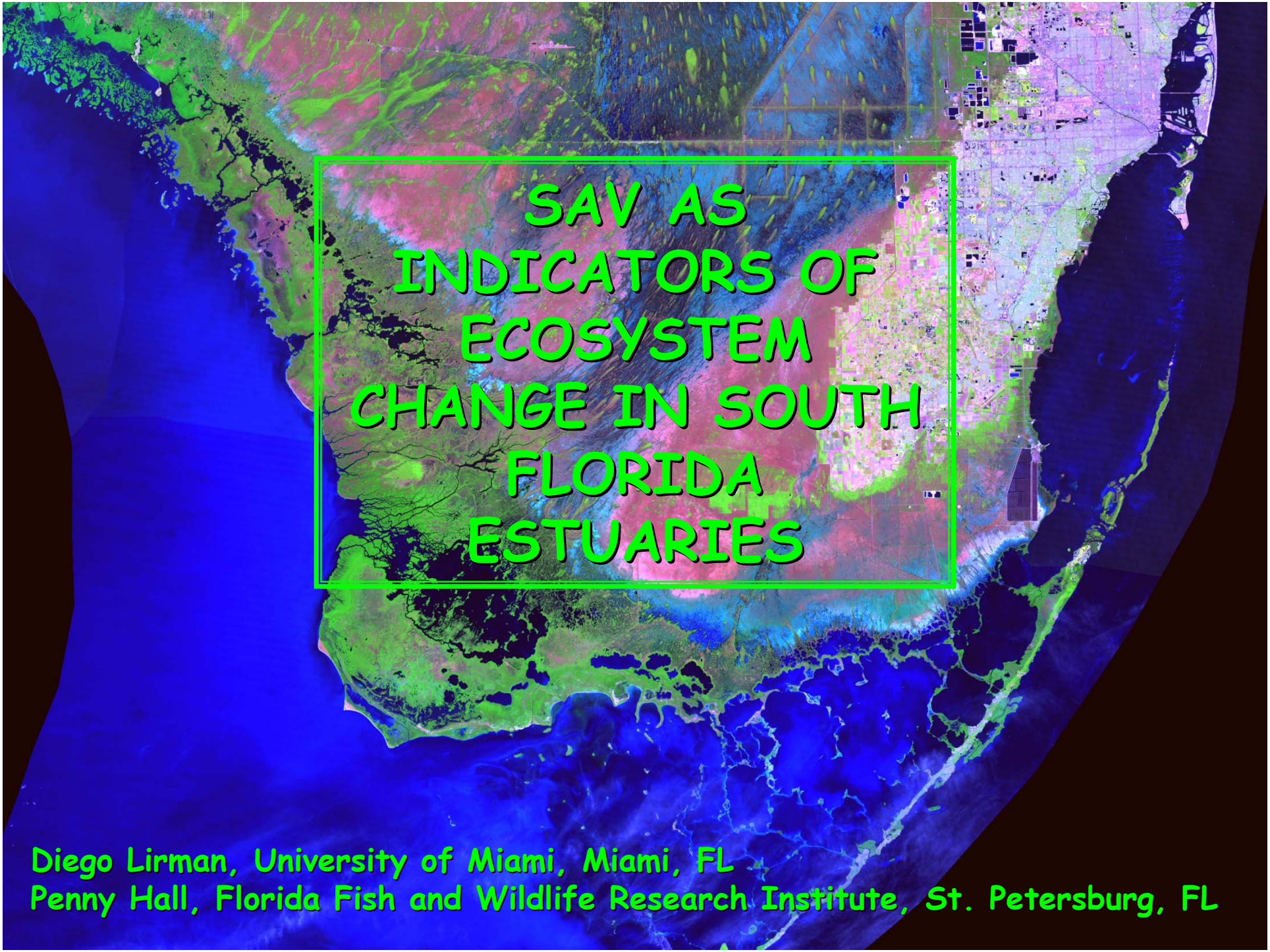
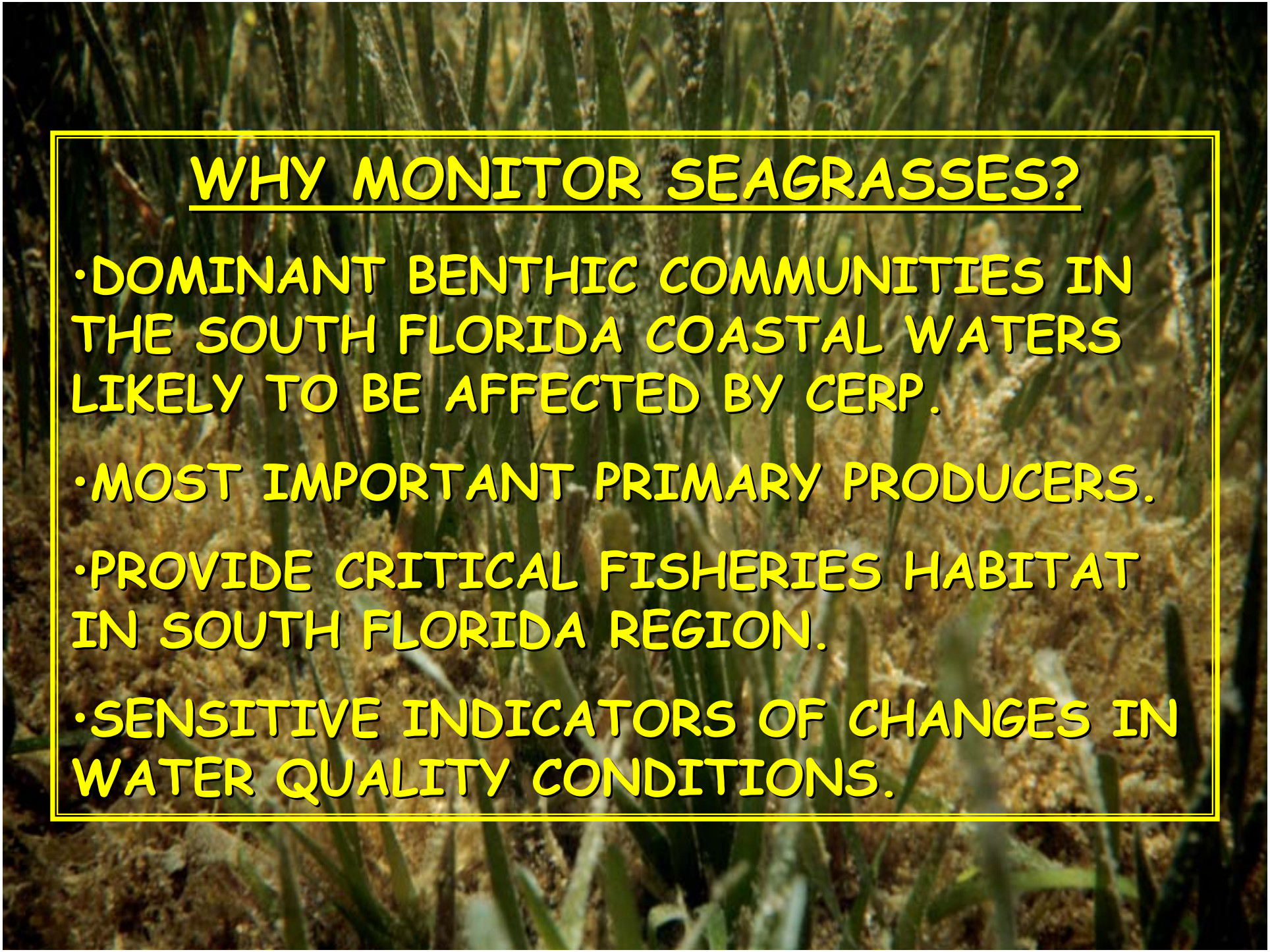
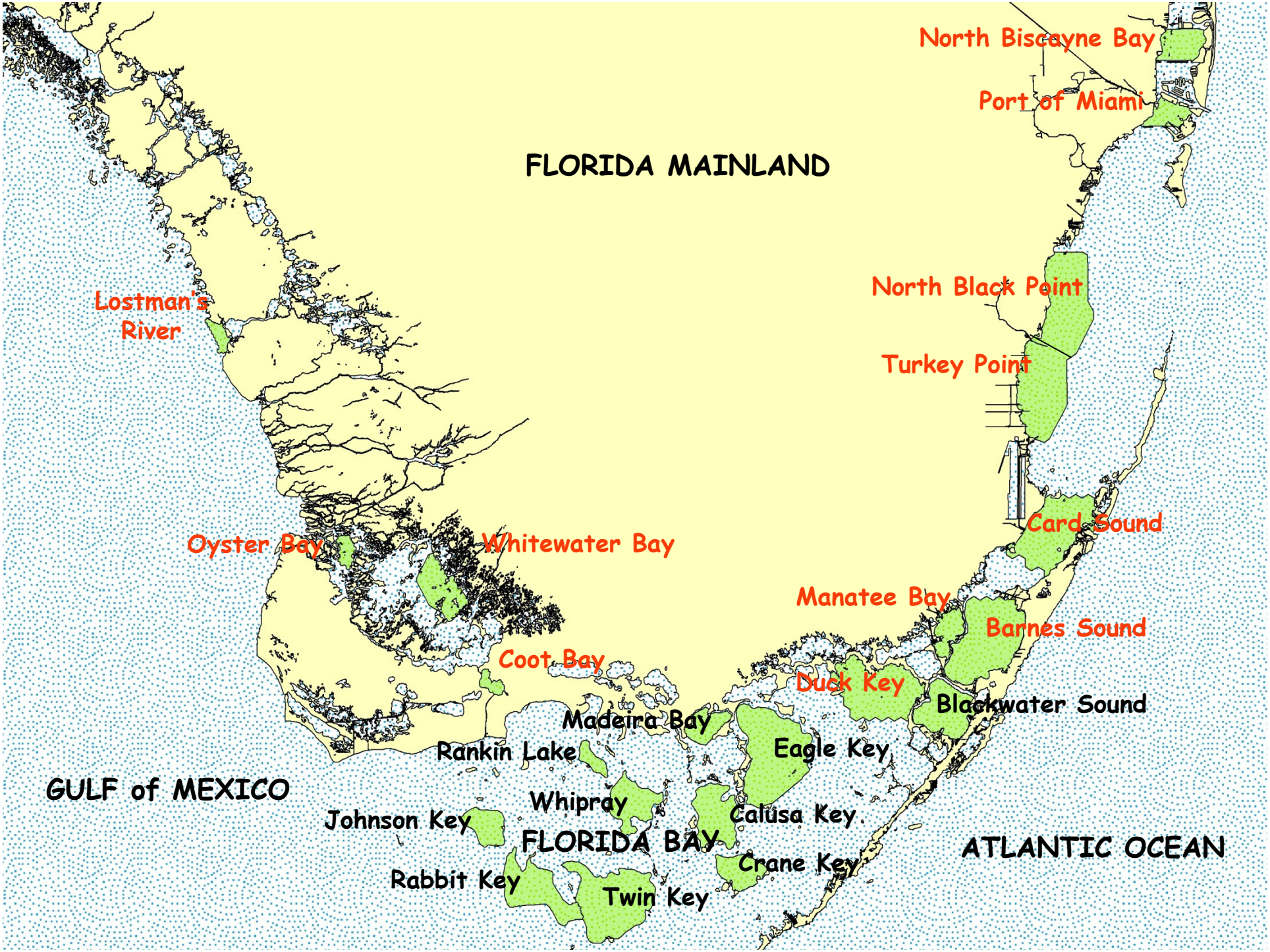


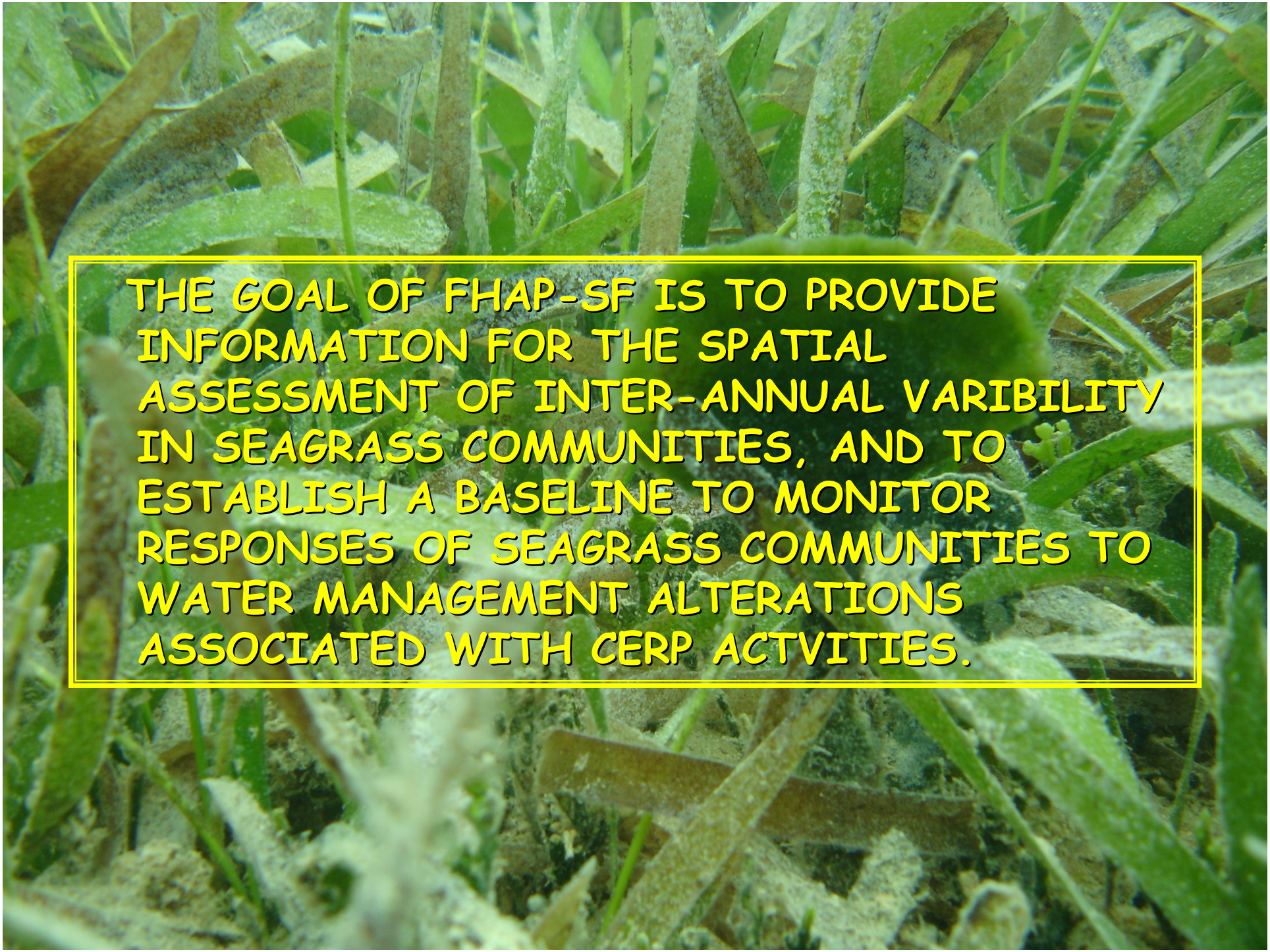
Diego Lirman, University of Miami, Miami, FL
Penny Hall, Florida Fish and Wildlife Research Institute, St. Petersburg, FL


WHY MONITOR SEAGRASSES?
·DOMINANT BENTHIC COMMUNITIES IN THE SOUTH FLORIDA COASTAL WATERS LIKELY TO BE AFFECTED BY CERP.
·MOST IMPORTANT PRIMARY PRODUCERS.
·PROVIDE CRITICAL FISHERIES HABITAT IN SOUTH FLORIDA REGION.
·SENSITIVE INDICATORS OF CHANGES IN WATER QUALITY CONDITIONS.

SOUTH FLORIDA FISHERIES HABITAT ASSESSMENT PROGRAM (FHAP-SF)

[1]Margaret O. Hall, [2]Michael J. Durako, [1]Manuel Merello, [1]Donna Berns, [1]Jennifer Kunzelman, and [1]Katie Toth
[1]Florida Fish and Wildlife Conservation Commission, Florida Fish and Wildlife Research Institute, St. Petersburg, FL
[2]Center for Marine Science, University of North Carolina at Wilmington, Wilmington, NC


North Biscayne Bay
Port of Miami
FLORIDA MAINLAND
North Black Point
Lostman's River
Turkey Point
Card Sound
Oyster Bay
Whitewater Bay
Manatee Bay
Barnes Sound
Coot Bay
Duck Key
Blackwater Sound
Madeira Bay
Rankin Lake
Eagle Key
GULF of MEXICO
Whipray
Johnson Key
Calusa Key
FLORIDA BAY
ATLANTIC OCEAN
Crane Key
Rabbit Key
Twin Key

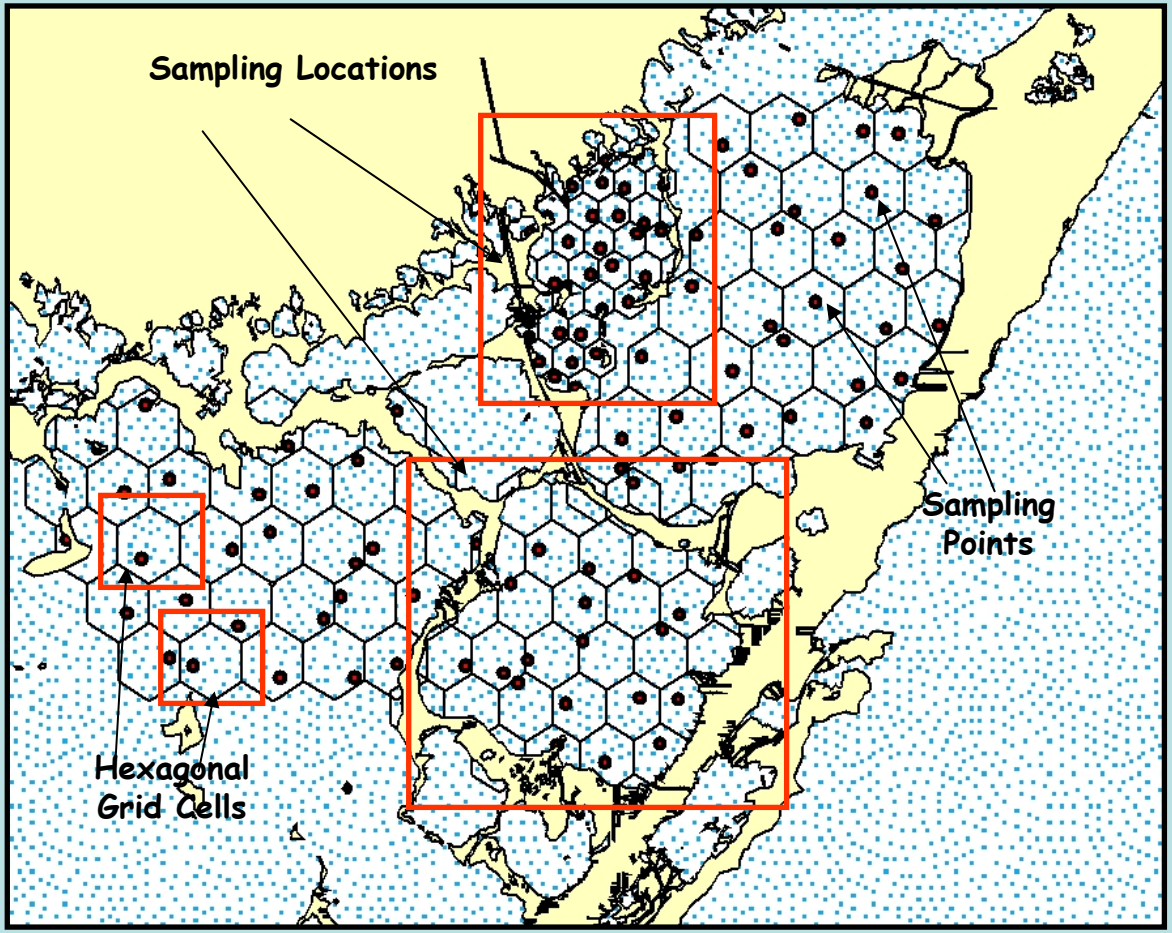

THE GOAL OF FHAP-SF IS TO PROVIDE INFORMATION FOR THE SPATIAL ASSESSMENT OF INTER-ANNUAL VARIBILITY IN SEAGRASS COMMUNITIES, AND TO ESTABLISH A BASELINE TO MONITOR RESPONSES OF SEAGRASS COMMUNITIES TO WATER MANAGEMENT ALTERATIONS ASSOCIATED WITH CERP ACTVITIES.

SAMPLING DESIGN:

• MONITORING STATIONS ARE DETERMINED USING A SYSTEMATIC RANDOM-SAMPLING DESIGN.

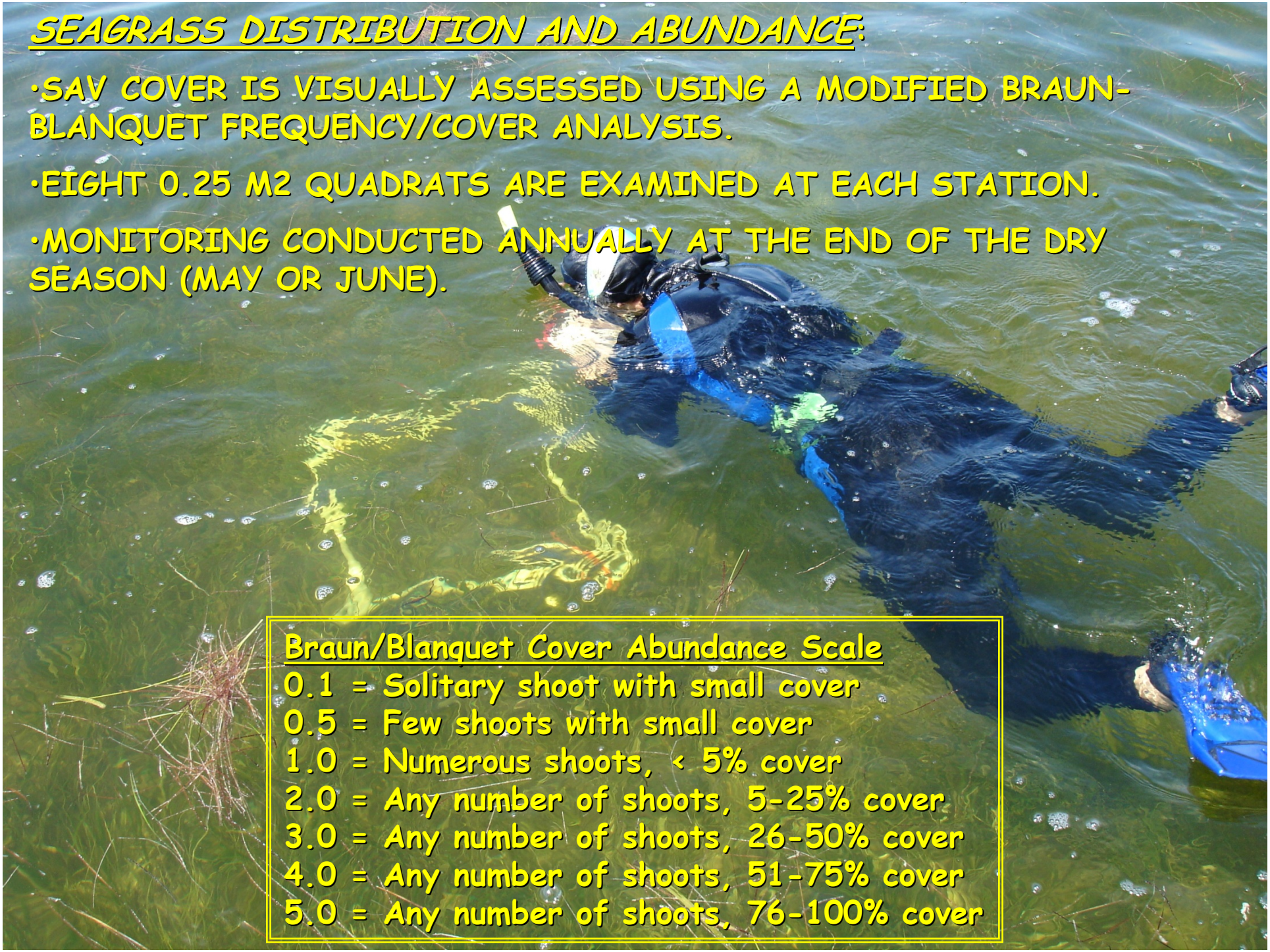
•EACH LOCATION IS DIVIDED INTO 30 TESSELATED HEXAGONAL GRID CELLS.

•SINGLE SAMPLING STATION RANDOMLY SELECTED FROM EACH GRID CELL.



SEAGRASS DISTRIBUTION AND ABUNDANCE:

- SAV COVER IS VISUALLY ASSESSED USING A MODIFIED BRAUN-BLANQUET FREQUENCY/COVER ANALYSIS.
- EIGHT 0.25 M2 QUADRATS ARE EXAMINED AT EACH STATION.
- MONITORING CONDUCTED ANNUALLY AT THE END OF THE DRY SEASON (MAY OR JUNE).



Braun/Blanquet Cover Abundance Scale

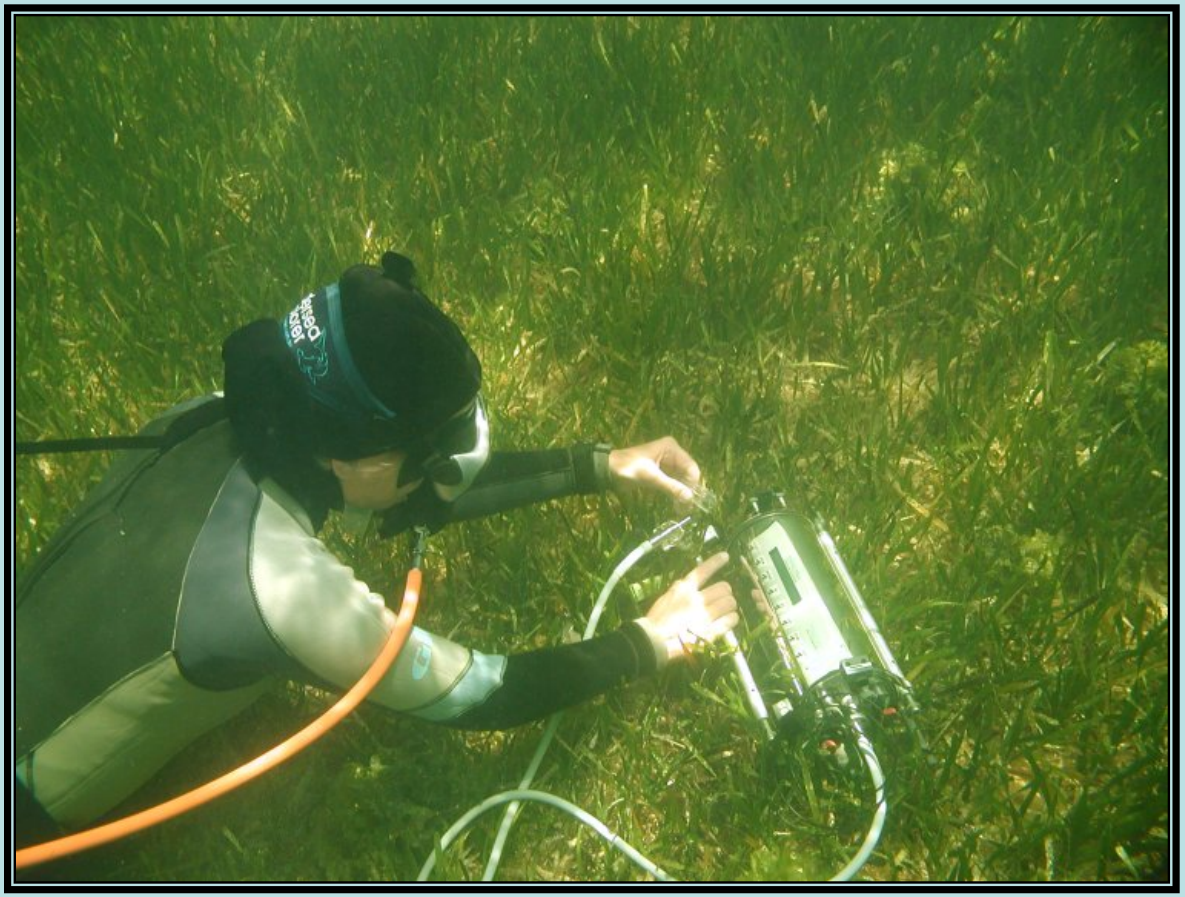
0.1 = Solitary shoot with small cover
0.5 = Few shoots with small cover
1.0 = Numerous shoots, < 5% cover
2.0 = Any number of shoots, 5-25% cover
3.0 = Any number of shoots, 26-50% cover
4.0 = Any number of shoots, 51-75% cover
5.0 = Any number of shoots, 76-100% cover

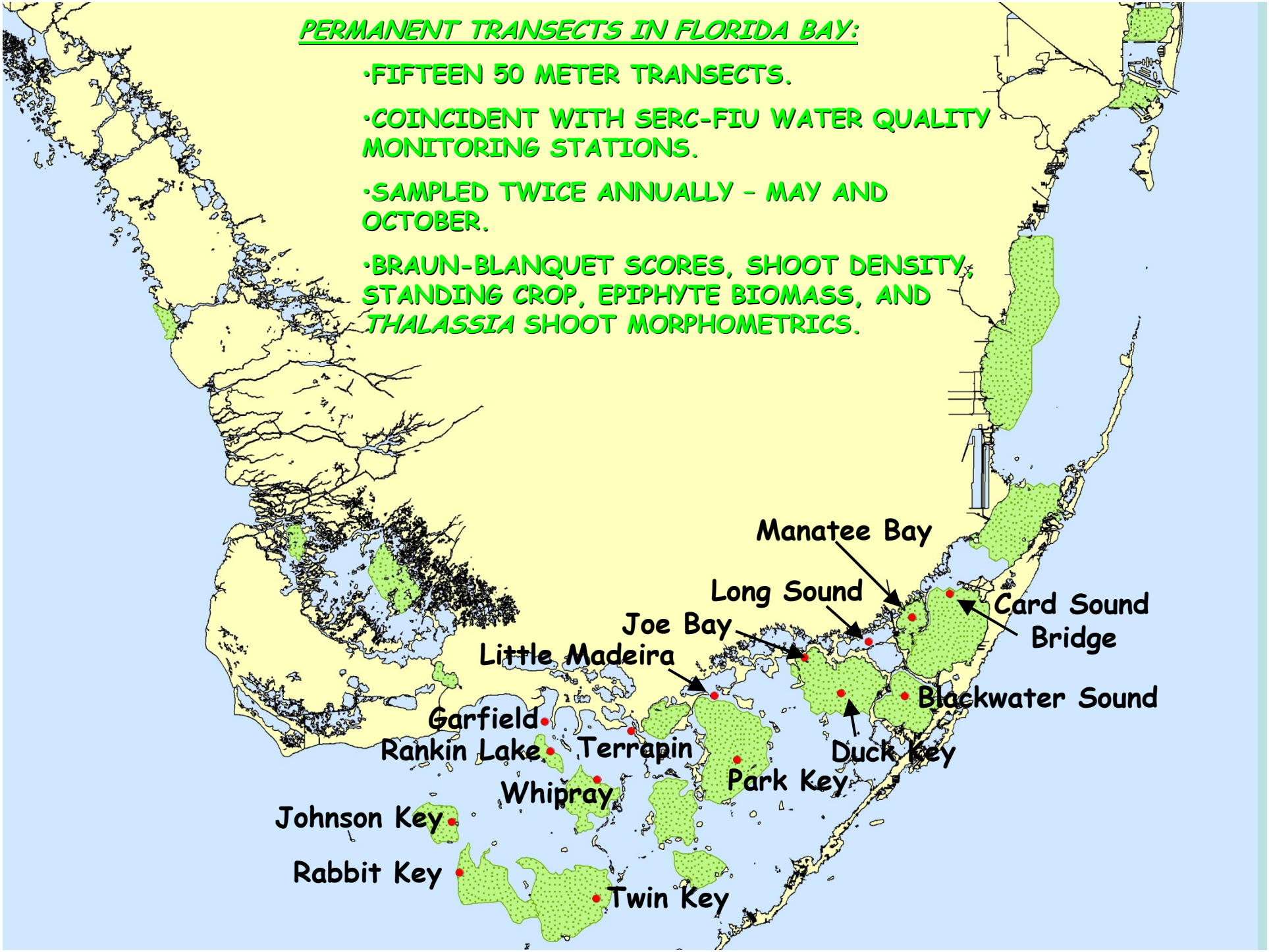
EPIPHYTE ABUNDANCE AND SHOOT MORPHOMETRICS:

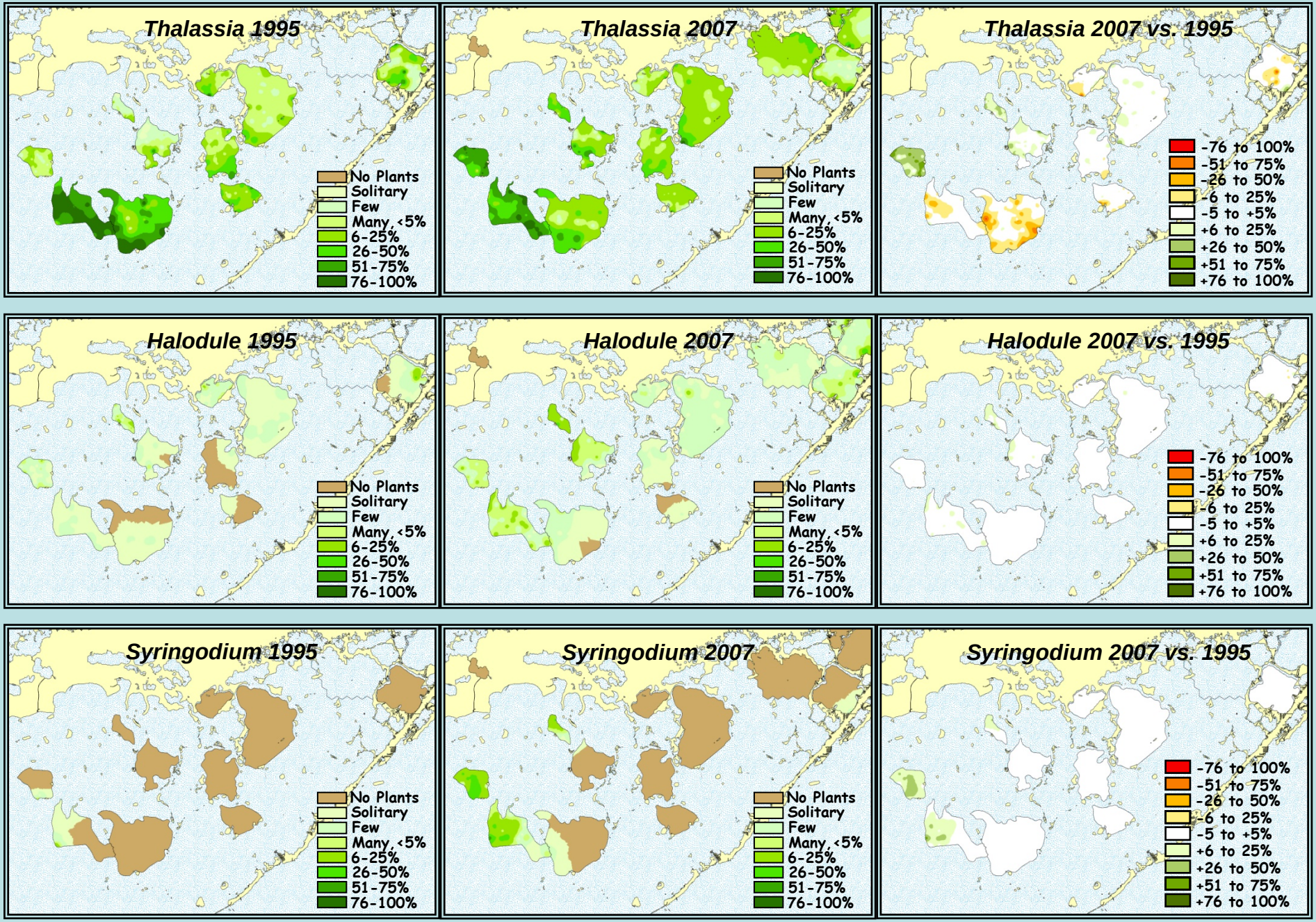
- TEN *THALASSIA* SHOOTS ARE COLLECTED AT EACH SITE TO DETERMINE EPIPHYTE ABUNDANCE AND SHOOT MORPHOMETRICS.

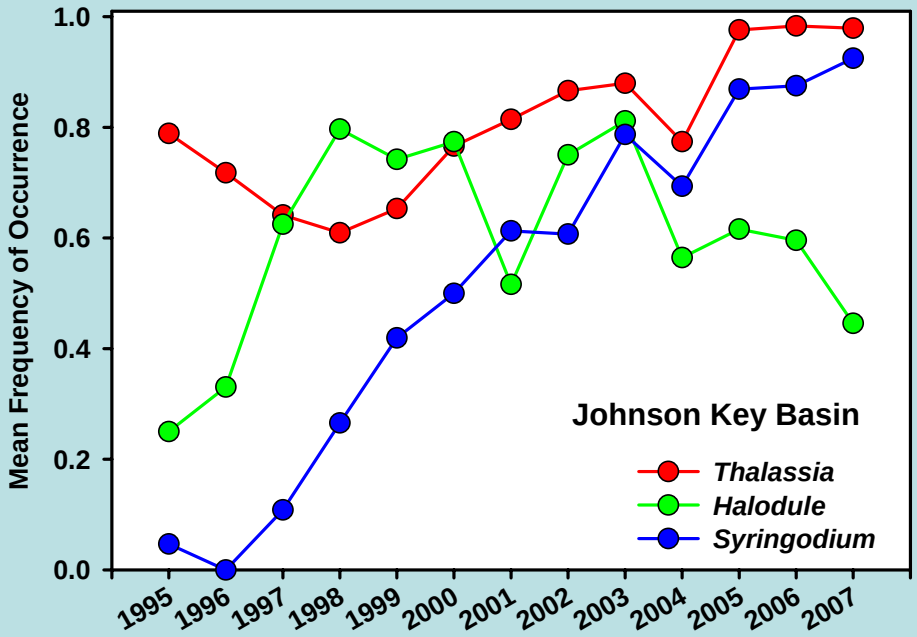
THALASSIA PHOTOSYNTHETIC CHARACTERISTICS:

- PHOTOSYNTHETIC EFFICIENCY IS MEASURED AT EACH STATION USING A PULSE-AMPLITUDE MODULATED (PAM) FLUORESCENCE METER.
- CHANGES IN PHOTOSYNTHETIC CHARACTERISTICS MAY BE EVIDENT BEFORE CHANGES IN SEAGRASS ABUNDANCE AND BIOMASS BECOME APPARENT.




PERMANENT TRANSECTS IN FLORIDA BAY:
•FIFTEEN 50 METER TRANSECTS.
•COINCIDENT WITH SERC-FIU WATER QUALITY MONITORING STATIONS.
•SAMPLED TWICE ANNUALLY – MAY AND OCTOBER.
•BRAUN-BLANQUET SCORES, SHOOT DENSITY, STANDING CROP, EPIPHYTE BIOMASS, AND THALASSIA SHOOT MORPHOMETRICS.
Manatee Bay
Long Sound
Joe Bay
Little Madeira
Card Sound Bridge
Blackwater Sound
Duck Key
Garfield
Rankin Lake
Terrapin
Park Key
Whipray
Johnson Key
Rabbit Key
Twin Key


Thalassia 1995
No Plants
Solitary
Few
Many, <5%
6-25%
26-50%
51-75%
76-100%
Thalassia 2007
No Plants
Solitary
Few
Many, <5%
6-25%
26-50%
51-75%
76-100%
Thalassia 2007 vs. 1995
-76 to 100%
-51 to 75%
-26 to 50%
-6 to 25%
-5 to +5%
+6 to 25%
+26 to 50%
+51 to 75%
+76 to 100%
Halodule 1995
No Plants
Solitary
Few
Many, <5%
6-25%
26-50%
51-75%
76-100%
Halodule 2007
No Plants
Solitary
Few
Many, <5%
6-25%
26-50%
51-75%
76-100%
Halodule 2007 vs. 1995
-76 to 100%
-51 to 75%
-26 to 50%
-6 to 25%
-5 to +5%
+6 to 25%
+26 to 50%
+51 to 75%
+76 to 100%
Syringodium 1995
No Plants
Solitary
Few
Many, <5%
6-25%
26-50%
51-75%
76-100%
Syringodium 2007
No Plants
Solitary
Few
Many, <5%
6-25%
26-50%
51-75%
76-100%
Syringodium 2007 vs. 1995
-76 to 100%
-51 to 75%
-26 to 50%
-6 to 25%
-5 to +5%
+6 to 25%
+26 to 50%
+51 to 75%
+76 to 100%

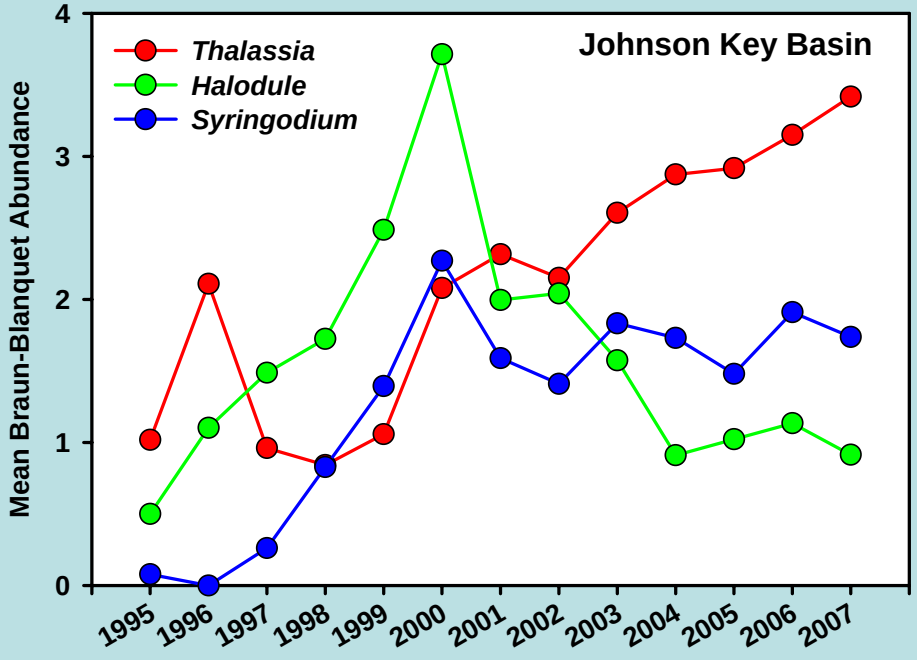


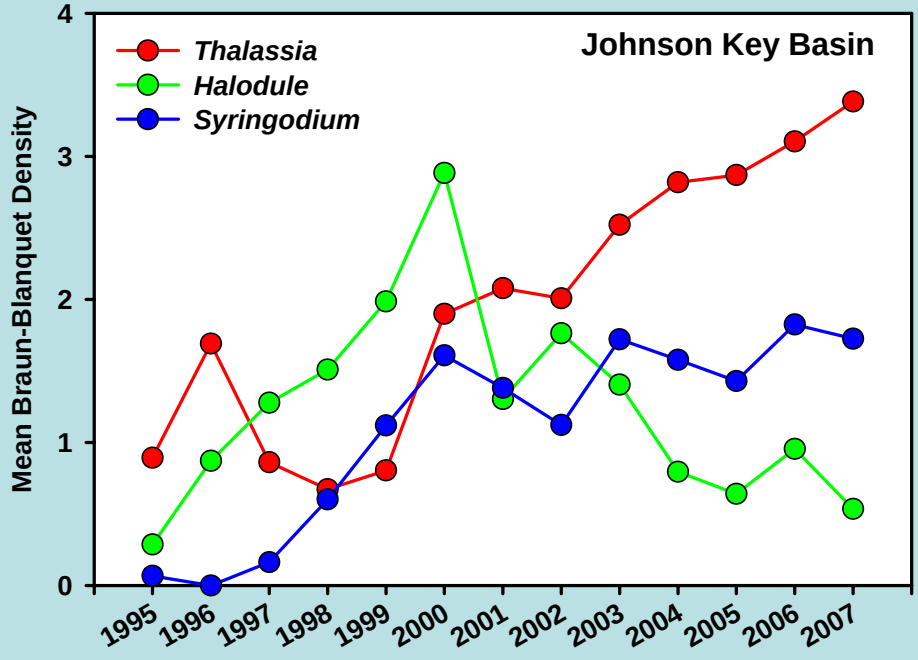
Braun-Blanquet Metrics

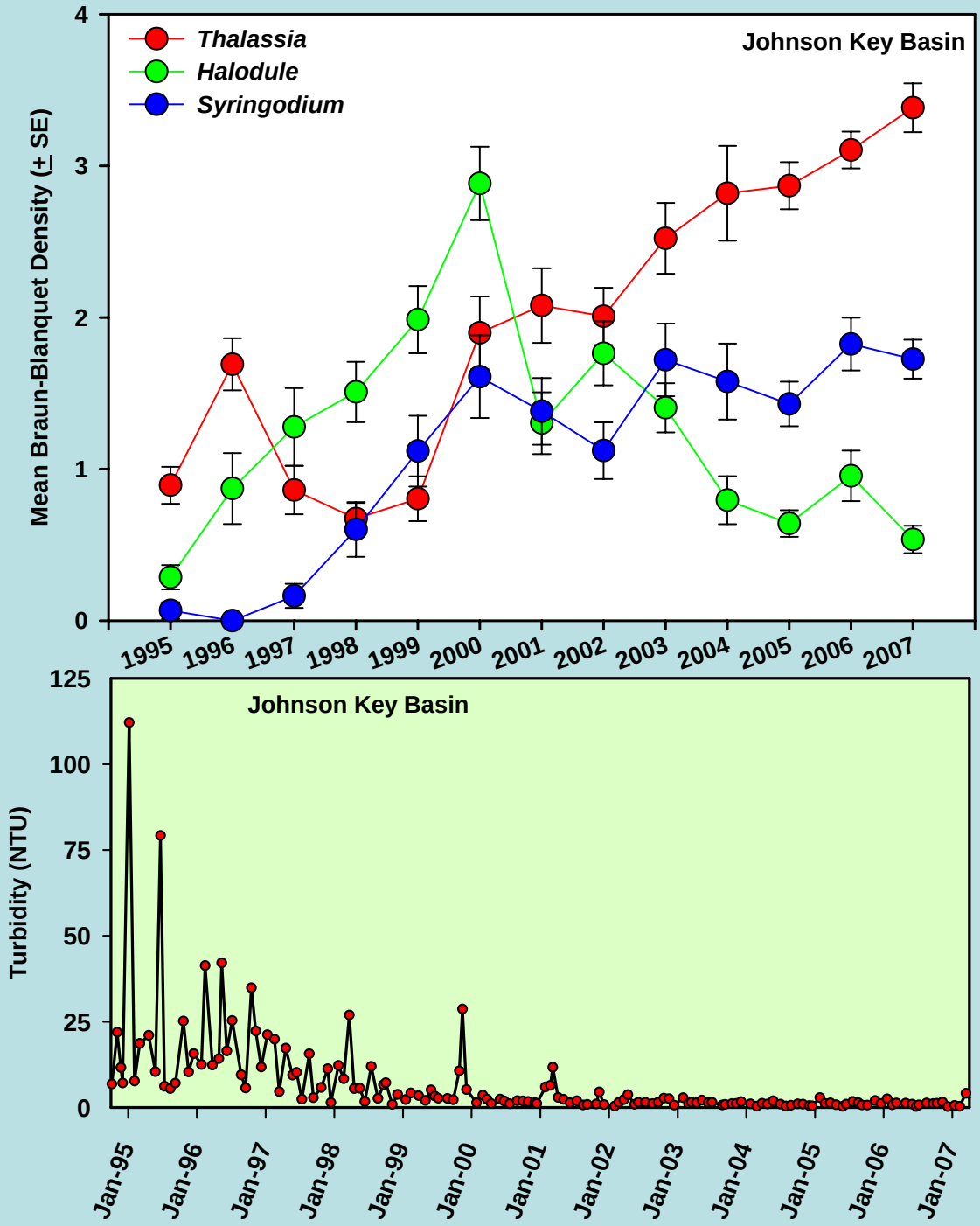
Frequency – # of occupied quads/total # of quads.

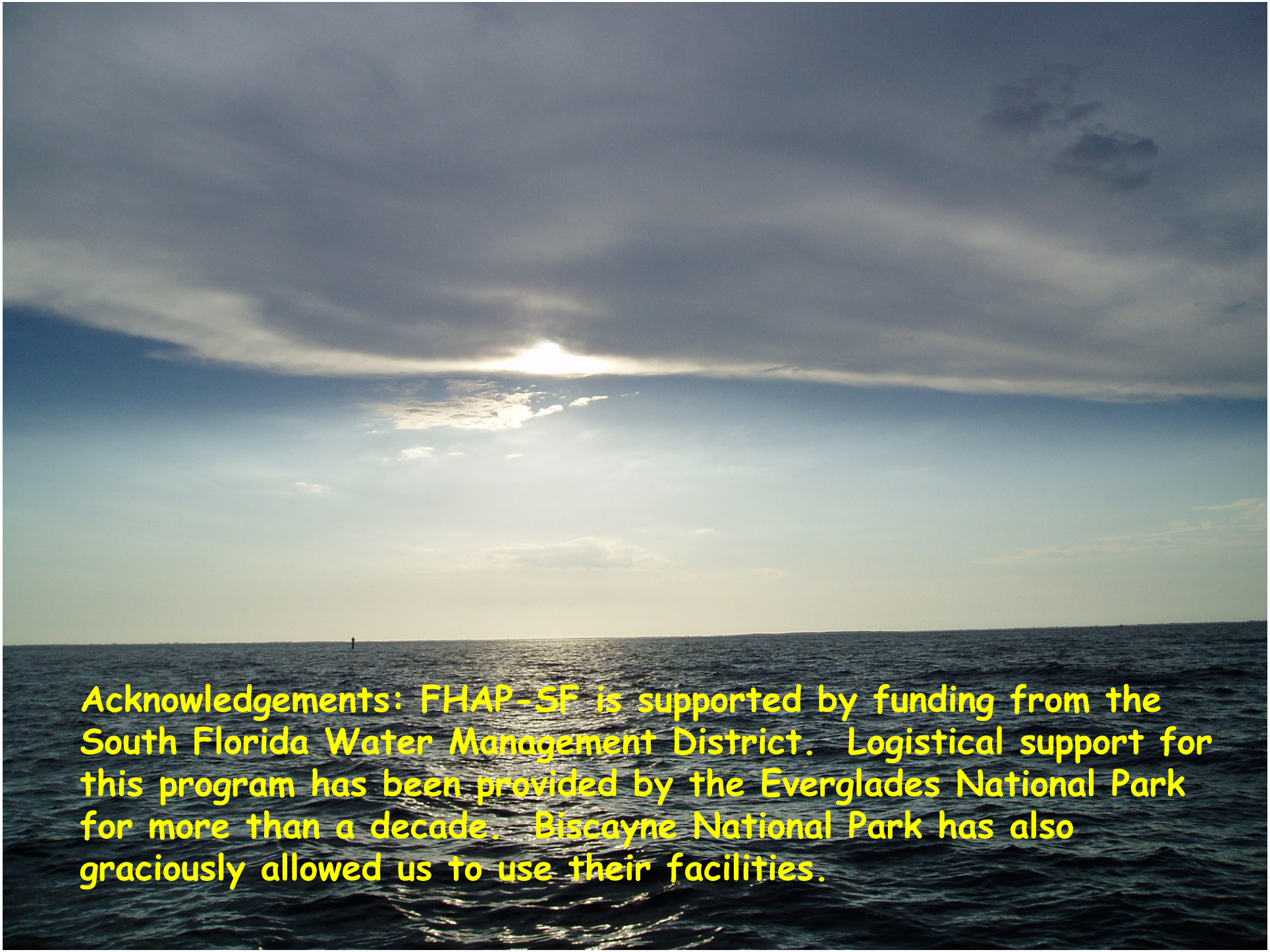
Abundance – Sum of BBCA values/# of occupied quads.

Density – Sum of BBCA values/total # of quads.






Thalassia
Halodule
Syringodium
Johnson Key Basin
Mean Braun-Blanquet Density (± SE)
0
1
2
3
4
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Johnson Key Basin
Turbidity (NTU)
0
25
50
75
100
125
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07



Acknowledgements: FHAP-SF is supported by funding from the South Florida Water Management District. Logistical support for this program has been provided by the Everglades National Park for more than a decade. Biscayne National Park has also graciously allowed us to use their facilities.

Nearshore Benthic Habitats Program

Diego Lirman, Greg Deangelo, Joe Serafy, Travis Thyberg, Sarah Bellmund, Ligia Collado, Joan Browder

Rosenstiel School of Marine & Atmospheric Science
University of Miami

NOAA / National Geodetic Survey

NOAA / National Marine Fisheries Service

Biscayne National Park

Florida International University

Why monitor nearshore benthic habitats??

- These habitats have been under-represented in monitoring efforts due to limited boat access (< 1m in depth)
- Critical nursery habitats
- Their location makes them susceptible to changes in freshwater deliveries
- These habitats are explicit CERP Restoration Targets

CERP Restoration Goals for Southern Biscayne Bay:

1) provide mesohaline salinity patterns in nearshore waters;
2) increase cover of seagrass, primarily *Halodule,* in nearshore areas devoid of seagrass;
3) increase the abundance and diversity of fish and macroinvertebrates associated with SAV.

Nearshore Benthic Habitats Program: Components

1. GeoSpatial SAV surveys (Shallow Water Positioning System, SWaPS)

   Large-scale (Matheson Hammock – Manatee Bay)

   Seasonal Surveys (Dry Season, Wet Season)

   Stratified Random Site Selection (5 buffers, 4 zones)

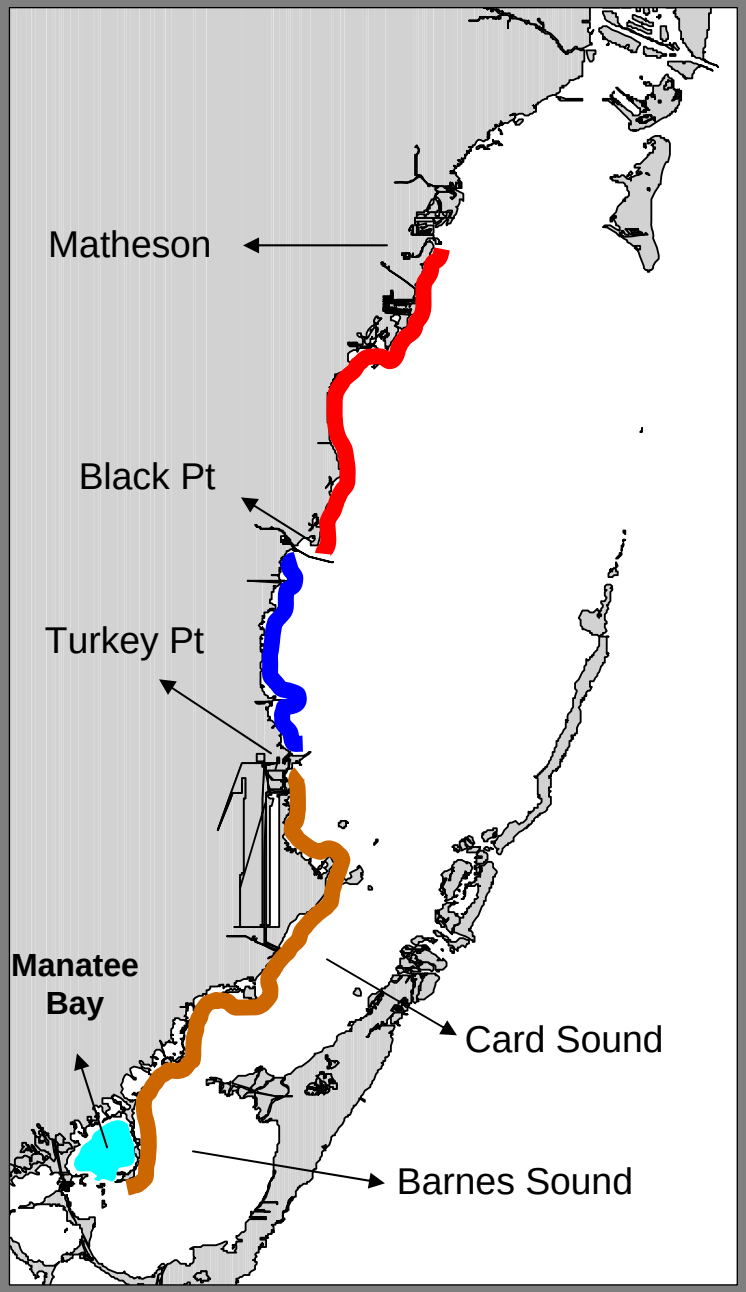
Products:

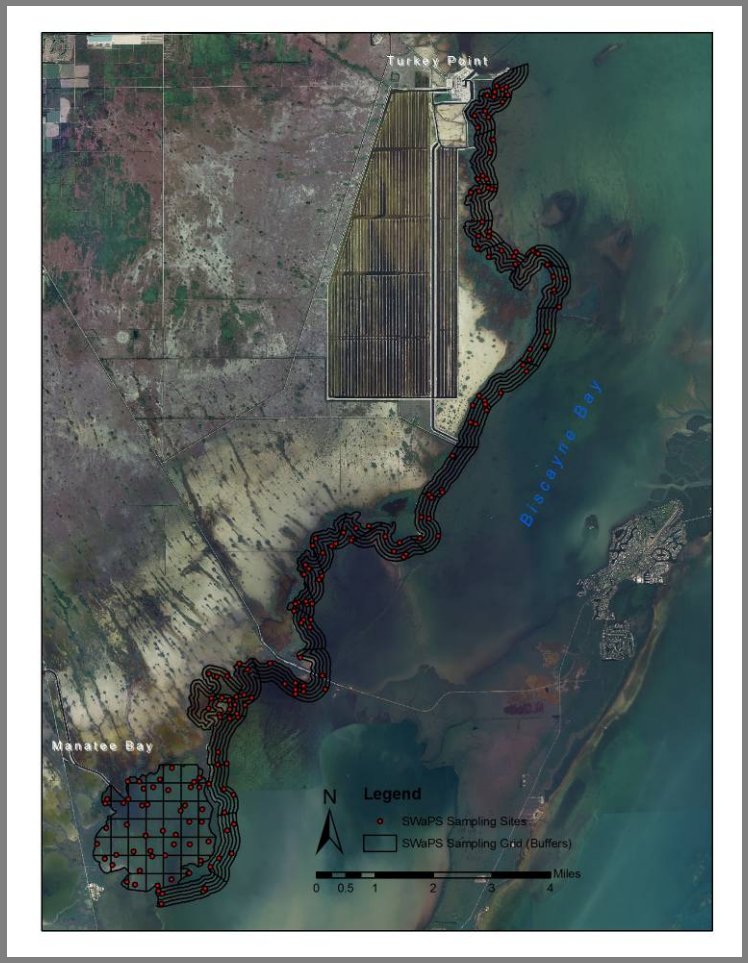
- Spatially and seasonally resolved patterns of SAV abundance, distribution, and diversity
- Geo-tagged High-resolution digital images of the benthos
- WQ parameters at each survey site (WQ-SAV correlations)

SWaPS website: http://www.rsmas.miami.edu/groups/SWaPS/

Survey Area / Design

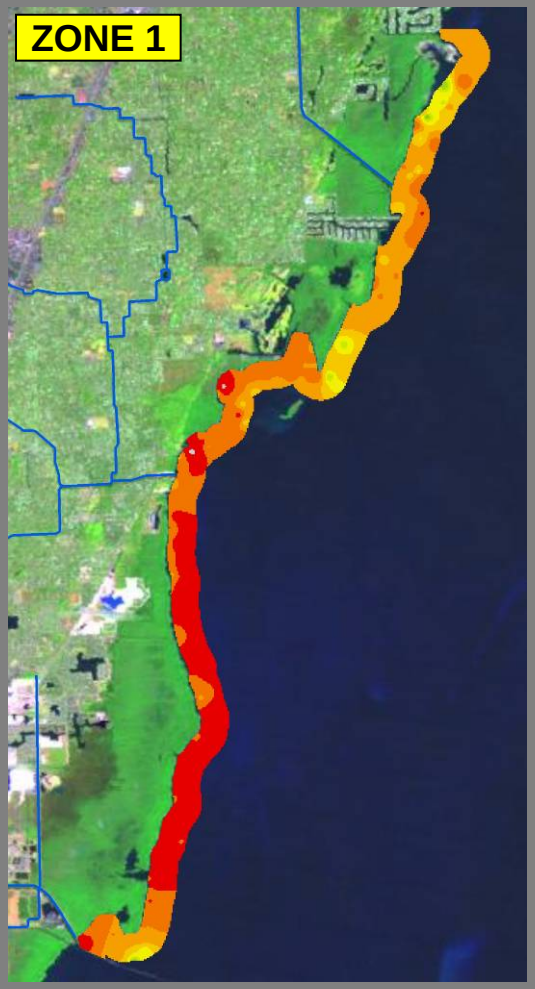
- 4 survey regions (salinity, hydrodynamics)
- 5 cross-shelf buffers (100 m)

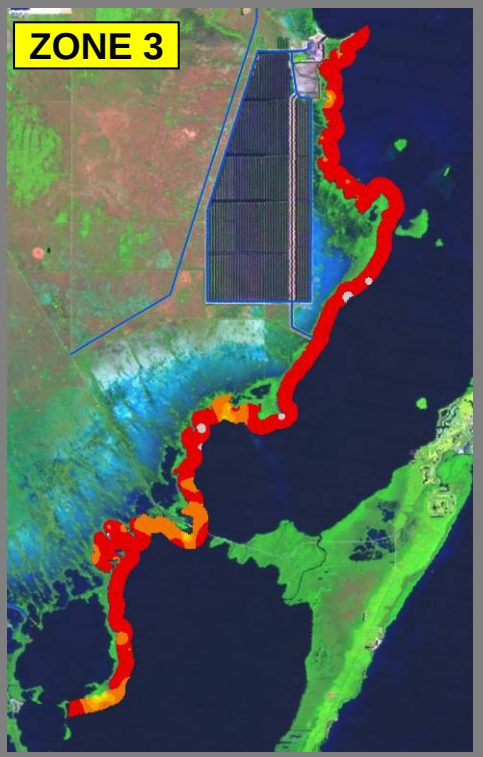


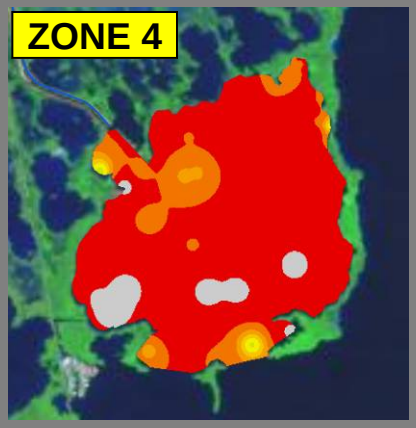


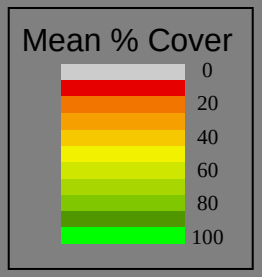
Survey Methodology : SWaPS

SAV Survey Products





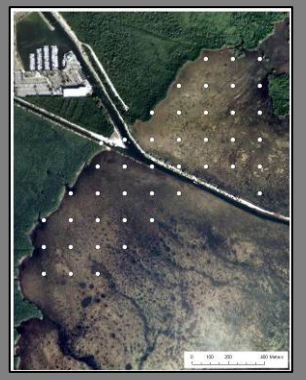




All Seagrasses, 2008 Dry Season, N = 421 sites

Nearshore Benthic Habitats Program: Components

2. Canal-SAV surveys (Springs to be added)



Small-scale (50-m cell grid around 5 canals)
Wet Season

3. SAV surveys at 32 Permanent BNP WQ stations

Characterization of SAV (cover, biomass, nutrients)
Model input (Madden SG model, SFWMD)

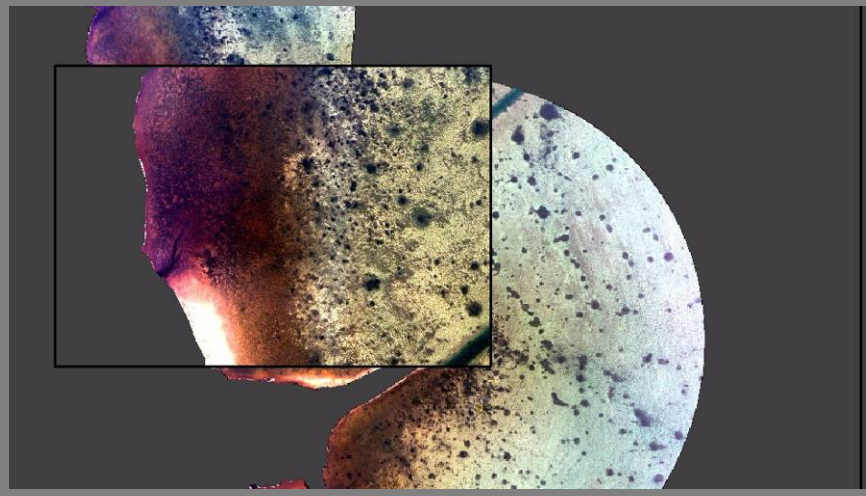
4. Focused Black Point Research (N and S of jetty)

Characterize continuous nearshore salinity and temperature
Characterize SAV community (bi-monthly grid surveys)
Develop a Macroalgal Community Index (L. Collado, FIU)

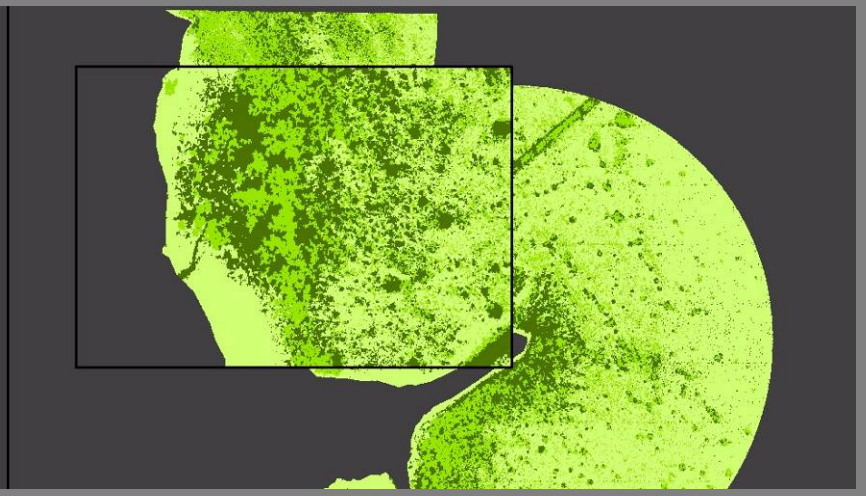
Nearshore Benthic Habitats Program: Components

5. Remote Sensing

Explore patterns of habitat structure (patchiness, fragmentation) in relation to WQ patterns



Aerial Image

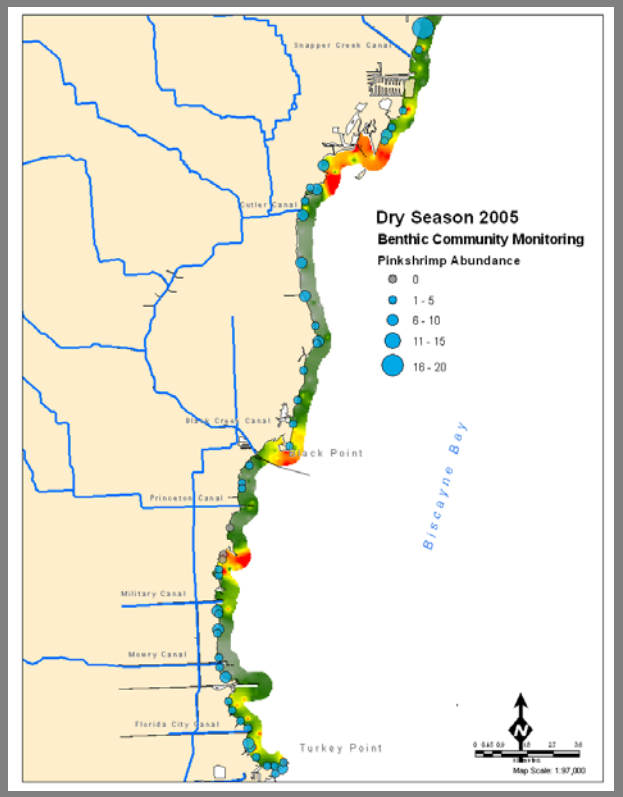


Classified Image

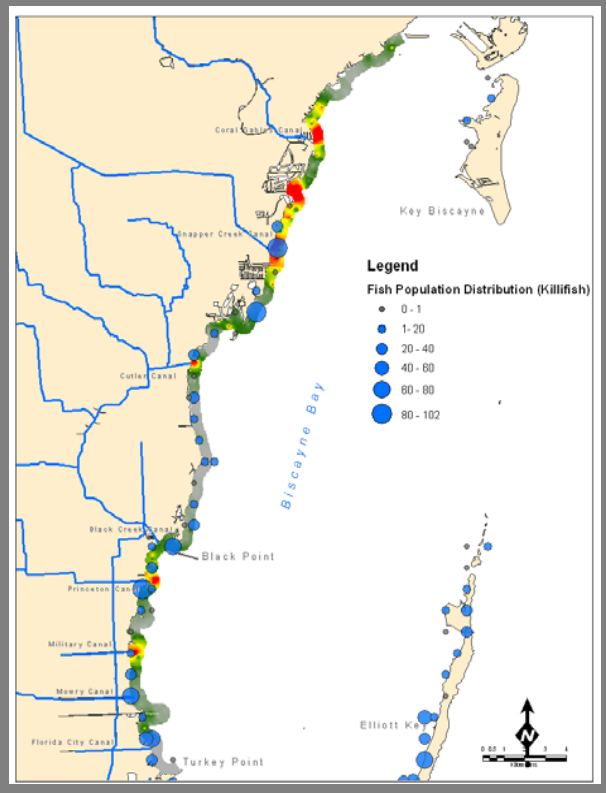
Nearshore Benthic Habitats Program: Components

6. Explore Trophic Linkages (SAV as habitat)

SAV assessment at sites surveyed by J. Serafy (mangrove fishes, N = 130), and J. Browder (epibenthic macroinverts and fishes, N = 72)



PINK SHRIMP



KILLIFISH

Nearshore Benthic Habitats Program: Summary

- SAV (seagrasses and macroalgae) components are good indicators of salinity patterns (e.g., distribution presently influenced by salinity regime)

Seagrasses are the principal component of the nearshore SAV community during the Dry season (mean cover = 25.5 %), while macroalgae dominate during the Wet season (33.4 %).

The distribution and abundance of SAV are directly related to the tolerance of each taxon to salinity patterns.

- Need a nested suite of indicators that work at different spatial and temporal scales
- Provide direct input into modeling efforts
- Need to establish a long-term baseline comparable to that of other components

ACNOWLEDGEMENTS

Funding

National Geodetic Survey

DOI NPS CESI Program

NOAA NMFS

CERP RECOVER Program

US ACoE

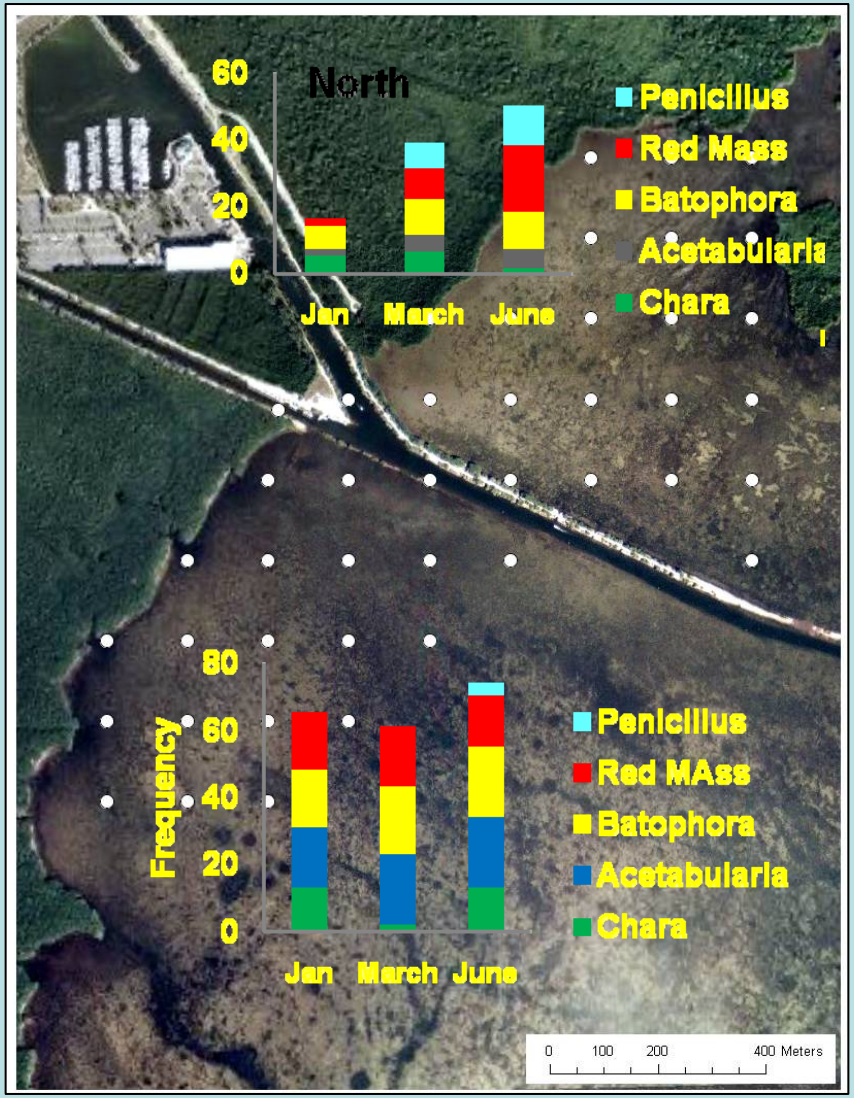
NGS
Gerry Mader

NPS
Richard Curry

NOAA
Erick Buck
Tom Jackson

Lirman Lab
James Herlan
Caitlin Burman
Megan Porter
Rolando Santos
Britt Huntington

> 18 Macroalgal species



Chara hornemanii dominates in estuarine waters close to land. Changes of abundance seasonal and reduces its distribution as salinity increases.

Batophora oerstedi-Acetabularia schencki are an estuarine tolerant association

Drift Macroalgae present in both areas but dominant in the southern region