The Rapids

US EPA's Trash Free Waters Monthly Update

May 2023

epa.gov/trash-free-waters

Introduction

Hello everyone,

After a several month break in delivery, the Trash Free Waters program will once again be publishing the *Rapids* on the first Monday of every month to make you aware of various EPA announcements, funding opportunities, upcoming events, and important microplastics research. Thanks to all of you who have let us know in past months about your appreciation of the *Rapids!*

EPA—co-led by the Office of Resource Conservation and Recovery and the Office of Water's Trash Free Waters program—recently released the **Draft National Strategy to Prevent Plastic Pollution** on its website, pursuant to Section 301 of the **Save Our Seas 2.0 Act** of 2020. Working closely with industry leaders and additional stakeholders, EPA identified three key objectives for the strategy to effectively address the problem of plastic waste in the environment, especially our waterways and oceans. A notice will soon be published in the Federal Register for a 45-day public comment period. Please join a public webinar on May 11, 2023, at 1:00 pm US Eastern Time to hear an overview of the draft strategy and the key questions EPA is seeking comment on. You can register to participate **here**: The webinar will be recorded and posted online after the event.

175 nations are currently working together to develop an **international plastic treaty**, with hopes of an agreement sometime in 2024. The treaty will address the importance of circular economy, as many actors have expressed their belief that circular economy approaches are a vital part of the solution space with respect to the problem of solid waste—including plastic waste—in the environment.

A recent **PLOS ONE article** emphasizes the severity of marine plastic pollution. This paper estimated 1.1-4.9 million tons of plastics in the marine environments globally, calling for immediate intervention in plastic use and pollution.

Please share any upcoming events with Cassidy Fredette-Roman (fredetteroman.cassidy@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

Draft National Strategy to Prevent Plastic Pollution
EPA recently released the Draft National Strategy to Prevent Plastic Pollution on its website. See introduction for details.

Where the Rubber Meets the Road: Opportunities to Address Tire Wear Particles in Waterways
Tire Particle Article
Tire wear particles as a pollutant in waterways is a relatively new field of study without standardized terminology, assessment methodologies, or established solutions. The emergence of tire wear particles as a significant category of microplastics found in waterways prompted the Trash Free Waters program to convene stakeholders in two roundtable discussions in 2022 in order to facilitate shared learning about the challenges of addressing the problem of tire wear particle pollution. Stakeholders represented diverse perspectives on the nature of the problem and how to effectively address it. The roundtables provided a

forum for discussion among participants without committing to a specific course of action. Participants discussed a set of questions aimed at understanding the barriers to and opportunities for managing tire wear particles in waterways. This brief report summarizes the roundtable discussions. In producing it, EPA seeks to share the challenges and potential solutions discussed during the roundtables, in order to inform the public and broaden the community engaged in addressing tire wear particle pollution.

EPA Publishes Proposed PFAS Drinking Water Regulation
On March 29th, the EPA published a proposal to regulated six different Per- and Polyfluorinated Substances (PFAS) chemicals under the Safe Drinking Water Act. This would establish nationwide drinkable water Maximum Contaminant levels for these six chemicals. Public water systems would have three years to implement the practices mentioned in the proposal. A public hearing will be held by the EPA on May 4th.

Funding Opportunities

Gulf of Mexico Environmental Justice Grants Program
The EPA is looking for applicants to develop and administer a competitive subaward program to fund projects in communities that are underserved. The recipient of the grant must provide technical assistance to assist the applicants and subrecipients. To be eligible for the funding, subawards must take place in only one of the five Gulf states and be within eligible counties. **The deadline for submissions is May 8, 2023.**

Funding Availability for Ensuring Environmental Justice, Human Wellbeing, and Ecosystem Recovery in Puget Sound
In order to meet the goals stated in the 2022-2026 Puget Sound Action Agenda, this grant is providing benefits to overburdened and underserved communities with environmental justice concerns regarding Puget Sound restoration and recovery. **The deadline for submissions is May 31, 2023.**

Research to Action: Assessing and Addressing Community Exposures to Environmental Contaminants
This National Institute of Health Funding Opportunity Announcement encourages applications using community-engaged research methods to investigate the potential health risks of environmental exposures of concern to communities and to implement an environmental public health action plan based on research findings. The overall goal is to inform and support efforts to prevent or reduce exposure to harmful environmental exposures and improve community health. Researching the disproportionate impact of emerging and ongoing exposures like microplastics is an eligible topic. **This is a rolling application, but the next review will take place on June 5, 2023.**

Upcoming Events

Sustainable Packaging: The Innovations and Players Pushing the Circular Economy Forward: IDTechEx Webinar
May 4 (multiple times), virtual
On May 4th, this webinar will focus on addressing plastic pollution in every sector, specifically the fast-moving consumer goods from the packaging sector. The webinar will provide information on technology and materials that can make sustainable packaging more obtainable, an analysis on the main barriers to circular economy, and a market outlook on the growth of sustainable packaging.

Draft National Strategy to Prevent Plastic Pollution
May 11 (1:00 PM EST), virtual
On May 11th, this webinar will provide an overview of the National Strategy to Prevent Plastic Pollution. This strategy focuses specifically on actions to reduce, reuse, collect, and capture plastic waste. EPA will collect comments from the public for 45 days once the notice is posted. The registration link for this webinar is available at the link above.

Bioplastics 101 Webinar
May 18 (10:00 AM EST), virtual
On May 18th, this webinar will provide information on the future of plastics as society switches to a circular economy for plastics. Some plastics will still need to be produced as society makes this transition, but this webinar will focus on the use of biobased plastics rather than plastics from fossil fuels.

Second session of Intergovernmental Negotiating Committee to develop an international legally binding instrument on plastic pollution, including in the marine environment (unep.org)
May 29-June 2, Paris, France
From May 29th to June 2nd, the second session of the Intergovernmental Negotiating Committee to develop an international legally binding instrument on plastic pollution will be held in Paris. The meeting will be at the UNESCO headquarters preceded by regional consultations.

National Resilience Listening Session 3
May 9 (3:00 PM EST), virtual
This series of 60-minute listening sessions will gather input to develop guidance that will help stakeholders understand critical roles in community resilience. The sessions also include facilitated discussions open to all attendants.

National Resilience Listening Session 4
May 25 (3:00 PM EST), virtual
This series of 60-minute listening sessions will gather input to develop guidance that will help stakeholders understand critical roles in community resilience. The sessions also include facilitated discussions open to all attendants.

Save the dates for future months...

National Resilience Listening Session 5
June 6 (3:00 PM EST), virtual
This series of 60-minute listening sessions will gather input to develop guidance that will help stakeholders understand critical roles in community resilience. The sessions also include facilitated discussions open to all attendants.

National Resilience Listening Session 6
June 15 (3:00 PM EST), virtual
This series of 60-minute listening sessions will gather input to develop guidance that will help stakeholders understand critical roles in community resilience. The sessions also include facilitated discussions open to all attendants.

CLU-IN | Training & Events > Microplastics
June 13 (1:00-3:15 PM EST), virtual
On June 13th, this course will provide a background and introduction to microplastics. It will discuss the human health and ecological risks associated with microplastic pollution in the environment. Different examples of how to manage and reduce microplastics from entering waterways will be discussed.

2023 U.S. Product Stewardship Forum - Product Stewardship Institute
September 11-14, Oregon
From September 11th to September 14th, the Product Stewardship Forum conference will focus on Extended Producer Responsibility (EPR). Stakeholders from around the globe will gather to discuss product stewardship. Previously enacted packaging EPR laws will be discussed as well as the anticipated EPR laws.

In case you missed it...

Virginia Clean Waterways Conference
This conference discussed the importance of stormwater control and plastic pollution. Different efforts made in the past to address this problem were discussed, including campaigns to limit floatables in the Prince William County waterways, Virginia's litter control and recycling fund, and reducing litter.

National Estuary Program meeting
EPA, National Estuary Programs (NEPs), and other federal and state partners met to encourage collaborative networking and the development of connections between programs to benefit NEP. Several speakers shared the current programs they are working on, a networking space was provided, and the meeting included a discussion with EPA leadership.

The Microplastics Breakdown
HUMAN EXPOSURE TO MICROPLASTICS AND POTENTIAL HEALTH IMPACTS

Detection of Microplastics and Nanoplastics Released from a Kitchen Blender Using Raman Imaging

Yunlong Luo a, Olalekan Simon Awoyemi , Ravi Naidu Cheng Fang

The researchers in this study examined the presence of microplastics and nanoplastics in a plastic blender by characterizing the plastic fragments created under high shear force applied in a blender. As described in the article, the blender was first cleaned with tap water, boiling water, ethanol and MQ water and then the researchers scratched the walls of the container using a stainless knife to collect some debris which served as reference for their test. Ice made from milli-Q water was blended with milli-Q water; the liquid generated was then prepared and Raman imaging and was used to characterize the fragments. The researchers found that a significant amount of microplastics and nanoplastics are released from the plastic container. While they noted that the results could vary depending on the manufacturer, the researchers asserted that their study results send a strong warning that we should be careful to use blenders to make juice or to blend food. Risk assessment was recommended, which would support the management and regulation targeted at plastic product safety.

Microplastics and Human Health: Integrating Pharmacokinetics

Joana C. Prata

This review observed that, while studies on the prevalence of microplastics in human tissues have multiplied, little is known their pharmacokinetics. As described, the goal of this review was to provide an integrated assessment of the fate of microplastics in the human body. Specifically, the author asserted that the article was an initial attempt at constructing a pharmacokinetics model for microplastics. The author described the progression of microplastics as they move through the processes in the human body, e.g., in the digestive system, the respiratory system. Microplastics were observed to be distributed by the circulatory system, accumulating in the respiratory system, digestive system, liver, spleen, and brain. In addition, the review hypothesized that metabolism could lead towards the biodegradation of microplastics and then removal of most of the particles by the liver or spleen and excreted in the feces. The article asserted that further research is required, which should include work conducted using histopathology techniques to determine the precise location of particles within the tissues and radio-labelled particles to allow tracking through time.

EXPOSURE OF ORGANISMS TO MICROPLASTICS AND POTENTIAL IMPACTS

Arctic Ice Algae Heavily Contaminated with Microplastics

This April 21, 2023, blog post described research conducted in 2021 by a team led by Melanie Bergman of the Alfred Wegener Institute at the Helmholtz Centre for Polar and Marine Research and reported in the journal *Environmental Science and Technology*. Samples of *Melosira* algae (described as a food source for organisms at the sea surface as well as bottom-dwelling animals and bacteria) and the surrounding water were taken from the ice floes. *Melosira arctica* was described as growing rapidly under the sea ice during spring and summer months and forming meter-long cell chains there. The clumps of algae were found to contain about ten times the concentration of microplastic particles as the surrounding water. This concentration of microplastics at the base of the food web poses a threat to creatures that feed on the algae at the sea surface. One of the team members, Deonie Allen of the University of Canterbury and Birmingham University, was quoted as describing this finding as resulting from the algae's "slimy, sticky texture" potentially collecting "microplastic from the atmospheric deposition on the sea, the sea water itself, from the surrounding ice and any other source that it passes. Once entrapped in the algal slime they travel as if in an elevator to the seafloor, or are eaten by marine animals." Clumps of dead algae were also found to transport the plastic with its pollutants particularly quickly into the deep sea, which was thought to explain the high microplastic concentrations in the sediment there. As described in this post, these clumps were formed when the algae cells die and the ice to whose underside they adhere melts, they stick together to form clumps that can sink several thousand meters to the bottom of the deep sea within a single day. Furthermore, the speed of this descent means that the clumps fall almost in a straight line below the edge of the ice. As reported, according to the researchers, this helps explain why higher microplastic numbers are measured under the ice edge.

Microplastics and Nanoplastics Effects on Plant–Pollinator Interaction and Pollination Biology

Sakhawat Shah, Muhammad Ilyas, Rui Li, Jie Yang, and Feng-Lian Yang

This literature review focused on the effects of microplastic and nanoplastic particles (MNPs) on pollinator health (defined in this article as "the state that permits the individuals even in the presence of pathogens to live longer and reproduce more") and on plant health. The mechanisms by which MNPs disrupt the pollination process were also discussed. The researchers described insect pollination, or entomophily, as referring to the transfer of pollen grains from anthers to stigmas by insects and highlighted that a total of 87.5% of all wild plants depends on insect pollination, of which 20% pollinate from bees. They cited estimates indicating that globally, 1500 crops need insect pollination, and from 3%

to 8% of the world crop production is dependent on insect pollination. The article observed that there is a growing body of evidence suggesting that oral delivery of MNPs to organisms causes adverse effects on individual health by blocking digestive tracts, inhibiting or altering feeding behavior, which causes reduction in growth, whole body weight, and size. Research was also found which demonstrated that there are dosage-dependent effects of microplastics (MPs) with the highest concentration of MPs altering the highest number of gut microbial taxa or vice versa. MP exposure was not found to result in mortality; however, alterations in composition and diversity of gut microbiota were observed. Other study results indicated that when bees were exposed to MPs accompanied by antibiotics, the lethality of MPs increased dramatically and depleted the gut microbiota of bees. The article asserted these results indicate that MNPs are able to carry different chemicals, pesticides, and other xenobiotics, which increase the pollution of MNPs and lethality on pollinators health and because of this the chemical effects of MPs could be far higher than the physical effects. Some of the research described on exposure to plants included findings that polystyrene MPs disturb the regulatory network of phytohormones in different studied plants. They also highlighted studies on the relationship between pollinators and plants, and noted that MNPs adverse effects on pollinators learning, memory, cognition, foraging, and feeding behaviors could cause disruption in communication between plant and pollinator cues and affect pollination biology. Research was outlined on the effects of MNPs stress on plant physiology and morphology such as cytotoxicity, genotoxicity, nutritional and oxidative stress, changes in plant photosynthesis, and metabolism. The article concluded with recommendations for future studies.

GLOBAL DISTRIBUTION OF MICROPLASTICS

Contribution of Plastic and Microplastic to Global Climate Change and Their Conjoining Impacts on the Environment - A Review

Shivika Sharma, Vikas Sharma , Subhankar Chatterjee

This literature review was premised in part on the authors' observation that emissions of greenhouse gases (GHG) during different processes involved in the lifecycle of plastic-related products are a significant threat to the environment as it contributes to global temperature rise. The article focused on the contribution of plastic and plastic waste to global climate change covering the current plastic production and future trends, the types of plastics and plastic materials used globally, plastic lifecycle and GHG emission, and how microplastics become a major threat to ocean carbon sequestration and marine health. As described, the researchers identified and analyzed approximately 600 journal articles. The subtopics discussed include: current trends and future commercial plastic production; types of plastics and plastic materials used globally; contribution of plastic to global climate change; lifecycle of plastic (plastic production) and greenhouse gas emission; and plastic waste and global climate change. The review concluded with a discussion of strategies to reduce the climate impact of plastics. One such strategy aimed at the reduction of harmful greenhouse gas emissions produced during the lifecycle of plastic production could be the use of bio-based plastics instead of conventional plastics, which the authors asserted generally have lesser lifecycle GHG emissions than their counterparts. The banning of single-use plastic was another strategy discussed in this review; the potential limitations of this approach was acknowledged, and accompanying measures were discussed.

Microplastics and Other Emerging Contaminants in The Environment After COVID-19 Pandemic: The Need of Global Reconnaissance Studies

Yolanda Picó, Damià Barceló

The authors' objective in conducting this review was to investigate the increase in emerging contaminants resulting from the COVID-19 pandemic with its associated use of personal protective equipment (PPE), disinfectants, pharmaceuticals, etc. and their possible effects on environmental health. This review, they asserted, will provide valuable information on the potential pathways through which emerging contaminants may spread and accumulate in different environmental compartments. While acknowledging that there are no official data on the production or use of medical waste, the article pointed out that it has been demonstrated that the COVID-19 pandemic has worsened the environmental contamination by microplastics and other emerging contaminants. One of the estimates cited was that the face masks discarded throughout the year 2020 would lead to >1370 trillion microplastics entering the coastal marine environment globally, with a release rate of 396 billion microplastics per day. Household disinfectant product consumption was found to have increased after the COVID-19 outbreak, thereby increasingly present in wastewater discharged from treatment plants or adsorbed to sludges. This increase, according to the review, implies an increased chance of antimicrobial resistance emergence. Additionally, the authors observed that significant environmental problems could result from disinfectants, such as chlorine, that react with dissolved organic matter and other compounds to form nonbiodegradable byproducts; pharmaceuticals and other medical compounds present in wastewater can also react with these oxidizing disinfectants to form many new and more toxic nonbiodegradable byproducts. As described in the review, the initial research found by the review team suggested that these emerging contaminants may have harmful effects on aquatic organisms and human health. They

also noted that further research is needed to fully understand the impacts, as well as to develop effective approaches to mitigate their potential negative effects.

MICROPLASTIC REMOVAL

This Backyard Mould [sic] Can Break Down Plastic in 140 Days
An April 18, 2023, web article on the World Economic Forum described the discovery, published in the journal Materials Degradation by scientists at the University of Sydney, that two kinds of fungi commonly found in plants and soil: *Aspergillus terreus* and *Engyodontium album* can break down plastics in 140 days. According to this story, the researchers described this as the "highest degradation rate reported" in the literature worldwide. These scientists are reportedly testing the fungi's degradation process to determine how they can improve efficiency and make them ready for commercial scale use. This process was estimated to take the next three to five years.

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