A Review of Nearshore Hardbottom Edge Variability and Classification of Associated Benthic Communities in Broward County

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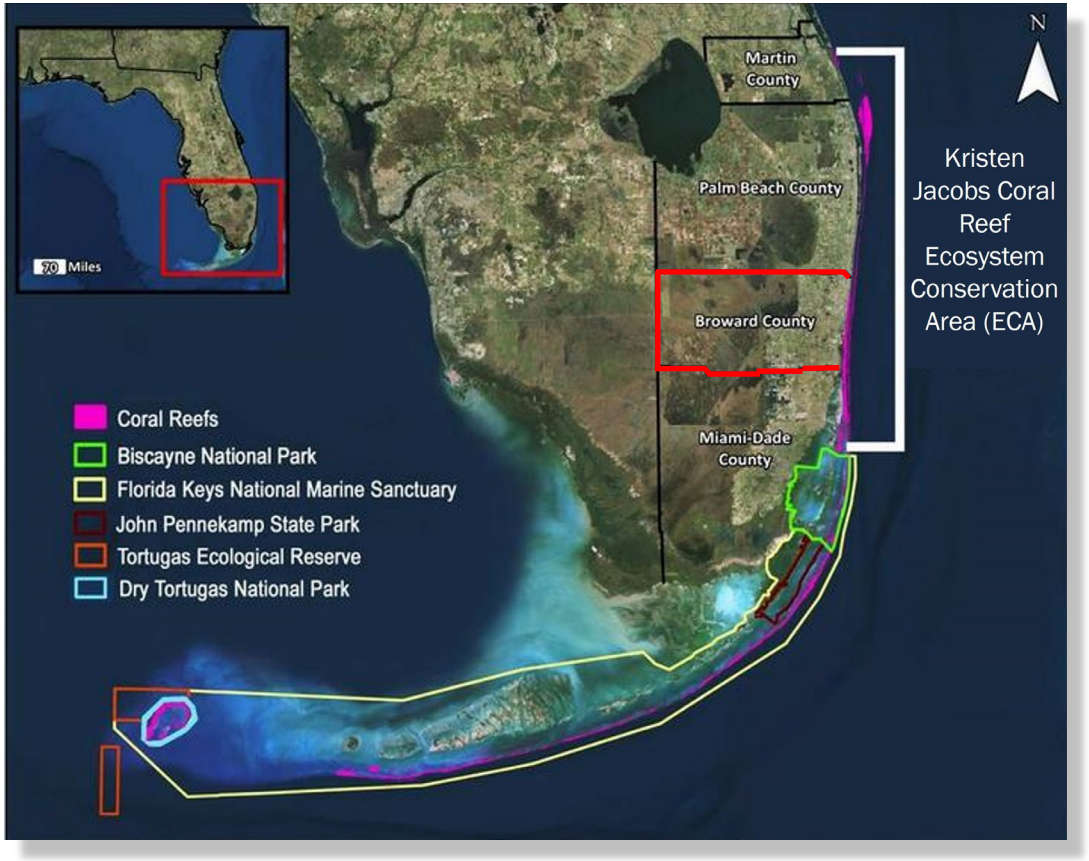
Setting: Where, What, Why?

Broward County: Southeast coastal Florida



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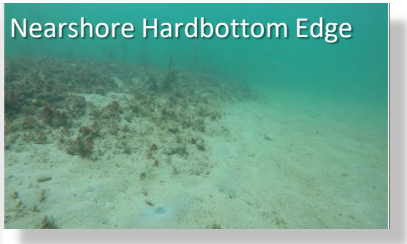
Setting: Where, What, Why?

Nearshore Hardbottom (NHB): relic, drowned reef, consolidated hard substrate, typically lithified shell and sand.



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Setting: Where, What, Why?

Hardbottom Edge Mapping: typical requirement for coastal construction projects, permit specified biological monitoring

Standard Operation Procedures for Nearshore Hardbottom Monitoring of Beach Nourishment Projects (FDEP, 2016)

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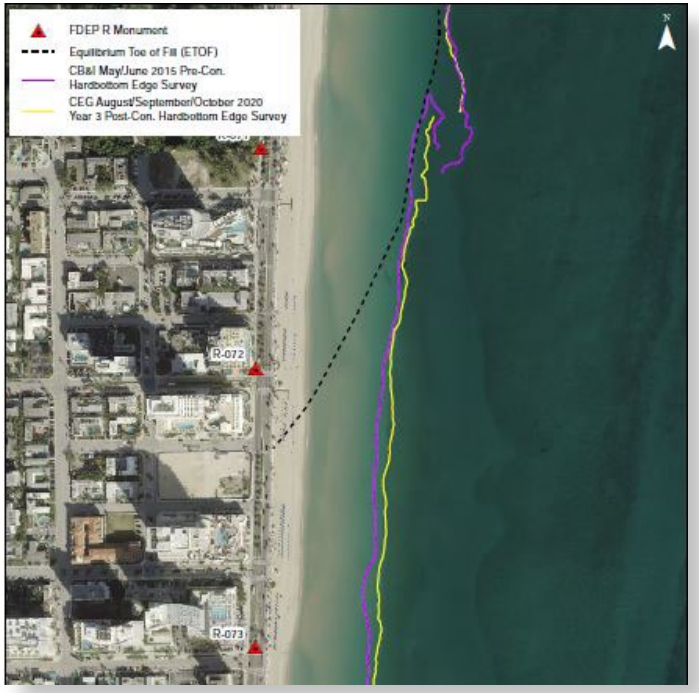
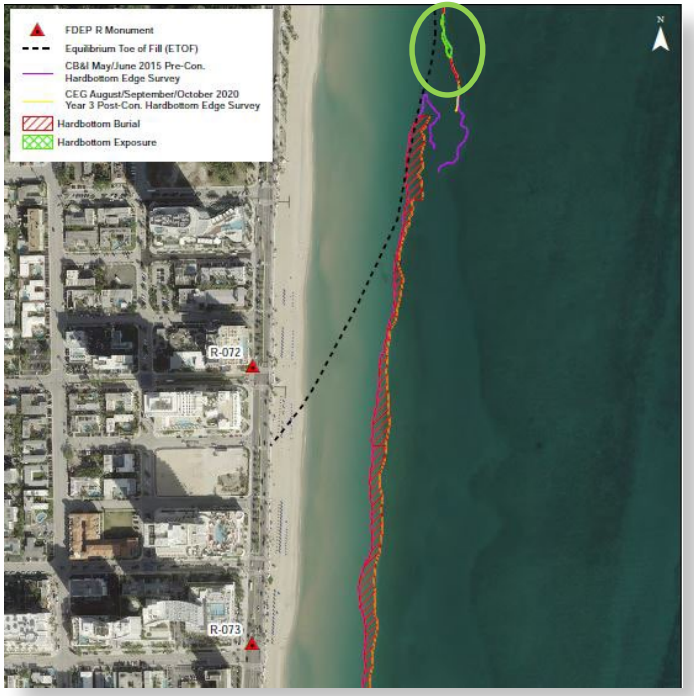
Setting: Where, What, Why?

Hardbottom Edge Mapping: results in a continuous linear feature across the area of interest. Successive mapping provides for comparison of hardbottom edge burial/exposure across time





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Data and Methods

Hardbottom Edge Data: hardbottom edge line mapping products delivered to regulatory agencies and reporting often occurs in table format based on monitoring designated areas of concern.

Assessment Area (FDEP R-monuments)	Total Reach Length (ft)	HB Burial (acres)	HB Exposure (acres)	HB Net Change (acres)
Outside Project North (R-25 to R-26)	11030	-6.7	3.9	-2.8
Project Area North (R-36 to R-42)	5730	-1.3	0.1	-1.2 ?
Outside Project Center (R-42 ft to R-51)	9030	-4.4	0.0	-4.3
Project Area South (R-51 to R-72)	21030	-2.0	4.1	2.1
Outside Project South (R-72 ft to R-84.7)	13370	-0.7	6.6	5.8
Outside Project Total	**33430**	**-11.8**	**10.5**	**-1.3**
Project Area Total	**26760**	**-3.3**	**4.2**	**0.9**
Total	**60190**	**-15.1**	**14.8**	**-0.4**

Project Reaches and Associated Hardbottom Edge Area Change, September 2015 to February 2017

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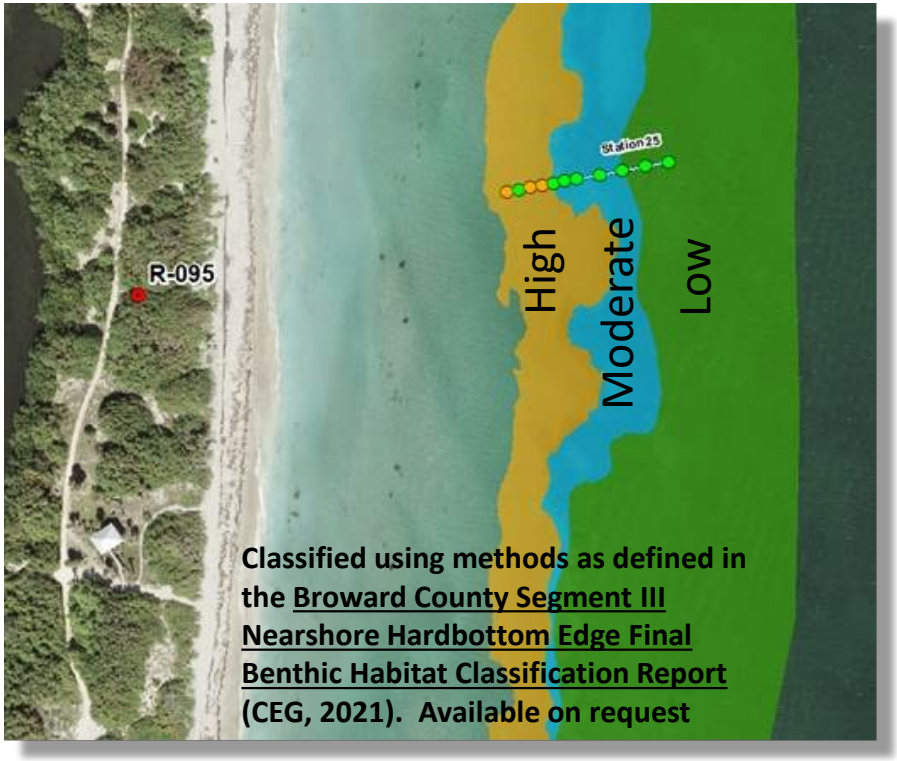
Data and Methods

Hardbottom Edge Data: Broward County Long-term Environmental Monitoring Program, 2014 - 2021.

Data and Methods

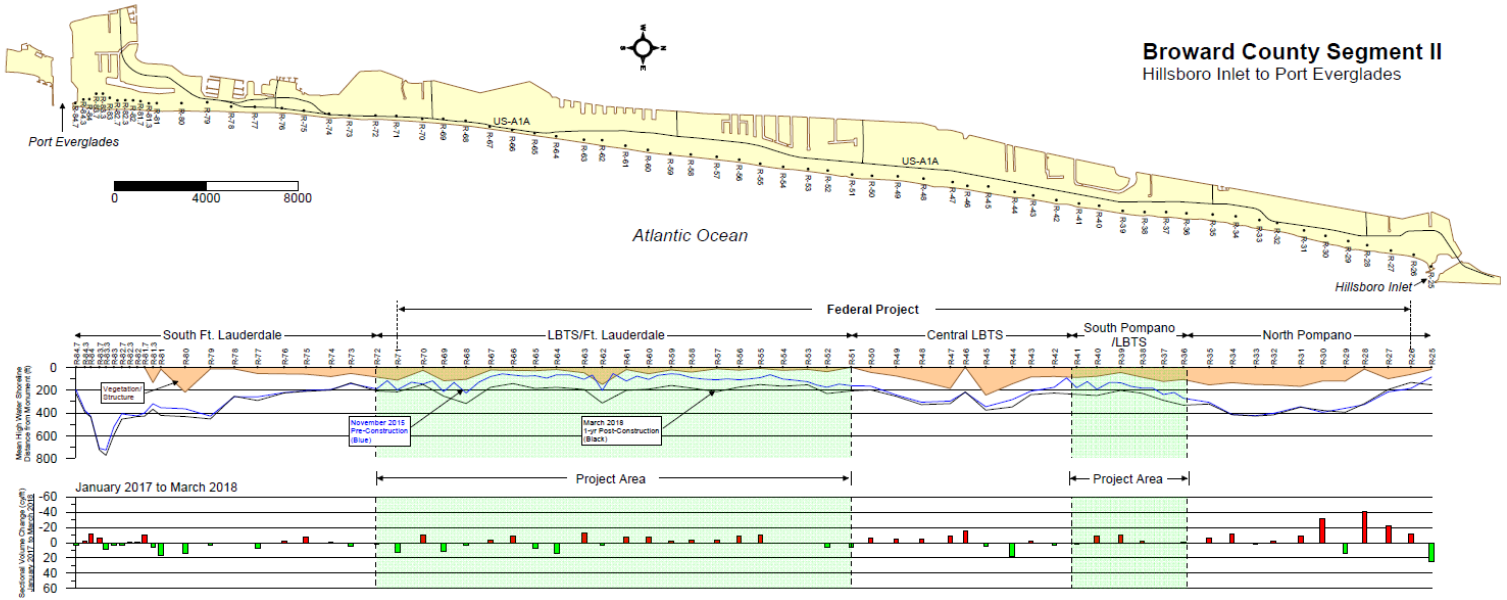
Transect Community Data: Broward County Long-term Environmental Monitoring Program, 2014 - 2021.



Classified using methods as defined in the Broward County Segment III Nearshore Hardbottom Edge Final Benthic Habitat Classification Report (CEG, 2021). Available on request

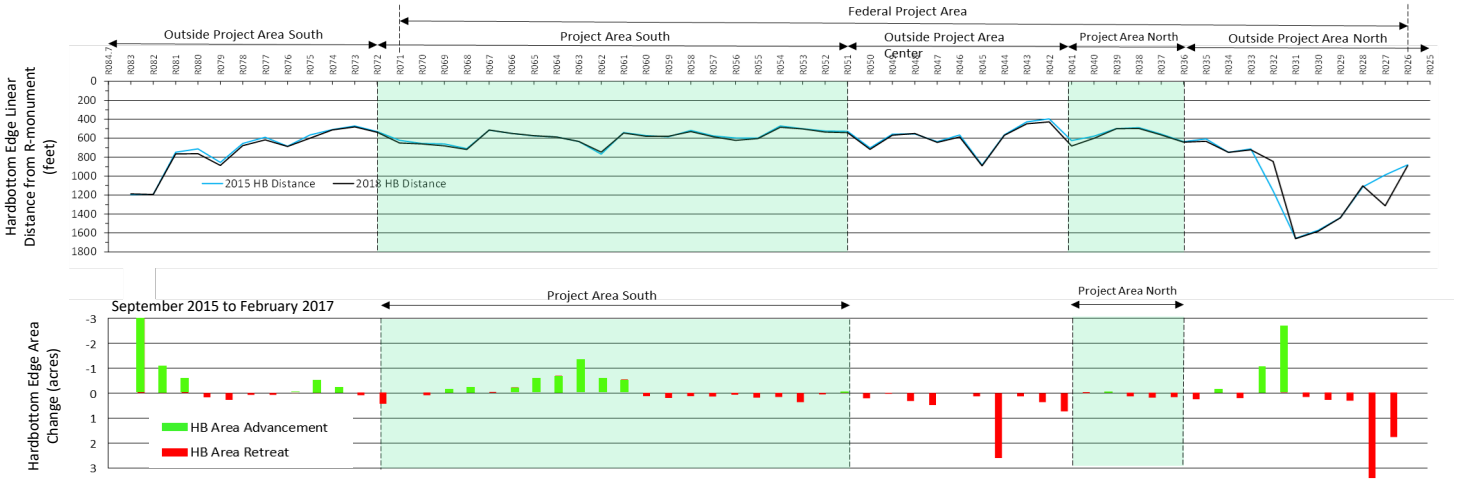
Results

Hardbottom Variability: Direct comparison to closest temporal physical survey results

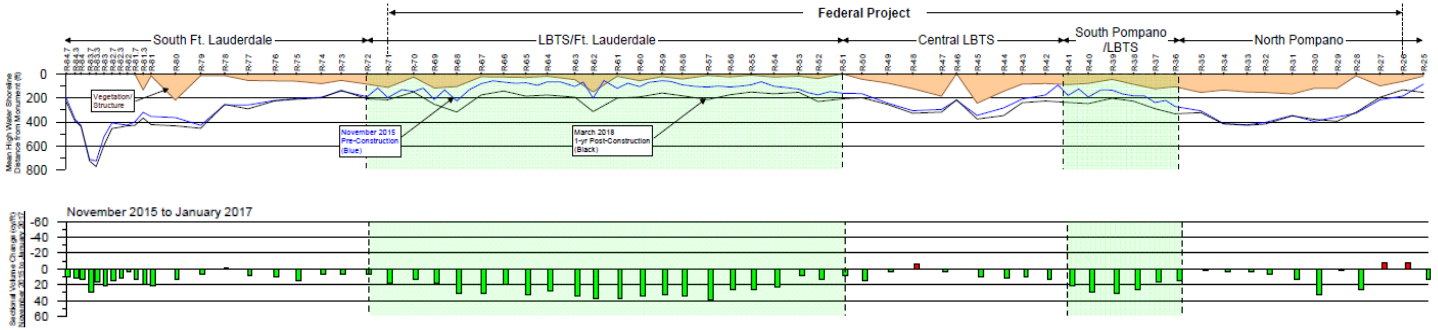


Results

Hardbottom Edge Change: September 2015 to February 2017

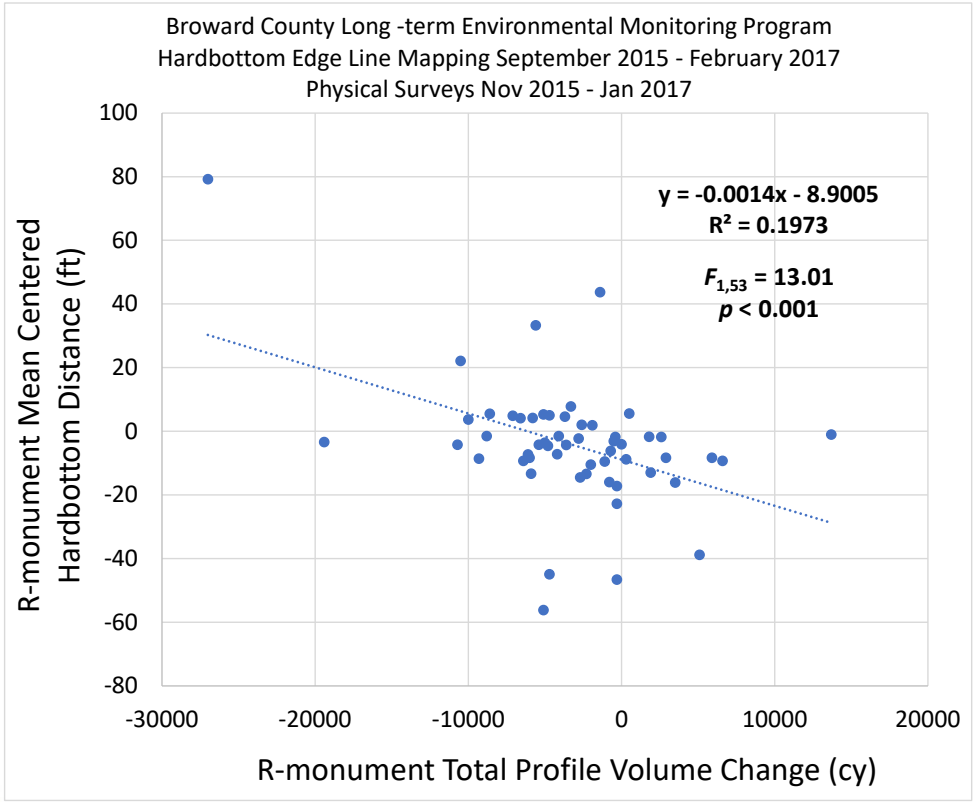


Physical Survey Change: November 2015 and January 2017

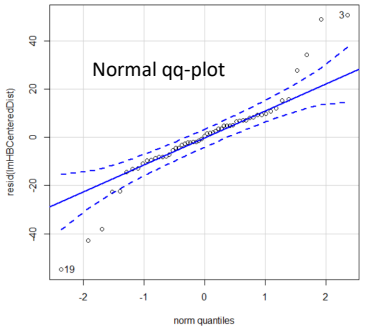


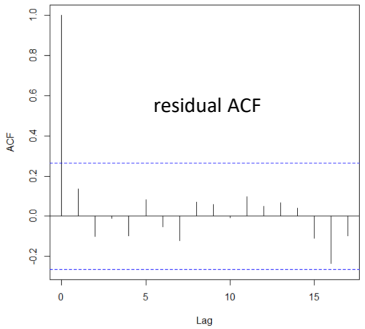
Results

Hardbottom Variability: Physical and Environmental Survey Compatibility



Residual Structure





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Results

Hardbottom Variability: R-monument estimates

Estimates of the annual and seasonally moderated mean distance to, and area cover of, the hardbottom edge made for each R-monument, by season, and accounting for annual variability among years and r-monuments nested within years. No seasonal effect improvement in either model results in:

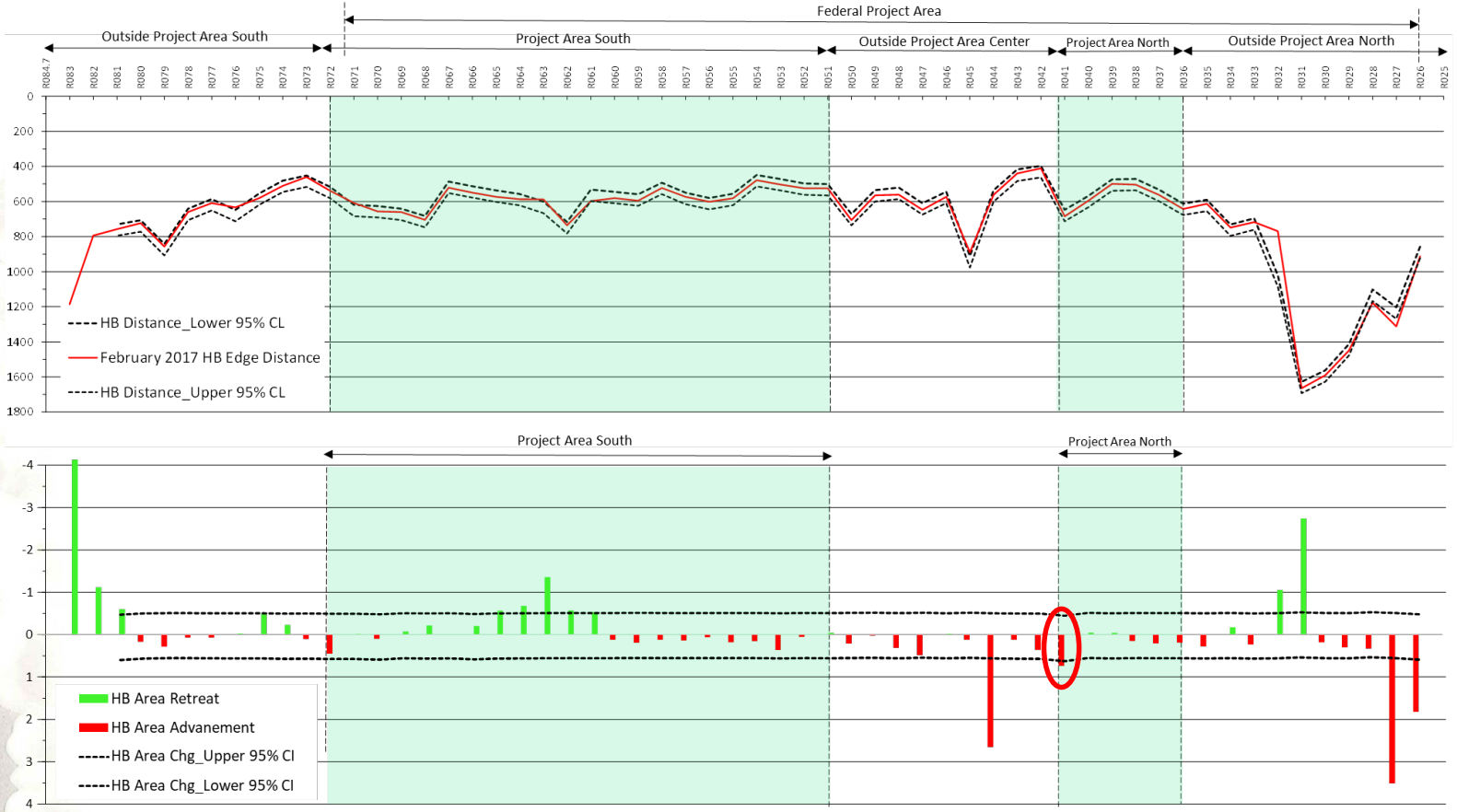
HB_Distance ~ RMON + (1|ASSESSMENT_YEAR/RMON), data = RMON.dat)

HB_Area ~ RMON + (1|ASSESSMENT_YEAR/RMON), data = RMON.dat)

95% Confidence Limit output with model results provides estimates of variability for each R-monument averaged across twelve to thirteen individual hardbottom edge lines collected over six years of observation.

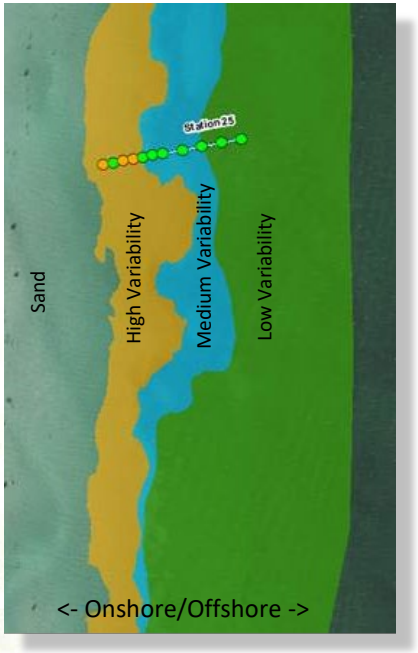
Results

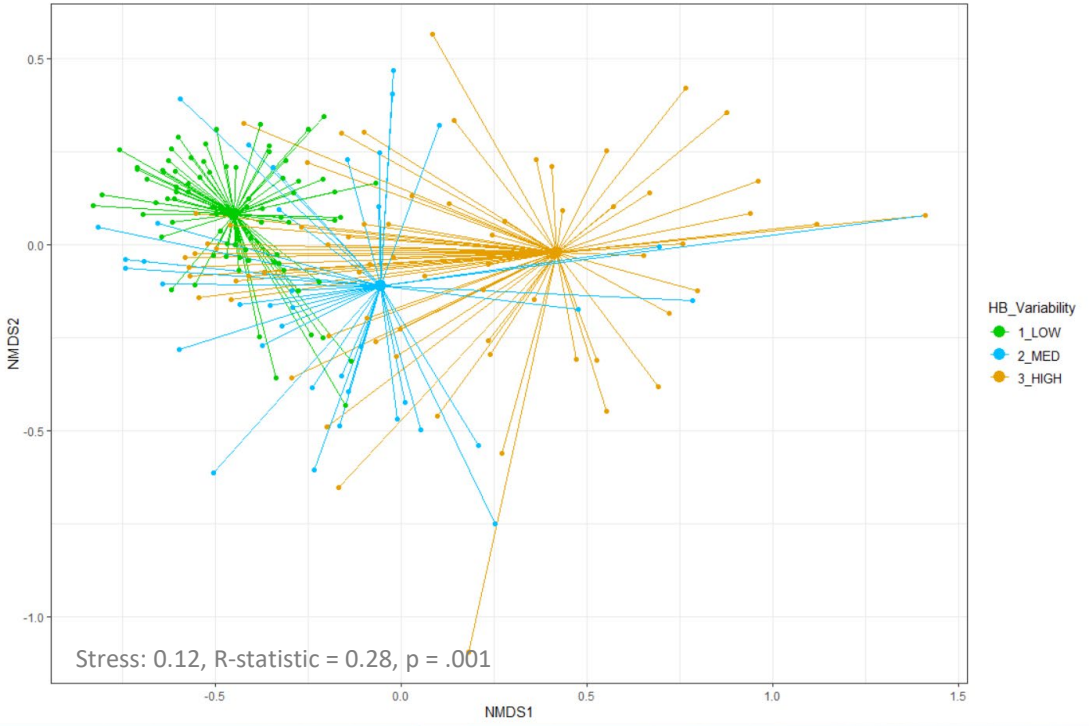
Hardbottom Variability: R-monument estimates



Results: Biological Communities

Community separation within hardbottom variability categories - site aggregated data, blocked by year





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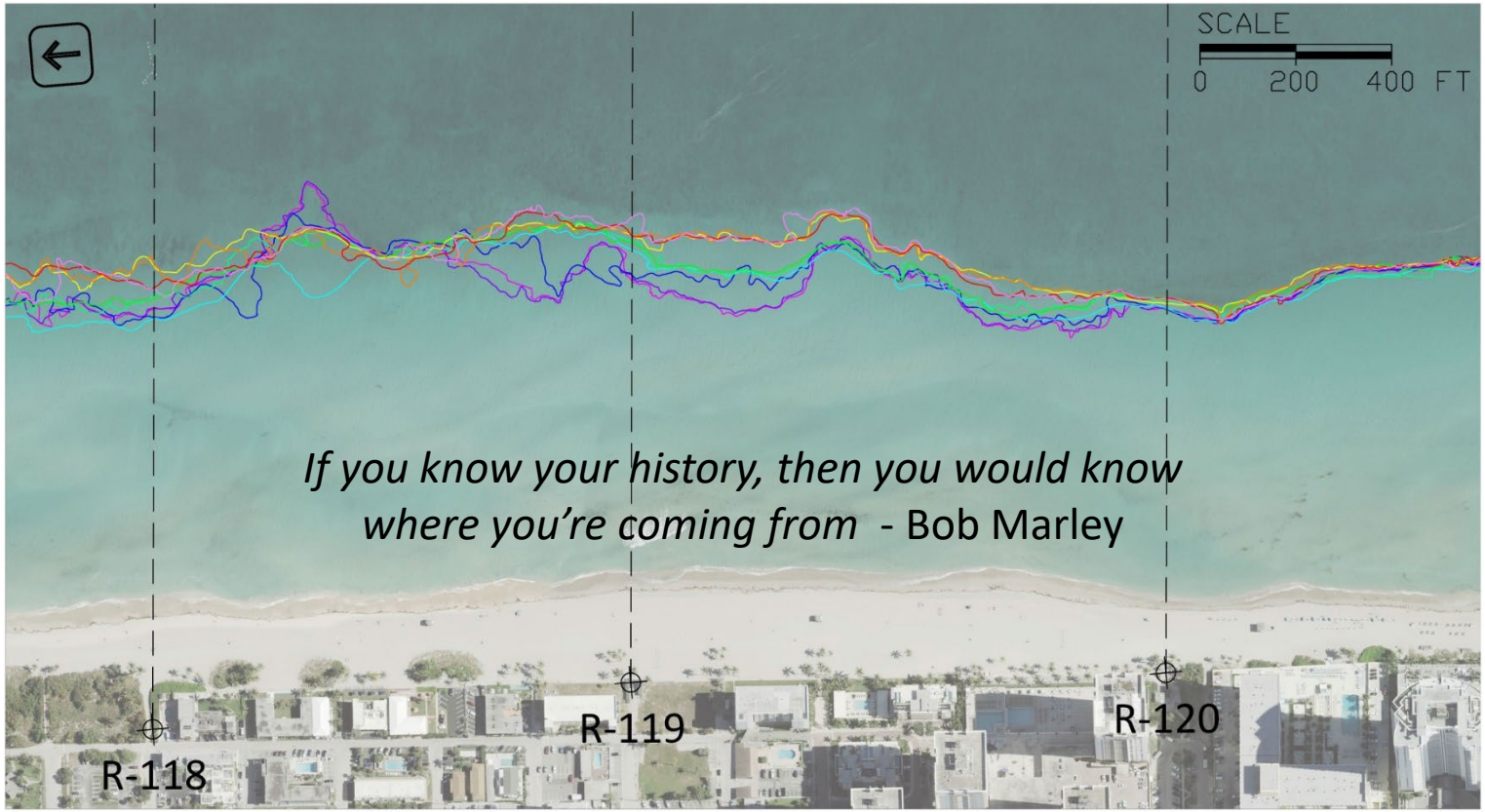
Conclusions: where next?

- **Determine what constitutes natural variability, depending on reasonable assumptions, based on distance to, and time since, potential project impacts: longshore transport rates applied to post-project datasets expands potential R-monument natural set.**
- **Collate and process all available hardbottom edge line data for finer scale resolution of change**
- **Reassess the determination of biological impacts to include long-shore transects placed in distinct areas of variability to allow for more powerful determinations of community change**

That's that! Questions?

Extended thanks to those that contributed to the development of this data and presentation: Katelyn Klug, Nicole Dancho, Jenna Soulliere



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