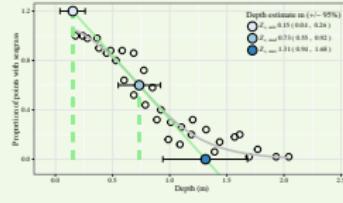


Quantifying seagrass light requirements using an algorithm to spatially resolve depth of colonization

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Nov. 4, 2016





Seagrasses and water quality

Seagrasses are beneficial - healthy seagrass, healthy estuary

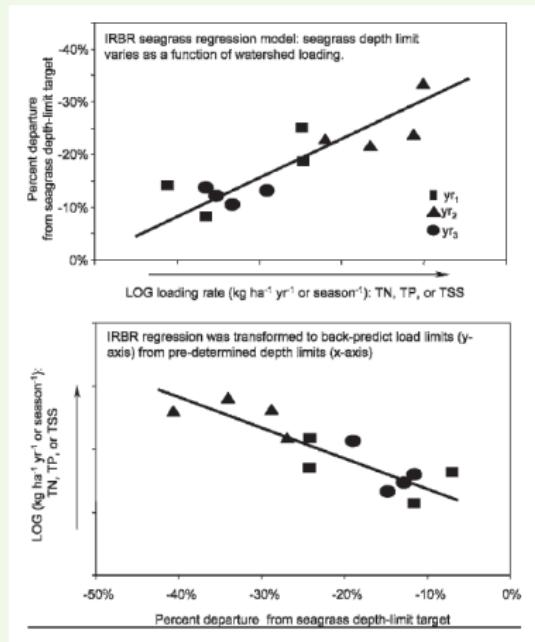
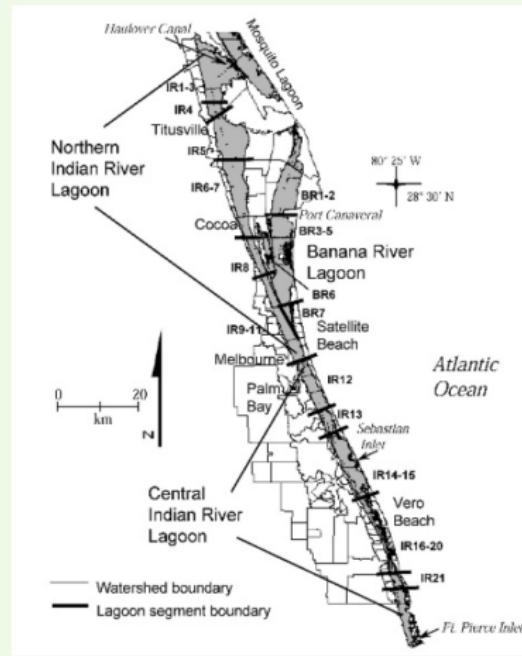


Seagrasses are sentinels of water quality [Short and Wyllie-Echeverria, 1996]

flickr.com/photos/swimvixen2

Seagrasses and water quality

Nutrient limits using seagrass depth-limit targets [Steward and Green, 2007]





Seagrasses and water quality

The maximum depth of colonization is a useful proxy of eutrophication

Often used as a basis for establishing nutrient criteria



Seagrasses and water quality

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Problem 1: No consensus on the best way to measure depth of colonization

Problem 2: Plenty of data are available but standardized techniques have not been developed



Seagrasses and water quality

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Problem 2: Plenty of data are available but standardized techniques have not been developed

Study objective

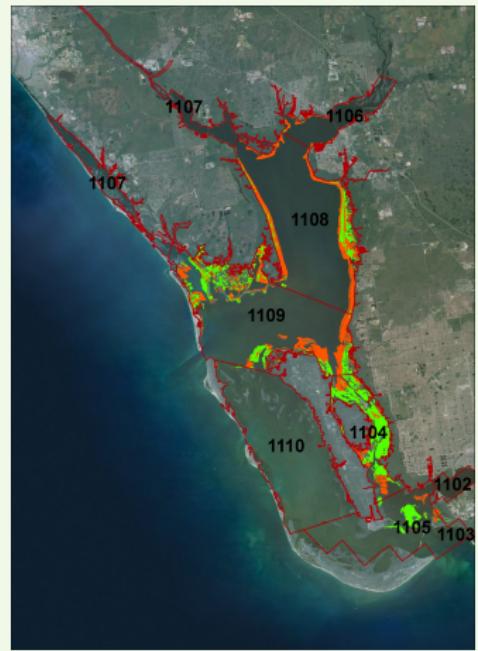
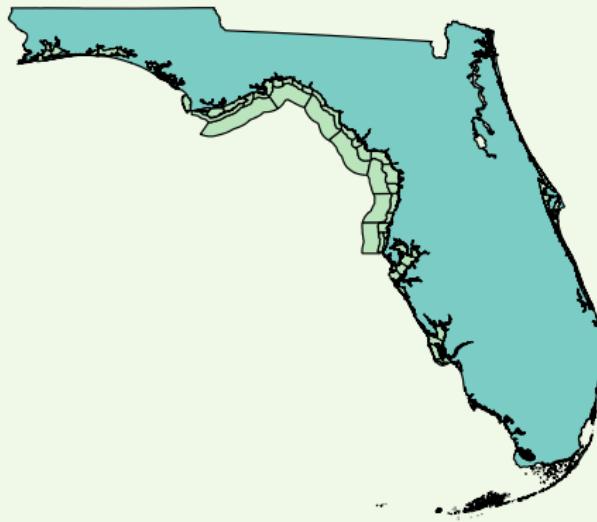
Develop and apply an algorithm that uses geospatial data to describe relationships between seagrass depth limits, water clarity, and light requirements [Beck, Hagy, Le, in review]



Seagrasses and water quality

Existing geospatial datasets - coastal segments, seagrass areal coverage, bathymetry

Segment-based approach





Seagrasses and water quality

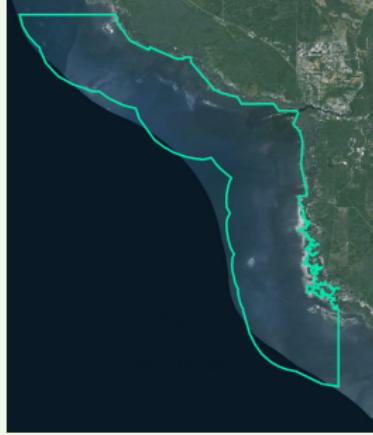
How can we estimate depth of colonization?



Seagrasses and water quality

How can we estimate depth of colonization?

1. Pick a segment

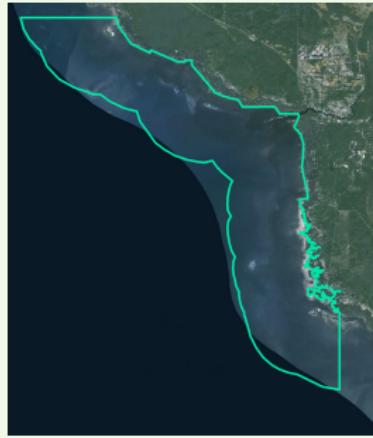




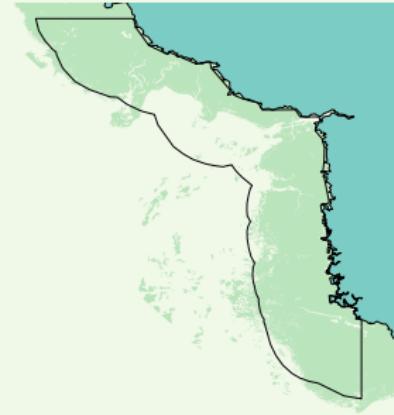
Seagrasses and water quality

How can we estimate depth of colonization?

1. Pick a segment



2. Get seagrass area

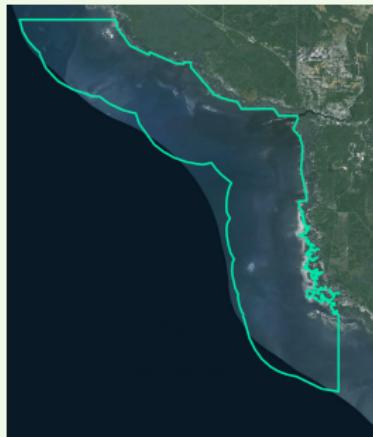




Seagrasses and water quality

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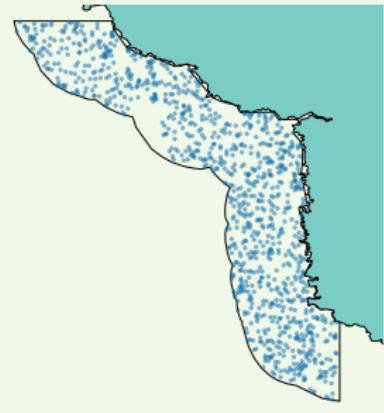
1. Pick a segment



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3. Get depth points

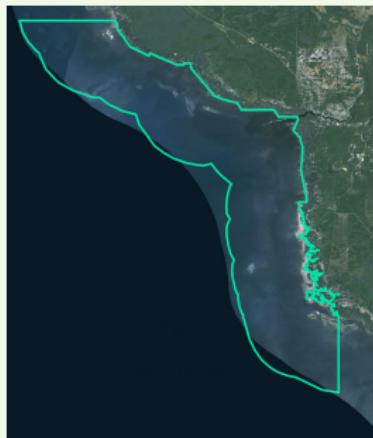




Seagrasses and water quality

How can we estimate depth of colonization?

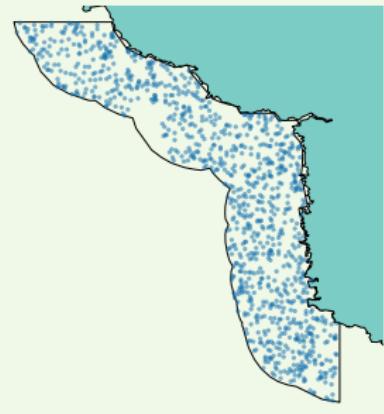
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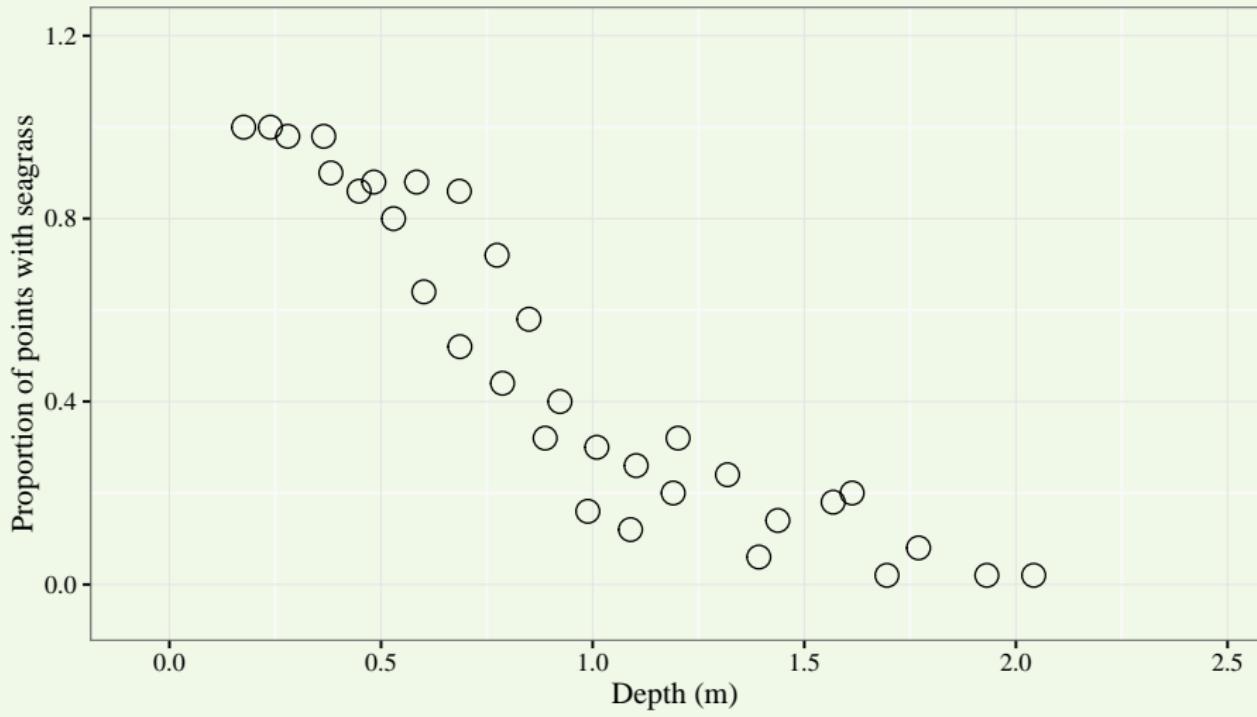


4. Match depth points with p/a of seagrass...



Seagrasses and water quality

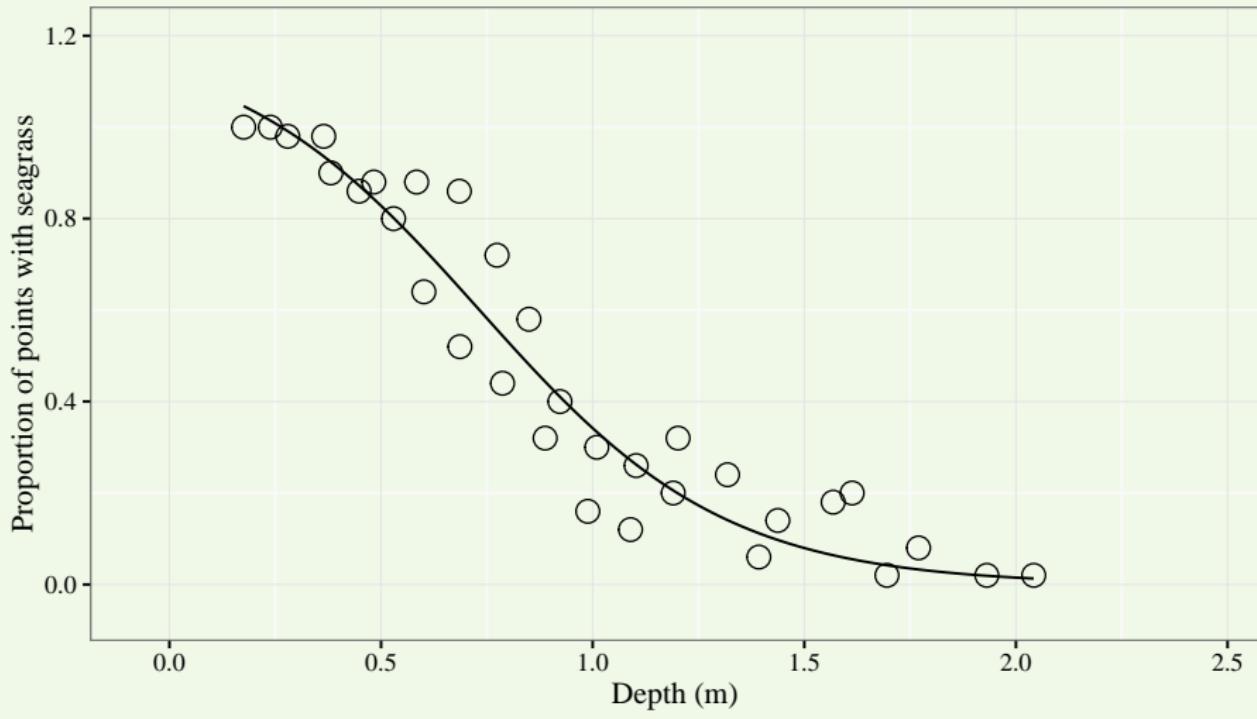
Plot the distribution of seagrass by increasing depth





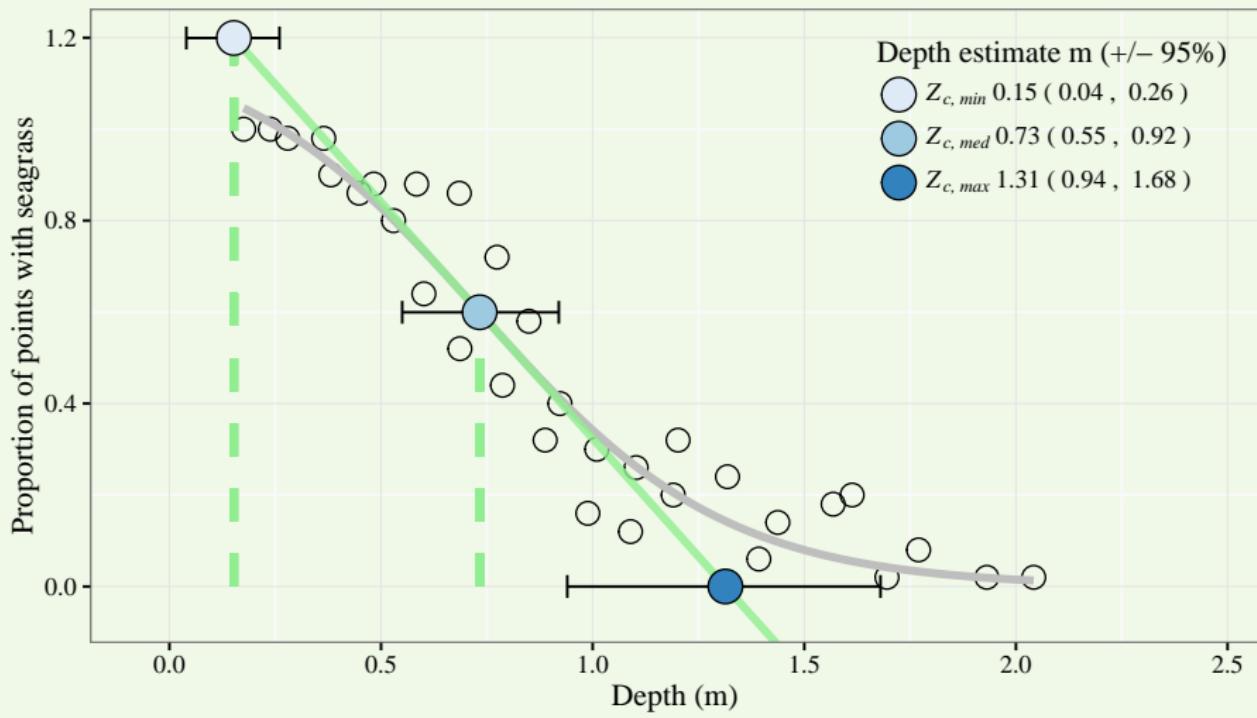
Seagrasses and water quality

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Seagrasses and water quality

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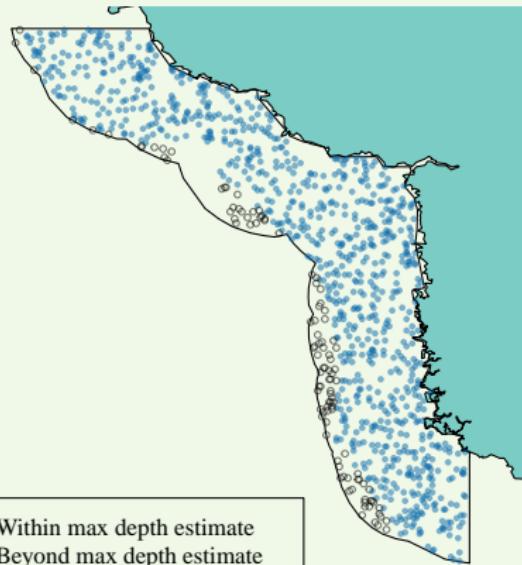
Seagrasses and water quality

The estimate depends on the spatial context...



Seagrasses and water quality

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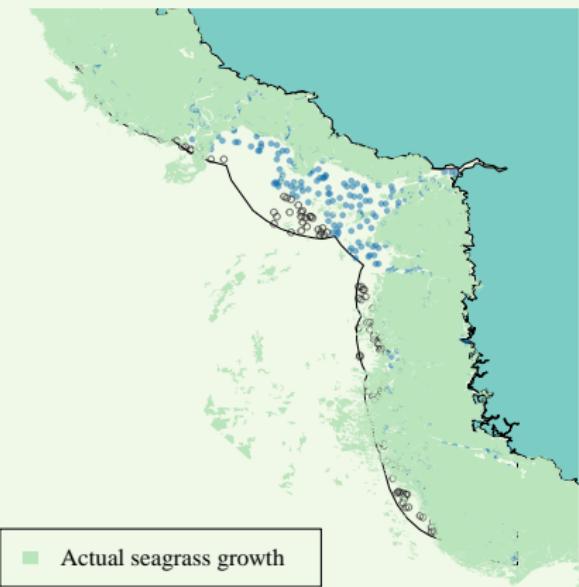
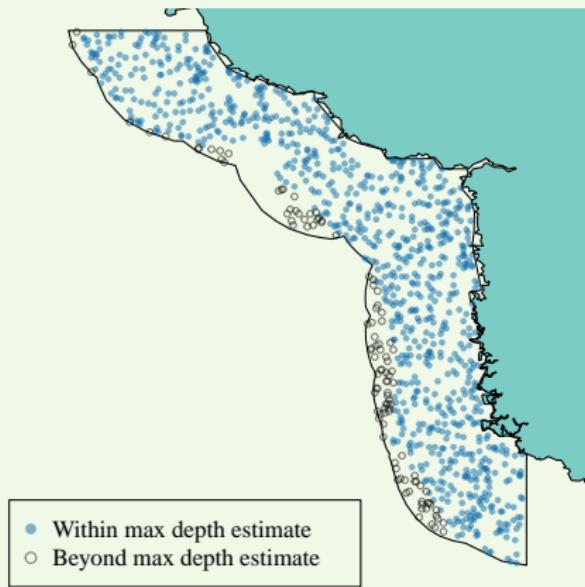


- Within max depth estimate
- Beyond max depth estimate



Seagrasses and water quality

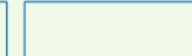
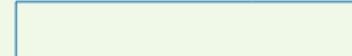
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Seagrasses and water quality

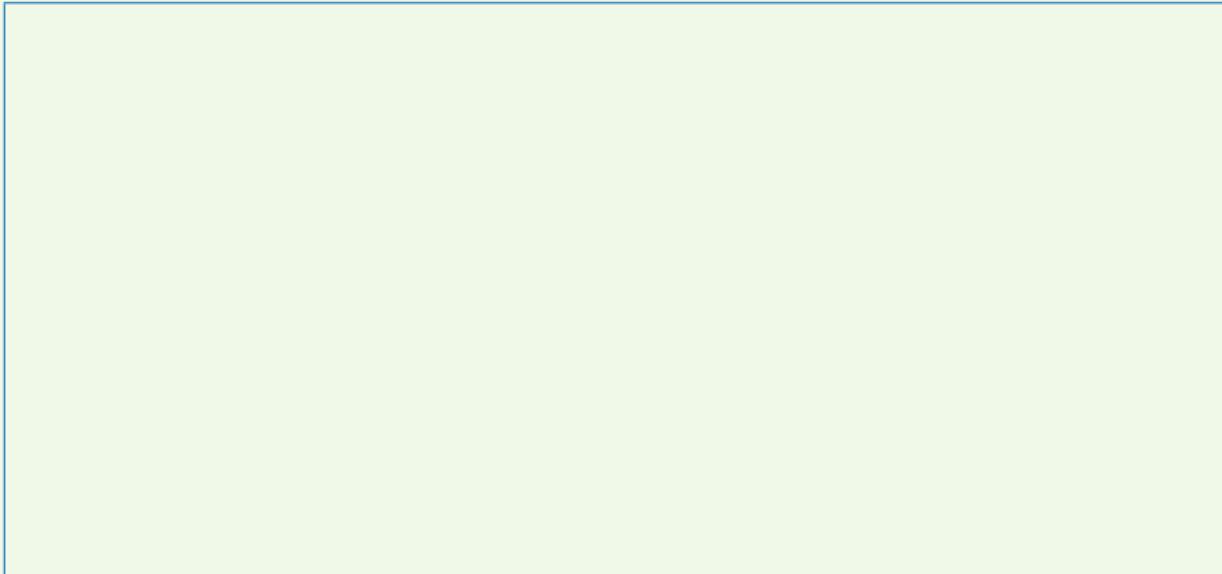
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Seagrasses and water quality

The estimate depends on the spatial context...





Seagrasses and water quality

Applied to four coastal segments



Seagrasses and water quality

Can we link depth estimates with water clarity to understand light requirements? $\%SI = 100 \cdot \frac{I_z}{I_o} = \exp(-K_d \cdot Z_{c,med})$

Case 2: Seagrass and water quality

Making the most of existing data

Benefits of the approach:

- The spatial unit for any estimate of seagrass growth limit is problem-specific
- Allows for a ‘compliance-point’ approach (saves time/money)
- Increased understanding of seagrass growth patterns - natural and anthropogenic drivers

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Lots to be done...

References

- Short FT, Wyllie-Echeverria S. 1996.
Natural and human-induced disturbance of seagrasses.
Environmental Conservation, 23(1):17–27.
- Steward JS, Green WC. 2007.
Setting load limits for nutrients and suspended solids based upon seagrass depth-limit targets.
Estuaries and Coasts, 30(4):657–670.