Executive Summary

Delta smelt was historically one of the most common open-water species of fish in the Sacramento-San Joaquin Delta, CA. It declined significantly between the late 1970s and early 1980s and has been listed as a threatened species by the Federal and State Endangered Species Act since 1993. The purpose of this proposal is two fold, first, to quantify the extent of entrainment losses of all life stages of delta smelt (Hypomesus transpacificus) due to water exports and second, include these entrainment estimates in a quantitative synthesis model to evaluate the likely conditions under which hydrodynamic conditions should trigger beneficial population responses through the use of environmental water. The study area is the State Water Project (SWP) located in the south Delta region of the Upper San Francisco Estuary, CA. The SWP and the adjacent Central Valley Project (CVP) export Delta water year-round for agricultural and urban purposes. Both the SWP and CVP have fish salvage facilities to reduce entrainment losses. We propose to provide critically needed information at the SWP to rigorously evaluate salvage facility efficiency and pre-screen loss using cultured delta smelt in replicated mark-recapture experiments. We will then synthesize that information along with the existing information at the CVP and available hydrodynamic data, field survey data and further knowledge on delta smelt to accomplish the following objectives: 1) quantify prescreen loss for juvenile and adult delta smelt at Clifton Court Forebay, 2) quantify entrainment loss for juvenile and adult delta smelt through the Skinner Fish Facility, 3) estimate entrainment losses of delta smelt larvae at the SWP and CVP in the south Delta and 4) evaluate the past and the potential effectiveness of environmental water on delta smelt using a synthesis model. The expected outcomes of this project should have direct management applications including: 1) quantitative estimates for delta smelt entrainment losses not accounted for in salvage statistics of juvenile and adult stages and entrainment estimates for the larval stage, 2) a quantitative evaluation of the effectiveness of environmental water available to delta smelt in past years, including Environmental Water Account actions, and 3) quantitative evaluations of alternative water management to determine which environmental water scenarios are the most likely to yield the greatest benefits for delta smelt. Our proposed synthesis model to evaluate alternative environmental water scenarios in reference to past actions is intended to provide a useful adaptive management framework to gain further understanding of the likely consequences of water management actions on the delta smelt population. This interdisciplinary proposal should primarily contribute to the following goals of the CALFED Science Program: 1) articulate, test, refine, and grow understandings about natural and human systems, 2) establish and improve communication pathways between Science, management, and public communities, 4) evaluate technical performance of CALFED Program and 5) integrate use of best available scientific understandings and practices throughout CALFED.