National *fish, wildlife & plants* CLIMATE ADAPTATION STRATEGY

Project Title: "Sea-level rise modeling across the salt marsh gradient for resource managers."

Headline Title (2-5 words): Pacific coast sea-level rise modeling

Brief Summary (Abstract): This project uses a bottom-up local modeling approach to assess the effects of sea-level rise (SLR) on coastal tidal salt marshes. At 18 different tidal marshes located in California, Washington and Oregon, the project team measured elevation, accretion rate, tidal inundation, and plant communities and put that data into ArcGIS models to create comparable datasets across the Pacific coast tidal gradient. Marsh SLR response models were developed to 2100 in 10-year increments to assist decisions making by the site managers. The project leads met often in-person with the land managers to help them understand the products and incorporate results into local planning documents, vulnerability assessments and decision making processes.

Project Location: California, Oregon and Washington

Partners: USGS Western Ecological Research Center, North Pacific Landscape Conservation Cooperative, U.S. Fish & Wildlife Inventory & Monitory Program, USGS California Water Science Center, Southwest Climate Science Center, Northwest Climate Science Center, San Diego and San Francisco Bay U.S. Fish & Wildlife Service National Wildlife Refuges (NWR), San Pablo NWR, Bandon NWR, Willapa Bay NWR, Gray's Harbor NWR, Siletz NWR, Nisqually NWR, Tijuana Estuary NOAA NERR, South Slough NERR, Padilla NERR, California State Parks and Ecological Reserves, Morro Bay NEP, University of CA, Los Angeles, Oregon State University, UC Davis, and the US Navy

Background: Coastal areas are high risk zones to impacts of global climate change. Projected sea-level rise (SLR) up to 1.6 m by 2100 is expected to alter coastal estuaries (NRC 2012) resulting in loss of tidal salt marshes and their associated species (Takekawa *et al.* 2006). Loss of salt marsh habitats along the Pacific coast tidal gradient will impact demographic and community structure of these sensitive communities, and targeted restoration and triage will be required to save remnant areas. Rather than downscaling global climate models that are difficult to interpret at a particular site, this project is working with local managers and communities to assess parcel-scale information from the bottom-up.

Project Goals: Project goals include understanding how sea-level rise and changes in storm frequency and intensity alter salt marsh habitats and wildlife populations along the Pacific coast and improving decision-making tools for coastal land managers by providing sea-level rise (SLR) modeling relevant at a parcel level.

Strategy Goals Implemented: Goal 5, Strategy 5.3 "Advance understanding of climate change impacts and species and ecosystem responses through modeling."

[Also meets: Goal 3, Strategy 3.1 "Increase the climate change capacity of natural resource managers…" Goal 4, Strategy 4.2 "Identify, develop and employ decision support tools"]

Climate Impacts Addressed: Sea level rise and storm impacts on coastal ecosystems including tidal marshes and mud flats

Status of Project Implementation (Timeline, Milestones, Next Steps):

Project Outcomes: Work at numerous sites has been completed and outreach to managers continues up and down the Pacific Coast. A final report is complete for sea-level rise modeling for 12 sites across San Francisco Bay. Results from the modeling suggested that 95% (1,942 ha) or nine of the sites would become mudflats by 2100 with a 1.24 m sea-level rise. Three sites with the remaining 4% (85 ha) is projected to be low marsh habitat dominated by *Spartina* spp. by 2100. All upland transition, high and mid marsh habitats were projected to be lost by 2100.

A final report is complete for San Diego National Wildlife Refuge Complex. Results show that low marsh will decrease dramatically after 2030 under low SLR rates, whereas under mid SLR, low marsh will increase through 2090 before beginning to decrease. Under high SLR rates, low marsh increases to 2060 and then decreases until it disappears in 2090.

Next steps: Ongoing work is underway to improve SLR marsh response modeling at a number of sites. Additionally, site-specific data and modeling results are being disseminated to land managers at different project sites in a "roadshow" by USGS where they are taking the science to the managers at several (7-8) of the network of local sites.

Funding Sources: National Climate Change and Wildlife Science Center, California Landscape Conservation Cooperative, North Pacific Landscape Conservation Cooperative, U.S. Fish & Wildlife Inventory & Monitory Program, Southwest Climate Science Center, and Northwest Climate Science Center

Photos/Attachments:

        Photo/Figure Credits (do we have permission to print): Credit, USGS

        Suggested Photo Caption: Photo 1. Sea level rise modeling sites.

Photo 2. Gathering elevation data with a Real Time Kinematic (RTK).