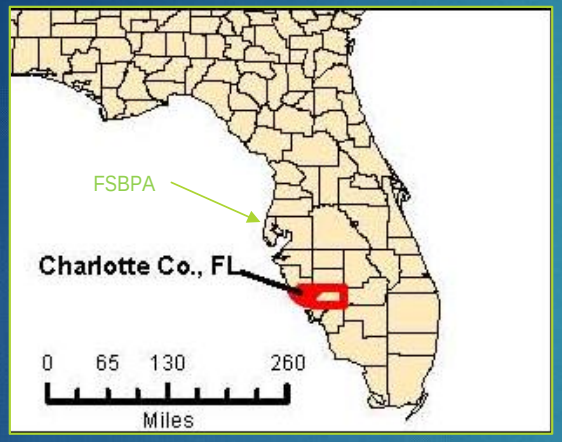
JCP Environmental Monitoring – Making It Meaningful, A Case Study

CHARLOTTE COUNTY STUMP PASS EROSION CONTROL PROJECT

SEAGRASS MONITORING

Stump Pass, Charlotte County



Project History

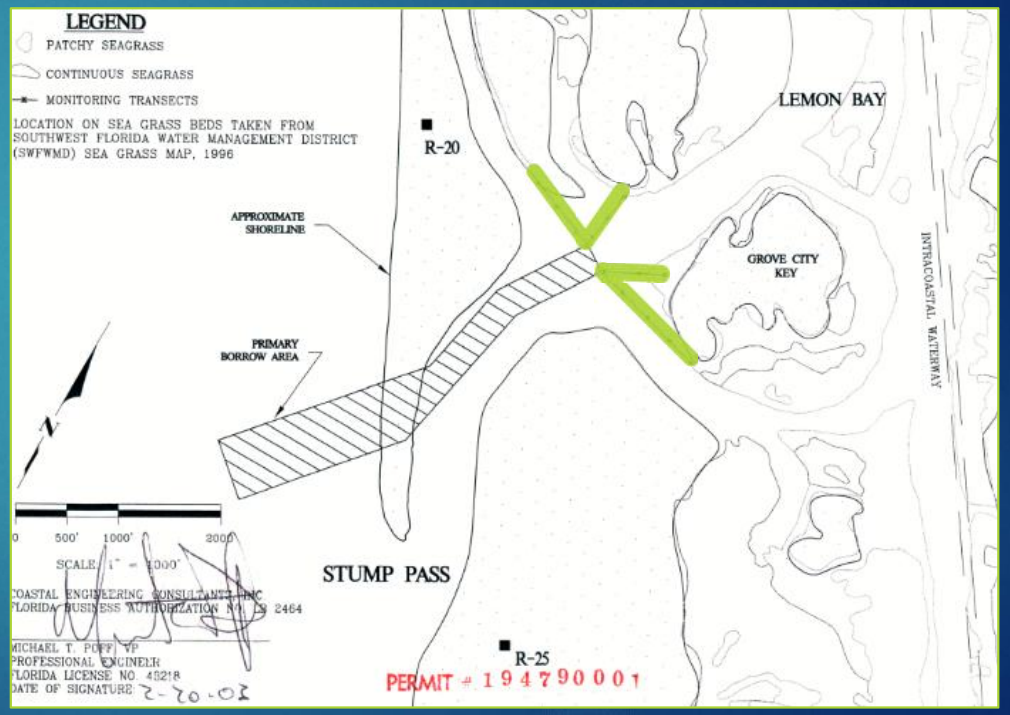
- Original channel dredging 1980, two subsequent maintenance events in 1998 and 2001.
  - County/CEC monitored inlet system 1980-1989.
  - Stump Pass Inlet Management Study 2001.
  - Joint beach nourishment/navigational project proposed 2002.
- Erosion Control Management Plan implemented in 2003.
  - Improved navigation by dredging naturally-occurring sand spit.
  - Beach restoration on south Manasota Key and Knight/Don Pedro Island using dredged sand.
- 2003 permit required a Seagrass Protection Plan using a standard line-intercept transect approach.

1998 Photo

Seagrass Protection Plan Development

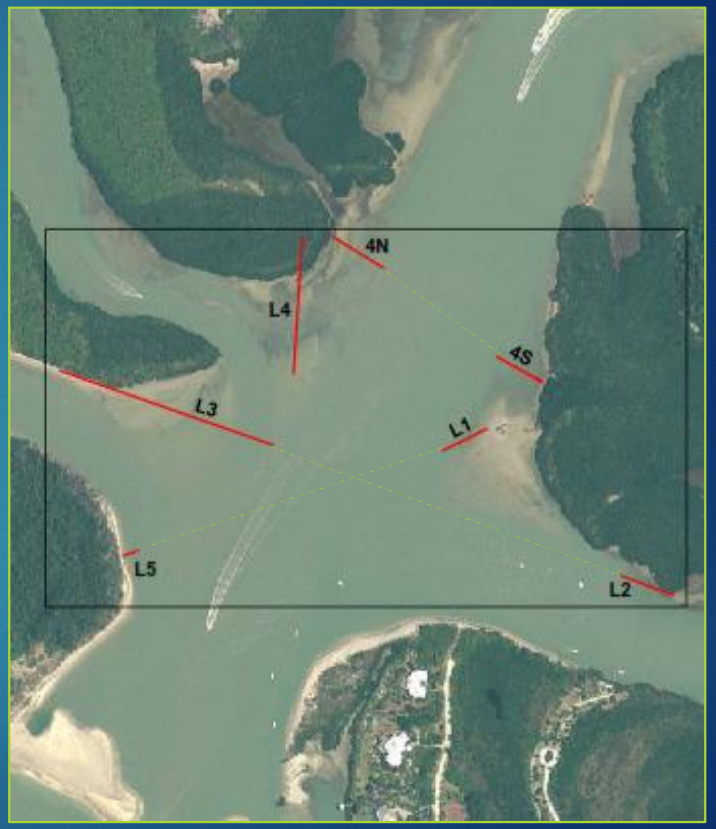
2003

- Collaborative effort between regulatory staff and project team based on past SWFWMD seagrass data.
- Transect locations focused on the channel relocation area.
- Monitoring transects also coincided with turbidity monitoring plan for the 2003 project.
- Initially, 4 fixed transects were identified within the plan.
- Pre-construction, during construction, and immediate post-construction monitoring.
- Bi-annually for 5 years post-construction, in April and October.



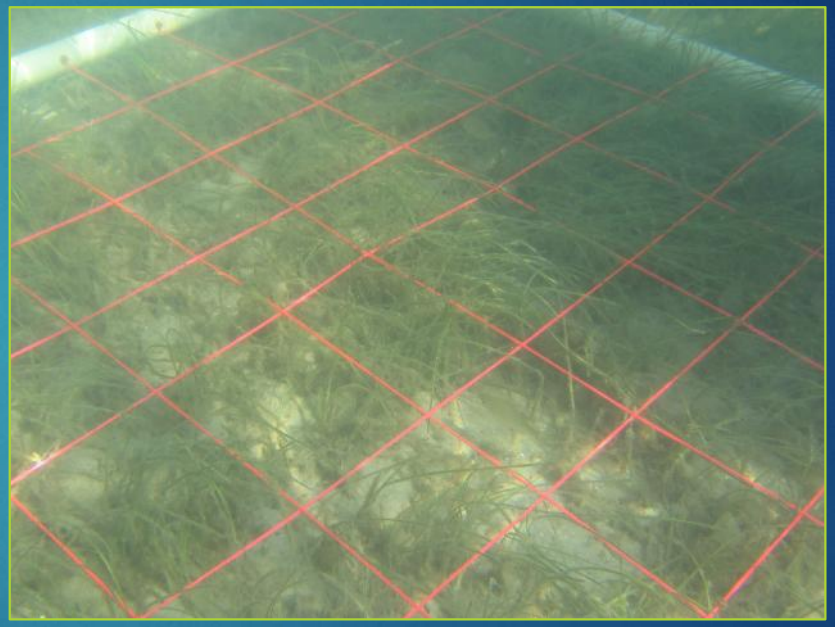
Seagrass Protection Plan Elements

- Increased to seven transects (in red).
- Sampling stations every 20m along each fixed transect:
  - Seagrass species, height, percent coverage, number of occupied quadrat subunits (100 total)
  - Sediment type
  - Epiphytes (type, coverage amount)
  - Macroalgae type present
  - Water depths, adjusted to MLW
- At terminus of each transect:
  - Water quality (temperature, salinity, pH, conductivity, DO)
  - Light attenuation measurements with a light meter (every 20cm from surface to 100cm depth)
  - Secchi depth measured
  - Two water samples collected for lab analysis of turbidity and chlorophyll-a



Seagrass Protection Plan Data Analysis

- Braun-Blanquet cover scale system used.
- Calculations performed:
  - Frequency of occurrence = Number of occupied subunits / total number of subunits (100)
  - Abundance = Sum of cover scale values / number of occupied quadrats
  - Density = Sum of cover scales / total number of quadrats
- Not prescribed within seagrass protection plan, but performed by monitors: nonparametric statistical test to compare results of pre-construction and post-construction events.

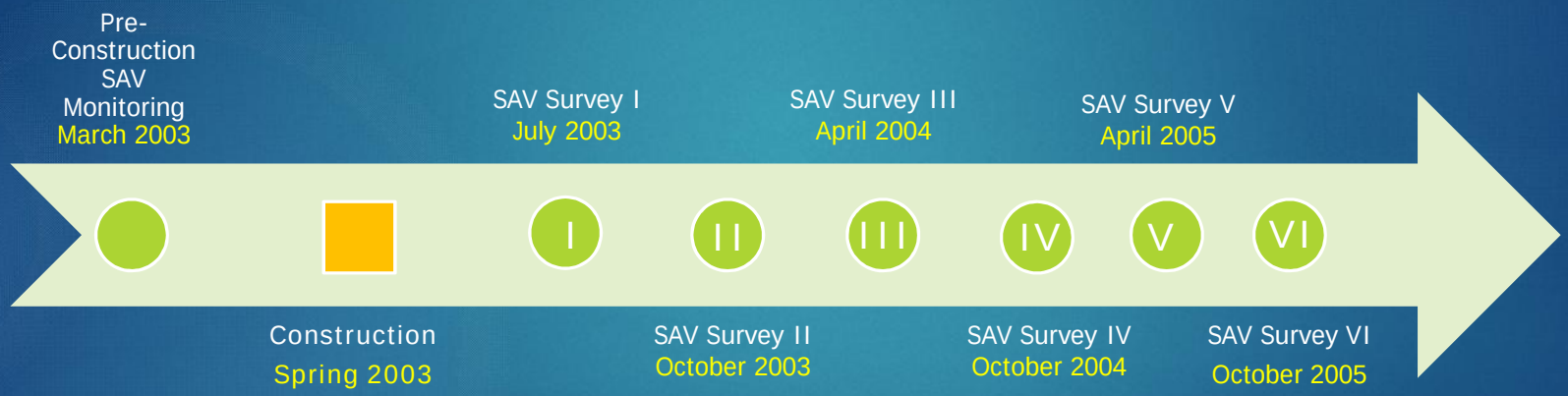


Seagrass Results, 2003 Project

- Two pre-construction monitoring events, both conducted in March 2003
  - Initial event, then transects added
  - Seagrasses sparsely distributed throughout Study Area
- Six monitoring events post-construction July 2003 to October 2005.
- DCA noted loss of seagrasses along L3 and L5 due to increased scouring.
- Variation of seagrass coverage along the other transects was observed, no significant decrease.
- Active hurricane seasons 2004 and 2005.

DCA 2005

2003 Erosion Control Project Seagrass Monitoring



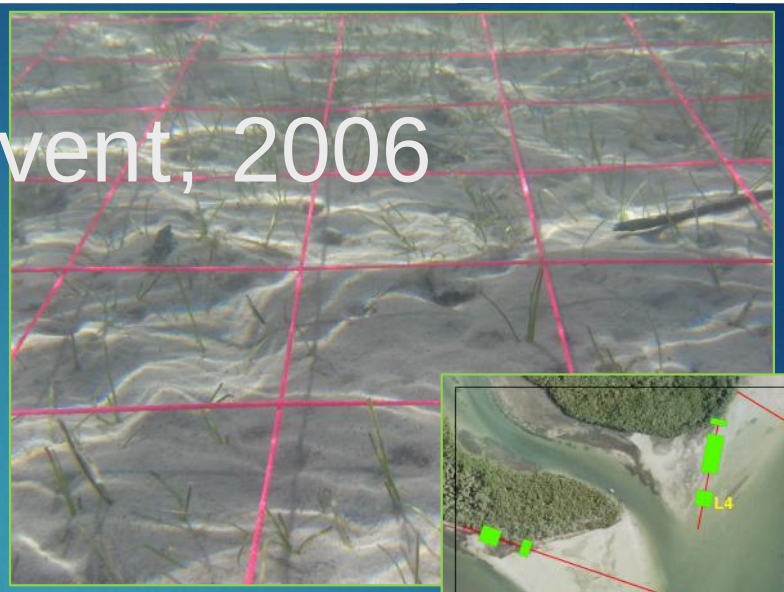
The times, they are a-changin’

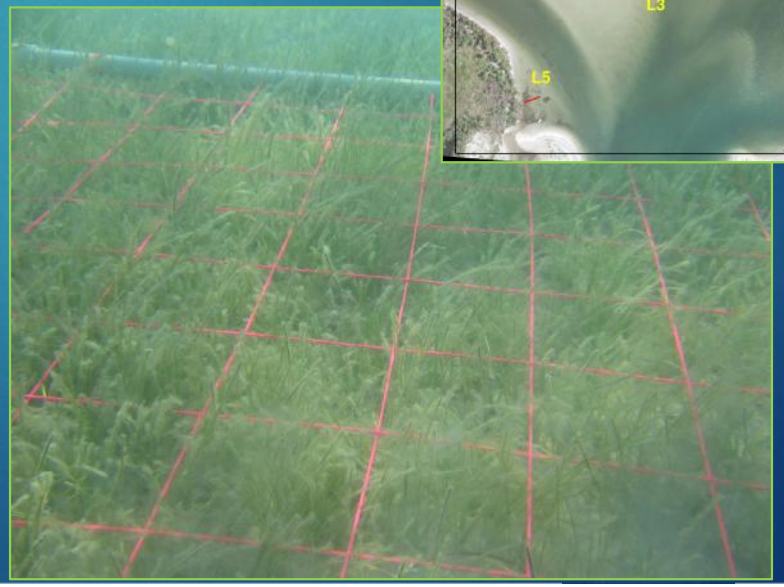
December 2003

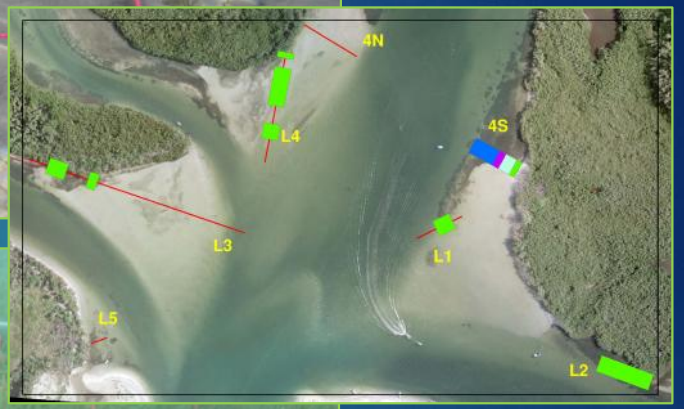
December 2005

First Maintenance Event, 2006

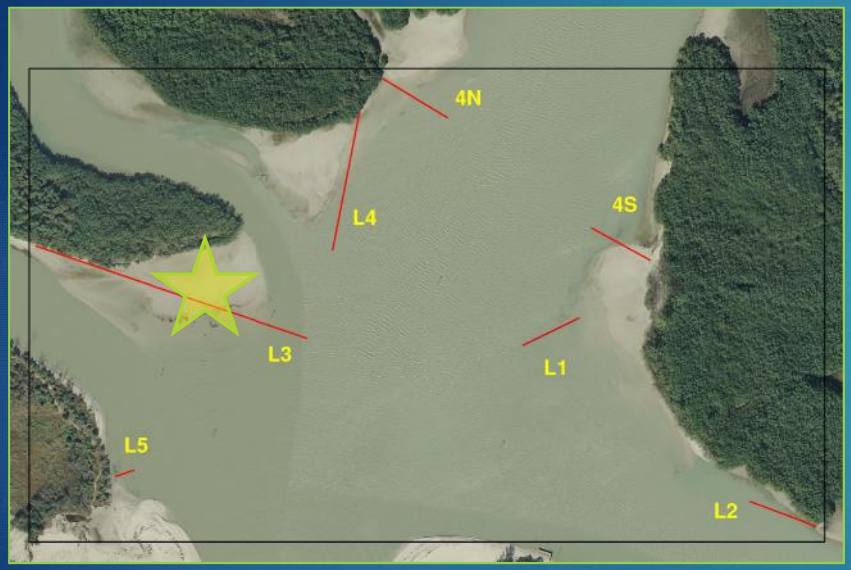
- 2006 Seagrass Protection Plan followed the 2003 plan during permit processing.
- Pre-construction monitoring February 2006 – SAV Survey VII.
- Two post-construction monitoring events in 2006 – July, October.
- April/October biannual monitoring resumed 2007 through October 2010.
- Surveys documented variation in conditions as well as seagrass extent and coverage.
- Variation in water quality parameters and light attenuation documented, among and between survey events.

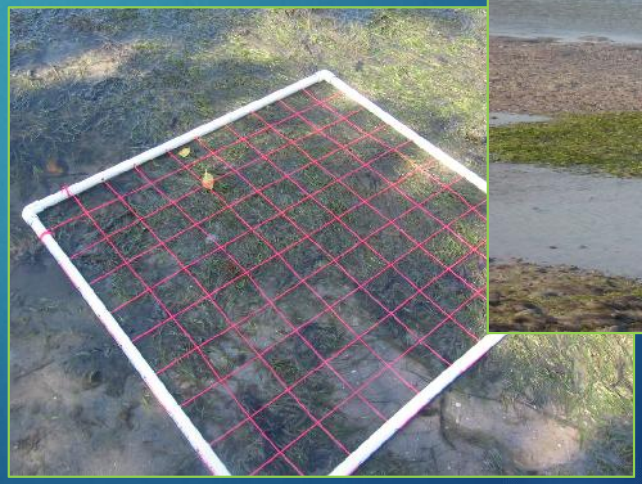






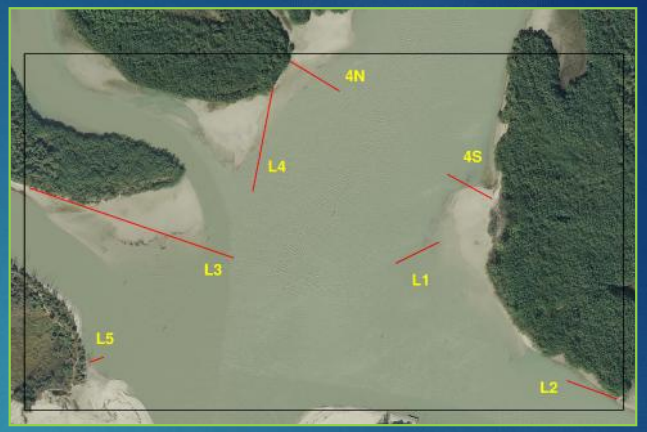
October 2006
Survey IX

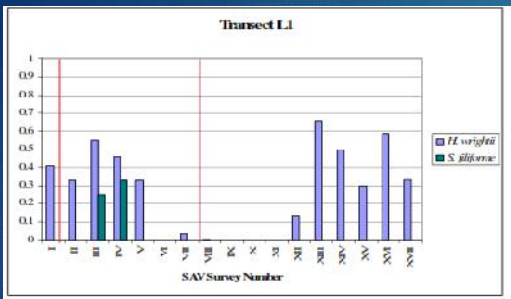


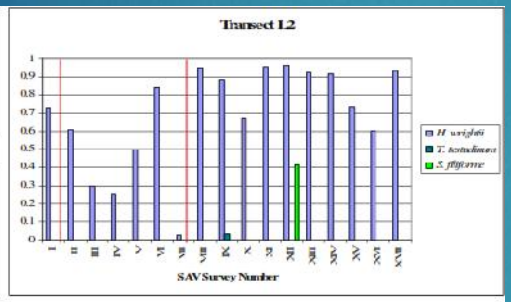


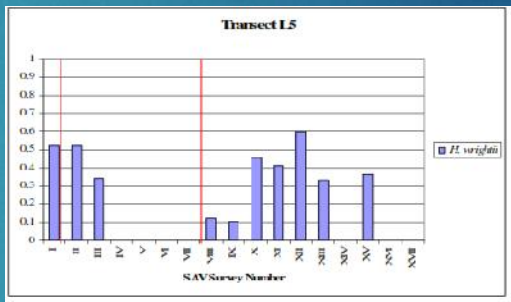
2006-2010 Monitoring

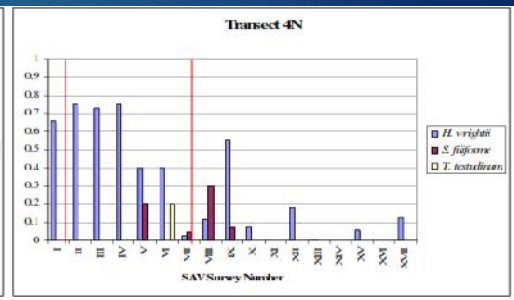
Frequency of Occurrence Calculations

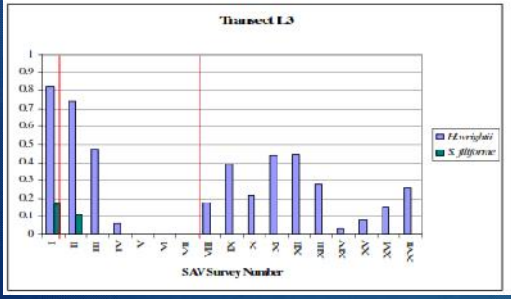


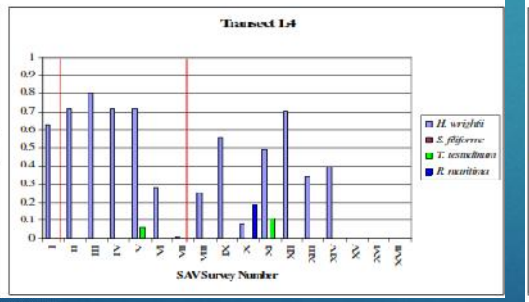


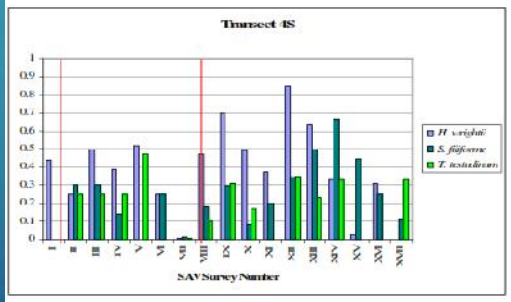








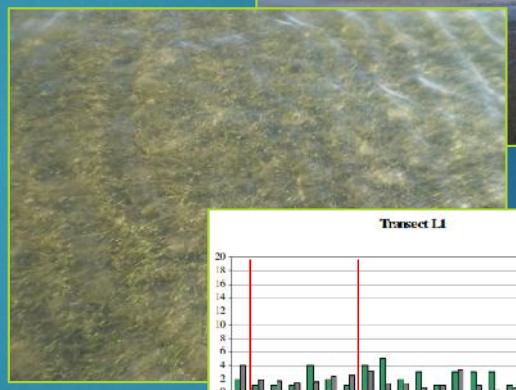


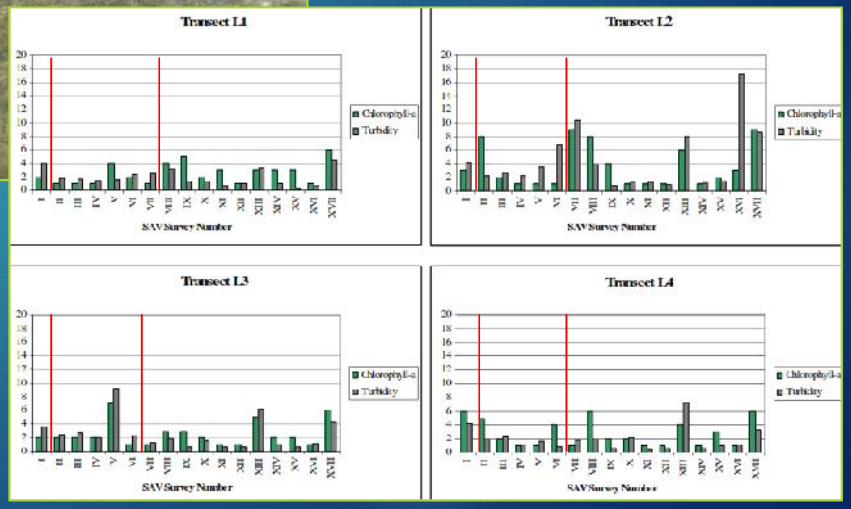


SAV Survey	Date
I	March 2003
II	July 2003
III	October 2003
IV	April 2004
V	October 2004
VI	April 2005
VII	February 2006
VIII	July 2006
IX	October 2006
X	April 2007
XI	October 2007
XII	April 2008
XIII	October 2008
XIV	April 2009
XV	October 2009
XVI	April 2010
XVII	October 2010

2006-2010 Monitoring Results

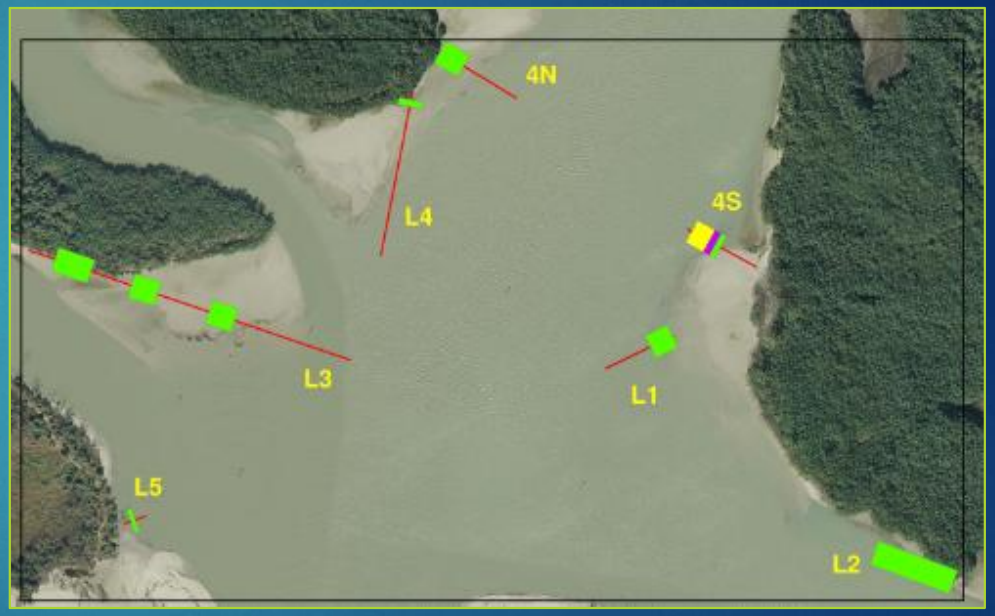
- Seagrass coverage and extent varied, as did frequency of occurrence, abundance, and density calculations based on field data.
- Water quality data varied among and between survey events.
- Turbidity measurements varied among and between survey events.
- Chlorophyll-a measurements varied among and between survey events.
- Transect L2, the most interior transect was also the most stable, exhibiting high coverage and extent of seagrasses during most surveys.
- Sediment characteristics tended towards sand along all transects except L2 over time.





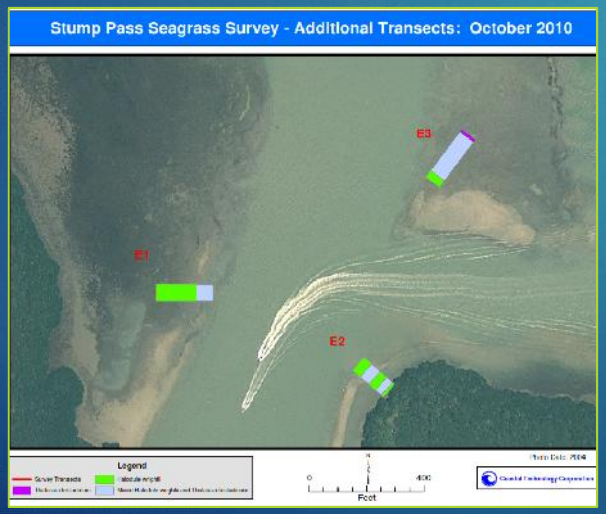
October 2010 Results

- SAV Survey XVII (October 2010) nonparametric statistical test results
  - All seagrass species and Halodule wrightii alone significantly higher frequency of occurrence than pre-construction.
  - No significant difference for abundance and density.
- No patterns or trends apparent from pre-construction (February 2006) through October 2010.
- This survey served dual purpose: biannual monitoring event and pre-construction for next Erosion Control Program maintenance event.



Additional Interior Transects, 2010-2011

- Project team independently added three fixed transects further interior to examine any regional changes.
- Eventually abandoned because consistently stable interior beds, composition, density, coverage.

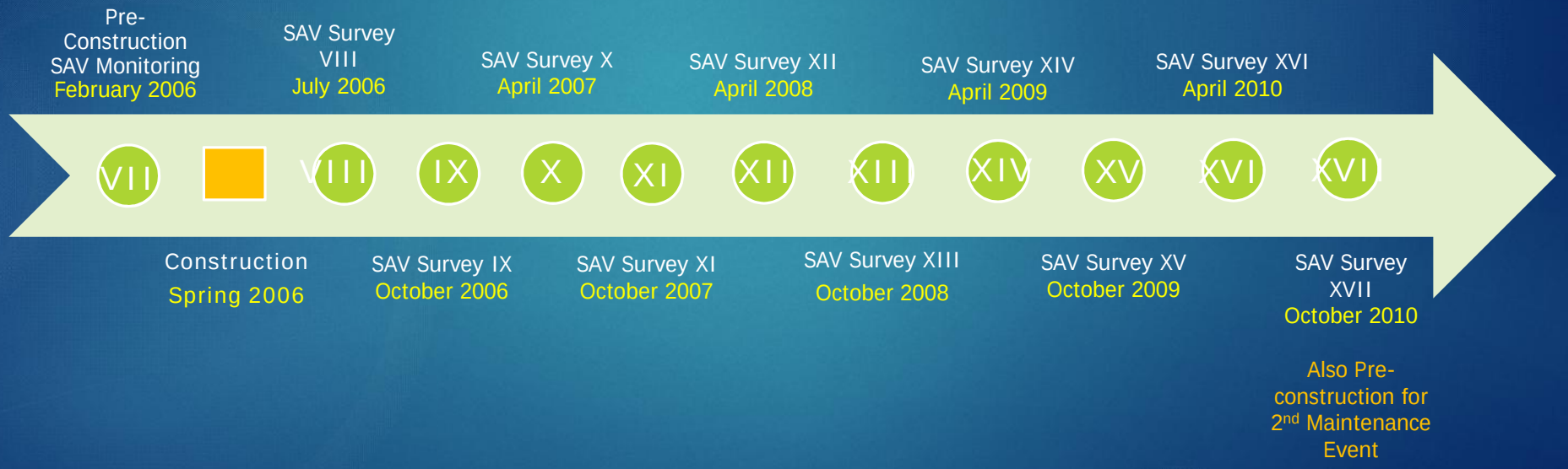


Ch-ch-ch-changes

May 2007

December 2010

2006 Erosion Control Project Maintenance Event Seagrass Monitoring

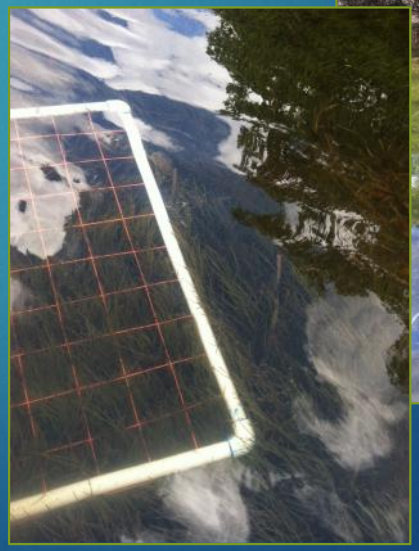


2010 Second Erosion Control Maintenance Event Permitting

- Environmental component to permitting for 2010 project was concentrated on shorebird nesting on Knight Island, associated mitigation.
- No documented seagrass impacts from project, 2003 Seagrass Protection Plan remained in effect.
- Four monitoring events associated with 2010 project followed 2003 Seagrass Protection Plan (XVIII – XXI).
- JCP permit modified with updated Seagrass Protection Plan in December 2012 and initiated in 2013.

2012 Updated Seagrass Protection Plan

- Reduced biannual monitoring to annual event during mid-late season to begin SAV Survey XXII.
- Water quality data (temperature, pH, salinity, conductivity, DO, turbidity sample) collected only at Transect L1 deep end, rather than all seven transects.
- No light attenuation data.
- No chlorophyll-a data.
- Remainder of 2003 Plan remained intact:
  - 7 transects, monitoring stations every 20m.
  - Quadrat data and analyses.

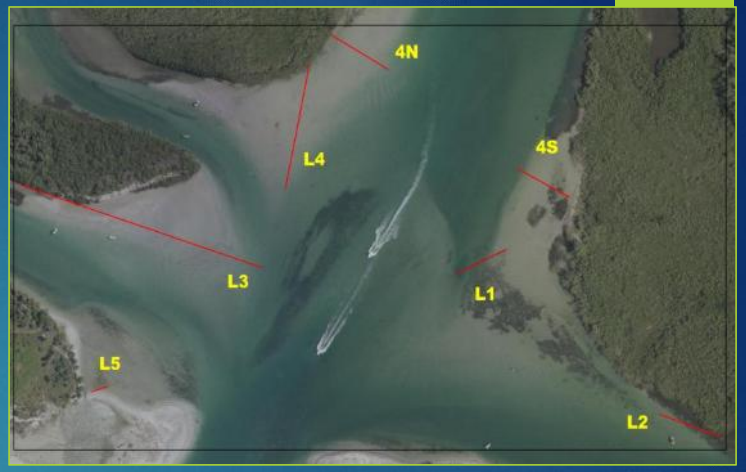


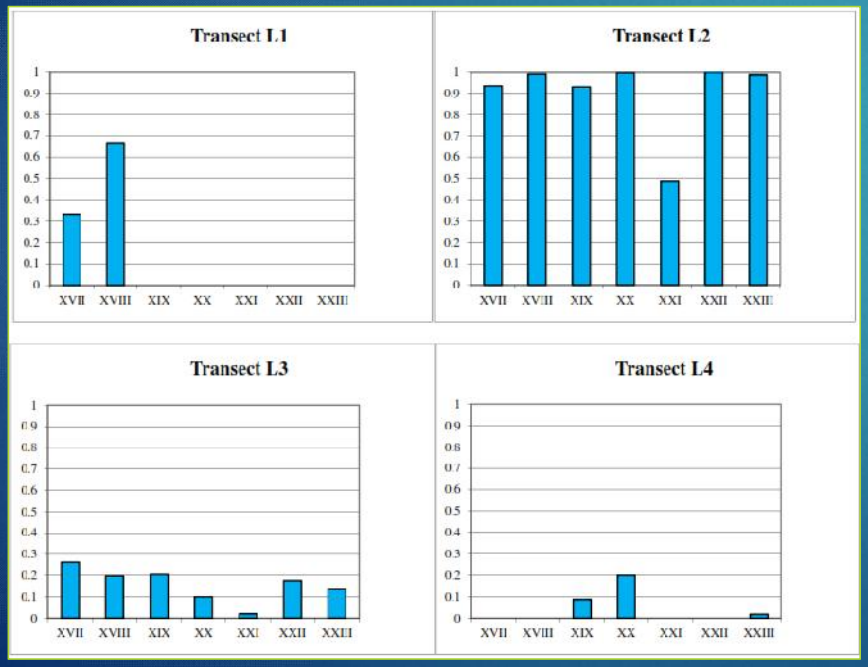
Results 2010-2014

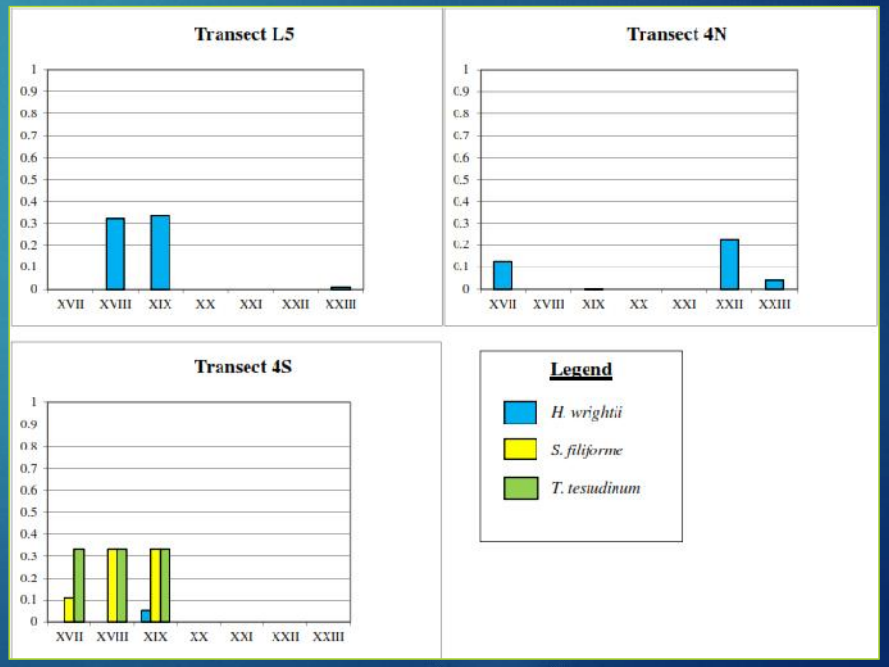
- SAV Survey XVIII through XXIII (April 2011-August 2014) nonparametric statistical test compared to pre-construction (October 2010):
  - No significant difference between pre- and post-construction seagrass frequency of occurrence, abundance, or density.
  - No significant difference when testing hypothesis that pre-construction values were higher than post-construction, and vice-versa.
- No patterns or trends apparent from pre-construction (October 2010) through most recent survey (August 2014) when using collected data.

2010-2014 Monitoring

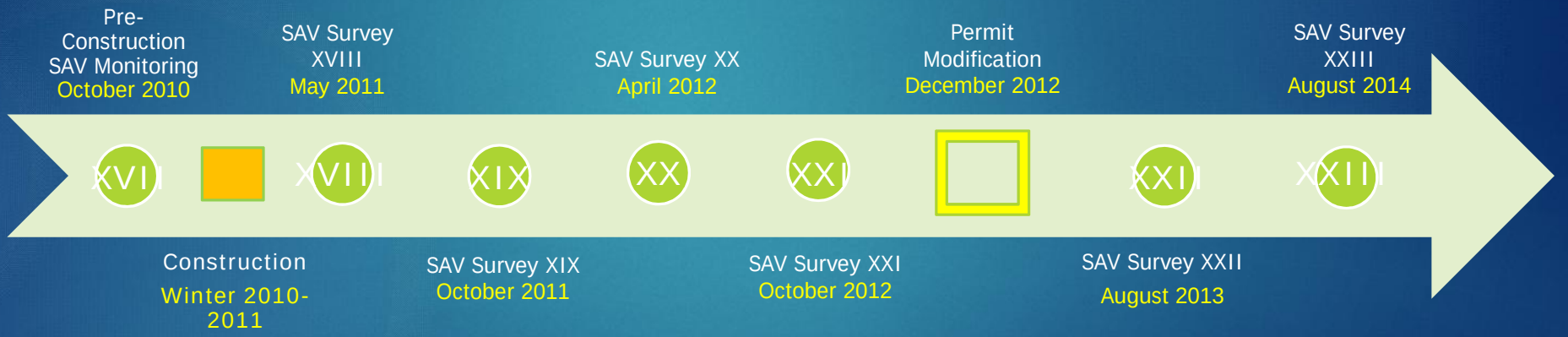
Frequency of Occurrence







2010 Erosion Control Project Second Maintenance Event Seagrass Monitoring



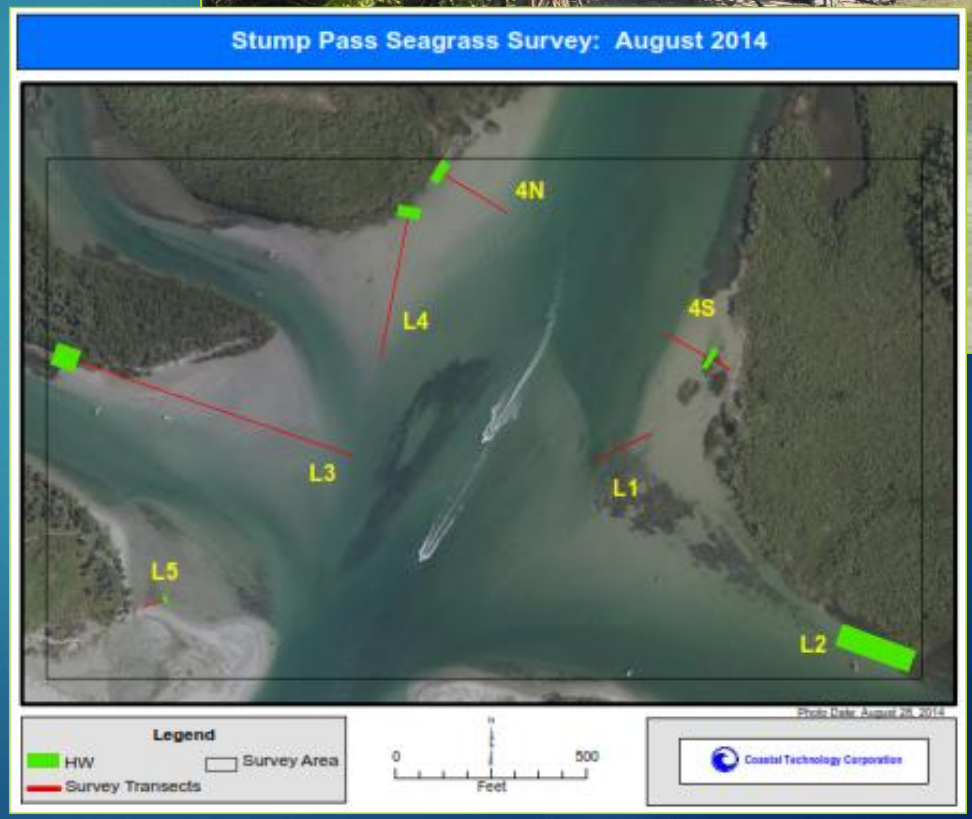
Explaining Past Results

2003-2014

- Conditions within Stump Pass are under the control of other physical/biological factors not included in the monitoring parameters.
- Documented human impacts from recreational use, but not quantified relative to seagrass presence/absence.
- H. wrightii dominant species during all surveys – ephemeral, pioneering species. No clear connection to the dredging events.
- The 2003 monitoring plan is inadequate to detect changes in seagrasses or any relationship to the project.

Conclusions to Date

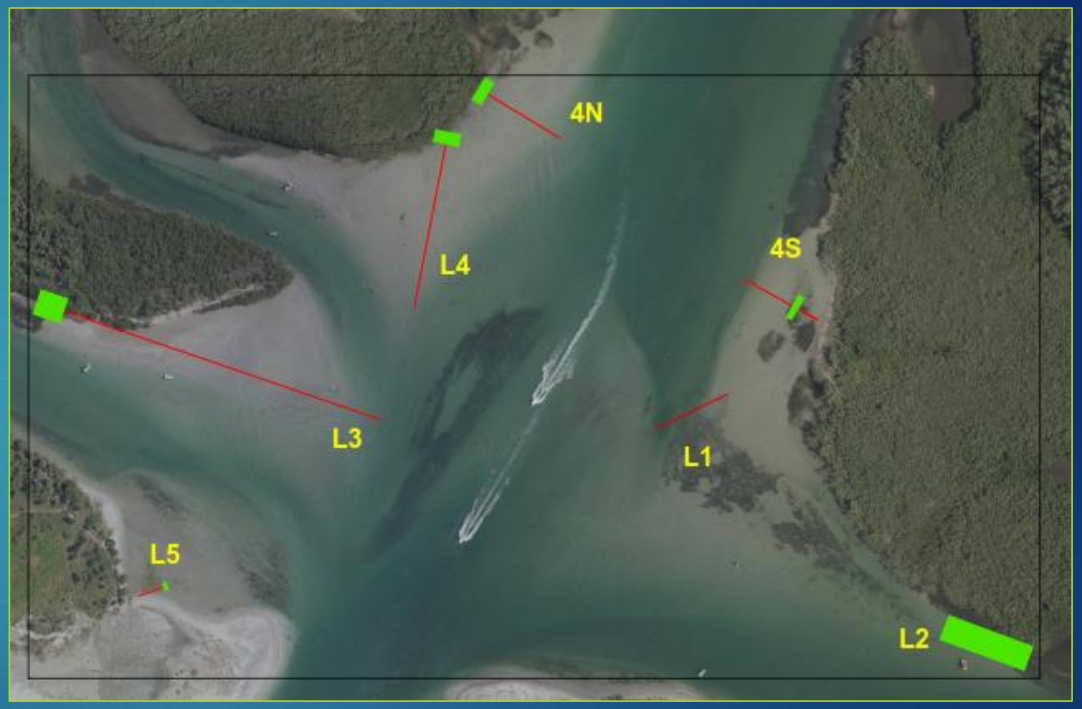
- Fixed transects do not account for seagrasses in the study area that do not occur on those fixed transects.
  - Seagrasses often occur adjacent to transects, along transects but not pre-determined sampling stations; analysis does not account for these seagrasses within study area.
- Since 2003, there have been 23 (25 including baseline surveys) monitoring events. No pattern or trend has emerged from the data.
- Seagrass occurrence, density, and location have been variable with no apparent relationship to the project.
- Monitoring strategy should change to reflect what is happening – make the efforts meaningful.



Time to Change

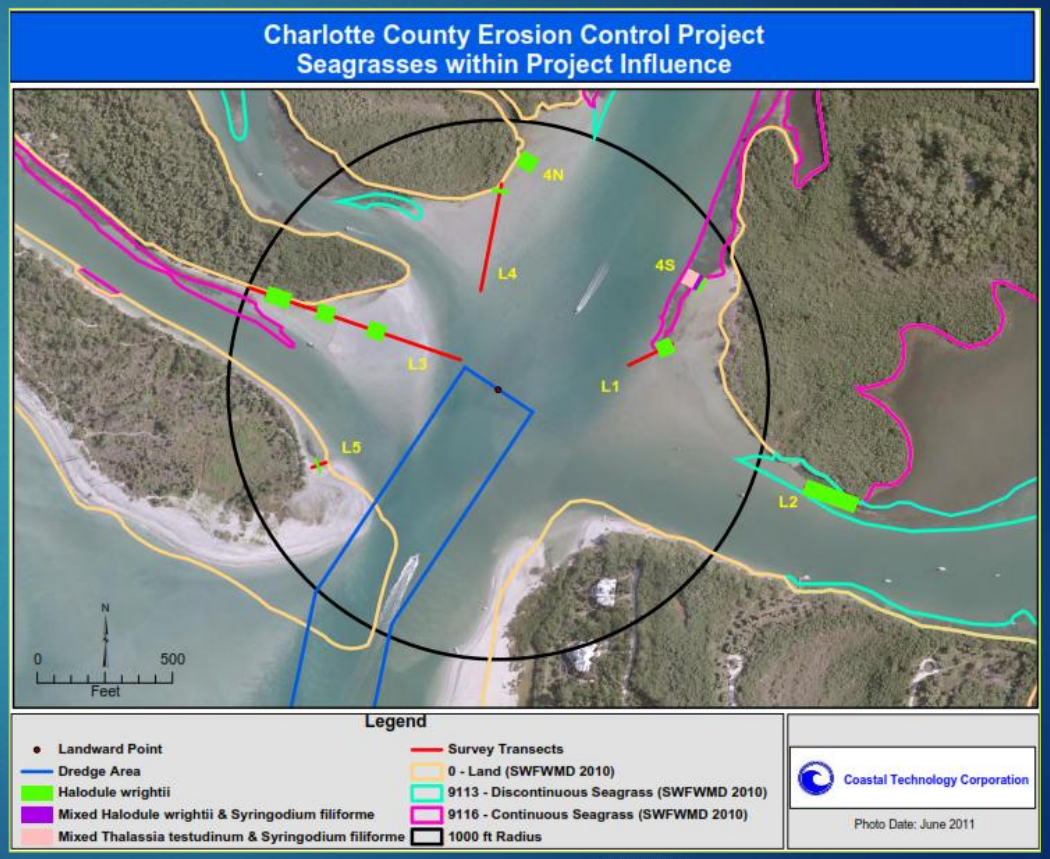
(with apologies to Peter Brady)

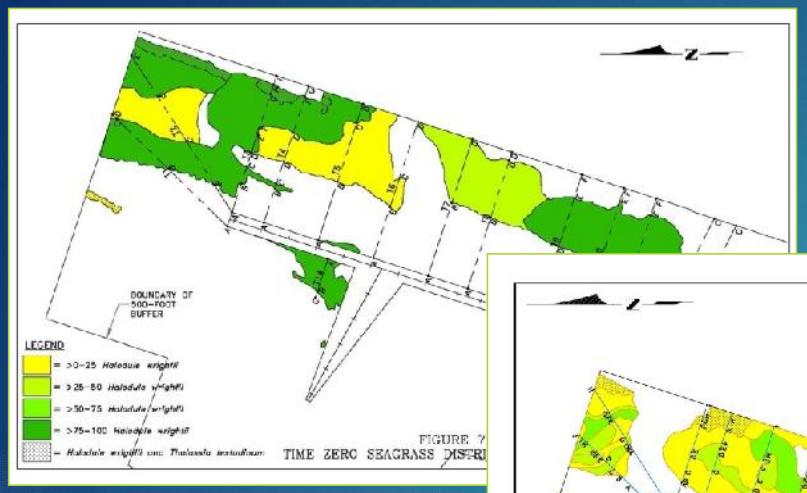
- Project team currently collaborating with FDEP staff to adjust monitoring parameters and schedule.
- FDEP recognizes spatial and temporal distribution of seagrasses is dynamic.
- Fixed transects unlikely to (and haven't) capture data that results in project-specific conclusions.
- Many other factors besides project: natural events, heavy recreational use, H. wrightii traits.
- Seagrasses most often and typically associated with mangrove fringes.
- No significant difference between pre-construction and post-construction seagrasses frequency, abundance, density.



Proposed Seagrass Monitoring

- Adaptive management component with option to review and adjust efficacy of monitoring plan annually.
- Three monitoring components:
  - Record edge of beds within 1000' radius of dredge cut
  - Qualitative assessment: seagrass species composition, cover, epiphyte coverage, overall condition.
  - Quantitative assessment: randomly-located quadrats in each bed.
- Conducted during seagrass growing season, peak if possible.
- Collaborative effort with FDEP staff underway to finalize monitoring plan component details.





TIME ZERO SEAGRASS DISTRI

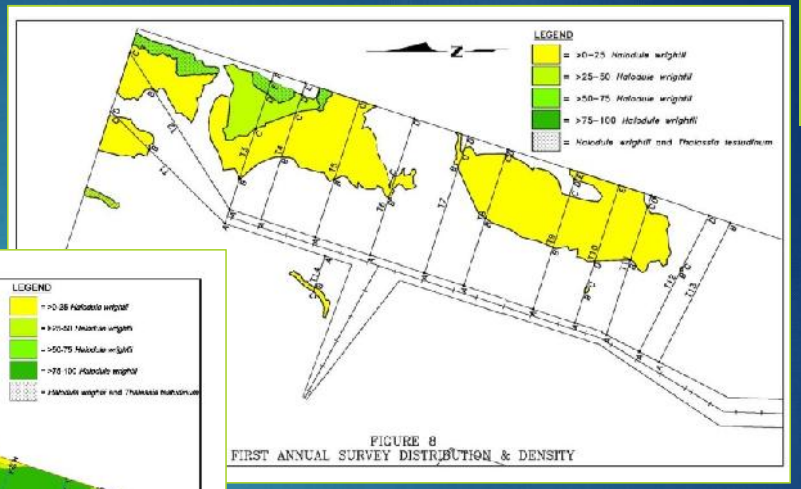


FIGURE 8
FIRST ANNUAL SURVEY DISTRIBUTION & DENSITY

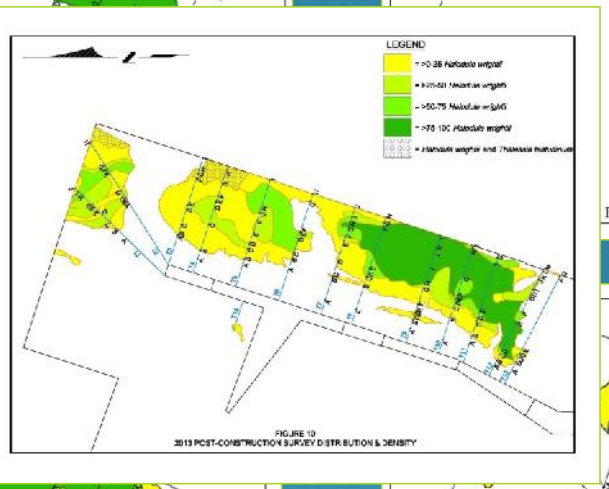


FIGURE 10
2013 POST-CONSTRUCTION SURVEY DISTRIBUTION & DENSITY

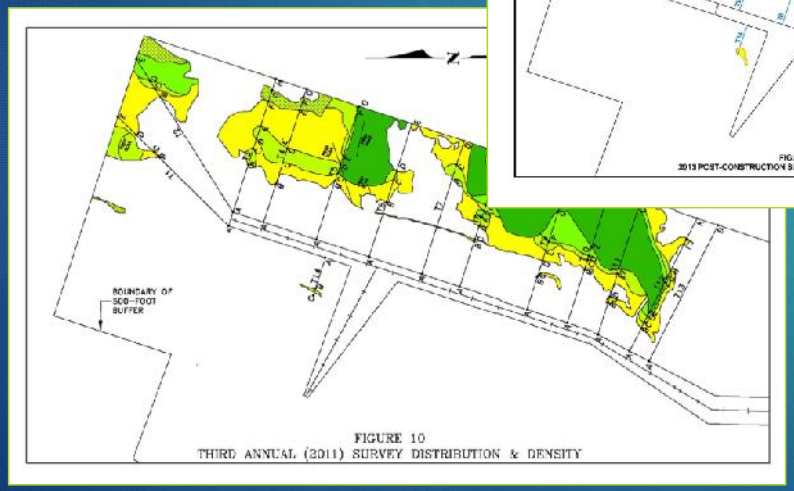


FIGURE 10
THIRD ANNUAL (2011) SURVEY DISTRIBUTION & DENSITY

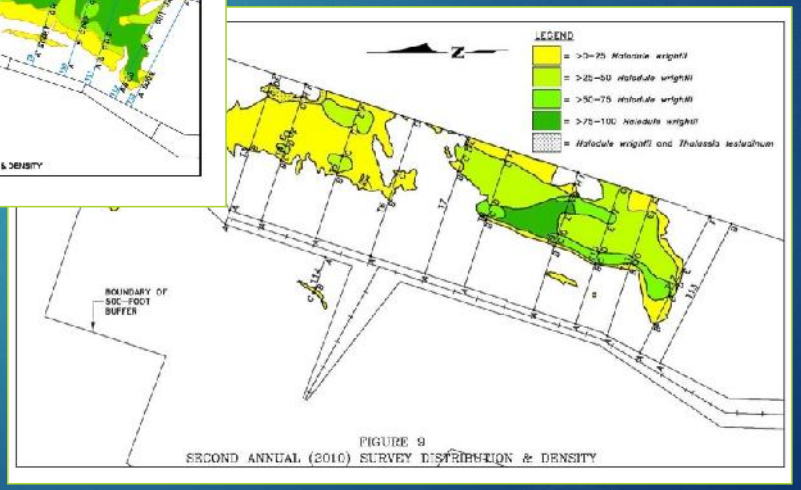


FIGURE 9
SECOND ANNUAL (2010) SURVEY DISTRIBUTION & DENSITY

SQUIRREL!

Thank you!

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