WELCOME

Robert Shuford
Lead Scientist
Ecosystem Restoration and Capital Projects

18th Annual Public Meeting on the Long-Term Plan for Achieving Water Quality Goals for the Everglades Protection Area Tributary Basins
February 22, 2021

AGENDA

1.	**Welcome and Introduction** Robert Shuford, Ecosystem Restoration and Capital Projects Bureau	**9:00**
2.	**System Conditions** Jose Otero, Ecosystem Restoration and Capital Projects Bureau	**9:05**
3.	**Everglades Stormwater Treatment Areas (STA) Performance Update** Jake Dombrowski, Applied Sciences Bureau	**9:25**
4.	**STA Vegetation Management and Enhancement** Eric Crawford, Land Resources Bureau	**9:45**
5.	**Restoration Strategies: Stormwater Treatment Area (STA) Science Plan Update & Highlights** Tom James, Applied Sciences Bureau	**10:05**
6.	**Restoration Strategies: Design and Construction Update** Lucine Dadrian, Engineering and Construction Bureau	**10:25**
7.	**Southern Everglades Nutrient Source Control Program Update** Steve Sarley & Youchoa Wang, Ecosystem Restoration and Capital Projects Bureau	**10:45**
8.	**Public Use on SFWMD Stormwater Treatment Areas** Jerry Krenz, Land Resources Bureau	**11:05**
9.	**Public Comment**	**11:25**

System Conditions

Jose Otero, P.E.
Section Administrator
Ecosystem Restoration and Capital Projects

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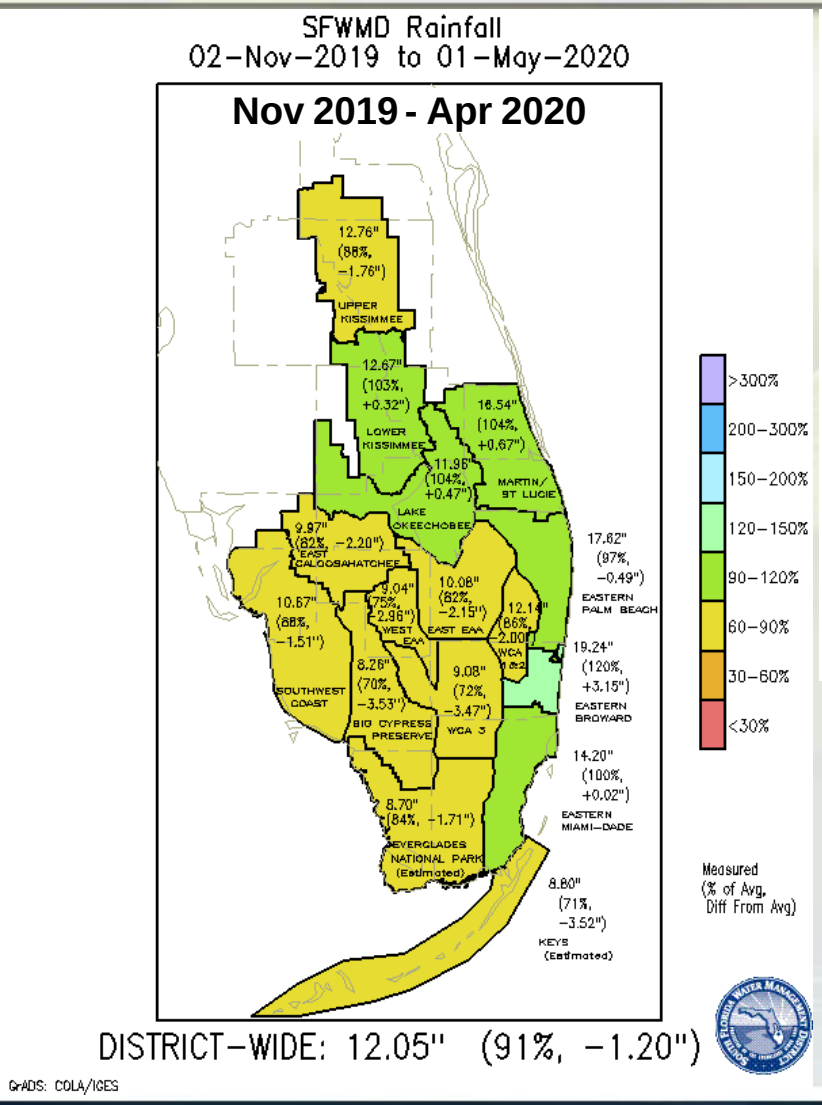
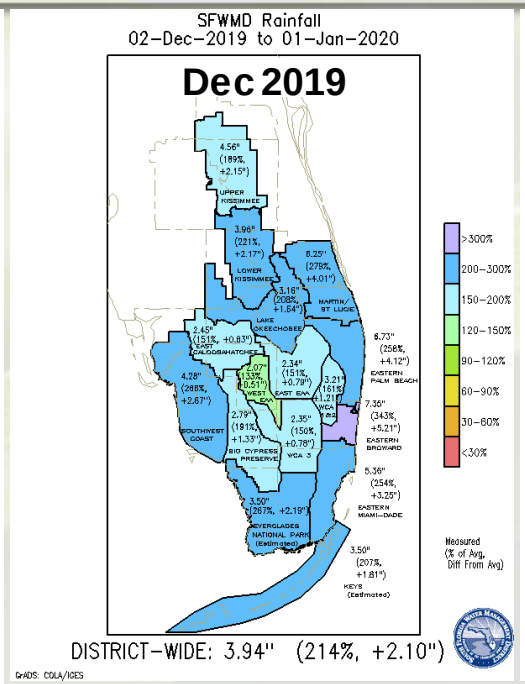
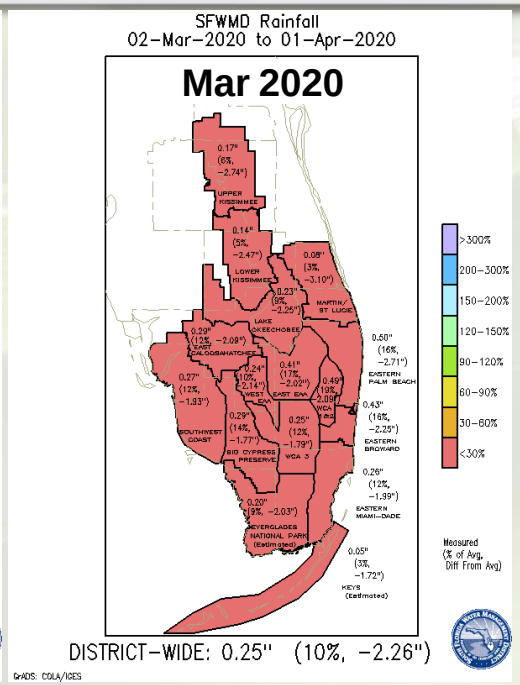
Rainfall Dry Season Water Year 2020

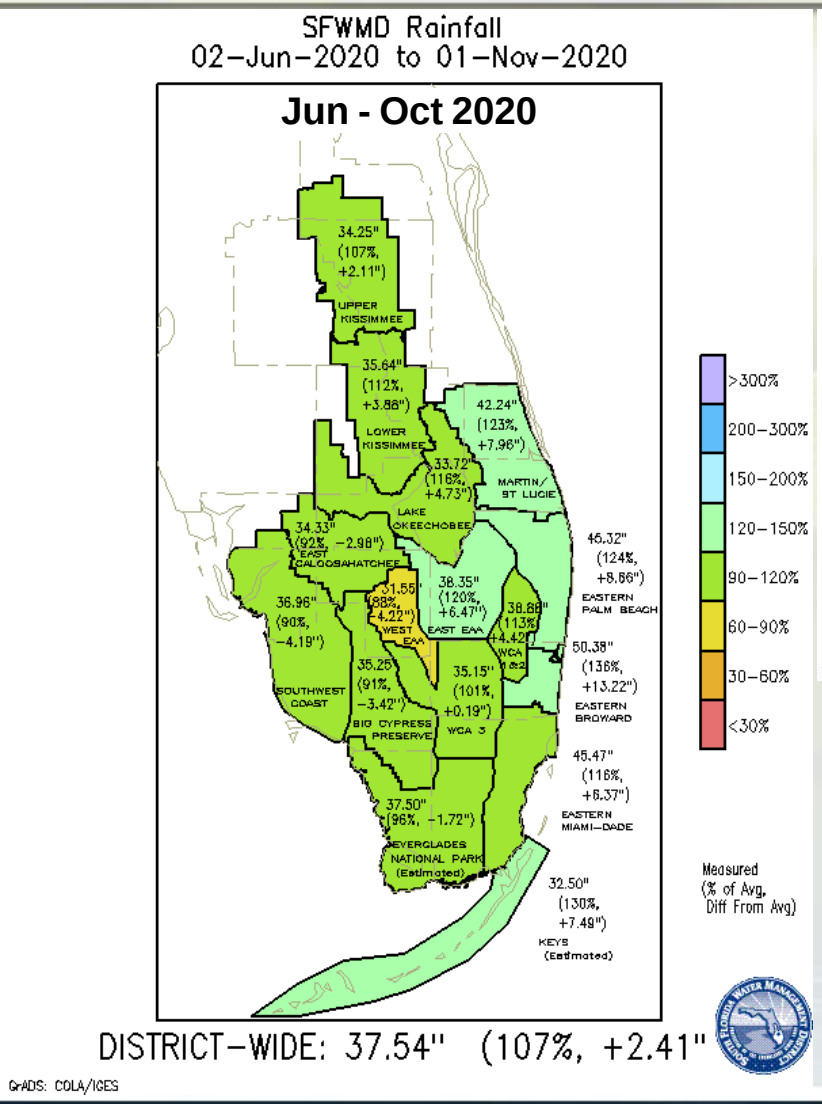


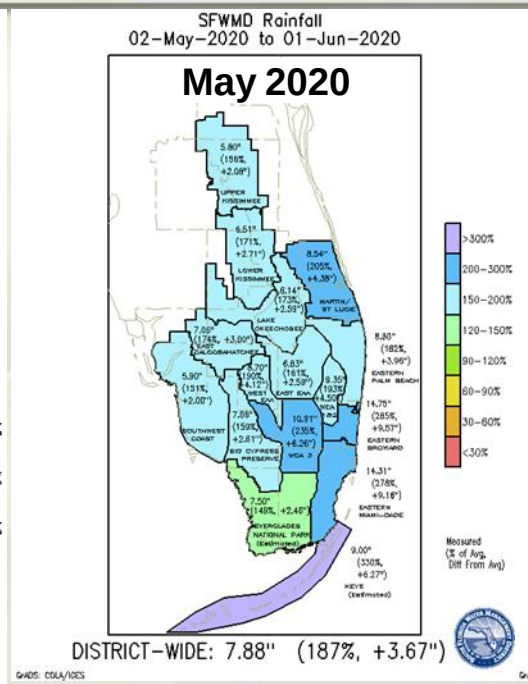


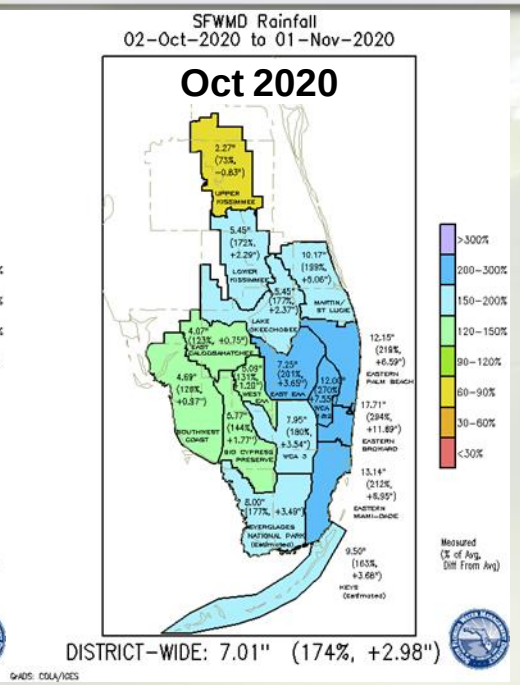


- Dry Season normal to drier than normal
- Dec 2019 very wet to extremely wet (Lower Kissimmee and Okeechobee)
- Mar 2020 extremely dry, some areas 5% of average

Rainfall Wet Season Water Year 2021

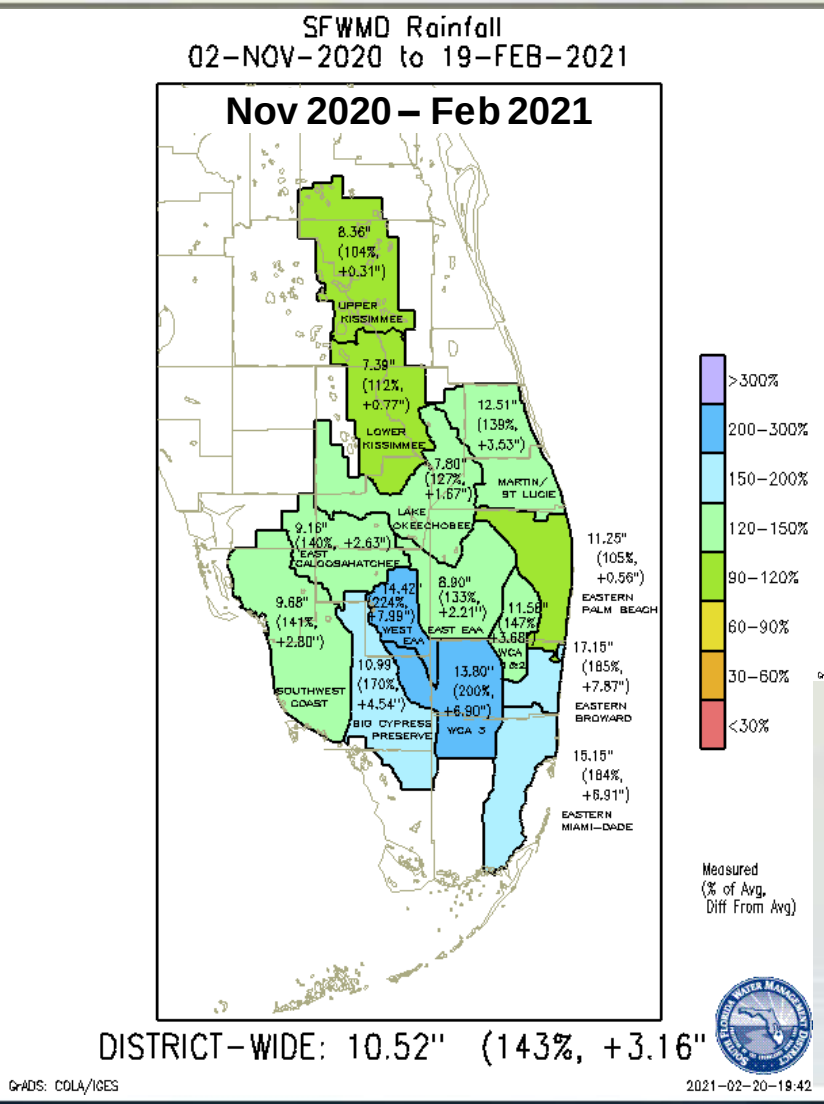


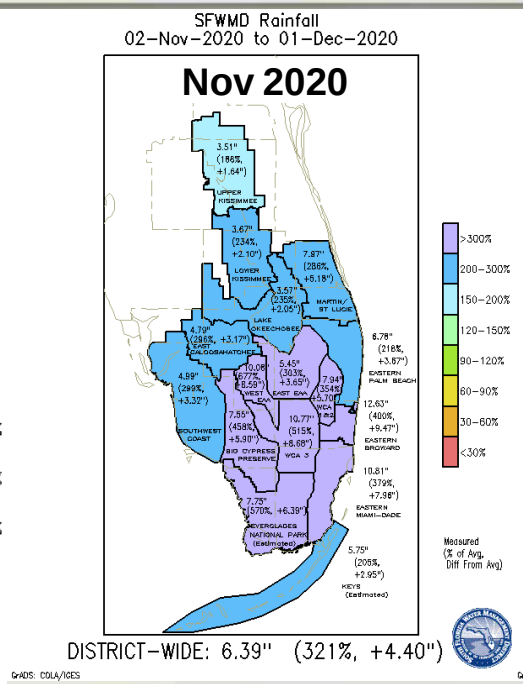


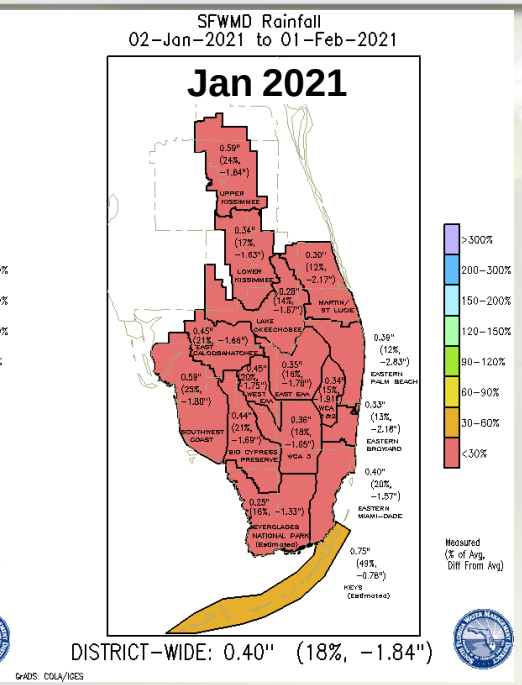


- Wet Season normal to wetter than normal
- May 2020 very wet to extremely wet (WCA 3A)
- Oct 2020 very wet to extremely wet (East EAA, WCA 1, and WCA 2A), Upper Kissimmee drier than normal

Rainfall Dry Season Water Year 2021 (partial)

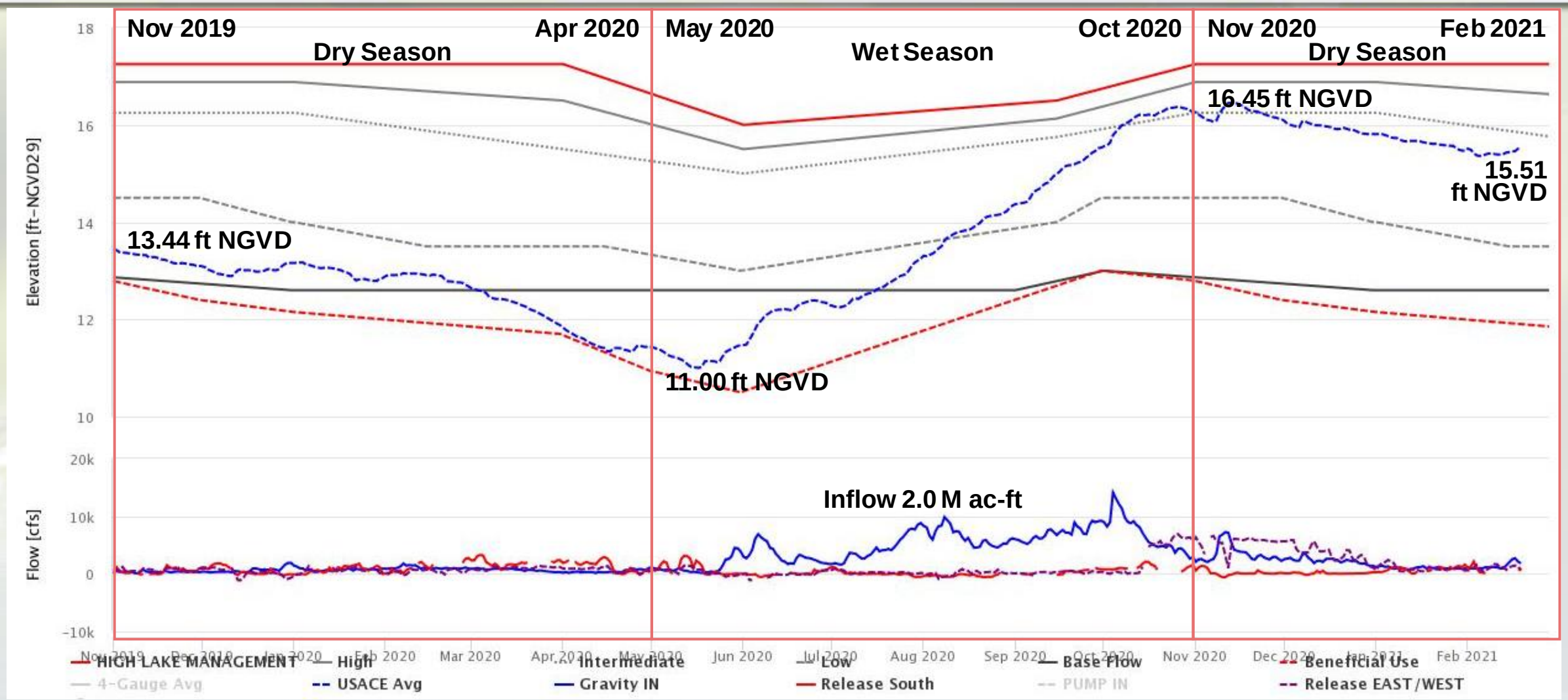




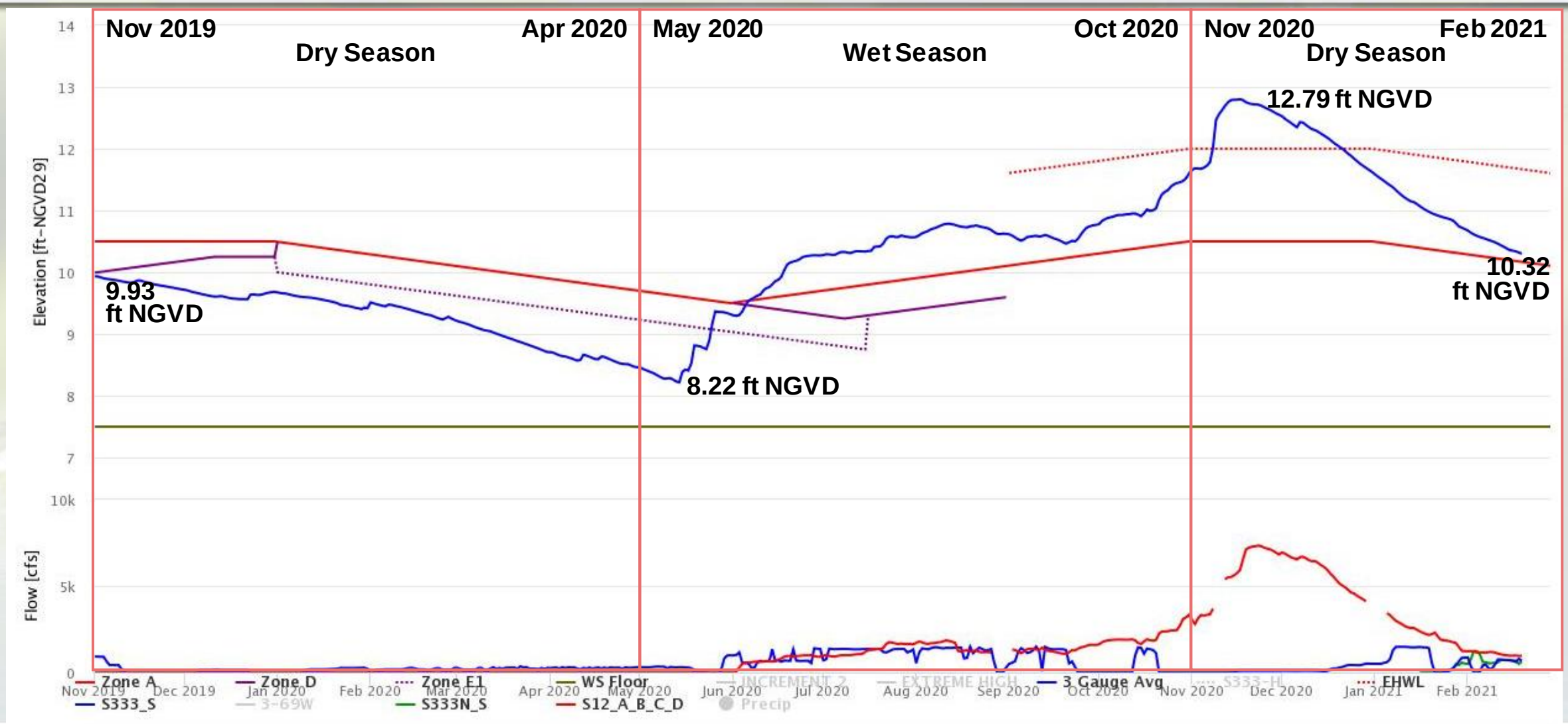


- Dry Season normal to extremely wet, especially WCA 3A
- Nov 2020 very wet to extremely wet (south of Lake Okeechobee)
- Jan 2021 extremely dry, some areas 5% or average

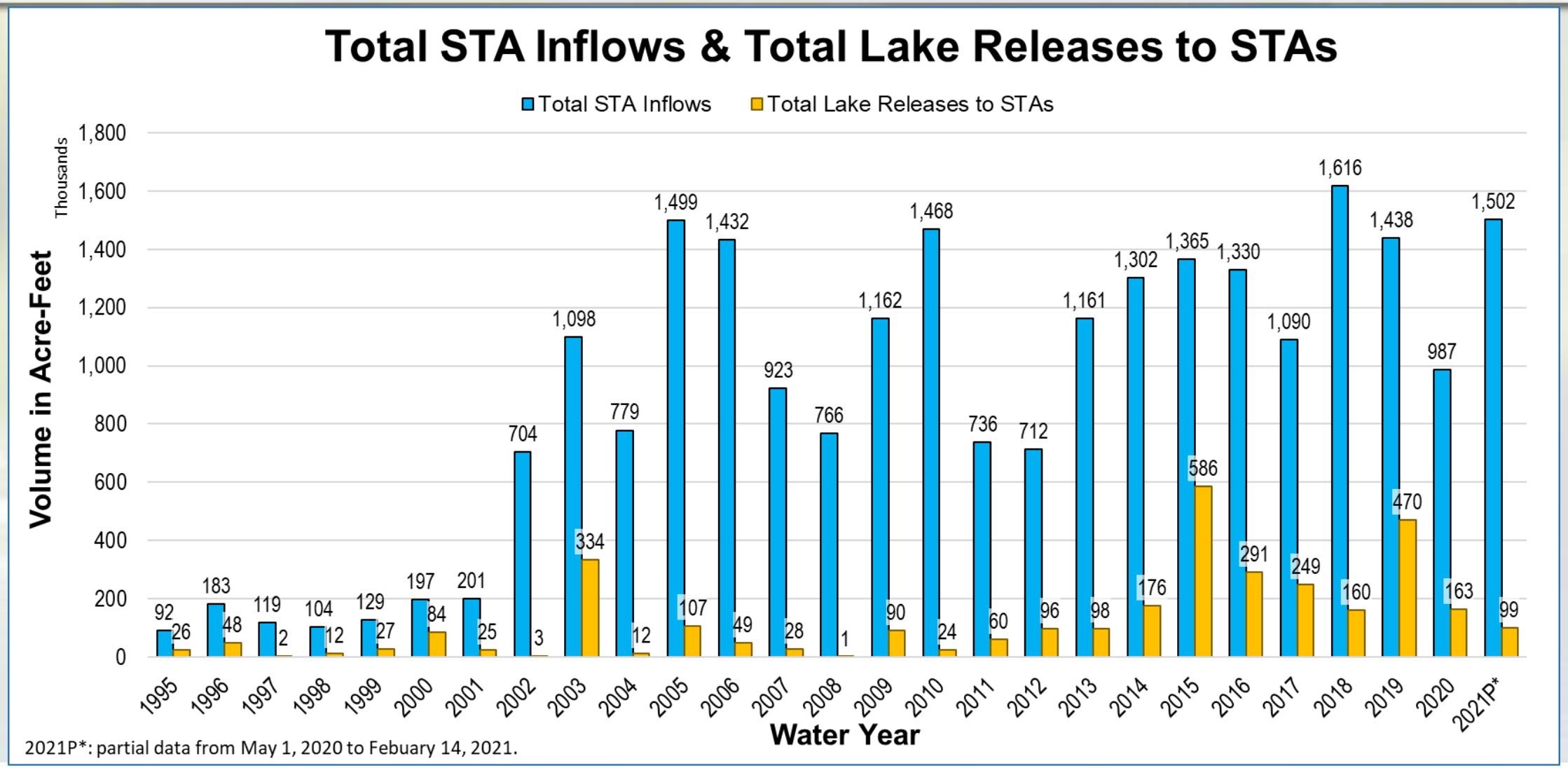
Lake Okeechobee Stage



WCA 3A Stage


Nov 2019
Apr 2020
Dry Season
May 2020
Oct 2020
Wet Season
Nov 2020
Feb 2021
Dry Season
12.79 ft NGVD
9.93
ft NGVD
8.22 ft NGVD
10.32
ft NGVD
Elevation [ft-NGVD29]
Flow [cfs]
Zone A
Zone D
Zone E1
WS Floor
3 Gauge Avg
EHWL
S333_S
S333N_S
S12_A_B_C_D
Precip

Water Year Inflows to STAs



Contact Information

Jose Otero
jotero@sfwmd.gov

Everglades Stormwater Treatment Areas Performance Update

Jake Dombrowski
Scientist 4
Applied Sciences

18th Annual Public Meeting on the Long-Term Plan for Achieving Water Quality Goals for the Everglades Protection Area Tributary Basins
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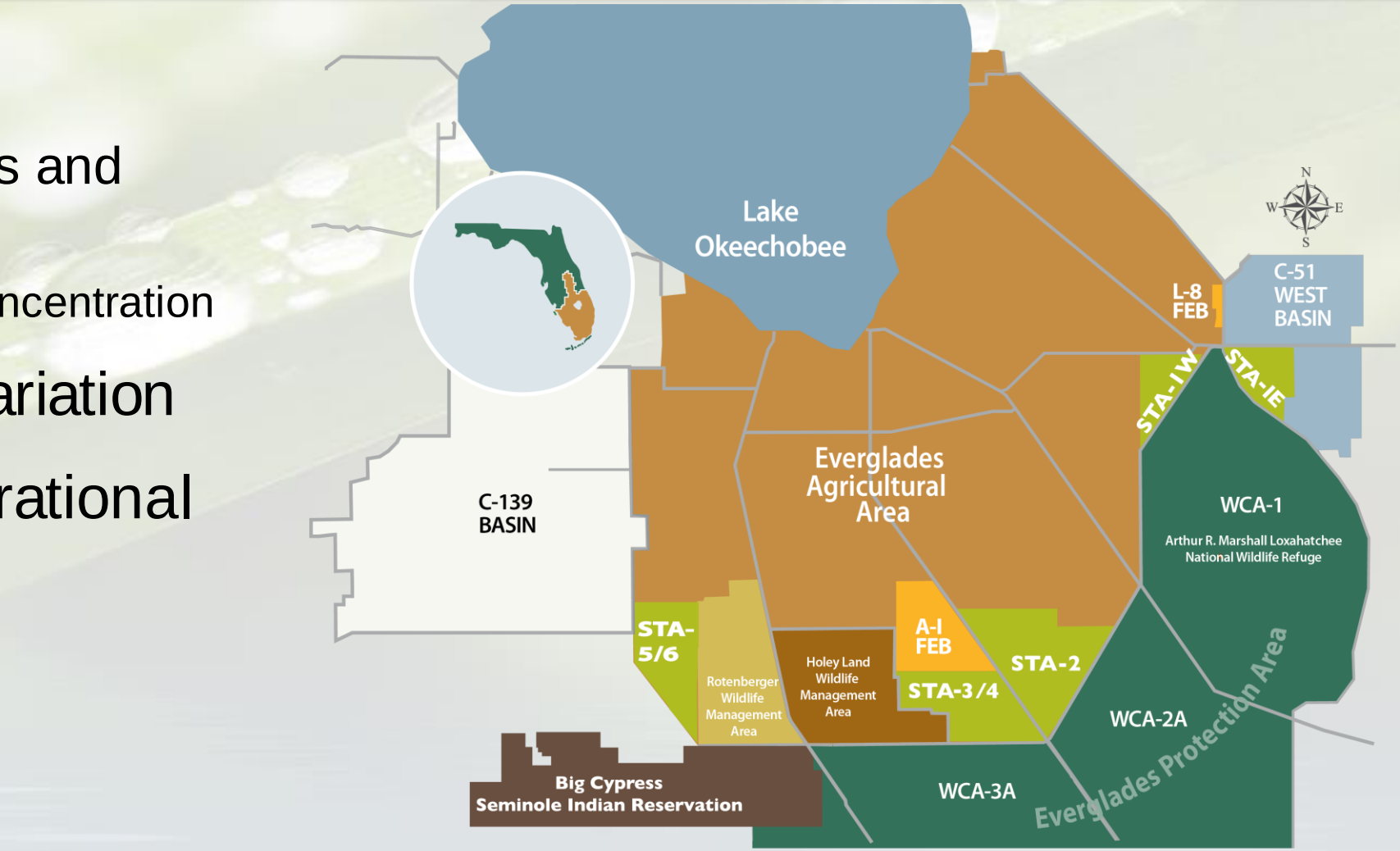
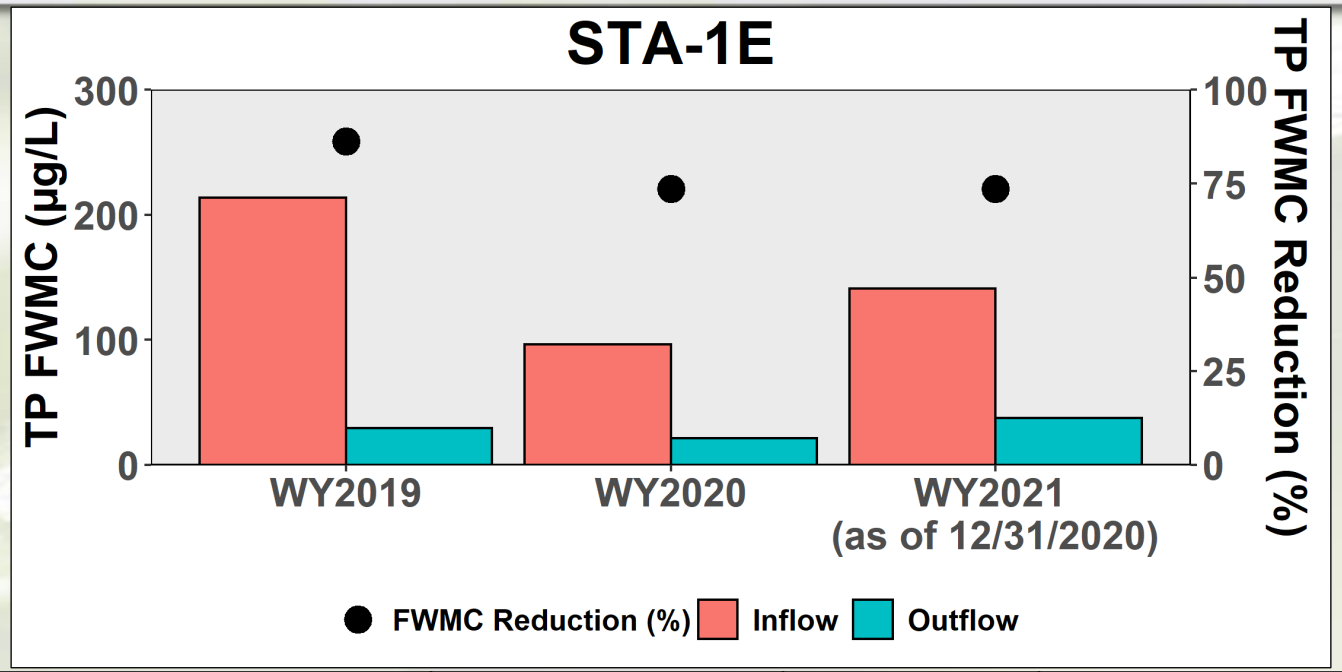
Introduction

- STA Performance
  - Flow volumes, TP loads and FWMC
    - Flow-weighted Mean Concentration
- Yearly and monthly variation
- Construction and operational restrictions



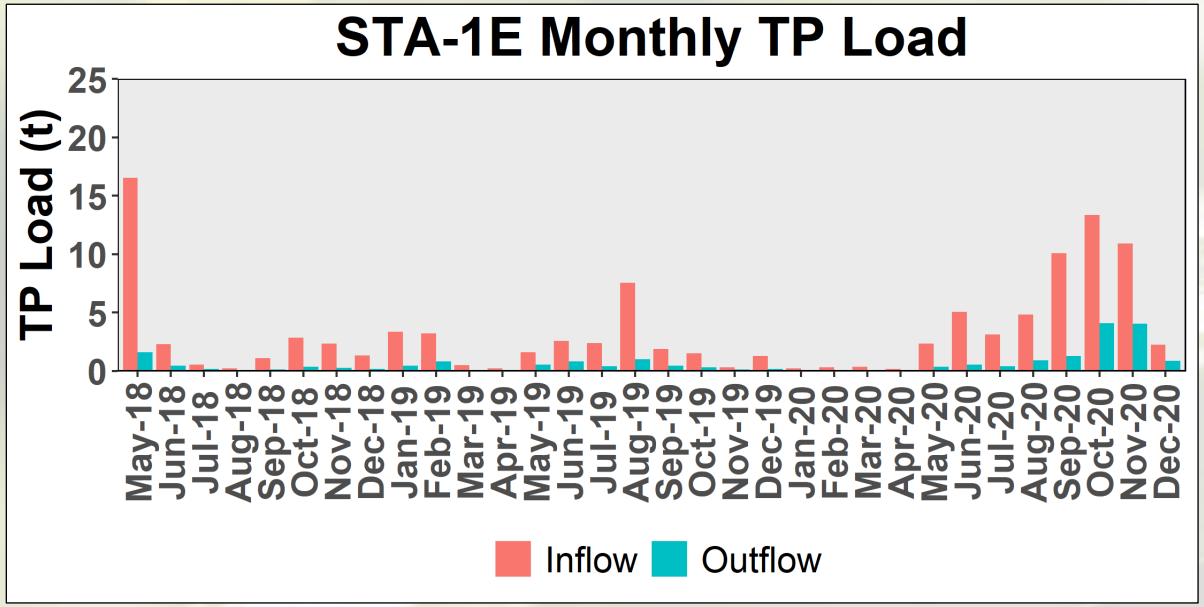
STA-1E Performance Comparison by WY

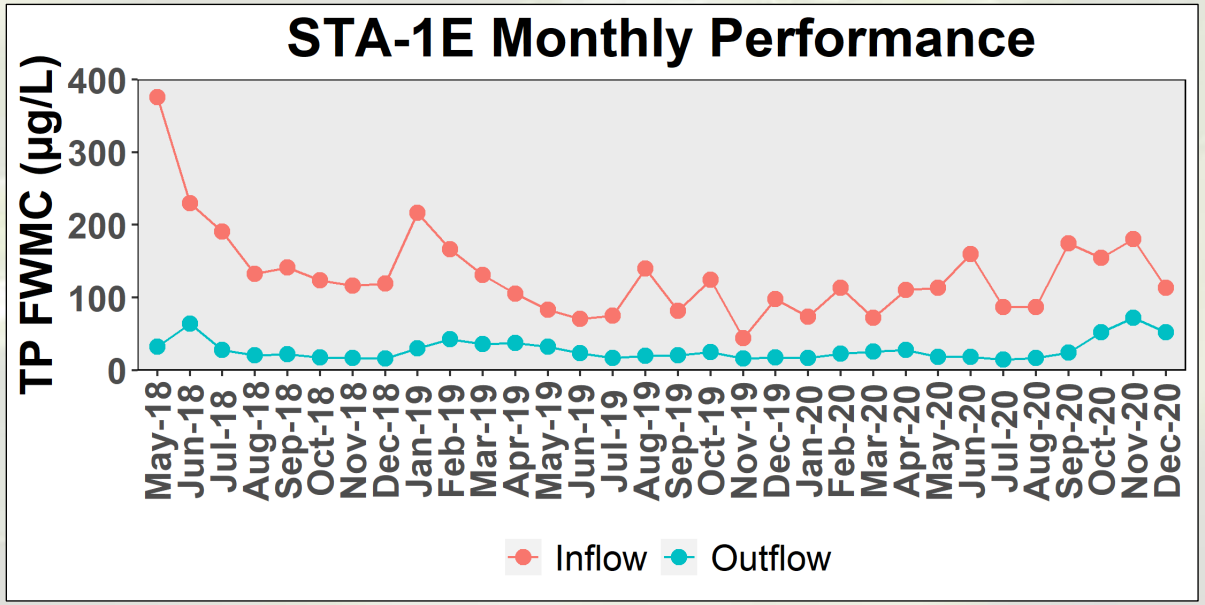


Includes preliminary data

	WY2019	WY2020	Partial WY2021 (05/01/2020 - 12/31/2020)
Total inflow (k acre-feet)	131	170	299
Lake releases (k acre-feet)	46	12	21
TP FWMC inflow / outflow (µg/L)	214 / 30	96 / 21	141 / 37
TP load inflow / outflow (tons)	34 / 5	20 / 4	52 / 13
Reduction in TP FWMC / load	86% / 87%	74% / 76%	74% / 76%

STA-1E Monthly TP Load and FWM Concentration





- Elevated inflow TP loads, FWMC during WY2021
- Outflow TP FWMC has previously been stable in the 15-25 ppb range, rising during WY2021 to the 50-75 ppb range

Includes preliminary data

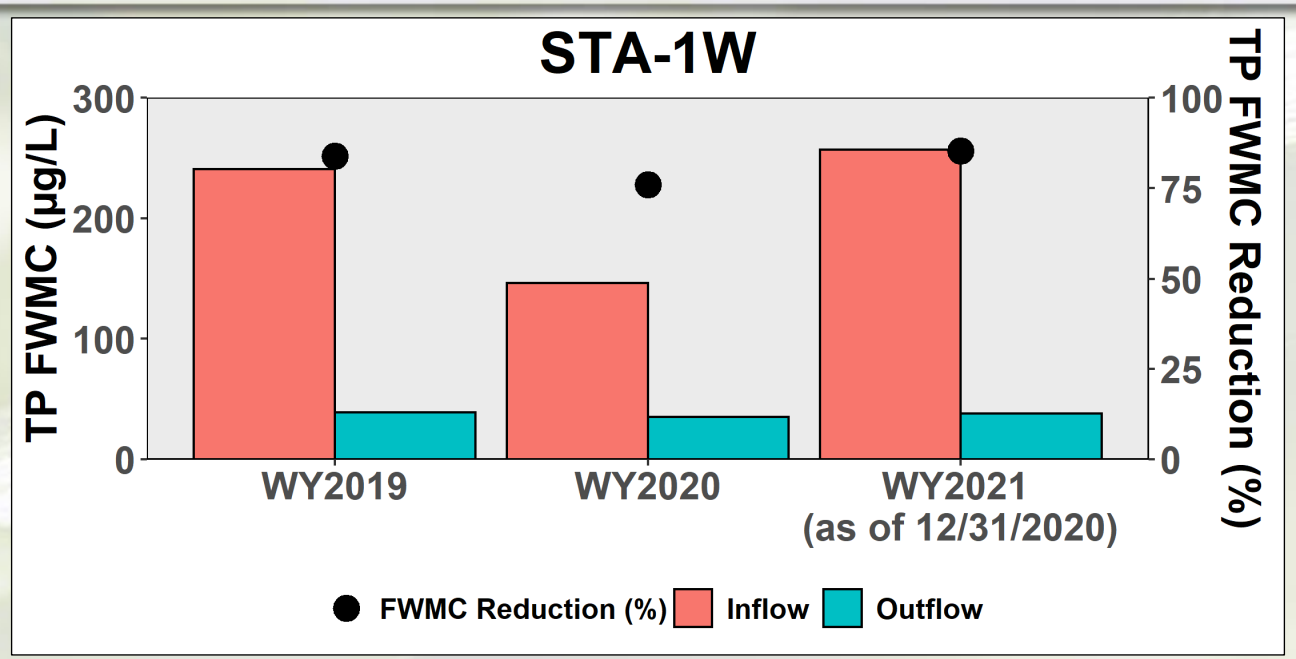
STA-1E Highlights
(Jan. 1, 2020 – Dec. 31, 2020)

- Western flow-way offline
  - WDC levee repairs, Restoration Strategies earthwork Cells 5 &7, road removal Cell 6
- Periodic restrictions in all three flow-ways
  - EDC levee repairs
  - Vegetation management activities: spraying, inoculation, and planting
  - Black-necked stilt nesting reported in Cells 4N, 5, 6, and 7


Remnant road removal in Cell 6


Fill staging in Cell 7

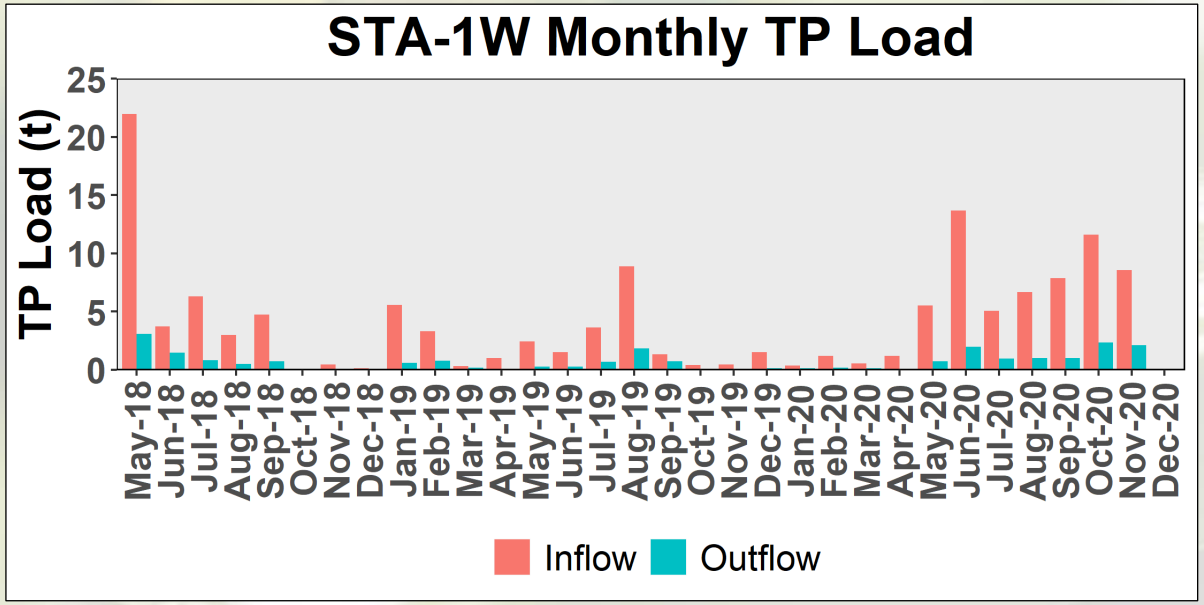
STA-1W Performance Comparison by WY

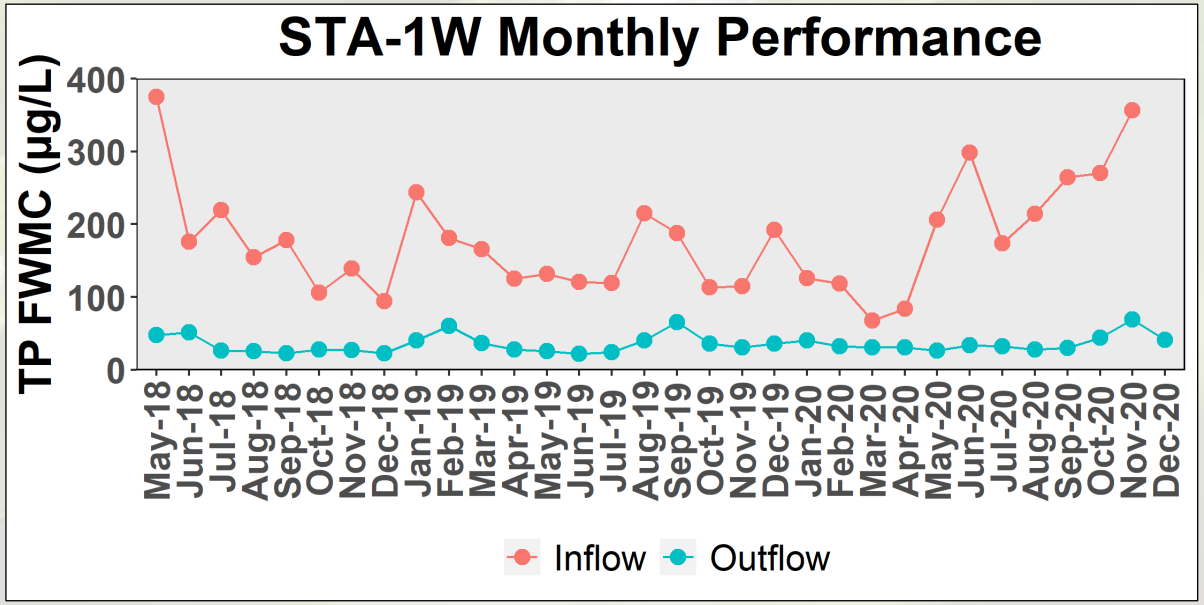


Includes preliminary data

	WY2019	WY2020	Partial WY2021 (05/01/2020 - 12/31/2020)
Total inflow (k acre-feet)	170	130	186
Lake releases (k acre-feet)	26	17	5
TP FWMC inflow / outflow (µg/L)	241 / 39	146 / 35	257 / 38
TP load inflow / outflow (tons)	50 / 8	23 / 5	59 / 10
Reduction in TP FWMC / load	84% / 84%	76% / 81%	85% / 83%

STA-1W Monthly TP Load and FWM Concentration





- Elevated inflow TP loads and FWMC during WY2021
- Outflow TP FWMC remains relatively stable around 30 ppb

Includes preliminary data

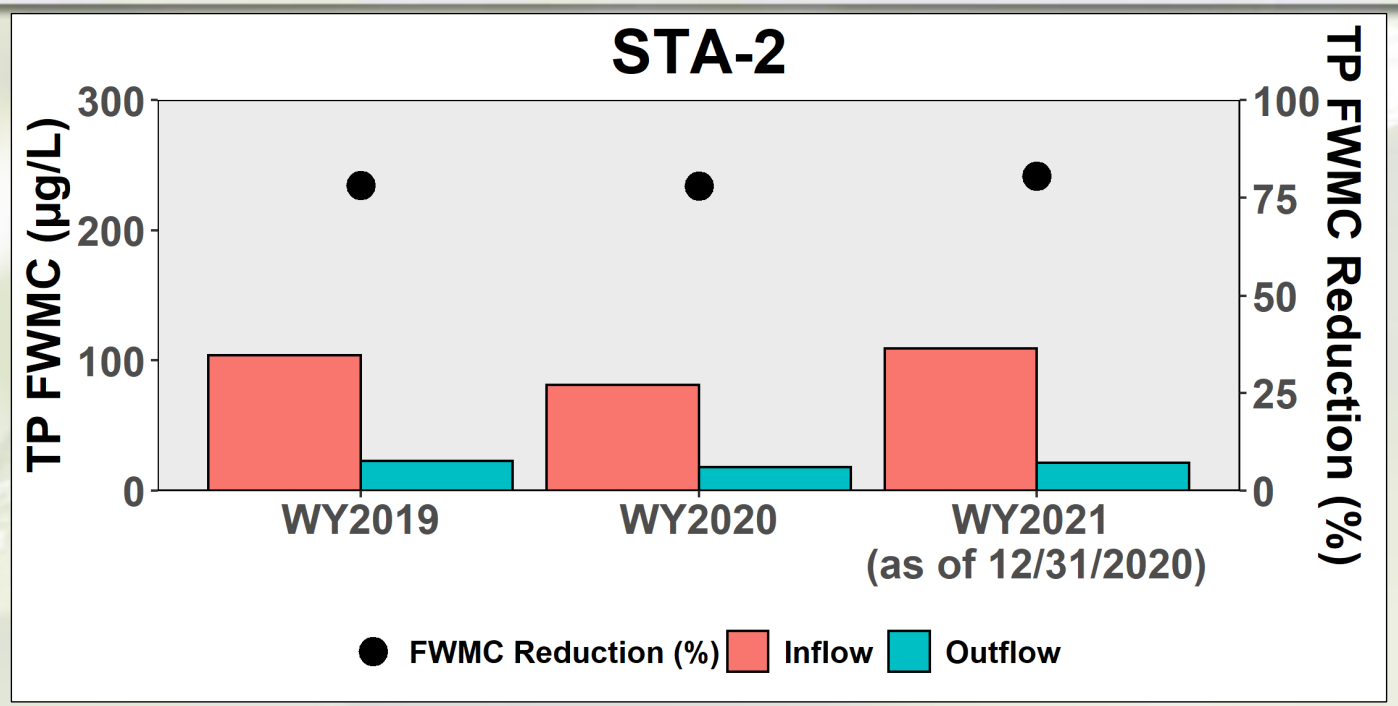
STA-1W Highlights (Jan. 1, 2020 – Dec. 31, 2020)

- Periodic restrictions in all three flow-ways
  - Construction activities related to the STA-1W Expansion #1
    - Discharge canal plug construction complete
  - Black-necked stilt nesting reported in Cell 8

SAV recruitment in STA-1W Expansion Cell 6

Discharge canal plugwork

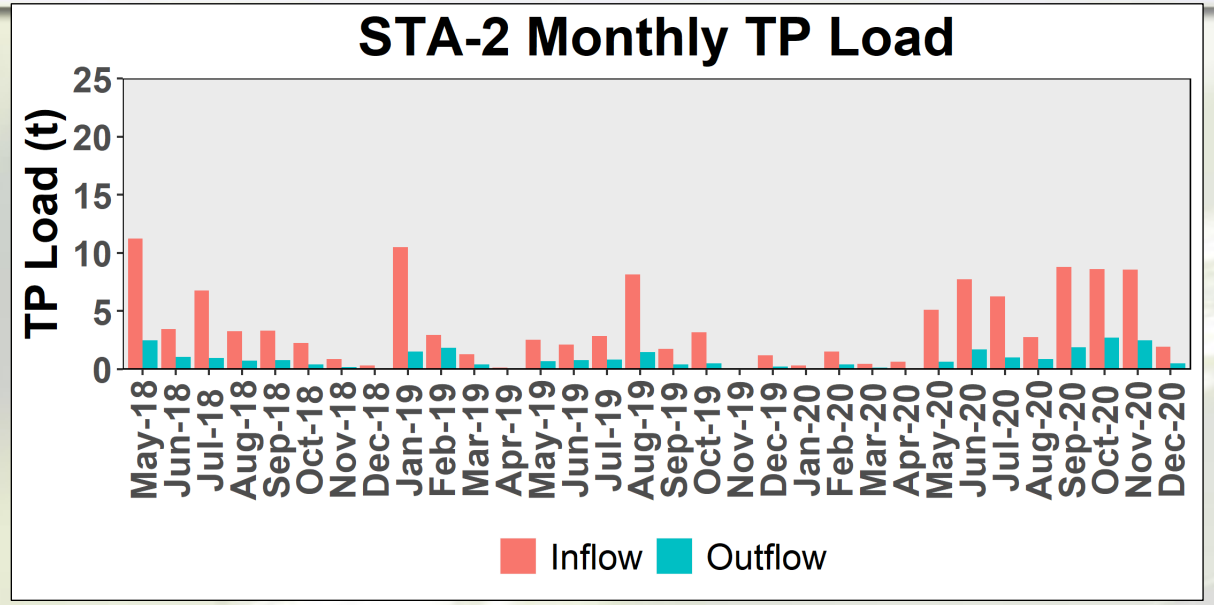
STA-2 Performance Comparison by WY

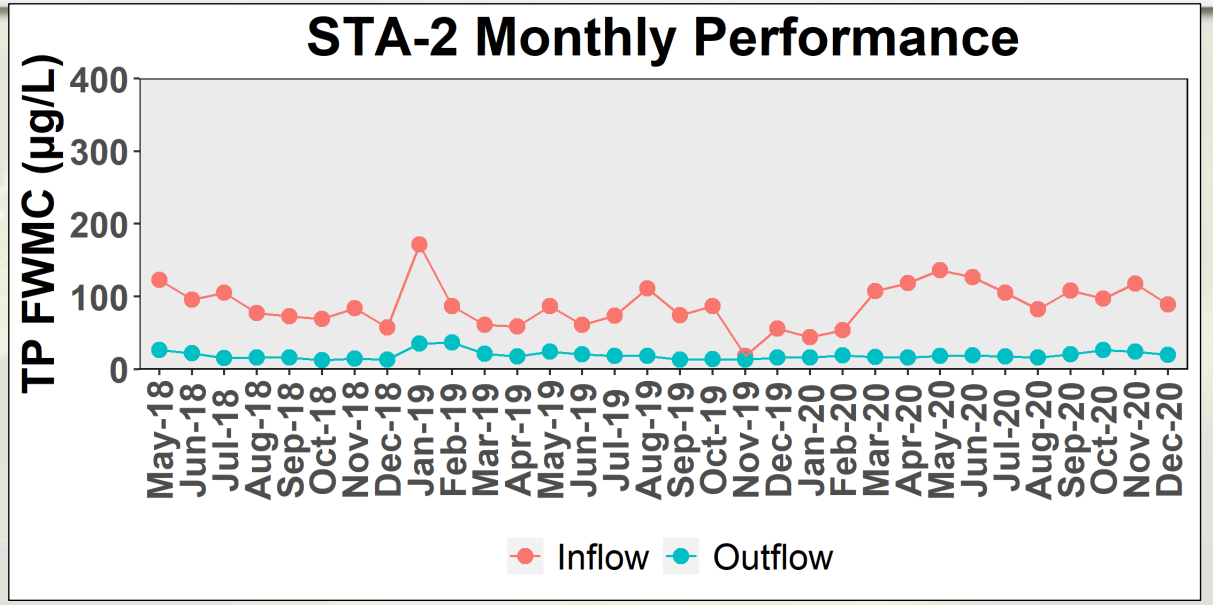


	WY2019	WY2020	Partial WY2021 (05/01/2020 - 12/31/2020)
Total inflow (k acre-feet)	362	247	370
Lake releases (k acre-feet)	122	37	27
TP FWMC inflow / outflow (µg/L)	104 / 23	81 / 18	109 / 21
TP load inflow / outflow (tons)	46 / 10	25 / 6	50 / 12
Reduction in TP FWMC / load	78% / 78%	78% / 78%	81% / 76%

Includes preliminary data

STA-2 Monthly TP Load and FWM Concentration



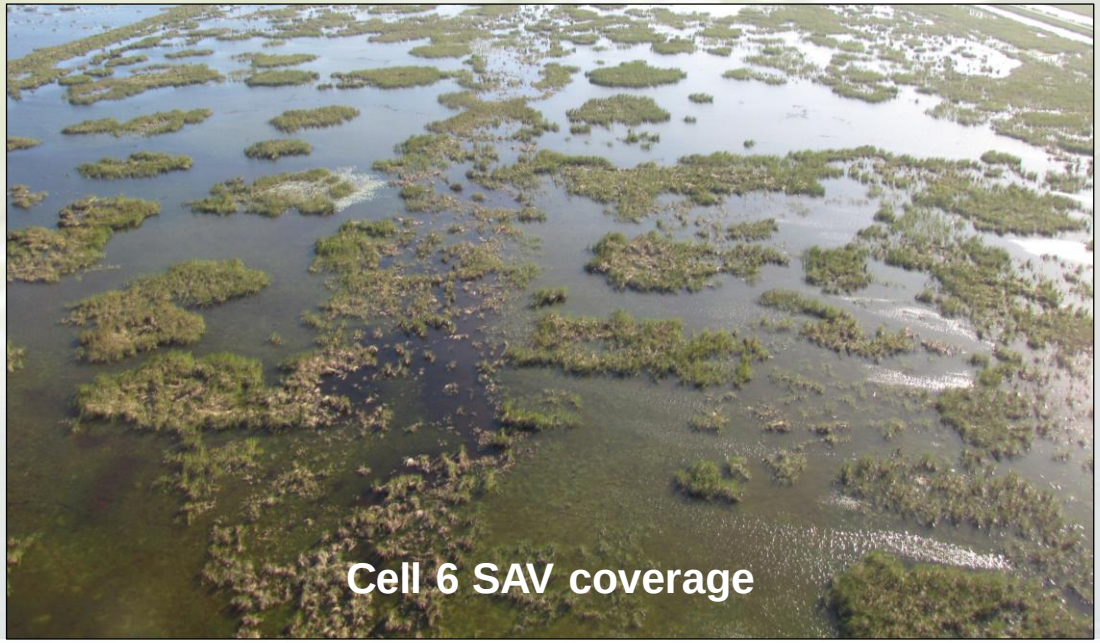


- Elevated inflow TP loads/FWMC during WY2021
- Outflow TP FWMC remains in the 15-20 ppb range and has been stable since March 2019

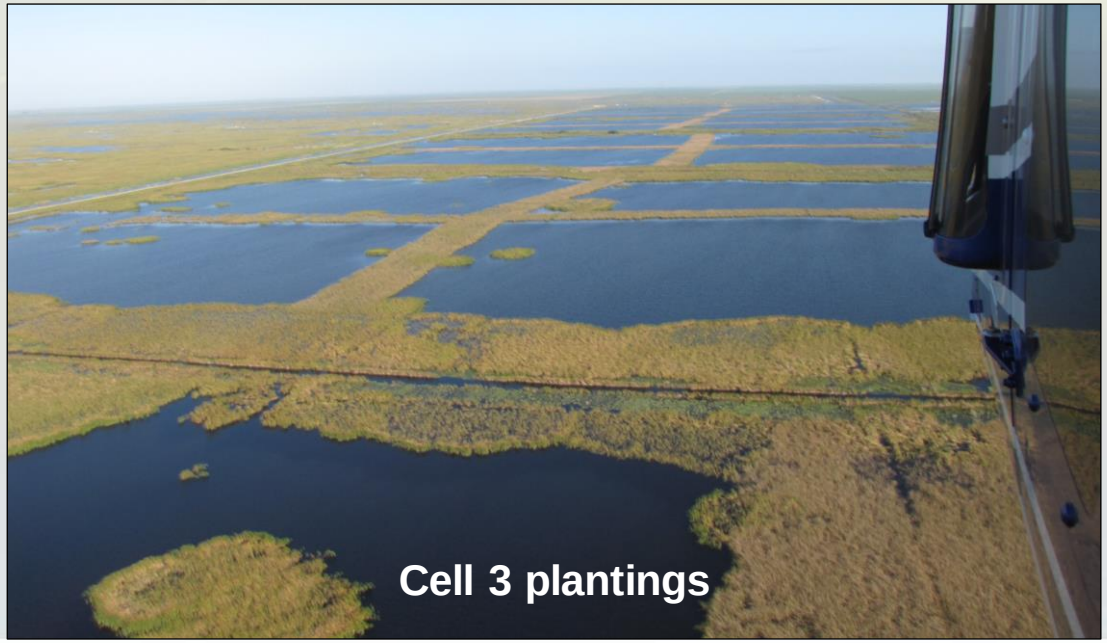
Includes preliminary data

STA-2 Highlights (Jan. 1, 2020 – Dec. 31, 2020)

- Periodic restrictions in all flow-ways
  - Flow-way 2 offline for earthwork project
  - Vegetation management activities: spraying, inoculations, plantings, tussock removal
- No monitored avian species nesting reported in STA-2

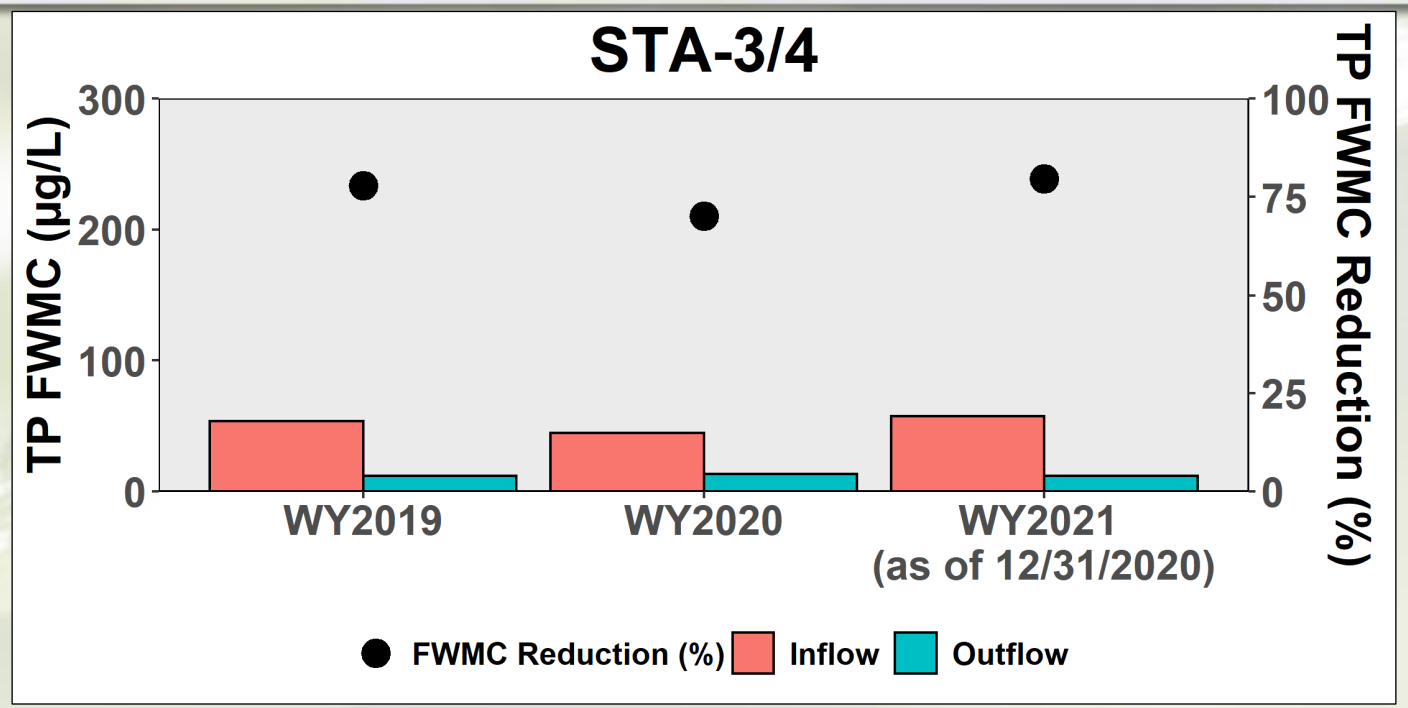


Cell 6 SAV coverage



Cell 3 plantings

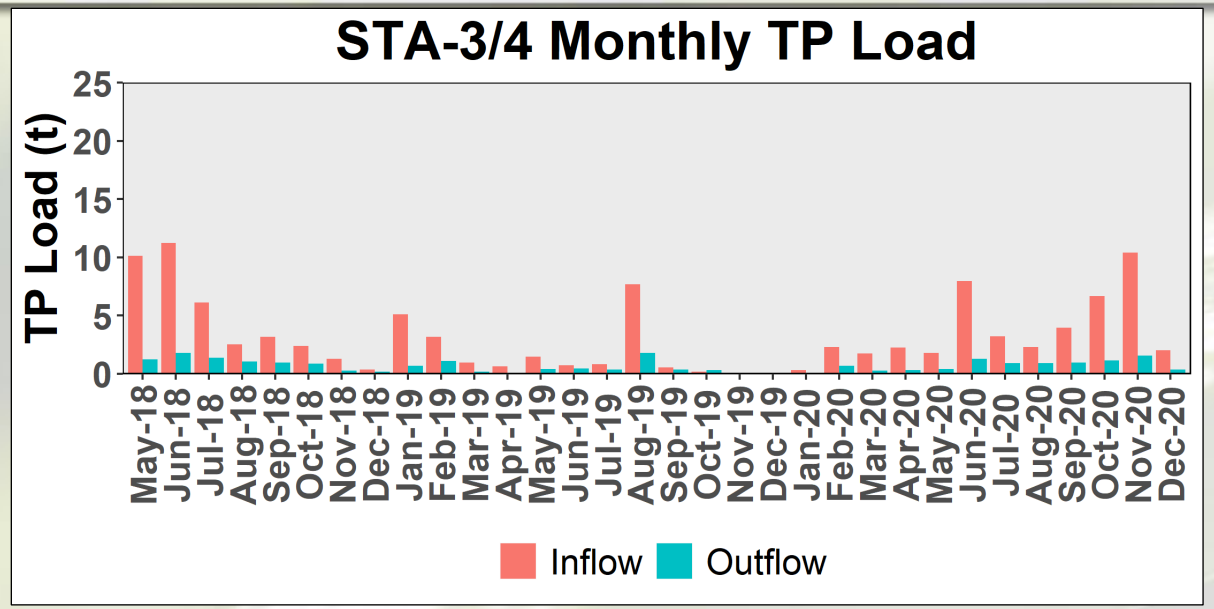
STA-3/4 Performance Comparison by WY

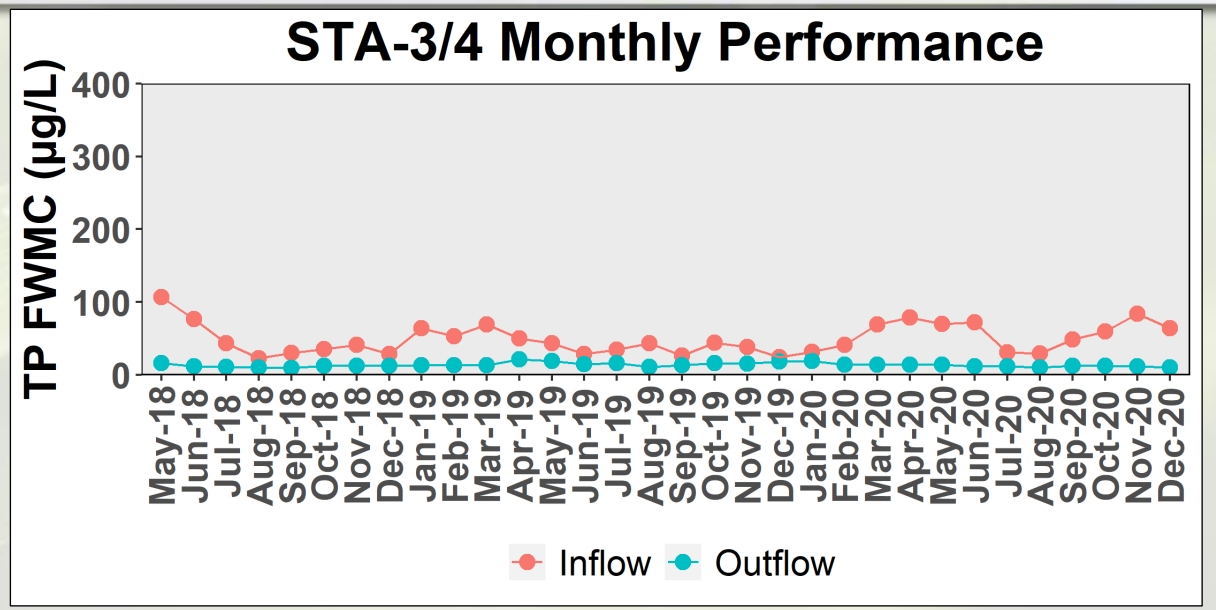


Includes preliminary data

	WY2019	WY2020	Partial WY2021 (05/01/2020 - 12/31/2020)
Total inflow (k acre-feet)	710	328	540
Lake releases (k acre-feet)	206	56	32
TP FWMC inflow / outflow (µg/L)	54 / 12	45 / 13	57 / 12
TP load inflow / outflow (tons)	47 / 10	18 / 5	38 / 8
Reduction in TP FWMC / load	78% / 79%	70% / 72%	80% / 80%

STA-3/4 Monthly TP Load and FWM Concentration





- Compared to other STAs, less variability in inflow TP loads due to A-1 FEB
- Outflow TP FWMC remains low and stable in the 10-15 ppb range

Includes preliminary data

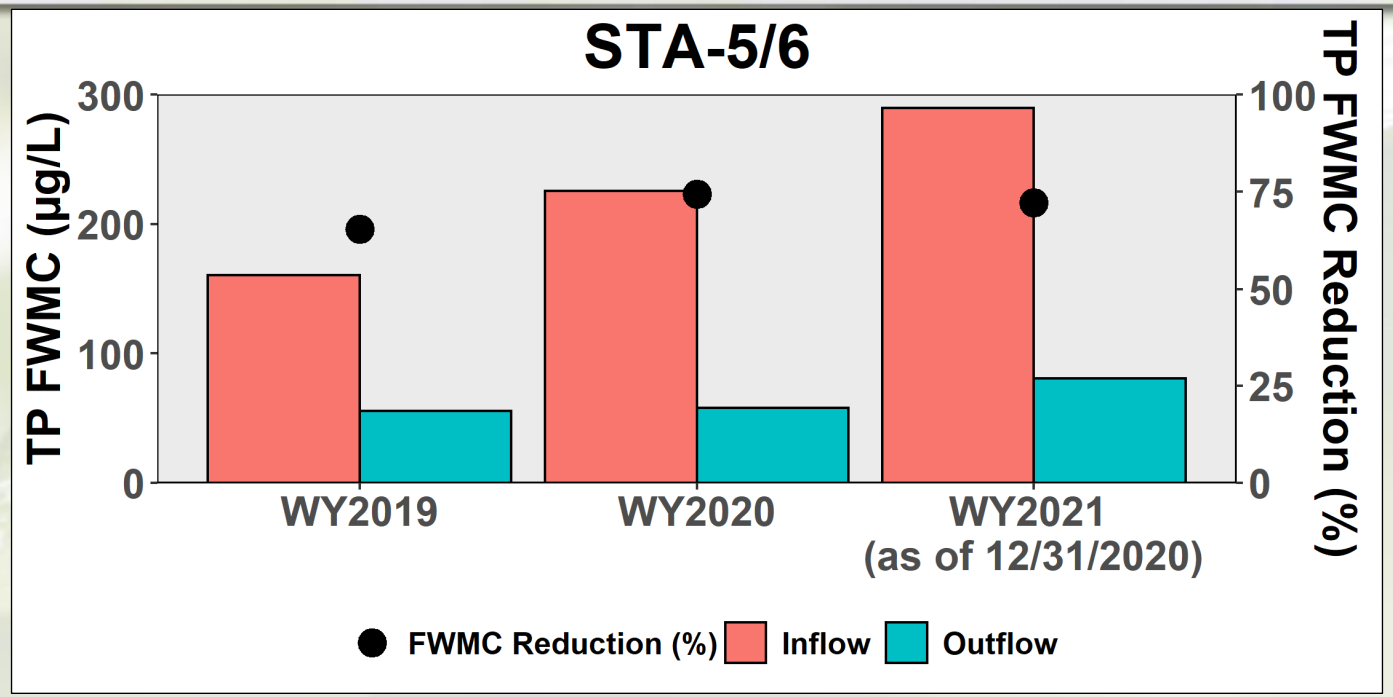
STA-3/4 Highlights (Jan. 1, 2020 – Dec. 31, 2020)

- All flow-ways were operational
- Periodic restrictions
  - Installation of energy dissipators at all flow-way inflow structures
  - Vegetation management activities: planting, inoculations, spraying, tussock removal
  - No monitored avian species nesting observed

Energy dissipator construction

Cell 3B mixed marsh

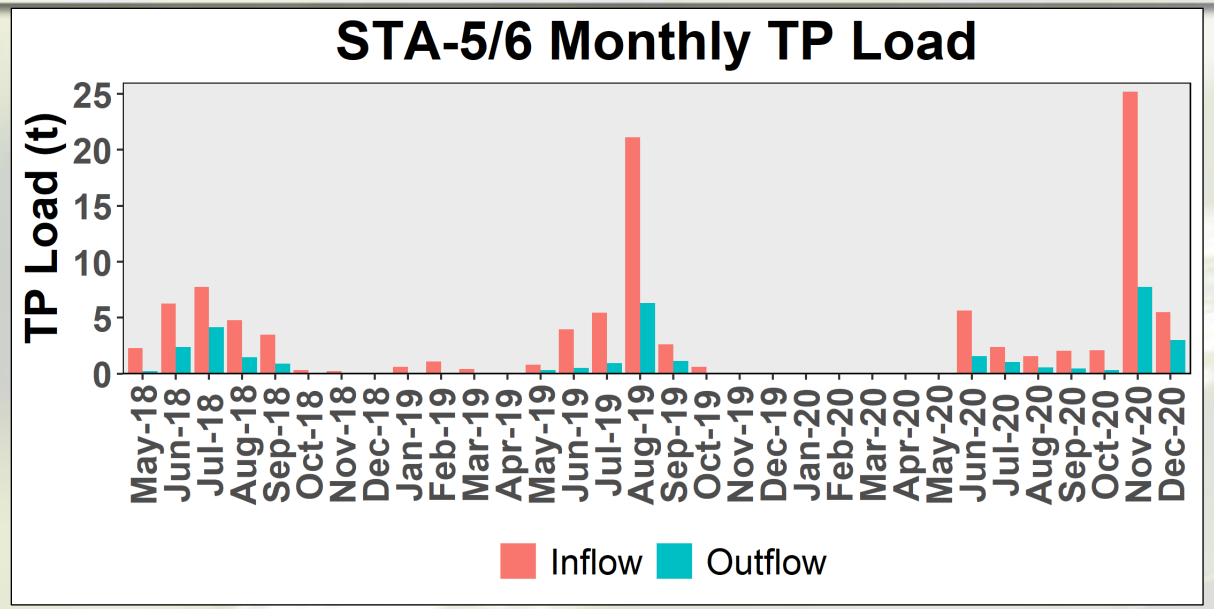
STA-5/6 Performance Comparison by WY

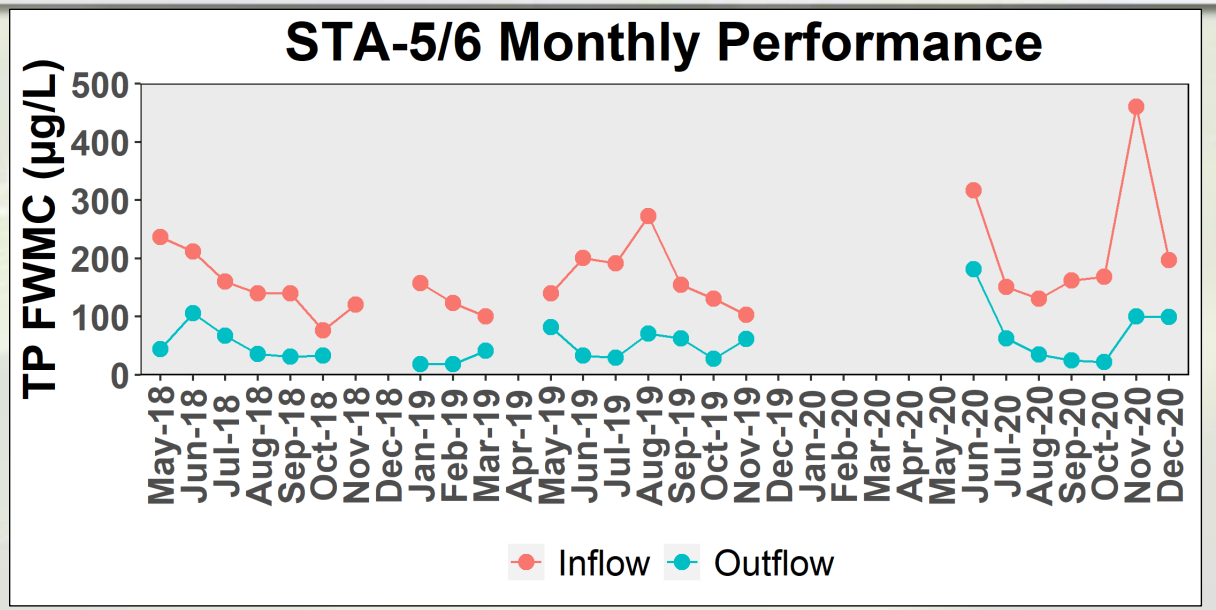


	WY2019	WY2020	Partial WY2021 (05/01/2020 - 12/31/2020)
Total inflow (k acre-feet)	138	124	124
TP FWMC inflow / outflow (µg/L)	161 / 56	226 / 58	289 / 81
TP load inflow / outflow (tons)	27 / 9	35 / 9	44 / 15
Reduction in TP FWMC / load	65% / 66%	74% / 73%	72% / 67%

Includes preliminary data

STA-5/6 Monthly TP Load and FWM Concentration



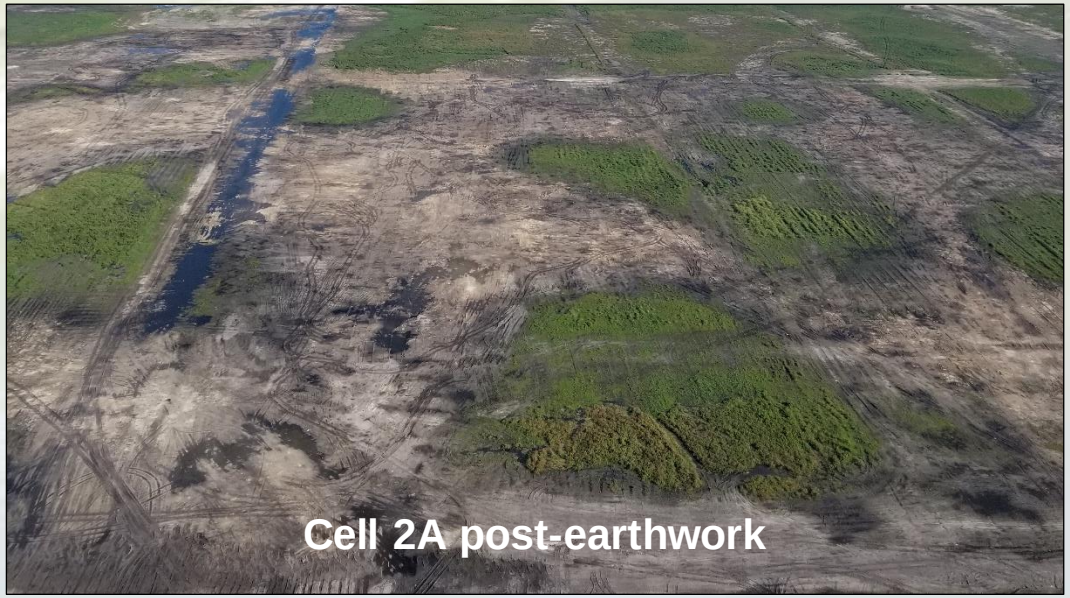


- Inflow TP load spike due to storm events in August 2019 and November 2020
- Frequent dry-out conditions during the dry seasons
- Elevated inflow/outflow TP FWMC following rehydration

Includes preliminary data

STA-5/6 Highlights (Jan. 1, 2020 – Dec. 31, 2020)

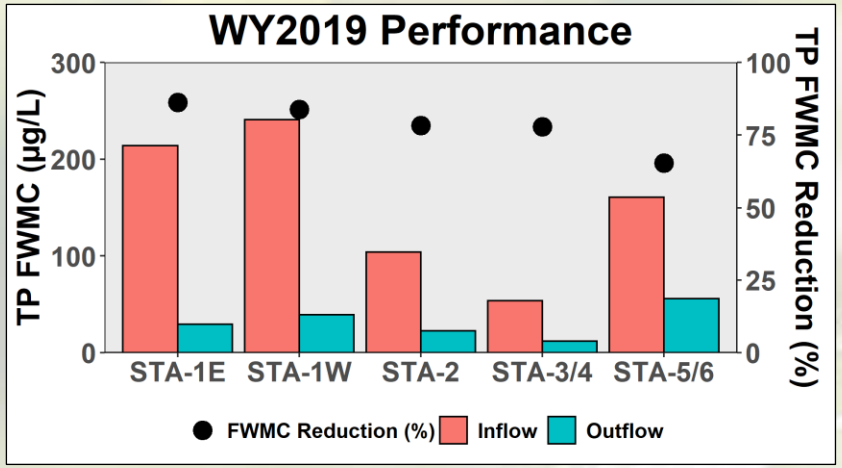
- All flow-ways were operational
- Periodic restrictions
  - Restoration Strategies earthwork project in Flow-ways 2 and 3
    - Project complete, awaiting vegetation rehabilitation before flow-through
  - Black-necked stilt nesting in Cells 1B, 4A, 4B, and 6-2

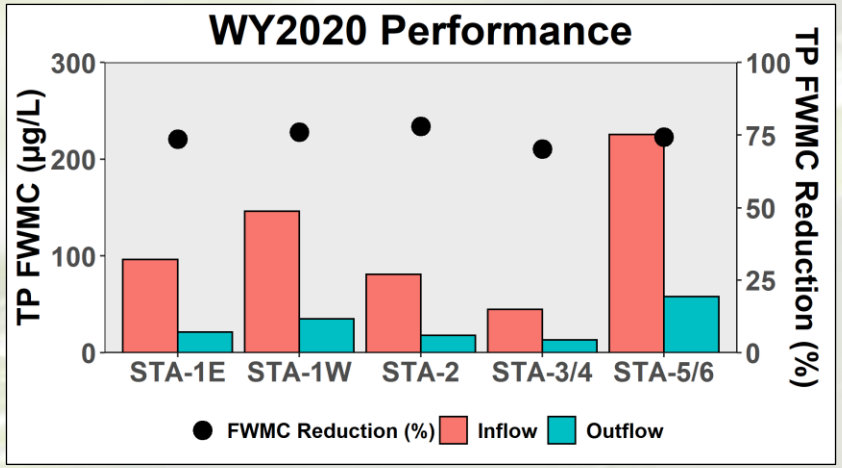


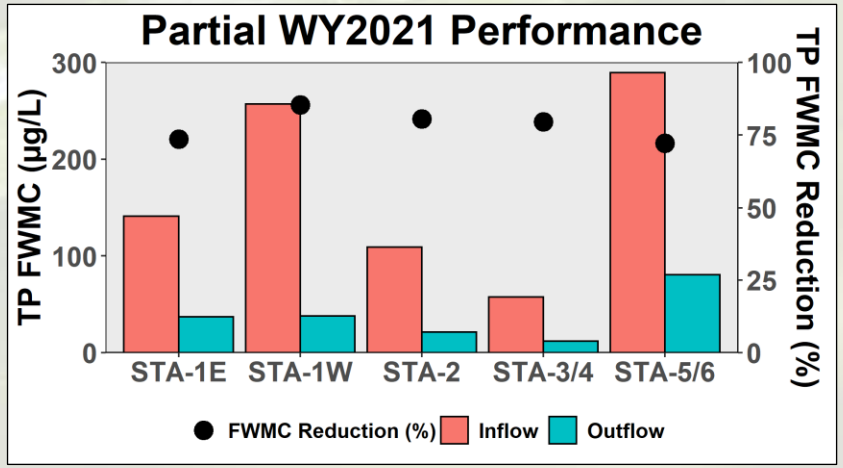
Cell 2A post-earthwork

Cell 1B SAV coverage

All STAs Performance Comparison by WY







	WY2019	WY2020	Partial WY2021 (05/01/2020 - 12/31/2020)
Total inflow (k acre-feet)	1510	1000	1519
Lake releases (k acre-feet)	470	163	97
TP FWMC inflow / outflow (µg/L)	110 / 23	98 / 24	130 / 28
TP load inflow / outflow (tons)	206 / 42	121 / 28	243 / 57
Reduction in TP FWMC / load	79% / 79%	75% / 76%	78% / 77%

Includes preliminary data

Contact Information

Jake Dombrowski

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STA Vegetation Management and Enhancement

Eric Crawford
Senior Scientist
Land Resources

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Objective

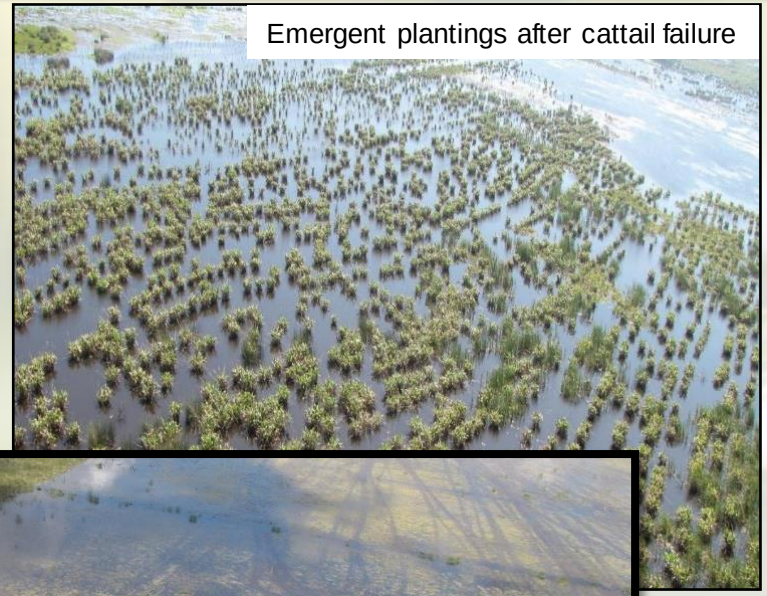
Maintain sustainable vegetation-based phosphorus uptake processes

- Vegetation Enhancement
  - Establish/maintain appropriate vegetation communities
  - Improve stability and functional redundancy
- Selective Management
  - Increase desirable species
  - Control Invasive/Undesirable species
  - Control exotic populations

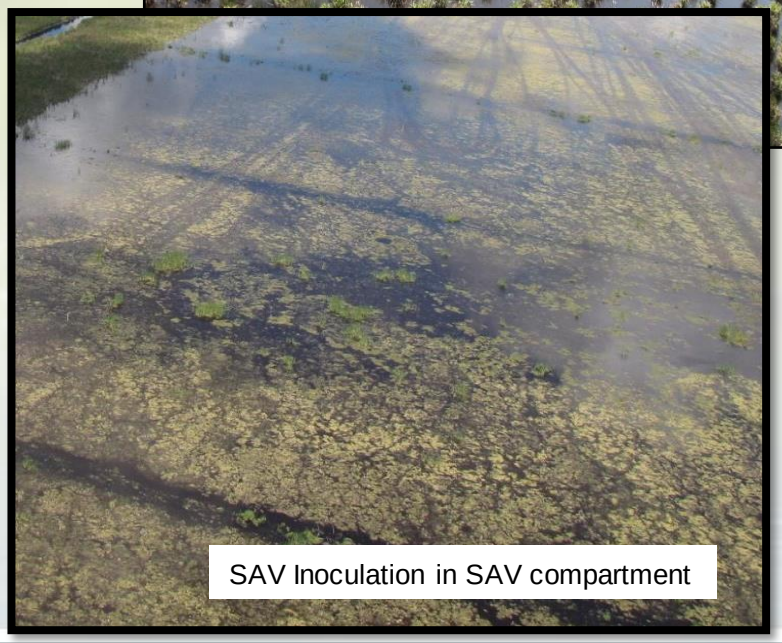
Invasive Species Control

- Dense native vegetation plantings can be made after treatments to interfere with the continued spread of invasive plants
- District staff have identified several native species to use in varying conditions to maximize resiliency and performance

Vegetation Function



Emergent plantings after cattail failure



SAV Inoculation in SAV compartment

➢Emergent Aquatic Vegetation (EAV)

- Re-establish stable soils
- Re-direct flow
- Nutrient uptake
- SAV stabilization
- Increase diversity/decrease clonal populations

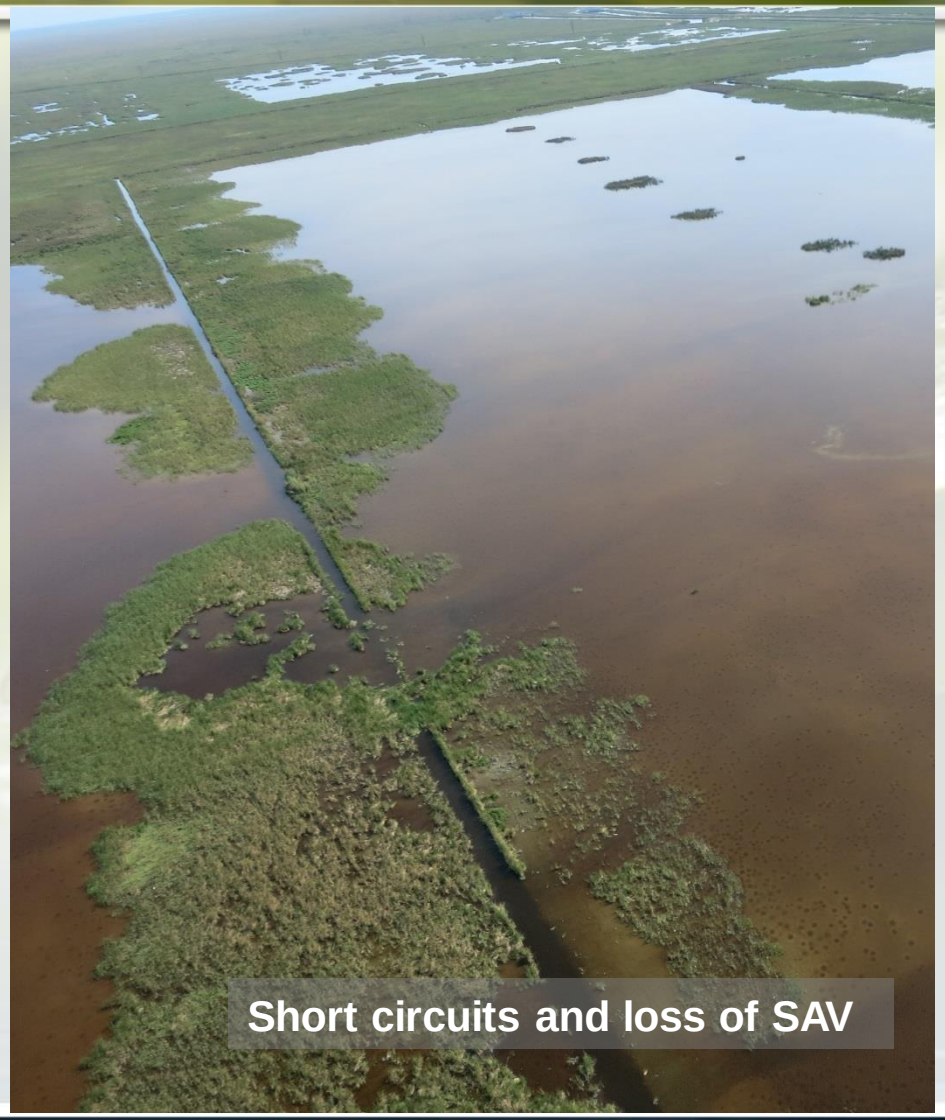
➢Submerged Aquatic Vegetation (SAV)

- Water column nutrient uptake
- Replenish seasonal die-off
- Replenish loss due to predation
- Repair damage
- Establish new SAV bed
- Increase species diversity

Healthy EAV

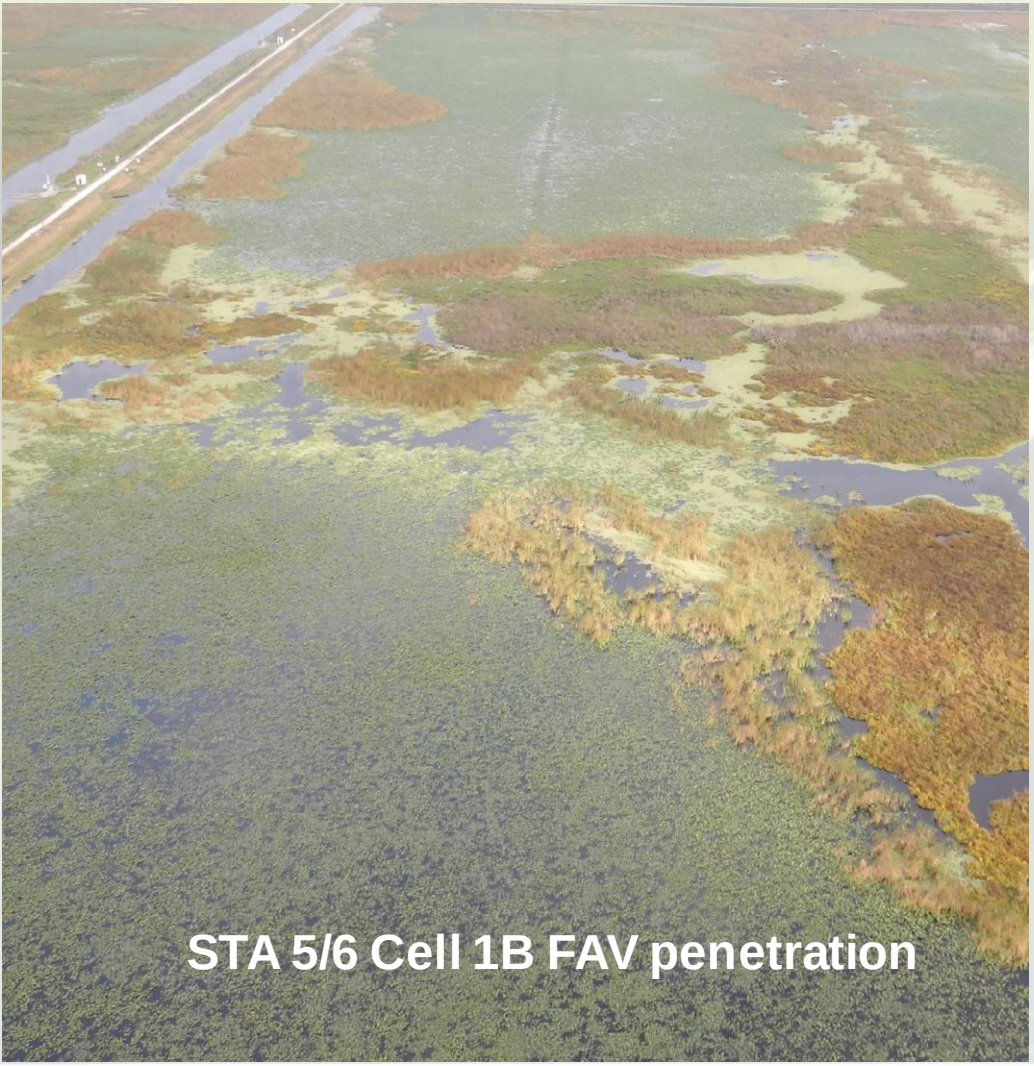
Highly Stressed EAV

Adaptive Management Process



- Monitor vegetation health

Adaptive Management Process


STA 5/6 Cell 1B FAV penetration

- Monitor vegetation health
- **Coordinate with water management**
  - **Stage, flow rates (cfs), redirecting flow**

Adaptive Management Process

- Monitor vegetation health
- Coordinate with water management
  - Stage, flow rates (cfs), redirecting flow
- **Proactively manage vegetation**
  - **Increase cover and health of desired species at a specific location**
  - **Control growth of undesirable species**

Adaptive Management Process

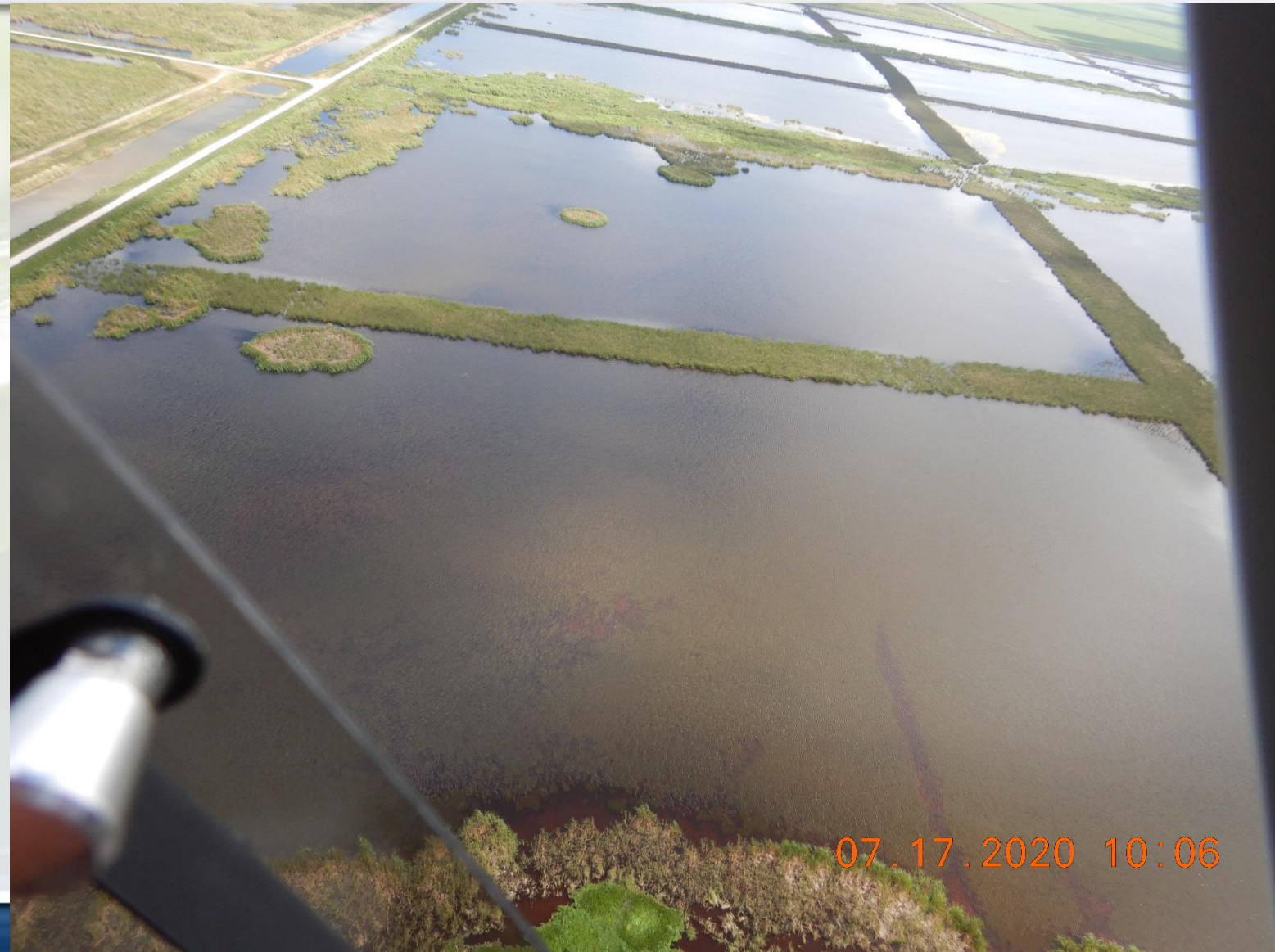
STA 1W Cell 1A: EAV decline and restoration plantings

- Monitor vegetation health
- Coordinate with water management
  - Stage, flow rates (cfs), redirecting flow
- Proactively manage vegetation
  - Increase cover and health of desired species at a specific location
  - Control growth of undesirable species
- **Repair and restore**
  - **Emergent vegetation enhancements where vegetation is damaged or undesirable**

Rehabilitation: Emergent Plants

Repair and Restoration of STA 2 Cell 3

- Over ten miles of emergent vegetation strips planted to protect and compartmentalize the Cell prior to SAV restoration
- Multiple short circuits and scoured out boat trails filled and planted
- SAV was planted and enhancements continue throughout the cell.



Rehabilitation: SAV Inoculation

Inoculations to enhance growth in bare areas and increase diversity

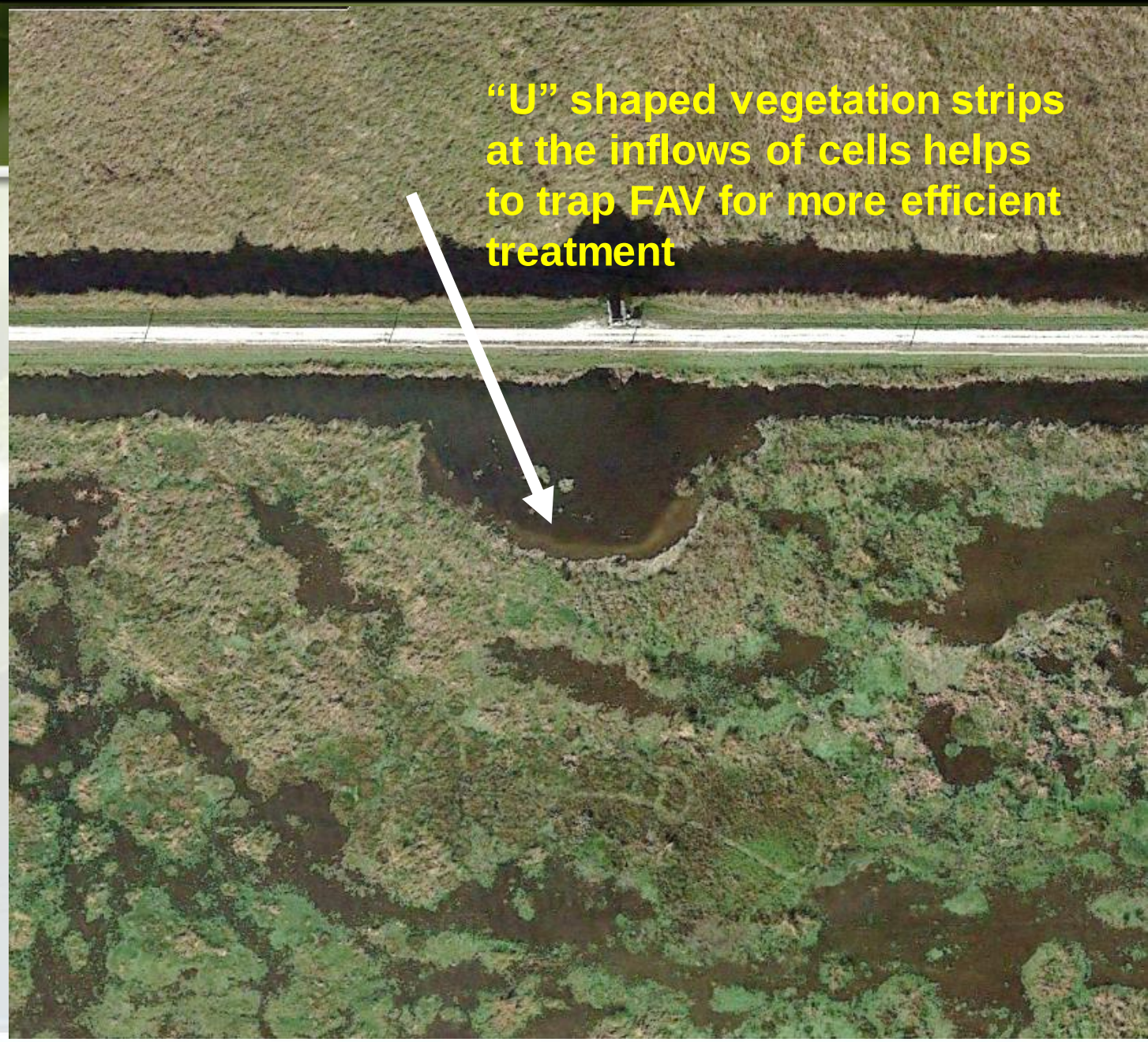
SAV harvest and transport

SAV Management in STA Operations

- Compartmentalizing the SAV cells with vegetation strips can help protect and stabilize SAV populations
- Smaller, more diverse and compartmentalized SAV beds can be more resistant to short circuiting, disturbance, storm events and seem better at resisting colonization by exotic species.
- EAV provides structure, protection, and litter to assist with nutrient uptake

FAV Control

- Dense vegetation strips at the inflows can reduce FAV entering a cell
- Inflow strips can be shaped to trap and concentrate FAV decreasing herbicide use in the cells and reducing costs
- Repairing damage and short circuits can minimize FAV penetration into the cells



FAV Control

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Coordinate with Engineering and Construction Group on Repairs and New Construction

- STA 1E Cells 5 and 7, fill and regrade
- STA 1E Cell 6, internal Levee degrading and canal filling to improve flow patterns
- STA 2 Cell 2, fill and grade northern section to improve performance
- STA 2 Cell 3, remove portions of remnant levees to improve flow patterns
- STA 1W Expansion 2 design
- A2 STA design

Contact Information

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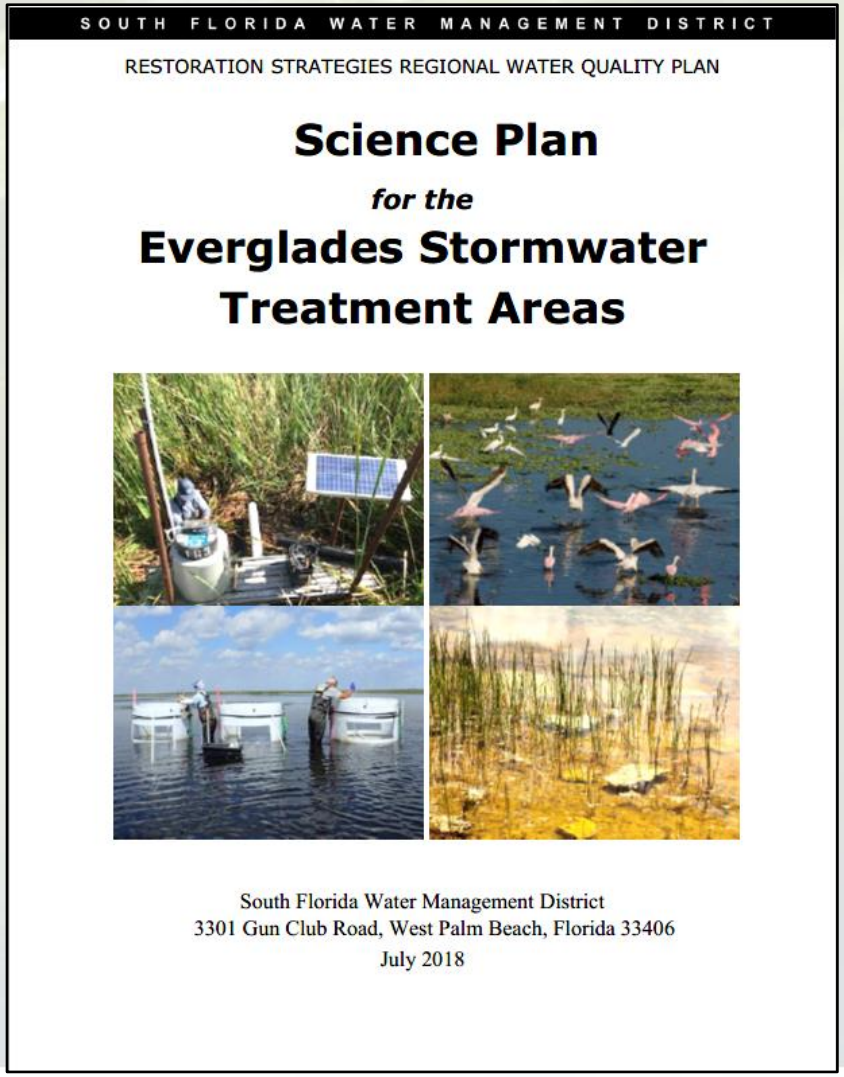
Restoration Strategies Science Plan

R. Thomas James
Principal Scientist
Applied Sciences

18th Annual Public Meeting on the Long-Term Plan for Achieving Water Quality Goals for the Everglades Protection Area Tributary Basins
February 22, 2021

The Science Plan

- Developed in 2013 and updated in 2018
- Specified in Restoration Strategies and required by STA permits and consent orders
- Framework for scientific studies
  - Evaluate key factors and processes that affect phosphorus removal in the STAs
  - Support design, operation, & management of STAs to achieve Water Quality-Based Effluent Limits (WQBEL)


SOUTH FLORIDA WATER MANAGEMENT DISTRICT

RESTORATION STRATEGIES REGIONAL WATER QUALITY PLAN

Science Plan

for the

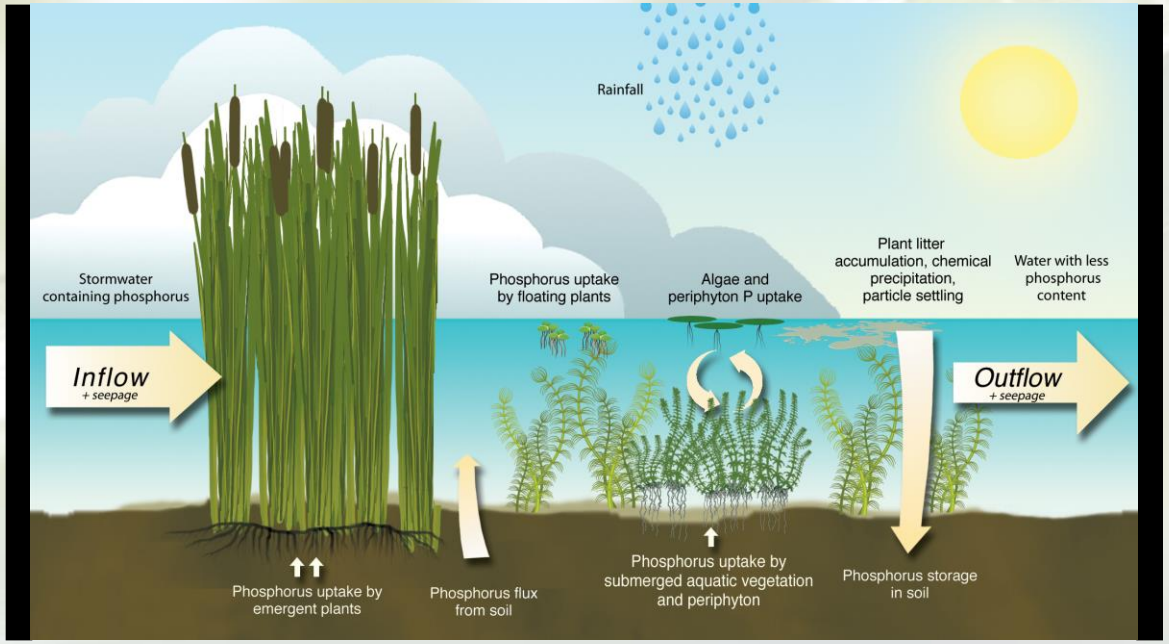
Everglades Stormwater Treatment Areas

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

Areas of Investigation

6 Key questions and 18 sub-questions on these topics

FEB



1. Design and operation of FEBs
2. Design and operation of STAs
3. Vegetation improvement
4. Internal loading of phosphorus
5. Biogeochemical and physical mechanisms
6. Role of fauna

Studies Completed

Study Title	Major Findings

Development of Operational Guidance for Flow Equalization Basin (FEB) and STA Regional Operation (Operation Study)	• Wave tests within the STAs
	  • Equations for flow, slope and resistance
	  • Equations support STA operations
	• Developed iModel for Restoration Strategies Operational Protocol
	  • FEB operations can be optimized to meet the WQBEL.

Influence of Canal Conveyance Features on STA and FEB Inflow and Outflow P Concentrations (Canal Study)	• Canals can remove or export TP • Export related to high flow events and increase of particulate P • Use of FEBs to reduced peak flow should reduce TP export.
Investigation of STA-3/4 Periphyton-based Stormwater Treatment Area (PSTA) Technology Performance, Design, and Operational Factors (PSTA Study)	• Muck removal low inflow TP concentrations/loads resulted in annual flow weighted mean discharge of TP ≤ 13 ppb for last 13 years. • Continue monitoring to evaluate performance.

Evaluation of Sampling Methods for TP (Sampling Study)	• Time-based autosampler, grab sample and flow-based auto samplers
	  • Time and grab more reliable for low flow gated structures,
	  • Autosamplers vulnerable to plant and animal contamination.

Evaluation of the Role of Rooted Floating Aquatic Vegetation (rFAV) in STAs (rFAV Study)	• rFAV does not enhance P reduction in outflow region Compared to submerged aquatic vegetation

Studies Completed

Study Title	Major Findings
Evaluation of P Sources, Forms, Flux and Transformation Processes in the STAs (P Flux Study)	• P removal in EAV is primarily organic in SAV primarily mineral • Decreasing P Gradients from inflow to outflow • Non flow conditions result in increased water column TP in SAV regions, especially after high load events • Internal loading affects STA performance
STA Water and P Budget Improvements (Water and P Budget Study)	• Improved Period of Record flow data at all structures of STA-2 Flow-ways 1, 2, 3 and STA-3/4 all flow-ways • Greatly improved water budgets (reduced residuals) • Rainfall, ET, change in storage, and seepage are minor contributors • More accurate Water and TP budgets were developed for STA-2 Flow-ways 1, 2 and 3, and all cells of STA-3/4

Current Studies

Study Title	Year Initiated
Evaluation of Inundation Depth and Duration Threshold for Cattail Sustainability (Cattail Study)	2013
Use of Soil Amendments and/or Management to Control P Flux (Soil Management Study)	2013
Evaluation of Factors Contributing to the Formation of Floating Tussocks in the STAs (Tussock Study)	2018
Improving Resilience of SAV in the STAs (SAV Resilience Study)	2018
Investigation of the Effects of Abundant Faunal Species on P Cycling in the STAs (Faunal Study)	2018
Periphyton and Phytoplankton P Uptake and Release (Periphyton Study)	2019
L-8 FEB Operational Guidance (L8-FEBOG Study)	2019

New Studies

Study Title	Objectives
Data Integration and Analyses (Data Integration Study)	• Review and compile RSSP and STA study reports and publications • Evaluate data sets for relationships among variables • Develop and/or update models • Analyze for data gaps • Write guidance document to improve STA performance

Quantifying the Recalcitrance and Lability of Phosphorus (P) to Optimize P Retention Within STAs (Biomarker Study)	• Use biomarkers to determine relative source contribution from
	  ○ Inflow sources
	  ○ Vascular plants
	  ○ Algae/periphyton
	  ○ Fish
	  ○ Degradation products of litter

Phosphorus Dynamics in the Everglades Stormwater Treatment Areas (P Dynamics Study)	• Evaluate under-performing STA flowways • Use methods of the P-Flux study
Assess Feasibility and Benefits of Consolidating Accrued Marl in the Everglades Stormwater Treatment Areas (Marl Study)	• Determine if marl consolidation can be improved • Determine if improvement results in lower water column P concentration

Cattail Study

- **Objective**

  Identify water depth, duration of inundation, and frequency affecting the health of cattail communities in selected STA cells.

- **Results**
  - **In-situ study**
    - Given water depths of 3 feet or greater for more than 100 consecutive days
      - Cattail density and below ground biomass declined
      - Leaf elongation in deeper conditions increased
  - **Test Cell Study**
    - Five water depths: 1.3 (control), 2.0, 2.75 (moderate) 3.4 and 4.1 feet (deep)
    - Deep waters compared to controls
      - Reduced density of adult and juvenile cattail
      - Increased leaf elongation
      - No significant differences for photosynthesis, water use efficiency and stomatal conductance

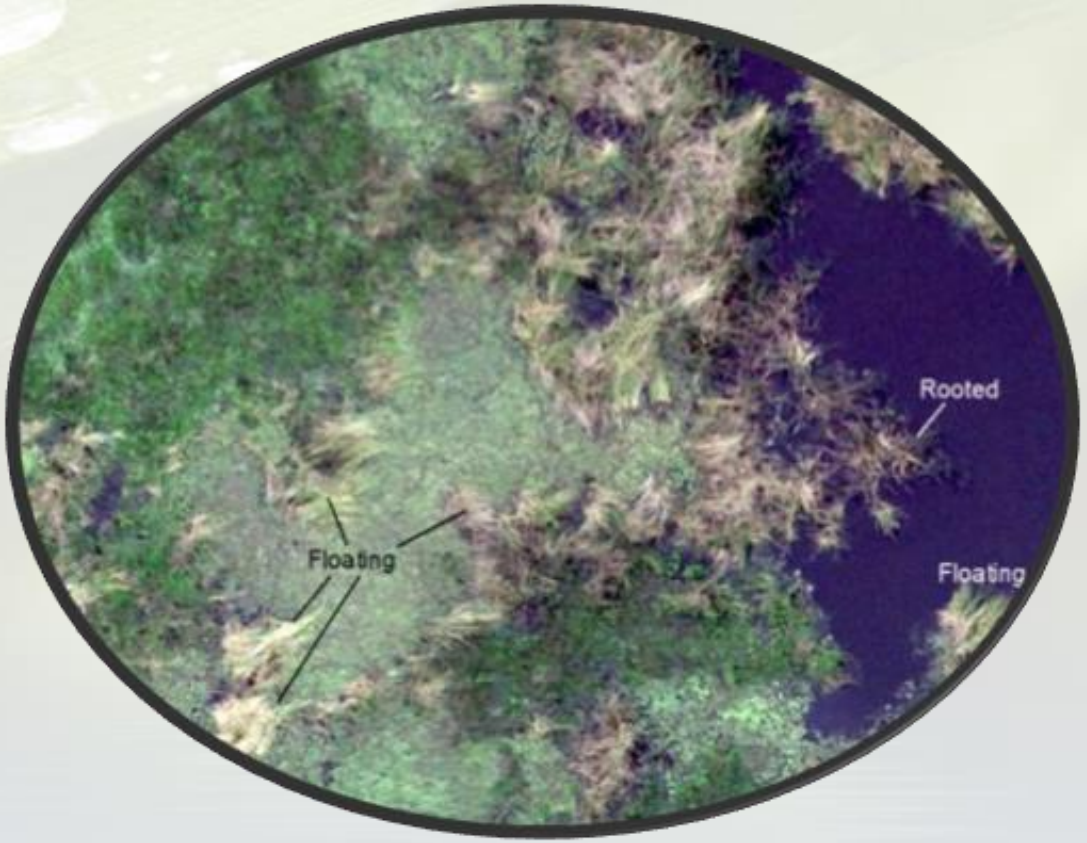
- **Status**
  - Field sampling complete
  - Nutrient analyses complete
  - Final report is pending

Soil Management Study

- **Objective**
  - Investigate whether internal loading of phosphorus can be reduced by application of soil amendments and/or soil management techniques
- **Results**
  - Technologies exist that could improve STA performance
    - High costs and unknown effects to downstream Everglades
    - No further testing of chemical amendments planned
  - Soil inversion study of Cell 7 of STA-1W Expansion Area
    - Soils in Cell 7 inverted, not in Cell 8
    - Post flooding results
      - Water column TP concentrations have declined over time
      - Cell 7 SAV is sparse throughout even months after flooding
      - Cell 8 SAV is high throughout
      - Soil TP in top 10 cm similar in both Cells but more heterogenous in Cell 7
- **Status**
  - Sampling at inflow and outflow structures will begin when flow-through operations begin

Tussock Study

- **Objective**
  - Determine factors that cause the formation of floating cattail (Typha sp.) communities and tussocks
- **Results**
  - Unmanned aerial vehicle (UAV) with multispectral scanner found tussocks not found in satellite imagery
  - Nomenclature developed
    - Tussock vs wetland vs complex
    - Island vs mat complex
  - Predictors of historical tussock formation
    - High-water levels
    - Past land use (agriculture)
    - TP content of soils
- **Status**
  - Methods to improve UAV imagery processing underway
  - Buoyancy model to be developed



Fauna Study

- **Objective**
  - Quantify abundant fauna and evaluate their effects on outflow STA cell P-cycling and loading
- **Results**
  - Fish in STAs contain a greater proportion of P in body tissues than fish in Everglades
  - STAs support 2 to 15 x higher biomass of fish & invertebrates than Everglades
  - In STA- 2, 10 of the most abundant fish species store one metric ton of P within their body tissues
  - Bioturbation can double the TP content in enclosures
  - Excretion by fish can reprocess over 100% of external loading
- **Status**
  - Calibration of electrofishing in enclosures is planned
  - Herbivory study will be carried out
  - Biomass sampling, bioturbation experiments and excretion rate studies to continue

SAV Resilience Study

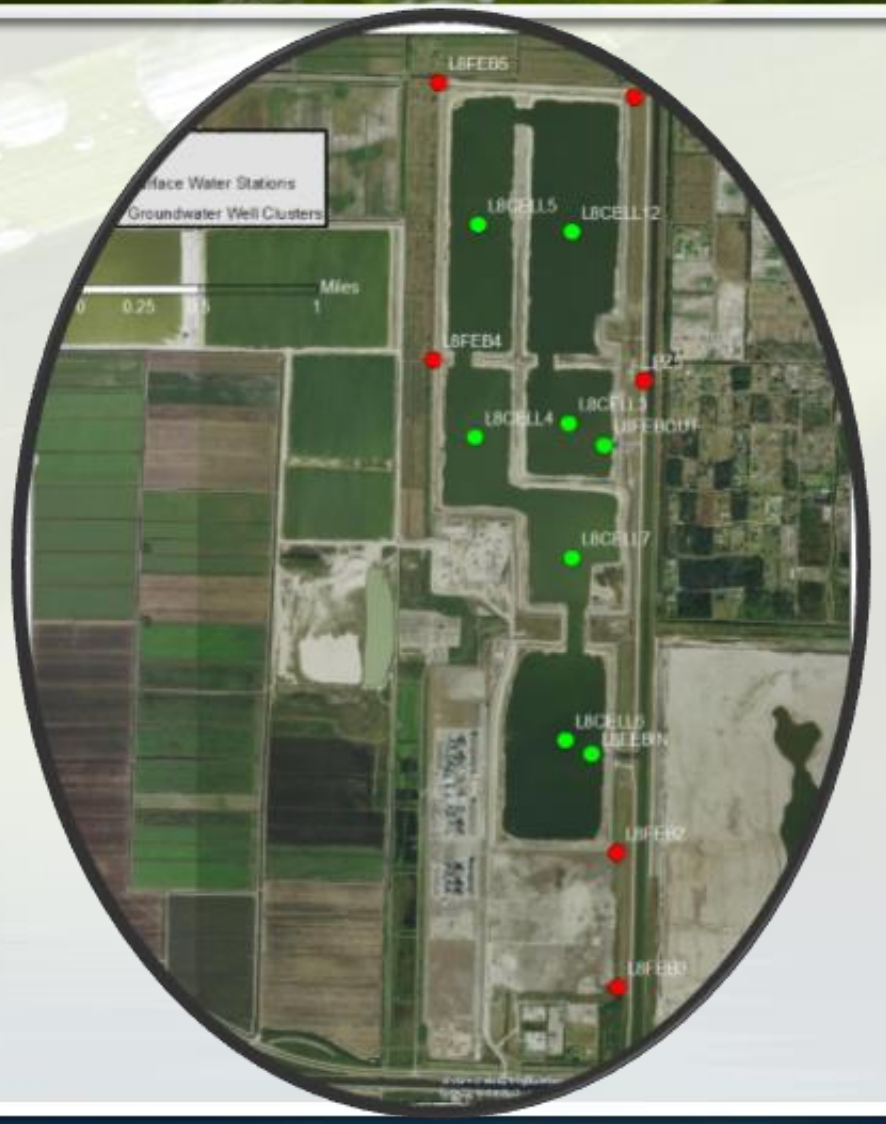
- **Objective**
  - Investigate the effects of operational and natural environmental conditions on SAV health
- **Results**
  - Factors influencing SAV sustainability include: P loading, soil type, and water depth
  - SAV standing crop biomass and tissue P contents decrease from inflow to outflow regions of STAs
  - SAV grew well on aged muck, farmed, and marl soils in mesocosms
  - SAV density was higher at higher P load rates in mesocosms
  - SAV germinated faster on previously dried soils, no differences in growth
  - SAV growth reduced in enclosures with fish
- **Status**
  - P load experiments ongoing, added a mesocosm with higher P soils to determine if high loads can lead to SAV collapse

Periphyton Study

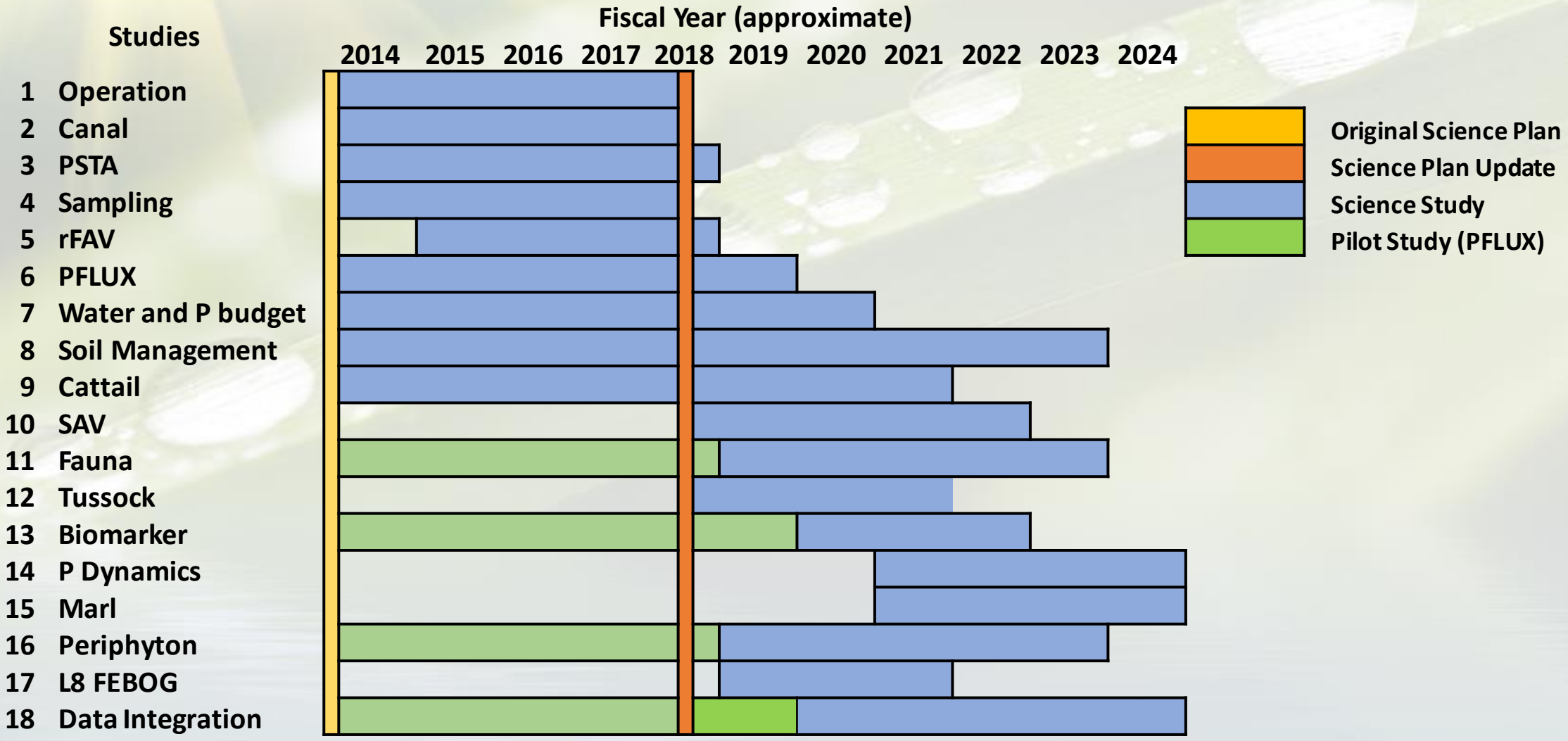
- **Objective**
  - Estimate growth, senescence, P uptake and release rates from periphyton and phytoplankton in downstream STA treatment flow ways under various flow conditions
- **Status**
  - Literature review and report completed (Phase I)
  - Bioavailability study of dissolved organic P and N from the STAs underway (Phase II)
  - Metagenomics study to evaluate metabolism is being developed (Phase III)

L-8 FEB STUDY

- **Objective**
  - Provide insight into the relationships between L-8 FEB water quality, stage, and flow conditions, along with potential for groundwater interaction
- **Results**
  - P concentrations are considerably lower in groundwater than L-8 FEB surface water
  - Groundwater not responsible for periods of elevated P in surface water
  - Large inflows
    - Contribute significant loads of nutrients and suspended materials
    - Inflow induced resuspension of benthic sediments may be major contributors to periods of elevated P in surface water at low stages
- **Status**
  - Monitoring response of L-8 FEB to large inflow events at low stage
  - Spatial sampling and characterization of benthic sediments to be analyzed for nutrients and minerals



Science Plan Study Timelines



Contact Information

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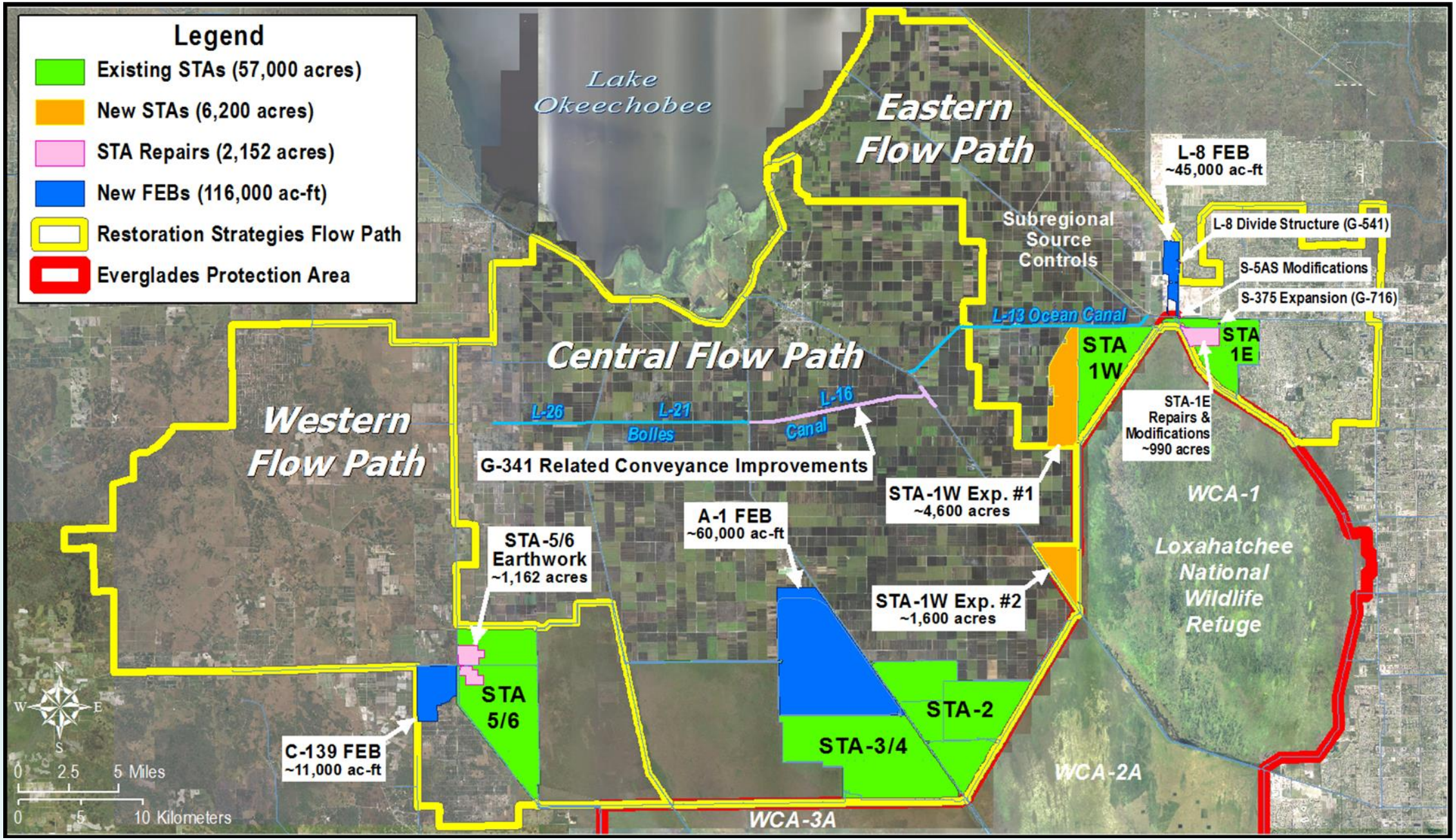
For more information:

https://www.sfwmd.gov/our-work/restoration-strategies/science-plan

Restoration Strategies:
Engineering & Construction Update

Lucine Dadrian, P.E.
Project Management Section Administrator
Ecosystem Restoration and Capital Projects

18th Annual Public Meeting on the Long-Term Plan for Achieving Water Quality Goals for the Everglades Protection Area Tributary Basins
February 22, 2021


Legend
Existing STAs (57,000 acres)
New STAs (6,200 acres)
STA Repairs (2,152 acres)
New FEBs (116,000 ac-ft)
Restoration Strategies Flow Path
Everglades Protection Area
Lake Okeechobee
Eastern Flow Path
Central Flow Path
Western Flow Path
Subregional Source Controls
L-8 FEB
~45,000 ac-ft
L-8 Divide Structure (G-541)
S-5AS Modifications
S-375 Expansion (G-716)
L-13 Ocean Canal
STA 1W
STA 1E
STA-1E Repairs & Modifications ~990 acres
L-26
L-21
Bolles
Canal
L-16
G-341 Related Conveyance Improvements
STA-1W Exp. #1
~4,600 acres
A-1 FEB
~60,000 ac-ft
STA-5/6 Earthwork
~1,162 acres
STA-1W Exp. #2
~1,600 acres
WCA-1
Loxahatchee National Wildlife Refuge
STA 5/6
STA-2
STA-3/4
C-139 FEB
~11,000 ac-ft
WCA-2A
WCA-3A
N
W
E
S
0 2.5 5 Miles
0 5 10 Kilometers

Restoration Strategies Project Status

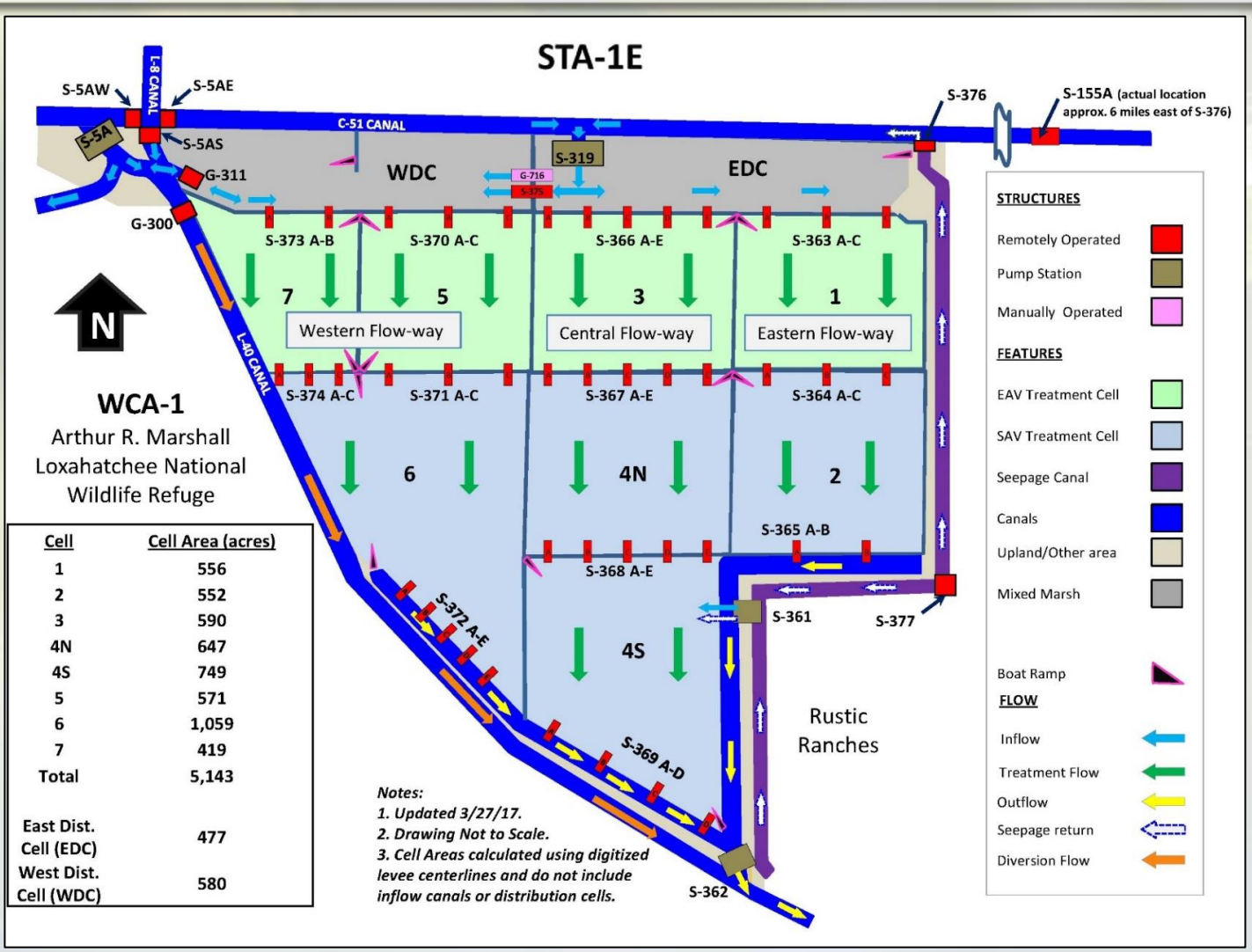
Completed Construction:

- STA2 Expansion Compartment B
- STA 5/6 Expansion Compartment C
- S-5AS Modifications
- L-8 FEB *Multi-Use Operation*
- A-1 FEB
- L-8 Divide Structure (G-541)
- S-375 Expansion (G-716)
- STA 5/6 Earthwork *Optimization*
- STA-1W Expansion #1
- G-341 Segments 1 – 3

Ongoing:

- STA-1E Repair *Construction*
- STA-1W Expansion #2 *Construction*
- G-341 Conveyance Seg 4 *Construction*
- G-341 Conveyance Seg 5 *Design*
- C-139 FEB *Construction*

STA-1E Repairs & Modifications Project



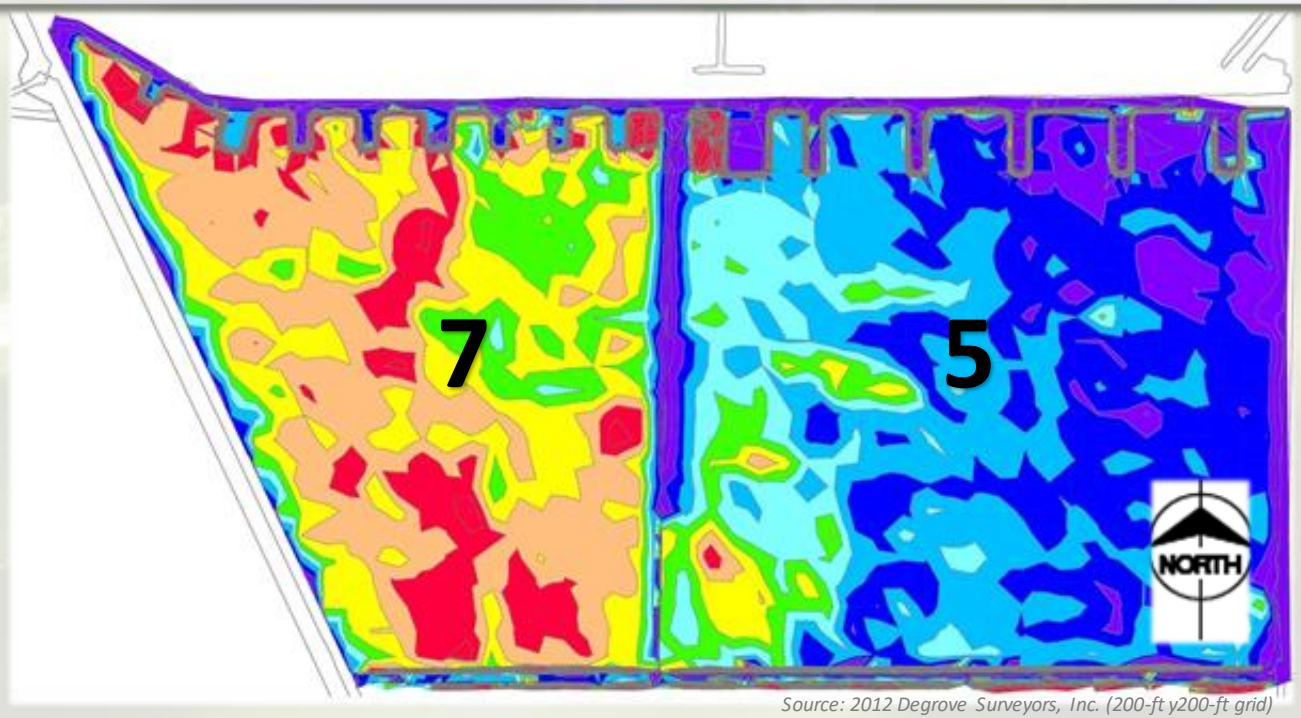
Cell	Cell Area (acres)
1	556
2	552
3	590
4N	647
4S	749
5	571
6	1,059
7	419
Total	5,143
East Dist. Cell (EDC)	477
West Dist. Cell (WDC)	580

Notes:
1. Updated 3/27/17.
2. Drawing Not to Scale.
3. Cell Areas calculated using digitized levee centerlines and do not include inflow canals or distribution cells.

- Raise and regrade ~990 acres in Cells 5 and 7 to achieve sustainable Emergent Aquatic Vegetation
- USACE Designed and Constructed STA-1E
  - Adjacent to northeast side of WCA-1 (Loxahatchee National Wildlife Refuge)
  - Flood control by stormwater retention
  - Stormwater treatment
  - Re-establish WCA-1 hydro-periods
- Transferred to SFWMD in October 2005
  - Cells 5 & 7 experienced performance issues related to excessive water depths
  - Complete regrading of Cells 5 & 7 by December 31, 2022

STA-1E Repairs & Modifications Project

- Regrade Cells 5 & 7 to ~11.75-ft NAVD
- Cell 5
  - Level and redistribute existing material
- Cell 7
  - Entire cell is below target elevation
  - Imported sandy soil required to raise & regrade Cell 7
- District awarded two Contracts to support project
  - Palm Beach Aggregates - Imported Soil awarded at Feb 2020 GB for $10,091,280
  - Thalle Construction Co - Regrading awarded at April 2020 GB for $13,078,500



Source: 2012 Degrove Surveyors, Inc. (200-ft y200-ft grid)

RED = LOW

TARGET ELEVATION

BLUE = HIGH

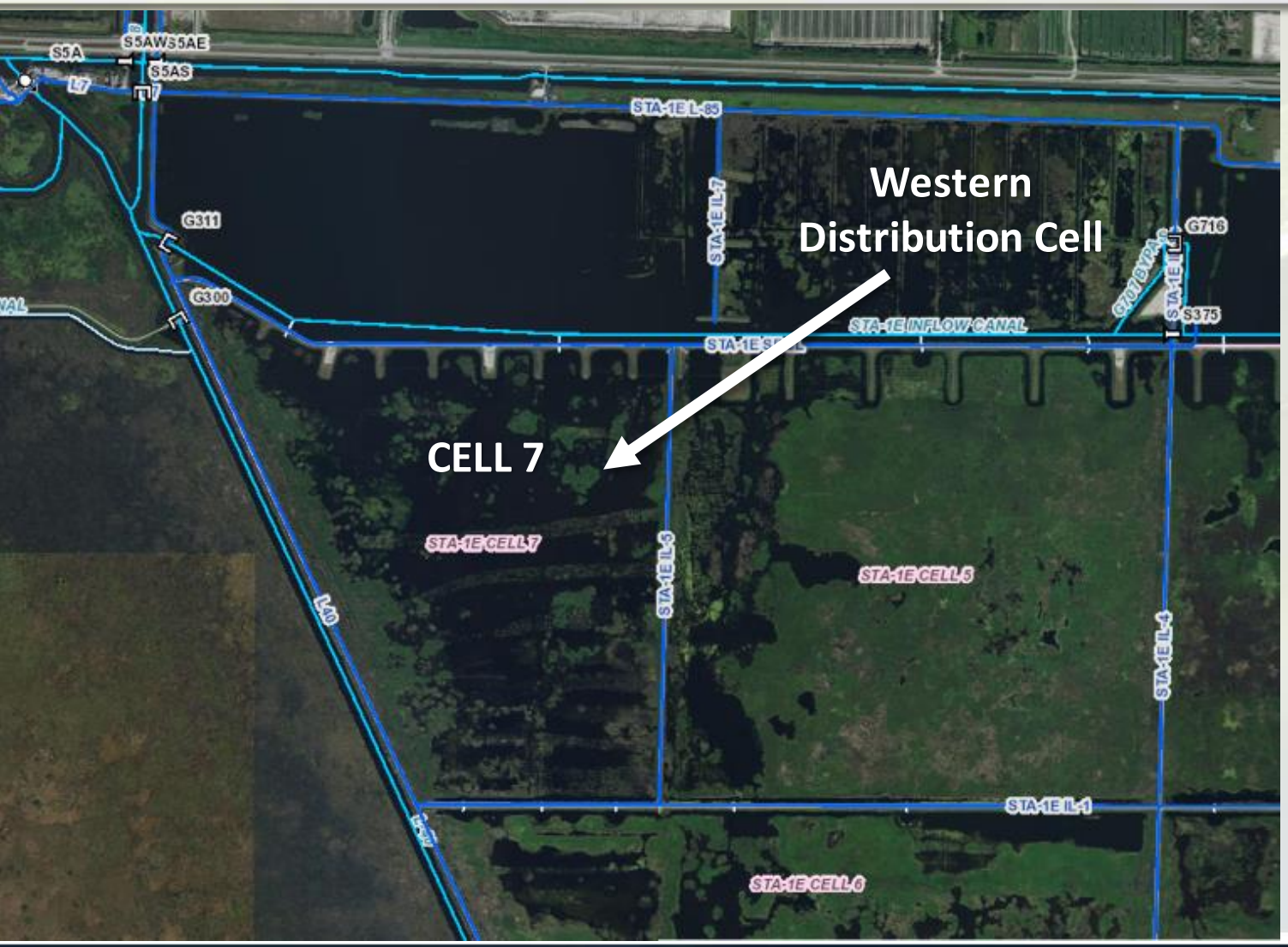
EXISTING GRADE NAVD			
NUMBER	MINIMUM	MAXIMUM	COLOR
1	3.1	9.5	
2	9.5	10.0	
3	10.0	10.5	
4	10.5	11.0	
5	11.0	11.5	
6	11.5	12.0	
7	12.0	12.5	
8	12.5	14.0	

STA-1E Repairs & Modifications Project

Cell 5 - Level and Redistribute Existing Material

Cell 5 – Leveling and Canal Reshaping

STA-1E Repairs & Modifications Project



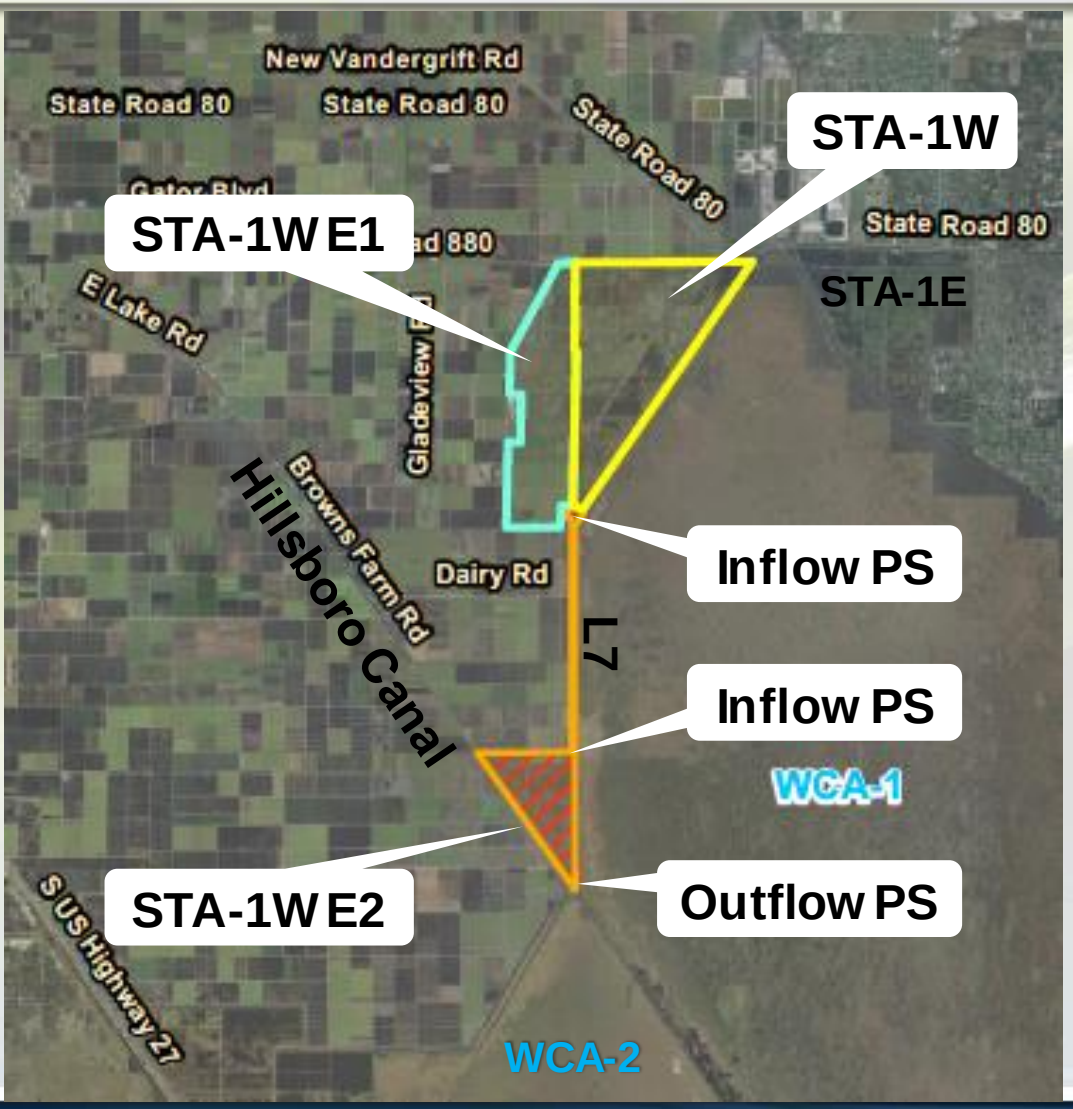
- Additive Change Order
  - WDC: Excavate 300,000 cubic yards of sandy soil (current Contract includes 150,000)
  - Cell 7: Transport and fill
  - Total Change Order $1.2M
- Palm Beach Aggregates Deductive Change Order
- $460,000 net savings to District
- Net schedule improvements will allow for replanting earlier in the dry season for improved root establishment prior to the wet season operations

STA-1E Repairs & Modifications Project

Cell 7- Imported Soil Hauling

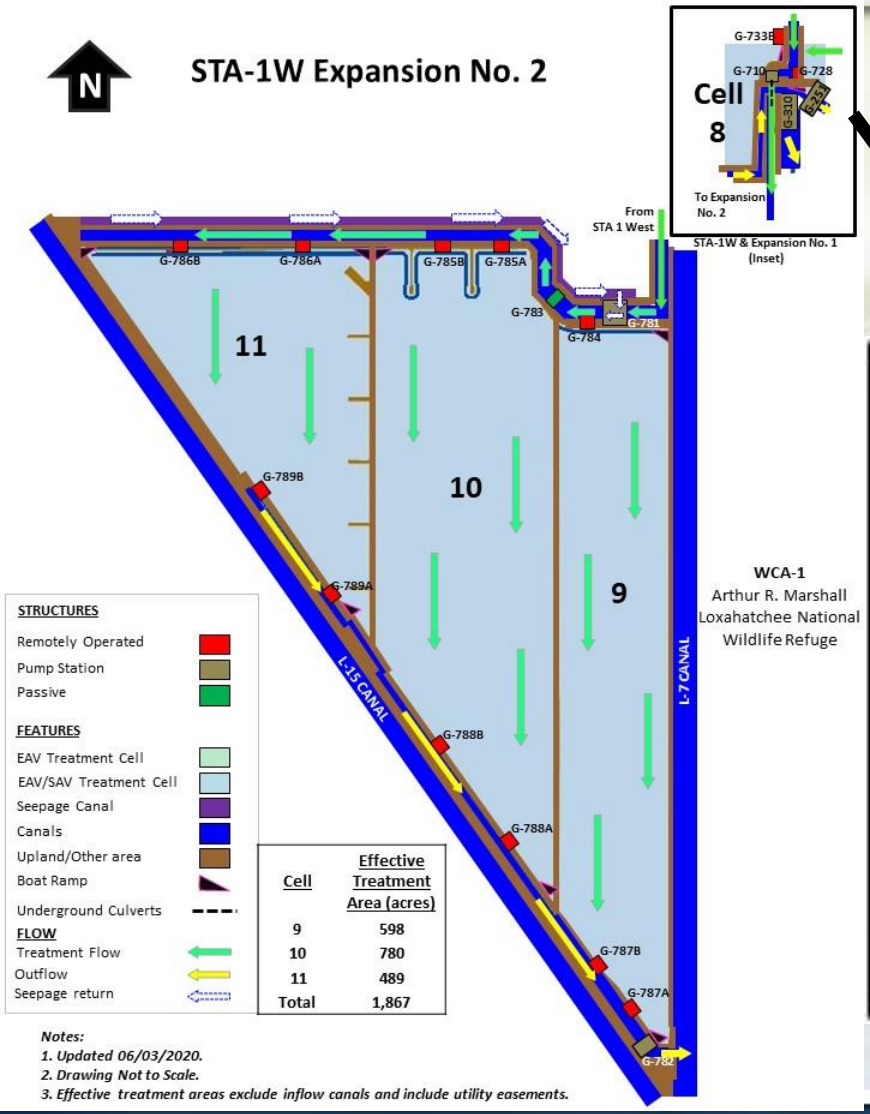
Cell 7- Imported Soil Distribution ~25% complete

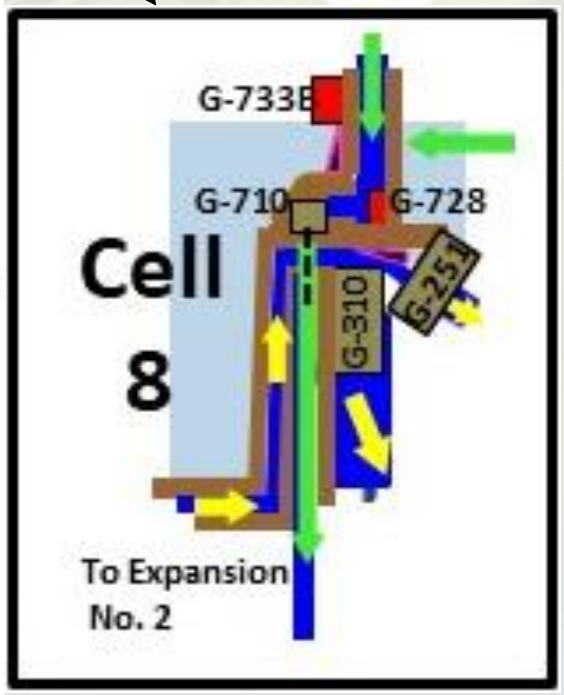
STA-1W Expansion No. 2



- Purpose is to extend treatment flow-ways for STA-1W
- Overall Construction Cost $214M
- Features 1,600 acres of additional treatment area
- Inflows from S-5A and C-51 West Basins via STA-1W
- Outflow to Water Conservation Area 1

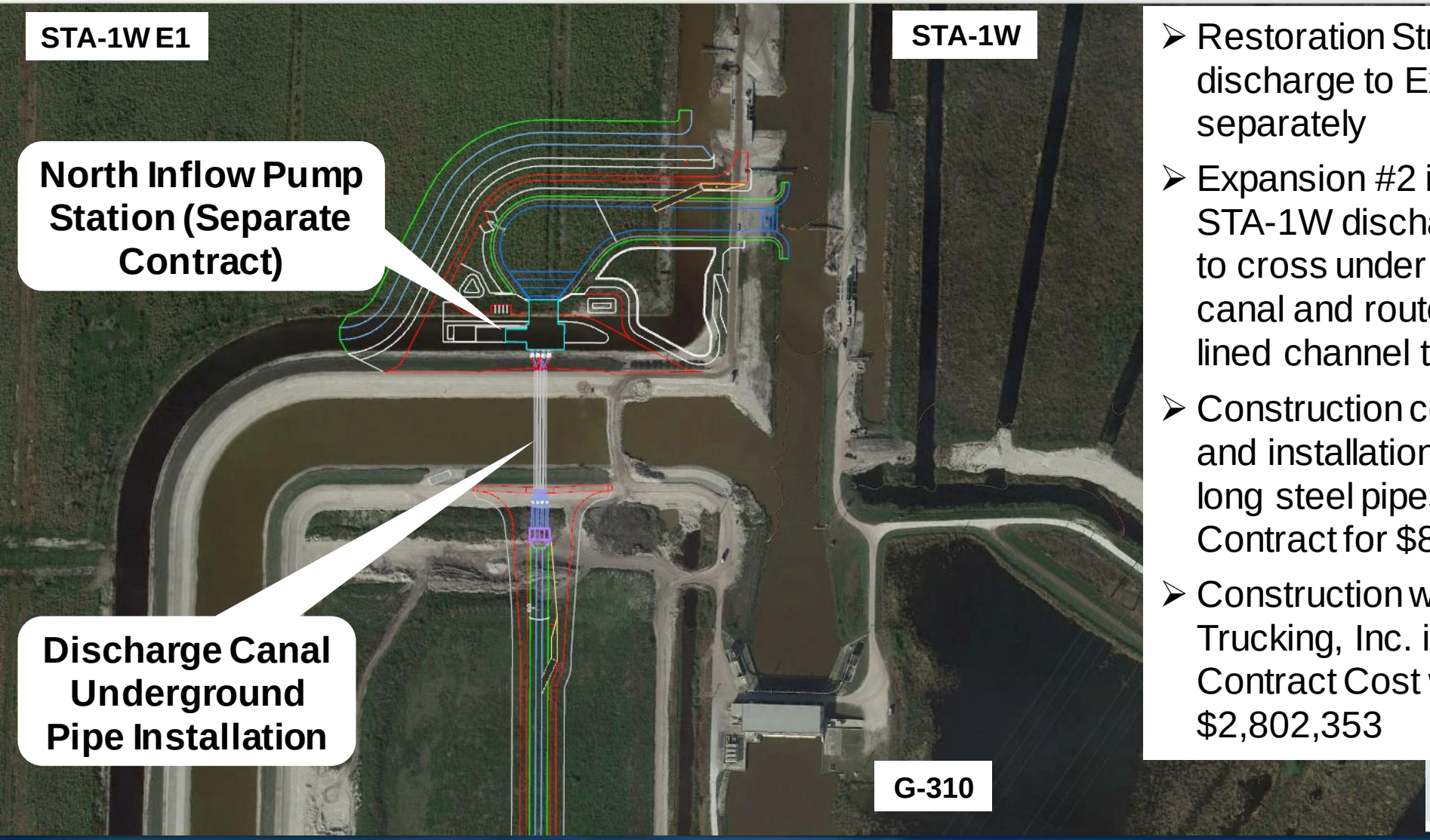
STA-1W Expansion No. 2 – Schedule of Bid Packages





- **Package A - Underground Piping**
  - Complete Design - December 2019 ✓
  - Start Construction - February 2020 ✓
  - Complete Construction - December 2020 ✓
- **Package B – STA and Connector Canal**
  - Complete Design - June 2020 ✓
  - Start Construction - September 2020 ✓
  - Complete Construction - December 2022
- **Package C - Inflow Pump Stations (G780 & G781)**
  - Complete Design – October 2020 ✓
  - Start Construction – November 2020 ✓
  - Complete Construction – December 2022
- **Package D - Outflow Pump Station (G782)**
  - Complete Design – October 2020 ✓
  - Start Construction – November 2020 ✓
  - Complete Construction – December 2022

Bid Package A – Underground Pipes



- Restoration Strategies requires STA-1W to discharge to Expansion #1 and #2 separately
- Expansion #2 inflow is from the south end of STA-1W discharge canal, pipe installation is to cross under Expansion #1 discharge canal and route STA-1W water south along a lined channel to the Expansion #2 footprint
- Construction contract required excavation and installation of four 60-inch by 310 feet long steel pipes purchased through separate Contract for $812,720
- Construction was completed by Loren Jock Trucking, Inc. in December 2020 for a total Contract Cost with Change Orders of $2,802,353

Bid Package B – STA Civil Works

- STA-1W Expansion #2 consists of 2,071 acres and is connected to the existing STA-1W complex by a new canal. This connection canal encompasses approximately 100 acres of land running north-south parallel and adjacent to the existing L-7 levee.
- Project includes the construction of three (3) new STA cells, a 6-mile concrete lined connection canal, perimeter and interior levees, canals, structures, culverts, boat ramps, maintenance ramps, and all other associated appurtenances
- Awarded at August 13, 2020 Governing Board meeting to Thalle Construction Company, Inc. for $96,800,000. NTP was on September 28, 2020.

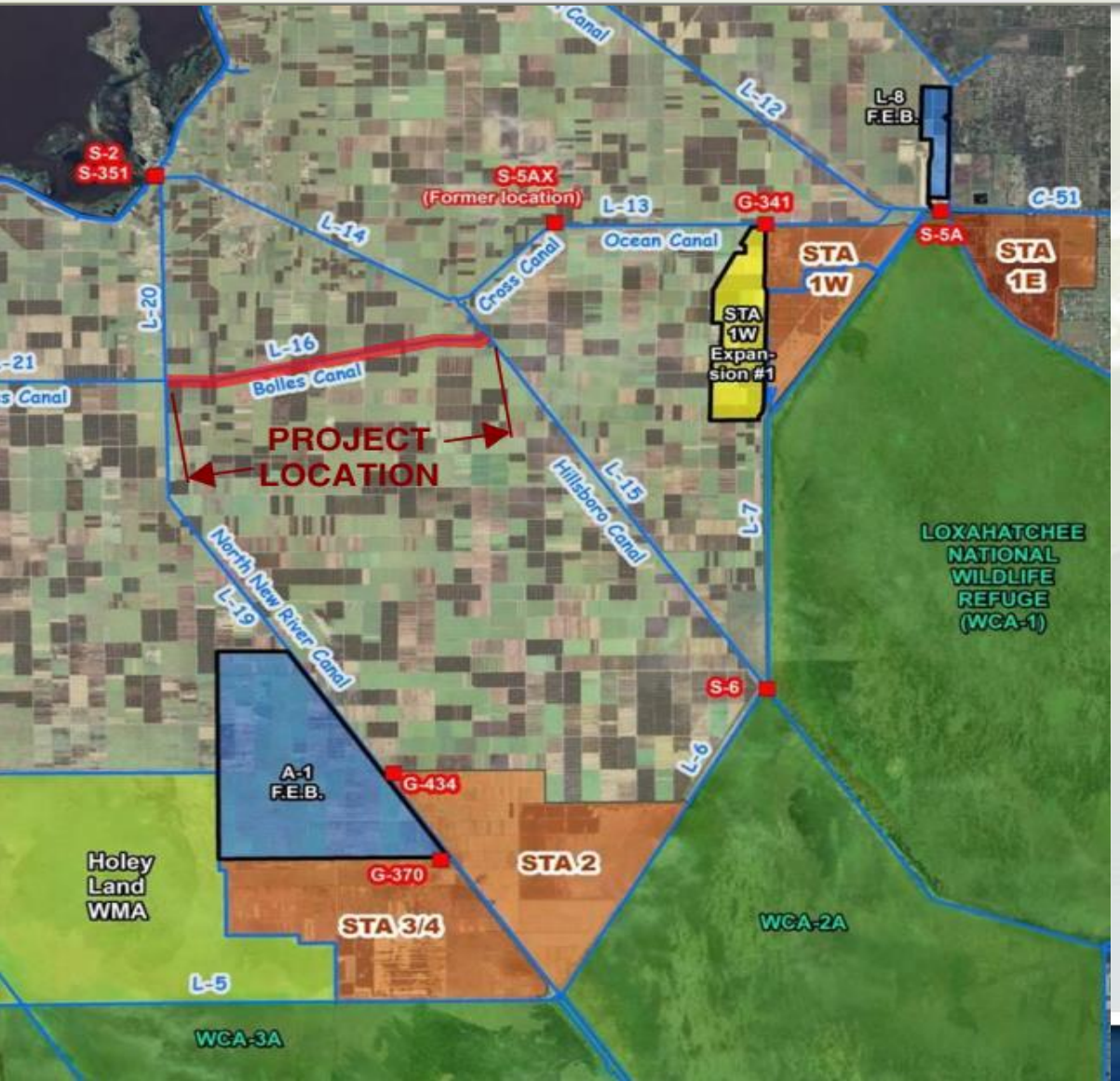
Bid Package C – Inflow Pump Stations

- The STA Expansion #2 is located approximately 6-miles south of the existing STA 1 W complex. A new Connection Canal, to be constructed as part of Package B, will connect the existing STA 1W facility to the STA Expansion #2.
- Project includes two (2) new pump stations: a North Inflow Pump Station, G-780, to send water from the STA 1W discharge canal to the proposed Connection Canal, a South Inflow Pump Station, G-781, to lift the water from the proposed Connection Canal into the new Inflow Canal.
- Awarded at November 12, 2020 Governing Board meeting to Harry Pepper and Associates, Inc. for $76,122,514. NTP was on December 18, 2020.

Bid Package D – Outflow Pump Station

- The STA Expansion #2 is located approximately 6-miles south of the existing STA 1 W complex. A new Connection Canal, to be constructed as part of Package B, will connect the existing STA 1W facility to the STA Expansion #2.
- Project includes one (1) new Outflow Pump Station, G-782, to lift water from the Outflow canal to WCA –1.
- Awarded at November 12, 2020 Governing Board meeting to Harry Pepper and Associates, Inc. for $37,418,195. NTP was on December 18, 2020.

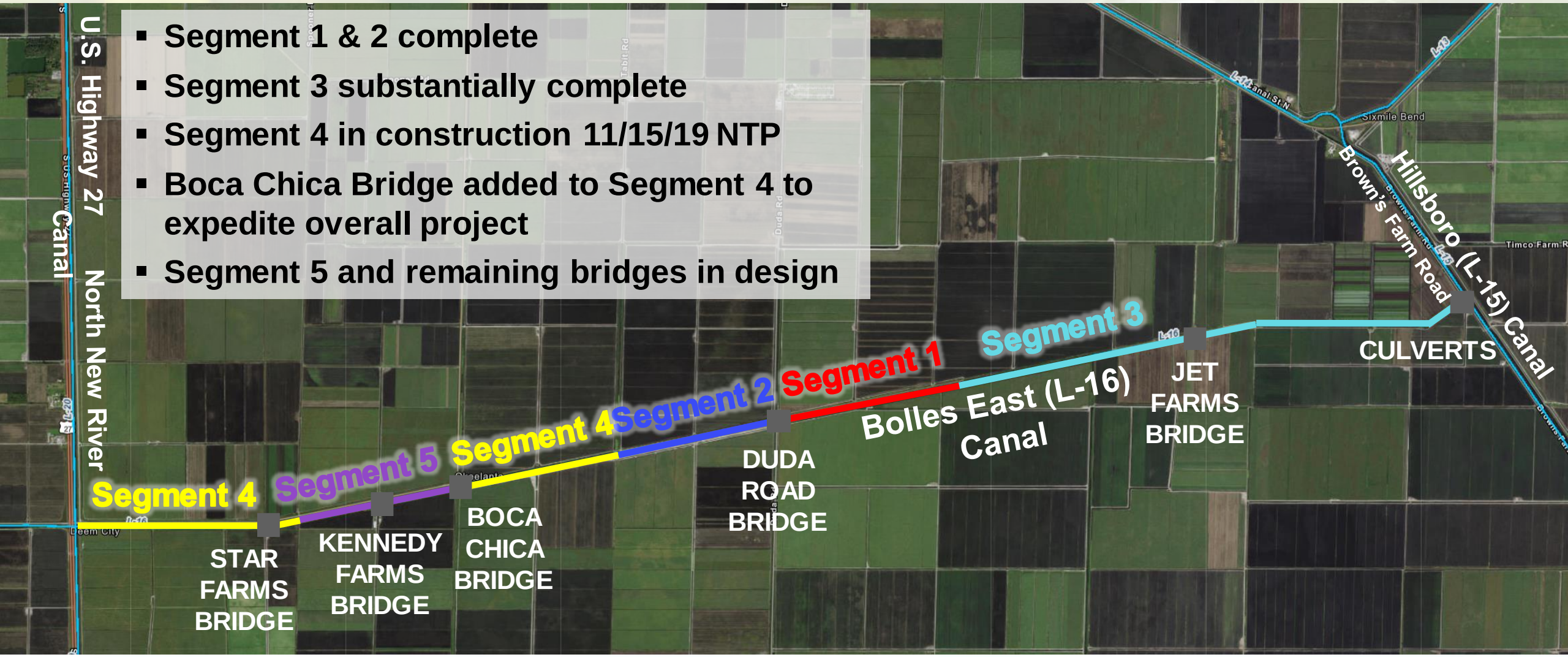
G-341 Related Conveyance Improvements
Bolles East Canal



- Project boundary between Hillsboro Canal and North New River
- Deepening and widening of the L-16 Bolles Canal to construct largest possible cross-section within District right of way to increase operational flexibility
- Replace impacted farm ditches and roads outside of right of way
- Relocation of existing electrical services
- Replace canal crossings impacting the increased canal cross section

G-341 Related Conveyance Improvements
Bolles East Canal

- Segment 1 & 2 complete
- Segment 3 substantially complete
- Segment 4 in construction 11/15/19 NTP
- Boca Chica Bridge added to Segment 4 to expedite overall project
- Segment 5 and remaining bridges in design

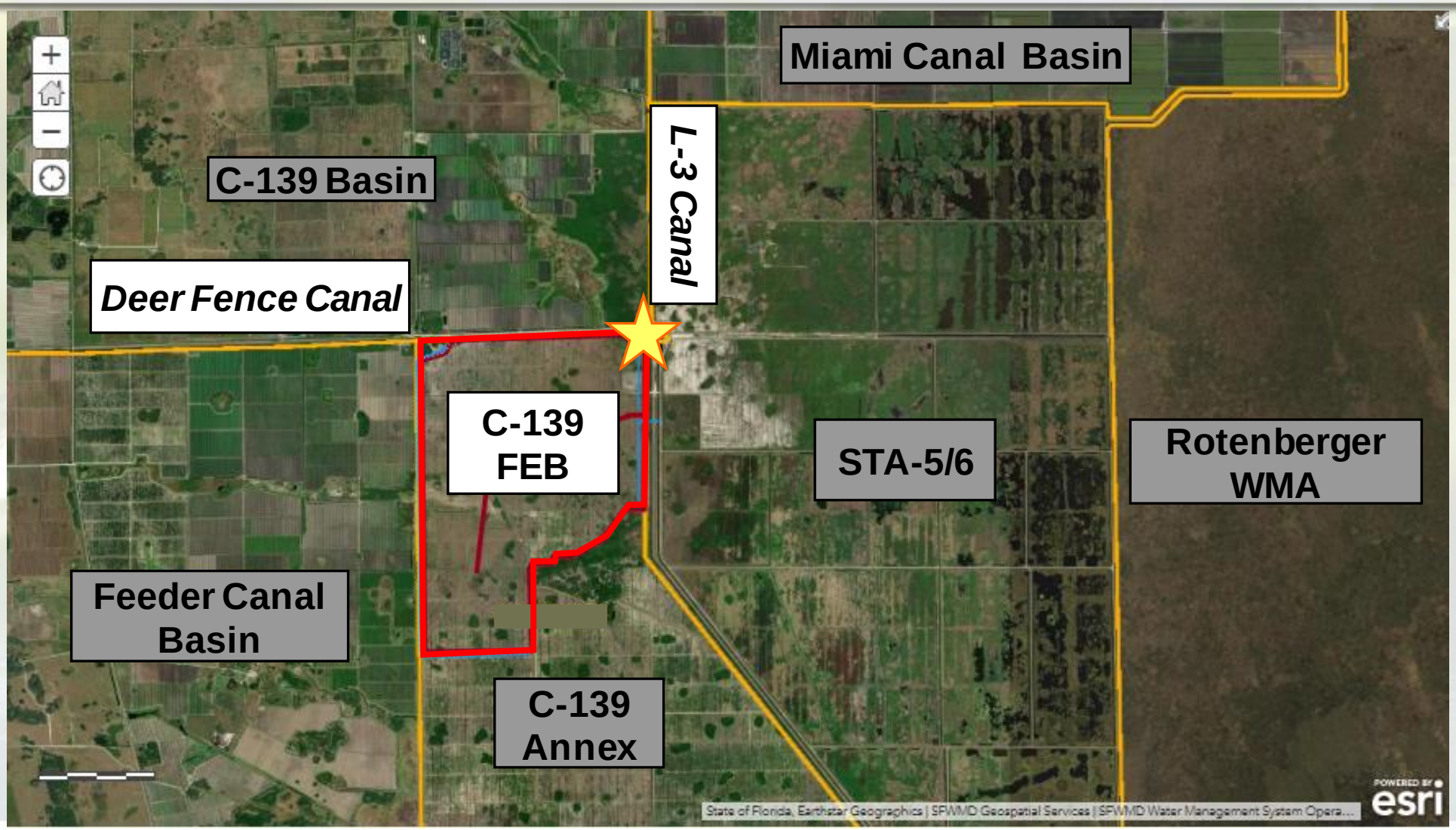


Excavation of Segment 4

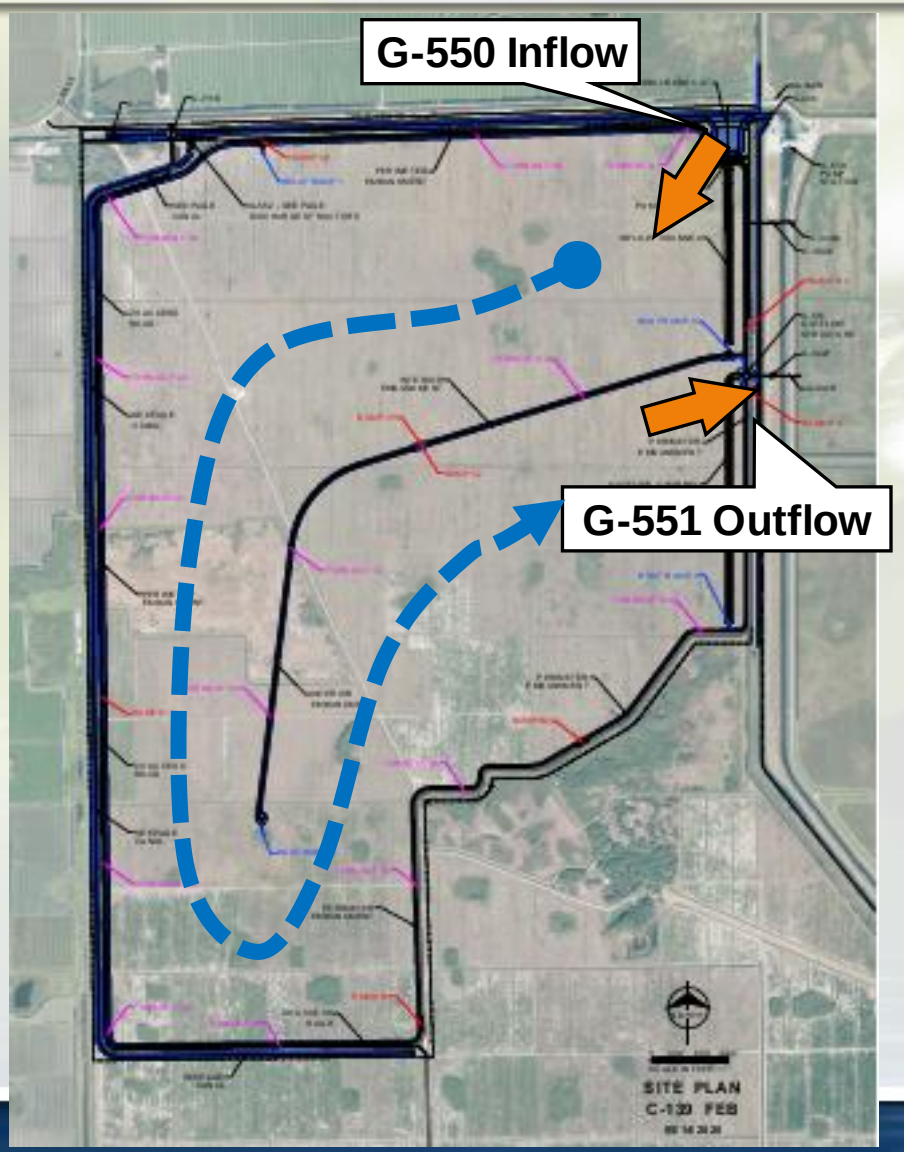
Dewatering Activities - Looking East

Dewatered Segment - Looking West towards SR7

C-139 Flow Equalization Basin

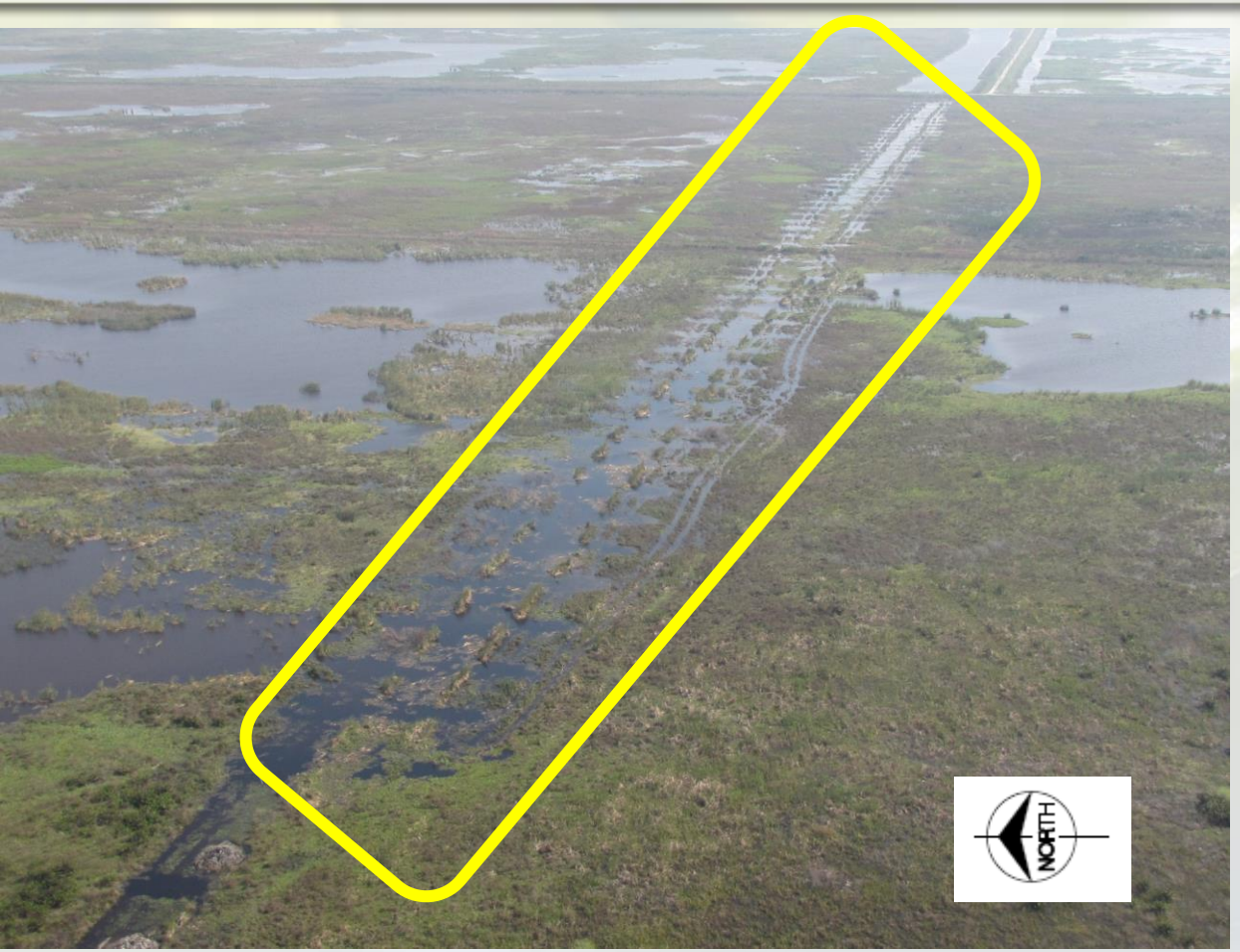


C-139 Flow Equalization Basin

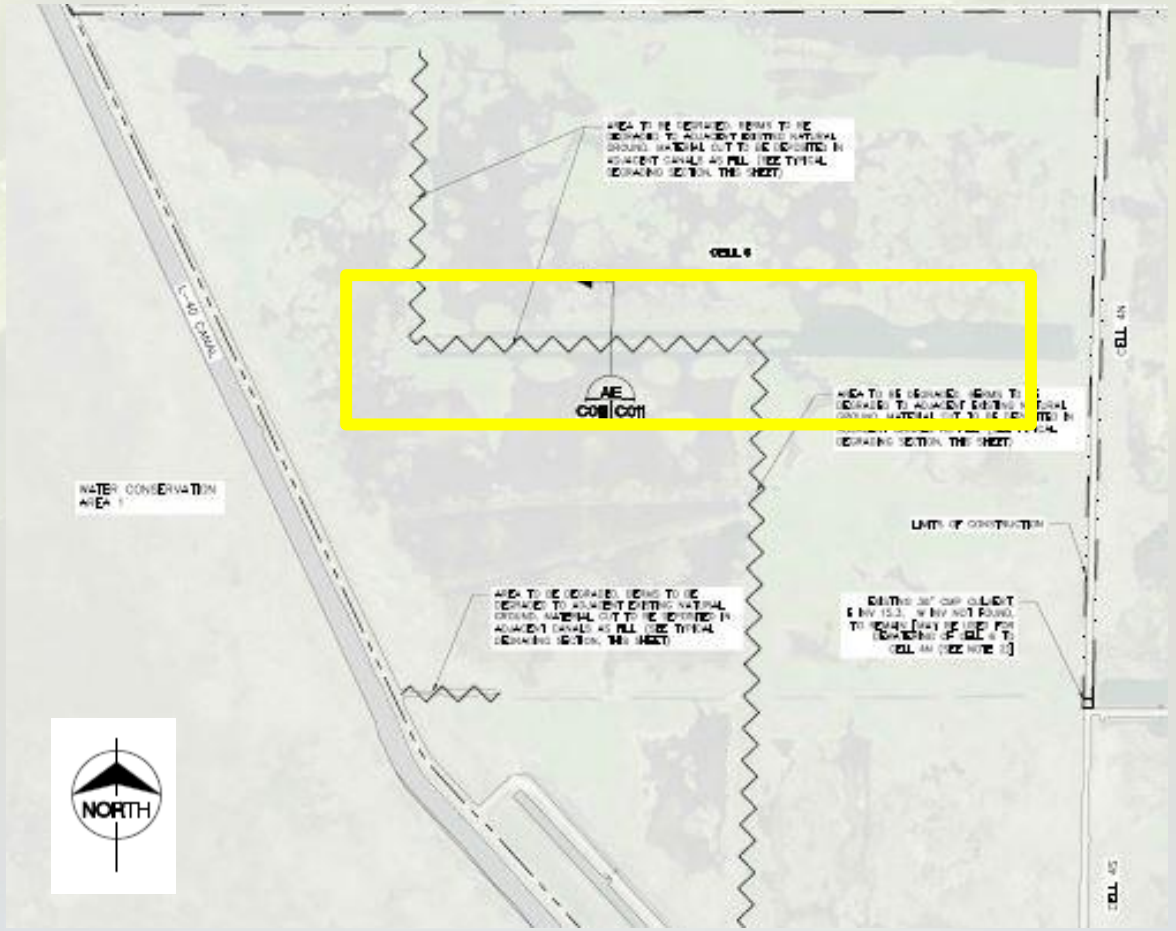


- Inflow Pump Station captures runoff from the C-139 Basin
- FEB provides approximately 10,500 acre-feet of storage and pre-treatment at its maximum storage of 4-feet deep
- Discharges stored water to STA-5/6 for treatment
- Includes 690 cfs inflow pump station and 690 cfs outflow structure
- Awarded at December 10, 2020 Governing Board meeting to Condotte-Ryan JV for $79,933,411. NTP was on February 1, 2021

STA Refurbishments – STA-1E

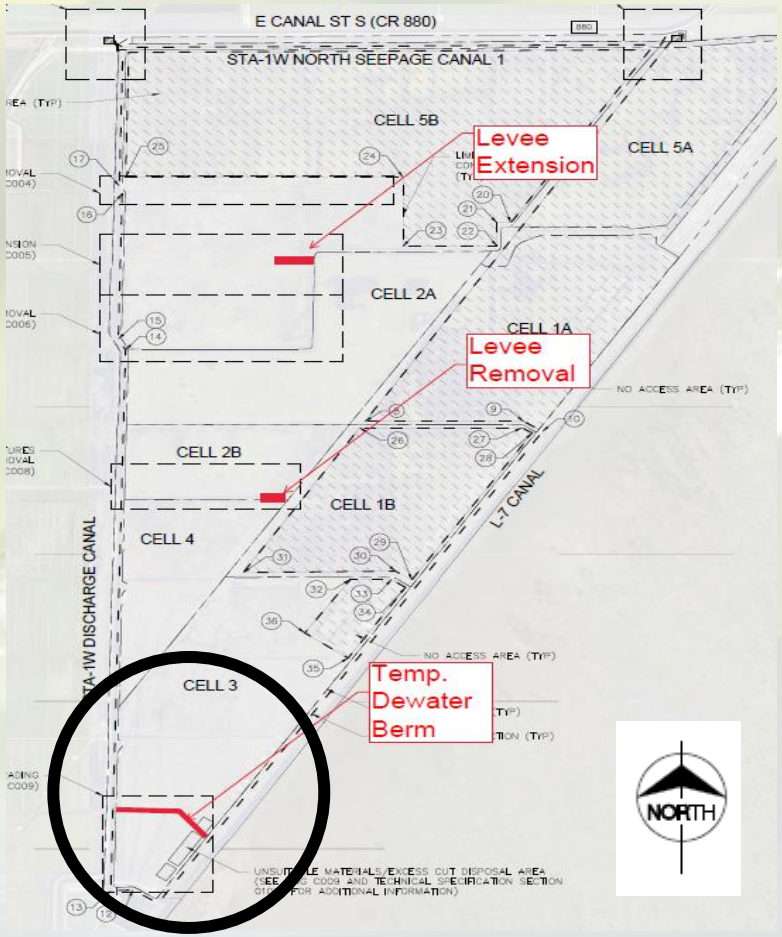


STA-1E Cell 6 – Berm Degrade Facing East



STA-1E Cell 6 – Berm Degrade Plan

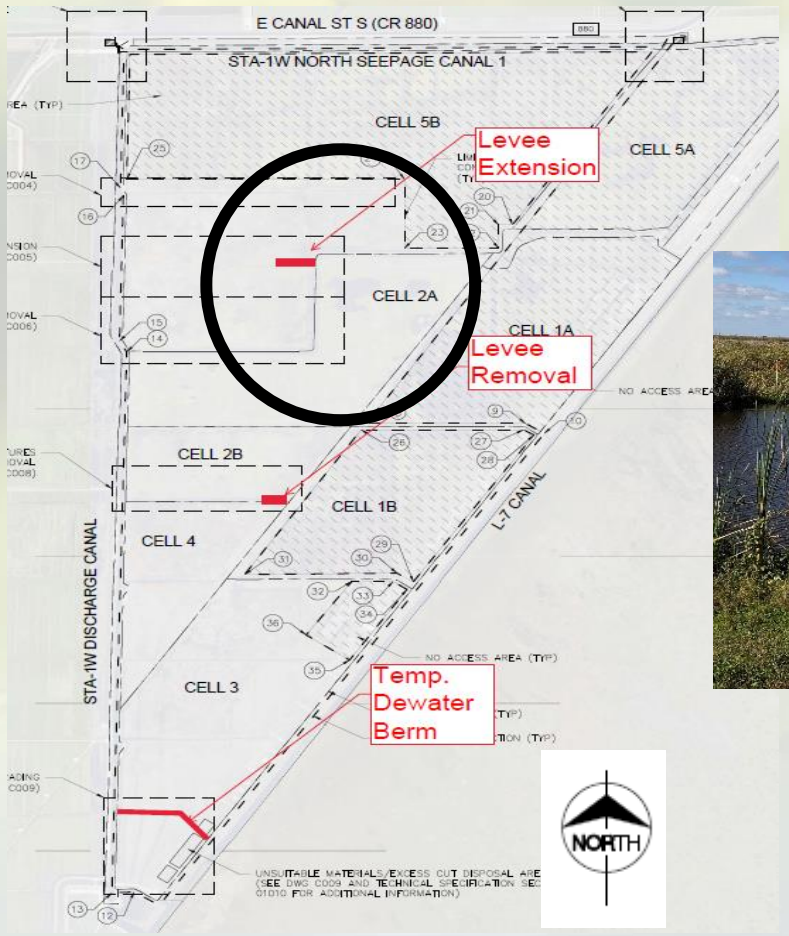
STA Refurbishments – STA-1W



STA-1W Schematic

STA-1W Cell 3 – Dewatering Berm (Regrade Prep)

STA Refurbishments – STA-1W

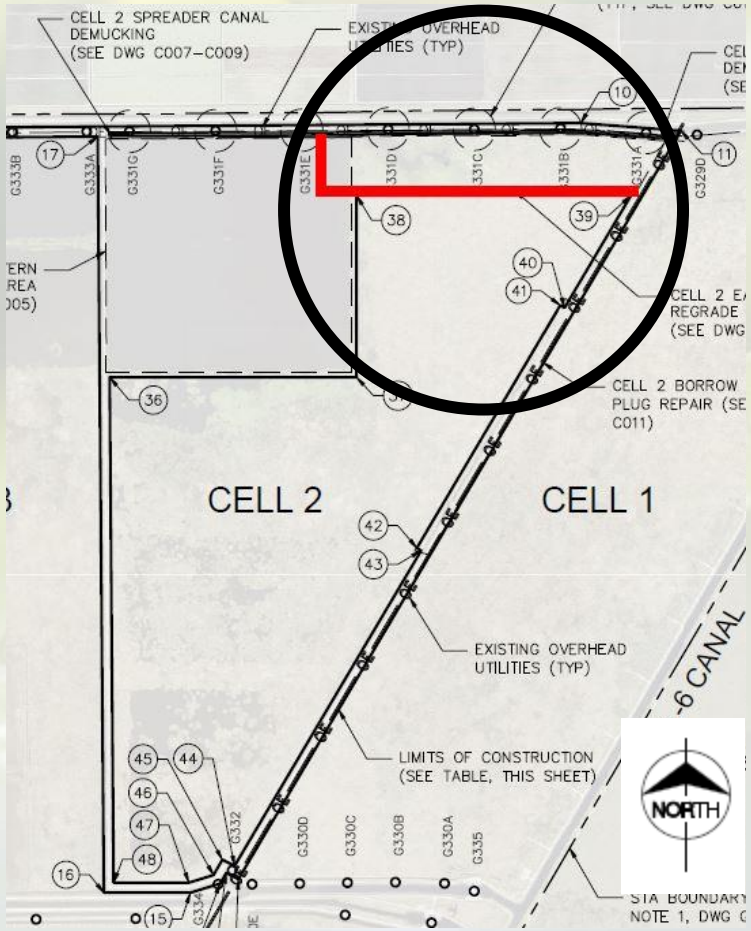


STA-1W Schematic

STA-1W Cell 5B/2A Levee Extension - Facing West

STA-1W Cell 5B/2A Levee Extension - Start

STA Refurbishments – STA-2



STA-2 Schematic

STA-2 Cell 2 Dewatering Berm Facing East

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

EASTERN FLOW PATH

STA-1W Expansion #2 (100864)

Activity	Deadline	
Complete land acquisition	3/31/2018	✓
Initiate design	10/1/2018	✓
Submit state and federal permit applications	8/1/2019	✓
Complete design	7/31/2020	✓
Initiate construction	11/30/2020	✓
Construction status report	3/1/2021	
Construction status report	3/1/2022	
Complete construction	12/31/2022	
Initial flooding and optimization period complete	12/31/2024	

STA-1W Expansion #1 (100818)

Activity	Deadline	
Complete land acquisition	9/30/2013	✓
Initiate design	9/30/2013	✓
Submit state and federal permit applications	7/30/2014	✓
Complete design	7/30/2015	✓
Initiate construction	1/31/2016	✓
Construction status report	3/1/2017	✓
Construction status report	3/1/2018	✓
Complete construction	12/31/2018	✓
Initial flooding and optimization period complete	12/31/2020	✓

COMPLETE

STA-1E Repairs and Modifications

Activity	Deadline	
PSTA Decommissioning complete	12/31/2022	✓
Culvert repairs complete	12/31/2022	✓
Cell 5 and 7 improvements complete	12/31/2022	

L-8 FEB (100813)

Activity	Deadline	
Submit state and federal permit applications	1/31/2014	✓
Construction status report	3/1/2014	✓
Construction status report	3/1/2015	✓
Complete construction (begin multi-purpose ops)	12/31/2016	✓
Long term operations commence	12/31/2022	

G-341 Related Conveyance Improvements (100802)

Activity	Deadline	
Initiate design	10/1/2020	✓
Submit state and federal permit applications	8/1/2021	✓
Complete land acquisition (if required)	9/30/2021	
Complete design	7/31/2022	
Initiate construction	11/30/2022	✓
Construction status report	3/1/2023	
Construction status report	3/1/2024	
Complete construction	12/31/2024	

L-8 Divide Structure (100817)

Activity	Deadline	
Initiate design	10/1/2012	✓
Complete design	9/30/2014	✓
Initiate construction	10/1/2016	✓
Complete construction	9/30/2018	✓

COMPLETE

S-5AS Modifications (100822)

Activity	Deadline	
Initiate design	10/1/2012	✓
Complete design	9/30/2014	✓
Initiate construction	10/1/2014	✓
Complete construction	9/30/2016	✓

COMPLETE

S-375 Expansion (100819)

Activity	Deadline	
Initiate design	9/30/2013	✓
Complete design	7/30/2015	✓
Initiate construction	1/31/2016	✓
Complete construction	12/31/2018	✓

COMPLETE

LEGEND

- Flow Equalization Basin
- Stormwater Treatment Area
- Conveyance Improvement
- ✓ Complete

Projects Complete = 7 of 13
Activities Complete = 57 of 74
% Activities Complete = 77 %
% Time Complete = 63 %

Last 4 Projects are in Construction

CENTRAL FLOW PATH

STA-2 Expansion: Compartment B

Activity	Deadline	
Initial flooding and optimization period complete	5/31/2014	✓

COMPLETE

A-1 FEB (100706)

Activity	Deadline	
Initiate design	4/1/2012	✓
Submit state and federal permit applications	12/1/2012	✓
Design status report	3/1/2013	✓
Complete design	8/1/2013	✓
Initiate construction	6/30/2014	✓
Construction status report	3/1/2015	✓
Construction status report	3/1/2016	✓
Complete construction	7/30/2016	✓
Operational monitoring and testing period complete	7/29/2018	✓

COMPLETE

WESTERN FLOW PATH

STA-5/6 Internal Improvements (100868)

Activity	Deadline	
Initiate design	10/31/2019	✓
Submit state and federal permit applications	8/30/2020	✓
Complete design	10/31/2021	✓
Initiate construction	1/31/2022	✓
Construction status report	3/1/2023	✓
Construction status report	3/1/2024	✓
Complete construction	12/31/2024	✓
Initial flooding and optimization period complete	12/31/2025	

STA-5/6 Expansion: Compartment C

Activity	Deadline	
Initial flooding and optimization period complete	5/31/2014	✓

COMPLETE

C-139 FEB (100867)

Activity	Deadline	
Initiate design	10/31/2018	✓
Submit state and federal permit applications	8/30/2019	✓
Complete design	10/31/2020	✓
Initiate construction	1/31/2021	✓
Construction status report	3/1/2021	
Construction status report	3/1/2022	
Construction status report	3/1/2023	
Complete construction	12/31/2023	
Operational monitoring and testing period complete	12/31/2024	

Contact Information

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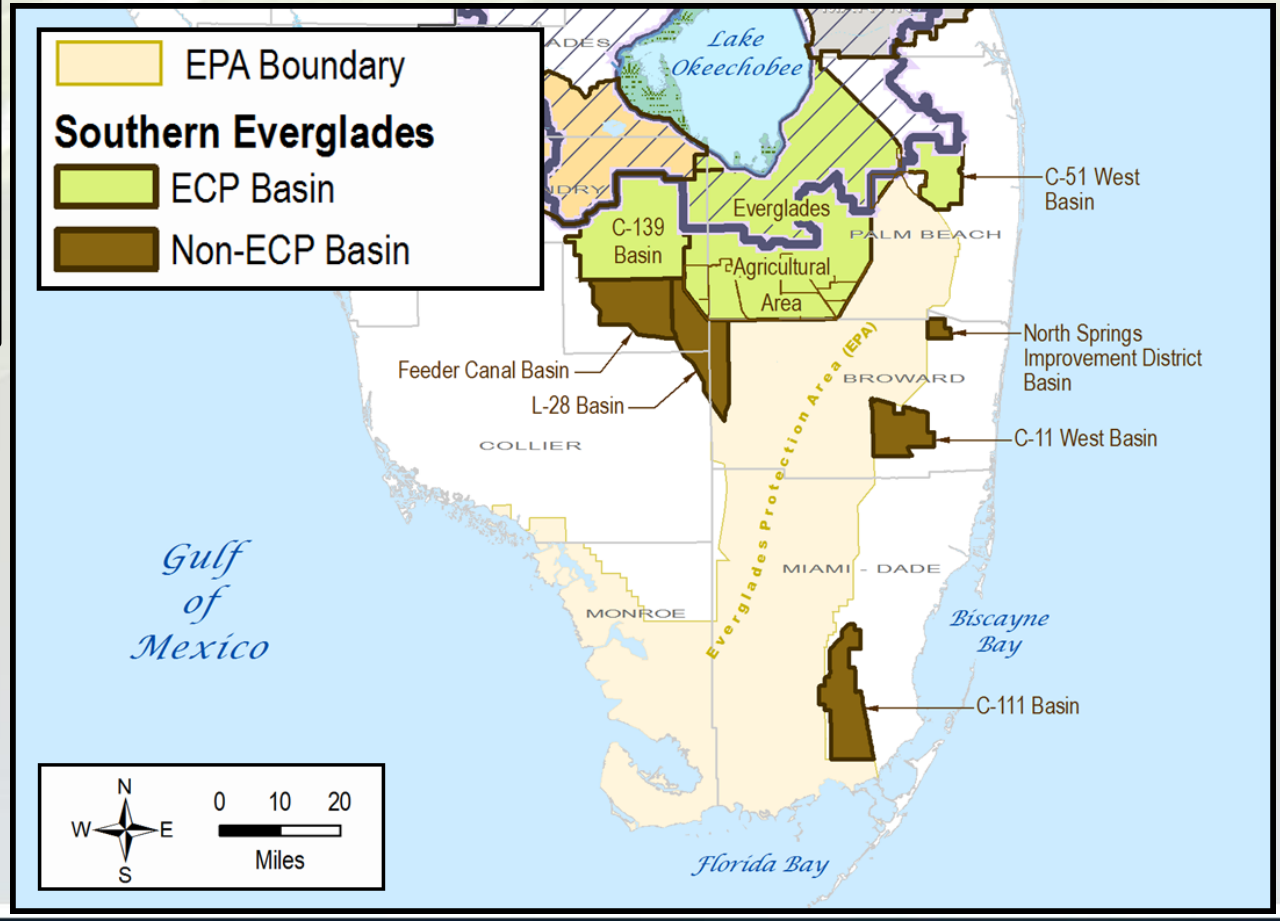
ldadrian@sfwmd.gov

SFWMD Southern Everglades Nutrient Source Control Program Update

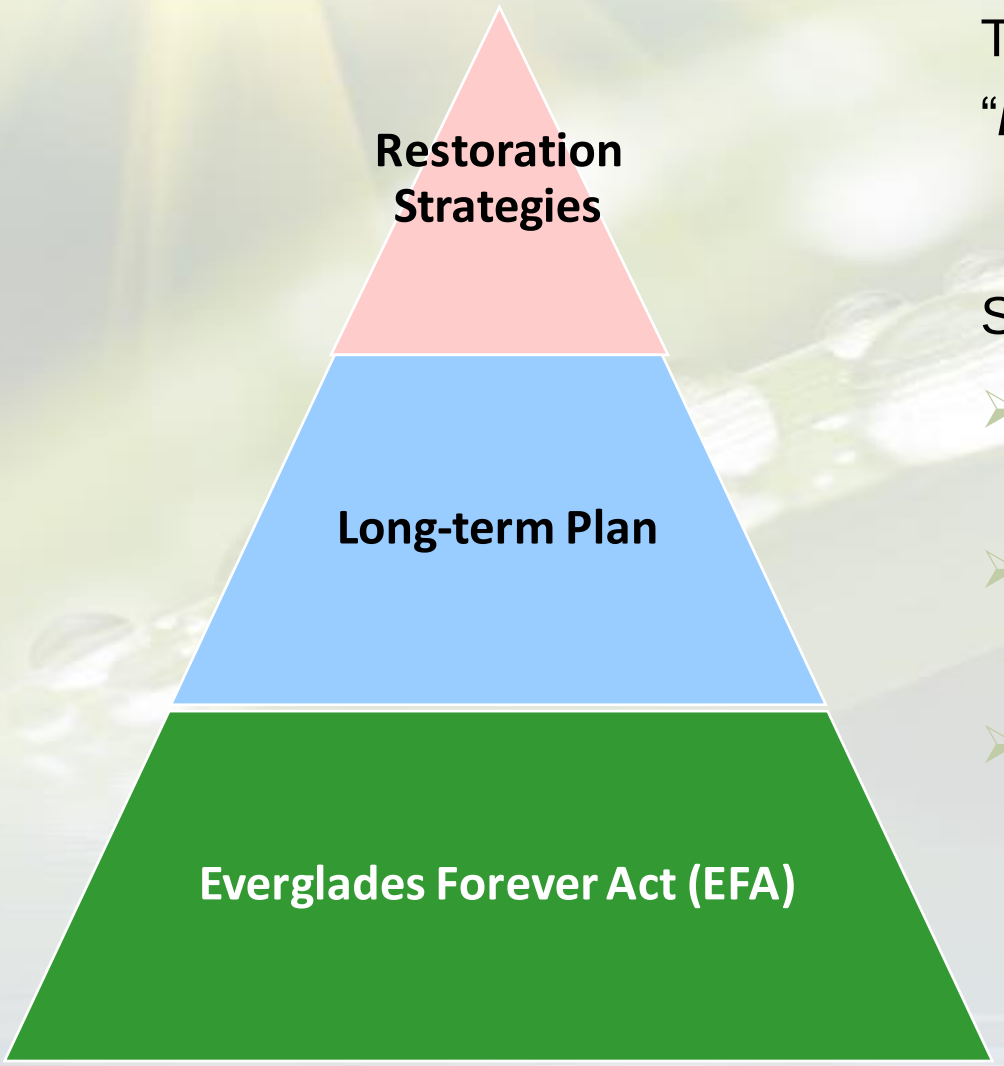
Youchao Wang, P.E.
Steve Sarley, P.E.
Ecosystem Restoration and Capital Projects

18th Annual Public Meeting on the Long-Term Plan for Achieving Water Quality Goals for the Everglades Protection Area Tributary Basins
February 22, 2021

Basins Tributary to the Everglades Protection Area



Long Term Plan Project Objectives

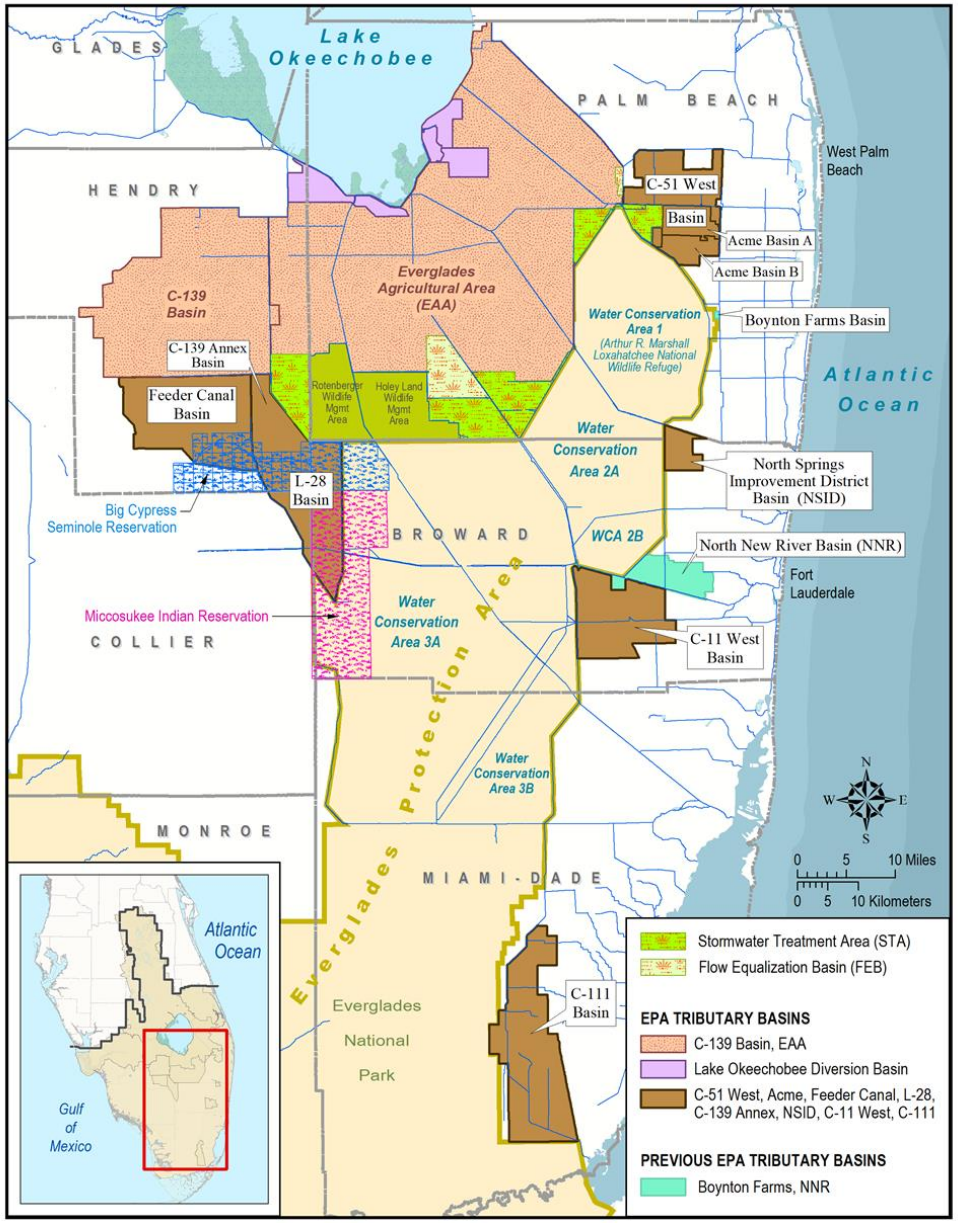


The Long-Term Plan recommends activities designed to:

"***Maintain and improve*** *upon the contribution of source controls to overall water quality improvement goals."*

Specifically:

- **Identify** discharges that are candidates for implementation of **cost-effective** source controls
- Characterize management practices on lands or processes tributary to those discharges
- Implement these source controls **in concert with** landowners or municipalities



Contents

- EAA and C-139 Basins
  - Regulatory activities
  - Research and demonstration projects
  - Sub-regional source control projects
- Other Tributary Basins
  - Regulatory and cooperative activities
  - Permit integration

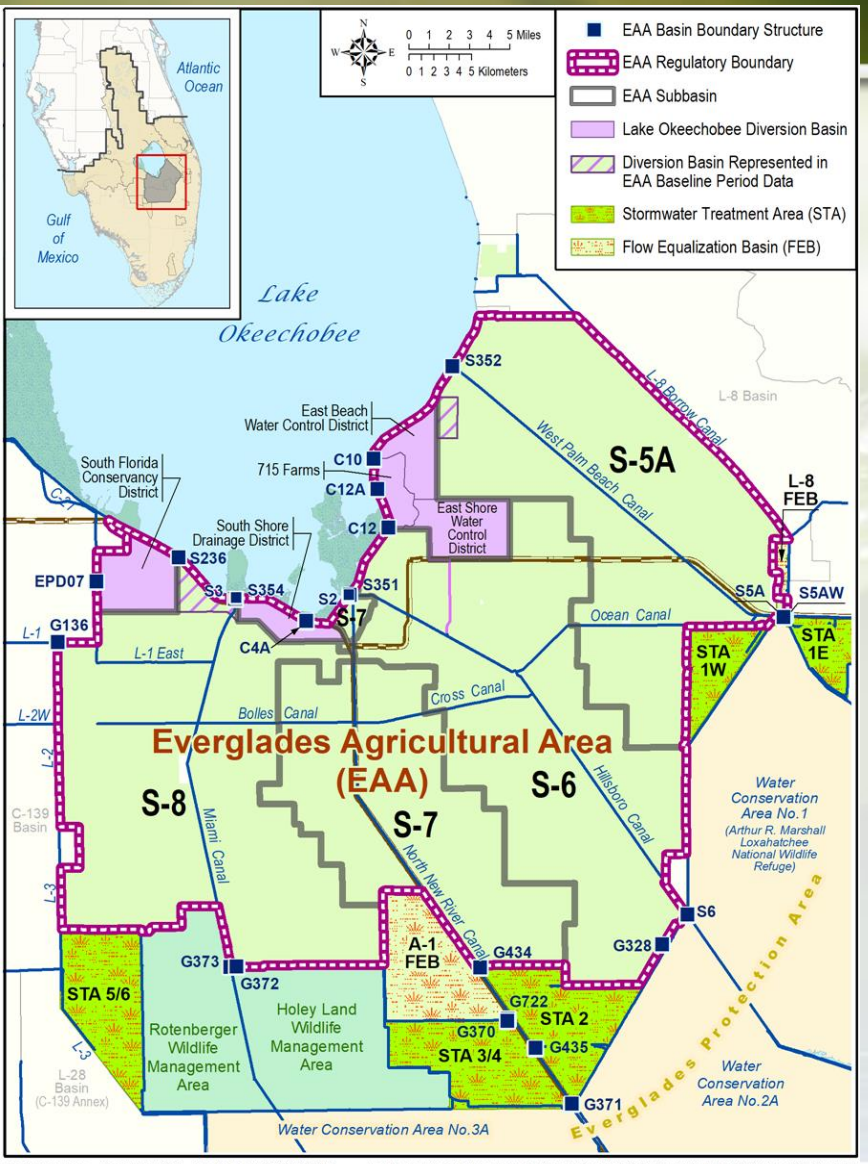
WY2020 Phosphorus Data by Basin

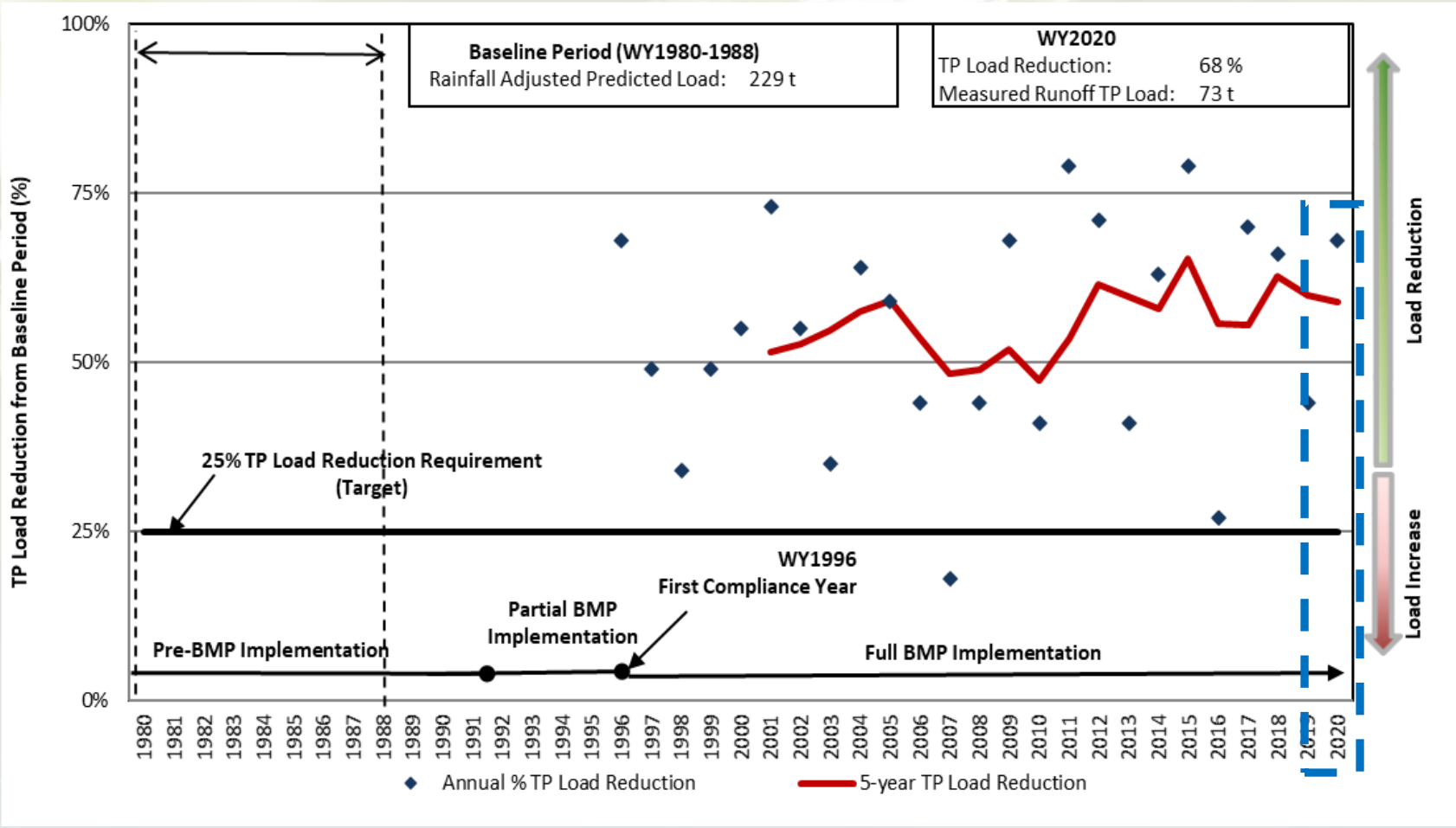
Basin	Receiving Water Body	WY2020 TP Load (metric tons)	WY2020 TP FWMC (µg/L)
Everglades Agricultural Area (EAA)	STAs and Lake Okeechobee	73	86
C-139	STA 5/6 and EAA	36	217
C-51 West and ACME	STA-1E and C-51 East Basin	12	87
L-28	Water Conservation Area (WCA) 3A	4	54
C-11 West	WCA-3A	3	13
Feeder Canal	WCA-3A	3	78
C-111 ✖	Everglades National Park	2	6
North Springs Improvement District (NSID)	WCA-2A	0	-
North New River (NNR) ✖	Coastal Broward County	0	-
Boynton Farms ✖	Lake Worth Drainage District	0	-

EAA and C-139 Basin Source Control Programs

Chapter 40E-63	EAA	C-139 Basin
Permit-level compliance	• Comprehensive BMPs • Permittee water quality monitoring • Post-permit compliance activities	• Comprehensive BMPs • Sub-basin water quality monitoring • Post-permit compliance activities
Basin-level water quality compliance	Reduce TP Loads by 25% in comparison to pre-BMP period levels	Maintain TP Loads below pre-BMP period levels
Research and Demonstration	EAA Everglades Protection District (EAAEPD) Research Master Permit	Demonstration projects in partnership with landowners
Supplementary Projects	Restoration Strategies EAA Eastern Flow path source control projects	Upstream monitoring initiatives

EAA Basin-Level Compliance *25% Reduction in TP Load*





EAA BMP Master Research Permit

- The EFA requires a comprehensive program of research, testing and implementation of BMPs.
- A 5-year Master Research Permit was issued on September 15, 2020.
  - Qualified experts
  - Identify appropriate BMPs
  - BMPs field-tested in representative sites
  - Soil, crops, other factors affecting BMP design and effectiveness
  - Outreach and Training

Photo 1

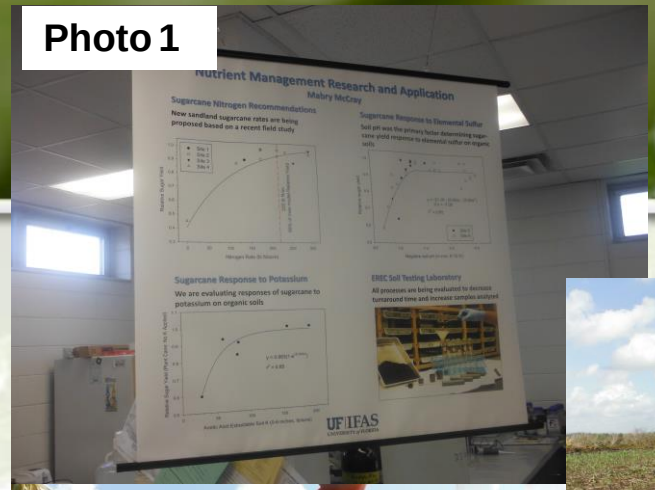
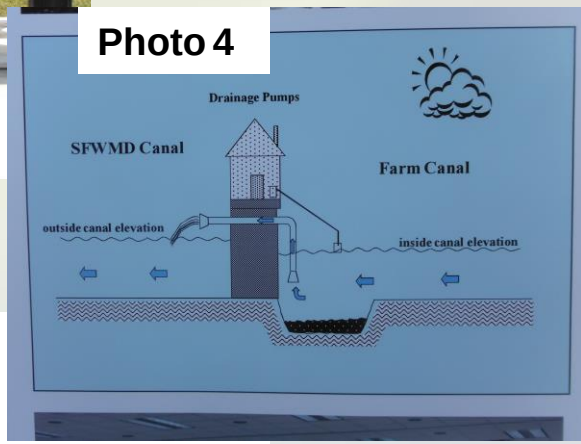


Photo 2

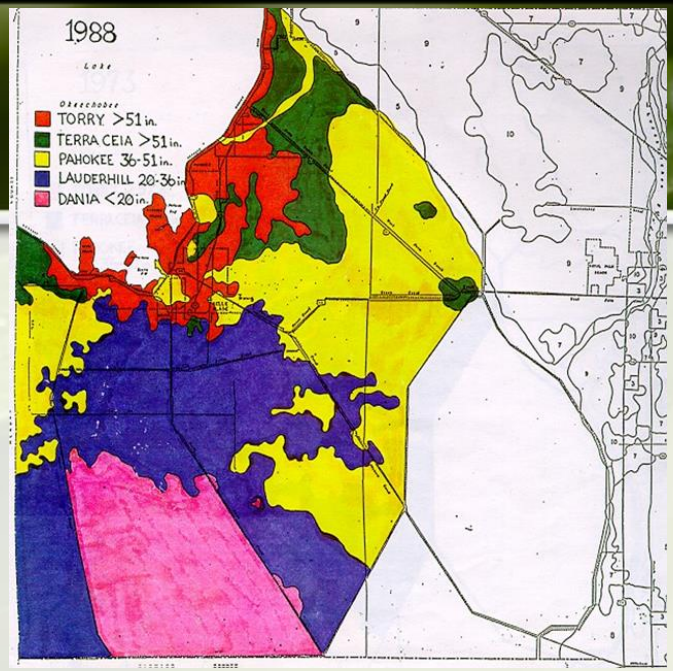
Photo 3

Photo 4



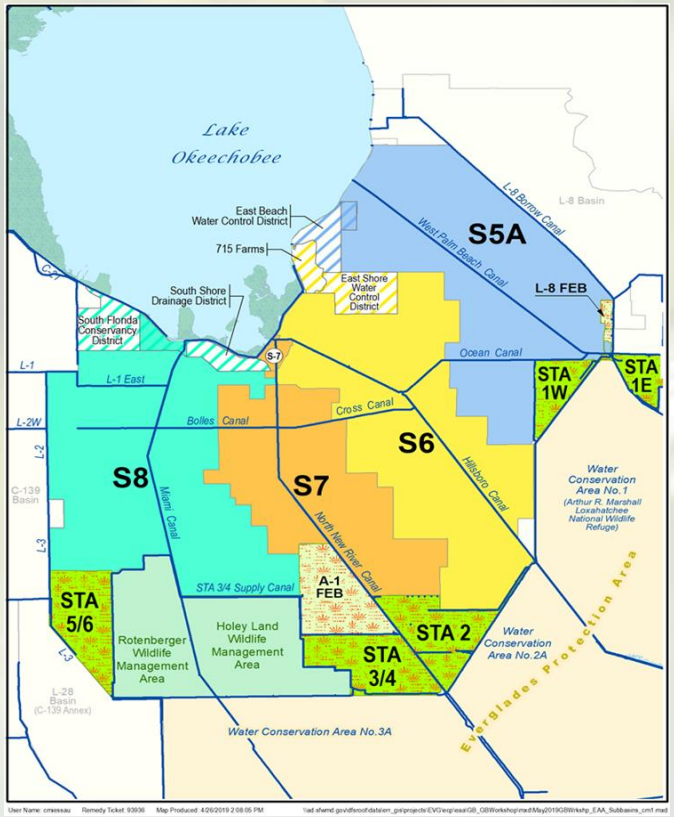
Photos:
1. Soil Testing Research at UF-IFAS Belle Glade
2. Controlled application
3. Aquatic vegetation and sediments research at UF-IFAS
4. Discharge pump diagram at UF-IFAS

EAA BMP Master Research Permit



- **Scope:** Implementation and Verification of BMPs to Reduce Everglades Agricultural Area Farm P Loads: Evaluation of performance differences of EAA farm basins with similar BMPs
- **Hypotheses:** TP in discharges is higher with:
  - Certain prior crops/land uses;
  - Deeper soils; and
  - Soils that do not promote high P retention due to native properties or prior cropping activities
- **Objective 1:** Evaluate the effect of organic soils chemistry and properties, and land management on Total Phosphorus (TP) in farm discharges.
- **Objective 2:** BMP Education and Extension Activities: Use the information from this research to determine what BMPs work most effectively on farms in the EAA with similar soil, crop, and management conditions

Priority Permit Basins Consultations



- Six permit basins were identified in the EAA as priority based on greater contribution in EAA Restoration Strategies flow paths
- Voluntary consultations by UF IFAS in the five agricultural basins
- Preliminary report for Task 1 is expected at the end of February 2021

Task 1
Site visit, interview with grower, review of documentation. Produce Preliminary Report

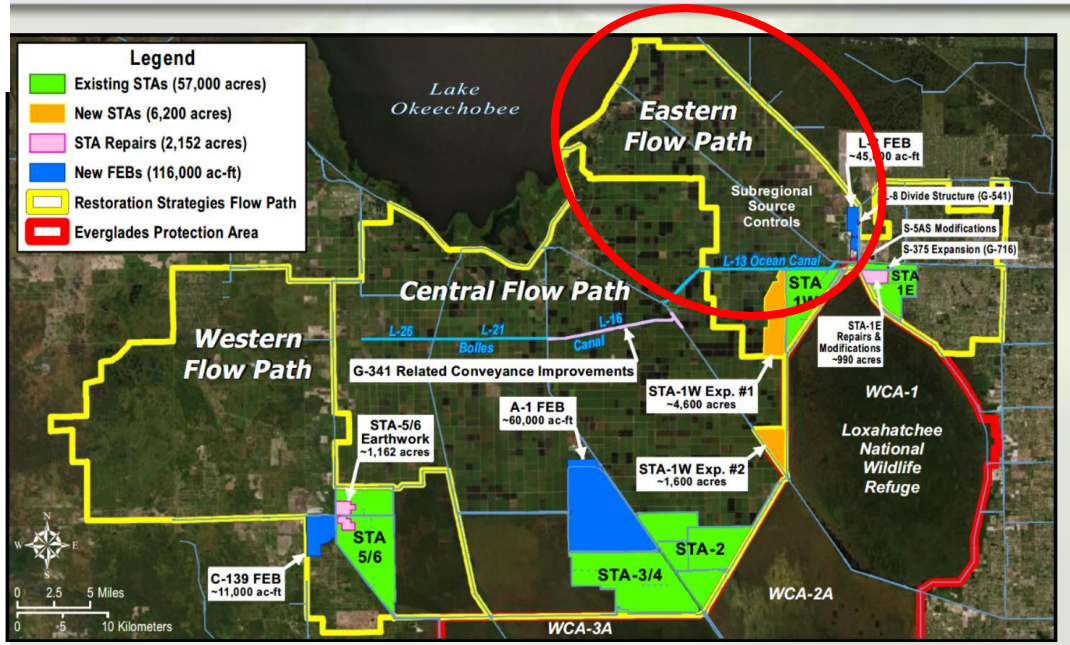
Task 2
UF IFAS provides recommendations for reducing phosphorus. IFAS with growers identify farm units to implement recommendations

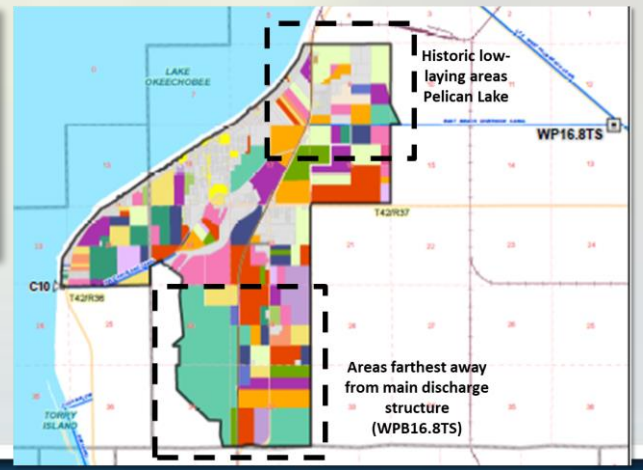
Task 3
Implementation for 3 years. As needed phosphorus speciation data may be collected to evaluate if the recommendations have reduced phosphorus

Task 4
IFAS produces a final report

Restoration Strategies Sub-regional Source Controls

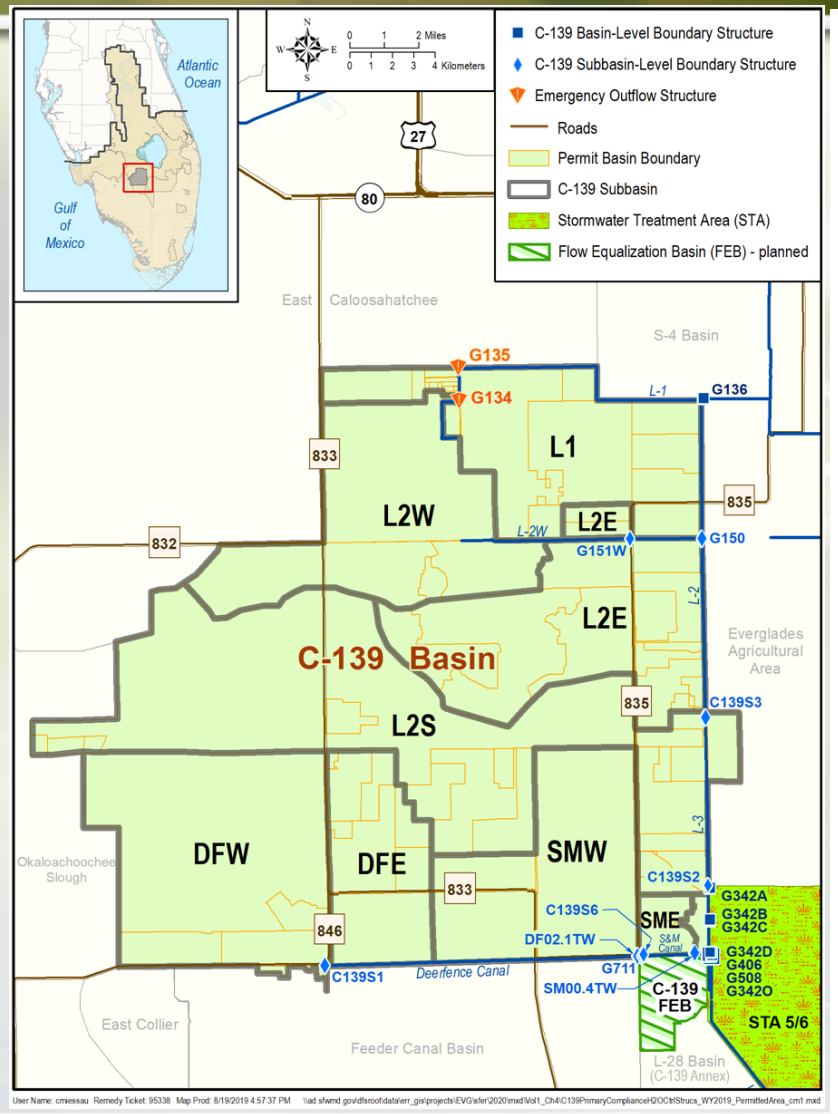
- Build on the SFWMD regulatory BMP program
  - Projects…
    - Strategic on-site locations or sub-regional source control projects in series with on-site BMPs
    - Focus on areas and projects with the greatest potential to improve water quality
    - Designed to increase retention or detention of TP above what is currently required
- Evaluating the feasibility of more flexible water management approaches in the East Beach Water Control District

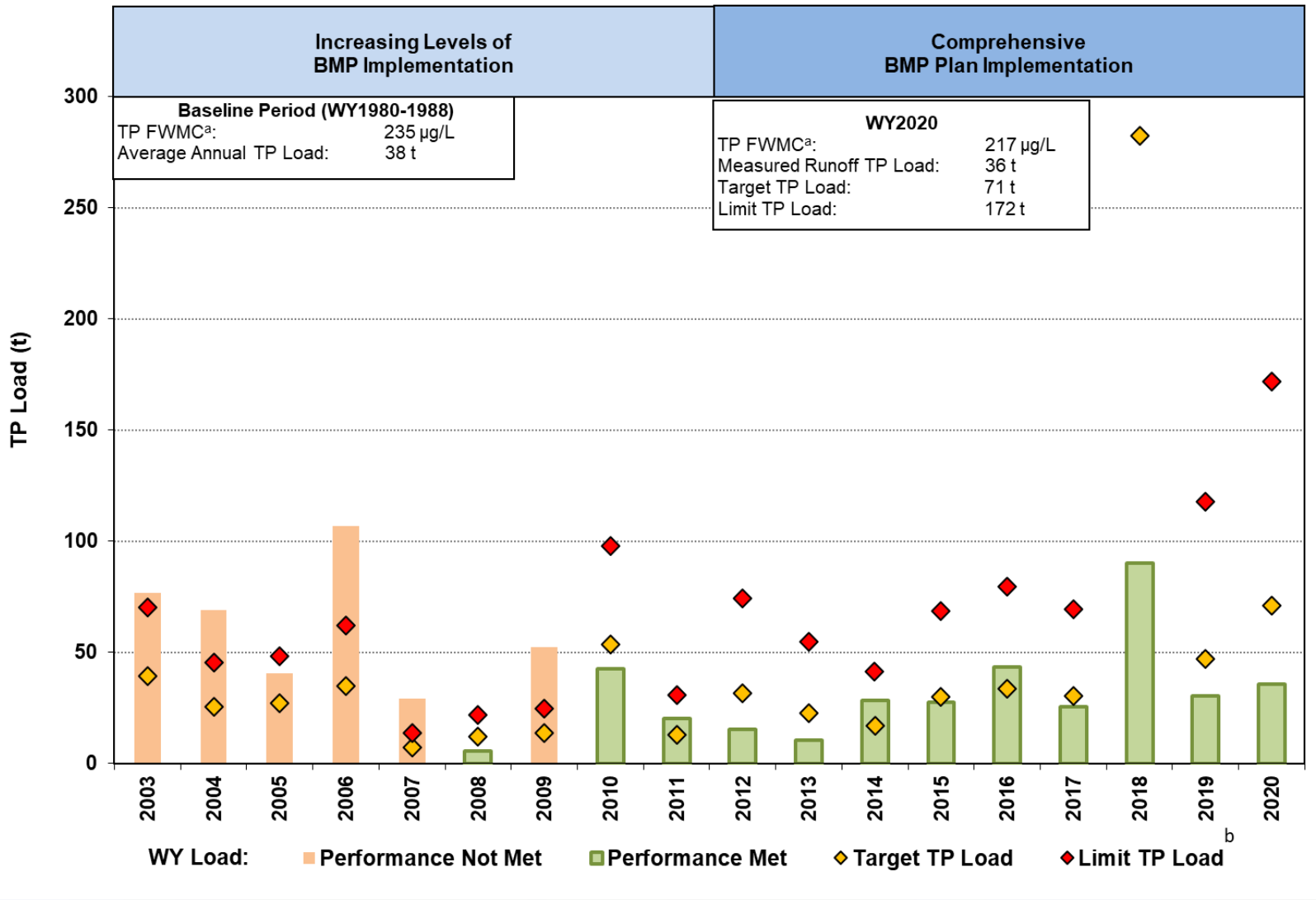




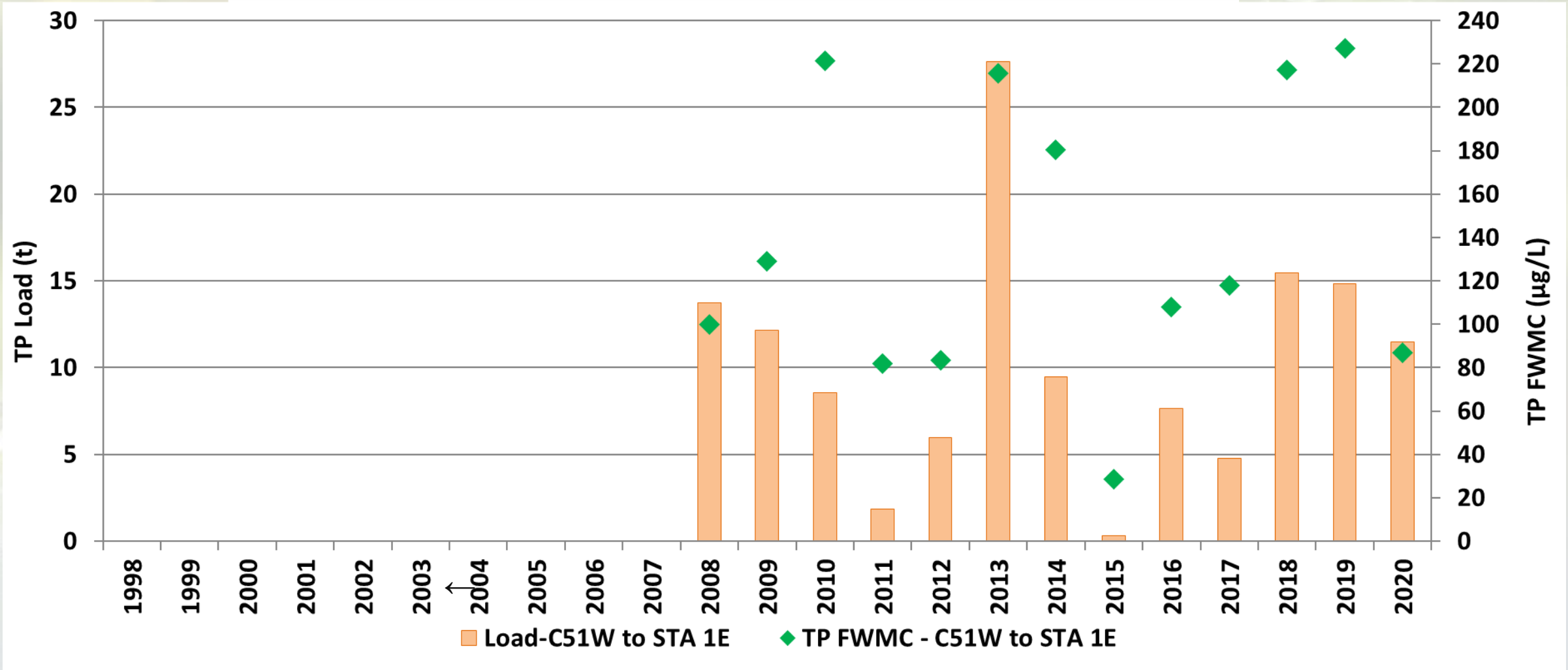
C-139 Basin Level Compliance

TP Load below historic levels

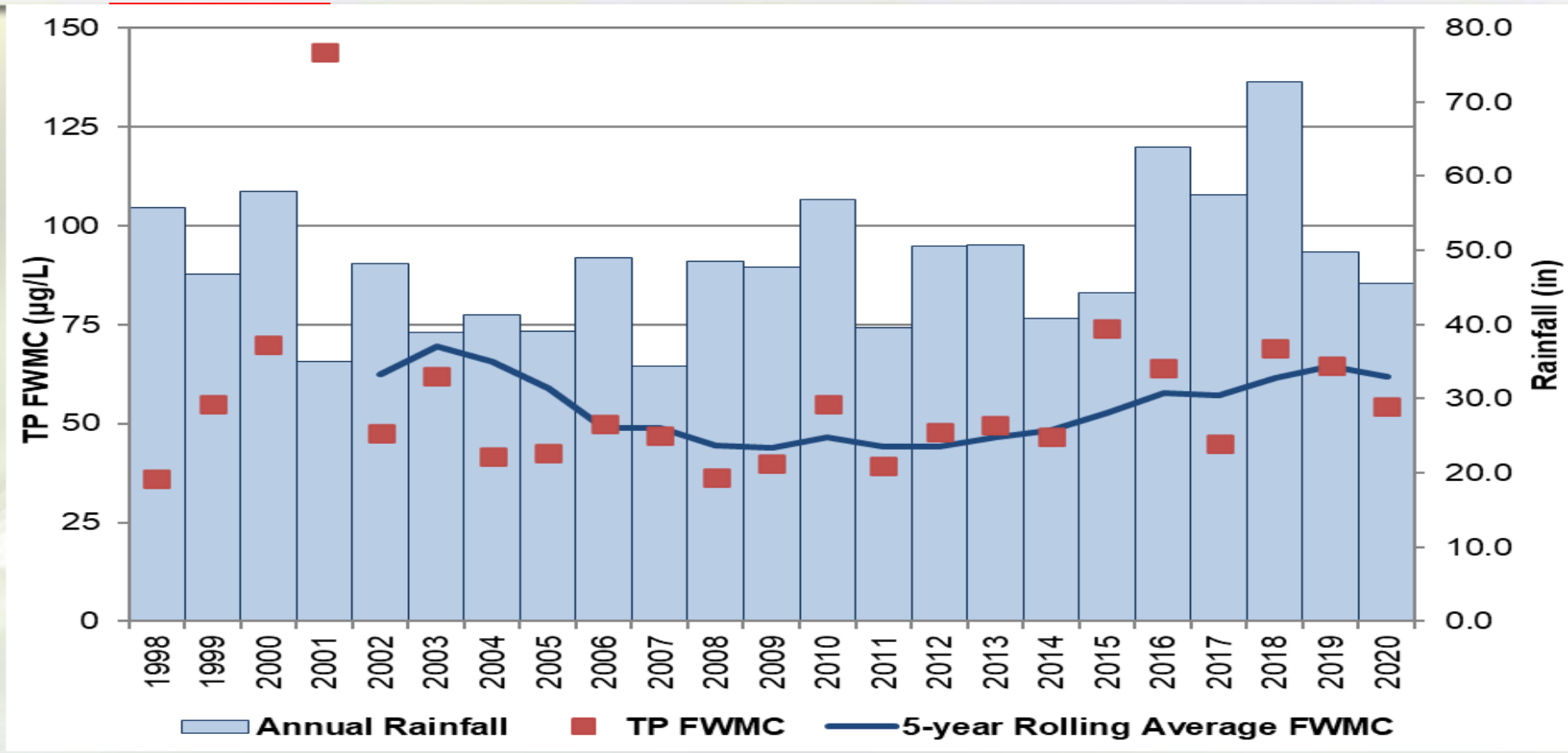




C-51 West and ACME Basin

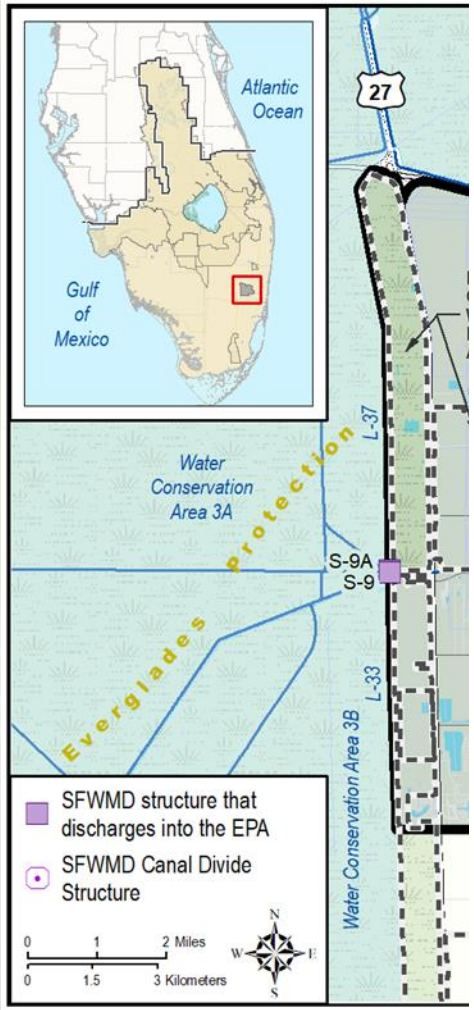


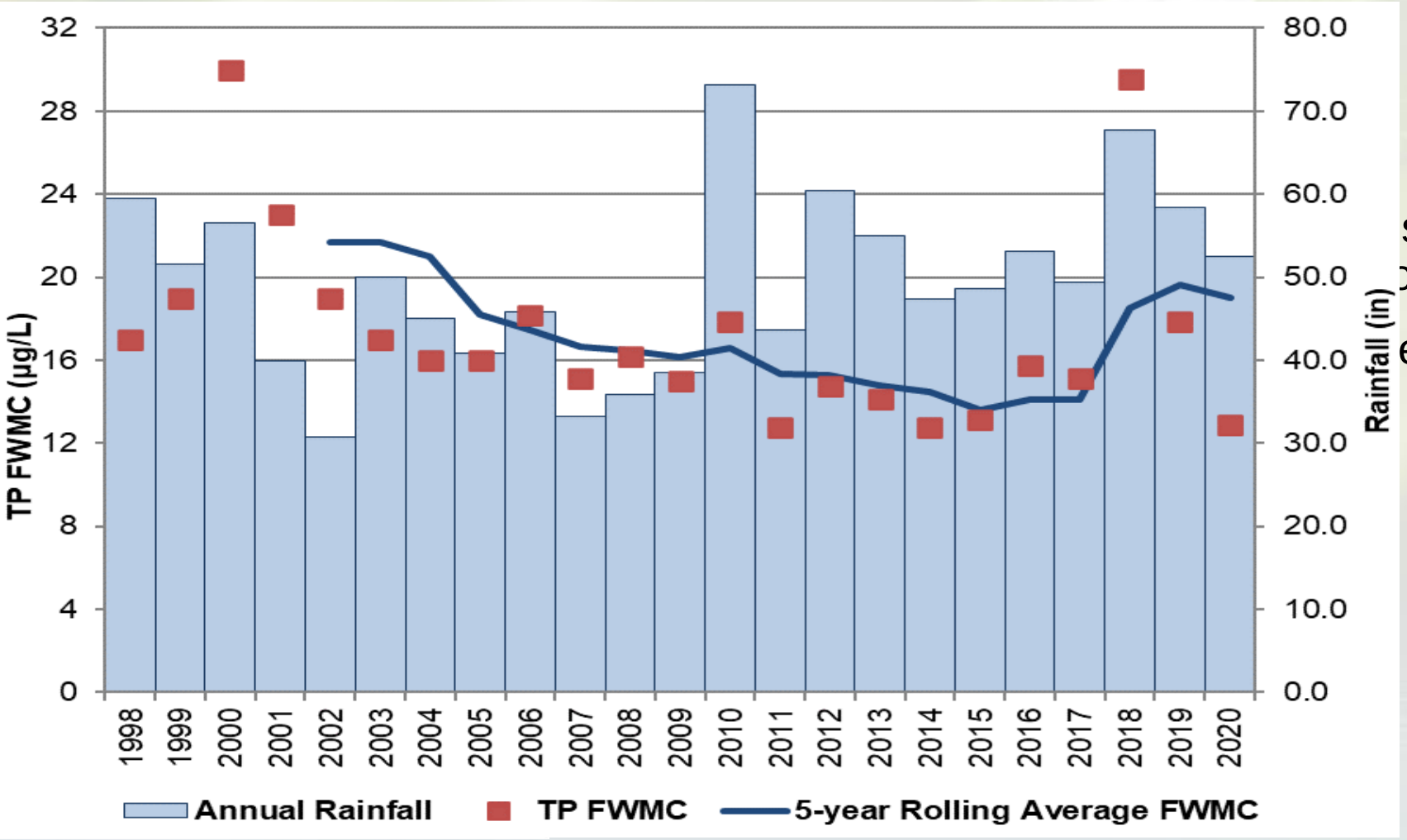
L-28 Basin



- Environmental Resource Permit to Southern Gardens Groves includes conditions for Best Management Practices
- Other projects: C-139 Flow Equalization Basin and Sam Jones Abiaki Prairie Restoration
- CERP Big Cypress/L-28 Interceptor Modification (WERP)

C-11W Basin





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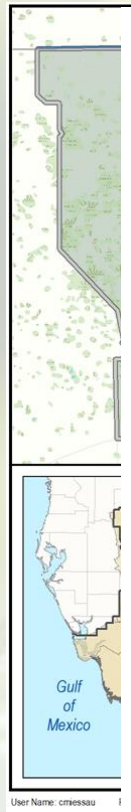
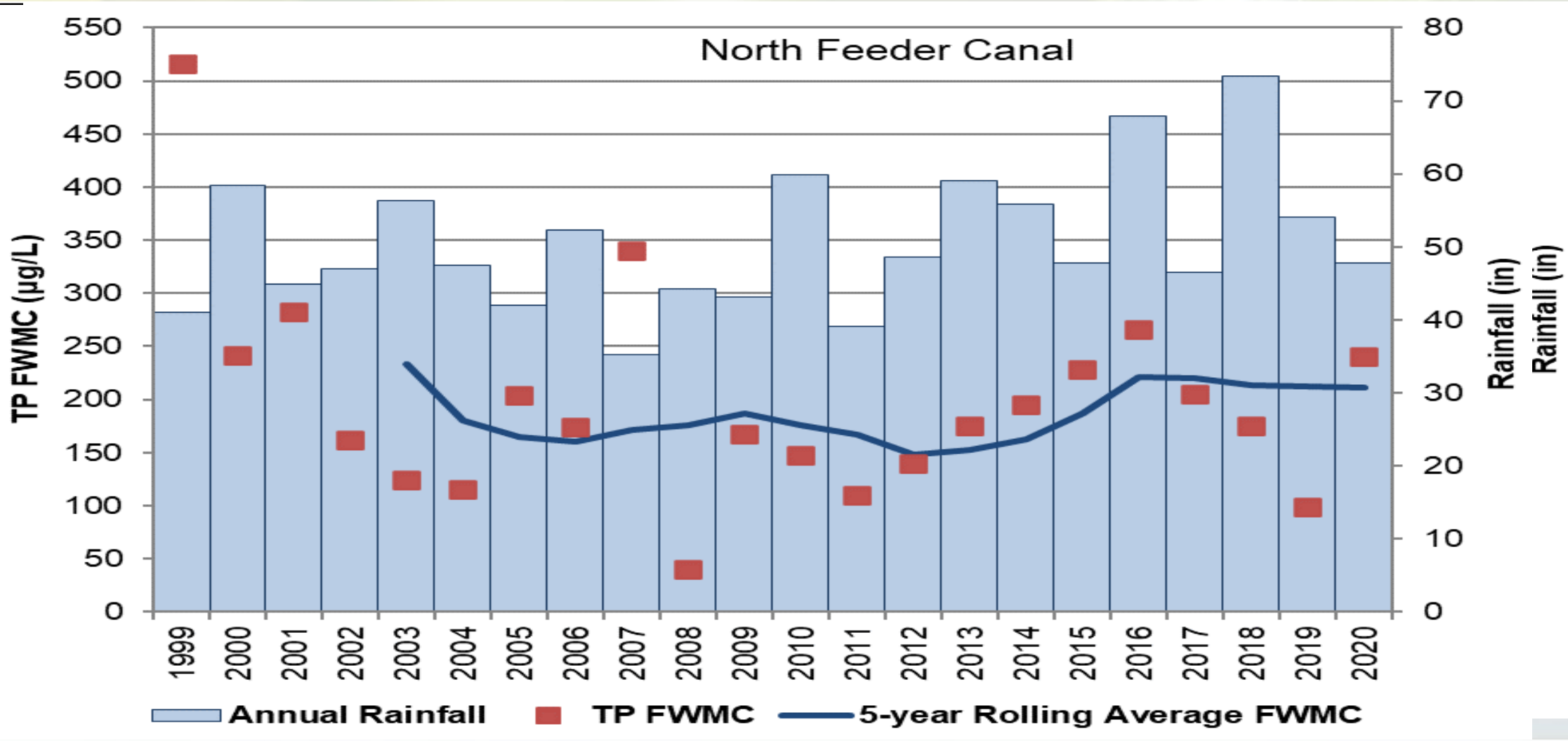
orting

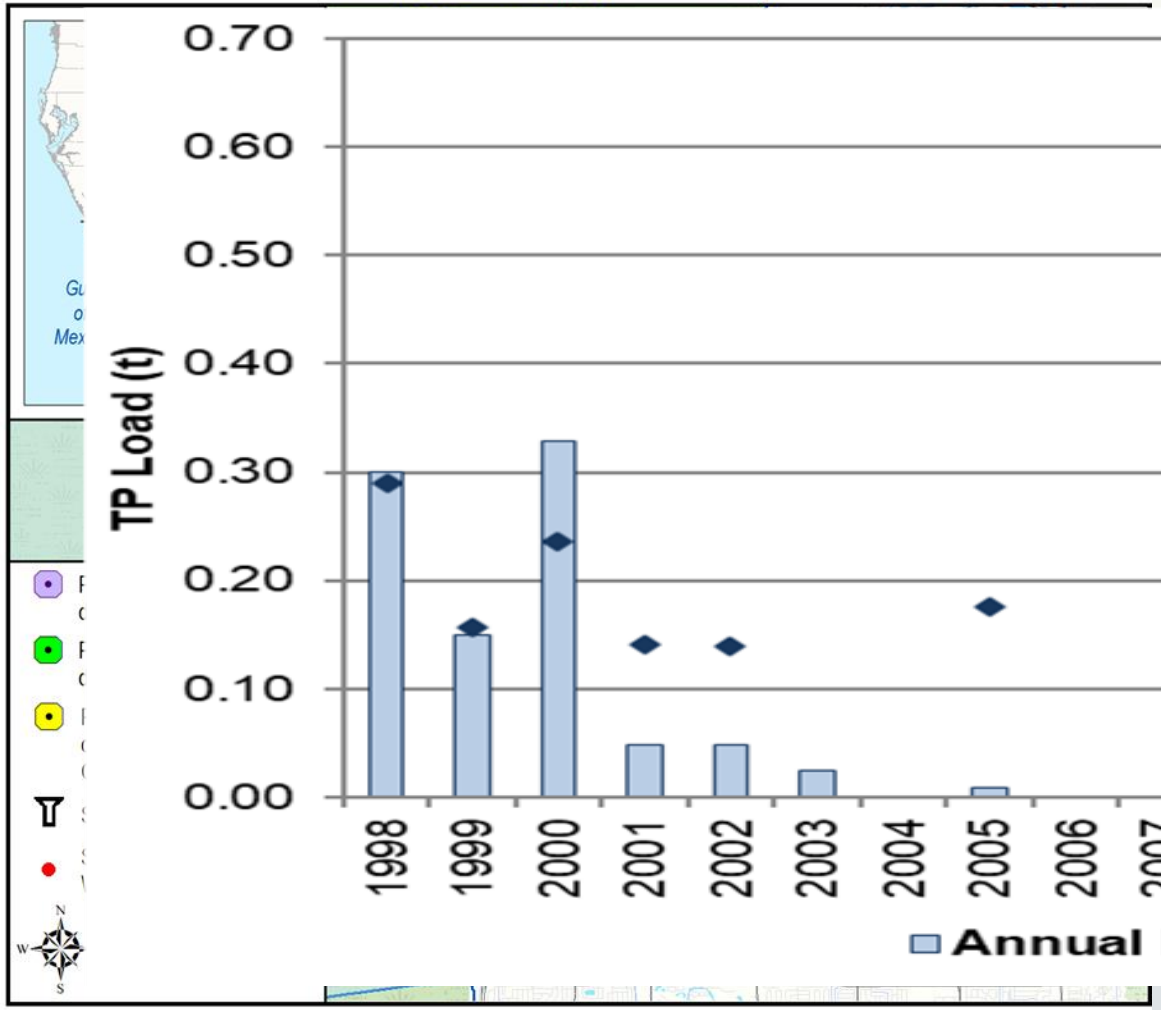
erve Area

Feeder Canal Basin





NSID Basin



TP Load (t)
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
TP FWMC (µg/L)
80
70
60
50
40
30
20
10
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Annual Load
TP FWMC

Summary

- Regulatory programs
- Cooperative agreements
- Integration with ERP conditions

- Verification of implementation
- Water quality monitoring to ensure effectiveness

- Program improvement

- BMP research and demonstration projects
- Data collection and supplemental evaluations

- Synergize benefits with regional and sub-regional projects

- Restoration Strategies source control projects
- CERP and others

Additional Information

Everglades and Estuaries Protection Bureau

www.sfwmd.gov/sfer

Contact Information

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Public Use on SFWMD Stormwater Treatment Areas

Jerry Krenz
Sr. Project Manager
Land Resources

18th Annual Public Meeting on the Long-Term Plan for Achieving Water Quality Goals for the Everglades Protection Area Tributary Basins
February 22, 2021

Public Use On STAs

- Public Use on District Lands
  - Why have Public Use?
  - Policy and Rules
  - Recreation Partnerships
  - STA

Allapattah Trail Head

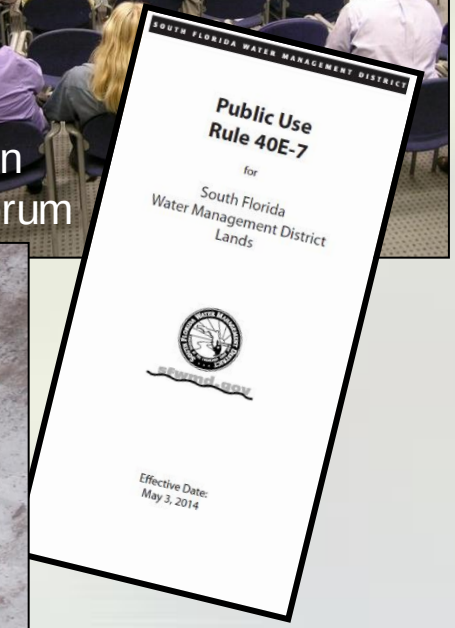
DuPuis

Public Use Program Background Information

- Why Have Public Use?
  - 373.4592 “the district shall allow these areas to be used by the public for recreational purposes… unless such uses are incompatible with the restoration goals of the Everglades Construction Project..”
  - SFWMD Created
    - Public Use Policy, 2004
    - Public Use Rules, 2006

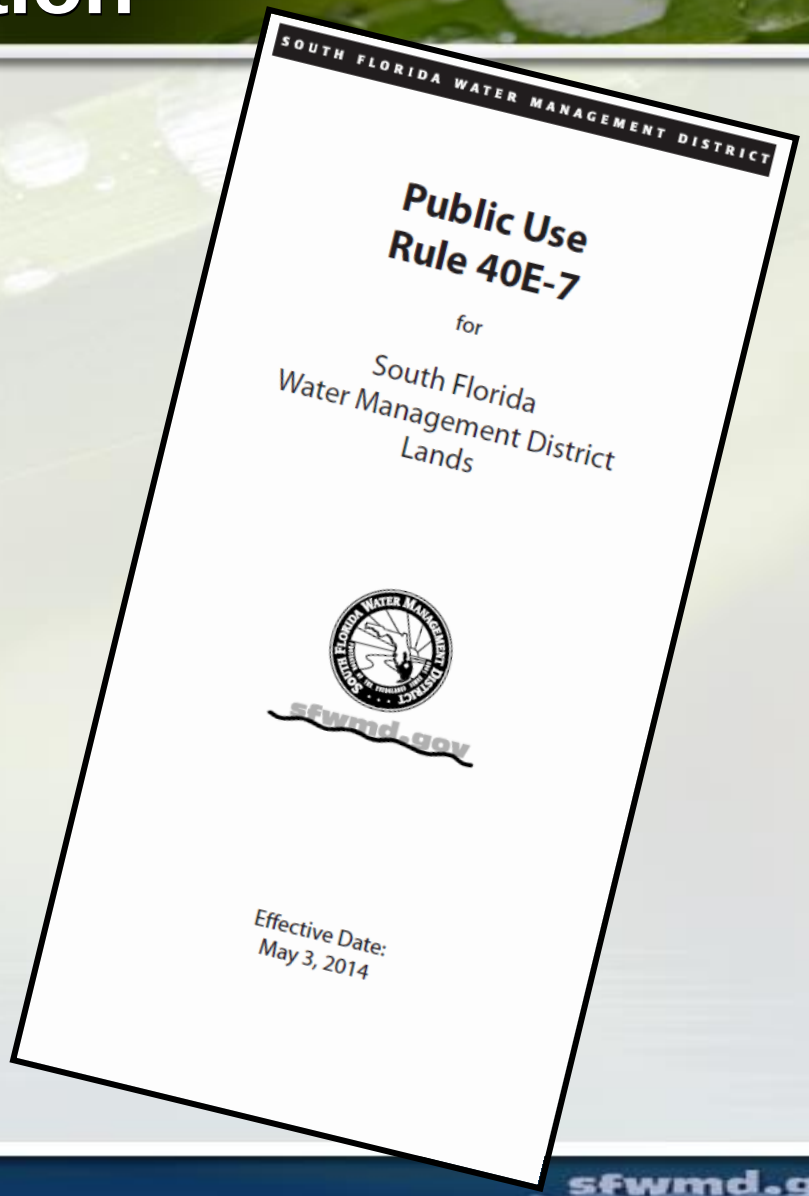
Public Use Program Background Information

- Public Use Policy
  - Public Participation
    - Recreation Issues Forum
  - Project Purposes First
    - Different rules for different types of lands
    - Not interfere with intent of the project
  - Project Planning, Design and Construction
    - Incorporate recreation facilities



Public Use Program Background Information

- Public Use Rule 40E-7
  - Rules provide commitment for public access and nature-based recreation on District lands consistent with state statutes and District policy
  - Types of Land include
    - Conservation
    - Interim
    - Right of Way
    - Project Lands

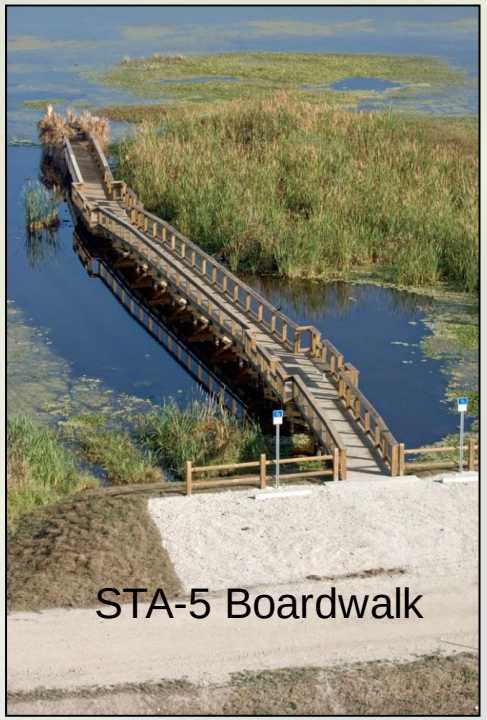


STA Activities and Facilities

- Public access, open on “extended weekends” Friday – Monday
- Daylight hours
- Bird watching, hiking, biking
- Fishing
- FWC hunting alligator and waterfowl
  - Friday waterfowl hunts
    - STA-1W and STA-3/4


STA-1W


STA-3/4


STA-5 Boardwalk

Public Use Program
Partnerships – Audubon, Florida Trail

- Audubon Society- Cooperative guided bird-watching tours on the STAs.
  - 1st Audubon tour in 2005 at STA-5, now 3 Chapters leading over 65 tours with 1,600+ participants at STA-1E, STA-2 and STA-5/6
- Florida Trail Association

Public Use Program Partnerships- FWC

- Florida Fish & Wildlife Conservation Commission
  - Waterfowl & alligator, quotas
  - Specialty hunts
    - Youth and wounded warrior
  - Enforce all public use rules

STA-2 Wounded Warrior Outdoors

STA-2 Youth Hunts

STA-5 Boardwalk

Public Use on STAs

- Project / Constructed Wetlands
  - Stormwater Treatment Areas

STA-1W

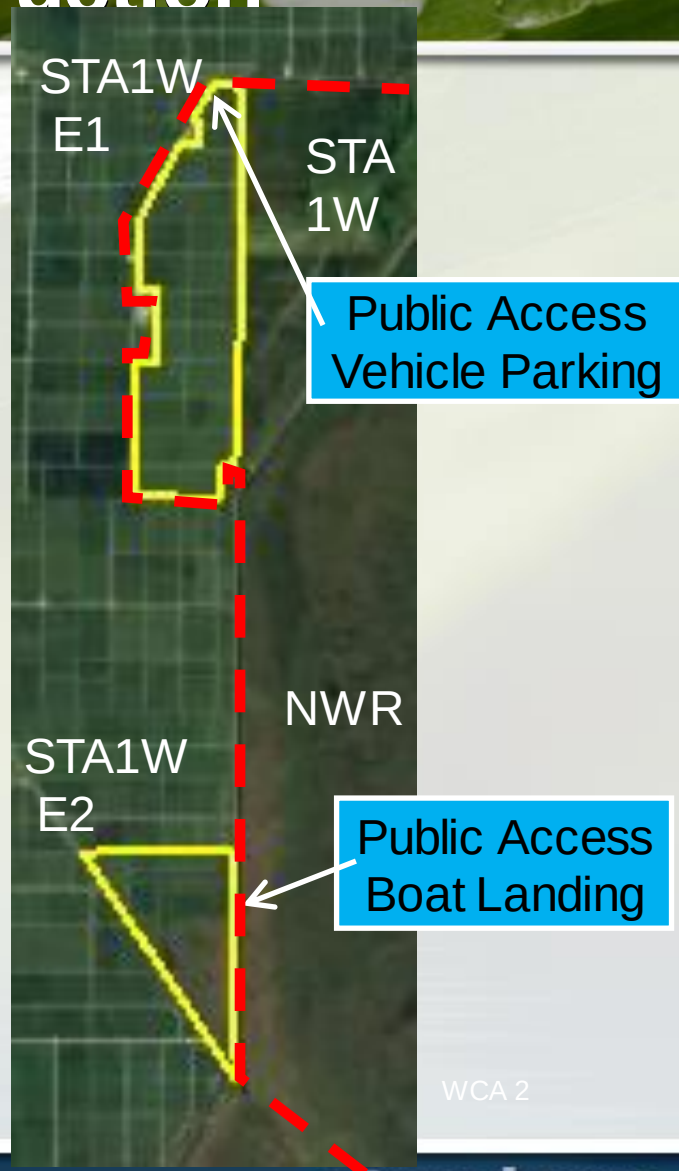
STA-3/4

Public Use Program
Coordination with Multiple Construction Projects

- Project Purposes First
  - Waterfowl and alligator quotas
  - Noticed FWC and stakeholder to prepare for changes and uncertainty
  - Alligator hunters noticed season may end early
  - Coordinated with FWC to offer waterfowl quotas, only early portion of season
  - Closed southern STA 1W and northern STA 2
  - Changed check station locations and access routes
  - As construction progressed offered additional waterfowl quotas at end of season

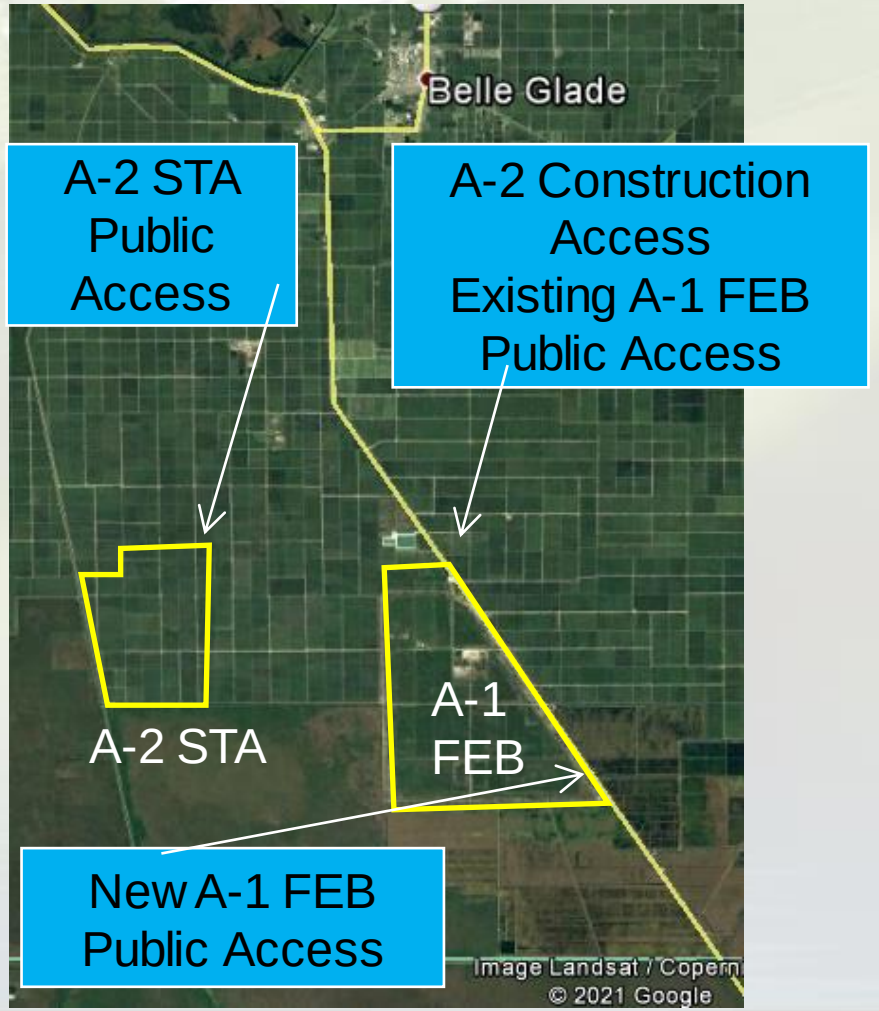
Public Use Program
Project Planning, Design and Construction

- Public Use Facilities
  - STA 1W E1
    - Public access vehicle parking
    - Bike trail connection east and south bound
  - STA 1W E2
    - No vehicle parking on site
    - FWC check station vehicle access to be off site
    - Public access boat landing, camping on NWR side
    - Bike trail connection north and south bound



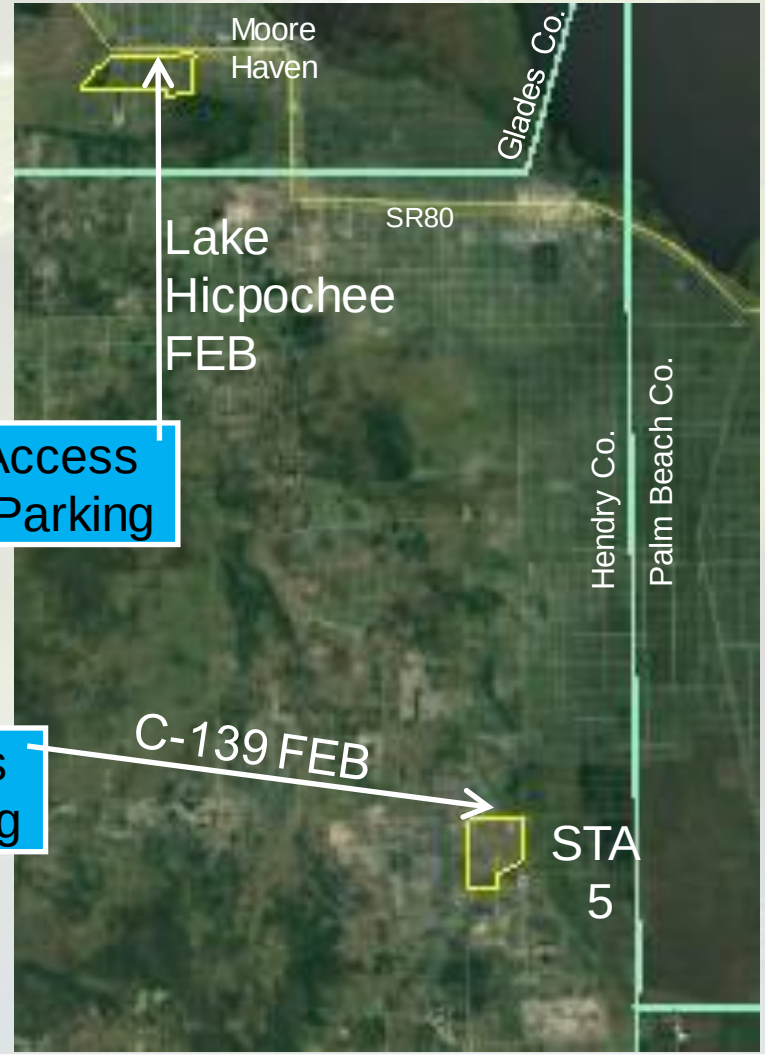
Public Use Program
Project Planning, Design and Construction

- Public Use Facilities
- A-1 FEB
  - Creating new SE access point to avoid current construction access routes to A-2 STA and A-2 Reservoir
  - A-2 STA
    - Road to be along north side of A-1 FEB and A-2 Reservoir
    - Public access vehicle parking,
    - Trail shelter in SE corner



Public Use Program
Project Planning, Design and Construction

- Public Use Facilities
  - C-139 FEB
    - Public vehicle parking
  - Lake Hicpochee FEB
    - Public vehicle parking



Contact Information

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Loxahatchee River

18th Annual Public Meeting on the Long-Term Plan for Achieving Water Quality Goals for the Everglades Protection Area Tributary Basins

Public Comment