

EXECUTIVE SUMMARY

2006

SOUTH FLORIDA
ENVIRONMENTAL
REPORT

MARCH 1, 2006

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On behalf of Florida's Department of Environmental Protection and the South Florida Water Management District, we are pleased to present the results of another remarkable year restoring America's Everglades and the entire South Florida ecosystem. Restoration work began just a decade ago, yet today is providing environmental returns such as water quality improvements and pollution control. In a short time, the State of Florida has become a world leader in meeting the complex challenges of environmental restoration.

This *2006 South Florida Environmental Report* provides a snapshot of Florida's success over the past year. The report represents the dedicated work of wetland scientists, ecologists, hydrologists, engineers, planners, financial analysts, program managers and agency support staff at both the state and federal levels. Their commitment to carrying out the work of environmental restoration is establishing a lasting legacy for all citizens.

Despite the impacts of the 2004 hurricanes, which inundated the natural system with stormwater flow and increased phosphorus concentrations, the Stormwater Treatment Areas treated almost 1.5 million acre-feet of water and prevented 189 metric tons of phosphorus from reaching the Everglades. Best Management Practices (BMPs) recorded its tenth consecutive year of outstanding results in reducing phosphorus inputs. The BMP program achieved a 59 percent phosphorus load reduction in the Everglades Agricultural Area this year, more than double the 25% required by law.

Florida has already invested \$1 billion and committed more than \$2.5 billion through the end of the decade to continue restoration progress. To further protect Florida's natural environment and growing economy, Governor Bush ranked growth management reform as a top priority during the 2005 Legislative Session. Signed into law on June 24th, the growth management reforms – the first in 20 years – created a stronger link between local water supply planning and regional plans. In the next five years, alternative water supply projects will provide more than 300 million gallons of water per day to the communities of South Florida, supporting local economies, the environment and our quality of life.

These are just a few highlights from a broad and exciting environmental restoration effort. We invite you to turn the pages of the *2006 South Florida Environmental Report* and review the first-rate science, engineering and water resource management that is making environmental restoration a reality.

Sincerely,



Colleen M. Castille

Colleen M. Castille
Secretary
Florida Department of
Environmental Protection



Carol Ann Wehle

Carol Ann Wehle
Executive Director
South Florida Water
Management District



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2006 SOUTH FLORIDA

FOREWORD



On the heels of success with the 2005 pilot project, the *2006 South Florida Environmental Report* (SFER) represents the first complete report consolidation effort following the newly authorized state legislation, Chapter 2005-36, Laws of Florida. Notably, the 2006 Report is also the eighth comprehensive publication authored cooperatively by the South Florida Water Management District and the Florida Department of Environmental Protection. The document consists of multiple reports presented in two volumes, providing the public and decision makers with diverse, up-to-date information on South Florida's unique environment, while at the same time streamlining the publication process and legislative review.

Volume I, the South Florida Environment, updates last year's consolidated report with relevant information from a year of scientific and engineering efforts by many outstanding technical professionals. This first volume brings together information from across the entire 16-county South Florida Water Management District. In 13 chapters, it covers the Everglades, the Kissimmee River and Chain of Lakes, Lake Okeechobee, and South Florida's coastal ecosystems. It also satisfies various annual reporting requirements of the Everglades Forever Act, the Lake Okeechobee Protection Act, the Comprehensive Everglades Restoration Plan, and other state and federal laws.

Volume II, District Annual Plans and Reports, represents a significant achievement toward unified reporting standards across the state. For several months over the past year, the Florida Department of Environmental Protection and all five of Florida's water management districts worked closely together to determine which mandated annual reports

could be combined into a single volume to improve efficiency and statewide communication. Stemming from this effort, the second volume is now comprised of six annual plans and reports required by all water management districts. Specifically, this volume documents the South Florida Water Management District's progress in implementing plans developed to address areas of responsibility in the 11 programs outlined in the Strategic Plan. In its second year of development, the Volume II database provides a single source of project-related information and allows for greater efficiency in project reporting and data retrieval.

The entire 2006 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 the SFER represents the scientific soundness of the District's programs and projects that support prudent environmental management. This annual publication continues our communication with the public as we work toward sound management and restoration of the South Florida region.



ENVIRONMENTAL REPORT

The Bottom Line

The 2006 South Florida Environmental Report combines more than 50 individual reports into a single, two-volume document. Key findings from the South Florida Water Management District's numerous research and monitoring projects during Water Year 2005 (WY2005) are presented in *Volume I, The South Florida Environment*, on pages 2 and 3. These pages also include highlights of the District's financial resources management during Fiscal Year 2005 (FY2005). The findings cover the entire South Florida region including the Kissimmee River basin, Lake Okeechobee, and coastal ecosystems. Some key highlights on the impacts of the 2004 hurricanes on the South Florida environment are also presented. Page 4 highlights *Volume II, District Annual Plans and Reports*, summarizing the FY2005 planning and project status for six annual reports required annually by all water management districts under various regulatory mandates.

VOLUME I, THE SOUTH FLORIDA ENVIRONMENT

Water Quality in the Everglades Ecosystem

- The Florida Department of Environmental Protection (FDEP) analyzed deviations (excursions) from water quality criteria for WY2005 and reported that Everglades water quality generally meets state numeric criteria. Overall, patterns seen in water quality constituents, except total phosphorus (TP) for WY2005 were very similar to recent years and varied across regions of the Everglades Protection Area (EPA) in association with local environmental conditions and water management activities. Everglades marshes also generally showed little change in water quality from previous years despite the 2004 hurricanes.

- Mercury continues to be an issue in the Everglades and it appears that its declining trend has ended. Mercury concentrations in bass in the Everglades National Park have increased since 1998, and presently exceed federal criteria. Further study is needed to understand the relative importance of local and global atmospheric mercury deposition on levels in Everglades fish. Everglades mercury management also requires confirmation of sulfur sources, research on sulfur cycling, and attention to controlling sulfur input.
- The revised rule for the phosphorus criterion of 10 parts per billion (ppb) received final approval from the U.S. Environmental Protection Agency in July 2005. The FDEP is now working with the District and other interested parties to establish the monitoring networks to determine compliance with the rule.
- Phosphorus source control programs are continuing to exceed expectations. Stormwater Treatment Area (STAs) and Best Management Practices (BMPs) combined have prevented more than 2,200 metric tons (mt) of phosphorus from entering the Everglades over the past nine years.

Performance of the STAs

- Despite the 2004 hurricane-related impacts and increased flow and TP concentrations received, STA operations were able to reduce TP concentrations by 71 percent during WY2005. The operational STAs together treated almost 1.5 million acre-feet (ac-ft) of inflow and removed 189 mt of TP from surface water. TP concentrations were reduced from an average inflow of 147 ppb to an average outflow of 41 ppb.



- STA-3/4, the largest of the six wetland treatment areas, removed 77 mt of phosphorus by treating over 670,000 ac-ft of water to an impressive outflow concentration of just 13 ppb.

Performance of Agricultural BMPs

- Although the 2004 hurricanes did not have major effects on the Everglades source control programs as a whole, they did affect some water quality results in localized areas.
- BMPs continue to be a very effective tool for reducing phosphorus at its source in the Everglades Agricultural Area (EAA). In WY2005, the EAA reported a 59 percent TP load reduction with its BMP program as it continued outstanding performance at reducing nutrient inputs to the Everglades.
- The C-139 basin continued to be out of the compliance in WY2005, the third year of BMP program implementation. However, a reduction in TP concentrations was observed during the water year. Results suggest that the program is having positive effects, moving the basin toward compliance with regulatory requirements.

Hydrology and Ecology of South Florida

- South Florida experienced an extremely rare occurrence of a series of hurricanes in 2004. The region was hit by three major hurricanes and a remnant of a fourth in less than seven weeks. Collectively, the storms drove a cascade of impacts across the region beginning in mid-August and lasting in many areas to the present time.
- WY2005 wading bird nests in South Florida were down sharply from the positive trend observed since 1999, primarily due to fluctuating water levels from the 2004 hurricanes and extreme hydrologic events.
- Widespread efforts to control invasive exotic species across South Florida continued in WY2005. Notably, the millionth acre of melaleuca was cleared in the CERP project area, while nearly 5,000 acres of *Lygodium* were treated in the Everglades region. A leaf-eating moth was also released for the first time in South Florida as a biological control for *Lygodium*.

CERP Performance

- Many achievements for the Comprehensive Everglades Restoration Plan (CERP) were made in FY2005. Most notably, the Acceler8 initiative was launched in October 2004 to expedite the construction and operation of eight ecosystem restoration projects. With a projected total cost of \$1.5 billion, the initiative is expected to achieve 70 percent of the restoration plan's goals by 2011 – five years ahead of the current schedule – while maintaining CERP's overall momentum.
- More than 210,000 acres of land – approximately 50 percent of lands needed – have been acquired for use in CERP. During FY2005, total CERP revenues were

\$237 million and total CERP expenditures were \$260 million (unaudited). The anticipated expenditures for FY2006 are \$442 million (unaudited).

- A key milestone for RECOVER is the completion of the Initial CERP Update in September 2005. This is the first step in assuring that new technical information is integrated into CERP's implementation, and will be used in determining if the goals and purposes of the plan are achieved.

Long-Term Plan for Achieving Water Quality Goals

- During FY2005, the District continued implementation of the numerous projects of the Long-Term Plan, as required by the amended Everglades Forever Act (EFA). Currently, the plan's initial 13-year phase has a projected total cost of \$749.8 million.
- The EFA requires that revisions to the Long-Term Plan be developed through an adaptive management approach and be approved by the FDEP. The FDEP approved the second requested revision to the Long-Term Plan in December 2004. This revision included STA expansion, revised STA enhancements, and the addition of recreational facilities at each STA.

Lake Okeechobee Protection Plan

- Projects on Lake Okeechobee watershed are moving forward as planned despite the 2004 hurricanes. The hurricanes led to high inflow and discharges and substantial increases in lake levels. Large TP loads and high sediment resuspension led to high phosphorus and suspended solids concentrations in the water column. TP loadings totaling 950 mt during WY2005 were extremely high and directly related to the unprecedented 2004 hurricanes, which drastically impacted the lake and its watershed.
- To aid in hurricane recovery and to minimize future impacts, the District and U.S. Army Corps of Engineers are currently refining the lake's operating schedule. The overall goal is to establish favorable conditions to maintain the lake's long-term ecological health and reduce large discharges to downstream ecosystems, while also minimizing water supply impacts.

Kissimmee Basin

- The District is working with the U.S. Army Corps of Engineers to implement Kissimmee River Basin restoration projects. These projects will reestablish the river-floodplain system's ecological integrity, provide water storage, and increase shoreline fish and wildlife habitat in some lakes. Phased construction efforts are continuing, and these projects have an estimated combined cost of \$578 million as of FY2005.

- The Kissimmee Chain of Lakes Long-Term Management Plan is being prepared to improve and sustain the lakes' ecosystem health. A draft ecosystem model for the lakes has been completed, and will be used as a key tool for analyzing ecosystem components and developing associated performance measures. The Long-Term Management Plan is scheduled for completion in 2007.

Coastal Ecosystem Management

- The District is continuing efforts to scientifically establish freshwater inflows that protect and restore South Florida coastal ecosystems. Ongoing research continues to focus on analyzing the effects of freshwater discharges on salinity and, in turn, the effects of altered salinity on seagrasses and oyster beds. The District is working with other regulatory agencies to produce a broad range of data and tools that will assist in achieving these challenging goals.
- During WY2005, the District made significant progress toward developing the technical basis for Restoration Flows in the Northwest Fork of the Loxahatchee River, and for Minimum Flow and Level (MFL) criteria in Florida Bay and south-central Biscayne Bay.

EFA Financial Report

- The Everglades Construction Project is one of the nation's largest environmental restoration projects, with a projected cost of \$836.2 million over 20 years. The Florida Bay Restoration Program has a projected total cost of \$367 million. EFA Program revenues totalling \$551.1 million are forecast for the next five years. The total current estimated cost of implementing the EFA Program for the next 10 years is \$2 billion.

VOLUME II, DISTRICT ANNUAL PLANS AND REPORTS

- The FY2005 Annual Work Plan Report shows that 202 out of 249 major District projects – 81 percent – were within one quarter of schedule (coded green) as of September 30, 2005. Of the remainder, 29 projects were within two quarters of schedule (coded yellow), while 18 projects were behind schedule by more than two quarters (coded red). During FY2005, the District collected 81 percent of budgeted revenue, including more than 99 percent of budgeted taxes. The District expensed 71 percent of the total FY2005 budget of \$765 million (excluding personnel and managerial reserves), which is 10 percentage points higher than the historical rate.

- Since 2001, Minimum Flow and Level criteria for 10 water bodies have been adopted by the District. The District completed MFLs for Lake Istokpoga during 2005; and will complete MFLs for southern Biscayne Bay in 2006 and Loxahatchee River tributaries in 2007. The Florida Bay MFL was delayed until 2006 to resolve restoration and long-term management issues.
- In accordance with the Five-Year Capital Improvements Plan, the District's total budgeted capital expenditures for FY2006 are \$676.4 million, which is 63.8 percent of the total annual budget of \$1.1 billion and 18.2 percent of the total projected Five-Year Capital Improvements Plan budget of \$3.7 billion. The FY2006 capital budget is \$187.6 million greater than last year's capital budget of \$488.8 million, mainly due to substantial increases in the CERP and District Everglades programs, which in turn reflect implementation of Acceler8.
- The District has allocated \$12.8 million in FY2006 and anticipates spending \$55.2 million over the next five years on water resource development projects exclusive of CERP. These projects support development of Alternative Water Supply (AWS) projects that will make water available in future years. The District has also initiated an aggressive funding program for AWS projects in response to the 2005 Water Protection and Sustainability Program. For FY2006, almost \$61 million is directed to water supply activities. The state is providing \$30 million for FY2006 project funding. When completed, the 80 AWS projects will provide more than 300 million gallons per day of additional water supply.
- In FY2005, the Florida Forever Program funded acquisitions of nearly 11,000 acres of land, completing 85 percent of the required land acquisition for the Kissimmee River Restoration Project, and approximately 50 percent of land required for CERP projects, thereby enabling the launch of Acceler8.
- In FY2005, the District utilized a total of \$3.7 million of mitigation funds to acquire 195 acres and restore more than 9,000 acres within the two approved regional mitigation areas – CREW and Pennsuco. Anticipated FY2006 expenditures for mitigation are \$1.6 million.





THE SOUTH FLORIDA ENVIRONMENT

VOLUME I

Introduction to the *2006 South Florida Environmental Report – Volume I*

Building on the success of last year's pilot project, the *2006 South Florida Environmental Report* (SFER) streamlines and consolidates previous reporting efforts by the South Florida Water Management District and efficiently unifies more than 50 individual reports into a single, two-volume document. This introductory chapter provides the reader with a basic understanding of the governmental, scientific, and legal context behind Volume I of the *2006 South Florida Environmental Report*. The information presented in this volume continues to aid in Everglades restoration and to support restoration, management, and protection activities of Lake Okeechobee, the Kissimmee River, and South Florida's coastal ecosystems. Collectively, this volume addresses numerous research and monitoring projects throughout the District (see map). Updates on these projects for the current reporting year, Water Year 2005 (May 1, 2004–April 30, 2005), are provided throughout this volume.

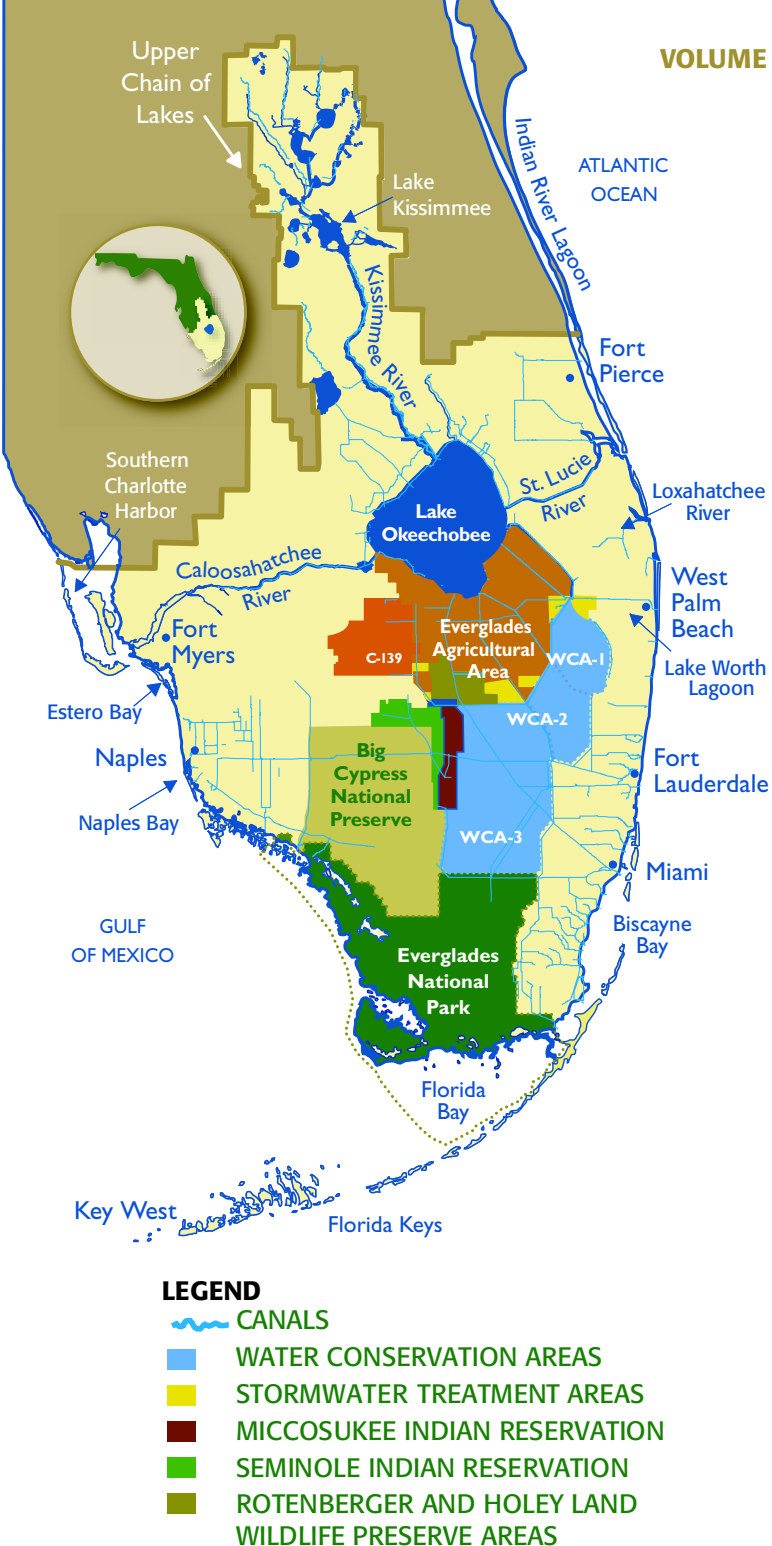
Similar to previous consolidated reports since 1999, the *2006 South Florida Environmental Report – Volume I* was subjected to an intensive review process, including posting the draft report on an interactive WebBoard, three days of public workshops, and peer review by an independent expert panel. This scrutiny ensures that the SFER continues to communicate the best information available in support of the District's programs. This inclusive report continues to be used by the District, the Florida Department of Environmental Protection (FDEP), and other agencies to support environmental management decisions.

VOLUME I IS REORGANIZED TO FURTHER CONSOLIDATE AND ENHANCE REPORTING

The *2006 South Florida Environment Report* is comprised of Volumes I and II, and the Executive Summary. *Volume I, The South Florida Environment*, is a technically based volume reorganized into a 13-chapter framework. Volume I provides data summaries for all major ecosystems in South Florida. Chapters 1 through 9 of this volume include all of the 2005 SFER topics, with new coverage of the Comprehensive Everglades Restoration Plan (CERP) Annual Report to complement annual reporting on RECOVER (Chapters 7A and 7B). These chapters continue the overall objective to summarize available data and findings related to Everglades restoration.

Providing a more integrated perspective on water management in South Florida, this year's report continues its coverage of the Lake Okeechobee Annual Report in Chapter 10, fulfilling the requirement of the Lake Okeechobee Protection Program on the lake and its large watershed. Technical information and project updates on the Kissimmee River and Upper Chain of Lakes (Chapter 11), and South Florida's coastal ecosystems (Chapter 12) are also included. This volume's expanded coverage also highlights the District's fiscal resources management during Fiscal Year 2005 (October 1, 2004–September 30, 2005) for CERP, Lake Okeechobee and the Everglades (Chapters 7A, 10 and 13, respectively). 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 to comply with various permit requirements. *Volume II, District Annual Plans and Reports*, summarizes the planning and project status for District-wide annual reports required under several mandates (see page 42).





MAJOR AREAS OF THE SOUTH FLORIDA ENVIRONMENT

SOUTH FLORIDA RESTORATION CONTINUES ON MULTIPLE FRONTS

Over the past century, the Kissimmee-Okeechobee-Everglades and coastal ecosystems in South Florida have been altered fundamentally by changes in spatial extent, hydrology, water quality, and ecology. The environmental management and restoration of South Florida, a massive undertaking, is unique in regional scale and complex issues associated with water quality, flood control, natural systems, and water supply. The far-reaching impacts of these issues, along with strategies for restoring the ecosystem, are addressed throughout Chapter 1A. This chapter also provides an integrated summary of the opportunities and obstacles facing South Florida environmental restoration. This includes an overview of the Everglades restoration strategy, a multifaceted, comprehensive approach that includes interim and long-term plans for achieving water quality goals and for optimizing environmental management. Highlights of the District's broad restoration strategies throughout South Florida, including the Everglades, Kissimmee River, Lake Okeechobee, and coastal ecosystems, are also presented.

PEER REVIEW ENHANCES THE REPORT'S QUALITY AND EFFICIENCY

A unique and valued aspect of the SFER production process each year is review by a panel of eight independent experts. The review process involves detailed critiques by the panel and open discussion in a public workshop process as it fulfills the requirement for peer review from the amended Everglades Forever Act. This requirement applies directly to Volume I, Chapters 1 through 9 on the Everglades Protection Area, but is also applied to Chapters 10, 11, and 12 voluntarily by the District and the FDEP as a tool for quality assurance and public participation.

Once again this year, the panel made useful suggestions for enhancing the SFER. It was recommended that future reports be reviewed in a three-tiered manner with each section of the report being subject to either (1) evaluation of technical aspects, (2) assessment of progress toward long-term goals, or (3) review at the program level for improving integration. The panel also recommended continuing to develop cross-cutting themes in a separate section of the report, suggested some organizational changes, and noted the need to further standardize the reporting format to enhance readability. Overall, the panel emphasized its continued support for the SFER reporting process and the growing national and international recognition of this annual effort.

Cross-Cutting Issues in the *2006 South Florida Environmental Report* – Impacts of the 2004 Hurricanes on the South Florida Environment

THE 2004 HURRICANES SLAM SOUTH FLORIDA

During the 2004 hurricane season, South Florida was hit by hurricanes Charley, Frances, and Jeanne and tropical storm Ivan (see map). This is quite a remarkable event for the District area, as such an active hurricane season is only expected to occur once in about every 100 years. Hurricane Charley made landfall as a Category 4 hurricane and passed near Kissimmee and Orlando on August 14. Hurricane Frances came ashore over Hutchinson Island on September 5 as a Category 2 hurricane, traveled through Central Florida, and entered the Gulf of Mexico on September 6. Hurricane Jeanne also made landfall over Hutchinson Island on September 26 as a Category 3 hurricane, and then went west about 30 miles north of Tampa. Hurricane Ivan made landfall in Alabama as a Category 3 hurricane, then circled back as an extratropical system and crossed South Florida from east to west on September 21. Together, these back-to-back, intense storms caused extensive damage to both natural and built environments in the region.

LAKE OKEECHOBEE SUSTAINS LONG-TERM HURRICANE DAMAGE

The 2004 hurricane season impacted Lake Okeechobee greatly. The hurricanes produced a huge inflow volume of 3.2 million acre-feet (ac-ft) of water which conveyed 792 metric tons of total phosphorus (TP) into the lake in the three months following the storms. This is 83 percent of the total 950 metric tons of TP received by the lake during the entire WY2005. The lake level rose by over 5 feet, while solids suspended in the water and TP more than doubled. Wind-driven waves, currents, and deep water uprooted much of the lake's aquatic vegetation. In turn, the high suspended solids in the water and resulting low light penetration promoted a severe decline in submerged aquatic vegetation.

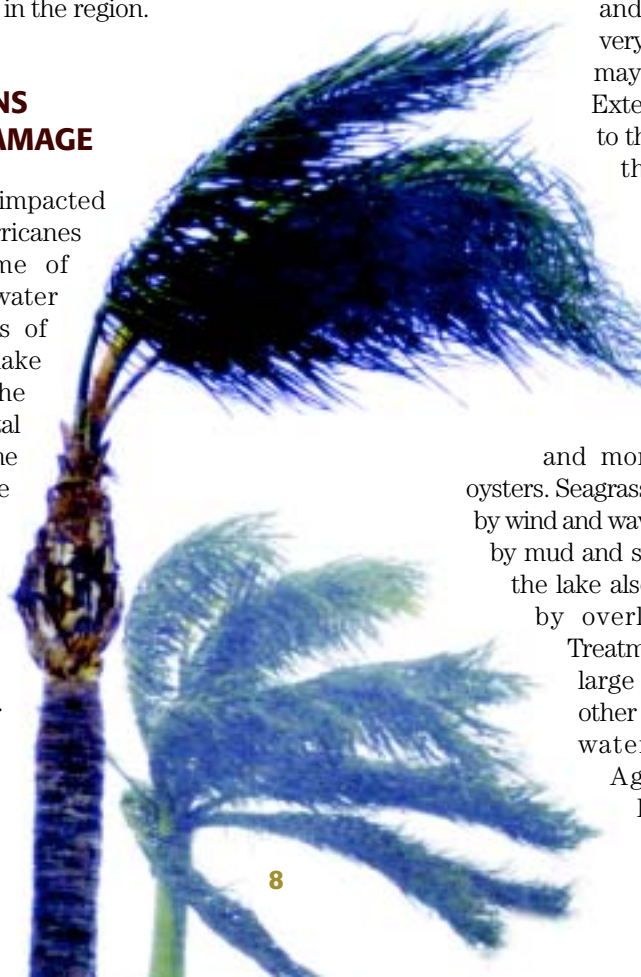
This pattern has created a vicious circle in which turbid water limits the regrowth of submerged vegetation and the absence of plants on the bottom allows sediments to be easily resuspended, lowering light penetration and hampering recovery. The lake remains in this disturbed condition to this day and widespread surface algal blooms, particularly blue-green algae (*Microcystis*), have been reported from a variety of locations around the lake as a result.

COASTAL ECOSYSTEMS TAKE THE BRUNT OF HURRICANE RUNOFF

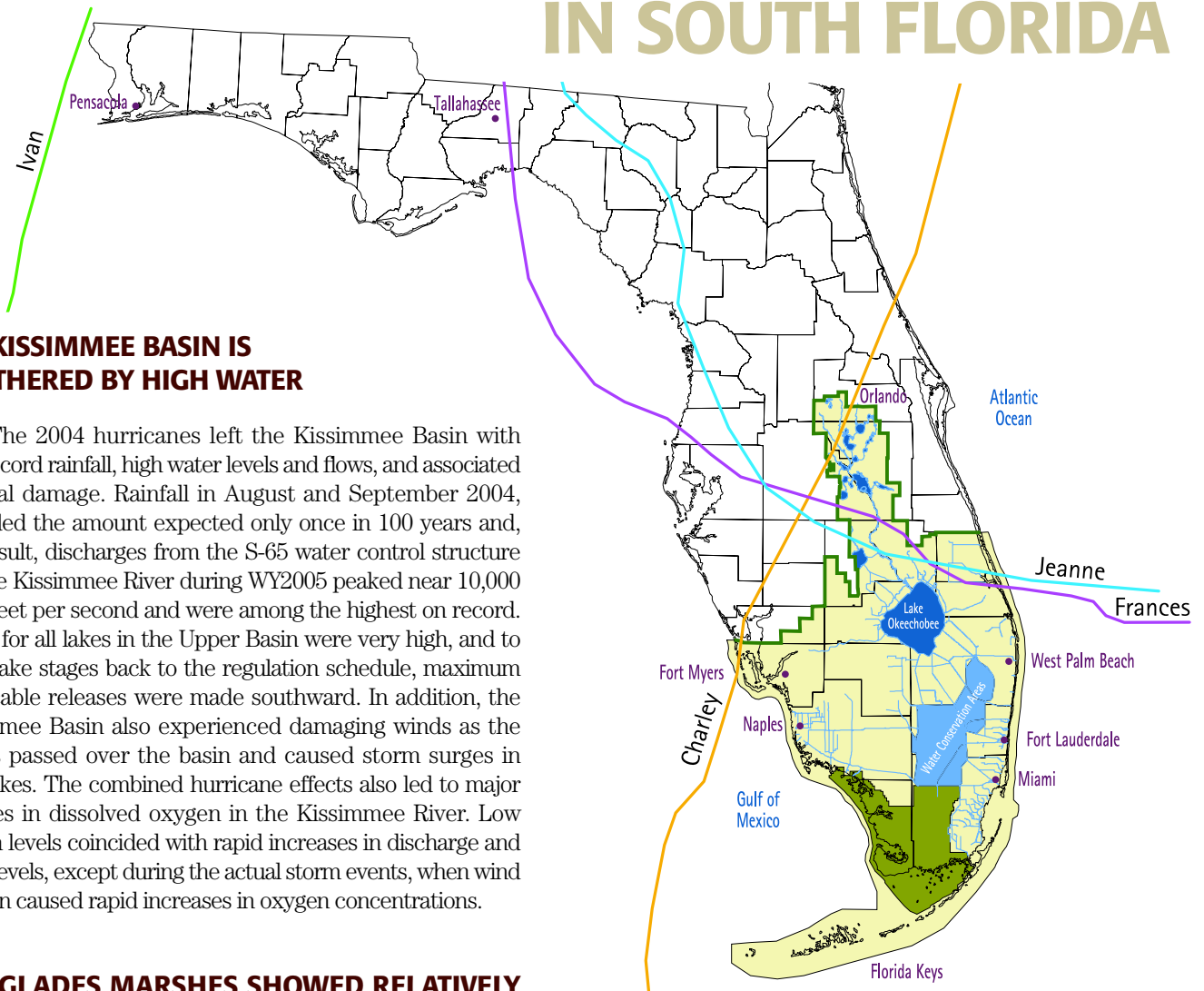
All coastal ecosystems were impacted physically, chemically, and biologically by the four 2004 hurricanes. The impacts on the lake cascaded downstream through high discharges to the St. Lucie and Caloosahatchee estuaries to the east and west. The releases of huge amounts of fresh water stressed these estuarine systems immediately and

transported nitrogen, phosphorus, and suspended sediments at very high concentrations, which may have longer-term effects. Extensive damage can be traced to the large influx of fresh water that followed the storms.

Releases from Lake Okeechobee prolonged and exacerbated storm-related discharges, which lowered salinity and water clarity in areas that are typically marine, causing stress and mortality to seagrasses and oysters. Seagrass beds were widely damaged by wind and wave action and were blanketed by mud and sand. Discharges south from the lake also created serious problems by overloading the Stormwater Treatment Areas and transporting large amounts of nutrients and other substances borne by turbid water into the Everglades Agricultural Area and Everglades Protection Area.



THE 2004 HURRICANES IN SOUTH FLORIDA



THE KISSIMMEE BASIN IS SMOTHERED BY HIGH WATER

The 2004 hurricanes left the Kissimmee Basin with near-record rainfall, high water levels and flows, and associated physical damage. Rainfall in August and September 2004, exceeded the amount expected only once in 100 years and, as a result, discharges from the S-65 water control structure into the Kissimmee River during WY2005 peaked near 10,000 cubic feet per second and were among the highest on record. Stages for all lakes in the Upper Basin were very high, and to lower lake stages back to the regulation schedule, maximum practicable releases were made southward. In addition, the Kissimmee Basin also experienced damaging winds as the storms passed over the basin and caused storm surges in local lakes. The combined hurricane effects also led to major changes in dissolved oxygen in the Kissimmee River. Low oxygen levels coincided with rapid increases in discharge and water levels, except during the actual storm events, when wind and rain caused rapid increases in oxygen concentrations.

EVERGLADES MARSHES SHOWED RELATIVELY LITTLE HURRICANE IMPACT

Even with the large amounts of water moving south, the remnant Everglades was not as heavily impacted as more northern parts of the region. The Water Conservation Areas did receive substantial surface water inflows following the 2004 hurricanes and were kept relatively deep when the hurricanes filled all District basins and forced them to be held at high stages due to a lack of conveyance capacity. Data on water quality and ecology suggest that Everglades marshes did not suffer any lasting effects due to the climatic variation seen in WY2005.

OVERALL, PHOSPHORUS CONTROLS PERFORM WELL DESPITE HURRICANE DISTURBANCES

Even after the 2004 hurricanes, the Everglades Agricultural Area basin TP load met its overall the basin load reduction goal. Likewise, the 2004 hurricanes had

minimal effects on basin compliance in the C-139 basin. In fact, TP load and discharge from the C-139 basin were reduced from the prior year by 42 and 20 percent, respectively. Most basins outside of the Everglades Construction Project showed relatively little change in TP concentration in discharges as a result of the hurricanes.

The 2004 hurricanes impacted Stormwater Treatment Areas 1 East, 1 West, and 2 (STA-1E, STA-1W, and STA-2) significantly. STA-1E and STA-1W had serious erosion damage on the interior levees and culverts as a result of the hurricanes. There was also extensive damage to the submerged aquatic plant community in STA-1W and STA-2. To the west, strong winds and heavy rainfall also impacted STA-3/4, STA-5, and STA-6, although no long-term damage was observed in these more resilient wetlands. Although treatment efficiencies varied, overall the STAs performed well during WY2005.

Status of Water Quality in the Everglades Protection Area

Information from comprehensive water quality monitoring programs in the Everglades Protection Area (EPA) during WY2005 is evaluated in Chapter 2A of the *2006 South Florida Environmental Report – Volume I*. This chapter assesses water quality parameters that did not meet their state Class III water quality criteria during WY2005 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.



A DISTRICT SCIENTIST COLLECTS WATER QUALITY DATA FROM INFLOWS TO THE REFUGE.

WATER QUALITY NETWORK CONTINUES TO TRACK COMPLIANCE

Most water quality data from the EPA continues to meet applicable water quality criteria. However, as in previous years, some concentrations 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 WY2005 were identified for dissolved oxygen (DO), pH, alkalinity, conductivity, and un-ionized ammonia.

Dissolved oxygen excursions, primarily in the marsh interior, frequently occurred in phosphorus-enriched areas. Such areas are expected to remain impaired until total phosphorus (TP) concentrations in surface water and sediment are reduced and biological communities recover. When unenriched areas are evaluated separately, DO is generally considered a minimal concern in the EPA. Excursions from pH and alkalinity criteria continued to be localized mainly to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) and related to natural conditions within the area.

Two pesticides, atrazine and chlorpyrifos ethyl, which do not have numeric Class III water quality criteria, were detected at concentrations above toxicity-based guidelines. Pesticide exceedances occurred at the inflows to the Refuge and Water Conservation Area 2 (WCA-2). These findings are consistent with previous consolidated reports, which have noted similar levels in localized areas of the EPA.

2004 HURRICANES HAD MINIMAL IMPACT ON WATER QUALITY IN THE EPA

Everglades marshes generally showed little change in water quality as the result of the 2004 hurricanes. More rain from the hurricanes increased runoff discharged to the EPA from areas to the north, resulting in increased input of some parameters, such as phosphorus and nitrogen (see Volume I, Chapter 2C), while conversely diluting others, such as dissolved ions. Overall, any direct effects from the storms, such as disturbance of the water column and underlying sediments, were short-lived and appeared to have little or no adverse effect on the water quality reported in this region.

Mercury Monitoring, Research and Environmental Assessment in South Florida

The Florida Department of Environmental Protection (FDEP) and the South Florida Water Management District continue to support studies of the causes, risks, and solutions to the Everglades mercury problem. Chapter 2B of the *2006 South Florida Environmental Report – Volume I* updates findings in program areas documented in previous consolidated reports.

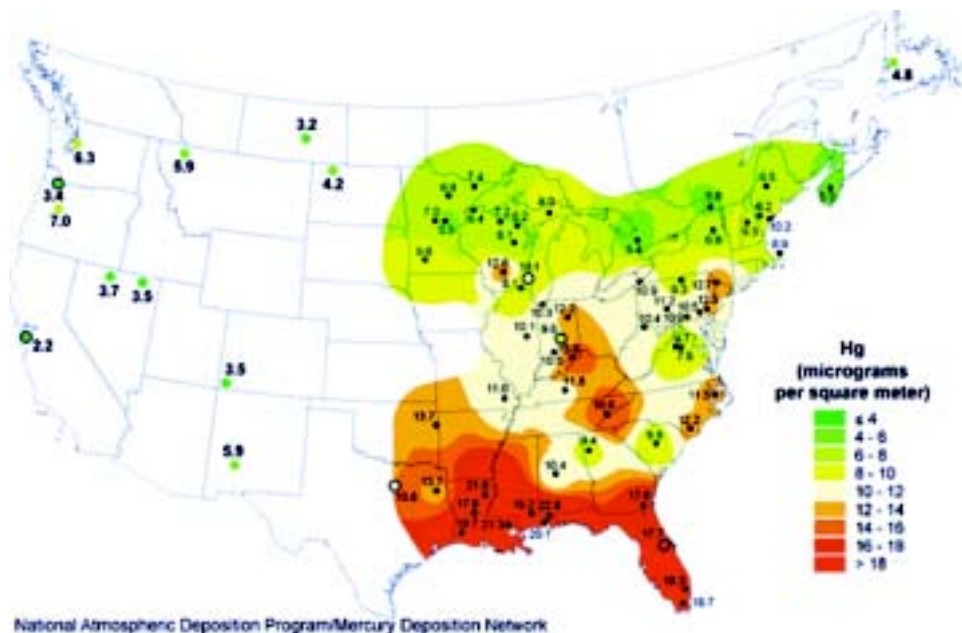
FISH MERCURY CONCENTRATIONS REMAIN LEVEL IN THE WCAs, BUT ARE UP IN THE PARK

Methylmercury, a highly toxic mercury form, bioaccumulates strongly in aquatic food chains posing health risks to humans and fish-eating wildlife. Mercury in Everglades fish and wading birds has declined sharply over the past 10 to 15 years, with levels in largemouth bass in the WCAs down 40 to 80 percent. Despite these declines, mercury concentrations in bass – averaging about 0.5 milligrams per kilogram (mg/kg) – remain above the proposed U.S. Environmental Protection Agency (USEPA) water quality criterion of 0.3 mg/kg for fish consumption; mercury levels have not declined since about 1998. In contrast, mercury concentrations in bass have increased since 1998 in the Everglades National Park and are presently at levels exceeding federal criteria.

MORE RESEARCH IS NEEDED FOR FUTURE MANAGEMENT

Mercury atmospheric emission rates in South Florida have declined about 90 percent since peak levels in 1990, while mercury wet deposition has declined by nearly 25 percent from 1993–2002. However, it appears that this declining trend has ended. In 2003 and 2004, annual volume-weighted mean rainfall mercury concentrations were higher than previous years at all three Everglades monitoring stations. Levels in wet deposition also increased at two sites and remain substantially greater than most other U.S. regions (see map). Overall, there is a need to determine the relative importance of local, regional, and global atmospheric mercury sources on levels in fish to evaluate options for reducing mercury in the Everglades.

Sulfur has emerged as an important cofactor, affecting not only the rate of mercury production but, as a biologically active element, also has forms that are highly toxic (e.g., sulfide) or that may promote phosphorus releases from sediments (e.g., sulfate). Further research is needed to better understand the diverse effects of sulfur from the Everglades Agricultural Area on the Everglades ecosystem and the efficacy of sulfur loading controls in reducing methylmercury production and other consequences of sulfur inputs.



**TOTAL
MERCURY
WET
DEPOSITION,
2004**

Status of Phosphorus and Nitrogen in the Everglades Protection Area

The Everglades ecosystem evolved as a highly oligotrophic (nutrient-poor), phosphorus-limited system, with the natural flora and fauna adapting to these harsh conditions in order to persist. Research has shown that relatively small additions of nutrients, especially phosphorus, can have dramatic effects on the biological conditions of the natural ecosystem. Chapter 2C of the *2006 South Florida Environmental Report – Volume I* presents an overview of the status of phosphorus and nitrogen levels in the surface waters within the Everglades Protection Area during WY2005. This chapter also provides an update on the establishment and application of a numeric phosphorus criterion for the EPA.

EXTREME CONDITIONS IMPACT PHOSPHORUS LEVELS IN WY2005

Similar to previous years, in WY2005 total phosphorus concentrations in surface water decreased from north to south in the EPA regions. As shown on the map on page 13, the highest levels were present in the inflow to the Refuge and WCA-2, and concentrations decreased to a minimum within the Everglades National Park (Park or ENP).

TP concentrations measured across the EPA during WY2005 were strongly affected by climatic and hydrologic extremes, including both multiple hurricanes with intense rainfall, and periods of little or no rainfall, resulting in marsh dryout. As a result, annual TP concentrations measured during WY2005 were generally higher than those reported for last year, but were within the range of the historical period (WY1978–WY2003). TP concentrations at inflow and interior marsh sites generally responded differently to external changes. TP concentrations at inflow sites typically followed rainfall patterns in which high rainfall resulted in greater inputs of nutrient-laden stormwater runoff and elevated peaks at inflow structures. During WY2005, the highest TP concentrations occurred from June–October 2004, corresponding to more rain received during the wet season and hurricanes Charley, Frances, and Jeanne. During periods of low rainfall, inflow TP concentrations were generally at their lowest.

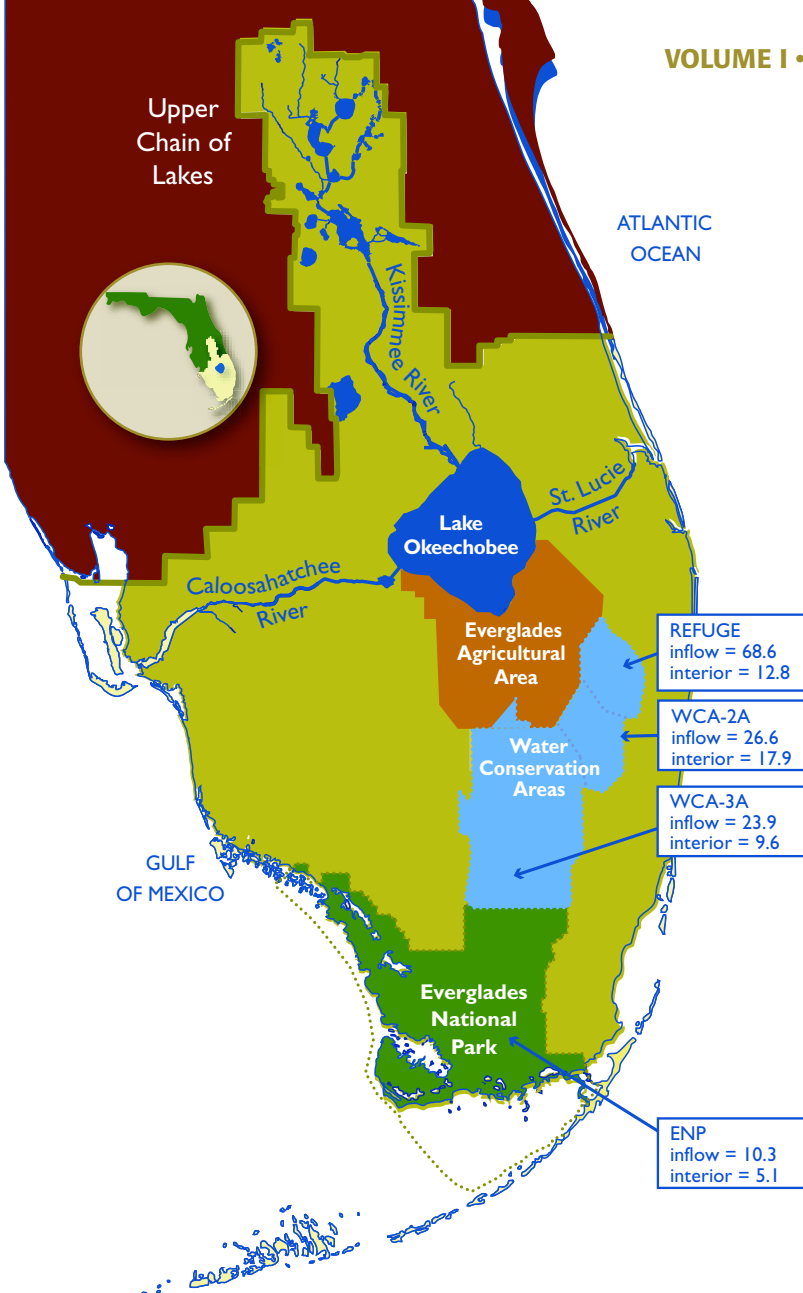
In contrast, TP concentrations at the interior marsh sites did not reflect the peaks in inflow concentration and exhibited a nearly opposite trend than the inflows. During periods of high rainfall when inflow concentrations were

maximized, the TP concentrations at interior marsh sites were generally low, likely due to dilution. Conversely, when rainfall was low for extended periods, and following marsh dryout, nutrients were released into surface waters during rainfall events. During WY2005, peak TP concentrations at interior sites generally occurred during two periods (May–June 2004 and February–March 2005), when portions of the marsh dried out and exposed sediments, followed by sufficient rainfall to transport released nutrients from the sediments. Notably, during more normal conditions, both inflow and interior TP concentrations in the EPA returned to levels similar to lower levels observed in last year. Similar trends during WY2005 were observed for soluble orthophosphate. This quick recovery suggests that the extreme conditions experienced during this water year did not result in any long-lasting impacts to the system.

During WY2005, inflow and interior geometric mean TP concentrations exceeded levels reported in WY2004 and the historical period. The annual geometric mean TP concentration across interior marsh sites in WCA-3 and the Park remained below the phosphorus criterion of 10 parts per billion (ppb). The geometric mean concentrations for the interior marsh sites in WCA-1 and WCA-2 were slightly above the annual 11-ppb limit, due to the impacts from the unusual climatic events during WY2005. Again, these higher levels obviously reflect the extreme conditions experienced during WY2005 and are not considered to be a worsening of nutrient conditions in the marsh, or a reversal of the general decreasing concentration trend noted in previous consolidated reports.

FINAL PHOSPHORUS CRITERION RULE IS UNANIMOUSLY APPROVED

The Florida Department of Environmental Protection has used the results of extensive research to numerically interpret the existing narrative criterion, as directed by the Everglades Forever Act, to propose a total phosphorus criterion of 10 ppb for the EPA. The 10-ppb TP criterion rule was approved during the FDEP's Environmental Regulation Commission (ERC) in July 2003. Following this approval, both environmental and agricultural interest groups filed administrative challenges, resulting in an administrative hearing over



WY2005 GEOMETRIC MEAN PHOSPHORUS CONCENTRATIONS (ppb)

WY2004 Geometric Mean Phosphorus Concentrations (ppb)

EPA AREAS:		
REFUGE	INFLOW = 38.8	INTERIOR = 9.3
WCA-2A	INFLOW = 24.0	INTERIOR = 11.8
WCA-3A	INFLOW = 26.4	INTERIOR = 7.6
ENP	INFLOW = 7.7	INTERIOR = 4.3

TOTAL PHOSPHORUS CONCENTRATIONS IN THE EPA

several months. In June 2004, a final order was filed by an administrative law judge in favor of the state of Florida upholding all parts of the proposed rule, which was then submitted to the U.S. Environmental Protection Agency for approval.

In January 2005, the USEPA approved all portions of the rule, except the use of the assessment methodology for achievement of the criteria in the Refuge specified in Appendix B of the Settlement Agreement in the federal Everglades lawsuit. The FDEP revised the rule to apply the same four-part test that is used for WCA-2 and WCA-3 to assess achievement of the criteria to the Refuge. The revised rule was presented to the ERC and received unanimous approval in April 2005. It was then filed with Florida's secretary of state in May 2005 and received final approval from the USEPA in July 2005. The FDEP is currently working with the District and other interested parties to establish the monitoring networks to track compliance with the rule. Future evaluations of the phosphorus status in the EPA will be conducted in accordance with the requirements of the final rule.

WY2005 NITROGEN LEVELS VARY ACROSS THE EPA

As documented for previous years, water quality results for WY2005 show that total nitrogen (TN) concentrations decreased from north to south in the EPA regions. Similar to phosphorus, this gradient likely reflects the higher concentrations associated with agricultural discharges to the northern portions of the system, with levels gradually reducing across the marsh as water flows southward.

Overall, TN concentrations measured across all portions of the EPA during WY2005 were more variable than those observed in previous years. Except for the Park, the mean inflow TN concentrations during WY2005 were the same or lower than those reported last year. In contrast, TN concentrations at interior sites during WY2005 were higher than levels reported last year in all areas, due to the effects of marsh dryout and the associated nutrient release resulting from sediment oxidation. Mean TN concentrations at inflow stations during WY2005 ranged from 1.1 to 2.5 parts per million (ppm), with the mean concentration at interior marsh stations ranging from 1.3 to 2.3 ppm.

Phosphorus Controls for the Basins Tributary to the Everglades Protection Area

Chapter 3 of the *2006 South Florida Environmental Report – Volume I* 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 stipulated in Florida Department of Environmental Protection (FDEP) permits 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.

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 (see map on page 7), the largest tributary sources to the EPA. It also requires the District to provide reasonable assurance that a phosphorus source control program using Best Management Practices (BMPs) has been implemented in the EAA and C-139 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. These drainage areas discharge directly into the EPA with no downstream treatment through the STAs. They are known as the non-ECP basins and have voluntary or cooperative source control programs. The District is responsible for administering the non-ECP permit for eight basins, including 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 on page 29).

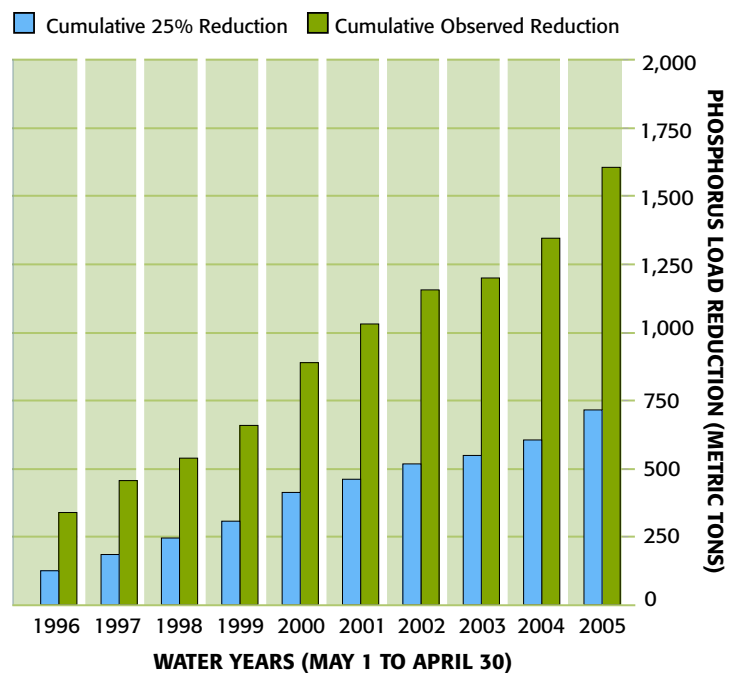
In order to meet both ECP and non-ECP permit requirements, basin-specific water quality data for total phosphorus (TP) collected by the District during WY2005 is presented in this chapter. Notably, WY2005 was characterized by an unprecedented active hurricane season, and some of the ECP and non-ECP basins were in the direct path of hurricanes Charley, Frances, and Jeanne. Although the 2004 hurricanes did not have major effects on the Everglades source control programs as a whole, they

did affect some water quality results. It appears that the effects were caused primarily by localized, higher-than-average rainfall in specific areas.

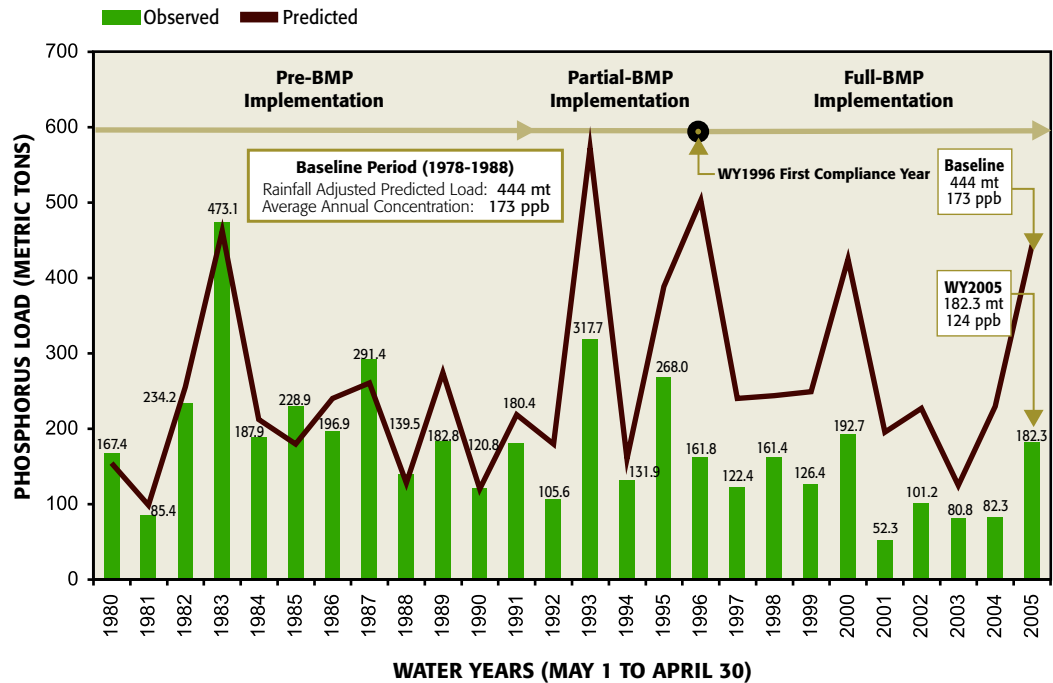
BMP PROGRAM HAS KEPT MORE THAN 1,600 METRIC TONS OF PHOSPHORUS FROM LEAVING THE EAA

Notably, the EAA basin has been in compliance with the BMP Everglades Regulatory Program for the last 10 years, since its first compliance year of BMP implementation in WY1996 (see figure on page 15). As shown in the figure below, this program has prevented a total of 1,617 metric tons (mt) of phosphorus from leaving the EAA in water discharges. The ECP permit requires the EAA basin to reduce TP loads by 25 percent when compared to the 10-year, pre-BMP baseline period (October 1, 1978–September 30, 1988). The TP load discharged from the EAA basin in WY2005 was 182.3 mt, representing a significant increase

TOTAL PHOSPHORUS LOAD REDUCTION FROM THE EAA SINCE WY1996



TOTAL PHOSPHORUS LOADS FROM THE EAA, MEASURED AND CALCULATED SINCE WY1980



over last year, but below the TP load of 444 mt predicted to have occurred in the baseline period. This rise was mainly caused by the higher-than-average rainfall from the 2004 hurricanes, resulting in increased runoff and higher TP loads from the S-5A sub-basin. Overall, the annual percentage load reduction average 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.

BMP PROGRAM SHOWS IMPROVED RESULTS IN THE C-139 BASIN

WY2005 is only the third compliance year for the BMP program in the C-139 basin and its goal is to maintain TP loads at or below historical baseline levels. The C-139 basin has been determined to be out of compliance since its initial compliance period in WY2003 (see figure on page 16). However, WY2005 marked the first time in six years that the flow-weighted mean TP concentration was below 200 parts per billion (ppb). Although the impact of BMPs on water quality was not expected to be realized immediately, a 25 to 30 percent reduction in TP concentrations was observed in the basin over the past year. The lower TP concentration in WY2005, after only three years since the BMP program implementation, suggests that the program is having positive effects.

Building on past accomplishments, continuing optimization of source control programs will improve performance. Because the C-139 basin was out of compliance in WY2005, the action plan for this

basin has been revised to (1) increase the level of BMP implementation, (2) extend existing funding programs to accelerate the implementation of BMPs on individual farms, (3) provide training to landowners on effective implementation of BMPs, and (4) utilize BMP demonstration projects at the farm and regional levels to ensure a holistic approach to improving water quality.

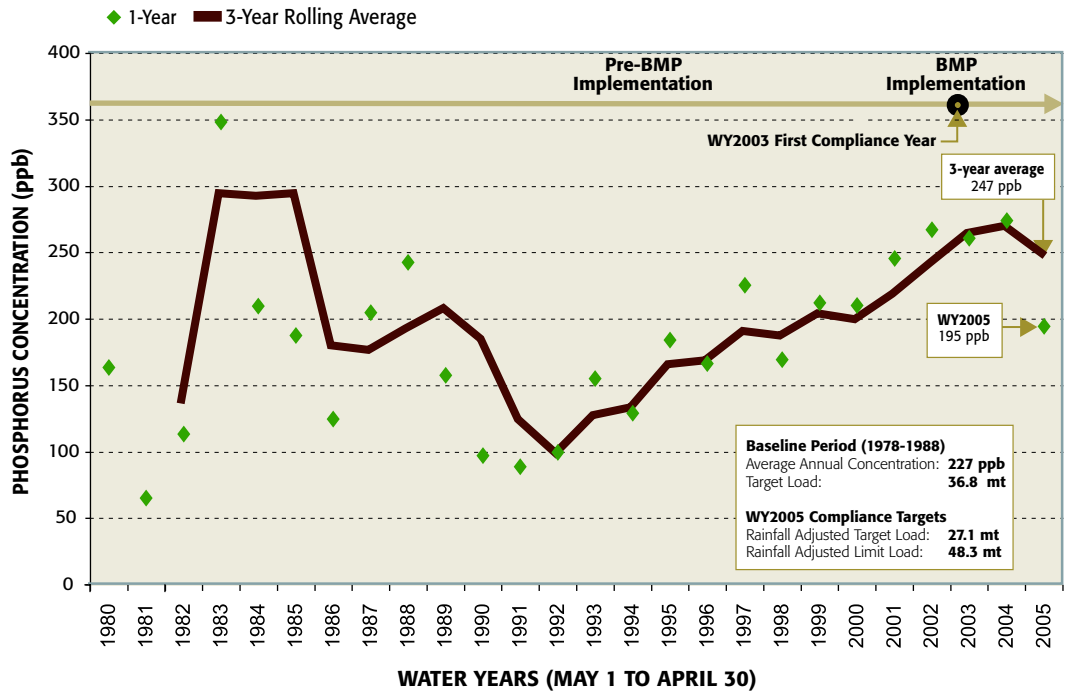
OTHER BMP INITIATIVES ARE PROGRESSING WELL

In addition to BMP implementation, the EFA and Chapter 40E-63, Florida Administrative Code, includes other source control initiatives in the EAA. One key initiative requires EAA landowners to sponsor a program for BMP research, testing, and implementation. Another important initiative expands the BMP program to the



AERIAL VIEW OF AGRICULTURAL LANDS AND
WATER MANAGEMENT AREAS IN THE C-139 BASIN

FLOW-WEIGHTED TOTAL PHOSPHORUS CONCENTRATIONS IN C-139 SINCE WY1980



EFA-specified Chapter 298 diversion areas under the ECP. The 298 diversion areas are basins that previously discharged directly to Lake Okeechobee but are now required to have at least 80 percent of their annual flow and TP load diverted to the STAs through the EAA. Once all of the 298 District diversion projects are completed, flows from approximately 28,500 acres that previously discharged only to Lake Okeechobee will combine with flows from the EAA (500,000 acres) and be routed to the ECP.

ESP PROGRAM TRACKS PROGRESS TOWARD ACHIEVING WATER QUALITY GOALS IN NON-ECP BASINS

Unlike the ECP basins, there is no specific phosphorus requirement established at the point of discharge for the non-ECP basins. It is anticipated that the implementation of the water quality improvement plans in these basins will significantly contribute to achieving long-term water quality goals in the EPA. Water quality data is continually tracked so that the plans can be modified adaptively to optimize phosphorus reduction at the source.

Water quality data from non-ECP structures during WY2005, the eighth year of non-ECP data, were evaluated against state water quality criteria. The quality of water discharging into the EPA during WY2005 was generally acceptable, with some exceptions (e.g., phosphorus and dissolved oxygen). Similar to previous years, analysis of TP concentrations in WY2005 continues to indicate significant differences 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 WY2005, four of the eight non-ECP basins had either no discharge to the EPA or had TP concentrations below 20 ppb. The overall TP load from non-ECP basins into the EPA during WY2005 was 10 percent less than in WY2004.

EVERGLADES LONG-TERM PLAN OPTIMIZES SOURCE CONTROLS

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 the Comprehensive Everglades Restoration Plan and other federal projects.

PUBLIC OUTREACH IS VITAL FOR SOURCE CONTROLS

Public education and outreach is a major component of water quality improvement plans. An educational web site (<http://www.sfwmd.gov/everglades4ever>) guides the public to diverse information on source control programs, including information on turf and landscape and equine BMPs. District staff and stakeholders are cooperating through working groups to develop BMPs and promote their application.

STA Performance, Compliance and Optimization

To date, more than 40,000 acres of treatment wetlands have been constructed in the Everglades region by the South Florida Water Management District and the U.S. Army Corps of Engineers (USACE), as mandated in the 1994 Everglades Forever Act. These wetlands, known as Stormwater Treatment Areas (STAs), are crucial components of Everglades restoration. The primary purpose of the STAs is to remove excess total phosphorus (TP) from surface waters entering into the Everglades Protection Area (EPA) by accumulating phosphorus in the sediments through biological and chemical wetland processes (see diagram below). In an STA, water moves through vegetated treatment cells aligned in one or more parallel flow-ways that are operated in unison to optimize nutrient removal.

The various aspects of the STAs, such as operations, vegetation management, phosphorus performance, water quality monitoring, and permit compliance for each of the six treatment areas [STA-1 East (STA-1E), STA-1 West (STA-1W), STA-2, STA-3/4, STA-5, and STA-6], are presented in Chapter 4 of the *2006 South Florida Environmental Report – Volume I* (see overview on page 18). As part of the integrative theme for this year's SFER, this chapter includes STA-specific impacts

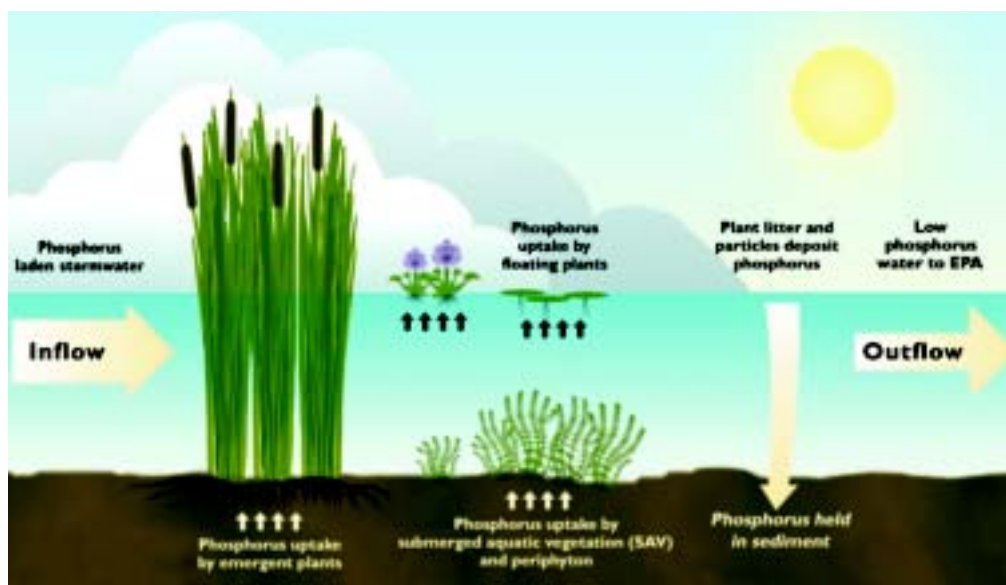


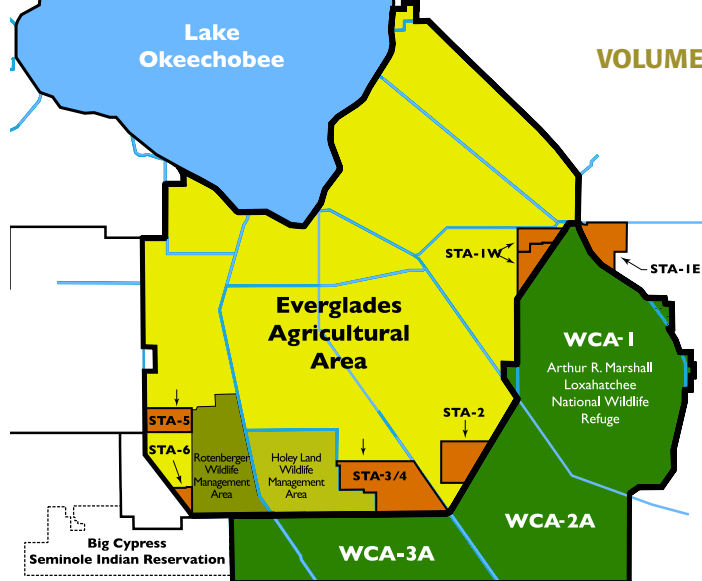
associated with the 2004 hurricanes. The chapter also provides an update of the progress of STA enhancement projects identified in the Long-Term Plan for Achieving Water Quality Goals in the EPA (see Volume I, Chapter 8).

STA PERFORMANCE AND ENHANCEMENT

STA ENHANCEMENTS IN SELECT CELLS INCLUDE:

- ADDITIONAL
COMPARTMENTALIZATION
- IMPROVEMENT
OF FLOW CONTROL
- CONVERSION OF
VEGETATION TO SAV





STA OVERVIEW

During Water Year 2005

STA-1E	<ul style="list-style-type: none"> • 5,132 acres* • Initial flooding in summer 2004; discharge permit granted in September 2005 • Completed by the USACE, and two of the three flow-ways are currently in flow-through operation • The USACE is constructing a PSTA demonstration project in the remaining flow-way • Enhancements: Establish SAV in emergent marsh cells prior to and during start-up
STA-1W	<ul style="list-style-type: none"> • 6,670 acres • Removed 57 mt TP • 55% reduction • Inflow TP reduced from 247 ppb to 98 ppb • Utilized adaptive management activities • Refined operational strategies and principles in response to hydraulic overload event and hurricane damage • Enhancements: Constructed divide levee in Cell 2; improved water control structures
STA-2	<ul style="list-style-type: none"> • 6,430 acres • Removed 40 mt TP • 81% reduction • Inflow TP reduced from 126 ppb to 20 ppb • Refined operational strategies and principles • Enhancements: Hydraulic tracer study in Cell 3
STA-3/4	<ul style="list-style-type: none"> • World's largest constructed wetland operational • 6,543 acres • Better than anticipated phosphorus removal: removed 77 mt TP • 88% reduction • Inflow TP reduced from 105 ppb to 13 ppb • Completed grant to evaluate methods for eliminating undesirable vegetation (herbicide, fire, flooding) • Constructed full-scale PSTA demonstration project completed; currently in vegetation establishment phase • Enhancements: Successfully transplanted more than 60,000 pounds of SAV to accelerate vegetation grow-in
STA-5	<ul style="list-style-type: none"> • 4,110 acres • Removed 12.2 mt TP • 50% reduction • Inflow TP reduced from 165 ppb to 81 ppb • Enhancements: Constructed divide levee between Cells 1A and 1B; improved water control structures
STA-6	<ul style="list-style-type: none"> • 870 acres • Removed 2.7 mt TP • 84% reduction • Inflow TP reduced from 78 ppb to 19 ppb

*Denotes effective treatment area

DESPITE THE 2004 HURRICANES, THE STAS CONTINUE TO WORK WELL

Hurricanes Frances and Jeanne impacted the STAs in fall 2004. Both hurricanes damaged the wetlands, degraded levees, caused erosion around some of the water control structures, and uprooted submerged aquatic vegetation (SAV), especially at STA-1E, STA-1W, and STA-2. Inflows into the STAs were very high during August and September 2004. Hurricane Frances also temporarily caused emergency conditions affecting public health that necessitated an Emergency Authorization and Order to operate STA-1E prior to permit issuance. Strong winds and heavy rainfall during the hurricane also impacted STA-3/4, STA-5, and STA-6, although no damage was observed in these resilient wetlands.

Despite the 2004 hurricane-related impacts and increased flow and TP concentrations received, STA operations were able to reduce TP concentrations by 71 percent during WY2005. The operational STAs together treated almost 1.5 million acre-feet (ac-ft) of inflow and removed 189 metric tons (mt) of TP from surface water. TP concentrations were reduced from an average of 147 ppb (inflow) to an average of 41 ppb (outflow).

The final STA to be built as part of the Everglades Construction Project, STA-1E, was completed by the USACE and the permit to discharge was issued in September 2005. Two of the three flow-ways are currently in flow-through operation. The USACE is currently constructing a Periphyton-Based Stormwater Treatment Area (PSTA) demonstration project in the remaining flow-way at this STA to evaluate the applicability of using an algal-based system as a means to further reduce TP concentrations.



A NEW WATER CONTROL STRUCTURE, G-307, IS BEING CONSTRUCTED AS PART OF STA-1W ENHANCEMENTS.



LARGE GATED STRUCTURES AND PUMPS, SUCH AS G-302 AT STA-1W, ARE USED TO MOVE WATER THROUGH THE STAS.

LONG-TERM PLAN ENHANCEMENTS CONTINUE TO IMPROVE STA PERFORMANCE

Implementation of the Long-Term Plan enhancements continues at the STAs. These enhancements include elements aimed at improving the water flow through wetlands, expanding STAs, and encouraging growth of desirable plant communities. Construction activities, such as building divide levees and improving water control structures, occurred in WY2005 at STA-1W, STA-3/4, and STA-5.

The District continues to conduct research on the application of alternative technologies to reduce phosphorus concentrations leaving the STAs. A full-scale, 400-acre PSTA demonstration project located in STA-3/4 was completed in July 2005, and vegetation is now being established in this study area.

Future expansion of STA-2 and STA-5 was made possible by the availability of additional land that had been designated for the CERP Compartments B and C Reservoir projects. This expansion will provide about 18,000 acres of additional treatment area and is scheduled to start in early 2006.

Vegetation management has an important role in the STAs. Results from research projects are used in conjunction with a maintenance program to promote select vegetation in the STAs. Research projects conducted in WY2005 include the evaluation of the effects of a large-scale inoculation program on the establishment of SAV in STA-3/4 and the use of management options such as herbicide, flooding, and fire on the control of undesirable species.

OPTIMIZATION AND ADAPTIVE MANAGEMENT ARE KEY TO EFFICIENCY

Increasing the phosphorus removal capability of the STAs is a fundamental goal of their management. To better understand and operate these large, biological treatment systems, adaptive management responses and optimization activities are utilized. The adaptive management activities include evaluating real-time data as compared to how they were designed and developing a recovery plan for STA-1W in response to hydraulic overloading events and hurricane damage to the SAV communities. The optimization program includes analytical evaluations, such as estimating treatment cell water and nutrient budgets and quantifying the soil and vegetation components of the wetland.

STAS PROVIDE OPPORTUNITIES FOR PUBLIC RECREATION

The abundant wildlife found in the STAs can be enjoyed as recreational opportunities are opened to the public. Duck hunting and bird watching tours are being conducted at STA-1W and STA-5, and future plans to incorporate nature interpretative centers and other facilities are scheduled. Further information about the STAs, including recreational activities, can be found in the *Everglades* section of the District's web site at <http://www.sfwmd.gov>.



Hydrology of the South Florida Environment

Information on hydrology is essential to the entire South Florida environmental restoration and water management functions of the South Florida Water Management District. Therefore, an entire chapter in the *2006 South Florida Environmental Report – Volume I* is devoted to a detailed account of annual hydrology for the region. Chapter 5 updates hydrologic data and

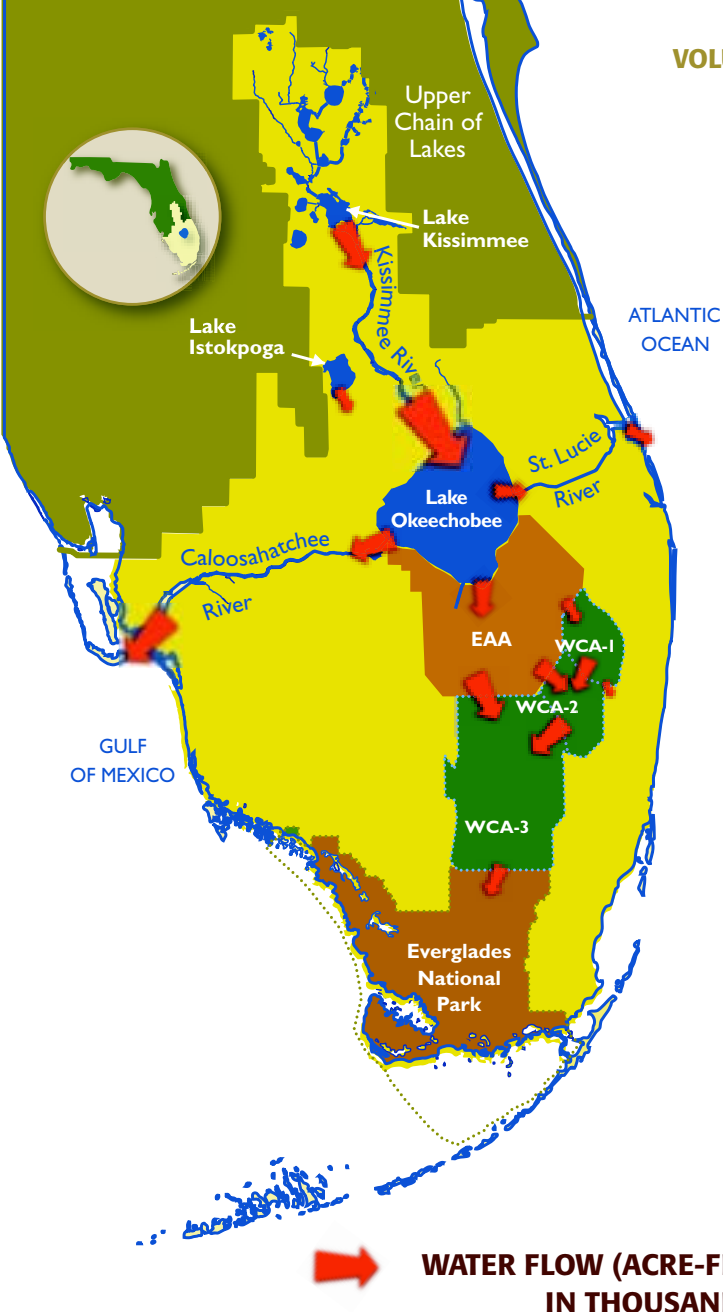
analysis from the *2005 South Florida Environmental Report* with coverage on hydrology of the entire area within the District's boundaries, providing a comprehensive overview of the South Florida hydrology in three chapter sections. The first section presents an analysis on long-term temporal and spatial variation of South Florida hydrology. The second section documents the hydrologic impact of the 2004 hurricane season on South Florida and includes historical records of hurricane events on South Florida. The third section summarizes WY2005 hydrology – rainfall, potential evapotranspiration, water levels, inflows, and outflows – collected during the water year for all major components of the South Florida region. In this section, hydrologic conditions in this water year were compared with the previous water year, WY2004. For comparison, historical hydrologic data also was analyzed and contrasted with the current and previous water year's hydrology.



IN WY2005, ABOVE-AVERAGE RAINFALL IN THE NORTH HAD SIGNIFICANT IMPACT ON THE WATER MANAGEMENT SYSTEM.

SOUTH FLORIDA IS A DYNAMIC SUBTROPICAL ENVIRONMENT

South Florida experiences climatic variation that ranges from extreme droughts to extreme wet conditions. The hydrology of the area is driven by rainfall inputs, surface water runoff, and evapotranspiration releases to the atmosphere. Rainfall observations at rain gauges across South Florida vary greatly through time, ranging widely from 30 to 100 inches. Rainfall varies seasonally with June being wettest and December being driest, and about two-thirds of rainfall occurring from June through October during the wet season. The average yearly rainfall within the District is 52.8 inches, but rainfall is lowest in the Kissimmee and Lake Okeechobee regions to the north and highest along the southeastern coast in Palm Beach, Broward, and Miami-Dade counties. The loss of water to the atmosphere via evapotranspiration is lowest in December and highest in May. Severe droughts occur about every 10 years and have dramatic effects on lake levels and the incidence of wild fires.



WY2005 INFLOWS AND OUTFLOWS INTO MAJOR HYDROLOGIC COMPONENTS OF SOUTH FLORIDA

TROPICAL SYSTEMS ARE COMMON OCCURRENCES IN SOUTH FLORIDA

Tropical systems, often accompanied by damaging winds and surge, are an important source of rainfall and environmental stress for South Florida. As such, information on these systems is essential to understanding aspects of the region's hydrology and ecology. Interestingly, Atlantic hurricanes have been observed for more than 500 years. As part of the research for this year's chapter, published historical records on tropical cyclones, storms, and hurricanes affecting Central and South Florida from 1871–2004 were collected from the National Hurricane Center and other available sources and concisely summarized into a reference table. According to the records, the average annual number of tropical storms and hurricanes in the North Atlantic Ocean from 1886–1994 was about nine per year, of which half were typically hurricanes. From 1871–1996, there were 114 hurricanes and tropical storms affecting peninsular Florida. On the average, Florida is impacted by about one named storm every year and a hurricane every two to three years. Narrowing down to the District, South Florida has been affected by 91 named storms, including 48 hurricanes, from 1871–2005.

**WATER FLOW (ACRE-FEET
IN THOUSANDS)**

Lake Kissimmee Outflows	1,397K
Lake Istokpoga Outflows	405K
Lake Okeechobee Inflows	3,502K
Lake Okeechobee Outflows	2,833K
St. Lucie Canal Inflows	630K
St. Lucie Canal Outflows	707K
Caloosahatchee Inflows	1,210K
Caloosahatchee Outflows	2,002K
WCA-1 Inflows	477K
WCA-1 Outflows	411K
WCA-2 Inflows	980K
WCA-2 Outflows	876K
WCA-3 Inflows	1,367K
WCA-3 Outflows	972K
ENP Inflows	803K

AN UNPRECEDENTED STORM SEASON IN 2004 HAS A CASCADING IMPACT

The South Florida water management system consists of lakes, impoundments, wetlands, and canals that are managed for flood control, water supply, and environmental needs. The general surface water direction is from the north to the south, but there are also water supply and coastal discharges to the east and the west. The major hydrologic components within the District's boundaries are the Upper Kissimmee Chain of Lakes, Lower Kissimmee Basin, Lake Okeechobee, Lake Istokpoga Surface Water Management Basin, Everglades Agricultural Area, Caloosahatchee Basin, St. Lucie Basin, and Everglades Protection Area.

South Florida experienced an extremely rare occurrence of a series of hurricane events in WY2005. As depicted on the map on page 9, the region was hit by three major hurricanes (Charley, Frances, and Jeanne) and a remnant of a fourth hurricane (Ivan) in less than seven weeks during August and September 2004. All of these hurricanes had far-reaching hydrologic impacts on South Florida. From available records since 1871, such a series of storm events on South Florida had not been previously observed until 2004. The losses from these hurricanes were extremely high. High rainfall, high surface water flows, and rises in water levels in lakes were experienced during the hurricane events and following months.

The 2004 hurricanes drove an imbalance in water inputs and outputs that altered the region's environmental conditions through the year. The map on the preceding page provides an overview of the hydrologic features and water movement in South Florida during WY2005. Due to impacts of the 2004 hurricane season as well as wide-ranging climatic conditions throughout the District, there were notable variations in the water conditions between northern and southern components of the water management system throughout the water year. In the northern areas, inflows to Lake Okeechobee were more than 1.5 times the long-term average and the lake's outflow was nearly two times the historical average, mainly due to the 2004 hurricanes. This unexpected rise in volume had a cascading effect on the St. Lucie and Caloosahatchee estuaries, which generally received more fresh water in FY2005 than anticipated, up sharply from historical averages. Farther south, Water Conservation Area 1 (WCA-1) inflows and outflows were slightly lower than historical averages. Conversely, WCA-2 inflows and outflows were much higher than historical averages. WCA-3 inflows and outflows were similar to historical averages. In contrast to the other areas in the South Florida region, WY2005 inflows to the Everglades National Park were much lower – approximately 65 percent of historical levels. Overall, these differences in water conditions throughout the region continue to underscore the ongoing challenge for restoring and managing the South Florida environment with large subregional variation linked through a water management system.

A SERIES OF FOUR HURRICANES IN SEVEN WEEKS PUT INCREASED DEMANDS ON DISTRICT OPERATIONS



DESPITE THE 2004 HURRICANES, THE DISTRICT OVERALL HAD LOWER RAINFALL IN WY2005

South Florida is a high-rainfall area, mainly driven by the variability associated with convective and tropical rainfall events. Despite the remarkable four-hurricane season, rainfall in WY2005 for the District area (50.7 inches) was lower than WY2004 (52.4 inches) and the historical average (52.8 inches). Generally, in WY2005 the northern areas of the District had higher rainfall due to the 2004 hurricanes. Rainfall areas from Lake Okeechobee south to the Everglades National Park had below historical average rainfall for this water year, corresponding quite well to the paths of the three hurricanes (Charley, Frances, and Jeanne) that crossed through the northern portion of the District. Because the above-average rainfall occurred in the large rainfall areas of the Upper and Lower Kissimmee, the headwaters of Lake Okeechobee, the rise in water levels and flows had significant impact on the water management system.

WATER CONDITIONS IN WY2005 VARIED GREATLY ACROSS THE REGION

The unique conditions in 2004 were reflected in components of the water cycle. In addition to rainfall, evapotranspiration is another key hydrologic parameter

monitored. The balance and distribution of these two parameters in the hydrologic system leads to wet or dry conditions. Evapotranspiration, the process by which water is released to the atmosphere by evaporation from water surfaces and transpiration from plants, is primarily related to solar radiation and varies spatially and temporally over South Florida. Similar to previous water years, evaporation in WY2005 from lakes, wetlands, and impoundments, which cover a significant portion of South Florida, was close to the expected District-wide average of 52.7 inches.

Throughout South Florida, water levels are mostly influenced by rainfall, evapotranspiration, seepage, and surface water management. During WY2005, monthly average water levels in most of the lakes in the Upper Chain of Lakes were generally higher than WY2004 levels and historical average levels. Despite the 2004 hurricanes, water levels for the remaining areas to the south were generally comparable to previous water years. The Lake Okeechobee average water level for WY2005 was lower than the WY2004 average water level. The 2004 hurricanes generated large inflows into Lake Okeechobee and raised the water level to 18.0 ft NGVD on October 13, 2004. However, because the lake stage was at a low level of 12.2 ft NGVD on July 17, 2004 (prior to the 2004 hurricanes), the average stage for the year was less than WY2004. The average water levels observed throughout the Everglades Protection Area during WY2005 were lower than observed in WY2004.



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. Chapter 6 of the *2006 South Florida Environmental Report – Volume I* updates some recent ecological research programs associated with wildlife, plant, ecosystem, and landscape ecology of the Everglades Protection Area (EPA). These programs, sponsored by the South Florida Water Management District and other collaborating agencies, continues to focus on (1) characterizing the existing communities, (2) creating a baseline dataset, (3) relating patterns of distribution and abundance to hydrology, and (4) evaluating performance measures and alternatives for preservation and restoration.

RIISING TREND OF WADING BIRD NESTING TAKES A TURN IN WY2005

Each year, the District and other supporting governmental agencies monitor wading bird nesting success in South Florida. The estimated number of wading bird nests in South Florida in 2005 was 31,869. This is a 41 percent decline since last year's relatively successful season and a 54 percent decline from the record year of 2002, the best nesting year on record since the 1940s. Although the 2005 estimate is relatively high compared to the average of recent decades, it represents a sharp divergence from the general increasing trend recorded since 1999. Reduced prey availability, as a result of anthropogenic changes in hydrology, is considered the primary factor responsible for the decline in Everglades wading bird populations.

During WY2005, despite the substantially lower-than-average rainfall in each of the Everglades sub-basins, hydrologic conditions were generally higher than the average throughout most of the EPA. The inconsistency between lower-than-average rainfall and higher-than-average stage is due to two significant hydrologic events. The first event was an extended dry season that ended in mid-July 2004. This dry period was unusually severe due to the lack of rain in June, a month that normally contributes 10 to 12 inches of precipitation to the annual total. The second was a series of hurricanes in August and September 2004 that quickly filled all the District's basins, which in turn could not be drained for an extended period due to a lack of conveyance. These extremes created unfavorable foraging habitat and resulted in an overall poor nesting season.

ENVIRONMENTAL STUDIES BRIDGE SCIENCE AND WATER MANAGEMENT

The threat to the numerous species that depend on tree islands, a cornerstone of Everglades ecology, is increased by the reduced number and quality of tree islands relative to historical times. Consequently, ongoing plant ecology studies on tree islands are being performed to better understand vegetation dynamics in relation to water management activities in the region. Efforts for Everglades restoration will require preventing additional tree island losses, restoring islands where they have been lost, and possibly creating them to mitigate for losses. In order to accomplish such efforts, the District is continuing its implementation of the Loxahatchee Impoundment Landscape Assessment (LILA) research facility at the Arthur R. Marshall Loxahatchee Wildlife Refuge. One purpose of LILA is to assess tree island restoration techniques for developing cost-effective and reliable protocols, which are not well known.

In 2004, the District initiated a LILA experiment to assess the drought and flood tolerances of seedlings of eight typical tree island species. While all species were impacted, the most drought-resistant species was dahoon holly (*Ilex cassine*), and the most flood-resistant species was coastal plain willow (*Salix caroliniana*). The findings of this study also showed that the overall mortality rate for the seedlings observed for the three-month drought was slightly greater than for the six-month flood. This suggests that seedling



POND APPLE SEEDLINGS WERE PLANTED IN THE LILA RESEARCH FACILITY AT THE REFUGE IN SPRING 2004.

populations may be more sensitive to drought than flooding. This year, the results from belowground root analysis on tree islands located on Water Conservation Area 3 (WCA-3) were also completed. Surprisingly, the tree islands with longer hydroperiods (that is, standing water present for at least seven months of the year) had a significantly greater amount of live roots, which appears to be an adaptive response to the stress of flooding and reduced oxygen levels. As the District's tree island program continues, more detailed studies will be performed to understand natural patterns on tree islands and the potential to restore islands that have been lost.

NEW RESEARCH REVEALS INFORMATION ON AQUATIC ECOSYSTEMS IN THE EVERGLADES

This year, the District initiated two new studies to evaluate how aquatic organisms interact with hydrology. The first study was conducted at the LILA facility to examine how populations of a key trophic species, the

slough crayfish (*Procambarus fallax*), responds to changing hydrologic conditions, and to determine the implications of this response for wading birds. The findings of this study show that the crayfish responds to seasonal drawdown by remaining on the sawgrass ridges, which provide shelter from foraging wading birds until water levels become low. As water levels continue to decline, they move into the sloughs where they become more available to foraging birds. Understanding these types of crayfish responses may be essential for the successful restoration of Everglades wading bird populations.

Alarming, at least 36 nonindigenous fish species have become established in South Florida through anthropogenic introductions, and many species are now abundant within the canal system that surrounds and dissects the EPA. To better understand the impacts of such species on the Everglades ecosystem, the District has launched an extensive survey of exotic fishes in the vicinity of the L-67 canal in WCA-3. Initial results suggest that at least two exotic species – and possibly a third – are now using Everglades marsh habitat for refuge or feeding. To date, little is known of the distribution and abundance of these invaders yet their potential effects on native aquatic communities, as well as wading bird populations, may be significant. Therefore, future studies will be needed to focus on the factors determining the distribution of invasive fish species and to reevaluate the specific physiological requirements that are necessary for these species to successfully adapt to regional conditions.

MAPPING TECHNIQUES CONTINUE TO DEFINE THE EVERGLADES LANDSCAPE

The District continues to map the Everglades landscape, building on existing vegetation maps created with special remote sensing and photointerpretation techniques. These techniques are important for the Water Conservation Areas, which were originally designed for flood control and water supply but are now recognized for the ecological value in restoring the Everglades. In addition to WCA-3, the District has recently completed the first grid-based vegetation mapping projects for WCA-2A and the Rotenberger Wildlife Management Area utilizing 1:24,000 scale color infrared aerial photographs. Additionally, the District has initiated a new program to evaluate and monitor tree island hydrology by completing the construction of 31 new benchmarks in WCA-3. These benchmarks will be used to obtain reliable elevation and water depth measurements. To continue the analysis of the pre-drainage system and better understand the ecological processes that drive the Everglades, the District has also completed a new elevation contour that, when peer reviewed, will be used with the District's Natural System Model to help set restoration performance goals.

Comprehensive Everglades Restoration Plan Annual Report

The Comprehensive Everglades Restoration Plan (CERP) is focused on restoring the quantity, quality, timing, and distribution of water to the Everglades ecosystem. The goal of CERP is to restore, preserve, and protect South Florida's ecosystem, and to provide for other water-related needs of the region, including water supply and flood protection. Strategies for achieving this goal include implementing Acceler8; continuing to acquire necessary land; and completing Project Implementation Reports (PIRs). Chapter 7A of the *2006 South Florida Environmental Report – Volume I* presents the fifth CERP Annual Report, as required by Section 373.470(7), Florida Statutes. This report, comprised of three parts, summarizes the progress of CERP implementation and related financial information for FY2005.



NEARLY 250,000 NATIVE PINE SEEDLINGS WERE PLANTED IN 2005 FOR THE ALLAPATTAH NATURAL STORAGE AREA RESTORATION.

CERP EXPENDITURES EXCEED \$260 MILLION IN FY2005

In Part (A), the South Florida Water Management District and the Florida Department of Environmental Protection (FDEP) jointly identify funding sources and amounts, itemize FY2005 expenditures and fund balances, and provide a schedule of anticipated expenditures for FY2006. In FY2005, total CERP revenues were \$236,696,387 and total CERP expenditures were \$260,066,511 (unaudited). The anticipated expenditures for FY2006 are \$442,377,410 (unaudited).

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. FY2005 acquisitions increased the total lands available for use by CERP projects to 193,574 acres and 18,130 acres for the STA Expansion Acceler8 project. To date, more than 50 percent of the land for CERP has been acquired, as discussed in the Florida Forever Work Plan (see Volume II, Chapter 6).

MAJOR CERP MILESTONES WERE ACHIEVED IN FY2005

Stepping up the pace of Everglades restoration, the Acceler8 initiative was launched in October 2004 to expedite the construction and operation of eight ecosystem restoration projects. With a projected total cost of \$1.5 billion, the initiative is expected to achieve 70 percent of the restoration plan's goals by 2011 – five years ahead of the current schedule – while maintaining CERP's momentum. Initial efforts, such as surveying and design, are under way for all Acceler8 projects, while construction is scheduled from FY2006–FY2007.

In FY2005, the Acme Basin B Discharge and Site 1 Impoundment Draft PIRs were completed. The Master Implementation Sequencing Plan and the Five-Year Report to the U.S. Congress were completed. The North Palm Beach County – Part 1 Project Management Plan was completed, and construction began on the G-161 structure and M canal widening components. Construction of the Western C-11 Water Quality Improvement Project was completed and the S-381 structure was turned over to the District. Construction was completed at the Taylor Creek STA. The progress of these and other CERP projects and studies, including Acceler8, is reported in Part (C) and on the CERP web site at <http://www.evergladesplan.org>.

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. RECOVER is made up of interagency, interdisciplinary teams sponsored by the U.S. Army Corps of Engineers and the South Florida Water Management District. Chapter 7B of the *2006 South Florida Environmental Report – Volume I* provides an update on RECOVER's monitoring and assessment activities. This update highlights activities in RECOVER's four key mission areas: RECOVER-wide, Assessment, Evaluation, and Planning and Integration. The status of CERP projects is presented in Volume I, Chapter 7A.



Performance Assessment, system responses to CERP implementation are analyzed using an integrative assessment protocol. In Phase 3, Management and Science Integration, new scientific and technical information is integrated into the decision-making process for CERP. In Phase 4, CERP Update Process, the plan is modified as necessary to ensure that its goals and purposes are being met.

The final draft Adaptive Management Strategy is currently being reviewed and is expected to be completed in early 2006.

RECOVER is developing components of the CERP Adaptive Management Strategy including conceptual ecological models, performance measures, interim goals and interim targets, a monitoring program, and an integrative assessment protocol. Conceptual ecological models are being published in a special edition of *Wetlands* in December 2005. Systemwide performance measures for evaluation and assessment have been integrated and are being updated in the revised CERP Systemwide Performance Measures Report, expected to be completed in March 2006. CERP interim goals and targets were completed in February 2005. Implementation of the CERP Monitoring and Assessment Plan is continuing. The final draft Assessment Strategy for the Monitoring and Assessment Plan was reviewed in fall 2005. The strategy provides guidance for the assessment of monitoring information from the plan and a process for preparing annual reports on their findings.

ADAPTIVE MANAGEMENT STRATEGY WILL TRACK CERP PERFORMANCE

As part of RECOVER-wide activities, a CERP Adaptive Management Strategy is being developed. The strategy consists of four phases and contains the principles and guidelines for how adaptive management will operate throughout CERP's implementation. In Phase 1, CERP Planning, adaptive management principles are applied during CERP planning activities. In Phase 2,



THE ROSEATE SPOONBILL NESTING SUCCESS PROJECT MONITORS BREEDING WADING BIRD POPULATIONS IN THE GREATER EVERGLADES.

THE INITIAL CERP UPDATE WAS COMPLETED IN 2005

Another milestone for RECOVER is the completion of the Initial CERP Update in September 2005. This is the first step in assuring that new technical information is integrated into CERP's implementation. The update is the first of the periodic reports required by the Programmatic Regulations for CERP and will be used in determining if the goals and purposes of the plan are achieved or if improvements are warranted. Further information on RECOVER can be found on the CERP web site at <http://www.evergladesplan.org/pm/recover/recover.cfm>.

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

In accordance with the requirements of Section 373.4592(13), F.S., Chapter 8 of the *2006 South Florida Environmental Report – Volume I* presents an update on the progress of the implementation of the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area (known as the Long-Term Plan). The diverse activities in the Long-Term Plan are detailed in several chapters of this volume. Projects being executed under the Everglades Stormwater Program to manage inputs

from tributary basins are highlighted in Chapter 3. Chapter 4 conveys the set of actions being undertaken to enhance the performance of the Stormwater Treatment Areas (STAs) and summarizes data on their performance to date. Research and other technical activities needed to accelerate recovery of impacted areas in the EPA are addressed in Chapter 6. The financial reporting related to the implementation of the Long-Term Plan is covered in Chapter 13.



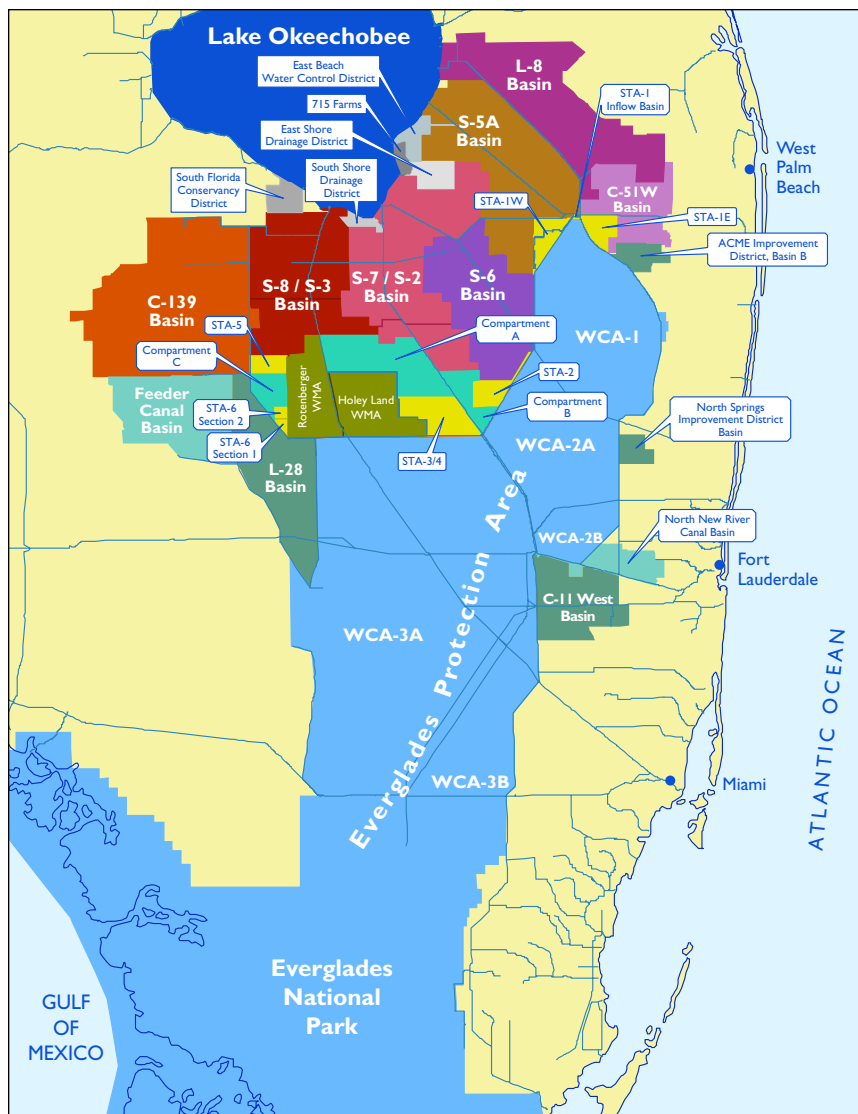
WCA-2 IS PART OF THE EVERGLADES THAT WILL BENEFIT FROM THE WATER QUALITY IMPROVEMENTS REALIZED THROUGH THE LONG-TERM PLAN.

EFA PROGRAMS CONTINUE TO EXCEED EXPECTATIONS FOR ACHIEVING 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 inception and through the end of April 2005, the Everglades Agricultural Area's Best Management Practices and the Stormwater Treatment Areas combined have removed about 2,234 metric tons of TP that otherwise would have entered the Everglades. Of this amount, approximately 445 metric tons of TP were removed during WY2005. Additional source control measures have been implemented in urban and other tributary basins included in the Everglades Stormwater Program (see Volume I, Chapter 3). However, additional measures are necessary to achieve the Everglades water quality goal. The Long-Term Plan contains activities to achieve that goal, and it permits the state of Florida and the South Florida Water Management District to fulfill their obligations under both the Everglades Forever Act and the federal Settlement Agreement (Case No. 88-1886-CIV-MORENO).

LONG-TERM PLAN HAS AN ADAPTIVE IMPLEMENTATION PROCESS

The South Florida Water Management District continued implementation of the Long-Term Plan in FY2005. The 2003 Long-Term Plan contains a proposed process for revisions to the plan, including a public involvement component. In keeping with the adaptive implementation



EPA TRIBUTARY BASINS ADDRESSED IN THE LONG-TERM PLAN

process envisioned during the development of the Long-Term Plan, the first revision to the plan was approved by the Florida Department of Environmental Protection in April 2004 (see the 2005 SFER – Volume I, Chapter 8). The initial revision involved funding a portion of the design activities for the proposed improvements to the Bolles and Cross canals, situated north of STA-3/4. This revision ties into the Acceler8 Everglades Agricultural Area Reservoir - Phase 1 with Bolles and Cross Canals Improvements Project, which is being implemented to provide improved flood protection and water flow capabilities for moving water to the EAA Reservoir and STAs. The District requested a second revision to the plan in November 2004, which was subsequently approved by the FDEP in December 2004. This revision included STA expansion, modifications to the STA enhancements, and the addition of recreational facilities for each STA in accordance with the public access and recreation requirements of the Everglades Forever Act.

THE DISTRICT CONTINUES IMPLEMENTATION OF THE LONG-TERM PLAN

The long-term Everglades water quality goal is for all discharges to the Everglades Protection Area to achieve and maintain water quality standards, including compliance with the phosphorus criterion established in Rule 62-302.540, Florida Administrative Code. In order to achieve this goal, in FY2005 the District continued implementation of the numerous projects of the Long-Term Plan, as required by the EFA, and is following a process of adaptive implementation. The EPA tributary basins included in the plan are illustrated in the map on this page. More details on the Long-Term Plan can be found on the District's web site at <http://www.sfwmd.gov/org/erd/longtermplan/index.shtml>.

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. In 2003–2004, the state expended more than \$100 million on invasive species prevention, control, and management efforts. This widespread impact reaches beyond financial concerns, as 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 enormous challenge to governmental agencies, including the South Florida Water Management District, tasked to manage and restore South Florida's environment. Successful ecosystem restoration hinges on being able to reverse the damaging anthropogenic impacts that have occurred over the last century while preventing further degradation.

Chapter 9 of the *2006 South Florida Environmental Report – Volume I* presents a detailed evaluation of both plant and animal nonindigenous species in South Florida. This chapter reviews the broad issues involving these species in the region and their relationship to restoration,

management, planning, organization, and funding. It also documents several key aspects where recent progress and successes have been made and where future efforts are being developed to bridge data gaps and improve interagency coordination. The report represents the first complete “all taxa” listing for South Florida and

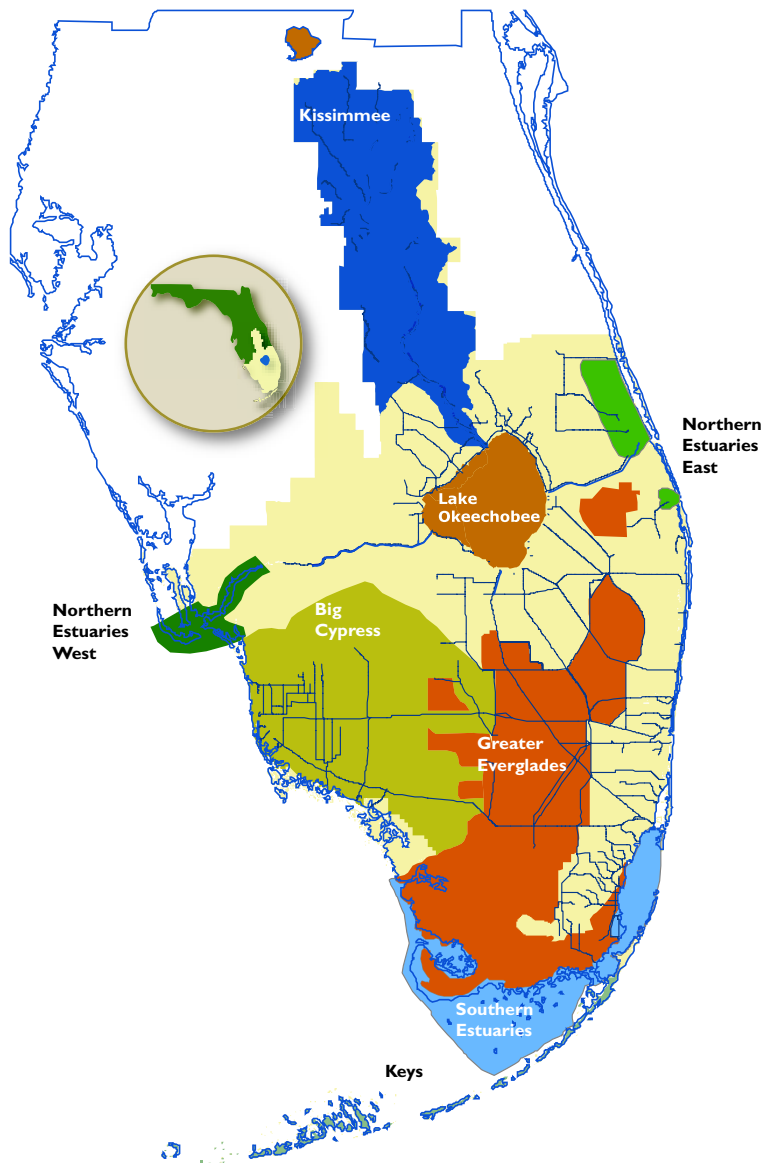
presents the magnitude and extent of the numerous species' threats posed by these invaders. While details on many of these species are still simply unknown, this is the first to provide a comprehensive listing for known or potential species that may jeopardize Everglades restoration.

The chapter also provides a brief review of the relationship between hurricanes and impacts of nonindigenous species. The 2004 hurricanes in South Florida severely damaged many native plant communities, perhaps making them more susceptible to the invasion of exotics. The hurricanes also likely caused the unintended release or spread of nonindigenous animals. However, due to the complexity of invasive species' biology and post-storm effects, hurricane-related impacts are extremely difficult to measure and further work is needed to better understand such relationships.

NONINDIGENOUS SPECIES ARE INVADING AT ALARMING RATES

This year's chapter has been reorganized to highlight nonindigenous species within eight South Florida regions (see map on page 31). These areas are consistent with the regional components (known as modules) identified by RECOVER in the CERP Monitoring and Assessment Plan to aid in improved coordination of invasive species control and management. 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, while aquatic plants such hydrilla (*Hydrilla verticillata*) and water hyacinth (*Eichhornia crassipes*) are high priorities in the Kissimmee and





EIGHT REGIONAL RECOVER MODULES

Non-native Burmese python (*Python molurus bivittatus*) populations appear to be expanding at an alarming rate in the Greater Everglades. In 2005, there were 86 pythons removed from Everglades National Park and surrounding areas, representing a 250 percent increase from last year. A workshop was held in July 2005 to address this growing issue. The Park, with the District's support, is spearheading an unparalleled effort to develop a python management plan. District funding for python research and control was increased by 100 percent for FY2006 to implement control measures.

BIOLOGICAL CONTROL IS ESSENTIAL TO INVASIVE SPECIES MANAGEMENT

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. For the first time, a biocontrol agent – a leaf-eating moth – was released this year in South Florida to help control and minimize the spread of *Lygodium*. While this represents an important step in effectively managing this invader, it will likely take many years to monitor results and determine its effectiveness. Other biocontrol efforts are under way including the CERP Melaleuca Eradication and Other Exotic Plants Project, which will mainly benefit melaleuca and *Lygodium* biocontrol. The project is anticipated to be initiated in FY2009 and implemented over 15 years with a federal cost of about \$4 million.

Lake Okeechobee modules. There are also considerable numbers of nonindigenous animals known to occur throughout the region, ranging from nearly 55 species in the Kissimmee Module up to more than 150 species in the Greater Everglades and Southern Estuaries modules. Despite these numbers, no attempts have been made yet to prioritize animals. Further work is urgently needed for these many plants and animals, especially given their ubiquitous nature in South Florida.

Several milestones were reached in WY2005 – nearly 5,000 acres of *Lygodium* were treated in the CERP project area and the millionth acre of melaleuca was cleared in the Everglades. Ongoing invasive species control efforts also were actively carried out this year. For example, control activities for invasive plants within the Greater Everglades Module totaled 19,136 acres for FY2005. A control and management plan was initiated for the Gambian pouch rat (*Cricetomys gambianus*), an exotic species of interest to the Florida Keys. An updated *Lygodium* management plan is also expected to be completed in early 2006.

Lake Okeechobee Protection Program – State of the Lake and Watershed

Lake Okeechobee, the largest freshwater body in the southeastern United States, is a valuable resource for South Florida. The lake serves as a regional water supply and provides flood control for surrounding areas. It is also home to migratory waterfowl, wading birds, and the federally endangered Everglade snail kite, as well as a multimillion-dollar recreational and commercial fishery. Lake management is essential to address excessive phosphorus loading, unnatural fluctuations in water levels, and the rapid spread of invasive exotic species. The South Florida Water Management District and partnering agencies are addressing these interconnected 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 locations so that water levels in the lake can be properly regulated, while still supporting water supply and other water resource functions.

Chapter 10 of the *2006 South Florida Environmental Report – Volume I*, representing the sixth Lake Okeechobee Annual Report, presents the status of Lake Okeechobee and its surrounding watershed during WY2005. This chapter provides an overview of the major issues impacting water quality and habitat conditions and highlights the implementation of projects to address those issues under the Lake Okeechobee Protection Program. The financial reporting related to the program's implementation during FY2005 is also covered in this chapter.

LONG-TERM EFFECTS OF THE 2004 HURRICANES ARE FAR-REACHING

From August–October 2004, the lake received a huge volume of water from inflows and rainfall totalling 3.2 million acre-feet, which is only slightly below the total average volume typically received for the entire water year. During this three-month period, the lake also received 83 percent of the TP load for the water year. Lake water levels also increased by nearly 6 feet, with the highest levels occurring in mid-October. Consequently, water levels were reduced in the lake through discharges into the St. Lucie and Caloosahatchee rivers, with further releases occurring throughout the water year in order to adhere to the lake's overall regulation schedule.

As a result of the 2004 hurricanes and subsequent windy conditions, large amounts of phosphorus-laden sediments were resuspended and distributed throughout the lake. Sediments reduced light availability, damaging submerged aquatic vegetation (SAV) and increasing blooms of blue-green algae. In August 2004, there were 54,857 acres of SAV in Lake Okeechobee, the maximum coverage recorded since annual mapping surveys were instituted in 1999. Hurricanes Frances and Jeanne produced storm surges of up to 10 feet, wind-driven waves, strong currents, and a rapid increase in lake stage that resulted in immediate and severe damage to much of the lake's emergent and submerged aquatic vegetation.

Excessive phosphorus loads to Lake Okeechobee originate from agricultural and urban activities in the 3.5-million-acre watershed. TP loading now averages 580 metric tons (mt) per year (five-year rolling average, 2001–2005). This is more than four times higher than the recently established Total Maximum Daily Load (TMDL) of 140 mt per year. TP loadings totaling 950 mt during WY2005 were extremely high and directly related to the unprecedented 2004 hurricanes, which drastically impacted the lake and its watershed. Hurricane-related conditions resulted in an increase in phosphorus to historical highs, including an in-lake average of 237 parts per billion for the water year.





THE LAKE OKEECHOBEE PHOSPHORUS SOURCE CONTROL GRANT PROGRAM IS ADDRESSING VARIOUS TECHNOLOGIES FOR PHOSPHORUS REDUCTION.

A MASSIVE EFFORT IS UNDER WAY TO REDUCE PHOSPHORUS LOADS TO THE LAKE

The 2000 Lake Okeechobee Protection Act (Section 373.4595, F.S.) mandates that the TMDL to the lake be met by 2015, and a diverse series of efforts are under way to achieve this goal. The CERP Lake Okeechobee Watershed Project is expected to contribute 39 percent of the TP load reduction needed to meet the TMDL. This massive project will also store approximately 273,000 acre-feet of water, which will help reduce high lake stage and reduce flood control discharges to nearby estuaries.

Overall, 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 and is expected to take decades. To aid in this process, the Lake Okeechobee Protection Plan, completed in January 2004, 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 65 projects are currently being undertaken by the District and its partnering agencies to reduce phosphorus exports to the lake from the watershed. Activities include the Phosphorus Source Control Grant Program for agricultural landowners, dairy best available technology pilot projects, and remediation of former dairies. The load reduction from phosphorus source control projects is estimated to be 18 percent of the total reduction necessary to meet the lake's TMDL.

LAKE'S OPERATING SCHEDULE IS BEING REFINED FOR FUTURE MANAGEMENT

To aid in recovery from the 2004 hurricanes and to minimize future impacts, the District and U.S. Army Corps of Engineers are in the process of refining the operating schedule for the lake. This effort includes developing release rules that will be more favorable to maintaining its long-term ecological health and reducing large discharges to downstream ecosystems, while also reducing the impact on water supply. Until there are large alternative storage projects, this will be a difficult balancing act, because the lake receives water from a large watershed, it provides the main source of irrigation water in drought, and its major outlets are to estuarine systems that are impacted by large releases of fresh water.

ISLAND RESTORATION IS PROGRESSING

As part of the overall restoration of Lake Okeechobee, about five miles of agricultural berms surrounding Ritta Island at the south end of the lake have been removed to date. Restoration activities on Ritta Island also include the removal of exotic vegetation and backfilling of the adjacent ditches to reestablish natural hydrologic connections between the island's wetland habitat and the lake. The removal of two former berms on Kremer and Torry islands is also planned once berm removal activities on Ritta Island have been completed. A 100-acre section of degraded wetland on Torry Island has been replanted in native pond apple. Pond apple and cypress will also be replanted on Ritta Island's restored shoreline. These restoration activities will enhance the natural areas of the lake and surrounding watershed that provide high-quality habitat for fish and other resident wildlife.

Kissimmee River Restoration and Upper Basin Initiatives

The diverse wetland and aquatic ecosystems of the Kissimmee watershed, including the Kissimmee River and Kissimmee Chain of Lakes, form the headwaters of the Kissimmee-Okeechobee-Everglades system. Chapter 11 of the *2006 South Florida Environmental Report – Volume I* summarizes the mission-critical activities of the South Florida Water Management District for flood control, water supply, water quality, and natural systems in the Upper and Lower basins of the Kissimmee watershed. This chapter also highlights major projects associated with the Kissimmee River restoration and Kissimmee Chain of Lakes. Key activities include ecosystem restoration, restoration evaluation, aquatic plant management, water quality improvement, and water supply planning.

THREE 2004 HURRICANES HIT THE KISSIMMEE BASIN

Three of the four 2004 hurricanes (Charley, Frances, and Jeanne) passed directly over the Kissimmee Basin. The basin experienced high winds during each storm with large displacements of water and disturbance to ecological systems. Large quantities of the aquatic plant hydrilla (*Hydrilla verticillata*) were ripped apart and massed along the shoreline of Lake Kissimmee. The basin also experienced record-high rainfall during WY2005, primarily due to the 2004 hurricanes. For example, the total rainfall during September 2004 in the Upper Basin (17.3 inches) and in the Lower Basin (12.0 inches) both exceeded the 100-year wet return period. Notably, discharges from the S-65 water control structure into the Kissimmee River during WY2005 peaked near 10,000 cubic feet per second and were among the highest on record. These discharges had cascading effects on the downstream areas south of the Kissimmee watershed, especially Lake Okeechobee.

NEW HYDROLOGIC MODEL HELPS PLAN FUTURE BASIN WATER MANAGEMENT

The Kissimmee Basin Hydrologic Assessment, Modeling, and Operations Study is being used to develop a hydrologic and hydraulic model that will identify alternative structure operating criteria to meet operations objectives of the Kissimmee Basin and its associated



water resource projects. Using the existing water control infrastructure and existing land interests of the District, this study will identify ways to achieve a more acceptable balance among flood control, water supply, aquatic plant management, and natural resource water management objectives, while balancing impacts across downstream ecosystems. Study accomplishments in WY2005 include conducting a preliminary analysis of hydrologic data within the Kissimmee Basin watersheds, evaluating and selecting appropriate modeling tools, and evaluating the adequacy of the existing hydrologic monitoring network to meet established monitoring objectives.

CHAIN OF LAKES LONG-TERM MANAGEMENT PLAN WILL BE RELEASED IN 2007

Initiated in April 2003, the Kissimmee Chain of Lakes (KCOL) Long-Term Management Plan is being prepared to improve and sustain the ecosystem health of the KCOL. During WY2005, a summary of KCOL literature, with more than 650 references, was completed. A survey was

also conducted to better understand stakeholder needs and expectations of the KCOL. Survey results showed that picnicking, boating, hiking, and fishing are the most common recreational activities within the KCOL, and fish and wildlife habitat preservation is considered a higher priority than recreation. Interestingly, the survey also revealed that the agency's management activities are not widely known, reinforcing the recognized need for continued public outreach. A draft ecosystem model for the KCOL also was completed, which will be used as a key tool for conceptualizing relationships among ecosystem components and for developing associated performance measures. The KCOL Long-Term Management Plan is scheduled for completion in 2007.

PHASED CONSTRUCTION SUPPORTS KISSIMMEE RESTORATION

The District is working with the U.S. Army Corps of Engineers to implement the Kissimmee River Restoration and the Kissimmee River Headwaters Revitalization projects. These large-scale restoration projects will reestablish the river-floodplain system's ecological integrity to be comparable to that of regional natural habitats. Restoration of ecological integrity requires reconstructing the river's physical form and reestablishing pre-channelization hydrologic characteristics (stage and discharge). These projects will also provide the water storage and regulation schedule modifications needed to approximate the historical flow characteristics of the Kissimmee River system. Also, restoration projects will increase the quantity and quality of shoreline habitat in Lakes Kissimmee, Hatchineha, Tiger, and Cypress for the benefit of fish and wildlife. As of FY2005, these projects have an estimated combined cost of \$578 million.

The first major phase (Phase I) of canal backfilling was completed in early 2001. During this initial phase of construction, approximately 7.5 miles of C-38 canal were backfilled, 1.25 miles of new river channel were

recarved, and one water control structure (S-65B) was removed, resulting in 15 continuous miles of reconnected river channel. This phase will reclaim approximately 12,000 acres of floodplain habitats. The next phase of construction, Phase IVa, includes backfilling of 1.9 miles of C-38 canal and removal of three weirs and will commence in 2006. All restoration-related construction will be completed by 2012, and evaluation of restoration success will continue through 2017. In total, it is expected that this project will restore ecological integrity to approximately 40 square miles of river/floodplain habitat and more than 40 continuous miles of meandering river channel.

TRACKING CONFIRMS ECOLOGICAL RESPONSES

A key element of the Kissimmee River restoration is a comprehensive evaluation program for tracking ecological responses to restoration efforts. In addition to assessing restoration success, the evaluation program will provide scientific information for fine-tuning future project phases and for managing water resources of the recovering and restored ecosystem. 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 of 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. Early responses to Phase I backfilling include increases in dissolved oxygen in river channels, decreases in organic sediments that had accumulated in river channels after channelization, increased representation of bass and other sunfishes in river channels, and increased use of the river and floodplain by shorebirds, wading birds, and waterfowl. Evaluation of Phase I and future restoration phases will continue through 2017.



LAKE KISSIMMEE – THE LARGEST SINGLE SOURCE OF SURFACE WATER FOR LAKE OKEECHOBEE – IS THE PRIMARY HYDROLOGIC CONNECTION BETWEEN THE UPPER BASIN AND THE KISSIMMEE RIVER.

Management and Restoration of Coastal Ecosystems

South Florida's coastal ecosystems are complex and are challenged and threatened on many levels. There are continuing and widespread concerns over several key issues related to these ecosystems. Importantly, coastal ecosystems throughout the region are negatively impacted by altered delivery of fresh water, continued habitat loss, and declining water quality. The South Florida Water Management District focuses primarily on managing freshwater discharges to South Florida's estuaries in a way that preserves, protects, and where possible restores these essential estuarine resources. The District is collaborating with other agencies to produce a broad range of data and tools that will assist in achieving the challenging goal of managing freshwater input to these systems. Aspects of this progress and related efforts by the District are presented in Chapter 12 of the *2006 South Florida Environmental Report – Volume I*.

UNDERSTANDING THE LINK BETWEEN WATER MANAGEMENT AND DOWNSTREAM RESPONSES IS VITAL TO RESTORING ESTUARIES

South Florida's coastal resources include several major watershed-estuarine systems within the District. These ecosystems are the Southern Indian River Lagoon, including the St. Lucie River and Estuary; Loxahatchee River and Estuary; Lake Worth Lagoon; Biscayne Bay; Florida Bay and the Florida Keys; Naples Bay; Estero Bay; Caloosahatchee Estuary; and Southern Charlotte Harbor. While each system possesses some unique characteristics, 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 our understanding is not consistent across all nine systems – some are far less well studied than others – identifying these principles will take time and commitment to monitoring and research.

Because of the breadth of the issues, variety of legal mandates, and the direction of investigations, each ecosystem is at a different stage of science, management, and restoration. Overall, 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. These ecological communities have been chosen because (1) both are stationary and consistent features of South Florida's estuaries with some historical data, (2) they are key indicators of ecosystem health, and (3) much of the subtidal physical structure in South Florida's estuaries is biological (e.g., coral reefs, oysters, and seagrass beds). The District is continuing to collaborate with other agencies to better understand the relationships between water management and estuarine habitats.

A COMBINATION OF MONITORING, RESEARCH, AND MODELING SUPPORTS ECOSYSTEM MANAGEMENT

Monitoring biological resources, measuring inflow volumes, and assessing water quality within South Florida's estuaries provide essential information for effective management and restoration. The District is continuing to develop and administer cooperative agreements with a variety of agencies and stakeholders to fund a significant number of stormwater quality improvement and habitat restoration projects in priority water bodies. The agency also provides consistent monitoring of freshwater discharge and salinity response in estuaries, lagoons, and bays. Additionally, District staff has responded to the need for increased monitoring of coastal tributaries and for specialized studies in partnership with state and local agencies. Water quality continues to be a major concern, and the District continues to collaborate with its partners, especially the Florida Department of Environmental Protection, to address water quality concerns. Ongoing efforts will quantify the controls on coastal water quality, especially as affected by freshwater inflow and its management.

During WY2005, there was significant progress in the development of technical criteria to support restoration planning for the Northwest Fork of the Loxahatchee River. Likewise, technical support for the development of Minimum Flows and Levels (MFLs) in Biscayne Bay and Florida Bay continued to progress. Monitoring and field assessments necessary for development of Naples Bay restoration objectives are currently under way. In Southern Charlotte Harbor, cooperative agreements for fisheries monitoring are also under way. Further details on ecosystem-specific efforts during the past year are highlighted as follows.





THE DISTRICT MONITORS SEAGRASSES, OYSTERS, AND WATER QUALITY IN SOUTH FLORIDA'S COASTAL ECOSYSTEMS.

HIGHLIGHTS OF MANAGEMENT AND RESTORATION ACTIVITIES FOR SOUTH FLORIDA'S COASTAL ECOSYSTEMS

Southern Indian River Lagoon and St. Lucie River and Estuary

- Initiated construction of the Ten-Mile Creek Water Preserve Area along with a design contract for the C-44 Reservoir/Stormwater Treatment Area Project.
- Implemented 20 projects funded by the Indian River Lagoon License Plate Program and the St. Lucie River Issue Team funds.

Loxahatchee River and Estuary

- Completed the Northwest Fork of the Loxahatchee River Restoration Scenario Modeling to evaluate the effect of seasonal hydrologic flows on valued ecosystem components.
- Developed the Restoration Plan for the Northwest Fork.
- Prepared a peer-reviewed report describing three models being used for environmental analyses to support management of the river (see Volume I, Appendix 12-1).

Lake Worth Lagoon

- Provided \$615,000 in funding for continuation of restoration and monitoring projects to support the objectives of the Lake Worth Lagoon Management Plan.
- Continued to prepare the Project Implementation Report for the CERP North Palm Beach County – Part 1 Project.

Biscayne Bay

- Continued land acquisition provides a total of 33,000 acres needed for the CERP Biscayne Bay Coastal Wetlands Project in public ownership.

- Supporting the trend since 1991, total phosphorus concentrations continue to decrease throughout the canals that discharge into Biscayne Bay.
- Completed draft MFL criteria for south-central bay based on salinity requirements for seagrasses and various aquatic invertebrates.
- Initiated, completed, or continued 18 research, monitoring, planning, and construction projects to improve bay water resources.

Florida Bay and Florida Keys

- During WY2005, hydrologic conditions were very dry with unusually low rainfall and freshwater flow to Florida Bay. The largest creek entering the bay had only one-third its long-term average flow. This drought resulted in very high salinity conditions throughout the bay, peaking at 52 parts per thousand in the central bay in July 2004.
- Nearshore seagrass habitat was monitored by the District and appears to have responded to changing salinity conditions. Along the northeastern bay, there was a decrease in widgeon grass (*Ruppia maritima*), a seagrass species common to brackish water environments, and an increase in a more marine species, shoal grass (*Halodule wrightii*), due to an increase in salinity.
- Completed a detailed technical analysis of the effects of high salinity to provide recommendations for MFL criteria. The effort included data synthesis, statistical analysis, model development, and model applications that link freshwater flow, salinity, habitat, and fish and invertebrate species. The dominant seagrass species (*R. maritima*) was identified as an indicator of the health of the bay's nearshore zone, and a definition of significant harm was developed.
- Completed the Project Management Plan and final Environmental Impact Statement for the Florida Keys Water Quality Improvements Program.

Naples Bay

- Assessed current and historical water quality conditions and trends, and collected water quality and bathymetric data to support a hydrodynamic and water quality model of Naples Bay.
- Cooperated with the Conservancy of Southwest Florida to produce a chronological account of human development and changes to the mangrove shoreline.
- Authorized a Surface Water Improvement and Management Reconnaissance Report for the bay in WY2005, scheduled to be finalized early in WY2006.
- Collaborated with Collier County to enhance a stormwater management system, improve water quality, and reduce stormwater runoff to the bay.

Estero Bay

- Developed a two-dimensional hydrodynamic/salinity model of Estero Bay for the South West Florida Feasibility Study (SWFFS). Present-day bathymetry was produced, and five major tributaries flowing into the bay were used to enhance the model grid.
- Conducted a study in collaboration with the Florida Gulf Coast University to characterize temporal hydrologic changes that have occurred in the bay.
- Funded the expansion of Florida Fish and Wildlife Conservation Commission's Fisheries Independent Monitoring Program and began collaborative studies with Florida Gulf Coast University to examine effects of freshwater inflow on the bay's ecology.
- Collaborated with local communities to improve stormwater management through restoration of flow-ways, enhancements of drainage, and cleaning, repairing, and replacing structures.

Caloosahatchee River and Estuary

- Observed indirect effects of decreased salinity and water clarity from increased basin runoff and Lake Okeechobee releases related to Hurricane Charley and the subsequent wet season, including the decline of plant coverage and habitat availability.
- Despite deviations from the MFL criteria in WY2005, the brackish-freshwater plant *Vallisneria americana* (tape grass) continued recovery since its die-off during the 2001 drought.
- The University of Florida refined its habitat suitability model for assessing alternatives for CERP and the SWFFS. The model depends on habitat suitability indices that were developed this year for a range of key species and on the Caloosahatchee hydrodynamic/salinity model, which underwent further improvements this year to achieve its supportive requirements.
- The relationship between nutrient loading and phytoplankton production was further defined this year in order to develop targets for nutrient loading. These targets will protect submerged plants from decreased water clarity and estuarine species inhabiting the near-bottom ecosystem from depressed dissolved oxygen levels.

Southern Charlotte Harbor

- Continued restoration activities including removal of exotics and reestablishment of native vegetation, the reestablishment of mangroves along disturbed shoreline, and the restoration of oyster reefs in San Carlos Bay.
- Collaborated with Lee County and the city of Sanibel to improve surface water management through planning, construction of culverts to improve or reestablish flow-ways, and improvement of drainage to prevent flooding.



Everglades Forever Act Annual Financial Report

The South Florida Water Management District is required to provide detailed financial information on Everglades restoration. The 1997 Everglades Oversight Act requires the reporting of financial information for Everglades restoration. The Everglades Forever Act (EFA) requires the District to account for all monies used to fund the 1994 Everglades Construction Project (ECP) and the 2003 Long-Term Plan for Achieving Water Quality Goals for Everglades Protection Area Tributary Basins (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 financial reports are central to Chapter 13 of the *2006 South Florida Environmental Report – Volume I*.

DEDICATED FUNDING CONTINUES TO SUPPORT SOUTH FLORIDA RESTORATION

Dedicated funding is vital to the Everglades and Florida Bay protection and restoration programs. The 1994 ECP, a major element of the Everglades Restoration Program and the 1994 EFA, 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 long-term water quality goals for the Everglades Protection Area. 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 Stormwater Treatment Area (STA) enhancements, research, and operation and maintenance of the Everglades Construction Project.

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 \$749.8 million. This revised estimate reflects the addition of STAs on Compartments B and C, the addition of recreational facilities at each of the STAs, and other revisions to the pre-2006 projects contained in the Revised Part 2 of the Long-Term Plan dated November 2004. Further information on the STAs and the Long-Term Plan can be found in Volume I, Chapters 4 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 (FDOT) received federal authorization to redirect the use of Alligator Alley tolls for both restoration programs. A total of \$33.1 million – split equally between both restoration programs – has been received from the FDOT since 1997. Further information on Florida Bay can be found in Volume I, Chapter 12.

FUNDING SOURCES RAISE MORE THAN \$63 MILLION IN FY2005

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 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 \$613.8 million. In FY2005, net revenues totaled \$63.6 million (unaudited), of which \$61.2 million came from tax collections, and the remaining \$2.4 million were from the other sources listed above.

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 FY2005, \$374.4 million

net *ad valorem* tax revenue was received for Everglades restoration, of which \$49.1 million (unaudited) were collected in FY2005. The 1/10 mill *ad valorem* tax is projected to generate \$59.2 million in FY2006.

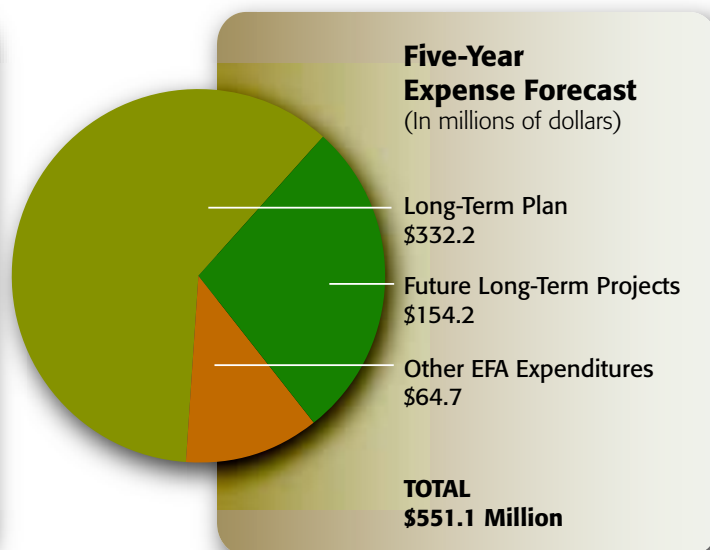
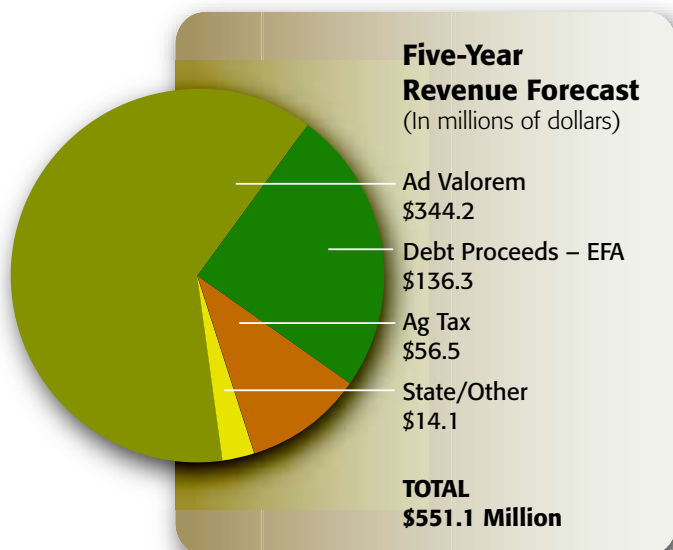
To fund the first phase of the Everglades Restoration Program, including implementation of the Long-Term Plan, the EFA imposes an annual tax on agriculture within the Everglades Agricultural Area (EAA) and C-139 basins. Net EAA agricultural privilege taxes collected from FY1995–FY2005 were \$131.3 million. During this period, the net C-139 basin agricultural privilege taxes totaled \$6.0 million. During FY2005, net agricultural privilege taxes received were \$12.1 million (unaudited), and this is projected to be \$11.7 million in FY2006.

IMPLEMENTATION OF EFA RESTORATION PROGRAM IS NOW PROJECTED TO TOTAL \$2 BILLION

As shown in the pie charts below, the five-year forecast (FY2006–FY2010) of revenues by source for the EFA Program totals \$551.1 million. As presented in Chapter 6 of the *2005 South Florida Environmental Report – Volume II*, the FY2005–FY2009 forecast was \$372.5 million. This represents an increase of \$178.6 million since last year's estimates, and is primarily associated with the Long-Term Plan Acceler8 projects (EAA STA Compartments B and C). 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 billion.



FIVE-YEAR EFA PROGRAM ESTIMATES (FY2006-FY2010)



A photograph of a young deer standing in a grassy field. In the background, there is a wooden picnic table and a dense line of green trees. The scene is brightly lit, suggesting a sunny day. The deer is looking directly at the camera.

DISTRICT ANNUAL PLANS AND REPORTS

VOLUME II

Introduction to the *2006 South Florida Environmental Report – Volume II*

Chapter 1 of the *2006 South Florida Environmental Report – Volume II* 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 as specified by Chapter 2005-36, Laws of Florida, which was passed during the 2005 legislative session. This legislation built upon the pilot project completed in 2005 by the South Florida Water Management District, and calls for all five of Florida's water management districts to consolidate annual plans and reports submitted to the governor or the Florida legislature.

ALL FIVE DISTRICTS ARE CONSOLIDATING MANDATED REPORTS

Volume II incorporates several plans and reports that are required annually by each of Florida's five water management districts. Prior to the 2005 legislation, these products were submitted individually. The agencies have now consolidated these documents to improve reporting efficiency, quality, and accessibility. This unified reporting yields a better, more efficient 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 six reports have been consolidated into separate chapters in Volume II:

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

The design of this single submission fulfills reporting requirements, facilitates comparisons to the District's 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 (October 1 through September 30), representing the 12-month period for which the District's annual budget is developed and implemented.

PROJECT DATABASE CONTINUES TO IMPROVE EFFICIENCY

Building on the success of the initial database last year, the Consolidated Project Report Database has been updated by the District. Prior to the 2005 SFER, individual annual project descriptions, multifunctional projects (activities with start and end dates), and processes (ongoing activities) were repeatedly described in several reports. The database is designed to uniformly describe projects and processes linked to report-related planning efforts, while providing these descriptions only once rather than multiple times. Storing project and process information in a single location enables rapid data 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.



DISTRICT-FUNDED LANDS PROVIDE A MULTITUDE OF BENEFITS, SUCH AS PUBLIC EDUCATION, WHILE MEETING THE AGENCY'S MISSION.

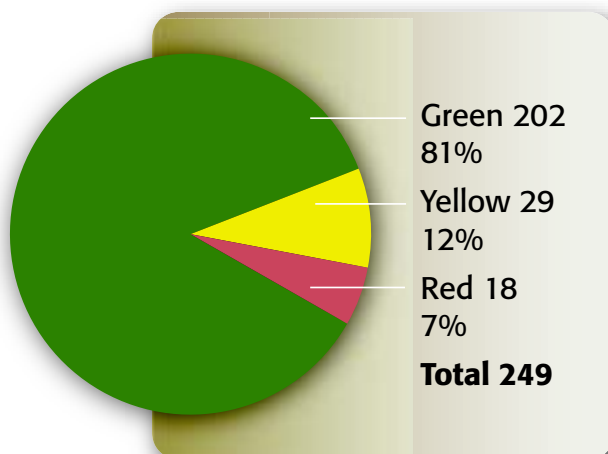
Fiscal Year 2005 Annual Work Plan Report

In 2005, the South Florida Water Management District committed to a four-part annual business cycle (see diagram on the right). Elements of the cycle are used by the District to maximize efficiency and effectiveness. The Annual Work Plan Report is a key part of this business cycle. Work Plan Status Reports are prepared quarterly and at the end of each fiscal year (FY). Chapter 2 of the *2006 South Florida Environmental Report – Volume II* presents the Fiscal Year 2005 Annual Work Plan Report. This chapter shows compliance with project schedules by program, as well as financial summaries and success indicators for the District's 10 FY2005 programs, and is subject to audit by the District's Office of Inspector General.

SIGNIFICANT ACHIEVEMENTS WERE MADE ON MOST PROJECTS IN FY2005

In the FY2005 Annual Work Plan Report, project compliance with schedules is categorized using the following criteria: “green” - within one quarter of schedule; “yellow” - within two quarters of schedule; or “red” - behind schedule by more than two quarters. As shown on the pie chart, at the close of FY2005, the District was green for 81 percent of major projects.

FY2005 STATUS OF MAJOR DISTRICT PROJECTS



THE DISTRICT'S BUSINESS CYCLE



FINANCIAL RESULTS TRACK PROGRESS

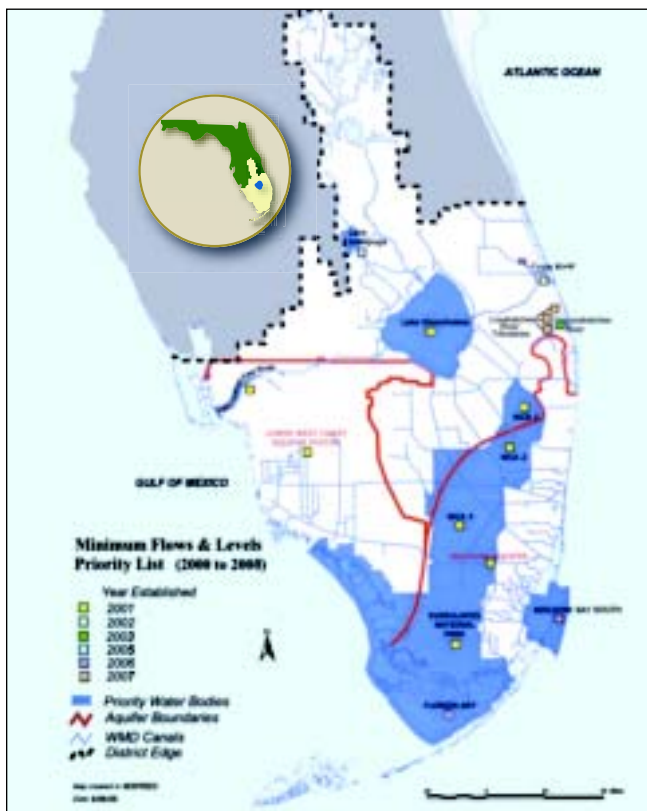
This report also tracks the status of revenues collected and expenditure rates by funding type. During FY2005, the District collected 81 percent of budgeted revenue, including over 99 percent of budgeted taxes and 111 percent of budgeted investment earnings. Intergovernmental revenue collection was 62 percent of budget, which includes state appropriations and reimbursements from state and federal agencies. The nature and timing of these expenses and subsequent reimbursements caused a lower than anticipated collection rate.

Expenditure rates are used as indicators of progress in program implementation. For reporting purposes, personnel expenditures and managerial reserves are excluded from both budgeted and actual expenditures. During FY2005, the District expended 71 percent of the budget of \$765 million. This represents an increase of 10 percentage points over the historical (FY2001–FY2004) rate of 61 percent. The discretionary budget of \$202 million was spent at a rate of 78 percent, or 12 percentage points over the historical rate, while the restricted budget spending rate was 68 percent, or 9 percentage points higher than the historical rate. Nine out of 10 programs achieved higher than historical overall expenditure rates. Programs with projects that were not started or were on hold were encouraged to make budgeted funds available for transfer to other priority projects.

2006 Minimum Flows and Levels Priority List and Schedule

Florida law requires the water management districts to establish Minimum Flows and Levels (MFLs) for surface waters and aquifers within their jurisdiction [Section 373.042(1), F.S.]. 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.” Chapter 3 of the *2006 South Florida Environmental Report – Volume II* describes the general process and legal authority for development of MFL criteria, the linkage between MFLs and other South Florida Water Management District planning documents, the recently adopted 2006 MFL Priority Water Body List and Schedule, and proposed changes to be incorporated in 2006.

PRIORITY MFL WATER BODIES



MFLs ARE AN IMPORTANT TOOL TO PROTECT WATER RESOURCES

The District is required to establish MFLs for state waters that are listed on a MFL Priority Water Body List. Based on this list, the District undertakes research, analysis, and interpretation of data necessary to develop “technical criteria” for each water body. These criteria are generally subjected to scientific peer review. Once the proposed criteria are approved by the District’s Governing Board, rule development and rule-making processes, including public workshops and opportunities for challenge, are initiated. The final rule has been approved by the Governing Board and adopted as part of Chapter 40E-8, Florida Administrative Code. More details on MFLs can be found on the District’s web site at <http://www.sfwmd.gov/org/wsd/mfl/>.

SCHEDULE CHANGES REFLECT DISTRICT PRIORITIES AND THE NEED FOR IMPROVED COORDINATION

To date, MFL criteria for 10 water bodies (eight in 2001, one in 2002, and one in 2003) have been developed by the District (see map). The agency proposes to complete MFLs for Lake Istokpoga in 2005, southern Biscayne Bay and Florida Bay in 2006, and Loxahatchee River tributaries in 2007. In 2005, four water bodies [Estero Bay, Lower West Coast surficial aquifers, Kissimmee Chain of Lakes (KCOL), and Floridan aquifer] were removed from the priority list because they were deemed not likely to be impacted by consumptive use withdrawals, and some of these resources may receive better protection through the establishment of water reservations. The Kissimmee River MFL has been delayed beyond 2008 due to staff constraints and the need to better coordinate with ongoing efforts to develop a Long-Term Management Plan for the KCOL. The Florida Bay MFL has also been delayed due to technical issues and the need to coordinate with ongoing efforts to develop restoration goals and water reservations. A letter describing the 2006 list and schedule was sent to the Florida Department of Environmental Protection in November 2005, and comments are expected by January 2006.

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 FY2006–FY2010. 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 District's mission by efficiently directing resources to District programs based on the agency's priorities. Capital improvement projects include improvement/refurbishment, construction, and land acquisition for seven of the 11 District programs highlighted in the table below.

Chapter 4 of the *2006 South Florida Environmental Report – Volume II* updates information presented in Chapter 9 of last year's SFER. This chapter provides the

five-year financial schedule of revenues and expenditures for those capital projects approved for FY2006, 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 below, an annual capital budget for the seven District programs presented in the CIP are consistent with the following strategic priorities established by the District's Governing Board. These priorities are to expedite the construction and operation of Everglades restoration projects through Acceler8; achieve Everglades water quality standards; acquire land for Kissimmee River restoration; reduce Lake Okeechobee phosphorus inputs; and refurbish the regional water management system. As shown in the table, the Comprehensive Everglades Restoration Plan (CERP) and District Everglades programs annually receive about four-fifths of the District's capital budget.

FIVE-YEAR ANNUAL CAPITAL BUDGET ESTIMATES (FY2006–FY2010)



PLAN FORECASTS \$3.7 BILLION TO BE SPENT OVER FIVE YEARS

The five-year (FY2006–FY2010) CIP represents \$3.7 billion in District-related projects. As reflected in the table, the total FY2006 budgeted capital expenditures are \$676.4 million, which represents 63.8 percent of the total District FY2006 budget of \$1.1 billion and 18.2 percent of the total five-year CIP projected budget. The FY2006 capital budget is \$187.6 million greater than last year's \$488.8 million, largely because of substantial increases in the CERP and District Everglades programs, more specifically due to the implementation of Acceler8. Acceler8 will expedite ecosystem revitalization by stepping up the pace of design and construction on eight major restoration projects. The construction of these projects will be financed through the issuance of approximately \$1.5 billion in Certificates of Participation revenue bonds, making it possible to complete these key restoration projects years ahead of schedule.

Water Supply

Chapter 5 of the *2006 South Florida Environmental Report – Volume II* fulfills several important requirements for reporting on planning, projects, and funding related to water supply. The chapter fulfills the mandates of Section 373.536(6)(a)4, F.S., requiring each water management district to annually prepare a five-year water resource development work program. It also satisfies the mandates in Section 373.1961(2), F.S., requiring each water management district to submit an annual report to the Florida legislature and governor on Alternative Water Supply (AWS) funding. Together, these reports reflect Florida's 2005 growth management legislation partially identified in Section 373.0361, F.S., which requires regional water supply plans to specifically identify AWS projects in addition to water supply development sources. This newly established chapter provides an annual update to these requirements that were reported previously in the 2005 SFER – Volume II, Chapters 4 and 5, respectively.

UPDATED REGIONAL WATER SUPPLY PLANS WILL BE ADOPTED IN 2006

The Five-Year Water Resource Development Work Program provides an implementation update of the South Florida Water Management District's regional water supply plans. These are detailed plans developed by the District to evaluate available regional water supply in comparison with projected demands. The plan includes analyses of future supplies and demands for 20 years and outlines strategies to meet identified needs. The District has developed water supply plans for each of its four planning regions: Upper East Coast, Kissimmee Basin, Lower West Coast, and Lower East Coast (see map on page 47). These planning regions collectively cover the entire District. The

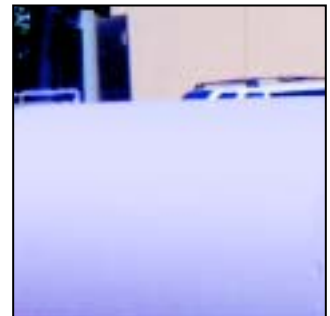
plans for these regions currently are being updated and are scheduled for completion in 2006. As the District is updating water supply plans, the current Five-Year Water Resource Development Work Program includes the water resource development projects that are anticipated to be included in the revised plans.

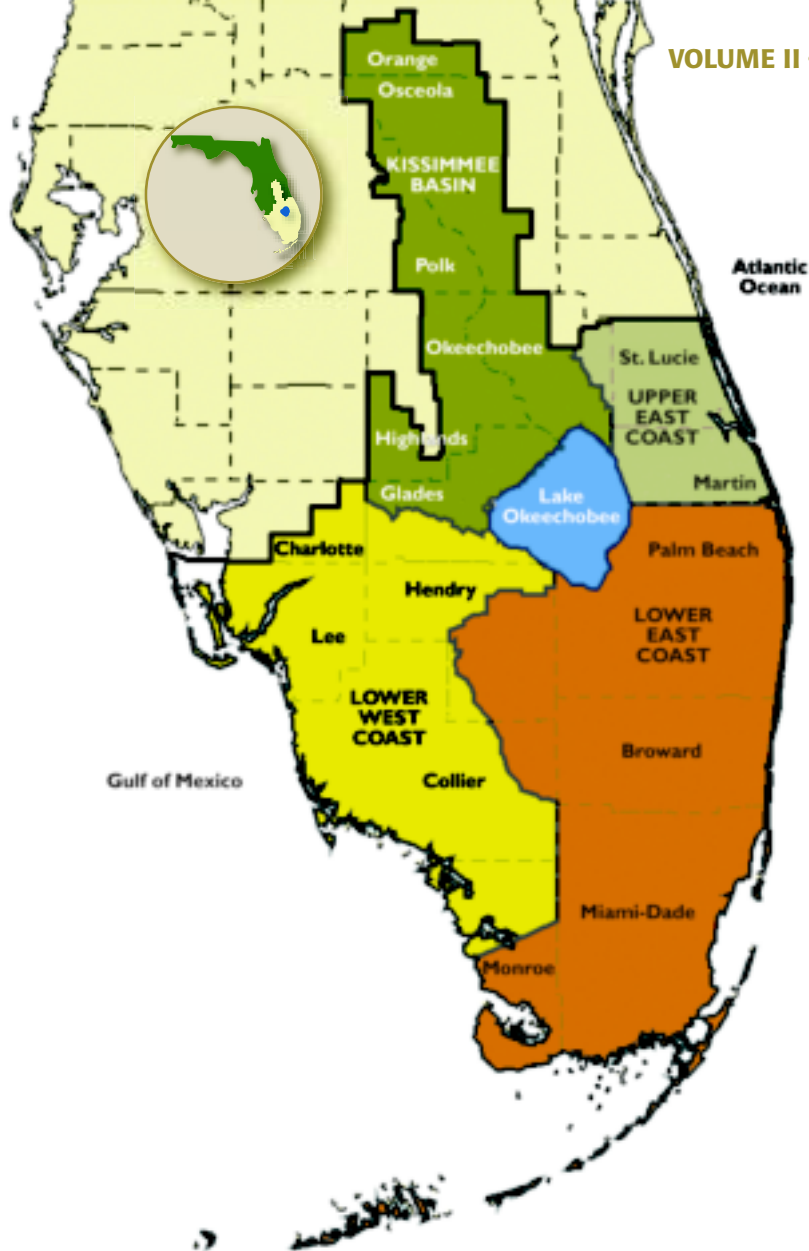
The District has allocated \$12.8 million in FY2006 for water resource development projects and anticipates spending \$55.2 million on these projects over the next five-year period (FY2006–FY2010). These projected estimates do not include CERP projects with water resource development benefits. In addition, for FY2006 the District has budgeted \$1.65 million to implement its conservation program and establish mobile irrigation labs.

WATER RESOURCE DEVELOPMENT SUPPORTS FUTURE WATER SUPPLY NEEDS

The water resource development projects described in this chapter support development of future water supply projects that, when developed, will make water available. Therefore, the water resource development projects referenced in the chapter 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 the development of

THE DISTRICT HAS PROVIDED \$600,000 IN AWS FUNDING TO SUPPORT PALM BEACH COUNTY'S SOUTHERN REGION WATER RECLAMATION PROJECT.





DISTRICT WATER SUPPLY PLANNING AREAS

more advanced computer groundwater models. As the District revises its regional water supply plans, updated water resource development project information will be included in future Five-Year Water Resource Development Work Programs.

INCREASED FUNDING IS APPROPRIATED FOR ALTERNATIVE WATER SUPPLY

The District continues to offer an AWS Funding Program. However, with infusion of funds and direction from the state of Florida, the program is significantly different from previous years. During the 2005 legislative session, a new program was authorized by the Florida legislature under Senate Bill 444. This new program provides recurring funding annually to implement recommendations contained in the regional water supply plans to develop alternative water supplies. This legislation dramatically increased funding for the Alternative Water Supply Funding Program. For FY2006, the Florida legislature has appropriated \$100 million statewide for the program, with \$30 million dedicated to the South Florida Water Management District. The legislation further directs the District to match the state with District-specific funds budgeted for water resource and water supply development. The District has budgeted a total of almost \$61 million toward water resource and AWS development projects in FY2006.

In order to implement this program immediately, as directed by the legislation, the District's Governing Board approved an interim process to expedite funding. Because the District's water supply plan updates are currently under way, this interim process allows entities with projects that may be eligible for funding to submit applications for FY2006 funding. The legislation also provides factors that should be considered in selecting projects for funding. The District is requiring that these projects be completed by August 1, 2006, and is imposing certain readiness standards, namely that permits must be in hand and contractors must be selected prior to receipt of funding.

Through this process, 61 projects have been authorized to receive combined funding of \$36 million. In addition, the District has provided an additional \$7.1 million to 19 projects identified in the budget prior to the approved 2005 legislation. Funded projects include 41 water reuse projects, 21 brackish water/reverse osmosis projects, and 8 Aquifer Storage and Recovery projects. The funded projects will create 172 million gallons per day of new water by summer 2006, and 304 million gallons per day when completed.

Florida Forever Work Plan, 2006 Annual Update

The 2006 Florida Forever Work Plan describes projects eligible for funding under the Florida Forever Act (Section 259.105, F.S.) and reports on the South Florida Water Management District's progress and changes since the previous annual work plan (see the 2005 SFER – Volume II, Chapter 8). This update focuses on project activities that will impact land acquisition requirements – acres to be acquired, costs, and schedules – over the next five years. It highlights how lands acquired under the Florida Forever Program are being used to implement projects, and how future land acquisition requirements are evolving as a result of project planning activities and environmental studies. The status of land acquisitions is also presented for eligible projects.

The 2006 plan identifies a total of 70 eligible projects, including CERP and Save Our Rivers projects, as well as initiatives, plans, and studies for water quality and water supply. In this year's update, Acceler8 restoration projects, an integrated set of water quality initiatives in the Long-Term Plan, and the Lemkin Creek Water Storage and Treatment Facility water resource project have been added. The Biscayne Bay Regional Restoration Initiative Water Resource Project has been removed.

FLORIDA FOREVER FUNDS SECURE LAND TO SUPPORT CERP AND KISSIMMEE RIVER RESTORATION

The Florida Forever Program helped to fund acquisition and commitments in FY2005, completing approximately 98 percent of the required land acquisition for the Kissimmee River Restoration Project and

approximately 50 percent of land required for CERP projects. Advance acquisitions of CERP lands positively positioned the District and the state of Florida to launch Acceler8 in FY2005.

\$3.6 BILLION IS PROJECTED TO BE SPENT ACQUIRING FLORIDA FOREVER LANDS

Real estate expenditures for eligible projects over the next five-year period (FY2006–FY2010) are estimated to total \$3.6 billion, including \$3.5 billion for land acquisition and \$38.5 million for engineering solutions to avoid costly acquisitions. These projections incorporate the new CERP Master Implementation Sequencing Plan (see Volume I, Chapter 7A) and revised estimates reflective of escalating land costs in South Florida. Over this period, the District should receive about \$180 million in Florida Forever funds and \$500 million from the Save Our Everglades Trust Fund to fund acquisitions under the Florida Forever Program.

In order to meet needed projected land acquisition funding requirements for eligible projects of nearly \$4 billion, the District will seek additional funding alternatives, including requesting extended authorization of Save Our Everglades funding. With respect to the balance of funding to be made available through Florida Forever, the District anticipates directing the balance toward the construction of eligible projects, but not necessarily land acquisition and management.

A RESTORED SECTION OF THE KISSIMMEE RIVER PROVIDES IMPROVED HABITAT FOR WADING BIRDS.



Mitigation Donation Annual Report

In accordance with Section 373.414(1)b(2), F.S., water management districts are required to report annually 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.

Chapter 7 of the *2006 South Florida Environmental Report – Volume II* summarizes the District's mitigation fund expenditures for Fiscal Year 2005 (FY2005) and the utilization of mitigation funds anticipated for FY2006 in two authorized mitigation projects: Corkscrew Regional Ecosystem Watershed (CREW) in Lee and Collier counties and Pennsuco Regional Mitigation Area in Miami-Dade County. Notably, the CREW lands contain some of the largest remaining pristine cypress wetlands in the U.S., providing habitat to a number of rare, threatened, and endangered species. Pennsuco is an impaired ecosystem that likely will continue to degrade and further impact adjacent natural areas unless actions are taken to reduce the spread of exotics. The enhancement of Pennsuco has the potential to yield regional ecological benefits and contribute to the goals of Everglades restoration. This chapter provides a brief description of the two projects; expenditures associated with each project in categories of acquisition, restoration, and long-term management; project implementation status; monitoring; and plans for FY2006.

FLORIDA DEDICATES MORE THAN \$1.5 MILLION TO SUPPORT WETLAND ENHANCEMENTS

The District is authorized to accept cash contributions only for a Governing Board-endorsed mitigation project that has necessary permits under Part IV, Chapter 373, F.S. In 1995, the District began accepting cash payments for the CREW and Pennsuco projects as a form of mitigation to offset impacts to wetlands. Mitigation funding provides land acquisition, chemical treatment



THE ENVIRONMENTAL BENEFIT OF LAND ACQUISITION IN CREW CONTRIBUTES TO CORRIDOR BUILDING AND IMPROVED WILDLIFE HABITAT.

of exotics, hydrologic enhancement (CREW only), restoration progress monitoring, and prescribed burning. Although both projects no longer accept mitigation funds, existing dedicated funds continue to be used for mitigation efforts at these sites.

In FY2005, the District expended a total of \$3.7 million on the acquisition and restoration of lands for the two projects. FY2005 funding provided for the acquisition of 15 acres and restoration of 3,559 acres in CREW and for the acquisition of 180 acres and restoration of 5,444 acres in Pennsuco. Based on monitoring results to date, both projects are trending toward restoration success. The anticipated total expenditures for FY2006 are \$1.6 million. Of this amount, \$360,000 is dedicated to land acquisition, and \$208,500 is dedicated to restoration and monitoring in CREW. A total of \$1,008,060 is budgeted for the treatment of 8,200 acres for exotics and continued monitoring in Pennsuco.



Glossary

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 (ASR): The injection of fresh water into a confined saline aquifer (underground, water-bearing layer) during times when supply exceeds demand (wet season), and recovering it during times when there is a supply deficit (dry season).

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 Improvements Plan.

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).

Drawdown: A lowering of the water level in a reservoir or other body of water.

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 twelve 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 (F.S.): 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 (FWM) 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.

Lake Okeechobee Construction Project (LOCP): As required by the Lake Okeechobee Protection Act, a project designed to improve the hydrology and water quality of the lake and downstream receiving waters.

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.

Mitigation: Acquisition, creation, restoration, or enhancement of wetlands to compensate for permitted wetland impacts.

Parts per billion (ppb): A unit of measure, equivalent to micrograms per liter ($1 \text{ ppb} = 1 \mu\text{g/L}$).

Phosphorus: An element that is essential for life. In freshwater aquatic 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, from stormwater runoff using natural processes.

Submerged aquatic vegetation (SAV): 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. They are primary targets of the Everglades restoration and are major components of the Everglades Protection Area.

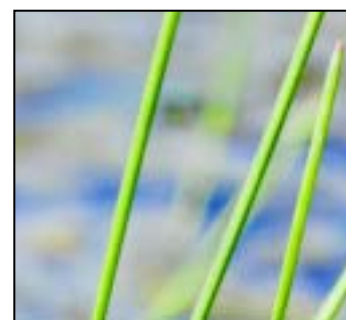
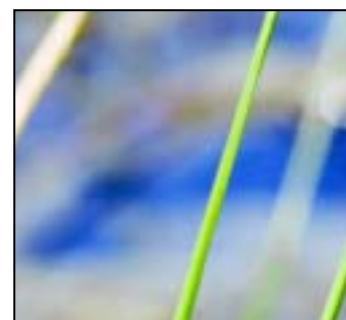
Water quality (WQ) criteria: Constituent concentrations based on scientific data and judgments on the relationship between pollutant concentrations and environmental and human health effects.

Water quality standards (WQS): State-mandated water quality levels that are comprised of a beneficial use classification, water quality criteria applicable to that classification, Florida antidegradation policy, and several provisions in other rules.

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

Water Year 2005 (WY2005): The period from May 1, 2004, through April 30, 2005, during which water quality and other data were collected and reported on in the *2006 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, marshes).



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Gilpin-Hudson, Lead Planner in the District's Finance and Administration Department, serves as the project manager for the *2006 South Florida Environmental Report – Volume II*.

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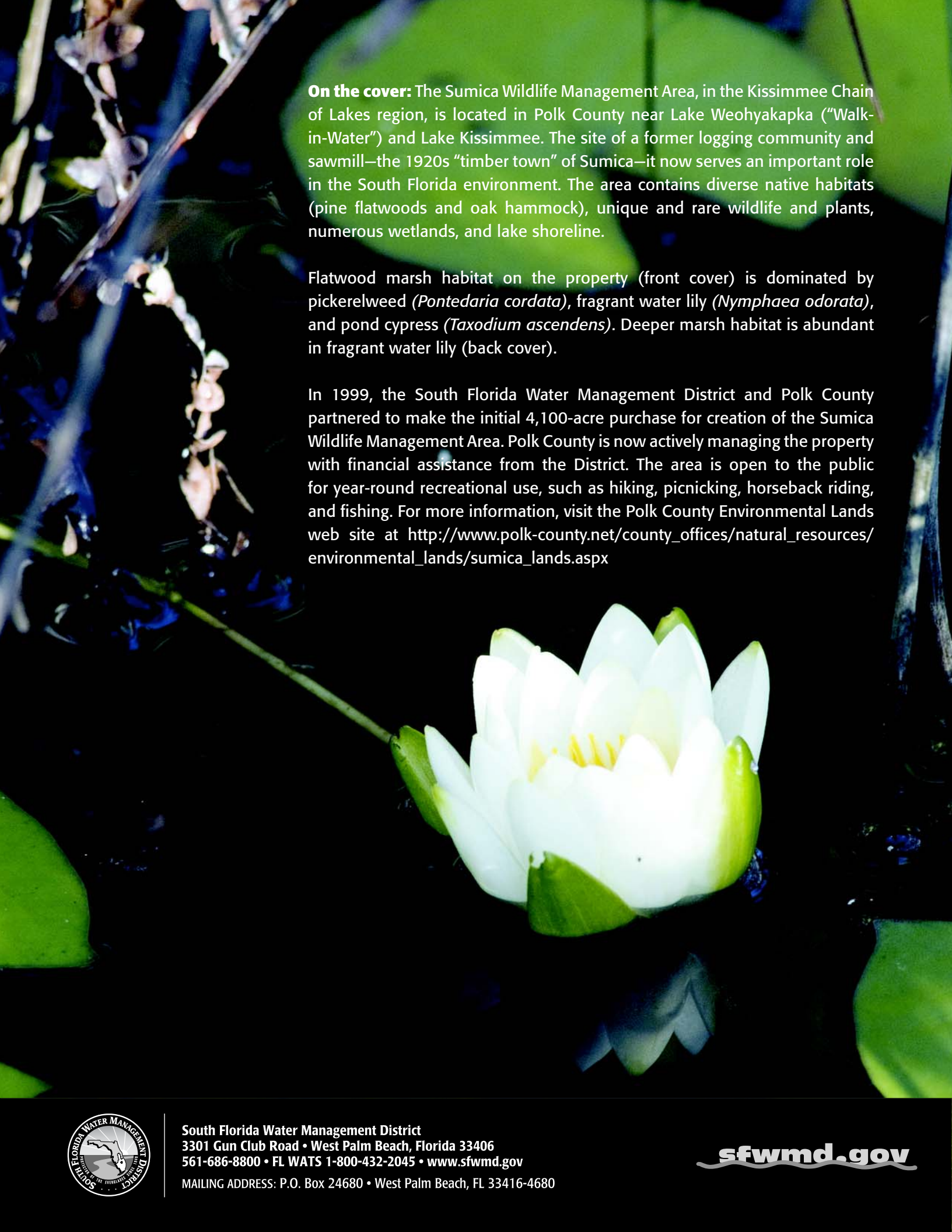
EXECUTIVE SUMMARY

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On the cover: The Sumica Wildlife Management Area, in the Kissimmee Chain of Lakes region, is located in Polk County near Lake Weohyakapka (“Walk-in-Water”) and Lake Kissimmee. The site of a former logging community and sawmill—the 1920s “timber town” of Sumica—it now serves an important role in the South Florida environment. The area contains diverse native habitats (pine flatwoods and oak hammock), unique and rare wildlife and plants, numerous wetlands, and lake shoreline.

Flatwood marsh habitat on the property (front cover) is dominated by pickerelweed (*Pontedaria cordata*), fragrant water lily (*Nymphaea odorata*), and pond cypress (*Taxodium ascendens*). Deeper marsh habitat is abundant in fragrant water lily (back cover).

In 1999, the South Florida Water Management District and Polk County partnered to make the initial 4,100-acre purchase for creation of the Sumica Wildlife Management Area. Polk County is now actively managing the property with financial assistance from the District. The area is open to the public for year-round recreational use, such as hiking, picnicking, horseback riding, and fishing. For more information, visit the Polk County Environmental Lands web site at http://www.polk-county.net/county_offices/natural_resources/environmental_lands/sumica_lands.aspx



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