Assessing Ecological and Physical Performance of Sustainable Shoreline Structures

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Hudson River Sustainable Shorelines Project

Promoting choices that preserve or enhance ecology and shoreline benefits while meeting engineering needs in a changing climate.

www.hrnerr.org/hudson-river-sustainable-shorelines/
Monitoring Protocol

• Culmination of > 10 years Shoreline Research and Outreach

• Indicators grounded in research findings

• Addresses key request from end-users – “Do these work?”

• Applied at sites in demonstration network

• Baseline for Change Assessment
Ecological and Structural Performance

- Physical – Stability of “built” structures
  Assess the physical forces on the site
- Ecological – Several variables known to be linked to ecological functions in the Hudson River.
Physical Forces

• GIS layers of Modelled currents/waves, ice observations [Desktop]
  o https://www.hrnerr.org/hudson-river-sustainable-shorelines/spatial-information-designing-shoreline

• Wave attenuation by sill if present

• Plaster casts for erosive forces
Physical Attributes (tied to Ecological Function)

- Substrate Composition
- Slope
Stability

- Asset Displacement –

- Key Elevations –

- Erosion -
ECOLOGICAL VARIABLES

• Wrack – Indicator, Organic Matter and Habitat

• Wood – Indicator, Habitat

• Vegetation – Indicator, Habitat and Structural element
Ecological and Structural Performance

- Physical – Stability of “built” structures
  Assess the physical forces on the site

- Ecological – Several variables known to be linked to ecological functions in the Hudson River.
SLOPE

R² = 55%
P < 0.01

Number of small fish vs. Shore zone width +1 (m)
HETEROGENEITY

\[ R^2 = 25\% \]
\[ P = 0.03 \]
Sustainable Shore Relative to Other Types

Slope (deg)

Nat Sand, Bedrock, Coxsack, Nat Rock, Bezack, Nut Hk, Foundry, Esop, Mead, RipRap

SS
Sustainable Shore Relative to Other Types

- Nat Sand
- Bezack
- Coxsack
- Nut HK
- Nat Rock
- Esop
- Mead
- Foundry
- Bedrock
- RipRap

Substrate Size (categorical)

- SS
Change over Time

- Just examples of approach. Only two years!
- Individual sites will have specific areas of concern
- For the network – what is useful scale?
  - Site means???
  - Break out by segments???
  - Suggestions???
Change in Particular Segments
Slope in front of eroding scarp

Foundry Dock
Mean Slope (deg)
0
2
4
6
8
10
12
14
16
2017 2018

Change in Particular Segments:
Slope in front of eroding scarp

2017 2018
SITE MEANS - Substrate composition – 2017 versus 2018

2018

0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

1:1
Represents no change

Sand/Mud

Gravel/Cobble

2017

0 1 2 3 4

Substrate composition – 2017 versus 2018
Still To Do

• Link to other Shoreline Research/Assessment
• Long-Term Data Collection, Curation, Analysis (HRNERR role)
• New Sites monitored pre- & post-construction
• Continued and New Participant Training
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Sustainable Shorelines

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ESTUARY TRAINING COUNCIL

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Estuary Science Collaborative

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Hudson River Estuary Program

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