What We Know About Microplastics in Wastewater Effluent

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WHAT ARE THE QUESTIONS

- What you asked:
  - What do we know about microplastics in wastewater effluent?

- What I think you were asking:
  - How many studies have quantified microplastics in wastewater effluent?
  - How much is being exported from wastewater treatment plants?
  - How much is removed during the treatment process?
  - How does the amount coming out of wastewater treatment plants compare to other sources?

MICROPLASTICS POLICIES

- **SB1422–re: Drinking Water**
  - Charges the State Water Board with defining microplastics in drinking water and developing methods to analyze within two years

- **SB 1263–re: - Statewide Microplastics Strategy**
  - Charges the Ocean Protection Council to develop a Statewide Microplastics Strategy in Collaboration with the State Water Board

HOW MANY STUDIES HAVE QUANTIFIED MICROPLASTICS IN WASTEWATER EFFLUENT?

- At least 15 credible studies
  - 10 studies done in 2016/2017

- 7 countries

- LACSD did one of the best

HOW MUCH IS BEING EXPORTED FROM WASTEWATER TREATMENT PLANTS?

- Average over all studies was 13 microplastics/liter of effluent
- Roughly 50 million microplastics per 100 million gallons of discharge/day
  - 18 billion/year
  - 110 metric tons/year
- Six orders of magnitude difference
  - Range is from 0.00088 to 150 microplastics/liter of effluent

HOW COMPARABLE ARE THE RESULTS OF THOSE STUDIES?

- Different types of facilities/treatments
  - Influent source
  - Primary/Secondary/Tertiary
- The size of microplastics measured varies
- Variations in how microplastics are measured
  - Many different methods are used

MOST COMMON METHODS

1mm
Quantifies
1 hour/sample
$

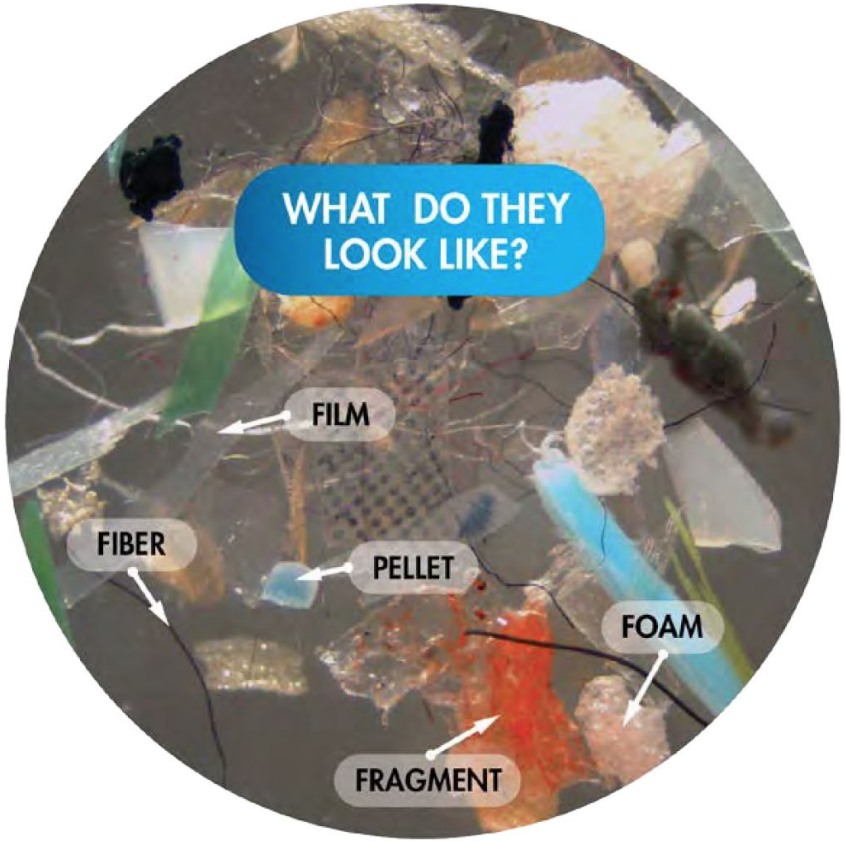
Light Microscopy

10µm
Polymer type
8 hours/sample
$$

Fourier-Transform Infrared (FTIR) Spectroscopy

1µm
Polymer type
40 hours/sample
$$$$

Raman Spectroscopy



TYPES OF MICROPLASTICS

- **Fragment** – hard, jagged particle
- **Fiber or line** – thin or fibrous, straight plastic
- **Pellet/Microbead** – hard, rounded, or spherical particle
- **Film** – thin plane of flimsy plastic
- **Foam** – lightweight, sponge-like plastic

Modified from: Sampling and Analysis Plan for Microplastic Monitoring in San Francisco Bay and Adjacent National Marine Sanctuaries

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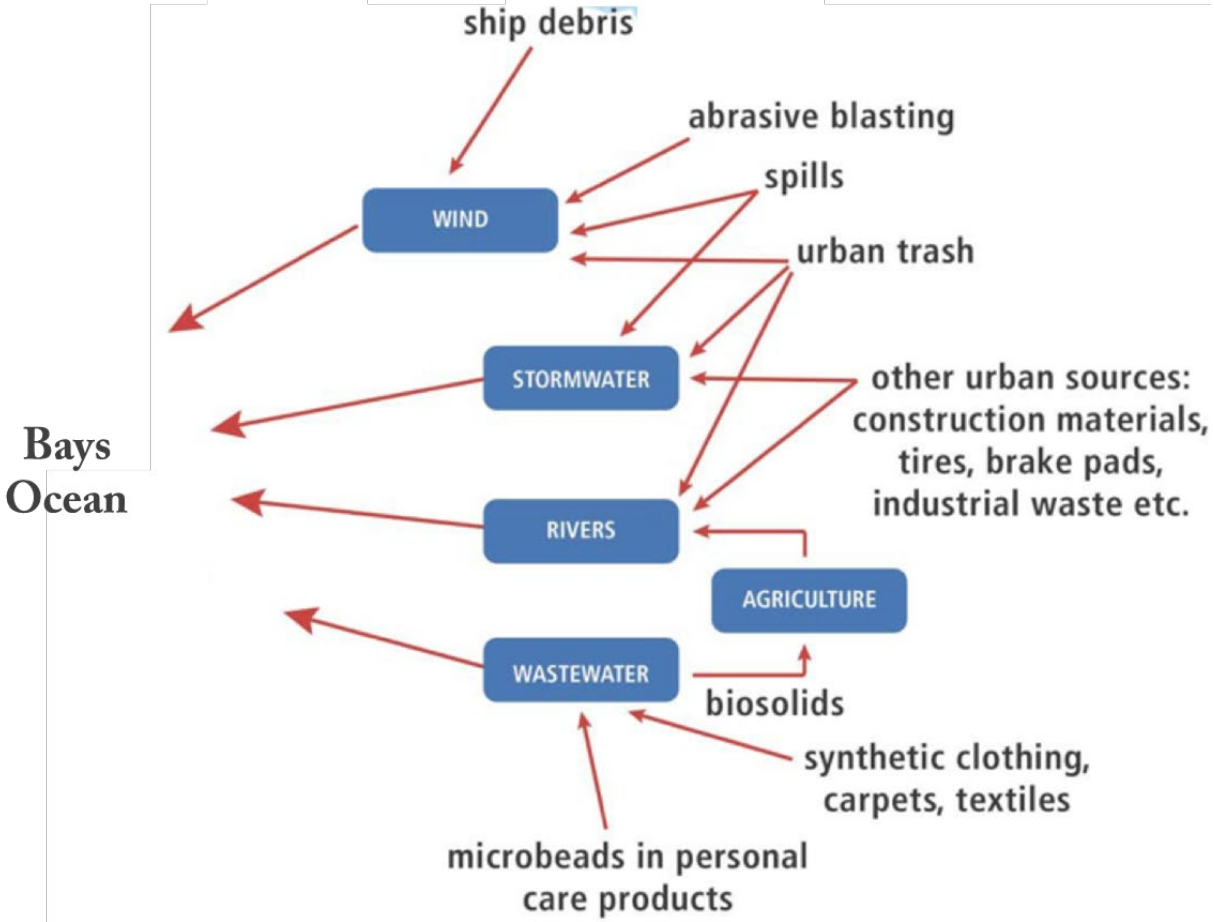
HOW MUCH IS REMOVED DURING THE TREATMENT PROCESS?

- Small percentage makes it to receiving waters
  - One study estimated that 1.76 + 0.31 trillion microplastics entered the wastewater treatment plant annually
  - Only 0.03 + 0.01 trillion microplastics were released into the receiving environment

- Wastewater treatment is effective
  - Primary treatment is most effective
    - Removes up to 98% of microplastics
  - Secondary removes a little more
  - Tertiary has no effect on microplastics concentration

HOW DOES THIS COMPARE WITHOTHER SOURCES?



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SFEI WORKING ON THAT NOW

- Habitats they are addressing
  - Surface water
  - Sediment
  - Prey Fish
  - Wastewater effluent
  - Stormwater

- Where are they at
  - Completed field sampling
  - Should have results in 6 months

What is SCCWRP doing right now…

- Planning Microplastics Methods Workshop
  - Most of the leading researchers in the world are participating
  - Goal is to work towards standardizing methods

- SCCWRP is assuming leadership roles in the State
  - Ocean Protection Council – Ocean Litter Strategy
  - California Water Quality Monitoring Council

- Trends in North Pacific Gyre