

NERRS Science Collaborative Progress Report for the Period March 1, 2012 through August 31, 2012

Our Coast–Our Future: Planning for Sea Level Rise and Storm Hazards in the San Francisco Bay Area

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Contributing team members and their role in the project: Patrick Barnard (applied science PI), Grant Ballard (applied science PI), Michael Fitzgibbon (lead engineer), Thomas Fonseca (informatics engineer), Kelley Higgason (project coordinator), Doug Moody, (informatics engineer), Marina Psaros (collaboration lead), Sam Veloz (spatial ecologist), Julian Wood (collaboration liaison), Megan Elrod (outreach coordination)

A. Progress overview: State the overall goal of your project, and briefly summarize in one or two paragraphs, what you planned to accomplish during this period and your progress on tasks for this reporting period. This overview will be made public for all reports, including confidential submissions.

The ultimate goal of the Our Coast–Our Future (OCOF) project is to provide the tools and information needed for local decision-makers to develop climate change adaptation strategies, and take actions to ensure healthy, viable, and sustainable coastal ecosystems and communities. We plan to accomplish this goal by producing a science-based, online decision-support tool to help local decision makers plan for and respond to sea level rise and storm hazards along the San Francisco Bay shoreline. The support tool will be built in collaboration with end users. A fine scale resolution (2 meter) Digital Elevation Model for San Francisco Bay, and localized extreme storm and sea level rise scenarios will be developed to underlie the tool. This project builds on a related effort already underway on the North-central California outer coast (referred to hereafter as “Outer Coast”), and the resulting tool will be available for the shoreline of the entire 9-county San Francisco Bay Area.

During this reporting period, the team has continued to focus on early stage activities: conducting a stakeholder analysis and needs assessment; managing a focus group for the Outer Coast portion of the tool; synthesizing and processing feedback received from stakeholders; presenting the project at several professional conferences and meetings; and interfacing with expert peers.

B. Working with Intended Users:

Describe the progress on tasks related to the integration of intended users into the project for this reporting period.

Our project objectives are closely tied with the integration of intended users into the project, and extensive details on that progress can be found in Section C. In addition to the project objectives and tasks identified in the original proposal, the team has undertaken other activities to understand and integrate the needs of our users. PRBO held two workshops with Marin County and Sonoma County bay shoreline stakeholders in June to gain a better understanding of how existing decision support tools can be used to assess vulnerabilities and develop adaptation plans for preparing for future sea level rise.

What did you learn? Have there been any unanticipated challenges or opportunities?

We have learned that stakeholders want local case studies to demonstrate how decision support tools could be applied, and we were also able to solicit stakeholder data that can be used to apply to the development of the OCOF tool. We have gained a better sense of the relevant planning horizons for coastal managers that will enable us to pick the appropriate range of sea level rise and storm scenarios to meet user needs.

The interest in groundwater impacts is more of an issue to managers along the San Francisco Bay margin than along the outer coast. Although beyond this project's scope, we are seeking funding to include groundwater considerations in the future.

Who has been involved?

The entire team has been involved in various outreach and integration activities.

Has interaction with intended users brought about any changes to your methods for integration of intended users, the intended users involved, or your project objectives?

Through interacting with intended users we have learned that the needs of stakeholders on the outer coast and the bay are similar, but also somewhat divergent regarding the vulnerabilities they are most concerned with. So while some of the lessons we learned from our interactions with outer coast stakeholders will also apply within the bay, we will also need to continue to engage with our intended users to ensure that differing needs are addressed.

Interviews with intended users expanded our understanding of their needs and the unique challenges that different types of users face in their own climate change adaptation work. A stakeholder assessment process helped us identify a diverse set of potential Advisory Committee members whose interests and perspectives expand those represented by our original core set of intended users. Early interactions with stakeholders highlighted the importance of including vertical land motion in flooding vulnerability along the San Francisco Bay in future flooding scenarios, which will be addressed based on twenty years of IfSAR measurements in the region, currently being analyzed by Roland Burgmann at UC Berkeley.

How do you anticipate working with intended users in the next six months?

The next six months will be an exciting time for the team to be working with our intended users. We will hold our first Advisory Committee meeting; unveil our new logo and website; and release the first version of the tool for the outer coast. Details are provided in section C below.

C. Progress on project objectives for this reporting period:

Describe progress on tasks related to project objectives for this reporting period.

Project Team meetings, management: Proceeded as planned. Team meetings were held on May 3rd and July 11th.

May 3, 2012 – Updated project timeline and deliverables; modeling, tool development (outer coast), and stakeholder engagement discussed; vision for outer coast and San Francisco Bay tool integration discussed; workshop planning for San Francisco Bay kick off meeting.

July 11, 2012 – Modeling, tool development (outer coast), and stakeholder engagement (including SF Bay workshop debrief and summary report development, Advisory Committee, and Needs Assessment)

discussed. Webinar capability was provided through PRBO.

Preliminary interviews with Intended Users: Proceeded as planned. Telephone and in-person interviews were conducted, and the interview protocol was then re-purposed for the Open House as the basis for one of the breakout sessions held in the afternoon (see Workshop Summary Report for additional details and findings). Interview results assisted the project team in designing interactive sessions at the Open House and determining stakeholder advisory committee composition, and were incorporated into the Needs Assessment.

Project Open House meeting for San Francisco Bay: Modified. As described in the previous progress report, this objective changed over time. The OCOF team partnered with the Bay Conservation and Development Commission and NOAA's Coastal Services Center to deliver a workshop that met the needs of all three organizations and helped to frame and clarify the adaptation work that each entity is engaged in. This collaboration led to improved working relationships amongst the organizations and the identification of additional partnership opportunities in the future. The Workshop Summary Report is available here: http://data.prbo.org/apps/ocof/docs/BayOfTheFuture_Workshop_Summary.pdf.

Needs assessment for SF Bay: Proceeded as planned. A draft document has been created and will be reviewed, discussed, and if necessary expanded, at the initial advisory committee meeting.

Hold San Francisco Bay working group meetings: Did not proceed as planned. Because of work underway with the outer coast component of the project and delays in communications due to stakeholder organizations' staff changes and vacations, the final composition of the Advisory Committee was not determined until recently. The Collaboration Lead felt it was important to hold the initial meeting only once all members had been determined and were available to attend. The initial meeting of the committee will take place on October 19, 2012.

What data did you collect?

We have continued to aggregate infrastructure layers, although this process is slowing down as we are learning of fewer and fewer new layers that we haven't already acquired. We are also starting to work with wave propagation datasets under development. Through our stakeholder workshops in the North Bay, we learned of ongoing efforts to quantify wave attenuation provided by tidal marsh ecosystems. We are looking to collaborate with these efforts in order to have a better understanding of the ecosystem services provided by bay tidal marsh ecosystems with respect to flood protection.

The USGS Earth Resources Observation and Science (EROS) Data Center is nearing completion of the the Digital Elevation Model (DEM) for the entire San Francisco Bay area, due to be completed by October 2012, using all recently collected multibeam bathymetry and topographic LiDAR. Along the outer coast, a DEM was completed and published (<http://pubs.usgs.gov/ds/684/>). Roland Burgmann at UC Berkely is in the midst of analyzing twenty years of IfSAR data to assess recent rates of vertical land movement, which will soon enable us to modify the DEM for future scenarios as appropriate. We have completed future wave modeling projections for the Pacific Ocean using forcing from Global Climate Models developed for CMIP5 (IPCC5). The results of this work will be used to drive ocean swell into San Francisco Bay in our model runs.

Has your progress in this period brought about any changes to your methods, the integration of intended users, the intended users involved or the project objectives?

With regard to the decision support tool, we have experimented with a few interactive online mapping approaches and now settled on a combination of OpenLayers and the GeoExt javascript libraries. We found that this combination performs best with the large number of map layers that will be managed by this system and the need for several online GIS functionalities that are not supported by most other approaches. We are also now considering using the California Climate Commons technology (climate.calcommons.org) for handling all of the OCOF metadata and user discussion forums. We have settled on the high level design of a data driven architecture for the decision support tool, which will be implemented over the next six months.

Have there been any unanticipated challenges, opportunities, or lessons learned?

While not necessarily unanticipated, there are challenges and opportunities presented by the rapidly evolving technology available for use on this project. We are engaged with an ever-growing set of application developers and more examples of decision support tools are made available regularly, so we strike a balance between looking for great examples of things similar to what we are building and making progress internally.

In discussions with climate scientists in the region, including those involved in climate model downscaling, primarily within the USGS CaSCADE2 project (e.g., Noah Knowles, Dan Cayan, Mike Dettinger, etc.), we recognized the importance of including downscaled winds in San Francisco Bay to refine our in-Bay wave development and wave-induced flooding. In addition, that group has also agreed to share their future estimates of fluvial discharge from the Bay-Delta, which will allow us to further improve our flooding projections, particularly in the North Bay which can be significantly affected by Delta floods.

What are your plans for meeting project objectives for the next six months?

The following objectives are scheduled to take place during the next 6 months:

Project Team meetings, management: Monthly team meetings will be held with webinar capability.

Hold San Francisco Bay working group meetings: We will hold our first Advisory Committee meeting in October 2012. Once this has been held, we will have a clearer understanding of how our intended users would prefer to interact with the project, and therefore what our future meeting schedule would look like.

In depth technical assistance, feedback, and formal evaluation workshop for outer coast tool already developed: The outer coast tool is now scheduled to be complete in winter 2012. Due to this, over the next 6 months we will begin soliciting interested users that desire in depth technical assistance in applying the tool to their project, but it will be after February 2013 once the technical assistance program is underway.

Develop flexible framework for web-based DST; revise as needed: Over the next six months we will receive detailed feedback from our outer coast focus group and use this to improve the map interface, community of practice, and overall usability of the decision support tool. We will also be implementing a fully data-driven architecture for all the tool components, which will enable rapid deployment of new data layers (i.e., making changes to all relevant user interface components, such as variable selection drop-down lists and color-ramps), as these are identified by stakeholders.

Predict physical climate change impacts from scenarios: We will continue to interact with our colleagues in the region to develop the best approach for integrating the completed vertical land motion rates in our DEM, downscaled wind and pressure fields, and fluvial discharge rates. In addition, we will continue to develop the best approaches for incorporating long-term shoreline change in our projections. We are planning a technical meeting at the AGU Fall Meeting 2012 to iron out many of these details. Lastly, we will have a series of meeting with our primary partners on this project (e.g., OSU and Deltares), to finalize the scenarios to be run in 2013.

Assess effects of scenarios on infrastructure and ecosystems; develop/revise web-based DST: We will use GIS and the full set of aggregated layers as identified by stakeholders to assess impacts of scenarios and begin to incorporate visualizations of impact risk/vulnerability into the DST.

D. Benefit to NERRS and NOAA: List any project-related products, accomplishments, or discoveries that may be of interest to scientists or managers working on similar issues, your peers in the NERRS, or to NOAA. These may include, but are not limited to, workshops, trainings, or webinars; expert speakers; new publications; and new partnerships or key findings related to collaboration or applied science.

We are producing several documents that will be of use to others within and outside of NOAA. Marina Psaros compiled a report that synthesizes what we learned about the state of climate change adaptation planning in the Bay Area from our May 23rd workshop. Psaros has also drafted a needs assessment that will be reviewed by the Advisory Committee and will be distributed to our stakeholders and partners.

During this report period, several team members served as expert speakers at a variety of conferences and meetings. Sam Veloz gave an invited talk presenting the OCOF approach at the Society for Conservation Biology meeting in July. The talk was held in a special session highlighting existing decision support tools for addressing conservation and climate change adaptation planning. Veloz also presented on the project at the Ecological Society of America Conference. Patrick Barnard presented the technical approach for the numerical modeling at the Headwaters to Oceans (H2O) conference in San Diego, the North Bay Watershed Association in Petaluma, the Humboldt Bay Symposium, and to the City of Los Angeles Mayor's Office and Emergency Management Board.

The OCOF project has also provided two opportunities for "transfer" within the NERR system. The first transfer project stems from our users' interest in accessing climate change visualization data on mobile devices, and will result in a needs assessment / product plan for Padilla Bay NERR. The second project is to transfer products and process used to conduct the stakeholder analysis to the Tijuana River NERR as they launch a climate change vulnerability assessment for the Tijuana River Valley.

E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.

These have been adequately addressed in other sections of the report.