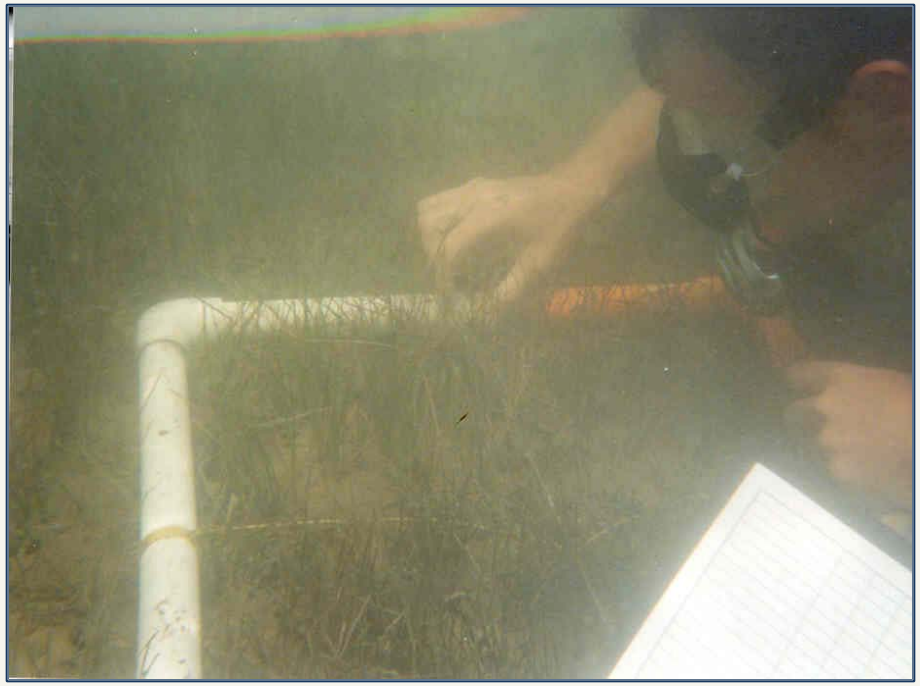
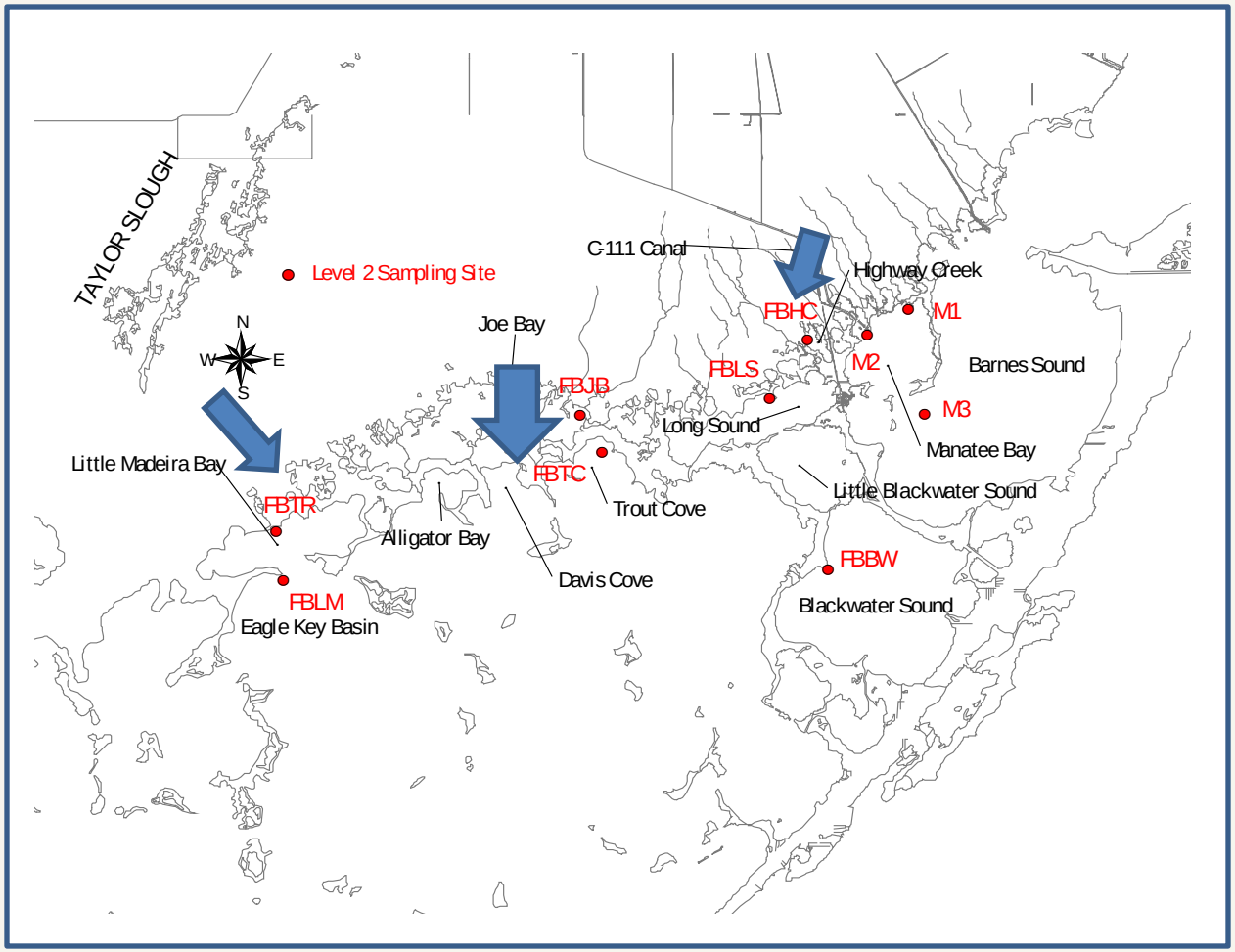
Miami-Dade County DERM's Northeastern FL Bay SAV Monitoring Program

Funded by the SFWMD



MIAMI-DADE COUNTY

SAMPLING DESIGN



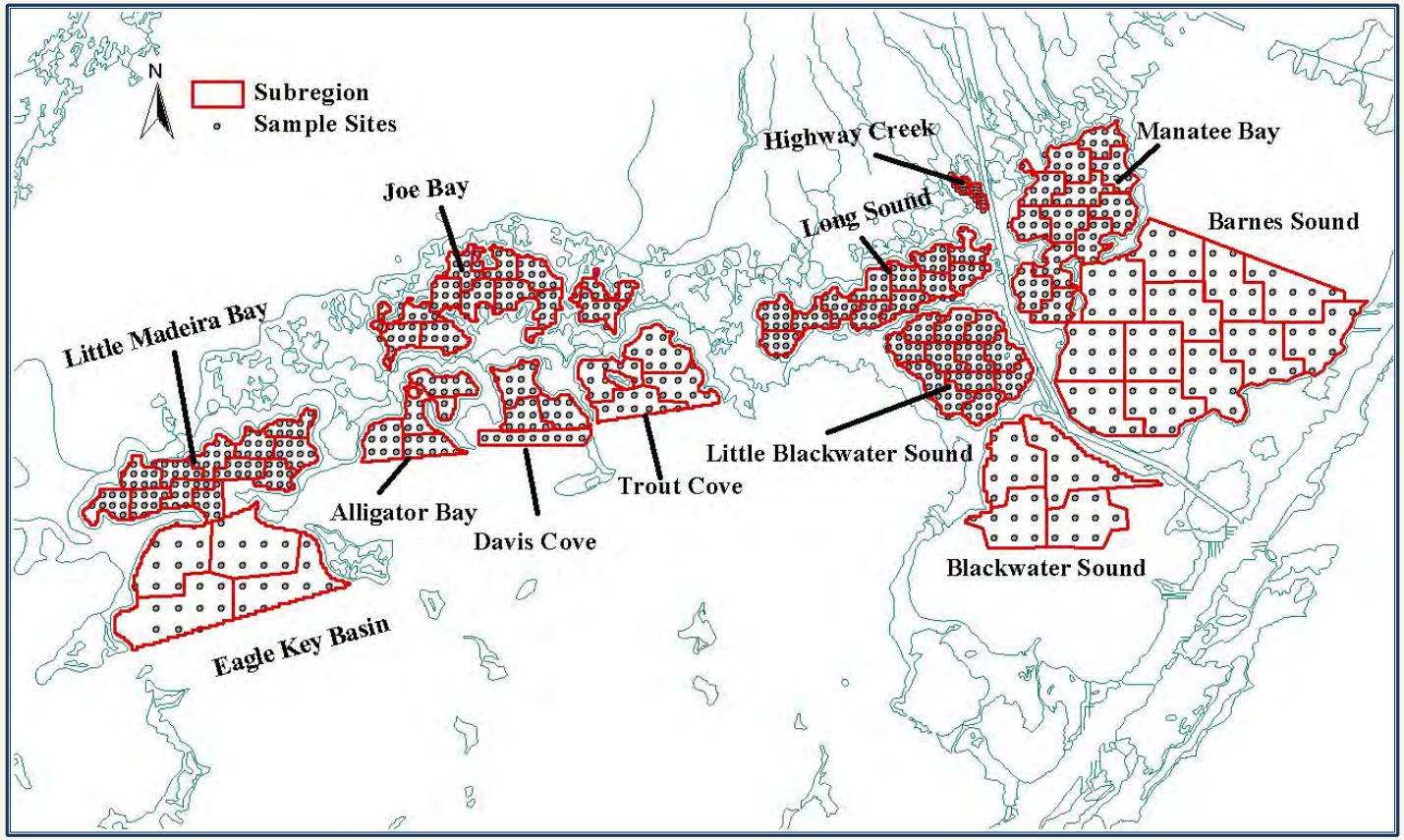
Flow inputs W – E

- **Taylor River**
- **Trout Creek**
- **Highway Creek**

❖ **Program initiated in 1993 with 6 fixed stations**

- **Sampled monthly until October 1995, then biannually in May and November**
- **Shoot Density, Braun-Blanquet, Cores – Biomass**
- **Originally monitoring following expansions to the Taylor River bridge**

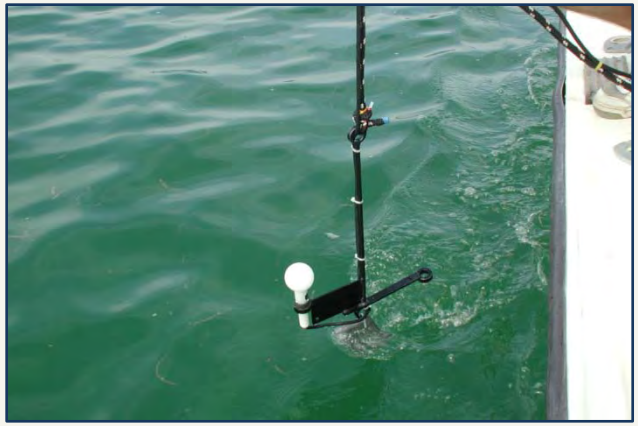
SAMPLING DESIGN



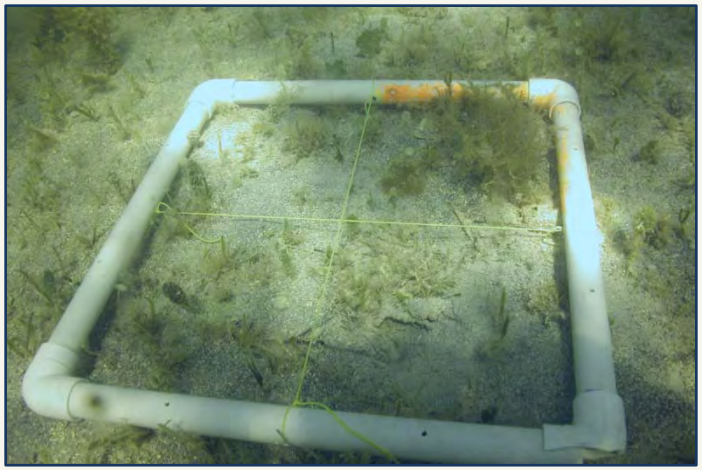
- **Expanded spatial coverage in October 1995 with stratified random stations.**
  - **Made program consistent with EMAP methods used throughout FL Bay by FMRI & FIU**
  - **1997, Manatee Bay and Barnes Sound were added.**
  - **96 Stations per sampling event**
  - **Monthly sampling from 1995-1999, Bi-monthly sampling 2000-2006, Quarterly 2007-present**

SAMPLING DESIGN: Stratified Random Stations

Multi-parameter probe ; Temp, pH, Salinity, Dissolved Oxygen, Redox

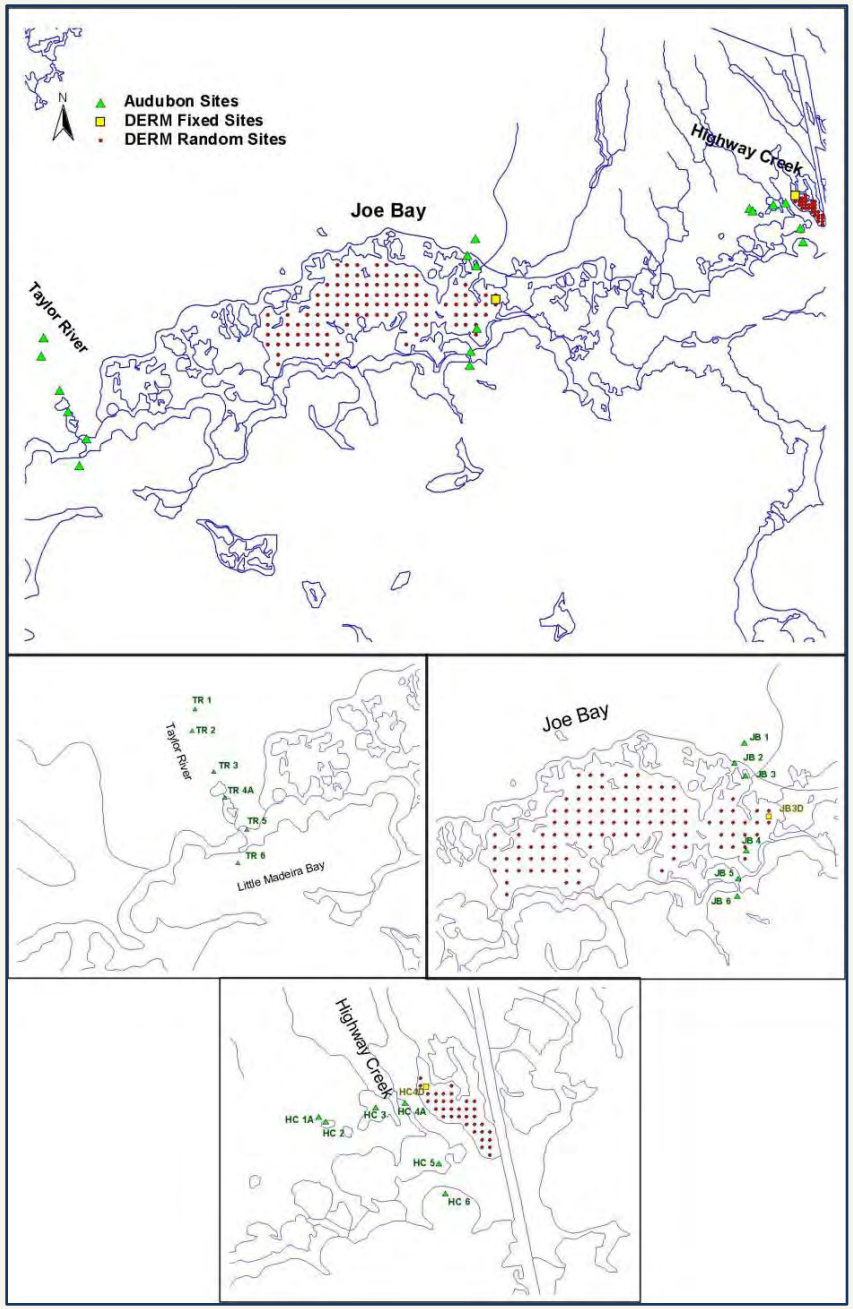


LiCor: Photosynthetic Active Radiation & Light Extinction Coefficient



SAV sampled with 0.25m^2 grid – BBCA and Seagrass shoot density

Receiving Basins - Ruppia Review



❖ **Receiving Basins Joe Bay and Highway Creek**

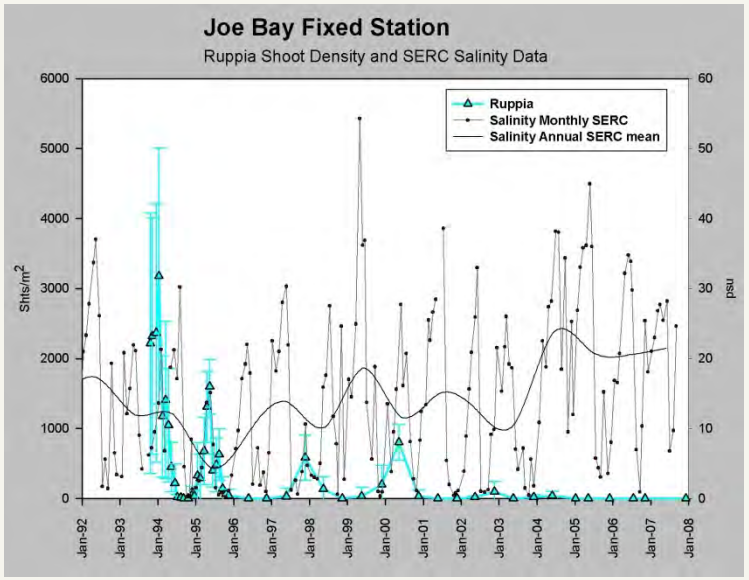
- **Thalassia absent**
- **Predominantly Halodule & Ruppia**

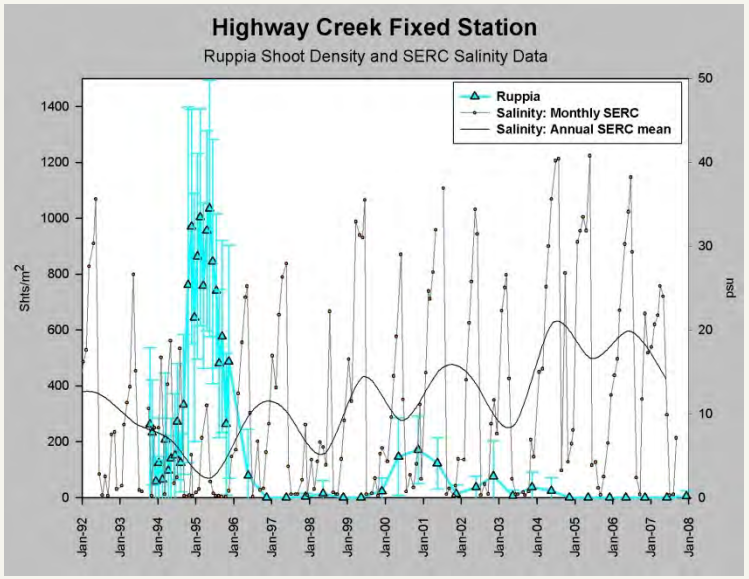
❖ **Proximity to Florida Audubon sites.**

❖ **Conducted a joint Review of Ruppia in Relation to Salinity**

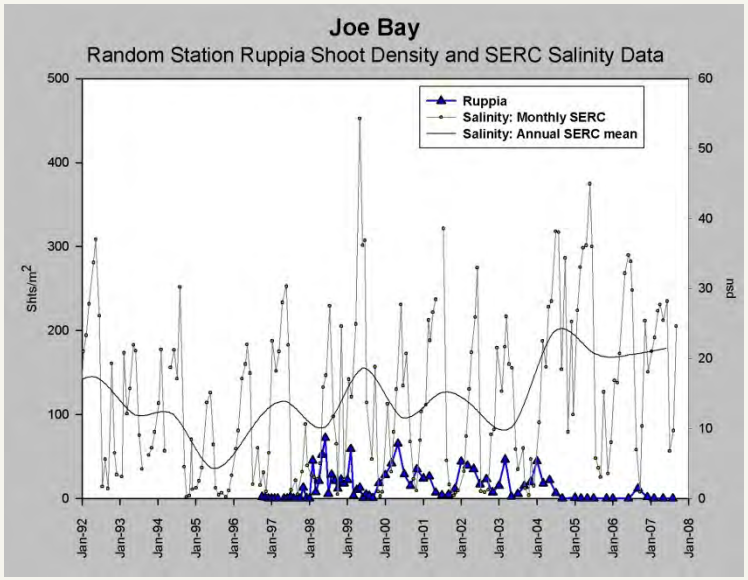
Ruppia Time Series

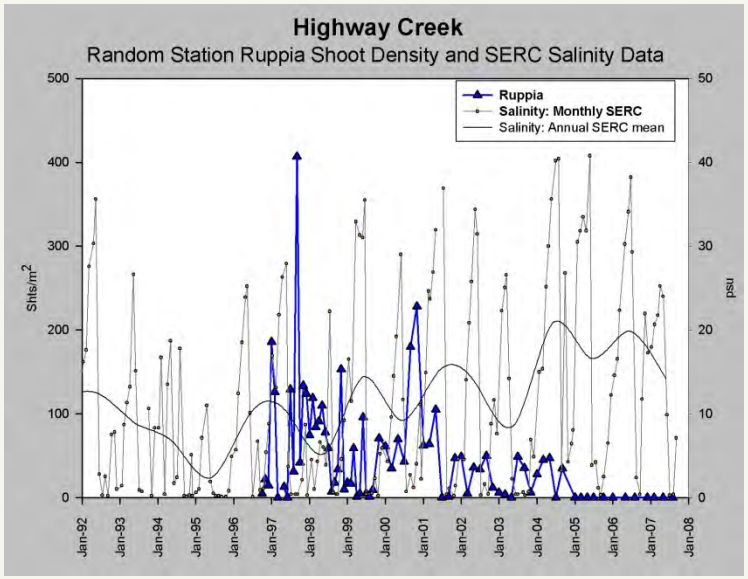
Fixed Stations





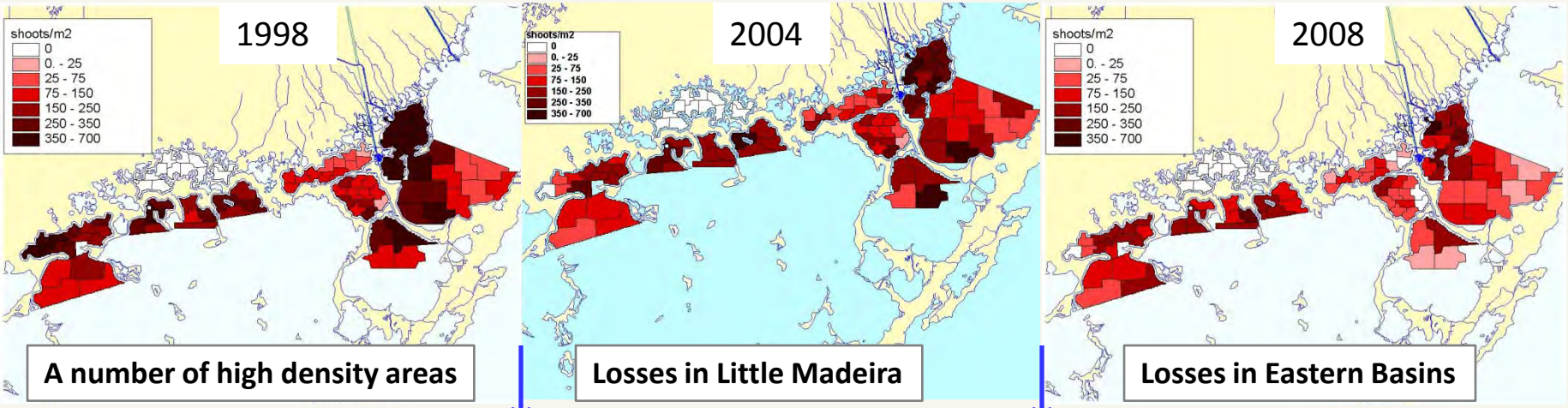
Random Stations

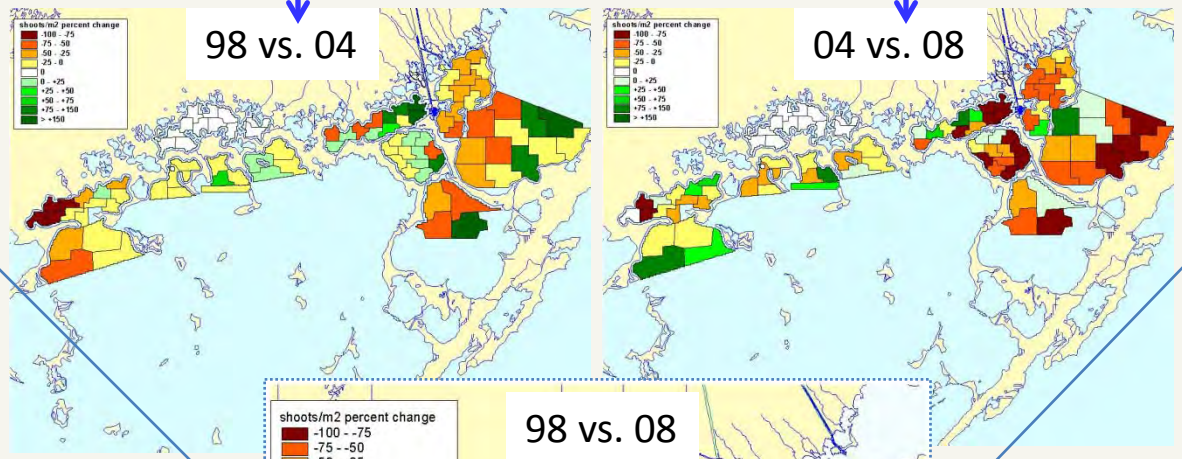


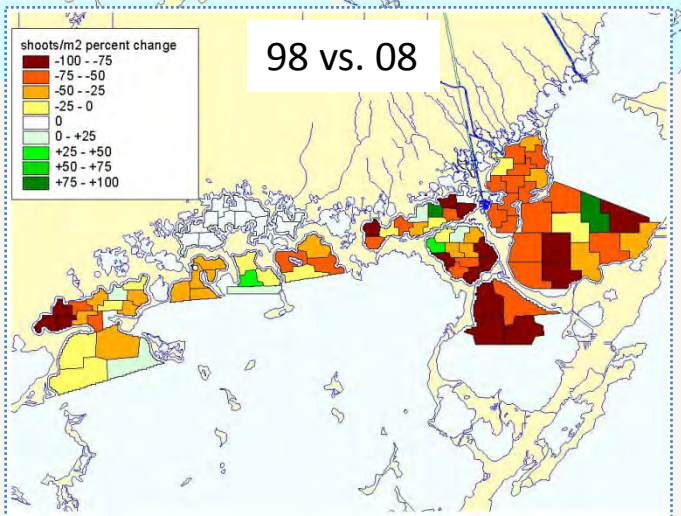


- Highly variable responses in both timing and density to salinity
- Mostly absent following elevated salinity of 2004-2005

Long term Thalassia review in the Northeastern Basins 1998 -2008

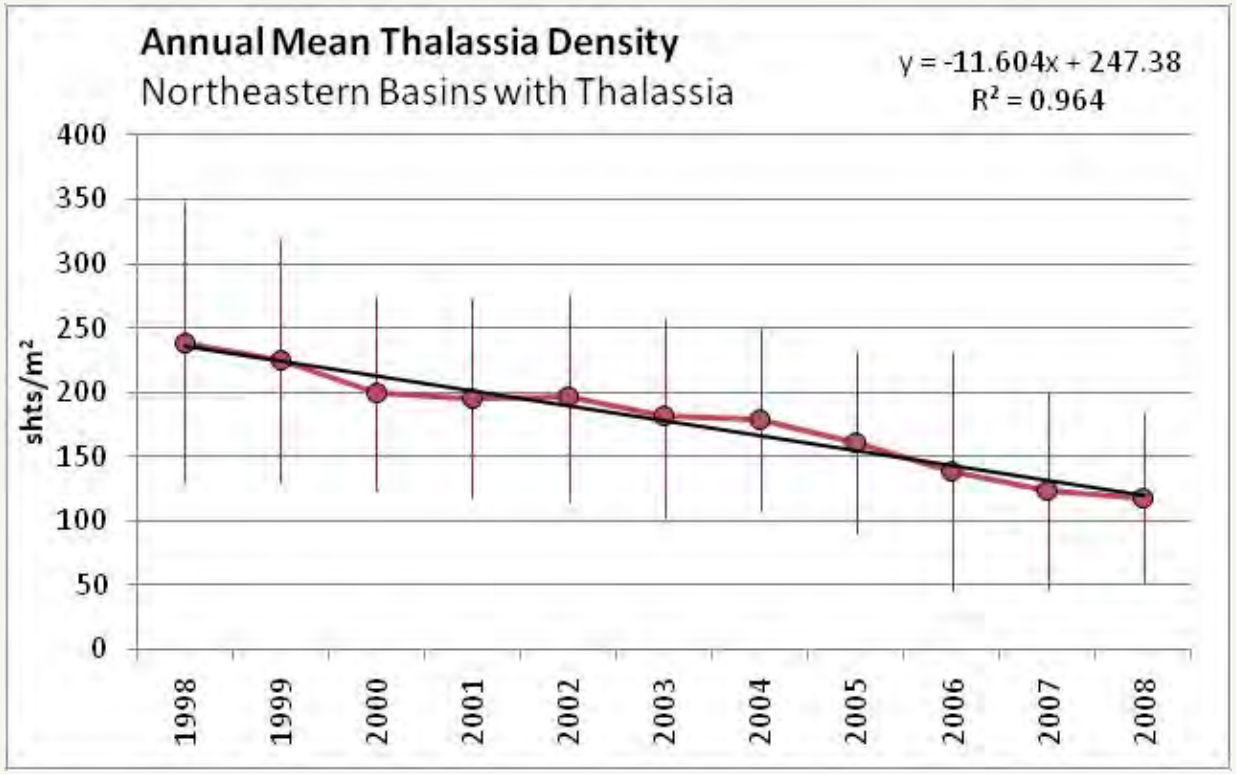






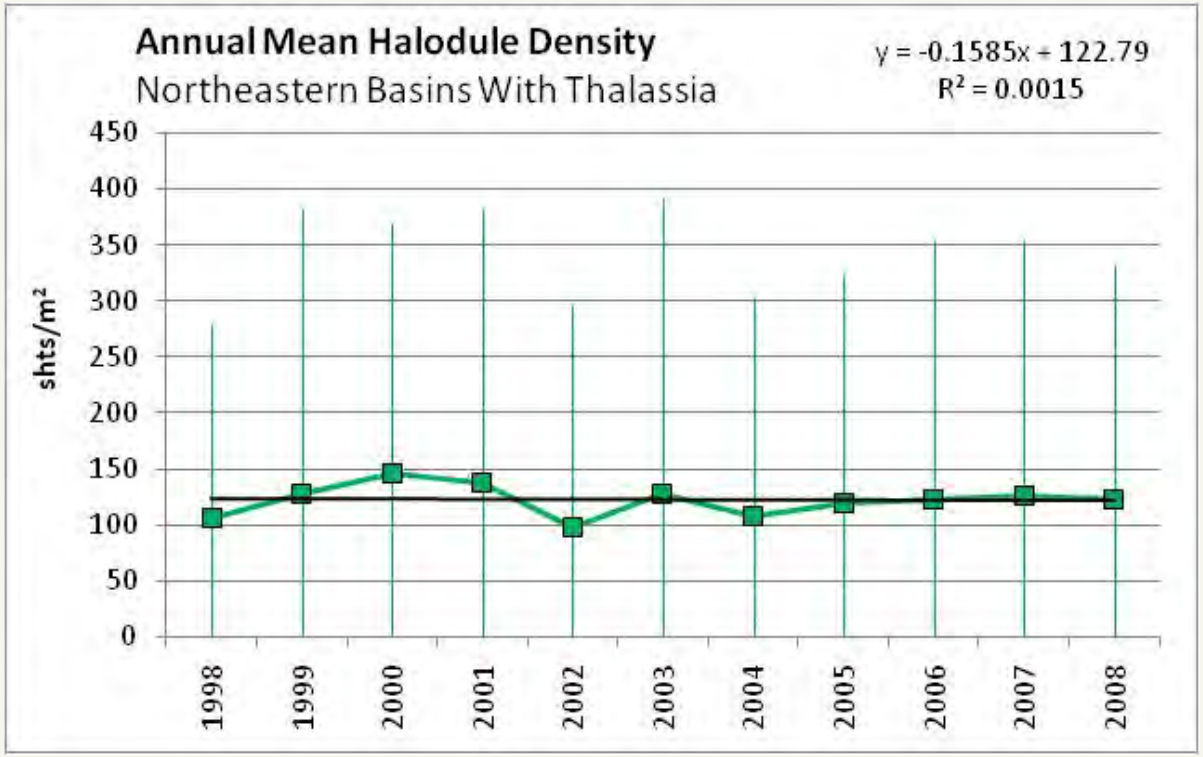
- Net result – lower density Thalassia throughout study area

Thalassia in the Northeastern Basins 1998 -2008



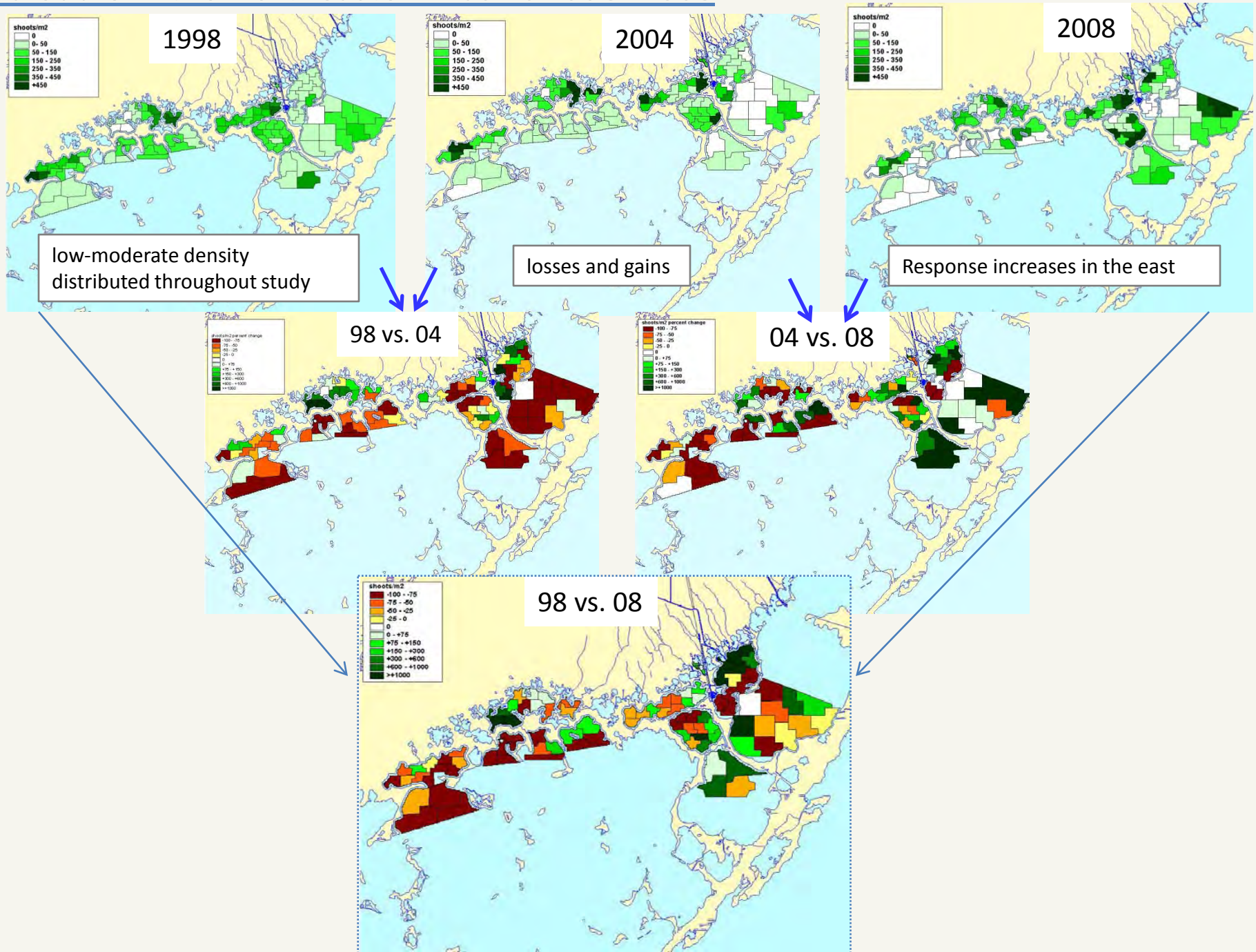
- Net long term decline for the study area during the period of record
  - Driven in large part by event losses in specific high density areas
    - 1999 Little Madeira Bay
    - 2005 Eastern Basins

Halodule in the Northeastern Basins 1998 -2008

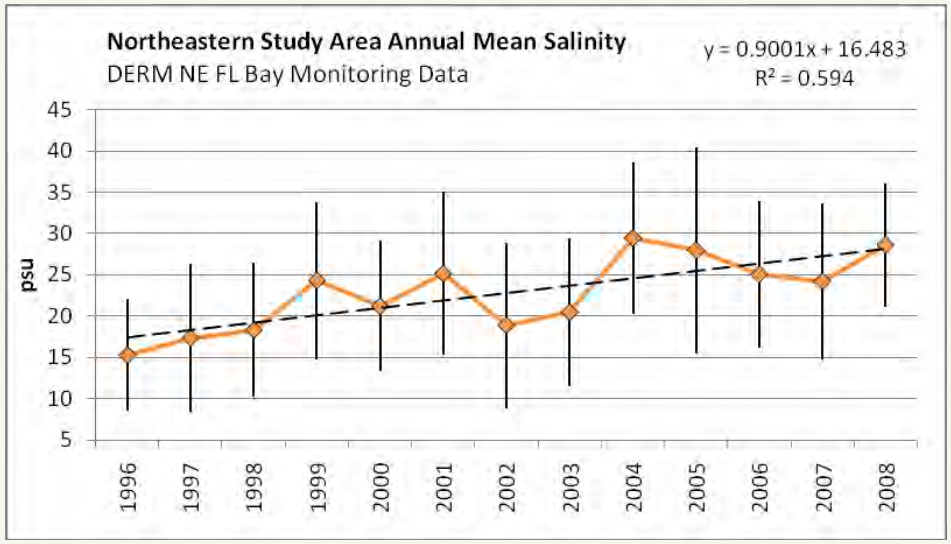


- Overall Halodule density at the study area level has remained constant
- However distributions have changed

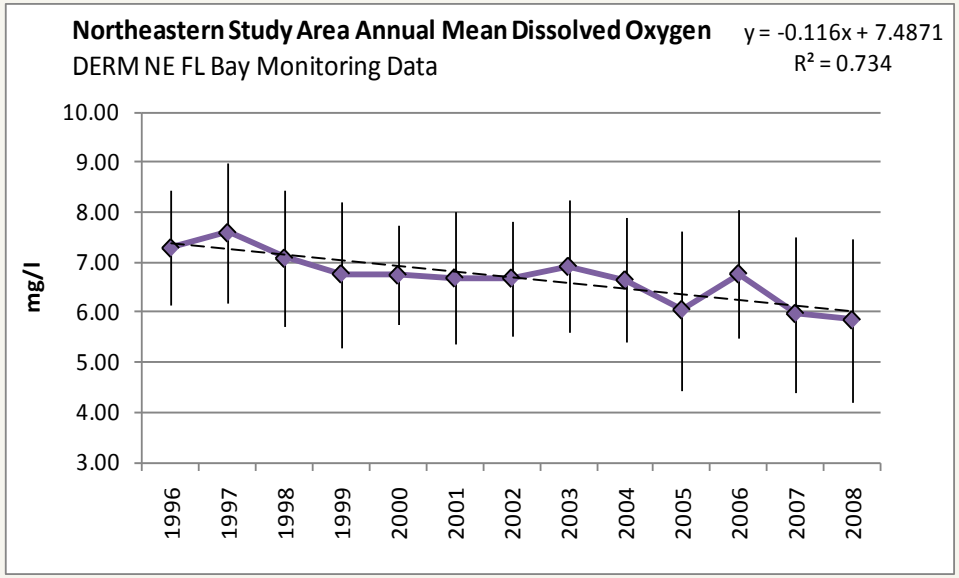
Halodule in the Northeastern Basins 1998 -2008



Physical parameter trends in the Northeastern Basins 1998-2008

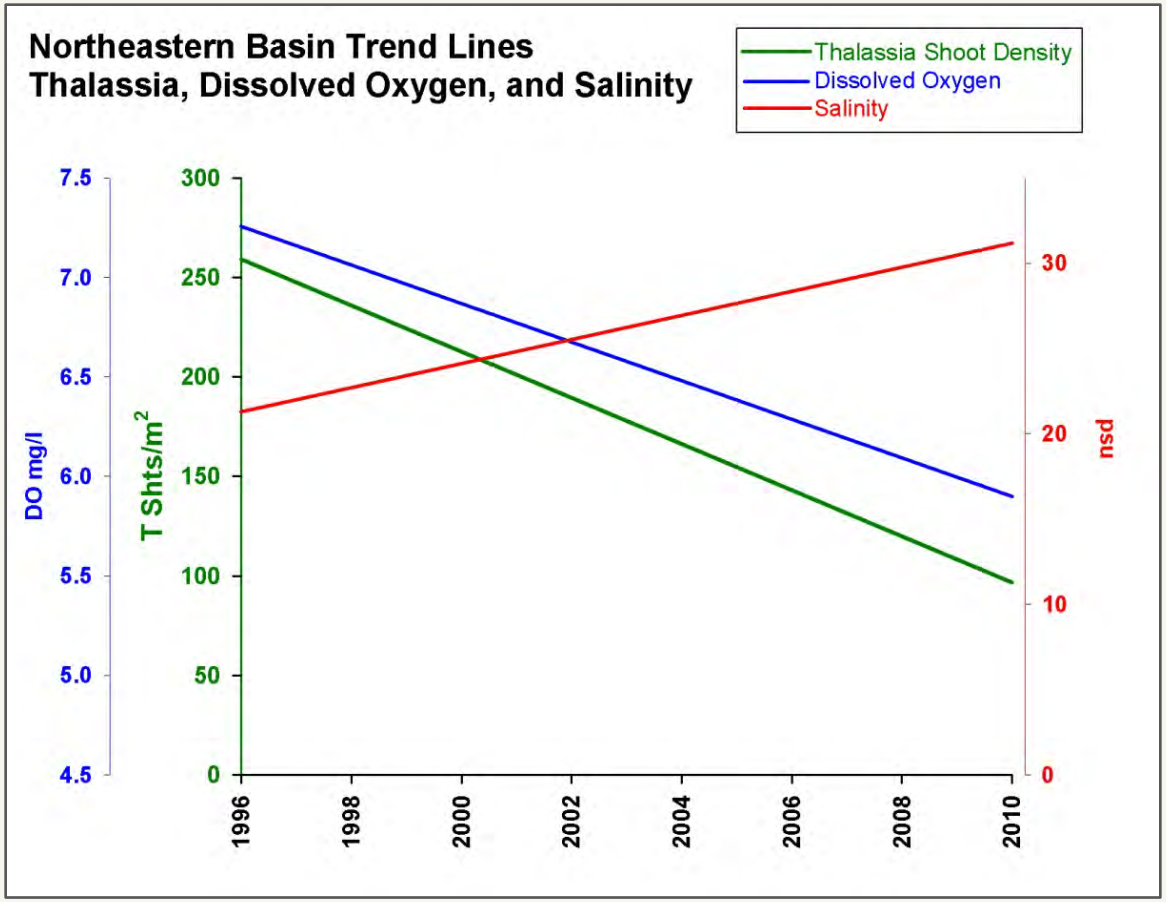


- Salinity has trended up since the program's inception in 1996
- 2008 mean almost double 1996
- 2004 & 2005 were peak years
  - Set monthly and basin maxima
- 2008 distinctive year - high mean with low deviation



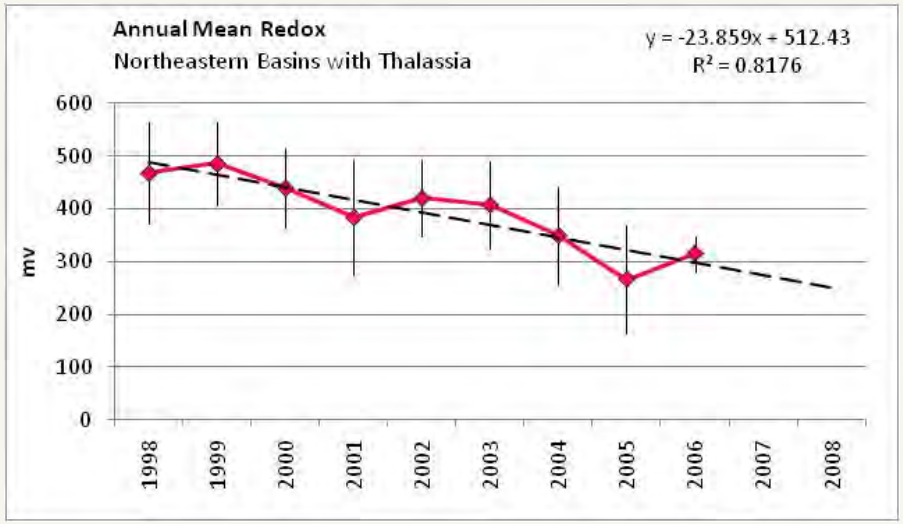
- Dissolved oxygen has trended lower during this time period as well

Thalassia and Physical trends in the Northeastern Basins 1998-2008

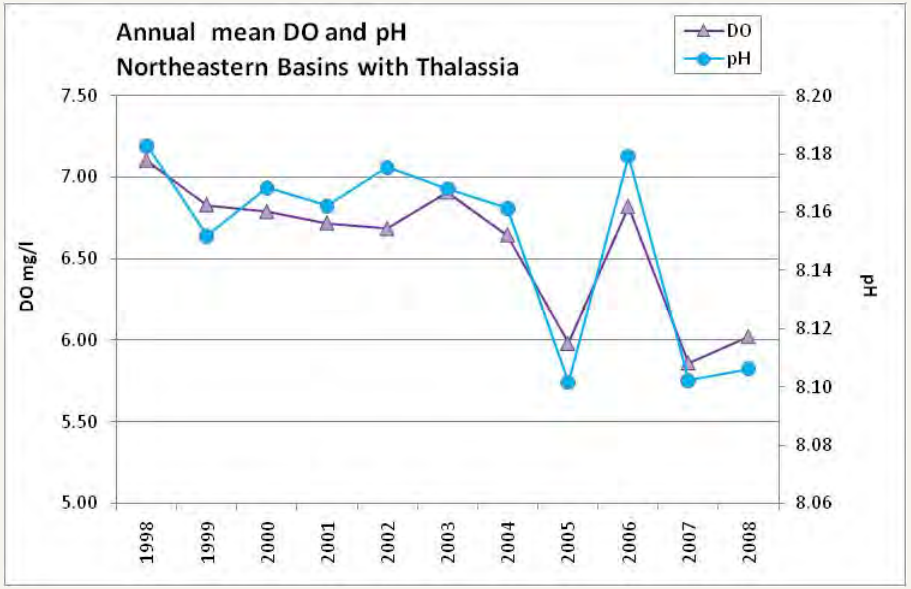


- *Potential* feedback & dynamics
  - Increased salinity
    - increases Thalassia 's metabolic demands
  - Less Thalassia
    - less O2 production
    - increases in hydrogen sulfide

Related Physical parameter trends in the Northeastern Basins 1998-2008



- Oxidation-Reduction Potential (Redox/ORP) can provide an indication of hydrogen sulfide activity
  - The trend is expected with reduction in Thalassia and DO



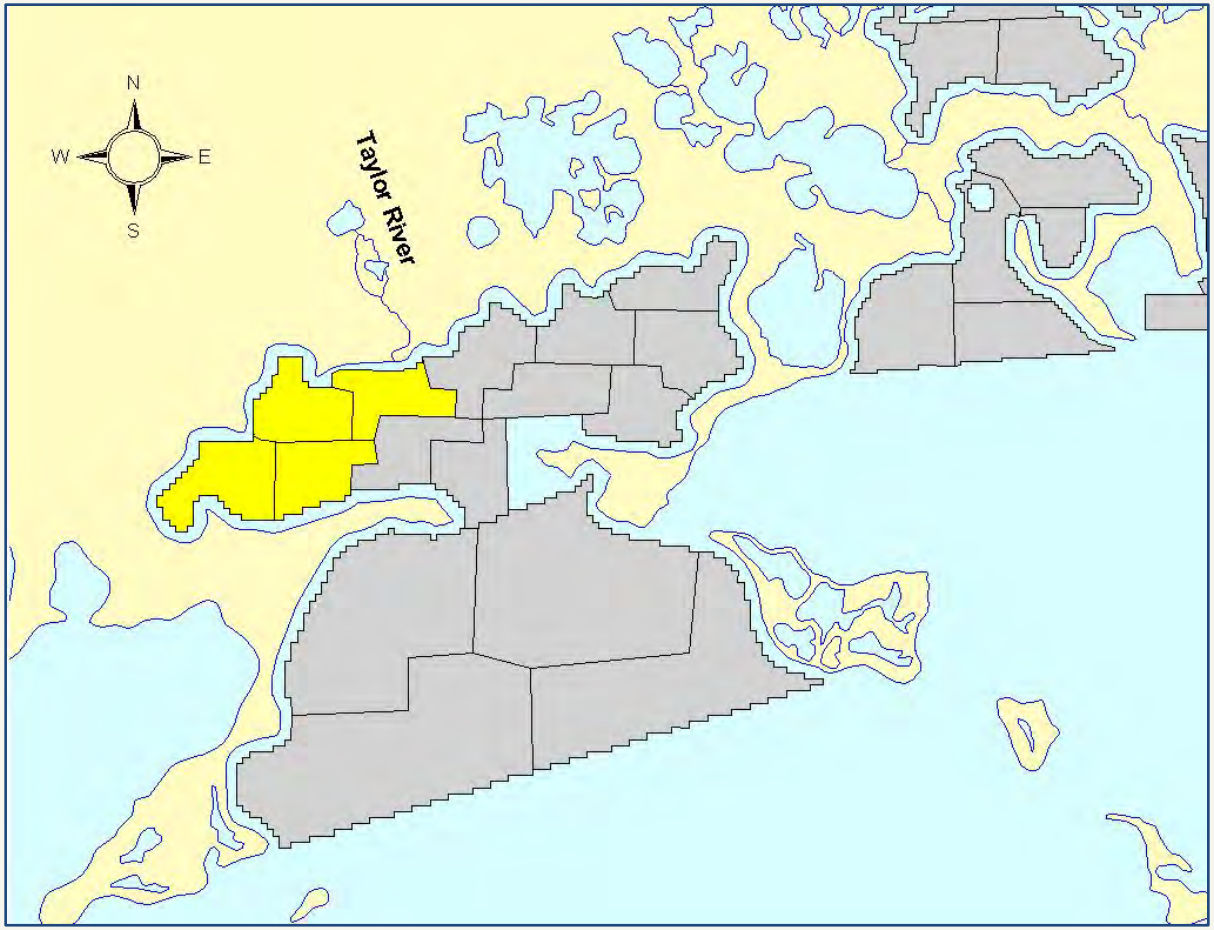
- Not a large swing in pH – but does track DO closely
  - Increased CO2 accompanying lower DO???

Thalassia Change Events

- **Little Madeira Bay 1999**
  - Loss of dense Thalassia in western portions of basin
  - Following initial losses were measurements of low dissolved oxygen and redox
  - Was not closely associated with any tropical storms or high salinity

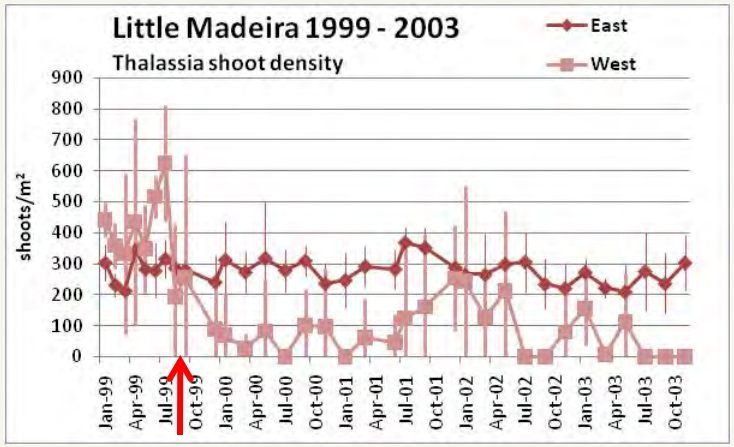
- **Eastern Basins Fall 2005**
  - Preceded by prolonged elevated salinity 2004 - 2005
  - Hurricane Katrina
    - Post storm sampling within a week measured low DO and Redox
    - Sponge losses were observed
    - Spot checks of Thalassia did not yet show obvious losses
  - Changes in Thalassia were present sampling within a month (Post Hurricane Rita)
  - Hurricane Wilma
  - SAV losses evident through 2006 sampling
  - Algal Bloom
  - Recovery ongoing

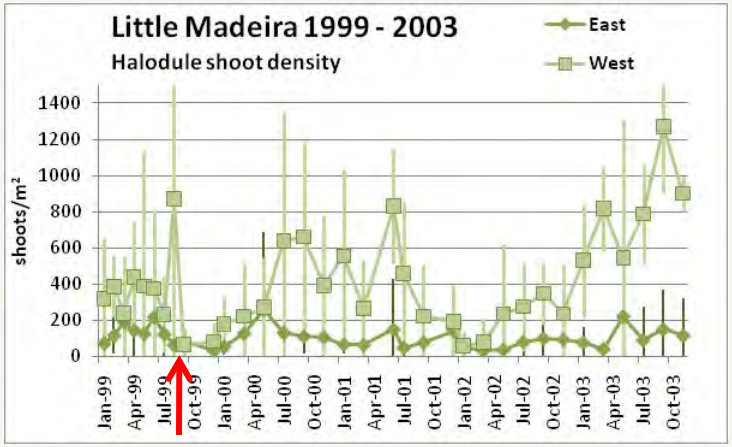
Little Madeira Bay Thalassia loss event

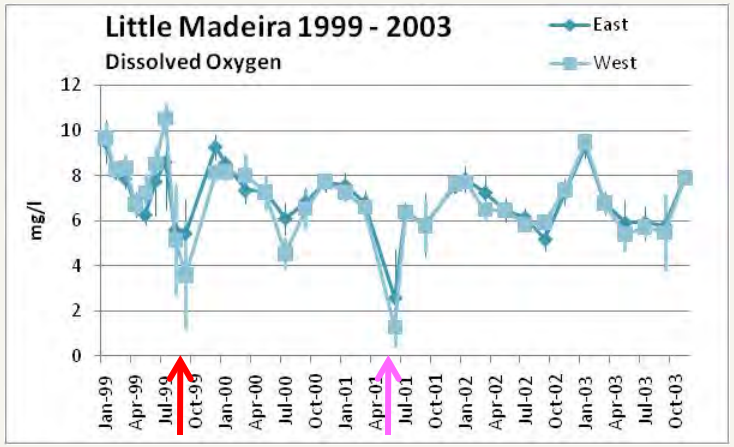


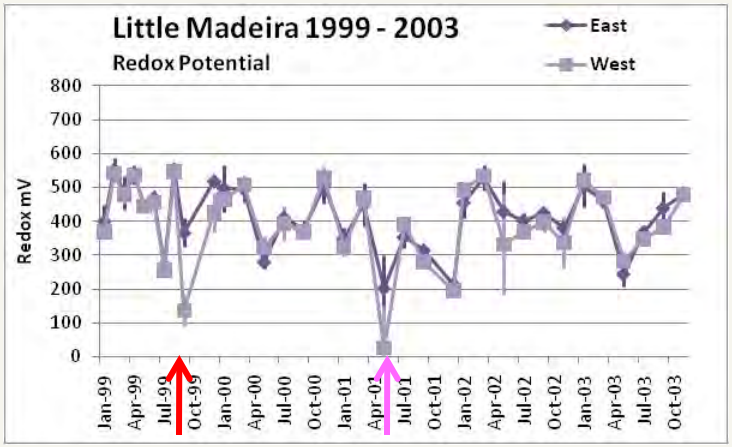
• Beginning in 1999 losses of Thalassia occurred – mostly in 4 sampling subunits of the western bay

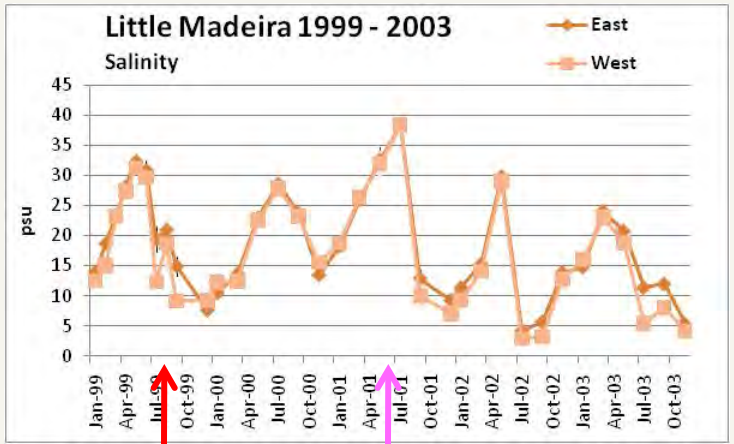
Little Madeira Bay Thalassia loss event











Little Madeira Bay Thalassia loss event

Jan -99

- High density Thalassia
- DO concentrations high throughout the bay
- Redox normal - high

Mar-99

- First 0 measure for Thalassia
- DO and Redox within normal ranges

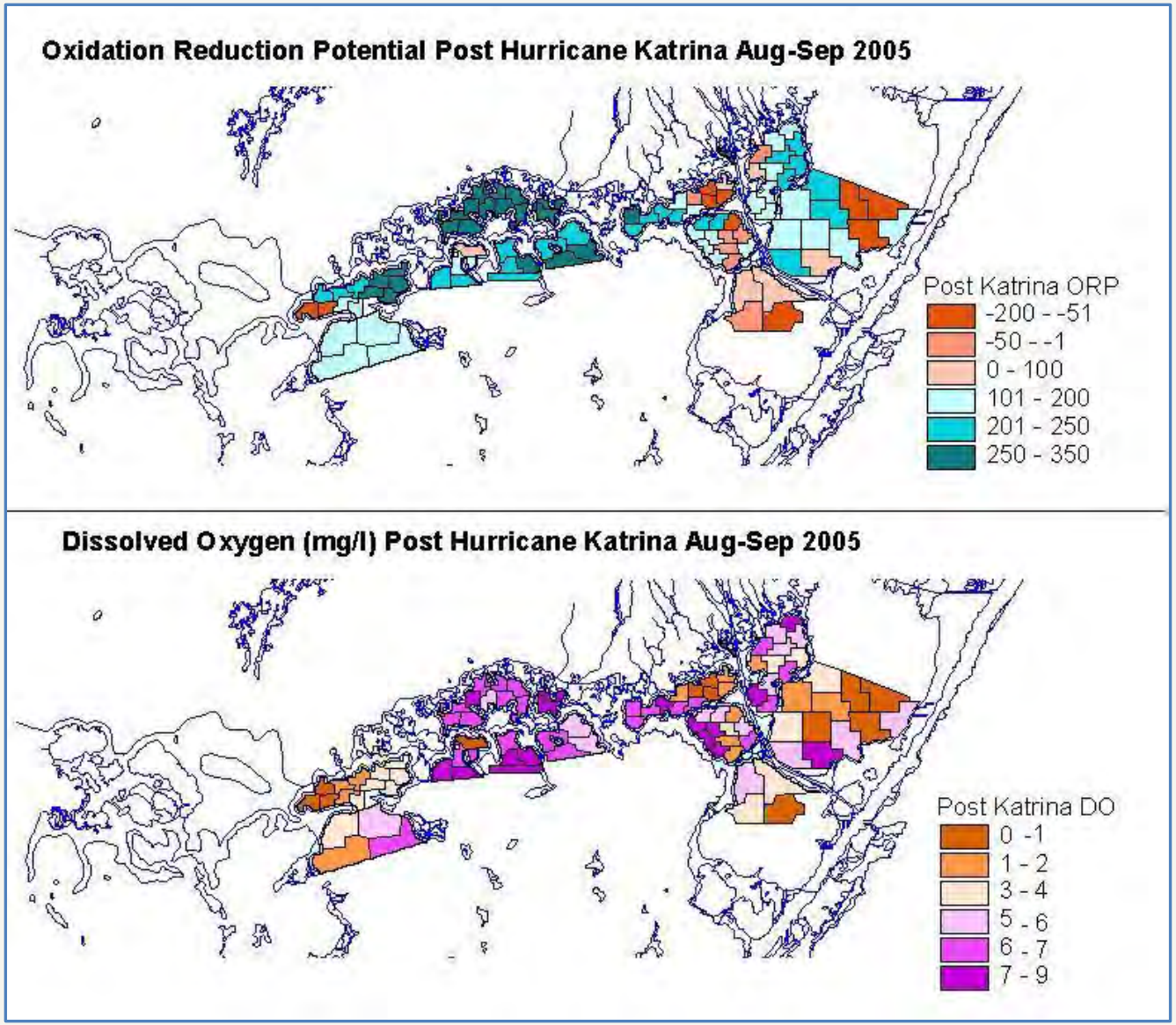
Sept-99

- Continuing 0 measures of Thalassia in the western end
- DO and Redox low in the area of change

May-01

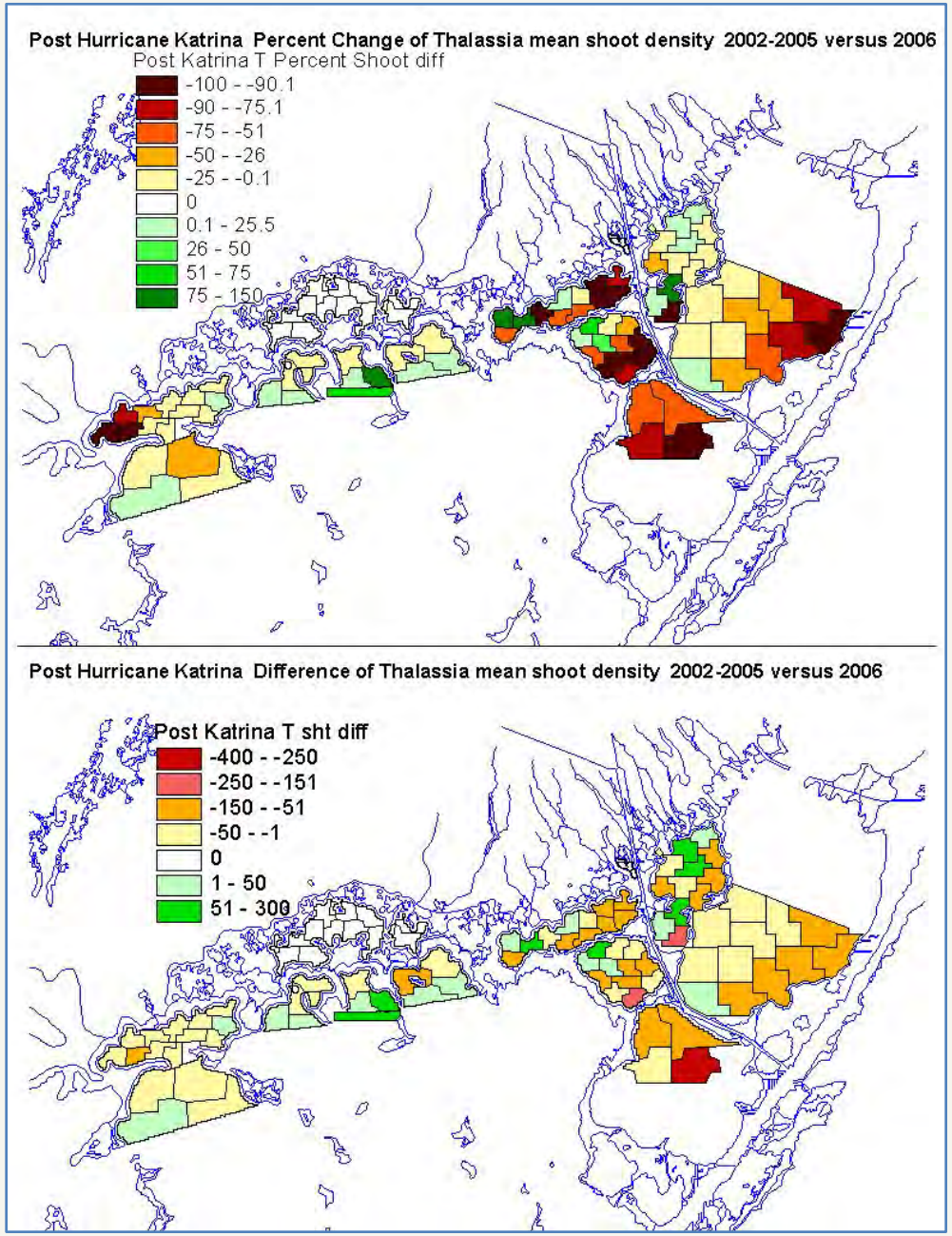
- Notable losses of Thalassia in western bay apparent
- May 01 sampling measures DO >2mg/l throughout the bay and negative redox in western portion

Eastern Basins Fall 2005



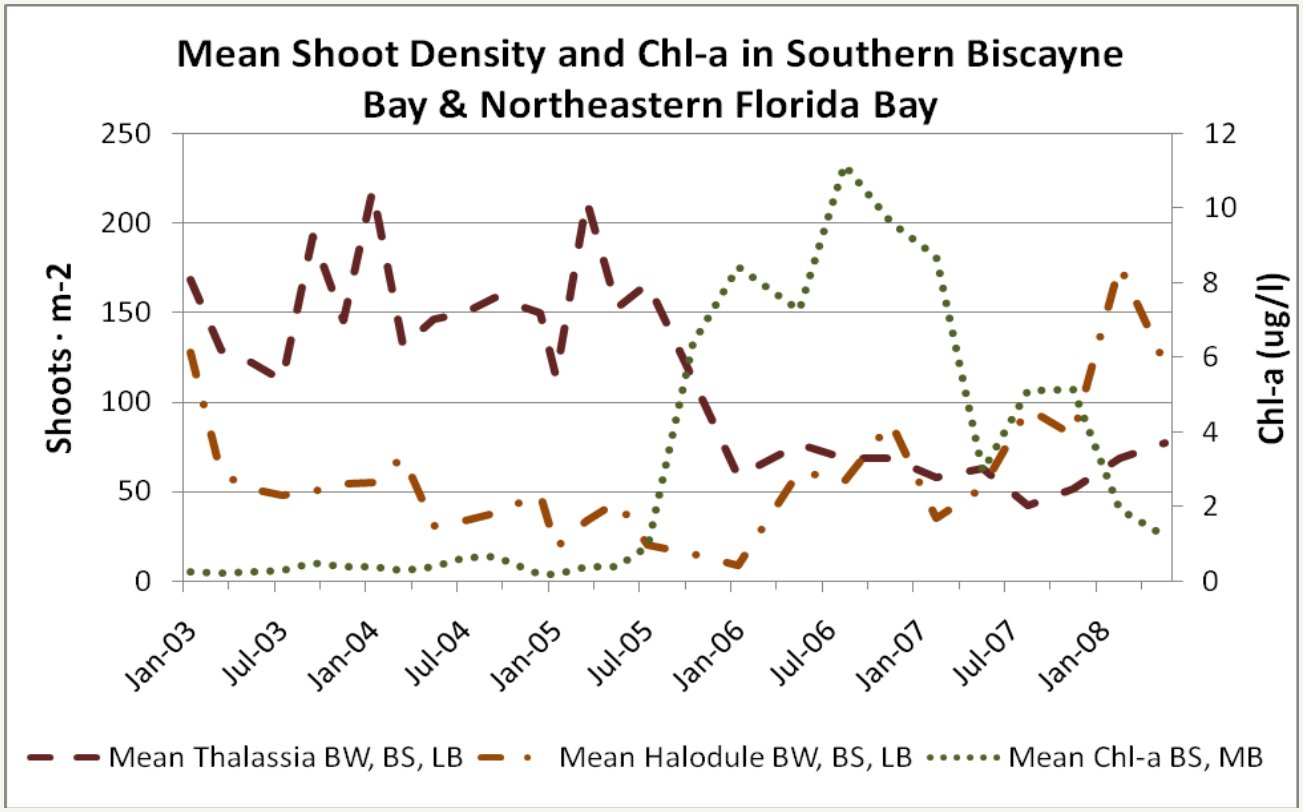
- Negative Redox
- DO <2mg/l
- More widespread in the eastern basins
- Western Little Madeira Bay
- Preceded observed changes in Thalassia

Eastern Basins Fall 2005



- Most of the severe losses occurred in eastern basins
- Western Little Madeira Bay lost the low density that was returning
- Loss areas overlap with low DO and Redox

Eastern Basins Fall 2005



- Algal bloom timed with loss of Thalassia and lasting though 2007
- Halodule response in early/mid 2006 and increases sharply with abatement of bloom

Summary

- **Ruppia in the receiving basins – Joe Bay and Highway Creek**
  - Variable responses to salinity – timing and density
  - Mostly absent since 2004-2005 elevated salinity

- **Program record trends**
  - Increases in salinity
  - Declines in Thalassia
  - Decreases in dissolved oxygen
    - pH and Redox potential follow oxygen closely
  - Changes in the distribution of Halodule

- **Thalassia loss events**
  - Measurements of low DO and negative Redox have been associated with losses