MONITORING LIVING SHORELINES WITH SHOREWATCH

Monitoring living shoreline projects provides information about how well a living shoreline technique works to achieve protection and ecosystem goals. Key indicators of living shoreline performance are related to physical and biological processes and reflect the level of shore protection and ecosystem function. The collection of standardized monitoring data strengthens our understanding of the effectiveness of these projects for shore protection and ecosystem benefits in different settings and for varied designs.

ELEMENTS OF LIVING SHORELINES

For the purposes of monitoring with ShoreWatch, there are three main elements that constitute a living shoreline site:

TYPES OF MONITORING

Monitoring living shorelines with ShoreWatch is categorized into two tiers: Tier I and Tier II. At the least, Tier I monitoring metrics should be captured during monitoring. The option of Tier II monitoring allows for a more statistically based analysis of living shoreline metrics.

Tier I consists of qualitative measurements collected through broad visual assessments of the living shoreline site and its elements.

Tier II consists of quantitative measurements collected using transects and plots that provide more in-depth measurements of the living shoreline elements.

KEY METRICS AND IMPORTANCE FOR MONITORING

TIER I	
Nearshore Zone (Structures)	**Structural integrity:** Warns of possible failure or need for maintenance. **Presence of oysters, mussels, algae:** Bivalves provide ecosystem benefits while algae can prevent their settlement on the structure. **Percent Oyster Cover:** Indicates oyster production and would ideally increase over time.
Marsh Vegetation Zones	**Areas of Marsh Plantings:** Serves as a baseline to assess the evolution of marsh plant growth and expansion. **Vegetation (Percent Cover & Dominant Plant Species):** Representes the ability of the marsh to provide fish and wildlife habitat, attenuate waves and stabilize shorelines. **Fauna Presence:** A well-established marsh will not only support key marsh species but will benefit from the critical roles they play in marsh processes. **Presence of *Phragmites*:** Indicates invasive species colonization and marsh stress. **Width of Vegetation Zones:** Provides an indication of how marsh zones are expanding, shrinking, or migrating with possible water level changes. **Problem Areas:** Tracking issues such as bare spots or marsh edge erosion can warn of needs for maintenance or further investigation.
Riparian Zone	**General Conditions & Vegetation:** A stable bank has uniformly spread vegetation while a bank with bare ground or impervious cover may pose potential stressors on the system. **Bank Height (Categories):** Indication of erosion or stability and the potential for future marsh migration. **Presence of Phragmites:** Signifies invasive species colonization. **Problem Areas:** Tracking issues such as bank erosion indicates the site may not be reducing wave energy as well as hoped.
Overall	**Fixed Photos:** Document changes in the living shoreline by comparing photos of the same area over time. **Wildlife Observations:** Evidence of wildlife within the site is an indicator or ecosystem function.
TIER II	
Nearshore Zone (Structures)	**Height, Width & High-Water Mark Measurements:** Shows how the structure changes over time or in response to storm events and changing water levels. Along with the overall length of the structure, height and width measurements provide an accurate areal extent of structures. **Oyster, Mussel, and Attached Algae Density:** Counting the number of oysters and mussels present within a defined area is used to extrapolate the density of these species across the entire structure and provides a quantitative measurement of increasing or decreasing coverage.
Marsh Vegetation Zones	**Vegetation (Percent Cover, Species Composition, Plant Height):** Indicates marsh establishment, stability, health, diversity and marsh resilience. **Count of Key Marsh Species:** Tracks ecosystem development and marsh establishment. Dominant Sediment Type: Sign of soil richness (organic carbon).
Riparian Zone	**Bank Height and Slope:** Quantitative measurements provide assessment of dissipation of wave energy and potential for marsh migration. **Number of Shrubs/Saplings and Trees:** Density of vegetation are indicators of bank stability, diversity and habitat provision.