

***Algal Blooms in Eastern Florida Bay and  
Southern Biscayne Bay***

***David Rudnick***

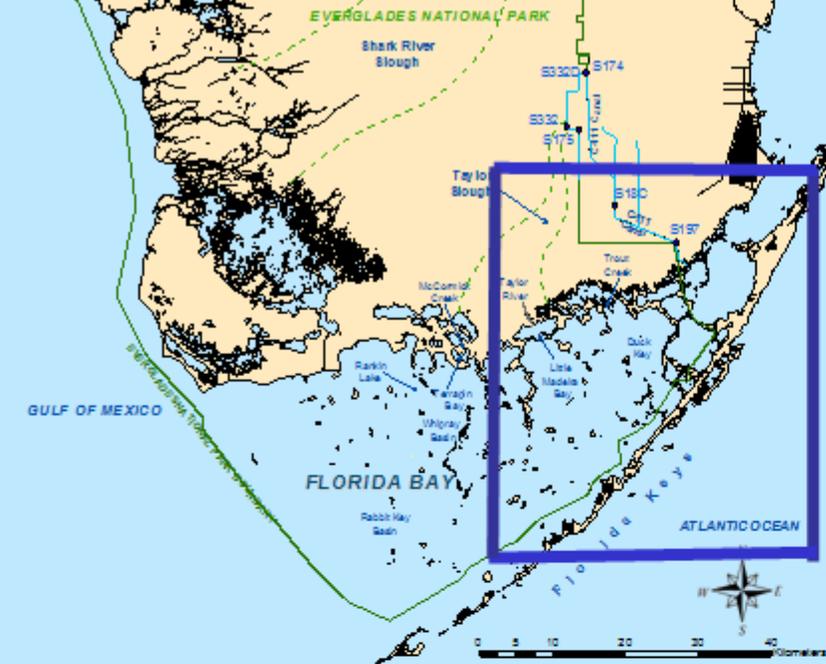
***Everglades Division***

***South Florida Water Management District***

***Presentation to the Water Resources Advisory Committee***

***April 5, 2007***

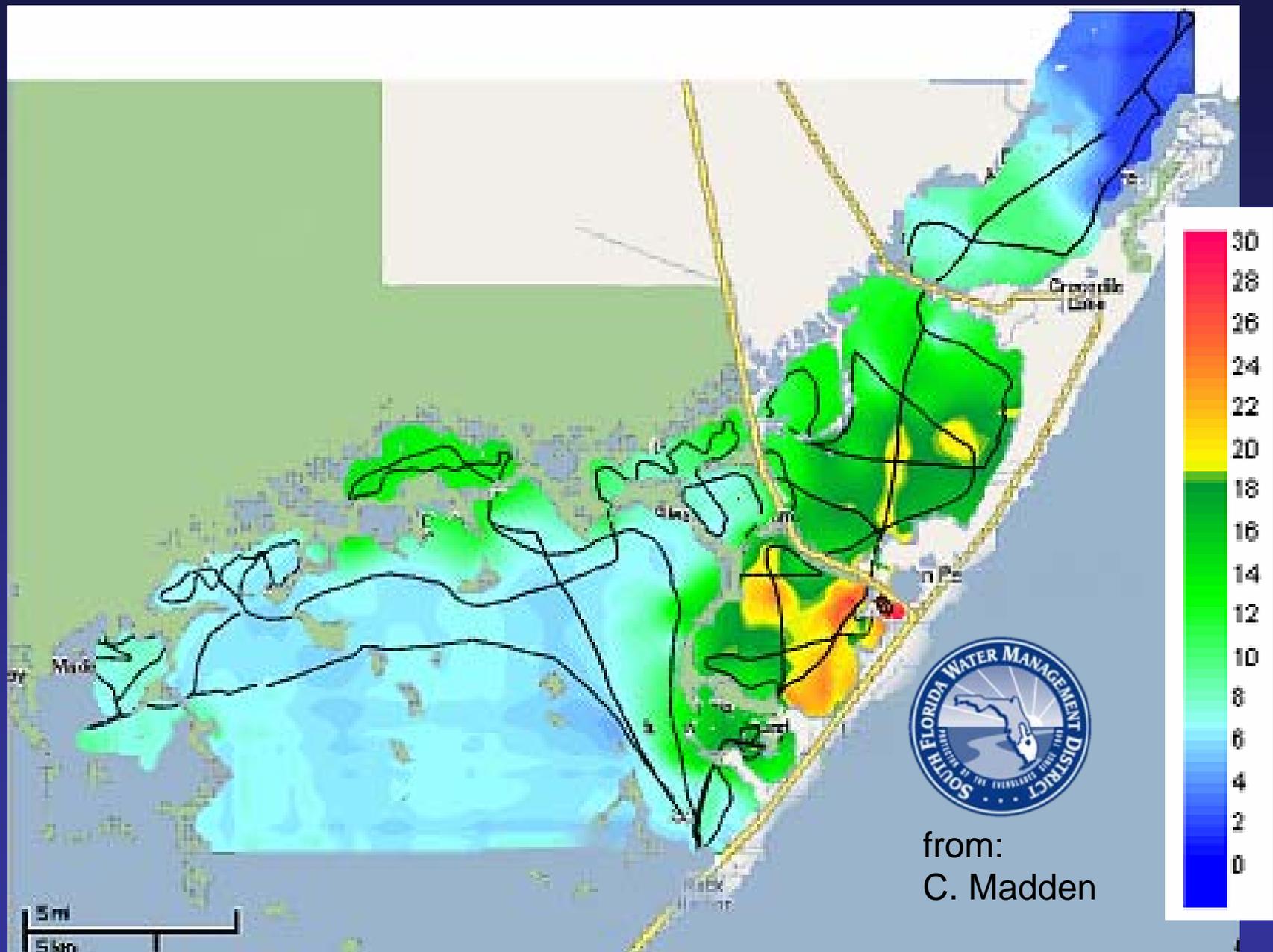




## *Algal Bloom Introduction*

- Located in eastern Florida Bay and southern Biscayne Bay
- No similar bloom previously documented
- Sustained since Nov. 2005
- Mostly blue-green algae

# High resolution map of chlorophyll-a ( $\mu\text{g/L}$ ) – Jan 31 – Feb 1, 2007



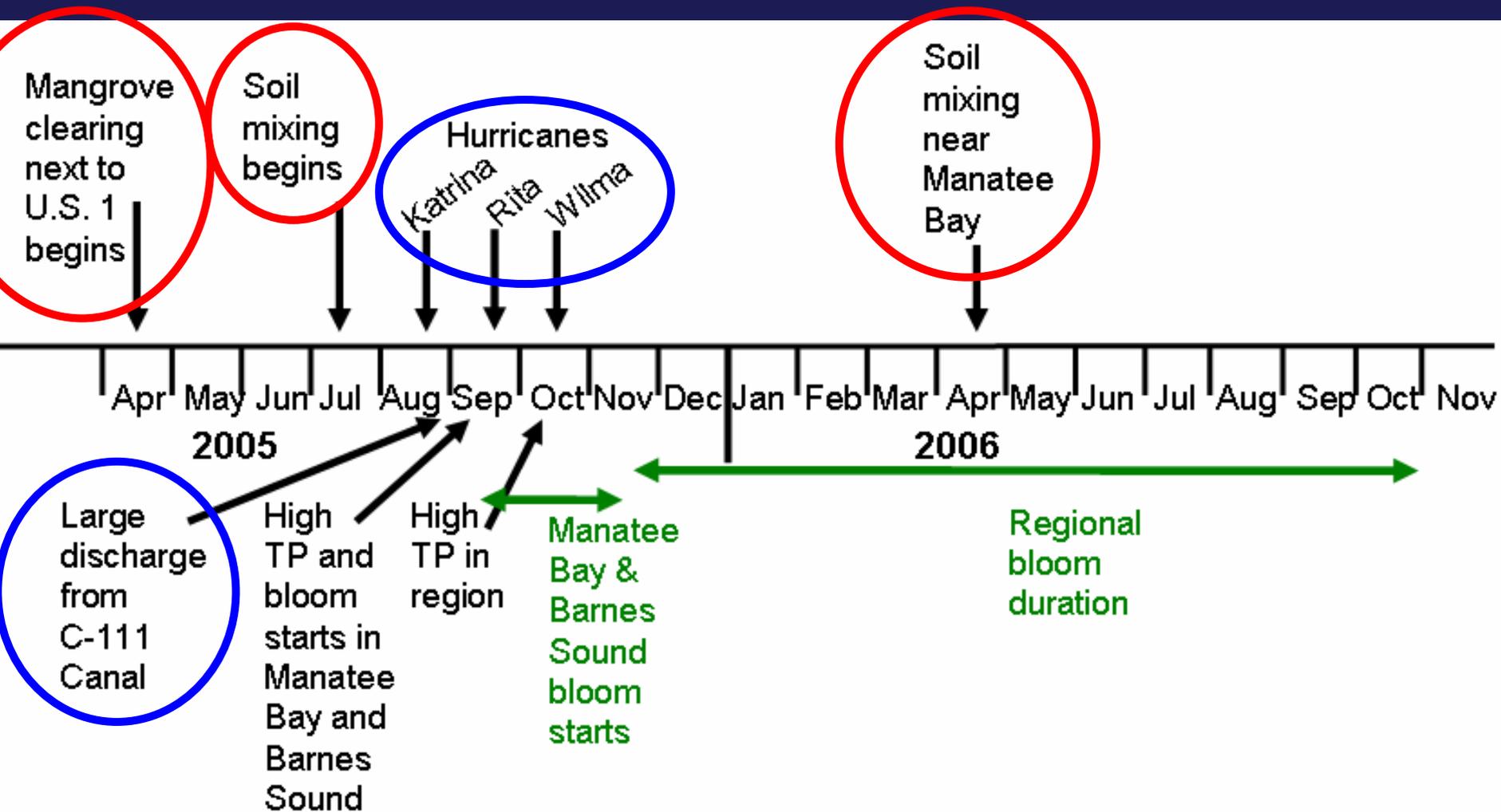
***Spatial distribution of bloom consistent with road disturbance hypothesis and .....***



***...timing of bloom initiation consistent with hurricane disturbance hypothesis and....***

***..... bloom persistence by multiple factors.***

# Timeline of Eastern Florida Bay – Southern Biscayne Bay Algae Blooms and Potentially Related Events



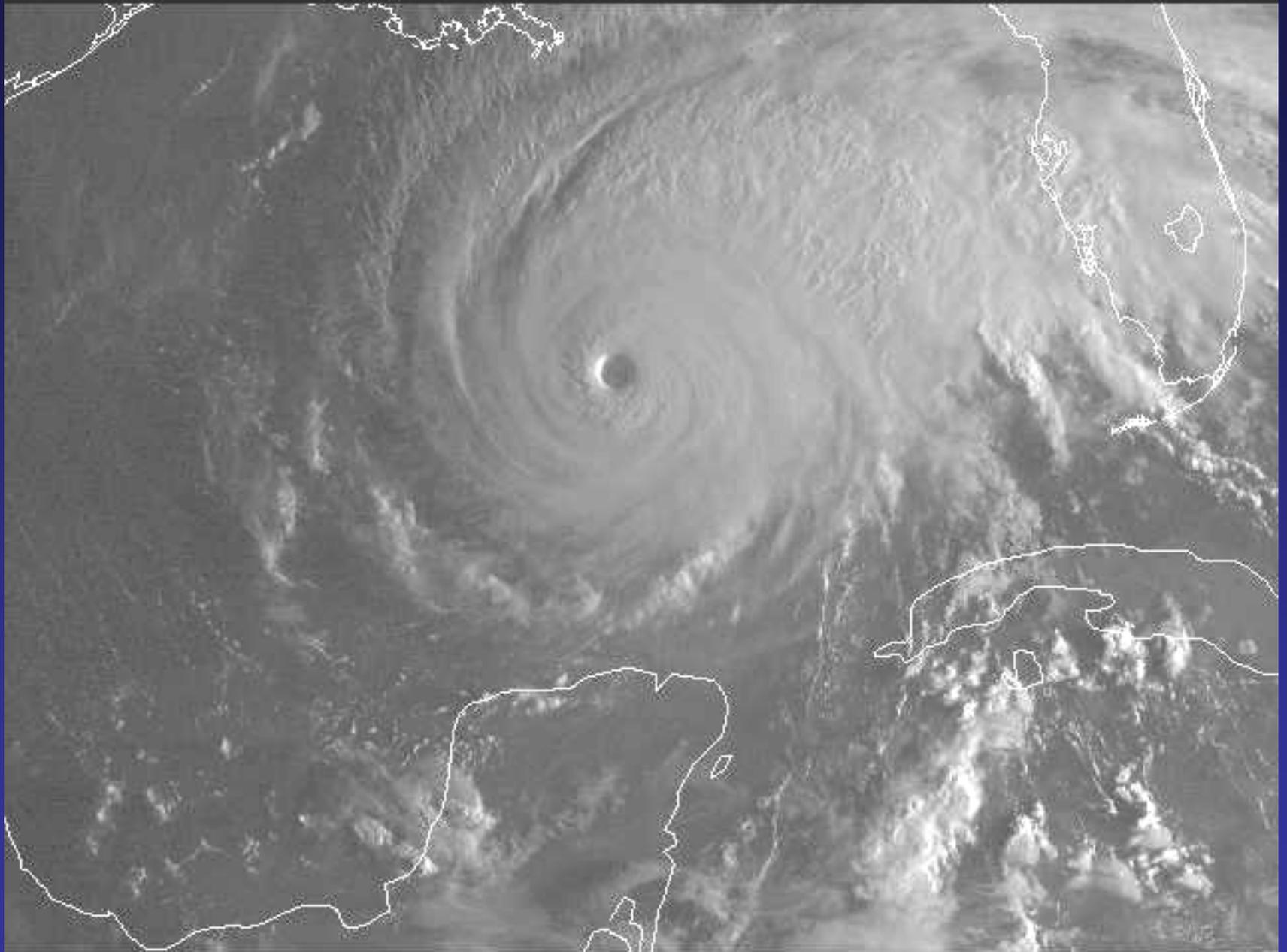
# ***U.S. Highway 1 Construction next to Barnes Sound***



# ***U.S. Highway 1 Construction at Jewfish Creek***



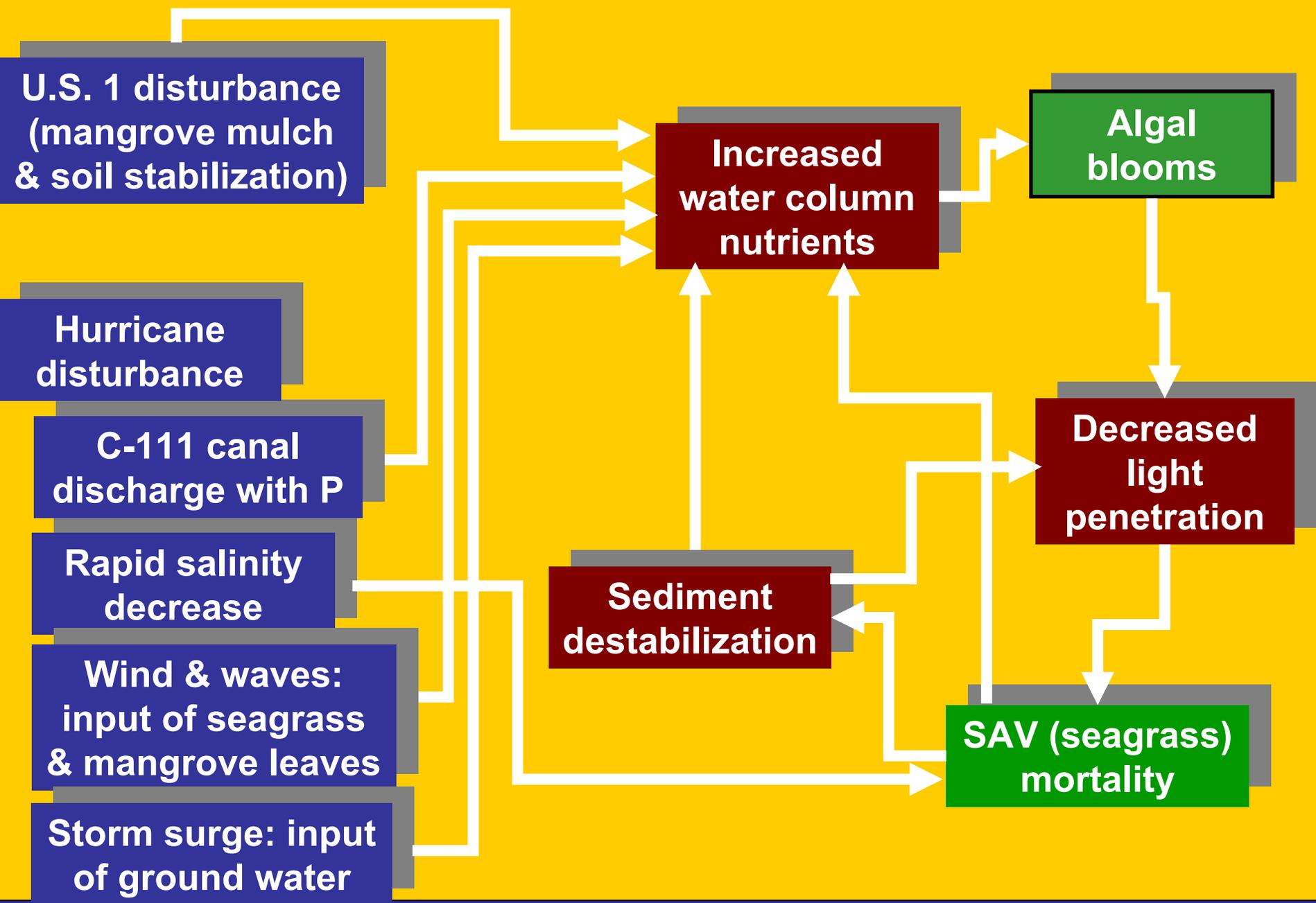
# *Hurricane Rita (Florida onslaught: Sept. 20, 2005)*



# S-197 Structure on C-111 Canal (looking north)



# *Algal blooms: hypothesized cause and effect*



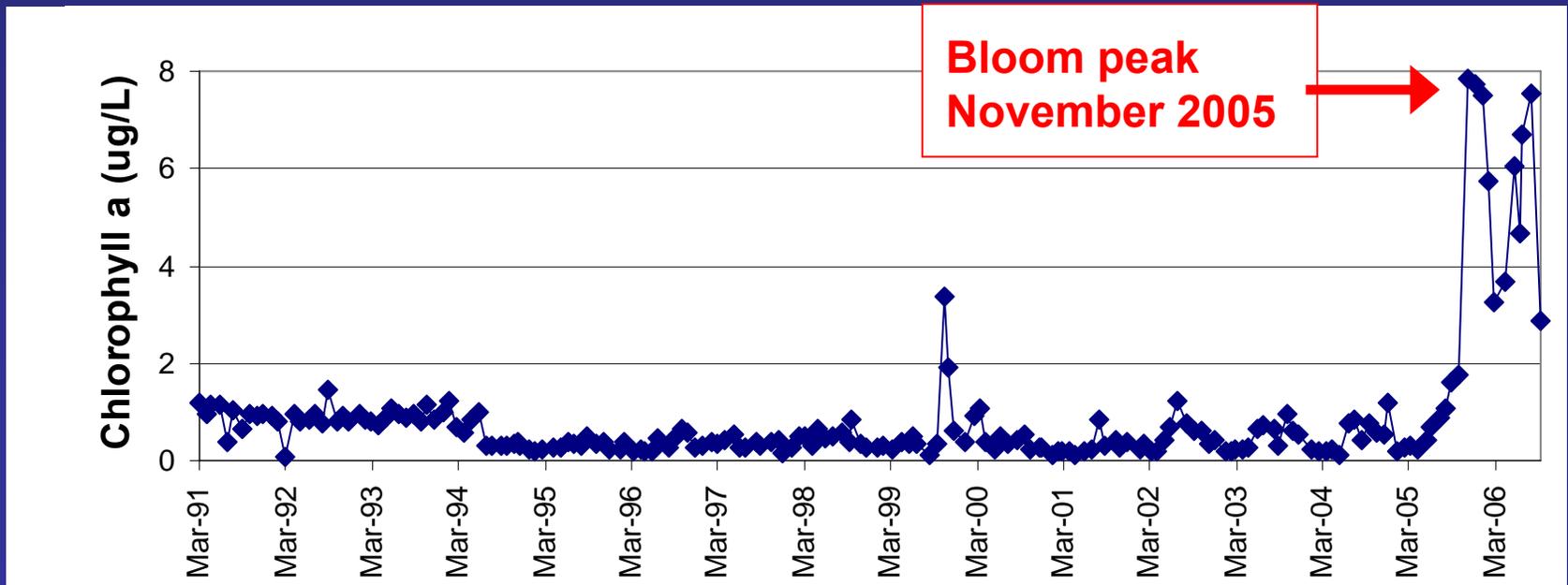
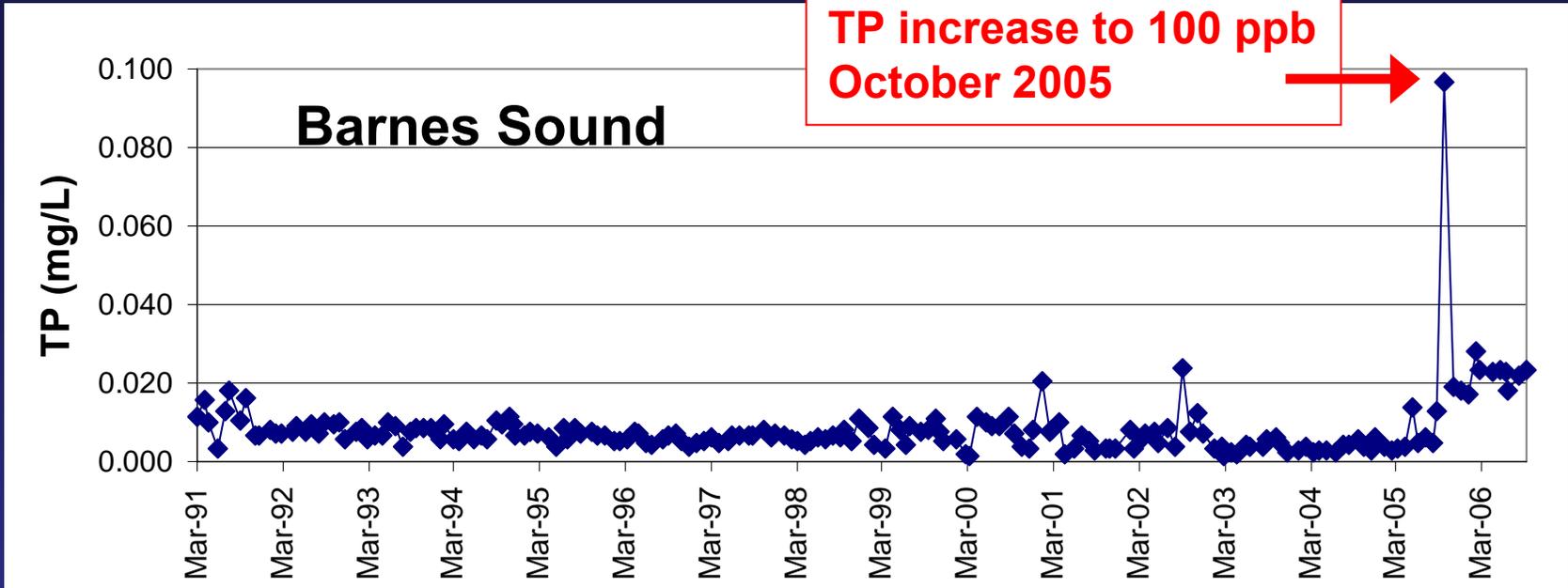
# ***Bloom Monitoring and Assessment***

**Multi-agency cooperation:**

**SFWMD, FIU, FDOT, Miami-Dade DERM, FFWCC, NOAA, NPS, USGS**

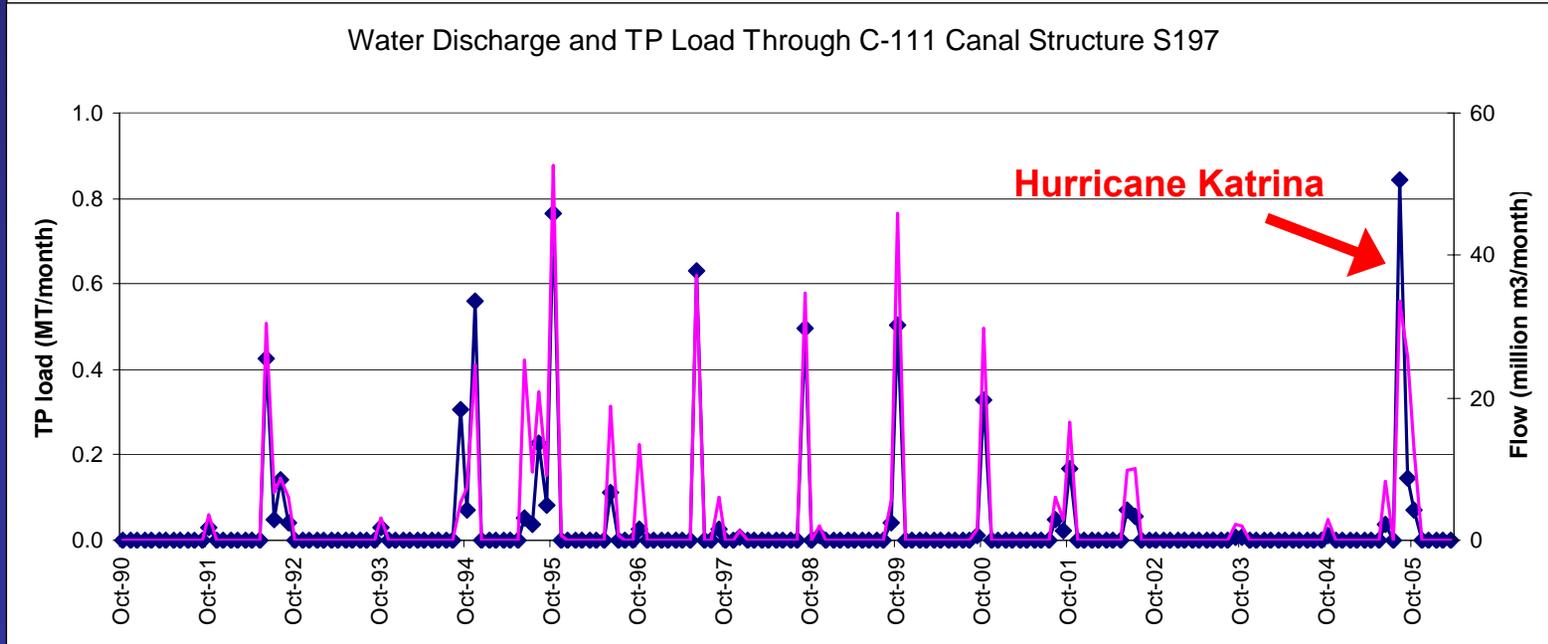
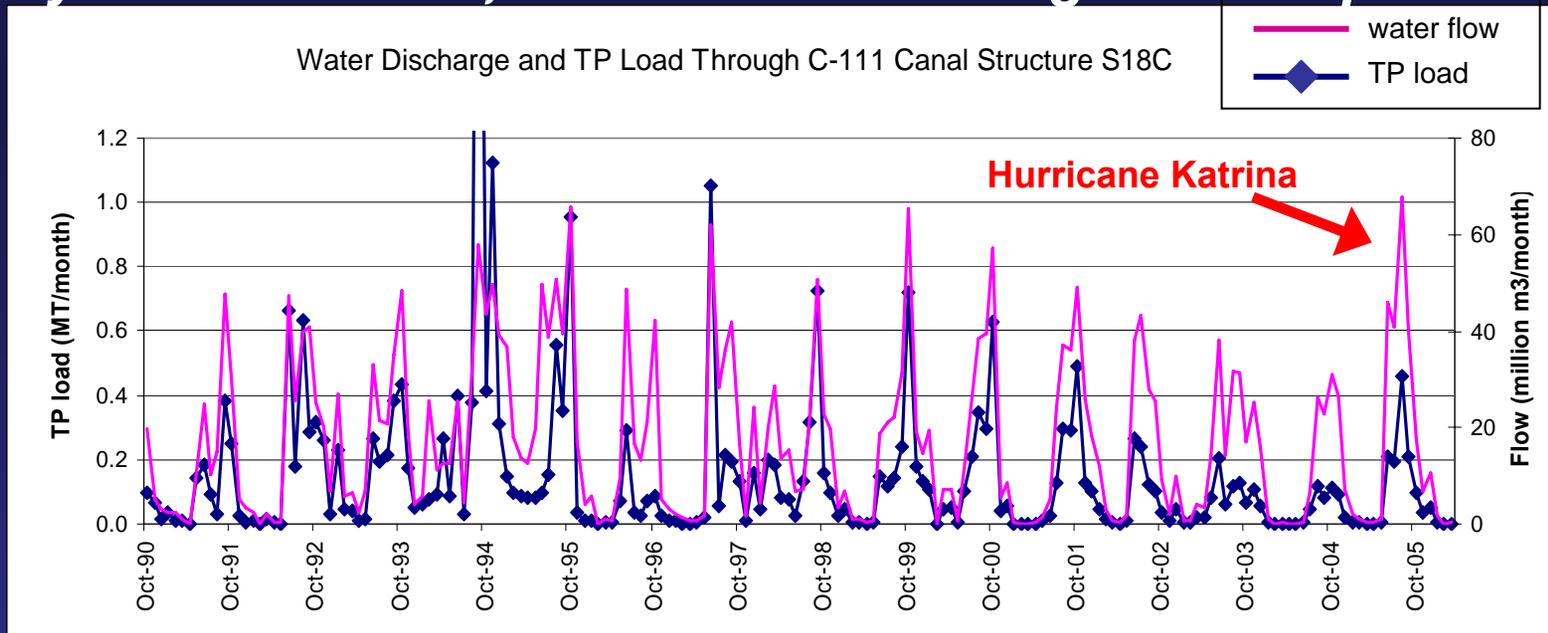
- **Regional Water quality monitoring (SFWMD, FIU, DERM, NOAA)**
- **Bloom fine-scale mapping (SFWMD, NOAA)**
- **US 1 Construction Phase II water quality monitoring (Manatee Bay to C-111 bridge) (FDOT, DERM)**
- **Dissolved oxygen monitoring (SFWMD)**
- **SAV monitoring (Miami-Dade DERM, FFWCC, SFWMD, FDOT)**
- **Chemical analysis of cement and slag additives (FDOT contractors)**
- **Soil and mulch nutrient content (FDOT contractors)**
- **Effects of soil extracts and cement/slag additives on algae (FFWCC, U. MD/NOAA)**

*Phosphorus and chlorophyll-a concentrations reached unprecedented levels in the fall of 2005 and high levels since have been sustained*

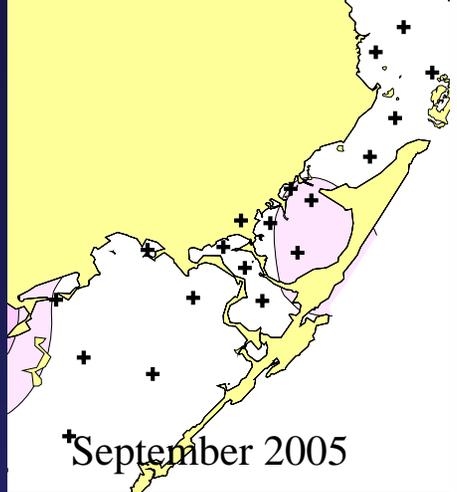




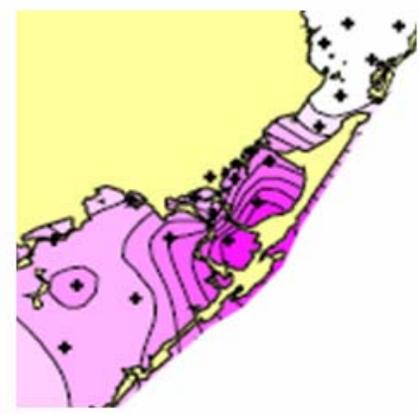
# Discharge and TP load through the C-111 canal since 1991: many similar events, but no sustained algal bloom prior to 2005



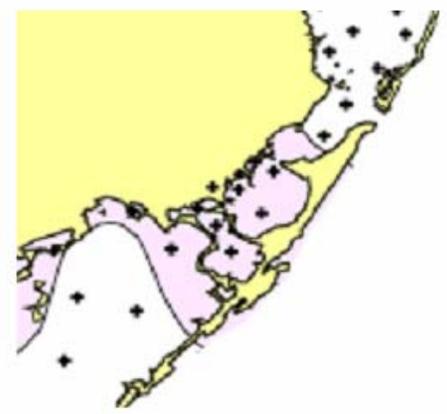
**Total phosphorus concentrations in eastern Florida Bay and southern Biscayne Bay.**



September 2005

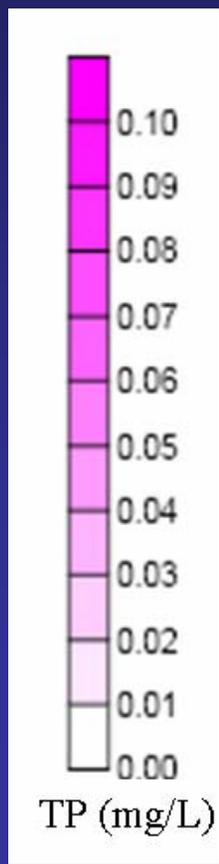


October 2005

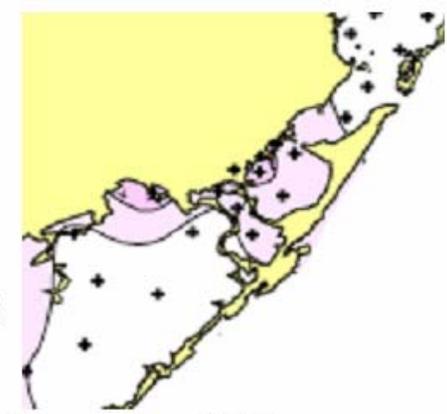


November 2005

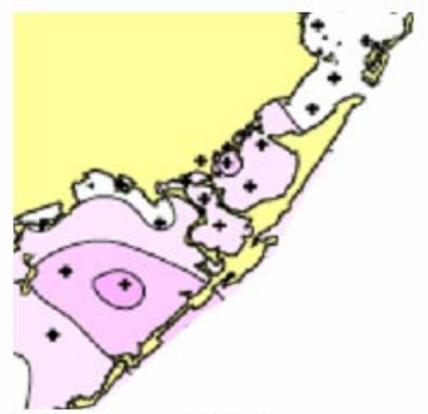
- **Peak TP was found October 6, following Hurricane Rita, not following Hurricane Katrina discharges (late August)**
- **Spatial and temporal pattern not consistent with C-111 source.**



TP (mg/L)



December 2005



January 2006



February 2006

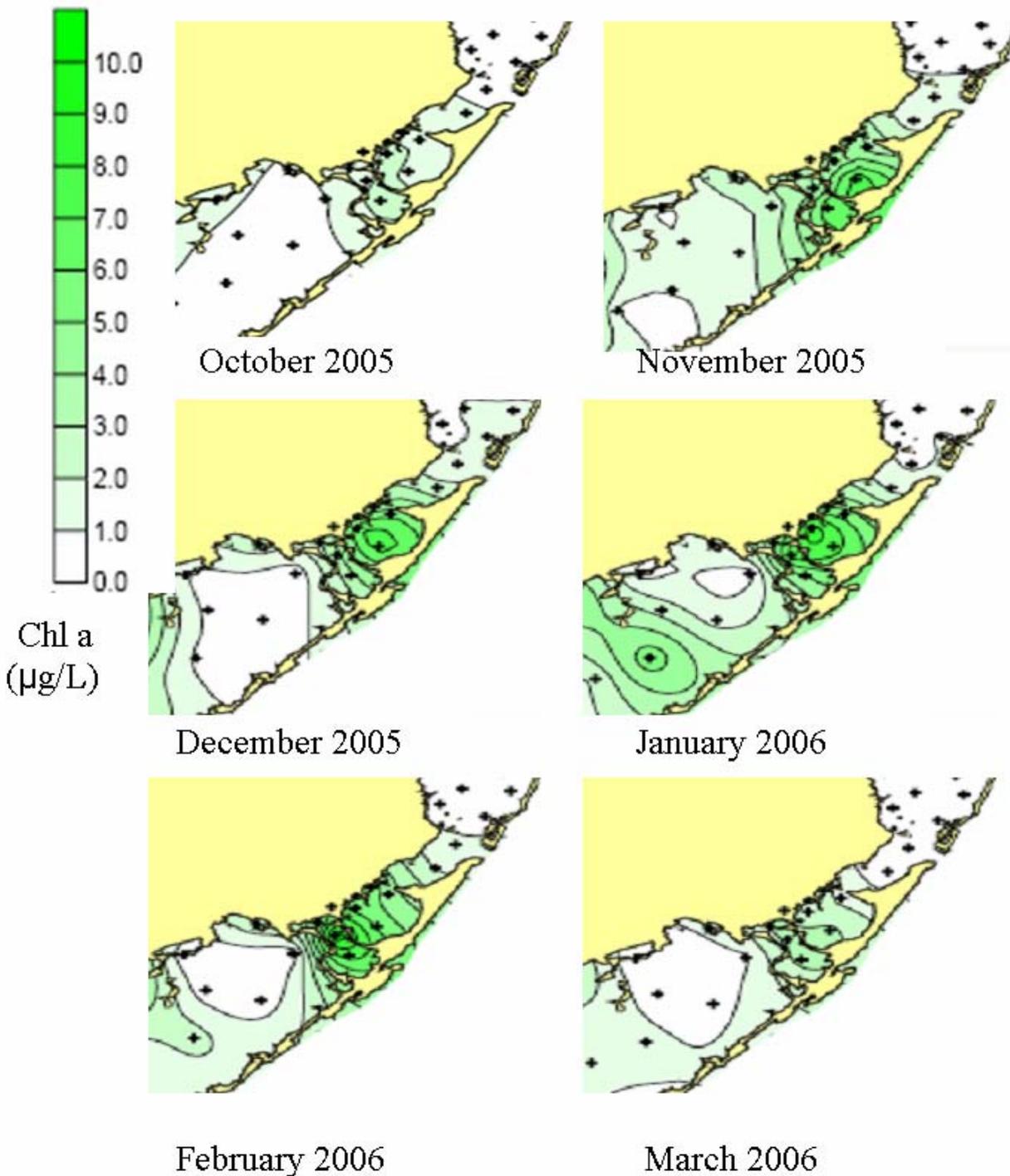


March 2006

Concentration contours calculated by J. Boyer.

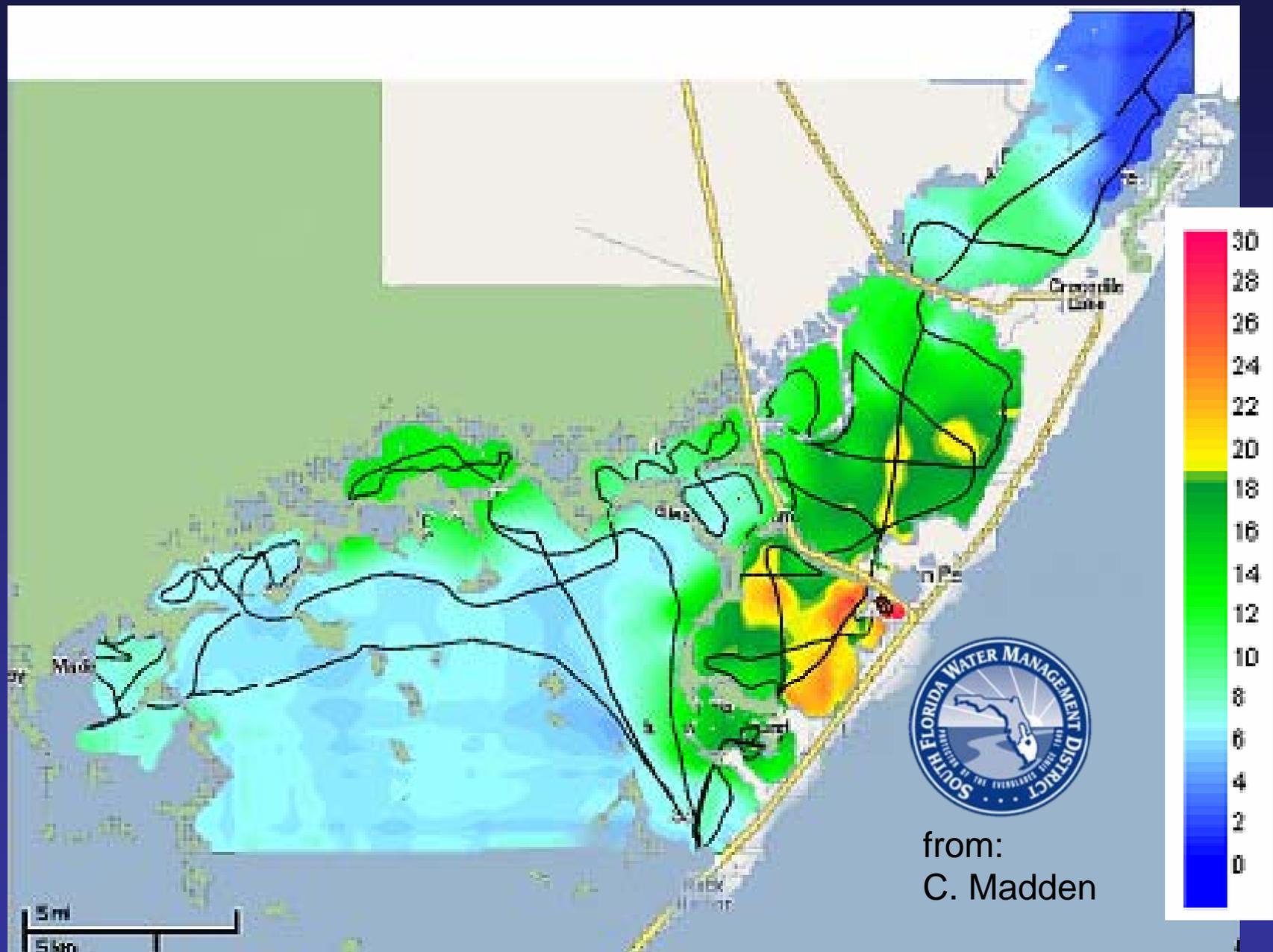
# ***Chlorophyll-a concentrations in eastern Florida Bay and southern Biscayne Bay***

- Regional bloom started in November 2005 (after TP peak)***
- Bloom most dense near U.S. 1 and Key Largo***

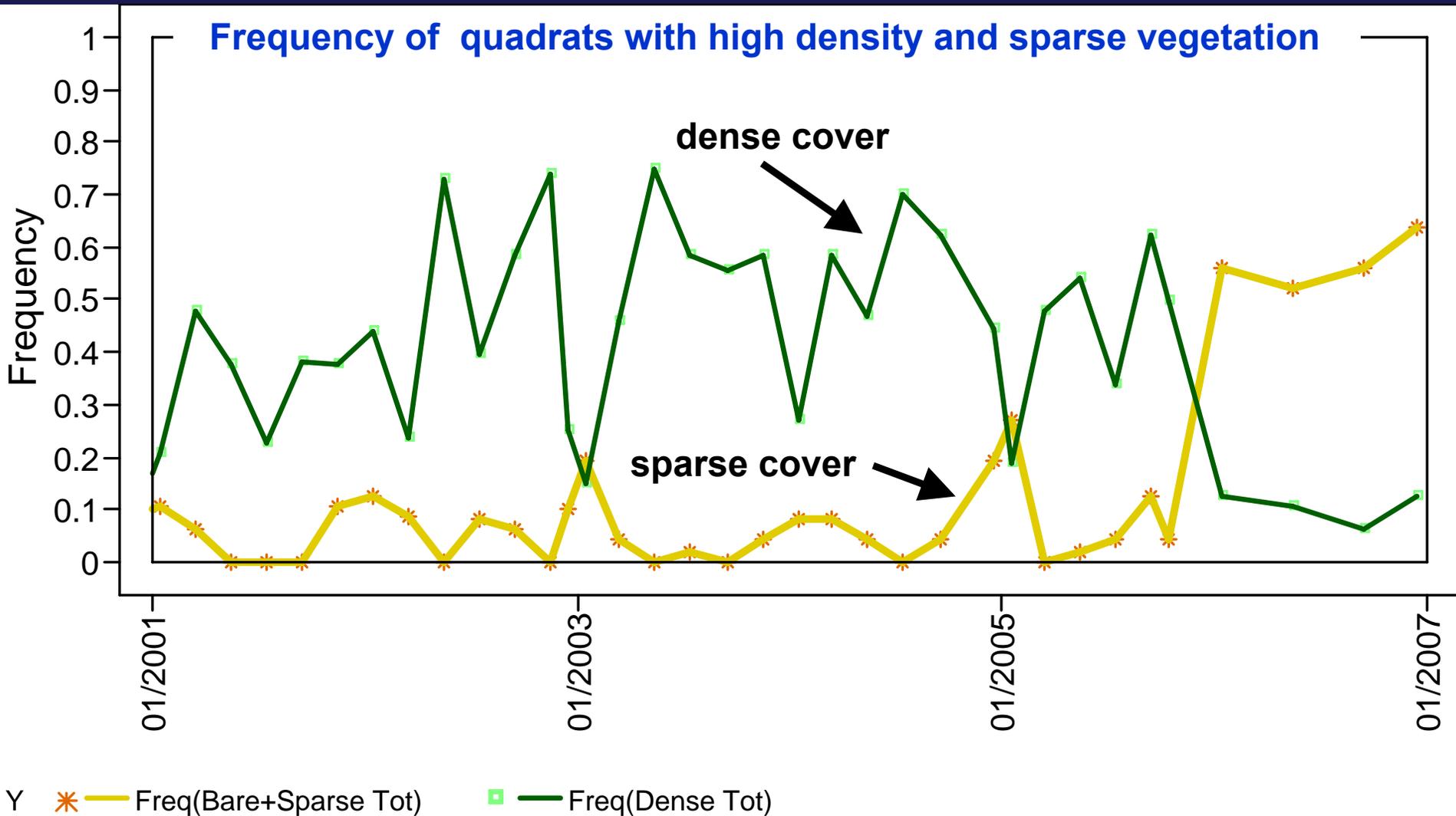


Concentration contours calculated by J. Boyer.

# High resolution map of chlorophyll-a ( $\mu\text{g/L}$ ) – Jan 31 – Feb 1, 2007

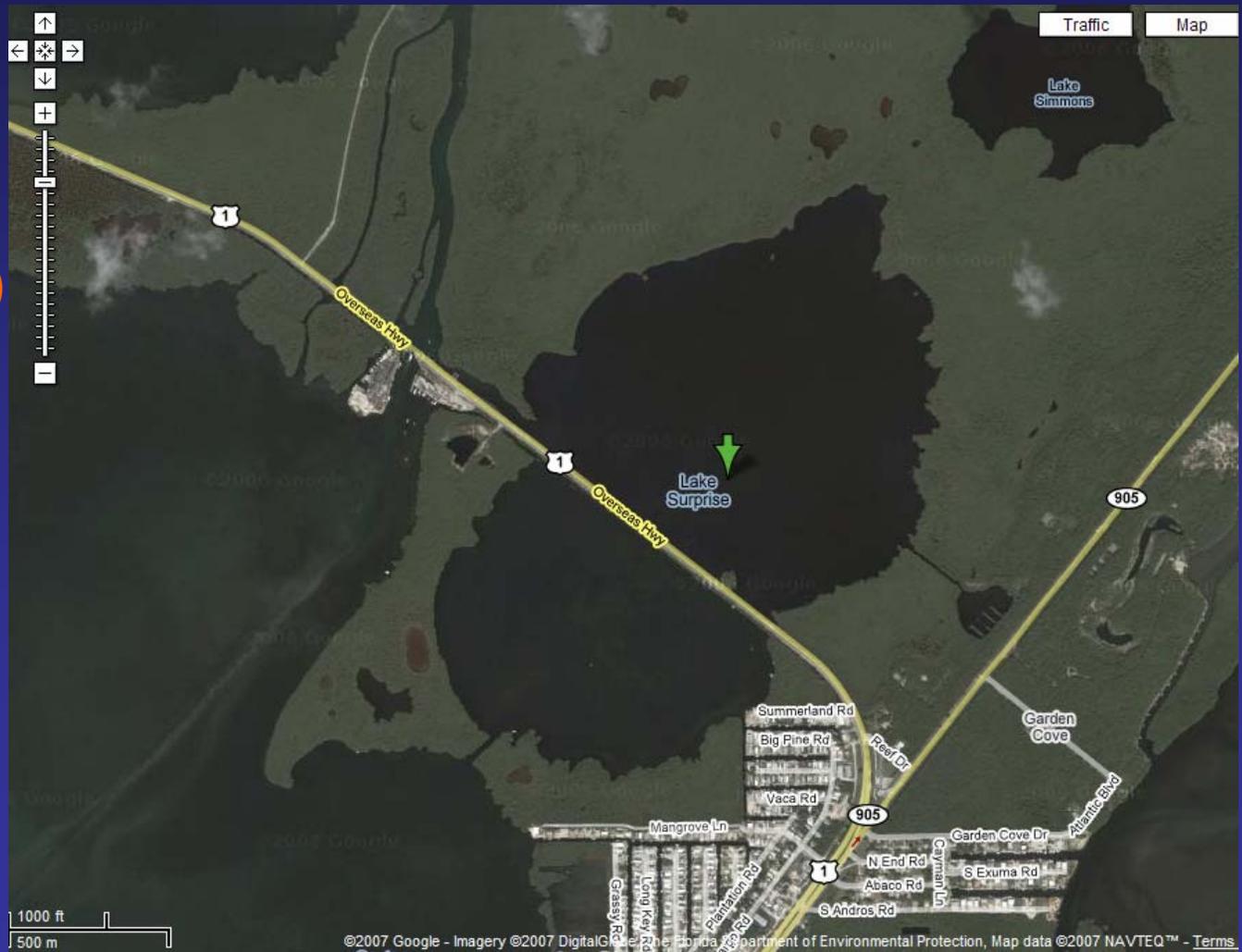


# Submerged Aquatic Vegetation Status: Barnes Sound (recent loss - mostly macroalgae)



# Lake Surprise Causeway Removal

- Expected benefit to crocodiles, fish, Lake Surprise water quality, recreation
- Concern regarding nutrient export and potential negative effect on regional bloom



# ***Summary of Algal Bloom Information***

## **Bloom Description: Structure, Distribution, Timing**

- **Bloom mostly blue-green algae (bacteria)**
- **Bloom has covered 45 to 95 sq. miles in east Florida Bay & south Biscayne Bay**
- **Sustained since November 2005**
- **No similar bloom previously observed in region**

## **Bloom Causation: Hypotheses and Evidence**

- **Multiple factors involved**
- **Spatial pattern consistent with possible effect of U.S. 1**
- **Timing consistent with possible hurricane effect**
- **Bloom sustained by:**
  - **long water residence time (poor flushing)**
  - **efficient P retention**
  - **possible seagrass mortality**
  - **construction disturbance**

# Questions?



Surveying for the railroad bridges ca. 1906

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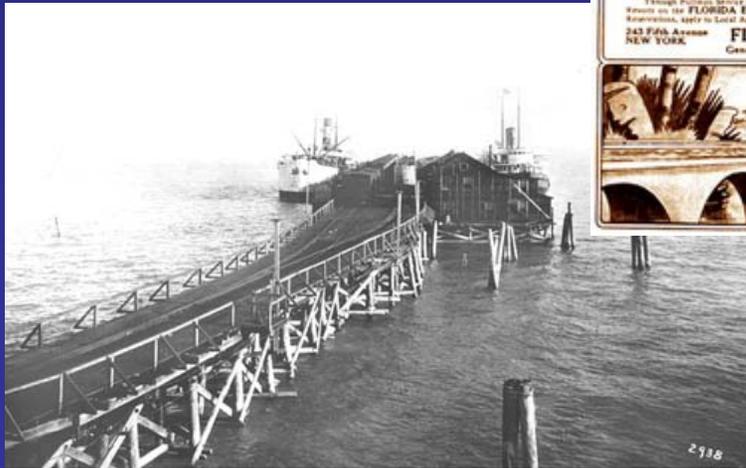
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Jewfish Creek Bridge under construction February, 1907



Two steamships and two trains at Knight's Key Dock ca. 1909

