

RMP PCB Workgroup Meeting

Season 15, Meeting #1
May 8, 2026



Zoom Stuff

1. This meeting is being recorded and AI transcribed
2. Update your name and add your affiliation
3. Raise your hand if you have a comment or question
4. Unmute yourself and turn on video when you are speaking
5. Use the chat function if you have a **secondary** comment, question, or technical issue



Item 1: Introductions and Meeting Goals



INTRODUCTIONS



PCBWG (and Other) Science Advisors

- Frank Gobas, Simon Fraser University
- Earl Hayter, USACE Engineer Research and Development Center
- Jon Butcher, Tetra Tech
- Derek Muir, Environment and Climate Change Canada (retired)



Goals/Agenda for the Meeting

1.	Introductions, Meeting Goals, Agenda Review Major goals for the meeting: 1. Update the group on RMP and PCBWG planning 2. Update the group on studies that are in progress 3. Discussion of draft reports from two major studies 4. Decision on a proposal and multi-year workplan through 2028 Materials: None	9:00 Jay Davis
2.	Information: PCB Workgroup Planning Update An overview of studies that have been funded and are underway, and draft plans for using available funds leading up to the July 2028 deadline for studies to inform the revision of the TMDL. Materials: Slides presented at the meeting	9:10 Jay Davis
3.	Discussion: San Leandro Bay OPTICS Study A major field study measuring fluxes of sediment and PCBs in San Leandro Bay was funded by the RMP in 2024. A summary of the report will be provided, followed by a discussion of feedback and guidance for finalizing the report. Written comments on the OPTICS report are requested by May 29. Materials: Draft report (attached separately)	9:30 Integral
4.	Information: Updates on Don's Mud Studies Updates will be provided on three sediment studies led by Don Yee. • Monitoring of Sediment Deposition in San Leandro Bay Intertidal Areas (2023) • Mapping Mudflat Morphodynamics Matching Imagery with Water Levels (\$25K, 2025) • Sediment Trap Collection Reconnaissance Pilot (\$22K, 2025) Materials: Slides presented at the meeting	10:30 Don Yee

- Times are estimates and flexible
- Earl leaves at 3:00
- Shorter lunch?

	Break	11:00
5.	Discussion: Food Web Model A food web modeling study was funded as part of the Destination Clean Bay project and a draft report has been completed. A summary of the report will be provided, followed by a discussion of feedback and guidance for finalizing the report. Written comments on the report are requested by May 29. Materials: Draft report (attached separately)	11:10 Frank Gobas, Yung-Shan Lee
	LUNCH	12:10
6.	Decision: Special Study Proposal - PCB Synthesis Work on modeling sediment and contaminants at the segment and whole Bay scales is beginning, with funding from the Destination Clean Bay project. An update on this workplan will be provided, including a summary of coordination meetings earlier this month. Materials: Proposal writeup (to be sent on Monday)	1:00 Jay Davis
7.	Discussion: PCB Workplan for 2026-2028 A draft workplan for the \$2 million from USEPA for PCB studies will be presented and discussed. Each of the proposed elements will be discussed: 1. Archived surface sediment analysis (Davis) 2. Stormwater monitoring (Gilbreath) 3. San Rafael Creek conceptual model (Davis) 4. OPTICS Part 2: Redwood Creek (Integral) 5. In-Bay modeling (Davis, Integral) a. SLB Update b. Whole Bay model c. SS/RC model Materials: Slides presented at the meeting	1:30 Jay Davis, Alicia Gilbreath, Integral
	Break	2:30
7.	Continued	2:40
8.	Review Next Steps and Action Items and Adjourn	3:55 Jay and Group

Item 2: PCB Workgroup Planning Update



Developments Since Last Meeting

- Funding increase for USEPA San Francisco Bay Program Office
- Full “Tracking Bay Health” funding approved (!)
 - Doubles the overall RMP budget for the next four years – now over \$9 million per year
 - Includes **\$2 million** for studies to support the PCB TMDL
- Other funded PCB-focused studies: watershed modeling, watershed monitoring
- Another proposed PCB-related study: Protecting Bay Fishers

TMDL Revision Timeline

- Deadline for revised TMDL: 2030
- Cutoff for new science to inform the TMDL: **July 2028**
- Urgent need to plan how to use the \$2M between now and July 2028
 - Goal: use these funds in the most effective way possible to support the TMDL revision
 - One wet season to work with – need to plan wet season work ASAP
- (Side note: similar situation for mercury - cutoff of July 2026)

MULTI-YEAR PLAN FOR PCBs

Special studies and monitoring in the RMP from 2023-2029. Numbers indicate budget allocations in \$1000s. Budgets in parentheses represent funding from external sources (e.g., SEP funds). Items shaded in yellow are considered high priority for 2027 funding and beyond.

Category	Study	Funder	MQs	2023	2024	2025	2026	2027	2028	2029
General	Develop and update multi-year workplan and continued support of PCB Workgroup meetings	RMP USEPA [†]	1a,b			20 (10)	20 (10)	20 (10)	20 (10)	20 (10)
	In-Bay Fate Model	SEP USEPA [~] USEPA [†]	1a,b	(136)	(136) (350)	(136) (340)	(235) (200)	(200)	(200)	
	General empirical data	USEPA [†]				(21)	(44) ^f			
PMU	Synthesis, PMU Conceptual Models	RMP USEPA [†]	1a				102 ^g (100) ^k	103 ^h	121 [?]	
	PMU Sport Fish Monitoring (3 PMUs)	S&T	1a		Sport Fish					Sport Fish
	PMU Prey Fish Monitoring (4 PMUs)	RMP S&T	1a	37ss ^c Fish ^e						
	PMU Sediment	RMP	1a,b	38ss ^c	96					
	PMU General Empirical Data	RMP SEP USEPA [~] USEPA [†]				85 ⁱ (860) ⁱ (47) ⁱ (24)	(600)	(700)		
PMU/General	Food Web Model	USEPA [~]	1a,b		(71)	(71)				
RMP-funded Special Studies Subtotal – PCBWG				75	96	105	122	123	141	20
High Priority Special Studies for Future RMP Funding								103	121	
RMP-funded Special Studies Subtotal – Other Workgroups										
MMP & Supplemental Environmental Projects Subtotal – PCBWG				136	136	996				
Pro-Bono & Externally-funded Special Studies Subtotal – PCBWG					421	513	1,189	910	210	10
TOTAL – PCBWG				211	653	1,614	1,311	1,033	351	30

Draft Allocation of the TBH \$2M for PCBs

Study	2026	2027	2028	2029	
Strategy	10	10	10		
General empirical data	44				Archived sediment
PMU General Empirical Data	600	400			\$1M for OPTICS Part 2
Stormwater	210				
In-Bay Fate Model	200	200	200		Integral modeling
Synthesis, PMU Conceptual Models		100			San Rafael Creek
Food Web Model ?					

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Food Web Model ?					

Item 3: The San Leandro Bay OPTICS Study



Desired Outcomes for This Item

- Summary presentation to inform the Workgroups (PCBWG and SedWG)
- Obtain preliminary feedback on the report
 - Written comments requested by May 29
- Set stage for consideration of OPTICS Part 2 (to be discussed this afternoon)



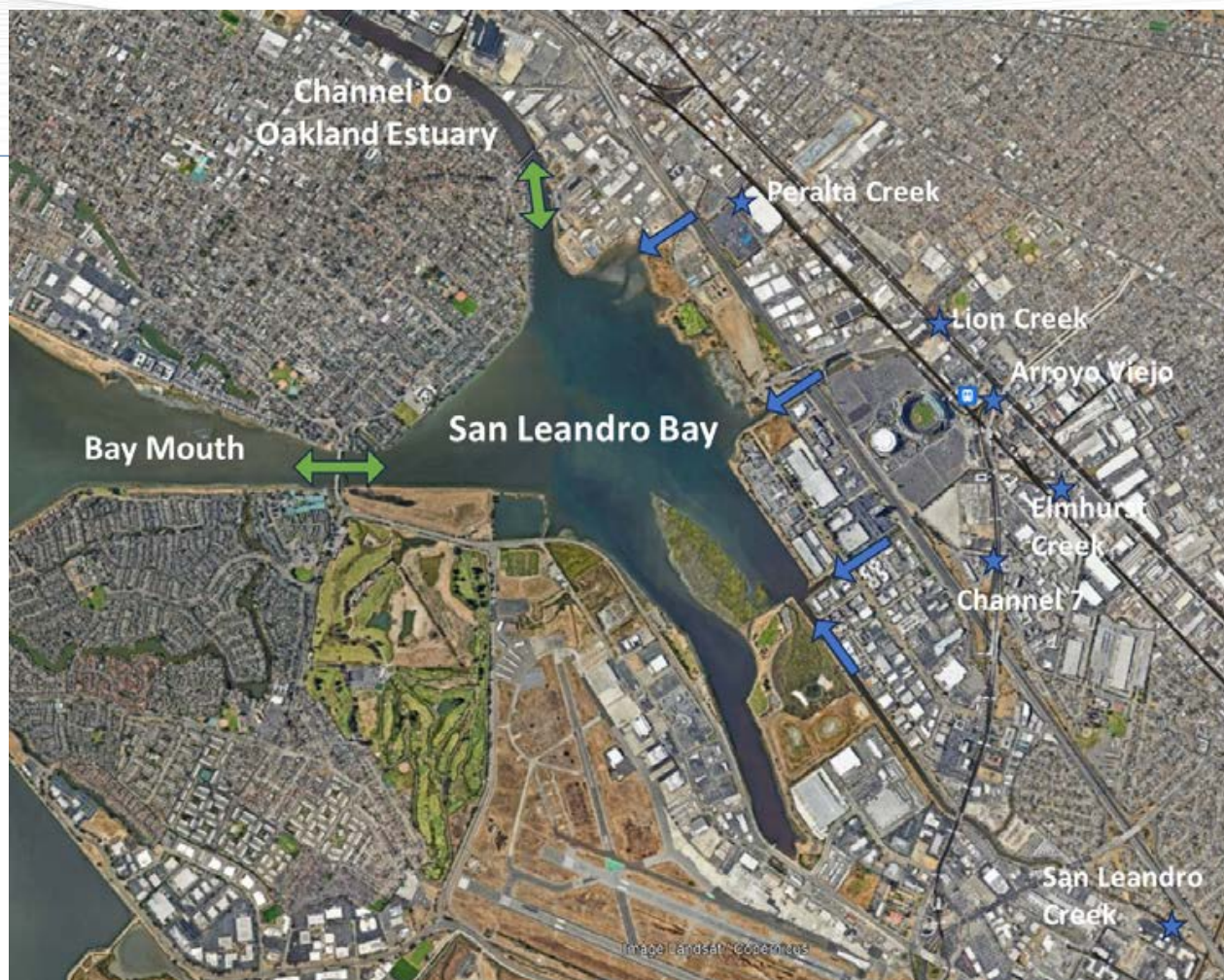
RMP PCB Workgroup Meeting - 5/8/2026

San Leandro Bay OPTICS Study

Kara Scheu, Ph.D.
Grace Chang, Ph.D.
Samuel McWilliams
Craig Jones, Ph.D.

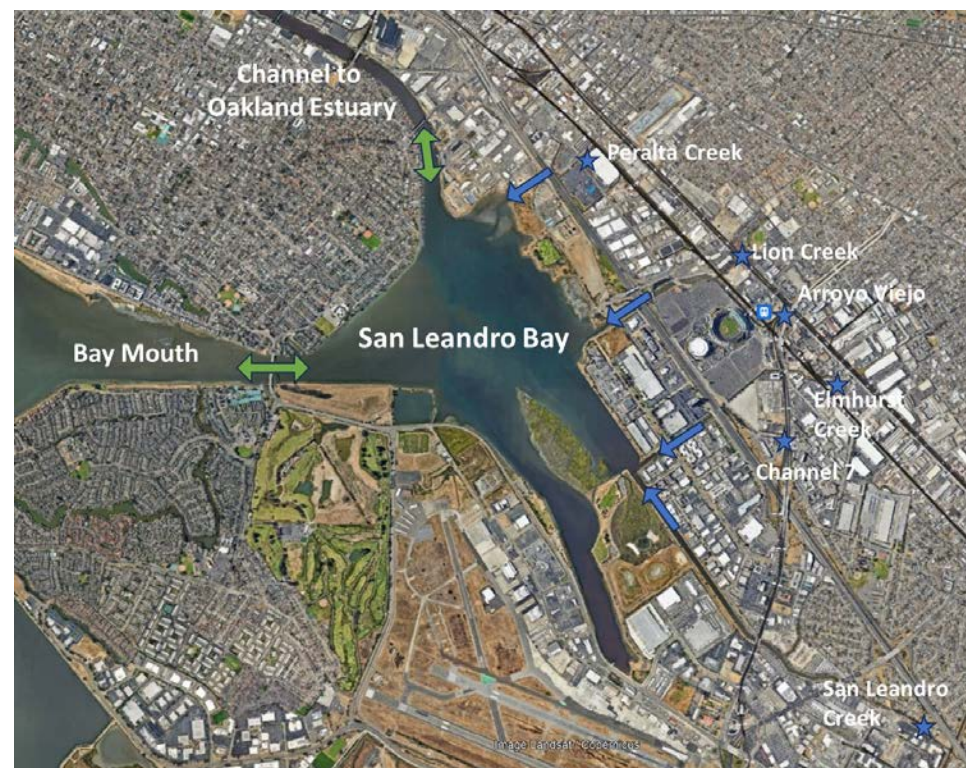
Site Overview

- SLB is a high priority PMU given significant impairment
- Relatively enclosed, depositional system
- Prior modeling analysis demonstrates potential for management actions to affect recovery rates
- *However*, there are key data gaps and sources of uncertainty



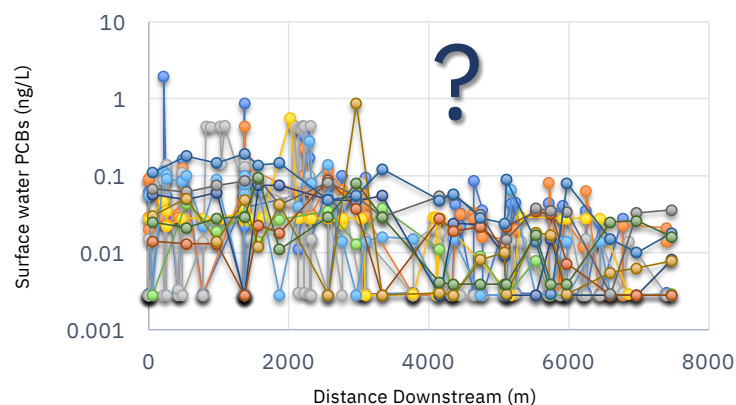
Identified Data Gaps – Source of Uncertainty

- Key sources of uncertainty:
 - Sediment and PCB loading to SLB from watersheds
 - Sediment and PCB loading from San Francisco Bay
 - Sediment bed characterization and sediment stability
 - Suspended sediment/PCB data to calibrate/validate numerical model
- Study objective:
 - Fill the key data gaps and sources of uncertainty

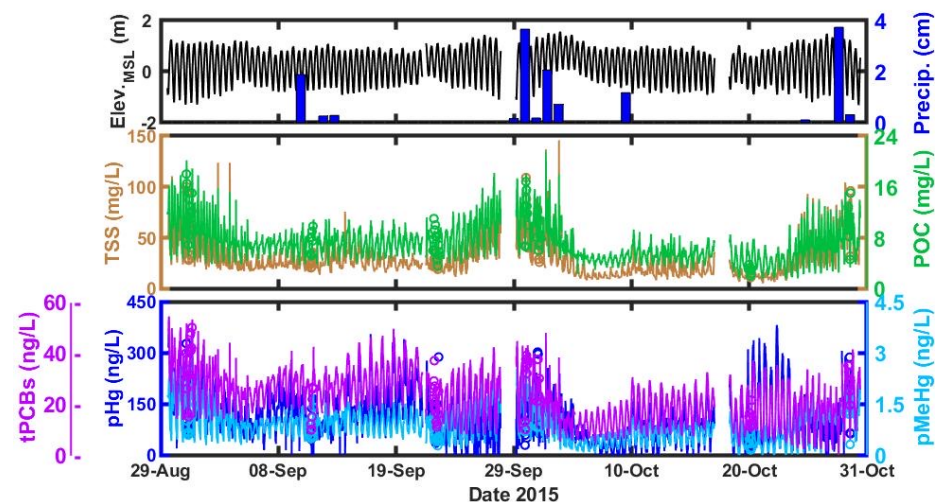


What is OPTICS?

- **OPTICS** (OPTically-based In-situ Characterization System) provides chemical contaminant concentrations in the context of biophysical processes, at resolution generally unattainable through traditional discrete water column sampling



OPTICS



What is OPTICS?

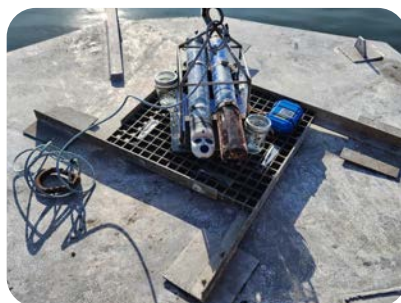
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Discrete samples

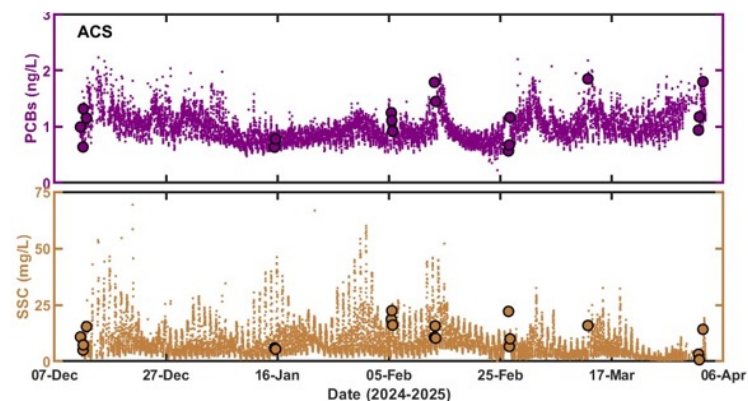


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Time series measurements



Continuous Concentration Measurements



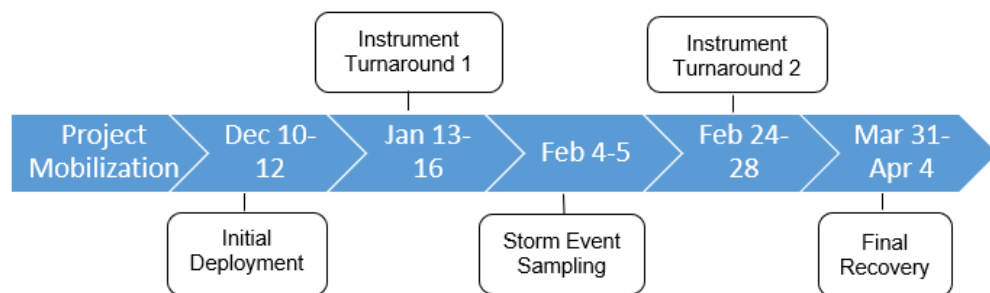
Study Overview

- OPTICS platforms at 7 locations
 - Discrete surface water samples for SSC and PCB
 - *In situ* continuous measurements of physical, water quality, and optical properties
 - Estimates of sediment and PCB concentration
- Flux at all inputs/outputs to SLB (6 locations)
 - ADCP transects and predicted flow rate
 - Estimated sediment and PCB flux into/out of SLB
- SEDFlume cores to evaluate sediment stability and bed characterization



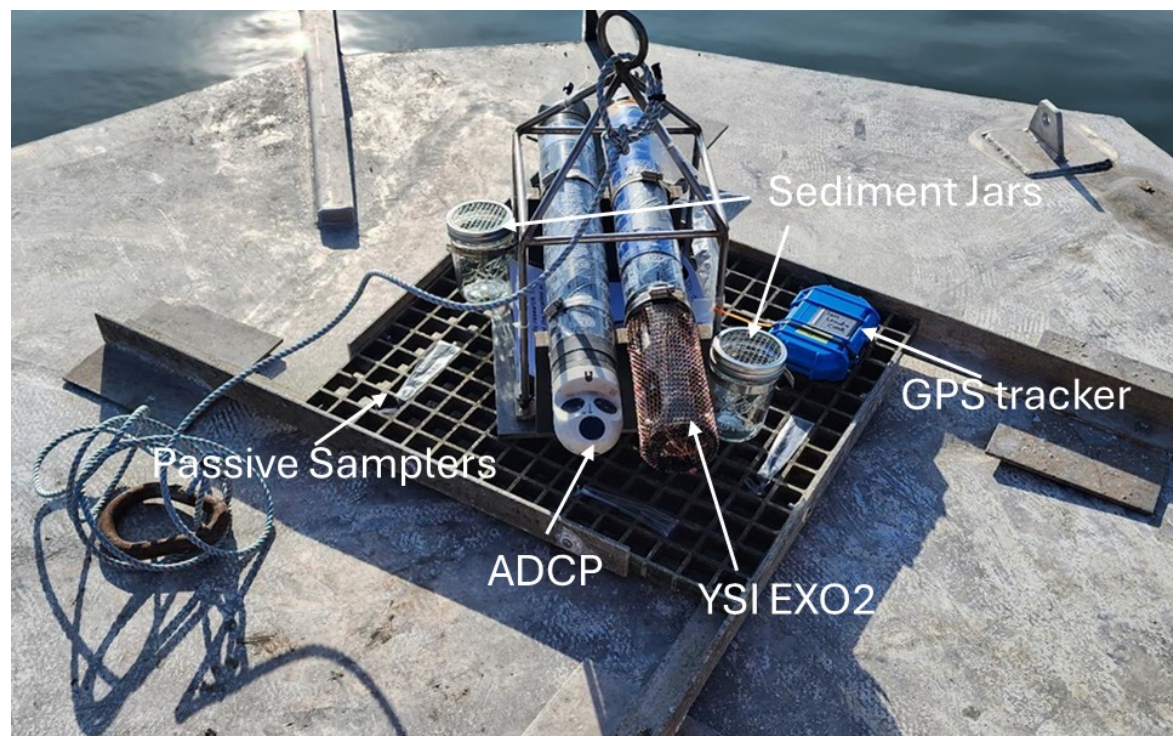
Field Data Collection

Field Sampling Overview



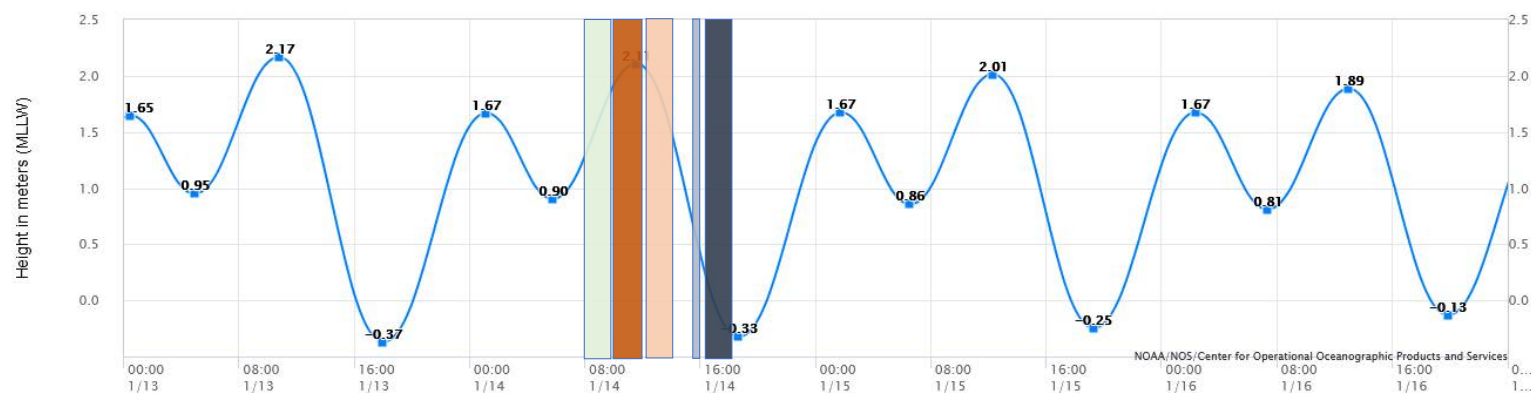
Monitoring Platforms

- Collect continuous data every 15-minutes
- ADCP measure water column currents (magnitude/direction) and water depth
- YSI EXO2 water quality sonde measures:
 - Temperature/salinity
 - Turbidity
 - Dissolved oxygen
 - Chlorophyll
 - Water depth
- Sediment traps (SFEI)
- Passive samplers (Stanford)



Discrete Surface Water Sampling

- Water sampling for sediment and PCBs over range of conditions
 - Tidal variability
 - Storm sampling
- Total of 155 sediment and PCB samples collected by Integral and SFEI

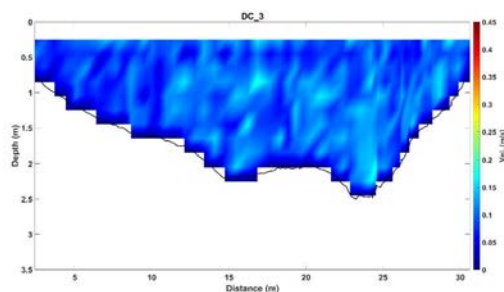


ADCP Transecting

- Total of 120 towed or vessel-mounted water column current transects
- Flow rate measurements over range of site conditions
- Used to derive continuous flow rate measurements

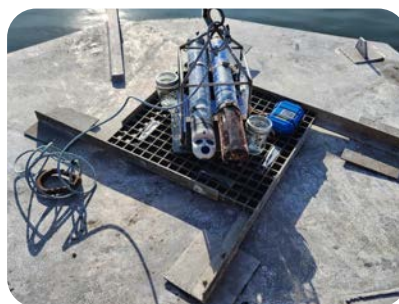


Transect Flow Rate

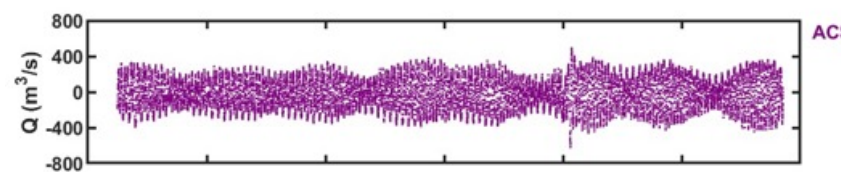


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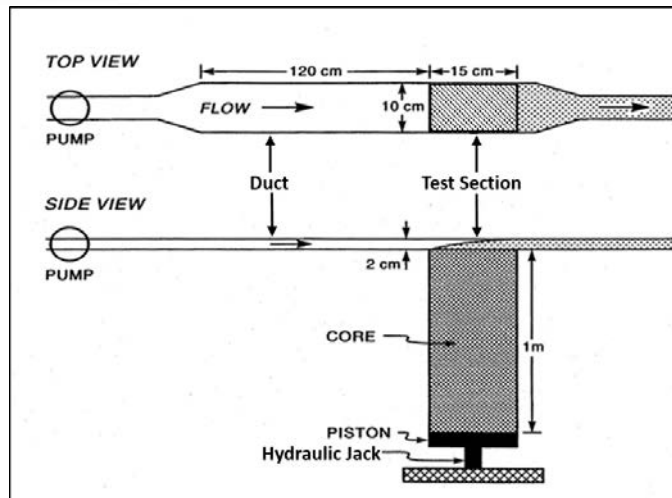
Current measurements



Flow Rate Time Series



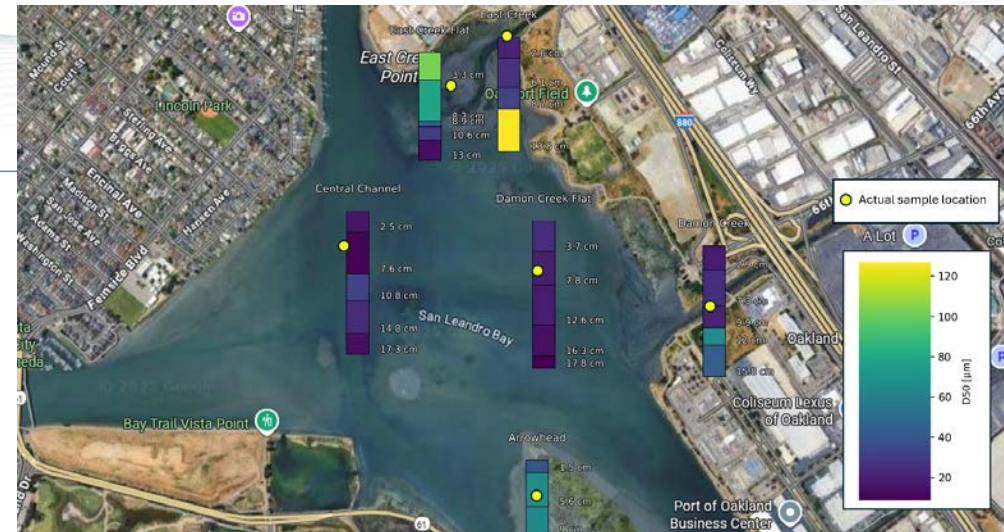
SEDFlume



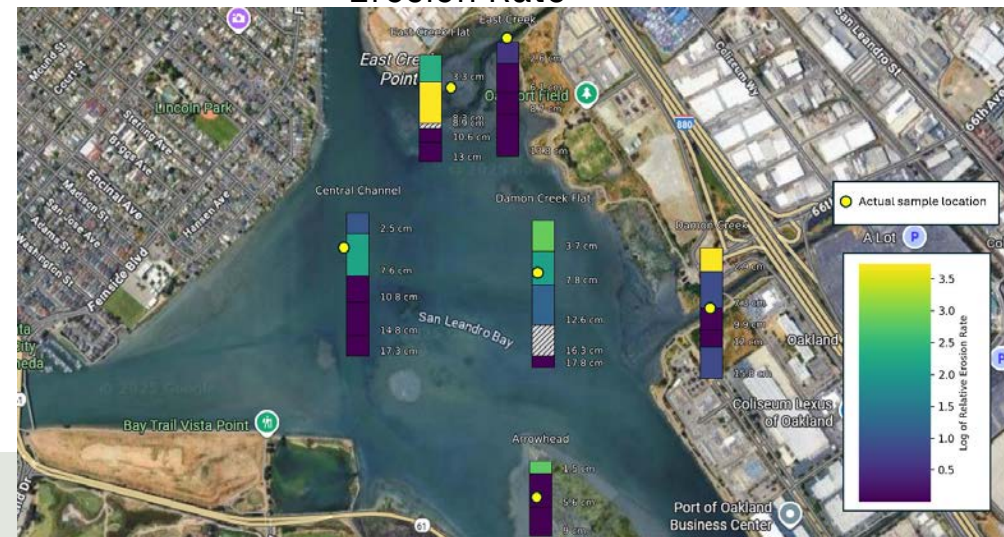
- SEDFlume cores collected at 6 locations in SLB
- Analyzed for grain size as a function of depth
- Used to determine erosion rate and critical shear stress as a function of depth

Median Grain Size

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Erosion Rate



Field Summary

- 7 monitoring platform locations over 4 deployment periods (4 months in total)
- 150+ surface water samples
- 120 ADCP transects
- 6 SEDFlume cores

- Field challenges
 - Debris in the channels caused some instrument fouling (e.g., large blanket wrapped around platform in Damon Slough)
 - Tidal data dropout (asymmetrical data drop out around sensor wetting/drying)

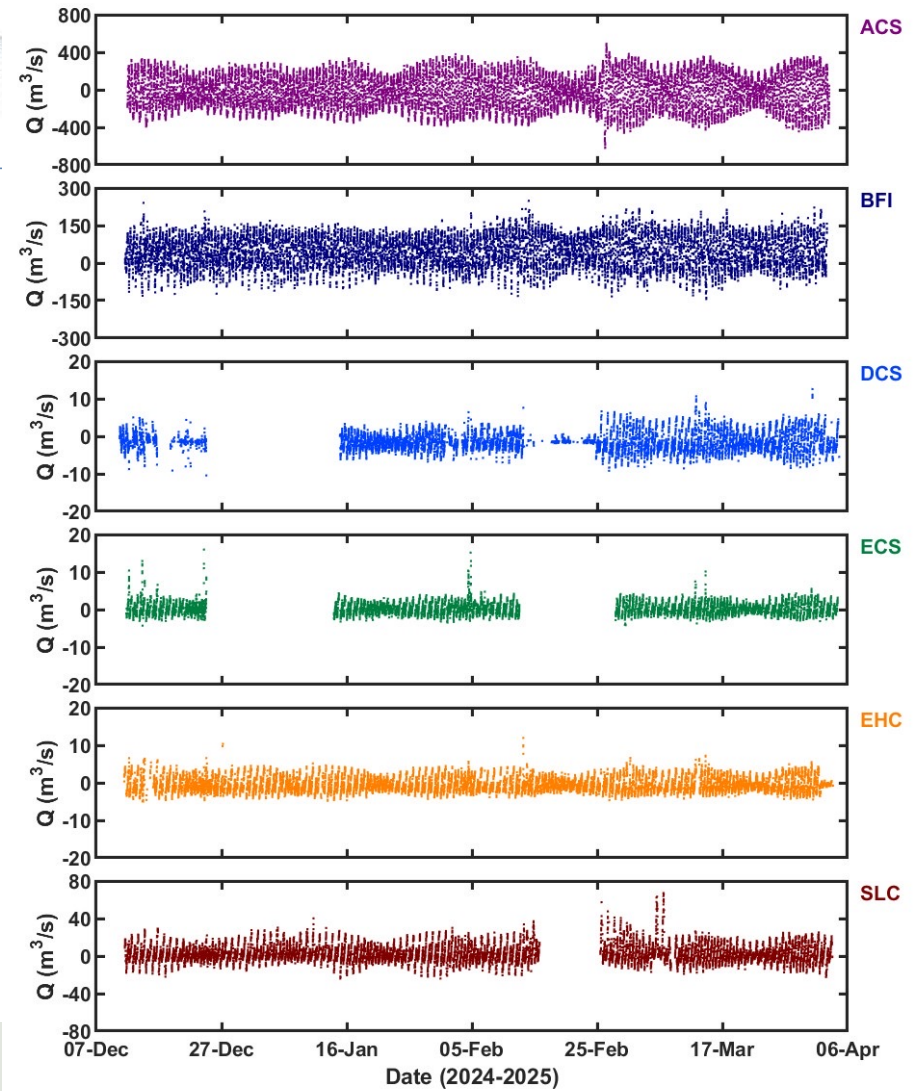
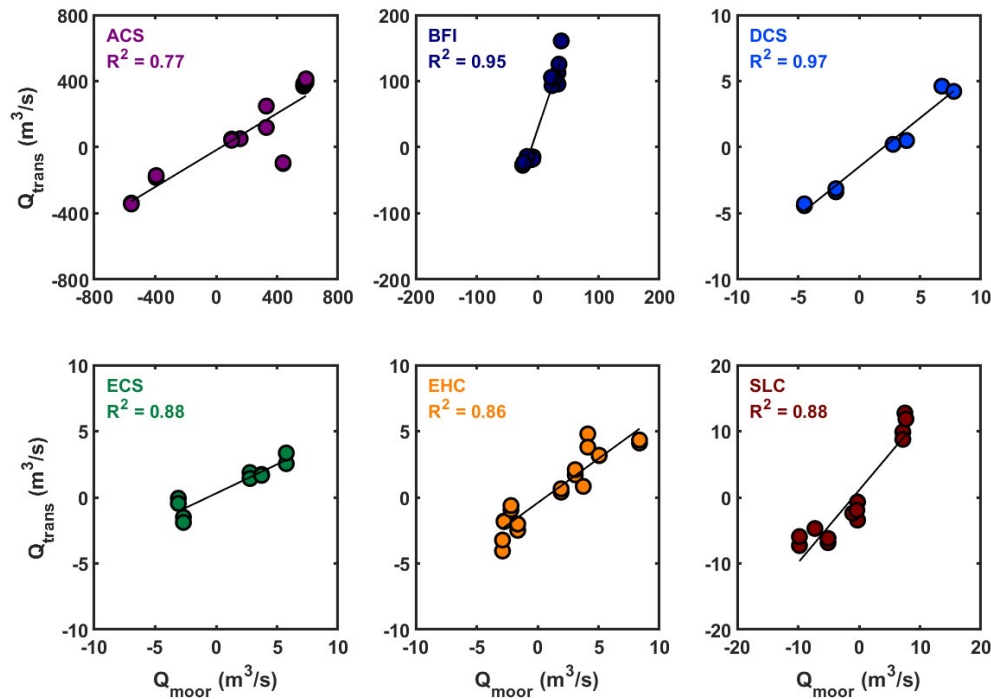
Data Processing & Analysis

Data Processing

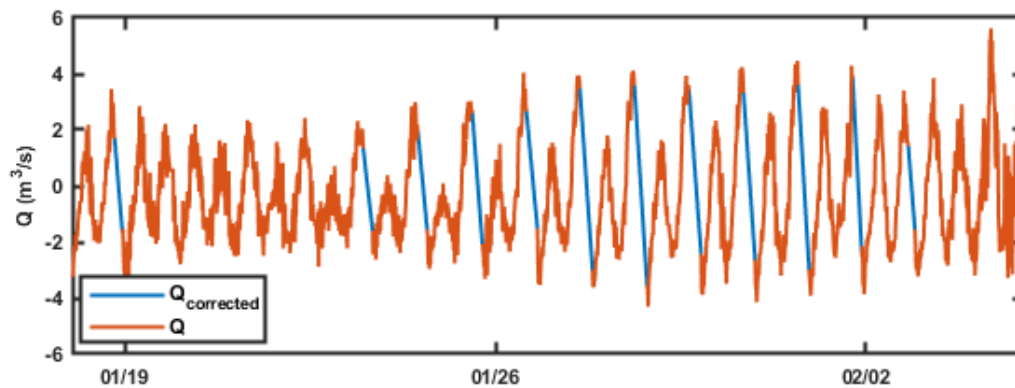
- All data is QA/QCed to remove poor quality data
 - Out of water data
 - Sensor drift or spikes
 - ADCP – poor correlation data across acoustic beams

- Q - Flow rate estimate (ADCP transects + water column measurements)
- C - Predicted SSC and PCB concentration (OPTICS analysis with surface water samples and continuous monitoring data)
- F - Flux of SSC and PCB is a function of concentration and flow rate ($F = Q \cdot C$)

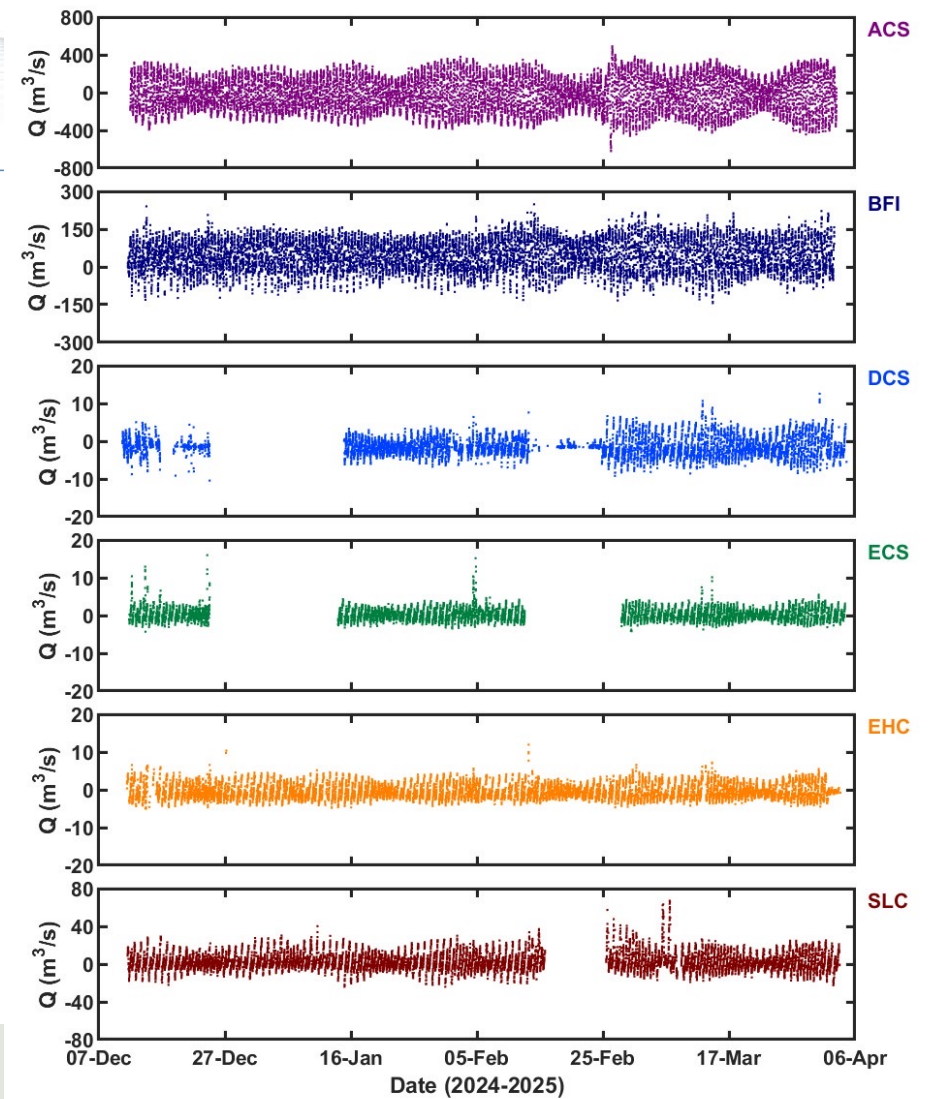
Predicted Flow Rate



Predicted Flow Rate

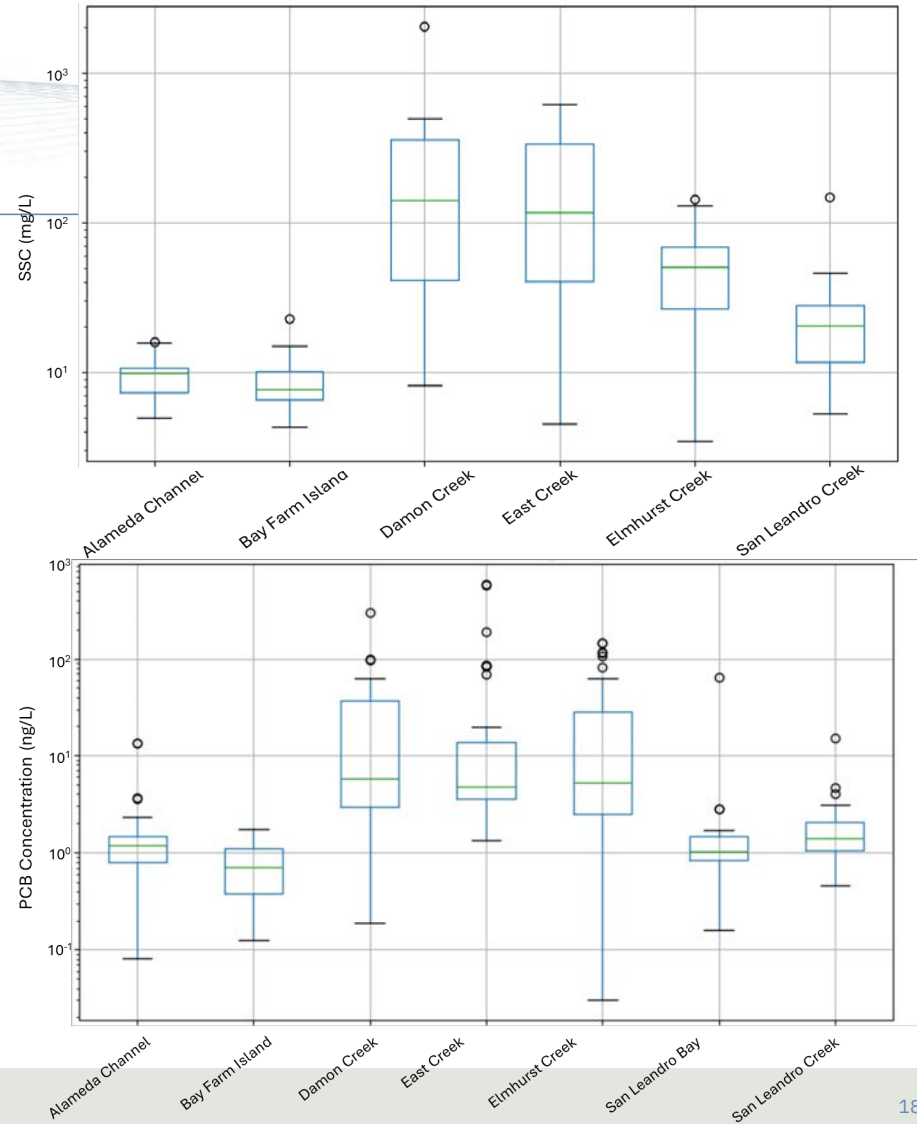


Filled in asymmetrical tidal dropout



SSC and PCB Samples

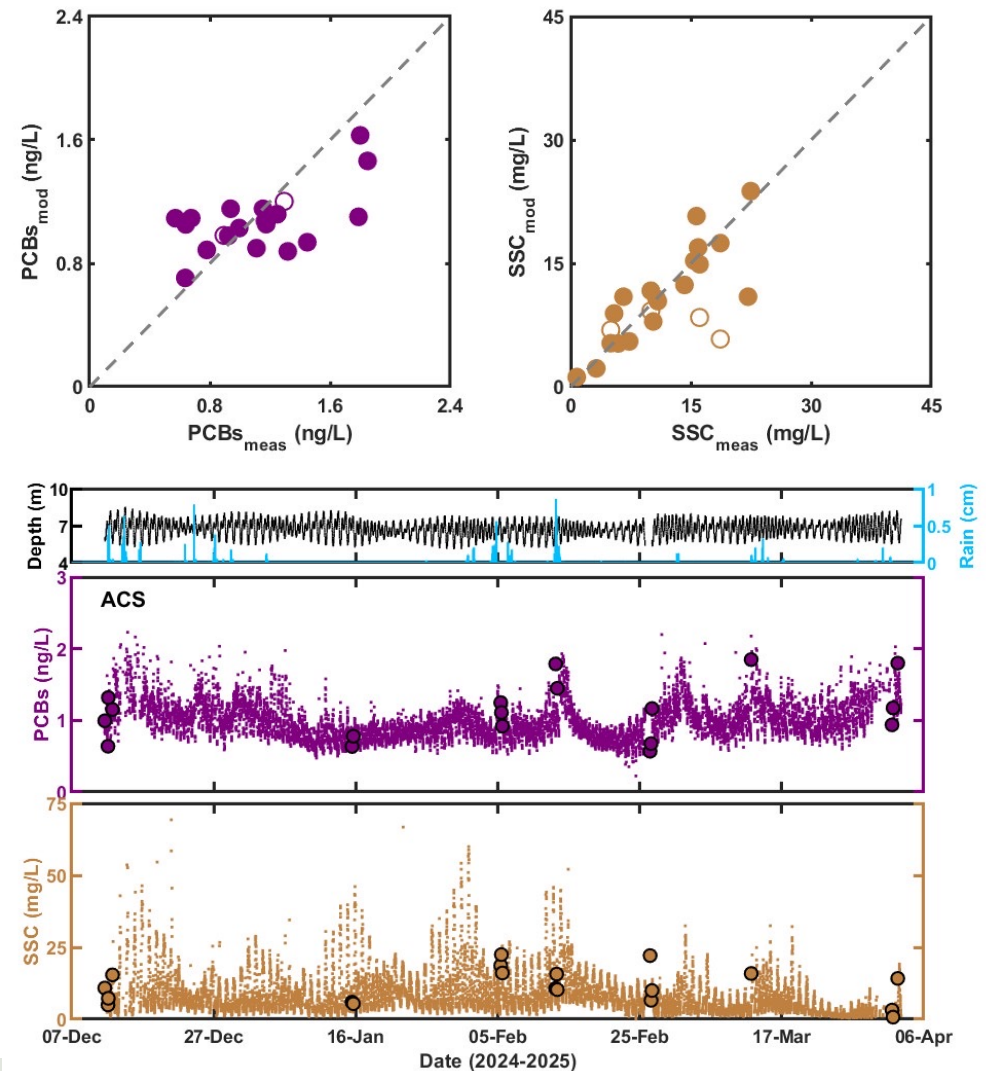
- Alameda Channel and Bay Farm Island
 - Small SSC and PCB concentration
- Highest PCB concentrations in Damon Slough, East Creek, and Elmhurst Creek
- Largest sediment concentration at Damon Slough and East Creek



OPTICS Results

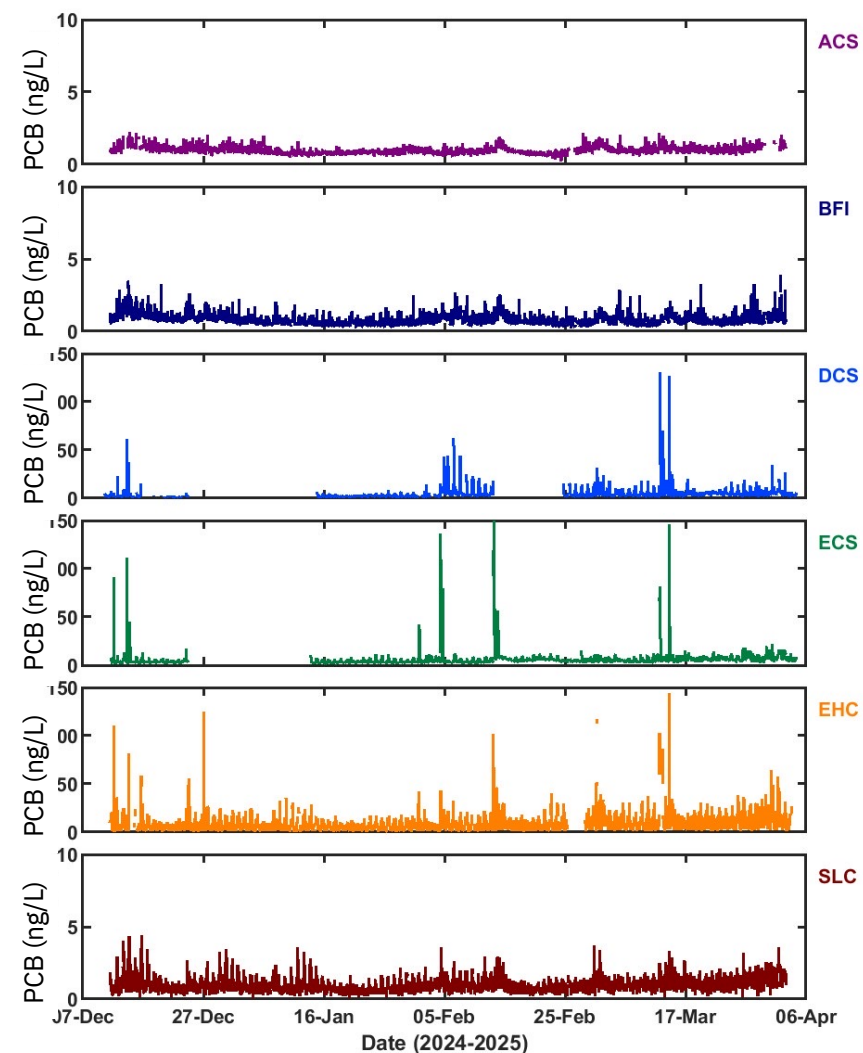
Predicted Concentration

- OPTICS analysis components
 - Predictor variables (*in situ* physical, water quality, and optical properties)
 - Response variables (SSC or PCB concentration)
- OPTICS regression analysis performed to minimize variance between predictor and response variables with minimized number of predictor variables
- Site specific regressions were developed at each location
- Regression coefficients applied to continuous measurements provides time series estimate of response variable (i.e., SSC and PCB concentration)



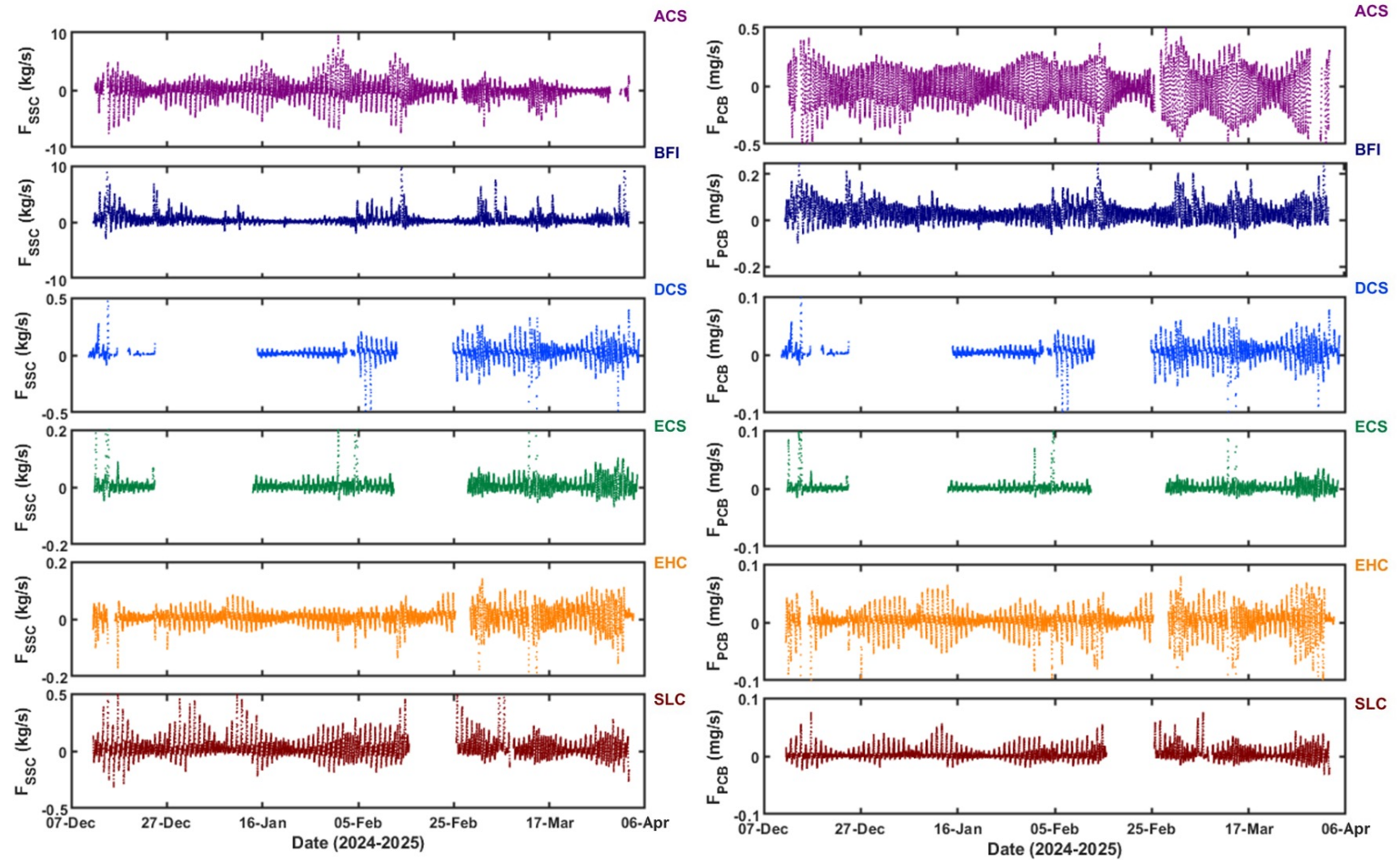
OPTICS Estimated PCB Concentration

- Result of OPTICS analysis at monitoring platforms
- SF Bay boundary concentration are small (< 5 ng/L)
- Precipitation tied spikes in PCB concentration at Damon Slough, East Creek and Elmhurst (>100 ng/L)
- Low concentrations (<5 ng/L) at San Leandro Creek



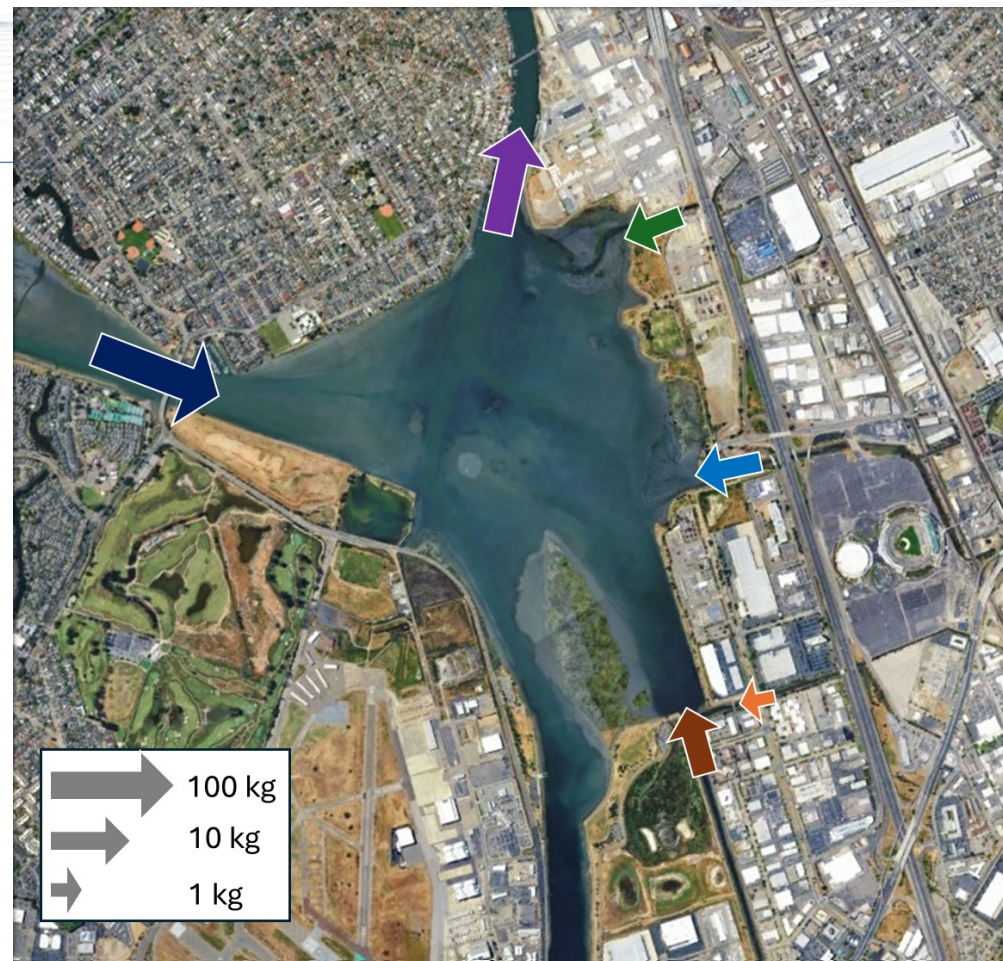
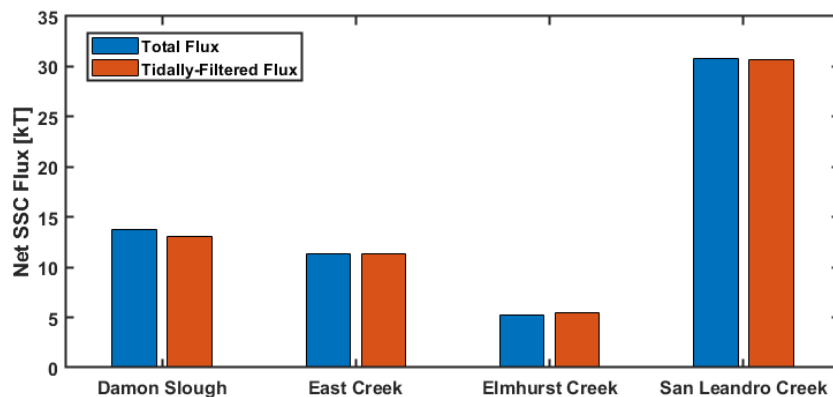
Flux

- $F = QC$



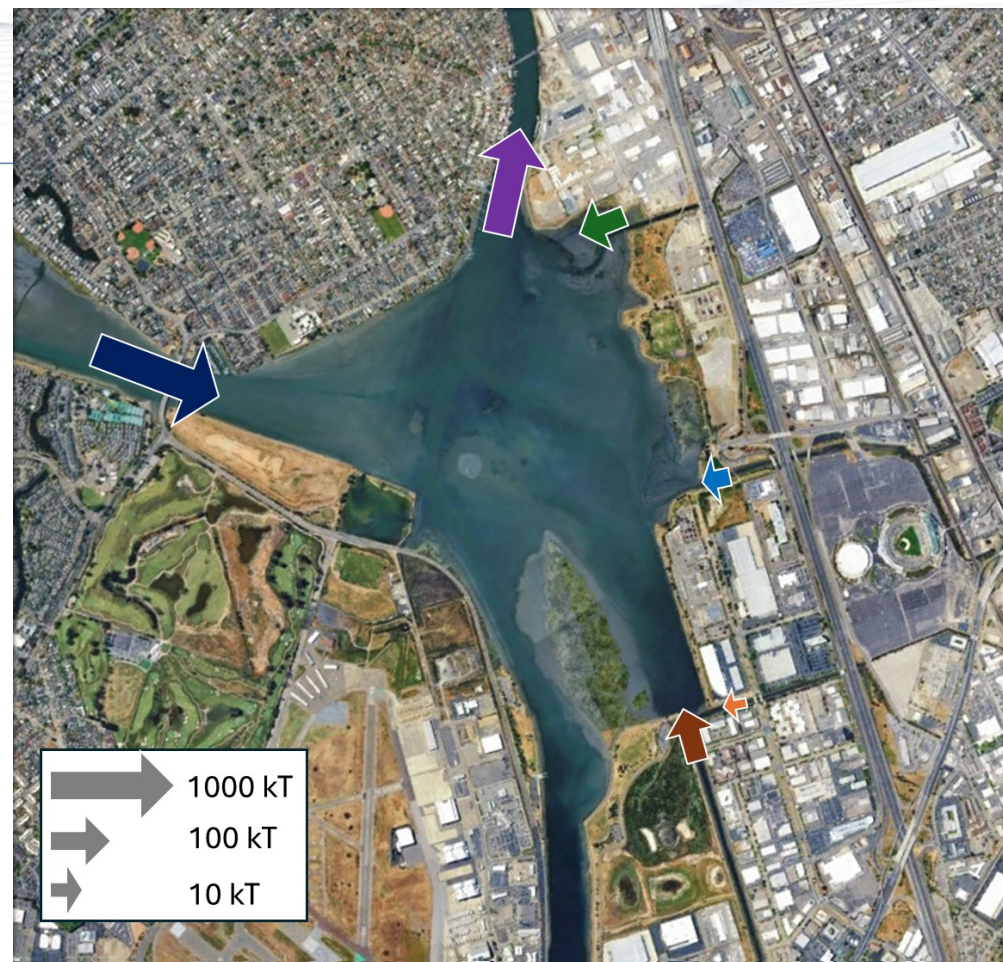
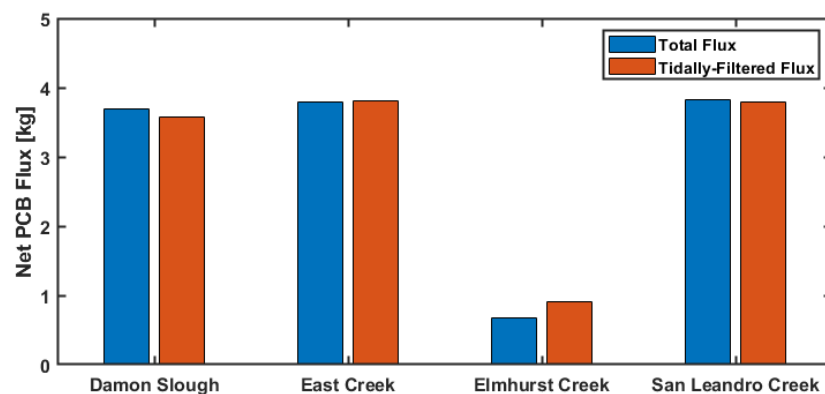
Net Sediment Flux

- Total sediment flux over the deployment period with flux data at all locations
- Largest sediment flux in/out of SLB at the bay boundaries
- San Leandro Creek has largest sediment input from tributaries
- Negligible difference between total and tidally-averaged flux



Net PCB Flux

- Largest contaminant flux in/out of SLB at the bay boundaries
- Negligible difference between total and tidally-averaged flux
- Larger contributions from Damon Slough and East Creek
- Note small concentration x large flow rate -> large flux



Summary

- Successful deployment of 7 monitoring platforms for 4 months with collection of >150 discrete water samples and 120 ADCP transects
 - Some small gaps in data due to debris and platform fouling
- OPTICS predicted PCB concentrations are low at the bay boundary and San Leandro Creek and high during storm events at the 3 main tributaries
 - Majority of elevated PCB contamination to SLB comes from East Creek, Damon Slough, and Elmhurst during storm events
 - Supports CSM that PCB loading from local tributaries is driving contamination (also greatest potential for management action)
- Residual tidal flux is into SLB from Bay Farm Island and out of SLB through Alameda Channel
 - Unlikely that elevated PCB sediment in Alameda Channel is affecting recovery in SLB

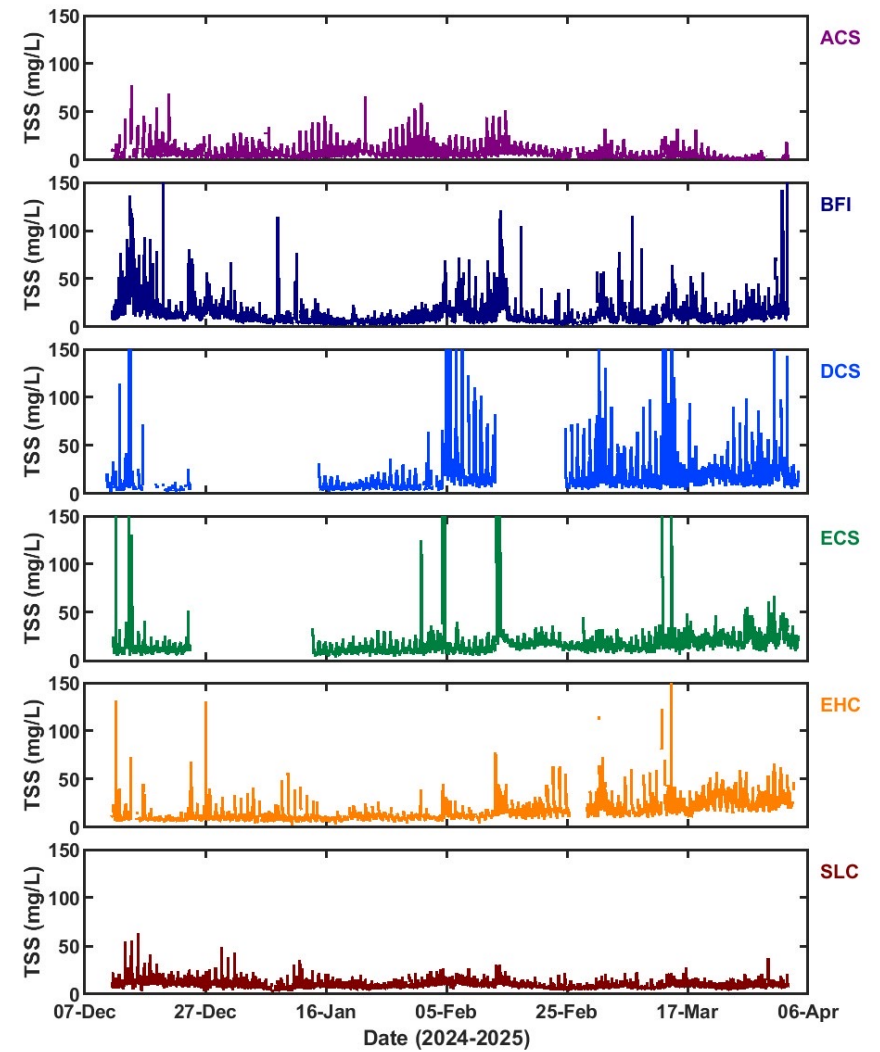
Opportunities and Next Steps

- Calibrate and validate the WDM model with watershed loading estimates
 - Evaluation of daily average vs continuous (15-minute) data
 - Update SLB sediment recovery model with sediment and PCB loading
 - Update SLB sediment recovery model sediment bed characterization with SEDFlume cores
 - Calibrate and validate the SLB sediment recovery model with suspended sediment and PCB concentration in central SLB
 - Revise SLB PCB recovery estimates
-
- Take lessons learned from SLB OPTICS study and potentially apply to other sites within SF Bay

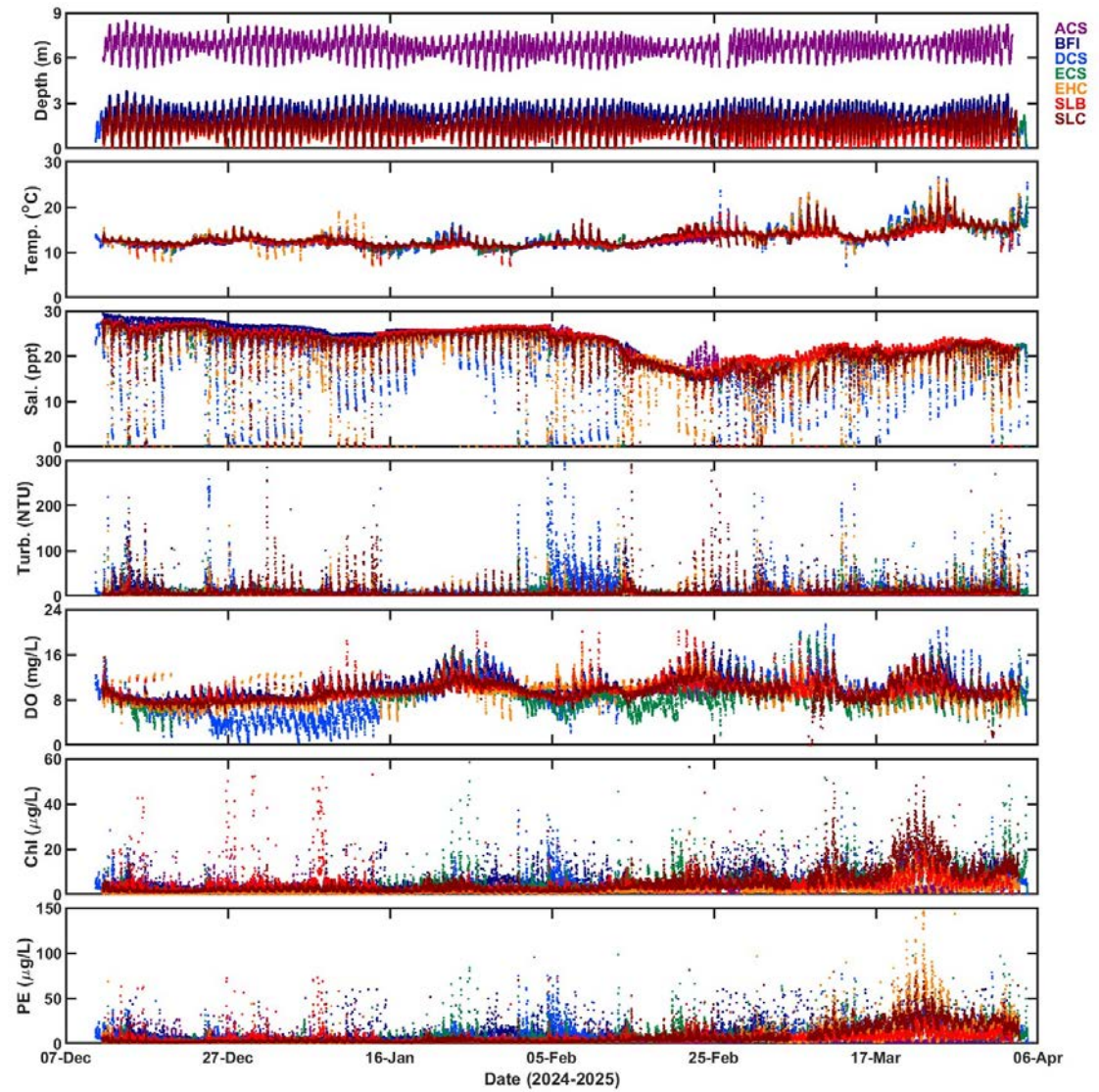
Supplemental Slides

SSC Concentration

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Water Quality Measurements



Item 4: Updates on Don's Mud Studies



Desired Outcomes for This Item

- Informational updates on work in progress



San Leandro Bay PCB & Sediment Studies

RMP PCB Workgroup 2026 May

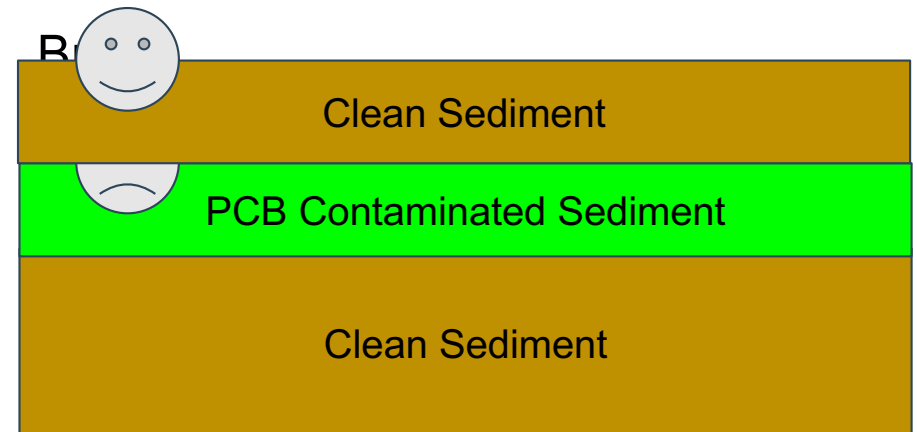
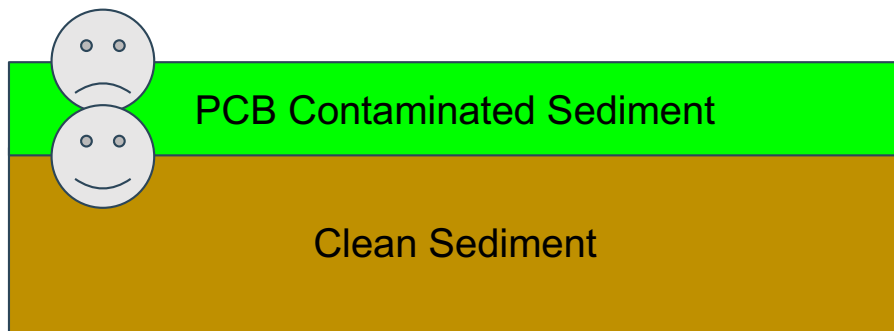
Don Yee



SLB Sediment Markers (&PCB) Study

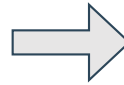
Recovery mechanisms

Erosion/export

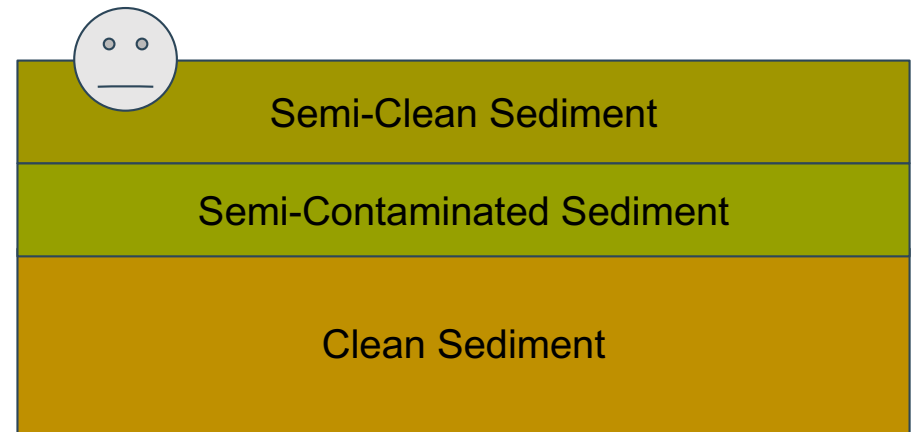
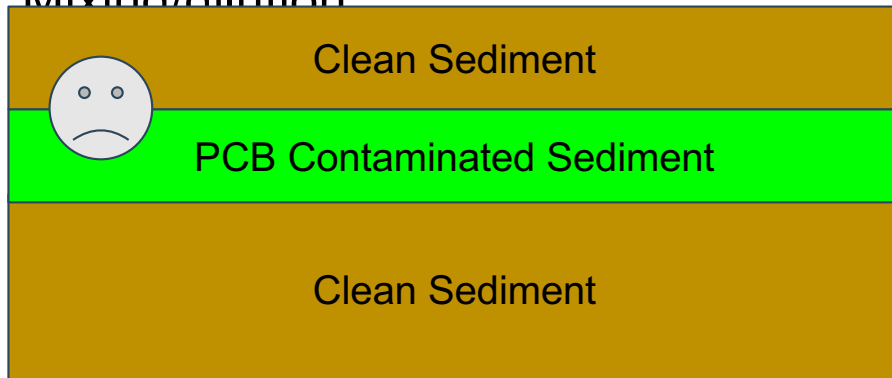


Recovery mechanisms

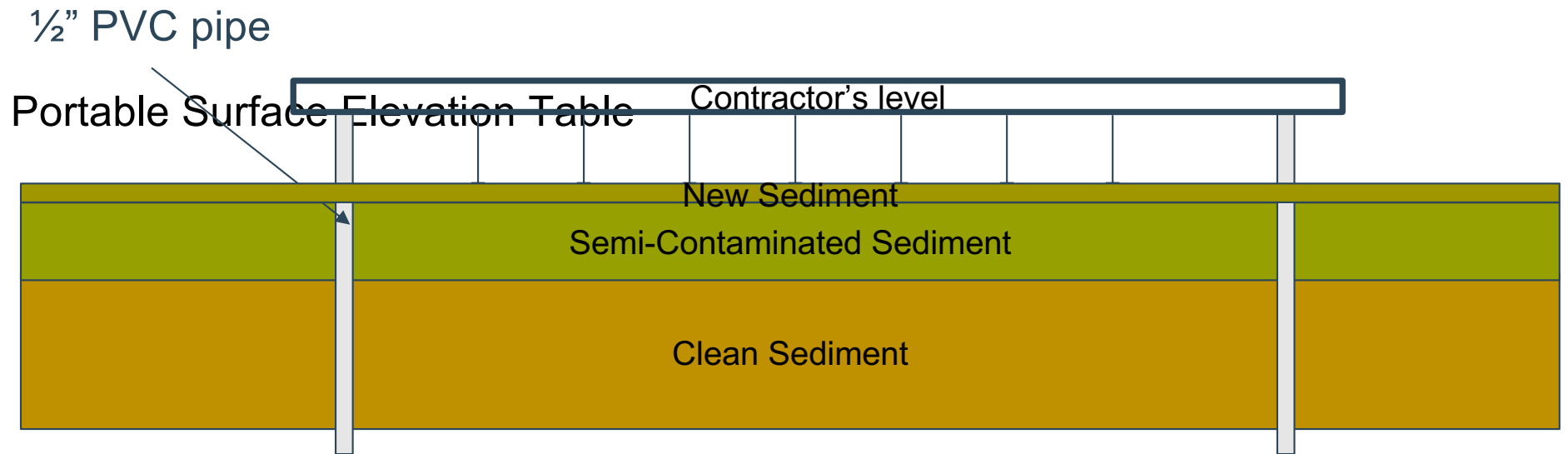
Likely reality: maybe a blend of all these processes



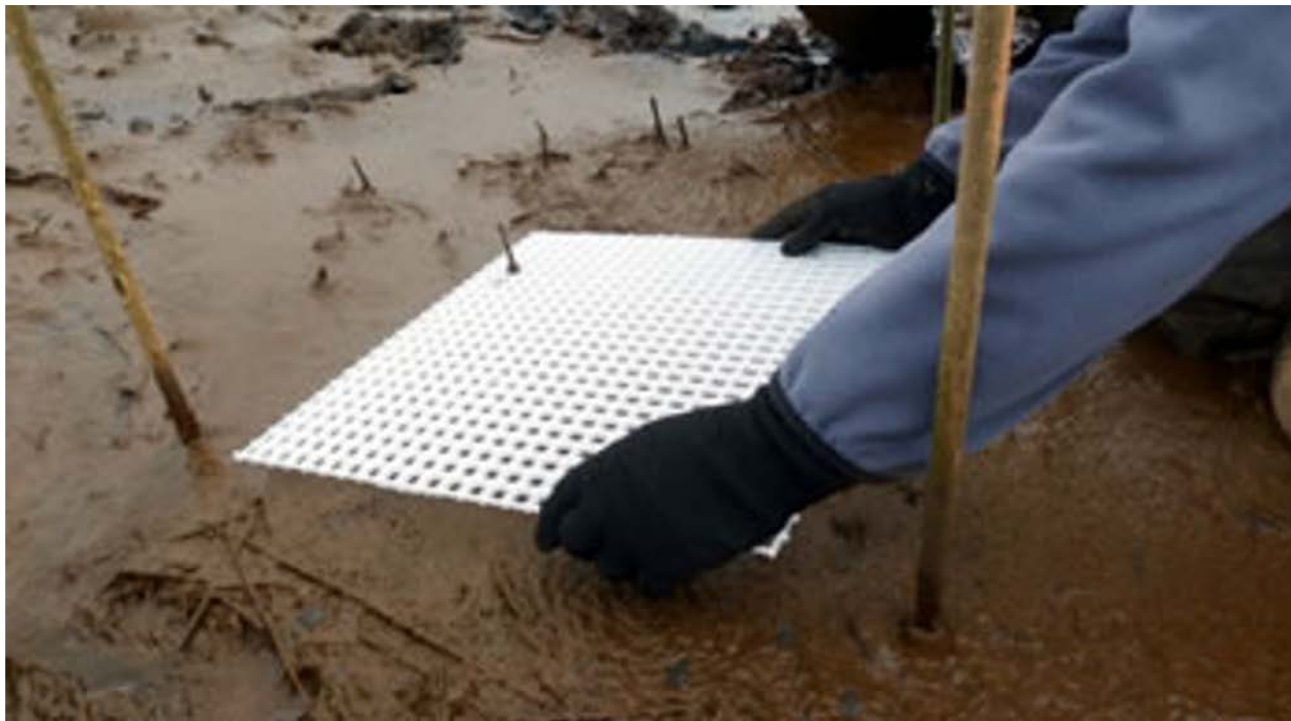
Mixing/dilution



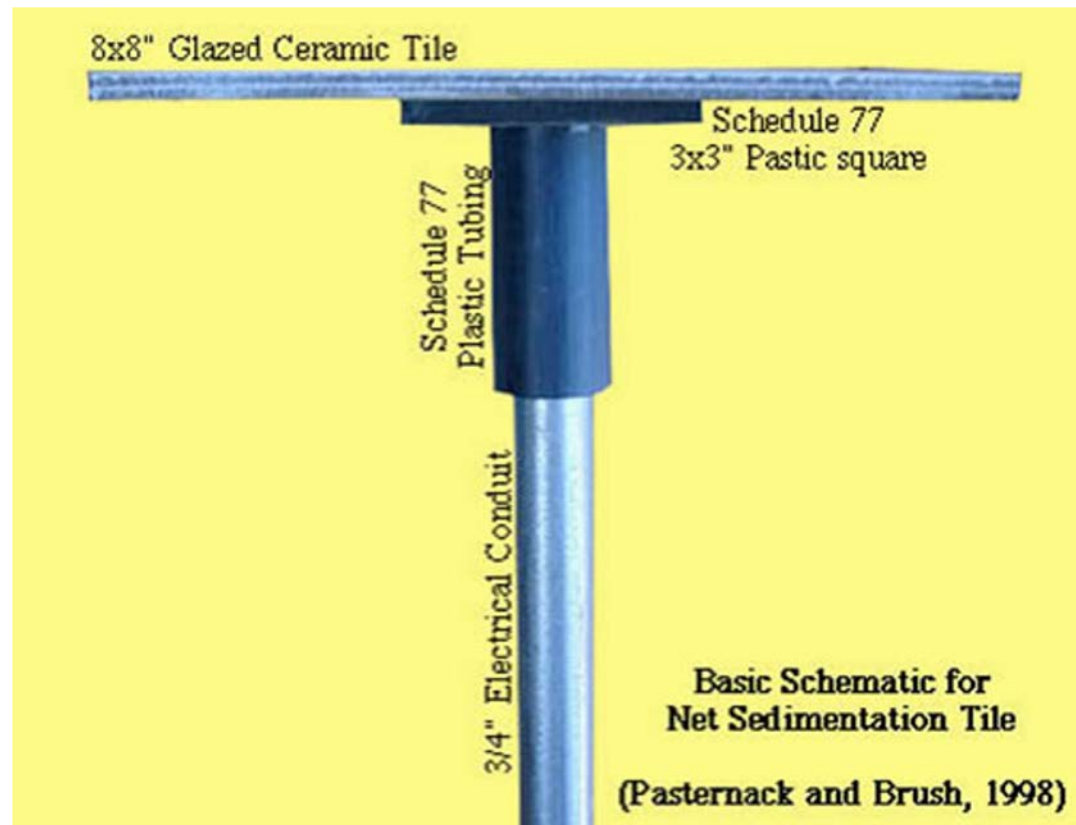
Sediment Markers & Measurements



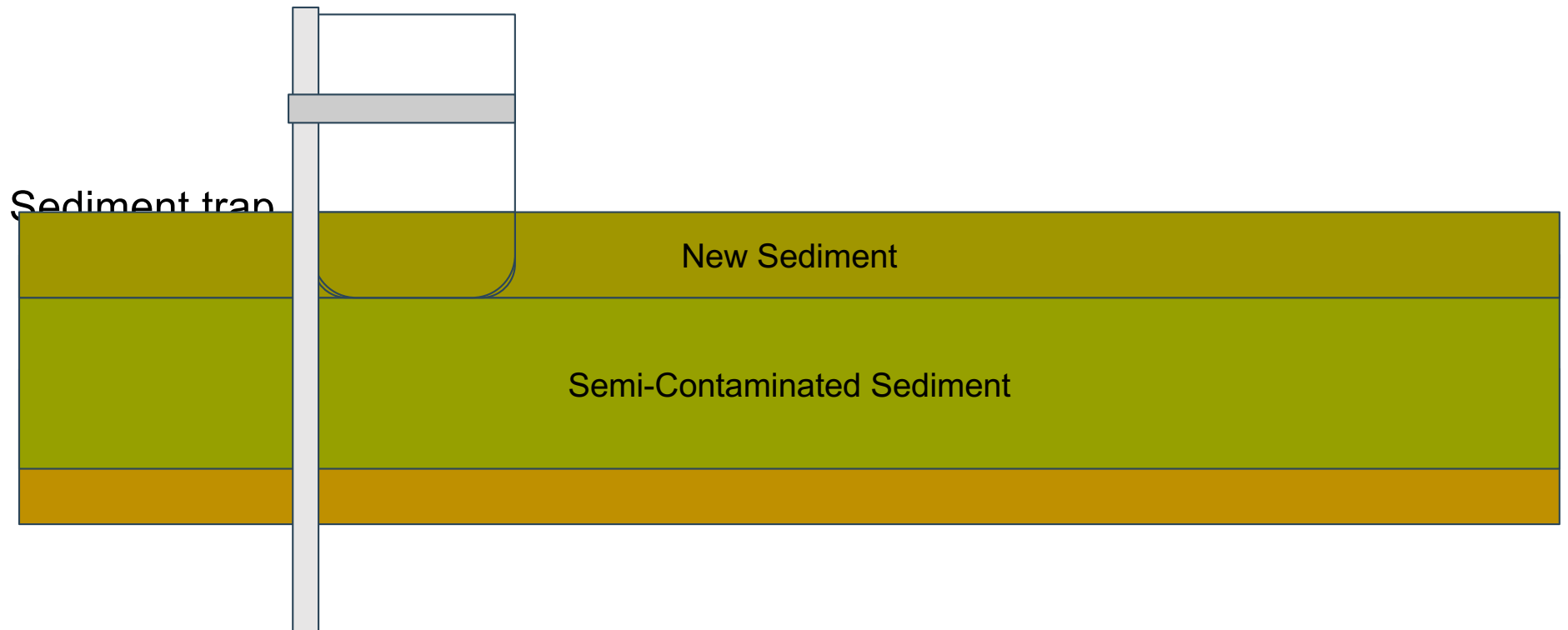
Sediment Surface Change Methods: Grid Marker



Sediment Surface Change Methods: Sediment Plate



Sediment Markers & Measurements





Damon MTL, March 2024, Mar 2025

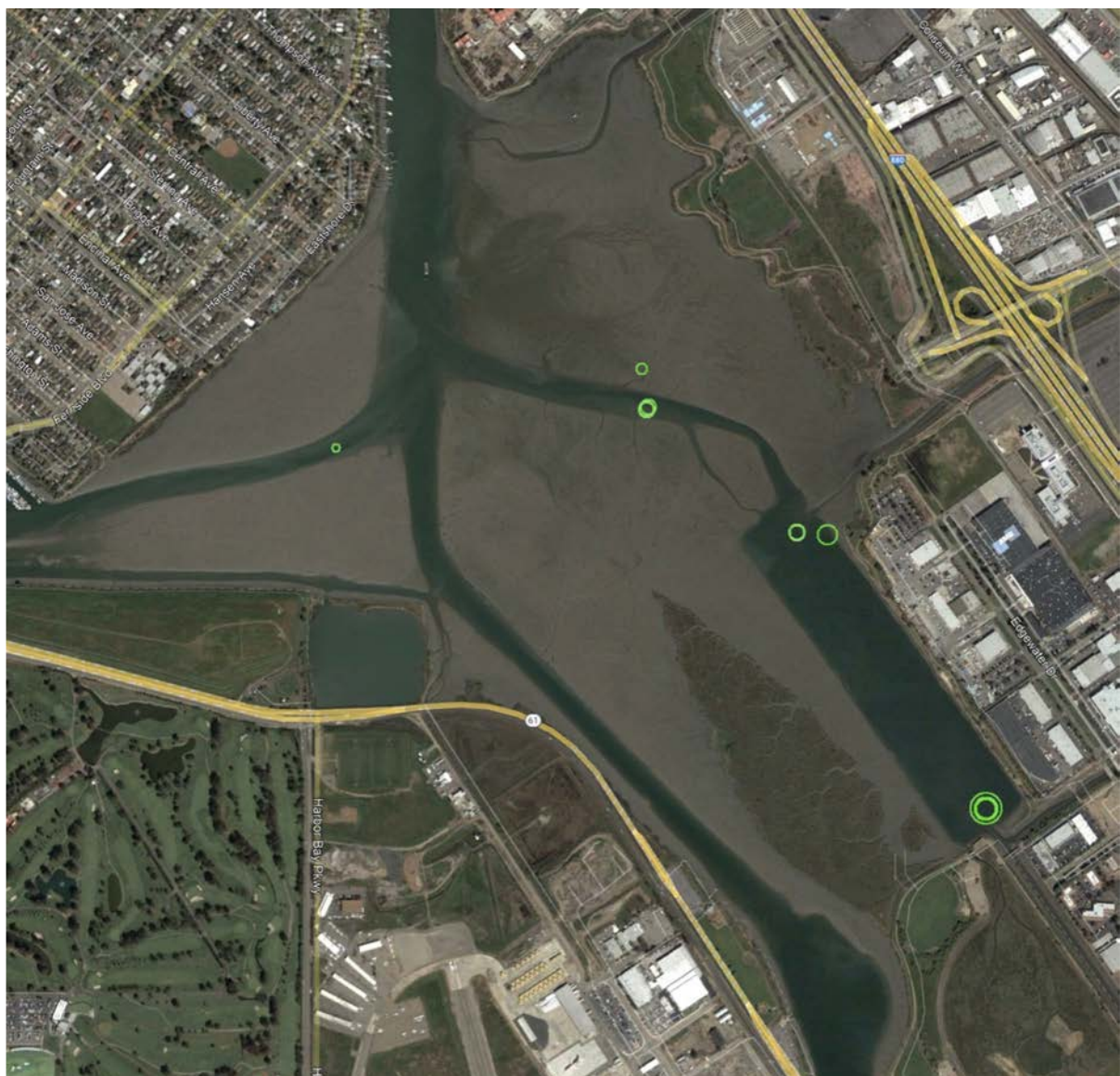


Minor Erosion Erosion



Massive



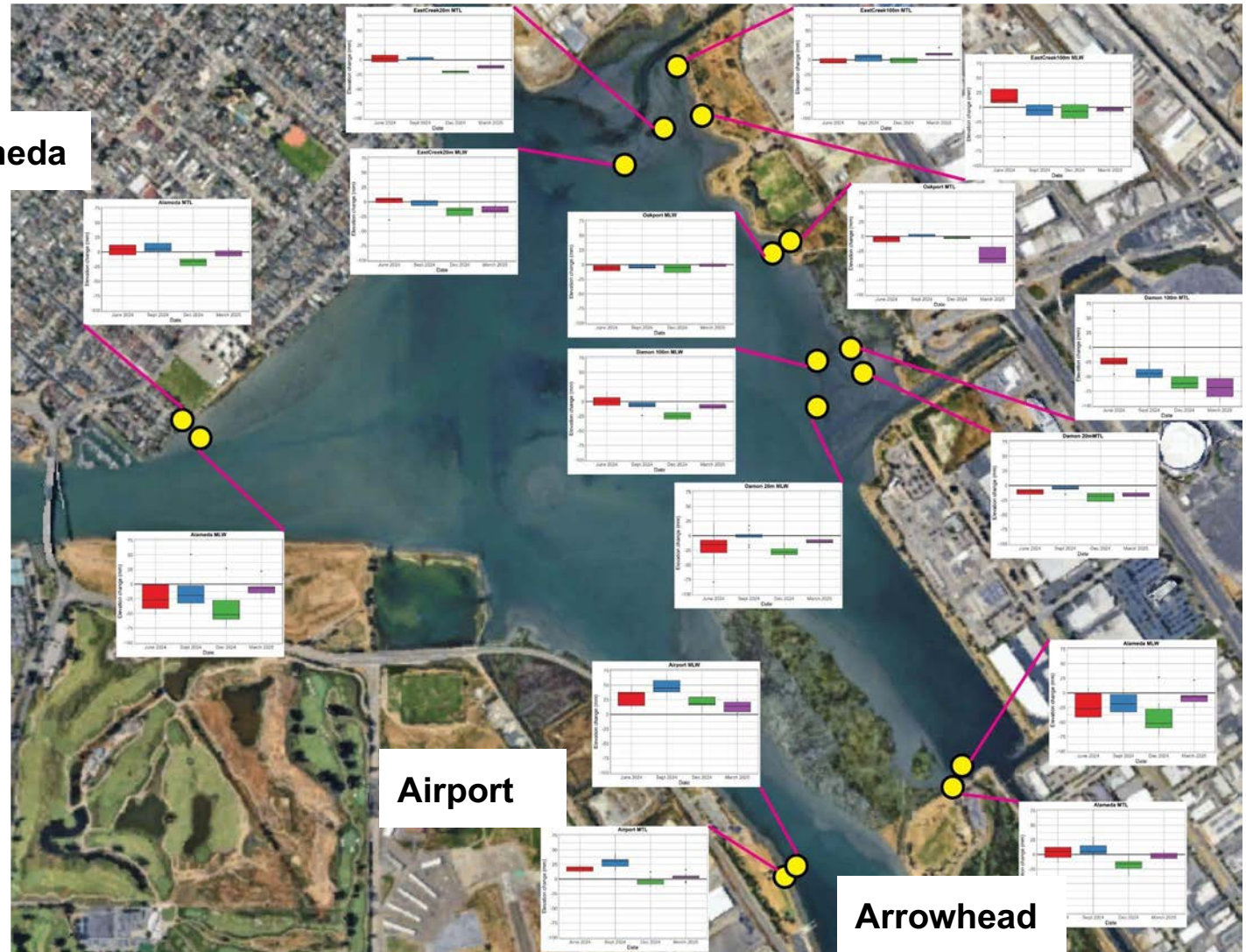


SLB Markers Map

Alameda

Airport

Arrowhead



Mudflats Sed Traps

g/cm²/month

	Q2 2024	Q3 2024	Q4 2024	Q1 2025	Avg	stdev
Airport MLW	0.31	0.22	0.63	0.47	0.41	0.18
Airport MTL	0.28	0.18	0.49	0.48	0.36	0.15
Alam MLW	1.89	1.44	0.12	1.12	1.14	0.75
Alam MTL	0.38	0.47	0.39	0.61	0.46	0.11
Arrow MLW	0.62	0.52	0.28	0.35	0.44	0.16
Arrow MTL	0.46	0.32	0.13	0.17	0.27	0.15
Damon100 MLW	0.74	0.87	0.53	1.00	0.79	0.20
Damon100 MTL	0.82	0.62	0.27	0.62	0.58	0.23
Damon20 MLW	0.74	0.99	0.75	0.59	0.76	0.17
Damon20 MTL	0.65	0.65	0.44	0.54	0.57	0.10
EC100 MLW	0.27	0.50	0.23	0.35	0.34	0.12
EC100 MTL	0.43	0.58	0.27	0.70	0.50	0.19
EC20 MLW	0.46	1.08	0.71	0.56	0.70	0.27
EC20 MTL	0.58	0.75	0.28	1.56	0.79	0.55
Oakport MLW	0.71	0.74	0.27	0.95	0.67	0.28
Oakport MTL	0.41	1.34	0.46	1.50	0.93	0.57



Sed Traps PSD μm (L/R, lab reps)

Sample ID	Mean	SD	D_75		Sample ID	Mean	SD	D_75
Airp_MLW_L	16.3	3.0	40.7		Airp_MLW_R	45.6	4.7	133.3
Airp_MTL_L	31.5	4.6	88.5		Airp_MTL_R	41.7	5.1	130.4
Alam_MTL_L	34.4	5.4	111.9		Alam_MTL_R	34.4	5.2	105.5
Arro_MLW_L	58.6	6.2	226.7		Arro_MLW_R	36.0	6.3	172.6
Dam100_MLW_L2	20.4	4.8	58.4		Dam100_MLW_R	30.7	5.3	93.2
Dam20_MTL_L	163.6	6.4	693.3		Dam20_MTL_R	199.0	5.7	745.0
Lab reps								
Alam_MTL_R	34.4	5.2	105.5		Alam_MTL_R_2	35.4	5.3	107.6

Mudflats Traps PSD (mean μm)

Sample ID	24Q3 Mean	24Q4 Mean	25Q1 Mean
Airp_MLW_L	31	11	11
Airp_MTL_L	37	16	20
Alam_MLW_L	14	15	21
Alam_MTL_L	34	26	16
Arro_MLW_L	47	11	15
Arro_MTL_L	30	9	14
Dam100_MLW_L2	26	15	22
Dam100_MTL_L	50	30	63
Dam20_MLW_L2	15	14	21
Dam20_MTL_L	181	69	112
EC100_MLw_L1	18	14	17
EC100_MTL_L	32	17	54
EC20_MLW_L	18	26	19
EC20_MTL_L	32	25	74
Oakport_MLW_L1	36	18	69
Oakport_MTL_L	134	97	134



Mudflats Traps PCBs

µg/kg dw only MLW sites

	Jun		Dec	
Site (MLW)	Total PCBs	Total RMP 40	Total PCBs	Total RMP 40
Airport	72	69	100	97
Alameda	44	44	43	26
Arrowhead	160	150	90	80
Damon20	160	150	140	140
Damon100	110	100	260	240
EC20	440	410	160	130
EC100	480	450	230	220
Oakport	120	110	250	240



OPTICs Sed Traps

g/cm²/month*

Site	Feb 25	Apr 1
Alameda Channel #1	0.5	0.9
Bay Farm Island #1	1.9	3.2
Damon Creek #1	3.4	3.6
East Creek #1	1.2	1.1
Elmhurst Creek #1	0.9	1.5
San Leandro Bay #1	0.2	0.6
San Leandro Creek #1	2.6	4.9

* possibly some loss via tipped retrieval



OPTICs Traps PCBs

	Feb		Apr	
$\mu\text{g/kg dw}$	Sum209	Sum208	Sum209	Sum208
AlamedaChan_HighStBr	52	52	52	51
DamonCk_PedBr_Oakport	416	415	132	131
EastCk_PedBr_Oakport	430	428	247	245
ElmhrstCk_PedBr_Edgewater	509	503	703	700
SanLeandroCk_PedBr_Pardee	104	102	91	90
SLB_BikeBr_BayFarmls	10	10	7	7
SLB001	64	64	56	56



Sed Trap Recon Pilot Study

PPSSS

Past Pilot Passive Suspended Sediment Samplers



SSSSSS

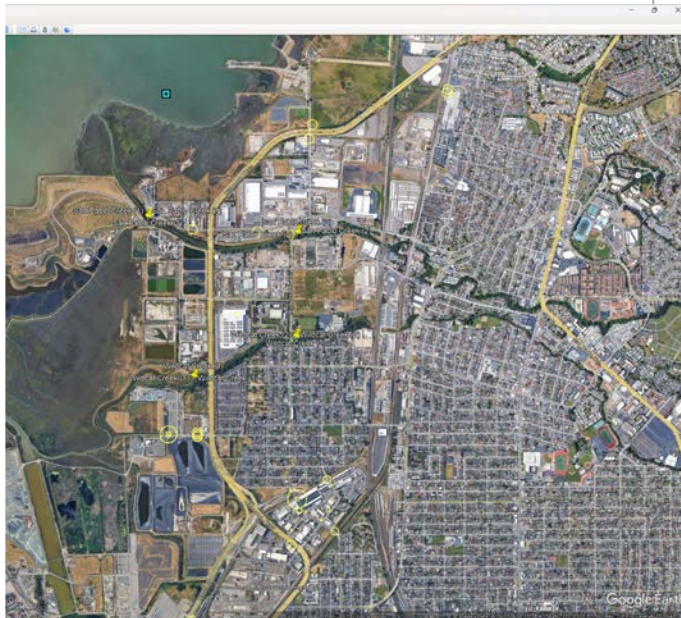
Small Super Simple Suspended Sediment Sampler



Coming Next Year

More SSSSSS!

Other pathways sites of interest
>10 with some RB2 funds?



PCB Sediment jar pilot study location candi...

File Edit View Insert Format Data Tools Extensions Help

Location suggested (at least name of watershed)

A	B	C	D	E	
Location suggested (at least name of watershed)	Location coordinates	Location description	County	Receiving water body	Rationale (d known/expe (unknown u body, geogr interest... th columns
Northern most trib to Emeryville Crescent	37.83714326128014, -122.29759429326953	Small drainage that flows into the Emeryville Crescent across from the Shell gas station just off Powell St. at W Frontage Rd.	Alameda	Emeryville Crescent	This is a total industrial area Margin Unit
Codornices Creek	37.88187, -122.3069	Access at N. end of 2nd St. Looks like it might have been fenced recently (City of Berkeley?).	Alameda		
Temescal Creek	37.83441, -122.29249	Coordinate access thru Bay Street Mall. Suggested as a more secure option than the hotel	Alameda		
Ettie St PS	37.82924, -122.29504	Emeryville Crescent. Safety concerns - would need to park on shoulder of freeway	Alameda	Emeryville Crescent	
Damon Slough	37.75199, -122.20997	Access from Damon Slough	Alameda		
Elmhurst Creek	37.74372, -122.20649	Access from public trail	Alameda		
San Leandro Creek	37.74260, -122.20833	Access from Arrowhead M.	Alameda		
Estudillo Canal	37.69124, -122.18395	Access from San Leandro Bay Trail	Alameda		



RMP

REGIONAL MONITORING
PROGRAM FOR WATER QUALITY
IN SAN FRANCISCO BAY

sfei.org/rmp

Mapping Mudflat Morphodynamics

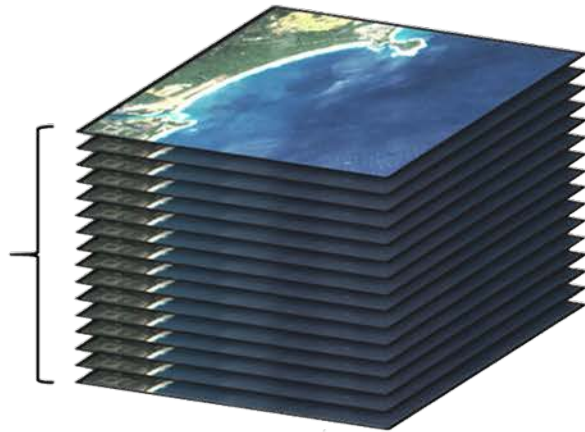
By: Alex Braud

In collaboration with Don Yee, SFEI

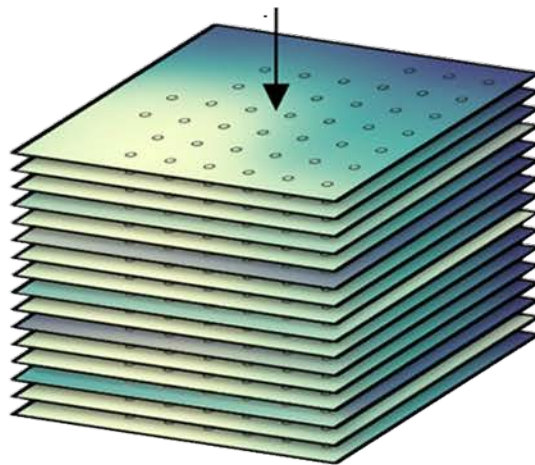


Satellite data array

Landsat and
Sentinel-2



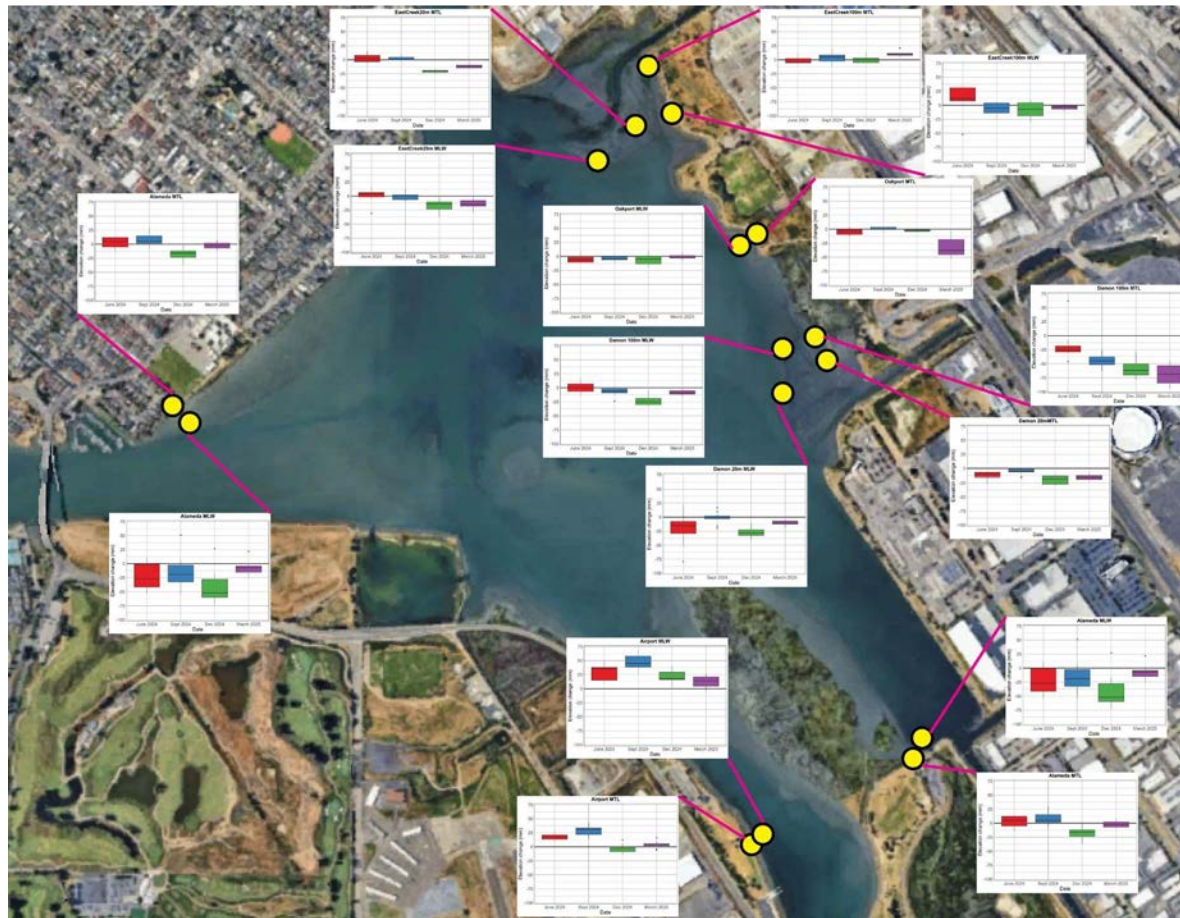
Tide height array



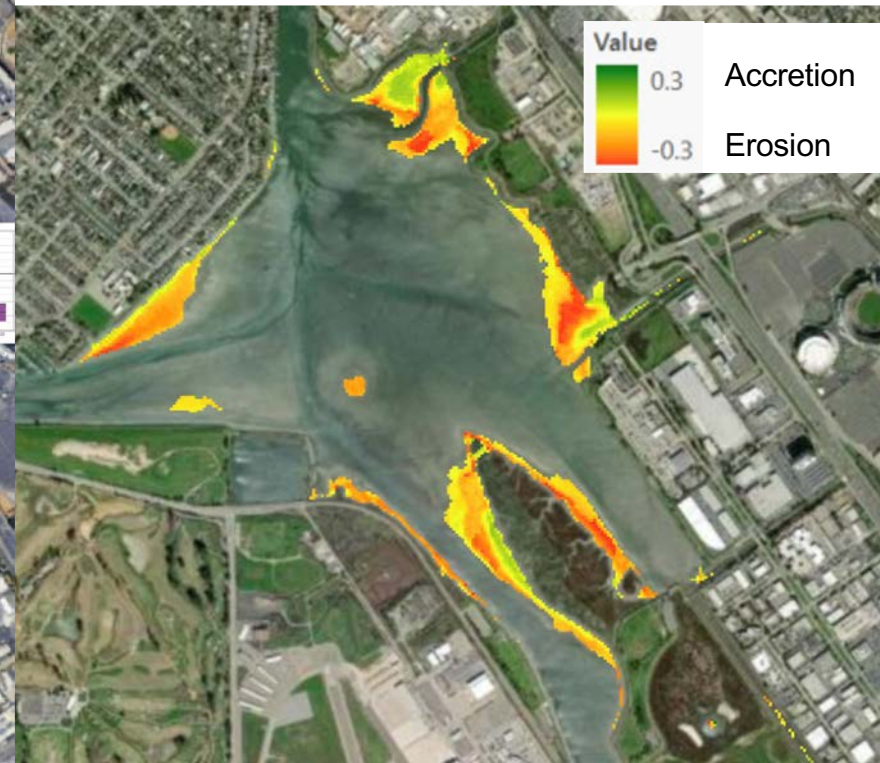
Tides modelled for every satellite
pixel through space and time
using global ocean tide models



March 2024 - March 2025 Field Observations



Change between 2023 and 2025 DEM (Red = -0.3m erosion)



Validation - Alameda Lidar Aug. 2019 (red)



- 2025 LIDAR below MTL but not very low
 - Very little exposed mudflat

Next Steps (2026)



- Mudflat markers tech report (midsummer)
- Mapping mudflat morphodynamics tech report (late summer)
- SSSSSS site selection, permitting, logistics
 - (Sept?/before WY2027)

Item 5: Food Web Model

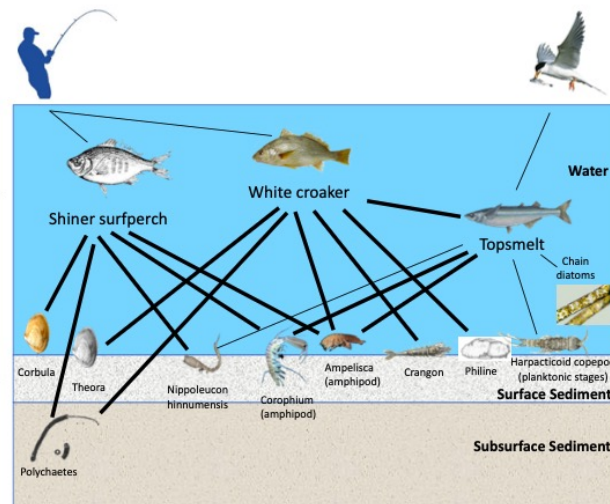


Desired Outcomes for This Item

- Summary presentation to inform the Workgroup
- Obtain preliminary feedback on the report
 - Written comments requested by May 29
- Set stage for consideration of whether more work is needed: either modeling or field studies
- Key questions: Does this work provide what is needed for the TMDL?

A Food-Web Trophic Transfer Model for PCBs in San Francisco Bay for Supporting the Implementation of Total Maximum Daily Loading (TMDL) Remediation Targets and Timelines for Recovery.

Dr. Frank Gobas, Dr. Yung-Shan Lee and Nicole Berg



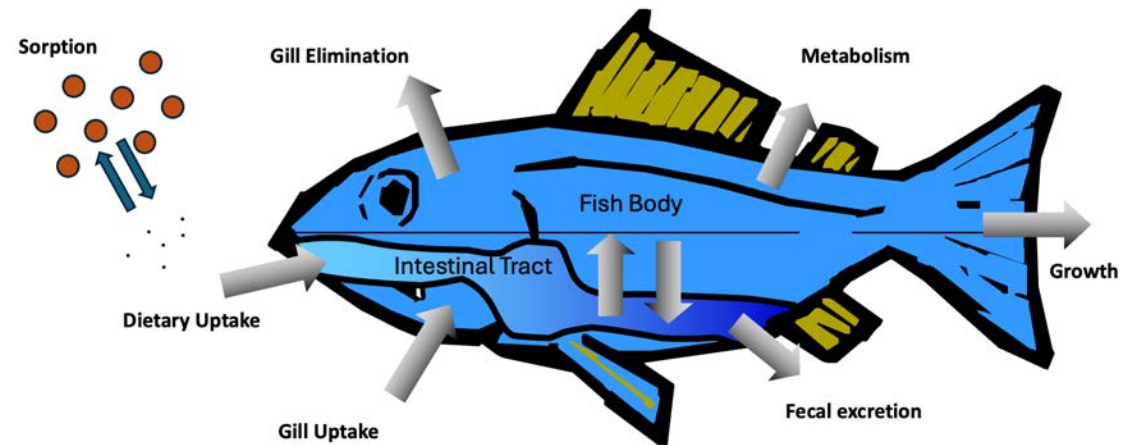
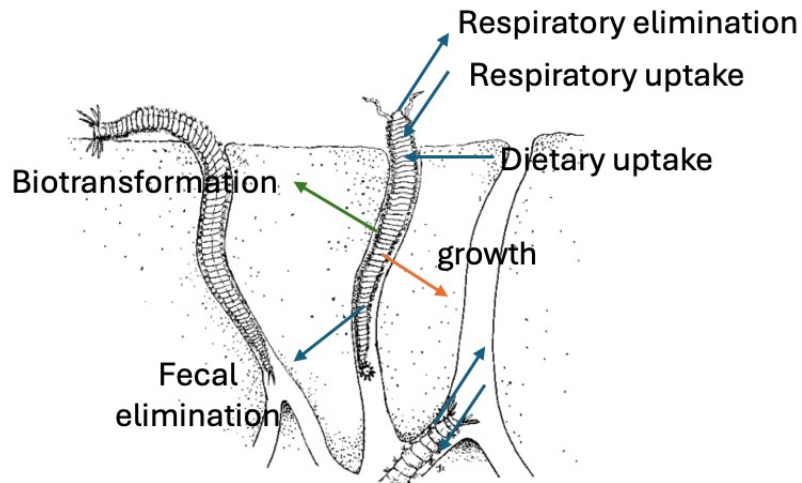
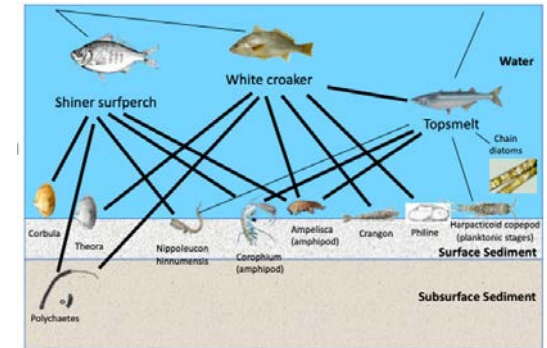
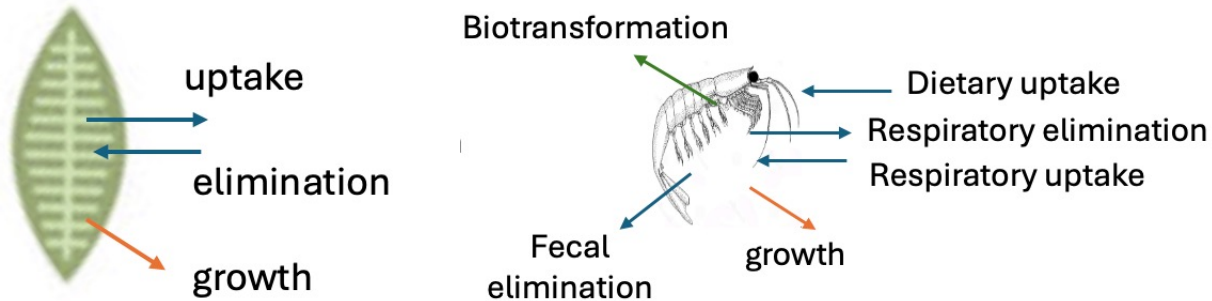
Objectives

- Develop a model for the food-web transfer of PCBs in (i) various areas of San Francisco Bay with a focus on Priority Margin Units (PMUs) and (ii) San Francisco Bay as a whole.
- The purpose of the model is to derive quantitative relationships between concentrations of PCBs in water, sediments, plankton, benthic invertebrates, fish, and sport fish that can be used to support the implementation of Total Maximum Daily Load (TMDL) estimates for the Bay; and (ii) inform on timelines for the PMU's & SFB's recovery.

Summary of Methodology

- Development of the mathematical framework for the model and presenting it in an Excel Spreadsheet.
- Compiled up-to-date information on ecological, environmental, spatial and temporal characteristics of the PMUs and the larger San Francisco Bay to **parameterize** the model for specific PMUs (i.e., Emeryville, San Leandro Bay, Steinberger Slough/Redwood Creek complex (SS/RC) and the larger San Francisco Bay.
- Compiled measured concentrations of PCB congeners in water & sediments at various locations in the Bay for the **testing** and potential calibration of the food-web model.
- Compiled measured concentrations of PCB congeners in several sport fish species for testing and potential calibration of the food-web model.
- Tested the model at San Leandro Bay, Steinberger/Redwood Creek and the larger San Francisco Bay. There were not sufficient data to test the model at the Emeryville PMU.
- Conducted **sensitivity analyses** and **uncertainty analyses** for PCB congeners and total PCBs.

Conceptual Diagram of Food-Web Bioaccumulation Model



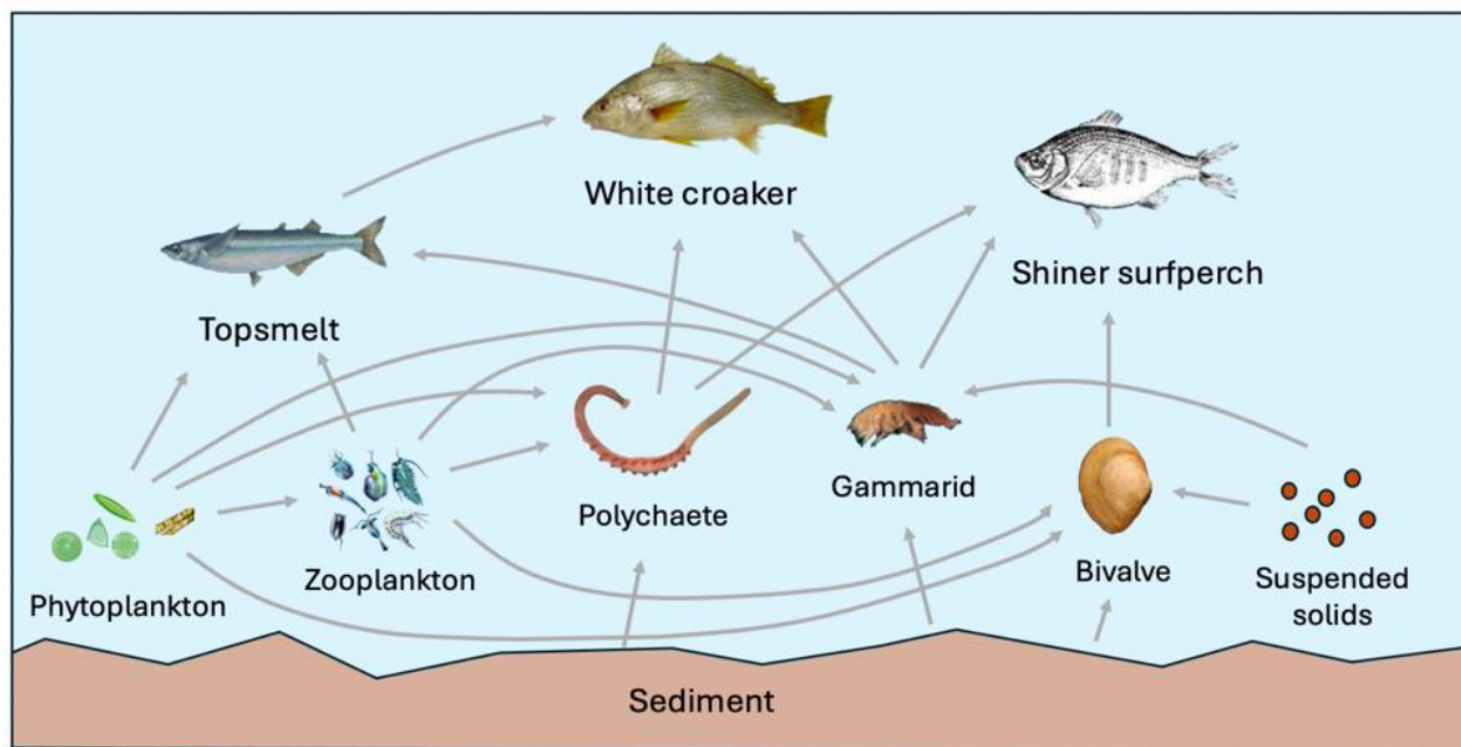


Figure 1. Conceptual diagram illustrating organisms included in the San Leandro Bay PMU food-web bioaccumulation model and their trophic interactions.

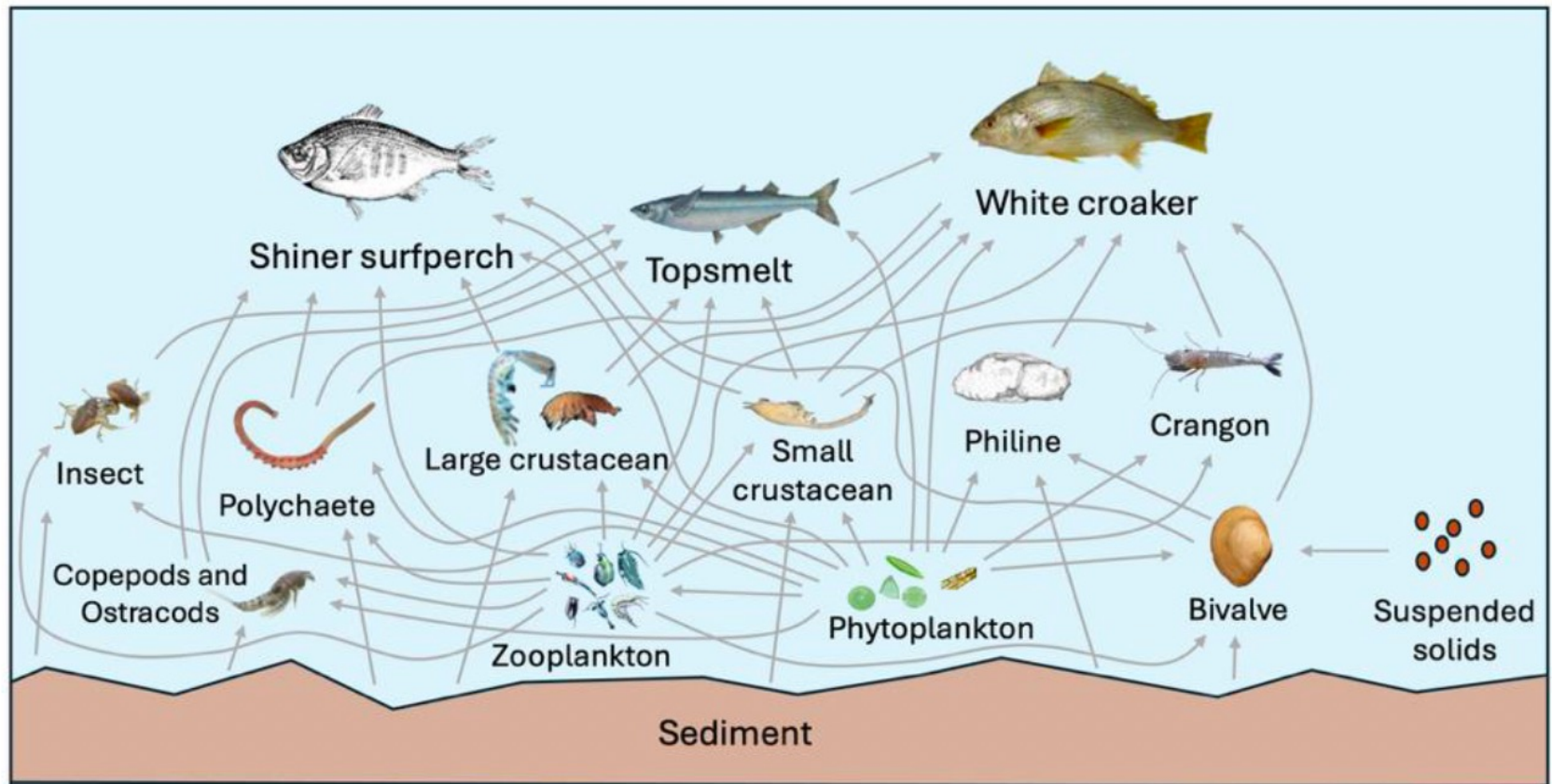


Figure 2. Conceptual diagram illustrating organisms included in the Steinberger Slough/Redwood Creek Complex PMU food-web bioaccumulation model and their trophic interactions.

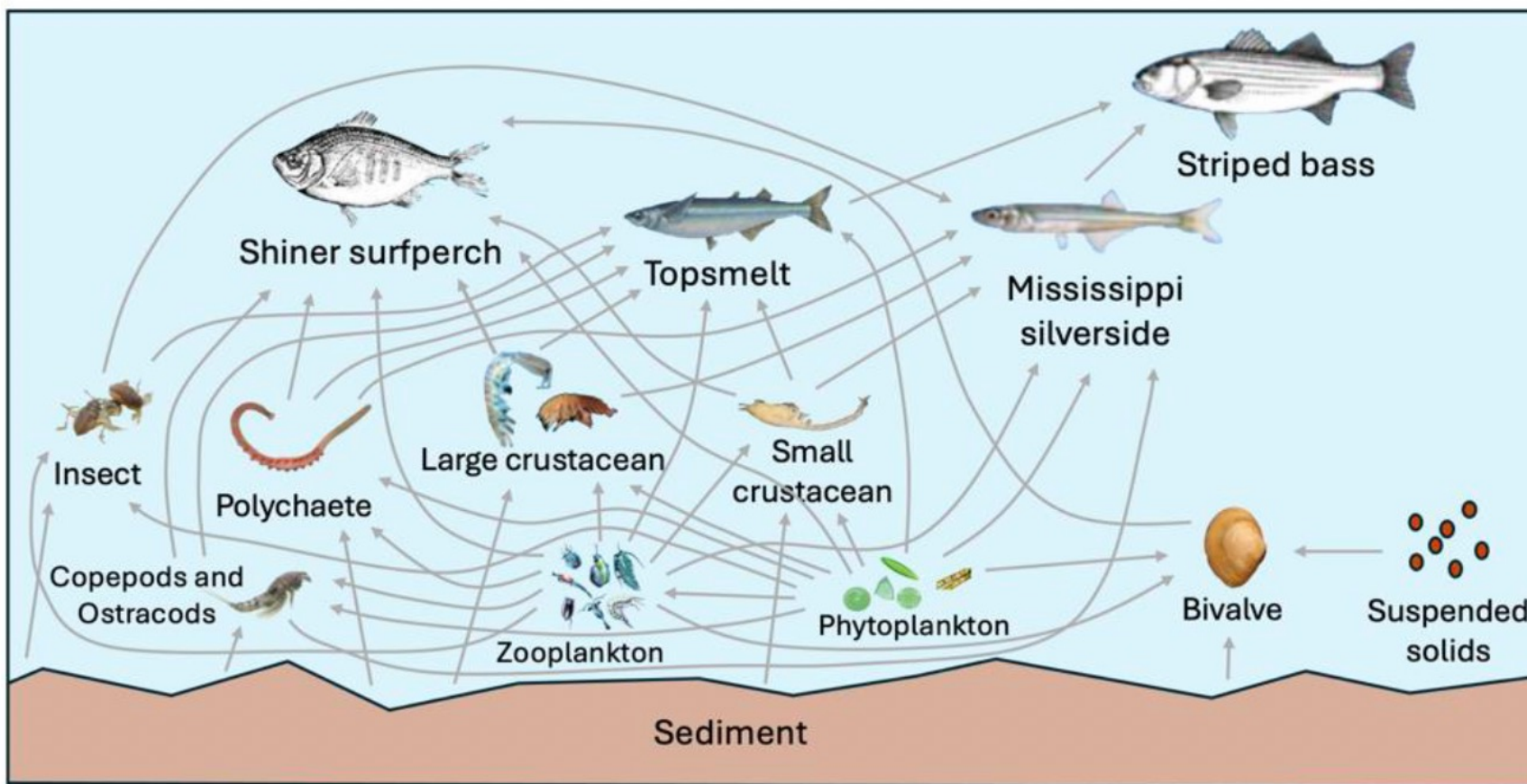


Figure 3. Conceptual diagram illustrating organisms included in the Emeryville Crescent PMU food-web bioaccumulation model and their trophic interactions.

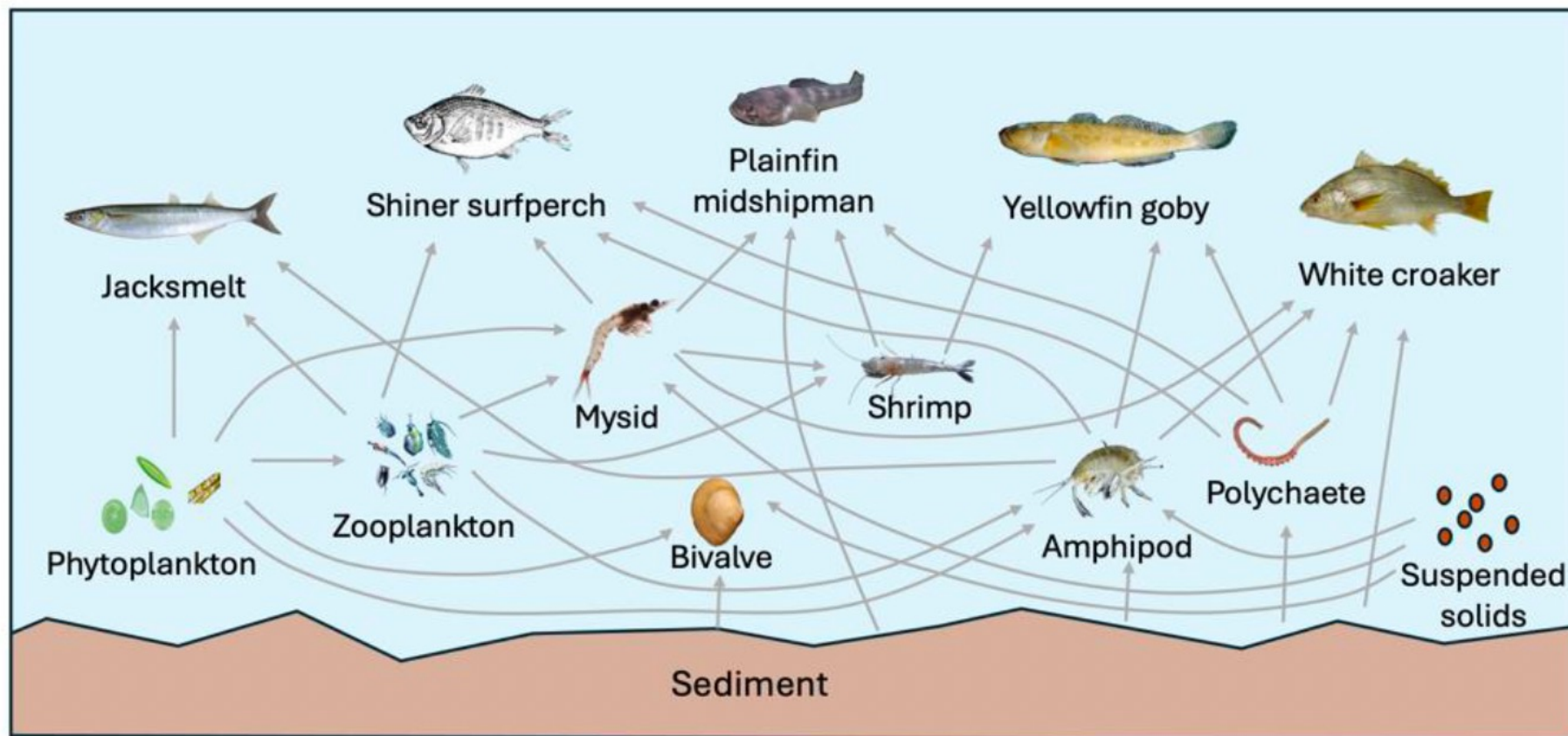
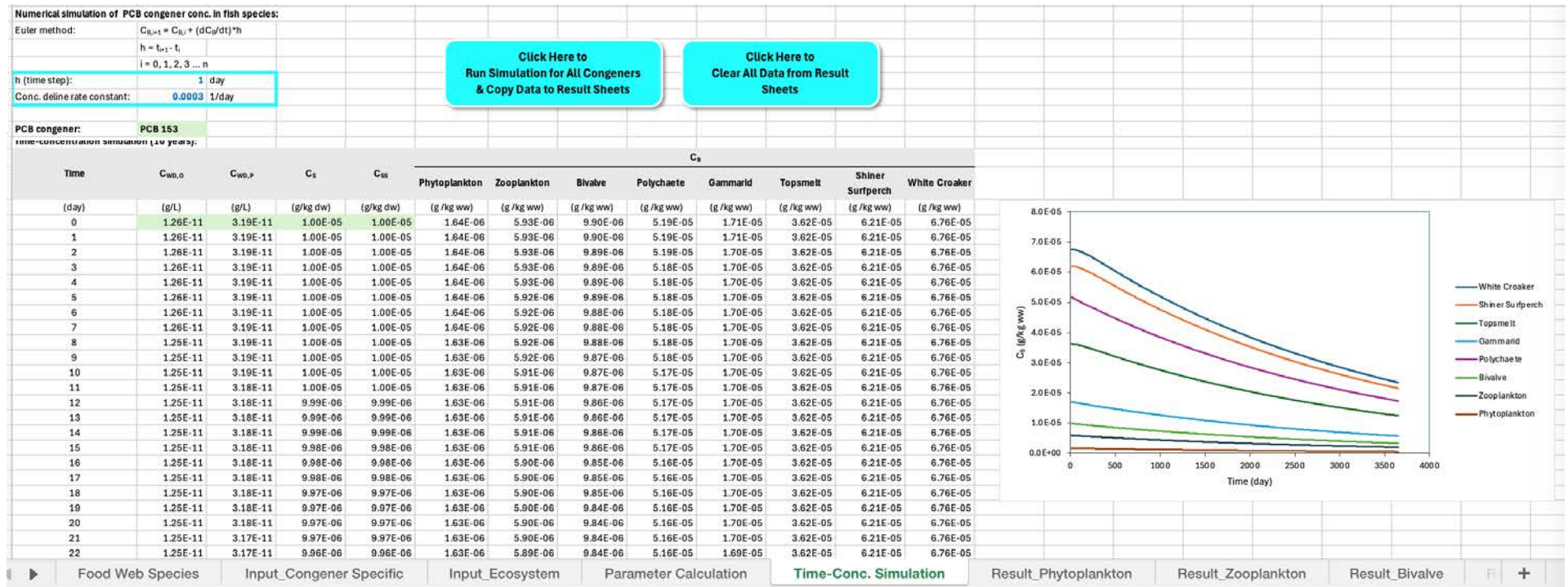


Figure 4. Conceptual diagram illustrating key organisms included in the San Francisco Bay food-web bioaccumulation model and their trophic interactions.

Main Model Attributes

- Time Dependent & Steady State
- Accepts input on time dependent PCB concentrations in water and bottom & suspended sediment from other models
- Accepts data from passive sampling programs
- PCB congener specific and total PCBs
- Uses updated food-web data
- Models are parameterized for specific PMUs

SFB Food-Web Model in Excel



Input Sheets

- Environmental concentrations
- Species info
- Food web info



Calculation Sheet

- Chemical uptake & elimination rate constants



Model Simulation

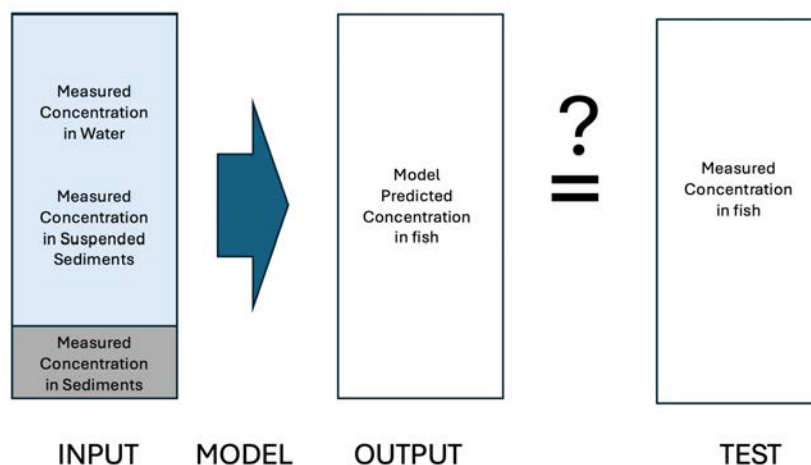
- Macros



Result Sheets

- Time-concentration results for each species

Model Testing



- Used QGIS spatial analysis tool to access PCB congener concentration data in water, bottom sediments, suspended sediments and various fish species from the CD3 SFEI data base and more recent (>2020) passive sampling and fish & sediment concentration data on spatial and temporal basis to find the best data for model testing.

Uncertainty Analysis

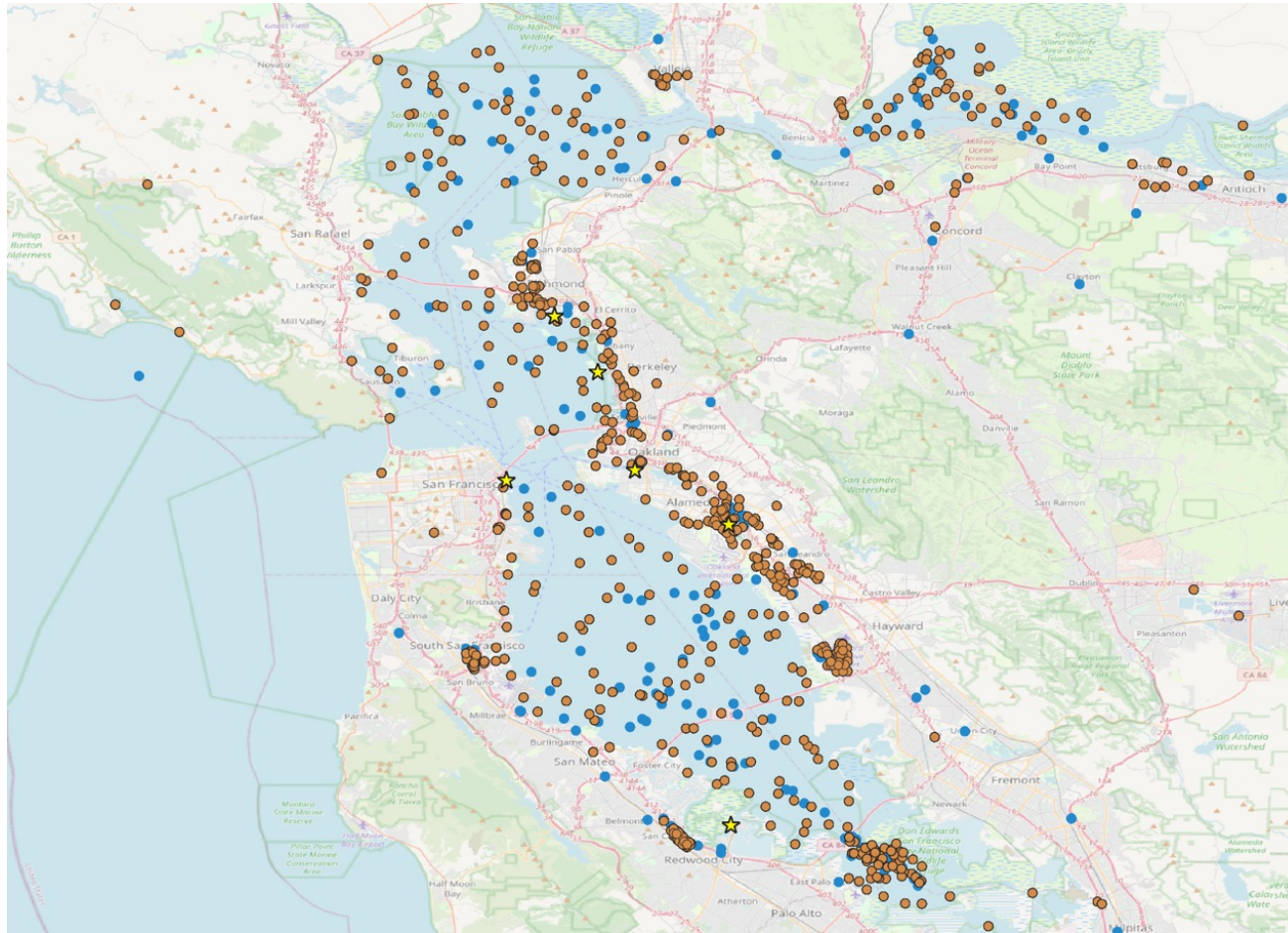
Congener Specific:

$$MB = 10^{(\sum_{i=1}^n (\log (C_{P,i}/C_{O,i}))/n)} \pm SE$$

Total PCBs:

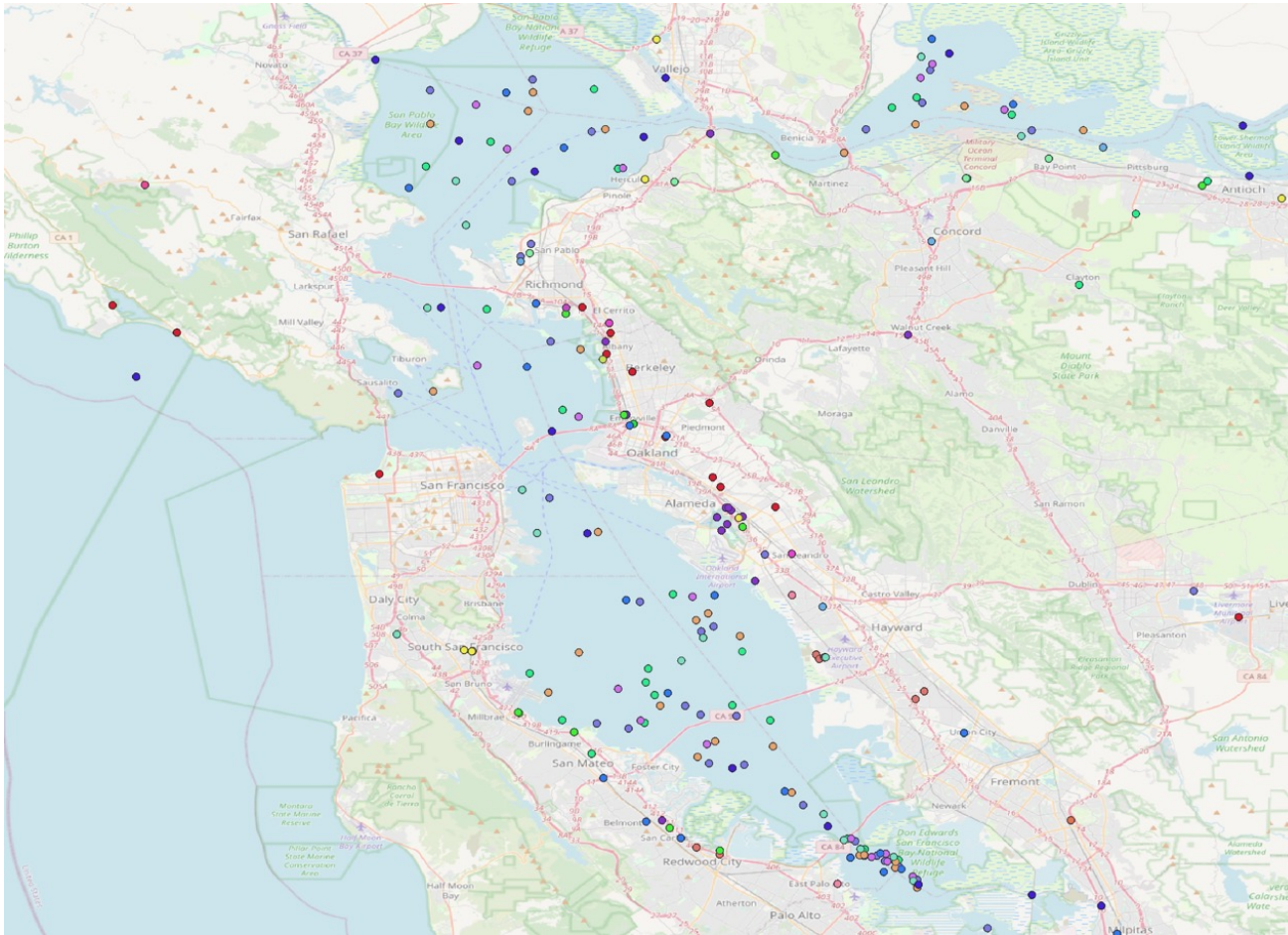
$$MB^* = \frac{\sum_{i=1}^n C_{P,i}}{\sum_{i=1}^n C_{O,i}}$$

Uncertainty due to model uncertainty and measurement uncertainty



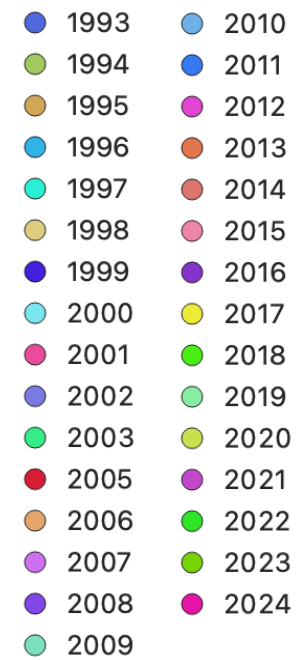
SFEI CD3 Database

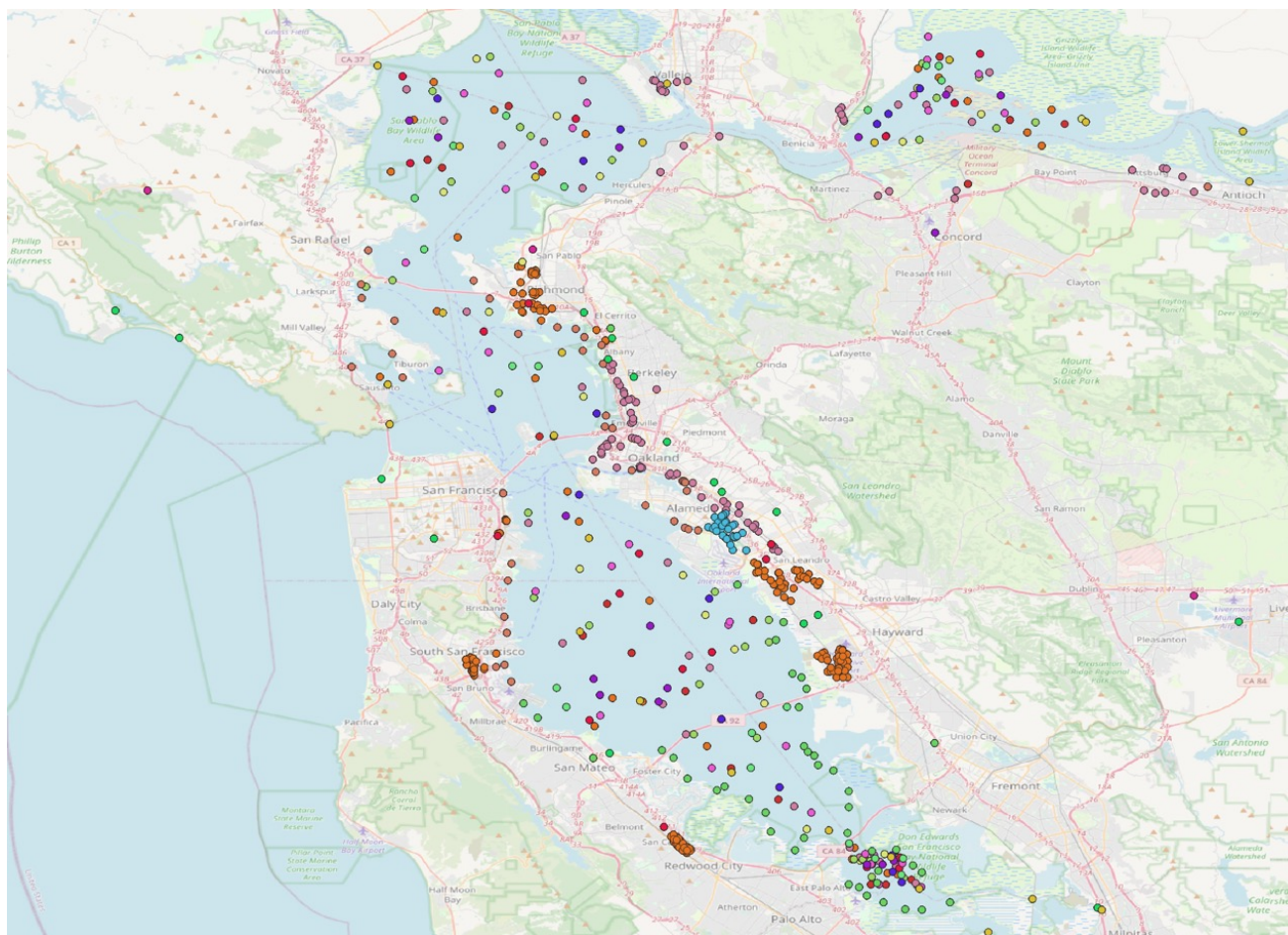
- ★ Shiner surfperch (2019)
- Water, total (1993-2024)
- Sediment (1993-2019)



SFEI CD3 Database

Water, total





SFEI CD3 Database

Sediment

● 1993	● 2007
● 1994	● 2008
● 1995	● 2009
● 1996	● 2010
● 1997	● 2011
● 1998	● 2012
● 1999	● 2013
● 2000	● 2014
● 2001	● 2015
● 2002	● 2016
● 2003	● 2017
● 2004	● 2018
● 2005	● 2019
● 2006	

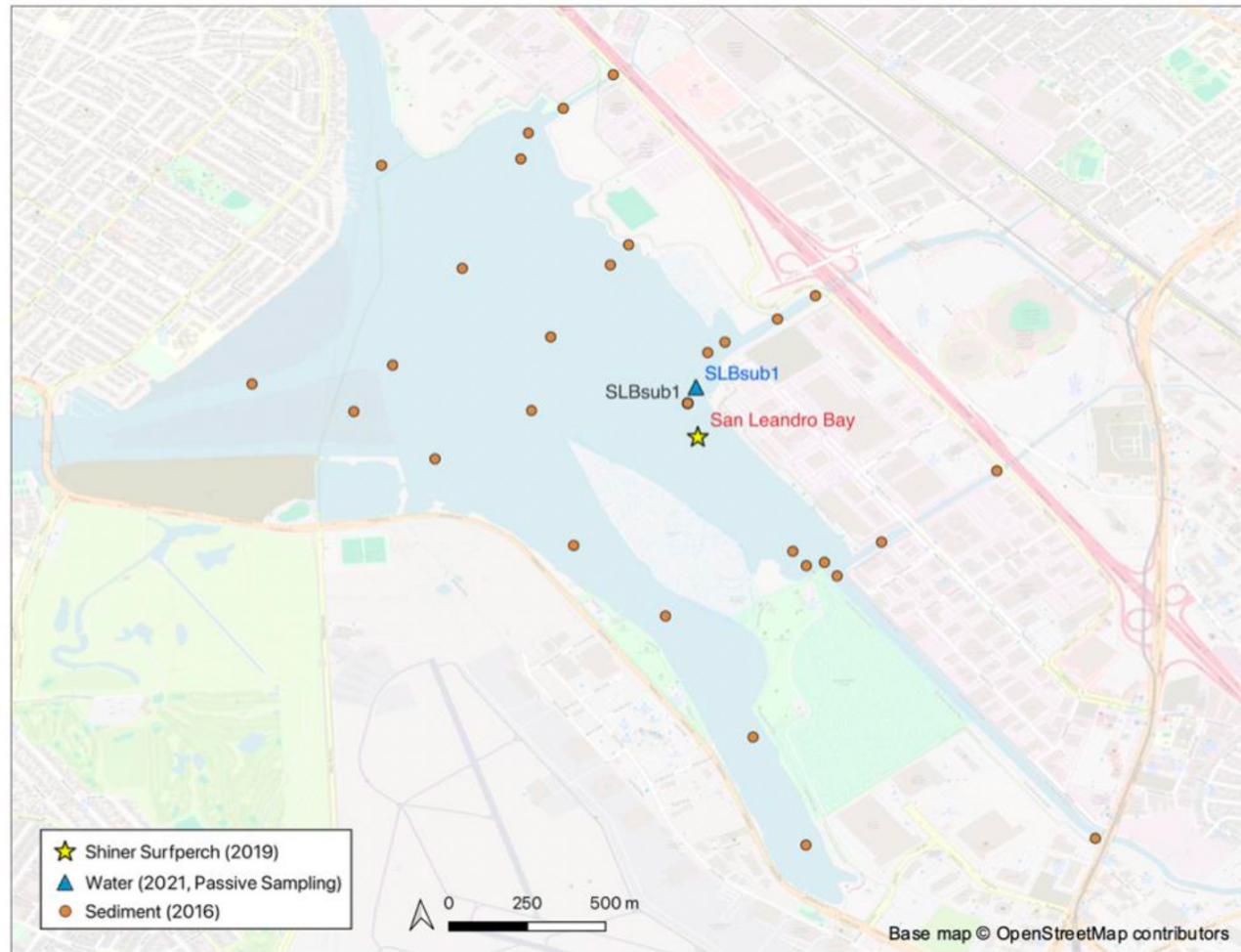


Figure 5. Sampling locations of shiner surfperch (2019 sampling), water (2021 passive sampling), and sediments (2016 sampling) for testing the San Leandro Bay PMU food-web bioaccumulation model.

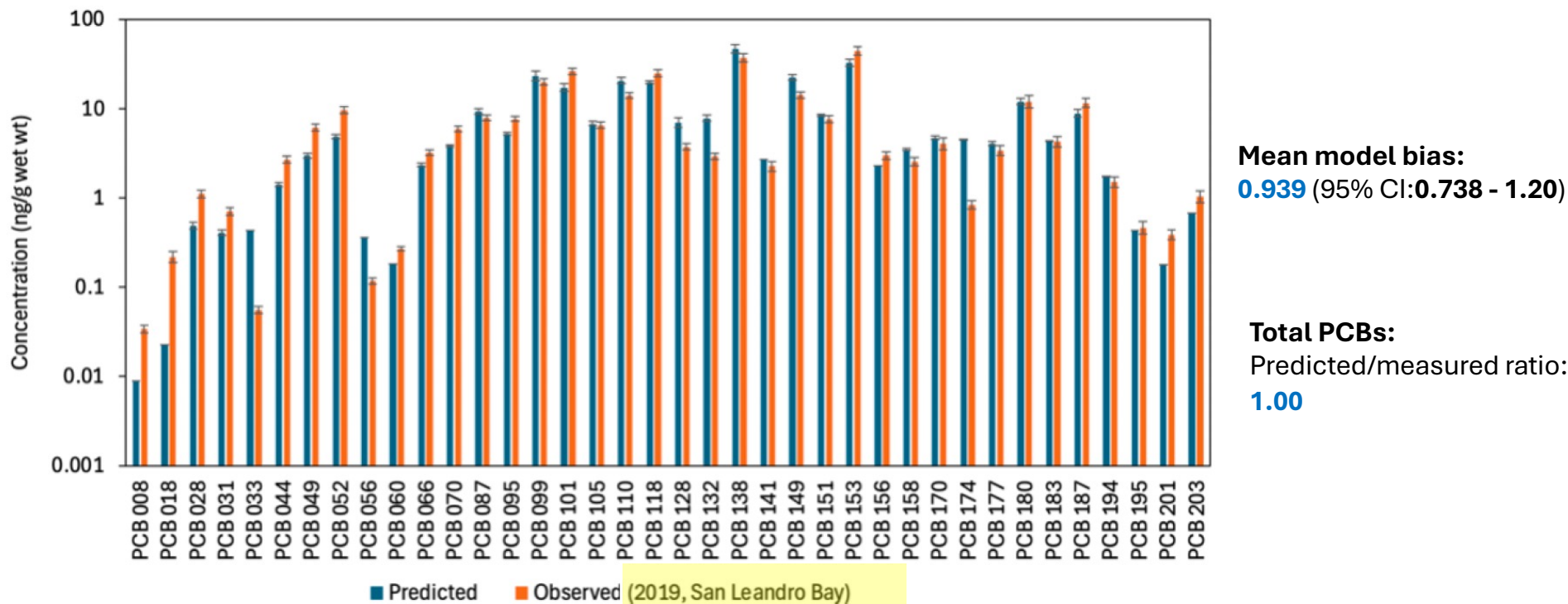


Figure 13. Geometric mean concentrations of PCB congeners in shiner surfperch calculated using the San Leandro Bay PMU food-web bioaccumulation model (blue bars) and observed in 2019 at San Leandro Bay (red bars). Error bars of predicted concentrations in shiner surfperch represent uncertainty in PCB congener concentrations in sediments and water. Error bars of the observed concentrations represent standard error of the geometric mean of observed PCB concentrations in fish.

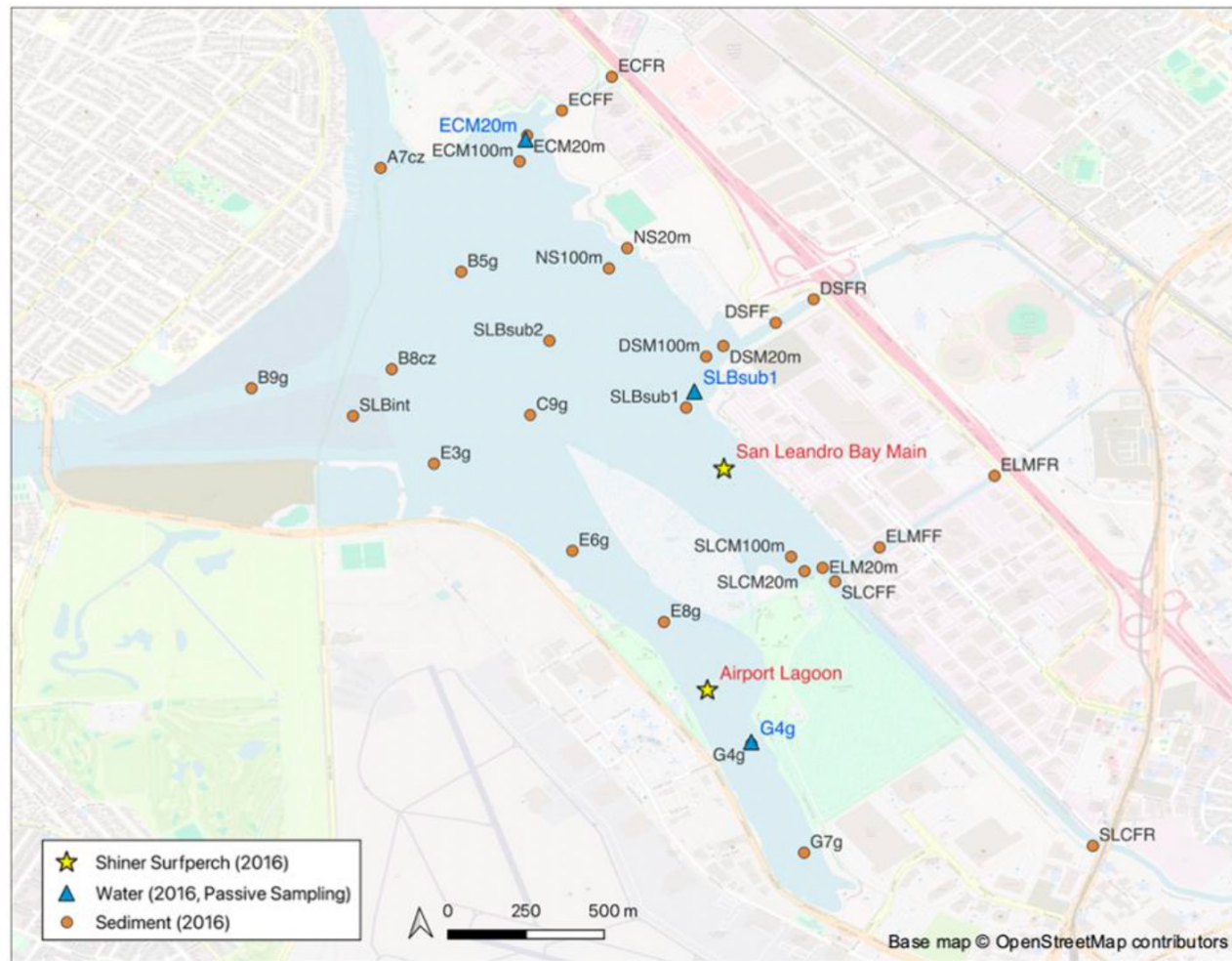
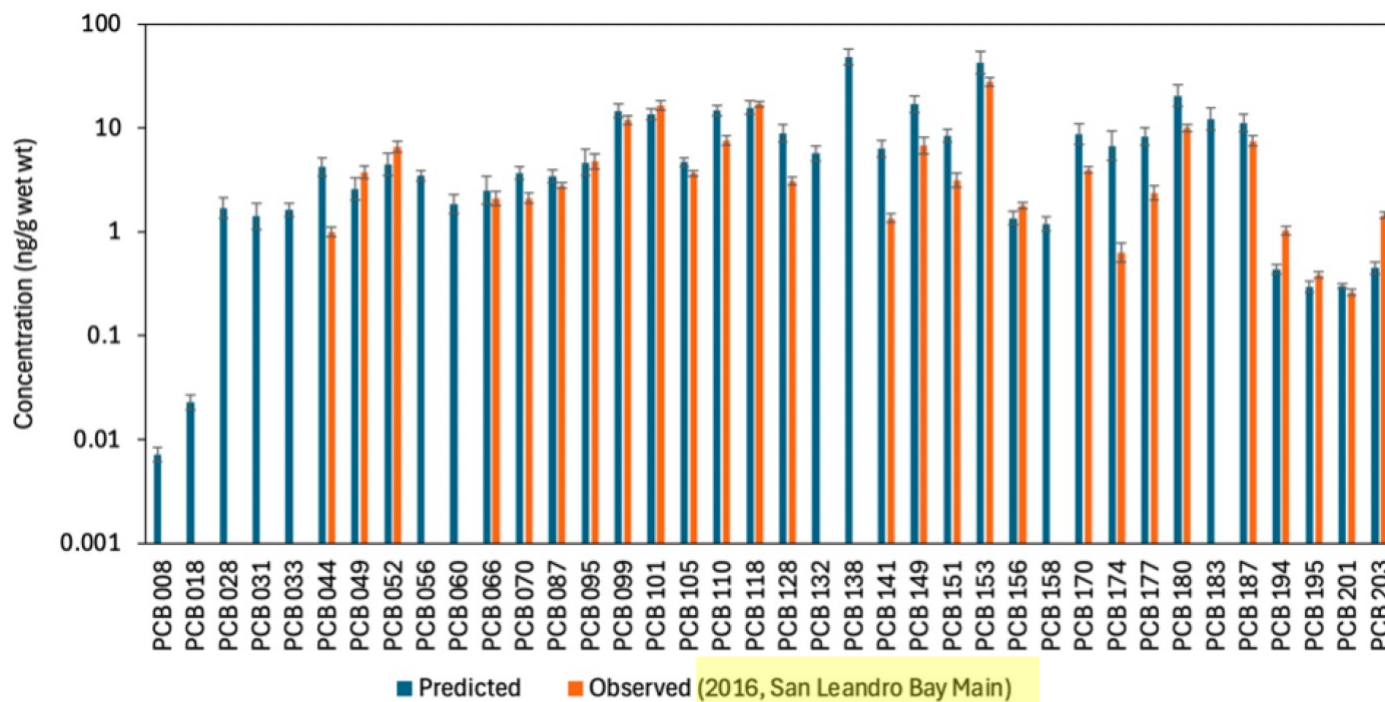


Figure 6. Sampling locations of shiner surfperch (2016 sampling), water (2016 passive sampling), and sediments (2016 sampling) for testing the San Leandro Bay PMU food-web bioaccumulation model.



Mean model bias:

1.47 (95% CI: **1.10** - **1.97**)

Total PCBs:

Predicted/measured ratio:

1.52

Figure 14. Geometric mean concentrations of PCB congeners in shiner surfperch calculated using the San Leandro Bay PMU food-web bioaccumulation model (blue bars) and observed in 2016 at the San Leandro Bay Main sampling site (red bars). Error bars of predicted concentrations in shiner surfperch represent uncertainty in PCB congener concentrations in sediments and water. Error bars of the observed concentrations represent standard error of the geometric mean of observed PCB concentrations in fish.

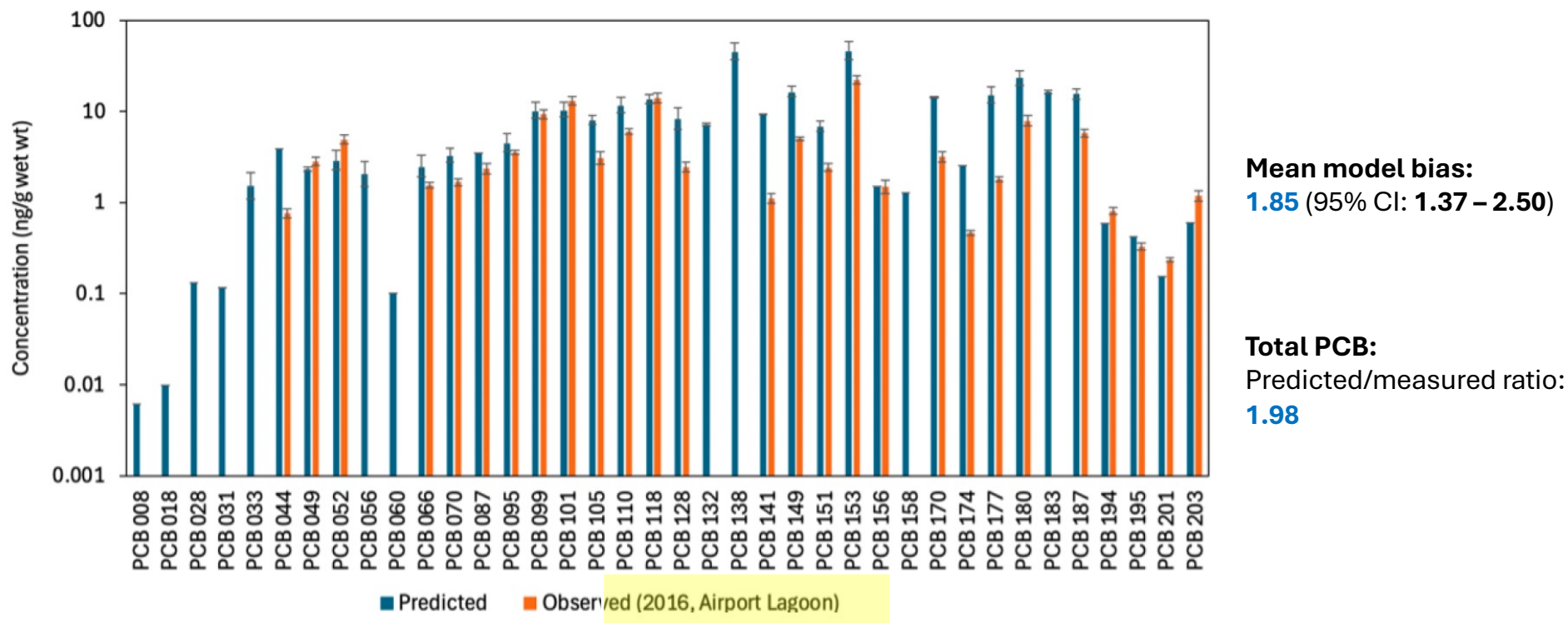


Figure 15. Geometric mean concentrations of PCB congeners in shiner surfperch calculated using the San Leandro Bay PMU food-web bioaccumulation model (blue bars) and observed in 2016 at the Airport Lagoon sampling site (red bars). Error bars of predicted concentrations in shiner surfperch represent uncertainty in PCB congener concentrations in sediments and water. Error bars of the observed concentrations represent standard error of the geometric mean of observed PCB concentrations in fish.

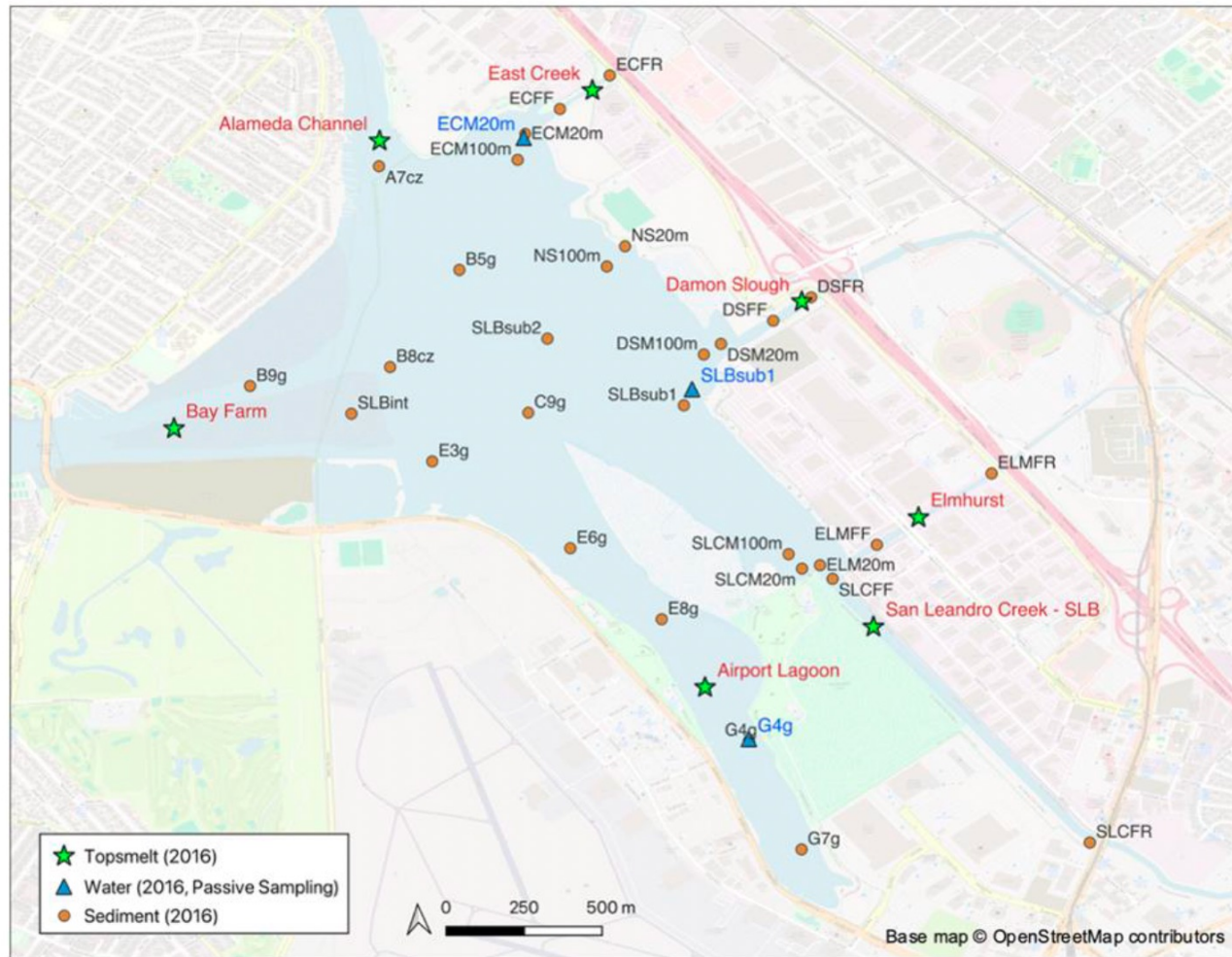


Figure 7. Sampling locations of topsmelt (2016 sampling), water (2016 passive sampling), and sediments (2016 sampling) for testing the San Leandro Bay PMU food-web bioaccumulation model.

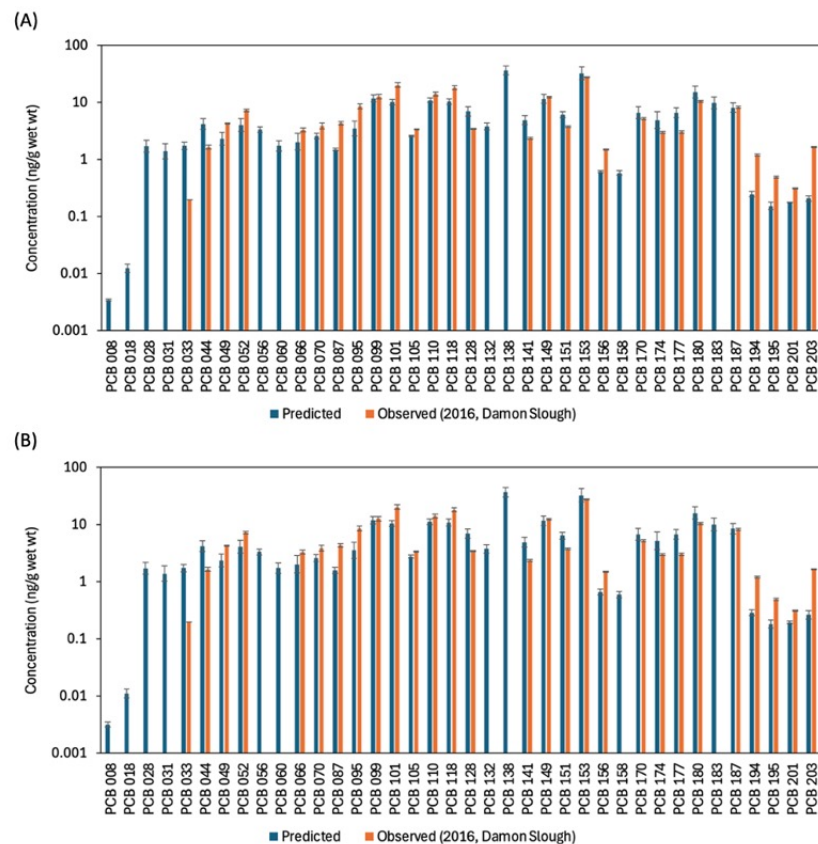


Figure 16. Geometric mean concentrations of PCB congeners in topsmelt calculated using the San Leandro Bay PMU food-web bioaccumulation model (blue bars) and observed in 2016 at the Damon Slough sampling site (red bars). Input PCB concentrations in sediments were collected from adjacent sites (A) or all sediment sampling sites (B). Error bars of predicted concentrations in shiner surfperch represent uncertainty in PCB congener concentrations in sediments and water. Error bars of the observed concentrations represent standard errors of the geometric mean of observed PCB concentrations in fish.

Adjacent Sites

Mean model bias:
0.839 (95% CI: **0.639– 1.04**)

Total PCB:
 Predicted/measured ratio:
0.921

All Sites

Mean model bias:
0.870 (95% CI: **0.60– 1.18**)

Total PCB:
 Predicted/measured ratio:
0.945

Table 1. Calculated mean model bias values (MB and MB) for model testing at San Leandro Bay. An MB or MB* of 1 indicate a lack of model bias and good agreement between model-calculated and observed concentrations of PCBs in fish.*

Fish species (sample year)	Fish site (sample year)	Water (passive sampling) site (sample year)^a	Sediment site (sample year)^a	MB (n) 95% CI^b	MB*^c
Shiner surfperch (2019)	San Leandro Bay (2019)	SLBsub1 (2021)	SLBsub1 (2016)	0.939 (38) 0.738–1.20	1.00
Shiner surfperch (2016)	San Leandro Bay Main (2016)	SLBsub1 (2016)	DSM20m, DSM100m, SLBsub1, SLCM100m, SLCM20m, ELM20m (2016)	1.47 (27) 1.10–1.97	1.52
	Airport Lagoon (2016)	G4g (2016)	E8g, G4g (2016)	1.85 (27) 1.37–2.50	1.98
Topsmelt (2016)	Damon Slough (2016)	SLBsub1 (2016)	DSFR, DSFF (2016)	0.839 (28) 0.601–1.14	0.921
			All stations (2016)	0.870 (28) 0.639–1.18	0.945
	Airport Lagoon (2016)	G4g (2016)	E8g, G4g (2016)	1.02 (27) 0.732–1.43	1.24
			All stations (2016)	1.04 (27) 0.741–1.45	1.25
	Alameda Channel (2016)	ECM20m (2016)	A7cz (2016)	0.986 (27) 0.555–1.75	1.46
			All stations (2016)	1.40 (27) 0.936–2.09	1.63
	East Creek (2016)	ECM20m (2016)	ECFR, ECFF (2016)	2.04 (30) 1.37–3.04	2.31
			All stations (2016)	1.37 (30) 0.839–2.24	1.78

^a The locations of sampling sites are shown in Figures 5–7.

^b Mean model bias MB determined based on PCB congener concentrations and calculated using Equation 1.

n = number of comparisons. 95% confidence interval (CI) = antilog (log MB ± [$t_{v,0.05}$ × standard deviation]).

^c Model bias MB* determined based on total PCB concentrations and calculated using Equation 2

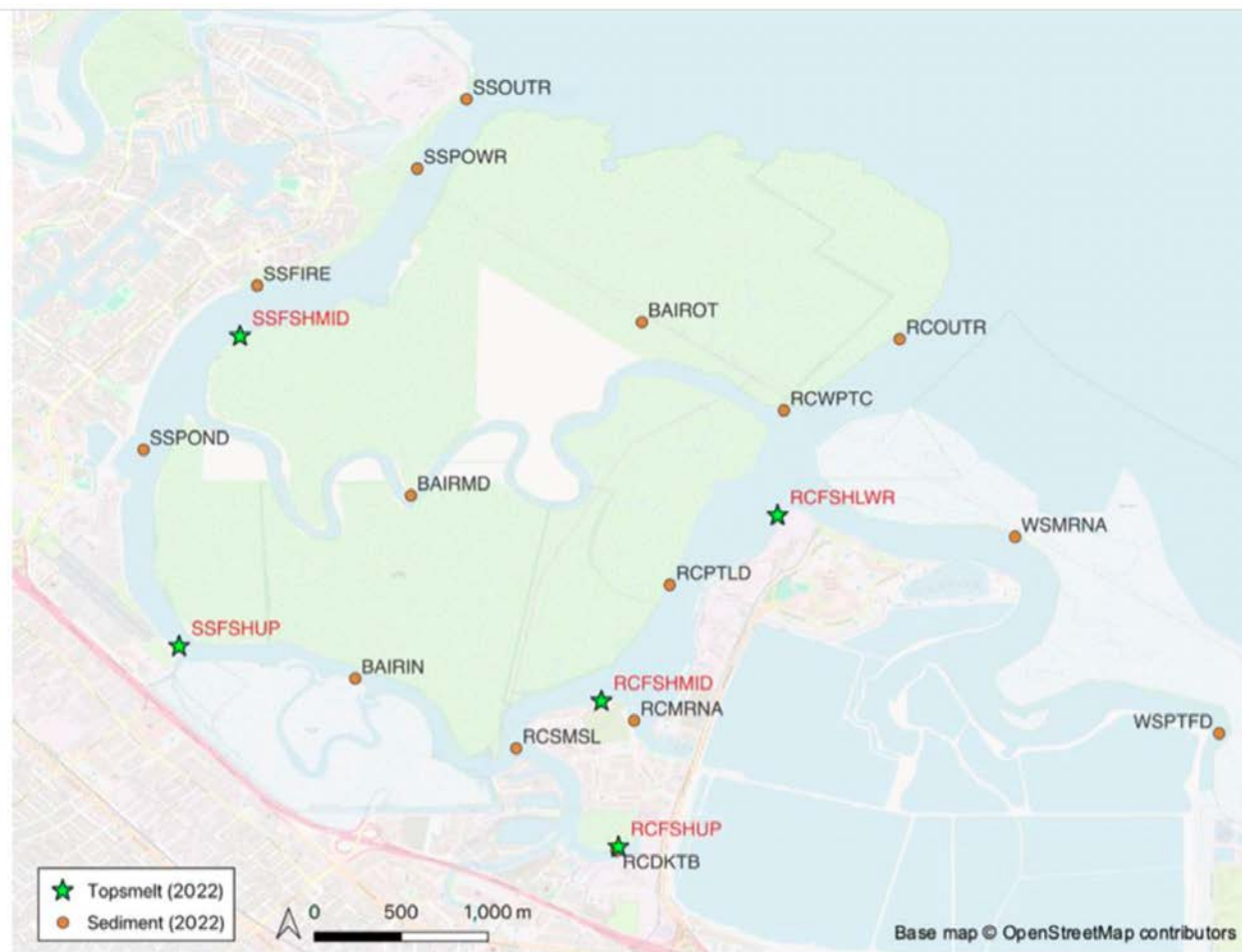


Figure 8. Sampling locations of topmelt (2022 sampling) and sediments (2022 sampling) for testing the Steinberger Slough/Redwood Creek Complex PMU food-web bioaccumulation model.



Figure 9. Sampling locations of shiner surfperch (2019 sampling) and sediments (2022 sampling) for testing the Steinberger Slough/Redwood Creek Complex PMU food-web bioaccumulation model.



Figure 10. Sampling locations of white croaker (2019 sampling) and sediments (2022 sampling) for testing the Steinberger Slough/Redwood Creek Complex PMU food-web bioaccumulation model.

Table 2. Calculated model bias values (MB and MB) for model testing at Steinberger Slough/Redwood Creek Complex. An MB or MB* of 1 indicate a lack of model bias and good agreement between model-calculated and observed concentrations of PCBs in fish.*

Fish species (sample year)	Fish site (sample year)	Sediment site (sample year) ^a	MB (n) 95% CI ^b	MB* ^c
Topsmelt (2022)	RCFSLWR (2022)	RCWPTC, RCPTLD (2022)	2.05 (38) 1.55, 2.70	1.63
		All stations (2022)	2.75 (38) 2.19, 3.47	2.12
	RCFSHMID (2022)	RCMRNA (2022)	1.81 (38) 1.46, 2.24	1.53
		All stations (2022)	1.40 (38) 1.17, 1.66	1.21
	RCFSHUP (2022)	RCDKTB (2022)	7.14 (38) 5.74, 8.88	5.69
		All stations (2022)	2.01 (38) 1.64, 2.45	1.68
	SSFHSHMID (2022)	SSFIRE (2022)	4.11 (38) 3.26, 5.17	3.04
		All stations (2022)	3.05 (38) 2.29, 4.08	2.13
	SSFHSHUP (2022)	SSPOND, BAIRIN (2022)	1.56 (38) 1.23, 1.97	1.15
		All stations (2022)	2.32 (38) 1.87, 2.87	1.83
Shiner surfperch (2019)	South Bay (2019)	RCPTLD (2022)	1.41 (38) 0.909, 2.20	0.918
White croaker (2019)	South Bay (2019)	RCPTLD (2022)	2.64 (38) 1.57, 4.44	1.59

^a The locations of sampling sites are shown in Figures 8–10.

^b Mean model bias MB determined based on PCB congener concentrations and calculated using Equation 1.
n = number of comparisons. 95% confidence interval (CI) = antilog (log MB ± [$t_{v,0.05}$ × standard deviation]).

^c Model bias MB* determined based on total PCB concentrations and calculated using Equation 2

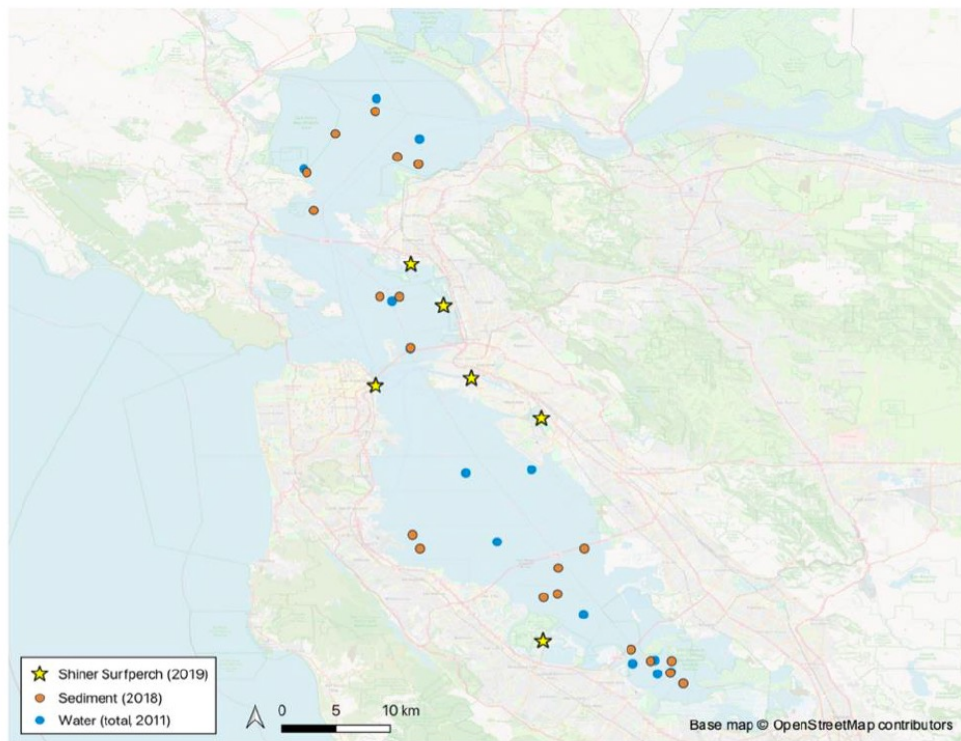


Figure 11. Sampling locations of shiner surfperch (2019 sampling), sediments (2018 sampling), and water (2011 sampling) for testing the San Francisco Bay food-web bioaccumulation model.

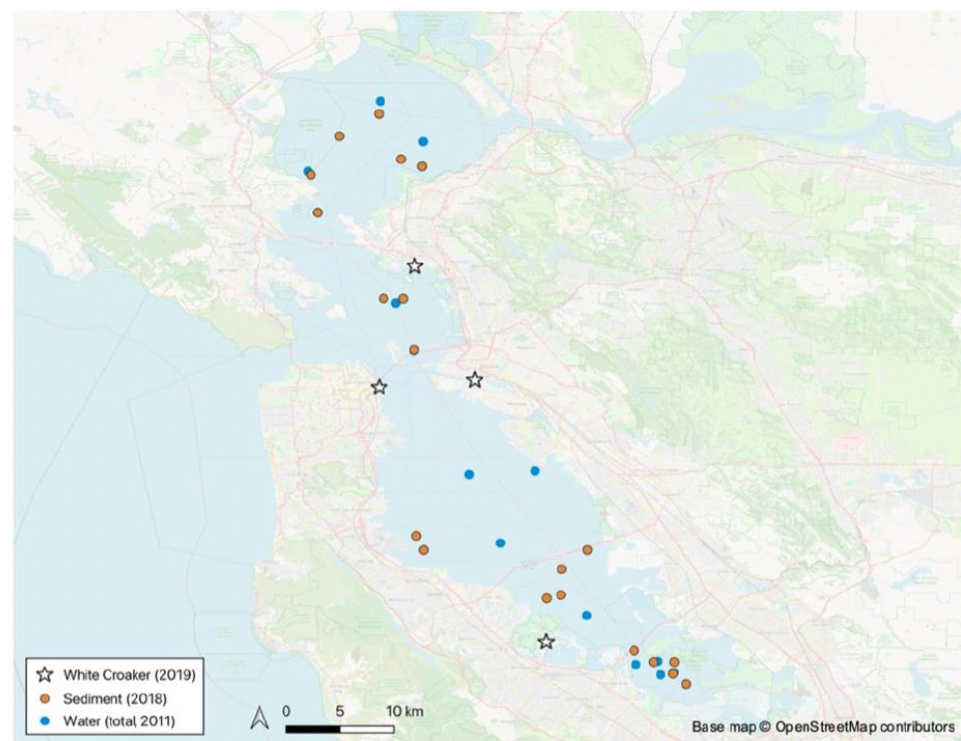


Figure 12. Sampling locations of white croaker (2019 sampling), sediments (2018 sampling), and water (2011 sampling) for testing the San Francisco Bay food-web bioaccumulation model.

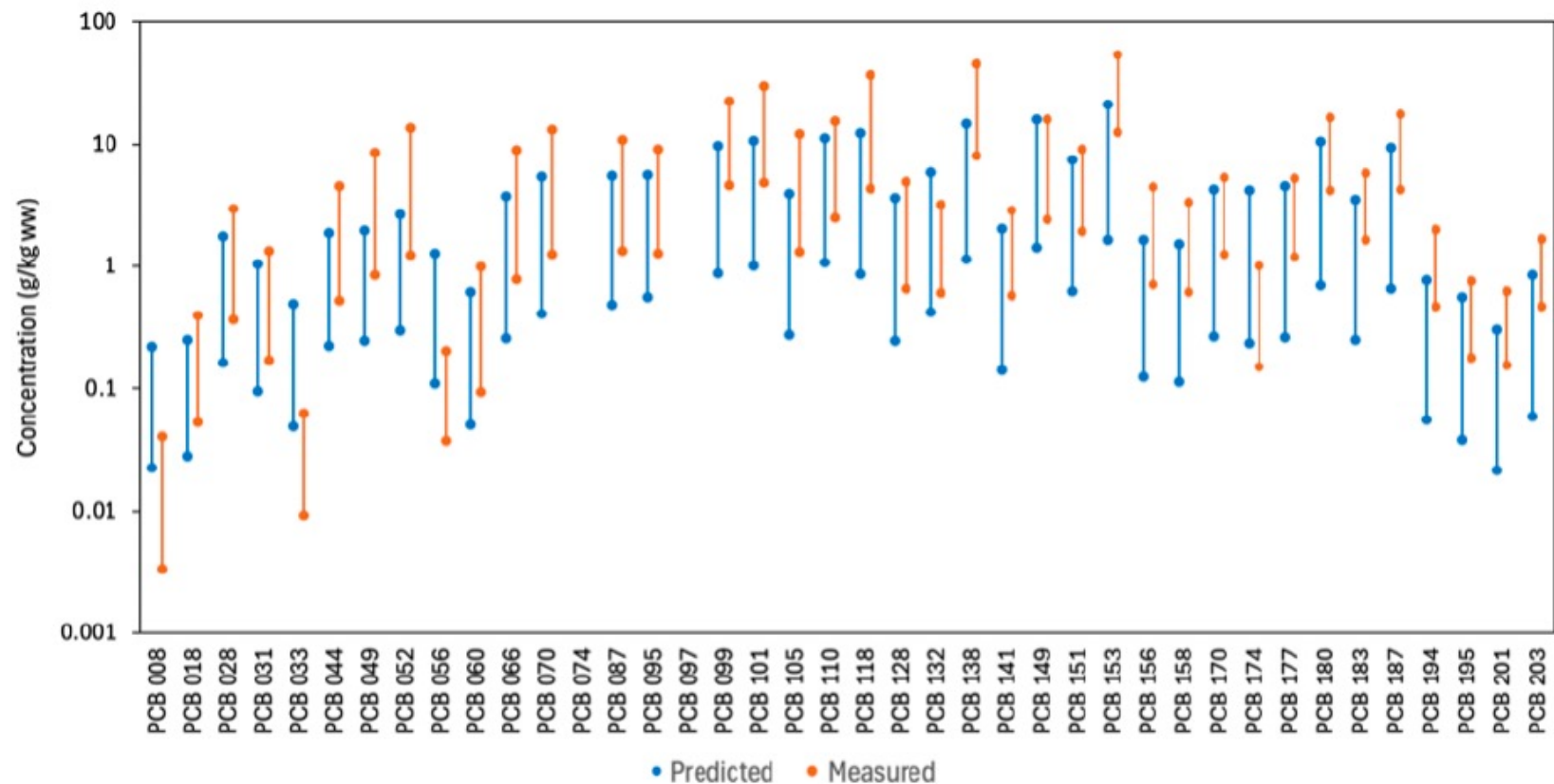


Figure 27. Ranges of concentrations of PCB congeners in shiner surfperch calculated using the San Francisco Bay model (blue lines) and observed in the 2019 sampling collected at San Francisco Bay (red lines).

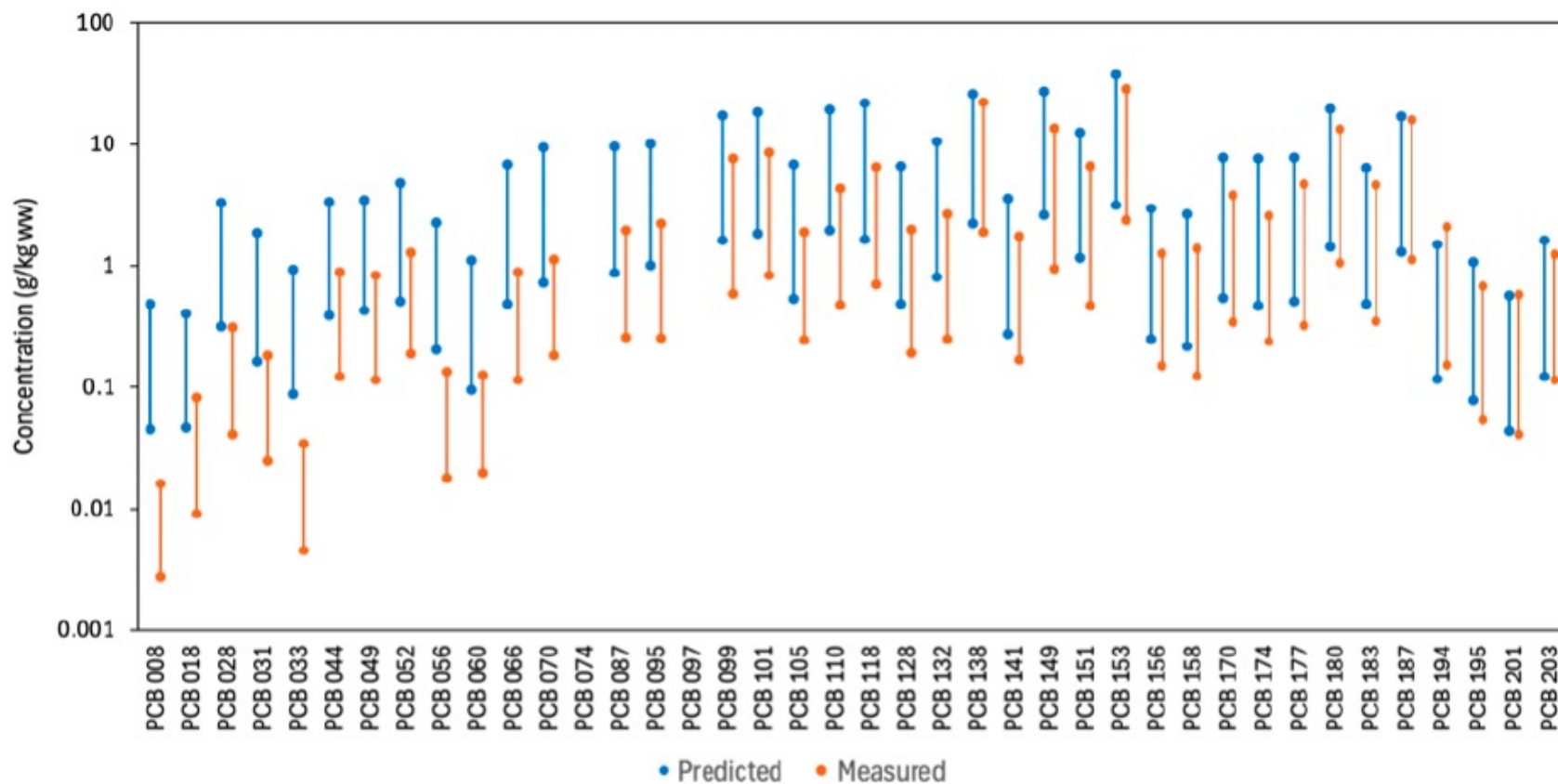


Figure 28. Ranges of concentrations of PCB congeners in white croaker calculated using the San Francisco Bay model (blue lines) and observed in the 2019 sampling collected at San Francisco Bay (red lines).

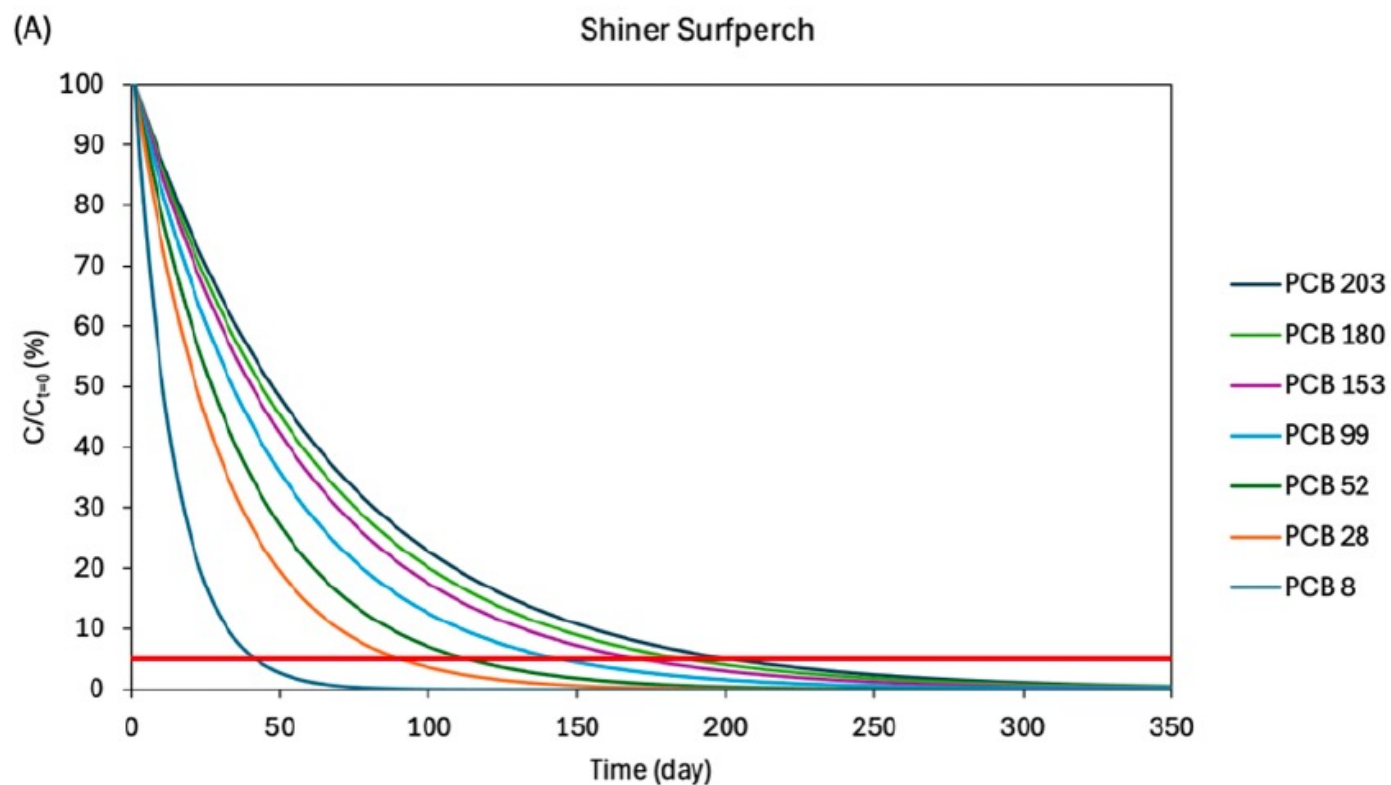


Figure 29. Demonstration of relative changes in representative PCB congener concentrations in shiner surfperch (A) and white croaker (B) over time using the San Leandro Bay PMU food-web bioaccumulation model under a hypothetical scenario where PCB concentrations in sediments and water drop to zero at day 0. The red line represents 95% reduction in the initial PCB congener concentration in fish.

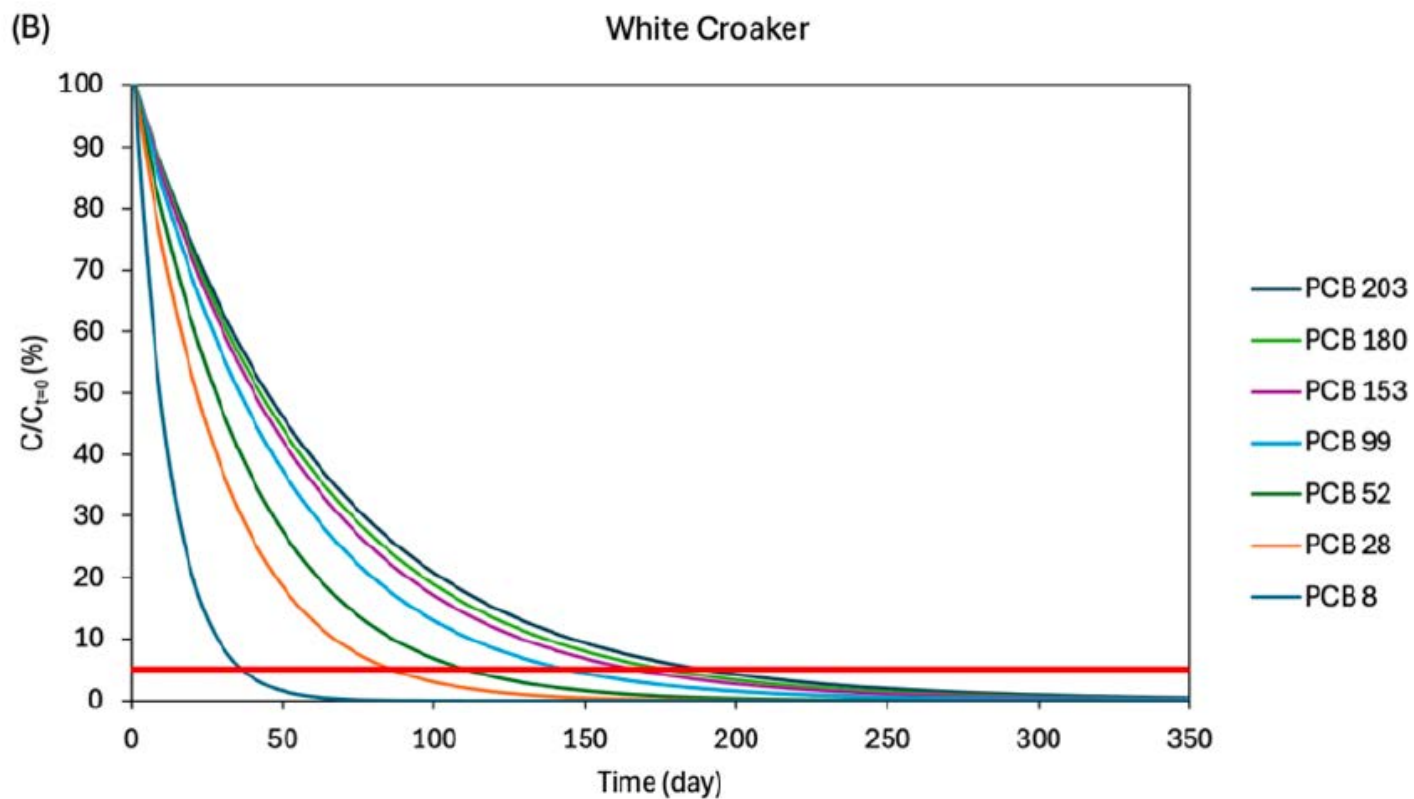


Figure 29. Demonstration of relative changes in representative PCB congener concentrations in shiner surfperch (A) and white croaker (B) over time using the San Leandro Bay PMU food-web bioaccumulation model under a hypothetical scenario where PCB concentrations in sediments and water drop to zero at day 0. The red line represents 95% reduction in the initial PCB congener concentration in fish.

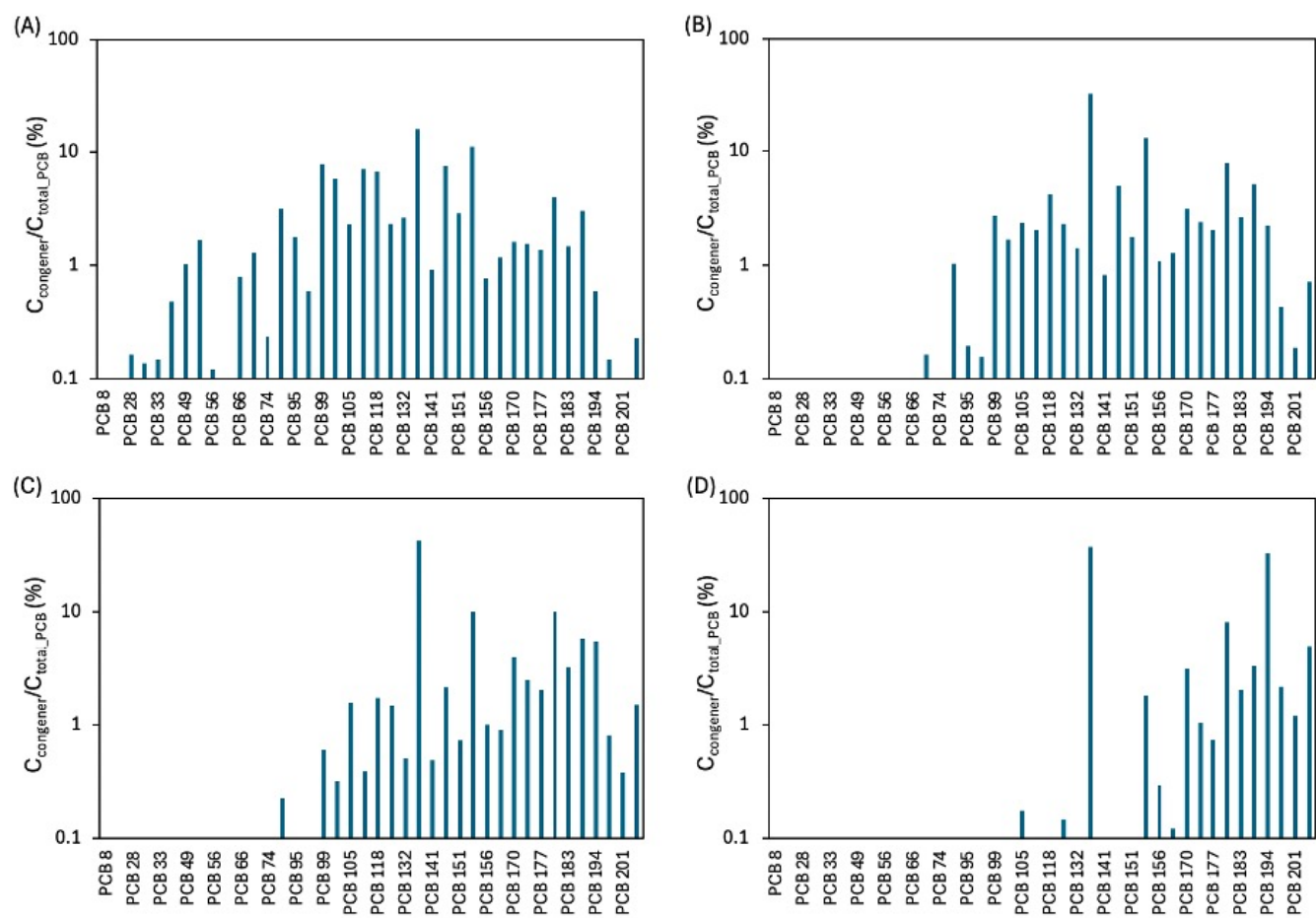


Figure 30. Demonstration of changes in PCB congener profiles in shiner surfperch at day 0 (A), 1 year (B), 2 years (C), and 5 years (D) using the San Leandro Bay PMU model under a hypothetical scenario that input PCB concentrations in sediments and water are dropped to zero at day 0.

Conclusions

- Developed a model for the food-web transfer of PCBs at PMUs and SFB.
- The main goal of the model is to anticipate PCB concentrations in sport fish consumed by local fishers as a result of remediation efforts at the PMUs.
- The overall approach is to inform on when PCB concentrations are going to be low enough to safely consume fish caught at the PMUs and the larger San Francisco Bay.
- The model includes knowledge gained from years of studies of San Francisco Bay. The model imbeds information on the chemistry and ecology of the Bay and presents this knowledge in a mathematical form such that it can be used as a management tool and serve as a hypothesis for further scientific and monitoring studies aimed at improving knowledge of the environmental fate of PCBs and informed decision making with regards to pollutants.

Conclusions

- Model can receive input on temporal changes in concentrations of PCB congeners in sediments and water from other models and forecast corresponding changes in PCB concentrations in fish
- In most tests, observed PCB concentrations were found to be well within a factor of 2 of the predicted concentrations. On average the model overpredicts concentrations of PCBs in fish by approximately 59%. This uncertainty is a combination of uncertainties in the model and measurements of concentrations of PCBs in water, sediments and fish.
- We suggest that a factor of 2 is used to represent the uncertainty in model predictions of the concentrations of PCBs in fish. The model without further calibration can be expected to be slightly on the conservative side.
- Examples of model application illustrate that significant reductions in PCB concentrations in fish and changes in congener profiles can be achieved at PMUs over relatively short time frames.

Suggestions

- Continue sport fish monitoring program to refine, test, calibrate models and monitor progress towards remediation
- Better field data on the equilibrium status of PCBs between water and suspended and bottom sediments is expected to further improve the model.
- Apply a congener specific approach to the modeling of PCBs due to the large differences in environmental behavior between PCB congeners
- While the model is specific to PCBs it can be useful to address other pollutants as well.

Acknowledgement

Thanks to Jay Davis for help with the modeling and the support of SFEI throughout the study.

Item 6: Special Study Proposal – PCB Synthesis



Desired Outcomes for This Item

- Workgroup recommends this study to the TRC for funding using 2027 RMP Special Study funds
- Obtain input on the proposed workplan

- Similarities to the Mercury Synthesis
- Develop detailed outline in late 2026
- Close consultation with the WB and PCBWG

PCB Synthesis

Summary/Overview

The Regional Water Board (WB) will be revising the PCBs TMDL for the Bay in 2030. The WB has identified a list of information needs to be addressed by July 2028 in order to support the revised TMDL. One of the main items on the list is a synthesis of information generated on PCBs in the Bay since the last synthesis was published in 2014 ([Davis et al. 2014](#)). The WB specified the following topics to be addressed in the synthesis:

1. PCB uses in transformers
2. PCB concentrations in biota
3. Water column PCB concentrations
4. PCB concentrations in sediment
5. Total mass of PCBs in ambient sediment/coring info
6. Contaminated sites in the Bay
7. Atmospheric deposition
8. Central Valley load
9. Wastewater inputs
10. Watershed inputs
11. Buried sediment / Review of bed erosion/deposition information
12. Recovery trajectories at the PMU, segment, and whole Bay scale

The work would be done in coordination with WB staff and with close consultation with the PCBWG.

Proposed by: Jay Davis, SFEI

Estimated Project Cost: \$103,000

Oversight Group(s): PCBWG

Time Sensitive? Yes, to inform the upcoming PCBs TMDL revision

Proposed Deliverables and Timeline

Deliverable	Due Date
Task 1. Draft report	April 2028
Task 2. Final report	July 2028

Budget

Item	Cost
SFEI Labor	
Project Tasks	\$98,000
Project Management	\$5,000
GRAND TOTAL	\$103,000

Item 7: PCB Workplan for 2026-2028



Desired Outcomes for This Item

- Workgroup recommends development of proposals for OPTICS Part 2 and stormwater PCB monitoring
- Advance the discussion on whether to develop a conceptual model report for San Rafael Creek
- Discuss whether additional work is needed on food web modeling
- Obtain general feedback on the plan for the \$2M

Draft Allocation of the TBH \$2M for PCBs

Study	2026	2027	2028	2029	
Strategy	10	10	10		
General empirical data	44				Archived sediment
PMU General Empirical Data	600	400			\$1M for OPTICS Part 2
Stormwater	210				
In-Bay Fate Model	200	200	200		Integral modeling
Synthesis, PMU Conceptual Models		100			San Rafael Creek
Food Web Model ?					

Item 7.1 – Archived Sediment Analysis

- Analysis of PCBs in archived surface sediment samples collected in 2023
- Analysis is in progress

Item 7.2 – Stormwater Monitoring

- Alicia



Water Year 2027 Stormwater Monitoring to Support PCB Watershed Modeling

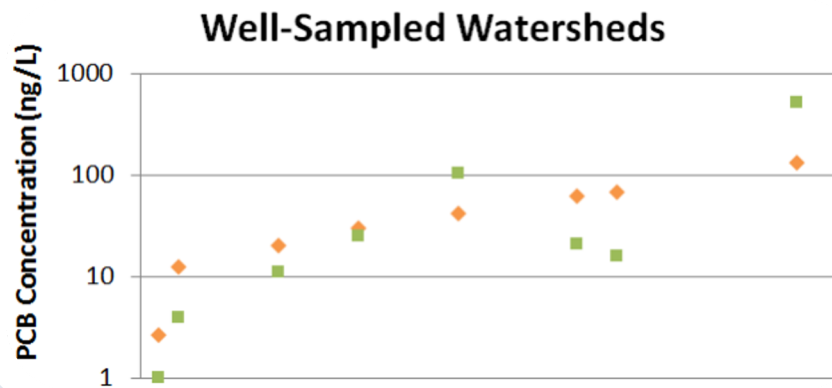
Project Goal and Motivation

Goal

Support PCB calibration for modeling using the Watershed Dynamic Model

Motivation

The PCB TMDL Reevaluation is planned for 2030 and watershed load estimates to the Bay are fundamental for modeling recovery trajectories



Modeled vs Simulated annual PCB loads to the San Francisco Bay via stormwater runoff from 8 intensively monitored watersheds using the Regional Watershed Spreadsheet Model (Wu et al., 2017)

Background



Model Calibration & Validation

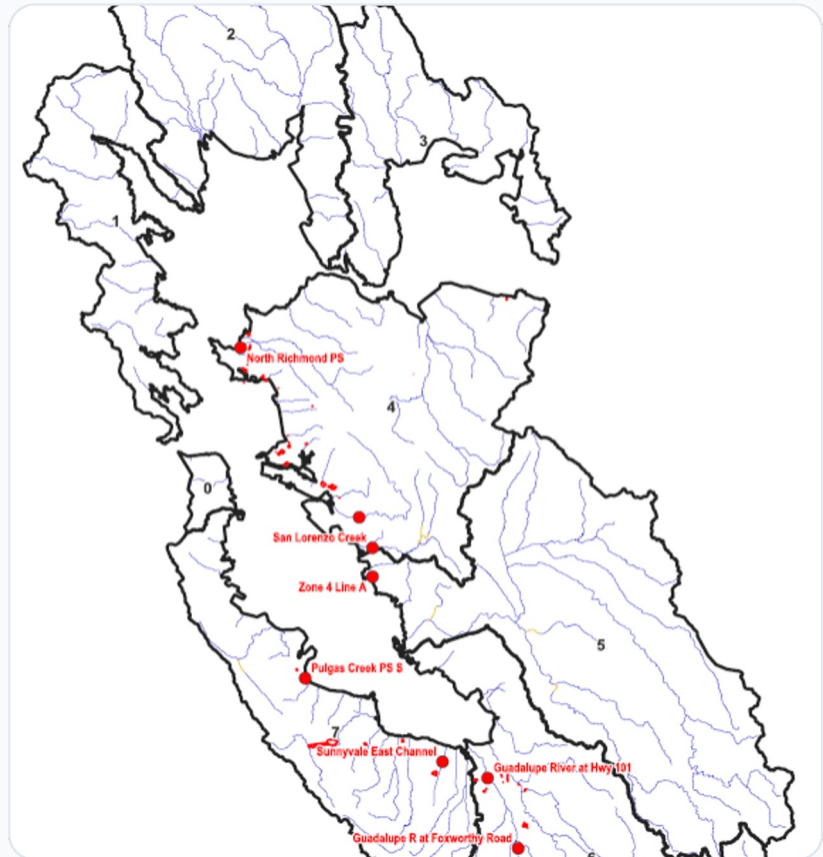
8 stations intensively monitored for PCBs are being used for calibration of the WDM.

Additional data at these stations could extend the monitoring timescale to the present, providing a longer time series.

Management Questions

Focus on how PCB loads and concentrations are changing due to control measures and/or natural attenuation or source depletion.

Resampling previously monitored sites helps to answer this question quantitatively.



Study Approach



01

Site Selection & Optimization

Work with modeling team to determine sites providing maximum benefit to WDM regional loads estimates.

02

Storm Monitoring (WY 2027)

Collect PCBs and SSC composites during 12 storm monitoring efforts across 3-4 locations (3-4 storms per location).

03

Flow Verification

Measure stage to verify WDM flow.



Year 1 Tasks and Budget

Task/Item	Budget
Task 1. Collaborate with modeling team to create sampling plan	\$5,000
Task 2. Stormwater Monitor 12 storm monitoring events	\$105,000
Task 3. Data Management and QA	\$20,000
Task 4. Reporting	\$20,000
Task 5. Project Management	\$16,000
Shipping and Travel	\$4,000
Supplies	\$1,500
PCB Laboratory Analysis	\$23,500
SSC Laboratory Analysis	\$2,000
Permits	\$3,000
Project Total	\$200,000

Timeline and Deliverables



July 2026

Site Selection

Aug/Sep 2026

Permitting

Oct 2026 - Apr 2027

Stormwater Monitoring
12 monitoring efforts

Summer 2027

Laboratory Analysis

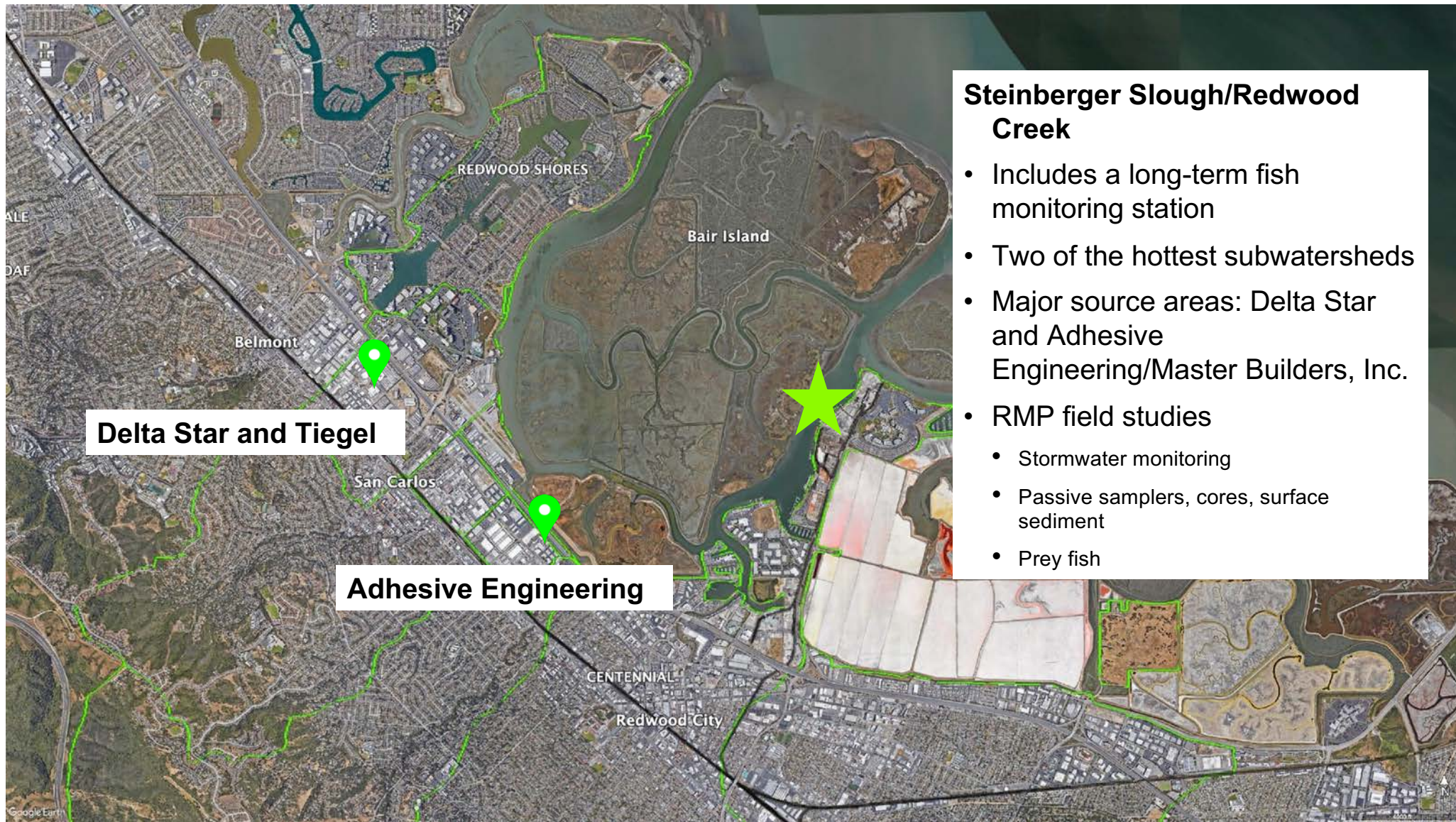
Fall 2027

Quality Assurance

Spring 2028

Report and Workgroup Presentation

Item 7.4 – OPTICS Part 2: Redwood Creek



Steinberger Slough/Redwood Creek

- Includes a long-term fish monitoring station
- Two of the hottest subwatersheds
- Major source areas: Delta Star and Adhesive Engineering/Master Builders, Inc.
- RMP field studies
 - Stormwater monitoring
 - Passive samplers, cores, surface sediment
 - Prey fish

Figure 3. Aroclor indices in stormwater at the outlet of Pulgas Pump Station South over time.

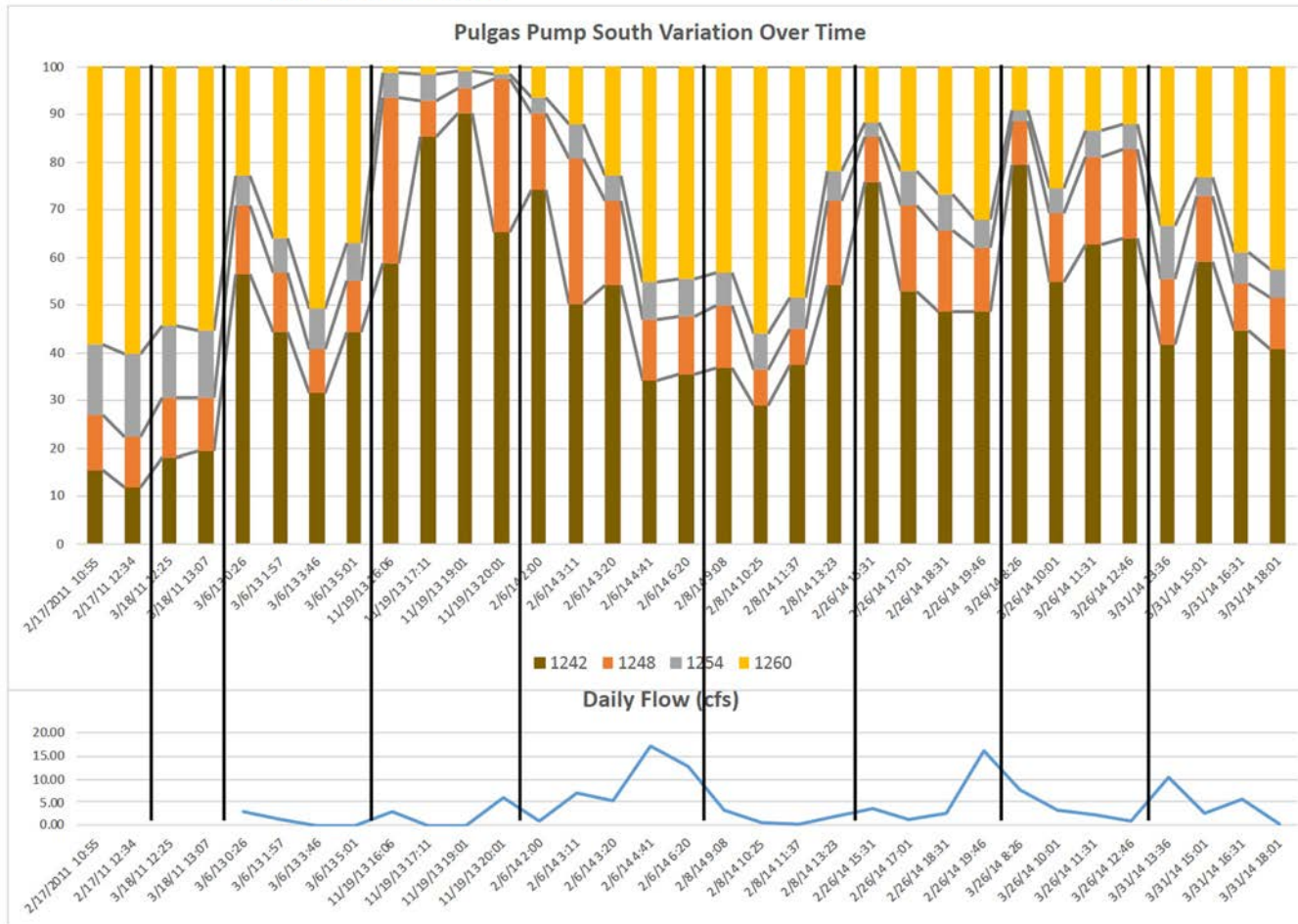
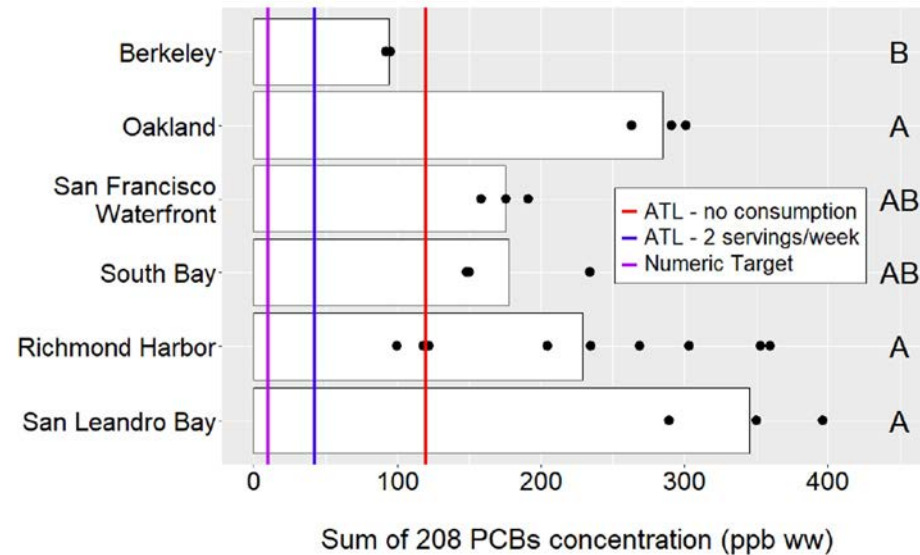


Figure 3. PCB concentrations (ppb ww) in shiner surfperch in San Francisco Bay, 2019. Bars indicate average concentrations. Points represent composite samples with 20 fish in each composite. Locations labeled with the same letter did not have significantly different means (Tukey HSD, alpha = 0.05). The colored lines indicating ATL thresholds show the lower end of the ATL ranges.



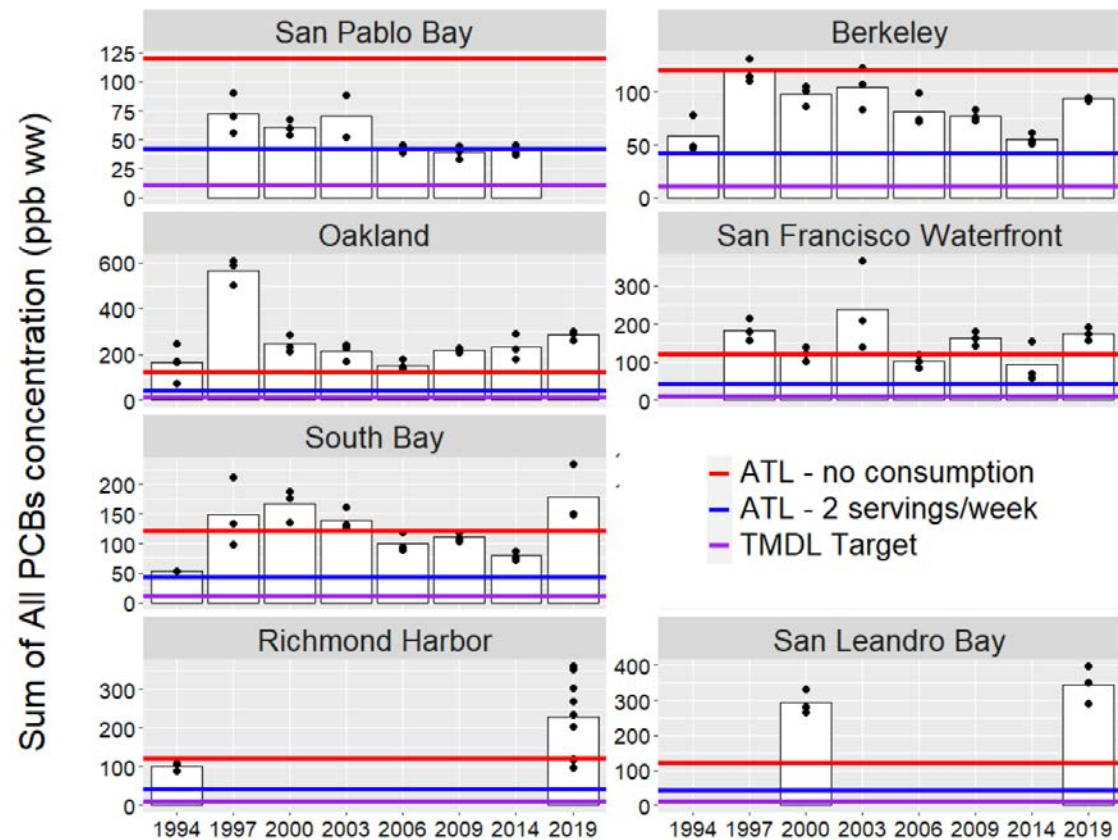


Figure 12. PCB concentrations (ppb ww) in shiner surfperch in each region of San Francisco Bay, 1994-2019. Bars indicate average concentrations. Points represent composite samples with 20 fish in each composite. Data shown are the Sum of PCBs for all congeners analyzed; the number analyzed varied from 47 in 1994 to 52 in 2014, and then increased to 209 in 2019. Data were obtained from the Bay Protection and Toxic Cleanup Program (1994) and the Regional Monitoring Program (all other years). The colored lines indicating ATL thresholds show the lower end of the advisory tissue level ranges.

Sediment Composite Sites



○ PSD Site

○ Lost PSD

○ Core Site

□ New Site

(No Field Reps Planned)

Compare w/ some PSD site
core surface sections

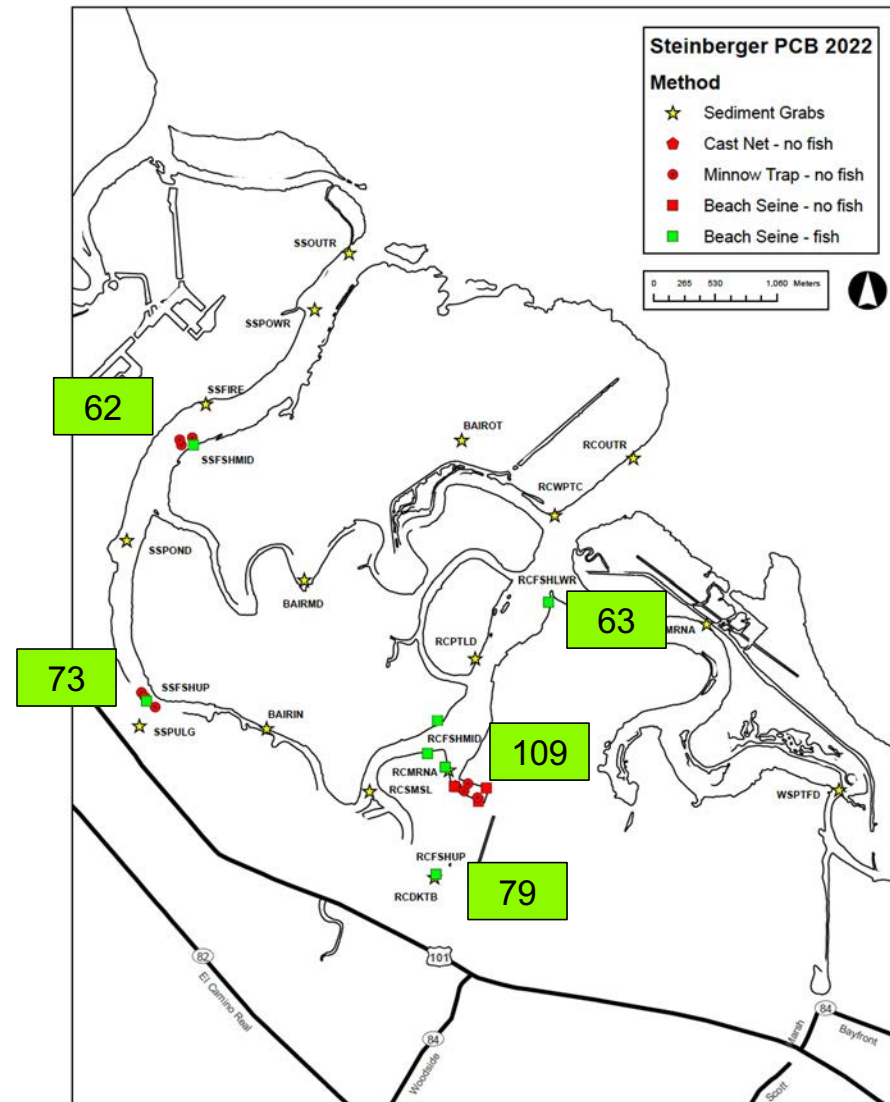
Surface Sediment PCBs (preliminary)

StationCode	long	lat	Sum208
BAIRIN	-122.233	37.50663	5
BAIRMD	-122.23	37.51839	21
BAIROT	-122.215	37.52952	23
RCDKTB	-122.216	37.49559	84
RCMRNA	-122.215	37.50394	31
RCMRNA	-122.215	37.50394	32
RCOUTR	-122.198	37.52843	14
RCPTLD	-122.213	37.51265	26
RCSMSL	-122.223	37.50215	61
RCWPTC	-122.205	37.52385	14
SSFIRE	-122.24	37.53186	37
SSOUTR	-122.226	37.54383	34
SSPOND	-122.247	37.52133	51
SSPOWR	-122.229	37.53938	45
WSMRNA	-122.19	37.51574	15
WSPTFD	-122.177	37.50311	15
WSPTFD	-122.177	37.50311	19
sspulg	-122.245	37.50681	



Steinberger Slough Prey Fish and Sediment (2022/2023)

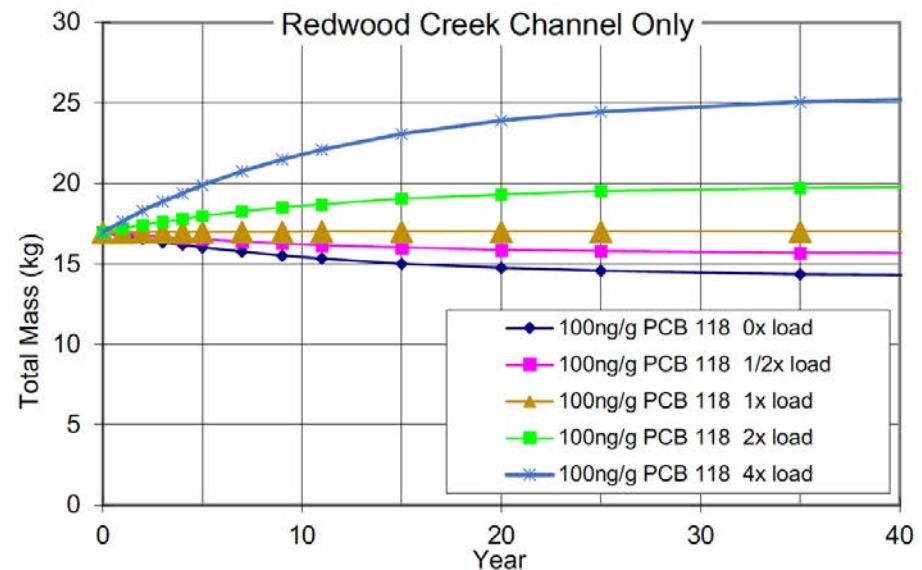
Congener profiles:
all stations dominated
by 1254/1260
congeners

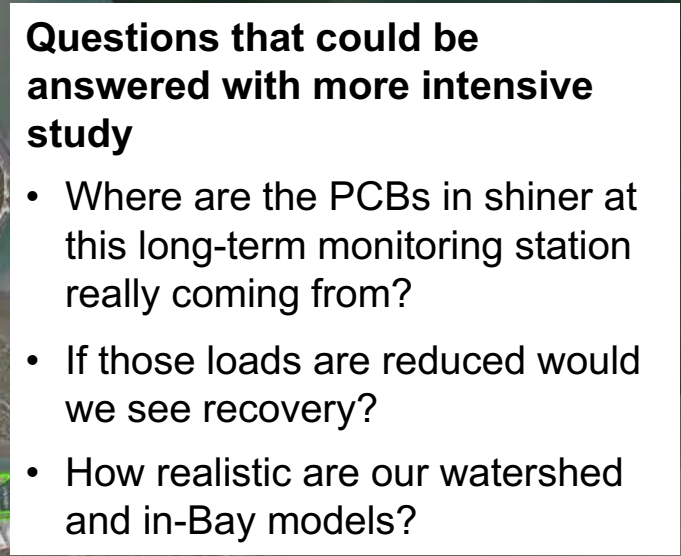


Simple box model recovery curves (from Conceptual Model report)

- Suggested load reductions would not have much of an effect on the mass in sediment due to tidal inputs from the Bay
- Would be valuable to see if this conclusion holds up under more rigorous scrutiny

Figure 4- 5 Redwood Creek recovery with 100 ng/g starting concentration, differing watershed (WS) loads. Other parameters same as in Figure 4-3. In the base (1x = 238 g/yr) load case, the tidal load from the Bay is about 5x the watershed load.





- Where are the PCBs in shiner at this long-term monitoring station really coming from?
- If those loads are reduced would we see recovery?
- How realistic are our watershed and in-Bay models?

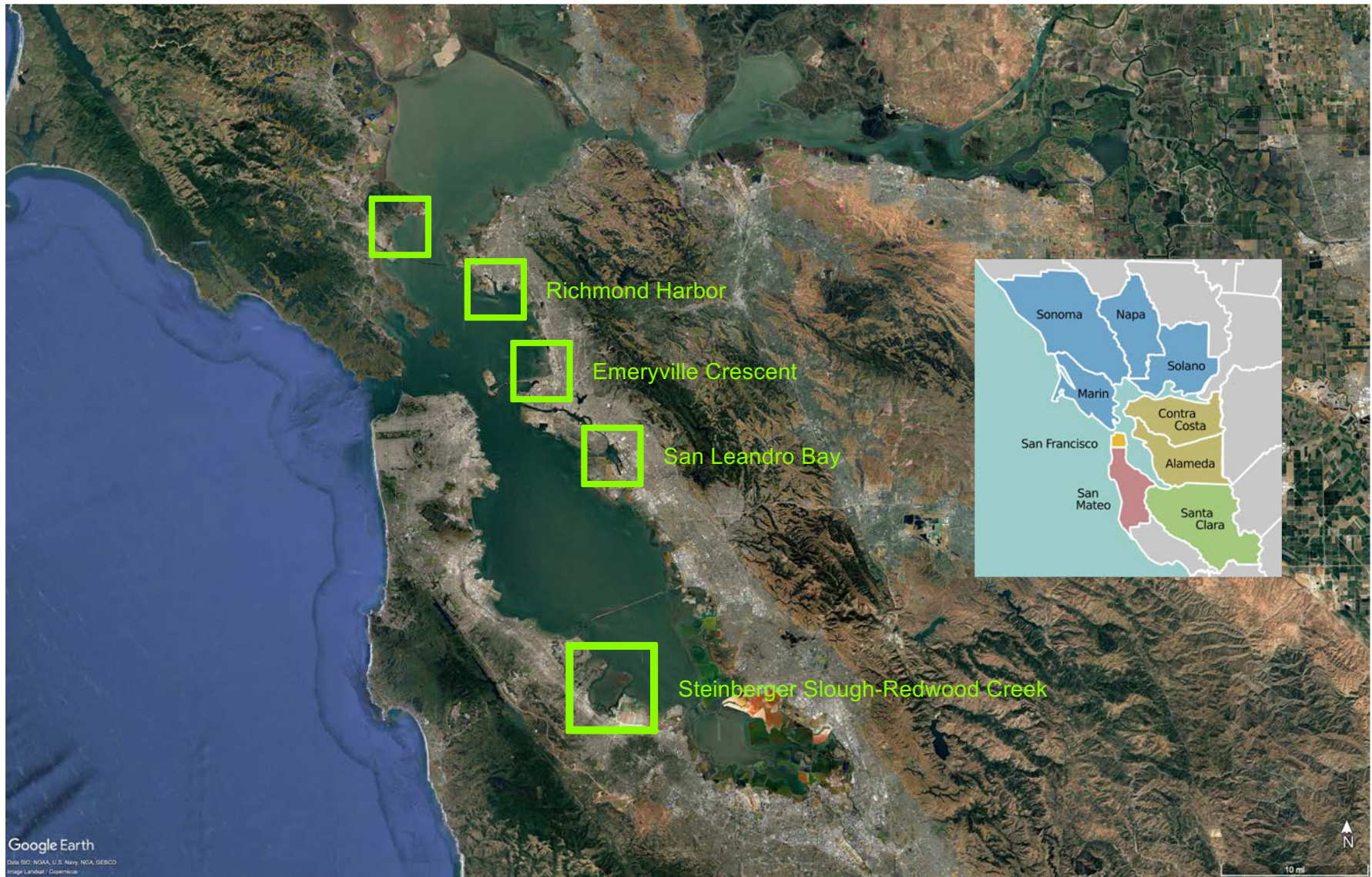
- Where are the PCBs in shiner at this long-term monitoring station really coming from?
- If those loads are reduced would we see recovery?
- How realistic are our watershed and in-Bay models?

BINGO

45

12	25	41	51	63
3	30	37	54	66
7	21	FREE	56	74
1	26	35	50	69
10	17	45	47	64

MILTON BRADLEY COMPANY
Springfield, Massachusetts



BINGO

	San Leandro Bay	Steinberger/Redwood	Emeryville	Richmond Harbor	San Rafael Creek	Hunters Point	Stege Marsh?	xx
County	Alameda	San Mateo	Alameda	Contra Costa	Marin	San Francisco	xx	xx
Significant management of source areas	X	X	X	X		X		
Linkage of source areas being managed to PMU impairment	Good	Unclear	Unclear	?	?	Good	xx	xx
Shiner surfperch present	X	X		X	?	X	xx	xx
Level of impairment	High	High	?	High	?	?	xx	xx
Prey fish data available	X	X	x	x	x	x	xx	xx
Configuration	Semi-enclosed	Wetland complex	Open	"Semi-enclosed"	Tidal creek	Open	xx	xx
Significant source area reductions in progress	X	X	?	X	?		xx	xx
Significant information from prior studies	X			X		X	xx	xx
Fishing activity	X	X		X	?	X	xx	xx
Lawsuits								



PCB Workgroup meeting 5/8/2026

OPTICS Applications for SF Bay PCB Evaluations

Samuel McWilliams

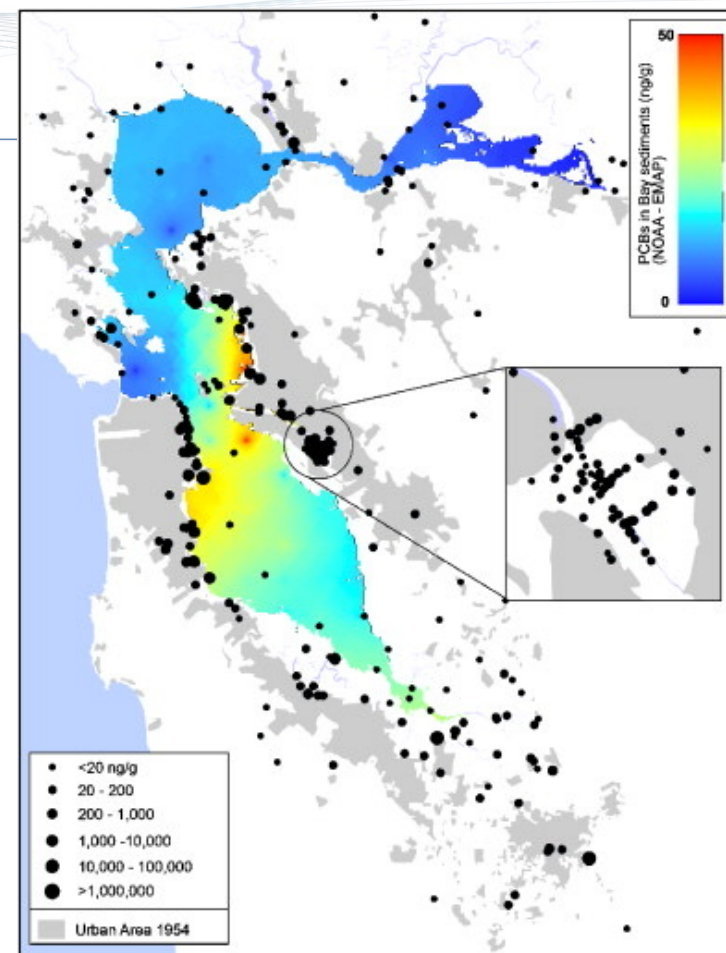
Kara Scheu Ph.D.

Grace Chang Ph.D.

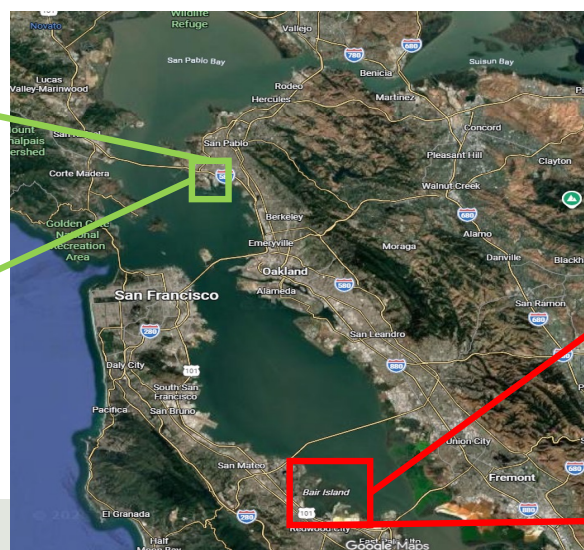
Craig Jones Ph.D.

RMP PCB Studies Objectives

- Evaluate the impact of watershed management actions on in-Bay PCB concentrations.
- Evaluate sources, sinks, and pathways of sediment and sediment-bound contaminants.
- Understand PMU and Bay-wide recovery rates.
- Can OPTICS help support these evaluations?



- Directed evaluation of process-based studies around remedial activities in PMUs.
- Evaluate loads to PMUs and habitats for key indicator species.
- Support the refinement of conceptual site models and numerical models.



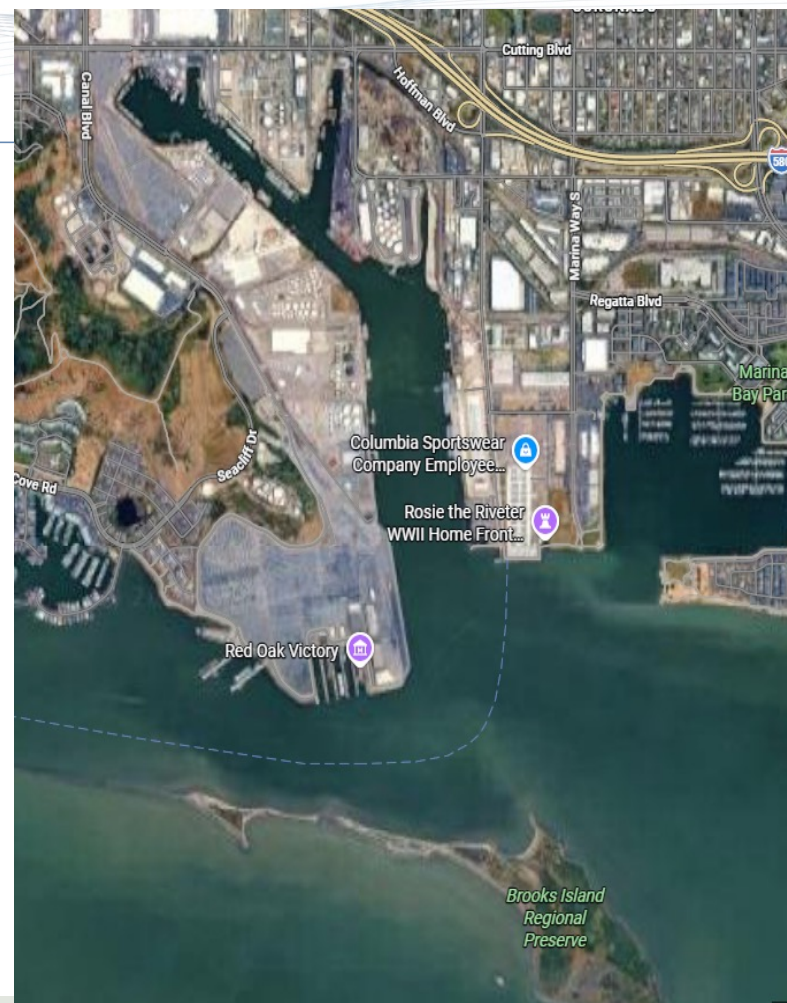
Richmond Harbor

Challenges

- Active remediation ongoing for other contaminants.
- Dredging and propwash impact sediment dynamics.
- Loads are from stormwater outfalls rather than open-water channels.

Opportunities

- Study could support evaluation of human activities on PCB fate and transport.



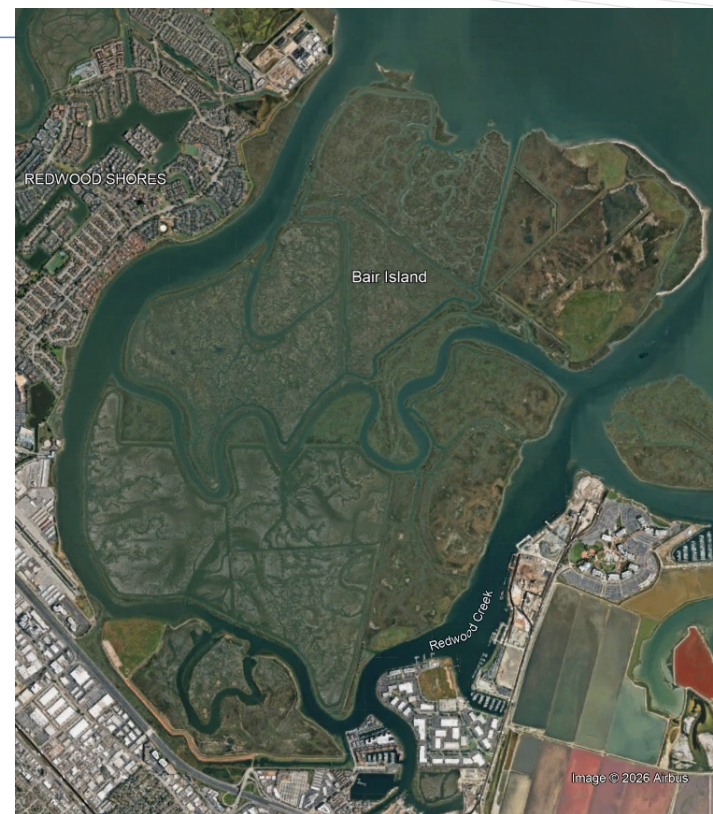
Redwood Creek

Challenges

- Fish tissue trends diverge from understanding of loadings to PMU.
- Complex site with uncertain transport dynamics.

Opportunity

- Characterize loads to Redwood Creek around fish sampling location to support evaluation of persistent signal in indicator species.



Redwood Creek

- Focus the study area around fish sampling site.
- Characterize sediment and PCB transport from Smith Slough, Redwood Creek, and SF Bay
 - PCB and Sediment transport through the system
 - TSS and Total/Dissolved PCB samples
- Evaluate bed processes
- Consider influence of Bair Marsh
- Surface water samples at nearby sources (Pulgas Creek) for reference loads.
- Would support understanding of local PCB trends relevant to bioaccumulation.
- Would enhance PMU scale fate and transport modeling.



Next steps

- Solicit feedback from workgroup on study priorities.
- Develop specific data quality objectives to inform sampling methodology.
- Develop field sampling plan.
- Target upcoming wet season – Fall 2026 to Winter 2027.

integral

Item 7.5 – In-Bay Modeling Update and Plan

- Integral



RMP PCB Workgroup 2026: Meeting #1 5/8/2026

In-Bay Modeling Updates

Samuel McWilliams

Kara Scheu Ph.D.

Craig Jones Ph.D.

Jay Davis Ph.D.

Don Yee Ph.D.

Allie King Ph.D.

Pedro M. Avellaneda Ph.D.

Model PCB Recovery Trajectories - Whole Bay

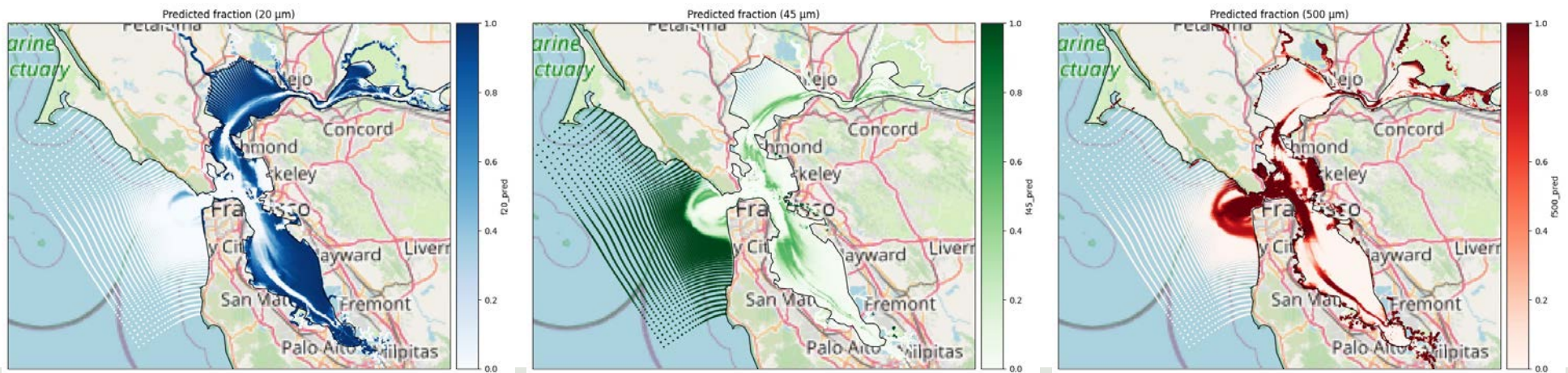
- Build upon work supporting mercury TMDL evaluation
- Sediment fate is key driver for contaminant fate
 - Hydrodynamics & Waves –Dflow-FM model
 - Watershed loadings- WDM
 - Sediment Characteristics
- Model complexity will increase to account for additional processes.
 - Contaminant dynamics – DELWAQ



San Francisco Bay is a photograph by Jesse Allen And Robert Simmon/u.s. Geological Survey/nasa which was uploaded on August 2nd, 2016.

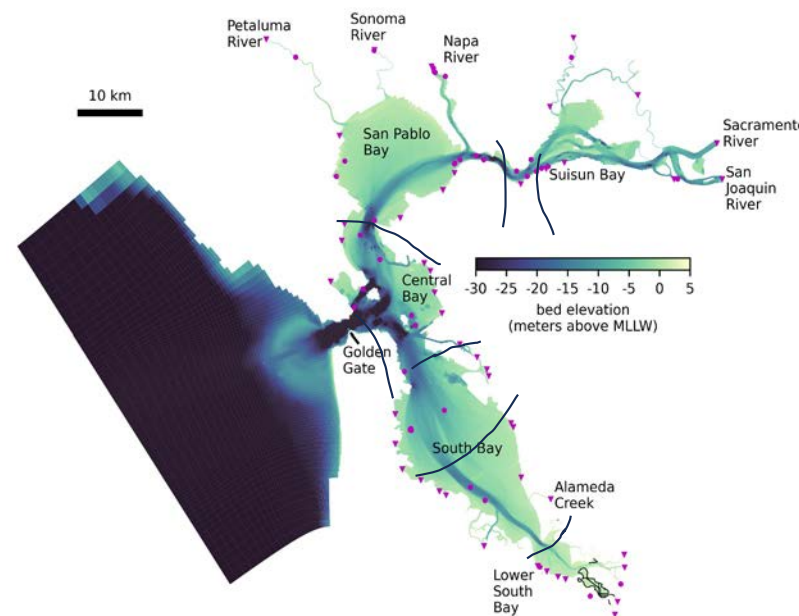
Bay-Wide Sediment Bed

- Sediment bed composition was specified using average modeled shear stress (provided by SFEI) and available USGS particle grain size data (Barnard et al., 2013)
 - 3 size classes (20, 45, and 500 microns)
 - 1 m. thick sediment bed
- Utilizing least squares fitting of water depth and modeled shear stress to measured grain size, sediment distributions were calculated for each model grid cell



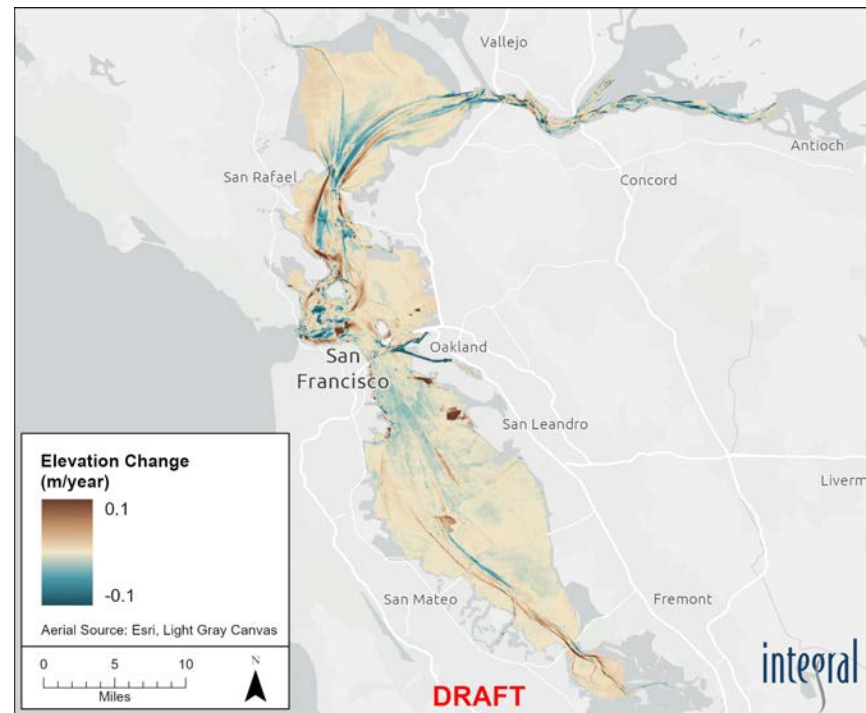
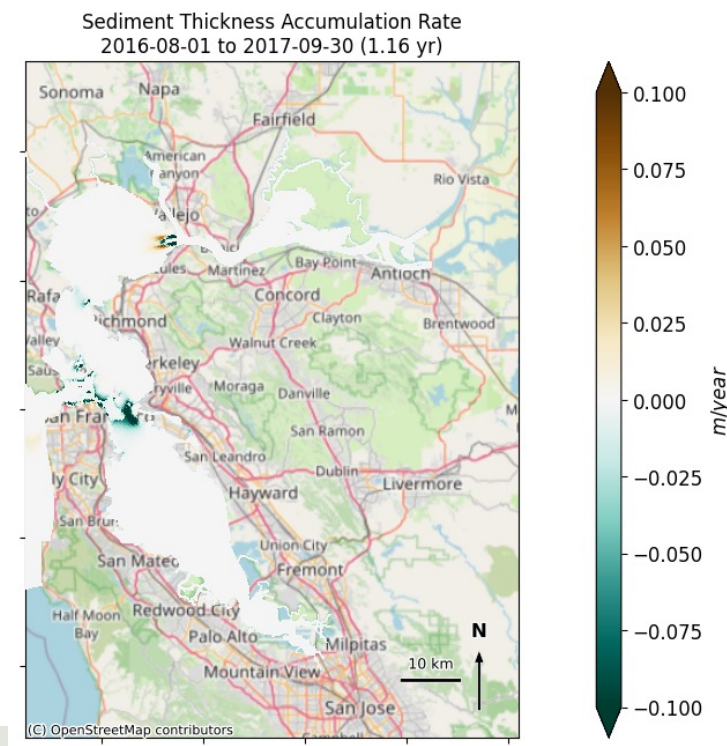
Simplified Inputs and Forces

- Watershed sediment concentrations constant. Discharge variable.
- Considering the following water years:
 - WY 2016 as an average year (533 mm of rainfall)
 - WY 2017 was selected as a wet year (889 mm)
 - WY 2021 as a dry year (208 mm)
- Evaluating fetch-limited waves to account for additional energy in system.
 - SWAN model may be more robust alternative in future applications.
- Tracking sediment from all watershed inputs, Delta, and subregions of in-bay sediment
 - Provides method to differentiate composition sources



Tracking Sediment Bed Changes in the Bay

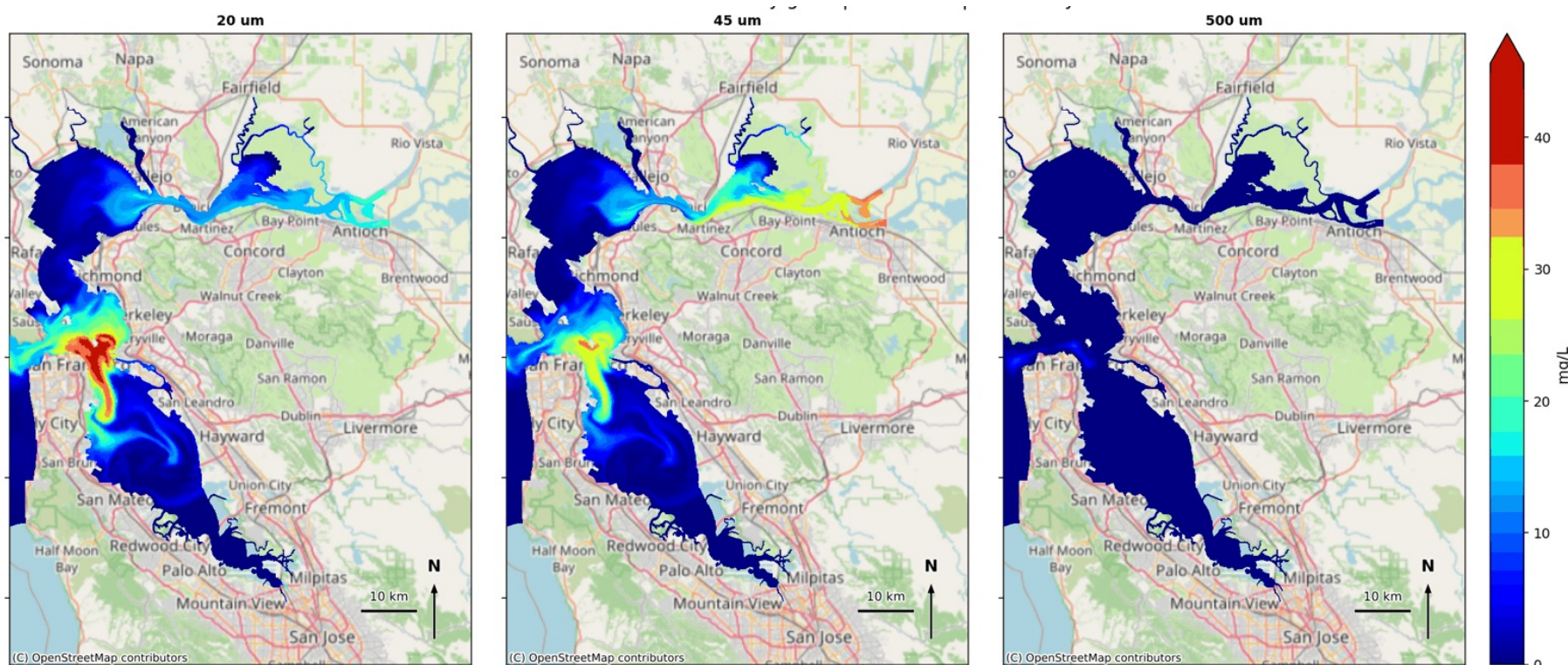
Evaluating sediment bed change to evaluate model performance



Derived from USGS Bathymetry Change maps

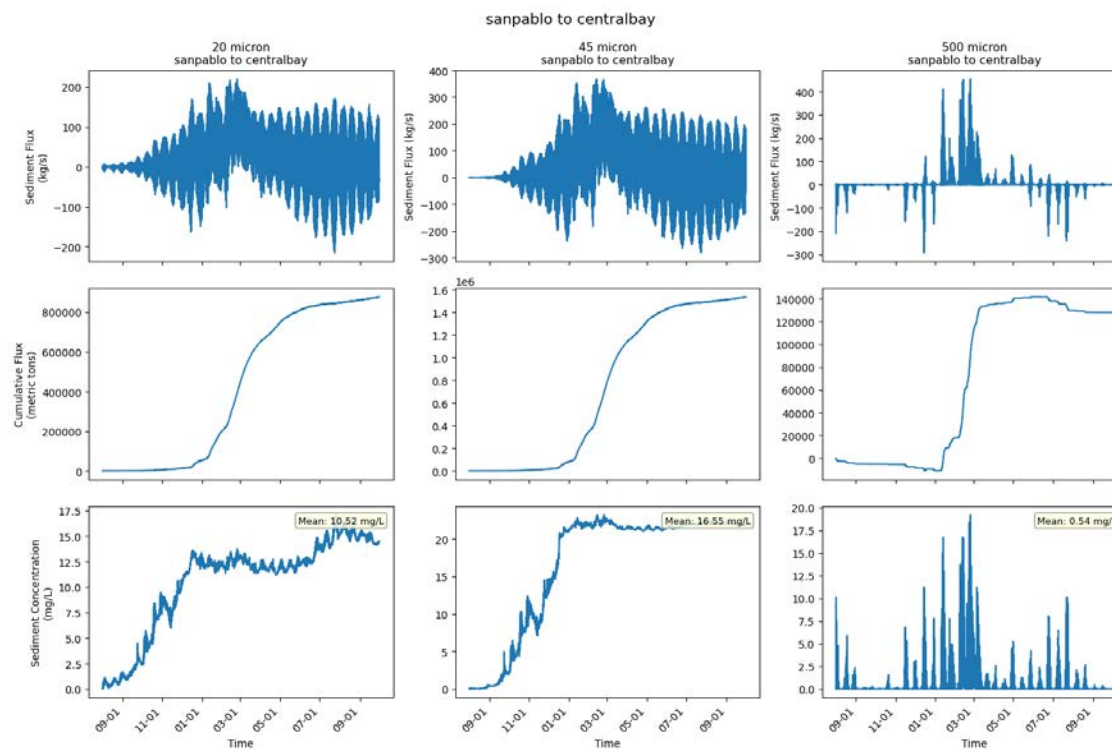
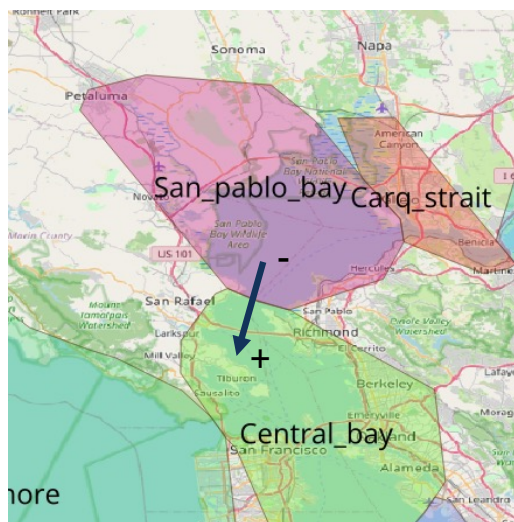
Example of Suspended Sediment Concentrations

- Can track concentration and flux between different regions and from different sources



Suspended Sediment Concentrations

- Driven by both in-bay sediment resuspension and watershed loads



Next Steps for PCB Evaluation

- Refine forcing conditions
- Develop sediment bed characterization
 - Consider bed layers
 - Refinement of composition
- Updated watershed loads
- Contaminant transport model using DELWAQ
 - Will include partitioning to address dissolved/particulate transport.
- Connecting Bay-wide with PMU-specific investigations
- Recovery rate evaluation may mirror SLB approach

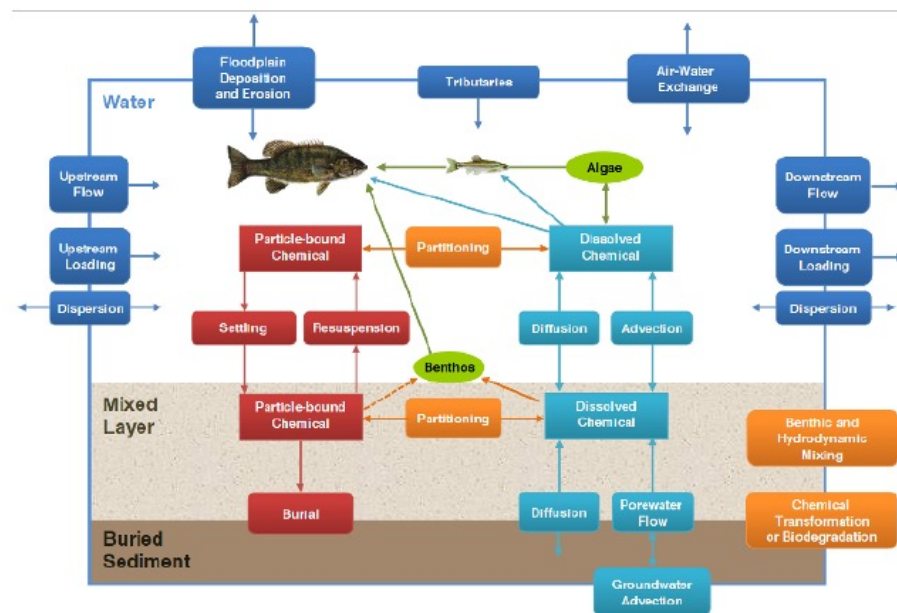


Figure 5. Overview of contaminant fate and transport processes (USEPA 2009).

SLB OPTICS and Modeling Linkages

- **Confirms tributaries as primary PCB source pathways**

OPTICS showed and PCB concentrations at Damon Creek Slough, East Creek Slough, and Elmhurst Creek are greater than at the tidal exchange channels.

- **Supports storm-driven loading assumptions**

Tributary sediment and PCB fluxes were primarily associated with stormflows, reinforcing the model emphasis on event-scale watershed loading.

- **Supports depositional / sediment-retentive SLB conceptual model**

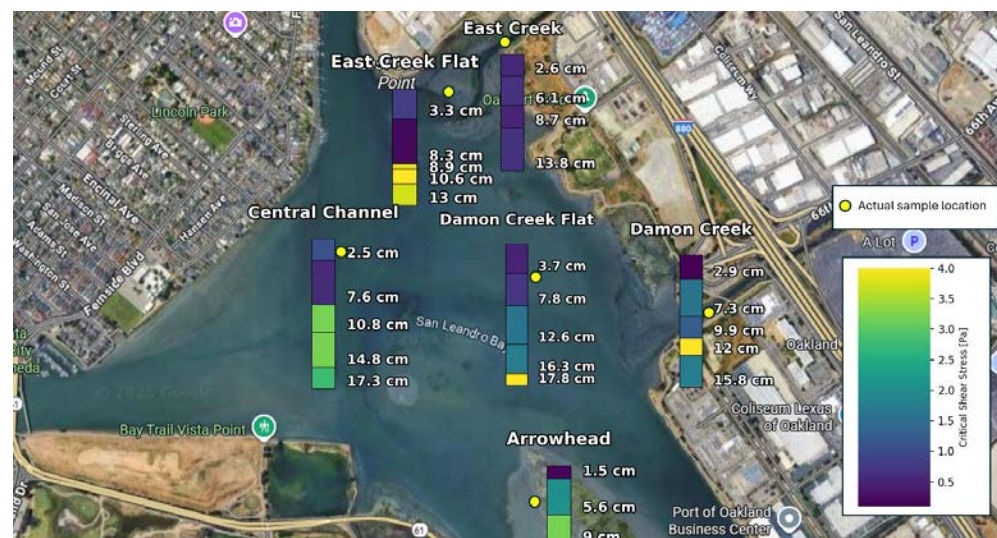
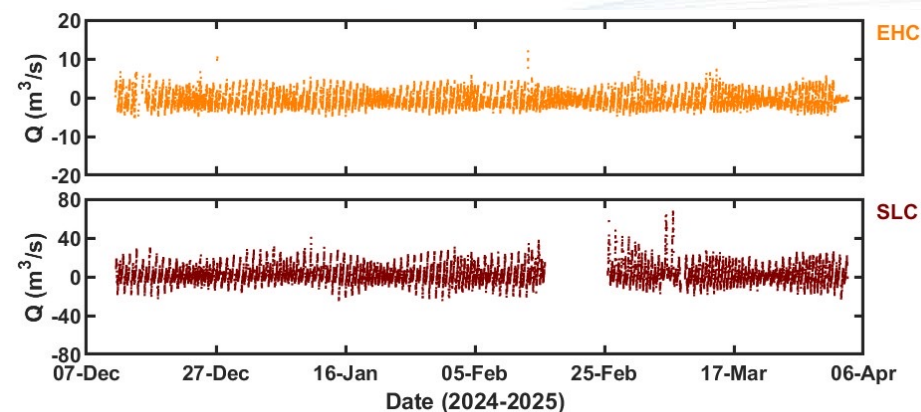
Results support the model interpretation that SLB recovery is controlled more by local watershed inputs, sediment retention, and burial than by rapid flushing.

- **Data to be used for model inputs and as independent verification**

Field-derived concentration can be used to update model boundary conditions (and verify WDM model), while central bay values can be compared directly against model predictions.

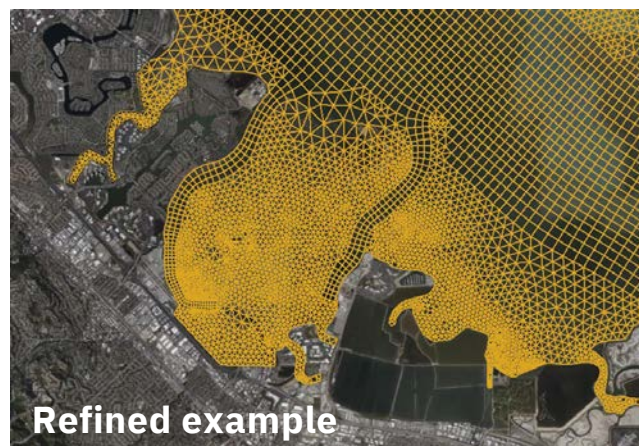
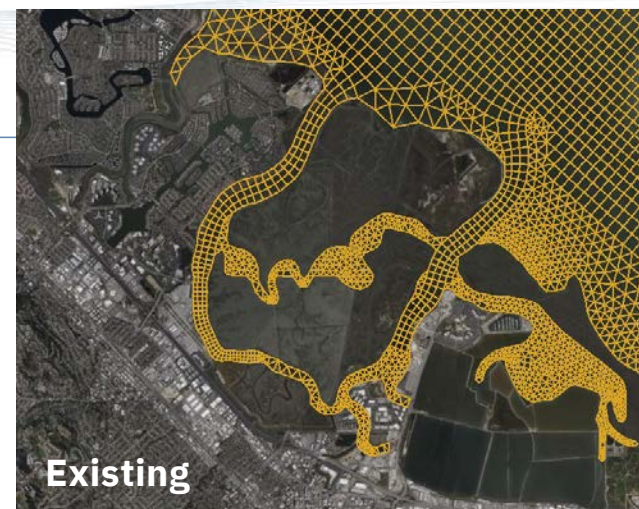
San Leandro Bay Updates

- Update boundary conditions with OPTICS measurements
- Confirm hydrodynamic patterns
- Update bed characteristics with SEDflume data
 - Grainsize distribution, critical shear stresses
- Compare PMU focused results with whole-bay model predictions
 - How does the coarse model of the bay compare to the refined SLB model?



Redwood Creek Model

- Resolve marsh and surrounding channels.
 - Evaluate need for level of refinement
- Resolve exchange with Bay and retention in margin
 - What impact do Bay waves have on fate/transport in this system?
- Potential OPTICS study could support model calibration and validation data.
- Could come after Bay-wide sed-trans model developed to reduce assumptions of bay loads.



Tentative Schedule

Q1-Q2 2026

- Bay-wide sediment model development
- Mercury TMDL support

Q2 2026 –
Q2 2027

- Sediment bed & boundary condition refinement
- PCB model development
- PCB evaluation and sensitivity assessment
- Determine bay-wide recovery rates

2027-2028

- Refinement of model scenarios
- PMU-specific evaluations- Redwood Creek and San Leandro Bay

integral

Item 7.3 – San Rafael Creek Conceptual Model

San Rafael Creek



BINGO

	San Leandro Bay	Steinberger/Redwood	Emeryville	Richmond Harbor	San Rafael Creek	Hunters Point	Stege Marsh?	xx
County	Alameda	San Mateo	Alameda	Contra Costa	Marin	San Francisco	xx	xx
Significant management of source areas	X	X	X	X		X		
Linkage of source areas being managed to PMU impairment	Good	Unclear	Unclear	?	?	Good	xx	xx
Shiner surfperch present	X	X		X	?	X	xx	xx
Level of impairment	High	High	?	High	?	?	xx	xx
Prey fish data available	X	X	x	x	x	x	xx	xx
Configuration	Semi-enclosed	Wetland complex	Open	"Semi-enclosed"	Tidal creek	Open	xx	xx
Significant source area reductions in progress	X	X	?	X	?		xx	xx
Significant information from prior studies	X			X		X	xx	xx
Fishing activity	X	X		X	?	X	xx	xx
Lawsuits								

General Discussion

Tom's Input

Jay - we need to assume that there will be limited future funding, so we must ensure optimum benefit of these funds to inform the Water Boards review of the TMDL. That means we need to focus on what will deliver certain benefits in a timely manner, and avoid or minimize doing things that will result in lack of or insufficient closure before the Water Board acts on the TMDL. Here are my initial thoughts:

- OPTICS part 2 centered on Redwood Creek (~ \$1M) = maybe or no. While I like OPTICS conceptually, as I point out in my recent comments, there are issues with the SLB study that need attention before we invest this much, if any, on Redwood Creek. I'm not envisioning what this will tell us that will be substantially different from coupled Watershed and Bay modeling and observations, or in other words, if we are going to invest ~ \$1M, we need a working hypothesis on what we will gain from the study and what actions it will inform. We also need to consider other margin units that may benefit from OPTICS.
- Additional stormwater monitoring for PCBs to support the WDM (\$210K) = yes/maybe. I expect the forthcoming WDM PCBs load estimates will raise questions and data needs, e.g., new/additional data to corroborate/improve model predictions. I assume the \$210K would be used primarily in 2027 rather than all in 2026 as shown in the table.
- A conceptual model for San Rafael Creek (\$100K) = maybe/no. I'm the one that suggested consideration of San Rafael Creek based on PCBs concentrations in sediments planned to be dredged. However, there needs to be some initial ground truthing on the significance of the contamination and what may already be happening to remediate PCBs sources in and ongoing loading from the local watershed. Also, I cannot fathom spending \$100K on just a conceptual model; a conceptual model is just phase one of multiple phases to inform resolution of issues in a PMU. We have to have more certainty on the need to take on San Rafael Creek and subsequent steps, and we certainly need to engage San Rafael and Marin County.

Before taking on Redwood Creek and Marin County, we need to make sure we will be getting critical information needed to affect directions/decisions on the PMUs in Alameda, Contra Costa, and San Mateo counties. Also, a critical issue that I raised in the past is that Santa Clara county needs some focussed attention. While there is no known highly contaminated margin unit in Lower South Bay, one option is to consider the Lower South Bay a large margin unit.

- Additional funds to keep Integral going on the modeling = yes. However, the amount needs more than fine tuning, and it will be challenging to determine until we see the results of the forthcoming Bay-scale modeling and what can be realistically accomplished to model all of the PMUs, including following-up modeling of SLB to inform the Water Board's TMDL review.

Lastly, your plan is silent on food-web modeling. Perhaps that's because there are remaining funds in the previous EPA grant. Also, I have some next steps in mind, and it's not clear what is already planned beyond what is presented in the draft report. I have some next steps in mind.

Draft Allocation of the TBH \$2M for PCBs

Study	2026	2027	2028	2029	
Strategy	10	10	10		
General empirical data	44				Archived sediment
PMU General Empirical Data	600	400			\$1M for OPTICS Part 2
Stormwater	210				
In-Bay Fate Model	200	200	200		Integral modeling
Synthesis, PMU Conceptual Models		100			San Rafael Creek
Food Web Model ?					

Item 8: Review Next Steps and Action Items and Adjourn



Next Steps

- Proposal goes to the TRC and Steering Committee
- Write up proposals for ...
- Meet again soon - continue discussion of proposals and remaining workplan elements

