PROJECT TITLE: Phytoplankton communities in the San Francisco Estuary: monitoring and management using a submersible spectrofluorometer

EXECUTIVE SUMMARY

Estuaries form the transition zone between freshwater riverine and saline marine environments and are characterized by highly variable environmental conditions and dynamic ecosystem processes. While estuaries such as the San Francisco Estuary (SFE) receive large inputs of organic materials from upstream sources, phytoplankton (algae) provide the most important food resource for estuarine consumers such as invertebrates and fish, including highly endangered SFE species such as Delta smelt. Some phytoplankton species can also adversely affect water quality by forming harmful blooms. Algal blooms, including blooms of a potentially toxic species, have become increasingly common in the upper SFE and affect water project operations. Water resource management and ecosystem restoration conducted by CALFED and other programs in the SFE can affect phytoplankton species composition and biomass, with consequences for bloom formation, water quality, and the food web. Accurate monitoring of phytoplankton species composition and biomass is needed to maximize the positive and minimize the negative effects of phytoplankton in the SFE ecosystem, but made difficult by the highly dynamic nature of the estuarine environment and estuarine phytoplankton communities. The primary purpose of this project is to evaluate a new high-frequency method for \textit{in situ} monitoring of phytoplankton biomass associated with different taxonomic groups using a submersible spectrofluorometer. This evaluation will be carried out in the laboratory with algal cultures and natural SFE samples and during stationary and vessel-based SFE field deployments of varying lengths. Most field deployments will be conducted during routine monitoring cruises and site visits. This will save travel and labor costs and provide a large amount of ancillary data and information. Secondly, this project intends to apply the spectrofluorometric method to investigations of spatial and temporal phytoplankton group distributions, monitoring design optimization, and improved ecosystem restoration and management strategies for the SFE. One important application that is expected to result from these investigations is an improved monitoring and rapid early-warning strategy for harmful algal bloom occurrences. This university-agency project will be tightly integrated with ongoing and proposed monitoring and research activities in the upper SFE and leverage substantial agency and university expertise and resources.