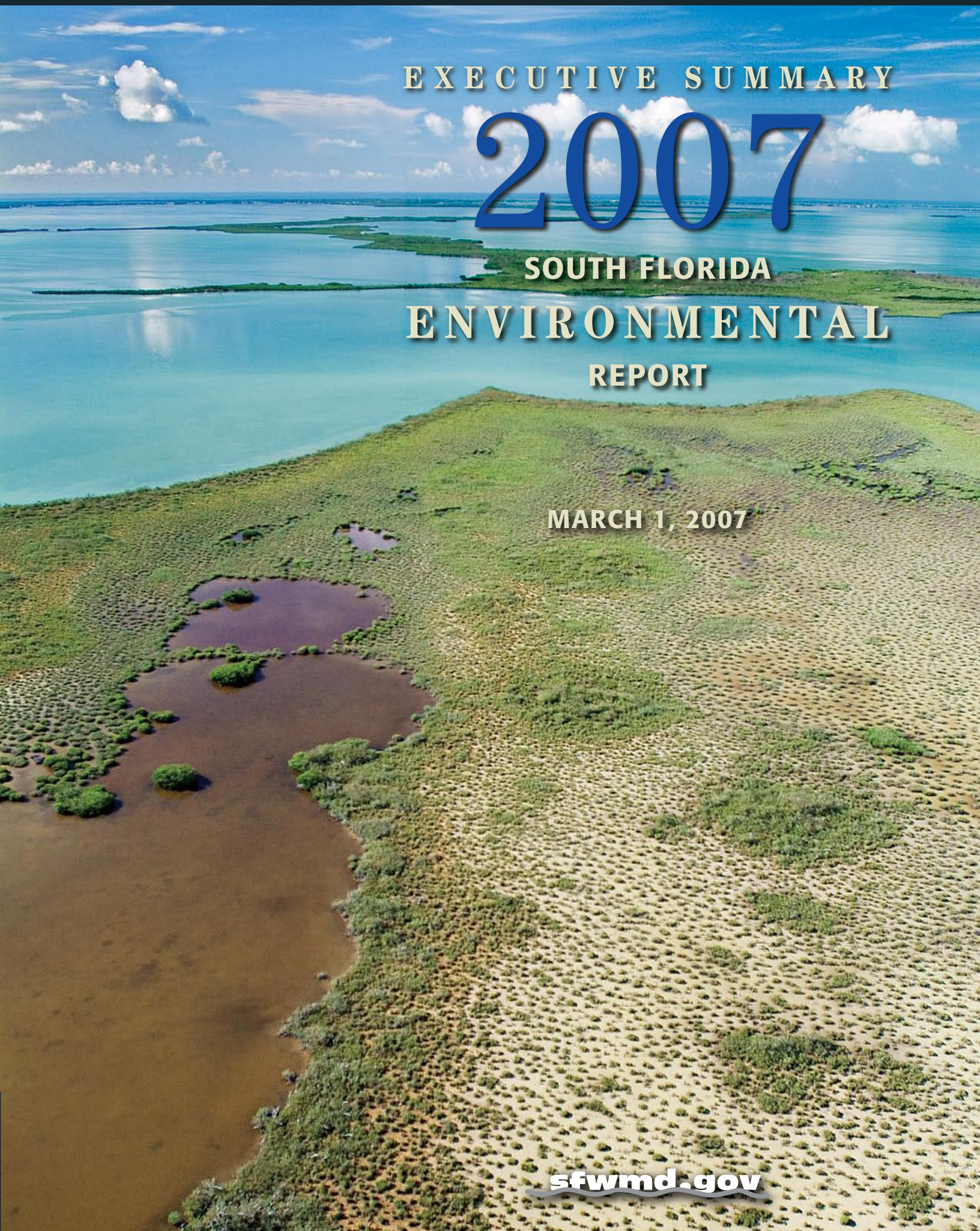
SOUTH FLORIDA WATER MANAGEMENT DISTRICT



EXECUTIVE SUMMARY

2007 SOUTH FLORIDA ENVIRONMENTAL REPORT

MARCH 1, 2007

sfwmd.gov

Each year the Florida Department of Environmental Protection and the South Florida Water Management District collaborate to comprehensively report on the restoration of the South Florida ecosystem. For nine consecutive years we have been able to share outstanding news about the progress of restoration, and this year is no different.

The *2007 South Florida Environmental Report* is again filled with world-class science on an ecosystem that repeatedly draws attention from around the globe. Restoration of America's Everglades is a massive, groundbreaking effort requiring innovative, large-scale thinking from our nation's best ecologists, hydrologists, engineers and planners. Their exemplary individual efforts must mesh effectively into the many projects and programs that fold into the overall restoration effort. The unprecedented results demonstrate that South Florida's complex and beautiful ecosystems are being cared for by dedicated experts from dozens of specialized disciplines.

The *2007 South Florida Environmental Report* captures a year's worth of work —from May 2005 through April 2006, known as Water Year 2006. This timeframe includes environmental impacts from an unprecedented hurricane season that produced 26 named storms, including Hurricanes Dennis, Katrina, Rita and Wilma. Impacts on South Florida were most severe from Hurricane Wilma, whose intense rainfall resulted in the highest recorded flows into and out of Lake Okeechobee. Fortunately, comprehensive restoration efforts to improve the lake were already under way. The Lake Okeechobee & Estuary Recovery Plan, announced in October 2005 and reported here, is helping to restore the ecological health of Lake Okeechobee as well as its fragile east and west coast outlets: the St. Lucie and Caloosahatchee estuaries.

Despite weather-related challenges, our restoration work moved steadily forward in 2006. Phosphorus control programs continued to exceed expectations, with Stormwater Treatment Areas cleansing nearly 1.5 million acre-feet of water and reducing phosphorus inflows to the Everglades by 68 percent. Best farming practices achieved a 44 percent reduction in phosphorus load from the Everglades Agricultural Area, well above the 25 percent reduction required by law. Over the past decade, these phosphorus control programs together prevented 2,500 metric tons of phosphorus from entering America's Everglades.

Financing the world's largest environmental restoration also has required innovative thinking. Our financial analysts successfully customized investment instruments known as Certificates of Participation, which, like municipal bonds, raise funds for large-scale projects. This is the first time in history that revenue bonds are being used for natural resources—another example of our groundbreaking work. When put on the market in October 2006, our Certificates of Participation sold quickly and provided $572 million in initial funds for the restoration, specifically benefiting Florida's fast-tracked projects, known as *Acceler8*, within the Comprehensive Everglades Restoration Plan.

From the headwaters of the Kissimmee River to the mangrove-fringed vastness of Florida Bay, the greater Everglades ecosystem continues to challenge and captivate us. It is a vital part of South Florida and a treasured part of the American landscape. As you read the *2007 South Florida Environmental Report*, you will appreciate the impressive work being done to restore and protect this remarkable resource.

Michael W. Sole
Secretary
Florida Department of
Environmental Protection

Carol Ann Wehle
Executive Director
South Florida Water
Management District

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2007 SOUTH FLORIDA

FOREWORD

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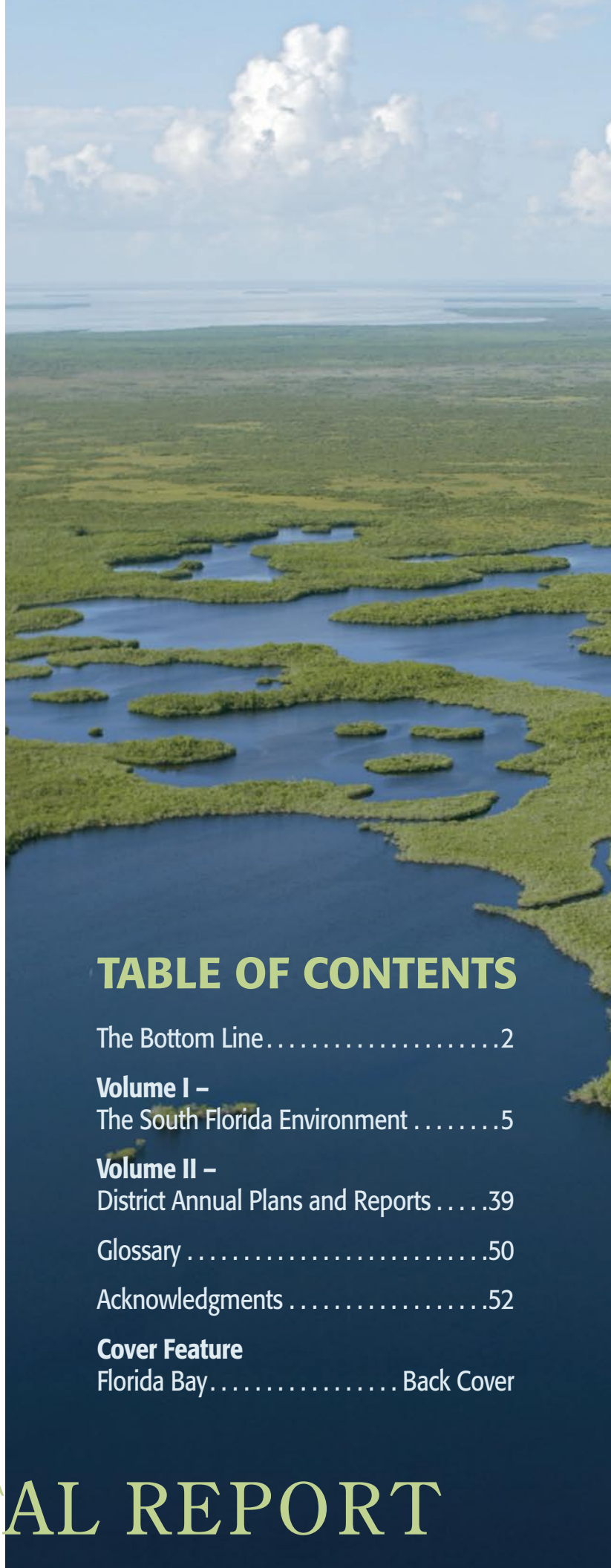
Pursuant to Chapter 2005-36, Laws of Florida, the *2007 South Florida Environmental Report* represents the ninth comprehensive publication authored jointly by the South Florida Water Management District and the Florida Department of Environmental Protection. As in previous South Florida Environmental Reports, this consolidated document is comprised of multiple reports woven into two volumes. In a concerted effort by our agencies to continue on the path toward a more streamlined publication, the 2007 Main Report – complemented by this Executive Summary – focuses on key updates and highlights from the past year. It provides the public and decision makers with diverse, up-to-date information on South Florida's environment, while at the same time making legislative review a more efficient and cost-effective process.

Volume I, *The South Florida Environment*, updates relevant scientific and engineering efforts throughout the entire South Florida region, including the Kissimmee Basin, Lake Okeechobee, the Everglades, and coastal ecosystems. It also satisfies many annual reporting mandates of the Everglades Forever Act, the Lake Okeechobee Protection Act, the Comprehensive Everglades Restoration Plan, and other state and federal laws and permits.

Volume II, *District Annual Plans and Reports*, comprises eight annual plans and reports required by all of Florida's water management districts. Specifically, it documents the South Florida Water Management District's progress in implementing plans developed to address the areas of responsibility in the 11 programs outlined in the agency's Strategic Plan. In its third year, the consolidated database in this volume also provides more unified reporting and data retrieval of project-related information.

The entire 2007 Report, as well as all previous consolidated reports, can be found on the District's web site (http://www.sfwmd.gov/sfer/) and also on the compact disc inside the back cover of this booklet. Overall, the information provided in this report represents the scientific soundness of the District's programs and projects that support prudent environmental management and decision making. This annual publication continues our communication with the public as we work toward sound management and restoration of the South Florida region.



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ENVIRONMENTAL REPORT

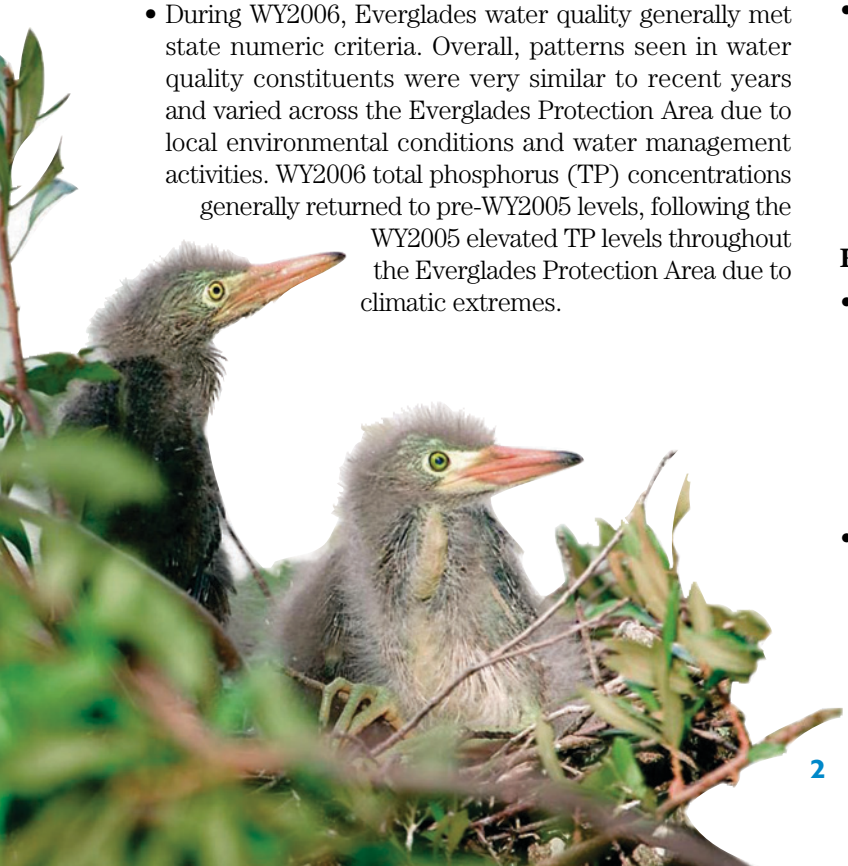
The Bottom Line

The *2007 South Florida Environmental Report* unifies more than 50 individual reports into a single, two-volume document. Covering the entire South Florida region, key Volume I findings were derived from the numerous research and monitoring projects during Water Year 2006 (WY2006) and highlight the District's financial resources management during Fiscal Year 2006 (FY2006). Volume II details the FY2006 planning and project status for eight reports required annually by all water management districts under multiple statutory mandates. A snapshot of the agency's many notable achievements over the reporting period is presented below.

VOLUME I, THE SOUTH FLORIDA ENVIRONMENT

Water Quality in South Florida

- Phosphorus source control programs are continuing to exceed expectations. Since 1994, Stormwater Treatment Areas (STAs) and Best Management Practices (BMPs) together have prevented approximately 2,500 metric tons of phosphorus from entering the Everglades.
- During WY2006, Everglades water quality generally met state numeric criteria. Overall, patterns seen in water quality constituents were very similar to recent years and varied across the Everglades Protection Area due to local environmental conditions and water management activities. WY2006 total phosphorus (TP) concentrations generally returned to pre-WY2005 levels, following the WY2005 elevated TP levels throughout the Everglades Protection Area due to climatic extremes.



- Mercury levels in Everglades fish have declined substantially but remain above federal criteria. Methylmercury hot spots persist in Everglades National Park, while sulfur levels are elevated in over half of Everglades marshes. Managing mercury requires further research and attention to reducing mercury emissions and controlling sulfur input to the Everglades ecosystem.
- Using WY2002–WY2006 TP data under the state's newly established four-part assessment for the phosphorus criterion rule, unimpacted portions of each conservation area completely passed the test, whereas the impacted portions failed one or more parts and did not meet the criteria. Together, these results affirm the ability of the test to correctly assess achievement of the phosphorus criterion.

Long-Term Plan for Achieving Everglades Water Quality Goals

- During FY2006, the District continued implementation of the Long-Term Plan, as required by the Everglades Forever Act. The 2003 Long-Term Plan, a key component of Everglades restoration, continues and expands the objectives of the 1994 Everglades Construction Project.
- The Florida Department of Environmental Protection approved three major revisions to the Long-Term Plan in FY2006. These include the addition of three Acceler8 projects – Acme Basin B Discharge and C-9 and C-11 Impoundments – into the Long-Term Plan. The revisions also address STA enhancements and the plan's Process Development and Engineering component.

Performance of the Stormwater Treatment Areas

- In WY2006, the six STAs combined treated nearly 1.5 million acre-feet of inflow. Notably, these constructed wetlands lowered TP levels from an inflow flow-weighted mean concentration of 144 parts per billion to an outflow concentration of 44 parts per billion. The STAs retained 176 metric tons of TP and reduced the inflow TP load to the Everglades by 69 percent.
- STA optimization research is seeking ways to stabilize the STAs for long-term sustainability and optimal treatment performance. Major efforts were under way to stabilize sediments through rice plantings and to protect existing vegetation from future storm-related damage using vegetation strips.

- Several groundbreakings occurred in WY2006 for STA expansion and enhancement projects, including the addition of large treatment cells to STA-2, STA-5, and STA-6 to increase the total effective treatment area by over 5,300 acres. STA vegetation and construction enhancements continued in STA-1W, STA-3/4, and STA-5.
- Public access facilities are planned for all STAs, and current recreation at STA-1W and STA-5 includes duck hunting, bird watching, and public tours. The design of recreational facilities at STA-3/4, STA-1E, and STA-1W began in FY2006 and construction will occur in FY2007.

Performance of Everglades Source Controls

- Implementation of source control BMPs in the Everglades Agricultural Area (EAA) basin continues to reduce phosphorus inputs to the Everglades Protection Area. In WY2006, the EAA basin achieved a 44 percent reduction in TP load, exceeding the 25 percent requirement for the eleventh consecutive year.
- For the fourth consecutive year, BMPs in the C-139 basin have not resulted in appreciable reductions in TP loads or compliance with regulatory requirements. Therefore, additional measures are under way to bring the basin into compliance. Additional rulemaking will be initiated by the District and future efforts are expected to include implementing more stringent BMPs and reviewing existing practices and monitoring plans.
- Basin-specific water quality improvement plans continue to be implemented for the non-Everglades Construction Project (non-ECP) basins. In WY2006, the annual TP load from non-ECP basins was about two times higher than WY2005. The increased load is mainly attributable to the Feeder Canal basin. The strategy to reduce Everglades nutrient input from the non-ECP basins consists of BMPs, Environmental Resource Permit modifications, diversion strategies, local construction and capital improvement projects, and integration with the Comprehensive Everglades Restoration Plan (CERP).

Hydrology and Ecology Issues in South Florida

- In WY2006, South Florida was impacted by four hurricanes: Dennis, Katrina, Rita, and Wilma. Hurricane Wilma had the most impact on regional hydrology and water management, with the highest recorded levels of Lake Okeechobee inflows, outflows, and discharge from the Caloosahatchee River in nearly 35 years.
- Two large-scale research projects began in the disturbed areas of Water Conservation Area 2A in WY2006 to aid in accelerating recovery in impacted marshes. These experimental projects use controlled burns and herbicides to remove undesirable cattail and maintain slough-like openings to increase wildlife utilization.
- Widespread efforts to control nonindigenous plants across South Florida continued in WY2006. To date, more than one million acres of melaleuca have been cleared in the CERP project area, and over 5,000 acres of *Lygodium* have been treated in the Everglades. A third biological control agent for melaleuca was also released in South Florida.

Comprehensive Everglades Restoration Plan and Acceler8 Performance

- Following the state's launch of the Acceler8 initiative in fall 2004 and much progress in FY2005, many Acceler8 and CERP milestones were achieved in FY2006. Under Acceler8, there were five groundbreakings – including the EAA Reservoir, Acceler8's flagship – and eight projects or components under construction.
- Keeping up with CERP's momentum, six Critical Restoration Projects, predecessors to CERP, have been substantially completed. The District also is continuing its partnership with the U.S. Army Corps of Engineers to prepare federal Project Implementation Reports and Feasibility Studies for congressional approval.
- Series 2006 Certificates of Participation – the first publicly issued revenue bonds in the United States for a natural resources project – successfully raised a total of $572 million for Acceler8 projects.
- RECOVER is developing a methodology to enable project teams to compare ecosystem benefits of project design alternatives and to select the most appropriate alternative for each project. In early 2006, RECOVER completed the CERP Adaptive Management Strategy Report, outlining the recommended approach for integrating adaptive management into the implementation of CERP projects.

Lake Okeechobee Management and Restoration

- In October 2005, the state announced the Lake Okeechobee & Estuary Recovery (LOER) Plan to help restore the ecological health of Lake Okeechobee and the St. Lucie and Caloosahatchee estuaries. The LOER is a combination of capital projects and interagency initiatives designed to provide improvements to water quality and quantity in the lake and its adjoining estuaries. Under this plan, five CERP construction projects are being fast-tracked to provide additional water storage and water quality and flow improvements.
- Large TP loads from the watershed and high sediment resuspension from hurricanes Frances and Jeanne in 2004 and Wilma in 2005 led to increases in suspended solids and TP concentrations in the lake. In WY2006, TP loadings to the lake totaled 795 metric tons, lower than the previous year (960 metric tons) impacted by the 2004 hurricanes. The reduced load is due to lower TP inflow concentrations, although flows were much higher in WY2006.

- The regulation schedule for Lake Okeechobee is being revised to improve system-wide benefits and to balance the needs of the lake, downstream estuaries, Water Conservation Areas, and other regional demands.

Kissimmee Basin Restoration

- The District and the U.S. Army Corps of Engineers are implementing the Kissimmee River Restoration Project to reestablish the river-floodplain system's ecological integrity in the Lower Basin and to increase near-shore fish and wildlife habitat in some Upper Basin lakes. The second phase of construction was initiated in June 2006 to backfill almost 2 miles of the C-38 canal and to perform other structural modifications.
- The Kissimmee Chain of Lakes Long-Term Management Plan is being prepared to improve and sustain the ecosystem health of the lakes. This plan is expected to complement existing local government and watershed projects and initiatives, such as the Lake Okeechobee Protection Plan and Total Maximum Daily Loads.

Coastal Ecosystem Management and Restoration

- The District and its partners are continuing efforts to scientifically establish freshwater inflows that will protect and restore South Florida coastal ecosystems. Several notable achievements were made in WY2006, including the District's Governing Board approval of the Restoration Plan for the Northwest Fork of the Loxahatchee River, and the completion of technical documents to support the proposed Minimum Flow and Level (MFL) rule for Florida Bay and Initial Water Reservations for the Caloosahatchee River.

Everglades Financial Report

- The Everglades Long-Term Plan's initial 13-year phase has a projected total cost of approximately $1 billion, reflecting approved revisions through the end of FY2006. The Florida Bay Restoration Program has a projected total cost of $367 million. In FY2006, dedicated funding sources generated about $72 million for Everglades Forever Act programs. Newly issued Certificates of Participation successfully raised nearly $69 million for Long-Term Plan Acceler8 projects, and bond revenues received from future certificates will be reserved for Everglades Forever Act projects.

VOLUME II, DISTRICT ANNUAL PLANS AND REPORTS

- Seventy-five percent of major District projects were within 60 days of their planned schedules at the end of FY2006. During FY2006, the District collected 96 percent of budgeted revenue, up from 81 percent in FY2005. The District spent 76 percent of the total FY2006 budget of over $1 billion, an increase of over 13 percentage points over the historical expenditure rate.
- Since 2001, MFL criteria for 12 water bodies have been adopted by the District. The District will complete MFLs for the Northwest Fork of the Loxahatchee River in 2007 and Biscayne Bay in 2008. In 2006, the District updated the schedule for the development of Initial Water Reservations, which includes three areas in 2007 and three more areas in 2008.
- The District's total budgeted capital expenditures for FY2007 are $907 million, which is nearly 65 percent of the total annual budget of $1.4 billion, and 21 percent of the projected five-year (Fiscal Years 2007–2011) Capital Improvement Plan budget of $4.3 billion. The FY2007 capital budget is $231 million greater than last year's, mainly due to Lake Okeechobee Fast-Track projects and increases in the CERP and District Everglades programs, which reflect Acceler8 implementation.
- The District has allocated $5.9 million in FY2007 and anticipates spending $21.8 million in FY2007–FY2011 on water resource development projects identified in water supply plan updates. The District also continues its aggressive funding program for Alternative Water Supply projects. For FY2007, $40.5 million will be directed to water supply activities. The state is providing $18 million for FY2007 project funding. When completed, the 62 Alternative Water Supply projects funded in FY2007 will provide an additional 184 million gallons per day.
- In FY2006, the Florida Forever Program funded land acquisitions of more than 33,000 acres. Aggressive purchasing has provided 96 percent of land needed for Acceler8, and nearly all land required for Kissimmee River Restoration. The Herbert Hoover Dike Rehabilitation and LOER projects were added to the Florida Forever Program eligibility list, and 19 projects were removed.
- The District operates two regional mitigation projects – Corkscrew Regional Ecosystem Watershed in Lee and Collier counties and Pennsuco in Miami-Dade County – to compensate for permitted wetland impacts. Neither mitigation project still accepts cash payments, but existing funds are used to restore the sites. In FY2006, the District spent $1.1 million to restore 7,000 acres in the two project areas, and anticipates FY2007 expenditures of $2.3 million.
- The District protects and restores its 623,000 acres of public lands while providing recreational opportunities. Restoration practices include hydrologic and habitat restoration, exotic species control, and prescribed burning. The FY2006 budget for land management was $13.2 million, including $3.1 million of project lands funds. Also in FY2006, over $4 million was received by the District from agricultural leases and other dedicated sources for future expenditures. Land management costs in FY2007 are anticipated to be $10.9 million.

THE SOUTH FLORIDA ENVIRONMENT

VOLUME I

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Introduction to the *2007 South Florida Environmental Report* – Volume I

As a sweeping consolidation of agency reporting, the *2007 South Florida Environmental Report* (SFER) unifies more than 50 separate reports into a single document. This introductory chapter provides the reader with a basic understanding of the governmental, scientific, and legal context behind the 2007 SFER – Volume I. Collectively, Volume I addresses numerous research and monitoring projects throughout the unique regions of South Florida including the Kissimmee Basin, Lake Okeechobee, Everglades, and South Florida's coastal ecosystems (see opposite map). Updates for the current reporting year, Water Year 2006 (May 1, 2005–April 30, 2006; WY2006) and Fiscal Year 2006 (October 1, 2005–September 30, 2006; FY2006), are provided throughout the volume. Overall, this inclusive report continues to be used by the South Florida Water Management District, the Florida Department of Environmental Protection, and other agencies to support regional environmental management and restoration decisions.

AGENCY-WIDE INITIATIVE CONTINUES TO UNIFY REPORTING

Notably, a new initiative was launched by the District in early 2006 to further streamline the sizable SFER. While continuing to provide efficient communication, the annual SFER now focuses on the past year's major highlights and findings, with a more comprehensive update to be completed every five years. These efforts will enable to agency to fulfill its dozens of annual legal and reporting requirements, while continuously striving toward a more efficient and cost-effective process.

The complete 2007 report is comprised of the two-volume Main Report and Executive Summary. Volume I, *The South Florida Environment*, is a technically based volume that provides data summaries for all major ecosystems across South Florida. In a 13-chapter framework, the topics covered in this volume are primarily the same as those in the 2006 SFER. As recommended by last year's expert panel, a synthesis chapter (Chapter 1B) was also added to provide a more integrative view of regional water quality. The hydrology of South Florida (Chapter 2) also now follows the introduction to provide supporting hydrologic information for subsequent chapters. Chapters 3 through 9 continue the overall objective to summarize information related to Everglades restoration efforts, paired with annual reporting on the status of the Everglades Comprehensive Restoration Plan (CERP) and RECOVER (Chapters 7A and 7B, respectively).

With a more integrated perspective on regional water management, this year's volume continues its coverage of Lake Okeechobee (Chapter 10), the Kissimmee Basin (Chapter 11), and coastal ecosystems (Chapter 12). Financial reporting during FY2006 for CERP (Chapter 7A), Lake Okeechobee (Chapter 10), and the Everglades (Chapter 13) are also provided. Volume I chapters are supported and enhanced by an extensive amount of appended documentation providing data summaries and detailed analyses for the special-interest reader as well as complying with various permit requirements. Volume II, *District Annual Plans and Reports*, summarizes the planning and project status for District-wide annual reports and plans required under several mandates (see page 39).

WETLAND RESTORATION IS A KEY ASPECT OF ENVIRONMENTAL REPORTING FOR THE SOUTH FLORIDA REGION.

LEGEND

- CANALS
- WATER CONSERVATION AREAS
- STORMWATER TREATMENT AREAS
- MICCOSUKEE INDIAN RESERVATION
- SEMINOLE INDIAN RESERVATION
- ROTENBERGER AND HOLEY LAND WILDLIFE MANAGEMENT AREAS

MAJOR AREAS OF THE SOUTH FLORIDA ENVIRONMENT

MANY CHALLENGES LIE AHEAD AS SOUTH FLORIDA RESTORATION CONTINUES

Over the past century, the Kissimmee-Okeechobee-Everglades and coastal systems in South Florida have been altered fundamentally by changes in spatial extent, hydrology, water quality, and ecology. The massive undertaking of environmental management and restoration in South Florida is quite distinctive in regional scale and in its complex issues of water quality, flood control, natural systems, and water supply. The far-reaching impacts of these issues, along with related District programs and comprehensive restoration efforts throughout South Florida, are addressed throughout the report. Weaving this information together, Chapter 1A provides an integrated summary of the many opportunities and obstacles facing these restoration efforts. This includes an overview of the Everglades restoration strategy, a multifaceted, comprehensive approach that incorporates interim and long-term plans for achieving water quality goals and for optimizing environmental management. Highlights of the District's broad restoration strategies for other areas across South Florida region are also presented.

A NEW THREE-TIERED REVIEW PROCESS IS UNVEILED IN 2006

Similar to previous consolidated reports, the 2007 SFER – Volume I was subjected to an intensive review process. As part of this process, the draft report was posted on an interactive WebBoard for public and peer review. Detailed critiques by an eight-member expert panel and open discussion in a public workshop were subsequently conducted, fulfilling the peer-review requirement in the amended Everglades Forever Act. While this requirement applies directly to Chapters 1 through 9 on the Everglades Protection Area, it was also applied to Chapters 10, 11, and 12 voluntarily by the District and the Florida Department of Environmental Protection as a tool for thorough quality assurance and public participation. This scrutiny ensures that the SFER continues to openly communicate the best information available in support of the District's strategic priorities and programs.

Following the 2005 panel's recommendation for further enhancing the SFER, this year's peer-review process was implemented in a three-tiered manner. Using this approach, each section of the report was subject to (1) evaluation of technical aspects, (2) assessment of progress toward long-term goals, or (3) program-level review for improving integration. While many useful suggestions were made for further improving future SFERs, the 2006 panel emphasized their continued support for the SFER reporting process and the growing national and international recognition of this annual effort.

An Integrative Perspective on Regional Water Quality and Phosphorus

WATER QUALITY IS A CORNERSTONE OF ECOSYSTEM RESTORATION

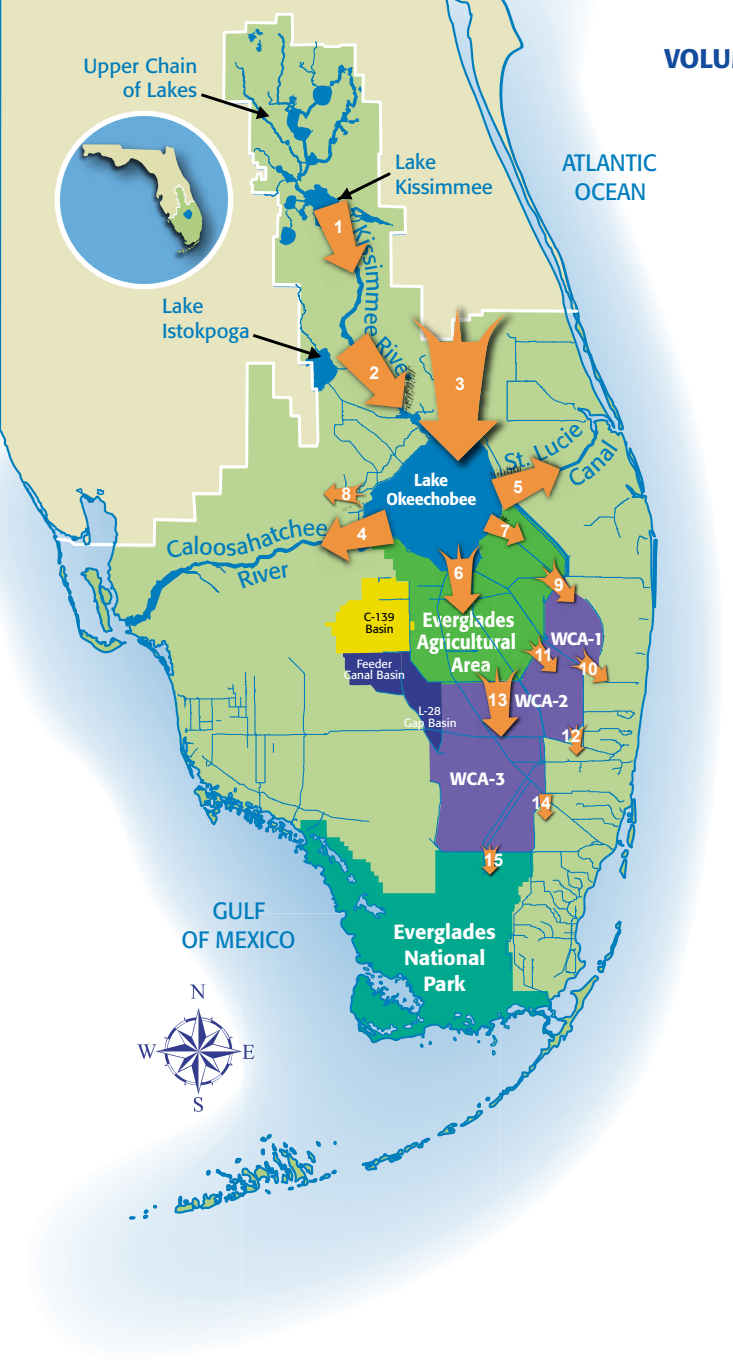
Landscape changes over the last 50 years in South Florida, like many other locations across the globe, are associated with declining water quality and its widespread impacts, most importantly due to excessive inputs from phosphorus. In response, water quality has become a key element of the District's mission, and most of the agency's primary programs contribute to the protection and improvement of water quality. The South Florida Water Management District and Florida Department of Environmental Protection, along with other partnering agencies, are working collaboratively on water quality improvement actions to achieve compliance with applicable water quality standards. Many regional initiatives also are being implemented through the Surface Water Improvement and Management Act, Total Maximum Daily Loads, Everglades Forever Act, Long-Term Plan for Achieving Water Quality Goals in the EPA, Lake Okeechobee Protection Act, Lake Okeechobee & Estuary Recovery Plan, and the Comprehensive Everglades Restoration Plan to protect and restore more than 160 water bodies and to preserve ecosystem health. Therefore, water quality is a key topic of the 2007 SFER and is presented throughout most chapters in this volume. Covering some of the key highlights, Chapter 1B focuses on phosphorus as a water quality and an environmental stressor in South Florida by summarizing regional total phosphorus (TP) levels and the comprehensive programs and strategies for their control.

PHOSPHORUS CASCADES THROUGH THE INTERCONNECTED WATER MANAGEMENT SYSTEM

The opposite map illustrates the surface water movement of phosphorus across South Florida. Water from the Kissimmee Basin transports about one-third of Lake Okeechobee's annual TP load into the lake, supplementing inputs from other tributaries from the large 3.5-million-acre watershed. Excessive TP loads over the last few decades have resulted in high in-lake TP concentrations. These concentrations increased markedly over the last two years due to exceptional hurricane activity. About two-thirds of outgoing phosphorus from the lake moves east to the St. Lucie Estuary and west to the Caloosahatchee Estuary, while most of the remaining one-third exits to the south through the Everglades Agricultural Area (EAA). Outflows from the EAA along with those from 11 other tributary basins move into the three Water Conservation Areas and Everglades National Park, together known as the Everglades Protection Area (EPA). TP loading to the EPA has been reduced markedly through implementation of phosphorus source control programs (agricultural Best Management Practices, or BMPs) and treatment in constructed wetlands (Stormwater Treatment Areas, or STAs). When all these inputs and outputs are viewed collectively, they show the interlocking nature of water quality and the cascading movement of phosphorus across the region. As also depicted on the map, annual TP loads decrease dramatically from north to south. Over the most recent five-year period (Water Years 2002–2006), almost 700 metric tons (mt) of TP entered the lake and about 160 mt moved into the EPA, of which 13 mt went into Everglades National Park each year.

EVERGLADES WATER QUALITY PROGRAMS ARE EFFECTIVE, REGIONAL CHALLENGES REMAIN

Since 1994, the Everglades Agricultural Area's BMPs and STAs combined have removed about 2,500 mt of TP that would have otherwise entered the EPA. Source controls in the EAA have reduced TP loads leaving the area by over 50 percent since full program implementation in 1996, an excellent performance for these land-based BMPs. This strong performance has not been achieved in the C-139 basin, and revisions to this basin's regulatory program are in progress to improve its performance and achieve compliance with TP load requirements. The STAs work in tandem with the source controls and have proven to be very effective, responsible for one-third of the TP loads being removed from water moving into the EPA. While this performance is impressive, the treatment efficiency of managed wetlands has constraints, particularly due to limits imposed by



TOTAL PHOSPHORUS LOADING ACROSS SOUTH FLORIDA

FIVE-YEAR AVERAGE LOADS (WATER YEARS 2002–2006)* (METRIC TONS PER YEAR)

1	Upper Chain of Lakes (S-65 to Kissimmee River)	140
2	Kissimmee River (S-65E to Lake Okeechobee)	211
3	Lake Okeechobee (total in)	679
4	Lake Okeechobee to Caloosahatchee River	144
5	Lake Okeechobee to St. Lucie Canal	124
6	Lake Okeechobee (out to Everglades Agricultural Area)	98
7	Lake Okeechobee (out to L-8)	38
8	Lake Okeechobee (other discharges)	27
9	Water Conservation Area 1 (total in)	44
10	Water Conservation Area 1 (total out)	22
11	Water Conservation Area 2 (total in)	29
12	Water Conservation Area 2 (total out)	14
13	Water Conservation Area 3 (total in)	78
14	Water Conservation Area 3 (total out)	14
15	Everglades National Park (total in)	13

*See assumptions and additional details in the Main Report.

biological functions and multiple stresses on these systems. Treatment efficacy can also be quite dynamic because the STAs must deal with dynamic inflows and loading as part of the flood protection component of the regional water management system. STA vegetation can also be damaged by hurricanes, hampering performance for several years. For instance, STA-1W was severely impacted by the 2004 and 2005 hurricanes, and treatment cells had to be taken off-line for recovery activities over extended periods, with many still ongoing. On a regional level, the high TP loads entering Lake Okeechobee from upstream sources are being addressed aggressively through several lake and watershed programs. Regional efforts also are being integrated into the many CERP projects across South Florida.

The District continues to build on its many successes achieved through the Everglades Program by applying the valuable information gained and lessons learned to further other regional programs and endeavors. Comprehensive efforts are being made to optimize STA and source control programs in concert with regional water quality projects and water storage programs being implemented under the agency's many initiatives. Collectively, these projects and programs reflect a watershed-based management approach to regional water quality by the District and its partnering agencies. Underlying all these projects is a continuing commitment to implement water quality improvements using adaptive management.

Hydrology of the South Florida Environment

Most topics presented in the 2007 SFER – Volume I are strongly linked to regional hydrology, a key aspect of the District's water management functions and environmental restoration. Leading this year's volume, Chapter 2 presents a comprehensive update on the hydrology of the entire area within the District's boundaries. This chapter provides an overview of the regional water management system and water management activities as well as related impacts due to the 2005 hurricane season. Water Year 2006 (WY2006) hydrology, including rainfall, potential evapotranspiration, water levels, inflows, and outflows, for all major components of the South Florida region is presented and compared to the previous water year (WY2005) and historical conditions. Relevant findings from two emerging areas of interest – South Florida's hydrologic monitoring system and long-term climatic changes and variability – are also highlighted in support of current and future regional water resource modeling, planning, and operational decisions.

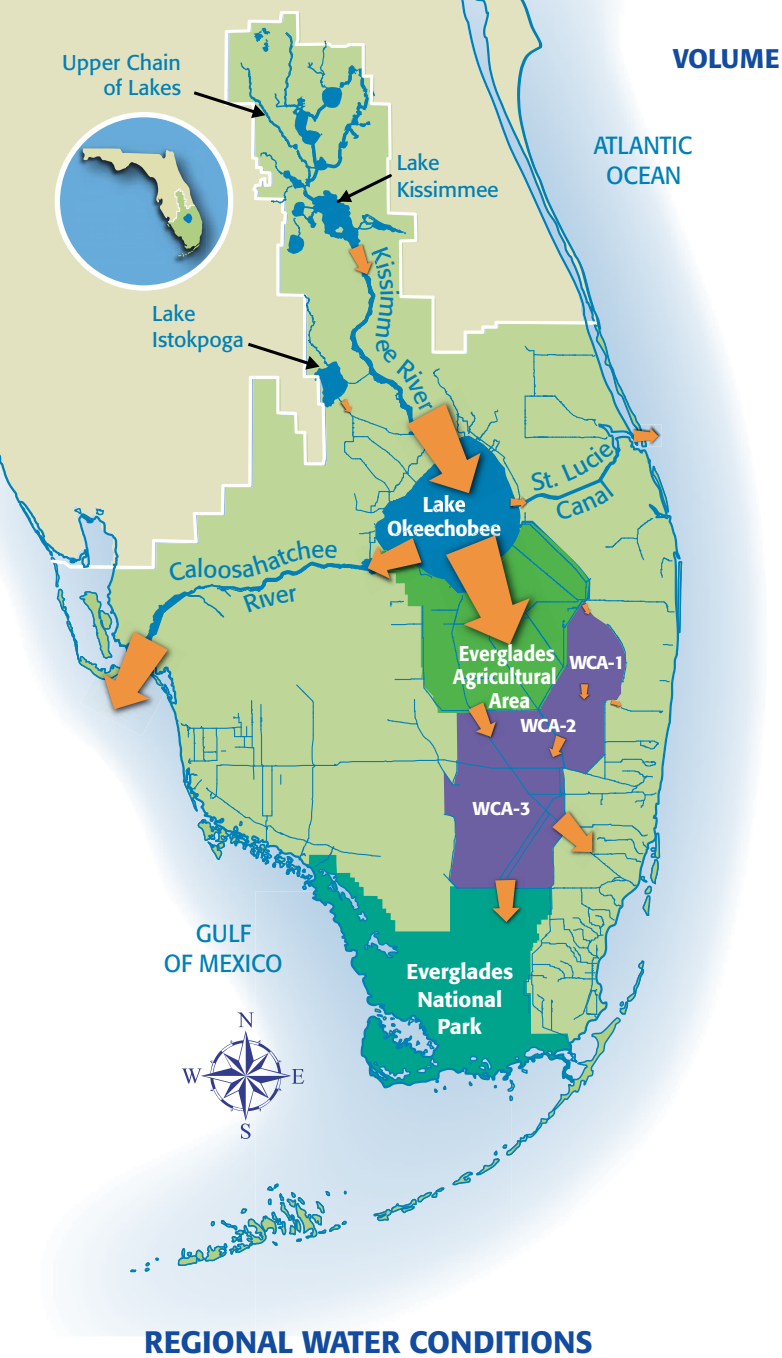
ANOTHER YEAR OF UNPRECEDENTED HURRICANES TRIGGERS CASCADING IMPACTS

Similar to WY2005, the South Florida region experienced another exceptional year of several record-breaking hurricane events in WY2006. During the remarkable 2005 hurricane season, South Florida was impacted by four hurricanes – Dennis, Katrina, Rita, and Wilma – that sequentially impacted various parts of the region from July through October. For a second consecutive year, extensive hurricane-related losses were quite extraordinary, with far-reaching hydrologic effects throughout South Florida.

As depicted on the opposite map, regional surface water generally moves from north to the south, along with water supply and coastal discharges to the east and the west. The 2005 hurricanes drove an imbalance in water inputs and outputs that drastically altered the region's hydrologic state. As a result of these storm-related impacts as well as wide-ranging climatic conditions throughout the District, there were notable variations in water conditions between northern and southern components of the water management system throughout the water year. In the northern areas, an unforeseen rise in volume, primarily due to the hurricanes and a wetter-than-normal June, had a cascading effect on downstream areas. Inflows to Lake Okeechobee were almost two times the long-term average, while the lake's outflow was nearly three times the historical average. Importantly, these impacts resulted in the highest recorded levels of Lake Okeechobee inflows, outflows, and discharge from the Caloosahatchee River since 1972.

Farther south, Water Conservation Area 1 inflows and outflows were dramatically less than historical averages. Conversely, Water Conservation Area 2 and 3 inflows and outflows were much greater than historical averages. Similarly, WY2006 inflows to the Everglades National Park were quite high, with levels approximately two times greater than WY2005 and 1.5 times greater than historical values. These marked differences in varying regional water conditions, balanced through a complex water management system, continue to underscore the ongoing challenge for restoring and managing the South Florida environment.

UNDERSTANDING REGIONAL HYDROLOGY SUPPORTS SOUND WATER MANAGEMENT.



WATER YEAR 2006 INFLOWS AND OUTFLOWS INTO REGIONAL HYDROLOGIC COMPONENTS

WATER FLOW (ACRE-FEET IN THOUSANDS)	
Lake Kissimmee Outflows	1,474
Lake Istokpoga Outflows	528
Lake Okeechobee Inflows	3,708
Lake Okeechobee Outflows	3,979
St. Lucie Canal Inflows	907
St. Lucie Canal Outflows	1,193
Caloosahatchee Inflows	2,175
Caloosahatchee Outflows	3,616
Water Conservation Area 1 Inflows	252
Water Conservation Area 1 Outflows	206
Water Conservation Area 2 Inflows	895
Water Conservation Area 2 Outflows	1,109
Water Conservation Area 3 Inflows	1,685
Water Conservation Area 3 Outflows	1,821
Everglades National Park Inflows	1,901

REGIONAL WATER CONDITIONS IN WATER YEAR 2006 WERE MORE EXTREME THAN USUAL

WY2006 was a wetter-than-average year, with two peaks of elevated rainfall during June and October 2005 across many areas in South Florida. Rainfall across the District in WY2006 (55 inches) was markedly higher than both WY2005 (51 inches) and the historical average (53 inches). Such conditions were exacerbated in the northern District areas, particularly in the Upper and Lower Kissimmee basins, which had significantly higher rainfall due to the 2005 hurricanes. Because this above-average rainfall occurred in the large rainfall areas of the Upper and Lower Kissimmee – the headwaters of Lake Okeechobee – increased rises in water levels and flows had significant impact on the entire water management system. Despite these spikes, the notably drier winter and spring months that followed dampened out much of the hydrologic impact of the high summer and fall rains.

Along with natural conditions such as rainfall, evapotranspiration, and seepage, water levels across South Florida are actively influenced by surface water management. During WY2006, monthly average water levels in most of the Upper Chain of Lakes were generally comparable to WY2005 and historical average levels. Water levels for the remaining areas to the south were generally higher than the previous water year. The Lake Okeechobee average water level for WY2006 was higher than the WY2005 and historical average water levels, primarily due to the increases following Hurricane Wilma. These hurricanes generated large inflows into Lake Okeechobee and sharply raised water levels in fall 2005. Subsequent discharges from the lake, followed by much drier conditions through spring 2006, led to improved, lower levels. The average water levels observed throughout the Everglades Protection Area during WY2006 also were slightly higher than those observed in WY2005.

Status of Water Quality in the Everglades Protection Area

Information from comprehensive water quality monitoring programs in the Everglades Protection Area (EPA) during WY2006 is evaluated in the 2007 SFER – Volume I, Chapter 3A. This chapter assesses water quality parameters that did not meet state Class III water quality criteria during WY2006 and evaluates conditions affecting water quality on a regional scale in the EPA. These criteria are defined in Section 62-302.530, Florida Administrative Code, and establish enforceable management and societal goals for Everglades water quality conditions.

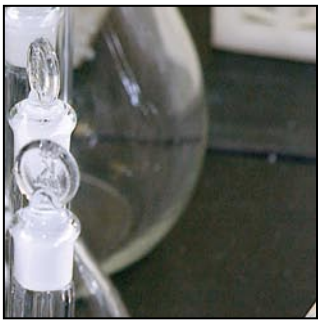
THE STATE CONTINUES TO TRACK WATER QUALITY COMPLIANCE IN THE EVERGLADES PROTECTION AREA

The South Florida Water Management District annually monitors over 100 water quality parameters in the EPA. The Florida Department of Environmental Protection compares water quality data for about 80 of these parameters with the state's Class III water quality criteria pursuant to Chapter 62-302, Florida Administrative Code. Based on this evaluation, most WY2006 water quality data from the EPA continues to meet applicable water quality criteria. However, as in previous years, some parameters exceeded state criteria (identified as "excursions"). These excursions vary greatly across different EPA regions, as expected, considering local environmental conditions and water management activities. Continuing the trend observed in previous years, water quality excursions in WY2006 were identified for dissolved oxygen, pH, alkalinity, conductivity, and un-ionized ammonia.

Dissolved oxygen excursions, within the interior marsh, occurred primarily in phosphorus-enriched areas. Such areas are expected to remain impaired until TP concentrations in surface water and sediment are reduced and biological communities recover. However, when unenriched (phosphorus-unimpacted) areas were evaluated separately, dissolved oxygen was classified as a minimal concern for the Everglades National Park (Park) and Water Conservation Area 2 (WCA-2) and a potential concern for the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) and Water Conservation Area 3 (WCA-3). Excursions from pH and alkalinity criteria continued to be restricted mainly to the Refuge and related to natural conditions within the area.

Two pesticides, atrazine and naled, which do not have numeric Class III water quality criteria, were each detected at concentrations above their respective toxicity-based guidelines. The pesticide exceedances occurred at the inflows to the Refuge and WCA-3A, respectively. These findings are consistent with previous consolidated reports, which have noted similar levels in localized areas across the EPA.

OVER 25,000 WATER QUALITY SAMPLES FROM THE EVERGLADES PROTECTION AREA WERE ANALYZED BY THE DISTRICT'S LABORATORY IN WATER YEAR 2006.



Mercury Monitoring, Research and Environmental Assessment in South Florida

The Florida Department of Environmental Protection and the South Florida Water Management District continue to support studies into the causes, risks, and solutions to the Everglades mercury problem. In the 2007 SFER – Volume I, Chapter 3B reports on the current status of mercury science in South Florida, highlighting recent collaborative research findings and results during Water Year 2006.

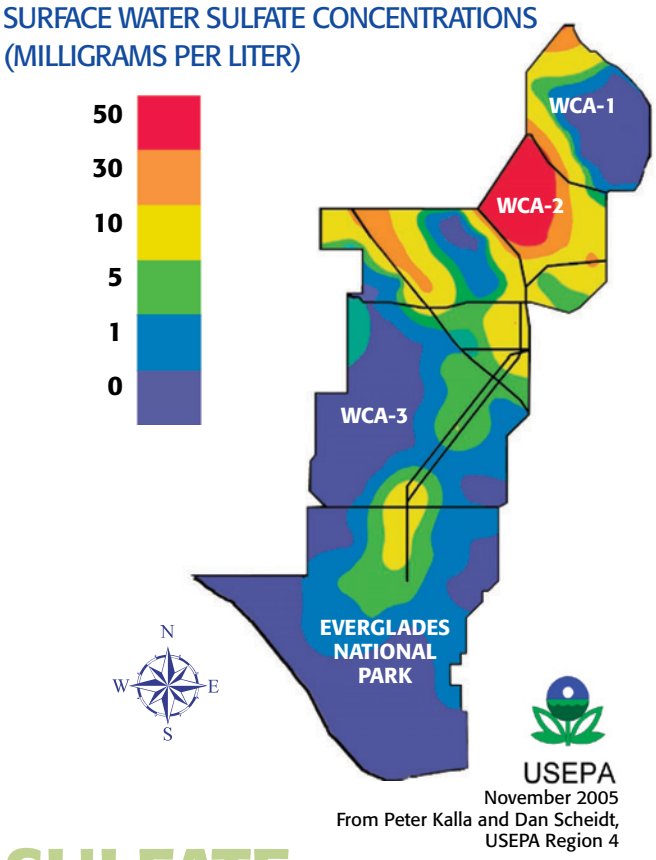
MERCURY LEVELS IN EVERGLADES FISH CONTINUE TO EXCEED FEDERAL GUIDELINES

Methylmercury is a highly toxic form of mercury that bioaccumulates strongly in aquatic food chains, thereby posing significant health risks to humans and wildlife that consume fish. While mercury levels in fish in the Everglades Water Conservation Areas (WCAs) have declined substantially since the late 1980s, concentrations in largemouth bass – averaging about 0.5 milligrams per kilogram (mg/kg) – remain above the recommended U.S. Environmental Protection Agency's human health criterion of 0.3 mg/kg for fish consumption. In contrast to the trend for the WCAs, mercury levels in bass from Everglades National Park (Park) have increased almost every year since 1998 and are presently at very elevated concentrations (up to 1.4 mg/kg), exceeding federal predator protection criteria. Mercury continues to be a regional water quality concern, particularly in methylmercury "hot spot" areas in the Park.

AGENCIES FOCUS ON THE ROLE OF SULFUR IN IMPACTED EVERGLADES MARSHES

Local mercury atmospheric emissions from South Florida have declined by about 90 percent since their peak levels in the early 1990s. However, mercury total wet deposition in South Florida did not decline over the 1994–2005 period and remains substantially greater than for most other U.S. regions. This emphasizes the need to determine the relative importance of local, regional, and global atmospheric mercury sources to support evaluation of options for reducing mercury in the Everglades.

Sulfur has emerged as an important cofactor, as it strongly affects the rate of methylmercury production and, as a biologically active element, it has forms that are highly toxic (e.g., sulfide) or that may promote phosphate releases from sediments (e.g., sulfate). Surface water sulfate levels above background (greater than 1.0 milligram per liter, or mg/L) are evident in about 60 percent of the Everglades marshes, with the highest concentrations primarily in the northern Everglades (see map). Further research is needed to quantify sulfur sources and better understand sulfur-related effects on the Everglades ecosystem and to evaluate the efficacy of sulfur loading controls in reducing mercury concentrations and other consequences of sulfur inputs.



SULFATE CONCENTRATIONS IN THE EVERGLADES PROTECTION AREA

Status of Phosphorus and Nitrogen in the Everglades Protection Area

The Everglades ecosystem evolved as a nutrient-poor, phosphorus-limited system, with the natural flora and fauna thriving under these harsh conditions. While primary nutrients, particularly phosphorus and nitrogen, in surface water are essential to the existence and growth of aquatic organisms, relatively small additions of these nutrients can have dramatic impacts on the native ecosystem. Currently, large-scale efforts are continuing to monitor the status and trends of nutrients across the Everglades region. In the 2007 SFER – Volume I, Chapter 3C presents an overview of the status of phosphorus and nitrogen levels in surface water within the Everglades Protection Area (EPA) during Water Year 2006 (WY2006) as well as comparisons to previous water years. The chapter also highlights efforts in assessing phosphorus in the EPA to comply with the requirements of the recently approved final phosphorus criterion rule.

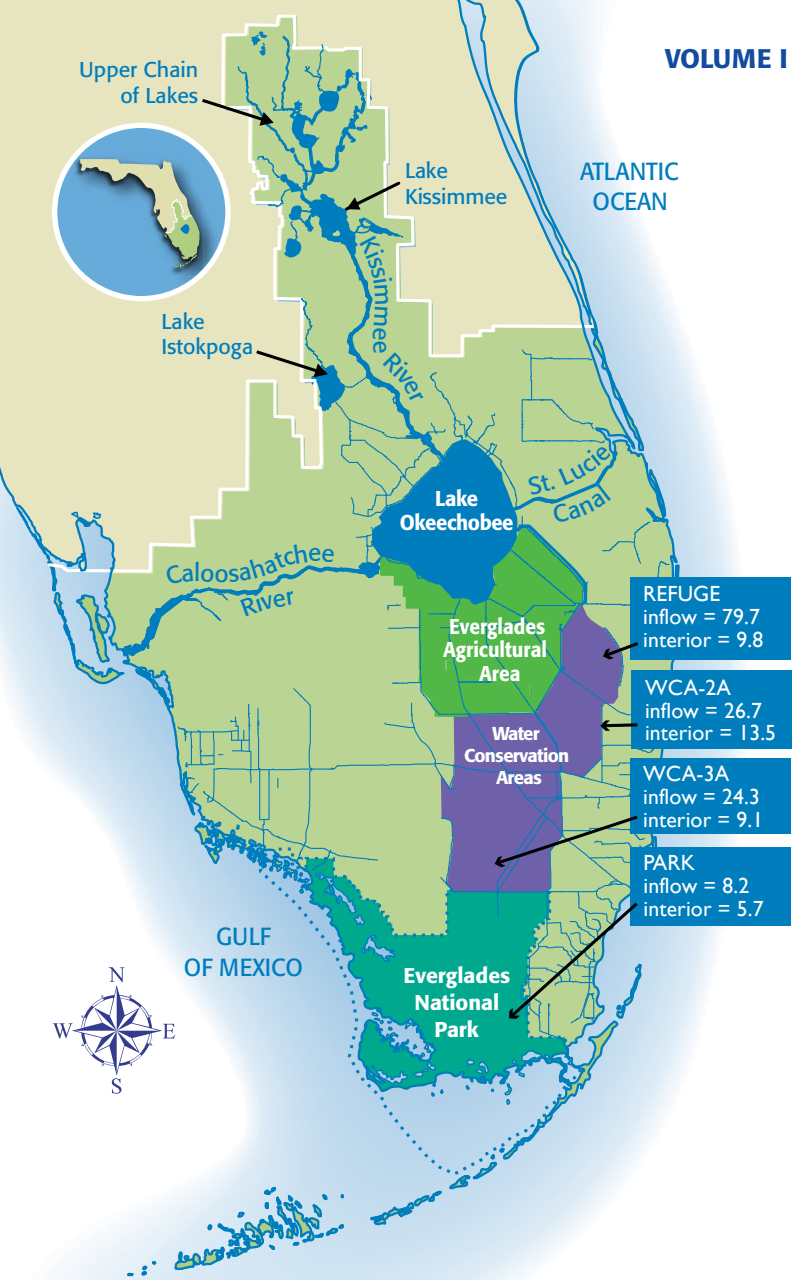
PHOSPHORUS LEVELS IN THE EVERGLADES REBOUND FROM RECENT HURRICANES

Similar to previous years, WY2006 total phosphorus (TP) concentrations in surface water showed a decreasing trend from north to south across the EPA regions. As depicted on the opposite map, the highest levels were present in the inflow to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) and Water Conservation Area 2 (WCA-2), with concentrations decreasing to a minimum within Everglades National Park (Park). TP concentrations in the EPA during WY2006 generally returned to pre-WY2005 conditions, following the previous water year's climatic and hydrologic extremes including both intense rainfall from multiple hurricanes and limited rainfall resulting in marsh dryout. Overall, annual TP concentrations measured during WY2006 were generally lower than those reported for WY2005 and were near or below levels from the WY1978–WY2004 historical period. The largest decreases were observed within the Refuge and WCA-2 marshes, which showed a dramatic rebound from the 2004 hurricane-related impacts in these areas. The quick recovery suggests that the harsh conditions experienced during WY2005 did not result in any long-lasting impacts to the system.

During WY2006, inflow and interior geometric mean TP concentrations were generally lower than those levels reported in WY2005 and the historical period, except for inflows to the Refuge. Elevated TP levels to the Refuge may have been driven by several factors. These include reduced effectiveness of nutrient removal by STA-1W caused by damaged from Hurricane Wilma in October 2005 and several short-lived diversions of surface water into this area as a result of elevated rainfall and increased movement of surface water from Lake Okeechobee southward, as part of managed efforts to lower water levels in the lake following back-to-back hurricanes in 2004 and 2005. Despite these conditions, the annual geometric mean TP concentration across all interior marsh sites, except WCA-2, remained below the five-year and annual network limits (10 and 11 parts per billion, or ppb, respectively) for assessing achievement with the phosphorus criterion rule. Although TP levels at interior sites in WCA-2 have improved during recent years, the geometric mean for WY2006 in this area remains above the annual 11-ppb limit.

THE STATE APPLIES NEW PHOSPHORUS RULE FOR THE EVERGLADES PROTECTION AREA

The U.S. Environmental Protection Agency approved all portions of the revised phosphorus criterion rule for the Everglades Protection Area in July 2005. Since that time, the Florida Department of Environmental Protection has been working with the District and other interested parties to establish the necessary monitoring networks to determine compliance with the rule. The Florida Department of Environmental Protection has also developed a specific method for TP criterion achievement assessment to serve as a uniform framework (or "template") to guide future phosphorus evaluations in the EPA. The newly established



WATER YEAR 2006 GEOMETRIC MEAN PHOSPHORUS CONCENTRATIONS (PARTS PER BILLION)

Water Year 2005 Geometric Mean Phosphorus Concentrations

EVERGLADES AREAS	INFLOW	INTERIOR
REFUGE	66.9	14.6
WCA-2A	26.5	17.7
WCA-3A	23.6	9.6
PARK	10.3	5.6

TOTAL PHOSPHORUS CONCENTRATIONS IN THE EVERGLADES PROTECTION AREA

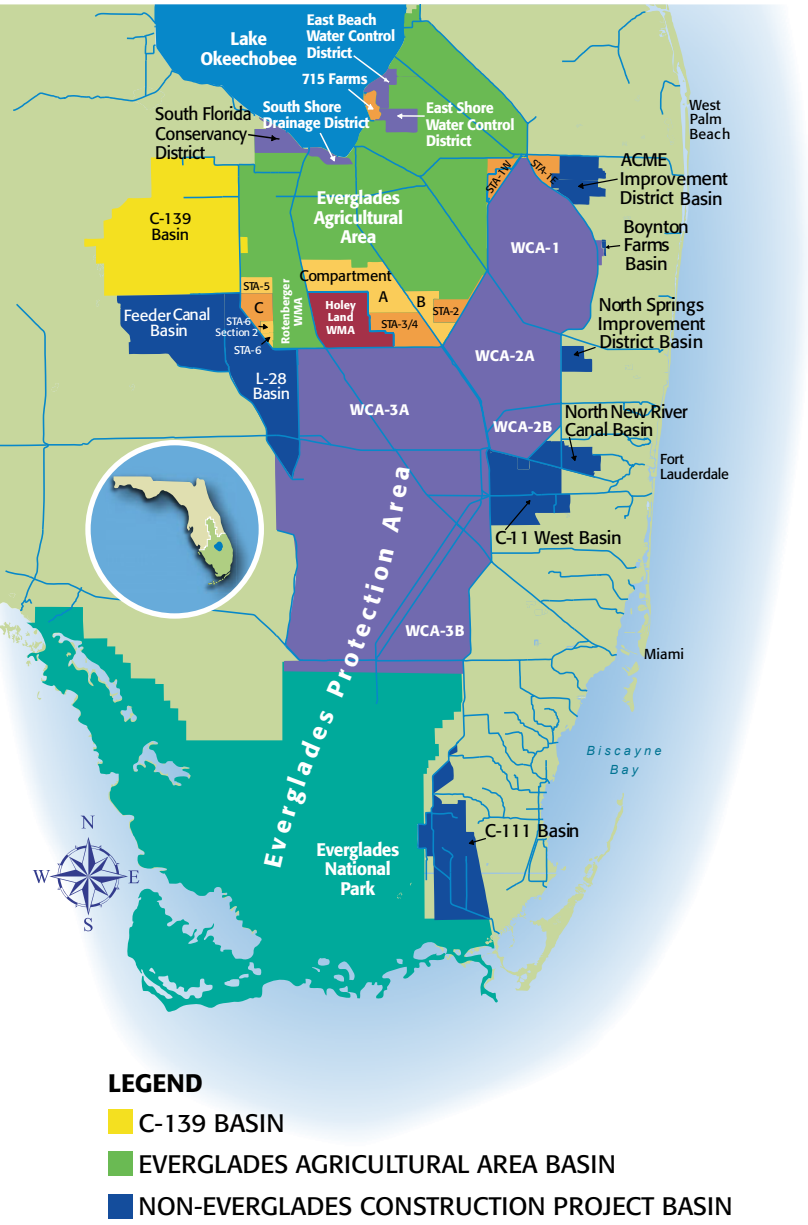
assessment is based on the four-part test outlined in the TP criterion rule and uses available data from existing monitoring sites in the EPA during the most recent five-year period (WY2002–WY2006). This test is comprised of four components, which establish goals for TP concentrations for the monitoring networks within each portion of the EPA and for individual monitoring stations within the EPA on an annual or five-year basis. Importantly, all four components of the test must be achieved for the water body to comply with the established TP criterion.

The results of the four-part assessment using WY2002–WY2006 data showed that the unimpacted portions of each WCA passed all parts of the test and therefore met the criteria. In contrast, WY2002–WY2006 data from the portions of each WCA that have been impacted by historical phosphorus enrichment did not meet the criteria due to failing one or more parts of the test. The geometric mean TP concentrations at most individual sites within the impacted portions of the WCAs exceeded both the 10-ppb five-year network limit and the 15-ppb annual site limit. These findings were predicted because the high TP concentrations in existing soils in the WCAs are expected to take several decades to be restored to more historical levels. Because TP data is limited in some portions of the EPA, additional monitoring sites are being considered to expand the existing monitoring network and provide a more uniform spatial coverage. As more robust datasets are established over the next several years, future assessments are expected to provide a more complete picture of phosphorus throughout the EPA.

NITROGEN LEVELS CONTINUE TO SHOW SIMILAR TRENDS IN WATER YEAR 2006

As in previous years, total nitrogen concentrations during WY2006 decreased moving south through the EPA. Like phosphorus, this gradient generally reflects the higher concentrations associated with developed landscapes to the northern portions of the system, with levels gradually decreasing as water flows southward across the marsh. Total nitrogen concentrations measured across all portions of the EPA during WY2006 were marginally lower than those observed in previous years. This is likely due to the more stable conditions experienced in the marsh over the water year, particularly as a result of less direct hurricane impacts and marsh dry-out in the EPA as well as continued effectiveness of agricultural Best Management Practices and nutrient removal by the Stormwater Treatment Areas. During WY2006, mean total nitrogen concentrations at interior marsh and inflow stations, except Refuge inflows, were slightly lower than the previous water years, with levels from the Park to the Refuge ranging from approximately 1.0 to 2.4 parts per million, respectively.

Phosphorus Source Controls for the Basins Tributary to the Everglades Protection Area



LEGEND

- C-139 BASIN
- EVERGLADES AGRICULTURAL AREA BASIN
- NON-EVERGLADES CONSTRUCTION PROJECT BASIN

TRIBUTARY BASINS IN THE EVERGLADES PROTECTION AREA

In the 2007 SFER – Volume I, Chapter 4 updates the progress of the Everglades Program, mandated by the amended Everglades Forever Act (EFA) to control phosphorus in discharges tributary to the Everglades Protection Area (EPA). The South Florida Water Management District must comply with specific requirements in the operating permits issued by the Florida Department of Environmental Protection to assure that the District complies with the EFA. These permits are the Everglades Construction Project (ECP) and non-Everglades Construction Project (non-ECP) permits. Both permits have adopted a comprehensive approach of controlling phosphorus at the source utilizing regulatory, voluntary, and educational programs. To meet both permit requirements, basin-specific water quality data for total phosphorus (TP) during Water Year 2006 (WY2006) is reported in this chapter.

Source controls are the foundation of the Everglades Program. The ECP permit requires the District to construct, maintain, and operate the ECP in the Everglades Agricultural Area (EAA) and the C-139 basins, the largest tributary sources to the EPA (see map). It also requires the District to provide reasonable assurance that a phosphorus source control program using Best Management Practices (BMPs) has been implemented in these basins prior to discharging to the Stormwater Treatment Areas (STAs).

The non-ECP permit regulates the operation and maintenance of discharge structures within the District's control, and that discharge into, within, or from the EPA but are not included in the ECP. The following eight drainage areas that discharge directly into the EPA with no downstream treatment through the STAs are known as non-ECP basins: the ACME Improvement District, North Springs Improvement District, C-11 West, North New River Canal, Feeder Canal, L-28, Boynton Farms, and C-111 basins (see map). The District is responsible for administering source control programs in these basins as well as a monitoring program to measure progress toward achieving compliance with water quality standards.

In addition to the original EFA source control programs, the amended EFA references the Long-Term Plan for Achieving Water Quality Goals in the EPA, which identifies supplemental water quality improvement projects for ultimately achieving Everglades long-term water quality criteria (see Volume I, Chapter 8). For the ECP and

non-ECP basins, the Long-Term Plan will optimize existing phosphorus source control programs, including improvements in urban and agricultural BMPs and integration with CERP and other federal projects.

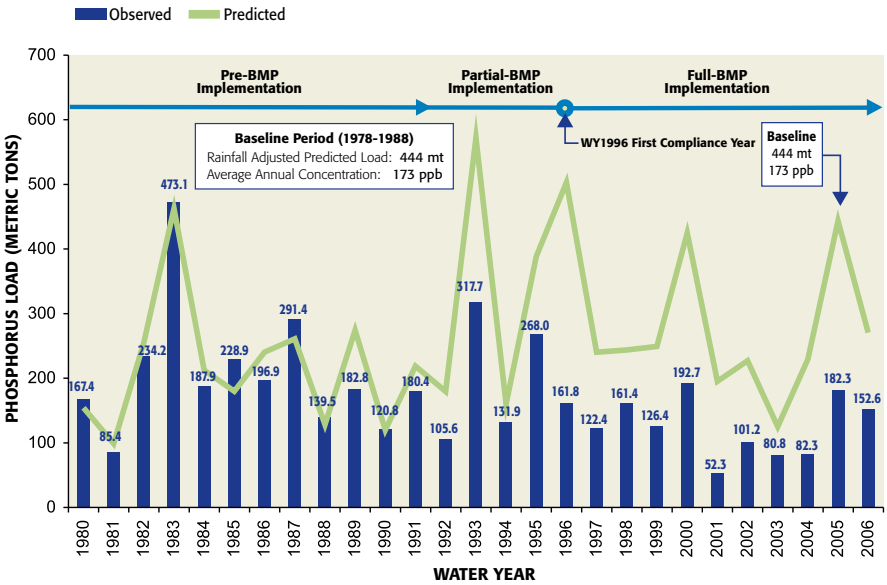
AGRICULTURAL SOURCE CONTROLS CONTINUE OUTSTANDING PERFORMANCE

The EAA basin has been in compliance with the BMP Everglades Regulatory Program for the last 11 years, since its first compliance year of BMP implementation in WY1996. Most notably, this program has prevented a total of 1,734 metric tons (mt) of phosphorus from leaving the EAA in water discharges. As shown on the top figure, the TP load discharged from the EAA basin in WY2006 was nearly 153 mt, representing a 16 percent decrease over last year and a 44 percent reduction from the TP load predicted from the 10-year, pre-BMP baseline period (October 1, 1978 through September 30, 1988). The ECP permit requires the EAA basin to reduce TP loads by 25 percent when compared to the baseline period. Overall, the annual average load reduction from the EAA is greater than 50 percent since the program's initiation. Adaptive management of both BMPs and STAs is expected to provide further declines in TP loads and concentrations attributable to the EAA basin and conveyed to the EPA.

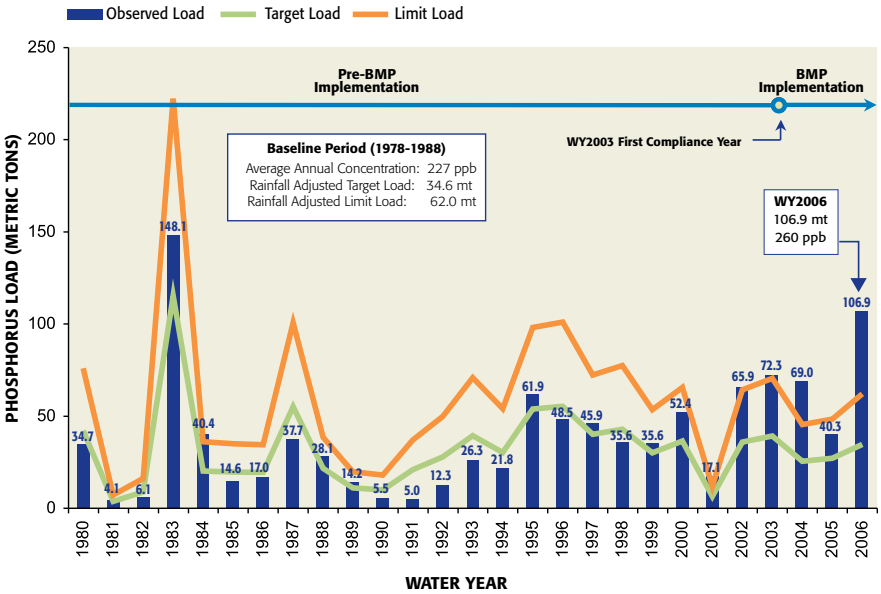
NEW RULEMAKING WILL TARGET PHOSPHORUS REDUCTION IN THE C-139 BASIN

Although WY2006 was characterized by another unprecedented active hurricane season across South Florida, impacts were minimal in most source control basins, except for the C-139 basin. Higher-than-average rainfall during summer 2005 and from Hurricane Wilma in October 2005 resulted in much higher runoff and elevated TP concentrations from the C-139 basin than in WY2005. Consequently, during WY2006 the C-139 basin did not meet the statutory requirement to maintain TP loads at or below historical baseline levels (see bottom figure). Since the program's initiation in WY2003, BMPs in this basin have not shown appreciable reductions in TP loads. Because it is the fourth consecutive year that the basin did not meet its target load, the District is now required to initiate rulemaking pursuant to Chapter 120, Florida Statutes. Refinement of the mandated program and supplementary activities are also needed to achieve the EFA-required level of performance. Additional measures are under way to bring the C-139 basin into compliance and will include (1) increasing research on local phosphorus application rates and movement, (2) developing a hydrologic and water quality model to evaluate on-farm and regional water quality improvement projects, (3) expanding and optimizing the upstream water quality monitoring network, and (4) soliciting input from basin landowners on BMP implementation and water quality improvement activities.

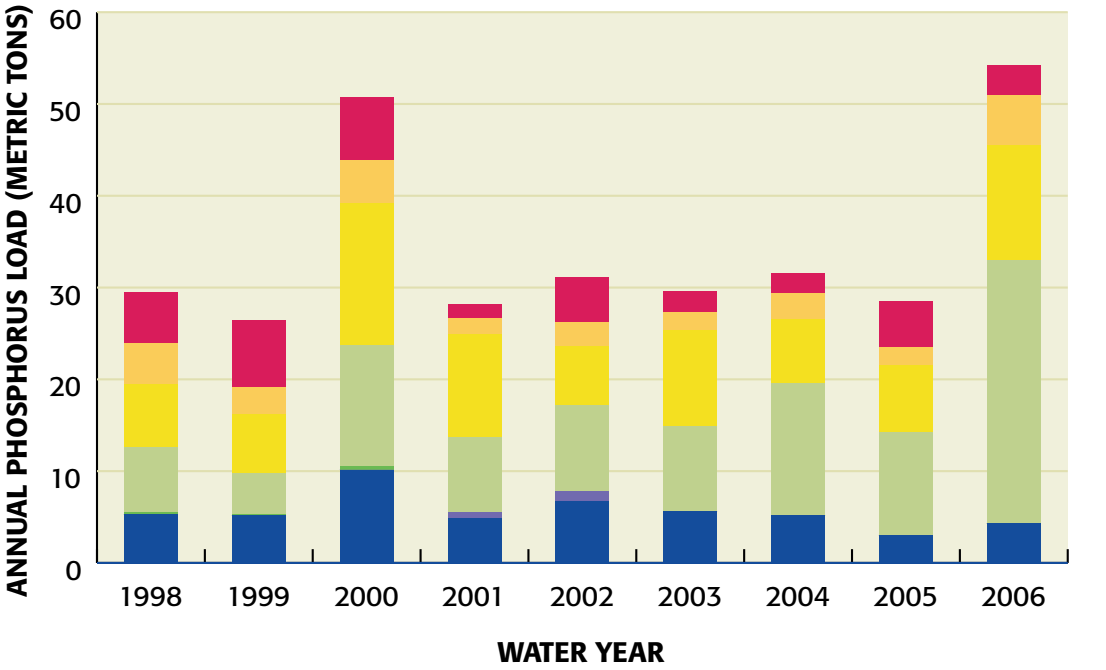
TOTAL PHOSPHORUS LOADS FROM THE EAA BASIN



TOTAL PHOSPHORUS LOADS FROM THE C-139 BASIN



TOTAL PHOSPHORUS LOAD DISTRIBUTIONS FOR THE NON-EVERGLADES CONSTRUCTION PROJECT BASINS



LEGEND

- ACME IMPROVEMENT DISTRICT BASIN
- C-111 BASIN
- L-28 BASIN
- FEEDER CANAL BASIN
- NORTH SPRINGS IMPROVEMENT DISTRICT BASIN
- NORTH NEW RIVER CANAL BASIN
- C-11 WEST BASIN

ADDITIONAL MEASURES ARE UNDER WAY IN THE FEEDER CANAL BASIN

The primary strategy for the non-ECP basins is to develop the voluntary BMP programs initiated in WY1998 and to rely on future CERP projects and other local construction projects for holding or diverting flows that ultimately discharge into the EPA. Unlike the ECP basins, currently there is no specific phosphorus requirement established at the point of discharge for the non-ECP basins. It is anticipated that the implementation of Water Quality Improvement Plans for each non-ECP basin will significantly contribute to achieving Everglades long-term water quality goals. These basin-specific plans include a combination of voluntary BMPs, landowner training and education, modified stormwater permits, cooperative agreements, and basin-specific regulatory programs. Water quality data is also continuously tracked so that the plans can be modified adaptively, as needed, to optimize phosphorus reduction at its source.

Water quality data from non-ECP structures in WY2006, the ninth year of non-ECP data, was evaluated against state water quality criteria to determine the effectiveness of source controls. The quality of water discharged into the EPA during WY2006 was generally acceptable, with some exceptions such as phosphorus and dissolved oxygen. Similar to previous years, there were significant differences in TP concentrations between non-ECP basins, with the highest levels observed in the north (ACME Improvement District and Feeder Canal basins), decreasing southward with the lowest levels (C-111 basin). In WY2006, four of the eight non-ECP basins had either no discharge to the EPA or had average flow-weighted mean TP concentrations below 20 parts per billion. As shown on the figure above, the elevated TP load from the Feeder Canal basin was the main contributor of the non-ECP basins to the overall TP load into the EPA. The extreme rainfall received in the Feeder Canal basin during early summer 2005 coupled with high TP concentrations contributed to elevated TP loads from this basin. Investigation of causative factors is under way to support the development and implementation of additional measures to reduce TP loads from this basin.

STA Performance, Compliance and Optimization

As mandated by the Everglades Forever Act, over 40,000 acres of large constructed wetlands, known as Stormwater Treatment Areas (STAs), have been established along the southern extent of the Everglades Agricultural Area and are managed by the South Florida Water Management District. As surface water moves through vegetated treatment cells, the STAs accumulate phosphorus in sediments through biological and chemical processes, thereby reducing total phosphorus (TP) levels in waters entering into the Everglades Protection Area (EPA). In the 2007 SFER – Volume I, Chapter 5 presents the Water Year 2006 (WY2006) status of the six STAs (STA-1E, STA-1W, STA-2, STA-3/4, STA-5, and STA-6) including operations and management, phosphorus removal performance, water quality monitoring, and permit compliance (see overview on next page). This chapter also summarizes the progress of the STA enhancement projects identified in the Long-Term Plan for Achieving Water Quality Goals in the EPA (see Volume I, Chapter 8).

TREATMENT AREAS CONTINUE TO REDUCE PHOSPHORUS LEVELS MARKEDLY IN DISCHARGES TO THE EVERGLADES

The ability of the STAs to assimilate phosphorus is a vital part of Everglades restoration. Notably, the STAs have retained over 800 metric tons (mt) of TP since 1994. Similar to WY2005, the STAs combined received almost 1.5 million acre-feet of inflow in WY2006. During this water year, the STAs reduced TP levels from an inflow flow-weighted mean concentration of 144 parts per billion (ppb) to an outflow concentration of 44 ppb. The STAs also retained 176 mt of phosphorus, while reducing the inflow TP load to the EPA by 69 percent. Despite recent operational challenges, overall the STAs continue to significantly reduce phosphorus levels in stormwater discharges to the EPA.

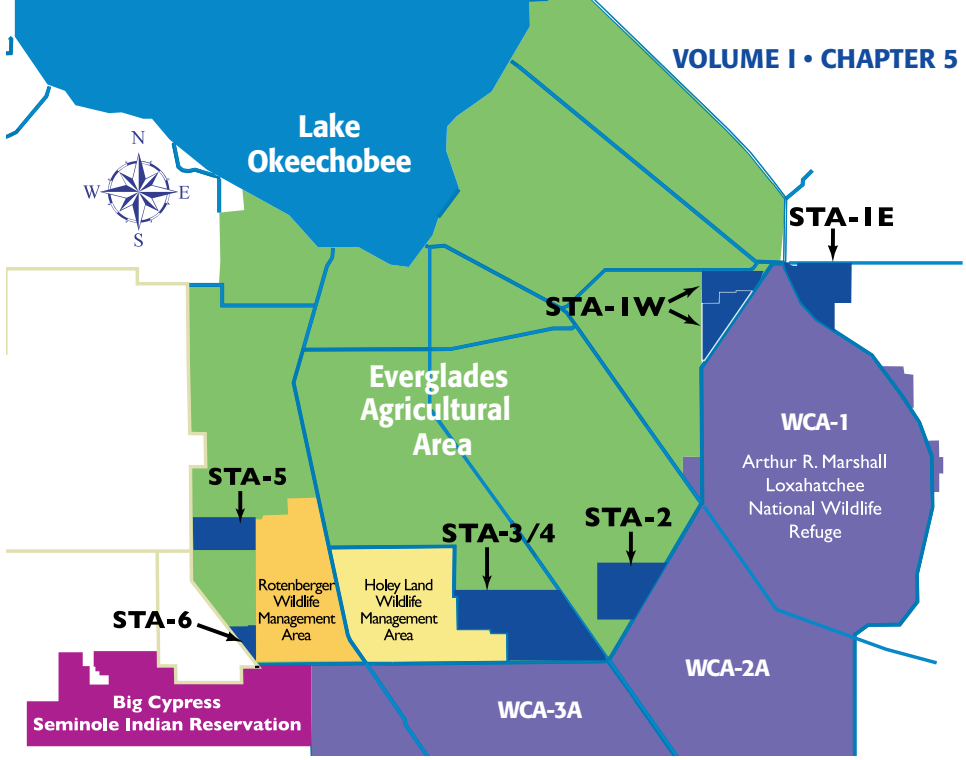
IMPROVEMENTS WILL BENEFIT TREATMENT AS WELL AS RECREATIONAL OPPORTUNITIES

Structural, vegetative, and operational enhancements for each STA are outlined in the Long-Term Plan. In support of such efforts, many groundbreakings for STA expansion and enhancements projects were held during WY2006. The expansion projects involve the addition of large treatment cells to STA-2, STA-5, and STA-6, which will increase the total amount of effective treatment area by more than 5,300 acres. STA enhancements, including the construction of interior levees and water control structures, improvements for surface water flow, and adjustments to vegetation composition, were also under way in WY2006. Beyond these enhancements, the District is designing and constructing facilities to provide recreational use opportunities for the public. Duck hunting, bird watching, and hiking are currently offered at STA-1W and STA-5, while more activities and locations are expected to be added in future years.

ADAPTIVE MANAGEMENT IS KEY TO THE CONTINUED SUCCESS OF STA OPERATIONS

Operation of the STAs involves extensive coordinated efforts by multi-disciplinary teams and the use of innovative technologies and integrative diagnostic tools. STA operational and management issues are discussed frequently through

ENHANCEMENTS, VEGETATION, WILDLIFE, AND RECREATION ARE KEY TO STORMWATER TREATMENT AREA MANAGEMENT.



various regularly scheduled meetings. Operational recommendations are made using real-time flow and TP loading data compared to target flows and TP loads. Efforts are also focused on achieving target water depths between storm events. Models are used to predict the effect of structural and operational modifications and STA phosphorus removal performance. Because the composition and distribution of vegetation are crucial to the success of STA performance, vegetation in each cell is monitored routinely and less desirable species are actively controlled. The establishment of more desirable vegetation, particularly those species that are most effective in phosphorus removal, is key to STA management.

STA OVERVIEW

DURING WATER YEAR 2006*

STA-1E	• Inflow TP reduced from 188 ppb to 146 ppb • 40% reduction in TP load • Removed 4.8 mt TP • Operational permit issued in August 2006 • Cells 1 and 2 off-line for construction of the U.S. Army Corps of Engineers PSTA Demonstration Project
STA-1W	• Inflow TP reduced from 213 ppb to 113 ppb • 49% reduction in TP load • Removed 18.2 mt TP • Major rehabilitation efforts initiated and Long-Term Plan Enhancements under way in Northern Flow-way (Cell 5) • Long-Term Plan Enhancements under way in Western Flow-way (Cells 2 and 4)
STA-2	• Inflow TP reduced from 120 ppb to 21 ppb • 81% reduction in TP load • Removed 35.8 mt TP • Vegetation management activities and reduction of hydraulic loadings under way in Cell 3 to promote vegetation recovery • Construction of new treatment cell (Cell 4) under way
STA-3/4	• Inflow TP reduced from 123 ppb to 23 ppb • 80% reduction in TP load • Removed 83.8 mt TP • WY2006 outflow flow data revised in October 2006 • Full-scale PSTA Implementation Project is in vegetation establishment phase • Long-Term Plan Enhancements under way in Cell 3
STA-5	• Inflow TP reduced from 199 ppb to 96 ppb • 55% reduction in TP load • Removed 29.3 mt TP • Construction of new treatment cells (Flow-way 3) under way
STA-6	• Inflow TP reduced from 104 ppb to 26 ppb • 84% reduction in TP load • Removed 4.3 mt TP • Construction of new treatment cell (Section 2) under way

*See text on pages 19 and 20 for definitions of all acronyms in the table.

Many notable events impacted the performance of the STAs during WY2006. Over the past two years, the STAs were impacted by hurricane-force winds from Hurricanes Frances and Jeanne in summer 2004 and Hurricane Wilma in October 2005, resulting in widespread power outages and vegetation damage. As a result, considerable measures are being taken by the District to fortify the STAs against future storm damage. These include installing generator receptacles for emergency back-up power at key structures and creating emergent vegetation buffering strips in treatment cells to reduce the effects of waves and high winds. Additionally, STA performance has been affected by the rehabilitation and enhancement activities in certain treatment cells, as some STAs have not been able to use all their available effective treatment area.

APPLIED RESEARCH IS BEING USED TO SUPPORT SUSTAINABLE TREATMENT AREAS

Applied research conducted in the STAs is focusing on ways to stabilize the STAs for long-term sustainability. The District is resolving the difficulties encountered while rehabilitating and restarting STA treatment cells after planned construction activities and hurricane damage. As further support, a multifaceted recovery plan was initiated by the District in September 2005. This plan includes planting rice to stabilize sediments, removing sediment from water control structures, and adding emergent vegetation within submerged aquatic vegetation cells. A full-scale implementation project using algae, referred to as Periphyton Stormwater Treatment Areas (PSTA), is in the grow-in phase in STA-3/4, and the U.S. Army Corps of Engineers is currently constructing a PSTA project in STA-1E. Focused efforts to optimize STA performance are continuing, and additional improvements will be made as new information becomes available.

Ecology of the Everglades Protection Area

Over the last century, drainage of the Everglades has dramatically changed South Florida's landscape. As a result of this altered hydrology, the Everglades has been reduced to half its original size, water tables have dropped, hydroperiods have been altered, flows have been diverted, wetlands have been impounded, wildlife has been reduced, water quality has been degraded, and habitats have been invaded by nonindigenous plants. It is evident that several important factors – diminished extent of the Everglades and surrounding uplands, changes in the soil and topography, presence of exotic species, and the current system of canals and levees – all constitute constraints on environmental restoration to pre-drainage conditions. The challenge facing science and society is determining which key hydrologic driving forces will be restored to guide future succession in the remaining Everglades. Research efforts are essential to meet this challenge.

In the 2007 SFER – Volume I, Chapter 6 updates some recent ecological research programs and studies associated with wildlife, plant, ecosystem, and landscape ecology of the Everglades Protection Area. These programs, sponsored by the South Florida Water Management District and other collaborating agencies, continue to focus on characterizing the existing communities, creating a baseline dataset, relating patterns of distribution and abundance to hydrology, and evaluating performance measures and alternatives for preservation and restoration.

ALTERED WATER FLOWS AND LEVELS IN THE EVERGLADES HAVE CAUSED A 60 PERCENT LOSS IN TREE ISLANDS OVER THE LAST 50 YEARS.

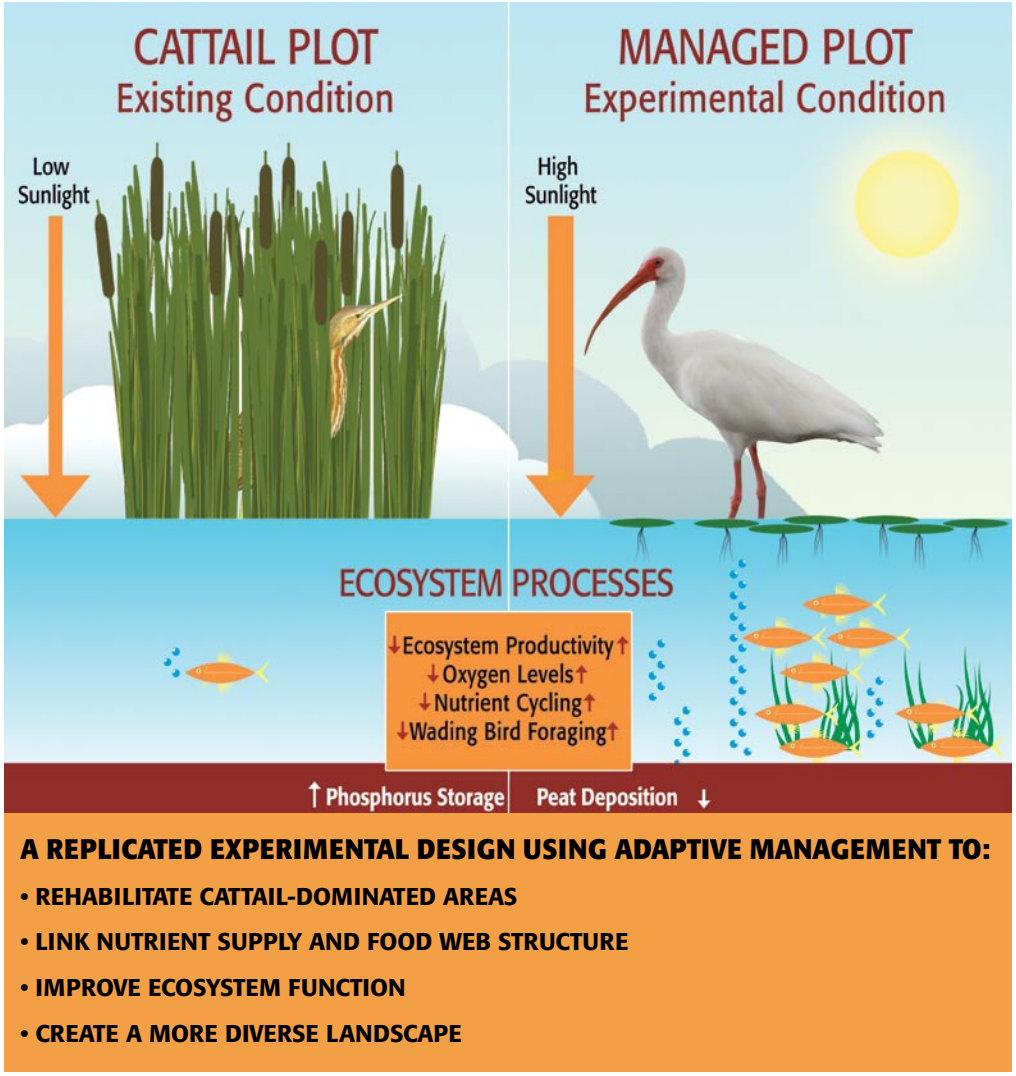
WADING BIRD NESTING RISES AGAIN IN 2006

For the past 10 years, the District and other partnering agencies have been monitoring and reporting on annual wading bird nesting success in South Florida. The estimated number of wading bird nests in South Florida in Water Year 2006 (WY2006) was almost 55,000. This is about 13 percent lower than WY2002, the best nesting year on record since the 1940s. However, this total also represents a 71 percent increase from WY2005, the first water year to experience a reversal in the recent rising trend since WY1999. Overall, the WY2006 estimate is relatively high compared to the average over the past few decades and is consistent with the general rising trend in recent years. This year's increase can be attributable primarily to the well-suited hydrological conditions experienced in the region during WY2006. Specifically, a pattern of receding water levels during summer 2006, which coincided with the breeding season, created favorable foraging habitat and resulted in an overall strong nesting season.

RESEARCH FINDINGS REVEAL CRITICAL DETAILS FOR EVERGLADES RESTORATION

Tree islands – a cornerstone of Everglades ecology – have a unique composition of plant species and are crucial for many animal species that use these areas for mating, nesting, and foraging. Yet, these distinct regional habitats have been diminishing at considerable rates over recent decades. Although tree islands possess some inherent resilience to changes in water depth, most of these areas are extremely susceptible to degradation and species loss as a result of marked changes in water levels, especially those caused by drought or flooding. To better understand vegetation dynamics in relation to water management activities in the

CONCEPTUAL MODEL FOR CATTAIL HABITAT IMPROVEMENT PROJECT



A REPLICATED EXPERIMENTAL DESIGN USING ADAPTIVE MANAGEMENT TO:

- **REHABILITATE CATTAIL-DOMINATED AREAS**
- **LINK NUTRIENT SUPPLY AND FOOD WEB STRUCTURE**
- **IMPROVE ECOSYSTEM FUNCTION**
- **CREATE A MORE DIVERSE LANDSCAPE**

region, the District has been conducting studies on constructed island habitats at the Loxahatchee Impoundment Landscape Assessment research facility at the Arthur R. Marshall Loxahatchee National Wildlife Refuge. Importantly, the final results of a three-year tree seedling experiment showed that only three plant species – pond apple *(Annona glabra)*, dahoon holly *(Ilex cassine)*, and willow *(Salix caroliniana)* – are resilient to the extreme hydrological conditions of drought and flooding. Research findings also indicated that drought is more harmful to the seedling populations than flooding in these sensitive systems. As the District's tree island program continues, these new crucial findings along with information obtained from additional detailed studies will be used to understand natural patterns on tree islands and the potential to restore islands that have been lost across the Everglades.

TWO NEW PROJECTS ARE LAUNCHED TO STUDY IMPACTED ECOSYSTEMS IN WATER CONSERVATION AREAS

A significant portion of the Everglades ecosystem has been impacted by excessive phosphorus levels. Under current regional conditions, phosphorus-enriched areas are readily evidenced by over 11,000 hectares of cattail (*Typha* spp.) stands that have extensively replaced the historic Everglades landscape of a sawgrass and slough mosaic. Over and above the ongoing efforts being implemented by the District to monitor and control the release of elevated phosphorus into the Everglades, considerable restoration efforts are also under way to remove invasive cattail across the Water Conservation Areas (WCAs). During WY2006, the District initiated two new projects in WCA-2A to evaluate how the large-scale manipulation of cattail communities affects impacted ecosystems. The first project, the Fire Project, uses controlled burning to physically remove cattails. The second project, the Cattail Habitat Improvement Project, uses herbicides to maintain slough-like openings, similar to those present in unimpacted areas of the Everglades, to increase wildlife utilization. As shown in the diagram on this page, dense cattail stands are being cleared in the managed plots. Subsequently, these managed areas are being monitored and compared to unmanaged areas for various ecosystems processes, such as nutrient cycling, oxygen levels, and habitat utilization by wading birds and other native species. Together, these projects will help to better understand the factors and uncertainties involved in accelerating the recovery of impacted regional wetlands. It is expected that further updates on these noteworthy projects will be presented in future SFERs.

Comprehensive Everglades Restoration Plan Annual Report

The Comprehensive Everglades Restoration Plan (CERP) is the foundation for the largest ecosystem restoration project in the world. CERP is focused on restoring the quantity, quality, timing, and distribution of water to the Everglades and other components of the regional ecosystem. Under the 2000 Water Resources Development Act, the U.S. Congress approved this landmark plan and authorized 10 initial full-scale projects and six pilot projects. These authorized projects include water storage reservoirs, water treatment areas for waters delivered to the Everglades and coastal estuaries, and other key wetland restoration projects. As the major local sponsor, the South Florida Water Management District is partnering with the U.S. Army Corps of Engineers (USACE) to implement CERP, along with related Feasibility Studies and Critical Restoration Projects that support the plan.

The overarching goal of CERP is to restore, preserve, and protect South Florida's ecosystem while providing for other water-related needs of the region, such as water supply and flood protection. Strategies for achieving this ambitious goal include completing Acceler8 projects, continuing to acquire necessary lands, finalizing federal Project Implementation Reports (PIRs), and completing project design and construction. In the 2007 SFER – Volume I, Chapter 7A highlights the progress of CERP implementation and related financial information for FY2006. The chapter also summarizes the status of Acceler8, a state initiative consistent with the objectives of CERP and the Everglades Long-Term Plan. Further information is available on the CERP web site at http://www.evergladesplan.org.

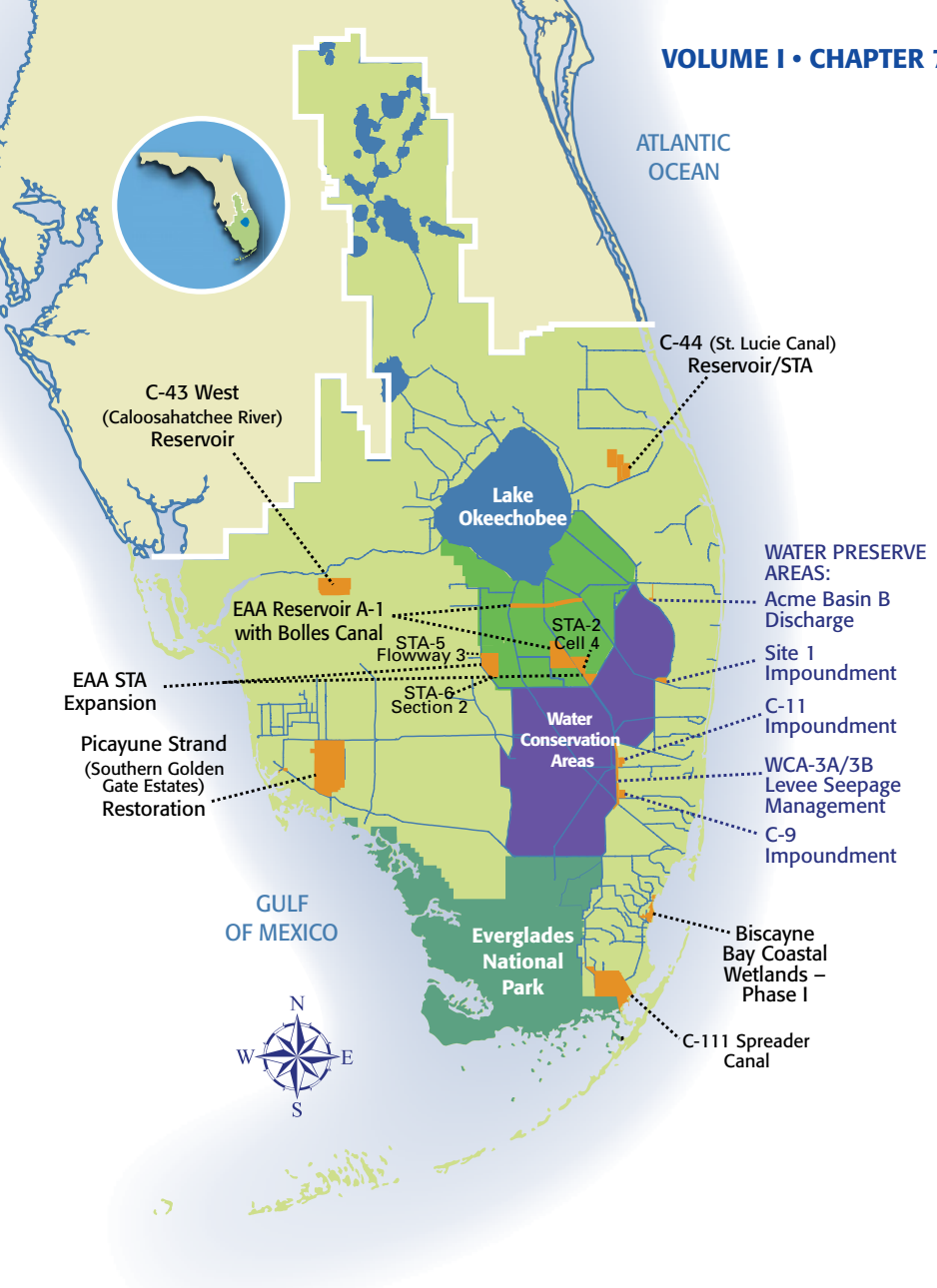
MANY CERP AND ACCELER8 MILESTONES ARE REACHED IN FISCAL YEAR 2006

Acceler8 was launched in October 2004 to expedite Everglades restoration through eight of the initially authorized CERP components along with additional Stormwater Treatment Areas (STAs) and wetland restoration projects (see map on page 24). Collectively, the Acceler8 projects include construction of nearly 30,000 acres of treatment marshes and above-ground reservoirs that will provide over 400,000 acre-feet of water storage in the region. With a projected total cost approaching $2 billion, this sweeping initiative is expected to deliver over 50 percent of the above-ground CERP program storage and over 70,000 acres of restored wetlands five years ahead of the current schedule while maintaining CERP's overall momentum.

During FY2006, significant progress was made in planning for CERP projects and in constructing the Critical Restoration Projects that provide part of the foundation for CERP. The District continued its partnership with the USACE to prepare PIRs and Feasibility Studies. Project-related activities, including project planning, design, and construction, are under way for all Acceler8 projects. Highlights of key achievements made in FY2006 are presented below.

- Acceler8 was successful in delivering restoration projects, with six groundbreakings in FY2006. In August 2006, groundbreaking for the Everglades Agricultural Area (EAA) Reservoir launched construction of a massive reservoir that will hold 62 billion gallons of water, capture flood-control releases from Lake Okeechobee, and store stormwater runoff in the EAA.

A RIBBON-CUTTING TO MARK COMPLETION OF THE CONSTRUCTED TAYLOR CREEK AND NUBBIN SLOUGH STORMWATER TREATMENT AREAS IN 2006.



ACCELER8 OVERVIEW

A MAJOR SOUTH FLORIDA ECOSYSTEM RESTORATION INITIATIVE TO:

- EXPEDITE 8 OF 10 CONGRESSIONALLY AUTHORIZED CERP COMPONENTS
- PROVIDE SIGNIFICANT BENEFITS AHEAD OF SCHEDULE
- RESTORE OVER 70,000 ACRES OF DRAINED WETLANDS
- ENHANCE THE NATURAL AREAS ACROSS THE GREATER EVERGLADES

ACCELER8
everglades**now**.org

- Eight Acceler8 projects or project components were under construction in FY2006. In July 2006, the District completed two 28-acre test cells that will provide detailed data to guide the design and construction of the C-43 West Reservoir Project. The District also acquired 12,000 acres of land for the construction of the C-44 Reservoir and STA. Together, these two projects will store large volumes of localized stormwater runoff and, in the C-43 West Reservoir, freshwater releases from Lake Okeechobee as well, collectively reducing harmful impacts to the downstream Caloosahatchee and St. Lucie estuaries.
- The District continued its planning efforts with the USACE to prepare PIRs for congressional approval. Final Draft PIRs were completed for the Acme Basin B, Site 1 Impoundment, Everglades Agricultural Area Reservoir, and Broward County Water Preserve Areas projects.
- Under Acceler8, the expansion of three STAs in the EAA (STA-5 Flow-way 3, STA-6 Section 2, and STA-2 Cell 4) began in early FY2006 in support of the Long-Term Plan

IN JULY 2006, THE DISTRICT CONSTRUCTED THE C-43 WEST RESERVOIR TEST CELLS TO EXPEDITE CALOOSAHATCHEE ESTUARY RESTORATION.

STEPPING UP THE PACE ON EVERGLADES RESTORATION PROJECTS CONTINUES, AS THE EAA RESERVOIR PROJECT – ACCELER8'S FLAGSHIP – BREAKS GROUND IN FISCAL YEAR 2006.

(see Volume I, Chapters 5 and 8). Construction of the Acme Basin B Project, now part of the Long-Term Plan, also was initiated this year.

- A detailed plan for the CERP Lake Okeechobee Watershed Project was completed in August 2006 and is under federal review. As a keystone of the Lake Okeechobee Protection Plan, this project will aid in managing water levels and reducing phosphorus loading to the lake.
- Six of the seven Critical Restoration Projects were substantially completed this year. Reservoirs and STAs were constructed in the Taylor Creek and Nubbin Slough basins and the Ten-Mile Creek Basin to improve the timing and quality of water deliveries from associated watersheds. Structural modifications have also been completed under several CERP projects, such as the C-11 Impoundment and Picayune Strand projects, as part of focused efforts to improve regional water quality.
- The Lake Trafford Critical Restoration Project containment facility and dredging of about 3.5 million cubic yards of muck were completed in summer 2006. This project will improve water quality and enhance fish and wildlife habitat in the Big Cypress Basin.

THE FIRST CERP PROGRESS REPORT WAS RELEASED IN 2006

To fulfill the requirements of the 2000 Water Resources Development Act, the District and the USACE completed the CERP 2005 Report, which is expected to be submitted to the U.S. Congress in early FY2007. As the first in a series of periodic reports, this report provides an update on CERP's progress over the first five-year period of its implementation.

In September 2006, the National Research Council's Committee on Independent Scientific Review of Everglades Restoration Progress released a mandated report to Congress documenting an in-depth independent review of CERP restoration progress. The report commends the state for achievements on regional restoration – accelerated funding and project implementation, sound science, land acquisition, and phosphorus control – and it recognizes the funding and federal collaboration challenges to CERP's momentum as an effective partnership.

THE STATE APPROVES PUBLICLY OFFERED BONDS TO ACCELERATE RESTORATION PROJECTS

The financial and project status reporting for CERP is outlined in three parts and was prepared mutually by the District and the Florida Department of Environmental Protection (FDEP). In Part (A), the District and the FDEP jointly identify funding sources and amounts, itemize FY2006 expenditures and fund balances, and provide a schedule of anticipated expenditures for FY2007. In FY2006, total CERP revenues were $392.2 million and total CERP expenditures were $409 million (unaudited). The anticipated expenditures for FY2007 are $570.7 million.

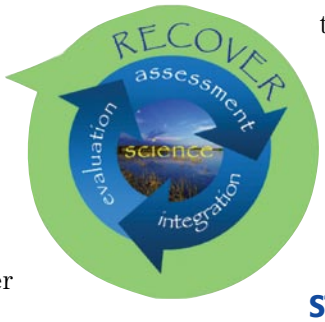
In Part (B), the FDEP provides a detailed report on all state funds appropriated and expended on current land acquisition projects related to CERP. The amount of expenditures to be credited toward the state's share of funding for executing CERP will be determined in each project's cooperative agreement.

In Part (C), the District and the FDEP provide a progress report on CERP's implementation, including status of acquired land. During FY2006, 18,294 acres were acquired for CERP projects at a total cost of $275.7 million. Approximately 55 percent of the land for CERP has been acquired.

Formally approved by the state court in February 2006, the District is using Certificates of Participation revenue bonding to cost-effectively finance the construction of expedited restoration projects. The first nationally issued bonds were released in fall 2006, successfully raising a total of $572 million (see Volume I, Chapter 13). The District and its partners will continue to strive toward expediting Everglades restoration through innovative financing options.

Update on RECOVER Implementation and Monitoring for the Comprehensive Everglades Restoration Plan

RECOVER (Restoration Coordination and Verification) organizes and applies scientific and technical information to support the goals and purposes of the Comprehensive Everglades Restoration Plan (CERP). RECOVER is made up of interagency, interdisciplinary teams sponsored by the U.S. Army Corps of Engineers and the South Florida Water Management District.



In the 2007 SFER – Volume I, Chapter 7B provides an update on RECOVER's monitoring and assessment activities and highlights the many efforts being performed by RECOVER to aid in implementing and expediting CERP projects. Further information on RECOVER can be found at http://www.evergladesplan.org, and the status of CERP projects is presented in Volume I, Chapter 7A.

NEW METHODS ARE BEING DEVELOPED TO CONSISTENTLY EVALUATE CERP PROJECTS

One of the many challenges of CERP is to establish a consistent protocol for evaluating project-specific goals and applying system-wide performance measures. To support this complex process, RECOVER is currently drafting a Benefits Evaluation and Analysis Methodology, which will standardize how benefits to the Everglades ecosystem will be evaluated for all CERP projects. Importantly, this methodology will help provide a uniform basis for CERP Project Delivery Teams to assess the many possible options ("alternatives") during project development and to guide the final design and implementation of each selected project. It will also support program-wide management decisions for prioritizing future CERP projects and for expediting and funding crucial components of the program.

ADAPTIVE MANAGEMENT STRATEGIES AID IN CERP DECISION MAKING

The CERP Adaptive Management Strategy Report was completed in April 2006. As an important step in the CERP oversight process, this strategy outlines the recommended approach for integrating adaptive management into the implementation of CERP projects. The intent of this approach is to substantially improve the chance of success in achieving restoration goals of the highly complex Everglades ecosystem. As one of the many notable CERP project examples, RECOVER has been working over the past year on adaptive management initiatives for the Decompartmentalization Project. Project-related activities include developing field-scale physical models, establishing a monitoring program, and analyzing field data to reduce uncertainties associated with this CERP project. The multi-phase project involves reconnecting significant portions of the now-compartmentalized Everglades and restoring its altered landscape and surface sheetflow. Such comprehensive efforts are essential for restoring the Everglades ecosystem and its function. Importantly, the adaptive management approaches used for this and other CERP projects will be instrumental to CERP's overall success.

THE CERP DECOMPARTMENTALIZATION PROJECT WILL RECONNECT LARGE SECTIONS OF EVERGLADES SAWGRASS MARSH AND RESTORE A MORE NATURAL SHEETFLOW INTO EVERGLADES NATIONAL PARK.

Implementation of the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area

The long-term Everglades water quality goal is for all surface water discharges to the Everglades Protection Area (EPA) to achieve and maintain water quality standards, in accordance with the Everglades Forever Act. To achieve this goal, the South Florida Water Management District is implementing the projects outlined in the 2003 Long-Term Plan for Achieving Water Quality Goals in the EPA (known as the Long-Term Plan) and its subsequent amendments. In the 2007 SFER – Volume I, Chapter 8 updates the progress on implementing the Long-Term Plan. The diverse activities in this plan are covered in the following Volume I chapters: Chapter 3C (Everglades water quality), Chapter 4 (phosphorus source controls for Everglades tributary basins), Chapter 5 (performance and enhancements of the Stormwater Treatment Areas), Chapter 6 (research on Everglades ecosystems), and Chapter 13 (financial reporting on Long-Term Plan activities).

EVERGLADES PROGRAMS SURPASS EXPECTATIONS FOR ATTAINING WATER QUALITY GOALS

Substantial progress toward reducing total phosphorus (TP) levels discharged into the EPA has been made by the state of Florida and other stakeholders. Since their inception and through the end of April 2006, the Everglades Agricultural Area's Best Management Practices and the Stormwater Treatment Areas combined have removed about 2,500 metric tons of TP that otherwise would have entered the Everglades. Of this amount, approximately 300 metric tons of TP were removed in Water Year 2006. Many phosphorus source control measures are being implemented in urban and other tributary basins throughout the region, while additional measures are still necessary to achieve the overall Everglades water quality goal.

LONG-TERM PLAN REVISIONS OPTIMIZE MEASURES FOR PHOSPHORUS REDUCTION

The 2003 Long-Term Plan contains an adaptive implementation process for revising the plan, with collective input from the state, stakeholders, and the public. To date, five revisions to the plan have been approved by the Florida Department of Environmental Protection. The first two revisions are highlighted in the 2005 and 2006 SFER – Volume I, Chapter 8, respectively. The third revision includes modifications to the structural and vegetation improvements for STA-1W and STA-3/4. The fourth revision includes the addition of the Acme Basin B Discharge Acceler8 Project into the Long-Term Plan to provide a dedicated funding source and to facilitate better coordination with STA-1E, the planned destination for this basin's runoff. The latest revision includes several modifications, including the addition of two Acceler8 projects, C-9 and C-11 Impoundments, into the Long-Term Plan to provide dedicated funding for completion of these projects. This revision also provides adjustments to the Process Development and Engineering component of the plan.

SPRING 2006 GROUNDBREAKING FOR THE LONG-TERM PLAN PROJECT, EXPANSION OF STA-2 CELL 4, AN ACCELER8 INITIATIVE.

The Status of Nonindigenous Species in the South Florida Environment

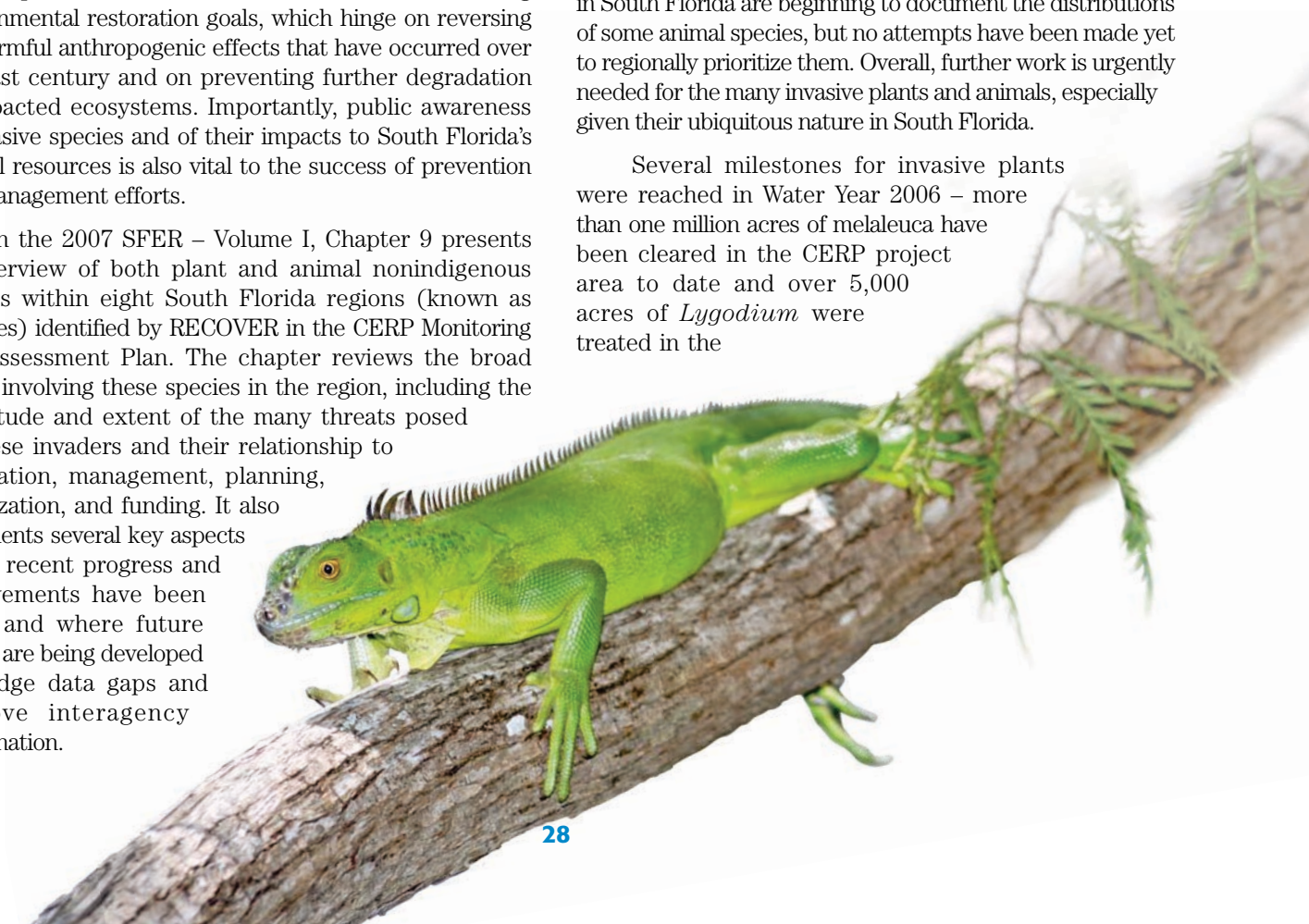
Nonindigenous plants and animals aggressively invade natural habitats and cause significant ecological changes, particularly by displacing native species. Nonindigenous species have not only become one of the most serious global environmental problems but a significant concern throughout Florida. Beyond the state's multimillion-dollar expenditures to date, the District spent over $21 million in Fiscal Year 2006 for invasive plant prevention, control, and management efforts in South Florida. The widespread impacts reach beyond financial concerns, and South Florida has more introduced animals than any other U.S. region and has the distinction of having one of the world's largest non-native naturalized animal communities. This presents an immense challenge to governmental agencies, including the South Florida Water Management District, tasked to manage and restore South Florida's environment. While many details on invasive species are simply unknown, collaborating agencies are working together to better understand and manage this massive problem. Focused efforts are crucial to achieving environmental restoration goals, which hinge on reversing the harmful anthropogenic effects that have occurred over the past century and on preventing further degradation to impacted ecosystems. Importantly, public awareness of invasive species and of their impacts to South Florida's natural resources is also vital to the success of prevention and management efforts.

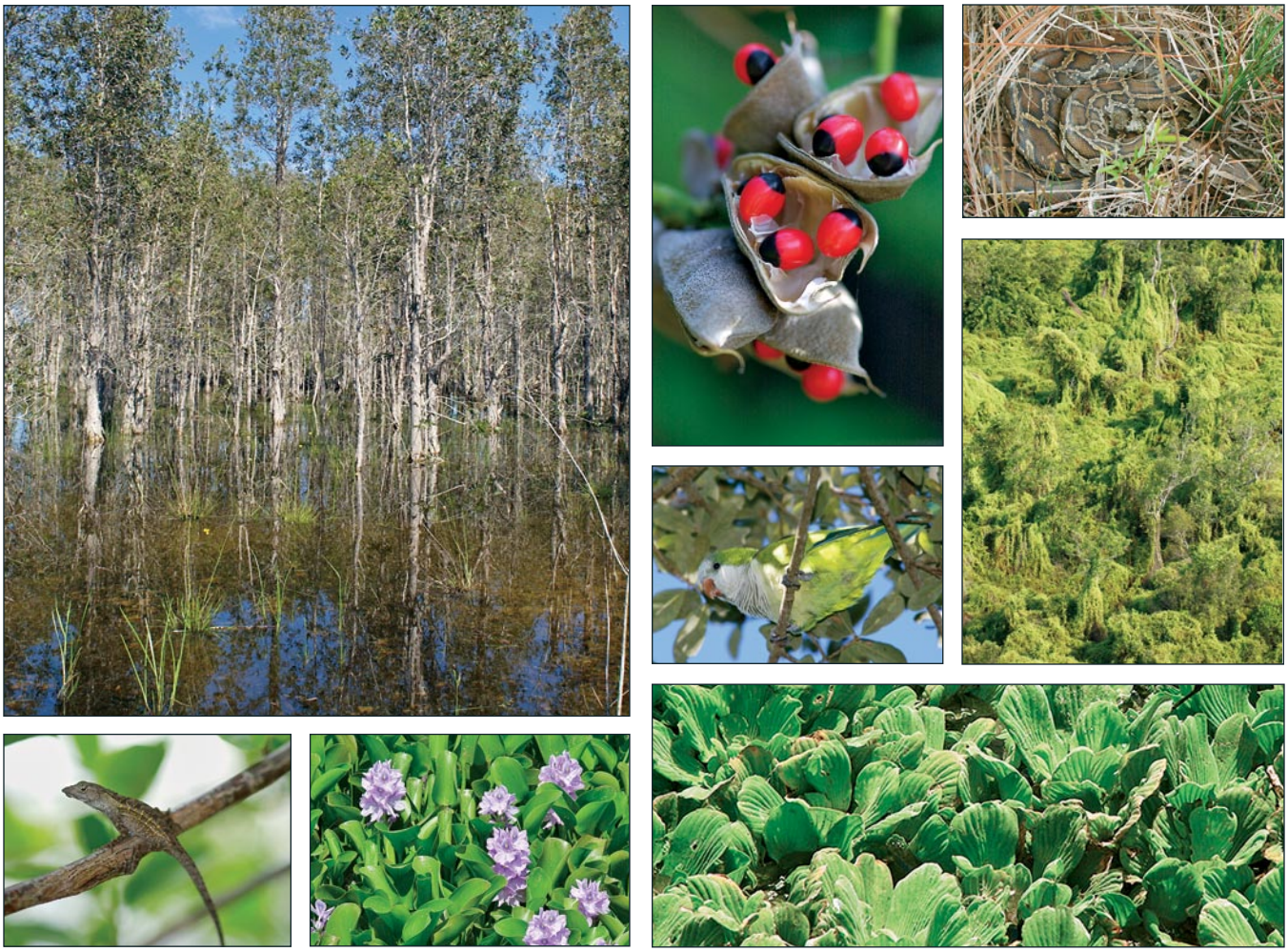
In the 2007 SFER – Volume I, Chapter 9 presents an overview of both plant and animal nonindigenous species within eight South Florida regions (known as modules) identified by RECOVER in the CERP Monitoring and Assessment Plan. The chapter reviews the broad issues involving these species in the region, including the magnitude and extent of the many threats posed by these invaders and their relationship to restoration, management, planning, organization, and funding. It also documents several key aspects where recent progress and achievements have been made and where future efforts are being developed to bridge data gaps and improve interagency coordination.

SCORES OF EXOTIC SPECIES ACROSS THE REGION POSE RESTORATION CHALLENGES

About 25 nonindigenous plants are listed as priority plant species in South Florida. Old World climbing fern *(Lygodium microphyllum)*, melaleuca *(Melaleuca quinquenervia)*, and Brazilian pepper *(Schinus terebinthifolius)* are generally a priority in all regions, and aquatic plants such as hydrilla *(Hydrilla verticillata)* and water hyacinth *(Eichhornia crassipes)* are high priorities in the Kissimmee and Lake Okeechobee modules. There are also considerable numbers of nonindigenous animals known to occur throughout the region, ranging from about 55 species in the Kissimmee and Lake Okeechobee modules up to more than 125 species in the Greater Everglades and Southern Estuaries modules, respectively. Some of these animals are commonly found in all modules, whereas others are limited geographically, such as the purple swamphen *(Porphyrio porphyrio)* only found in the Greater Everglades and Lake Okeechobee modules. Land managers in South Florida are beginning to document the distributions of some animal species, but no attempts have been made yet to regionally prioritize them. Overall, further work is urgently needed for the many invasive plants and animals, especially given their ubiquitous nature in South Florida.

Several milestones for invasive plants were reached in Water Year 2006 – more than one million acres of melaleuca have been cleared in the CERP project area to date and over 5,000 acres of *Lygodium* were treated in the





HUNDREDS OF EXOTIC SPECIES ARE KNOWN TO BE INVADING SOUTH FLORIDA'S NATURAL HABITATS AND THREATEN NATIVE PLANTS AND ANIMALS.

Everglades this year. Ongoing vegetation control efforts also were actively carried out during Fiscal Year 2006, with the treatment of almost 70,000 acres within District-managed lands. Yet, management options, funding, and regulations are extensively needed for managing the increasing number of invasive nonindigenous animal species.

Recently introduced Burmese python *(Python molurus bivittatus)* populations are continuing to expand at an alarming rate in the Greater Everglades. As a top predator with a growing presence in the natural landscape, the python presents a potentially significant threat to valued resources and planned restoration efforts. In 2006, there were approximately 160 pythons removed from Everglades National Park and surrounding areas, representing a twofold increase from the previous year. The Park, with the District's support, is spearheading an unparalleled effort to develop a python management plan. The Park also is continuing python tracking, control, and research to support management of this rapidly spreading invader.

FLORIDA RECEIVES APPROVAL FOR BIOCONTROL AGENTS TO HELP TACKLE INVASIVE PLANTS

Along with mechanical and chemical control methods, biological control is a key tool to effective long-term management of many invasive plants, such as melaleuca and *Lygodium*. Research programs to develop additional biocontrol agents and to optimize methods of treatment are continuing at an accelerated pace. Three agents have been released on melaleuca to date. Notably, in 2006 the state received approval from the federal Technical Advisory Group, and federal approval is currently pending for the release of an additional biological control agent – a leaf-eating moth species – to help control and minimize the spread of *Lygodium* in South Florida. While these control options represent an important step in effectively managing these invasive species, it is expected to take many years to monitor results and determine their effectiveness.

Lake Okeechobee Protection Program – State of the Lake and Watershed

Distinctively the largest freshwater body in the southeastern United States, Lake Okeechobee is a central part of South Florida's interconnected hydrological and ecological systems. As a highly valued resource, the lake affords many benefits to the region's population and environment by serving as a primary water supply and providing flood control for neighboring areas. It is also home to migratory waterfowl, wading birds, and endangered species, as well as a multimillion-dollar fishery.

Lake management is essential to address three key issues – excessive phosphorus loading, unnatural fluctuations in water levels, and the rapid spread of invasive exotic species – facing the lake and its surrounding watershed. The South Florida Water Management District and its partnering agencies are addressing these interrelated issues to rehabilitate the lake and improve its function as a valuable ecosystem. In concert, the District and U.S. Army Corps of Engineers are implementing CERP components in the watershed to partially address elevated total phosphorus (TP) levels and provide alternative water storage areas to properly regulate lake water levels, while maintaining its water supply and other water resource functions.

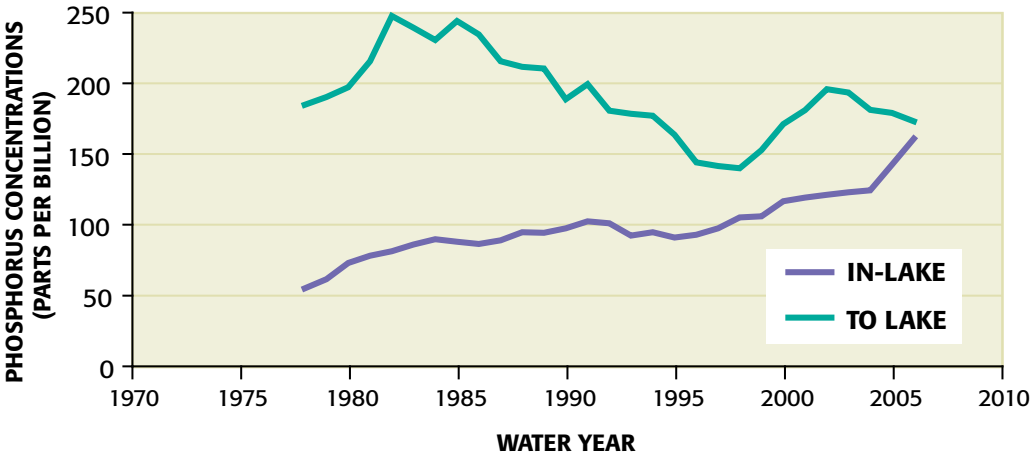
In the 2007 SFER – Volume I, Chapter 10 presents the Water Year 2006 (WY2006) status of Lake Okeechobee and its watershed on major concerns impacting water quality and habitat conditions and highlights project-related activities addressing those issues under the Lake Okeechobee Protection Program and the Lake Okeechobee & Estuary Recovery (LOER) Plan (see opposite map). Financial reporting on the program's implementation during Fiscal Year 2006 (FY2006) is also covered in the chapter.

DAMAGING EFFECTS OF MULTIPLE HURRICANES SLOW LAKE-WIDE RECOVERY

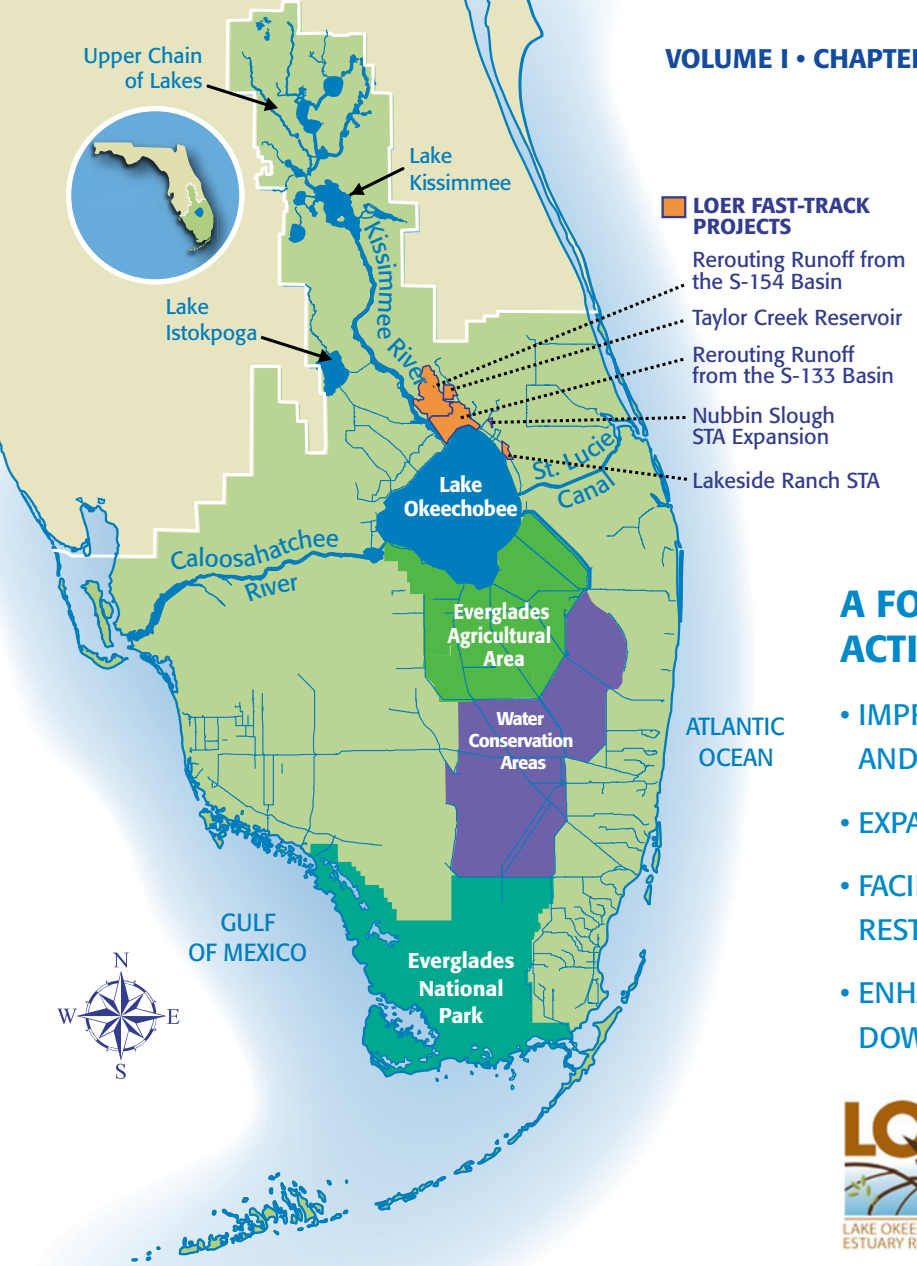
Lake Okeechobee was dramatically impacted by five hurricanes during summer and fall 2004. In October 2005, Hurricane Wilma passed directly over the lake, further compounding these devastating impacts. The hurricane-related effects have been far-reaching, as large amounts of phosphorus-laden sediments were resuspended and distributed throughout the lake, thereby sharply increasing in-lake TP concentrations during WY2005 and WY2006. In early WY2006, high water levels and increased suspended sediments reduced light availability, thereby damaging submerged aquatic vegetation. Prior to the 2004 hurricanes through August 2005, there was an approximate fivefold decline in the total acres of submerged aquatic vegetation within the lake.

Due to the increased inflows and rainfall during spring and summer 2005, Lake Okeechobee received a huge volume of water (3.7 million acre-feet) during WY2006. During this period, the lake also received 80 percent of the TP load for the water year. Lake water levels also increased by nearly 2.3 feet, with the highest levels occurring in November 2005. As a result, water levels were reduced in the lake through discharges into the St. Lucie and Caloosahatchee estuaries, with further releases occurring throughout the water year in order to adhere to the lake's overall water regulation schedule.

TOTAL PHOSPHORUS INFLOW AND LAKE CONCENTRATIONS WITH FIVE-YEAR MOVING AVERAGE



LAKE OKEECHOBEE & ESTUARY RECOVERY OVERVIEW



A FOCUSED INTERAGENCY ACTION PLAN TO:

- IMPROVE WATER QUALITY FOR THE LAKE AND ITS TRIBUTARIES
- EXPAND REGIONAL WATER STORAGE CAPACITY
- FACILITATE LAND ACQUISITION FOR RESTORATION PROJECTS
- ENHANCE THE HEALTH OF THE LAKE AND DOWNSTREAM ESTUARIES

LOER
LAKE OKEECHOBEE & ESTUARY RECOVERY

FLORIDA UNVEILS A NEW INITIATIVE TO FAST-TRACK LAKE AND ESTUARY RESTORATION PROJECTS

Excessive TP loads to Lake Okeechobee originate from the predominantly agricultural and urban activities in its watershed. To address these loads, the 2000 Lake Okeechobee Protection Act mandates that the lake's Total Maximum Daily Load (TMDL) of 140 metric tons (mt) per year, considered necessary to achieve the in-lake target of 40 parts per billion (ppb), be met by 2015. The act also requires that the Lake Okeechobee Protection Plan be reevaluated every three years to determine if further TP load reductions are needed to achieve the TMDL. The next evaluation is scheduled to be completed by January 2007.

Based on the most recent five-year period (WY2002–WY2006), the average TP load to the lake is 714 mt per year. This is over five times higher than the established TMDL. TP loads during WY2006 totaled 795 mt, with almost one-third of this amount originating from the Kissimmee River. The elevated TP loads during WY2006 are mainly attributable to the high inflows to the lake, which were slightly greater than those in WY2005. Overall, in-lake TP concentrations have increased fivefold since the 1970s, with the highest annual averages during the most recent two water years (223 ppb in WY2005 and 214 ppb in WY2006) dramatically increasing the slope of the five-year moving average (see opposite figure, with more details in the Main Report).

TP levels in Lake Okeechobee have not declined over the last decade because external loads have remained high and lake sediment, containing thousands of tons of phosphorus, continues to replenish this nutrient in lake water. The response of the lake to load reductions is a gradual process that is expected to take decades. To aid this process, the 2004 Lake Okeechobee Protection Plan provides a phased, comprehensive approach to reduce TP loading to Lake Okeechobee. It includes the Lake Okeechobee Protection Program, which monitors water quality and ecosystems in the lake and its watershed. More than 55 projects are currently being undertaken by the District and collaborating agencies to reduce phosphorus exports to the lake from the watershed.

To further bolster these comprehensive efforts, the Lake Okeechobee & Estuary Recovery Plan was initiated in October 2005 to benefit the lake and its downstream rivers, the St. Lucie and Caloosahatchee estuaries. The LOER Plan consists of a combination of several capital projects and interagency initiatives being carried out by the District, the Florida Department of Environmental Protection, and other state partners. Under this plan, five CERP construction projects are being fast-tracked to provide additional water storage and water quality and flow improvements (see map on page 31). Additional LOER components include revising the lake operating schedule, establishing TMDLs for lake tributaries, and implementing mandatory agricultural Best Management Practices and innovative land-use planning. Collectively, these efforts are designed to improve water quality, expand water storage, facilitate land acquisition, and enhance lake and estuary health. To support these enormous commitments, a total of $25 million was appropriated to the Lake Okeechobee Protection Program and the LOER Fast-Track projects in FY2006.

WATER MANAGERS ARE REFINING THE LAKE OPERATING SCHEDULE TO BALANCE REGIONAL NEEDS

The Lake Okeechobee operating schedule is continually used by water managers to regulate water releases from the lake to meet many regional objectives. However, releases need to be optimal for the lake environment while minimizing stresses to downstream ecosystems. Localized conditions have been exacerbated by recent above-average rainfall and the passage of four hurricanes during WY2005 and WY2006, which caused rapid increases in the lake stage by more than 4.5 feet in summer 2004 and 2.5 feet in summer 2005. To aid in recovery from the damaging 2004 and 2005 hurricanes and to minimize future impacts, the District and the U.S Army Corps of Engineers are in the process of revising the operating schedule for the lake. This complex effort includes developing release rules that will be more favorable to maintaining its long-term ecological health, while reducing large discharges to downstream ecosystems and minimizing impacts on the regional water supply. Until alternative water storage and other key projects are completed under the CERP, Acceler8, and LOER initiatives, this will be a difficult balancing act because the lake typically receives large quantities of water from its watershed, provides the main source of irrigation water during drought conditions, and has major outlets to estuarine systems that are affected by large releases of fresh water.

ISLAND RESTORATION EFFORTS ARE SET BACK BY RECENT STORM DAMAGE

In recent years, native pond apple *(Anona glabra)* and cypress (*Taxodium* spp.) trees were planted on Torry Island as part of habitat restoration efforts. Nearly all these trees were destroyed during the 2004 and 2005 hurricanes, although planting efforts resumed in 2006 on the island's restored shoreline. Notably, about 100 Okeechobee gourds *(Cucurbita okeechobeensis)* – a federally endangered plant exclusive to Palm Beach and Glades counties – were discovered growing among the temporary debris piles placed along the damaged lakeshore after Hurricane Wilma. In summer 2006, a few of these gourds were successfully transplanted to adjacent spoil islands, where others were found thriving.

As part of ongoing vegetation control efforts, about 8,000 acres of exotic and invasive vegetation were treated along lake marshes during 2006. After Hurricane Wilma passed over the southeastern portion of the lake, the wind shifted to the northwest and most of the cattail (*Typha* spp.) in the southeastern portion of South Bay was uprooted and transported to Torry and Kreamer islands and to the Rim Canal. Following this hurricane damage, large amounts of cattail were also removed from both islands. While many areas are recovering from recent storm damage, ongoing restoration activities continue to enhance the lake's natural areas that provide important habitat for fish and other resident wildlife.

LAKE OKEECHOBEE AND ITS WATERSHED ARE A CENTRAL PART OF SOUTH FLORIDA'S HYDROLOGY AND ENVIRONMENT.

Kissimmee River Restoration and Upper Basin Initiatives

Covering approximately 3,000 square miles, the Kissimmee watershed forms the headwaters of the Kissimmee-Okeechobee-Everglades system. This watershed is comprised of a diverse group of wetland aquatic ecosystems within its Upper Basin – with 19 water bodies and their tributary streams, known as the Kissimmee Chain of Lakes (KCOL) – and Lower Basin, the Kissimmee River. The meandering Kissimmee River was channelized to prevent catastrophic flooding and much of the original floodplain was drained. However, there were pronounced impacts on the ecosystem – drastic declines in wintering waterfowl, wading bird, and fish populations and loss of ecosystem functions. In the 2007 SFER, Volume I, Chapter 11 highlights major projects and key activities during Water Year 2006 (WY2006) associated with the Kissimmee River restoration and Upper Basin initiatives. This chapter also summarizes the mission-critical activities of the South Florida Water Management District for flood control, water supply, water quality, and natural systems in the Kissimmee Upper and Lower basins.

ANOTHER YEAR OF ABOVE-AVERAGE RAINFALL IN THE KISSIMMEE BASIN POSES REGIONAL WATER MANAGEMENT CHALLENGES

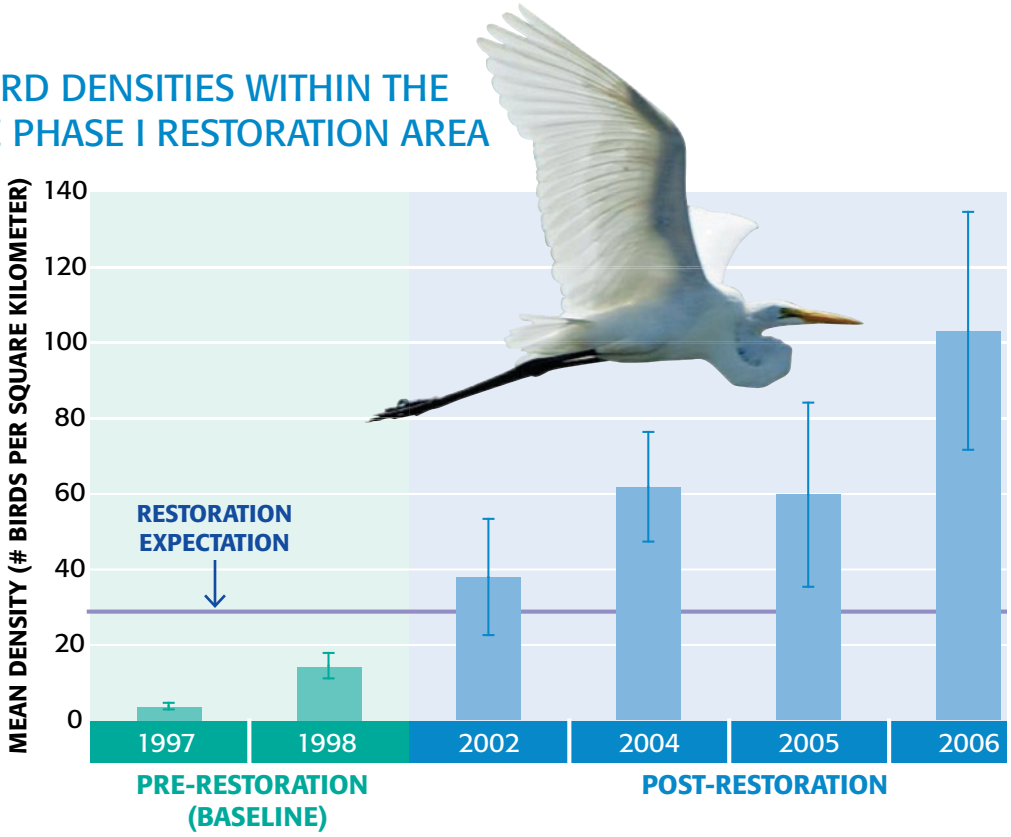
During WY2006, hydrologic conditions in the Kissimmee watershed were quite variable, particularly due to extreme seasonal rainfall conditions. There were high levels of rainfall in June 2005, followed by a relatively dry spring and another surge of intense rainfall in October 2005 from Hurricane Wilma. The basin also experienced another year of above-average rainfall during WY2006, primarily due to Hurricane Wilma. The total rainfall during WY2006 in the Upper Basin (53 inches) and in the Lower Basin (49 inches) exceeded historical annual averages by about 3 to 4 inches, respectively. Notably, the increased rainfall in these basins from Hurricane Wilma contributed to roughly 10 percent of the WY2006 totals, which would have been slightly below average without the hurricane-related impacts. During this water year, discharges from the S-65 water control structure into the Kissimmee River peaked near 9,000 cubic feet per second and, similar to WY2005, were among the highest recorded in nearly 75 years. These discharges had cascading effects on the downstream areas south of the Kissimmee watershed, especially Lake Okeechobee, which is still recovering from the far-reaching impacts of the 2004 and 2005 hurricanes (see Volume I, Chapter 10).

THE NEXT PHASE OF KISSIMMEE BASIN CONSTRUCTION WAS LAUNCHED IN WATER YEAR 2006

The District and the U.S. Army Corps of Engineers are collaborating in the Kissimmee River Restoration and the Kissimmee River Headwaters Revitalization projects. Together, these large-scale restoration projects will (1) reestablish the river-floodplain system's ecological integrity by reconstructing the river's physical form and reestablishing pre-channelization hydrologic characteristics (stage and discharge), (2) provide the water storage and regulation schedule modifications needed to approximate the historical flow characteristics of the Kissimmee River system, and (3) increase the quantity and quality of shoreline habitat in lakes Kissimmee, Hatchineha, Tiger, and Cypress for the benefit of fish and wildlife.

The first of four major phases of canal backfilling was completed in early 2001, resulting in 15 continuous miles of reconnected river channel and reclaiming almost 6,000 acres of floodplain habitat. Initiated in June 2006, the second phase of construction will backfill 1.9 miles of C-38 canal, remove

WADING BIRD DENSITIES WITHIN THE KISSIMMEE PHASE I RESTORATION AREA



three weirs, and excavate some portions of river channel. It is projected that all restoration-related construction will be completed by 2012 and evaluation of restoration success will continue through 2017. In total, this project will restore ecological integrity to approximately 20 square miles of river/floodplain habitat and 44 continuous miles of meandering river channel.

KISSIMMEE RIVER RESTORATION PRODUCES PROMISING RESULTS

A key element of the Kissimmee River Restoration is a comprehensive, multi-phased evaluation program for tracking ecological responses to restoration. To address the goal of ecological integrity, the evaluation program has a broad scope encompassing hydrology, water quality, and major biological communities such as plants, invertebrates, fish, and birds. Prior to fully implementing restoration efforts, monitoring has been conducted for all these components to establish a baseline for evaluating future changes. A set of restoration expectations also has been developed to predict changes anticipated to result from restoration. Although restoration efforts only have been under way for a few years and will continue through 2012, many positive responses to the first phase are already being observed. These responses include increases in dissolved oxygen levels, reductions in accumulated sediments, and increased populations of bass and sunfishes in river channels, as well as increased use of the river and floodplain by various birds. Remarkably, the highest densities of both waterfowl and long-legged wading birds, such as white ibis *(Eudocimus albus)*, on the restored floodplain were recorded in 2006, almost two times those observed in 2005 (see figure above). Since completion of Phase I construction in 2001, wading bird densities have exceeded the projected restoration expectation in this area.

LONG-TERM LAKE MANAGEMENT PLAN WILL AUGMENT COORDINATED RESTORATION EFFORTS IN THE UPPER BASIN

Initiated in April 2003, the Kissimmee Chain of Lakes Long-Term Management Plan is being prepared by the District and other partnering agencies to improve and sustain the ecosystem health of the lakes, while balancing impacts between upstream and downstream ecosystems. This plan is currently under development and will address five goals: hydrologic management, habitat preservation and enhancement, aquatic plant management, water quality improvement, and recreational and public use. It is intended to complement existing local government and watershed projects and initiatives, such as the Kissimmee Basin Water Supply Plan, the Lake Okeechobee Protection Plan, Total Maximum Daily Loads, and regional land management activities. During WY2006, an ecosystem model for the KCOL was completed by the District and its partners. This model will be used as a key tool for conceptualizing relationships among ecosystem components and developing associated performance measures for the lakes. The KCOL Long-Term Management Plan is scheduled to be released in 2007.

Management and Restoration of Coastal Ecosystems

One of the primary goals of the South Florida Water Management District is to manage freshwater discharges to South Florida's estuaries in a way that preserves, protects and, where possible, restores these essential resources. Coastal management is challenging because these are complex ecosystems, and there are many continuing and widespread threats to coastal areas. Three major issues – altered delivery of fresh water, continued habitat loss, and declining water quality – are impacting South Florida's coastal ecosystems. The cumulative impact of these stresses has resulted in altered ecosystem structure and impaired function throughout the region. The District is working with many agencies and organizations to produce a broad range of data and tools that will improve management of freshwater input to coastal estuaries. The agency also has organized resources to increase its focus on coastal science, as part of continuing efforts to support Comprehensive Everglades Restoration Plan (CERP) activities and other critical needs, including development of Minimum Flows and Levels (MFLs), Initial Water Reservations, Pollutant Load Reduction Goals, and Total Maximum Daily Loads. In the 2007 SFER – Volume I, Chapter 12 highlights aspects of this progress and related collaborative management and restoration efforts.

COASTAL RESOURCES ARE VITAL TO THE HEALTH OF SOUTH FLORIDA'S ENVIRONMENT

Coastal resources within the District's boundaries include several major watershed-estuarine systems: Southern Indian River Lagoon including the St. Lucie River and Estuary, Loxahatchee River and Estuary, Lake Worth Lagoon, Caloosahatchee River and Estuary, Southern Charlotte Harbor, Estero Bay, Naples Bay, Biscayne Bay, and Florida Bay and the Florida Keys. Given the breadth of the issues, variety of legal mandates, and oversight requirements of state and federal agencies, each ecosystem is at a different stage of science, management, and restoration. Each system possesses unique characteristics, and one of the biggest challenges facing the District and its partners is to identify common hydrological and ecological principles that can be used to manage these systems on a regional scale. Because the depth of agency understanding varies across systems, identifying these principals will take time and commitment to monitoring, research, and funding.

INFORMATION GATHERING IS A FUNDAMENTAL PART OF ESTUARY RESTORATION

Monitoring biological resources, measuring inflow volumes, and assessing water quality within South Florida's estuaries provide essential information for effective management and restoration. Much of the science has focused on analyzing the effects of freshwater discharges on salinity and, in turn, the effects of altered salinity on seagrasses and oyster beds and the organisms that utilize these critical habitats. The District continues to collaborate with its partnering agencies to better understand the relationships between water management and estuarine habitats.

Continued progress on several fronts was made during Water Year 2006 (WY2006). The District is continuing to develop and administer cooperative agreements with a variety of agencies and stakeholders to fund a significant number of stormwater improvement and habitat restoration projects in priority water bodies. The agency also provides consistent monitoring of freshwater discharge

THE LOXAHATCHEE RIVER WINDS THROUGH A CANOPY OF CENTURIES-OLD, NATIVE CYPRESS TREES.

and salinity response in estuaries, lagoons, and bays. Water quality continues to be a major concern, and the District collaborates continually with the Florida Department of Environmental Protection to address regional water quality concerns. Ongoing investigations are being conducted to quantify the controls on coastal water quality, particularly as quality is affected by freshwater inflow and its management. There has also been continued support in establishing technical criteria for the development of MFLs and Initial Water Reservations for several regional water bodies, including the Northwest Fork of the Loxahatchee River, Biscayne Bay, Caloosahatchee River, and St. Lucie River and Estuary (see Volume II, Chapter 3). Key highlights of the many efforts and activities for each ecosystem during WY2006 are presented below.

WATER YEAR 2006 HIGHLIGHTS OF MANAGEMENT AND RESTORATION ACTIVITIES FOR COASTAL ECOSYSTEMS

Southern Indian River Lagoon and St. Lucie River and Estuary

- With the support of RECOVER and other partners, initiated the Ten-Mile Creek Adaptive Management Project to optimize operation of the newly constructed facility
- Continued monitoring of freshwater discharges, salinity, and assessment of the health of oysters and seagrasses in the St. Lucie Estuary and Indian River Lagoon

Loxahatchee River and Estuary

- Received Governing Board approval for the Restoration Plan for the Northwest Fork, which establishes restoration targets for water reservations and CERP projects in the watershed and provides the basis for operational protocols for water delivery structures in the watershed
- Prepared a peer-reviewed report describing vegetation data being used for environmental analyses to support management of the river (see Volume I, Appendix 12-1)

Lake Worth Lagoon

- Initiated a multiagency pilot project for sediment removal in the C-51 canal, in support of the CERP North Palm Beach County – Part 1 Project
- Continued collaboration with local governments to improve stormwater management

Caloosahatchee River and Estuary and Southern Charlotte Harbor

- Initiated a two-year project to examine nutrient limitation of phytoplankton growth in the Caloosahatchee Estuary
- Provided technical support documents for developing Initial Water Reservations for the Caloosahatchee River
- Completed the development and quantification of habitat types used to identify the Tentatively Selected Plan for the CERP C-43 Basin Storage Reservoir Project

Estero Bay

- Expanded the District's three-dimensional hydrodynamic/salinity model to include Estero Bay in support of the CERP C-43 Basin Storage Reservoir Project and Southwest Florida Feasibility Study
- Initiated work on a shoreline vegetation survey to locate and monitor transition from freshwater to salt-tolerant vegetation in major tributaries of the bay
- Continued collaboration with local governments to improve stormwater management

Naples Bay

- With the Florida Department of Environmental Protection, initiated development of the Surface Water Improvement and Management Plan for Naples Bay
- Continued collaboration with local governments to improve stormwater management through flow-way restoration and facility enhancement

Biscayne Bay

- Initiated the development of a water quality database for Biscayne Bay
- Executed a funding agreement with the U.S. Geological Survey for modeling surface water and groundwater flows to Biscayne Bay to identify causes of recurring hypersalinity events in nearshore regions of the bay

Florida Bay and Florida Keys

- Performed analyses using hydrologic and ecological models and completed a peer-reviewed report to provide the technical basis for the Florida Bay MFL rule
- Using an adaptive management process, collaborated with the National Audubon Society to increase water delivery into the southern Everglades during early winter to enhance productivity and roseate spoonbill *(Ajaja ajaja)* nesting success
- As part of a multiagency coordinated effort, assessed and reported on an extensive algal bloom in eastern Florida Bay and southern Biscayne Bay, including the long-term nature and potential causes of the bloom

Everglades Forever Act Annual Financial Report

Each year, pursuant to the 1997 Everglades Oversight Act, the South Florida Water Management District is required to provide detailed financial information on Everglades restoration. The Everglades Forever Act (EFA) also requires the District to account for all monies used to fund the Everglades Construction Project (ECP) and the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area (Long-Term Plan) and to provide a comparison annually of actual versus projected revenues and a projection of costs and revenues over the successive five-year period. These annual financial reports comprise the 2007 SFER – Volume I, Chapter 13.

DEDICATED FUNDS ARE CENTRAL TO EVERGLADES AND FLORIDA BAY PROTECTION AND RESTORATION

The 1994 ECP, a major element of the Everglades Restoration Program and the 1994 Everglades Forever Act, is one of the nation's largest environmental restoration projects, with a projected cost of $836.2 million over 20 years. The 2003 state legislative session amended the 1994 EFA to include the Long-Term Plan as the strategy for achieving the Everglades long-term water quality goals. The amended EFA also expanded the use of the 1/10 mill *ad valorem* tax to include the initial phase of the Long-Term Plan, including STA enhancements, research, and operation and maintenance.

The 2003 Long-Term Plan continues and expands the goals and objectives of the 1994 ECP and is a critical component of the overall effort to restore and protect the Everglades. Currently, the Long-Term Plan's initial 13-year phase has a projected total cost of approximately $1 billion. This revised estimate reflects the approved revisions to the Long-Term Plan through the end of Fiscal Year 2006 (FY2006). Further information on the STAs and the Long-Term Plan can be found in Volume I, Chapters 5 and 8, respectively.

The Florida Bay Restoration Program has a projected total cost of $367 million. In 1996, the District and the Florida Department of Transportation received federal authorization to redirect the use of Alligator Alley tolls for both restoration programs. A total of $35.1 million – split equally between both restoration programs – has been received since 1997. Further information on Florida Bay can be found in Volume I, Chapter 12.

EVERGLADES FUNDING SOURCES RAISE OVER $72 MILLION IN FISCAL YEAR 2006

The District, other agencies, and the agricultural community share the cost of implementing the ECP, the Long-Term Plan, and other EFA-related activities. Funding sources designated by the EFA for the ECP, the Long-Term Plan, and other EFA-related activities include the 1/10 mill *ad valorem* tax, agricultural privilege taxes, state land funds, federal funds, excess revenues from Alligator Alley tolls, other environmental mitigation funds, and any additional funds that become available. Since 1994, net revenues received were $686.1 million. In FY2006, net revenues totaled $72.5 million (unaudited), of which $69.3 million came from *ad valorem* and agricultural privilege tax collections, and the remaining $3.2 million was from the other above-listed sources.

Since the EFA's enactment, the District has dedicated its maximum Lake Okeechobee Basin 1/10 mill *ad valorem* taxing authority to the ECP, the Long-Term Plan, and other EFA-related activities. Through FY2006, $432.5 million net *ad valorem* tax revenue was received for Everglades restoration, of which $58.1 million (unaudited) was

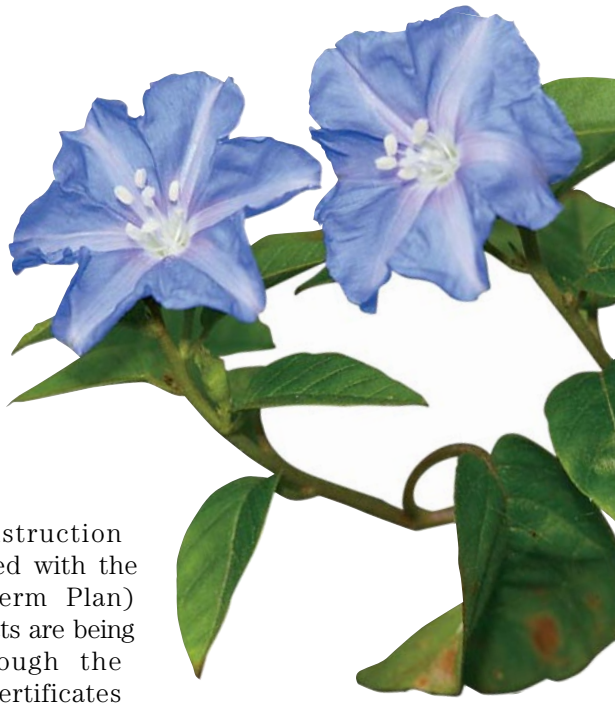
DEDICATED FUNDS CONTINUE SUPPORTING LONG-TERM PLAN ACTIVITIES, SUCH AS STA-6 EXPANSION, TO EXPEDITE EVERGLADES RESTORATION EFFORTS.

collected in FY2006. The 1/10 mill *ad valorem* tax is projected to generate $73.7 million in FY2007.

To fund the first phase of the Everglades Restoration Program including implementation of the Long-Term Plan, the EFA imposes an annual tax on agriculture within the Everglades Agricultural Area (EAA) and C-139 basins. Net EAA agricultural privilege taxes collected from FY1995–FY2006 were $141.9 million. During this period, the net C-139 basin agricultural privilege taxes totaled $6.5 million. Net agricultural privilege taxes received in FY2006 were $11.2 million (unaudited) and are projected to be $11.7 million in FY2007.

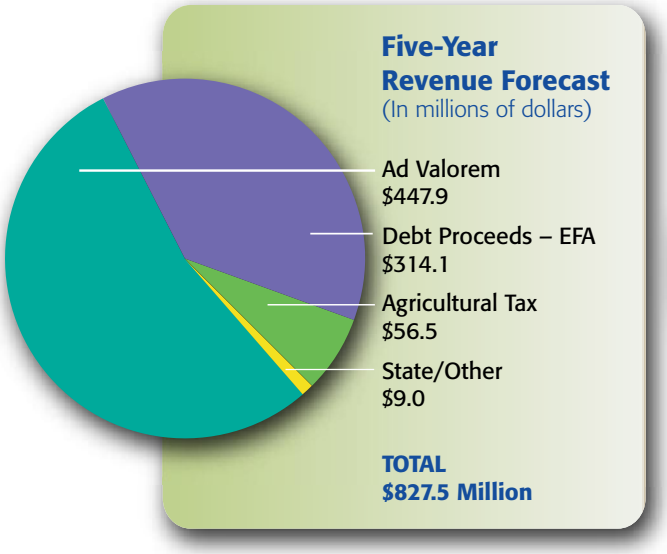
NEWLY ISSUED BONDS RAISE OVER $69 MILLION FOR ACCELERATED LONG-TERM PROJECTS

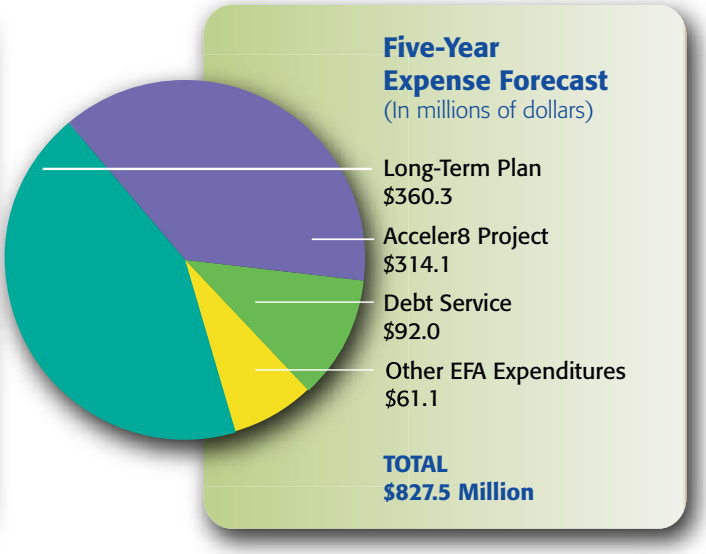
As shown in the pie charts below, the five-year forecast (FY2007–FY2011) of revenues by source for the EFA Program totals $827.5 million. This represents an increase of $276.4 million since last year's estimates and is primarily associated with the addition of three Acceler8 projects – Acme Basin B Discharge and C-9 and C-11 Impoundments projects – to the Long-Term Plan. When combined with future Long-Term Plan projects and the 1994 ECP, the total current estimated cost of implementing the EFA Program through FY2016 is $2.4 billion.



The construction costs associated with the EFA (Long-Term Plan) Acceler8 projects are being financed through the issuance of Certificates of Participation. The newly issued revenue bonds were offered nationally in the primary stock market in October 2006 and successfully raised $572 million in funds, of which $69.1 million has been designated for EFA Acceler8 projects. Future bonds issuance will have additional funds earmarked for EFA projects. Notably, the District's Certificates of Participation are the first bonds to be issued for a natural resources project in the United States and reaffirm the state's commitment to restoring the Everglades

FIVE-YEAR EVERGLADES FOREVER ACT PROGRAM ESTIMATES (FISCAL YEARS 2007–2011)





DISTRICT ANNUAL PLANS AND REPORTS

VOLUME II

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Introduction to the *2007 South Florida Environmental Report – Volume II*

Chapter 1 of the *2007 South Florida Environmental Report – Volume II* (SFER) provides an overview of the reporting objectives, as well as a basic understanding of the governmental and legal basis for this volume. It has been prepared in accordance with Chapter 2005-36, Laws of Florida. This legislation calls for all five of Florida's water management districts to consolidate annual plans and reports submitted to Florida's governor and legislature.

EIGHT REPORTS ARE NOW COMBINED INTO VOLUME II

Volume II incorporates several plans and reports that are required annually by each of Florida's five water management districts. The agencies have consolidated documents to improve reporting efficiency, quality, and accessibility. This unified reporting facilitates communication, making information more accessible to policymakers, stakeholders, and the public. The chapter sequence and topics in Volume II are consistent with the corresponding reports of the other districts. The following eight reports – including the newly added chapter on Land Stewardship – have been consolidated into the correlating chapters in Volume II:

- Annual Work Plan Report
- Minimum Flows and Levels Priority List and Schedule
- Five-Year Capital Improvements Plan
- Water Supply
- Florida Forever Work Plan, Annual Update
- Mitigation Donation Annual Report
- Land Stewardship Annual Report

The design of this single submission fulfills mandated reporting requirements, facilitates comparisons to the earlier separate reports, and enables statewide evaluations with parallel chapters in the consolidated reports of the other water management districts. The project-related information in this volume is described on a fiscal-year basis (from October 1 through September 30), representing the 12-month period for which the District's business cycle – the Strategic Plan, Annual Work Plan, Annual Budget, and Reporting and Evaluation – is developed and implemented.

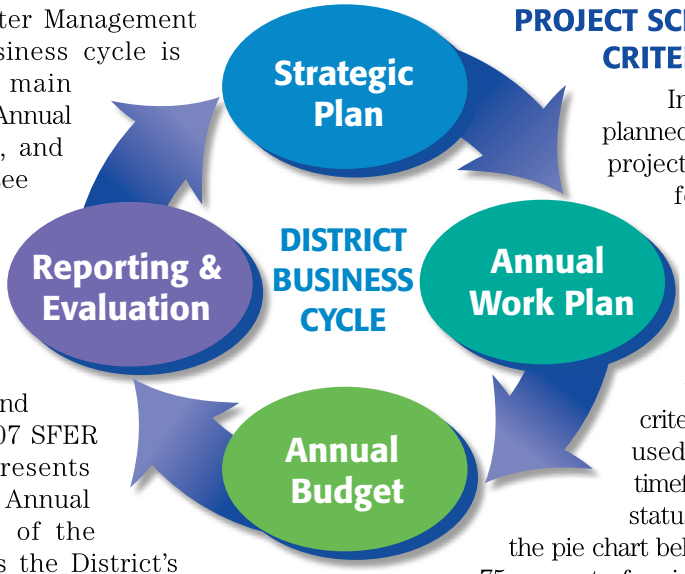
PROJECT DATABASE CONTINUES TO PROVIDE EFFICIENCY

For its third year, the Consolidated Project Report Database has been updated and includes descriptions of District projects (activities with start and end dates) and processes (ongoing activities) that are referenced throughout the *2007 South Florida Environmental Report*. This database is designed to uniformly describe projects and processes linked to report-related planning efforts, while providing these descriptions only once rather than repeating them in several reports. Storing project and process information in a single location enables rapid data sorting, searches, and retrieval for efficient information and project management. Future SFERs will continue to provide updated information. Further details on the database are provided in the appendices to this chapter.

WATER QUALITY, FLOOD CONTROL, NATURAL SYSTEMS, AND WATER SUPPLY RESPONSIBILITIES GUIDE THE DISTRICT IN SETTING ITS STRATEGIC PRIORITIES.

Fiscal Year 2006 Annual Work Plan Report

The South Florida Water Management District's annual business cycle is comprised of four main elements: the Strategic Plan, Annual Work Plan, Annual Budget, and Reporting and Evaluation (see diagram). In this process, Work Plan Reports on the agency's project and financial status are prepared quarterly, and the 4th Quarter Report represents the status at the end of the fiscal year. In the 2007 SFER – Volume II, Chapter 2 presents the year-end report of the Annual Work Plan, the final step of the annual process, and details the District's major project activities during Fiscal Year 2006 (FY2006). This chapter reports on the status of planned project schedules, financial summaries for the agency's 11 programs, and the success indicators for each of these programs, as outlined in the Strategic Plan.

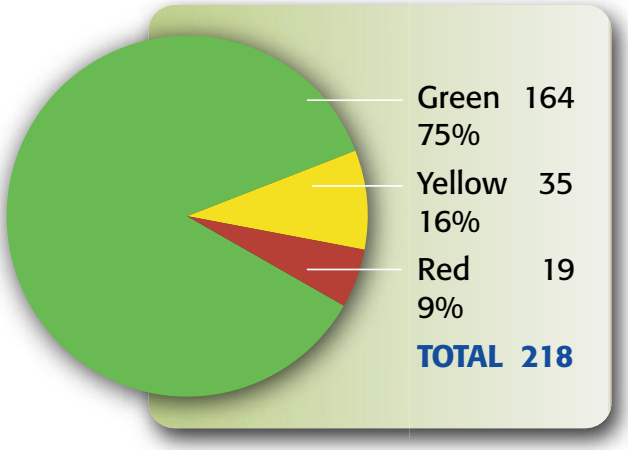


PROJECT SCHEDULE CRITERIA TIGHTENED

In FY2006, adherence to the planned schedules for major District projects was categorized using the following criteria: "green" - within 60 days of schedule; "yellow" - within 120 days of schedule; or "red" - behind schedule by more than 120 days. It is important to note that these reporting criteria were tightened from those used in FY2005, as the specific timeframes used to measure project status were reduced. As shown in the pie chart below, the District was green for 75 percent of major projects using the updated criteria. In keeping with raising performance levels, the reporting criteria will be lowered further in FY2007.

FISCAL YEAR 2006 STATUS OF MAJOR DISTRICT PROJECTS

(OCTOBER 1, 2005–SEPTEMBER 30, 2006)



FINANCIAL RESULTS IMPROVE IN FISCAL YEAR 2006

This year's Annual Work Plan Report tracked the status of revenues collected and the expenditure rates. During FY2006, the District collected 96 percent of budgeted revenue – up from 81 percent in FY2005 – including over 99 percent of budgeted taxes and 168 percent of budgeted investment earnings.

Expenditure rates were tracked as an indicator of overall program activity. In FY2006, the District spent 76 percent of the total budget of over $1 billion (excluding personnel and reserves). This represents an increase of 13 percentage points over the 63 percent historical rate from the last five years (FY2001–FY2005) and 5 percentage points over FY2005. Both discretionary and restricted budget expenditure rates improved over the historical and FY2005 rates. The Modeling & Scientific Support Program was newly added in FY2006 and did not have previous expenditure rates. Of the remaining 10 programs, nine achieved overall expenditure rates higher than their five-year historical rates, and six had higher rates than in FY2005.

2007 Minimum Flows and Levels Priority List and Schedule

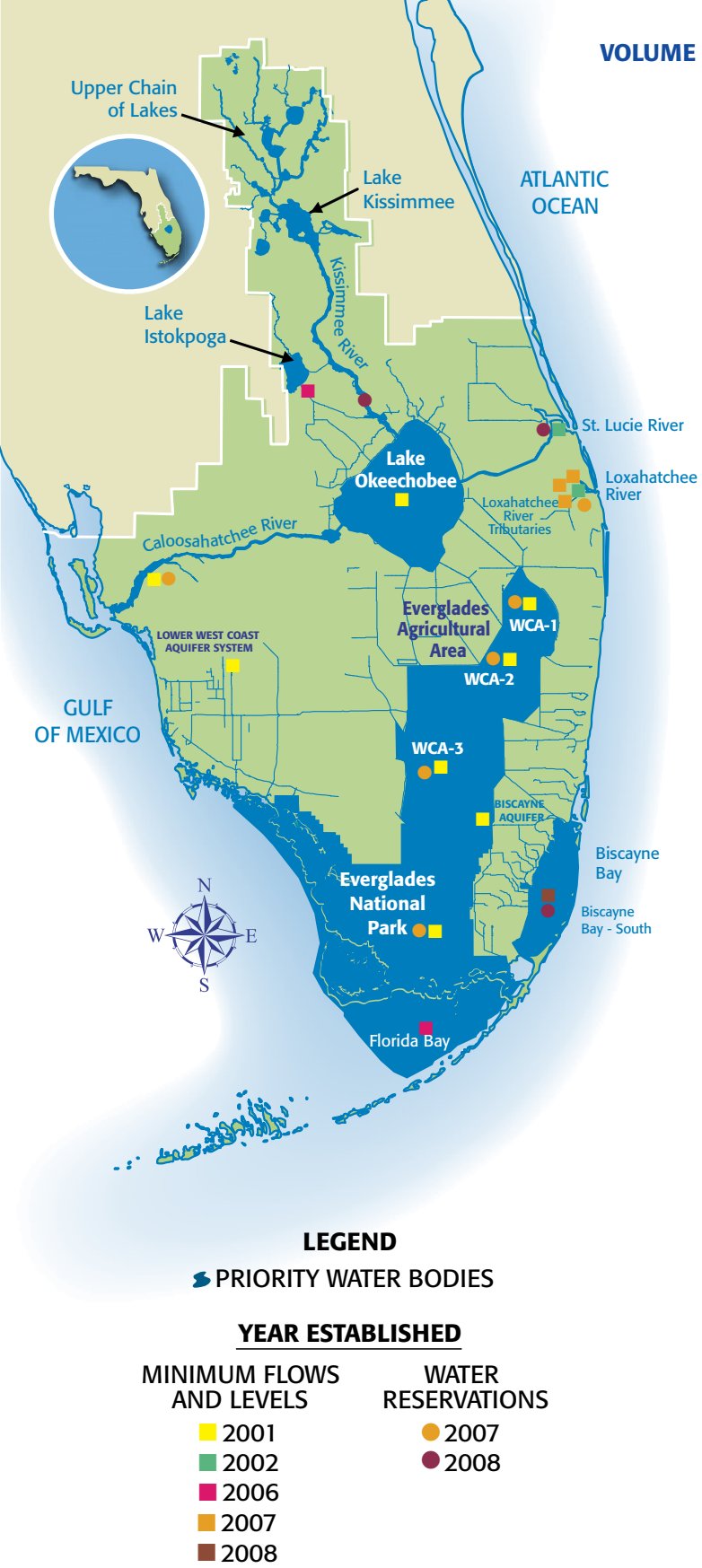
Florida law requires that all water management districts establish Minimum Flows and Levels (MFLs) for surface waters and aquifers within their jurisdiction. The minimum flow is defined as the "...limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area." The state also mandates the establishment of Water Reservations, defined as surface waters set aside in a certain location, time, or quantity and designated for a specific use that may be required for the protection of fish and wildlife or public health and safety. In the 2007 SFER – Volume II, Chapter 3 describes the general process and legal requirements for development of MFL criteria, the linkage between MFLs and other South Florida Water Management District planning documents, and the newly adopted 2007 MFL Priority Water Body List and Schedule including changes made since 2006. The 2007 Priority Water Body List and Schedule for the development of Initial Water Reservations is also provided in this chapter.

MINIMUM FLOWS AND LEVELS WERE ADOPTED FOR LAKE ISTOKPOGA AND FLORIDA BAY IN 2006

The District must establish MFLs for waters of the state that are outlined on the MFL Priority Water Body List and Schedule. Each year, the list is updated by the District, with consideration of additional information and comments from the Florida Department of Environmental Protection. The District conducts research, analysis, and interpretation of scientific data necessary to develop technical criteria for each listed water body (see Volume I, Chapter 12). These technical criteria are used to determine if low water levels or flows may cause significant harm to regional water resources. They are often subject to scientific peer review to validate their technical basis. Once the MFL criteria are approved by the District's Governing Board, rule development and rulemaking processes, including public workshops and participation, are initiated to implement the criteria. The final MFL criteria are established once the final rule is approved and adopted by the state.

As of the end of 2006, MFL criteria have been adopted for 12 water bodies, including eight water bodies in 2001, two in 2002, and two in 2006. As depicted on the opposite map, these water bodies include Lake Okeechobee, four areas of the Everglades, the northern portion of the Biscayne aquifer, Lower West Coast deeper aquifers, Caloosahatchee River, St. Lucie River and Estuary, the Northwest Fork of the Loxahatchee River, Lake Istokpoga, and Florida Bay. MFLs for the Northwest Fork of the Loxahatchee River in 2007 and Biscayne Bay – South are scheduled for development in 2008.

MINIMUM FLOW AND LEVEL CRITERIA WERE ADOPTED IN 2006 FOR LAKE ISTOKPOGA, A KEY REGIONAL WATER SOURCE TO THE KISSIMMEE AND LAKE OKEECHOBEE WATERSHEDS.



LEGEND

PRIORITY WATER BODIES

YEAR ESTABLISHED

MINIMUM FLOWS AND LEVELS	WATER RESERVATIONS
2001	2007
2002	2008
2006	
2007	
2008	

WATER RESERVATIONS WILL PROVIDE A HIGHER STANDARD FOR PROTECTING FISH AND WILDLIFE

The District recently began efforts to develop Initial Water Reservations for natural areas across South Florida. In 2006, the District developed the 2007 Initial Water Reservation Priority Water Body List and Schedule – the agency's first proposed list for establishing water reservations for regional surface waters. Similar to MFLs, the list was developed by the District with the support of the Florida Department of Environmental Protection. Specific technical criteria for each water body will be established and subject to scientific peer review and District Governing Board approval, followed by rule development and rulemaking processes for final adoption.

Initial Water Reservations will be established by the District based on the evaluation of existing water availability and consideration of future water needed to achieve regional ecosystem restoration. As depicted on the map, Initial Water Reservations will be developed in 2007 for three areas: the Northwest Fork of the Loxahatchee River, the Caloosahatchee River, and the Everglades, including the Water Conservation Areas and Everglades National Park. Initial Water Reservations for the Kissimmee River, the St. Lucie River and Estuary, and Biscayne Bay – South are scheduled for development in 2008.

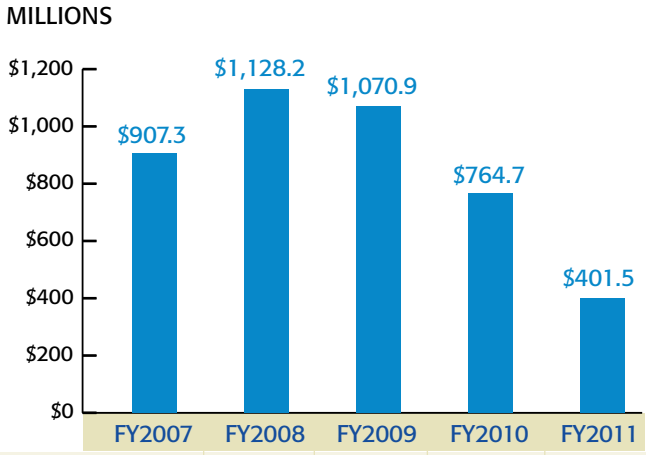
While MFL criteria are used to protect water resources that are presently or likely to experience harm, it is expected that reserved surface waters will provide additional protection for fish and wildlife resources in South Florida. Reservations may also provide a more appropriate basis for restricting consumptive use water allocations than is provided by the MFLs, but it will take some time and experience with the use of this tool to determine its effectiveness. Some areas may require development of both MFL criteria and water reservations to ensure adequate resource protection.

PRIORITY WATER BODIES

Five-Year Capital Improvements Plan

The Five-Year Capital Improvements Plan (CIP) is a multiyear budget plan that includes estimated capital project expenditures, anticipated revenues, and project descriptions for the five-year period from Fiscal Years 2007 through 2011 (FY2007–FY2011). The CIP reflects the South Florida Water Management District's priorities as outlined in its Strategic Plan and Annual Work Plan, provides a formal mechanism for decision making, and serves as a financial management tool and reporting document. It supports the agency's mission by efficiently directing resources to District programs based on strategic priorities. Capital improvement projects include improvement/refurbishment, construction, and land acquisition for seven of the 11 District programs highlighted in the table below.

FIVE-YEAR ANNUAL CAPITAL BUDGET ESTIMATES (FISCAL YEARS 2007–2011)



	FY2007	FY2008	FY2009	FY2010	FY2011
Lake Okeechobee	$54.3	$118.4	$85.4	$44.3	$3.2
Kissimmee Watershed	$16.7	$1.5	$6.3	$0	$0
Land Stewardship	$14.9	$14.6	$14.6	$13.1	$12.8
Mission Support	$2.0	$7.3	$0.6	$0.3	$0.4
Operations & Maintenance	$68.7	$73.5	$88.2	$89.5	$97.8
District Everglades	$174.1	$180.0	$197.8	$170.2	$130.4
CERP	$576.6	$732.9	$678.0	$447.3	$156.9
Total	$907.3	$1,128.2	$1,070.9	$764.7	$401.5

In the 2007 SFER – Volume II, Chapter 4 updates information presented in last year's CIP. This chapter provides the five-year financial schedule of revenues and expenditures for those capital projects approved for FY2007, along with the District's four-year capital project forecast. It also includes a description for each of the capital projects found in the Consolidated Project Report Database (see Volume II, Appendix 1-3).

PLAN FUNDING IS ALIGNED WITH STRATEGIC PRIORITIES

As reflected in the table, the annual capital budget for the seven District programs presented in the CIP are consistent with the strategic priorities established by the District's Governing Board. These priorities are to (1) expedite Everglades restoration through completion of Acceler8 projects, (2) achieve Everglades water quality standards, (3) integrate Kissimmee Watershed management strategies and river restoration, (4) restore the health of Lake Okeechobee, and (5) refurbish the regional water management system. As emphasized in the table, District Everglades and Comprehensive Everglades Restoration Plan (CERP) program funding receive the major share of the District's financial support to align with priorities.

PLAN FORECASTS $4.3 BILLION TO BE SPENT OVER THE NEXT FIVE YEARS

The five-year (FY2007–FY2011) CIP represents $4.3 billion in District-related projects. As reflected in the chart, the total FY2007 budgeted capital expenditures are $907.3 million, which represents nearly 65 percent of the total District FY2007 budget of $1.4 billion and 21 percent of the total five-year CIP projected budget. The FY2007 capital budget is $230.8 million greater than last year's $676.5 million, largely related to the implementation of the Lake Okeechobee & Estuary Recovery (LOER) Plan fast-track projects and CERP/District Everglades Acceler8 projects. The LOER fast-track capital projects will expedite water quality improvement in Lake Okeechobee and adjoining estuaries, and Acceler8 will expedite ecosystem revitalization by stepping up the pace of design and construction on eight major Everglades restoration projects.

Water Supply

Each year, water management districts are required to prepare a Five-Year Water Resource Development Work Program describing the agency's implementation strategy for the water resource development component of each approved regional water supply plan. Water management districts are also required to submit an annual report to the Florida legislature and governor on Alternative Water Supply (AWS) funding. Both reports address Florida's 2005 growth management legislation, requiring regional water supply plans to specifically identify AWS projects in addition to water supply development sources. Together, these reports comprise the 2007 SFER – Volume II, Chapter 5 and fulfill various reporting requirements on planning, projects, and funding related to water supply.

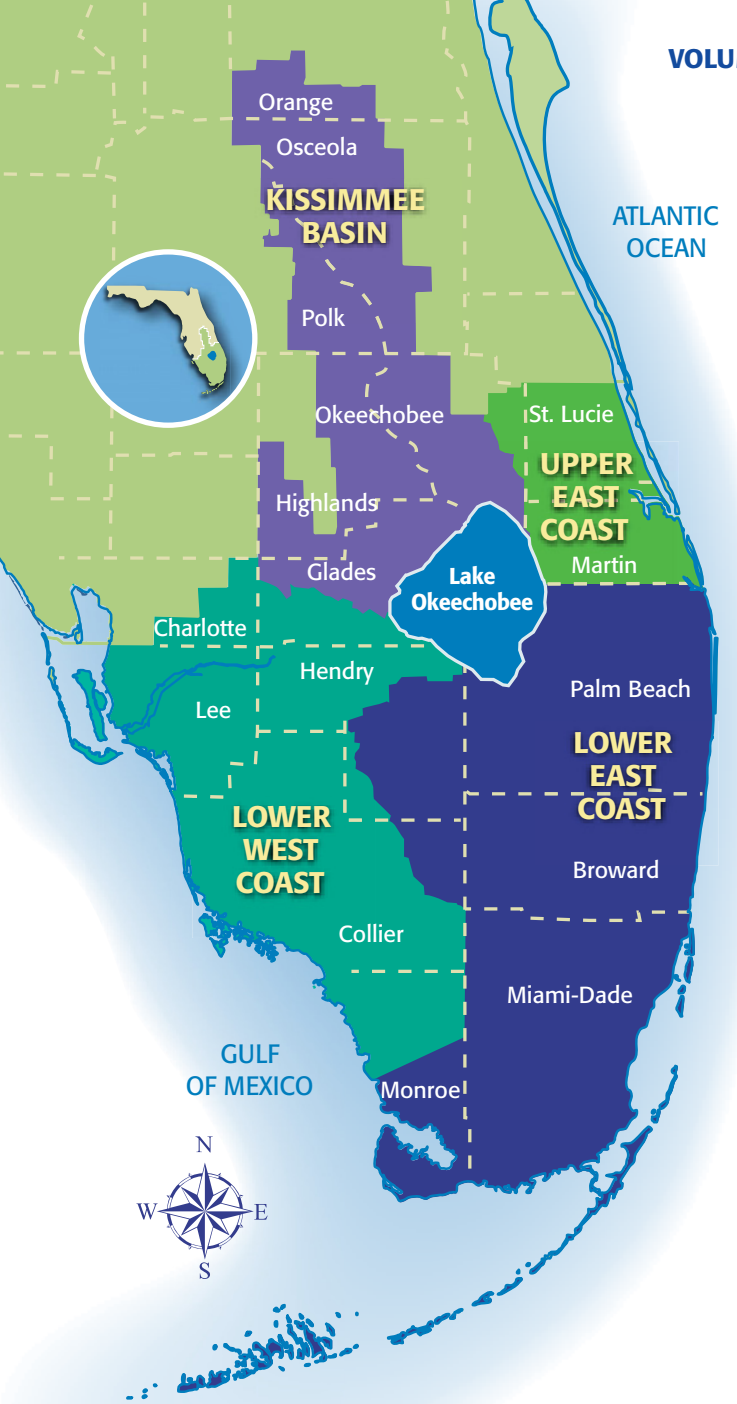
WITHIN THE DISTRICT, MORE THAN 200 MILLION GALLONS OF RECLAIMED WATER IS USED DAILY TO IRRIGATE PARKS, GOLF COURSES, AND OTHER LANDSCAPES.

WATER SUPPLY PLANS ARE BEING UPDATED TO MEET CHANGING REGIONAL WATER NEEDS

Regional water supply planning is a key strategic priority of the South Florida Water Management District. The purpose of water supply planning is to develop strategies to meet future water demands of urban and agricultural uses, while meeting the environmental needs within the District. As an important step in the planning process, the Five-Year Water Resource Development Work Program provides an update on the water resource development component of the District's regional water supply plans. Regional water supply plans encompass a 20-year planning horizon and are updated every five years for each of the agency's four planning regions: Upper East Coast, Kissimmee Basin, Lower West Coast, and Lower East Coast (see map on next page).

The first water supply plan for the Upper East Coast was completed in 1998. In 2000, a regional water supply plan was developed for each of the District's other three planning areas – the Kissimmee Basin, Lower West Coast, and Lower East Coast. Five-year updates to these plans have been completed or are currently under way. The Upper East Coast Water Supply Plan Update was completed in 2004 and amended in 2006. The 2005–2006 Lower West Coast Water Supply Plan and the 2005–2006 Kissimmee Basin Water Supply updates have been completed. The update to the Lower East Coast Water Supply Plan is in progress and will be completed in early 2007. The updated plans identify water resource development and water supply development projects that are expected to meet the needs of all reasonable beneficial uses by 2025 during a 1-in-10 year drought event, while sustaining the region's water resources and related natural systems.

The District has allocated $5.9 million in Fiscal Year 2007 (FY2007) for water resource development projects and anticipates spending $21.8 million on these projects over the next five-year period (FY2007–FY2011). These allocations include $1.4 million in FY2007 and $6.3 million from FY2007–FY2011 to implement the Comprehensive Water Conservation Program, which carries out the recommendations of Florida's Water Conservation Initiative to improve efficiency in all water use categories. These projections do not include Comprehensive Everglades



DISTRICT WATER SUPPLY PLANNING AREAS

Restoration Plan projects and projects not identified in the 2005–2006 Water Supply Plan Updates and Upper East Coast Plan Amendment.

WATER RESOURCE DEVELOPMENT PROJECTS SUPPORT AND ENHANCE USE OF ALTERNATIVE WATER SUPPLIES

The water resource development projects described in this report support development of future water supply projects that, when developed, will make water available. Therefore, the water resource development projects referenced may not reflect water to be made available in the current reporting period. Examples of water resource development projects that will enable future water supply development include groundwater monitoring, exploratory drilling and testing, feasibility studies, and regional Aquifer Storage and Recovery development.

ALTERNATIVE WATER SUPPLIES ARE VITAL TO SATISFYING FUTURE REGIONAL DEMANDS

Through the passage of Senate Bill 444, the Water Protection and Sustainability Program was enacted by the Florida legislature in 2005. This program provides significant annually recurring state funding for the construction of AWS projects. These projects are defined using nontraditional water supply sources, such as reclaimed water, stormwater, saltwater and brackish water, surface water captured predominately during wet-weather flows, and sources made available through additional storage capacity.

To expedite the development of alternative water supplies, the state appropriated $100 million for all water management districts in the program's first year, with $30 million designated for the South Florida Water Management District. The District's AWS Funding Program was a success – a total of 71 funded projects were completed, making available 133 million gallons per day of water in FY2006. More than 300 million gallons per day of water will be made available when all phases of these projects are completed.

The District received 73 applications during the FY2007 solicitation for funding under the Alternative Water Supply Program, and 62 projects were selected for funding including seven projects funded separately by the Big Cypress Basin. These projects have a time frame for completion of one year and are expected to make available 65 million gallons per day of new water in FY2007 and 184 million gallons per day of water after all project phases are completed.

Florida Forever Work Plan, 2007 Annual Update

The 2007 SFER – Volume II, Chapter 6 presents the 2007 annual update of the Florida Forever Work Plan, listing projects eligible for funding under the Florida Forever Act and reporting on the South Florida Water Management District's progress and changes since the last update in the 2006 SFER. This update focuses on land acquisition requirements – acres to be acquired and costs – over the next five fiscal years (FY2007–FY2011). It also provides a summary of land acquisition activity during FY2006; along with a status of land acquisitions for eligible projects, highlighting the number of acres acquired and to be acquired as of the end of FY2006. Additionally, details on the District's land management activities are presented in Volume II, Chapter 8.

The 2007 update identifies a total of 53 eligible Comprehensive Everglades Restoration Plan (CERP), Save Our Rivers, and other projects. This includes the Herbert Hoover Dike Rehabilitation and Lake Okeechobee & Estuary Recovery projects that were added to the list of eligible Florida Forever Program projects. Water quality and water supply initiatives, plans, and studies were removed from the list, as alternate funding for these projects has become available under the Water Protection and Sustainability Program (see Volume II, Chapter 5).

FISCAL YEAR 2007 FUNDS SECURE CRITICALLY NEEDED LANDS FOR EXPEDITING RESTORATION PROJECTS

The total projected real estate expenditures for eligible projects for FY2007–FY2011 are estimated as $605 million, including $580 million for land acquisition and $25 million for constructed engineering solutions to avoid costly acquisitions. These forecasts incorporate the future lands needed for CERP and Acceler8.

Over the next five years, the District expects to receive a total of $544 million from the Florida Forever and Save Our Everglades Trust Fund (FF/SOETF). In July 2006, the District's Governing Board amended the FY2006 budget, authorizing the advance use of $86 million of the FY2007 funds to acquire critical lands needed for CERP and Kissimmee River Restoration projects. To meet the projected land acquisition funding requirements for eligible projects, as well as the costs of remaining lands required to complete CERP, the District will seek additional funding alternatives, including seeking extended FF/SOETF funding beyond 2010.

LAND ACQUISITIONS FOR ACCELER8 AND KISSIMMEE RIVER RESTORATION PROJECTS ARE NEAR COMPLETION

During FY2006, the District acquired more than 33,000 acres of land. Of this total, over 13,000 acres were acquired to complete negotiated land acquisitions for the Kissimmee River Restoration Project and over 18,000 of the acres were purchased for CERP projects, increasing the total land acquired for CERP projects to 55 percent of the total needed. The District's aggressive purchase of land, in advance of project plans being federally approved, has provided 96 percent of the real estate needed for early construction of Acceler8 projects.

THE DISTRICT'S EXPEDITED LAND ACQUISITIONS IN FISCAL YEAR 2006 PAVE THE WAY FOR SEVERAL ACCELER8 PROJECTS, SUCH AS THE C-44 RESERVOIR/STORMWATER TREATMENT AREA PROJECT.

Mitigation Donation Annual Report

Mitigation is the acquisition, creation, restoration, or enhancement of wetlands to compensate for permitted wetland impacts. Each year, Florida's water management districts are required to report on collected funds received as a form of mitigation for wetland impacts. Mitigation funding allows the South Florida Water Management District to direct funds in order to benefit the South Florida ecosystem, allowing for substantial wetland mitigation at costs that are comparable to or less than other forms of mitigation.

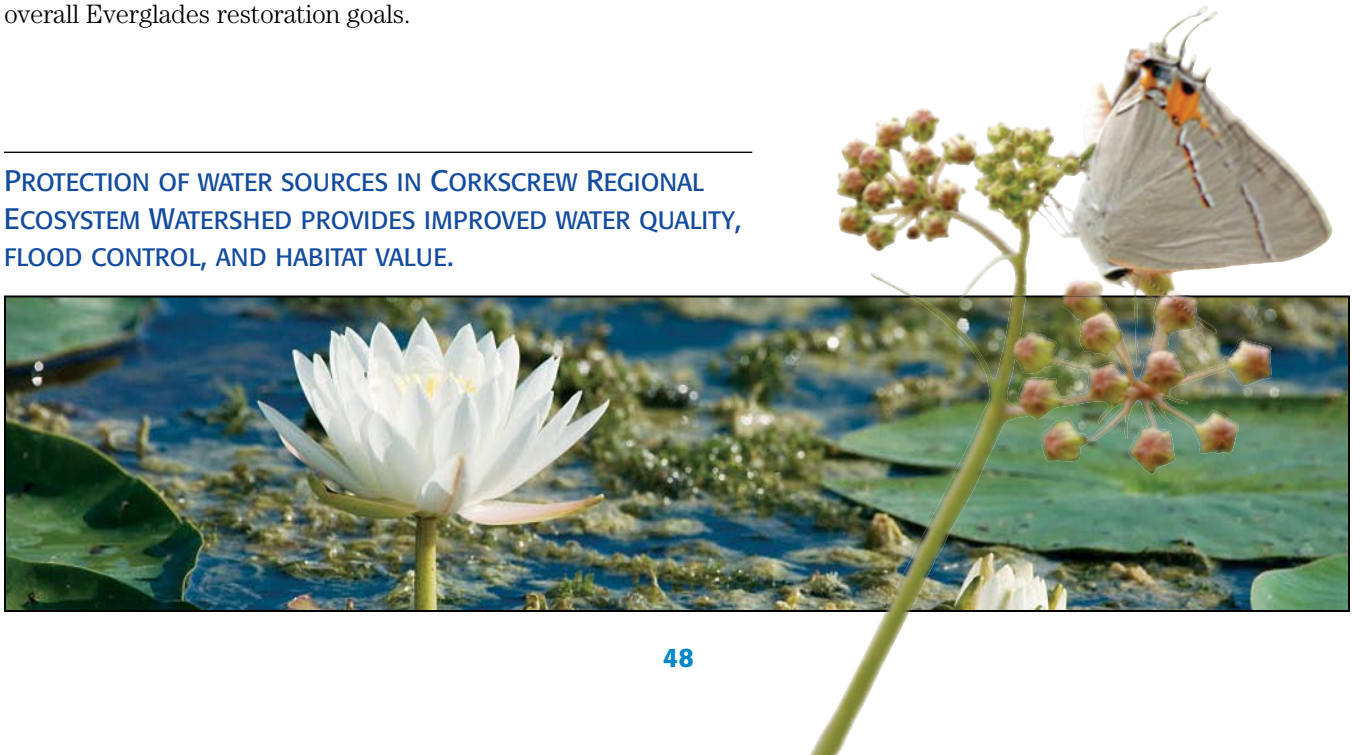
In the 2007 SFER – Volume II, Chapter 7 highlights the District's mitigation fund expenditures for Fiscal Year 2006 (FY2006) and the utilization of mitigation funds anticipated for Fiscal Year 2007 (FY2007) for the two regional mitigation projects: Corkscrew Regional Ecosystem Watershed (CREW) and Pennsuco. The chapter also highlights the restoration, monitoring, and long-term management efforts for these projects. Covering over 60,000 acres in Lee and Collier counties, CREW lands contain some of the largest remaining pristine cypress wetlands in the United States and provide habitat to many protected species. Covering about 13,000 acres in Miami-Dade County, Pennsuco is an impaired wetland ecosystem that likely will continue to degrade and further impact adjacent natural areas unless widespread invasive exotics are reduced. Beyond providing regional ecological benefits, enhancement of these vital wetlands will contribute to overall Everglades restoration goals.

DEDICATED FUNDING SUPPORTS WETLAND ENHANCEMENTS AND LAND MANAGEMENT

In 1995, the District began accepting cash payments for the CREW and Pennsuco projects as a form of mitigation to offset impacts to other wetlands. Mitigation funding provides land acquisition, chemical treatment of exotics, hydrologic enhancement (CREW only), environmental monitoring, and land management. Although both projects no longer accept mitigation funds, existing dedicated funds continue to be used for mitigation efforts at the sites.

In FY2006, the District expended a total of $1.1 million on the restoration of lands for the two mitigation projects. FY2006 funding supported environmental restoration activities for 2,555 acres in CREW and 4,425 acres in Pennsuco. Ongoing restoration efforts in both areas are having successful results. Native vegetation is showing a strong recovery in Pennsuco, increasing by more than 50 percent during this reporting period. There has also been a substantial decrease in invasive plants on CREW lands, which has positively resulted in increased native species.

The anticipated total expenditures for FY2007 are $2.3 million. Of this amount, approximately $800,000 is dedicated to land acquisition and $500,000 is dedicated to restoration and monitoring in CREW. An estimated $1 million is budgeted in FY2007 for the treatment of 3,816 acres for exotics and continued monitoring in Pennsuco.



PROTECTION OF WATER SOURCES IN CORKSCREW REGIONAL ECOSYSTEM WATERSHED PROVIDES IMPROVED WATER QUALITY, FLOOD CONTROL, AND HABITAT VALUE.

Land Stewardship Annual Report

THE DISTRICT STEWARDS PUBLIC LANDS FOR MANY REGIONAL BENEFITS

The Save Our Rivers (SOR) Program began in 1981 with legislative enactment of the Water Management Lands Trust Fund. This legislation enables Florida's water management districts to buy lands needed for water management, water supply, and the conservation and protection of water resources and to make them available for appropriate public use. The legislation further states that lands acquired through this program "shall be managed and maintained in an environmentally acceptable manner and, to the extent practicable, in such a way as to restore and protect their natural state and condition." This legislation forms the basis of the District's Land Stewardship Program goals, which are to restore public lands to their natural condition, manage lands in an environmentally acceptable manner, and provide public recreational opportunities while protecting natural resources. The managed lands covered under this program include both SOR and Florida Forever lands (see Volume I, Chapter 6).

Each year, the South Florida Water Management District is required to report on land management activities for all agency-owned properties and associated project areas. In the 2007 SFER – Volume II, Chapter 8 highlights SOR projects for the District's five land management regions – Upper Lakes, Kissimmee/Okeechobee, East Coast, Everglades, and West Coast – and the Fiscal Year 2006 (FY2006) land management activities and acquisition status for each region. The chapter also includes project-specific descriptions for each of the District's Land Stewardship Program's major components – hydrologic and habitat restoration, exotic species control, prescribed burning, public use and environmental education, mitigation, and project lands. Project lands – those lands acquired for future implementation of the Comprehensive Everglades Restoration Plan – are managed through lease agreements until the land is needed for construction.

MULTIAGENCY PARTNERSHIPS MANAGE OVER 600,000 ACRES OF PUBLIC LANDS

Over the past 25 years, the District and its partnering agencies have acquired 392,929 acres of environmentally sensitive lands. These lands span the entire South Florida region from the Kissimmee Chain of Lakes to the Southern Glades Wildlife and Environmental Area in Everglades National Park. As of September 2006, the District owns, and with its partners manages, over 623,000 acres of SOR and other valued lands, including key designated areas for planned Everglades restoration projects. To support the project lands, the District uses more than 100 separately managed contracts, agreements, and leases with other governmental agencies and private entities. The FY2006 budget for land management was $13.2 million, including $3.1 million of project lands funds. Also in FY2006, over $4 million of revenue was generated from agricultural leases and other dedicated sources. For FY2007, an estimated total of $10.9 million will support land management activities.

LAND STEWARDSHIP FOCUSES ON PROTECTING NATURAL RESOURCES AND MANAGING ENVIRONMENTALLY SENSITIVE LANDS WHILE ENSURING COMPATIBLE RECREATIONAL USE.

Glossary

Acceler8: A commitment, led by the State of Florida, through interagency partnership to revitalize the ecosystem by stepping up the pace for funding, design, and construction of eight critical Everglades restoration projects by 2011.

Acre-feet (ac-ft): The volume required to cover one acre to a depth of one foot, commonly used to express large volumes of water (1 acre-foot = 325,900 gallons).

Adaptive management: The application of scientific information and explicit feedback mechanisms to refine and improve future management decisions.

***Ad valorem* tax:** A tax imposed on the value of real and personal property, as certified by the property appraiser in each county.

Alternative Water Supply (AWS): A supply of water that has been reclaimed after municipal, commercial, and/or agricultural uses; or a supply of storm water, or brackish or salt water, that has been treated in accordance with applicable rules and standards sufficient to supply an intended use.

Aquifer Storage and Recovery: The injection of fresh water into a confined saline aquifer (underground, water-bearing layer) during times when supply exceeds demand (wet season from June to October), and recovering it during times when there is a supply deficit (dry season from November to May).

Best Management Practices (BMPs): Land, agricultural, industrial, and waste management techniques that reduce pollutant export from a specified area.

Capital Projects: Individual facilities and land acquisition projects identified in the District's Five-Year Capital Improvement Plan.

Certificates of Participation: As defined by Florida law (Section 373.584, Florida Statutes), a type of revenue bond that water management districts may issue to finance undertaking of any capital or other project for purposes permitted by the state's constitution.

Compliance monitoring: In a water quality management program, compliance is associated with meeting permit conditions as well as ambient standards. Ongoing monitoring provides periodic water quality data, which are used to assess compliance.

Discharge (or Flow): The rate of water movement past a reference point, measured as volume per unit time (usually expressed as cubic feet or cubic meters per second).

Ecosystem: Biological communities together with their environment, functioning as a unit.

Estuary: The part of the wide lower course of a river where its current is met by ocean tides or an arm of the sea at the lower end of a river where fresh and salt water meet.

Everglades Agricultural Area (EAA): An area extending south from Lake Okeechobee to the northern levee of Water Conservation Area 3A, from its eastern boundary at the L-8 canal to the western boundary along the L-1, L-2, and L-3 levees. The EAA incorporates almost 3,000 square kilometers (1,158 square miles) of highly productive agricultural land.

Everglades Construction Project (ECP): The foundation of a large ecosystem restoration program, composed of 12 interrelated construction projects between Lake Okeechobee and the Everglades, including about 40,000 acres of Stormwater Treatment Areas. It also contains four hydropattern restoration projects that will improve the volume, timing, and distribution of water entering the Everglades.

Everglades Forever Act (EFA): A 1994 Florida law (Section 373.4592, Florida Statutes), amended in 2003, to promote Everglades restoration and protection. This will be achieved through comprehensive and innovative solutions to issues of water quality, water quantity, hydroperiod, and invasion of exotic species to the Everglades ecosystem.

Everglades Protection Area (EPA): As defined in the Everglades Forever Act, the EPA is comprised of Water Conservation Areas 1, 2A, 2B, 3A, and 3B, the Arthur R. Marshall Loxahatchee National Wildlife Refuge, and Everglades National Park.

Expenditure: The disbursement of appropriated funds to purchase goods or services.

Fiscal Year (FY): The 12-month period for which the annual budget is developed and implemented. The fiscal year for the District begins on October 1 and ends on September 30.

Florida Forever Act: A 1999 Florida law (Section 259.105, Florida Statutes) authorizing the issuance of up to $3 billion in bonds over a 10-year period. This funding is used for land acquisition, water resource development, stormwater management projects, water body restoration activities, recreational facilities, public access improvements, and invasive plant removal.

Florida Statutes: A permanent collection of state laws organized by subject area into a code made up of titles, chapters, parts, and sections. The Florida Statutes are updated annually by laws that create, amend, or repeal statutory material.

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.

Geometric mean: A statistical average of a set of transformed numbers, often used to represent a central tendency in highly variable data, such as water quality. It is calculated from data transformed using powers or logarithms and then transformed back to original scale after averaging.

Loading (or mass loading): The amount of material carried by water into a specified area, expressed as mass per unit of time. One example is phosphorus loading into Water Conservation Area 2A, measured in metric tons per year. Note that 1 metric ton (mt) is equivalent to 1,000 kilograms, or 2,205 pounds.

Parts per billion (ppb): A unit of measure, equivalent to micrograms per liter (1 ppb = 1 µg/L).

Phosphorus: An element that is essential for life. In freshwater environments, phosphorus is often in short supply; increased levels of this nutrient can promote the growth of algae and other plants.

Revenue: Monies received from all sources (with the exception of fund balances) that will be used to fund expenditures in a fiscal year.

Slough: A depression associated with swamps and marshlands containing areas of slightly deeper water and a slow current, such as the broad, shallow rivers of the Everglades.

Stage: The height of a water surface above an established reference point.

Stormwater Treatment Area (STA): A large, constructed wetland designed to remove pollutants, particularly nutrients, such as phosophorus, from stormwater runoff using natural processes.

Submerged aquatic vegetation: Wetland plants that exist completely below the water surface.

Total Maximum Daily Load (TMDL): The maximum allowed level of pollutant loading for a water body, while still protecting its uses and maintaining compliance with water quality standards, as defined in the Clean Water Act.

Water Conservation Areas (WCAs): Diked areas of the remnant Everglades that are hydrologically controlled for flood control and water supply purposes. The primary targets of the Everglades restoration, and major components of the Everglades Protection Area.

Water quality: The physical, chemical, and biological condition of water as applied to a specific use, typically propagation of fish and wildlife, public water supply, industry, or recreation.

Water quality criteria: Constituent concentrations based on scientific data and judgments on the relationship between pollutant concentrations and environmental and human health effects.

Watershed: A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water.

Water Year (WY): The period from May 1 through April 30, during which water quality and other data were collected and reported on in the *South Florida Environmental Report*.

Wetland: An area that is inundated or saturated by surface water or groundwater with vegetation adapted for life under those soil conditions (for example, lakes, swamps, and marshes).

Acknowledgments

The South Florida Water Management District wishes to gratefully acknowledge the outstanding contributions of the many professionals who have made the *2007 South Florida Environmental Report* (SFER) a reality.

Authors: Teamwork and collaboration across organizational units and agencies for the reporting process is world-class and highly recognized. The 2007 Report could not exist without the competence of the over 200 authors and contributors that have played an important role in the development of this large, complex document. The professionalism and dedication of these many individuals are gratefully acknowledged.

Editorial and Production Team: To organize the development of this lengthy report under tight deadlines, continuous project management and close teamwork by the SFER production management team is required throughout the report production process. The team demonstrates advanced organizational skills as it expertly guides this annual process. The exceptional cooperation and productivity of the 2007 SFER editorial and production team are respectfully acknowledged, as well as the support of the District's Department of Public Information in producing the 2007 SFER Executive Summary. The outstanding work performed under contract to the District by the SFER technical editors, Kate Berrigan (Gannett Fleming, Inc.) and Naomi Chang (Greenhorne & O'Mara, Inc.), and the SFER Executive Summary graphic designer, Gail Marcarelli, is also immensely appreciated.

Project Team: The management of Volume I is centered in the District's Environmental Resource Assessment Department. The Volume I staff works closely with the Florida Department of Environmental Protection's Water Quality Standards and Special Projects Program to jointly coordinate the creation of Volume I, Chapter 3, and its associated appendices. The District's Finance and Administration Department provides oversight and support for the development of Volume II. Along with the significant contributions of these project management teams, this large, multidisciplinary document could not be produced without the guidance of our agencies' executive managers.

Peer Review and Public Workshop: The incredible knowledge and experience of the expert panel assembled for the 2007 SFER Peer Review and Public Workshop are greatly valued. The panel provided insightful and thorough scientific peer review in the major subject areas covered in Volume I. The District's Environmental Resource Assessment Department staff is also recognized for their vital assistance in conducting this year's workshop.

Other Contributors: The extensive amount of data and other information provided throughout Volume I are largely supported by the three divisions of the District's Environmental Resource Assessment Department – Water Quality Monitoring, Water Quality Analysis, and Water Quality Assessment. The long list of individuals throughout these divisions that have contributed to the essential data collection, monitoring, analyses, validation, and technical assessments for multiple Volume I chapters and appendices continues to contribute to the enormous success of this report, and their efforts are deeply appreciated. Project managers and chapter authors are also appreciatively recognized for updating the 2007 SFER Consolidated Project Report Database.

For further reference, a more detailed list of authors and contributors is presented on the acknowledgments page of the 2007 Main Report.

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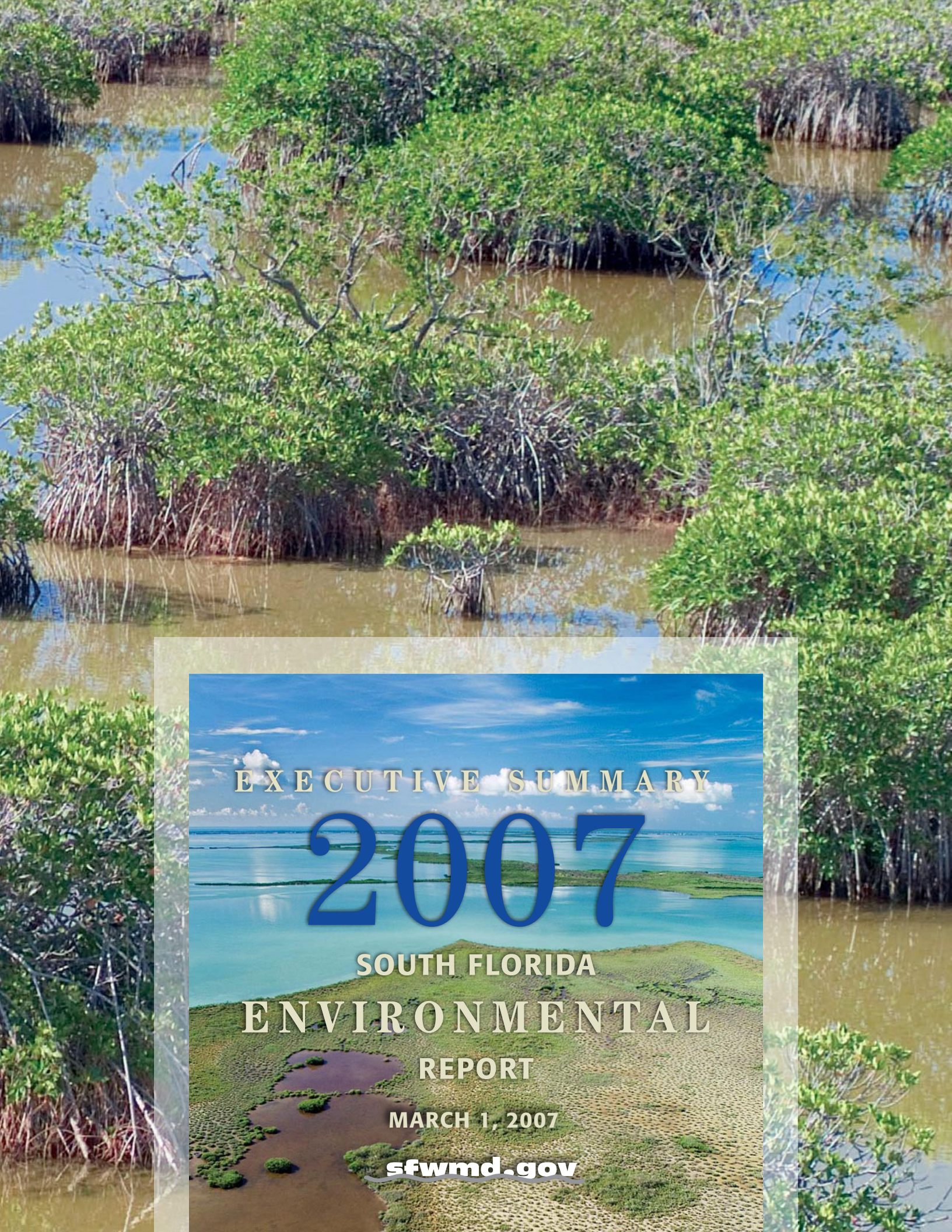
For additional *2007 South Florida Environmental Report* copies, or for the Consolidated Project Report Database CD, please contact the District's Reference Center at 561-682-2850. The complete 2007 report is also available online at **www.sfwmd.gov/sfer/**



EXECUTIVE SUMMARY

2007

SOUTH FLORIDA ENVIRONMENTAL REPORT

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On the cover: Florida Bay, a triangular-shaped, subtropical estuary located at the southernmost tip of the Florida peninsula, rests between the mainland and the Florida Keys and lies mostly within Everglades National Park. Stretching over 850 square miles, or 2,200 square kilometers, the bay's interconnected basins, seagrass beds, mud banks, and mangrove islands (as shown in the bird's eye view on the front cover and the close-up view on the inside cover) provide essential nursery and feeding grounds for many animals and serve an important role in the South Florida environment.

Through the widespread support of more than 40 educational and governmental organizations, including the District, the Florida Bay Science Program—a component of the larger South Florida Ecosystem Restoration initiative, guided by the interagency Program Management Committee—is producing data and models to better understand the complex ecosystem of Florida Bay. Key research findings on the bay's historical conditions, water circulation, water quality, nutrients, plant communities, and animal interactions are being used to support ecosystem restoration and management decisions. For more information, visit the District's web site at **http://www.sfwmd.gov**, under the *Coastal Areas, Florida Bay* section.

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