Regional Coastal Construction:

History and Lessons Learned

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Photo Credit: Daniel Eidsmoe

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Introduction

- Principal Engineer with Callaway Marine Technologies
- Over 37 years of Coastal and Ocean Construction Experience
- Project Experience ranging from Offshore outfall construction and repair to Coral Reef restoration of vessel grounding sites and Stormwater Treatment Areas in the Everglades watershed area
- Performed the first vessel grounding site restoration FKNMS in 1995

By the numbers…

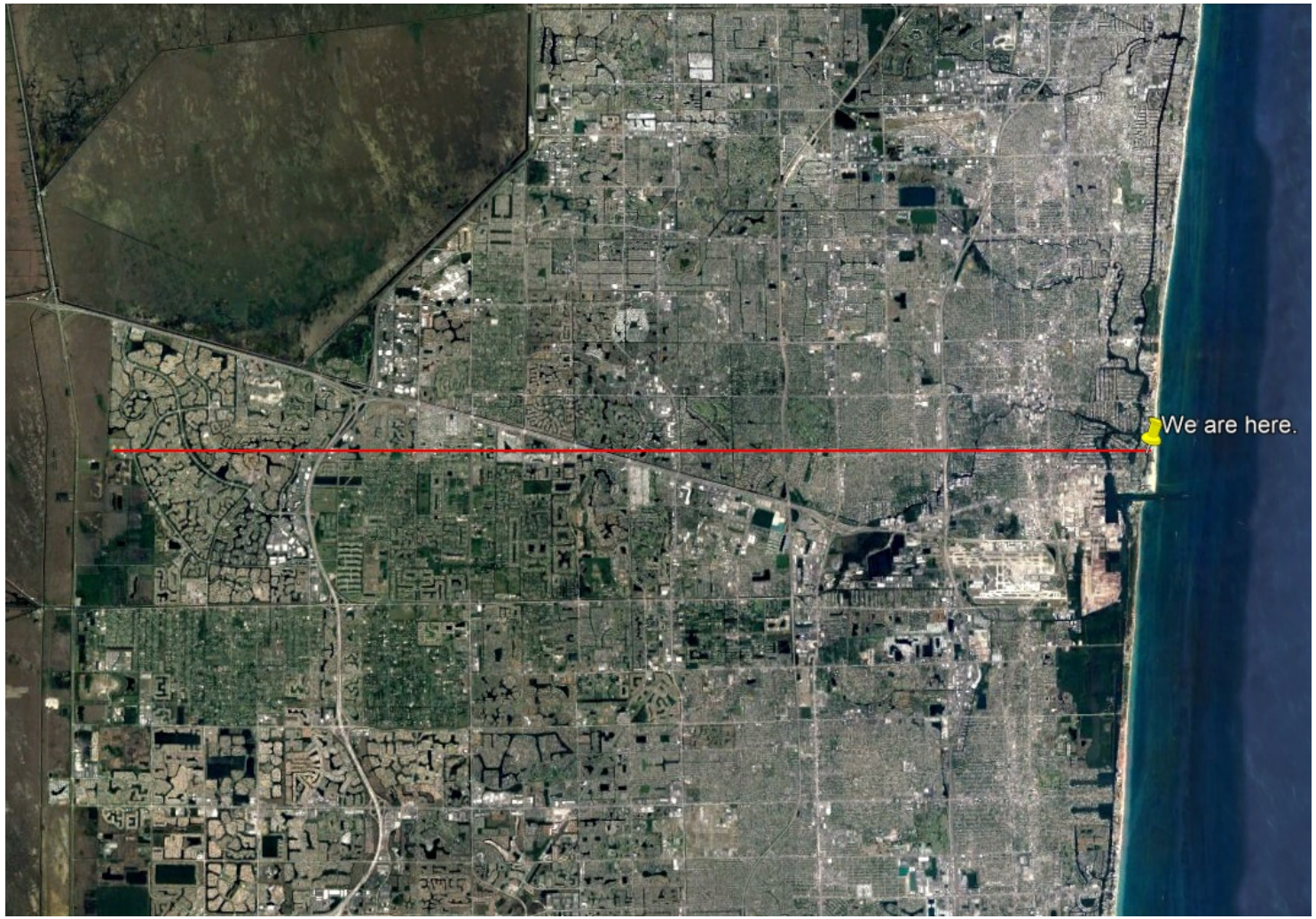
- 1930 : 233,000 people
- 2010 : 6,304,165 people
- 129,000 jobs

By the numbers...

- ~300 miles of reef from Monroe County to Martin County.

- 2,500 square miles of urban development in Miami-Dade, Broward, Palm Beach and Martin counties (southeast Florida).

- Reefs from 0.5 to 1.5 miles offshore in southeast Florida.



Coastal Construction in South Florida

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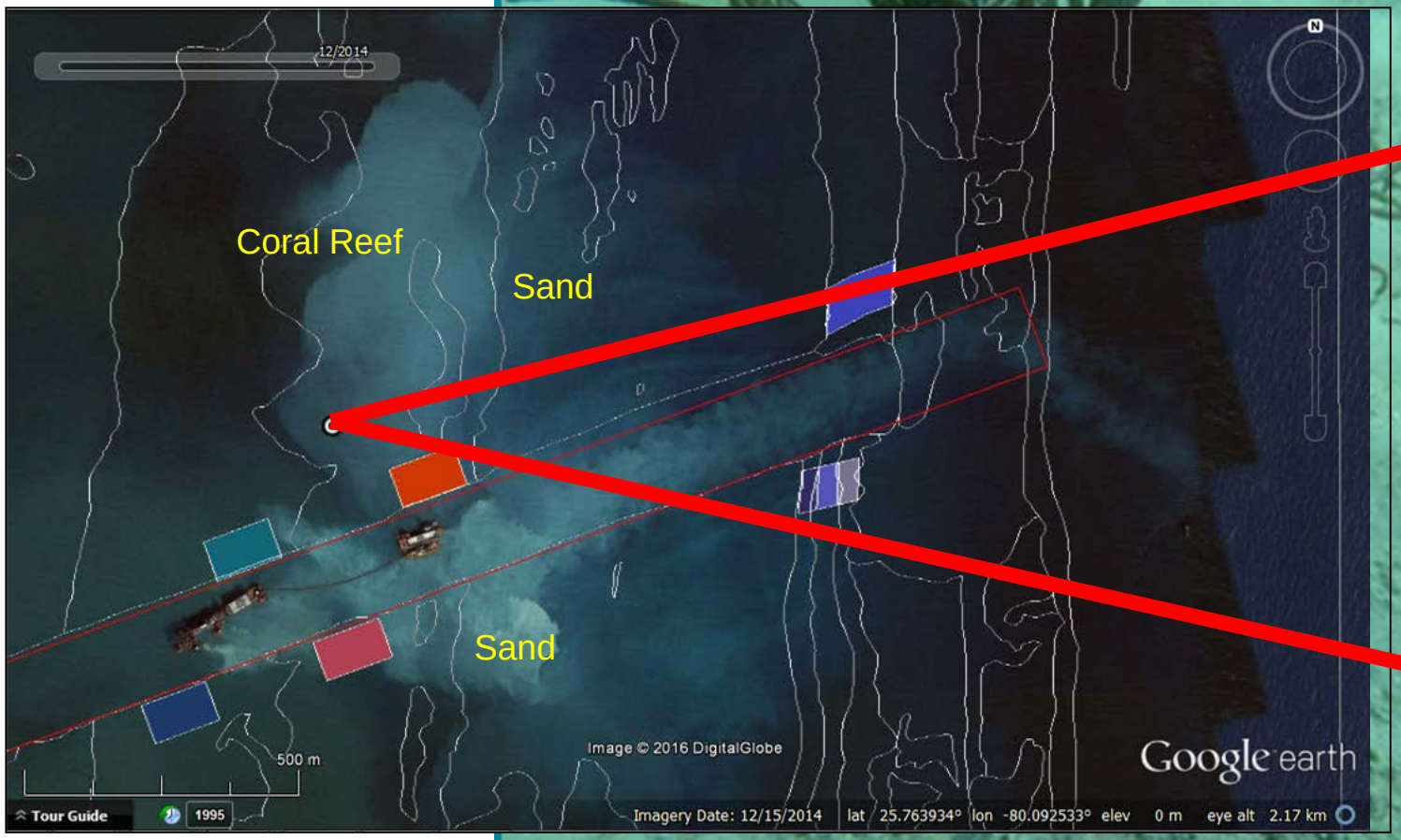
Sedimentation and Turbidity

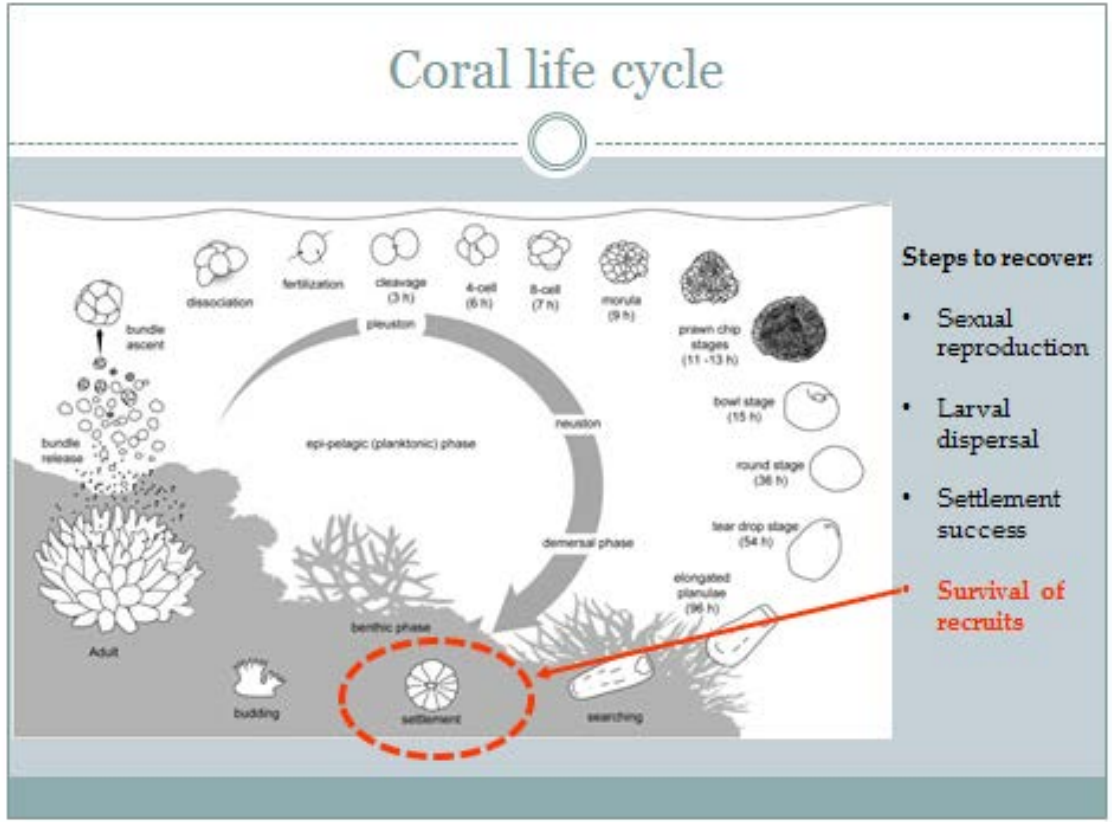


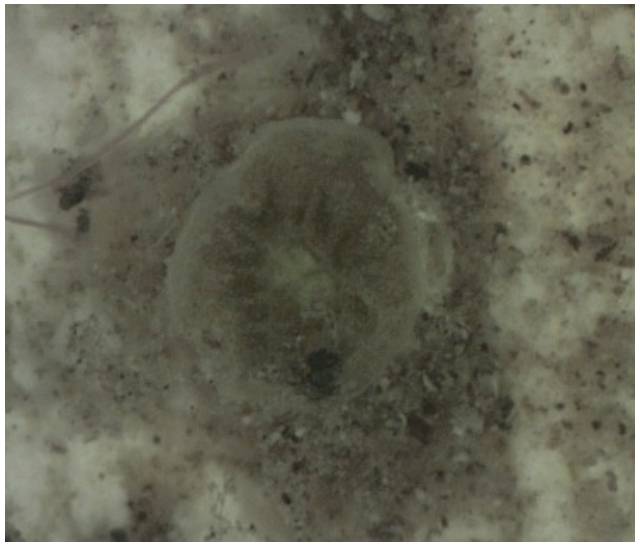
Mitigation Reefs

- Artificial reefs range from boulder piles to reef replicating modules
- Required to be in place if construction damages natural hardbottom
- Recent Segment II mitigation reef
  - $14,000,000 for 10 acres
  - $1.2 – 1.5 million per acre installation cost
- Limited equivalency to natural reefs

Reducing Sedimentation and Turbidity Impacts to our Coral Reefs

- 5 presentations from Florida, USVI, and Hawaii





Reducing Sedimentation and Turbidity Impacts to our Coral Reefs

Question 1: What is not working well with sedimentation and turbidity prediction, monitoring, assessment?

- Insufficient temporal and spatial scope of impact prediction and assessment
- Monitoring results are not being provided to resource trustees in a timely manner to inform adaptive management
- Meaningful adaptive management measures can be costly and are often not included in project budgets

Reducing Sedimentation and Turbidity Impacts to our Coral Reefs

Question 2: What do we know but are not implementing?

- Elsewhere, sediment producing activities (e.g., dredging) are halted when corals are spawning and most vulnerable to sediment impacts. No such provisions locally.
- Corals can succumb from turbidity impacts at levels well-below existing thresholds (e.g., 7 NTU vs the State of Florida standard of 29 NTU)
- Thermal events (e.g., warm water) reduce the energy reserves in corals and more conservative standards are warranted when these events occur

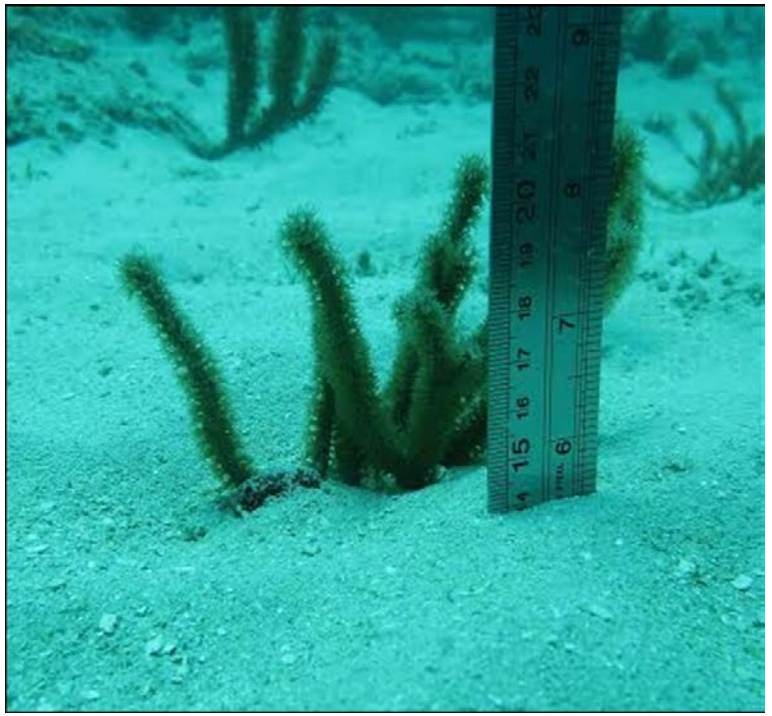
Reducing Sedimentation and Turbidity Impacts to our Coral Reefs

Question 3: What steps can we take to help achieve our shared goal of reducing impacts?

- Require all aspects of project monitoring to be independent from project contractors and proponents
- Satellite imagery can be used to enhance turbidity monitoring
- Challenge the marine industry with more conservative standards. Challenge results in innovation!

Lessons Learned

- What has previously caused sedimentation impacts?
  - Spider barge overflow
  - Scow door malfunctions
  - Roller-chopping
  - Tug thrusters
  - Unexpected sediment characteristics
  - Dredging



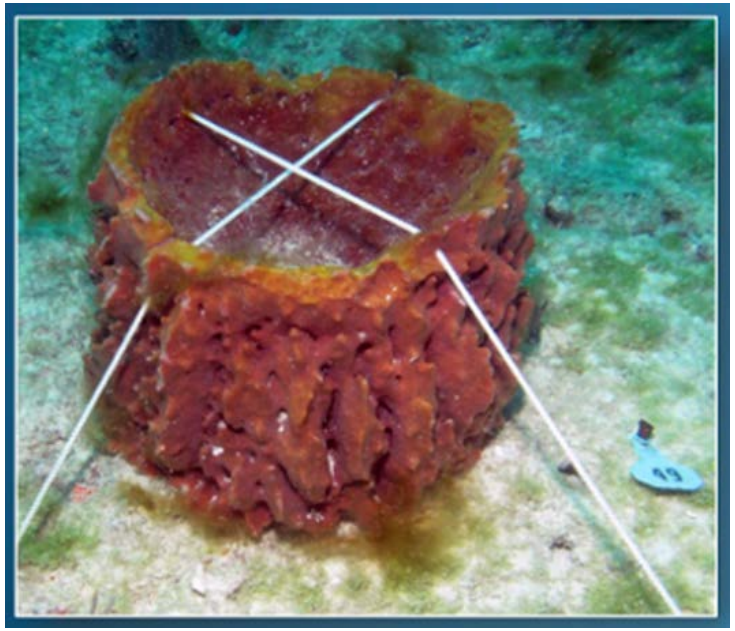
Lessons Learned

- Future proposed coastal construction projects must incorporate lessons learned from past projects-using technology or techniques proven to minimize adverse impacts in subsequent projects.

- Adequate funding for timely monitoring is necessary to facilitate adaptive management strategies

Lessons Learned

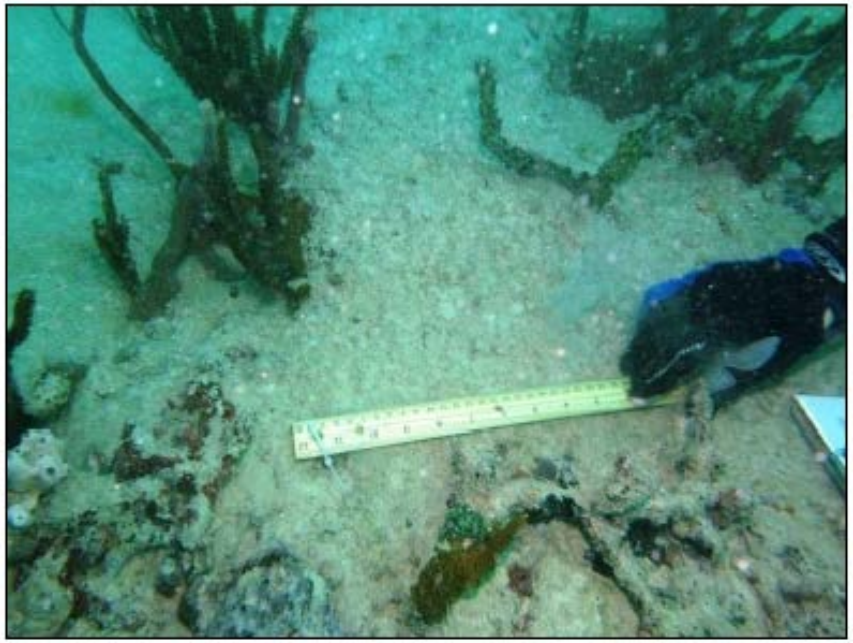
- Monitoring coral, octocoral, and sponge relocation improvements
  - Standardized data entry on the monitoring both pre and post-construction is necessary
  - Florida Fish and Wildlife Commission Coral and Octocoral mitigation relocation recommendations include:
    - Priority species and size classes
    - Recipient site selection prior to movement
    - Monitoring methods and schedules
    - Reporting requirements and schedule
    - Establishing criteria to determine success



Lessons Learned

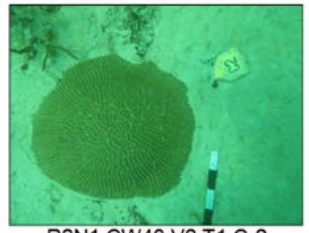
Improved standards are required to measure success of coral relocation

- Update performance standards
- Partial mortality of relocated corals can and often does exceed a majority of the colony's live tissue



Lessons Learned

- Adaptive Management and Contracting
  - Contingency plans
  - Environmental incentives vs schedule incentives
  - Agency staff
  - Partner agency or independent third parties oversight
  - Flexibility and cooperation
  - Fixed no-work windows during coral spawning periods must be built in to the contracts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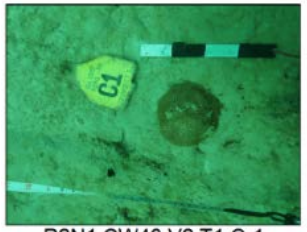
August 21, 2014


R2N1 CW43 T1 C-2
September 14, 2014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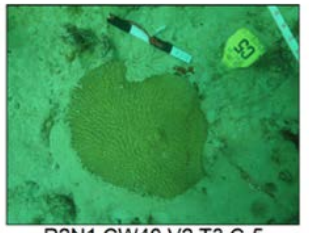
September 14, 2014


R2N1 CW40 V2 T3 C-5
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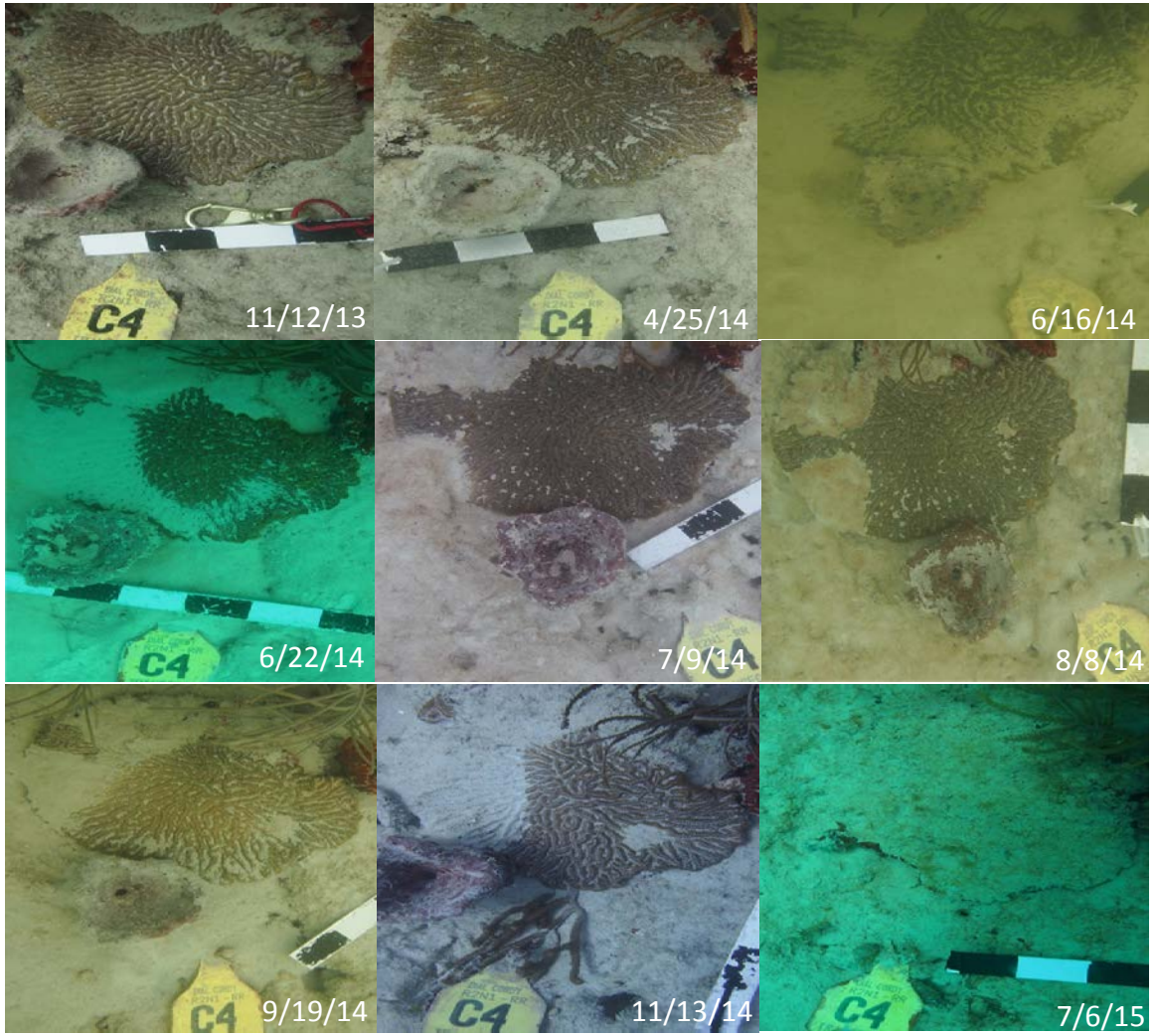
R2N1 CW43 T3 C-5
September 14, 2014

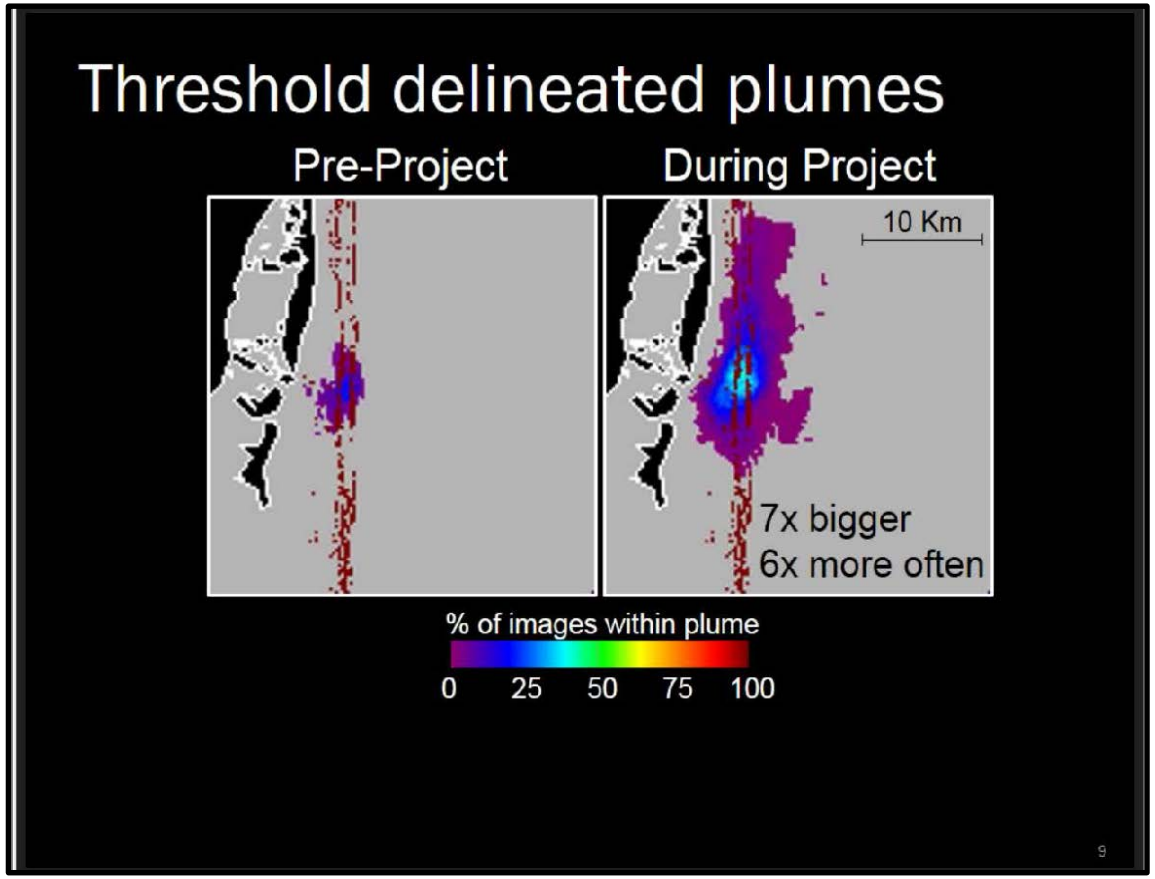
Lessons Learned

- Time-series analyses



Lessons Learned

Lessons Learned: The methods used in in Barnes et al. (2015) could be useful for determining spatial extent of monitoring at Port Everglades



Conclusions

- Coastal construction projects are necessary
- Healthy reefs are necessary
- Adaptive management with defined actions is a necessity, and should be included in planning phases for construction projects
- New technologies can and should be applied for monitoring
- Must learn from past projects, and utilize adaptive monitoring and construction methods to achieve both Healthy Reefs and a Healthy Economy

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