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Microplastics Monitoring in San Francisco Bay and Statewide to Inform Management Actions

State of the Estuary Conference, Oakland, May 29, 2024

Christine Sur, California Ocean Protection Council

Diana Lin, San Francisco Estuary Institute

OPC Mission & Priorities

Protect California's coast and ocean by advancing innovative, science-based policy and management, making strategic investments, and catalyzing action through partnerships and collaboration.

Climate Change

Equity

Biodiversity

Sustainable Blue Economy

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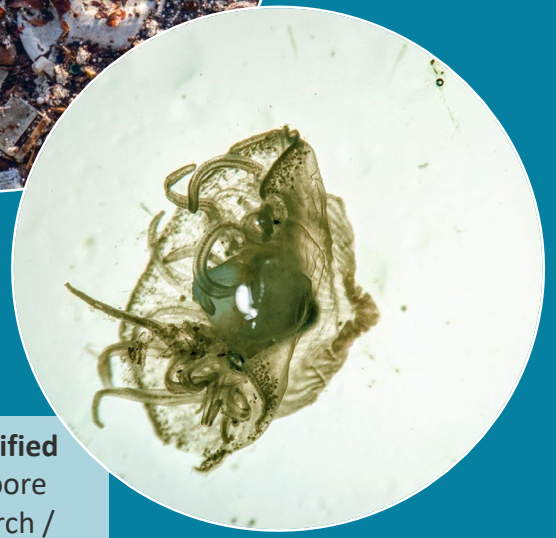
Plastic Pollution: The Problem

- Ubiquitous in the marine and coastal environment, streams, beaches, parks
- Ingested by marine life, causing impacts to individual species & food webs
- Entanglement and other causes of mortality
- Nanoplastics absorbed into human cells and tissue: Microplastics found in human stool, placenta, and blood.

Plastic Debris (San Francisco Bay), San Francisco Bay Estuary Institute / Yee, D.



Microplastic particle inside unspecified hydrozoan (North Pacific Gyre), Moore Institute for Plastic Pollution Research / Burney, J.

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What is California doing to manage plastic pollution?

1. Plastic Source Reduction

- California Plastic Pollution Prevention & Packaging Producer Responsibility Act (Senate Bill 54, Allen, 2022)
- Product & Single-use Plastic Bans (local ordinances)
- Microplastics: Proposed Addition to Candidate Chemicals List

2. Trash Interception

- Statewide Trash Amendments (2015): Trash (larger than 5 mm) prohibition in stormwater permits
- Total Maximum Daily Loads (TMDLs) for Trash

3. Identification & Monitoring

- Microplastics in Drinking Water, definition (2020) and policy handbook (2022)

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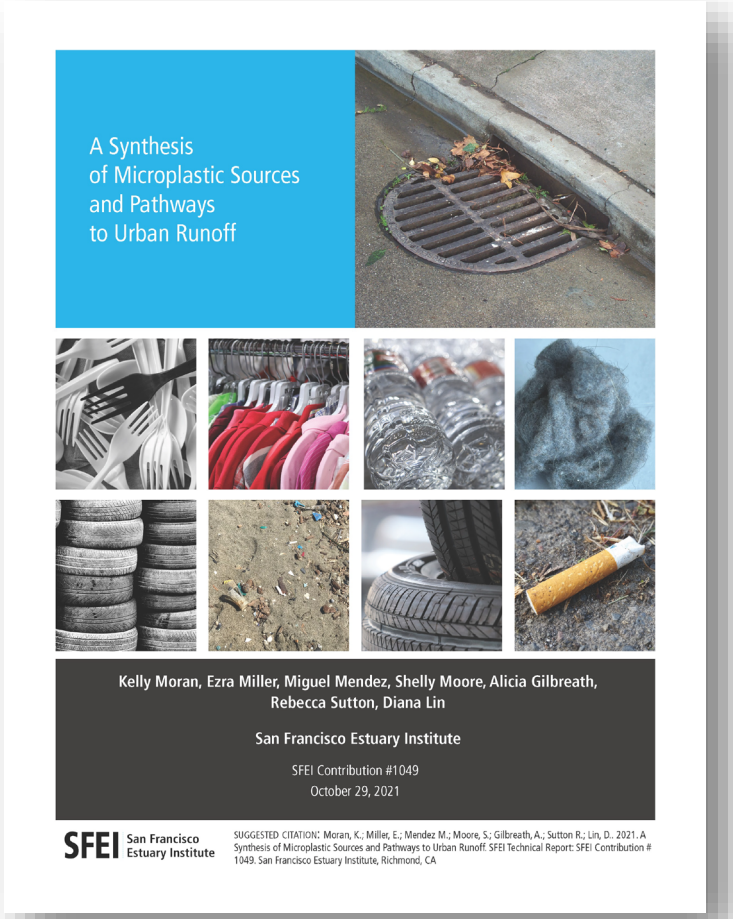
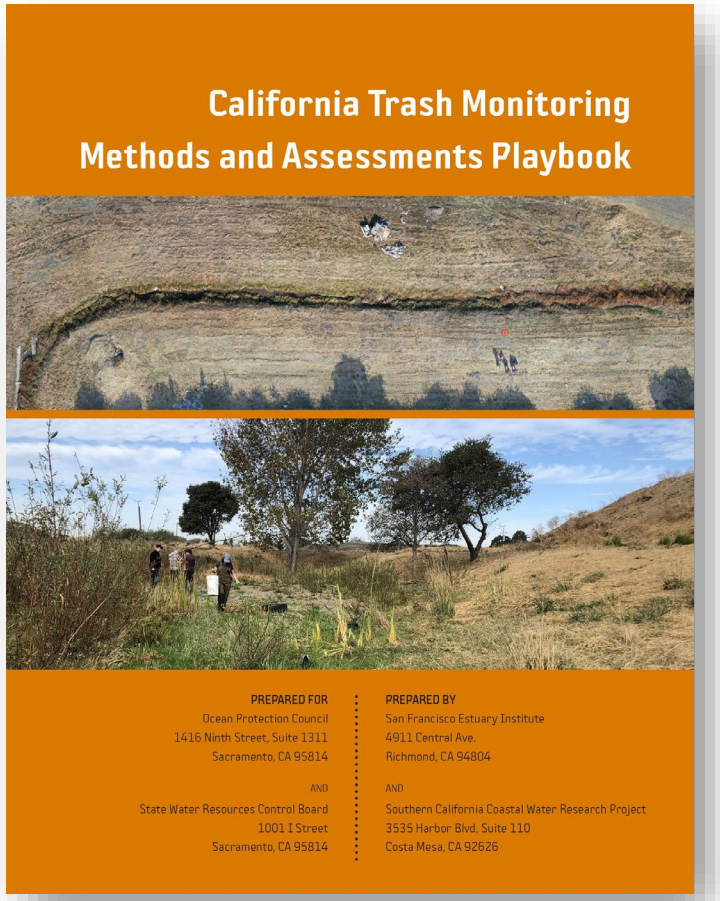
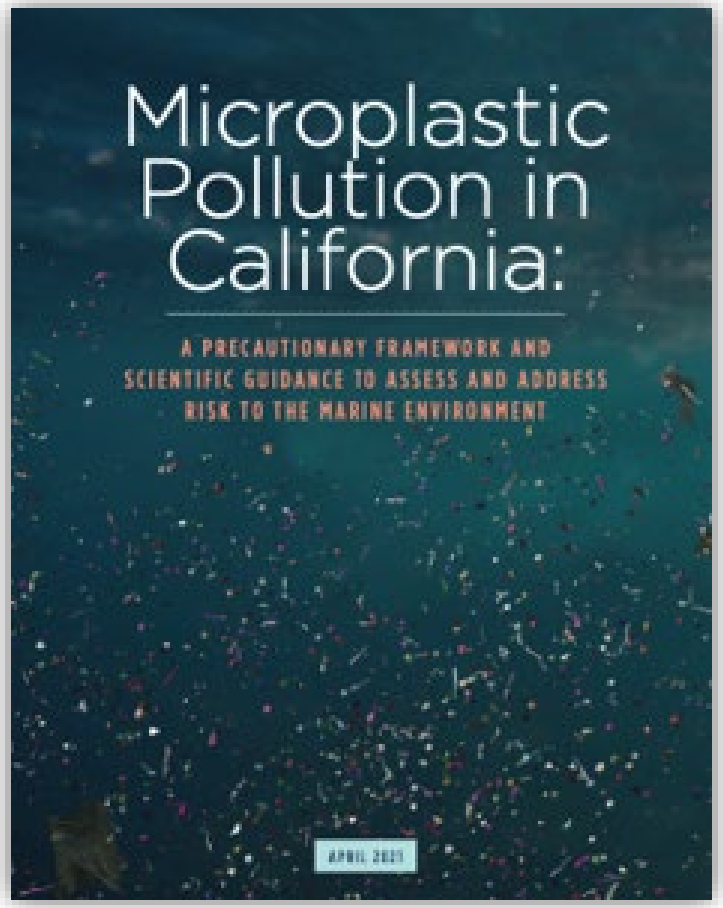
Funded Work (Non-Exhaustive)







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Statewide Microplastics Strategy

Pursuing early actions, as scientific knowledge advances

Track 1: Solutions

- Pollution Prevention
- Pathway Intervention
- Outreach & Education

Track 2: Science to Inform Future Action

- Monitoring
- Risk Thresholds & Assessment
- Sources & Pathways Prioritization
- Evaluating New Solutions

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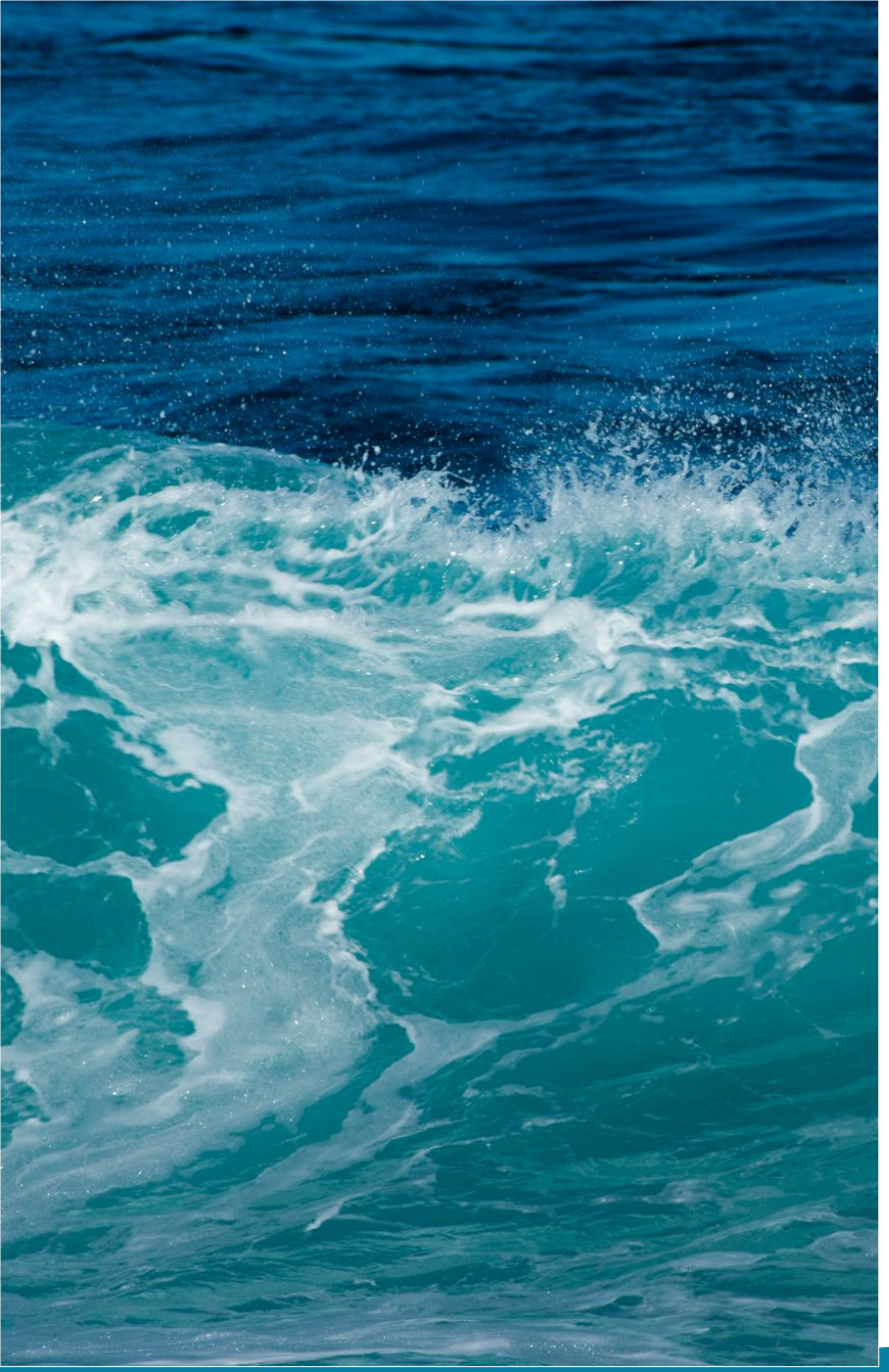

Science to Inform Future Action

Research Priorities

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Statewide Plastics Monitoring

Ambient Waters

Microplastics Sample Collection Method Evaluation & Standardization

- Sediment, Biota (fish tissue, shellfish), Stormwater
- Surface Water (State Water Resources Control Board)

Development of Statewide Plastics Monitoring Plan

- Phased, multi-year Plan with scientific guidance for consistent statewide monitoring


SFEI / Yee, D.

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Statewide Plastics Monitoring Plan

- Establish a **baseline** of plastic and microplastic contamination in state waters
- Identify **trends** in microplastic contamination
- Evaluate the **impacts** of this contamination
- Community **benefits** of successful trash and plastic management efforts
- Track the state's **progress** in reducing plastic pollution
- Inform **future** management measures

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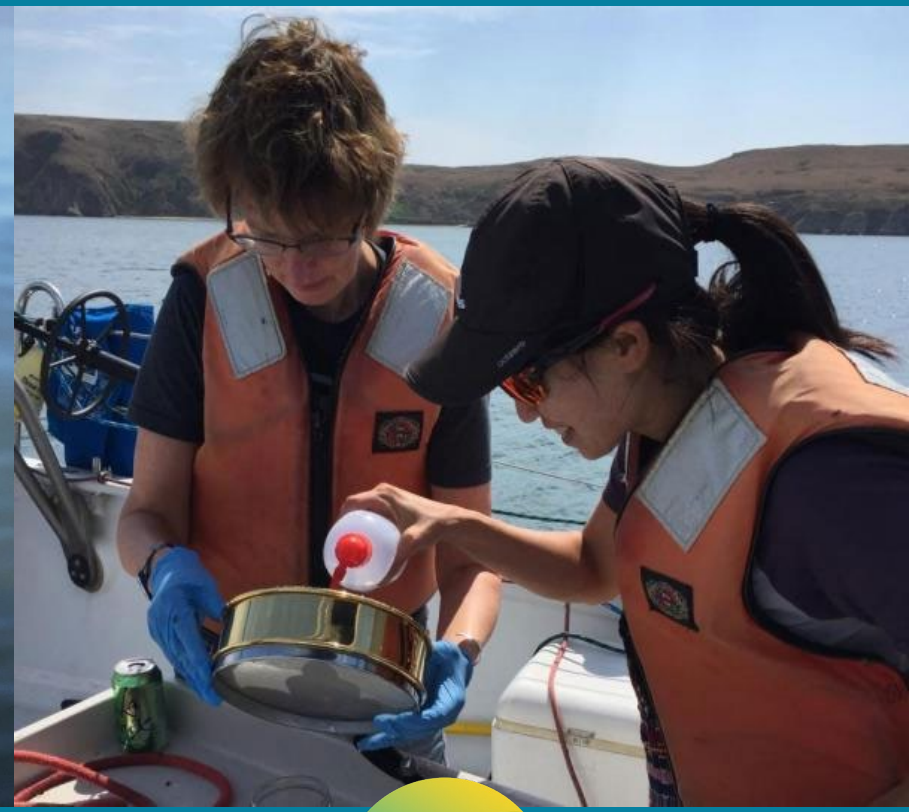
Plastic Monitoring Network
Implementation



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Timeline

2024

Identify Public Priorities Related to Plastics Monitoring

- Public & focused meetings to solicit community input/knowledge
- Identify community priority concerns & geographic locations
- Inform Technical Advisory Group Members

2025

Public Release of Draft Plan

- Focused meetings for feedback
- Written comment period

Final Monitoring Plan & Strategy (anticipated late-summer 2025)

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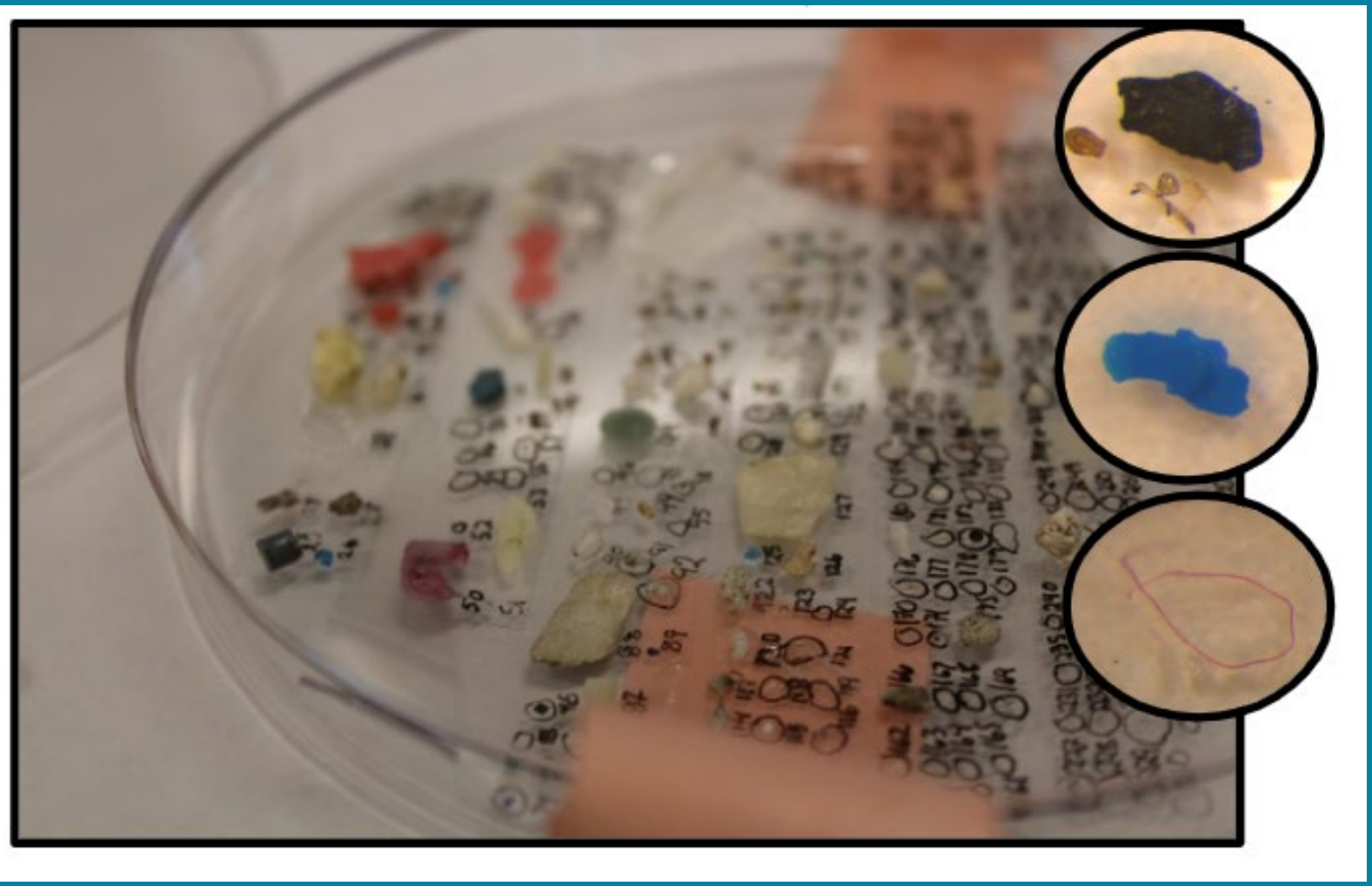
San Francisco Microplastics Study (2019)



SAN FRANCISCO BAY MICRO PLASTICS

GORDON AND BETTY MOORE FOUNDATION

SFEI AQUATIC SCIENCE CENTER

5 GYRES SCIENCE TO SOLUTIONS

RochmanLab Ecology & Evolutionary Biology University of Toronto

Priority Management Questions

- What are the levels of microplastics in the Bay?
- What are the sources and major pathways?

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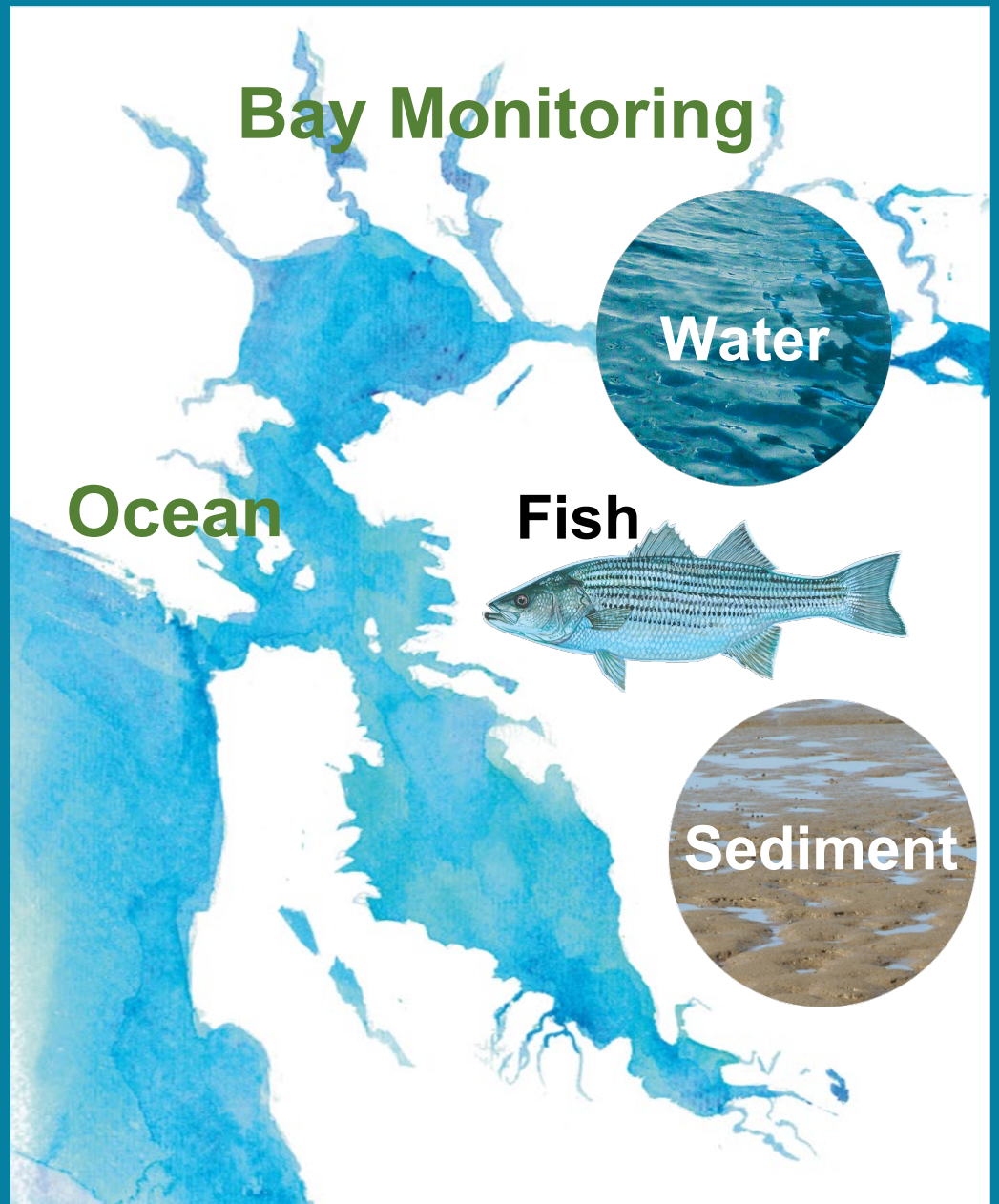
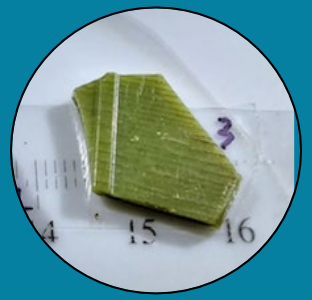
San Francisco Microplastics Study (2019)

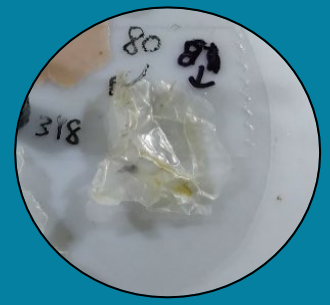


Fibers



Fragments

Foam

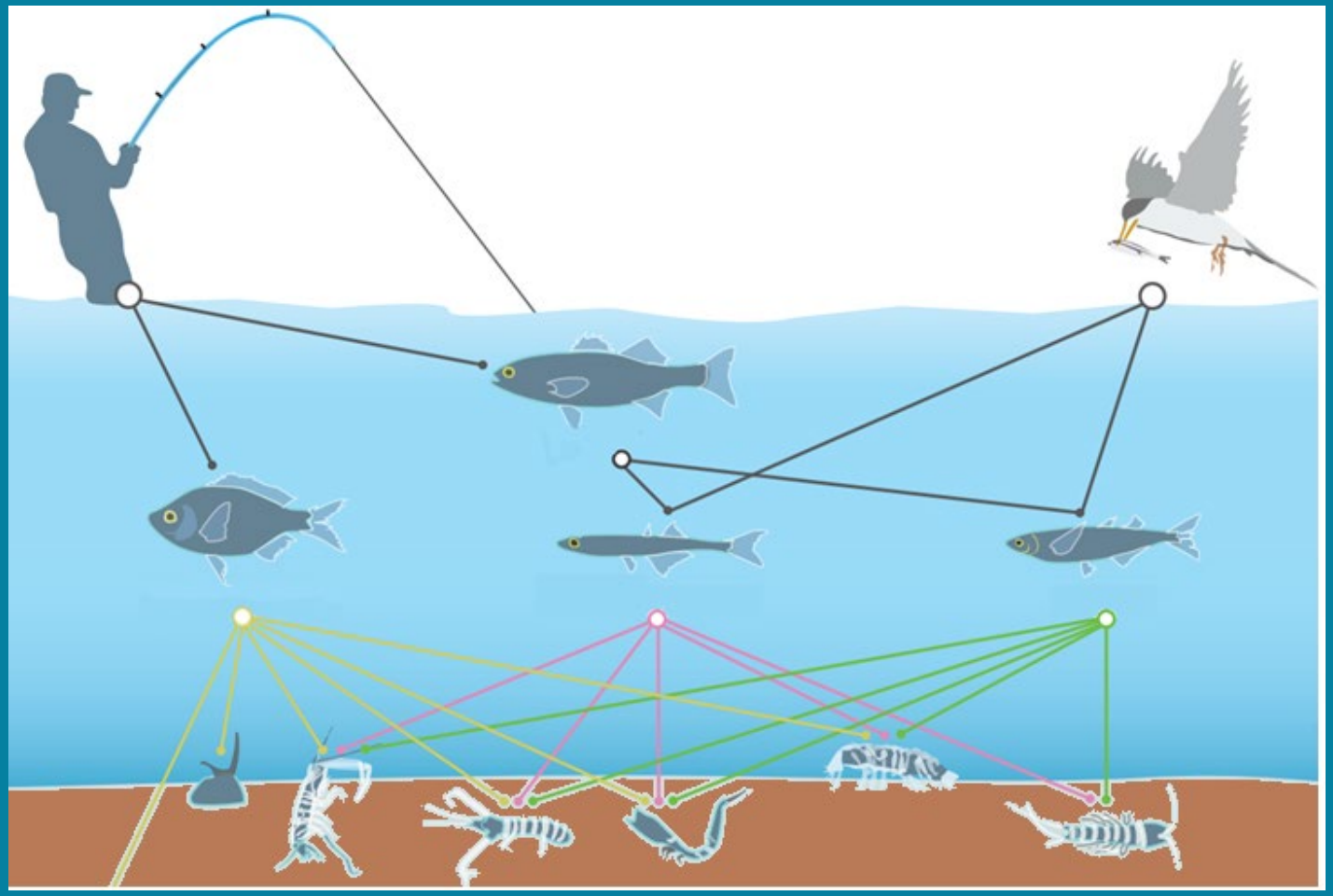


Film

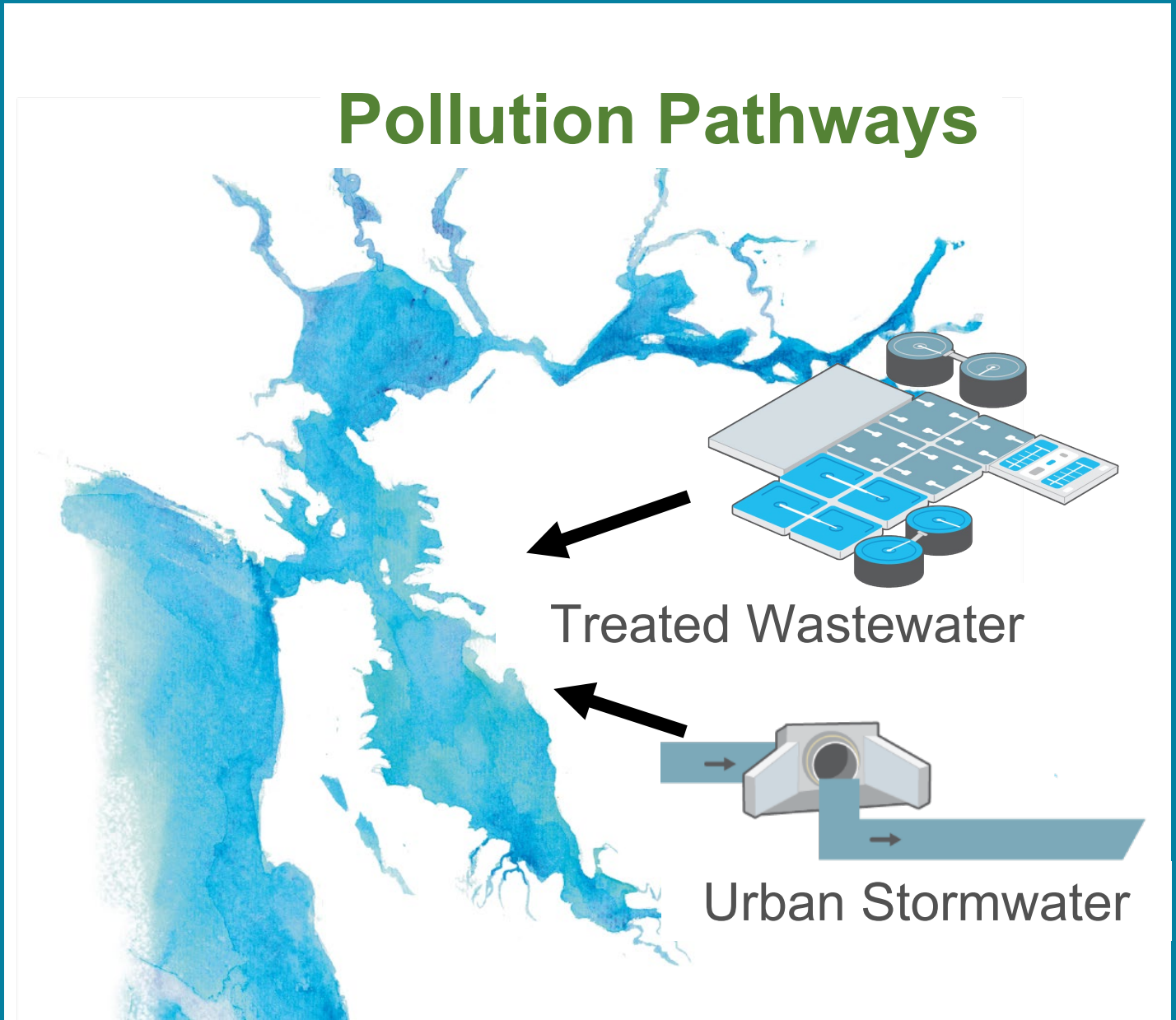
Impacts to Bay food web uncertain

Small Fish

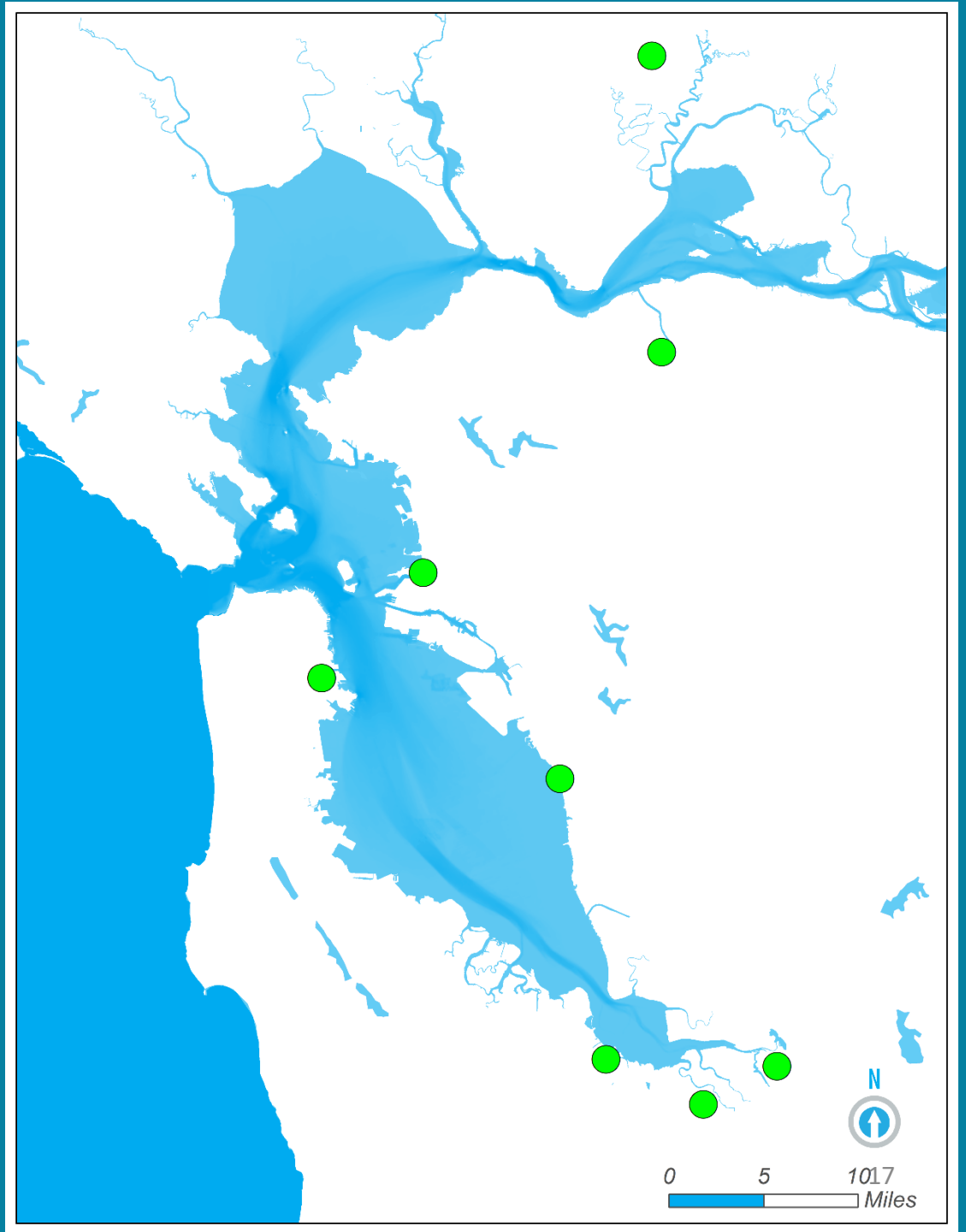
Sediment



How do they get in the Bay?

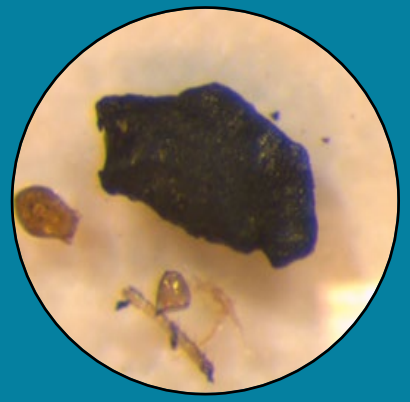


Wastewater Sampling

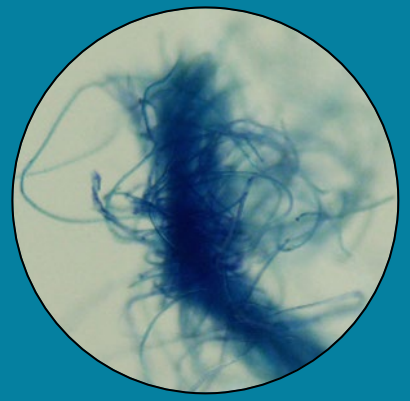


Stormwater Sampling

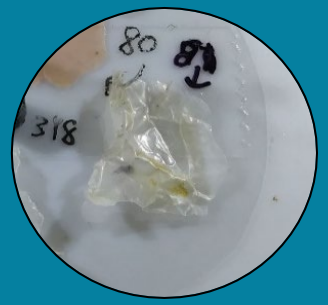
Microplastics in Stormwater



Black rubbery fragments

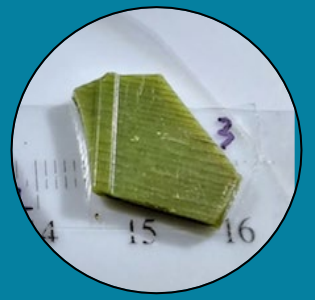


Fibers, including polyester, cellulose acetate



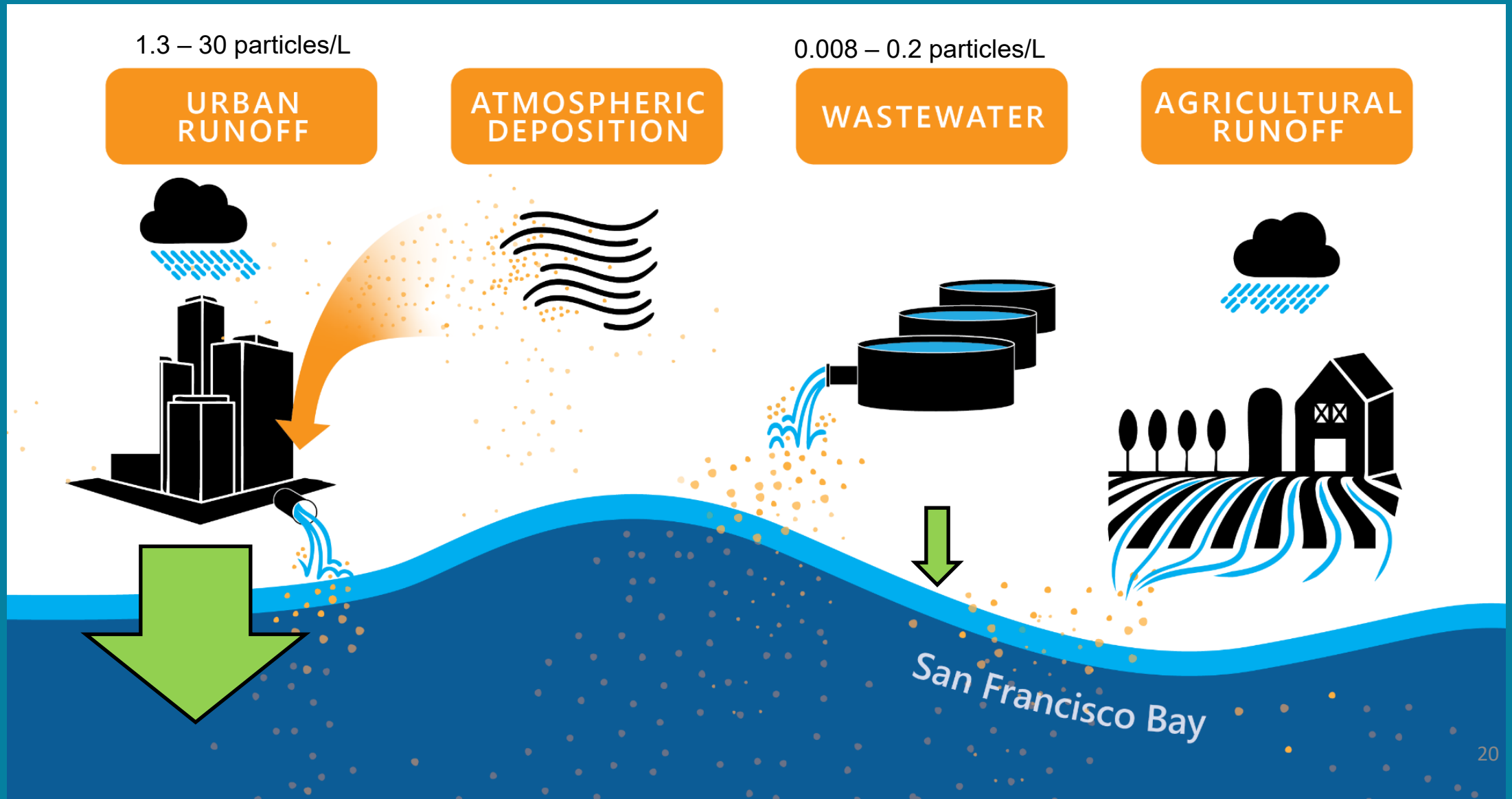
Film, polyester

Foam, polyurethane, polystyrene



Fragment, PET, polypropylene

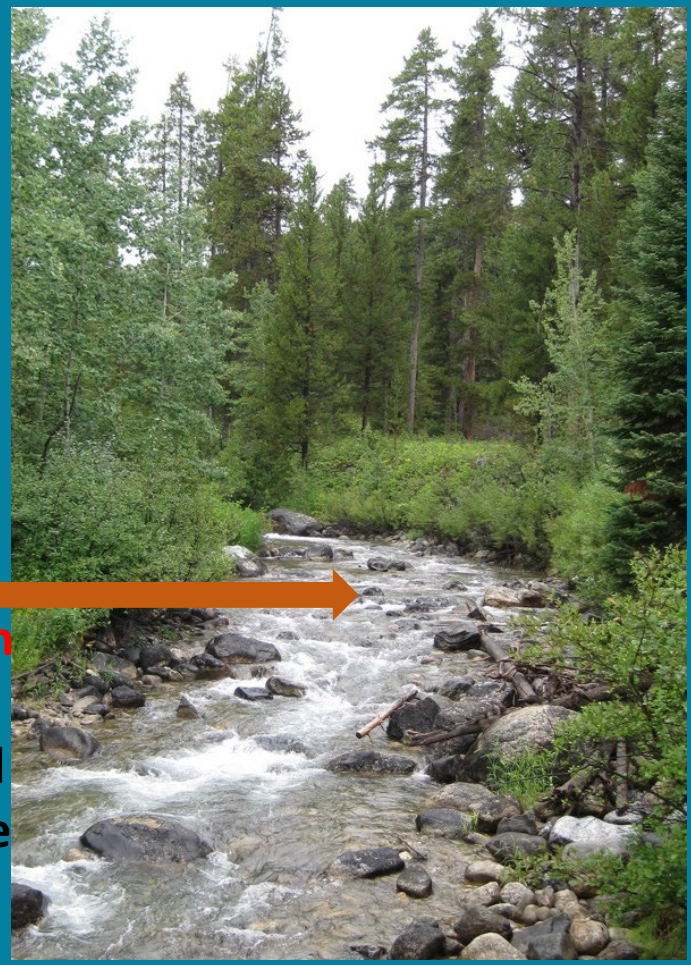
Stormwater concentrations were 100xs greater than wastewater



Tire wear particles are a major source of microplastics

15–19 million kg/year in the Bay Area

0.3-0.8 million kg/year
(2-6% of total estimated tire emissions)



Moran et al., 2023

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Chemical ingredients are an important part of tire particle toxicity

Tire Particles

Tires and the Chemicals they contain

Chemicals

Image credit: Lonny Meyer, courtesy of Estuary News

Fibers: Are dryers a significant release pathway?

Image Credit: Whirlpool

Image Credit: Lorien Fono

Identifying sources and pathways can inform management actions

- Examples of Prevention:
  - DTSC regulations on tire ingredients
  - Technologies to reduce tire wear rates
  - Technologies to capture emissions

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Takehome Messages

- Monitoring is important for informing management
- Tools available to develop actionable data
- Collaborations between scientists and water quality managers critical to define and articulate management questions and monitoring objectives

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Learn More and Stay Engaged!

Statewide Plastics Monitoring Strategy

SFEI Microplastics

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Christine.Sur@resources.ca.gov

THANK YOU!