



Microplastic Monitoring and Science Strategy for the San Francisco Bay

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Chesapeake Bay Program Plastic Pollution

Action Team Meeting

January 19, 2021

Presentation Goals

Share

- SF Bay microplastic strategy
- Objectives of monitoring study
- Findings and lessons learned

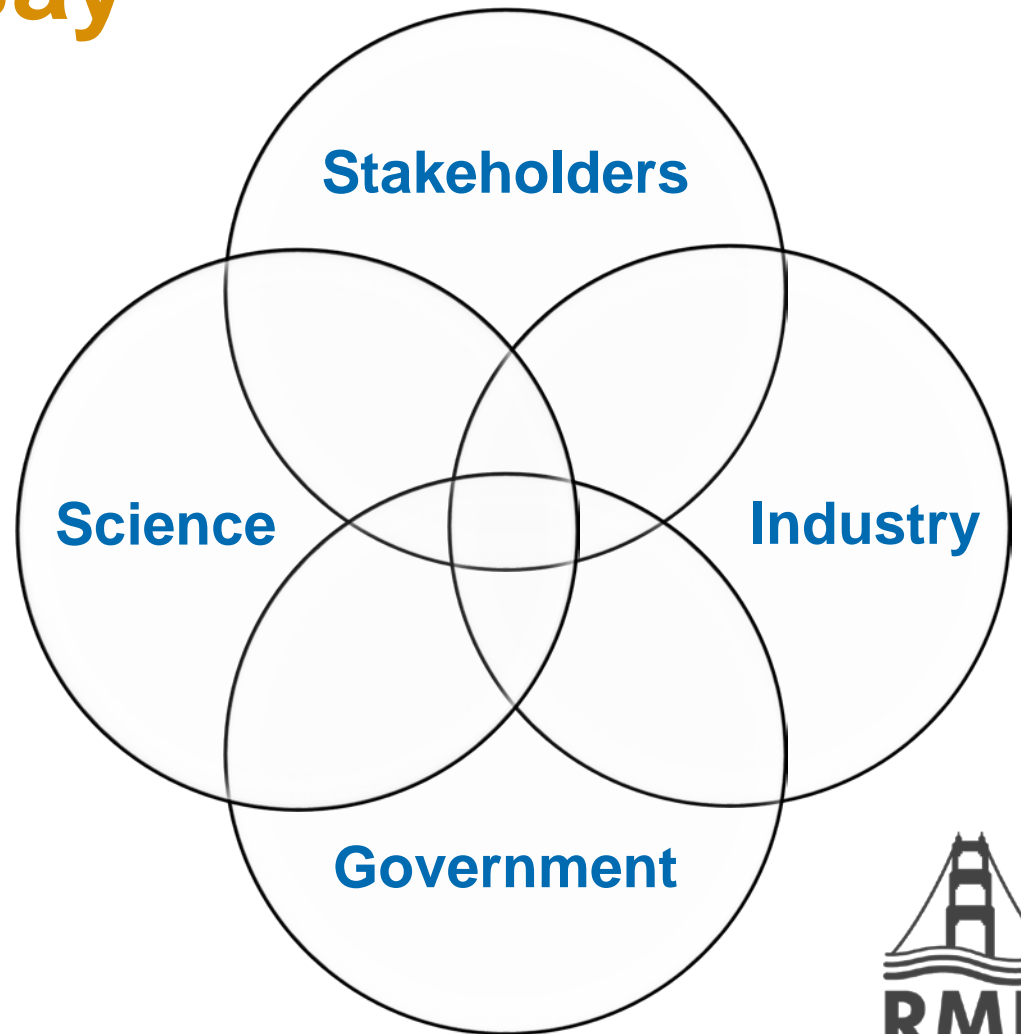
Share ecological risk assessment framework

Regional Monitoring Program: Partnership to monitor the health of the Bay

**Science
leadership on
microplastics**

RMP Strategy:

- sfei.org/projects/microplastics

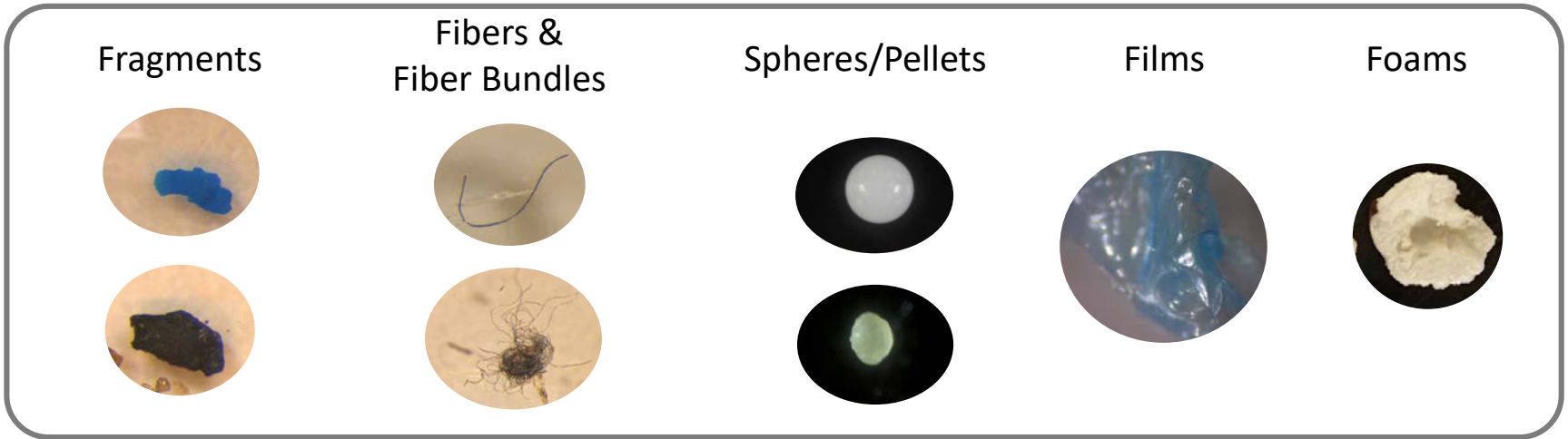


SFEI



What do microplastics look like?

Morphology



Chemistry

Polymer	Additives	Eco-toxins	Color	Size
PP LDPE HDPE PVC PU PET etc...	Plasticizers Colorants Reinforcements Fillers Flame retardants Stabilizers etc...	PCBs PAHs DDT Heavy metals PBDEs etc...	Red Orange Yellow Black Grey Blue Green etc...	mm µm nm



- Morphology and polymer give us clues to source

Microparticles and Microplastics

Sorted



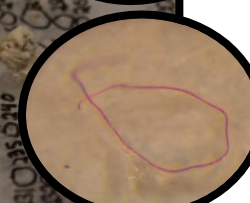
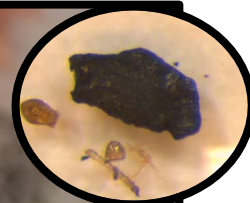
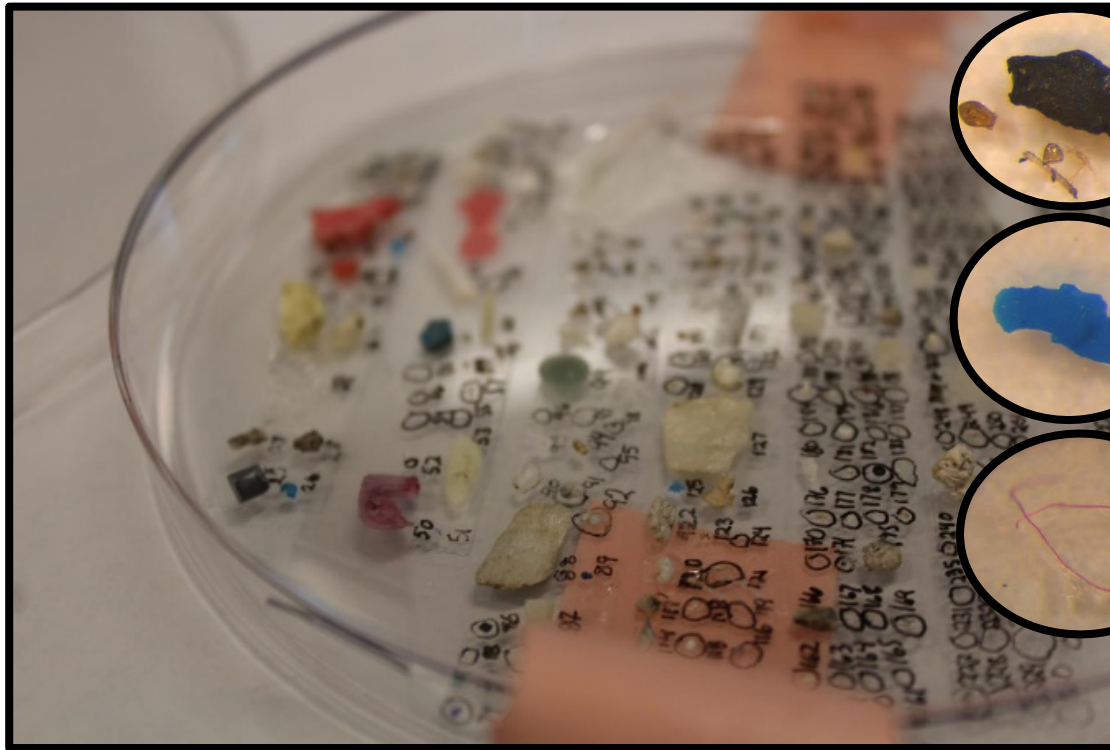
Characterized

Microparticles

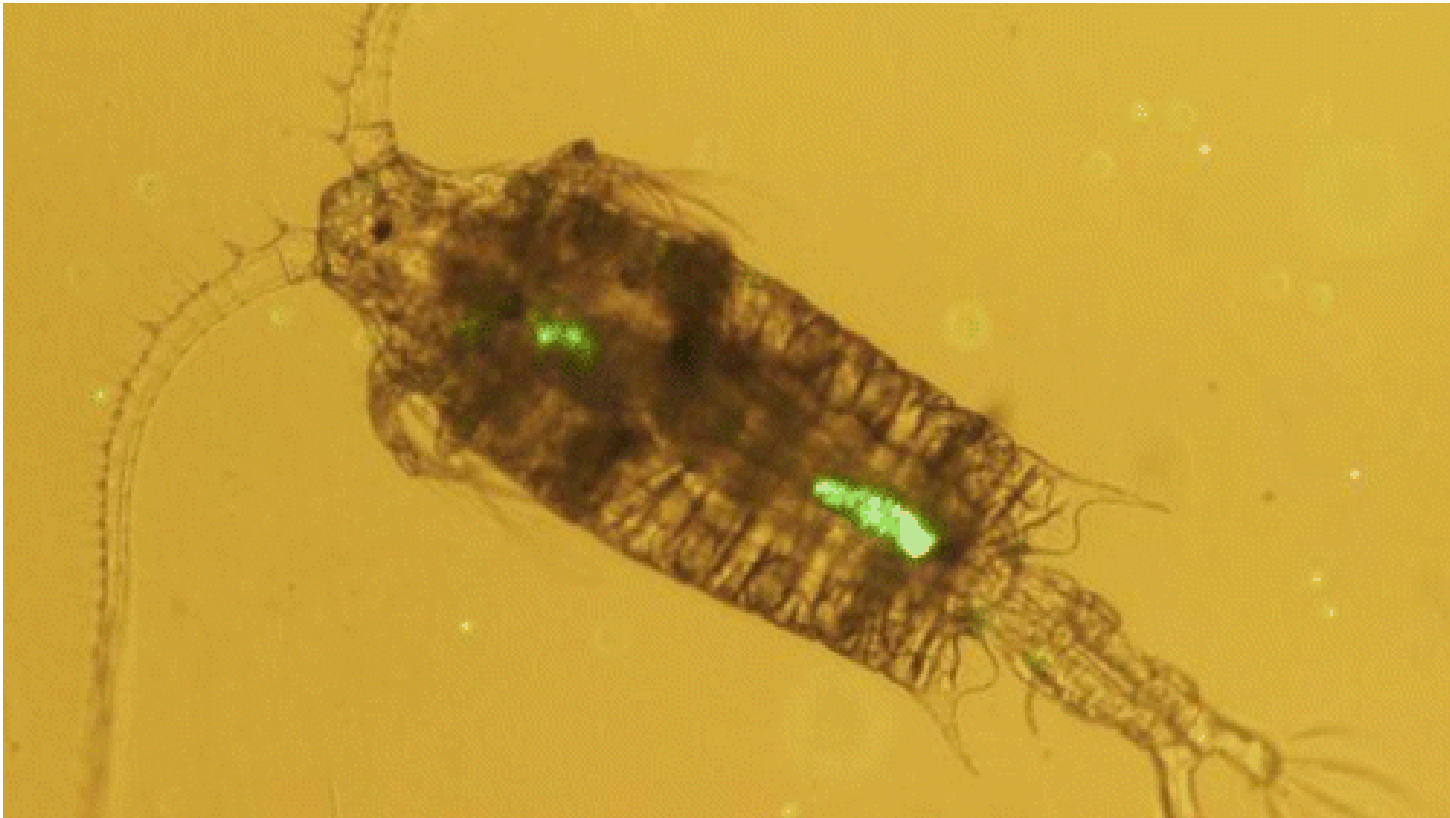


FTIR / Raman

Microplastics



Impacts to Wildlife

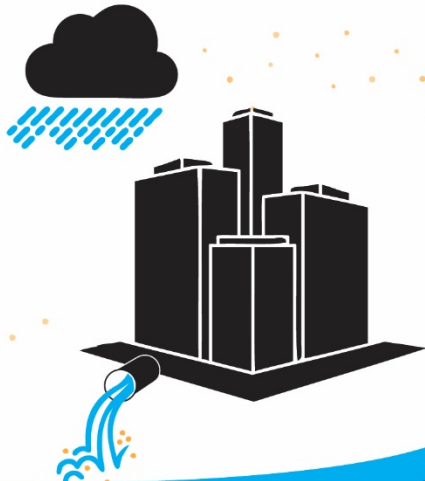


Zooplankton *Centropages typicus* (Cole et al. 2013)

Conceptual Model

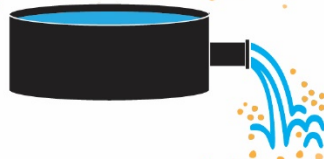
STORMWATER:

Vehicle tires, textiles, single-use plastic litter, cigarette filters, construction and roadway debris, spills, many others



WASTEWATER:

Textiles (via washing machines), personal care and cleaning products with microbeads, single-use items such as wet wipes



ATMOSPHERIC DEPOSITION:

Textiles (via clothes dryers), brake pads, auto shredders, abrasive blasting



RIVERS:

Delta wastewater and stormwater discharges, agricultural sources including land applied biosolids



AQUATIC AND SHORE ACTIVITIES:

Fishing lines, nets, marine and shipping spills, litter and debris



San Francisco Bay

Strategy Management Questions

1. How much pollution is in the Bay?
2. What are health risks?
3. What are the sources, pathways, loadings, and processes?
4. Have concentrations increased or decreased?
5. What management actions could be effective in reducing pollution?

San Francisco Bay Study

First comprehensive regional study

Inform pollution prevention actions

- Improve methods
- Identify baseline conditions
- Characterize pathways

SFEI

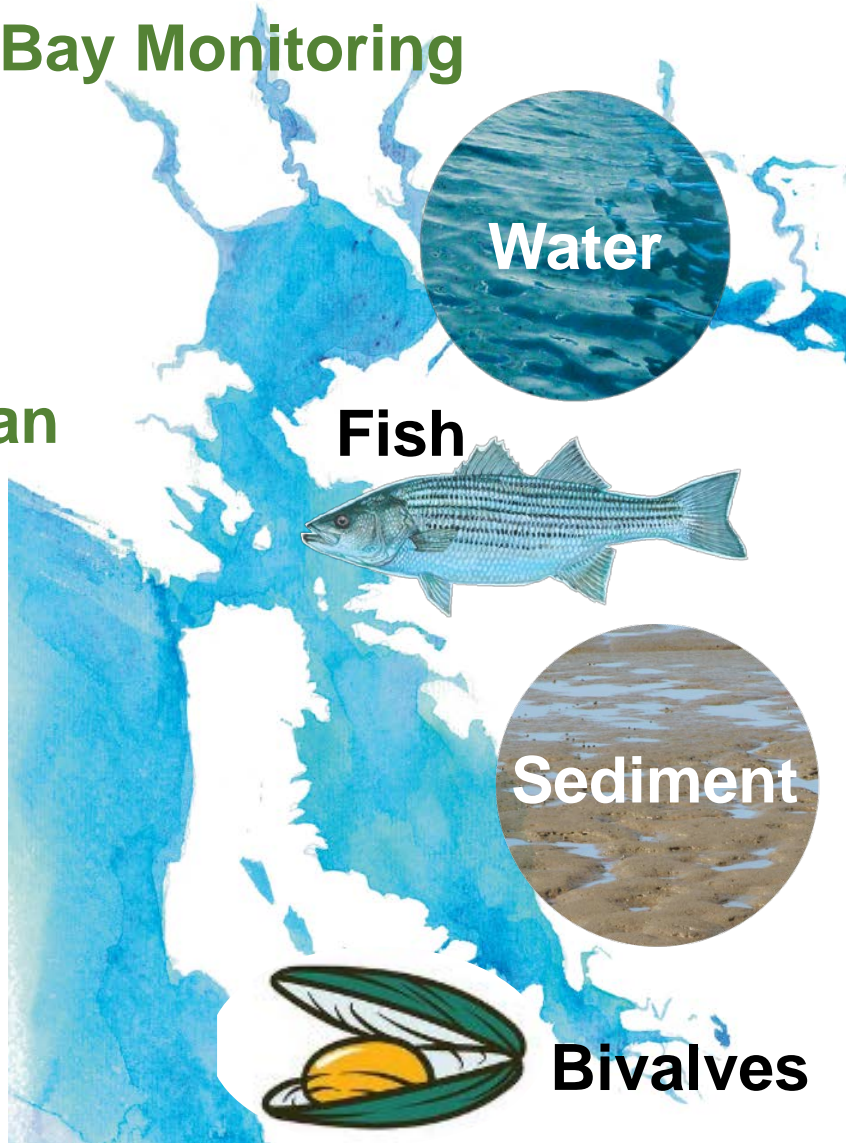
GORDON AND BETTY
MOORE
FOUNDATION


5 GYRES

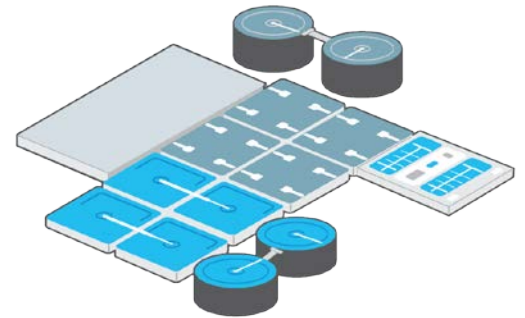
San Francisco Bay Study Design

Bay Monitoring

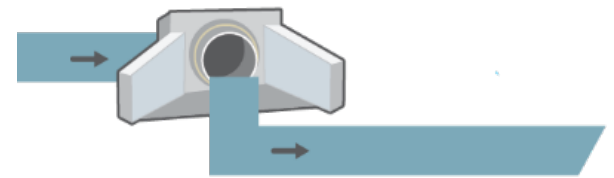
Ocean



Pollution Pathways

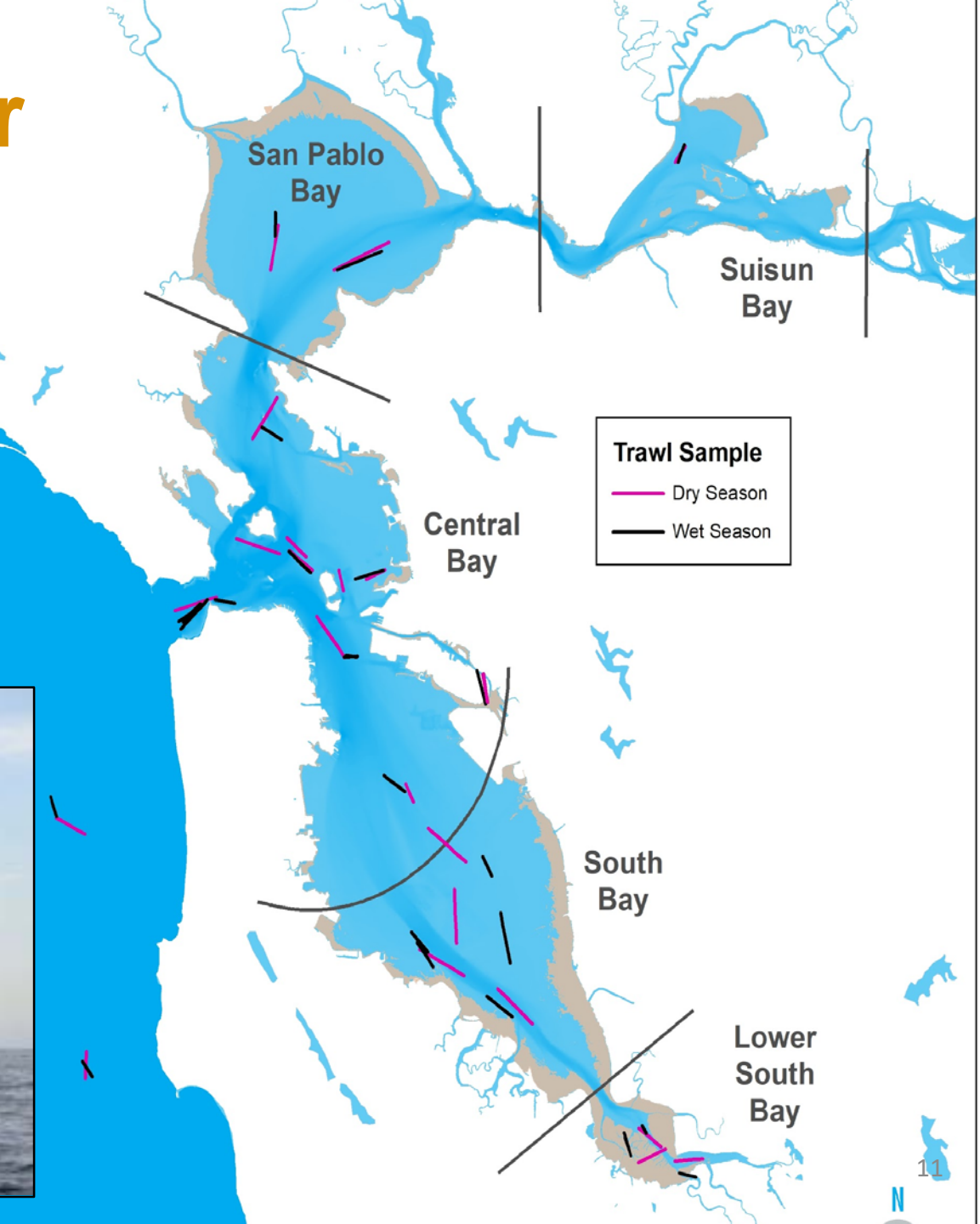


Wastewater

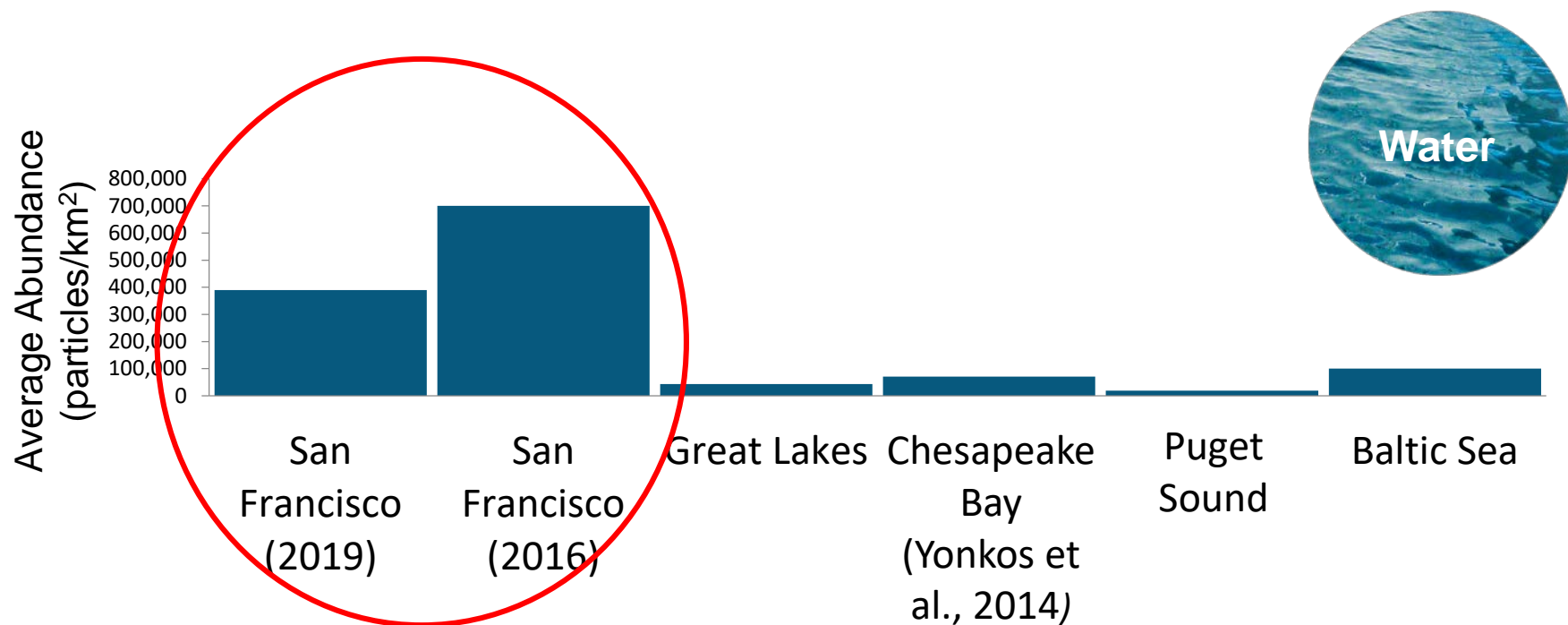


Stormwater

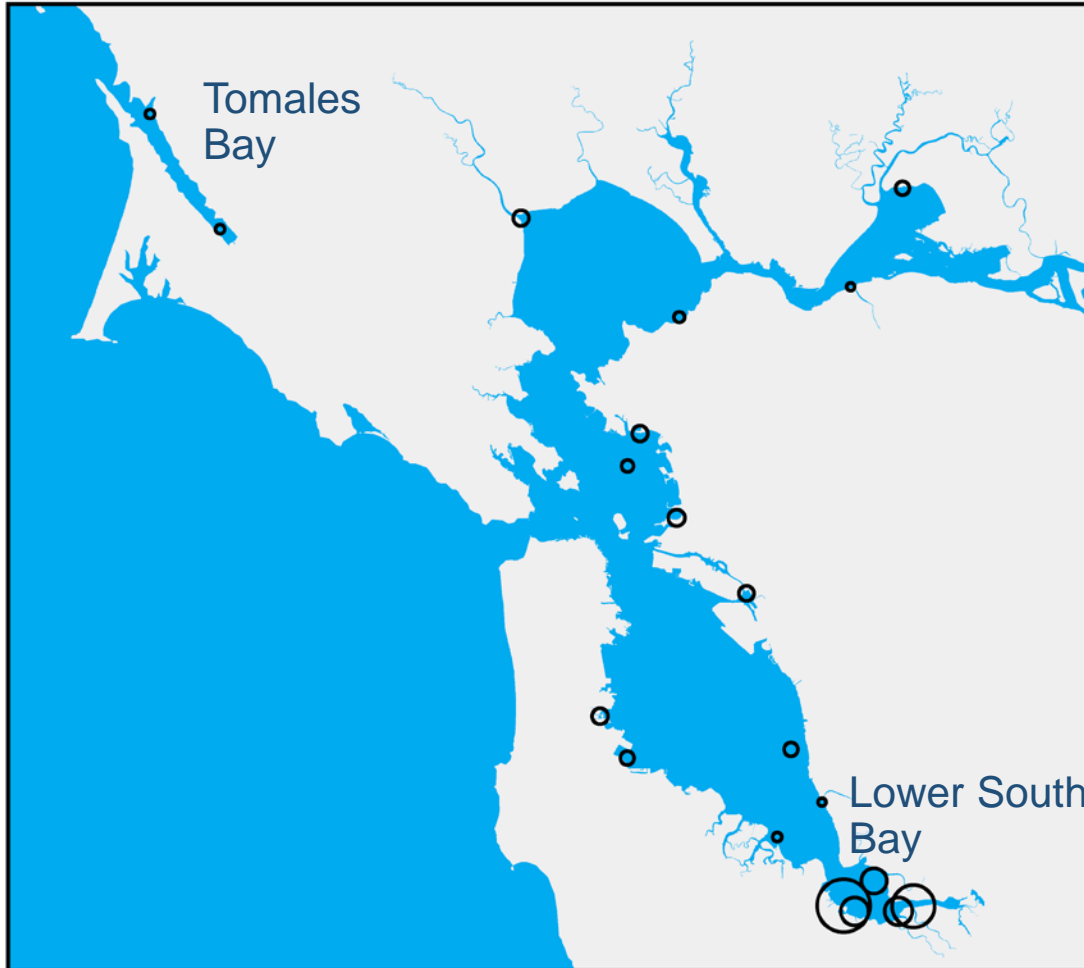
Surface Water



Bay microparticle levels higher than other urban coastal areas



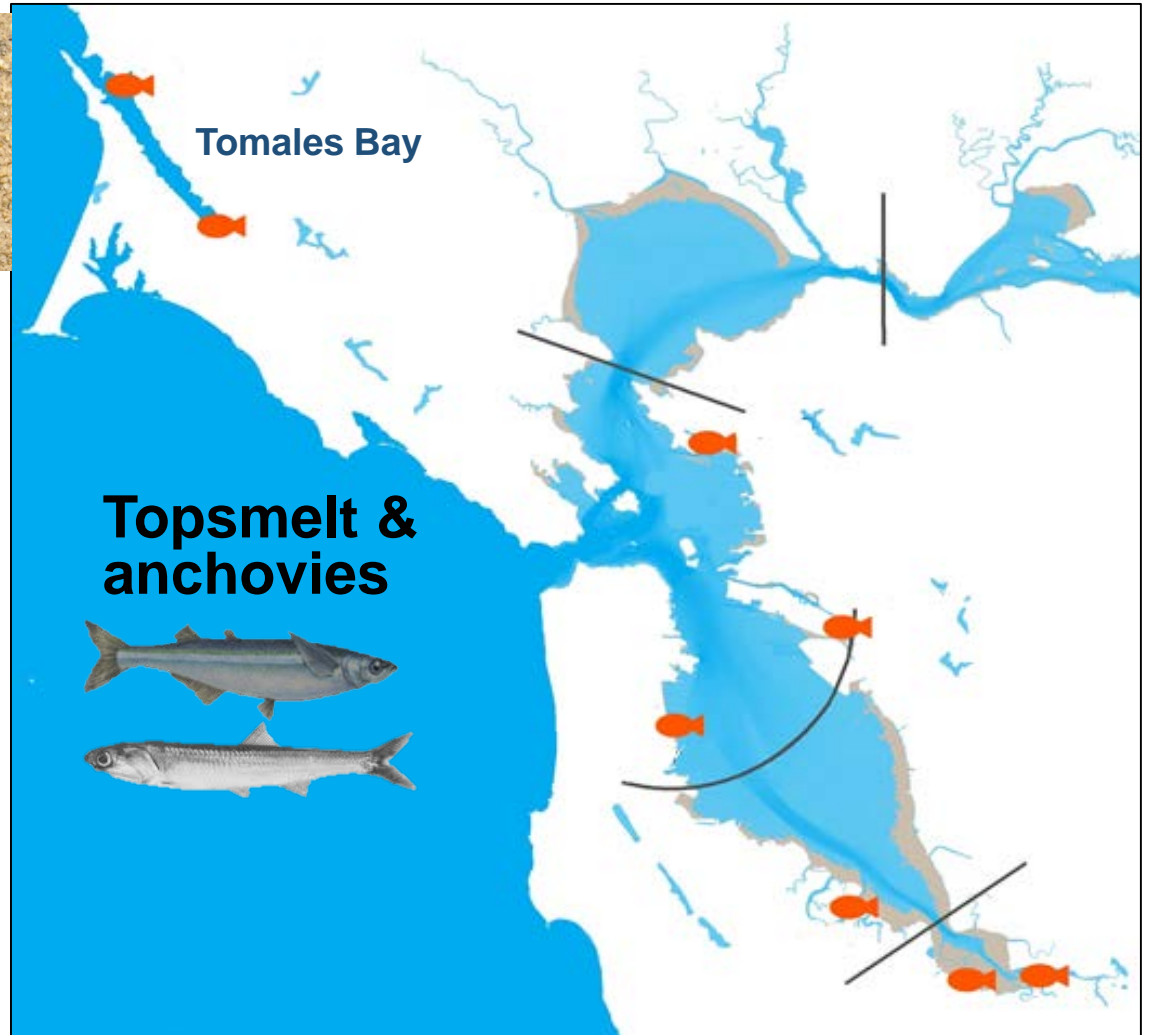
Microparticles are abundant in sediment



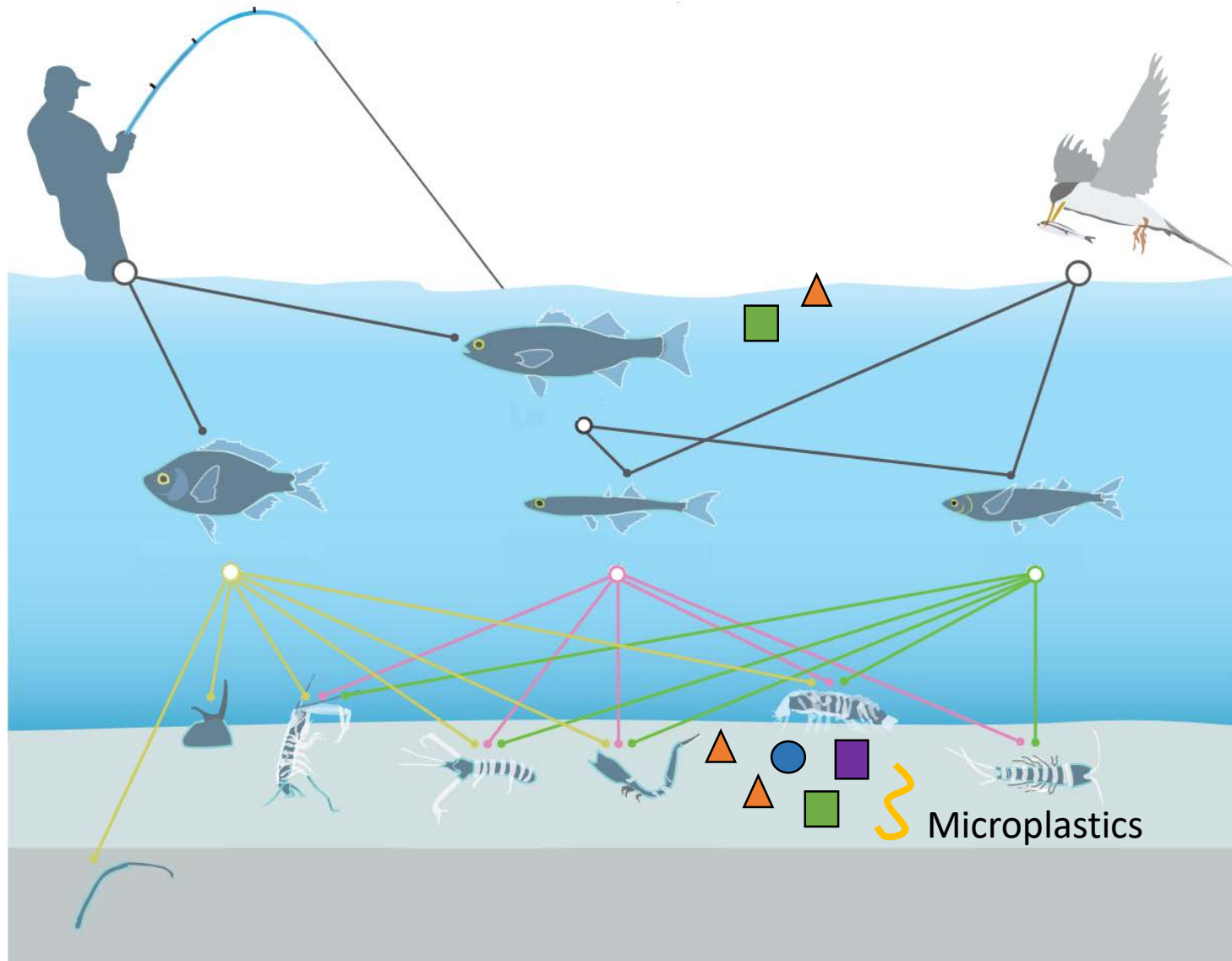
Ingestion by Wildlife



California mussel and Asian clam



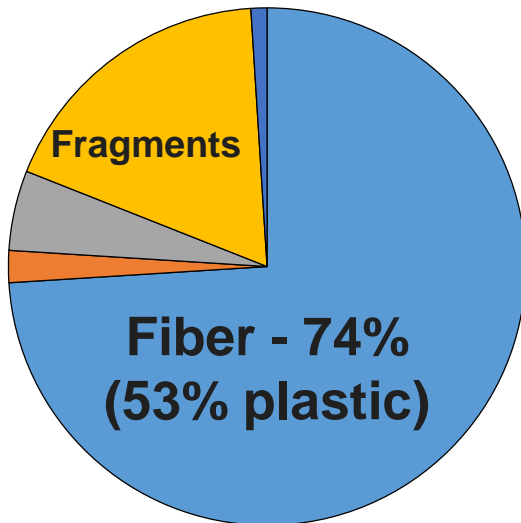
Impacts to Bay food web unknown



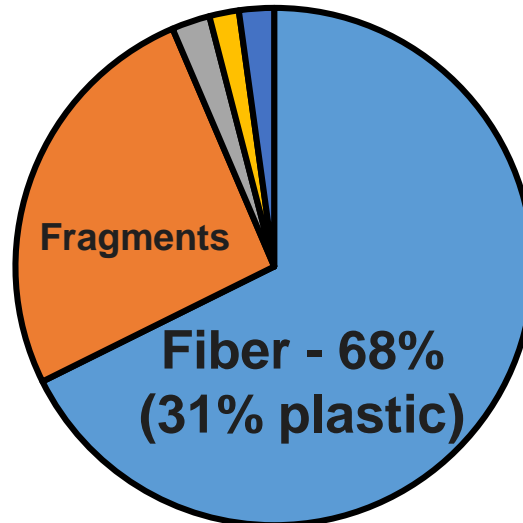
Fibers were most abundant in Bay samples



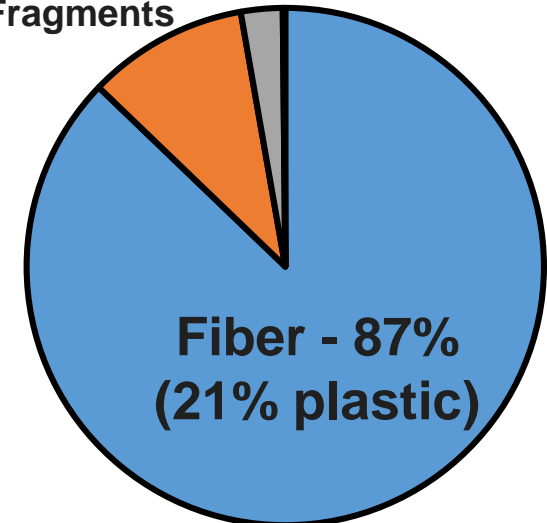
Water



Sediment

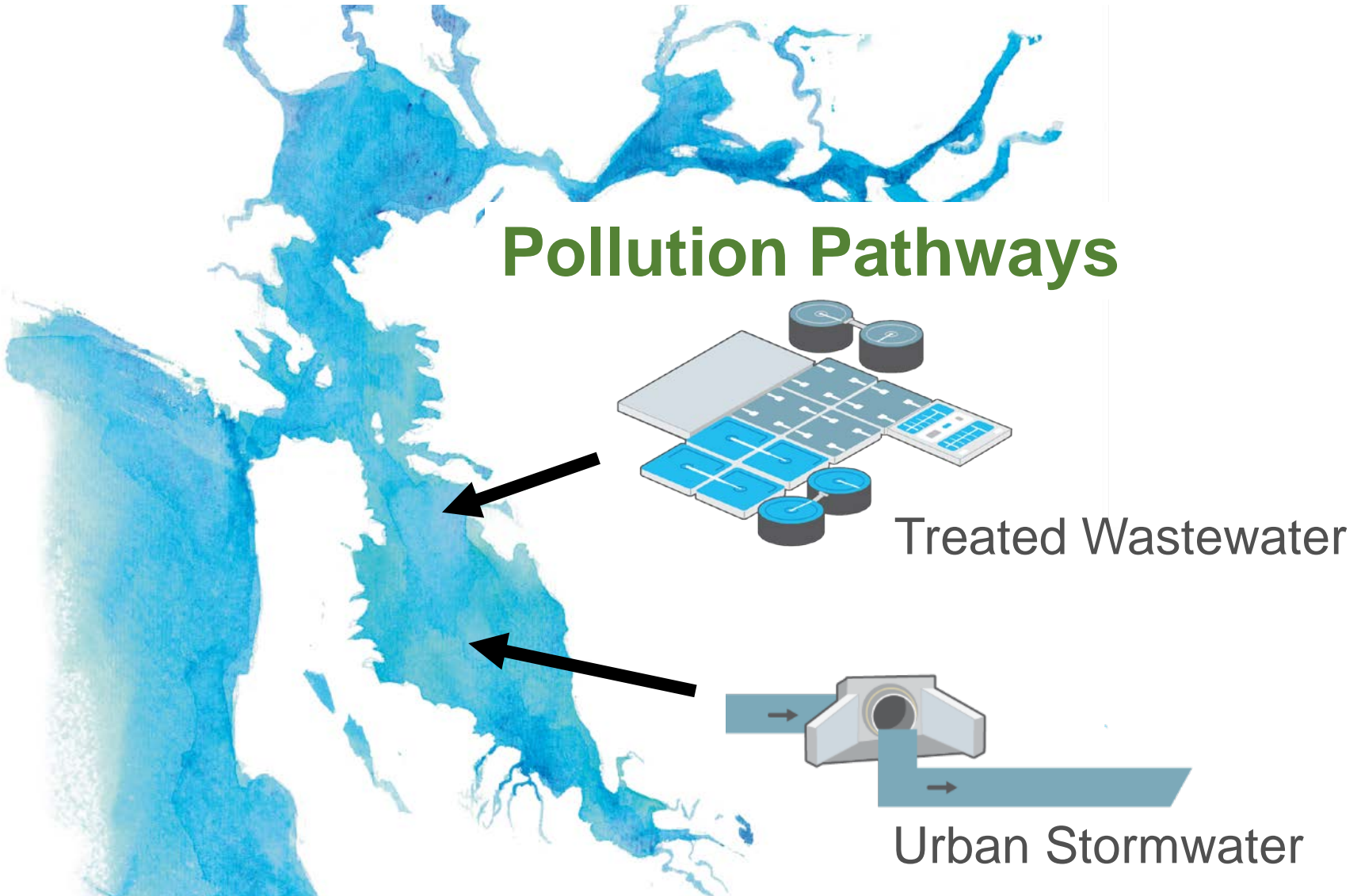


Fish
Fragments

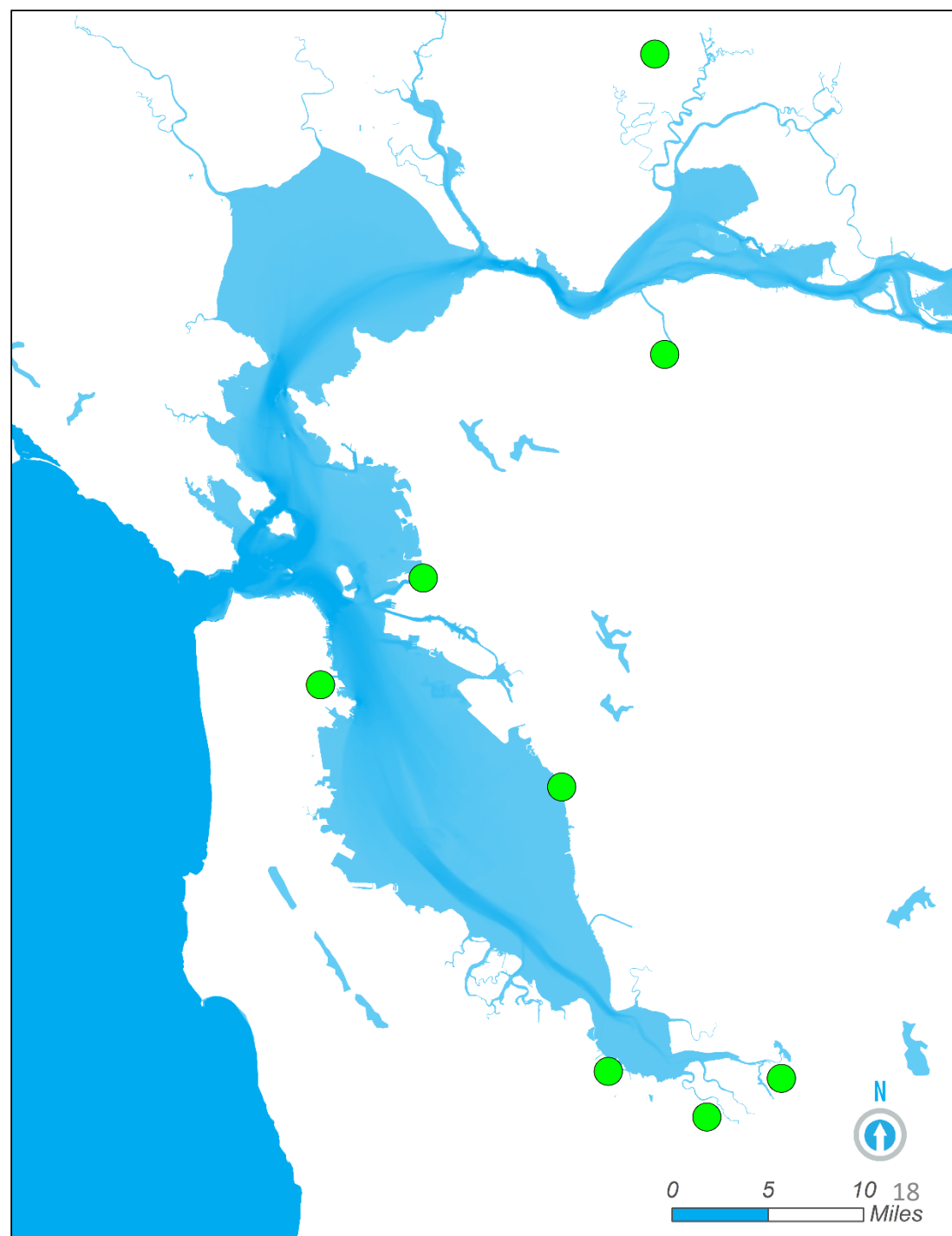


How do they get into the Bay?

Pollution Pathways



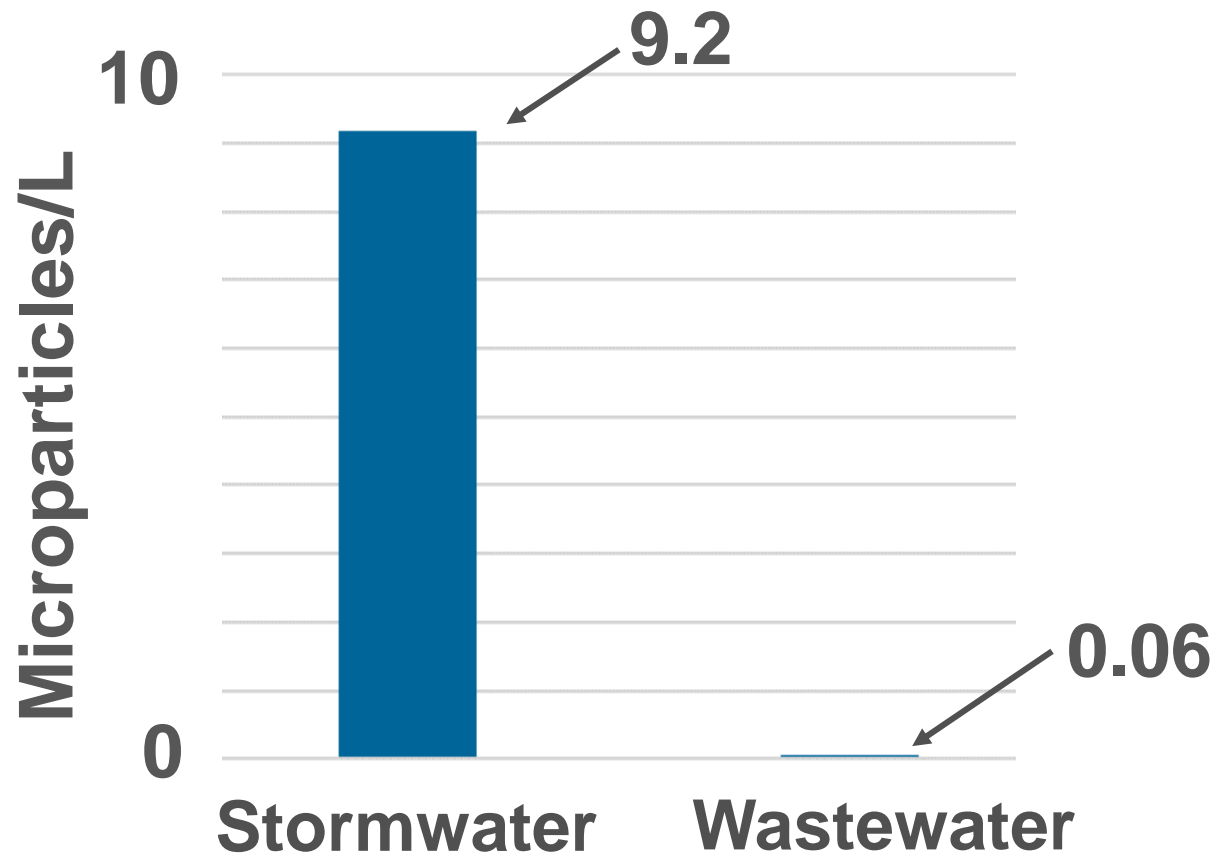
Wastewater Sampling



Stormwater Sampling



Average microparticle abundance is greater in stormwater



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.**

HOUSE ISSUES THREATS, TRUMP RAGES

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

By Eli Stohler, Chris Moorer and Sarah D. Wire

WASHINGTON — President Trump on Wednesday raged over House Democrats accelerating impeachment inquiry, leveling several false claims, doubling questions and publicly venting an anger that has been percolating for a week behind closed West Wing doors.

Trump's outburst came amid an interlocking showdown with Capitol Hill as House Democrats said they would issue a subpoena to the White House on Friday if the Trump administration did not voluntarily turn over records related to a July 25 phone call with Ukraine's president.

Later during public appearance at the White House, Trump repeated his claim that the whistleblower is a spy and vowed to sue out who that person was. Asked whether the whistleblower's identity should be protected, Trump told reporters in the Oval Office, "I don't care."

Earlier, Trump blasted Democrats for "wasting everyone's time and energy" and "not responding in real time to House Speaker Nancy Pelosi's alarming news conference."

Trump continued his attempt to paralyze the whistleblower's case during a news conference in the White House East Room, denouncing an affidavit by Poland's ambassador that says Trump, AP



The Golden Gate Bridge, a state symbol, is also a source of traffic. It is the No. 1 contributor of microplastics polluting San Francisco Bay, the study says.

Cars pollute the sea too, with tire rubber

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

By ROSANNA XIA

BERKELEY — Driving is not just an air pollution and climate change problem — turns out, it just might be the largest contributor of microplastics in California coastal waters.

That is one of many new findings, released Wednesday, from the most comprehensive study to date on microplastics in California. Rainfall washes more than 7 trillion pieces of microplastic, much of it tire particles left behind on streets, into San Francisco Bay each year — an amount 200 times greater than what comes from microfibers washing off polyester clothes, microbeads from beauty products and the many other plastics washing down our sinks, sewers and storm drains.

These tiny plastics, invisible to the naked eye, have been difficult for testing water and wildlife but are notoriously difficult to study. They're everywhere and seemingly come from everywhere. They wash into the ocean in all different shapes and sizes, many covered with dyes and chemicals. Scientists and labs across the state, the nation and the world haven't even agreed on how exactly to measure or sample or study them.

In a team of researchers, led by the San Francisco Estuary Institute and the Oryza Institute, a nonprofit research group focused on reducing plastic pollution, set off to create an inventory of ways to identify all the ways these different microplastics were getting into San Francisco Bay. They analyzed hundreds of samples from fish, sediment, surface water, wastewater and stormwater runoff and tried to trace the origins of all

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 FRIEY AND RICHARD WINTON

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.

The announcement is designed to fix a system that has led to many people being repeatedly ticketed and arrested for minor infractions, leading to growing fines and warrants. For homeless people, that has created roadblocks to accessing housing and services.

Nationally, critics have been trying to move away from citations and infractions that according to critics "trick and snare" those living on the streets into jail cells. Until now in Los Angeles, eliminating citations

A test-optional route into UC?

Regents debate lifting SAT requirement to even the playing field, a move that could set the bar nationwide.

By TERRY MATSUNAGA

Half century ago, the University of California rejected the SAT as a national admissions test. The decision was a landmark moment when it began rejecting all applicants to take the test and report their scores.

Now the UC system, by its own size and influence as the nation's premier public research university, is again poised to play an outside role in the future of standardized testing in America as its leaders consider whether to drop both the SAT and ACT as an admissions requirement.

Although the standardized tests are predictive of college performance, par-

had been done on a limited basis.

A Times data analysis in 2018 found a persistent cycle of arrests across Los Angeles has more than a dozen "quality-of-life" laws — restricting sleeping on the sidewalk, living in a car or low-level drug possession, for example — that police usually enforce with a citation. The tickets typically start out at less than \$200, but often top \$500 once court fees are added. Tickets pile up, and people go to jail.

In a joint announcement Wednesday, Los Angeles City Atty. Gen. Mike Feuer, Los Angeles County Dist. Atty. Jackie Lacey and LAPD Chief Michel Moore said they wanted to "bust" the court system.

The plan will save the courts money, they said, and help the LAPD focus on getting the worst criminals off the streets instead of having officers spend crucial time on minor infractions involving homeless people.

"We're taking action with our law enforcement partners today," Feuer said in a combined statement. "The focus is on the most important public safety issues, help

San Gabriel, AP

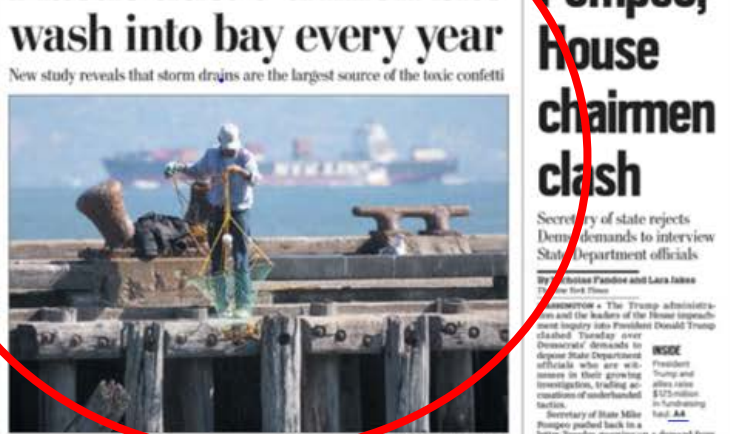
Sports: Sharks' Kane suspended for 3 games. C3
Business: Nestle, Dreyer's cutting hundreds of jobs in Bay Area. C7
Local: BART general manager's wish: A second route across the bay. B1
Nation: Ex-Dallas officer found guilty of murder. A3

The Mercury News

WEDNESDAY, OCTOBER 2, 2019

Plastic tide: 7 trillion bits wash into bay every year

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



A local fisherman checks his trap while some 'microplastic' pieces are being sent into San Francisco Bay, threatening the ecosystem.

By Paul Rogers

Every year, 7 trillion bits of plastic, roughly equal to 10 million pieces each for every man, woman and child in the Bay Area, flow into San Francisco Bay, according to a new comprehensive scientific study put on the shelves.

The three-year study found that billions of pieces of "microplastic" — particles smaller than 5 millimeters each, or roughly the size of a pencil eraser — pour through the Bay Area's 40 sewage treatment plants every year. The particles come from synthetic fibers in clothing, the fleece jackets that shed in washing machines or baby wipes flushed down toilets, and other sources.

Small bits, aquatic life in the bay can ingest microplastics in water and sediment or eat organisms that have already consumed microplastics.

Large sources: Tires, leather, single-use plastic items.

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IMPACTMENT INQUIRY

Pompeo, House chairmen clash

Secretary of state rejects Dems' demands to interview State Department officials

By Justin Fiedore and Lara Isaacson

WASHINGTON — The Trump administration and the leaders of the House impeachment inquiry into President Donald Trump clashed Tuesday over Democratic demands to depose State Department officials who are investigating, trading accusations of underplayed scrutiny.

Secretary of State Mike Pompeo pushed back in a letter Tuesday morning on a demand from three House committees for American diplomats to all this week for depictions on Capitol Hill, saying the effort amounted to "an act of intimidation" and did not allow immunity for the State Department to properly respond.

The chairman of the House Intelligence Committee, Rep. Adam Schiff, said the effort was "an act of intimidation."

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Impeachment history lessons Since President Andrew Johnson was impeached in 1868, such inquiry has had its unique circumstances. BACK STORY, A1

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2017 MURDER TRIAL

Excusal of black jurors ruled legal

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Potential Sources to the Bay

- Polyester and acrylic fibers
- PP and PE fragments
- Black rubbery fragments
- Polystyrene foam
- PE spheres (microbeads)



Thank you to our funders

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PROTECTION
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sfei.org/projects/microplastics

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Toronto

Lessons Learned Manuscript

(open access)

Miller, et al., Journal of Hazardous Materials
Volume 409, 5 May 2021

Developing conceptual model: focus on stormwater



San Francisco Bay study measured hazard

HAZARD

A **HAZARD** is something that has the potential to harm you



RISK

RISK is the likelihood of a hazard causing harm



Questions

www.sfei.org/microplastics

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