



CALFed Progress Questionnaire  
California Sea Grant College Program

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TypeQuestionnaire\_2B Interim Questionnaire

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**Project Information**

ProjectNo\_2C R/SF-20 StartDate\_3a 11/1/2006 EndDate\_3b 10/31/2007  
ProjectTitle\_4 Estimating route-specific survival and distribution of juvenile salmonids migrating through the Sacramento-San Joaquin River Delta

**CALFed Fellow contact information**

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FelPositionTitle\_5N Predoctoral Graduate Student Fellow

**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**

Dr. Jon Burau, Engineer  
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**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**

Our primary objective is to develop a mark-recapture model that will estimate parameters of population distribution through the Delta, survival probabilities of juvenile salmonids traversing different migratory pathways, and overall survival probabilities of the population migrating through the Delta.  
Additional objectives include  
1) Collaborating with community mentors to design the telemetry system needed to implement the mark-recapture model  
2) Estimating survival, detection, and migration distribution of juvenile salmonids through the Delta  
3) Assessing assumptions of survival models for valid interpretation of survival estimates  
4) Performing sample size and power analysis to aid in design of studies with the necessary precision required for sound management decisions  
5) Conducting simulation experiments to aid in understanding the complex physical and biological processes that govern population distribution and survival through the Delta in response to water management actions

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

**ProgressSummary\_11**

During the first year of this project, I worked directly with Jon Burau and Pat Brandes to design mark-recapture models for telemetry studies they conducted during the winter of 2006/2007. First, I worked with these researchers to design and implement a telemetry system necessary for estimating survival and movement of fish through the Delta. Then based on this design, I developed mark-recapture models to estimate 1) survival through specific reaches of the Delta, 2) the proportion of fish using specific migration routes such as Steamboat/Sutter Slough, the Delta Cross Channel, and Georgiana Slough, and 3) survival through the entire Delta. I then conducted simulations based on true parameter values and tested the mark-recapture model to ensure the model produced unbiased parameter estimates. Last, I then ran these models with the telemetry data of each study and produced survival route entrainment estimates. Although sample sizes were small, the estimates produced from this study represent a first glance at understanding the movement and survival of juvenile salmon at fine spatial scales in the Delta. For 2007-2008, the next step is to expand the scope of the model to the southern Delta, and apply the model to full-scale field studies.

**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 full-scale study planned by the USGS has been postponed from winter of 2007/2008 to winter of 2008/2009. The data likely will not become available until spring 2009. Due to the relatively short time period between receiving data and the end of this Fellowship (Oct. 2009), my graduate committee and I anticipate completion of my Ph.D. dissertation by Dec. 2009. I will pursue funding through the University of Washington to cover the period Oct. - Dec. 2009.

There have been no other substantial modifications.

**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 has already begun to contribute substantially to understanding the survival and movement dynamics of juvenile salmon in the Delta. Studies such as Delta Action 8 have aided in understanding effects of water management actions on survival of juvenile salmon. However, by coupling acoustic telemetry techniques with the coded wire tag studies, researchers are gaining much more detailed information about local-scale survival and movement of fish through the Delta. For example, with Pat Brandes' study, in December 2006 we found that 33% of tagged juvenile salmon in the Sacramento River entered the Delta Cross Channel, 17% entered Georgiana Slough, and 50% remained in the Sacramento. In contrast, in January 2007, we found that 16% entered Georgiana Slough and the remainder stayed in the Sacramento River (the Delta Cross Channel was closed). In January, survival through the North Delta was 58% (SE = 7.1%) and survival through the South Delta was estimated to be 28.1% (SE = 25.2%). Survival through the entire Delta was 49.1% (SE = 7.2%), which is weighted much more towards survival of the North Delta because a low proportion of fish was entrained into the South Delta. This research is helping to understand how both movement through specific routes and survival through those routes interact to affect the survival of the 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**

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| Oral Presentation  |
| Survival and Distribution of Juvenile Chinook Salmon Migrating through the San Joaquin-Sacramento River Delta              |
| American Fisheries Society National Conference   |
| San Francisco, CA  |
| September 3, 2007  |
| Oral Presentation  |
| Survival and Distribution of Juvenile Chinook Salmon Migrating through the San Joaquin-Sacramento River Delta              |
| DWR and CALFED Meeting   |
| Ryde, CA   |
| September 6, 2007  |
| Poster Presentation  |
| Estimating Survival and Distribution of Juvenile Chinook Salmon Migrating through the Sacramento ñ San Joaquin River Delta |
| State of the Estuary Conference  |
| Oakland, CA  |
| October 15-17, 2007  |
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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**

Steve Lindley, NOAA Fisheries, telemetry database support  
Bruce McFarlane, NOAA Fisheries, telemetry study design  
Dave Vogel, Natural Resource Scientists, telemetry database support

**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**

None (yet!)

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

**Keywords\_17**

juvenile salmon, survival, Delta Action 8, Delta, telemetry





