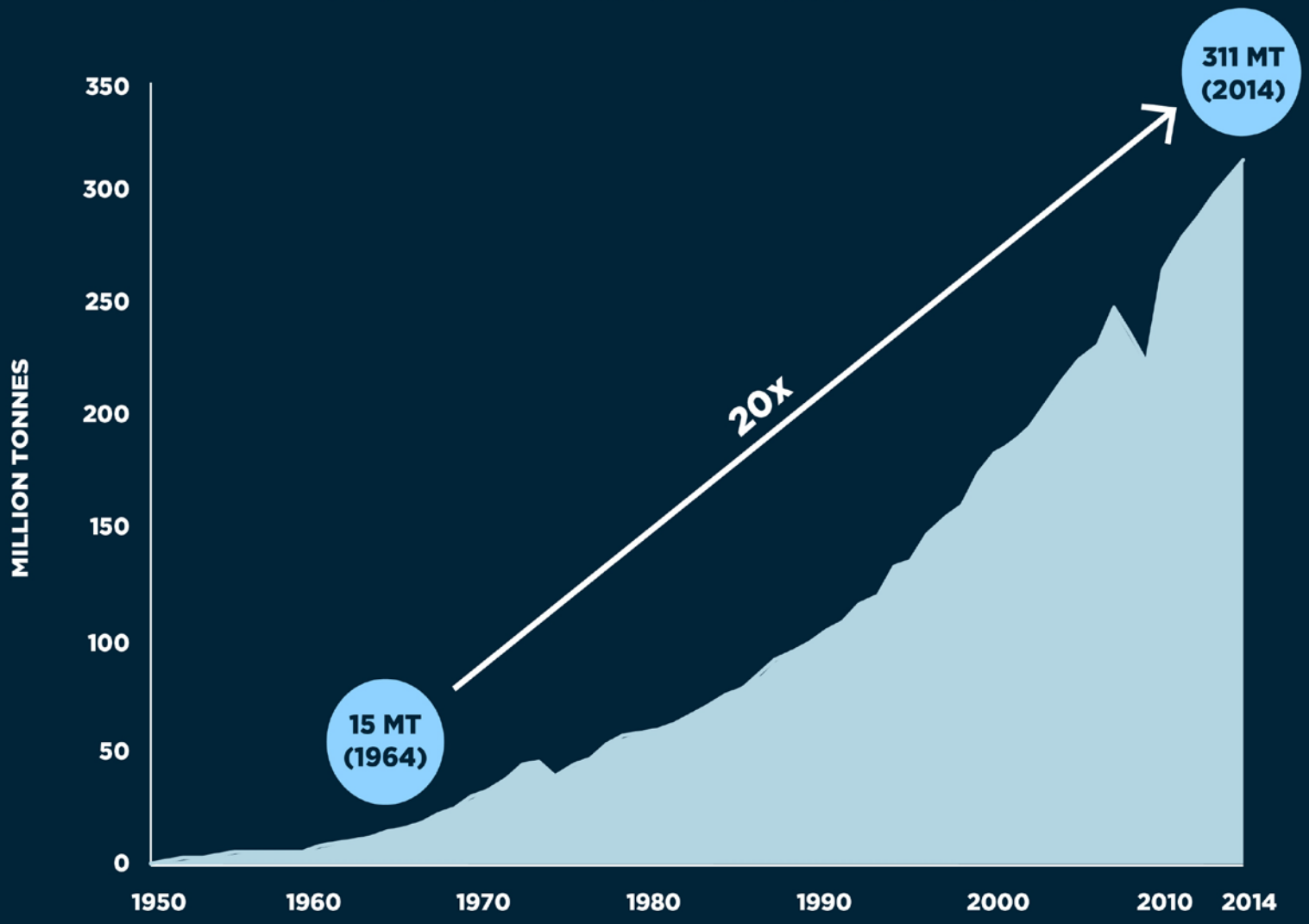
Moore Microplastic Study of Bay and Adjacent Sanctuaries

Meg Sedlak, Carolynn Box, Diana Lin, Rebecca Sutton,
SFEI and 5 Gyres

March 9th, 2017

PLASTICS PRODUCTION INCREASED TWENTY-FOLD OVER THE LAST 50 YEARS

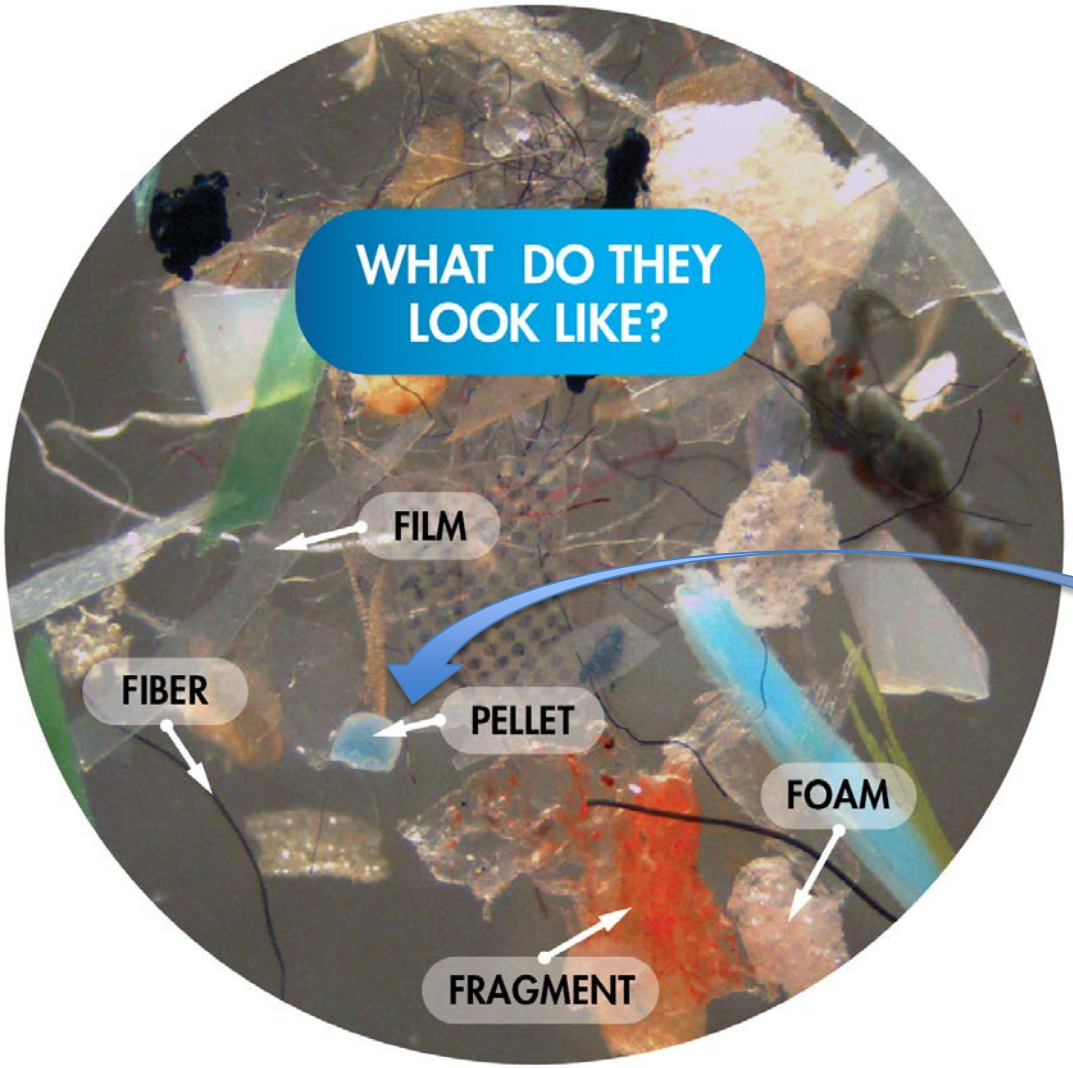


WORLD ECONOMIC FORUM, ELLEN MACARTHUR FOUNDATION, MCKINSEY & COMPANY,
A NEW PLASTICS ECONOMY: RETHINKING THE FUTURE OF PLASTICS (2016)
ELLENMACARTHURFOUNDATION.ORG/PUBLICATIONS

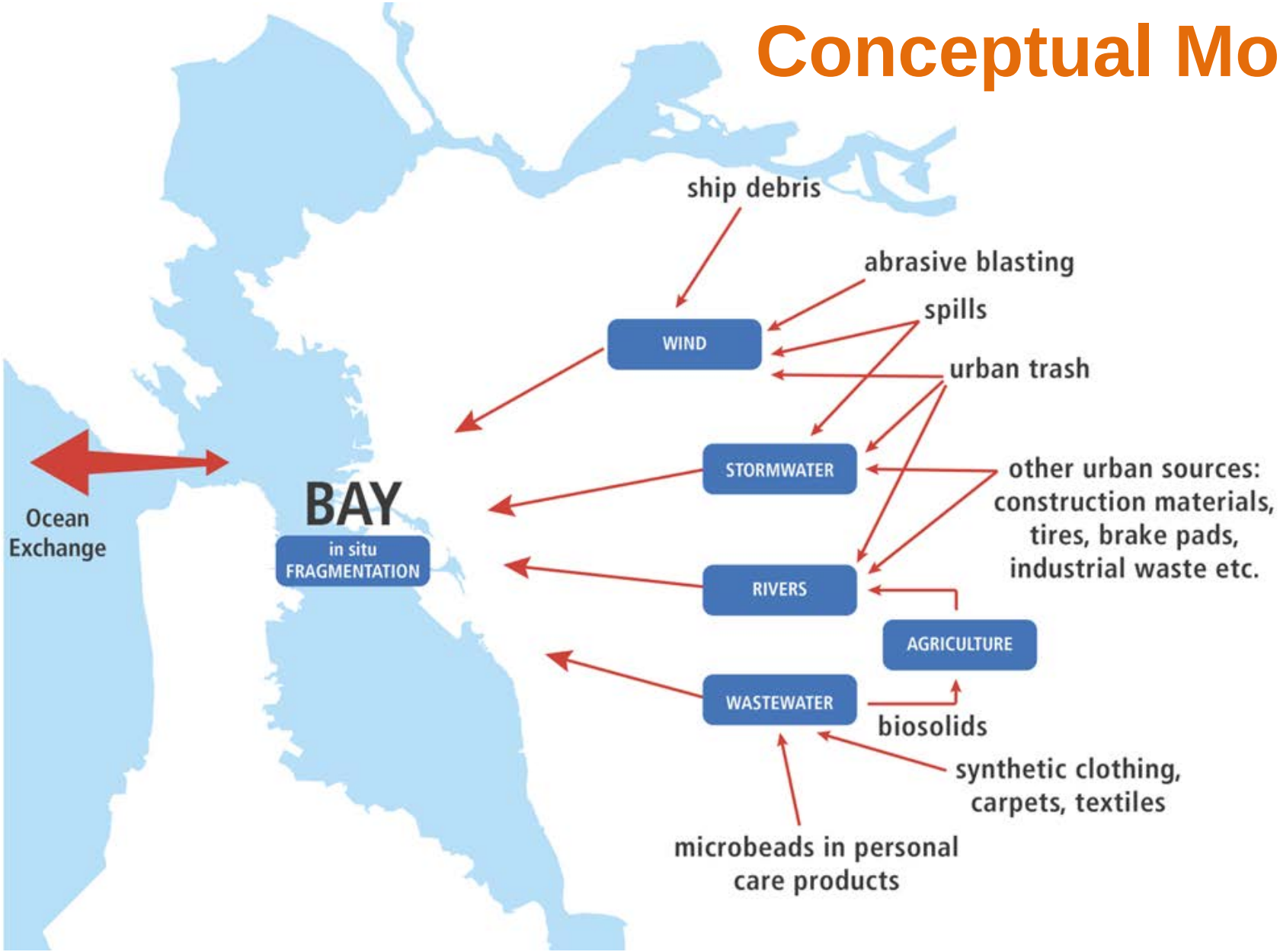
NOTE: Production from virgin petroleum-based feedstock only (does not include bio-based, greenhouse gas-based or recycled feedstock)
SOURCE: PlasticsEurope, Plastics – the Facts 2013 (2013); PlasticsEurope, Plastics – the Facts 2015 (2015).

ELLEN MACARTHUR FOUNDATION

Microplastics



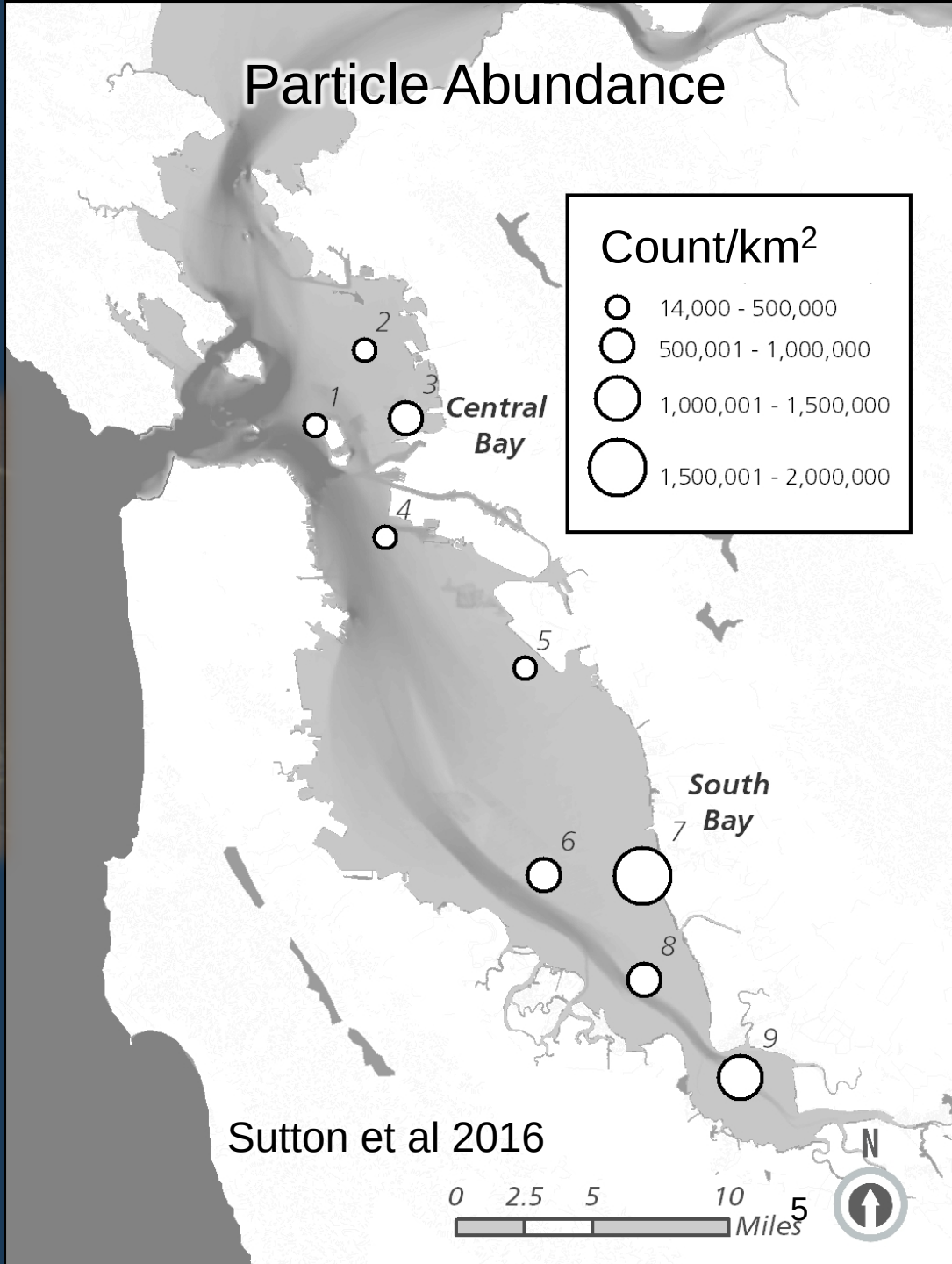
Conceptual Model

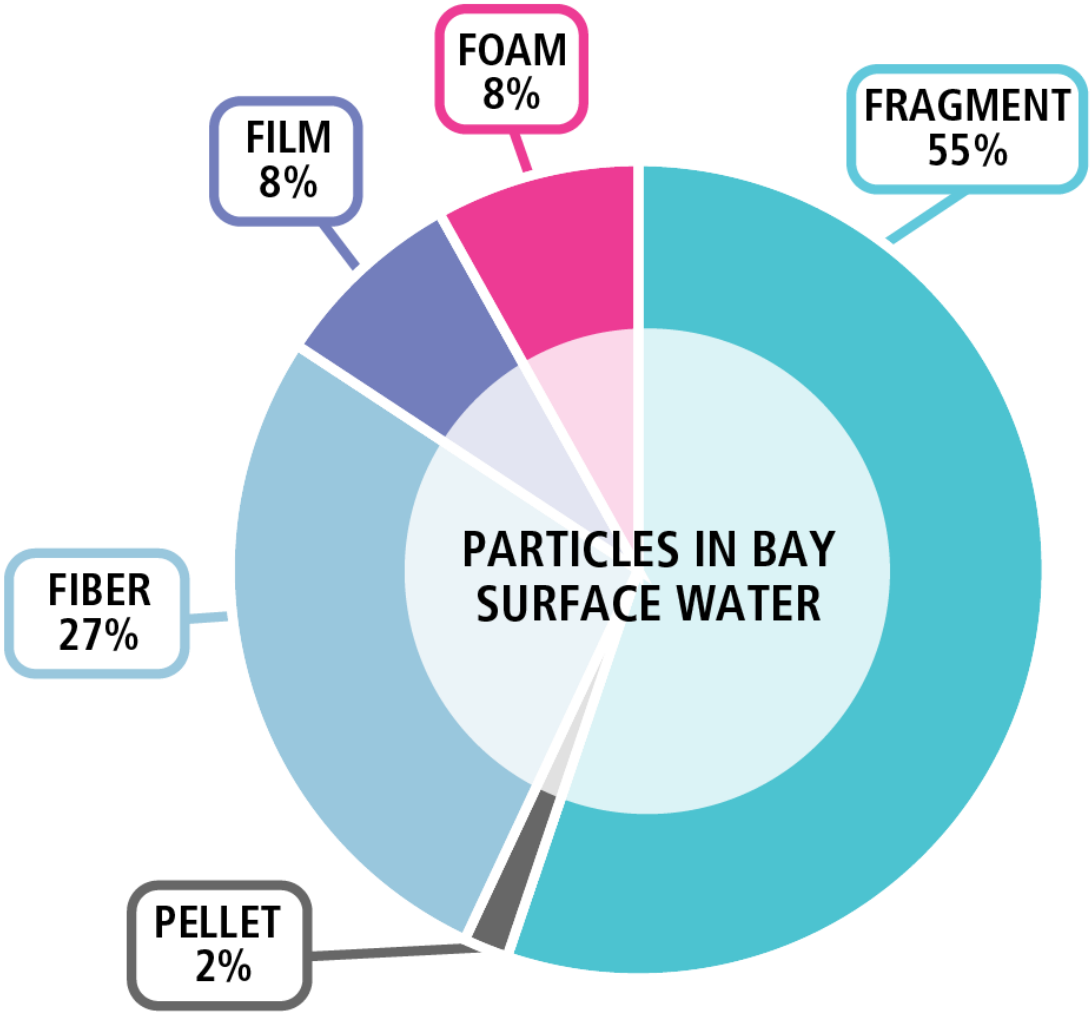


Microplastic Detected in Bay

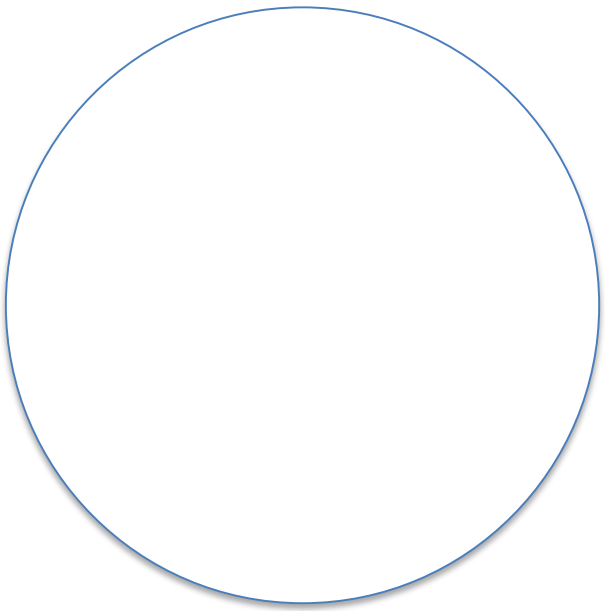
Levels higher than:

- Great Lakes
- Chesapeake Bay
- Salish Sea




FOAM
8%
FILM
8%
FRAGMENT
55%
FIBER
27%
PELLET
2%
PARTICLES IN BAY
SURFACE WATER

Pollution Pathway: Wastewater

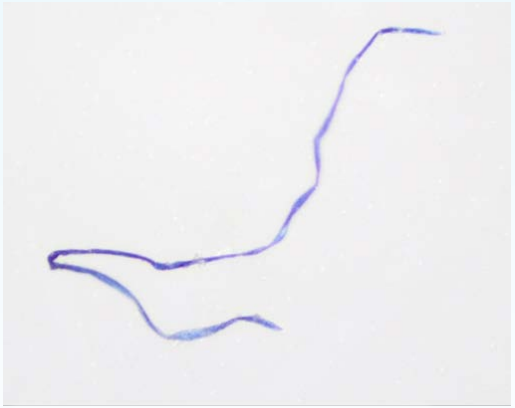


Wastewater Particles

BACWA BAY AREA CLEAN WATER AGENCIES

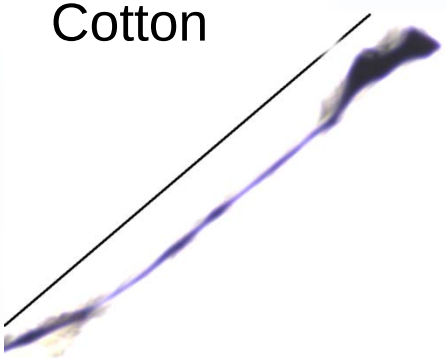
Followup Investigation

Micro-particle ≠ Micro-plastic



Cotton

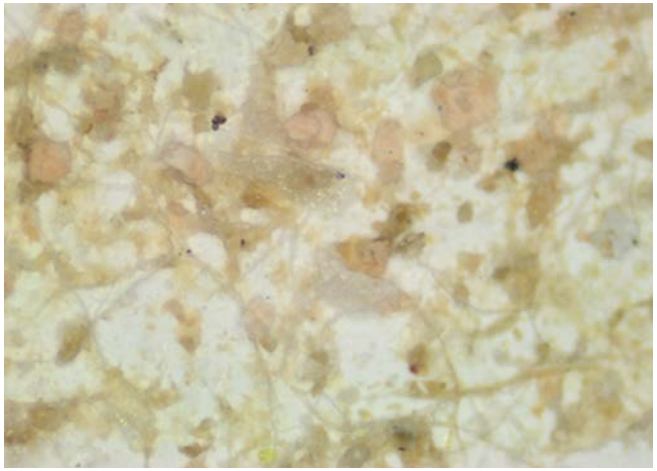
Polyethylene



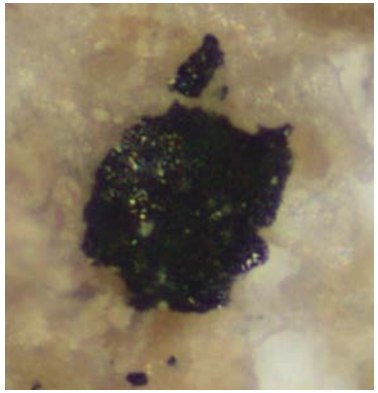
Dyachenko et al. 2016

Wastewater Particles

BACWA Findings



Cellulose fibers and grease balls

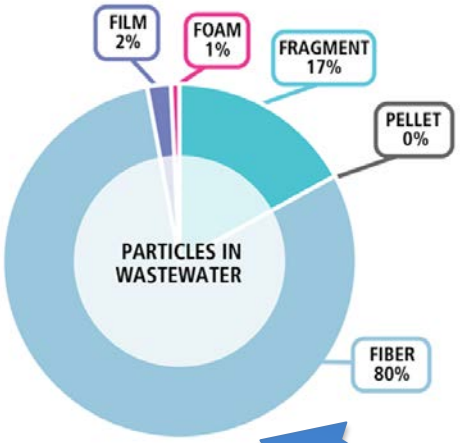


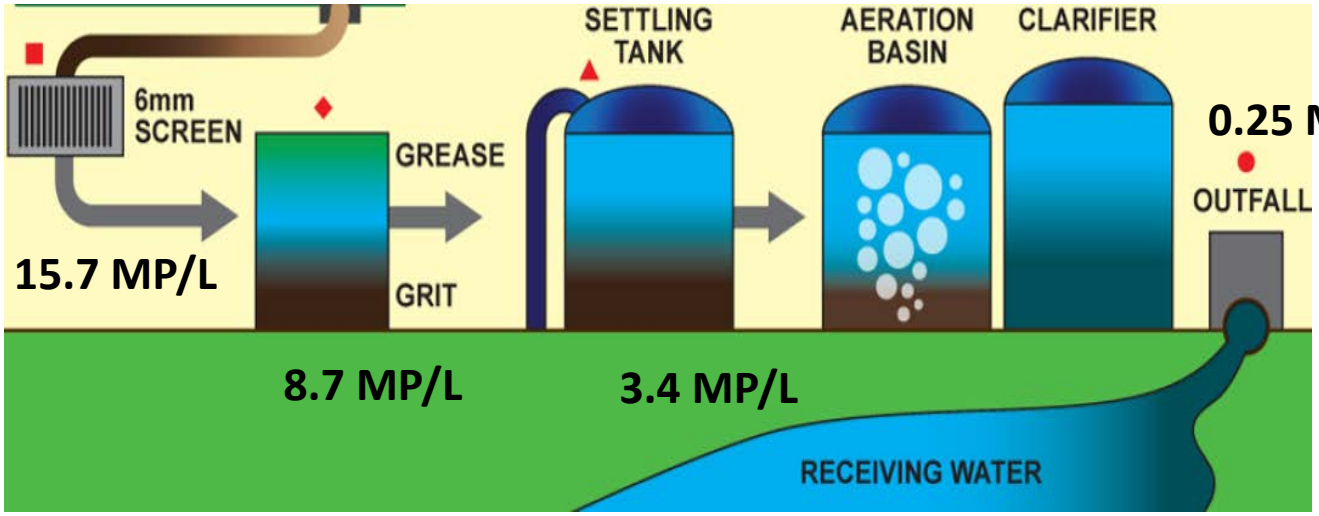
"UBO"

Nirmela Arsem, EBMUD (Lead)
Noel Enoki, San Jose
Jim Wan, CCCSD
Ken Lee, SFPUC
Guy Moi, Union San
Farid Remezanzadeh, Hayward

- NOAA Wet Peroxide Oxidation method is not optimized for wastewater
- Spectroscopic confirmation is needed
- QC, documentation, 24-hr composites are necessary
- *Extraction and identification of microplastic particles from secondary wastewater treatment plant effluent – A Dyachenko, J Mitchell, and N Arsem. Journal of Analytical Chemistry*

Wastewater Treatment





Sources: Boucher and Friot 2017; Murphy et al 2016

Anna-Marie Cook
US EPA Region 9

Dr. Chelsea Rochman
University of Toronto

Dr. Sherri “Sam” Mason
SUNY Fredonia

Strategy for Future Monitoring

Microplastic Monitoring in Bay and Sanctuary:

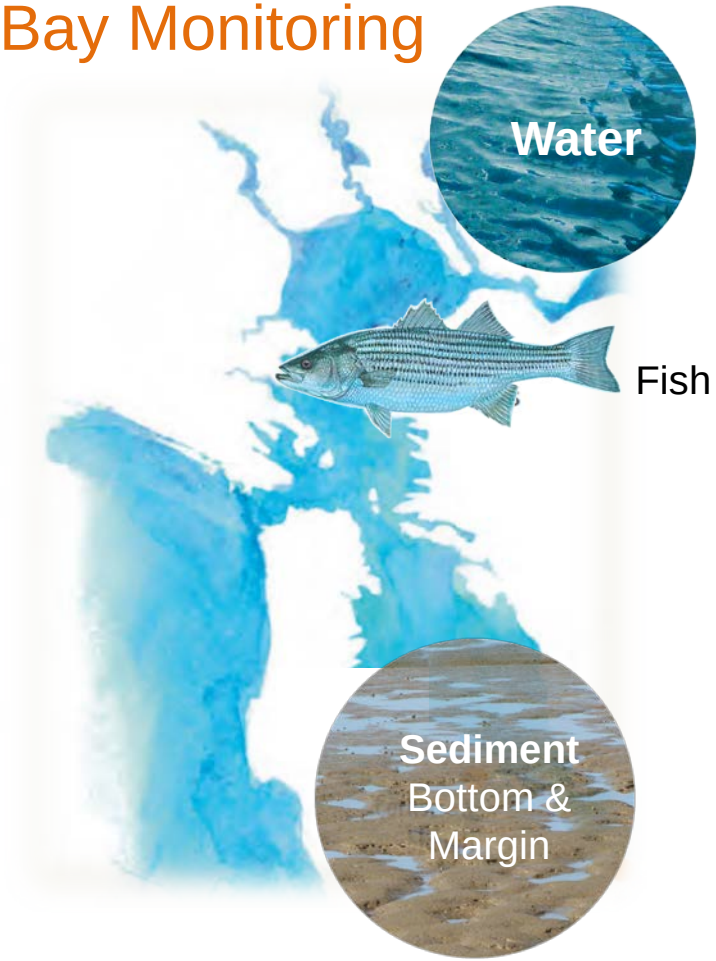
Information Needed to Support Decision-making

Pollution Pathways

Wastewater

Stormwater

Bay Monitoring



Sanctuary Monitoring

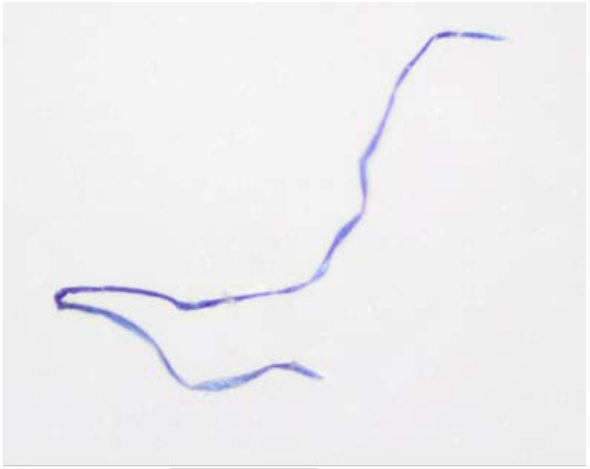
GORDON AND BETTY MOORE FOUNDATION

New Techniques

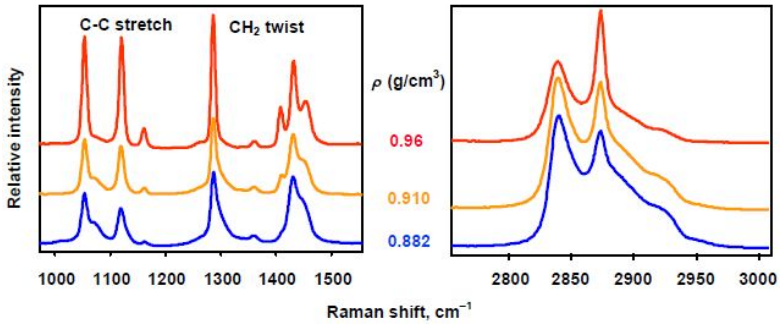
- New extraction methods
- Raman spectroscopy – chemical ID

Dr. Chelsea Rochman (U of T)

Polyethylene

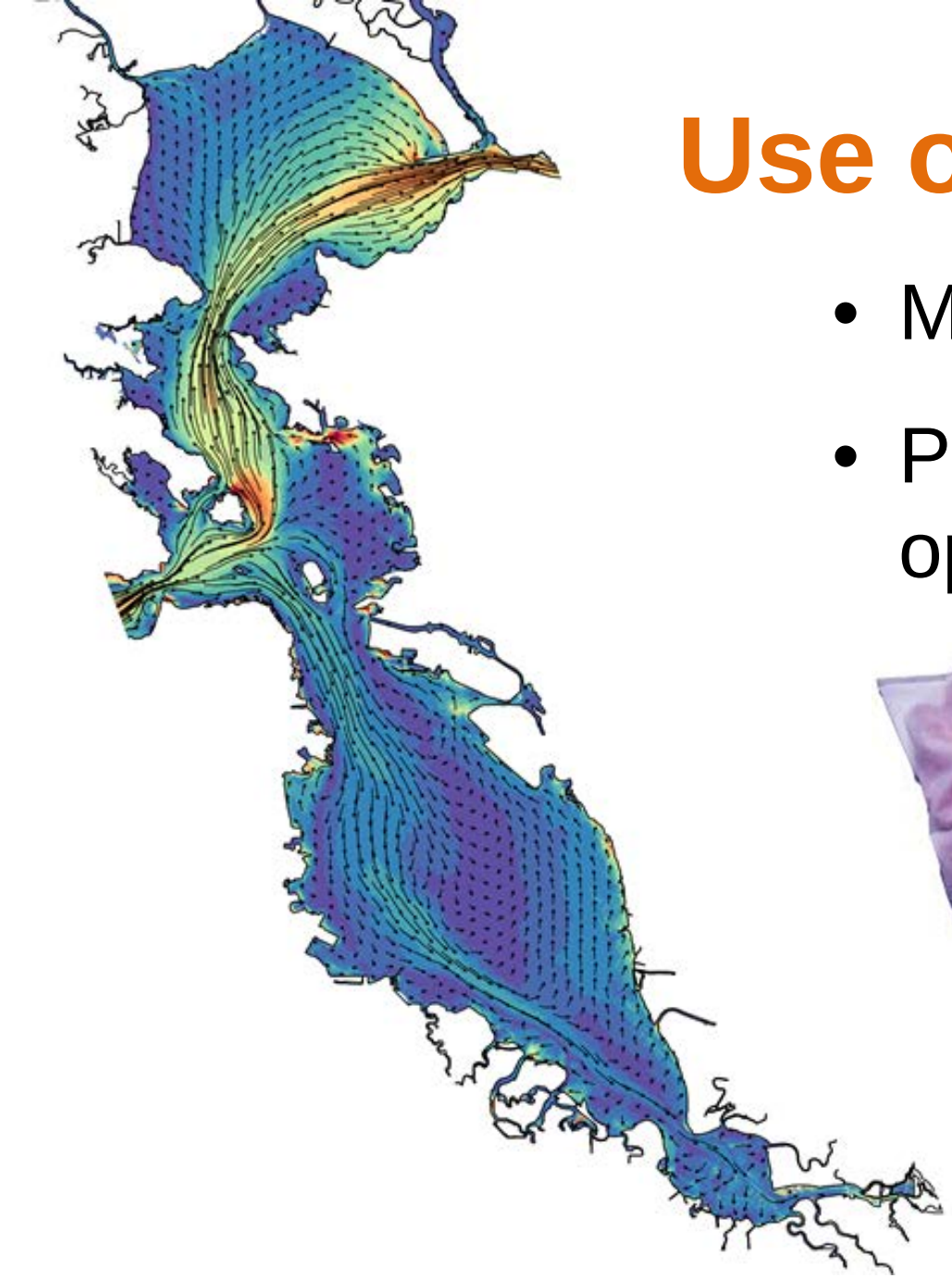


Cotton



Evaluation of Pathways

- Wastewater effluent
  - EBMUD
  - EBDA
  - San Jose
  - Palo Alto
  - SFPUC
  - CCSD
  - TBD – 2 more facilities
- Stormwater runoff

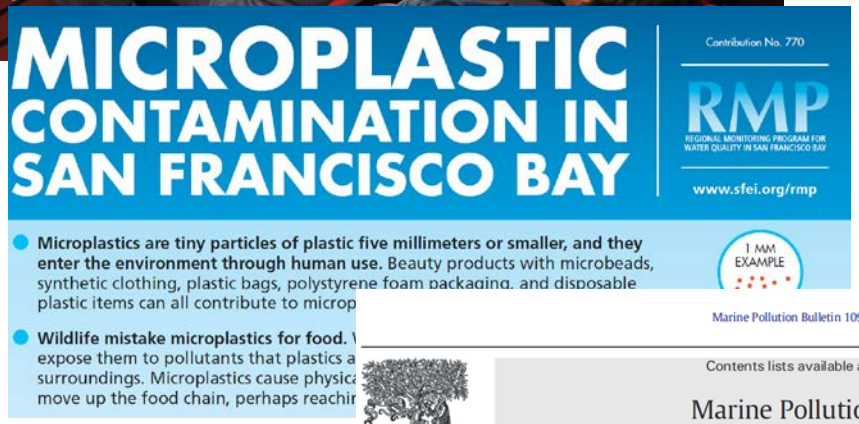


Use of Information

- Models
- Policy & treatment options

Communicating to Diverse Audiences

- Industry, regulators, academia, public
- Conferences
- Reports, articles, factsheets
- Educational materials
- Policy options



MICROPLASTIC CONTAMINATION IN SAN FRANCISCO BAY

Contribution No. 770

RMP

REGIONAL MONITORING PROGRAM FOR WATER QUALITY IN SAN FRANCISCO BAY

www.sfei.org/rmp

- **Microplastics are tiny particles of plastic five millimeters or smaller, and they enter the environment through human use.** Beauty products with microbeads, synthetic clothing, plastic bags, polystyrene foam packaging, and disposable plastic items can all contribute to microp
- **Wildlife mistake microplastics for food.** expose them to pollutants that plastics a surroundings. Microplastics cause physic move up the food chain, perhaps reachir

1 MM EXAMPLE

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Microplastic contamination in the San Francisco Bay, California, USA

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Photo by Sergio Izquierdo

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