SOUTH FLORIDA WATER MANAGEMENT DISTRICT

# Everglades Stormwater Treatment Areas: Two Decades of Integrating Science and Engineering for Ecosystem Restoration


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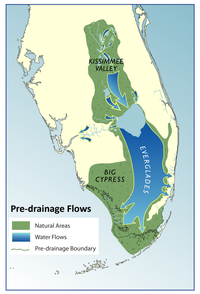
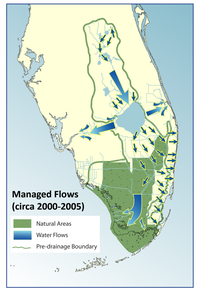
## Historic Everglades

- Water flowed from central Florida through Lake Okeechobee and south into Florida Bay
- Natural system included over 9 million acres of lakes, rivers and wetlands
- Unique and diverse mosaic of habitats



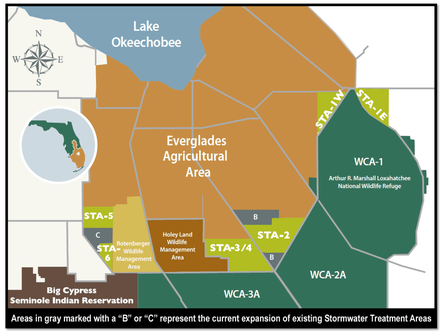

## Consequences of Current System

- Degradation of water quality
- Too much or too little water for the Everglades ecosystem
- Massive reductions in wading bird populations
- Repetitive water shortages and saltwater intrusion
- Declining estuary health
- An average of 1.7 billion gallons of water a day wasted to tide due to lack of storage capacity



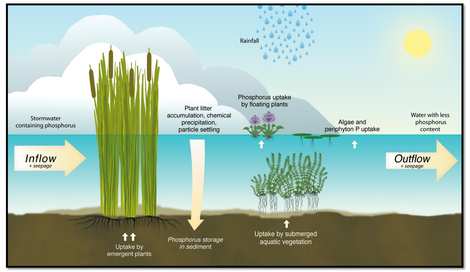

## Everglades Forever Act of 1994

- Build man-made wetlands (Stormwater Treatment Areas or STAs) to clean water entering Everglades
- Implement Agricultural and Urban Best Management Practices (BMPs)
- Establish funding mechanism
  - Taxes on agriculture
  - Dedicated property taxes
- South Florida Water Management District constructed 40,000 acres of STA by December 2006
- U.S. Army Corps of Engineers constructed 5,000 acres of STA




## Vegetation: The Foundation of Treatment

- Emergent vegetation provides initial treatment
- Submerged aquatic vegetation further reduces phosphorus concentrations
- Periphyton-based Stormwater Treatment Areas (PSTAs) have potential for additional treatment




## STAs Require Management, Analysis and Maintenance

Highly managed and maintained wetlands

- Field staff: operations, maintenance, vegetation management
- Part of flood control system with continuous operations
- 25 pump stations and 300 water control structures
- Continuous monitoring of water quality, water levels and flow data to optimize performance
- Scientists, engineers, and operators attend weekly, bi-weekly and monthly communication and coordination meetings

## Optimization Research

Over $50 million spent on optimization research since 1994

- Cattail Flood Tolerance Study
- Cattail Drought Study
- Vegetation Management Strategies
- Field trials of different types of vegetation to improve sustainability
- Pre- and Post-Rehabilitation Monitoring

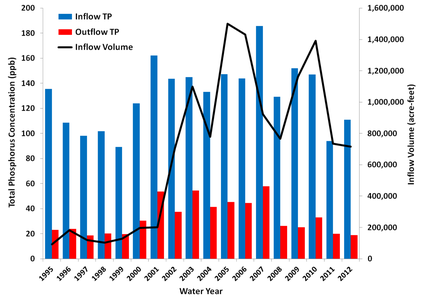
## STA Treatment Performance

***Preliminary*** Water Year 2012 (May 1, 2011 – April 30, 2012) data:

- Received 715,000 acre-feet of water
- Provided 83% reduction in phosphorus load
- Average inflow total phosphorus (TP) concentration: 111 parts per billion (ppb)
- Average outflow TP concentration: 19 ppb

Since 1994:

- Approximately 1,560 metric tons of phosphorus have been retained in the STAs that would have otherwise entered the Everglades




## Factors Affecting Operations and Performance

- Antecedent land use
- Inflows
  - Chemistry (hardness)
  - Phosphorus concentrations
- Vegetation composition
- Soil type
- Topography
- Size / shape
- Hurricanes, floods, droughts
- Enhancement activities
- Regional operations
- Endangered Species and Migratory Birds

## Additional STA Under Construction – Anticipated to be Complete by June 2012

Compartment B (7,000 acres) and Compartment C (5,000 acres) to assist with redistribution of flows and loads in the STA system to achieve optimal performance

STA-5/6 Inflow Pump Station G-508 – April 2011

STA-5/6 Inflow Pump Station G-508 – May 2012

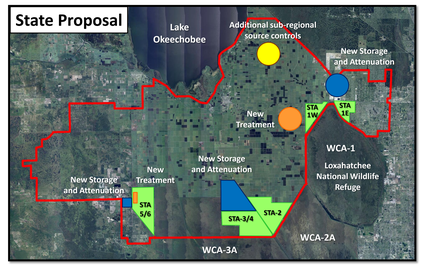
## Ongoing Challenges

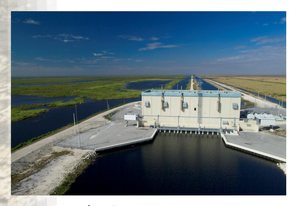
- Ultra-low limits on Total Phosphorus concentrations in STA discharges
- STAs are integral components of a complex water management system with multiple objectives and cannot be operated in isolation
- Continued STA expansion requires more supplemental water in dry periods
- Science is still being developed to understand factors affecting STA sustainability and long-term performance
- South Florida's sub-tropical climate (hurricanes, floods, and droughts)
- STA off-line time for repairs, enhancements and stabilization is unavoidable
- Wildlife use of the STAs / Impact on Operations
- Migratory Bird Treaty Act, Endangered Species Act, Bald Eagle Protection Act and others

Black-necked Stilt

## Florida's Water Quality Commitment Moving Forward

- Commitment to construct the right combination of water storage and treatment projects to meet water quality goals for the Everglades
- Comprehensive and integrated plan that addresses critical areas
- Uses sound science and engineering
- Practical and feasible
- Utilizes land already in public ownership
  - Minimizes impacts to agricultural-based economy; retains jobs
- Engages willing stakeholders
- Reasonable implementation schedule



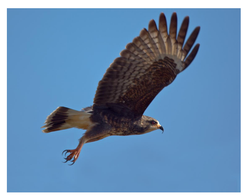



STA-3/4 Inflow Pump Station G-370

Emergent Aquatic Vegetation and Roseate Spoonbills

Submerged Aquatic Vegetation

Periphyton



Everglade Snail Kite

Compartment B STA Construction

Birds Foraging in STA-5

Airlifting Submerged Aquatic Vegetation