SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Innovation for Restoration: The C-43 Water Quality Treatment and Testing Project

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Background

- **The Caloosahatchee River Estuary Total Maximum Daily Load requires a 23% reduction in total nitrogen (TN) loads.**
- **To date, there have been limited efforts to design treatment wetlands to optimize nitrogen removal from non-point runoff and surface waters to the low concentrations that may be needed to achieve this reduction, especially true for dissolved organic nitrogen (DON), which accounts for approximately 80% of the TN present throughout the Caloosahatchee River and Estuarine system.**
- **The SFWMD, in partnership with Lee County, is investigating optimization of wetland-based strategies for removal of TN, particularly DON, from Caloosahatchee River surface water with the objective of demonstrating and implementing cost-effective, wetland-based strategies for reducing TN loads to the river and its downstream estuary.**
- **Phase I of this multi-phased project is under way. Future phases involve scaled up demonstrations and a full scale treatment facility at the site.**
- **Nutrient reduction strategies that are identified and tested through this project may be applicable to other South Florida river and estuarine systems.**

Phase I Demonstrations

- **The first phase of ongoing demonstrations involve:**
  1. **Quantification of biologically available DON (BDON) though bioassays.**
  2. **Mesocosms to assess potential surface water nitrogen removal rates using different plant communities and hydrologic loading rates (HLR).**
- **Collectively, this information will inform the Phase II demonstrations focused on scaling up the most effective mesocosm treatments.**

Mesocosm Demonstrations

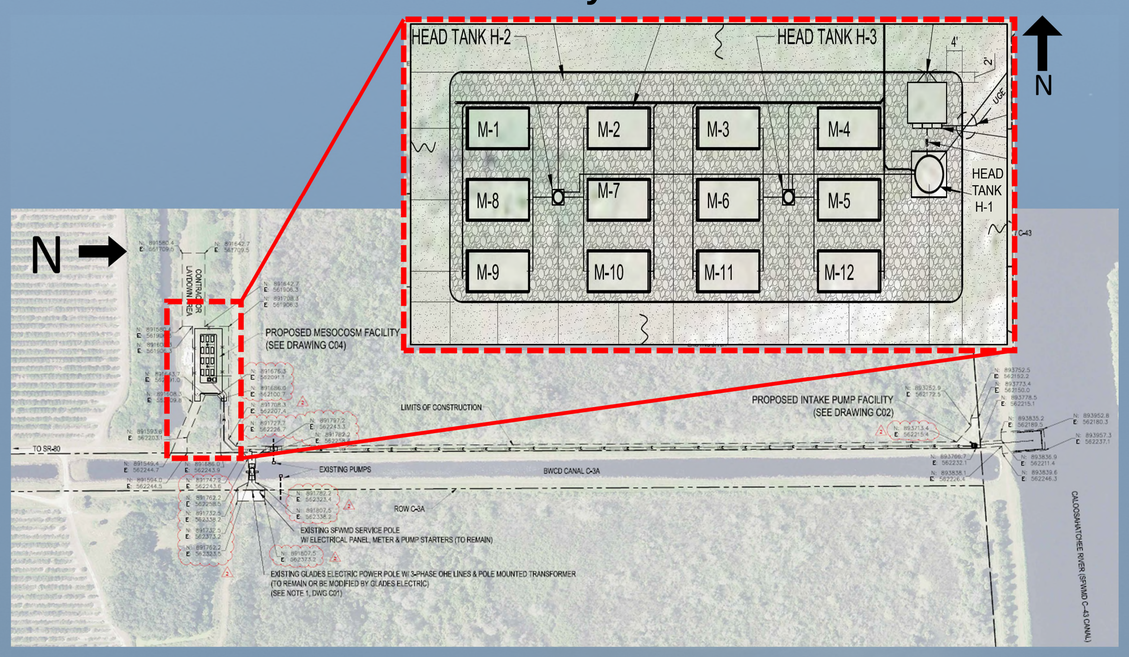
Objectives

1. Determine nitrogen removal rates in mesocosms with emergent vegetation (EMV) or submerged aquatic vegetation (SAV) communities under different hydraulic loading rates (i.e. mesocosm treatments).

2. Determine changes in BDON concentration after mesocosm treatment.

3. Develop a nitrogen mass balance model for each mesocosm treatment to determine long-term and short-term storage and removal potential.

Site Layout

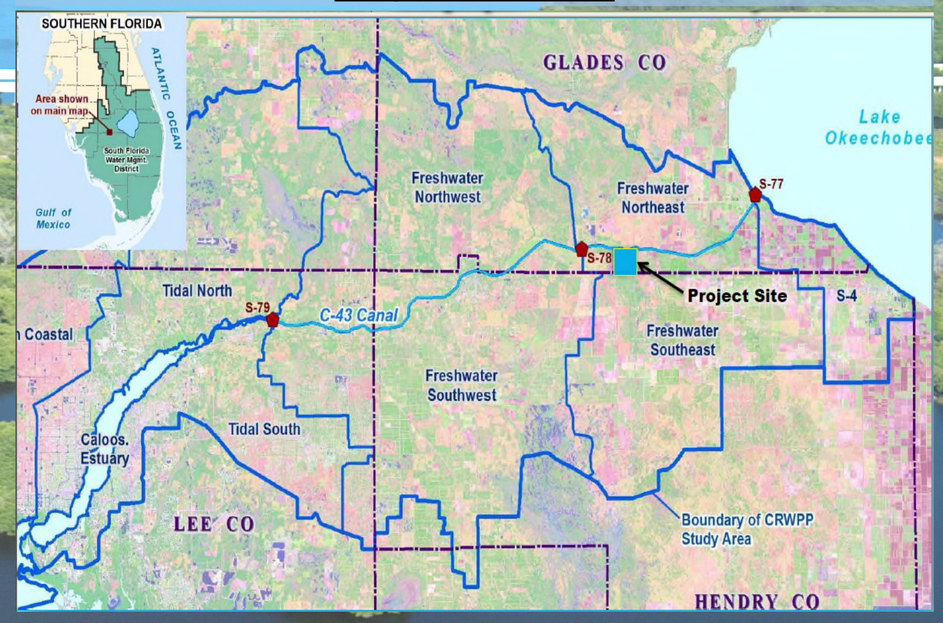


Experimental Design

	Purpose	Months
Start-up	Establish equilibration in mesocosms for sediment, water column and plant metabolism.	6
Experiment 1	Determine lowest background water column nutrient concentration (C*)	6
Experiment 2	Test effectiveness of treatments	12
Experiment 3	Confirm C*	6

Factor	Variable
Vegetation	EMV, SAV
Substrate	Native, Rinsed
HLR (cm/d)	0, 1.5, 6.0

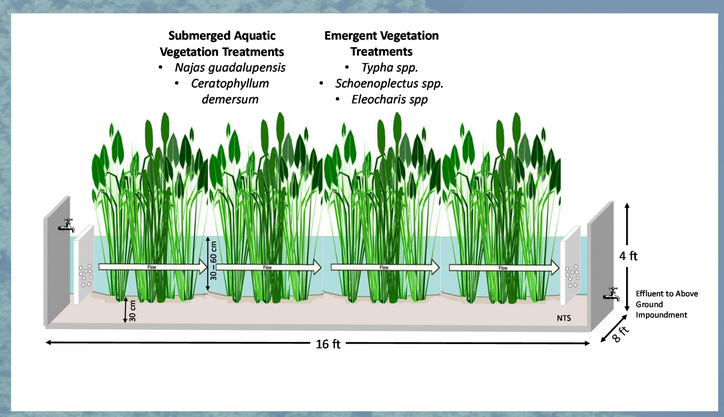
Project Location



C-43 Canal Bioassays

- **Laboratory incubations under different physical/chemical conditions of surface water collected along the river from December 2014 to October 2015.**
- **DON was approximately 80% of TN of which about 40% was bioavailable, consistent with other terrestrially-influenced aquatic systems.**
- **Bioavailability of DON varied greatly, being most available in the dry season but was not related to freshwater inflow rates or sampling location along the river.**
- **BDON did not increase with exposure to UV light which had important implications for the mesocosm experimental design in that the open water treatment became a lower priority.**
- **Seasonality of BDON may impact mesocosm results as plant function responds to South Florida's milder dry season temperatures with reduced growth rates. Therefore, when BDON concentration is highest, plant growth rate may be at its lowest reducing N removal potential.**

Mesocosm Schematic



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