

Title: The Effects of Wetland Restoration on the Production of Methyl Mercury in the San Francisco Bay-Delta System
Applicant: University of California, Davis (Thomas H. Suchanek and Darell G. Slotton et al.)
CALFED Project Number: 97-C05

Budget year: 1999
Statement Quarter: 1

Total Estimated Cost of Entire Project: \$553,948
Funding from Federal Bay-Delta Account: 546,171
Any other Funding: 7,777

\$7,777 in matching funds from UC Davis (33.3% x 23,331 cost of new mercury analyzer equipment; Task 1)

Phase I Schedule: (7/1/98 - 6/30/99) 1 year

Total Project Estimated Completion Date: (July 2001) 3 years

	PHASE I			PHASE I			PHASES I-3		
	(Quarterly Budget- 1st 2 qtrs)			(FY '99 Annual Budget)			(Total Three Year Budget)		
	Budget	Accrued Expenditures	Variance **	Budget	Accrued Expenditures	Remaining Balance **	Budget	Accrued Expenditures	Balance to Complete **
Task 1: Purchase new Mercury Analyzer	\$15,554	\$15,554	\$0	\$15,554	\$15,554	\$0	\$15,554	\$15,554	\$0
Schedule: 10/98									
Percent Work Complete for Task 1:									
	100%								
Task 2: Catalogue Wetlands; determine key gradients	\$27,268	\$27,268	\$0	\$54,535	\$27,268	\$27,268	\$54,535	\$27,268	\$27,268
Schedule: 7/1/98 through 6/30/99									
Percent Work Complete for Task 2:									
	50%								
Task 3: Quantify mercury levels in Delta field samples	\$30,010	\$30,010	\$0	\$60,020	\$30,010	\$30,010	\$200,068	\$30,010	\$170,058
Schedule: 7/1/98 through 4/30/01									
Percent Work Complete for Task 3:									
	15%								
Task 4: Mercury methylation experiments	\$26,179	\$26,179	\$0	\$52,358	\$26,179	\$26,179	\$201,615	\$26,179	\$175,436
Schedule: 7/1/98 through 4/30/01									
Percent Work Complete for Task 4:									
	13%								
Task 5: Formulate evaluative model	\$3,720	\$3,720	\$0	\$7,440	\$3,720	\$3,720	\$74,399	\$3,720	\$70,679
Schedule: 7/1/98 through 6/30/01									
Percent Work Complete for Task 5:									
	5%								
Phase I Total:	\$102,731	\$102,731	\$0	\$189,908	\$102,731	\$87,177	\$546,171	\$102,731	\$443,440

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Effects of Wetland Restoration on the Production of Methyl Mercury in the San Francisco Bay-Delta System

(CALFED Contract No. 97-C05)

University of California, Davis

Thomas H. Suchanek and Darell G. Slotton (Principal Investigators)

QUARTERLY PROJECT SUMMARY *(covering period of 7/1/98 – 12/31/98)*

Phase 1 of this project (July 1998-June 1999) includes the following tasks:

- Task 1. Purchase new mercury analyzer system; bring new unit reliably on-line.
- Task 2. Catalogue existing and projected wetlands; determine key gradients.
- Task 3. (Startup) Quantify mercury across key gradients in reflooded wetlands /control sites.
- Task 4. (Startup) Mercury methylation experiments.
- Task 5. (Startup) Formulate Conceptual Model.

We are pleased to report that a considerable amount of progress has been made in the startup phase of this project. Unavoidable delays at CALFED resulted in field and analytical tasks commencing many months later than planned. However, despite a very late start and, consequently, less than ideal sampling conditions, we were able to (1) choose appropriate preliminary sampling regions and sites, (2) purchase and install the new mercury analyzer, (3) outfit and test our field sampling operation and, most importantly, (4) collect an excellent preliminary set of biological indicator samples from five key regions of the Delta and over 25 individual sites.

Because of the delay in startup time for the field and analytical tasks, some of the deliverables originally intended for January 1999 will not be available for several months. Key to this has been the necessary delay in bringing the new mercury analyzer system reliably on-line. Once we have devoted the time necessary to accomplishing this task, we can (a) provide CALFED with an analytical QA/QC Report and (b) work through the analyses of our large archive of preliminary samples. Ongoing work in Tasks 2-5 will be largely guided by these initial results. Below, we summarize work to date.

Task 1. Purchase new mercury analyzer system; bring new unit reliably on-line.

Once administrative delays were overcome, we used the 2/3 funding from CALFED and 1/3 matching funding from UC Davis to purchase the new Perkin-Elmer system in October 1998.

Because of the concurrent intensive field sampling effort at that time, equipment QA/QC trials and method development/refinement (which had been planned for the summer months) had to be delayed, while we focused our energies on mobilizing our field operation and obtaining samples in the shortened collection season. We have installed the new equipment and, at the time of this writing, are commencing a series of tests and methodological revisions to bring the unit into compliance with our needs for the project.

Task 2. Catalogue existing and projected wetlands; determine key gradients.

We have been interacting with state agencies and other researchers working within the Delta to assemble a current inventory and map of existing and proposed wetland habitats throughout the Delta. Recent and historic aerial photographs have been studied. Through communication with relevant agencies and research groups, site visits with them, and through our own extensive reconnaissance and initial sampling, we have made considerable progress in ranking the various existing wetland reaches (and those projected to be flooded) in relation to physical, chemical, and biological gradients that are likely to influence the cycling and subsequent biological uptake of mercury. We are utilizing sites that span a range across each of the various environmental gradients of primary interest (including surficial mercury concentration and source type, salinity, and age since flooding). One activity we conducted toward this end was the week-long field support we provided in November for University of Washington-associated researchers, helping them to collect sediment cores from nine representative flooded Delta sites (also included in our biological field sampling regime). We will have access to subsamples of the resultant sediment core sections and may utilize these to analyze for mercury and construct historical profiles of mercury deposition, aided by sectional dating and supplemental chemistry to be performed by the other research group.

Task 3. (Startup) Quantify mercury across key gradients in reflooded wetlands /control sites.

Mobilizing an effective field sampling operation for routine work throughout the Delta was a large task, involving numerous rush purchases, boat/motor/trailer modifications and repairs, field testing of the sampling vessel and new GPS and depth sounding units, familiarization with Delta habitats and navigation, and testing of numerous field sampling techniques. We explored and collected samples from over 25 sites in five key regions of the Delta: (1) Northern sites dominated by Sacramento River (and Cache Creek) inflows (Prospect, Old Prospect, Liberty, and Little Holland flooded islands, plus reference sites on Cache and Lindsey Sloughs), (2) Southeastern sites dominated by San Joaquin inflows and the city of Stockton, (both sides of Rough and Ready Island plus two sites south on San Joaquin River), (3) Gold mining region Sierra Nevada inflows in the Walnut Grove region (Cosumnes River and Mokelumne River, plus The Meadows Slough), (4) Central Delta sites (including the flooded islands of Franks Tract, Mandeville Tip, Venice Tip, and Mildred Island, plus Sand Mound Slough), and (5) Western Delta sites, including a series across a range of salinity exposure (Sherman, Browns, Chipps, Grizzly, and Ryer Islands, plus Marsh Creek and Montezuma and Suisun Sloughs). In our initial reconnaissance season, we sampled all readily available and easily collected potential bioindicator species. While the parameter list for ultimate inter-site comparison may be refined later, all of this initial data will be useful. Because of the highly variable nature of the Delta,

sample types which were dominant throughout one region were often not present (or replaced by alternate types) in other regions. That is the inherent nature of the system. We were able to obtain fairly consistent samples of the small fish Mississippi Silversides at a majority of sites and numerous other fish, invertebrate, and emergent macrophyte samples across various reaches of the Delta. Crayfish, a primary target of this work due to their high trophic level (similar to fish) and great site fidelity were taken at many of the sites, but collections were constrained by the lateness of the season (crayfish become inactive and very difficult to capture in November). Additionally, two different crayfish species were dominant in different habitats; related work we are conducting in Putah Creek indicates that the two species may have different mercury uptake patterns. In any case, a large, diverse series of samples were obtained in the fall with a series of multi-day expeditions. Analytical results will help us determine optimal ongoing sample types and will provide our first data indicating relative mercury bioavailability among the diverse regions and sites.

Task 4. (Startup) Mercury methylation experiments.

The methylation rate experiment component of the project is in development stage. Dr Nelson has been researching various alternative techniques. Actual field sample incubations will not begin until we have determined appropriate regions for representative cores, based on the analytical results from the bioindicator sampling. The laboratory experimental component of the project will be further developed and refined throughout Phase 1. Representative sediment cores from chosen project sites will be brought back to our laboratories for extensive testing of various potential procedures. Based on the characteristics of the samples and the utility of the various potential methodologies, a standard protocol will be developed for the critical quantification of relative methylation rates.

Task 5. (Startup) Formulate Conceptual Model.

Data results of Phase 1 work related to Tasks 2, 3, and 4 will provide the primary basis for the development of a conceptual model of mercury cycling in flooded Bay-Delta wetlands. Until such results begin to be generated, work in this task area consists primarily of (a) determining basic factors/pools/pathways common to mercury dynamics in most aquatic systems and likely the Delta as well, and (b) determining potential key gradients, present in this particular system, which are likely to significantly influence mercury methylation and bioaccumulation.