

Preparer Information

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Project Information

ProjectNo_2C R/SF-14 StartDate_3a January 1, 2006 EndDate_3b December 31, 2008
ProjectTitle_4 Restoring non-equilibrium riparian communities in disturbance-altered ecosystems: implications for river management and climate change

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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

In the Central Valley of California, Fremont cottonwood (*Populus fremontii*) dominates the near-channel ecosystems. These forests provide a myriad of ecosystem services that benefit aquatic and terrestrial natural resources and human society; however, throughout the western U.S. and across Europe, water regulation, channel confinement, and land conversion have significantly altered the amount and distribution of cottonwood-dominated riparian vegetation, as well as the physical processes that drive forest regeneration rates and age structure. The ecological and hydrological functions of Valley riparian zones are directly tied to the population dynamics of this species. The goal of this research is to assess the health and dynamics of remnant riparian forest stands dominated by Fremont cottonwood throughout the Central Valley. The fundamental scientific and management challenge is to understand how to restore this disturbance-dependent community in a severely disturbance-altered ecosystem. The specific objectives are to (1) assess the current pattern of stand structure and spatial distribution of cottonwoods at the site- and landscape-scale relative to hydrogeomorphic and biological variables, and (2) to assess the health of remnant stands and understand the drivers of stand regeneration under various recruitment pathways, and (3) to integrate this information with management/restoration and climate change considerations.

Summary of progress in meeting each of these goals and objectives

ProgressSummary_11

sites, refining laboratory techniques for analyses of cottonwood tree cores, continued acquisition of existing data, and continued coordination and collaboration with other researchers working on the middle Sacramento River. Despite staffing transitions, significant work was accomplished during this program year, including (1) three field efforts to survey cottonwood stands and collect tree cores in abandoned channel sites along the middle Sacramento River, two of which were done in coordination with our French colleagues from the National Center for Scientific Research (CNRS) (2) acquisition of a significant body of existing data, particularly digital spatial data for analyses of current and historical cottonwood distribution along the Sacramento River, (3) development of a conceptual model of geomorphically-driven riparian forest dynamics along the middle Sacramento River, California (poster presented at the 8th biennial State of the San Francisco Estuary Conference, Oakland, CA, October 16-18), which is currently in preparation for publication, (4) a reconnaissance and information exchange trip to similar rivers in France hosted by our French collaborators at the National Center for Scientific Research in Lyon, and (5) submission of a proposal to the National Center for Airborne Laser Mapping for a graduate student seed grant to fly LiDAR for a ~26.5 km portion of the middle Sacramento River south of Hamilton City (Highway 32).

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

John Stella, the Research Fellow, accepted a faculty position at the State University of New York in Syracuse at the end of 2006. While Dr. Stella will continue to be intimately involved in the project and is committed to help guide the project through to completion, a new graduate student was brought on in May under the supervision of Dr. John Battles, the Research Mentor, to carry on the project. Maya Hayden has worked with Dr. Stella on several projects in the past, and is intimately familiar with the project history and research background, ensuring a successful staffing transition. As mentioned in last year's report, we have solidified collaborations with various researchers studying geomorphic processes and vegetation dynamics on the middle Sacramento River, in order to examine the patterns of stand structure and understand the drivers of cottonwood establishment and dynamics within

abandoned channels of the Sacramento River. This is essentially a refinement of Task 1 (as revised in September 2005), and will also explore if and how the processes driving cottonwood recruitment within abandoned channels (resulting from channel cutoff/avulsion events) differ from those on the more well-studied point bars (resulting from lateral migration).

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

Progress to date is preliminary, but seeks to directly inform CALFED's restoration of habitats and processes management cue by understanding the patterns and drivers of cottonwood establishment and dynamics within abandoned channels of the Sacramento River, and comparing these patterns/processes to those occurring within point bar stands, whose regeneration has been severely altered. Improving our knowledge of the ecology and population dynamics of Fremont cottonwood in the Central Valley is a necessary foundation for conserving, managing, and restoring the more complex dynamics of stream and riparian communities in similar systems, particularly under altered hydrogeomorphic conditions.

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

Stella, J.C., M.K. Hayden, J.J. Battles, H. Piégay, and S. Dufour. 2007. A conceptual model of geomorphically-driven riparian forest dynamics along the middle Sacramento River, California. Poster presented at the 8th biennial State of the San Francisco Estuary Conference, Oakland, CA, October 16-18.

Stella, J.C., J.J. Battles, J.R. McBride, B.K. Orr. 2007. Physiological adaptations increase survival for riparian tree seedlings subject to river stage decline. Annual Meeting of the Ecological Society of America, San Jose, CA. August 6-10, 2007.

Stella, J.C. 2007. Scaling from the leaf to the floodplain: Linking physiology studies with life history traits to restore streamside forests in arid regions. IGERT Biogeochemistry and Environmental Biocomplexity Seminar, Cornell University, Ithaca, NY. October 19, 2007.

Stella, J.C. 2007. Quantitative approaches to restoring streamside forests in a water-limited ecosystem. Department of Geography Symposium, Syracuse University, Syracuse, NY. September 22, 2007.

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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

Department of Environmental Science, Policy and Management, University of California, Berkeley. Laboratory space, library and administrative resources.
The Nature Conservancy, Chico, California. Scientific expertise and local knowledge of the middle Sacramento River, field logistical support during site selection, access to TNC properties.
Dr. HervÉ PiÉgay, National Center for Scientific Research (CNRS), Lyon, France. Collaborator working in abandoned channels of the middle Sacramento River.
(additional orgz listed in Additions)

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

Not applicable.

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

Keywords_17

Riparian vegetation, restoration, dredger tailings, Fremont cottonwood, river floodplain

PATENTS: List any patents associated with your project.

