CALFed Progress Questionnaire
California Sea Grant College Program

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ProjectYear_2A 2nd Year **ProjectNo_2C** R/SF-11

TypeQuestionnaire_2B Interim Questionnaire

Preparer Information

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Project Information

ProjectNo_2C R/SF-11 **StartDate_3a** 9/01/05 **EndDate_3b** 8/31/09
ProjectTitle_4 Effects of water temperature, streamflow, and habitat on the growth, survival and movement of steelhead trout with implications for water management.

CALFed Fellow contact information

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Research Mentor (for additional please see #8)

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RMPositionTitle_6N Professor

Community Mentor (for additional please see #9)

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CMPositionTitle_7N Research Associate

Additional Research Mentors and Community Mentors

Additional Research Mentors_8

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Additional Community Mentors_9

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

ProjectObjectives_10

Major goals of my research are to 1) determine the effects of water temperature, streamflow and food availability on steelhead / rainbow trout (Oncorhynchus mykiss) growth, survival and movement, 2) examine how O. mykiss movement patterns and habitat associations affect survival, growth and life history trajectories (i.e. going to sea or not), 3) determine how habitat features such as instream wood, gravel complexes, or side channels effect community structure of freshwater macro-invertebrates and fish, and in turn, 4) relate these results to how habitat qualities affect O. mykiss at the individual level such as growth, movement and survival, with population level consequences, 5) examine how water management regimes and their timing affect habitat qualities, and fish populations, and 6) provide information and tools to the East Bay Municipal Utility District (EBMUD) and CALFED for use in water management to efficiently provide water to customers while maximizing habitat and productivity for threatened O. mykiss.

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Summary of progress in meeting each of these goals and objectives

ProgressSummary_11

I have analyzed data from monitoring the ecological effects of engineering two side channel habitats in the Lower Mokelumne River. Results show that freshwater macro-invertebrates colonized the habitats rapidly with abundance and taxanomic richness increasing with time. Juvenile steelhead and Chinook salmon were found utilizing the side channels with full stomachs. Diet samples showed the two salmonids ate invertebrates provided by the habitat, yet in different numbers and types showing potential foraging partitioning. Overall the engineered habitats were a successful endeavor in increasing habitat heterogeneity and increasing juvenile salmonid rearing habitat. Releases from Camanche Dam have not been sufficient to wet the side channels in the following two years. It appears that releases should be made to benefit such beneficial habitats and declining salmonids with additional benefits of ìcue flowsî for migrating salmonids, and sufficient flows to clean out invasive vegetation and clear spawning and rearing gravels.

I am completing a lab experiment investigating upper water temperature affects on juvenile O. mykiss growth. Results are pending. Results will help in our understanding of how water conditions affect O. mykiss growth and survival across a varied landscape. Results are of special interest in light of 1) anthropogenically altered water conditions, and 2) climate change.

I am working on my second year of an acoustic telemetry project investigating the fine scale habitat associations, movement and survival of O. mykiss. Results from the first year show a ìcostî associated with movement in that the more individuals moved the more likely they were to die, likely by exposing themselves to risk of predation. There appears to be seasonal time of increased movement across the population.

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

NA

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

Monitoring results from two engineered side channels show rapid colonization by freshwater macro-invertebrates. The habitats and the invertebrates provide beneficial habitat and prey to juvenile steelhead and Chinook salmon. Water releases from Camanche Dam have not been sufficient to wet the side channels in the following two ìdryî years, and so the channels have remained dry and inaccessible to fish. It appears that dam releases should be made to benefit such beneficial habitats thereby benefiting declining salmonid populations. Additional benefits of such planned pulse releases include providing ìcue flowsî for migrating salmonids, and sufficient flows to clean out invasive vegetation and clear spawning and rearing gravels.

Preliminary results from my first year of acoustic telemetry monitoring O. mykiss habitat associations, movement and survival show two seasonal increases in movement rates across the population. This could have important management implications to manage flows during these seasonally important migration times to benefit migratory salmonids and ensure a more successful and more productive steelhead population.

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

A Preliminary Investigation of How Habitat Heterogeneity Affects Community Dynamics and Sensitive Species of the Mokelumne River, CA.
Walter Heady, oral presentation at:
4th Biennial CALFED Science Conference 2006

The effects of engineered side channel habitat on macroinvertebrate and fish populations in the Mokelumne River, California.
Walter Heady, oral presentation at:
26th Annual Salmonid Restoration Conference March 5-8, 2008 in Lodi, CA

Ecological effects of engineering two side channels in the Mokelumne River, CA.
Walter Heady, oral presentation at:
The 42nd Annual Conference of the Cal-Neva Chapter, American Fisheries Society, April 3-5, 2008, Tahoe City, California.
Awarded Best Student Presentation by the American Institute of Fishery Research Biologists.

Research on the upper water temperature effects of O. mykiss growth, and investigations of movement patterns of wild O. mykiss.
Walter Heady, oral presentation at:
NOAA Fisheries Steelhead Festival
Southwest Fisheries Science Center
July 30, 2008

Graduate research into wild O. mykiss habitat associations, movement and survival using acoustic telemetry on the Mokelumne River.

Walter Heady oral presentation to:
The Delta Flyfishers
Sacramento
September 10, 2008

Fine scale habitat associtations, movement and survival of Oncorhynchus mykiss of the Mokelumne River, CA, using acoustic telemetry in standardized transects
Walter Heady oral presentation at:
Co-authors Michelle Workman, and Joseph Merz
5th Biennial CALFED Science Conference 2008

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

East Bay Municipal Utilities District Fisheries and Wildlife (EBMUD) have provided me with technical and advising support. They have assisted me with logistics, and provided me with staff assistance.
NOAA Fisheries provided support, equipment and laboratory facilities.
California Urban Water Agencies funded the first year of acoustic telemetry equipment.
California Department of Fish and Game provide funding for tags and a receiver for the second year of acoustic telemetry.
Vemco has worked with me on my acoustic telemetry research.
Coleman National Hatchery, and Big Creek Conservation Hatchery both provided fish for my laboratory experiments.

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

Friends of Long Marine Lab Student Research Award - $750

STEPS Institute Award for Graduate Research - $1500

Awarded Best Student Presentation by the American Institute of Fishery Research Biologists for my oral presentation Ecological effects of engineering two side channels in the Mokelumne River, CA. at The 42nd Annual Conference of the Cal-Neva Chapter, American Fisheries Society, April 3-5, 2008, Tahoe City, California.
Vemco Student Discount on VR100 receiver.

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

Keywords_17

juvenile steelhead, rainbow trout, Oncorhynchus mykiss, growth, movement, survival, habitat features, habitat heterogeneity, life history
community, macro-invertebrates, instream wood, side channel, telemetry

California Sea Grant College Program
CALFed Progress Questionnaire

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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