

Microplastics in the Great Lakes

Heather Smith
Grand Traverse Bay WATERKEEPER®



PROTECT



RESTORE



CONNECT

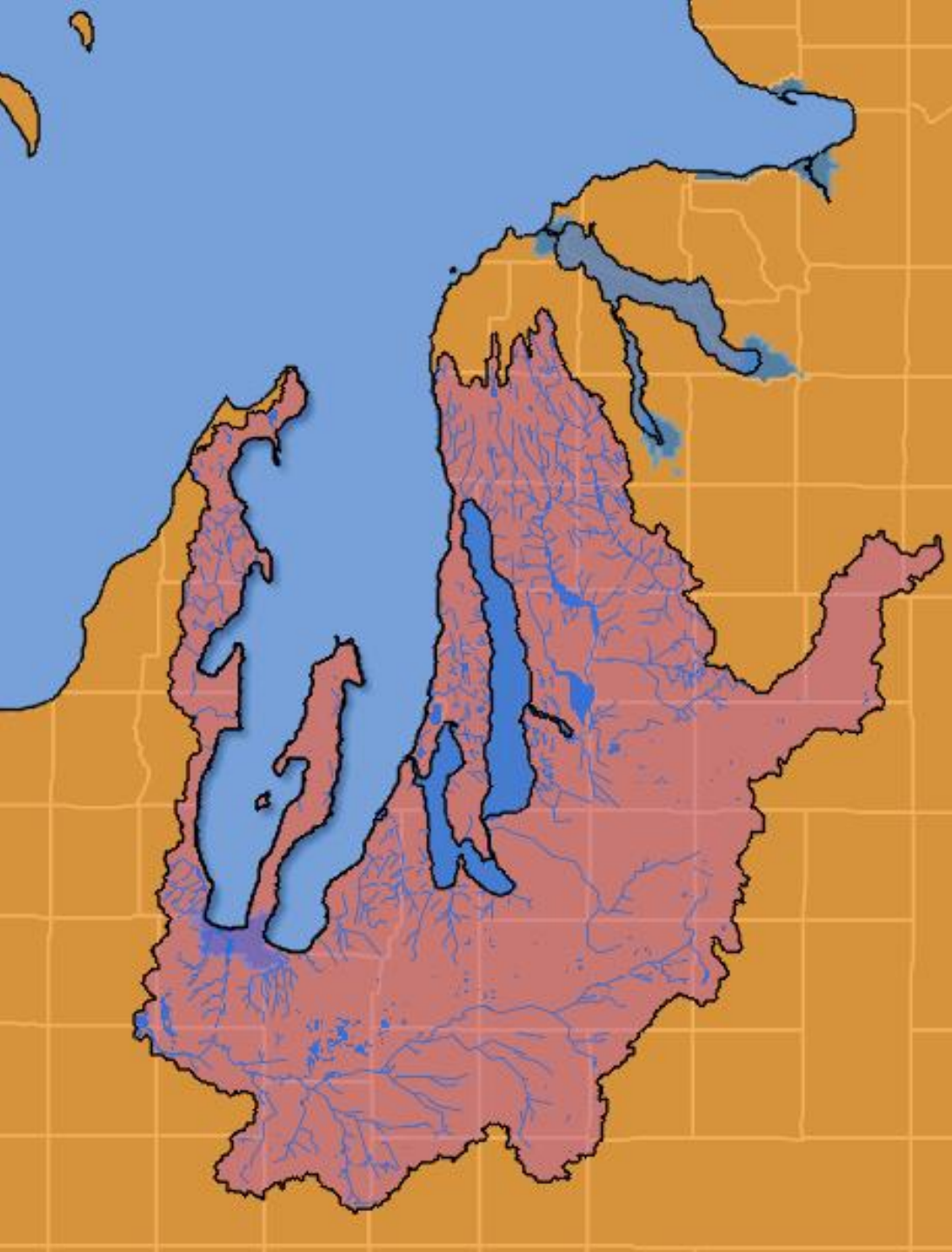


The Watershed Center

G R A N D T R A V E R S E B A Y



**WATERKEEPER® ALLIANCE
MEMBER**



Grand Traverse Bay Watershed

Agenda

The Age of Plastics

Plastic Pollution Classifications & Sources

Data from the Great Lakes

Transport

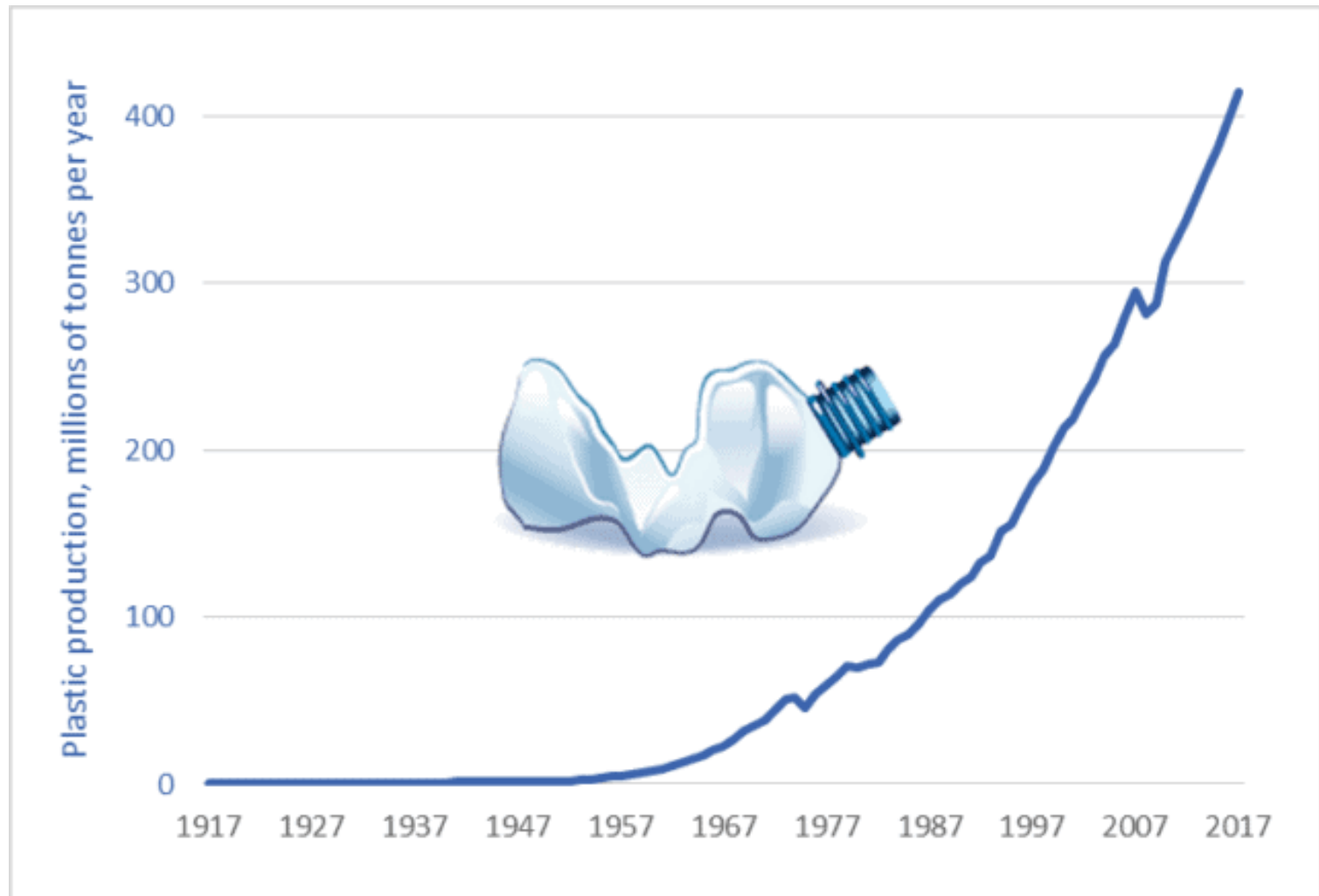
Concern

TWC's Work

Becoming Part of the Solution

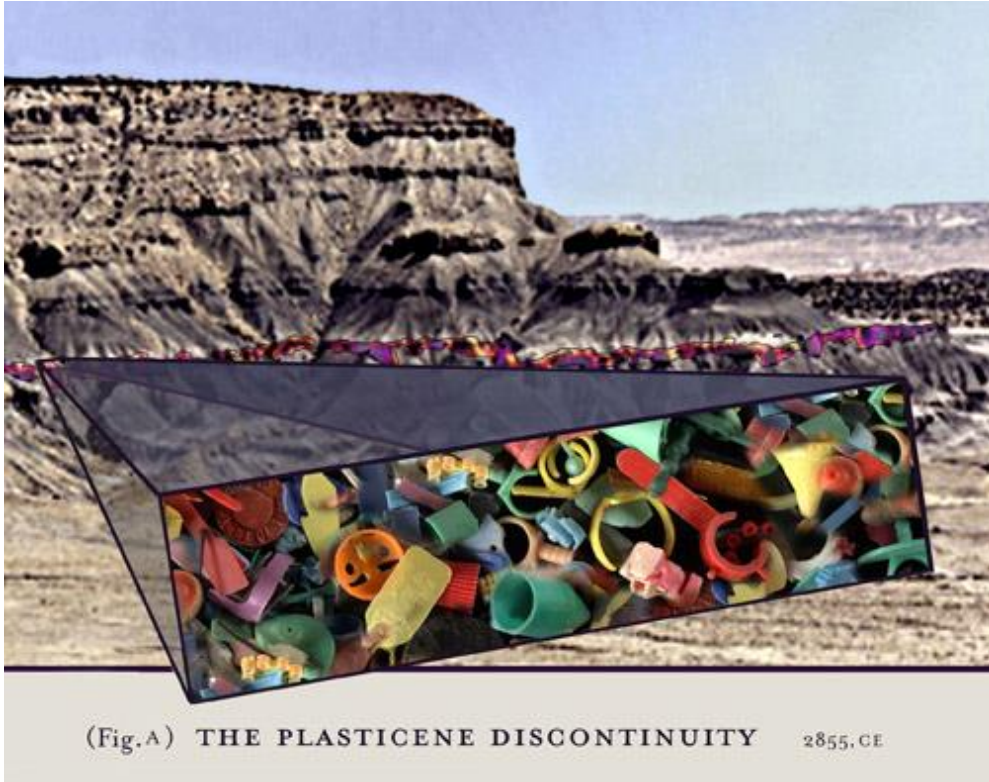
Resources

The Age of Plastics

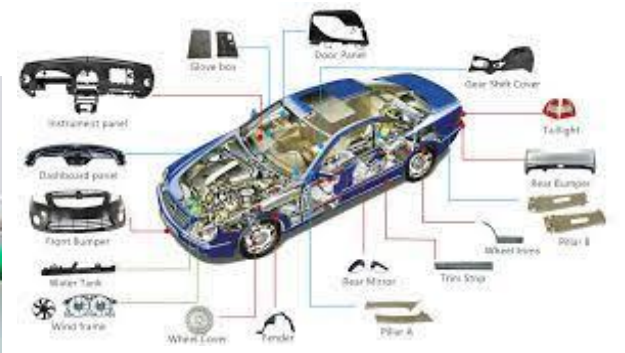
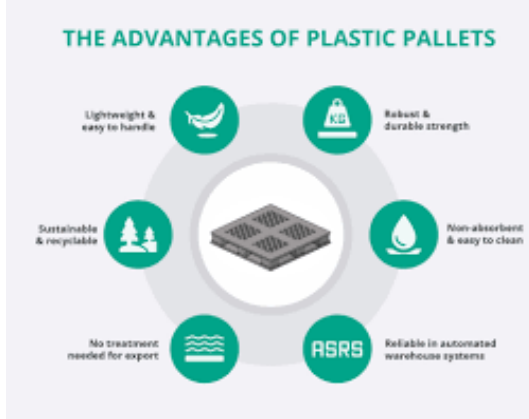
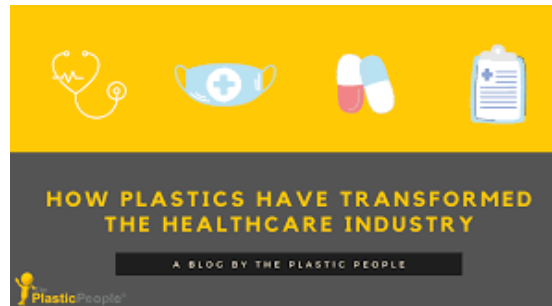


www.darrinqualman.com

The Plasticene



<https://plasticforever.blogspot.com/>



- ## ADVANTAGES
- Light in Weight
 - Easy to clean
 - Cheap to produce
 - Water, Chemical and corrosion resistant
 - Easily mold

- Excellent Finishing
- Good Adhesive Properties
- Odorless
- Unbreakable
- Recyclable and Versatile



Classifying Plastic Pollution

Plastic pollution size categories

Macro



Meso



Micro



Mini-micro



<25 - 5mm

<5 - 1mm

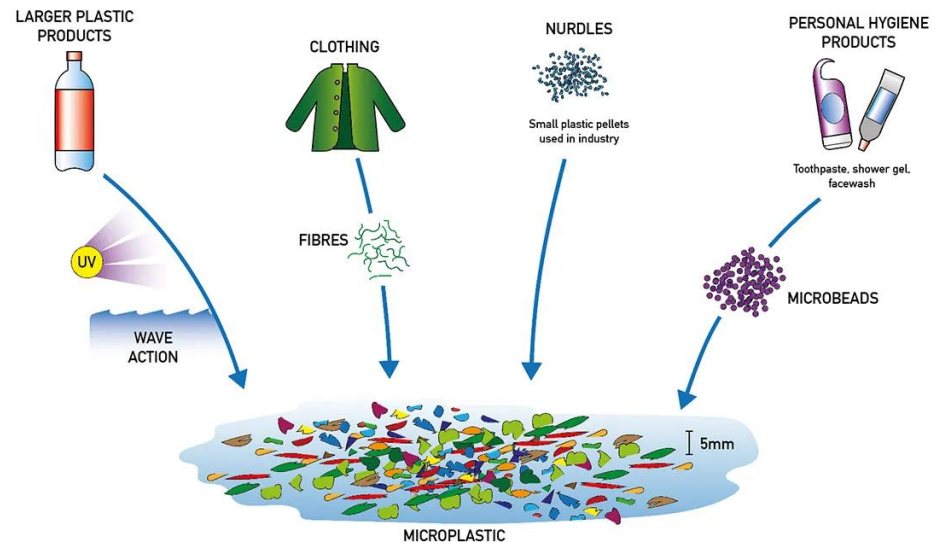
<1mm - 1 μ m

≥ 25 mm

What are Microplastics?

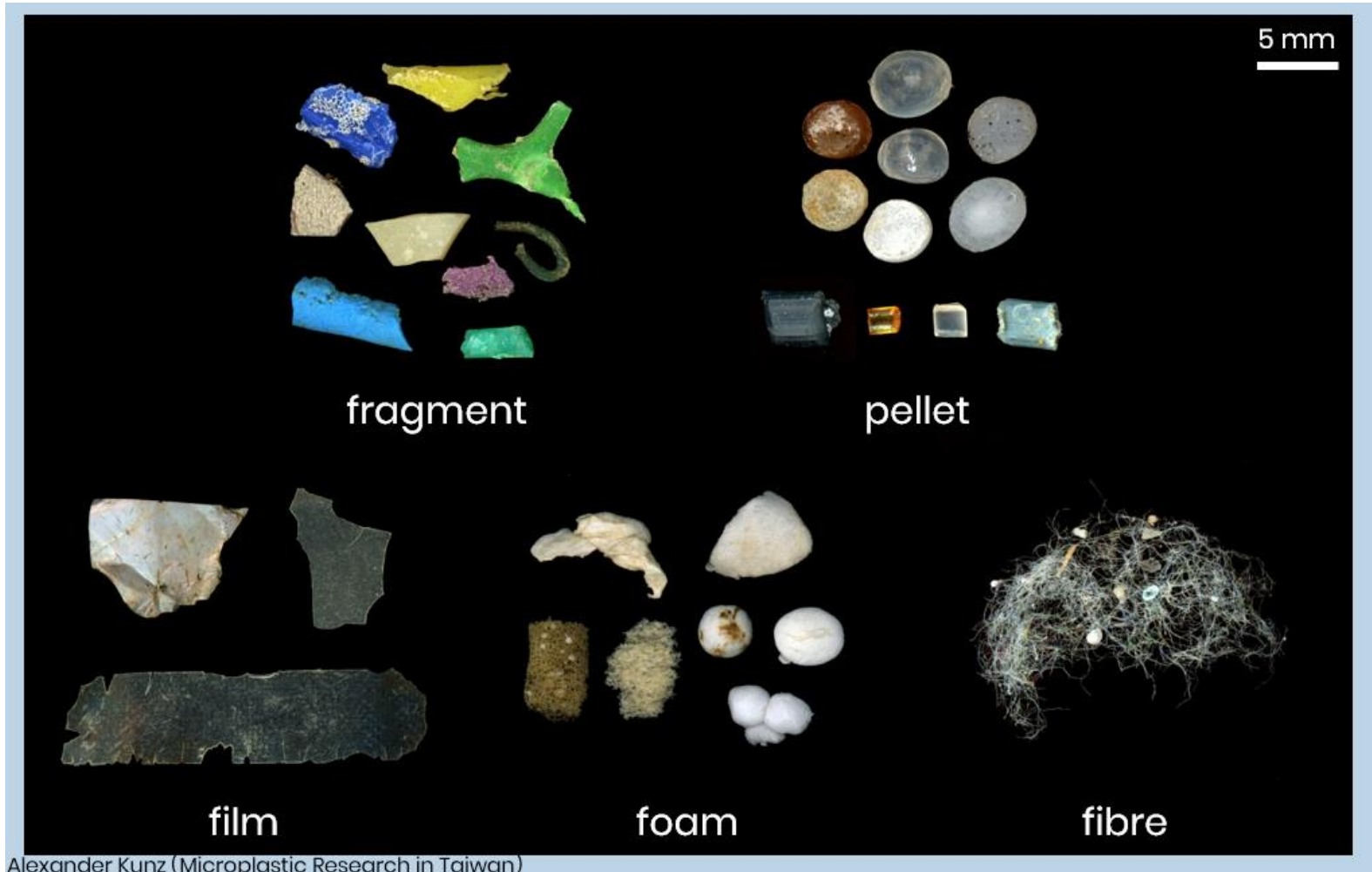
Particles smaller than
5 mm

- Primary microplastics (manufactured small; plastic pellets, microbeads)
- Secondary microplastics (fragments of larger plastics)
- Synthetic microfibers (0.1-5 mm long and 0.04 mm wide)



www.encountered.com

Types of Microplastics



Alexander Kunz (Microplastic Research in Taiwan)

Plastic Sources



**Single Use
Plastics**



Packaging



**Styrofoam in
Construction**



Toys



Fishing Gear



Tire Tread



**Plastic
Landscaping
Fabric**



**Agrochemicals
(encapsulated
fertilizer)**



**Plastic Pellet
(nurdles)**



**Microfibers
from textiles**



Microbeads



**Medical
Equipment**

Great Lakes Plastics

Plastics in the Great Lakes

Estimates that over 22 million pounds of plastic pollution end up in Great Lakes every year

Tracked in ocean since 70's but recent discovery in the Great Lakes

Great Lakes provide drinking water to over 40 million



2019 ISEA Grand Traverse Bay Microplastic Trawl Data



**Average number of
microplastic pieces
per km² = 4,859**

Unpublished Data from Inland Seas Education Association

- Fish from 3 Lake Michigan tributaries were analyzed for presence of MPs: 85% contained MPs in digestive tracts
- Research shows plastics contaminate every level of the food web in Great Lakes & bioaccumulation
- The average MP concentrations in the Great Lakes are comparable to those from some ocean surveys
- Researchers investigated 12 brands of beer made with water sourced from the Great Lakes and all brands contained microplastics

Microplastics in the Great Lakes: Environmental, Health, and Socioeconomic Implications and Future Directions. Claire Fuschi, Haihui Pu, Margaret MacDonell, Kurt Picel, Maria Negri, and Junhong Chen ACS Sustainable Chemistry & Engineering 2022 10 (43), 14074–14091

What Are We Finding?

Grocery Bags

Bottles

Caps

Straws

Toys

Styrofoam

Cigarette Butts

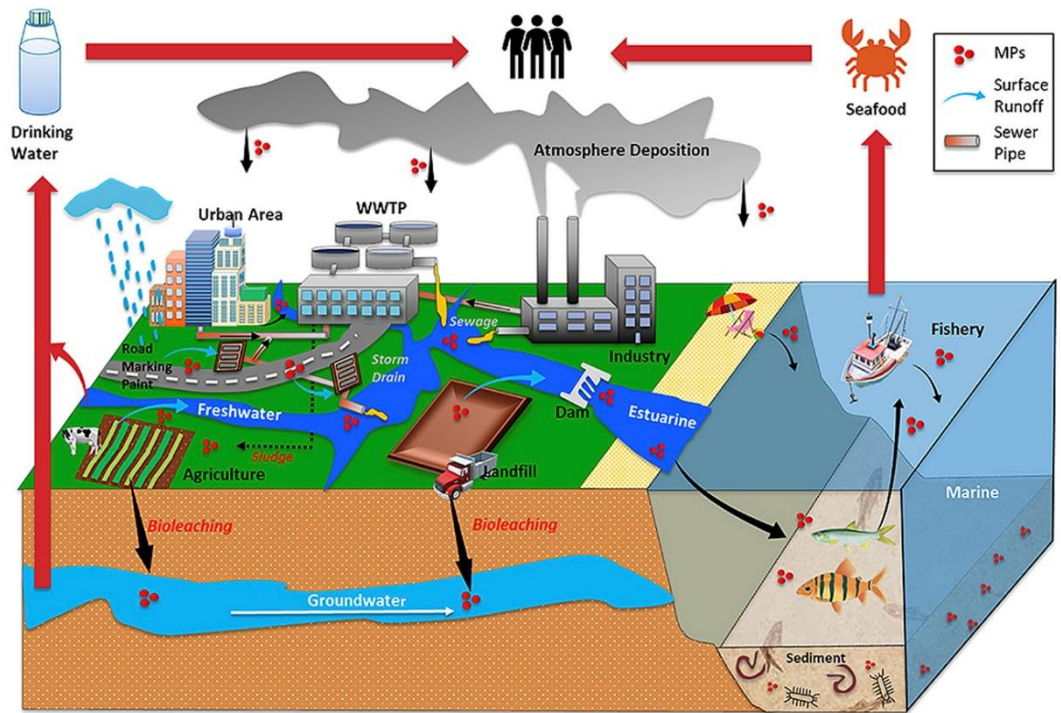
Microfibers

Balloons

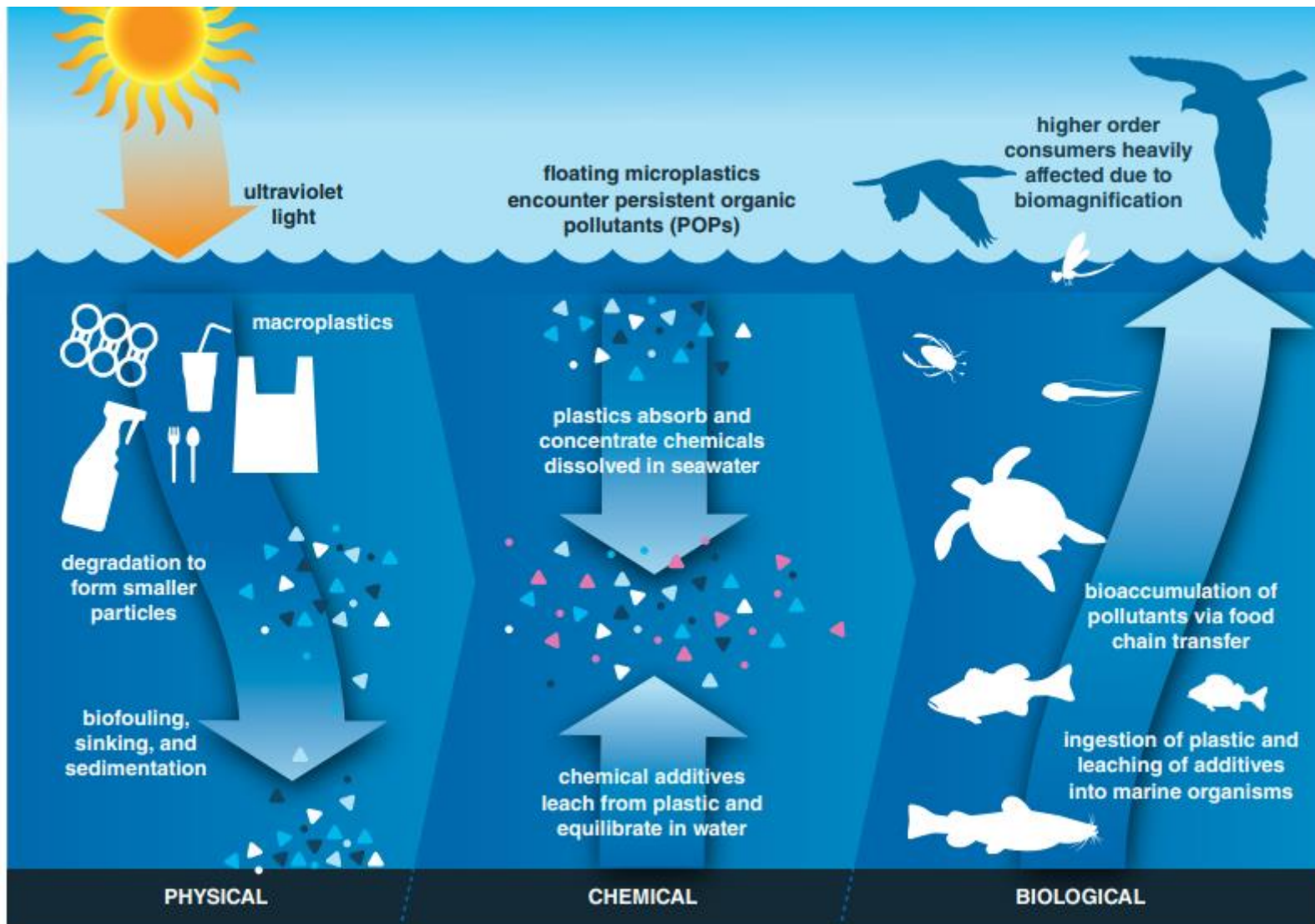
Transport

Transport

- Effluent from wastewater treatment plants
- Stormwater runoff
- Beach litter
- Landfill leachate
- Atmospheric deposition
- Litter delivered by rivers



Wu et al, 2019



www.sherrimason.com

Fun Facts about Plastics

Coca Cola produces 120 billion bottles a year

About 10 % of all plastic produced is recycled

2 million plastic bags are used every minute worldwide

Plastic may outweigh fish in the ocean by 2050

Average person consumes 70.000 pieces of microplastics annually

The average life span of a plastic bag is 12 minutes

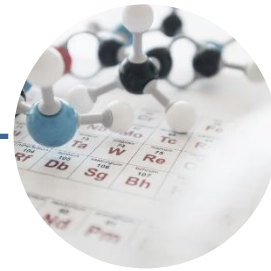
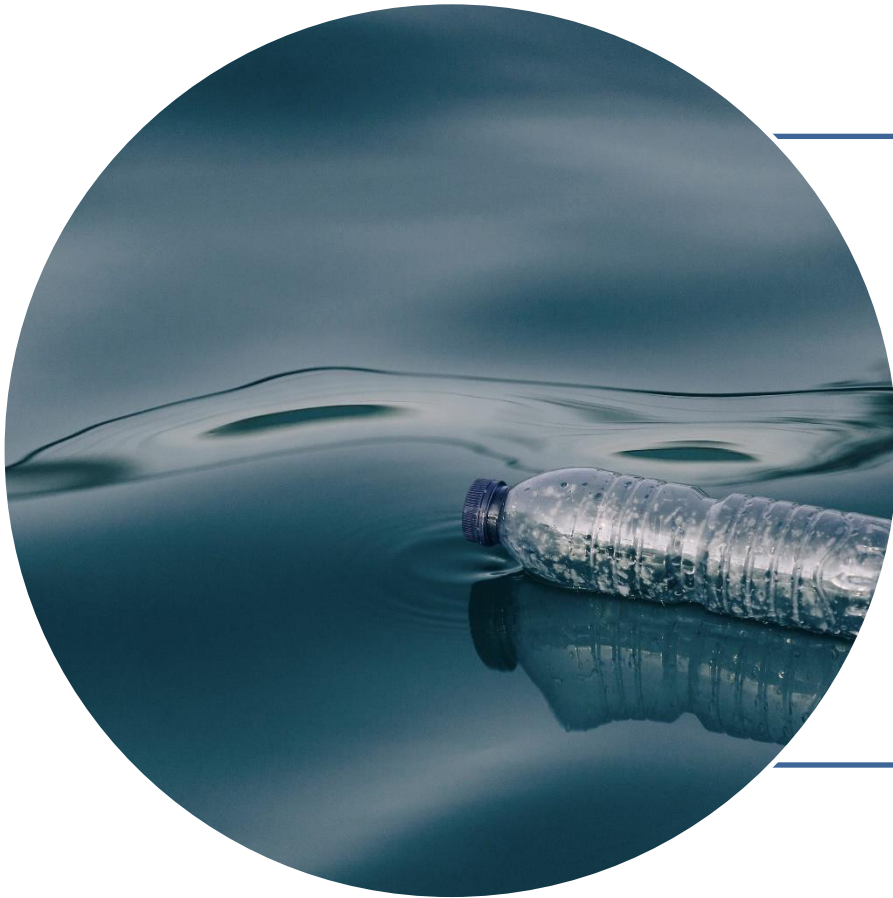
Half of all plastics are single-use applications

About 97% of plastics ever made still exist

8 states have banned single-use plastic bags; dozens have a preemption to ban plastic pollution

What's The Concern?

What's the Problem?



**Chemicals
absorb to
plastics**



**Plastics
themselves
contain
chemicals**



**Physical
issues
when
ingested**

HUMAN EXPOSURE TO CHEMICALS IN PLASTICS

SOURCES



EVERYDAY PLASTIC PRODUCTS, e.g. plastic-based food contact materials, building materials, electronics, textile, clothing and personal care and household products



CHILDREN'S products e.g. toys, clothing or furniture.



OCCUPATIONAL exposure at various stages of the plastic value chain

EXPOSURE PATHWAYS examples

inhalation of contaminated air

ingestion of contaminated food, water and dust

dermal contact



ADVERSE HEALTH EFFECTS examples

abnormal hormone functions

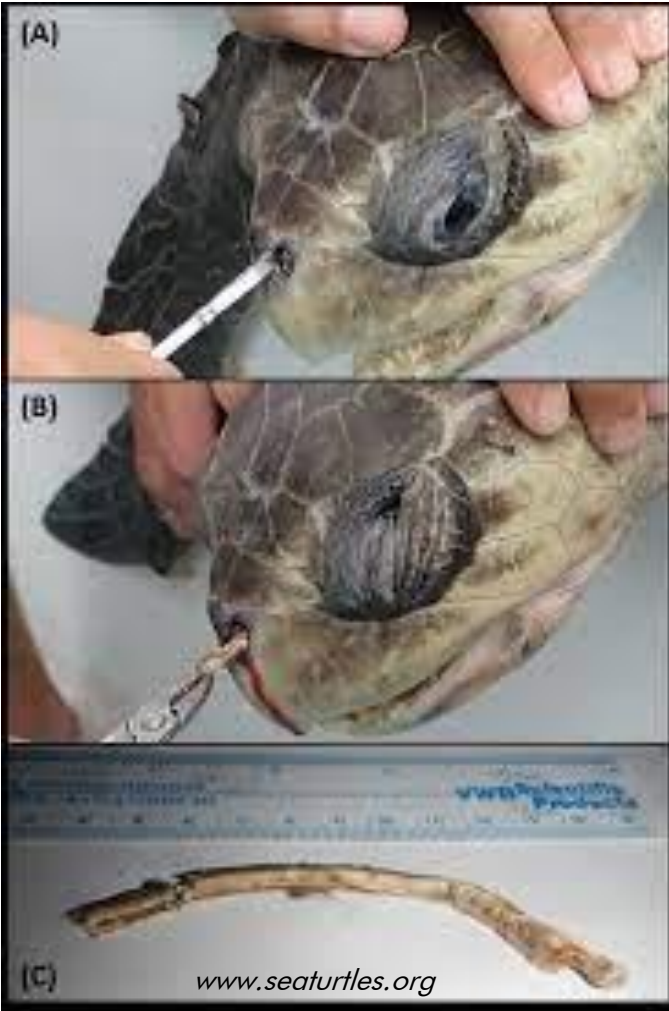
reduced fertility

damaged nervous system

hypertension/
cardiovascular disease

lung and liver cancer

Source: United Nations Environment Programme and Secretariat of the Basel, Rotterdam and Stockholm Conventions (2023). **Chemicals in plastics: a technical report**. Geneva.



The Watershed Center's Work



Photo Credit: Rick Kane



Photo Credit: Rick Kane

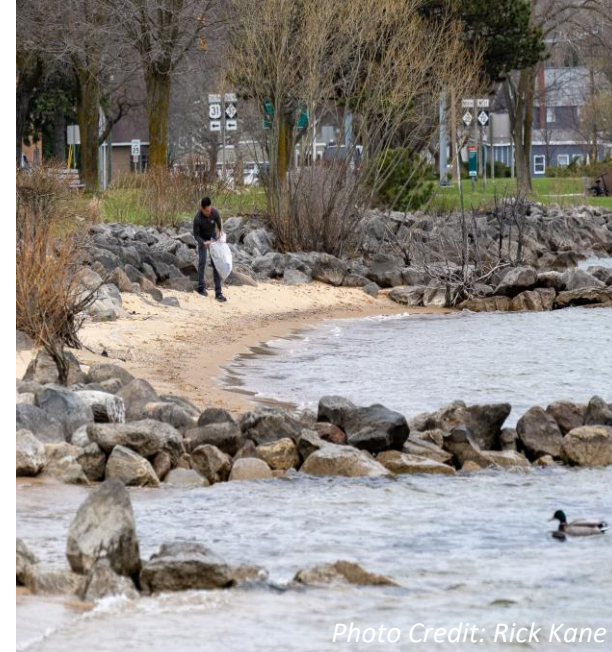


Photo Credit: Rick Kane



Photo Credit: Holly Wright



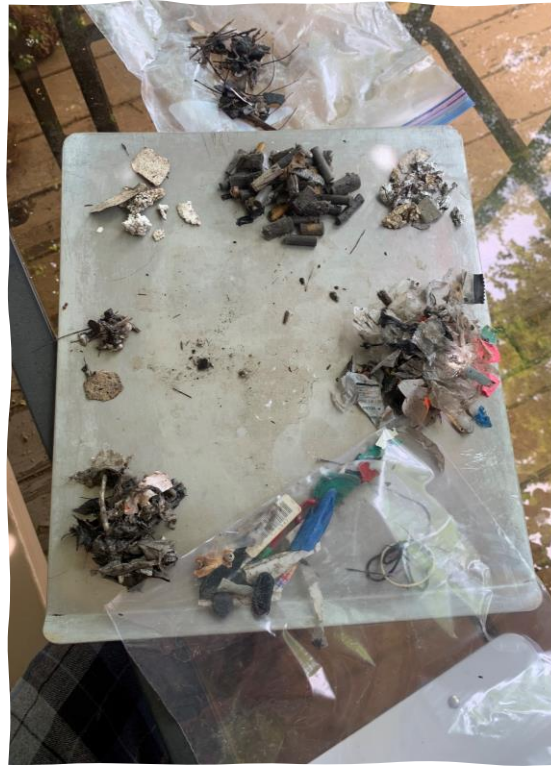
Photo Credit: Rick Kane

Beach Cleanups



Great Lakes Plastic Cleanup





Monitoring



Education, Awareness & Advocacy

Becoming Part of the Solution

Individual Actions



Evaluate own plastic footprint
& eliminate reliance on
nonessential plastics



Consider alternatives



Do some plastic-free
preaching



Start plastic-free local
campaign



Pick up litter/organize your
own cleanup



Engage in government
processes



Washing Machine Filters

Community Actions

Improved stormwater
management

Alternative
agricultural practices

Improve wastewater
and drinking water
treatment

Extending corporate
responsibility to
improve traditional
recycling
infrastructure

State and Federal Legislation



**Encouraging
Recycling**

**Reducing Plastic
Consumption**



Proposed State of MI Legislation



Michigan Microplastics Coalition

- **Draft Microplastic Legislation — Sept 2023**
 - **Statewide Strategy Plan**
 - **Microplastic Drinking Water Monitoring**
 - **Microbead Ban (furthering 2015 ban)**
 - **Microfiber Filtration**
 - **Stormwater Management**

Info Courtesy of Art Hirsch

Learn More

- EPA's Draft National Strategy to Prevent Plastic Pollution - www.epa.gov/circulareconomy/draft-national-strategy-prevent-plastic-pollution
- Break Free From Plastic Pollution Act – www.waterkeeper.org/news/tell-congress-to-pass-the-break-free-from-plastic-pollution-act/
- Dr. Sherri Mason - www.sherrimason.com
- Alliance for the Great Lake's Plastic-Free Toolkit – www.greatlakes.org/plastic-free/
- Huron River Watershed Council's Microplastics And You Video - www.youtube.com/watch?v=uwQS1BsgzOI
- Lake Ontario's Waterkeeper Investigation: Microplastics in the Great Lakes Video www.youtube.com/watch?v=W0ieE6wyt1Y
- The Watershed Center – www.gtbay.org
- Microplastics in the Great Lakes: Environmental, Health, and Socioeconomic Implications and Future Directions – www.pubs.acs.org/doi/10.1021/acssuschemeng.2c02896
- Northern Michigan Environmental Action Council's Microplastics in the Great Lakes with Art Hirsch - https://www.nmeac.org/microplastics_in_the_great_lakes?utm_campaign=microplastics_video_5&utm_medium=email&utm_source=nmeac





**“I’m not anti plastic, I am
anti stupid plastic”**

– *Dr. Sherri Mason*