



# Assessing Ecological and Physical Performance of Sustainable Shoreline Structures

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# Impetus



NRC – “Decision-makers should appreciate the costs and benefits of the spectrum of potential solutions to shoreline erosion problems, including potential cumulative impacts on shoreline features, habitats, and other amenities.”

USACE - “Consider the full array of measures and account for the full array of benefits”

HRSSP – “Regional demonstration projects/case studies are needed”

NYCGIRP – “Conceptual models and monitoring protocol development”, “Pilot project identification, implementation, and monitoring (living laboratory)”, “Development of rapid assessment and ecosystem models”

HRSSP – “Developing a region-wide consistent set of “important” parameters would assist comparisons between ecosystems as well as states. Specifically, but not limited to the monitoring discussions, funding was identified as a barrier for implementation of sustainable shorelines.”

# Problem: Time/Money

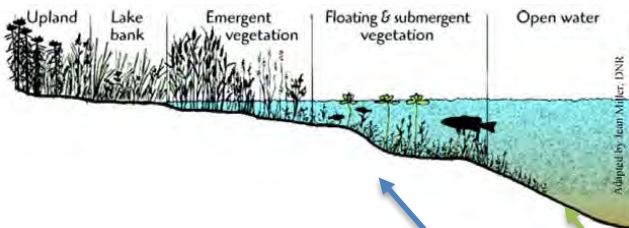
## Solution: Rapid Assessment

Objective: Develop simple, cheap, but reliable assessment protocols which can be carried out by a trained non-technical user.

- Vegetated Slopes

- Rocky Slopes

- Offshore Mounds



Terrace

Sill



# Basis: Cary Institute Ecological Rapid Assessment Protocol

So simple even an engineer can do it...or not

**Composition** – Can you list the 5 most common plants?

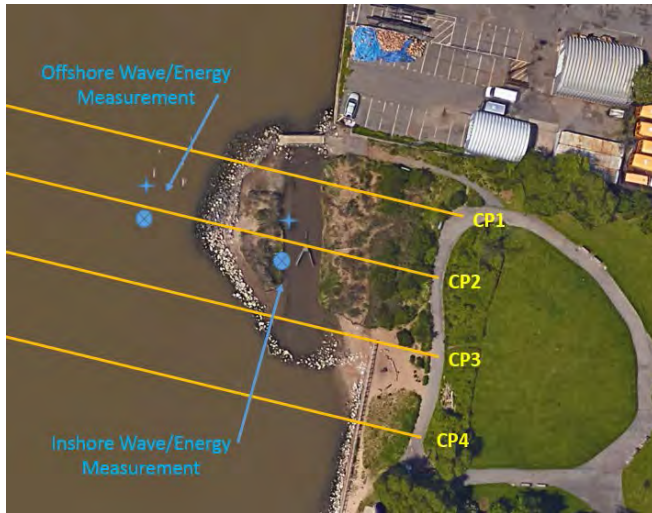


LOCATION Quiet Cove Riverfront Park DATE/TIME/TIDE 2/26/12 11 am

SEGMENT LENGTH ~~150~~ 125 m

Points within segment	1	2	3	4
GPS (north/east; UTM83)				
SLOPE	10	10	10	
SUBSTRATE SIZE (Cover 0-4)				
Bedrock/Manmade	0	0	0	
Boulder	2	1	3	
Cobble/Gravel	3	3	1	
Sand/Mud	0	0	0	
Other	0	0	0	
WRACK (Y/N)	N	N	N	
LWD (Y/N)	N	N	Y	
ADJACENT LAND USE	park	visitor center	park	
VEGETATION (Cover 0-4)				
Canopy	1	0	1	
Understory	2	4	4	
Groundcover	3	1	4	
COMPOSITION	grass trees evergreen bushes bushes	bushes	grass trees bushes	
AQUATIC PLANTS (Y/N)	N	N	N	
MOWING/MANAGEMENT	Y	Y	Y	

# Step 1: Develop an Engineering Corollary (Done)

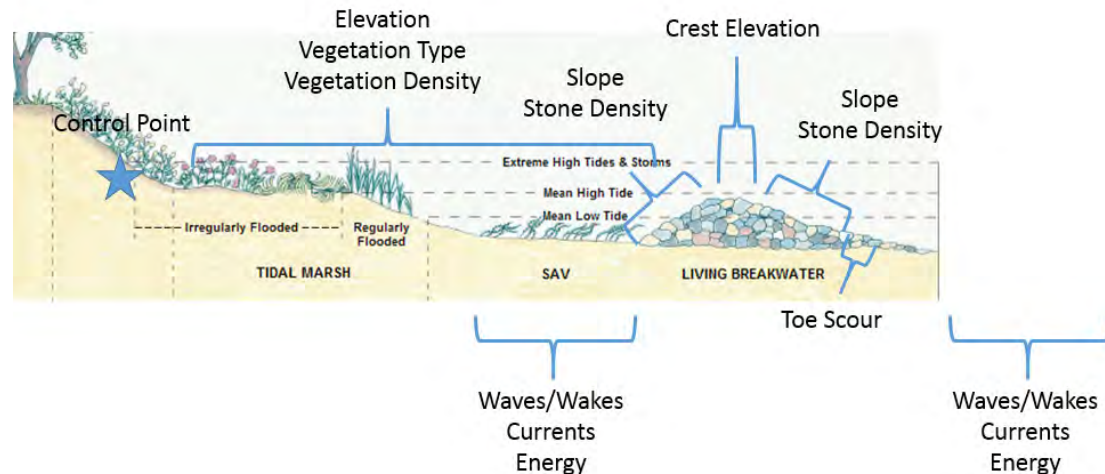


## Integrity Parameters

- Crest Elevation*
- Slope Measurements*
- Stone Density*
- Vegetation Density*
- Asset Displacement*

## Functional Parameters

- Erosion Measurement*
- Visual Wave Assessment*
- Bulk Energy Assessment*
- Current Measurement*



# Step 1: Develop an Engineering Corollary (Done)

Pilot tested several measurement techniques

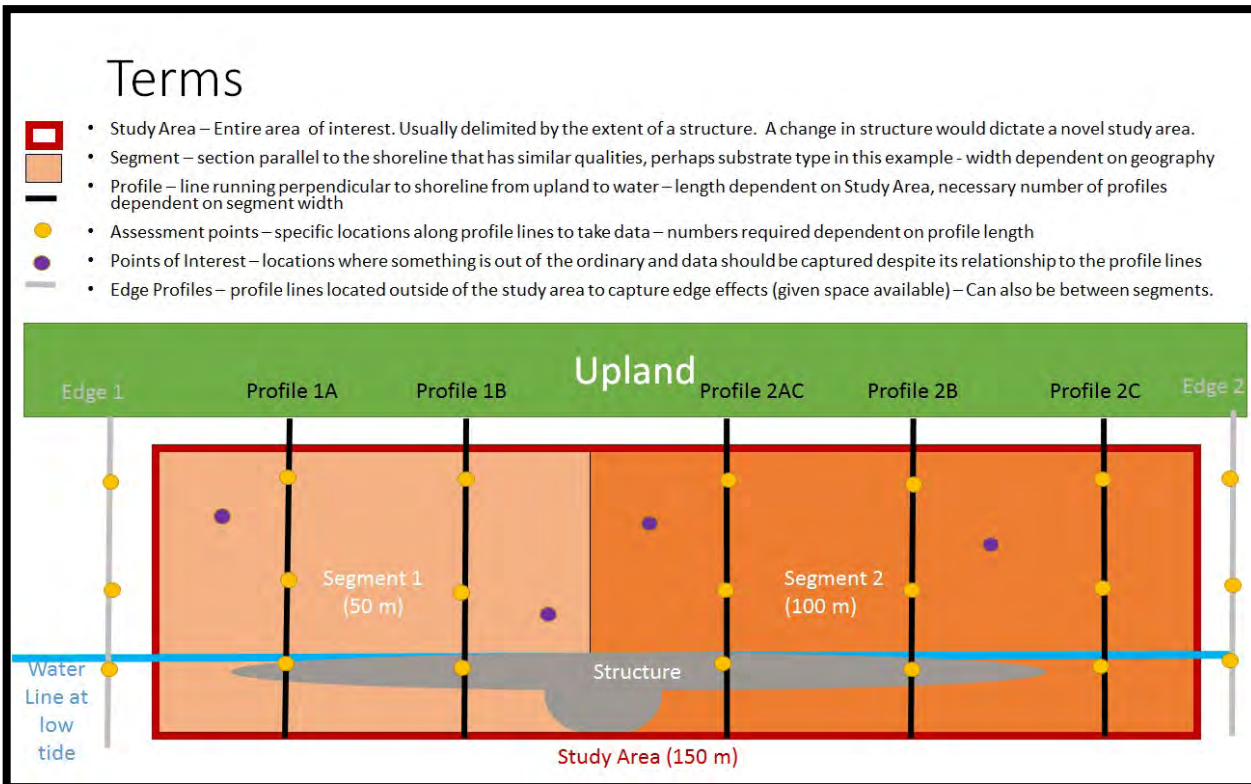
Investigating the potential of smart phone derived measurements

Balancing cost, accuracy, consistency, skill



# Step 2: Integrate Ecological & Engineering Protocols (nearly done)

- Rapid Assessment Data Sheets
- Rapid Assessment Field Guide
- Satellite imagery/GIS information
- Tidal Data
- Clipboard
- Tape Measure (100')
- Tape Measure (25')
- Camera**
- Waders
- Stopwatch**
- Handheld GPS**
- Scale
- Compass**
- Hula Hoop
- Binoculars
- Hand Level
- Line Level**
- Marked Rope
- Graduated Staffs
- Plaster Spheres
- Mounts
- Anemometer
- Inclinometer**



*Italicized items may be replaced with a smartphone with appropriate apps loaded*

# Step 2: Integrate Ecological & Engineering Protocols (nearly done)

## PART 2B FIELD DATA SHEET (collect during EACH survey)

### INTEGRITY PARAMETERS – Ground Cover (Section 4.3) and VEGETATION DENSITY (Section 4.4)

Use the table below to assignment Percent Cover Values to parameters

Percent Cover	Absent	10%-25	25-50	50-75	>75%
Value to Assign	0	1	2	3	4

Diameter of Assessment Points (diameter of hula hoop) \_\_\_\_\_

		Profile Line				
		1	2	3	4	5
<b>Ground Cover (Section 4.4)</b>						
Assessment Point GPS (north/east; UTM83)						
Percent Cover Value (0-4)	Bedrock/Manmade					
	Boulder					
	Cobble/Gravel					
	Sand/Mud					
Present/Absent	Wrack (dead plants, stems, etc)					
	Large Woody Debris					
<b>Vegetation Cover (Section 4.5)</b>						
Assessment Point GPS (north/east; UTM83)						
Percent Cover Value (0-4)	Canopy					
	Understory					
	Groundcover					
Stem Count						
Species Richness (# of different types of plants)						
Present/Absent	Aquatic Plants					
	Mowing/Management					
Species Composition (if you can identify any plants, list them)						

Photos comments:

## PART 2B FIELD DATA SHEET (collect during EACH survey)

### INTEGRITY PARAMETERS – CREST ELEVATION, SLOPE, AND STONE DENSITY (Section 4.1, 4.2 & 4.3)

		Profile Lines				
		1	2	3	4	5
<b>CREST ELEVATION (Section 4.1)</b>						
Crest 1	GPS (north/east; UTM83)					
	Backsight Height (ft)					
	Foresight Height (ft)					
Crest 2	GPS (north/east; UTM83)					
	Backsight Height (ft)					
	Foresight Height (ft)					
Crest 3	GPS (north/east; UTM83)					
	Backsight Height (ft)					
	Foresight Height (ft)					
<b>SLOPE MEASUREMENTS (Section 4.2)</b>						
Waterside	GPS (north/east; UTM83)					
	Slope (degree)					
Landside	GPS (north/east; UTM83)					
	Slope (degree)					
<b>STONE DENSITY (Section 4.3)</b>						
Waterside	GPS (north/east; UTM83)					
	Density (count)					
Landside	GPS (north/east; UTM83)					
	Density (count)					

Photos comments:



# Status Update/Schedule

Step 1: Develop preliminary engineering corollary to the ecological rapid assessment - completed

Step 2: Integrate the protocols - nearly complete

Step 3: Apply protocols at several sites – Summer 2016

Step 4: Train an initial group of “Super Users” (guinea pigs) – Summer 2016

Step 4: Revise/refine protocol – Winter 2016/Spring 2017

Step 5: Independent application of protocol – Summer 2017

Step 6: Finalize training materials - 2018

Throughout, opportunities to link to/with other work will be evaluated.



# Questions/Comments

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<https://www.hrner.org/hudson-river-sustainable-shorelines/assessing-ecological-physical-performance/>