Shoreline stabilization and ecosystem enhancement of eroding marsh habitats using intertidal reef communities - R/6840-0003

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Research Summary

Habitat restoration is a fundamental component of the overall strategy to improve ecological conditions within the Delaware Estuary, as identified in both the Comprehensive Conservation and Management Plan (CCMP) for the Delaware Estuary and the Water Resources Plan for the Delaware River Basin. Despite ever-increasing interest and effort to broaden restoration and enhancement throughout the region, opportunities to conceive and carry out restoration in many areas are limited because techniques have not been developed or proven regionally. For example, strategies have not been developed or widely adopted in the Delaware Estuary or elsewhere in New Jersey to combat sea level rise by arresting erosion of tidal marshes and intertidal shorelines. This is despite the fact that the extensive tidal wetlands of the

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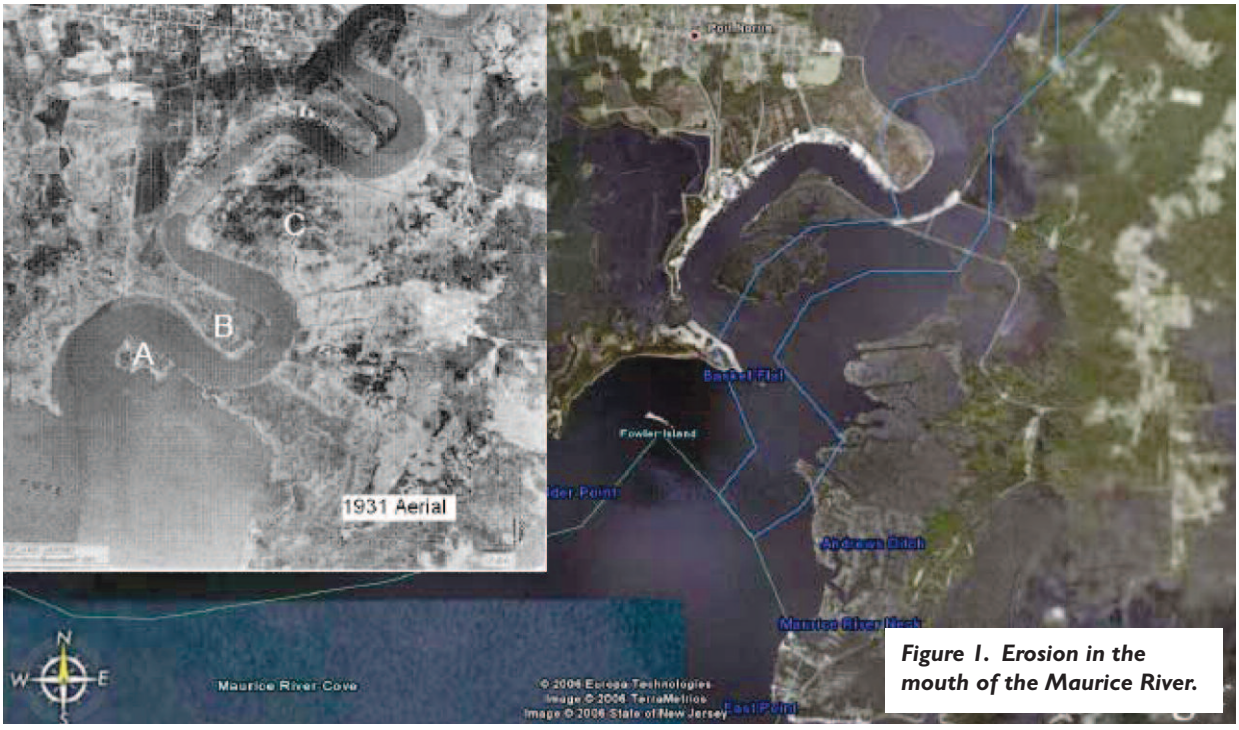

Figure 1. Erosion in the mouth of the Maurice River.

Figure 2. Although ribbed mussels live throughout intertidal areas of salt and brackish marshes, they are most dense along the marsh edge. In the top photograph, dense aggregations are attached to rhizomes of marsh grasses. They appear to have naturally armored the grasses protecting them from erosion that created the peat terrace just below the marsh. In the lower photograph, mussels collected from the field readily attached to a coir fiber mat within 48 hours.

Delaware Estuary are regarded as one of the system's hallmark traits of fundamental significance to fish, shellfish, wildlife and water quality, storm protection, and overall ecosystem vigor. Rutgers University and the Partnership for the Delaware Estuary are collaborating to develop novel methods to protect marshes and enhance habitats by using living structures in a project called the Delaware Estuary Living Shoreline Initiative (DELSI). Tidal marshes throughout the estuary and elsewhere are threatened by a variety of factors, but sea level rise is gaining attention by eating away at the seaward margins. In many areas, the apparent rate of sea level rise is much greater than the global average due to local effects such as land subsidence and hydrodynamic alteration. Impacts related to human use, such as boat wakes and bulkheading, can also contribute to marsh erosion (Anderson 2002, Meyer et al. 1997). The images in Figure 1 show the severe erosion occurring in the mouth of the Maurice River. Note that since 1931 an entire meander has disappeared and two more are severely eroded threatening to alter navigation and access via the towns of Port Norris and Bivalve. With much of the adjacent uplands already developed, the ability of marshes to retreat landward with rising sea level is restricted. Therefore, the stabilization of eroding marsh edges with living shorelines concepts to help marshes accrete vertically to keep pace may provide one of the tools needed to offset impacts of sea level rise.

In this component of the DELSI project, scientists are testing the use of natural coir fiber products to not only stabilize sediments for plant growth, but to also attract marsh mussels to naturally armor banks and shorelines against erosion. Intertidal ribbed mussels are a functionally dominant species in the ecology of most salt and brackish marshes of Delaware Estuary. Populations are often abundant along marsh edges where they live among the roots of *Spartina alterniflora* (Fig. 2). In this habitat, they increase the deposition of sediments through their active filtration of the water column when submerged and they physically armor the marsh edge against erosion. To catch recruitment of mussel spat in the intertidal zone, the researchers will employ natural fiber products that mussels adhere to using their byssal threads (Fig. 2). The primary objective for this project is to evaluate the use of coir fiber materials as a specific tactic and the goal is marsh habitat restoration and stabilization using shellfish as a tactic.

Literature Cited

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Meyer, D.J., E.C. Townsend and G.W. Thayer. 1997. Stabilization and Erosion Control Value of Oyster Cultch for Intertidal Marsh. Restoration Ecology 5(1): 93-9