Science AMA Series: Hi, we are NOAA scientists Amy Uhrin and Carlie Herring. We're here to talk about microplastics in our ocean and Great Lakes–what they are, where they come from, and what you can do to help. Ask Us Anything!

NOAAgov [1] and r/Science AMAs[1]

[1]Affiliation not available

April 17, 2023

Abstract

Hi, we are NOAA scientists Amy Uhrin and Carlie Herring and we work to understand and reduce the impacts of trash and other marine debris on our ocean and Great Lakes. Have you been hearing about microplastics in the ocean and wondering what are microplastics? Where do they come from? What's the big problem with microplastics? And what can I do to help? Of all the marine debris that ends up in these important water bodies, plastics are the most common. While plastics can range from consumer items like plastic bottles and bags to abandoned fishing nets, they all eventually break down into smaller and smaller plastics called microplastics. These tiny plastics can have a big impact on our environment. We're here from 1:00 to 3:00 p.m. ET today to answer your questions about microplastics in our ocean and what you can do to help. Ask Us Anything! Thank you for joining us today and for your interest in research on microplastics! Unfortunately, we are out of time for today. If you are interested in learning more about microplastics and marine debris research, explore some of these online resources: Plastics in the Ocean NOAA Marine Debris Program Listen to podcast with Amy Uhrin on microplastics Current research

the WINNOWER

REDDIT

Science AMA Series: Hi, we are NOAA scientists Amy Uhrin and Carlie Herring. We're here to talk about microplastics in our ocean and Great Lakes--what they are, where they come from, and what you can do to help. Ask Us Anything!

NOAAGOV R/SCIENCE

Hi, we are NOAA scientists Amy Uhrin and Carlie Herring and we work to understand and reduce the impacts of trash and other marine debris on our ocean and Great Lakes. Have you been hearing about microplastics in the ocean and wondering what are microplastics? Where do they come from? What's the big problem with microplastics? And what can I do to help?
Of all the marine debris that ends up in these important water bodies, plastics are the most common. While plastics can range from consumer items like plastic bottles and bags to abandoned fishing nets, they all eventually break down into smaller and smaller plastics called microplastics. These tiny plastics can have a big impact on our environment.
We're here from 1:00 to 3:00 p.m. ET today to answer your questions about microplastics in our ocean and what you can do to help. Ask Us Anything!
Thank you for joining us today and for your interest in research on microplastics! Unfortunately, we are out of time for today. If you are interested in learning more about microplastics and marine debris research, explore some of these online resources:
Plastics in the Ocean
NOAA Marine Debris Program
Listen to podcast with Amy Uhrin on microplastics
Current research

CORRESPONDENCE:

DATE RECEIVED:
January 13, 2017

DOI:
10.15200/winn.148422.29070

ARCHIVED:
January 12, 2017

CITATION:
NOAAgov , r/Science , Science AMA Series: Hi, we are NOAA scientists Amy Uhrin and Carlie Herring. We're here to talk about microplastics in our ocean and Great Lakes--what they are, where they come

Hi NOAA scientists, thank you for the AMA, what can the average American like me who is in the Midwest do to help?

Blind_philos

Yay mid-west! I grew up in the corn fields of Iowa and even though this is a long way from the ocean, we can all help tackle the issue of marine debris. I'll first state what you probably already know… reduce, reuse and recycle. Different states and counties have different recycling regulations, so I'd first check out this website (http://www.iwanttoberecycled.org/) to learn how to recycle right (https://marinedebrisblog.wordpress.com/2016/07/26/recycle-right/) in your area. Also, reusing items like reusable grocery bags, water bottles, etc. will reduce the amount of waste that may make it into the environment and eventually the ocean. There are many other things you can do, such as join a cleanup in your area. There are often many cleanups happening around the country (you can check out our monthly e-newsletter (https://marinedebris.noaa.gov/our-work/marine-debris-news) for a list of some of them), and the Ocean Conservancy hosts the International Coastal Cleanup (http://www.oceanconservancy.org/our-work/international-coastal-cleanup/?

from, and what you can do to help. Ask Us Anything!, *The Winnower* 4:e148422.29070 , 2017 , DOI: 10.15200/winn.148422.29070

referrer=https://www.google.com/) every September – however, this isn't just limited to coastal states. Also, check out the Marine Debris Tracker app. With this app, you can pick up litter items and record the data of what you pick up. You can keep track of the debris you collect and your data also feeds into a large database. This video (https://marinedebris.noaa.gov/videos/trash-talk-what-can-we-do-about-marine-debris) also goes over some ideas of how everyone can help. Every little effort to combat marine debris truly makes a difference no matter where you live, so spread the word and encourage others to join you! -- Carlie

Hi, NOAA Scientists. Thank you very much for doing this AMA!

- How do you identify the presence of microplastics (≤ 5 mm) in the ocean?
- What are the potential risks posed by potential organic pollutants in microplastics to the environment and human health?
- What recommendations to policy makers and stakeholders would you give to reduce the negative impacts of microplastics?

Edit: corrected symbol

AudiWanKenobi

Thanks for your questions and interest in the microplastic marine debris issue! I'll answer your questions in order: 1) To identify microplastics in the ocean, scientists usually tow large nets (such as neuston nets or manta trawls) alongside a boat moving at a very slow speed (1- 1.5 nautical miles/hour). The nets have a fine mesh size, so will collect microplastic debris between the sizes of 0.33mm and 5mm. Anything smaller than 0.33mm will likely pass through the net. Because of this, some organizations are starting to collect and analyze whole water samples to identify some of the smaller sizes of microplastics (with the neuston nets and manta trawls, the water passes through the net and scientists only collect the microplastic particles). Other scientists are starting to look into using pumps to filter water for microplastics. Once the microplastics are collected, they then need to be separated from natural materials and then counted. 2) Scientists are in the thick of answering your second question. We know that pollutants can sorb onto microplastics and we know that marine organisms (many types ranging from zooplankton to whales) ingest microplastic debris. Now we are trying to determine what the consequences of ingestion are. Scientists around the world are interested in this issue and are investigating whether the contaminants sorbed to the microplastics will de-sorb into the organism, and if the contaminants will accumulate in the animal. Other scientists are investigating the effects of contaminated microplastics to higher tropic levels (https://marinedebrisblog.wordpress.com/2017/01/11/different-types-of-plastic-litter-lead-to-different-types-of-effects-in-animals/) in the food web. There is interest in linking effects from polluted contaminants to human health, however, I do not know of any studies that are actually examining this at this time. Fun fact: did you know that humans may be exposed to microplastic debris by eating sea salt? (Yang et al. 2015 (http://pubs.acs.org/doi/abs/10.1021/acs.est.5b03163)). 3) The NOAA Marine Debris Program does not make policies for marine debris, but we provide the science that policy makers and stakeholders can use to inform marine debris policies. For instance, a recent monitoring study (https://marinedebrisblog.wordpress.com/2017/01/09/the-united-states-of-trash-a-quantitative-analysis-of-marine-debris-on-u-s-beaches-and-waterways/), found that states with container deposit laws (where you return plastic beverage bottles for a refund) can reduce the presence of these bottles on local beaches.

What are the most dangerously impactive microplastics, and how can average people tell which products contain them?

ceropoint

This is a great question and somewhat tricky to answer as we are still trying to understand the extent of the effects of microplastic debris. Most of the concern surrounding microplastic debris has focused on the ingestion of these small plastic particles by marine organisms. So the answer will likely vary by the organism in question, the concentration of microplastics the organism is exposed to and ingests, whether the organism can pass the debris through its digestive tract and excrete it, and the clearance rate of debris (how quickly the organism ingests and then excretes the microplastics). What we do know is that marine organisms can be impacted by the physical presence of the microplastic debris. For instance, one study found that oysters ingesting polystyrene microplastic particles resulted in feeding modification and reproductive disruptions (Sussarellu et al. 2016 (http://www.pnas.org/content/113/9/2430)). In another study, long-term microfiber ingestion by Nephrops norvegicus (the Norway lobster, Dubline Bay prawn, or langoustine) resulted in reduced feeding rates, body mass, and metabolic rates in a laboratory environment (Welden and Cowie 2016 (http://www.sciencedirect.com/science/article/pii/S0269749116307278)).
We also know that microplastic debris can both leach chemical additives (chemicals added to plastics during the production process to give them ideal qualities, such as flame/fire resistant properties, specific structures such as hard/rigid or flexible properties, etc.) and sorb contaminants that are already in the water. Different plastic polymer types (such as polyethylene, polystyrene, etc.) will act differently in how much they leach/sorb. One of our partners at VIMS has just completed a study on the leaching of additives and sorption of contaminants to microplastic debris (see this blog (https://marinedebrisblog.wordpress.com/2017/01/12/influence-of-various-aqueous-conditions-on-additives-releasing-from-and-pollutants-sorbing-to-microplastic-debris/)).
A number of products contain microplastics, such as personal care products (toothpastes, face scurbs, body washes, etc.), industrial scrubbers used for blast cleaning, and also clothing (microfibers in synthetic clothing). There are a number of ways to tell if products contain microplastics or microfibers. First, there is an app call "Beat the Microbead," which will tell you what items contain microbeads. Also, when reading ingredients lists for products, look for the following items: polyethylene, polystyrene, polypropylene, polyethylene terephthalate, etc. When reading the labels of clothing, look for the following names: nylon, polyester, polypropylene, fleece, acrylic, spandex, etc. -- Carlie

I am a University of Michigan - Flint student. The amount of plastic water bottle coming into the city, and not being recycled, is unprecedented due to the leaded water distribution, which is an issuing being unearthed in many more parts of the nation.

As citizens begin to trust their municipal water sources less, and begin importing (bottled) water, if this rate continues, how big of an effect can these unphathomable amount of plastic bottles have on our great lakes, even from inland state?

carefullycalibrated

It all depends on how the plastic bottles are disposed of, whether they are recycled properly or end up in the environment! Plastics become a problem when they enter the environment because they are not biodegradable. Sunlight, wave action and other physical forces fragment these larger items into smaller and smaller pieces (microplastics), but they never truly go away. Animals from zooplankton to fish and seabirds ingest the plastics which can physically damage or disrupt their digestive system. Once in the animal's digestive system, chemicals from the plastics can transfer to the animal's tissues so now you have exposure leading to toxicity. Researchers at SUNY Fredonia have studied this issue in Great Lakes – you may try looking them up! -- Amy

As far as I know, one important problem is the ingestion of microplastics by aquatic animals. What are some latest findings regarding how that may affect food chains and eventually humans?

edwinksl

Well, we know that animals that comprise the base of the oceanic food web (i.e., zooplankton) do ingest microplastics, and that fish and other seafood containing plastics in their digestive tracts are available for potential human consumption through market outlets. A study of cultured oysters being sold for human consumption found that plastic was ingested by the oysters and that an average dietary portion of six oysters (100g) could contain around 50 plastic particles. Researchers from China have also documented the occurrence of microplastics in sea salt. However, the risks to and implications for humans from consumption of microplastic-laden seafood or other ocean products are not yet understood. This question is very timely, as one of our Program-funded research projects sought to answer the question of trophic transfer! You can read more about this project in more detail on the Marine Debris Program's blog (https://marinedebrisblog.wordpress.com/2017/01/11/different-types-of-plastic-litter-lead-to-different-types-of-effects-in-animals/). -- Amy

Hi! Thanks for doing this AMA!

In the UK, the cosmetic microbead/microplastic 'fad' sprang up almost overnight in the mid 2000s from what I recall - soaps went from being made entirely of soap to containing microbeads in a short space of time. Just where did it come from? I understand the 'exfoliation' aspect that made companies want to use them, but it seemed to be included in cosmetic and cleaning products very suddenly. Was there some sort of advancement that made companies start using them?

I've also seen some countries and companies try to replace them with more 'natural' exfoliants like sand. Is there any reason that this wasn't done from the start? Was the potential environmental impact from microplastics underestimated by this industry?

OldBoltonian

I cannot speak on behalf of this particular industry, but I would guess that the rise in microbead use may have been due to the fact that most products that utilize plastic exfoliants and abrasives are cheaper and faster to produce compared to using natural alternatives. Interestingly though, from a consumer perspective, the natural exfoliants like pumice, apricot shells, walnut husks, have textured edges which should make them more effective as exfoliants (versus a perfectly round, smooth microbead). Wastewater treatment plants were designed to do just that – treat wastewater. They were not designed to filter out microplastics being washed down the drain from personal care products. Research indicates that although wastewater treatment plants are fairly effective at removing microplastics from effluent (95-99% of the particles end up in the sludge material), so much water is processed throughout the day (millions of liters) that a significant amount of microplastics and microfibers still make it out into the environment. Researchers at Loyola University Chicago found that microplastic abundance was greater in riverine water samples collected downstream from wastewater treatment plants versus upstream. Anywhere from 15,000 – 4.5 million particles per day per treatment plant were estimated to be released into 10 urban rivers in Illinois. Conservative estimates suggest that 8 trillion microbeads per day are emitted into aquatic habitats in the United States from wastewater effluent. Additionally, the sludge material is often applied on land as fertilizer and so the microplastics that have settled out during treatment could still make it into waterways via runoff. However, how much microplastic actually ends up in the ocean from riverine contributions remains to be seen. -- Amy

I've heard some bad things about the giant trash heap of stuff in the middle of the Pacific Ocean.

My question is: is there anything being done to clean it up, or is it more about trying to prevent the pile from growing?

It's obviously easier said than done, but I don't know why this isn't more of a pressing issue in the minds of humanity.

Thank you for your efforts and for doing this AMA!

theuniquenerd

The North Pacific Gyre is one of the largest gyres and spans roughly 7-9 million square miles. To put that into perspective, the total land area of the United States is about 3.5 million square miles. Our Program has made some very rough back-of-the-envelope calculations and determined that if we had 100 ships each skimming a 200m swath of the gyre's surface and these ships operated for 10 hours every day and traveled a speed of 11 knots (12-13 mph), only about 2% of the gyre could be covered in one year. And so at this same rate, it would take approximately 50 years for these ships to cover the whole gyre once. And while those ships are skimming, the faucet it still flowing. Imagine if your bathtub or kitchen sink was overflowing and you were attempting to mop up the floor but the faucet was still running. Because this task would be so daunting, we instead focus on removing shoreline debris and preventing debris from entering the environment in the first place! -- Amy

Hi and thanks for being here today!

Do microplastics in our drinking water pose a threat to public health?

Do microplastics bioaccumulate in predatory fish and does that pose a risk to public health?

PHealthy

Little information exists on microplastics in drinking water and this is an issue that is on the radar of the EPA. The risks to and implications for humans from consumption of microplastic-laden seafood or other ocean products are not yet understood. We do know that animals comprising the base of the oceanic food web, like zooplankton, ingest microplastics. Research has also shown microplastics present in fish in markets, in oysters, and even sea salt. -- Amy

Hi,

According to WWF the oceans will soon have more plastic in them than fishlife. How true is that or am i correct that that is an vastly exagerated statement that would not be true even if we continued our plastic pollution of the oceans for another 10,000+ years? Thanks

Tamazin_

The report is by the World Economic Forum. The statistic is 1 ton of plastic for every 3 tons of fish by the year 2025 and more plastics than fish by weight in 2050. You can find the report here. Thank you for seeking clarification!

http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf -- Amy

Is there any evidence to suggest that micro plastics are being consumed by hard corals and soft corals?

If so how do you think this accumulation will affect the organism? (particularly in relation to their resilience to other mounting pressures like ocean acidification and climate change)

Otherwise, thanks for your hard work! It's a tough issues that needs solutions in all aspects of society.

Bainosaur

Thanks for the question! Although to date, there is no published documentation of coral ingestion in the wild, research suggests that corals "prefer" to feed on very small particles (10-400 micrometers in size) and because microplastics fall within that preferred size range, it is quite possible that incidental ingestion occurs. Laboratory feeding experiments conducted in Australia using individual colonies of Dipsastrea pallida, a mound-shaped stony coral, found that on average, corals can consume up to approximately 50 micrograms of microplastic particles (polypropylene shavings) per cm^2 per hour. These feeding rates were comparable to previously published coral feeding rates on plankton and other natural food sources. Given the high concentration, found mainly in the gut cavity, it is possible that microplastic ingestion by corals could impair their health by inhibiting digestion of natural food items. -- Amy

As a current packaging student at Michigan State University, I am curious to know--what are some of the most common and/or detrimental consumer items that end up in water bodies? What do you think of the current trend of switching food items that are typically in cans, glass jars, etc. into stand up plastic pouches?

vanslammer

We are able to get data on the most common debris items from the International Coastal Cleanup. The top 10 items found around the world were: cigarette butts, plastic food wrappers, plastic beverage bottles, plastic bottle caps, straws, other plastic bags, plastic grovery bags, glass beverage bottles, beverage cans and plastic cups & plates. You can find more information and that data on their website (http://www.oceanconservancy.org/our-work/international-coastal-cleanup/?referrer=https://www.google.com/)! -- Amy

Hi, thanks for doing this ama!

What are some viable alternatives to microplastics?

Iranoutofalts

We have had a number of questions like this! There are a number of natural alternatives for microbeads as exfoliants, like pumice, apricot shells, and walnut husks. -- Amy

Minnesotan here, what's your favorite great lake?

Scrubakistan

I (Amy) recently spent two winters in Madison, Wisconsin (Go Badgers!). In February of 2014, I was fortunate enough to travel to the northern part of the state to explore the famous Lake Superior ice caves at Apostle Islands National Lakeshore! It was a truly breathtaking experience unlike any I had experienced prior and so for that reason my vote goes to Lake Superior! -- Amy

Hello! I'm a student at the University of Southern Mississippi studying polymer engineering and the school of Polymers and High Performance Materials. Have you met or heard of Dr. Robert Lockhead? He recently retired from our program to devote his time to continue his research on microplastics in the ocean. He's a wonderful man that I wish everyone had the chance to meet.

Southern_Rugger

Cool! Golden Eagles! My sister graduate from USM two years ago! I know that Dr. Lockhead has worked extensively with polymers used in skin care products but I will definitely look into his work now that you have mentioned him. Thanks! -- Amy

Thanks for doing this AMA. I grew up in Western New York and I've been given to understand that Lake Erie is particularly polluted. Are efforts being made to preserve our Great Lakes, or are most initiatives being aimed at the oceans? If there are, are they effective?

PM_ME_UR_FLOWERS

We love the Great Lakes and we are definitely working there! You can check out the projects we are working on in the region on our website (https://marinedebris.noaa.gov/great-lakes).

On average, how long do microplastics take to biodegrade? Sorry, not a scientist but I just want to know more. Thanks.

letsgoantiquing

Unfortunately, plastics are not biodegradable. They fragment into smaller and smaller pieces due to physical forces like sunlight and wave action on a beach, but they never truly go away. At the smallest scale, they break down into their component polymers, which still remain in the environment. -- Amy

First off, thank you very much for what you do. We need people with your level of dedication and awareness to help guide folks in the right direction here. My question(s) for you would be, is there any hope of cleaning up the "islands of trash" out there? What impact are they making on the environment and what do people need to know to avoid these islands of trash from re-occurring in the future? What other issues are currently out there and what can we do to rectify and/or improve the situation?

AudioSin

The garbage patches are often misunderstood. Rather than "islands of trash" out in the ocean, these areas are actually places with increased concentrations of debris. However, the majority of this debris is very small, having fragmented from larger items into tiny pieces from exposure to the sun, salt, winds, and waves. This debris is located not only at the on the water's surface, but throughout the water column and all the way down to the ocean floor. Unfortunately, this debris is a difficult problem to address. Due to winds, waves, and ocean currents, this debris is constantly moving and mixing. In addition, since the majority of debris within the open ocean and Great Pacific Garbage Patch (https://marinedebris.noaa.gov/videos/trash-talk-what-great-pacific-garbage-patch-0) is microplastic debris (https://marinedebris.noaa.gov/info/plastic.html), it's possible to sail through the garbage patch without even realizing it! For these reasons, we focus on removal efforts (https://marinedebris.noaa.gov/current-efforts/removal) on our shorelines and coastal areas, before debris items have the chance to make it to our open ocean and before they have broken into microplastic pieces, which are inherently difficult to remove from the environment. However, our main focus is on prevention (https://marinedebris.noaa.gov/current-efforts/prevention), which is the key to the solving the marine debris problem. If you think about an overflowing sink, it is obvious that the first step before cleaning up the water is to turn the faucet off. That is exactly what prevention is. By working to prevent marine debris through education and outreach, we can stop this problem from growing.

What is the largest source of microplastics? Is there a feasible substitute?

yacobi-yacobi

Thanks for your question! The best answer I can give you is HUMANS! It's tricky to determine the exact sources of microplastic debris because there are so many products and types of microplastics and once they get into the ocean, it is difficult to single out the specific sources. One of the emerging sources of marine debris (that we all contribute to) is microfibers from our clothing. When we wash our clothing, the small fibers (think of what you clean off of the lint trap) are carried away with the water and can end up in the watershed. Natural materials such as cotton, hemp, wool, etc. are alternatives to synthetic clothing. However, some people have linked these alternatives with other environmental concerns. There are some technologies that are being tested that will help catch/collect these fibers in the wash. Hopefully we will see more inventive ideas to address this issue in the coming years! Microbeads are another source of microplastics. These are the small beads we find in face scrubs, toothpastes, etc. Some products use natural exfoliants instead of plastic microbeads, such as walnut, coconut, coffee, salt, etc. In December 2015, the Microbead-Free Water Act of 2015 was passed (check out this blog (https://marinedebrisblog.wordpress.com/2015/12/30/the-president-signs-a-national-microbead-ban/)), so we should be seeing more products incorporating these natural exfoliants soon. I make my own face scrub (1/2 cup sea salt, ½ cup coconut oil) to avoid using products with microbeads! -- Carlie

Hello, your work is awesome.

Where do the majority of marine plastics come from? For example, is it terrestrial blow off from litter? From landfill? Is it dumping? What countries contribute the most? What industries or consumer sources are big contributers?

I really want to know where/why/how it's getting into the ocean, and the relative impact of each source.

-me

P.s. I save my plastic trash and photograph it each month, in an effort to reduce my usage. Going on 3 years now. :D

kidconcept

I'm impressed that you are doing so much to reduce your waste usage each month! Way to go! Marine debris can come from all the sources you've listed – and here are a few additional sources: the microbeads in our face products and toothpastes, litter left behind by beach-goers, lack of waste management infrastructure in which there is no place to throw away trash (see the Jambeck et al. 2015 (http://science.sciencemag.org/content/347/6223/768) for more info on this issue), natural disasters (hurricanes, floods, storms, etc.) where debris is washed out into waterways and the ocean, recreational or commercial fishing vessels, cruise ships, oil rigs/platforms, etc. Jenna Jambeck and her co-authors came out with a paper in 2015 (http://science.sciencemag.org/content/347/6223/768), that highlight your questions about the countries contributing the most debris – I'll direct you to that paper for the specifics! -- Carlie

Hi Carlie and Amy! I was just wondering if you have any advice for someone pursuing a career in the sciences? I would love to become a marine biologist with a specialization in conservation. Your work is amazing! Also, nice name (my name is carlie, too!).

xXmisscarcarrXx

Hi Carlie, you have a lovely name! If you are looking at graduate programs, I suggest you look for ones that will fund you (so you don't end up with a ton of loans/debt). As a graduate student, I worked as a Teaching Assistant (I taught Bio 101 labs) and as a Research Assistant for my advisor. I also suggest that you look for good advisors (rather than the name of the school) – while reading scientific papers, if a subject really interests you, note who the author is and their affiliations. Lastly, you can never take too much math and statistics... this will help you in the long run! Best of luck! -- Carlie

Hi Amy and Carlie!

I am curious, does your team or related teams work with industrial engineers in any regard? If not, what kinds of educational backgrounds do most people have? I am a senior undergrad student graduating college this May, and I would love to know if this is a field I can professionally contribute to.

Thank you both for hosting this AMA! The responses so far have been great.

hannashap

Hello! Most of the folks on our team have masters degrees or PhD's in marine science or environmental science. One of the things I love about working in this field is that it spans so many scientific disciplines (oceanography, chemistry, ecology, biology, toxicology, etc.) and we have to collaborate with scientists in all these disciplines to fully understand the effects of marine debris on the environment. One of our partners, Jenna Jambeck, from the University of Georgia has an engineering background and she has done some great work for the marine debris world! This field welcomes folks with all sorts of backgrounds! Best of luck in your studies :)

Is there any simple experiment I can perform with my children to capture and examine microplastics?

URABUSA

There are lots of marine debris activities and experiments that are available and appropriate for kids. This can be a great way to talk about this important issue in an engaging way. Check out the educational materials (https://marinedebris.noaa.gov/activities-and-curricula) section of our website for activities and lessons that may be useful, or watch this Trash Talk Webinar for Educators (http://oceantoday.noaa.gov/trashtalk_webinar/) which walks you through some great activities for kids. Many of the curricula on our website include microplastic activities and lessons, so check them out! For example, take a look at our Educator's Guide to Marine Debris (https://marinedebris.noaa.gov/educators-guide-marine-debris), which includes a high school microplastics lesson and experiment on page 18.

I live in Buffalo, NY. Lake Erie is just a hop and Lake Ontario is a skip from my home. I am also an avid fisherman. Seeing as my drinking water comes from the lakes and I eat fish from the lakes (in small amounts because of mercury) what kind of impact do microplastics have on public drinking water and on the food chain?

For a guy like me who wants to keep clean water for my kids to drink and for my kids to play in, and for my kids to get fish from, what can I do to keep plastics from getting into the water and how can I help clean the water that is already contaminated? I want to do something actively, and not merely support those who do the work. I am seeking practical ways that I can make a difference.

TheHobbitPimp

We have had a lot of questions about the impacts microplastics can have on humans. We don't yet know the full extent, but microplastics have been found in animals like zooplankton, fish, oysters, and even in sea salt! There are many ways you can get involved in your community! The first is by recycling and properly disposing of waste before it gets into the environment. You can also join a cleanup in your area (you can check out our monthly e-newsletter (https://marinedebris.noaa.gov/our-work/marine-debris-news) for a list of some of them), and the Ocean Conservancy hosts the International Coastal Cleanup (http://www.oceanconservancy.org/our-work/international-coastal-cleanup/?referrer=https://www.google.com/) every September. If you want to go a step further, you can also help us collect data with the Marine Debris Tracker app (https://marinedebris.noaa.gov/partnerships/marine-debris-tracker)!

Hi!, and thanks for the AMA! Are there data indicating how microplastics initially enter waterways?

Recent litigation in the US bans microbeads, since many wastewater treatment plants cannot remove particles that small. Do effluent streams from wastewater treatment plants make up the majority of microplastic sources, or do data indicate that regulation on wastewater treatment couldn't resolve the issue?

edit: data plurality issues

Halfloaf

Thanks for your question! Microplastic debris can come from various sources. It can be manufactured as microbeads, capsules, or pellets - these are what we call "primary microplastics." Microplastic debris can also form from the breakdown of larger debris items (such a plastic bottles, bags, containers, etc.) due to photo degradation and mechanical wave action; we call these "secondary microplastics." There are a number of ways these debris items enter our waterways (and ocean). We generally break this down into land-based and ocean-based sources. Land-based sources may come from the microbeads in our face products and toothpastes, litter left behind by beach-goers, wind transport (blowing items into waterways), lack of waste management infrastructure (this is a huge problem in developing countries), and a lot of debris is washed into the ocean during natural disasters (hurricanes, floods, storms, etc.). Ocean-based debris may come from recreational or commercial fishing vessels, cruise ships, oil rigs/platforms, aquaculture and other fisheries, and container ships (to name a few). Determining the percentage of debris that comes from each of the land- and ocean-based pathways is difficult to estimate. For example, if we see a plastic bottle in the ocean, we don't know if it was littered on a beach, transported to a waterway by wind, or tossed overboard from a recreational vessel or cruise ship. Determining the sources of microplastics from each of these pathways is even more tricky, because we don't know the sources of the secondary microplastics. Now, on to your specific questions about wastewater treatment plants! Wastewater treatment plants (WWTPs) are actually quite effective at removing microplastics from the water (some have removal efficiencies of 95-99%). However, even with these high efficiency removal rates, millions of microplastics can still be discharged into the waterways each day. A recent paper by Mason et al. (2016) (https://www.ncbi.nlm.nih.gov/pubmed/27574803) estimated that an average of 13 billion microbeads are discharged into US waterways every day from WWTPs. Even though we have estimates of the microplastic loads from WWTPs, we do not have the estimated loads from other sources of marine debris entering the ocean, so we don't know how much the contribution from WWTPs compares to other sources. The bottom line – all marine debris comes from humans and so we can also be the solution! -- Carlie

This might be a bit off-topic, but I noticed that one of your last names is Herring. MBARI has a scientist whose last name is Haddock. Do you find that there are a larger-proportion of people in your field with

last names that are also the names of fish? Is it nominative determination at work?

i_invented_the_ipod

Hah! Many people have made this connection with my last name. I should meet this Haddock scientist ;) I can't think of other scientists (off the top of my head) with fun, fishy last names, but I'm sure they are out there! Have a great day.