

Why Living Shoreline Design and Implementation Differs for Southern California: *A Regional Perspective*

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ABSTRACT

This article provides a perspective on living shorelines in Southern California, specifically focusing on what makes the region unique when planning and implementing successful living shoreline projects. The article reflects insight captured in a series of workshops held in 2017 in San Diego, and Costa Mesa, California as part of the Resilient Coastlines Project of Greater San Diego¹ and seeks to share this insight in an effort to broaden living shoreline expertise and knowledge.

Prior to the workshops, many cities in the region had conducted sea level rise vulnerability assessments and were developing coastal resilience strategies that could include living shoreline projects. The workshops were designed to advance local dialogue around living shorelines and to increase collaboration amongst local coastal resilience planning efforts, living shorelines, and coastal restoration projects. The workshops also provided the first ever opportunity for stakeholders to outline what is unique about designing living shorelines in the context of Southern California shorelines.

From the workshop, seven conclusions were made: 1) determining project goals is key; 2) habitat restoration and living shorelines are not synonymous; 3) engineered structures can be

¹ A project led by the San Diego Regional Climate Collaborative, with funding from the NOAA Regional Coastal Resilience Grant Program. www.resilientcoastlines.org

living shorelines shorelines; 4) permitting and implementation guidance and experience is needed; 5) creating better relationships among engineers, natural resource managers and planners is vital; and 6) community engagement and ownership of these projects is paramount.

Background

What do we know about Living Shorelines?

Hurricane Katrina and Hurricane Sandy generated significant national interest in natural approaches to protect our nation's shorelines. According to the National Oceanic and Atmospheric Administration (NOAA), a living shoreline is "a broad term that encompasses a range of shoreline stabilization techniques along estuarine coasts, bays, sheltered coastlines, and tributaries. NOAA further elaborates:

*"[A] living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural "soft" elements alone or in combination with some type of harder shoreline structure (e.g. oyster reefs or rock sills) for added stability. Living shorelines maintain continuity of the natural land–water interface and reduce erosion while providing habitat value and enhancing coastal resilience."*²

The California State Coastal Conservancy (SCC) which has been the leading funder for pilot living shorelines projects in California, outlined four main principles for living shorelines: 1) restore with multiple benefits; 2) protect and enhance habitat values for fish and wildlife; 3) adapt to sea level rise and climate change; and 4) link to regional habitat recommendations.³

Living shoreline approaches began on the East Coast, where projects have been demonstrated and tested significantly more than on the West Coast. However, many of these model approaches are not applicable to Southern California because this region experiences high wave energy, seasonal El Nino storm events, and King Tide events. Successful living shoreline approaches also need to consider the uniqueness of Southern California coastal habitats and the fact that its coastal and ocean landscapes are heavily used and developed. Some potentially suitable approaches have recently been designed and tested in Southern California conditions. Examples of these early pilot projects include: The Cardiff Dune Restoration

² NOAA "Guidance for Considering the Use of Living Shorelines", 2015.
http://www.habitat.noaa.gov/pdf/noaa_guidance_for_considering_the_use_of_living_shorelines_2015.pdf

³ Marilyn Latta, California Coastal State Conservancy "Living Shorelines 101", 2017
<http://scc.ca.gov/webmaster/pdfs/LivingShorelinesFinal.pdf>

Project, the Santa Monica Beach Restoration Project, the San Diego Bay Native Oyster Restoration Project, and Ventura's Surfers Point.

Why Southern California Coastal Resilience Efforts Need Living Shorelines

Southern California's coast is one of the most hardened coastlines in the country (more than 75%)⁴. As sea level rises and climate change brings more extreme coastal storms and wave surges, building coastal community and ecosystem resilience are of the utmost importance for the long-term vitality of the region.

Living shorelines can provide unique opportunities for Southern California to enhance and restore historically lost coastal habitats and features. This is of critical importance to the region, which has already lost 75 percent of its coastal vegetated wetlands due to development.⁵ Southern California has also lost other key coastal habitats such as dune systems, oyster colonies, kelp beds, salt marsh, and eelgrass habitat. Restoration or enhancement of these natural ecosystem features could help with anticipated climate change impacts such as increased wave run-up, coastal flooding, and beach sand loss. These ecosystems can also provide many other co-benefits, such as improved water quality, and are more adaptive than hard shoreline protection structures. Living Shorelines also enhance public access and interaction with the coastal landscape. The ocean and beaches have historically been an integral part of Southern California culture, and living shorelines support that. Living shorelines, such as dune projects, are a good alternative to hard armoring since they can both decrease beach erosion, as well as protect coastal infrastructure, while maintaining public access.

A trend away from armoring has also naturally led to support for living shorelines. Over the past 50 years, construction of hard coastal armoring has been the typical response to coastal hazards⁶, but research has shown that armoring negatively impacts beaches and the California Coastal Commission (the Commission) has become more strict about allowing the practice. Specifically, the Commission's Sea Level Rise Policy Guidance calls for "maximizing natural shoreline values and processes while avoiding expansion and minimizing the perpetuation of shoreline armoring." The policy also notes that "priority should be given to options that enhance and maximize coastal resources and access, including innovative nature-based

⁴ Gittman et al., "Engineering away our natural defenses: an analysis of shoreline hardening in the US", 2015

⁵ Stein et al., "Wetlands of the Southern California Coast: Historical Extent and Change Over Time", 2014
http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/826_WetlandsHistory.pdf

⁶ Griggs, "The Impacts of Coastal Armoring", 2005

approaches such as living shoreline techniques or managed/planned retreat.”⁷ Having recently received this guidance from the Commission, cities are increasing efforts to develop sea level rise and coastal storm mitigation strategies and updating their Local Coastal Programs with serious consideration to advancing living shorelines approaches in Southern California.

Insight From The Southern California Living Shorelines and Coastal Resilience Workshop Series

In 2017, a series of workshops were held to bring together engineers, natural resource managers, land use planners and coastal conservation groups from across the counties of San Diego, Orange, Los Angeles, and Santa Barbara. The workshops sought to advance local dialogue around living shoreline and increase connections between local coastal resilience planning efforts, living shorelines and coastal restoration projects. Specifically, participants focused on the unique benefits, challenges and opportunities for implementing living shorelines in the region, and the nexus between nature-based solutions and ongoing local adaptation planning. The workshops also provided the first ever opportunity for Southern California stakeholders to outline what is unique about designing living shorelines in the context of Southern California shorelines for state and federal entities. The following summarizes several key insights heard from the perspectives of participants.

Project Goals Need to Articulate the “Living” Component of the Resilience Strategy

Project goals should reflect the distribution of resilience benefits the project will bring to the ecosystem, infrastructure and the community. Living shorelines project goals should clearly articulate how the project will help to enhance a more natural habitat and other natural functions (water quality, increase biodiversity, etc.) while protecting infrastructure (natural or man-made) and/or a community from storm surges, flooding, etc.. The project may result in multiple co-benefits; however, it is important to define what “success” means for the project.

For example, an offshore reef project constructed to decrease wave energy may not fit the criteria of a successful living shoreline project even if the reef has created additional fish habitat as an unintended benefit. Living shoreline goals related to habitat enhancement should be

⁷ State Coastal Commission, “California Coastal Commission Sea Level Rise Policy Guidance: Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits”, 2015
https://documents.coastal.ca.gov/assets/slr/guidance/August2015/0_Full_Adopted_Sea_Level_Rise_Policy_Guidance.pdf

articulated at the beginning and influence the design of the project so that there is a baseline to determine if the “living” component of the project is successful.

Habitat Restoration and Living Shorelines Are Not Always Synonymous

Living shoreline projects require taking a broader look at building resilience for ecosystem services and functions. As sea level rise increases and climate change intensifies coastal storm events, it is important to look at what ecosystems and habitats will look like in the future, not always at what they historically looked like. When designing the natural components of living shoreline projects, “habitat enhancement” may be a better goal to reflect how the project will create ecosystem and community resilience.

The natural component of a living shoreline project should also contribute to wave dissipation or flood mitigation (oyster reefs, marsh, etc.) to be a successful living shorelines project in Southern California. The natural component of the project should be resilient and able to bounce back after a weather event. Habitat restoration goals may not always be in concurrence with these goals, and in fact, they may actually conflict. For example, in Southern California a challenge for wetland resilience is the lack of open space to allow the wetlands to migrate which means that a project designed to accommodate increased flooding could result in a loss of marsh or upland habitats.

Engineered Structures Can Be Living Shorelines

“Engineered” tends to insinuate manmade, unnatural structures. However, when it comes to living shorelines, thoughtful engineering is often required. Although living shorelines projects have a natural component, the Southern California coastline is heavily developed. Therefore, the re-establishment of natural landscapes to serve climate change mitigation purposes will need to involve collaborative design and planning between coastal engineers, ecologists and biologists. In the context of living shorelines projects, there are many projects that will be a combination of traditional “gray” infrastructure techniques and “green” nature-based solutions. For example, one major project soon under construction in San Diego involves the re-establishment of coastal dunes made of sand-filled geotextile cubic shaped bags and placing a cobble berm in front of it for enhanced durability. At first, the project’s manmade features may be prominent, but as time goes by, sand and vegetation cover would help the dunes become a more natural ecosystem.

Road Testing Permitting and Implementation is Needed

Before 2016, no national permitting process specifically for living shorelines projects existed. This meant that living shoreline permitting took longer than traditional hard structures because of the “living” components. In June 2016, the U.S. Army Corps of Engineers (Corps) released a national living shorelines permit (Nationwide Permit 54) to streamline federal permitting for these type of projects. However, the permit has never been applied in Southern California. With few pilot projects on the ground in the region, it is important for those projects to help influence guidance for the region, which can also facilitate permitting and implementation in the future. Our workshops demonstrated that participants were eager for case study examples and that there is a need for testing living shoreline approaches. Guidelines specific to the west coast, as well as workshops or presentations on the permitting process, and funding options are required to encourage living shoreline projects. This would help planners feel more comfortable moving away from traditional hard armoring and explain why living shorelines can be less time consuming and more beneficial (both environmentally and financially). Bringing stakeholders together to discuss best practices, as well as possible misconceptions or misunderstandings, is extremely important to know what data, monitoring, design requirements etc. are needed to make these projects successful in the region.

Success Requires Breaking the Silos between Engineers, Natural Resource Managers and Planners

Because living shorelines projects are a relatively new concept for Southern California, it is even more important to include everyone in the planning process. By including engineers, natural resource managers, and planners from the beginning, new perspectives and ideas will also come forth that were not considered before. In our workshops, engineers expressed their need to be a part of the planning and design process, rather than being included later in the implementation process. Natural resource managers want to be involved in planning in order to provide ideas on what and how habitats and species can be enhanced, as well as define how stressors such as invasive species or public access may be barriers to project success. Finally, Southern California coasts have been significantly altered from their natural state. Therefore, local government staff and community groups are an important part of building community goals and involvement in the project to ensure buy-in and manage expectations about what the project will and will not achieve. Explaining why the project is happening and what will come from the project are both important when engaging the community.

Community Ownership of Living Shorelines is Paramount

Project goals should not only focus on mitigating coastal storm, erosion, or sea level rise impacts, but should also define how the project is going to improve the surrounding community. Because Southern California coastlines are heavily used and relied upon by communities, support is critical to project success.

Community engagement should be an important part of the planning, implementation and monitoring of the projects. During the planning process, public meetings should be organized to ensure community engagement, increase awareness of living shoreline projects, and to gain public input. This is also an important opportunity to educate Southern California residents and tourists about the benefits of historic coastal habitats. For example, most community members are familiar with broad/wide beaches and are not familiar with dune systems. There may also be a need to manage expectations of benefits. For example, If an oyster reef is being implemented, explaining why or why not the oysters may be harvested should be clarified as to not create unrealistic community expectations of the project.

Once a project is constructed, involving the community in monitoring efforts can reduce costs, limit vandalism, and develop long-term support for the project. Creating a citizen science program or involving nearby schools, are two ways to establish a relationship between the community and the project. Ensuring that the community understands the goals and benefits of the project and that they support implementation will create broader community support for living shorelines.

Thoughtful development of community resilience goals including social, economic, and recreational goals are also critical for the success of living shorelines projects in Southern California. Beach tourism is an enormous income for the state; In 2010, coastal communities generated \$662 billion in wages and \$1.7 trillion in GDP.⁸ Access to the coast for social and recreational purposes is also central to the Southern California lifestyle. Where access needs to be limited, living shoreline projects should be designed to compliment public access goals and incorporate signage to clearly articulate what the project is providing in terms of community benefits. Living shoreline projects are also a possibility for new revenue from tourism. Enhanced habitats can provide new opportunities for wildlife viewing or enhance coastal aesthetics that contribute to coastal recreation and business opportunities.

⁸ NOAA "The National Significance of California's Ocean Economy", 2015.
<https://coast.noaa.gov/data/digitalcoast/pdf/california-ocean-economy.pdf>

The Santa Monica Beach Restoration Pilot Project⁹ is a good example of a living shorelines project that contributes to community resilience. The project set out to return approximately three acres of beach to its natural state to address climate change issues for both humans and wildlife, and serves as model to show that heavy recreational use and habitat restoration are possible in the same area. The project began with communication and community engagement in mind. It set out to help familiarize people with nature, as well as to increase tourism based on environmental values. Project proponents also publicized its low-to-no impact aspects on existing recreational uses of the beach and the maintenance of coastal access. Throughout the duration of the project, education and outreach programs were created to link active and passive activities, specify the role of human actions in both degradation and restoration of natural environments, and encourage business and resident participation. Partnerships with local government and beach managers, as well as stakeholder meetings and technical advisory group meetings were also an important part of the project's outreach strategy.

The Future of Living Shorelines in Southern California

In Southern California, living shoreline projects are largely in the planning, designing, and early construction phases, so there is still much to be learned about the expanding practice. The participants in the Southern California Living Shoreline workshops represent leaders in our region and together they are laying the groundwork for advancing expertise and knowledge about living shorelines. We hope that this summary benefits this growing community of practice and their individual efforts on the ground.

Additional information on the Living Shoreline Workshop series and the participants can be found at: www.resilientcoastlines.org/livingshorelines.

⁹ For more information about the Santa Monica Beach Restoration Pilot Project, visit: <http://www.santamonica.org/explore/beaches-dunes-bluffs/beach-restoration/santa-monica-beach-restoration-pilot/>