



CALFed Progress Questionnaire
California Sea Grant College Program

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Project Information

ProjectNo_2C U-04-SC-005 StartDate_3a 9/01/05 EndDate_3b 8/31/08
ProjectTitle_4 Long-term Geomorphic Effects of Dams on Rivers in the Central Valley of California: A Comprehensive and Comparative Approach

CALFed Fellow contact information

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Additional Research Mentors and Community Mentors

Additional Research Mentors_8

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Michael Singer, USGS Post-doc, mdsinger@usgs.gov, 510-813-4848
Dr. Peter Downs, Stillwater Sciences, 2855 Telegraph Ave #400 Berkeley CA 94705 510-848-8098

Additional Community Mentors_9

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

ProjectObjectives_10

My objectives for this study are the quantification and comparison of the hydrologic and geomorphic alterations that have occurred on the major dammed tributaries in the Central Valley of California. Specifically, I will quantify pre- and post-dam sediment budgets, sediment deficits and changes in the magnitude and frequency of the geomorphic processes affecting the channel and associated communities. Additionally, at eight to twelve study sites, I will evaluate the corresponding changes that have occurred in channel form. From the previous analyses, this study will provide specific and accurate recommendations for CalFed's hydrologic and geomorphic restoration targets, particularly for the programmatic targets: iCentral Valley Streamflowsi and iCoarse Sediment Supplyi (CalFed ERPP Volume II).

Summary of progress in meeting each of these goals and objectives

ProgressSummary_11

To date I have completed a review of historical literature on Central Valley streams, primarily using the USGS library in Menlo Park and archives in San Bruno but also including the California Geological Survey library in Sacramento and the UC system libraries. I finished a hydrologic comparison of the magnitude of changes in flows downstream of each of the dams with adequate gage records using peak and daily flow data. I established twelve gravel tracer sites on seven relatively unstudied rivers in the Central Valley in the fall of 2005 and reoccupied the sites in the spring and summer of 2006. Currently, I am beginning the analysis of this data to determine relative mobility thresholds on each tributary. I have also begun a search for aerial photographs to determine channel change at each of the seven chosen study tributaries. Additionally, my advisor and I recently finished a model estimating the amount of sediment and gravel stored behind dams draining into the Central Valley to approximate the amount of gravel that would have been added had there been no dams (manuscript in preparation).

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

I have had no problems with my experimental protocols as yet. One difficulty I have run into that I had not expected was the prevalence of bedrock claypan deposits downstream of dams in the Central Valley. It is likely that these deposits have been exposed due to removal of overlying sediment (i.e. downcutting). To evaluate the extent of the claypan bedrock, I am planning a field campaign in September to map these deposits in the seven study rivers I have chosen. Additionally, during the months of March and

April this year, the high flows prevented me from returning to my study sites. In lieu of field work, I chose to spend time at the UC Berkeley Richmond Field Station, working on several flume experiments to model the downstream effects of dams and methods of gravel augmentation to restore gravel-bedded rivers. This theoretical work has been greatly valuable for understanding some of the complicated responses and forms I have seen at my field sites. I hope to run one more set of experiments sometime during the winter of 2006.

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

Through the course of my field and lab work, I have found a number of issues that management should consider but is not now doing so. Primary among these is the difference in channel response downstream of dams that have reduced flows. Several dams in the Central Valley, such as Monticello Dam on Putah Creek and Friant Dam on the San Joaquin have greatly reduced the flows downstream in the post-dam period. Other dams, such as Oroville Dam on the Feather River, Folsom Dam on the American, and Shasta Dam on the Sacramento have not reduced flows as much. What effects these differences have on channel change I have not determined yet, but regardless, different restoration techniques should be employed below dams to reflect these differences in hydrologic alteration. The CalFed Environmental Water Account could use this information to assess the comparative advantage of investing in environmental flows in one watershed versus another.

From the experimental lab work this spring, it appears that ecologically-significant bars are often the first features in a river to adjust to a reduction in sediment supply (as occurs downstream of dams). The bars adjust by downcutting at the toes, leaving the bed relatively flat and with relatively little ecological value. The response that we observed is similar to that found below some types of dams (e.g. on the Trinity River downstream of Lewiston Dam) that others have called the "bowling alley" form.

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A large rectangular area with horizontal dashed lines, intended for handwritten responses.

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

California Department of Fish and Game (Kris Vyverberg) - technical assistance and advice regarding rivers around Sacramento
California Department of Water Resources (Koll Buer) - provided technical feedback and advice for rivers in the Northern Sacramento Valley
U.S. Geological Survey (Michael Singer) - provided advice on sampling methods and overall scope for Northern Sacramento Valley Rivers
Stillwater Sciences (Peter Downs) - provided advice on overall scope and methods for the San Joaquin Tributaries
McBain & Trush (Scott McBain) - provided advice on sampling protocol and methods for the overall project

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

none yet received

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

Keywords_17

Central Valley rivers, geomorphology, sediment, fisheries, gravel, hydrology

PATENTS: List any patents associated with your project.

Patents_18

does not apply.....

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

Additions_19

