Microplastic Monitoring Strategy

Science for Solutions in San Francisco Bay

Rebecca Sutton, Ph.D.
San Francisco Estuary Institute
Microplastic Strategy: Goals

JUNE 2016 STRATEGY WORKSHOP

RMP stakeholders and microplastic experts established:

• Consensus priorities for the Bay
• Multi-Year Plan
• Identify study ideas to be developed into proposals for multiple funding agencies
Microplastic Experts

Anna-Marie Cook
US EPA Region 9

Dr. Chelsea Rochman
University of Toronto

Dr. Sherri “Sam” Mason
SUNY Fredonia
2 Overview

Microplastic: Definition

Particles of plastic smaller than 5 mm
2 Overview

Microplastic: Risks

Zooplankton *Centropages typicus*
Cole et al. 2013
Cocktail of Toxicants

- PBDEs
- BPA
- PCBs
- phthalates
- Ni
- Pb
- PAHs
- styrenes

Rochman et al. 2013 Nature
2 Overview

Microplastic Monitoring: RMP Special Study (2015)

Sherri Mason
SUNY Fredonia

Image: 5 Gyres
Photo: Cheryl Corley
Photo: Meg Sedlak

Image: 5 Gyres
2 Overview

Microplastic Particles Detected in Bay

Levels higher than:

• Great Lakes
• Chesapeake Bay
• Salish Sea

Sutton et al. 2016
2 Overview

WHAT DO THEY LOOK LIKE?

- FILM
- FIBER
- PELLET
- FOAM
- FRAGMENT

PARTICLES IN BAY SURFACE WATER

- PELLET 2%
- FILM 8%
- FOAM 8%
- FIBER 27%
- FRAGMENT 55%
2 Overview

Pollution Pathway:
Wastewater

To be continued...
3 Management Questions

Science to Support Decision-Making

MQ1: How much microplastic pollution is there in the Bay?
  – Analytical methods
  – Quantification across matrices

MQ2: What are the health risks?
  – Wildlife
  – Humans
3 Management Questions

MQ3: What are the sources, pathways, loadings, and processes?
MQ4: Have the concentrations of microplastic increased or decreased?

MQ5: Which management actions may be effective in reducing microplastic pollution?

– Source controls

– Pathway controls
4 Methods

Not all fibers are plastic

Followup Investigation

Cotton

Polyethylene

FILM 2%
FOAM 1%
FRAGMENT 17%
PELLET 0%
FIBER 80%

PARTICLES IN WASTEWATER
Microplastic Science from Wastewater Agencies

METHOD DEVELOPMENT:
Is NOAA method appropriate for wastewater samples?

- NOAA sample processing not optimized for effluent
- Cellulose-based fibers require aggressive digestion
- Visual-only identification is insufficient
- Quality control, documentation, 24-hour composite

Nirmela Arsem, EBMUD, BACWA Lab Workgroup Lead
Noel Enoki, San Jose
Jim Wan, CCCSD
Ken Lee, SFPUC
Guy Moy, Union San
Farid Remezanadeh, Hayward

Dyachenko et al. in review
Essential Focus on Methods

Spectroscopic Identification Necessary

Visual Identification Sufficient

Previous Study
Visual Only

1 μm  10 μm  100 μm  1 mm  10 mm

4 Methods
5 Data Gaps

Stakeholders: Bay Data Needed

Pollution Pathways

Bay Monitoring

✓ Water

✓ Wastewater

✓ Stormwater

Connect with Marine Debris

Fish

Mussels (filter-feeders)

Sediment

Bottom & Shore
Microplastic Monitoring Strategy: Multi-Year Plan

to 2020 and beyond

- Method development
- Monitoring fish & biota
- Monitoring water & sediment

- Characterizing sources, pathways, loadings, processes
- Evaluating control options
- Synthesis
Source Control

OCTOBER 2015:
Governor Brown Signs AB 888, the Microbead Ban Bill
• Effective 2020
• Strictest among state bans

DECEMBER 2015:
Federal **Microbead-Free Waters Act** signed into law
• Microbeads in rinse-off products only
• No “biodegradable” plastic exemption
• Bans production July 2017, sale July 2018
• Preempts state bans
Microplastic Monitoring Strategy: Multi-Year Plan

Designed to serve broad Bay science and management community

RMP Workshop Participants:
- Industry
- State & Federal Agencies
- NGO Community