Regulatory Issues for Implementing Living Shorelines

The benefits of living shorelines over traditional man-made structures have been well known for decades, however, obstacles still exists to their widespread use. Regulatory reform, better coordination among regulatory agencies, and improved perception can help remove barriers to living shorelines.

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As communities begin to adapt to climate change, the initial response is to construct more traditional coastal engineering structures such as seawalls and revetments (Shepard et al. 2011). A few spatially distributed coastal-protection structures should have little effect on coastal habitats; however, shorelines are becoming increasingly hardened, resulting in significant habitat degradation (National Research Council 2007; Currin et al. 2010). In some areas, over 50% of the shoreline is already protected with man-made structures. Over the last few decades, increasing awareness of the potential adverse impacts of traditional, hardened coastal protection structures on coastal processes and nearshore habitats has prompted interest in the development of shoreline stabilization approaches that preserve intertidal habitats, or at least minimize the destructive effects of traditional shoreline protection approaches (e.g., Augustin et al. 2009; Feagin et al. 2009; Gedan et al. 2011; Shepard et al. 2011; Arkema et al. 2013; Bridges et al. 2015; Guannel et al. 2015). Many states have developed guidelines, incentives, and regulations to encourage or even require property owners to adopt more natural or nature-based methods of shoreline erosion control (Thomas-Blate 2010; Currin et al. 2010). Although many terms are used for shoreline stabilization approaches that protect or enhance the natural shoreline habitat, these approaches are frequently referred to as "living shorelines."

Figure 1. Non-structural living shorelines: (*Top*) dune restoration; and (*Bottom*) tidal wetlands restoration. Photo credits: Jennifer E.D. O'Donnell

Figure 2. Hybrid living shorelines: (*top*) marsh sill provides vegetation protection. Photo credit: Jennifer E.D. O'Donnell; and (*bottom*) coir log toe protects coastal bank. Image provided courtesy of Wilkinson Ecological Design.

Background

Living shorelines can be categorized into two basic approaches. The first approach is constructed entirely of soft materials with no hard structure. Examples include vegetation management, marsh restoration, beach nourishment, and dune restoration (Figure 1). The second approach uses biodegradable material to provide protection while the vegetation becomes established (coir fiber logs and matting) or hard structures to provide additional protection to the vegetation. Examples include marsh toe revetments, rock sills, breakwaters, and oyster reefs. These types are frequently

referred to as hybrid living shorelines (Figure 2) (Duhring 2008; Ray-Culp 2007). O'Donnell (2016) provides an overview of different types of living shoreline approaches and their effectiveness for shoreline stabilization.

While traditional types of shoreline protection provide varying degrees of protection to upland property, they can cause unintended consequences such as increased erosion, flanking of the structure, and loss of available sediment for longshore transport (e.g., Douglass & Pickel 1999; NRC 2007). Many property owners build homes to be near the beach, but then construct a bulkhead or seawall that contributes to loss of the beach—the initial attraction of the location (Hardaway et al. 2010). Traditional coastal protection may also lead property owners or even entire communities into a false sense of security from storm surge and wave action. Development decisions based on the assumption of protection from all disasters can result in devastating consequences in the event of structure failure (Sutton-Grier et al. 2015).

In addition to the engineering impacts, coastal armoring can cause significant ecological impacts, including loss of the intertidal zone, which is critical to submerged aquatic vegetation (SAV) and shallow water habitats (NRC 2007; Duhring 2008), and reduced diversity of aquatic organisms and birds that use the sandy beach for foraging, nesting, and nursery areas (Dugan et al. 2008). In many states, under the public trust doctrine, the land between mean high water (MHW) and mean low water (MLW) is open to the public, but shoreline armoring can cause loss of the intertidal zone, thus restricting or eliminating public access to the water (Roberts 2008; Scyphers et al. 2011).

Unlike traditional shore protection approaches, living shorelines provide numerous benefits to the coastal environment. Properly designed living shorelines attenuate wave energy, provide buffers to uplands from storm surge and wave action, reduce the volume and velocity of surface water runoff, and maintain natural coastal processes (Ray-Culp 2007; Sutton-Grier et al. 2015). In addition to mitigating shoreline erosion, a central goal of living shorelines is to maintain ecosystem services such as: critical habitat for economically and ecologically important fish, shellfish, and marine plants; improving water quality through groundwater filtration; reducing surface water runoff; and decreasing sediment transport (Thomas-Blate 2010).

Constructed living shorelines do not necessarily have the same environmental properties as their natural counterparts. The potential of living shorelines to affect, negatively or positively, coastal habitats, navigation, and recreational opportunities (NRC 2014) must be considered with their potential to provide environmental benefits that traditional shore protection approaches are unable to provide. Although hybrid approaches may not provide the same environmental or protective benefits as natural infrastructure, careful design can maximize the strengths of the natural and man-made components resulting in increased ecosystem services compared to traditional coastal protection (Seitz et al. 2006; Bilkovic & Mitchell 2013; Sutton-Grier et al. 2015).

Many states encourage the construction of nature-based structures through financial incentives and regulatory measures, yet the design, environmental and protective effectiveness, and permitting of living shorelines are still under development (Pinsky et al. 2013). With the exception of locations with local or state regulatory environments that strongly encourage living shorelines, implementation is relatively rare (RAE 2015).

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Permitting Issues

The regulatory climate is one of the major difficulties limiting the construction of living shorelines. Multiple layers of time-consuming and costly permitting has put living shoreline projects at a considerable disadvantage, as engineers and property owners may select shoreline stabilization approaches based on the ease of permitting. Approaches that are located above the MHW do not require federal permits. Vertical structures such as bulkheads and seawalls maximize the landward extent of the property without triggering federal review of the project. Thus, construction of hardened erosion protection can be quicker, easier, and less expensive than creating a living shoreline (NRC 2007).

Federal Permits: Through the Rivers and Harbors Act of 1899 and the Federal Water Pollution Control Act (CWA) of 1972, the U.S. Army Corps of Engineers (the Corps) regulates most activities occurring in U.S. navigable waters up to MHW, including interstate wetlands and wetlands adjacent to navigable waters. It is through this authori-

zation that the Corps oversees the permitting of shore protection projects (NRC 2007). The Corps and the U.S. Environmental Protection Agency (EPA) share administrative responsibility for wetlands under the CWA, however, the Corps is the permitting agency. EPA has veto authority over Corps-issued permits, but this is rarely used (NRC 2007; RAE 2015). The National Marine Fisheries Service, EPA, and the U.S. Fish and Wildlife Service are also consulted during the Corps review process.

The Corps issues two types of permits: General Permits, which may be Regional or Nationwide, and Individual Permits. General Permits provided by the Corps do not require an individual case review and, if the proposed project is within the General Permit criteria, construction may be initiated after specified notifications and assurances are received (NRC 2007; RAE 2015). Living shoreline projects may fit Nationwide Permit 27 (NWP 27) for stream and wetland restoration and enhancement activities (USACE 2002). NWP 27 is used primarily for wetlands restoration and creation of oyster habitats, both of which may be constructed as living shoreline protection. Another General Permit, NWP 13 for bank stabilization activities, authorizes the construction of structures and fills necessary for erosion prevention, but is not applicable to inland or salt marshes, mud flats, vegetated shallows, sanctuaries and refuges, coral reefs, or riffle and pool complexes (USACE 2014). However, living shorelines and other innovative approaches often do not meet the terms and conditions of a General Permit, and therefore require an Individual Permit (NRC 2007). The Individual Permit includes a more detailed and lengthier process requiring public notification and a 30-day comment period for all interested parties (adjacent property owners and federal, state, and local agencies) to review and comment on the project proposal before the Corps makes its decision. The Corps bases its decision on all probable impacts, including environmental, economic, aesthetic, conservation, wetlands, fish and wildlife, recreation, coastal erosion, flooding, cultural value, land use, water supply and quality, energy requirements, safety, navigation, and the needs and welfare of the public (NRC 2007; USACE 2015).

Restore America's Estuaries (RAE 2015) found that, except in states that have changed their permitting regulations to strongly encourage the use of living shorelines, federal regulatory agencies are biased against living shoreline approaches. For instance, some Corps districts (covering states that encourage the use of living shorelines) require 60 days to approve a marsh sill, which compares favorably with 90 days to obtain a permit for a bulkhead. However, in other districts, a marsh sill may still need 60 days for a permit, while a bulkhead permit, including state and federal approvals, can be obtained in only one or two days (RAE 2015).

State Permits: Despite the existence of Nationwide and Regional General Permits, each state may impose more conditions for the construction of shoreline protection structures, including living shorelines, that can be more restrictive than the federal permitting terms and conditions to ensure the state's interests in water quality and wetlands are addressed (NRC 2007). States also have an interest in the intertidal zone, usually to MHW, although a few states (Delaware, Georgia, Maine, Massachusetts, New Hampshire, Pennsylvania, and Virgina) only own to MLW. State permitting may be approved separately or in conjunction with federal permits; each state has a unique approach to the permitting process (NRC 2007). The variation among states is even greater than exists among Corps districts due to differences in coastal geomorphology, habitats, ecosystem services, government organization (for instance, home rule versus regional authority), economic resources, and historical and cultural foundations (NRC 2007).

Local Permits: In addition to federal and state permitting regulations, local (municipal or county) governments can impose further regulations on the use of living shorelines though planning and zoning policies and construction permits (NRC 2007) potentially increasing impediments to living shoreline implementation. Local governments exert considerable control over development and hazard mitigation; however, some of the approaches employed to mitigate shoreline erosion and flooding may encourage increased coastal development (NRC 1999). Although local governments are in a good position to regulate coastal structures, they are frequently too small to have the staff or budget for addressing coastal development concerns, and planning and zoning boards may feel pressured to authorize variances to local residents to avoid the risk of litigation (NRC 2007).

Strategies for Resolving Permitting Challenges

Restore America's Estuaries (RAE 2015) determined that regulatory barriers to living shorelines were caused by lack of incentives to change from traditional coastal protection approaches. For centuries, hard coastal structures have provided protection from waves and storm surges; regulations have evolved to manage their construction. The public's and regulators' perceptions of coastal protection differs from current understanding of coastal structures, the services they provide, and their effects on the environment. Therefore, to improve the regulatory environment for living shorelines, we must look beyond exclusively legislative solutions and consider the importance of communication and regional approaches to shoreline management.

Develop Online Resources: Private property owners, coastal consultants, and regulators need up-to-date, easily accessible, accurate, and practical information on the benefits and approaches of living shorelines, as well as the adverse impacts and limitations to the protection provided by traditional coastal structures. The web resource should provide descriptions of the different types of living shorelines (non-structural and hybrid) and their site suitability, performance, construction and maintenance costs, permitting requirements, and sources of further information. Online resources should discuss the roles, responsibilities, and jurisdictions of the numerous federal, state, and sometimes local, agencies involved in the permitting process.

Encourage Regional Approaches: Coordination among agencies and individuals should be improved to encourage and support regional control plans (Thomas-Blate 2010). A regional approach to shoreline erosion and habitat restoration or preservation would focus on areas with similar geomorphology or ecology as opposed to political boundaries, such as the Corps' Regional Sediment Management Program, EPA's National Estuary Program, and Rhode Island's Coastal Resources Management Council Shoreline Change Special Area Management Plans.

Update Permitting Regulations: Revise state and federal permitting procedures to ensure that all shoreline stabilization projects, traditional coastal structures, and living shoreline approaches are subject to the same review processes and approval time lines. Regulatory agencies may require outside expertise to assist in the review of proposed projects to ensure that familiarity with hardened structures does not bias the permitting process against living shoreline approaches. The burden of cost can be placed on the permit applicant, as not all permit applications will require such extensive review, thus easing potential financial cost to regulating agencies.

Consider Systemwide Impacts: Regulatory processes should consider evaluation of systemwide impacts of proposed projects and emphasize the environmental and economic benefits of developing system-scale projects. Even small-scale projects would benefit from coordination with neighboring property owners. Although a few, spatially separated coastal protection structures will likely have little effect on coastal habitats, construction of one coastal protection structure frequently leads to a rapid increase in construction of additional structures as neighbors either respond to a perceived increase risk to their properties or to adverse impacts caused by adjacent or updrift structures.

Increase Coordination Among Regulatory Agencies

Local, state, and federal regulatory agencies need to increase their coordination to ensure permitting is consistent and reliable (RAE 2015). Property owners and coastal consultants need confidence and understanding to design coastal protection that will meet permitting guidelines and receive permitting approval without exhaustive and time-consuming modifications to the original design. Development of regional design criteria to address different geological, ecological, climatic, and sea-level rise conditions will increase this likelihood.

Conclusion

There are many coastal environments where traditional hard protection is necessary. For instance, in areas with significant wave action or where critical infrastructure is at risk; however, familiarity with traditional structures and the perception that they provide complete and maintenance-free protection has led to their usage in locations where less environmentally damaging approaches would be more appropriate. This bias has resulted in regulations that favor permitting of hard structures despite advances in scientific knowledge that have revealed their adverse impacts to neighboring properties and to the coastal environment. While regulatory reform is necessary to overcome many obstacles to increased usage of living shorelines as coastal protection, additional coordination among agencies and property owners, as well as improved public education, will lead to efforts for permitting reform. ■

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