Report as of FY2006 for 2006CA168B: "Ecohydrologic Effects of Stream Restoration"

Publications

Project 2006CA168B has resulted in no reported publications as of FY2006.

Report Follows

RESEARCH PROGRAM:

Ecologic and hydrologic conditions in rivers and streams throughout the developed world have been degraded by changes in land use and water management activities. One cause of river degradation is channelization, which alters the functions of riparian and floodplain wetlands by fundamentally changing the hydrologic, sedimentologic and biogeochemical connectivity between channels and floodplains. A growing recognition of the functions that seasonal floodplain wetlands provide has prompted global interest in the restoration and rehabilitation of many of these degraded ecosystems. While restoration activities are abundant, sound scientific basis for various actions, protocols for design, and post-project monitoring are generally lacking. Specifically, the effects of geomorphic channel restoration upon floodplain hydrology and wetland vegetation remain relatively un-documented.

Through assessment and modeling of an exceptionally well-documented stream restoration project, this research seeks quantitative answers to two fundamental questions: 1) *what are the hydrologic effects of geomorphic stream restoration*? It is widely believed that geomorphic channel restoration re-establishes the hydrologic drivers that support floodplain wetlands. However, this has rarely been demonstrated or quantified. 2) *How will these hydrologic changes impact the distribution of native wetland plant species*? This also is assumed to be a direct benefit of geomorphic restoration, but is rarely assessed. The proposed research will focus on a recently restored meadow reach of Bear Creek, the most significant tributary to the Fall River, Shasta County, California.

The research plan involves two, linked programs, hydrology and vegetation response. 1) *Hydrology* - In order to quantify the impact of restoration activities on hydrologic storage and fluxes, a hydrologic model was developed. The hydrologic model was used to simulate the hydrologic connectivity of the restoration site comparing the pre- and post-project topographic conditions. 2) *Vegetation Response* – The distribution of floodplain wetland plants is controlled by many factors including the availability of suitable substrate, seed sources, duration of inundation, in addition to the access to and rate of change of shallow groundwater. To evaluate the change in wetland plant distribution based upon hydrologic parameters, a probabilistic vegetation model will be coupled to the hydrologic model described above using a direct gradient analysis. Vegetation data were classified into community types using Two-Way Indicator Species Analysis (TWINSPAN), and a habitat suitability statistical approach will be used to determine the distribution of various community types throughout the restored meadow as a function of depth to groundwater during the growing season and the range of depth to groundwater during the growing season. The coupled hydrologic-vegetation model will be used to simulate the effect of the restoration upon the availability of suitable physical habitat for native species and the spatial extent of various plant communities will be compared.

Results of the coupled ecohydrologic modeling effort will provide a better understanding of the potential impacts of geomorphic restoration upon native wetland plant distribution to help guide future restoration efforts aimed at the conservation of rare, threatened, and endangered species. The results of the study will benefit land managers, restoration practitioners and regulators by establishing baseline information regarding the potential benefits of stream restoration, as well as developing new predictive tools to assess potential design considerations.

INFORMATION TRANSFER PROGRAM:

Elements of the monitoring data have been used toward the preparation of a Post Project Appraisal of the Bear Creek Meadow Restoration Project, for inclusion on the National River Restoration Science Synthesis database (http://nrrss.nbii.gov/). No additional information transfer has been conducted.

STUDENT SUPPORT:

	Total Project Funding		Supplemental Awards	Total
	Federal Funding	State Funding		
Undergrad.				
Masters				
PhD.	1	1		1
Post-Doc.				
Total	1	1		1

* One PhD student, Chris Hammersmark has been supported by these project funds.

NOTABLE ACHIEVEMENTS AND AWARDS:

Chris Hammersmark was awarded an Honorable Mention for his presentation “Hydrologic Effects of A Pond and Plug Stream Restoration in A Mountain Meadow” presented at the 2007 Society of Wetland Scientists International Conference: Water, Wetlands, and Wildlife – Resolving Conflicts and Restoring Habitat, held in Sacramento, CA, June 10-15, 2007.

PUBLICATIONS FROM PRIOR PROJECTS.

Not Available.

PUBLICATIONS & CITATION FORMAT:

None.