CALFed Progress Questionnaire
California Sea Grant College Program

ConfirmationNumber: 20040815181629

ProjectYear_2A: 1st Year | ProjectNo_2C: R/SF-1

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Project Information

ProjectNo_2C: R/SF-1 | StartDate_3a: July 1, 2003 | EndDate_3b: June 30, 2006
ProjectTitle_4: Terrestrial carbon in aquatic foodwebs: restoring ecosystem function by linking aquatic insects and terrestrial consumers

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Research Mentor (for additional please see #8)

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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:

Additional Community Mentors_9:

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

ProjectObjectives_10

In California, most floodplains are disconnected from river water because of dams, water withdrawals, and levees. The Cosumnes River however, is unique in that it has a floodplain that is hydrologically connected to its river. A stated conservation goal of the Consumes River is to restore the landscape from past agricultural use. Understanding the links between flood pulse, habitat diversity and soil invertebrate communities will be important in meeting this goal and restoring floodplain soil fertility. Invertebrate communities, directly and indirectly, affect soil fertility. Floodplain soil invertebrates must adapt to changing moisture regimes from winter floods to summer droughts. When wet, nutrients and carbon are transferred from plant derived organic matter to aquatic organisms. During dry periods, stranded aquatic algae serves as a food source, in addition to plant material, for floodplain soil organisms. My research objectives are to understand how soil invertebrate communities vary between different floodplain habitats, whether differences in the amount and type of organic matter control the density and diversity of soil invertebrates, how aquatic algae is transferred to floodplain soils, and the importance of this process in maintaining floodplain soil fertility.

Summary of progress in meeting each of these goals and objectives

ProgressSummary_11

The research is being conducted on the lower reaches of the Cosumnes River at the Cosumnes River Preserve (CRP), a restored floodplain ecosystem in south Sacramento County. The majority of the river has levees, except where restoration projects are ongoing. The CRP encompasses 53 km2 including floodplain and uplands, and protects some of the last remaining cottonwood-willow and valley oak riparian forests in the California central valley. Restoration projects have include the breeching of levees to allow natural flooding of adjacent floodplain habitats. These activities have resulted in a floodplain that is predominately composed of 4 habitats: the channelized river and bordering riparian vegetation where levees still remain, the open meadow floodplain, the cottown-willow forest floodplain, and the tall oak forest floodplain.

The goals for the first research year were to collect background information on floodplain soil invertebrates in various habitats and quantify the different amounts and types of organic matter (plant material and algae). Invertebrate abundance and diversity would be correlated to the amount of each organic matter type, soil fertility measures, soil nutrients, and soil physical measures. To measure invertebrates and soil properties, I established 5-100 m(sup)2(/sup) permanent plots in 4 habitats: 2 open meadow sites with high algal accumulation, open meadow with low algal accumulation, and cottonwood forest. Plots have been sampled monthly (except when flooded) for soil solution nutrients using anion exchange resins. Oligochaetes and microcrustaceans were sampled immediately following the fall rains but before flooding, once during winter between flood events, and in early summer. Soil nutrients and properties were measured on the pre- and postflood samples. To assess plant litter accrual on the floodplain, a 1-m(sup)2(/sup) organic matter plot was placed next to each 100-m2 plot. Plant litter is being collected from this small plot monthly (more often during fall). Litter is sorted by species and type (leaves, seeds) and each fraction is weighed and measured for total carbon and nitrogen. Plant litter, soil nutrients, physical and fertility measures are currently being analyzed. Initial invertebrate results suggest that more insect larvae and oligochaetes occur in cottonwood forest soils compared to the other habitat types. Within the meadow, however, more insect larvae and oligochaetes occur in plots that accumulate high amounts of algae.

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

The project as originally conceived sought to investigate linkages between organic matter quality and quantity as a food source for aquatic invertebrates. My overall question was: How does the timing and duration of inundation affect the accrual and decomposition (microbial processing) of various dominant types of plant biomass, and the amount of aquatic secondary productivity they can support? After receiving funding, I learned that Dr. Ted Groholz (UC-Davis) was addressing linkages between carbon source and aquatic invertebrate production on the CRP (CALFED Proposal # 2001-A-205, Dr. J. F. Quinn, Project Director). Subsequently, I revised my project to focus on soil invertebrates and soil fertility since there was little ongoing research on this topic at the CRP, it was of interest to the Nature Conservancy, and it complemented the ongoing larger project under the direction of Dr. Quinn (UC-Davis). I am continuing to measure the accrual and decomposition of organic matter as outlined in my CALFED proposal.

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

Although a lot of information exists on soil invertebrates, there is less known on floodplain soil communities. This project will contribute to that general base of knowledge. The project will also offer information on how the size and structure of floodplain wetlands affect soil fertility and biodiversity and how those properties feedback into other subsystems (aquatic and aboreal food webs) of the floodplain. Understanding these relationships are important since they can impact essential floodplain services such as degradation of organic matter, cycling of nutrients, sequestration of carbon, production and consumption of trace gases, and degradation of water, air, and soil pollutants, that are of management concern for both humans and wildlife.

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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

Clinton, S. M., G. Benigno, and M. E. Power. 2004. Soil invertebrate communities in meadow and forest habitats on the Cosumnes River floodplain. CALFED Science Conference, Sacramento, California.

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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

NA

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

NA

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

Keywords_17

floodplain, soil invertebrates, algae, organic matter

PATENTS: List any patents associated with your project.

Patents_18

NA

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

Additions_19

NA

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