

SMALL FISH MERCURY MONITORING 2011 EXTENSION PROPOSAL**Estimated Cost: \$51,636****Oversight Group: RMP Technical Review Committee****Proposed by: Kat Ridolfi and Ben Greenfield, SFEI****BACKGROUND AND JUSTIFICATION**

Mercury contamination is one of the highest-priority water quality issues for the Estuary (Johnson and Looker 2004), and the RMP Mercury Strategy indicates that the focus should be on “improving understanding of the production and uptake of *methylmercury*.” The greatest health risks due to Hg are faced by humans and wildlife that consume fish. Adaptive implementation of the Hg TMDL and adaptive management of habitat restoration will depend heavily on appropriate monitoring of impacts on water quality (Mumley and Looker 2004). Since 2005, SFEI has been monitoring resident small prey fish in the San Francisco Estuary in order to assess the sources and sites of mercury entering the Estuary. These results have established a clear spatial gradient in food-web MeHg, with elevated concentrations in the Lower South Bay (near Alviso Slough) and declining concentrations moving towards the Delta (Greenfield and Jahn 2010). Spatial patterns have been consistent among years, with specific sites exhibiting elevated concentrations, indicating potential areas of elevated concern. This monitoring has also provided a trend data set that will indicate inter-annual and spatial variation in biotic exposure to MeHg produced in the Bay ecosystem.

Hg in small fish is a TMDL target, and the long-term monitoring program is needed to determine how successful TMDL implementation and management actions are at reducing hazard to Bay piscivorous wildlife (SFBRWQCB 2006). Continued sampling at long term fixed monitoring stations (Table 1) aids in evaluating interannual trends of mercury in fish tissue (Greenfield et al. 2005; Greenfield and Jahn 2010), and the potential effects on wildlife that consume these fish. Continuing assessment of seasonal variation (at the Martin Luther King, Jr. Regional Shoreline site) has, and will continue to provide useful information for interpreting longer-term trends, and identifying management opportunities. The seasonal variation monitoring is intended to complement previous and ongoing work funded by the CalFed program and by the South Bay Mercury Program (Slotton et al. 2007; Eagles Smith and Ackerman 2009).

Table 1. Fixed monitoring stations for evaluating long-term trends in mercury and effects of restoration activities.

Site Name	Region	Sampled						Proposed
		2005	2006	2007	2008	2009	2010	2011
Long-term monitoring stations								
China Camp Wetland	San Pablo Bay	X	X	X	X	X	X	X
Mouth of Newark Slough	South Bay	X	X	X	X	X	X	X
Hoffman Marsh at Pt. Isabel	Central Bay		X	X	X	X	X	X
Benicia State Park	Carquinez Strait	X	X	X	X	X	X	X
Candlestick Point	San Pablo Bay		X	X	X	X	X	X
Eden Landing at Old Alameda Creek	South Bay	X	X	X	X	X	X	X
Mouth of Alviso Slough (Pond A8)	South Bay	X	X	X	X	X	X	X
Oakland Middle Harbor	Central Bay	X	X			X	X	X
Bair Island at Steinberger Slough	South Bay	X	X	X		X	X	X
Hamilton Army Airfield	San Pablo Bay			X		X	X	X

APPLICABLE RMP MERCURY STRATEGY MANAGEMENT QUESTIONS

1. Where and when is mercury entering the food web? *Small fish are the best tool for assessing inter-annual variation in food-web mercury in aquatic habitats*
2. What are the high leverage processes, sources, and pathways? *Continued long-term and seasonal monitoring may aid in identifying high leverage processes, such as seasonal flooding events in high flow years, which are hypothesized to result in elevated biotic Hg exposure.*
3. What effects can be expected from management actions? *Continued long term monitoring is needed to determine whether specific management activities (e.g., source control through the MRP; wetland restoration activities) affect Hg biotic exposure in the Bay.*

OBJECTIVES AND APPROACH

Consistent with the long term monitoring since 2005, young-of-the-year fish will be collected in early fall, allowing capture of as much of the summer increase in growth, consumption, and consequent mercury uptake as possible. Fish will be collected from the ten fixed monitoring sites for interannual trend analysis and from Martin Luther King Jr. Regional Shoreline for seasonal analysis. As in prior years, these seasonal samples will be augmented with fish obtained by the USFWS nearshore beach seining program, to continue the seasonal trend database developed at those sites. All sites are fixed, rather

than randomly located, to allow analysis of trends in bioaccumulation of mercury over time.

Four composites of whole fish from two species (Mississippi silverside and topsmelt) from each location will be analyzed for total mercury. Five fish will be included in each composite. At the Martin Luther King Jr. Regional Shoreline, the species collected will also include Arrow goby, to continue the long term data set available for this species. Total mercury will be analyzed rather than methylmercury, because most mercury assimilated by fish is methylmercury (Huckabee *et al.* 1979) and these species are not likely to have much sediment (containing inorganic Hg) in the gut.

Because the objective is to continue a data set for long-term evaluation, data analysis, interpretation, and presentation will focus on identifying long-term trends. Following established methods (Greenfield and Jahn 2010), data will be length corrected, and then plotted by sampling year at all sites. These graphical analyses will be made available to the RMP community through the Annual Monitoring Results, the Pulse of the Estuary, and a presentation to the Technical Review Committee. Statistical analyses will also be performed to determine whether any sites exhibit unusual trend patterns. Such patterns will be compared to ongoing management activities, to aid in developing hypotheses regarding potential impacts thereof.

PROPOSED DELIVERABLES AND TIME LINE

Draft data results – January 31, 2012

Final formatted data results – February 28, 2012

Trend reporting for Annual Monitoring Results and Pulse of the Estuary

Pulse – September 30, 2012

Annual Monitoring Results – January 31, 2013

Results Presentation to Technical Review Committee

March 2012

BUDGET

Tasks	Cost
Site selection	\$2,363
Field sampling and logistics	\$12,175
Data management	\$5,865
Data analysis, presentation and reporting	\$6,733
<i>SFEI Labor Total</i>	<i>\$27,136</i>
Direct Costs (Field Equipment and Truck Rental)	\$1,500
UC Davis Subcontract Field Work	\$24,000
Project Total	\$52,636

LITERATURE CITED

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