

Everglades Restoration and Water Quality

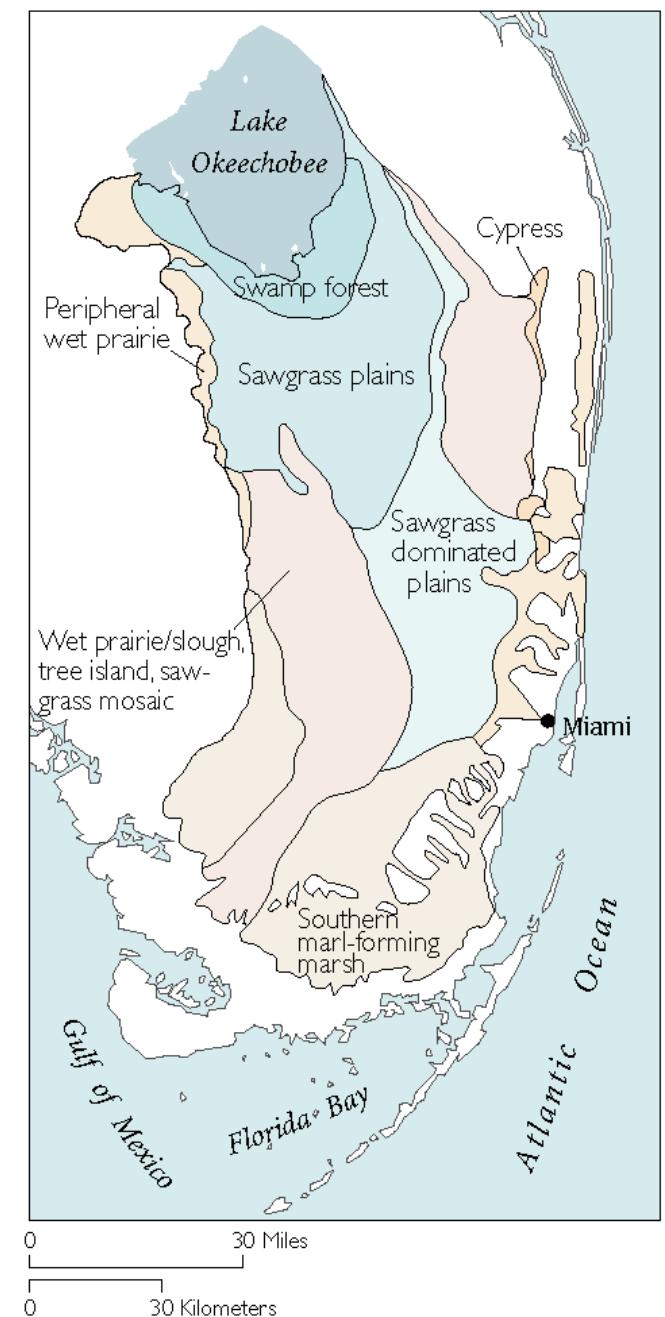
Paul Julian
Florida Native Plant Society

Historic Everglades

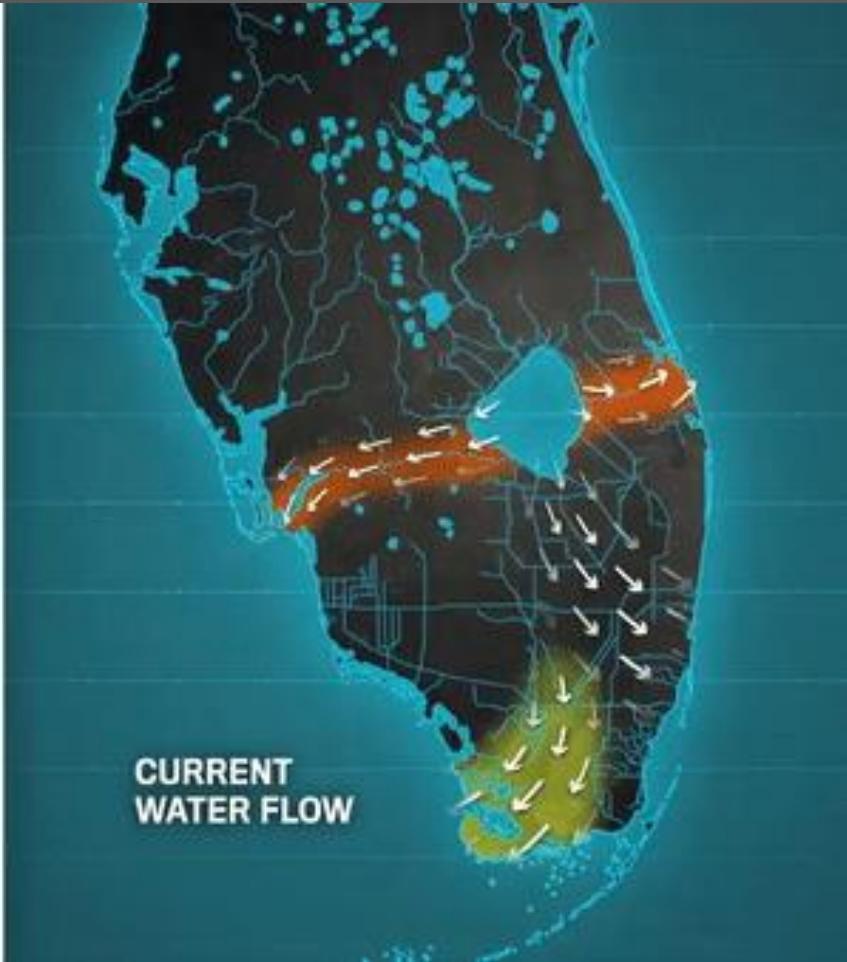
River of Grass



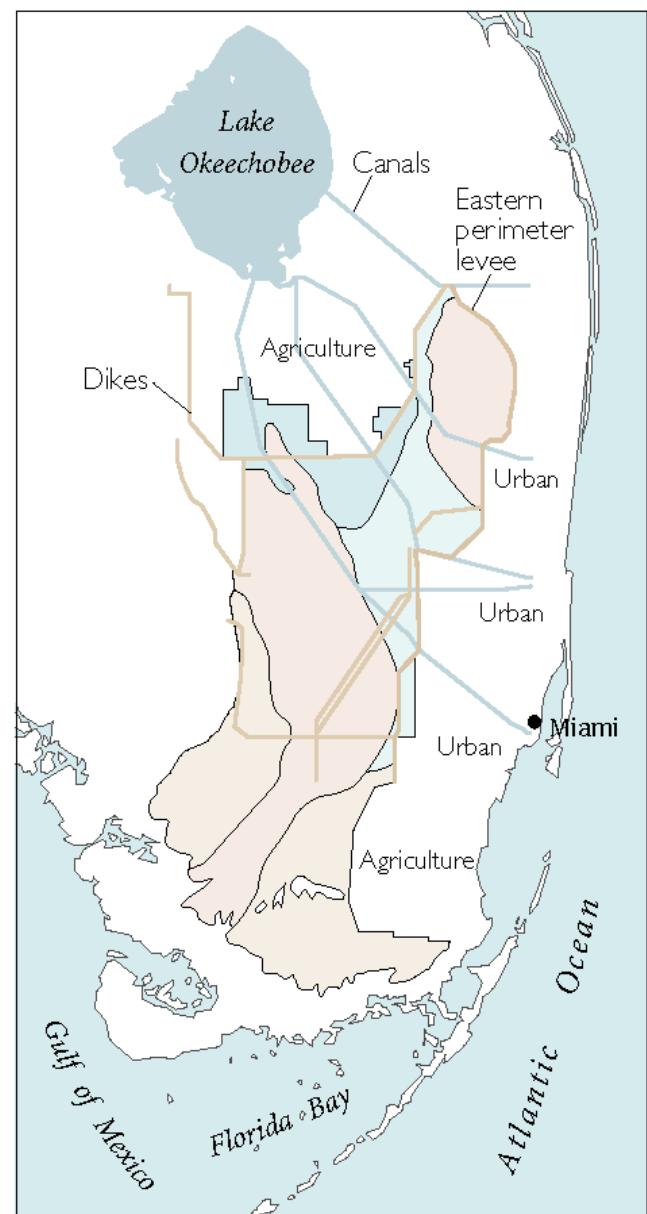
HISTORIC EVERGLADES VEGETATION (ca. 1900)



Current Everglades



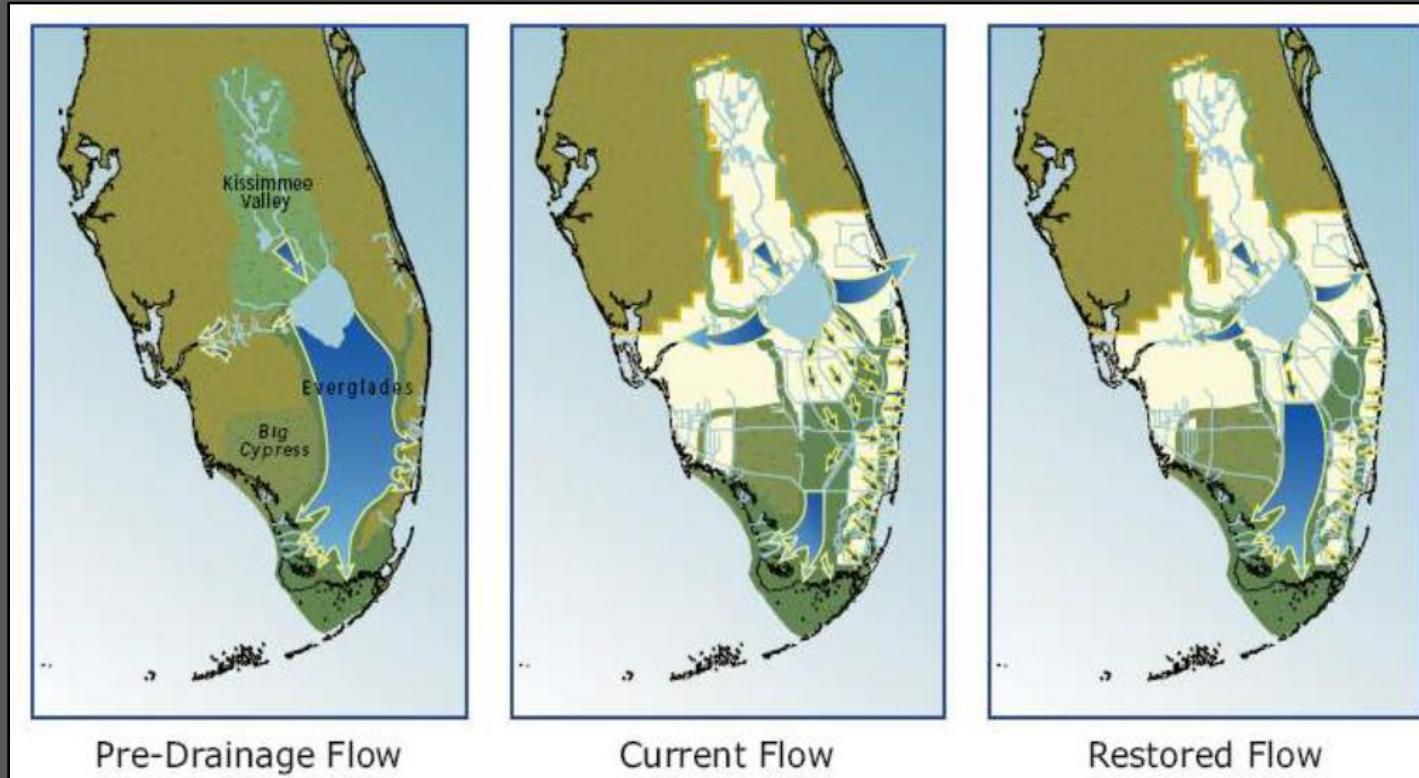
CURRENT EVERGLADES VEGETATION (ca. 1990)



(Vegetation from Davis and Odgen, 1994)

Overview of Restoration Efforts

Restore, Protect and Preserve Water Resources



Overview of Restoration Efforts

Restore, Protect and Preserve Water Resources

Comprehensive Everglades Restoration Plan (CERP)

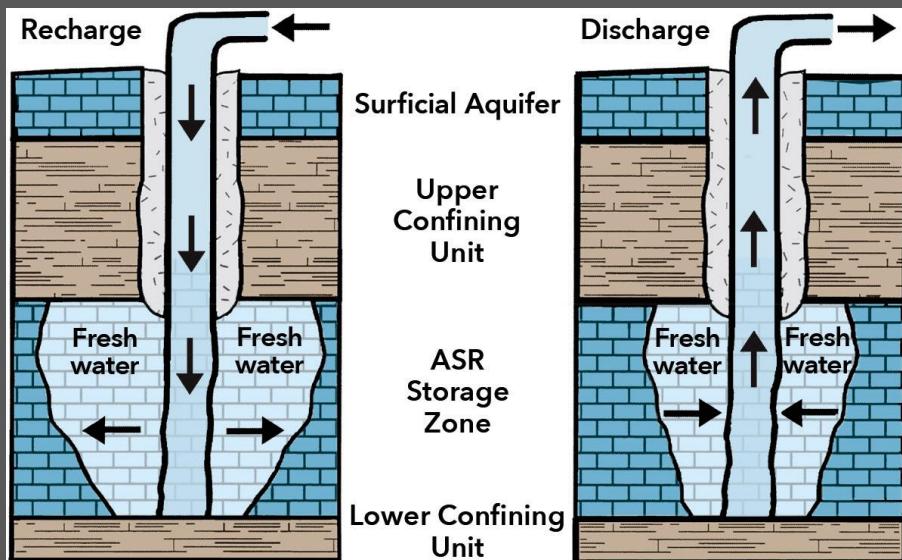
- Authorized 2000 (Dec. 11, 2000)
- Initial cost 7.8 Billion USD*
 - 68 Individual elements
 - 4 Project types
 - Above-ground storage
 - Underground storage
 - Water management
 - Conveyance
- 30+ year implementation
- State-Federal cost share



Overview of Restoration Efforts

Storage

Aquifer Storage and Recovery



Kissimmee River ASR System components.
Source USACE

Overview of Restoration Efforts

Storage

Above-ground storage



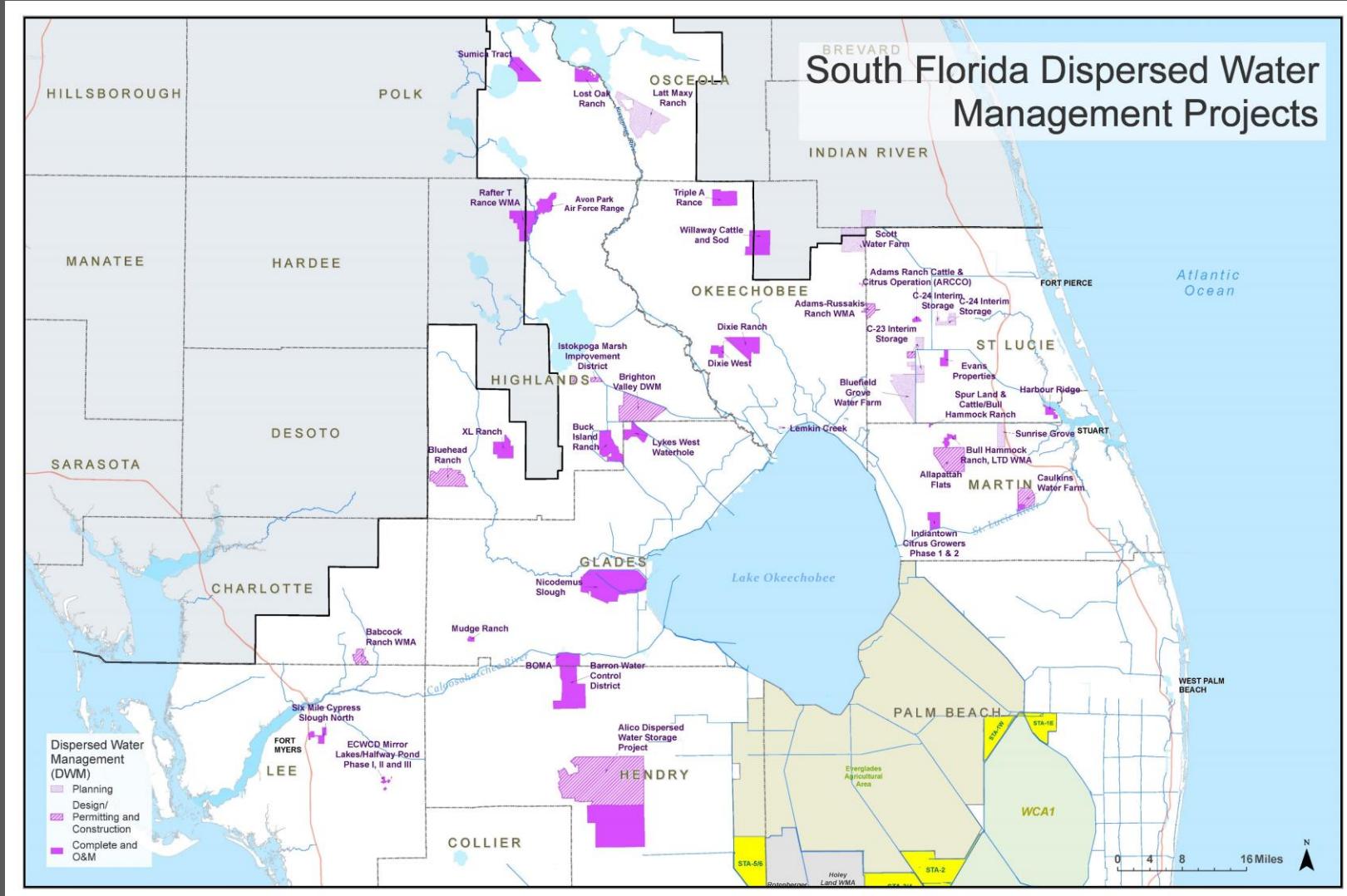
L-8 Flow
Equalization
Basin.

Area:
~800 acres
Depth:
~55 ft
Storage:
~45,000 acre-feet

Source: SFWMD

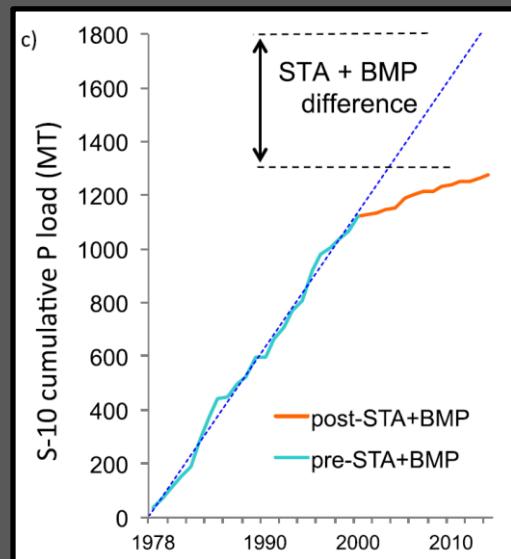
Overview of Restoration Efforts

Storage

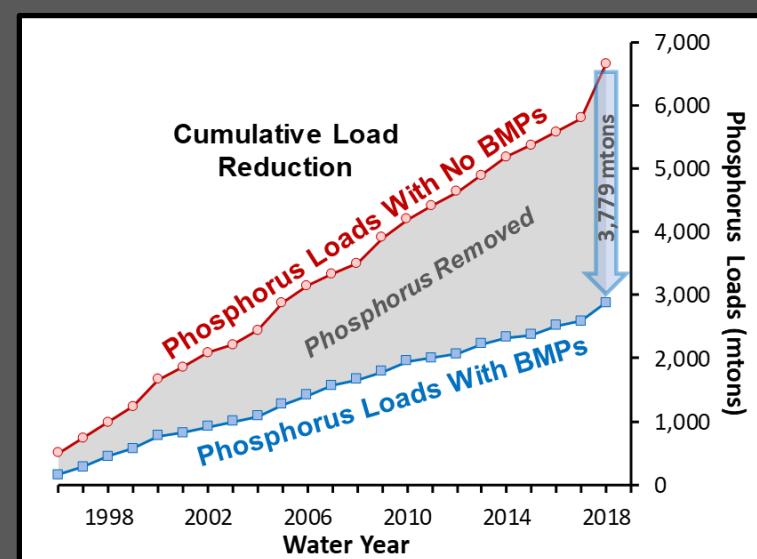


Overview of Restoration Efforts

Treatment



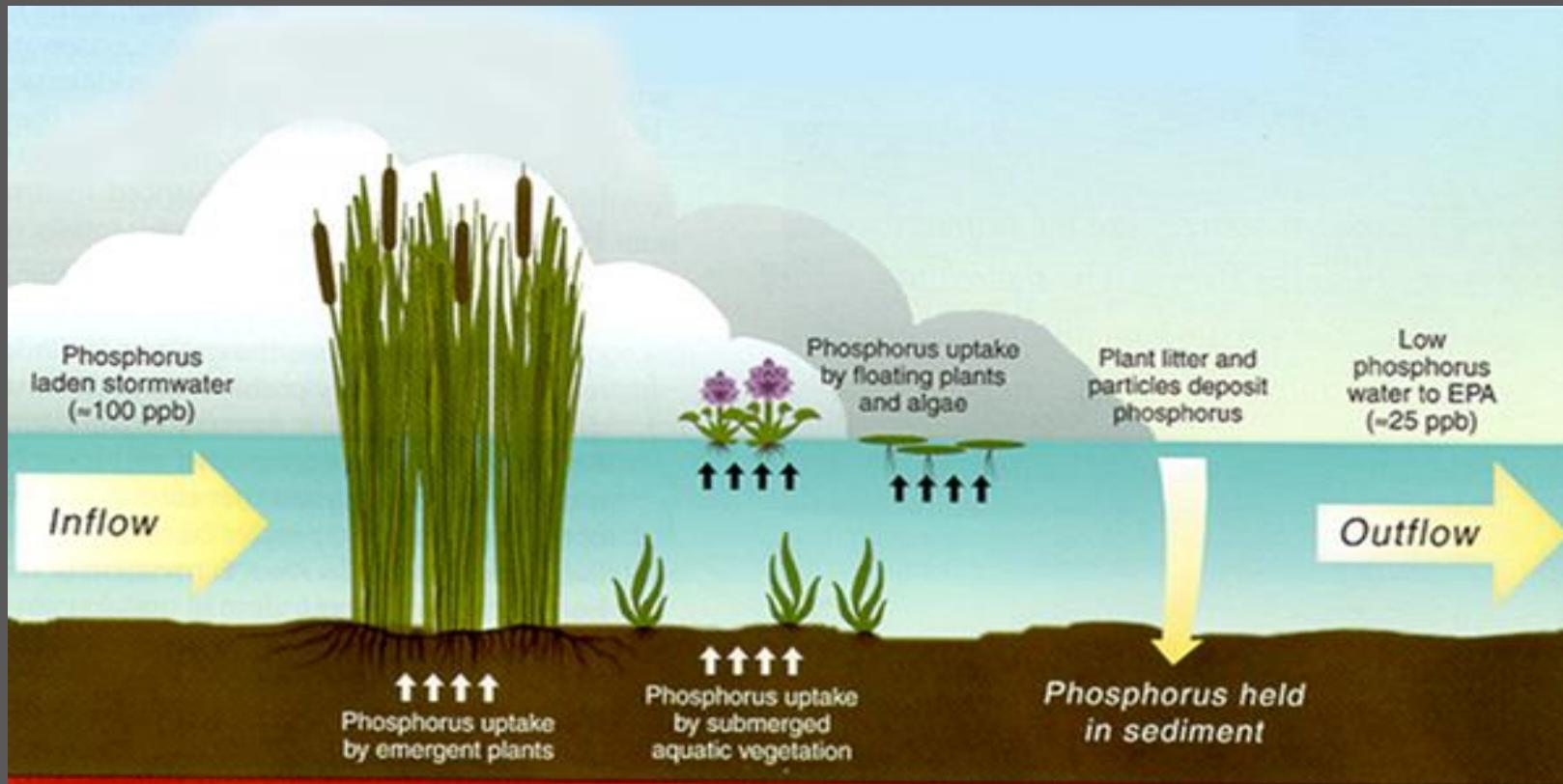
(Juston et al., 2015)



(SFWMD 2018)

Overview of Restoration Efforts

Treatment



Overview of Restoration Efforts

Treatment



Source: SFWMD



Source:
R Bhomia



Overview of Restoration Efforts

Treatment

Emergent Aquatic Vegetation



Cattail
(*Typha domingensis*)



Sawgrass
(*Cladium jamaicense*)



Spike-rush
(*Eleocharis palustris*)

Overview of Restoration Efforts

Treatment

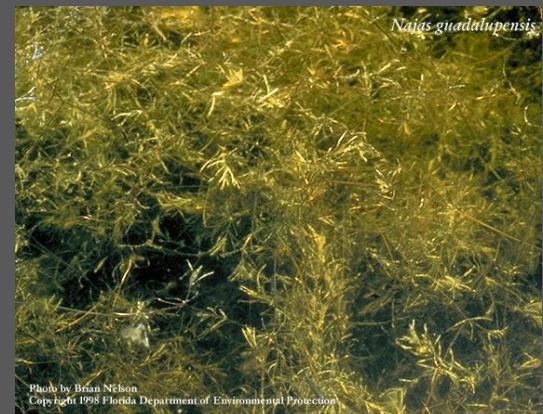
Submerged Aquatic Vegetation



Musk grass
(*Chara* spp.)



Coontail
(*Ceratophyllum demersum*)

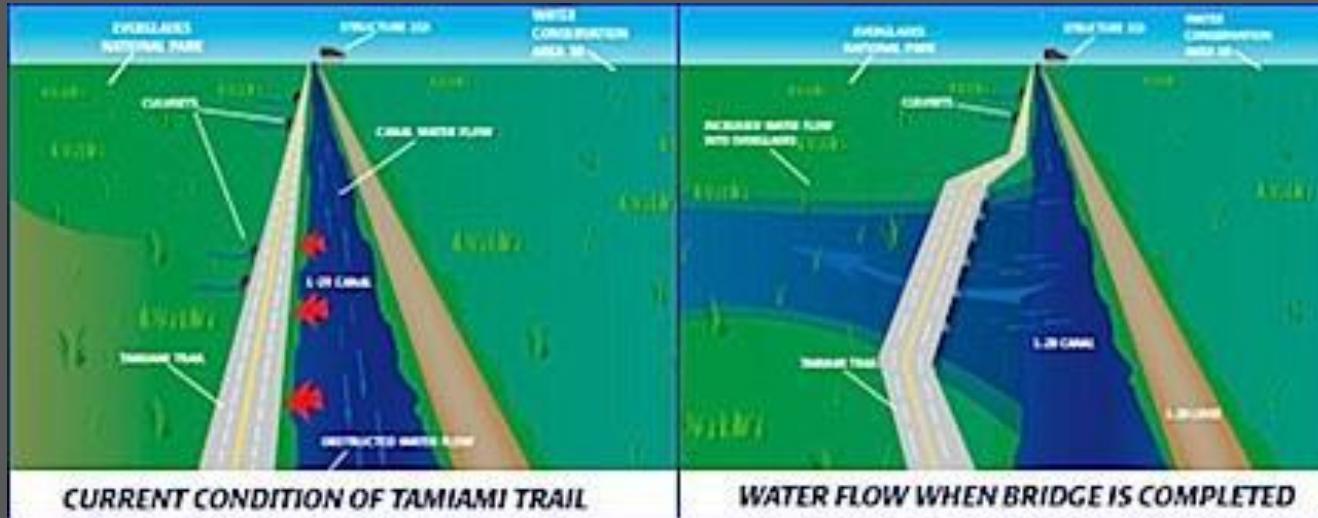


Southern naiad
(*Najas guadalupensis*)

Also Spiny naiad, Hydrilla, pondweed, and bladderworts to name a few.

Overview of Restoration Efforts

Conveyance and Distribution



Overview of Restoration Efforts

Conveyance and Distribution



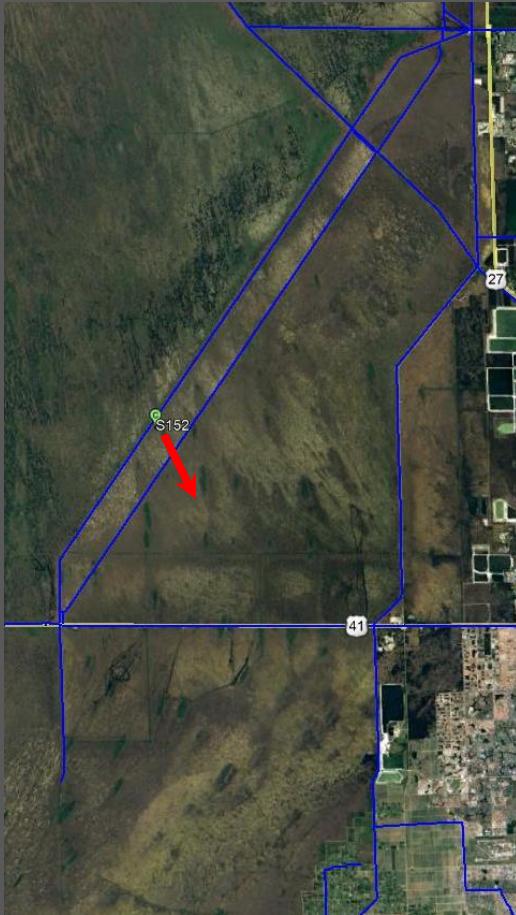
Overview of Restoration Efforts

Conveyance and Distribution



Overview of Restoration Efforts

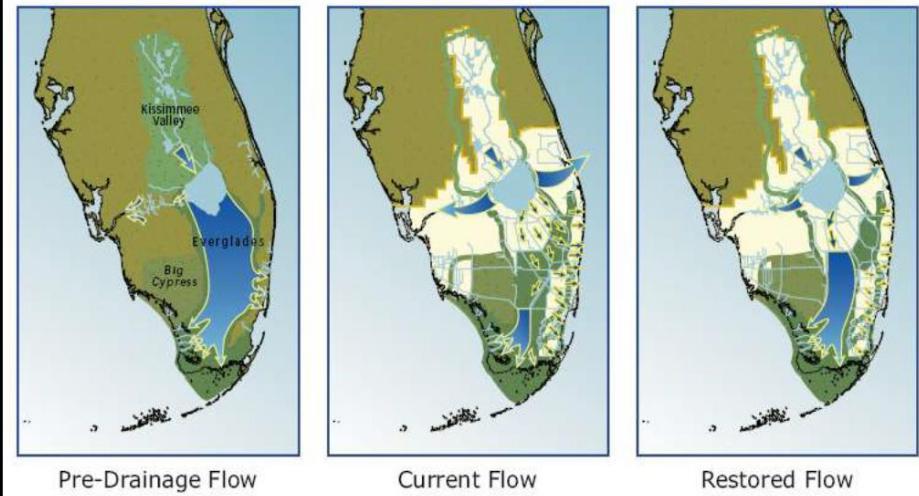
Conveyance and Distribution



Decompartmentalization Physical Model, Source USGS
Note: Fluorescent green color is a non-toxic tracer.

Overview of Restoration Efforts

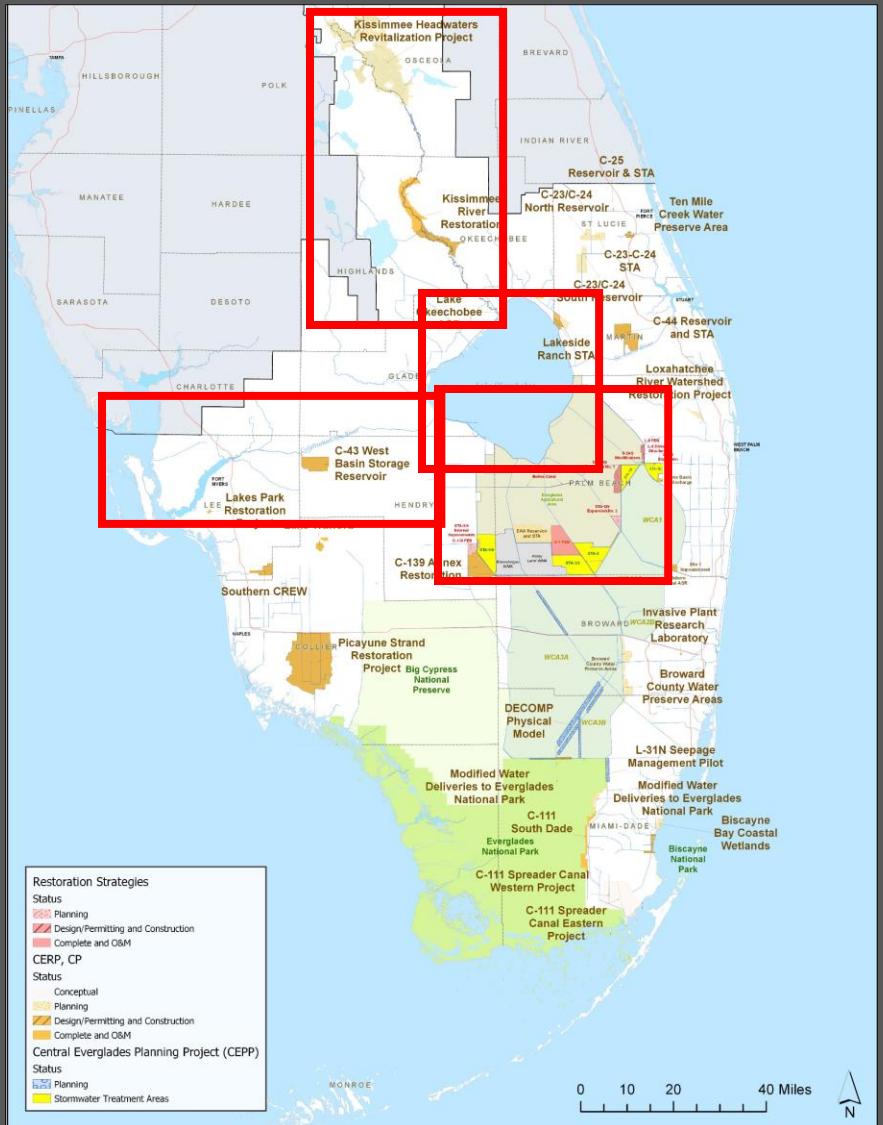
Restore, Protect and Preserve Water Resources



Everglades restoration will enable the right **quantity** of water, at the right **quality**, to be **distributed** to the right place, at the right **time** throughout south Florida.

This will be accomplished through the implementation of multiple projects that will work together to provide:

- Water Storage
- Water Treatment
- Water Conveyance
- Water Distribution



North of Lake Okeechobee Projects

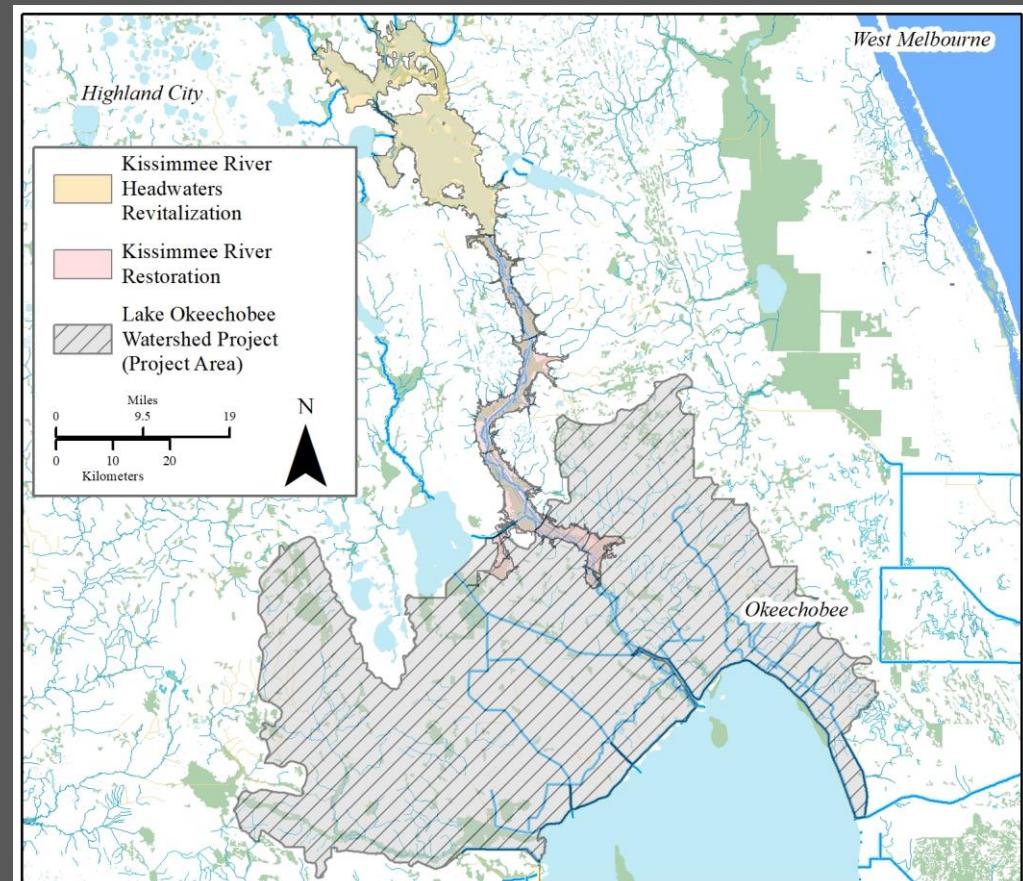
Kissimmee Restoration Project and Lake Okeechobee Watershed Restoration

- **Status**

- Kissimmee River Headwater Revitalization Project (Complete)
- Kissimmee River Restoration: Underway (Expected 2020)
- Lake Okeechobee Watershed Restoration: Planning underway (expected 2030)

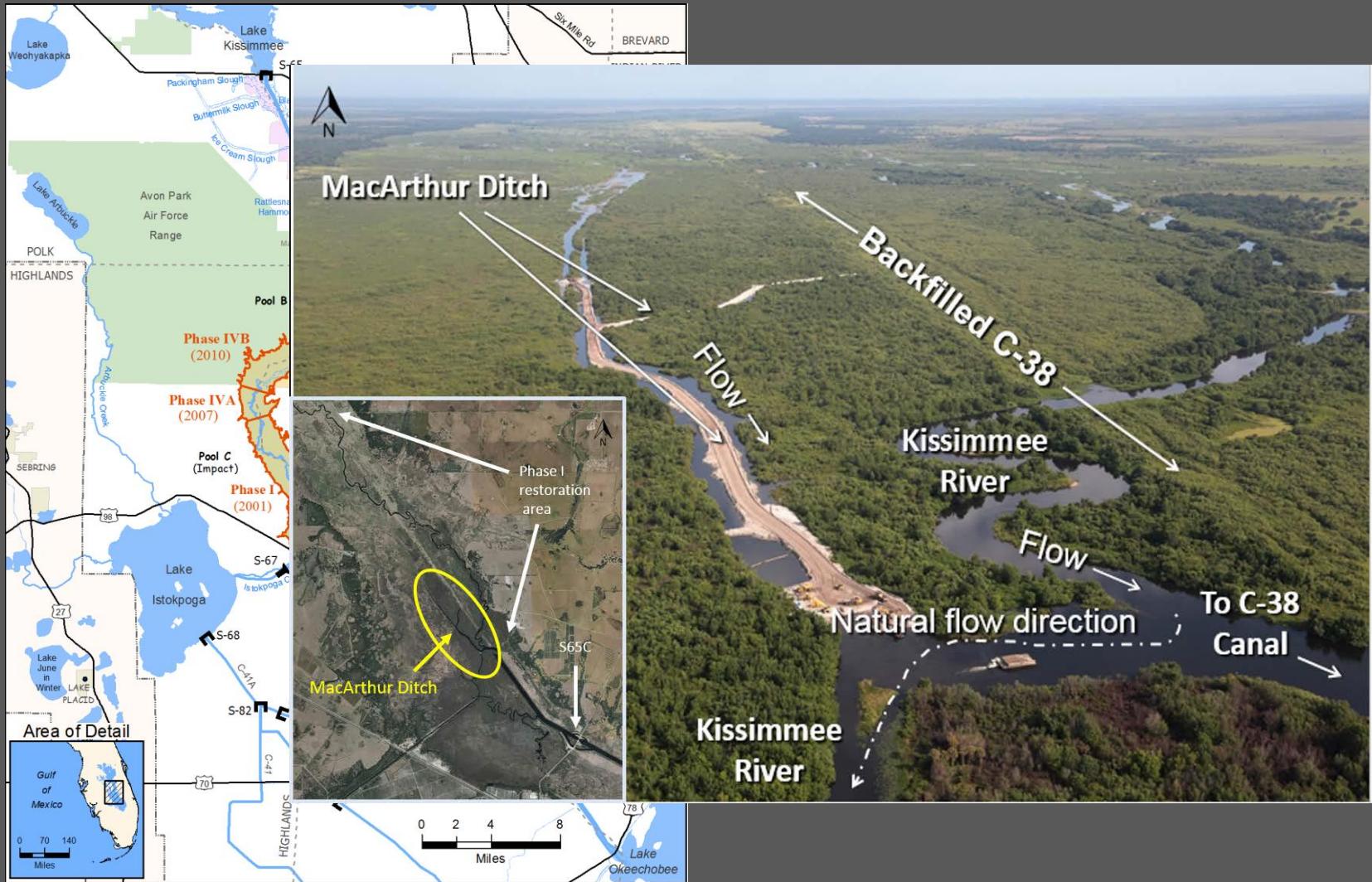
- **Combined Benefits**

- 710,000 acre feet of storage
(+~490,000 acre-feet planned LWP)
- 80,000 lbs TP removed annually
- 35,000 acres of wetlands restored
(+~5,300 acres planned LWP)



North of Lake Okeechobee Projects

Kissimmee Restoration Project and Lake Okeechobee Watershed Restoration



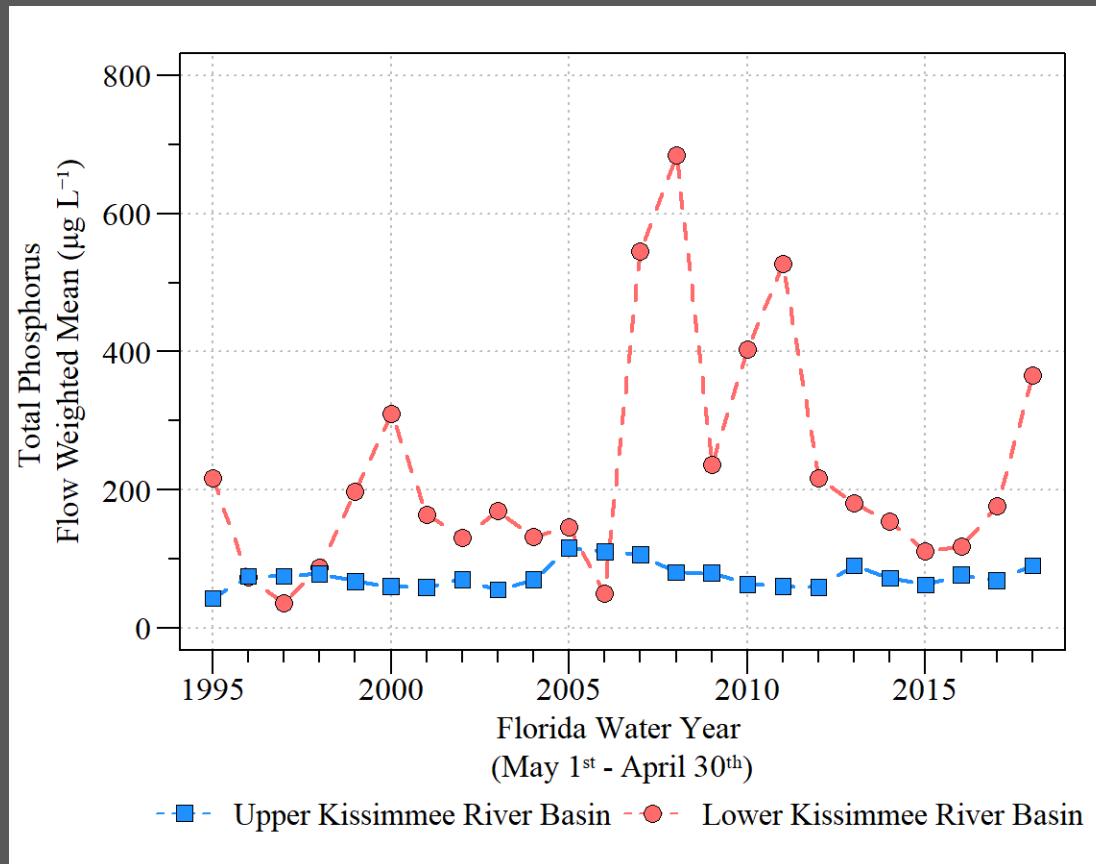
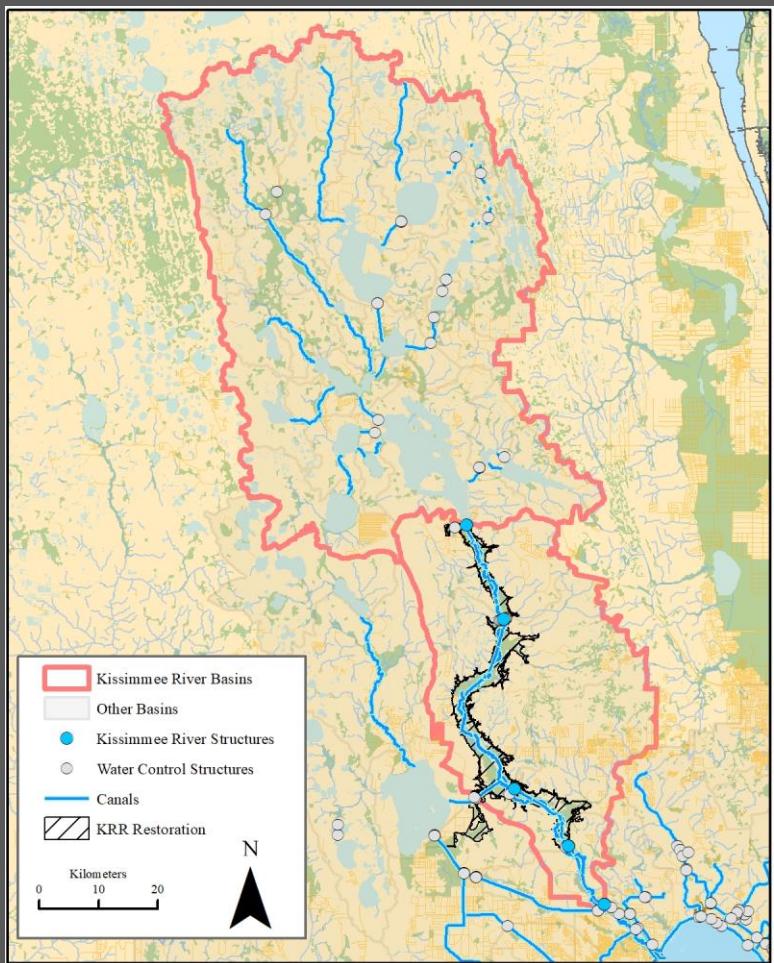
North of Lake Okeechobee Projects

Kissimmee Restoration Project and Lake Okeechobee Watershed Restoration



North of Lake Okeechobee Projects

Kissimmee Restoration Project and Lake Okeechobee Watershed Restoration



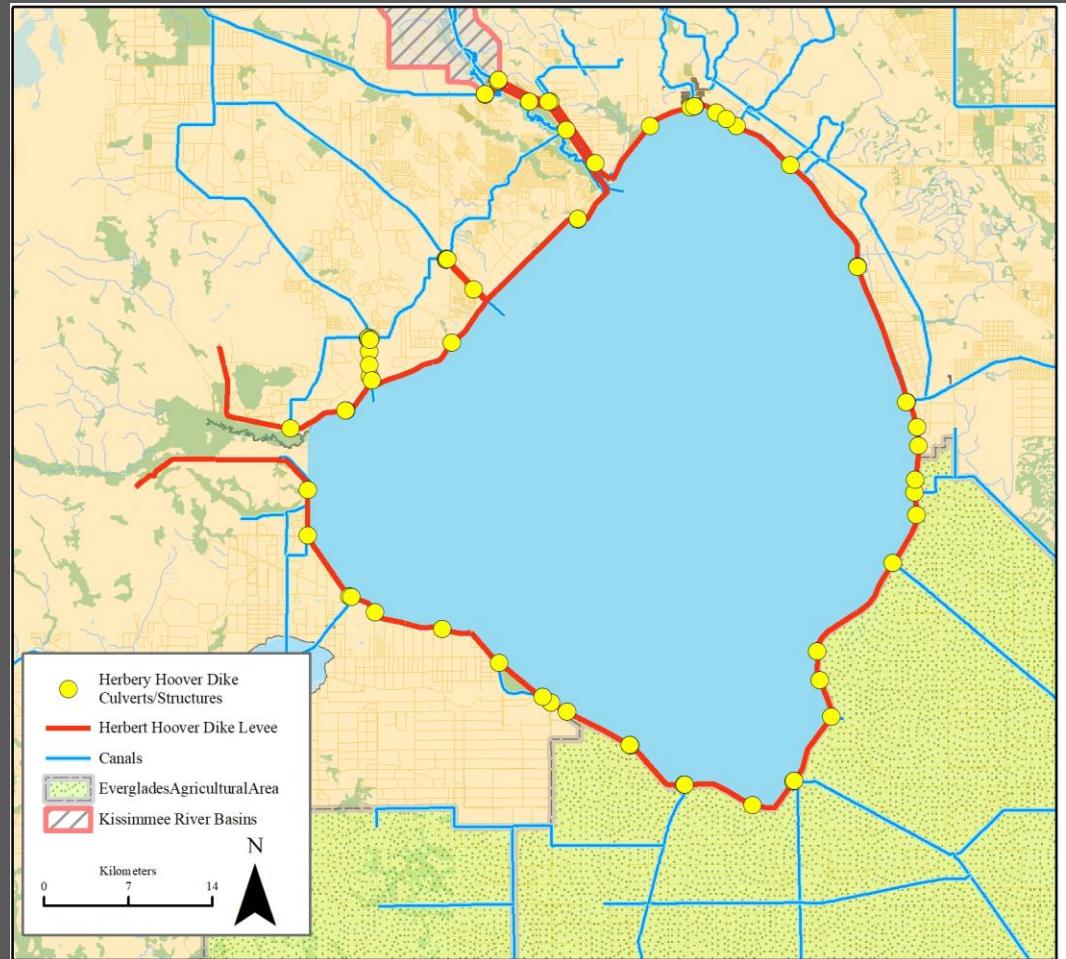
¹ $\mu\text{g L}^{-1}$ = parts-per-billion

² Data from SFWMD (www.sfwmd.gov/dbhydro).

Lake Okeechobee Projects

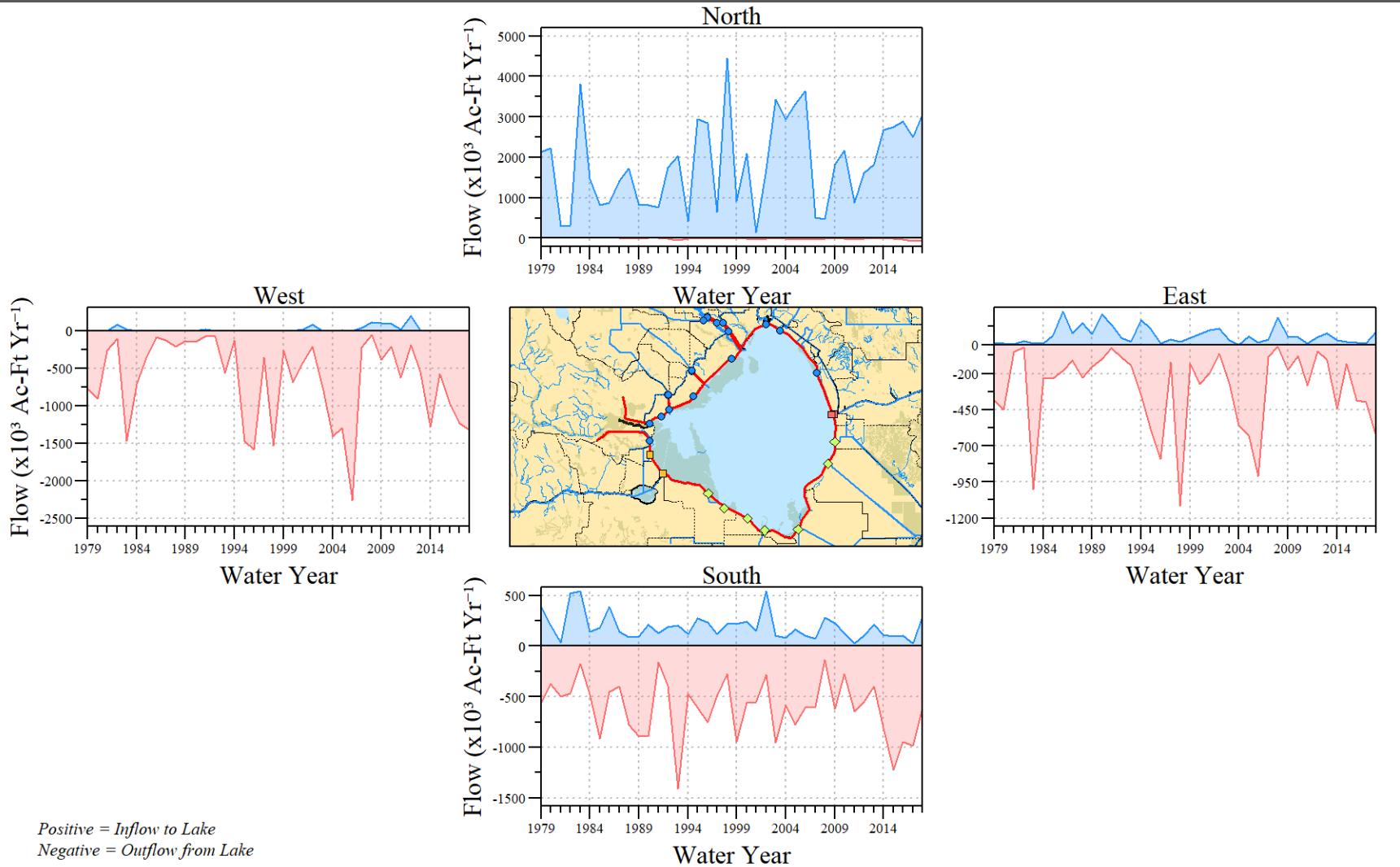
Herbert Hoover Dike Rehabilitation Project

- **Project Components**
 - Culvert replacement and repair
 - Levee improvements
- **Status**
 - Final construction contract to be issued 2019
 - Expedited by State's contributions
 - LORS planning anticipated to start next month



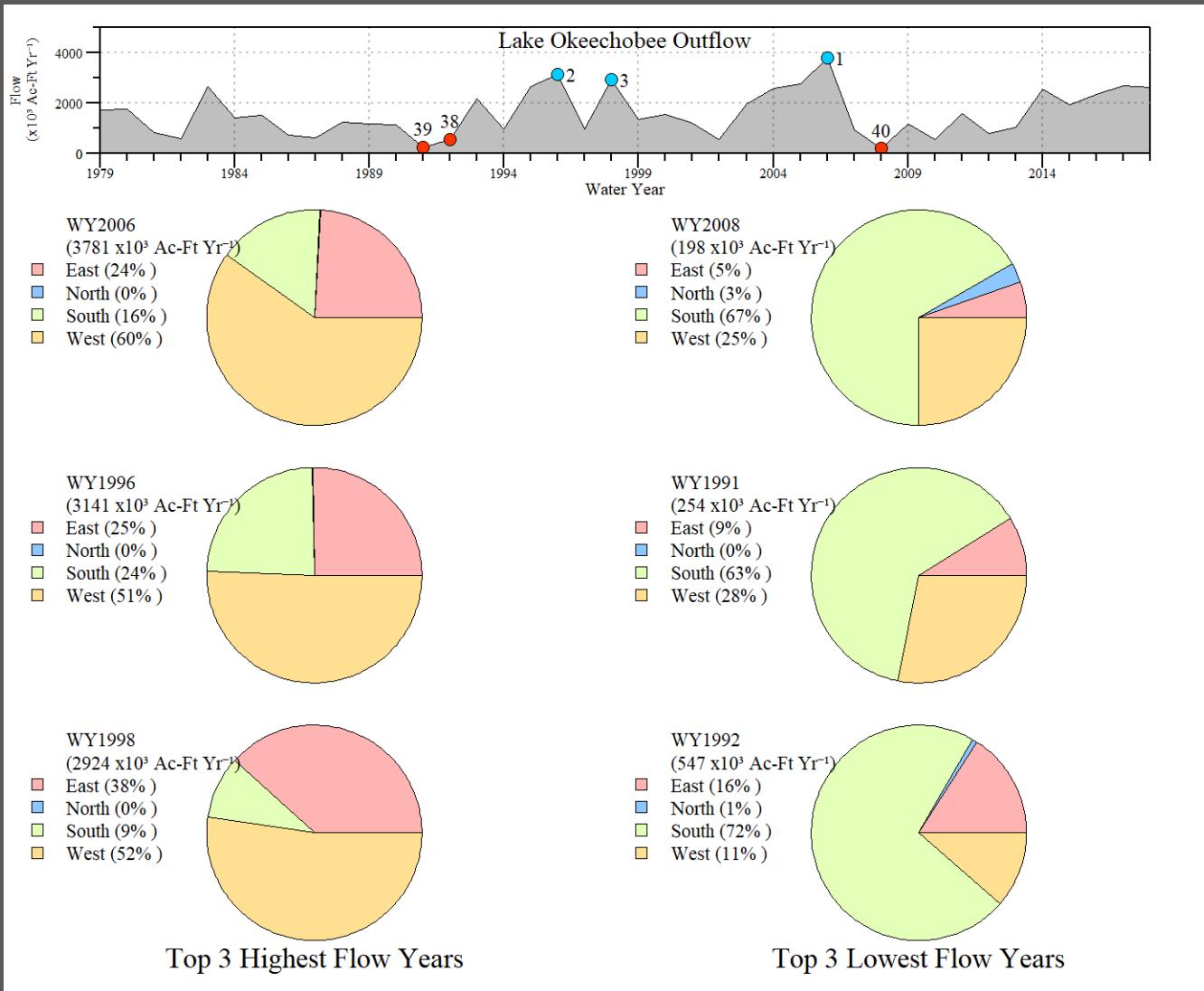
Lake Okeechobee

Surface Water Flow



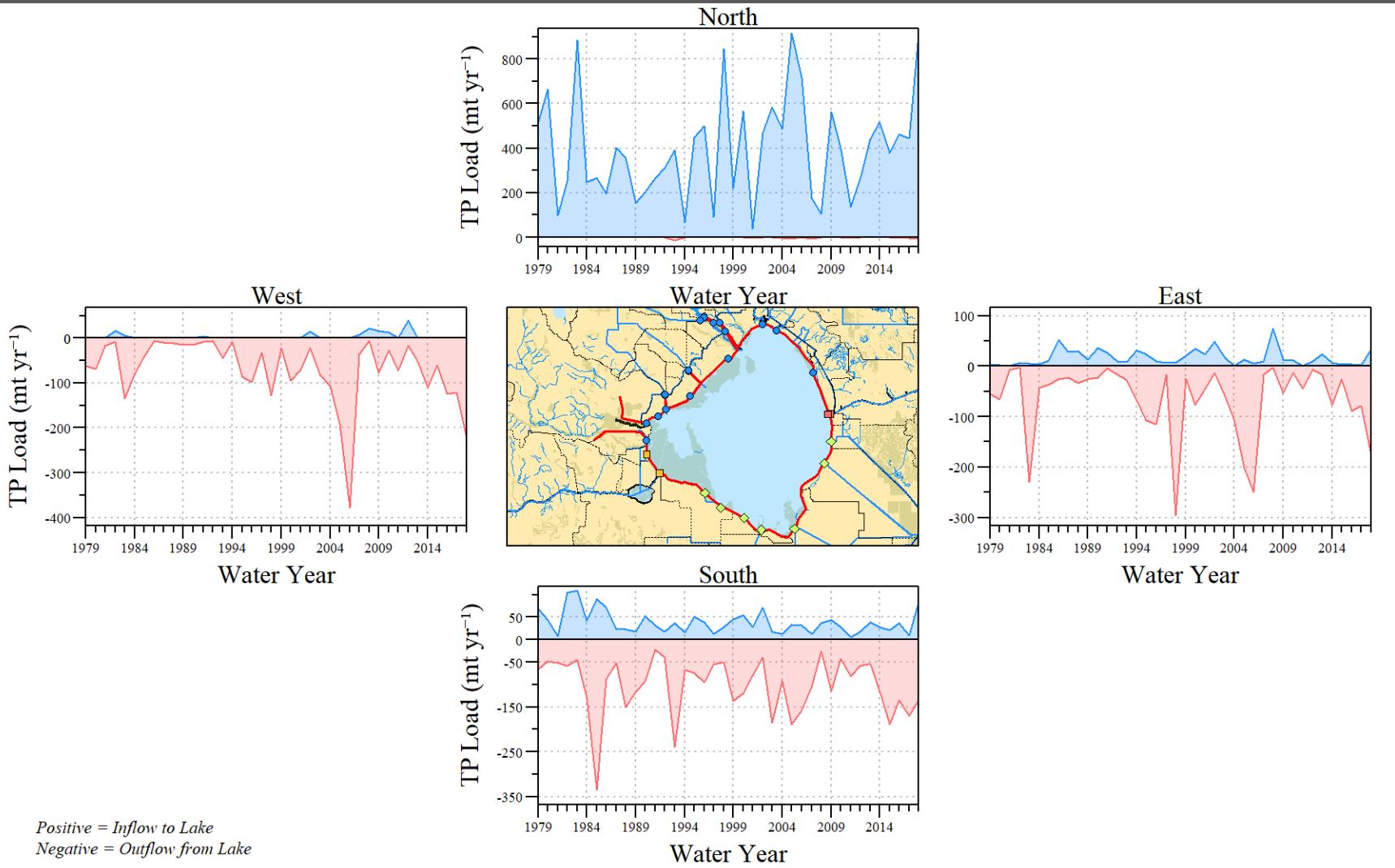
Lake Okeechobee

Surface Water Flow



Lake Okeechobee

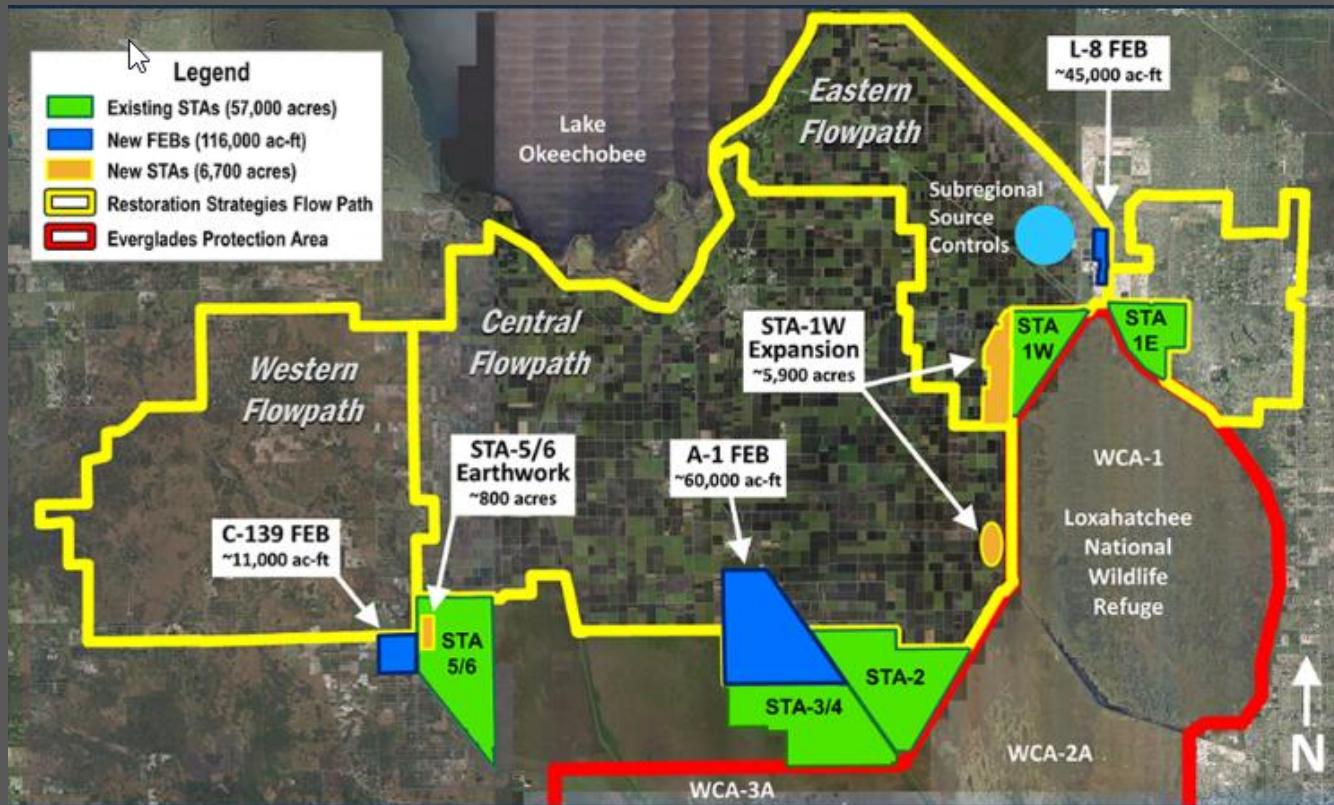
Total Phosphorus Load



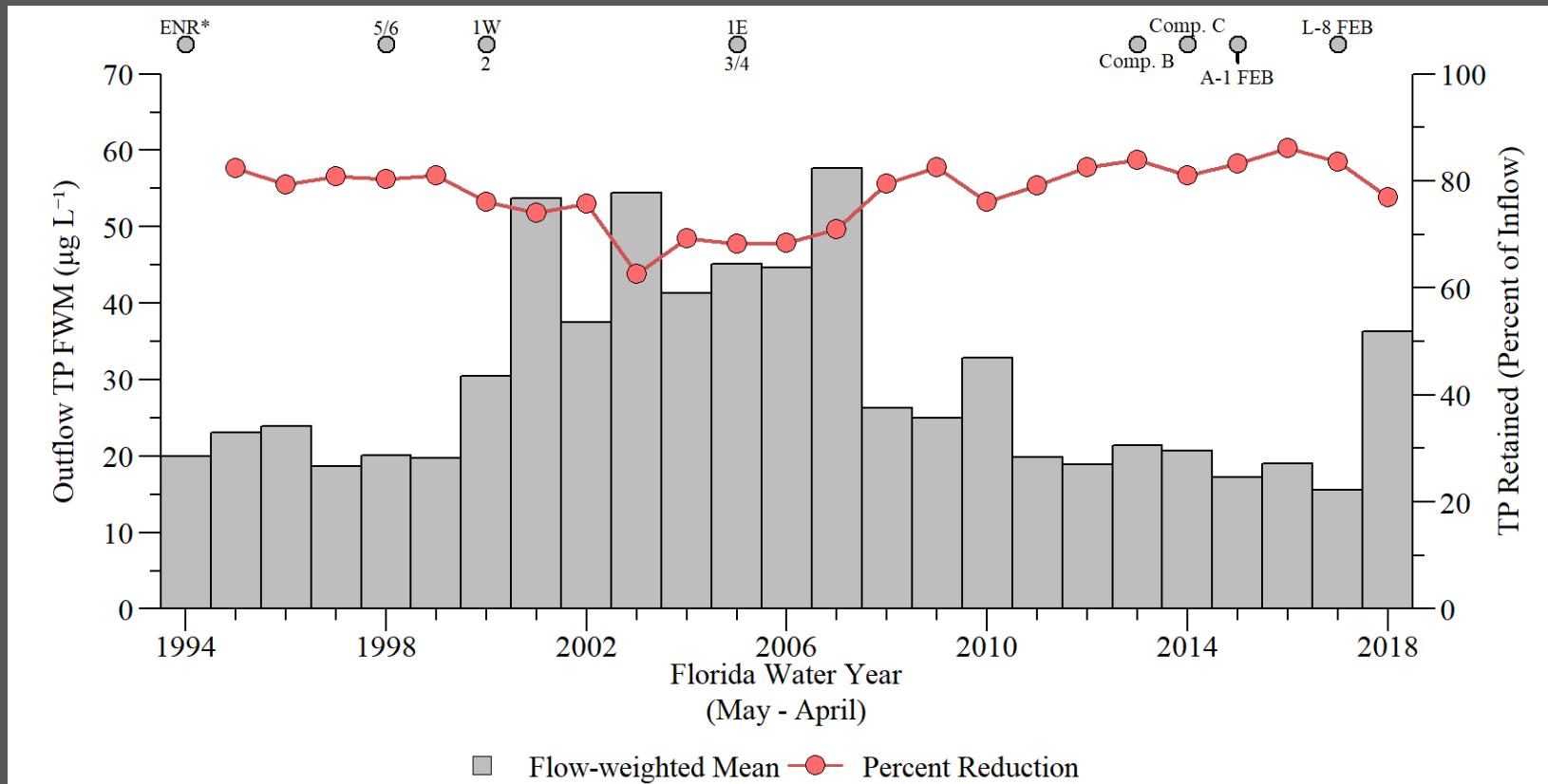
Restoration Strategies

Water Quality Improvement Project for America's Everglades

- Construction of the treatment, storage and conveyance improvement projects complete by 2025.
- Several projects are already operational, under construction or under design.

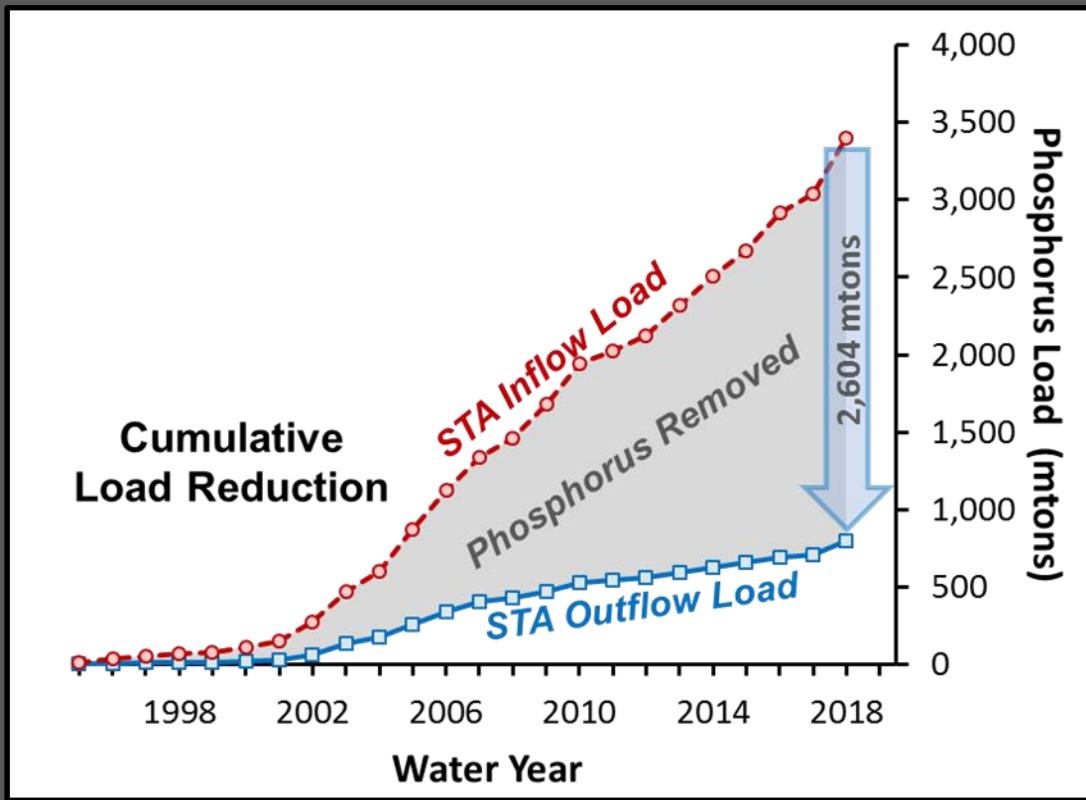


Everglades Stormwater Treatment Areas



- To date (circa May 2018) STAs removed 2,604 metric tons of P
- Approximately 5,700 acres of treatment
- Additional treatment area expected

Everglades Stormwater Treatment Areas



(SFWMD 2018)

Everglades Stormwater Treatment Areas

- To date (circa May 2018) STAs removed 2,604 metric tons of P



X 35

On average 1.25 Space Shuttles per year

Comprehensive Everglades Restoration Plan

EAA Reservoir and STA, Chapter 2017-10

- Status

- Design and Engineering underway
- USACE Review
(Expected early 2019)
- Expected completion
2026 -2028

- Benefits

- 370,000 acre feet of storage
- Expected TP removal



Northern Everglades and Estuaries Protection Plan

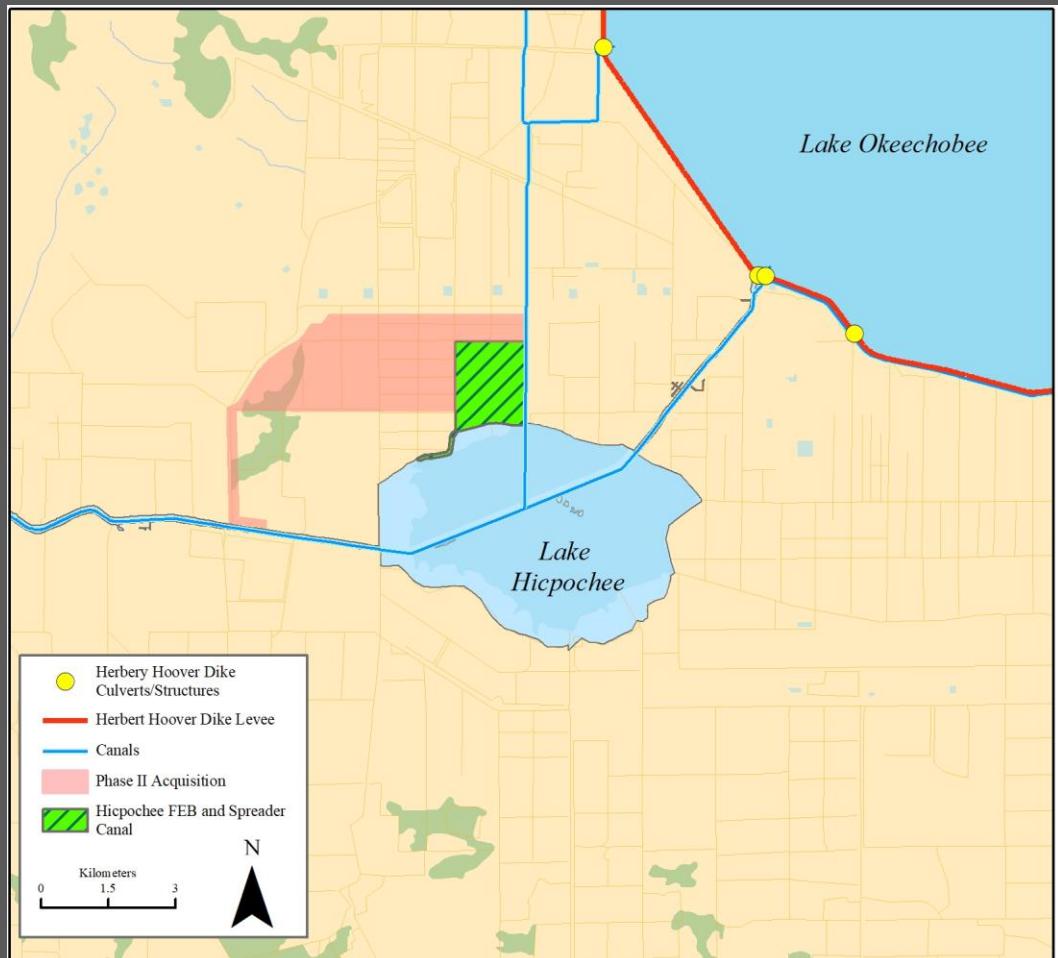
Lake Hicpochee Hydroperiod Restoration

- Status

- Authorized for Phase I construction (2016)
- Expected completion early-2019
- Funding to acquire Phase II secured (June 2018)

- Benefits

- Hydrate Lake Hicpochee
- 1280 acre feet of storage (+ ~9,000 acre-feet Phase II)
- Improve water quality

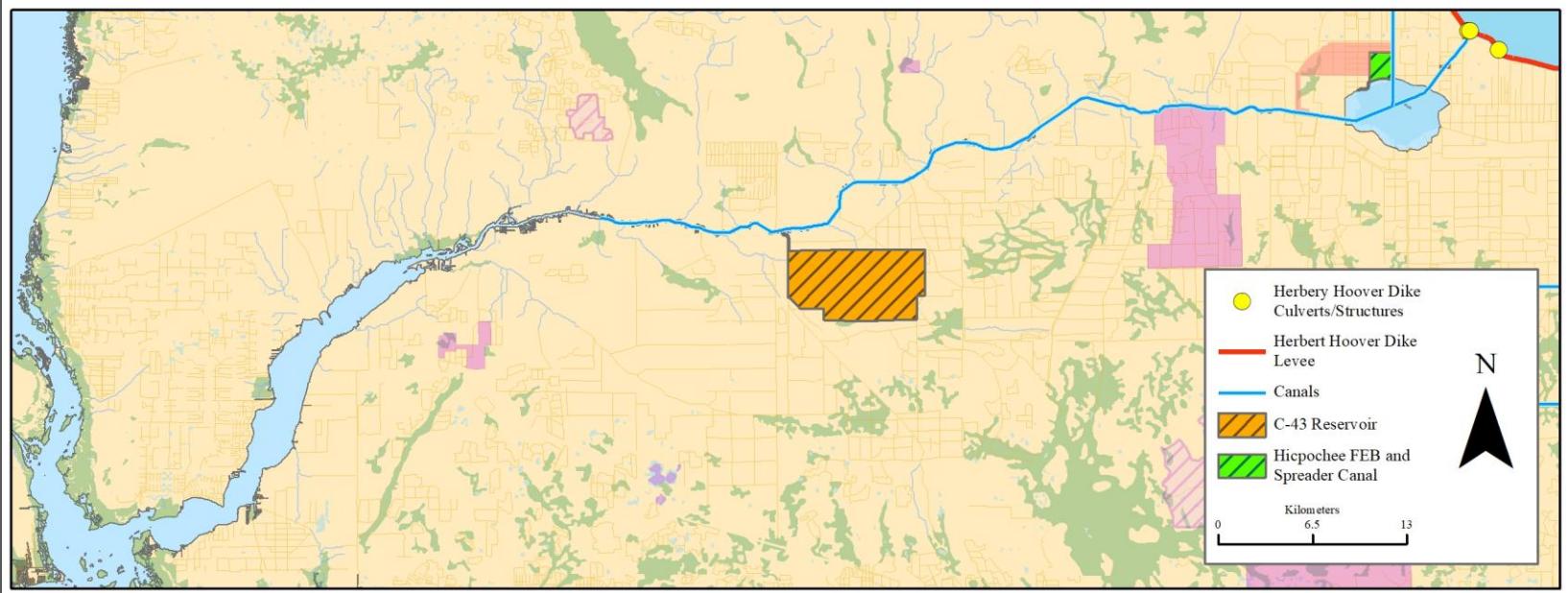


FEB = Flow Equalization Basin

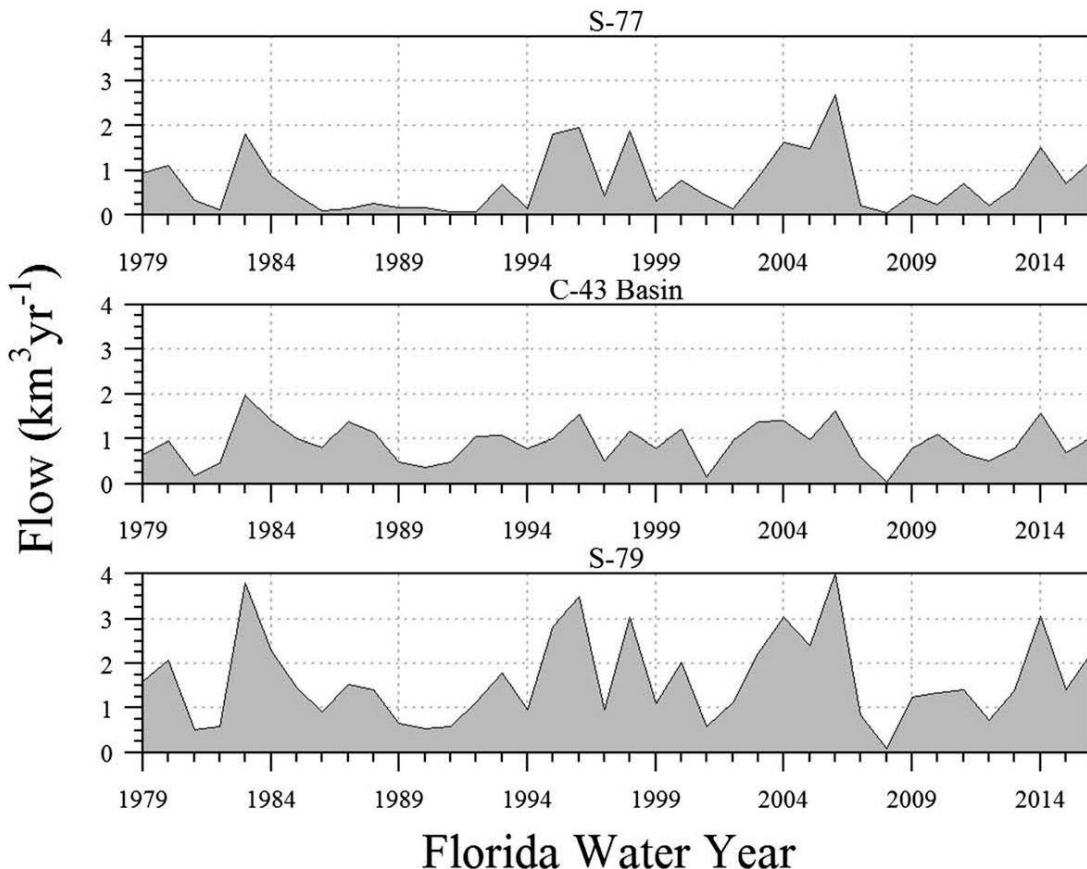
Comprehensive Everglades Restoration Plan

C-43 Reservoir

- Status
 - Construction ongoing
 - Final construction contract anticipated early 2019
 - Expected completion 2022
- Benefits
 - 170,000 acre feet of storage
 - 18,000 lbs TP removed annually
 - Expected 12% reduction in high flow events



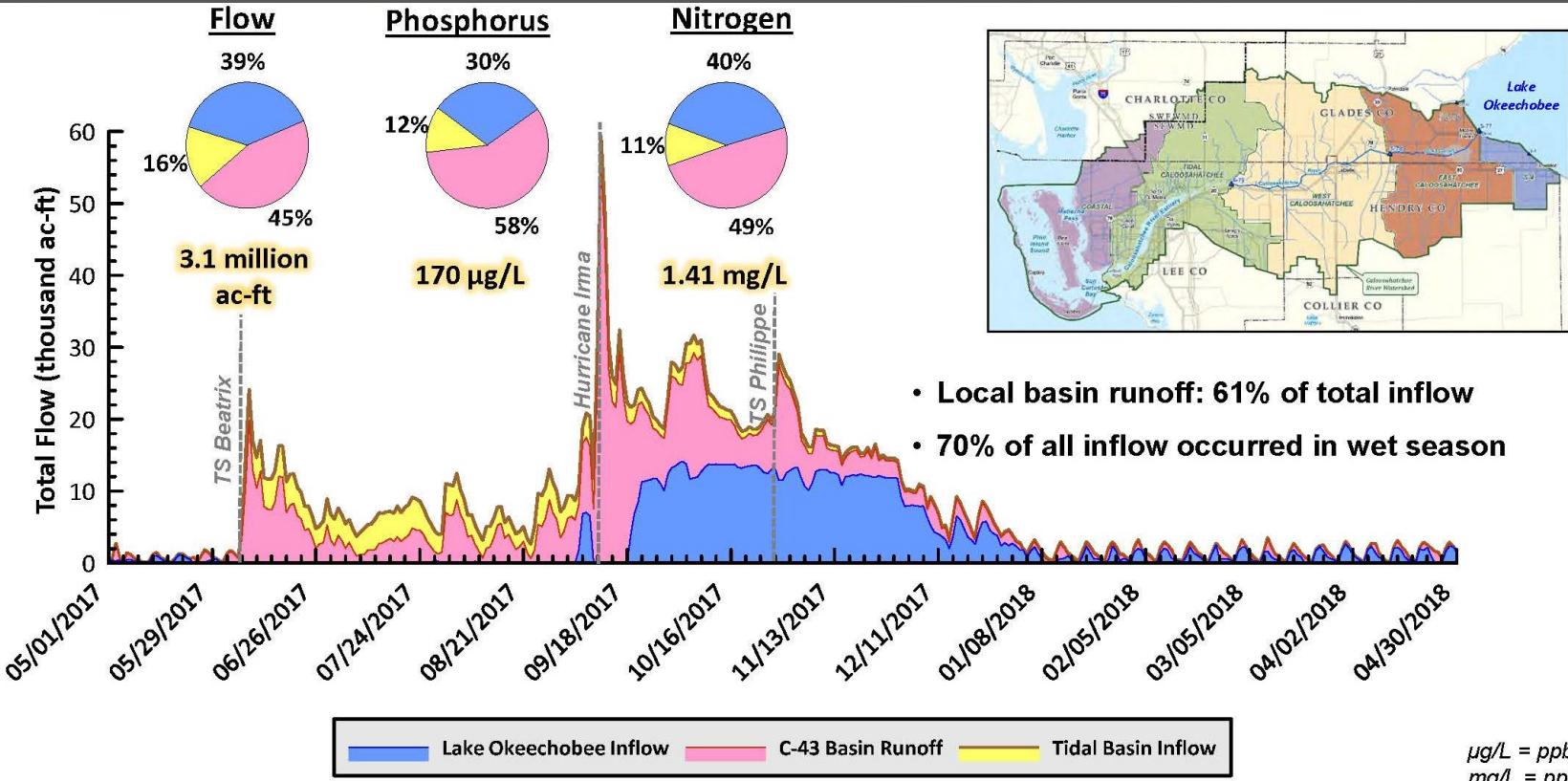
Caloosahatchee River/C-43 Canal



From
Lake Okeechobee

To Caloosahatchee
Estuary

Caloosahatchee River/C-43 Canal



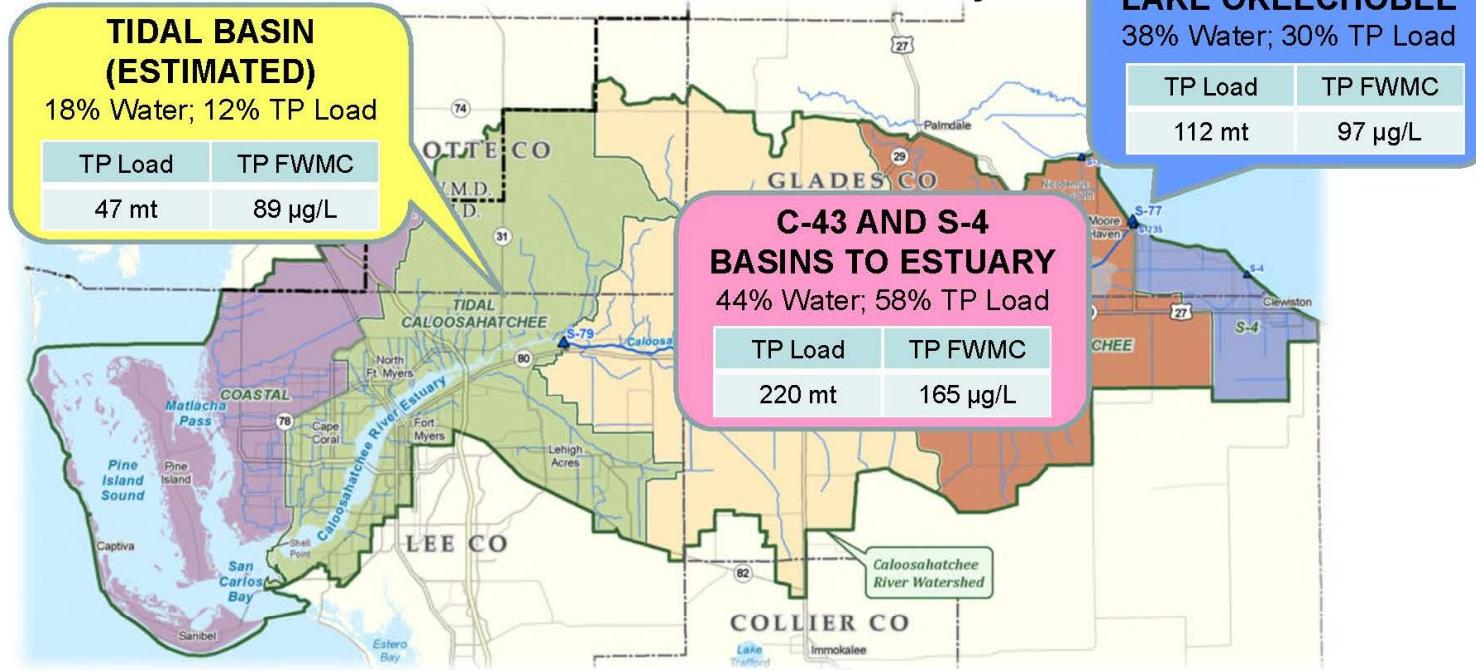
Year of Hurricane Irma

Caloosahatchee River/C-43 Canal

WY2014 - 2018

5-YEAR AVERAGE

Local Basin Runoff accounted for about 62% of flow
and 70% of TP load to Estuary



Note: Coastal Basin runoff (west of Shell Point) is not included as Estuary contribution.

Source: Draft 2019 South Florida Environmental Report, Appendix 8C-1

$\mu\text{g}/\text{L}$ = ppb

Wrap up

- **Restoration**
 - Increased wetland area (wetland restoration)
 - Reduce stormwater run-off
 - Improve timing and distribution of water
- **Storage**
 - Increased storage through a variety of projects (DWM, ASR, Reservoirs)
- **Treatment**
 - Reduction of nutrient concentrations from stormwater run-off
 - Water attenuation resulting in ancillary water quality benefits





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