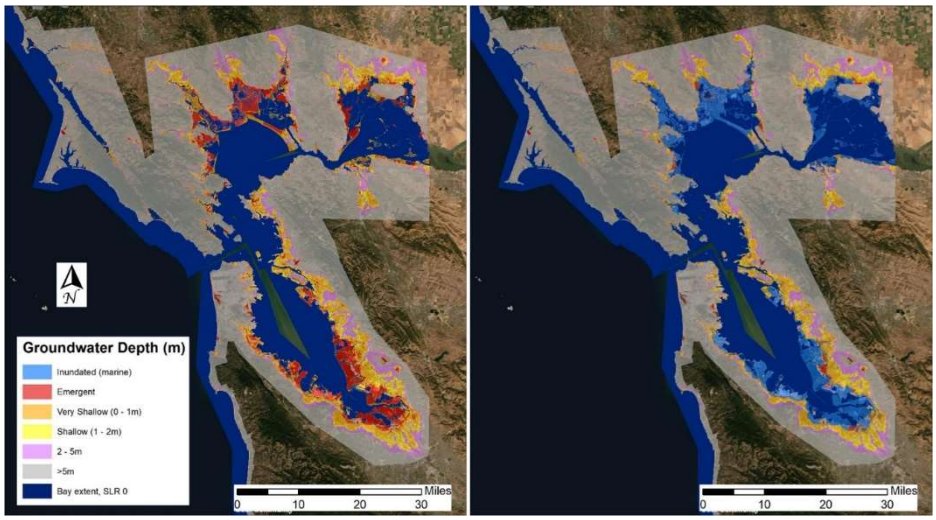
PROJECT ID:
628

Evaluation of Resiliency of Coastal Environmental Restoration Sites from the Impacts of Natural Hazards



Modeling Sea Level Rise (SLR) will aid in the identification of the most vulnerable sites to enable proactive remediation before problems arise. (Image credit: Coastal Storm Modeling System – Groundwater: CoSMoS-GW; Juliette Finzi-Hart, Patrick Barnard, Kevin Befus, USGS)

OBJECTIVE

This project will develop a monitoring and modeling framework that will provide a reliable forecast of the potential impacts of sea level rise (SLR) on Navy Environmental Restoration (ER) sites that still have residual groundwater and soil contamination under long term management.

PROBLEM STATEMENT

Sea level rise (SLR) threatens to mobilize groundwater contaminants at coastal sites, affecting both groundwater and surface water quality. While currently theoretical, this risk is expected to become significant, especially at the approximately 1,800 coastal DoD installations worldwide. SLR could also impact coastal Superfund sites by altering groundwater levels or flow, complicating contaminant management.

Many ER sites rely on long-term strategies like Monitored Natural Attenuation (MNA) or engineered barriers to manage contaminant movement. However, these methods were not designed with SLR in mind and may become less effective as SLR disrupts groundwater dynamics, mobilizing contaminants and creating new risks. It is crucial to understand how future SLR might impact these systems and identify vulnerable ER sites for proactive remediation.

DESCRIPTION

Using historical experience of Navy ER sites and investigating SLR and groundwater fluctuations at Navy installations, the project team will develop a portfolio of up to 20 modeling-scenarios with various factors that will be evaluated. Factors may include geography, coastal hydrologic setting, constituents of concern (COCs), sources of contaminants, hydrogeologic characteristics, and on-going remediation efforts.

Using an existing fate and transport groundwater model, MODFLOW-USG-Transport (USG-T), the team will test how sea level rise and extreme storm events influence groundwater levels, groundwater flow paths, and potential contaminant transport for the typical scenarios as well as for the site-specific model to ground-truth

the SLR/groundwater rise scenarios using actual site data. Key factors that will be accounted for during modeling may include changes in groundwater elevation, mass balance, flow velocity, and concentration of contaminants. Additionally, the transport models will account for spatial and geochemical complexities of contaminant migration by including reactions, dispersion, diffusion and other chemical transformations that may occur by considering geochemistry of soil, water and the contaminant of interest.

An end-product of this effort is a guidance document that assimilates the results of the model simulations for the various scenarios tested into categories of risk. This will delineate the varying degrees of susceptibility of a site, ranging from moderate to high vulnerability. This document will provide stakeholders an increased understanding of the potential risks posed by SLR and storm-surge events at coastal ER sites. Recommendations for adaptive remedial site management and practical strategies for mitigating risks will be provided.

RETURN ON INVESTMENT

SLR poses a significant risk of mobilizing groundwater contaminants, potentially impacting surface water quality. By understanding these effects, the Navy can better select preventative measures and select remedial options that will most effectively reduce the risks associated with ER sites. Additionally, by incorporating this modeling framework and analysis into the evaluation of resiliency for coastal environments, the Navy can enhance fleet readiness by mitigating risks, protecting infrastructure, ensuring operational continuity, and optimizing resource allocation.

NAVY BENEFITS

The SLR Response Framework will be a streamlined decision support system designed to help RPMs model, monitor, and manage the effects of SLR and storms at coastal Navy ER sites. The system will provide key data and guide users in combining this information with their local knowledge of residual sources, groundwater conditions, land topography, and anticipated SLR at the site. With this comprehensive data, the Navy's RPMs can use the framework to forecast the potential risks and impacts of future groundwater changes at their specific ER sites.

TRANSITION DESCRIPTION

The SLR Response Framework will be shared with end-users using clear, instructional resources. The project team will deliver this technology and remediation knowledge via a peer-review publication, webinar and a conference short-course. Demonstration data and model output interpretations, predictions and recommendations will be provided to the site-specific clients.

CONTACT

For more specific information about this project, contact the Principal Investigator, at erika.h.beyer.civ@us.navy.mil

ABOUT THE NESDI PROGRAM

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development demonstration and validation program, sponsored by Office of the Chief of Naval Operations (OPNAV) Compliance and Mission Readiness Division (N4I1) and managed by the Naval Facilities Engineering Systems Command (NAVFAC) from the Engineering and Expeditionary Warfare Center (EXWC) in Port Hueneme, CA.

The mission of the program is to provide solutions by demonstrating, validating and integrating innovative technologies, processes and materials; and by filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring fleet readiness.

For more information, visit the program's web site at www.navfac.navy.mil/nesdi
or contact the NESDI Program Managers at NESDI.fct@navy.mil