

Living Shorelines: Models of State Permitting Structures

Maine Sea Grant
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After winter storms in early winter 2023, the Maine Geological Survey (MGS) worked with the Maine Bureau of Parks and Lands Popham Beach State Park staff to test the beneficial reuse of washed up driftwood in helping to restore eroded sand dunes. In March 2024, 580 Christmas trees were placed in multiple rows along about 1,800 feet of the beach. Over the next several months, windblown and high tide-deposited sediment was trapped by the trees and dune vegetation established. Placement of excess wrack (e.g., seaweed) into the trees helped capture more sand.

Executive Summary

Living Shorelines engineering and a legacy of coastal protection

Living shorelines are becoming an increasingly important tool in the coastal protection tool box as coastal erosion in the United States is exacerbated by the impacts of climate change. In response to the growing recognition of the importance of preserving natural ecosystems and mitigating the impact of climate change, society is gradually shifting towards adopting these environmentally friendly approaches. However, permitting novel living shoreline projects poses significant challenges due to the existing legal framework and management practices.

For years, coastal management has followed a hands-off approach, aiming to limit human intervention in natural environments. This approach is intended to minimize the human footprint on nature and maintain the ecological integrity of coastal areas. Consequently, the laws and regulations governing coastal activities have been designed accordingly.

However, as our understanding of natural systems and engineering techniques has improved, we have come to appreciate the potential of using natural systems to address environmental and human challenges. Living shorelines, which involve strategic placement of structural improvements for intertidal habitat, natural materials, and mixed vegetation, provide a sustainable alternative to hard structures like seawalls and bulkheads. These nature-based solutions offer effective protection against coastal erosion and flooding, provide valuable wildlife habitat, improve water quality, and enhance the aesthetic of the landscape.

The existing legal framework and safeguards that limit activity in the coastal zone often pose obstacles to the implementation of these innovative solutions. Permitting processes for living shorelines can be lengthy and complex, requiring multiple approvals from various regulatory agencies. The lack of specific guidelines and standardized procedures for living shoreline projects adds to the challenges faced by applicants, making it difficult to navigate through the system.

Additionally, the laws and precedent have primarily developed to regulate and manage traditional, engineered structures. As a result, they may not adequately account for the unique characteristics, purpose, and benefits of living shorelines. The criteria and standards used to evaluate and approve permits may not be fully aligned with the ecological considerations and long-term sustainability goals associated with these nature-based solutions.



Minimal proactive living shoreline treatments combining coir logs and plantings that stabilize existing vegetation and soils and maintain stairway access to coastal wetland.

Addressing these permitting challenges is crucial for the successful implementation and widespread adoption of living shorelines as an effective tool in coastal hazard mitigation.

Maine Department of Environmental Protection (DEP) is seeking models for innovative and alternative approaches used in other states to facilitate implementation of resilience projects within environmental regulatory review processes. Specifically, what are the regulations and guidance in place, what appear to be best practices, and how is the application and review process operationalized effectively?

How we conducted this policy research:

To answer these questions, we conducted research on the permitting processes of other coastal states through a three-phase research approach:

- ▶ Phase I consisted of broad-brush research on various state approaches. This consisted of a review of states with model policies and very brief descriptions of their approach with links for more information. We looked at a high-level at 16 states at various levels of depth (California, Connecticut, Delaware, Georgia, Hawaii, Louisiana, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Oregon, Rhode Island, Texas, Virginia, Washington). The initial landscape-scale review was compiled into a Phase I Working Document which is on file with the DEP climate program.
- ▶ During Phase II we took a deep dive into the practices of four states”. This included a compilation of permitting tools from selected states that we found to be novel and informative for Maine’s response. The states selected were Connecticut, New York, Maryland, and Virginia. However, given additional time, the team may have also included the permitting structures of Texas and Georgia, as well as other specific aspects or tools implemented in the coastal permitting processes of other states.
- ▶ Phase III, the final phase, was a synthesis of research with Maine Law. This came in the form of a final document which made presentable the research completed during Phase II put into the context of Maine’s laws and regulations governing living shorelines as well as the creation of an accompanying slide presentation.

Through legal research, interviews with agency representatives from each state, and comprehensive analysis, we aimed to identify and assess the similarities and differences in the permitting process and legal frameworks of these states. Regulatory requirements, legal definitions and exemptions, how environmental considerations are articulated, and expectations for stakeholder engagement were key factors considered. The scope of the research was limited to state law.

Findings

By drawing upon best practices and lessons learned from Connecticut, New York, Maryland, and Virginia, we aim to inform Maine’s own deliberation for an effective, efficient, and environmentally sound framework for living shoreline permitting in the context of sea level rise and increasing hazards along Maine’s coast and waterways. Improved permitting processes for living shorelines and other forms of nature-based hazard mitigation will contribute to the preservation and enhancement of Maine’s ecosystems while promoting sustainable development and resilience in the face of climate change.

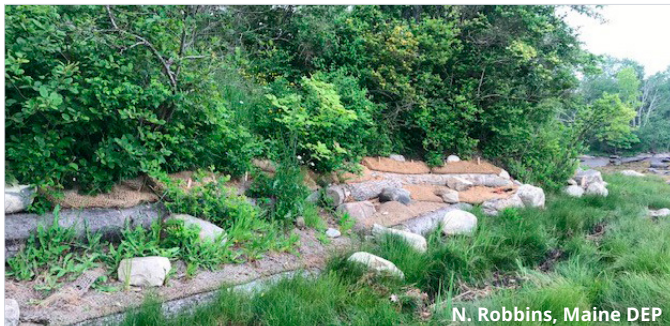
This initial research is meant to provide an objective survey of the key features of models from other US states. The team identified options that may be appropriate for Maine DEP to consider. Based on these findings and agency discussions, this review can provide a starting point for further research and conversation with other states and experts. The findings can address current questions the department has to resolve, or be referenced in the future for questions that arise. We learned from conversations with other states that there is a high level of interest for follow-up with them directly or through a regional convening with multiple states present.

Maine Living Shoreline permitting

The Maine Natural Resources Protection Act (NRPA) is the preeminent legal framework by which Maine protects its coastal environments. Any project which involves soil disturbance in, on, over, or, in some cases, adjacent to a coastal wetland triggers NRPA and requires approval. Maine has a Permit by Rule program through the DEP which provides an expedited permit process in certain instances where an applicant commits to meet certain performance standards and DEP has determined the specific activity will have *de minimis* or minimal project-specific and cumulative environmental effects. If a project doesn't qualify for approval under NRPA's "permit by rule" regulations, an individual permit is required; currently, a living shoreline project requires an individual permit as there is no Permit-by-Rule specific to living shorelines and a full NRPA permit is required in any instance where there is no existing riprap or other shoreline armoring. However, if the stabilization project is under 100' in length, it may be completed under Permit by Rule Section 8 for Shoreline Stabilization if the design meets applicable standards.

Additionally, a project that involves wetlands alteration and requires an individual permit under NRPA is subject to review under the Maine DEP's Wetland Rules. The Wetland Rules generally require avoidance of impacts to wetlands, the minimization of unavoidable impacts, and sometimes compensatory mitigation, often through the Maine In Lieu Fee Program or Maine Natural Resource Conservation Program. DEP's Wetland Rules require an alternatives analysis which shows the proposed project is the least damaging practicable alternative. If the project is in a coastal wetland that is considered a "wetland of special significance," a practicable alternative is presumed, with exceptions for certain projects including "water-dependent uses"; a bank or shoreline stabilization project, or living shoreline project, is not specifically covered under a "water-dependent use."

Maine's Shoreline Zoning Act (SZA) provides that municipalities, with DEP oversight, must manage activities within 250 feet of the upland edge of coastal wetland pursuant to local ordinances which meet or exceed the minimum requirements of the SZA and DEP's mandatory minimum shoreline zoning ordinance (model ordinance). At a minimum, structures located below the high-water line must not interfere with developed or natural beach areas and be located to minimize adverse effects on fisheries. The SZA and DEP's model ordinance distinguish between a "functionally water-dependent" use and other uses in terms of proximity to water and the intensity of development allowed. A "functionally water-dependent" use, which includes shoreline structures necessary for erosion control purposes, is not subject to requirements for setback from



Begun in 2021, this site shows different living shoreline stabilization techniques including areas of enhanced fringe marsh, areas of pinned logs, root wads, small boulders, and areas of bluff face enhanced by lifts of coir filled with organics.



Simple solutions, such as roping off an area to stop foot traffic, allow for vegetation to establish without need to purchase plantings.

coastal wetlands. The SZA and DEP's model ordinance limit the clearing of vegetation and require vegetative screening and retention unless an exception applies, however, no such exemption applies for "functionally water-dependent" uses or a living shoreline project.



As a result of Hurricane Irene in 2011, followed by an intense rain event a week later, a highly accelerated river flow undermined and collapsed this 50-foot section of the riverbank in Farmington Falls, affecting Whittier Road, an important thoroughfare. Root wads were installed as a mitigation measure for deflection of flow energy away from the badly eroded outside bend, and to provide fish and animal habitat. The slope was planted with a variety of seedlings.

In the application of pertinent laws and regulations on coastal and freshwater development, Maine focuses on avoidance and minimization; moving projects above the high tide line and focuses on an alternative analysis. Generally, the project need must be first determined with a finding that 1) there is a structure to protect, and 2) the bank is unstable and requires stabilization. Once a project need is determined, when considering the best practicable alternative for stabilization design, the options for stabilization are most often riprap, using a (fully) vegetated solution, or do nothing. The best alternative will depend on what the stated use of the land is compared to what is being protected in the upland, specifically, starting with whether the stated use of the land is one that should be stabilized and protected.

In practice today, many proposals include an alternative of 100% vegetation that the applicant deems insufficient, without considering a hybrid vegetative and structural alternative. Another emerging issue is the increasing number of requests from property owners to stabilize their property for speculative use when no development currently exists on the property.

In project review, Maine DEP largely focuses on the environmental impacts of an erosion control project. Property owners rely on their engineers and contractors to meet design performance needs of the project. Maine's design community's acceptance to living shorelines as effective solutions to erosion control is mixed depending on which engineer or contractor is contacted, but as more living shoreline projects are being implemented and showing success, the examples appear to be providing counterweight to previous arguments against their effectiveness. The term soft solution, referring to vegetation, is also being seen as a misnomer, since vegetative designs become stronger over time, and more examples of them standing up to storms is helping to change that narrative. At the same time, more hardened gray riprap designs have been failing in recent storm events, putting into question the efficacy of those solutions as the preferred choice for protection. 🇺🇸



Carina Brown, Portland Water District
Root wads, post-assisted wicker weaves, and brush aggradation bundle structures at Sebago Lake State Park addressing chronically eroding shoreline near the park's swimming beach area. Lake level is especially high from 2024 winter storms. These structures were designed to be out of harm's way from winter ice sheets.



Maine DEP
Project began in 2012 using a combination of hard and soft engineering: riprap at the toe of the slope and coir logs locked in place with helical anchors and secured with reinforced turf mats and native salt marsh vegetation. The existing vegetation was cut to ground. The slope was regraded, and geotextile material placed in combination with topsoil, erosion control mix, and native plantings. Biodegradable jute mat was used to prevent erosion while the vegetation established.



bangormaine.gov
The City of Bangor Capehart Brook Restoration is being completed in accordance with the watershed-based plan for Arctic Brook. Beginning 2021, Phase III included this in-stream habitat improvement designed to increase in-stream velocities, improve habitat with the addition of coarse substrate and tree root wads, and restore flood plains.



D. Bannon, GEI and P. Slovinsky, MGS
Tensar GeoReef baskets tucked under installed logs and filled with shell. Excess crevices above the baskets were filled with coir bags and coir bags were installed along the remainder of the treatment. GeoReef basket lids were custom cut and twined closed with a UV-stabilized braid; coir bags were staked and twined using a double-cross pattern.

The following sections briefly summarize living shorelines permitting processes in four Atlantic Coast states: Connecticut, Maryland, New York, and Virginia.

Connecticut Living Shoreline permitting

Connecticut's coastal areas are densely populated. Shorelines have largely been fortified against flooding and erosion using seawalls and stone revetments. Non-structural solutions are now required unless proven unfeasible, with an emphasis on minimizing negative environmental impacts. Living shorelines are seen as a preferable alternative, as they restore coastal resources and habitats while providing shoreline protection.

To be classified as a living shoreline project in Connecticut, activities must have a significant positive impact on the restored land and consider various environmental factors. If the proposed activity's primary purpose is the restoration or enhancement of tidal wetlands, beaches, dunes, or intertidal flats, it is not considered a shoreline flood and erosion control structure at all, and is eligible for an expedited review process without public notice and hearing requirements.

However, some living shorelines have been misused as flood control structures without restoring tidal habitats. The state is now working to increase upfront consultation with developers and municipalities to address permitting issues early on. Ultimately, the decisions on shoreline management are made by municipal commissions. Applications approved by municipal commissions are referred to the state if projects are in a coastal floodplain, though the municipality can choose to ignore the State recommendations. 



Chris Zajac

Living shoreline enhancements Hepburn Dune and Crab Creek work to significantly increase the area between the dune and the creek, helping to avert a breach of the barrier spit while maintaining the tidal flow to the creek and pond. The tidal wetlands created waterward of the dune in conjunction with the stone sills help form a protective buffer that dissipates wave energy and promotes sedimentation inshore.

Maryland Living Shoreline permitting

Maryland law creates a preference for Living Shoreline projects and the use of nature-based solutions, and recognizes that Living Shorelines are an effective means of erosion control and habitat restoration. Improvements to protect a person's property against shoreline erosion must consist of marsh creation or other nonstructural shoreline stabilization measures, i.e., Living Shorelines, that preserve the natural environment unless a waiver is obtained. In order to obtain a waiver, the applicant must show that (1) the project shoreline is mapped as an area appropriate for structural shoreline stabilization measures and displayed on the Maryland Department of the Environment's website, or (2) the project site is not suitable for a Living Shoreline due to excessive erosion, severe high-energy conditions, extreme water depths, or the fact that the waterway is too narrow for effective use of nonstructural shoreline stabilization measures.

Even when a statute is most favorable to a nature-based solution, easy implementation is not a guarantee. Maryland finds itself providing more living shoreline waivers than they would like. While not every situation calls for a Living Shoreline, Maryland law clearly favors them over traditional hard shoreline erosion control measures. 🏴󠁧󠁢󠁥󠁮󠁧󠁿



A standard living design in Maryland consists of a stone sill structure with vegetated wetlands to stabilize the shoreline in accordance with the Living Shoreline Protection Act. These examples show a few projects funded through the MD Department of Natural Resources. All photos Maryland DNR

New York Living Shoreline permitting

New York recognizes the impact climate change will have on coasts and the Governor has signed legislation that requires the Department of Environmental Conservation (DEC) to implement permit regulations and guidance pertaining to nature-based solutions (NBSs) for shoreline management.

New York's sustainable shoreline laws require the Department of Environmental Conservation to prefer and prioritize NBSs. Preferably, living (nature-based) shoreline projects should be constructed and designed to provide for necessary erosion control while enhancing the area involved through improvement of water quality, creation of habitat, adaptability to sea level rise and promotion of natural sand movement. All projects must meet the standards for permit issuance for each permit required. A tidal wetland project must not have an undue adverse impact on the present or potential value of the affected tidal wetlands, adjacent areas, and/or other resources of the state, or a negative impact on public health and/or welfare. The proponent of a regulated activity in a wetland must demonstrate that the proposal is reasonable and necessary, and be a proper "use category."

New York's State Environmental Quality Review Act, their equivalent to National Environmental Policy Act (NEPA), has been amended to allow lead agencies to consider climate change in their decisions. As of now, New York DEC is working on updating their environmental assessments to trigger a harder look at climate change resilience. New York is working on getting additional questions involving climate change added to their permit assessments which would trigger a deeper review, particularly around coastal resilience 

The Hudson River Sustainable Shorelines Project is focused on natural and nature based erosion control in anthropogenic land uses, which is relevant for climate adaptation as we start to see more powerful storms. The HRSS Project has a series of demonstration sites that are monitored over time. Photos: Hudson River National Estuarine Research Reserve ([FMI https://hrnerr.org/sustainable-shorelines/](https://hrnerr.org/sustainable-shorelines/))



Dockside Park is part of the Hudson Highlands State Park Preserve. Vegetation and invasive plants, concrete slabs, and rip rap were removed from site. New stabilization practices include regrading, tiers of boulder revetments, live stakes and plug plantings of native vegetation, and offshore boulders providing an ice break to lessen damage of ice scour. Maintenance plan stipulates that wrack and woody debris will not be removed.



Esopus Meadows before restoration in 2002. Existing shoreline consisted of a brick building protected by a failing bulkhead that was damaging shoreline habitats, interrupting sediment processes, and limiting access for paddlers.



Esopus Meadows after restoration and intact just after Hurricane Sandy. Seawall is overhung by vegetation planted in the soft gabions. Dogwood, chokeberry, elderberry, and arrowwood were originally planted between the soft gabions. New species like ninebark have appeared and original ones like elderberry remain.



NYC Parks is working to protect and restore Alley Creek on Little Neck Bay, Queens. Work includes installation of a pilot living shoreline; oyster castles; debris removal and planting in marsh migration areas; and invasive management and planting in the riparian forest. (CSC grant awarded in 2016) All photos: Piermont Marsh (FMI hrnerr.org/shore-protection-piermont/)

Virginia Living Shoreline permitting

Virginia has declared Living Shorelines as the default method of shoreline erosion control. Virginia's general permit provides a streamlined process as an incentive to encourage property owners to utilize a Living Shoreline approach when appropriate. Under the general permit, the permittee shall, to the greatest extent practicable, minimize adverse impacts of the project on adjacent properties and wetlands and upon the natural resources of the Commonwealth.

The Virginia Marine Resources Commissioner, with jurisdiction over tidal wetlands, shall permit only Living Shoreline approaches to shoreline management unless the best available science shows that such approaches are not suitable. In addition, Virginia created an expedited permit for Living Shorelines to create an incentive for its application in bolstering coastal resilience. The Commission shall preserve and prevent the despoliation and destruction of wetlands while accommodating economic development. This is accomplished in a manner consistent with wetlands preservation and any standards set by the Commonwealth in addition to those identified in Standards for Use and Development of Wetlands to ensure protection of shorelines and sensitive coastal habitats from sea level rise and coastal hazards. 



Restoring the public beach at Jamestown included removing an existing concrete groin and rubble and reusing that material to construct three offshore breakwaters and a spur. Each structure was between 125 feet to 150 feet in length and approximately 100 feet offshore. Over 82,000 square feet of sand was filled behind the breakwaters to replenish the beach. Additional shoreline stabilization was completed by grading and planting of slopes and the landward areas of the breakwaters. FMI [Living Shorelines: Beaches and Dunes](#).

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