

Appendix 10: Living Shorelines in Southern California

of the *Wetlands on the Edge: The Future of Southern California's Wetlands Regional Strategy 2018*



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The term living shorelines can be referenced a number of different ways. For example, while some people refer to living shorelines as “green infrastructure,” “natural infrastructure,” or “nature-based solutions,” the general meaning is always the same. A living shoreline refers to a natural shoreline ecosystem that is designed to restore habitat as well as physically protect the coast from the effects of large storm events and sea-level rise caused by climate change. Although man-made elements can be used when appropriate in living shoreline designs, those elements must not interrupt the natural water and land continuum of the shoreline ecosystem (RAE 2015).

Living shorelines are needed to provide effective coastal resilience and habitat in the face of global climate change. Coastal flooding due to extreme storm events and sea-level rise is a hazardous problem across the country today and is only projected to get worse in the near- and long-term future (IPCC Working Group II, 2014; OPC-SAT 2017). Growing evidence suggests multi-objective living shorelines can enhance open space, aquatic habitats, and food webs, as well as provide coastal resilience by reducing the risk of coastal flooding. Hard infrastructure can also provide physical protection, but that is the only benefit of such strategies. Further, hard infrastructure often does not function well over time, has negative effects on coastal processes and habitats, and requires expensive and continuous maintenance (Sutton-Grier et al. 2015).

Living shorelines are built through the strategic placement of plants, stone, sand fill, and other structural and organic materials (RAE 2015). The most natural living shorelines are solely built using organic materials and resemble a typical coastal ecosystem restoration project. While living shorelines often rely on the planting of native vegetation, sometimes other less-natural materials such as stone sills, coir logs, oyster reef elements such as “reef balls” or shell material, or grounds are included to further reduce wave energy or trap sediment.

While the many living shoreline projects contain solely natural elements, many levels of combinations of natural and built elements can be used to provide both biological and physical protection benefits. These “hybrid” or “nature-based” approaches can include several built elements, but as soon those elements are impeding natural coastal processes and/or do not provide biological benefits, the project may no longer be deemed a “living shoreline. These nature-based or hybrid approaches can often serve as an accommodation to many stakeholders’ needs and thus may be an important approach for local governments trying to adapt to climate change.

Living shorelines are specific to coastal ecosystems, but the range of ecosystems and habitat types that can be included in a living shoreline are numerous. To date, California has implemented native Olympia oyster reefs, eelgrass beds, tidal wetlands revegetation, upland ecotones, sand beaches, and coastal dune restoration projects as living shorelines. Coastal ecosystems contain an array of habitat-types along the elevation gradient from deep to shallow subtidal, intertidal, and upland ecotone transition zones (i.e. “complete tidal wetland” in Figure 1). The most resilient living shoreline projects will be those that incorporate several habitats along this gradient to optimize the natural coastal processes that provide flood protection. While oysters, eelgrass, tidal wetlands, upland ecotones, sand beaches, and coastal dune habitats will likely dominate many living shoreline projects in California, other habitats can also be included and need to be demonstrated and studied for wider use. Other potential habitats include coastal islands and boulder fields, kelp forests and other types of seaweed beds, rocky intertidal areas, and coastal bluffs.

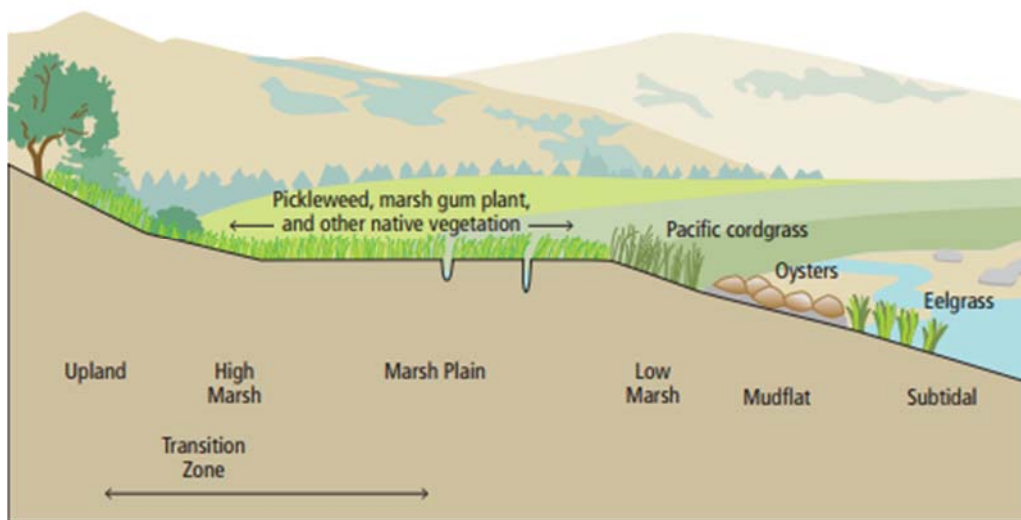


Figure 1. Schematic of the complete tidal wetland system (Goals Project 2015).

Southern California has been a leader in piloting and implementing living shoreline approaches across the west coast. The State Coastal Conservancy has funded several living shoreline project in southern California including the Upper Newport Bay Living Shoreline Project (i.e. oyster and eelgrass restoration) and the San Diego Bay Native Oyster Restoration Project. However, Southern California is also highly urbanized with one of the most hardened coastlines in all of the United States (Gittman et al. 2016). Due

to this expansive urbanization, many living shoreline projects will need to be coupled with the managed removal and retreat (i.e. horizontal or vertical) of built infrastructure to provide the space needed for coastal ecosystems to function properly.

References

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