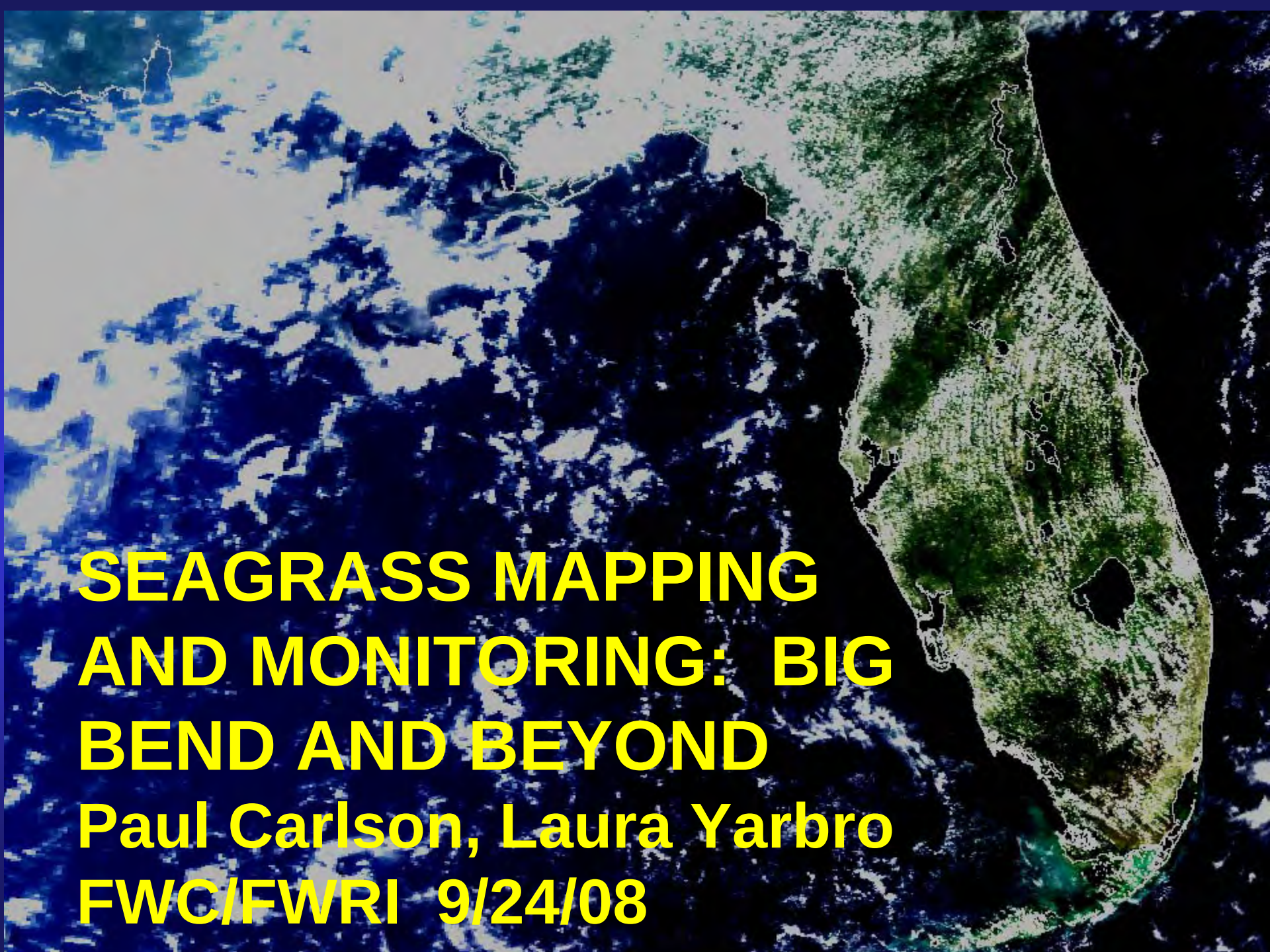




SEAGRASS MAPPING AND MONITORING: BIG BEND AND BEYOND

**Paul Carlson, Laura Yarbrow
FWC/FWRI 9/24/08**

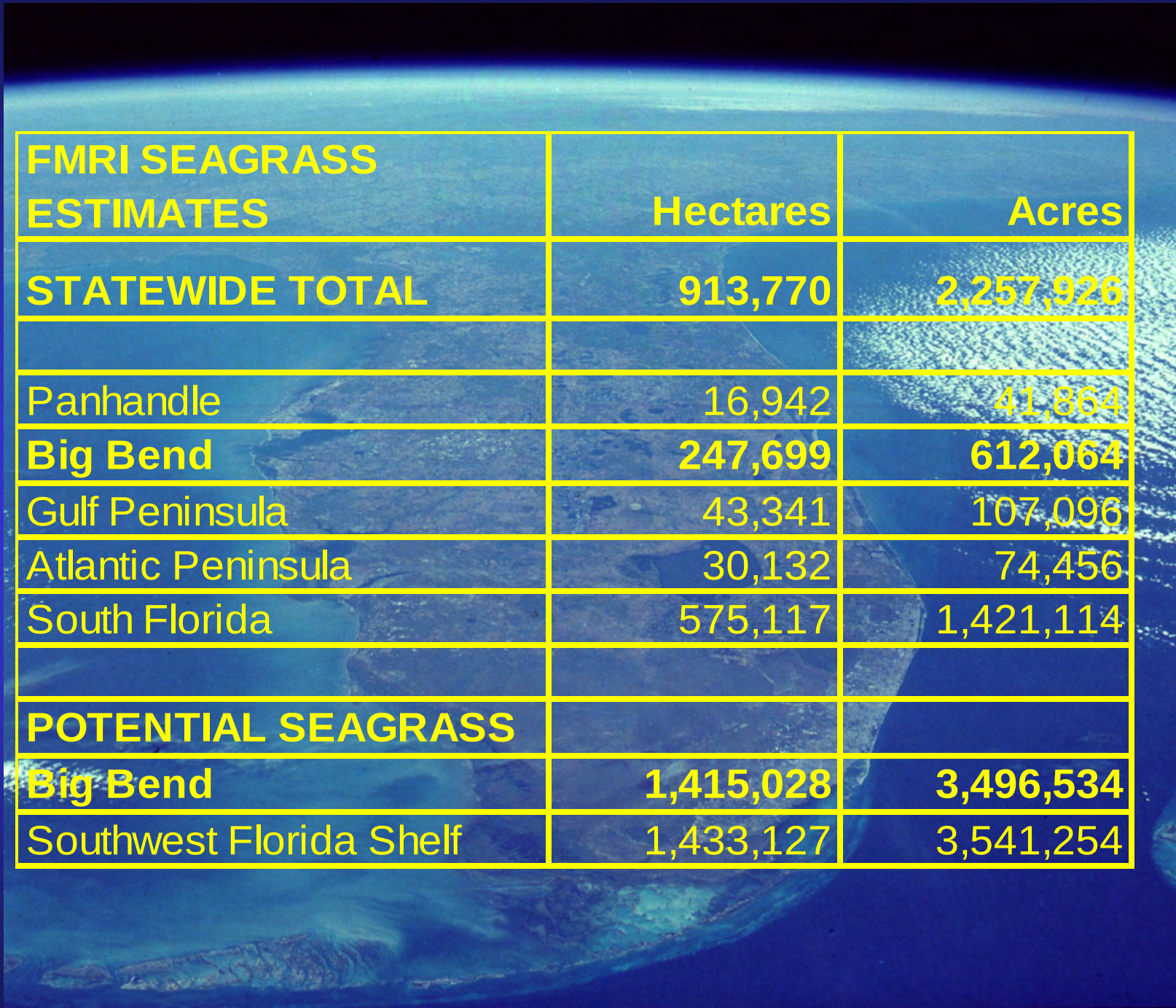
TO EFFECTIVELY PROTECT AND MANAGE FLORIDA'S LIVING MARINE RESOURCES, FWC AND PARTNERS NEED TO MONITOR

- COMMERCIAL AND RECREATIONAL FISH AND SHELLFISH STOCKS
- BENTHIC MARINE HABITATS- CORALS, SEAGRASSES, OYSTER REEFS, WETLANDS
- SEA TURTLES, MAMMALS, AND BIRDS
- THREATS TO HABITATS AND ORGANISMS- NUTRIENT LOADING, WATER QUALITY, HYPOXIA, HARMFUL ALGAL BLOOMS, HABITAT LOSS

FLORIDA SEAGRASS MEADOWS



- One of the most important fisheries habitats
- One of the greatest seagrass resources in the United States
 - 2 million acres inshore
 - 1.5 million acres offshore
 - 800,000 acres in the Florida Keys

A satellite map of Florida and the surrounding Gulf of Mexico serves as the background for the table. The map shows the coastline of Florida, with various regions highlighted in different shades of blue and green, indicating seagrass distribution. The table is overlaid on the map, with the text in white and yellow. The table has three columns: 'FMRI SEAGRASS ESTIMATES', 'Hectares', and 'Acres'. The rows include 'STATEWIDE TOTAL', 'Panhandle', 'Big Bend', 'Gulf Peninsula', 'Atlantic Peninsula', 'South Florida', 'POTENTIAL SEAGRASS', 'Big Bend', and 'Southwest Florida Shelf'.

FMRI SEAGRASS ESTIMATES	Hectares	Acres
STATEWIDE TOTAL	913,770	2,257,926
Panhandle	16,942	41,864
Big Bend	247,699	612,064
Gulf Peninsula	43,341	107,096
Atlantic Peninsula	30,132	74,456
South Florida	575,117	1,421,114
POTENTIAL SEAGRASS		
Big Bend	1,415,028	3,496,534
Southwest Florida Shelf	1,433,127	3,541,254

Economic Value of Seagrass Habitat

- TPD \$9,000-\$28,000 per acre per year
- FDEP \$20,000 per acre per year
- 2.2 million acres
- \$44 billion per year
- Restoration costs estimated to be 10-20x higher

SEAGRASS LOSS IN FLORIDA

- Tampa Bay- 80% loss since 1890's
- Hillsborough Bay- 90% loss
- Sarasota Bay- 30% loss since 1950
- St. Joseph Sound- 72% loss since 1950
- Charlotte Harbor- 30% loss since 1950
- Northern Biscayne Bay- 43% loss
- Indian River- 30% loss

CAUSES OF SEAGRASS LOSS

- Direct losses: Dredging for navigation and residential construction. Propeller scarring.
- Changes in timing and volume of freshwater delivery to estuaries
- Indirect impacts on water quality and clarity: Point and non-point source nutrient loading, sediment resuspension

TBEP NITROGEN MANAGEMENT STRATEGY PARADIGM

TN Load → Chlorophyll → Light Attenuation

Seagrass Growth & Reproduction ← Seagrass Light Requirement

Figure 1-1. The TBNEP Nitrogen Management Strategy Paradigm.

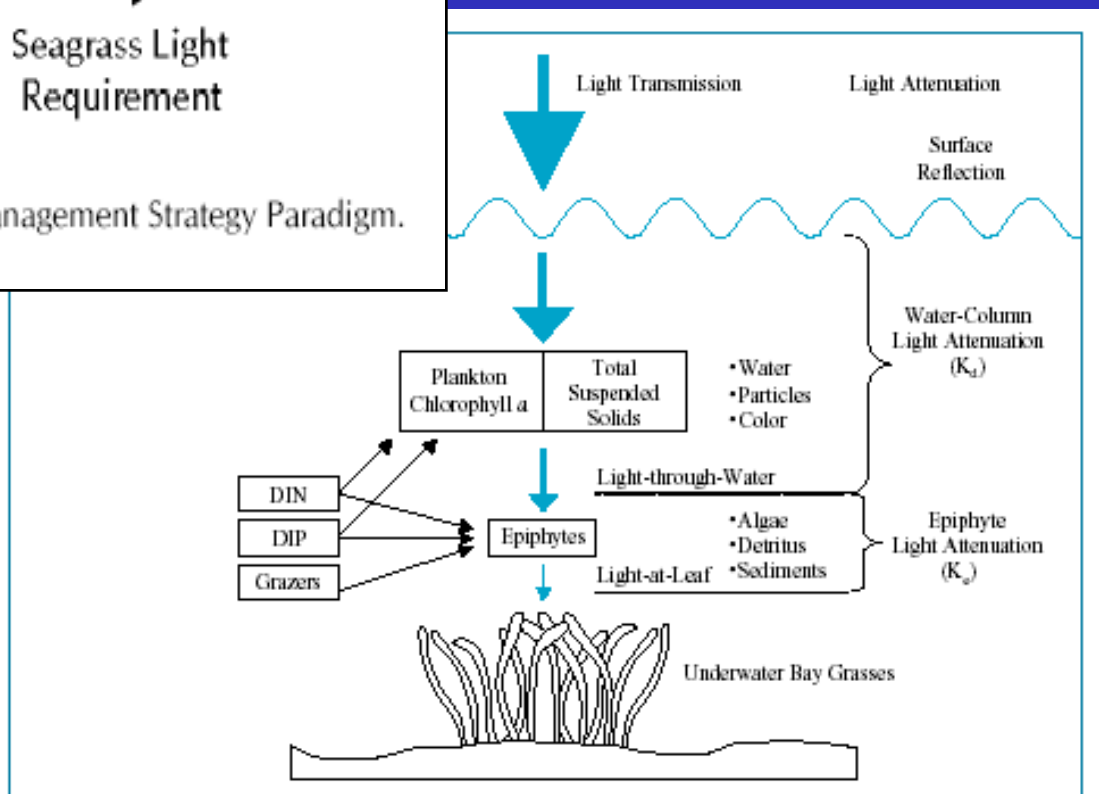
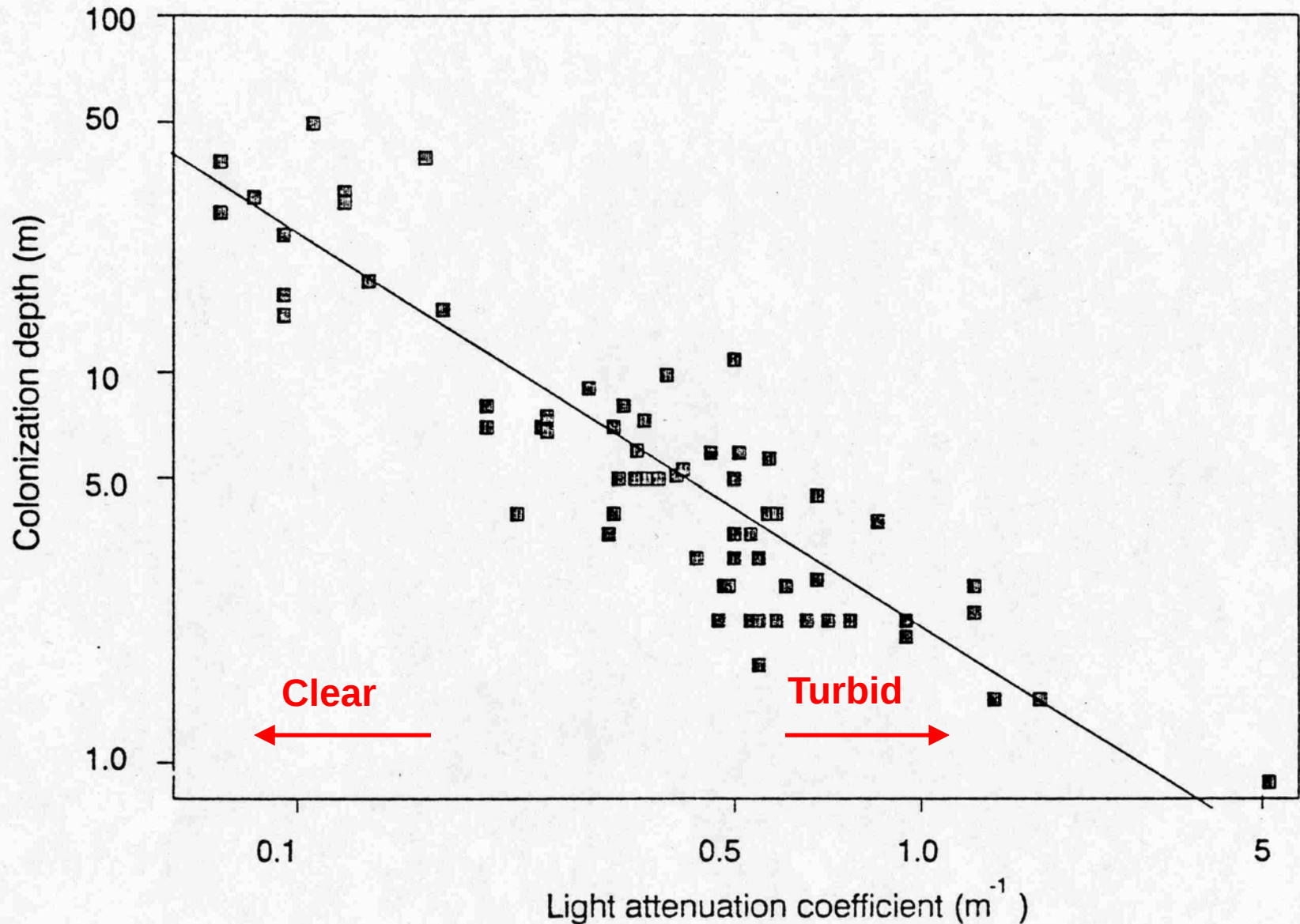


Figure IV-1: Availability of light for underwater bay grasses is influenced by water-column and at-the-leaf surface light attenuation processes. DIN = dissolved inorganic nitrogen and DIP = dissolved inorganic phosphorus.

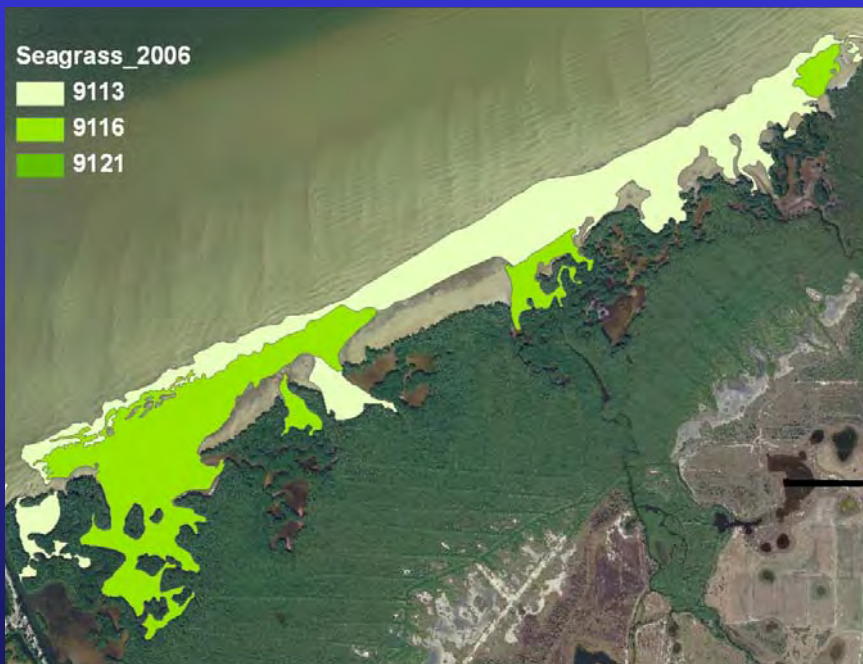
Depth distribution of seagrasses throughout the world is determined by water clarity



Triennial Review of WQ Stds

- Do we really need to monitor water quality in areas with seagrass?
- Would a narrative criterion based on seagrass loss be as effective as a numeric criterion for transparency?
- Seagrass loss listed as a trigger for assessment in IWR

Integrated Mapping and Monitoring



Mapping and Monitoring are Complementary

Characteristics	Mapping	Monitoring
Spatial coverage	Large- 100s km ²	Small- 100s m ²
Spatial resolution	Coarse- 0.2 ha	Fine- 1 m ²
Classification	Coarse- 9113,16	Fine- scalar
Species Comp	None	Complete
Revisit interval	Long- 5 to 10 y	Short- 6 to 12 mos
Data lag time	Long- 12 to 24 mo	Short- 1 to 2 mos



BIG BEND SEAGRASS BEDS

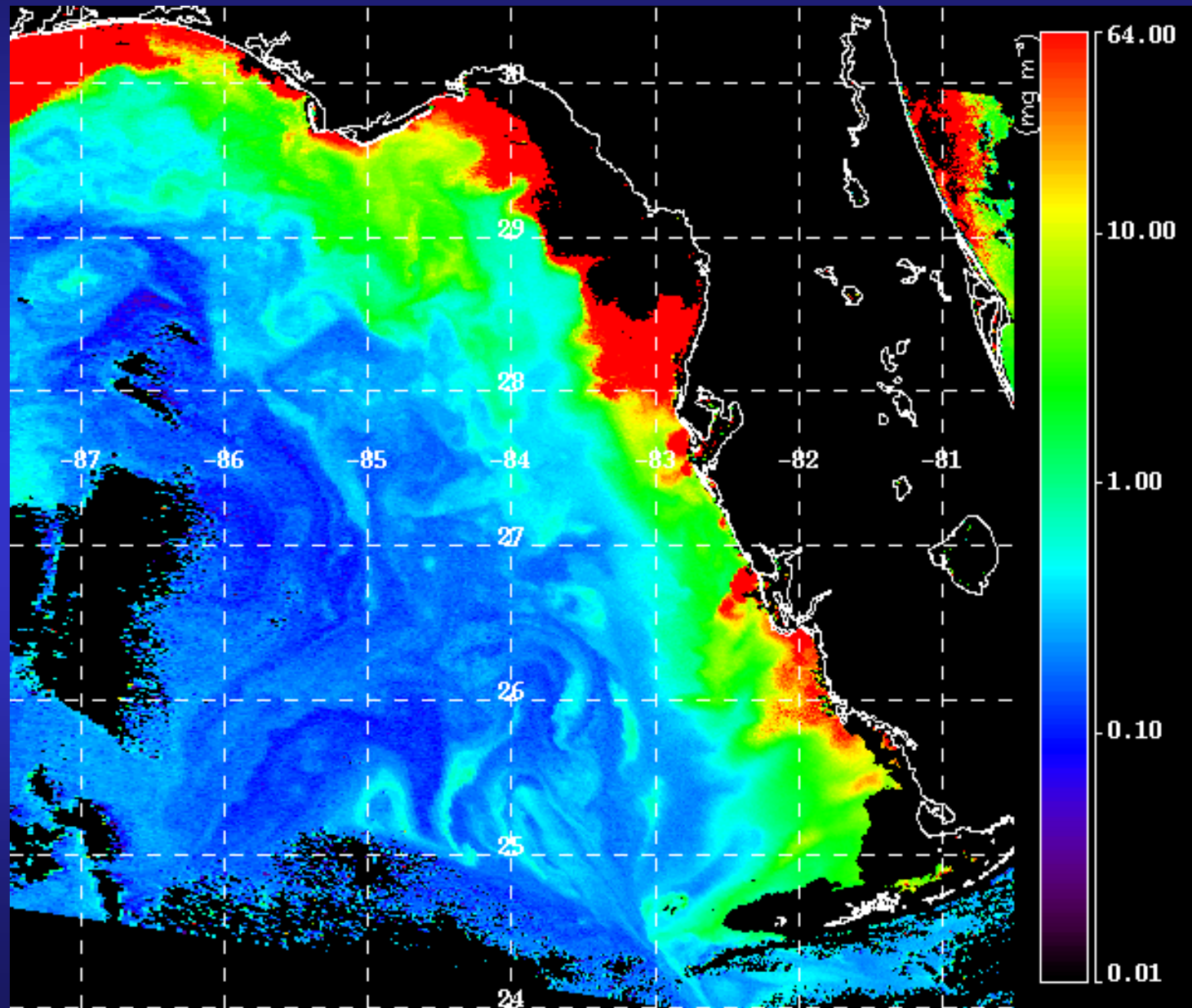
- Extensive
- Logistically difficult
- Pristine?

CAUSES FOR CONCERN

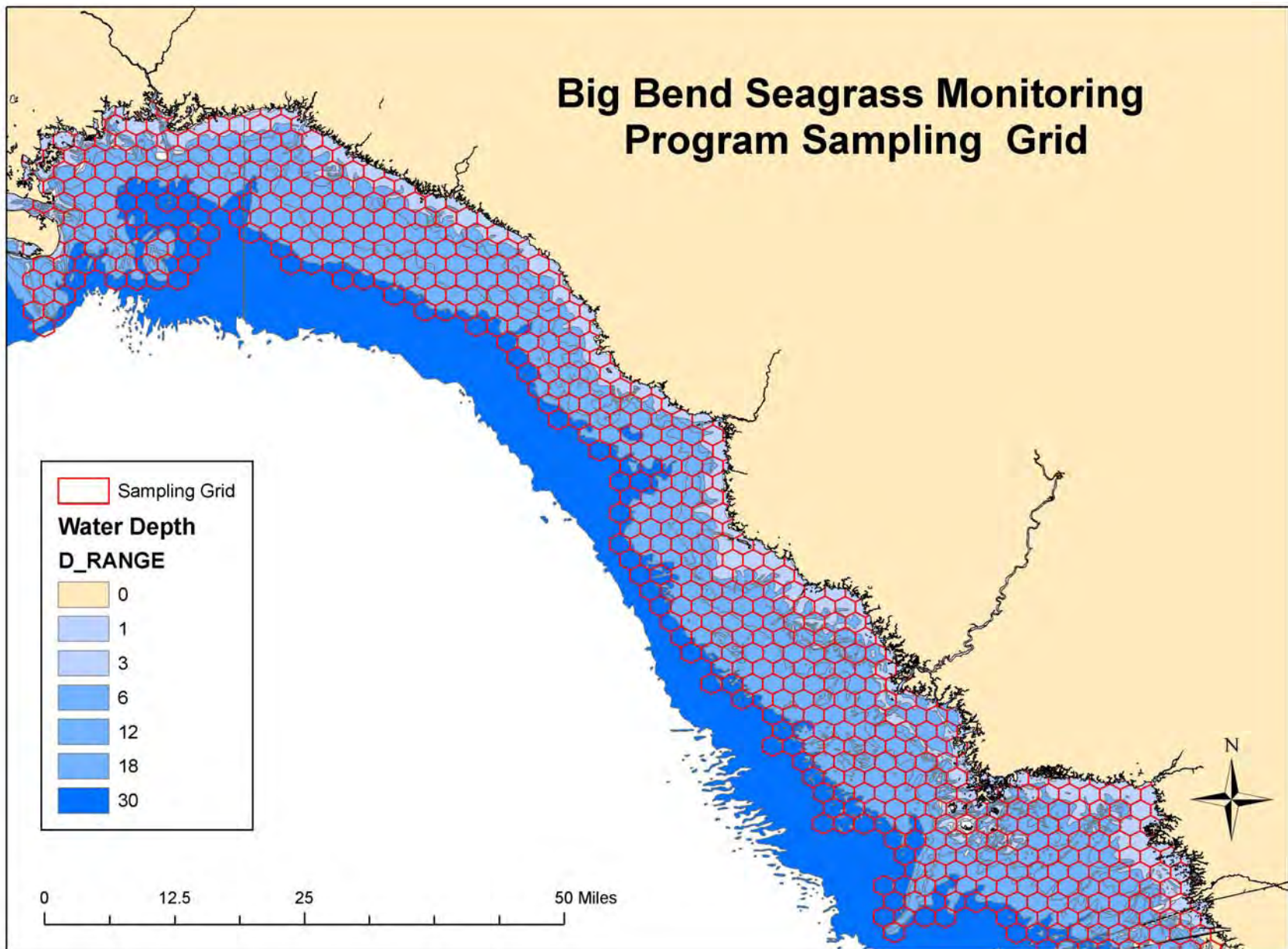
- Tremendous resource at risk
- Rising nutrient loads in Suwannee Basin
- Coastal development
- El Nino runoff

MODIS RGB, March 2003

SPRING 1998 SEAWIFS CHLOROPHYLL



Big Bend Seagrass Monitoring Program Sampling Grid





VEGETATION

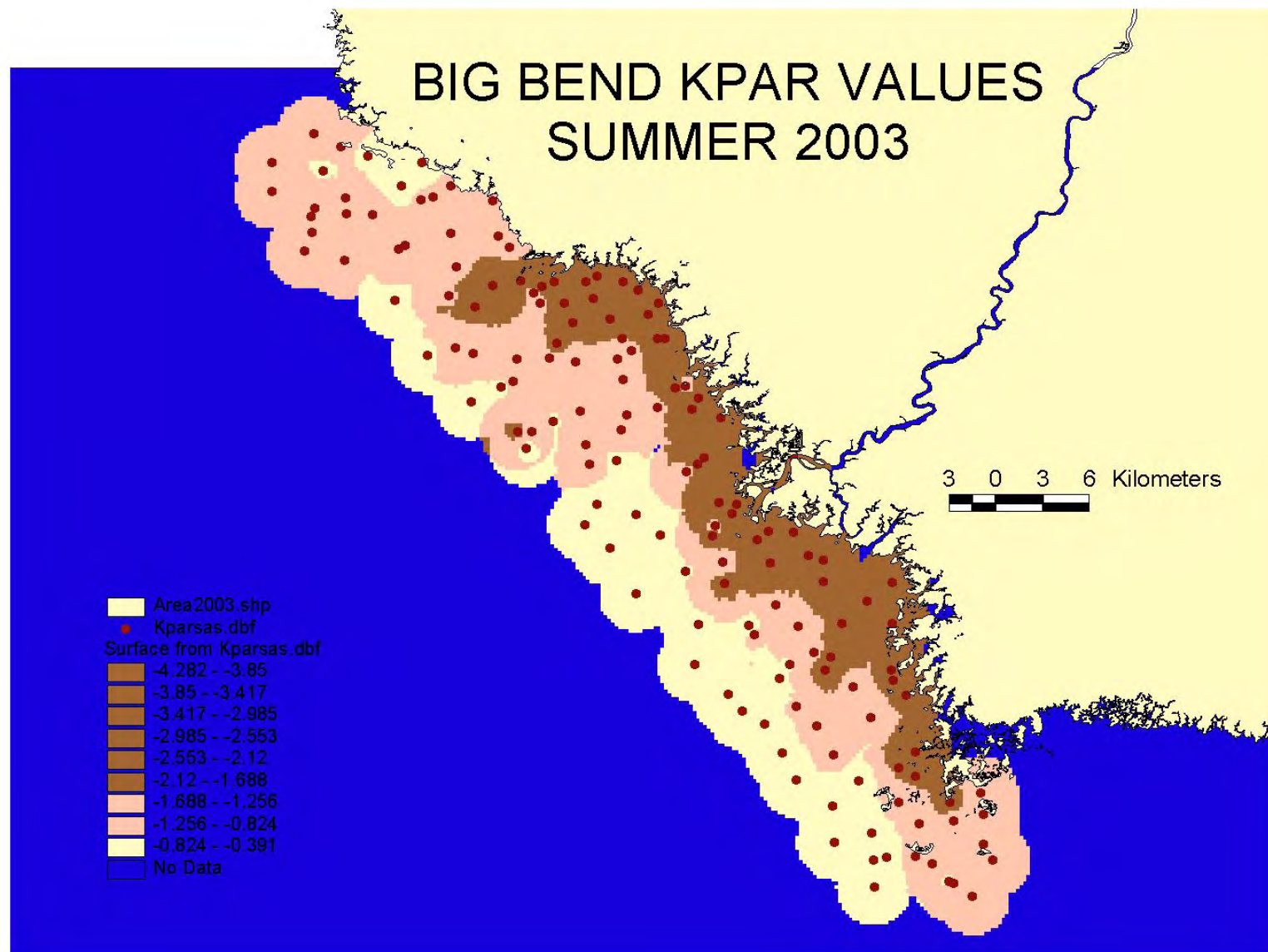
- Braun Blanquet cover
- Epiphyte load
- Epiphyte light attenuation
- Biomass
- Morphometrics

WATER QUALITY

- Salinity, Temperature
- Secchi depth
- Water depth (MLW)
- PAR vertical profiles
- Color, turbidity
- Chlorophyll

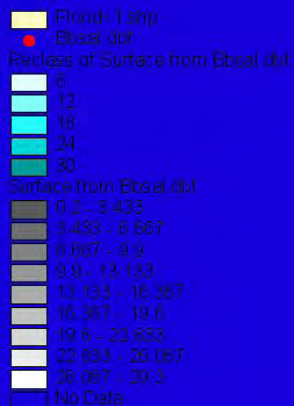


BIG BEND KPAR VALUES SUMMER 2003



BIG BEND SURFACE SALINITY SUMMER 2003

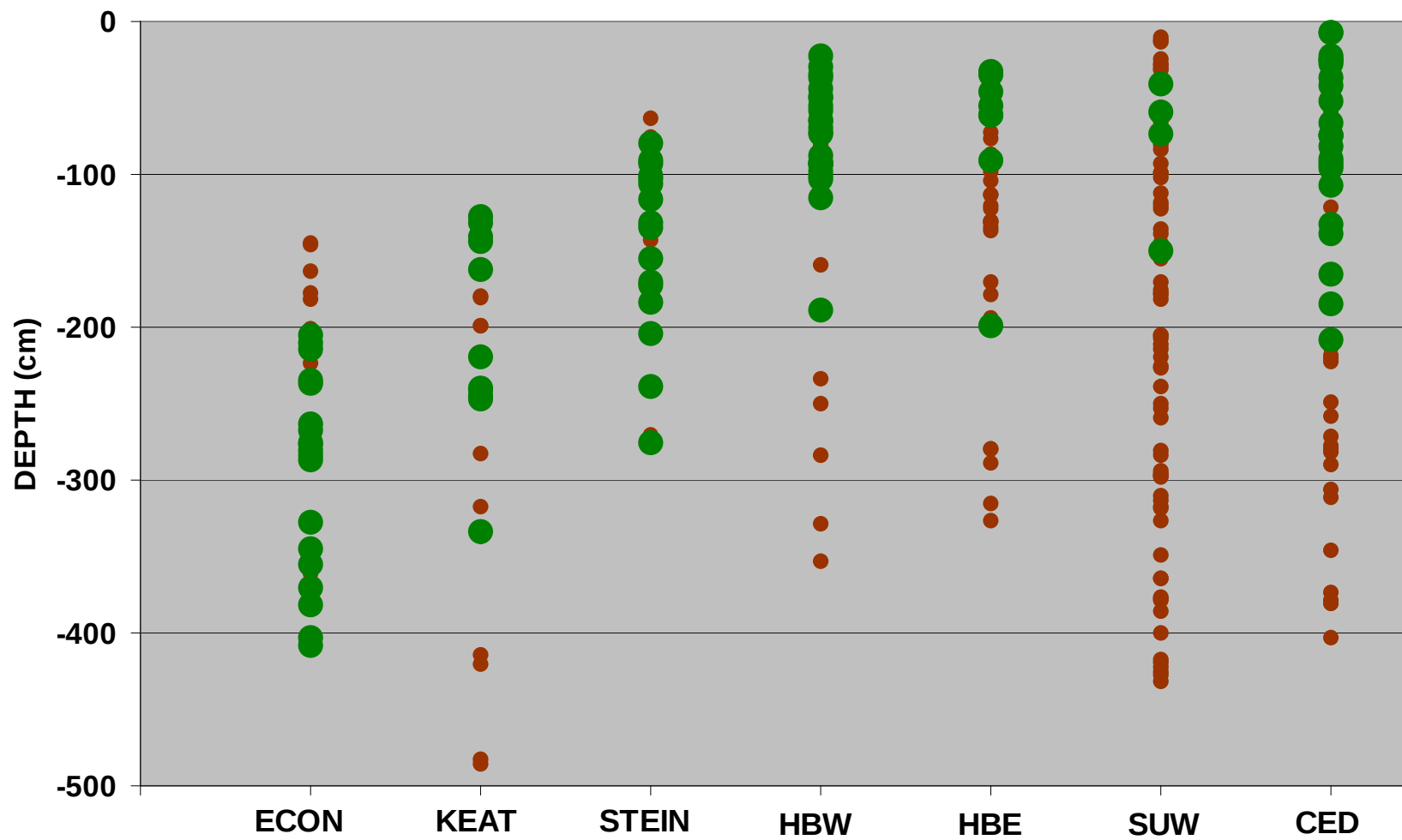
5 0 5 10 Kilometers

SEAGRASS DENSITY WHERE PRESENT

	Mean Braun Blanquet Scores		
Region	Thalassia	Halodule	Syringodium
Cedar Keys	2.7	2.5	3.0
Econfina	3.3	2.2	2.1
Keaton Beach	3.3	2.6	2.5
Steinhatchee	3.3	2.8	2.5
Suwannee	0.0	3.0	4.7

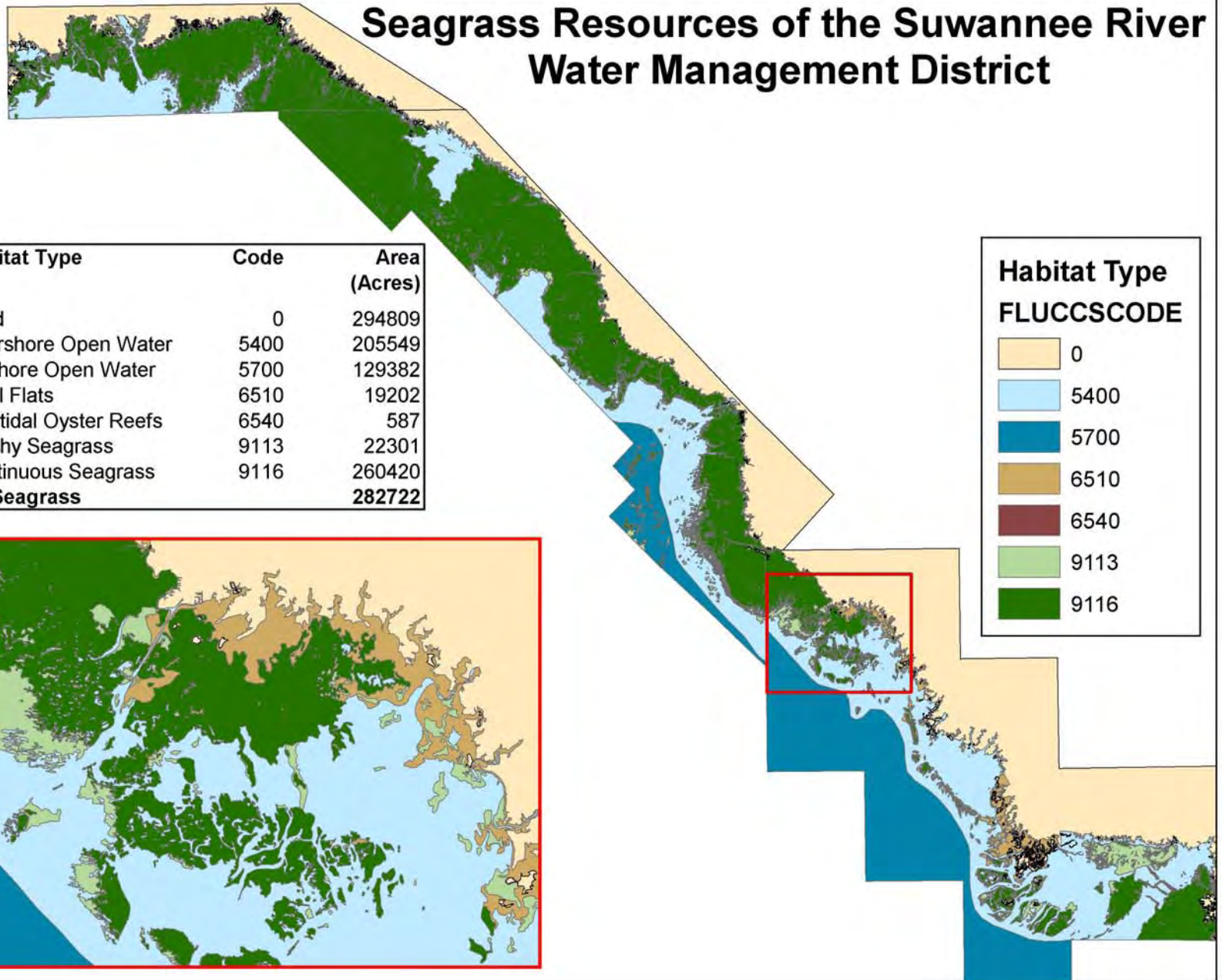
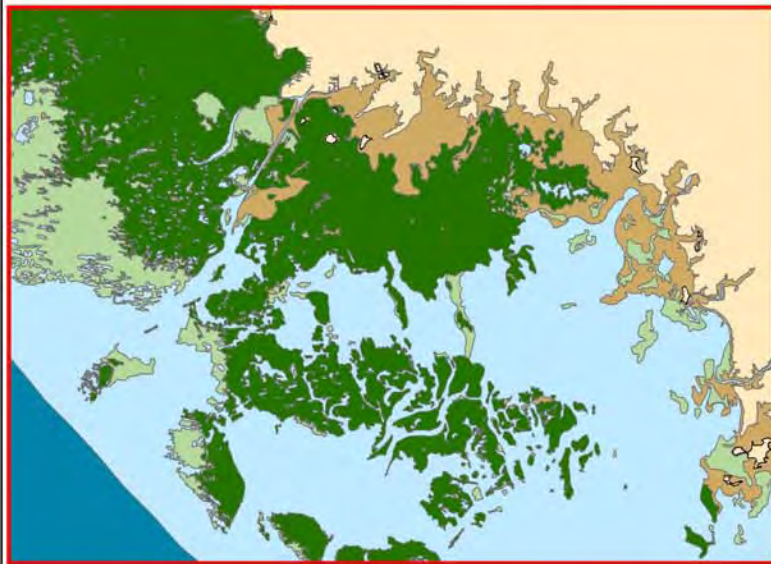
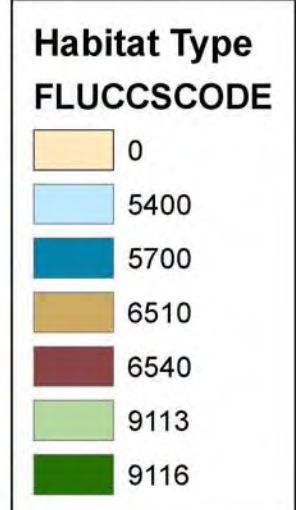
DEPTH DISTRIBUTION OF THALASSIA

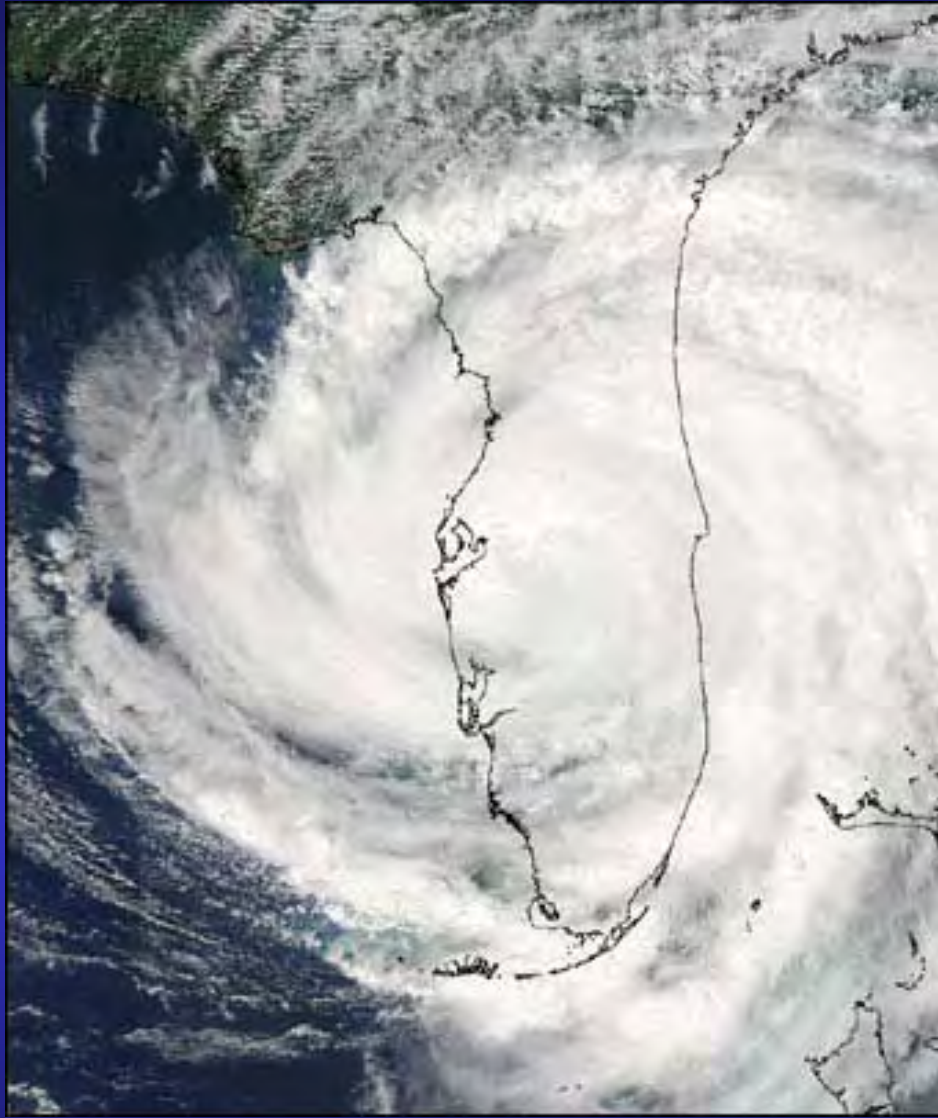


**BIG BEND SEAGRASS
AERIAL PHOTOGRAPHY
LAST FLOWN 2001,
MAPPED 2005,
RE-FLOWN 2006**

Seagrass Resources of the Suwannee River Water Management District

Habitat Type	Code	Area (Acres)
Land	0	294809
Nearshore Open Water	5400	205549
Offshore Open Water	5700	129382
Tidal Flats	6510	19202
Intertidal Oyster Reefs	6540	587
Patchy Seagrass	9113	22301
Continuous Seagrass	9116	260420
All Seagrass		282722







May 2004



November 2004

Comparison of Seagrass Abundance, 2004-2005. Data are means of Braun-Blanquet scores for four quadrats at each site

Region	2004		2005	
	Mean	Std	Mean	Std
Econfina	8.1	4.7	10.2	5.9
Horseshoe West	15.5	5.6	14.1	9.3
Horseshoe East	11.2	8.0	2.6	4.0
Suwannee	7.7	8.1	2.9	4.2

Comparison of Seagrass Species Composition, 2004-2005.
Data are frequency of occurrence by species and region

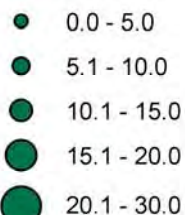
	Thalassia		Syringodium		Halodule	
Region	2004	2005	2004	2005	2004	2005
Econfina	58.1%	73.3%	51.6%	70.0%	61.3%	83.3%
Horseshoe West	73.5%	65.4%	58.8%	65.4%	14.7%	17.3%
Horseshoe East	35.3%	33.3%	47.1%	23.8%	23.5%	19.0%
Suwannee	9.1%	33.3%	18.2%	11.1%	36.4%	33.3%

Seagrass Density Changes (Braun-Blanquet Scores) Horseshoe Beach Region, June 2004- June 2005

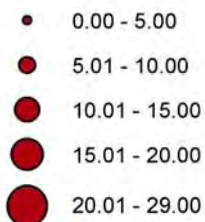
Seagrass Density

BBFLD04B Events

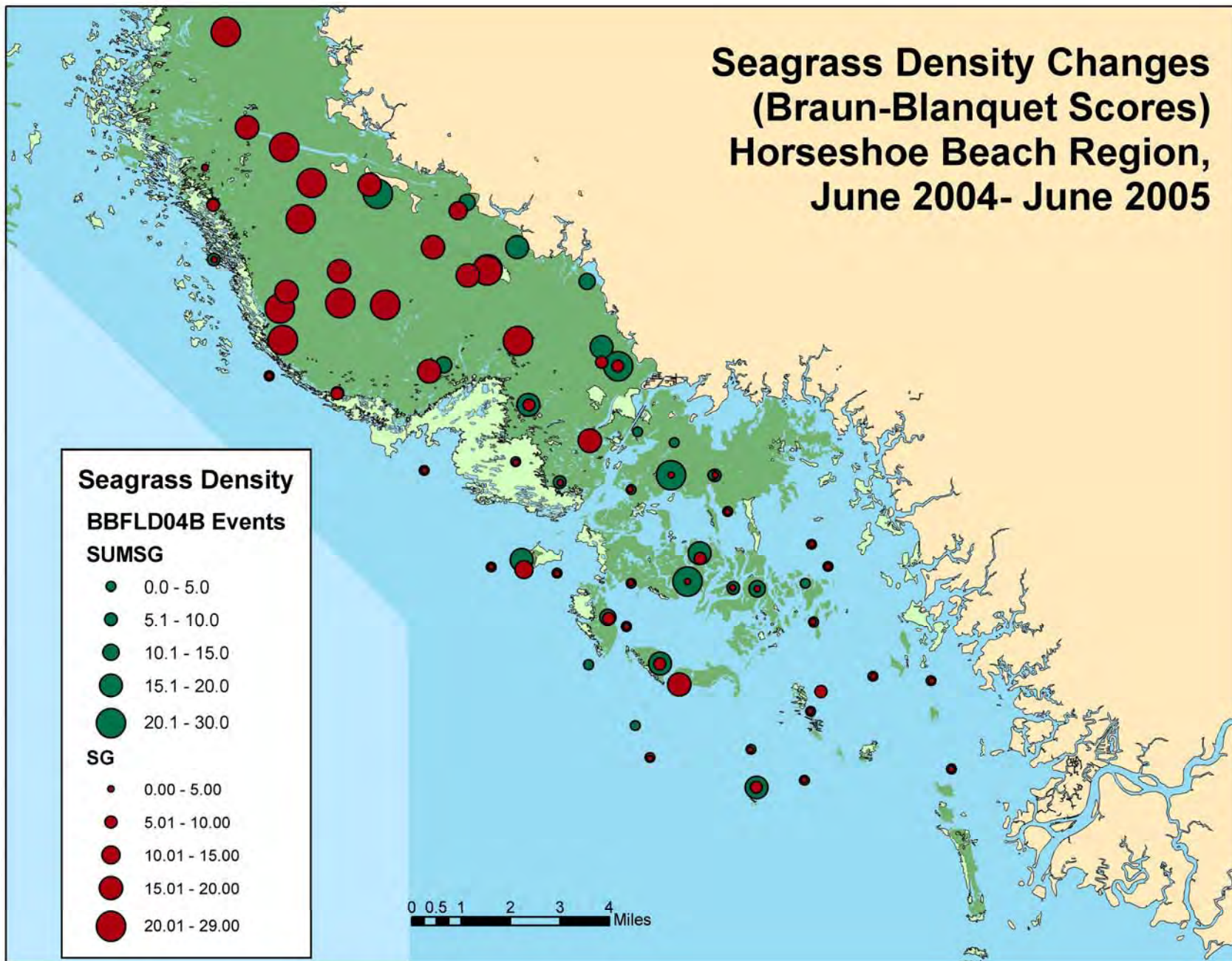
SUMSG



SG



0 0.5 1 2 3 4 Miles

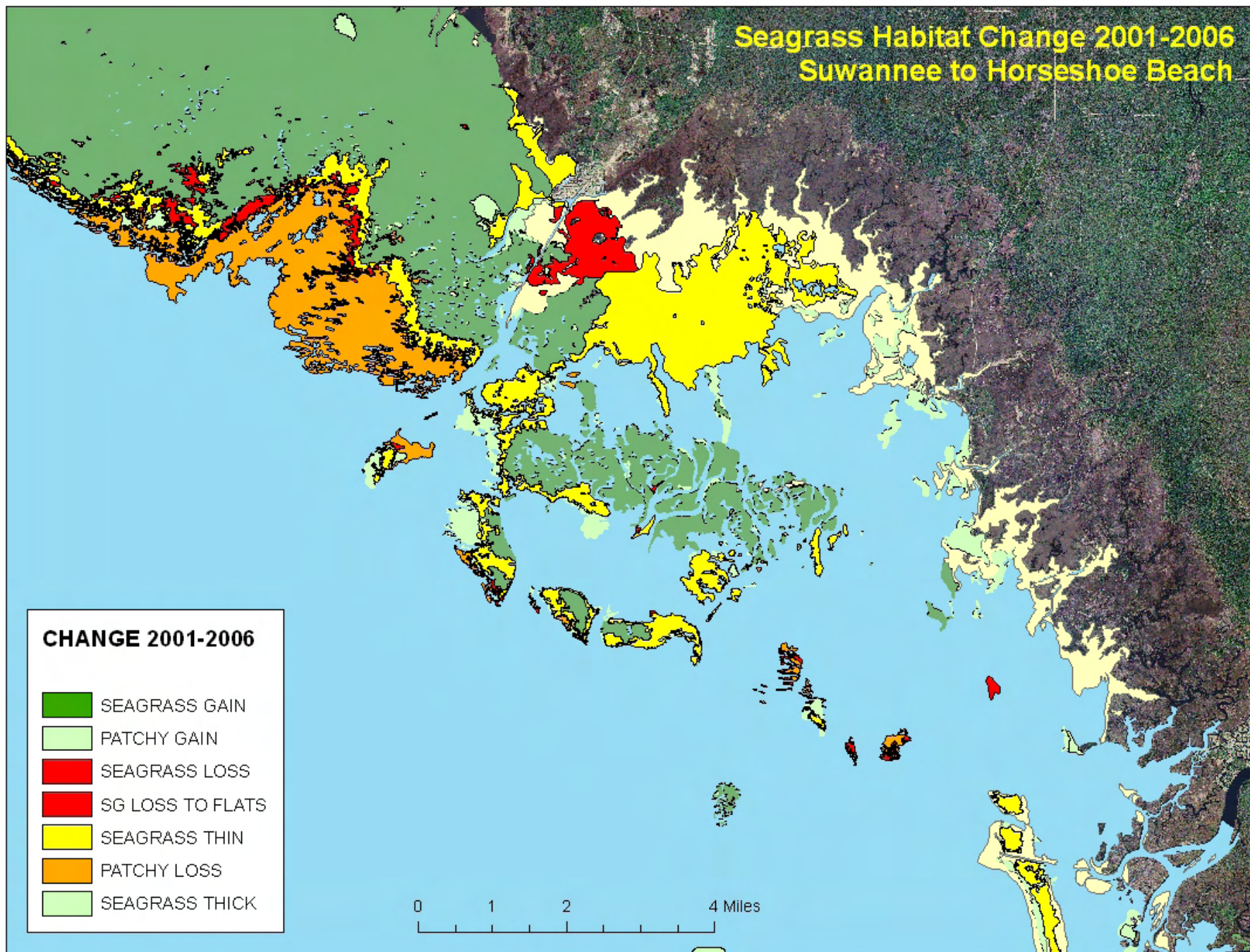


Seagrass Habitat Change 2001-2006 Suwannee to Horseshoe Beach

CHANGE 2001-2006

- SEAGRASS GAIN
- PATCHY GAIN
- SEAGRASS LOSS
- SG LOSS TO FLATS
- SEAGRASS THIN
- PATCHY LOSS
- SEAGRASS THICK

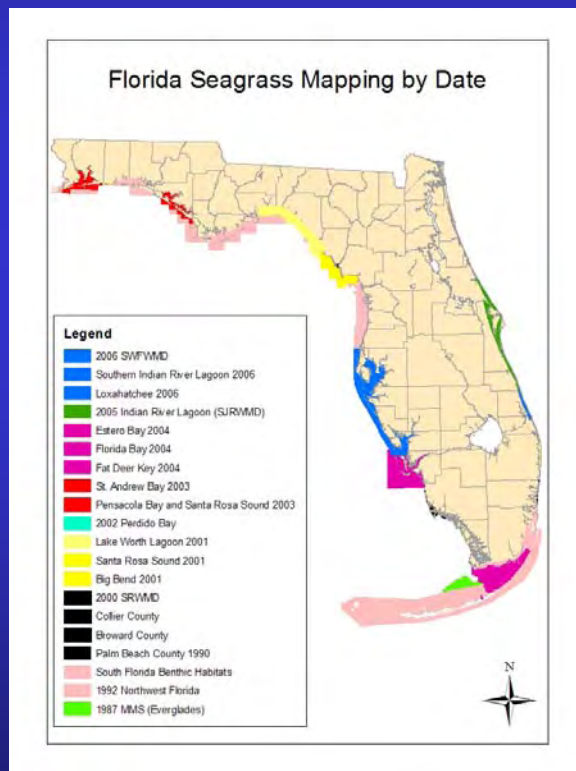
0 1 2 4 Miles



The SIMM Program- Seagrass Integrated Mapping and Monitoring

Program Elements

- Map all seagrass within the State on a six-year cycle.
- Monitor seagrass throughout Florida annually
- Annual monitoring report
- Hexennial mapping and monitoring report



The Vision: Distributed network of partners working in their “back yards”

