

Human and ecosystem health in coastal systems

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ABSTRACT

U.S. coastal economies and communities are facing an unprecedented and growing number of impacts to coastal ecosystems including beach and fishery closures, harmful algal blooms, loss of critical habitat, as well as shoreline damage. This paper synthesizes our present understanding of the dynamics of human and ecosystem health in coastal systems with a focus on the need to better understand nearshore physical process interactions with coastal pollutants and ecosystems (e.g. fate and transport, circulation, depositional environment, climate change). It is organized around two major topical areas and six subtopic areas: 1) Identifying and mitigating coastal pollutants, including fecal pollution, nutrients and harmful algal blooms, and microplastics; and 2) Resilient coastal ecosystems, which focuses on coastal fisheries, shellfish and natural and nature-based features (NNBF). Societal needs and the tools and technologies needed to address them are discussed for each subtopic. Recommendations for scientific research, observations, community engagement, and policies aim to help prioritize future research and investments. A better understanding of coastal physical processes and interactions with coastal pollutants and resilient ecosystems (e.g. fate and transport, circulation, depositional environment, climate change) is a critical need. Other research recommendations include the need to quantify potential threats to human and ecosystem health through accurate risk assessments and to quantify the resulting hazard risk reduction of natural and nature-based features; improve pollutant and ecosystem impacts forecasting by integrating frequent and new data points into existing and novel models; collect environmental data to calibrate and validate models to predict future impacts on coastal ecosystems and their evolution due to anthropogenic stressors (land-based pollution,

overfishing, coastal development), climate change, and sea level rise; and develop lower cost and rapid response tools to help coastal managers better respond to pollutant and ecosystem threats.

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