Emerging Contaminants Workgroup Meeting

Amy Kleckner, RMP Manager

April 16-17, 2024 – Hybrid

SFEI Housekeeping Reminders

Out the doors and to the right

Password:
sfsfsfsfsf

Please silence cell phones & laptops

Zoom tips

1. Update your name and add your affiliation
2. Raise your hand if you have a comment or question
3. Unmute yourself and turn on video when you are speaking
4. Use the chat function if you have a comment, question, or technical issue

In person attendees

1. Mute your microphone and the volume on your laptop.
2. Turn off your camera.

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Guidelines for Inclusive Conversations

1. Try it on
2. Practice self focus
3. Understand the difference between intent and impact
4. Practice both / and
5. Refrain from blaming or shaming self and others
6. Move up / move back
7. Practice mindful listening
8. Right to pass
9. Avoid jargon
10. It’s okay to disagree

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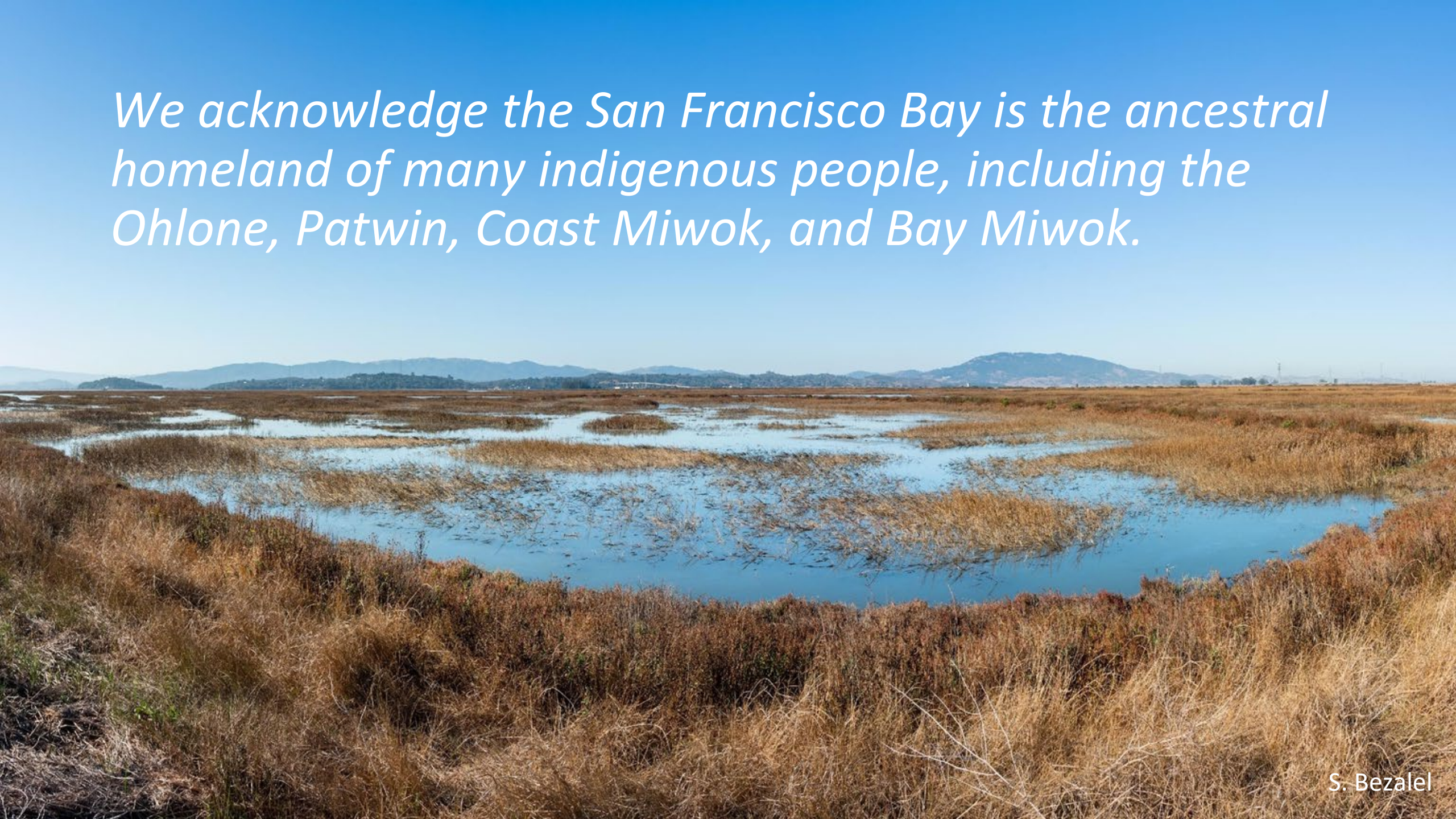
We acknowledge the San Francisco Bay is the ancestral homeland of many indigenous people, including the Ohlone, Patwin, Coast Miwok, and Bay Miwok.
S. Bezalel

ECWG Expert Advisors

Miriam Diamond
University of Toronto

Lee Ferguson
Duke University

Derek Muir
Environment & Climate Change Canada

Heather Stapleton
Duke University

Bill Arnold
University of Minnesota

Dan Villeneuve
US EPA

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INTRODUCTIONS

Meeting Agenda: DAY ONE

1. Introduction and Goals for Meeting	9:00
2. Information: RMP CECs Science Update	9:15
3. Discussion: CEC Strategy Revision	9:45
Break	10:30
3. Discussion: CEC Strategy Revision cont.	10:45
LUNCH	11:30
4. Information: Update on Nontarget Analysis of Bay Harbor Seals	12:10

Meeting Agenda: DAY ONE cont.

5. Discussion: Proposed Study Design for S&T NTA of Bay Water	12:30
6. Information: Update from the DTSC Safer Consumer Products Program	1:00
Break	1:30
7. Information: Update on the State Water Board CEC Strategy	1:40
8. Information: Update on PFAS in San Francisco Bay	2:10
9. Information: Chlorinated Paraffins in Bay Sediment	2:40
10. Information: Setting the Stage for Day 2	2:55
ADJOURN	3:00

Meeting Agenda: DAY TWO

JOINT ECWG & SPLWG

11. Summary of Yesterday, Goals for Today	9:00
12. Information: PFAS Sources to Solutions Project	9:15
Break	9:45
13. Introductions and Goals for the Meeting	10:00
14. Information: Stormwater CECs Projects Update	10:10
15. Discussion: Stormwater CECs Integrated Modeling & Monitoring Approach: Straw proposal for monitoring design	11:10
16. Information: Next Steps	11:55

Meeting Agenda: DAY TWO cont.

LUNCH	12:00
17. Summary of Proposed ECWG Special Studies for 2025	12:30
18. Discussion of Recommended Speacial Studies for 2025 - General Q&A, Prioritization	1:15
19. Closed Session – Decision: Recommendations for 2024 Special Studies Funding	2:10
20. Report out on Recommendations	2:50
ADJOURN	3:00

Goals for Meeting

- Provide updates on recent and ongoing ECWG activities (today & tomorrow)
- Discuss CEC Strategy Revision and future direction of the program (today)
- Review Status and Trends monitoring data (today)
- Overview of PFAS Sources to Solutions project and implications for RMP PFAS science (tomorrow)
- Discuss ongoing stormwater CECs projects; joint meeting with Sources, Pathways, and Loadings Workgroup (tomorrow)
- Recommend special study proposals for funding in 2025 (tomorrow)

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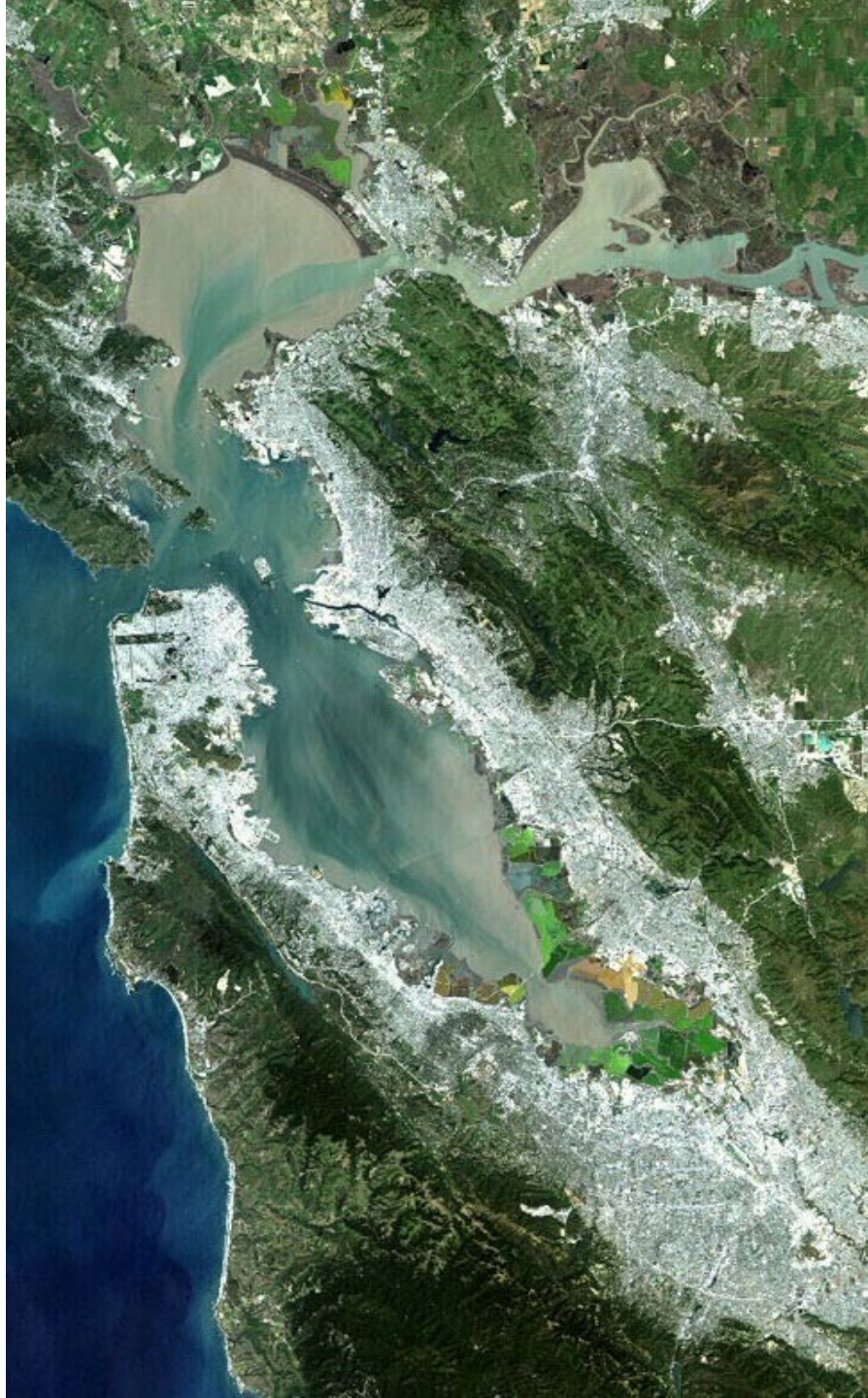
Regional Monitoring Program

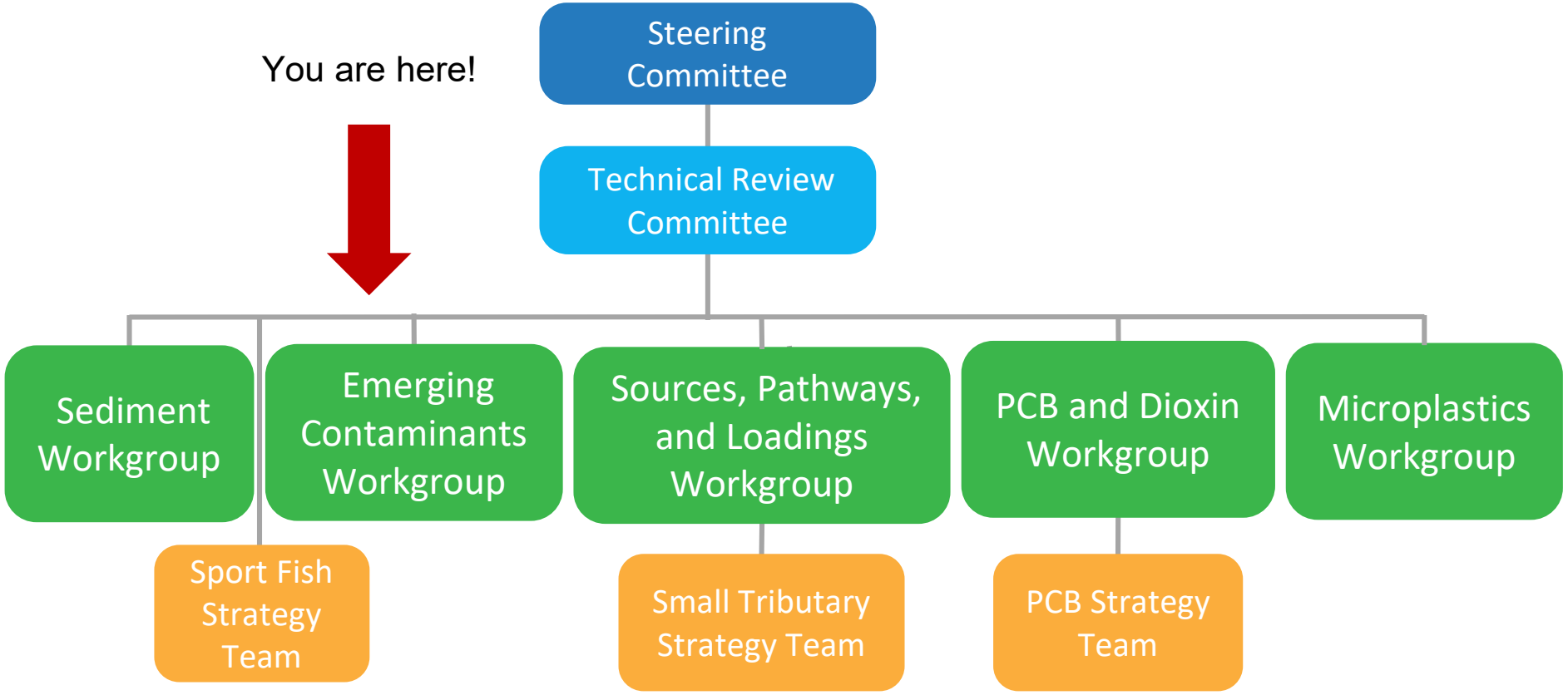
Collect data and communicate information about water quality in San Francisco Bay in support of management decisions

~ 68 entities in the Program

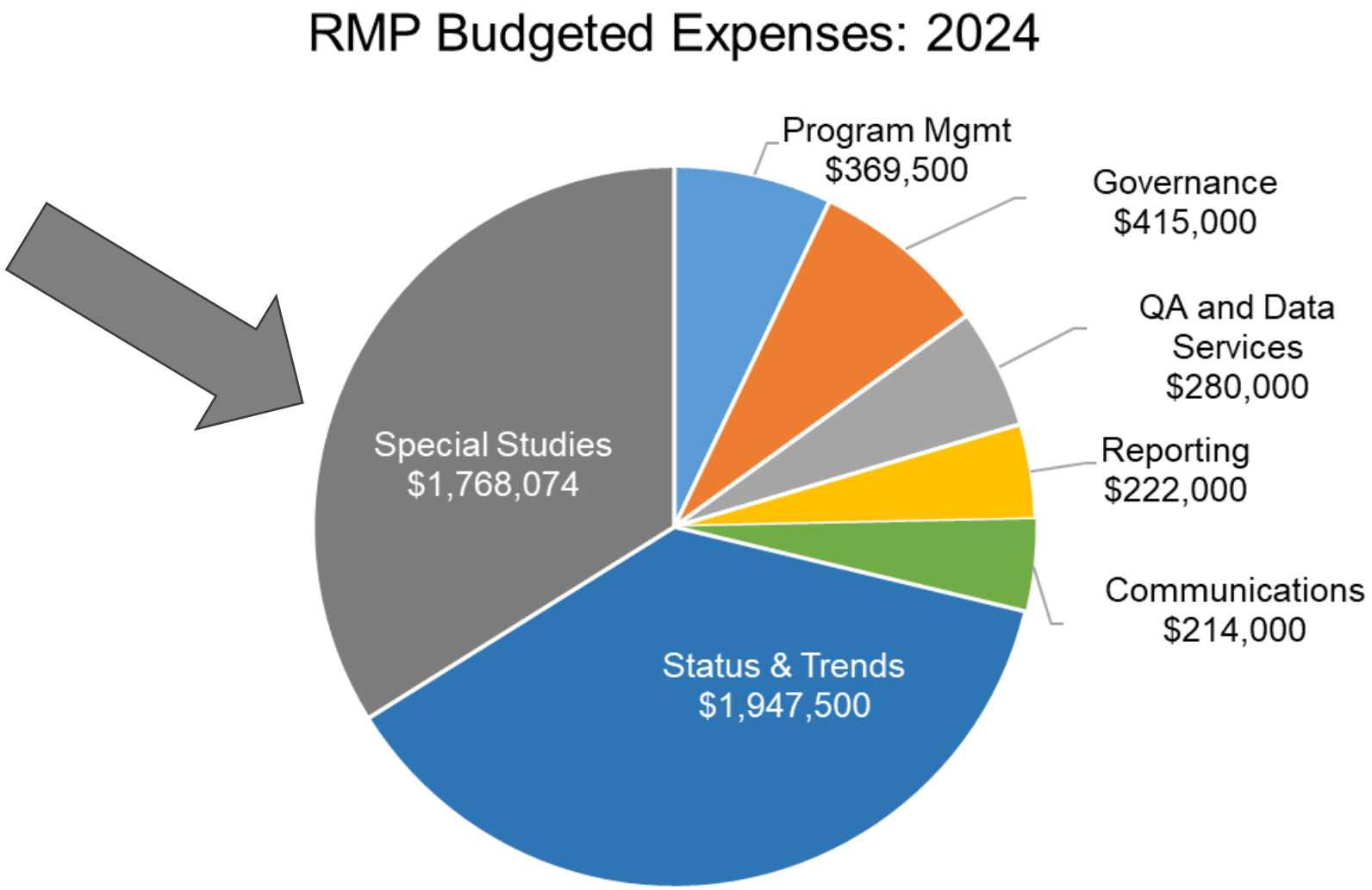
- Municipal wastewater
- Industrial wastewater
- Municipal stormwater
- Dredgers



RMP Program Structure



Regional Monitoring Program



Special Studies Budget for 2025

Predicted RMP Special Studies Budget for 2025 = $1.54M

★ Includes: AMR Funds + Stormwater CECs funds

But wait there's more!

USEPA San Francisco Bay Program Office

- Expected $54M per year (!) for San Francisco Bay

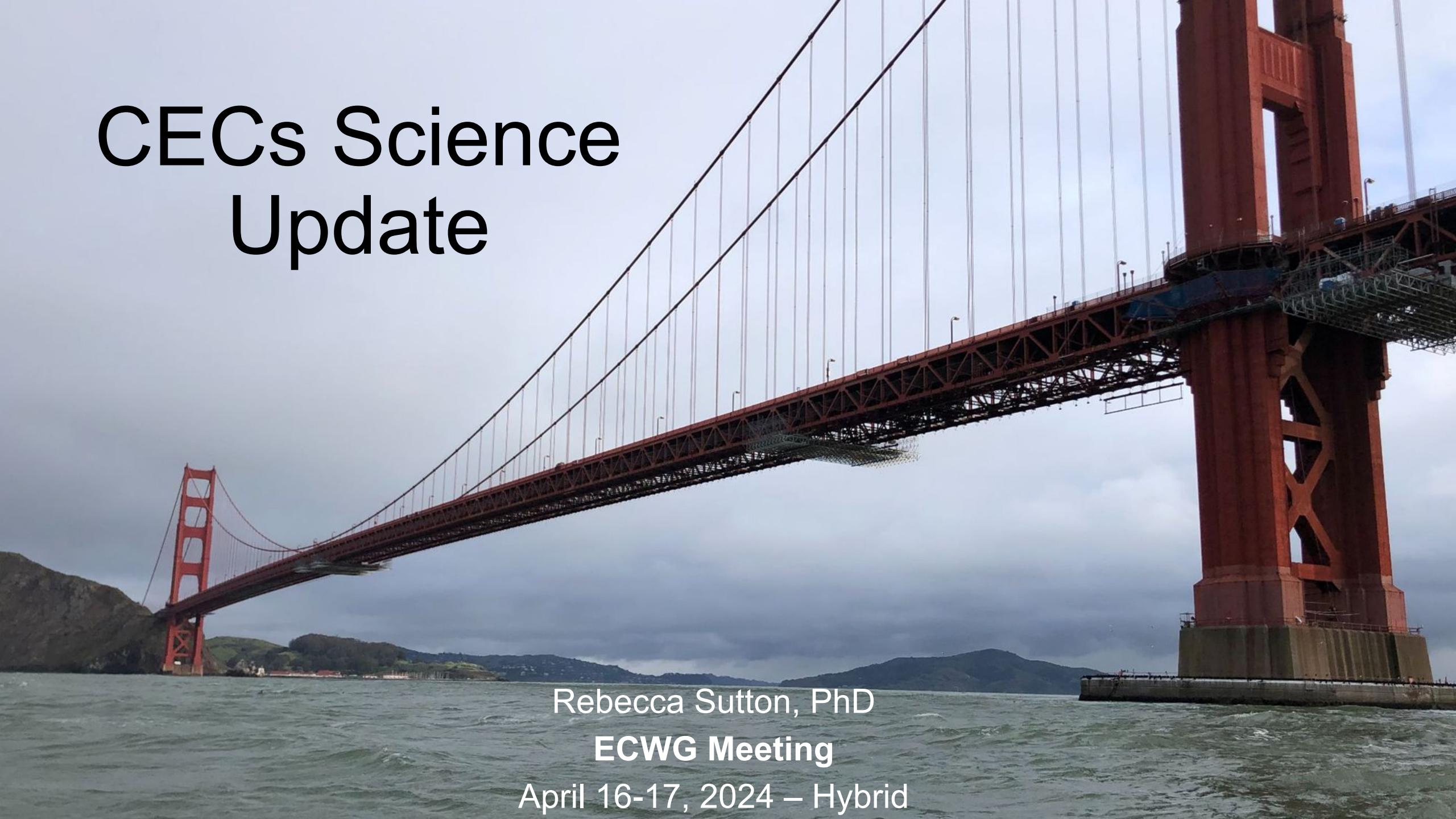
EPA Region 9
San Francisco Bay Program Office
FY24 Draft Annual Priority List

- Subtidal eelgrass and oyster reef restoration
- Wetlands Regional Monitoring Program
- Beneficial Reuse of Dredged Material Support
- In-Bay Monitoring of Pollutants, including trash, and algal species under the Regional Monitoring Program
- Large scale shoreline resilience, multi-benefit projects including horizontal levees and wastewater treatment/reuse
- Nutrient Management Strategy
- Special studies/projects for addressing PFAS in SF Bay
- Large scale tidal wetlands restoration
- Special studies/projects for addressing PCBs under TMDL implementation plan
- Large scale implementation of urban green stormwater infrastructure
- BRRIT (Bay Restoration Regulatory Integration Team)

Getting the RMP Bucket Ready

- SC guidance to workgroups and staff: aim for 50% funding increase in 2025, 100% increase starting in 2026
- Important to include EJ and climate adaptation
- Great time for bigger ideas

CECs Science Update



Rebecca Sutton, PhD

ECWG Meeting

April 16-17, 2024 – Hybrid

CECs Team at SFEI

Rebecca Sutton
(she/her)

Diana Lin
(she/her)

Kelly Moran
(she/her)

Ezra Miller
(ze/zir)

Jennifer Dougherty
(she/her)

Miguel Mendez
(he/him)

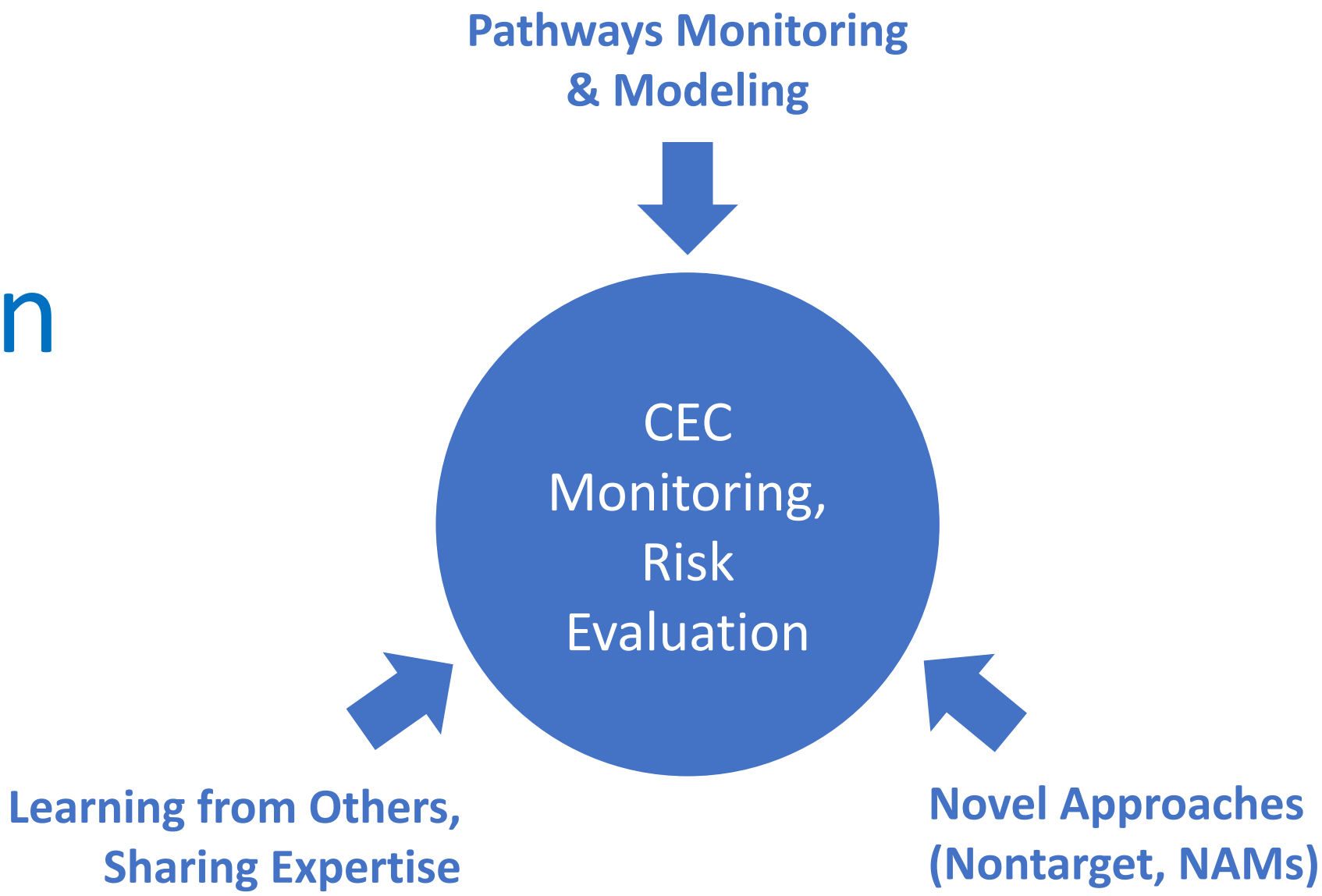
Pedro Avellaneda
(he/him)

Martin Trinh
(he/him)

Alicia Gilbreath
(she/her)

Kayli Paterson
(she/they)

Update on Current Activities



Very High Concern

NONE

High Concern

Organophosphate esters, PFAS

Moderate Concern

Alkylphenols/ethoxylates, bisphenols, fipronil & degradates, imidacloprid, microplastics

Low Concern

Chlorpyrifos & diazinon, HBCD, PBDEs, personal care & cleaning, pharmaceuticals, pyrethroids

Possible Concern

Alternative flame retardants, BZT-Uvs, indole, 4-methylphenol, plastic additives, PCB-11, PHCZs, QACs

1. Bay Monitoring: High Concern CECs

PFAS

- Synthesis and Strategy – Launching
- Water – Ongoing Status & Trends monitoring and special study (TOP)
- Sediment – Ongoing S&T and SEP-funded monitoring
- Biota – Ongoing S&T monitoring, expanded fish investigation, pilot marine mammals & prey fish studies

Organophosphate Esters

- Water – Ongoing S&T monitoring

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1. Bay Monitoring: Moderate Concern CECs

Bisphenols

- Water – Ongoing Status & Trends monitoring
- Sediment – Ongoing S&T monitoring

Alkylphenol Ethoxylates & other surfactants

- Water – Ongoing special study
- Sediment – Ongoing special study

1. Bay Monitoring: Possible Concern CECs

Quaternary Ammonium Compounds

- Water – Ongoing special study
- Sediment – Ongoing special study

Tire Chemicals (not classified in tiered risk-based framework)

- Water – Ongoing special study

Chlorinated Paraffins

- Sediment – Ongoing SEP-funded study

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2. Pathways Monitoring

Stormwater

- Multi-year screening of PFAS, OPEs, bisphenols, tire chemicals, ethoxylated surfactants – Nearing completion
- SFEI Mayfly remote sampler – Piloting for PFAS
- Monitoring approach – In development
- USEPA-funded tire chemicals and microplastics – Ongoing project

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2. Pathways Monitoring

Wastewater

- BACWA PFAS Phase 2 – Now complete
- Quaternary ammonium compounds – Ongoing special study
- Ethoxylated surfactants – Ongoing special study
- Plastic additives, including OPEs and bisphenols – Launching

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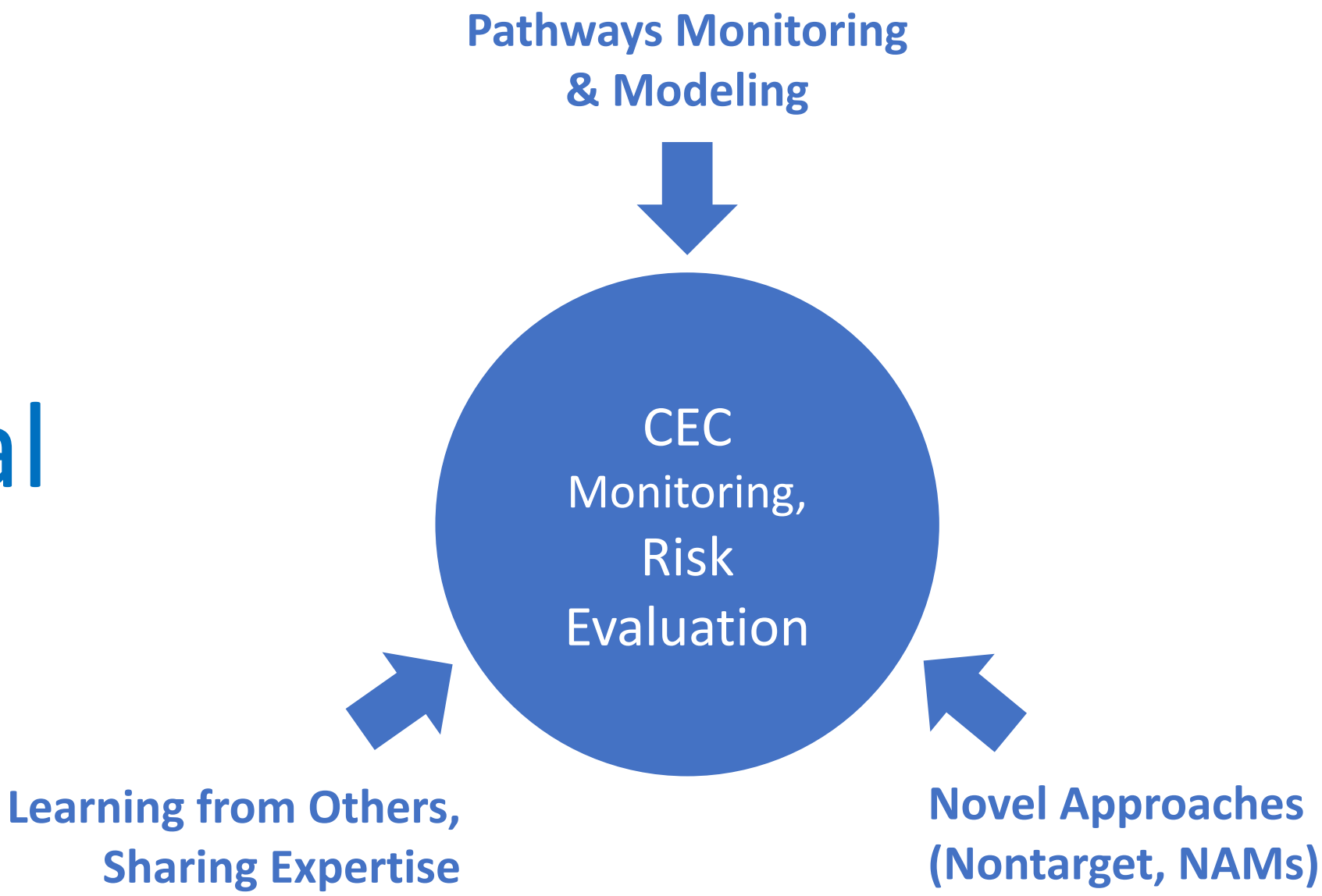
Additional Elements



3. Novel Approaches

Nontarget Analysis

- Sediment NTA
  - GC-based, nonpolar compounds – Masters theses complete
  - LC-based, polar compounds – Manuscript in preparation
  - Fact sheet summarizing results is in development
- Marine mammals – Study ongoing (GC & LC methods)
- Sport fish – Launching (GC & LC methods)
- Data mining of past results – Later this year

Ecotoxicology (New Approach Methodologies)

- Pro bono application to stormwater – Method in development

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4. Learning from Others, Sharing Expertise

SCIENTIFIC PUBLICATIONS

- Quaternary Ammonium Compounds: A Chemical Class of Emerging Concern
- Pharmaceuticals, Pesticides, and Ultraviolet Filters in Wastewater Discharges to San Francisco Bay as Drivers of Ecotoxicity
- Where the Rubber Meets the Road: Emerging Environmental Impacts of Tire Wear Particles and their Chemical Cocktails
- Storms Mobilize Organophosphate Esters, Bisphenols, PFASs, and Vehicle-derived Contaminants to San Francisco Bay Watersheds (submitted)
- Interstate Technology and Regulatory Council: Tire Anti-Degradants (6PPD) Guidance Documents (in review)
- Evaluation of Per- and Polyfluoroalkyl Substances in San Francisco Bay Fish from 2009 to 2019 (in prep)

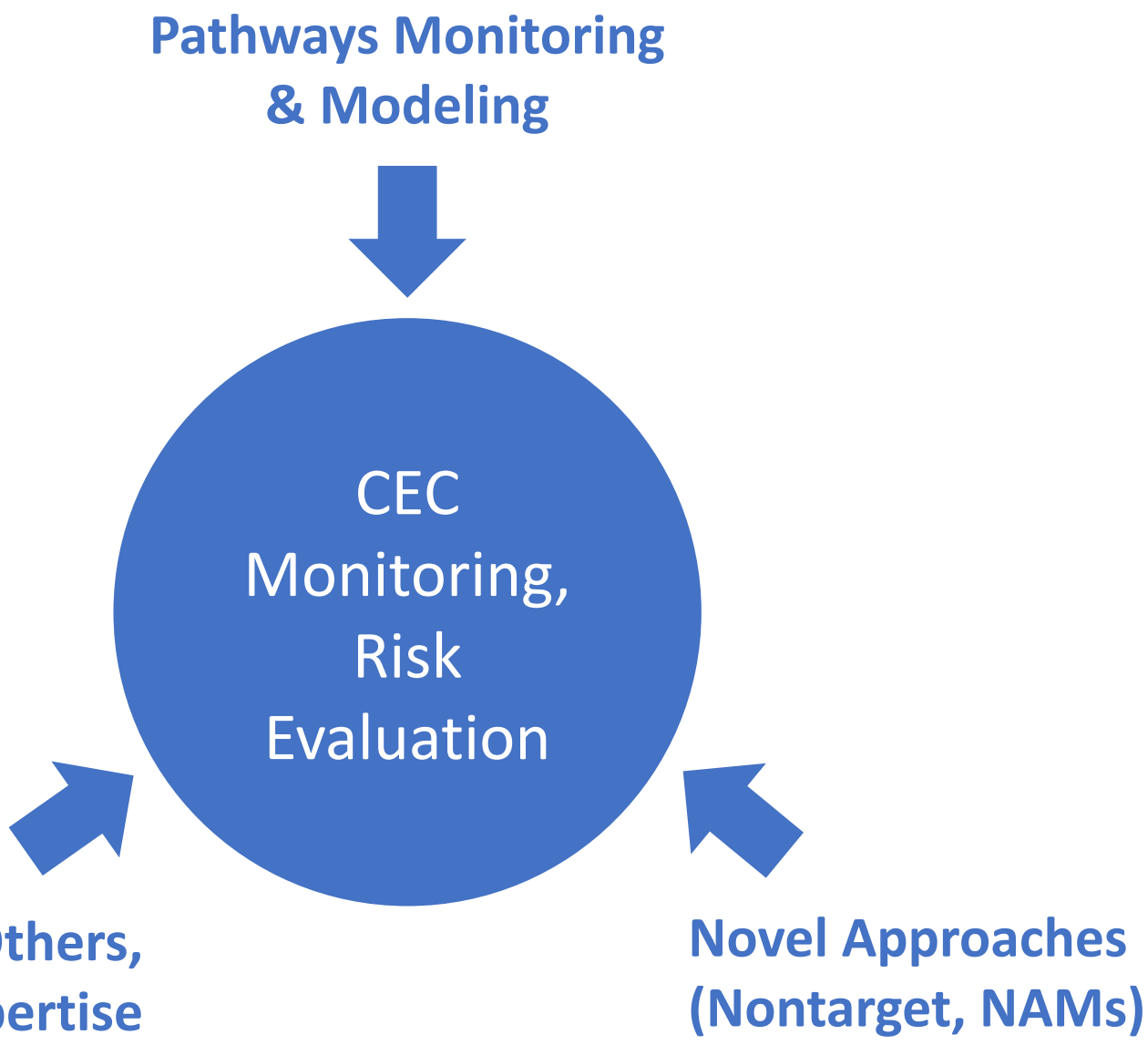
4. Learning from Others, Sharing Expertise

SETAC®

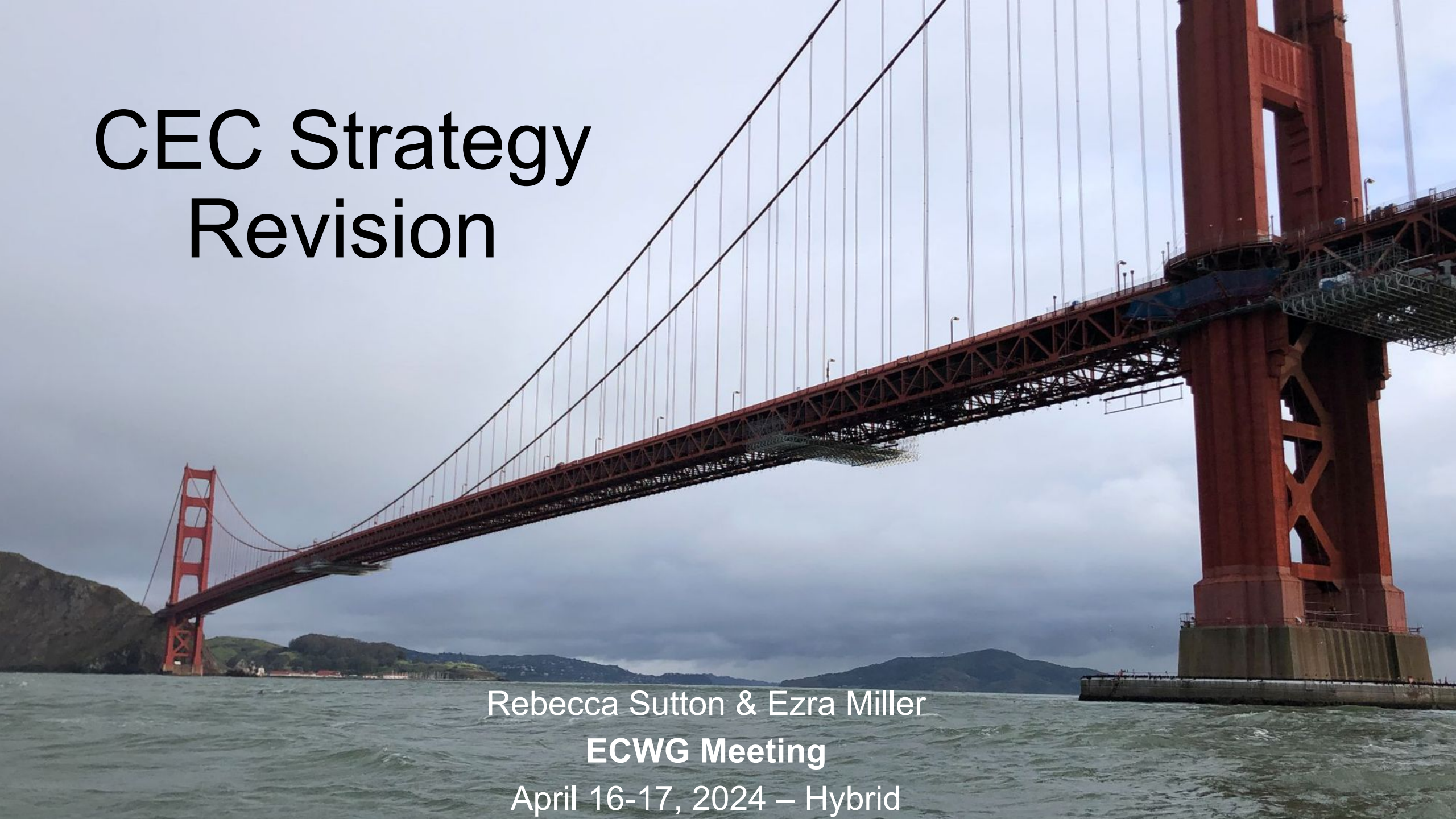
NATIONAL PFAS CONFERENCE

4. Learning from Others, Sharing Expertise

Questions?


Pathways Monitoring & Modeling
CEC Monitoring, Risk Evaluation
Learning from Others, Sharing Expertise
Novel Approaches (Nontarget, NAMs)

CEC Strategy Revision



Rebecca Sutton & Ezra Miller

ECWG Meeting

April 16-17, 2024 – Hybrid

Draft CEC Strategy Revision V1.0

1. Introduction
2. Risk-based Approach to Identify and Prioritize CECs
3. CEC Risk Evaluation and Monitoring Recommendations ★

   Profiles of 21 contaminants or classes
4. Scanning the Horizon: Identifying New CECs ★
5. Conclusion: Multi-year Plan ★

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What's Missing? V1.1, Summer

- Additional chemical profiles?
  - Alkylphenol ethoxylates // Ethoxylated surfactants
  - Carbendazim
  - Chlorinated paraffins
  - Tire/roadway CECs, including 6PPDQ
- Additional insights from nontarget analysis data mining

- Final Report: October 2024

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Topics for Today

- Review final management questions
- Placement of key CECs in the tiered risk-based framework
  - PFAS
  - OPEs
  - Fipronil and Degradates
  - Imidacloprid
  - NEW: Carbendazim (not yet included in strategy document)
  - NEW: Chlorpyrifos and Diazinon
  - Smaller refinements
- BREAK ~ 10:30
- Ecotoxicology approach
- Multi-year plan, future directions

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Final ECWG Management Questions

Section 1.3
Page 12

1. Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?
2. ★ What are the sources, pathways, loadings, and processes?
3. What are the physical, chemical, and biological processes that may affect transport and fate?
4. ★ Have levels of individual CECs or groups of CECs changed over time in the Bay or pathways? What are potential drivers contributing to change?
5. Are CECs predicted to increase or decrease in the future?
6. What are the effects of management actions?

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Key CECs in the Tiered Risk-based Framework

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<u>Very High Concern</u>: $RQ_{eco} >> 100$, $RQ_{human} >> 10$

Occurrence data suggest a very high probability of an adverse impact on Bay wildlife or people

<u>High Concern</u>: $10 < RQ_{eco} < 100$, $1 < RQ_{human} < 10$

Occurrence data suggest a high probability of an adverse impact on Bay wildlife or people

<u>Moderate Concern</u>: $1 < RQ_{eco} < 10$, $RQ_{human} < 1$

Occurrence data suggest a moderate probability of an adverse impact on Bay wildlife or people

<u>Low Concern</u>: $RQ << 1$

Occurrence data suggest minimal impact on Bay wildlife or people

<u>Possible Concern</u>: RQ = ?

Significant uncertainty in occurrence data and/or the level of effect on Bay wildlife or people

Very High Concern

NONE

High Concern ★ ★

Organophosphate esters, PFAS

Moderate Concern ★ ★

Alkylphenols/ethoxylates, bisphenols, fipronil & degradates, imidacloprid, microplastics

Low Concern ★

Chlorpyrifos & diazinon, HBCD, PBDEs, personal care & cleaning, pharmaceuticals, pyrethroids

Possible Concern

Alternative flame retardants, BZT-Uvs, indole, 4-methylphenol, plastic additives, PCB-11, PHCZs, QACs

	Monitoring Recommendations	Management Recommendations
Very High Concern	• Studies to support TMDL • S&T monitoring	• 303(d) listing • TMDL or alternate management plan • Aggressive control / treatment
High Concern	• S&T monitoring • Studies on sources, pathways • Consider studies on fate, effects	• Prioritize action plan / strategy • Aggressive pollution prevention • Cost-effective control / treatment
Moderate Concern	• Consider S&T monitoring • Consider studies on sources, pathways • Consider studies on fate, effects	• Action plan / strategy • Moderate pollution prevention • Cost-effective control / treatment
Low Concern	• Periodic screening – Bay, pathways • Transitional – Sunset S&T monitoring • Deprioritized	• Low-cost source identification / control • Low-level pollution prevention • Track product use / market trends
Possible Concern	• Periodic screening – Bay, pathways • Deprioritized	• Continue to identify / prioritize CECs • Track external efforts • Develop screening methods

Organophosphate Esters: **High** Concern

Section 3.2.1 Page 33

Sources: Widely used flame retardants and plastic ingredients

Risk driver: Water concentrations exceed aquatic toxicity thresholds

- Maximum risk quotient (TDCPP, n=34): **120**
- Secondary factor: Cumulative impacts

Management: Bans on flame retardants in some products

Monitoring strategy

- Status & Trends water
- Special studies in wastewater & stormwater
- Synthesis & strategy, conceptual model

PFAS: High Concern

Section 3.3.3 Page 37

Sources: Numerous consumer and industrial products

Risk driver: Fish tissue concentrations exceed human health thresholds

- Maximum fish tissue risk quotient (PFOS, n=134): **39**
- Secondary factors: Persistence, bioaccumulation, cumulative impacts

Management: Recent product bans; prior long-chain PFAS phase-out

Monitoring strategy

- S&T water, sediment, biota
- Special studies in wastewater, stormwater, precipitation
- Complementary use of novel analytical methods
- Synthesis & strategy, conceptual model

Fipronil & Degradates: Moderate Concern… or High?

Section 3.3.3 Page 48

Sources: Urban insecticide against ants, termites, pet fleas

Risk driver: Water concentrations exceed aquatic toxicity thresholds

- Maximum risk quotient (fipronil sulfone, n=22, 3 detections): **27**
- Secondary factors: Persistence, potential cumulative impacts

Management: Recent label changes for professional application outdoors

Monitoring strategy

- Deprioritized, DPR does not need estuarine data

Imidacloprid: Moderate Concern

Section 3.3.4 Page 51

Sources: Agricultural and urban insecticide (ants, fleas, termites)

Risk driver: Water concentrations similar to aquatic toxicity thresholds

- Risk quotients, depending on toxicity threshold (n=50): **0.29 – 0.96**
- Secondary factor: N/A

Management: Regulation and legislation is restricting some uses

Monitoring strategy

- Deprioritized, DPR does not need estuarine data

Carbendazim: Moderate Concern?

Potential sources: Preservative ingredient in paints

- Also the degradate of a pesticide with little use

Risk driver: Water concentrations exceed aquatic toxicity thresholds

- ECHA threshold (PNEC): 150 ng/L
- Risk quotient (n=10): **~4**
- Secondary factor: N/A

Monitoring strategy

- Continued screening in Bay water, stormwater via stormwater CECs suite

Chlorpyrifos & Diazinon: Low Concern?

Section 3.4.1 Page 56

Sources: Agricultural and urban insecticides

Risk driver: Not detected in Bay water

- Sufficiently sensitive method, n=24
- Secondary factor: Anticipated declines due to effective management

Monitoring strategy

- Deprioritized

Smaller Refinements

- **PBDD/Fs** category collapsed into **PBDEs**
  - Polybrominated dioxins & furans are impurities in PBDEs and can be derived from natural sources
  - Older data indicate low risk, declines anticipated due to PBDE bans
- **Phthalates** category expanded into **Other Plastic Additives**
  - Recent pilot data include phthalates and alternatives in Bay water
- **Siloxanes** moved to a future priority
  - Recent data include qualitative tentative identifications in sediment via nontarget analysis
  - Older pro bono observations in bivalves

Specific Discussion Topics

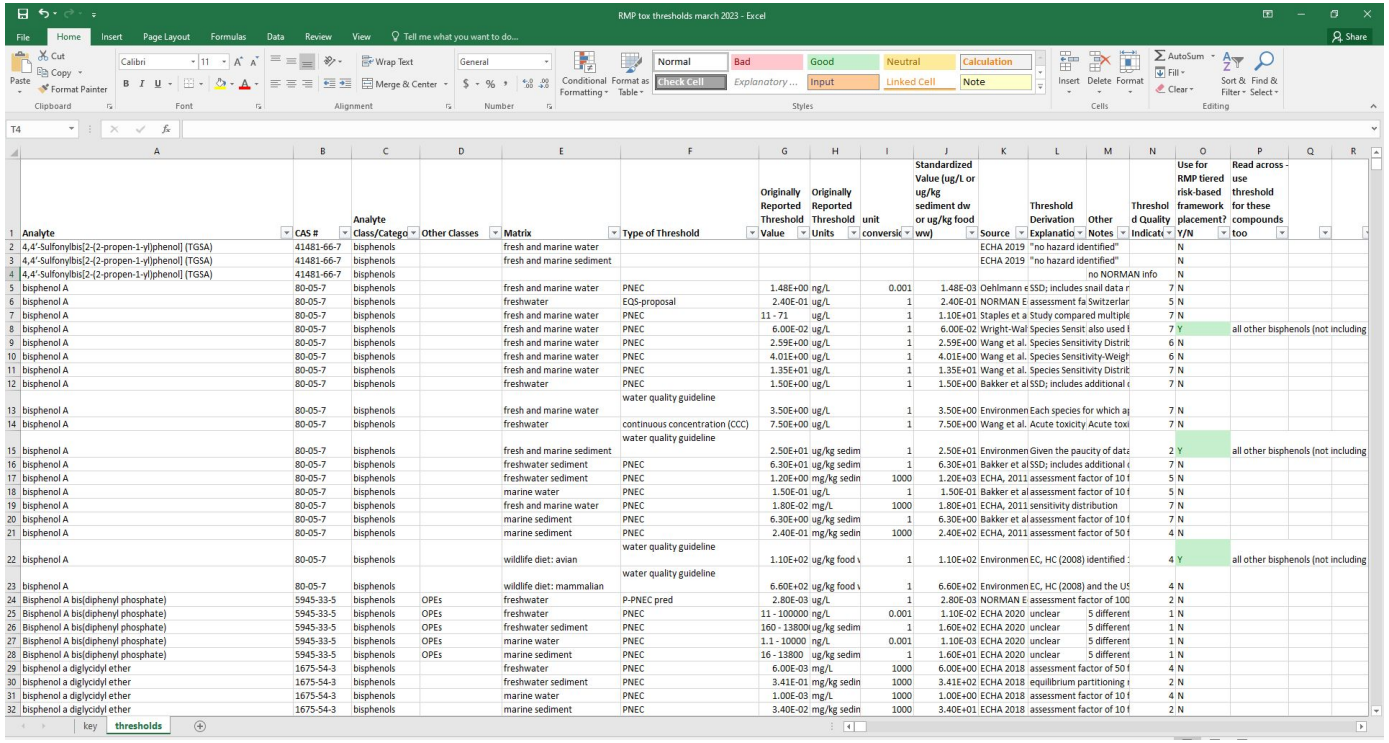
- Is there consensus on **OPEs** and **PFAS** as High Concern contaminants?
- Do **fipronil and degradates** belong in the Moderate or High Concern tier?
  - Are there implications for future RMP monitoring?
- Is there consensus on **imidacloprid** as a Moderate Concern contaminant?
- Are there any considerations we should factor into our review and risk screening of **carbendazim**?
- Is it useful to document our data and Low Concern classification for **chlorpyrifos and diazinon**?

Break

Ecotoxicology Approach

Thresholds Spreadsheet

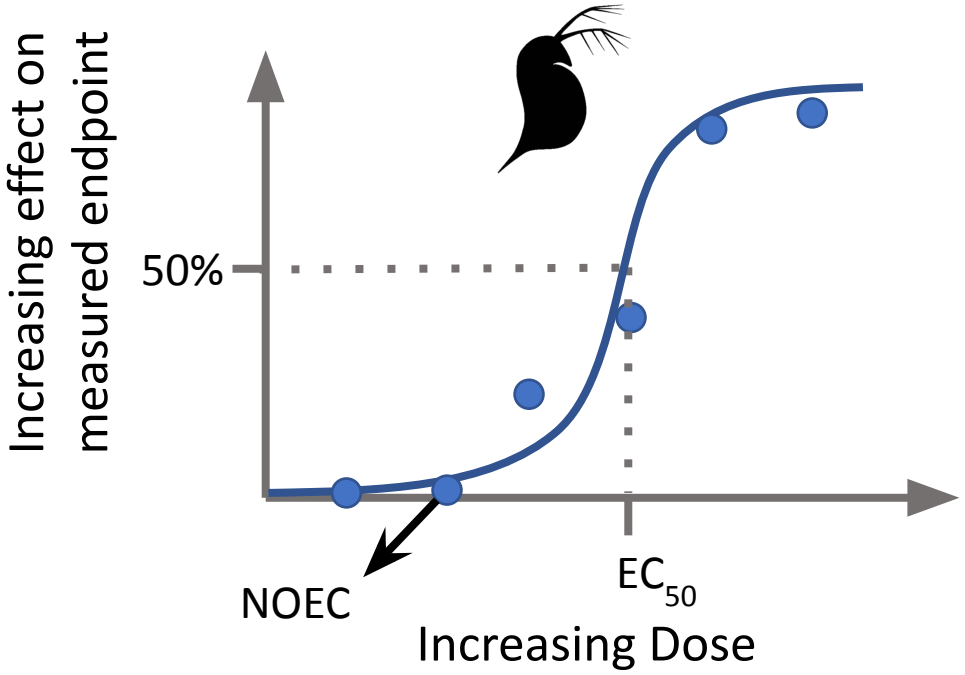
- Compilation of ecosystem effects level thresholds
- Living document updated periodically
- Available by request (EzraM@sfei.org)



Analyte	CAS #	Analyte Class/Catego	Other Classes	Matrix	Type of Threshold	Originally Reported Threshold Value	Originally Reported Threshold Units	unit conversio	Standardized Value (ug/L or ug/kg sediment dw or ug/kg food ww)	Source	Threshold Derivation Explanatio	Other Notes	Threshol d Quality Indicat	Use for RMP tiered risk-based framework placement? Y/N	Read across - use threshold for these compounds too
4,4'-Sulfonylbis[2-(2-propen-1-yl)phenol] (TGSA)	41481-66-7	bisphenols		fresh and marine water						ECHA 2019	"no hazard identified"			N	
4,4'-Sulfonylbis[2-(2-propen-1-yl)phenol] (TGSA)	41481-66-7	bisphenols		fresh and marine sediment						ECHA 2019	"no hazard identified"			N	
4,4'-Sulfonylbis[2-(2-propen-1-yl)phenol] (TGSA)	41481-66-7	bisphenols										no NORMAN info		N	
bisphenol A	80-05-7	bisphenols		fresh and marine water	PNEC	1.48E+00	ng/L	0.001	1.48E-03	Oehlmann e	SSD; includes snail data r		7	N	
bisphenol A	80-05-7	bisphenols		freshwater	EQS-proposal	2.40E-01	ug/L	1	2.40E-01	NORMAN E	assessment fa	Switzerlar	5	N	
bisphenol A	80-05-7	bisphenols		fresh and marine water	PNEC	11 - 71	ug/L	1	1.10E+01	Staples et a	Study compared multiple		7	N	
bisphenol A	80-05-7	bisphenols		fresh and marine water	PNEC	6.00E-02	ug/L	1	6.00E-02	Wright-Wal	Species Sensit	also used f	7	Y	all other bisphenols (not including
bisphenol A	80-05-7	bisphenols		fresh and marine water	PNEC	2.59E+00	ug/L	1	2.59E+00	Wang et al.	Species Sensitivity Distrib		6	N	
bisphenol A	80-05-7	bisphenols		fresh and marine water	PNEC	4.01E+00	ug/L	1	4.01E+00	Wang et al.	Species Sensitivity-Weigh		6	N	
bisphenol A	80-05-7	bisphenols		fresh and marine water	PNEC	1.35E+01	ug/L	1	1.35E+01	Wang et al.	Species Sensitivity Distrib		7	N	
bisphenol A	80-05-7	bisphenols		freshwater	PNEC	1.50E+00	ug/L	1	1.50E+00	Bakker et al	SSD; includes additional		7	N	
bisphenol A	80-05-7	bisphenols		fresh and marine water	water quality guideline	3.50E+00	ug/L	1	3.50E+00	Environmen	Each species for which ap		7	N	
bisphenol A	80-05-7	bisphenols		freshwater	continuous concentration (CCC)	7.50E+00	ug/L	1	7.50E+00	Wang et al.	Acute toxicity	Acute toxi	7	N	
bisphenol A	80-05-7	bisphenols		fresh and marine sediment	water quality guideline	2.50E+01	ug/kg sedim	1	2.50E+01	Environmen	Given the paucity of data		2	Y	all other bisphenols (not including
bisphenol A	80-05-7	bisphenols		freshwater sediment	PNEC	6.30E+01	ug/kg sedim	1	6.30E+01	Bakker et al	SSD; includes additional		7	N	
bisphenol A	80-05-7	bisphenols		freshwater sediment	PNEC	1.20E+00	mg/kg sedin	1000	1.20E+03	ECHA, 2011	assessment factor of 10 f		5	N	
bisphenol A	80-05-7	bisphenols		marine water	PNEC	1.50E-01	ug/L	1	1.50E-01	Bakker et al	assessment factor of 10 f		5	N	
bisphenol A	80-05-7	bisphenols		fresh and marine water	PNEC	1.80E-02	mg/L	1000	1.80E+01	ECHA, 2011	sensitivity distribution		7	N	
bisphenol A	80-05-7	bisphenols		marine sediment	PNEC	6.30E+00	ug/kg sedim	1	6.30E+00	Bakker et al	assessment factor of 10 f		7	N	
bisphenol A	80-05-7	bisphenols		marine sediment	PNEC	2.40E-01	mg/kg sedin	1000	2.40E+02	ECHA, 2011	assessment factor of 50 f		4	N	
bisphenol A	80-05-7	bisphenols		wildlife diet: avian	water quality guideline	1.10E+02	ug/kg food	1	1.10E+02	Environmen	EC, HC (2008) identified		4	Y	all other bisphenols (not including
bisphenol A	80-05-7	bisphenols		wildlife diet: mammalian	water quality guideline	6.60E+02	ug/kg food		6.60E+02	Environmen	EC, HC (2008) and the US		4	N	
Bisphenol A bis(diphenyl phosphate)	5945-33-5	bisphenols	OPEs	freshwater	P-PNEC pred	2.80E-03	ug/L	1	2.80E-03	NORMAN E	assessment factor of 100		2	N	
Bisphenol A bis(diphenyl phosphate)	5945-33-5	bisphenols	OPEs	freshwater	PNEC	11 - 100000	ng/L	0.001	1.10E-02	ECHA 2020	unclear	5 different	1	N	
Bisphenol A bis(diphenyl phosphate)	5945-33-5	bisphenols	OPEs	freshwater sediment	PNEC	160 - 13800	ug/kg sedim	1	1.60E+02	ECHA 2020	unclear	5 different	1	N	
Bisphenol A bis(diphenyl phosphate)	5945-33-5	bisphenols	OPEs	marine water	PNEC	1.1 - 10000	ng/L	0.001	1.10E-03	ECHA 2020	unclear	5 different	1	N	
Bisphenol A bis(diphenyl phosphate)	5945-33-5	bisphenols	OPEs	marine sediment	PNEC	16 - 13800	ug/kg sedim	1	1.60E+01	ECHA 2020	unclear	5 different	1	N	
bisphenol a diglycidyl ether	1675-54-3	bisphenols		freshwater	PNEC	6.00E-03	mg/L	1000	6.00E+00	ECHA 2018	assessment factor of 50 f		4	N	
bisphenol a diglycidyl ether	1675-54-3	bisphenols		freshwater sediment	PNEC	3.41E-01	mg/kg sedin	1000	3.41E+02	ECHA 2018	equilibrium partitioning		2	N	
bisphenol a diglycidyl ether	1675-54-3	bisphenols		marine water	PNEC	1.00E-03	mg/L	1000	1.00E+00	ECHA 2018	assessment factor of 10 f		4	N	
bisphenol a diglycidyl ether	1675-54-3	bisphenols		marine sediment	PNEC	3.40E-02	mg/kg sedin	1000	3.40E+01	ECHA 2018	assessment factor of 10 f		2	N	

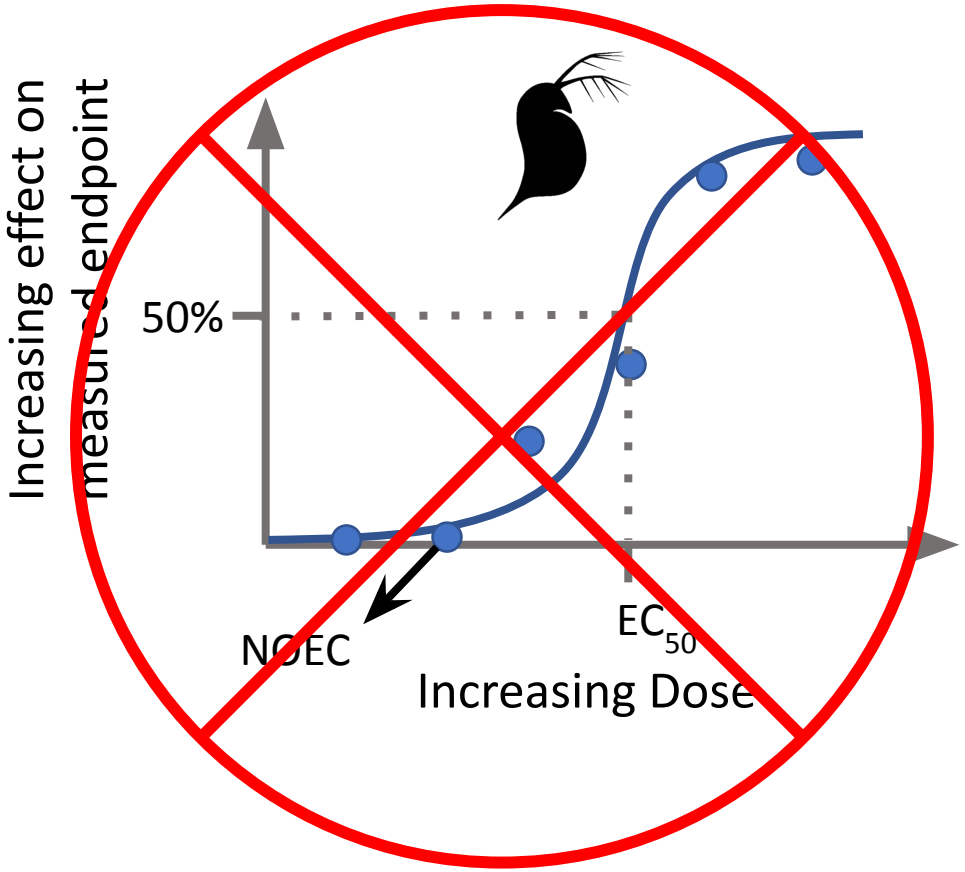
Ecotox Thresholds

Single species toxicity test
(one endpoint e.g., mortality OR change in reproduction)



Ecotox Thresholds

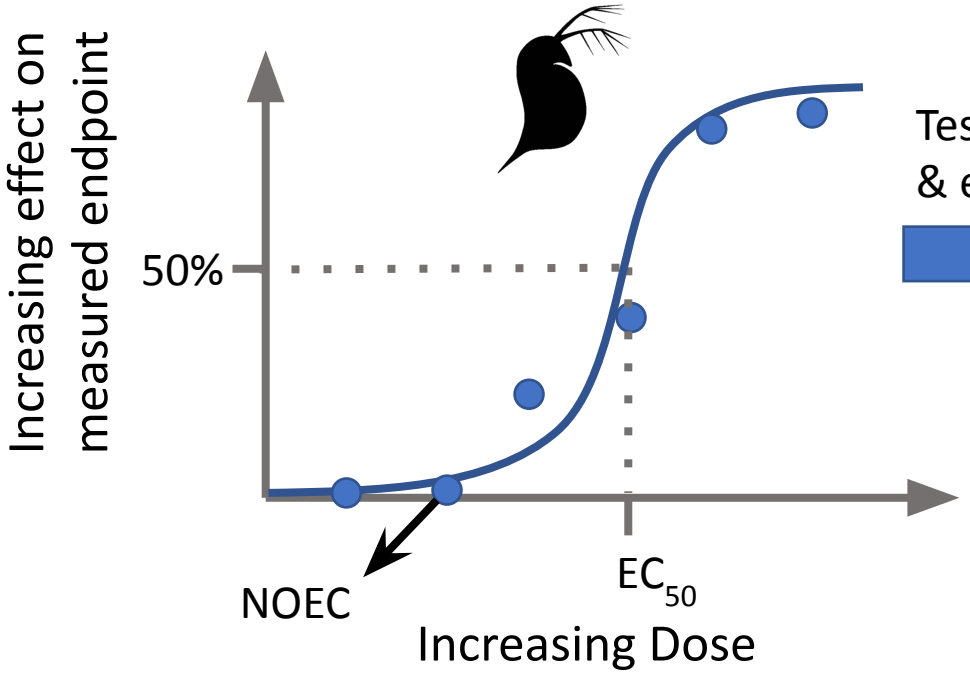
Single species toxicity test
(one endpoint e.g., mortality OR change in reproduction)



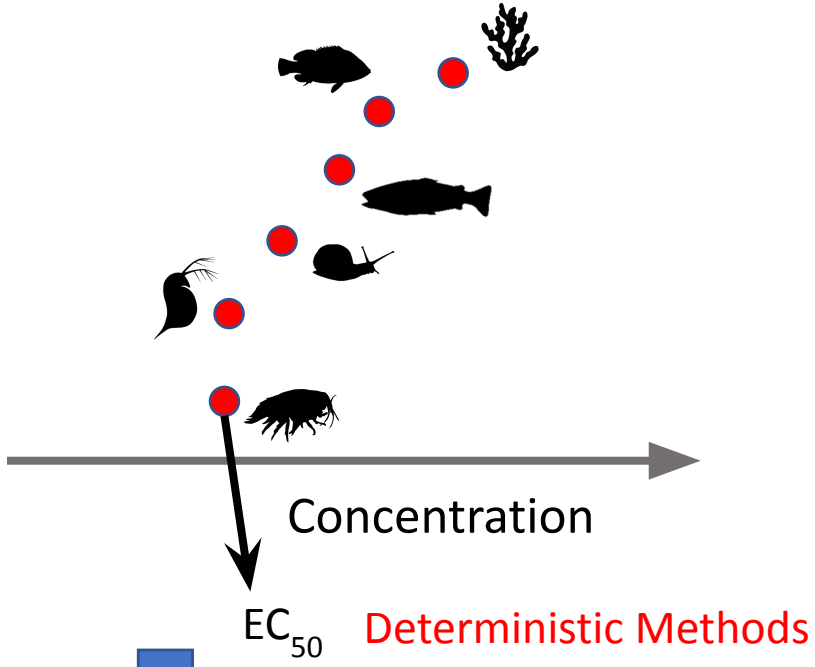
Not listed as rows in the spreadsheet

Ecotox Thresholds

Single species toxicity test
(one endpoint e.g., mortality OR change in reproduction)



Test many species & endpoints

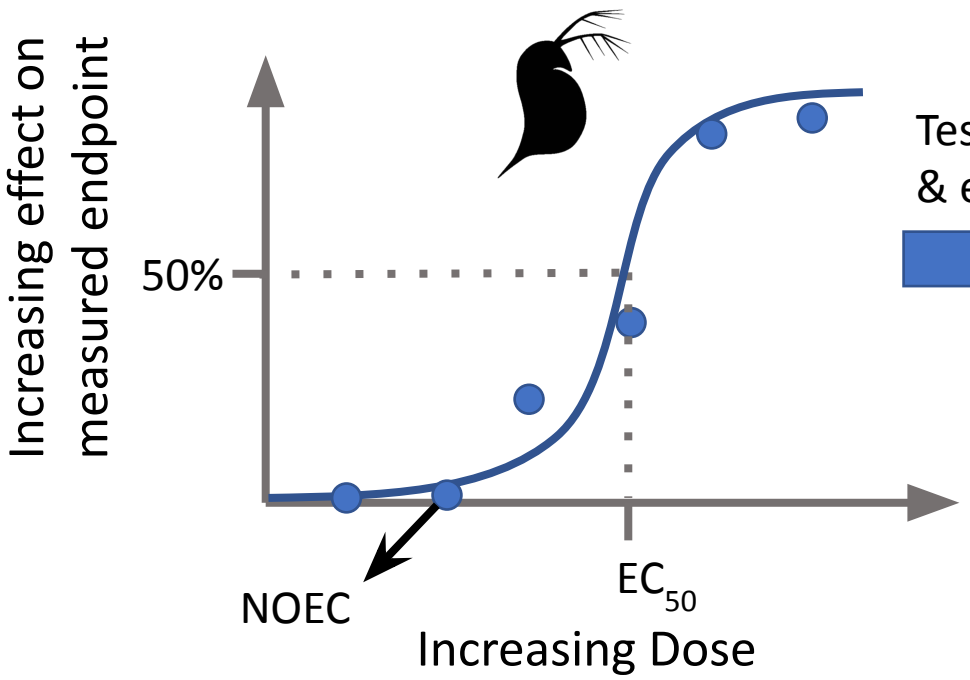


× uncertainty factors

Ecosystem-level threshold
e.g., Predicted No Effect Concentration (PNEC)

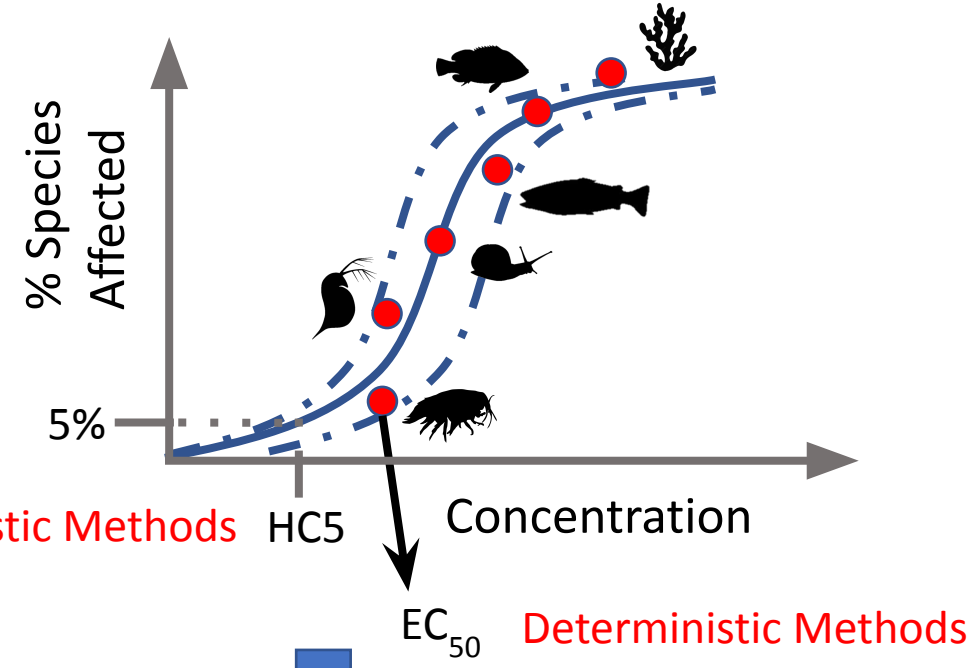
Ecotox Thresholds

Single species toxicity test
(one endpoint e.g., mortality OR change in reproduction)



Test many species & endpoints

Species Sensitivity Distribution
(compares one endpoint across species)



Probabilistic Methods

Deterministic Methods

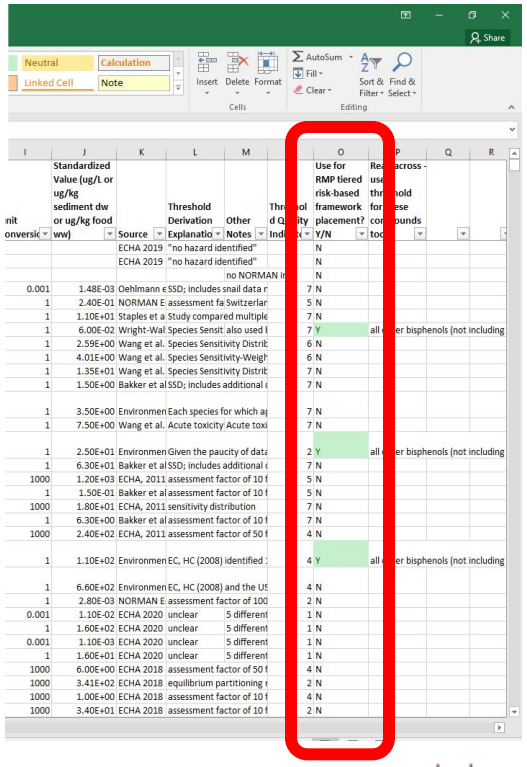
× uncertainty factors

Rows in the spreadsheet

Ecosystem-level threshold
e.g., Predicted No Effect Concentration (PNEC)

When Multiple Thresholds are Available

- Preference to
  - data for the appropriate matrix (e.g., freshwater vs. marine)
  - more species (and more trophic levels)
  - chronic exposures (rather than acute)
  - more experimental data (rather than predicted)
  - lower (more protective) thresholds
  - California-specific values when available



I	J	K	L	M	O	P
nit onversic	Standardized Value (ug/L or ug/kg sediment dw or ug/kg food ww)	Source	Threshold Derivation Explanatio	Other Notes	Use for RMP tiered risk-based framework placement? Y/N	Rea use thr for ese co too ounds across -
		ECHA 2019	"no hazard identified"		N	
		ECHA 2019	"no hazard identified"		N	
				no NORMAN i	N	
0.001	1.48E-03	Oehlmann e	SSD; includes snail data r		7 N	
1	2.40E-01	NORMAN E	assessment fa	Switzerlar	5 N	
1	1.10E+01	Staples et a	Study compared multiple		7 N	
1	6.00E-02	Wright-Wal	Species Sensit	also used l	7 Y	all er bisphenols (not including
1	2.59E+00	Wang et al.	Species Sensitivity Distrib		6 N	
1	4.01E+00	Wang et al.	Species Sensitivity-Weigh		6 N	
1	1.35E+01	Wang et al.	Species Sensitivity Distrib		7 N	
1	1.50E+00	Bakker et al	SSD; includes additional		7 N	
1	3.50E+00	Environmen	Each species for which a		7 N	
1	7.50E+00	Wang et al.	Acute toxicity Acute toxi		7 N	
1	2.50E+01	Environmen	Given the paucity of data		2 Y	all er bisphenols (not including
1	6.30E+01	Bakker et al	SSD; includes additional		7 N	
1000	1.20E+03	ECHA, 2011	assessment factor of 10 f		5 N	
1	1.50E-01	Bakker et al	assessment factor of 10 f		5 N	
1000	1.80E+01	ECHA, 2011	sensitivity distribution		7 N	
1	6.30E+00	Bakker et al	assessment factor of 10 f		7 N	
1000	2.40E+02	ECHA, 2011	assessment factor of 50 f		4 N	
1	1.10E+02	Environmen	EC, HC (2008) identified		4 Y	all er bisphenols (not including
1	6.60E+02	Environmen	EC, HC (2008) and the US		4 N	
1	2.80E-03	NORMAN E	assessment factor of 100		2 N	
0.001	1.10E-02	ECHA 2020	unclear	5 different	1 N	
1	1.60E+02	ECHA 2020	unclear	5 different	1 N	
0.001	1.10E-03	ECHA 2020	unclear	5 different	1 N	
1	1.60E+01	ECHA 2020	unclear	5 different	1 N	
1000	6.00E+00	ECHA 2018	assessment factor of 50 f		4 N	
1000	3.41E+02	ECHA 2018	equilibrium partitioning		2 N	
1000	1.00E+00	ECHA 2018	assessment factor of 10 f		4 N	
1000	3.40E+01	ECHA 2018	assessment factor of 10 f		2 N	

Filter Column O to "Y"

- No calculations of new thresholds when established literature threshold is available

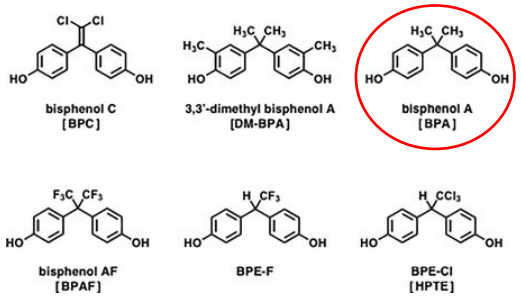
When No Established Threshold Is Available

- Calculations of new thresholds
  - When single species ecotox data is available
  - Deterministic methods

E.g., 6PPD-quinone

- Read Across
  - When a threshold for a structurally similar compound is available

E.g., bisphenols

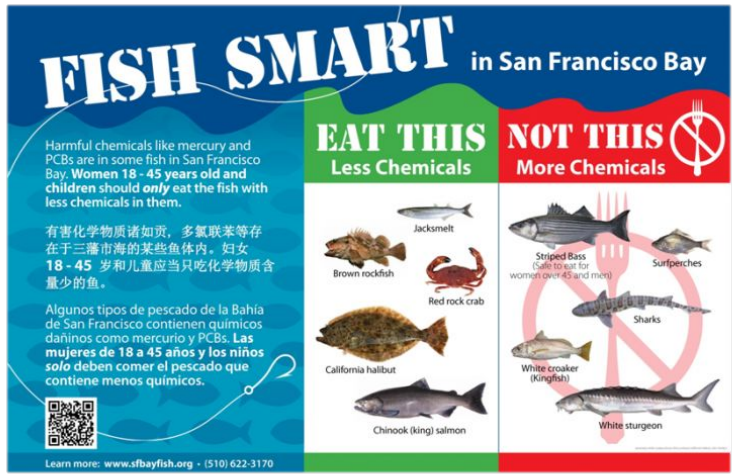


E.g., biota thresholds

- In some cases, simply no threshold for comparison

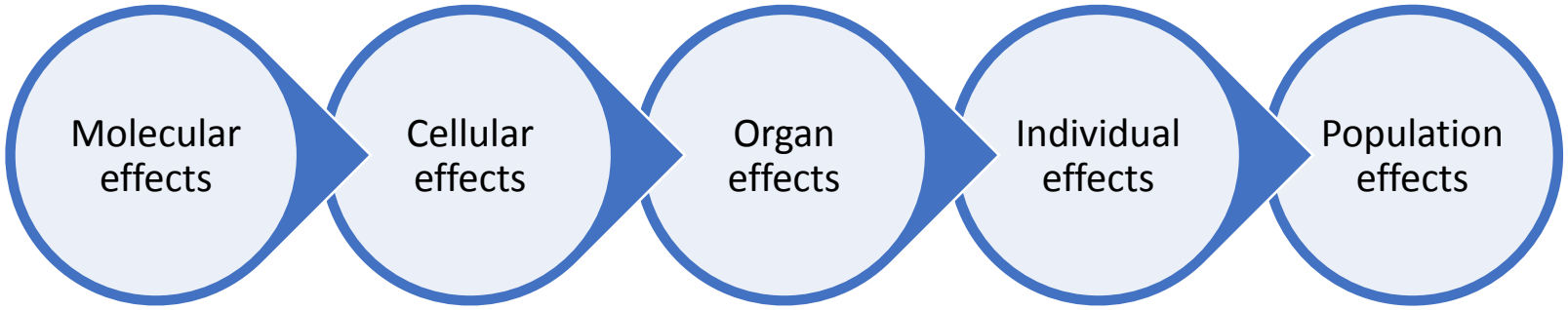
Human Health

- For fish consumption only
  - Thresholds exist for some CECs for tissue and/or water matrix
  - No comparison with drinking water thresholds
- Preference to
  - California-specific values when available
  - Lowest (most protective) available threshold when there are no California-specific values
- No calculations of new thresholds



Cumulative Impacts

- Co-exposure to members of the same class of CECs or to commonly co-occurring contaminants from different chemical classes with the same mode of action



- Receptor/ligand interaction
- DNA binding
- Protein oxidation

- Signaling
- Gene expression (protein production)

- Physiology
- Homeostasis
- Tissue development/ function

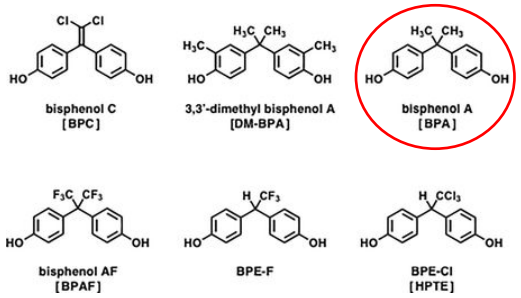
- Disease
- Survival
- Reproduction

- Population size
- Sex ratio

Cumulative Impacts

- Co-exposure to members of the same class of CECs or to commonly co-occurring contaminants from different chemical classes with the same mode of action
- Approach: Compare sums of relevant contaminants with the toxicity threshold of the most potent (known) compound
  - Assumes additive impacts and equivalent potency
  - More likely to over-estimate rather than under-estimate mixture effects (protective)

E.g., bisphenols



Bioassay Screening

- High-throughput *in vitro* assays
- Focus on biological modes of action instead of specific chemical classes

Known Chemicals Detected in SF Bay

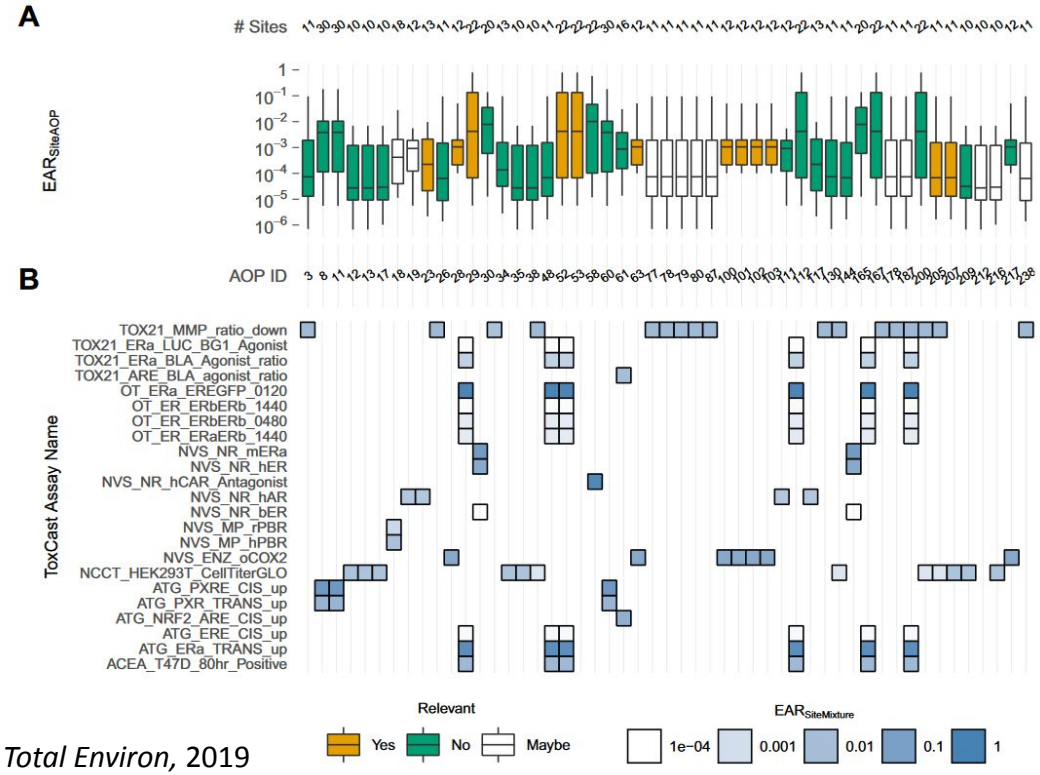
- Individual chemical assay data

Bioassay Screening

- High-throughput *in vitro* assays
- Focus on biological modes of action instead of specific chemical classes

Known Chemicals Detected in SF Bay

- Individual chemical assay data
- Identify potential toxicity of specific individual chemicals (including those without available ecotox thresholds)
- Estimate potential mixture toxicity based on shared mode of action



Example: Corsi et al., *Sci Total Environ*, 2019

Bioassay Screening

- High-throughput *in vitro* assays
- Focus on biological modes of action instead of specific chemical classes

Whole Environmental Samples

Bioassay Screening

- High-throughput *in vitro* assays
- Focus on biological modes of action instead of specific chemical classes

Whole Environmental Samples

- Screen for biological activity / toxicity
- Identify mixture effects not predicted from known chemicals
- Compare whole sample results with those of specific chemicals to identify drivers of toxicity

★ Proposals:

- Stormwater tox screen
- S&T Bay Water NTA

Multi-year Plan & Future Directions

Multi-year Plan Organization

Multi-year Plan Page 112

- Strategy
- Stormwater monitoring & modeling
- High Concern CECs
- Moderate Concern CECs
- Low or Possible Concern CECs
- Nontarget analysis, toxicology (novel methods)

RMP

Stormwater Monitoring and Modeling

- Significant ongoing focus of resources anticipated
  - Stakeholder-Science Advisor Team (SST) previously advised RMP contribution of **$300k annually**
  - Two EPA Water Quality Improvement Fund projects provides additional resources 2024-2027
  - Additional funds could be allocated to important priorities during this critical startup period

More discussion tomorrow during joint ECWG-SPLWG meeting

RMP

High Concern: PFAS

Current / ongoing

- Status & Trends water, sediment, sport fish, bird eggs
  - Pilots: Marine mammals, prey fish
- Synthesis and strategy
- TOP assay in Bay water and sediment
- Integrated monitoring and modeling in stormwater
- Soon: PFAS Sources to Solutions (EPA WQIF) – discussed tomorrow

Tier Two Concepts

- PFAS NMR in wastewater and stormwater, other matrices
- PFAS in precipitation
- PFAS stormwater depth profile pilot

RMP

High Concern: Organophosphate Esters

Current / ongoing

- Status & Trends water
- RMP stormwater, wastewater

Ideas for future years

- Synthesis and strategy
- Conceptual model
- Follow-up study

Moderate Concerns

Current / ongoing: Bisphenols

- RMP stormwater, wastewater
- Status & Trends water, sediment

Current / ongoing: Ethoxylated surfactants

- RMP wastewater, stormwater, sediment

Future Work on Other Classes

Current / ongoing

- Other plastic additives
- Quaternary ammonium compounds (SEP)
- Chlorinated paraffins in sediment (SEP)
- Tire-derived compounds

Ideas for future years

- Alternative brominated flame retardants
- Other plastic additives

Nontarget Analysis

Current / ongoing

- Sediment
- Status & Trends marine mammals pilot
- Data mining for new CECs priorities
- Sport fish

Ideas for future years

- Data mining follow-up studies
- Microplastic fibers and stormwater
- Status & Trends water

Toxicology

Current / ongoing

- Toxicology strategy development (CEC Strategy Revision)
  - Spreadsheet of thresholds (living document)

Ideas for future years

- Stormwater monitoring using new in vitro assay in development
  - Based on rainbow trout gill cells
  - Modest add-on to larger external study

RMP

Multi-year Plan Discussion Questions

Multi-year Plan Page 112

- Are we missing anything?
  - What should we add as additional resources become available?
- Are there upcoming management actions we can inform?

RMP

CEC Strategy Revision Timeline

Preferred deadline for comments (V1.0): May 3, 2024

- Draft Report (V1.1) to ECWG: Summer 2024
- Final Report: October 2024

Time for lunch!

Preliminary Results of The Halogenated Contaminants found in Bay Harbor Seals

Sally Abskhroun[1], Sujan Fernando[2], Bernard Crimmins [3,4]

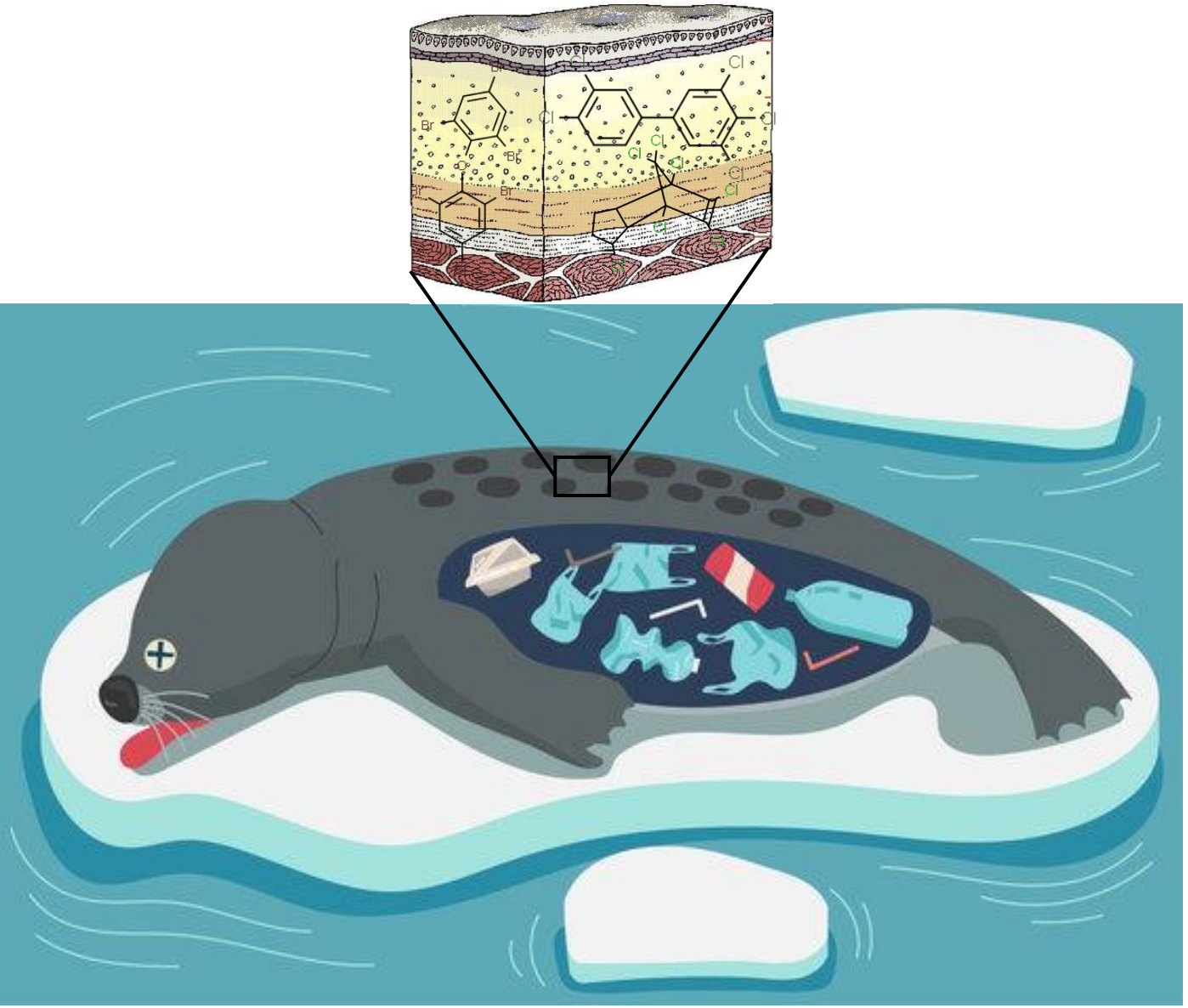
[1]*Department of Chemistry and Biomolecular Science*

[2]*Center for Air and Aquatic Resources Engineering and Science*

[3]*AEACS, LLC, New Kensington, Pennsylvania 15068, United States*

[4]*Clarkson University, Department of Civil and Environmental Engineering, 8 Clarkson Avenue, Potsdam, New York 13699, United States*

Introduction



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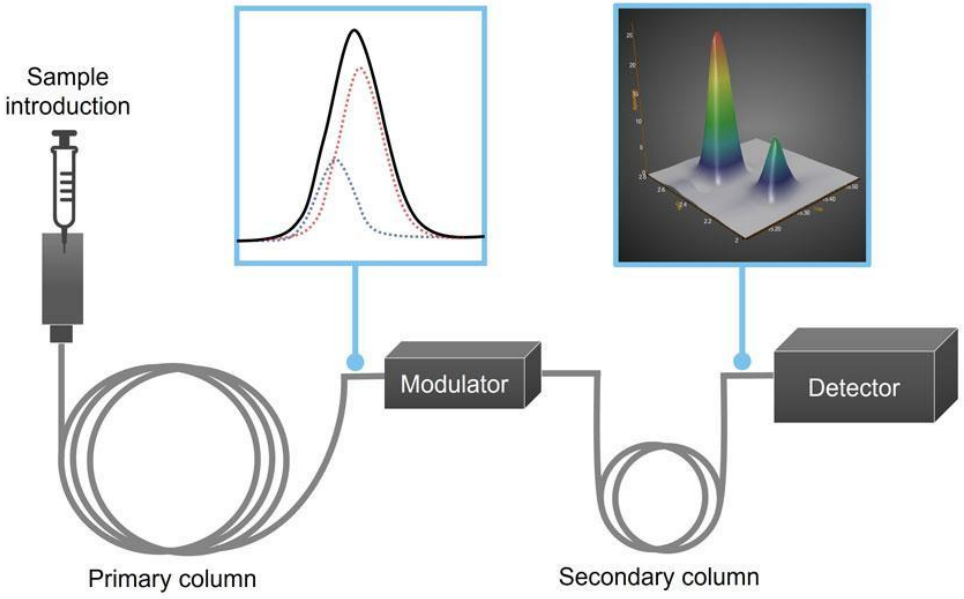

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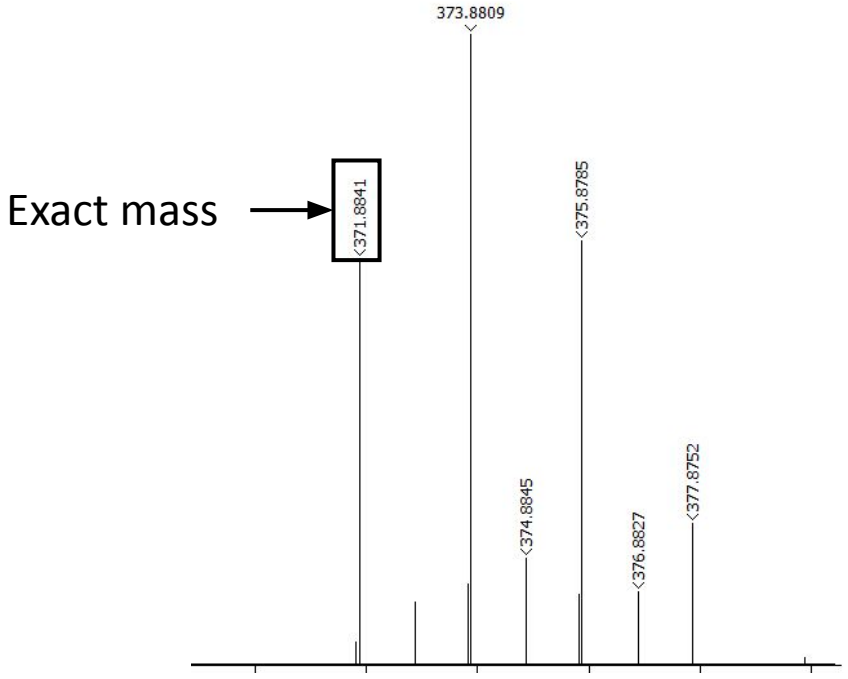
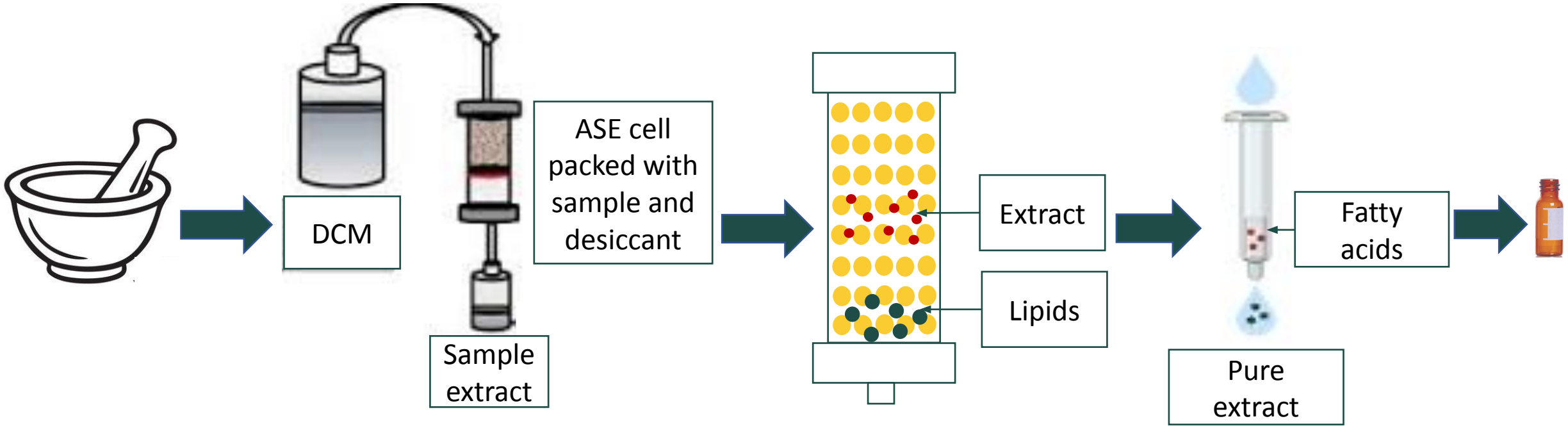


Analytical Protocol



Grinding | Accelerated solid extraction | Gel permeation Chromatography | Solid Phase extraction

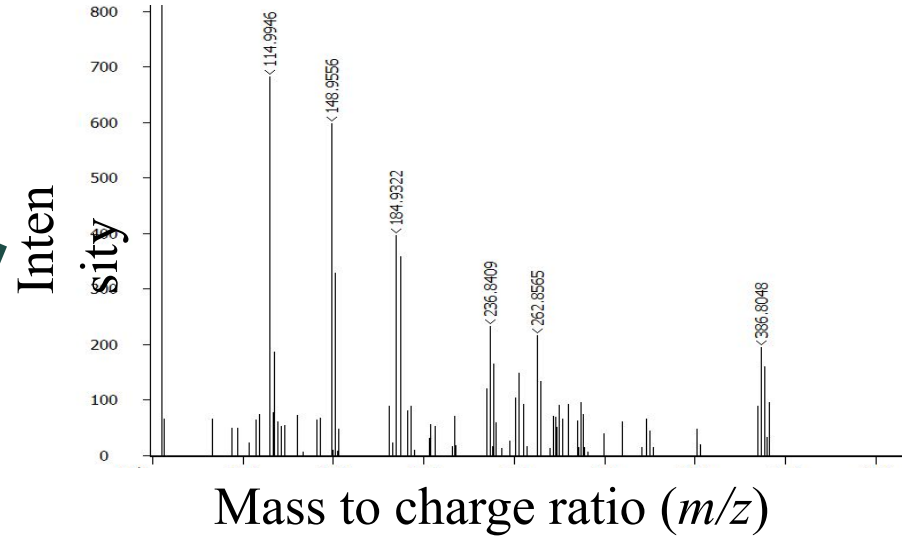
Instrumentation

2-dimensional gas chromatograph equipped with a high-resolution time-of-flight mass spectrometer

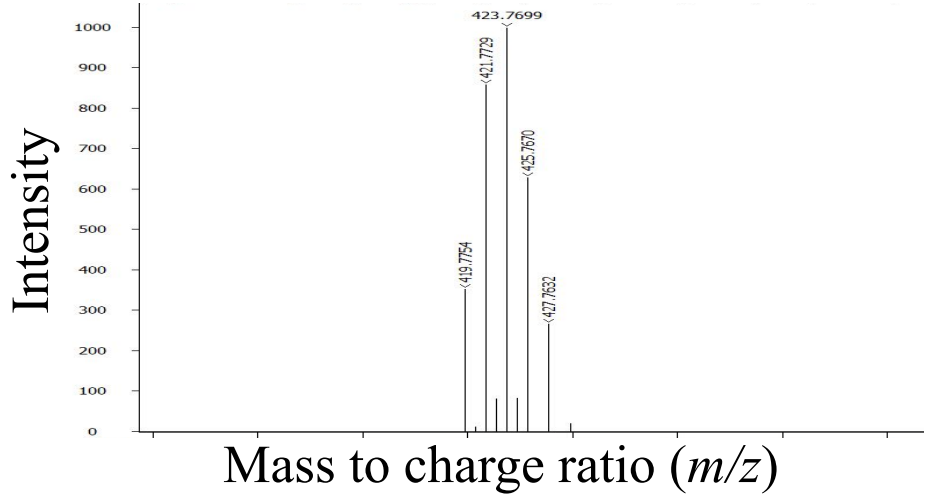
Structural information

Molecular mass

Electron Impact Ionization (EI)



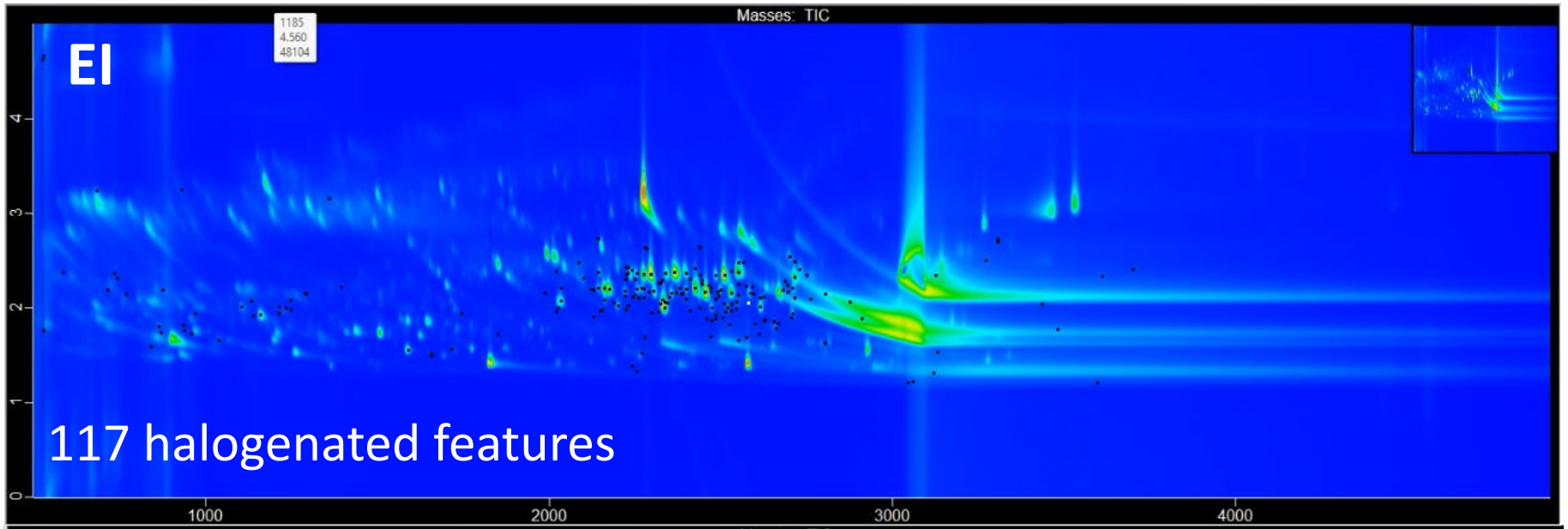
Negative Chemical Ionization (NCI)

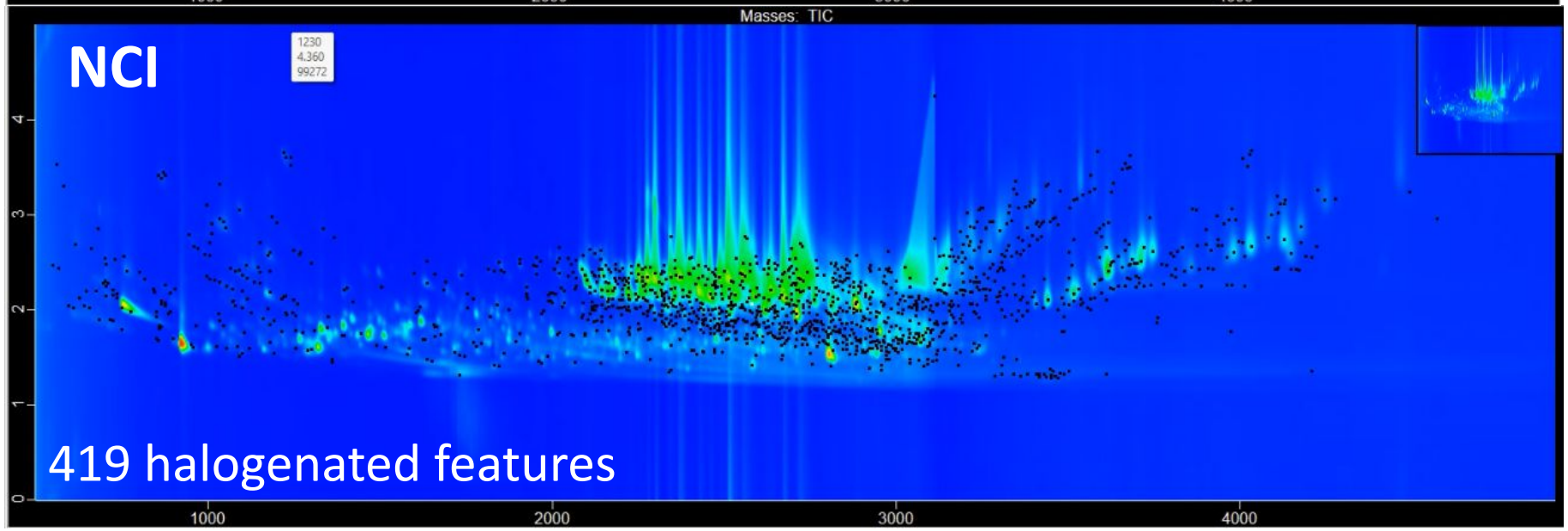


Multi mode ion source

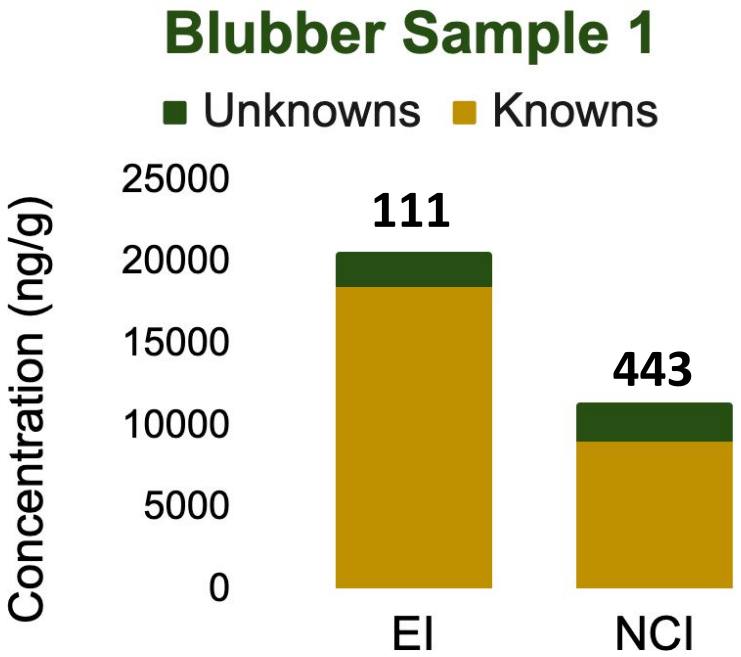
Exact mass measurements

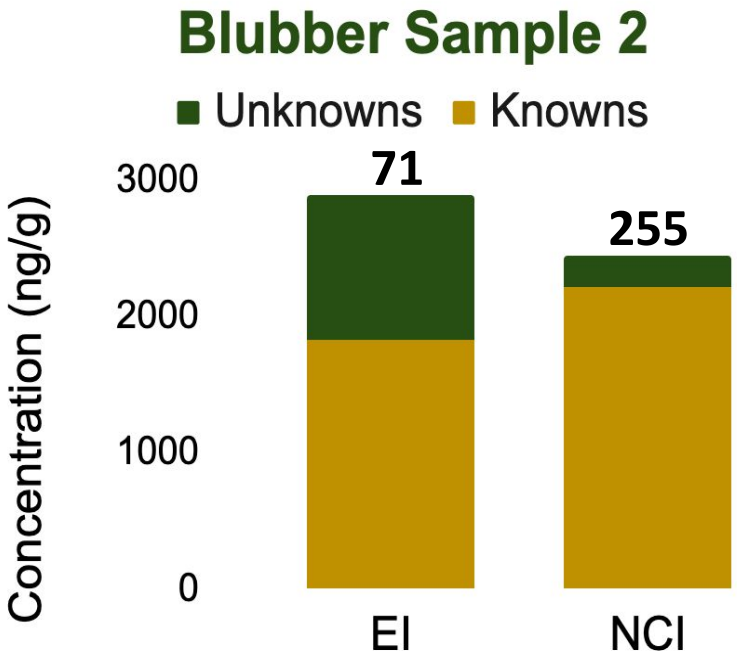
Comparison of EI and NCI Chromatograms

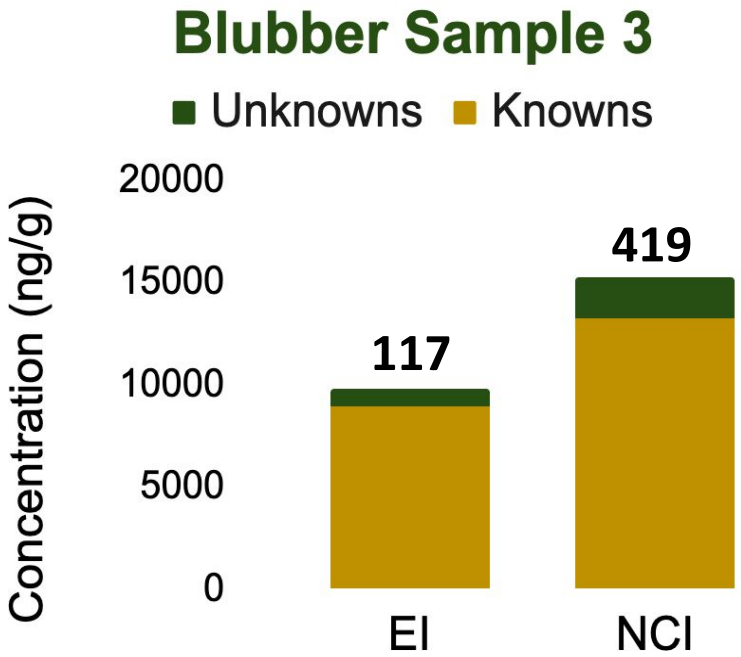




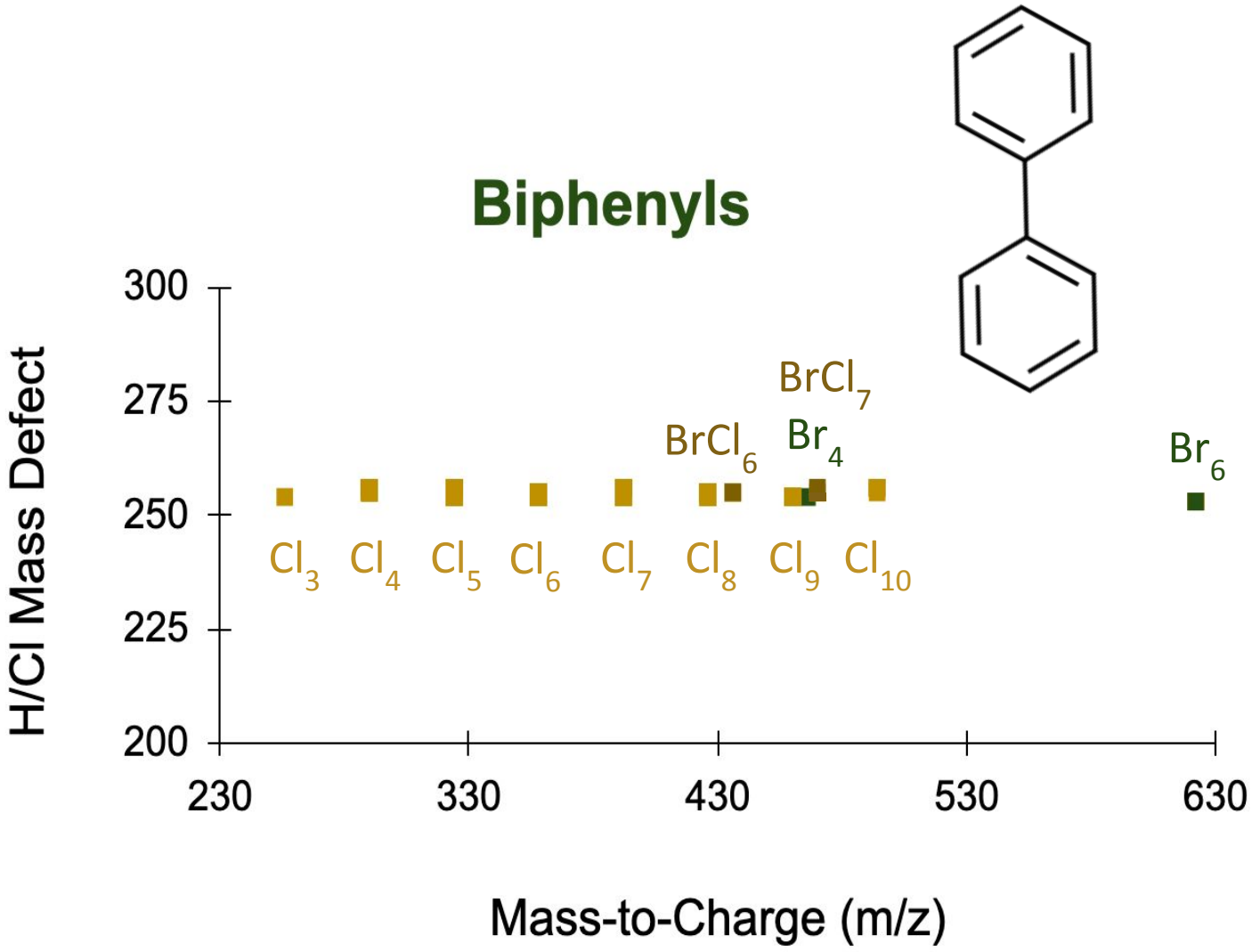
Results- Estimated *Total Concentration of Halogenated Features*

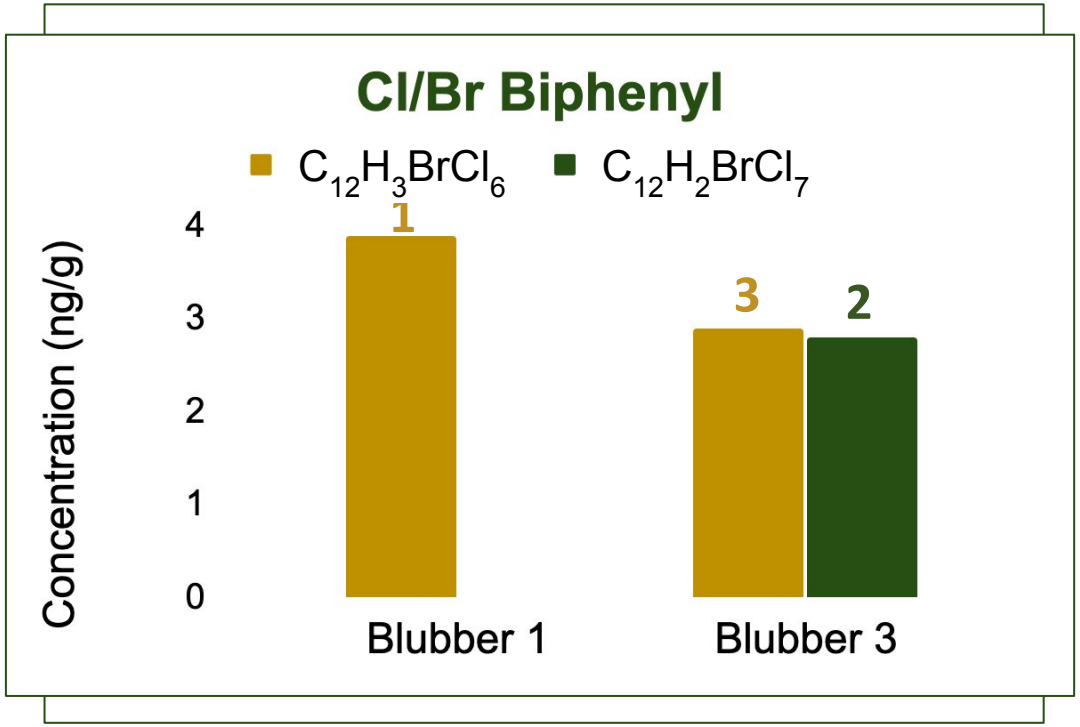




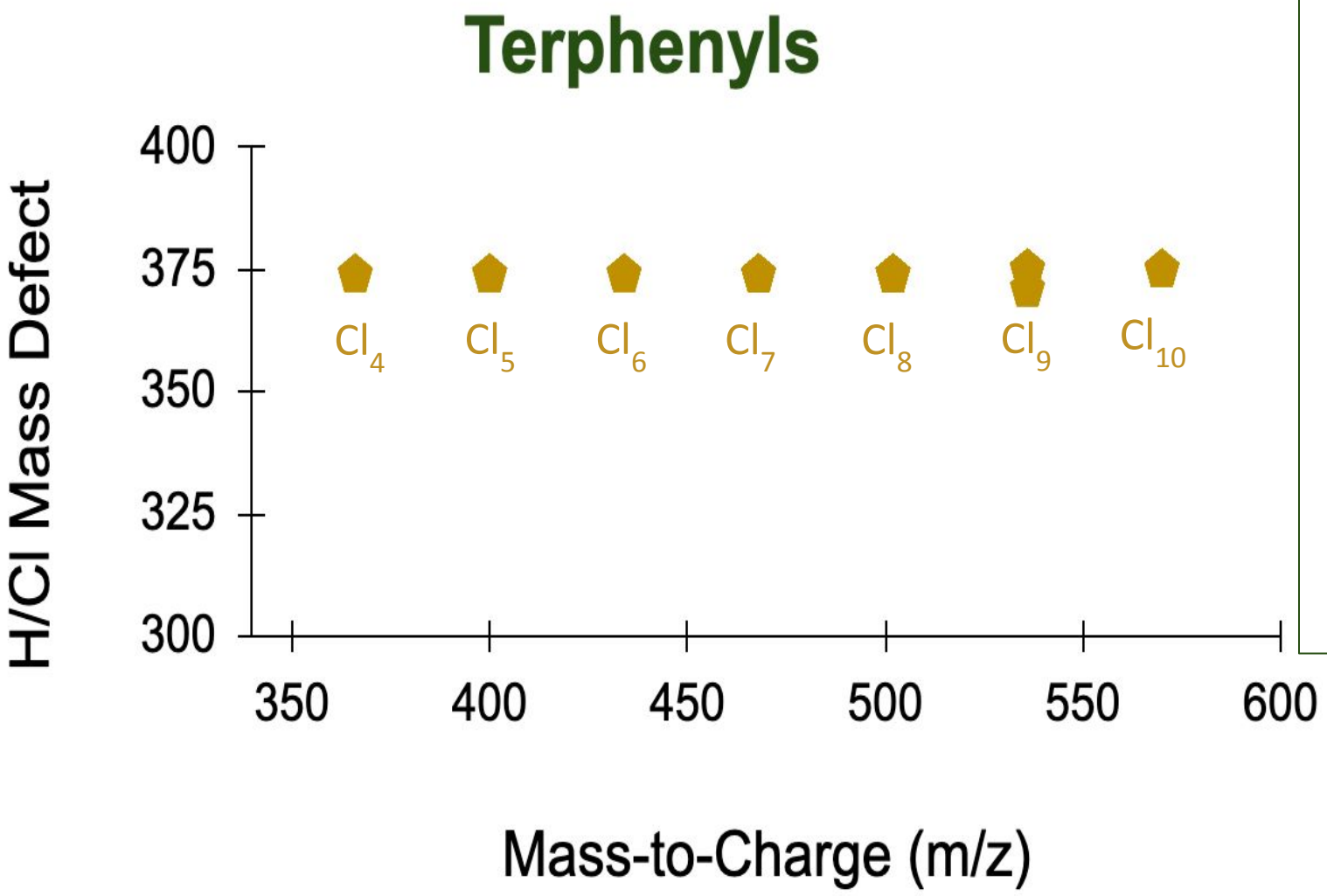


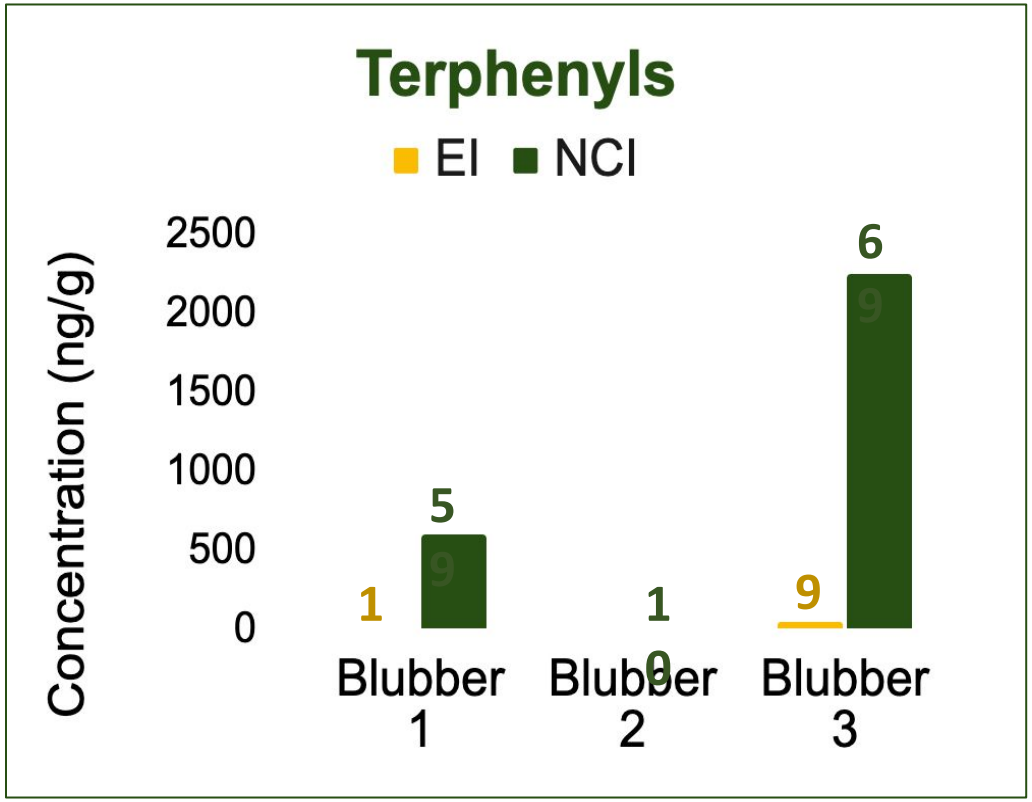
Knowns-*Polychlorobiphenyl (PCBs)*



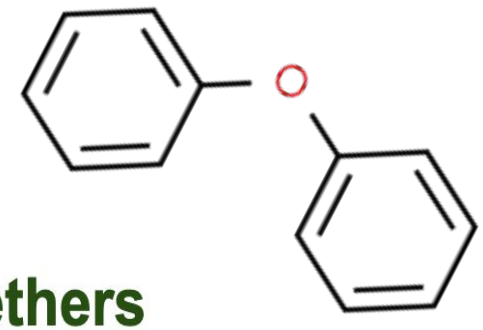


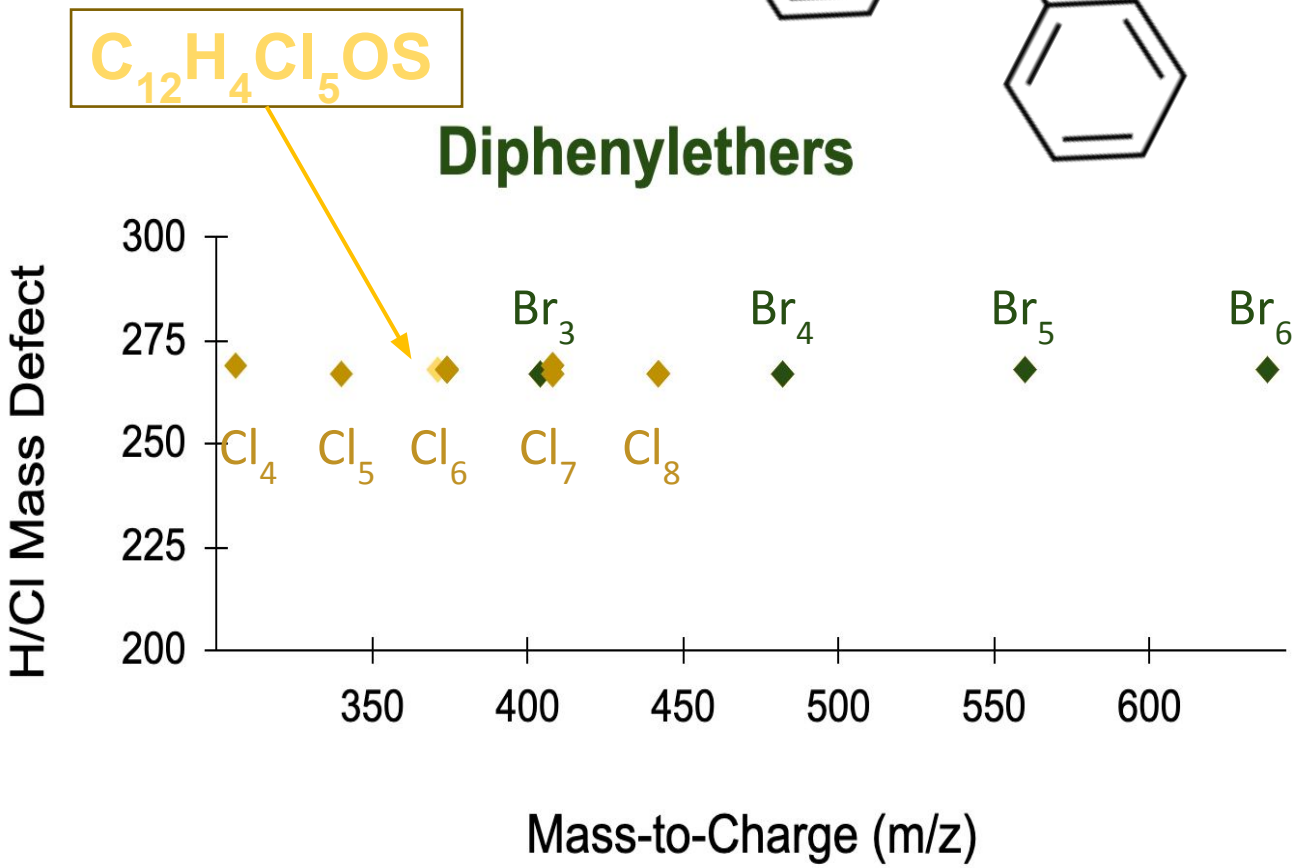
Knowns-*Polychloro*terphenyl

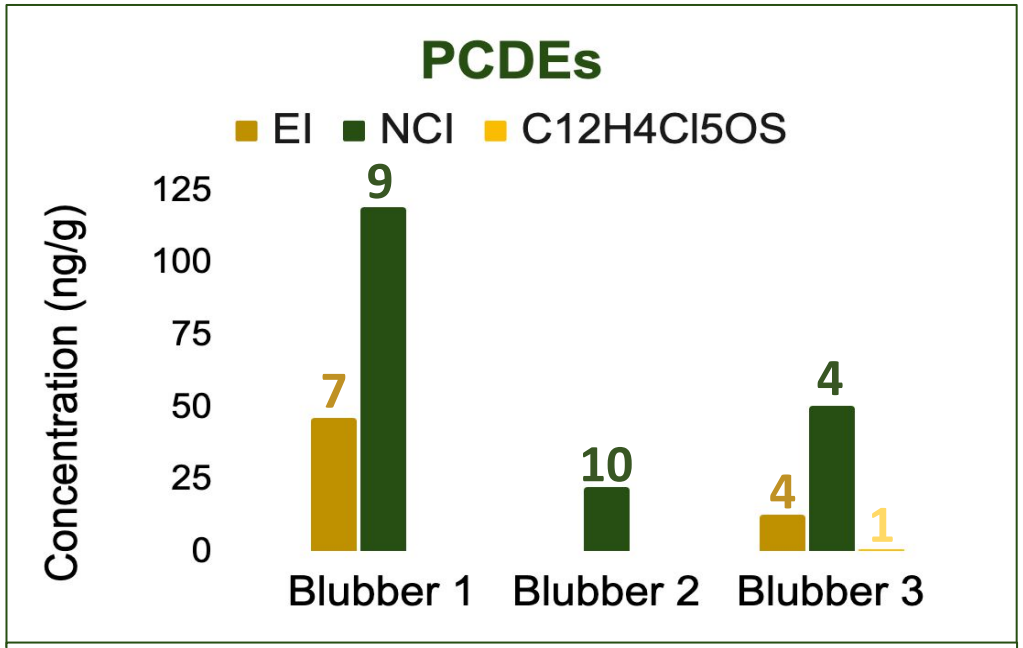


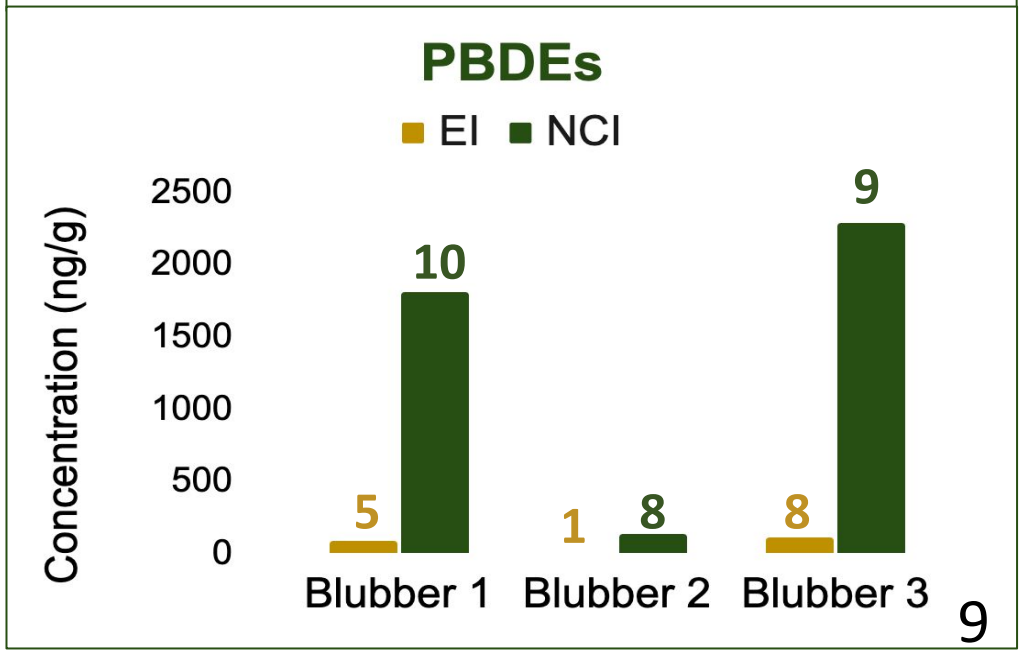


Knowns-*Polychloro/bromo diphenyl ether*

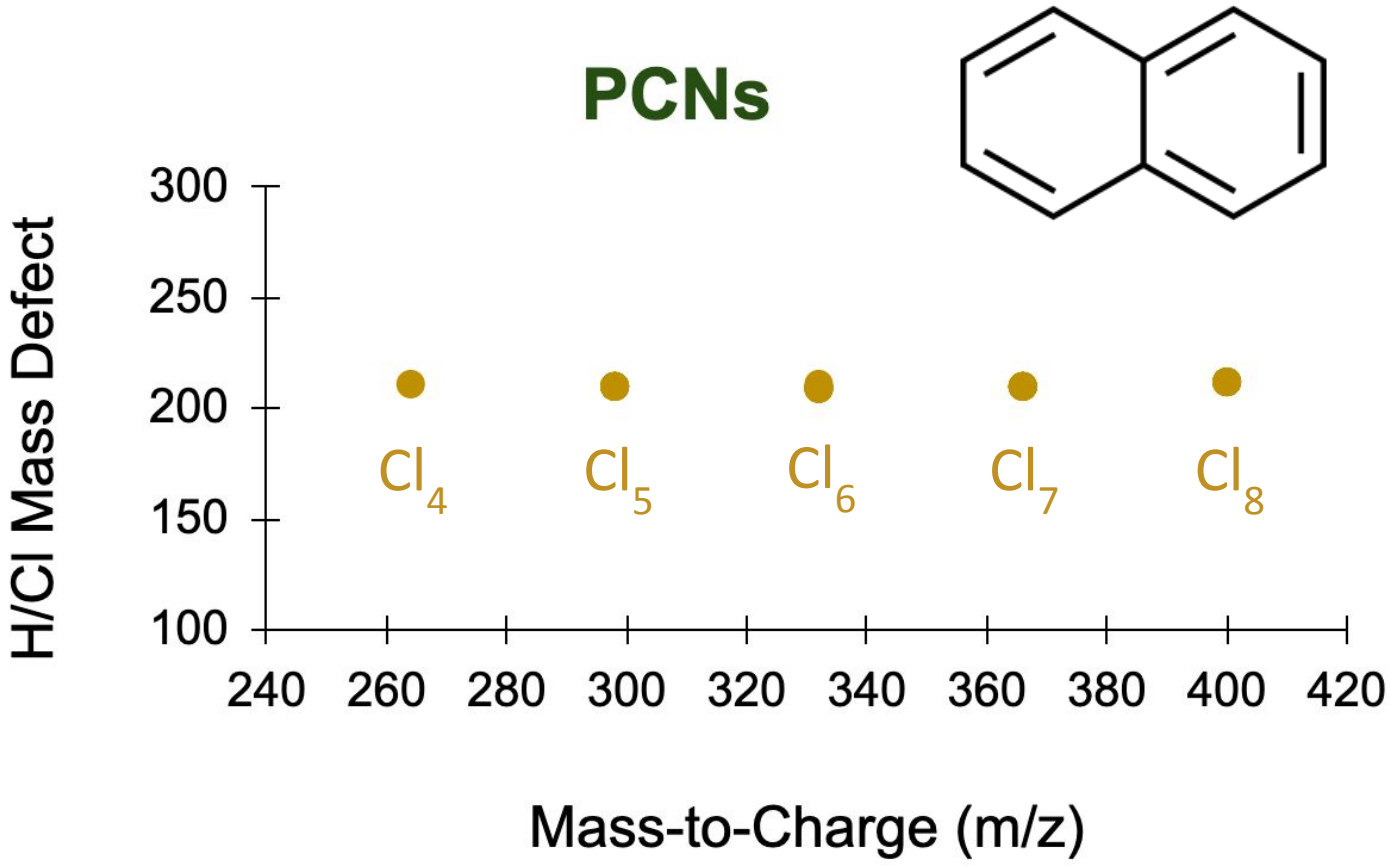


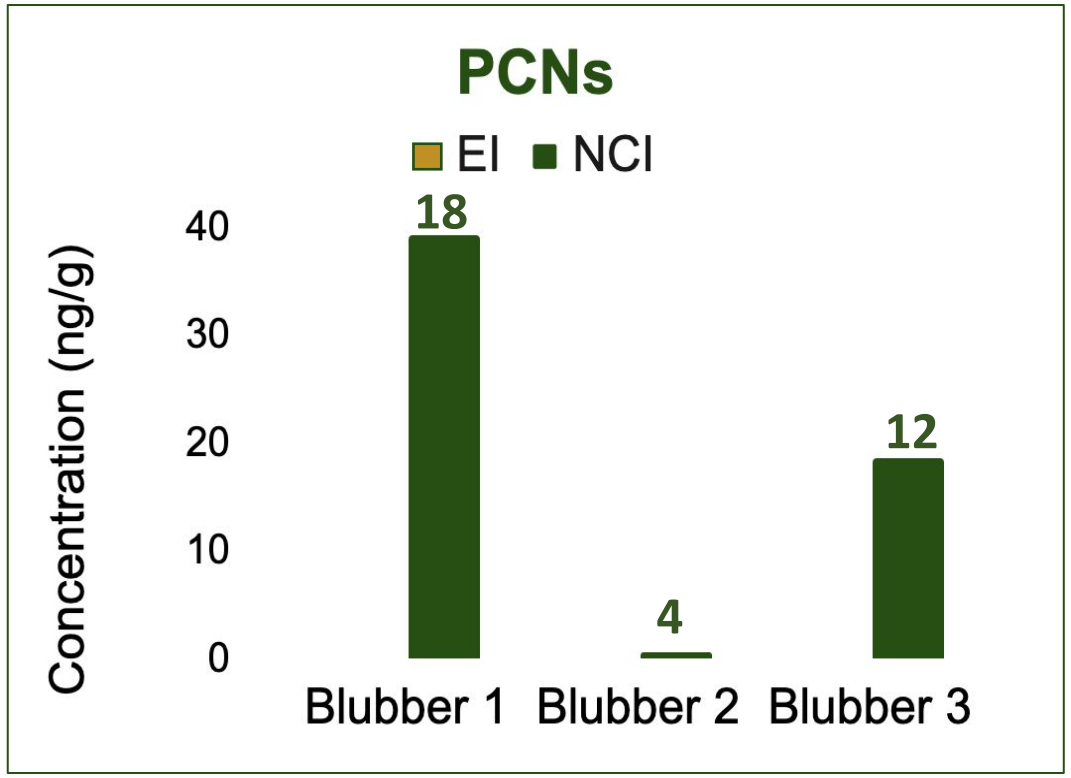


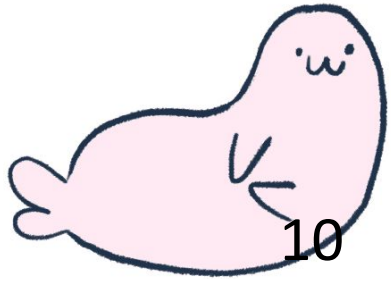




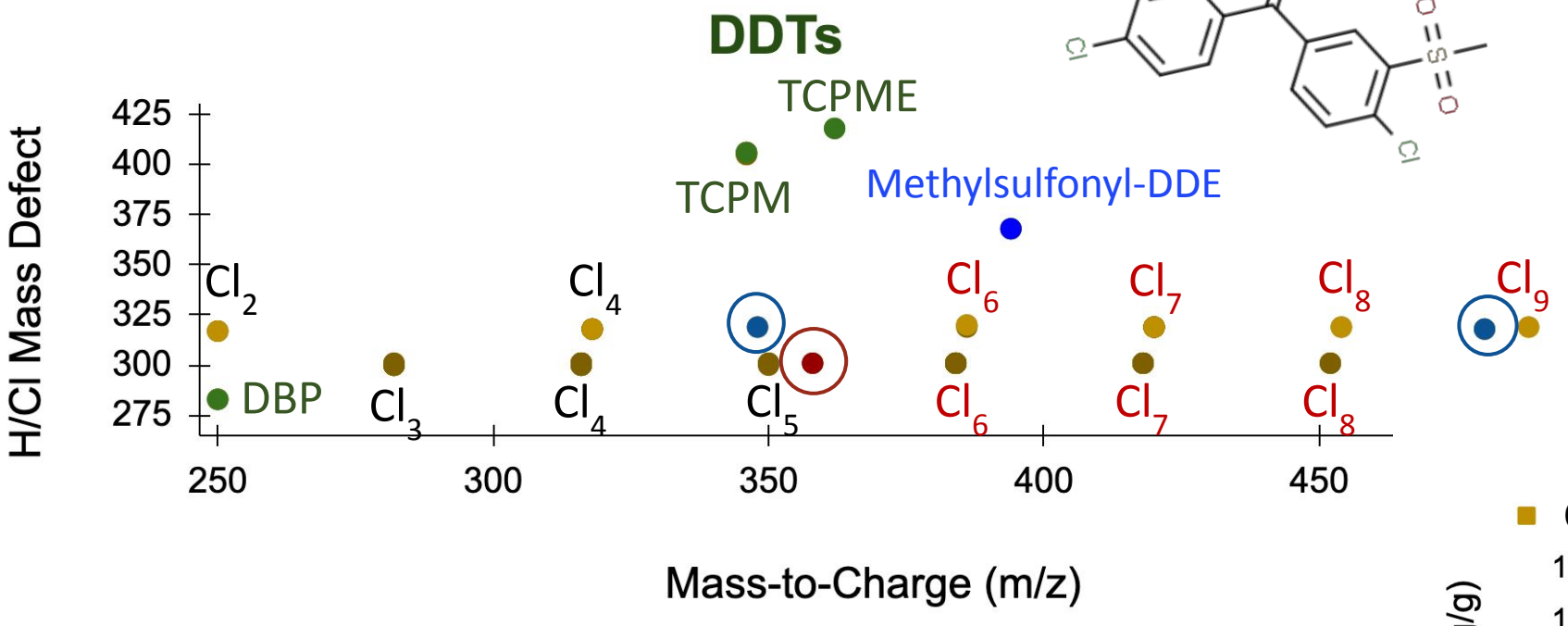
Knowns-*Polychloronaphthalenes (PCNs)*

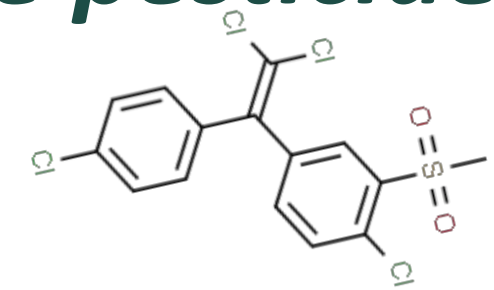


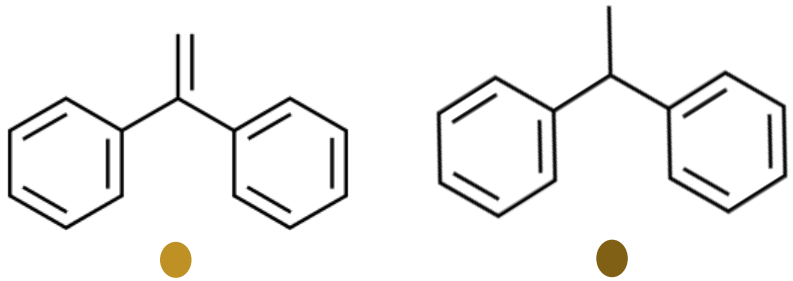




Knowns-*Organochlorine pesticides (OCPs)*

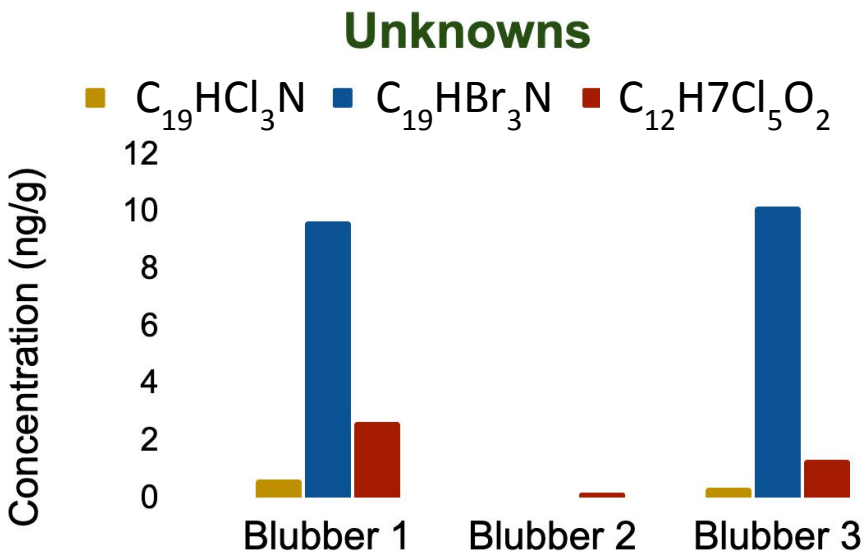






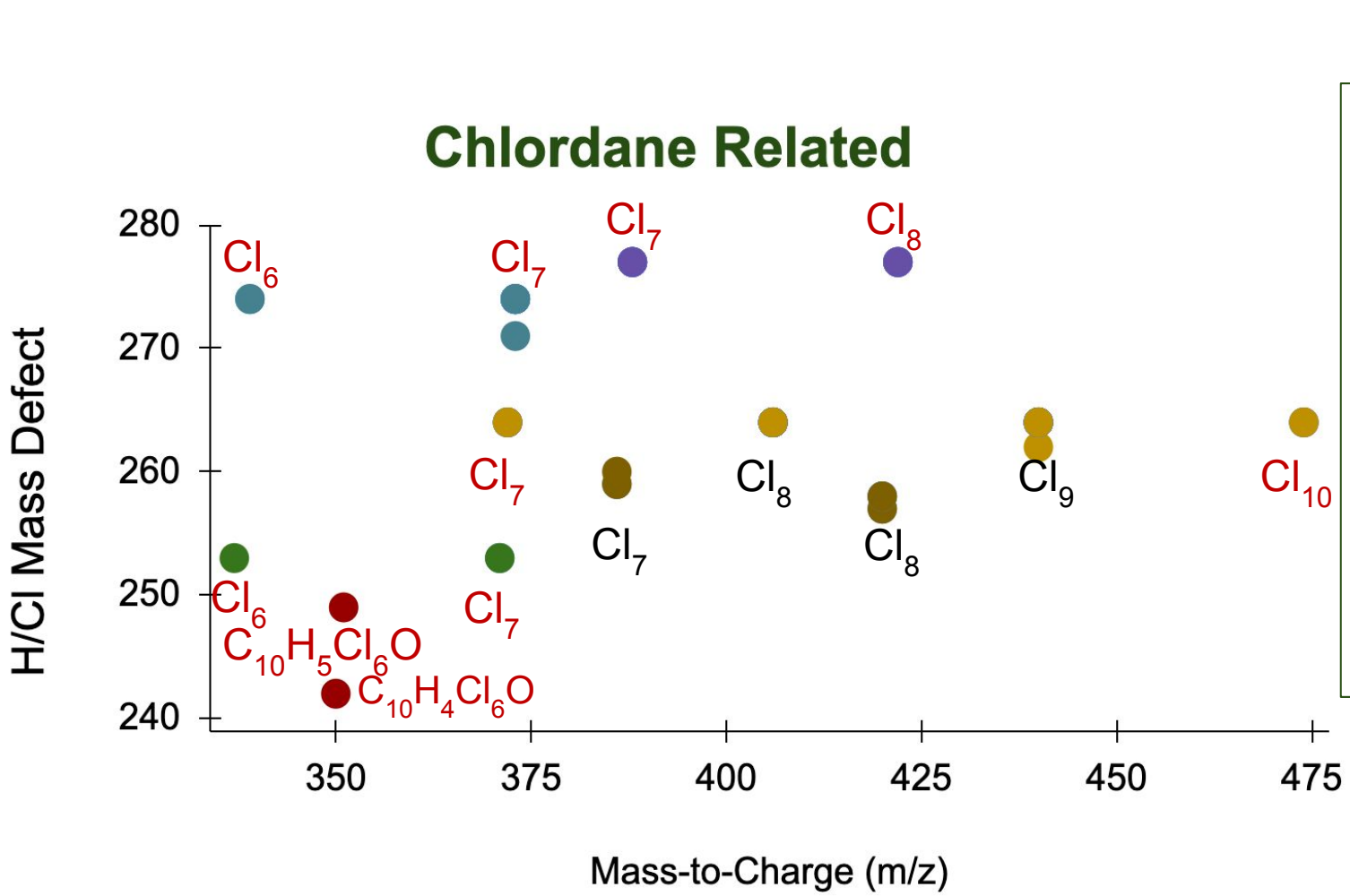
$C_{19}HCl_3N$
$C_{19}HBr_3N$

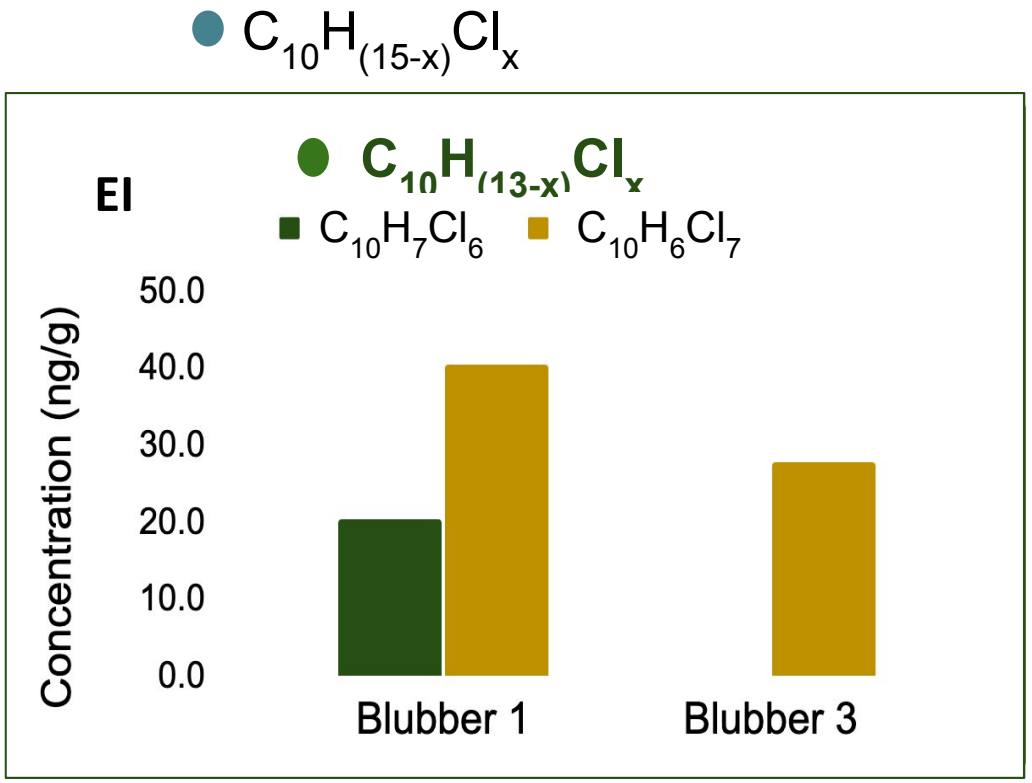
$C_{12}H_7Cl_5O_2$



https://pubs.acs.org/doi/10.1021/acs.est.6b03150

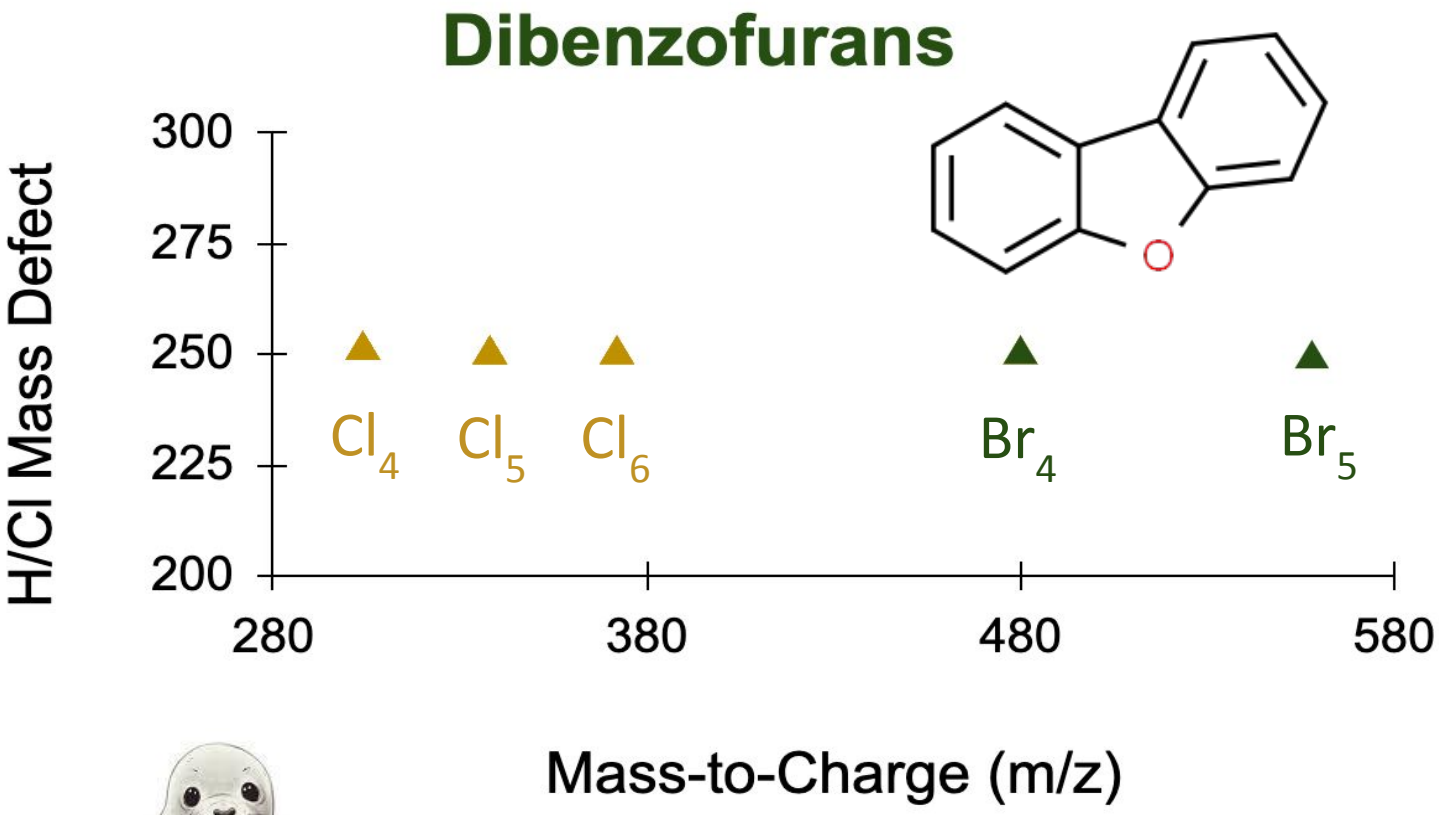
Knowns-*Organochlorine pesticides (OCPs)*

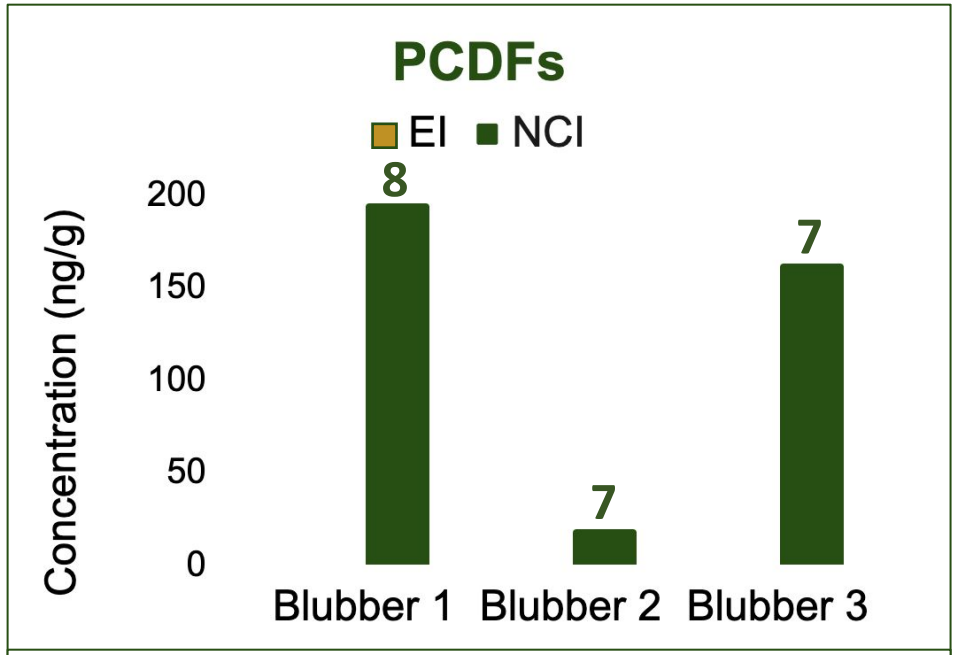


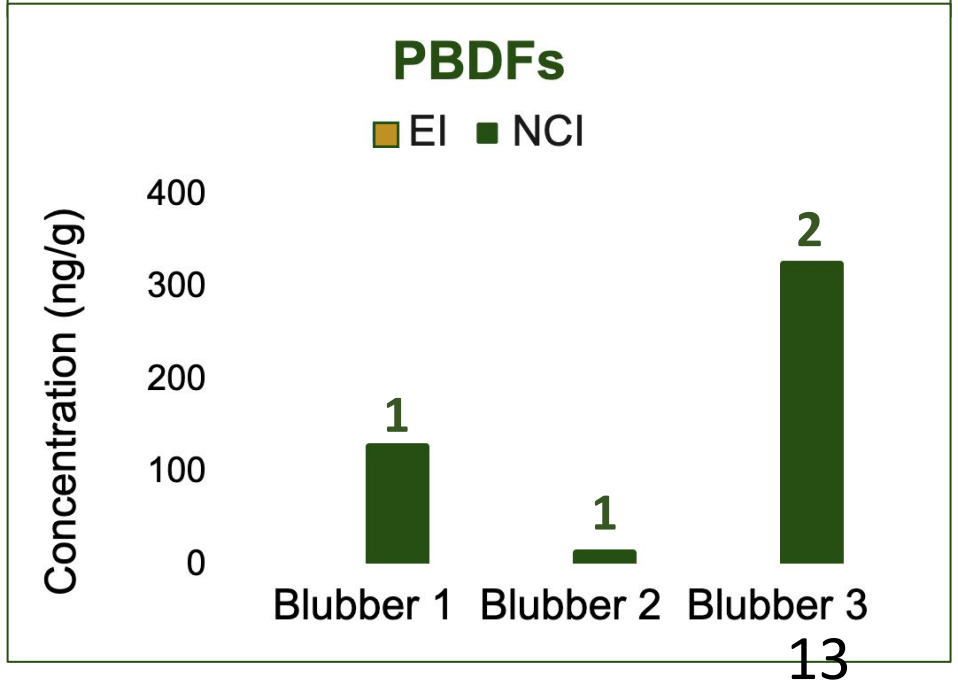


https://pubs.acs.org/doi/10.1021/acs.est.6b03150

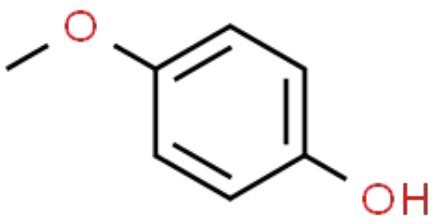
Knowns-*Polychloro/bromo dibenzofurans*

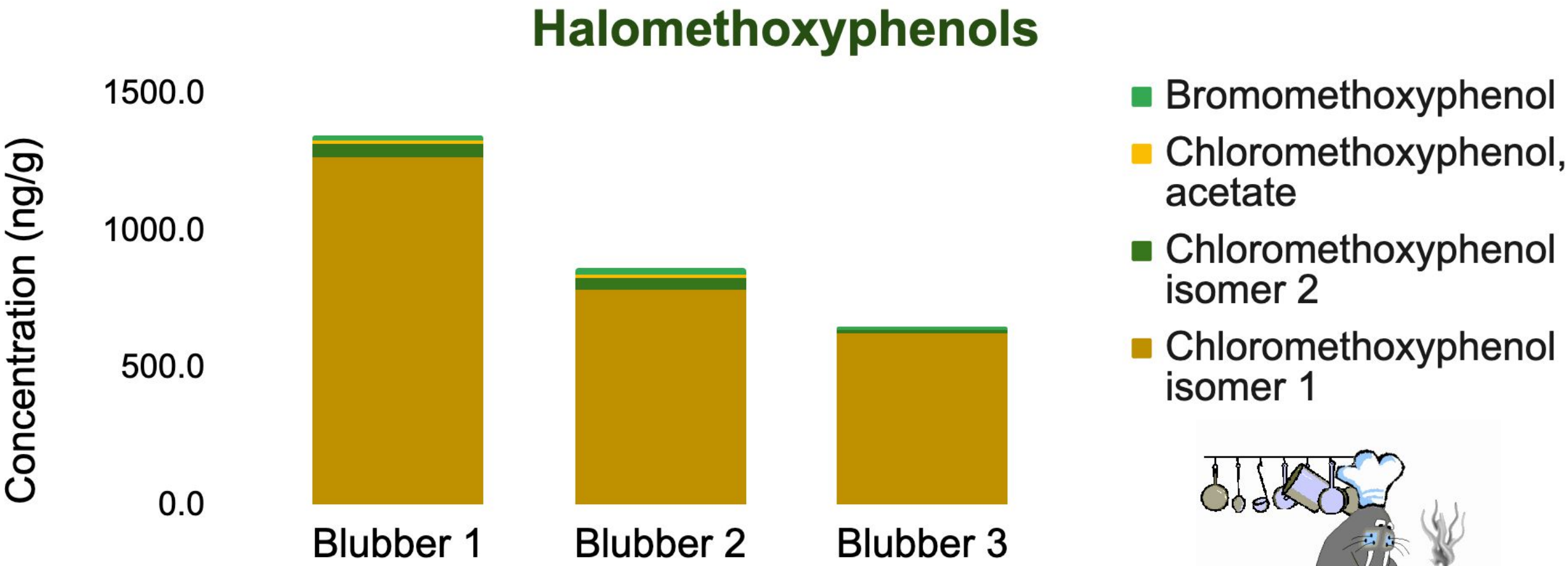






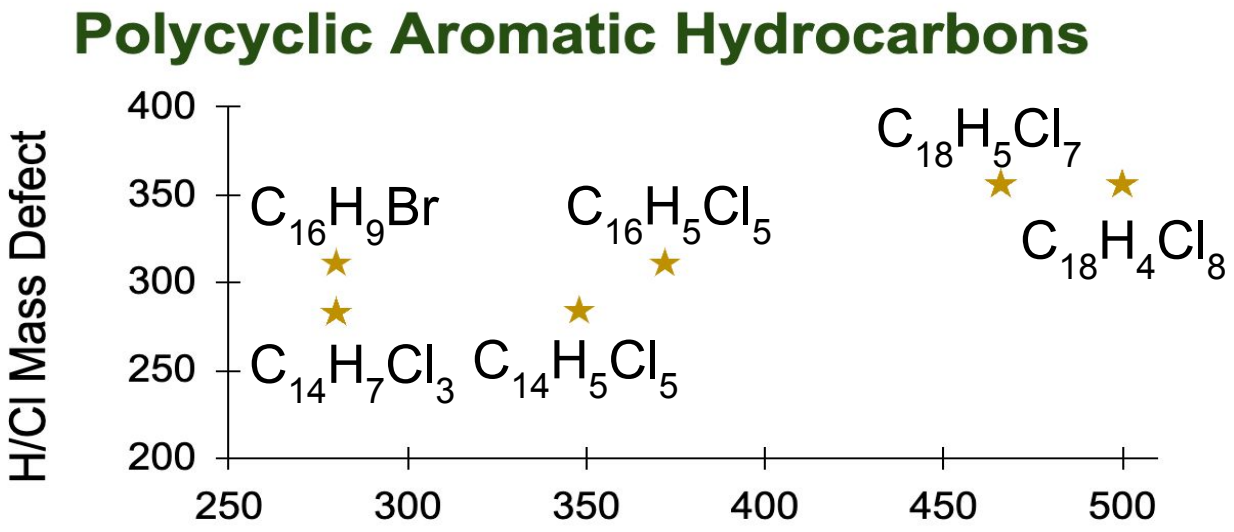
Unknowns-*Halomethoxyphenols*

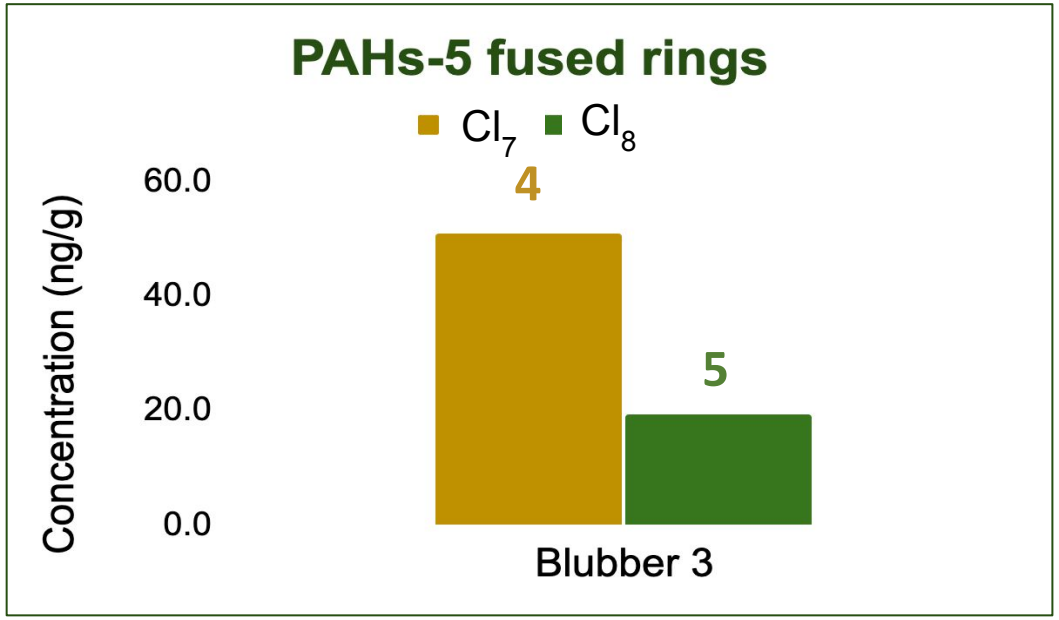


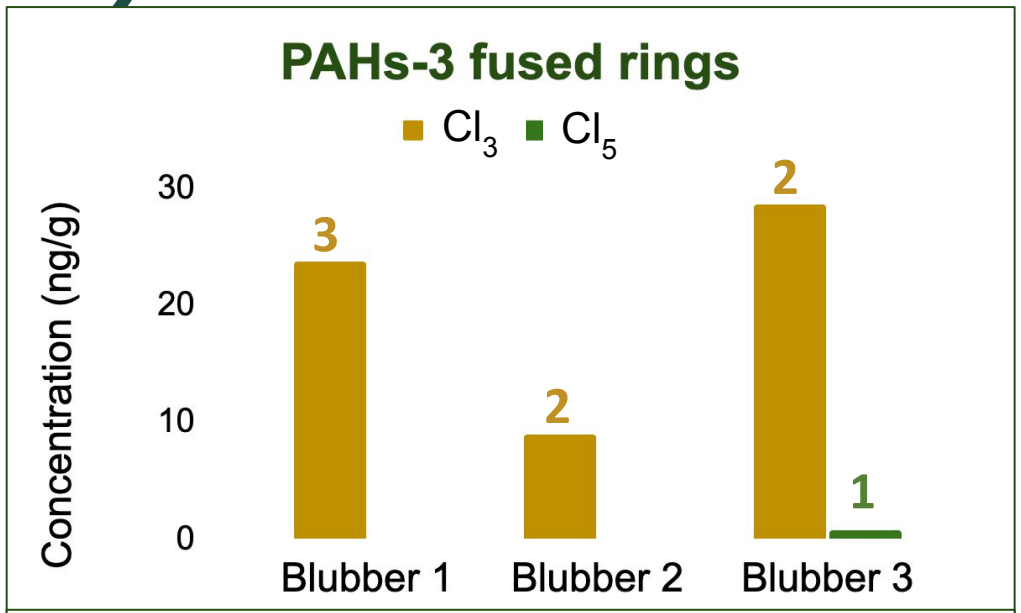


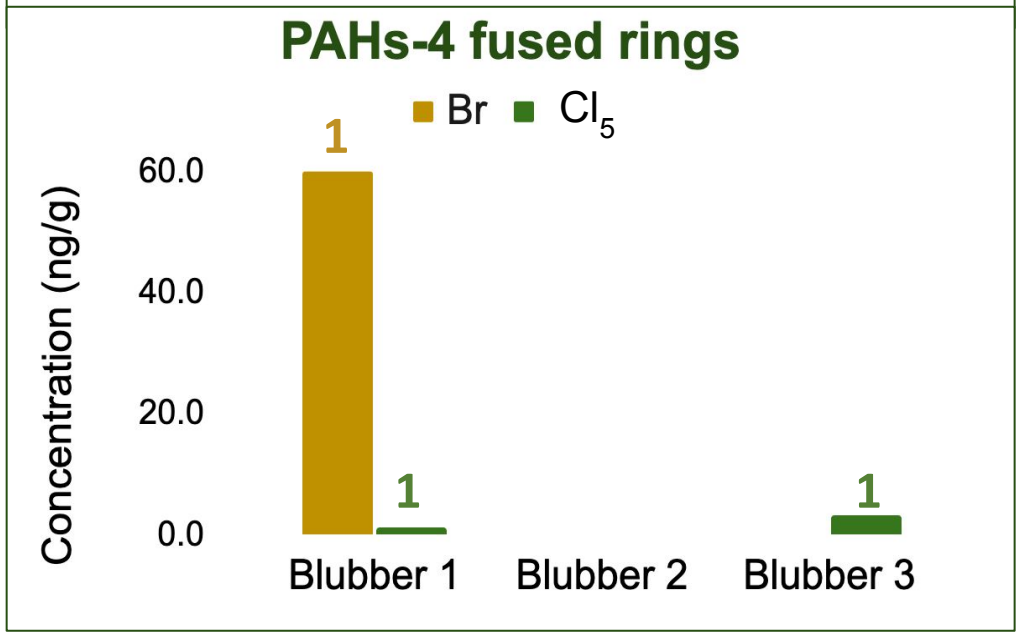
Only detected in EI

Unknowns-*Polycyclic Aromatic Hydrocarbons*

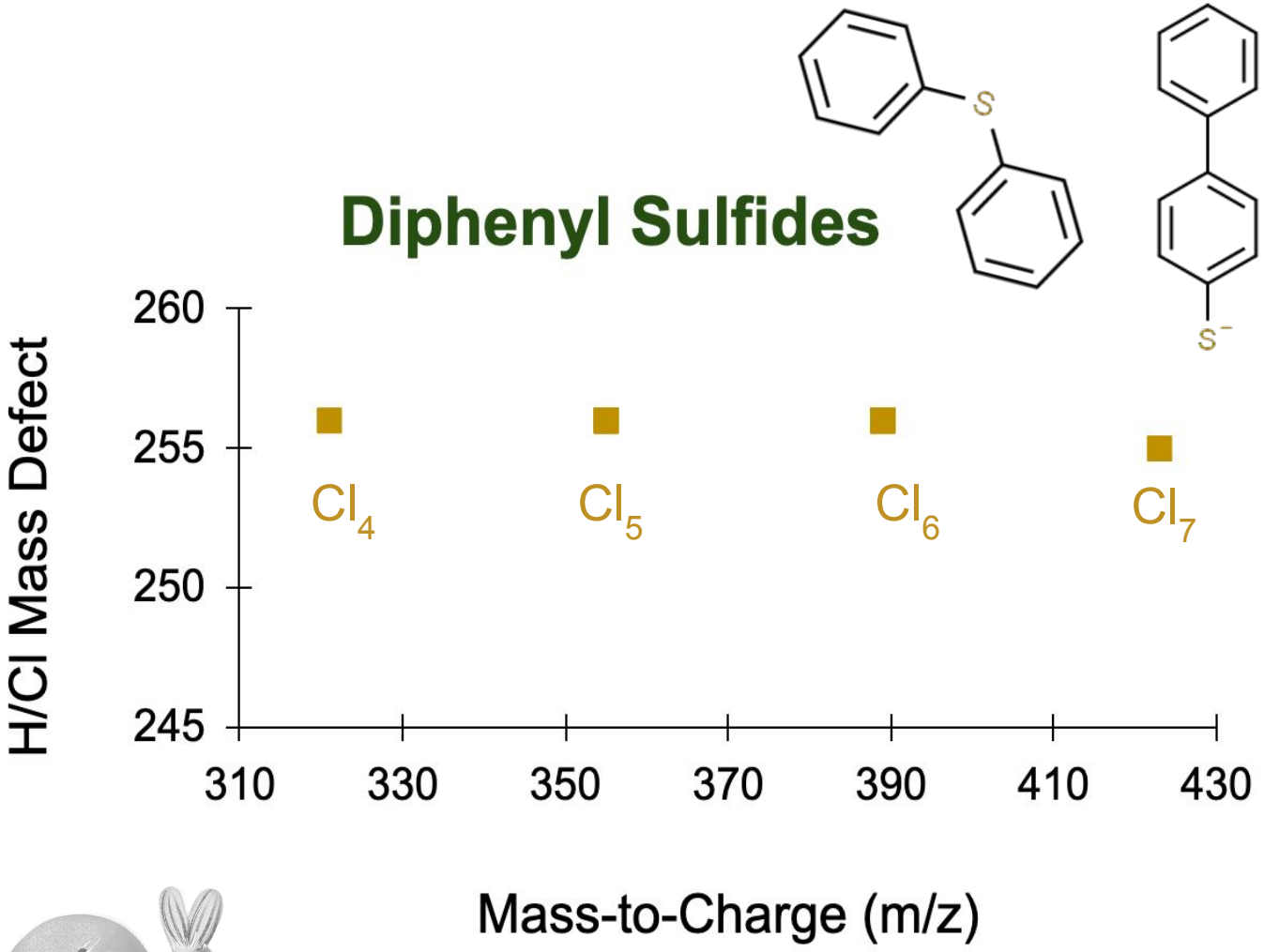


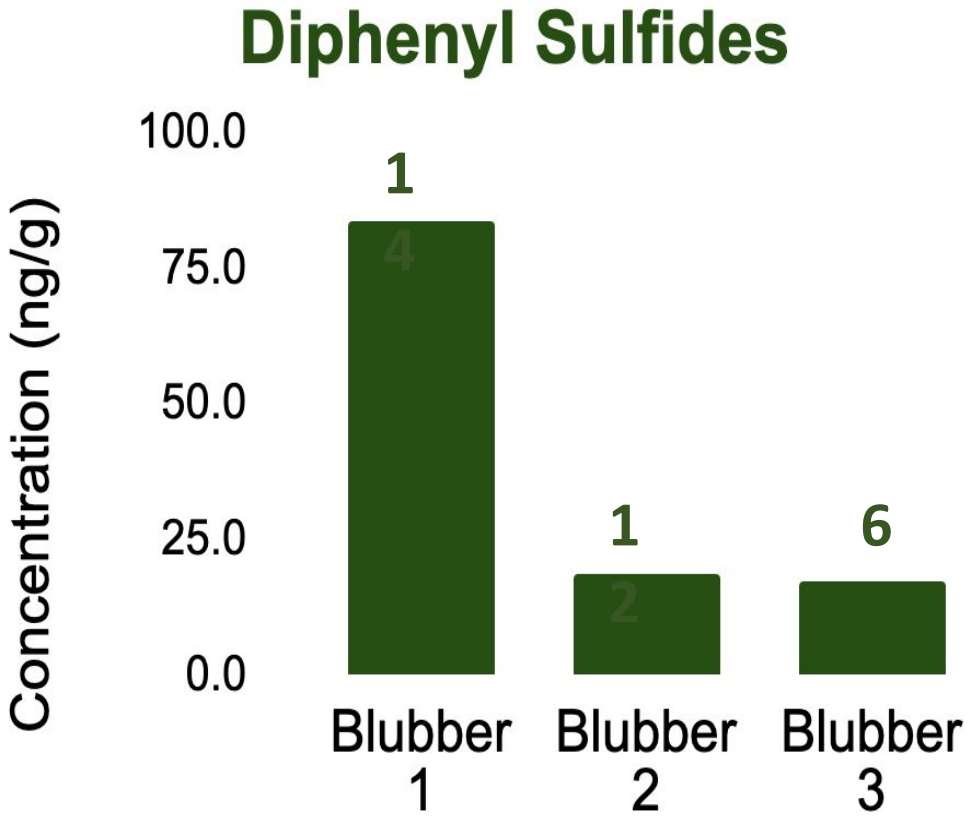






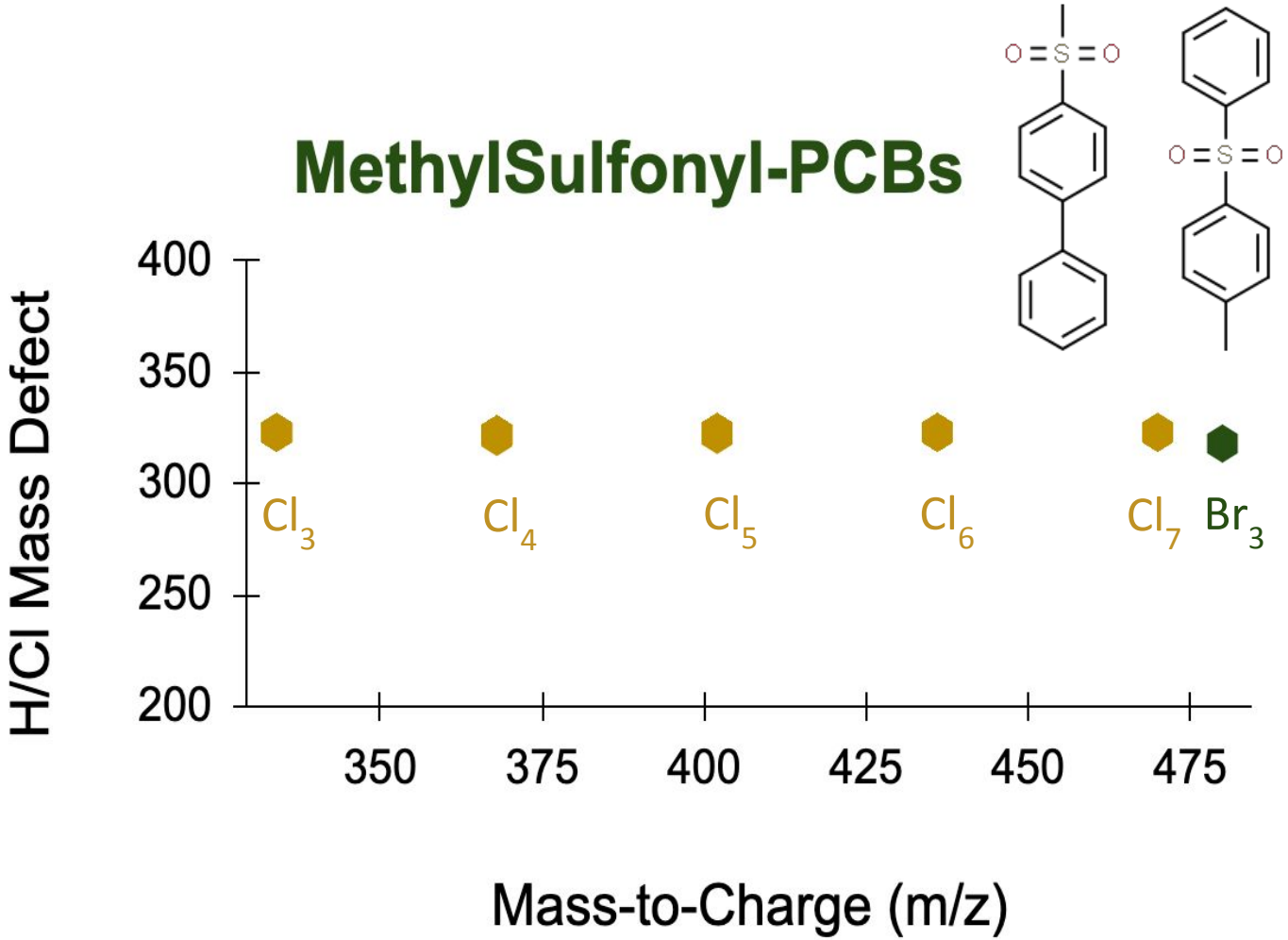
Unknowns-*Diphenyl Sulfides*

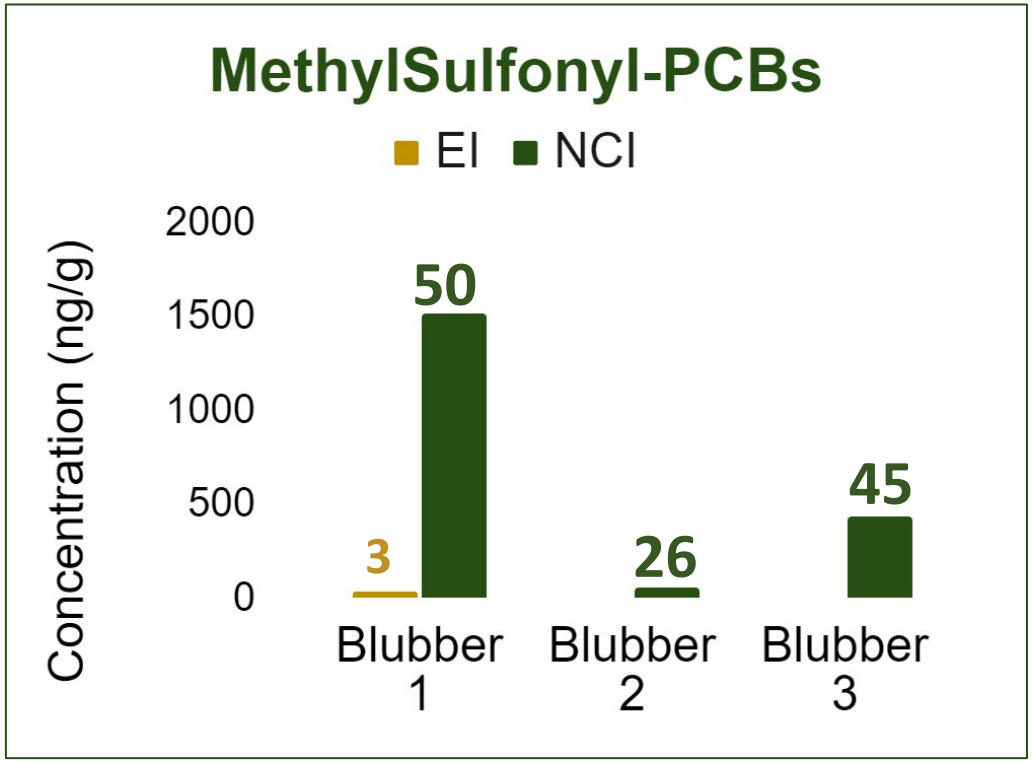




https://www.sciencedirect.com/science/article/abs/pii/0045653583901601

Unknowns-*MethylSulfonyl PCBs*

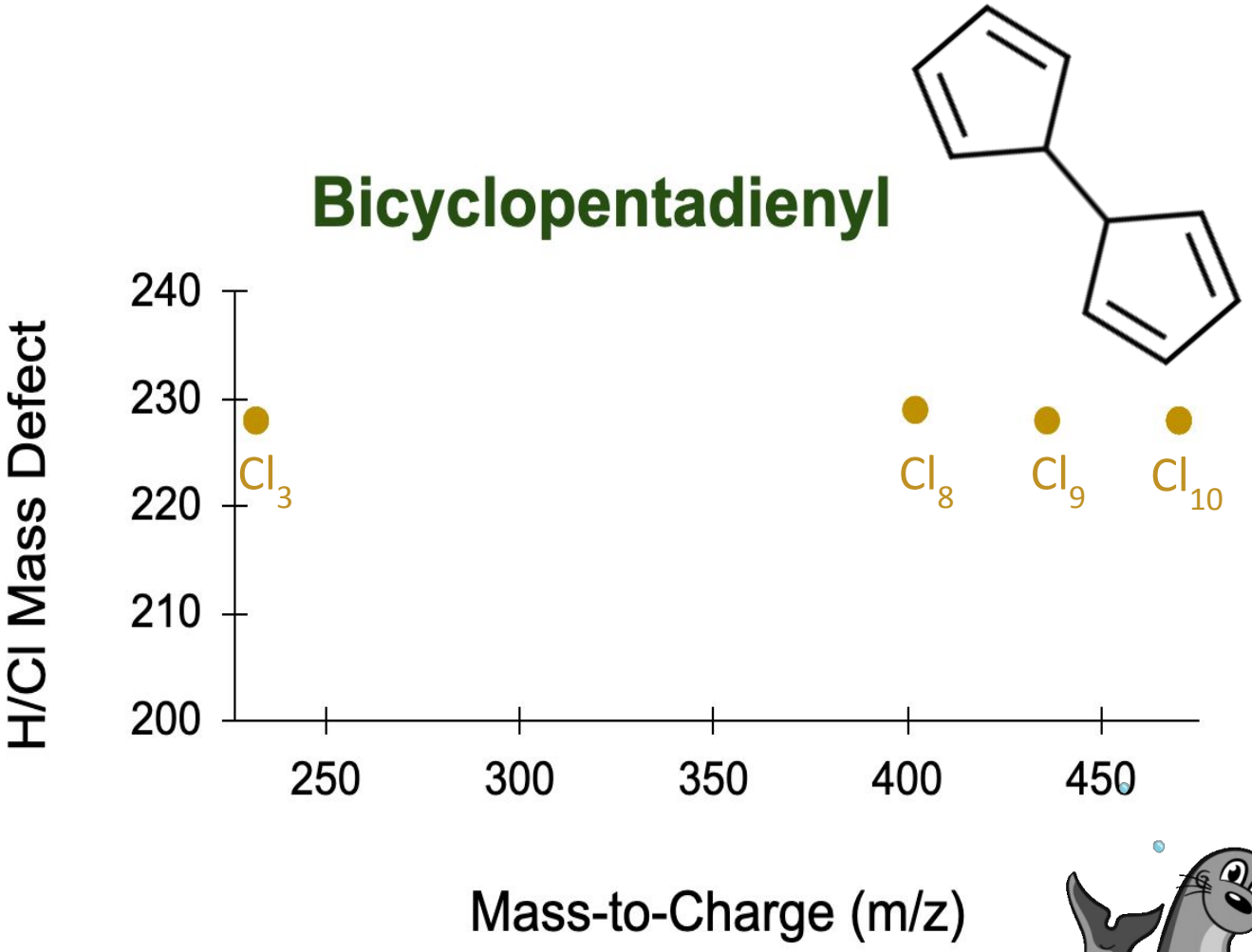


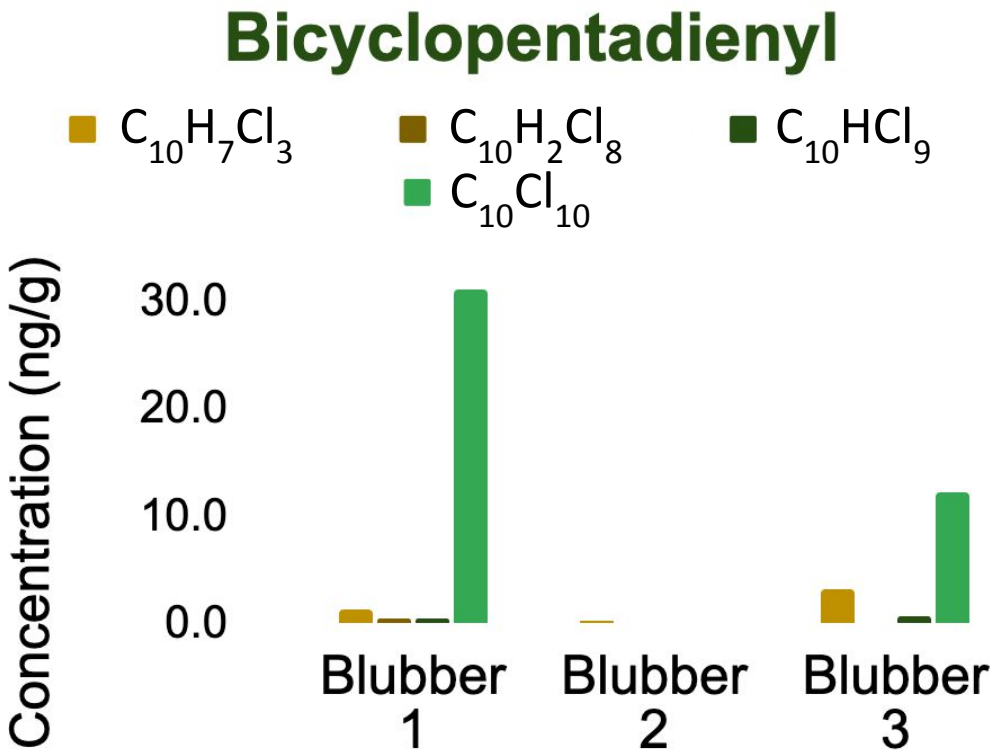


https://ehp.niehs.nih.gov/doi/abs/10.1289/ehp.59-1568084

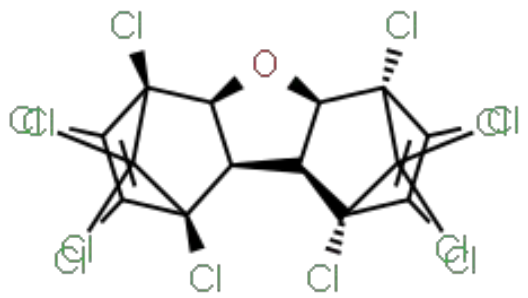
https://ehp.niehs.nih.gov/doi/abs/10.1289/ehp.97105644

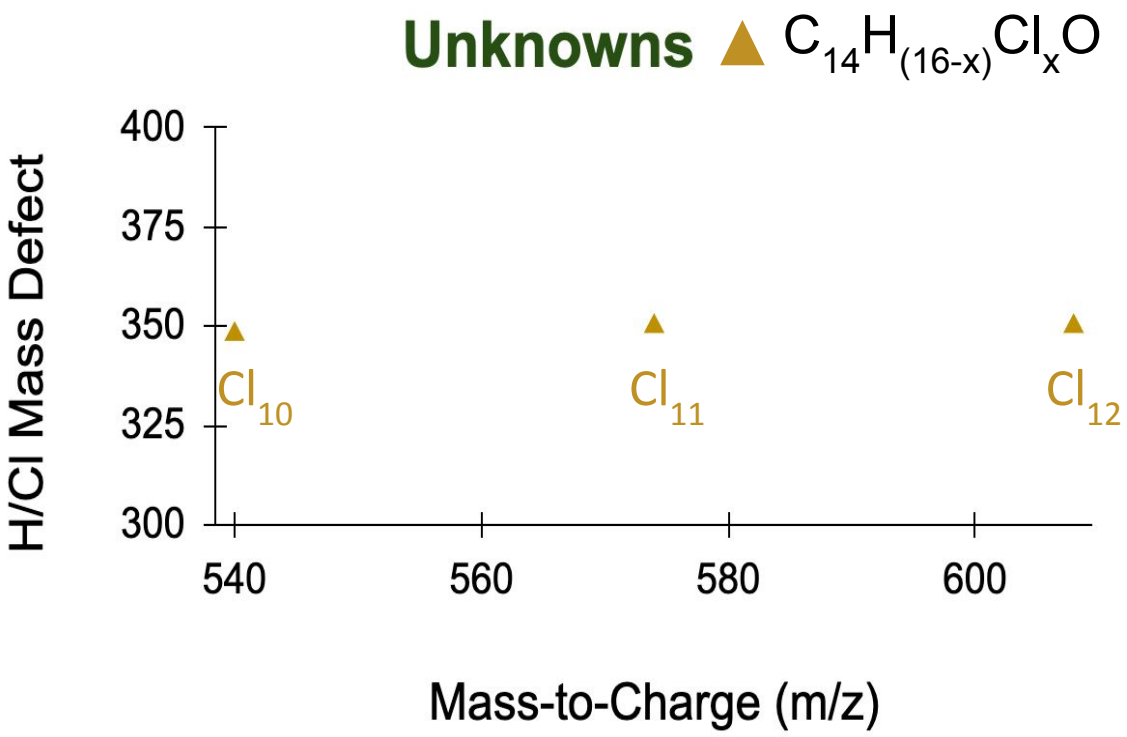
Unknowns-*Dienochlor*

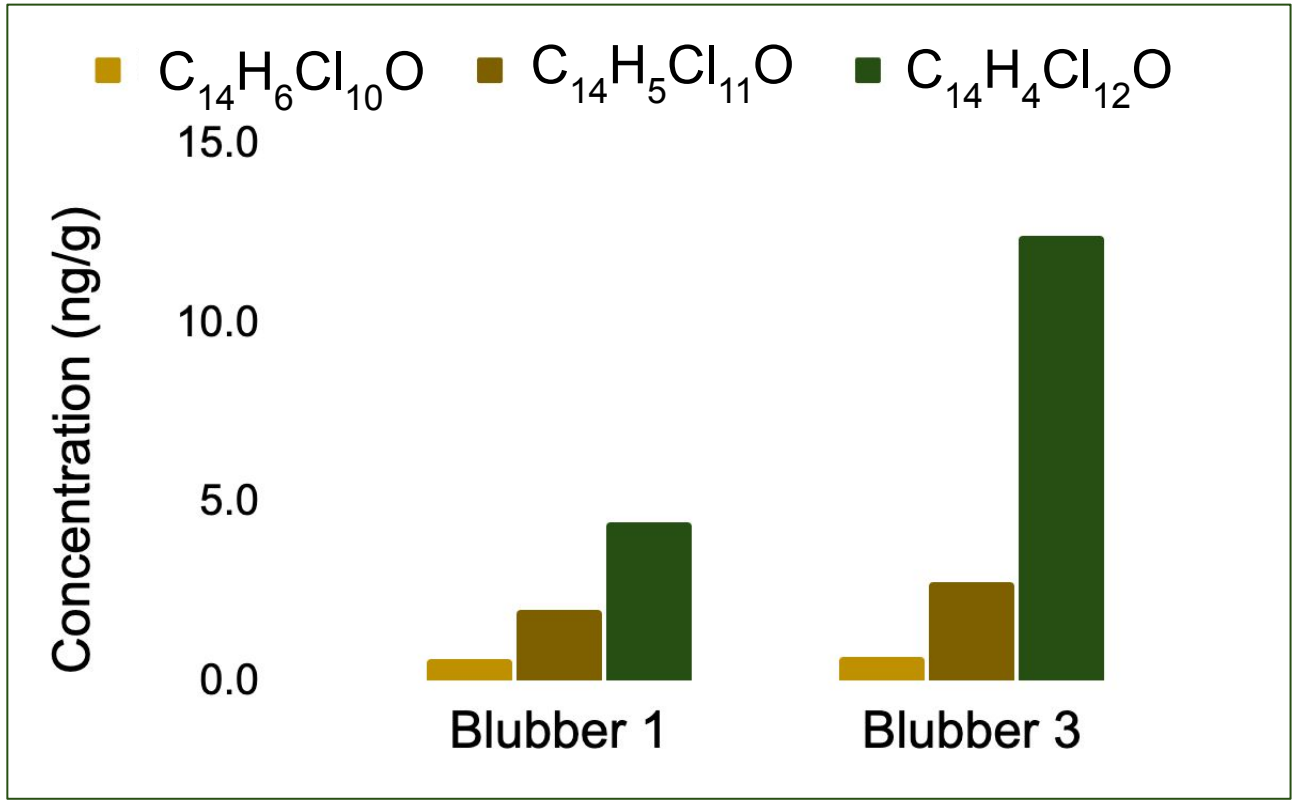




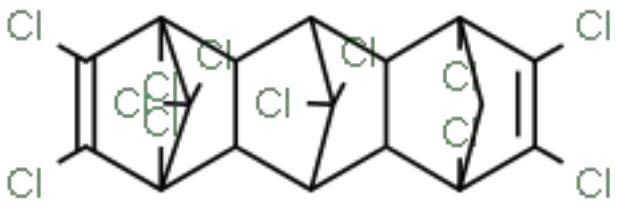
Unknowns-*Dechlorane 602*

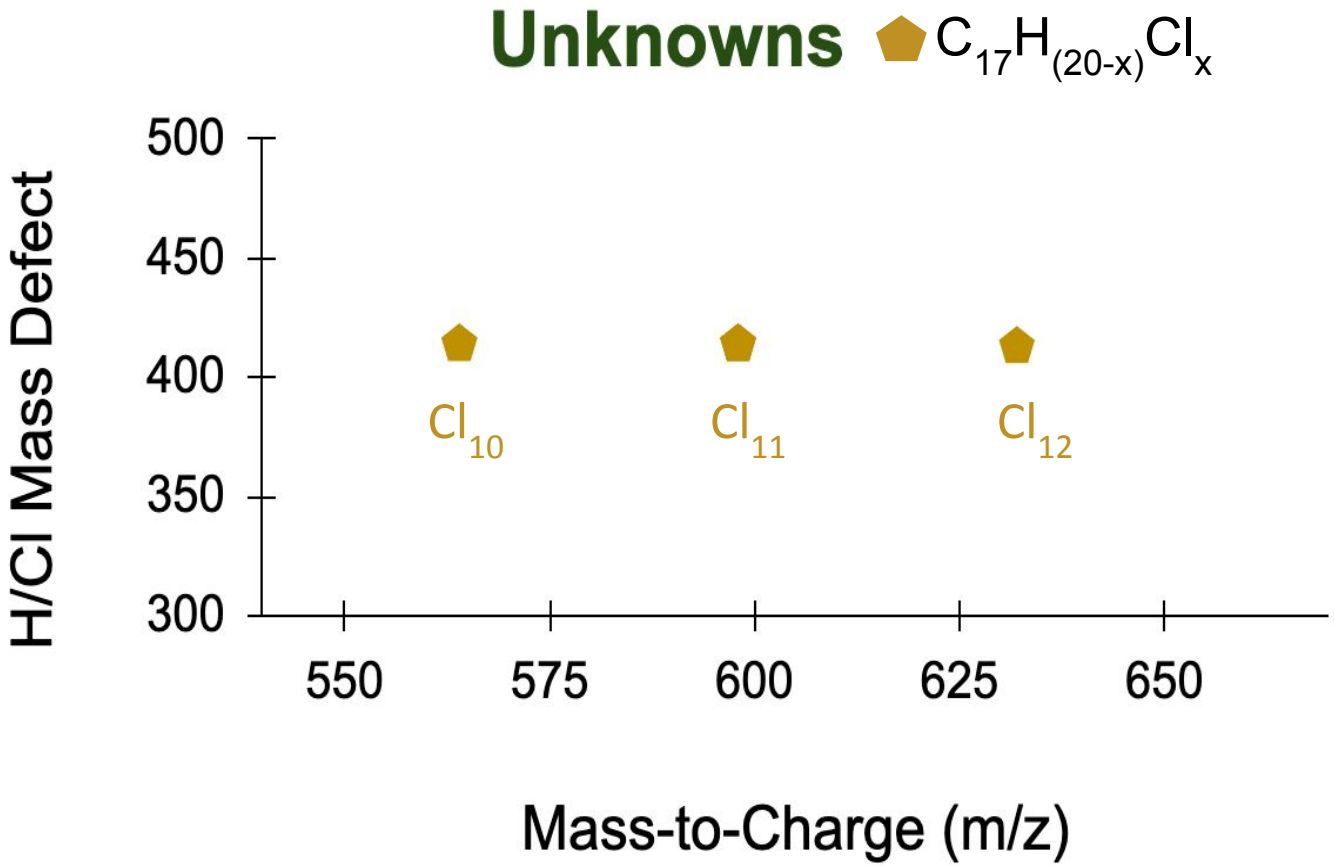


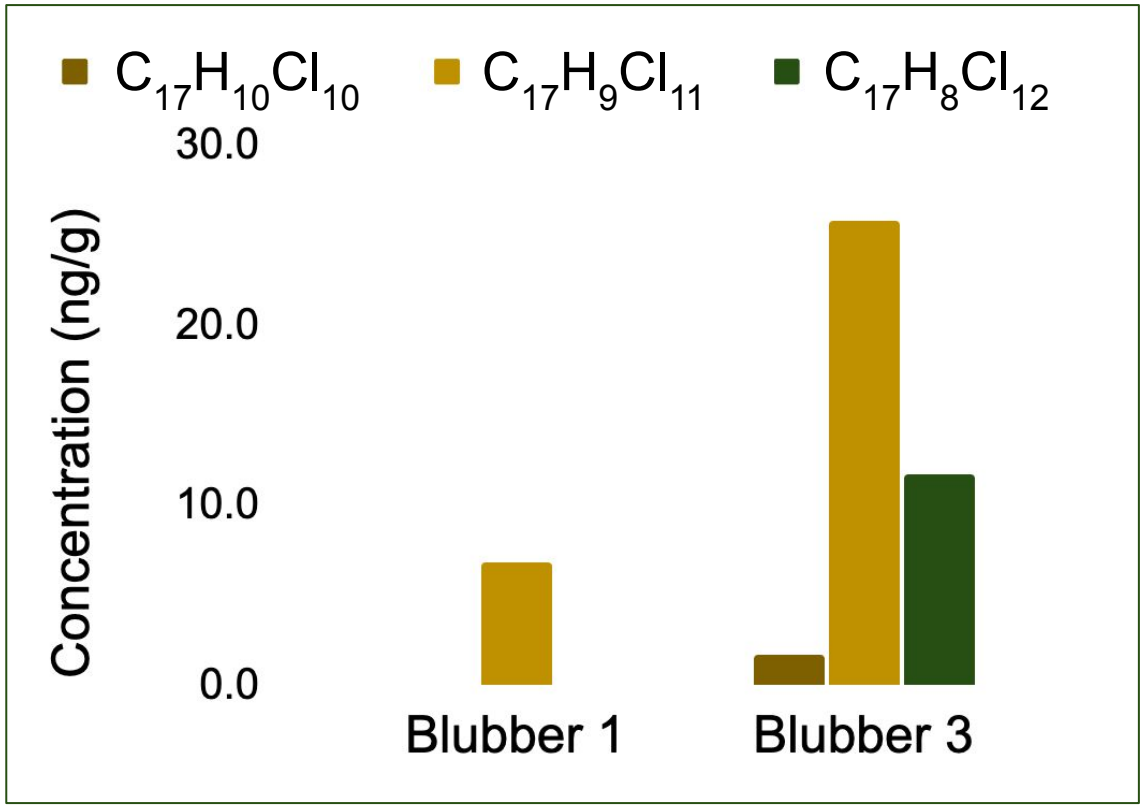




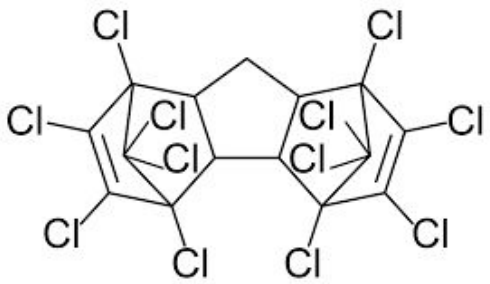
Unknowns-*Dechlorane 603*

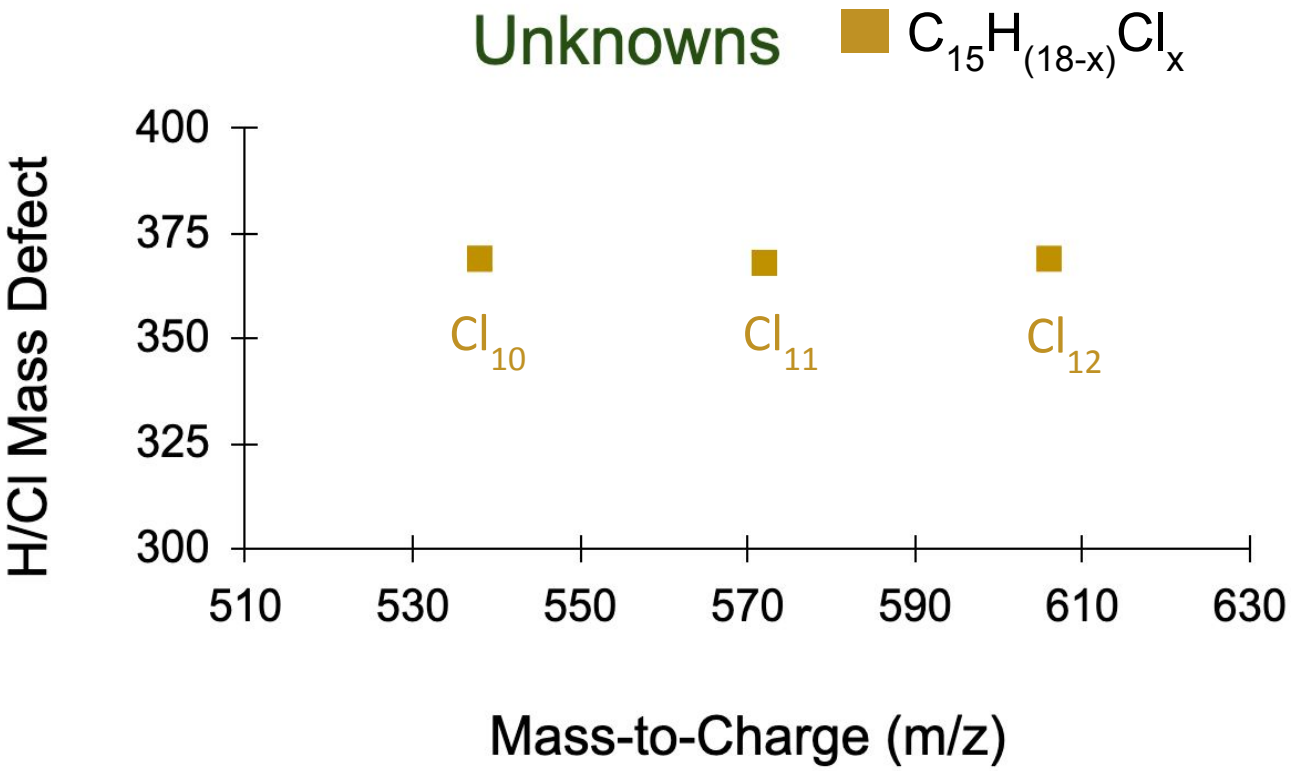


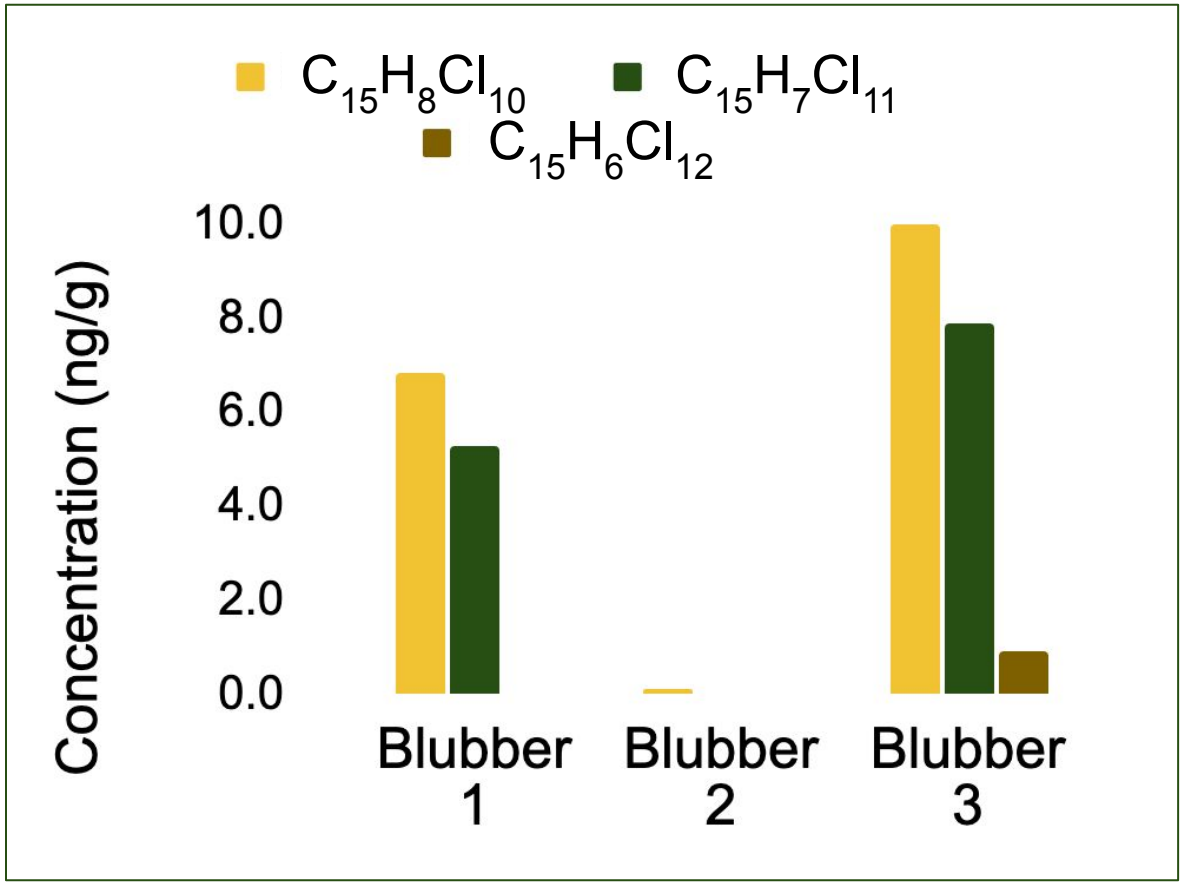




Unknowns-*Chlordene Plus*







Conclusion

- The total number of halogenated features was over 400 for adult seals. *Blubber sample 1 > Blubber sample 3 > Blubber sample 2*
- The estimated concentration of halogenated contaminants reached 20,000 ppb in adult seals. *Blubber sample 1 > Blubber sample 3 > Blubber sample 2*
- Major contributors: PCBs, OCPs, and Methoxyphenols.
- 13 Unknowns were found in the Great Lakes fish, indicating the widespread of these contaminants beyond regional barriers.

Acknowledgment

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Prof. Thomas Holsen
Prof. Philip Hopke
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Comparison with other seals

Coastal Chukotka ringed, spotted and bearded seals (2019) doi: 10.3390/ijerph16050695

- Total POPs around 200 ppb.
- PCBs around 120 ppb

Canadian Arctic (Ulukhaktok, NT) ringed seals (2010) https://doi.org/10.1016/j.scitotenv.2019.02.138

- Total POPs around 1500 ppb.
- PCBs around 600 ppb.

West Antarctica Weddell, Ross and crabeater seals (2021) https://doi.org/10.3389/fmars.2021.768715

- Total POPs around 750 ppb.
- PCBs around 65 ppb.

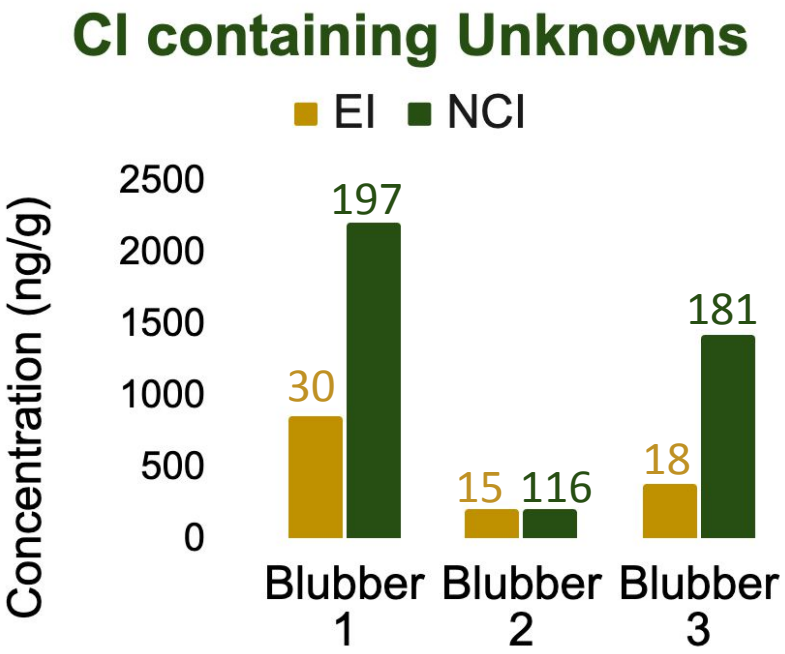
Unknowns in EI and NCI

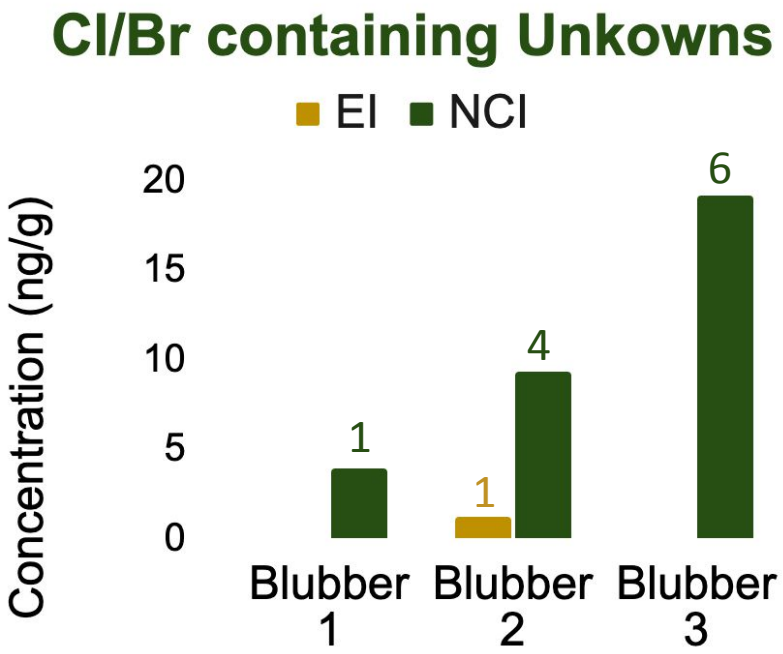
Sample	Unknown ID	Observed Monoisotopic mass on EI	Observed Monoisotopic mass on NCI	Predicted Formula (EI)	Predicted Formula (NCI)	1DRT EI	2DRT EI	1DRT NCI	2DRT NCI	Difference in 1DRT	Difference in 2DRT
Blubber 1	1	139.9786	174.9491	C4H6Cl2O	C4H6Cl3O	865	1.81	860	1.81	5	0
Blubber 2	1	139.9786	174.9491	C4H6Cl2O	C4H6Cl3O	865	1.81	860	1.815	5	-0.005
Blubber 1	2	139.9786	216.9961	C4H6Cl2O	C7H12Cl3O	1105	2.015	1100	2.021	5	-0.006
Blubber 2	2	139.9786	216.9961	C4H6Cl2O	C7H12Cl3O	1105	2.015	1105	2.015	0	0
Blubber 3	2	139.9786	216.9961	C4H6Cl2O	C7H12Cl3O	1110	2.005	1105	2.01	5	-0.005
Blubber 1	3	201.9617	201.9636	C7H7BrO2	C7H7BrO2	1715	1.565	1715	1.555	0	0.01
Blubber 2	3	201.9617	201.9636	C7H7BrO2	C7H7BrO2	1715	1.565	1715	1.56	0	0.005
Blubber 3	3	201.9617	201.9636	C7H7BrO2	C7H7BrO2	1715	1.565	1715	1.56	0	0.005
Blubber 1	4	256.0857	256.0874	C13H17ClO3	C13H17ClO3	2280	1.688	2280	1.695	0	-0.007
Blubber 2	4	256.0857	256.0874	C13H17ClO3	C13H17ClO3	2280	1.705	2280	1.695	0	0.01
Blubber 1	5	465.7196	78.9195	C12H6Br4	Br-	2440	2.007	2440	2	0	0.007
Blubber 1	6	336.8665	371.8371	C10H7Cl6	C10H7Cl7	2460	1.883	2460	1.885	0	-0.002
Blubber 1	7	383.8603	383.8608	C14H6Cl6	C14H6Cl6	2490	2.169	2490	2.175	0	-0.006
Blubber 1	8	349.8983	349.8991	C14H7Cl5	C14H7Cl5	2510	2.046	2510	2.05	0	-0.004
Blubber 3	9	621.5375	621.54	C12H4Br6	C12H4Br6	2910	2.185	2915	2.23	-5	-0.045
Blubber 3	10	346.0075	346.0084	C19H13Cl3	C19H13Cl3	2910	1.885	2910	1.905	0	-0.02
Blubber 1	11	234.9946	234.9964	C12H7Cl2N	C12H7Cl2N	3480	1.777	3485	1.773	-5	0.004

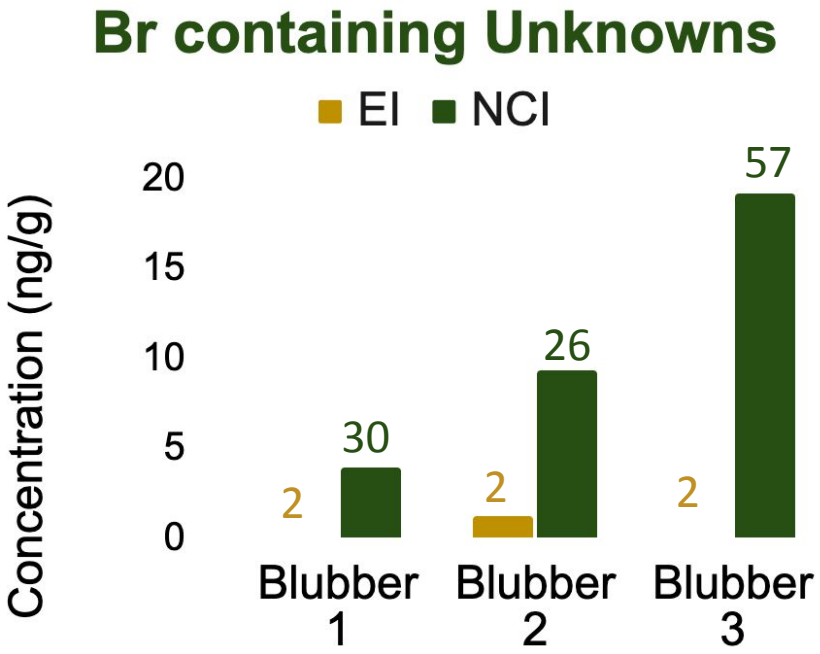
Results-*Other knowns*

Name	1st Dimension Time (s)	2nd Dimension Time (s)	Observed Ion m/z	Formula	Concentration (ng/g)			Mode
					Blubber 1	Blubber 2	Blubber 3	
Hexachlorobenzene	1635	2.28	281.8138	C6Cl6	23.9	33.8	69.9	NCI
Heptachlorostyrene	1735	2.37	341.7902	C8HCl7	5.3	0.4	N/A	NCI
Pentachloroanisole	1755	2.175	277.8631	C7H3Cl5O	0.3	N/A	2.8	NCI
Heptachlorostyrene	1815	2.43	341.7902	C8HCl7	1.0	N/A	N/A	NCI
Octachlorostyrene	1910	2.48	375.7517	C8Cl8	4.0	0.7	5.8	NCI

Total Unknowns concentration



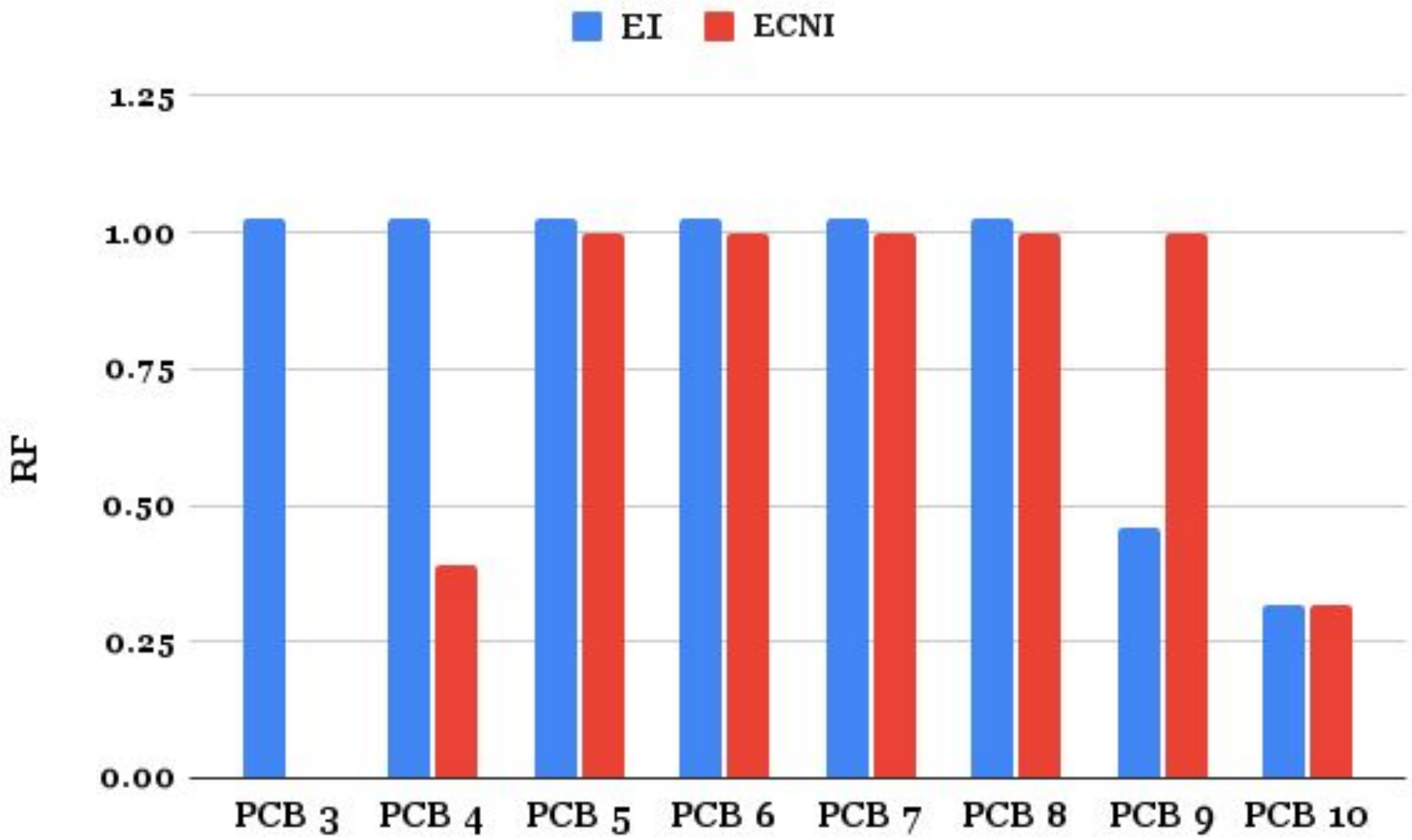




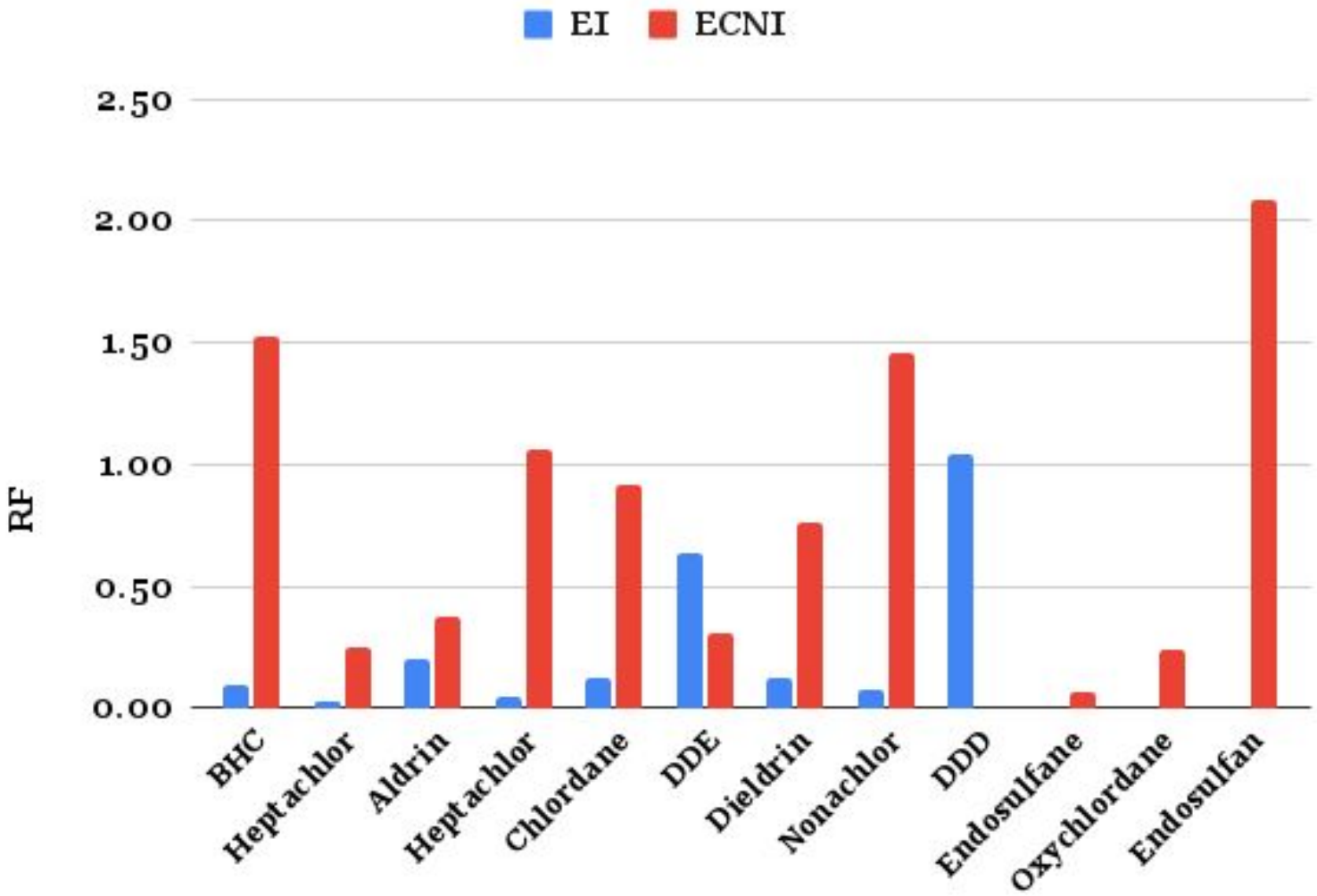
Response factor calculations

$$RF = \frac{Average\ area\ of\ authentic\ \ standard * Concentration\ of\ injection\ standard}{Area\ of\ Injection\ standard * concentration\ of\ authentic\ standard}$$

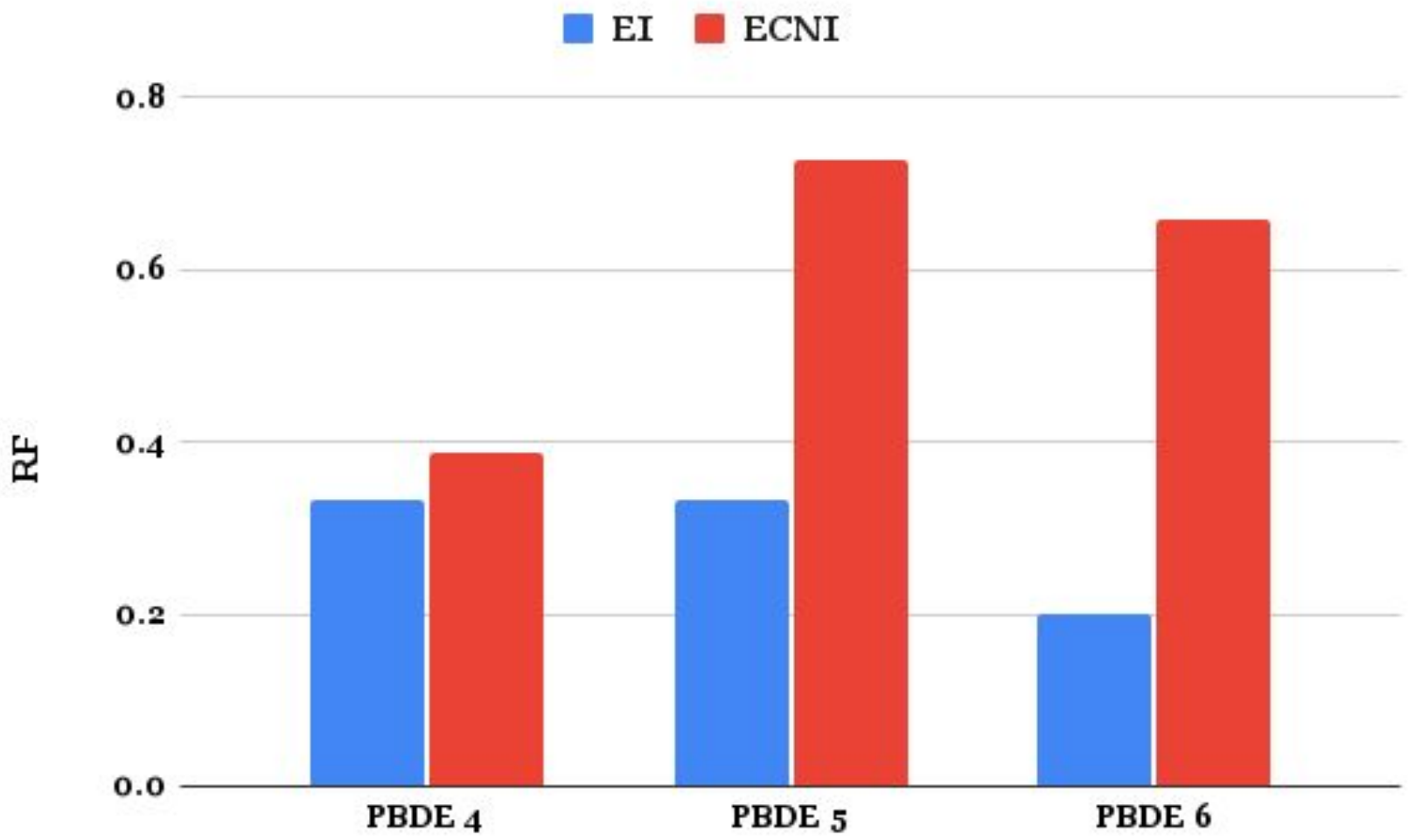
Response factor of PCBs



Response factor of OCPs



Response factor of PBDEs



Concentration calculations

- Concentration of $x = \frac{area\ x * Conc.IS\ (\frac{ng}{\mu L}) * 100\ \mu L}{RF * sample\ weight\ (g)}$
- IS: internal standard
- Conc.: Concentration
- RF: Global response factor

Nontargeted vs targeted concentrations

- The total PCB and PBDE concentrations for SRMs 1946 and 1947 were within **11%** of the certified values.
- Total PCB and PBDE concentrations measured using the GC×GC-HRT and global response factors were also within **17%** of the values obtained from targeted methods.

Environmental Science & Technology

Article

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Comprehensive Analysis of the Great Lakes Top Predator Fish for Novel Halogenated Organic Contaminants by GC×GC-HR-ToF Mass Spectrometry

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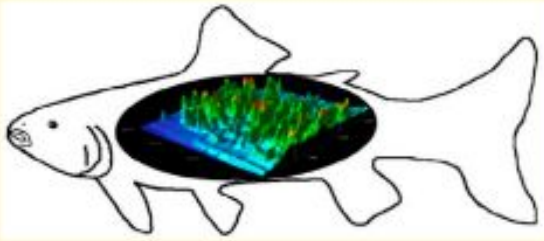
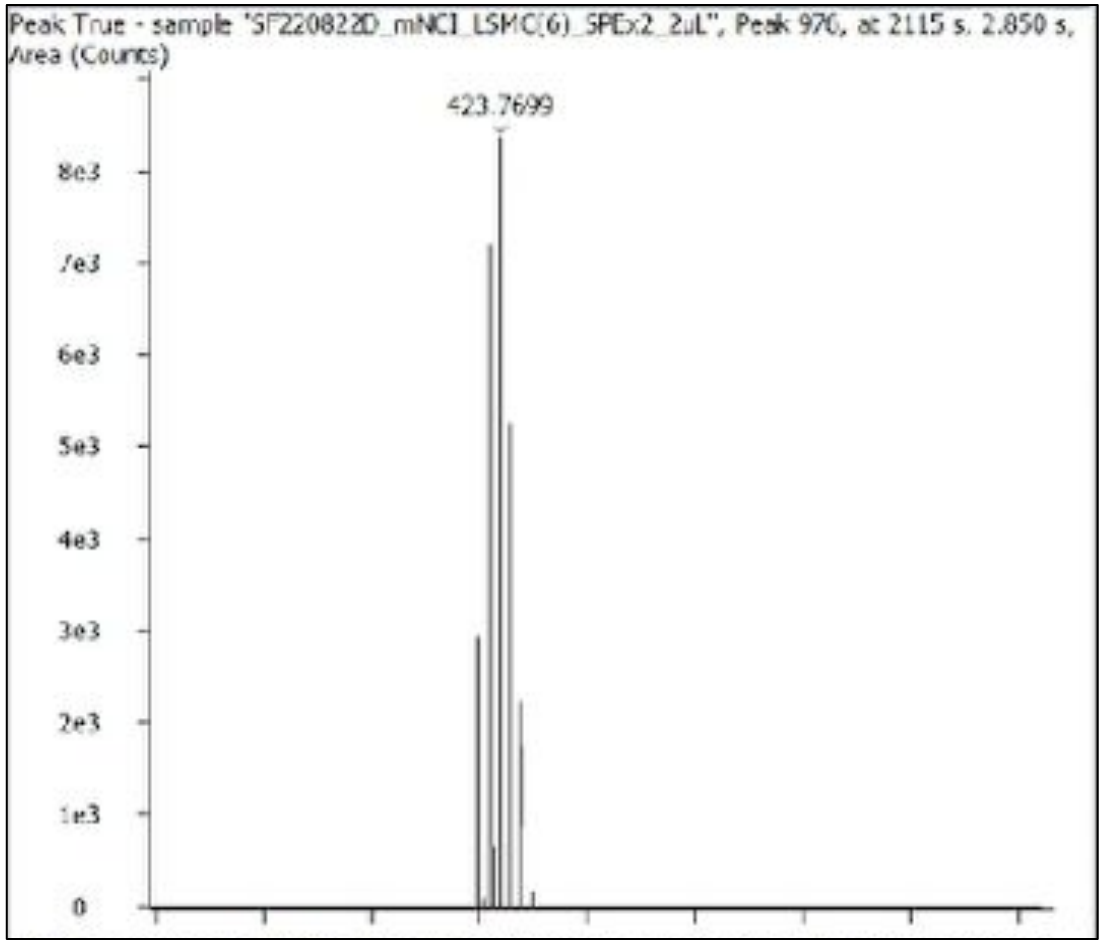
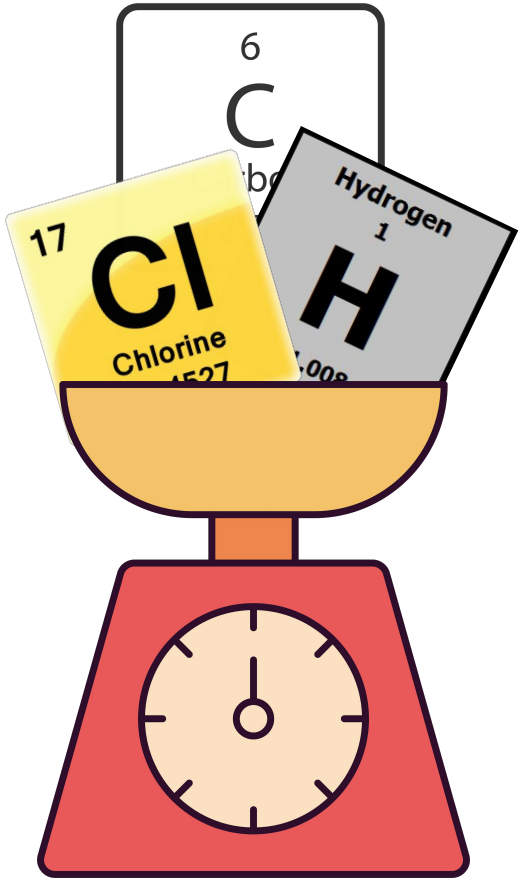
Supporting Information

ABSTRACT: The U.S. Environmental Protection Agency's Great Lakes Fish Monitoring and Surveillance Program (GLFMSP) has traced the fate and transport of anthropogenic chemicals in the Great Lakes region for decades. Isolating and identifying halogenated species in fish is a major challenge due to the complexity of the biological matrix. A nontargeted screening methodology was developed and applied to lake trout using a 2-dimensional gas chromatograph coupled to a high resolution time-of-flight mass spectrometer (GC×GC-HR-ToF MS). Halogenated chemicals were identified using a combination of authentic standards and library spectral matching, with molecular formula estimations provided by exact mass spectral interpretation. In addition to the halogenated chemicals currently being targeted by the GLFMSP, more than 60 nontargeted halogenated species were identified. Most appear to be metabolites or breakdown products of larger halogenated organics. The most abundant compound class was halomethoxyphenols accounting for more than 60% of the total concentration of halogenated compounds in top predator fish from all five Great Lakes illustrating the need and utility of nontargeted halogenated screening of aquatic systems using this platform.



Identifying unknowns



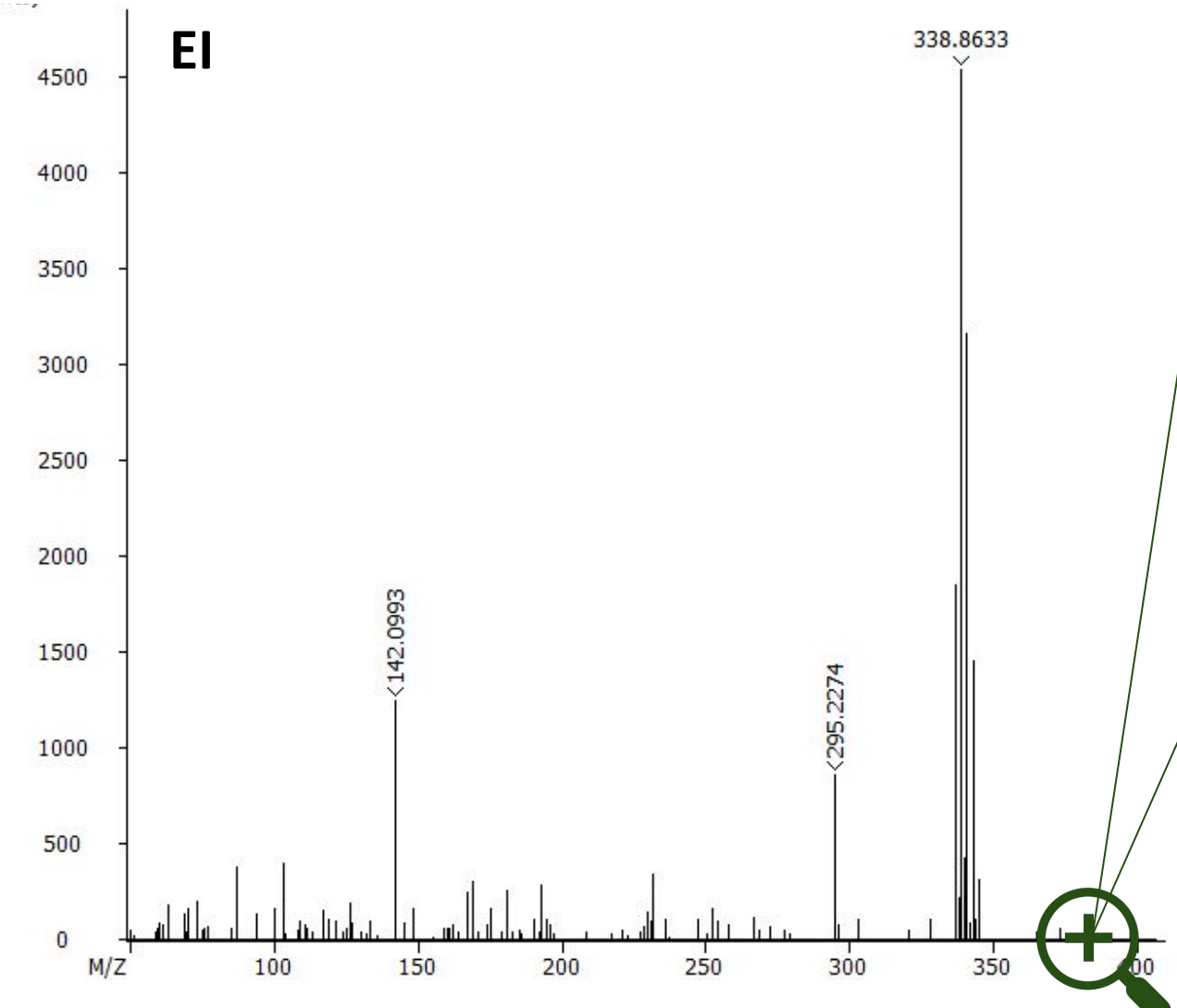


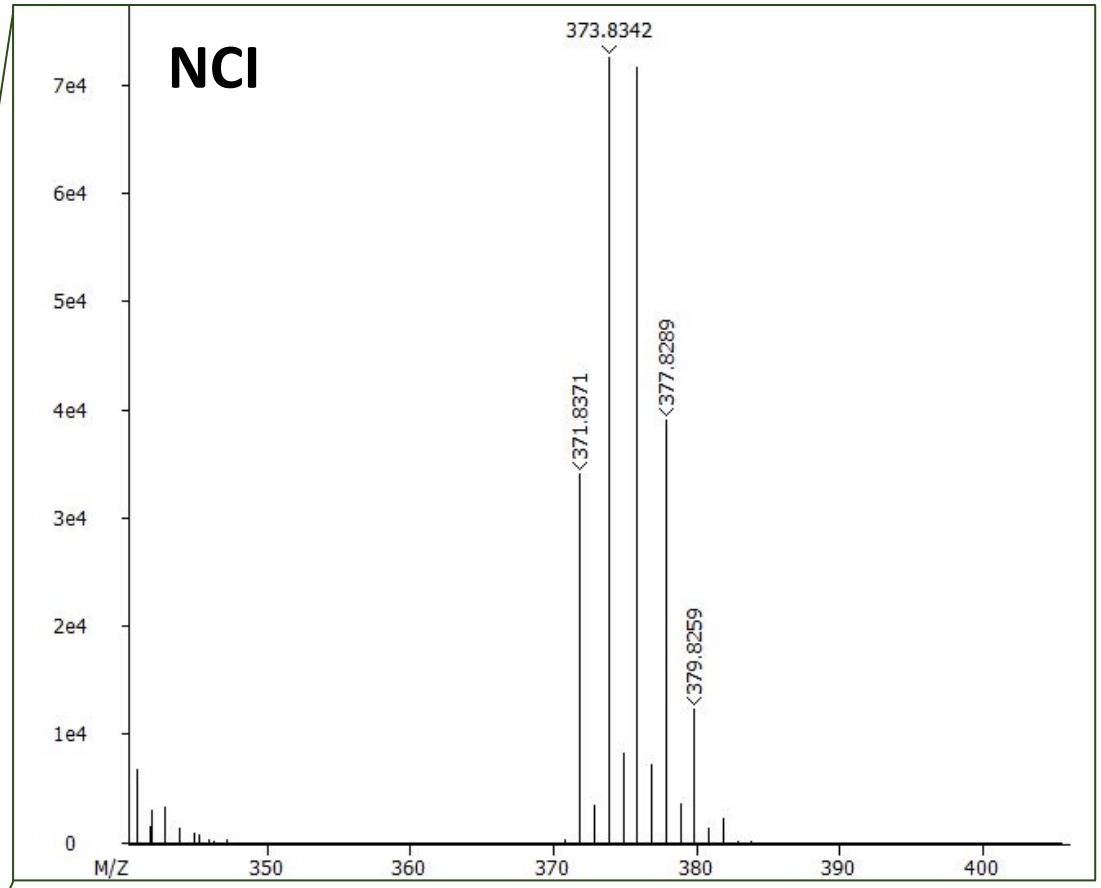
H9Br2Cl3N4O4
C3H9BrCl6N3O
CH2Cl6N4O7
C12H3Cl7
C8H10Br3ClN

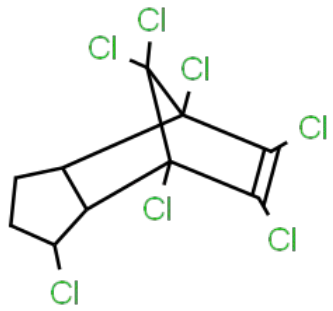
Confidence levels

Confidence Level	Identification	Confirmed with	Criteria
1	Confirmed Structure	Authentic standard, Accurate mass measurement	The retention time and mass spectra of the acquired spectrum and standard are a match. Mass accuracy within 5ppm.
2	Probable Structure	Library spectrum match, Accurate mass measurement, Isotopic profile	Library match score 600 or higher, molecular formula is within 5ppm mass error and isotopic profile is in agreement.
3	Tentative Structure(s)	Accurate mass measurement, Isotopic profile	Molecular formula is within 5ppm mass error and isotopic profile is in agreement. Corresponding structures available in ChemSpider database.
4	Molecular formula	Accurate mass measurement, Isotopic profile	In this case the selected molecular formula is within 5ppm mass error and isotopic profile is in agreement.
5	Exact mass of interest	Isotopic profile	In this case no meaningful molecular formula(s) are obtained for the observed m/z.

Detecting The Molecular Ion



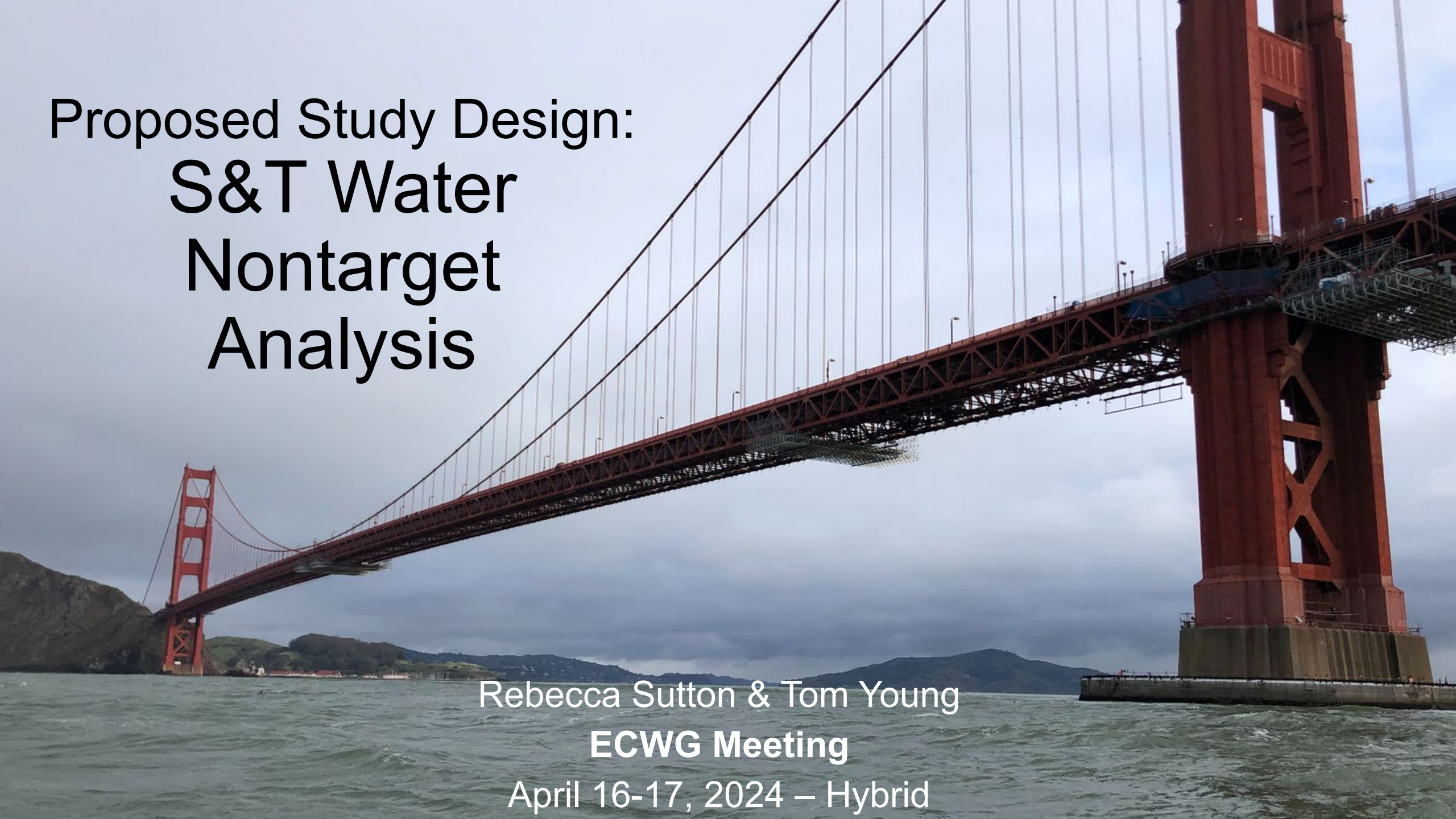




«β»-Dihydroheptachlor

Unknowns found in the Great Lakes top predator fish

Unknown ID	1D RT	2D RT	Observed Ion m/z	Proposed Formula	Concentration (ng/g)		
					Blubber 1	Blubber 2	Blubber 3
1	615	0.475	130.9229	C2H2Cl3	11	39.7	280
2	610	1.8	130.9229	C2H2Cl3	0	0	6
3	1995	2.18	278.8167	C6Cl5S	1	15.1	6
4	2625	2.38	228.879	C6HCl4O	41	6.0	32
5	2445	2.33	228.8791	C6HCl4O	5	5.3	0
6	870	1.97	131.0255	C6H8ClO	0	82.1	9
7	2065	1.451	155.9988	C7H5ClO2	2	2.2	0.4
8	1425	1.81	144.0352	C7H9ClO	0	2.4	3
9	2705	1.765	370.829	C10H6Cl7	5	1	3
10	2640	1.86	421.7931	C10H6Cl8O	2	0	1
11	2680	1.814	421.7931	C10H6Cl8O	2	0.6	1
12	2195	2.34	453.7756	C11H7Cl9	3	0.2	2
13	2220	2.34	453.7756	C11H7Cl9	2	0.5	1



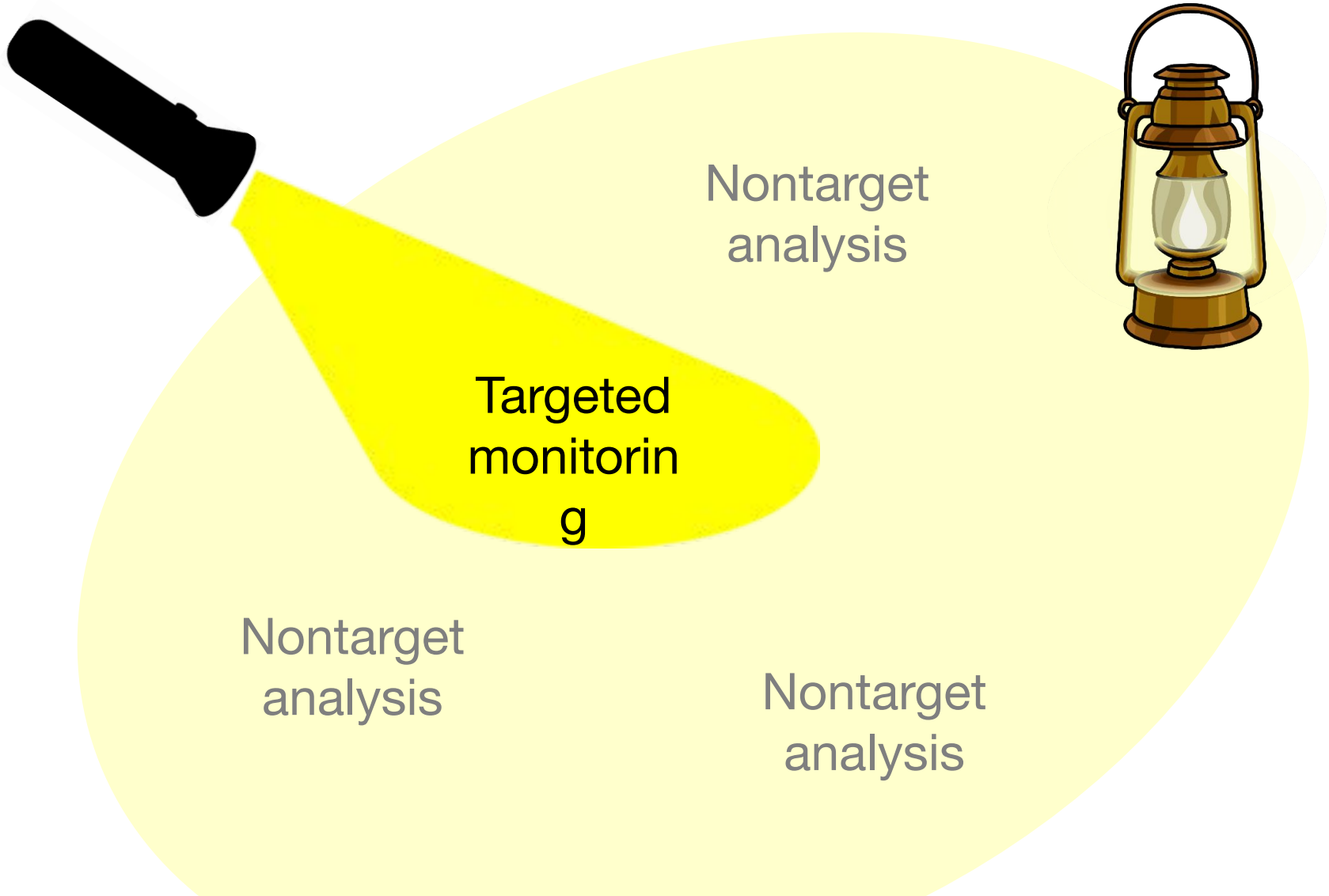
Proposed Study Design: S&T Water Nontarget Analysis

Rebecca Sutton & Tom Young

ECWG Meeting

April 16-17, 2024 – Hybrid

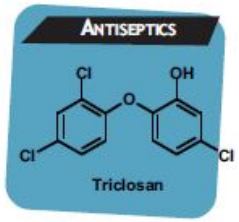
Identifying new CECs with nontarget analysis

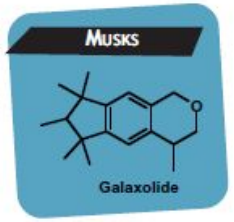


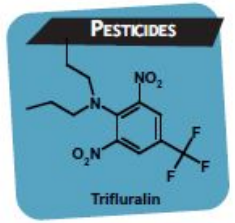
RMP

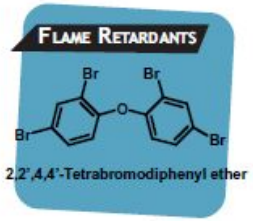
RMP Detective Work: Identifying New Organic Contaminants in the Estuary

by Daniel R. Oros









The recent addition of a surveillance component to the Regional Monitoring Program for Trace Substances (RMP) was prompted by a need to make the regulatory system more proactive in anticipating potential problem contaminants in the San Francisco Estuary. Our efforts have focused mainly on identifying as many as possible of the "unknown" organic compounds that were resolved by combined gas chromatography-mass spectrometry (GC-MS).

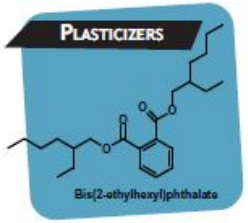
All samples were collected by the RMP and during the earlier SEDQUAL program from 1990 to the present year. Water samples were extracted in-situ with polyurethane foam or XAD resin. Foam plugs and resin, sediment, and biota tissue samples were each spiked with surrogate standards then extracted with organic solvents (MeOH and CH_2Cl_2). Sample extracts were combined and then subjected to Florisil column chromatography for separation into PCB/aliphatic (F1), pesticide/aromatic (F2) and polar fractions (F3). Fractions were analyzed by GC-MS.

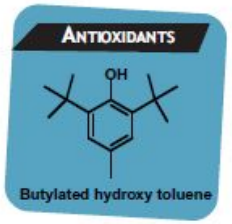
Preliminary findings show the presence of both natural (e.g., terrestrial and marine plants) and anthropogenic (e.g., biomass burning, meat cooking, petroleum, synthetics, etc.) organic compounds and their decomposition products in environmental samples.

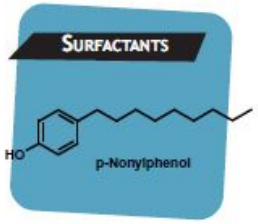
The anthropogenic organic compounds that are of immediate concern to the RMP include antioxidants used as preservatives (butylated hydroxy toluene, butylated hydroxy anisole), flame retardants (tetra- and pentabromo diphenyl ethers), surfactants (nonylphenol and alkylbenzenes), organophosphate pesticides (oxadiazon, diazinon and chlorpyrifos), industrial polymer plasticizers (di-N-butyl phthalate, butyl benzy phthalate and bis(2-ethylhexyl) phthalate), a flame retardant plasticizer (triphenylphosphate), and fragrance compounds (musk ketone, galaxolide, and versalide).

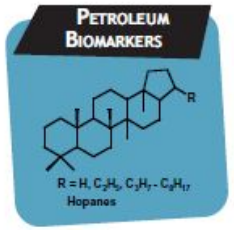
Recent evidence suggests that some of these synthetic compounds and their metabolites may induce toxicity, disrupt endocrine systems, and accumulate in marine biota (fish, crabs, and bivalves) and in higher food chain consumers (birds, marine mammals, and humans). Herein, we demonstrate that a monitoring program can incorporate a surveillance component that is useful for identifying past, current, and potential problems in the environment. Studies to confirm contaminant spatial and temporal distributions, and link these newly identified compounds to adverse impacts in the Estuary are warranted to ensure these contaminants do not become the legacy pollutants of the future.

Author: Daniel Oros (510) 746-7386; daniel@sfei.org









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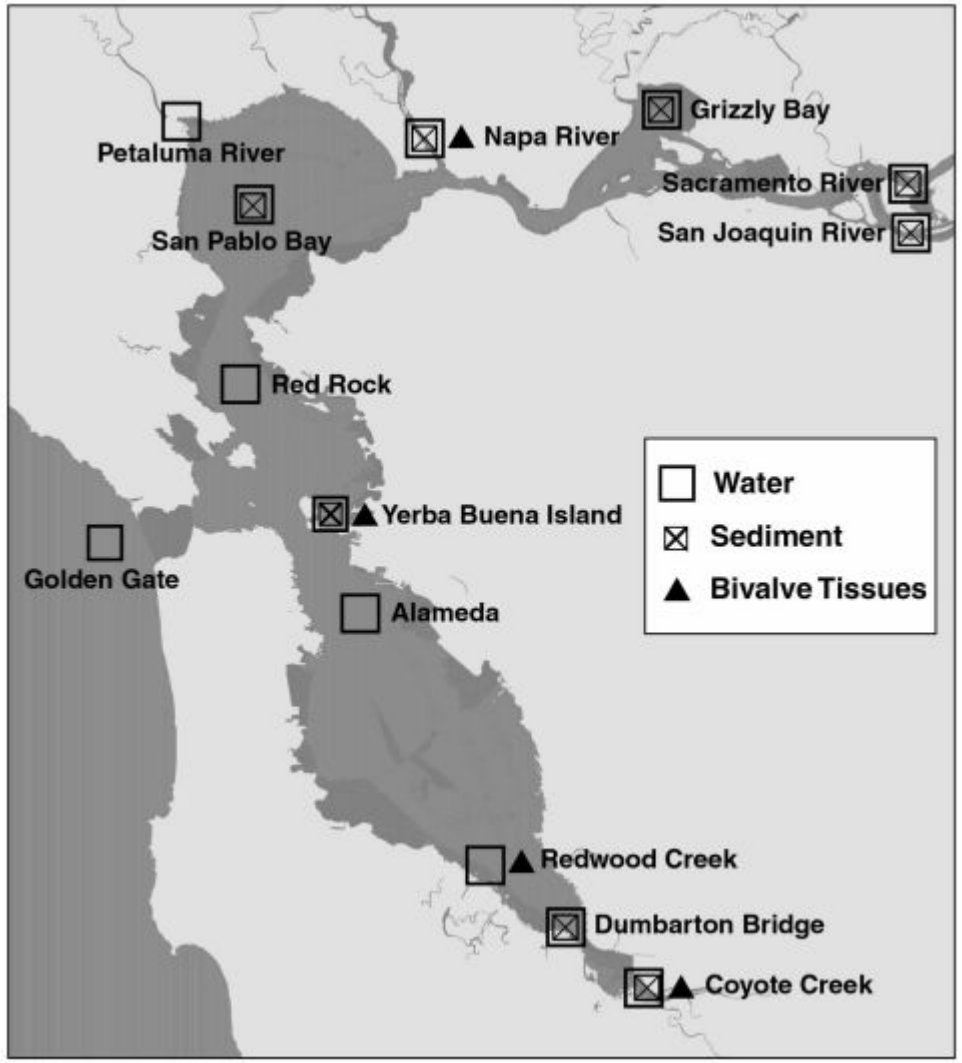


David & Oros. 2002. *Identification and evaluation of unidentified organic contaminants in the San Francisco Estuary*. SFEI Contribution No. 45. San Francisco Estuary Institute: Oakland, CA. https://www.sfei.org/documents/identification-and-evaluation-unidentified-organic-contaminants-san-francisco-estuary

NTA led to RMP focus on stormwater CECs

Overdahl et al. 2021

NON-TARGETED ANALYSIS

Status & Trends Redesign

Sport Fish
Every 5 Years

Bird Eggs
Every 3 Years

Bivalves
Archive only

Bioaccumulation matrices

Nontarget Analysis
Every ~10 Years

Water
Every 2 Years

Sediment
Every 5 Years

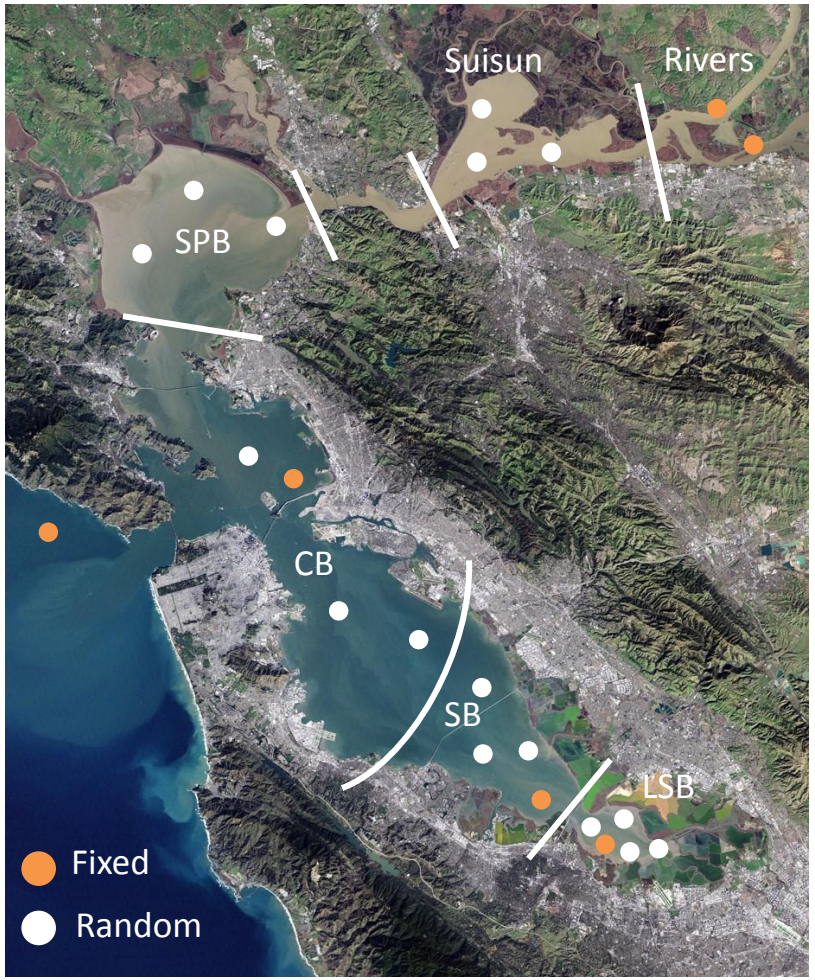
Core matrices

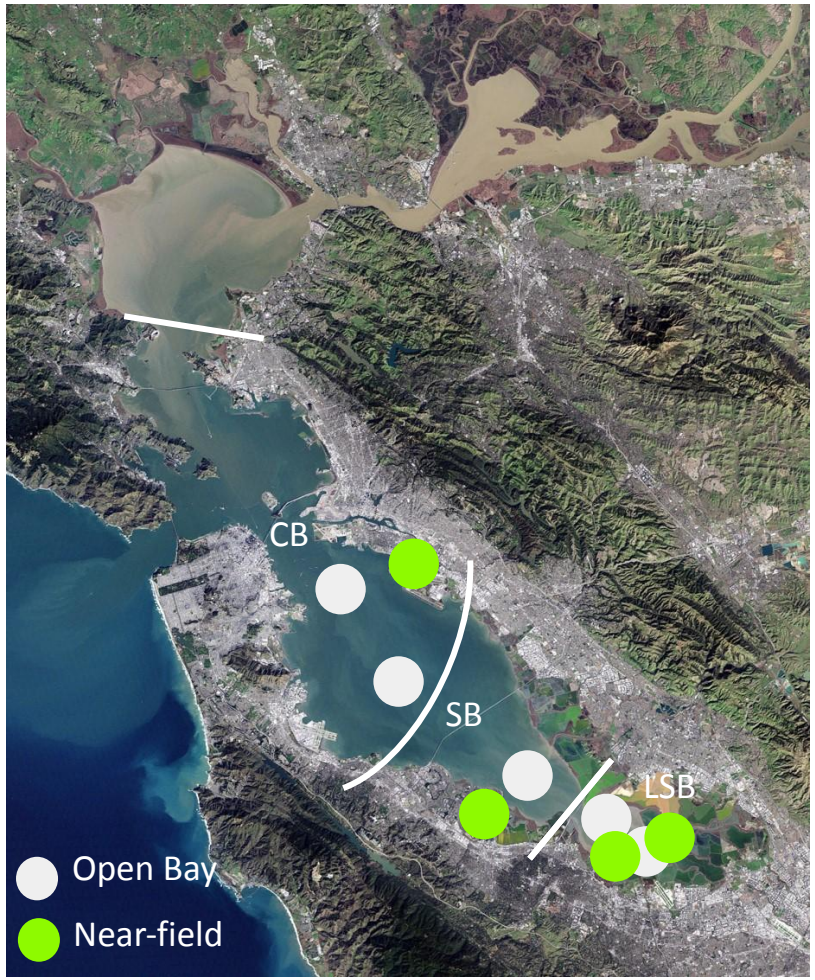
RMP

Objectives of Status & Trends Nontarget Analysis

- Apply nontarget analysis to Bay water to assess the status (initially) and trends (eventually) of unanticipated CECs
- Relatively consistent study design and methods in future years; maintain complete data and archives for benchmarking
- First implementation (2025) can be considered a pilot effort

Broad screening: Dry & wet season





Seasonal influence relates to pathways

Broad screening: LC and GC methods

Unified Data Analysis Scheme

Analysis Base
File Converter

MS-DIAL

MS-FINDER

Confirmation Scheme

Sirius:CSI-FingerID and
Unknowns Analysis

Aqueous: Solid Phase Extraction - HLB or layered

Solids: Sonication - hexane: acetone - acetone

Evaporation and Filtration

solvent exchange
ISTD addition

ISTD addition

LC-QTOF-MS

Agilent 6530

Zorbax Eclipse Plus C 18
ESI+: H_2O+FA / ACN+FA
ESI-: H_2O+NH_4F / ACN
Data Acquisition:
All-Ion CE 0, 10, 20, 40 (target + nontarget)
tMS/MS follow-up on priority features

GC-QTOF-MS

Agilent 7250

HP-5MS (30m x 0.25mm, 025µm)
Temp gradient: linear increase
35-325°C in 80 min
Data Acquisition:
EI (target + nontarget)

Validated methods:

- Ambient water[1]
- Household dust[2]
- Skin wipe samples[3]
- SVOCs in air[4]
- Wildfire ash[5]
- Biosolids[6]
- Aldehydes/carbonyls in air[7]
- Wastewater[8] (influent/effluent)
- Drinking water[9]

1. *ES&T*, **2017**, 51:1553
2. *ES&T*, **2018**, 52: 2878
3. *ES&T*, **2019**, 53: 1608
4. *ES&T*, **2021**, 55: 2820
5. *ES&T*, **2021**, 55: 3657
6. *ES&T*, **2021**, 55:6729
7. *ES&T*, **2021**, 55:12809
8. *ES&T*, **2023**, 57: 5404
9. In preparation

Prioritizing NTA interpretation via targeted chemistry

Statistical relationships between nontarget signals and targeted data can reveal additional insights

Available RMP targeted chemical data

- CECs in all samples: PFAS, organophosphate esters, bisphenols
- 2025 dry season cruise:
  - Copper, cyanide
  - Other California Toxics Rule parameters (PCBs, PAHs, legacy pesticides, etc.)
  - Ancillary data

Prioritizing NTA interpretation via bioassays

Prior experience connecting chemicals detected using NTA and biological activity (e.g., drinking water)

Recommended bioassays

- *Xenopus laevis* tadpole induced metamorphosis assay, tests for thyroid hormone and retinoid-X receptor (RXR) signaling in vivo
- TH responsive mammalian (rat) pituitary cell line with an integrated TH responsive reporter gene
- A mammalian RXR only reporter transfection assay, to rule in or out compounds affecting TR activity through its RXR partner
- Cell based bioassay for glucocorticoid receptor activity
- Cell based bioassay for progesterone receptor activity

RMP

Deliverables to support trends analysis

- List of tentatively identified compounds
- Publicly accessible baseline spectra for future NTA comparisons (including retrospective analysis)
- Archived extracts of water samples
- Draft manuscript to be submitted to a peer-reviewed journal

Budget

Expense	Estimated Hours	Estimated Cost
Labor		
Study Design	24	4,680
Sample Collection	24	3,600
Data Technical Services	24	3,840
Analysis and Reporting	160	38,400
Subcontracts		
Tom Young, UC Davis		323,730
Direct Costs		
Equipment		2,000
Travel		2,000
Shipping		2,000
Open Access Publication Fee		3,000
Grand Total		**383,250**

Discussion

Is this study design heading in the right direction?

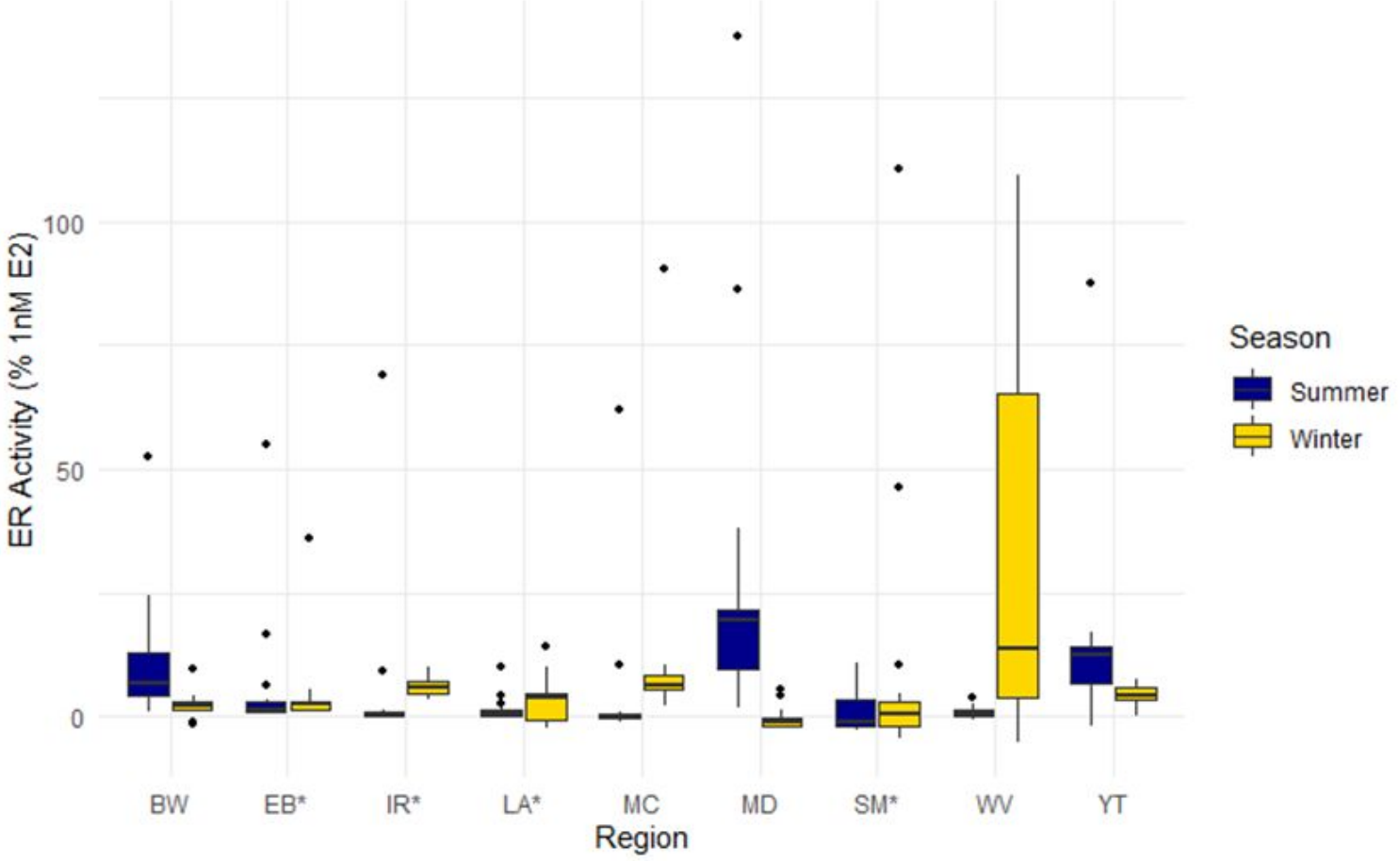
- Are there elements we're missing?

If resources are limited, which aspects are essential vs. optional?

- Dry and wet season sample collection
- Geographic scope
- LC and GC methods
- Bioassays (add or subtract tests)

Bioassays Useful in NTA Prioritization

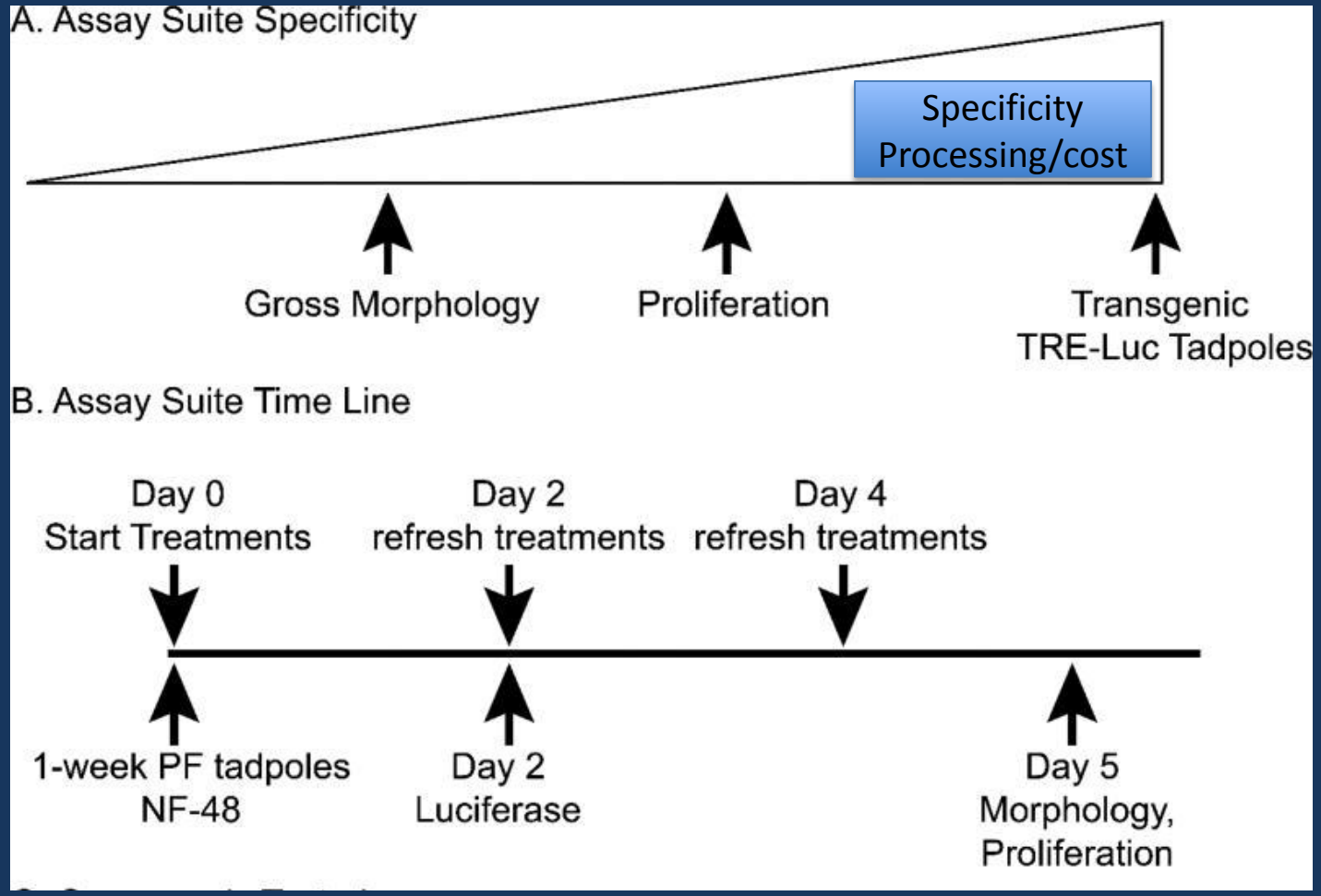
- Concentrated extracts used for chemical analysis are solvent exchanged into bioassay compatible solvent
- Results in excellent connection between chemicals detected using NTA and bioassay activity
- This approach has provided sufficient sensitivity for detecting estrogenic activity in a CALUX estrogen receptor assay using drinking water samples



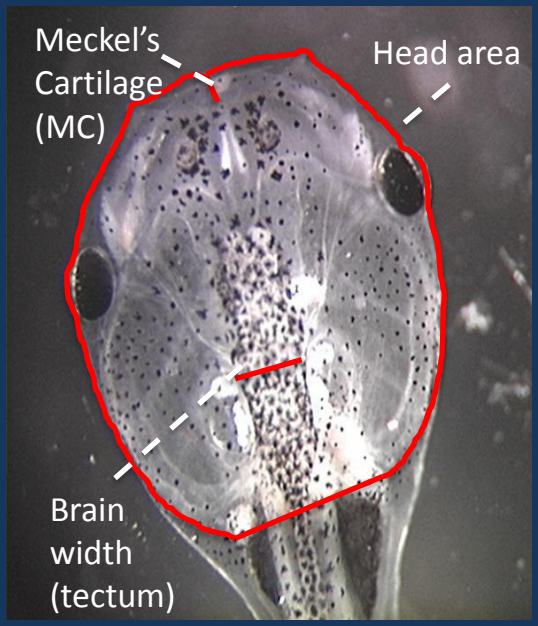
BW-Bottled Water LA-Los Angeles SM-San Mateo
EB-EBMUD MC-Merced WV-Weaverville
IR-Irvine Ranch MD-Madera YT-Yurok Tribe

Assays to detect T3 induced changes in one week old *X. laevis* tadpoles (12-15 mm)

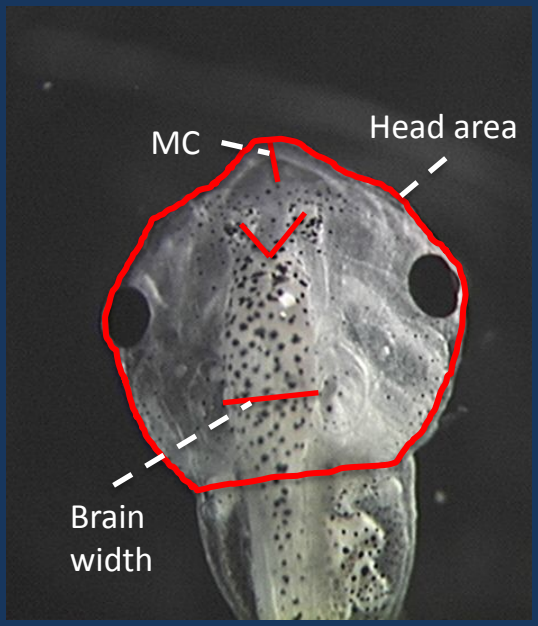
Expose tadpoles to natural hormones, synthetic agonists, suspected THD compounds, environmental samples

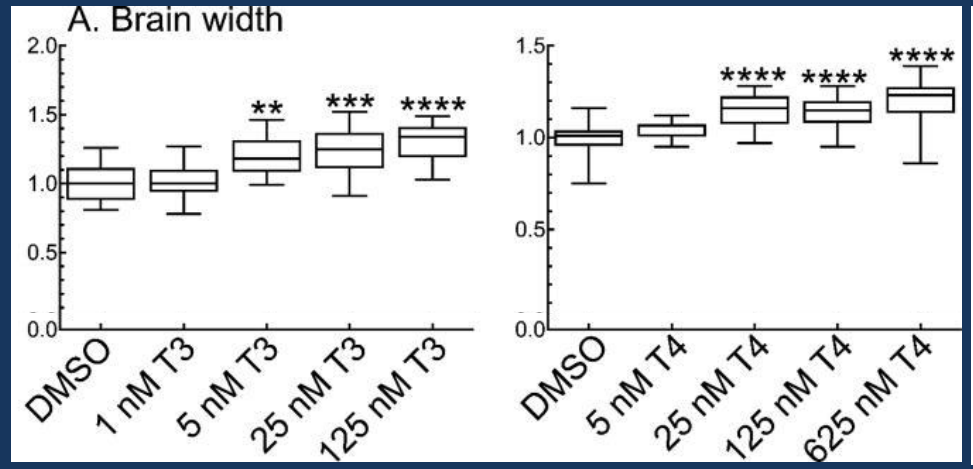


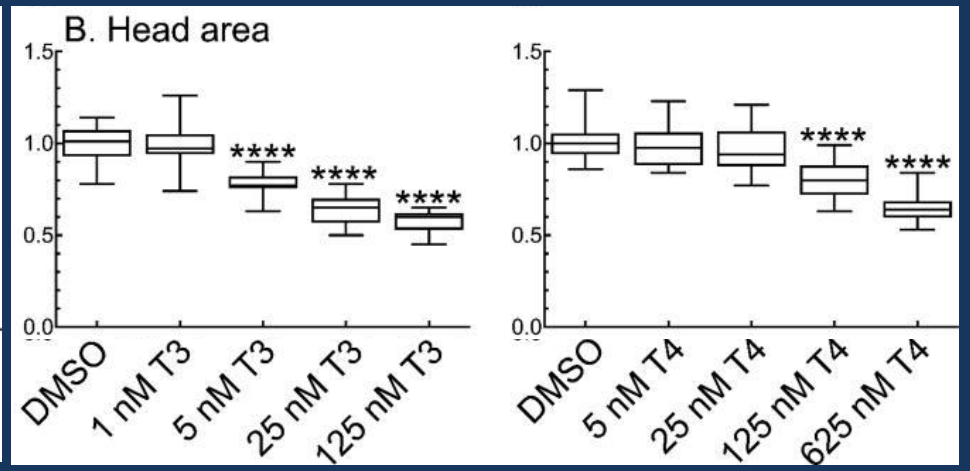
Morphological assay example with indicated measurements (DMSO and TH treated one week old tadpoles)



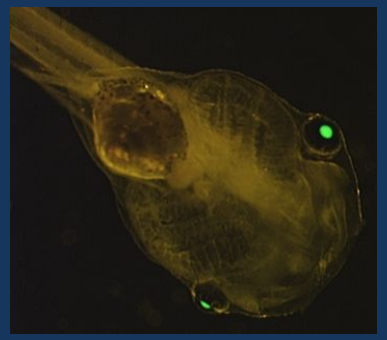
+/- T3
+/- test samples

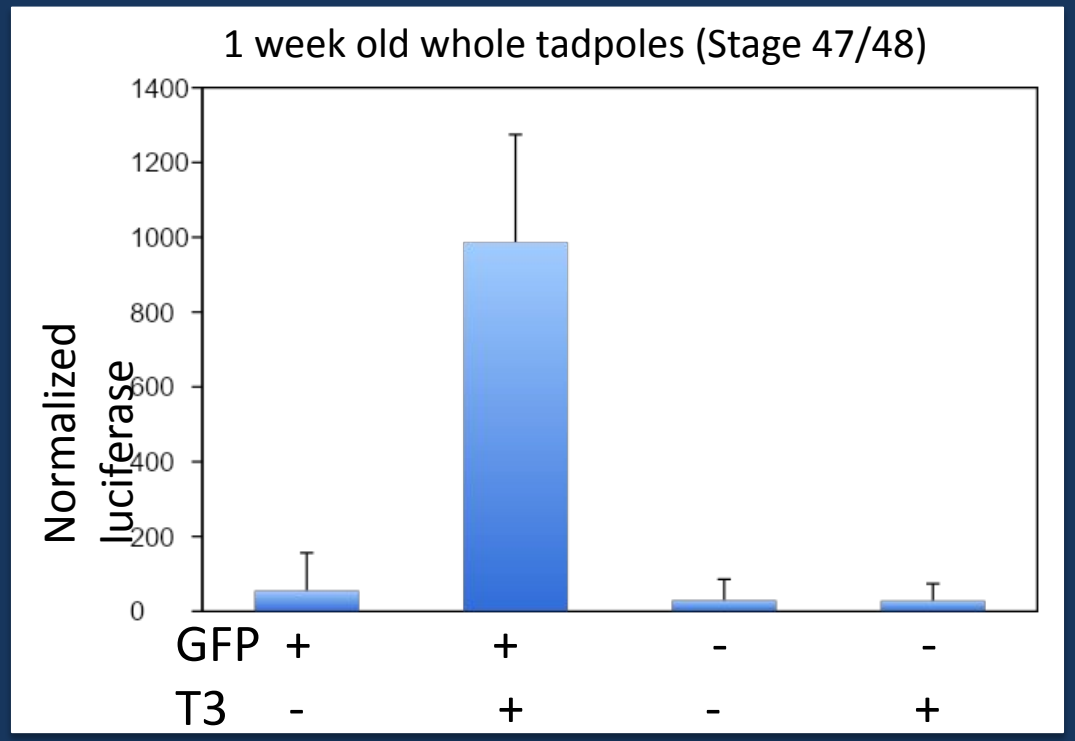


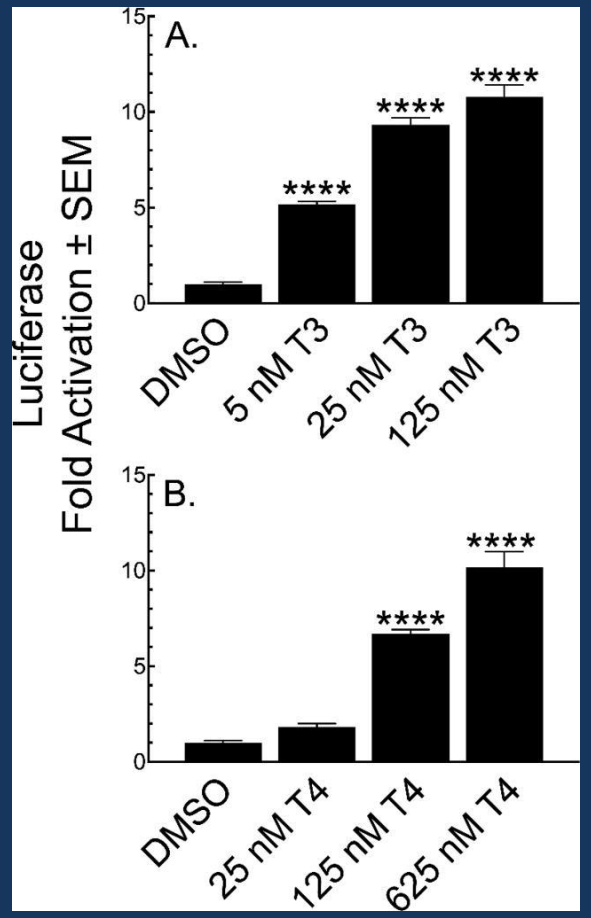




TRE-LUC transgenic *Xenopus laevis* tadpoles (Lens promoter:GFP construct co-integrated with TH responsive luciferase reporter gene



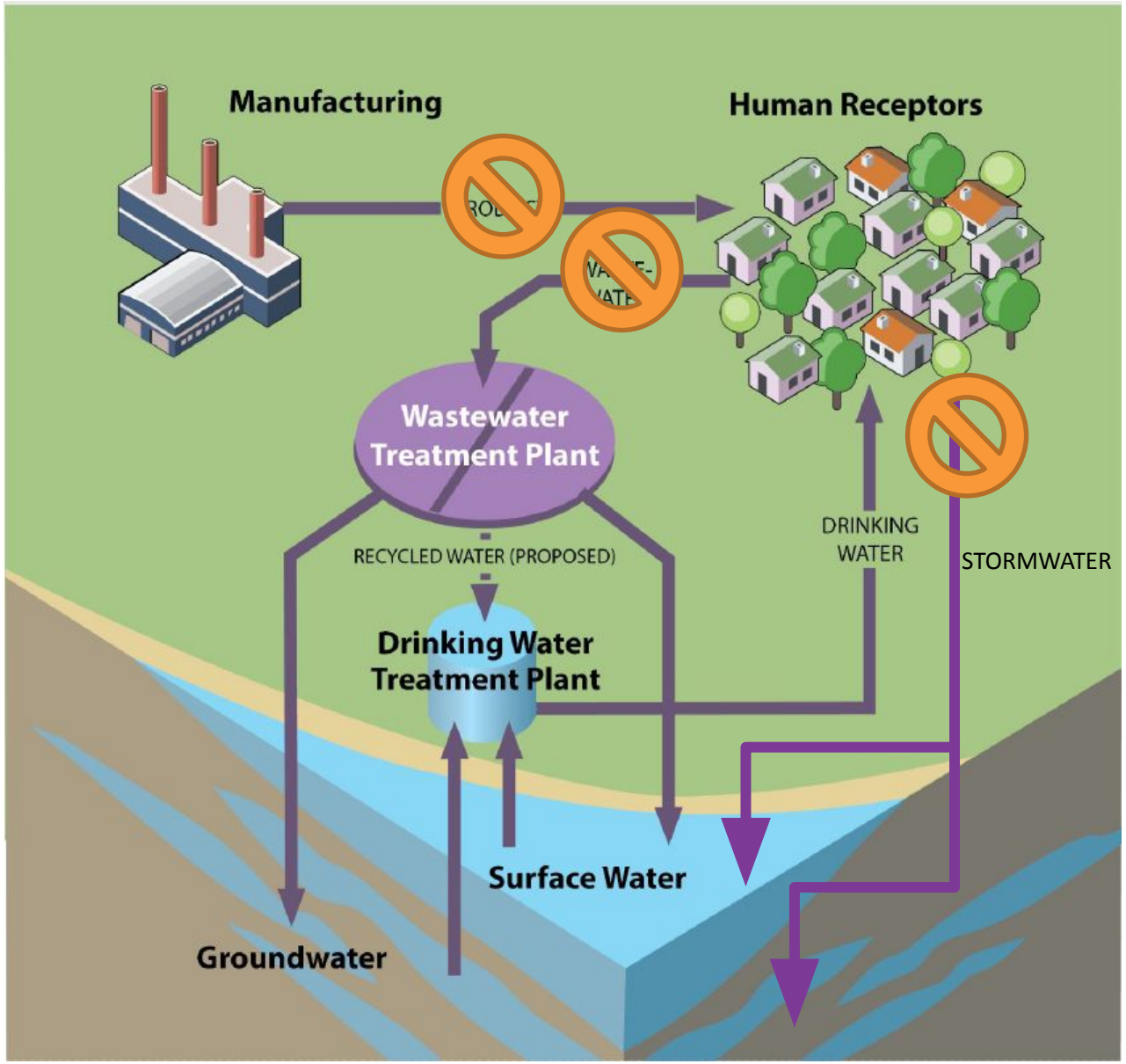




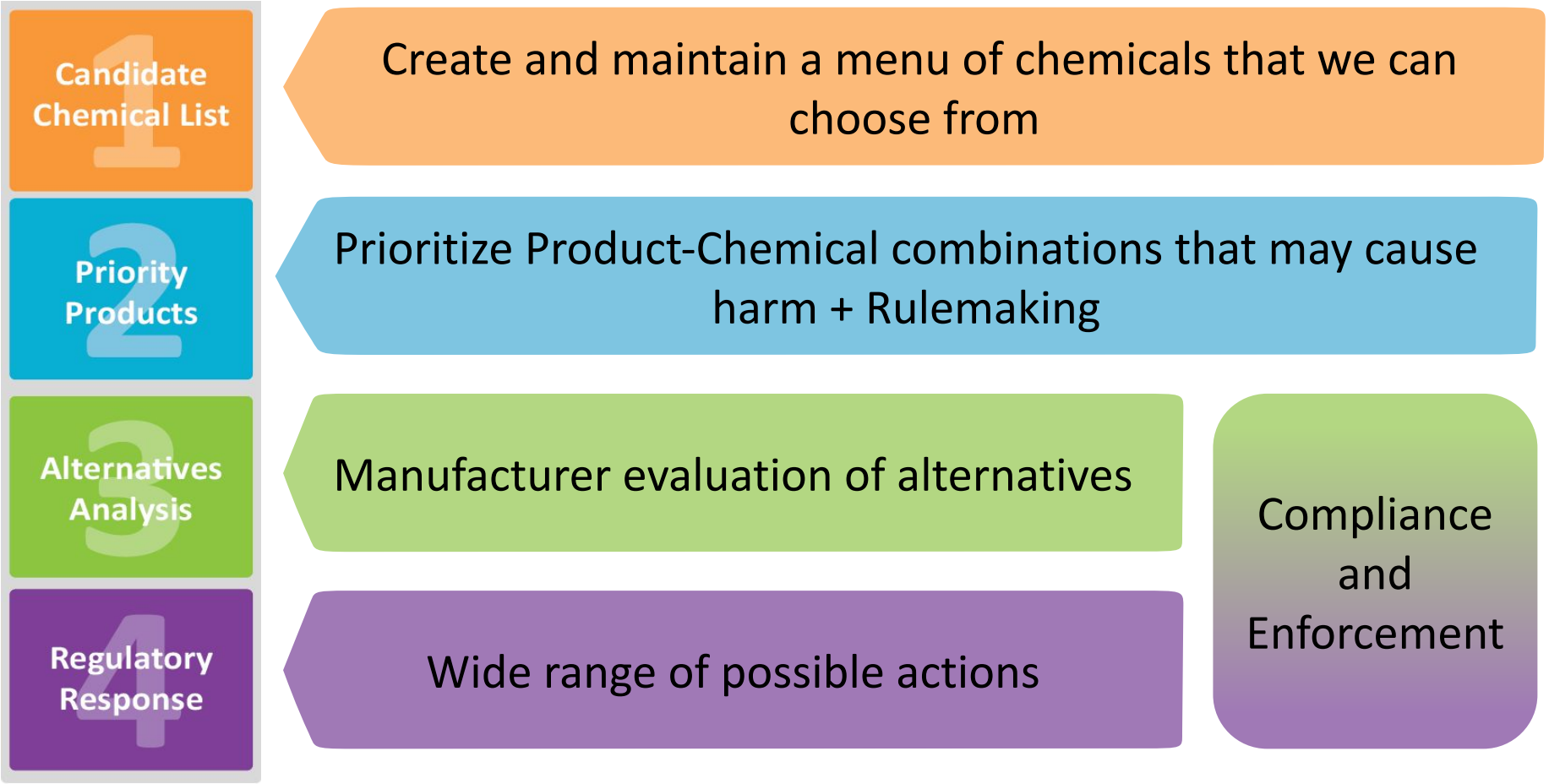
California's Safer Consumer Products Program: Advancing chemically safer products for people and the environment

Anne-Cooper Doherty, Ph.D.
Lead, Chemical Evaluation Unit

April 16, 2024


Manufacturing
Human Receptors
Wastewater Treatment Plant
RECYCLED WATER (PROPOSED)
Drinking Water Treatment Plant
DRINKING WATER
STORMWATER
Surface Water
Groundwater

Safer Consumer Products (SCP) Process



SCP Process

CalSAFER
SAFER CONSUMER PRODUCTS INFORMATION MANAGEMENT SYSTEM

1 Candidate Chemical List

2 Priority Products

3 Alternatives Analysis

4 Regulatory Response

Menu of chemicals that we can choose from

CalSAFER
SAFER CONSUMER PRODUCTS INFORMATION MANAGEMENT SYSTEM

http://calsafer.dtsc.ca.gov

N(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine

Related Priority Product

[No related priority products.]

Basis for Listing

Bioaccumulation - OSPAR Priority Action Part A - **Date Listed** 01/01/2002
Chemicals that are identified on Part A of the list of Chemicals for Priority Action, Oslo and Paris Conventions for the Protection of the Marine Environment of the North-East Atlantic

Environ. Persistence - OSPAR Priority Action Part A - **Date Listed** 01/01/2002
Chemicals that are identified on Part A of the list of Chemicals for Priority Action, Oslo and Paris Conventions for the Protection of the Marine Environment of the North-East Atlantic

Toxicity Undefined - OSPAR Priority Action Part A - **Date Listed** 01/01/2002
Chemicals that are identified on Part A of the list of Chemicals for Priority Action, Oslo and Paris Conventions for the Protection of the Marine Environment of the North-East Atlantic

SCP Process

1 Candidate Chemical List

2 Priority Products

3 Alternatives Analysis

4 Regulatory Response

Prioritize Product-Chemical combinations that may cause harm + Rulemaking

Scope of Products

Priority Products 2

- Exclusions:
  - FIFRA pesticides
  - Prescription drugs
  - Radioactive chemicals
  - Natural toxins

- Priority Product Work Plan = menu of products
  - Released every 3 years

New Work Plan coming soon – input welcomed!

https://dtsc.ca.gov/scp/priority-product-work-plan/

2024-2026 Priority Product Work Plan – Under Consideration

Product Categories Currently Under Evaluation

Priority Products 2

Beauty, Personal Care, and Hygiene Products

Building Products & Materials Used in Construction and Renovation

Products that Contain or Generate Microplastics

Cleaning Products

Children's Products

Paints

2024-2026 Priority Product Work Plan – Under Consideration

Product Categories Intended For Evaluation

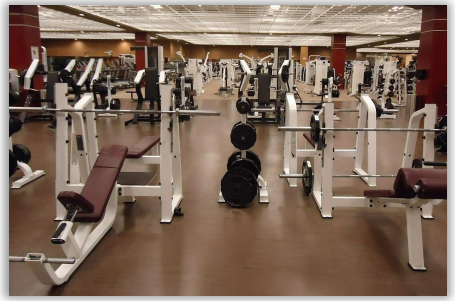
Priority Products 2

Food Contact Articles

Motor Vehicle Parts, Accessories, Maintenance, and Repair Materials

Electronics

Products Used or Produced by Metal Plating and Finishing Facilities



Sporting and Athletic Equipment

Pet Care Products

Priority Product Prioritization Process

Priority Products 2

- Evaluate chemicals in the context of products.
- Consider the **potential** for:
  - Exposure to the chemical from the product
  - Significant or widespread harm from that exposure
- Narrative standard

Work Plan website: https://dtsc.ca.gov/scp/priority-product-work-plan/

Safer Consumer Products Framework

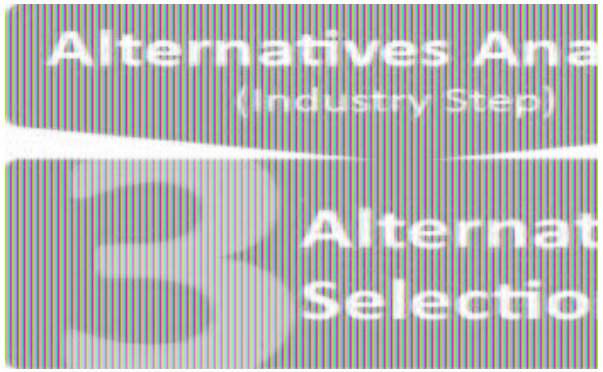
1 Candidate Chemical List

2 Priority Products

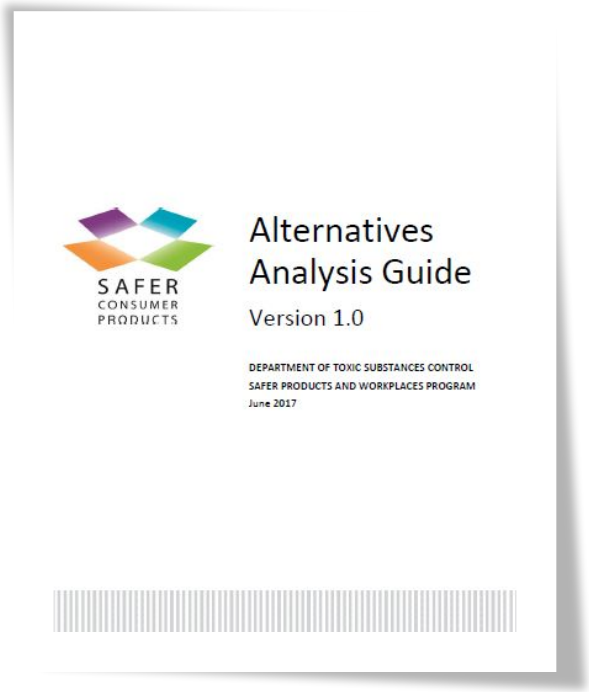
3 Alternatives Analysis

4 Regulatory Response

Manufacturers search for and evaluate alternatives



The AA process seeks to avoid regrettable substitutions



Answers key questions:

- Is it necessary?
- Is there a safer alternative?
- What are the tradeoffs?

Requires:

- Ecological impacts
- Life cycle impacts
- Economic analysis
- Performance evaluation
- Public comment

4 Regulatory Response

- Draft Regulatory Response proposed by DTSC
- Available for public comment
- Final Regulatory Response

The Regulatory Response is customized to each entity

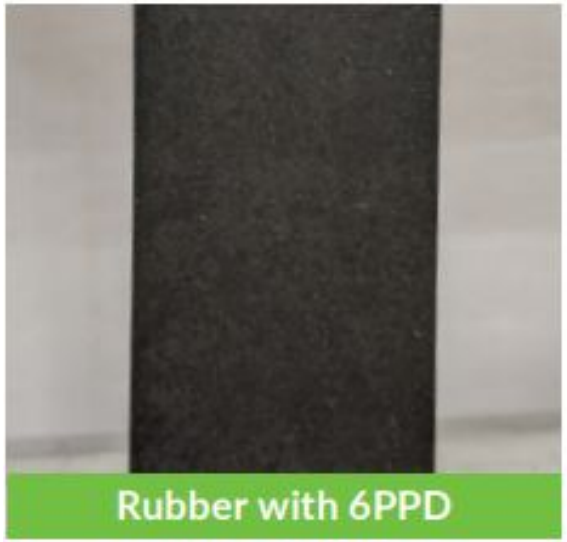
Options include:

- No response
- Additional info to DTSC
- Additional info to consumers
- Additional safety measures
- Sales restrictions/ prohibitions
- End-of-life product stewardship
- Research funding

Priority Product Designation Case Study: 6PPD in Motor Vehicle Tires

6PPD

- Antidegradant (ozone, oxygen)
- Prevents cracking of rubber
- Reacts with ozone to form 6PPD-quinone
  - recently discovered to be acutely toxic to coho salmon, rainbow trout, and brook trout



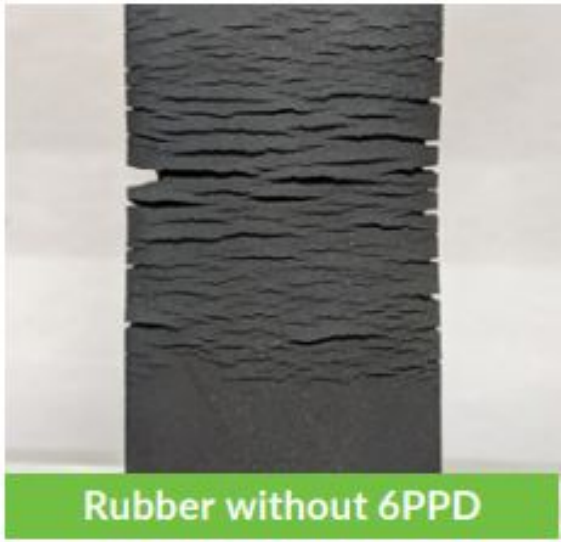


Table 1. Comparison of the Toxicity of 6PPD-Q to Coho Salmon with Those of the Most Toxic Chemicals for Which the U.S. Environmental Protection Agency Has Established Aquatic Life Criteria[a]

chemical class	name	most sensitive species	LC_{50} (ppb)	95% CI	ref	CMC (ppb)	EPA document
OP	parathion	*Orconectes nais*	0.04	0.01–0.2	25	0.065	EPA 440/5-86-007
quinone	6PPD-Q	*O. kisutch*	0.10	0.08–0.11	this study	not available	not available
OC	mirex	*Procambaris blandingi*	0.10	not reported	26	0.001	EPA 440/5-86-001
OP	guthion	*Gammarus fasciatus*	0.10	0.073–0.014	25	0.01	EPA 440/5-86-001
OP	chlorpyrifos	*Gammarus lacustris*	0.11	not reported	27	0.083	EPA 440/5-86-005
OC	endrin	*Perca flavescens*	0.15	0.12–0.18	28	0.086	EPA 820-B-96-001
OC	4,4′-DDT	*O. nais*	0.18	0.12–0.30	25	1.1	EPA 440/5-80-038
OP	diazinon	*Ceriodaphia dubia*	0.25	not reported	29	0.17	EPA-822-R-05-006
metal	cadmium	*Oncorhynchus mykiss*	0.35	not reported	30	1.8	EPA-820-R-16-002
OC	methoxychlor	*O. nais*	0.50	0.25–1.8	25	0.03	EPA 440/5-86-001
OC	dieldrin	*Pteronarcella badia*	0.50	0.37–0.67	28	0.24	EPA 820-B-96-001
OP	malathion	*G. fasciatus*	0.76	0.63–0.92	25	0.1	EPA 440/5-86-001
OC	toxaphene	*Ictalurus punctatus*	0.8	0.5–1.2	31	0.73	EPA 440/5-86-006

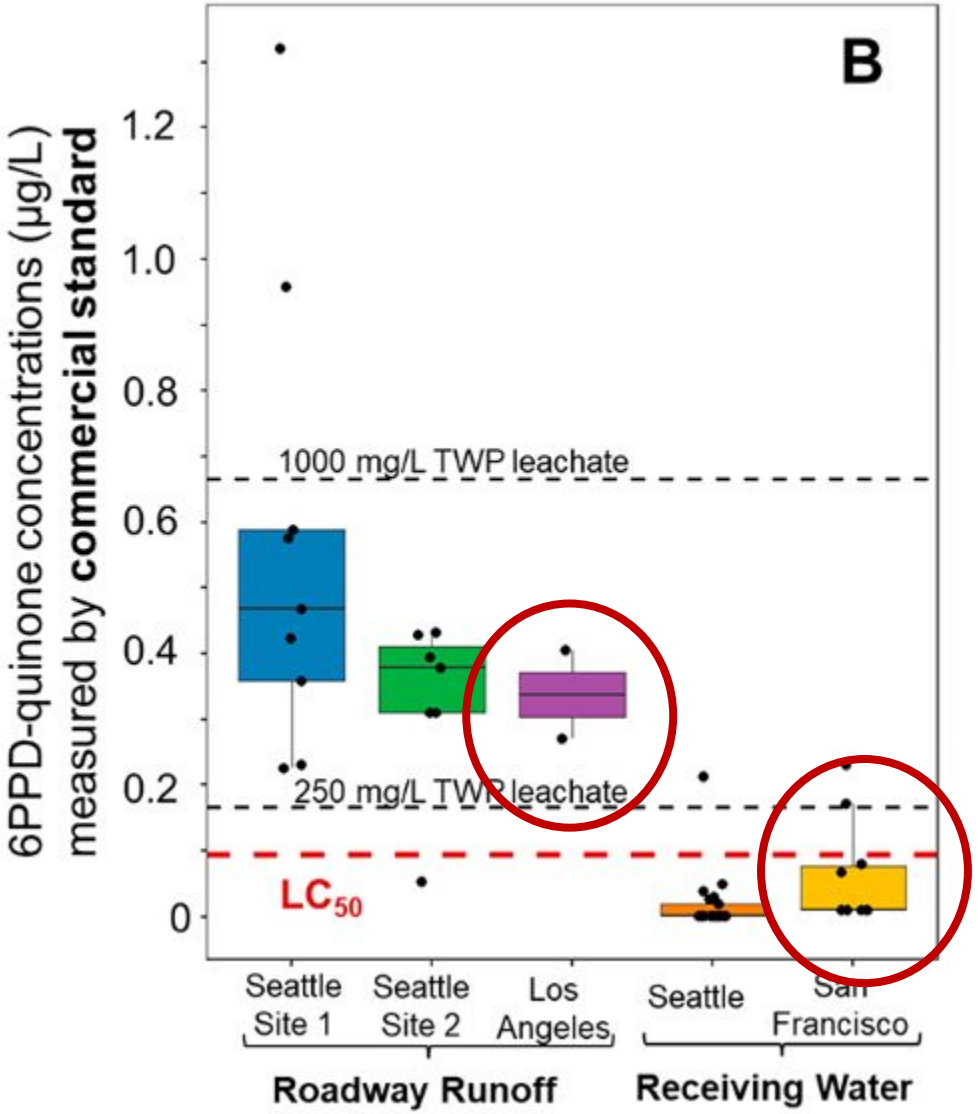
ustires.org/sites/default/files/2022-02/USTMA-6PPD-0120-v2.pdf

Potential for Exposure to 6PPD, 6PPD-Quinone from Tires

- Used in presumably all tires
- High rates of release of tire wear particles containing 6PPD, 6PPD-quinone to the aquatic environment
- End-of-life applications may further contribute
- Detections of 6PPD-quinone in California runoff and waterways

Potential for Significant Adverse Impacts

- 6PPD toxic at multiple trophic levels
- 6PPD-quinone acutely toxic to coho, an endangered species, at a variety of life stages
- Environmental detections of 6PPD-quinone in California above the concentration that kills half of the exposed coho
- Impacts to California's Native American tribes



Tian et al. (2022)

Leading the way on 6PPD

FINAL REGULATORY TEXT

May 2023

SAFER CONSUMER PRODUCTS REGULATIONS – Listing Motor Vehicle Tires Containing N-(1,3-Dimethylbutyl)-N′-phenyl-p-phenylenediamine (6PPD) as a Priority Product

Department of Toxic Substances Control reference number: R-2022-04R

Amend section 69511 and adopt section 69511.7, to article 11, chapter 55, division 4.5 of title 22 of the California Code of Regulations, to read as follows:

Section 69511. General.

(a) This article specifies product-chemical combinations listed as Priority Products pursuant to section 69503.5.

- Regulations effective October 2023
- First agency in the world to regulate 6PPD in tires
- Preliminary Alternatives Analyses were due March 29, 2024
  - 33 PAAs submitted by the USTMA consortium, 20 from non-USTMA manuf
  - Total of about 10 unique PAAs of varying quality
  - Alternatives under evaluation include PPD derivatives, graphene, lignin, TMPPD (Durazone 37), Irganoz 1076 (hindered phenol), SP-120 DLD (styrenated phenol), and SA 6000

Ongoing Work Related to CECs

Additional Work on Tires

- Proposed Priority Product: Motor Vehicle Tires Containing Zinc
  - Working on finalizing rulemaking proposal documents

- Other Chemicals in Tires and Motor Vehicles:
  - Proposed expansion of product category
  - Continue to monitor and evaluate

Candidate Chemical Additions

- Potential CC List Addition: PPD Derivatives
  - Require additional scrutiny during the AA process for 6PPD
  - Rulemaking later this year

- Potential CC List Addition: Microplastics
  - Finishing the External Scientific Peer Review process
  - Rulemaking coming soon

PFAS

Commentary

A Section 508–conformant HTML version of this article is available at https://doi.org/10.1289/EHP7431.

Regulating PFAS as a Chemical Class under the California Safer Consumer Products Program

Simona Andreea Bălan,[1] Vivek Chander Mathrani,[1] Dennis Fengmao Guo,[1] and André Maurice Algazi[1]

[1]Safer Consumer Products Program, California Department of Toxic Substances Control, Sacramento, California, USA

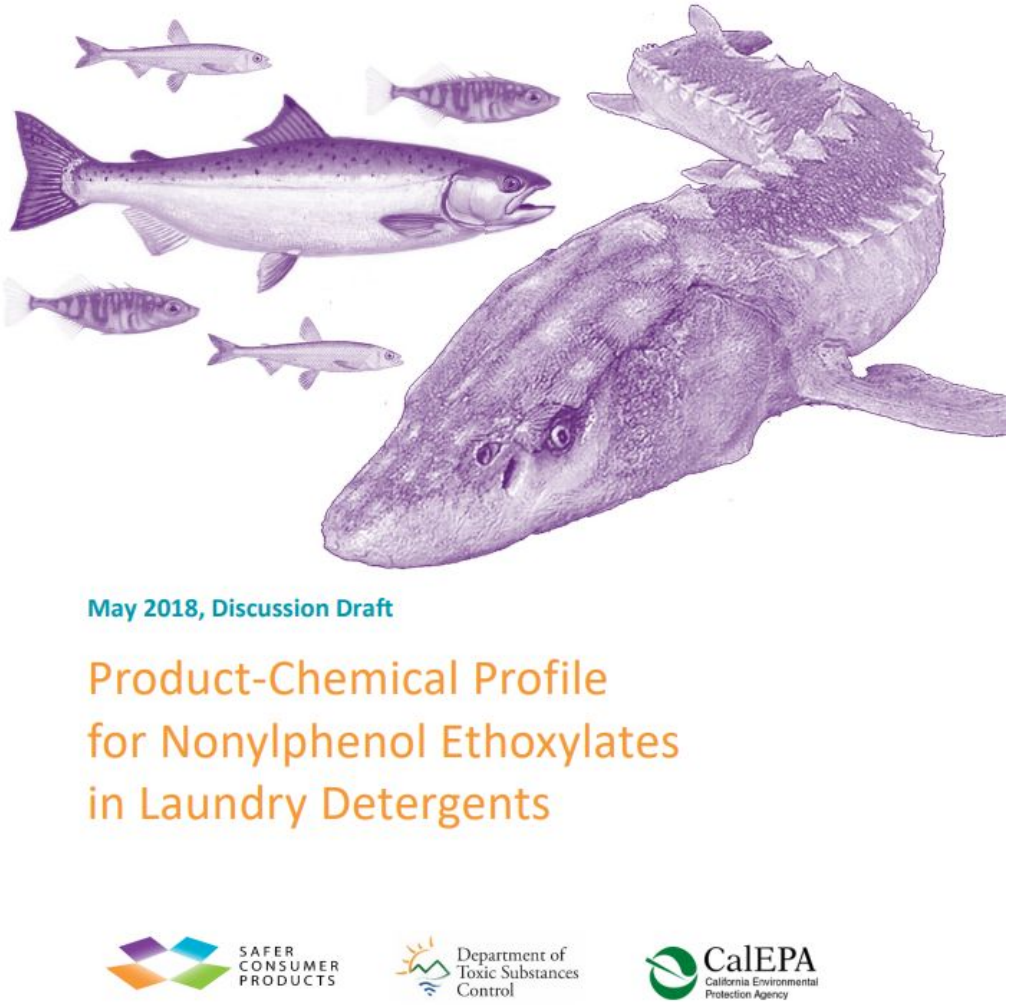
BACKGROUND: Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a group of manmade chemicals containing at least one fully fluorinated carbon atom. The widespread use, large number, and diverse chemical structures of PFAS pose challenges to any sufficiently protective regulation, emissions reduction, and remediation at contaminated sites. Regulating only a subset of PFAS has led to their replacement with other members of the

- Two Adopted Priority Products:
  - Carpets and Rugs Containing PFAS
  - Treatments Containing PFAS for use on Converted Textiles or Leathers
- Our Technical document on Food Packaging Containing PFAS heavily informed subsequent legislation
- Evaluating as part of work on Artificial Turf
- Class based approach

Nonylphenol Ethoxylates

- Proposed Priority Product: Laundry Detergents Containing Nonylphenol Ethoxylates

- Rulemaking proposed, finalizing now



Additional Screening/Early Research

- Quaternary Ammonium Compounds in Personal Care and Cleaning Products
  - Background document to be released and workshop held later this year

- Artificial Turf
  - Background document to be released and workshop held later this year

Questions?

annecooper.doherty@dtsc.ca.gov

Update on Water Board's Constituents of Emerging Concern (CECs) Program Strategic Plan

Emerging Contaminants Working Group Meeting

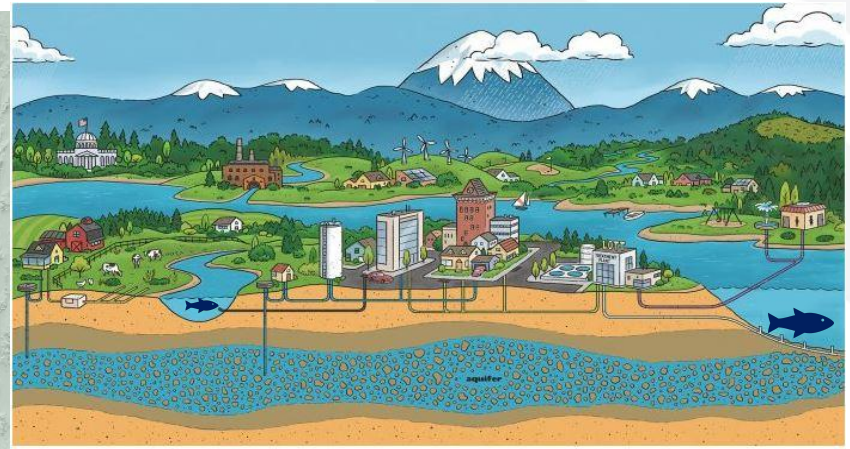
Erica Kalve
Senior Engineering Geologist
Division of Water Quality

CALIFORNIA Water Boards

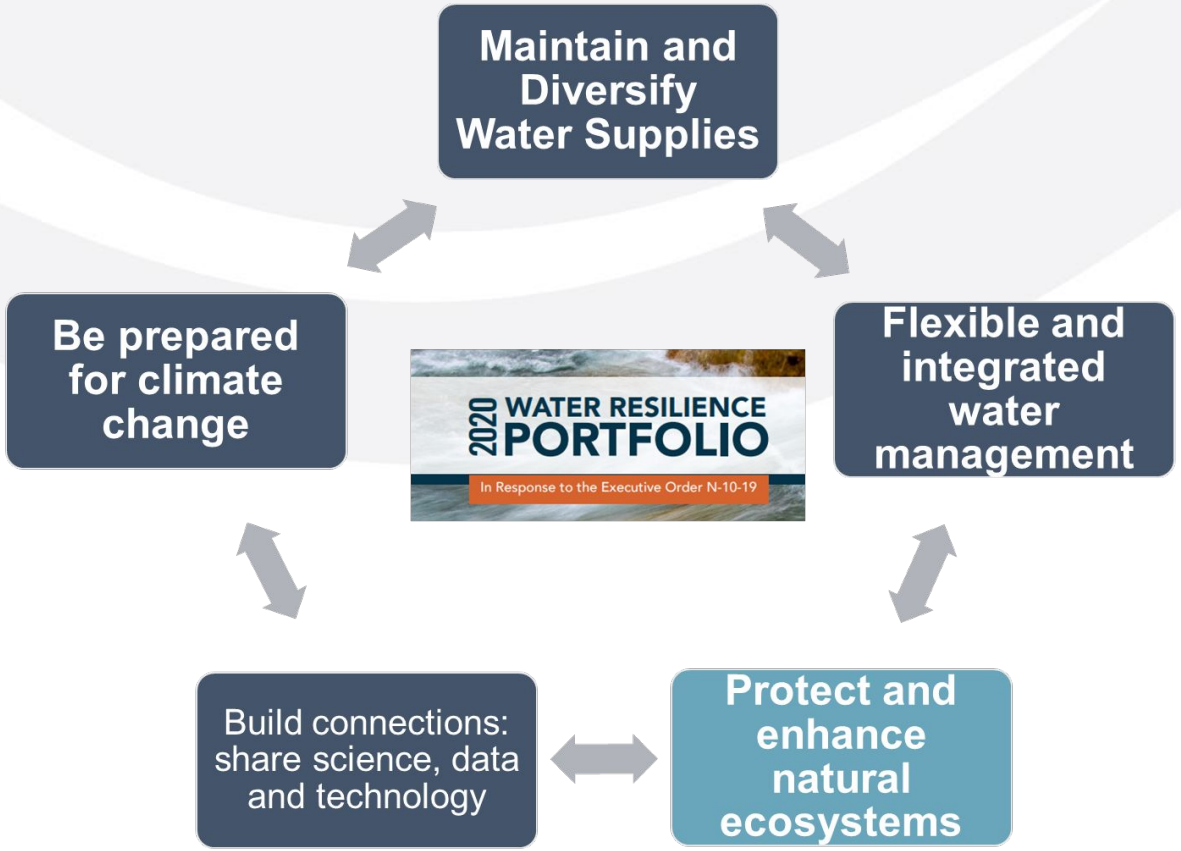
California CECs Program

April 16, 2024

Water Quality, Water Resiliency, and Protecting California's Aquatic Ecosystems



The urban cycles moves water through a system of pipes. Photo courtesy: WET Science Center



Impetus for CEC Programmatic Approach

(late 90s to early 2000s)

Monitoring and management based on local requirements

(2006)

Stakeholders requested holistic approach

(2009; and 2013, 2018)

Development of the Recycled Water Policy

(2015 to current)

Program development for data driven process guided by risk-based framework

CEC Program Team

The CEC Program is a technical resource for the Water Boards to guide decision-making processes and address issues with CECs.

Claire Waggoner
Environmental Program Manager
Sustainable Water Plans and Policies

Erica Kalve, P.G
Senior Engineering Geologist
Pretreatment and CEC Unit

Sarabeth George, M.Sc.
Engineering Geologist
Pretreatment and CEC Unit

Manoela Romano de Orte, Ph.D.
Research Scientist III
Pretreatment and CEC Unit

CEC Program Extended Team

Maggie Monahan, P.E.
Senior Water Resource Control Engineer
San Francisco Bay Region

Wendy Linck, P.G.
Senior Engineering Geologist
State Board PFAS Lead

Claire Waggoner
Environmental Program Manager
Sustainable Water Plans and Policies

Erica Kalve, P.G.
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Sarabeth George, M.Sc.
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Research Scientist III
Pretreatment and CEC Unit

CEC Program Support

Steering Committee

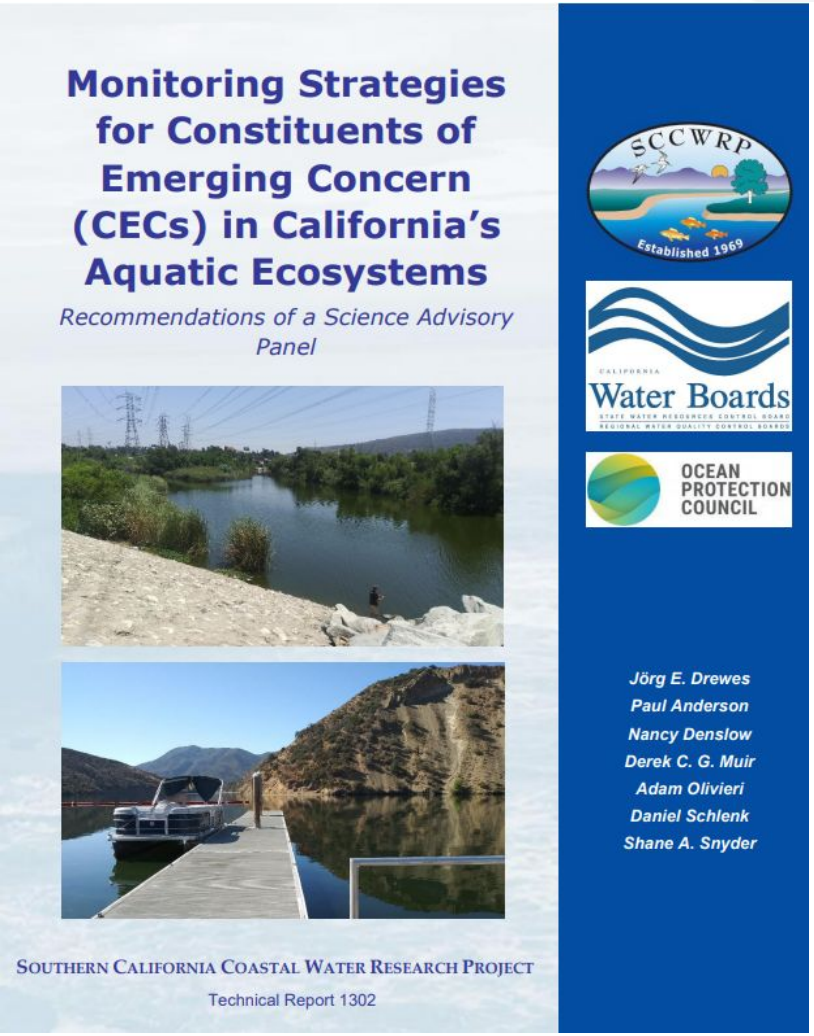
- Comprised of 12 members
- Representatives from OIMA, DWQ, DDW, Region 2, Region 4, Region 5, and Region 8
- Role:
  - Make recommendations for CEC Program priorities
  - Offer guidance and expertise to inform CEC Program decisions
  - Facilitate communication within the Water Boards (e.g., DMC) and externally

Technical Team

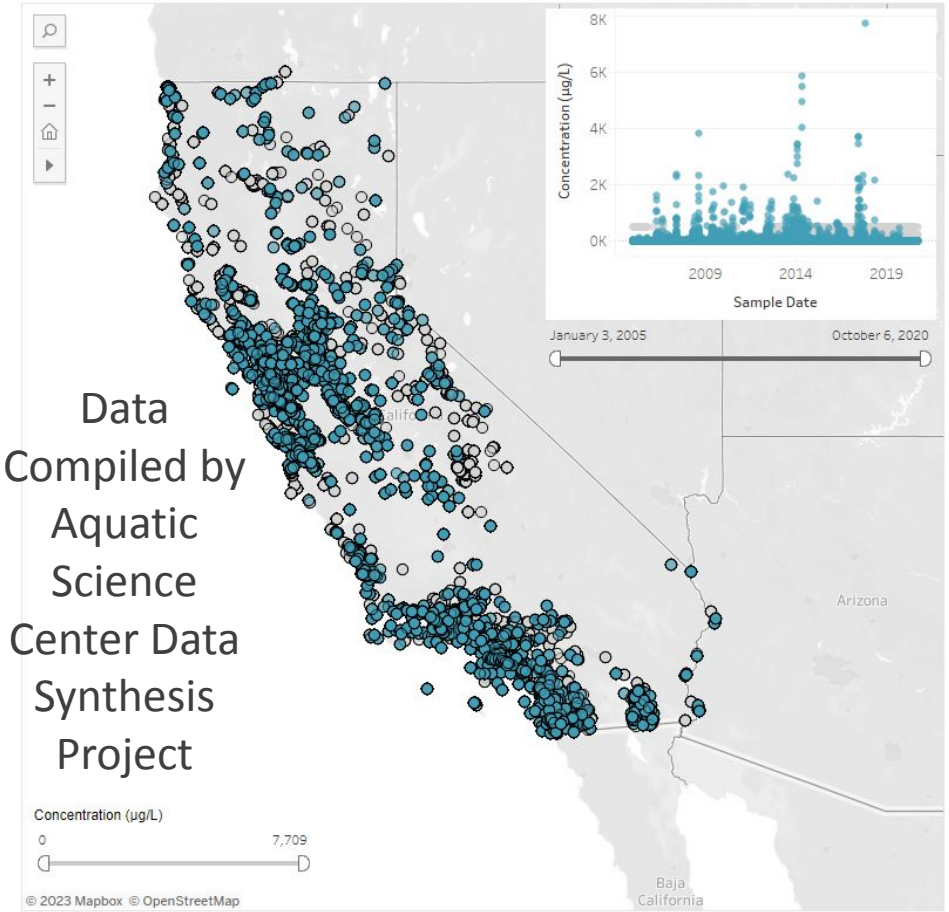
- Comprised of ~20 Water Boards staff
- Representatives from OIMA, DWQ, DDW, and many regional water boards
- Role:
  - Provide technical input and expertise
  - Communicate regional priorities and interests
  - Develop recommendations for CEC program activities, and priorities
  - Facilitate communication within the Water Boards and externally

CEC Program Milestones

Constituents of Emerging Concern (CEC) | California State Water Resources Control Board



Aquatic Ecosystems Interactive Tableau



Data Compiled by Aquatic Science Center Data Synthesis Project

Bioassay Toolbox Project – June 2024

Freshwater Preliminary Screening Results

~100 High Priority

~25 Moderate Priority

~65 Low Priority

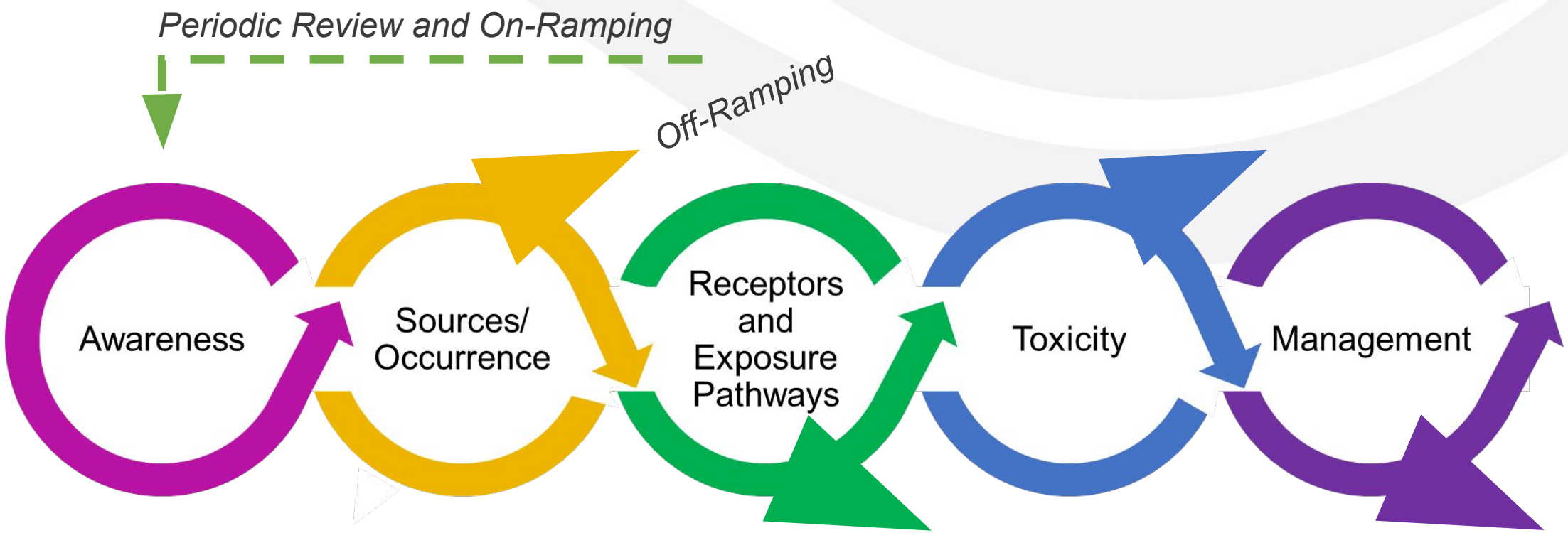
~115 No Concern

- ✔ Pesticides
- ✔ Pharmaceuticals
- ✔ AP/APEs
- ✔ Phthalates
- ✔ PBDEs
- ✔ BFRs
- ✔ PFAS
- ✔ PCPs
- ✔ Bisphenols
- ✔ OPEs
- ✔ Natural toxins

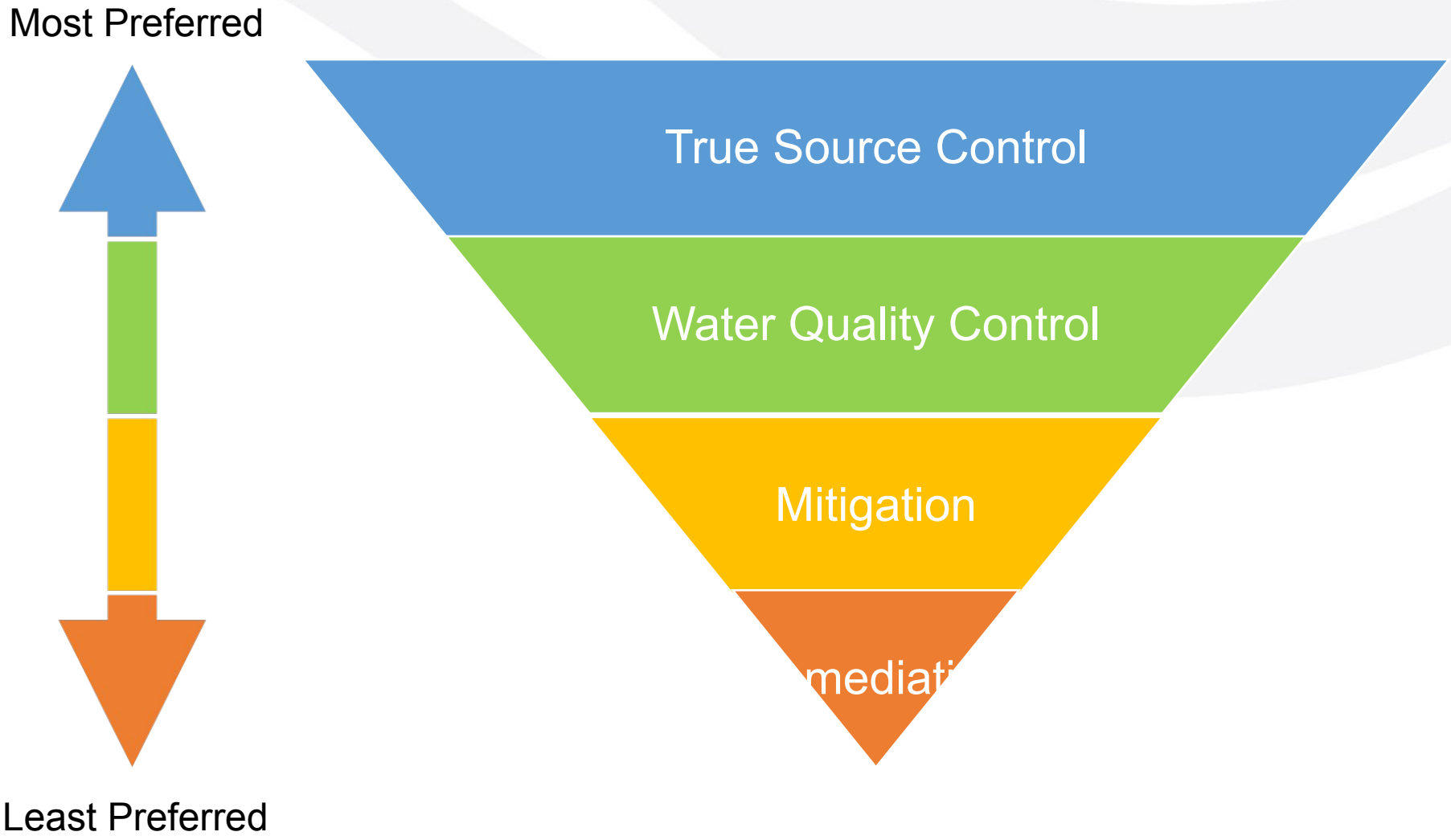
CEC Definition

Any Substance	Any Media	Without Environmental / Health Standard	Incomplete Physiochemical Characterization
• Chemical • Biological • Radiological	• Soil • Water • Air (via aerial deposition) • Biota	• Notification Level • MCL • Water Quality Objective • TMDL	• Occurrence • Fate • Transport • Toxicology • Analytical Method

CEC Lifecycle



CEC Management Approach



Risk-Based Prioritization Processes

Current – Targeted Data and Toxicity Thresholds

Summarize Data

Identify

Prioritize

Future – Non-Targeted Analyses

Traditional monitoring

- Targeted Chemistry
- Whole organism toxicity test

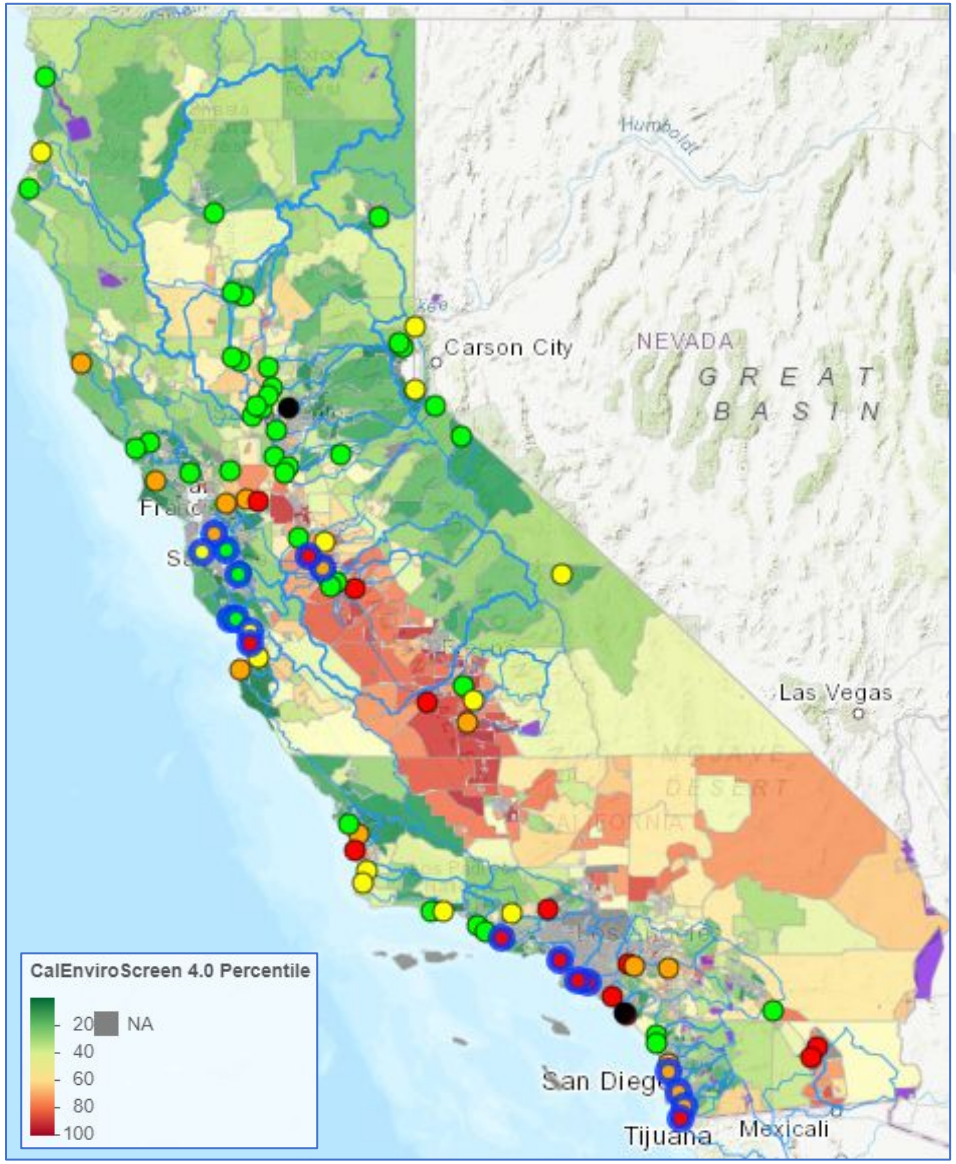
Next generation monitoring

- Non-targeted chemistry
- Bioanalytical cell assays
- Other effects-base d tools

Upcoming Program Actions & Documents

CEC Program Strategic Plan	• Describes how the Program will guide decision-making processes to address issues with CECs
Quality Assurance Program Plan	• Roadmap for implementing quality control measures for CEC monitoring in the State
Data Management Plan	• Describes CEC data management procedures as well as the process to compile CEC data from statewide databases
Gain Experience Using Advanced Monitoring Tools	• Support current efforts to further develop the necessary skills to appropriately apply advanced monitoring tools for CECs monitoring and management
Program Mapping	• Leverage experience working on current CEC issues and projects (e.g., PFAS, microplastics, 6PPD-quinone, etc.) and create a map for optimal coordination on future issues and topics

Collaboration with Existing Statewide Monitoring Programs



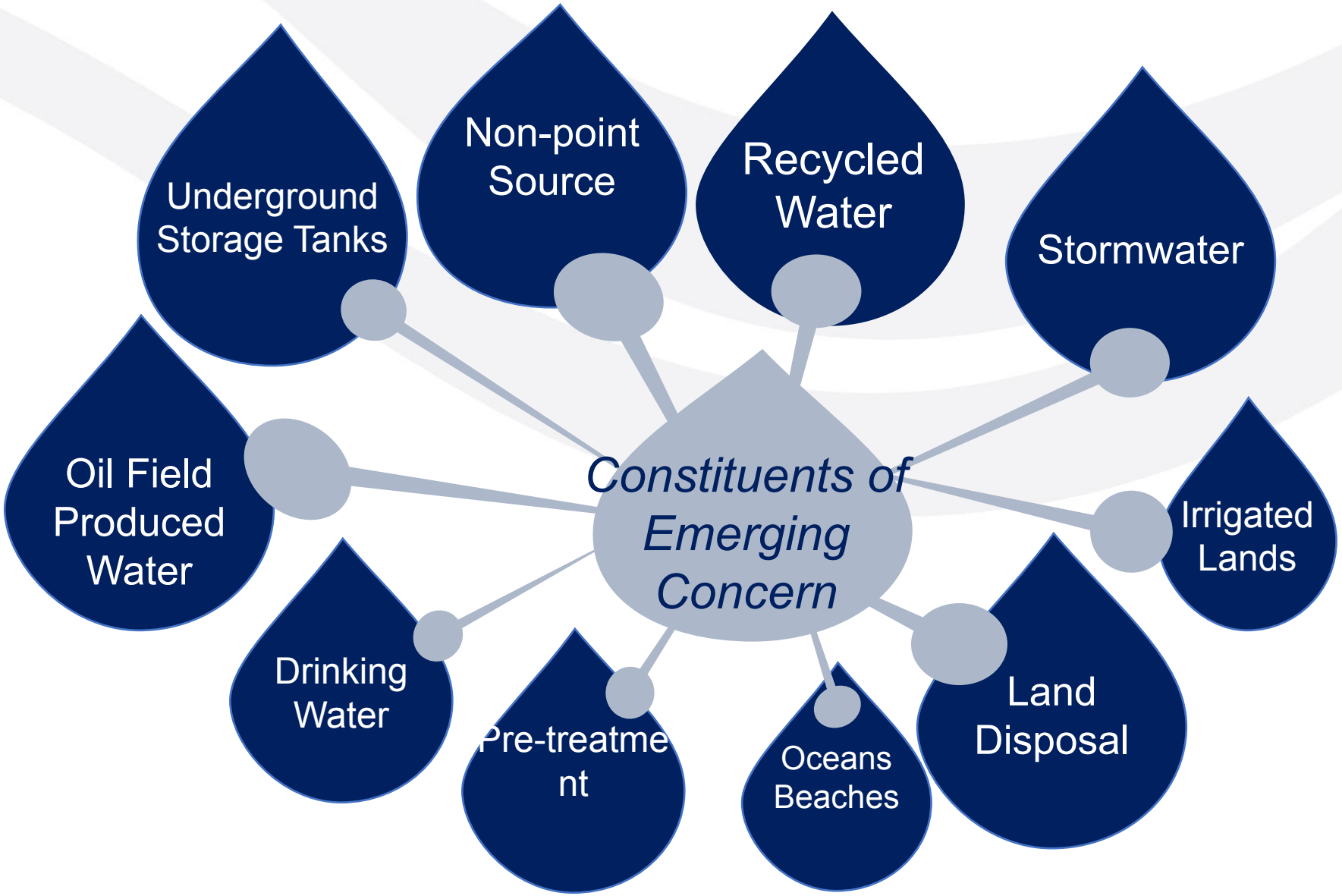
Stream Pollution Trends Monitoring Program (SPoT)

Goal: Leverage SPoT's annual sediment chemistry and toxicity monitoring by adding surface water analyses and advance monitoring tools

Cell Bioassays

Non-Target Analysis

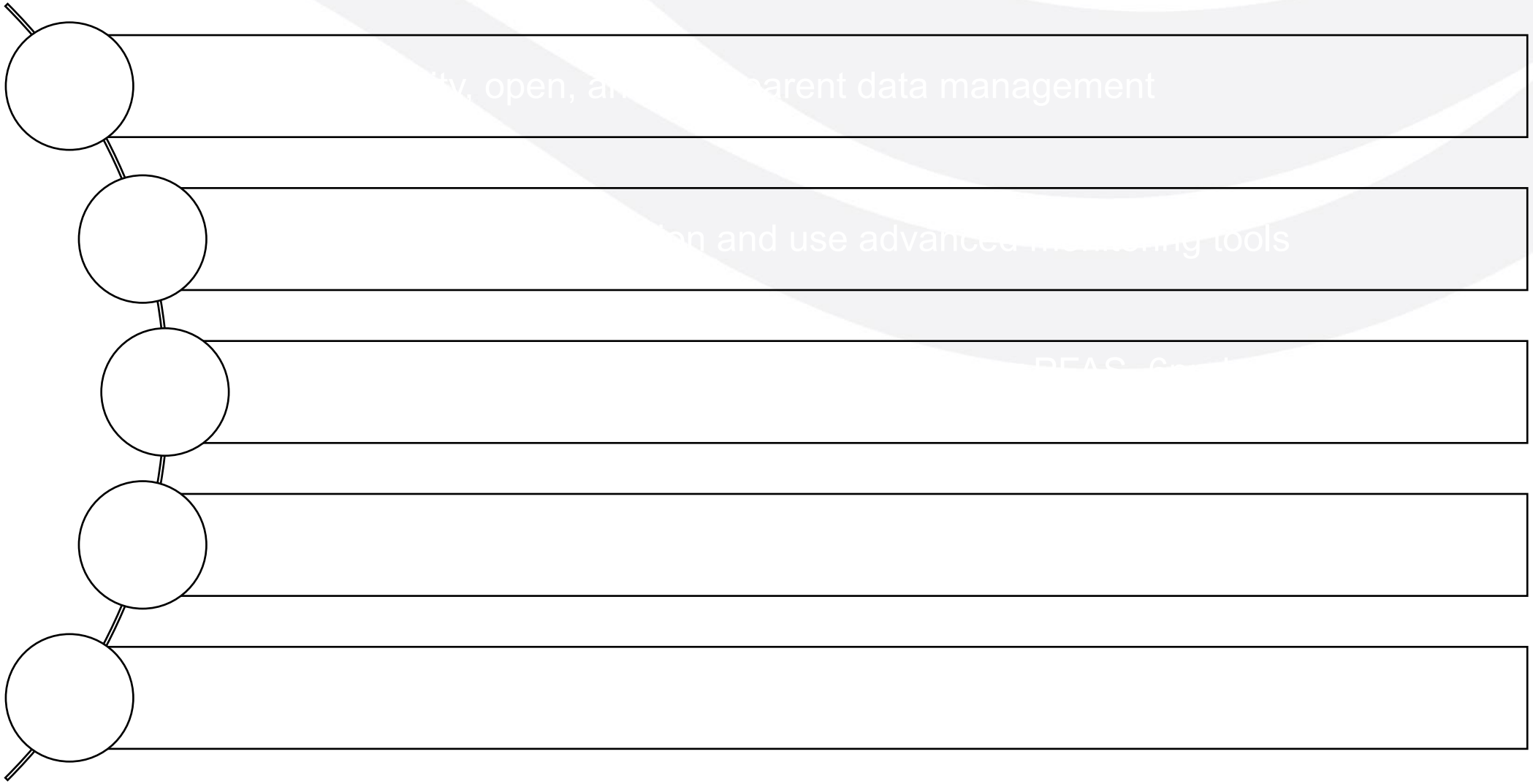
CEC Program – Internal Program Coordination



Achieve Program Goals and Objectives by Working with Many Partners

Government Agency	And more!
Tribes and Interested Parties	California Native American Tribes (Tribes), non-governmental organizations, academic, research, association, public entities/utilities, community organizations, other members of the public

Key Take Home Messages



Thank You!

Follow up with us at
EmergingContaminants
@waterboards.ca.gov

Check out the
Program website at
www.waterboards.ca.gov/water_issues/cec/index.html

Update on PFAS in SF Bay

Preliminary Findings

Miguel Mendez

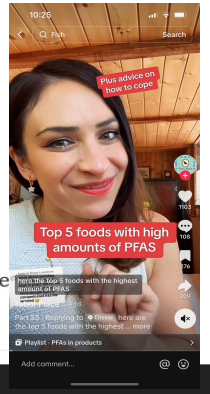
ECWG Meeting

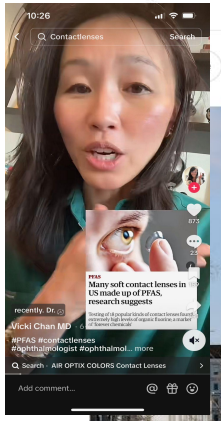
4/17/2024

Per- and Polyfluoroalkyl Substances (PFAS)

3M Reaches $10.3 Billion Settlement in 'Forever Chemicals' Suits

The deal followed an agreement by Chemours, DuPont and Corteva to pay $1.19 billion to help resolve claims that the chemical manufacturers contaminated drinking water across the country.





The headquarters of 3M in Maplewood, Minn., in 2020. The company is suits accusing chemical manufacturers of contaminating drinking wate
Pfosi/Reuters

By Lisa Friedman and Vivian Giang
June 22, 2023

Biden Administration to Restrict Cancer-Causing 'Forever Chemicals'

The government will strictly limit in drinking water two chemicals that are ubiquitous in modern society but are linked to a range of health effects.

Share full article 146

YOUR HEALTH

Lots of Tap Water Contains 'Forever Chemicals.' Take These Steps to Reduce Your Risk.

You can't avoid toxic PFAS chemicals completely but you can lessen your exposure at home

WISCONSIN

Island residents seek $40M from Wisconsin city over PFAS contamination

In a Wisconsin town over 500 wells were found to be contaminated with PFAS as of June 2021

Associated Press

Published July 14, 2023 2:16pm EDT

The New York Times Magazine

'Forever Chemicals' Are Everywhere. What Are They Doing to Us?

PFAS lurk in so much of what we eat, drink and use. Scientists are only beginning to understand how they're impacting our health — and what to do about them.

EPA proposes first standards to make drinking water safer from 'forever chemicals'

By Jen Christensen, CNN
Updated 3:53 PM EDT, Wed March 15, 2023

Photo: iStock/sonsam

Forever Chemicals Are in Nearly Half of America's Tap Water. Here's How to Reduce Your Exposure.

PUBLISHED JULY 24, 2023

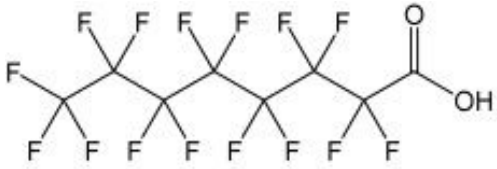
Tim Heffernan

Clean, safe drinking water is a luxury that many people in the United States take for granted. But your tap water may not be as safe as you think.

Per- and Polyfluoroalkyl Substances (PFAS)

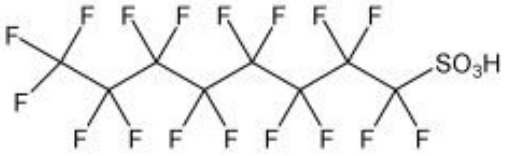
PFOA

Perfluorooctanoic acid



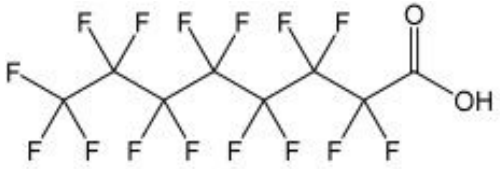
PFOS

Perfluorooctane sulfonic acid



Per- and Polyfluoroalkyl Substances (PFAS)

PFOA
Perfluorooctanoic acid



PFOS
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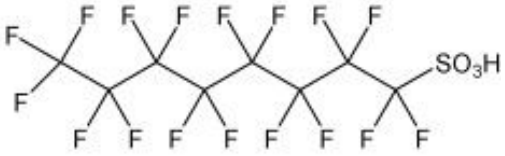
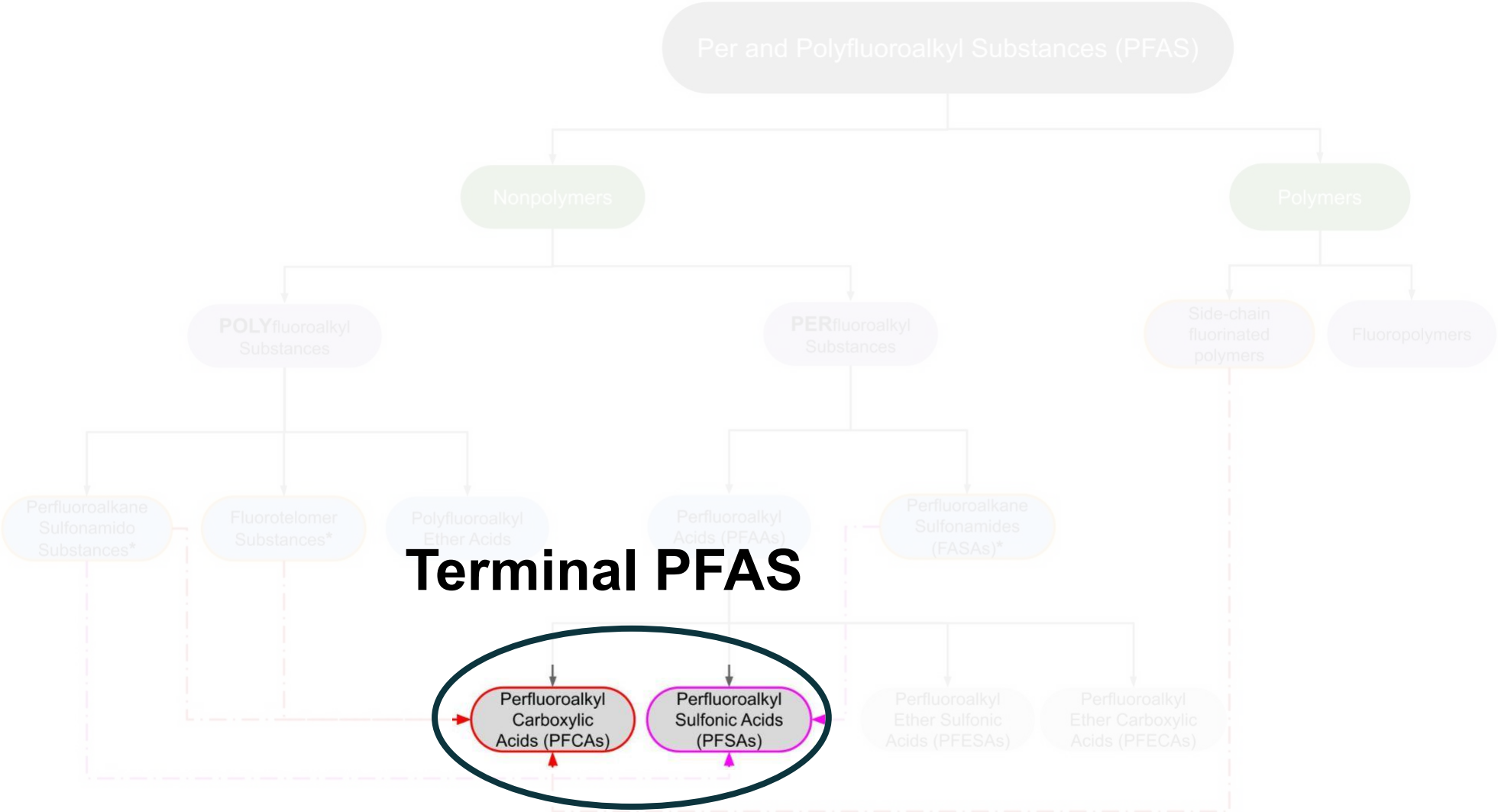


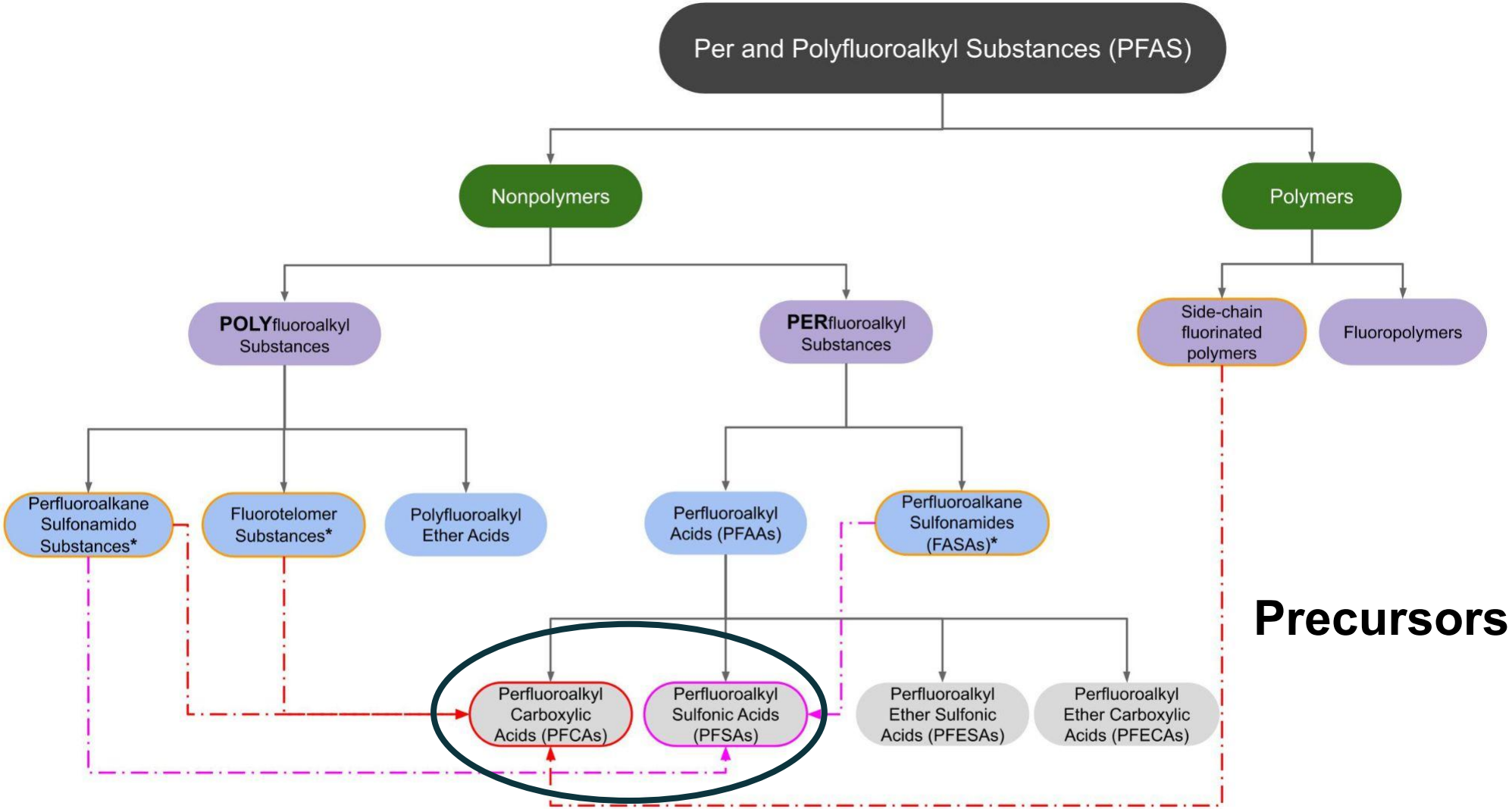
PFCAs
Perfluorocarboxylic Acids

PFSAs
Perfluorosulfonic Acids

Long-Chain: **≥ 8 Carbons** **≥ 6 Carbons**

Terminal PFAS

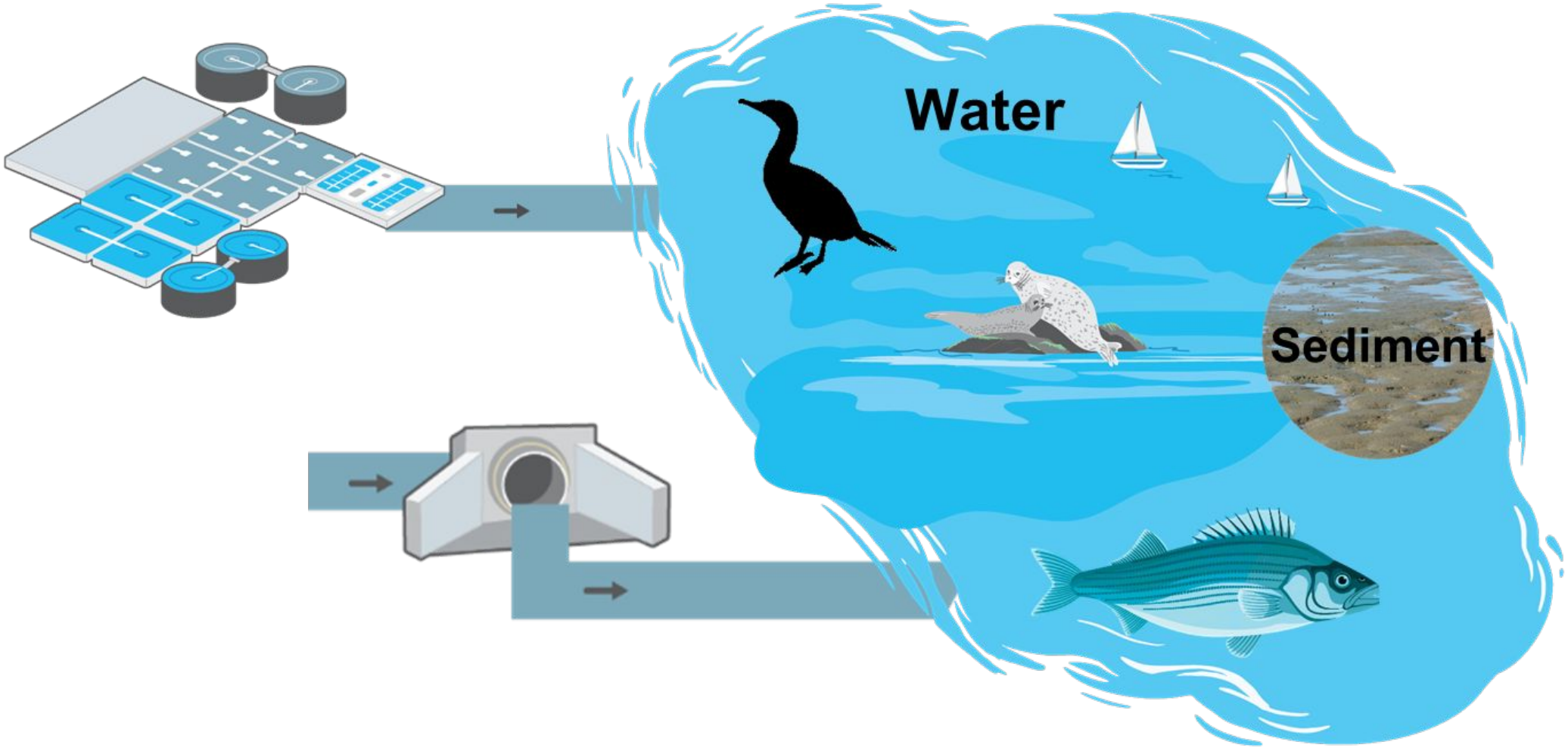




Precursors

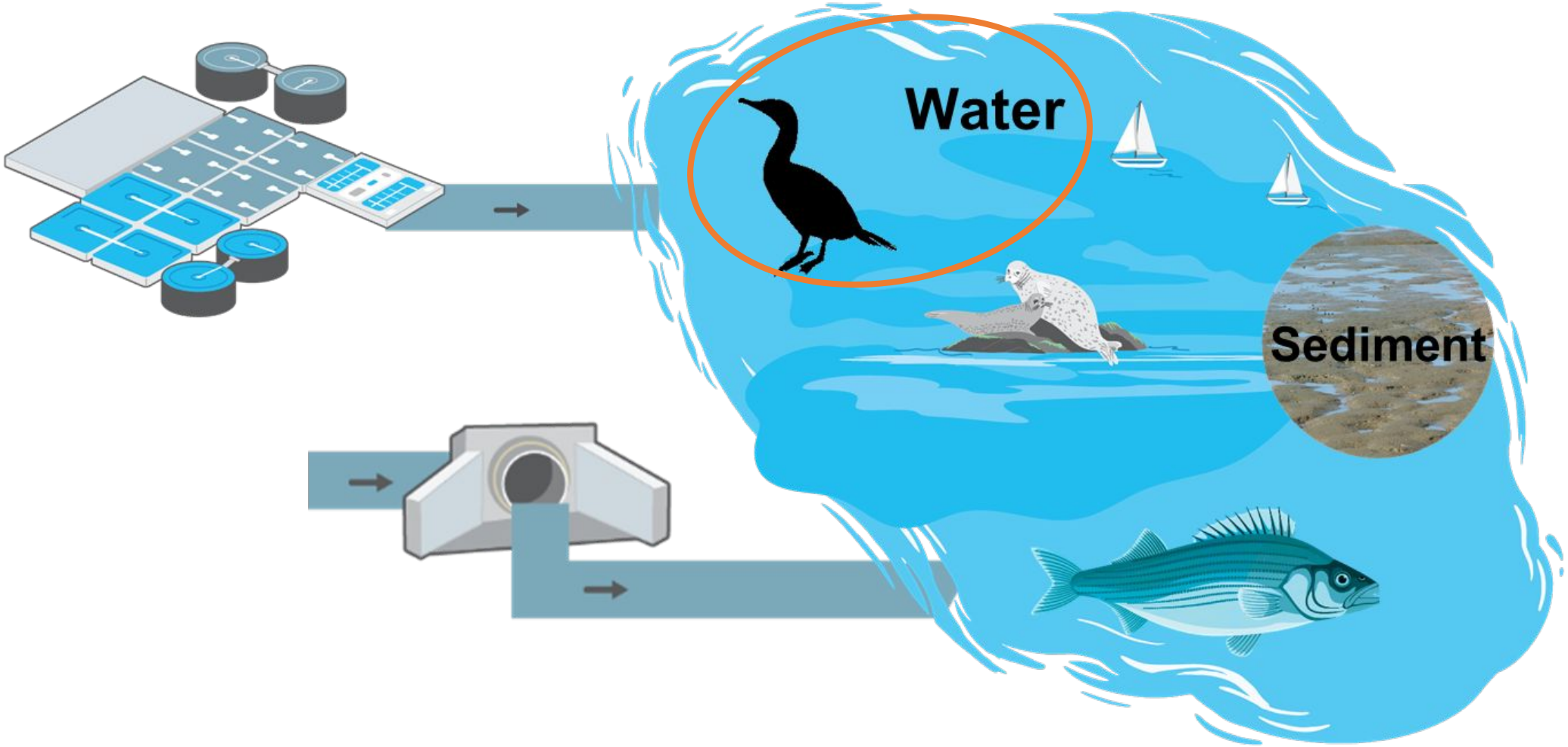
Precursors

Monitoring *PFAS* in San Francisco Bay



RMP

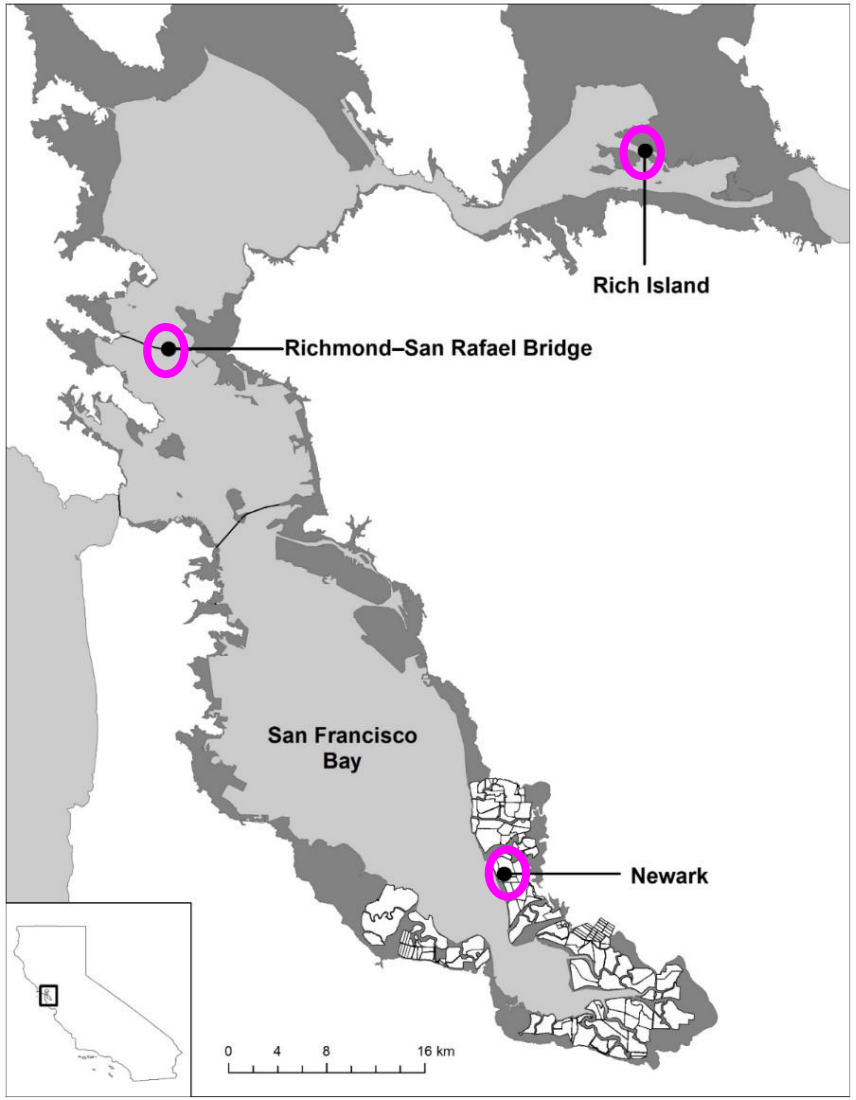
Monitoring *PFAS* in San Francisco Bay



RMP

Bird Eggs: Sampling and Analysis

- Began in 2006
  - Near double-crested cormorant nesting sites
  - 3 sites each monitoring year
- Most recently in 2022
  - 10 composite samples
  - Expansion from 13 to 40 analytes (EPA Method 1633)



Bird Eggs: 2022 Results

- 18 Analytes detected
  - 14 detected in 100% of samples
  - 10 for the first time
- PFOS predominantly detected

  Range: 37-251 ng/g *Median: 97 ng/g*
- 7:3 FTCA and PFDA next highest

  Medians: 29 & 10 ng/g
- Long-chain PFCAs widely found (C_8 - C_{14})

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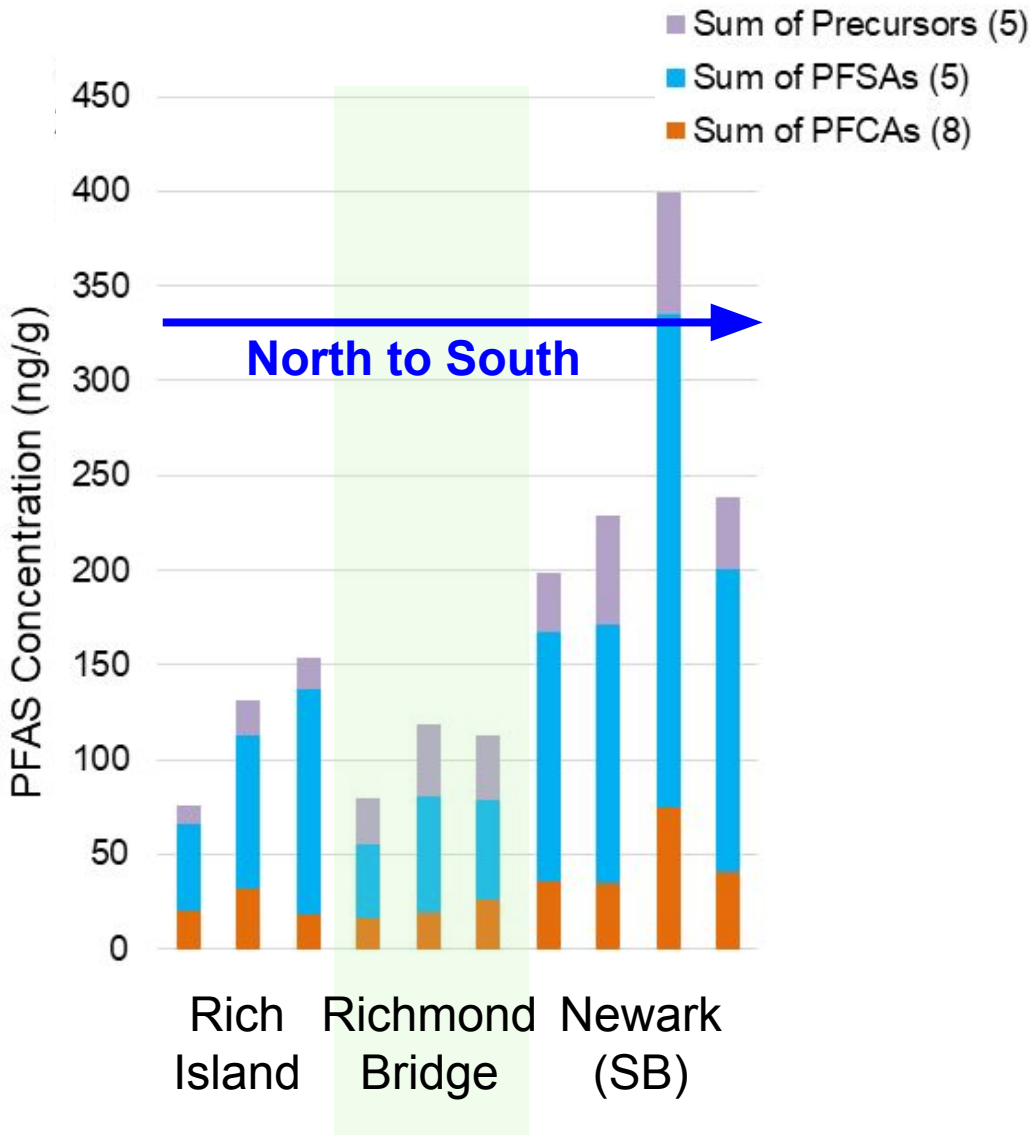

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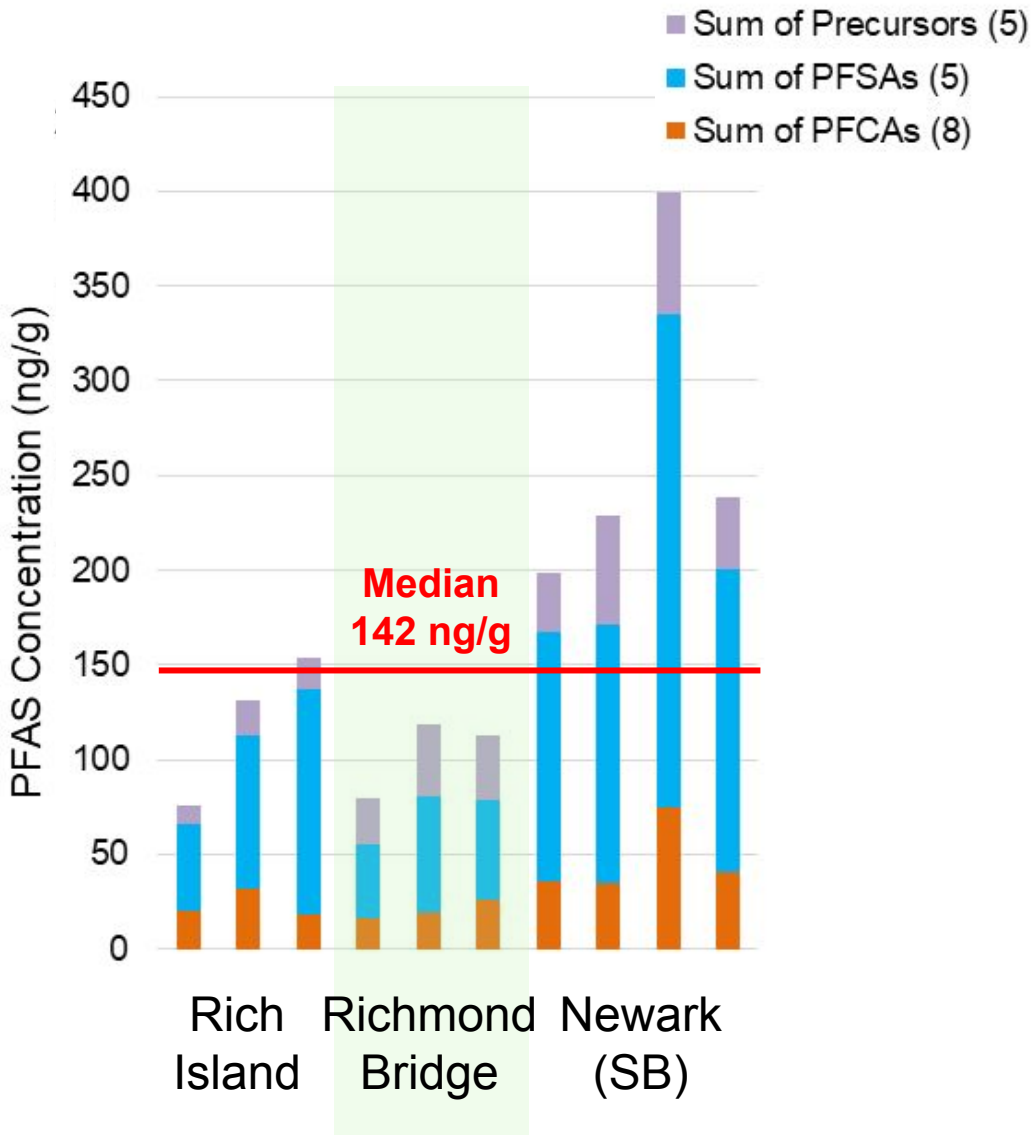
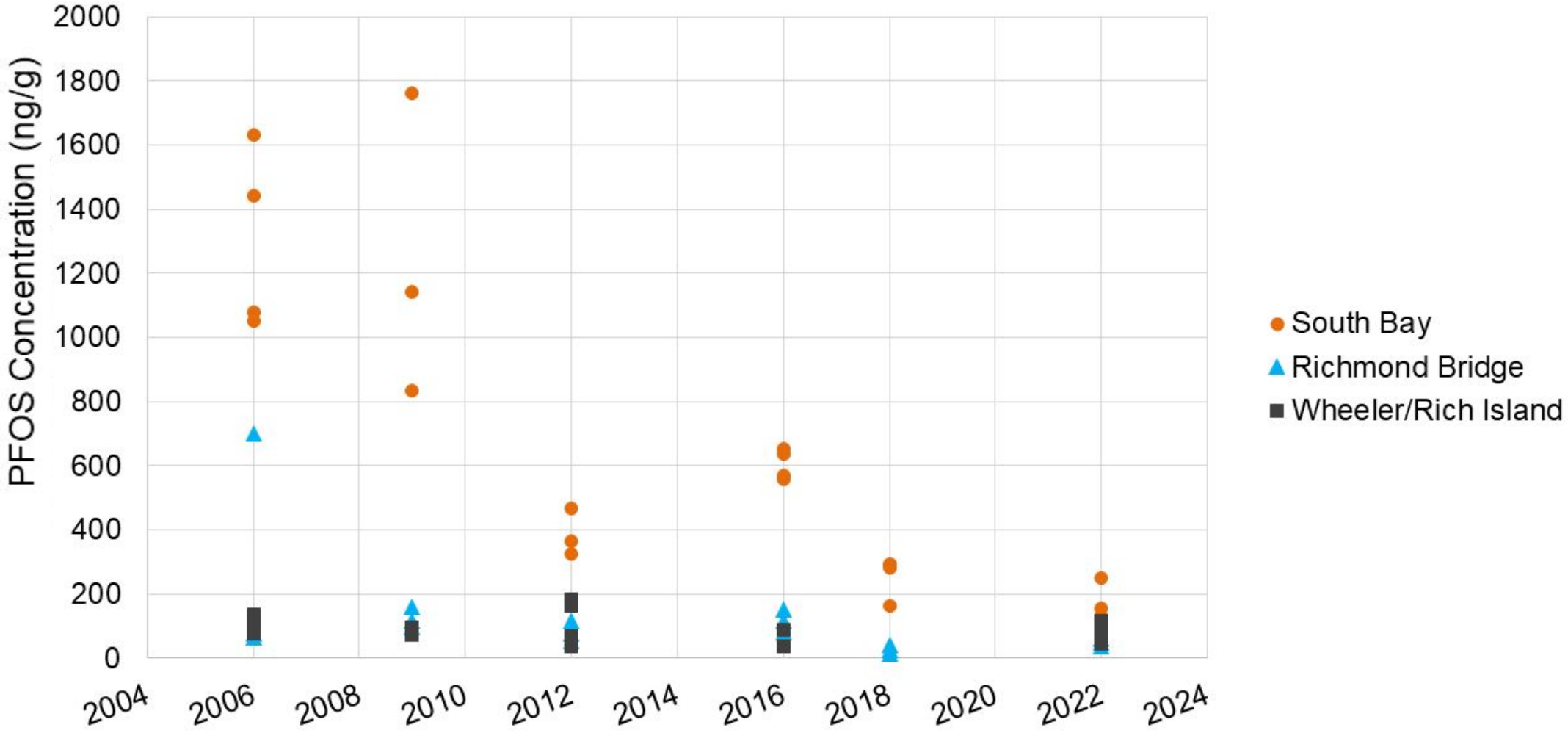


Bird Eggs: PFOS Declines in South Bay 2006-2022



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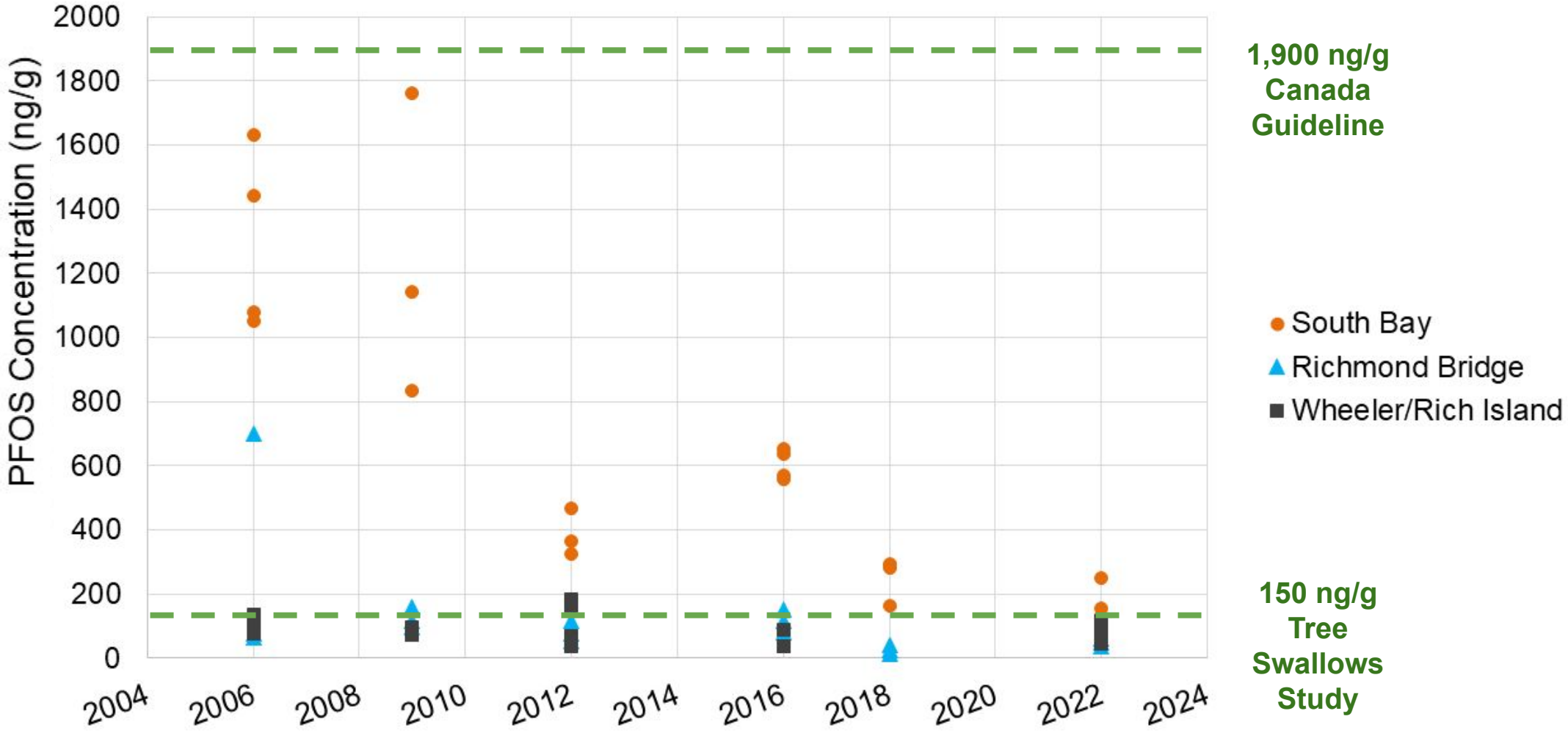
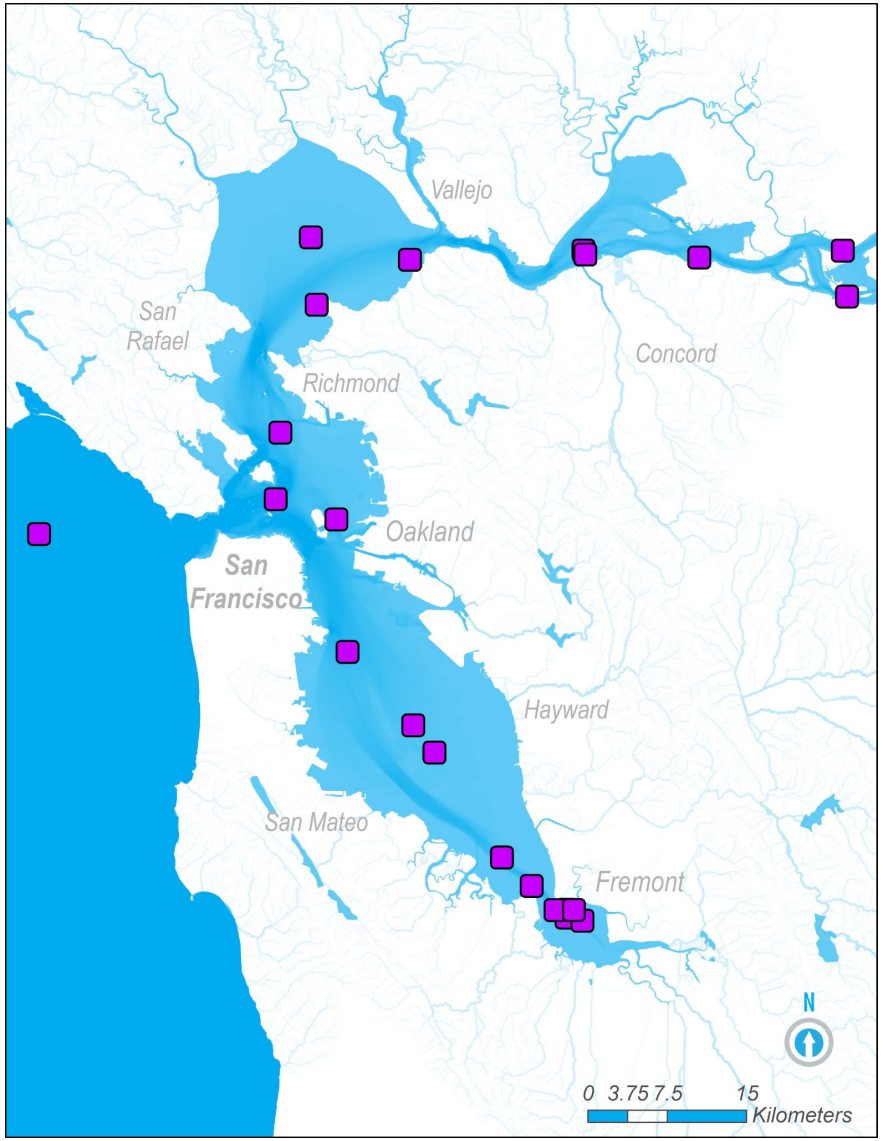


Main Takeaways

- PFAS detected across the Bay
  - Many new PFAS detected especially 7:3 FTCA and long-chain PFCAs
- Higher concentrations in the South Bay and Lower South Bay
  - Decline of PFOS
- Still overall concern for potential risks

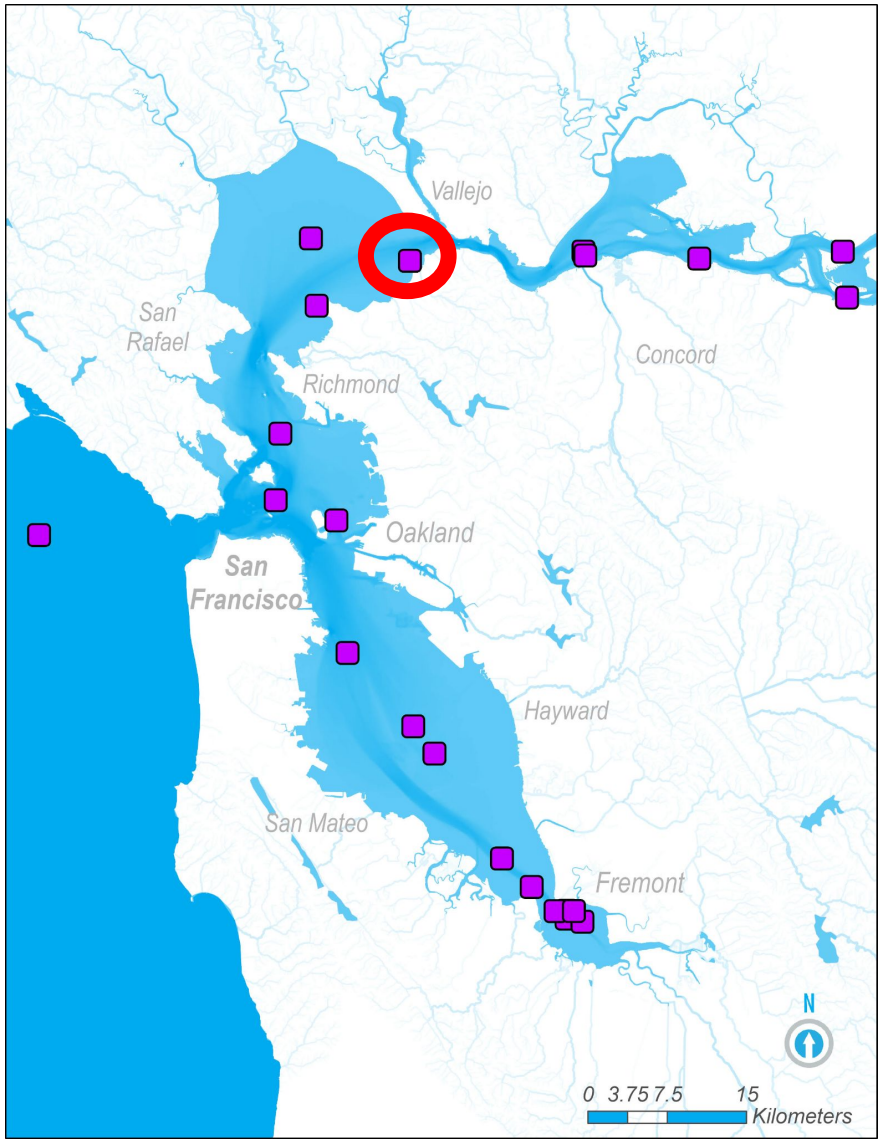
Bay Water: Sampling and Analysis

- Broad study in 2021
  - 22 sites (dry season)
  - Targeted: 40 analytes (EPA Method 1633)
- Continued monitoring in 2023 (S&T)
  - Similar 22 sites (dry season)
  - 40 Analytes
  - Special Study: Total Oxidizable Precursors (TOP) Analysis
  - *Wet Season Monitoring (2023-2024)*



Bay Water: Targeted Analysis (2023)

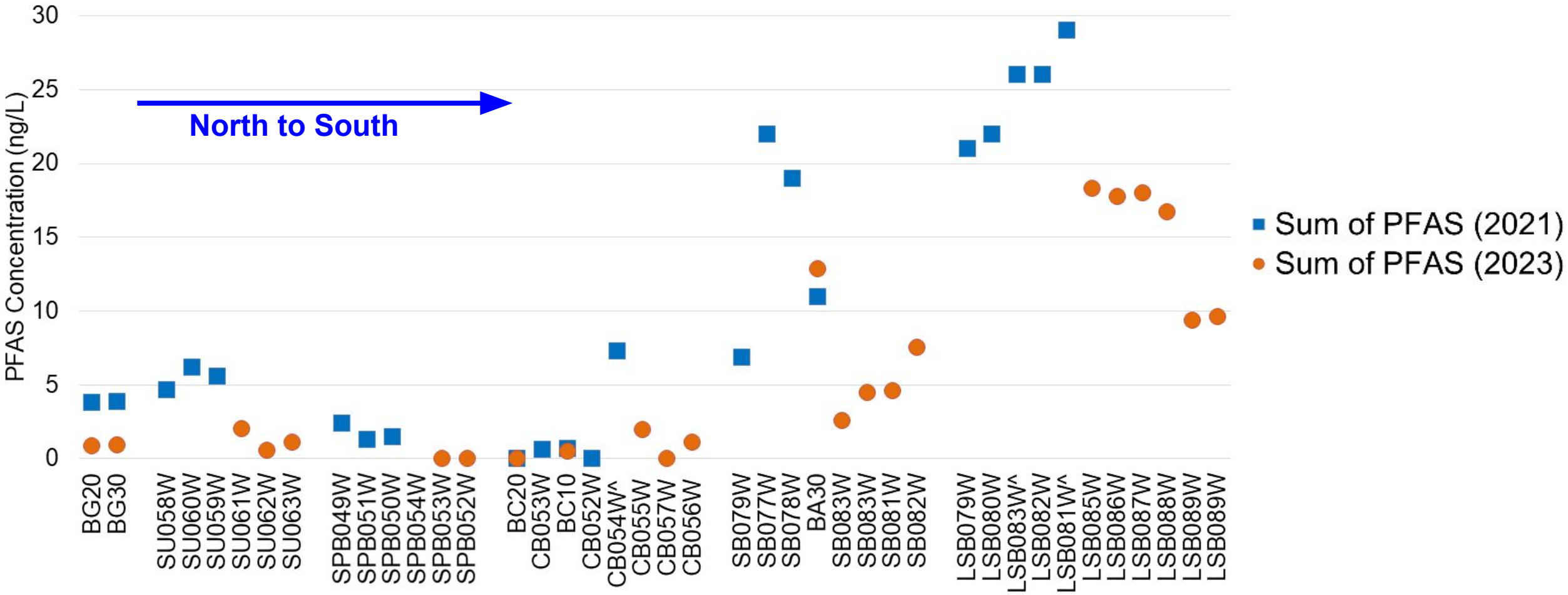
- 11 analytes detected
  - Only three were detected at greater than 50% of sites: PFHxA, PFOS, and PFOA
- Samples in South Bay and Lower South Bay typically highest
  - Site in San Pablo Bay particularly high and all made up of 6:2 FTS (178 ng/L!)
- Median Sum of PFAS: 2.3 ng/L



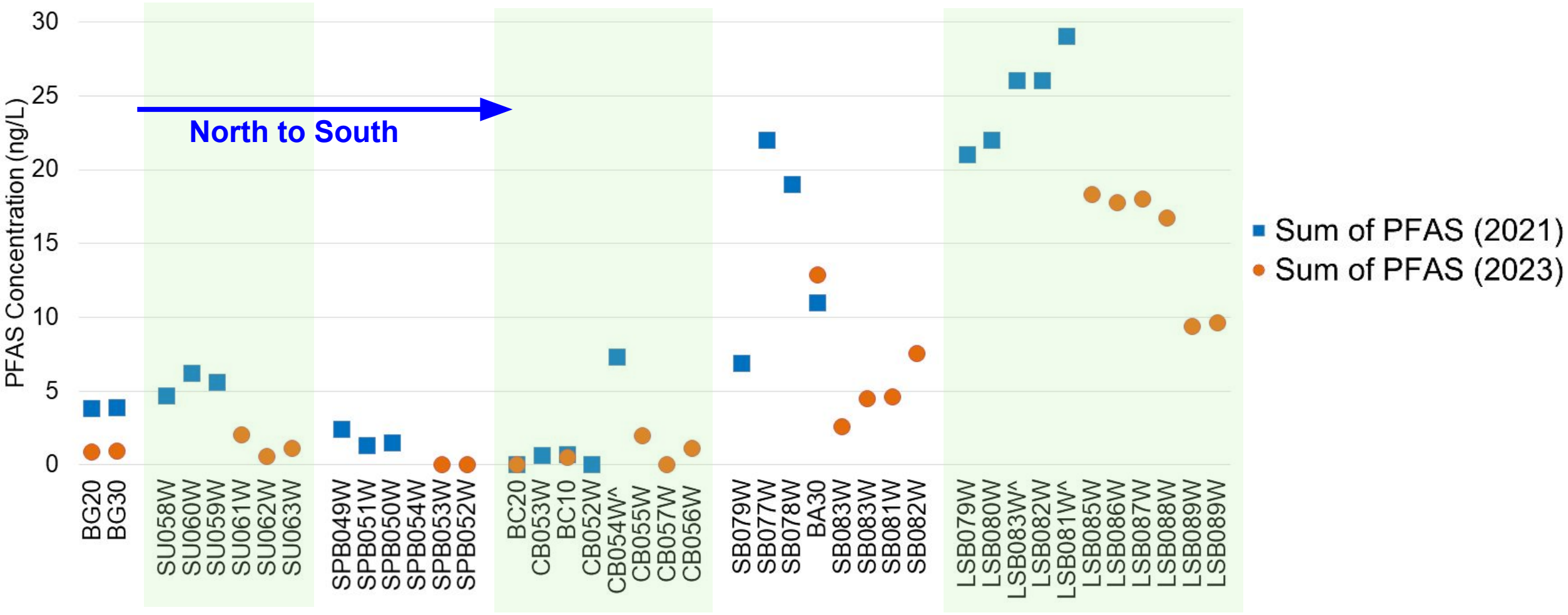
Bay Water: Targeted Analysis Comparison 2021 & 2023 Data

		2021	2023
	# of Analytes Detected (≥ 50%)	**11 (7)**	**11 (3)**
Medians (ng/L)	PFHxA	**1.5**	**0.7**
	PFOS	**0.9**	**0.6**
	PFOA	**0.8**	**0.3**
	Sum of PFAS	**5.9**	**2.3**

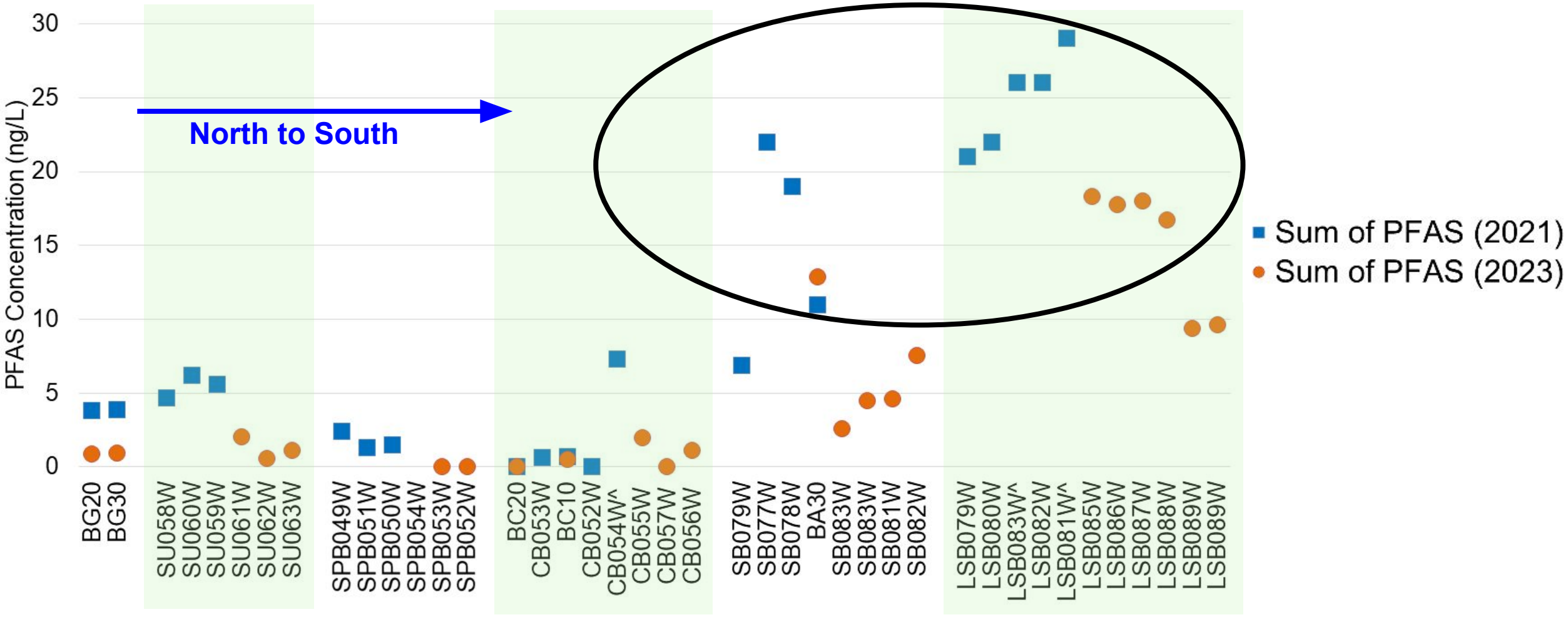
Bay Water: Targeted Analysis Comparison 2021 & 2023 Data



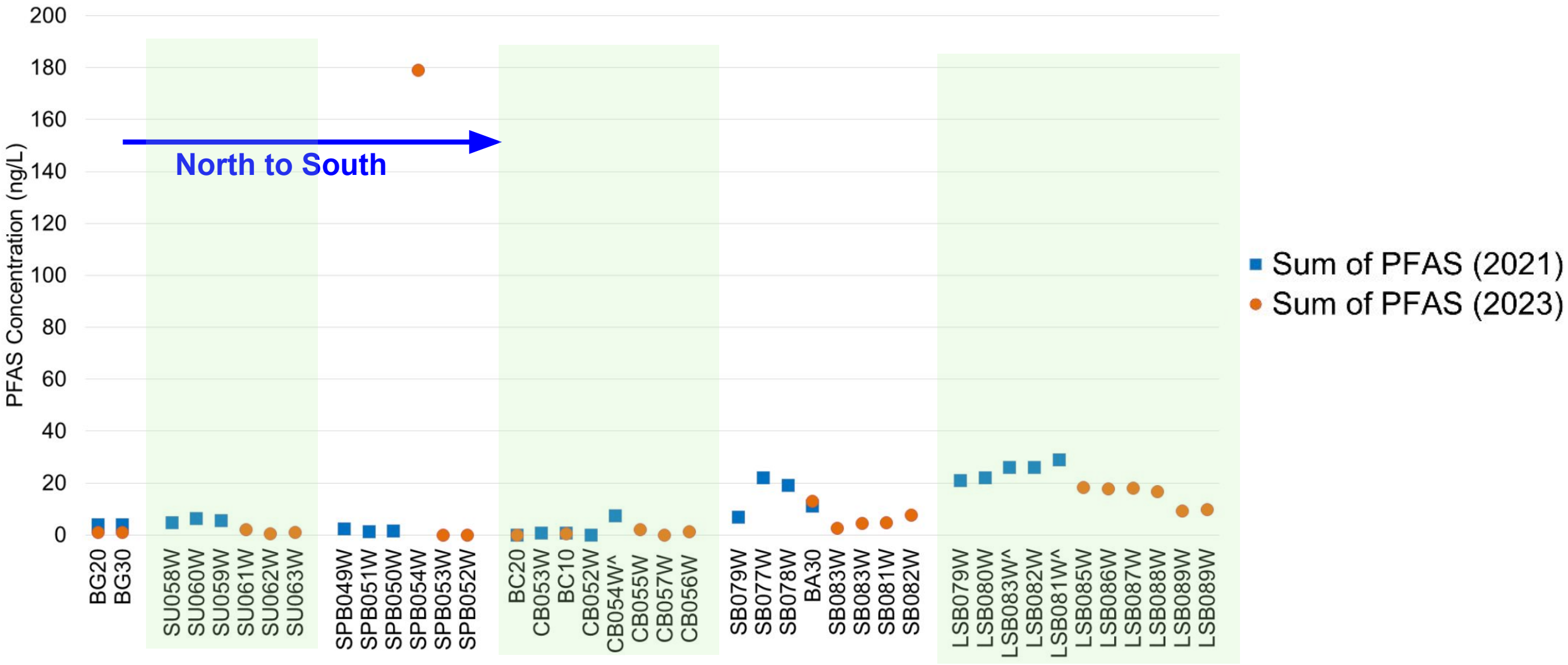
Bay Water: Targeted Analysis Comparison 2021 & 2023 Data



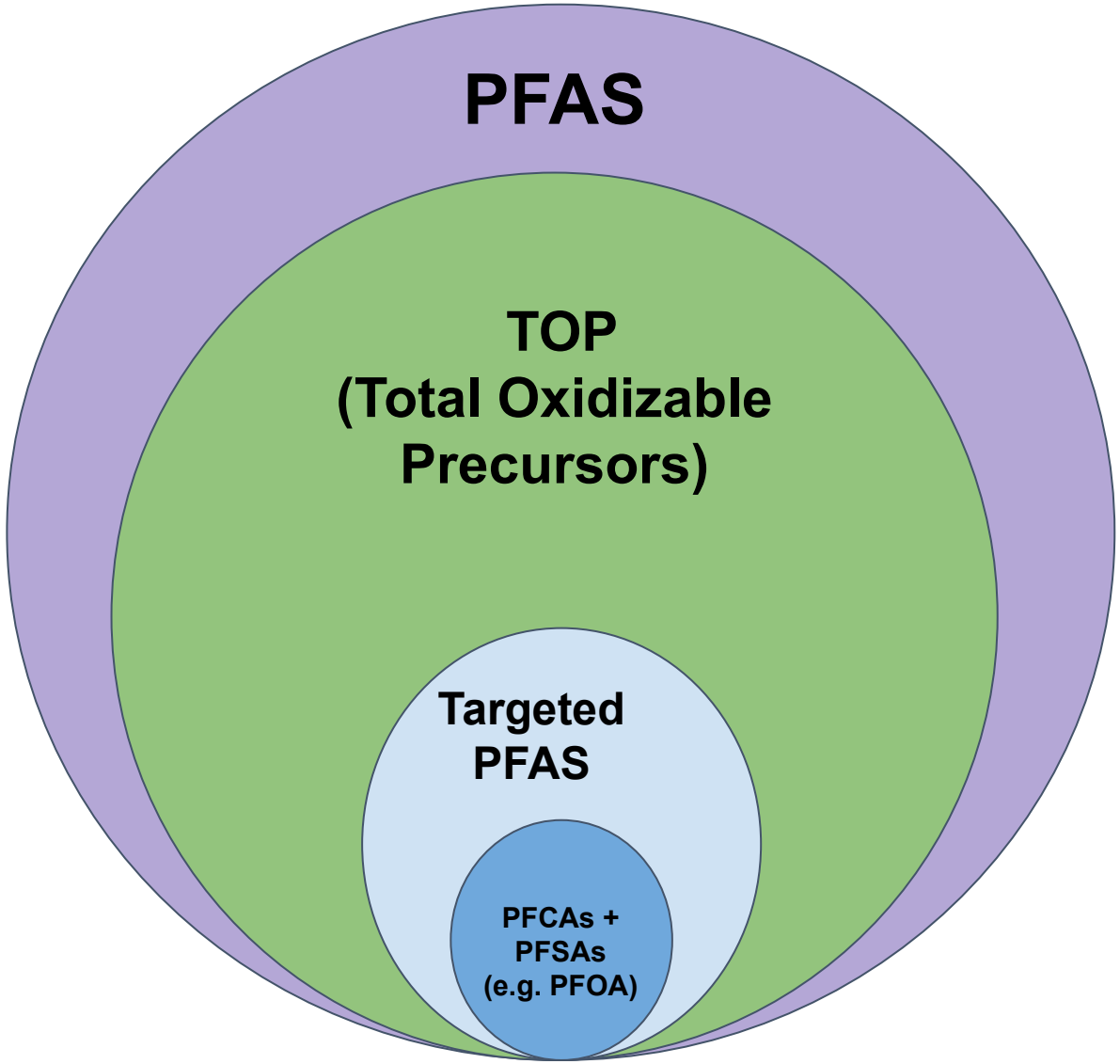
Bay Water: Targeted Analysis Comparison 2021 & 2023 Data



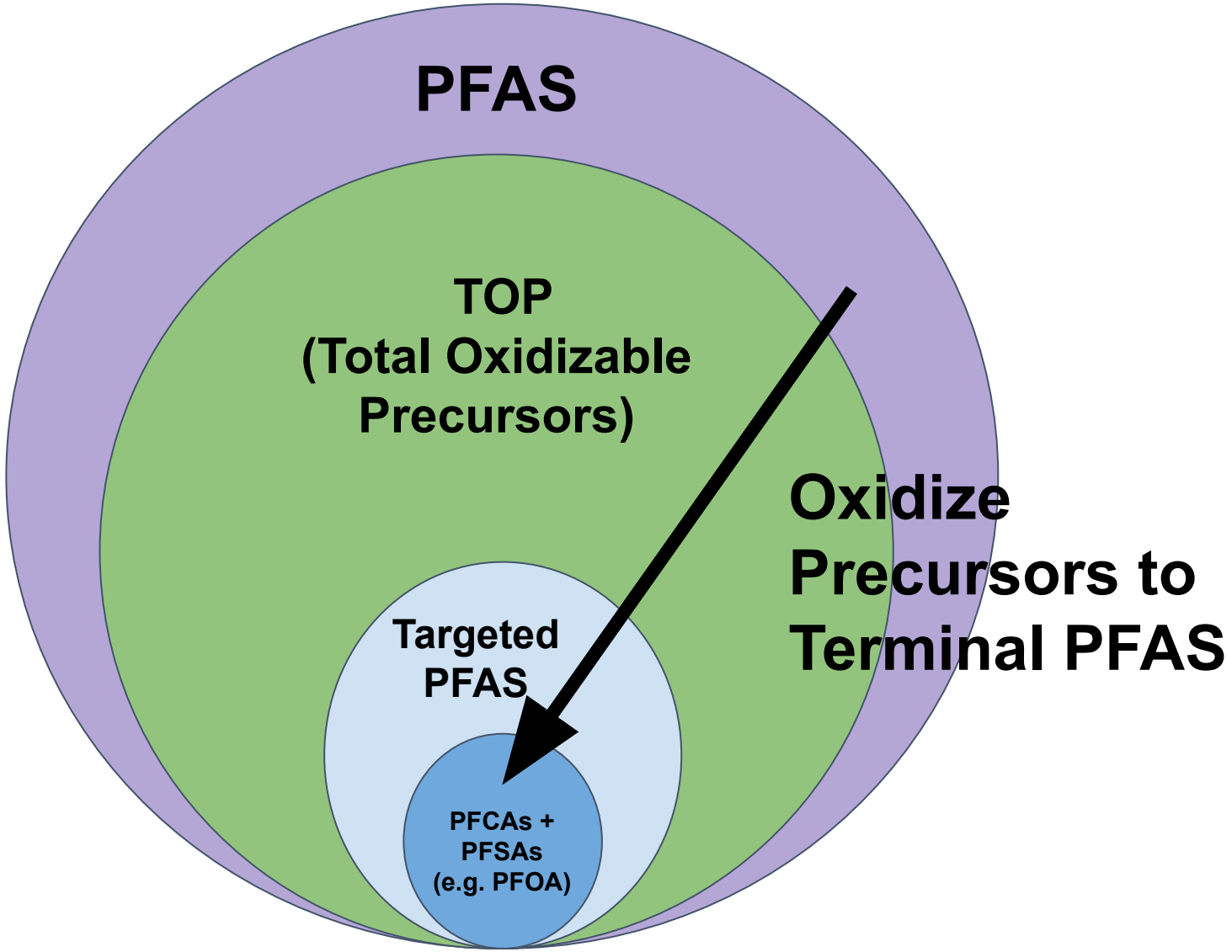
Bay Water: Targeted Analysis Comparison 2021 & 2023 Data



Bay Water: TOP Analysis



Bay Water: TOP Analysis



Bay Water: Targeted and TOP Analysis

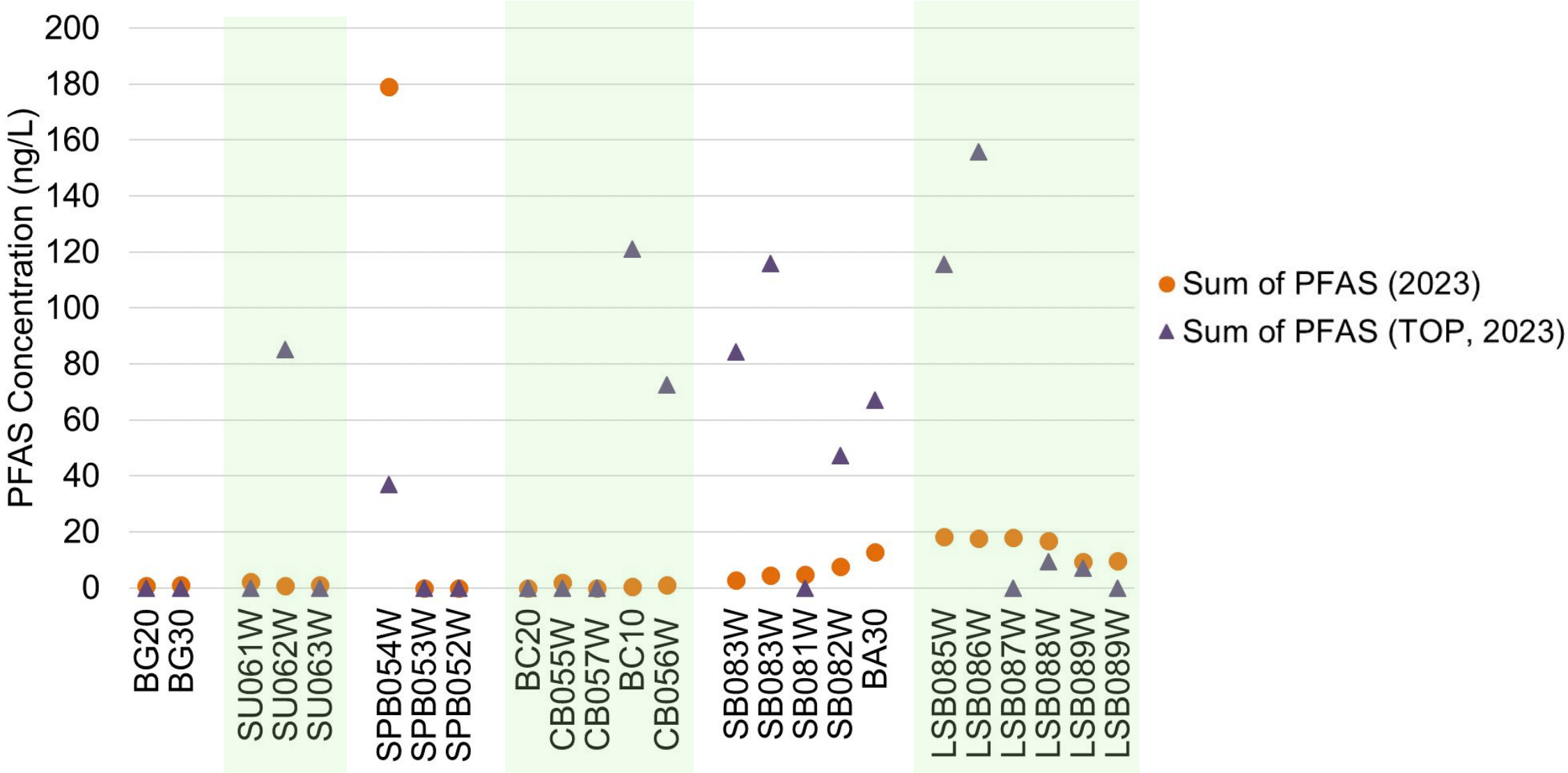
- Method detection limits (MDLs) are different across analyses

	MDLs in ng/L	
	Target	**TOP**
PFBA	2	15 - 120
PFOA	0.5	3.5 - 21
PFOS	0.5	3.5 - 21

Bay Water: TOP Analysis Results

- 5 analytes detected
  - PFBA predominant
  - PFHxA, PFOA, PFOS, and 6:2 FTS also found
  - Half of samples were ND
- Range of Sum of PFAS: 7 - 156 ng/L
  - Median: 3.5 ng/L (ND = 0)
- Samples in South and Lower South Bays are highest but not as consistently as in target
- Otherwise, limited consistency across target and top samples

Bay Water: Target and TOP Analysis (2023)



Bay Water: Main Takeaways

- PFAS detected across Bay (all segments)
- Target levels appear lower than previous sampling but TOP concentrations particularly high across Bay sites
- Samples in South Bay and Lower South Bay typically highest

Bay Water: Main Takeaways

- PFAS detected across Bay (all segments)
- Target levels appear lower than previous sampling but TOP concentrations particularly high across Bay sites
- Samples in South Bay and Lower South Bay typically highest
- CA Environmental Screening Levels for Water

  Target: PFOS Median: 0.6 ng/L PFOA Median: 0.3 ng/L

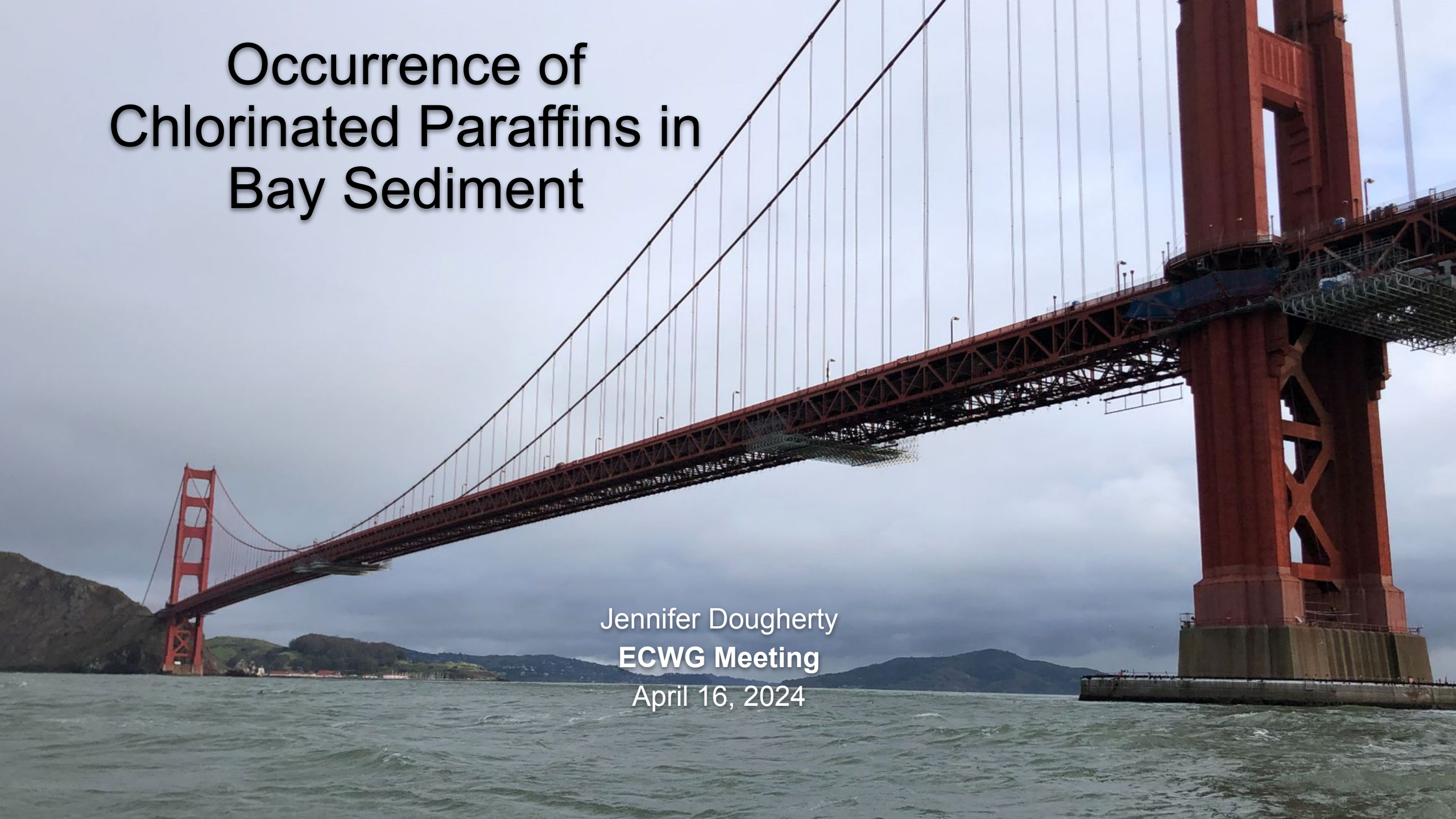
  - For Aquatic Ecotoxicity:
    - PFOS: 75 ng/L
    - PFOA: 4,400 ng/L
  - For Human Health (seafood ingestion)
    - PFOS: 0.0047 ng/L
    - PFOA: 0.022 ng/L

Next Steps

- Bay Water Wet Season sample analysis completion
- Full Report on PFAS in Bay Water and Sediment (Fall 2024)
- Ongoing monitoring of PFAS
  - Bird Eggs (2024)
  - Bay Water (2025)
  - Sport Fish (2025)

Questions?

Occurrence of Chlorinated Paraffins in Bay Sediment



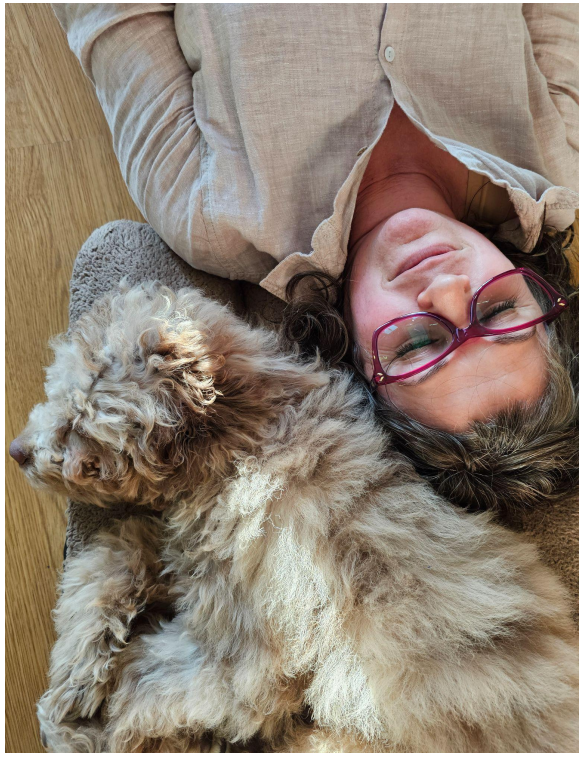
Jennifer Dougherty

ECWG Meeting

April 16, 2024

About Me

- Joined SFEI in April 2023
- PhD in Environmental Engineering

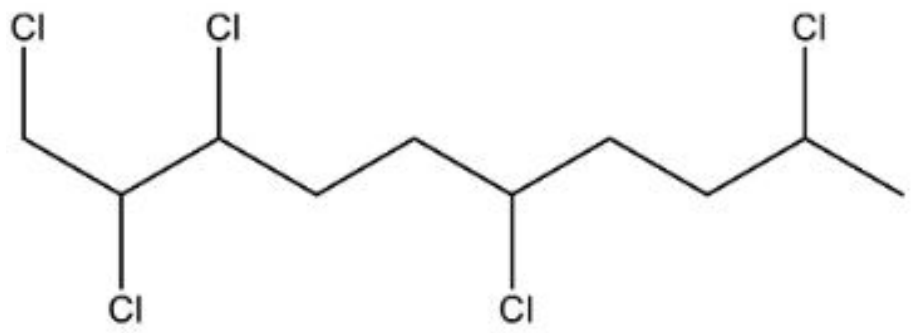


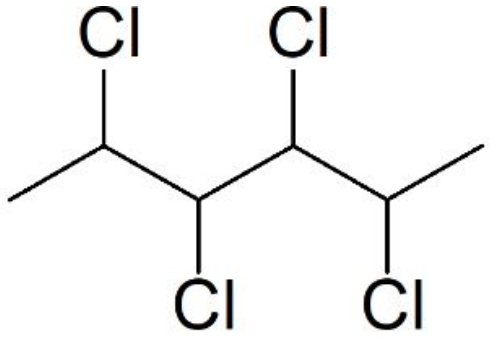
Outline

- Chlorinated paraffins?
- Motivation
- Study design and method
- Results
- Risk assessment
- Next steps

RMP

Overview of Chlorinated Paraffins

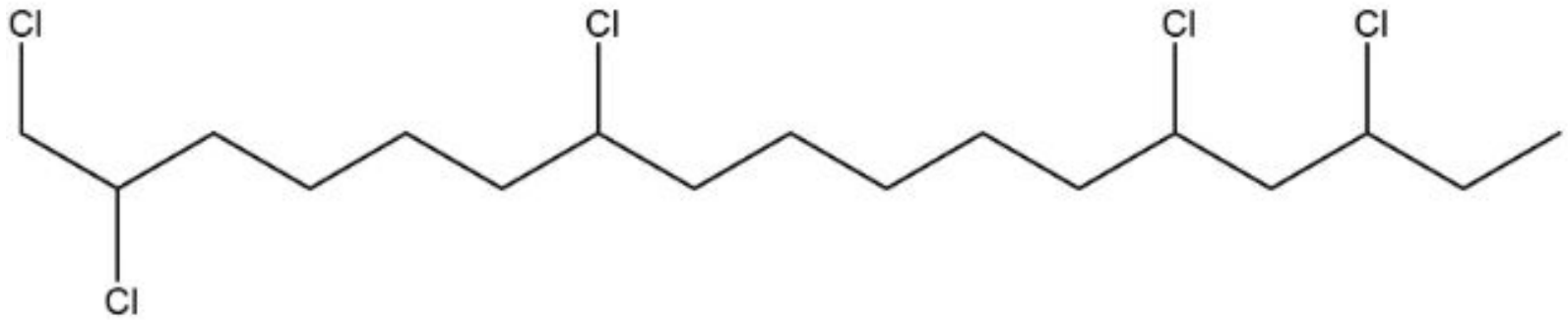




vSCCP (C6-C9)

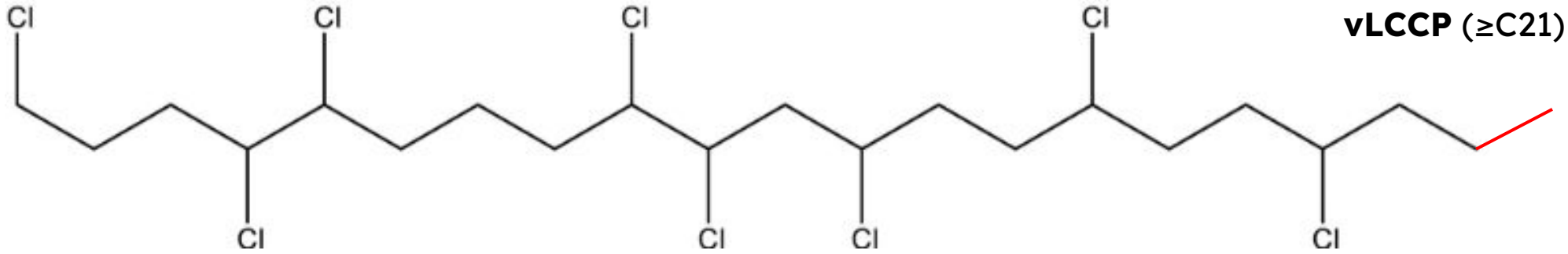
SCCP (C10-C13)

MCCP (C14-C17)



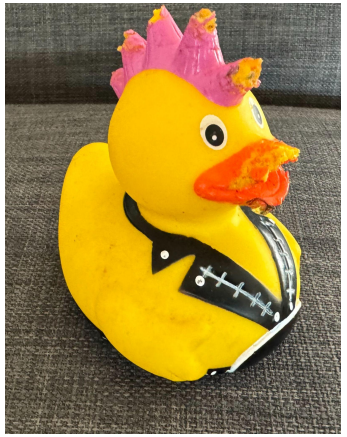
LCCP (C18-C20)

vLCCP (≥C21)



Modified from EFSA Journal, Volume: 18, Issue: 3, First published: 09 March 2020, DOI: (10.2903/j.efsa.2020.5991)

Motivation



- Widely applied in various products as coolants, flame retardants, and plasticizers
- Enter the environment during production, transportation, and recycling processes and through leaching and volatilization from landfills
- Current global production volume estimate of 1.3 million metric tons per year(C. Chen et al., 2022), production began in 1930's
- Management action for SCCP in US, Canada, EU & Stockholm Convention, MCCP proposed to Stockholm & elsewhere

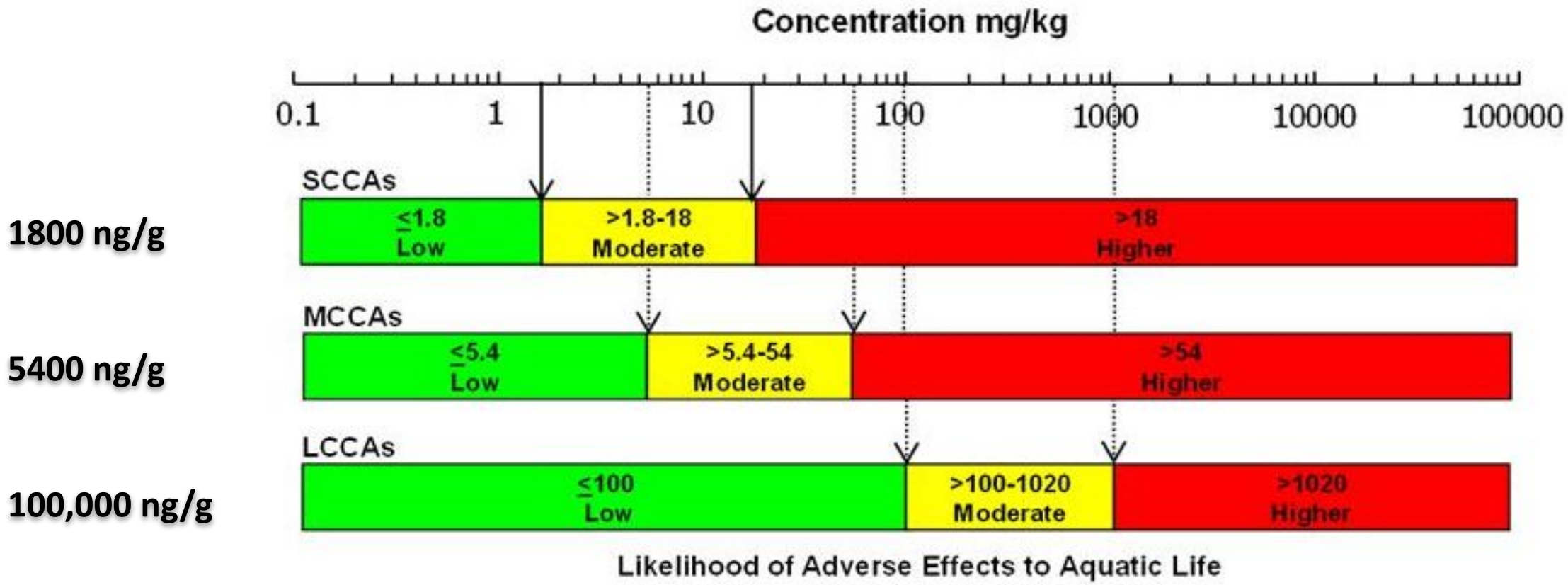
Study Design and Method

- Archived sediment (2014-2020) from 10 sites
- SGS AXYS MLA-117 (2020)
  - Dr. Ehrenstorfer standards
  - C_{10}—C_{20} and Cl_5—Cl_{11}
  - UPLC-MSMS

Results

- Reporting Limits for 63 isomer groups
  - 0.6 -11.5 ng/g
  - median 3.5 ng/g

Risk assessment



- Limited effects & exposure data
  - Thresholds use equilibrium partitioning method

Figure from Environment and Climate Change Canada - Federal Environmental Quality Guidelines Chlorinated Alkanes. Government of Canada, 2016

Is the method sufficiently sensitive? Does lack of detection mean low risk?

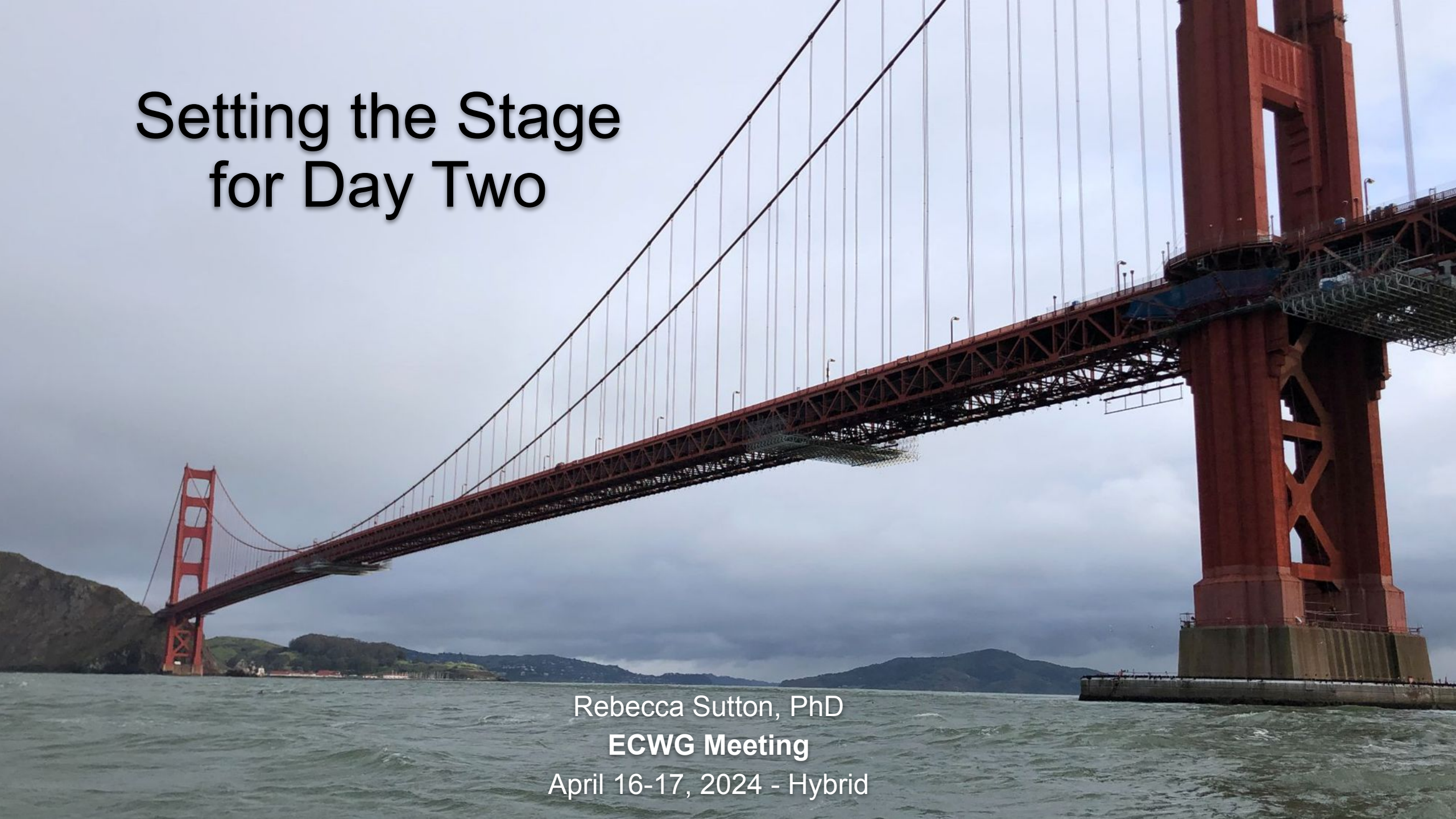
- Thought experiment: What if all isomer groups are present at levels just below the isomer specific reporting limits?
  - ∑SCCP(20) = ~75.6 ng/g **<< 1800 ng/g**
  - ∑MCCP(28) = ~91.2 ng/g **<< 5400 ng/g**
  - ∑LCCP(15) = ~144.4 ng/g **<< 100,000 ng/g**
- Risk Screening: Method is sufficiently sensitive and indicates Low Concern

RMP

Next Steps

- Report coming Summer 2024
- Recommend screening in biota
  - Blubber
  - Fish tissue
  - Bird eggs
- Re-evaluate sediment
  - with more certain ecotox thresholds
  - with lowering current thresholds
  - methods for vSCCPs

RMP



Setting the Stage for Day Two

Rebecca Sutton, PhD

ECWG Meeting

April 16-17, 2024 - Hybrid

Topics for Tomorrow (9am to 3pm)

9:15	PFAS Sources to Solutions project
10 to noon	ECWG & SPLWG Joint Meeting ● Review progress on stormwater CECs projects ● Discuss stormwater CECs monitoring approach
12:30 to 3	2025 ECWG Special Studies ● Closed door session

Adjourn

Thank you!