Mitigation Matters: Policy Solutions to Reduce Local Flood Risk

This brief is one of 13 that examine state and local policies that have resulted in actions to mitigate flooding.

A "living shoreline" on a residential property on Maryland's Eastern Shore that incorporates a stone groin, sand fill, and marsh grasses. Living shorelines can combat erosion and help reduce flood risk.

Maryland's 'Living Shorelines' Help Communities Become Resilient

Residents use state loans to restore natural barriers to storms, sea level rise

Overview

With over 7,000 miles of shoreline along the Chesapeake Bay, the Potomac River, and the Atlantic Ocean,[1] Maryland is highly vulnerable to hurricanes and sea level rise. Since 2011, the state has been battered by six severe storms—including Hurricane Sandy—requiring millions of dollars in federal public assistance.[2]

To combat shoreline erosion caused partly by sea level rise and strong storms—and mitigate associated flooding—the state has invested heavily in "living shorelines." Instead of hard structures, this technique uses native vegetation and other natural materials to stabilize coastlines. To incentivize residents to create or restore living shorelines and other natural areas, the state offers loans for such projects on waterfront properties. Since 1971, the loans have protected more than 200,000 linear feet of shoreline and created over 3.7 million square feet of marsh.[3]

Erosion leaves coastal areas vulnerable to storms

Shoreline erosion in Maryland has stripped away land and sediment, bringing the coastline inland, submerging other areas, and putting infrastructure and valuable waterfront property at risk. Almost 70 percent of the state's 7,000 miles of shoreline—close to 4,600 miles—is eroding.[4] Each year, waters along the bay and the Atlantic claim 580 acres,[5] a process that is occurring at varying rates, with about 65 percent of the shoreline experiencing low to moderate erosion (0-4 feet per year).[6] Thirteen islands in the Chesapeake Bay have been submerged by rising waters, and all 16 coastal counties are experiencing varying degrees of erosion.[7]

While much of the erosion has been caused by rising sea levels, diurnal tides, and boat wake, some of it is due to the surge of waves that accompany severe storms. Hurricane Isabel, for example, washed away shorelines along the Chesapeake Bay when it made landfall in 2003, in addition to causing $84 million in damage to shoreline structures.[8] Sixty percent of Maryland counties now lie within the Federal Emergency Management Agency's Special Flood Hazard Area[9]—places where flood risk is so high that residents are required to buy flood insurance.[10]

Legislature backs natural solutions to protect shores

Efforts by Maryland's Legislature to halt erosion began decades ago. In 1968, the state created the Shore Erosion Control Revolving Loan Fund to provide financial and technical assistance to property owners who take measures to protect eroding shorelines.[11] The fund offers five-, 15-, or 20-year loans to such property owners.[12]

In 1972, flash floods triggered by Hurricane Agnes devastated many parts of the state. By then, Edgar Garbisch, a well-known chemist from St. Michaels, Maryland, had demonstrated how to restore marshes in the state using stone, sand, and marsh grasses.[13] Although the state began urging residents to employ these techniques, its shores continued to erode. When Maryland's Commission on Climate Change was formed in 2007, it recommended stronger action, urging the use of more "soft" shore protection than hard techniques, such as bulkheads, retaining walls, and revetments.[14] These hard surfaces halt erosion only temporarily and reflect rather than absorb wave energy, destroying shallow-water vegetation and marshes along with the crabs and smaller fish that Maryland is known for. By reflecting wave energy, hard surfaces can also harm nearby properties instead of protecting them.

On the left, a concrete retaining wall and piled stone form a hard shoreline. On the right, a living shoreline on the Chesapeake Bay absorbs water and supports the ecosystem.

Hard vs. Living Shoreline

A hard shoreline—which can include concrete retaining walls, wooden bulkheads, or piles of rocks called revetments—serves as a fixed barrier intended to limit the impact of water by blocking water surges up to its set height. Living shorelines, on the other hand, include a variety of techniques that use natural materials such as plants, sand, and rock to minimize coastal erosion. They can absorb about half of an incoming wave's energy, according to the National Oceanic and Atmospheric Administration,[15] helping to reduce property damage. They also promote the growth of plants, creating a stabilizing effect on the shoreline. In addition to their aesthetic beauty, living shorelines may be more cost-effective.

In 2008, the Maryland Legislature passed the Living Shoreline Protection Act, requiring shoreline property owners to use natural solutions to prevent erosion unless they can prove that such methods would not work on their property.[16] Before they begin a shoreline project, property owners must apply for a Tidal Wetlands License and include a plan for how they will design and put the natural features in place.[17] They can seek a waiver from the Maryland Department of the Environment if they believe living shorelines are impractical and prefer a hard shoreline stabilization method instead. To receive a waiver, owners must meet one of the following criteria:

- The shoreline is mapped as an area appropriate for structural shoreline stabilization measures and displayed on the Maryland Department of the Environment's website.
- The site is not suitable for a living shoreline due to excessive erosion, strong waves, extreme water depths, or the fact that the waterway is too narrow for effective use of living shorelines.[18]

The state has generated enough funding from loan repayments to its shore protection revolving loan fund—about $600,000 to $700,000 annually—that it is using these funds to lend to other property owners for their projects.[19] Since its inception, the loan program has distributed more than $3 million in loans for 475 living shoreline projects, protecting 200,036 linear feet of shoreline and creating over 3.75 million square feet of marsh.[20]

Despite growing demand for living shorelines, obstacles remain

Although living shorelines are the state's preferred method to protect its shores, they may not be effective in all situations. In certain places, the adjacent body of water is too narrow to install a natural solution, or the waters are too deep to support marsh growth.

Another issue is that more than 1,000 miles of Maryland's shoreline have already been hardened,[21] and the Living Shoreline Protection Act of 2008 does not require that concrete or other hard barriers be converted to softer solutions. And despite property owners' growing interest in living shorelines, few contractors have been trained to create them, and some are reluctant to adopt them. Lastly, although the state's resources to promote living shorelines are substantial, funding gaps for these projects remain.

Conclusion

Despite these challenges, Maryland is prioritizing living shorelines to address its erosion problem and help communities become more resilient to sea level rise. Restoring marsh grasses and other natural materials is already helping to protect homes along its coastline.

Point of Comparison on Nature-Based Solutions: Alabama Living Shorelines

Alabama's 800 miles of tidal shorelines are a valuable economic resource for the state, drawing many residents and visitors each year. Historically, hard structures, such as seawalls and bulkheads, have been used to protect the beaches and marshes that line Mobile Bay. However, the state has recently promoted living shorelines instead. As with Maryland and a number of other states, the Army Corps of Engineers requires applicants seeking to install hard structures instead of natural solutions to halt erosion to prove that living shorelines are not possible on their property. In the past five years, the state has issued 22 permits to restore or create natural barriers.

The permits are required before a landowner can initiate such a project. They fall under three categories:

- Individual permit—for large projects. This option requires a public comment period.
- U.S. Army Corps of Engineers permit—for smaller projects to restore or enhance wetlands and riparian zones, areas that border rivers and streams. It applies nationwide.
- General permit for living shorelines—for reef and/or breakwater construction in conjunction with living shorelines. Introduced by the U.S. Army Corps of Engineers in 2011, this permit provides a streamlined process for approving and completing projects.

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Permit applicants must submit a joint application to the U.S. Army Corps of Engineers' Mobile District; the Alabama Department of Environmental Management (ADEM); and the Alabama Department of Conservation and Natural Resources, State Lands Division (ADCNR SLD). The Mobile District decides which of the three options best applies to the project and works with ADEM or ADCNR SLD, depending on the type of permit being issued.

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"Mitigation Matters: Policy Solutions to Reduce Local Flood Risk" examines policies in 13 locations: Arkansas; Brevard, North Carolina; Fort Collins, Colorado; Indiana; Iowa; Maryland; Milwaukee; Minnesota; Norfolk, Virginia; South Holland, Illinois; Vermont; Washington state; and Wisconsin.

To prepare the briefs, The Pew Charitable Trusts contracted with consulting engineering firm Dewberry, which identified a range of state and local policies across the U.S. that are helping to reduce flood risk. Local officials and disaster resilience experts provided input during the research process. Two external reviewers—Nate Woiwode, project manager of The Nature Conservancy's North American Risk Reduction and Resilience team, and Elizabeth Albright, assistant professor of the practice of environmental science and policy methods at Duke University's Nicholas School of the Environment—provided expert insight. Neither they nor their organizations necessarily endorse the conclusions.

Endnotes

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For further information, please visit:

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