CALFed Progress Questionnaire
California Sea Grant College Program

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ProjectYear_2A 1st Year **ProjectNo_2C** R/SF-7

TypeQuestionnaire_2B Interim Questionnaire

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Project Information

ProjectNo_2C R/SF-7 **StartDate_3a** Sept 1, 05 **EndDate_3b** Aug 31, 08
ProjectTitle_4 Development of a Simulation Model of Juvenile Salmon Movement in the Sacramento-San Joaquin Delta

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

NA

Additional Community Mentors_9

NA

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

ProjectObjectives_10

I am addressing an important research need for CALFED agencies: predicting how management actions affect movement of juvenile salmon in the Sacramento-San Joaquin Delta. The goal of my research is to merge a particle transport model that incorporates Delta hydrodynamics with models of fish behavior to produce and test a model of how natural and operational flow changes affect juvenile salmon movement. I will address the goal via the following objectives:

1) Assemble and review all available observations of juvenile salmon movement in Delta. Observations from a wide variety of spatial and temporal scales and from as many life history states (from fry to smolt) as possible will be examined.

2) Identify different types of fish behavior that could be important, and alternative models of those behaviors from literature and previous models. Differences among life history states will be considered.

3) Build a simulation model from an existing hydrodynamic and particle tracking model, adding the effects of behavior to particle tracking.

4) Use the simulation model to test the alternative models of fish behavior (including no behavior, i.e., particle tracking only) to see which best reproduce the observed patterns.

5) Study results will be presented to CALFED and published, and the model transferred to CALFED scientists and managers.

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Summary of progress in meeting each of these goals and objectives

ProgressSummary_11

Objective 1: Existing (and near future) field studies of juvenile salmon movement in the Delta include coded wire tag releases from around 1969 to the present, 2000-03 radio telemetry studies conducted by Natural Resource Scientists, acoustic tracking and radio telemetry studies of juvenile salmon movement near the Delta Cross Channel (DCC) in 2000/01, recent acoustic tracking studies in the south Delta, future (late 2006, early 2007) acoustic tracking studies in the north Delta. Of the observations listed above I have had access to the coded wire tag results and the 2000-2003 radio telemetry studies conducted by Natural Resource Scientists. I have yet to acquire (but hope to soon) the radio telemetry and acoustic observations at the DCC as well as the south Delta acoustic tracking studies. I hope to have access to the north Delta acoustic results before the end of next year.

I have reviewed and analyzed the results of coded wire tag releases and the results of the 2000-03 radio telemetry studies and compared these results to simulations of passive particles using the Department of Water Resources Delta Simulation Model ñ Particle Tracking Model. Due to the Deltaís intricate channel network and the influence of tides, combined with the relatively low observation frequency (both in space and in time) in the two studies, it is difficult to determine exact routes of observed fish. Thus, I have been developing metrics that can be used to compare model results and field data. I have been conducting passive particle simulations and comparing the results to the field data to evaluate different metrics that can be used for model testing and validation. These metrics are necessary to compare different model results to observed patterns to determine the model of fish behavior that best reproduces a variety of observed patterns.

Objective 2: I have conducted a literature review of existing studies, both in the field and in the laboratory, of juvenile salmon movement in different life stages (pre-smolt, smolt and yearling). I have reviewed literature on research of juvenile salmon from both the Delta and on the Columbia River. Examples of studies of juvenile movement include laboratory studies of fine scale movement: behavior as fish encounter divergences, swimming behavior, and turbulent attraction flows. Other examples include: juvenile movement through the Delta (results at the DCC), studies in the 80ís and 90ís on life history of juveniles in the Delta, migratory habits of juveniles in the Columbia River, models of juvenile movement in the Snake River, as well as physiological and migratory differences between pre-smolts, smolts and yearlings.

Objective 3: I have copies of DWRís delta simulation model and particle tracking model (DSM2-PTM) and have learned how to run each. Since there is little documentation on the PTM, I have obtained the source code for the particle tracking portion of the model. I have read through and outlined the particle tracking source code. I am now able to revise and compile the source code for the particle tracking model so I can begin to make changes corresponding to fish behavior.

Also, since the output for the particle tracking model is not geo-referenced (it only gives results as a downstream distance from a node in the model), I have been in the process of developing a method that allows comparisons between actual fish locations in geographic coordinates (as from radio telemetry data) and simulated particle locations (from the model).

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 substantial modifications to my research plans have been made.

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

My research is not at the position where results can affect resource management or user group behavior. The behavior model still needs to be created (goal of the second year).

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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

Poster presented at the 2006 World Conference on Natural Resource Modeling
Location & Date: Bergen, Norway, 25th ñ 28th June 2006
Title: Juvenile Salmon Movement in the Sacramento-San Joaquin Delta
Challenges in Using Field Data to Validate Models

Oral presentation at the 2006 CALFED Science Conference
Location & Date: Sacramento, California, 23-25 October 2006
Title: Challenges in Using Field Data to Validate Models of Juvenile Salmon Movement Through the Delta

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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

1) Humboldt State University - Provided ARC Editor software
2) Department of Water Resources, Modeling Division (Mike Mierzwa, Tara Smith) - provided DSM2 and source code for PTM as well as assistance to get everything running and any existing documentation.
3) Natural Resource Scientists (Dave Vogel) - provided radio telemetry data
4) Steve Railsback, Adjunct Professor at Humboldt State University - provides expert advice on modeling and analyses
5) Redwood Sciences Laboratory (Brett Harvey) - provided expert advice on fish behavior/physiology
6) USFWS (Pat Brandes) - expert advice on salmon in the Delta

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

no special awards or honors

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

Keywords_17

Simulation model of juvenile salmon movement in the sacramento-san joaquin delta

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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