Summary of Performance of the Everglades Stormwater Treatment Areas (STAs)

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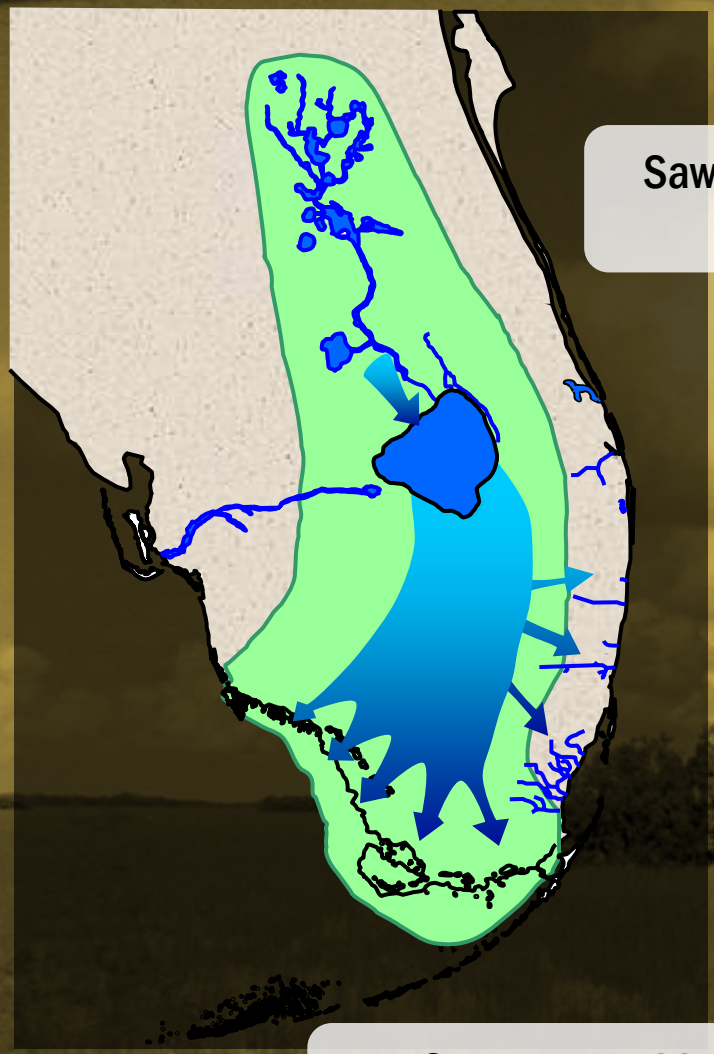
Overview

- Historical perspective on Everglades restoration
- Performance of the Stormwater Treatment Areas (STAs)

The Historic Everglades Ecosystem

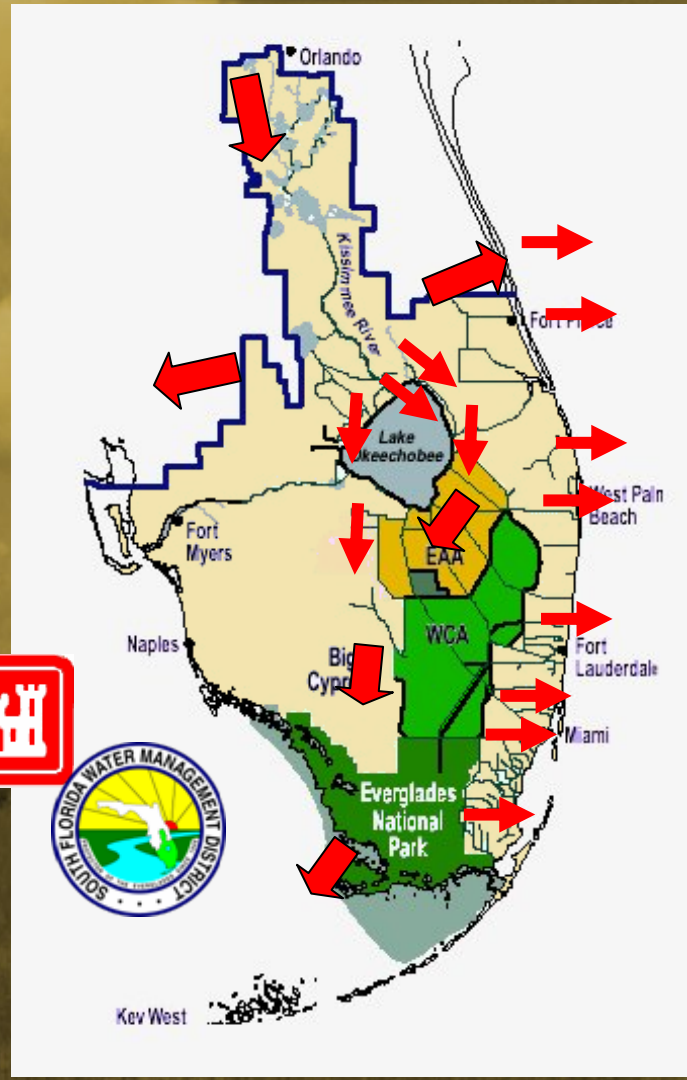


Sawgrass and tree islands

Sawgrass prairie & open water sloughs

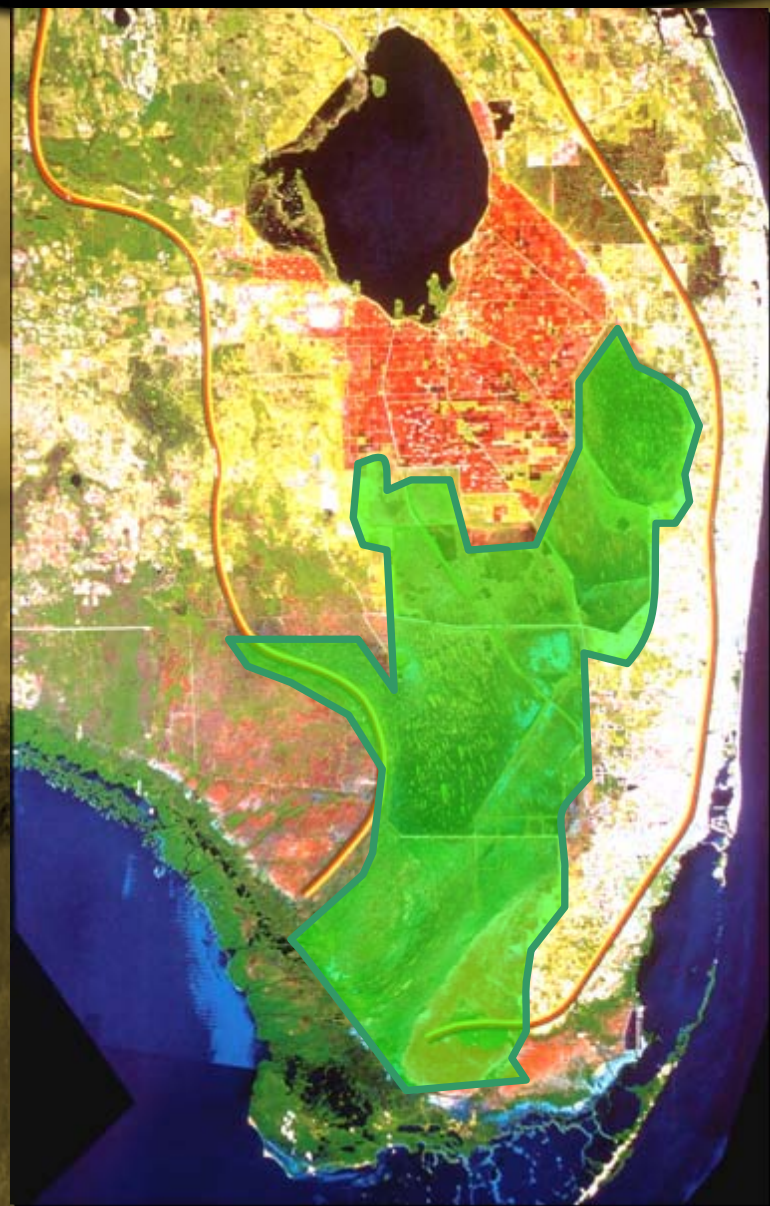
The Central and Southern Flood Control Project

- Early drainage projects began in late 1880s
- Storms of 1920s and 1940s highlighted deficiencies
- Initially authorized in 1948
- Constructed between 1950's and 1970's
- Operated in accordance with USACE criteria



Major Problems Facing Everglades

- **Loss of Everglades habitat**
- **Disruption of hydropatterns (i.e., timing, volume & distribution)**
  - **Repetitive water shortages and salt water intrusion**
  - **1.7 billion gallons of water a day wasted to tide**
- **Degradation of water quality**
- **Exotic plant species**



Everglades Restoration

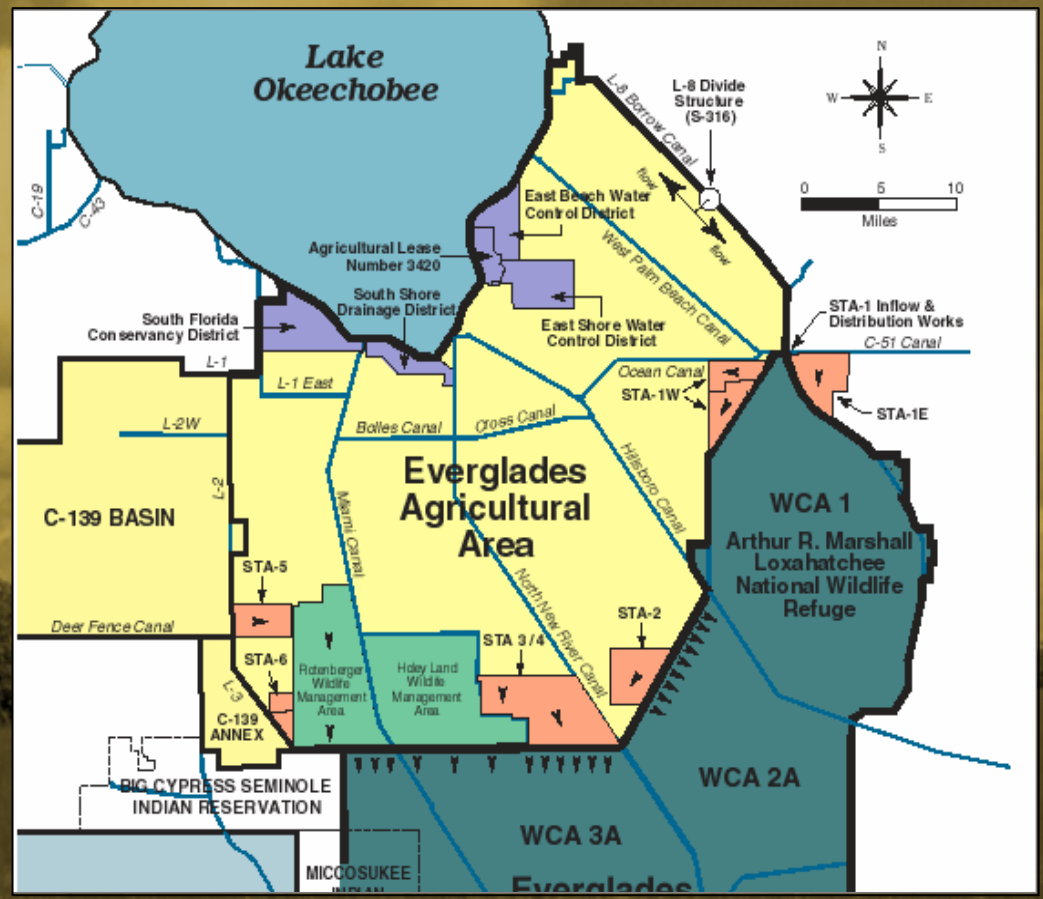
- **Two initiatives:**
  - **Everglades Forever Act (EFA) – primary focus is water quality, with some quantity and distribution features**
  - **Comprehensive Everglades Restoration Plan (CERP) – primary focus is water quantity and distribution, with some water quality features**
- **This presentation will cover the STAs of the Everglades Forever Act restoration program**

Everglades Forever Act

- 1991, amended 1994 and 2003
- Achieve state water quality standards by 12/31/06
- Construction
  - Stormwater Treatment Areas
  - Diversion and hydropattern restoration
- Research
  - Phosphorus criterion research
  - Advanced treatment technology research
- Regulation
  - Best Management Practices (BMPs)
  - Everglades phosphorus standard

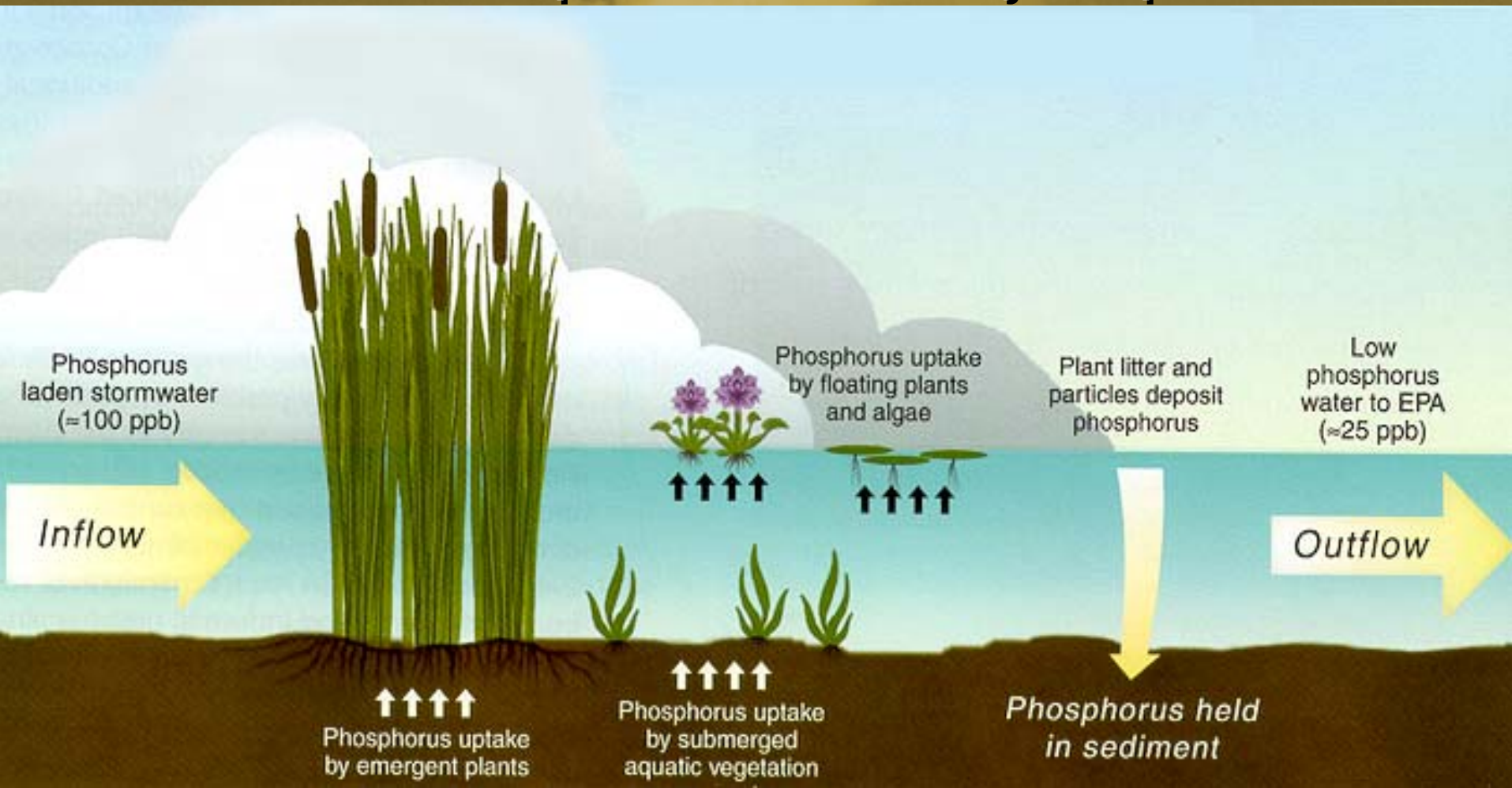
Everglades Construction Project

- 6 STAs
- Over 40,000 acres of constructed wetlands
- Capture and treat 75% of the water entering the Everglades

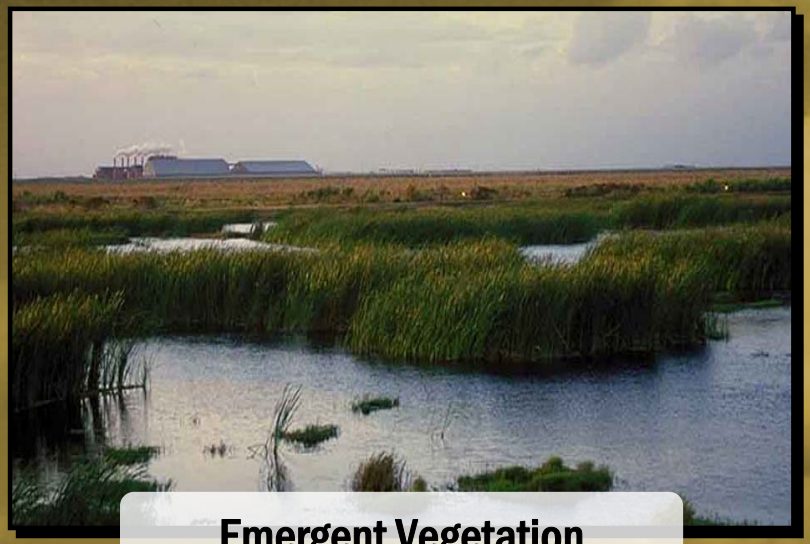


Stormwater Treatment Areas

STAs are constructed wetlands that remove and store nutrients through plant growth and the accumulation of dead plant material in a layer of peat.



STA Vegetation Types

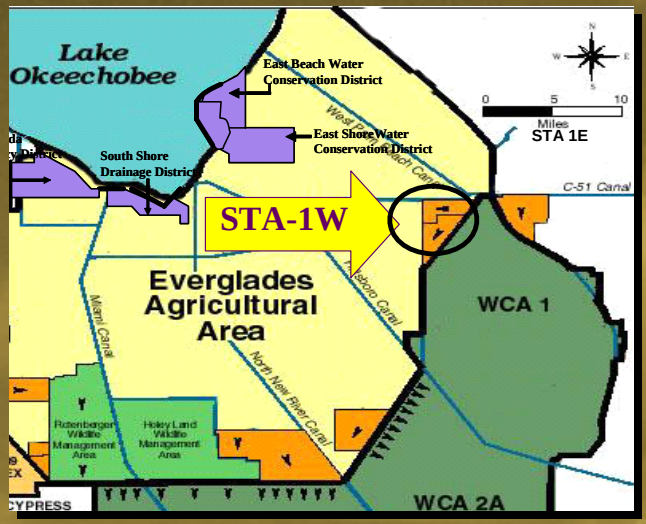


Emergent Vegetation

Submerged Aquatic Vegetation

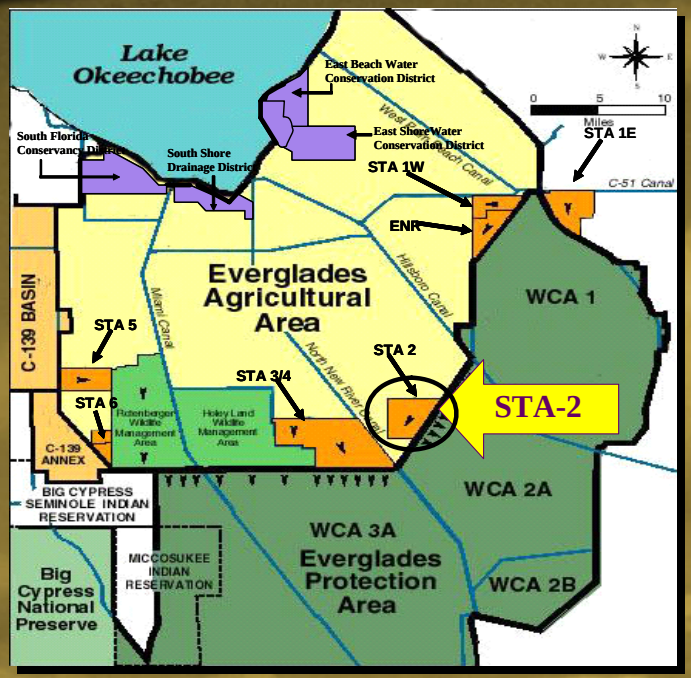
Periphyton-based Stormwater Treatment Area (PSTA)

STA-1W



- 6,760 acres of effective treatment area
- Parallel flow-ways: emergent followed by SAV

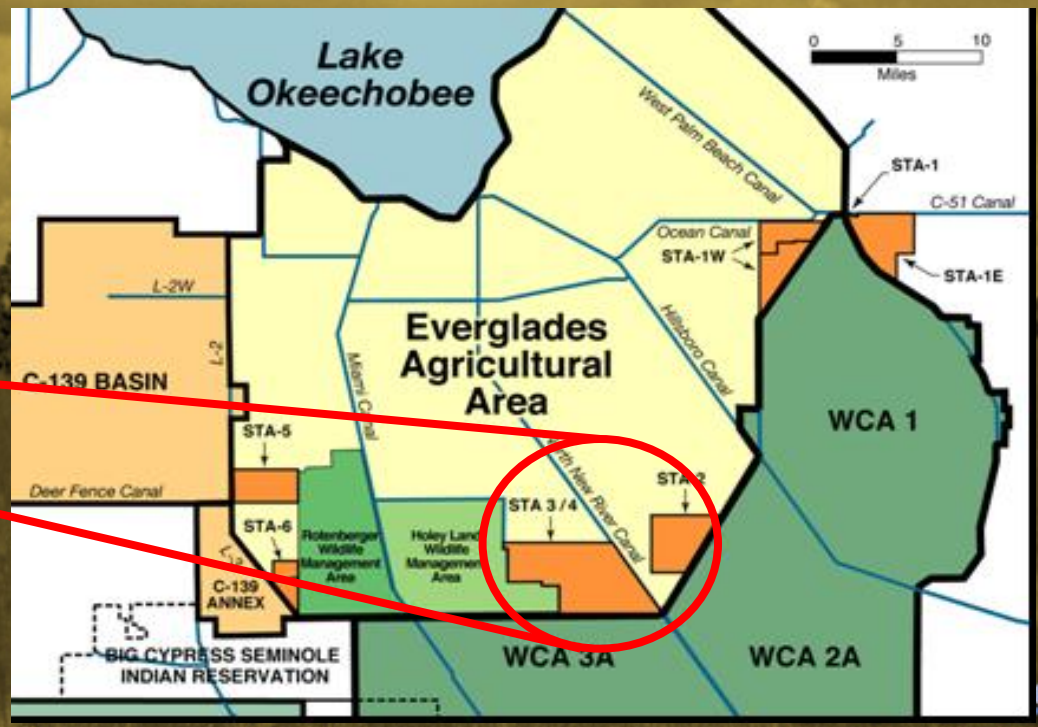
STA-2



- 6,430 acres of effective treatment area
- Parallel flow-ways: emergent followed by SAV

STA-3/4

Stormwater Treatment Area 3/4 is the world's largest constructed wetland! Over 16,500 acres of former agricultural land has been converted to a biological treatment system designed to remove over 55 tons per year of phosphorus from water entering the Everglades.



STA-3/4

- 16,530 acres of effective treatment area
- Lessons learned from other STAs applied to design and construction
- Parallel flow-ways: emergent vegetation

STA-5

- 4,118 acres of effective treatment area
- Parallel flow-ways: emergent and the emergent followed by SAV

STA-6

- 870 acres of effective treatment area
- Parallel flow-ways: emergent and emergent with periphyton

Performance

General operating principles

1. Try to ensure inflows (flows and TP loads) are within the design envelope
2. Avoid dry out – minimum of 15 cm depth
3. Avoid too deep for too long – maximum 137 cm depth for 10 days
4. Maintain target depths between storm events:
   - Emergent: 38 cm
   - SAV: 45 cm
5. Frequent field observations by site managers
6. Adaptive management for performance optimization

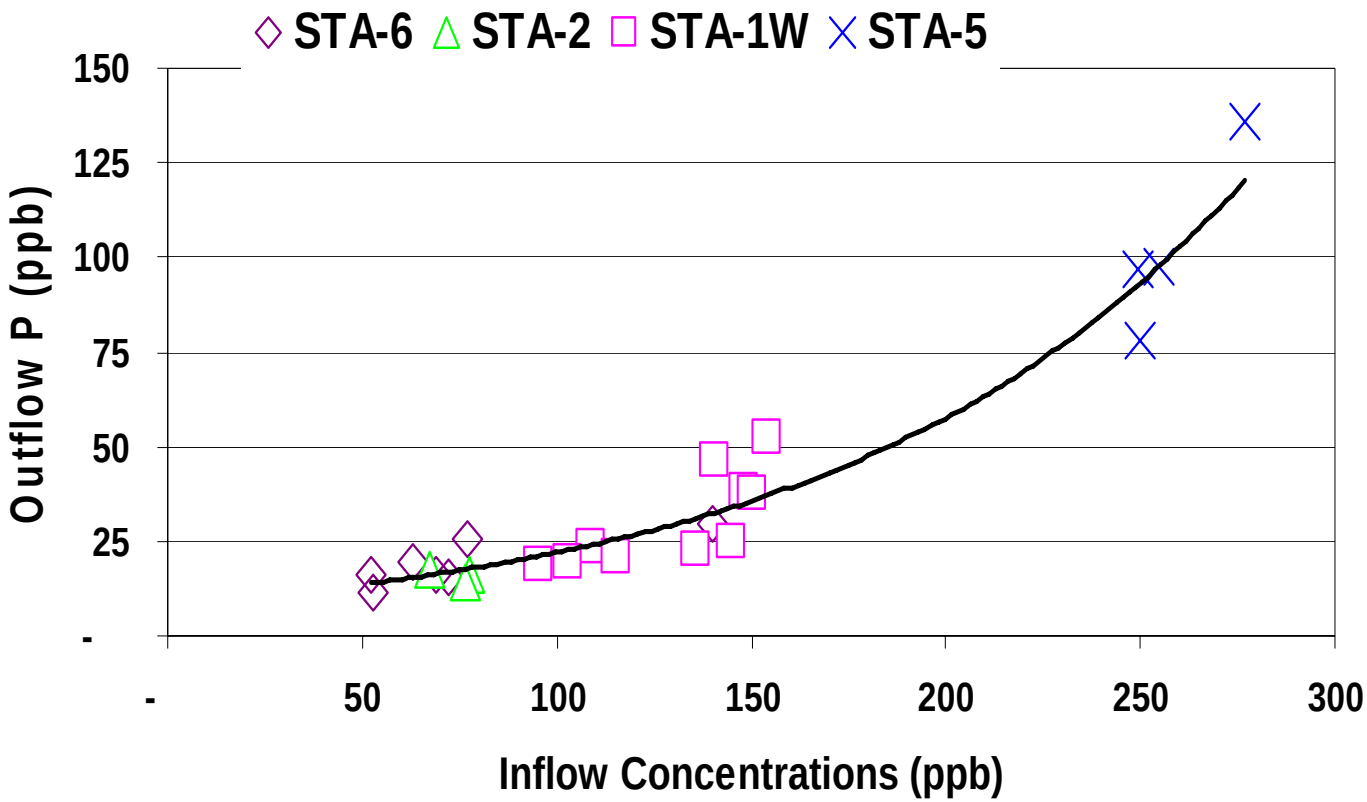
Summary of STA Performance

- **STA-1W (8/1994 – 9/2004)**
  - 290 m tons removed; average outflow = 43 ppb
- **STA-2 (6/1999 – 9/2004)**
  - 82 m tons removed; average outflow = 16 ppb
- **STA-3/4 (10/2003 – 9/2004)**
  - 40 tons removed; average outflow = 14 ppb
- **STA-5 (1/1999 – 9/2004)**
  - 121 m tons removed; average outflow = 101 ppb
- **STA-6 (12/97– 9/2004)**
  - 27 m tons removed; average outflow = 18 ppb

STA Performance Synopsis – 9/04

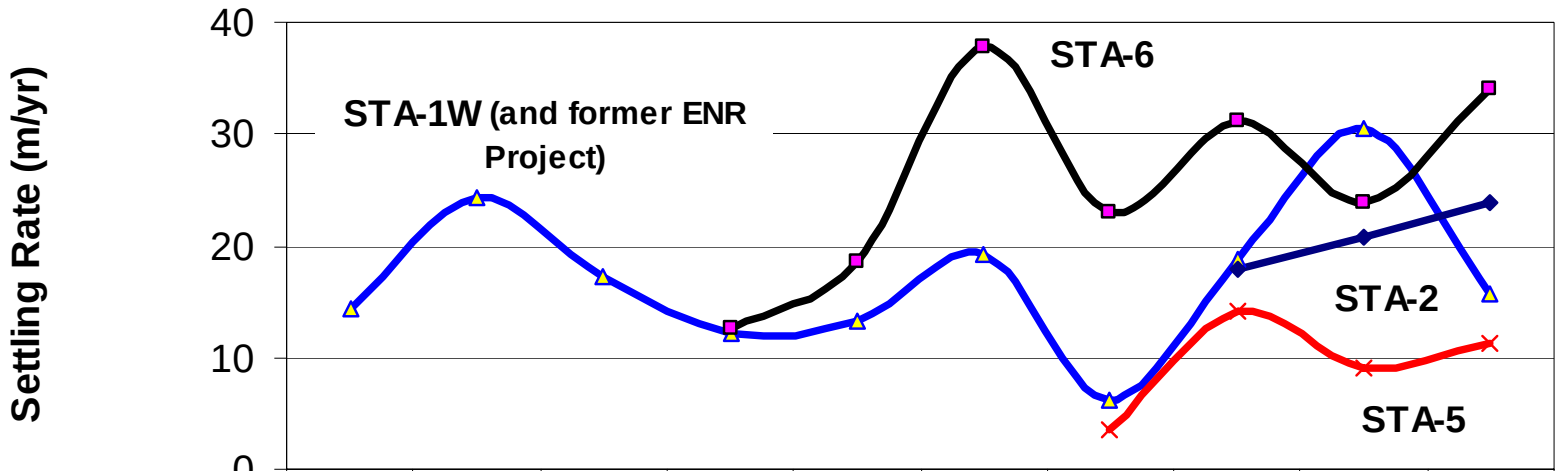
- Glancing blows from Hurricanes Frances, Ivan and Jeanne
- In general, STAs performed well
  - Inflow: 411,000 acre feet & 95 tons of phosphorus
    - 30% of annual flows; 60% of annual loads
  - 65 m tons removed (68%); average outflow = 54 ppb
- STA-1W
  - Inflow: 70% of annual flows; 150% of annual loads
  - 20 m tons removed; average outflow = 127 ppb
  - Recovery Plan being implemented
    - Divert flows to other STAs
    - Restricting inflow to 5% of maximum – diversion to Refuge
    - Additional monitoring and assessment
    - Additional vegetation and wq monitoring

STA Performance: Function of Inflow Levels



Suggests biological limits are being approached
Identifies where upstream BMPs will be more effective

STA Performance: Settling Rate



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
STA-1W	14.3	24.3	17.3	12.1	13.2	19.2	6.2	18.7	30.5	15.6
STA-2								18.0	20.7	23.8
STA-5							3.6	14.2	9.2	11.2
STA-6				12.5	18.5	37.9	22.9	31.1	23.8	34.0

Water Year

Exceeding design assumption of 10 m/yr

Summary

- **Performance has exceeded expectations**
  - **More than 560 metric tons of phosphorus removed**
  - **Discharges have averaged 40 ppb**
  - **Continuing a strong science-based program of research to optimize performance**
- **STA enhancements underway to achieve new phosphorus criterion of 10 ppb in the Everglades**

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