99D-124
Panel A

Executive Summary

Background:

Rivers, wetlands, and agricultural operations supply organic material to the Sacramento-San Joaquin Delta and San Francisco Estuary, providing essential nutritive material to the food web and thus an important ecosystem benefit. Unfortunately, the presence of high concentrations of organic material in Delta drinking source waters increases the difficulty of treating those waters, and may result in the formation of carcinogenic disinfection byproducts (DBPs) regulated by US EPA.

Over 22 million people drink water from the Delta. It is not known if the creation of new wetlands within the Delta will alter the concentrations of precursors of carcinogenic disinfection by-products (DBPs) that form when Delta water is processed for drinking water. DBPs form when a disinfectant such as chlorine or ozone is added during treatment and then reacts with bromide and naturally occurring DOC.

To restore ecological health in the Bay-Delta system, over 100,000 acres in the Delta may be converted to wetlands. As CALFED proceeds with these ecosystem restoration activities, it is desired that the restored wetlands provide sources of organic material beneficial to the Bay and Delta foodweb while minimizing sources of organic material that would adversely impacting drinking source water quality. An example of how this might be accomplished would be to restore only specific types of wetlands – those exporting small quantities of deleterious organic carbon– on flow paths affecting drinking water intakes.

However, little information is available regarding the amount or quality of organic material released from different types of wetlands (or even agricultural sources) and its effect on either the Delta food web or on drinking water treatment. Consequently, CALFED identified the following 5 questions as the highest priority information needs for assessing the potential effect of ecosystem restorations on dissolved and total organic carbon (DOC, TOC) levels in the Delta:

1. *How much and what forms of TOC do wetlands generate?*
2. *To what extent is TOC released from wetlands altered and consumed in Delta waters?*
3. *By comparison, how much and what forms of TOC are released from agricultural activities?*
4. *What wetland management strategies may be used to limit introduction of TOC into Delta waters?*
5. *How will the impacts of restored wetlands change in the future as they mature?*

Approach:

To answer each of these questions, independent information is needed about both the **quality** and the **amount** of the organic material released from various wetlands and agricultural operations. This proposal addresses questions 1, 3, and 4 relative to **amounts** of organic carbon. A companion proposal addresses all five questions relative to the **quality** of organic carbon released by wetlands and agricultural operations. Different scientific approaches are used to examine these two aspects of DOC release. Together, these proposals will provide a quantitative basis for estimating the relative contributions of different wetlands to Delta TOC/DOC, in comparison to current agricultural activities. When coupled with accurate physical modeling, these results will provide a quantitative basis for estimating the impacts of restoration efforts on organic carbon supply to the Estuary and to drinking water intakes.

The goals of this project are to 1) quantify export loads of DOC and DBPPs from a tidal wetland, a non-tidal wetland, and an agricultural operation; and 2) assess the potential change in contributions of DOC/TOC and DBPPs from changes in land use from agriculture to wetlands.

Study Design:

Only a small fraction of DOC – the disinfection byproducts precursors (DBPPs) – form DBP, and the amount of DBPPs within DOC is highly dependent on the source and extent of degradation of the organic material. Samples from different areas in the Delta have over a 10-fold difference in the amount of DBPPs found within the DOC, on top of the 10-20 fold differences observed in DOC concentration. No studies to date have quantitatively assessed the biogeochemical processes influencing the relative contributions of DOC and DBP precursor sources in the Delta. We propose to quantify the DOC/TOC and DBPP loads from tidal wetlands, non-tidal wetlands, and agricultural operations, and assess their relative importance as sources of carbon for the Delta foodweb and for drinking source water quality.

The companion proposal (Part I) focuses on the concentration and **quality** of DOC/TOC released from different carbon sources to the Delta (wetland types, rivers, and agricultural activities), assessing both DBPPs and the incorporation into Delta foodwebs, and determines how microbial alteration affects the composition of DOC and DBPPs. This proposal (Part II) mainly focuses on the **amounts** (loads) of DOC and DBPPs contributed by tidal and non-tidal wetlands and agricultural operations. Together these two proposals should provide the quantitative and qualitative knowledge needed for CALFED to make informed decisions regarding ecosystem and human health.

A team of scientists with diverse expertise has been assembled to address these issues. Principal investigator Roger Fujii, who will bear responsibility for all scientific products, will lead the team. The various team members bring a wealth of scientific experience in carbon release from peat soils, estuarine transport of sediment and other constituents, physical and chemical processes affecting peat soils, wetland ecology, chemical characterization of natural organic material, organic geochemistry, and the chemistry of DBP formation. The progress and products of the study will be monitored by an independent scientific advisory panel composed of internationally recognized experts in DOC release from wetlands, chemical characterization of DOC, aquatic food web interactions, water treatment, and DBP formation. The final reports will analyze and synthesize the experimental results to identify specific options to CALFED regarding the potential impacts of different restoration actions on drinking source water quality and DOC-supported biological production in the Delta.