CALFED Progress Report
California Sea Grant College Program

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ProjectYear_2A 2nd **ProjectNo_2C** R/SF-39

TypeQuestionnaire_2B Final Report

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Project Information

ProjectNo_2C R/SF-39 **StartDate_3a** 9/1/2008 (rev. **EndDate_3b** 8/31/2010 (rev.
ProjectTitle_4 Scenarios for Restoring Ecologically Functional Floodplains and Providing Flood Control Services in the Sacramento-San Joaquin Delta

CALFed Fellow contact information

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Research Mentor (for additional please see #8)

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RMPositionTitle_6N Adjunct Associate Professor, Cooperative Ext. Specialist

Community Mentor (for additional please see #9)

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CMPositionTitle_7N Conservation Director

Additional Research Mentors and Community Mentors

Additional Research Mentors_8

Additional Community Mentors_9

Project Objectives: Please type your responses, and answer the questions in a style appropriate for laymen.

ProjectObjectives_10

The main objective of this project was to develop a spatially explicit model of potential floodplain restoration sites using a new indicator for quantifying floodplain function that can serve ecological, water supply, and public safety goals. There are two primary components to developing this idea: 1) a coarse level evaluation of spatial data and 2) a fine scale analysis of site functional floodplain potential. The tasks below describe this process.

Year 1
Task 1: Scoping, interviews, and identification of analysis watersheds
Task 2: Data collection (aerial LIDAR, ground-based LIDAR, field visits, and hydrologic data)
Task 3: Coding and testing of initial GIS and hydrological analysis methodology
Task 4: Preparation of year 1 results (spatial statistics, maps, and code)
Year 2
Task 1: Collection of ground based LIDAR if necessary to characterize more sites
Task 2: Run climate change scenarios on selected floodplain landscape
Task 3: Preparation/refinement of all metrics of floodplain size, shape, connectivity, and proximity for potential floodplain restoration
Task 4: Final processing code, maps, and spatial layer development
Task 5: Final results documentation

Summary of progress in meeting each of these goals and objectives

ProgressSummary_11

Year2
Task 1: Additional LIDAR collection was not deemed necessary to do a detailed case study assessment because the South Delta region chosen for further development was sufficiently characterized with the available data.

Task 2: We evaluated climate change scenarios on a selected floodplain landscape. Daily flow data produced by the USGS CASCaDE: Computational Assessments of Scenarios of Change for the Delta Ecosystem project allowed us to examine four future flow scenarios from 2001-2099. The Cascade data were derived from downscaled gridded observed fields from the University of Washington Land Surface Hydrology Research Group and from Global Circulation Model (GCM) simulations of historical climate conditions, A2 future greenhouse-gas-and-sulfate-aerosols emissions scenarios, and B1 future emissions scenarios. The GCMs represented are the National Center for Atmospheric Research's Parallel Climate Model 1 (PCM) and the NOAA Geophysical Fluid Dynamics Lab's GFDL CM2.1 model. We chose to run analyses based on the best-case scenario for a warm and wet future climate represented by B1PCM and the worst-case scenario that is hot and dry represented by A2GFDL. Delta flows were assessed using the Ecosystem Functional Model (EFM) for the Yolo bypass (Yolo), Eastern Rivers (Cosumnes + Mokelumne), Sacramento (Hood), and San Joaquin (Vernalis).

Task 3: Metrics were derived relating to functional flows considering floodplain size, shape, connectivity, and proximity for potential floodplain restoration scenarios for a case study identified as possessing high potential for ecosystem benefits per the coarse level GIS analysis. Hydraulic flow modeling was conducted in HEC-RAS for three scenarios on the San Joaquin River from Vernalis to Mossdale: 1) the current levee configuration, 2) removal of the eastern levee/cross levees, and 3) the addition of a bypass/slough. Inundation area curves were prepared for the newly flooded area as compared to the current configuration of floodplain constricted by today's levees. For each physical scenario, we identified the inundated area connected to the main river channel associated with given threshold flows identified in the EFM model.

Task 4: Processing code documentation, map preparation, and spatial layer archiving were done using ESRI Model builder, geodatabases, and exported JPG figures.

Task 5: Results documentation and discussion are contained within a completion report and a paper currently in work for publication.

PROJECT MODIFICATIONS: Please explain any substantial modifications in research plans, including new directions pursued. Describe major problems encountered, especially problems with experimental protocols and how they were resolved. Describe any ancillary research topics developed.

Modifications_12

BENEFITS AND APPLICATIONS: Suggest the relevance of these new findings to management. Describe any accomplishment, that is significant effects your project has had on resource management or user group behavior. CALFED is looking for "management cue" (see http://science.calwater.ca.gov/pdf/soemgmtcues.pdf).

BenefitsApplic_13

Promotion of multi-benefit projects that can improve flood risk management and support ecosystem functions is a goal of the Central Valley Flood Management Planning Program. Quantifying the achievement of floodplain ecosystem function is an important piece for enabling managers to assess and promote potential projects. Using the ecosystem functions model with hydraulic analysis of restoration alternatives allows managers to link floods to a range of specific benefits or desired management outcomes. Defining and quantifying floodplain benefits under climate change scenarios can also help managers plan for more resilient restoration alternatives.

PUBLICATIONS: List any publications, presentations, or posters that have resulted from this funded research. Give as many details as possible, including status of paper (e.g., in review; in press), journal name, conference location and date of presentation. Please note (as outlined in the conditions of the award) that each fellow is required to submit an abstract for an oral or poster presentation at each State of the Estuary conference and CALFED Science Conference during the duration of the fellowship.

Publications_14

Matella, M. and J. Cain. Scenarios for Restoring Ecologically Functional Floodplains and Providing Ecosystem Services in the Central Valley, California. Poster Presented at 28th Annual Salmonid Restoration Conference and the 44th Annual American Fisheries Society Cal-Neva Conference; 2010 March 12; Redding, CA.

Matella, M. and J. Cain. Scenarios for Restoring Ecologically Functional Floodplains and Providing Ecosystem Services in the Central Valley, California. Poster Presented at Bay-Delta Science Conference; 2010 September 27-29; Sacramento, CA.

Matella, M., and M. Tompkins. September 2011. Using integrated models to quantify ecological benefits of floodplain restoration: Scenarios on the San Joaquin River, California. Presentation at Floodplain Management Association Conference, San Diego, CA.

Matella, M. and A.M. Merenlender. Scenarios for restoring floodplain ecology given changes to river flows under climate change: Case from the San Joaquin River, California. <Working paper for submission to RIVER RESEARCH AND APPLICATIONS (1); ENVIRONMENTAL MANAGEMENT (2) >.

COOPERATING ORGANIZATIONS: List those agencies and/or persons who provided financial, technical or other assistance to your project since inception. Describe the nature of their collaboration.

CoopOrganiz_15

American Rivers
1101 14th Street, NW Suite 1400
Washington, DC 20005
I collaborated with John Cain/American Rivers to help them describe and map floodway expansions strategies in the Central Valley and quantify potential benefits of restoration.

NewFields River Basin Services, LLC
Oakland, CA 94612
mtompkins@newfields.com
I worked with Mark Tompkins on developing EFM metrics for quantifying benefits of floodplain restoration project ideas on the San Joaquin River.

AWARDS: List any special awards or honors that you, or mentor or members of the research team, have received during the duration of this project.

Awards_16

KEYWORDS: List keywords that will be useful in indexing your project.

Keywords_17

Floodplain restoration, ecosystem functions model

PATENTS: List any patents associated with your project.

Patents_18

None

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Additions: Additional information can be added here. Please begin the text with the number of the question you are adding to.

Additions_19