REGIONAL MONITORING PROGRAM FOR WATER QUALITY IN SAN FRANCISCO BAY

sfei.org/rmp

Technical Review Committee

December 10, 2020
9:00 AM ï 12:30 PM

REMOTE ACCESS
https://zoom.us/j/99806169514

Meeting ID: 998 0616 9514

Dial by your location
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AGENDA

1.	**Introductions and Review Agenda**	9:00 (10 min) Melissa Foley
2.	**Decision: Approve Meeting Summary from September 10, 2020, and Confirm/set Dates for Future Meetings** Scheduled meetings: SC: January 27, 2021 April 28, 2021 July 21, 2021 (3rd Wednesday) TRC: Proposed meetings: (2nd Thursdays) March 11, 2021 June 24, 2021 (4th Thursday) S&T Review: Puget Sound sediment program - December 9th, 12:30-2:30 pm	9:10 (10 min) Bridgette DeShields

	Materials: ŏ TRC Meeting Summary, see pages 6-10 Desired outcomes: ŏ Approve meeting summary ŏ Schedule future TRC meeting dates	
3.	**Information: MYP and SC Meeting Summary from October 22, 2020** Topics discussed at the September SC meeting included: ŏ RMP fees discussion for 2022 Materials: MYP and SC Meeting Summary, see pages 11-18 Desired outcome: ŏ Informed Committee	9:20 (20 min) Melissa Foley
4.	**Information: Status and Trends Review Update** Report out from the second Water matrix meeting held at the beginning of December. Materials: S&T Review water meeting agenda package, pages 19-51 Desired outcome: ŏ Informed Committee	9:40 (30 min) Melissa Foley
5.	**Decision: 2021 Status & Trends Sampling** The PM will provide an update on the bird egg sampling locations and discuss the merits of archiving samples for analysis after the S&T review for biota has been completed. The TRC will also confirm the water cruise design for 2021. Materials: ● S&T sampling schedule, pages 52-54 ● Map of possible tern sampling locations, page 55	10:10 (25 min) Melissa Foley

	Desired outcome: ● Review location possibilities for tern eggs ● Decide whether eggs should be archived for analysis in 2022	
6.	**Information: AQUA-GAPS: Comparison of Passive Samplers to Grab Sample Data** Results from the passive samplers deployed in San Francisco Bay and how they compare to results from grab samples of ambient water. Materials: Slides at meeting Desired outcome: ǒ Informed Committee	10:45 (25 min) Miguel Mendez
	Break	10 min
7.	**Decision: Data Challenge** Review and judge the Data Challenge submissions Materials: Data Challenge submissions, pages 56-70 Desired outcome: ǒ Informed Committee	11:20 (30 min) Nina Buzby
8.	**Discussion: Communications Update** Brainstorm theme ideas for the 2021 Pulse report. Updates on Estuary News articles and the RMP eUpdate. Materials: None Desired outcome: ǒ Ideas for 2021 Pulse content and Estuary articles	11:50 (25 min) Jay Davis
9.	**Information: Status of Deliverables and Action Items** Materials: Deliverables and Action Item tables, see pages 71-74 Desired outcome: ǒ Informed committee	12:15 (5 min) Melissa Foley
10.	**Discussion: Plan Agenda Items for Future Meetings**	12:20 (5 min)

	Desired outcome: ŏ Identify future agenda items	Melissa Foley
11.	**Discussion: Plus/Delta**	12:25 (5 min) Bridgette DeShields
	Adjourn	12:30

<u>Recently Completed RMP Reports/Products</u>

Brander, S. M.; Renick, V. C.; Foley, M. M.; Steele, C.; Woo, M.; Lusher, A.; Carr, S.; Helm, P.; Box, C.; Cherniak, S.; et al. 2020. Sampling and Quality Assurance and Quality Control: A Guide for Scientists Investigating the Occurrence of Microplastics Across Matrices. Applied Spectroscopy 74 (9).

Davis, J.; Foley, M.; Askevold, R.; Buzby, N.; Chelsky, A.; Dusterhoff, S.; Gilbreath, A.; Lin, D.; Miller, E.; Senn, D.; et al. 2020. RMP Update 2020. SFEI Contribution No. 1008.

Hung, C.; Klasios, N.; Zhu, X.; Sedlak, M.; Sutton, R. 2020. Methods Matter: Methods for Sampling Microplastic and Other Anthropogenic Particles and Their Implications for Monitoring and Ecological Risk Assessment. Integrated Environmental Assessment and Management 16 (6).

Livsey, D.N., Downing-Kunz, M.A., Schoellhamer, D.H. et al. Suspended Sediment Flux in the San Francisco Estuary: Part II - - The impact of the 2013 ï 2016 California drought and controls on sediment flux. (accepted, under USGS final review)

Livsey, D.N., Downing-Kunz, M.A., Schoellhamer, D.H., et al., 2020a, Suspended Sediment Flux in the San Francisco Estuary: Part Iŏ Changes in the Vertical Distribution of Suspended Sediment and Bias in Estuarine Sediment Flux Measurements. Estuaries and Coasts. https://doi.org/10.1007/s12237-020-00734-z

Livsey, D.N., Downing-Kunz, M., and Schoellhamer, D.H, 2020b, Improving suspended-sediment flux measurements: U.S. Fish and Wildlife Service, Hydrology and Aquatic Resources Conservation Webinar Series, April 29, 2020, 1 p. Viewable online here.

Livsey, D.N., Downing-Kunz, M., and Einhell, D.C., 2020c, Sediment concentration, water velocity, and suspended particle size and settling data to estimate estuarine sediment flux at Dumbarton Bridge, San Francisco Bay, CA from 2018 - 2019: U.S. Geological Survey data release, https://doi.org/10.5066/P9BVCW1N.

McKee, L., Lowe, J., Dusterhoff, S., Foley, M., and Shaw, S. (2020). Sediment Monitoring and Modeling Strategy. A technical report prepared for the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) Sediment Workgroup. SFEI Contribution No. 1016. San Francisco Estuary Institute, Richmond, California.

Miller, E.; Mendez, M.; Shimabuku, I.; Buzby, N.; Sutton, R. 2020. Contaminants of Emerging Concern in San Francisco Bay: A Strategy for Future Investigations 2020 Update. SFEI Contribution No. 1007. San Francisco Estuary Institute: Richmond, CA.

Yee, D.; Gilbreath, A.; McKee, L.; Davis, J. 2020. Conceptual Model to Support PCB Management and Monitoring in the Steinberger Slough/Redwood Creek Priority Margin Unit (Coming Soon). SFEI Contribution No. 1009. San Francisco Estuary Institute: Richmond, CA.

Bay RMP Technical Review Committee Meeting
September 10, 2020 - San Francisco Estuary Institute

Meeting Summary

Attendees (all participants remotely attending)

TRC Member	Affiliation	Representing	Present
Yuyun Shang	EBMUD	POTW	**yes**
Mary Lou Esparza	Central Contra Costa Sanitary District	POTW	**yes**
Tom Hall	EOA, Inc.	POTW	**yes**
Ross Duggan	City and County of SF	CCSF	**no**
Anne Hansen Balis	City of San Jose	POTW	**yes**
Bridgette DeShields*	Integral Consulting	Refineries	**yes**
Chris Sommers	BASMAA (EOA, Inc.)	Stormwater	**yes**
Shannon Alford	Port of San Francisco	Dredgers	**no**
Richard Looker	SF Bay Regional WQCB	Water Board	**yes**
Luisa Valiela	US EPA	US EPA -IX	**yes**
Ian Wren	Baykeeper	NGOs	**yes**
Tessa Beach	US Army Corps of Engineers	USACE	**yes**

*****Chair; alternates in gray and italicized

Staff and Others

- Tan Zi - SFEI
- Becky Sutton - SFEI
- Ezra Miller - SFEI
- Jay Davis - SFEI
- Melissa Foley - SFEI
- Miguel Mendez - SFEI
- Nina Buzby - SFEI
- Don Yee - SFEI
- Paul Salop - AMS

Introductions and Review Agenda

Melissa Foley went through a quick roll call with the meeting participants. None of the committee members had any general questions concerning the dayõs agenda.

Decision: Approve Meeting Summary from June 24, 2020, and Confirm/set Dates for Future Meetings

There were no comments on the previous meetingõs summary. Melissa Foley then reminded the group of upcoming meeting dates, specifically the October Multi-Year Planning meeting held with the Steering Committee. Calendar invites for 2021 TRC meetings were sent to committee members, but official dates will be confirmed at the December 2020 meeting.

Decision:

- Richard Looker moved to approve the June 24, 2020 meeting notes. Mary Lou Esparza seconded the motion, the motion was carried by all present members.

Information: Steering Committee (SC) Meeting Summary from July 22, 2020

Melissa Foley reviewed the highlights from the July SC meeting. The SC discussed the ongoing topic of program fees, agreeing that while 2022 fees will not include an increase, it would be beneficial to plan on normal 3% increases for 2023 and 2024. In response to the updated WG structure proposed by the TRC, the SC settled on a compromise. The SC agreed to maintain the microplastics strategy budget, while reducing the funding for the workgroup (MPWG) and have the group hold more of a óworkshopô to bring together stakeholders and identify external funding sources for priority data gaps.

TRC members asked for further details on the SC decision to reduce funding for the MPWG. Melissa explained that the Water Board does not currently consider microplastics a management priority, though dischargers maintain an interest in learning more about potential effects. The strategy funding would cover strategy development and serve as a key coordinating document for obtaining external funding. The SC did not discuss whether RMP funds would be allocated to MPWG special studies in 2022. This discussion will need to happen at the Multi-Year Planning Workshop.

The SC approved the TRC special studies recommendations, with two contingencies. First, the SC reduced the funding to contribute to a manuscript of the MP ecotox workshop. However, Melissa noted that Central San has offered to provide additional funds to cover these costs, and the RMP will provide additional funds to fill in remaining gaps. The second hesitation from the SC was on the DMMO database enhancement study. Because the dredgers and USACE expressed little need in the database, the SC wanted more details on the specific uses the enhancements would allow.

The SC meeting also included a brainstorm on MYP meeting agenda items and the Committee decided to form a subgroup to plan the agenda in further detail. Melissa asked if TRC members were interested in contributing to the meeting, and added that they should feel free to comment once the agenda gets sent out.

Information: Status and Trends Review Update

Melissa Foley informed the meeting participants of the S&T review water matrix expert meeting held the previous Thursday and Friday. The first day's discussions focused on management priorities, the existing water design, CEC-specific priorities, and results of the power analysis. The second day focused on draft wet and dry season sampling designs. For the TRC, Melissa specifically went through the proposed wet sampling design that would involve both targeted and probabilistic sampling. Jay Davis added that the impetus for developing wet season sampling came from the non-target analysis of water special study and recent sampling of CECs in stormwater. Melissa also detailed the proposed changes to dry season sampling, noting the main change would involve foregoing PCB and legacy pesticides monitoring except for those included in CTR sampling every 10 years.

Melissa noted that there are still a number of details to work out following the meeting with experts and next steps would focus on incorporating meeting feedback and further evaluating the performance of current and revised sampling designs. Tom Hall asked if the meeting included a discussion of legacy pesticides. Melissa gave further details that legacy pesticides and PAHs would also likely roll into CTR sampling. Jay also commented that water is not the key management matrix for legacy pesticides; monitoring biota is the highest priority.

Action Items:

- Share S&T meeting recording with TRC members. (Melissa Foley, 9/30/20)

Discussion: Status and Trends Sampling for 2021

Melissa Foley gave an overview for the TRC of the upcoming year's sampling plan, specifically pointing out changes to analytes, labs, or stations. Related to bird eggs, the USGS is looking for alternative sites for cormorant egg collection at Wheeler Island, due to site access challenges and a shrinking colony. Tern sites are likely to be located in the Lower South Bay, and the USGS will likely choose the four sites based on the size of the nesting colonies. Any sites that can be maintained from previous sampling will be the highest priorities. Melissa suggested that the USGS conduct dissections for both egg types to eliminate additional shipping and permitting steps with the international analytical lab - SGS AXYS. Jay noted the missed opportunity to have a redesign discussion prior to bird egg sampling; as adding legacy pesticides to cormorant analytes would help monitor recovery trends for these analytes. Along this line of thinking, Mary Lou Esparza suggested archiving the samples until there is a better direction from the redesign. Ian Wren and Luisa Valiela supported this idea, commenting on the particular importance of archived tissue given the level of change currently happening from the pandemic and wildfires. After some additional discussion the group agreed to further discuss analytes and sites at the December TRC meeting.

While reviewing the analytes and number and type of sites for water sampling, Tom Hall asked about the benefits of sampling outside of the Golden Gate. In addition to being a site of interest for the NMS, Becky Sutton also noted the importance of the samples in providing a boundary condition for modeling efforts. When asked about the potential analyte list, the TRC had a few comments. Tom Hall reasoned that cyanide and aquatic toxicity may not provide valuable data given the consistent ND results in recent rounds. The group supported moving legacy pollutants to the CTR cycle and keeping the current schedule for sampling CTR pollutants in 2025, as well as the addition of bisphenols and OPEs to the list of analytes for water.

The other concern for water sampling in 2021 is vessel availability. The RV Turning Tide may not be available for use in 2021. Melissa informed the committee members of the recently signed amendment with the USGS for the RV Peterson that will run through fiscal year 2021 for nutrients work. She also noted that in the absence of the RV Questary (SFSU), the RMP has been contracting a boat from Dixon Marine for the North Bay selenium sampling, which has been successful.

Information: Preview of Annual Meeting Presentations

Three relatively new RMP staff members - Ezra Miller, Tan Zi, and Miguel Mendez - practiced their presentations for the upcoming RMP Annual Meeting, soliciting feedback from the TRC. Ezra presented first on existing and future plans related to the class of PFAS chemicals. The class has recently come into the public eye and prompted management actions, although the knowledge is primarily around two specific chemicals - PFOS and PFOA. There is less known about the level of occurrence as well as impacts of other chemicals and PFAS mixtures. Ezra noted that the RMP is prioritizing stormwater and wastewater monitoring. The TRC feedback on Ezra's presentation focused on the messaging related to existing sport fish and prey fish data. The group encouraged Ezra to coordinate closely with OEHHA to ensure that the messaging is consistent. The meeting participants also commented on a few graphic details and presentation style aspects, with general praise for the presentation as a whole.

Tan Zi then presented his modeling work, specifically stormwater contaminant loading. The presentation, part of which Tan will also present at CASQA, covered a range of efforts. For example, he described a process evaluating green stormwater infrastructure and trees as potential treatment sources. The TRC members noted that given the subject matter, the pace of the presentation was somewhat intimidating, particularly given that the Annual Meeting often encompasses a broader audience. The group suggested that Tan highlight his successful iconography and reveal the take home message earlier in the talk.

Finally, Miguel presented on another class of chemicals currently in the spotlight - quaternary ammonium compounds (QACs). Within the class, Miguel focused on those found in antimicrobial products known as BACs and DADMACs, given their applicability to the COVID-19 pandemic. In addition to covering the contaminants pathways and fate, Miguel discussed current and future efforts that SFEI is involved in. The committee members generally encouraged Miguel to include more detail in the talk and expand on the connection with ñcovid-productsò.

Discussion: Communications Update

Jay briefly reminded the meeting participants of the two upcoming Estuary News articles as well as the finalization of the Annual Meeting (AM) agenda. The majority of the item was spent discussing the draft RMP Update that was sent out to the group with the meetingõs agenda package. Jay explained the plan to publish the PDF version at the Annual meeting and then have the printed version available upon request. In response to the draft, the TRC participants had positive responses and provided a few detailed comments. Yuyun Shang highlighted that EBMUD utilizes the publication and would be sure to have other folks at the organization look at the draft.

Information: Status of Deliverables and Action Items

Melissa began the item by notifying the TRC of a few updated deadlines due to pandemic-related delays such as lab closures. She also highlighted upcoming deliverables, and explained that the current pressing action items mostly related to the upcoming MYP meeting. The meeting participants appreciated Melissaõs updated and more streamlined way of presenting the topic.

Discussion: Plan Agenda Items for Future Meetings

The main item brought up during the meeting was to further discuss the tern egg sampling design for status and trends monitoring. Luisa Valiela also brought up a broader topic of accounting in future budgets for wildfires. Given that large wildfires are becoming more prevalent, the group agreed that it would be beneficial to discuss this topic at the upcoming MYP workshop and then have a more in-depth discussion at the December TRC meeting. Chris Sommers added two related ideas that the wildfire discussion could prompt - specifically the potential for coordination between monitoring groups to establish a statewide level of communication, as well as better understanding of the potential water quality impacts of fires.

Adjourn

Bay RMP Multi-Year Planning Workshop and Steering Committee Meeting
October 21, 2020
San Francisco Estuary Institute

Meeting Summary

Attendees

SC Member	Affiliation	Representing	Present
Eric Dunlavey	City of San Jose	POTW-Large	**Yes**
Amanda Roa	Delta Diablo	POTW-Small	**Yes**
Karin North**	City of Palo Alto	POTW-Medium	**Yes**
Adam Olivieri	BASMAA / EOA, Inc.	Stormwater	**Yes**
John Coleman	Bay Planning Coalition	Dredgers	**No**
Tessa Beach	US Army Corps of Engineers	USACE	**No**
Tom Mumley*	SF Bay Regional WQCB	Water Board	**Yes**
Maureen Dunn	Chevron	Refineries	**Yes**

* Chair, ** Vice Chair, alternates in gray and italicized

TRC Member	Affiliation	Representing	Present
Yuyun Shang	EBMUD	POTW	**No**
Mary Lou Esparza	Central Contra Costa Sanitary District	POTW	**Yes**
Tom Hall	EOA, Inc.	POTW	**Yes**
Ross Duggan	City and County of SF	CCSF	**No**
Anne Hansen-Balis	City of San Jose	POTW	**Yes**
Bridgette DeShields*	Integral Consulting	Refineries	**Yes**
Chris Sommers	BASMAA / EOA, Inc.	Stormwater	**Yes**
Shannon Alford	Port of San Francisco	Dredgers	**No**
Richard Looker	SF Bay Regional WQCB	Water Board	**No**

Luisa Valiela	US EPA	US EPA - IX	**Yes**
Ian Wren	Baykeeper	NGOs	**No**
Xavier Fernandez	*SF Bay Regional WQCB*	*Water Board*	**yes**

*Chair, alternates in gray and italicized

Staff and Others:

- Jay Davis - SFEI (for morning)
- Melissa Foley - SFEI
- Nina Buzby - SFEI
- Jen Hunt - SFEI
- Miguel Mendez - SFEI
- Jim Haussener - California Marine Affairs and Navigation
- Becky Sutton - SFEI

Multi-Year Planning Workshop

1. Introductions and Goals for the Meeting

Tom Mumley began the day by welcoming everyone and reminding the participants that the first half of the meeting would encompass the RMP Multi-Year Planning (MYP) Workshop, while the second would cover regular Steering Committee (SC) items. The group went through a round of expanded introductions for the newest SC member Amanda Roa. From Delta Diablo, Amanda is the replacement SC representative for small POTWs after Robert Wilson moved on from his position with the City of Petaluma.

After introductions, Tom acknowledged that the RMP is in a state of transition, with the S&T program review and economic downturn, so the group will need to think more strategically than usual. The main goals for the meeting will be to update the MYP and come up with a plan for workgroup funding levels.

2. Discussion: Setting the Scene - Planning for 2022 and Beyond

Tom Mumley provided context on the program's upcoming budget constraints, noting the working decision to not raise fees in 2022 and ongoing shortfalls in dredger fees. Melissa Foley gave more background on the challenges and opportunities for the RMP. In doing so, Melissa went over some of the Program's highlights and specific 2022 budget challenges - with the take home message that the group needs to set management priorities and decide what topics can be reduced or delayed.

Melissa also showed the group future budget scenarios based on different fee increases in 2023 in 2024, noting the high amount of S&T work planned under the current S&T Program for 2025 and the resulting need to draw from reserve funds. Luisa Valiela called out the 2025 scenario as an important reminder that the Program canʹt continue to grow without increases in funding. However, the role of the reserves is partially to build up funds in order to cover years when various S&T matrices fall within the same year. Tom pointed out that RMP fees come through a regulatory process, and the Program needs to consider how much of RMP funds are going towards monitoring work that doesnʹt directly benefit dischargers. Along with several other Committee members, Adam Oliveri brought up the need for the SC to consider a modification to how the Program formally views dredger contributions going forward. Maureen Dunn noted that dredgers would need sufficient notice of any fee changes. When discussing the recovery of reserve funds, Eric Dunlavey asked whether reserve fund use will continue to drop after 2025. Melissa responded that the reserve balance will increase but at a lower rate because of the discrepancy between inflation and fee increases.

Action Items:

- Review RMP funding structure (particularly dredger contributions) at upcoming SC meeting (Melissa Foley, 1/31/21)

3. Discussion: Potential Future Topics of Interest to the RMP

Jay Davis explained a pivotal reason for the annual MYP Workshop is to determine upcoming management decisions in order to tailor future program efforts. To begin the brainstorming exercise, Jay presented a list of potential future topics, gleaned from recent stakeholder meetings. These included large, event-based (e.g., wildfire-related) monitoring; diversity, equity, and inclusion (DEI) and community engagement; atmospheric deposition; biodiesel facility discharge; Wetland RMP collaboration; and beneficial reuse guidelines and monitoring. After hearing details on the topics, Tom Mumley asked if any Committee participants supported any of the suggested ideas. Luisa Valiela suggested the group engage in a poll to determine the relative priority of the topics. The poll showed a preference for beneficial reuse, and a three-way tie for second place among large event-based monitoring, community engagement, and the Wetlands RMP, which the group discussed following agenda item 4 (Information Priorities for 2022-2024).

The discussion on beneficial reuse began with Luisa Valiela noting the importance of identifying opportunities and growth areas that serve more needs than just water quality and help diversify the end users of RMP data (i.e., RMP participants). Luisa also stressed the importance of identifying the science that is needed to support beneficial reuse policy. Tom Mumley suggested that the topic would entertain new funders, specifically leveraging USACE funding through collaborative efforts. Karin North noted that POTWs are looking at beneficial reuse in relation to biosolids because of increasing challenges related to agricultural use.

Related to large events, Luisa highlighted the importance of being prepared given that such events are going to be an increasing part of reality going forward. The Program should prioritize planning where the RMP can contribute to these more sporadic, and time-sensitive projects. Eric Dunlavey added that science advisors to the NMS are grappling with nutrients standards as the climate changes, and how large events are changing the general understanding of Bay water quality. Luisa also suggested the Program seek out a resource with knowledge on atmospheric deposition related to wildfire events, though noting the need to determine questions and whether they can be definitely answered. Tom Mumley acknowledged all the participants' points and suggested building discussions on these topics into upcoming TRC and SC meetings.

Action Item:

- Include "Future priorities" in MYP Workshop for 2021 (Melissa Foley, 10/31/2021)
- Consider sampling for large events in S&T Program Review (Melissa Foley, 12/31/2021)
- Schedule talk on air deposition for an upcoming TRC meeting (Melissa Foley, 09/30/2021)

4. Discussion: Information Priorities for 2022-2024

The item's goals were reviewing the management decision table from the MYP and identifying priority management needs. After going through high priority and potential future management drivers, Melissa asked the group if the list was complete or needed any potential modifications/additions. Luisa suggested removing the South Bay (SB) Selenium TMDL from the list. Tom Mumley added that given the EPA's proposed criteria for the SB that at some point there will be a need to respond to the listing in a manner that shouldn't be restricted to a TMDL. Tom Hall also mentioned that management based onSe levels in fish tissue would be the preferred approach. In relation to adding sediment priority drivers to the table, Xavier Fernandez and Luisa suggested adding the LTMS goals and the Water Board's sediment testing criteria for reuse (DMMO) to the high priority category.

Action Items:

- Substitute South bay selenium TMDL for "regulatory action", add LTMS and DMMO sediment goals and criteria to the MYP priority management list (Miguel Mendez, 1/31/21)
- Send revised management table to SC and TRC (Melissa Foley, 12/15/2020)

5. Decision: Setting the Planning Budget for 2022 Special Studies

Melissa started the item by reviewing the planning budget set for workgroups and reminding the Committee members of the active workgroups set to meet in 2022. She provided the group with the context of what percentage of the overall RMP budget was allocated to special studies in 2021 and the ratio of high-priority special studies to actual available funding in 2022. Additionally, she showed the group the varying fractions of funding associated with each workgroup. Melissa asked the group to consider how WG priorities align with the management priority discussions from previous items.

Chris Sommers began the discussion by reminding the group that the Program has experienced seeing twice the amount of proposals compared to available funding, which prompted the decision to cap ŕplanningŏat a 1.5 ratio. This decision was motivated by a desire to maintain constructive dialogue at workgroups, while not wasting resources on eventually unfunded proposals. The group thought the 1.4 ratio of proposed:budget was acceptable for 2022. Related to workgroup coverage, Luisa asked about needs for data on fire-related dioxins, specifically suggesting talking to an expert to answer whether it should be a priority going forward. Jay Davis noted that a minimum approach would be looking at dioxins in fish which is currently happening in S&T efforts.

Decision:

- Karin North motioned to approve the 2022 special studies planning budget. Eric Dunlavey seconded the motion, and the motion was carried by all present members.

Adjourn Planning Workshop

Steering Committee Meeting

7. Introductions and Review Goals for the Meeting

Tom Mumley quickly reviewed the desired outcomes of the meetingŏs agenda items, and the group moved on to the SC related topics planned for the afternoon.

8. Decision: Approve Meeting Summary from July 22, 2020, and Confirm/Set Dates for Future Meetings

The group had no questions or comments on the previous meetingŏs summary. Karin North expressed a conflict with the planned July 2021 meeting date, to which the group agreed to move to the previous week (July 21, 2021).

Decisions:

- Adam Olivieri moved to approve the July 22, 2020, meeting summary. Karin North seconded the motion, and the motion was carried by all present members. Amanda Roa abstained from the vote because she was not present at the past meeting.

Action Items:

- Send updated meeting calendar invite to SC (Nina Buzby, 10/31/20)

9. Information: TRC Meeting Summary

Melissa briefly reviewed the prior month's TRC meeting summary, noting that half the meeting was used to practice annual meeting presentations. Most significantly, the TRC discussed the plans for 2021 S&T sampling efforts. The group agreed to proposed bird egg site relocations and to wait on sample analysis until after the Program is able to review the matrix as a part of the S&T redesign. The TRC also supported adding bisphenols and OPEs to the 2021 dry season water cruise, which Melissa clarified would add an additional $1000 per sample - the full cost depending on the number of sites sampled. Funds that could cover these analytes include money initially intended for "PCBs, PAHs, and legacy pesticides" that the S&T review concluded should be removed and instead added to CTR efforts. The SC had no comments on Melissa's summary and were in support of the TRC's decisions related to S&T sampling.

10. Information: RMP Financial Update for 2020, Quarter 3

Jen Hunt presented the agenda item to the group. She noted that the Program received another large contribution to MMP funds and is predicted to be under budget for the program management tasks (1-5) in 2020. Jen also presented the fee collection status for 2017-2019. Prior to the meeting the SC was asked to approve an additional $15K in funds to allow the S&T Program review work to continue - the full cost being $235K for the two year project. During the meeting, Jen presented an additional funding request to the Committee members; utilizing $15K of undesignated funds to supplement the budget for the North Bay selenium monitoring. Melissa provided some details as to why the project required more funding, specifically due to pandemic complications that caused tasks to be less straightforward than expected, in addition to significant coordination with labs on data format and submissions. Tom Mumley commented that the selenium work is a continuation of previous USGS efforts and the group should keep in mind the plan to move the work to S&T efforts.

The meeting participants brought up a few questions, mostly related to outstanding fee payers. Jen reminded the group that the update was referring to payment numbers from September, so she could check again at the end of the present month, October. Maureen Dunn mentioned that staff changes at organizations could be a source of fee delays. Melissa agreed and reminded the group that a similar idea to updating the current invoicing system had been brought up at a previous SC meeting, with the motivation to address the challenge of staff turnover.

The group also asked to change the "dredger shortfall" language in the financial memos to "reduced dredger budget." The previous wording implied dredgers were not paying their fees to the Program, which is not the case. The updated wording better communicates that the RMP fee structure does not adequately allow for collecting the full contribution amount.

Decision:

- Mauren Dunn motioned to approve additional funding for the North Bay selenium monitoring. Karin North seconded the motion, and the motion was carried by all present members.

Action Item:

- Send reminders for outstanding 2019 and 2020 RMP fees (Melissa Foley, 12/15/2020)

11. Decision: Approve the 2021 Budget and Detailed Workplan

Melissa began the item by showing the group figures related to the expected revenue and planned budget for 2021. The budget she presented included a $130K deficit. Most notably, Melissa highlighted an additional aspect of the 2021 budget related to S&T Program review, which is driving the budget deficit. The S&T Review will require $220K to cover staff labor, honoraria for experts, and subcontractors helping with power analyses. For the program management tasks (1-5), she noted that the budget was decreased by approximately $60K. While these tasks tend to end up with some surplus that can cover over-budget projects in other years, this decrease will take away such ability and require a close attention to project budgets. Tom Mumley inquired about the costs associated with RMP website maintenance, to which Melissa explained that the RMP is planning to redo the program webpage to make it easier to navigate and find information. Other programmatic pages on the SFEI website have undergone similar updates, so changes to the RMP page will implement similar strategies.

The following group discussion began with a conversation on covering the budget deficit. Adam Oliveri made several suggestions, including reducing funds for special studies and not producing as thorough a Pulse document. Tom Mumley also noted the existing $112K of MMP funds as well as the possibility of using SEP funds. The group agreed to make a final decision on how to balance the budget in January, with the primary options being MMP and SEP funds. A lower priority option could be cutting back on the Pulse budget, though the group did not want to go further down that path without the presence of Jay Davis.

Decisions:

- Adam Olivieri motioned to approve the 2021 budget and detailed workplan, with the assumption to use SEP funding to cover the deficit (either MMP or Discretionary Enforcement funds). Eric Dunlavey seconded the motion and the motion was carried by all present members.

Action Item:

- Report back on deficit-closing options at January SC meeting (Melissa Foley, 01/31/2021)

12. Discussion: Annual Meeting Feedback

After briefly discussing the feedback at the close of the MYP workshop, Melissa showed a few graphic highlights to the Committee members. The meeting hosted attendees from a wide range of fields, the majority of which listened to two or more of the day's sessions. Additionally, the preference towards virtual or in-person meetings was split evenly. Luisa suggested posting the graphics Melissa showed to the group to the SFEI webpage, which Melissa noted could also be shared through the RMP eUpdate.

The group then discussed potential ideas for the upcoming Estuary News article. Normally a topic brought up by Jay Davis at meetings, Melissa stepped in, in Jay's absence, and informed the group of the issue's theme and potential topic areas. The meeting participants brainstormed a few potential ideas, with the most supported being an article summarizing the RMP Annual Meeting (AM) and RMP Update publication. Tom Mumley suggested highlighting the success of the AM on a virtual platform, which Luisa agreed would be a good way to reach an audience that didn't participate in the meeting and could seek out the posted videos and resources.

Action Items:

- Send summary document of Annual Meeting Survey to TRC and SC (Nina Buzby, 10/31/20)
- Include survey results in eUpdate (Jay Davis, 12/31/2020)

13. Discussion: Status of RMP Deliverables and Action Items

Melissa presented the deliverables to the group in three categories: (1) recent completions, (2) items in progress, and (3) delayed projects due to pandemic or staff time. Many of the waiting deliverables are being held up with academic partners. Tom Mumley commented that the Program should consider not taking on more work while old projects remain incomplete. Melissa then relayed that upcoming due dates, prior to the next SC meeting, are on schedule for completion and action items have been addressed in a timely manner.

14. Discussion: Plan Agenda Items for Future Meetings

Melissa presented items that came up during the course of the day's meeting, including: revisiting the 2021 budget and reviewing 2022 special studies priorities. Melissa also asked the group if they would like a science update at the next meeting or prefer to keep meetings shorter. Most committee members were in support of a shorter meeting, and Melissa noted that the April agenda is usually light, so a short science update may be possible.

15. Plus/Delta

Tom Mumley congratulated the group on successfully completing a virtual MYP workshop, with a similar amount of dialogue to past meetings. Melissa added that the day required presentation of many details and numbers, and would welcome any suggestions on other ways to present them. Tom also asked what the potential timeline for reviewing the updated MYP document would be. Melissa said she would email a draft of the MYP to both committees, likely in November, and include a deadline for review.

Adjourn

San Francisco Bay Regional Monitoring Program
Status & Trends Review - Water Matrix
1 December 2020
11 am to 2 pm PDT

Goals:

- Review the updated draft sampling designs for wet and dry season water sampling

Agenda

Item	Topic	Time	Lead
1.	***Introductions and review meeting goals***	10:30 10 min	Melissa Foley
2.	***Recap of September meeting*** Review the highlights from the September meeting and the main suggestions for the draft sampling designs. **Materials:** S&T meeting notes, recap slides; pages 3-12 **Desired outcome:** Informed group	10:40 25 min	Melissa Foley & Tom Grieb
3.	***Wet season sampling design revisions*** Review the monitoring design for wet season sampling in water, including contaminants, frequency of sampling, and location of sampling, as well as the underlying motivations for the design. **Materials:** Wet season sampling design, wet season options, and cost breakdown; pages 13-23 **Desired outcome:** Justification for the revised design and input from the group on the revisions and additional suggested edits	11:05 75 min	Jay Davis
	Break	12:20 10 min	
4.	***Dry season sampling design revisions***	12:30 70 min	Melissa Foley

	Review the monitoring design for dry season sampling in water, including contaminants, frequency of sampling, and location of sampling, as well as the underlying motivations for the design. **Materials:** Dry season sampling design, dry season options, and cost breakdown; pages 24-33 **Desired outcomes:** Input from the group on the revisions and additional suggested edits		
5.	***Key messages, next steps, and action items*** Highlight the key messages and discuss how those will inform the next steps to finalize the water sampling designs. **Materials:** None **Desired outcome:** Informed group	1:40 20 min	Tom Grieb

REGIONAL MONITORING PROGRAM FOR WATER QUALITY IN SAN FRANCISCO BAY

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RMP Status and Trends Program Review

Water Matrix, Status and Trends Workgroup Meeting
September 3rd, 2020
Remote Zoom meeting

Attendees (all participants remotely attending)

Science Advisors	**Affiliation**	**Present**	
Maggie Dutch	Washington Department of Ecology	**Yes**	
Erin Foresman	State Water Board (Bay-Delta Science)	**Yes**	
Tom Grieb *(Chair)*	Tetra Tech	**Yes**	
Jim Meador	NOAA Northwest Fisheries Science Center	**No**	
Derek Muir	Environmental & Climate Change Canada	**Yes**	
Lisa Nowell	USGS National Water Quality Program	**Yes**	
Harry Ohlendorf	Independent	**Yes**	
Tony Olsen	EPA Western Ecology Division	**Yes**	
Stakeholders	**Affiliation**	**Representing**	**Present**
Tom Mumley	Water Board (SC chair)	Regulator	**Yes**
Bridgette DeShields	Integral Consulting	Refineries	**Yes**
Eric Dunlavey	City of San Jose	POTW	**No**
Maureen Dunn	Chevron	Refineries & Dredgers	**Yes**
Richard Looker	Water Board	Regulator	**Yes**
Adam Olivieri	EOA, Inc.	Stormwater	**No**
Chris Sommers	EOA, Inc.	Stormwater	**No**
Luisa Valiela	USEPA	Regulator	**Yes**

- Christopher Krembs (WA Dept. of Ecology)
- Michael Dumelle (EPA)
- Rebecca Sutton (SFEI)

- Nina Buzby (SFEI)
- Jay Davis (SFEI)
- Melissa Foley (SFEI)
- Don Yee (SFEI)
- Michael Ungs (Tetra Tech)

Day 1

1. Introductions and review meeting goals

Melissa Foley began the meeting by briefly reviewing the day�s agenda and noting that most of the items discussed on the first day would be in preparation for more in-depth sampling design conversations that would take place the following day. Meeting participants introduced themselves, identifying their affiliation and RMP involvement.

2. Management priorities

Melissa presented the materials for this item, starting by outlining the five general guiding management questions that are used to prioritize and categorize RMP efforts. In addition, Melissa shared Bay water quality management priorities, as well as some management decisions that are informed by RMP Status and Trends (S&T) monitoring. Examples of these include NPDES permits and TMDL values, respectively.

Prior to this workgroup meeting, RMP staff met with program stakeholders to begin to prioritize currently monitored contaminants. This exercise did not include contaminants of emerging concern (CECs), which have largely not been included in water S&T monitoring to date. The contaminants were binned into high (copper, selenium, and CTR parameters), medium (PCBs and aquatic toxicity), and low (methyl mercury and PAHs) priority categories. The group was asked to identify any priority contaminants not on the list and discuss how often to revisit management priorities.

Tom Grieb asked about the utility of ancillary parameter data (e.g., suspended sediment, total organic carbon); Jay Davis noted that they are usually considered in tandem with specific contaminant data. Melissa Foley also provided the example that after a method change in copper analysis, dissolved organic carbon data could help ground truth results - although the two past sampling efforts did not produce worthwhile DOC results. Derek Muir brought up the topic of detection limits in relation to water quality standards, commenting that detection limits should be considered in the planning process. The RMP usually uses methods with detection limits that are well below any regulatory values, with the exception of CECs that often have developing analytical methods.

On the topic of revisiting management priorities, Richard Looker commented that annual check-ups would be valuable for minor tweaks. However, Derek Muir commented that too many adjustments in management priorities that change the sampling design could compromise our ability to assess trends, and suggested reassessing on a five year basis. The group continued to discuss the tradeoffs between maintaining stability in the dataset and relevance of methods and approaches. Lisa Nowell asked how the RMP incorporates method changes, advising that having a few years of method overlap allows for the development of a conversion factor.

Christopher Krembs asked if other datasets could provide some leverage for Bay RMP data and whether those sorts of objectives warrant consideration in the sampling design. Don Yee explained that the low frequency in S&T monitoring makes it difficult to incorporate datasets with more frequent measurements, such as those collected for the Nutrient Management Strategy (NMS). Data set integration would likely not be a key aspect of the program redesign.

3. Current water monitoring design

Jay Davis provided the group with a more in-depth look at the current sampling design, describing analyte sampling frequency, sampling site distribution, and a cost breakdown. Based on the prior stakeholder meeting, Jay presented the reasoning and benefits associated with dropping legacy organic contaminants from the regular monitoring list. Most notably, these contaminants are currently only monitored every ten years (which greatly reduces their value in assessing status and trends), and other matrices provide more valuable data.

The resulting discussion began by considering the proposal to drop legacy organic chemicals. Don Yee and Tom Mumley brought up the California Toxics Rule (CTR) list, which includes legacy pesticides and some PCBs. The list of CTR contaminants is monitored every 10 years, so the legacy organic chemicals could be reduced to the CTR sampling list and frequency. In contrast, Derek Muir commented that PAHs may still be valuable to monitor because their sources are often broader and can be climate-related (e.g., wildfire). Water-soluble PAHs may be worth monitoring occasionally. Jay explained that the RMP will still monitor PAHs in sediment, and in resident bivalves to establish baseline data for oil spills. Maggie Dutch agreed that monitoring PAHs should be prioritized primarily in biota and secondarily in sediment.

4. Statistical analysis of current contaminants Part 1: power analysis

Prior to the presentation by Tom Grieb and Michael Ungs, Jay Davis outlined the motivation behind using copper as a driver of the power analysis. Both the regulatory context and phase-out from brake pads provide reasons to assess if the data show long-term decreasing trends. The power analysis was also used to assess the 3-year rolling averages for copper in relation to site-specific objective trigger levels. Tom and Michael then presented the results of the power analysis for RMP copper data and highlighted the findings that most inform the design process. Tom Grieb provided details on the statistical approach, noting that the data had different underlying mean concentrations and coefficients of variance depending on which three year period was examined. A key finding Tom highlighted was that power increased as the coefficient of variation decreased, and therefore trying to understand the source of variability for a contaminant should be considered when monitoring and selecting sampling locations. Another key point was that the ability to detect smaller changes in copper concentration requires an increase in sample size.

Richard Looker expressed concern that a single contaminant, copper, could end up as the main driver when determining the allocation of sampling effort. He also noted that the copper trigger levels were themselves derived using power analysis to ensure significant differences from the site specific objective, so a power analysis relative to trigger levels would be doubling up margins of safety. Tony Olsen asked whether the coefficients of variation could be generalized to other contaminants, to which Tom Grieb responded that it was possible. However, the scenario would require an understanding of variability and sources of variability associated with the contaminant. Jay suggested, and the group agreed, that CECs (not copper) should be the main driver in the sampling design. Derek Muir noted that the power analysis results provide a good general illustration of how to determine the frequency of sampling and sample size. Specifically, the results confirm the linkages between increased sampling station counts, or increased frequency of sampling, with resultant increased power (to detect trends, or significant differences from water quality criteria).

5. Statistical analysis of current contaminants Part 2: space-time model

Michael Dumelle presented on spatio-temporal modeling with RMP data, noting that the EPA is actively working on an R-package that would allow others to implement the same types of models. The package allows visualization of time series estimates through space and time as well as associated uncertainty.

The beginning of Michael's presentation went over the differences between design-based and model-based analyses, noting the differences in approach, knowledge requirements, and assumptions. Michael explained that while design-based efforts require fewer assumptions, they have a limited ability to relate ancillary variables relative to model-based approaches. The model-based work can investigate the response and influence of auxiliary variables, as well as any possible correlation. Another strength of model-based approaches is their ability to incorporate or integrate data collected under different design schemes (e.g., including data from deterministic sampling).

Given time constraints, the discussion for this item was somewhat brief. Melissa, however, commented that the group would likely return to the topic in the following day's conversations. Richard Looker and Don Yee both asked questions related to sample size and sampling frequency and the associated requirements and influence in model-based analyses. Michael responded that smaller sample sizes will make it harder to answer questions concerning confidence intervals, and that the model can leverage data from "nearby" years, meaning model precision can be influenced by the sampling interval.

6. Recommended CECs for sampling and review of existing data

Becky Sutton first provided the group with an overview of the three-element RMP CEC strategy and associated tiered risk-based framework that guides how the Program assesses and classifies contaminants. A key point was that contaminants currently classified as High or Moderate Concern in the risk-based framework would be worth considering for S&T monitoring, while those classified as Low or Possible Concern might be the subject of screening studies. Becky presented an information matrix that used details related to each class of CECs to synthesize information and guide development of a potential sampling scheme. Relevant information included expected pathways, existing Bay data, toxicity thresholds, and chemical properties. Becky noted that confirmation of associated management priorities and data needs would also be addressed.

Becky then presented examples of the information matrix and S&T monitoring recommendations for two Moderate Concern contaminant classes. The proposed classes were organophosphate esters (OPEs) and bisphenols. Both contaminant groups have existing data with a wet-season data gap and specific chemicals with levels near or above toxicity thresholds. Additionally, these specific OPEs and bisphenols showed highest levels in the Lower South Bay and thus this area could be targeted for a more focused monitoring effort. A full Bay survey still has merit because not all chemicals in the classes followed the same spatial pattern. Becky highlighted that the ñtrendsò aspect of the work would be less quantitative than traditional program contaminants, and would instead focus on identifying responses to management actions, including indications of the ñregrettable substitutionò of a data-poor compound in place of a similar chemical with well-established concerns.

Becky also reviewed the information matrix for two contaminants not prioritized for monitoring - imidacloprid and PBDEs. Discussions within the ECWG revealed that there is sufficient stream monitoring being done by the Department of Pesticide Regulation to inform management of imidacloprid. PBDEs have low water solubility and are often associated with particulate matter or sediment. This supports monitoring in sediment rather than water. Becky also listed a few contaminant groups that could be candidates for future S&T screening, noting that all were persistent and mobile organic contaminants (PMOCs).

Becky then prompted the group with questions on what the presented approach may be missing. Harry Ohlendorf commented on the success of the information matrix in synthesizing information and informing monitoring recommendations, and suggested that it be used in the review of other sampling matrices. Derek Muir asked whether the program would plan to measure a suite of contaminants, which brought up the tradeoffs between method stability and flexibility presented by commercial and academic labs, respectively. Tom Mumely also noted that when grouping contaminants, not all may be of equal concern and this should be taken into account when deciding on how to approach analyses. Richard Looker highlighted the need for clear objectives for data collection, as they would help prioritize aspects of the analytical approach.

At the end of the meeting, Melissa provided a quick overview of the goals for the following day, and brief context for how the past items would apply to the upcoming topics.

Day 2

1. Introductions, review meeting goals, recap Day 1

After quickly outlining the goals for the day, to discuss two draft sampling designs, Melissa Foley provided a brief recap of the previous day topics and outcomes. The group had few questions remaining from the past day, though Richard Looker asked for the slides from Michael Dumelleõs modeling presentation to be shared with the group.

2. Draft wet season sampling design

Jay Davis began the item by first describing the impetus for the water sampling redesign, noting the new focus on CECs and integrating as part of a broader strategy for CECs that incorporates pathway monitoring. Using a ñdesign checklist,ò Jay then went through a potential draft wet-season sampling design. Jayõs slides were used to guide and capture the discussion. Tom Mumley commented that determining the wet-season sampling plan will likely be an iterative process, given that wet season sampling will differ from existing S&T efforts. Tony Olsen suggested that wet season efforts would be valuable when there is uncertainty around CEC impacts, but there is knowledge of potential sources and pathways. On the other hand, dry season sampling would answer whether contaminants stick around or are diluted or degraded after entering the Bay - a second level of evaluation for CECs. Jay provided further details on wet season goals, including primary and secondary priority monitoring questions. Tom Mumley and Harry Ohlendorf suggested that contaminant fate, impact, and physical and biological processes should also be considered in a secondary capacity. The questions were taken from the CEC multi-year plan and prioritized as follows:

Primary

1) Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?

2) What are the sources, pathways and loadings leading to the presence of individual CECs or groups of CECs in the Bay?

Secondary

3) What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?

4) Have the concentrations of individual CECs or groups of CECs increased or decreased in the Bay?

5) Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?

6) What are the effects of management actions?

(5 will inform the design) (3 also important in design) (6 & 5 go together)

Jay explained that a previous non-targeted analysis (NTA) screening study, conducted with Dr. Lee Ferguson of Duke University, served as inspiration for the wet season design. This study sampled sites that were strongly influenced by distinct pathways, with a wastewater-influenced site sampled in the dry season and sites influenced by urban and agricultural runoff sampled in the wet season. Related to this work, Tom Grieb brought up the value of developing conceptual models that lay out the expected pathways for CECs. In agreement with this point, Melissa reminded the group of existing CEC strategy efforts, which include valuable conceptual models.

The specifics of the proposed sampling design include a hybrid of targeted and probabilistic monitoring with distinct sampling locations near key watersheds and focused, ambient monitoring in the Lower South Bay (LSB) segment. The LSB segment is highly influenced by a mix of wastewater and stormwater, provides important habitat for aquatic life, and is not flushed as substantially as many other parts of the Bay.

The ensuing discussion covered the meeting participantâ€s initial impressions of the potential design. Many members of the group were in support of the combination of both probabilistic and targeted sampling, though there was some hesitation about focusing too heavily on pathways. Maggie Dutch and Tom Grieb asked for more details on the specific objectives associated with each type of monitoring. These are gaining worst-case scenario data through targeted work near stormwater inputs, and being able to compare ambient results between seasons for an important subset of the Bay via LSB probabilistic sampling.

Richard Looker noted the importance of considering time in the sample design, specifically whether there is a desire to compare across sites, which would require thoughtful storm selection. This brought up a number of logistical questions, such as the desired type of sites and samples (e.g., fixed vs. random locations, grab vs. passive sampling). Jayâ€s draft design included collection of NTA samples every four years and a focus on surface grab sampling, with the potential to include passive samplers or sediment traps. Harry Ohlendorf made another well received suggestion to create strata in LSB and then assign random sites within each stratum every sampling period to balance the desire for sites close to pathways as well as ambient sites.

Action items:

- Share writeup demonstrating use of stratified approach. (Harry Ohlendorf, 9/25/20)

3. Draft dry season sampling design

Don Yee went through the proposed dry-season design that would largely follow the existing S&T design. The current design includes both random and fixed sampling locations throughout the Bay segments, outside the Golden Gate, and in river locations close to the Delta. The data show generally decreasing concentrations of contaminants towards the ocean, with weak gradients between shallow and deep waters.

The main question for discussion was whether the current design is sufficient for CEC monitoring. In discussing this topic, Tom Mumley mentioned the importance of determining an ideal spatial and temporal sampling frequency. Don suggested considering Bay segments along with substrata, as suggested by Tony Olsen the previous day, sampling a shallow, deep, and ónearsourceeôsampling strata to deliberately cover a range of conditions. Building off this idea, Jay suggested annual sampling at fixed stations adjacent to pathways, and conducting ambient Bay characterizations less frequently. Similar to the wet-season sampling proposal, the ambient or more probabilistic monitoring could cover the LSB biennially and the full Bay at a lower frequency.

Richard Looker noted that incorporating too many aspects to the design could spread resources too thin, and that the group should consider what objectives would be compromised. Therefore the benefit of introducing an annual sampling platform would need to be weighed against focusing too heavily on pathways. The group agreed that the design should be less focused on probabilistic aspects and significant consideration should also go into other matrices and how they integrate and overlap, especially related to site locations.

In agreement with the updated dry-season sampling design incorporating more targeted/fixed site monitoring, several meeting participants brought up the importance of considering the desired products and performance. Tom Grieb and Tom Mumley noted the need to think about anticipated results and reports as a way to further flesh out the potential sampling design and program in general.

4. Next steps and action items

At the close of the meeting, Melissa summarized the next steps discussed during the meeting. These included documenting key program questions and performance - both expected and realized, identifying desired key outputs, finalizing the program power analysis, and further exploring the space-time model. Melissa also noted specific tasks related to the wet season and dry season sampling plans. Finally, Melissa reviewed the upcoming timeline, asking the group whether they could provide comments on the next draft design via email or if another meeting would be needed. The participants supported another meeting, which would likely take place in early November - prior to the sediment matrix review in December.

Action Items:

- Schedule follow up meeting to provide comments on updated draft designs (Melissa Foley, 10/31/20)

Major Highlights

- The Water Board highlighted the need for shifting the focus from legacy pollutants to CECs
- Copper should no longer be the driver of the sampling design; CECs are now the driver
    - Itôs still worth looking at monitoring performance for copper to know what we are getting
- We can reduce sampling of ñPCBs, PAHs, and legacy pesticidesò to every 10 years at the same time as CTR sampling to save approximately $120K in 2021
- Agreement on the primary and secondary management questions for CECs monitoring (see next slide)
- The proposed wet season design focused on pathway input areas and a regional approach in Lower South Bay makes sense
    - Include some paired ambient stations
    - Support for stratification of LSB
    - Support for use of passive samplers (polar and nonpolar)
    - Prioritize a wide range of chemical analyses
- Dry season
    - Pathway monitoring not applicable (deep wastewater outfalls)
    - Consider stratifying within segments
- Accounting for variability is an important factor to consider in the design, particularly for CECs
- CECs to focus on include OPEs, bisphenols, PFAS
- Also need a platform for screening CECs (e.g., new targeted CECs, non-targeted analysis)
- Articulate the questions driving the different designs and evaluate how well we expect to answer them
- Identify the desired products and what kind of sampling would be needed to produce them
- For CECs, establishing status and at least semi-quantitative trend information will provide useful information for management

Item 3: Wet Season Sampling Design, Version 2

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Design Checklist

1. Prioritized management questions
2. Contaminants to focus on
3. Spatial design
4. Station number and selection
5. Type of analysis and frequency (targeted and non-targeted)
6. Sample types (grab, composite, passive, é)
7. Replication (statistical power and performance)
8. Timing
9. Anticipated results
10. Interannual frequency
11. Costs
12. Other considerations

Slide from last meeting (with added notes)

CEC Questions to Answer (Wet Season)

Primary

1) Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?

2) What are the sources, pathways and loadings leading to the presence of individual CECs or groups of CECs in the Bay?

Secondary

3) What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?

4) Have the concentrations of individual CECs or groups of CECs increased or decreased in the Bay?

5) Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?

6) What are the effects of management actions?

Notes: (5 will inform the design) (3 also important in design) (6 & 5 go together)

CEC Questions from the RMP Multi-Year Plan

1. Which CECs have the potential to adversely impact beneficial uses in San Francisco
2. What are the sources, pathways and loadings leading to the presence of individual CECs or groups of CECs in the Bay?
3. What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?
4. Have the concentrations of individual CECs or groups of CECs increased or decreased in the Bay?
5. Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?
6. What are the effects of management actions?

Updated

CEC Questions to Answer (Wet Season)

Primary

1) Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?

2) What are the sources, pathways and loadings leading to the presence of individual CECs or groups of CECs in the Bay?

4) Have the concentrations of individual CECs or groups of CECs increased or decreased in the Bay?

Secondary

3) What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?

5) Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?

6) What are the effects of management actions?

Notes:

Å 4 will be semi-quantitative and rely on higher signal data near source inputs rather than open Bay

Å 3 and 5 will inform the design design

Å 5 and 6 go together

For wet season this means: Sampling near-field at <u>stormwater</u> points of entry, sustained over years

Additional secondary question: Are there particular regions of concern? (in other words, what is the spatial extent of contamination?)

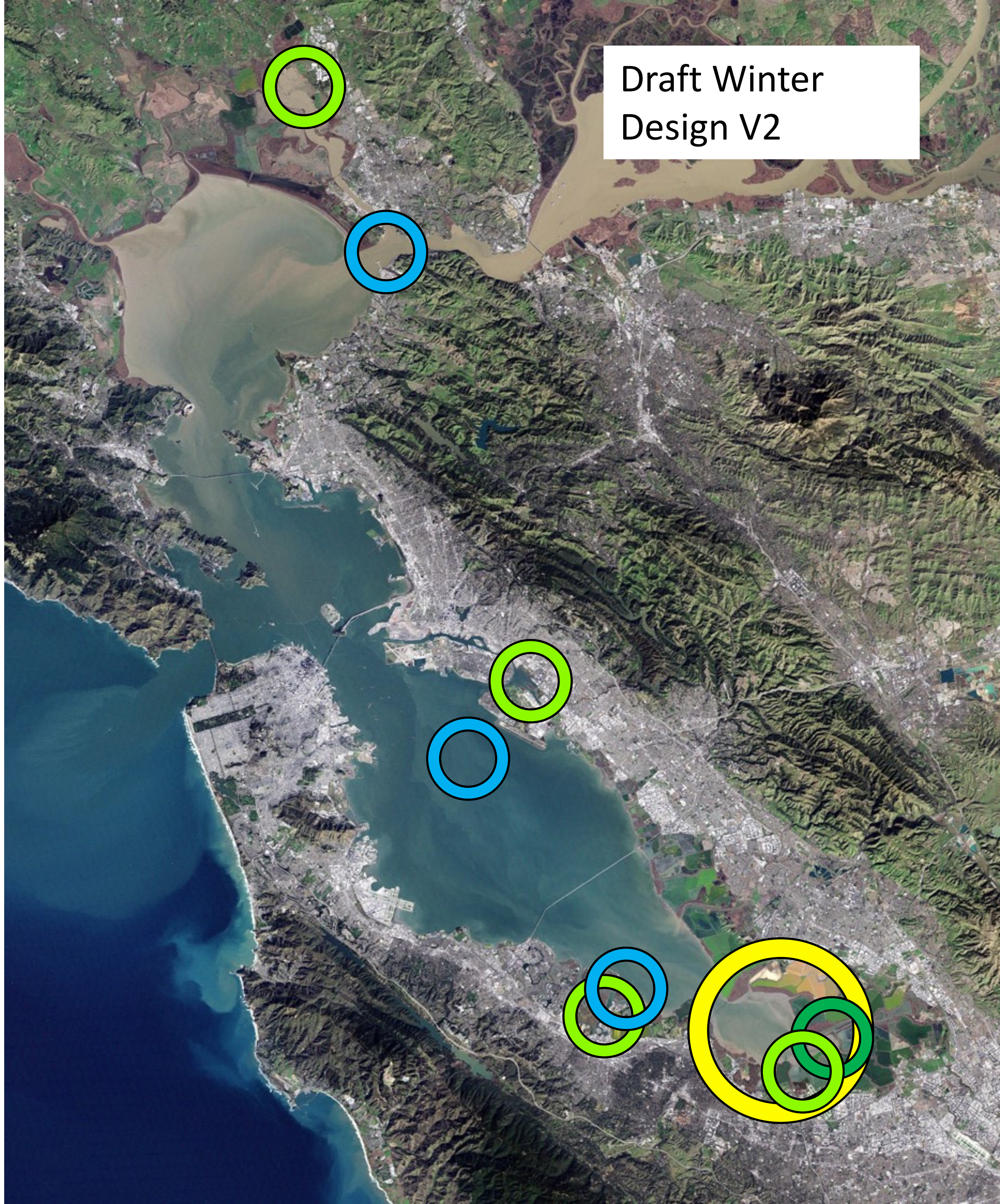
Draft Wet Season Design (Version 2)

Pathway-influenced Near-field Stormwater Stations
Å Sample from fixed structures
Å Sample immediately after storms
Å Depth-integrated grabs, POCIS, hydrophobic PSDs
Å 1 or 2(?) or 3(?) storms per year

Pathway-influenced Near-field Wastewater Station
Å Sample from fixed structure
Å Sample in summer (and winter?) along with rest of LSB
Å Depth-integrated grabs, POCIS, hydrophobic PSDs
Å Once per season

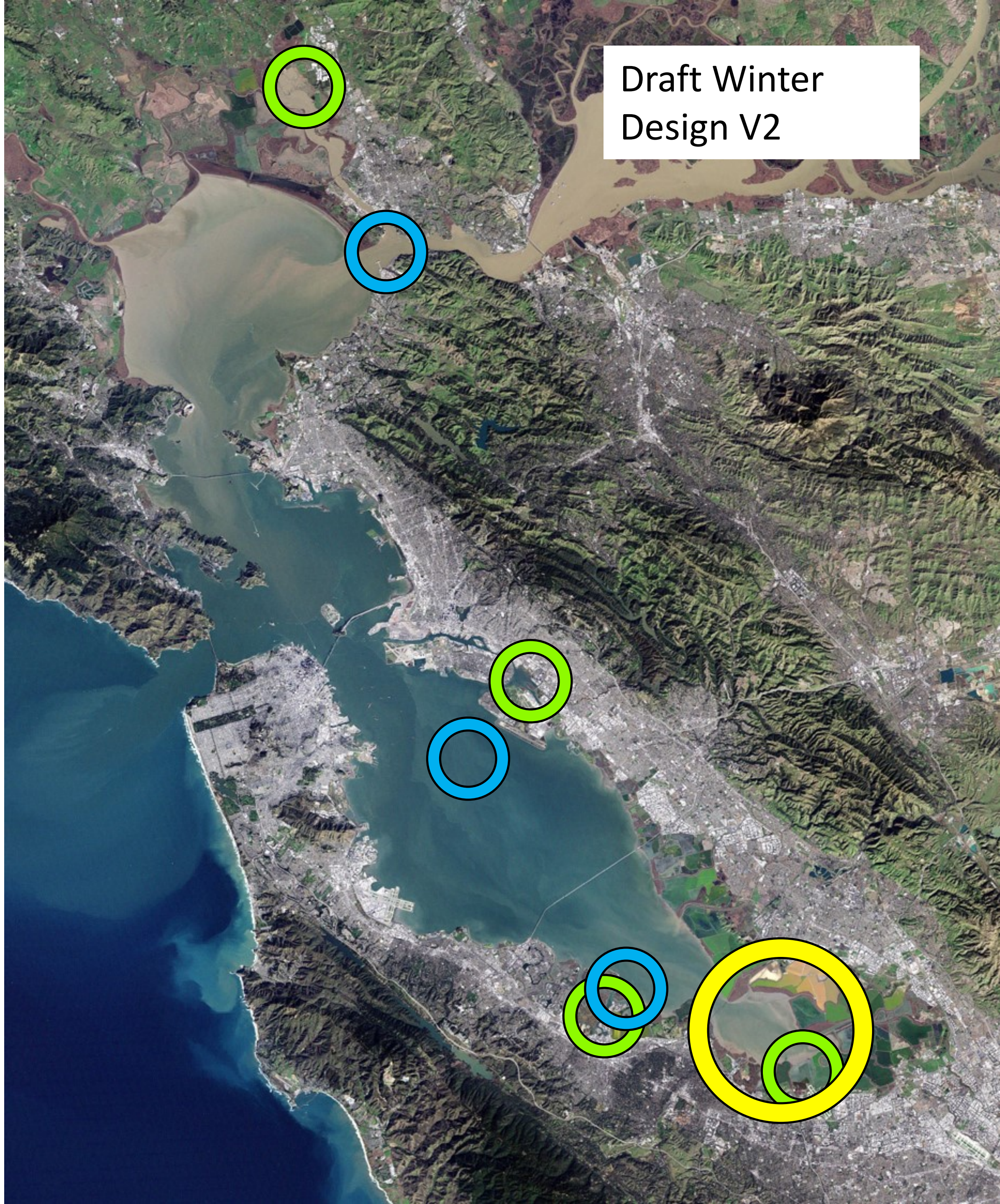
Paired Ambient Stormwater Station
Å Sample from boat (either NMS [nearest station] or a separate vessel)
Å Sample within 2 weeks of storms
Å Depth-integrated grabs
Å 1 or 2(?) or 3(?) storms per year

Lower South Bay
Å Match the dry season design (xx stations in the segment)
Å Sample from NMS station (boat or moored sensor) or a separate vessel
Å Sample within 2 weeks of storms
Å Once per season



Draft Wet Season Design: Station Selection and Number

- Conceptual model/rationale: Urban stormwater sites
  - Select areas with highest urban stormwater influence - strong signal, high risk
    - High proportion of inflow is stormwater
    - Land uses associated with sources
      - Industrial
      - Roadways and parking
      - Range of age of residential and commercial (changing building materials)
    - Semi-enclosed = less dilution, stronger signal
    - Important areas for beneficial uses
  - Include area(s) for contrast, other sources
    - Napa River (ag, wildfires)
    - Central Bay or Golden Gate (clean reference)
    - San Jose wastewater station
- Number is a balance of management priority and cost



Draft Wet Season Design: Costs

OPTION 1

- # of locations: Three (paired target and ambient) + Lower South Bay (n = 6)
- Sample type: Grab + passive samplers (2 types)
- Analytes: Non-targeted analysis, bisphenols, OPEs, PFAS
- # of storms: Three
- Frequency: Every year to start, then every other year

$229,000

OPTION 2

- # of locations: Three (paired target and ambient) + Lower South Bay (n = 6)
- Sample type: Grab ***+ passive sampler (1 type)***
- Analytes: Non-targeted analysis, bisphenols, OPEs, PFAS
- # of storms: ***Two***
- Frequency: Every other year

$187,000

OPTION 3

- # of locations: ***Two*** (paired target and ambient) + Lower South Bay (n = 6)
- Sample type: ***Grab***
- Analytes: Non-targeted analysis, bisphenols, OPEs, PFAS
- # of storms: **Two**
- Frequency: ***Every year, rotating sampling locations***

$138,000

Draft Wet Season Design: Interannual Frequency

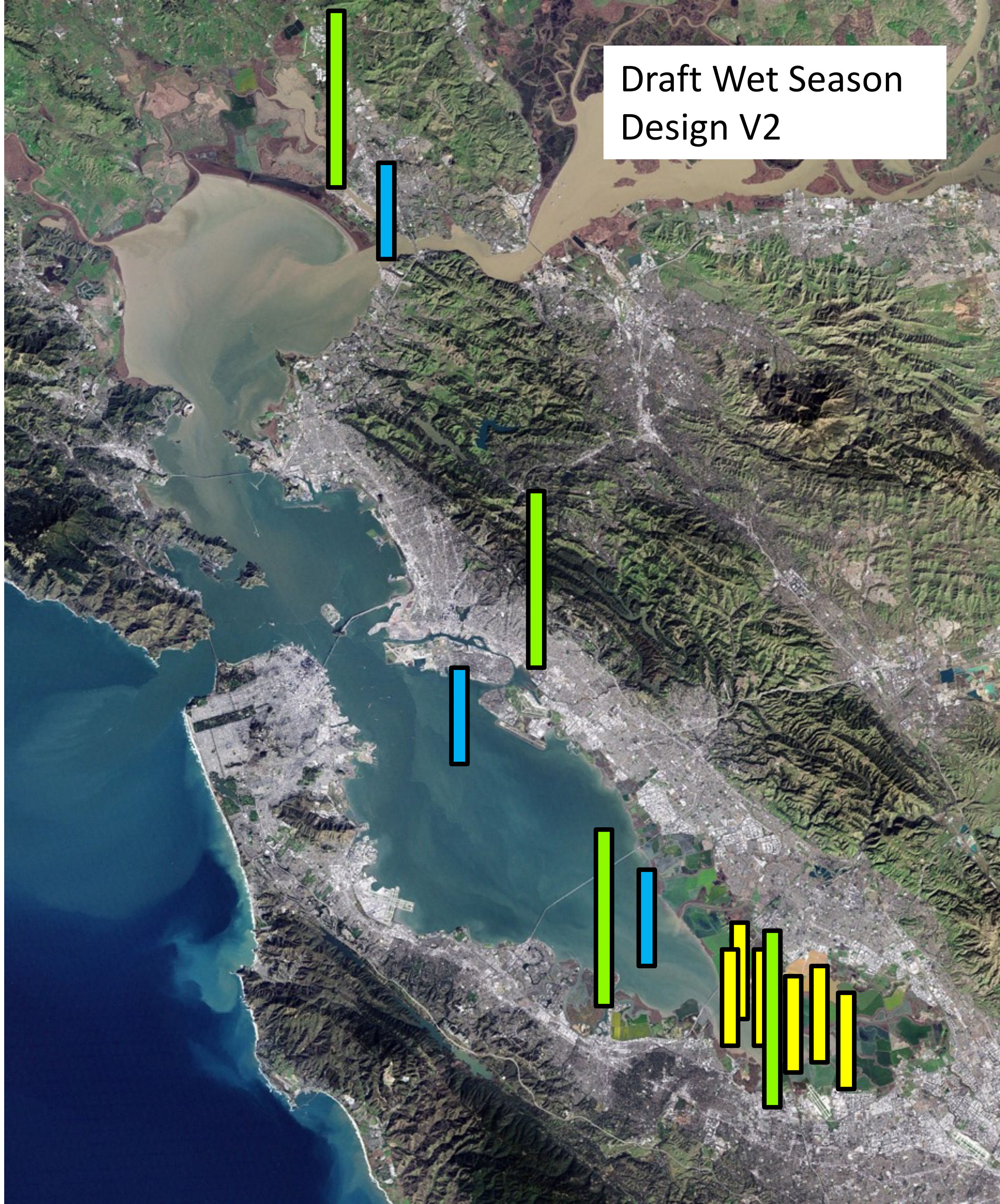
ÅCan vary by [station type]*[analyte]

ÅCan decide after first year

ÅThis is a pilot study

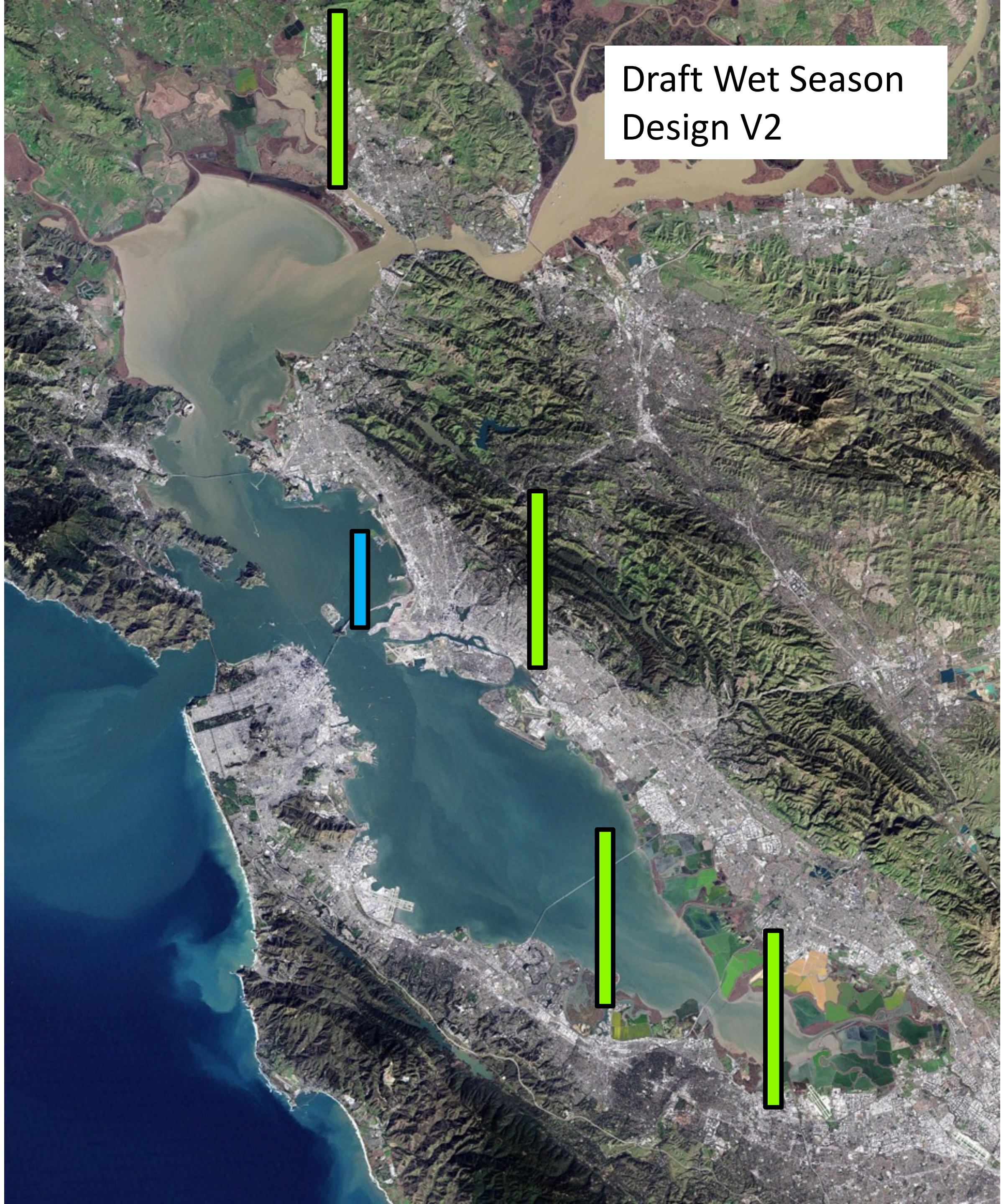
Draft Wet Season Design (Version 2): Results Mockup

Å Grab samples

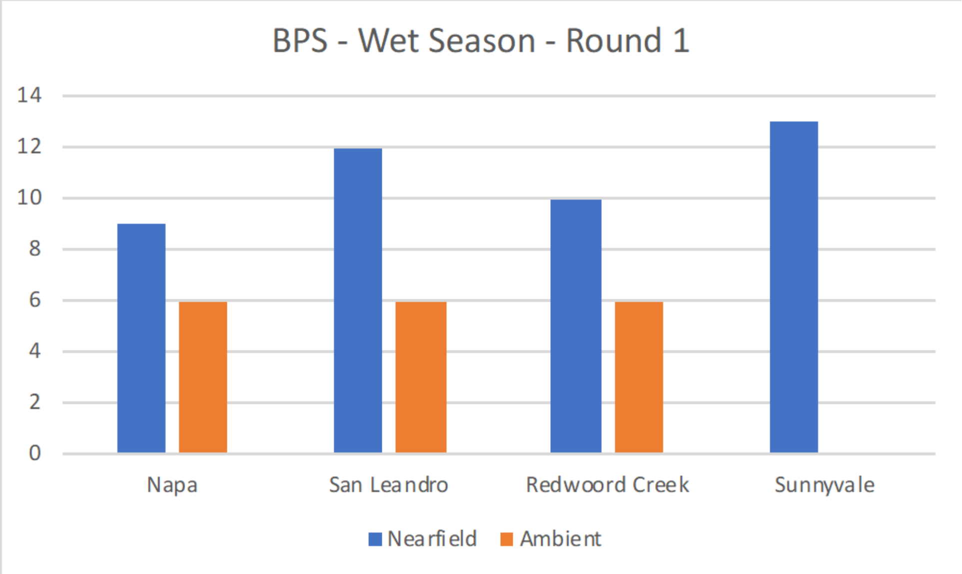


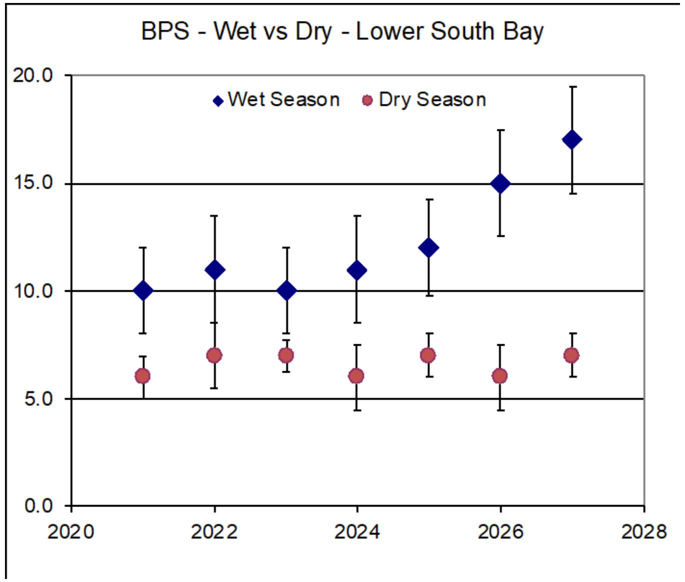
Draft Wet Season Design (Version 2): Results Mockup

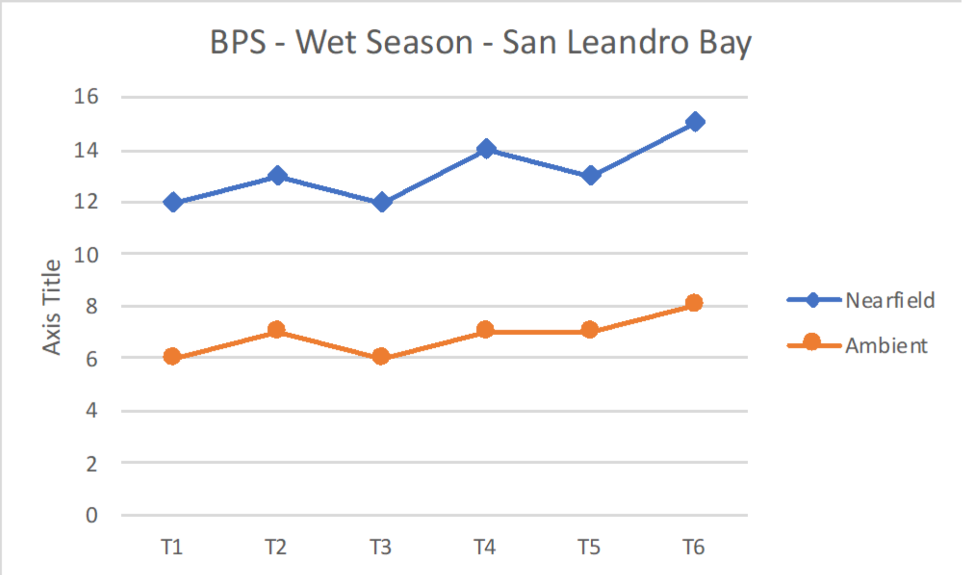
Å Passive samples



Draft Wet Season Design: Results Mockup







Item 4: Dry Season Sampling Design

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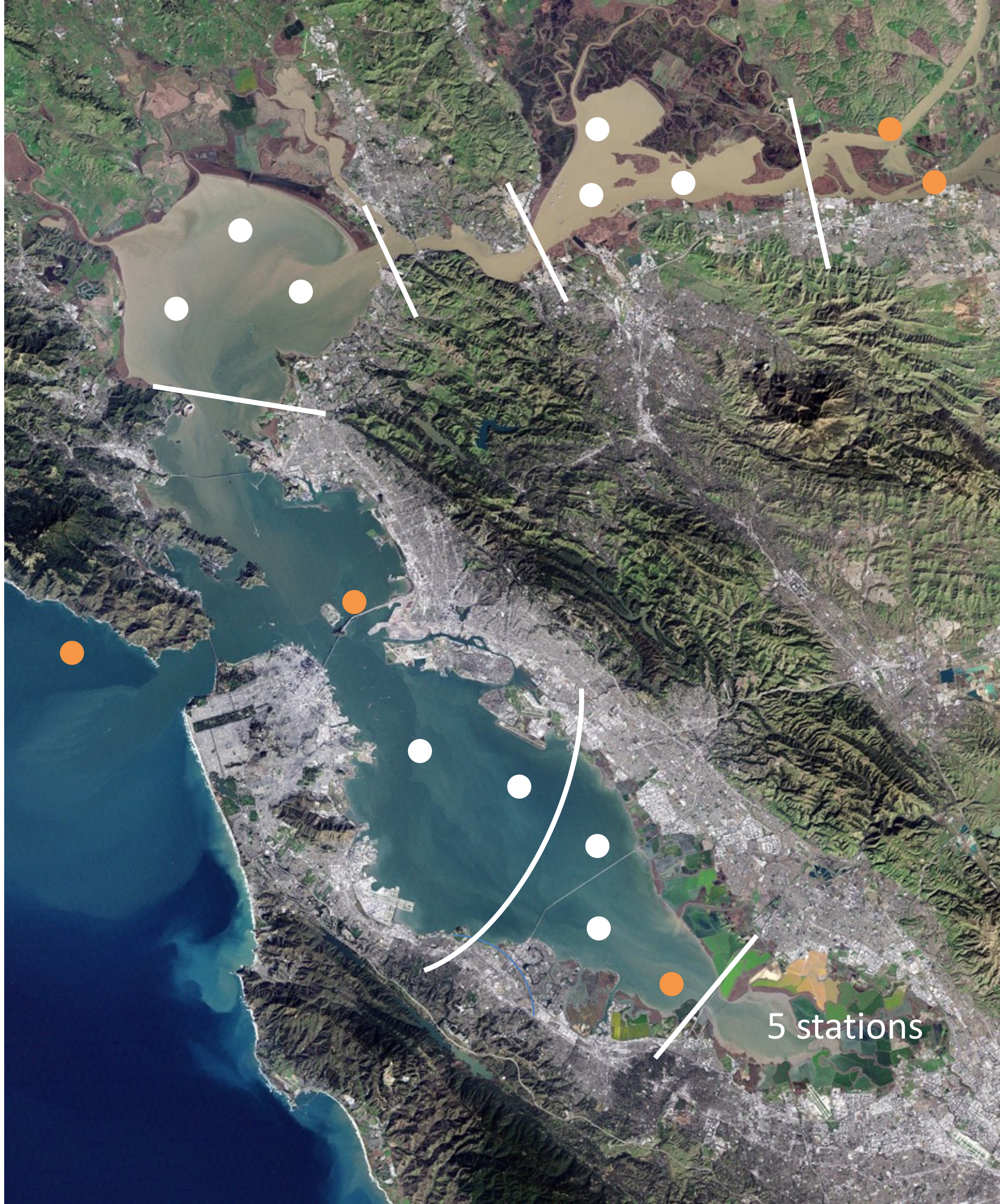
Design Checklist

1. Prioritized management questions
2. Previous results
3. Spatial design
4. Station number and selection
5. Type of analysis and frequency (targeted and non-targeted)
6. Sample types (grab, composite, passive, é)
7. Replication (statistical power and performance)
8. Timing
9. Anticipated results
10. Interannual frequency
11. Costs
12. Other considerations

Priority management questions for the S&T Program

1. What are the concentrations and masses of priority contaminants in the Bay, its compartments, and its segments?
2. Are contaminants at levels of concern?
3. Are there particular regions of concern?
4. Have concentrations and masses increased or decreased?
5. What are the associated impacts of those contaminants?



Priority management questions for CECs

Primary

1. Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?

2. What are the sources, pathways and loadings leading to the presence of individual CECs or groups of CECs in the Bay?

4. Have the concentrations of individual CECs or groups of CECs increased or decreased in the Bay?

Secondary

3. What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?

5. Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?

6. What are the effects of management actions?

Priority management questions for CECs

Primary

1. Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?

2. What are the sources, pathways and loadings leading to the presence of individual CECs or groups of CECs in the Bay?

4. Have the concentrations of individual CECs or groups of CECs increased or decreased in the Bay?

For dry season this means:
Sampling near-field at one <u>wastewater</u> point of entry, one stormwater point of entry, and multiple ambient stations, over multiple years

Secondary

3. What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?

5. Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?

6. What are the effects of management actions?

Draft Dry Season Design
Ambient + partial wet season

Ambient, random stations

Ambient, fixed stations

Pathway-influenced Near-field Stormwater Station

Pathway-influenced Near-field Wastewater Station

Å Sample in summer (and winter) along with rest of LSB

Paired Ambient Stormwater Station

Lower South Bay

Å Match the wet season design

Å Sample from NMS station (boat or moored sensor) or a separate vessel

Draft Dry Season Design
Station selection and number

- Conceptual model/rationale:
  - Maintain ambient sampling scheme for copper, ancillary parameters, CECs, and CTR parameters (every 10 years)
- Sample at the same sites in LSB in wet and dry seasons for comparisons
  - Wastewater and stormwater fixed stations
  - Four random stations
- Number of stations and frequency of sampling dependent on budget

Draft Dry Season Design: Costs

OPTION 1

Å # of locations: ***All Bay sites (22) + LSB wastewater fixed (1) + stormwater fixed (1)***
Å Analytes: Bisphenols, OPEs, PFAS, copper, ancillary parameters (Se every four years; CTR & AT every 10 years), non-targeted analysis in LSB ***(with passive samplers)***
Å Frequency: Every other year

$226,000

OPTION 2

Å # of locations: Lower South Bay (6) + CECs at ambient sites near pathway sites (3) + ***half of remaining random stations (9)***
Å Analytes: Bisphenols, OPEs, PFAS, copper, ancillary parameters (Se every four years; CTR & AT every 10 years)
Å Frequency: Every other year

$147,000

OPTION 3

Å # of stations: Lower South Bay only (6) + CECs at ambient sites near pathway sites (3) + legacy at NMS channel sites (8)
Å Analytes: Bisphenols, OPEs, PFAS, copper, ancillary parameters (Se every four years; CTR & AT every 10 years)
Å Frequency: Every other year
Å Boat: NMS cruise piggybacking; channel stations only

$115,000

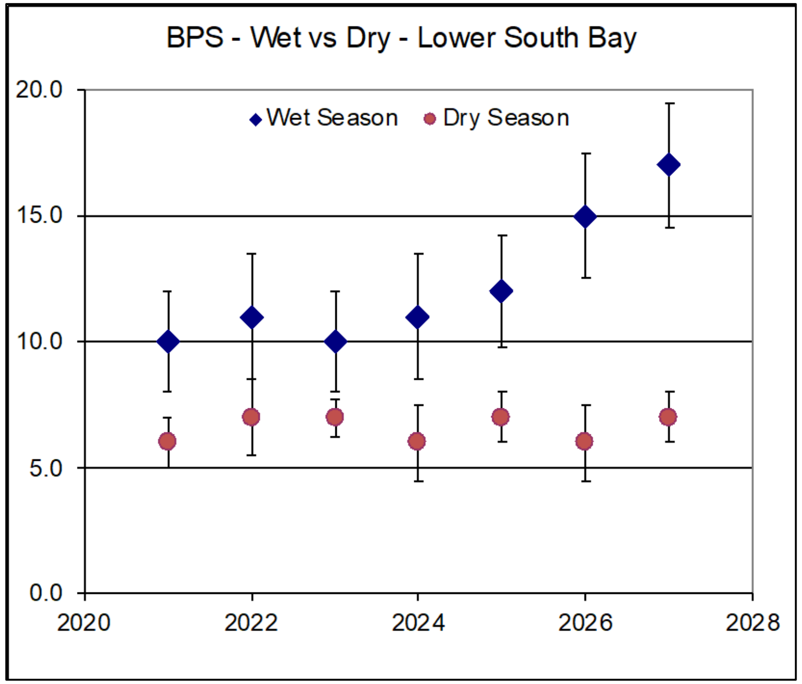
Draft Dry Season Design: Changes to legacy pollutant monitoring

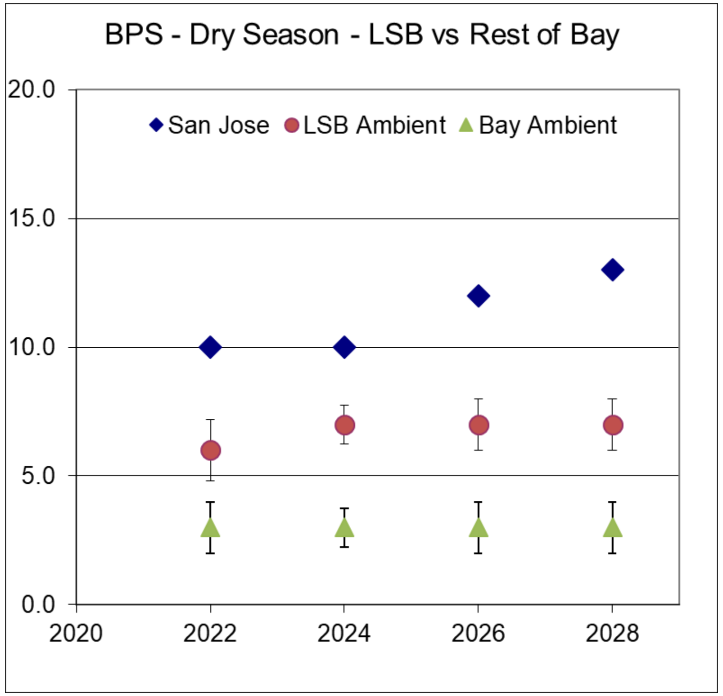
ÅRemoved parameters: Methyl mercury; broader suite of PCBs and pesticides

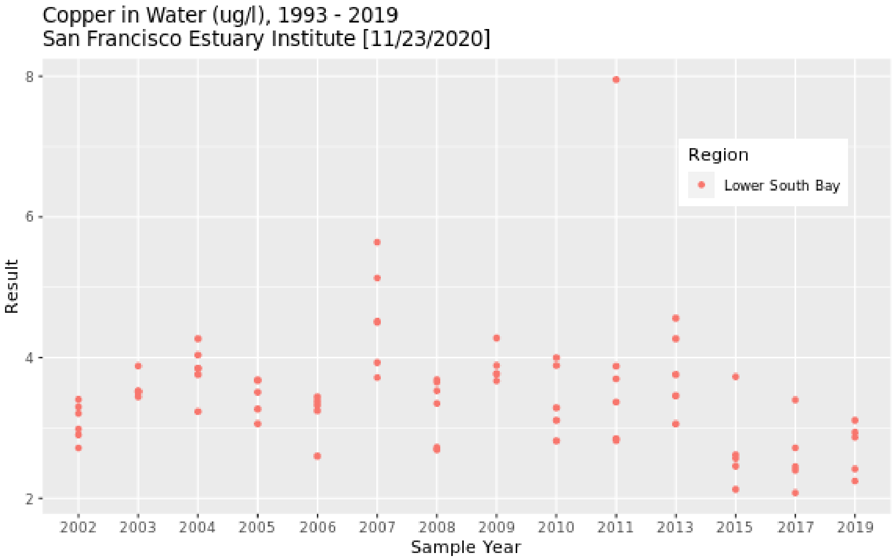
ÅReduced sampling frequency: Selenium (2 years to 4 years), Aquatic Toxicity (2 years to 10 years), PCBs/PAHs/Pesticides (5 years to 10 years)

ÅIncreased sites: Aquatic toxicity (3 sites to 11 sites)

Draft Dry Season Design: Results Mockup







Regional Monitoring Program for Water Quality in San Francisco Bay

Monitoring Design for the Status and Trends Monitoring Program (2014-2027)

Program	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
USGS Moored Sensor Network for Suspended Sediment (5 targeted sites) [a]														
Parameters: SSC, Water temperature, Salinity	X	X	X	X	X	X	X	X	X	X	X	X	X	X
USGS Monthly Cruises for Nutrients and Phytoplankton in Deep Channel (38 targeted sites)														
Parameters: CTD profiles, light attenuation, SSC, DO, Chl-a, Phytoplankton speciation, Nutrients (NO_2, NO_3, NH_4, PO_4, Si) [b]	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Every 2 Years: Toxic Contaminants in Water (5 targeted sites and 17 random sites)														
MeHg, Cu, Se (dissolved & particulate fractions in 2017 and onwards, dissolved & total fractions measured in 2015)		X		X		X		X		X		X		X
CN, Hardness, SSC, DOC, POC		X		X		X		X		X		X		X
Aquatic Toxicity (9 stations) [c]		X		X		X		X		X		X		X
Chl-a and Nutrients (NH4, NO3, NO2, TN, PO4, TP, Si) (at GG site only).				X		X		X		X		X		X
PCBs, PAHs, Pesticides								X						
CTR parameters (10 samples at 3 targeted stations) [d]		X										X		
Every 2 years: Toxic Contaminants in Bivalve Tissue (7 targeted sites) [e]														
Se, PAHs	X		X		X		X		X		X		X	
PBDEs	X		X											
PCBs	X								X					
Every 3 Years: Toxic Contaminants in														

Program	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Bird Egg Tissue														
Cormorant Eggs: Hg, Se, PCBs, PBDEs, PFCs (3 targeted sites) [f]			X		X			X			X			X
Tern Eggs: Hg, Se, PBDEs (variable fixed sites) [g]			X		X			X			X			X
Every 2 Years: Toxic Contaminants in Bay Margin Sediments (~40 random sites)														
Ag, Al, As, Cd, Cu, Fe, Hg, MeHg, Mn, Ni, Pb, Se, Zn, PCBs, TOC, N, % Solids, Grain Size		X		X			X		?		?		?	
Every 4 Years: Toxic Contaminants in Sediment (7 targeted sites and 20 random sites) [h]														
Ag, Al, As, Cd, Cu, Fe, Hg, MeHg, Mn, Ni, Pb, Se, Zn, PAHs, PCBs, TOC, N, % Solids, Grain Size	X				X				X				X	
PBDEs	X				X				X					
Legacy Pesticides and Fipronil (reconsider whether to include before the 2018 cruise)	X				?				?				?	
Sediment Toxicity [i]									?				?	
Benthic Macroinvertebrates [j]									?				?	
Every 5 Years: Toxic Contaminants in Sport Fish Tissue (7 targeted sites)														
Hg, Se, PCBs, PBDEs, PFCs, Dioxins	X					X					X			

Notes:

"X" = Planned sampling event. "?" = Event that is planned but must be approved by the RMP Steering Committee before implementation. Additional parameters can be added to sampling events to support RMP Special Studies.

a. The RMP Status and Trend Program provides direct support to the U.S. Geological Survey (PI: Dave Schoellhamer) for 5 SSC stations. However, this contribution leverages SSC data at 2 more stations and salinity at 8 stations funded by other partners. In addition, since 2012, the RMP has used Special Studies funds to add DO sensors at 6 stations and nutrient-related sensors to 3 stations.

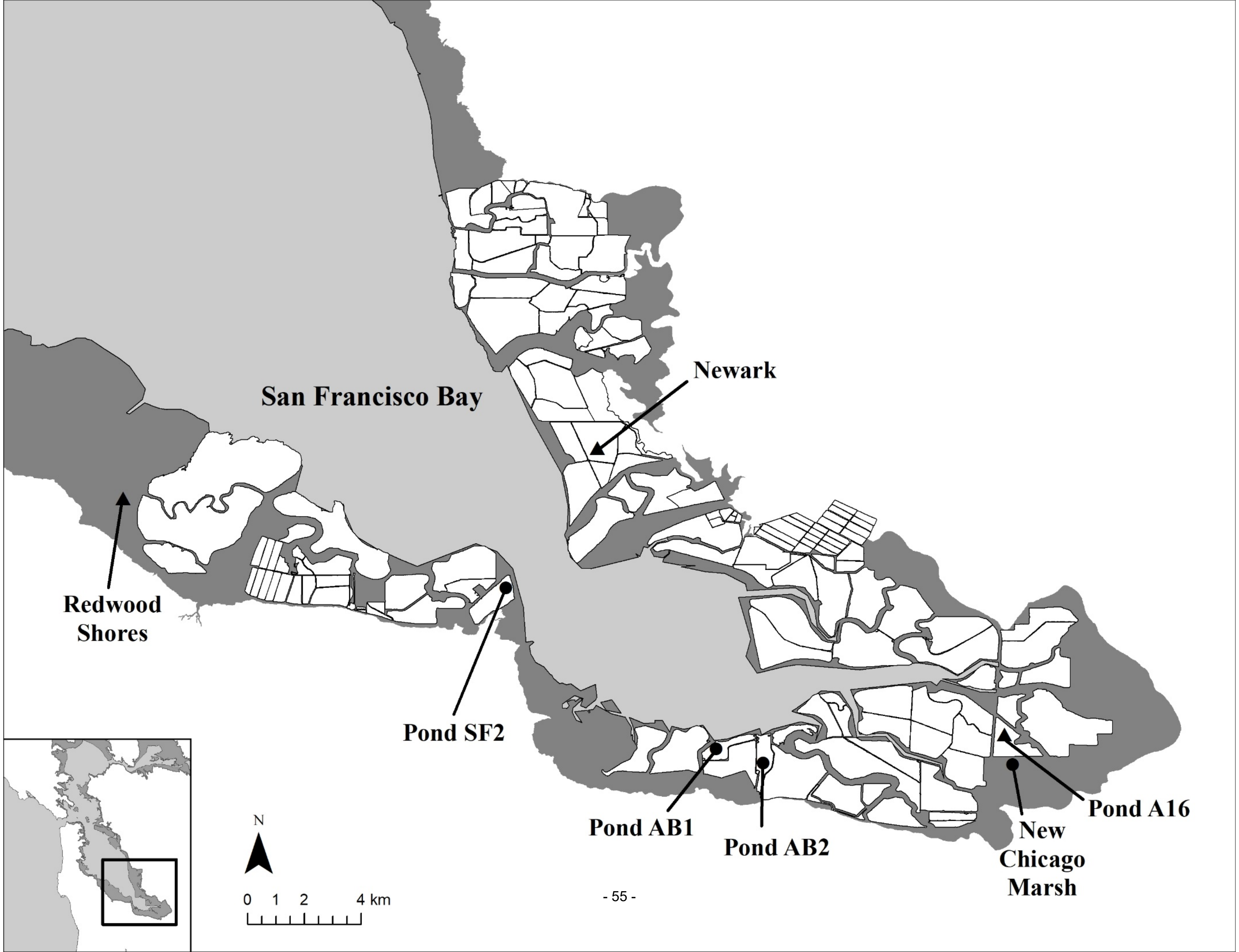
b. Monthly cruises are completed by the U.S. Geological Survey (PI: Jim Cloern). Phytoplankton speciation and nutrient sampling only occurs at 14 of stations.

c. Aquatic Toxicity is measured following EPA Method 1007.0 (*Americamysis bahia*).

d. CTR sampling occurs at the Sacramento River, Yerba Buena Island, and Dumbarton Bridge sites.
e. Mussels (*Mytilus californianus*) are collected from Bodega Head State Marine Reserve, an uncontaminated "background" site of known chemistry, and are transplanted to 7 targeted locations in the Bay. After ~100 days, mussels from the transplanted sites and a sample from Bodega Head are collected for analysis. Three of the 7 transplant sites serve as back-ups in case something goes wrong with the transplants at the 4 primary sites. At the same time, resident clams (*Corbicula fluminea*) are collected from 2 sites in the Sacramento River and San Joaquin River.
f. Double-crested Cormorants (*Phalacrocorax auritus*). Cormorant eggs are collected at three sites: Don Edwards National Wildlife Refuge, the Richmond-San Rafael Bridge, and Wheeler Island.
g. Forster's Tern (*Sterna forsteri*). Tern eggs are typically collected from multiple sites in the Don Edwards National Wildlife Refuge and the Hayward Shoreline Regional Park.
h. Sediment samples are collected in the dry season (summer).
i. Sediment toxicity is measured using the following methods: EPA 600/R-94-025 (*Eohaustorius estuaries*), EPA 821/R-02-012M (*Ceriodaphnia dubia*), EPA 600/R-99-064 (*Hyalella azteca*), and EPA 600/R-95-136M (*Mytilus galloprovincialis*)
j. Benthic macroinvertebrates are measured during dry-season sediment sampling events (2014, 2022). Sediment samples are sieved through nested 1.0 and 0.5 mm sieves Organisms are sorted into major taxonomic categories and taxonomy and abundance are determined to the lowest practical taxonomic level.

Acronyms:

SSC: Suspended Sediment Concentration
Chl-a: Chlorophyll-a
CTD: Conductivity, Temperature, and Depth
CTR: California Toxics Rule,
see http://water.epa.gov/lawsregs/rulesregs/ctr/
DO: Dissolved Oxygen
DOC: Dissolved Organic Carbon
MeHg: Methylmercury
NH_4: Ammonia (dissolved)
NO_2: Nitrite (dissolved)
NO_3: Nitrate (dissolved)
PAHs: Polynuclear Aromatic Hydrocarbons
PCBs: Polychlorinated Biphenyls
PBDEs: Polybrominated Diphenyl Ethers
"Pesticides": The suite of legacy pesticides that has been routinely measured by the RMP: Chlordanes (Chlordane, cis-; Chlordane, trans-; Heptachlor; Heptachlor Epoxide; Nonachlor, cis-; Nonachlor, trans-; Oxychlordane); Cyclopentadienes (Aldrin; Dieldrin; Endrin); DDTs (DDD(o,p'); DDD(p,p'); DDE(o,p'); DDE(p,p'); DDT(o,p'); DDT(p,p')); HCHs (HCH, alpha-; HCH, beta-; HCH, delta-; HCH, gamma-); Organochlorines (Hexachlorobenzene; Mirex).
PFCs: Perfluorinated Compounds
PO_4: Phosphate (dissolved)
POC: Particulate Organic Carbon
Si: Silica (dissolved)
TN: Total Nitrogen
TOC: Total Organic Carbon
TP: Total Phosphorus



San Francisco Bay
Newark
Redwood Shores
Pond SF2
Pond AB1
Pond AB2
New Chicago Marsh
Pond A16
N
0 1 2 4 km

Shambhavi Thite, UC Davis - Undergraduate

Safe Places to Fish in San Francisco Bay

Top Smelt

Sonoma Baylands
Oakland Middle Harbor
Mission Bay

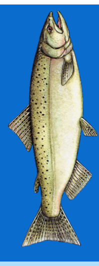
x South Basin near Candlestick Park

Shiner Surfperch

San Francisco Waterfront
San Pablo Bay
Carquinez Straits Region
Berkeley

x San Leonardo Bay

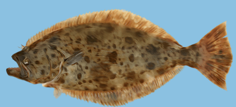
Chinook Salmon



Berkeley
Sacramento River
San Pablo Bay

x Lake Berryessa

California Halibut



Central Bay
San Pablo Bay
South Bay

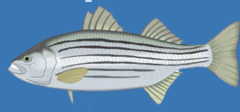
x San Francisco Waterfront

White Sturgeon

Central Bay
San Pablo Bay
Suisun Bay

x South Bay

Striped Bass



Suisun Bay
Central Bay
Berkeley

x South Bay

Leopard Shark

Berkeley
South Bay
Central Bay

x San Pablo Bay

X - Places to Avoid

Safe Fish to Eat in San Francisco Bay

Best

Top Smelt
Shiner Surfperch
Chinook Salmon

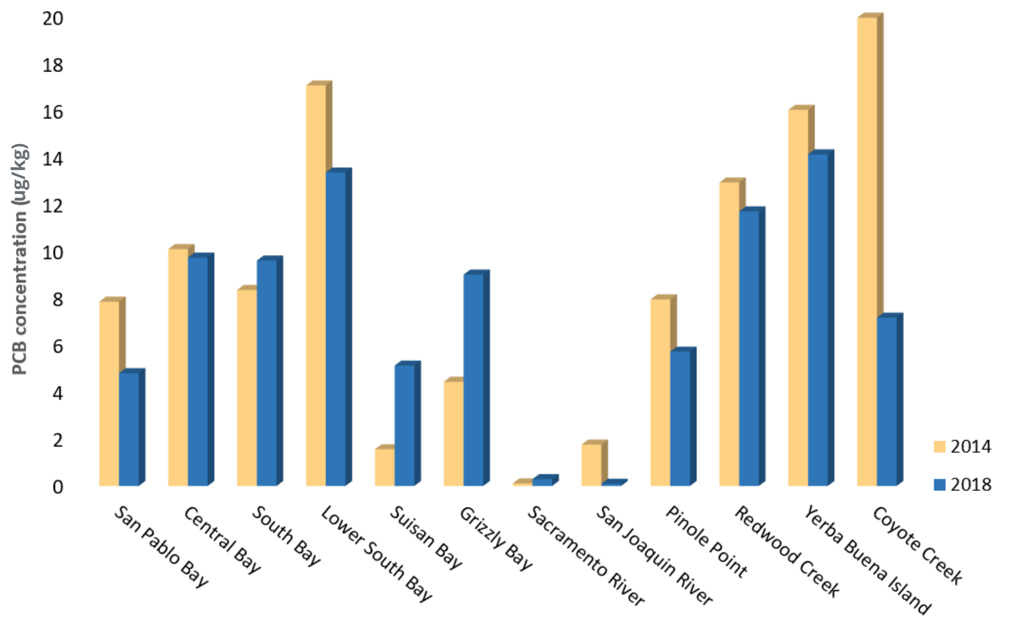
Good

California Halibut
White Sturgeon
Striped Bass

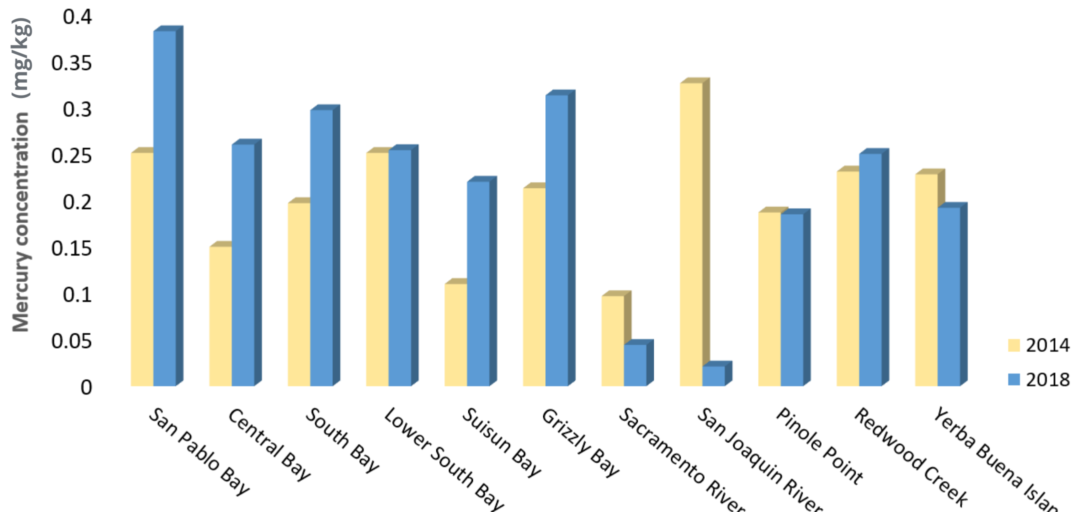
Avoid

Leopard Shark

Change in Polychlorinated Biphenyl (PCB) Contamination of Sediment



Change in Mercury Contamination of Sediment



Shambhavi Thite, UC Davis - Undergraduate

In this project, Safe Places to fish in San Francisco (SF) Bay with the lowest contamination of Mercury and Polychlorinated Biphenyls (PCB) were found so as to provide a guide for fishermen and their families. PCBs are man made industrial chemicals that are banned but persist in the environment as they bind strongly to sediment. Mercury is released into the aquatic system due to atmospheric deposition and point-source discharges. These contaminants bioaccumulate in fish tissue and if consumed, can cause serious health risks such as cancer and neurological deterioration.

To find the safest places to fish in SF Bay, SF RMP data for Sum of 40 PCBs and Mercury contamination in fish tissue was downloaded using the CD3 tool for seven different fish varieties. For relevance, only the most recent data was kept. Averages for each contaminant, for each fish variety in each location were found and this data was ranked from the least to most contaminated places to fish. Using EPA-FDA fish advisories, it was assessed whether concentrations for Mercury or PCB contamination posed a higher risk to human health for that specific fish variety and location. Using this method, the fish and fishing locations with the lowest overall contamination were found. To assess a change in sediment contamination, the SF RMP data of years 2014 and 2018 was graphed.

After analyzing data for sediment contamination of PCB and Mercury, it was found that the contamination for PCB is most acute in Yerba Buena Island, Lower South Bay and Central Bay whereas, for Mercury, it is most acute in San Pablo Bay, South Bay and Central Bay.

There is evidence that fish tissue and nearby sediment contamination are linked. It was found that the average contamination of PCB in both, fish tissue and sediment samples was highest in Lower South Bay and lowest in Suisun Bay. Similarly, the average contamination of Mercury in the fish tissue samples was highest in South Bay. This was as expected since South Bay had high PCB and Mercury concentrations of sediment contamination. Hence, South Bay and Lower South Bay especially, cannot be considered as a safe fishing location.

Despite this evidence, a consistent relationship between fish tissue and sediment was failed to be found. Fish tissue samples taken from San Pablo Bay had a relatively lower Mercury contamination, while the sediment sample had the most acute Mercury contamination. The elevated Mercury levels in the sediment of San Pablo Bay could be attributed to the loading of hydraulic mining debris that took place during the California gold-rush of the late 1800s. The inconsistent relationship between fish tissue and sediment contamination seen in few other samples, could be due to spatial and temporal variabilities. The concentration of contaminants adsorbed into sediment could be easily related to changes in temperature, pH, dissolved oxygen and the solubility.

The sediment contamination of PCBs and Mercury in 2014 and 2018 were analyzed and it was found that there was an overall decrease in PCB contamination of sediment. The overall Mercury contamination for sediment decreased from 2008 to 2014 but then spiked back up from 2014 to 2018. Hence, there was an overall improvement only in sediment contamination of PCB.

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Lealia Xiong, California Institute of Technology - PhD Candidate

Introduction

Mercury and polychlorinated biphenyls (PCBs) are two contaminants of concern for anglers in the San Francisco Bay. Mercury, in its elemental and methylmercury forms, can harm the nervous system. This can cause cognitive impairment, especially in children. Eating fish is the number one source of mercury exposure for Americans. Polychorinated biphenyls (PCBs) are industrial chemicals that were manufactured until 1979. A PCB congener is one chemical compound in the PCB category. There are 209 unique PCB congeners. PCBs can cause cancer as well as negatively affect the immune, reproductive, nervous, and endocrine systems. Despite the ban on PCB manufacturing, PCBs persist in the environment and can contaminate meat, dairy, water, and especially fish.

Methods

I obtained data from the Contaminant Data Display and Download (CD3) tool of the San Francisco Estuary Institute. I used Python 3.8 for all analysis and visualization. I used the Pandas package for data cleaning and Geoviews, Holoviews, and Bokeh for visualization.

Because the data came from different collection times and stations, I examined the units the results were reported in to ensure the data were all comparable (see supplementary information). Because of a significant difference in the distribution of mercury concentrations in fish tissue in ug/g dry weight (dw) versus ug/g wet weight (ww), I chose to plot data using the two units separately for the time series analysis. Mercury concentrations in sediment were reported in ug/kg dw and mg/kg dw, which should differ by three orders of magnitude. However, my analysis led me to conclude that the data belonged to similar distributions and the difference in units may be an error in reporting.

Fish and sediment were not collected at the same coordinates, so I grouped the data by county to facilitate comparisons.

Findings

The EPA recommends that people avoid eating fish that contain over 0.46 ug/g mercury. In the San Francisco Bay, the concentration of mercury in fish has decreased since 2003 such that the majority of fish contain less than this threshold. In recent years (2011-2015), fish caught off Pier 40 contain the lowest concentrations of mercury. The mercury concentration in sediment from the Bay does not show any trends over time except for a recent spike in Contra Costa county (El Cerrito). There is not a strong correlation between mercury levels in sediment and in fish.

The US tolerance for total PCBs in fish is 2000 ng/g wet weight. None of the fish sampled in San Francisco Bay in 2009 and 2010 reached this level. However, over those two years, the level of total PCBs increased. Individual PCB congeners spanned from 0 to 100 ng/g in fish tissue; the maximum concentration for any individual congener did not change over time. However, sediment in San Mateo county spiked to over 0.1 g/g in 2010, over ten thousand times higher than the next highest measurement. However, sediment concentrations have recovered to typical levels. Although much less data is available for total PCBs than for mercury, increased total PCBs in sediment appears to correlate strongly with total PCBs in fish tissue.

PCBs and Mercury Contamination in SF Bay
Visualization: https://ningning621.github.io/sfei-fish/
Lesley Huang

Through the visualization that I built, I attempted to guide the reader through two questions:

1. Where is the contamination most acute and how are fish and nearby sediment contamination linked?
2. Is there evidence of improvement over time in sediment and fish tissue in relations to contamination?

To collect data, I read through the Pulse of the Bay pamphlets and fish advisories before delving into the CD3 tool. The CD3 tool already provided a lot of useful insights on contaminants with the graphing and mapping feature, so I wanted to focus my visualization on highlighting the different segments in the SF Bay. I focused my attention on data points that were from the "SF Bay Segments - Basic Plan" area filter since that category seemed the most relevant, and I made sure to normalize all the units (ugk/g vs. mg/kg vs. ng/g).

As I was looking through the data, I noticed that there were large outliers for contaminants concentrations, especially data taken from 2003-2004, and there were also large gaps in missing data for some of the fish species. To make the graphs a little less misleading, I normalized that data by plotting the average of the concentrations instead of the raw total since plotting totals would bias the insights towards fish species and contaminants that were outliers. All of the processing work was done through Javascript and code.

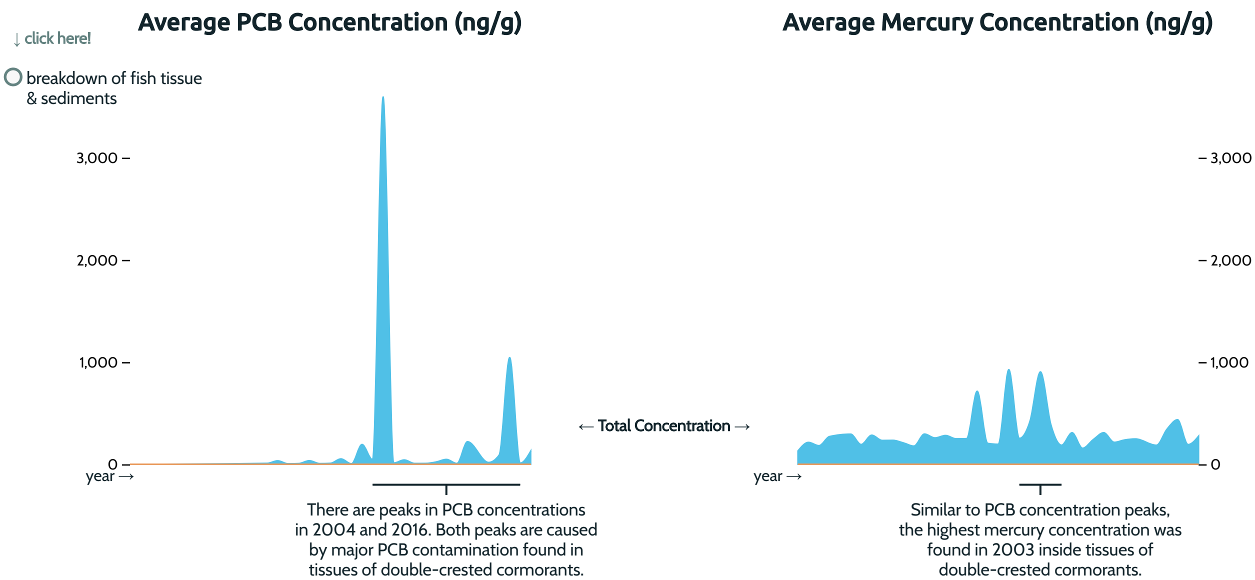
Through this process, I found that the peak periods of contamination for PCBs and Mercury in SF Bay was in 2004 and 2016 (though less major), but ever since the 2004s, contamination has been on the decline, meaning that the efforts that we're making to reduce these contaminants are paying off. Furthermore, the majority of the contaminants were found in fish tissues as opposed to sediments. PCB concentrations are on average relatively low, minus Central SF Bay being a slight concern with 294.86 ng/g of PCBs in fish tissues. Mercury, on the other hand, is fairly prevalent across almost all seven segments of the SF Bay, with the most detected in South SF Bay. As the graphs in the visualizations show, there is a correlation between fish tissue contamination and sediments contamination. Finally, I attempted to end the visualization on a happier note with advice on how to safely consume fish and which fishes are historically known to be low in contaminants. I believe that it was important to highlight the major trends and warning signs in the contaminants data while still provide actionable advice to readers about how they should consume fish from SF Bay.

PCBs and Mercury Contamination in SF Bay

Lesley Huang - Cornell University

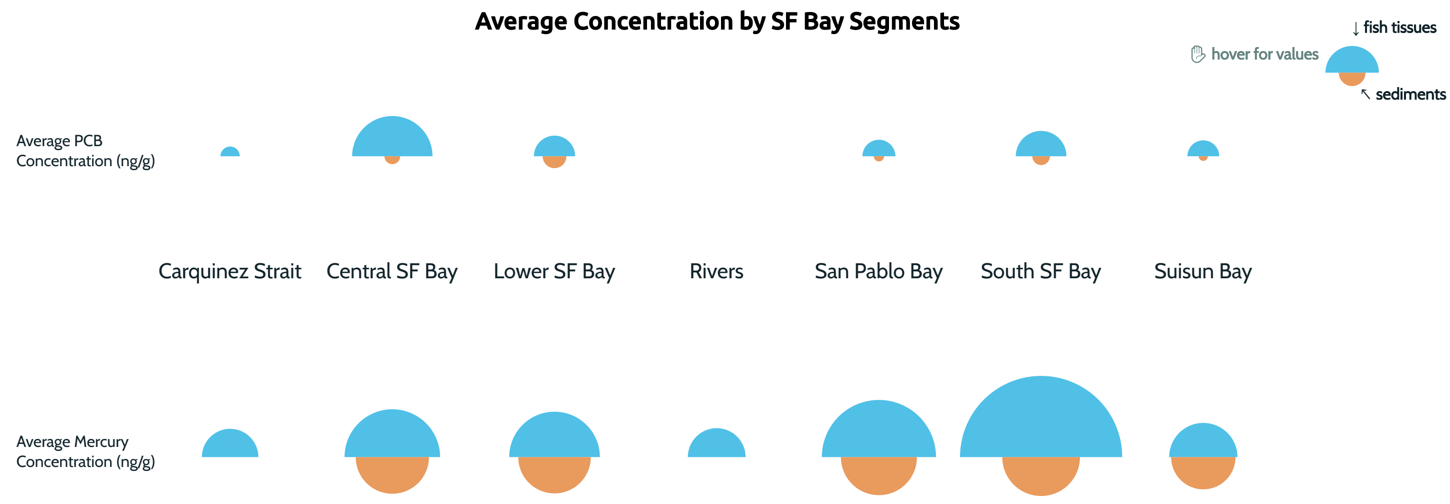
PCBs and mercury are two of the most dangerous contaminants in SF Bay waters. PCBs are known to cause cancer and other health risks while mercury is known to harm the brain and the nervous system. Since we consume wildlife from the SF Bay, it is important to be aware of the potential contaminants that the wildlife may contain.

If we were to compare PCB and mercury concentrations in fish tissues and sediments through 1980-2018, we can see from the graphs that PCB contamination is much more potent than that of mercury. More importantly, it's interesting that most of the containimation exists in fish tissues instead of sediments. (Note: results are normalized to reduce bias with testing frequency).

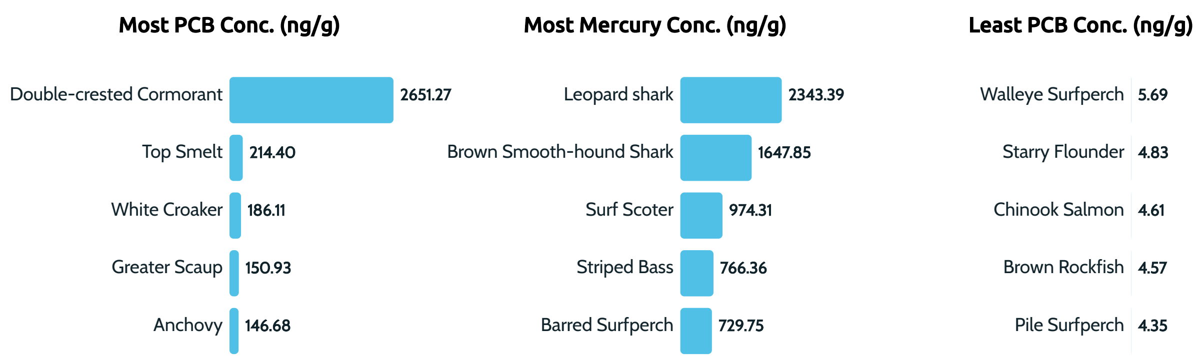


It is important to note from the graph above that peaks in contaminants' concentration occurred around 2003-2004, but ever since, there is a clear and conscious effort to reduce such contaminants, as evident by the graph.

Surprisingly, when we normalize the data by region (instead of by year), the outliers from 2003-2004 are reduced, and we see that, overall, it is more common to find mercury contaminations, especially in South SF Bay and San Pablo Bay. Another consistent pattern is that mercury tends to be prevalent in both fish tissues and sediments across the Bay while PCB isn't found commonly besides Central SF Bay.



Knowing that the SF Bay waters are not completely clean of contaminants, what does this say about the types of fish that we can safely consume? Let's take a look at the species to avoid based on contaminants' concentration. The Office of Environmental Health Hazard Assessment recommends that fishes are fully grilled or cooked before consumption to reduce chemicals. For the most part, PCBs can be cooked away while mercury cannot be removed through cooking.



The low numbers mean that these ↑
fish species are safe to eat! 🍴

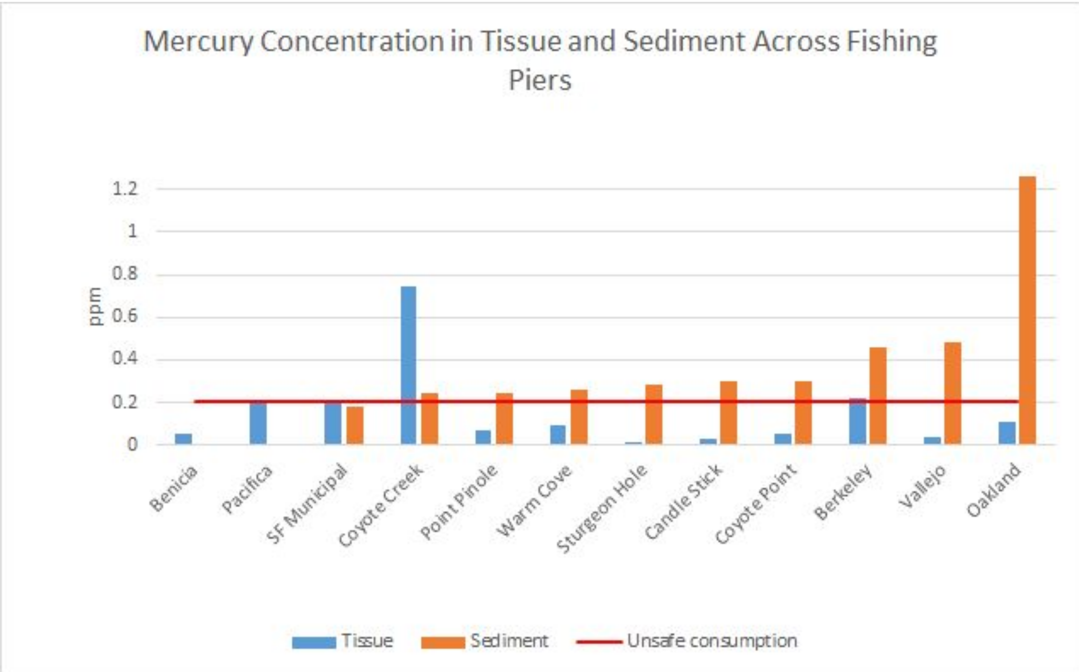
Built by Lesley 🐠🐡🐟

Mercury and PCB Contamination in the Bay

An evaluation of toxin concentrations in common fishing areas of the
San Francisco Bay

Elianna Kondylis

Most Contaminated Areas

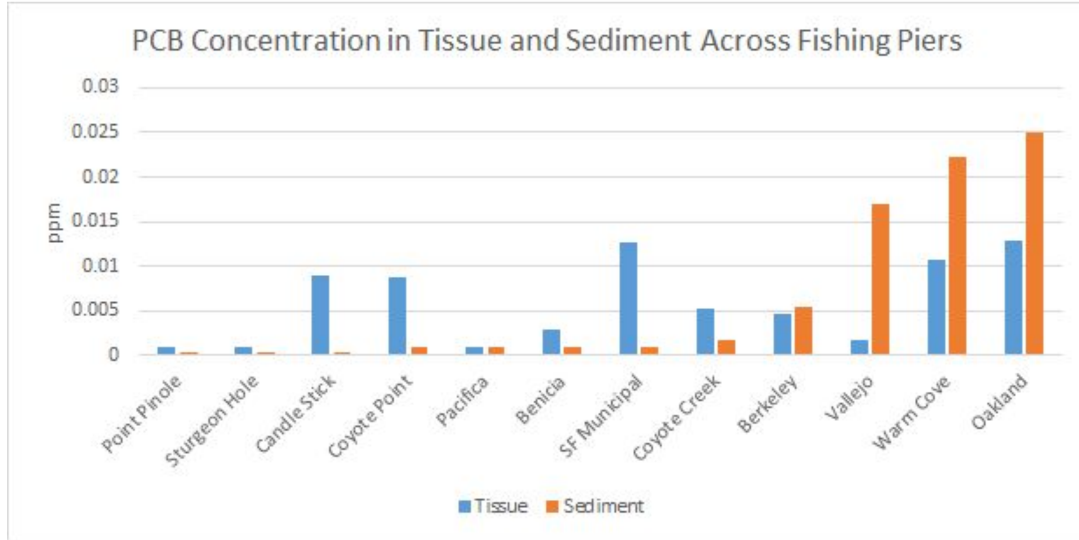


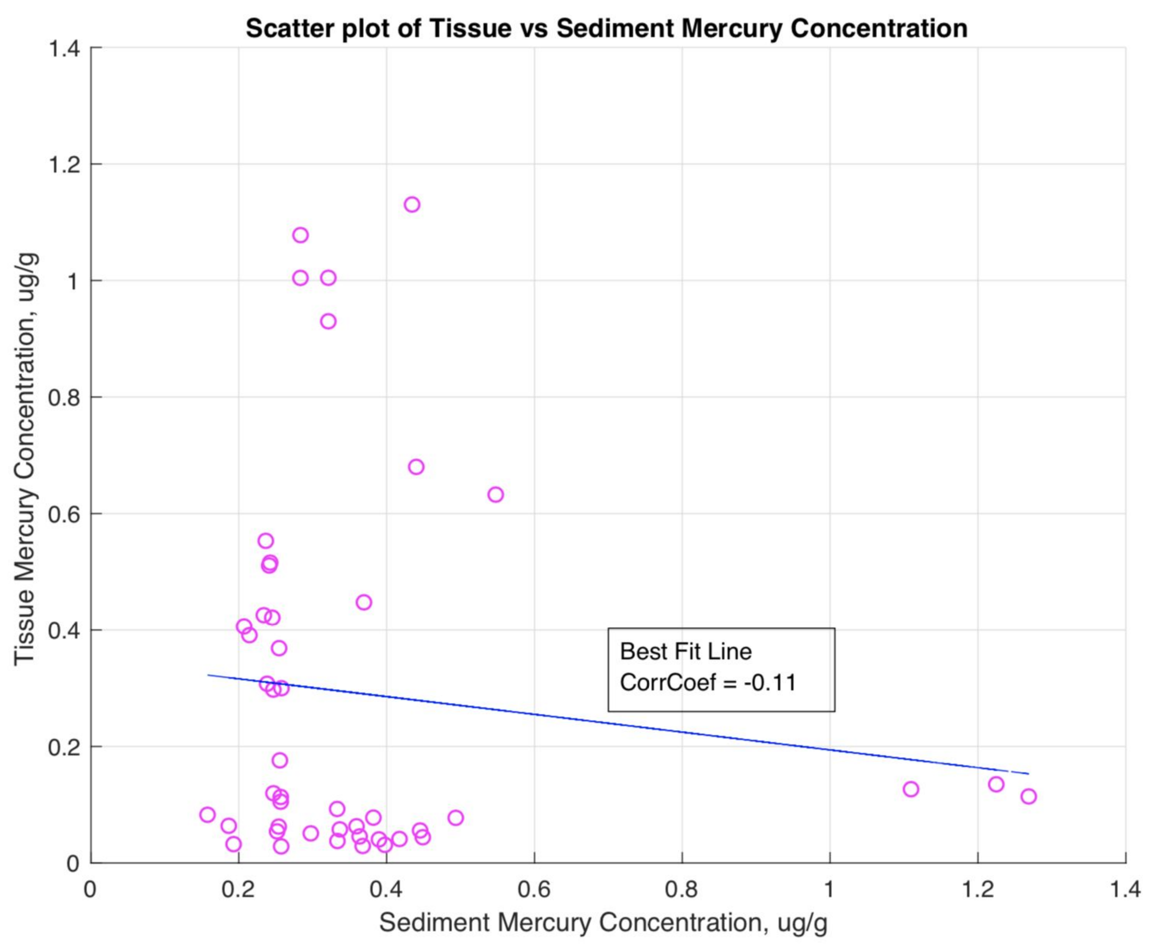
MERCURY

Oakland
Vallejo
Berkeley
Coyote Creek

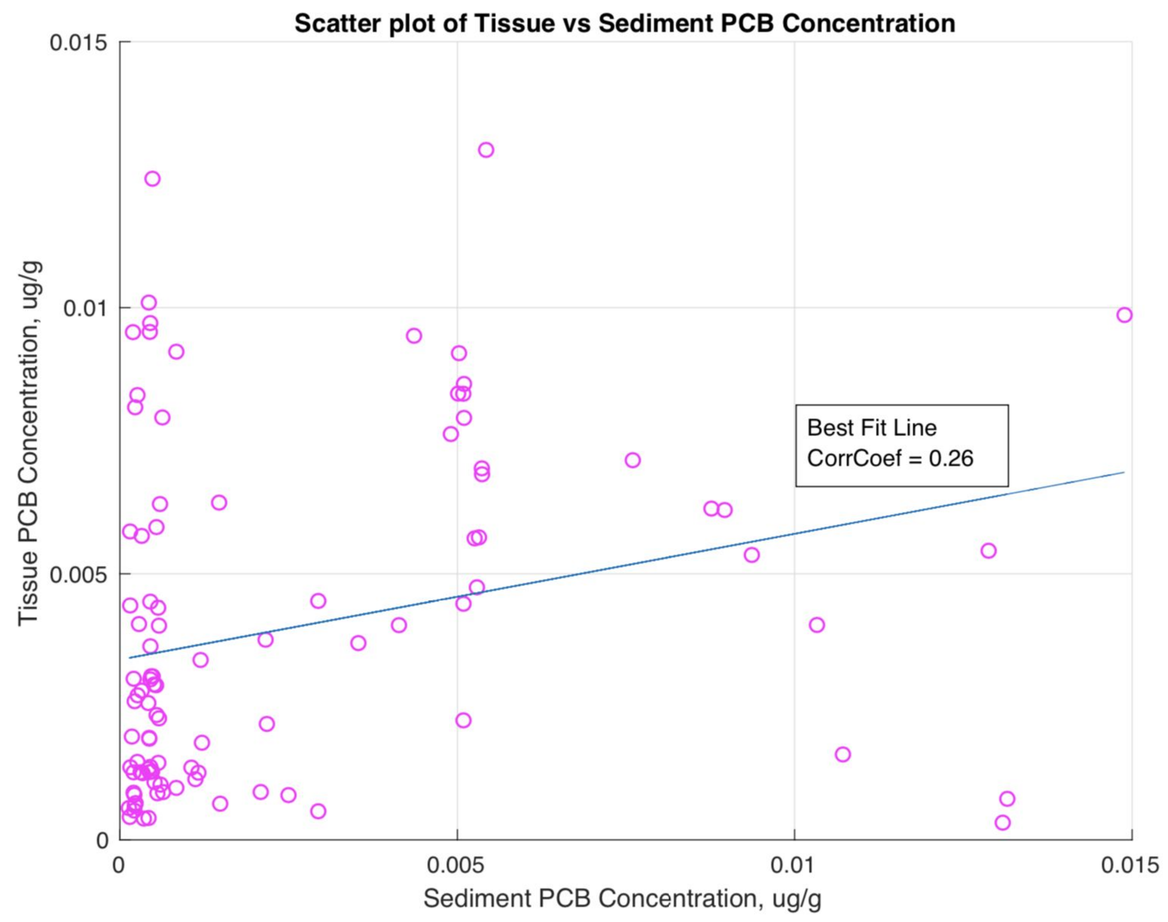
PCB

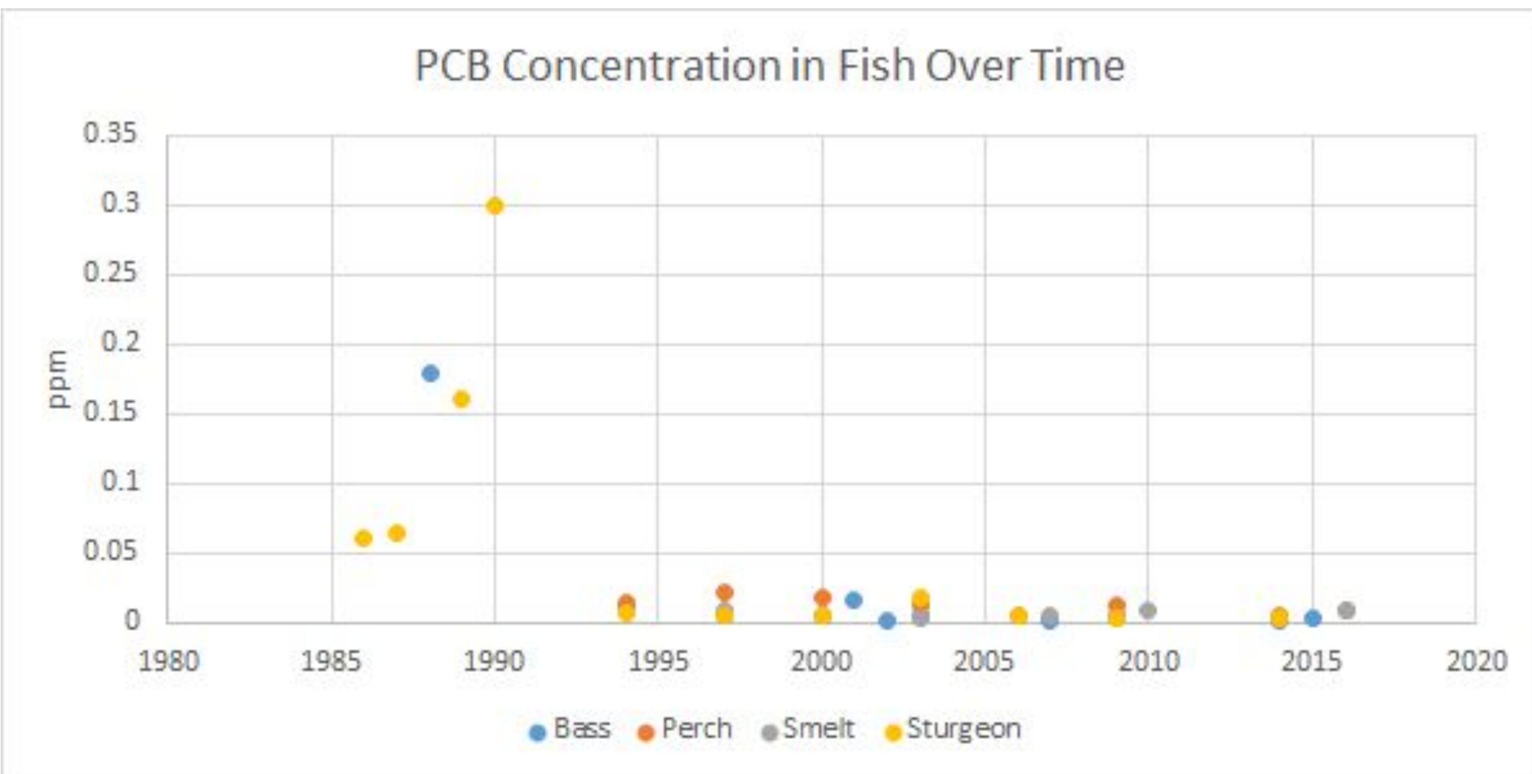
Oakland
Warm Cove
Vallejo



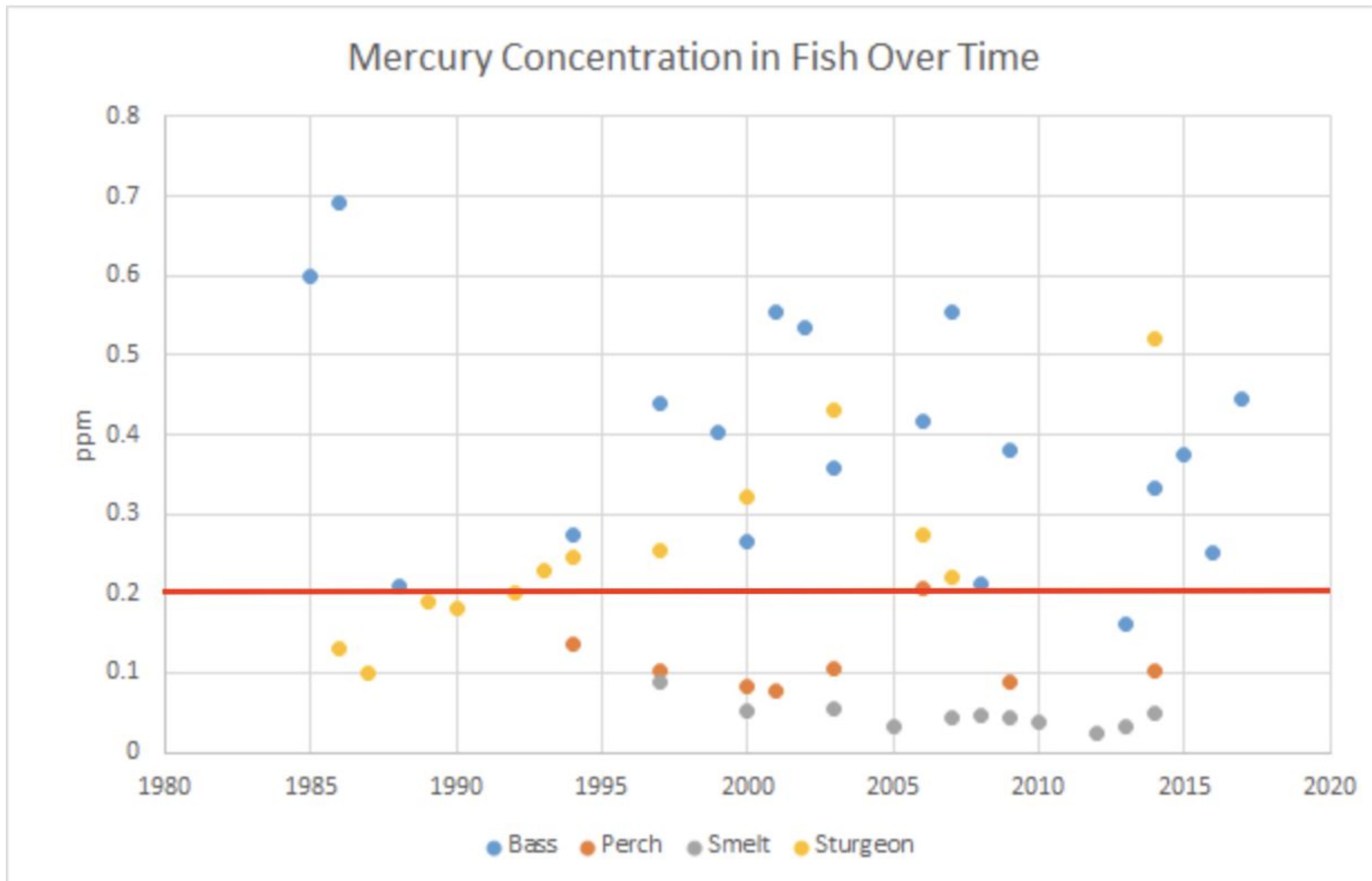


There is no correlation between sediment and tissue for mercury or PCB. The lack of correlation may be caused by low variability in sediment values.





PCB contamination in fish tissue has remained low since 1995. In contrast, mercury contamination in fish is still a problem; bass and sturgeon should be avoided.



https://github.com/elikond/SFEI_Challenge

Mercury and PCB Contamination in the Bay

Elianna Kondylis, 10th grade at The Nueva School, San Mateo

I wrote Python scripts to analyze the data in the spreadsheets I downloaded from the SFEI database. I uploaded my code to GitHub: https://github.com/elikond/SFEI_Challenge.

Where is contamination the most acute?

This analysis explores which areas of the San Francisco Bay have the highest concentrations of mercury and polychlorinated biphenyl (PCB). Mercury and PCB are toxins which have been proven to negatively affect human health; high levels of methylmercury and PCB can stunt childrens' development and cause cancer in animals (OEHHA 2011).

To select the data for this project, I applied the following filters to the Contaminant Data Display and Download (CD3) tool: "Sediment Toxicity," and "Tissue" (Analyte Groups); "Mercury" (Analyte) and "PCBs" (Analyte Group). For this question, I only selected data from the year 2000 and forward. For sediment data, I allowed for values in ug/g (equivalent to ppm), ng/g, mg/kg and ug/kg, and translated all to ug/g (results in ng/g and ug/kg got divided by 1000, others remained the same). For tissue data, I allowed for all types of fish and only for the units of wet and dry weight because the overwhelming majority of the data were in those units. I used the formula: wet weight = dry weight/5 to translate everything to wet weight in ug/g.

I started my analysis by selecting twelve fishing piers from the provided Fishing Maps 1 and 2 which span the Bay: Benicia, Sturgeon Hole, Coyote Point, Candle Stick, Warm Cove, Point Pinole, San Francisco Municipal, Pacifica, Vallejo, Coyote Creek, Berkeley, and Oakland. I then found the latitude and longitude of every pier from Google Maps. Using Python, I drew a circle of radius 2.5 miles around each one. I then averaged all the data points which were collected in a circle to calculate the average value of mercury and PCB for that area.

Figure 1

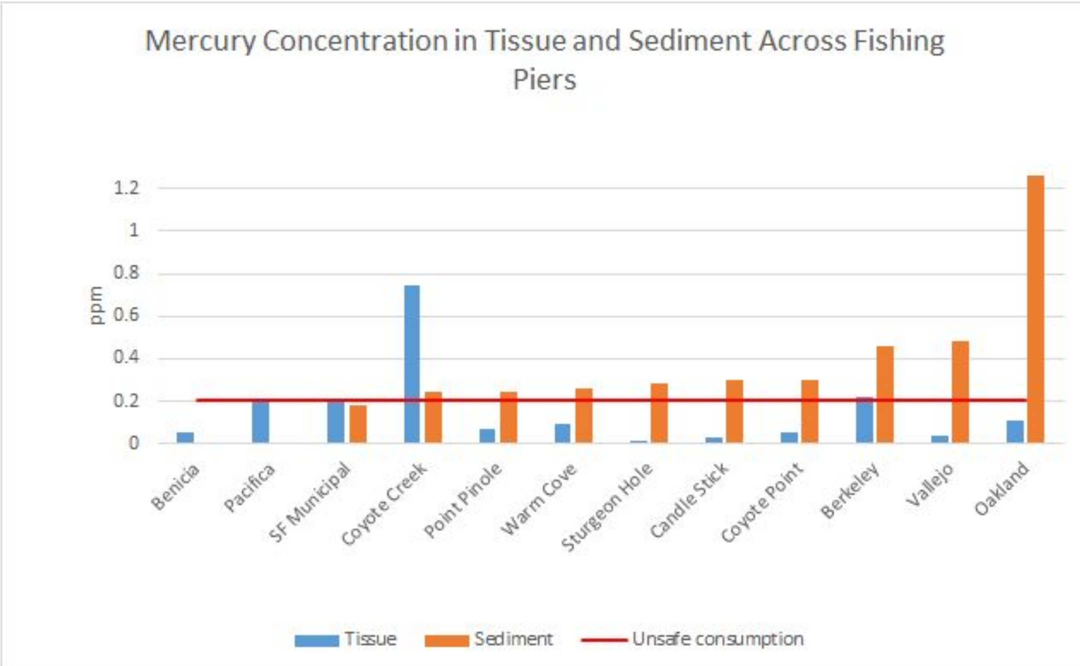
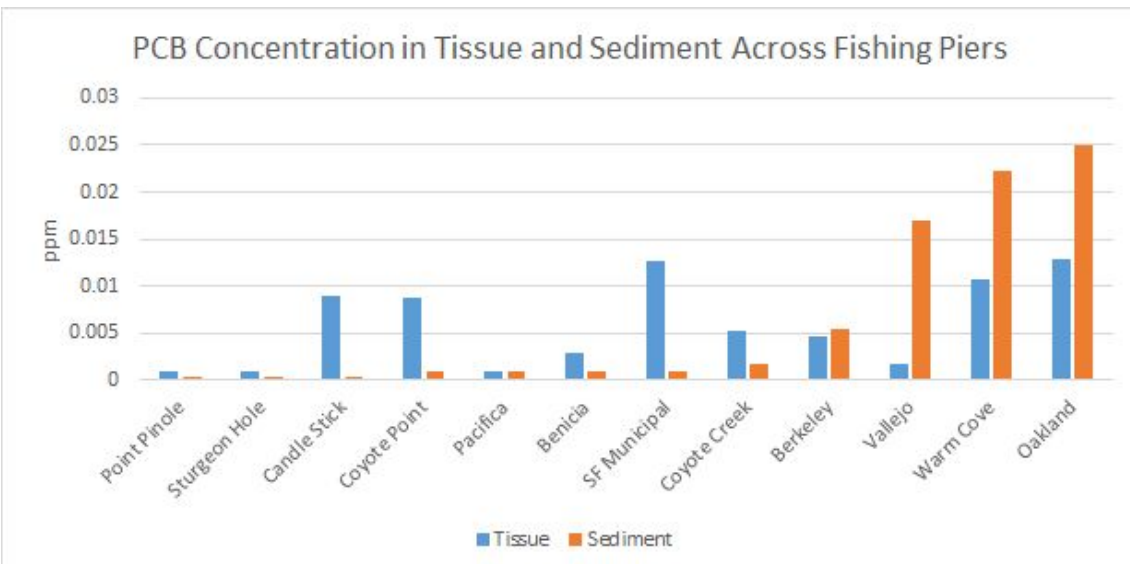


Figure 2



The red line at 0.2 ppm on Figure 1 indicates the level of unsafe mercury consumption according to the California government mandate (BACWA 2004). The FDA has set the level of unsafe PCB consumption at 2 ppm; the data in Figure 2 is well below 2 ppm so I did not graph a line (ATSDR 2014).

As Figure 1 shows, Oakland, Vallejo, Berkeley, Coyote Point, Candle Stick, Sturgeon Hole, Warm Cove, Point Pinole, and Coyote Creek all have unsafe mercury contamination in sediment. Coyote Creek, Berkeley and SF Municipal have unsafe mercury contamination in tissue. Although Oakland and Vallejo have the highest concentrations in sediment, they have low concentrations in tissue. However, sediment concentrations are more telling than tissue concentrations because “[m]ercury binds to sediment particles, so mercury concentrations in the sediment deposits on the bottom of the Bay are an important index of contamination of the ecosystem” (SFEI 2017).

As seen in Figure 2, while Oakland, Warm Cove, and Vallejo are the areas with the highest PCB concentrations in sediment, their concentrations are still well below the unsafe threshold. I followed precedent and sorted the data in terms of sediment contamination instead of tissue contamination as “concentrations of PCBs and mercury on suspended sediment particles...are measured as an index of the degree of watershed contamination and potential for effective management action” (SFEI 2017).

These results are important not only because they help anglers find safe areas to fish but also because they inform scientists of the areas where load reduction is critical/where contamination management has been ineffective.

Is there evidence that fish and nearby sediment contamination are linked?

For this research question, I also used data from 2000 and forward and converted all data into ppm. I only included values from stations that had collected more than ten tissue/sediment measurements to increase the accuracy of the calculations. Using Python, I created a circle of radius 2.5 miles around each station. I averaged the sediment values and then the tissue values within those regions. From every circle, I got an (x, y) point; x representing the sediment value and y representing the tissue value. I created a scatter plot of all the (x, y) points.

Figure 3

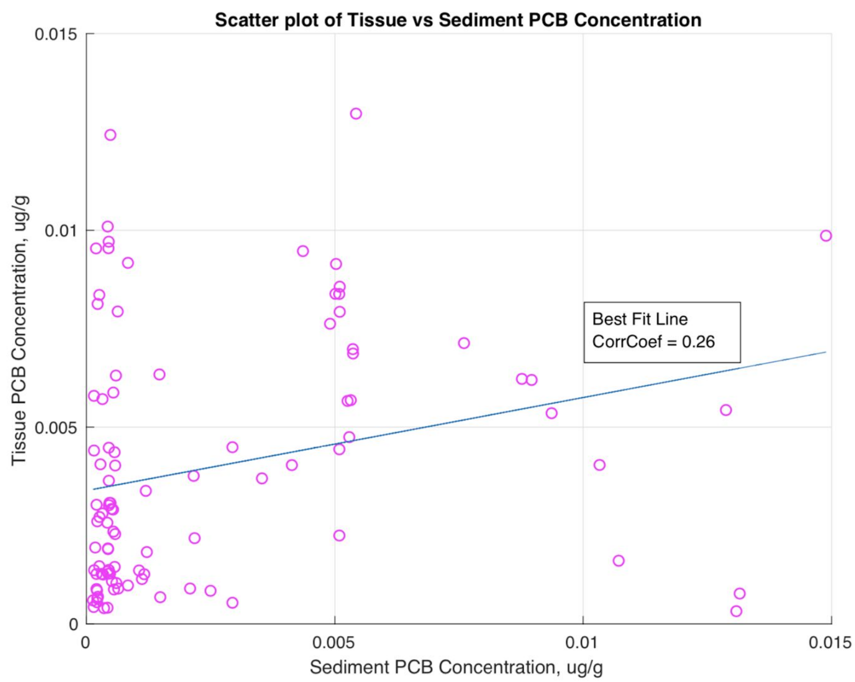


Figure 4

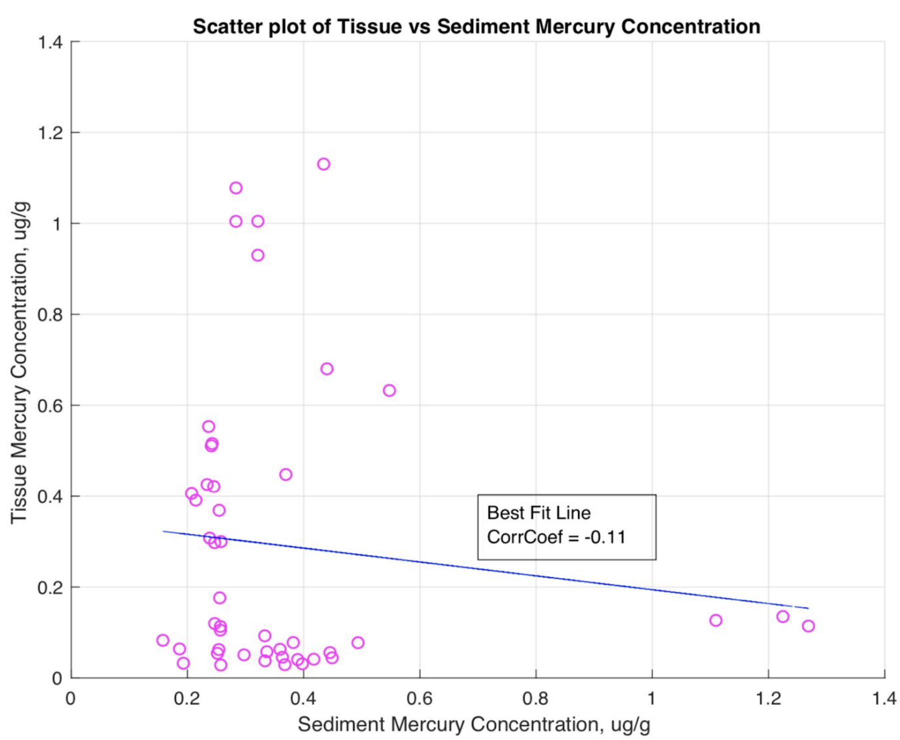
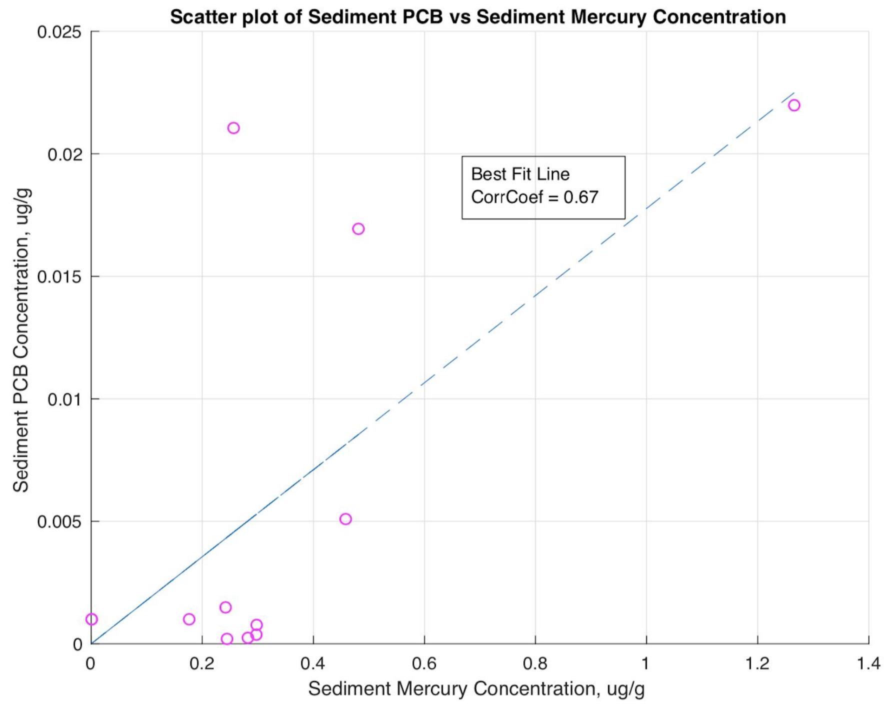


Figure 5

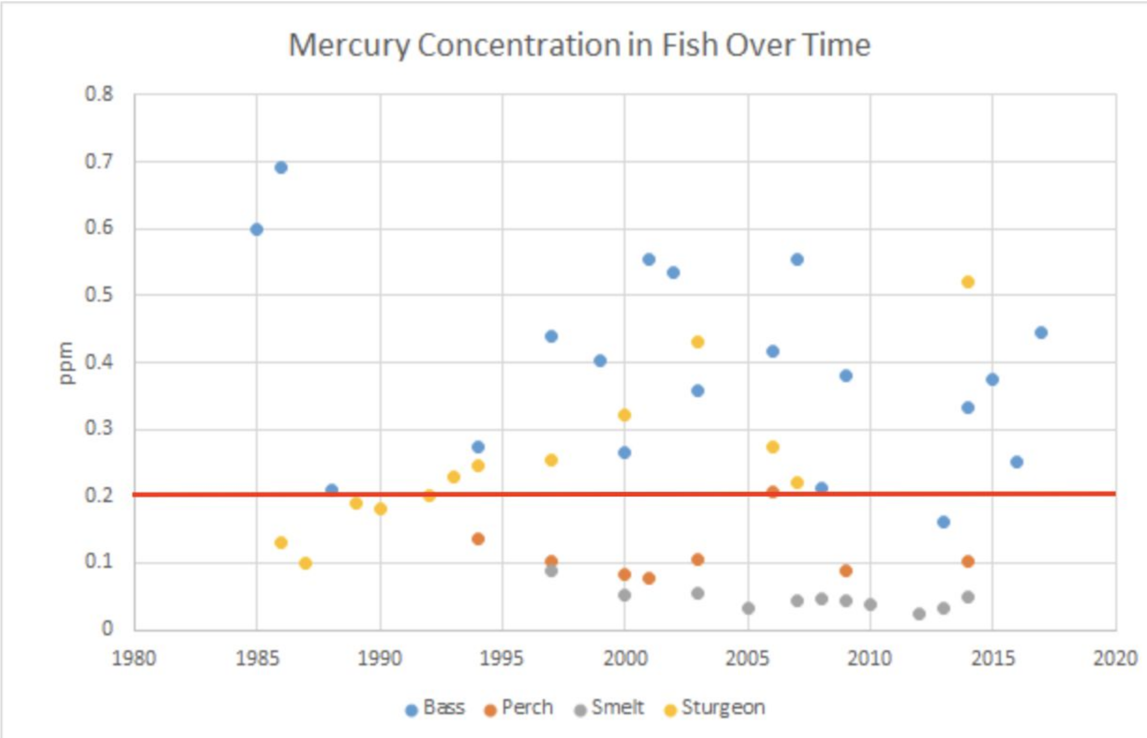


As the Figure 3 and 4 show, there is a low correlation between mercury or PCB concentrations in sediment and tissue (the correlation coefficients are -0.11 for mercury and 0.26 for PCB). The low correlation between tissue and sediment concentrations may be caused by the low variability in the sediment values. However, there is correlation between mercury and PCB concentrations in sediment (correlation coefficient is 0.67). This correlation makes sense because areas with high waste water dumps and agricultural runoff receive both PCB and mercury. Thus, areas with high contaminant loads will have both high PCB and high mercury concentrations in the sediment.

Is there evidence of improvement over time in sediment and/or fish tissue?

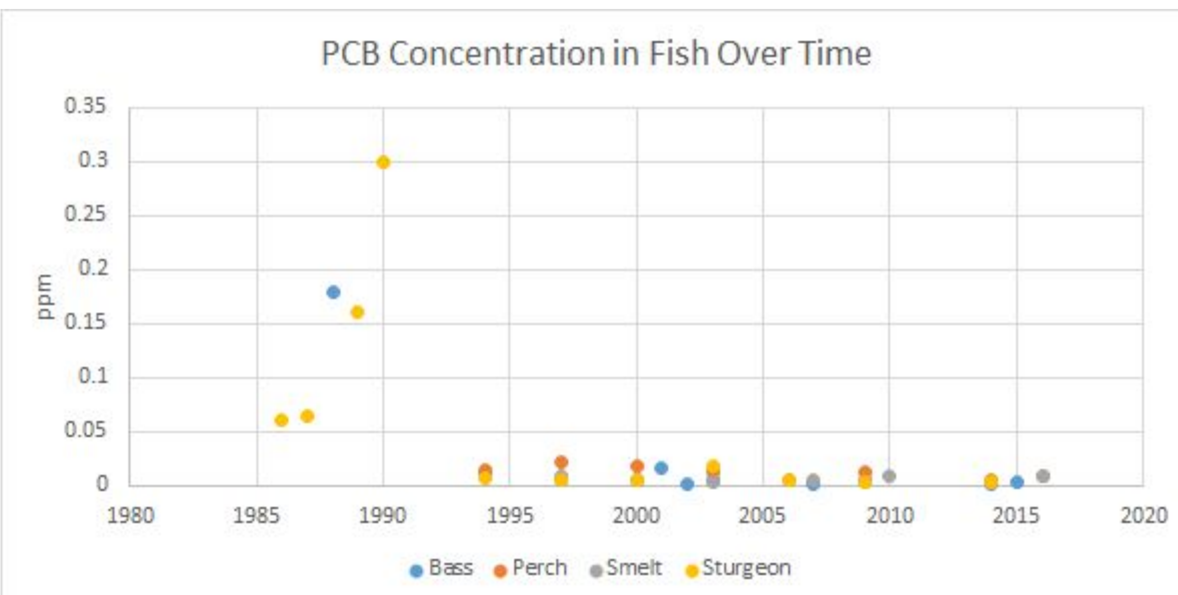
For the final research question, I analyzed data from 1985 and forward. I took data from across the Bay for four fish. I combined subspecies into the general category (i.e. "Striped Bass" and "Largemouth Bass" both fell under bass; "Top Smelt" and "Jacksmelt" both fell under Smelt). I took the values of all these fish and averaged them per type per year.

Figure 6



*Red line indicates unsafe consumption levels

Figure 7



Mercury concentrations displayed in Figure 6 are much more troubling than PCB concentrations shown in Figure 7. Bass and sturgeon mercury levels have mostly remained above unsafe consumption levels through the years. Sturgeon concentrations rose in a relatively linear fashion from 0.1 ppm in 1987 to 0.5 ppm in 2014. On the other hand, perch and smelt mercury concentrations have remained relatively steady below unsafe levels; they stood at 0.1 and 0.05 ppm respectively.

As seen in Figure 7, PCB concentrations for all fish remained low. Sturgeon and Bass concentrations were highest between 1985 and 1990, however, they dropped to below 0.05 ppm in the next five years. Data collection on PCB contamination in perch and smelt started later on, with values between 0.05 and zero.

References

ATSDR. 2014. Public Health Statement: Polychlorinated Biphenyls (PCBs). Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health.

BACWA. 2004. Public Health Statement: Mercury TMDL. Bay Area Clean Water Agencies, Clean Estuary Partnership.

OEHHA. 2011. Public Health Statement: Mercury and Polychlorinated Biphenyls (PCBs). Office of Environmental Health Hazard Assessment, California Office.

SFEI. 2017. The Pulse of the Bay: The 25th Anniversary of the RMP. SFEI Contribution #841. San Francisco Estuary Institute, Richmond, CA.

Bay RMP Action Items

Key to Status Colors:

Green indicates greater than 90 days until the deliverable is due.

Yellow indicates a deliverable due within 90 days.

Red indicates a deliverable that is overdue.

Primary	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	# of extensions	Due Date Extended (external delay)	Due Date Extended (internal delay)	Status	Comments	Meeting Date
Steering Committee Action Items from 10/21/20	Review RMP funding structure at upcoming SC meeting	Melissa Foley	01/31/21								10/21/20
Steering Committee Action Items from 10/21/20	Substitute South bay, selenium TMDL for alternative management decision as well as add LTMS and DMMO sediment goals and criteria to the MYP priority management list	Melissa Foley	01/31/21								10/21/20
Steering Committee Action Items from 1/22/20	Ask oil spill stakeholders for data needs required for keeping PAH baseline, and bring information to S&T Redesign subgroup for discussion.	Jay Davis	03/30/21	06/30/20	155	1					01/22/20
Technical Review Committee Action Items from 9/26/19	A RMP representative and an EPA representative (Terry Fleming) should attend the Delta RMP's equivalent Multi-Year Planning meeting	Melissa Foley	06/01/21	07/31/20	124	2				Delta RMP did not have a multi-year planning meeting in 2020	09/26/19

Bay RMP Deliverables Scorecard Report

Key to Status colors:
Green indicates greater than 90 days until the deliverable is due.
Yellow indicates a deliverable is due within 90 days.
Red indicates a deliverable that is overdue.

Focus Area	Project	Task	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	Due Date Extended (external delay)	Due Date Extended (internal delay)	# of extensions	Status	Comments
Emerging Contaminants	Bay RMP (2017)	Triclosan in Small Fish	Report on triclosan in small fish	Diana Lin	09/30/20	07/31/18	855	⚑	⚑	3	🔴	Report initially delayed because lab partner had not provided data. AXYS was still finalizing the lab method. Data now received and analyzed. Results will be presented at ECWG in April 2019. New schedule: Draft by fall 2020. Delayed further due to internal workflow challenges and priorities.
PCB Strategy	Bay RMP (2017)	PCB Margins Conceptual Model	Steinberger Slough Priority Margin Unit Conceptual Model Report	Jay Davis	09/30/20	08/31/17	1189	⚑	⚑	4	🔴	Revised due dates due to workflow and timing of WG meeting. Draft for WG/TRC/SC by March 2019. Analyses nearly completed, but did not reach goal of completing before PCBWG meeting. Work is progressing, but workflow issues due to competing priorities and holidays. Draft will be ready in January. Draft report distributed to PCBWG and TRC on Feb 3. Comment period ends on Mar 6. Waiting for comments from PCBWG advisor Frank Gobas. Comments received from Frank Gobas on June 23. Workflow issues preventing this from being finished.
Emerging Contaminants	Bay RMP (2018)	North Bay Post-Fire Monitoring	Brief technical memorandum with results of non-targeted analysis	Rebecca Sutton	09/30/20	11/30/18	733	⚑	⚑	3	🔴	On 10/24 SC approved additional 22k of undesignated funds to analyze additional (previously collected) samples. Final document is delayed due to continuing analysis on the part of our analytical partners. Manuscript is in preparation; COVID-19 delays have impacted workflow of analytical partners. Memo preparation to begin shortly.
	Bay RMP (2020)	3. QA and Data Services	QAPP Update	Don Yee	09/30/20	07/31/20	124	⚐	⚑	1	🔴	Need to make changes for new sediment ancillary lab
	Bay RMP (2020)	47. Sediment bioaccumulation threshold review for PCBs	Final report	Diana Lin	10/31/20			⚐	⚐		🔴	
Selenium Strategy	Bay RMP (2017)	2017 Sturgeon Derby Monitoring	Data management	Nina Buzby	12/31/20	09/30/17	1159	⚐	⚑	1	🟡	Data mgmt for this got lumped in with planned data mgmt for NB selenium monitoring work
PCB Strategy	RMP SEP	12. PCB Shiner Surfperch PMU Survey	Sample collection and analysis (documented in S&T Sampling and Analysis Plan and Sampling Report)	Jay Davis	12/31/20	12/31/19	337	⚑	⚑	3	🟡	Coordinated sampling of PCBs in shiner surfperch in four PMUs as an add-on to S&T sport fish sampling. https://www.sfei.org/sites/default/files/events/PCBWG%20-%2003%20-%20Shiner%20Surfperch%20PMU%20Survey%20Revised.pdf Collection is complete, but analysis has not yet been completed. Samples being sent to SGS AXYS by mid-March. MLML lab lockdown delayed sample processing. Completion of sample processing delayed to end of July due to COVID closure of MLML.
Emerging Contaminants	RMP SEP	16. Sunscreen in Wastewater	Sample collection and analysis	Diana Lin	02/27/21			⚐	⚐		🟡	
QA and Data Services	Bay RMP (2019)	3. QA and Data Services	QA Summary Report for 2019 S&T Activities	Don Yee	12/31/20	03/31/20	246	⚑	⚐	2	🟡	Sport fish samples still being analyzed.
Status and Trends	Bay RMP (2019)	6. Status and Trends Monitoring	Processing and upload Sport Fish data	Adam Wong	01/15/21	12/31/19	337	⚑	⚐	4	🟡	Due date extended based on time required for labs to complete their analyses. Coronavirus shutdowns have delayed sample homogenization and shipping to labs.
Emerging Contaminants	Bay RMP (2019)	Ethoxylated Surfactants Study	QA of data and upload to CEDEN	Adam Wong	01/01/21	02/28/20	278	⚑	⚐	1	🟡	Data collection delayed due to COVID-19.
	Bay RMP (2020)	1. Program Management	Q4 RMP Financial Report	Jennifer Hunt	01/31/21			⚐	⚐		🟡	
	Bay RMP (2020)	1. Program Management	RMP Participation Letters for BACWA and WSPA Agencies	Melissa Foley	12/31/20			⚐	⚐		🟡	
	Bay RMP (2020)	1. Program Management	Honoraria Payments to Science Advisors	Melissa Foley	12/31/20			⚐	⚐		🟡	
	Bay RMP (2020)	2. Governance	December TRC Meeting	Melissa Foley	12/12/20			⚐	⚐		🟡	
	Bay RMP (2020)	3. QA and Data Services	Online Data Access CD3	Cristina Grosso	12/31/20			⚐	⚐		🟡	
	Bay RMP (2020)	3. QA and Data Services	Database Maintenance	Adam Wong	12/31/20			⚐	⚐		🟡	
	Bay RMP (2020)	3. QA and Data Services	Updates to SOPs and Templates	Adam Wong	12/31/20			⚐	⚐		🟡	
	Bay RMP (2020)	3. QA and Data Services	DMMO Database Support	Cristina Grosso	12/31/20			⚐	⚐		🟡	
	Bay RMP (2020)	5. Communications	Q4 Estuary News Article	Jay Davis	12/31/20			⚐	⚐		🟡	
	Bay RMP (2020)	5. Communications	Q4 RMP eUpdate	Jay Davis	12/31/20			⚐	⚐		🟡	
	Bay RMP (2020)	6. Status and Trends Monitoring	Process and upload NB Margins data	Adam Wong	02/28/21	12/31/20		⚑	⚐		🟡	Sampling delayed due to pandemic shutdowns. Labs have until January to report the results.
	Bay RMP (2020)	6. Status and Trends Monitoring	Maintain and enhance the Archive Data Sample tool	michaelw@sfei.org	12/31/20			⚐	⚐		🟡	
	Bay RMP (2020)	6. Status and Trends	Garage & lab manager		01/01/21			⚐	⚐		🟡	
	Bay RMP (2020)	35. EC Bisphenols	Sample collection & analysis	Rebecca Sutton	12/31/20	09/30/20		⚐	⚐		🟡	Wastewater samples have been collected; analysis has not been completed.

Focus Area	Project	Task	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	Due Date Extended (external delay)	Due Date Extended (internal delay)	# of extensions	Status	Comments
	Bay RMP (2020)	43. Update of Erosion and Deposition in San Francisco Bay	Composite DEM of 2014-15 bathymetric surveys	Scott Dusterhoff	12/31/20							
	Bay RMP (2020)	44. Golden Gate Sediment Flux Modeling Study	Technical memorandum	Scott Dusterhoff	01/31/21							
	Bay RMP (2020)	26. Advanced data analysis	Final report	Lester McKee	12/31/20	08/31/20						This needs to be delayed. We have provided the draft results to STLS in June but as yet they have not provided any comments. We will continue working on the report in the mean time and have asked for comments back from them by eary September 2020.
	Bay RMP (2020)	27. STLS/SPL workgroup coordination and strategy	Hold 8 meetings	Lester McKee	12/20/20							
	Bay RMP (2020)	27. STLS/SPL workgroup coordination and strategy	Meeting summaries	Lester McKee	12/20/20							
	Bay RMP (2020)	30. POC watershed reconnaissance stormwater sampling	Reporting to BASMAA	Alicia Gilbreath	02/28/21							
	Bay RMP (2020)	29. Regional model development to support management decisions	Hydrology calibration and report	tanz@sfei.org	12/31/20	12/31/19						Dates pushed back a year after Jing left.
PCB Strategy	RMP SEP	11. PCB Stormwater Monitoring for PMUs	Analysis of stormwater samples from Emeryville Crescent sites in WY19 and WY20	Alicia Gilbreath	04/30/21	09/30/20	63			1		Samples will be collected with core funds (3018-021). Results will be reported in the WY20 STLS POC Recon Sampling Report. https://www.sfei.org/sites/default/files/events/PCBWG%20-%2002%20-%20Priority%20Margin%20Unit%20Stormwater%20PCB.pdf Due to low rainfall, sampling was not completed in WY20 and so the study shall be extended into WY21.
PCB Strategy	RMP SEP	11. PCB Stormwater Monitoring for PMUs	Collection and analysis of stormwater samples from San Leandro Bay sites in WY19 and WY20	Alicia Gilbreath	04/30/21	09/30/20	63			1		Results will be reported in the WY20 STLS POC Recon Sampling Report. Due to low rainfall, sampling was not completed in WY20 and so the study shall be extended into WY21.
PCB Strategy	RMP SEP	12. PCB Shiner Surfperch PMU Survey	Special Section in report on RMP S&T Sport Fish Sampling	Jay Davis	03/31/21	12/31/20	-29			1		Draft report by 1/31/21; Final by 3/30/21
Sources Pathways and Loadings	RMP SEP	14. Quantifying Stormwater Flow and Sediment Flux to the Bay	Technical Report	Lester McKee	12/01/21							
Sources Pathways and Loadings	RMP SEP	14. Quantifying Stormwater Flow and Sediment Flux to the Bay	Summary Factsheet	Lester McKee	12/01/21							
Sources Pathways and Loadings	RMP SEP	14. Quantifying Stormwater Flow and Sediment Flux to the Bay	Post data to CD3	Lester McKee	12/01/21							
Selenium Strategy	RMP SEP	15. North Bay Selenium Clam and Water Data Management and Reporting	QA / QC and Data management	Jay Davis	06/30/21							
Selenium Strategy	RMP SEP	15. North Bay Selenium Clam and Water Data Management and Reporting	Upload to CEDEN	Jay Davis	06/30/21							
Emerging Contaminants	RMP SEP	16. Sunscreen in Wastewater	QA/QC and data management	Diana Lin	05/31/21							
Emerging Contaminants	RMP SEP	16. Sunscreen in Wastewater	Technical Report	Diana Lin	10/31/21							
Sediment Strategy	RMP SEP	17. USGS Sediment Settling Velocity South Bay	Present initial results at Sediment Workgroup Meeting	Melissa Foley	05/31/21							
Sediment Strategy	RMP SEP	17. USGS Sediment Settling Velocity South Bay	Upload data to USGS ScienceBase-Catalog	Melissa Foley	01/31/22							
Sediment Strategy	RMP SEP	17. USGS Sediment Settling Velocity South Bay	Technical Report	Melissa Foley	01/31/22							
Sediment Strategy	RMP SEP	18. USGS Sediment Flux and Flocculation, Benicia Bridge	Technical Report	Melissa Foley	09/30/21							Daniel Livsey and Paul Work, leads (USGS)
Sediment Strategy	RMP SEP	21. Sediment Dynamics Assessment and Uncertainty Analysis for San Francisco Bay	Develop updated sediment transport conceptual model	Scott Dusterhoff	12/31/21							
Sediment Strategy	RMP SEP	21. Sediment Dynamics Assessment and Uncertainty Analysis for San Francisco Bay	Interpretive Technical Report	Scott Dusterhoff	12/31/21							
Emerging Contaminants	Bay RMP (2018)	Non-targeted Analysis of Sediment and Water	Fact sheet and technical report	Rebecca Sutton	06/30/21	08/02/19	488			4		De-prioritized for ECWG meeting in favor of North Bay Fire NTA. Draft report and fact sheet by fall '19; Final report and fact sheet by Dec '19. Lee and Eunha would like to present their findings to the ECWG in spring 2020 before finalizing the report. Lab and internal COVID-19 impacts and continued prioritization of the North Bay Wildfire NTA study have delayed this project. Lee and Eunha would like to present preliminary findings to the ECWG in spring 2021 before finalizing the deliverables.

Focus Area	Project	Task	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	Due Date Extended (external delay)	Due Date Extended (internal delay)	# of extensions	Status	Comments
Emerging Contaminants	Bay RMP (2018)	Non-targeted Analysis of Sediment and Water	Manuscript	Rebecca Sutton	06/30/21	08/02/18	853	🚩	🚩	4	●	De-prioritized for ECWG meeting in favor of North Bay Fire NTA. Draft report and fact sheet by fall '19; Final report and fact sheet by Dec '19. Lee and Eunha would like to present their findings to the ECWG in spring 2020 before finalizing the report. Lab and internal COVID-19 impacts and continued prioritization of the North Bay Wildfire NTA study have delayed this project. Lee and Eunha would like to present preliminary findings to the ECWG in spring 2021 before finalizing the deliverables.
Status and Trends	Bay RMP (2019)	6. Status and Trends Monitoring	Sport Fish Report	Jay Davis	03/31/21	12/31/20	-29	🚩			●	Draft report by 1/31/21; Final by 3/30/21
PCB Strategy	Bay RMP (2019)	Priority Margin Unit Stormwater PCB Monitoring	Stormwater sample collection at Emeryville Cresent sites in WY19 and WY20	Alicia Gilbreath	04/30/21	04/30/20	216	🚩		1	●	Analysis of samples will be covered by SEP funds (3300-011-A). Results will be reported in the WY20 STLS POC Reconnaissance Monitoring Report (due 12/31/20). https://www.sfei.org/sites/default/files/events/PCBWG%20-%2002%20-%20Priority%20Margin%20Unit%20Stormwater%20PCB.pdf Due to low rainfall, sampling was not completed in WY20 and so the study shall be extended into WY21.
Emerging Contaminants	Bay RMP (2019)	Ethoxylated Surfactants Study	Preliminary results presentation at ECWG Meeting	Diana Lin	04/15/21	04/22/20	224	🚩			●	Sampling delayed due to COVID-19. Preliminary results will be shared at the 2021 ECWG.
Emerging Contaminants	Bay RMP (2019)	Ethoxylated Surfactants Study	Manuscript and summary for managers	Diana Lin	07/01/21	08/01/20	123	🚩			●	Draft due 8/31/20. Final due 1/31/21. Sampling delayed due to COVID-19. Draft due February 1, 2021. Final due July 1, 2021.
Selenium Strategy	Bay RMP (2019)	Selenium in Muscle Plugs	Collect and analyze muscle plug samples	Nina Buzby	03/31/22	03/31/20	246	🚩		2	●	Muscle plug samples will be collected during CDFW cruises between August and October 2019. Laboratory analysis will follow. Data management and reporting was not funded. https://www.sfei.org/sites/default/files/events/SeWG%20-%2003%20-%20Sturgeon%20Muscle%20Plug.pdf Not enough tissue was collected by CDFW in 2019 so this will be delayed until 2020. No ability for DFW to collect samples for the RMP in 2020 so this will be delayed again until 2021.
	Bay RMP (2020)	3. QA and Data Services	QA Summary Report for 2020 S&T Activities	Don Yee	03/31/21						●	
	Bay RMP (2020)	6. Status and Trends Monitoring	Present to TRC on IC studies	Don Yee	03/30/21	12/31/20			🚩		●	Delayed to March TRC meeting; no immediate need in December
	Bay RMP (2020)	35. EC Bisphenols	Technical Report	Rebecca Sutton	09/20/21						●	
	Bay RMP (2020)	24. Stormwater Conceptual Model	Conceptual model report	Diana Lin	05/31/21						●	
	Bay RMP (2020)	Moored Sensor Network	NMS FY20 Annual Report	Dave Senn	04/01/21	12/31/20		🚩		1	●	NMS SC suggested a multi-year report rather than an annual report
	Bay RMP (2020)	Ship-based channel monitoring	NMS FY20 Annual Report	Dave Senn	04/01/21	12/31/20		🚩		1	●	NMS SC suggested a multi-year report rather than an annual report
	Bay RMP (2020)	21. Priority Margin Unit Stormwater PCB Monitoring	Stormwater sample collection at Emeryville Cresent sites in WY19 and WY20	Alicia Gilbreath	04/30/21						●	
	Bay RMP (2020)	22. PCB Loading in Steinberger Slough/Redwood Creek	Technical Report	Diana Lin	08/31/21						●	
	Bay RMP (2020)	43. Update of Erosion and Deposition in San Francisco Bay	Technical Report	Scott Dusterhoff	03/31/21						●	
	Bay RMP (2020)	41. Selenium in North Bay clams and water	Sample collection & analysis	Nina Buzby	05/31/21						●	
	Bay RMP (2020)	41. Selenium in North Bay clams and water	Technical Report	Nina Buzby	06/30/21						●	
	Bay RMP (2020)	30. POC watershed reconnaissance stormwater sampling	Final report	Alicia Gilbreath	05/30/21						●	
	Bay RMP (2020)	29. Regional model development to support management decisions	Sediment calibration and report	tanz@sfei.org	05/31/21	03/31/20			🚩		●	Dates pushed back a year after Jing left.