



NFWF

Living shores, cleaner streams

Early funding by BP, NFWF pays dividends in wake of Hurricane Sandy



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A "living shoreline cell" near the DuPont Nature Center | Credit: Danielle Kreeger, PDE

The roads were flooded and winds were blowing 15-25 mph out of the northeast when Danielle Kreeger and her team of researchers arrived last month at one of their experimental "living shoreline cells" near the DuPont Nature Center in Delaware.

The weather might have been stormy, but Kreeger's reports from the shore of the Delaware Estuary were sunny. Despite recent coastal flooding, the materials her team had put in place, including recycled coconut fiber logs, bagged oyster shell and native plants, had held up well. The recently planted marsh grass was even growing into the fibers of the logs, as hoped for.

What's more, the breakwater structures Kreeger's team had built just offshore using interlocking, concrete "oyster castles" were dispersing the wind-driven chop, leaving relatively calm water lapping at the augmented shoreline.

To top it off, juvenile oysters (spat) were growing on the sides of the breakwater structure.

"It's been another low recruitment year for oyster babies in Delaware Bay," Kreeger reported online to fans of her research. "But at least we got some and they are growing fast."

Kreeger, science director of the Partnership for the Delaware Estuary (PDE), has been at

The National Fish and Wildlife Foundation (NFWF) protects and restores our nation's fish and wildlife and their habitats. Created by Congress in 1984, NFWF directs public conservation dollars to the most pressing environmental needs and matches those investments with private funds. Learn more at www.nfwf.org

this for a long time. She was studying how to bring back natural shorelines, in lieu of bulkheads, long before 2012's Hurricane Sandy focused national attention on the critical need for natural buffers and improved coastal resiliency.

Many of her best techniques – not just for reshaping once-natural shorelines but also for conserving and restoring native mussels and oysters – were learned during a key period in 2005-2007, when funding from BP, the National Fish and Wildlife Foundation (NFWF) and other sources fueled emerging efforts to study and protect the imperiled Delaware Estuary.

“Working jointly with Dave Bushek’s crew at the Rutgers Haskin Shellfish Lab, we were the first to do any living shorelines in this watershed,” Kreeger said. “We learned a lot of lessons in that first grant, good and bad.”

Kreeger’s group recently took their shoreline project to a new level by incorporating breakwater structures into project design. Their work has garnered significant media coverage and drawn the attention of coastal builders and public works project managers.

“Up until Hurricane Sandy, not many people were really interested in what we were doing,” Kreeger said. “Most people were interested in doing bulkheads and the same-old-same-old. But now that they see that the properties that were next to protected, natural shorelines survived, while many next to bulkheads and things like that were destroyed, now everybody wants to do living shorelines.”

Such attention is a double-edged sword, Kreeger said. She hopes to work with her project partners at Rutgers University and elsewhere to learn even more about the best materials and methods for rebuilding a natural shoreline, before the rush to build gets out of hand.

She wonders how many augmented shorelines will last, how much maintenance will be needed, and what their affects might be on the surrounding environments.

“The interest,” Kreeger said, “has gotten way ahead of the science.”

SPRINGBOARD FOR NATURAL SHORES

PDE, a regional nonprofit established in 1996, serves as one of the 28 National Estuary Programs. It leads collaborative efforts to improve the estuary’s health, from New Jersey and Pennsylvania south to Delaware, where the estuary swaps water with the Atlantic Ocean.

Most of the 5 million or so people who live in the estuary’s watershed reside in Philadelphia, Pa., Camden, N.J., and Wilmington, Del., according to PDE. This urban area includes the



Installing a living shoreline | Credit: Danielle Kreeger, PDE

largest freshwater port in the world, along with a number of refineries and other petrochemical operations.

Nevertheless, nature abounds. In addition to clams, oysters, crabs and more than 130 species of finfish, the estuary holds the Western Hemisphere’s second-largest concentration of migrating shorebirds and the world’s largest population of spawning horseshoe crabs, according to PDE. Despite about 400 years of urbanization, the estuary waters near Philadelphia are also home to rare types of wetlands, freshwater mussels, and endangered sturgeon.

In an attempt to understand and mitigate the negative effects of nearby urban and industrial centers, conservation groups large and small began stepping up research and conservation efforts in the mid 2000’s.

With its funding partner BP, NFWF eventually awarded more than \$1.5 million to nearly 40 projects. Matching contributions boosted the total conservation investment in the watershed to more than \$2.7 million.



Research by the Partnership for the Delaware Estuary | Credit: Danielle Kreeger, PDE

The resulting work, mostly done in the 2005-2007 time-frame, focused on everything from managing marina waste to studying horseshoe crab reproduction and removing nonnative plants from forests along the estuary shore.

NFWF awarded PDE nearly \$102,000 for two projects, one focused on the restoration of freshwater mussels in Pennsylvania and Delaware and the other on the erosion of marsh habitat in New Jersey. Matching funds brought the total conservation investment in those two projects to more than \$254,000.

As the dozens of estuary projects played out, two common themes began to arise: The need to improve water quality in the watershed and the importance of resilient, natural coastlines. PDE and its research partners took a leading role in both issues.

The grants enabled the team to develop new techniques in propagating and reintroducing freshwater mussels, whose populations have suffered drastic declines. Establishing new beds of the mussels in the upper reaches of the estuary not only helps stabilize stream beds, but also can significantly improve the quality of water downstream. One mussel bed studied in southeast Pennsylvania was found to remove 26 metric tons of solids from the water in a single summer season. Recent studies have shown that the healthier mussel beds in the freshwater tidal river can filter more than a million gallons of water per day per hectare.

“A healthy bed is like a water treatment plant,” Kreeger said. “Bringing these animals back is great for biodiversity’s sake,

alone, but that’s really why we’re in the business of mussels.”

Using the BP- and NFWF-funded studies as a springboard, Kreeger’s group sought out and won new grants and expanded their studies into permanent projects. PDE launched its Freshwater Mussel Recovery Program (FMRP) in 2007 and followed up in 2008 with its Delaware Estuary Living Shoreline Initiative (DELSI). Both programs continue today.

PDE scientists have successfully reintroduced two mussel species into 11 streams in southeast Pennsylvania and northern Delaware. Subsequent monitoring using electronic tagging indicates that most animals survived, despite record flooding and severe erosion.

PDE also has installed living shorelines at numerous sites, including Matt’s Landing in New Jersey’s Maurice River; Nantuxent Creek Road in Downe Township, N.J.; the Lewes/Rehoboth Canal in Lewes, Del.; Indian River Marina in Rehoboth, Del.; and, of course, the Dupont Nature Center.

Aside from new knowledge and practical conservation techniques still used today, those initial grants also generated lasting research partnerships, she said.

“Through those alliances, we were able to bring together different experts to tackle the science needs. Afterward, we were able to really leverage that into bigger grants to do a lot of the base work for a basin-wide strategy, which is where we are now.” 