General Information

TITLE: STRUCTURED-DECISION MAKING FOR CLIMATE CHANGE ADAPTATION TO CONSERVE SAN FRANCISCO BAY TIDAL MARSH ECOSYSTEMS

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CA LCC Ecoregion for the work: Bay Delta

Partners and Management Relevance

Our group of willing and engaged partners for this proposed project includes 13 participants from the 2011 Structured Decision Making (SDM) workshop (sponsored by CA LCC), 24 additional partners who will actively participate throughout, along with 4 partners who will be invited to observe at the workshop. Of the 37 actively engaged partners, 15 will serve as experts on modeling and estimating biophysical processes, and 18 will serve as natural resource managers and coordinators. Our team is particularly diverse; 12 federal and 5 state natural resource management programs along with one university, and 13 nongovernmental conservation organizations will be represented as part of our team. Please see Appendix A for list of partner names, affiliations, titles, and roles.

Management Needs Being Addressed

As a direct continuation of the 2011 SDM workshop sponsored by the CA LCC in Sacramento, and building from knowledge generated through the current Baylands Ecosystem Habitat Goals technical update process, this project will bring together natural resource managers, conservation coordinators and planners, and scientists working at multiple scales within the San Francisco Bay to develop a spatially-explicit decision framework that cuts across jurisdictional boundaries while accounting for uncertainties about climate change. Individual land managers and coordinators within the Bay have to grapple with uncertainty related to climate change and would benefit from a transparent process leading to management priorities that optimize use of limited budgets for tidal marsh conservation in the face of sea level rise and other projected climate change impacts. In particular, the SDM framework will allow managers within the Bay to identify a recommended strategy among a set of alternative strategies that may vary among its subregions (e.g., North Bay, South Bay, East Bay). Management priorities will be those that yield the greatest expected conservation benefits across the Bay considering multiple objectives including endangered species recovery (e.g., California clapper rail), tidal marsh ecosystem integrity and services, and human health and safety over the next century. Our framework will account for uncertainties about future climate change impacts, outcomes of management actions, and available budgets. Furthermore, our project will reveal crucial information needs to be addressed through monitoring and research within an adaptive management approach.

How Work Implements the CA LCC Strategic Plan

This effort will implement the CA LCC Strategic Plan through its congruence with the LCC Mission Statement, Vision, Five-Year Goal, Guiding Principles, Objectives, Strategies, and Actions. First, our proposal is in harmony with the CA LCC mission statement to "inform and promote integrated science, natural resource management and conservation to address impacts of climate change". Our proposed decision framework is not only essential to achieve broad-scale conservation in the Bay Delta ecoregion but will also serve as an excellent demonstration project informing spatially-explicit management decisions in the face of uncertainty about climate change impacts through a collaborative and transparent process involving dialogues among natural resource managers and scientists. Our proposal specifically fulfills Objective 1 in the Strategic Plan: "…conduct & coordinate information exchange between scientists and managers to advance decision making and conservation at a landscape scale." It will therefore directly advance the CA LCC toward achieving its Five-Year Goal to witness "A growing community… successfully collaborating to advance and implement actions that promote resilient and adaptable ecosystems across the landscape in the face of environmental change."

The project will address the CA LCC Guiding Principles and many of the Actions from the CA LCC Strategic Plan, including: 1) **"Strengthen existing partnerships…"** – expanding the suite of decision-makers and scientists engaged in the process from 14 to over 30 bringing to the table new entities such as SFEI, SFEP and BCDC. (Appendix A "Bay Tidal Marsh SDM Partners"; Actions 1.2.2, 1.3.1); 2) **"Provide enhanced scientific capabilities…"–** our spatially-explicit decision tool will be developed in collaboration with managers and topic

experts enabling us to integrate the most relevant related science to inform conservation of multiple ecosystem processes and services accounting for uncertainties about climate change impacts at landscape scales (Actions 1.1.3-4, 2.1.3-4, 2.2.3-5); 3**) "Provide management agencies with additional science…"** – our decision framework will foster information sharing, and science translation for key audiences and leverage predictions about landscape to regional-scale responses of focal wildlife species to alternative management strategies and climate scenarios based on multiple models from the literature and our own expert elicitation (Actions 1.1.3-4, 2.1.3-4, 2.2.3-5); 4) **"Provide a forum for partners"** – the SDM process will provide training and support and facilitate communication for a wide diversity of decision-makers in the Bay (i.e., land managers, regulators, coordinators) by engaging them in a dialogue with relevant scientists (e.g., wildlife ecologists, geomorphologists, decision analysts) to develop collaborative agreement about ultimate management objectives, predictive models, management strategies, and optimization tools relevant at multiple scales from regions within the Bay to the entire Bay (Actions 1.1.5, 1.3.2-5, 1.4.1, 1.4.4, 3.3.4).

Work Summary: 2013 SDM Webinars (Semi-Weekly) And Workshop

Status of Existing Product Deliverables and Outreach Efforts

We completed a report based on a 1-week SDM workshop in October 2011 in Sacramento (Takekawa et al. 2012), and we are currently developing a manuscript for a peer-reviewed journal for submittal by September 1, 2013. We have held several conference calls and online communications with interested stakeholders since 2011 to continue the conversation and sustain interest in continuation of this process.

Description of Additional Work Relative to Existing Work

The aim of this proposal is to **engage a broader suite of San Francisco Bay partners** (Appendix A) in developing a **spatially-explicit adaptation framework** .In particular, we will hold series of four 90-minute **webinars followed by an in-person workshop.** The webinars will consist of interactive SDM modules on problem framing, identifying objectives, constructing management alternatives, predicting consequences, quantifying tradeoffs, developing optimization tools, and isolating crucial information gaps. These webinars will provide partners with background and training along with continuing the dialogue on the SDM process in the context of Bay conservation. Following the webinars we will hold a **3-day SDM workshop** to develop a spatially-explicit adaptation framework for **choosing conservation strategies** varying among **subregions within the Bay** accounting for **uncertainties about climate change and management effectiveness.** We will work collaboratively through each of the SDM steps while revisiting the existing prototype framework and agreeing on **how it can be revised and improved to enable on-the-ground implementation**. The process is geared toward not only identifying optimal solutions to climate adaptation but also **identifying key gaps of information** that would help guide decision-making for conservation in the Bay.

Description of Value Added to Existing Work

The initial SDM framework made a number of simplifying assumptions in the spirit of collaboratively generating a first prototype during a 1-week workshop (Takekawa et al. 2012). This proposed project will provide added value to the existing SDM process not only by **doubling the number of partners** involved and **customized SDM training** but also by **addressing three key assumptions from the initial prototype**: 1) The Bay is a single management unit; 2) Conservation of threatened and endangered species is represented by California clapper rail recovery; and 3) Predictive models accurately linked climate change and management strategies to fundamental objectives associated with "perpetuating tidal marsh ecosystem integrity and derived ecosystem services along with human benefits". For the first assumption we will develop **actionable alternative strategies** accounting for the heterogeneity among subregions of the Bay, for the second we will consider **multiple threatened and endangered or focal species** with contrasting life history requirements, and for the third we will revisit our predictive models **ensuring scientific robustness** of the component relationships and measureable attributes for each of the fundamental and means objectives.

Timeline For Deliverables (assuming September 2013 start date)

- Presentations on problem definition & objectives for webinars 2 & 3 (Oct 2013)
- Presentations on action alternatives, consequences, trade-offs, and optimization for webinars 4-6 (Nov 2013)
- Interim report describing structure of spatial decision model and workshop outcomes (March 2014)
- Final spatial decision framework for climate adaptation in the Bay (June 2014)
- Presentations describing final spatial decision framework (July 2014)
- Final report as draft manuscript for peer-reviewed journal describing spatial decision framework (Aug 2014)

Literature Cited

Takekawa, J., K. Thorne , B. Mattsson, J. Cummings, G. Block, V. Bloom, M. Gerhart, S. Goldbeck, J. O'Halloran, B. Huning, N, Peterson, C. Sloop, M. Stewart, K. Taylor, L. Valoppi, D. Crouse, S. J. Converse , and M. A. Haynes. 2012. Climate change and tidal marsh restoration in San Francisco Bay: should we restore more marshes to full tidal action and how should they be prioritized? A case study from the Structured Decision Making Workshop 17-21 October, 2011. Sacramento State University, Sacramento, California USA [online]: http://training.fws.gov/EC/Resources/Decision_Analysis/oct_2011/takekawaetal_2012_prevised_9_28_12.pdf

Budget

Expense category	Cost
Personnel Services	
SDM Coach (500 hrs. @ $46.65/hr.)	$23,325
Team Coordinator (210 hrs. @ $51/hr.)	$10,710
Team Co-coordinator (110 hrs @ $65/hr.)	$7,150
Facilitator (40 hrs @ $50/hr.)	$2,000
Subtotal Personnel Services	***$43,185***
Travel	
SDM coach (Vienna Austria)	$2,105
Subtotal Travel	***$2,105***
Contract Subtotal (Personnel Services + Travel)	***$45,290***
Overhead @ 10%	***$4,529***
GRAND TOTAL	**$49,819**

Appendix A. Partners in developing spatially-explicit adaptation framework for tidal marshes in the Bay. Asterisk (*) denotes 2011 SDM workshop participant.

	Name	Affiliation	Title	Role
1	Christina Sloop*	SFBJV	Science Coordinator	Team coord.
2	Beth Huning*	SFBJV	Coordinator	Team co-coord.
3	Brady Mattsson*	U. Nat. Resources & Life Sciences	Researcher	SDM coach
4	Kaylene Keller	FWS I&M	GIS and Data Manager	SDM co-coach
5	Karen Thorne*	USGS	Research Ecologist	Ecologist
6	Andy Gunther	BAECCC	Executive Coordinator	Coordinator
7	Anne Morkill	FWS Refuge (replaced M. Stewart)	Refuge Complex Manager	Manager
8	Brigid McCormack	Audubon California	Managing Director	Ornithologist
9	Bruce Wolfe	SF Bay Region. Water Qual. Board	Executive Officer	Manager
10	Catherine Burns	SFBBO	Executive Director	Ornithologist
11	David Lewis	Save the Bay	Executive Director	Manager
12	Dean Kwasney	USDA NRDC	Easement Program Specialist	Manager
13	Diane Ross-Leech	PG&E -- Habitat Protection	Program Manager	Manager
14	Ellie Cohen	PRBO Conservation Science	Executive Director	Ecologist
15	Giselle Block*	FWS I&M	Inventory & Monitoring Specialist	Biologist
16	Greg Martinelli	CA Dept. Fish & Wildlife	Bay Delta Program Manager	Manager
17	Jaime O'Halloran	Army Crops of Engineers	Project Planner	Manager
18	Jaimie Kooser	SF Bay NERR	Reserve Manager	Manager
19	Jeff McCreary	Ducks Unlimited	Regional Biologist	Biologist
20	Jeremy Lowe	ESA-PWA	Senior Coastal Geomorphologist	Geomorphologist
21	John Donelly	CA Wildlife Conservation Board	Executive Director	Manager
22	John Klochak	FWS Coastal Program	SF Bay Program Manager	Manager
23	John Takekawa*	USGS WERC	Research Wildlife Biologist	Biologist
24	Joy Albertson	FWS Refuges in Bay Area	Supervisory Wildlife Biologist	Biologist
25	Judy Kelly	San Francisco Estuary Partnership	Program Manager	Manager
26	Karen Taylor*	CA Dept. Fish & Wildlife	Associate Wildlife Biologist	Biologist
27	Laura Valoppi*	USGS South Bay Salt Pond Restor.	Lead Scientist	Biologist
28	Letitia Grenier	CA State Coastal Conservancy	Bayland Goals Update Coordinator	Biologist
29	Marc Holmes	The Bay Institute	Program Manager	Manager
30	Matt Gerhart*	CA State Coastal Conservancy	SF Bay Program Manager	Manager
31	Meredith Williams	San Francisco Estuary Institute	Executive Director	Scientist
32	Meg Marriot	FWS Refuge - San Pablo Bay	Wildlife Biologist	Biologist
33	Nadine Peterson*	CA State Coastal Conservancy	Deputy Director	Manager
34	Pat Rutten	NOAA Restoration Center	SW Region Supervisor	Manager
35	Rob Doster	FWS Mig Birds	Regional Migratory Bird Biologist	Biologist
36	Steve Goldbeck*	Bay Conserv. & Develop. Comm.	Deputy Directpr	Manager
37	Valary Bloom*	FWS Endangered Species Branch	Fish and Wildlife Biologist	Manager
38	Brian Fulfrost	Brian Fulfrost and Associates	GIS & Remote Sensing Expert	Observer
39	David Thomson	SFBBO	Senior Ecologist	Observer
40	Judy Drexler	USGS CA Water Science Center	Researcher	Observer
41	Tom Kimball	USGS WERC	Research Manager	Observer