Living shorelines from New York to the Gulf of Mexico... one size does not fit all

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Coastal Marsh Restoration and SLR Resiliency
Location: Long Island, New York
Client: New York Governor’s Office of Storm Recovery (GOSR)
GOSR’s Living with the Bay Resiliency Strategy identified the marsh restoration project that focused on 1) flood protection, 2) restoring and improving marsh habitat, 3) improving water quality in the West Hempstead Bay system through reduction of marsh erosion, and 4) increasing marsh vegetation and its associated capability to serve as a nutrient sink by protecting marshlands (hassocks) from erosion and filling flooded interiors. The study focused on the performance of marsh restoration and stabilization features in the mid and long-term time spans when sea level rise begins to significantly increase water levels and associated flood risks. Tetra Tech provided baseline field investigations, hydrodynamic modeling, and design services for marsh edge stabilization and restoration.

Fort Pierce Living Breakwater
Location: Fort Pierce, Florida
Client: City of Fort Pierce
Tetra Tech provided the planning, detailed design, permitting, and construction administration of the reconstructed and expanded outer marina with living breakwaters. This project included an island breakwater complex that incorporated mangroves, oyster reefs, and beach grasses to provide protection from hurricane waves, strong tidal currents, and enhance the stability and functional performance under existing and projected sea level rise conditions.

Point aux Pins Living Shoreline Breakwater Complex
Location: Point aux Pins, Alabama
Client: Alabama Department of Conservation and Natural Resources
Tetra Tech is providing engineering and design services to 1) limit wave heights, 2) minimize erosion of smooth cordgrass, and 3) design a breakwater that allows for recruitment of bivalves and other invertebrate infauna and epifauna to increase secondary benthic productivity. Tetra Tech completed field investigations including bathymetric and topographic surveys, sediment sampling and geotechnical laboratory testing, marine resource, and cultural resource surveys. Project goals include using living shoreline techniques utilizing artificial breakwater materials to increase productivity and stabilize shoreline along the Mississippi Sound.

Living Shoreline Demonstration
Location: St. Bernard Parish, Louisiana
Client: Coastal Protection and Restoration Authority of Louisiana
Tetra Tech provided engineering design and permitting services to establish 33 kilometers (21 miles) of living shoreline. Tetra Tech reviewed licensing requirements, material production rates, unit geometry, unit handling, installation procedures, performance, and cost. We applied detailed criteria to determine products best suited for specific geotechnical and topographic site conditions; as well as wind and wave environment. This criteria included reduction of wave transmission, area of substrate provided for oyster growth, geotechnical stability, hydrodynamic stability, and cost effectiveness.

Key Features
- 7 marsh communities (1,600 ac) characterized for SLR resiliency and capacity to reduce flood and wave effects
- Significant marsh loss projected in next 20 years due to SLR
- Marsh vegetation reduced storm waves by 60%
- 16 living shoreline concepts considered
- Ribbed mussels = “ecosystem engineers” = natural alternative to shoreline stabilization
- Dynamic flood tidal delta, ~3 kt currents, shifting sands
- Extensive regulatory and proprietary permitting for filling of ~15 ac of sovereign submerged lands
- 13 man-made islands comprised of revetments and T-groins
- Provides significant environmental benefits = mangroves, oyster reefs, seagrass, and sand dunes
- Shelters marina & waterfront from future storms
- American Society of Civil Engineers – Project Excellence Award
- National Association of Enr. Professionals – Excellence Award

Key Features
- Pilot project performed by others with caged oyster shell collapsed and smothered adjacent SAV beds
- The Breakwater Complex Project involved numerical circulation modeling (DELFT3D), storm wave modeling (WW3 and SWAN), and detailed wave modeling (CGWAVE)
- 4,120 lf of segmented breakwater to protect marsh and SAV beds from wave damage
- Designed to accommodate SLR intermediate projections
- Provide substrate to increase secondary faunal productivity
- Construction anticipated in Early 2020

Key Features
- Primary goal to attenuate wave energy with living shorelines
- Secondary goal to stimulate oyster growth
- Evaluation criteria = wave energy reduction, geotechnical stability, hydrodynamic stability, opportunity for oyster recruitment, cost effectiveness
- Recommended alternatives ranked as follows 1) Hesco Basket, 2) Marine Mattress, 3) Wave Attenuating Device, 4) Reef Balls, 5) Oysterbreak
- All products performed adequately, so cost effectiveness used for ranking

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