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Sustainable Design for Oyster Reef Restoration

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Abstract

Due to overharvesting and habitat destruction 85% of oyster reef populations have been lost globally over the past several decades. In order to combat the decline in habitat, prototypes were designed and tested to find the optimal structure desired to promote oyster spat attachment and stimulate the rebuilding of marsh ecology.

Oyster shell bags traditionally used in oyster reef rehabilitation in South Carolina

Introduction

Oyster reefs are key components in marine ecosystems; they help maintain diverse habitats, improve water quality through filtration, stabilize shoreline by dissipating tide energy and provide protection for intertidal environments. Oyster reefs increase wave attenuation by protecting the shoreline environment from intense wave action in addition to the reef's ability to cause sediment accretion; not just protecting shoreline environments but expanding them as well.

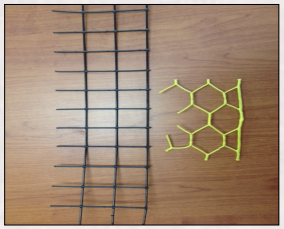
Oysters produce offspring known as spat that require substrate to attach to in order to grow into a healthy functioning reef. Ordinarily, other oysters in the reef provide such substrate, but with reef populations being over-harvested the spat doesn't have an appropriate surface to bind to. In the ACE Basin region a lack of substrate rather than spat population is hindering oyster reef development.

In an attempt to protect coastal shorelines as well as rehabilitate oyster reef populations within the ACE Basin lightweight, biologically-compatible structures have been designed and tested to provide the necessary substrate for oyster spat attachment. The goal of this research is to offset the global decline of natural oyster reefs with an ecologically compatible engineered design that can be implemented in various marine environments.

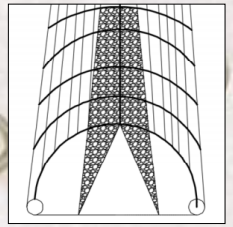
Objectives

Objective 1: Design and test the compatibility and efficiency of biologically engineered structures using various configurations and treatments of crab trap wire.

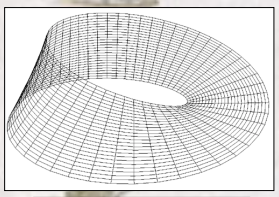
Objective 2: Implement designed prototypes and gather data regarding ecological compatibility and structural stability.



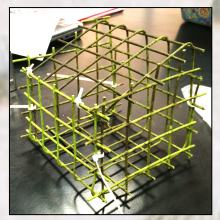
Crab trap wire used to construct prototypes



Design 1 – Cylinder with triangular support



Design 2 – Mobius Strip



Design 3 – Sloped rectangular prism

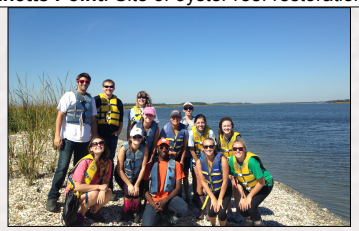
Permeable pavement treatment of crab trap wire

Lab setup for rate of corrosion of wire

Ongoing Research

- Testing the rate of corrosion of stripped crab trap wire using a simulation of marine environment
- Monitoring pH levels at varying salinities with stripped crab trap wire
- Testing various treatments of crab trap wire (permeable pavement)
- Creation of prototypes and implementation into the ACE Basin
- Gathering data on ecological compatibility and structural stability of installed prototypes

Bennetts Point: Site of oyster reef restoration



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