Roadblocks to Seagrass Recovery: Seagrass Restoration Planning

Pensacola Beach, January 29, 2016

Welcome and thank you for attending this workshop

Workshop goals and agenda:

1. Introduce and explain this project. Elicit feedback.
2. Locate as much information as possible on historical seagrass cover in Perdido Bay, Big Lagoon, Pensacola Bay, and Santa Rosa Sound
3. Locate original imagery and ancillary imagery from disparate sources for site-by-site evaluation.
4. Locate published and unpublished data on water and sediment quality.
5. Elicit expert opinion and information on site-specific timelines of seagrass loss and obstacles to recovery and expansion.

Basic Premises:

1. Seagrass recovery and enhancement can offset some habitat damage caused by Deepwater Horizon oil spill.

2. Seagrass transplanting is extremely expensive and the success is variable.

3. However, experience in Tampa Bay and Sarasota Bay has shown that, when favorable conditions are created, natural recovery and expansion of seagrass occurs.

4. In many cases, the roadblocks to seagrass recovery are not the same factors that caused seagrass loss in the first place.

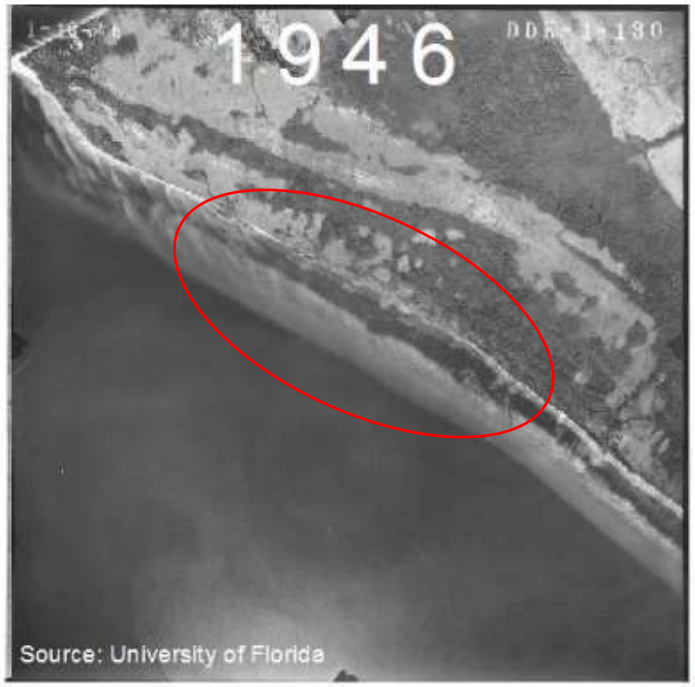
Project funded by NFWF Gulf Environmental Benefit Fund

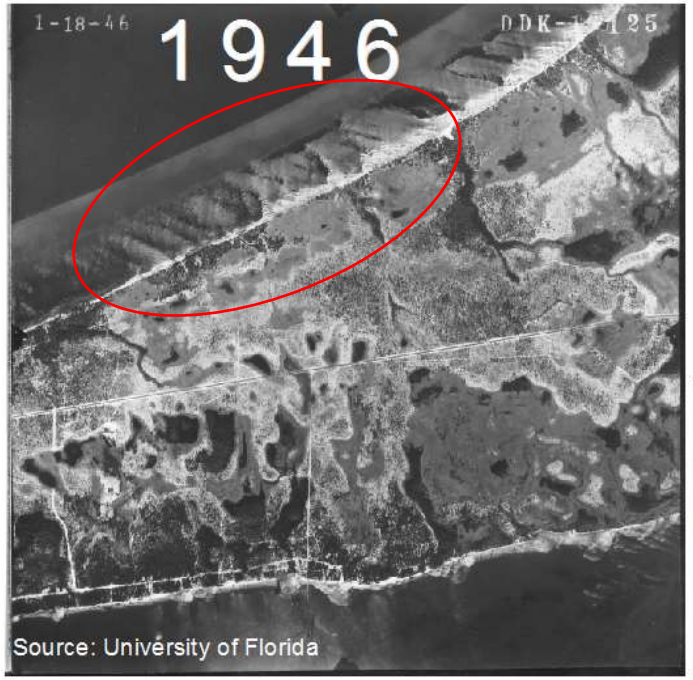
Project Goals:

1. Identify obstacles to seagrass recovery and expansion in target estuaries

2. Develop a GIS Seagrass Recovery Potential (SRP) model of potential stressors and obstacles to recovery and spread in each estuary

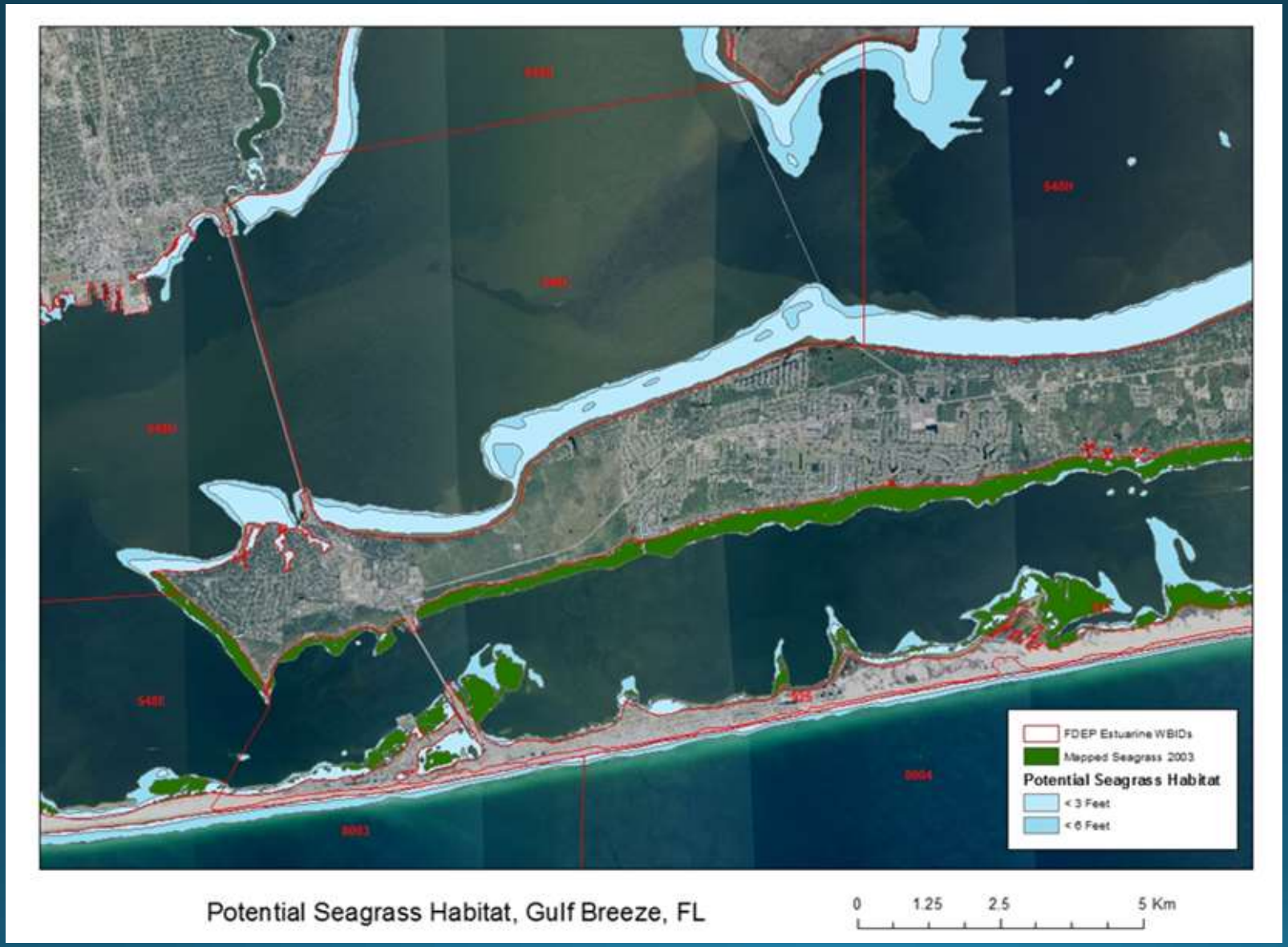
3. Use SRP model to identify candidate areas and tools for successful seagrass recovery and enhancement.





Pensacola Bay Seagrass

What are the barriers to seagrass recovery and/or expansion?



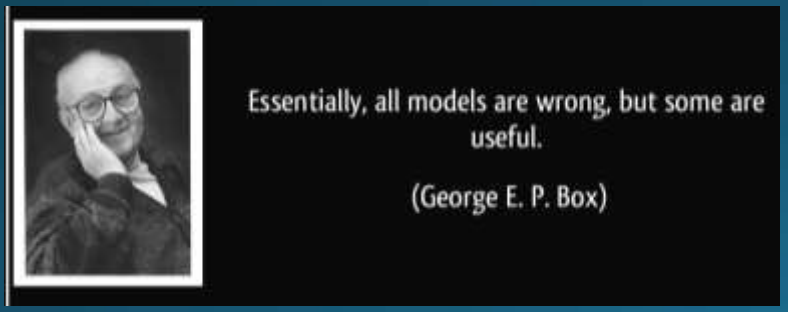
Potential Seagrass Habitat, Gulf Breeze, FL

Project Tasks and Deliverables

1. Assemble and create, where necessary, seagrass status and trends data for project estuaries.
2. Compare present seagrass distribution to historical target distributions
3. Determine estuary-specific and site-specific roadblocks to seagrass recovery and expansion in target estuaries.
4. Using available data supplemented by field sampling and Modis satellite imagery, construct a time series of optical water quality (OWQ) in target estuaries.
5. Build a user-friendly website for retrieval of OWQ data.

Project Tasks and Deliverables (Continued)

6. Based on elements 1-6 above, build a spatial Seagrass Recovery Potential (SRP) GIS model to guide seagrass recovery and enhancement projects.



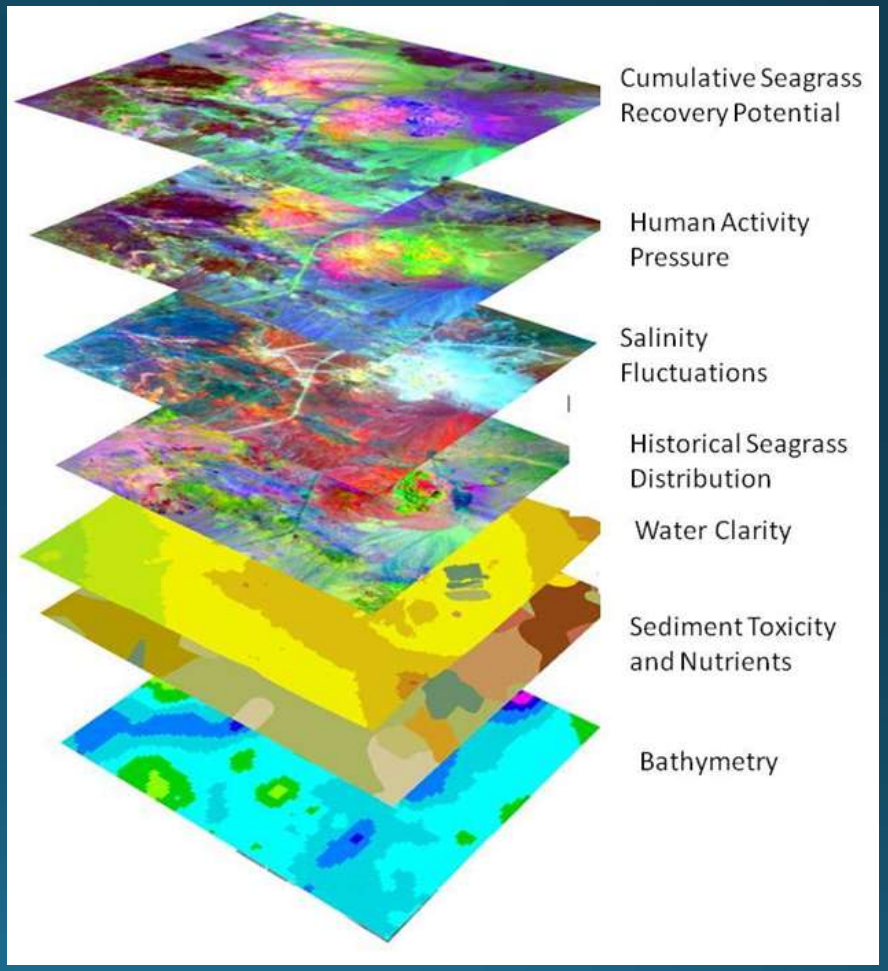
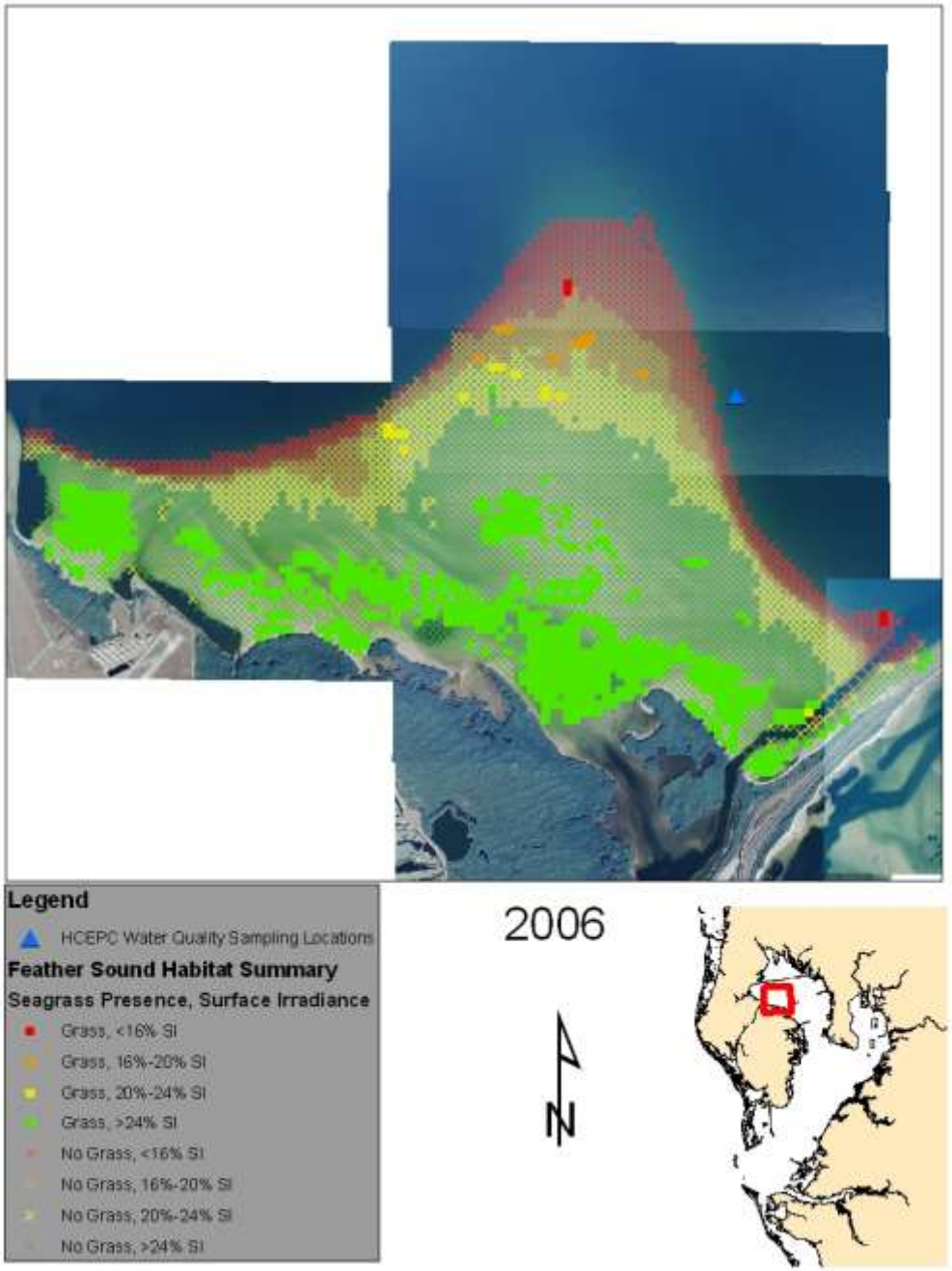


Image Credit: Geological Society of America



Example of Grid-Based Modeling Approach- Feather Sound, Tampa Bay

Inputs:

HCEPC Water Quality Data
Bathymetry Data
Seagrass aerial photos

Process: Use OWQ data to calculate transparency and bathymetry to calculate light availability (%SI).

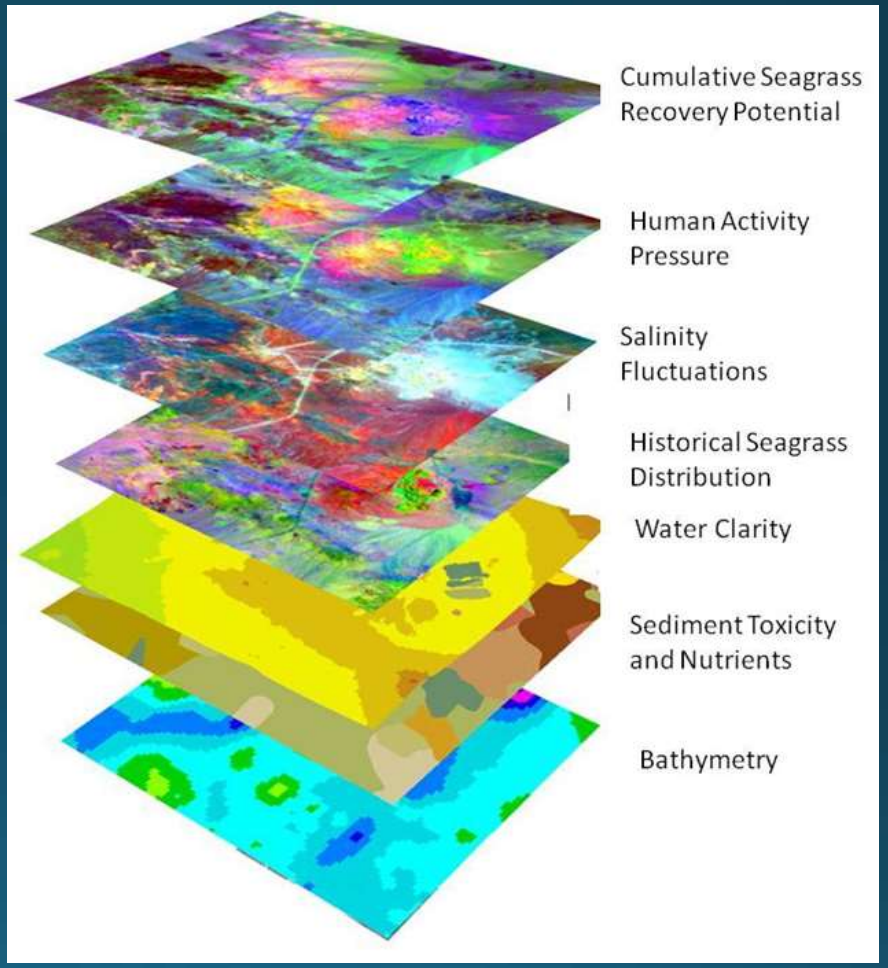
Result- Critical assessment of minimum light requirement for Shoalgrass- Halodule wrightii

Model Layers- Partial List

Current seagrass distribution
Historical seagrass distribution

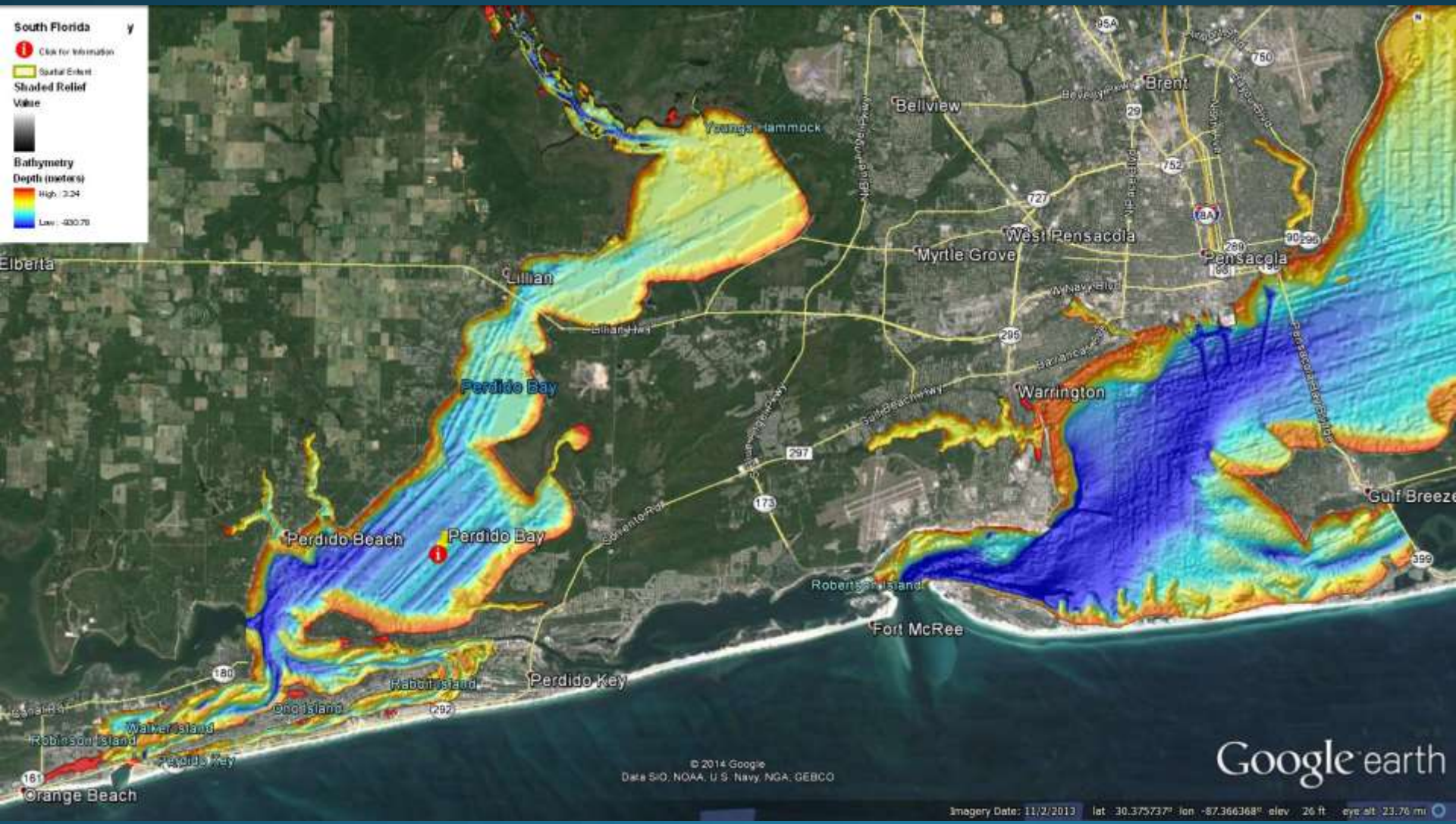
Bathymetry
In Situ Optical Water Quality
MODIS Optical Water Quality

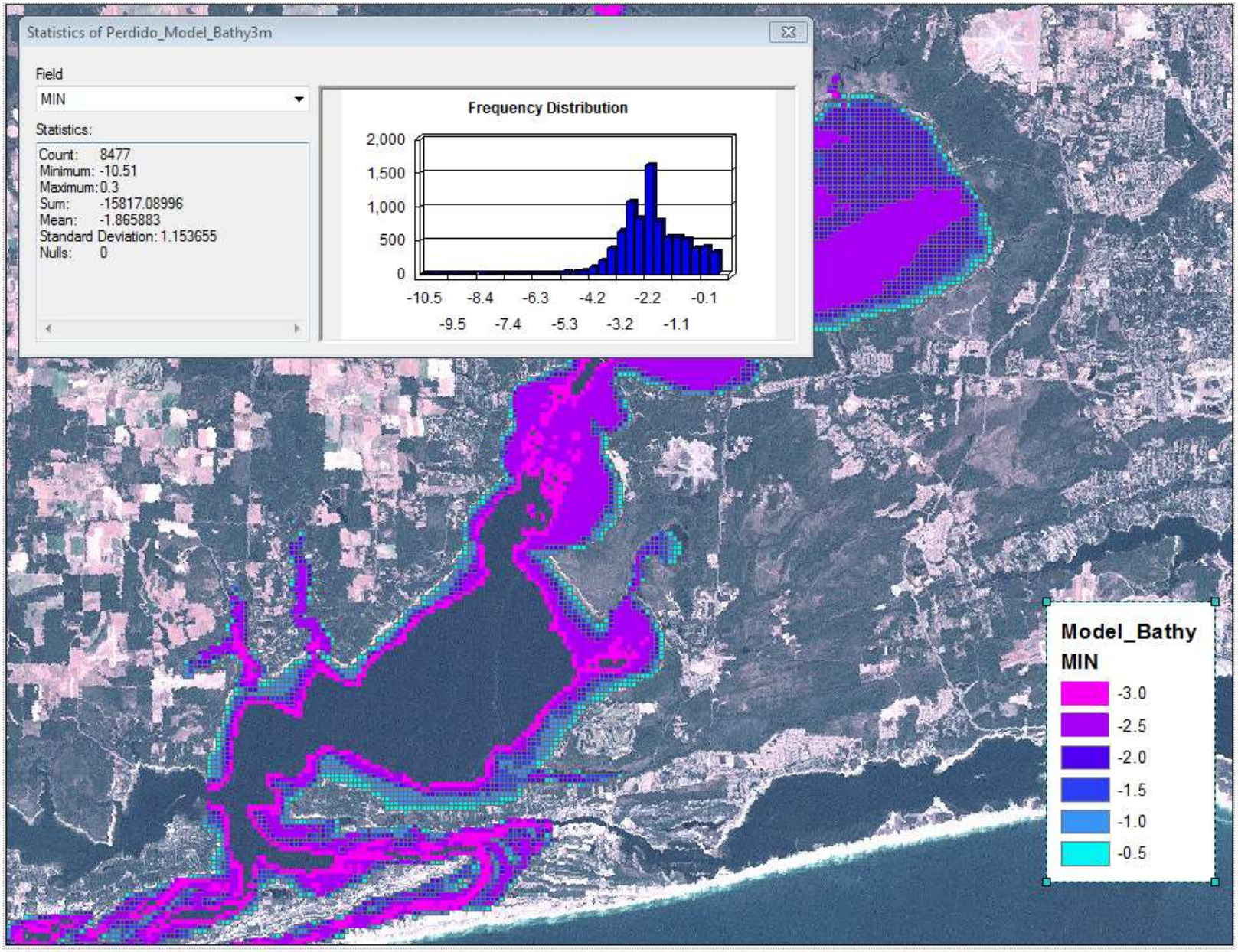
Sediment Toxicity
Physical Disturbance
Animal Disturbance
Salinity Fluctuations
Hypoxia and Anoxia
Human Activity Pressure



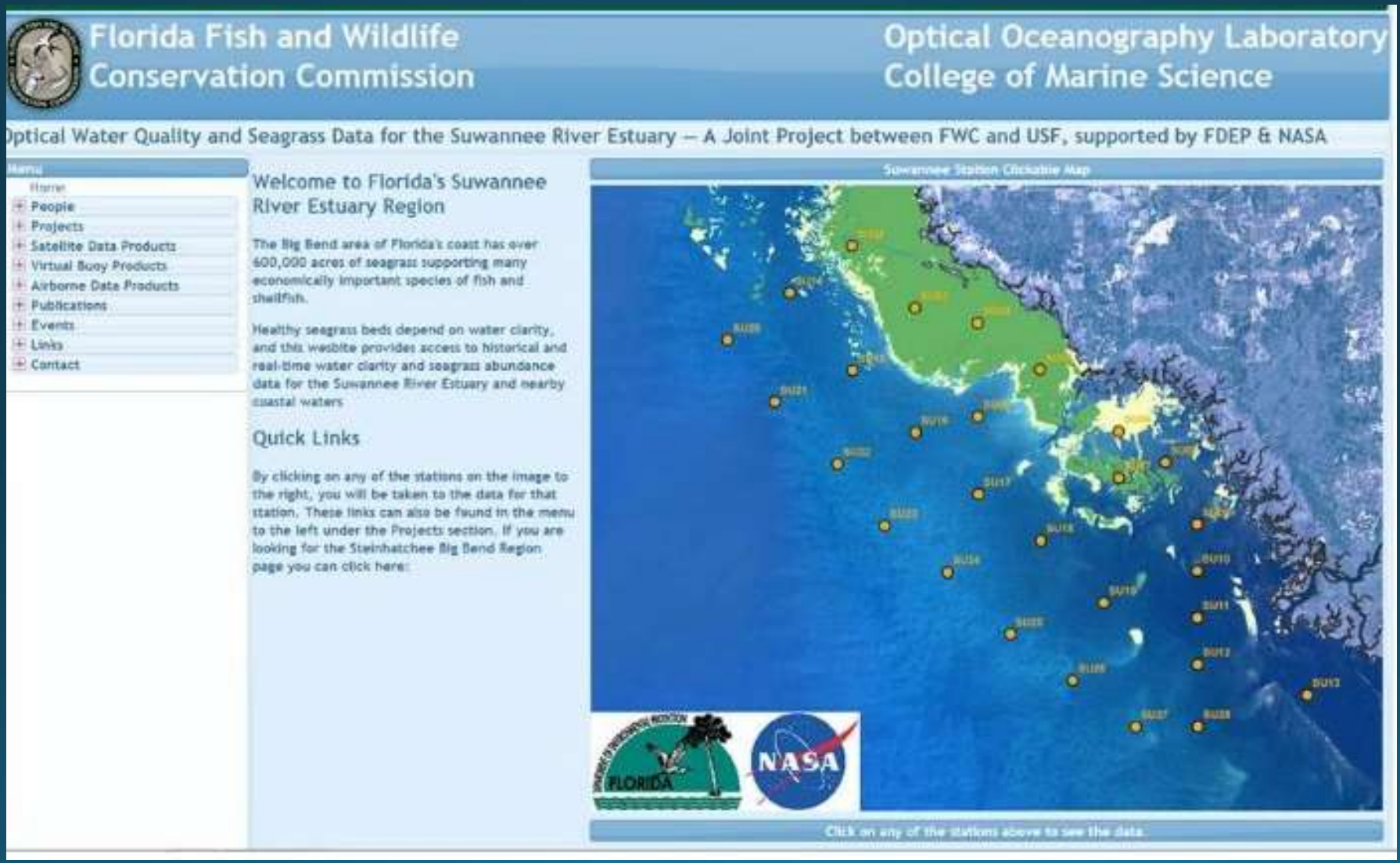
Platform- ArcGIS
Products- Shapefiles and KML

First Input Data Layer- NOAA Bathymetry




Statistics of Perdido_Model_Bathy3m
Field
MIN
Statistics:
Count: 8477
Minimum: -10.51
Maximum: 0.3
Sum: -15817.08996
Mean: -1.865883
Standard Deviation: 1.153655
Nulls: 0
Frequency Distribution
2,000
1,500
1,000
500
0
-10.5
-9.5
-8.4
-7.4
-6.3
-5.3
-4.2
-3.2
-2.2
-1.1
-0.1
Model_Bathy
MIN
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5

One approach to assessing light limitation: MODIS time series optical water quality (OWQ) data- optics.marine.usf.edu



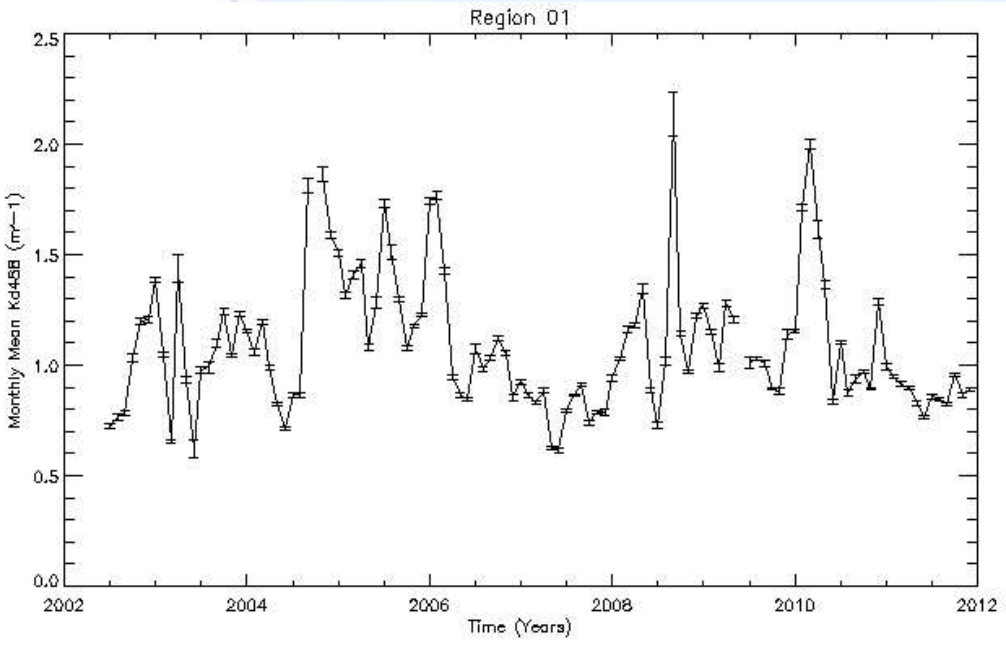
Florida Fish and Wildlife Conservation Commission

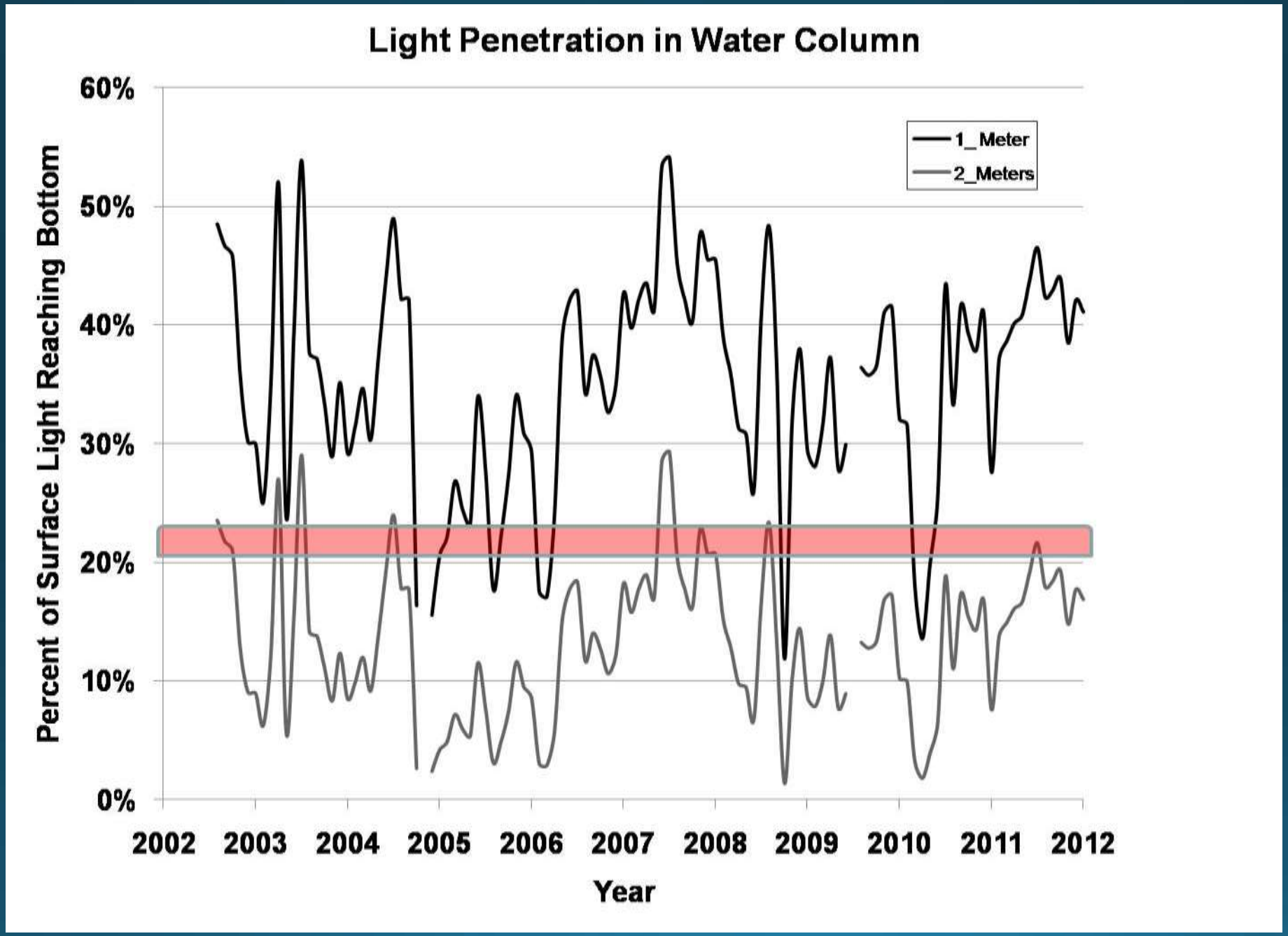
Optical Oceanography Laboratory
College of Marine Science

Optical Water Quality and Seagrass Data for the Suwannee River Estuary

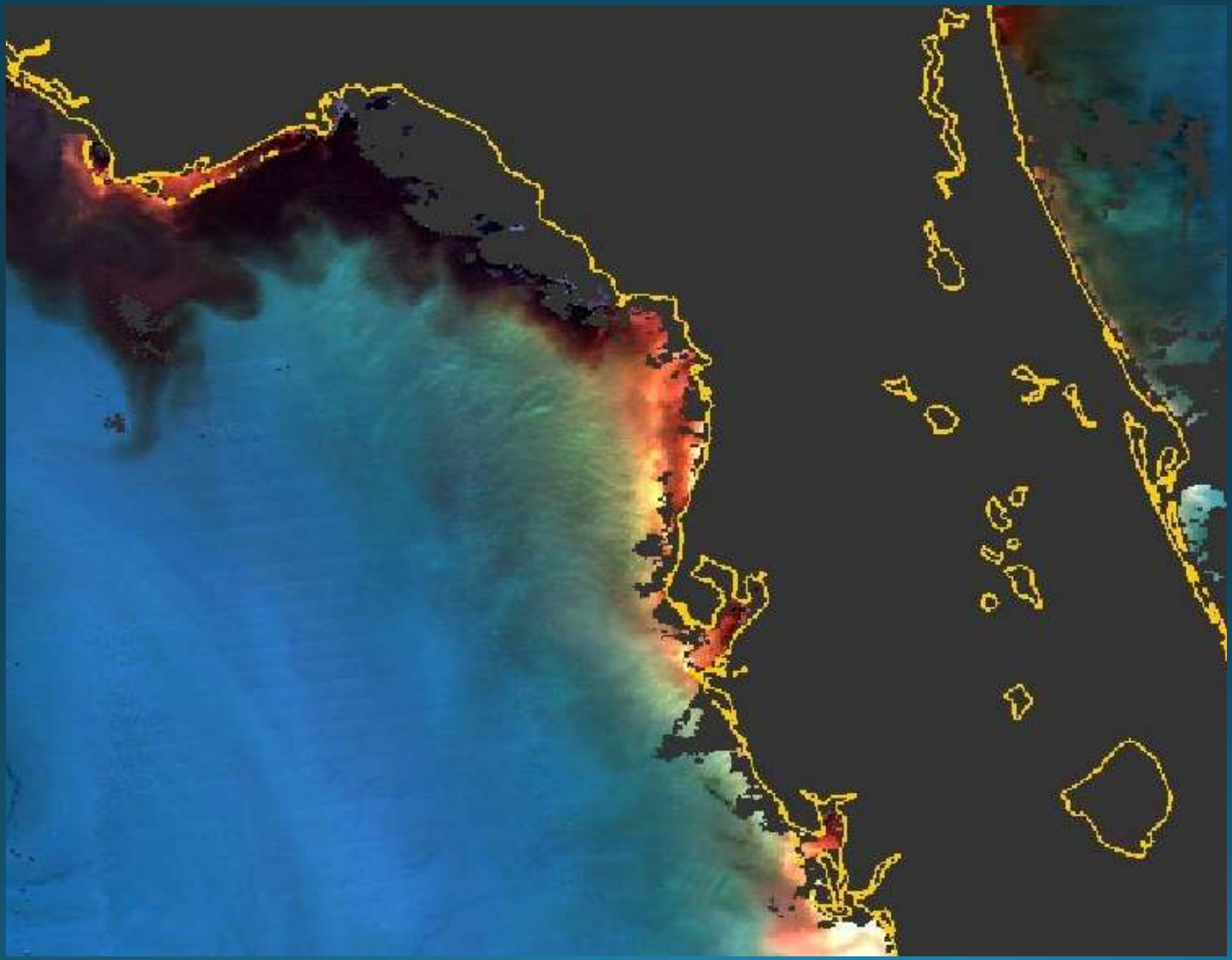
Station Name: SU 02 -Suwannee River Estuary

Measurement	Value Now	This week last year	This month last year	Long-term Average
Water Temperature	28.0	27.5	27.3	27.0
Chlorophyll	4.2	2.2	2.5	2.2
CDOM	10.2	5.5	5.0	5.3
Turbidity	2.4	3.2	2.8	2.5
Transparency (Kd488)	1.2	0.8	0.8	0.7
Light (% Surface)	18%	25%	25%	24%

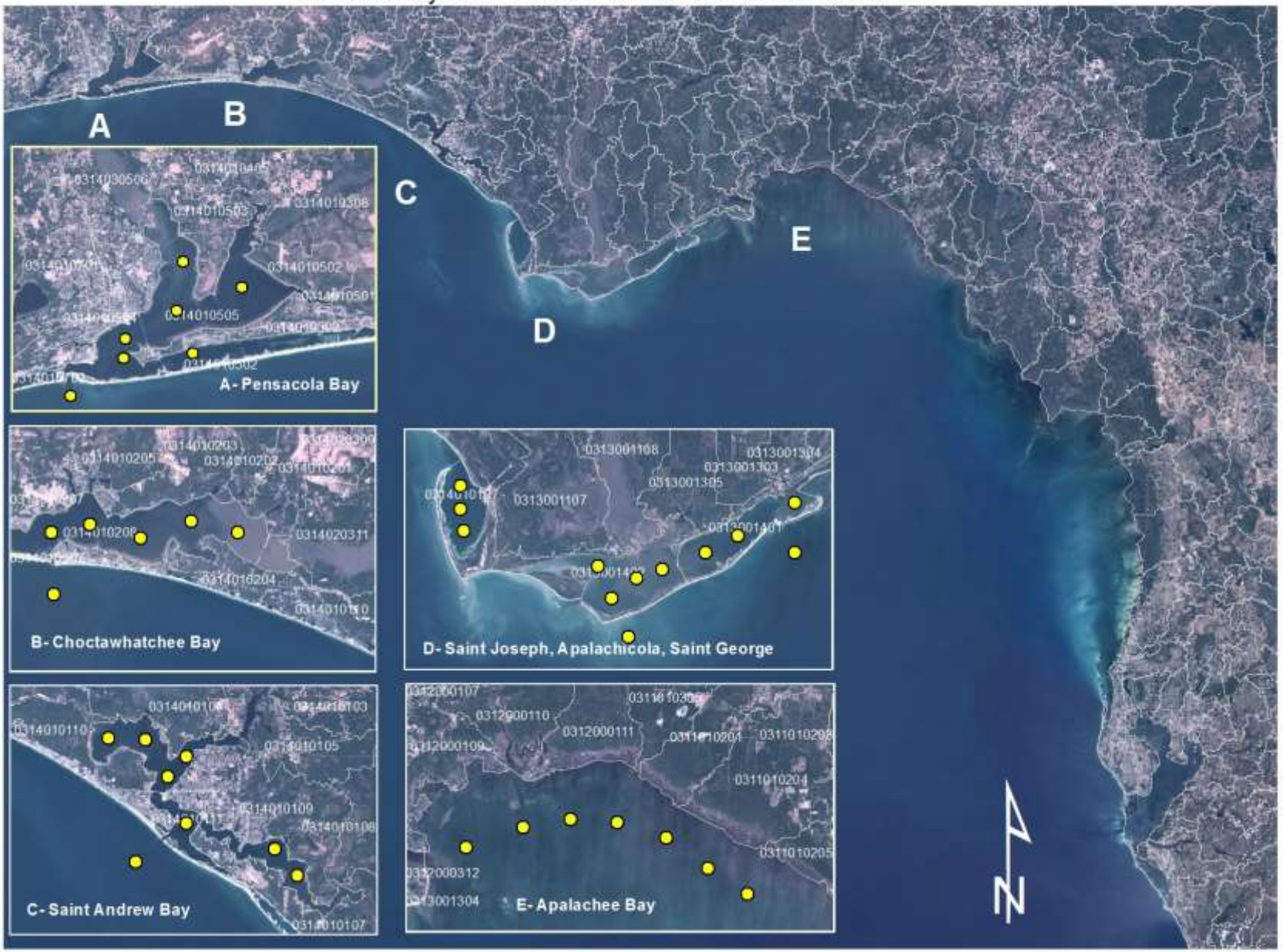



Light Penetration in Water Column
60%
50%
40%
30%
20%
10%
0%
Percent of Surface Light Reaching Bottom
1_Meter
2_Meters
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year

MODIS Image- CDOM from Suwannee and Ochlockonee Rivers



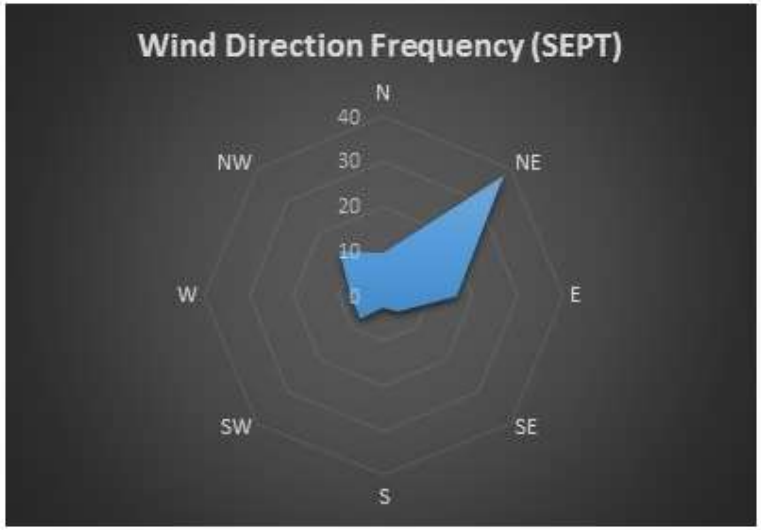
Virtual Buoy Stations for Florida Panhandle Estuaries

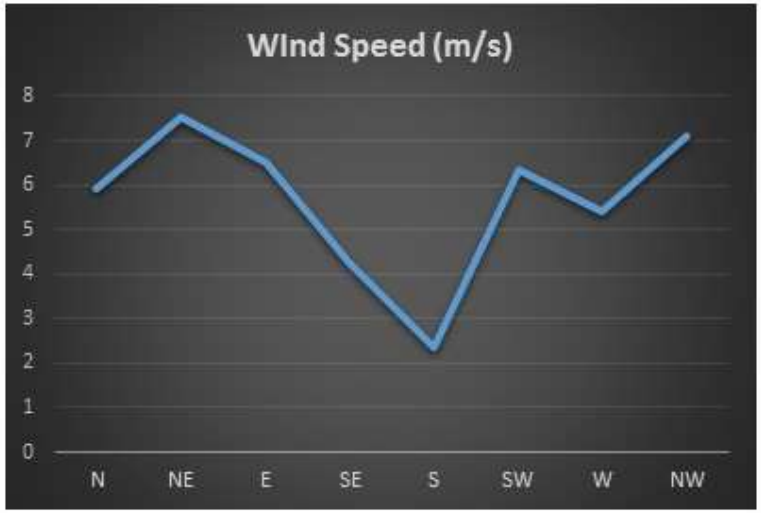


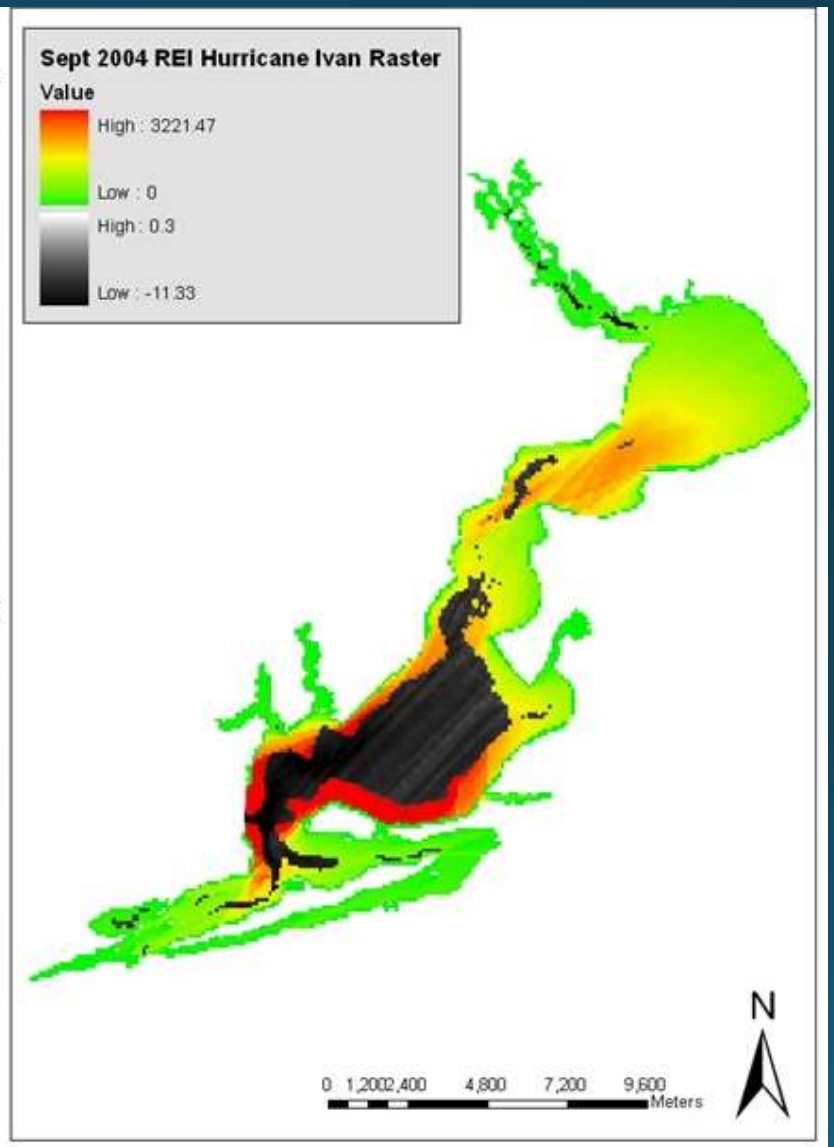
Physical Disturbance Suggested by Sediment Bed Form

NOAA Physical Disturbance Model (WEMo)- Perdido Bay, September 2004

Hurricane Ivan







Example of Wave Action and Erosion Along I-275 in Tampa, April 2010

Effect of Rip Rap Barriers, January 2014

Animal Disturbance- Manatees, Stingrays, Cownose Rays, Sea Urchins Inhabit Seagrass Beds

Periodic Irruptions of Sea Urchins Have Been Documented Stressors- Animal Disturbance and Water Quality can be Synergistic

Photo: Steve Geiger, FWRI

Human Activity Impacts Include Prop Scarring

St. Joseph Bay Propeller Scarring			
Score	Description	# Cells	% of vegetated cells
9	Bare bottom visible	1056	
0	Vegetated, no scars	1998	57.3%
1	1-2 scars	646	18.5%
2	3-10 scars	466	13.4%
3	11-25 scars	265	7.6%
4	>25 scars	81	2.3%
5	Cell mostly scarred	29	0.8%
	Total scarred cells	1487	42.7%
	Total vegetated cells	3485	
	Sun Glare	248	
	Unreadable	15	
	Too Deep	2709	

Table 2: Roadblocks to SAV Recovery

Stressor	Distribution	Severity	Effect(s)	Assessment Methods	Restoration Action(s)
Light Stress	Widespread	Varies by cause	Inhibited growth, death	*In situ* and satellite measurements, nutrient data, TMDL models	Nutrient reduction, sediment reduction, point and non-point source treatment
Salinity Pulses	Widespread	Varies by freshwater source	Metabolic drain	*In situ* salinity measurements, freshwater discharge data, models	Stormwater retention, watershed best management practices (BMPs)
Salinity Stratification	Frequent	Varies with depth, bottom contours	Metabolic drain	*In situ* salinity measurements, rainfall, runoff data, models	Stormwater retention, floodplain restoration, sandbar enhancement
Wind, wave, and tidal action	Frequent	Varies with fetch, depth, tide range	Removal of shoots, sediment resuspension	*In situ* sediment grain size and bedform analysis, models	Physical protection, sandbar enhancement
Sediment toxicity	Common	Alone or synergistic stressor	Acute or chronic; species vary	Sediment sulfide & carbon measurements, FDEP, US EPA, NOAA contaminant data	Removal, *in situ* remediation, source reduction
Bioturbation, Animal disturbance	Common	Locally severe	Grazing or removal	Field surveys for stingrays, cownose rays, sea urchins. FWC seine, trawl data	Exclosures, harvest, removal
Propeller Scarring	Common	Locally severe	Physical damage or death	Targeted aerial mapping	Boater education, signage, exclusion zones, remediation

Thank you again for attending this workshop

We need your help to locate as much information as possible on

1. Historical seagrass cover in Perdido Bay, Big Lagoon, Pensacola Bay, and Santa Rosa Sound
2. Original imagery and ancillary imagery
3. Published and unpublished data on water and sediment quality.
4. Your expert opinions and information on site-specific obstacles to seagrass recovery and expansion.

We will use this information to guide seagrass recovery efforts and all project data will be distributed on the web to guide future projects.