

Attendance:

Jay Davis, SFEI	Robert Brodberg, OEHHA	Harry Ohlendorf, CH2M Hill
Jon Marshack, SWRCB	Leland Tarnay, NPS	Gail Cho, CDFW-WPCL
Jennifer Salisbury, SWRCB	Jim Wiener, University of Wisconsin	Richard Fadness, North Coast RWQCB
Autumn Bonnema, MLML	Gary Ichikawa, CDFW	Lisa Holmes, SWRCB
Cassandra Lamerdin, MLML	Karen Taberski, SFRWQCB	Susan Klasing, OEHHA
Stacey Swenson, MLML	Josh Ackerman, USGS	Stephen Martenuk, MLML
Lori Lim, OEHHA	Billy Jakl, CDFW	Stephan Louie, CV RWQCB
Ellen Willis-Norton, SFEI	Chad Loflen, SDRWQCB	Mary Adams, Central Coast RWQCB
Michael Lyons, LA RWQCB	Margy Gassel, OEHA	Terry Fleming, USEPA
Karen Worcester, Central Coast RWQCB	Chris Jones, DWR	Bryan Frueh, City of San Jose
Dylan Service, MLML	Mary Curry, WPCL	
Amanda Palumbo, SWRCB	Chris Schmitt, USGS	

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

Jay Davis stated that the report and factsheet on Contaminants in Fish from California Rivers and Streams was published in May and received good press. He stated that there was a slow period following the release of the report because the 2012/2013 fiscal year contract didn't get put into place until later in the year. Recently, the SWAMP roundtable decided to reduce the budget for all SWAMP elements by 20%; therefore, the funds for 2013/2014 will be tight. Jay added for the 2013/2014 fiscal year more funds needed to be directed to data management and QA/QC.

The workplan for 2013/2014 fiscal year came shape later in the year with \$50,000 dedicated to developing a cyanotoxin monitoring strategy, \$15,000 for the portal work, \$240,000 for the sampling and analysis of clean lakes across the State. The five year summary of the sportfish work will no longer be completed because of the reduced funds.

Item 2: Information: Update on the Wildlife Study [Josh Ackerman, Collin Eagles-Smith]

Presentation

Josh Ackerman stated that the second field season for the wildlife study was successful, all 12 lakes included in the plan were sampled. Largemouth Bass were collected at most of the lakes, which was a suggestion from last year's review panel meeting. The contract for the second year of the study was put in place in the beginning of 2014. Since the contract was obtained, the mercury (Hg) analyses have been completed on the sport fish, prey fish, and grebe eggs. The Hg analysis has just started for grebe blood. The draft report is due March 31, 2015 and the final is due May 31, 2015. Autumn stated that the fish Hg data will be available in the next two weeks.

Panel Comments:

Harry Ohlendorf asked if the fish were analyzed individually. Autumn Bonnema replied that the fillets of sportfish were analyzed individually and that the whole bodies of the small fish (<100 mm) were analyzed individually. Harry also asked if blood samples were collected for all of the grebe individuals whose eggs were also collected. Josh replied that in 7 of the 25 lakes both grebe eggs and blood were collected; in the remaining lakes, only blood was collected. The primary linkage the study is attempting to establish is between grebe blood and prey fish. But, grebe blood and egg concentrations will be compared to analyze the effect of Hg on reproduction. Harry finally asked if Hg concentrations will be presented in wet weight (ww) or dry weight (dw). Josh responded that the concentrations would be reported in ww; for the eggs the dw concentration will need to be converted to a fresh ww concentration.

Item 3: Discussion and Decisions: The “Clean Lakes” Study [Jay Davis]

Part 1) Background and Goals of the Study

Presentation :

Jay Davis began the discussion on the Clean Lakes study by listing BOG’s recent accomplishments. BOG work has led to 303(d) listings, a statewide Hg TMDL effort, a BOG supported statewide consumption advisory, and updates to site-specific advisories. Jay stated that the BOG should continue to be useful to decision makers and of high impact, while ensuring that monitoring is coordinated and cost-effective.

Methylmercury (MeHg) is still the main containment of concern for the BOG, followed by PCBs and microcystin. SWAMP programs are charged with examining the status, trends, sources and pathways, and the effectiveness of management for the high priority pollutants. For MeHg, the BOG has completed a considerable amount of work on status; a small amount of work on trends by establishing baseline concentrations during the sportfish surveys; the BOG has learned that sediment and mining is a source of Hg into the food web, but there is limited information about the sources and pathways where management actions are possible as well as the role of atmospheric deposition; and there is limited information about the effectiveness of management.

Jay stated that the benefits of a Clean Lakes study is that it will inform the public of lakes that are good fishing and subsequently reduce exposure; the study will be a positive news story; it will help determine if the conditions in the lakes can be replicated to achieve low concentrations in other places; and the study will improve the accuracy of the information obtained from the lake survey. Region 7, Region 4, and Region 9 are interested in coordinating with the BOG because they are also planning surveys in some of the identified clean lakes.

The primary management questions are:

- 1) Which popular lakes in CA have relatively low concentrations of contaminants in sport fish?
- 2) Why do some lakes have relatively low concentrations of methylmercury in sport fish?
- 3) Did the 2007-2008 survey accurately characterize the status of lakes in which only rainbow trout were collected?

To address the management questions both MeHg and PCB data are needed from lakes where samples have already been collected and multiple indicator species need to be sampled and have low MeHg and PCB concentration.

Panel Comments:

Harry Ohlendorf stated that the study is worthwhile and appropriate, but wondered why microcystin and Selenium samples weren’t also being collected. Harry noted that maybe a small subset of lakes that aren’t clean should be measured to determine if the concentrations are also similar to the 2007-2008 study.

Chris Schmitt stated that the purpose of the study seems to be for due diligence, to ensure that the lakes identified as clean in the first study actually are clean. He is unsure that the study is the best investment for the BOG since no new information will be added. For him, the most important question is determining why some lakes are clean relative to other lakes in the region. To answer the question the BOG would need to sample in lakes that are similar except for their Hg concentrations. Chris suggested including species from two to three different trophic levels (small fish or invertebrates). Chris also stated that reservoirs can be managed and reservoir owners are required to monitor for Hg. Therefore, the BOG could sample other parameters in the reservoirs and help determine what is causing the high Hg concentrations. Jay Davis responded that the reservoir TMDL is not in place yet so not much monitoring is occurring.

Jim Wiener suggested re-wording the first management question to make clear that the goal is to confirm and validate the conclusions of previous sampling efforts. He agreed with Chris that understanding why Hg levels differ

between lakes is useful for managers. To answer the question the BOG would need to understand the lake's catchment area, the contamination history, and other lake processes including those that determine how MeHg enters the food web. It would be useful to categorize the variables into variables that can be managed and those that cannot (e.g. watershed area). Jim noted that Se can reduce the bioaccumulation of MeHg in the food web and may play a role in lakes that have lower Hg concentrations. Jim added that the BOG should reach out to other researchers to determine if they are interested in collaborating for the study.

Jim asked if any work had been done on whether the exposure to contaminated fish has decreased because of the information the BOG has produced. Bob Brodberg responded that there is not a good baseline dataset to determine if exposure had been reduced. There have been site-specific consumption study surveys and efforts to increase awareness, but nothing has been completed on a statewide level. Bob stated that 50% of anglers are generally aware of advisories, but it does not mean that their behavior has changed.

Group Discussion:

Bob suggested combining the first and third management questions. Jon Marshack stated that the goal of the study was to try and bridge the gap between the level of effort needed to create an OEHHA advisory and the screening level studies that the BOG typically completes. Bob stated that the public will be confused between the advisories OEHHA releases and the State Board's designation of lakes as "clean." He noted that the data from this sampling effort would be a piece of information for an OEHHA advisory, but the advisories are more comprehensive than the current study plan. Jay asked how much more information is needed to release an OEHHA advisory. Bob replied that the amount of data is lake specific, but as many species as the sampling team can obtain would be ideal (at least > 3). The advisories are not based on the concentrations in one species of fish, even if the species represents the worst case scenario. Additionally, the advisories also inform fishers what they can eat rather than just stating which species to avoid.

Jay stated that there are three options: 1) changing the goals to obtaining more information for OEHHA advisories, 2) deciding to use a State Board definition of "clean, 3) or shift the focus to why some lakes have low Hg concentrations. Autumn stated that on average it costs \$30,000 to obtain the amount of data necessary to develop an OEHHA advisory.

Part 2) Selection of Lakes to Include – Defining "Low"

Presentation

Jay Davis then listed the criteria for selecting an appropriate "clean" lake:

- 1) Existing data (but not too much)
- 2) Low Hg and PCB levels in sport fish
- 3) Popular fishing locations
- 4) Lakes should span across all the water board regions
- 5) A mixture of bass and trout lakes
- 6) The potential for partnering opportunities and piggybacking on other studies
- 7) Availability of ancillary data

Jay asked the group how "low" should be defined. The Statewide tissue objective and the Fish Contaminant Goal (FCG) for Hg is 0.2 ppm, which is the threshold used for 303(d) listings. OEHHA's Advisory Tissue Levels (ATLs) could also be used, with above 0.44 ppm as the no-consumption threshold. Jay noted that for PCBs the FCG are much lower than the ATLs.

Jay came up with five tiers for "clean" because only five lakes had 90% of the data below the FCG for Hg and PCBs. The first tier included the five lakes where 90% of the data was below both FCGs. The second tier was lakes included six lakes with 90% of the Hg data below the 303(d) listing criterion (0.2 ppm) and the mean of the organics concentration below the ATL for 3-servings per week. The third tier was the same organics threshold was tier two, but

instead of 90% of the Hg data below 0.2 ppm the mean of the data has to be below 0.2 ppm; six lakes qualified in tier 3. In the fourth tier either Hg or organics are sampled and 90% of the data has to be below the 303(d) listing criteria. Jay noted that in Region 2, none of the lakes fit into any of the tiers.

Jay noted that the FCGs for organics are lofty goals; he stated it may be more useful to inform the public that the lake is relatively clean rather than including the lake on the 303(d) list for not meeting the organics FCG. Jay wondered if it would be possible for some lakes that didn't meet the organics FCG to be left off the 303(d) list. Terry Fleming stated that allowing exceptions is not the issue, using FCG for listing purposes is the problem. Lisa Holmes stated that the FCG will actually be lower for organics because the Assessment program at the State Board is now including a cooking reduction factor. Michael Lyons stated that he was very concerned with the upcoming change and asked who to talk to regarding the reduced threshold; Lisa replied that Nick Martorano was the chief of the Water Quality Assessment Unit

Discussion:

Autumn Bonnema stated that in larger lakes (e.g. Lake Tahoe) the warmer portions had a large number of species, while the colder portions did not have anything. Therefore, there is a problem with the sampling plan for larger lakes.

Jay asked what tiers should be included in the sampling effort. Jim Wiener replied that he was not comfortable deciding because the differences between the tiers are small. He suggested choosing the lakes to sample based on the 10% (or the percent for which funds were available) that had the lowest concentrations. Chris Schmitt liked Jim's idea because it removes the policy decisions from the study design. Chris was concerned that 90% of the samples need to be lower than the threshold when the sampling team is out looking for larger fish that will have higher than average concentrations.

Harry noted that the group should truncate the list to the number of lakes that the group has funding for if OEHHA advisories cost approximately \$30,000 a lake. Chris noted that Bob Brodberg was more interested in advisories from lakes where there is a Hg problem. Harry responded that the study would provide the data needed to state that an advisory was not necessary for the lake. Jay asked Bob whether OEHHA puts out advice that informs the public where they can consume Bass. Lori replied that OEHHA informs the public what fish they can eat if bass should not be consumed. Autumn asked what OEHHA does if there are sufficient samples that indicate the lake is clean. Bob replied that OEHHA put advice out for Lewiston Lake, which is relatively clean. Autumn replied that the BOG is interested in proving OEHHA with enough evidence to help them inform fishers and tell a story. She stated that she will work with Bob to determine what information Bob would need to develop an advisory on a site-specific basis.

Action Items:

1. Autumn Bonnema will work with Bob to determine what information Bob would need to develop an advisory on a site-specific basis.

Part 3) Decision on Supplemental Parameters to Understand Why These Lakes Have Low Concentrations

Jay Davis stated that obtaining supplemental parameters is a secondary objective because collecting those parameters is not typically BOG's role. The draft list of supplemental parameters includes:

1. Available data from reservoir operators
2. Three sediment grabs for total Hg and TOC
3. Depth profile including redox, chlorophyll, temperature, conductivity, pH, and DO
4. Single water grab for total unfiltered Hg and potentially a chlorophyll a grab
5. Prey fish, which are particularly valuable to those involved in writing the Reservoir TMDL

The cost per lake with the supplemental parameters and sportfish is \$10,389 per lake; therefore, 23 lakes could be sampled. If invertebrates were also analyzed the cost per lake would increase by \$600. Jennifer Salisbury asked OEHHA to think about whether two sportfish composites per lake for organics were sufficient. Jay asked the panel whether some parameters should be added or removed from the list and whether the parameters should be measured in all of the lakes or only a subset.

Panel Comments:

Chris Schmitt stated that surface area, shoreline length, bathymetry, volume, turnover rates, shoreline development, catchment basin area, and any other parameter that can be generated with GIS should be measured. Jim Wiener stated that lake features, landscape factors, and fishing pressure can affect Hg levels in fish. Jim stated that there are three processes occurring in lakes that should be measured 1) microbial production of MeHg, 2) MeHg entering the food web, and 3) biodilution. The parameters that should be measured to address the microbial production are % MeHg in water, % MeHg in surficial sediment, and hypolimnetic DO. For the second process, MeHg entering the food web, MeHg in water, total Hg in water, Selenium, and total Hg in prey fish should be measured. To determine biodilution chlorophyll in the water column, total Phosphorous, and agricultural land cover should be monitored.

Chris responded that Jim's suggestions are logical, but would cost a lot of money. Jim responded that stable isotope analysis is low cost and would measure the difference in Hg concentrations between trophic levels. Jay replied that even stable isotope analysis can get expensive. Jim stated that DO production could be used to see where MeHg production is occurring. Stephan Louie said that when sampling for the TMDL project, the most important parameters were total Hg, the ratio between MeHg in water and chlorophyll a, and reservoir fluctuations. He added that more than one sample of total Hg would be useful; Jim stated that two to three samples during one visit is typically sufficient. Jennifer noted that the lakes being sampled will be affected by the season. Stephan replied that stratification occurs during the summer; he was interested in collecting three samples spread out across the lake.

Harry stated that the parameters Jim and Stephan listed could be sampled at a subset of lakes. He added that around five lakes with higher Hg and PCB concentrations should also be sampled for the above parameters to provide a comparison.

Group Discussion:

Autumn Bonnema asked if chlorophyll should be taken from a probe or a grab sample. She noted that Richard Fadness has a probe that can obtain an accurate chlorophyll number. She added that she will need to add the parameters Stephan suggested (total Hg, MeHg in water, chlorophyll a, and reservoir fluctuations) into the total cost. Harry stated that MeHg and total Hg should also be sampled in sediment. Jim noted that DOC is a good indicator of MeHg in wetlands; Jay replied that it is a good indicator if the bacteria are sulfate limiting.

Part 4) Review and Discussion of Other Details of the Design

Jay Davis reviewed the sampling design with the group. In small and medium lakes there will be one composited sample; in larger lakes there will be a super composite for organics (one composite from two locations). The EPA method for compositing will be used, except for in bass where there is a broad size range. The contaminants that will be analyzed include Hg, PCBs, legacy pesticides (in selected lakes), Se (in selected lakes), and cyanotoxins in one Region 9 lake. The samples will be archived in case RWQCBs want to complete follow-up studies.

Jay asked if the timing of the sampling should match that of the 2007-2008 effort. Autumn Bonnema stated that the cost would be too high. Jay then stated that the work products will include a technical report, a fact sheet, and a press release. Jim Wiener suggested also writing a manuscript, which would appeal to any academic partners.

Part 5) Next Steps to Complete the Design

Jay Davis reviewed the timeline for the study. The sampling plan was sent out April 2, final comments were due April 9, the final plan was released April 19, and the QAPP was then released at the end of April. Sampling will occur May through October; the sampling report will be due November 2014. The draft technical report will be due June 2015 and the final due in September 2015.

Autumn stated that OEHHA should start looking at the lakes they are interested in the BOG sampling. Bob Brodberg noted that Gene Wash and Senator Wash Reservoirs, two tier 1 lakes, were not popular lakes. Stephen Martenuk replied that the site is popular, but the majority of the people are from out of State. Bob noted that the two sites are essentially the Colorado River and there isn't a clear barrier in-between the lakes so the fish can move around. Jay stated that he will work with Region 7 to find out more information about the sites.

Action Items:

2. Jay Davis will work with Region 7 to find out more information about Gene Wash and Senator Wash Reservoirs.

IV. Discussion: Multi-Year Plan for BOG Activities – Focused Discussion on Trend Monitoring [Jay Davis]

Jay Davis asked the group to begin thinking about the BOG's long-term plan. He provided examples of other regions that have trend monitoring (e.g. Minnesota samples 130 lake and river segments per year with variable revisit frequency). Jay noted that various monitoring programs have observed a trend in which the Hg concentrations fall through the 1980s and early 1990s, but have started to rise since then. He noted that to observe that trend sampling needed to occur more often than every 10 years. Jim Wiener stated that the trend reversal may be due to climate change and possibly increases in atmospheric deposition from Asian emissions. Short-term interannual variation could be due to differences between dry years and wet years.

Jay stated that questions the BOG could answer with trend monitoring could answer include:

1. Are conditions statewide getting better or worse?
2. Are management actions on specific water bodies having an effect distinct from regional fluctuations?
3. Do unusually dry or wet years have systematically higher or lower concentrations?

Jay stated that trend monitoring options included no trend monitoring, repeat statewide surveys every 10 years, repeat the statewide survey on a five year cycle, a rotating panel approach that includes both targeted and random sites, or chose particular waterbodies and do intensive monitoring. Jay stated that repeating the statewide survey every 10 years is relatively low costs and produces good information, but there is a long wait for information. Therefore, the results would be a snapshot of current conditions rather than a real tend. The group agreed that repeating the statewide surveys every five years was too much effort. The rotating panels would be a similar level of effort to the 10 year statewide surveys, but across multiple years which would provide trend data. Additionally, sampling more often would make the BOG institutionally sustainable. Choosing a select number of waterbodies and doing intensive monitoring would characterize interannual variability and let regulators know if management actions are affecting concentrations. However, the effort would be intensive and the waterbodies would need to be representative.

Jennifer Salisbury noted that the State Water Board believes that trend monitoring should be handled by individual Regional Water Boards. Jay stated that rotating panels is popular in other states (e.g., in New York, New Jersey, Maryland, Massachusetts, Oregon, and Michigan).

Jon Marshack asked if the BOG is only looking into trend monitoring for long term plans. Jay replied that other potential options include continued sportfish monitoring, cyanotoxin work, bioaccumulation work, and supporting the portal. Jon replied that supporting OEHHA's consumption advisories should also be included in the long-term plan.

Panel Comments:

Harry Ohlendorf stated that he supported the rotating panels and suggested a random sampling design that included different habitats. Chris Schmitt noted that with rotating panels a moving average is generated. The rotating panels are most successful if the locations are from a probability draw. A probability draw means that each cycle is an independent draw, increasing the precision of the estimate and ensuring that each subset represents the same population. Chris and Jim Wiener recommended annual monitoring to increase statistical power and address interannual variation. Jim stated that the public is interested in trends; he is often asked whether things are getting better or worse. Jim stated that monitoring one year old yellow perch was useful to understand bioaccumulation without needing to account for age.

Group Discussion:

Terry Fleming did not think it is possible to manage statewide trends. He stated that the BOG may be able to identify representative spots across the state and analyze trends in those places. Terry would monitor both TMDL and non-TMDL lakes. He added that he does not think that rotating panels would have enough statistical power to identify a trend if the level of effort was the same as that put into the statewide sportfish surveys. Terry was also worried about confusing spatial and temporal variation.

Bob Brodberg asked what the minimum number of lakes that are needed to sample annually with the rotating panel approach. Jay replied that a random selection from 50 lakes could be sampled annually and the statistical power would build over time. Jay noted that he could look into the ability to detect a concentration difference over 10 or 20 years with 50 observations. Chris noted that if Terry's idea is pursued (representative lake trend sampling) the BOG will not be able to extrapolate to Hg trends statewide since it would not be a probability based design.

Karen Worcester wondered if sampling representative/selected lakes as well as rotating panel monitoring was possible.

Action Items:

3. Jay Davis will look into the ability to detect a concentration difference over 10 or 20 years with 50 observations