The Rapids

US EPA's Trash Free Waters Monthly Update
November 2024

epa.gov/trash-free-waters

Introduction

Hello all,

I'm pleased to announce the EPA's Trash Free Waters program released a new Escaped Trash Risk Map, developed in collaboration with the University of Georgia and the Sea Education Association, that displays a modeled estimate of escaped trash density across the United States. "Escaped trash" refers to waste materials that leak out from waste management systems, whether through spillage from non-secured containers, intentional littering or other means. This tool is designed to help local governments and communities identify high-density escaped trash areas so they can evaluate impacts and consider how to take action.

Estimated escaped trash counts, item types, material types and mass are viewable for each U.S. river basin. Escaped trash density estimates should be interpreted as a 'risk map' of what is estimated to be on the ground and at risk of getting into waterways based on model predictions. The model does not account for local activities such as illegal dumping, street sweeping, cleanup efforts or other local factors. Locations and summary data on microplastics presence are drawn from studies in freshwater systems across the U.S. are also displayed in the map. Data are insufficient to estimate microplastic concentration in all U.S. waterbodies.

Next, The Florida Department of Environmental Protection's Coastal Management Program has made available a new guide that provides operational Best Management Practices for marine debris removal to minimize adverse environmental impacts. The Florida Marine Debris Removal Guidance document provides general guidance, specific BMPs for debris removal in sensitive habitats and near protected wildlife, specific debris removal techniques and a regulatory consideration matrix.

Finally, the Organisation for Economic Co-operation and Development released a Policy Scenarios for Eliminating Plastic Pollution by 2040 report, which outlines strategies and actions that can be taken to reduce global plastic leakage into the environment by 96% by 2040. By implementing a mix of comprehensive policies – from enhancing plastic waste management and recycling, to curbing plastic use and waste – countries can achieve significant environmental benefits and economic savings compared to less balanced strategies.

Please share any upcoming events with me at nandi.romell@epa.gov so that the Trash Free Waters Team can advertise these opportunities.

Romell Nandi
US EPA
Trash Free Waters National Program Lead

EPA Announcements

The EPA has released a Framework for Monitoring Plastic Pollution in the Chesapeake Bay. This framework makes recommendations on monitoring strategies across various media, such as surface water, sediment, and key living resources, as well as scale, frequency, and locations for broad application throughout the Chesapeake Bay and its watershed.

The Urban Waters Federal Partnership invites you to join the Urban Waters Learning Network. Funded by the EPA and the National Park Service, the UWLN is a free, nationwide peer-to-peer network of people and organizations working to conserve, restore and revitalize America's urban waterways. They deliver tools, training, mentoring and financial assistance to support the work of UWLN members as they collaborate, develop solutions and elevate community priorities. Their work includes an online forum for Litter Free Waterways which discusses trash issues specifically.

Funding Opportunities

USDA Community Food Projects

The U.S. Department of Agriculture is providing $4.8 million in grants to help address food and nutrition insecurity. Food loss and waste reduction projects are eligible. Public food program service providers, Tribal organizations and private nonprofit entities can apply and are encouraged to collaborate with nonprofits or for-profit entities, including academic institutions, community-based organizations and local government entities. Applications are due **November 7, 2024**.

The EPA Solid Waste Infrastructure for Recycling and Recycling Education and Outreach Grant Programs

The EPA recently announced it is making $117 million available for three separate funding opportunities to advance recycling infrastructure and boost food waste prevention education across the country. Two of the notices are for Solid Waste Infrastructure for Recycling grants – one funding opportunity for Tribes and intertribal consortia and another for communities (such as cities, counties and parishes) across the country. Applications are due for SWIFR grants for Tribes by **March 14, 2025**, and for communities by **December 20, 2024.** The third notice is for EPA's Recycling Education and Outreach grant program which is focused on food waste prevention and composting. Applications are due for the REO grants by **December 20, 2024**.

The EPA Gulf of Mexico Division Funding Opportunities

The EPA Gulf of Mexico Division is pleased to announce the opening of four Gulf of Mexico Funding Opportunities. View all four opportunities on EPA's Gulf of Mexico webpage. Specific grants include:

- Understanding Water Quality through Monitoring Activities
- Trash Free Waters – Micro/Nanoplastics in the Gulf of Mexico
- Fisher-Led Aquatic Trash Prevention and Abatement in Urban and Inland Disadvantaged Communities
- Trash Free Waters Art and Slogan Competition

The EPA Community Change Grants Program Update

The EPA has published an updated version of the Notice of Funding Opportunity for the Community Change Grants Program. This new version replaces the previous versions of the Notice of Funding Opportunity. The first change is to the EPA map used to identify disadvantage communities and the second change is to remove the oral presentation requirement for the Track 1 Application process. The program is still accepting applications through **November 21, 2024**.

2025 Ocean Odyssey Marine Debris Prevention Awards for Diversity, Equity, Inclusion, Justice, and Accessibility

The NOAA Marine Debris Program and the National Marine Sanctuary Foundation announced a Request for Proposals for the Fiscal Year 2025 Ocean Odyssey Marine Debris Prevention Awards for Diversity, Equity, Inclusion, Justice, and Accessibility. With funding from the NOAA Marine Debris Program, the National Marine Sanctuary Foundation will award 10-15 grants, totaling up to $100,000 for this competition. Individual awards will range between $5,000 and $10,000 to support initiatives that prevent the adverse impacts of marine debris in communities that are underserved, underrepresented, or overburdened by marine debris. These projects may include marine debris prevention, education, and outreach activities. Priority will be given to projects that directly benefit or support communities in need and involve community members in all aspects of the project, from planning to execution. Projects throughout the coastal United States, Great Lakes, territories, and Freely Associated States are eligible for consideration. Full proposals are due on **November 20, 2024, by 11:59 PM Eastern Time**. Review the full Request for Proposals and applicant information.

Marine Debris Removal and Interception Technologies Grants Fiscal Year 2025

NOAA's Marine Debris Program is pleased to announce two Notices of Funding Opportunity for Marine Debris

Removal and Interception Technologies under the Bipartisan Infrastructure Law. NOAA will award up to $54 million to support impactful, large marine debris removal projects, as well as the installation of proven marine debris interception technologies, throughout the coastal United States, Great Lakes, United States territories, and Freely Associated States. For more information, please visit the Removal and Interception Technologies opportunities on Grants.gov and the NOAA Marine Debris Program's website.

Stormwater Filtration System Grant

The Council of the Great Lakes Region is offering a grant to help communities purchase, install and monitor innovative stormwater filtration systems. When in place, these devices, such as the LittaTrap™ and the Gutter Bin®, help prevent land-based plastic litter, oil and sediment from entering our waterways and ultimately the Great Lakes.

Upcoming Events

Reducing Runoff and Improving Water Quality with the Justice 40 Initiative

November 6, 2024, (2 pm ET), virtual

Stormwater University is holding a webinar to review various site planning and design techniques, approaches, principles, successes, pitfalls and roadblocks to designing, establishing and maintaining Green Infrastructure systems and how these landscapes can integrate with well-designed environments. The village of Jonestown in Caroline County, Maryland, has poorly draining soils and stormwater related flooding. The predominantly African-American community was established by free African Americans before the Civil War; and about 60% of its homes date back 50-100 years and many of the families have lived there for generations. Through federal funding from the Justice40 Initiative, the community is implementing stormwater runoff reduction and water quality improvement projects on private properties, the county owned community park, and on county roads. The project includes capacity building and education for community members. The presentation will include a discussion on the specific stormwater improvements including bioretention areas, grass swale, conservation landscaping and tree planting.

Charting the Course Towards Producer Responsibility for Marine Flares and Boat Wrap

November 7, 2024, (1 pm ET), virtual

The Stewardship Action Foundation and the Minnesota Pollution Control Agency are hosting a webinar focused on the issues surrounding end-of-life management of pyrotechnic marine flares and boat wrap, and solutions including legislation that passed or was introduced in 2024. Speakers include Senator Catherine Blakespear, (CA D-38, D); Representative Larry Kraft, (MN 46A, DFL); Annika Bergen, Minnesota Pollution Control Agency; Leslie Lukacs, Zero Waste Sonoma; Heidi Sanborn, National Stewardship Action Council; and Raj Bagaria, GDB Circular.

2024 Sea Grant Marine Debris Symposium

November 12-14, 2024, Silver Spring, MD with virtual component

The NOAA Sea Grant is hosting a marine debris conference to bring together grantees, researchers, community members and other partners to share updates on Marine Debris Challenge and Community Action Coalitions Competition projects, discuss marine debris prevention and removal, and create a network of peer support for current and future work.

A Sea of Success for Islands: Highlighting Plastic Waste and Pollution Solutions

November 13, 2024, (7 – 8:30 am ET), virtual

The International Union for Conservation of Nature and Natural Resources (IUCN) and the Open Communications for the Ocean (OCTO) are hosting a webinar focused on island-specific plastic pollution solutions, including tools for understanding plastic waste solutions, economic angles of plastic pollution, case studies and solutions platforms to generate knowledge exchange for more effective mitigation and prevention of plastic waste and pollution. Just a few of the tools and resources to be covered include the Blueprint to Zero Plastic Waste - a guide to reducing plastic waste on islands - and findings of studies estimating the impacts of marine plastics on the

fisheries and tourism sectors and the costs and benefits of implementing a solution (e.g., a national recycling system, with and without regional cooperation) to reduce mismanaged plastic waste and its leakage into the marine environment. Case studies will provide information on what has worked and not worked on islands, including the sustainability of projects. This webinar is part of SEA Success, a United Nations Development Programme Ocean Innovation Challenge project.

Fibre Fragmentation & Biodiversity Loss Webinar

November 14, 2024, (11 am ET), virtual

The Microfibre Consortium is hosting a webinar as part of its 'Triple Planetary Impact' series, to discuss fibre fragmentation and biodiversity loss. Industry specialists will discuss latest research developments and the need to embed fibre fragmentation as an integral part of broader environmental sustainability, and more focused material strategies. This webinar is intended to support industry understanding of the issue from a biodiversity loss standpoint so organizations can act to address the issue with urgency.

Pollution Prevention Project Webinar Series: Wet Wipes

November 14, 2024, (12 pm ET), virtual

The University of Toronto Trash Team is hosting a webinar to discuss wet wipes. They will discuss the problem of plastic wet wipe leakage and associated microplastics into our local aquatic ecosystems and share findings from Wipes vs Pipes, including research estimating the amount of wet wipe pollution in our local rivers and synthesizing potential solutions based on interviews with stakeholders.

Unveiling Ghost Farms: A Hidden Threat to Our Seas From Coastal Pollution to Microplastics – Collaborative Efforts to Tackle Ghost Farms and Their Impact

November 19, 2024, (11 am ET), virtual

The Healthy Seas Foundation is hosting a webinar to dive into the hidden world of ghost farms—abandoned aquaculture facilities that are wreaking havoc on marine ecosystems. Discover how these derelict farms not only contribute to plastic pollution but also foster the spread of microplastics in our oceans, affecting coastal areas worldwide. Speakers include: Veronika Mikos, Director, Healthy Seas Foundation; Christina Zantioti, PhD. Candidate; and Anastasios Filippides, Executive Director, Ozon Non-governmental Organization.

Bays and Bayous Symposium

November 19 -20, 2024, Biloxi, MS

This two-day event will bring together leading scientists, educators, and coastal experts to explore, share, and learn about the unique ecosystems of the Gulf of Mexico. Top scientists from universities, non-governmental organizations and government agencies share their latest research findings. Educators and extension professionals also share their successful outreach efforts and educational initiatives to drive change in communities. The conference will also provide networking opportunities among all types of organizations.

Save the Date for Future Months...

Pollution Prevention Project Webinar Series: Construction Foam

December 3, 2024, (12 pm ET), virtual

The University of Toronto Trash Team is hosting a webinar to discuss construction foam. They will discuss the problem of foam insulation and other materials leaking from construction sites into our local ecosystems and share findings from In Pursuit of Polystyrene, including a pilot working with local industries to reduce pollution at the source.

SPARKS 2024

December 9 -10, 2024, Seattle, WA

Sponsored by the Pacific Northwest Social Marketing Association, SPARKS is an annual social marketing

conference, covering two days of insights and instruction from prominent voices in the field. The event features more than a dozen social marketing experts speaking on behavior change related to some of the most urgent issues we face, including public health, injury prevention, environmental health and protection, and community well-being in the Pacific Northwest.

From Gear to Ghost: Reeling in the Problem

December 10, 2024, (3 pm ET), virtual

Tropical Islands Partnering on Solutions for Marine Debris is a bimonthly online webinar series hosted by the NOAA Marine Debris Program. The goal of the series is to help island communities connect and share perspectives from across the tropics on common marine debris issues and proposed solutions. This webinar will feature presentations from various organizations who engage in abandoned, lost or otherwise discarded fishing gear mitigation efforts. Presenters will speak to prevention and removal initiatives aimed to "reel in the problem."

Fibre Fragmentation and Climate Change Webinar

December 12, 2024, (11 am ET), virtual

The Microfibre Consortium is hosting a webinar in part of its 'Triple Planetary Impact' series to do a deep dive into fibre fragmentation and climate change. Industry specialists will discuss the latest research developments and the importance of making fibre fragmentation a part of material strategies. This webinar is intended to support industry understanding of the issue from a climate change standpoint, so that organizations can act urgently.

Circularity 25

Apr 29, 2025 - May 01, 2025, Denver, CO

Circularity offers thought-provoking keynotes, actionable breakouts, a solutions-oriented expo and networking opportunities for leaders implementing circular solutions. Join the growing community of visionaries and practitioners to move beyond incremental action, catalyze systems change and accelerate the circular economy.

In Case You Missed It…

Fibre Fragmentation and the Triple Planetary Impact

In June 2024, The Microfibre Consortium provided an update on scientific research connecting fibre fragmentation to three interlinked crises: biodiversity loss, environmental pollution and climate change. Speakers included Bettina Heller from the United Nations Environment Programme and Janne Koopmans from Zero Discharge of Hazardous Chemicals (ZDHC).

Organic Waste Management as Part of a Local Circular Economy

The U.S. Agency for International Development’s Clean Cities, Blue Ocean held a new training to learn more about the essential components of organic waste management, including community composting and the significant value that high-quality compost can bring to local waste management strategies, agriculture and climate mitigation plans. Program partners from Sri Lanka and the Maldives also shared their experiences in implementing various organic management models.

Policy Scenarios for Eliminating Plastic Pollution by 2040

The Organization for the Economic Co-operation and Development hosted a Green Talks LIVE webinar to launch a new OECD report Policy Scenarios for Eliminating Plastic Pollution by 2040. Following an introduction by Jo Tyndall, Director of the OECD Environment Directorate, OECD Environment Senior Economist Rob Dellink and Junior Policy Analyst Elena Buzzi dove into the potential environmental benefits and economic consequences of five levels of international policy ambition towards ending plastic pollution by 2040. Country representatives discussed the implications of these findings in the context of efforts to establish a global plastics treaty. The webinar was moderated by Shardul Agrawala, Head of the Environment and Economy Integration Division at the OECD Environment Directorate.

Diverse Solutions to Meet the Supply of Bio-Medical Plastic Waste

The Northeast Recycling Council hosted a webinar to discuss how to reduce and divert plastic waste from landfills or incineration in biomedical laboratories and facilities. Players across the value chain explored opportunities to build a circular infrastructure for a myriad of plastic waste streams, from products to packaging, inherent to the life sciences industry. Speakers included: Katherine Hofmann, Sustainability Manager for Eastman Chemical Company; Sam White, Chief Executive Officer for GreenLabs Recycling; and James O'Brien, CEO and Co-Founder of Polycarbin.

Integrated Marine Debris Observing System: Coordinating the Global Community to Provide Data to Inform Policy

Open Communications for the Ocean hosted a webinar to discuss the Integrated Marine Debris Observing System, a global ocean observing system to provide open access data on marine litter and provide coordination and guidance for the global marine debris community. IMDOS is essential for accurately assessing the extent of marine debris pollution and determining mitigation actions. In the context of the Intergovernmental Negotiating Committee developing an international legally binding instrument on plastic pollution, IMDOS fosters the delivery of the necessary data to inform effective actions, set realistic targets, and develop, implement and adjust policies. Finally, projects working on the global observation, monitoring and forecasting of marine litter can make their work visible in the IMDOS directory of initiatives.

How the United Nations Treaty Could Change the Global Plastics Industry (members only)

Plastic News held a webinar to discuss the UN plastics treaty, which will have a great impact on the global plastics industry long-term. This webinar will talk about the key players in the negotiations and their positions as well as what's likely to happen and on what timeline. Speakers include Kate Bailey, Chief Policy Officer for The Association of Plastics Recyclers; Stewart Harris, Managing Director of Global Affairs for the American Chemistry Council; and Patrick Krieger, Vice President of Sustainability for the Plastics Industry Association.

Seizing the Circular Economy Opportunity: A Guide for Marketers

The Ellen MacArthur Foundation hosted a webinar to explore how circular economy strategies can drive brand growth, strengthen customer loyalty and position an organization as a circular economy leader. Whether you are new to the circular economy or looking to deepen your understanding, this webinar will equip you with actionable insights to drive meaningful change.

Trash Free Waters Webinar: Microfibers are a Macro Issue: Interagency Report on Microfiber Pollution

In July 2024, the Trash Free Waters program and the National Oceanic and Atmospheric Administration's Marine Debris Division – on behalf of the Interagency Marine Debris Coordinating Committee - released the Interagency Marine Debris Coordinating Committee Report on Microfiber Pollution. This Report to Congress was mandated by Section 132 of the Save Our Seas 2.0 Act of 2020. This webinar covered the details in the report as well as some of the ongoing efforts in the United States and beyond that are addressing microfiber pollution.

Fibre Fragmentation & Environmental Pollution Webinar

The Microfibre Consortium hosted a webinar on the topic of Fibre Fragmentation and Environmental Pollution as part of their 'Triple Planetary Impact' series. Industry specialists discussed the latest research developments and the need to embed fibre fragmentation as an integral part of broader environmental sustainability, and more focused material strategies. It is critical that the industry embraces scientific evidence about the multifaceted risks posed by fibre fragmentation. This webinar supported industry understanding of the issue from an environmental pollution standpoint, so that organizations can act to address the issue with urgency.

Plastics 101 Webinar Series: Plastic Production and Design

The National Academies Roundtable on Plastics held its second webinar in its Plastics 101 series: Plastic Production and Design. The webinar focused on the state of knowledge on plastic design and plastic production, health and environmental impacts on communities, and the current policy landscape around plastic design and production. Participants included Katrina Knauer (National Renewable Energy Laboratory), Holli Alexander (Eastman Chemical Company), Joy Banner and Jo Banner (The Descendants Project), and Michelle Nowlin (Duke University School of Law). The recording for the first webinar in the series, What are Plastics?, is also available. The first session featured leading experts Rebecca Altman (Writer and Sociologist) and Tim Long (Arizona State

University), who delved into the history, current state, and future of plastics. The webinar culminated in panel discussion moderated by LaShanda Korley (University of Delaware), featuring Jill Martin (Dow Chemical Company) along with the two expert presenters.

Plastic-Free President: The Future of U.S. Policy on Plastics

Beyond Plastics hosted a webinar with a discussion with key allies and policy experts about recommendations and priorities for the next U.S. Administration, to protect people and the planet. Beyond Plastics has released a list of 27 priority policy recommendations for the next U.S. president to reduce plastic pollution. These recommendations pave the way to address the plastic pollution crisis by significantly reducing the production of plastics, thereby limiting their negative impacts on environmental justice communities, human health, climate change, fish and wildlife and our planet. These actions will be critical not only for the U.S. but for the world — since the U.S. is the world's top plastic polluting country. Panelists included: Judith Enck, President, Beyond Plastics; Jenny Hernandez, Climate Justice Framework Program Manager, Green Latinos; and Alexa White PhD, Climate and Environmental Justice Policy Director, Hip Hop Caucus. This webinar was moderated by Amy Westervelt, Executive Editor, Drilled.

PFAS: Promoting Alternatives in Consumer Products, Food Service Establishments & Facility Maintenance

The Northeast Waste Management Officials' Association held a webinar to learn more about the "forever" chemicals PFAS, including where PFAS may be found in common consumer products and products used at food establishments as well as how PFAS may impact human health. Finally, the webinar discussed how PFAS can move around the environment and impact water supplies as well as suggestions for alternatives.

Ubuntoo Wadden Islands Webinar

The IUCN Plastics Committee hosted a webinar in partnership with the IUCN WCEL to discuss Ubuntoo's new Artificial Intelligence Model which can be used for policy research on plastics waste management, Extended Producer Responsibility and the circular economy. The webinar also included an update on the Wadden Islands Project. Panelists included: Peter Schelstraete, CEO, Ubuntoo; Eileen Blackmore, Director and Senior Designer, House of Design; and Alexandra Harrington, IUNC WCEL, Chair, Plastic Pollution Taskforce.

Pricing Transparency in the Recycled Plastics Supply Chain

Be Waste Wise collaborated with The Circulate Initiative to present a webinar on Pricing Transparency of Recycled Plastics Supply Chain. Recycled plastics markets in India and Southeast Asia face multiple demand-and-supply linked bottlenecks along the value chain, including a lack of transparency in the pricing of plastic waste feedstock and recycled plastics. This opacity results in fluctuating demand and supply, poor capacity utilization at recycling facilities and, ultimately, challenges for brand owners to meet commitments to using recycled content in plastic packaging.

A 2023 study by The Circulate Initiative, "Pricing Transparency in the Recycled Plastics Supply Chain in India, Indonesia, Thailand, and Vietnam," sheds light on how pricing transparency can unlock demand for recycled plastics and support stakeholders across the value chain to understand the market opportunity better and make more informed decisions to drive positive change in the sector. Pricing transparency refers to the degree to which information on the prices of plastic waste and the finished products at each point in the recycled plastics supply chain is available to all buyers and sellers in each market. This webinar will discuss the need for transparency in the pricing of recycled plastics and aims to help participants understand the benefits, challenges and steps that can be taken to improve pricing transparency.

The Microplastics Breakdown

FATE AND TRANSPORT OF MICROPLASTICS

Colors and Microplastics: Bridging the Gap between Art, Science and Sustainability

Nilofar Asim, Akmal Aizuddin Bin Zulkifli, Nurul Syakirah Nazri, Mohammad Torkashvand, Marzieh Badiei, Armin Rajabi, Masita Mohammad

This review article explored the influence of colorants on polymers, including microplastic formation, environmental effects, identification and waste management topics. Concerns regarding colored MPs, including

their abundance, leaking, aging, waste management and sustainability, as well as future strategies for more effective mitigation of colored MPs were also explored. The authors observed that the presence of colorant can alter plastic degradation. Furthermore, the resulting MPs and their surrounding materials will interact with and affect the nearby environmental materials due to the colorant's interaction with polymer and fragmented color interaction with polymers. During photodegradation, the molecular structure of the polymer and colorants affect with light. The polymer as the colorant binder in colored plastics can influence the degradation of pigments. In turn, the degraded colorant may affect polymer degradation. The structure and composition of color pigment is a determining factor for adsorbing wavelengths that influence the photodegradation. The authors noted that a better understanding of the multiple effects of various colors (organic or inorganic) on resulting MPs and environments is necessary because it affects the interaction with other contaminants. They recommended further investigation of the effects of color on the aging of MP, which involves changes in surface physicochemical properties and alterations in the MP environmental behavior. They observed that there are potentially harmful effects of aged MP containing color on ecosystems due to their various abilities to adsorb contamination and release inherent additives in MPs; they recommended this as another area requiring further research. This kind of data, they asserted, could help to establish policies and regulations for using pigments in plastics.

Pervasiveness and Classification of Microplastics in Landfill Leachate: Impacts, Risks, and Treatment Efficiency

Fouzia Zaman, Md. Ashikur Rahman, Md. Morshedul Haque, Md. Ahedul Akbor, Shafi M. Tareq

As described in this article, microplastic pollution in surface and groundwater in Bangladesh is a significant issue. The main goal of the study was to assess the possibility of landfill leachate acting as a potential origin of MPs and to determine whether the surrounding surface water and groundwater act as recipients. In addition, this research evaluated MP removal efficacy and MP risk assessment of a leachate treatment plant. The study was conducted at Matuail Landfill in Dhaka, Bangladesh and the findings indicated that discharge leachate from the landfill contributes 3.5×10^8 particles per hour to the surrounding aquatic environment. High levels of MPs were found in the surface water and in the groundwater — with 48.9% of MPs ranging from 0.1 mm to 0.5mm. The dominant shapes were fibers and fragments. The leachate treatment method used at the site (described as employing activated sludge and biological treatment methods) resulted in the release of 83.33% of MPs, which the researchers conclude indicated a low removal efficiency in the leachate. The authors asserted study results could inform strengthening laws and regulations that mitigate MP pollution by revealing their characteristics and abundance. They recommended further research on the ecological risks due to MPs to facilitate the effective management of MP pollution.

Understanding the Dynamics of Microplastics Transport in Urban Stormwater Runoff: Implications For Pollution Control and Management

Arghavan Beheshtimaal, Nasrin Alamdari, Binbin Wang, Meysam Kamali, Maryam Salehi

This study centered on a modeling approach aimed at understanding the transport mechanisms of microplastics in an urban residential setting. This approach considered the effect of MP shapes (fibers, films and fragments) on the settling velocity. The researchers found that the MP shape affected the settling velocity of MPs, particularly as the diameter of the MPs increased. The transport mechanism for the smallest of the settling MPs (0.01 mm to 0.2 mm), regardless of the MP shape, density, and depth of flow, was found to be wash-load. For the larger MPs, the shape and size distribution of settling MPs, along with the depth of flow and slope were found to significantly influenced their transport mechanisms compared to sediment particles. The researchers found that the influence of weathering on the MPs' transport mechanisms depended on their sizes and shapes. Site-specific characteristics, including slope and surface friction, were found to have significantly influenced the velocity of stormwater runoff and, consequently, the extent of MP transport during rain events. The authors concluded that their study results underscored the complexity of MP transport dynamics and provided a foundation for developing targeted strategies to mitigate MP pollution in urban environments.

The Whole Life Journey and Destination of Microplastics: A Review

You Tao, Xiaoyan Feng, Hengyi Xu

The intent in conducting this review was to enhance public awareness regarding microplastic pollution and provide references for subsequent research and policy formulation. Topics addressed include the sources and migration pathways of MPs, their interactions with other pollutants, as well as the primary routes of human exposure. Some of what occurs in the human body after exposure is discussed, including the alterations of gut microbiota, gut microbiota metabolism and intestinal barrier after MPs enter the gut of organisms. Additionally,

the review highlighted the ease with which MPs translocate from the intestine to other organs along with their biological toxicities. The researchers observed real-life exposure to MPs occurs under complex circumstances, associated with many limitations in describing crucial aspects and details related to MPs invading the human body and their health risks. Therefore, they recommended more research geared toward better understanding the various stages during the life journey of MPs, including investigating and assessing the risk of foodborne MPs, and developing more sensitive detection technologies for locating these invisible plastic particles is essential for fully understanding the health risks associated with MPs (this could aid in improved detection of the migration of MPs in vivo and the associated cellular changes).

MICROPLASTICS EXPOSURE AND IMPACTS

Human Exposure to Microplastics: A Review on Exposure Routes and Public Health Impacts

Asim Nawab, Mushtaq Ahmad, Muhammad Tariq Khan, Mohammad Nafees, Imran Khan, I. Ihsanullah

This review analyzed the current knowledge about the presence of microplastics in the human body, sources and potential exposure pathways. The authors also examined the health impacts associated with MPs. While findings indicate that human exposure to MPs potentially occurs through several routes such as ingestion, inhalation and dermal contact, they observed that the exact routes for MPs entering the body remain unclear. They also noted that existing studies often involve small groups of individuals, which restricts the generalizability of findings beyond identifying the presence of MPs. Their review identified potential health impacts — oxidative stress, inflammatory responses, endocrine disruption and potential genotoxicity. However, they also observed the cellular and molecular mechanisms underlying these effects are still not well understood, especially when considering the diverse concentrations, shapes and sizes of MPs. The authors asserted that further research is essential, particularly to enhance epidemiological studies that could establish the link between MP exposure and health impacts in large populations. According to them, advancing this knowledge will be crucial for developing effective strategies to safeguard both environmental and public health from the detrimental effects of MPs. Additionally, they observed their study underscored the urgent need for standardized and validated techniques for accurate MP analysis and characterization in human tissues, addressing the methodological challenges in MP detection.

BIOTA EXPOSURE TO MICROPLASTIC POLLUTION: IMPACTS AND MITIGATION

Microplastics Detected in Dolphin Breath

This blog post on the ScienceBlog summarizes recent research findings that were published in the open-access journal PLOS ONE on October 16, 2024. The research team collected samples of exhaled air from five bottlenose dolphins in Sarasota Bay, Florida, and six bottlenose dolphins in Barataria Bay, Louisiana, during catch-and-release health assessment studies. To capture the air, they held a collection surface over or just above each dolphin's blowhole as it exhaled. The research team had also sampled the surrounding air near the dolphins, allowing them to confirm that the detected microplastics were not just airborne near the blowholes but were actually exhaled. Each of the 11 dolphins sampled was found to have at least one suspected microplastic particle. Analysis of these particles determined that they included both fibers and fragments and consisted of several types of plastic polymers, including polyethylene terephthalate (PET), polyester, polyamide, polybutylene terephthalate, and polymethyl methacrylate (PMMA). The team asserted that their findings support that inhalation may be a relevant route of exposure for dolphins. However, the authors observed that their findings were preliminary, and they highlighted that further research is needed to better quantify the degree of inhalation exposure to various types of microplastics among bottlenose dolphins and determine the potential impacts (e.g., the possibility of lung damage) on dolphins' health. The authors also stated, "[w]e are concerned by what we are seeing because dolphins have a large lung capacity and take really deep breaths, so we are worried about what these plastics could be doing to their lungs."

Natural-Based Solutions to Mitigate Dietary Microplastics Side Effects in Fish

N.Cattaneo, M. Zarantoniello, F. Conti, A. Tavano , A. Frontini, I. Sener, G. Cardinaletti, I. Olivotto

The authors identified the need for the development and implementation of strategies to mitigate microplastic (MP)-related issues on fish, since MPs can be consumed by fish, crossing through the gastrointestinal tract and the translocation of particles smaller than 20 µm to other organs, such as liver, and triggering oxidative stress.

Their study evaluated the effectiveness of microencapsulated astaxanthin**[1]** (ASX) in reducing both the dietary MPs-induced oxidative stress and the accumulation of MPs in zebrafish. As described, zebrafish were reared from larvae to adults (6 months) and fed diets containing MPs different in range-sizes (polymer A: 1–5 µm; polymer B: 40–47 µm) at different concentrations (50 or 500 mg/kg). The fish from each experimental group were then further divided in two sub-groups that were fed for an additional month, with the previous diets or with the same diets supplemented with microencapsulated ASX. The authors reported that their results showed that microencapsulated ASX was able to counteract the negative effects caused by MPs different in size. Notably, they found that microencapsulated ASX was able to restore the intestinal epithelium, affected by the abrasive role of MPs during gut transit in fish fed diets containing polymer B microbeads. In the case of the zebrafish fed diets containing polymer A microbeads, which were found to be absorbed at intestinal level and translocated mainly to the liver, the microencapsulated ASX decreased the oxidative stress response and reduced the MPs accumulation in target organs, which was attributed to the antioxidant and the coagulant properties of the ASX and microcapsules wall, respectively. The authors asserted that their results have identified microencapsulated astaxanthin as a potential tool to prevent MPs-related issues in fish.

[1] Astaxanthin is a carotenoid known for its strong antioxidant and health-promoting characteristics. https://www.sciencedirect.com/science/article/pii/S0308814616317381 In this study natural astaxanthin underwent microencapsulation using an innovative technology named Co.M.E. (Coating Made Easy), which was developed as part of a private project called + POP (Powder on Pellets). The encapsulation method was designed to protect the carried molecule to assist in ensuring optimal delivery to the fish.

U.S. EPA
TRASH FREE WATERS

EPA Trash Free Waters Program | nandi.romell@epa.gov | epa.gov/trash-free-waters