99B-191
Panel A

Executive Summary

Project description and primary biological/ecological objectives: Setback levees have been supported as an approach to multi-objective floodplain management on the Sacramento and San Joaquin Rivers, and are commonly recommended as a way to restore geomorphic and ecosystem function in riverine habitats. However, the benefits of setback levees, as weighed against the costs, have yet to be conclusively demonstrated to agency personnel and the public. This project seeks funding to develop a geomorphic model that allows simulation and demonstration of the response of riverine systems to levee removal and setback. The prototype model can be used in leveed reaches of rivers in the Bay-Delta system. This model also provides data for a riparian habitat model that is currently being developed by collaborator, Steven E. Greco, of UC Davis.

The levee setback simulations will be based upon a model that is currently in development. The model is a physics-based meander migration model that predicts channel evolution in response to measured or estimated hydraulic and geologic conditions. This model can ultimately be linked with an empirical model of the response of riparian forest and floodplain vegetation to channel dynamics and floodplain inundation. The geomorphic model will be used to simulate channel and floodplain changes in response to levee setbacks.

When applied to various levee setback designs, the model can be used to demonstrate and estimate spatial and temporal changes in floodplain development. These simulations can be used to inform decisions on appropriate magnitude of setbacks, ecosystem benefits, and potential third party benefits and impacts such as compatible land uses, placement of infrastructure, water quality impacts, and economic impacts. Additionally, the visualizations developed for CALFED and collaborating partners in this project will demonstrate the evolution of river meanders and their associated floodplains in response to levee setbacks and renewed channel migration. This will add to the public understanding of promoting natural processes as a means of restoration.

Approach/tasks/schedule: This project involves four tasks to be completed within two years of the start date. UC Davis researchers and staff, in collaboration with project partners, will complete all tasks. The California Department of Water Resources and the U.S. Army Corps of Engineers have agreed to supply sample hydrologic, geologic, land use, and topographic information, in order to develop prototype levee setback scenarios.

Task 1: Develop levee and infrastructure-placements component of migration model (Year 1)
Task 2: Apply model to simulate levee setback scenarios (First half, Year 2)
Task 3: Develop interactive computer visualization of model output (Second half, Year 2)
Task 4: Prepare model simulations, provide report and recommendations (Second half, Year 2)

Justification for project and funding by CALFED: As noted in the CALFED ERPP, the conservation and improvement of ecosystems within the Sacramento River Basin involves restoring channel dynamics and the links between the channel and its floodplain. This project will provide a tool to allow CALFED and other decisionmakers the method to evaluate the magnitude and timing of habitat that is likely to be created if levees are set back and geomorphic processes are restored. In addition, this tool can be used for public demonstration of the value and implications of setback levees and the restoration of geomorphic function, and aid in designing setbacks that minimize third party impacts. The General Bay-Delta Focused Action "*Develop ecologically-based hydrologic models*" is directly addressed by this project.

Budget costs and third-party impacts: This project seeks $104,458 for a two-year project. Most of the cost is salaries and overhead for a research scientist and post-graduate researcher.
Task 1: Develop levee component of model (Year 1) $52,662
Task 2: Apply migration model to simulate levee setback scenarios (First half, Year 2) $20,848
Task 3: Develop visualization code (Second half, Year 2) $13,924
Task 4: Prepare model simulations, report and recommendations (Second half, Year 2) $17,024
Total $104,458
No negative third party impacts are anticipated with this proposed project. The model and demonstration tool can ultimately be utilized by a broad range of stakeholders and agencies, including CALFED, in the understanding and analysis of levee setbacks.

Applicant qualifications: Eric W. Larsen, Ph.D. (1995), Assistant Research Scientist, Department of Geology, University of California, Davis. Area of emphasis: fluvial geomorphology, riverine restoration, river mechanics and sediment transport.
Jeffrey F. Mount, Ph.D. (1980), Professor and Chair, Department of Geology, University of California, Davis. Director, UD Davis Center for Integrated Watershed Science and Management. Area of emphasis: sedimentology, fluvial processes, flood management.

Monitoring and data evaluation: Because the levee setback scenarios are not site-specific, this project does not entail monitoring. Fundamental questions will be evaluated as follows: 1)What is the dynamic interaction between levees, hydrology and meander migration? Method: Measure the magnitude of lands eroded and deposited. Tabulate a time-rate of areal erosion and deposition. Vary the hydraulic input parameters, like discharge, to examine the effect of changing hydrology. 2) What will be the geomorphic response to levee setbacks? Method: Measure the magnitude of lands eroded and deposited. Tabulate a time-rate of areal erosion and deposition. Plot this against the distance of levee setback. 3) Can setback distances be optimized to promote multi-purpose ecosystem and flood management objectives? Method: Plot the magnitude and time-rate of lands eroded and deposited against the distance of levee setback. Determine optimum distance for various defined objectives. 4) How will different setback schemes effect sediment transport? Method: Tabulate the change in longitudinal bed slope for various setback schemes. Use the slope to estimate changes in sediment transport rates associated with different schemes.

Local support/coordination with other programs/compatibility with CALFED objectives: This project will rely upon close coordination between UC Davis, The Nature Conservancy, ACOE Comprehensive Study Group, DWR and USFWS. We will request that members of each agency participate in an advisory team to direct the development of the model and guide simulations, providing for consistency and coordination with other floodplain management programs. Additionally, the project will interact directly with the on-going California Interagency Floodplain Management Coordination Group and the ACOE Sacramento and San Joaquin Comprehensive Study. The Comprehensive study specifically recommends meander migration simulations. We will coordinate with the U.S. Army Corps of Engineers to develop a computer model that is compatible with the recommendations outlined in the comprehensive plan. In addition, the meander migration model will provide a valuable component of the Comprehensive Study's Floodplain Ecosystem Function Model. This project will provide a "rational, science-based model to aid in decision making in ecosystem-based management" (CALFED ERPP p. 3, Vol. 1.)

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