September 22, 2023

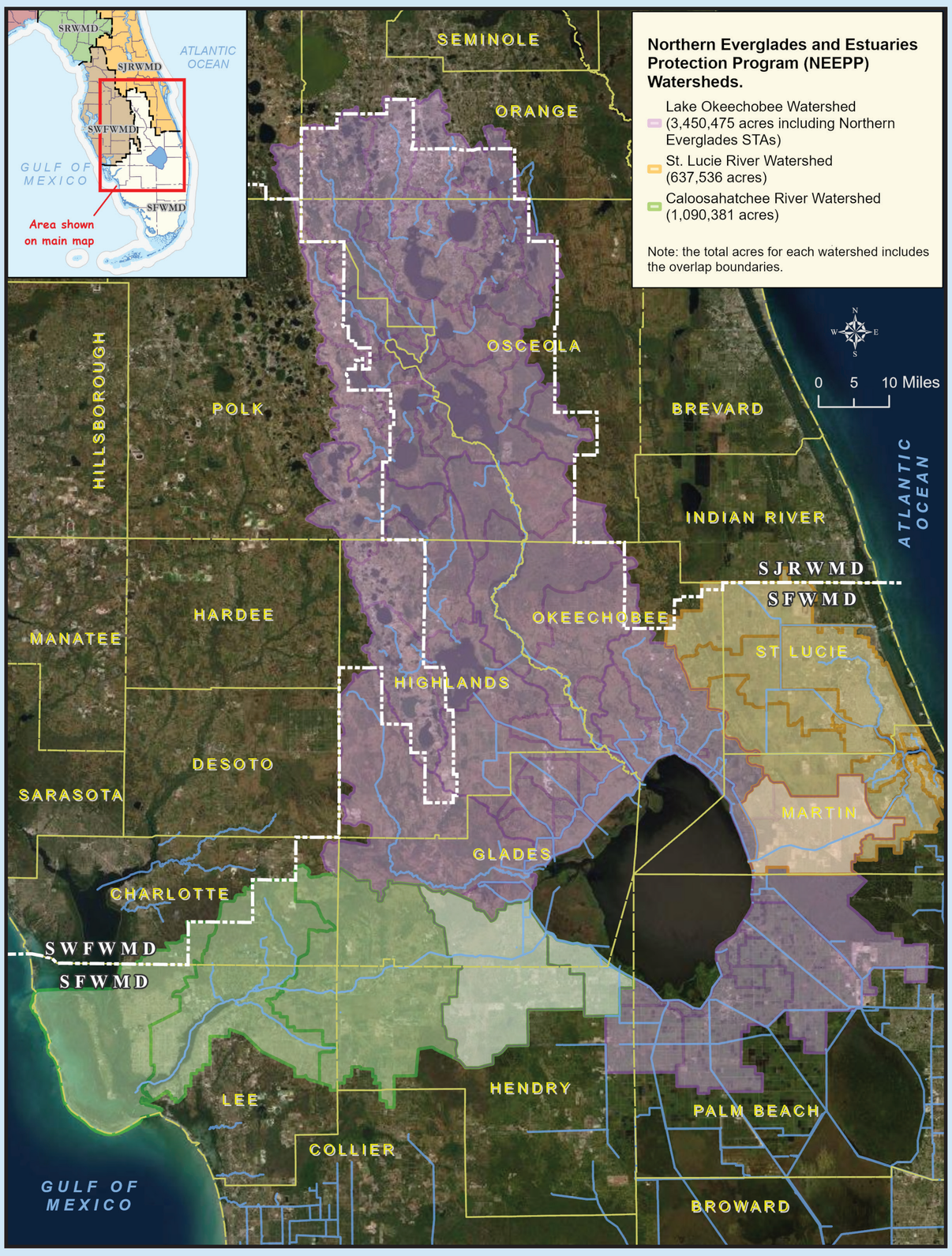
Northern Everglades and Estuaries Protection Program (NEEPP) Workshop and Open House

Encouraging Stakeholder and Public Engagement

The South Florida Water Management District (SFWMD), Florida Department of Environmental Protection (DEP) and Florida Department of Agriculture and Consumer Services (FDACS), "the Coordinating Agencies" welcome you to the first Joint NEEPP Workshop.

St. Lucie River Inlet

The purpose of NEEPP is to protect and restore surface water resources and achieve and maintain compliance with water quality standards in the Northern Everglades. The Northern Everglades watersheds include the Lake Okeechobee, Caloosahatchee and St. Lucie River watersheds.



NEEPP requires watershed protection programs (WPPs) to improve the quality, quantity, timing and distribution of water in the Northern Everglades ecosystem.

The programs are watershed specific and comprised of research and monitoring, development and implementation of best management practices (BMPs), refinement of existing regulations, and structural and nonstructural projects.

They are driven by DEP basin management action plans (BMAPs) and integrated with DEP and FDACS programs to control nutrient sources at the local, subregional, and regional levels.

Snowy Egrets on Posts, Lake Tohopekaliga

Together, the Coordinating Agencies are jointly responsible for implementing NEEPP, each with specific areas of responsibility.

DEP is the lead on water quality protection measures through the BMAPs, SFWMD is the lead on hydrologic improvements pursuant to the WPPs, and FDACS is the lead on agricultural interim measures, BMPs, and other measures.

Mouth of Caloosahatchee River Estuary

Chapter 8B: Lake Okeechobee Watershed Protection Plan Annual Progress Report

Part III: Lake Okeechobee Watershed Construction Project

Anthony Betts

Twenty operational projects in Water Year (WY) 2022 provided approximately:

- > **65,000 acre-feet** (ac-ft) of storage
- > **67 metric tons** (t) total phosphorus (TP) retention
- > **143 t** total nitrogen (TN) retention
- > **50,000 acres** (ac) of hydrated wetlands

Northern Everglades Request for Proposals:

In 2022, the South Florida Water Management District Governing Board authorized staff to negotiate up to **eight** projects in the Lake Okeechobee Watershed.

- **Four** 10-year contract extensions were executed for existing projects.
- **Two** new projects in the Lake Istokpoga and Upper Kissimmee subwatersheds.

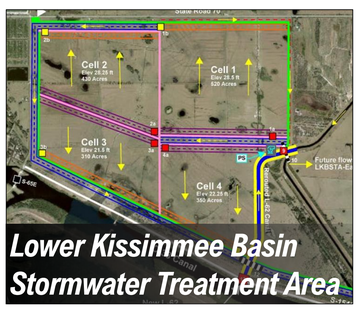
Advancing Watershed Construction Projects

Partin Family Ranch

Basin: **Upper Kissimmee**
Project Area: **3,000 ac**
Storage: **4,270 ac-ft/yr**
TP Retention: **0.4 t/yr**
TN Retention: **5.2 t/yr**

COMING SOON

Basin: **S-154 & S-154C**
Project Area: **3,350 ac**
Est. Storage: **3,600 ac-ft/yr**
Est. TP Retention: **14.0 t/yr**
Est. TN Retention: **TBD**



Lower Kissimmee Basin Stormwater Treatment Area


XL Ranch

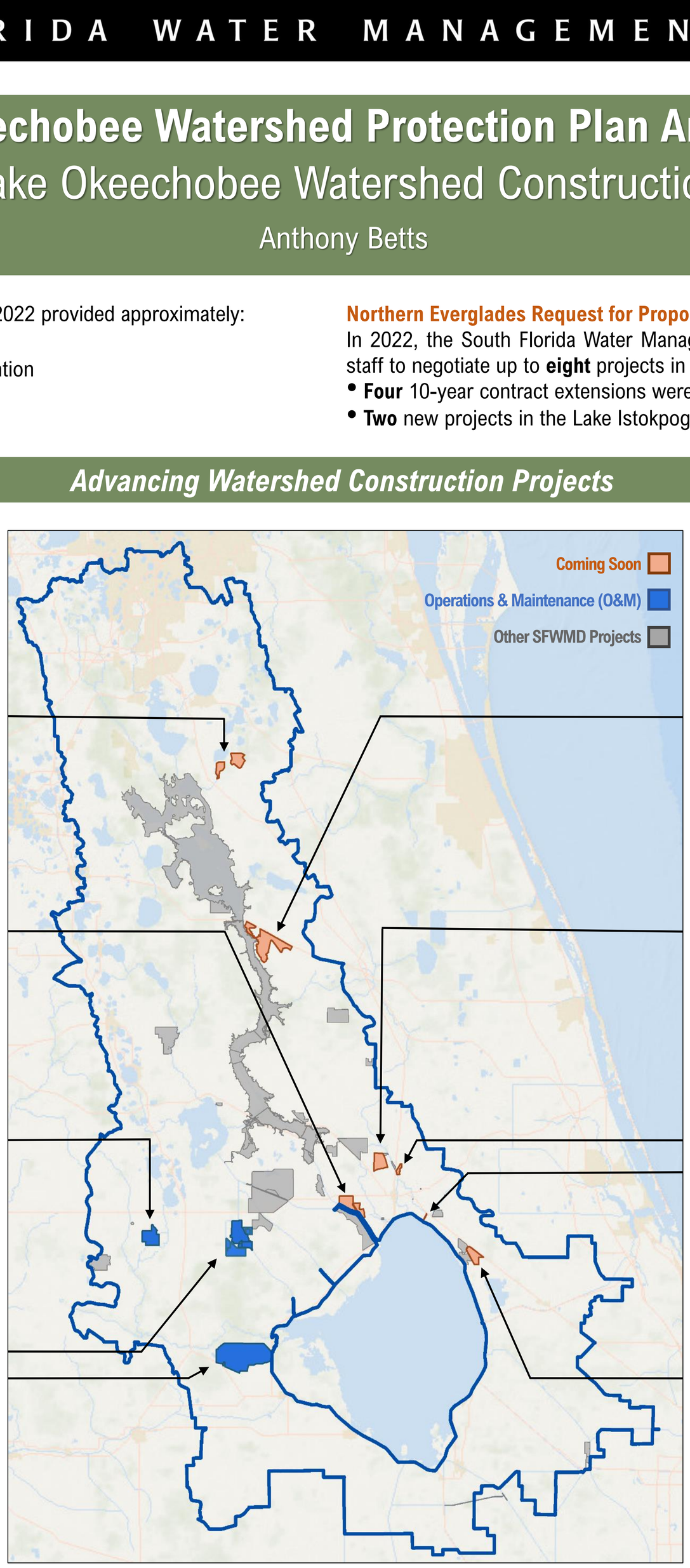
Basin: **Fisheating Creek**
Project Area: **765 ac**
Storage: **847 ac-ft/yr**
TP Retention: **0.1 t/yr**
TN Retention: **1.5 t/yr**

Basin: **C-41**
Project Area: **4,796 ac**
Storage: **2,741 ac-ft/yr**
TP Retained: **2.4 t/yr**
TN Retained: **13.2 t/yr**


Buck Island Ranch

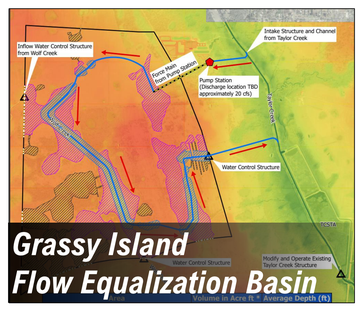

Nicodemus Slough

Basin: **Nicodemus Slough North**
Project Area: **15,858 ac**
Storage: **21,062 ac-ft/yr**
TP Retention: **2.3 t/yr**
TN Retained: **47.2 t/yr**



Basin: **Lower Kissimmee**
Project Area: **7,030 ac**
Storage: **2,500 ac-ft/yr**
TP Retention: **2.4 t/yr**
TN Retention: **7.0 t/yr**

El Maximo Ranch

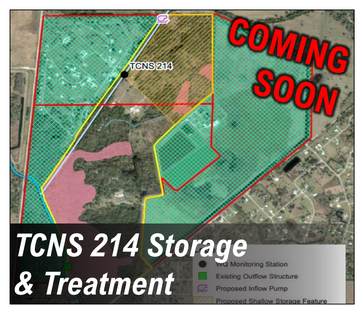


Grassy Island Flow Equalization Basin

COMING SOON

Basin: **S-191**
Project Area: **2,400 ac**
Storage: **3,200 ac-ft/yr**
TP Retention: **0.8 t/yr**
TN Retention: **TBD**

Basin: **S-191**
Project Area: **410 ac**
Storage: **312 ac-ft/yr**
TP Retention: **1.0 t/yr**
TN Retention: **4.0 t/yr**



TCNS 214 Storage & Treatment


S-191 Basin Phosphorus Removal

COMING SOON

Basin: **S-191**
Project Area: **ac**
Est. Storage: **N/A**
Est. TP Retention: **2.9 t/yr**
Est. TN Retention: **TBD**

Basin: **S-191**
Project Area: **1,800 ac**
Storage: **7,200 ac-ft/yr**
TP Retention: **4.0 t/yr**
TN Retention: **TBD**

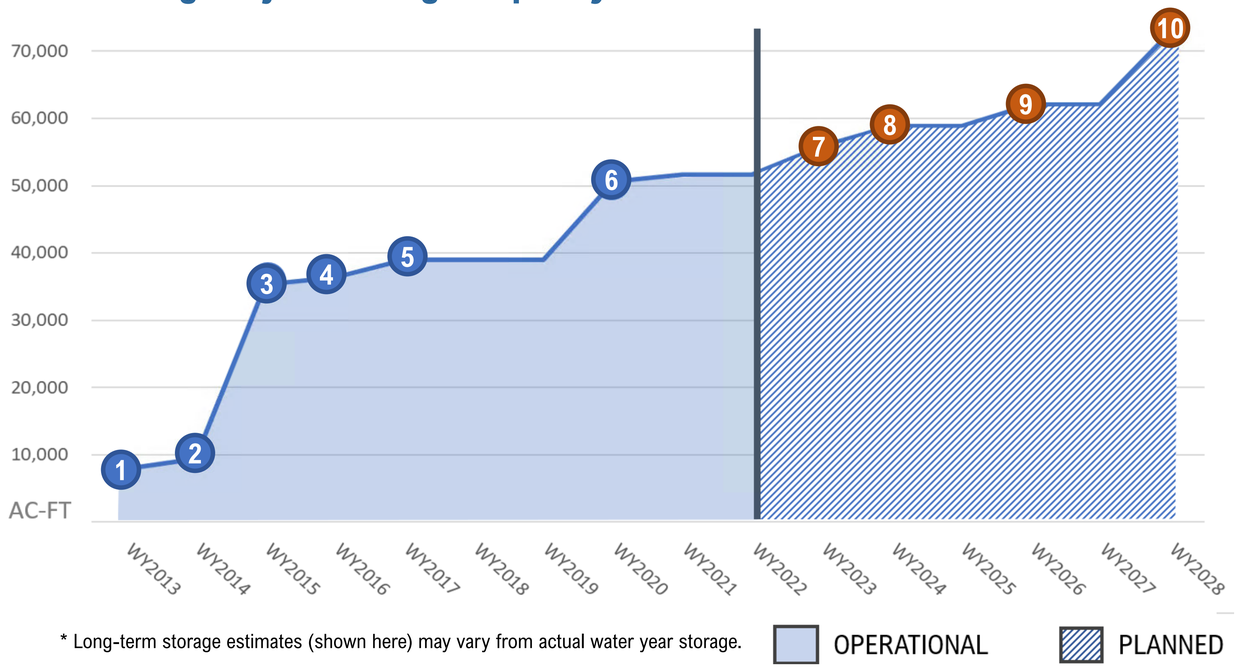
Brady Ranch Flow Equalization Basin

Progress Towards Water Quality and Storage Goals

TP Annual Load

Total Watershed Storage

Increasing Project Storage Capacity in the Lake Okeechobee Watershed



* Long-term storage estimates (shown here) may vary from actual water year storage.

1. BUCK ISLAND RANCH
   DIXIE RANCH
   DIXIE WEST
2. EAGLE HAVEN RANCH
   XL RANCH
3. NICODEMUS SLOUGH
   RAFTER T RANCH
4. ABINGTON PRESERVE
5. LLANO RANCHES
6. BRIGHTON VALLEY
7. PARTIN FAMILY RANCH
8. EL MAXIMO RANCH
   TCNS 214 STORAGE AND TREATMENT
9. GRASSY ISLAND FEB
10. BRADY RANCH FEB
    LOWER KISSIMMEE BASIN STA

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

SFER Chapter 8C: St. Lucie River Watershed Protection Plan Annual Progress Report
Part III: St. Lucie River Watershed Construction Project

Aubrey Frye and Sara Ouly

The Northern Everglades and Estuaries Protection Program (NEEPP) promotes a comprehensive approach to protect the St. Lucie River Watershed (SLRW). Using a combination of research, monitoring, source controls and construction projects, the NEEPP will restore and protect surface water resources by addressing water quality and storage in the natural system. The following are the key accomplishments and successes during the Water Year 2022 (WY2022; May 1, 2021 – April 30, 2022) reporting period.

Operational Projects in WY2022 provided:

- **> 63,098 acre-feet per year** (ac-ft/yr) of water storage
- **> 29 metric tons per year** (t/yr) total phosphorus (TP) removal
- **> 307 metric tons per year** (t/yr) total nitrogen (TN) removal

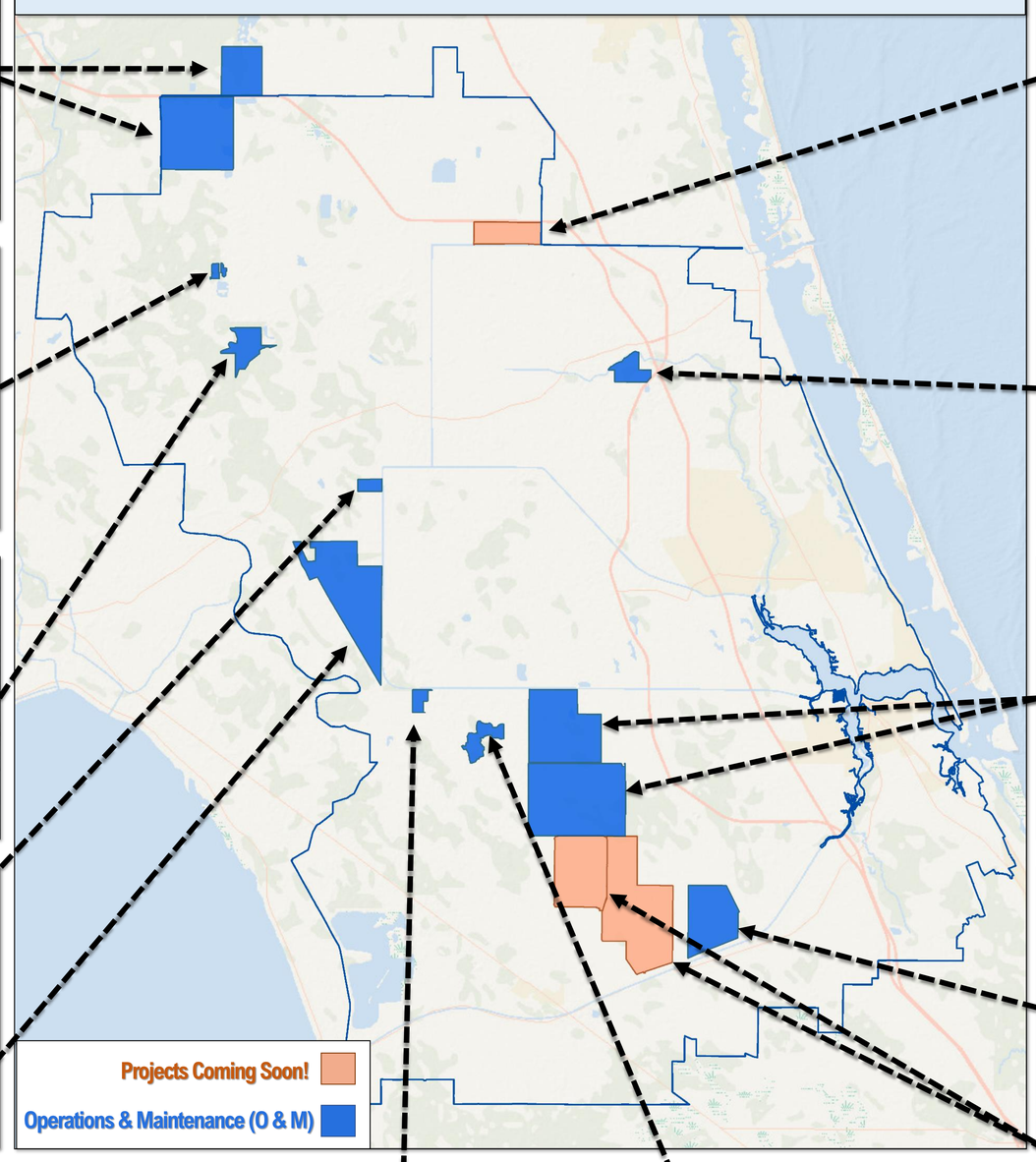
Northern Everglades Request for Proposals:

In May 2022, the District Governing Board authorized staff to negotiate up to **four** water retention and nutrient load reduction projects in the St. Lucie River Watershed.

- **Two** 10-year contract renewals were executed.
- **One** new project is in development in the C-24 basin.

Advancing Watershed Construction Projects

Watershed Construction Projects with Storage Benefits



Status: **O & M**
Basin: **C-25**
Project Area: **7,444 ac**
Storage: **5,595 ac-ft/yr** [a]
TP Removed: **1.4 t/yr** [a]
TN Removed: **10.8 t/yr** [a]


SCOTT WATER FARM


ALDERMAN-DELONEY RANCH

Status: **O & M**
Basin: **C-25**
Project Area: **170 ac**
Storage: **73 ac-ft/yr**
TP Removed: **0.01 t/yr**
TN Removed: **0.1 t/yr**

Status: **O & M**
Basin: **C-24**
Project Area: **1,000 ac**
Storage: **444 ac-ft/yr**
TP Removed: **0.1 t/yr**
TN Removed: **0.7 t/yr**


ADAMS-RUSSAIKIS RANCH

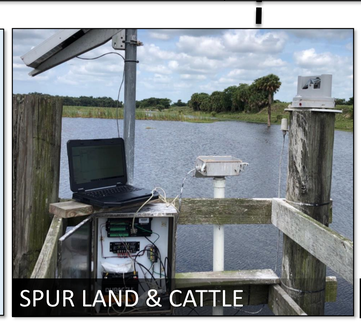

C23/C24 INTERIM STORAGE SECTION C

Status: **O & M**
Basin: **C-24**
Project Area: **297 ac**
Storage: **2,008 ac-ft/yr**
TP Removed: **0.3 t/yr**
TN Removed: **2.7 t/yr**

Status: **O & M**
Basin: **C-23**
Project Area: **6,104 ac**
Storage: **18,573 ac-ft/yr** [a]
TP Removed: **5.2 t/yr** [a]
TN Removed: **27 t/yr** [a]


BLUEFIELD GROVES

Status: **O & M**
Basin: **C-23**
Project Area: **210 ac**
Storage: **1,420 ac-ft/yr**
TP Removed: **0.9 t/yr**
TN Removed: **3.6 t/yr**

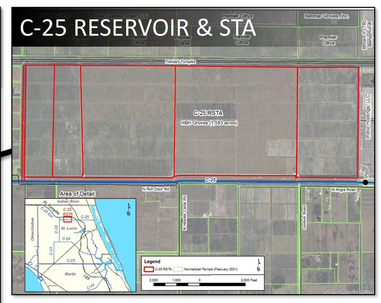

SPUR LAND & CATTLE


BULL HAMMOCK RANCH

Status: **O & M**
Basin: **C-23**
Project Area: **608 ac**
Storage: **847 ac-ft/yr**
TP Removed: **0.3 t/yr**
TN Removed: **1.2 t/yr**


C-44 RESERVOIR & STA

Status:
OPERATION & TESTING
Basin: **C-44**
Project Area: **9,300 ac**
Est. Storage: **60,050 ac-ft/yr**
Est. TP Removed: **23 t/yr**
Est. TN Removed: **77 t/yr**



Status: **COMING SOON!**
Basin: **C-25**
Project Area: **1,583 ac**
Est. Storage: **5,392 ac-ft/yr**
Est. TP Removed: **8.9 t/yr**
Est. TN Removed: **35.6 t/yr**

Status: **O & M**
Basin: **Ten Mile Creek**
Project Area: **658 ac**
Storage: **2,240 ac-ft/yr**
TP Removed: **2.6 t/yr**
TN Removed: **4.8 t/yr**


TEN MILE CREEK WATER PRESERVE AREA


ALLAPATTAH PARCELS A & B

Status: **O & M**
Basin: **C-23**
Project Area: **12,724 ac**
Storage: **11,687 ac-ft/yr**
TP Removed: **N/A**[b]
TN Removed: **N/A**[b]

Status: **O & M**
Basin: **C-44**
Project Area: **3,275 ac**
Storage: **20,211 ac-ft/yr**
TP Removed: **3.6 t/yr**
TN Removed: **26.1 t/yr**


CAULKINS WATER FARM

a. Project completed construction mid-WY and, therefore, was not operational for the full water year.
b. N/A – not applicable. Nutrient reduction is not associated with the project's primary objective.

Progress Towards Water Quality and Storage Goals

Protection Plan and BMAP Targets

Storage Volume:
200,000 acre-feet

Estuary TMDL Concentrations:
TP: **0.08 mg/L**
TN: **0.72 mg/L**

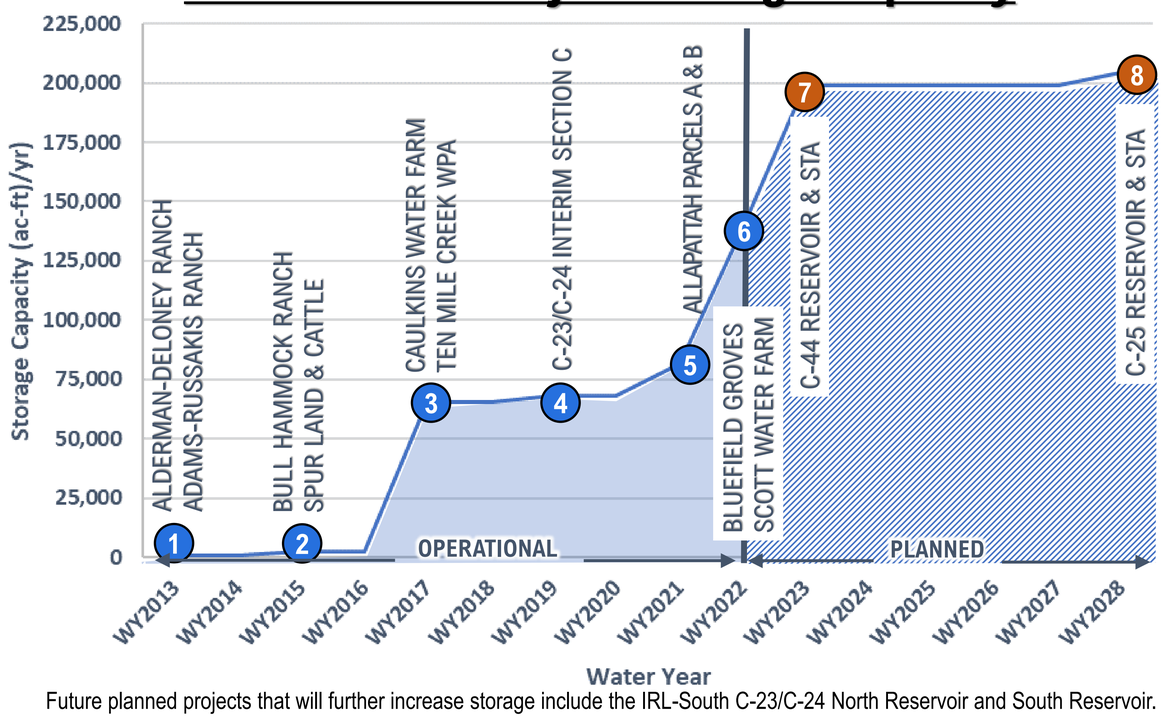
Estimated Nutrient Removal Needed:
TP: **185 t/yr**
TN: **568 t/yr**

TP Removal

TN Removal

Project Storage

Construction Project Storage Capacity



Future planned projects that will further increase storage include the IRL-South C-23/C-24 North Reservoir and South Reservoir.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Chapter 8D: Caloosahatchee River Watershed Protection Plan Annual Progress Report

Part III: Caloosahatchee River Watershed Construction Project

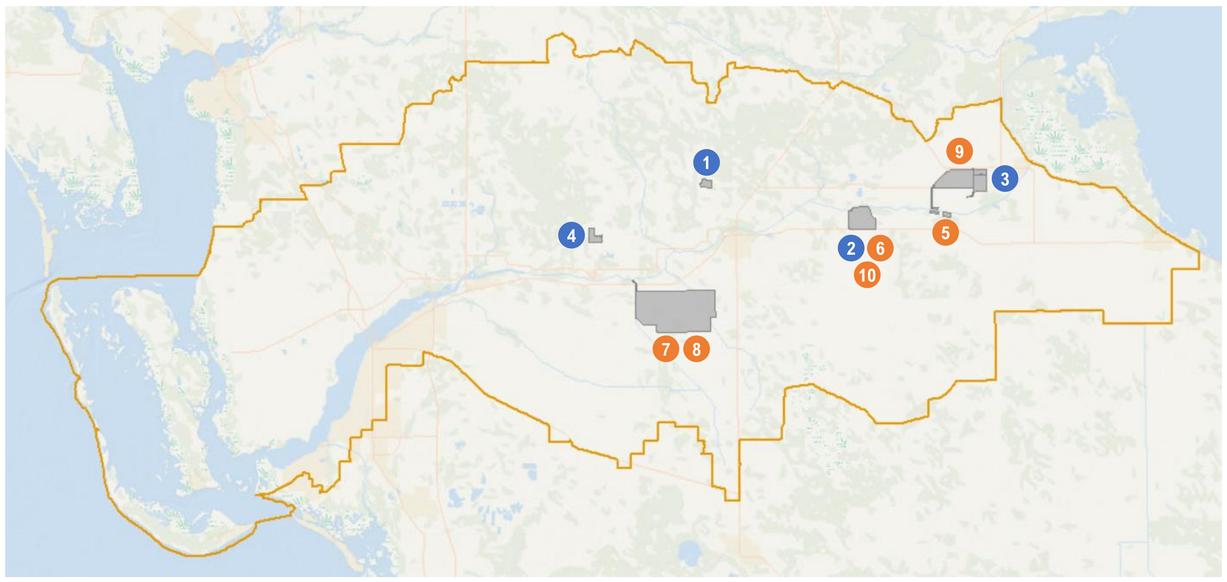
Jenna Bobsein

Three operational projects in WY2022 provided approximately:

- 8,800 acre-feet of storage
- 2 metric tons total phosphorus (TP) retention
- 27 metric tons total nitrogen (TN) retention

Northern Everglades Request for Proposals:
In 2022, the SFWMD Governing Board authorized staff to negotiate up to **two new projects** in the Caloosahatchee River Watershed.

Advancing Watershed Construction Projects



Operational Projects


Inspection at Mudge Ranch

1. Mudge Ranch

- Dispersed water management (DWM) public-private partnership
- Passive storage on 304 acres
- Operational since 2014


Pump at Boma Interim Storage Project

2. Boma Interim Storage Project

- Temporary storage until construction begins for the Boma Flow Equalization Basin (FEB) in 2024
- Operational since 2019


Pump Station G-725 at LHHEP Phase I

3. Lake Hicpochee Hydrologic Enhancement Project (LHHEP) Phase I

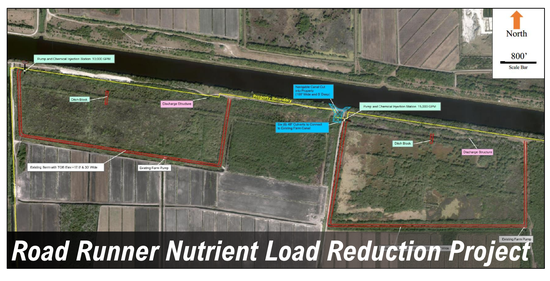
- Enhance hydration of the historic Lake Hicpochee
- Phase I captures excess surface water from the C-19 canal
- Operational since 2021


Ribbon cutting at FCRI Project

4. Four Corners Rapid Infiltration Project

- 366-acre above ground impoundment (AGI), including a 22-acre rapid infiltration area
- Operational since 2023

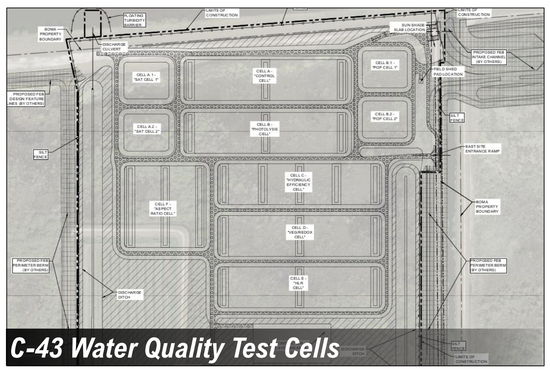
Planned Projects



Road Runner Nutrient Load Reduction Project

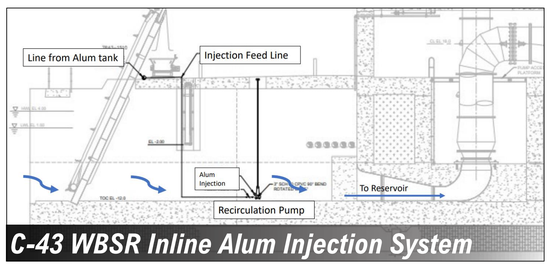
5. Road Runner C-43 Nutrient Load Reduction Project

- Alum treatment for water diverted from the C-43 canal for nutrient load reduction
- Status: Design
- Expected to be operational by 2025


C-43 Water Quality Test Cells

6. C-43 Water Quality Treatment and Testing Project – Phase II (Test Cells)

- Study evaluating the effectiveness of constructed wetland treatment systems in reducing nitrogen at a test scale
- Status: Construction
- Expected to be operational by 2025



C-43 WBSR Inline Alum Injection System

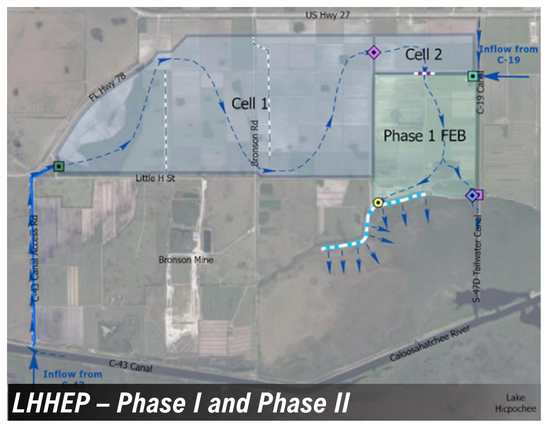
7. C-43 West Basin Storage Reservoir (WBSR) – Water Quality Component

- Inline alum injection system at the C-43 WBSR project
- Status: Design
- Expected to be operational by 2026


C-43 West Basin Storage Reservoir

8. C-43 West Basin Storage Reservoir

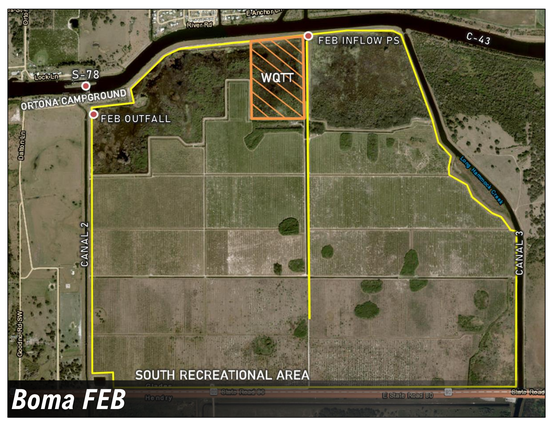
- Provide storage to reduce harmful discharges to the Caloosahatchee River Estuary during the wet season and provide freshwater flow during the dry season
- Status: Construction
- Expected to be operational by 2026



LHHEP – Phase I and Phase II

9. LHHEP Phase II

- Phase II includes a new 2,200-acre FEB and a pump station to withdraw water from the C-43 canal
- Status: Design
- Construction will begin in 2024
- Expected to be operational by 2027



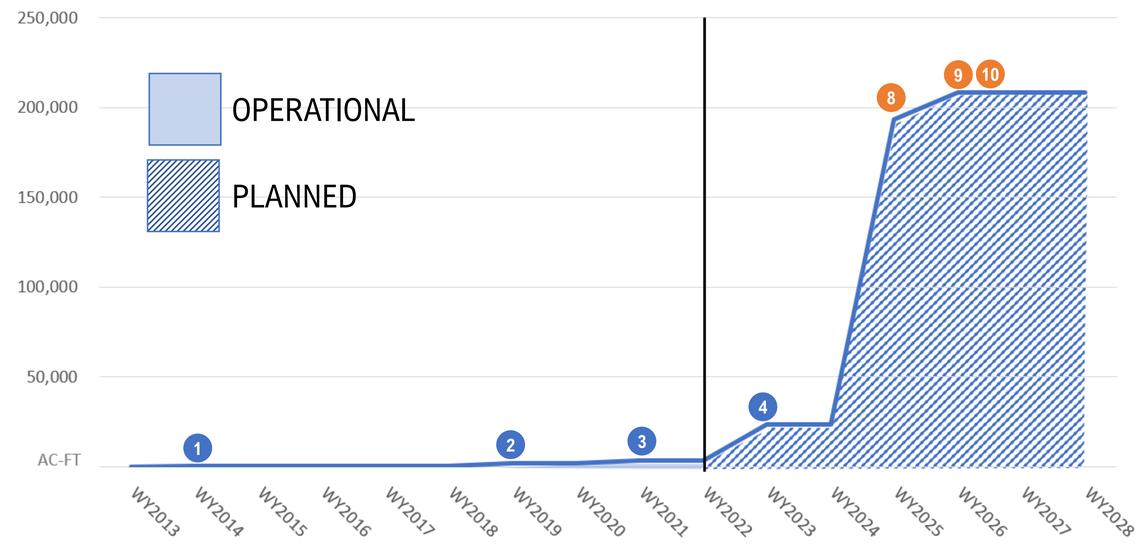
Boma FEB

10. Boma FEB

- Provide storage to reduce harmful discharges to the Caloosahatchee River Estuary
- Status: Design
- Construction will begin in 2024
- Expected to be operational by 2028

Progress Towards Water Quality and Storage Goals

Construction Project Storage Capacity Progress



** WY – water year (May 1 to April 30); long-term average storage estimates (shown here) may vary from actual water year storage.*

Total Storage

GOAL = 400,000
WY2022 = 8,860
Units = ac-ft

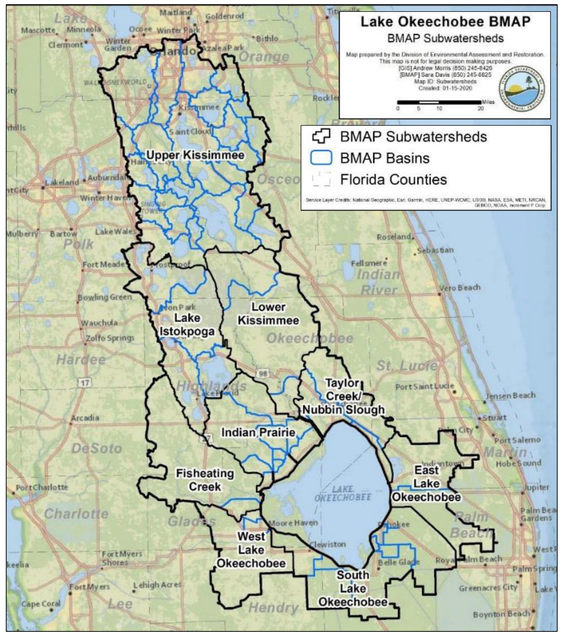
TN Total Maximum Daily Load (TMDL)

GOAL = 1,383
WY2022 = 3,578
Units = metric tons

Lake Okeechobee BMAP

Northern Everglades and Estuaries Protection Program (NEEPP) Workshop 2023

BMAP Background



TP TMDL for the lake adopted in 2001.

TMDL set at a total load of 140 mt/yr TP.

35 mt/yr falls directly on the lake.

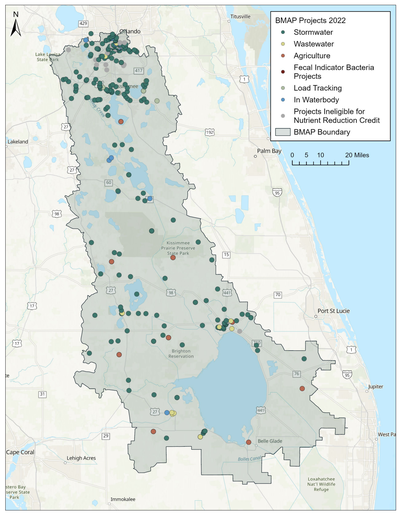
105 mt/yr allocated to the entire watershed.

The watershed is composed of nine subwatersheds and 65 basins.

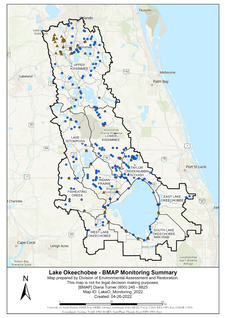
BMAP Progress

Lead Entity	Canceled	Completed	Ongoing	Planned	Underway	Grand Total
Avon Park Air Force Range	-	1	-	-	-	1
City of Avon Park	-	2	1	-	-	3
City of Clewiston	-	1	3	-	1	5
City of Edgewood	-	-	3	-	-	3
City of Kissimmee	-	5	2	2	-	9
City of Moore Haven	-	1	-	1	-	2
City of Okeechobee	-	2	3	1	2	8
City of Orlando	1	7	10	1	-	19
City of Sebring	-	1	1	-	-	2
Coordinating Agency	1	-	-	-	-	1
FDACS	-	11	18	4	1	34
FDOT	-	37	13	-	2	52
Glades County	-	3	2	-	3	8
Hendry County	-	-	-	2	1	3
Highlands County	-	3	4	-	-	7
Istokpoga Marsh Watershed Improvement District	-	1	-	-	1	2
Martin County	-	-	-	-	1	1
Okeechobee County	-	8	-	-	-	8
Okeechobee Utility Authority	-	-	-	1	2	3
Orange County	3	59	7	1	16	86
Osceola County	-	30	3	2	-	35
Polk County	-	1	3	-	-	4
Reedy Creek Improvement District	-	-	3	-	-	3
SFWMD	-	30	-	7	1	38
Spring Lake Improvement District	1	1	-	-	-	2
Town of Lake Placid	-	-	-	-	1	1
Town of Windermere	-	1	-	-	-	1
Valencia WCD	-	1	1	-	-	2
Grand Total	**6**	**206**	**77**	**22**	**32**	**343**

343 projects in the BMAP address both stormwater and wastewater pollution sources.

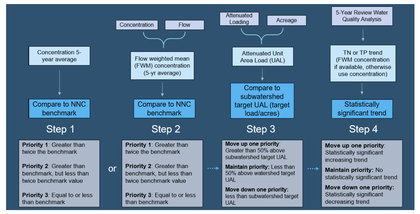


Monitoring and Evaluation

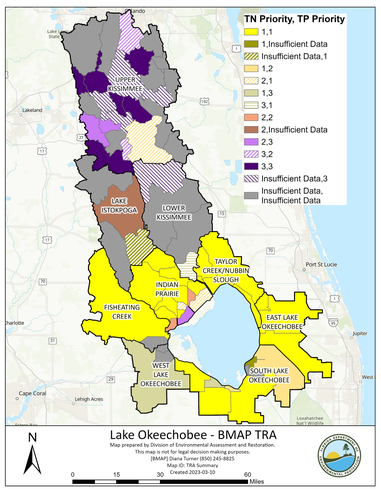


309 stations monitor water quality throughout the watershed.

Water Quality Parameters Monitored	
Alkalinity	Nitrate-Nitrite (N)
Ammonia (N)	Total Kjeldahl Nitrogen (TKN)
Biological Oxygen Demand (BOD)	Total Nitrogen (TN)
Organic Carbon	Orthophoshate (P)
Total Carbon	pH
Chlorophyll-*a*	Total Phosphorus (TP)
Color	Specific Conductance/Salinity
Dissolved Oxygen	Temperature
Dissolved Oxygen (Saturation)	Total Suspended Solids
Flow	Turbidity



Targeted Restoration Areas (TRA) sequentially compare four parameters to determine priority basins for restoration projects.



Subwatershed Goals

Subwatershed	WY2014–WY2018 TP Load (mt/yr)	% Contribution of Load	TP Load Required Reduction (mt/yr)	TP Target (mt/yr)	WY2018–WY2022 TP Load (mt/yr)	% Contribution of Load	TP Load Required Reduction (mt/yr)	TP Target (mt/yr)
Fisheating Creek	72.4	12	59.7	12.7	51.1	10	40.3	10.8
Indian Prairie	102.5	17	84.5	18.0	71.0	14	56.0	15.0
Lake Istokpoga	47.7	8	39.3	8.4	38.9	8	30.7	8.2
Lower Kissimmee	125.9	21	103.8	22.1	118.3	24	93.3	25.0
Taylor Creek/Nubbin Slough	113.6	19	93.7	19.9	88.9	18	70.1	18.8
Upper Kissimmee	90.5	15	74.6	15.9	83.5	17	65.8	17.7
East Lake Okeechobee	16.8	3	13.9	2.9	23.3	5	18.4	4.9
South Lake Okeechobee	29.0	5	23.9	5.1	21.0	4	16.6	4.4
West Lake Okeechobee	0.0	0	0	0.0	0.0	0	0.0	0.0
Total	598.4	100	493.4	105.0	496.0	100	391.0	105.0

Targets in 2020 BMAP based on 2019 South Florida Environmental Report (WY2014 through WY2018).

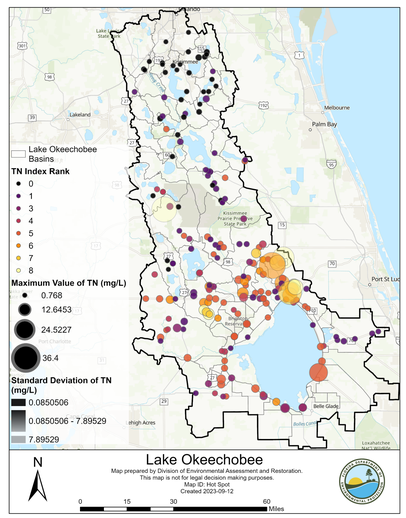
Progress has been made throughout the LOW since 2014, but there is still work to be done.

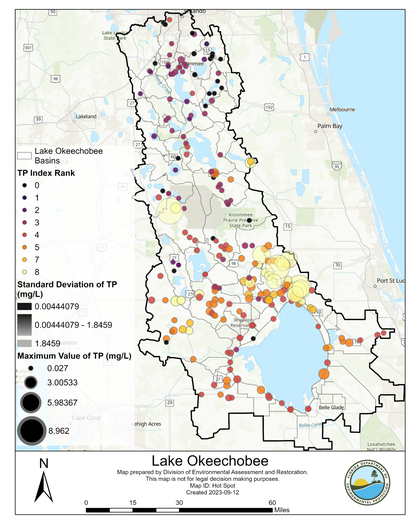
Subwatershed	TP Load Required Reduction (mt/yr)	TP Reduction Through December 31, 2022 (mt/yr)	TP Reductions Achieved Through December 31, 2022 (%)
Fisheating Creek	40.3	15.4	38%
Indian Prairie	56.0	22.7	41%
Lake Istokpoga	30.7	2.7	9%
Lower Kissimmee	93.3	13.2	14%
Taylor Creek/Nubbin Slough	70.1	32.3	46%
Upper Kissimmee	65.8	18.4	28%
East Lake Okeechobee	18.4	2.3	13%
South Lake Okeechobee	16.6	3.0	18%
West Lake Okeechobee	0.0	0.6	100%
Total	391.0	110.6	28%

Upcoming BMAP Update

- Evaluating milestones.
- Evaluating subwatershed targets.
- Evaluating monitoring network.
- Evaluating model needs.
- Conducting more detailed trend analysis.
- Developing hotspot analysis.
- Identifying additional projects.
- Adding Clean Waterways Act requirements.
- Adding HB 1379 Requirements.

Hot Spot Analysis - In Progress





Developing analysis method for prioritization at a more local scale than the TRA analysis and with less robust data needs than trend analyses.

Scan the QR Code to learn more!

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St. Lucie River and Estuary BMAP

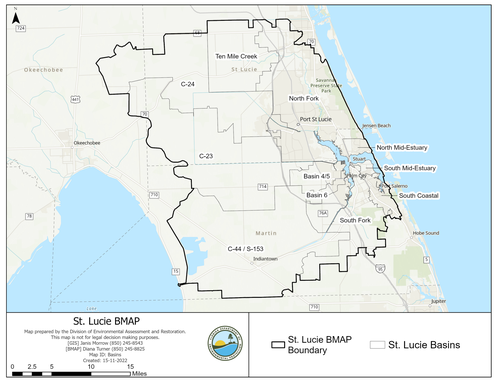
Northern Everglades and Estuaries Protection Program (NEEPP) Workshop 2023

BMAP Background

TN and TP TMDL concentrations were established in 2009:

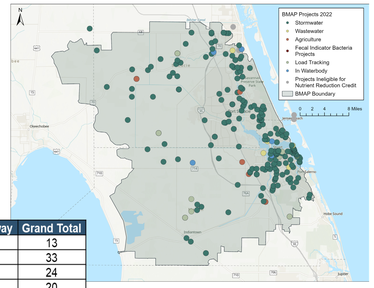
TP: 0.081 mg/L
TN: 0.72 mg/L

BMAP established in 2013, boundary was updated in 2020.



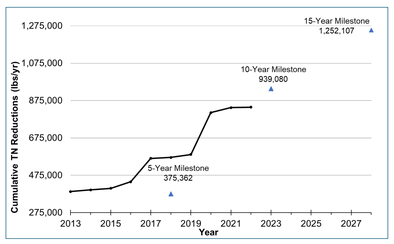
BMAP Progress

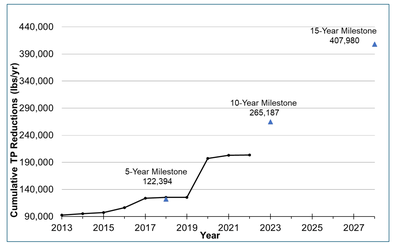
305 projects in the BMAP address both stormwater and wastewater sources of pollution.



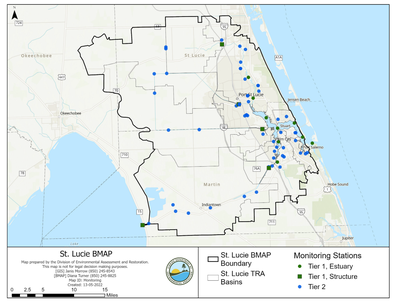
Entity	Completed	Ongoing	Planned	Underway	Grand Total
City of Fort Pierce	9	4	0	0	13
City of Port St. Lucie	25	4	0	4	33
City of Stuart	20	3	0	1	24
FDACS	12	8	0	0	20
FDOT District 4	59	2	0	2	63
Fort Pierce Utilities Authority	0	0	1	5	6
Hobe St. Lucie Conservancy District	1	0	1	0	2
Martin County	39	3	1	4	47
North St. Lucie River WCD	10	0	0	1	11
SFWMD – Coordinating Agency	9	0	1	1	11
St. Lucie County	9	9	2	2	22
St. Lucie West Services District	2	3	0	0	5
Town of Sewall's Point	29	2	3	5	39
Troup-Indiantown WCD	2	0	0	2	4
Turnpike Enterprise	3	2	0	0	5
Grand Total	229	40	9	27	305

Completed and ongoing projects have achieved 67% TN and 50% TP required reductions.





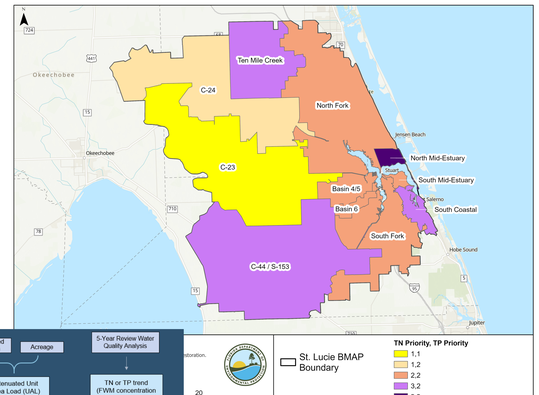
Monitoring and Evaluation

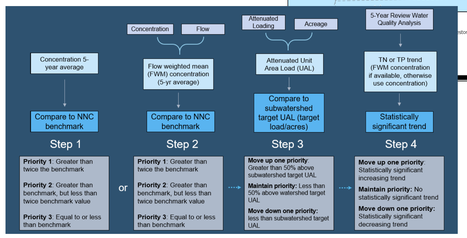


Water Quality Parameters Monitored	
Alkalinity	Nitrate-Nitrite (N)
Ammonia (N)	Total Kjeldahl Nitrogen (TKN)
Biological Oxygen Demand (BOD)	Total Nitrogen (TN)
Organic Carbon	Orthophoshate (P)
Total Carbon	pH
Chlorophyll-*a*	Total Phosphorus (TP)
Color	Specific Conductance/Salinity
Dissolved Oxygen	Temperature
Dissolved Oxygen (Saturation)	Total Suspended Solids
Flow	Turbidity

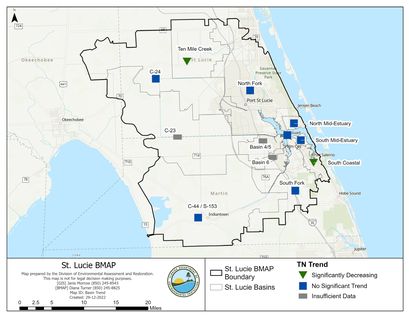
69 stations monitor water quality throughout the watershed.

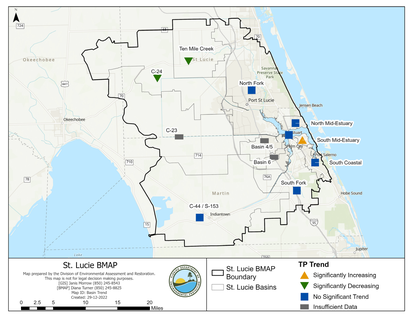
Targeted Restoration Areas (TRA) sequentially compare four parameters to determine priority basins for restoration projects.





Seasonal Kendall Trend Analysis investigates trends in TN and TP concentrations for the basins.



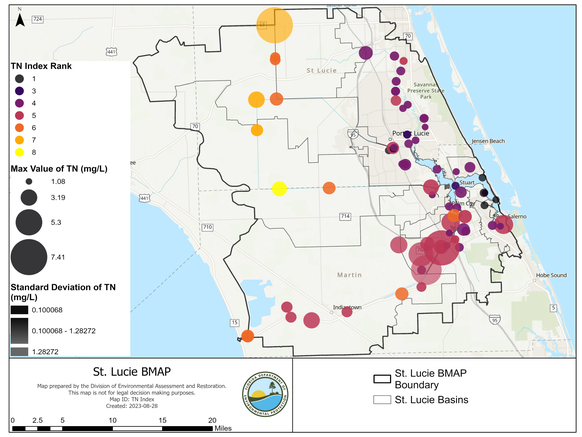


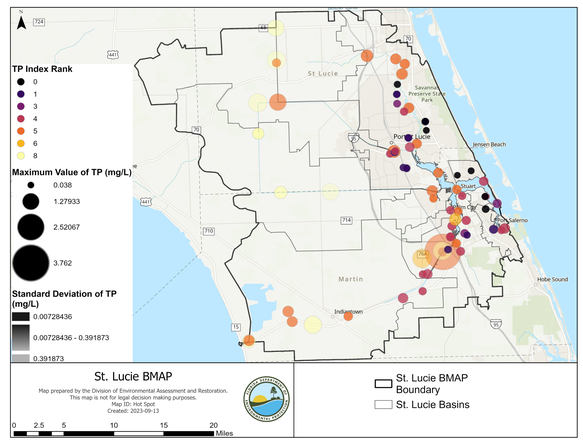
Upcoming BMAP Update

- Evaluation of current TN and TP milestones.
- Identification of additional projects.
- Incorporation of requirements identified in HB 1379 and the Clean Waterways Act.
- Water quality monitoring network updates.
- Evaluation of modeling needs.

Hot Spot Analysis - In Progress

Developing analysis method for prioritization at a more local scale than the TRA analysis and with less robust data needs than trend analyses.





Scan the QR Code to learn more!

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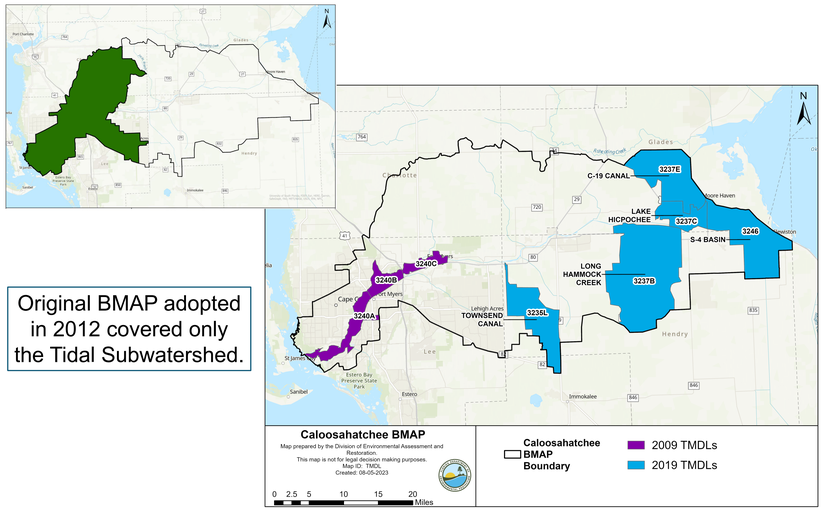
850-245-8521

Caloosahatchee River and Estuary BMAP

Northern Everglades and Estuaries Protection Program (NEEPP) Workshop 2023

BMAP Background

- Covers six TMDLs.
- Estuary TMDL is for TN.
- Tributaries have TN and TP TMDLs.

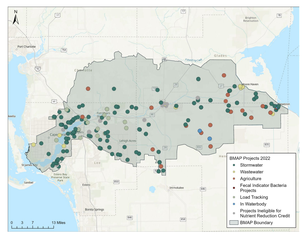


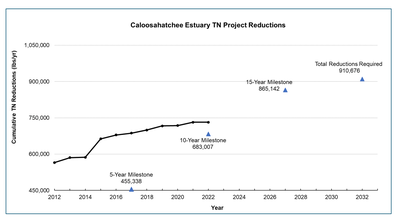
Original BMAP adopted in 2012 covered only the Tidal Subwatershed.

Progress in the BMAP

Entity	Completed	Ongoing	Planned	Underway	Grand Total
Barron WCD	1	1	3		5
Charlotte County		1			1
City of Cape Coral	15	2	1	1	19
City of Clewiston	2	3		1	6
City of Fort Myers	10	2	3	1	16
City of LaBelle			2	3	5
City of Moore Haven	1		1		2
Clewiston Drainage District	1	1	3		5
Collins Slough WCD	1	1	3		5
County Line Drainage District	1	1		3	5
Cow Slough WCD	1	1	3		5
Devil's Garden WCD	1	1	3		5
Disston Island Conservancy District	1	1	3		5
Agriculture		6			6
FDOT District 1	29	2			31
Flaghole Drainage District	1	1	3		5
Gerber Groves WCD	1	1	3		5
Glades County	2			2	4
Hendry County		1	2	3	5
Hendry-Hilliard WCD	1	1	3		5
LA-MSID (formerly ECWCD)	15	1	1	1	18
Lee County	42	2	5	3	52
Lucaya CDD		2			2
Mirada CDD		2			2
Port LaBelle CDD			1		1
Portico CDD	3	1			4
Coordinating Agency	2		4	1	7
Sugarland Drainage District	1	1	3		5
Verandah East CDD		1			1
Verandah West CDD		1			1
Grand Total	132	37	50	19	238

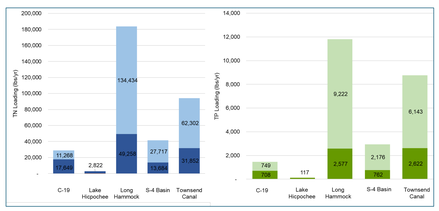
238 projects in the BMAP address both stormwater and wastewater pollution sources.



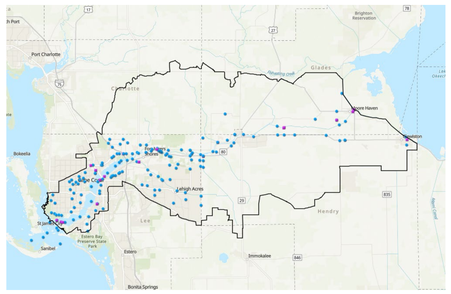


Currently, completed and ongoing projects address 80% of the required reduction to TN loading for the estuary.

More recent tributary projects have begun to address TN and TP loading in the East and West Caloosahatchee Subwatersheds.



Monitoring and Evaluation



Water Quality Parameters Monitored	
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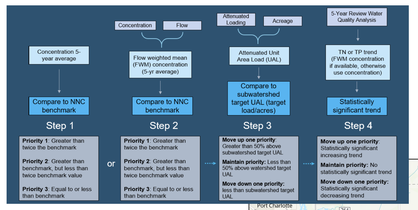
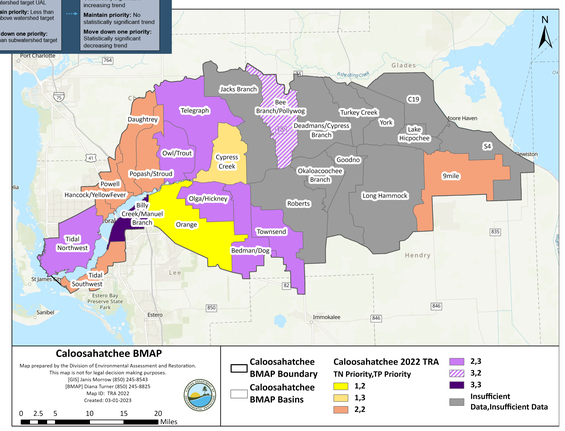
Ammonia (N)	Total Kjeldahl Nitrogen (TKN)
Biological Oxygen Demand (BOD)	Total Nitrogen (TN)
Organic Carbon	Orthophoshate (P)
Total Carbon	pH
Chlorophyll-*a*	Total Phosphorus (TP)
Color	Specific Conductance/Salinity
Dissolved Oxygen	Temperature
Dissolved Oxygen (Saturation)	Total Suspended Solids
Flow	Turbidity

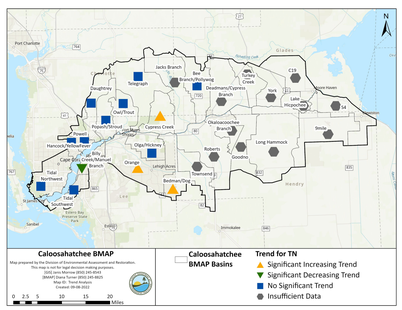
62 stations monitor water quality throughout the watershed.

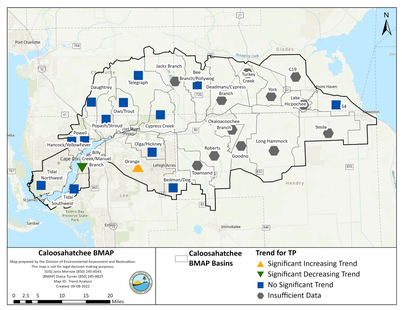


Targeted Restoration Areas (TRA) sequentially compare four parameters to determine priority basins for restoration projects.

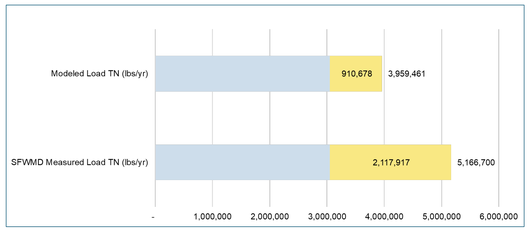


Seasonal Kendall Trend Analysis investigates trends in TN and TP concentrations for the basins.





Upcoming BMAP Update

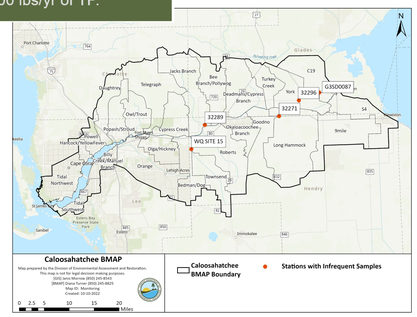


Monitoring data shows higher loading than expected. Required reductions for East and West Caloosahatchee subwatersheds will be increased.

Modify compliance language to make consistent with other Northern Everglades BMAPs.

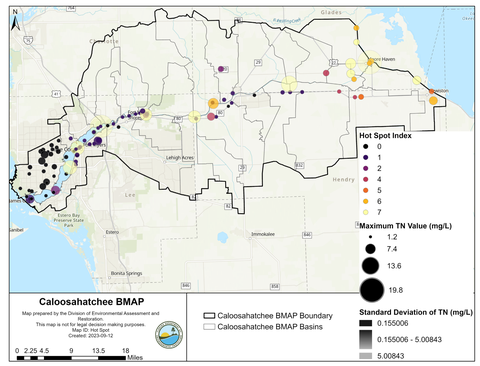
- Caloosahatchee Estuary — 3,048,783 lbs/yr of TN.
- C-19 Canal — 31,327 lbs/yr of TN and 1,579 lbs/yr of TP.
- Lake Hicpochee — of 24,929 lbs/yr of TN and 1,348 lbs/yr of TP.
- Long Hammock — of 253,673 lbs/yr of TN and 16,295 lbs/yr of TP.
- S-4 — 111,935 lbs/yr of TN and 7,555 lbs/yr of TP.
- Townsend Canal — 160,314 lbs/yr of TN and 14,300 lbs/yr of TP.

Water quality monitoring efforts will be increased in areas with insufficient data.



Hot Spot Analysis - In Progress

Developing analysis method for prioritization at a more local scale than the TRA analysis and with less robust data needs than trend analyses.



Scan the QR Code to learn more!

Dr. Nicole Morgan, Basin Coordinator
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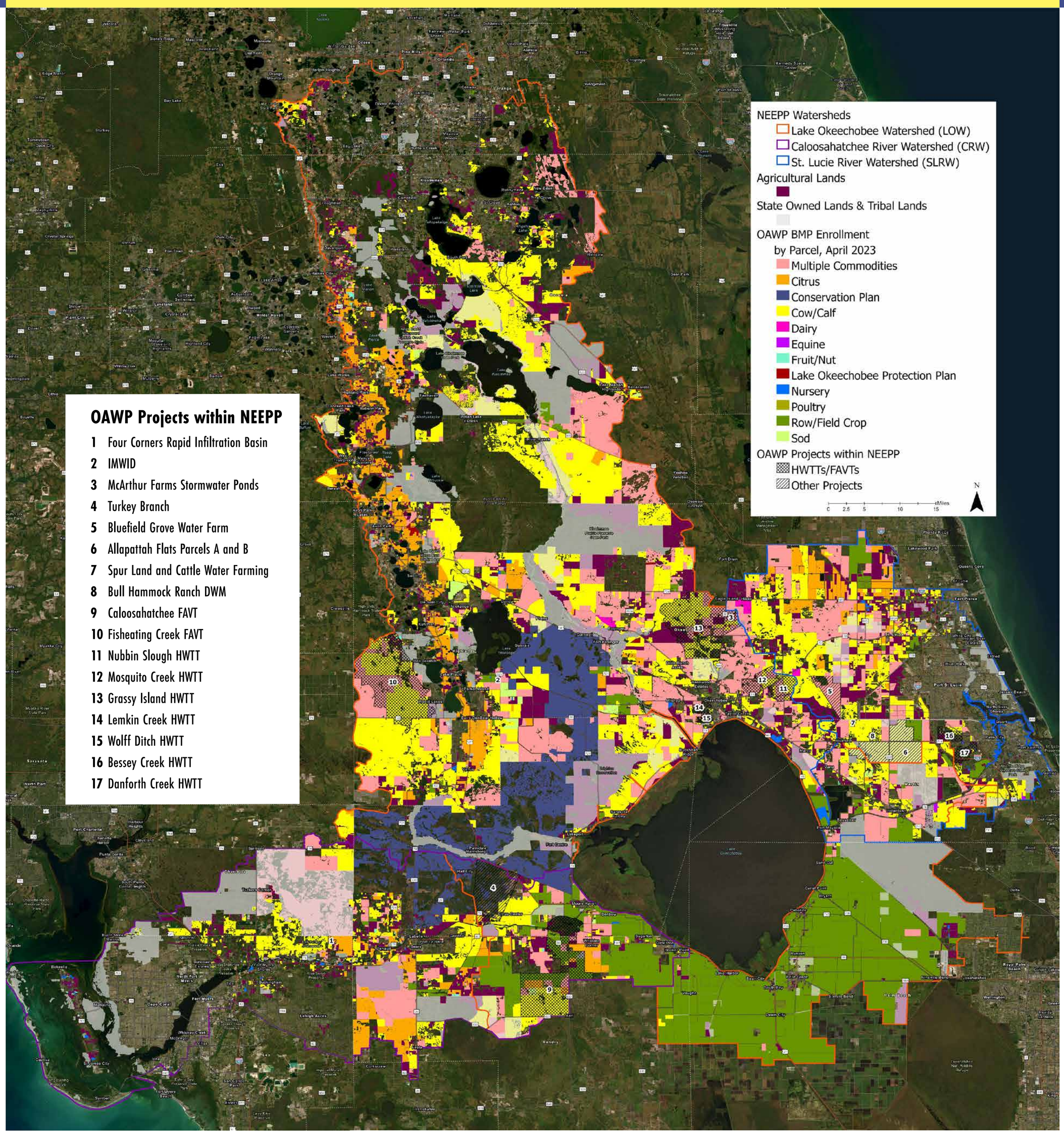
850-245-8521

Summary of Agricultural Nonpoint Source Best Management Practice (BMPs) in the Northern Everglades and Estuaries Protection Program (NEEPP) Boundary

Working together to protect Florida waters!



Florida's farmers and ranchers play an important role in conserving water resources and ecosystems across the state by implementing FDACS Best Management Practices (BMPs).

In 2022, producers worked with FDACS staff to:

- Maintain over 12,000 BMP enrollments
- Complete 2,043 BMP implementation verifications including 93% of all enrollments within Basin Management Action Plan areas
- Implement new BMPs assisted by more than $12.5 million in cost share funds

	Caloosahatchee River Watershed	Lake Okeechobee Watershed	St. Lucie River Watershed
Total Ag Acres	443,344	1,827,665	374,716
Enrolled Ag Acres	374,622	1,560,013	307,194
Percent Enrolled	**84%**	**85%**	**82%**
Total Irrigated Ag Acres	181,000	641,112	89,002
Enrolled Irrigated Ag Acres	168,274	603,674	81,090
Percent Enrolled	**93%**	**94%**	**91%**

BMP enrollment as of April 30, 2023 and the 9th Florida Statewide Agricultural Irrigation Demand (FSAID) Geodatabase

Scan here for more on agricultural BMP enrollments and to view data and maps

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

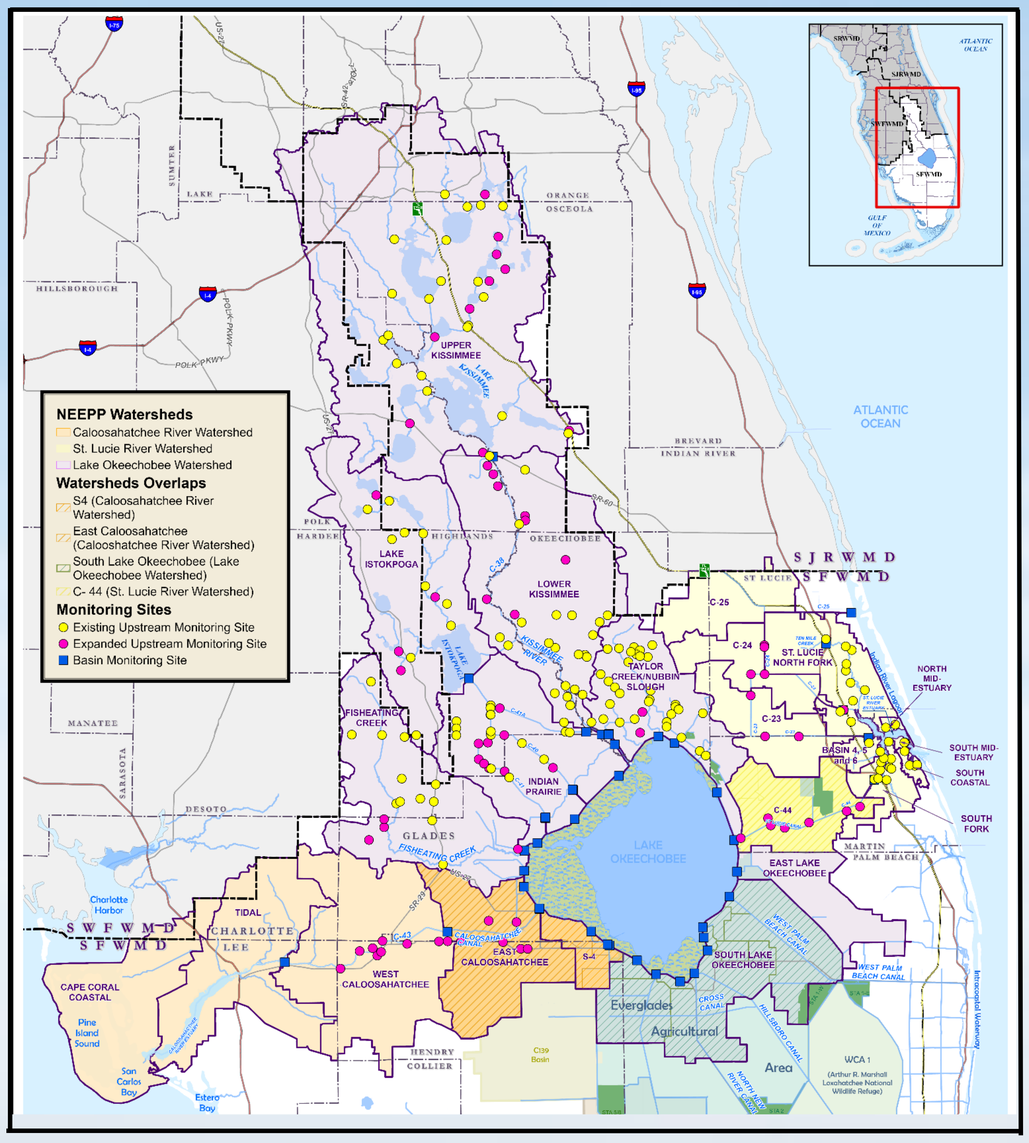
Northern Everglades Upstream Water Quality Monitoring Network

2023 SFER - Volume I, Appendices 8B-1, 8C-1, and 8D-1

Steffany Olson, Amanda McDonald, Aubrey Frye, and Megan Junod

Purpose of Upstream Monitoring: ➢highlight areas of concern ➢prioritize resources ➢track progress

Water Quality Monitoring Network



Governing Board Expansion of Upstream Network

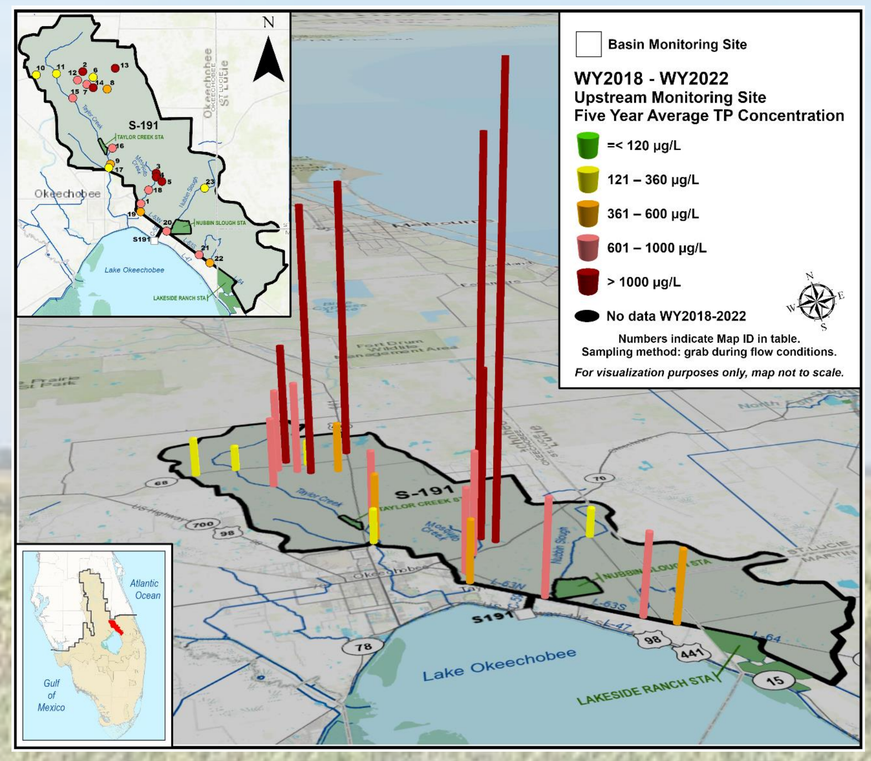
➢Increased:

- number of sites
- collection frequency to bi-weekly
- parameters collected

Total Number of Sites

Monitoring Level	Lake Okeechobee Watershed	Caloosahatchee River Watershed	St. Lucie River Watershed
Basin	37	5	6
Upstream	150	15	46
Upstream Monitoring Plan			
Frequency	Biweekly when flowing (some weekly)		
Parameters	TP, OPO4, TN, NH3-N, NOx, pH, Temp, DO, Conductivity		

Total Phosphorus Concentrations (App. 8B-1)



Total Phosphorus Loads (App. 8B-1)

Dissolved Inorganic Nutrient Concentrations Water Year 2022 (App. 8B-1)

S-191 Map ID	Orthophosphorous OPO4 (µg/L) Samples	Avg.	Ammonia NH3-N (mg/L) Samples	Avg.	Nitrate-Nitrite NOx (mg/L) Samples	Avg.
1	12	*328*	11	0.08	12	0.36
2	0	-	0	-	0	-
3	2	*2,698*	2	1.18	2	0.84
4	1	*2,337*	1	0.76	1	0.03
5	2	*3,686*	2	*1.84*	2	0.01
6	1	71	1	0.26	1	0.01
7	2	*468*	2	*2.94*	2	1.15
8	2	16	2	0.75	2	0.02
9	1	*382*	1	0.15	1	0.08
10	0	-	0	-	0	-
11	6	*148*	6	0.15	6	0.22
12	3	*469*	3	0.54	3	1.11
13	0	-	0	-	0	-
14	6	*3,178*	6	*20.61*	5	0.85
15	17	*881*	17	*4.64*	16	0.38
16	20	*381*	20	0.15	20	0.15
17	12	*182*	12	0.11	12	0.14
18	9	*376*	9	0.32	9	0.15
19	17	*281*	17	0.55	17	0.46
20	0	-	0	-	0	-
21	1	*366*	1	0.11	1	0.05
22	5	*429*	5	0.14	5	0.07
23	1	99	1	0.07	1	0.01

- Data bars are included to help the viewer spot highest and lowers numbers at a glance.
- Red italicized numbers indicate concentrations above the numeric nutrient criteria (NNC) values for total phosphorus and total nitrogen. Note that this is presented for reference and is not an assessment of NNC compliance.

App. 8B-1 SCAN ME

App. 8C-1 SCAN ME

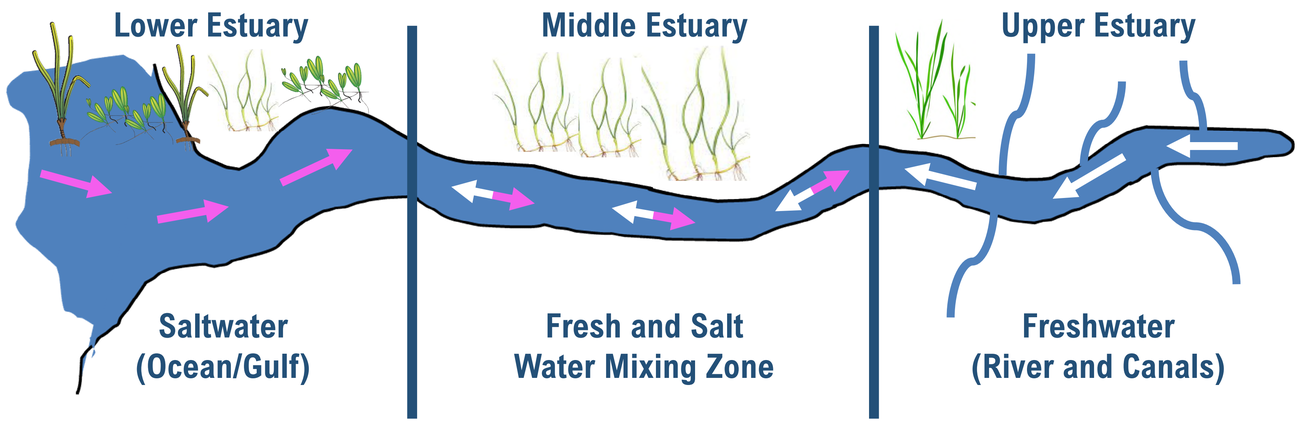
App. 8D-1 SCAN ME

Chapters 8C and 8D: Submerged Aquatic Vegetation in the St. Lucie and Caloosahatchee Estuaries

Danielle Taylor and Melanie Parker

Chapter 8C — SCAN ME

Chapter 8D — SCAN ME

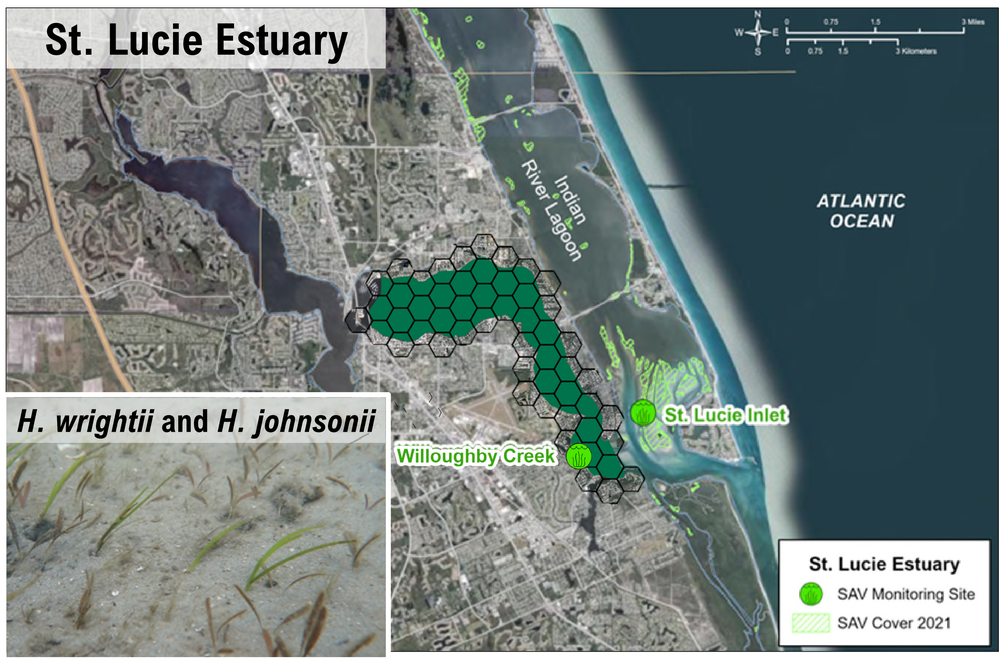


*Arrows indicate flow of saltwater (pink) and freshwater (white).

Importance of Submerged Aquatic Vegetation

- Submerged aquatic vegetation (SAV) includes freshwater, estuarine, and marine species (seagrass), each with a unique salinity tolerance range
- Provide habitat, food source, sediment stabilization, improved water quality, and serve as indicator species for estuarine health
- Light availability, temperature, and salinity affect SAV health and distribution

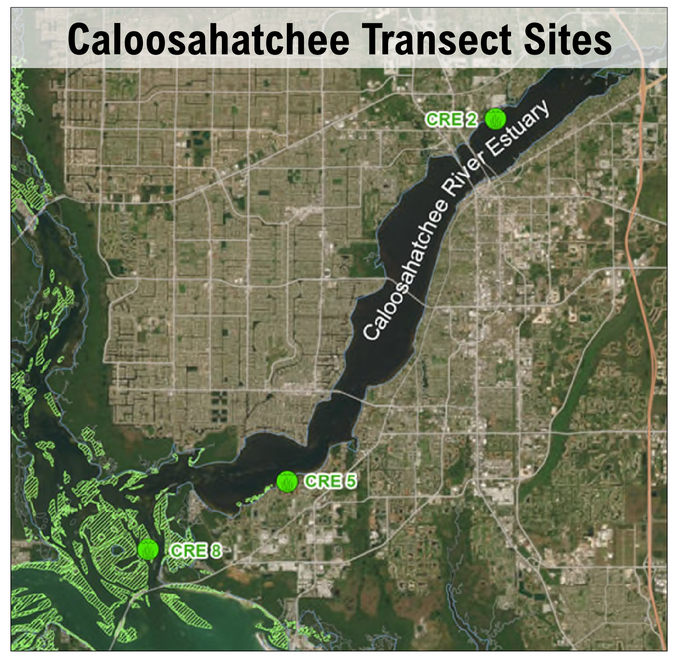
Ecosystem-Scale SAV Monitoring

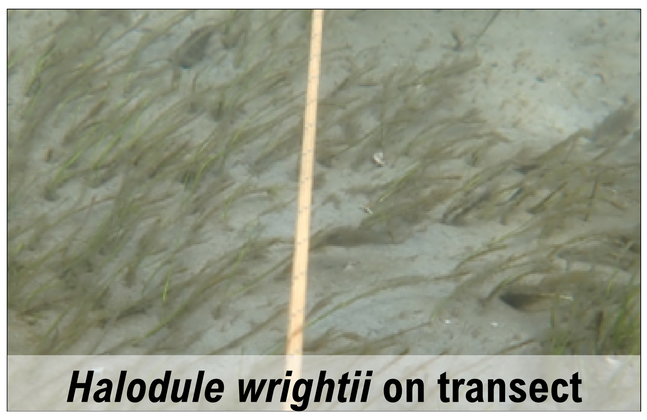


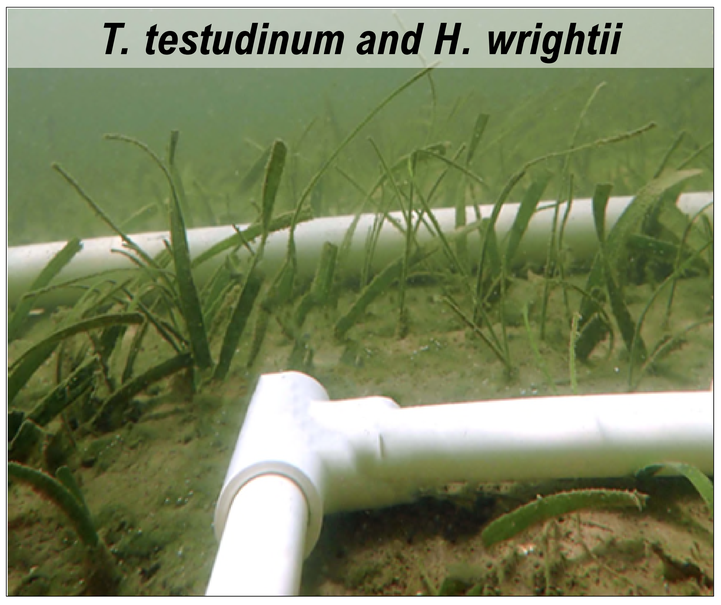
Ecosystem-Scale SAV Monitoring	Spatial Extent			Abundance		
	WY2022 Results	Change from WY2021		WY2022 Results	Change from WY2021	
St. Lucie Estuary	0.04	↓	14%	0.27	↑	30%
CRE – Segment A	0.12	↑	36%	0.31	↑	24%
CRE – Segment B	0.20	↓	13%	0.29	↑	32%
CRE – Segment C	0.19	↑	2%	0.24	↑	32%
CRE – Segment D	0.65	↑	43%	0.40	↓	14%

Community-Scale SAV Monitoring

Community-Scale SAV Monitoring	Percent Cover		
	WY2022 Results	Change from WY2021	
SLE – Willoughby Creek	1.9	↑	186%
SLE – St. Lucie Inlet	17.5	↓	21%
CRE 2	0.8	↓	22%
CRE 5	10.4	↑	3%
CRE 8	32.2	↓	2%







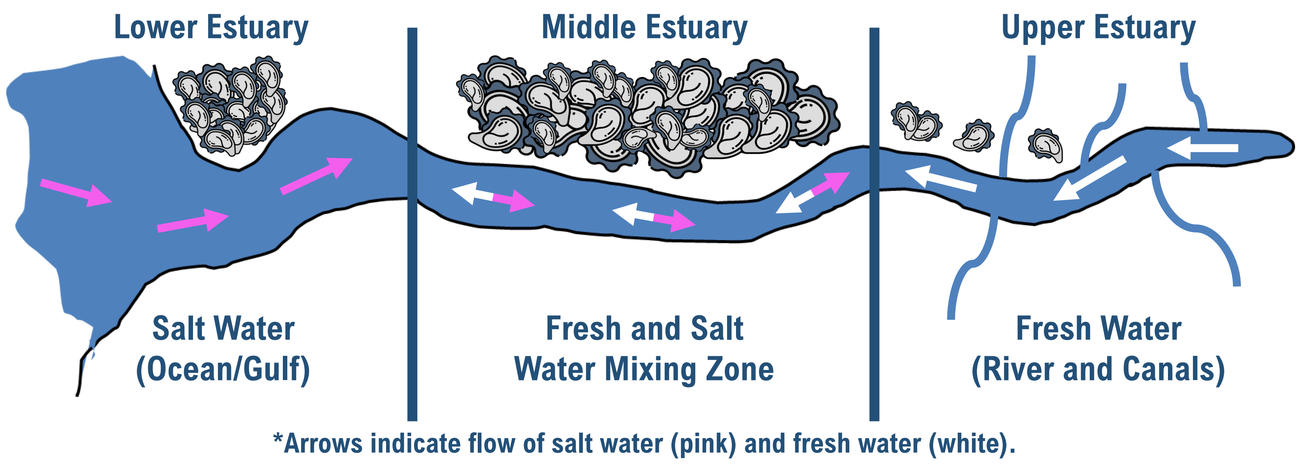
Note: CRE – Caloosahatchee Rive Estuary, SLE – St. Lucie Estuary, and WY – Water Year (May 1–April 30).

Chapters 8C and 8D: Oysters in the St. Lucie and Caloosahatchee Estuaries

Melanie Parker and Danielle Taylor

Chapter 8C ENVIRONMENTAL REPORT SCAN ME

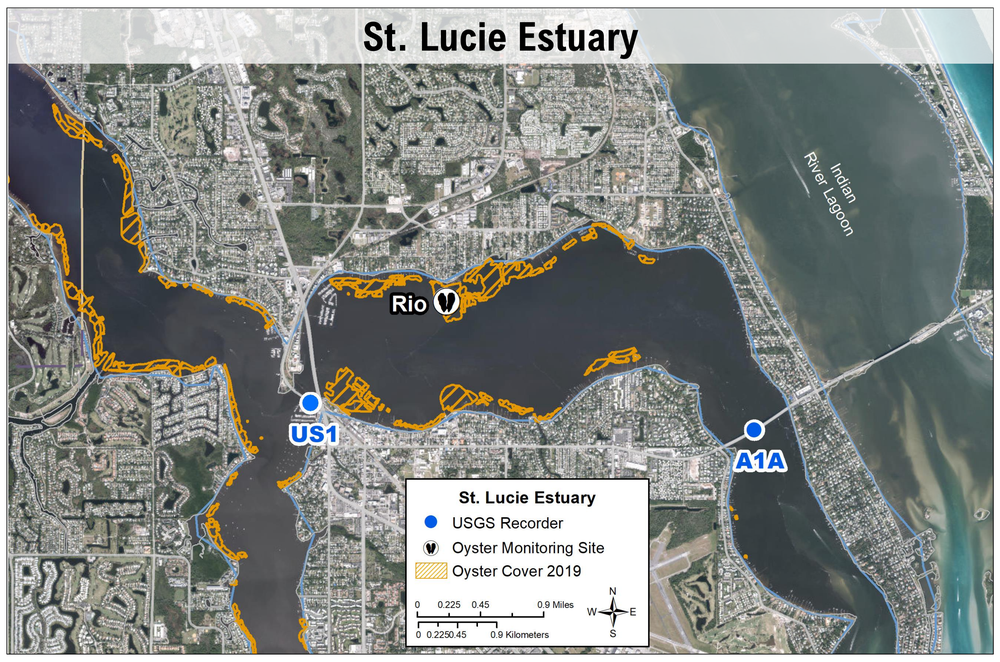
Chapter 8D ENVIRONMENTAL REPORT SCAN ME



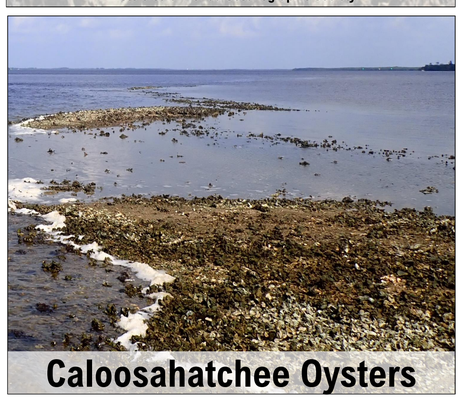
*Arrows indicate flow of salt water (pink) and fresh water (white).

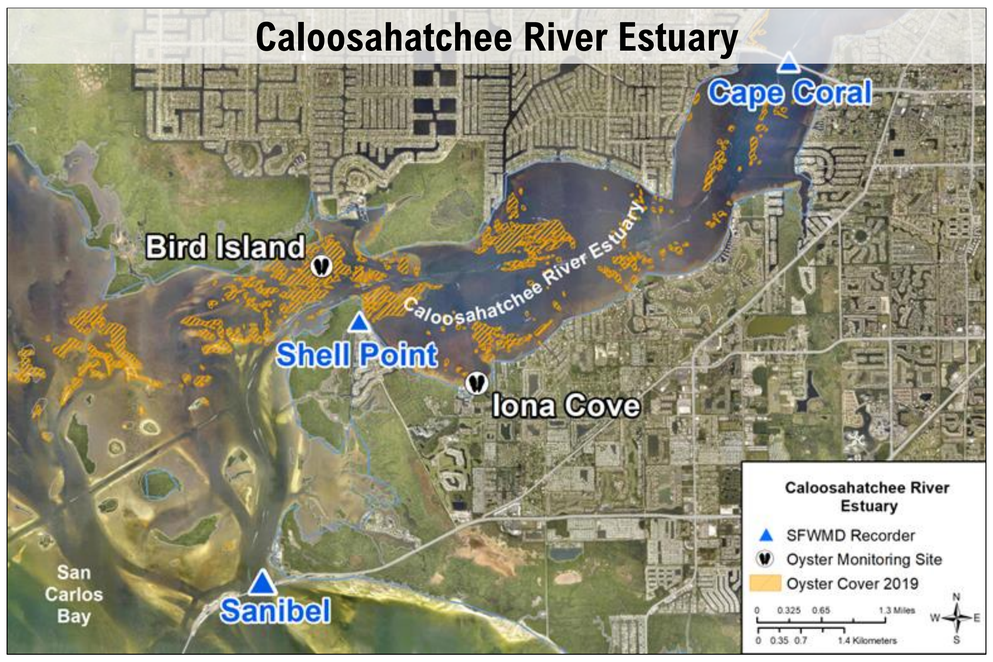
Importance of Oysters

- Oysters are monitored by the Fish and Wildlife Research Institute for RECOVER (Restoration Coordination & Verification) as an indicator species for estuarine health
- Provide habitat, food source, sediment stabilization and improve water quality
- Respond more quickly to changes in water quality than seagrass




St. Lucie Oysters
Photo credit: Florida Oceanographic Society


Caloosahatchee Oysters



Salinity and Oysters

- Salinity is the most important factor determining distribution and health of oyster populations
  - **Low salinity** → acute physiological stress and death
  - **High salinity** → high disease and predation rates
- Oysters weakened by disease are more susceptible to predators
- Short-term salinity decreases can benefit oysters by decreasing parasite and predator densities

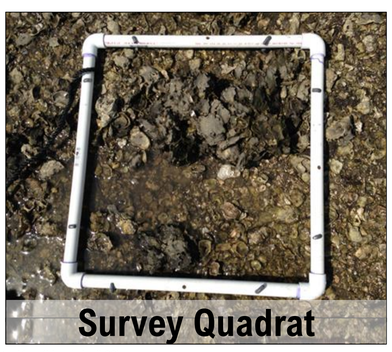
# of Days in Optimal Salinity Range for Oysters (10-25)	WY2022 Results	Change from WY2021	
St. Lucie Estuary	288	↑	24%
Caloosahatchee River Estuary Cape Coral	230	↑	3%
Caloosahatchee River Estuary Shell Point	245	↑	9%


Blue crab

Settled Oyster Density

- Density reflects abundance of all sizes of settled oysters
- Low salinity events cause oyster die-offs
- Greater densities at CRE-Bird Island = higher recruitment rates

Settled Oyster Density (Oysters/m^2)	WY2022 Results	Change from WY2021	
St. Lucie Estuary	277	↓	9%
Caloosahatchee River Estuary Iona Cove	241	↑	92%
Caloosahatchee River Estuary Bird Island	770	↑	162%

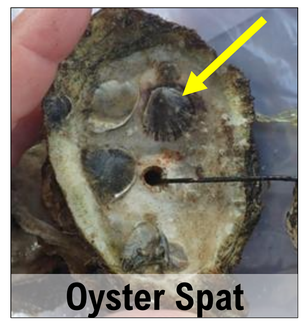

Survey Quadrat

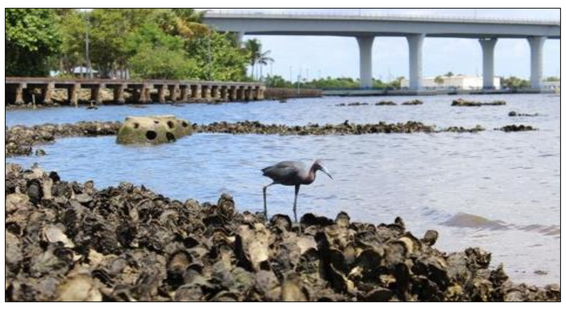
Note: CRE Caloosahatchee River Estuary, m^2 – square meter, SFWMD – South Florida Water Management District, USGS – United States Geological Survey, and WY – Water Year (May 1–April 30).

Juvenile Oyster Recruitment

- Spat recruitment occurs in spring through late fall in Florida
- Peak recruitment in the spring and fall if salinities remain optimal
- Low salinity events disrupt spawning season: WY2021 Hurricane Eta
- Salinities usually within or above optimal at Caloosahatchee River Estuary Bird Island, generally result in higher recruitment rates

Juvenile Oyster Recruitment (Spat/Shell/Month)	WY2022 Results	Change from WY2021	
St. Lucie Estuary	4.5	↑	179%
Caloosahatchee River Estuary Iona Cove	1.8	↓	27%
Caloosahatchee River Estuary Bird Island	8.9	↑	89%


Oyster Spat

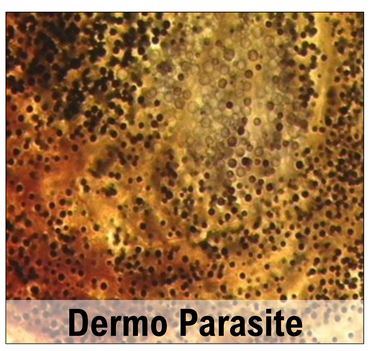



Oyster Sampling T-bars

Oyster Disease

- Dermo is a protozoan parasite (*Perkinus marinus*) that prefers warm, salty waters
- Low salinity events decrease parasite numbers and infection rates (WY2021 Hurricane Eta)
- Prolonged periods of high salinity increase infection rates
- Much higher infection rates in CRE oysters since salinities frequently exceed the optimal range

Oysters with Dermo Infections (%)	WY2022 Results	Change from WY2021	
St. Lucie Estuary	17	↑	97%
Caloosahatchee River Estuary Iona Cove	57	↓	3%
Caloosahatchee River Estuary Bird Island	57	↑	20%

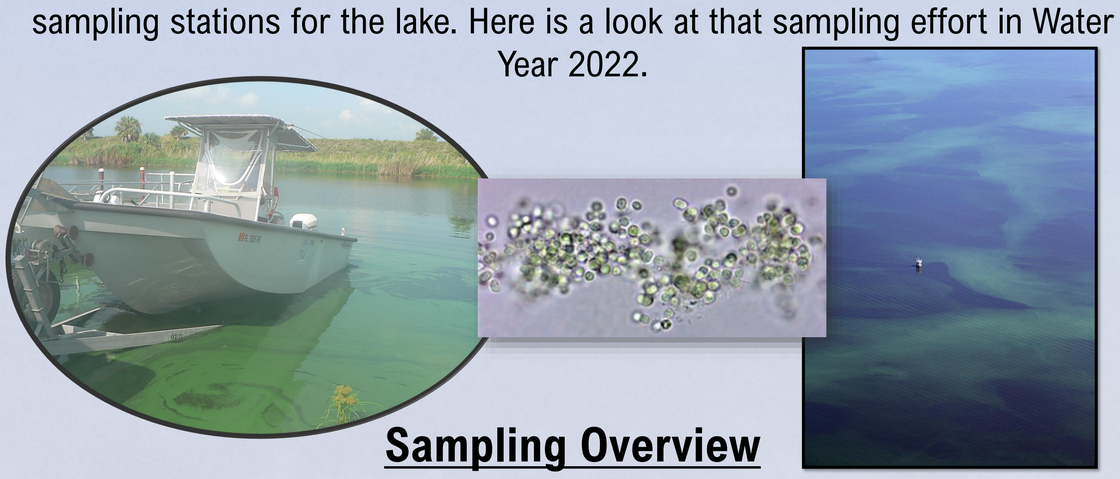

Dermo Parasite

Chapter 8B: Lake Okeechobee Phytoplankton Monitoring in Water Year 2022

Anna Swigris, Environmental Scientist
Lake and River Ecosystems Section, South Florida Water Management District, West Palm Beach, FL

The Challenge

The South Florida Water Management District (SFWMD) aims to understand the prevalence and distribution of phytoplankton blooms and their associated toxins in Lake Okeechobee. To accomplish this, SFWMD monitors 19 historic sampling stations for the lake. Here is a look at that sampling effort in Water Year 2022.



Sampling Overview

- Water Year 2022 (WY2022) = May 2021 through April 2022
- Dry season = November through April
- Wet (Bloom) Season = May through October
- Monthly at 19 stations (**Figure 1**)
- Chlorophyll *a* (chl-*a*), as a proxy for phytoplankton biomass, is measured at all sites.
- Algal identification and microcystin-LR toxin concentrations are measured at 6 sites.
- Surface water quality is measured at all sites.

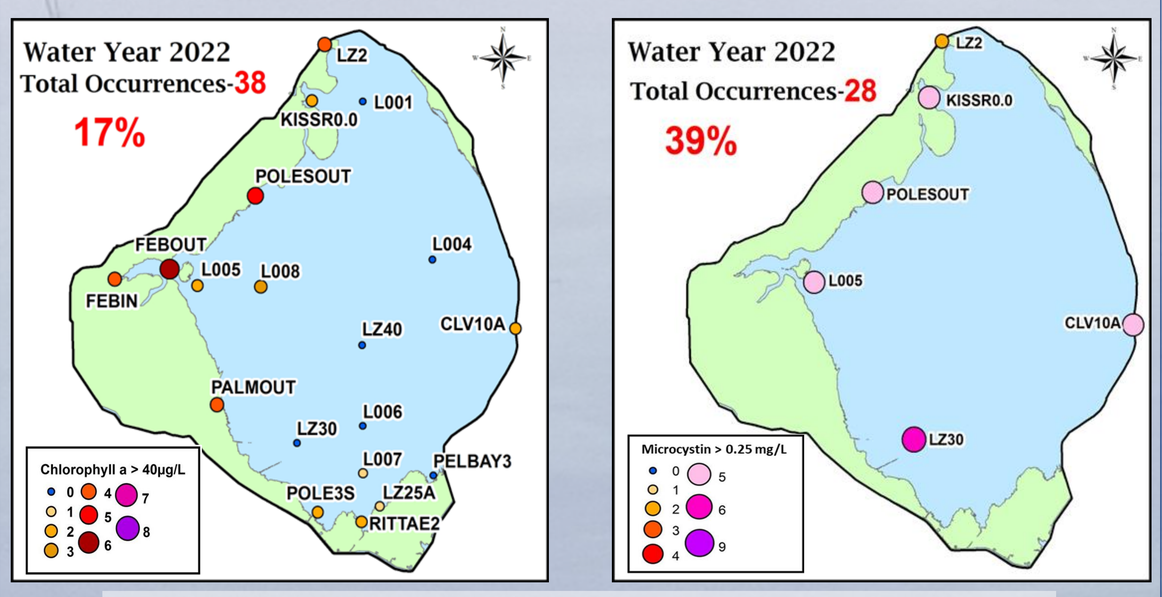


Figure 2. Frequency of algal blooms (left) and detectable microcystin-LR toxin levels (right) from Water Year 2022. The number of occurrences is depicted by the size of the dot.

Under or Over?

SFWMD scientists use several phytoplankton thresholds to define blooms and microcystin-LR toxin levels in Lake Okeechobee. Here is how phytoplankton in Water Year 2022 compares to those standards.

1. Bloom Event Threshold = 40 µg chl-*a*/L. This level was exceeded in 17% of samples (**Figure 4**).
2. Microcystin-LR Toxin Detection Level = 0.25 µg/L. This level was exceeded in 39% of samples (**Figure 4**).
3. United States Environmental Protection Agency (USEPA) Standard for Recreational Waters = 8 µg microcystin-LR/L. This level was exceeded in 4% of samples.
4. World Health Organization (WHO) Guideline for Recreational Waters = 24 µg microcystin-LR/L. This level was exceeded in 3% of samples.
5. Restoration Coordination and Verification (RECOVER) Program Target = Less than 5% of samples exceeding the Bloom Event Threshold. This target was exceeded this year, with 17% of samples being blooms.

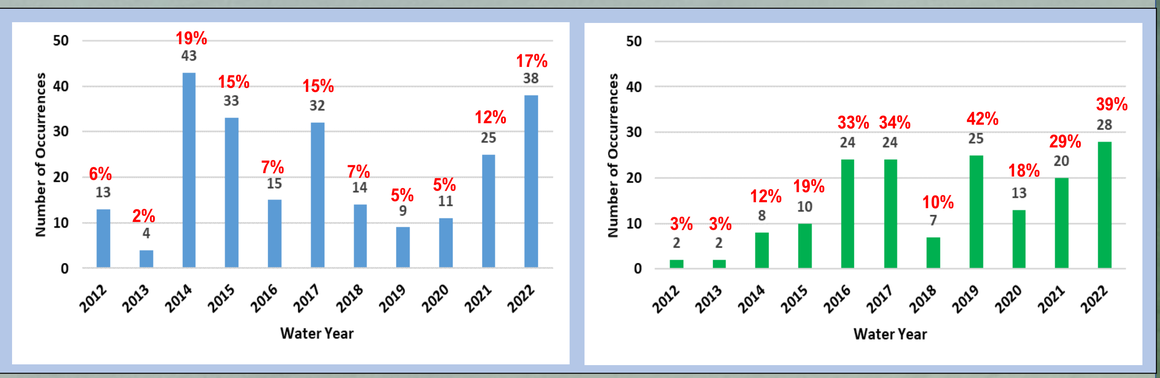


Figure 4. Frequency of algal blooms (left) and detectable microcystin toxin levels (right) from Water Year 2012 through Water Year 2022.

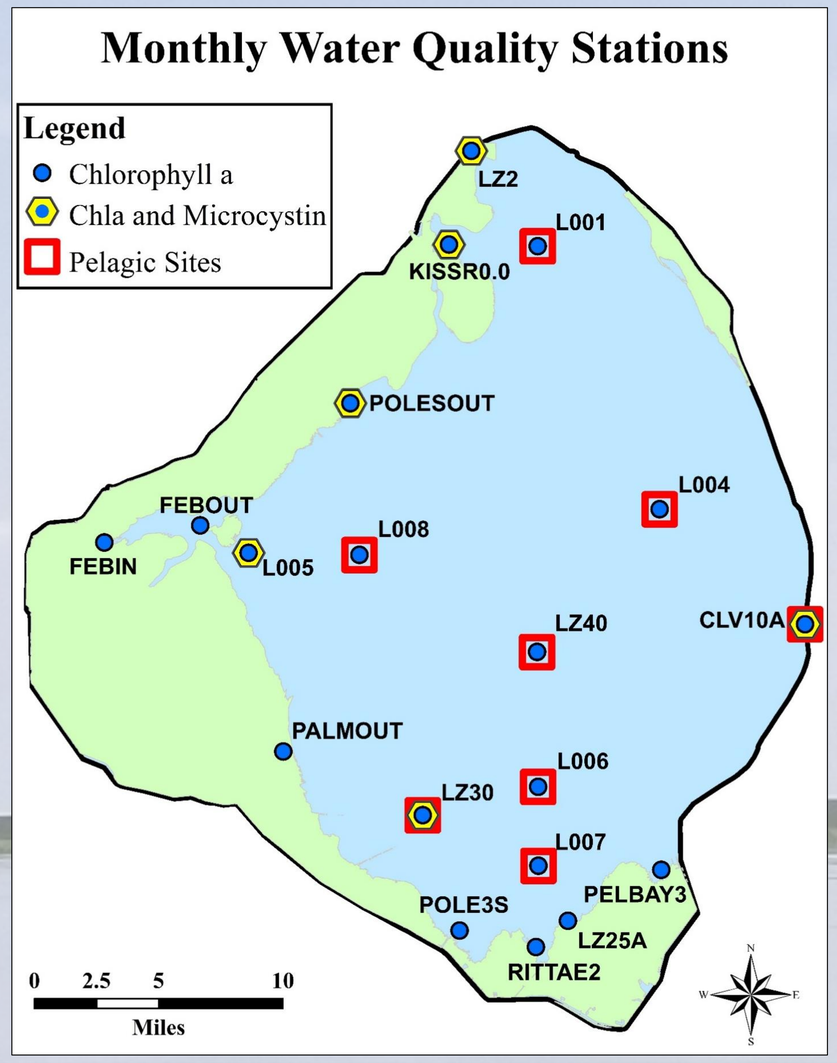


Figure 1. Long-term monitoring stations for chlorophyll *a* (19) sites (blue circles), and microcystin-LR levels and algal identification (6) sites (yellow outline). These sites have been sampled monthly since WY2012 in Lake Okeechobee. Pelagic stations are outlined with red squares.

Past vs. Present

Phytoplankton biomass, bloom events, and toxin levels vary in response to a multitude of environmental variables. Here is how Water Year 2022 compares to data from the prior ten water years.

Water Year 2022
May 2021-April 2022

- 17% of samples exceeded the bloom threshold
- 39% of samples exceeded the microcystin-LR toxin detection level
- Average microcystin-LR concentration of 1.8 µg/L, the highest of the eleven water years
- Average chl-*a* concentration of 24.5 µg/L, the highest of the eleven water years

Water Years 2012 - 2021
May 2011-April 2021

- 9.3% of samples exceeded the bloom threshold
- 20.1% of samples exceeded the microcystin-LR toxin detection level
- Average microcystin-LR concentration of 0.5 µg/L
- Average chl-*a* concentration of 18.2 ug/L

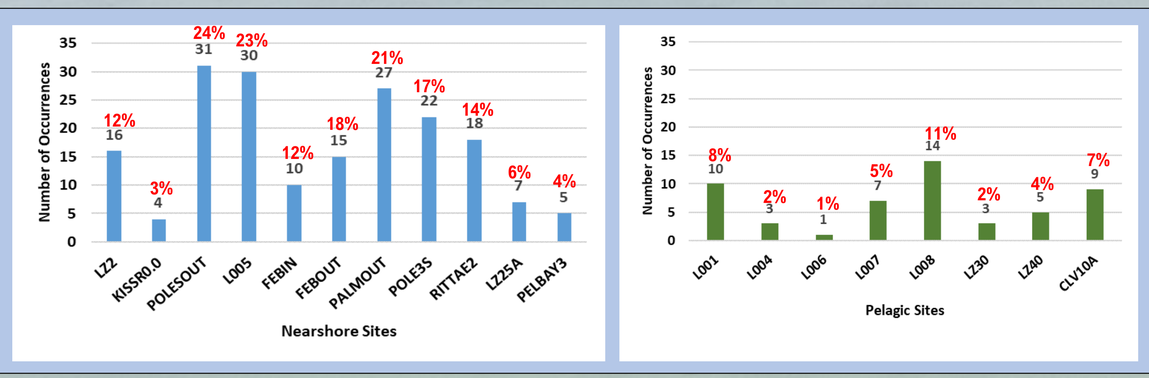


Figure 3. Frequency of blooms (chl-*a* concentrations of 40 µg/L or greater) for 11 nearshore (left panel) and 8 pelagic (right panel) sites in Lake Okeechobee over the past eleven water years (WY2012-WY2022).

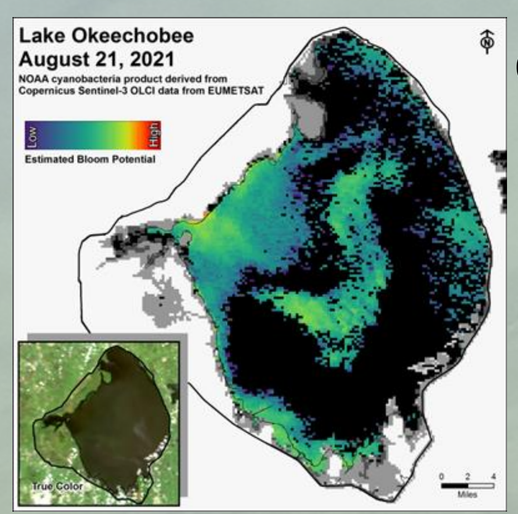


Figure 5. Satellite imagery showing bloom potential in Lake Okeechobee during a day in WY2022's bloom season.

It's a Shore Thing.

Over the last eleven water years, the highest frequency of algal blooms occurred in the western nearshore areas in Lake Okeechobee. Of the 237 total blooms recorded from WY2012 through WY2022, 78.1% occurred at nearshore sites and 21.9% occurred at offshore sites (**Figure 3**). However, when looking at microcystin-LR concentrations, the opposite trend is seen, with nine out of the ten samples exceeding the USEPA recreational water standard of 8 µg/L occurring at offshore sites.

SCAN ME

Chapter 8B: The Current State of Submerged Aquatic Vegetation in Lake Okeechobee

Daniel Marchio, Environmental Scientist
Lake and River Ecosystems Section

Submerged Aquatic Vegetation (SAV) is a key indicator of overall ecological health and benefits the lake ecosystem in a multitude of ways, such as :

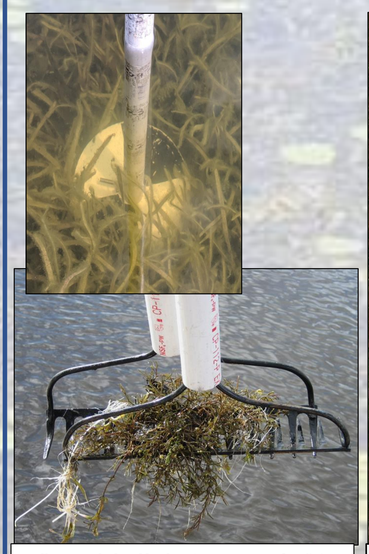
- increased water clarity
- improved water quality
- stabilization of substrate
- increased mammalian and invertebrate species richness

SAV distribution and abundance is principally governed by light availability and water depth in Lake Okeechobee.

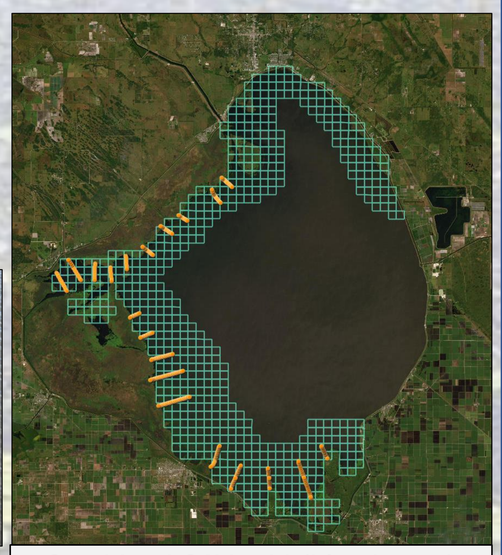
SAV coverage has varied dramatically over the period of record, coincident with hydrology:

- SAV coverage generally peaks 1-2 years after low lake stage and increased underwater irradiance.
- SAV coverage generally decreases after major hurricanes.

SAV is monitored by two methods to track responses to environmental conditions at different scales in time and space using a combination of methods. Each fall (August to September) the entire nearshore region of the lake is mapped to determine the total area of each SAV species using a systematic grid and biomass of SAV species is measured twice a year on transects.



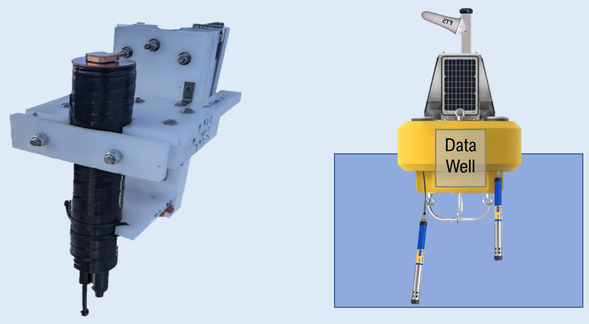
Secchi disk (upper left) and modified-rake SAV sampler.



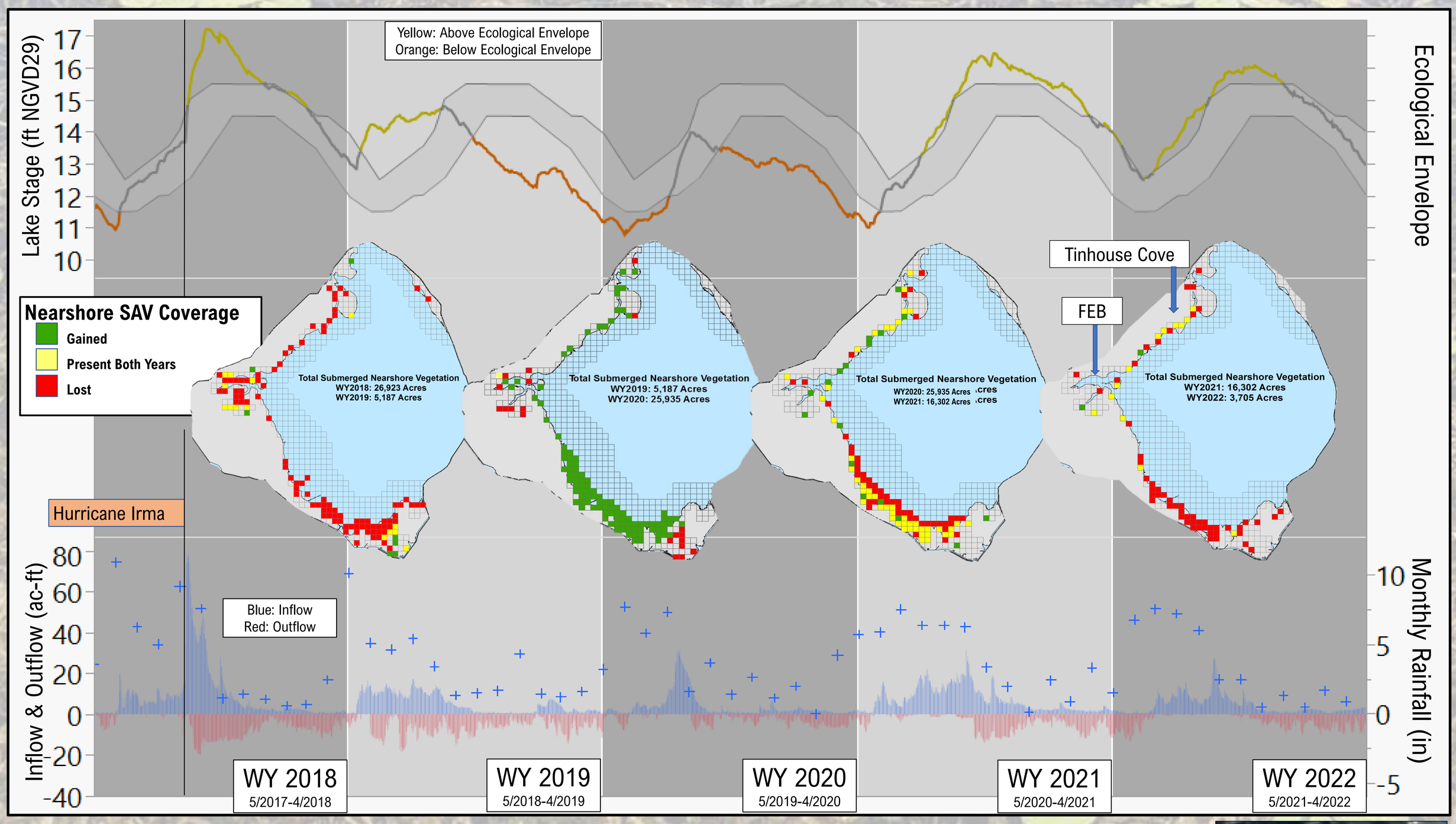
Combined SAV grid (blue boxes) projection and transects (orange dots) on Lake Okeechobee.

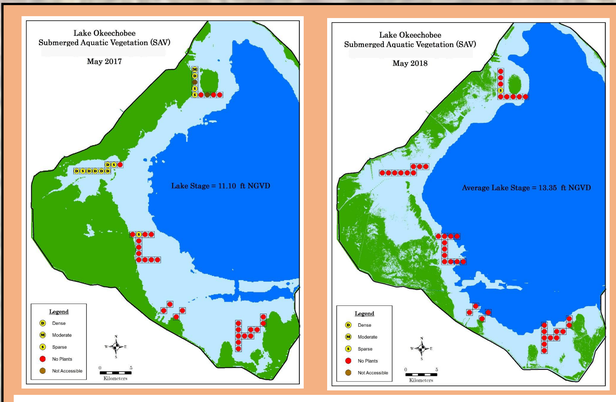
Ongoing research dealing with SAV may allow identification of an optimal range of water levels, and in turn could be used to maximize ecological benefits from regional hydrologic restoration programs (i.e., the Comprehensive Everglades Restoration Plan).

Current research is investigating underwater light availability, seedbank dynamics and near real-time water quality, to gain a better understanding of environmental stresses imposed on SAV.



Photosynthetic Active Radiation sensor* (left) and water quality buoy (right). *not to scale





A year after Hurricane Irma passed near the lake the coverage of SAV reached its lowest level in 12 years.

Low water levels and sediment covered SAV (May 2019)

Low lake stages in WY2020 assisted the SAV recovery from lingering impacts of Hurricane Irma. Coverage of SAV increased from 5,187 acres to 25,935 acres, the vast majority was from, *Chara*, the non-vascular species (macroalgae).
SW Shore Lake Okeechobee, 2020

Vallisneria sprouts found during transect sampling (September 22, 2022 at location FEB)

SAV at Tinhouse Cove, Lake Okeechobee. (March 23,2022)

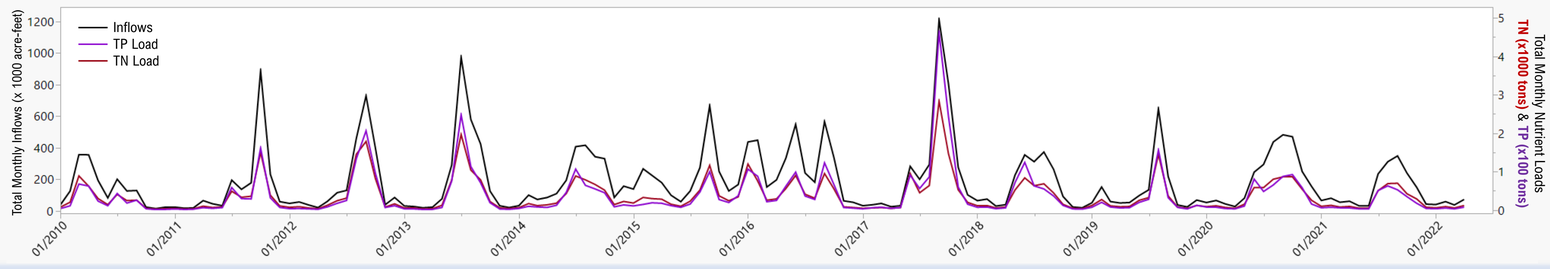
ENVIRONMENTAL REPORT
SCAN ME

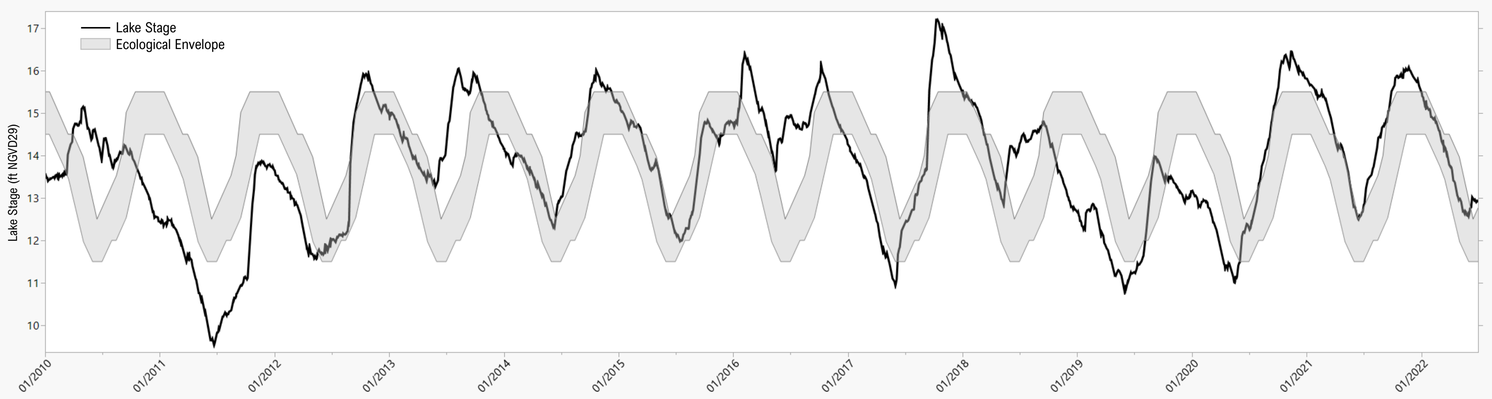
Chapter 8B: Lake Okeechobee Hydrology, Water Quality, and the Ecological Envelope

Paul Jones
Applied Sciences Bureau

Flows & Loads

Nutrient loads (total nitrogen [**TN**] and total phosphorus [**TP**]) to Lake Okeechobee are determined primarily by the quantity of surface water inflows. Elevated inflows are also the main driver of rapid rises in lake stage. With milder weather and lower inflows, Water Year 2022 (WY2022; May 1, 2021–April 30, 2022) had relatively low TN and TP loads.





Lake Stage Ecological Envelope

Lake Okeechobee stages (in feet National Geodetic Vertical Datum of 1929 [ft NGVD29], black line) fluctuate in response to variations in inflows, outflows, rainfall, and evaporation.

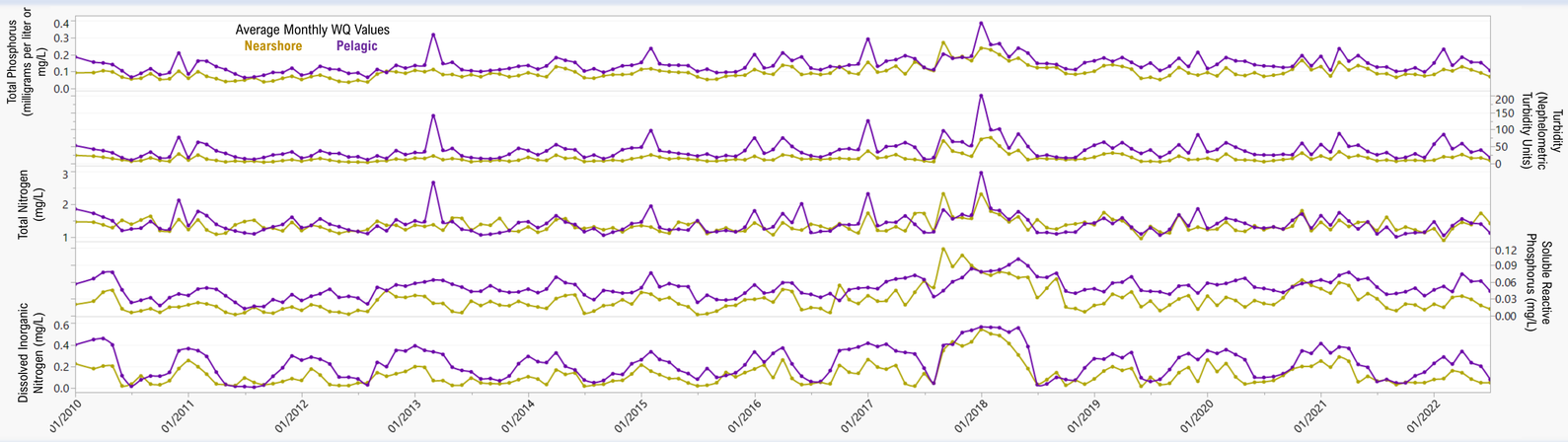
The ecological envelope (gray band) defines the ideal lake stages. It is a range of water levels that represents a compromise of optimal conditions across seasons, habitats, flora, and fauna

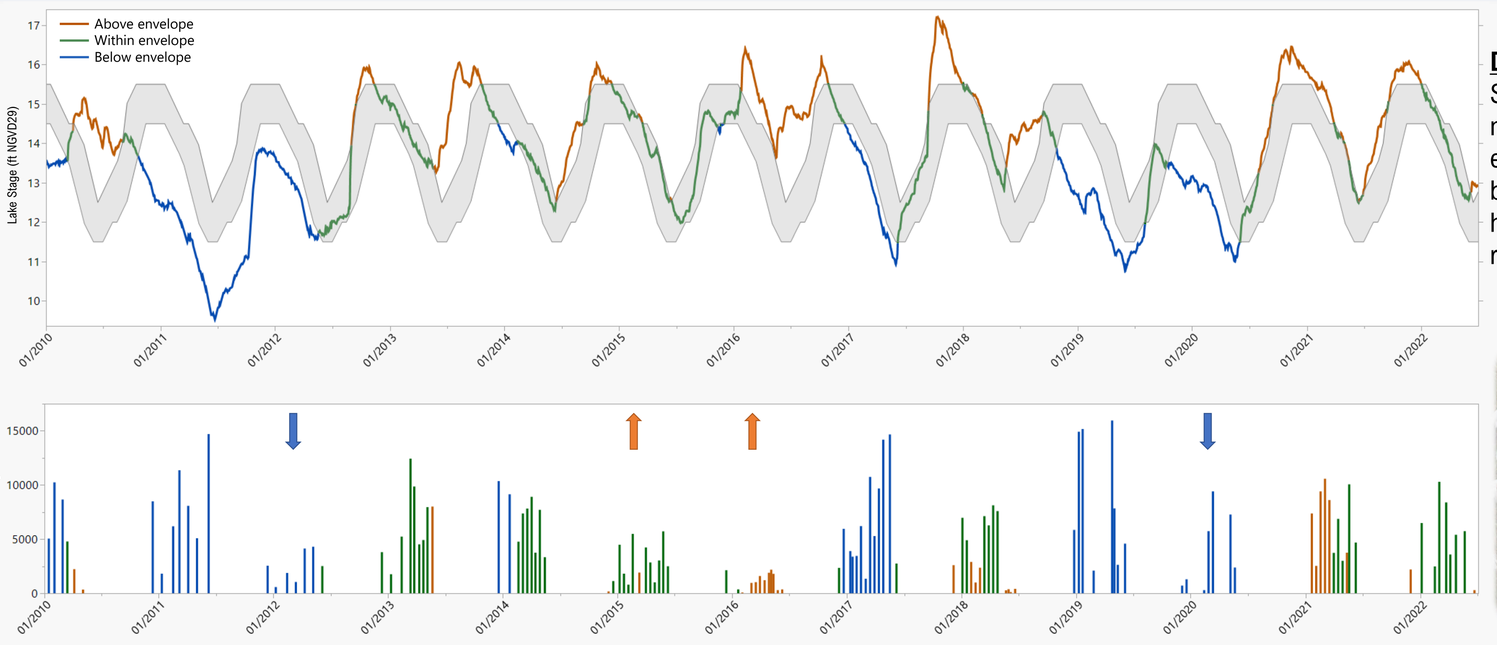
In-lake Water Quality

Due to the large volume of water, in-lake nutrient concentrations are not as governed by inflows.

Particulate associated nutrients (e.g., turbidity, TP, and TN) are influenced by strong winds, especially in the **Pelagic** region.

Dissolved nutrients (e.g., dissolved inorganic nitrogen [DIN] and soluble reactive phosphorus [SRP]) are more indicative of biological activity, and elevated levels suggest an increase risk of phytoplankton blooms.



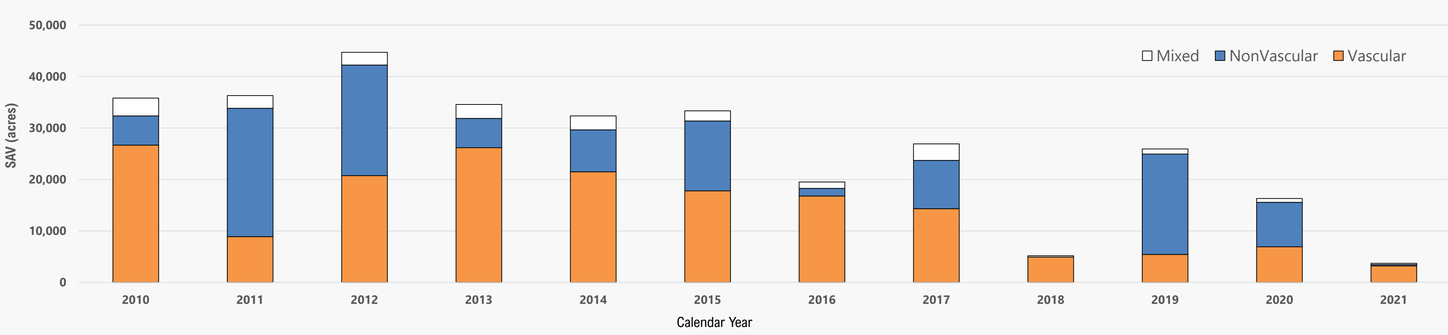


Deviations from the Ecological Envelope

Short periods **above** or **below** the envelope are not always ecologically harmful, but rapid and extreme variations in water levels within or between years is unnatural and a function of the highly channelized watershed. Balance and slow rates of change are desirable.

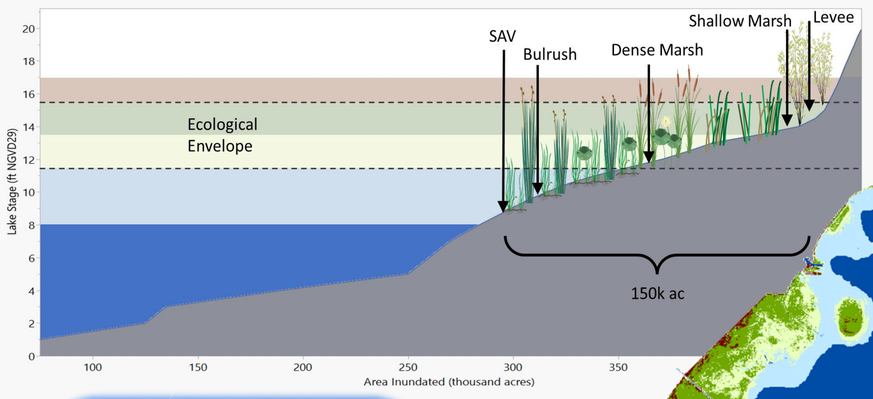
Wading Bird Foraging

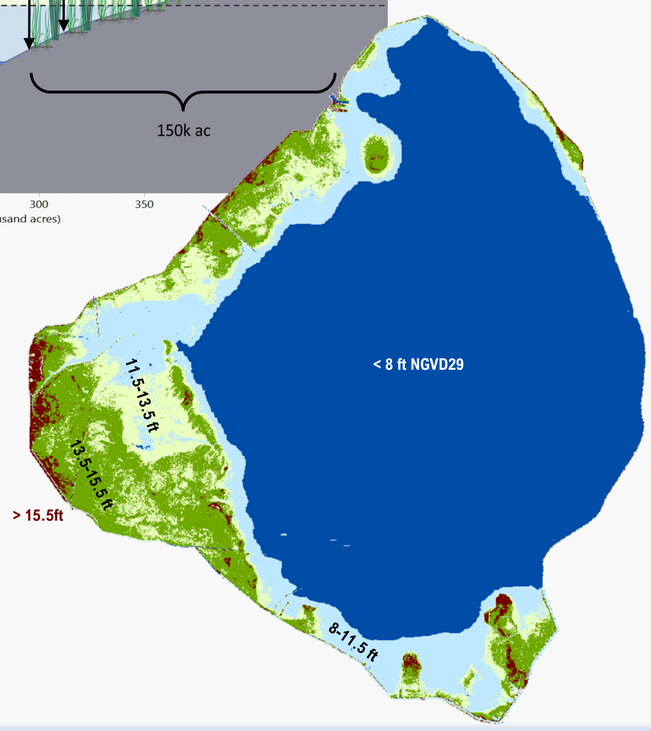
Higher lake levels promote prey production in the upper marshes. As lake levels recede and the marshes dry, prey are more concentrated and easier to catch. If lake levels are too low prior to nesting season (e.g., ⇩), or too high during (e.g., ⇧), then foraging numbers are usually lower.

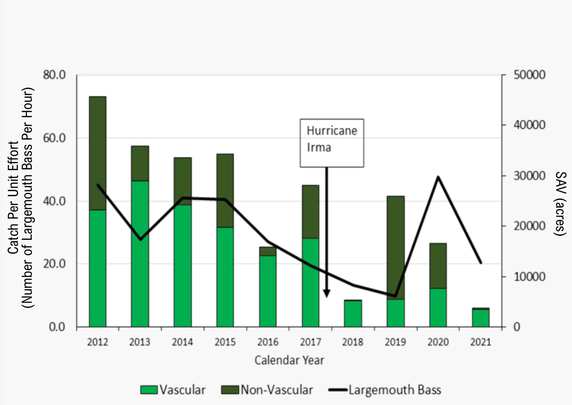


Submerged Aquatic Vegetation (SAV)

Lower lake stages increase the amount of light reaching young/seedling SAV and promote growth. If stages stay too low, SAV beds may dry out and become dominated by emergent plants. Similarly, if lake stages stay too high, only tall and well established SAV remains. The impacts of Hurricane Irma (September 2017) and high stages in 2021 and 2022 on the vascular SAV are still evident.

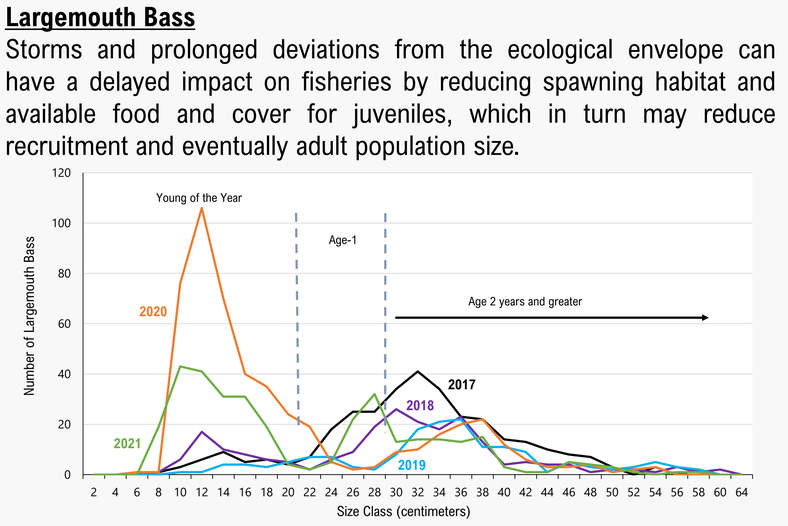


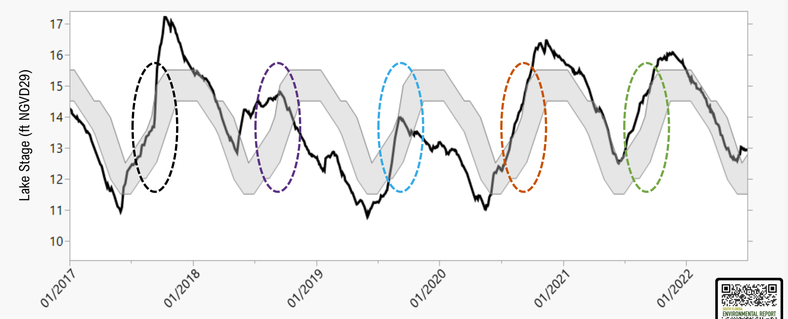




Largemouth Bass

Storms and prolonged deviations from the ecological envelope can have a delayed impact on fisheries by reducing spawning habitat and available food and cover for juveniles, which in turn may reduce recruitment and eventually adult population size.





SCAN ME

CHAPTER 9:

Kissimmee River Restoration and Other Kissimmee Basin Initiatives

Steve Bousquin, Kissimmee River Restoration Evaluation Program (KRREP)

THE PURPOSE OF CHAPTER 9

Chapter 9 reports progress toward the hydrologic and ecological goals of the Kissimmee River Restoration (KRR) Project

- **Components of the KRR include:**
  - **Construction (USACE)**
  - **Engineering (USACE)**
  - **Land acquisition (SFWMD)**
  - **Restoration evaluation (SFWMD)**

THE KISSIMMEE RIVER RESTORATION EVALUATION PROGRAM (KRREP)

The District's Kissimmee River Restoration Evaluation Program (KRREP):

- **Conducts scientific monitoring and evaluations of the success of KRR**
- **Reports findings in SFER and peer-reviewed publications**
- **Develops strategies for improvement**
- **Will conduct final project success evaluations after HRS is fully implemented**
- **Restoration evaluation is a mandated component of KRR**

SUMMARY OF ECOLOGICAL RESPONSES TO DATE

- **Success to date has been limited to river channel metrics, while ecological response on the floodplain needs improvement in hydrology**
- **This is because flow has been nearly continuous in the Phase I area since 2001, while floodplain inundation has been inadequate**
- **Future success is dependent on the following:**
  - **The additional storage that will be provided by phased implementation of HRS**
  - **Our ability to put water on the Kissimmee River floodplain at historic durations and frequencies**

RECENT KRR MILESTONES

KRR construction was completed in 2021

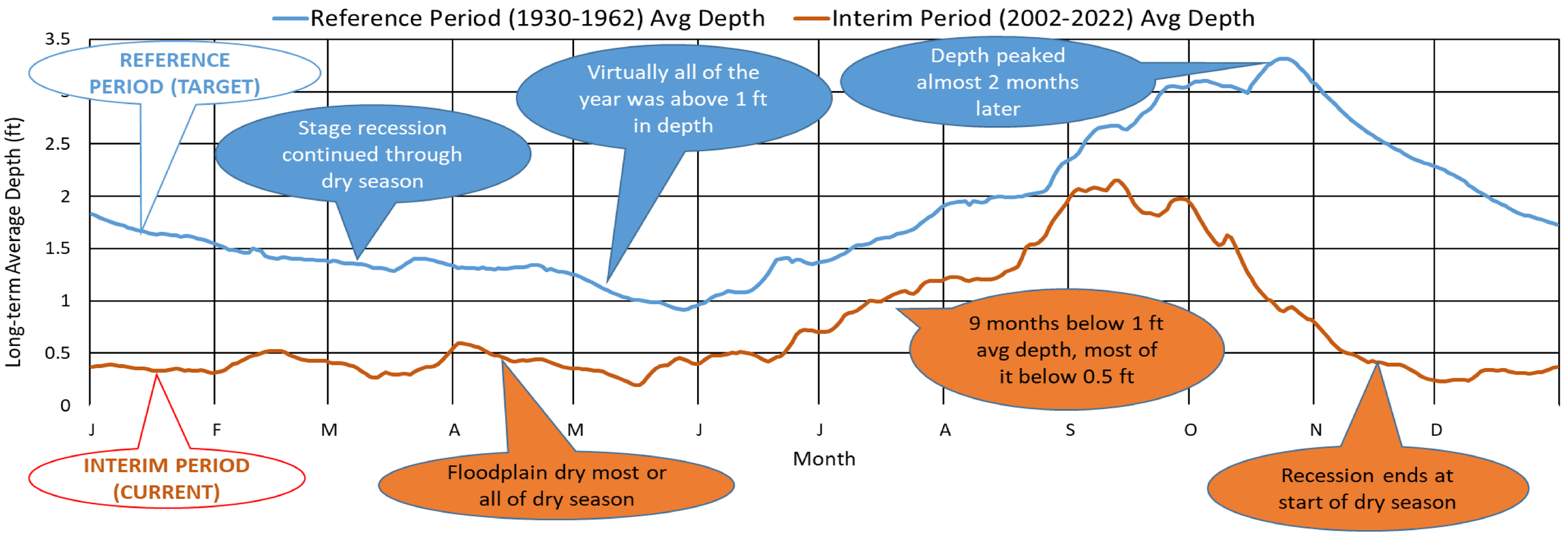
- **Repairs are ongoing**
- **Completion of construction sets the stage for:**
  - **Gradual implementation of the Headwaters Revitalization Schedule (HRS) starting in 2023**
  - **Improved water management for river and floodplain restoration**

Treatment of invasive vegetation to control incursions of invasive grasses begins in 2023

- **Monitoring of herbicide effects will be ongoing to determine the most effective methods**

RECOVERY STATUS (General Summary of Performance Measures)	AREA	METRIC CLASS
Good	River Channel	Hydrology
		Invertebrate Communities
		Vegetation
		Geomorphology
Needs Improvement	Floodplain	Bass Populations
		Wading Bird Abundance
		Waterfowl Abundance
		Dissolved Oxygen
		Hydrology
		Vegetation
	River Channel	Bass Populations
Not Currently Sampled	Floodplain	Invertebrate Communities
		Herpetofaunal Communities

WHY FLOODPLAIN RESPONSE HAS BEEN SLOW TO DATE



SOLUTIONS

- **In addition to continuous flow, sustained periods of higher flow are needed to restore a recurring annual flood pulse to the floodplain**
- **More and longer floodplain inundation are needed, with slower transitions to a dry floodplain**
- **A completely inundated floodplain is not necessary every year, but when rainfall presents opportunities, we must take advantage of it to ultimately achieve floodplain restoration**

ENVIRONMENTAL REPORT

SCAN ME

The photo sequence below illustrates the approximate annual cycle of drying and flooding comprising a flood pulse: (a) Floodplain drying down with a "drying pool" attracting wading birds; (b) flow contained in river channel; (c) floodplain fully inundated