

MARSH FUTURES:

Assessment and Mapping of Elevation Capital and Shoreline Erosion to Guide Coastal Wetland Projects

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Partnership for the Delaware Estuary

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The Nature Conservancy

Diane Rosencrance and Meghan Boatright

Natural Lands Trust



Coastal Resilience

Climate:

Shifting Baselines
Greater Oscillations

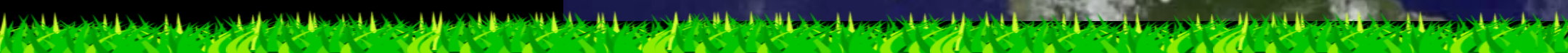
→ Coastal Wetlands

Need to Sustain

Ecoservices
Buffers



Hurricane Sandy (NASA)



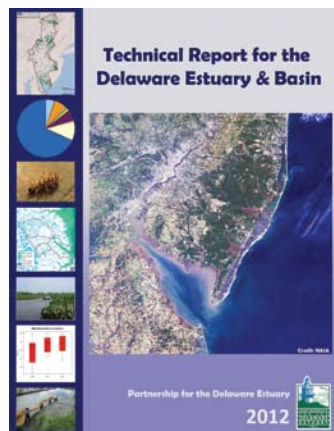
Post-Sandy Lessons

Flooding and storm damage was lower adjacent to protective coastal wetlands and dunes



Coastal Marsh Declines

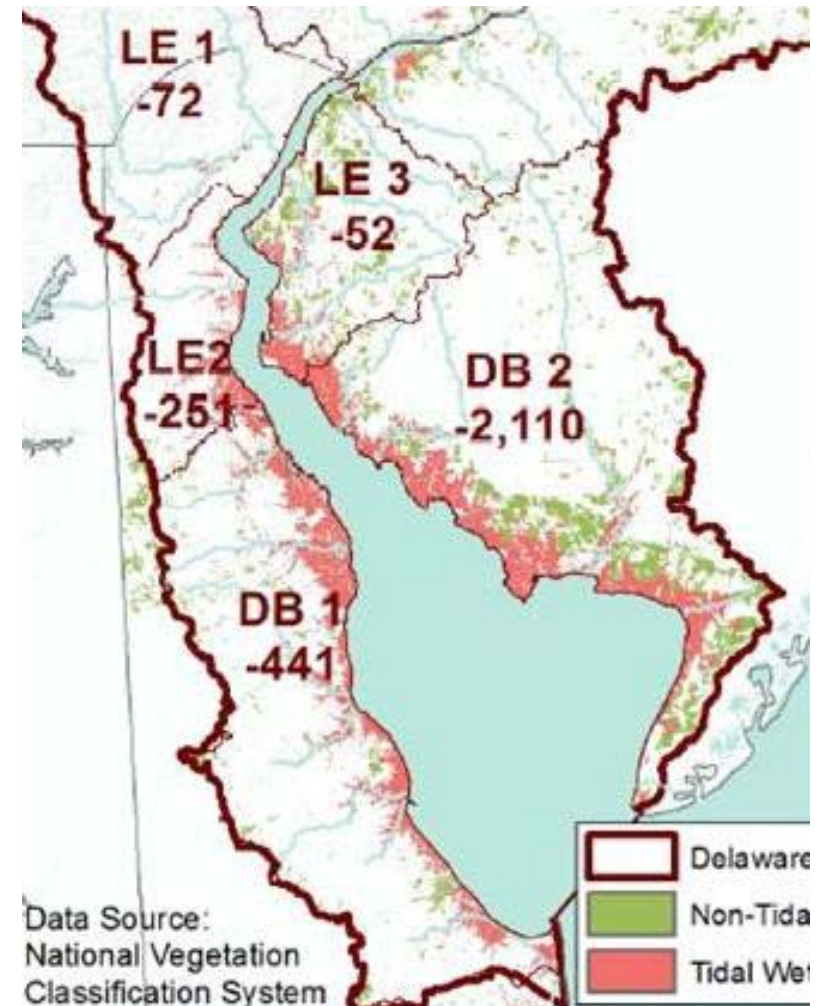
- Losing ~1 acre per day in the Delaware Estuary
- Loss rates greatest in NJ
- Losses due to various stressors



Sources:

Technical Report for the Delaware Estuary and Basin, 2012

Science Summit 2013

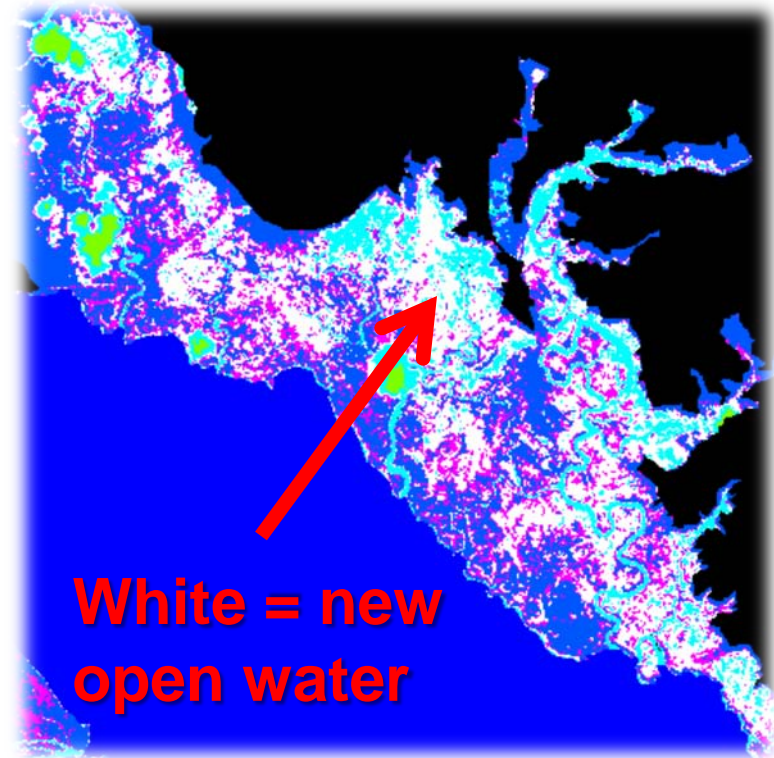


Two Decline Patterns

Edge Erosion (Horizontal)

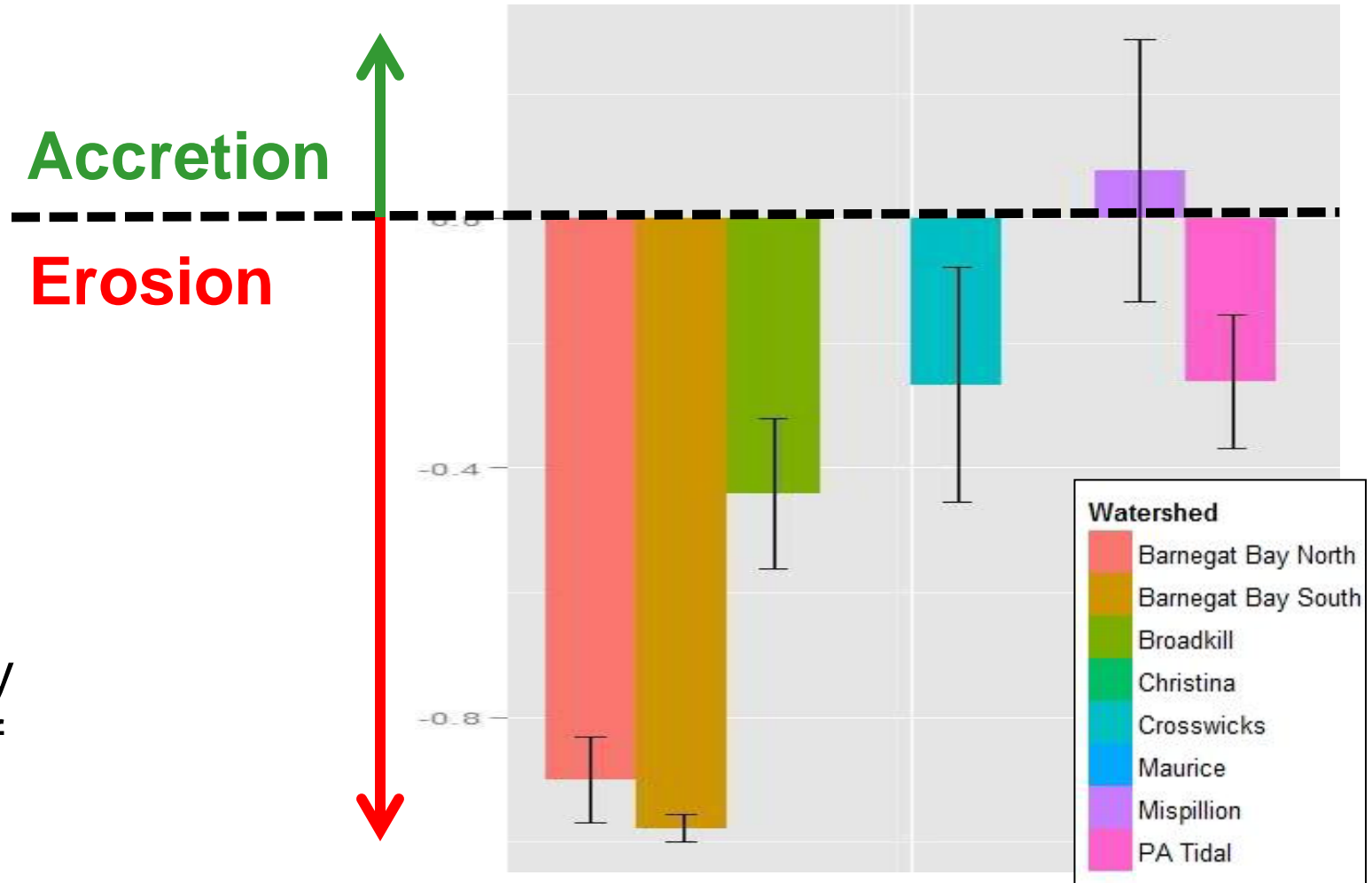


Interior Drowning (Vertical)



Source: Riter and Kearney 2009

Erosion (Horizontal Loss)

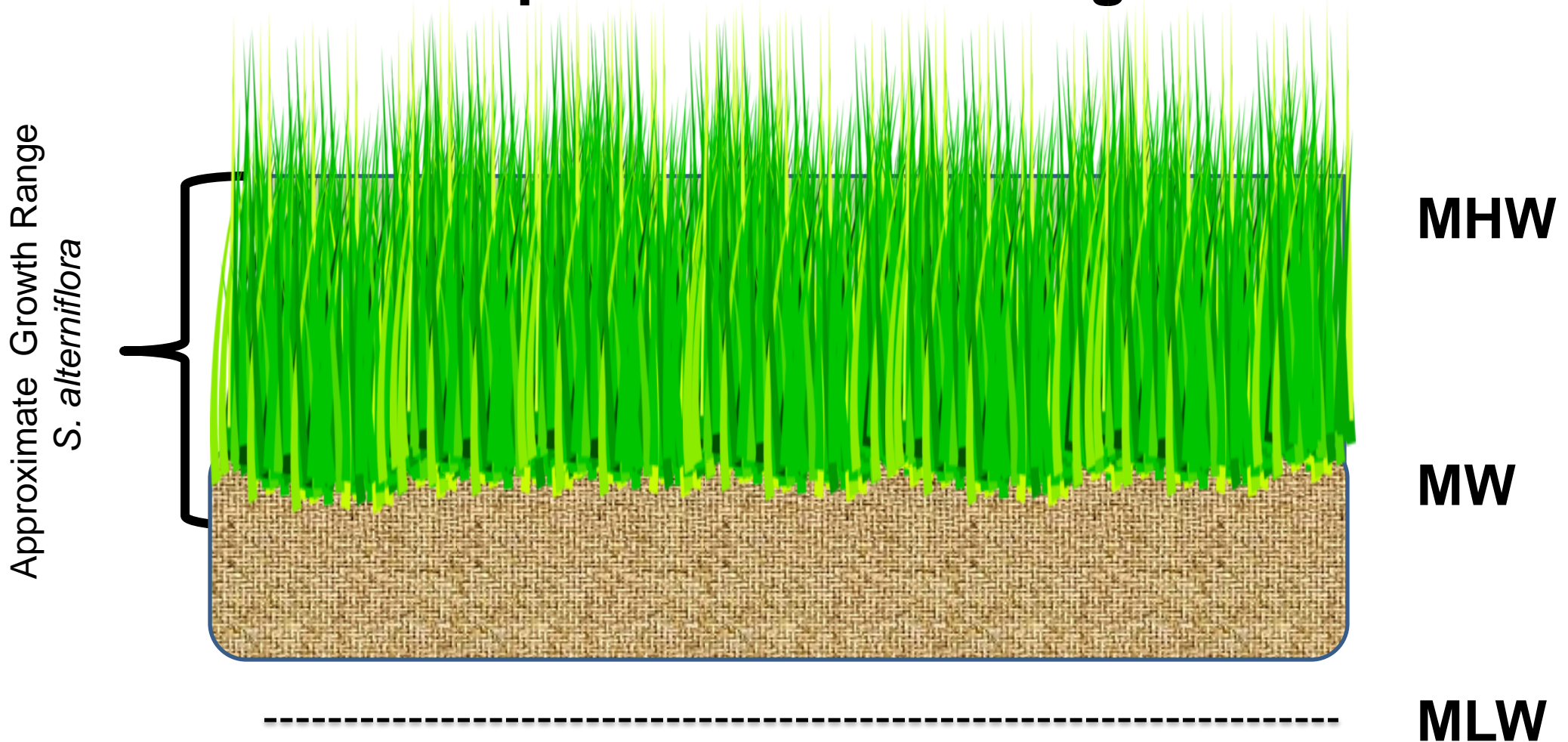


see poster by
LeeAnn Haaf

Source: MACWA 2014 Annual Report (draft)

Drowning (Vertical Loss)

- Plants Have Optimal Growth Ranges



Slide adapted from James Morris

Drowning (Vertical Loss)

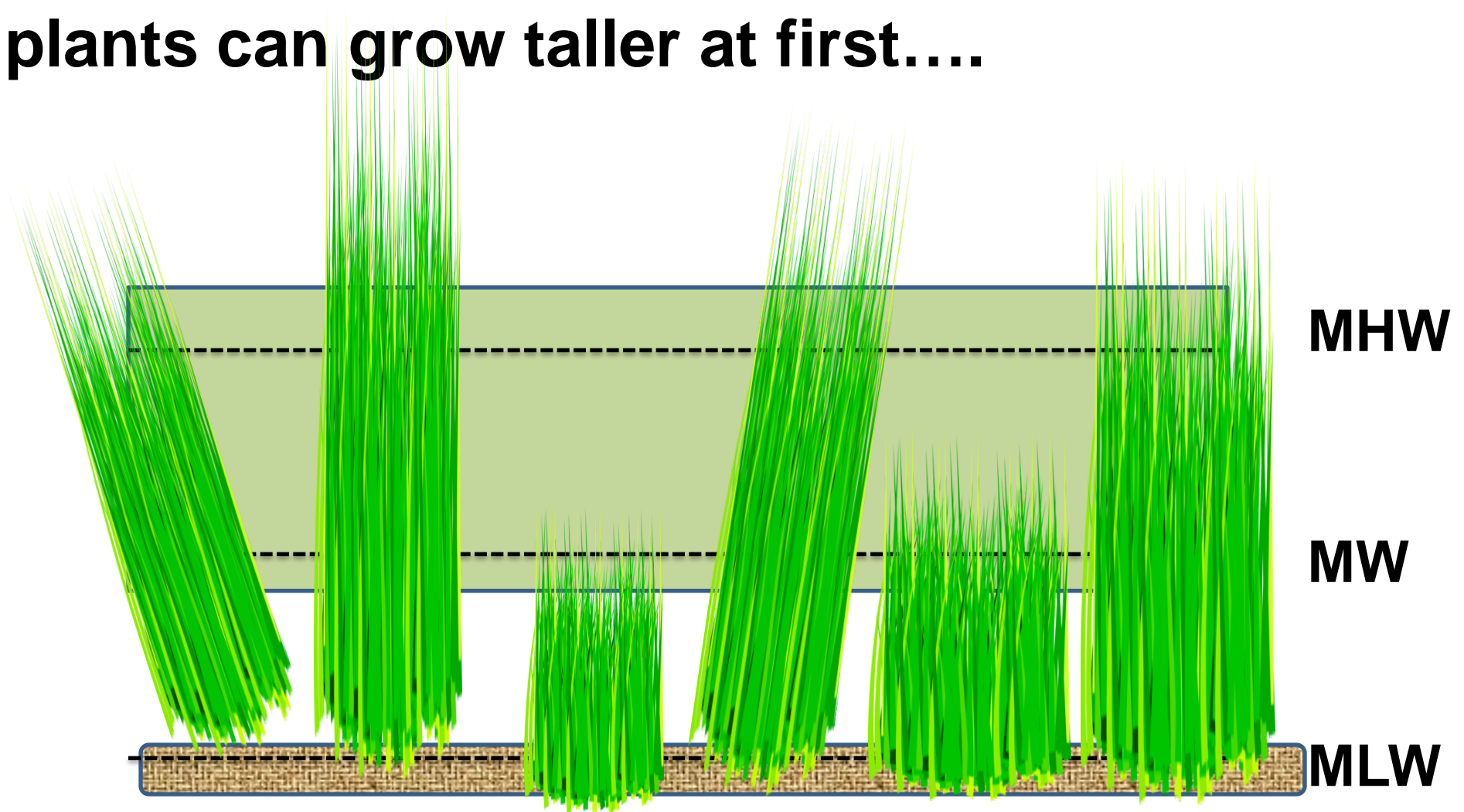
When rate of SLR > rate of (net) accretion



Slide adapted from James Morris

Drowning (Vertical Loss)

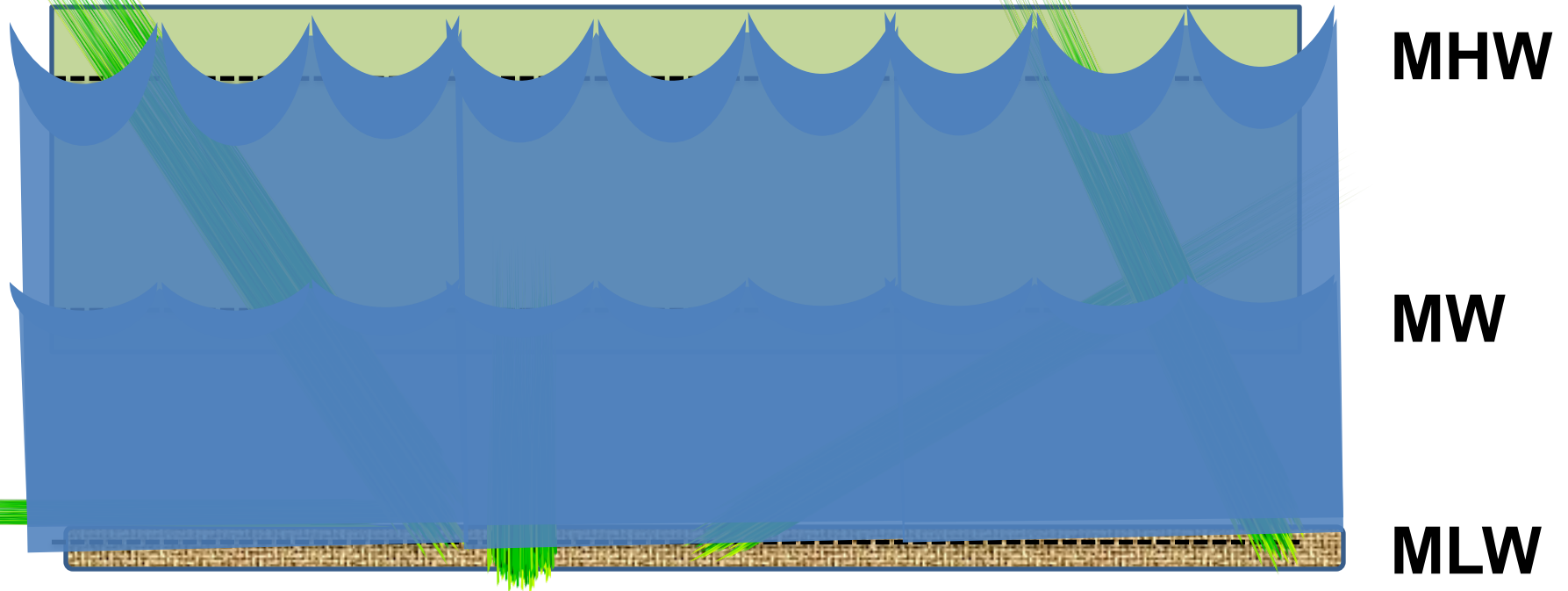
... plants can grow taller at first....



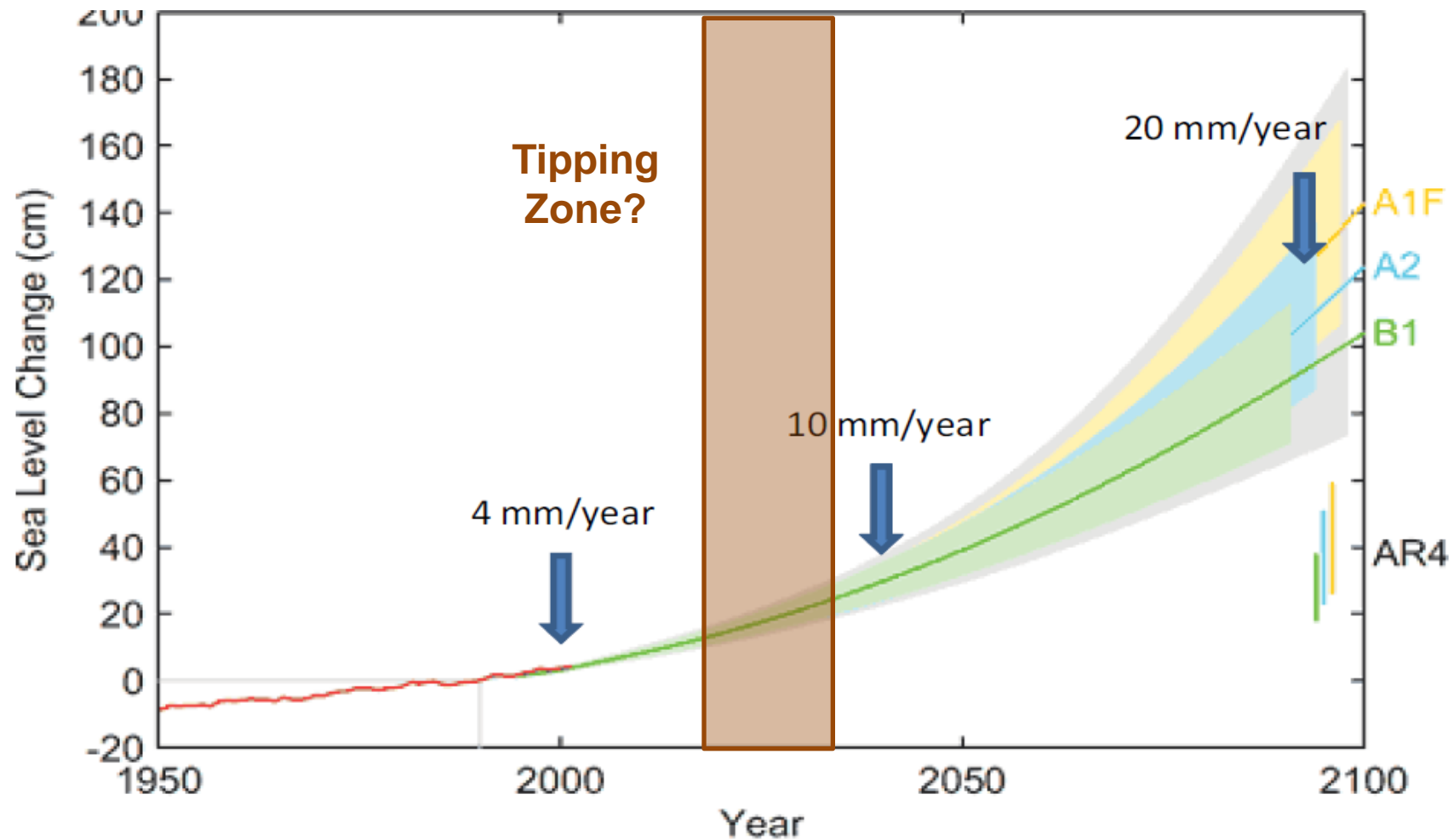
Slide adapted from James Morris

Drowning (Vertical Loss)

But eventually succumb



Future Challenges



Most Salt Marshes Cannot Survive When Sea Levels Rise >1 cm Per Year

Enhancement Tactics



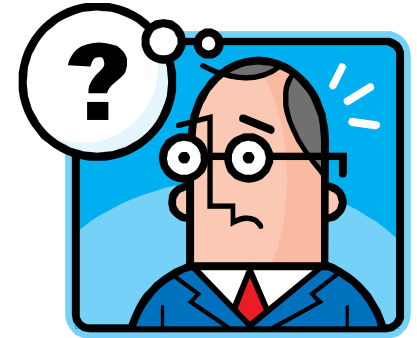
Oyster/Rock Breakwaters



Living Shorelines



Sediment Placement

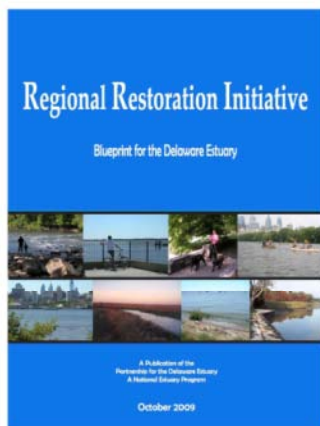
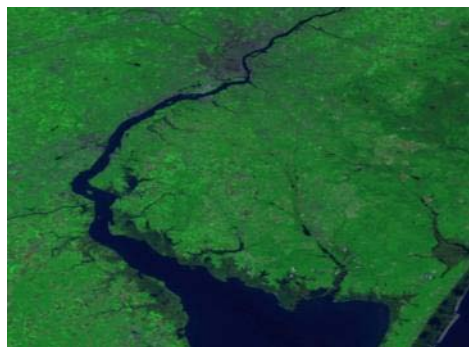


What Tactics?
Where Best?
Successful?

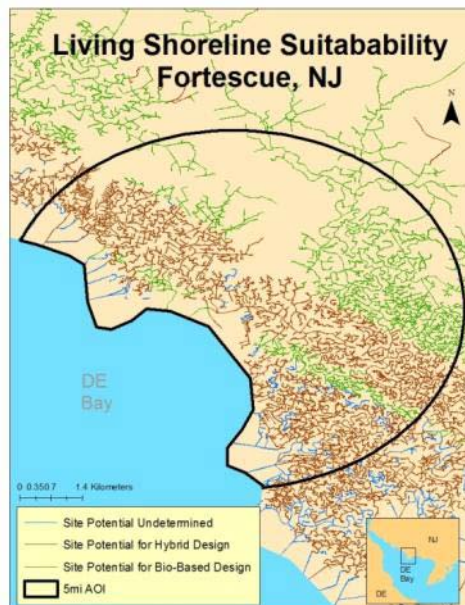


Strategic Investments

Regional Habitat Prioritization



Area Planning Desktop Data



Marsh Futures

Local Planning Field Data



Goal & Desired Outcome

Goal: Develop a field-based rapid assessment method to guide suitable projects that enhance salt marsh integrity

Outcomes:

- Refined Vulnerability Maps
 - reflect horizontal/vertical processes
- Project Guidance Maps
 - reflect temporal/spatial needs
- Three Demo Areas of Interest

**Local Site
Planning**

**Verified
Conditions**

Approach

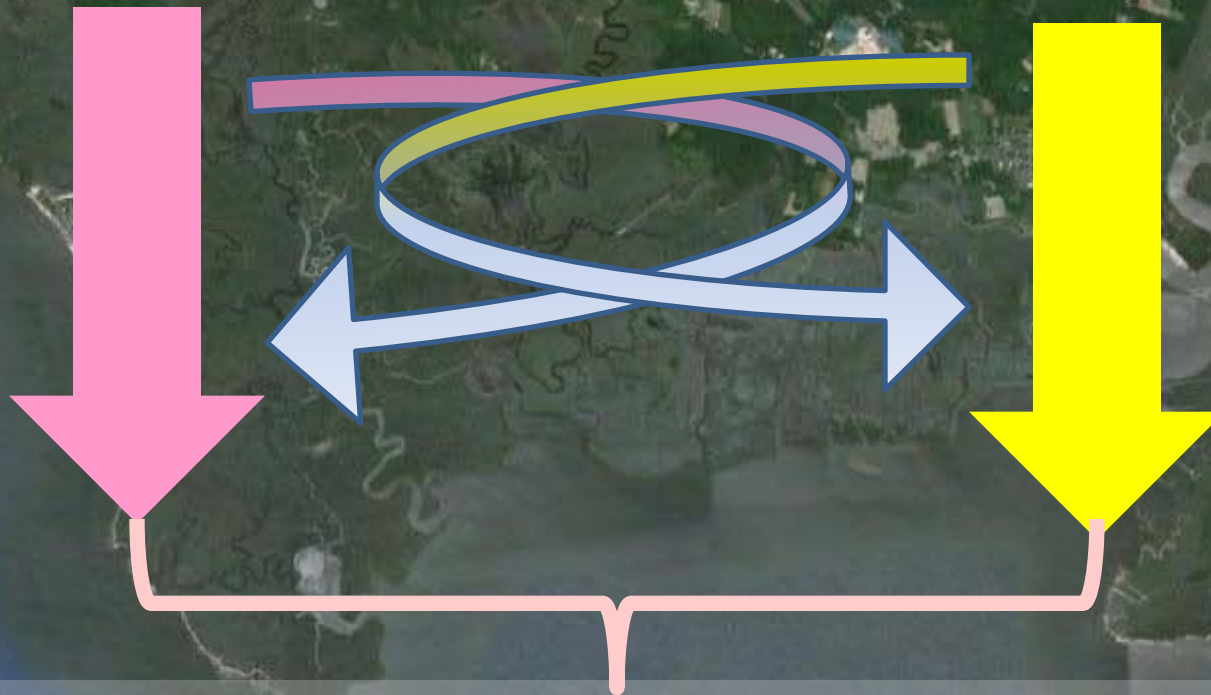
- 1. Focus on Marshes that People Care Most About**
e.g., areas that protect communities, roads
- 2. Analyze Desktop Data**
e.g., aerials, LIDAR
- 3. Refine Data with Rapid Field Assessments**
e.g., RTK, substrate & vegetation condition
- 4. Map Vulnerability to Erosion & Drowning**
- 5. Map Recommended BMP Tactics**

1. Select Marshes of Interest

Bayshore Sustainable Infrastructure Planning Project (BAYSIPP)



Community
Interests/Needs

Environmental
Needs/Options

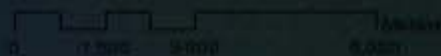


Effective Resilience Projects in Places
People Care Most About

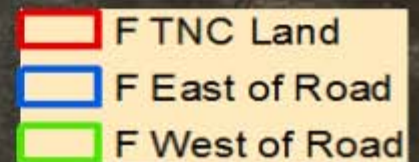


-  Maurice River
-  Fortescue
-  MoneyIsland_GandysBeach

BaySIPP Areas of Interest



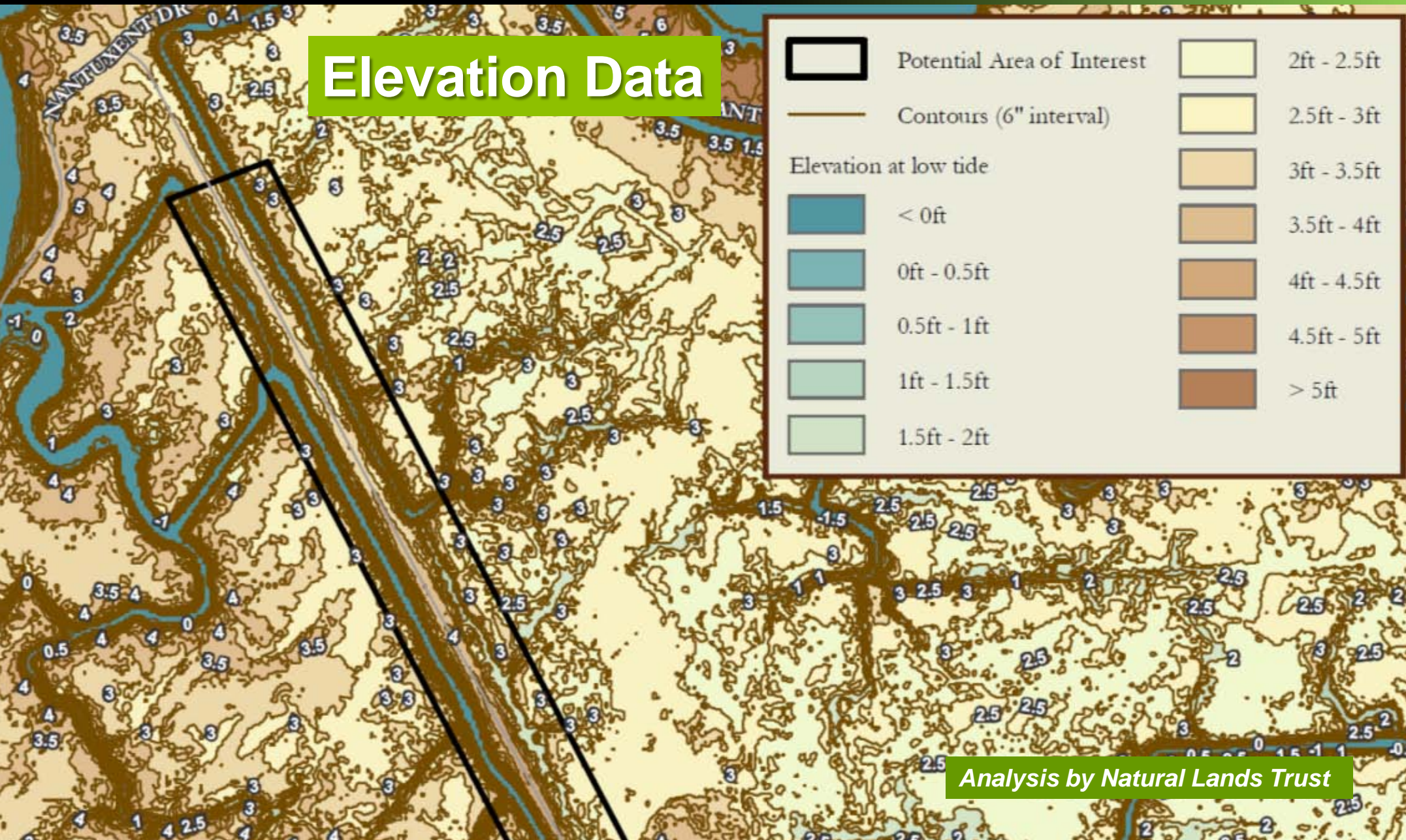
Source: Esri, DigitalGlobe, GeoEye, iSat, USDA, USGS, AEX, © mapping, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community



Source: ERI, Dig2Map, GeoEye, GeoEye, Inc., USA, USGS, Aerial, Earthmapp, Aerogrid, IGN, IGN, swatch, and the USGS Community.

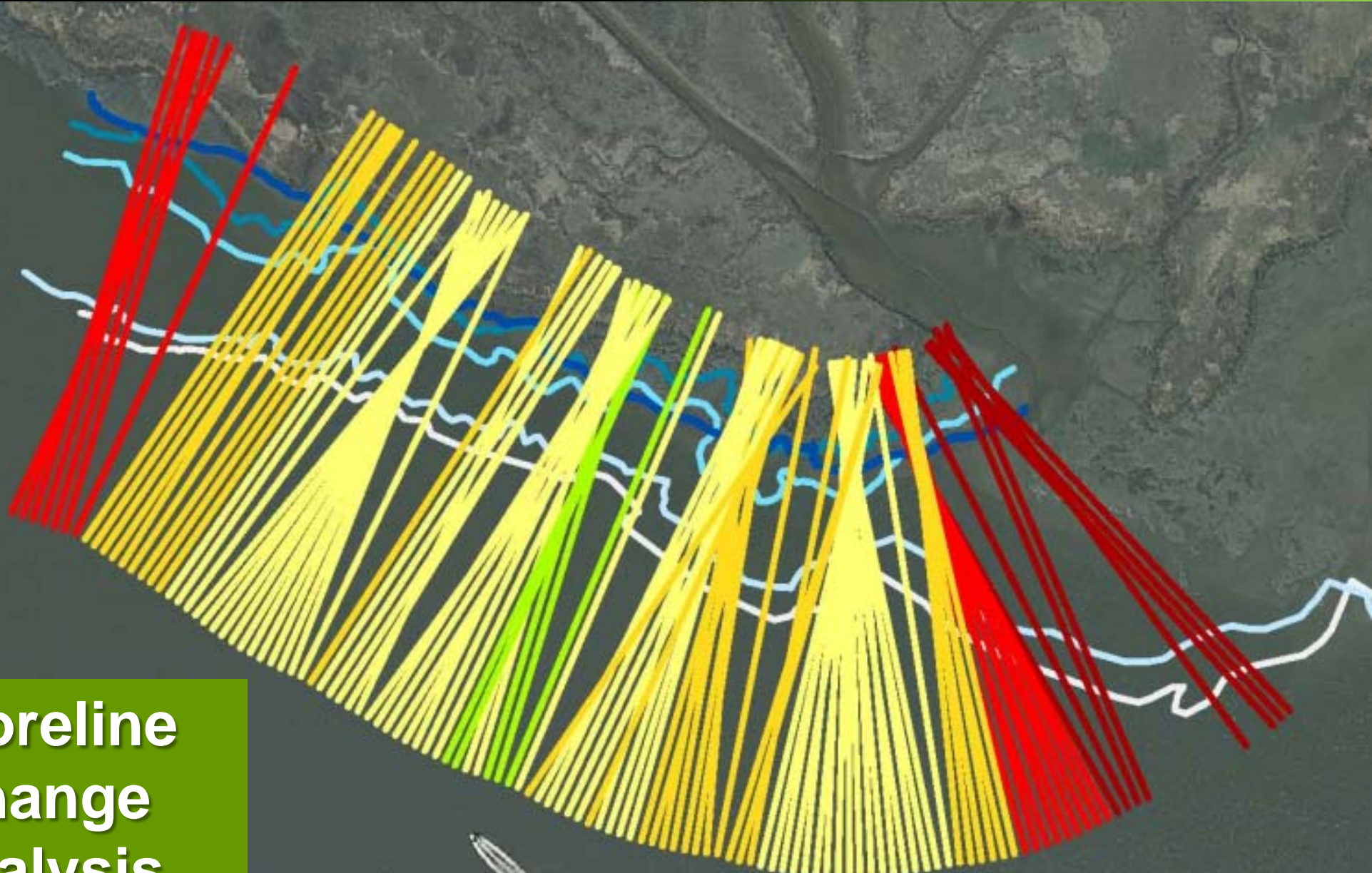
2. Desktop Analyses

Elevation Data



2. Desktop Analyses

Shoreline
Change
Analysis



Natural Lands Trust Analysis using USGS Digital Shoreline Analysis System

3. Rapid Field Assessments

Physical – elevation, slope, erosion, substrate firmness

Biological – blade height, light penetration



Happy, Healthy Plants on
Living Shoreline



Unhappy Plants on
Nearby
Living Shoreline

see talk by Josh Moody – Tues. pm

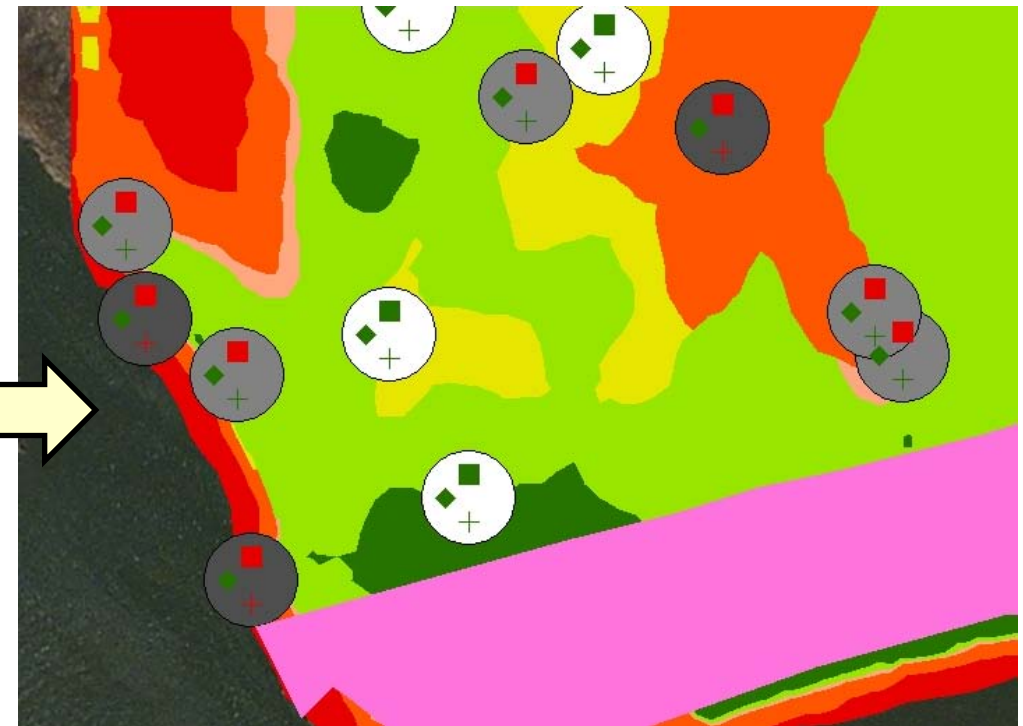
see poster by Moody & Cole

4. Vulnerability Mapping

Combine data on plant
growth ranges and elevation

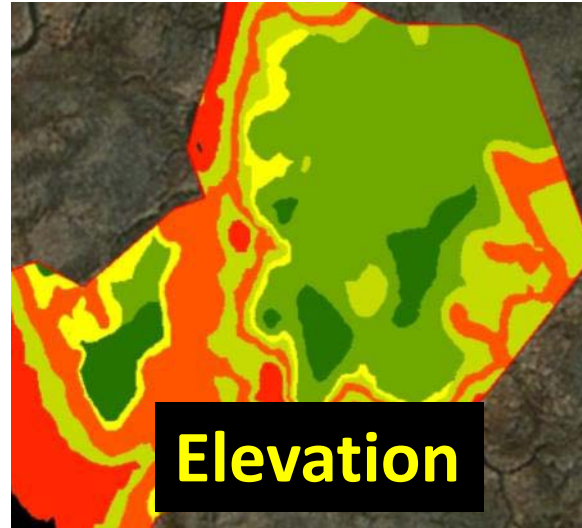
Elevation Capital Mapping

Weighted measures adjusted elevations
(unitless)



4. Vulnerability Mapping

Drowning Risk



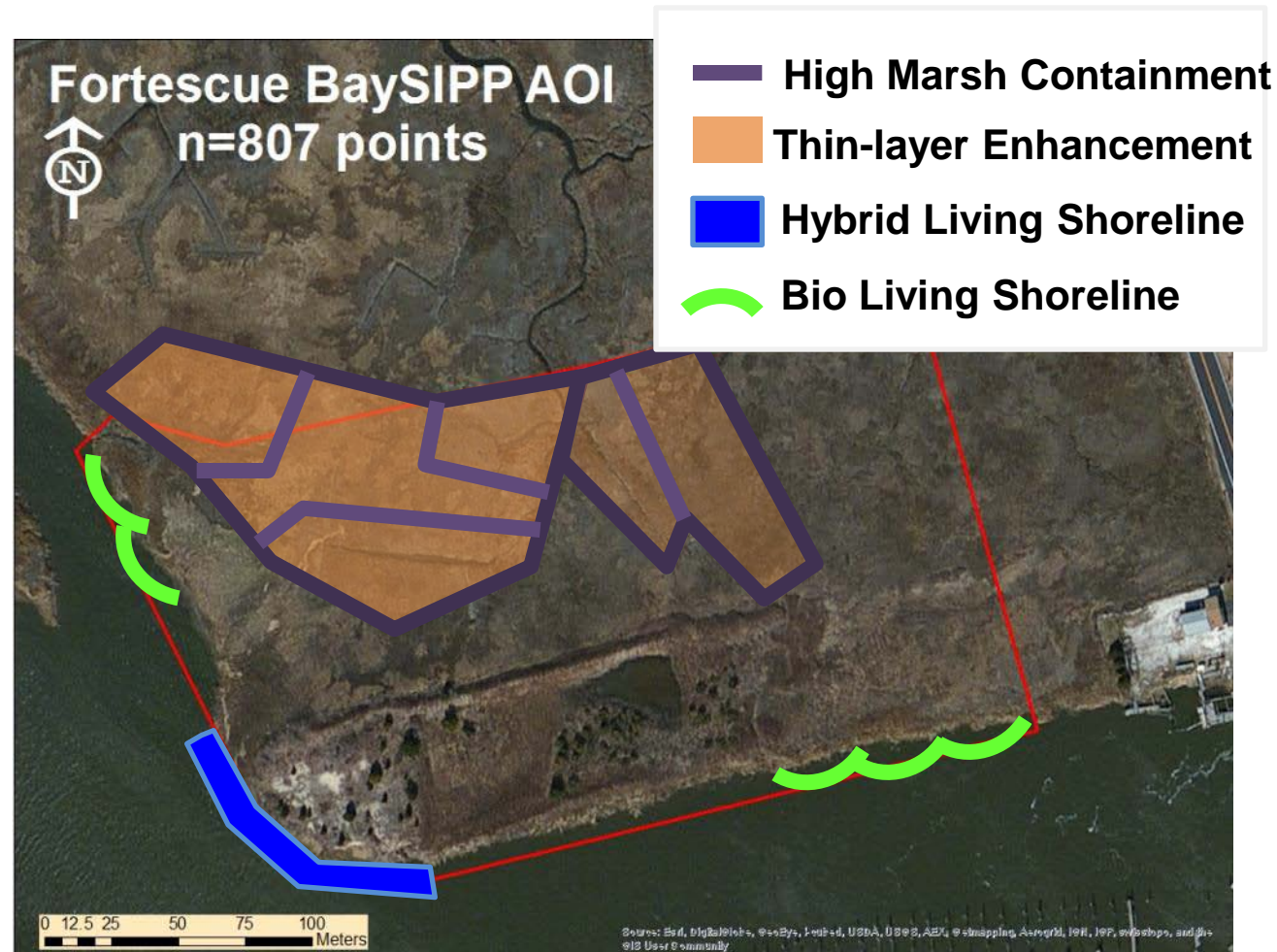
Erosion Risk



5. Project Guidance Mapping

**Where will
various
investments
yield greatest
outcomes?**

**What should be
the sequence of
interventions?**



Results – Vulnerability Maps

Edge Erosion Risk

Maurice >> Fortescue > Money Island

Interior Drowning Risk

Fortescue > Money Island > Maurice

Hydrological Impairment

Money Island > Fortescue > Maurice

Results – BMP Maps

Maurice:

Living Shorelines (aggressive mix needed)

Fortescue

Thin Layer Sediment (in low spots)

High Marsh Containment

Living Shorelines (to maintain)

Money Island

Hydrological Connectivity? (more study needed)

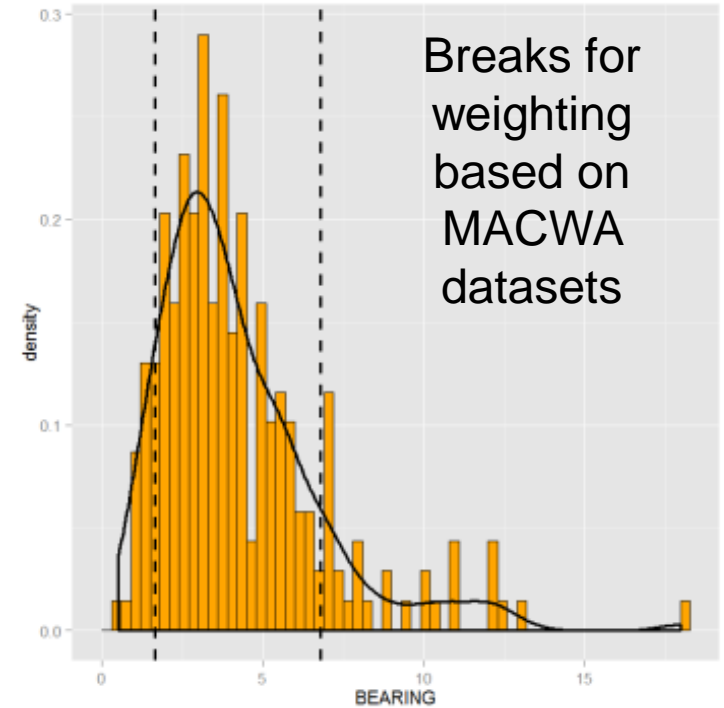
High Marsh Containment

Caveat: Recommendations are only for the study area



Next Steps

- **Refine Metrics for Elevation Capital Maps**
- **Streamline Field Effort to Expand to Larger Areas**
- **Link to Project Design and Performance Monitoring**
- **Test in More Places with Varying Conditions**



Conclusions

- Coastal wetlands are vital for coastal resilience in the Delaware Estuary and vicinity
- They are in decline and increasingly vulnerable
- Strategic planning for projects is needed due to limited resources
- Marsh Futures is a promising, science-based approach for refining desktop planning outputs
- Marsh Futures outputs can guide restoration decisions at the local scale, and help gauge success



Acknowledgements

Funding: New Jersey Recovery Fund

Project: Creating a Sustainable Infrastructure Plan for the South Jersey Bayshore

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Kathy Ireland

Barney Hollinger



Technical Assistance:

LeeAnn Haaf (PDE)

Jacqueline Jahn (TNC)

Angela Padeletti (PDE)

[For More Info](#)

PDE Report No. 15-03. Marsh Futures: use of scientific survey tools to assess local salt marsh vulnerability and chart best management practices and interventions. <http://delawareestuary.org/sciencereports>

