BACWA Hot Topics: Contaminants of Emerging Concern

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CEC and Microplastic Team at SFEI
Contaminants of Emerging Concern

- PFOS
- PFAS
- PBDEs & Flame Retardants
- Microplastics
- Pesticides
Anticipating the Next Silent Spring

Reactionary monitoring

Anticipatory monitoring
Regional Monitoring Program

Partnership to monitor the health of San Francisco Bay in support of management decisions

Implemented by

SFEI | AQUATIC SCIENCE CENTER

SAN FRANCISCO ESTUARY INSTITUTE & THE AQUATIC SCIENCE CENTER

RMP
Monitoring San Francisco Bay

Water

Sediment

Bivalves

Fish

Bird Eggs

Mammals
Tiered risk-based framework

High Concern

- moderate or high impact

Bay levels above observed effects

Uncertainty as to impact

Insufficient data

Bay levels above protective thresholds

Bay levels below protective thresholds
Monitoring & management actions

High Concern
moderate or high impact
Studies to support clean up
Clean up plan

Moderate Concern
low impact
Status & trends
Pollution prevention

Low Concern
limited impact
Periodic screening & trends
Low-cost source control

Possible Concern
uncertainty as to impact
Screening
Analytical methods
Presentation Outline

1. Microplastics
2. PFOS, PFAS
3. Wastewater Monitoring
4. CEC Synthesis
What are microplastics?

Particles of plastic smaller than 5 mm
Impacts to Wildlife

Zooplankton *Centropages typicus*
Cole et al. 2013
Microplastics Study
First comprehensive regional study

SFEI
5 GYRES
GORDON AND BETTY MOORE FOUNDATION
RMP
OCEAN PROTECTION COUNCIL
EBMUD
VIRGINIA WELLINGTON CABOT FOUNDATION
CITY OF PALO ALTO
RMP
Los Angeles Times

HOUSE ISSUES THREATS, TRUMP RAGES

L.A. vows to void 2 million court citations and warrants

Officials say the move will benefit the poor and homeless, who often go to jail over minor offenses.

By Mark Zwick of The Associated Press

The city of Los Angeles has announced a plan to void 2 million court citations and warrants it issued in recent years, a move that could benefit thousands of people who had been looking to move on with their lives.

The city said in a statement that the plan is part of a broader effort to reduce the number of people in jail and to make the criminal justice system more equitable.

England’s waters are awash in microplastics, and automobiles may be the primary source

A test-optional route into UC?

BY ROSEMARY JIA

Plastic tide: 7 trillion bits wash into bay every year

New study reveals that storm drainages are the largest source of the toxic confetti

The Mercury News

Pompeo, House chairmen clash

Security of state rejects demands to interview State Department officials

For announcer. As playoffs part of growing up Oakland A's can also be seen in the field.

Excusal of black jurors ruled legal

300 MURDER TRIAL

The San Francisco Chronicle

HOW MICROPLASTICS GET INTO THE BAY

A new study finds that storm drainages are the largest source of the toxic confetti that washes into the bay every year.

300 MURDER TRIAL

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HOW MICROPLASTICS GET INTO THE BAY

A new study finds that storm drainages are the largest source of the toxic confetti that washes into the bay every year.
San Francisco Bay Study Design

Bay Monitoring

Pollution Pathways

Ocean

Water

Fish

Sediment

Wastewater

Stormwater

Transport Model

UC DAVIS
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Microparticles and Microplastics

Sorted -> Characterized Microparticles -> FTIR / Raman Microplastics
Bay microparticle levels higher than other urban coastal areas


Great Lakes Chesapeake Bay Puget Sound Baltic Sea

Average Abundance (particles/km²)
Wastewater Sampling
Facilities using additional filtration release lower levels.
Fibers were most abundant in effluent samples

- Average 0.06 microparticles / L
Average microparticle abundance is greater in stormwater.
Stormwater Sampling
Wastewater: 17 billion
Stormwater: 7 trillion
estimated microplastics to Bay annually

Stormwater load is over **300** times greater than the wastewater load to the Bay.
New RMP Study: Understanding Urban Stormwater

Kole et al. 2017
Transport Model
Particle Tracking: Currents + Particle Buoyancy

RED: Rising, 5mm/s
GREEN: Passive
BLUE: Sinking, 5mm/s
Presentation Outline

1. Microplastics
2. PFAS
Poly- and Perfluoroalkyl Substances (PFASs)

**PFOA**
Perfluorooctanoic acid

**PFOS**
Perfluorooctane sulfonic acid

Moderate Concern
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 8:2 PFPi)

Perfluorosulfonamide (ex. FOSA)

Perfluorinated cyclo sulfonates (ex. PFECHS)

Perfluorosulfonamidoethanol (ex. N-EtFOSA)

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

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

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

>4,000
RMP Studies

- 2009 and 2014 Studies
- Important pathway
- Changes
  - PFOS and PFOA
  - Short chain
  - Many unknown PFAS present
- Airport, military, and industrial operations: high concentrations and unique profiles
Wastewater Monitoring

- **Completed:** Ethoxylated Surfactant Sampling
- **Upcoming:** Data results

![Chemical Structure](image)

Moderate Concern

[Image of Duke University logo]
Wastewater Monitoring

- Completed: Ethoxylated Surfactant Sampling
- Upcoming: Data results
- Upcoming 2020: Bisphenols sampling

Moderate Concern
CEC Synthesis

- Tiered risk framework
- Inform priorities for monitoring and management
- Stakeholder input on scope and priorities
- 2-year Study
Thank you for your support

Stakeholders

Scientists

Government
Thank you

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