CA LCC Statement of Interest: Using scenario planning to support climate-smart adaptation for the South Bay Salt Ponds Restoration Project: A case study for making science accessible to managers

Section 1 – General Information

Title of Existing Projects: Tidal Marsh Bird Population and Habitat Assessment for SF Bay Under Future Climate Change Conditions; A Broad-Scale, Multi-Species Monitoring Protocol to Assess Wintering Shorebird Population Trends in Response to Future Land Use Change and Climate Change (Phase I & II); Vulnerability Analysis and Monitoring Program for Detecting Changes in SF Bay Tidal Marsh Bird Populations Resulting from Climate Change; An Improved Decision Support Tool for Adaptive Tidal Wetland Restoration and Management

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We propose using existing decision support tools (DST) in a scenario planning analysis for the South Bay Salt Ponds Restoration Project (SBSPRP) as a case study that other bayland managers can reference for best practices for using these DST's for adaptation planning. Through substantial investment by the CA LCC and other partners, we have developed a set of DSTs that support conservation decision making for San Francisco Estuary ecosystems (www.prbo.org/sfbayslr and http://data.prbo.org/apps/pfss/). Our tools are ideally suited to support climate-smart restoration planning for shorebird and marshbird habitat. However, the utility of these tools could be promoted through their application in an actual case study, working closely with a team of managers. The strength of our tools is that they provide estuary-wide estimates of ecosystem response to a set of plausible but widely divergent sea-level rise scenarios. The resulting uncertainty in potential outcomes hampers the adaptive planning process. However, by applying a scenario planning analysis we can identify management solutions which are robust to uncertainty (Veloz et al., 2013). We propose to work with the SBSPRP Management Team (PMT) to engage in a scenario planning analysis to evaluate their adaptive management plan for tidal marsh restoration and salt pond management in the context of sea-level rise. Through the scenario planning process the PMT will explore a range of management options for a set of plausible future scenarios and identify actions that are robust to future uncertainty. In addition, this case study will demonstrate best practices for using our DSTs that other wetland managers could use to develop climate adaption plans. Moreover, our approach including the initial tool development could be applied in other estuaries and other ecosystems throughout the CA LCC region.

Section 2 – Partners and Management Relevance

The South Bay Salt Pond Restoration Project (SBSPRP) is the largest wetland restoration project (15,100 acres) on the West Coast of the United States. The PMT has developed an adaptive management plan that was designed to meet population targets for tidal marsh birds and shorebirds as well as to provide recreation opportunities and flood protection to local communities. The adaptive management plan was developed to allow modifications if any of the targets are not being met after initial implementation phases. Specific objectives for our project will be developed in cooperation with the PMT but we anticipate that our proposed case study will allow the PMT to: 1. Explore how tidal marsh birds and shorebirds at restored sites are projected to respond to sea level rise; 2. Estimate optimal configurations of tidal marsh restoration and salt pond habitat for a set of future scenarios; 3. Evaluate whether management targets for tidal marsh and shorebird species will be met in each scenario through the existing adaptive management plan; 4. Provide a quantitative context for the PMT to explore alternative management strategies if targets are not being met under the existing plan.

Our proposed project implements the CA LCC's strategic plan by addressing several of the CA LCC's guiding principles and objectives. Our project will strengthen existing partnerships among the stakeholders that comprise the PMT by allowing the team to explore management options that meet individual stakeholder objectives and address uncertainty in future conditions. Additionally, we will consider how potential SPBSPRP restoration projects will contribute to population objectives currently being developed by the San Francisco Bay Joint Venture. By explicitly addressing uncertainty through the scenario planning process we are demonstrating how science can be used to identify conditions under which management options fail to meet objectives (Lempert, 2012) helping to limit the paralysis that uncertainty can have on decision making. The proposed case study with the PMT will serve as an example of how LCC-funded decision support tools can be used to deliver science to managers in a form that will directly support their ongoing adaptation planning, providing an example of meeting objective 1

in the CA LCC's strategic plan to conduct information exchange between scientists and managers to advance conservation decision making at landscape scales. The project also addresses the CA LCC's objective 2, to enhance climate-smart conservation through the development of tools and demonstration of their application to anticipate future changes in ecosystems at the landscape scale and to identify management actions that are robust to our uncertainty of the effects of climate change.

Section 3 - Work Summary

Four CA-LCC-funded and completed projects will be used to support the proposed projects: (1)Tidal Marsh Bird Population and Habitat Assessment for SF Bay Under Future Climate Change Conditions; (2 & 3)A Broad-Scale, Multi-Species Monitoring Protocol to Assess Wintering Shorebird Population Trends in Response to Future Land Use Change and Climate Change (Phase I & II); (4) Vulnerability Analysis and Monitoring Program for Detecting Changes in SF Bay Tidal Marsh Bird Populations Resulting from Climate Change. PRBO staff (Veloz, Nur, Reiter and Wood) have made numerous presentations in person and through nationally advertised webinars (e.g. NCTC safeguarding wildlife seminar series) highlighting the tools we have developed through the project to stakeholders and we have also published a paper demonstrating how robust adaptation strategies can be identified using our tools (Veloz et al., 2013). Additionally, several technical reports for our projects and an interactive population modeling tool are available through the California Climate Commons website.

We propose to rely primarily upon LCC-funded models and products in the analyses for this project. However, we will make several enhancements including the incorporation of a newly available, higher resolution DEM as a base for subsequent analyses and by applying models of shorebird response to our existing climate change scenarios, leveraging the work produced by Reiter in two of the LCC-funded projects listed above. The majority of the proposed work will be to work with the PMT to use our tools to address management needs.

The proposed project will involve four stages and an optional fifth stage depending on funding. The first stage will involve a scoping meeting wherein the PMT will: 1) describe the specific management questions for the analysis, 2) describe the spatial and temporal extent of the project, and 3) select indicators for the analysis. Potential management questions include, identifying which salt ponds should remain as ponds and which should be restored to tidal marsh and whether the currently adopted 50:50 ratio of tidal marsh habitat to salt pond habitat will meet management targets under all future sea-level and sediment scenarios. During the second stage of the project, PRBO will analyze the impacts of the management actions on the indicators proposed in stage 1for each of four future scenarios, defined by high and low rates of sea-level rise and high and low suspended sediment concentrations. Potential indicators used in the impacts assessment could include the density and abundance of tidal marsh birds and shorebirds. In this stage, management actions that are robust or that fail under the four scenarios can be identified. The PMT will convene a workshop in the third stage of the project where the impacts for each of the scenarios will be reviewed. Through the meeting the PMT will be encouraged to explore new management actions which can accommodate the range of possible future outcomes illustrated in the scenarios. We will prepare a guiding document in the final stage to communicate to other stakeholders in the region the process that was used, what were the outcomes and what are the best practices for using our existing decision support tools and products. Veloz will lead the project and scenario planning analyses. His experience co-leading a scenario planning training course this summer hosted by the National Conservation Training Center will be a great asset to the project. Dr. Matt Reiter and Dr. Nadav Nur will contribute to the impacts assessment. An optional fifth stage of the project is to develop a monitoring protocol based on the analysis that will be designed to best identify when "triggers" for adaptive management are reached. Nur and Reiter will lead the development of the monitoring protocol incorporating findings from the SF Bay shorebird monitoring plan and tidal marshbird monitoring plan to assess compatibility with PMT monitoring needs.

Timeline:

Task	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Stakeholder scoping meeting	x			
Assess impacts		x	x	
Stakeholder meeting to review impacts/ identify alternative strategies			x	x
Communicate results to partners/ produce guide				x

References

Lempert, R. (2012). Scenarios that illuminate vulnerabilities and robust responses. *Climatic Change*, *117*(4), 627–646. doi:10.1007/s10584-012-0574-6

Veloz, S. D., Nur, N., Salas, L., Jongsomjit, D., Wood, J. K., Stralberg, D., & Ballard, G. (2013). Modeling climate change impacts on tidal marsh birds: Restoration and conservation planning in the face of uncertainty. *Ecosphere*, *4*(4).