

## **ILTER Synthesis Working Group Final Report**

### **Responses of soft sediment coastal ecosystems to sea level rise and coastal squeeze in the LTER Network**

The LTER network includes a range of coastal soft sediment sites that differ in their vulnerability and in the location and resilience of their built infrastructure to erosion and the effects of SLR from climate change. Our working group utilized this variety of coastal sites and long-term coastal data in the LTER network to address gaps in our understanding of the ecological impacts of coastal armoring and alternatives, such as living shorelines, on soft sediment coastal ecosystems.

#### **Working Group goals:**

- 1) Summarize existing information on the extent and types of coastal armoring including living shoreline structures present at LTER coastal sites and identify relatively unconstrained LTER shorelines where coastal retreat of intertidal habitats may occur,
- 2) Compile and review existing information that can be used to evaluate ecosystem responses to armoring/coastal squeeze across a range of soft sediment shoreline types represented in the LTER network
- 3) Develop a synthesis of the effects of armoring structures on the biodiversity, structure, and function for the range of soft sediment coastal ecosystem types represented in the LTER network

#### **Participants: (\*Graduate student)**

##### Organizers:

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## **Group meetings**

First Meeting: April 10-11, 2013 Virginia Coast Reserve LTER, Oyster, VA

Second Meeting: June 12-13, 2013 Skidaway Inst. of Oceanography, Savannah, GA

The April 2013 meeting focused on information sharing and gathering, including 1) developing a catalog of the extent and types of armored and unarmored shorelines, including shorelines with the potential to retreat for the participating LTER sites, 2) identifying a matrix of potential ecosystem responses to armoring and living shorelines for each different shoreline type and considering how these might vary along different axes of hydrologic energy and environment and 3) identifying existing information that could be used to evaluate ecosystem responses to coastal squeeze across the range of developed and undeveloped soft sediment shorelines present in the participating coastal LTER sites. The group decided to focus primarily on shore parallel structures (Figure 1) including bulkheads, revetments, seawalls, living shorelines and oyster reefs to provide scope for comparisons across coastal ecosystems. The meeting included a field trip to the tidal flat and barrier islands of VCR.

The June 2013 meeting focused on synthesis and analysis of the information identified in the first meeting and gathered by the graduate students, and the outline and rationale for a manuscript. This meeting involved a smaller number of participants, including the graduate students who compiled datasets and conducted literature reviews. The matrices developed for each soft sediment ecosystem type, salt marshes, tidal flats, living shorelines, mangroves and open coast beaches were reviewed. The group developed and test drove a conceptual framework for evaluating ecological responses to armoring across soft sediment ecosystems ranging from tidal marshes to wave exposed ocean beaches. The meeting included a field trip to the coastal habitats of Skidaway Island, including armored shorelines.

Three graduate students and one postdoctoral participant received stipends provided by the working group to 1) compile geographic information on the extent and types of coastal armoring, including living shoreline structures, present at LTER coastal sites (1 student), 2) conduct literature reviews on the ecological responses of salt marshes, tidal flats, tidal channels to armoring including living shorelines (2 students) for use in our synthesis and draft manuscript, and 3) develop ecosystem matrices and contribute to the synthesis on geomorphic responses for the manuscript (postdoc).

## **Products**

- A database of existing information on the extent and types of coastal armoring including living shoreline structures present at LTER coastal sites has been developed and will be available at the GCE LTER website.
- Literature review of ecosystem responses to armoring by ecosystem type (Table 1)
- A set of matrices of potential responses for a range coastal soft sediment ecosystems was developed

- A draft manuscript containing the synthesis and literature review components is in progress

### Future Plans

The draft manuscript will be circulated and reviewed by the group in October 2013. A number of the group members will have the opportunity to meet to discuss the manuscript and next steps at the CERF meetings in San Diego, CA in November 2013.

Table 1. Tally of the studies on armoring effects that were reviewed as part of the working group activities.

Environment	Number of Studies	
	Ecological Response	Geomorphic Response
Mangrove	4	2
Beach	6	6
Living Shorelines & Oyster Reefs	9	6
Tidal & Marsh Systems	48	23
Total	67	37

Figure 1. An intertidal bulkhead at the Skidaway Institution of Oceanography as an example of the shore parallel armoring structures focused on by the working group.

