Everglades Stormwater Treatment Areas: Managing Flows to Achieve Performance Goals

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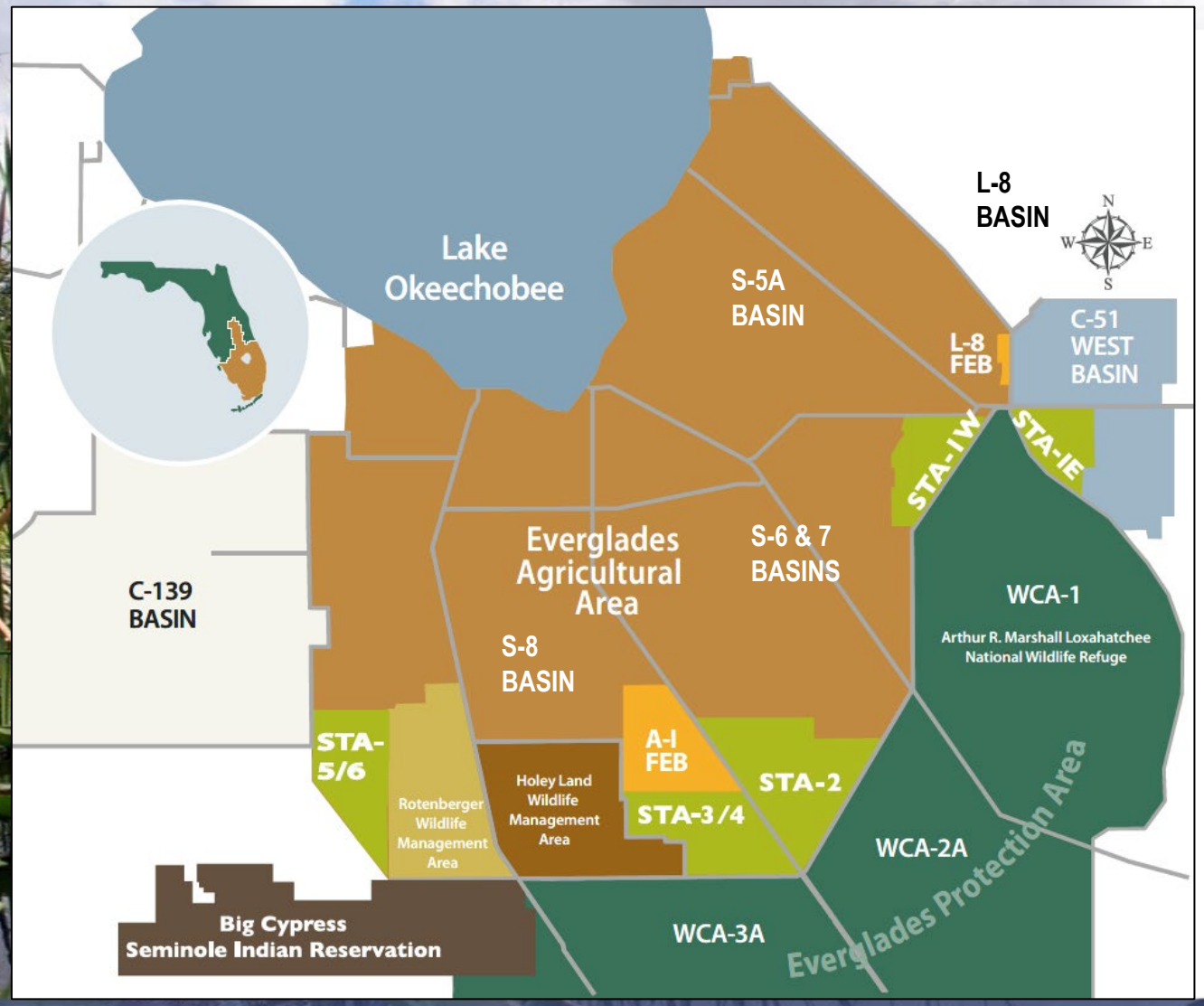
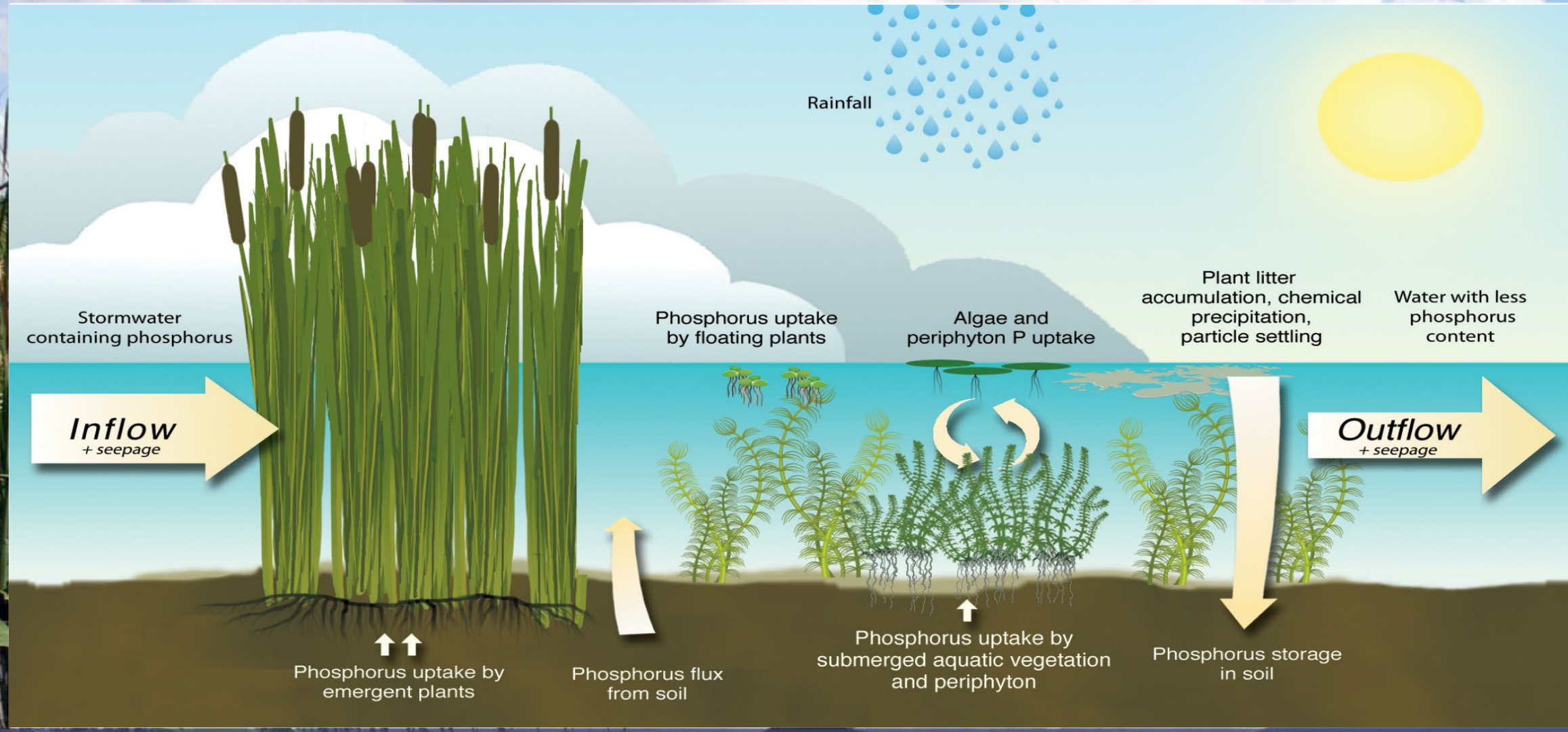
Everglades STAs



- Currently SFWMD operates ~62,000 acres of STAs south of Lake Okeechobee
  - Operate within regional water management system to provide flood protection for agricultural and urban areas
  - Reduce phosphorus loads and concentrations from runoff prior to discharge to Everglades
    - Water Quality Based Effluent Limit

STA Phosphorus Removal



WQBEL

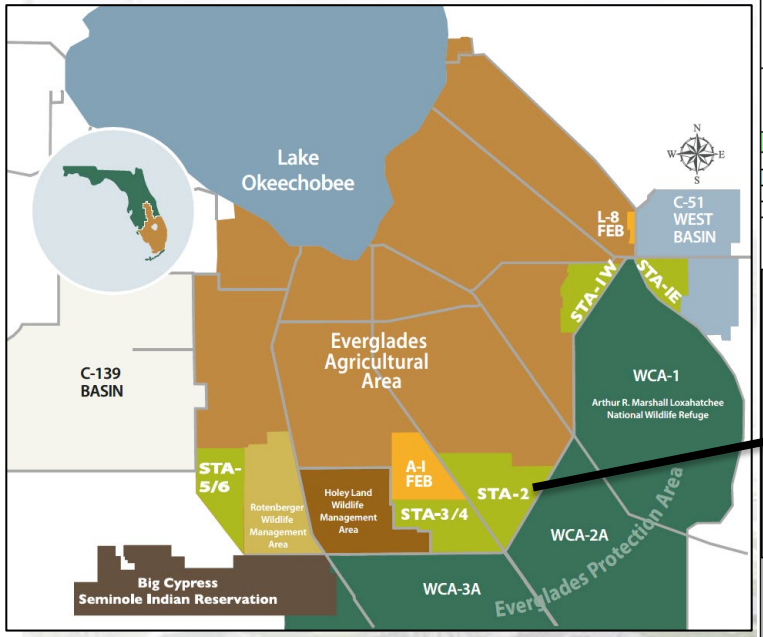
- Established in permits issued by FDEP to SFWMD to operate STAs
- Compliance is measured in two components
  - TP long-term flow weighted mean of 13 ppb, not to be exceeded in more than three out of five water years on rolling basis, and
  - A maximum TP annual flow weighted mean of 19 ppb in any water year
- Ensures that STA discharges will not cause or contribute to a violation of state water quality standards in the Everglades
- FDEP issued Consent Orders to complete Restoration Strategies projects designed with existing STAs to meet WQBEL
  - Projects to be completed in December 2025

Managing Flows to Achieve Performance Goals

- Balance flows and phosphorus loading rates (PLRs) among flow-ways and STAs
- Flow equalization basins (FEBs) reduce peak flows and reduce TP concentrations and load to STAs
- Energy dissipators installed downstream of STA inflow culverts
  - Reduce vegetation damage and short-circuits caused by high flows
- Science studies investigating relationship of flow and TP
  - Optimal flow rates for optimal TP reduction
  - Sediment resuspension/sediment transport
  - Vegetation response; EAV vs. SAV

STA Weekly Performance Summary

- Dashboard for each STA
- Annual, monthly and weekly summaries
- Near real-time flow and phosphorus data
- Supports operational recommendations



WEEKLY STA PERFORMANCE SUMMARY

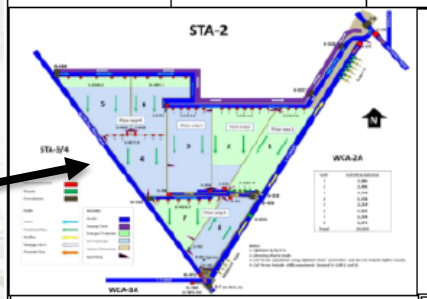
PROJECT STA-2 DATE 1/5/2022 LATEST DATA 1/2/2022

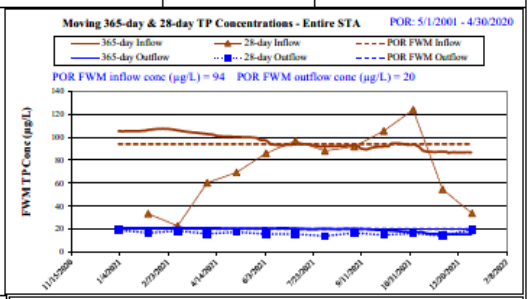
WY2022 to Date Flow-weighted Mean Conc (µg/L) Inflow: 96 Outflow: 15

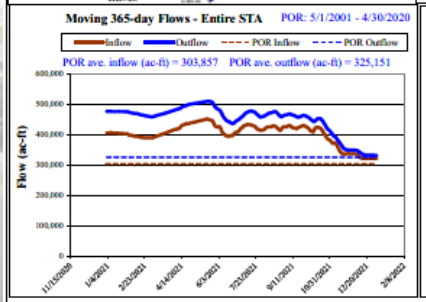
		Entire STA	Flow-way 5	Flow-way 4	Flow-way 3	Flow-way 2	Flow-way 1
365-day Values	Inflow Volume (ac-ft)	321,905	30,157	119,459	131,809	5,173	56,456
	Inflow Load (kg)	34,466	1,751	11,066	11,775	458	4,133
	Inflow Flow-weighted Mean Conc (µg/L)	87	47	75	72	72	59
	Outflow Volume (ac-ft)	331,564	23,018	106,950	135,894	37,465	57,944
	Outflow Load (kg)	6,367	278	1,577	2,777	1,237	955
	Outflow Flow-weighted Mean Conc (µg/L)	16	10	12	17	27	13
	365-day load reduction (kg)	28,099	1,474	9,490	8,997	-779	3,178
28-day Values	Inflow Volume (ac-ft)	2,505	1,477	6,121	12	no flow	no flow
	Inflow Load (kg)	104	84	211	0	no flow	no flow
	Inflow Flow-weighted Mean Conc (µg/L)	34	46	28	28	no flow	no flow
	Outflow Volume (ac-ft)	2,452	58	622	no flow	8,051	no flow
	Outflow Load (kg)	59	1	13	no flow	339	no flow
	Outflow Flow-weighted Mean Conc (µg/L)	20	14	17	no flow	34	no flow
7-day Values	Inflow Volume (ac-ft)	1,138	1,138	372	no flow	no flow	no flow
	Inflow Flow-weighted Mean Conc (µg/L)	50	50	28	no flow	no flow	no flow
	Outflow Volume (ac-ft)	305	no flow	no flow	no flow	2,104	no flow
	Outflow Flow-weighted Mean Conc (µg/L)	19	no flow	no flow	no flow	47	no flow
	365-day phosphorus loading rate ($g/m^2/yr$)	0.6	0.1	0.5	1.3	N/A	0.6
	6-month trend in outflow TP concentration (- means decrease; µg/L)	-4	0	-1	0	-16	1

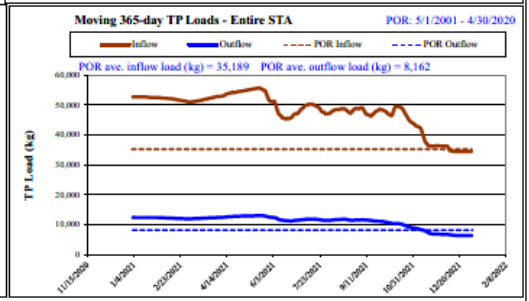
Flow-Way Information (Research projects, stage-duration, vegetation, etc.)

Flow-way 5	Flow-way 4	Flow-way 3	Flow-way 2	Flow-way 1
On-line	On-line	On-line	Off-line	On-line
	On-line with restrictions for vegetation managements activities starting on 10/28/2019.	On-line with restrictions for vegetation rehabilitation activities starting on 05/21/2019.	Off-line for construction activities starting on 9/7/2021.	









The data provided in this summary report were developed using a combination of provisional and quality-assured flow and water quality data. In some cases, best professional judgment was used to estimate missing data or revise questionable data. Values provided are not considered final, but are appropriate for use in STA operational decision-making. The PLRs being reported on the weekly sheets are adjusted to account for length of time and/or treatment area offline.

STA Weekly Performance Summary

WEEKLY STA PERFORMANCE SUMMARY

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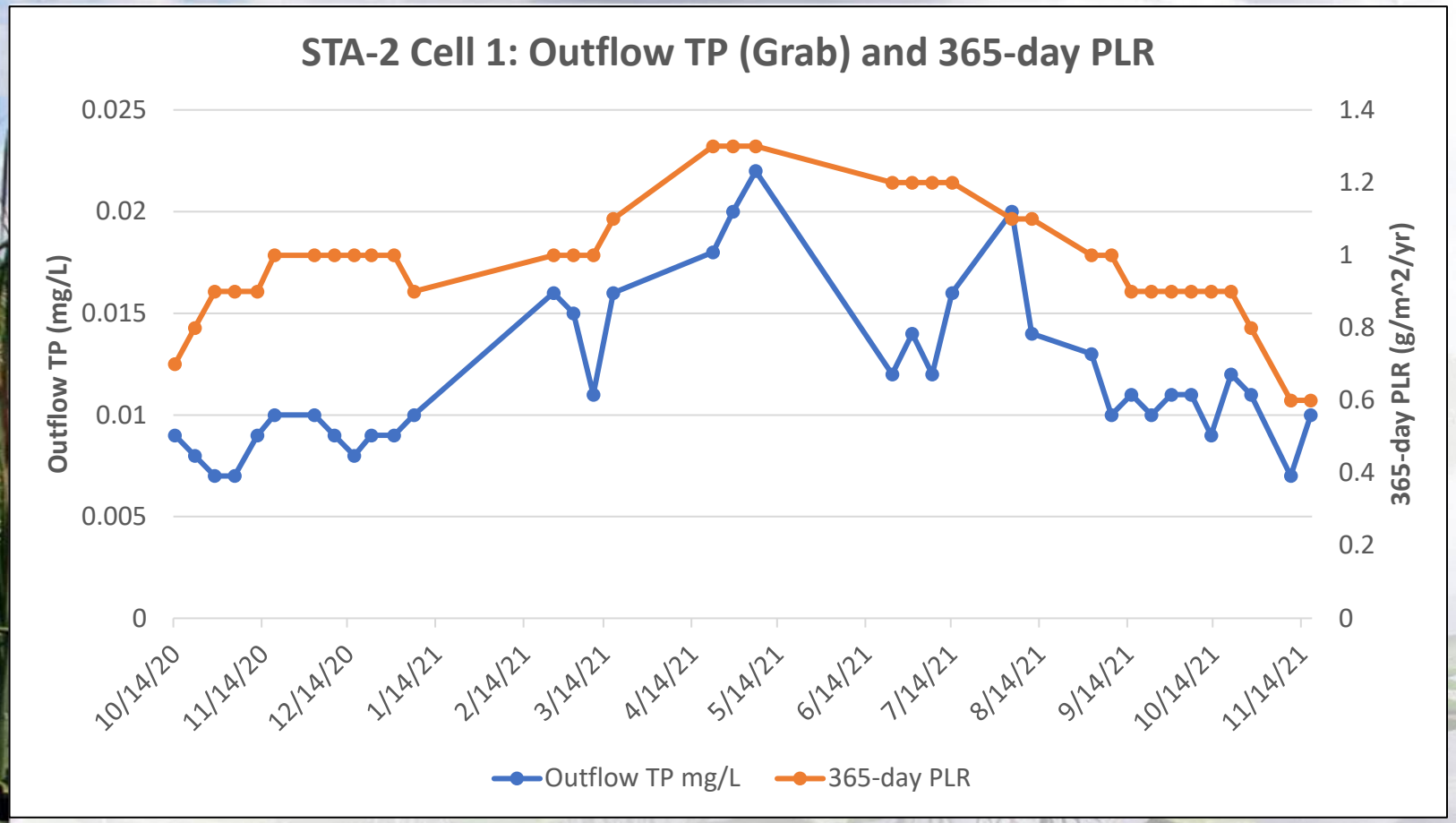
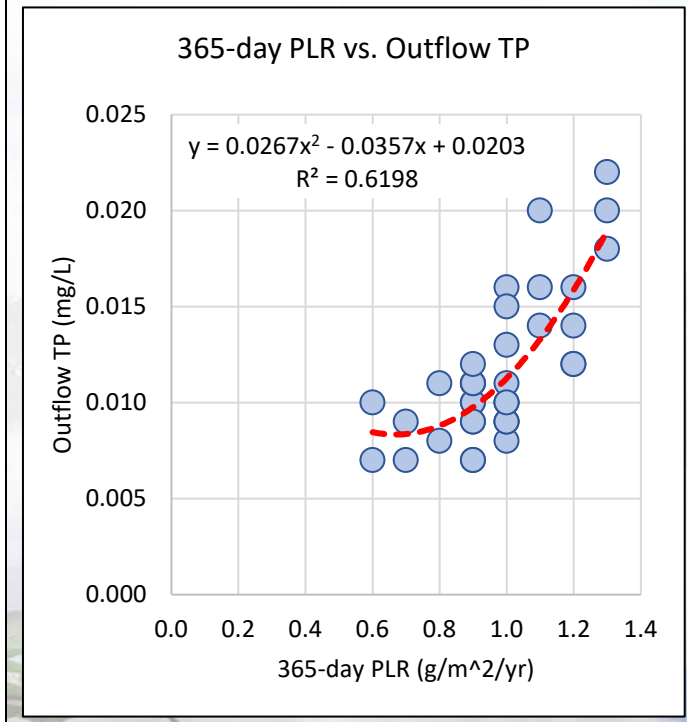
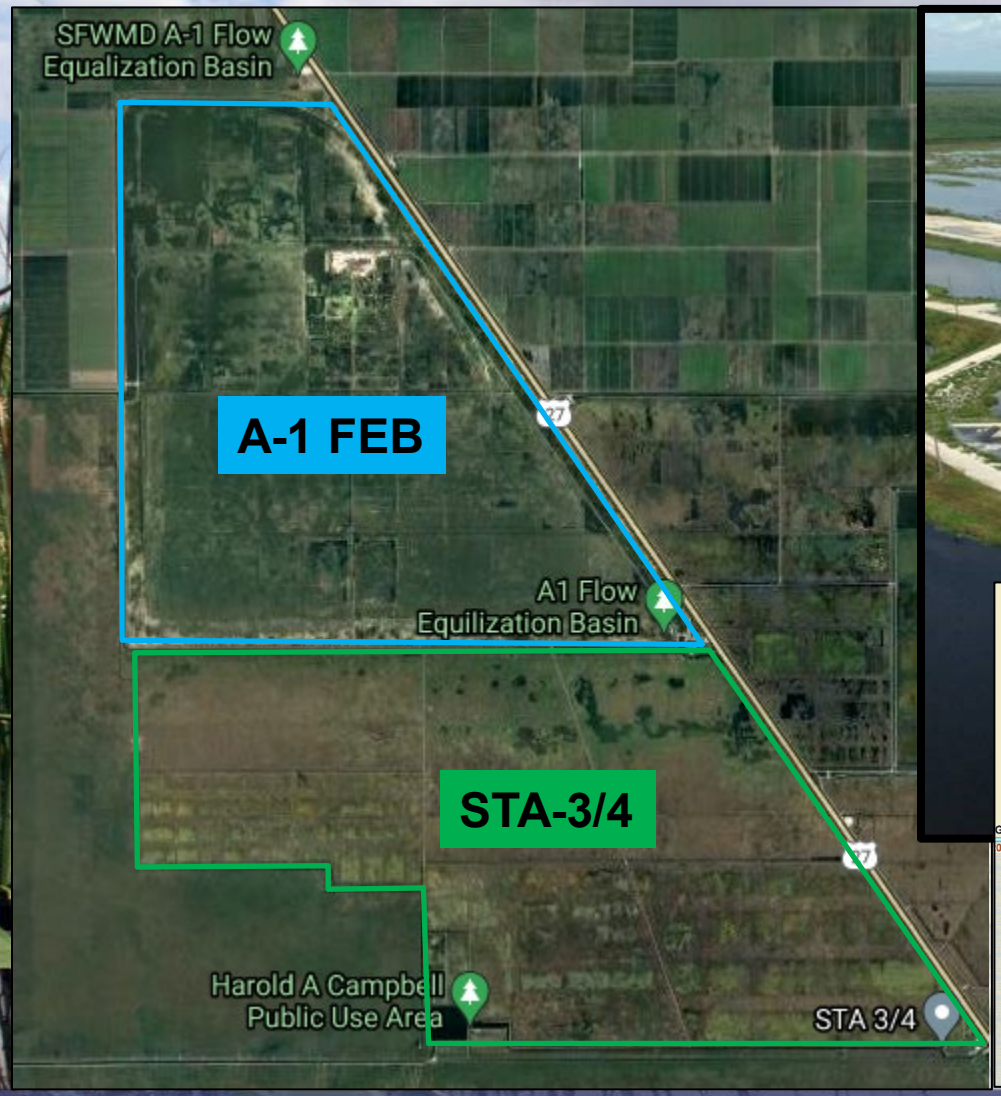
365-day PLR and Outflow TP



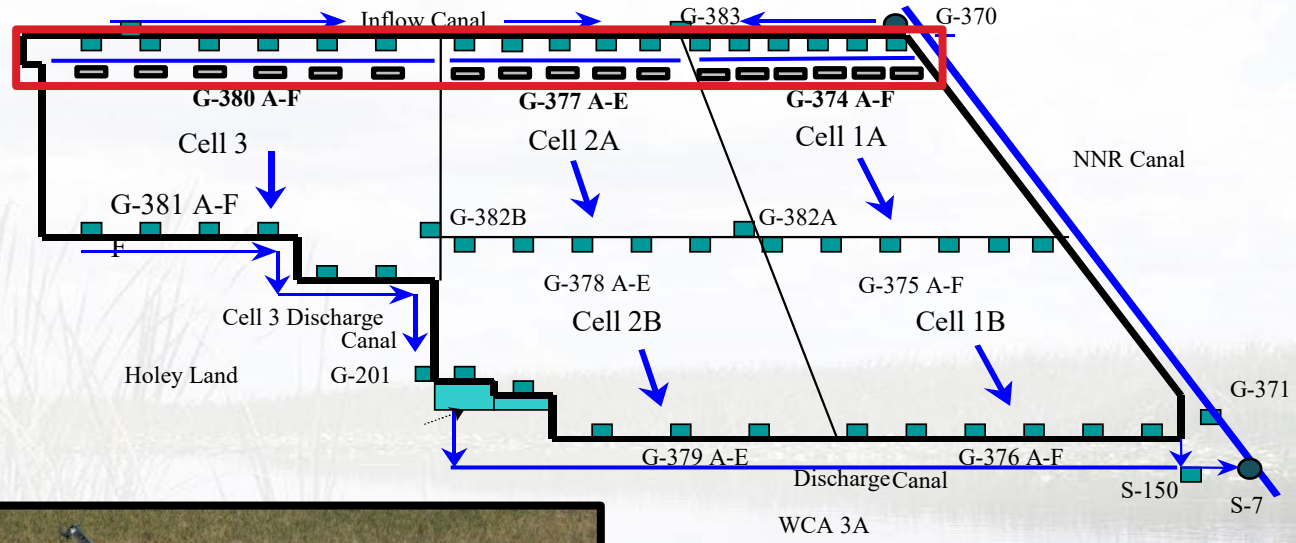


A-1 Flow Equalization Basin (FEB)



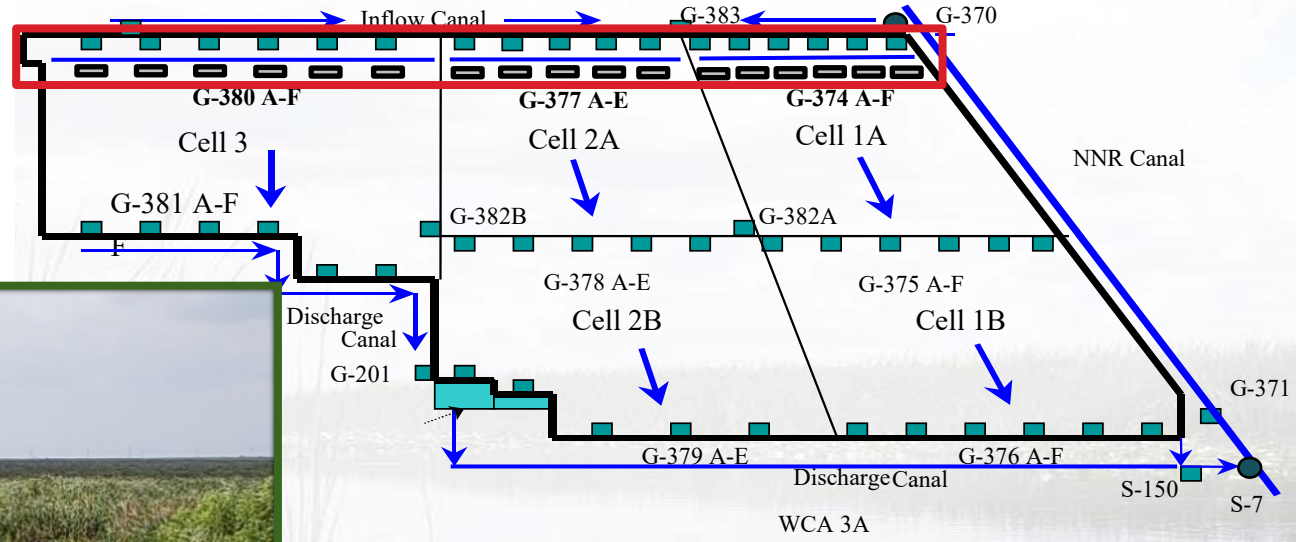
Inflow Culvert Energy Dissipators

- High flows and velocities downstream of inflow culverts damage vegetation causing channelization of flows in treatment cells
  - Short-circuits and reduced hydraulic residence time affect phosphorus retention



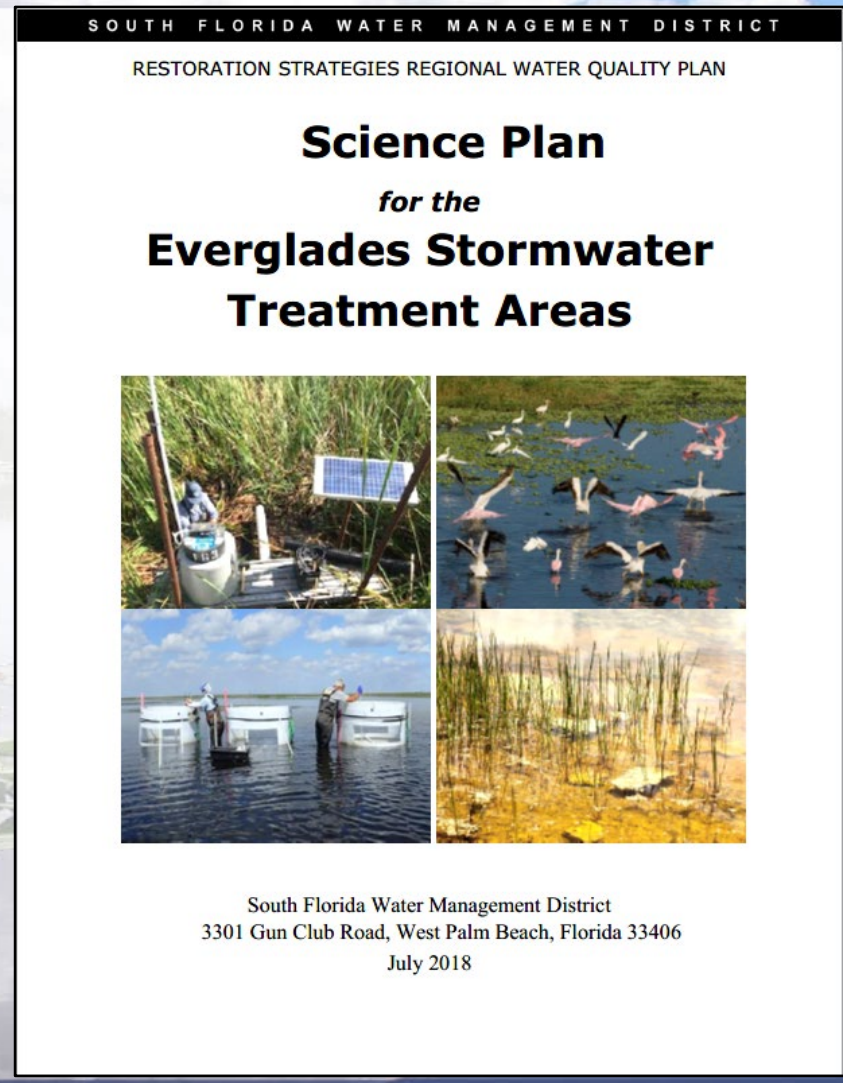
Energy dissipators

- Riprap energy dissipators installed downstream of inflow culverts to slow velocities and facilitate sheet flow through marsh



Restoration Strategies Science Plan

- Developed in 2013 and updated in 2018
- Required by STA permits and consent orders
- Studies evaluating key factors and processes that affect phosphorus removal in STAs
  - Support design, operation and management of STAs to achieve Water Quality-Based Effluent Limit (WQBEL)
  - Studying vegetation, internal phosphorus loads, biogeochemical and physical mechanisms, fauna


SOUTH FLORIDA WATER MANAGEMENT DISTRICT

RESTORATION STRATEGIES REGIONAL WATER QUALITY PLAN

Science Plan

for the

Everglades Stormwater Treatment Areas

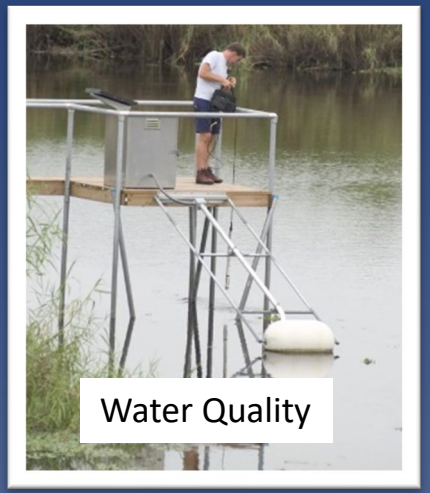
South Florida Water Management District
3301 Gun Club Road, West Palm Beach, Florida 33406
July 2018

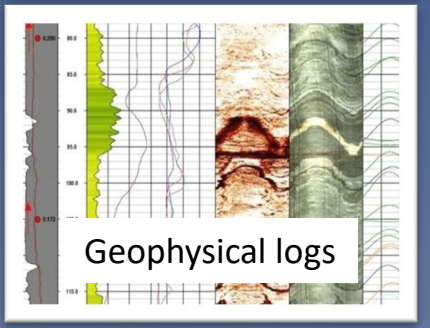
Science Plan Major Findings to Date

Flow/Stage Related Major Findings to Date
• Canal TP export related to high flow events and increased particulate P • FEBs to reduce peak flows should reduce STA canal TP export
• No flow (stagnant) conditions resulted in increased water column TP in SAV areas especially after high flow events
• Water depths greater than 3 feet for more than 14 weeks resulted in cattail stress   • Reduced density of adult and juvenile cattail in first 8 weeks

DBHYDRO Insights


Groundwater

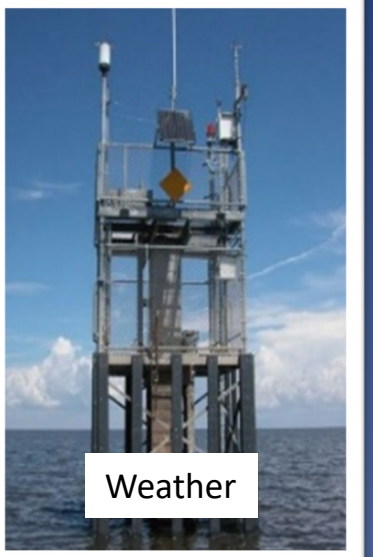

Water Quality


Geophysical logs

- Environmental database of hydrologic, meteorologic, hydrogeologic, and water quality data
- Historical and up-to-date data for SFWMD's 16-county region
- Search browser using one or more criteria and summarize data from available period of record
- Data displayed on screen in tables or graphs, or user can download data to computer
- In 2021, SFWMD released ***DBHYDRO Insights*** to make data more easily accessible to the public and stakeholders
  - https://www.sfwmd.gov/dbhydro
- New features are under development and SFWMD welcomes feedback to improve user experience:

Lokendra Matoli, Chief Architect – IT, *lmatoli@sfwmd.gov*
Brian Turcotte, Enterprise Scientific Data Mgr., *bturcott@sfwmd.gov*


Discharge


Weather


Field Measurements

Questions

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