EESLR 2016: Codevelopment of modeling tools to manage sediment for sustainable and resilient coastal lowland habitat in Southern California

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The proposed project will advance scientific, engineering and policy perspectives on the most fundamental Natural and Nature-based Feature (NNBF): sediment. In this project we will develop modeling tools to study the effect of sediment management practices on the resiliency and vulnerability of coastal communities and coastal wetlands under climate change scenarios projected through approximately 2100. Modeling tools will enable analysis of flood risk, instability and erosion risk, and habitat distributions afforded by alternative sediment management practices. We will also develop a framework to improve the characterization of extreme events (flood hazards) associated with multiple drivers, such as a combination of storm tides, streamflow, and precipitation. This important modeling challenge facing coastal areas has yet to be systematically addressed, and is a fundamental issue for analyzing and comparing alternative strategies to adapt coastal lowlands.

Modeling tools will be co-developed with a Management Transition Advisory Group (MTAG) consisting of representatives from regulatory agencies, resource agencies, local government, and the academic community. A premise of this project is that southern California should consider new sediment management policies that balance human security and ecological concerns through multi-purpose, phased, and stakeholder-driven implementation. Indeed, in a previous effort to discuss the state of sediment management, a focus group comprised of managers and regulators articulated the need for additional research to provide a scientific basis for improved decision-making. Another premise of this project is that sediment fluxes in southern California are dramatically altered by anthropogenic activities, and as such, an active and ongoing anthropogenic redistribution of sediment – and an increased understanding of the sediment value chain - is key to the resilience of vibrant and healthy coastal communities and ecosystems. A theme of our modeling work is the characterization of tradeoffs: the benefits and potential drawbacks of alternative policies, and of action vs. inaction. We will apply a participatory system dynamic modeling approach (STELLA) to integrate scientific results with stakeholder preferences and expert opinion.

Modeling will focus on the two largest estuarine systems in southern California, Newport Bay Estuary (NBE) and Tijuana River Estuary (TRE). These represent extreme cases for the region in terms of sediment, with NBE facing a deficit of sediment and TRE facing an excess, and both have been subject to extensive sediment analyses which provide a strong foundation for development of advanced modeling tools.

The outcome of this project will be improved knowledge and tools for managing sediment so coastal lowlands can adapt to increasingly higher sea levels resulting from global warming, and recommendations for sediment management that bear on policy and practice regionally. The project will support the goals of NOAA's Ecological Effects of Sea Level Rise (EESLR) Program objectives to "evaluate and quantify the ability of coastal natural and nature-based features to mitigate the effects of sea level rise and inundation (storm surge, nuisance flooding, and/or wave run-up) effects on coastal ecosystems and communities".