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Shark River



from **Engineering With Nature: An Atlas, Volume 3.**

by US Army Engineer Research and Development Center



Neptune, New Jersey, United States

Using ecological concrete materials to create a hybrid living shoreline.

Seaview at Shark River Island is an active boating and waterfront community in the Shark River Inlet in Neptune, New Jersey. The highly eroded northwest corner of the island is subject to continuous wave action and boat wakes from the adjacent navigation channel; significant flooding of the nearby homes occurred during Hurricane Sandy in 2012. A bulkhead lining the project site to maintain the shoreline's position had degraded severely, allowing for major erosion of the marsh along the western shoreline. Charged with the property, the island's homeowners association (HOA) sought to stabilize the highly exposed shoreline while providing it with ecological benefits. After a comprehensive site analysis, the selected design included the creation of a hybrid living shoreline using EConcrete's ecologically enhanced articulated concrete block mattresses to stabilize the northwest corner of the island. A nearshore sill was placed along the adjacent western shoreline to protect the marsh area, with the area shoreward of the sill being replanted in an effort to restore the eroded marsh. The promising results allowed for the hybrid solution to qualify for

general permits from the New Jersey Department of Environmental Protection (NJDEP) and the U.S. Army Corps of Engineers (USACE).

Article Cover: The living shoreline a month after installation. (Photo by EConcrete)

Producing Efficiencies

The northwest corner's high level of erosion required a novel robust solution by using the ecologically beneficial articulated concrete block mattress. The area was covered with a geotextile filter fabric and stabilized with marine mattresses running the length of the shoreline, offering erosion control along the inter- and subtidal areas. A berm was planted with upland vegetation to mitigate erosion during extreme weather events and to further stabilize the area's slope, with a coir log placed to prevent damage along its toe. For the western shoreline's less exposed marsh, a more traditional living shorelines approach was taken. A marsh sill was constructed for shoreline stabilization and habitat restoration.

Using Natural Processes

The project's hybrid solution creates habitat opportunities while maintaining shoreline protection. The ecological marine mattresses include a scientifically proven bioenhancing admixture, retaining features, and a unique surface texture that allow the structure to serve as a substrate for marine flora and fauna and promote sedimentation and the growth of terrestrial flora. In a two-year pilot study to evaluate ecological and structural performance, EConcrete blocks had significantly higher species richness and diversity than traditional control blocks. Monitoring of the full installation will take place over several years to evaluate the project's overall performance, with preliminary results already showing 19 species colonizing the ecological concrete units.





Aerial view of the site area postconstruction. The project functioned as a true hybrid living shoreline, which integrated ecological concrete materials that complemented native upland plantings for erosion and sediment control.

(Photo by EConcrete)

Broadening Benefits

The HOA wanted a holistic design approach to improve the physical condition of the shoreline while providing ecological uplift. Objectives included creating a hybrid living shoreline to prevent ongoing erosion at the island's northwest corner, mitigating potential damage to the pump station and condos along the island's northwestern shoreline during extreme weather events, incorporating nature-based elements for ecological uplift, and providing community access for recreation like fishing and kayaking. Under the NJDEP General Permit 24 for living shorelines and the USACE Living Shorelines General Permit, project designers expedited the permitting process, which provided cost savings.



An aerial view of the installation.

(Photo by EConcrete)

Promoting Collaboration

The project is an excellent showcase for stakeholder engagement and collaboration. EConcrete worked with the HOA on design. Financial support was provided by the HOA and Neptune Township, in addition to a grant from The Nature Conservancy to mitigate design and permitting costs. Renova Environmental Services, the project's contractor, was responsible for the regrading of the shoreline, placement of the marine mattresses, construction of the nearshore sill, marsh restoration, and creation of the terrestrial upland habitat. The American Littoral Society provided ecological consulting and logistical support toward completing restoration, organizing a volunteer planting event. Fill material was provided by Neptune Township.



Marine growth layer observed during biological monitoring.
(Photo by EConcrete)



Biological monitoring showing the EConcrete mattress (right) compared to control units (left). EConcrete blocks had extensive growth of both *Ulva* and *Fucus* algae, alongside Sabellidae worms and bivalves, whereas the control blocks were almost completely barren.

(Photo by EConcrete)



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5min pages 268-271



Cape Cod

4min pages 264-267



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4min pages 260-263



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5min pages 252-255

**Conclusion**

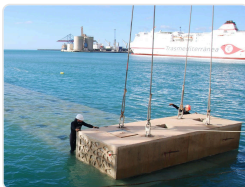
4min pages 292-297

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4min pages 288-291

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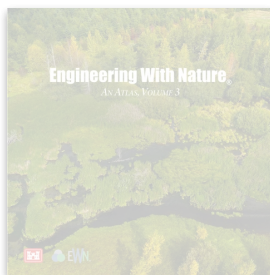
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4min pages 280-283

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4min pages 276-279

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