



RMP

REGIONAL MONITORING
PROGRAM FOR WATER QUALITY
IN SAN FRANCISCO BAY

sfei.org/rmp



CECs: The San Francisco Bay Story

Tom Mumley, SF Bay Regional Water Board

Karin North, City of Palo Alto

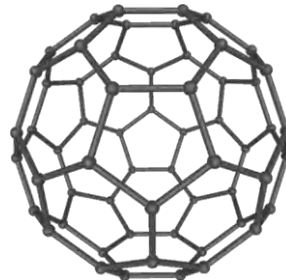
Rebecca Sutton, SFEI - ASC

Contaminants of Emerging Concern

Pesticides



PFOS
PFAS



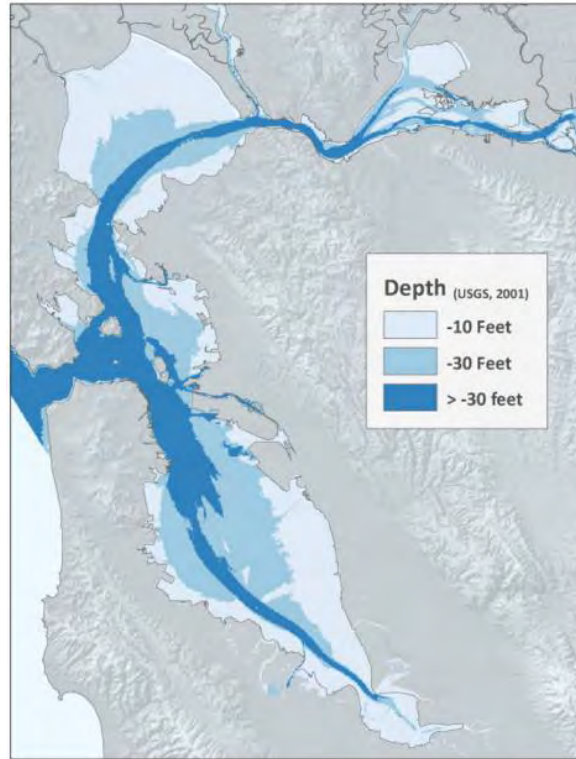
PBDEs &
Flame
Retardants

San Francisco Bay

BIG, URBANIZED
Area = 4,100 km²



SHALLOW, COMPLEX
Median Depth = 4 m



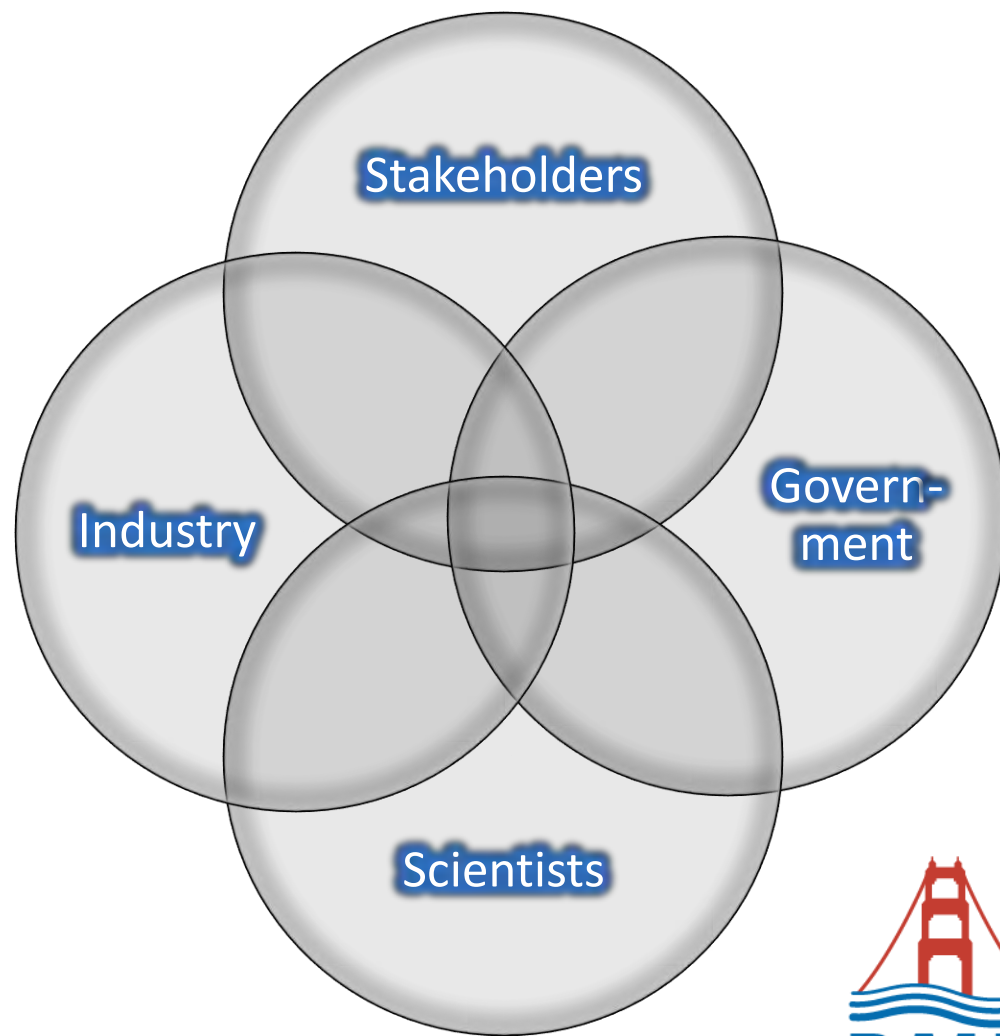
LARGE WATERSHED
40% of CA



Regional Monitoring Program

Partnership to understand the **health** of San Francisco Bay

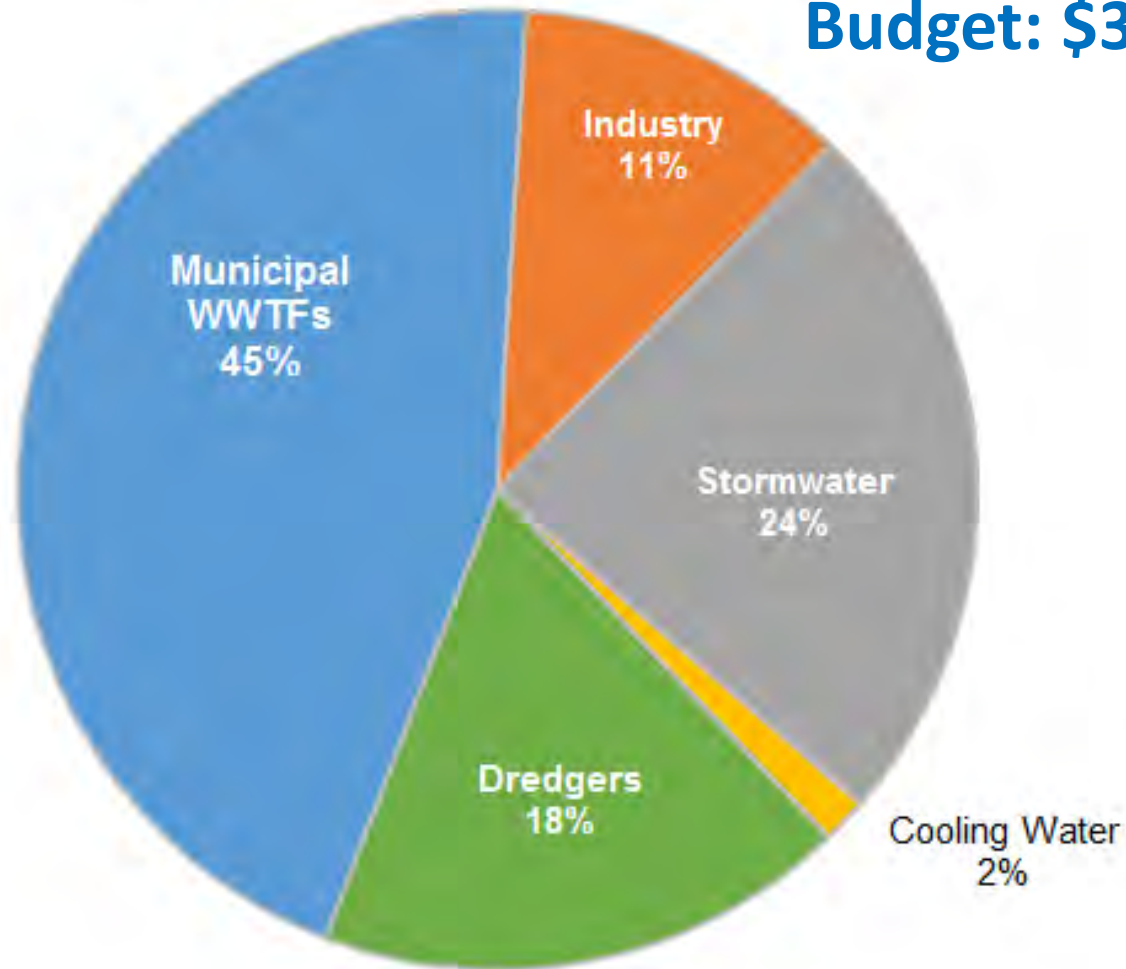
Celebrating
our 25th year!



RMP Participants

RMP Fees by Sector: 2017

Budget: \$3.5M



RMP Focus on CECs

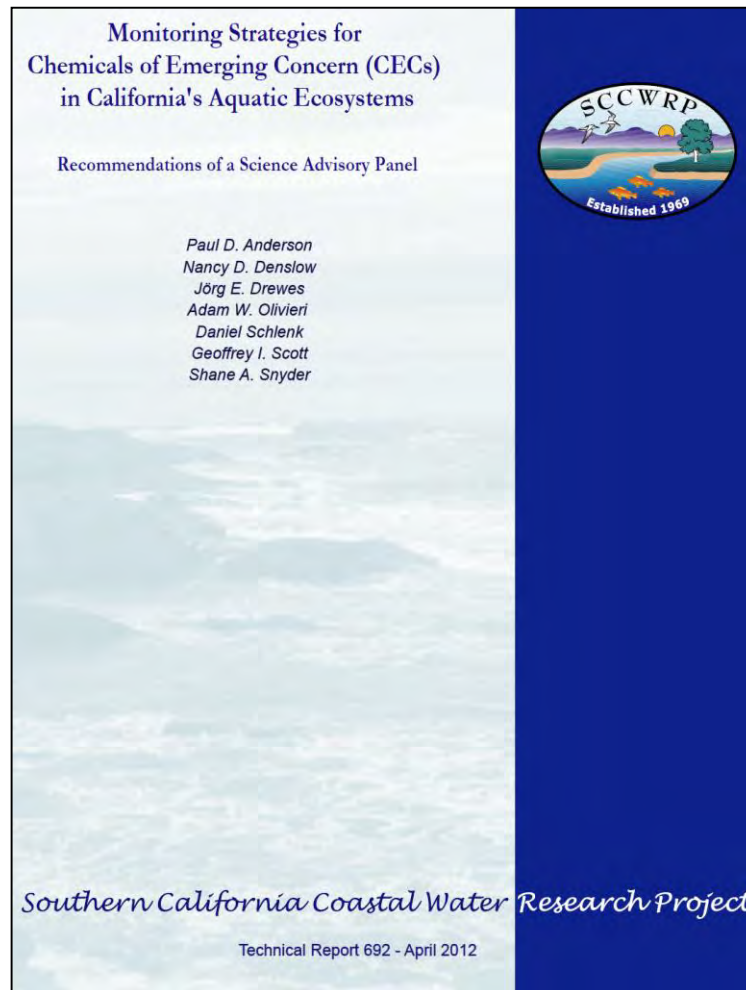
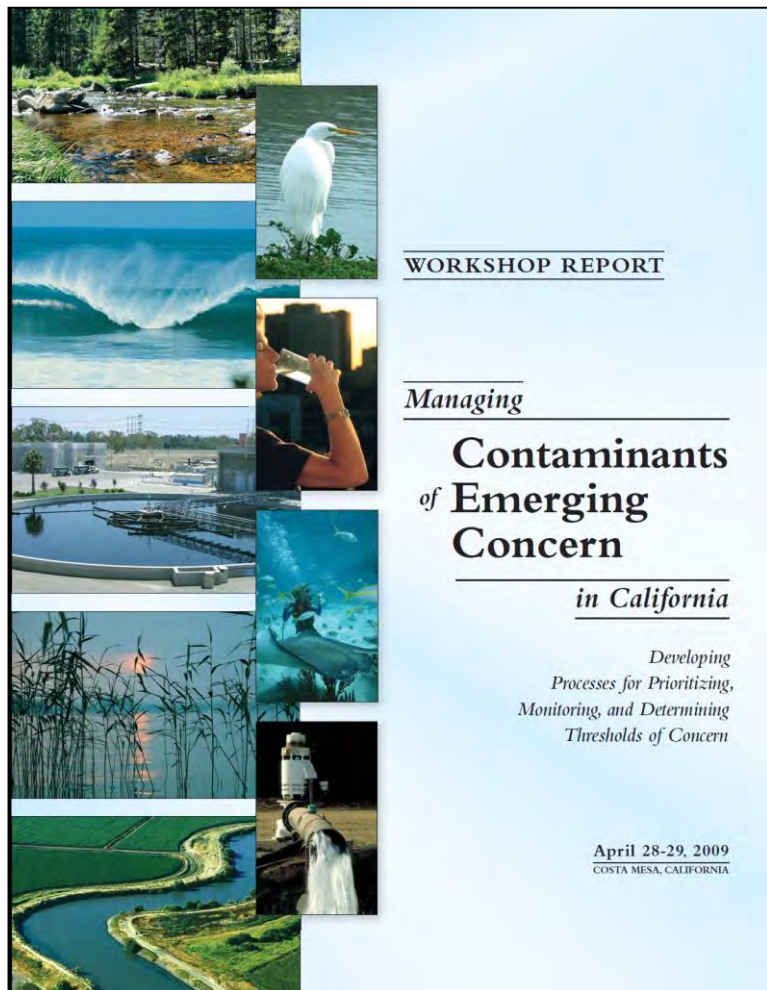
- 10+ years of monitoring and studies
 - Primarily ambient water, sediment, biota
 - Some wastewater and stormwater
- 2013 CEC Synthesis and Strategy
 - Added non-targeted analysis, bioanalytical tools
- 2017 Strategy Revision



Contaminants of
Emerging
Concern

IN SAN FRANCISCO BAY

Informed and Informed-By



ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/600_CEC_wkshp2009.pdf

http://www.waterboards.ca.gov/water_issues/programs/swamp/cec_aquatic/docs/cec_ecosystems_rpt.pdf

Management Questions

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

What are the sources, pathways, loadings, and processes leading to CEC pollution in the Bay?

Have the concentrations of CECs in the Bay increased or decreased?

Which management actions may be effective in reducing CEC levels?



CECs Science Advisors



Dr. Bill Arnold
University of Minnesota



Dr. Kelly Moran
TDC Environmental



Dr. Derek Muir
Environment & Climate
Change Canada



Dr. Lee Ferguson
Duke University



Dr. Daniel Schlenk
UC Riverside



Dr. Heather Stapleton
Duke University

CEC Strategy: Three Elements

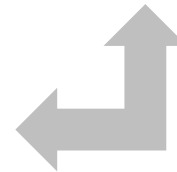
1. CEC monitoring,
evaluating risk



2. Learning from others,
sharing expertise



3. Non-targeted monitoring
(bioassays, broadscans)



Risk Tiers



**MODERATE
OR HIGH IMPACT**

High probability of moderate or high level effect on Bay wildlife



LOW IMPACT

High probability of low level effect on Bay wildlife



NO IMPACT

High probability of no effect on Bay wildlife



UNCLEAR

Uncertainty in Bay levels or toxic thresholds



Monitoring Strategy

TIER 4
HIGH
CONCERN

Studies to support Total Maximum Daily Load (TMDL) or alternatives

TIER 3
MODERATE
CONCERN

Trends monitoring and/or fate, effects, and sources and loadings studies

TIER 2
LOW
CONCERN

Periodic ambient and/or source trend screening

TIER 1
POSSIBLE
CONCERN

Ambient and source screening



Management Strategy

TIER 4
HIGH
CONCERN

303(d) list → TMDL or alternative(s)

TIER 3
MODERATE
CONCERN

Action plan or strategy

- Aggressive pollution prevention
- Seek product or chemical alternatives

TIER 2
LOW
CONCERN

Track product use and market trends
Easy, low-cost source identification
and pollution prevention actions

TIER 1
POSSIBLE
CONCERN

Identify and prioritize potential CECs
Develop bio and chemistry methods



CEC Strategy: Three Elements

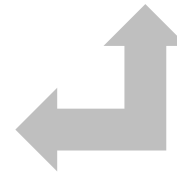
1. CEC monitoring,
evaluating risk



2. Learning from others,
sharing expertise



3. Non-targeted monitoring
(bioassays, broadscans)



Work Underway in 2017

1. CEC monitoring, evaluating risk

- Alternative Flame Retardants in Bay Water
- Neonic Pesticides and Degradates in Bay Water
- Bisphenols in Bay Water
- Triclosan and Methyl Triclosan in Small Fish
- PFAS Synthesis and Strategy
- Advancing modeling capabilities





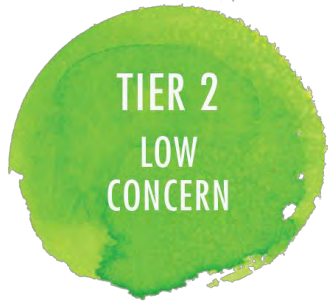
**MODERATE
OR HIGH IMPACT**

None currently



LOW IMPACT

PFOS
Fipronil
Nonylphenol



NO IMPACT

PBDEs and HBCD
Pyrethroids*
Pharmaceuticals and
Personal Care Products
PBDDs and PBDFs



UNCLEAR

Alternative Flame Retardants
PFAS (Fluorinated Chemicals)
Pesticides, Plasticizers
Microplastic
PCB 11, PHCZs, others

Tracking the Science

2. Learning from others, sharing expertise

- Read the literature
- Attend scientific conferences
- Communicate with decision-makers
- Educate stakeholders
- Collaborate with leading minds



Work Underway in 2017

3. Non-targeted monitoring

- Non-targeted Analysis of Bay Water and Effluent
- Bioassays of South and Lower South Bay Margin Water and Sediment for Estrogenicity (EEWG)
- 2018 Proposal: Non-targeted Analysis of Sediment



Multi-Year Plan: Proposed Special Studies

Moderate Concern Priorities

- PFOS/PFAS
 - Focus on trends, unknown PFAS
- Nonylphenol/Ethoxylates
 - Broad screening, temporal trends, synthesis
- Fipronil & degradates
 - Fish tissue



Coordinate with Status & Trends monitoring



Multi-Year Plan: Proposed Special Studies

- Alternative flame retardants
- Dyes
- Pharmaceuticals
- Personal care & cleaning products
- Plastic additives
- Pesticides



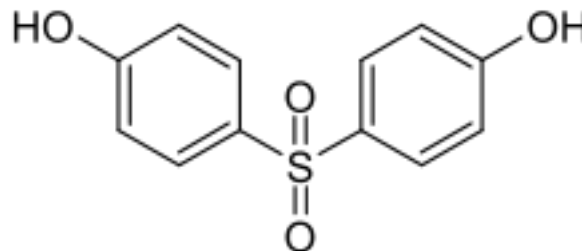
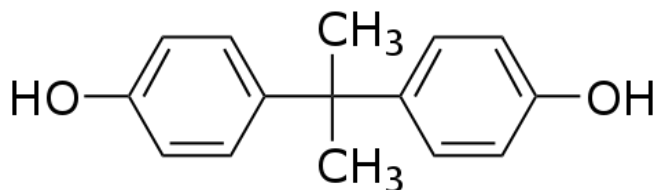
3. Non-targeted monitoring

- Series of studies in different matrices
- Followup targeted studies



RMP CEC Strategy: Themes

Focus on
chemical and functional classes



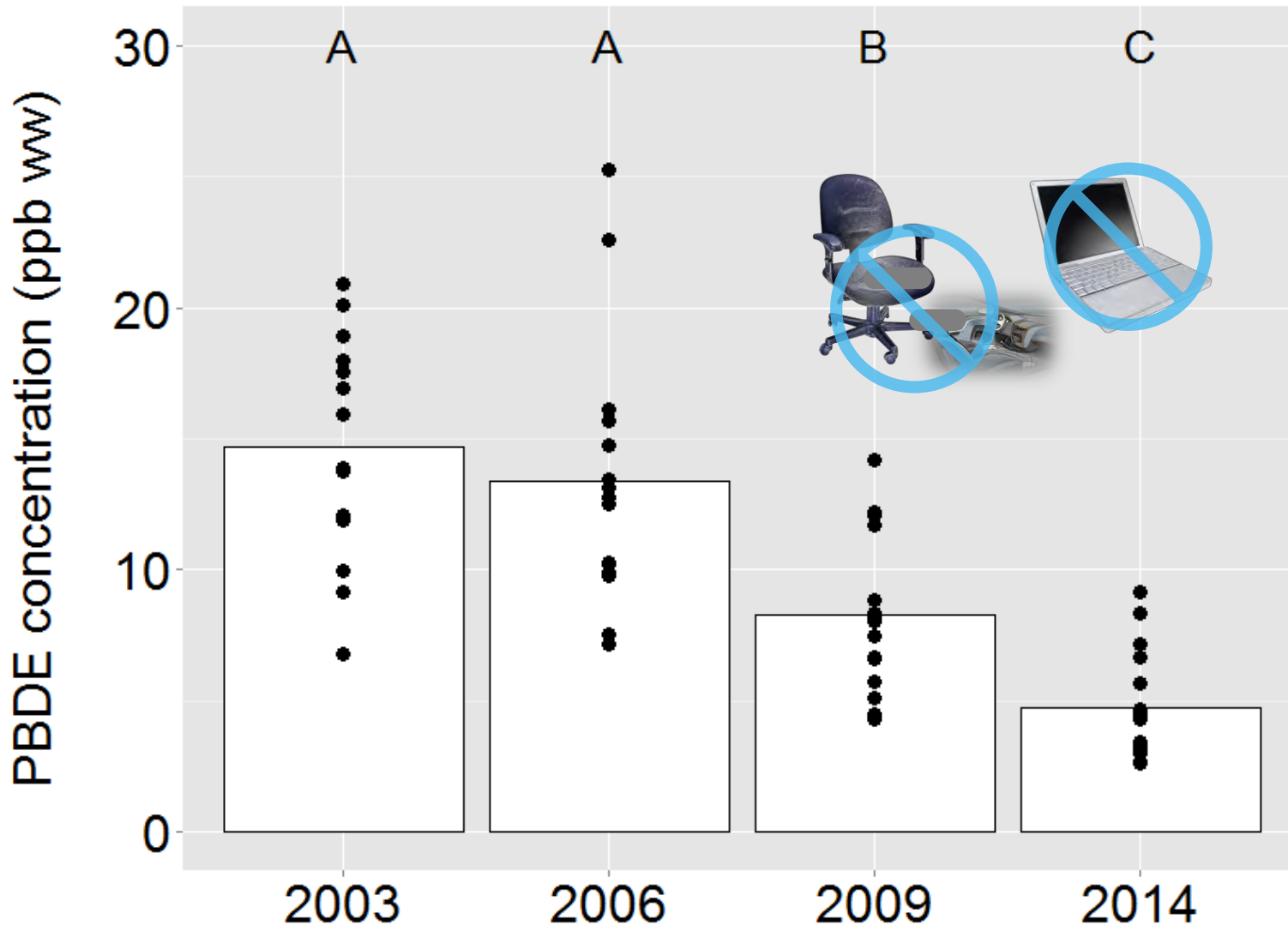
Policy-relevant science



PBDE Recovery



Shiner Surfperch



Alternative Flame Retardants

PBDE replacements detected in consumer products and San Francisco Bay led to management actions

California
Bureau
of Home
Furnishings

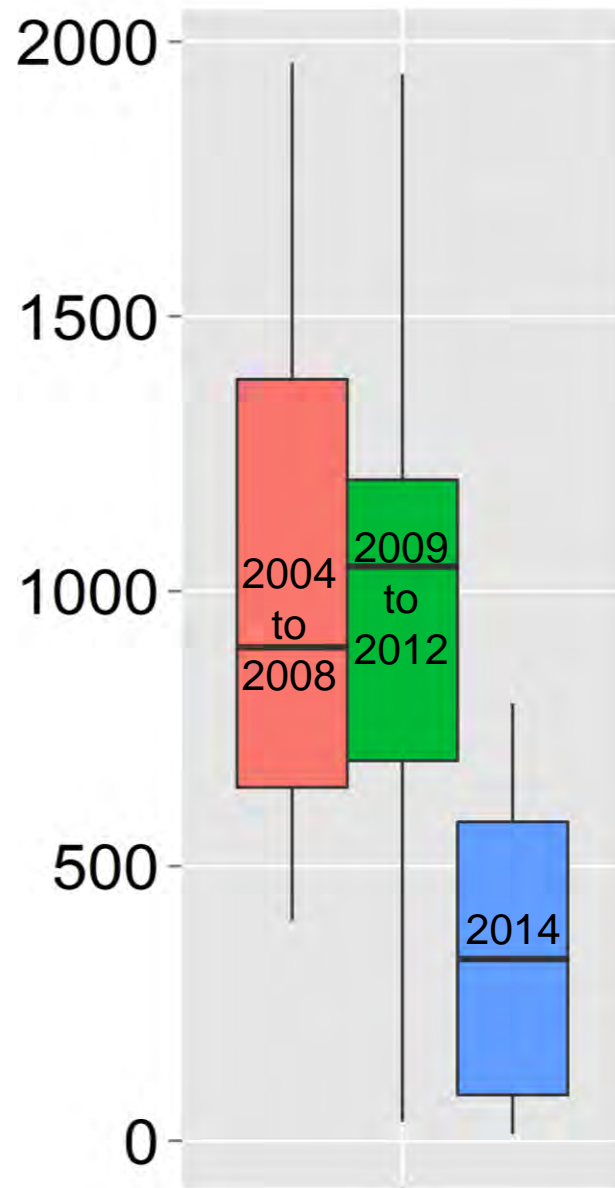


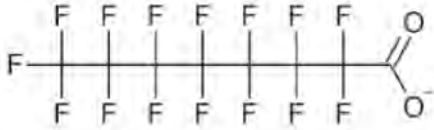
- ✓ TB117-2013: New standard for foam furniture, exemptions for baby products
- ✓ SB 1019: Furniture labeling law

PFOS Recovery

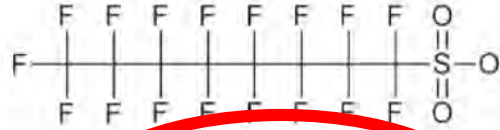


South Bay
Harbor seals
PFOS in Serum
(ng/g or ng/mL)

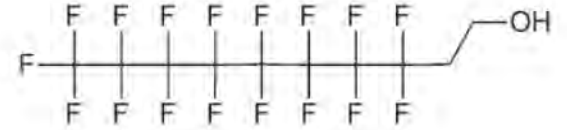




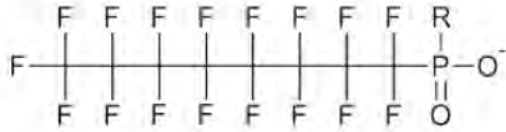
Perfluorocarboxylic acids
(ex. PFOA)



Perfluorosulfonic acids
(ex. PFOS)



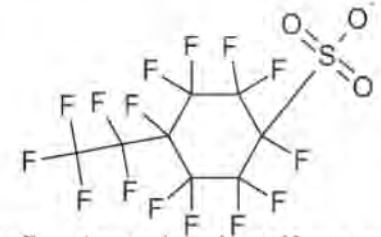
Fluorotelomer alcohol
(ex. 8:2 FTOH)



Perfluorophosphonic/phosphinic acids
(ex. If R=OH then PFOPA
If R=C8 perfluoroalkane then 8:8 PFPi)

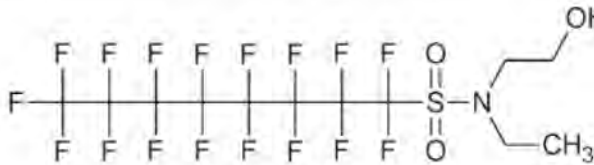


Perfluorosulfonamide
(ex. FOSM)

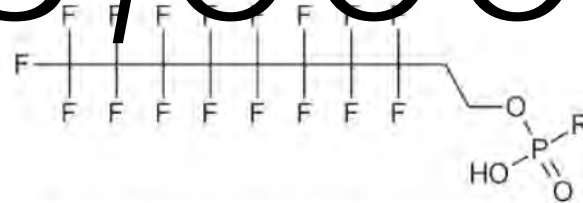


Perfluorinated cyclo sulfonates
(ex. PFECHS)

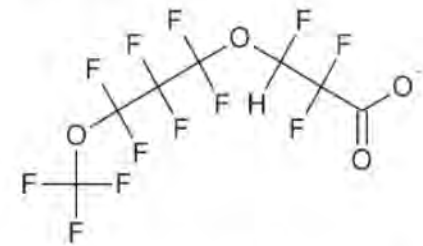
3,000



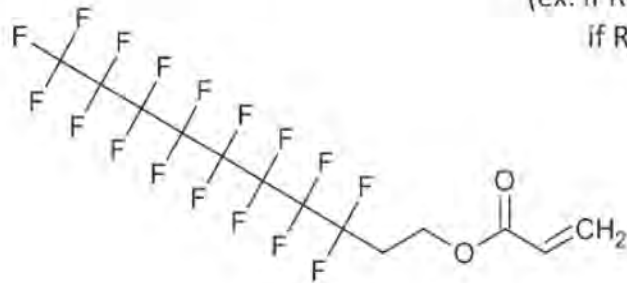
Perfluorosulfonamidoethanol
(ex. N-EtFOSE)



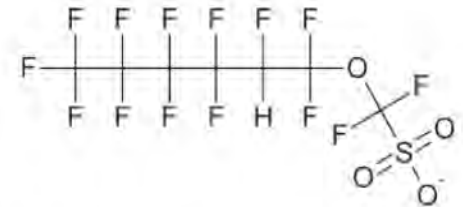
Fluorotelomer phosphate esters
(ex. if R= OH then 8:2 monoPAP
if R= 8:2 FTO ester then 8:2 diPAP)



Polyfluorinated ether carboxylates
(ex. 4,8-dioxa-3H-perfluorononanoate)



Polyfluorinated polymeric unit
(ex. 1H,1H,2H,2H-perfluorodecyl acrylate)

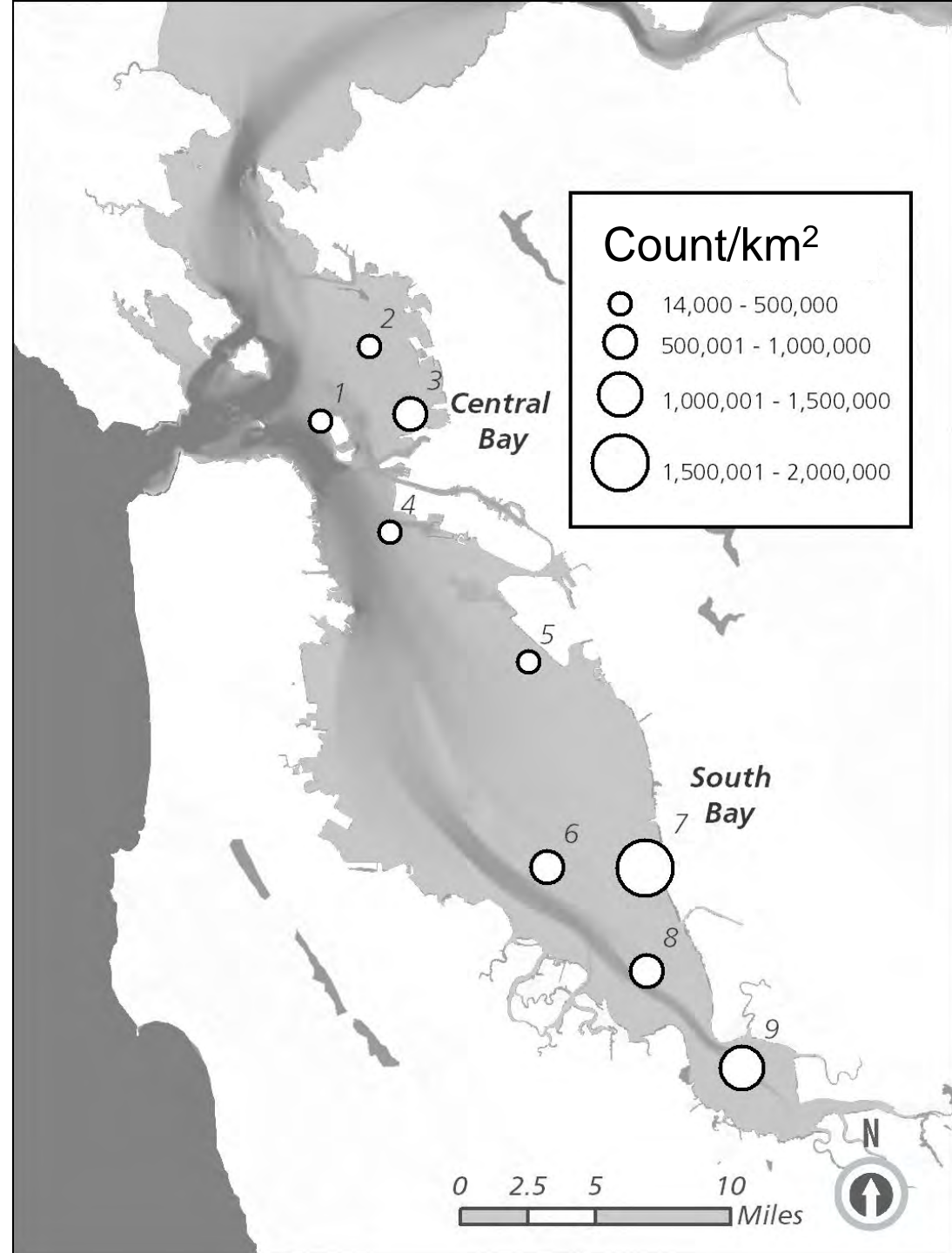


Polyfluorinated ether sulfonates
(ex. Perfluoro [hexyl ethyl ether sulfonate])

Microplastic

2015 Bay
study levels
higher than:

- Great Lakes
- Chesapeake
- Salish Sea



Microplastic: Broader Impacts

Policy:

- Federal **Microbead-Free Waters Act** signed into law (2015)

Funding:

- Gordon & Betty Moore Foundation 2-year, \$880,000 grant for further study
- Guided by RMP Microplastic Monitoring and Science Strategy



Management Strategy

TIER 4
HIGH
CONCERN

303(d) list → TMDL or alternative(s)

TIER 3
MODERATE
CONCERN

Action plan or strategy

- Aggressive pollution prevention
- Seek product or chemical alternatives

TIER 2
LOW
CONCERN

Track product use and market trends
Easy, low-cost source identification
and pollution prevention actions

TIER 1
POSSIBLE
CONCERN

Identify and prioritize potential CECs
Develop bio and chemistry methods





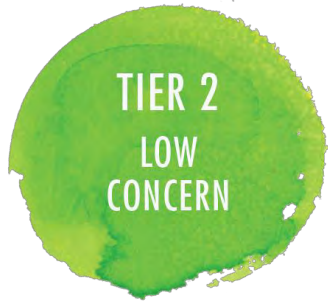
**MODERATE
OR HIGH IMPACT**

None currently



LOW IMPACT

PFOS
Fipronil
Nonylphenol



NO IMPACT

PBDEs and HBCD
Pyrethroids*
Pharmaceuticals and
Personal Care Products
PBDDs and PBDFs



UNCLEAR

Alternative Flame Retardants
PFAS (Fluorinated Chemicals)
Pesticides, Plasticizers
Microplastic
PCB 11, PHCZs, others

Management Actions: Moderate Concern (Tier III)



Regional CEC Action Plans:

- Source identification
- Source control identification and evaluation
- Track product use and market trends
- Communication and outreach
- Monitoring/study strategy
- Track recovery
- **Referral to other regulatory authority(s)**



Fipronil: Spot-on Flea Control



RMP study establishes wastewater as pathway

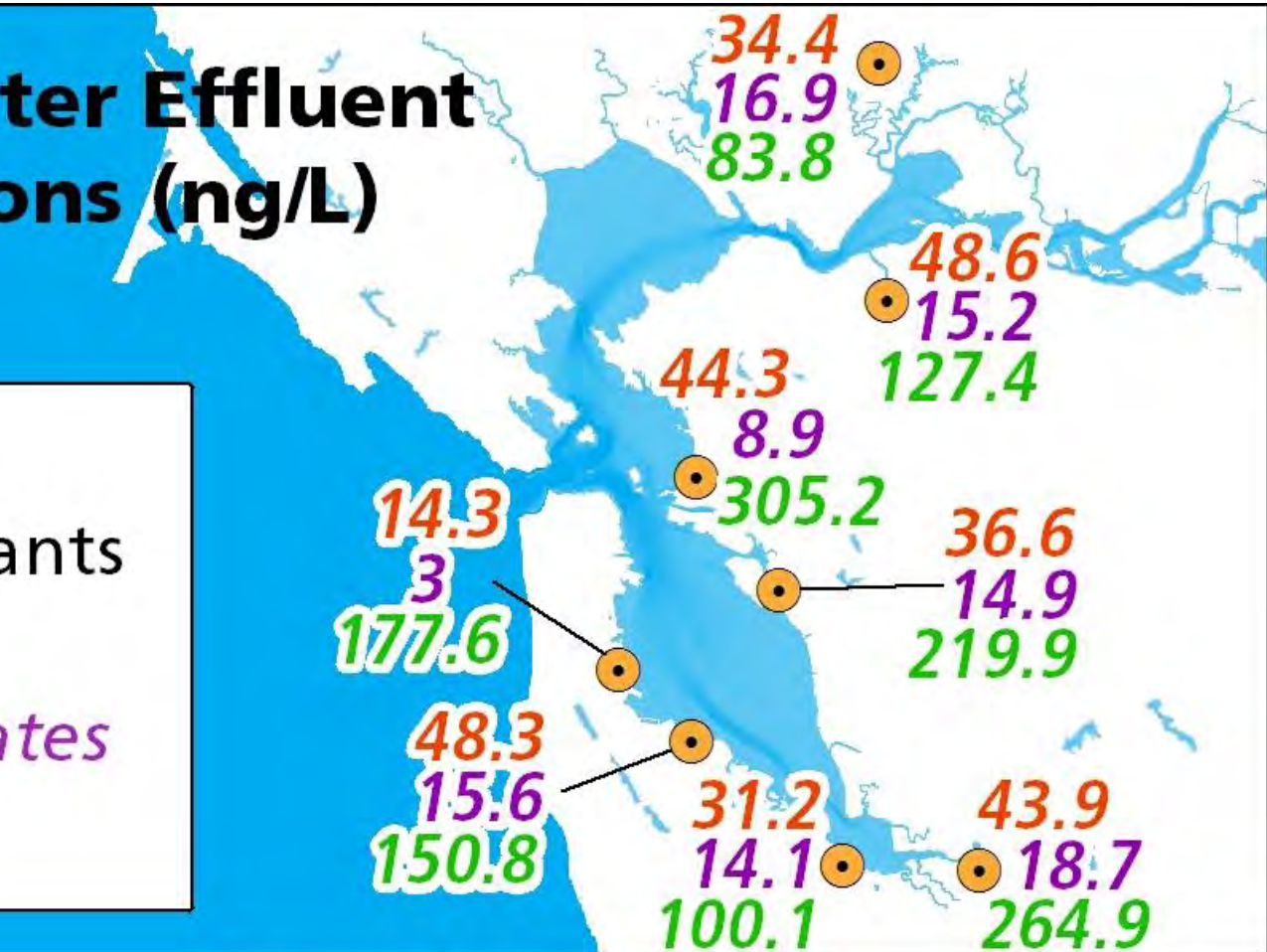
Final Wastewater Effluent Concentrations (ng/L)

- Wastewater Treatment Plants

Fipronil

Fipronil degradates

Imidacloprid



Managing Pesticides in Wastewater

TIER 3
MODERATE
CONCERN

- Regulation: DPR reviewing uses & mitigation
- Prevention: Down-the-Drain model to support registration recommendations
- Monitoring, source identification, education

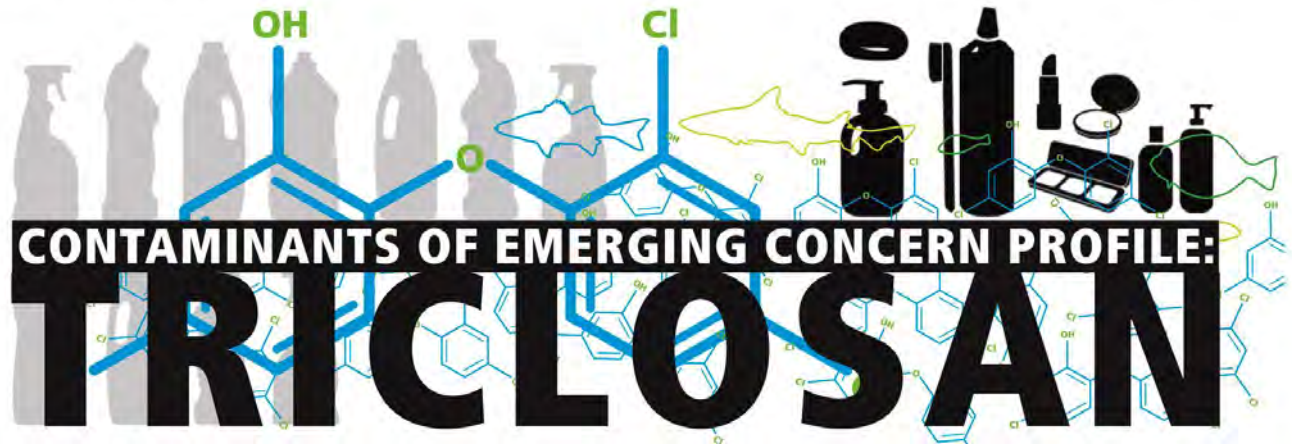


Triclosan



Fact Sheet: Triclosan
April 2011
SFEI Contribution No. 633
www.sfei.org/rmp

REGIONAL MONITORING PROGRAM
FOR WATER QUALITY IN THE SAN FRANCISCO ESTUARY



Palo Alto and other SF Bay wastewater agencies

- Consumer education
- Purchasing



Triclosan



2016: FDA bans triclosan and 18 other antibacterials from hand & body washes



Other uses may be addressed via DTSC:

- **Safer Consumer Products Program** (Green Chemistry)

Pharmaceuticals



Support for extended producer responsibility:

- RMP data for Senate hearings, council meetings, boards of supervisors
- 2016-2017 testing by wastewater agencies



Leveraging Resources

- Partnership with other organizations
 - Department of Toxic Substances Control
 - Department of Pesticide Regulations
 - Pro bono academic projects
- Alternative Monitoring Permit – provides RMP with extra funding for CECs (\$235,000)
- Supplemental Environmental Projects (Enforcement) funding possible



Keys to RMP's Success

Forum for Collaboration



Clear Objectives



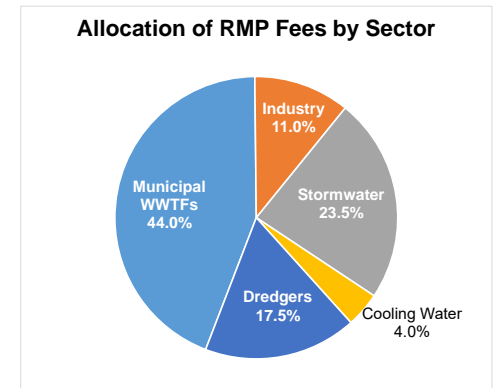
Adaptability



Long Range Planning



Stable Funding

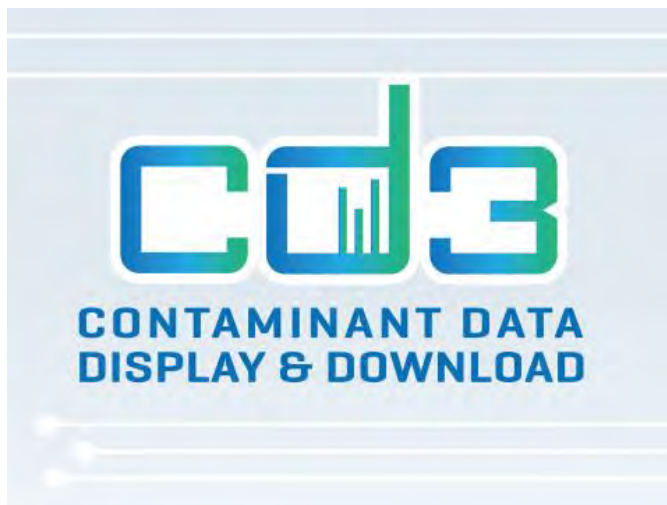


RMP Data: Reliable, Available

Quality Assurance



Online Access



Formatting
and Databases

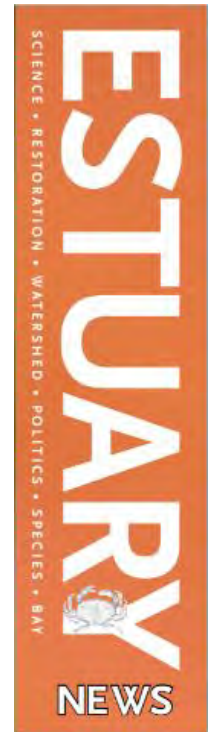


Communicating RMP data

www.sfei.org/rmp



Fact Sheets





Thank you

For more information:

Thomas.Mumley@waterboards.ca.gov

Karin.North@cityofpaloalto.org

RebeccaS@sfei.org