



CALFED Progress Report
California Sea Grant College Program

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TypeQuestionnaire\_2B Final Report

Preparer Information

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Project Information

ProjectNo\_2C R/SF-12 StartDate\_3a 9/1/05 EndDate\_3b 6/30/10
ProjectTitle\_4 Addressing Stakeholder Concerns: Pests and Pest Control in the Sacramento River Conservation Area

CALFed Fellow contact information

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Community Mentor (for additional please see #9)

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Additional Research Mentors and Community Mentors

Additional Research Mentors\_8

Form with 5 horizontal lines for entering additional research mentors.

Additional Community Mentors\_9

Form with 5 horizontal lines for entering additional community mentors, starting with Geoffrey Geupel - Point Reyes Bird Observatory.



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

**ProjectObjectives\_10**

My first objective is to use extensive fieldwork and existing data to answer the following questions concerning the interactions between riparian restoration areas and adjacent farmlands:

- 1) What are the quantities and distribution patterns of serious agricultural pests, including weeds, and insects, from riparian forest into farmlands?
- 2) Does crop production benefit from elevated densities of pest enemies, including both arthropod and avian predators, that move from riparian forest areas into nearby farmlands? If so, how far does this beneficial effect of riparian forest sites extend into farmlands?

My second major objective is to use my empirical results to inform stakeholders in the region, so that their perceptions of the costs and benefits of restoration are better grounded with real information.

**Summary of progress in meeting each of these goals and objectives**

**ProgressSummary\_11**

To determine weed distributions on farms at different distances from restored and remnant riparian forest I collected soil samples from 26 farms at 16 different points for a total of 416 samples that were germinated in the greenhouse to determine the weed seed distribution and density. I found that weed seed density was higher directly adjacent to restored forest, but not more than 50m into the agricultural field. This research is in press in Restoration Ecology.

I collected two years of data on pest and pest predator birds in orchards at different distances from restored and remnant riparian forest. I collected bird survey data at 828 points in the Sacramento River Conservation Area in 2006 and 2007. These data included over 16,000 observations of birds on the orchards and adjacent edge habitats. I also collected bird survey data at 60 points in restored habitat in 2007. I collected foraging behavior data on 15 farms in 2006 and 2007, spending over 150 hours observing birds each year and collecting over 600 observations of insectivorous birds. I raised and set out overwintering codling moth larvae on three farms with caged and uncaged larvae at 0-m and 400-m from the edge of restored, remnant or agricultural habitat. I had bird predation at only one site, at the edge of restored habitat. This research is in review at the Journal of Applied Ecology.

I also collected data at these same farm points on presence of navel orange worm, walnut husk fly and codling moth. I found that there was no significant effect of riparian habitat on pest insect abundance. This research is in preparation for publication in collaboration with Dr. Greg Golet at The Nature Conservancy. The paper is focusing on agricultural pests and restoration, including weeds, agricultural pest birds, navel orangeworm, walnut husk fly, codling moth, and small mammals, and will be targeted as a publication for California Agriculture in order to reach a wider audience for this information within the California agricultural community.

I investigated the differences in support and opposition to restoration within agricultural stakeholder groups, in order to understand why scientific approaches were not always successful in facilitating support for restoration. I found, using interviews, document review, and datasets, that geography, negative authority, and leadership led to the differences in support and opposition to restoration within the agricultural community. This research is in preparation for publication.

I have fulfilled my second major objective through several presentations in both the agricultural and conservation communities. I presented results to the agricultural community through the Sacramento River Conservation Area Symposium in April 2007 and the Sacramento River Conservation Area Forum, Technical Advisory Committee in 2008. I also summarized this information for use in a report by The Nature Conservancy on pests and pest control to be used in meetings with the Colusa Subreach Committee to determine how to move forward on the restoration in that reach of the river. I also presented the research to the Point Reyes Bird

**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**

No modifications since 2nd year report.

**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**

- This research was summarized in a report for The Nature Conservancy and was used for the Colusa Subreach Planning Committee to determine some of the effects of restoration on adjacent farms.
- Supplying information on both the ecosystem services and dis-services from research in the restoration landscape could build trust between restoration and agricultural communities.

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**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**

Publications:

Langridge, S. (In press). Limited effects of large-scale riparian restoration on seed banks in agriculture. *Restoration Ecology*.

Langridge, S. (In review). Distribution and behavior of bird pests and pest-predators at the interface of agriculture and restored riparian forest. *Journal of Applied Ecology*.

Holl, K., A. Concilio, T. Cornelisse, B. Ferguson, S. Langridge, L. Reid, D. Schweizer, J. Torres-Ortega, G. Tadesse, M. Vasey. 2009. Book Review: *New Models for Ecosystems Dynamic and Restoration*. *Restoration Ecology* 17(4):562.

Langridge, S., M. Buckley, K.D. Holl. 2007. Strategies for overcoming obstacles to restoring natural capital: Large-scale restoration on the Sacramento River. Chapter 17 in Aronson, J., S. Milton, and J. Blignaut (editors) *Restoring Natural Capital: Science, Business and Practice*. Island Press.

Presentations:

Society for Conservation Biology Annual Meeting, Chatanooga, TN, 2008  
Understanding landscape effects of ecological restoration of wildland on nearby farms

Calfed Science Conference, Sacramento, CA, 2008  
Using science in collaborative restoration processes: Transboundary effects of riparian habitat restoration on farms

University of California Santa Cruz, Environmental Studies Seminar Series, CA, 2008  
Contested landscapes: can scientific information and collaborative processes lead to success in large-scale restoration projects

Sacramento River Conservation Area Forum, Technical Advisory Committee, CA 2008  
Invited talk: Distribution of agricultural pests and pest-predators on the Sacramento River

Bay Area Conservation Biology Symposium, Davis, CA, 2008  
Large-scale restoration and ecosystem services

National Conference on Agriculture and the Environment, Monterey, CA, 2007  
Ecology of ecosystem services at the interface of large-scale restoration and agriculture

Stanford/UCSC Species Interactions Workshop, Stanford University, CA, 2007  
Ecosystem services at the interface of riparian and agricultural habitat

Point Reyes Bird Observatory, Bolinas, CA, 2007  
Invited talk: Distribution of riparian birds at the interface of agricultural and riparian habitats

Ecological Society of America Annual Meeting, San Jose, CA, 2007  
Large-scale riparian restoration and agriculture: ecosystem services and habitat buffers?  
American Association of Geographers, San Francisco, CA, 2007  
Contested views of restoration: large-scale restoration on the Sacramento River, California  
Sacramento River Conservation Area Conference, Chico, CA, 2007  
Effects of large-scale riparian restoration on bird pests and pest predators  
Calfed Science Conference, Sacramento, CA, 2006  
Large-scale riparian restoration in agricultural landscapes: are weeds causing conflict?

**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**

The Nature Conservancy, Dr. Gregory Golet. \$8500 contract for report on pests and pest control in the Sacramento River Conservation Area. Also provided housing, access to land, and logistical support.  
Point Reyes Bird Observatory. Information and data sharing on bird populations in the Sacramento River Conservation Area. Feedback on research.  
US Fish and Wildlife Service. Provided access to land.  
Cerus Consulting, Fred Thomas. Provided access to farm communities for permission to conduct research on farms.

**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**

David Gaines Award, Environmental Studies Department, UCSC

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

**Keywords\_17**

riparian, restoration, agricultural pest, bird, insect, weed, ecosystem services, ecosystem dis-services



