP-Level Activities

Program	Activities
Restoration Coordination and Verification (RECOVER)	Organize and apply scientific and technical information in ways that are most effective in supporting the objectives of the plan
Public Outreach	Involvement and information will play key roles in the plan implementation due to the high level of public, political and media interest in the Everglades ecosystem restoration
Socioeconomic and Environmental Justice	Identify and assess any adverse economic, human health and environmental effects on local communities
Program Controls	Provide program managers and project managers with processes and tools to manage and control costs, schedules and resources resulting in high quality products delivered on time and within budget



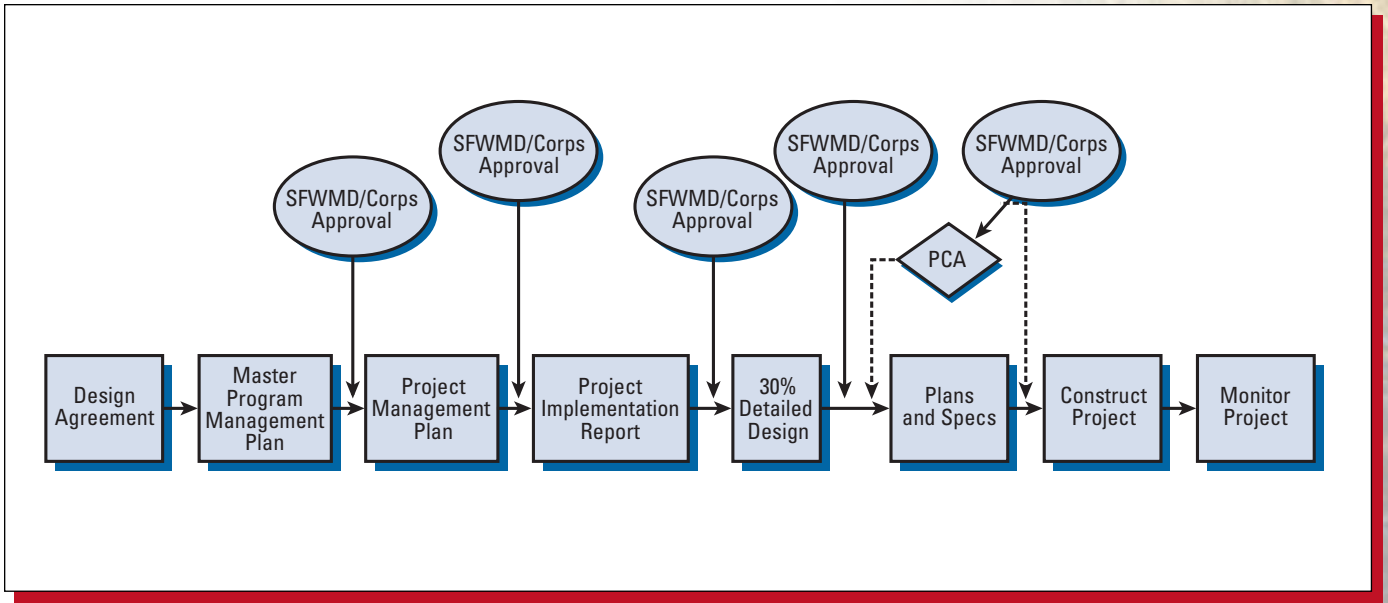
Map represents selected projects. For a complete list of projects, please refer to Chapter 10 in the main report.

The project-level activities include planning, engineering, design and project management activities that are specific to an individual project. Project-level activities will be described, scheduled and cost-estimated in an individual project management plan for each project. The map at left highlights primary project components.

The proposed implementation schedule of the Comprehensive Plan is based on the best professional judgment and available knowledge regarding technologies to be used and availability of lands. The schedule and cost estimates will have to be updated regularly, based on new developments, knowledge gained from field studies, land acquisition opportunities, actual funds appropriated, staffing availability and new state and federal legislation.

Ongoing activities are the Water Preserve Areas Feasibility Study, the Indian River Lagoon Feasibility Study, the Southwest Florida Study, the South Florida Water Quality Protection Program and the Committee on the Restoration of the Greater Everglades Ecosystem.

Project Approval Process for the Everglades Comprehensive Restoration Plan



CHAPTER

11 The Everglades Stormwater Program

As part of its efforts to improve and regulate the water quality of discharges into the Everglades, the District created the Everglades Stormwater Program. This program is responsible for the implementation of the Best Management Practices programs in the Everglades Agricultural Area and C-139 Basin, as well as the implementation of the Non-Everglades Construction Project (Non-ECP) permit issued by the Department regulating the discharges of certain structures discharging into, within and from the Everglades Protection Area.

Water quality data analysis indicates that from May 1, 1999 through April 30, 2000, with the exception of dissolved oxygen, very few excursions from state water quality numeric criteria were found for the Non-ECP structures. Annual flow-weighted mean total phosphorus concentrations at structures discharging into the Everglades Protection Area ranged from a low of 8 ppb for the C-111 basin to 153 ppb for Acme Basin B.

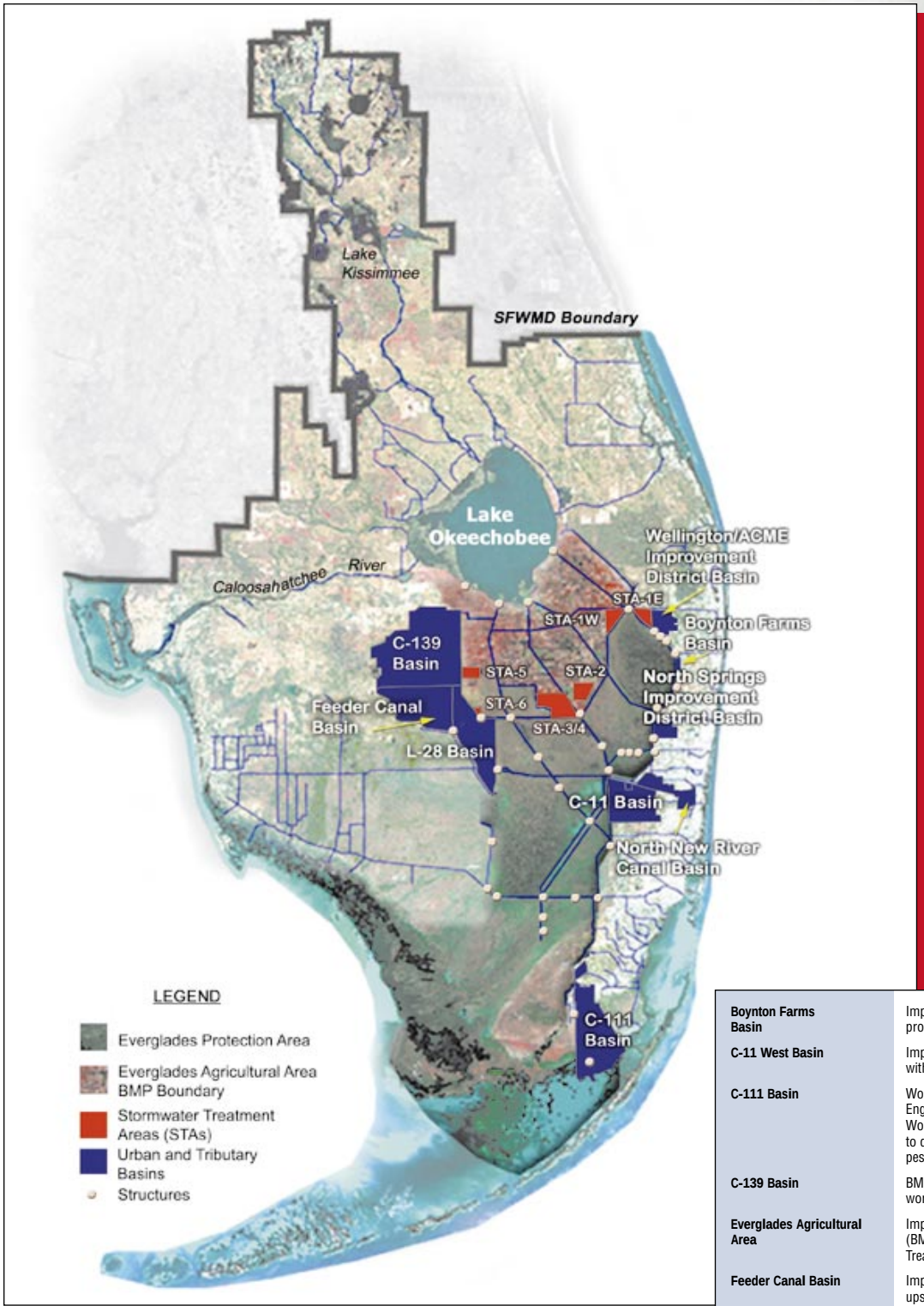
To further improve the quality of waters being discharged into the Everglades, the District is implementing its Regulatory Action Strategy in accordance with existing permit conditions. This strategy was created to determine the character of basin water quality, identify the upstream source of water quality concerns, and develop geographically based regulatory programs or other solutions to address these concerns. For some upstream basins, the Everglades Stormwater Program is still in its early water quality monitoring stage of this strategy. In other upstream basins, water quality improvement plans, including agricultural Best Management Practices, and operational modifications have been partially implemented. Local drainage districts are implementing smaller scale capital projects, such as creating sumps (drainage area), adding control structures and dredging of canal sediments to enhance water quality.

Water quality improvement continues in the Everglades Agricultural Area when compared with historic levels. An annual report on the Best Management Practices of the Everglades Agricultural Area Regulatory Program indicates that a 55-percent reduction in phosphorus loads discharging into the Everglades Protection Area from the Everglades Agricultural Area was achieved for Water Year 2000, as opposed to the pre-Best Management Practice base period (October 1978 through September 1988). The District is developing rules to establish the compliance methodology and actions required by landowners in the C-139 Basin if the phosphorus load limitation of the basin is exceeded.

By December 31, 2003, the Everglades Stormwater Program will be responsible for the submission of a long-term compliance permit application. That permit will identify specific plans, including engineering design documents, construction projects, implementation schedules and cost-estimates, to achieve compliance with all water quality standards in the Everglades Protection Area by December 31, 2006. To achieve this requirement, the Everglades Stormwater Program is involved in extensive coordination with external state and federal agencies, local governments and private groups. Related District activities and programs, such as the Comprehensive Everglades Restoration Plan and ongoing critical restoration projects, will facilitate the development of these long-term plans and help to achieve and maintain water quality standards for Non-ECP basins.

Progress is being made toward compliance with state water quality standards by 2006 through cooperative relationships with local governments and through successful implementation of on-farm Best Management Practices.

Everglades Stormwater Program Status



Boynton Farms Basin	Implementing a water quality sampling program from Boynton Farms.
C-11 West Basin	Implementing cooperative agreements with local water control districts.
C-111 Basin	Working cooperatively with the Corps of Engineers on C-111 project modifications. Working with agencies and growers to develop basin-specific BMPs and pesticide monitoring programs.
C-139 Basin	BMP rulemaking being developed; workshops scheduled.
Everglades Agricultural Area	Implementing Best Management Practices (BMPs) and constructing Stormwater Treatment Areas (STAs)
Feeder Canal Basin	Implementing voluntary BMP strategies and upstream basin water quality sampling.
L-28 Basin	Implementing voluntary BMP strategies and upstream basin water quality sampling.
North Springs Improvement District Basin (NSID)	Implementing a cooperative agreement with NSID for enhanced water quality monitoring and improvement measures.
North New River Canal Basin	Implementing cooperative agreements for water quality monitoring and improvement programs.
Wellington/ACME Improvement District Basin	Implementing agreements for water quality improvements and assisting in the development of BMP ordinance.

CHAPTER 12

Land Acquisition Projects in the Everglades Region

Acquiring land for water resources management is an important part of the South Florida Water Management District's (District's) mission for the Everglades Construction Project. From May 1, 1999 through April 30, 2000, the District's Real Estate Division completed hundreds of transactions for Everglades-related land acquisition projects. The District acquired a total of 4,159 acres. A description of these land acquisition projects is provided in the table below and highlighted on the map.

More than 1,700 acres of land were acquired for the Water Preserve Areas from May 1, 1999 through April 30, 2000. These lands will serve as a buffer between natural and urban areas, collecting and storing excess water discharged to tide.

The South Florida Water Management District acquired over 4,000 acres of land from May 1, 1999 through April 30, 2000. This land will help achieve its mission in successfully managing water resources for the Everglades Construction Project.

The Model Lands are used to maintain the saltwater barrier line, preventing further saltwater intrusion into the south Miami-Dade Region. From May 1, 1999 through April 30, 2000, the District acquired over 1,200 acres of Model Lands. The District was able to work successfully on a joint venture with Miami-Dade County, which was able to acquire over 5,700 acres of Model Lands.

The District acquired nearly 1,000 acres for building Stormwater Treatment Areas from May 1, 1999 through April 30, 2000. The majority of this land was purchased from Camaro Farms Inc. STAs are used to remove the harmful nutrients in the stormwater runoff before the water can enter the Everglades Protection Area.

On August 12, 1999, the District's Governing Board postponed its consideration of an additional phase of the 8.5 Square Mile Area to the District's Save Our Rivers Acquisition Plan. The Governing Board has not yet made a final determination about the Locally Preferred Option for the Modified Water Deliveries Project, and this decision will affect the Save Our Rivers Acquisition Plan. The District acquired slightly over 100 acres of land in the 8.5 SMA from May 1, 1999 through April 30, 2000.

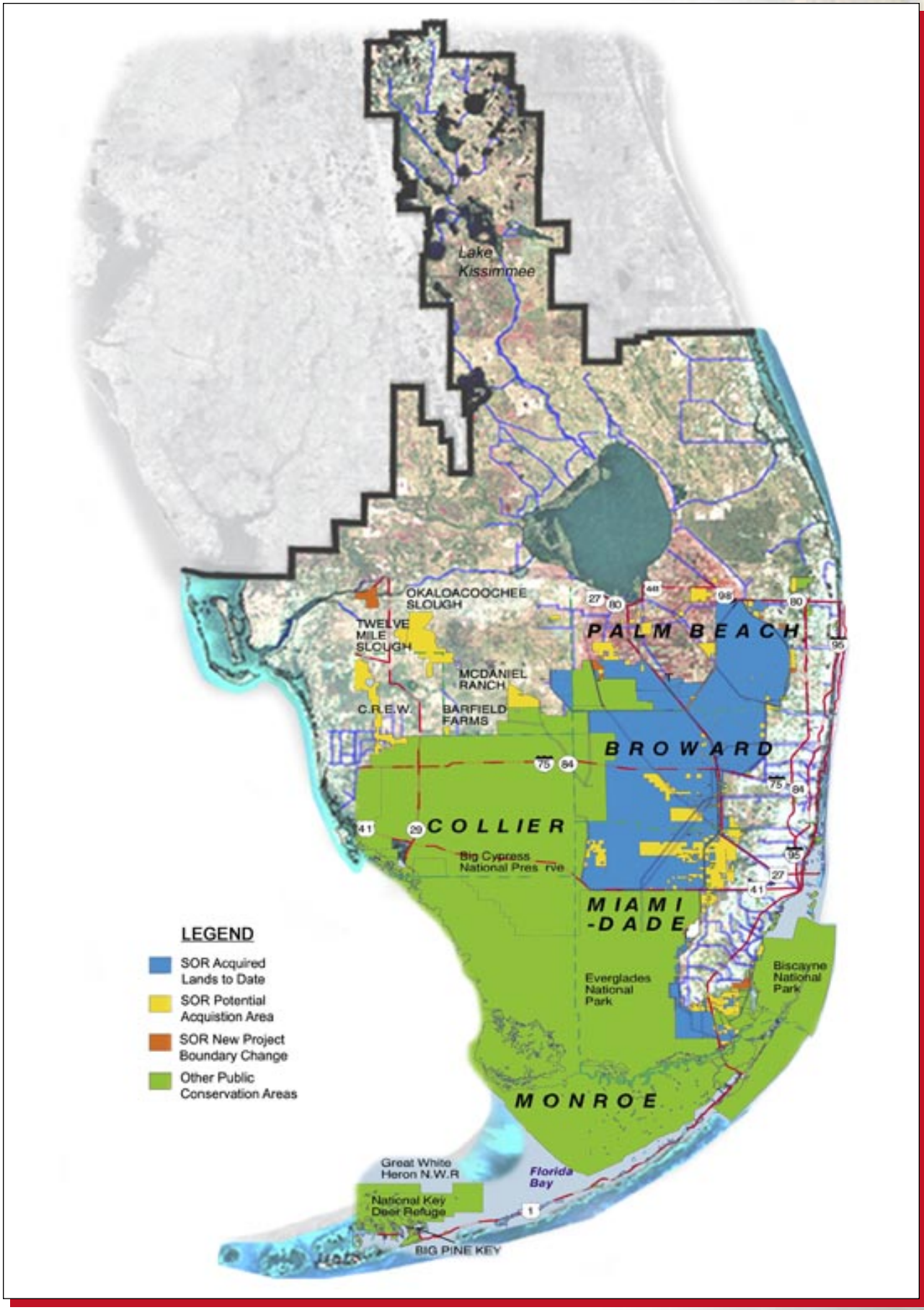
Other land acquisitions this year included about 100 acres in the Southern Glades (C-111).

The Everglades Agricultural Area land, which was acquired in the First Quarter of 1999, will enhance thousands of acres of wetlands that were once part of the greater Everglades watershed. The Everglades Agricultural Area land will be used for reservoirs, as part of the Comprehensive Everglades Restoration Plan (CERP), and Stormwater Treatment Areas, as part of the Everglades Construction Project. No transaction was completed from May 1, 1999 through April 30, 2000.

Closings May 1, 1999 through April 30, 2000

Water Preserve Areas	Marshes, reservoirs and groundwater recharge area that abut East Coast Protective Levee	1,740.94 acres
Model Lands	Recharge area for maintenance of saltwater intrusion	1,208.01 acres
Stormwater Treatment Areas	Wetland treatment marshes that will naturally remove nutrients from stormwater runoff	986.92 acres
8.5 Square Mile Area	East Everglades in low-lying area of Miami-Dade County	116.12 acres
Southern Glades (C-111)	Part of plan to improve original flood control system and drainage	107.16 acres
Everglades Agricultural Area	South of Lake Okeechobee and west of Water Conservation Areas	—
Water Conservation Areas	Part of the original Central and Southern Florida Flood Control Project	—

Everglades Land Management Region



CHAPTER 13

Managing Fiscal Resources

The 1997 Everglades Oversight Act requires the District to provide, annually, a comparison of actual versus projected revenues, and a projection of costs and revenues over the succeeding five-year period, as shown in the pie chart opposite.

The Everglades Construction Project is the first major step in Everglades Restoration. The Everglades Forever Act, passed by the Florida Legislature in 1994, established requirements essential to restore significant portions of the Everglades. The program represents the District's efforts to implement the Everglades Construction Project, which is a specific element of the comprehensive Everglades Forever Act. This Act directs the District to acquire land, design, permit and construct a series of Stormwater Treatment Areas to reduce phosphorus levels from stormwater runoff and other sources before it enters the Everglades Protection Area.

The overall restoration and cleanup effort described in the Act is known as the Everglades Program. It is composed of seven elements:

- The Everglades Construction Project
- Hydropattern Restoration, Research and Monitoring
- Regulation (Everglades Regulatory Rules, Construction and Operating Permits for the Everglades Construction Project)
- Exotic Species Control
- Funding
- Annual Progress Reporting

The Everglades Construction Project is one of several program elements within the comprehensive Everglades Program Plan.

Funding sources

A dedicated funding source is essential to carry out Everglades and Florida Bay restoration programs. As the major component of achieving interim water quality goals, the Everglades Construction Project is estimated to cost approximately $827 million over 20 years. At this time, sources of funding to implement long-term water quality goals are unknown.

An Everglades Trust Fund was created to account for all money used for the Everglades Construction Project. The District provides quarterly reports on the fund to the governor and legislature. For Fiscal Year 2000, actual net tax revenues (unaudited) for the Everglades Construction Project were approximately $42.3 million (unaudited). Listed below is the Fiscal Year 2000 (October 1, 1999 through September 30, 2000) breakdown by tax revenue source:

- Ad Valorem (1/10 mil) Taxes: $29.6 million
- EAA Agricultural Privilege Taxes: $12.1 million
- C-139 Basin Agricultural Privilege Taxes: $632,394

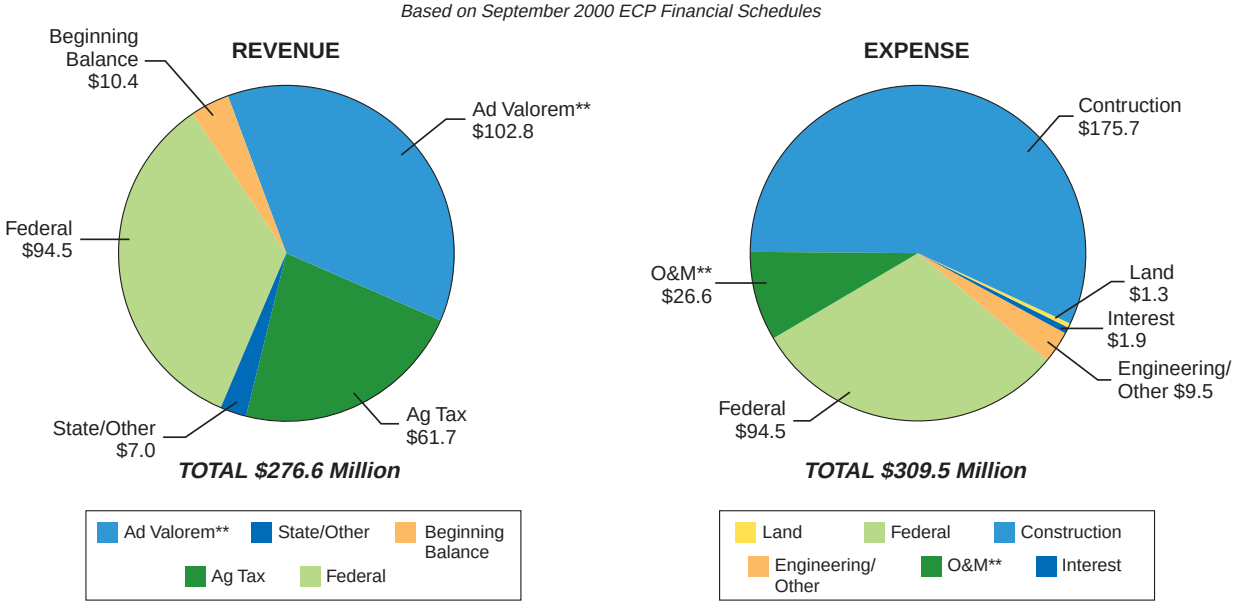
The Everglades Forever Act designated other funding sources for the Everglades Construction Project, including excess revenues from Alligator Alley tolls, state land funds, federal funds, other environmental mitigation funds, and any additional funds that become available for this purpose. The Alligator Alley toll revenues could provide up to $63 million for the Everglades and Florida Bay restoration projects through Fiscal Year 2016 (toll revenues must be split equally between the Everglades Construction Project and Florida Bay restoration).

The Everglades Construction Project is estimated to cost approximately $827 million over 20 years.

Everglades Construction Project
Five Year Project Estimates

October 1, 2000 to September 30, 2005

Based on September 2000 ECP Financial Schedules



***excludes operating millage and expense for non-STA O&M*
Projected revenues are net of collection cost.

Project estimates and cash flow underwent further review, validation, and updating in Fiscal Year 2000. Current cash flow estimates reflect projected cash deficits for Fiscal Year 2002 through Fiscal Year 2006 at the conclusion of the construction period. Funds borrowed to make up these deficits could be paid back from projected cash balances generated during the operations and maintenance period, beginning in Fiscal Year 2007 through Fiscal Year 2014.

Stormwater Treatment Area 1 East/C-51 West is the only Everglades Construction Project element that is federally funded. The federal government is providing about 90 percent of the total estimated cost of $210.7 million, which is approximately $190.2 million. The remaining $20.5 million will be funded by the District.

Funding for the estimated $7.8 billion Comprehensive Everglades Restoration Plan (CERP) will be shared equally between the federal government and the local/state agencies. The District is responsible for all land acquisition, which totals $2.3 billion; the total non-federal responsibility is $3.9 billion. At this time, funding sources for the local share have not been determined, but various funding alternatives are being identified and evaluated.

In addition to the interim and long-term solutions, the Everglades Forever Act has other significant unfunded mandates totaling approximately $78 million through the year 2014. They include research, regulatory program development and implementation, exotic species control and other related activities. Since the Everglades Forever Act did not designate funding sources beyond the Everglades Construction Project, the District will rely almost exclusively on ad valorem funds to cover these mandates.

Amendment 5, which was passed in November 1996, requires the polluter to pay for clean up in the Everglades Agricultural Area and the Everglades Protection Area. The impact of this amendment is not certain at this time.

CHAPTER

14 Exotic Species in the Everglades

Invasive exotic species have become one of the most serious global environmental problems today. Florida is listed with California, Hawaii and Louisiana as one of the states with the most non-indigenous species. Currently, more than 26 percent of all animals found in Florida are non-native. Also, one-third of Florida's flora is now composed of exotic plant species.

In compliance with the Everglades Forever Act of 1994, the South Florida Water Management District has a well-established program that monitors the distribution of invasive plants. This program also manages exotic pest plants with emphasis on the Everglades Protection Area. Invasive plant management methods include biological control, herbicide application, physical removal and physical treatments, such as water level manipulation and prescribed burning. Prevention measures should aim to reduce current stands and halt further spread of the nuisance species already established in Florida. However, prevention measures are also needed to halt the introduction of new invasive species. Varied mandates and legislation have supported exotic species management. However, doubts remain whether fully integrated programs can be developed to overcome obstacles currently limiting effective management throughout the region.

Exotic plants such as melaleuca, Brazilian pepper, Australian pine, and Old World climbing fern continue to pose major threats to the Everglades.

Of approximately 220 species of exotic plants recorded in Everglades National Park, very few are major nuisance plants. These include melaleuca (*Melaleuca quinquenervia*), Old World climbing fern (*Lygodium microphyllum*), Brazilian pepper (*Schinus terebinthifolius*) and Australian pine (*Casuarina* spp.). Melaleuca has long been a major threat to the Everglades; however, aggressive management and continuous funding have successfully reduced the melaleuca population in the past decade. Old World climbing fern has now supplanted melaleuca as the single greatest threat to the greater Everglades ecosystem.

A regional approach is essential to effectively contain these pests. While melaleuca management is proving to be successful on public lands, adjacent private properties continue to harbor the plant. Effective control may require the expenditure of public funds on private lands or incentives for control of plants on private lands, such as property tax breaks.

While state and federal mandates and legislation have supported invasive plant management, exotic animal problems are poorly understood and their management efforts suffer from a lack of basic ecological information including exotic animals' distributions, impacts and possible countermeasures. Such basic information is needed to inform both planning efforts and supportive legislation. For the Fiscal Year 2001 (October 1, 2000 – September 30, 2001) the Science Coordination Team has recommended enhanced funding for the Invasive Species Control Strategy Program under the Critical Ecosystem Studies Initiative. However, funding for exotic animal studies was not included.

Information gaps and future research needs remain for dozens of lesser known plant and animal species, none of which are subject to any control at this time. There is a great need to identify those species most likely to develop into serious problems and begin management during their incipient phase of expansion, or, best of all, prior to their introduction.

Generally speaking, the problems facing invasive exotic species managers need to be regionalized. Multifaceted programs must maintain current management efforts, support basic research, encourage management on private lands and establish effective programs to prevent new exotic species introductions.

Aggressive management efforts have reduced the melaleuca population, which has been a major threat to the Everglades.

Old World climbing fern's fertile fronds are one of many threats in the Everglades. State and federal agencies are working hard to control the most invasive exotic species in the Everglades.

Glossary

Advanced Treatment Technologies - Wetland and chemical treatment technologies to remove phosphorous from stormwater to low concentrations.

Aquifer - Underground layer of porous rock, sand or gravel where large amounts of water can be stored.

Best Management Practices - Land, industrial and waste management techniques that reduce pollutant loading from an industry or land use.

Bioaccumulation - Great increase in concentration of certain chemicals (such as pesticides and metals) by organisms over that to which they are exposed in their environment.

Excursion - Constituent concentration that is of potential concern as an apparent exceedance of water quality criteria.

Fauna - All animal life associated with a given habitat.

Flora - All plant life associated with a given habitat.

Flow - Movement of water expressed as volume discharged from a source in a given time period.

Flow-Weighted Mean Concentration - The average concentration of a substance in water corrected for the volume of water flow at the time of sampling; samples taken when flow is high are given greater weight in the average, and flow-weighted concentrations can be used to calculate mass loading at a particular location.

Loading (Mass loading) - The mass of a material entering an area per unit time (e.g., phosphorus loading into Water Conservation Area 2A as metric tons per year).

Mesocosm - Experimental container large enough to approximate the structure and function of critical processes and organisms in the ecosystem of interest.

Parts per billion (ppb) - Equivalent to one microgram per liter.

Periphyton - Community of algae, tiny animals and microbes attached to surfaces that takes up the phosphorous from the water and often serves as the base for aquatic food webs in wetlands.

Stormwater Treatment Area - Large, constructed wetland designed to remove pollutants from stormwater runoff.

Total phosphorous (TP) - Element that is essential to life and often promotes the growth of algae in water. Total phosphorous includes organic and inorganic forms and is measured in unfiltered water samples after the oxidation of all organic matter.

Water Year - The period from May 1,1999 - April 30, 2000 during which water samples are collected to provide data for the Everglades Consolidated Report.

The Everglades Construction Project represents by far the largest environmental cleanup and restoration program of this type ever undertaken, and the returns from substantial public and private investment must be maximized so that available resources are managed responsibly.

—The Everglades Forever Act,
Sec. 373.4592(1)(h) Florida Statutes

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The *2001 Everglades Consolidated Report* is also available on the World Wide Web at this URL:
www.sfwmd.gov/org/ema/everglades

On the cover: A Roseate spoonbill, one of dozens of species of wading birds that call the Everglades home, hunts for fish in Florida Bay. Photo by Patrick M. Lynch, South Florida Water Management District.