Lower American River and Lake Natoma Mercury TMDL
Stakeholder Meeting

Meeting Summary

Meeting Date: August 12, 2010 (10 am – 12 pm)

Location: Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA

Attendees: See below.

Agenda Items:

- Sources of Inorganic Mercury (Upstream, In-stream, NPDES, Atmospheric Deposition)
- Sources of Methylmercury (Upstream, In-stream, NPDES, Atmospheric Deposition)
- Potential fish tissue targets
- Linkage Analysis

Summary:

Patrick Morris (Central Valley Water Board Mercury TMDL Unit supervisor) welcomed everyone, reviewed the purpose of the meeting and meeting logistics, and led a round of introductions of meeting participants.

Stephen Louie (Central Valley Water Board LAR Mercury TMDL Lead) gave a slide presentation that provided:

- An overview of the extent of fish mercury impairment and sources of inorganic mercury and methylmercury;
- A review of the data and calculations used to calculate the loads of inorganic mercury and methylmercury for the various sources identified in the watershed;
- Several potential fish tissue objective alternatives that varied based on fish consumption rates; and
- Calculations regarding bioaccumulation factors to relate methylmercury levels in fish to methylmercury concentrations in ambient water.

Stephen Louie's power point presentation was shown in the meeting room and via web conference. In-person attendees were also given paper copies of the slides. The following is a brief summary of questions and concerns made by meeting participants throughout Mr. Louie's presentation, organized by presentation slide number: The slide presentation is available on the web.

Slide 3 "TMDL Elements"
Stakeholder question: The definition of linkage analysis provided was atypical. A linkage usually relates sources to the goal. Will there be an accounting of methylmercury transport and/or transformation?

- Board staff will provide a link between fish tissue methylmercury concentrations, aqueous methylmercury concentrations, and the sources of mercury/methylmercury . Total and methyl- mercury mass balances have been developed for the LAR and Lake Natoma. These account for total and methyl-mercury sources. The methylmercury mass balance assumes that methylmercury is conservative through Lake Natoma to Discovery Park.

Slide 7 "Extent of Impairment"
Stakeholders asked about the origin of the safe levels shown on the slide. Are the fish of a certain size?

- The USEPA's criterion of 0.3 ppm mercury in fish is based on a one fish meal every other week consumption rate that is derived from a national consumption survey. The other two safe levels show Board staff's calculations of levels necessary to protect wildlife, as described on later slides.
- The slide displays all fish mercury concentration available (including anadromous species) to show all the fish that people and wildlife could possibly consume from the LAR and Lake Natoma.

Slide 8 "Summary of Fish Mercury Concentrations"

- The table displays a summary of the mercury concentrations in the fish species that were used for numeric targets and the linkage analysis.
    - Fish data that were collected from 2000-2008 were used because these are the years that correspond with the available aqueous mercury data.
    - Anadromous fish were not included because their tissue mercury concentrations do not likely represent bioaccumulation from the LAR mercury.
    - The Office of Environmental Health Hazard Assessment's safe eating guidelines for Lake Natoma indicate that mercury levels in landlocked, large salmon in Lake Natoma are high. In the lower American River, mercury concentrations are low (0.09 mg/kg average).

Slide 10 "Total Mercury Concentrations" (graph)
Stakeholder question: What was the Regional Board's sampling strategy and length of time?

- Total mercury samples were collected by the Regional Board, Sacramento River Watershed Program, Coordinated Monitoring Program, and the USGS National Water Quality Assessment Program. Samples were collected during the years 2000-2008.

Slide 11 “Total Mercury Concentrations” (table)
Stakeholder questions: What were detection limits, and how were non-detects handled?

- The typical method detection limit for the samples analyzed was 0.2 ng/L. For statistical calculations, non-detects were substituted with values that were ½ the detection limit.
- Elevated concentrations of total mercury have been measured in urban runoff discharges.

Mr. Louie noted that more than half (57%) of the mercury in water coming out of Nimbus Dam passes through an analytical filter, meaning that it is not bound to sediment. This result is surprising, given that total mercury is often associated with particulate matter in the water column. He suggested that dissolved, inorganic mercury could be fluxing from sediment in the lake bottom. The percent of dissolved mercury decreases down the LAR to Discovery Park to 44%. The particulate bound Hg to sediment ratio decreases slightly from Nimbus to Discovery Park (0.22 to 0.19 ppm, respectively). A reference to a CALFED study that provides more detail on the mercury and suspended sediment concentrations and loads in the Central Valley will be provided on the Water Board’s website.

Slides 12 “Lake Natoma MeHg Concentrations”
Stakeholder questions: What is causing the mercury to methylate? Are fertilizers important?

- The process which inorganic mercury is transformed into methylmercury is a complicated, multi-step process. Primarily, mercury is methylated by sulfate reducing bacteria in the sediment. Many factors contribute to the rate at which methylation occurs including, but not limited to, inorganic mercury concentration, dissolved organic carbon concentration, pH, temperature, etc.
- Elevated concentrations of methylmercury have been measured from urban runoff discharges. Additionally, elevated levels of methylmercury have been measured in ponds located adjacent to the mainstem river. These ponds are occasionally connected to the mainstem water bodies during very high flow, and may or may not be hydrologically connected through groundwater.

Slide 13 “LAR MeHg Concentrations”
Stakeholder question: Do the load estimates account for mercury from the mine tailings along the river? Rainfall/runoff from the tailings should be included in the mass balance.

- The load from runoff through mine tailings has not been calculated. Board staff will research the possibility of calculating this source load.

Slide 15 “Total Mercury Mass Balance”
Stakeholder question: Do the mass balance calculations incorporate mercury fluxing from sediment to the water column. Elsewhere, the USGS proposed studying mercury flux from sediment because it is expected to produce a significant load.

- The mass balance calculations estimated that 1% and 2% of the total loads for Lake Natoma and the lower American River come from sediment flux of mercury. However, the rates used to calculate the loads were developed in Delta sediments. Sediment flux rates in the American River watershed may be different.
- Folsom Lake load estimates were calculated using concentration data collected during WY2009. Precipitation during WY2007-2009 were considered dry. Because total mercury concentrations are typically positively correlated with flow, the total mercury concentrations used from this period may underestimate loads from Folsom Lake.

Slide 16 "Methylmercury Mass Balance"
Stakeholder question: Are loads calculated using average methylmercury concentrations?

- Methylmercury loads are calculated using mean methylmercury concentrations. No flow vs. concentration relationship has been found.

Stakeholder question: What does "instream wetland" represent? How are the instream and upstream wetlands different? Are the ponds along the AR like wetlands? Water in the perimeter wetlands is likely static. How did you calculate loads?

- Using GIS land use data from the CA DWR and National Wetland Inventory, wetland acreage was estimated. "Instream wetlands" represent wetlands that were located within 50 m of the mainstem water bodies and/or hydrologically connected. Wetland loads were calculated using methylmercury production rates developed from seasonal wetlands used in the Delta TMDL because these are the best rates currently available.
- Adjacent ponds are not included in the wetland source calculation. The ponds are categorized as open water. All ponds sampled had mean methylmercury concentrations greater than the mainstem river. During the study, the ponds were not hydrologically connected to the mainstem through surface water, however, the ponds may be connected through subsurface interactions. The ponds may be significant sources of methylmercury to the LAR, however, this source rate has not been calculated.

Stakeholder recommendation: Better data could become available relatively soon, through a 319(h) grant and other projects. Use new data to tighten load estimates from wetlands.

- Estimates will be made using the latest data, rates, etc. available to Board staff. As new data are available, staff will recalculate loading estimates, targets, etc.

Slide 19 "Wildlife Fish Tissue Targets"
Stakeholder question: What is the source of the reference doses?

- The reference doses are given by the USFWS and USEPA. The reference dose for birds is based on laboratory studies with mallards. The reference dose for mammals is based on studies with mink.

Slide 23 “Fish Tissue Safe Levels for to Protect Human Health”

- The green highlighted boxes show the human consumption rates that are currently being met in the American River, however, these conditions are not protective of all wildlife. The yellow boxes highlight what human fish consumption rates could be at given fish concentrations that are protective of sensitive wildlife.

Staff and stakeholders discussed the fish consumption scenarios shown in the table. A stakeholder asked whether the diets of people eating LAR and Lake Natoma fish are expected to contain 21% of trophic level 2 fish.

- The trophic level consumption rates were derived from a national fish consumption survey and is part of USEPA’s default rate for fish consumers. The USEPA advises that this consumption rate may be used, if a site specific consumption survey has not been completed. To date, no LAR specific fish consumption data are available. Site-specific consumption information will be considered if available.
- Clams and crayfish would be examples of trophic level 2 species that humans eat.

Stakeholder recommendation: Base consumption scenarios on people’s actual consumption of local fish. Data haven’t been collected specifically for the American River, but data are available for the northern Delta and lower Sacramento River, where locals also fish. Some stakeholders expressed skepticism that site-specific human fish consumption information would be used, since it was not for the Delta TMDL.

- People’s actual trophic level consumption distribution may or may not be similar to USEPA’s default consumption rates. Staff has provided alternative consumption distributions and consumption rates to be considered.

Slide 24 “Allowable Human Consumption Using Wildlife Safe Levels”

A stakeholder commented that wildlife safe levels are based on the amounts and species of fish that wildlife species are eating now. However, safe human consumption levels seem to assume people will eat less fish and/or different species.

- The table presents the amount of fish that a human could safely consume from the American River, if fish tissue targets derived from wildlife safe fish tissue levels are used.

A stakeholder noted that safe consumption rates assume average concentrations of mercury in fish, but many people target large catfish and striped bass. These fish have higher mercury concentrations than the trophic level 4 average.

- Below is a summary of creel surveys (not presented in the meeting presentation) conducted in the LAR during 1999 through 2003 showing the number of fish taken. Thirteen percent and less than 1% of the total number of fish taken (excluding salmon) were striped bass and catfish, respectively. The percent of catfish that are taken from Lake Natoma may be higher, however, no data has been presented. Because Striped bass are anadromous, its fish tissue mercury levels may not be representative of mercury bioaccumulation from the LAR. However, once mercury levels in the American River, Sacramento River, Delta, and San Francisco Bay decrease as a result of mercury control programs, striped bass mercury concentrations may show a decline.

- The data from the creel surveys shows that the majority of fish taken from the LAR during the surveys, other than salmon, are American Shad. Currently, average mercury concentrations in American Shad are 0.044 ppm. People could consume nearly 5 meals/week of American Shad.

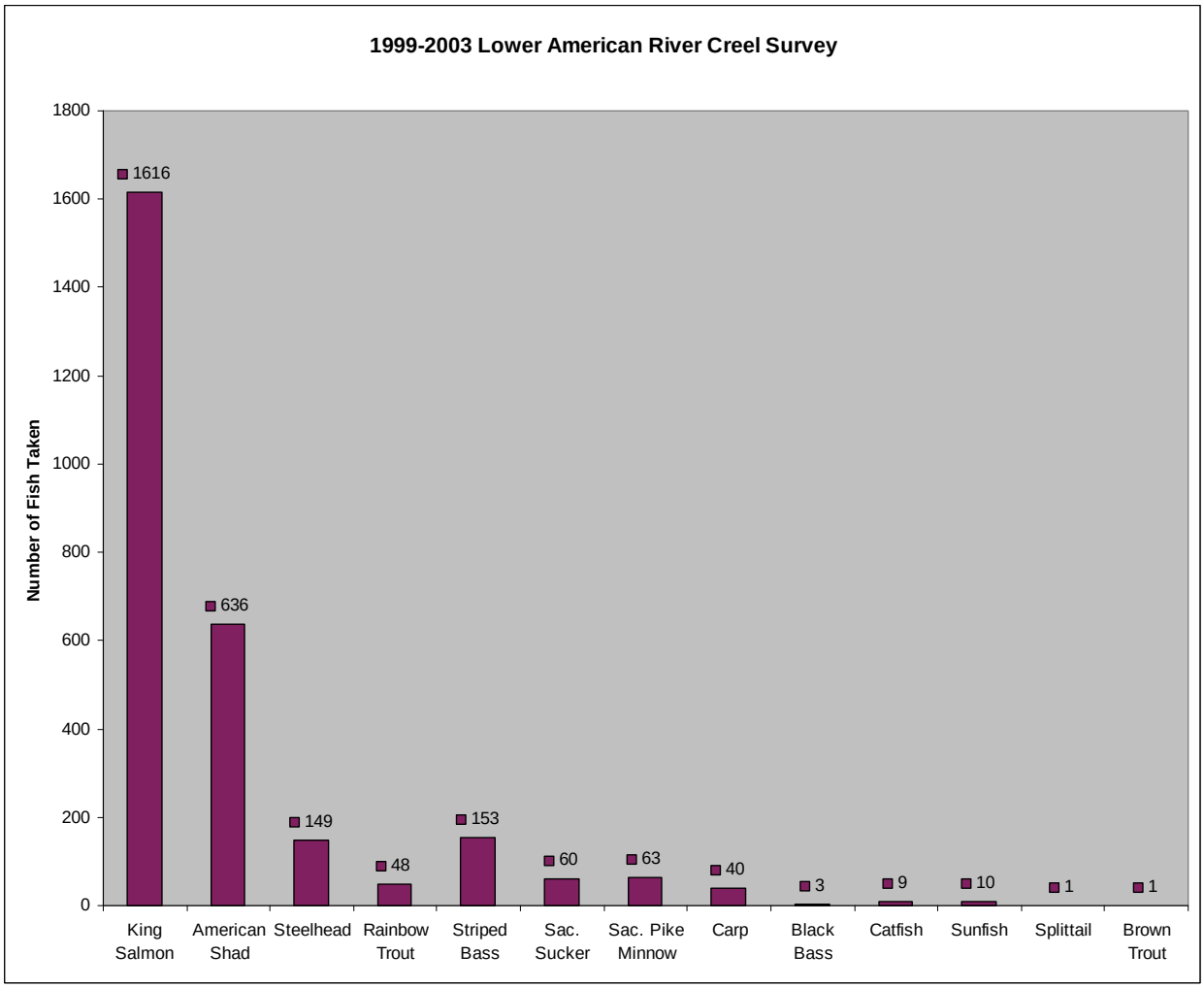

*Figure not presented during the stakeholder meeting.

Stakeholder recommendation: describe how the safe consumption levels change when calculations include the highest fish mercury concentrations.

- Board staff will explore how consumption rates and safe tissue levels change by using different distributions of fish sizes and/or concentration metrics.

Slide 27 "Bioaccumulation Factor"
Stakeholder question: How did you separate American River fish at Discovery Park, since Discovery Park is at the confluence of the American and Sacramento Rivers?

- Board staff calculated bioaccumulation factors from many distributions of fish (ex. Discovery Park fish only, LAR fish only, and both LAR and Lake Natoma). Targets, goals, consumption rates, etc. have been analyzed using different fish

distributions. Calculations using different distributions of fish locations in the LAR account for about a 13% difference in safe aqueous methylmercury concentrations.

- Board staff will explore fish mercury concentrations collected from the LAR and nearby Sacramento River to determine if they may contain different populations of fish.

Slide 29 "Proposed Methylmercury Goals"

Stakeholder question: You are assuming that if methylmercury decreases in water, it will decrease in fish. Have you considered the methylmercury flux and uptake from the benthic portion of the food web and surficial sediment?

- The water to fish methylmercury linkage includes, at least, part of the benthic food pathway because trout and other fish eat insect larvae that accumulate some methylmercury from the benthos. Statistically significant positive correlations have been observed between methylmercury concentrations in water and fish. This relationship suggests that methylmercury concentration in water is an important factor in controlling the methylmercury bioaccumulation in the aquatic food chain.
- Because of the relationship between aqueous and fish tissue methylmercury concentrations, Board staff assume deceases in aqueous methylmercury concentrations will result in decreases in fish tissue mercury concentrations.

Stakeholder question: How are you making the link between methylmercury in water and fish?

- Many factors affect the rate of bioaccumulation of methylmercury in aquatic organisms including, but not limited to, benthic food pathways, growth rates, distribution and abundance of insects and algae, etc. Staff calculated the ratio of the concentration of methylmercury in fish and in water (bioaccumulation factor). This approach is typical for determining cleanup goals in water that relate to desired fish tissue concentrations. When methylmercury concentrates, the biggest increase occurs between methylmercury in water and methylmercury in algae. When measuring methylmercury in unfiltered water samples, we actually measure methylmercury in algae floating in the water. The linkage analysis uses unfiltered methylmercury concentrations, so that the water concentration portion of the linkage incorporates this first, major step in bioaccumulation.
- Fish mercury concentrations have been shown to respond very quickly to changes in aqueous methylmercury concentrations. In 2006, biosentinel fish mercury concentrations in the San Joaquin nearly mirrored 4-6 fold increases and then decreases in aqueous methylmercury concentrations that occurred a few months prior.

Stakeholder questions: Can we be sure that LAR and Lake Natoma fish would respond to changes in aqueous methylmercury, as happened in the San Joaquin River? The LAR is colder, has more mercury from upstream historic mining activity, and already has low methylmercury levels.

- Biosentinel fish located in the Cosumnes River displayed similar reactions to aqueous methylmercury fluxes as happened in the San Joaquin River. The Cosumnes River watershed is located adjacent to the LAR watershed and has had a similar history of mining activity.

- Staff evaluated information from other water systems in additions to the San Joaquin River. For example, the USGS monitored methylmercury in water and fish in three reservoirs in the Bear River system, which is colder water. Many California reservoirs have relatively high levels of methylmercury in fish, but low concentrations in water. Studies will need to be conducted to determine how methylmercury and/or mercury reductions will be achieved by all various sources. Reductions could be made by reducing methylmercury or changing a different factor. We anticipate that the implementation plan will be adaptive. Targets and allocations can be changed as needed.

Stakeholder question: How is the plan related to total mercury? Inorganic mercury is entering the lake and river; sediment mercury can be disturbed.

- Statistically significant positive correlations have been observed between methylmercury and total mercury concentrations in Delta sediment, and methylmercury production increases in intact sediment cores amended with increasing concentrations of inorganic mercury, in the laboratory. Board staff anticipates that total mercury reductions will be necessary to reduce methylmercury concentrations and loads.

Stakeholder question: The slide shows proposed methylmercury goals. Are the goals based on what people are actually eating?

- No site specific consumption surveys have been completed for the LAR or Lake Natoma. The staff report will evaluate a range of consumption rates that will be presented to the Board. A range of consumption rates, trophic level distributions, etc. and their corresponding safe fish levels are presented on Slide 23.

Stakeholder question: What is the role of stakeholders in this process?

- Staff will develop alternatives for water quality objectives and the implementation plan. Staff will take input from the stakeholders to: develop the water quality objectives, choosing the alternatives to propose to the Board, develop possible implementation actions, etc.

Stakeholder question: If Tribes or others provided local fish consumption information, would staff like to use it?

- Board staff will consider data that is available regarding local fish consumption.

Stakeholder recommendations:

- Provide information about total mercury in LAR and Lake Natoma, and better explain how total mercury might be addressed to achieve the methylmercury goal in water.
- Clearly explain the basis for the proposed fish tissue targets and who is and is not protected by the targets when eating LAR and Lake Natoma fish,
- If potentially achievable levels and timelines for cleanup will be factors in decision making, staff should provide all information and assumptions that it uses to determine the potential for cleanup.
- In calculating protection provided to fish consumers by a target, consider looking at maximum mercury concentrations in fish, not just the averages.

Next Steps:

- The final version of the 12 August 2010 Stakeholder Meeting summary will be posted to the Board's website.
- Links to references for studies discussed during the stakeholder meeting have been posted on the Board's website.
- Stakeholder meeting 16 September 2010 at the Regional Board Office.

Lower American River and Lake Natoma Mercury TMDL
Stakeholder Meeting
August 12, 2010

Attendees

Bill Christner, ECORP
Chris Hammersmark,* CBEC / Water Forum
Dave Tamayo, Sacramento County SWP
Gene Lee, U.S. Bureau of Reclamation
Hong Lin,* City of Sacramento
Stephen McCord, Larry Walker Associates
John Fields, U.S. Bureau of Reclamation
Patrick Morris, Central Valley Water Board
Robyn Alongi,* California Dental Association
Sherri Norris,* California Indian Environmental Alliance
Stephen Louie, Central Valley Water Board
Tom Mauer,* U.S. Fish & Wildlife Service
Brenyale Norman,*
Carol Kennedy,* U.S. Forest Service
Fraser Shilling,* UC Davis
Bonnie Van Pelt,* U.S. Bureau of Reclamation
Michael Peterson,* Sacramento County
Joshua Israel,* U.S. Bureau of Reclamation
Sarah Staley, City of Folsom
Rod Miller, City of Folsom
Janis Cooke, Central Valley Water Board
Lauren Dailey, CA DFG
Stuart Augerer, U.S. Bureau of Reclamation
George Booth, Sacramento County
Michael Stephens, CA State Parks
La Donna Williams,* People for Children's Health & Environmental Justice

* People who attended by Webinar/conference call.