

Microplastics in Our Food, Water, and Air

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Seaside Sustainability, Inc**

[Video https://www.bbc.com/news/world-us-canada-49845940](https://www.bbc.com/news/world-us-canada-49845940)

**We eat a credit cards' weight in plastic
a week! (5grams)**



History of Plastics

- **1869** The first “plastic” created from cellulose
 - A replacement for Ivory billiard balls
 - French Ivory – Tortoise shell combs
- **1907** The first synthetic polymer – Bakelite
- **1935** Nylon WWII ropes, parachutes



History of Plastics

- **1940 DuPont makes Dacron/polyester PETE #1**
- **1960 Plastics pollution in the oceans recognized**
- **1979 Polar Fleece invented in Malden, MA**
- **1980 Recycling developed to address the problem**
 - **Bisphenol recognized as a health hazard PVC #3**



The Now of Plastics

- **300 million tons plastic is produced a year**
- **50% of this is single use plastic**
- **79% is in landfills, roadsides, or the ocean**
- **<3% of plastic is recycled**
- **2018 China no longer takes our waste**
 - **China buried or burned the plastic**
- **Our Plastic is now our problem**



What are Microplastics?

- **Microplastics are defined as 1mm-5mm in size**
- **Created by environmental exposure to light and agitation**
- **Microplastics are present in the air, fresh water, and our food**
- **Oceans are the largest sink of microplastics**



The Shapes of Microplastics



Microfibers

Microscopic fibers that are the cast off of synthetic cloth.



Fragments

Plastics that form when larger plastic items break down.



Pellets or Nurdles

Loose pellets of plastic of a smooth and uniform design.



Where do Microplastics come from?

Compostable, Biodegradable, Degradable

Compostable bags are made of plant material & Breakdown in commercial composting process into



Biodegradable bags are made out of Plastic & Breakdown in landfills by microbes into



Biodegradable

Degradable



Microfibers Come From...



- **Poorly filtered laundry water**
- **Clothing cast off on the land and water's surface**
- **Littered synthetic clothing/fabrics**

Microplastic Shards Come From...

- Plastic litter particularly PETE#1 is exposed to elements
- Litter in the ocean breaks apart due to the currents and wave action.
- Spread through currents and settles on beaches or below the water.



Microbeads Are...

- **Tiny plastic/synthetic pellets**
- **Used in sanitary cosmetic products**
- **Often too small to be effectively filtered through common methods**
- **Hundreds of microbeads can get washed down the drain once the product is emptied**



Microplastic Pellets (Nurdles) Are...



- **Small plastic pellets used during the manufacturing process**
- **Appear as smooth, pebble-like materials mixed in sand, dirt, and gravel.**
- **Nurdles can clog up an animal's digestion, killing them**
- **Thousands can get lost in spills during transport**

Plastics and Microplastics are in our Stormwater Runoff that Goes to the Sea



DRAIN SMART GLOUCESTER
SCHOOLS PROJECT
ARTIST MANUAL

WWW.SEASIDESUSTAINABILITY.ORG/RAIN-SMART

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Microplastics in Animals

- **Microplastics build up in the digestive system. Leading to malnutrition, intestinal blockage, and poisoning**
- **Some studies have suggested that ocean algae can attach itself to floating plastics, making it appear edible to birds and marine life**

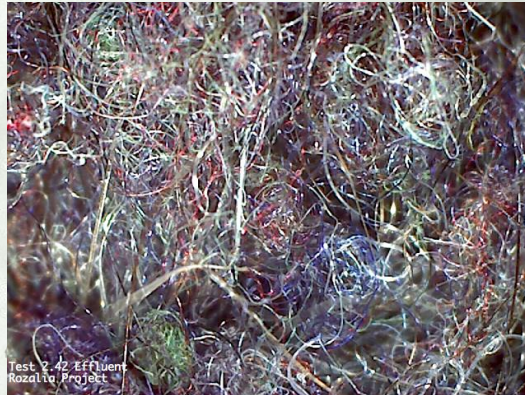




Nurdles can attract the attention of fish and birds who ingest lots of them.



Microfibers clump together in the body and act like a hairball, clogging their system.



Certain whales may ingest a lot more trash because they are filter animals, so they feed with their mouths wide open.

Microplastics in the Body

- **Studies show that humans are ingesting microplastics**
 - **Fecal samples suggests humans could be ingesting 39,000 to 52,000 microplastic particles/year.**
- **There is the potential that toxins in the plastics could poison us like other animals**
 - **Studies done on the effects are still being carried out**



Microplastics in the Air

- **Studies show that Air in the Pyrenes Mt contained 365 microplastic particles/m²/day**
- **These particles are a 100x to 1000x times smaller than microparticles in the ocean**
- **In the body they travel to the lung and can be coated with toxic chemicals from air pollution, literally dosing us with toxins**

How to Survey for Microplastic in the Water

Video

- Using a Manta net we trawl for microplastics
- Net is 35" x 15" x 12' with a fine grid 0.33mm
- We trawl at 1 knot = 1.15mph for 15mins
- We have filtered 42,000 gallons of water
- 8oz collection bottle contains our sample
- NOAA Protocol for analysis

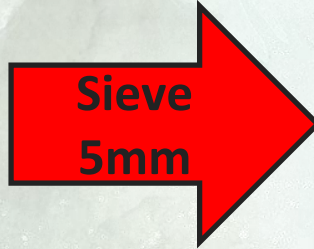




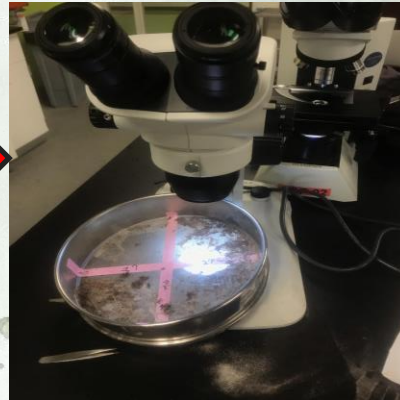
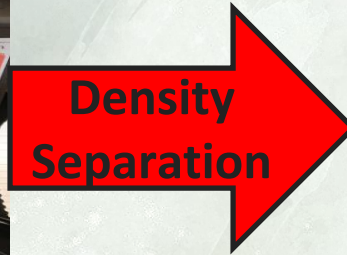
Photo credit: NOAA Marine Debris Program

Laboratory Methods for the Analysis of Microplastics in the Marine Environment: Recommendations for quantifying synthetic particles in waters and sediments

NOAA Marine Debris Program
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Technical Memorandum NOS-OR&R-48
July 2015



Dry Sample



Microplastic

Digest Organic Material

Sort Out Plastic

Results Survey for Microplastic in the Water

Sample #	Mass of Dry Sample	Mass of Microplastics
Annisquam 1	150mg	7.5mg
Annisquam 2	440mg	9.3mg
Ipswich Bay 3	2,160mg	21.1mg
Ipswich Bay 4	590mg	6.2mg

How to Survey for Microplastic in the Sand



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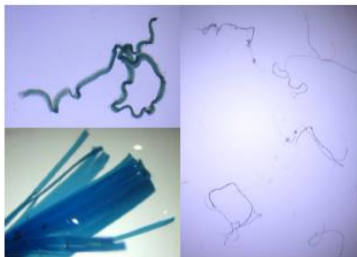
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THE MICROPLASTICS TOOLBOX
A Rocha International



Filaments

Single or multiple fibres



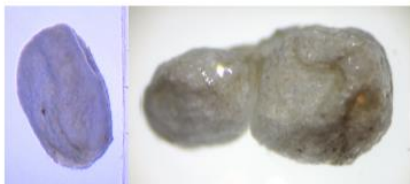
Films

Thin, flexible pieces of plastic
Often transparent



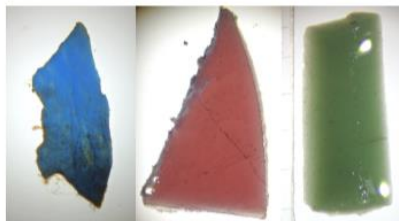
Foam

White and spongy, often spherical
Occur singly or stuck together



Fragments

Hard, angular pieces of plastic
Formed by breakage of larger plastics



Pellets

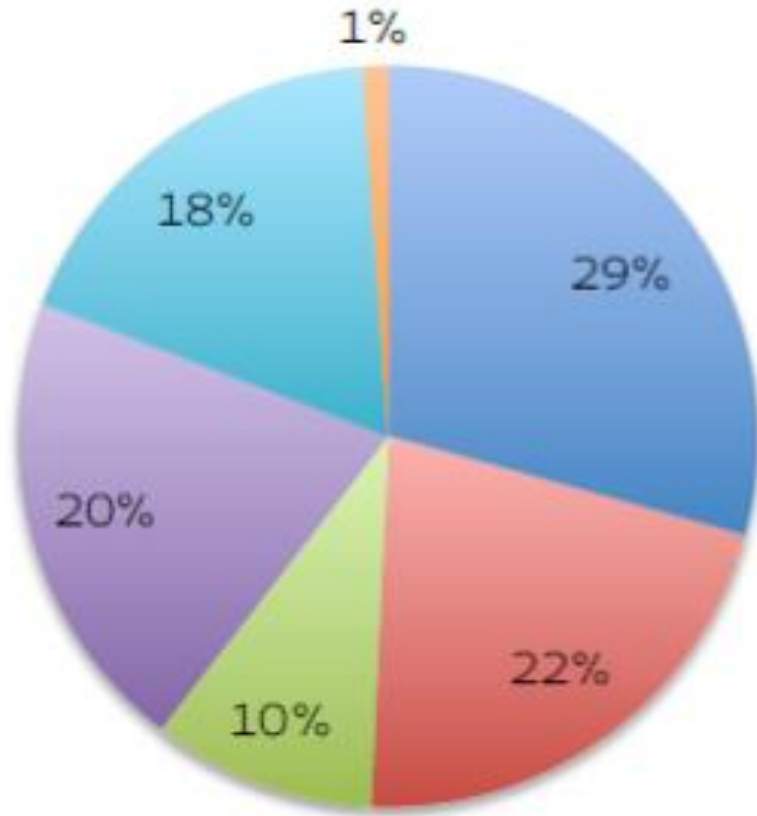
Cylindrical, disc- or lentil-shaped
Mostly white or transparent but can also be coloured



Other

Other pieces can include spherical granules or 'micro' sized plastics manufactured between 1 and 5mm



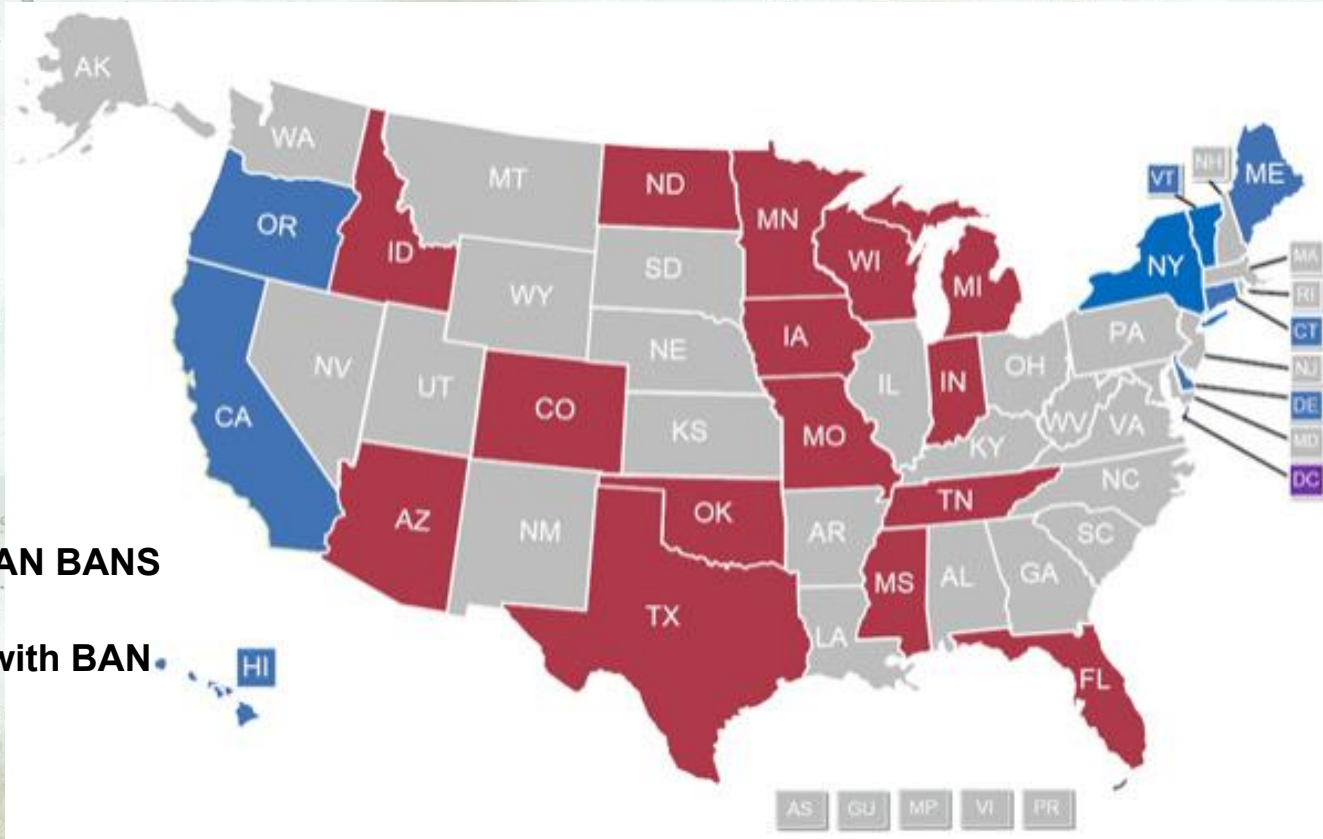


Proportion of type of microplastic at site 1

- Fragment
- Foam
- Filament
- Film
- Pellet
- Other



Single Use Plastic Bans



How-to Conduct a Successful Single-Use Plastic Ban in Your Community



Seaside Sustainability, Inc.

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Participate in Cleanup Events



- Find cleanup events near your area or in places you feel attached to and participate
- Even if there's no event, pick up litter if you see it!
- Removing plastic from the environment helps prevent them from breaking down

Goby



REUSE
REPAIR
REFUSE
REDUCE
RECYCLE



Join Organizations Devoted to Sustainability



- Organizations like *Seaside Sustainability* promote a healthy environment.
- Donations, volunteering, and application to these organizations
- Find the one that best suits your own sustainable goals!

There is no place to throw *AWAY* Trash...



We are on Spaceship Earth

Acknowledgements

Thanks to:
Dominique Gilbert,
Seaside Sustainability Intern 2020
For her assistance in making this presentation



HOW LONG UNTIL IT'S GONE?

Estimated decomposition rates of common marine debris items



Estimated individual item timelines depend on product composition and environmental conditions.

Source: NOAA (National Oceanic and Atmospheric Administration), US / Woods Hole Sea Grant, US
Graphics: Oliver Lüde / Museum für Gestaltung Zürich, ZHdK

Picture Sources

- **Slide Two:** [Ocean Microplastics: what are they, why are they bad, and what are we doing to phase them out?](#)
- **Slide Three:** [Far more microplastics floating in oceans than thought, Plastic pellets used in manufacturing are spilling into oceans, Microfiber Pollution: The latest topic in sustainability](#)
- **Slide Five:** [The Real Dirt on Laundry](#)
- **Slide Six:** [Pesky plastic: The true harm of microplastics in the oceans](#)
- **Slide Seven:** [Microbeads In Beauty Are Doing More Harm Than You Think](#)
- **Slide Eight:** <https://www.goodthingsguy.com/environment/nurdles-sa-environment-plastics-sa/>
- **Slide Ten:** <https://www.thegreatcoursesdaily.com/microplastics-found-in-deep-ocean-raising-marine-life-concerns/>
- **Slide Eleven:** [Microplastic discovered in the bodies of every dolphin, whale and seal studied,](#)
<https://yrehub.global/2019/04/30/protecting-our-75/>, <https://www.theguardian.com/environment/2017/sep/06/plastic-fibres-found-tap-water-around-world-study-reveals>
- **Slide Twelve:** <https://www.britannica.com/science/human-body>
- **Slide Eighteen:** <https://littoralartproject.com/tag/cross-curricular-education/>
- **Slide Twenty-Two:** [5 Easy and Practical Tips To Create A Fuss-Free Zero Waste Kitchen](#)
- **Slide Twenty-Three:** https://news.cgtn.com/news/3d3d414e3226b6a4d77457a6333566d54/share_p.html
- **Slide Twenty-Four:** <https://www.purdueglobal.edu/blog/student-life/45-sustainability-resources/>

**With your food, use 4, 5, 1 and 2.
All the rest aren't good for you.**

Safer choices for foods and beverages



PETE



HDPE



LDPE



PP

Avoid



V



PS



OTHER *

**Except new bio-based plastics labeled as such.*

Household

Plastics

■ In your quest to go green, use this guide to use and sort plastic. The number, usually found with a triangle symbol on a container, indicates the type of resin used to produce the plastic. Call **1-800-CLEANUP** for recycling information in your state.

**Number 1 • PETE or PET (polyethylene terephthalate)**

IS USED IN microwavable food trays; salad dressing, soft drink, water, and beer bottles

PETE

STATUS hard to clean; absorbs bacteria and flavors; avoid reusing
IS RECYCLED TO MAKE . . . carpet, furniture, new containers, Polar fleece

**Number 2 • HDPE (high-density polyethylene)**

IS USED IN household cleaner and shampoo bottles, milk jugs, yogurt tubs

HDPE

STATUS transmits no known chemicals into food
IS RECYCLED TO MAKE . . . detergent bottles, fencing, floor tiles, pens

**Number 3 • V or PVC (vinyl)**

IS USED IN cooking oil bottles, clear food packaging, mouthwash bottles

V

STATUS is believed to contain phalates that interfere with hormonal development; avoid
IS RECYCLED TO MAKE . . . cables, mudflaps, paneling, roadway gutters

**Number 4 • LDPE (low-density polyethylene)**

IS USED IN bread and shopping bags, carpet, clothing, furniture

LDPE

STATUS transmits no known chemicals into food
IS RECYCLED TO MAKE . . . envelopes, floor tiles, lumber, trash-can liners

**Number 5 • PP (polypropylene)**

IS USED IN ketchup bottles, medicine and syrup bottles, drinking straws

PP

STATUS transmits no known chemicals into food
IS RECYCLED TO MAKE . . . battery cables, brooms, ice scrapers, rakes

**Number 6 • PS (polystyrene)**

IS USED IN disposable cups and plates, egg cartons, take-out containers

PS

STATUS is believed to leach styrene, a possible human carcinogen, into food; avoid
IS RECYCLED TO MAKE . . . foam packaging, insulation, light switchplates, rulers

**Number 7 • Other (miscellaneous)**

IS USED IN 3- and 5-gallon water jugs, nylon, some food containers

OTHER

STATUS contains bisphenol A, which has been linked to heart disease and obesity; avoid
IS RECYCLED TO MAKE . . . custom-made products

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