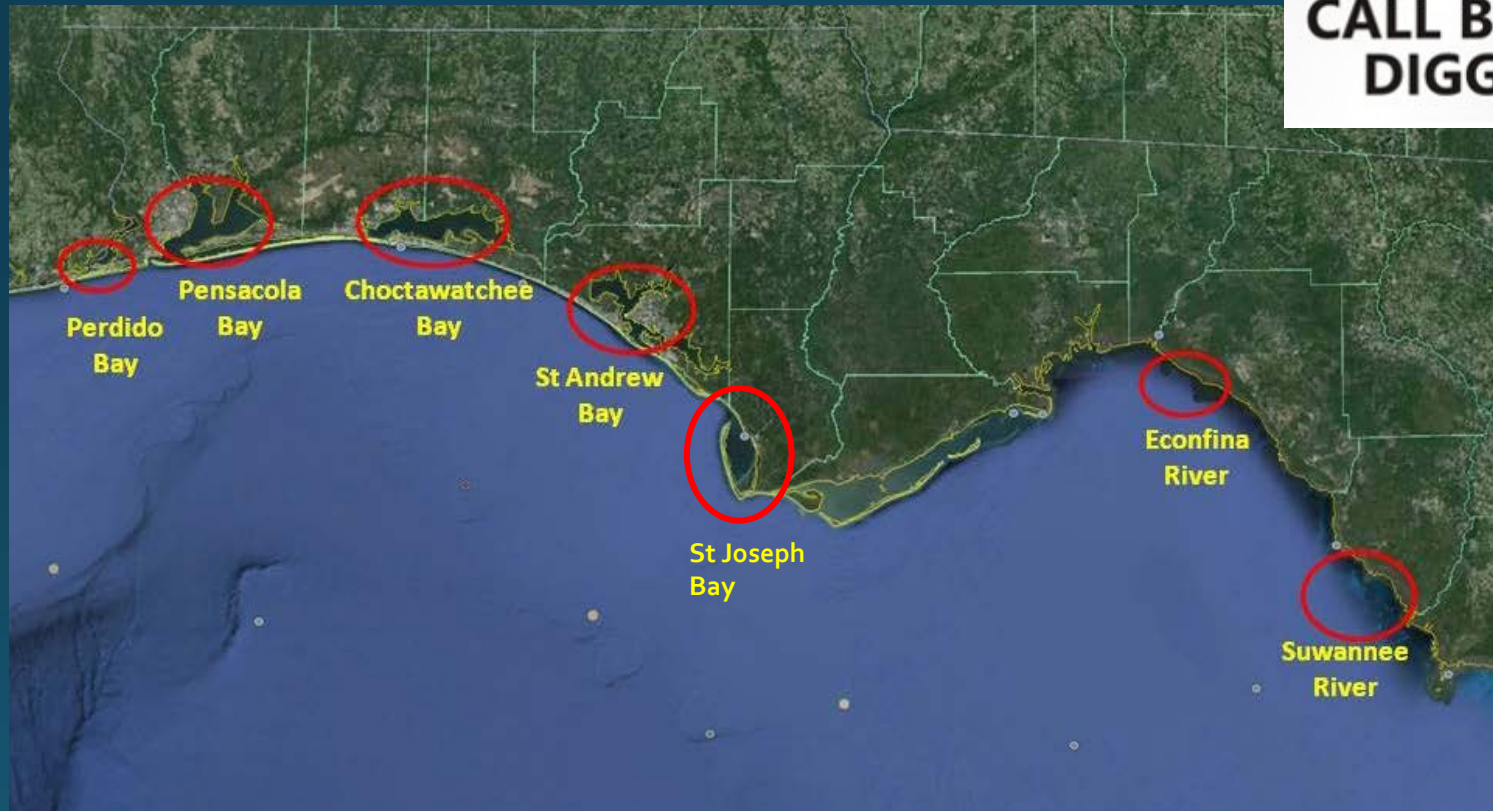


Roadblocks to Seagrass Recovery: Seagrass Restoration Planning



Tallahassee, March 7, 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 Apalachee Bay and the Big Bend.
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 Locate published and unpublished data on water and sediment quality.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

<http://nfwf.org/gulf/Pages/GEBF-Florida.aspx> GEBF Florida

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Green sea turtle | Credit: iStock

Gulf Environmental Benefit Fund in Florida

Current Projects

To date, NFWF has awarded over \$69.7 million from the Gulf Environmental Benefit Fund for 21 restoration projects in the state of Florida. These projects were selected for funding following extensive consultation with the Florida Fish and Wildlife Conservation Commission, the Florida Department of Environmental Protection, the U.S. Fish & Wildlife Service (FWS) and the National Oceanic and Atmospheric Administration (NOAA).

FEATURE STORY



Keeping Sea Turtles in the Dark: GEBF boosts efforts to cut light pollution along Florida's nesting beaches.

[Learn more ►](#)

STAFF REPRESENTATIVE

Michael Sharp 
Director, Gulf Environmental Benefit Fund (AL, FL, MS)

GULF NEWS ►

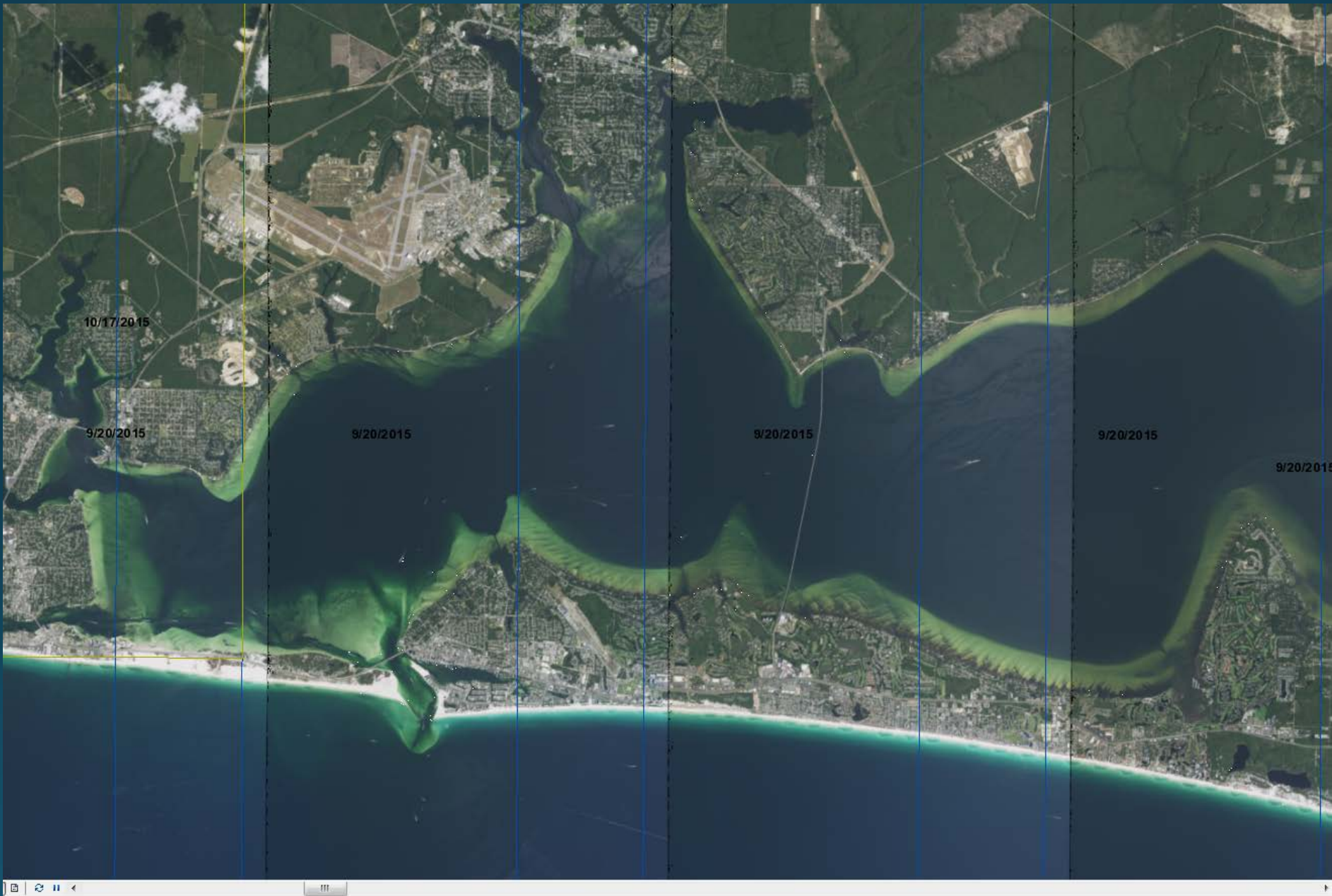
11/10/2015
More than \$80 Million for New Restoration Projects on the Gulf Coast

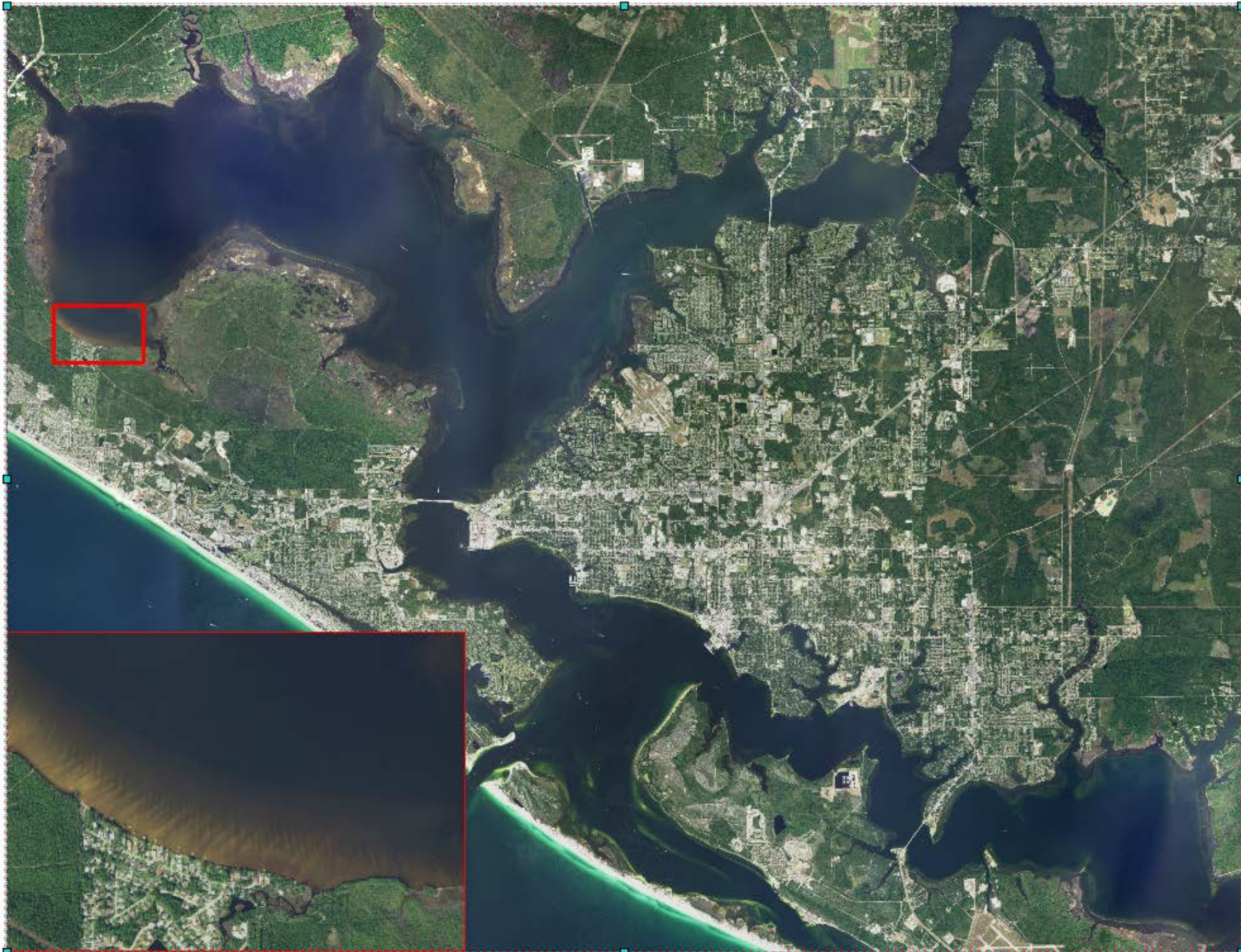
10/8/2015
Keeping sea turtles in the dark

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, methods, tools, and projects for successful seagrass recovery and enhancement.

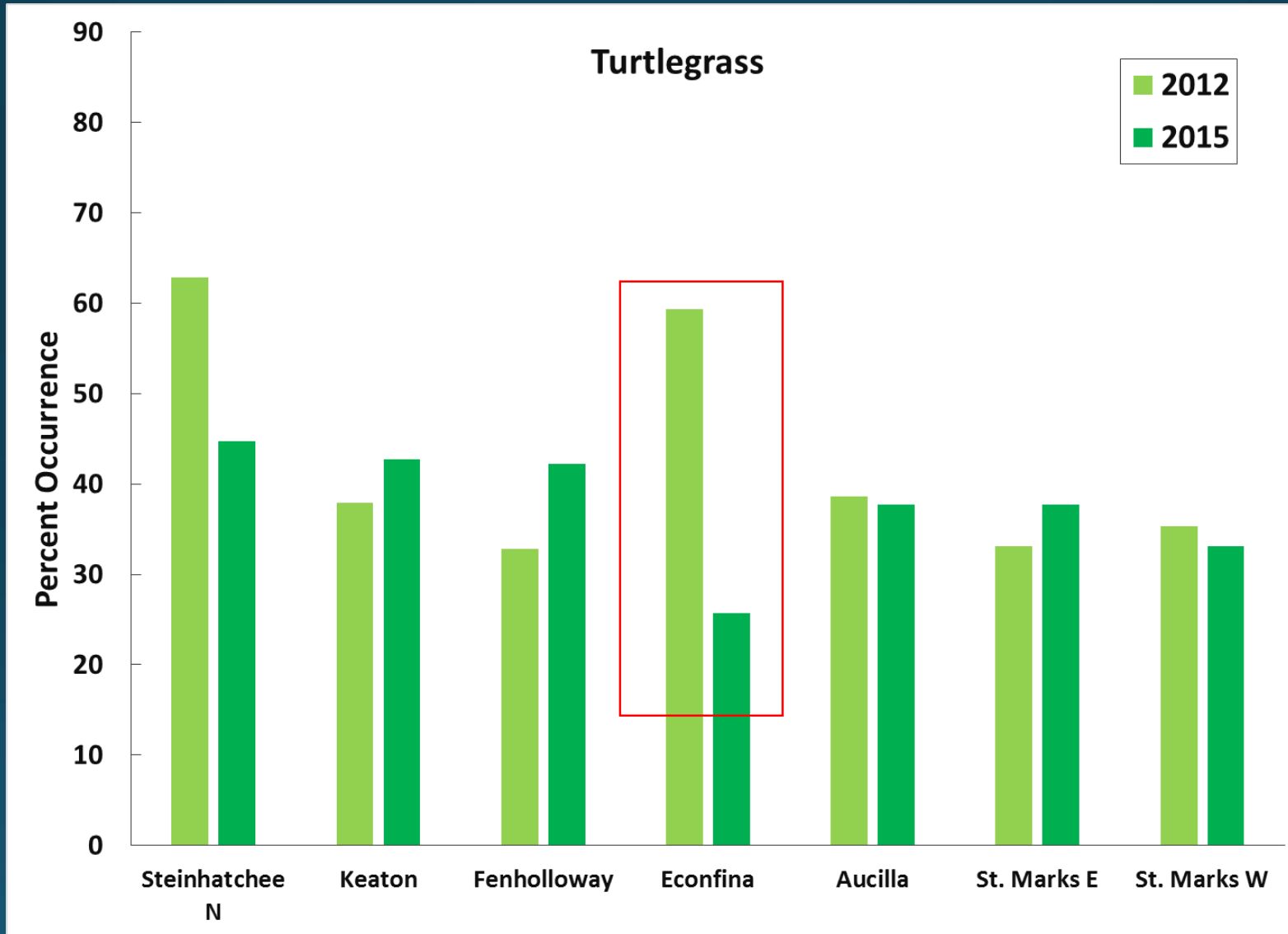
Broad Littoral Shelf- Why so little seagrass?



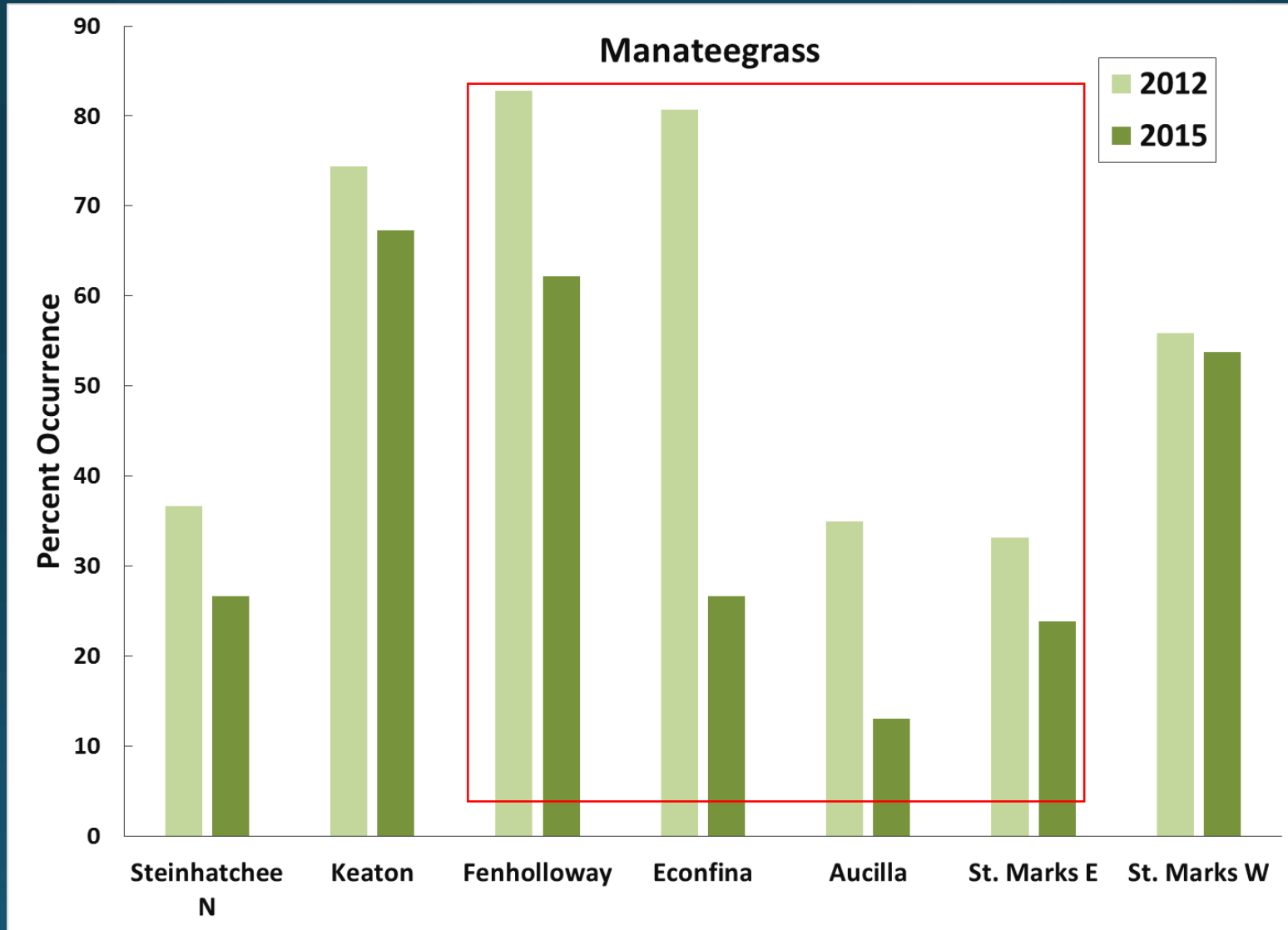




Changes in Turtlegrass occurrence in northern Big Bend between 2012 and 2015



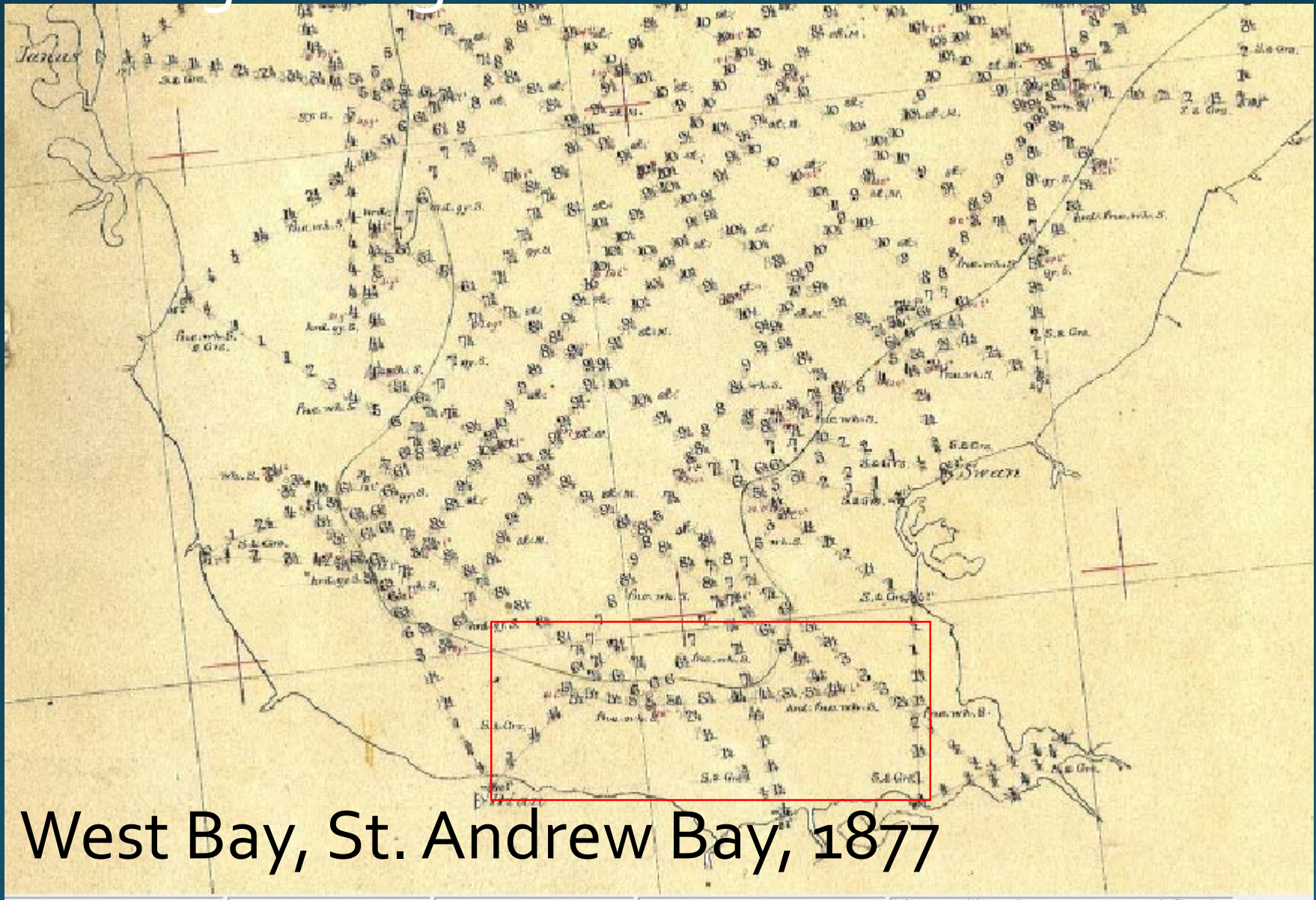
Changes in Manateegrass occurrence in northern Big Bend between 2012 and 2015



Project Tasks and Deliverables

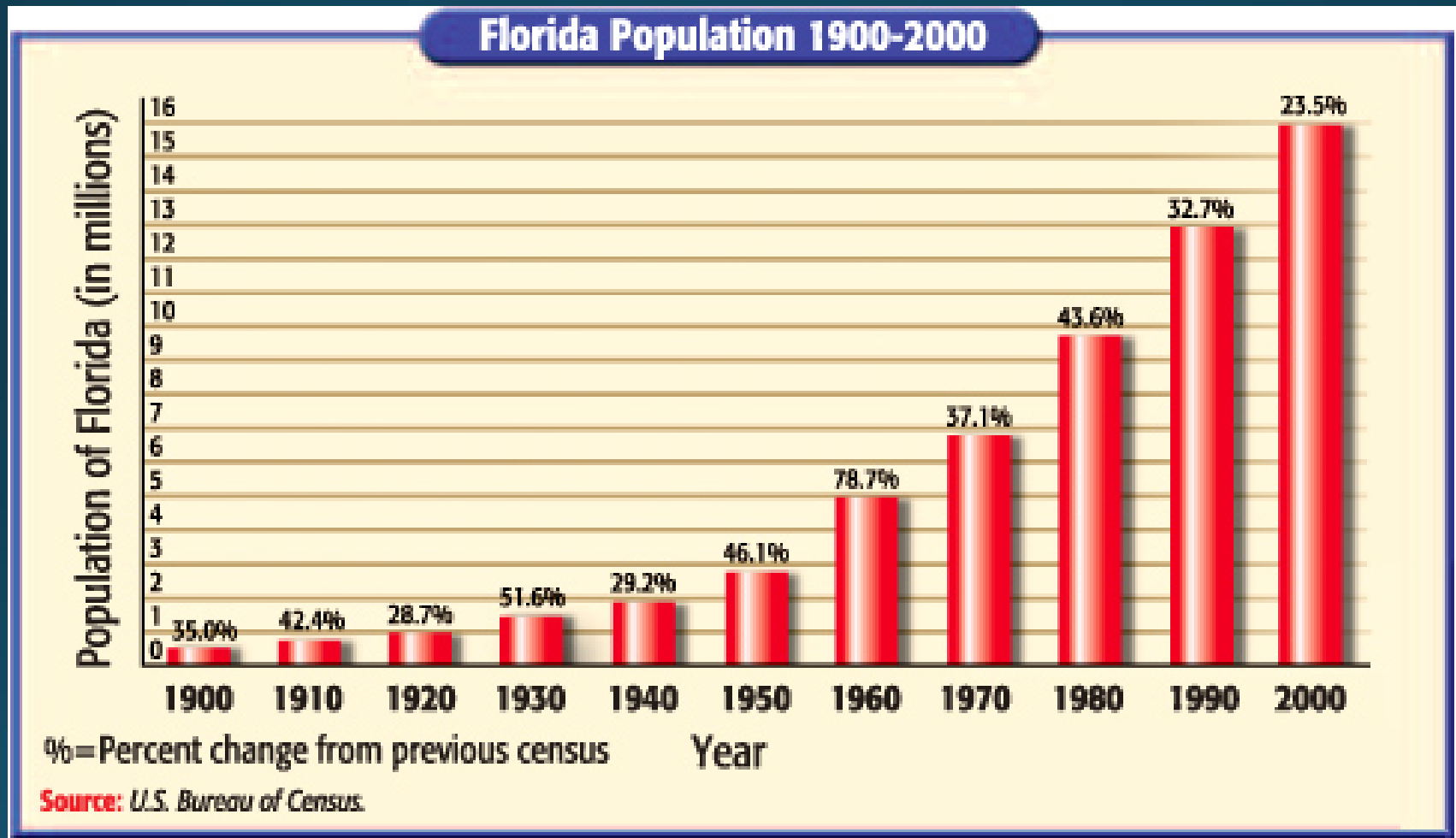
1. Assemble and create, where necessary, seagrass status and trends data for project estuaries.
2. Compare present seagrass distribution to historical target distributions
3. Determine estuary-specific and site-specific roadblocks to seagrass recovery and expansion in target estuaries.
4. Using available 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.

Setting a Seagrass Abundance Benchmark-

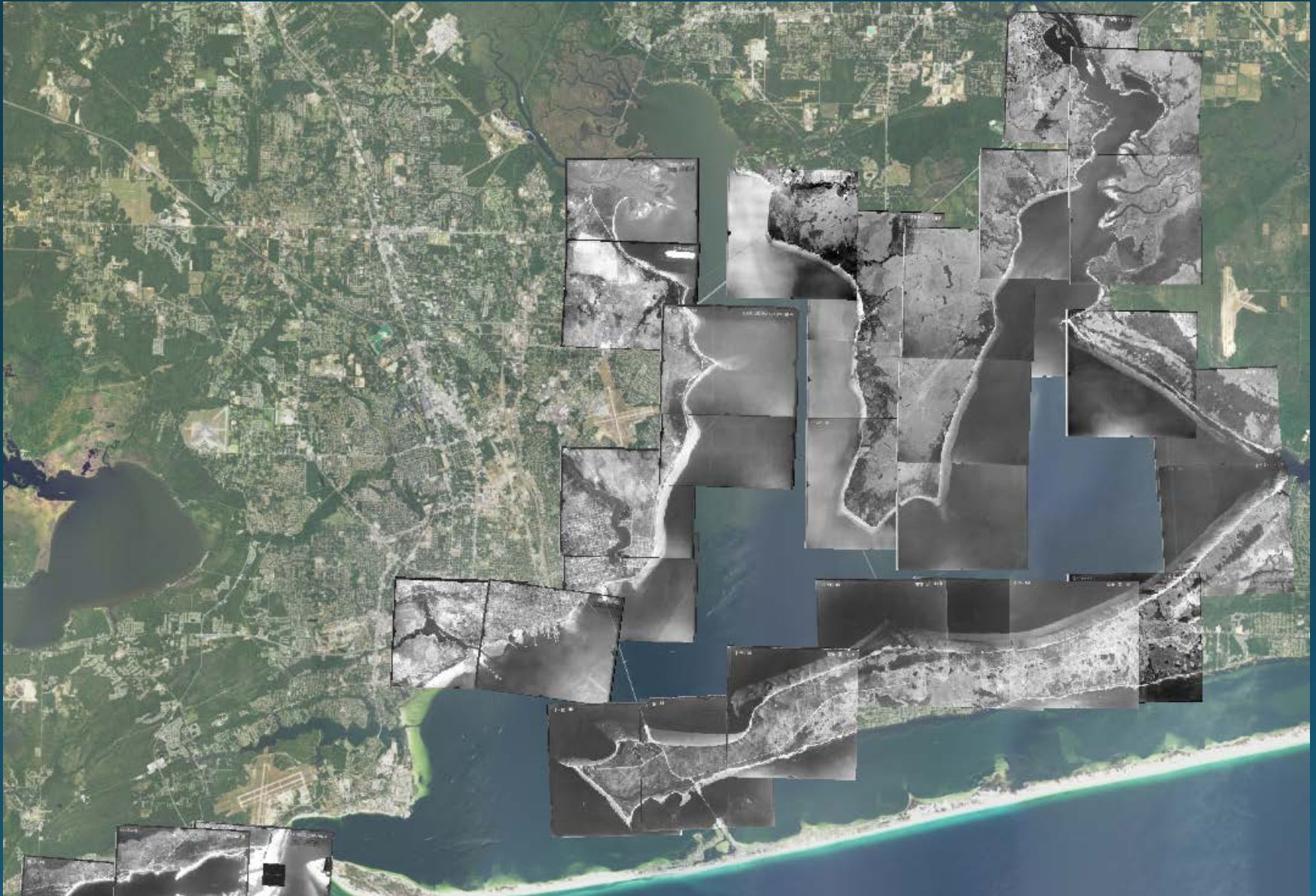


West Bay, St. Andrew Bay, 1877

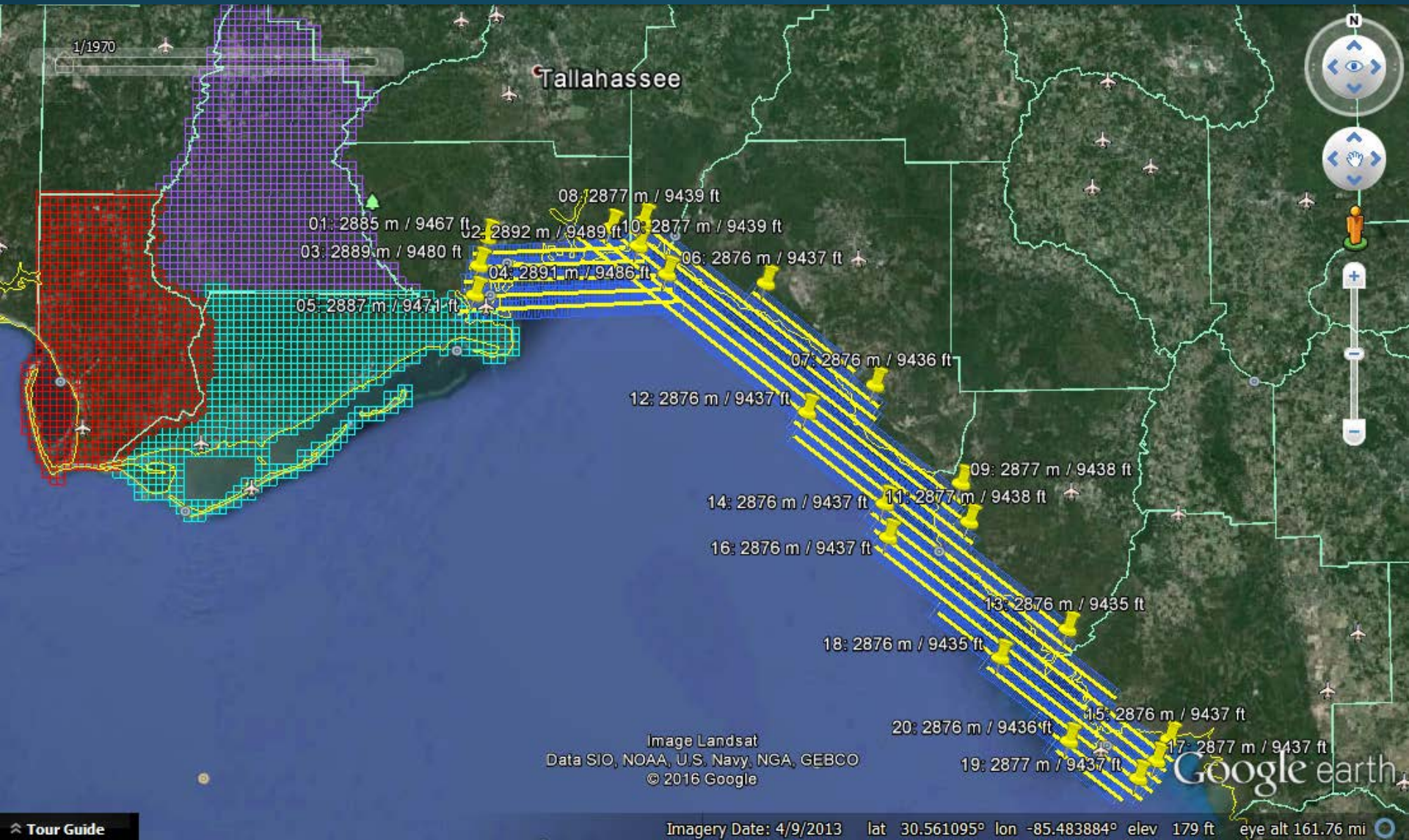
Florida's population began to grow rapidly in the 1950's.



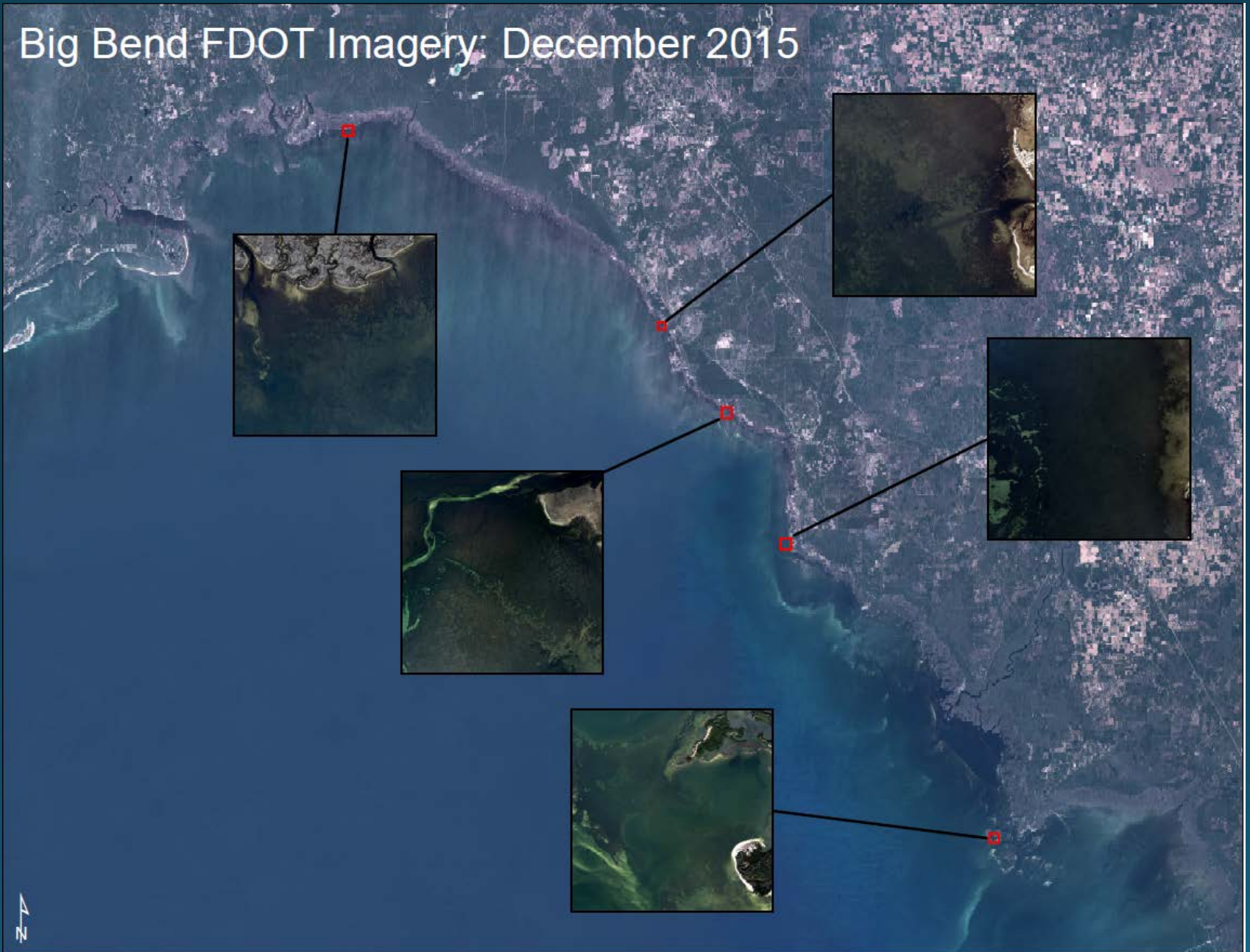
More reasonable benchmark- 1940's aerial photography
with painstaking Georeferencing



SIMM aerial acquisitions 2015-2016



Big Bend FDOT Imagery: December 2015





Winter storms resuspend sediment and rivers discharge large amounts of highly colored dissolved organic matter (CDOM)

Project Tasks and Deliverables (Continued)

6. Based on elements 1-5 above, build a spatial Seagrass Recovery Potential (SRP) GIS model to guide seagrass recovery and enhancement projects.



Essentially, all models are wrong, but some are useful.

(George E. P. Box)

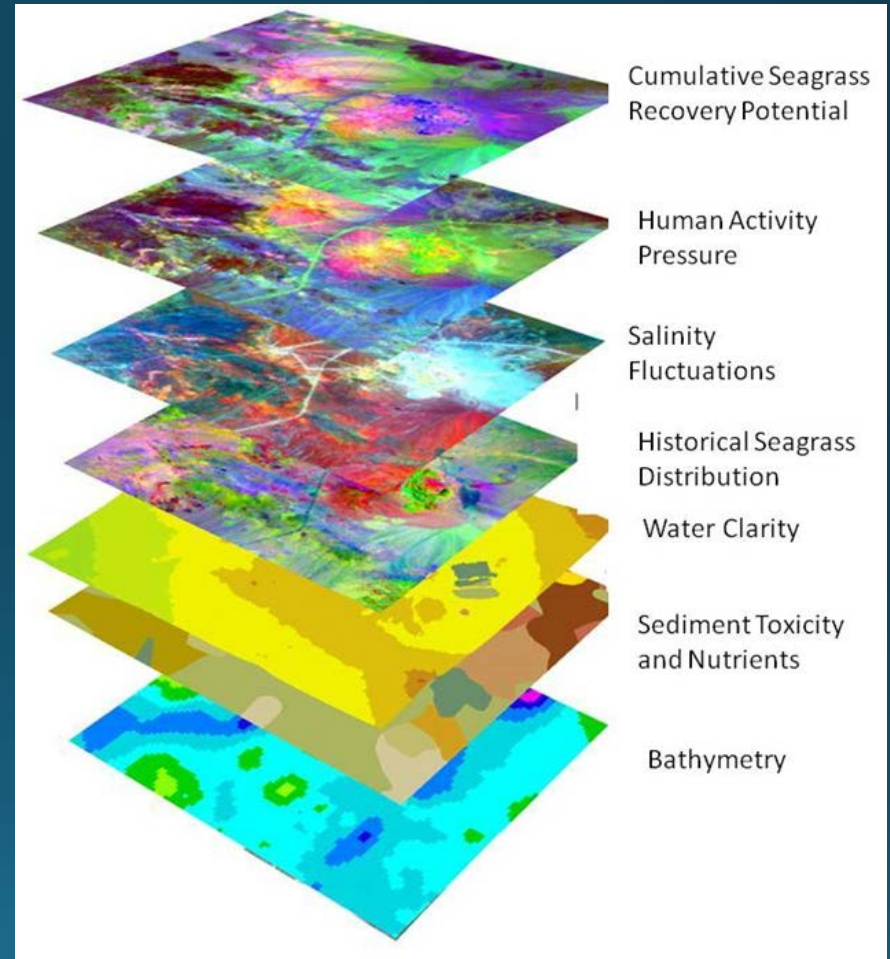


Image Credit: Geological Society of America

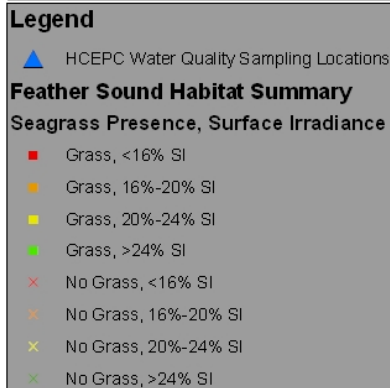
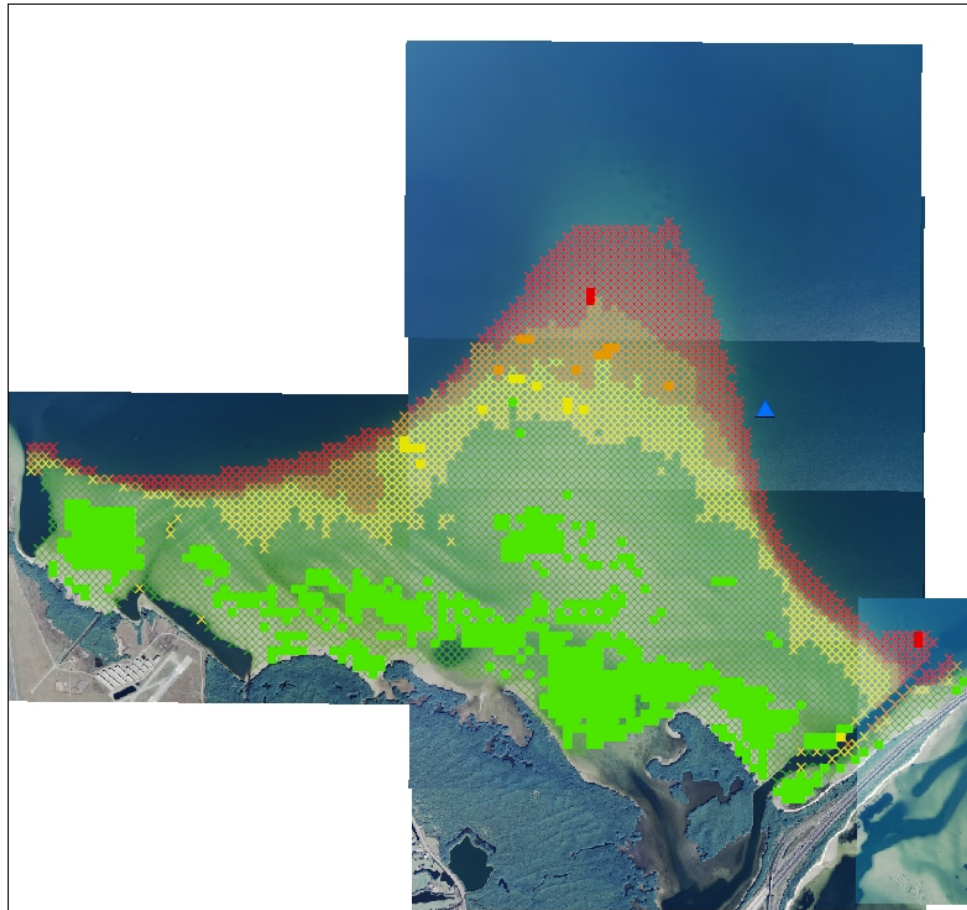
Example of Grid-Based Modeling Approach- Feather Sound, Tampa Bay

Inputs:

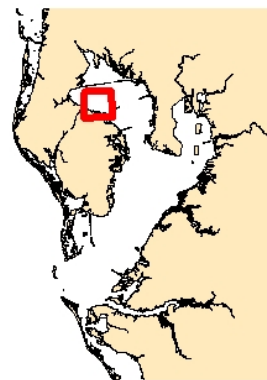
HCEPC Water Quality Data
Bathymetry Data
Seagrass aerial photos

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*



2006



Model Layers- Partial List

Current seagrass distribution
Historical seagrass distribution

Bathymetry

In Situ Optical Water Quality

MODIS Optical Water Quality

Sediment Toxicity

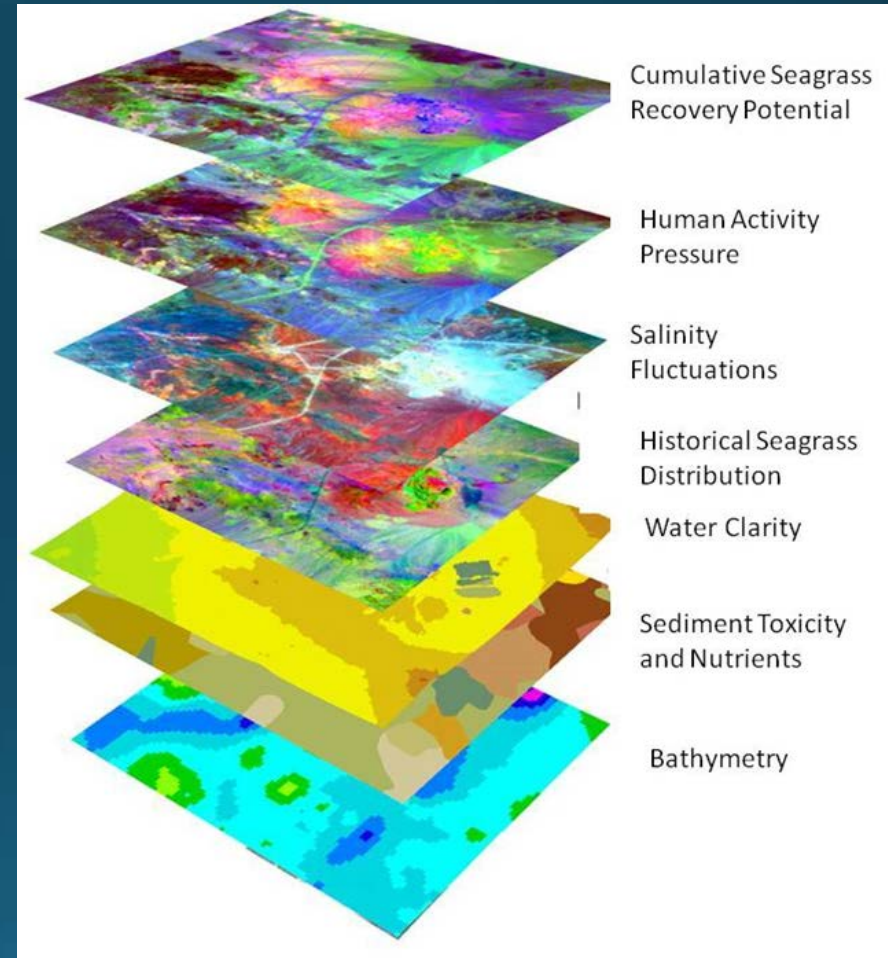
Physical Disturbance

Animal Disturbance

Salinity Fluctuations

Hypoxia and Anoxia

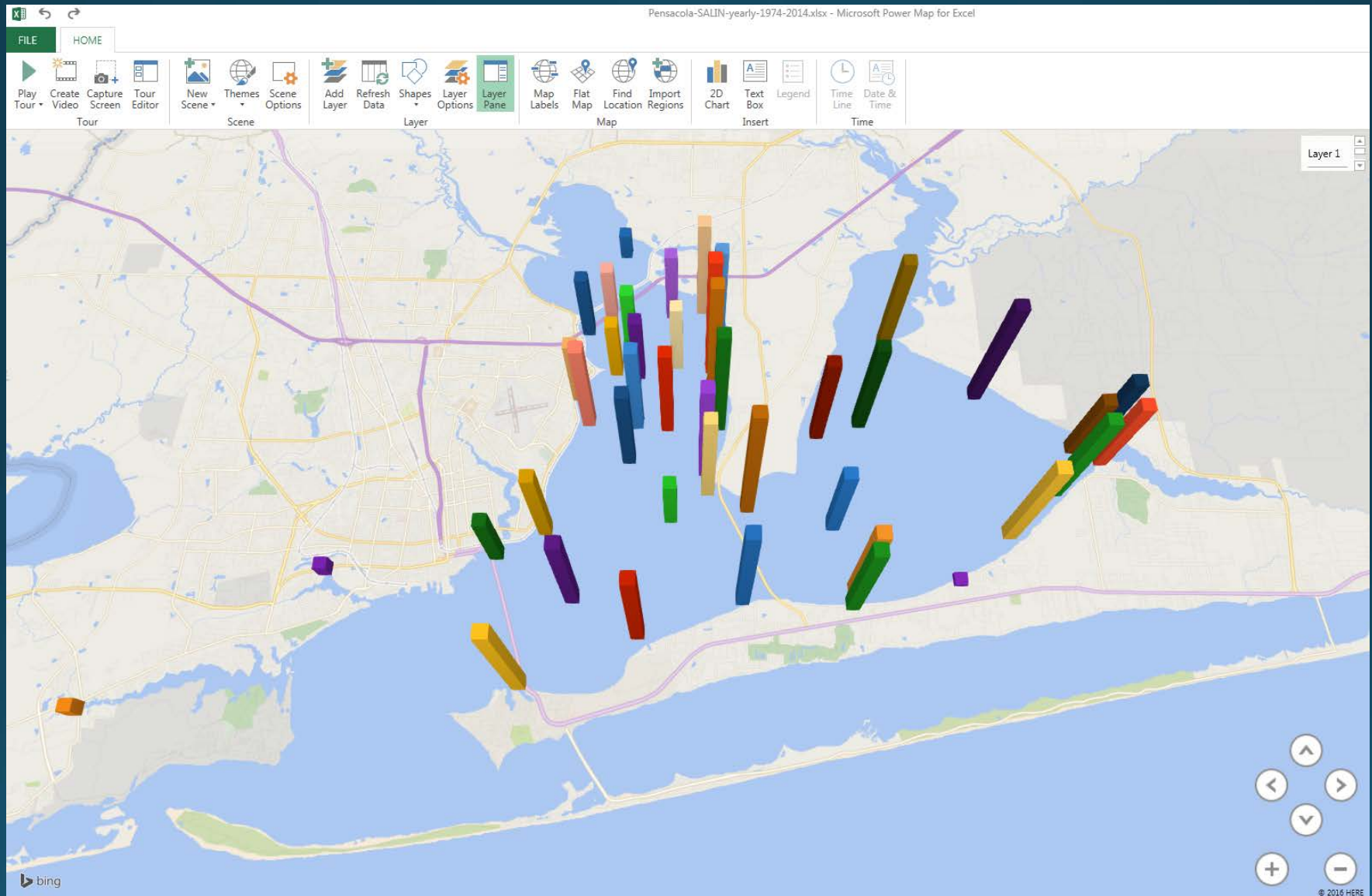
Human Activity Pressure



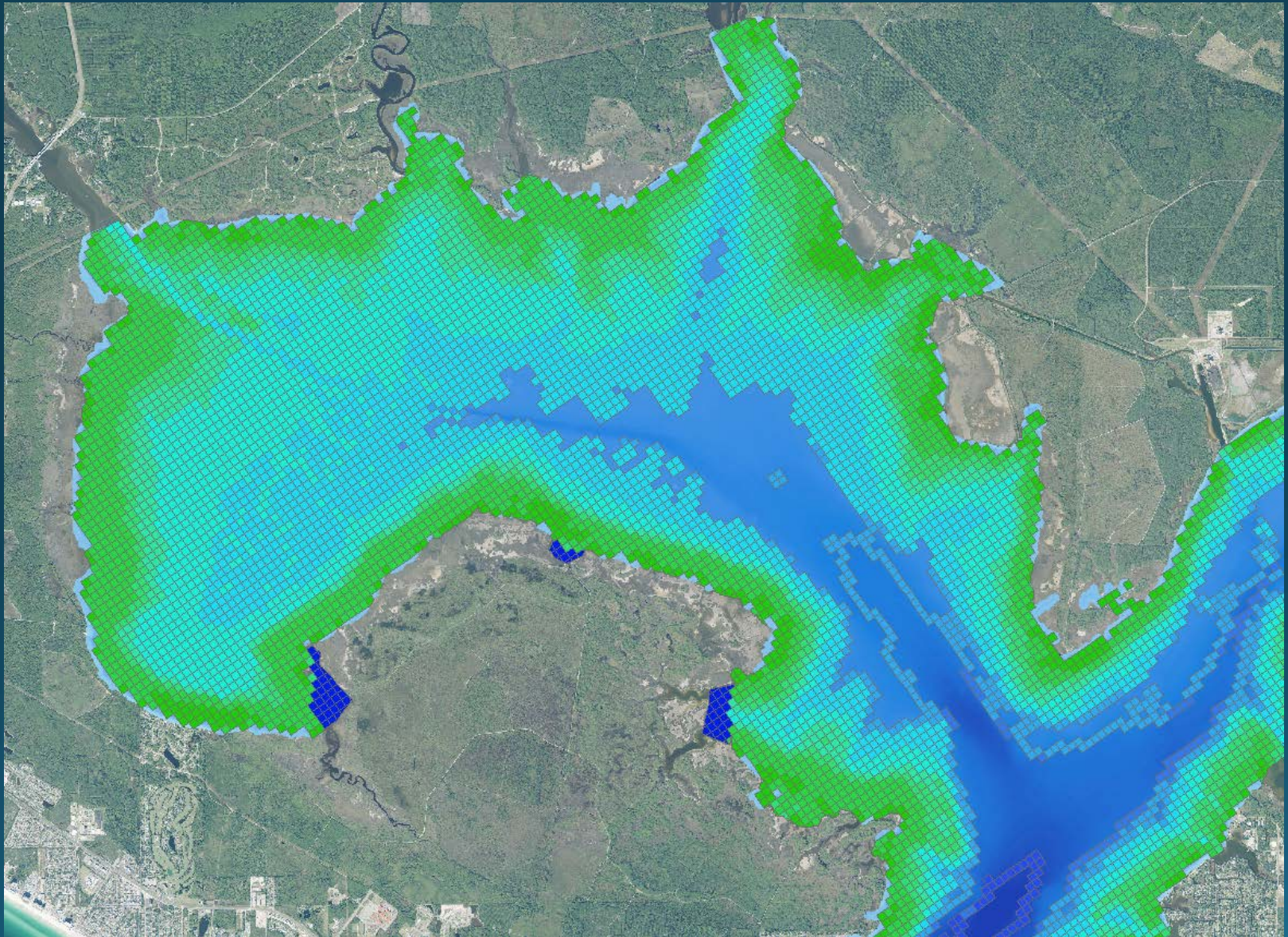
Platform- ArcGIS

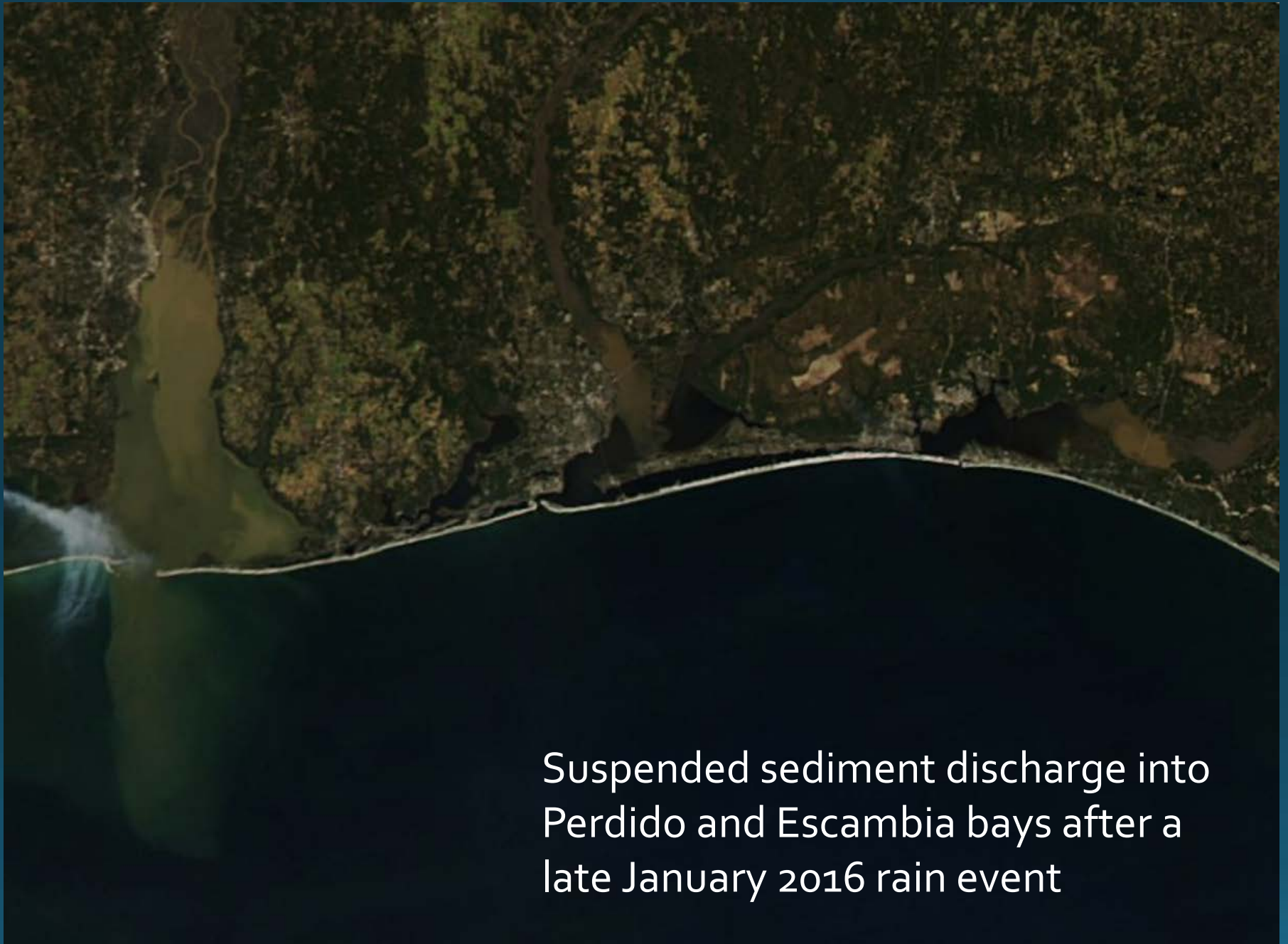
Products- Shapefiles and KML

Water Quality Data Mining- Which Datasets and Sampling Programs have the Richest Spatial and Temporal Coverage?



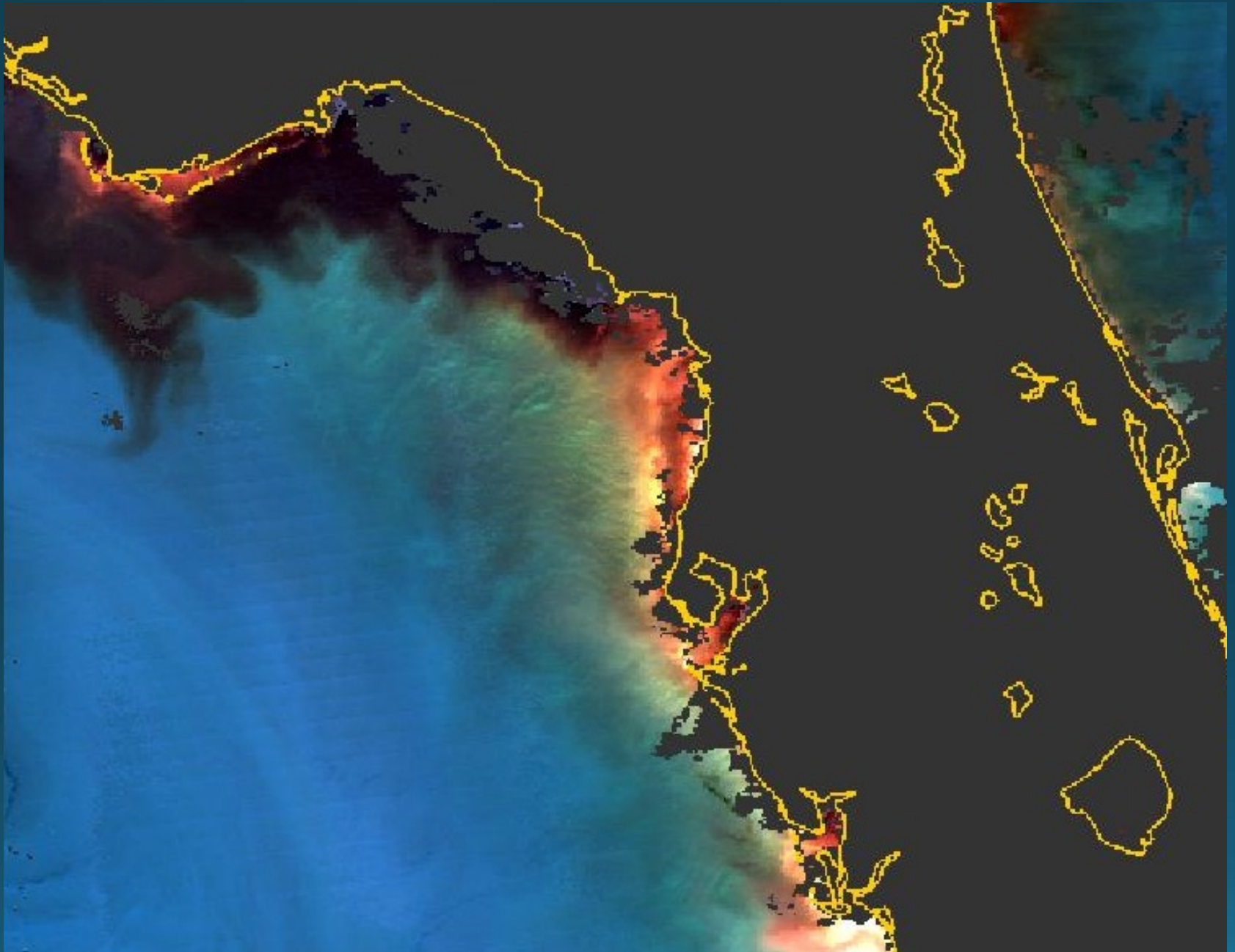
One-hectare model grid cells for St Andrew Bay overlain on bathymetry





Suspended sediment discharge into
Perdido and Escambia bays after a
late January 2016 rain event

MODIS Image- CDOM from Suwannee and Ochlockonee Rivers



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 – A Joint Project between FWC and USF, supported by FDEP & NASA

Menu

- Home
- + People
- + Projects
- + Satellite Data Products
- + Virtual Buoy Products
- + Airborne Data Products
- + Publications
- + Events
- + Links
- + Contact

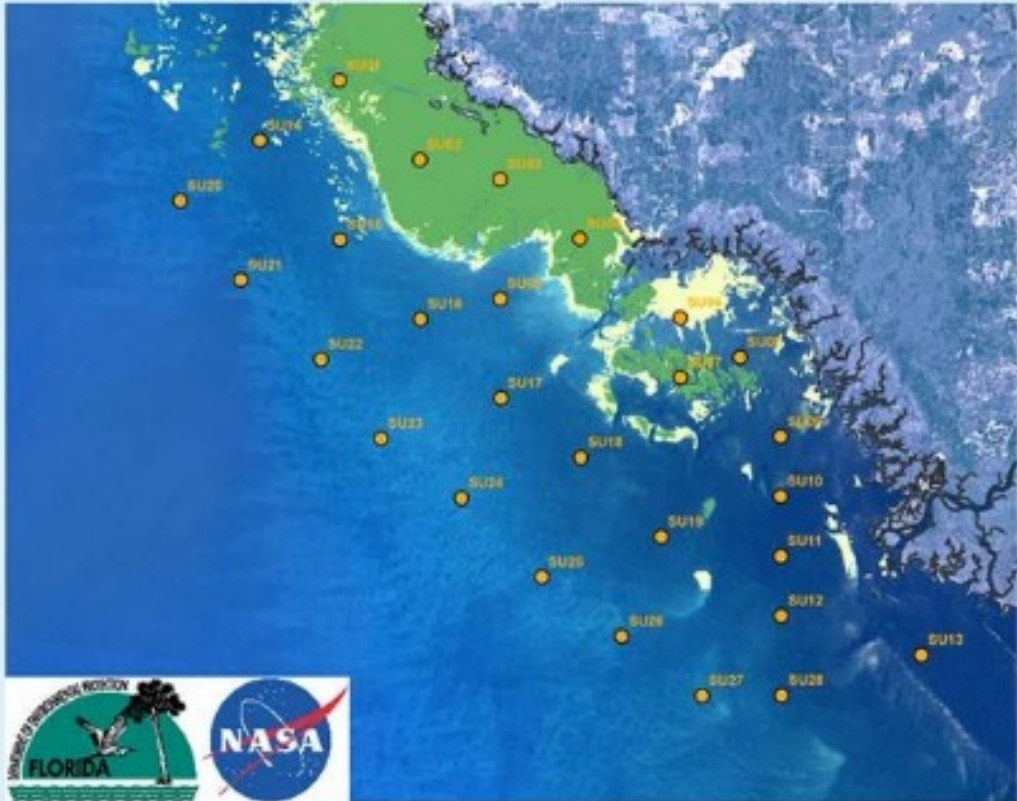
Welcome to Florida's Suwannee River Estuary Region

The Big Bend area of Florida's coast has over 600,000 acres of seagrass supporting many economically important species of fish and shellfish.

Healthy seagrass beds depend on water clarity, and this website provides access to historical and real-time water clarity and seagrass abundance data for the Suwannee River Estuary and nearby coastal waters.

Quick Links

By clicking on any of the stations on the image to the right, you will be taken to the data for that station. These links can also be found in the menu to the left under the Projects section. If you are looking for the Steinhatchee Big Bend Region page you can click here:

Suwannee Station Clickable Map

Click on any of the stations above to see the data.



Optical Water Quality and Seagrass Data for the Suwannee River Estuary Seagrass Cover Data SU 02

- Home
- People
- Projects
- Satellite Data Products
- Virtual Buoy Products
- Airborne Data Products
- Publications
- Events
- Links
- Contact

Location / Bottom

Kd(488)

Light Penetration

Chlorophyll-a

aCDOM(443)

bhp(700)

SST

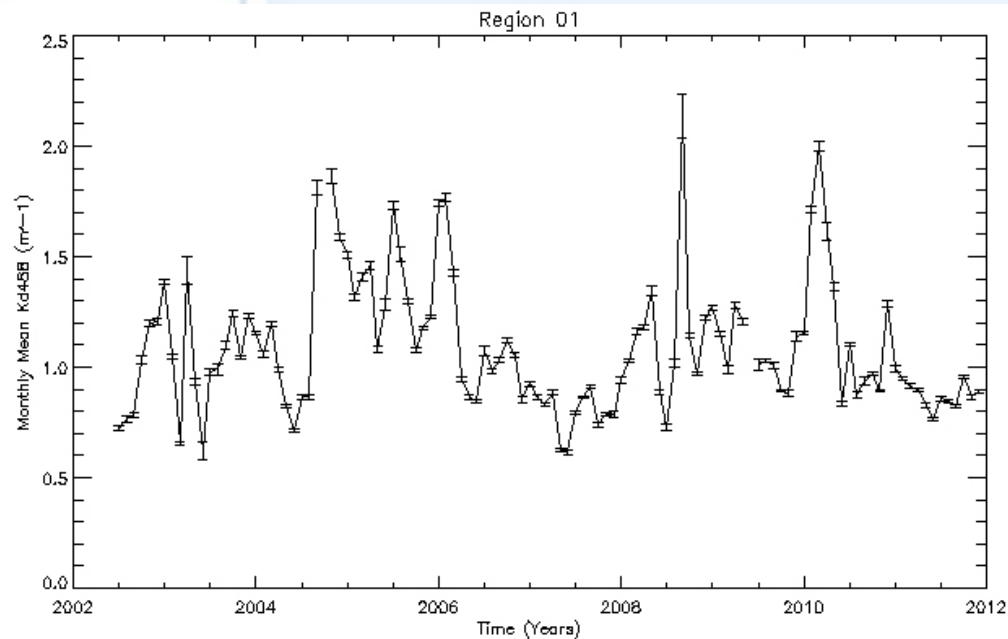
Station Name: SU 02 Suwannee River Estuary

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%

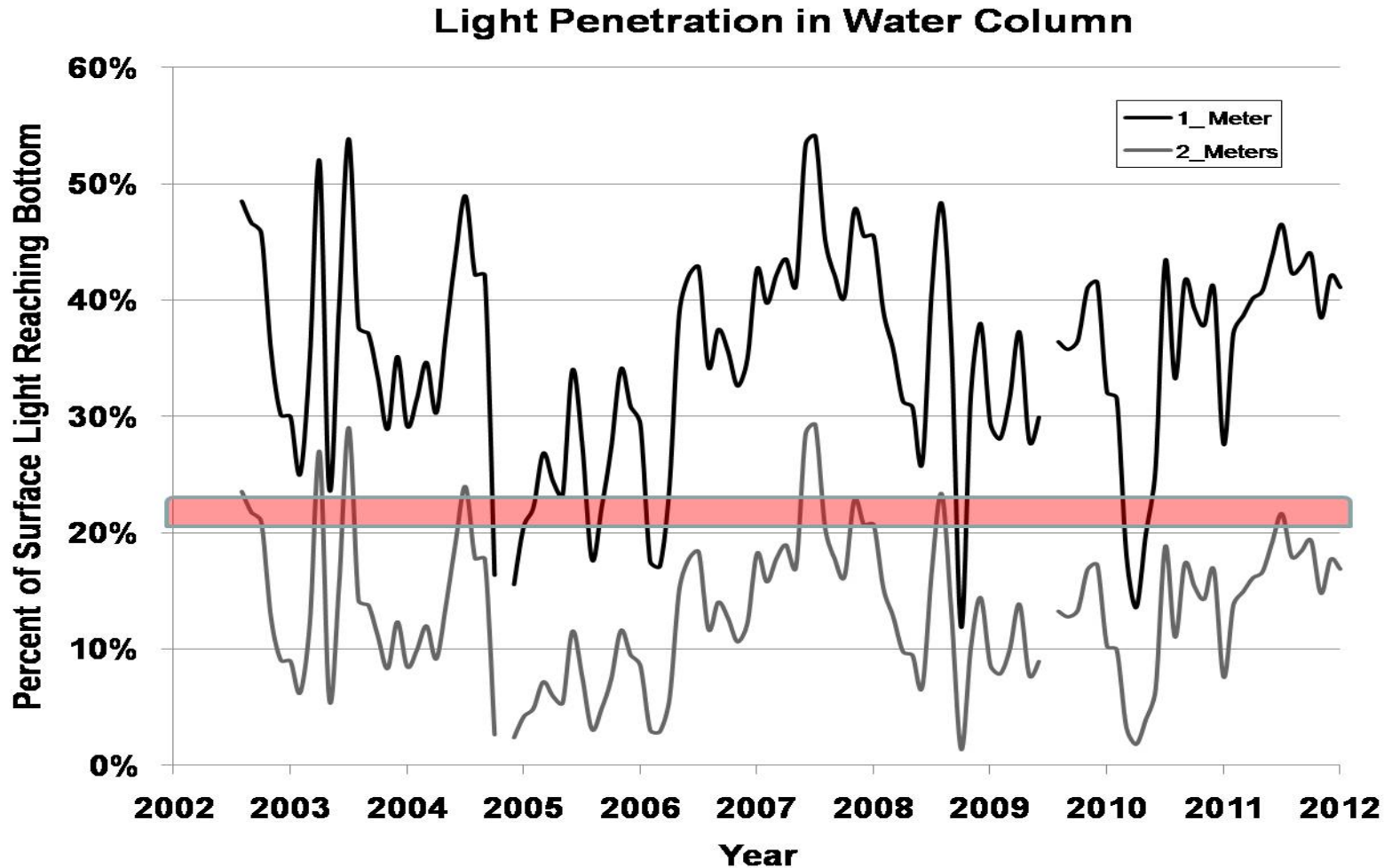
Bottom Image SU 02



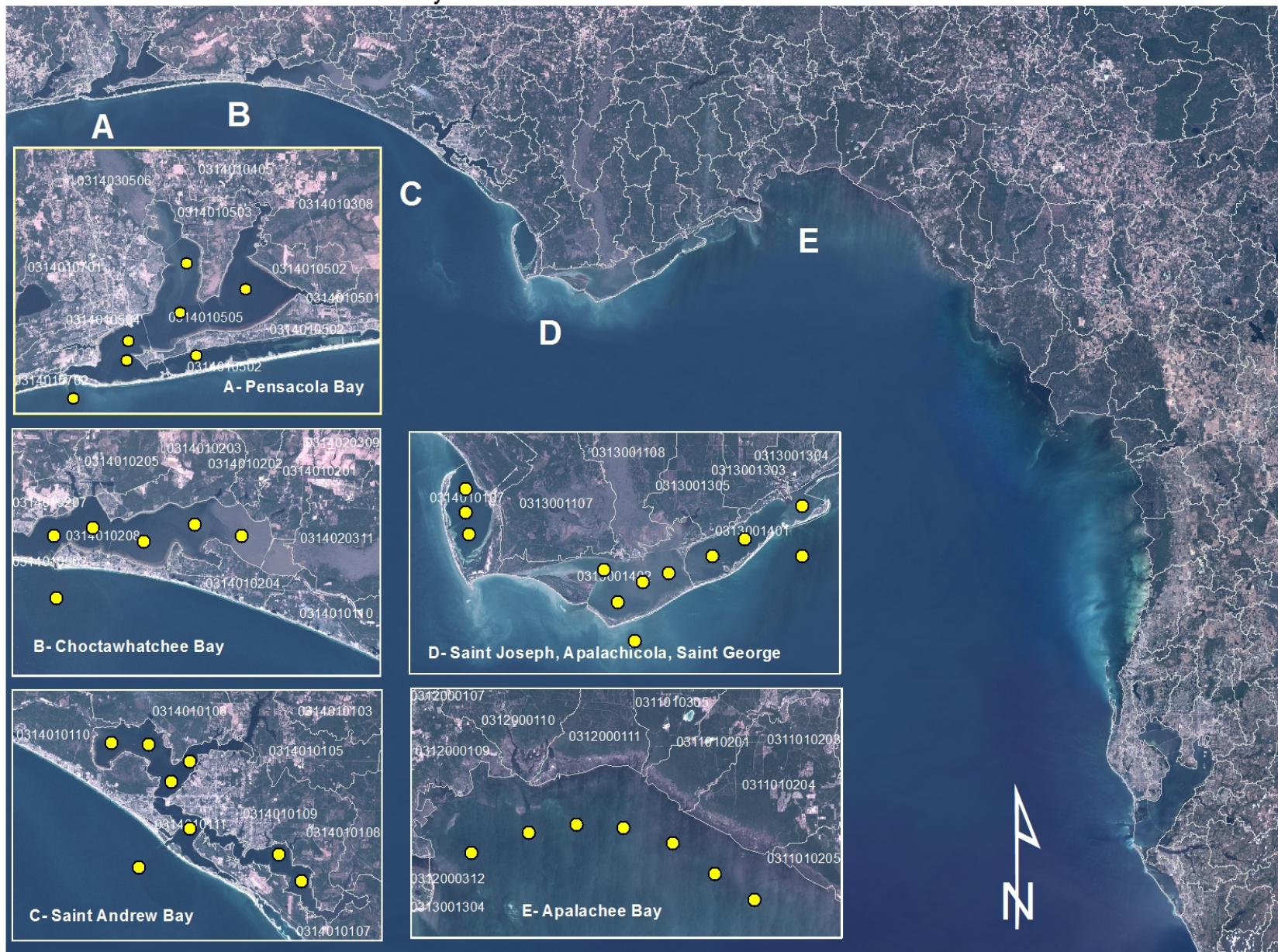
This is an image representative of the bottom of Station SU 02. It is described as "DECO" which is explained to the left in the "Bottom Type" section. Click on the image to open a larger image.



With a water depth of 1 meter, most of the time light is adequate for seagrasses on the bottom. However, if the water depth is 2 meters or more, light is not sufficient for seagrass survival except for brief periods.



Virtual Buoy Stations for Florida Panhandle Estuaries

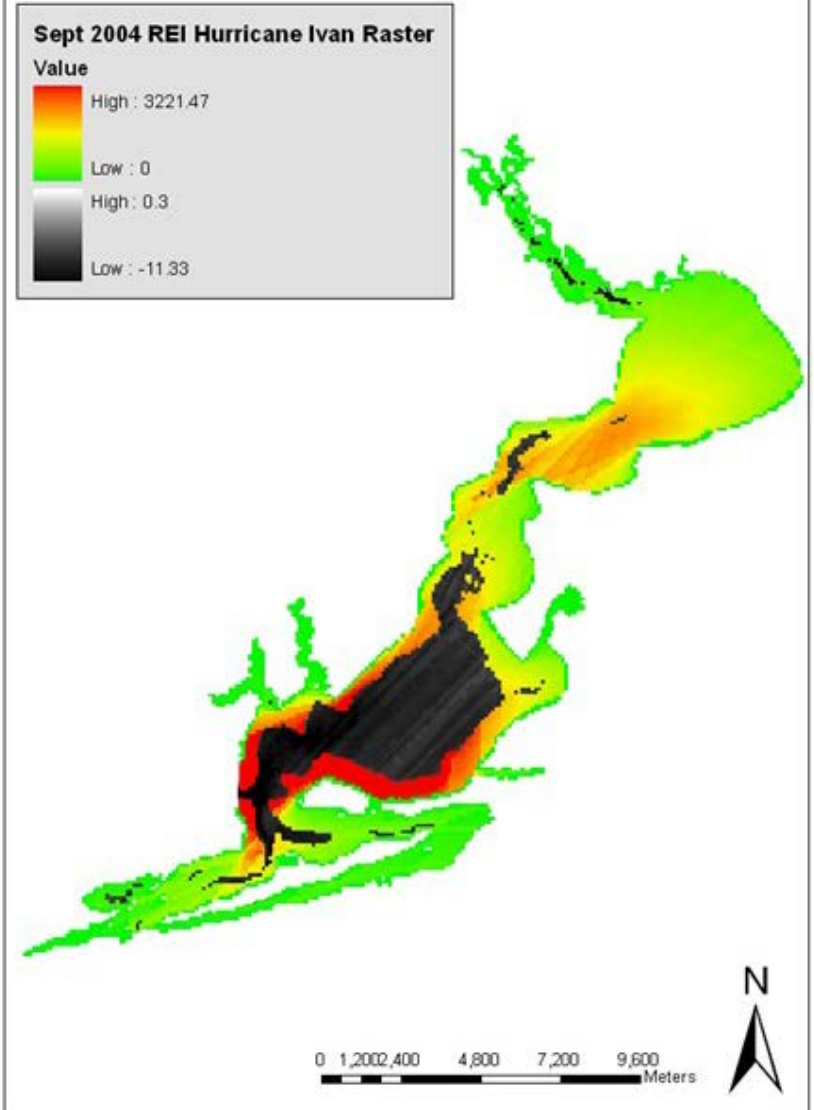
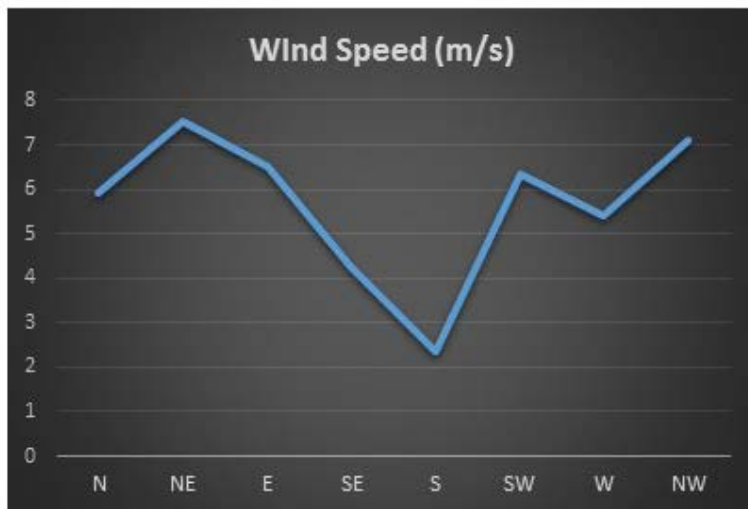
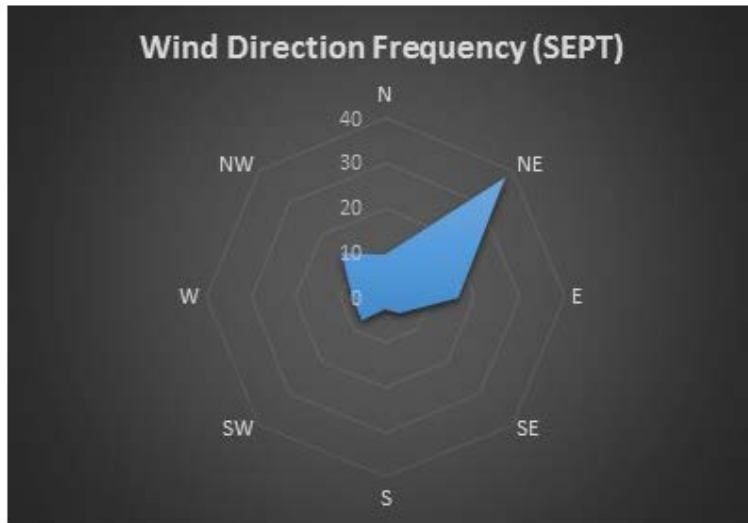


Physical Disturbance Suggested by Sediment Bed Form



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 propeller scarring.



Data in progress; obtained from GIS assessment of imagery collected in 2013.

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

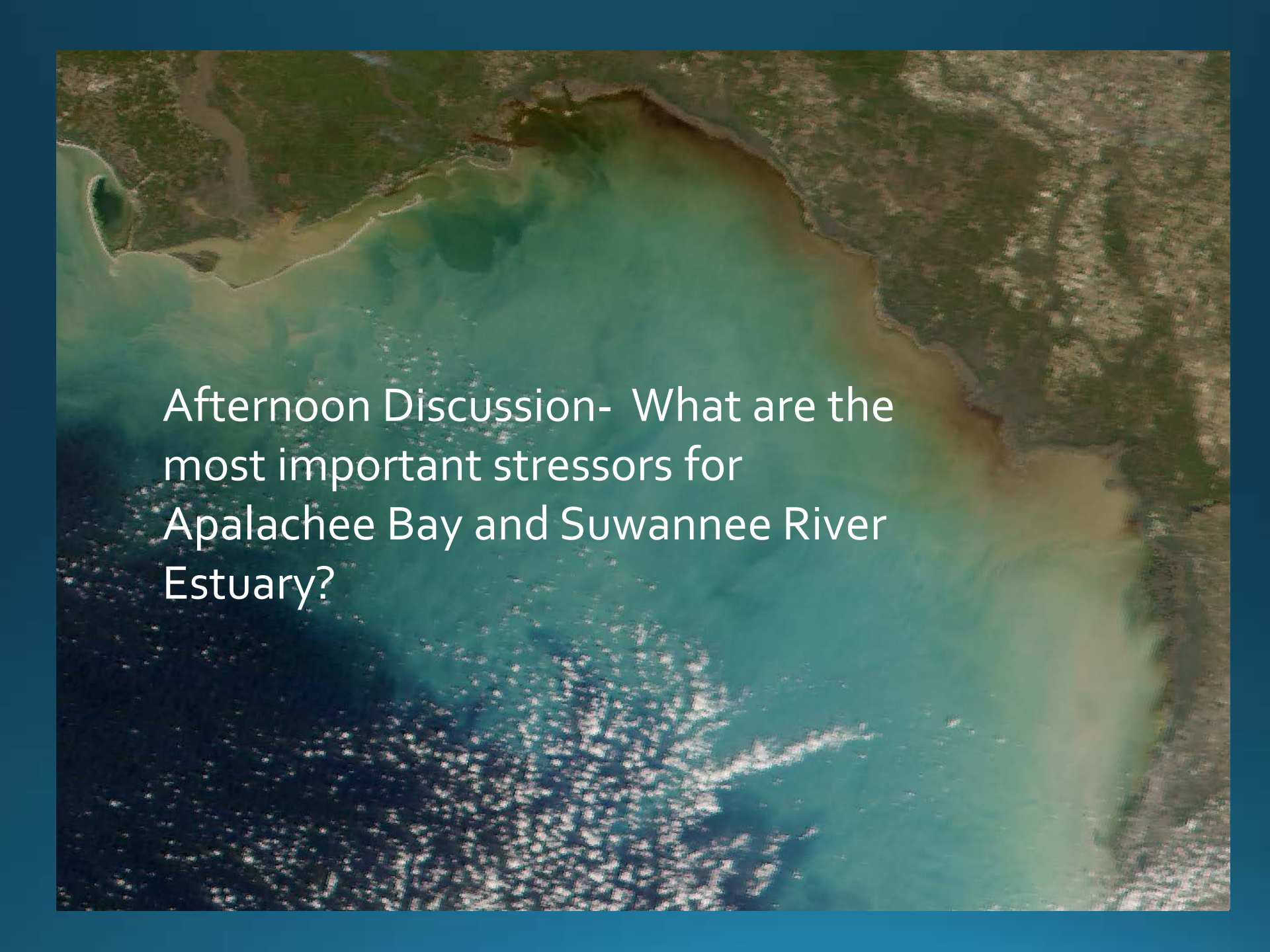
Stressor	Distribution	Severity	Effect(s)	Assessment Methods	Restoration Action(s)
Light Stress	Widespread	Varies by cause	Inhibited growth, death	<i>In situ</i> and satellite measurements, nutrient data, TMDL models	Nutrient reduction, sediment reduction, point and non-point source treatment
Salinity Pulses	Widespread	Varies by freshwater source	Metabolic drain	<i>In situ</i> salinity measurements, freshwater discharge data, models	Stormwater retention, watershed best management practices (BMPs)
Salinity Stratification	Frequent	Varies with depth, bottom contours	Metabolic drain	<i>In situ</i> 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	<i>In situ</i> 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, <i>in situ</i> 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 Apalachee Bay and Big Bend.
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.

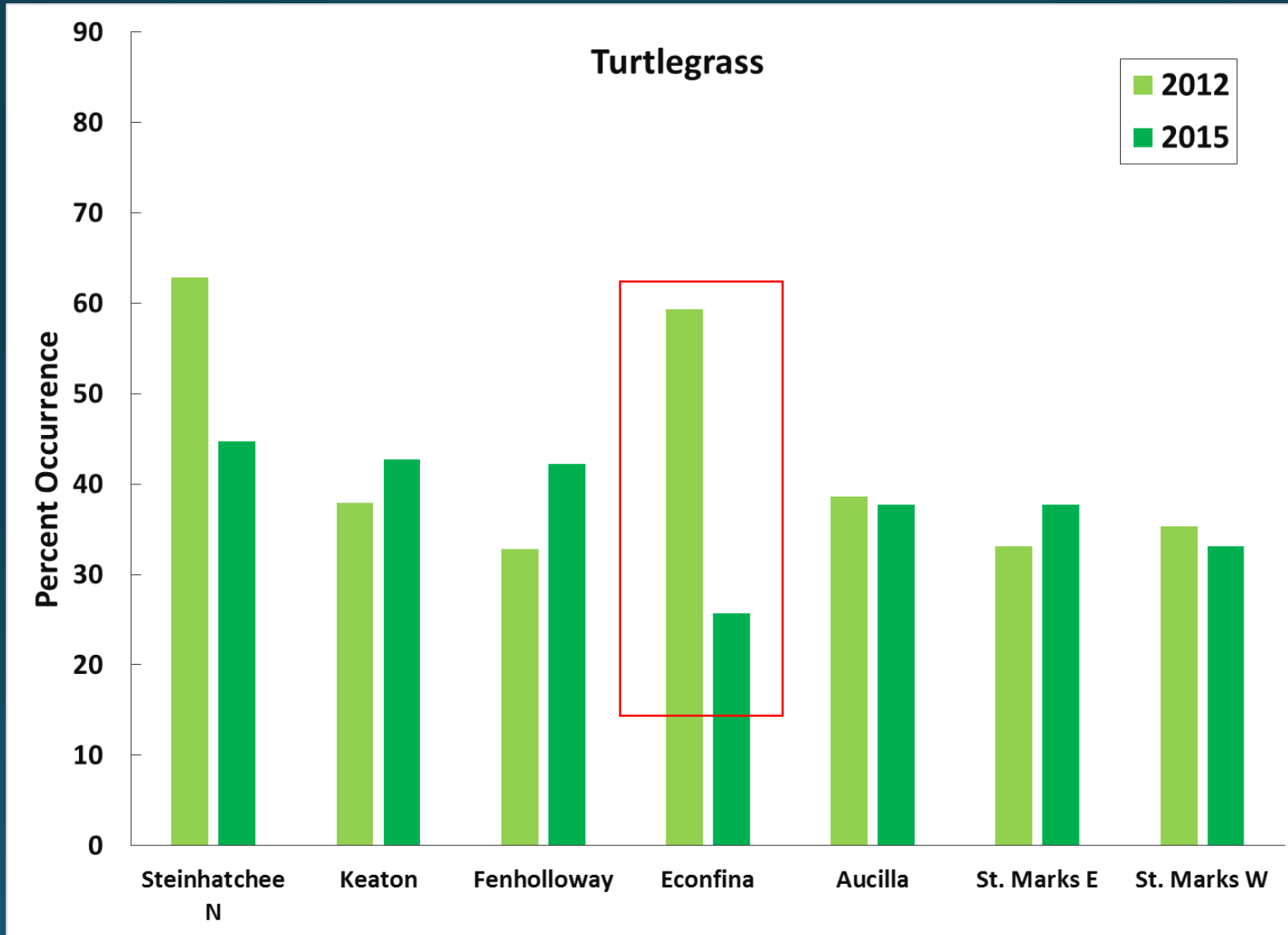
An aerial photograph of a coastal estuary. The water in the upper and middle portions of the image is a murky greenish-brown color, indicating high turbidity or the presence of phytoplankton. This greenish water transitions into a dark blue, clearer ocean water in the lower-left corner. The shoreline is irregular, with patches of green vegetation and brownish, possibly bare or eroded, land. The text is overlaid on the greenish water area.

Afternoon Discussion- What are the most important stressors for Apalachee Bay and Suwannee River Estuary?

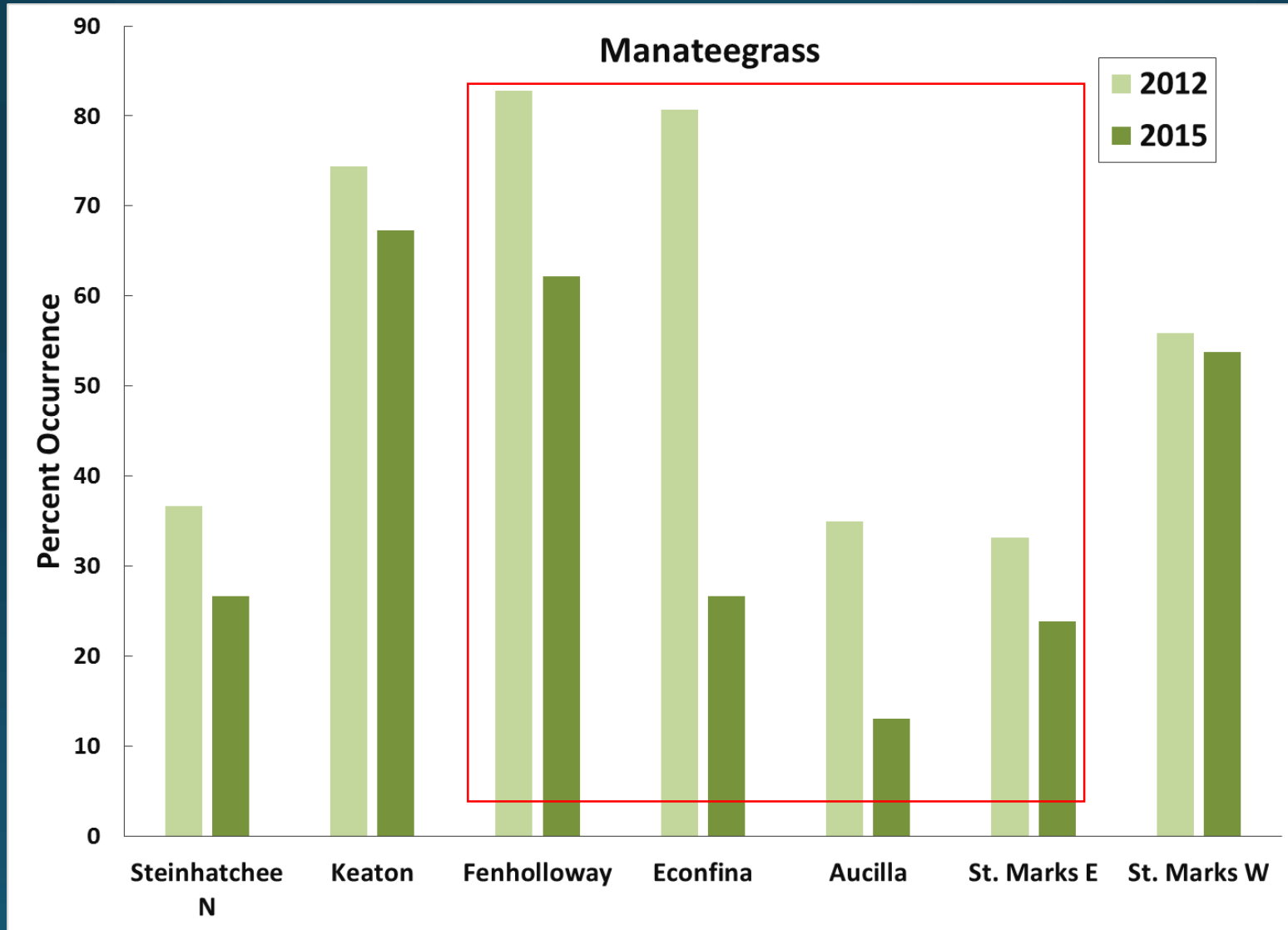
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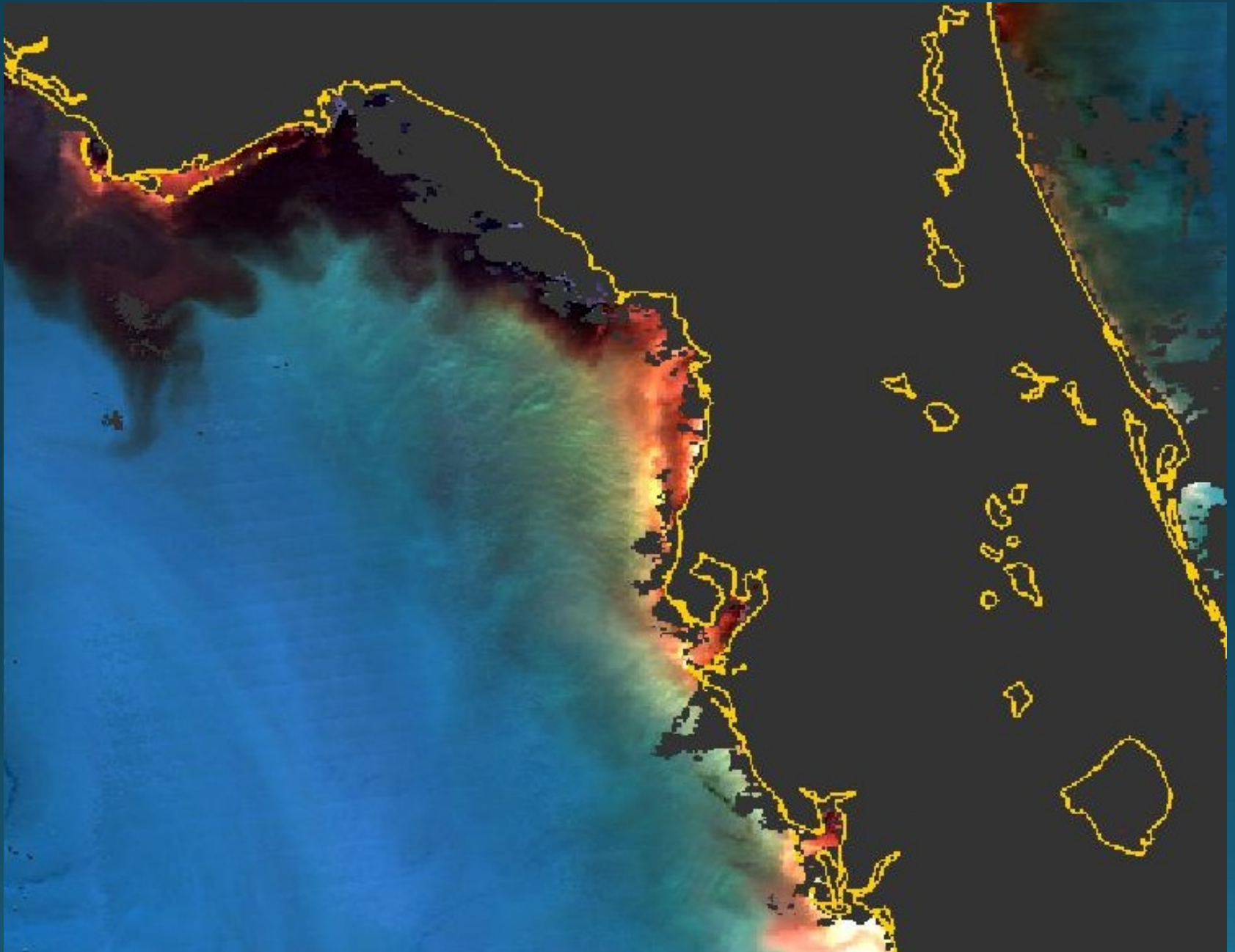
Changes in Turtlegrass occurrence in northern Big Bend between 2012 and 2015



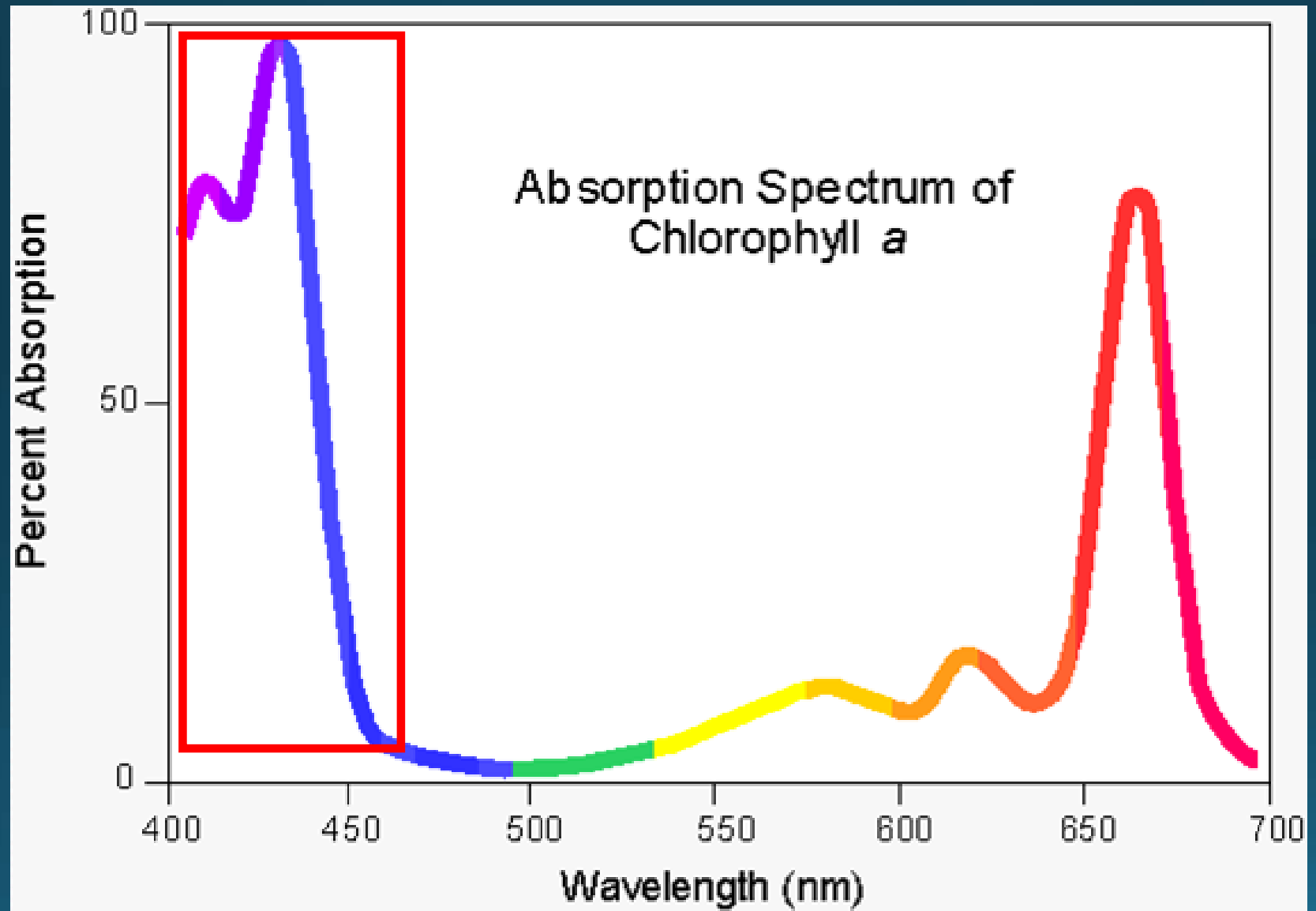
Changes in Manateegrass occurrence in northern Big Bend between 2012 and 2015



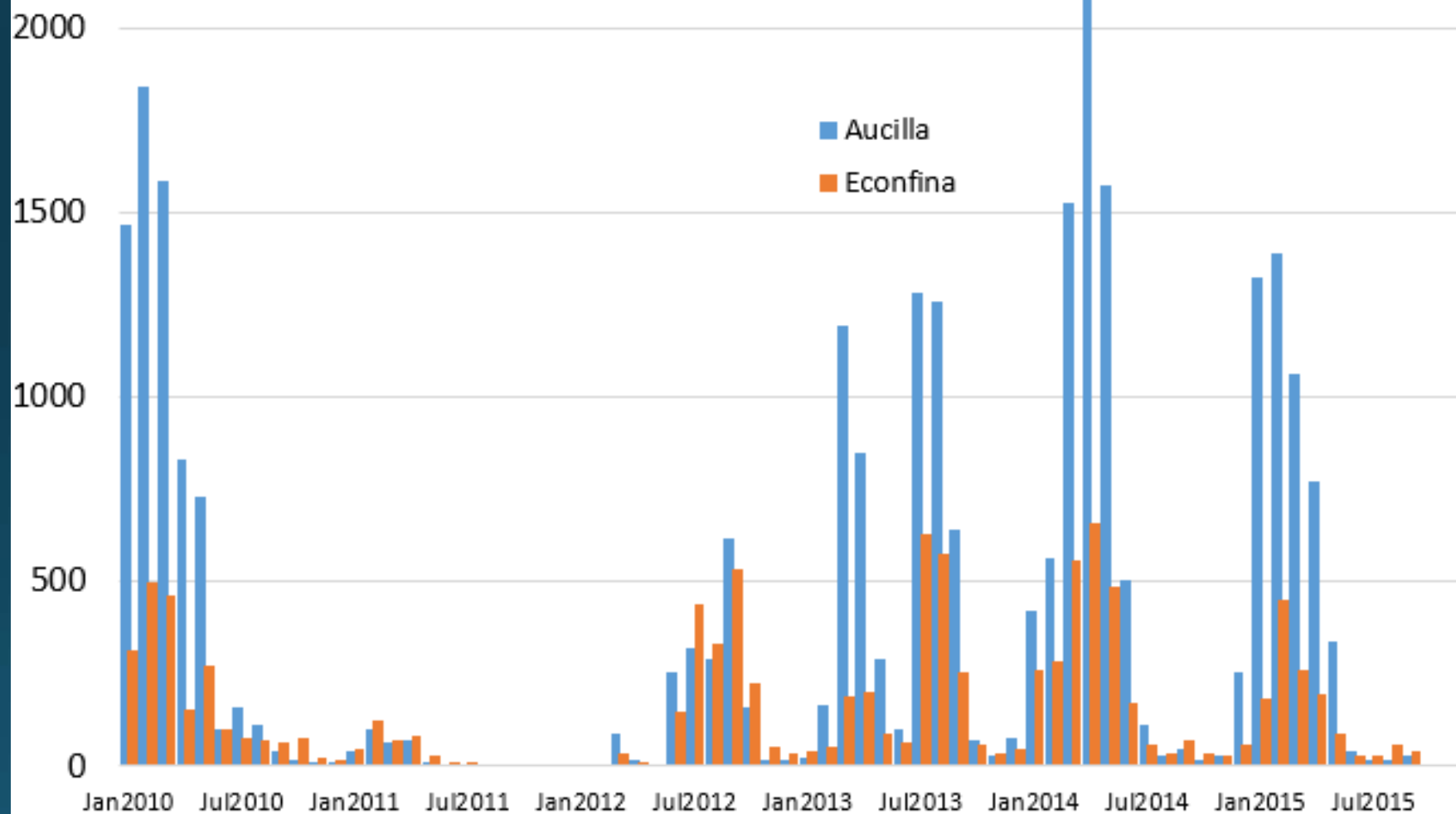
MODIS Image- CDOM from Suwannee and Ochlockonee Rivers



CDOM blocks blue light.



River Discharge



Pearson correlation coefficient matrix for river discharge (SPFLO, SPAUC, SPECO, JUNAUC, JUNECO), optical water quality (AUCPCU, ECOPCU, AUCCHL, ECOCHL), and water column light attenuation (KPARAU, KPAREC).

Light attenuation in the Aucilla region is strongly correlated with chlorophyll and CDOM. Phytoplankton chlorophyll and CDOM are strongly correlated with spring river discharge.

	<i>SPFLO</i>	<i>SPAUC</i>	<i>SPECO</i>	<i>JUNAUC</i>	<i>JUNECO</i>	<i>AUCPCU</i>	<i>ECOPCU</i>	<i>AUCCHL</i>	<i>ECOCHL</i>
SPFLO	1.00								
SPAUC	1.00	1.00							
SPECO	1.00	0.99	1.00						
JUNAUC	0.80	0.79	0.83	1.00					
JUNECO	0.64	0.63	0.66	0.91	1.00				
AUCPCU	0.94	0.94	0.94	0.84	0.58	1.00			
ECOPCU	0.79	0.80	0.76	0.59	0.45	0.78	1.00		
AUCCHL	0.81	0.81	0.81	0.73	0.45	0.94	0.86	1.00	
ECOCHL	0.92	0.92	0.93	0.79	0.51	0.99	0.74	0.93	1.00
KPARAU	0.79	0.80	0.75	0.52	0.22	0.88	0.83	0.91	0.88
KPAREC	0.50	0.51	0.45	0.32	0.22	0.51	0.92	0.69	0.47