I. Introductions and Agenda Review
No comments on the summary of the January 9, 2018 meeting.

II. Project Updates & Upcoming Events
Announcements are attributed to Stephen McCord (MEI) unless otherwise noted.

Mine Site Cleanups

- The Corona Twin Peaks project remains in progress. Lots of ongoing field work. Tuleyome just received USEPA settlement agreement as Good Samaritan. For more information: [http://tuleyome.org/projects/mercury-mine-remediation-program/](http://tuleyome.org/projects/mercury-mine-remediation-program/).

- The Brownfields Coalition Assessment Project remains in progress, doing another Phase II ESA and a site cleanup plan. The project team will also continue working with municipal staff (and others) on area-wide planning over the next year. For more information: [http://www.westsideirwbrownfields.org/](http://www.westsideirwbrownfields.org/).
Teichert’s project to restore 3 miles of dredge-mined lower Yuba River and eventually to remove a diversion dam and more upstream to improve anadromous fish habitat/passage and recreation has stalled to follow a formal bidding process for construction.

Carrie Monohan (The Sierra Fund, TSF): [1] The Headwaters Source Reduction Technical Advisory Committee continues to make progress on the strategy document. [2] Golder Assoc. and USGS continue to work with CA State Parks at Malakoff Diggins to address the site’s WDR by monitoring and conducting an alternatives analysis. [3] Nevada Irrigation District’s $6M dredging project at Lake Combine has been scaled back to remove only 60,000 yd³, in the dry and in the wet. USGS conducted baseline monitoring, will monitor throughflows and fish during operations, and at the end will repeat the baseline monitoring. [4] TSF has a new planning grant for two hydraulic mines on USFS forest and fuel treatment sites, Grizzly Creek and Tippacanoe [5] TSF is developing a biochar amendment test plot project for hydraulic mine sites.

Mercury Studies and Monitoring Activities

- The Guardian published an article detailing acute mercury exposure of remote Amazon tribe in Peru caused by illegal mercury use in gold mining.
- Jacob Fleck (USGS): (1) UC Merced and USGS colleagues recently received a $1.7M grant to map mercury concentrations throughout the Delta using a variety of tools, including satellite imagery, synoptic samples, and fixed continuous optical sensors. (2) Stumpner and other USGS colleagues recently published “Geochemical Data for Water, Streambed Sediment, and Fish Tissue from the Sierra Nevada Mercury Impairment Project, 2011–12” as a USGS Data Series product. https://pubs.er.usgs.gov/publication/ds1056
- The Delta Regional Monitoring Program recently completed annual sportfish monitoring and continues to sample water 8x/year and sediments 4x/yr.
- Carol DiGiorgio (DWR): Modeling of mercury cycling in the Yolo Bypass and Delta continue.
- John Nosacka (DWR): Mercury transport studies by USGS in the Cache Creek Settling Basin continue.

Regional and Statewide Mercury Regulation

- Patrick Morris (Regional Water Board); Staff have received and addressed external peer reviewer comments on the draft staff report for the Statewide Mercury Control Program for Reservoirs. The responses document was recently posted online https://www.waterboards.ca.gov/water_issues/programs/mercury/reservoirs/.
- Staff will be hosting two Reservoir Working Group Members Governance Committee meetings to review and comment on the Guiding Principles for Coordinating Pilot Tests for the Statewide Mercury Control Program for Reservoirs (guiding principles) document in Sacramento and Lake Tahoe. Contact Patrick Morris for more information.

Recent & Upcoming Conferences

- The 2018 California Land Recycling Conference will be held on October 24 - 25, in Carson, CA. Topics address reclamation issues for brownfields, including mine sites.
Charlie Alpers (USGS): The Bay-Delta Science Conference (Sept. 10-12, 2018) had a mercury-focused session. There were five presentations:

- Simulation of Biogeochemical Processes Driving Methylmercury Production in Different Sediment Habitats of the Delta and Its Tributaries; Stefanie Helmrich, UC Merced
- Headwater Mercury Source Reduction Strategy: 2018 Update; Carrie Monohan, The Sierra Fund / CSU Chico
- Sediment Scour and Legacy Mercury Remobilization in Alviso Slough, South San Francisco Bay; Amy Foxgrover, USGS
- The Effect of 2015 Wildfires on Particulate Total Mercury Concentrations in Cache Creek; Charles Alpers, USGS
- Source and Dispersal of Sediment and Contaminant Runoff from the Atlas and Nuns Fires in Northern San Francisco Bay; Renee Takesue, USGS

A session on "Water and Land Management to Reduce Methylmercury Bioaccumulation" will be held at the SETAC North America 39th Annual Meeting, in Sacramento, CA, Nov. 4-8, 2018 (https://sacramento.setac.org/). The session is in the track "Engineering, Remediation and Restoration." There will be eight oral presentations and 6 poster presentations on Thursday, Nov. 8. Contact Charlie Alpers (USGS) for more information about the session.

Other News & Updates

- OEHHA issued several new fish advisories with safe eating advice: (1) Yuba River and Deer Creek in Nevada, Placer, Sierra, and Yuba Counties; (2) Lake Del Valle in Alameda County; and (3) Laguna de Santa Rosa in Sonoma County. OEHHA continues to develop advisories statewide based on available data.
- Yocha Dehe continues soliciting mercury improvement projects in the Cache Creek watershed for funding. Contact Stephen McCord (530-220-3165; sam@mccenv.com) for more information.

III. Presentations

Five presentations were given:

1. Methylmercury Fluxes in Agricultural Wetlands in the Sacramento Valley, California – Luke Salvato (UC Davis)
2. Coagulant Dosing for Hg Control – Jacob Fleck (USGS)
3. CA Suction Dredge Mining Permitting – Izzy Martin (The Sierra Fund)
4. Phytoremediation options for mercury contaminated lands and water – John Freeman (Intrinsyx)
5. Mercury in California Watersheds and the Effects of Wildfire on Mobilization – Jackson Webster (CSU Chico)
1 – Methylmercury Fluxes in Agricultural Wetlands in the Sacramento Valley, California – Luke Salvato (UC Davis)

In California there is approximately 2.5-fold the amount of land area in rice agriculture than in native wetland ecosystems. So understanding mercury cycling in rice fields is important at the basin scale. This research follows on work by Christy Tanner, addressing several major questions: (1) To what extent is mercury a problem in rice fields in the Sacramento Valley? (2) When does methylmercury production occur in rice fields? (3) What is the form of MeHg in a rice paddy water (is it dissolved or particulate?) (4) What are the primary drivers of methylmercury cycling? (5) What variables can be used as a proxy for MeHg in rice fields in the Sacramento Valley?

Six (3 pairs with the same management regime but having fresh or recycled source water) rice fields in the Sacramento Valley are being monitored for through-flow rates, as well as filtered and dissolved forms of total and methyl mercury concentrations. Potential explanatory variables monitored include DOC, sulfate, chloride and SUVA.

Filtered total and methyl mercury concentrations appear to increase in all fields, as does DOC. Sulfate-reducing bacteria appear to be active in all fields. Next steps are to collect additional samples through the harvest season, process samples at the USGS lab, calculate water balances, and analyze the complete dataset.

For more information: Luke Salvato, lasalvato@ucdavis.edu.

2 – Coagulant Dosing for Hg Control – Jacob Fleck (USGS)

Research into coagulant dosing began over a decade ago on Twitchell Island in the Delta. Organic and metal-based salt coagulants can be used to flocculate suspended material (including aromatic dissolved organic matter) and associated mercury. The study tested both aluminum- and iron-based coagulants.

Coagulants were found to quickly convert total and methyl mercury from filterable to particulate, which then settle out quickly in wetlands. Net decreases in total mercury and MeHg concentrations were observed in the treated wetlands relative to the control wetland, although in spring the filterable fractions increased through the wetlands and in summer all wetlands were sources of filterable MeHg (and DOC).

Net annual load reductions were 40-60% for both total and methyl mercury, but appeared to either vary over a seasonal cycle (iron-based) or suggest a potential net decrease in effectiveness over time (Al-based). Interestingly, sediment Hg decreases, because the coagulant removes organic material with a higher C/Hg ratio than the native soils on Twitchell Island (degraded peat with concentrated Hg relative to C). Fish accumulated mercury when placed in the test plots but the iron-based treated wetland was lower than the control or Al-based. Lab studies confirmed that fluctuating redox environments could release some of the sequestered Hg and MeHg, but at relatively small proportion compared to that removed and the iron-based treated wetland showed suppressed net MeHg production.

A more recent study of Cache Creek water was conducted during the 2015 drought year using an organic coagulant (shell-based) as well as ferric sulfate- and aluminum-based coagulants. All removed 70-90% of total and methyl mercury, as dosage was increased. The aluminum-based Ultrion™ coagulant increased the median grain size more than others, implying greater settling and physical stability of the flocs. A mesocosm experiment indicated minimal coagulant effect
on bio-sentinel fish Hg, although all fish in the mesocosms were significantly different than fish in the surrounding pond.

Current studies indicate the technique is promising for MeHg control measures, and further studies are warranted to optimize technique and track longer-term effects in both controlled and real/field-based conditions.

For more information: Jacob Fleck, jafleck@usgs.gov, 916-278-3063.

3 – CA Suction Dredge Mining Permitting – Izzy Martin (The Sierra Fund)

In 2006 the State Water Board studied the environmental impacts associated with suction dredge mining, which was permitted through the CA Department of Fish and Game (CDFG). Based on the results of that study, the State Board issued a moratorium in 2008 so that agencies could clarify the impacts. The environmental review conducted by CDFG found several significant impacts. Public hearings were held in 2016-2017 to consider renewing the permit program, but no decision was reached on how to permit such activities nor on appropriate conditions to permit.

The study that was used most extensively to understand impact of suction dredge mining was done by USGS under contract to SWRCB, but there are several references available:

The following references relate to the impacts of historical gold mining and suction dredging on mercury fate and transport:

Specific issues remaining include:

- Dredging would not be allowed in water bodies already listed as impaired by mercury (by the Regional Water Board), but what about water bodies not listed yet with fish consumption advisories (by the Office of Environmental Health Hazard Assessment)?
- What environmental endpoint (e.g., fish, water, sediment) should be monitored to confirm that impacts of dredging are being mitigated?
- Should “previously mined watersheds” be excluded, and if so what defines the term?

Another permitting option could be the Surface Mining and Reclamation Act (SMARA).

For more information: Izzy Martin, izzy.martin@sierrafund.org, 530-265-8454.

4 – Phytoremediation options for mercury contaminated lands and water – John Freeman (Intrinsyx)

Dr. Freeman works at Intrinsyx, but is also associated with Phytoremediation & Phytomining Consultants United. They provide multidisciplinary assessments, directions and solutions to assist in the stabilization and or removal / degradation of contaminants from polluted environments and the mitigation of risks associated with polluted environments. Pollutants that can respond well to these tools include mercury, among other metals, as well as nutrients, radionuclides, and organics. Phytoremediation has several advantages, including minimal energy input, diverse applicability, positive public perception, potential for producing valuable bi-products, safe to handle, and durability.

Several specialized plants could serve to address mercury contamination, including hyperaccumulating ferns/trees/grasses, floating wetlands, and endophytes that fix nitrogen. Lab-scale studies have found the Chinese brake fern to hyperaccumulate mercury, particularly in its roots, with minimal phytotoxicity. Pilot tests should consider planting non-native species, optimizing light and water conditions, soil chemistry, and mercury forms.

Continuous-flow treatment systems may hold the most promise, as roots and shoots can be maintained as they efficiently adsorb mercury. Plants that hyperaccumulate arsenic tend to also accumulate mercury, and several also have useful properties such as salt/boron tolerance.

For more information: John Freeman, Jfreeman@intrinsyx.com.

5 – Mercury in California Watersheds and the Effects of Wildfire on Mobilization – Jackson Webster (CSU Chico)

Dr. Webster’s research focuses on mercury transport in forested watersheds. Soil mercury trends throughout North America appear most driven by precipitation rates. Mercury tends to accumulate in soils, and wildfires tend to release some of that mercury. The increase in forest fires (both in terms of area burned and burn severity) throughout the western US thus implies increased mercury flux both during the fires into air as well as in subsequent erosion of denuded landscapes.

Soil mercury emissions during fires and effects on residual mercury in soils can be modeled as a function of soil temperature at depth, which can be estimated spatially based on soil and forest
cover type and burn severity. Application of the universal soil loss equation spatially can also be used to estimate soil mercury loss via erosion.

For more information: Jackson Webster, jwebster13@csuchico.edu.

IV. Meeting Wrap-Up

Future agenda item suggestions:

- Lake Mercury improvement projects—Klau & Buena Vista Mines Superfund site, and Sulphur Bank Mercury Mine Superfund site (Carter Jessup, USEPA)
- Updates on mercury regulations: statewide reservoirs mercury TMDL and Delta MeHg TMDL (Patrick Morris, RWQCB)
- Cosumnes River mercury studies (Josh Ackerman and/or Mark Marvin-DiPasquale, USGS)

Next Meeting
- **Date:** January 15, 2019
- **Location:** DWR in West Sacramento, Room 106