

# **BACWA Hot Topics:**Contaminants of Emerging Concern

Diana Lin, PhD January 10, 2020





### **CEC** and Microplastic Team at SFEI







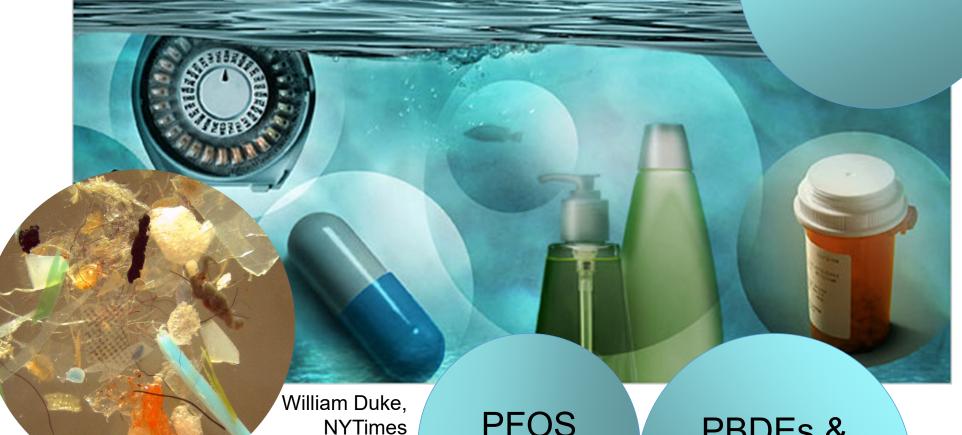






#### **Contaminants of Emerging Concern**

Pesticides



Microplastics

PFOS PFAS

PBDEs & Flame Retardants

## **Anticipating the Next Silent Spring**





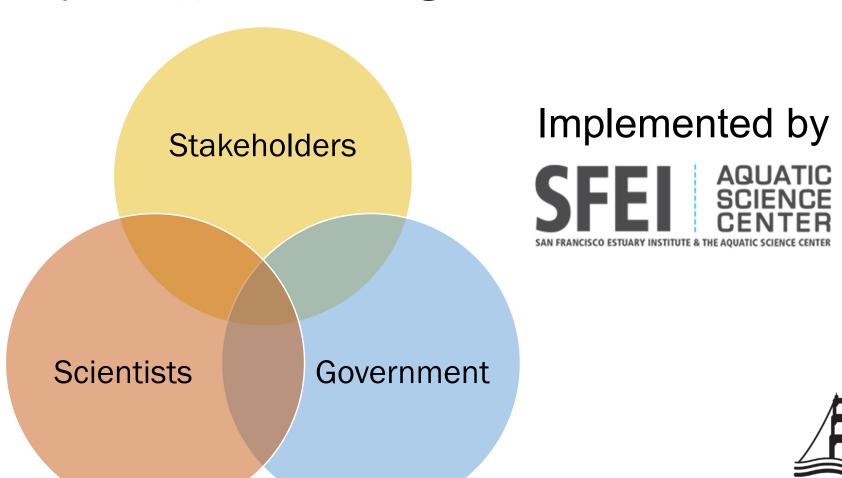
Reactionary monitoring

Anticipatory monitoring



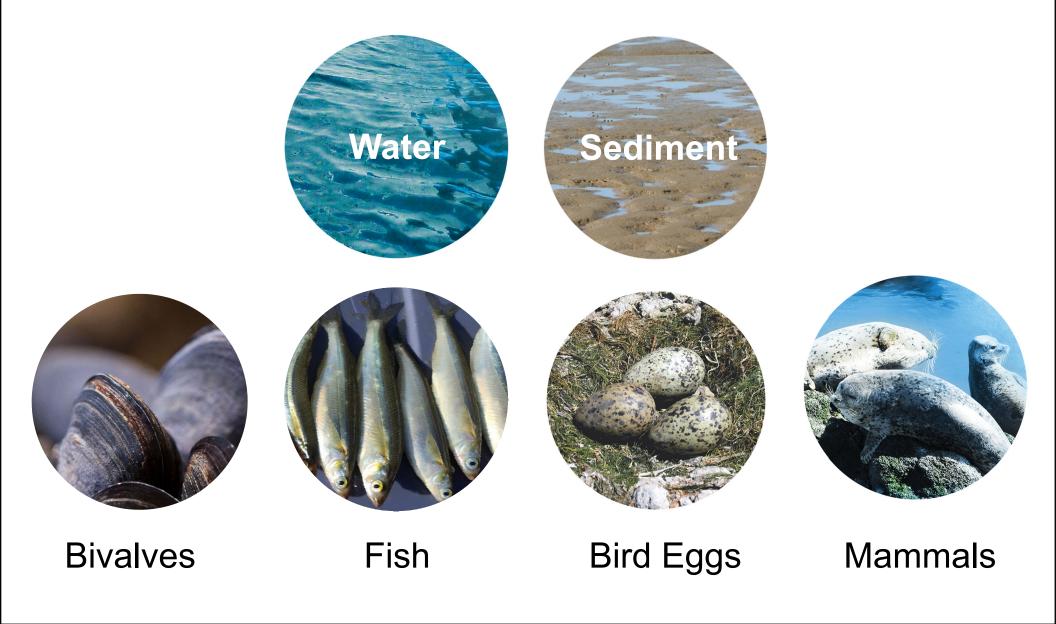
### Regional Monitoring Program

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





## **Monitoring San Francisco Bay**



#### Tiered risk-based framework

High Concern

moderate or high impact

Bay levels above observed effects



## 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



limited impact

Periodic screening & trends

Low-cost source control

Possible Concern

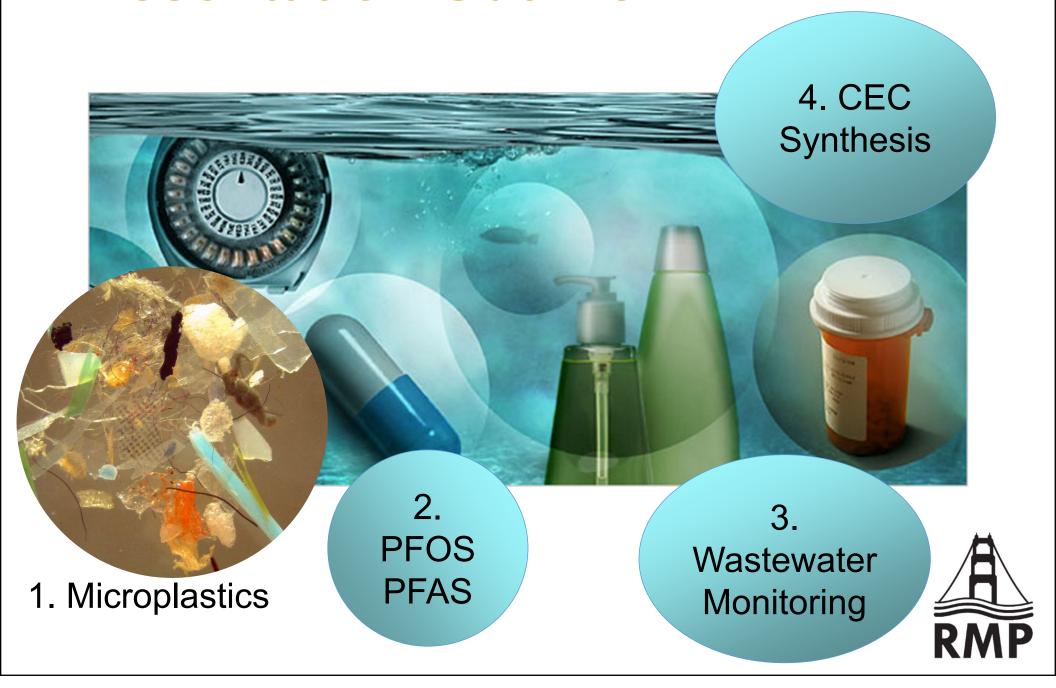
uncertainty as to impact

Screening

Analytical methods

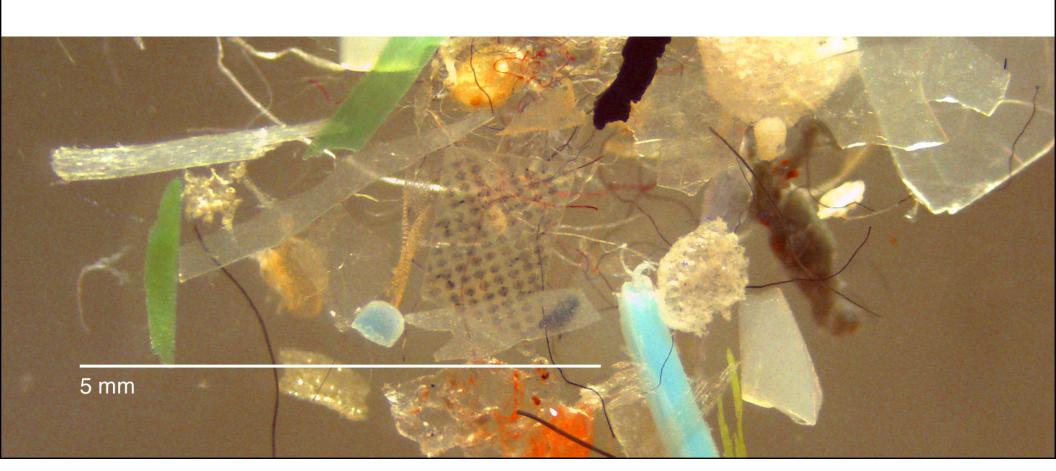


#### **Presentation Outline**

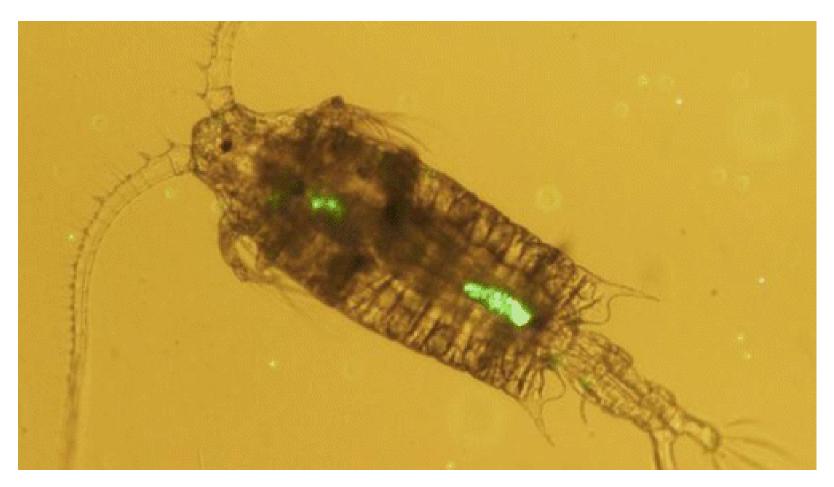


### What are microplastics?

Particles of plastic smaller than 5 mm



## Impacts to Wildlife



Zooplankton *Centropages typicus*Cole et al. 2013



### **Microplastics Study**

#### First comprehensive regional study





















### Los Angeles Times

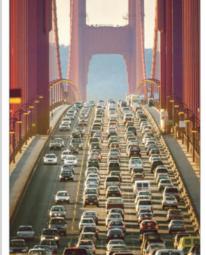
#### HOUSE **ISSUES** THREATS, **TRUMP** RAGES

As Democrats signal a possible White House subpoena, president lashes out at them and the whistleblower.

BY ELI STOROLA. AND SABAM D. WIRE



Since President Andre



#### Cars pollute the sea too, with tire rubber

California's waters are awash in microplastics, and automobiles may be the primary source

microplastics?

SPHERES

and climate change problem — turns out, it just might be the largest contributor of microplastics in California

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

Officials say the move basis.

A Times data analysis in a remotion of the control and homeless, who often go to jail over minor offenses.

In a major move designed to ease the challenges facing the region's poor and homeless people, Los Angeles officials said Wednesday that they were voiding nearly 2 million minor citations and warrants that had kept people trapped in the court system.

been trying to move away from citations and infrac-tions that according to crit-ics "nickel and dime" those

2016 found a persistent cycle of homeless arrests. Los An-"quality-of-th" lwas — re-stricting sleeping on the sidewalk, living in a car or low-level drug possession, for example — that police usually enforce with a citation. The tickets typi-cally start out at less than \$20, but often top \$300 ence court fees are added. Tickets

court fees are added. Tickets pile up, and people go to juit.

In a joint announcement.

Wednesday, Los Angeles

help the LAPD focus on g ting the worst criminals the streets instead of head

#### test-optional route into UC?

SAT ro rement to playing field, even t at could set a move

By TERR

ions requirement.
Although the stand-rdized tests are predictive

better registerment?

"Whatever we do will be a national procedent," UC President Janet Napolitano said at a recent Board of Regents meeting. "And so ... we want to get it right."

The decision will be a "monster deal" because UC's status is likely to beavi-

Sports: Sharks' Kane



Business: Nestle, Dreyer's cutting hundreds of jobs in Bay Area, C7



Local: BART general manager's wish:



Nation: Ex-Dallas officer found aulty of murder, A3



#### Mercury News

WEDNESDAY, OCTOBER 2.

#### Plastic tide: 7 trillion bits wash into bay every year

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



child in the Bay Area, flow Likely courses: Toro, tectiles, into San Francisco Bay, according to a the most consequence static devis, construction, problemsive scientific study pet.

Irains collect plastic litter breaks down but never fully Estuary Institute, a nonprofit from roads, foam food pack-disappears. research center in Richmond.

into buy waters. But 300 times more of the aging, rutber bits from our "These are pieces smaller "Many of them are too small relations tasks confertit, the tires, and other sources and, than a kernel of papeors," to even see. You have to sust prevaide, concent from definer the decirs to creeks and fiberocal piston, lead as a microscope. They are tiny norm drains, the largest and the bus especially during ther of the study and a senior little particles and tiny little source of the particles. The we wister mostfal, where is selected as the Bas Praincise Others."

#### Excusal of black jurors ruled legal

#### Pompeo, House chairmen

Secret ry of state rejects demands to interview State Department officials



#### PLAY-BY-PLAY MAN

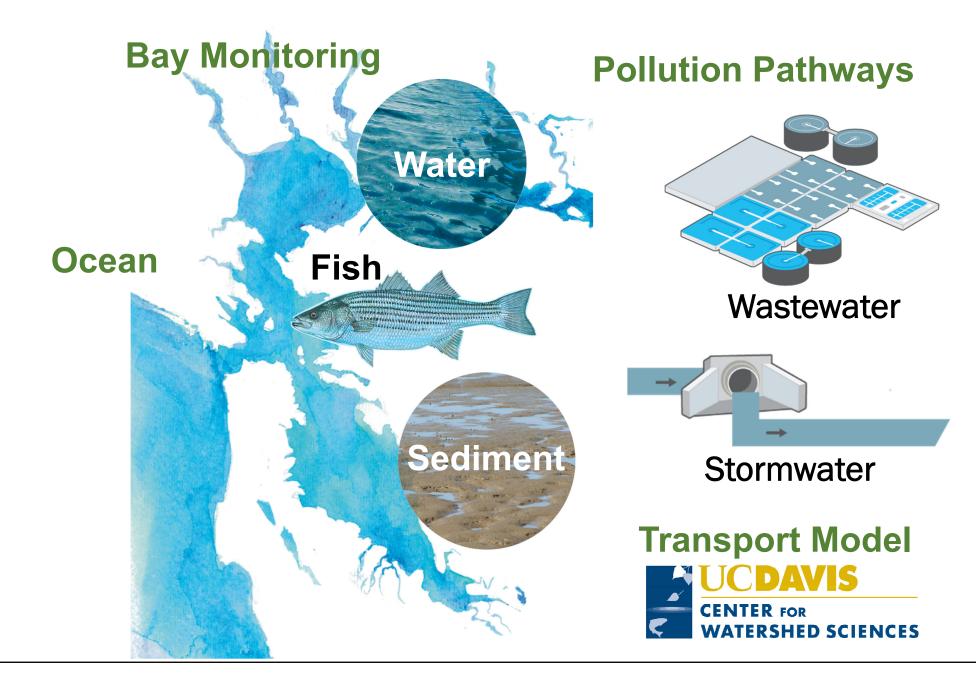
#### For announcer. As playoffs part of growing up

Oakland-born Vasgersian says that he used to bleed green and gold

#### By Chuck Barney

sey t-mock Battering com-characyphic Battering com-ESPN play-by-play man Matt Vangersian was barely 8 years old when he uttered a curse word in front of his dad for the first time — and the Oakland A's made him do it.

## San Francisco Bay Study Design



### Microparticles and Microplastics

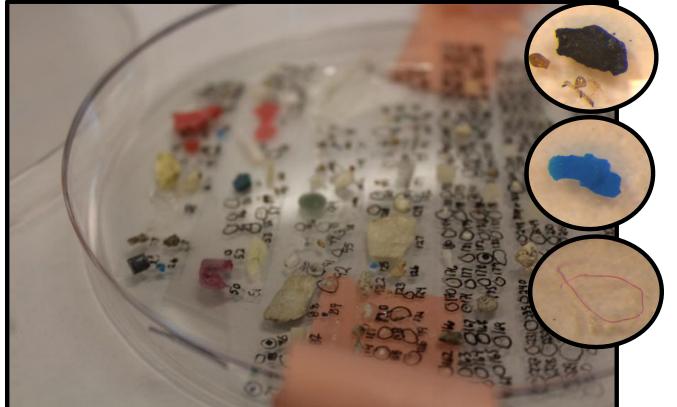






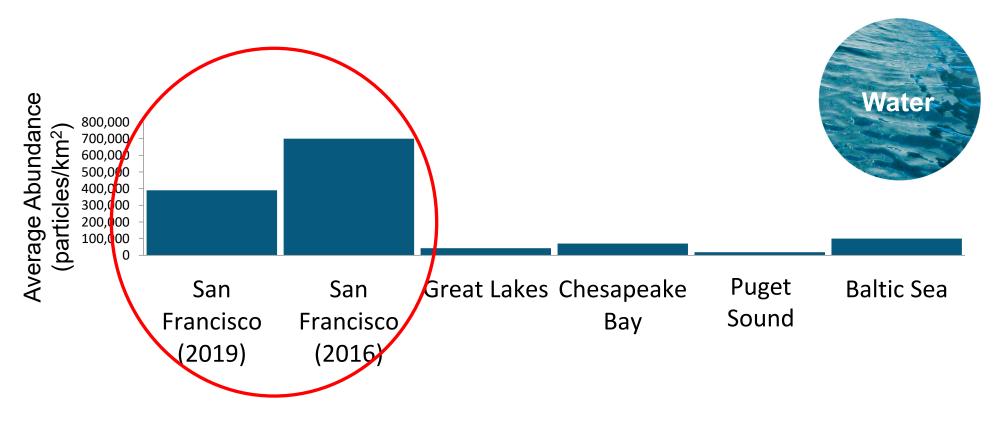








## Bay microparticle levels higher than other urban coastal areas



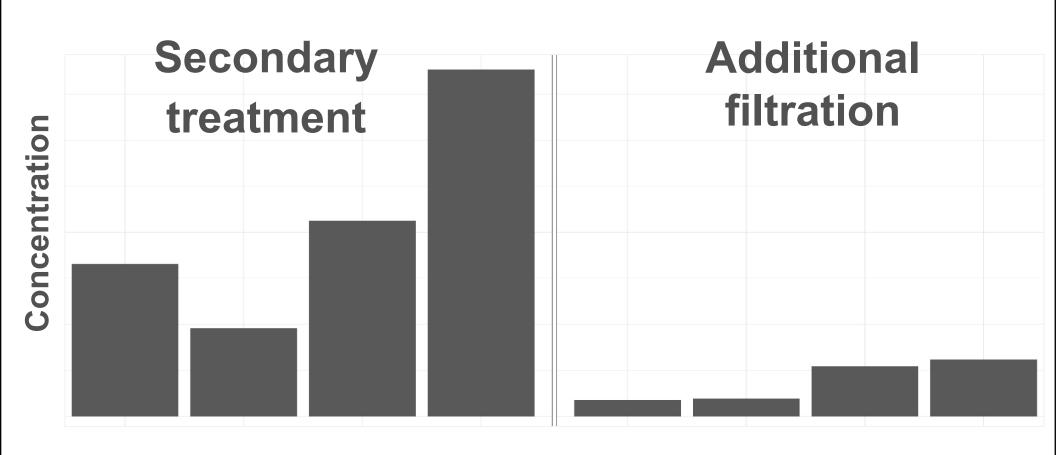


## Wastewater Sampling

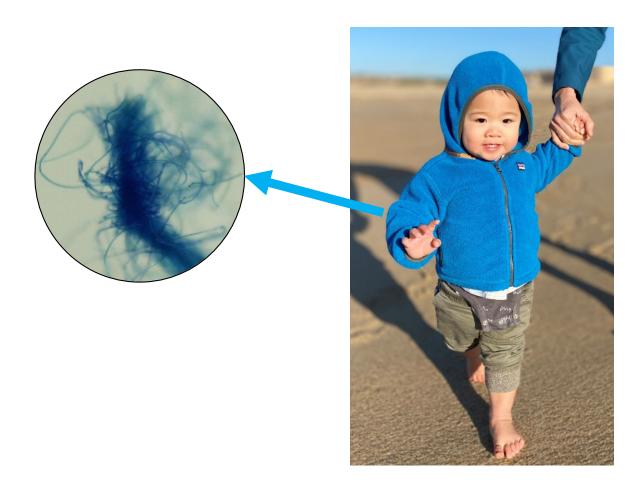




## Facilities using additional filtration release lower levels



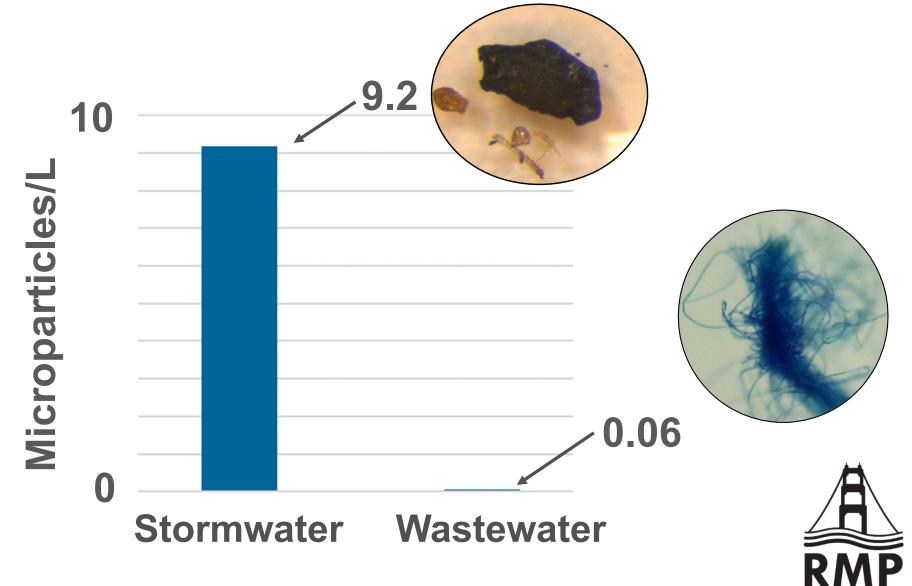
## Fibers were most abundant in effluent samples



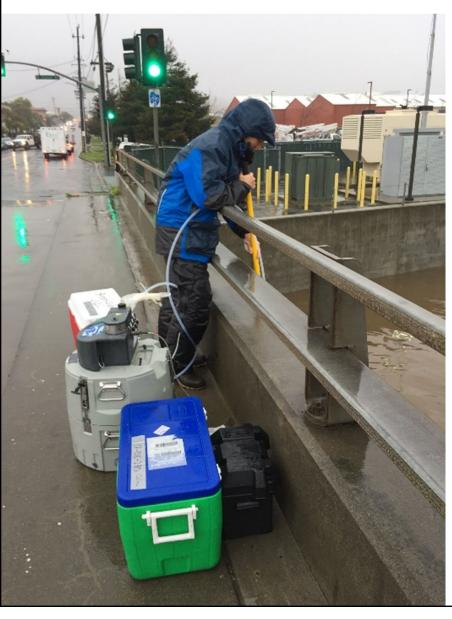
Average 0.06 microparticles / L



Average microparticle abundance is greater in stormwater



## Stormwater Sampling





Wastewater: 17 billion

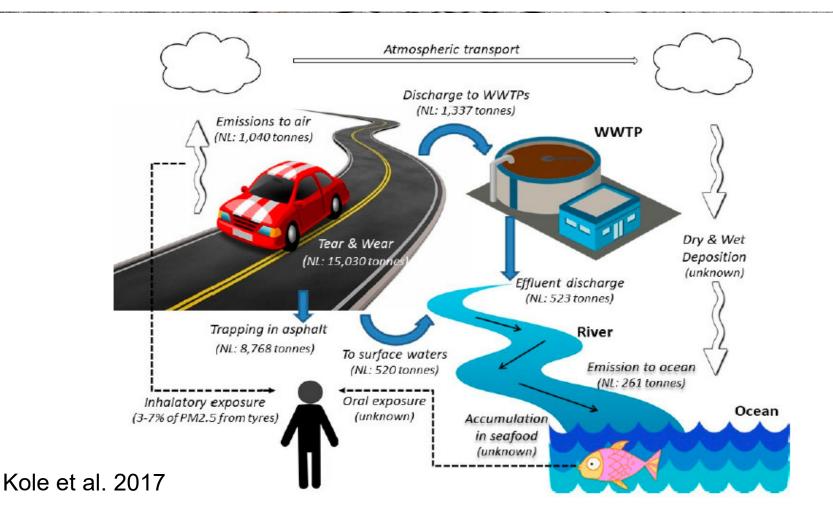
Stormwater: 7 trillion

estimated microplastics to Bay annually

Stormwater load is over 300 times greater than the wastewater load to the Bay.

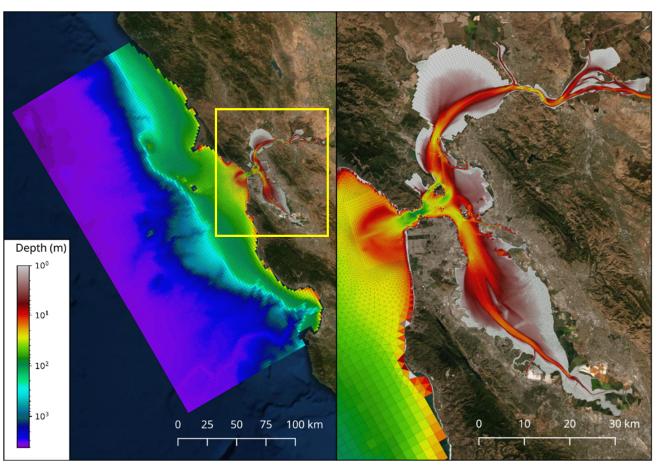


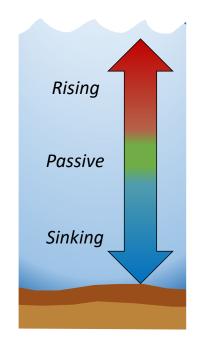
#### New RMP Study: Understanding Urban Stormwater





## **Transport Model**







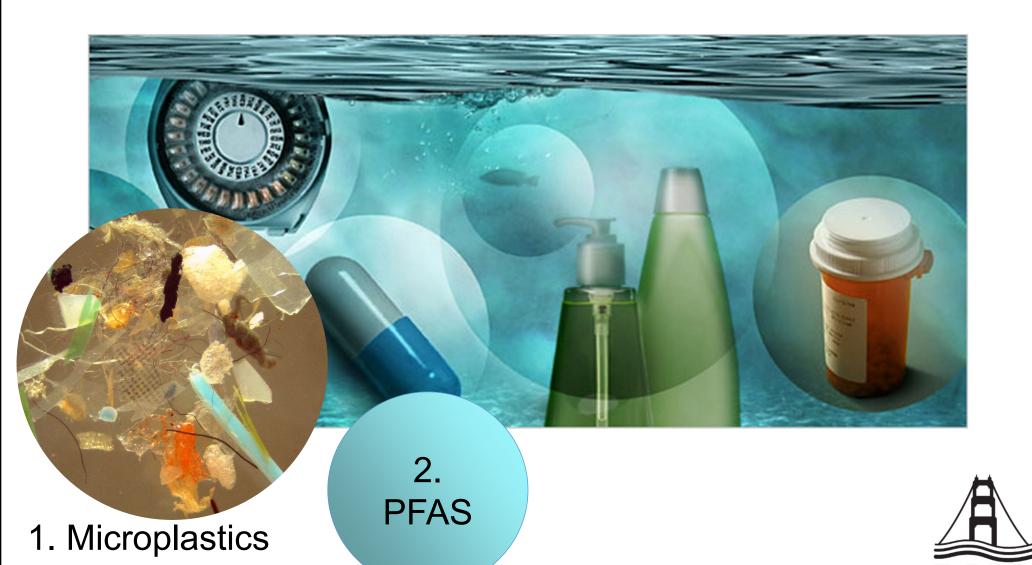


## Particle Tracking: Currents + Particle Buoyancy





#### **Presentation Outline**

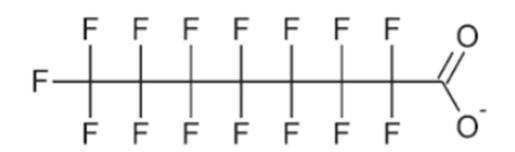


## Poly- and Perfluoroalkyl Substances (PFASs)

Moderate Concern

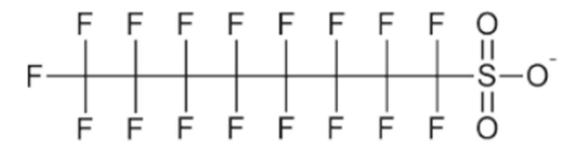
PFOA

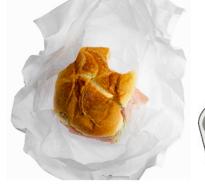
Perfluorooctanoic acid



Perfluorooctane

Perfluorooctane sulfonic acid



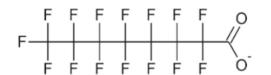




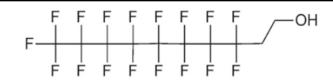








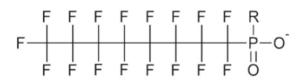
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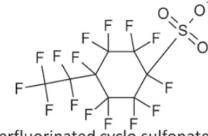


Perfluorocarboxylic acids (ex. PFOA)

Perfluorosulfonic acids (ex. PFOS)

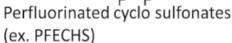


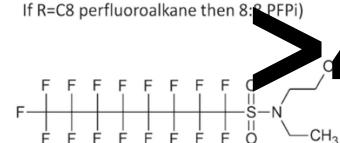


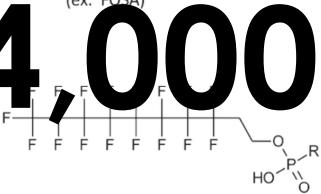


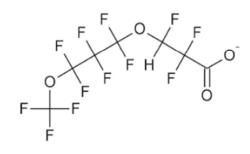
Perfluorophosphonic/phosphinic acids (ex. If R=OH then PFOPA

Perfluorosulfonamide (ex. FOSA)





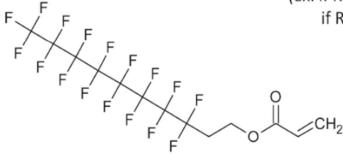




Perfluorosulfonamidoethanol (ex. N-EtFOSE)

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)

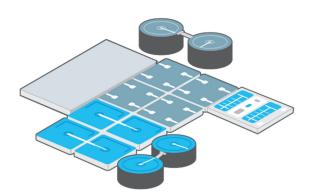


Polyfluorinated polymeric unit (ex. 1H,1H,2H,2H-perfluorodecyl acrylate)

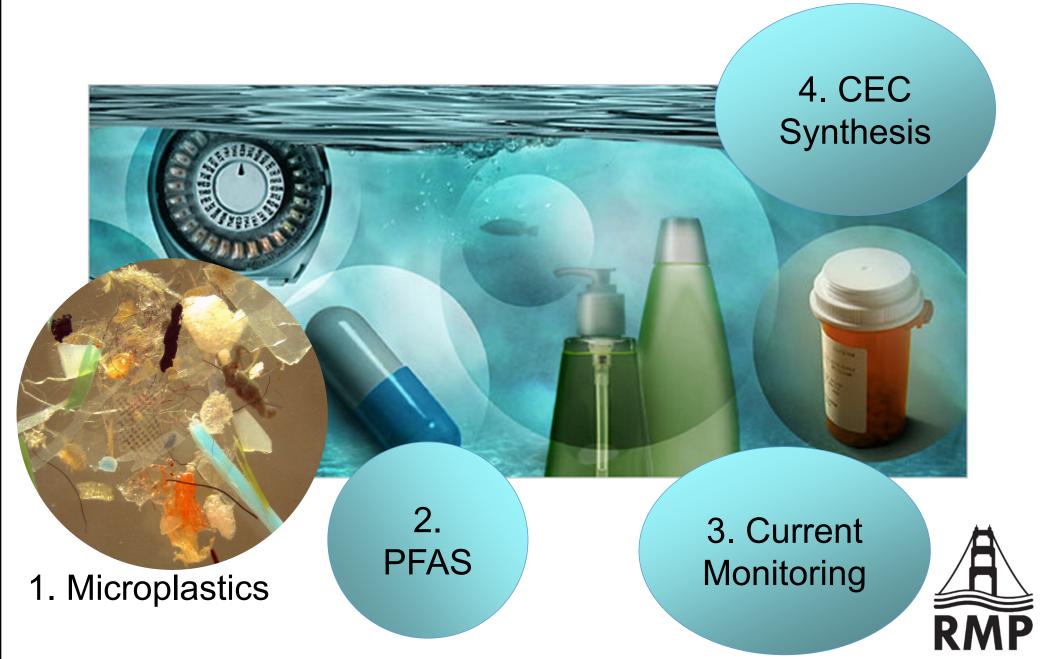
Polyfluorinated ether sulfonates (ex. Perfluoro [hexyl ethyl ether sulfonate])

#### **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



#### **Presentation Outline**



#### **Wastewater Monitoring**

- Completed: Ethoxylated Surfactant Sampling
- Upcoming: Data results

Moderate Concern

$$\left( \begin{array}{c} O \\ O \end{array} \right)_{n}^{H}$$







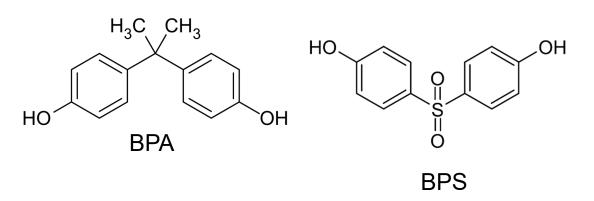






#### **Wastewater Monitoring**

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

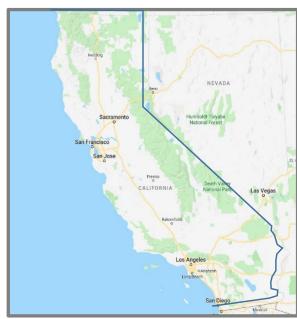


Moderate Concern

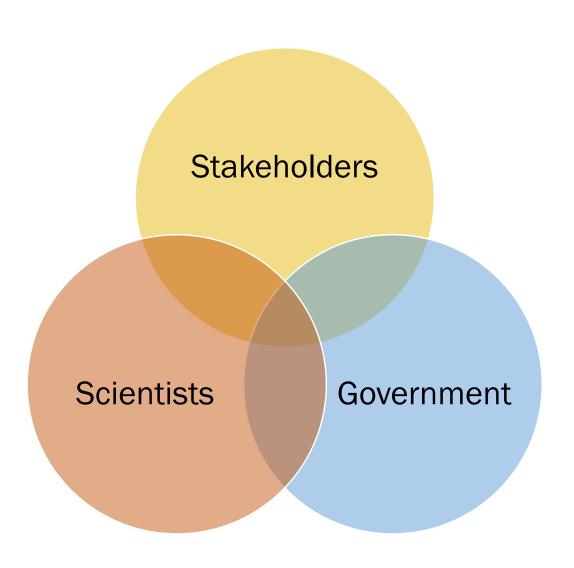


### **CEC Synthesis**

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



## Thank you for your support







## Thank you

www.sfei.org/CECs

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