
The Rapids

US EPA's Trash Free Waters Monthly Update

February 2022

epa.gov/trash-free-waters

Introduction

Hello all,

The Environmental Investigation Agency published a report last month titled [“Connecting the Dots: Plastic Pollution and the Planetary Emergency.”](#) The document outlines the many impacts associated with plastic production and consumption and recommends that UN member states should prioritize plastic prevention policies and support a global plastics treaty.

In other news, the U.S. Plastics Pact, made up of more than 100 businesses, non-profit, and government organizations as part of the Ellen MacArthur Foundation’s Plastics Pact Network, published a [“Problematic and Unnecessary Materials Report”](#) on January 25. This identifies eleven plastic packaging items that are not currently reusable, recyclable, or compostable at scale in the U.S.

Please continue to share any upcoming events with Layne Marshall (marshall.layne@epa.gov) so that the Trash Free Waters team can advertise these opportunities with all of you on the first Monday of each month.

Thanks,
Romell Nandi
US EPA
Trash Free Waters National Program Lead

EPA Announcements

[Release of the Region 8 Trash Free Waters Tribal Program Handbook](#)

The Trash Free Waters team in EPA's Region 8 Office (CO, MT, ND, SD, UT and WY) has developed a handbook to assist Tribal governments, Indigenous communities, and other relevant stakeholders to develop and implement projects that reduce trash in waterways on Tribal lands. This handbook provides basic information on project design, implementation, and funding to serve as a starting point for those

interested in taking action to reduce escaped trash in their community. This resource was developed specifically for Region 8 Tribes, but it may be helpful to other communities as well.

[TFW Hosts 7th Webinar in Series](#)

The TFW Program's January 20th webinar, "Outreach and Education for Trash Free Waters – What Makes a Successful Campaign?" drew over 230 attendees from local, state, and federal government offices, NGOs, universities, and businesses. Guest speakers provided the audience with practical information on how to craft an effective anti-littering or source reduction outreach campaign and discussed common barriers to achieving desired behavior changes and strategies for overcoming these barriers. A recording of this webinar will be posted on the TFW website later this month.

[TFW Program Educational Trifold](#)

The TFW team recently completed the development of a trifold brochure outlining the TFW program's mission, goals, services, and achievements. The intention of this resource is to help educate partners about TFW as a voluntary, non-statutory program.

[EPA Recognizes WasteWise Award Winners for Innovations in Waste Reduction](#)

EPA announced National WasteWise (WW) award winners for 2020 and 2021. These award winners prevented and diverted close to 408,000 tons of waste from landfills and incinerators. Instead, they saved over \$22.5 million in avoided landfill tipping fees and prevented climate and other environmental impacts associated with waste management.

[Creation of a "Citizen Science at EPA" StoryMap](#)

The EPA recently published a storymap outlining agency-supported citizen science efforts. The resource offers an in-depth look into how to engage the public in environmental protection.

Funding Opportunities

[Research to Reduce Consumer Food Waste in the United States \(EPA-G2022-STAR-E1\)](#)

EPA, as part of its Science to Achieve Results (STAR) program, is seeking applications proposing cutting-edge transdisciplinary research (integrating diverse disciplines such as behavioral science, psychology, economics, public health, and sociology) to develop, apply, and test innovative and creative community-engaged approaches and methods to reduce U.S. household food waste through prevention. **The deadline for submissions is February 9.**

[FY22 Gulf of Mexico Bay-Watershed Education and Training \(NOAA-NMFS-SE-2022-2007159\)](#)

The National Marine Fisheries Service Southeast Regional Office is seeking proposals under the Gulf of Mexico B-WET Program. This funding announcement focuses on the following priority areas: 1) Professional Development for Teachers related to Meaningful Watershed Educational Experiences, 2) Exemplary Programs combining Teacher Professional Development with Meaningful Watershed Educational Experiences for their students, 3) Systemic Meaningful Watershed Educational Experience Implementation, and 4) Capacity Building for Expanded Statewide K-12 Environmental Literacy Initiatives. **The deadline for submissions is February 18.**

[Alaska Marine Education and Training Mini-Grant Program \(NOAA-NMFS-AK-2022-2007143\)](#)

The National Marine Fisheries Service is soliciting competitive applications for projects seeking to improve education and training on marine resource issues throughout the region and increase scientific education for marine-related professions among coastal community residents. **The deadline for submissions is April 1.**

[OIA Coral Reef and Natural Resources Program 2022 \(OIAOIA-CRNR2200043\)](#)

The U.S. Department of the Interior's Coral Reef and Natural Resources Initiative provides grant funding for management and protection of coral reefs and to combat invasive species in the U.S. insular areas. **The deadline for submissions is April 1.**

[The PADI AWARE Mission Hub Community Grants](#)

The PADI AWARE Mission Hub Community Grants (Funding Cycle 0222) are open to funding ocean protection initiatives and projects that directly advance the PADI Blueprint for Ocean Action, in direct support of the United Nations Decade of Science for Sustainable Development. Marine debris is one of the five recommended project proposal categories. **The deadline for submissions is April 22.**

Other opportunities...

[Kellogg-Morgan Stanley Sustainable Investing Challenge](#)

Teams of graduate students from around the world are invited to develop and pitch creative financial approaches to tackle pressing social and environmental challenges through this competition. Plastic waste is specifically mentioned as a potential project focus. A total of 414 students from 87 schools across 50 countries competed last year. The first-place winner will receive \$10,000. **Project prospectuses are due February 13.**

[Earthshot Prize](#)

Plastic Pollution Coalition (PPC) is seeking scalable solutions to nominate for The Earthshot Prize. PPC will prioritize nominating projects that address the plastic pollution crisis at the source by seeking ways to reduce single-use plastic production and use, center environmental justice, and have the potential to scale in the next few years to make an even bigger impact. Two of the predetermined project category focus areas include: Revive Our Oceans and Build A Waste-Free World. Winners of The Earthshot Prize will be granted GBP £1 million. **To be considered, fill out a nomination form by February 14.**

[World of 7 Billion Student Video Competition](#)

Through the World of 7 Billion student video contest, hosted by Population Connection, middle and high schoolers are given the platform to think critically about global challenges related to population and share what they think we should do to fix it. Each entry must focus on one of following global challenges as it relates to population growth: Ocean Health, Urbanization, or Agriculture and Food. The maximum video length is 60 seconds. **The deadline for submissions is 5PM ET February 22.**

[EPA's "Companies Crushing Pollution" Video Challenge](#)

The "Companies Crushing Pollution" Video Challenge invites students and others including people who live near industrial facilities to create videos illustrating how businesses in the U.S. are reducing toxic chemical releases through innovative pollution prevention (P2) practices, and by having a positive impact on the environment and communities. Participants have a chance to win up to \$5,000. **All videos must be submitted by March 1.**

[EPA Environmental Justice Video Challenge for Students](#)

EPA and partners have launched the Environmental Justice Video Challenge for Students to enhance communities' capacity to address environmental and public health inequities. The goals of the challenge are to: Inspire students at accredited colleges and universities in the U.S. and its territories to work directly with communities in the identification and characterization of EJ challenges using data and publicly available tools and help communities address EJ challenges and/or vulnerabilities to environmental and public health hazards using data and publicly available tools. Video submissions should be less than 6 minutes in length. **Submissions are due April 1.**

Upcoming Events

[Advancing the Circular Economy in Your Community](#)

February 9th (11AM ET)

Join this Solid Waste Association of North America (SWANA) webinar to learn from circular economy champions around the nation on their journey toward advancing the circular economy in their communities. Furthermore, learn how to identify your own role and the tangible steps you can take, as an individual or organization, on creating circular economies in your communities. Guest speakers will include representatives from the Ellen MacArthur Foundation, as well as the City of Phoenix, Seattle Public Utilities, and Dane County Department of Waste & Renewables.

[2022 Waste Management Sustainability Forum](#)

February 9th (12-3:30PM ET)

Waste Management's (WM) Sustainability Forum event will feature compelling conversations around the following topics: Net Positivity, Partnering for Circularity, The Art of Innovation, Speaking Up for Environmental Justice, Climate and Culture, and Successful Sustainability Leaders.

[Warm up to UNEA 5.2: Towards a decision to launch negotiations for a new global agreement on plastics pollution](#)

February 10th (7AM ET)

GRID-Arendal and the Norwegian Ministry of Climate and Environment invite you to join a series of webinars to learn and exchange knowledge on the scope of a UNEA 5.2 global agreement on plastic pollution, including: insight into National action plans, the role of the United Nation systems, criteria on sustainability and possible financing mechanisms, and understanding of plastic recycling myths and what "taking a lifecycle approach" means in practical terms.

[Trash Free Texas Webinar: Making the Most of New Resources for Reducing Litter](#)

February 10th (11:30AM ET)

Join the North Central Texas Council of Governments (NCTCOG) for its latest Trash Free Texas webinar, which will include a presentation from Keep Texas Beautiful on how to use the [Texas Litter Database](#) to enter and store litter clean-up data, an overview of two new [Trash Free Texas](#) toolkits and new "Partner Packet," and an update on the next Mayor's Challenge clean-up event to be held this spring.

[What's Next for Waste and Recycling in 2022](#)

February 10th (2-3:30PM ET)

The U.S. waste and recycling sector is in for another year of rapid changes to address workforce issues, environmental, social, and governance (ESG) expectations, climate concerns, legislative and regulatory

policy, industry competition, environmental justice and more. Join Waste Dive for an exclusive, insightful discussion about what this all may mean for the year ahead and how we are planning to tackle it.

Global Waste Management Symposium

February 14-17th, Indian Wells, CA

North America's #1 technical conference for research and case studies on waste management will include world-class content, state-of-the-art breakthrough research, solutions for big challenges, networking opportunities, and innovative presentations. The conference will feature sessions on waste characterization, solid waste planning, environmental justice, recycling, and more.

Warm up to UNEA 5.2: Towards a decision to launch negotiations for a new global agreement on plastics pollution

February 15th (7AM ET)

GRID-Arendal and the Norwegian Ministry of Climate and Environment invite you to join a series of webinars to learn and exchange knowledge on the scope of a UNEA 5.2 global agreement on plastic pollution, including: insight into National action plans, the role of the United Nation systems, criteria on sustainability and possible financing mechanisms, and understanding of plastic recycling myths and what “taking a lifecycle approach” means in practical terms.

Scientists' Declaration on the Governance of Plastics Throughout their Lifecycles

February 16th (4AM ET)

This upcoming webinar is hosted by Environmental Investigation Agency (EIA) and marks the launch of the scientists' declaration (statement) on the governance of plastics in advance of the UN Environment Assembly next month, where the mandate for a new plastics treaty will be discussed. During the event, a range of international experts will provide evidence-based recommendations for how the upcoming treaty should be designed to ensure its effectiveness and utility.

"Don't Look Down": How Misinformation & Science Denial Obscures the Global Plastics and Climate Crisis

February 16th (5PM ET)

Join the Plastic Pollution Coalition for this discussion on the impacts of plastics on climate and human health and how science denial and misinformation are used to prevent urgent and transformative solutions from being adopted. We will be joined by Yvette Arellano, Founder & Executive Director of Fenceline Watch; Shilpi Chhotray, Co-Founder & Executive Director of People Over Plastic; and Dr. Michael Mann, Distinguished Professor of Atmospheric Science & Director, Earth System Science Center, Pennsylvania State University, whose work and persona provided inspiration for Leonardo DiCaprio's character in the satirical film Don't Look Up.

2022 Ocean Sciences Meeting

February 24th - March 4th

Co-sponsored by the American Geophysical Union (AGU), the Association for the Sciences of Limnology and Oceanography (ASLO), and The Oceanography Society (TOS), the Ocean Sciences Meeting is the global leader in ocean sciences conferences. Sessions include: "Plastic Litter Pathways Between Land, Freshwater and Oceans," "Chemical Methods to Understand Marine Plastic Pollution Quantities, Sources, Transport, Fate, Impacts and Solutions," and more.

Save the dates for future months...

World Ocean Summit Virtual Week

March 1-4th

Attendees can join Economist's 9th annual World Ocean Summit from anywhere in the world, free of charge. This global event will bring together the broadest cross-section of the ocean community while featuring six industry tracks: shipping, fishing, aquaculture, energy, tourism, and plastics. The goal of the plastics track is to identify new solutions to the growing global problem of marine plastic pollution.

Plastics Recycling Conference 2022

March 7-9th, near Washington, D.C.

The Association of Plastic Recyclers hosts this gathering of plastics recycling and sustainability professionals, bringing together more than 2,000 industry decision makers for networking and discussion of key trends annually.

3rd World Conference on Waste Management

March 10-11th

The theme of this year's Global Waste Management Conference is "Challenges & Practices on Waste Management and COVID-19 Post-Pandemic." One of the conference tracks will focus on the future of plastics recycling.

EWRI Operation & Maintenance of Stormwater Control Measures

March 13-16th, Wilmington, NC

The Environmental & Water Resources Institute of the American Society of Civil Engineers is hosting a conference where attendees can learn from national leaders in green and gray stormwater infrastructure, including design for maintenance, O&M training programs, new maintenance approaches, advances in municipal program management and implementation, life cycle analysis, and lessons learned from the field.

State of Lake Erie Conference (SOLE22)

March 16 -18th, Cleveland, OH (virtual participation option as well)

Hosted by the International Association for Great Lakes Research, this conference will feature two days of concurrent sessions, plenaries, field trips, and discussions. The series promotes collaborations between the science and policy communities—particularly lake-specific research, management, education, and nonprofit organizations—to broaden the discussion and provide diverse interaction among stakeholders.

Blue Economy Summit

March 18 -19th, Durham, NC

Hosted at Duke University in March 2022, the first-annual Blue Economy Summit will bring together diverse ocean stakeholders from industry, government, non-profits, and academia to identify the most promising opportunities to bring this vision to life. The Blue Economy Summit will create a collaborative setting where students and professionals can critically reflect on current ocean trends and challenges, facilitate productive conversations, and enable effective ocean stewardship actions.

Our Ocean - Palau 2022

April 13- 14th, the Republic of Palau

Our Ocean will focus on six Areas of Action, convening partners from across the globe to identify solutions to manage marine resources, increase the ocean's resilience to climate change and safeguard its health for generations to come. One of the key actions is tackling marine pollution. This panel will focus on opportunities and approaches to stop pollution at its source as well as highlight the need for effective local management of coastal catchments.

Beyond Plastic Pollution Virtual Class- Spring 2022

April 13th - May 25th (Wednesday evenings from 7-9PM ET)

This in-depth seven-week online masterclass on all things plastic pollution-related is offered by the founder and President of Beyond Plastic Pollution, Judith Enck, via Bennington College's Center for the Advancement of Public Action. The class is open to anyone, from high school student to concerned community member. The cost of enrollment is \$100. Space is limited so reserve a spot now if interested!

The Gulf of Mexico Conference 2022

April 25-28th

The Gulf of Mexico Conference (GoMCon) combines the annual Gulf of Mexico Alliance (GOMA) All Hands Meeting, the annual Gulf of Mexico Oil Spill and Ecosystems Science (GoMOSES) Conference, and the triannual State of the Gulf Summit. This conference seeks to promote the integration of science and management into decision-making. GoMCon will feature a wide variety of session themes including citizen science and education, water quality and quantity, and emerging issues including marine debris.

Virtual Salish Sea Ecosystem Conference 2022

April 26-27th

The theme of this year's Salish Sea Ecosystem Conference is "Honoring our Ancestors: Visions for Future Generations and the Salish Sea." The conference typically attracts about 1,500 participants and has become the premier scientific research and policy gathering in the Pacific Northwest. Conference presentations and discussions will serve as a platform to build shared policies, practices and procedures necessary to guide future actions for protecting and restoring the Salish Sea and its watersheds.

WasteExpo

May 9-12th, Las Vegas, NV

Whether you are from the private sector, a small, medium or large public sector waste management company, organics management, or food waste management company, or a manufacturer or supplier from the U.S. or abroad, count on WasteExpo to bring the entire industry together under one roof. 2022 conference tracks include: Operations, Fleet & Safety, Recycling & Landfill, Business Insights & Policy, and Tech & Innovation.

Circularity 22

May 17-19th, Atlanta, GA

As the leading convening of professionals building the circular economy, Circularity 22 offers thought-provoking keynotes, informative breakouts, a solutions-oriented expo and engaging networking opportunities. The goal of this conference is to encourage moving beyond individual action to catalyze systems change and accelerate the circular economy. Tracks include next-gen products and packaging, bio-based solutions, policy and infrastructure, and more.

Re|Focus Sustainability & Recycling Summit

May 23-25th, Cincinnati, OH

Hosted by the Plastics Industry Association, the Refocus Sustainability and Recycling Summit addresses the real-world challenges you face as your company pushes recycled content and sustainable manufacturing from goals and promises to action.

In case you missed it...

[Reckoning with the U.S. Role in Global Ocean Plastic Waste](#)

A NOAA Seminar Series Webinar titled “Reckoning with the U.S. Role in Global Ocean Plastic Waste” was held in mid-January to discuss a recent report to Congress. The event featured guest speakers Margaret Spring, Chief Conservation and Science Officer at Monterey Bay Aquarium; Jenna Jambeck, Professor at the University of Georgia; Michelle Gierach, Senior Scientist at the NASA Jet Propulsion Laboratory; and Mary Donohue, Specialist Faculty at the University of Hawai’i Sea Grant College Program.

[The Climate Consequences of Plastics](#)

This virtual briefing was originally hosted by the Environmental and Energy Study Institute (EESI) in December 2021. Guest speakers included Dick Ottinger, EESI Board Chair Emeritus and former U.S. Representative (D-N.Y.), Judith Enck, President of Beyond Plastics; Jim Vallette, Co-Founder and President of Material Research L3C and Miriam Gordon, Policy Director at Upstream.

[Salvaging Solutions to Abandoned and Derelict Vessels Series](#)

The NOAA Marine Debris Program is excited to announce that recordings for all the Salvaging Solutions to Abandoned and Derelict Vessels monthly webinar topics are now available. This 2021 webinar series featured almost 30 different experts who shared perspectives and solutions from across the country on common abandoned and derelict vessel issues to help communities better deal with them.

[Minimum Post-Consumer Recycled Content Model Legislation for Plastics](#)

Starting in 2020, a group of state recycling officials from the northeast worked together to develop draft Model Legislation for minimum post-consumer recycled plastic content in trash and carry-out bags and food, beverage, and household product containers. During this webinar, Northeast Waste Management Officials’ Association (NEWMOA) and the Northeast Recycling Council (NERC) reviewed the draft Model Legislation as a common starting point in the development of this kind of legislation.

[Emerging Contaminants: A Look at Microplastics](#)

This webinar, hosted by the North Central Region Water Network, takes a deep dive into microplastics and the ongoing research surrounding their pathways into our waterbodies and the effects on the ecosystem. Featured speakers included Sherri Mason, Director of Sustainability, at Penn State - Behrend and Melissa Duhaime, Assistant Professor in the Department of Ecology and Evolutionary Biology at the University of Michigan.

The Microplastics Breakdown

SOURCES, FATE AND TRANSPORT OF MICROPLASTICS

[From Bottle to Microplastics: Can We Estimate How Our Plastic Products are Breaking Down?](#)

Joana Marie Sipe, Nathan Bossa, William Berger, Nataliavon Windheim, Ken Gall, Mark R. Wiesner
The authors observed that there is lack of data to predict the rates of microplastics (MPs) generation as a function of abrasive forces. To help fill this gap, they developed a method to deliver scalable, quantitative release rates of MPs during mechanical stress throughout a plastic's life cycle. This included the use of a custom abrasion machine. They tested the generation rate of MPs through the abrasion of 3D printed polymers: polylactic acid (PLA), polycarbonate (PC), thermoplastic polyurethane 85A (TPU), polyethylene glycol terephthalate (PETG), high-impact polystyrene (HIPS), and nylon. Each polymer

underwent tensile strength material tests to identify which mechanical properties drive their abrasion rate. No correlation was found between the abrasion rate and macroscopic mechanic properties. The results were found to indicate that the order of abrasion from most to least were HIPS, nylon, PC, PLA, PETG, and then TPU. Results help provide a better understanding of the generation rates of MPs from consumer plastic products and macro-plastic debris. This, the authors pointed out, will be instrumental in helping to better understand the release of MPs and nanoplastics into the environment and to provide data for fate and transport models, especially in order to predict the amount of plastic entering water systems. MP generation rates and power inputs can be correlated with each plastic's use to inform which release the most MPs and how to change these products in order to reduce pollution in water sources.

Microplastics Retained in Stormwater Control Measures: Where do They Come from and Where do They Go?

Vera S.Koutnik, Jamie Leonard, Joel B. Glasman, Jaslyn Brara Hatic, Ceylan Koydemir, Anna Novoselov, Rebecca Bertel, Derek Tseng, Aydogan Ozcan, Sujith Ravi, Sanjay K. Mohanty

This study is based on the hypothesis that the number of MPs accumulated in stormwater control measures (SCM) may be underestimated and that there is MP accumulation via continuous atmospheric deposition. Additionally, authors also assert there is a potential downward mobility to ground water. The researchers analyzed the spatial distributions of MPs above ground on the canopy around SCM and below ground in the subsurface in and outside the boundaries of fourteen SCM in Los Angeles. With the assistance of a model, they were able to link subsurface retardation of MPs to the median particle size of soil and land use. Their results indicated that despite receiving significantly more stormwater, MP concentrations in SCM at surface depth or subsurface depth were not significantly different from the concentration at the same depth outside the SCM. The authors concluded that this indicates stormwater is not the sole source of MPs in SCM. High concentrations of MPs on leaves of vegetation in SCM were found and this suggests the contribution of atmospheric deposition is significant. Within and outside the SCM boundary, MPs were found to have been removed within the top 5 cm of the subsurface, and their concentration decreased with depth, which indicated there is limited potential for groundwater pollution from the microplastics accumulated in SCM. Additionally, outside the SCM boundary, the subsurface retardation coefficient was determined to decrease with increases in soil particle size, indicating straining of MPs as the dominant removal mechanism. Inside the boundary of SCM, however, the retardation coefficient was independent of the median soil particle size, implying to the authors that MPs could have either moved deeper into the filter layer in SCM or that compost, mulch, or organic amendments used in the filter media were pre-contaminated with MPs.

IMPACTS OF MICROPLASTIC EXPOSURE

Characteristics and Differences of Microplastics Ingestion for Farmed Fish with Different Water Depths, Feeding Habits and Diets

Zhou Aiguo, Sun Di, Wang Chong, Chen Yuliang, Xie Shaolin, Liu Peiqin, Xu Guohuan, Tang Huijuan, Zou Jixing

The researchers in this study examined 68 fish from five different fish species: grass carp; silver carp; mud carp or dace; Nile tilapia; and yellowhead catfish from aquaculture ponds in Nansha, Guangzhou, Guangdong China. These fish were described as the most commonly consumed fish in China and were chosen on the basis that they live at different water depths and had different feeding habits in a typical aquaculture farm. The area of each sampling pond was about 10 acres, the water depth was 1.8–2.0 meters. The level of MPs in the fish was determined and correlated with their feeding habits and with the number, color and size of the MPs materials in the gills and digestive tracts. MPs were found in all of the fish; with an average of 10.01 items/individual. The plastics were also detected in 91.18% of the gills and gastrointestinal tracts (GITs). Three shapes for the MPs were identified: fibers, fragments and films, with fibers

being the most prevalent. The authors indicated MPs likely came from a variety of sources including fishery and human activities. The number and abundance of MPs differed according to species and GITs and gill tissues in the same fish, consistent with previous studies. For example, omnivorous fish had a greater accumulation of MPs than herbivorous and carnivorous fish; and MP accumulation was found to be the greatest in the fish species living at lower water depths. The shape of ingested MPs were similar across the fish species; however, there were variations identified in the colors. The article concluded that MPs pollution is a hidden danger for the consumption of aquatic food. Mitigation and removal of MPs in aquaculture systems, is therefore, a concern both for fish health and food safety.

Exposure to Microplastics Leads to a Defective Ovarian Function and Change in Cytoskeleton Protein Expression in Rat

Asma Haddadi, Kaouthar Kessabi, Sana Boughammoura, Mariem Ben Rhouma, Rania Mlouka, Mohamed Banni, Imed Messaoudi

The main objective of this study was to assess the impact of oral exposure, during four estrous cycles, to 5 µm polystyrene-type-microplastics (MPs) on ovarian function in rats. Two types of 5 µm sized spherical MPs were used in this study: 1) fluorescent particles of polystyrene (FPS-MPs), which was used to evaluate the accumulation and distribution of MPs in the duodenum and ovary of the rats; and 2) pristine particles (PPS-MPs), which were used for toxicological tests. Twenty-one female adult Wistar rats *Rattus norvegicus*, with a regular estrous cycle, were randomly divided into two groups: a control group ($n = 7$) receiving ultrapure water and a group ($n = 14$) receiving 0.1 mg/day of MP during four estrus cycles. Seven of the animals in the experimental group received the FPS-MPs and the other animals received PPS-MPs. They found that the FPS-MP accumulation was significantly higher in the duodenum than in the ovary. Significant decreases in body weight gain, in the relative weight of the ovaries and in the levels of two cytoskeleton proteins were found at the end of the experiment in PPS-MP-exposed animals. Changes in the duration of the estrous cycle, several alterations in the ovary structure and reduction in estradiol (an estrogen hormone) concentration were also observed in the rats treated with PPS-MPs. The authors concluded that their results could provide support for the possibility that there is a risk to women's reproductive health risk from exposure to MPs.

From Properties to Toxicity: Comparing Microplastics to Other Airborne Microparticles

Simon Wieland, Aylin Balmes, Julian Bender, Jonas Kitzinger, Felix Meyer, Anja FRM Ramsperger, Franz Roederg Caroline Tengelmannh, Benedikt H. Wimmer, Christian Laforsch, Holger Kress

In this study, authors examined potential drivers of airborne MP toxicity to help adequately assess MP impact on human health. They pointed out the physiochemical properties like size, shape, electrokinetic potential, adsorbed molecules and pathogens, and the MP's bio-persistence have been proposed as possible drivers of MP toxicity but their role in MP toxicity is largely unknown. With the goal of addressing this gap, they reviewed the literature on toxicologically well-studied non-plastic airborne microparticles (asbestos, silica, soot, wood, cotton, hay). The article then described MP-associated diseases, which mainly focused on people working in the textile, flocking, and VC/PVC (vinyl chloride/polyvinyl chloride) industries, which are industries associated with very high MP concentrations. The authors observed that due to these high levels of exposure to MP, it was possible to link occupational diseases to MP pollution, many of which occurred in the lung and the gastrointestinal tract, the primarily exposed organs. Authors suggested future studies should quantify the magnitude of breathable MP pollution in outdoor and indoor environments, because smaller MP particles may not only be more readily respired but may also interact stronger with cells and tissues due to their relatively larger surface area.

MICROPLASTIC POLLUTION REMOVAL AND RECYCLING

Biotreatment Strategies for the Removal of Microplastics from Freshwater Systems. A Review

Martina Miloloža, Matija Cvetnić, Dajana Kučić Grgić, Vesna Očelić Bulatović, Šime Ukić, Marko Rogošić, Dionysios Dion Dionysiou, Hrvoje Kušić, Tomislav Bolanča

This review focused on the biodegradation of the five kinds of MP: polyethylene, polypropylene, polyvinyl chloride, polyethylene terephthalate, and polystyrene. This review provides a detailed background discussion of biodegradation and describes the state of the science on several topics including, bioremediation, biodegradation by fungi, biodegradation by bacteria, biodegradation by mixed consortia, and combination of processes for MP removal. Some key aspects of biodegradation were identified, including microorganisms capable of degrading MPs differ based on characteristics of the environment in which the biodegradation occurs; and the rate of biodegradation depends on the physiological state of the applied microorganism. Other determinants of the mechanism and rate of biodegradation were polymer properties such as surface area, hydrophobicity, morphology, functional groups, molecular weight, flexibility, glass transition temperature, melting temperature, elasticity, tacticity, crystallinity, and type define the mechanism and rate of the biodegradation. Notably, the authors found that across the studies reviewed there were inconsistencies in the characterization procedures and of the sample compositions, e.g., various matrices or diversities regarding the MP size and shape; which significantly complicated the comparison of reported results. One of their significant conclusions was that a path for the promising progress in biodegradation is hard to define but the greatest potential lies in synergistic actions of various microorganisms, i.e., the application of microbial consortia, or in combinations of biodegradation with chemical or physical treatments for the removal of microplastics.

How to Build a Microplastics-Free Environment: Strategies for Microplastics Degradation and Plastics Recycling

Junliang Chen, Jing Wu, Peter C. Sherrell, Jun Chen, Huaping Wang, Wei-xian Zhang, Jianping Yang

The authors analyzed published literature from 2004 to November of 2021 and highlighted several pieces of research, including articles focused on the degradability of typical synthetic plastics in the marine environment and the degradation resistance of microplastics (MPs) and their long-term toxic effects on marine organisms; analytical methods for aquatic MPs, uptake of MPs in aquatic organisms, and toxicity effects on these aquatic organisms; and the environmental effects on degradation rates of MPs with respect to their shape, size, and chemical composition. They observed that pioneering researchers have begun to emphasize the importance of developing efficient strategies to mitigate MPs contamination. They also found that even though researchers have identified the insufficiency of traditional technologies in practical application for MPs removal, the published reviews mostly focused on summarizing traditional physical methods rather than discussing the potential alternatives and their challenges. Though wastewater treatment plants (WWTPs) are regarded as reliable filters to trap all kinds of pollutants existing in the municipal water, it has also been reported that the effluent from WWTPs is actually a key outlet for releasing MPs to our natural environment. A fairly detailed description of currently available recycling/recovery methods is included; the topics ranging from mechanical recycling to the cracking of plastic wastes for energy recovery. The article concludes with six recommendations for furthering research and actions that could be taken to tackle MP pollution.

If you'd like to see your posting in this email, please email

Marshall.Layne@epa.gov with any suggestions!

