MARSH VULNERABILITY INDEX

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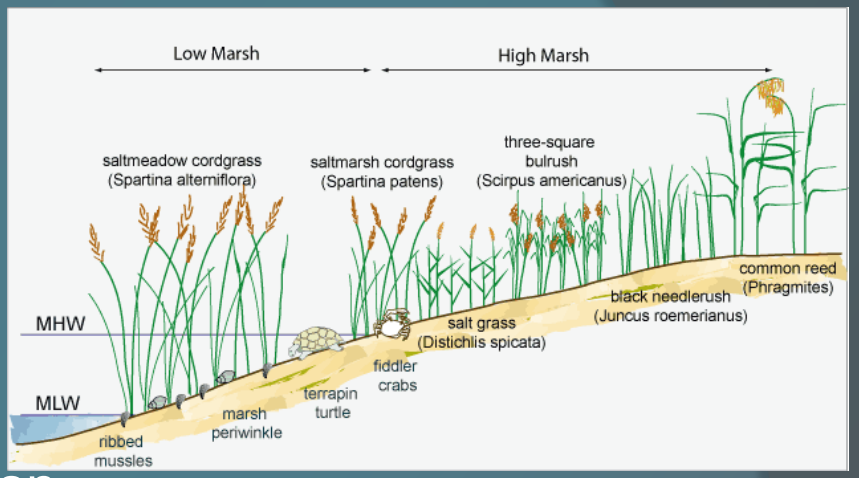
Purpose

- Develop optimal growth range for *Spartina alterniflora* salt marshes in Delaware
  - Most common Halophyte in Delaware's marshes
- Develop means to evaluate status of short-form *Spartina alterniflora* marshes
  - Standardized means of data collection and analysis
- Method to evaluate marsh vulnerability, determine relative timelines for collapse, setting priorities for potential restoration, and developing engineering criteria for restoration (i.e. restore marsh to this level).

Marsh “Organs”

Smooth Cordgrass or Saltmarsh Cordgrass

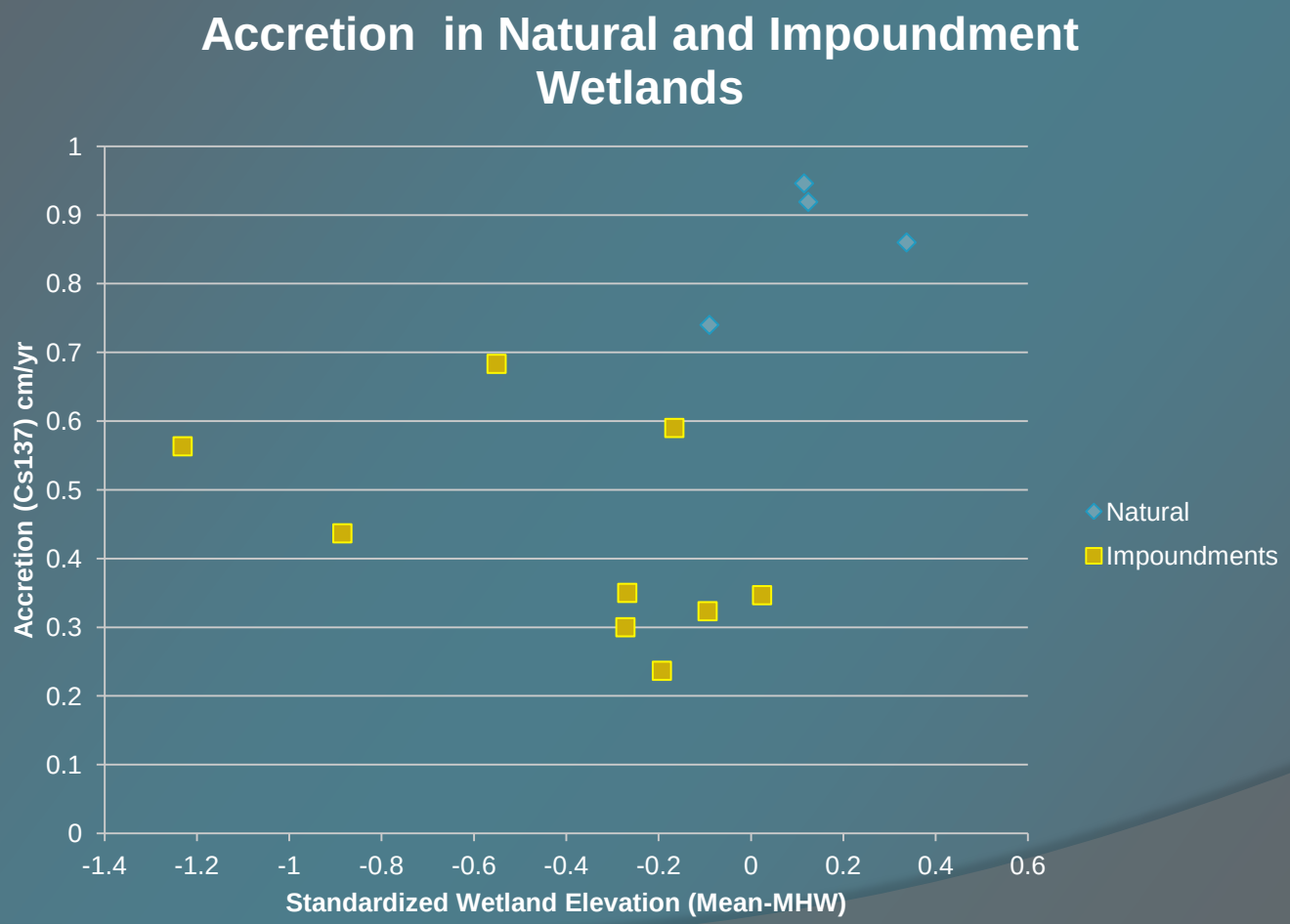


- Marsh surface and tidal surface elevation relationship is one of the ultimate controls in dictating wetland flooding frequency, length of inundation, available and potential suspended sediment concentrations, and type and density of vegetation cover (Morris et al., 2002).

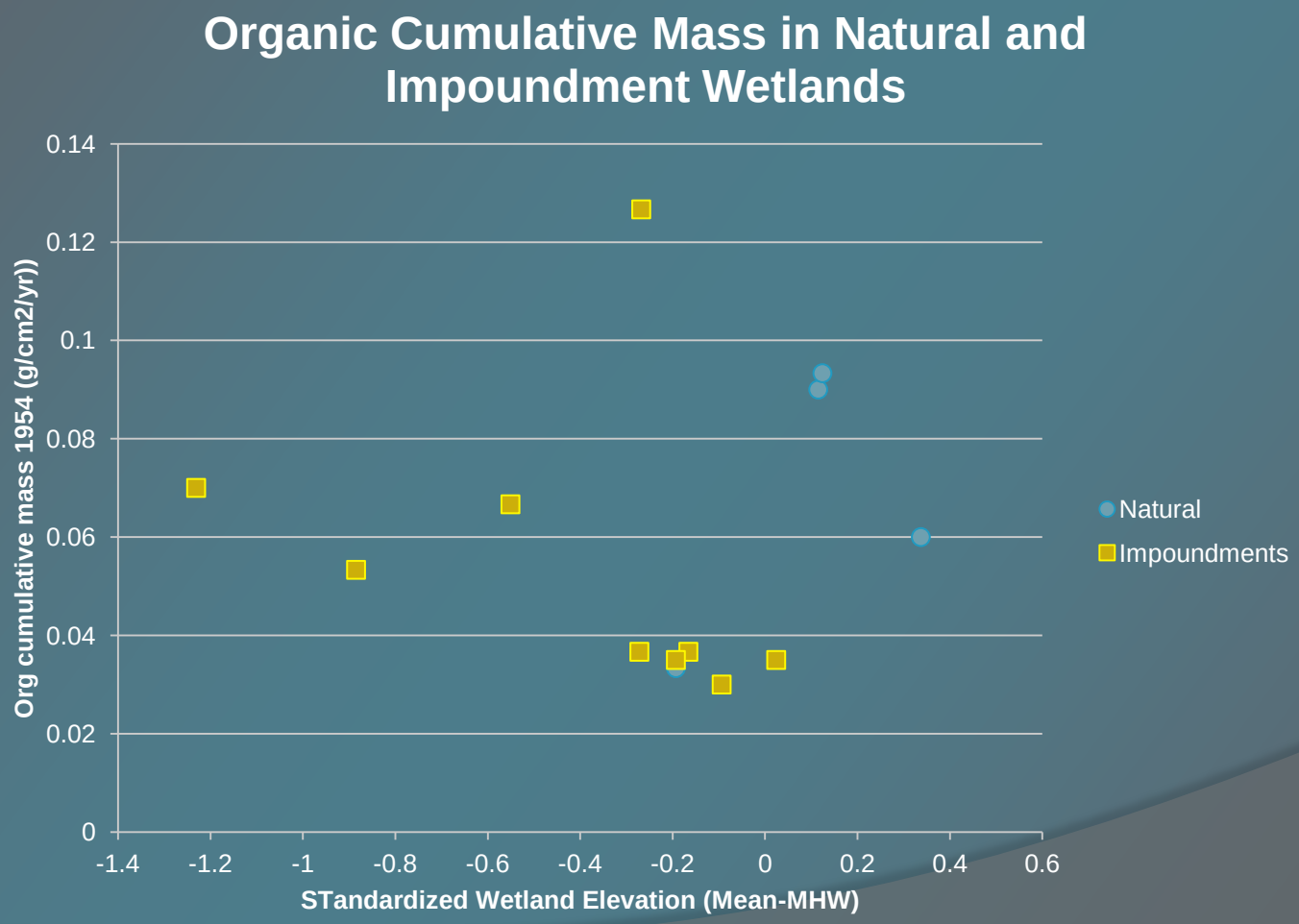
- “The Relationship of Smooth Cordgrass (*Spartina alterniflora*) to Tidal Datums: A Review” states that *S. alterniflora* tend to grow in relation to Mean High and Mean Low Water (McKee and Patrick, 1988)
  - Elevation of marsh platform within watersheds are dependant upon tidal datums

Morris et al. 2002

Why does organic matter production ....matter?



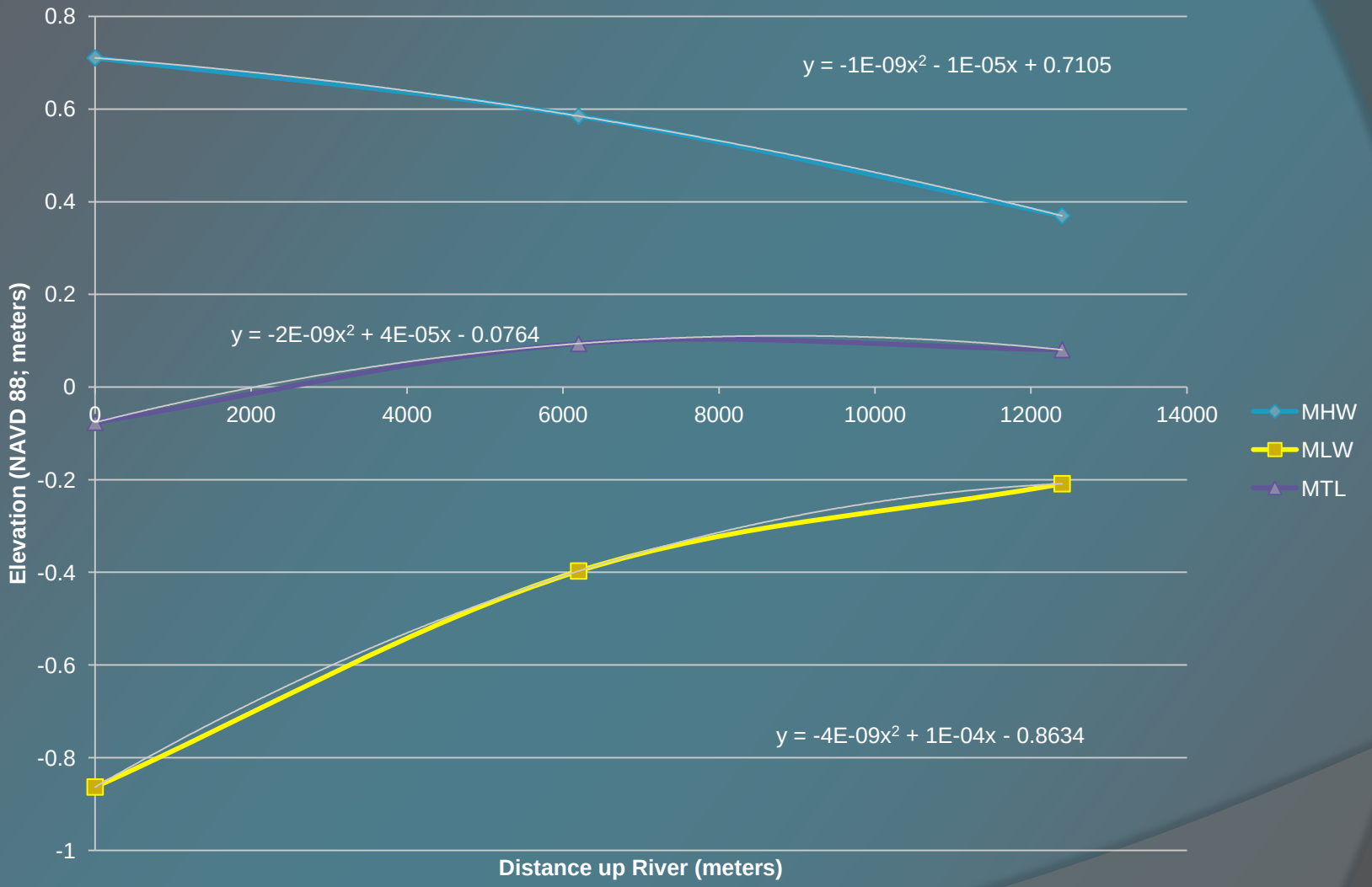
Why does organic matter production ....matter?



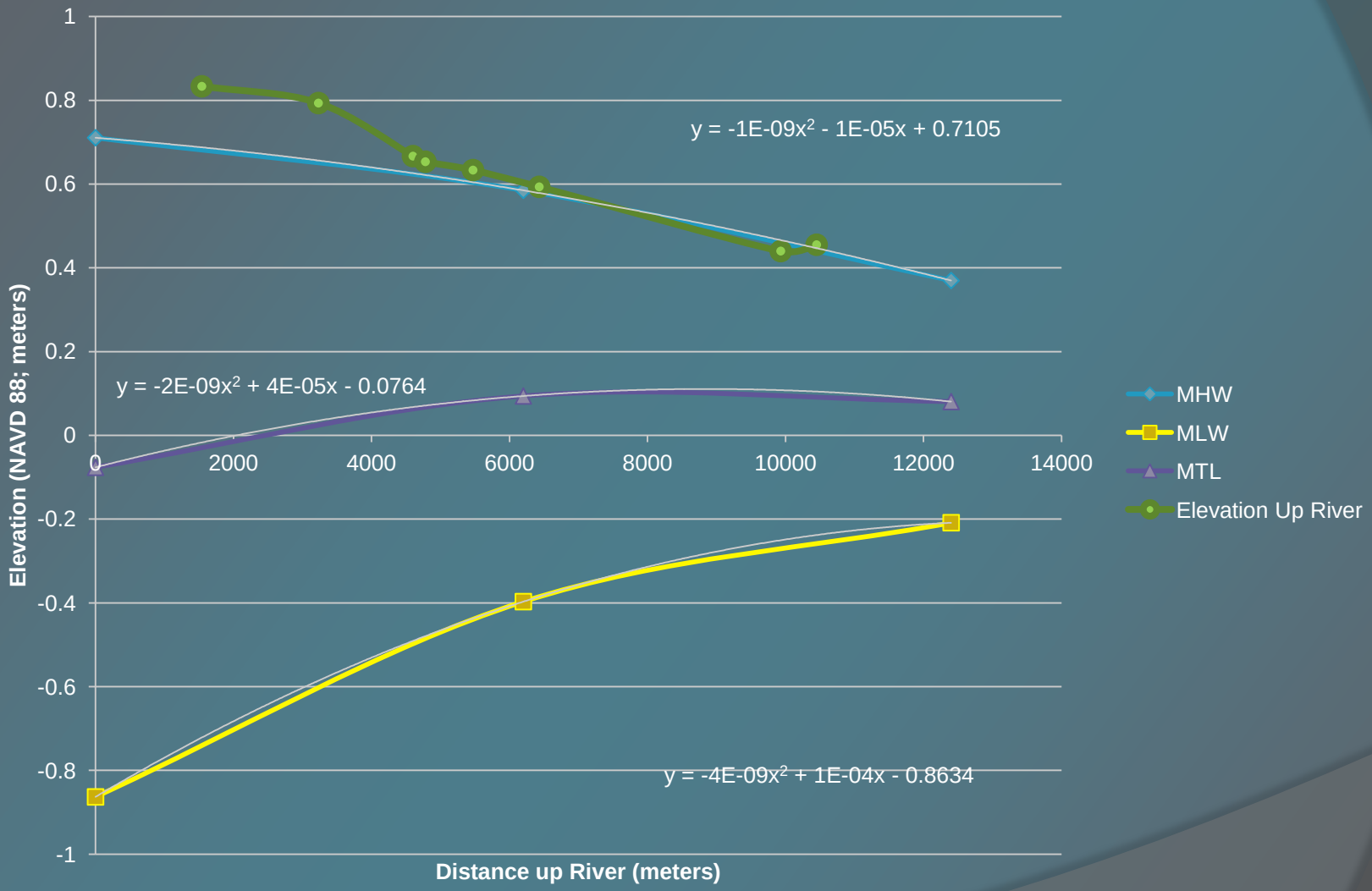
Methods

- Biomass Sampling
  - Three cores per site
  - Collect both above and below ground biomass samples
  - Sort and separate dead and alive plant matter
  - Perform simple statistics
  - Determine a “health correlation factor” for each watershed
  - Sampling methods utilized from MidTRAM
- Real-Time Kinematic (RTK) Survey
  - Provide elevation data for biomass sampling sites and additional *S. alterniflora* monotypic stands
  - Collect elevation data to help in correction of LiDAR vegetation error

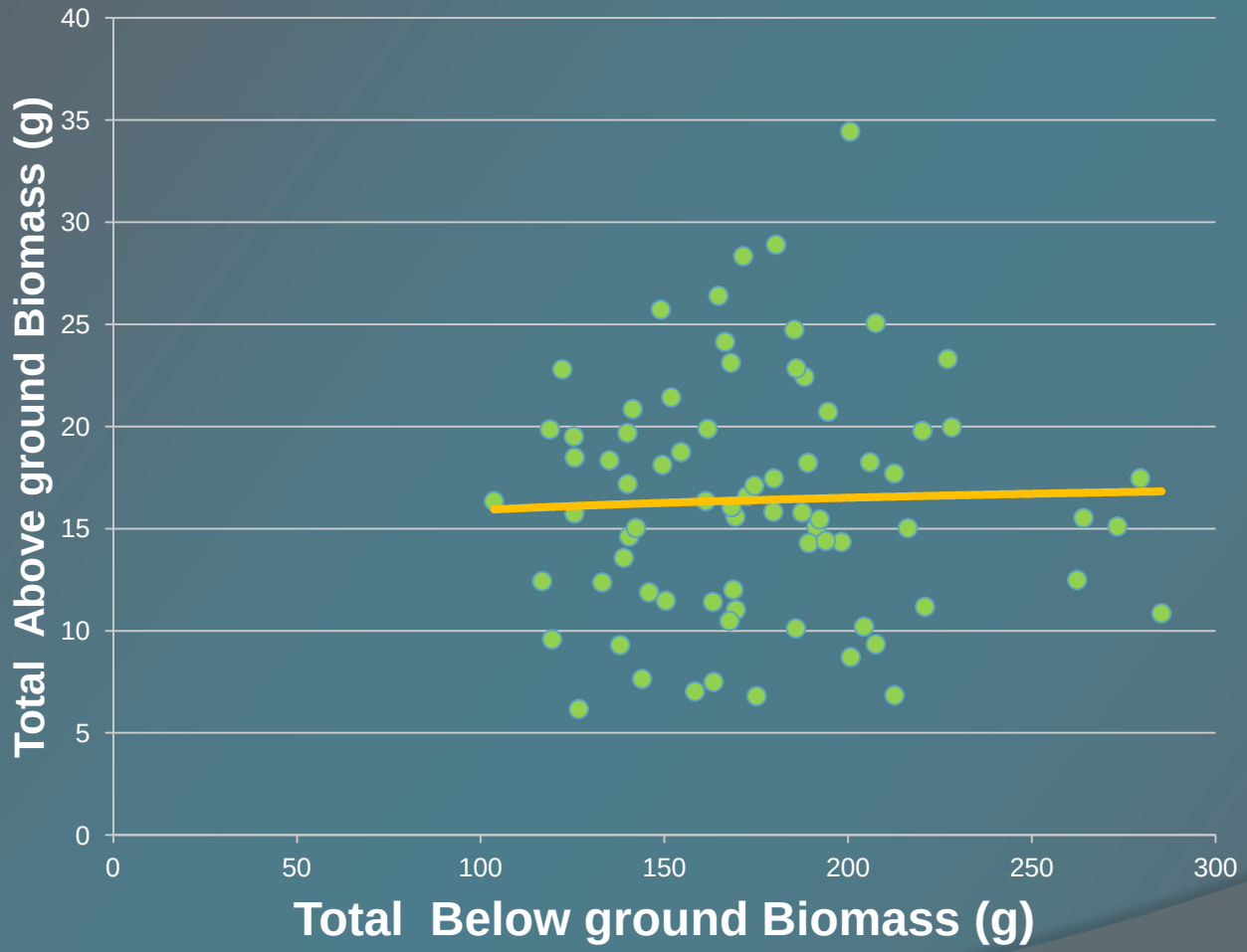
St Jones River



St Jones River

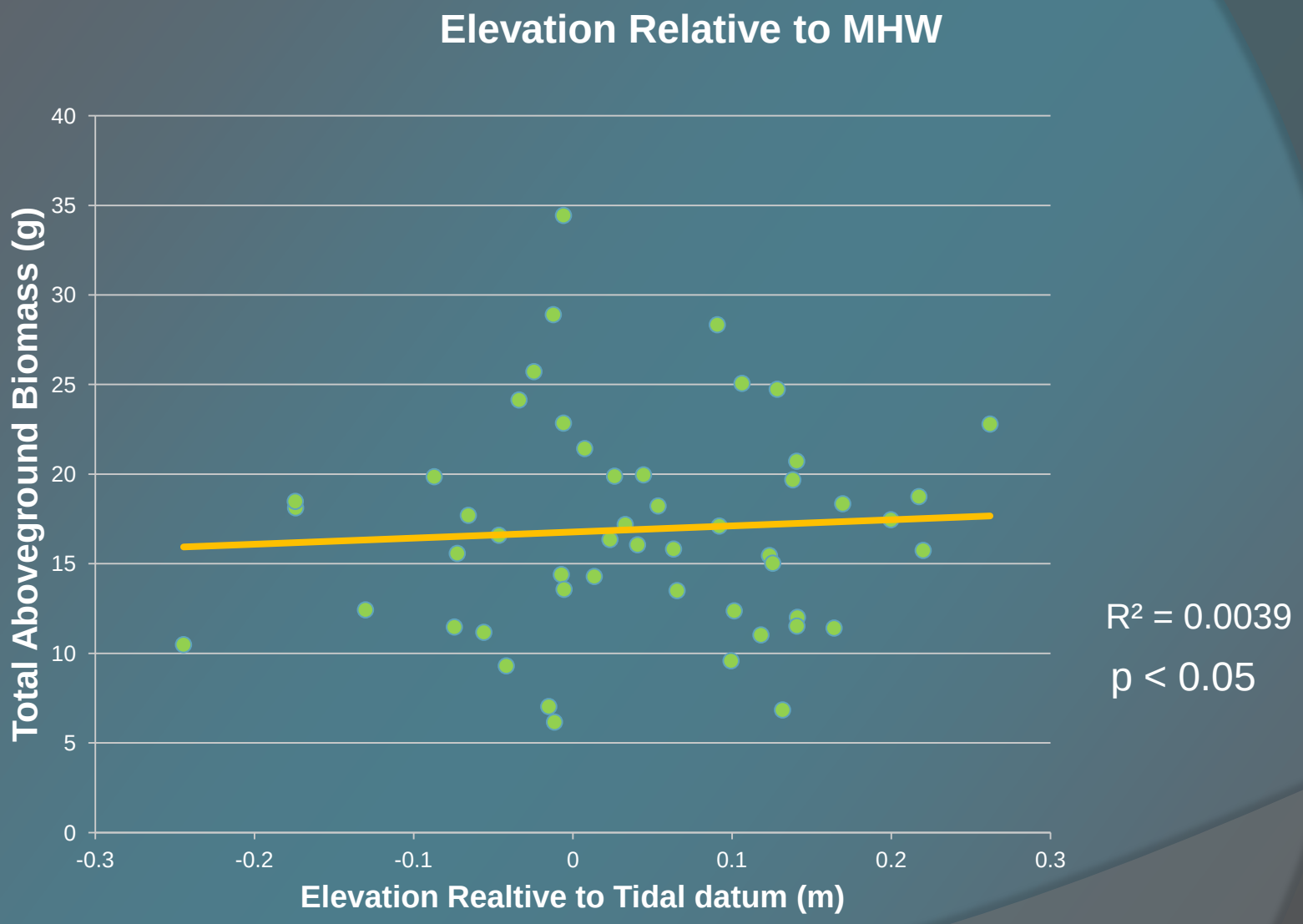


Below ground vs Above ground Biomass



$R^2 = 0.0011$

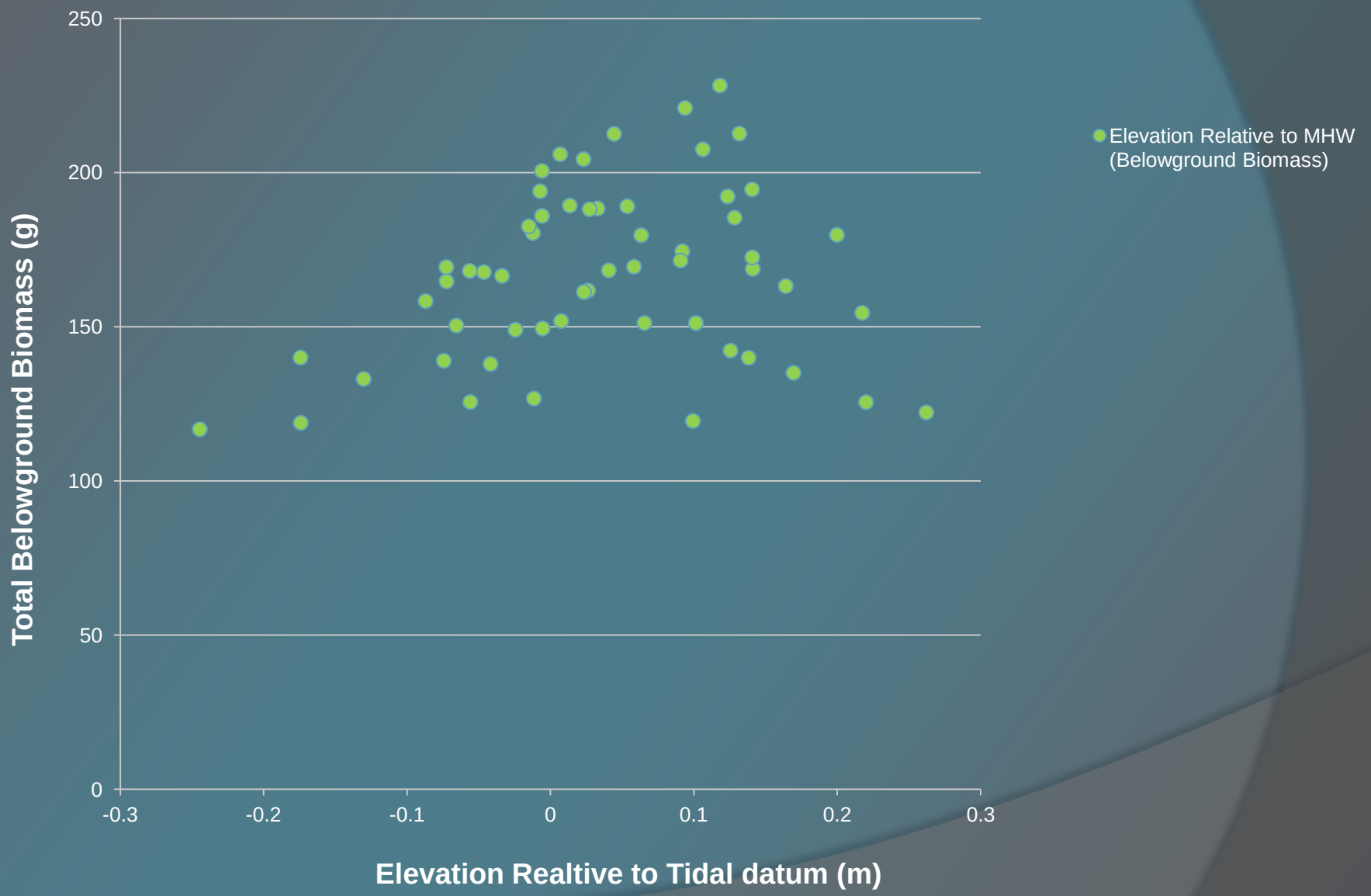
$p < 0.05$



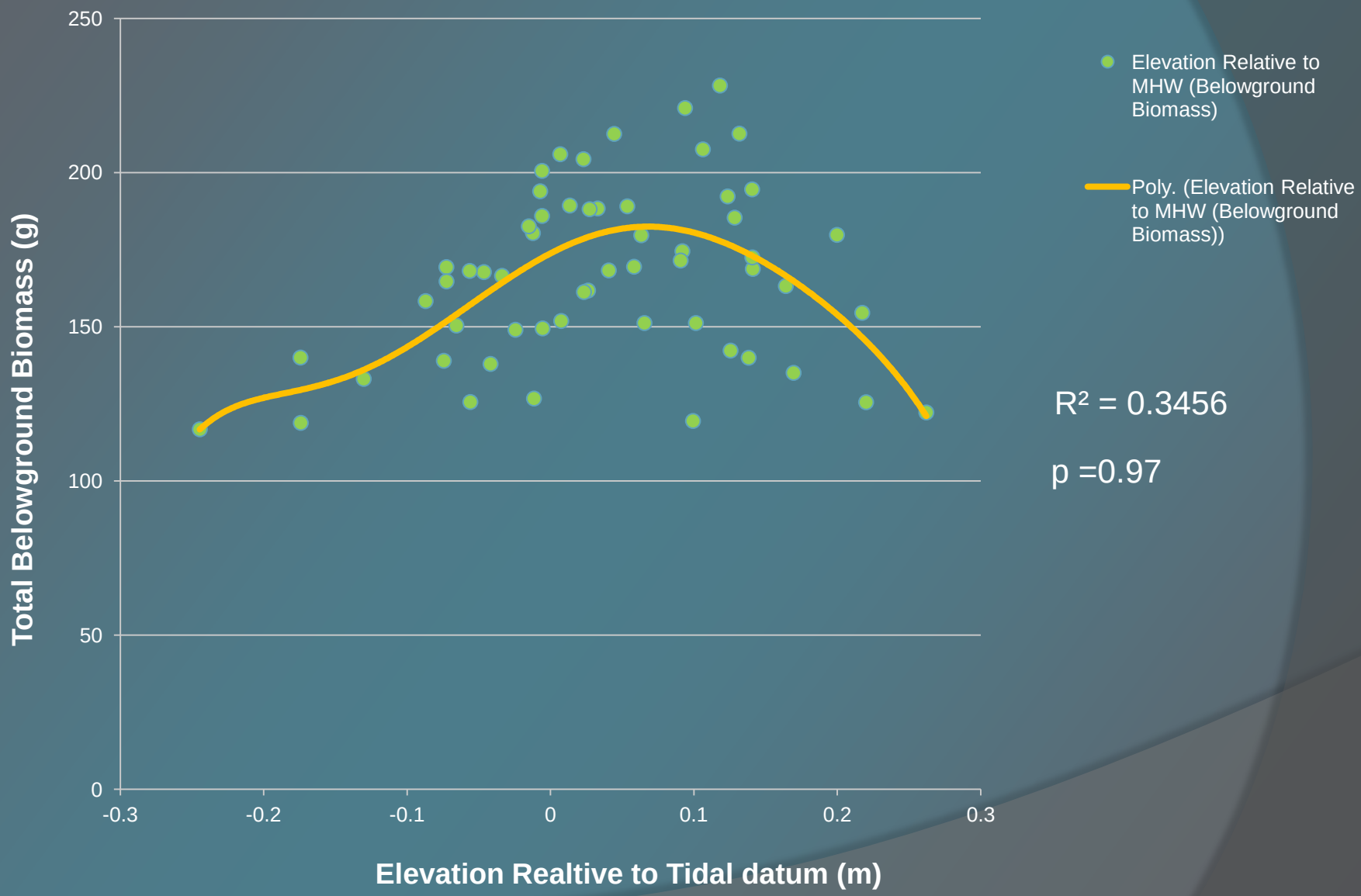
$R^2 = 0.0039$

$p < 0.05$

Elevation Relative to MHW



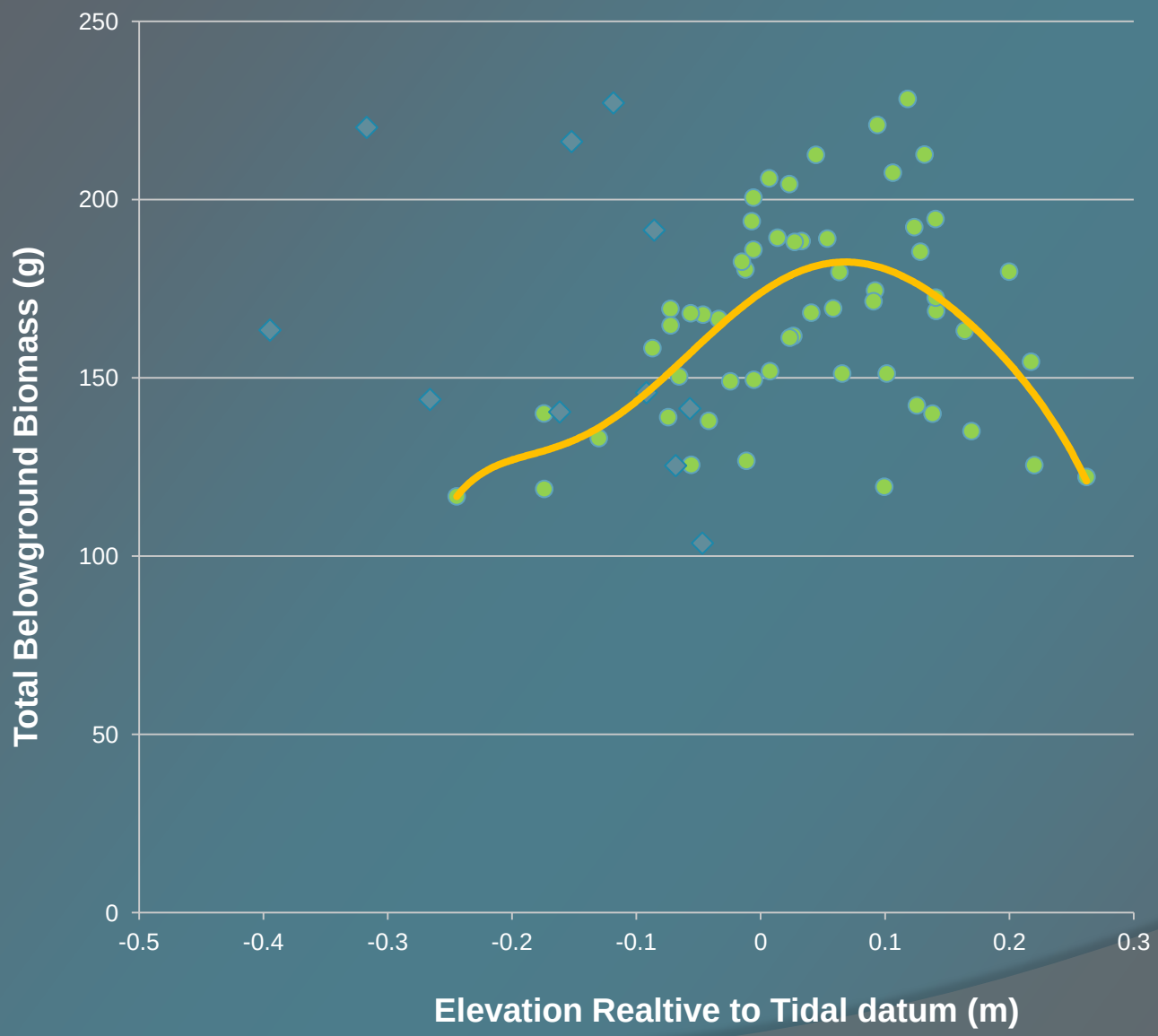
Elevation Relative to MHW



$R^2 = 0.3456$

p =0.97

Elevation Relative to MHW



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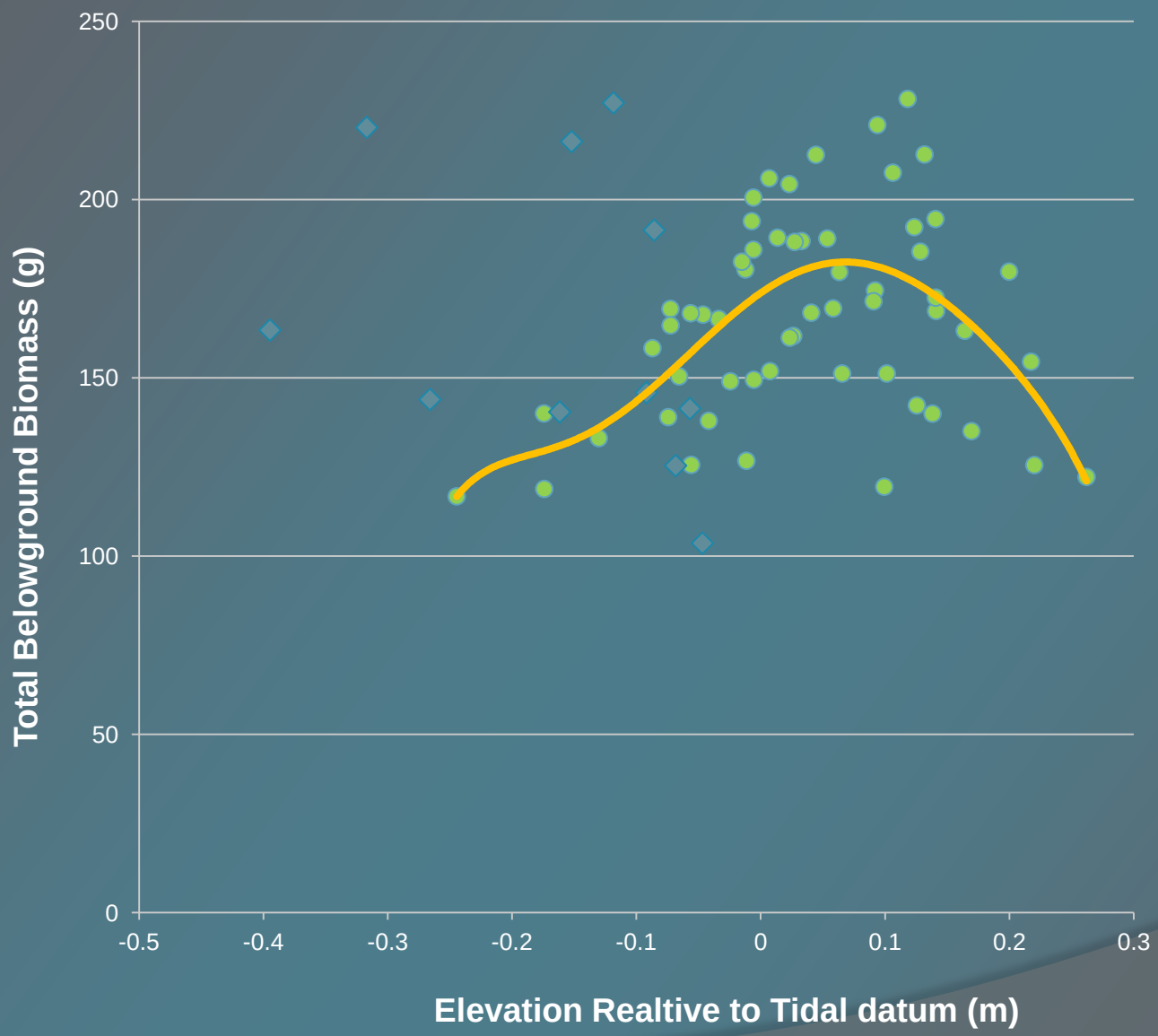
Elevation Relative to MHW



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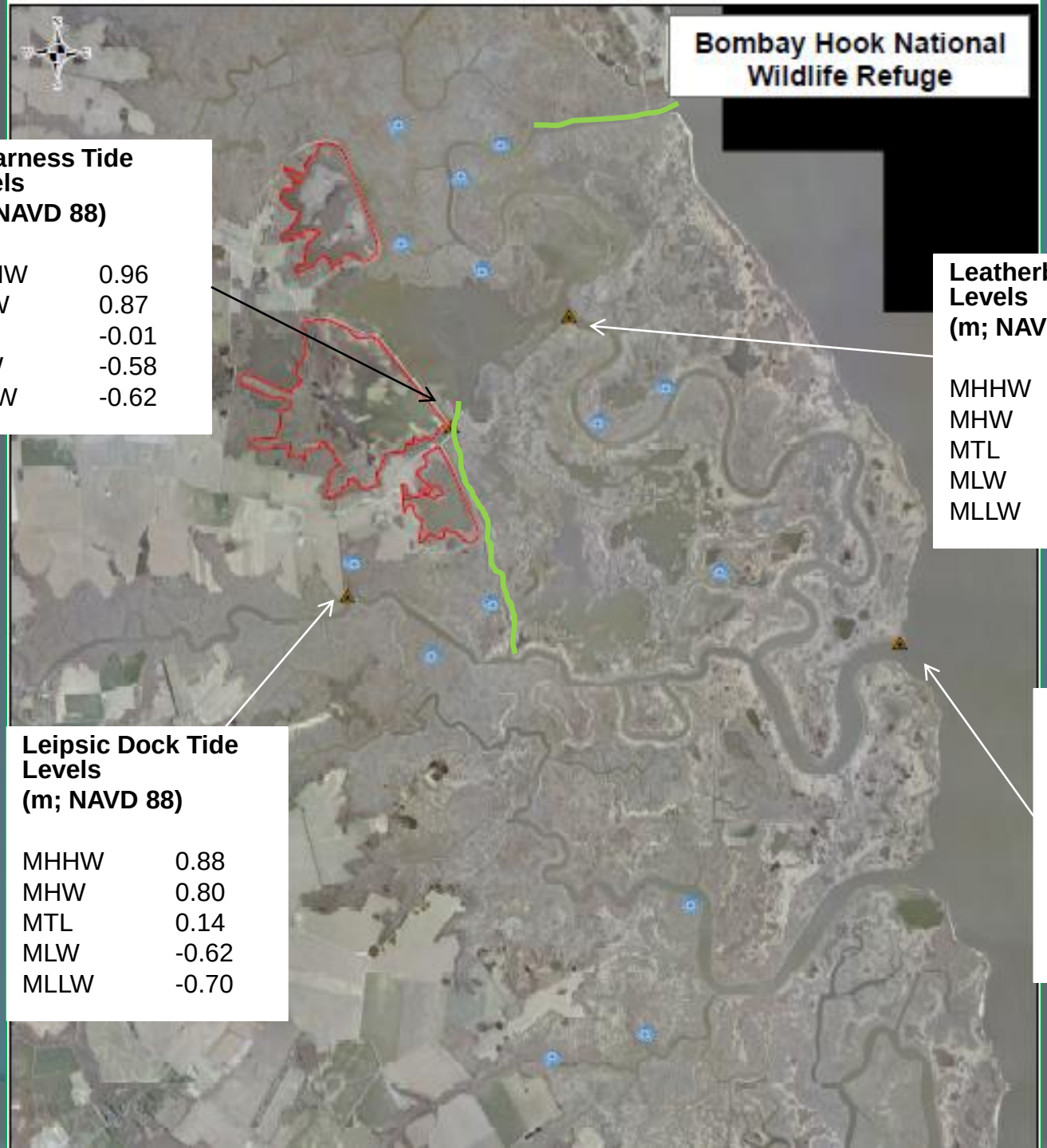


Shearness Tide Levels
(m; NAVD 88)

MHHW	0.96
MHW	0.87
MTL	-0.01
MLW	-0.58
MLLW	-0.62

Leatherberry Tide Levels
(m; NAVD 88)

MHHW	1.35
MHW	1.24
MTL	0.34
MLW	-0.63
MLLW	-0.70

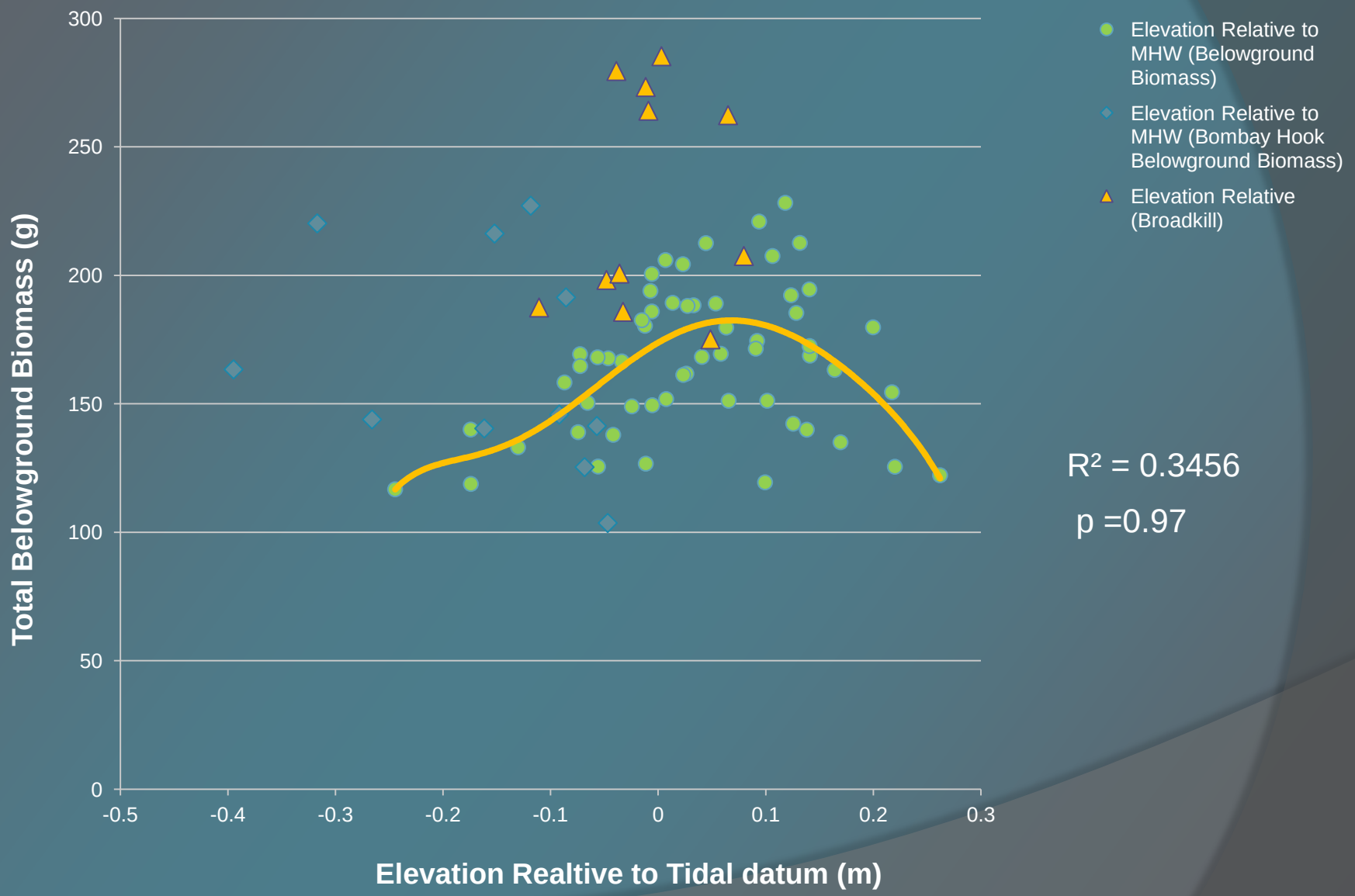
Leipsic Dock Tide Levels
(m; NAVD 88)

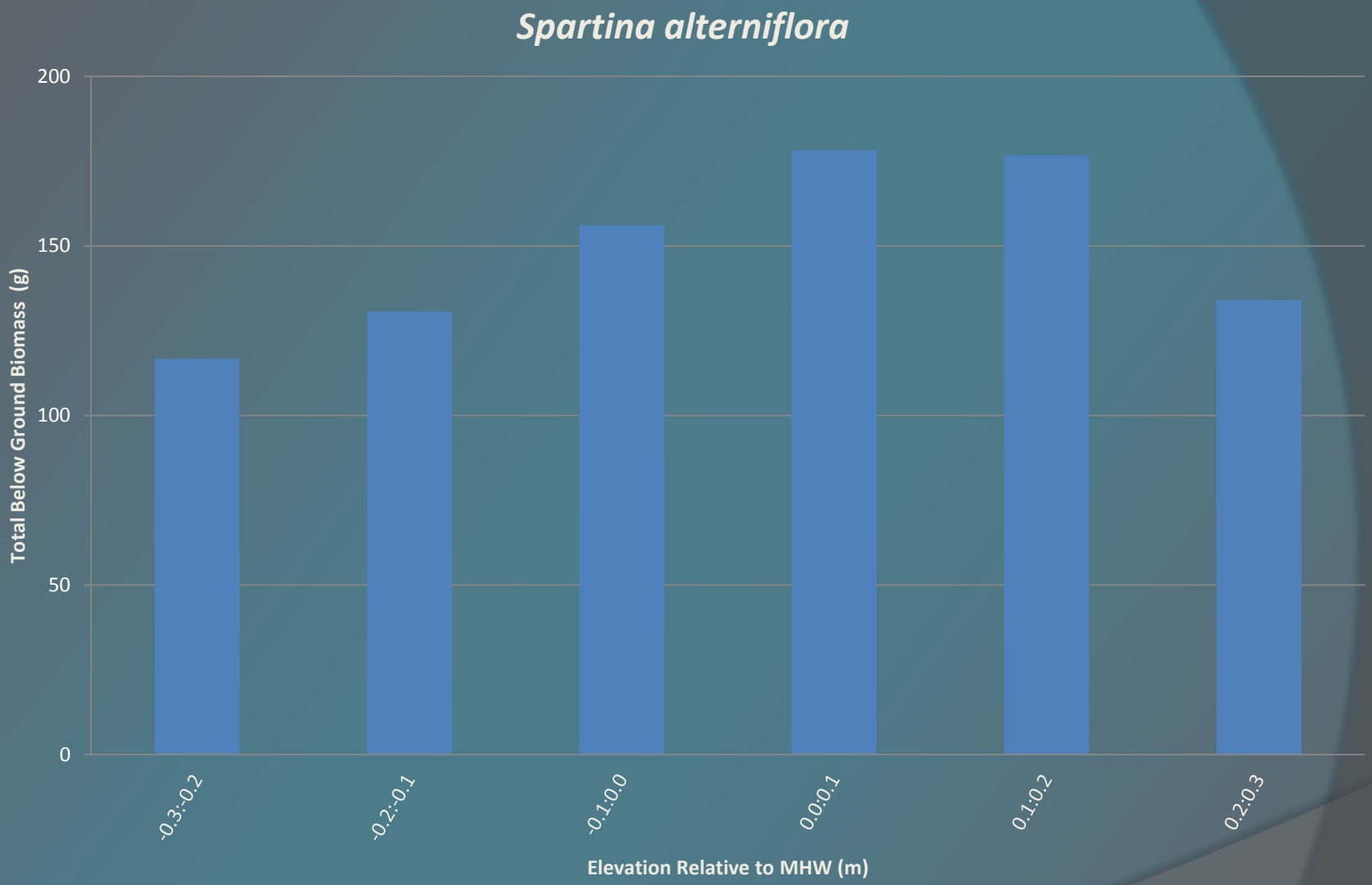
MHHW	0.88
MHW	0.80
MTL	0.14
MLW	-0.62
MLLW	-0.70

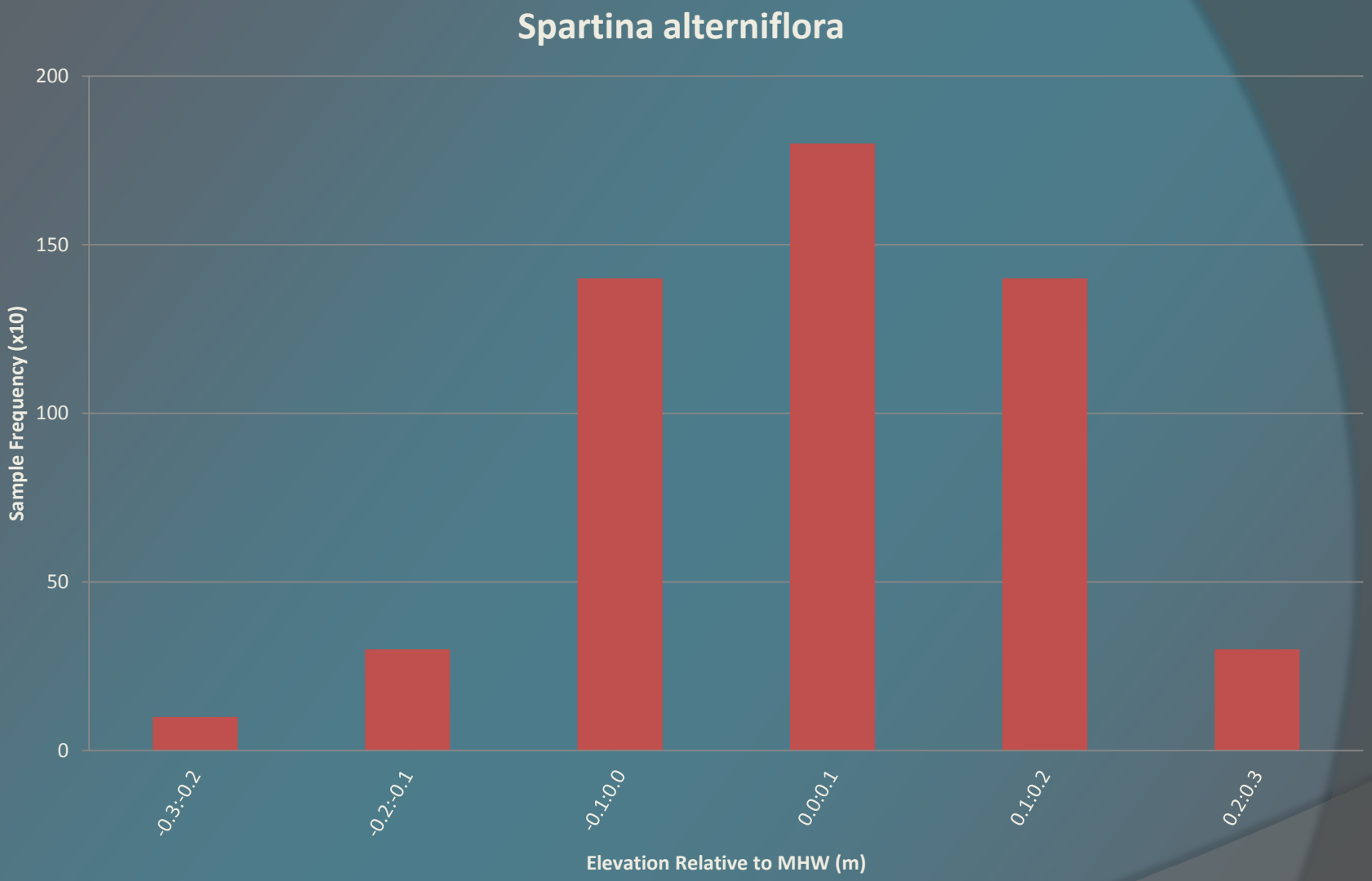
Nav Light Tide Levels
(m; NAVD 88)

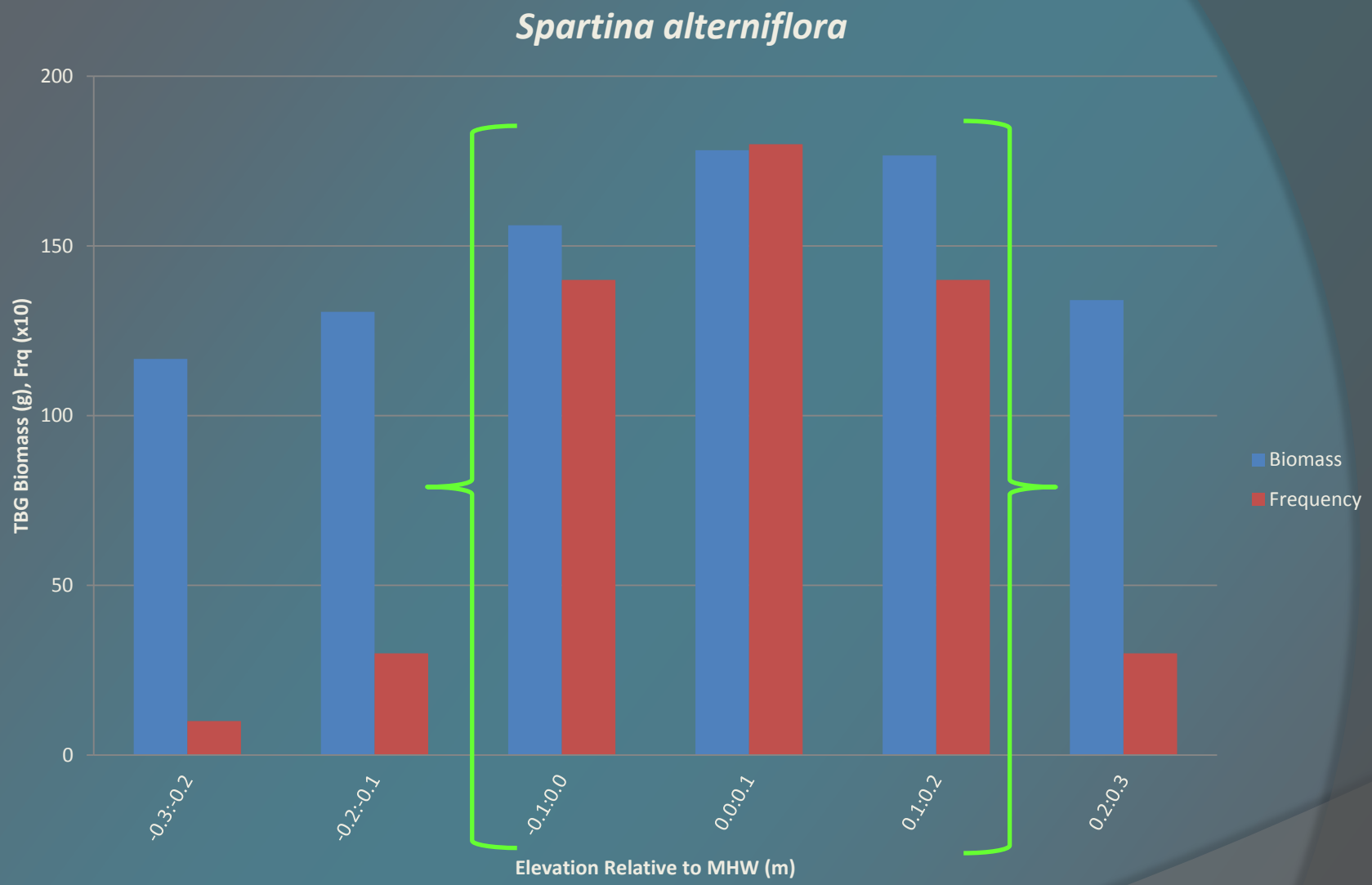
MHHW	1.02
MHW	0.90
MTL	0.09
MLW	-0.77
MLLW	-0.82

Elevation Relative to MHW




Spartina alterniflora
200
150
100
50
0
Total Below Ground Biomass (g)
-0.3:-0.2
-0.2:-0.1
-0.1:0.0
0.0:0.1
0.1:0.2
0.2:0.3
Elevation Relative to MHW (m)


Spartina alterniflora
200
150
100
50
0
Sample Frequency (x10)
-0.3:-0.2
-0.2:-0.1
-0.1:0.0
0.0:0.1
0.1:0.2
0.2:0.3
Elevation Relative to MHW (m)



Optimal Growth Range: -0.1m to 0.2m Mean High Water

How are we utilizing these relationships?

- Evaluate “health” or resiliency of *Spartina alterniflora* marshes on site specific bases.
- Identify and prioritize marshes in greatest need of additional anthropogenic involvement.
- Remove guess work out of what is the proper elevation in restoring marsh elevation.

r Application for Pepper Creek Dredging

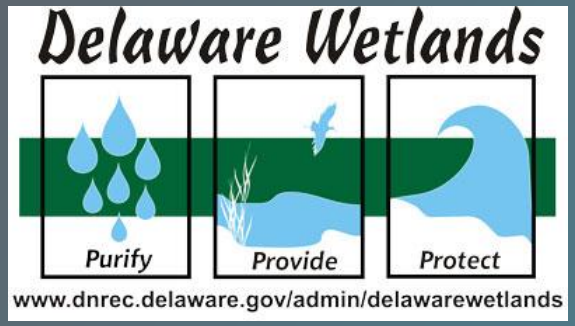
Legend

Proposed Thickness of Thin Layer Application

- 6 or More Inches
- 5 Inches
- 4 Inches
- 3 - 4 Inches
- 2 - 3 Inches
- 2 Inches
- 1 Inch
- Not Needed

0 250 500 1,000 Feet

ACKNOWLEDGEMENTS



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