

**Attendance:**

Jay Davis (SFEI)	Alex Hartman (USGS)	Chris Foe (CVRWQB)
Stacey Swenson (SWAMP)	Josh Ackerman (USGS)	Collin Eagles-Smith (USGS)
Mark Stephenson (MLML)	Amanda Palumbo (SWRCB)	Jim Wiener (University of Wisconsin)
Mike Horvath (SFPUC)	Harry Ohlendorf (CH2M Hill)	Lori Webber (SWRCB)
Gary Ichikawa (CDFW)	Jennifer Salisbury (SWRCB)	Autumn Bonnema (MLML)
Dylan Service (CDFW)	Rich Fadness (RWQCB)	Cassandra Lamerdin (MLML)
Karen Taberski (SFRWQCB)	Eric von der Geest (MLML)	Chris Schmitt (USGS)
Terry Fleming (USEPA)	Karen Worcester (CCRWQCB)	
Ellen Willis-Norton (SFEI)	Bob Brodberg (OEHHA)	
Steve Bay (SCCWRP)	Dave Crane (CDFW)	

**Item 1: General Update on SWAMP and BOG Developments since the Last Review Panel Meeting, and Future Plans [Jay Davis]**

---

**Information:**

Jay Davis updated the BOG on recent accomplishments related to the SWAMP side of the group, including the release of the two-year Coast Survey, which received substantial media attention, and running a Cyanotoxins Workshop in November. The Cyanotoxins Workshop resulted in ideas for increased coordination and a plan to synthesize existing cyanotoxin data. The Workshop members agreed that freshwater and marine algal toxin monitoring efforts should be integrated. Jay noted that there is no plan yet for 2014 BOG studies; the BOG needs to hear from managers what their information needs are for 2014 and beyond. Rich Fadness agreed that BOG money should be used to inform regulatory actions. Terry Fleming stated that BOG contributes to a lot of different efforts and it is important for the group to pare down their involvement and figure out what the BOG can do well. Terry ended the discussion by noting that SWAMP may no longer be funded by the 106 grant, which will make the program more flexible, but more susceptible to funding cuts.

Jay Davis then reviewed recent accomplishments from the Water Monitoring Council side of BOG. A finalized strategy was completed; however, it is a living document that will be revised and updated over time. In December, BOG held a symposium that summarized available information on bioaccumulation in California. Jay stated that the symposium drew in community organizations and public health professionals that Jay hopes will stay involved in BOG.

**Item 2: The Rivers and Streams Survey [Jay Davis]**

---

The draft report "Contaminants in Fish from California Rivers and Streams, 2011, and Summary of the SWAMP Statewide Sport Fish Surveys" will be distributed for review by Monday 3/18 (hopefully sooner). Written comments are requested by March 29. A presentation of the findings for rivers and streams will be provided, including discussion of feedback on the findings and this section of the report from the group.

**Discussion:**

Jay Davis presented the findings from the Rivers and Streams survey, the third element of a statewide sport fish screening study. The survey set out to answer two questions: 1) If the majority of the fish species in popular fishing locations have contaminant concentrations low enough to allow consumption and 2) if there is a need for further sampling to develop comprehensive consumption guidelines. The study focused

on popular fishing locations and fish species, to assess the risk for humans that consume fish. The targeted fish species included mercury indicators (e.g., largemouth bass), organic contaminant indicators (e.g., catfish), or widely distributed species such as trout, typically rainbow trout. If more than one type of trout species was collected, the species that was native to the region was sampled.

Steve Bay asked why there were hardly any sampling locations in Southern California, he wondered if the survey accurately represented spatial consumption patterns. Gary Ichikawa responded that there are not many popular stream/river sampling locations in Southern California. Most of the popular fishing locations in Southern California are in lakes and reservoirs. Terry Fleming suggested including a note in the report explaining the lack of sampling locations in the South.

Jay reviewed the results from the survey and noted that there were no surprises; the results reinforced the findings from previous surveys. Thirteen percent of the sampling locations possessed fish with average methylmercury (meHg) concentrations above OEHHA's no consumption limit; 21 percent had concentrations above 0.30 ppm (threshold for 303(d) listing); 24 percent exceeded 0.2 ppm; and 51 percent had fish with meHg concentrations below the lowest threshold, indicating that fish from the location could be eaten 3 times a week. Comparatively, there was only one location in the Coast survey that was considered clean. Terry Fleming suggested that the map of meHg concentrations Jay presented should not only illustrate concentrations above the 0.3 ppm threshold value, but also concentrations above 0.2 ppm because the State Water Board may start using a 0.2 ppm objective. In Rainbow trout, a popular fish species, only one sample exceeded the 0.3 ppm threshold. Trout typically have lower meHg concentrations because they are at a lower trophic level than other fish and they are stocked from hatcheries into rivers and streams. Terry suggested including information about the fish species in the figures, rather than only explaining species-specific differences in the text. Also, the group suggested that Jay should look at how far the sites were from reservoirs. If sampling locations were within 10 km, the rivers/streams could be under the influence of reservoirs that produce and export meHg. Josh Ackerman suggested controlling for variation in length, size, and species to improve the spatial analysis. Jay responded that he has not had the resources to conduct those analyses.

Fish species with high meHg concentrations included: 1) Sacramento pikeminnow, 2) Smallmouth bass at the Sacramento River mouth, 3) Largemouth bass from the Delta, and 4) San Francisco Bay/Delta Striped bass. Species with low meHg concentrations were trout and salmon. Bob Brodberg asked Jay to make clear in the text that even though the salmon were sampled at hatcheries, the salmon are adults that have already been influenced from the environment and are coming back to the hatchery to spawn. Gary noted that it is hard to tell a hatchery salmon from a wild salmon.

Jay presented plots that demonstrate that Hg concentrations are correlated with fish length for black bass (species with highest Hg concentrations). Jennifer Salisbury noted that it might be useful to separate the correlations by location (e.g., different regression lines for the two smallmouth bass locations). The fish were size standardized and the sampling locations that exceeded the no consumption ATL included Laguna de Santa Rosa and Delta sites. The time series plots indicate that Hg concentrations are staying constant over time (1997-2011). However, the data set is small, making it difficult to determine trends over time. The points without error bars are composite samples from the Sacramento River Watershed Program.

Jay then reviewed results for the other contaminants analyzed in the survey. Dieldrin had the second highest concentrations in fish relative to thresholds, unlike the lake and coast surveys where PCBs were second to Hg. Around half of the locations were below the fish contaminant goals (FCG) and none of the sampling locations were above the no consumption ATL. BOG members were surprised that there were

sites in the Eastern Sierra with concentrations above the FCG. Bob cited a National Park study that showed pesticides can be transported into the Sierra via the atmosphere. Additionally, degradation is lower in high elevations with colder temperatures. PCBs are in third place, with 68 percent of the sampling locations below the FCG and none of the samples above the no consumption ATL. The Delta has higher PCB concentrations from urban regions and hydroelectric equipment; the concentrations above the FCG in the Sierra are likely from atmospheric deposition and hydroelectric facilities. Terry stated that if FCGs become the threshold for listing water bodies, then TMDLs will need to be conducted for PCBs in the Sierras, which is unreasonable. For DDTs 95 percent of the locations were below the FCG; similarly, 98 percent of the locations were below the FCG for chlordane. Concentrations at Laguna de Santa Rosa were among the highest in the state for all contaminants. The site is already on the 303(d) list for elevated Hg concentrations. Laguna de Santa Rosa is surrounded by fields that flood regularly, a former agricultural site that is now influenced by urban inputs, and a habitat conservation area used for recreation.

Cyanotoxin data were not included in the report, but Jay presented cyanotoxin results from three studies. The studies looked for 13 cyanotoxins and there were only four detects. In the Klamath region, cyanotoxins have accumulated in fish and mussel tissue.

Jay finished his presentation by noting the report will be released on May 23, 2013. Jay will send the BOG the full report with the missing graphs and a separate document with just the graphs.

**Action Items:**

- Jay will send the BOG the full report with the missing graphs and a separate document with just the graphs.

**Item 3 & 4: Summary of SWAMP Statewide Fish Surveys [Jay Davis]**

---

A presentation of the summary will be provided, including discussion of feedback on the findings and this section of the report from the group.

**Presentation:**

Jay began his presentation of the SWAMP fish surveys summary by stating that BOG has generated an impressive five-year dataset. Over 400 locations and almost 9,000 fish were sampled. He noted that Hg contamination is a statewide problem, including high concentrations in Southern California Lakes. The survey determined that there are many sites in California that exceed the no consumption ATL (based on species with the highest average concentration). However, there are many fish species that can be safely consumed; cleaner species were often present alongside contaminated species. For PCBs, the contamination is greatest in San Francisco Bay and San Diego Bay. Dieldrin, DDT, Chlordane, and Se concentrations are mainly below the FCG. A BOG member asked if FCG is used as the criterion for a site being labeled as “clean”. Jay responded that he used the OEHAA Advisory Tissue Level (ATL) threshold, which is higher than the FCG. Steve Bay said that instead of stating that 35 percent of the coast was clean, the wording needs to be 35 percent of the stations sampled were clean. Jay agreed, except for lake sites because a random sampling of 50 sites was included in the lake survey and yielded similar results.

Jay noted that there are water bodies with moderate to high contaminant concentrations, but no advisories (e.g., Central California is not listed and Southern California lakes are not listed). A BOG member suggested mapping the water body advisories the same way the 303(d) listings are mapped.

Jay went over remaining information needs including:

- 1) Sport fish monitoring in lakes that are un-sampled
- 2) Developing consumption guidelines
- 3) Assessing long-term trends
- 4) Emerging contaminants
- 5) Wildlife exposure studies (fish, birds, and mammals). Harry Ohlendorf noted that bird egg monitoring should focus on non-migratory birds and Chris Schmitt suggested studying harbor seals.

**Discussion:**

BOG members agreed that the five-year summary report is more important than the Rivers and Streams Survey report. Additionally, there was consensus to publish the Rivers and Streams survey report and fact sheet followed by a five-year summary report and fact sheet. The group wants to see additional data analyses for the five-year summary. Jim Wiener stated that there is still a lot of information that can be mined from the data. Steve Bay mentioned that a larger meeting, including managers, could be held to decide what questions should be addressed in the synthesis. Terry suggested that Jay take a step back and think about how the statewide synthesis can be used to inform policy. Chris Schmitt added that the summary should discuss possible causal factors.

Chris Foe noted that the five-year summary is missing the human health component, an assessment of risk. Jay replied that a statewide consumption study has not been performed, highlighting a clear information gap. Chris suggested conducting a statewide consumption survey to determine who is eating the fish, where, and how much are they are eating. Bob Brodberg noted that there have been local consumption studies in San Francisco Bay and Santa Monica Bay and Fraser Shilling (UCD) is conducting tribal consumption surveys. Chris Schmitt thought that a consumption study was outside the scope of the BOG. Terry suggested creating a feature on the portal where users could change their consumption levels and then determine what locations exceed thresholds based on those levels of consumption.

Terry wants the five-year summary to include: 1) information on Selenium in wildlife, 2) the effect of changing fish consumption rates on listing thresholds, and 3) information illustrating the use of FCGs or ATIs as threshold values. Jay will include Terry's second and third requests in the synthesis, but he cannot gather information on Se in wildlife before the synthesis is published.

Jim is interested in understanding long-term Hg trends. He has observed trend reversals for Hg; for example, Hg concentrations have started to increase in the Great Lake states, Finland, Sweden, and Canada. Harry added that restoration activities in the Delta may promote Hg methylation. Additionally, ocean currents along the coast may be affecting meHg concentrations. Harry wondered data from the Toxic Substance Monitoring Program could be used for examining long term Hg trends.

**Item 5: The Wildlife Study [Josh Ackerman and Collin Eagles-Smith]**

---

A presentation of preliminary results from the 2012 sampling effort for the study "Incorporating Wildlife Methylmercury Exposure and Risk Estimates Using Biomagnification Factors into California Lake Monitoring", and description of plans for 2013, with discussion by the group.

**Presentation:**

Josh Ackerman presented an update on the wildlife study supported by the BOG. The study was conducted because the lakes and reservoirs screening study did not incorporate wildlife risks. Josh stated that it is logistically more difficult to study wildlife than fish. Therefore, the goal of the study was to determine if a

biomagnification factor (BMF), calculated by dividing the wildlife species Hg concentrations by the prey fish Hg concentration, could be used to assess risks of Hg to wildlife. Adult grebes were used as the wildlife biosentinel because they are widely distributed and become flightless during the breeding season, so their Hg exposure is localized. The study examined correlations between Hg in adult Western and Clark's grebe blood to Hg exposure in whole prey fish sampled at the same locations during the same time period. The study is in its second year, 13 out of 24 lakes have been sampled. The lakes are previous BOG sampling sites where sport fish Hg concentrations have been analyzed.

Lake Berryessa is a hotspot for Hg in Grebes, 94 percent of the Grebes sampled in the lake are at high risk (> 3ppm THg) for overall reproductive effects (e.g. number of fledglings per pair, behavioral abnormalities, hatching success, nest abandonment). Additionally, a large percentage of the Grebe population at Bridgeport Reservoir, Clear Lake, Crowley Lake, East Park Reservoir, and Lake San Antonio were at a moderate or high risk of exhibiting THg effects. Prey fish Hg concentrations were also elevated in the same locations as Grebes. Thus far, the average BMF is 20, but the variation was high (7.1-60.2).

The R squared between Grebes and all prey fish species, using simple geometric means, was 0.63. To improve the correlation, a model predicted, least-square regression correlation was run. The model predicted regression takes into account variation due to Grebe sex and species. The new regression allows users to determine the risk to a specific Grebe species and sex based on the prey fish Hg concentrations. Josh ended the presentation by stating the plan for 2013 was to sample more lake types and areas. Increasing the sample size will allow the authors to incorporate other variables into the model predicted, least-square regression such as elevation, lake size and area, fish species, and bird molt.

#### **Discussion:**

Cassandra Lamerdin asked if the Grebe egg data will also be correlated to small fish THg concentrations. Josh replied that the egg data would be used in the same way as the blood data. Jim Wiener was concerned about the lack of interannual variation; Josh agreed and said sampling site and calendar date is currently confounded.

Chris Foe wondered if the largemouth bass data from the lakes and reservoirs screening study will be used to correlate sport fish and prey fish. Josh responded that a correlation between grebes and sport fish was conducted, but the correlation was weak. Jennifer Salisbury suggested only including black bass in the correlation rather than a mixture of species. Additionally, the group said Josh should also correlate bass Hg concentrations with prey fish Hg levels. In 2012 sport fish were collected alongside prey fish, so a correlation is feasible. The group agreed that Josh should choose sampling locations where there are black bass instead of focusing on a regional distribution of lakes. A prey fish and bass correlation could be important for management because the use of black bass ties the work to a human health objective. Steve Bay noted that managers may be wary of applying the tool in Southern California when data from Southern lakes are not included. Josh responded that Southern California lakes will still be included, just not at the same density (if black bass become the main priority when deciding sampling location). The group asked Josh and Collin Eagles-Smith to make a table of the sampling locations that includes the rationale for choosing the site. The group agreed that the correlation between prey fish and Grebes could be enhanced if there were sampling locations with Hg concentrations between the medium and high range.

Josh addressed the suggestion of using stable isotopes to determine trophic position by stating the isotope ratio can be completely different between benthic and pelagic fish species. When asked what he envisioned for the tool's use, Josh replied that it could be used to determine the risk of Hg to grebe

populations for any California lake. The results could not be extrapolated to other bird species unless sampling on other species was conducted. Jim Wiener noted that grebes are considered a hardy species, even though they are a species of concern in California; therefore, the results may be underestimating the effects to wildlife.

Terry Fleming mentioned that managers are already having trouble reach the Hg thresholds for human health standards and was unsure if a wildlife Hg threshold could be achieved. Josh responded that unlike humans, fish and wildlife do not have a choice regarding their consumption. Additionally, the TMDL target for Hg is not very different from the grebes Hg threshold. BOG members suggested including error bars on the threshold concentrations so managers understand that the number is not exact.

#### **Action Item**

- Josh Ackerman and Collin Eagles-Smith will make a table of the sampling locations that includes their rationale for choosing the site.

#### **Item 6: Western North America Mercury Synthesis [Collin Eagles-Smith]**

---

A brief summary of this effort will be presented, followed by discussion of coordination with work being done in California.

#### **Presentation:**

Collin Eagles-Smith presented a background on the Western North America Mercury Synthesis, a tri-national collaboration between Mexico, the United States, and Canada to assess the Hg risk to ecological and human health. The synthesis will answer questions that are of value to both managers and scientists in the region. The synthesis is modeled on Hg syntheses that have already been conducted for the Northeast and Great Lakes regions.

Collin began his presentation by reviewing regional and global Hg sources (e.g. volcanism, legacy mining, ore processing, and fossil fuel burning). He also made clear that Hg sources are only one factor regulating meHg production. Environmental conditions, such as land use and habitat type, facilitate meHg production and ultimately determine exposure and risk. The goal of the synthesis is to collect and synthesize all of the available Hg data across Western North America and develop estimates of regional Hg and meHg production. The authors are interested in Hg spatial and temporal patterns, the importance of habitat types for meHg production, the effects of climate change on Hg levels, and potential management and policy implications. Collin noted that SWAMP's Hg data is the richest dataset that will be included in the synthesis. In general, California is providing a considerable amount of data compared to other states. BOG members mentioned that the synthesis authors need to make sure they acknowledge the monitoring programs that collected the data, not the database where the data is stored.

The organizing team includes David Evers, Collin Eagles-Smith, Mark Marvin-DiPasquale, and Jim Wiener. The organizing committee established four working groups that will address specific portions of the synthesis: 1) Mercury Sources, 2) Policy and Human Health, 3) Fish, Wildlife, and Foodwebs, and 4) Mercury Biogeochemistry. Jim Wiener noted that currently there are not many managers in the working groups; he is interested in involving more managers in the effort. The synthesis will include around 20 lead authors, the members of the working groups. The organizers are committed to including the synthesis and related papers into a journal that is open access. BOG members asked if they could comment on a draft of the synthesis; Collin replied that the organizing committee is working on a strategy to facilitate comments from groups like the BOG. One other suggestion was to take the entire synthesis model and isolate the California portion, so the results could be applied to state-wide Hg efforts.