Executive Summary

The CALFED Bay-Delta Authority (CBDA) has been charged with a daunting task – assuring a safe and stable supply of water to meet the needs of municipal, recreational, industrial and agricultural users, while at the same time safeguarding the ecosystems supporting the native species of the San Francisco Bay, the Sacramento-San Joaquin Delta, and the supporting watersheds. This task is complicated by the responsibility to protect certain species, such as delta smelt and several species of Chinook salmon, under the Federal and California Endangered Species Acts (ESA and CESA, respectively). The requirements mandated by these acts have placed rigid constraints on the allocation of California's limited water supply, as well as a severe demand on the financial resources available for environmental protection. In the last two years, summer and fall delta smelt population indices have reached historic lows – delta smelt were listed as a threatened species under the ESA in 1993. Concurrently, winter-run Chinook salmon on the Sacramento River, which were listed as an ESA endangered species in 1990, have seen resurgence in their numbers. Are these observations related? This proposal is motivated by the following:

Hypothesis: The changes in upstream reservoir operations - including temperature control in the upper Sacramento River in the summer, spring operations on the San Joaquin River, shifts in export timing, and other upstream uses - have changed seasonal salinity patterns in the Delta that have contributed to the decline of the Delta smelt. Although there are clearly many factors that combine to influence the survival of each of these species, we focus in this proposal on two main factors – seasonal salinity changes in the Delta plus changes in reservoir operations for temperature and flow control – which we suspect may, in combination with Delta Cross Channel and Head of Old River Barrier operations, be related to the decline of the delta smelt. Salinity is the key environmental feature defining the fundamental 'ecological niche' for delta smelt, and temperature is one of two main factors key to preventing the extinction of winter-run Chinook salmon. As these are factors over which we can exert considerable operational control, the results of this study have practical significance as well.

The goals of this project are: to assess the consequences of actions taken to protect threatened or endangered Chinook salmon species relative to other upstream and in-Delta water management actions that have changed seasonal salinity in the Delta, thus reducing the ability of delta smelt to survive as a species; and, to investigate with modeling scenarios the potential to ameliorate this trade-off with specific operational actions. The project scope includes historical data analysis, water quality and temperature modeling, salmon population modeling, and statistical analyses relating delta smelt population indices to Delta water quality and flow. These investigations will assess the extent to which changes in reservoir and barrier operations and in the timing of exports have contributed to the loss of 'environmental quality' in delta smelt habitat, and if changes in these actions can mitigate for the degradation of delta smelt habitat, particularly fall salinity, without harming Chinook salmon species. The results of this proposal are relevant to one of the most pressing environmental issues currently facing CALFED – the Pelagic Organism Decline and the continued survival of the delta smelt. The proposal integrates water supply and management decisions with the need to maintain or improve ecosystem quality for two ESA species – delta smelt and winter-run Chinook salmon.