

US EPA ARCHIVE DOCUMENT

## **Sustainable Coastal Habitat Restoration in the Pacific Northwest: Modeling and Managing the Effects, Feedbacks, and Risks Associated With Climate Change**

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The overall objective of this research project is to develop a predictive landscape simulation model, incorporating non-linear feedbacks, of the ecological and geomorphological consequences of climate-induced sea level rise and river flow alteration in two of the most ecologically significant estuarine systems in Puget Sound, Padilla Bay, and Skagit Bay. The investigators will use the model to guide the course of restoration and management efforts, given climate change, as they relate to salmon habitat in Puget Sound.

The investigators will develop and link a spatially explicit hydrodynamic and sediment transport model of Padilla Bay and Skagit Bay to a mechanistic wetland elevation dynamics and vegetation unit model and models of tidal channel geomorphology and juvenile salmon abundance and distribution. The linked models will be initialized, calibrated, and validated using extensive site-specific data sets that the investigators have already developed and the data that they have collected. The model will be run under various sea level rise and river flow scenarios.

Effective and sustainable habitat restoration needs to anticipate future environmental conditions to ensure that restoration efforts will be robust and capable of surviving anticipated climate change. The investigators will use this model to examine how recovery goals (e.g., hectares to be restored) should be adjusted depending on how much marsh progradation or erosion occurs over the next century, and will characterize regions in the estuary that would be high- or low-risk restoration sites depending on their likely vulnerability or resilience to climate change. It is precisely this “vulnerability/resilience” response to climate change that is nonlinear. The investigators anticipate immediately incorporating this model into planning and management processes used by local tribes, local restoration planning organizations (e.g., the Skagit Watershed Council), and regional restoration planning organizations (e.g., the Northwest Indian Fisheries Commission, Washington Shared Strategy, and the Puget Sound Nearshore Restoration Program, among others).

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