

**NOAA CPO COCA PROGRAM  
PROGRESS REPORT (08/01/12 – 04/30/13)**

**PROJECT TITLE:**

Incorporating uncertainty associated with climate change into coastal vulnerability assessments:  
toward developing an adaptive capacity

**INVESTIGATORS:**

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**Graduate Students:**

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**Other Participants**

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Paul Komar, College of Oceanic and Atmospheric Sciences, OSU  
Denise Lach, School of Public Policy, OSU  
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Nathan Wood, U.S. Geological Survey

**NOAA GRANT NUMBER**

NA12OAR4310109

**PROJECT YEARS**

08/01/2012 - 07/31/2014

**TIME PERIOD ADDRESSED BY REPORT**

08/01/2012 - 04/30/2013

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### I. PRELIMINARY MATERIALS

*(Information in this section is standard and may be copied from previous reports)*

#### A. **Research project objective** and the **stakeholders and decision makers** you are working with.

Sea level rise, increasing storminess, and accelerating development pressures are conspiring to leave coastal communities along the U.S. West Coast increasingly vulnerable to coastal change hazards and inundation. Along the coasts of Oregon and Washington, many beaches have not fully recovered from the major El Niño and moderate La Niña of the late 1990s which produced coastal flooding and erosion not seen in some decades. Several Pacific northwest (PNW) communities remain at high risk of coastal inundation in ensuing winter seasons and at present, local decision makers lack both the information and tools for an adaptive capacity to reduce their vulnerability, particularly in light of the uncertainty of climate change. Several stakeholder sectors (e.g., local community groups, emergency preparedness coordinators, and land use planners) are struggling to define appropriate responses to the perceived recent increase in the frequency and magnitude of coastal hazards and the increasingly startling, yet uncertain, predictions of how much worse their problems may get. Unfortunately, rather than being continuously refined by improved knowledge and predictions over time, possible ‘credible’ scenarios of both SLR and future extreme wave climates have increased in uncertainty in recent years. It is within this context of uncertainty and dearth of information that we propose to develop a transferrable approach for projecting the evolving probabilities of coastal flooding and erosion, and the associated evolving community vulnerability, through time along PNW dune-backed shorelines. In addition, we aim to co-develop, with PNW stakeholders, the information and tools necessary to assess impacts and initiate adaptation strategies over the next several decades in anticipation of potential SLR and changing patterns of storminess. The primary beneficiaries of the findings of this project include coastal resource, land-use, and emergency managers, state and federal agencies, as well as the general public.

#### B. **Approach** including methodological framework, models used, theory developed and tested, project monitoring and evaluation criteria. Include a description of the key beneficiaries of the anticipated findings of this project (e.g., decision makers in a particular sector/level of government, researchers, private sector, science and resource management agencies). *(Limit to one page)*

Our specific research objectives are as follows:

1. Build coastal ‘Knowledge to Action Networks’ (KTANs) consisting of collaborative teams of stakeholders, researchers, and outreach specialists who will co-produce knowledge to inform climate-resilient strategies in select PNW coastal counties.

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2. Develop an integrated methodology for projecting the evolving probability of coastal flooding and erosion, through time along the PNW coast, explicitly accounting for climate controls on the various processes relevant to coastal hazards.
3. Develop the information and tools necessary to enable PNW stakeholders to develop future scenarios, assess impacts and associated evolving community and ecosystem vulnerability, and initiate adaptation strategies over the next several decades in the context of SLR and changing storminess. We will incorporate both coastal flooding and erosion probability and community resilience data using *Envision*, an established multi-agent model specifically designed to allow exploration of the interactive dynamics and feedbacks of coupled natural and human systems in a spatially explicit, scenario-driven, policy-centric framework.

Our proposed project is relevant to two of NOAA's long-term goals as outlined in NOAA's Next-Generation Strategic Plan. First, the proposed work advances the goal of climate adaptation and mitigation as our work will help coastal resource managers incorporate a greater understanding of the risks of sea level rise and other climate impacts to reduce the vulnerability of coastal communities and ecosystem resources. Further, this proposed research aims to enhance decision maker's ability to prepare for and adapt to climate extremes. This work also advances the goal of achieving resilient coastal communities that can adapt to the impacts of hazards and climate change as it is specifically designed to develop a transferable approach to identify and assess key vulnerabilities of coastal communities and ecosystems and appropriate adaptation responses to changing climate conditions.

**C. Description of any **matching funds/activities** used in this project. (*Limit to one paragraph*)**

We have successfully leveraged resources from NOAA's Pacific Northwest Climate Impacts Research Consortium (PNW-CIRC). Regional Extension Climate Specialist (RECS) John Stevenson and Project partner Denise Lach (co-PI of PNW-CIRC) participate in bi-weekly PI meeting and are assisting with our KTAN development and interaction.

**D. **Partners** you are working with on this. Please make sure to include NOAA, other federal agencies, academia, nongovernmental organizations, private sector, etc.**

The primary beneficiaries of the findings of this project include coastal resource, land-use, and emergency managers, state and federal agencies, as well as the general public. A partial list of our partners includes:

Neskowin Coastal Erosion Work Group  
Oregon Coastal Processes and Hazard Working Group  
Oregon Department of Land Conservation and Development  
Tillamook County Office of Planning  
Tillamook County Commissioners

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Tillamook County Director of Community Development  
Oregon Sea Grant  
Washington Department of Ecology  
Oregon State Parks  
Climate Decision Support Consortium (CDSC, Pacific Northwest RISA)

**II. ACCOMPLISHMENTS**

- A. Brief discussion of **project timeline and tasks accomplished**.** Include a discussion of data collected, models developed or augmented, fieldwork undertaken, or analysis and/or evaluation undertaken, summary of findings, workshops held, stakeholder/user collaborations, training or other capacity building activities implemented. Where appropriate, describe the climate information products and forecasts considered in your project (both NOAA and non-NOAA) and identify any specific feedback on the NOAA products that might be helpful for improvement. If possible, please include a relevant high-resolution graphic or figure and if we have permission to use the images provided. *(This can be submitted in bullet form – limit to two pages)*
- PIs Ruggiero and Corcoran have continued to foster their close relationships with key stakeholders throughout the PNW coast, particularly focusing on Tillamook County, OR. We have become increasingly familiar with stakeholder questions regarding the impacts of climate change uncertainty on coastal hazards.
  - PI Corcoran attends monthly meetings of the Neskowin Coastal Erosion Work Group and has presented this project to them enlisting their support and engagement.
  - We have held weekly PI meetings since approximately 1 January, 2013, with an alternating focus of developing and engaging the Knowledge to Action Network (KTAN) that we plan on working with during this project and technical discussions regarding *Envision* model development.
  - We have planned our first official engagement with the Tillamook County KTAN planned for June 2013.
  - The Pacific Northwest RISA team, PNW Climate Impacts Research Consortium, has agreed to leverage expertise and experience from other projects and assist us in the KTAN development, engagement, and assessment components of this project.
  - We have made significant progress developing a full simulation, non-stationary, extreme value approach to evaluating extreme total water levels in the NE Pacific. This model will form the backbone of our approach to projecting the evolving probability of coastal flooding and erosion through time along the PNW coast. This work will be the Master's thesis of Katy Serafin who has worked full time on the project for the last two academic terms.

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- Initial results of our approach were presented at the Fall AGU meeting in San Francisco and at the 12th International Coastal Symposium in Plymouth, England in April, 2013.
- We have initiated the development of an *Envision* model for the Tillamook County, OR coastline. A host of GIS layers and tax parcel data have been incorporated into the model. *Envision* is an established multi-agent model specifically designed to allow exploration of the interactive dynamics and feedbacks of coupled natural and human systems in a spatially explicit, scenario-driven, policy-centric framework.
- The *Envision* component of this project will comprise Masters student Alexis Mills' thesis work.

**B. Brief discussion on the **application of your findings to inform decision making** and any highlights of communicating or translating science to decision makers (e.g. media events, presentations, briefings, representation on or input to decision making bodies, etc.). (*Limit to two 2 pages*)**

We are just beginning to engage with stakeholders in this new project. However, we continue to assist stakeholders and decision makers with results and knowledge generated from previous projects. Our probabilistic coastal change hazard zones and associated exposure and sensitivity analyses (completed SARP project) have been incorporated in Tillamook County's new 'Adapting to Coastal Hazards in Tillamook County: Framework Plan' (Rohse, 2011). We have been fully engaged with the Neskowin Coastal Hazards Committee, a group of local residents and leaders organized to address worsening erosion and increased damage to property. The mission of this group is to recommend to state and county agencies and officials ways to maintain the beach and protect the community, explore and how Neskowin might adapt to potential future changes. They are a learning oriented group that investigates options, publishes findings, and garners support for projects. Associate PI Corcoran serves the group through monthly meeting facilitation, collaborative learning workshops, and development of an online file sharing system.

**C. Brief discussion of the **planned methods to transfer** the information and lessons learned from this project. (*Limit one paragraph*)**

Alternative future scenarios for coastal communities will be co-developed using a stakeholder-driven process. We will work closely with stakeholders in Tillamook County, OR to identify and characterize decision-relevant change drivers, articulate a set of future scenario narratives that capture diverse set of plausible policy alternatives and associated scenario descriptors, and review and assess scenario results. The stakeholder process will identify a set of 10-20 community members, representing diverse perspectives on coastal community management to participate in the KTAN, engage the KTAN in a set of at least three meetings to understand and characterize backgrounds and perspectives, develop scenario narratives and assess intermediate results, 3) present final results for review and

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comment to the KTAN and other interested parties. The focus of this process is on building knowledge-to-action networks to facilitate co-learning in our study area.

- D.** Discussion of any **significant deviations from proposed workplan** (e.g., shift in priorities following consultation with program manager, delayed fieldwork due to late arrival of funds, obstacles encountered during the course of the project that have impacted outcome delivery). *(Limit to one paragraph)*

The only significant deviation from our proposed workplan is that that in year 1 we have solely focused our efforts on Tillamook County, OR. This is because our potential project partners from the Washington State Department of Ecology, Heather Baron and George Kaminsky, have been delayed in their efforts to perform a parallel study in Pacific County, WA. We anticipate that this work may begin in FY14 and plan on collaborating with these partners at that time.

- E.** List of **completed publications, white papers, or reports (with internet links if possible)**. These can be either non-peer reviewed or peer-reviewed. For peer-review publications, please list either **published** or in **press**, but *not* “in review”.

**Abstracts and Talks:**

- Serafin and Ruggiero, 2012. Evaluating extreme total water levels in the NE Pacific using a full simulation, time-dependent, extreme value approach, Fall AGU meeting, San Francisco, CA.
- Serafin and Ruggiero, 2013. Extreme Total Water Levels: Forecasting present and future coastal hazards, presentation to CEOAS graduate student seminar. (~40 attendees)
- Serafin and Ruggiero, 2013. Extreme Total Water Levels: Forecasting present and future coastal hazards, presentation to CIRC PI meeting. (~20 attendees)
- Serafin and Ruggiero, 2013. Simulating Extreme Total Water Level Events using a Time-Dependent Extreme Value Approach, presentation at the 12<sup>th</sup> International Coastal Symposium, Plymouth, England

**III. GRAPHICS: PLEASE INCLUDE THE FOLLOWING GRAPHICS AS SEPARATE ATTACHMENTS TO YOUR REPORT**

- A.** In order to better promote your work and the work of the program, please provide the following that can be used in communication materials for NOAA and external audiences.
- i.** One Power point slide depicting the overall project framework/approach/results to date.

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- ii.** If appropriate, additional graphic(s), photograph(s), or presentation(s) depicting any key information or research results thus far.  
N/A

**IV. WEBSITE ADDRESS FOR FURTHER INFORMATION (IF APPLICABLE)**  
N/A

**V. ADDITIONAL RELEVANT INFORMATION NOT COVERED UNDER THE ABOVE CATEGORIES**  
N/A