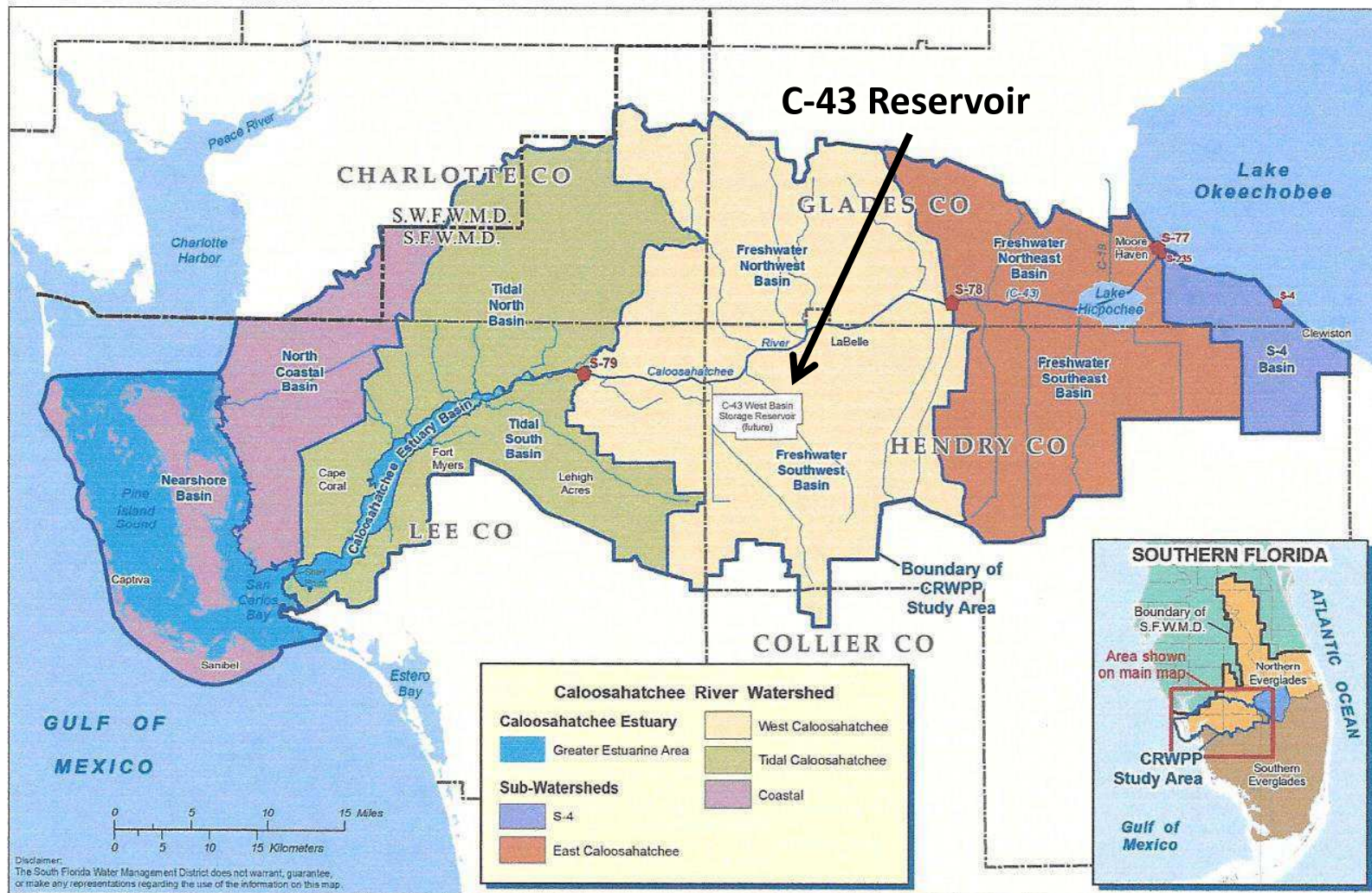


Water Quality Issues in the Caloosahatchee Watershed



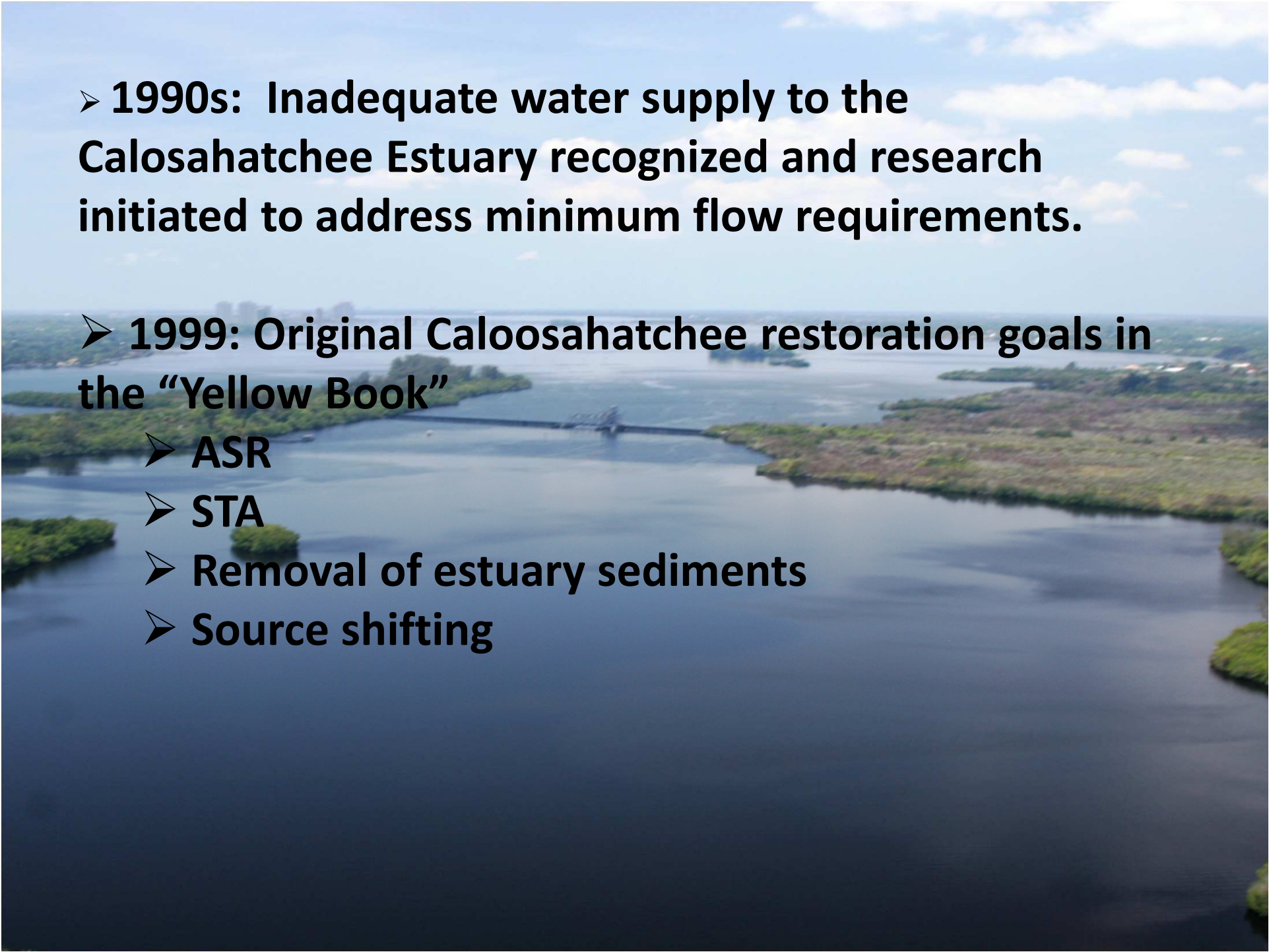
Caloosahatchee River Watershed Protection Plan Boundary and Sub-Watersheds



An aerial photograph of a coastal landscape. The foreground is dominated by a large body of water with a greenish-brown hue, possibly due to algae or sediment. In the middle ground, there are patches of marshland and a small, elongated island with a white sandy beach and some green vegetation. The background shows a hazy horizon under a cloudy sky. The text "BACKGROUND" is overlaid in large, bold, black capital letters, and "A 25 Year Perspective" is overlaid in smaller, bold, black capital letters below it.

BACKGROUND

A 25 Year Perspective



➤ **1990s: Inadequate water supply to the Caloosahatchee Estuary recognized and research initiated to address minimum flow requirements.**

➤ **1999: Original Caloosahatchee restoration goals in the “Yellow Book”**

➤ **ASR**

➤ **STA**

➤ **Removal of estuary sediments**

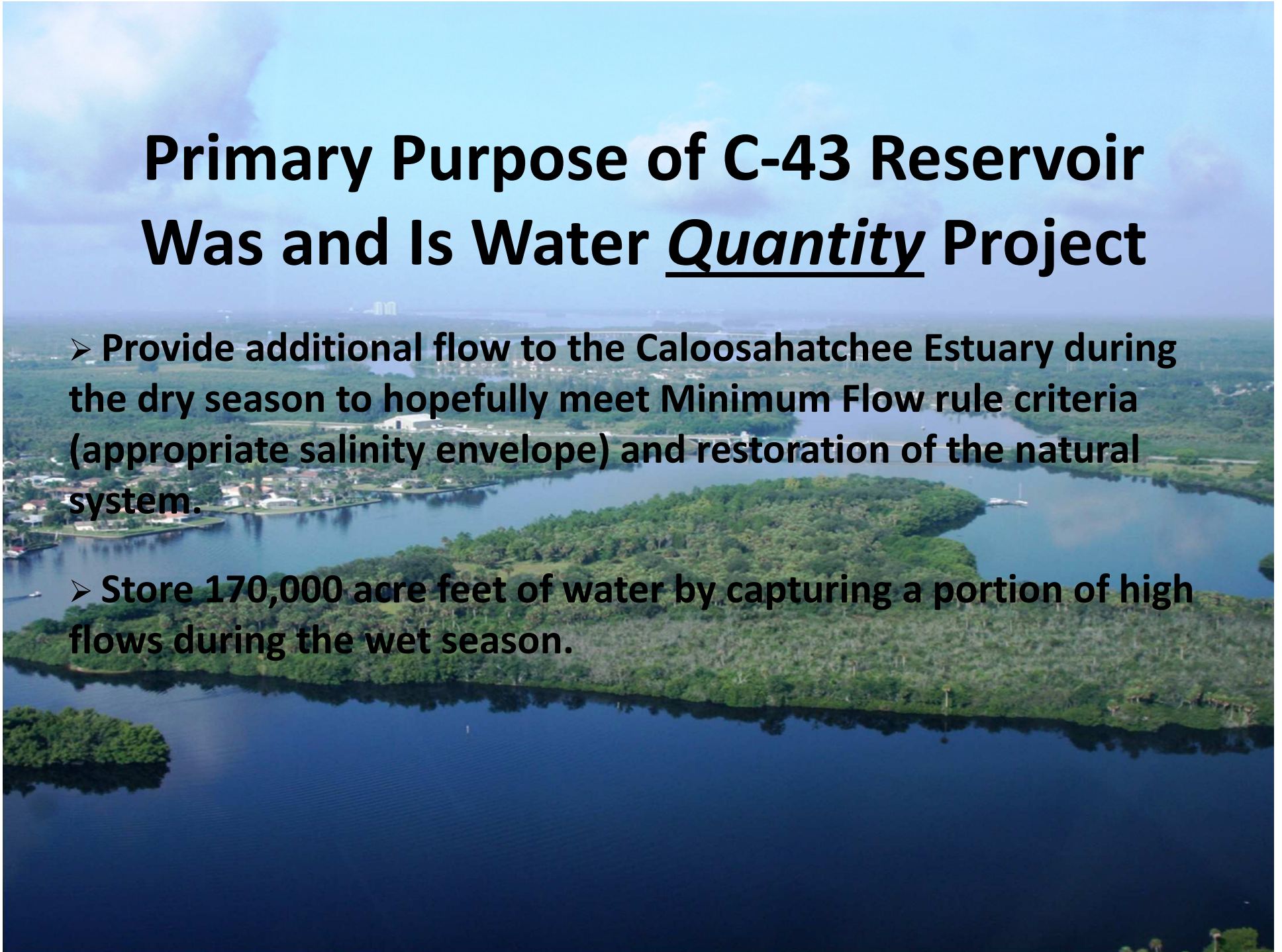
➤ **Source shifting**

BACKGROUND cont.

- **1999: Single reservoir option selected as the preferred alternative of the Caloosahatchee Water Management Plan (storage volume of 160,000 acre feet).**
- **2000: C-43 Reservoir incorporated as Western Everglades restoration component for Caloosahatchee Estuary.**
- **2001 Minimum Flow Rule adopted by the SFWMD.**

Primary Purpose of C-43 Reservoir Was and Is Water Quantity Project

- Provide additional flow to the Caloosahatchee Estuary during the dry season to hopefully meet Minimum Flow rule criteria (appropriate salinity envelope) and restoration of the natural system.
- Store 170,000 acre feet of water by capturing a portion of high flows during the wet season.



Concerns over water quality problems with C-43 Reservoir as early as 2005



"You got to get a filter marsh in there to help us" Captain Pete Quasius

"I think that's a big design issue" John Cassani

Deteriorating WATER QUALITY


**Has Created Potential Management and
Regulatory Constraints for The C-43 Reservoir**





By 2008 the magnitude of the nutrient enrichment problem in Florida had become widespread.

- **1000 miles of rivers a streams impaired**
- **350,000 acres of lakes impaired**
- **900 square miles of estuaries impaired**



**2009 Caloosahatchee Estuary
was determined impaired for
nutrients.**

**2011 Congress finally approved the
C-43 Reservoir Project
Implementation Report**

An aerial photograph of a wastewater treatment facility. The image shows several large, rectangular concrete basins or test cells, some of which are filled with dark water. A long, narrow canal runs vertically along the left side of the image. The surrounding area is a mix of green vegetation and bare, light-colored soil. The text "Test Cells were constructed to evaluate potential performance of the completed project" is overlaid in the center of the image.

Test Cells were constructed to evaluate potential performance of the completed project

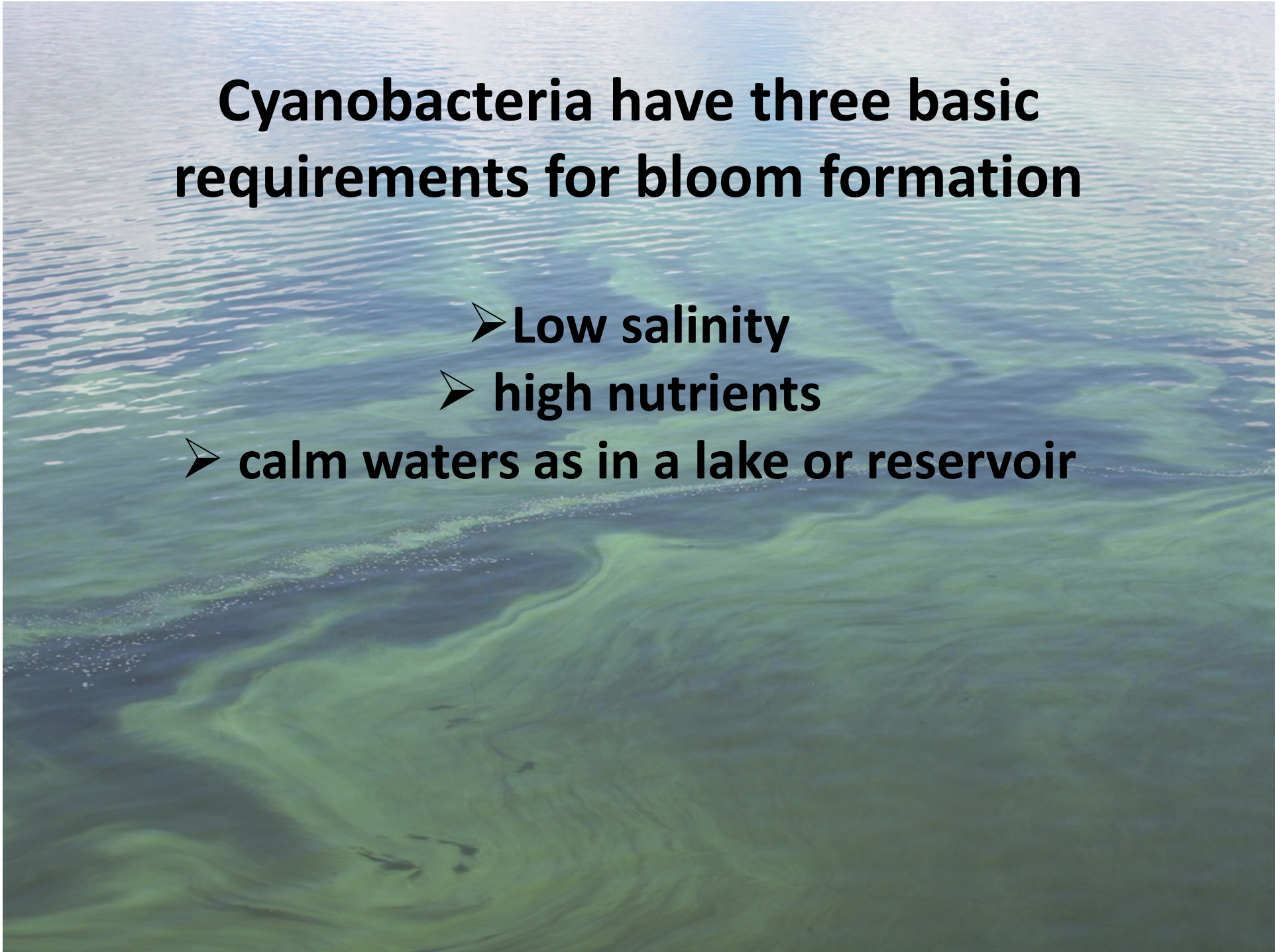


2007 SFWMD Test Cell Study Conclusions About Water Quality Issues

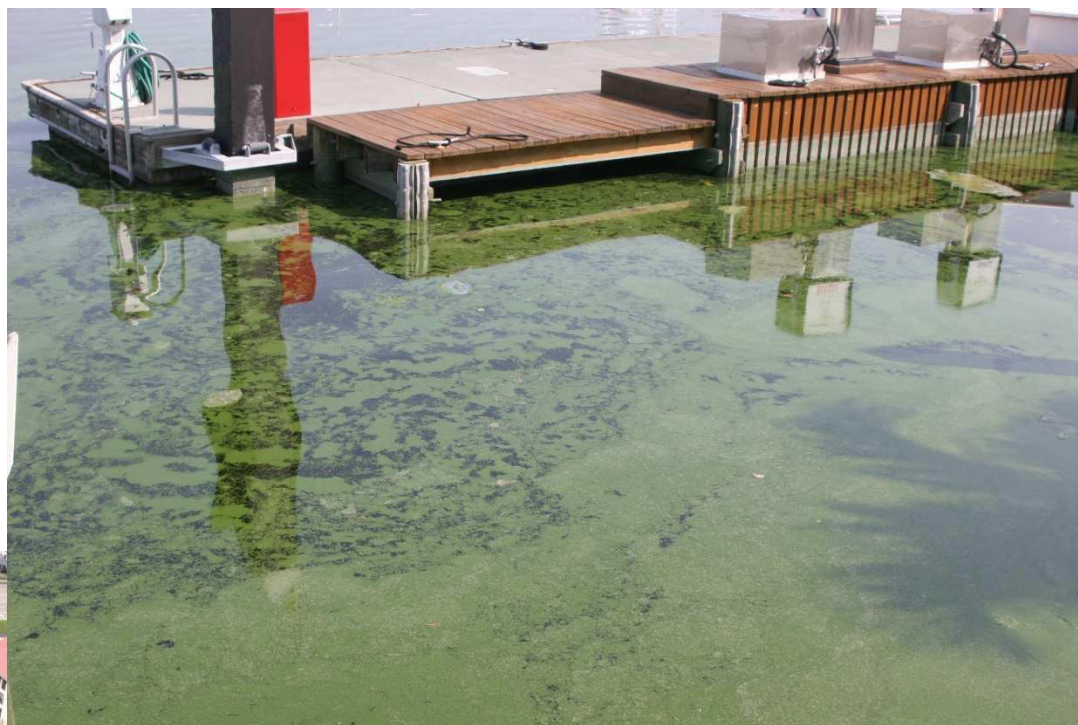
- **Estimated that the completed project would reduce nutrient concentrations at least initially but model estimates were highly variable. One model estimated the dry season TP load would increase at S-79.**
- **Would increase total loading of suspended solids or TSS at S-79 by 139 MT/yr.**
- **Algal biomass would increase.**

Cyanobacteria have three basic requirements for bloom formation

- **Low salinity**
- **high nutrients**
- **calm waters as in a lake or reservoir**







Issues Related to High Algal Concentrations From the Test Cell Study

- Five species of harmful, toxin producing algae were identified.
- Algal concentrations continued to increase for the duration of the Test Cell Study and potentially underestimated the magnitude of algal production.

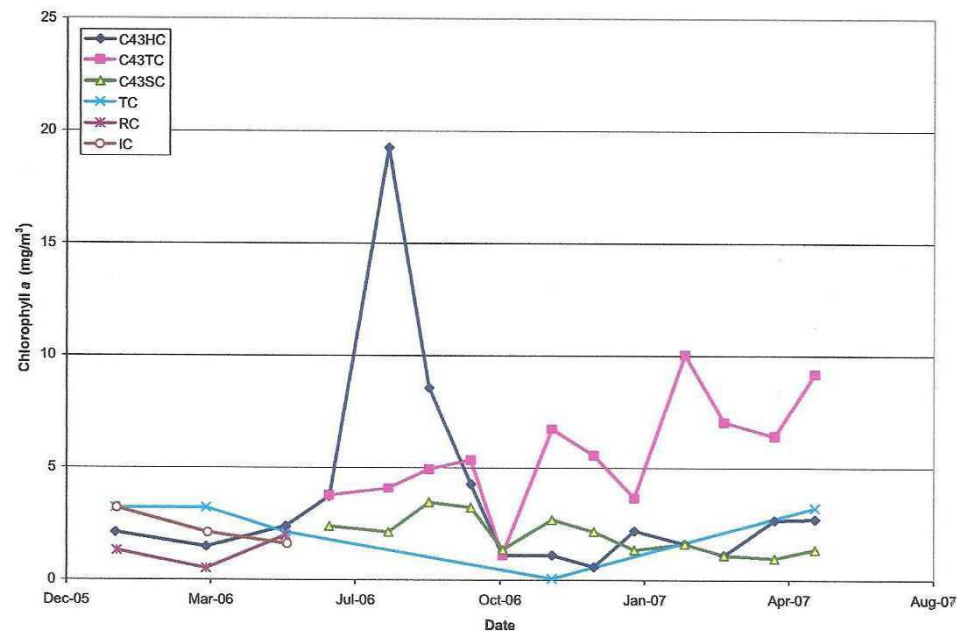
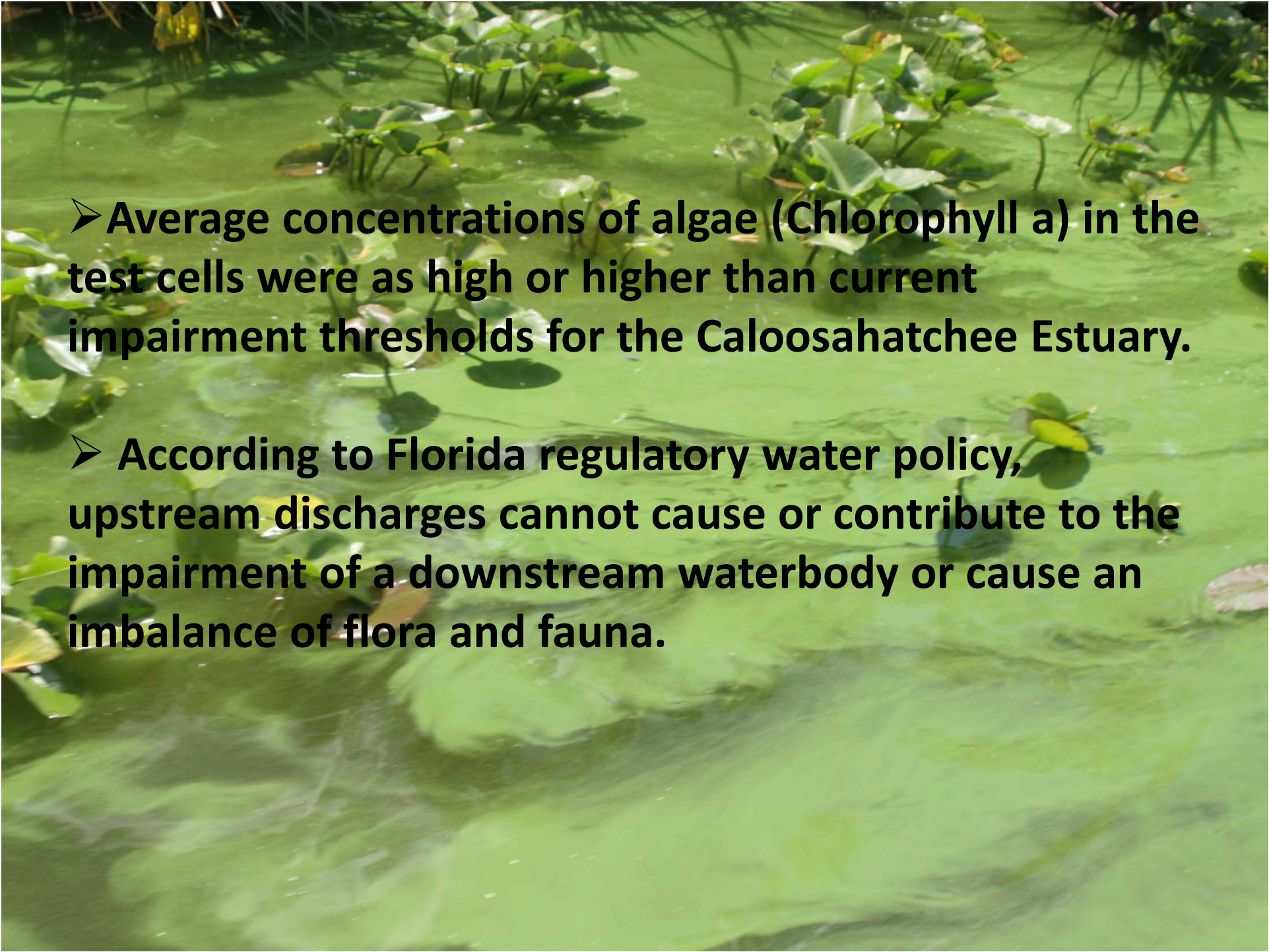


EXHIBIT 23

C-43 West Storage Reservoir Test Cell Project – Average Chlorophyll a by Station Group

- 
- **Average concentrations of algae (Chlorophyll a) in the test cells were as high or higher than current impairment thresholds for the Caloosahatchee Estuary.**
 - **According to Florida regulatory water policy, upstream discharges cannot cause or contribute to the impairment of a downstream waterbody or cause an imbalance of flora and fauna.**

Cyanobacterial Blooms and the Occurrence of the neurotoxin beta-N-methylamino-L-alanine (BMAA) in South Florida Aquatic Food Webs

[Larry E. Brand](#),^{1,*} [John Pablo](#),² [Angela Compton](#),¹ [Neil Hammerschlag](#),¹ and [Deborah C. Mash](#)²

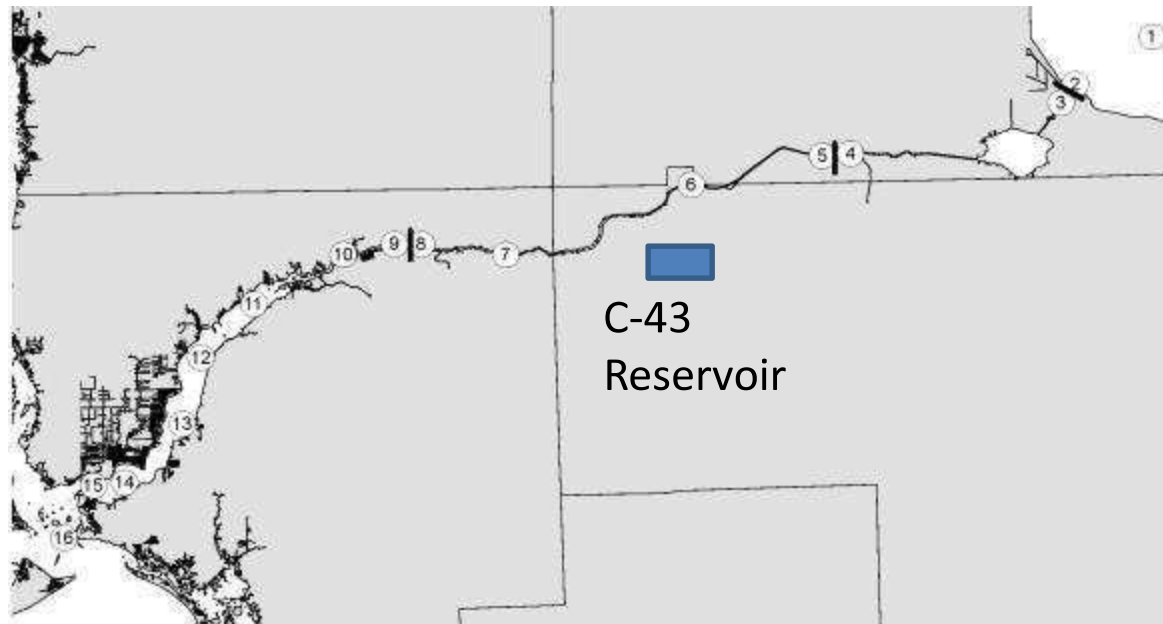
Harmful Algae. Author manuscript; available in PMC 2011 Sep 1.

Published in final edited form as:

Harmful Algae. 2010 Sep 1; 9(6): 620–635.

doi: [10.1016/j.hal.2010.05.002](https://doi.org/10.1016/j.hal.2010.05.002)

“It is predicted that human exposure to cyanobacteria and BMAA will increase, leading to a possible increased incidence of neurodegenerative diseases such as Alzheimer’s disease, Parkinson’s disease, and Amyotrophic Lateral Sclerosis (ALS).”





Institute for EthnoMedicine

PUBLIC RELEASE: 22-JAN-2016

Environmental toxin may increase risk of Alzheimer's disease and other neurodegenerative illnesses

First time scientists have observed brain tangles in an animal model through exposure to environmental toxin

The US National Toxicology Program is currently evaluating the physiological mode of action and risks associated with levels of public exposure to BMAA.



Olga Water Treatment Plant has at times been closed due to harmful algal blooms in the river.

Algal toxins have been detected in the treated water.





summary

- The C-43 reservoir as planned will provide 38% of the basin storage needed to address water supply to the estuary during the dry season at a cost of more than \$600 million.
- Storage reservoirs typically become sources rather than sinks for nutrients over time.
- In-reservoir methods for mitigating water quality issues exist but are uncertain and expensive and may conflict with the timing of discharges for water supply to the estuary.
- Associated water quality issues may constrain the operation of the reservoir from both management and regulatory considerations.
- C-43 PIR says that Florida's responsibility with the project implementation is to comply with state water quality regulations and that the quantity and quality of existing water is beneficial to the natural system.

summary cont.

- A water quality component has been proposed by multiple interest groups since at least 2005. CRCA and WC is again emphasizing a water quality component for the C-43 project similar to a STA or treatment wetland in order to comply with current Florida water quality regulations and the provisions of the C-43 PIR.

