
The Rapids

US EPA's Trash Free Waters Monthly Update

December 2022

epa.gov/trash-free-waters

Introduction

Good afternoon all,

In honor of America Recycles Day, EPA's Office of Land and Emergency Management [announced \\$100 million in funding](#) to help build and transform solid waste infrastructure, manage materials to achieve a circular economy, reduce greenhouse gas emissions, and create cleaner, resilient, and healthier communities. The Solid Waste Infrastructure for Recycling Grant Program and the Recycling Education and Outreach Grant program are included in the Funding Opportunities section below!

With apologies, there will be a temporary hiatus of the Trash Free Waters *Rapids* in the new year. We plan to continue distribution as soon as possible.

Romell Nandi
US EPA
Trash Free Waters National Program Lead

EPA Announcements

[EPA Releases a Recycling Program Toolkit](#)

EPA recently released an interactive collection of materials to help states, territories, local governments, tribes, schools, nonprofit organizations, companies, and public-private partnerships create effective programs for recycling, composting, anaerobic digestion, reuse, repair, and waste reduction. The toolkit includes case studies, training materials, consumer education materials, and standardized terms related to recycling.

[Reuse Projects Funded through EPA's Healthy Communities Grant Program](#)

The EPA recently announced the selection of 22 Healthy Communities Grants across New England to work directly with communities to reduce environmental risks, protect and improve human health and improve the quality of life. The City of Middletown, CT will receive \$40,000 for their Fostering Circular Solutions for Takeout Containers project to support reusable takeout containers and help Connecticut meet its goal of a 60% waste diversion rate. The Product Stewardship Institute (PSI) will receive \$39,992 for their Restaurants Building Back Better with Less Packaging and Plastic Waste project. This effort focuses on education and outreach materials, technical support, and funding to reduce the use of single-use food service ware in small restaurants in low-income areas where English is a second language.

[Release of Bipartisan Infrastructure Law First Anniversary Report](#)

Last month marked one year of progress in implementing President Biden's historic Bipartisan Infrastructure Law with the release of a new report detailing the Agency's investments in the Nation's infrastructure and communities. The Bipartisan Infrastructure law provides EPA with more than \$60 billion over five years for a wide range of environmental programs that will bring much-needed funding to America's water infrastructure, environmental cleanups, and clean air protections, while also advancing environmental justice and combatting climate change.

[Environmental Study Released for Projects to Mitigate San Diego – Tijuana Transborder Water Pollution](#)

Last month, EPA and the U.S. Section of the International Boundary and Water Commission (USIBWC) released the Final Programmatic Environmental Impact Statement (Final PEIS) for a set of proposed projects that comprise the Comprehensive Infrastructure Solution to mitigate transborder water pollution. This document includes the installation of one or more trash booms in the Tijuana River to capture solid waste before it reaches the U.S. border. The public comment period closes on December 19.

Funding Opportunities

[EPA Green Chemistry Challenge Awards Program](#)

The EPA Green Chemistry Challenge Awards promote the environmental and economic benefits of developing and using novel green chemistry. These prestigious annual awards recognize chemical technologies that incorporate green chemistry into chemical design, manufacture, and use. Focus areas of the challenge include Greener Synthetic Pathways, Greener Reaction Conditions, and The Design of Greener Chemicals. **The deadline for submissions is December 9.**

[EPA State and Territories Solid Waste Infrastructure for Recycling Grants \(SWIFR\)](#)

This new Bipartisan Infrastructure Law-funded grant program is for states, territories, and the District of Columbia to improve solid waste management planning, data collection, and program implementation. \$40 million is available through this program. Check out the Upcoming Events section for various informational webinars on this opportunity. **The deadline for Notices of Intent to Participate is December 15.**

[Solid Waste Management Grant Program](#)

The U.S. Department of Agriculture's Solid Waste Management (SWM) Grant Program has been established to assist communities through free technical assistance and/or training provided by the grant recipients. Public bodies, nonprofits, Federally recognized tribes, and academic institutions within rural areas and towns with a population of 10,000 or less are eligible to receive SWM grant funds to reduce or eliminate pollution of water resources in rural areas and improve planning and management of solid waste sites in rural areas. Funds may be used to evaluate current landfill conditions to determine threats to water resources, enhance operator skills in the operation and maintenance of active landfills, and help communities reduce the solid waste stream. **The deadline for submissions is December 31.**

[EPA Political Subdivisions Solid Waste Infrastructure for Recycling Grants \(SWIFR\)](#)

This new Bipartisan Infrastructure Law-funded grant program is for counties, cities, towns, parishes, and similar units of government to fund projects that improve materials management and infrastructure, including collection, transport, systems, and processes related to post-use materials that can be recovered, reused, recycled, repaired, refurbished, or composted. \$30 million is available through this program, with

expected award sizes ranging from \$500,000 to \$4 million. Check out the Upcoming Events section for various informational webinars on this opportunity. **The deadline for submissions is January 16, 2023.**

EPA Recycling Education and Outreach Grants

This new Bipartisan Infrastructure Law-funded grant program is for states, tribes, territories, local governments, and other organizations to fund projects to improve consumer education and outreach on waste prevention, reuse, recycling, and composting by providing them with the practical tools needed to reduce waste generation, decrease contamination in the recycling stream, and increase recycling rates across the country in a manner that is equitable for all. \$30 million is available through this program, with awards sizes ranging from \$250,000 to \$2 million. Check out the Upcoming Events section for various informational webinars on this opportunity. **The deadline for submissions is January 16, 2023.**

Building Resilient Infrastructure and Communities

The Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure and Communities (BRIC) grant program will support states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program's guiding principles are supporting communities through capability and capacity building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency. **The deadline for submissions is January 27, 2023.**

National Park Service Chesapeake Gateways Grants

The National Park Service Chesapeake Office (NPS Chesapeake) is proud to announce a new competitive grant opportunity to advance the Chesapeake Bay Initiative Act of 1998 within the full 41-million-acre Chesapeake Bay watershed. Specifically, this opportunity welcomes grant proposals focused on advancing equity, inclusion, accessibility, and community engagement across two strategic themes: Advance a Major Inclusive Interpretive Initiative with an Equity Lens; and Promote Resilient Communities & Landscapes Through Tourism, Sustainability, Conservation & Local Economies. **The deadline for submissions is January 30, 2023.**

Five Star and Urban Waters Restoration Grants

The Five Star and Urban Waters Restoration grant program seeks to develop community capacity to sustain local natural resources for future generations by providing modest financial assistance to diverse local partnerships focused on improving water quality, watersheds, and the species and habitats they support. Projects include a variety of ecological improvements along with targeted community outreach, education, and stewardship. Approximately \$1.6M is available and awards will range from \$25,000 to \$50,000, with 40-50 grants awarded per year. **The deadline for submissions is January 31, 2023.**

20th Annual P3 Awards: A National Student Design Competition Focusing on People, Prosperity, and the Planet

The EPA seeks applications proposing to take a holistic approach, grounded in research and innovation, to develop and demonstrate solutions to real-world challenges. The People, Prosperity, and the Planet (P3) Program highlights the use of scientific principles in creating innovative technology-based projects that achieve the mutual goals of improved quality of life, economic prosperity, and environmental protection. This award program is split into four separate funding opportunities: Clean and Healthy Air (EPA-G2023-P3-Q1), Clean and Safe Water (EPA-G2023-P3-Q2), Safeguard and Revitalize Communities (EPA-G2023-P3-Q3), and Ensure Safety of Chemicals (EPA-G2023-P3-Q4). **The deadline for submissions is February 1, 2023.**

Research to Action: Assessing and Addressing Community Exposures to Environmental Contaminants

This National Institutes 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 February 5, 2023.**

Other opportunities...

2023 NOAA Marine Debris Program Art Contest

The NOAA Marine Debris Program holds an annual art contest to reach K-8 students and help raise awareness about marine debris. An awards panel will collect all entries and select 13 winners to be featured in a marine debris calendar. Entries will be judged on their creativity, artistic presentation, and relevancy to the theme of 1) How marine debris impacts the ocean and the Great Lakes environment, and 2) What you are doing to help prevent marine debris. **The deadline for submissions is December 16.**

2023 President's Environmental Student and Teacher Awards

EPA's Office of Environmental Education is now accepting applications for the 2023 President's Environmental Youth Awards (PEYA) and Presidential Innovation Awards for Environmental Educators (PIAEE). PEYA recognizes outstanding environmental stewardship projects from students in grades K-12 and PIAEE recognizes outstanding K-12 grade educators who integrate environmental, place-based experiential learning into school curricula and school facility management across the country. EPA is seeking award applications for a variety of environmental topics, including environmental justice, reducing contributions to ocean and marine litter, solutions in recycling, and more. **The deadline for submissions is January 11, 2023.**

Upcoming Events

Restore America's Estuaries Coastal and Estuarine Summit

December 4-8, New Orleans, LA, and virtual

Restore America's Estuaries (RAE) proudly presents the 2022 Coastal & Estuarine Summit with support from Coalition to Restore Coastal Louisiana (CRCL). In its 11th year, the 2022 Summit will bring together the coastal restoration and management communities to explore issues, solutions, and lessons learned in their work. The Summit Program will address all aspects of coastal and estuarine restoration and management, including the Great Lakes and international locales. These topics are crucial as coastal communities pursue new, more robust strategies to effectively manage, protect, and restore their resources in a changing climate.

Webinar I: EPA Political Subdivisions SWIFR Grant Program Overview

December 5 (2-3:30 PM), virtual

During this webinar, EPA will provide an overview of the Political Subdivisions Solid Waste Infrastructure for Recycling Grant request for applications, eligible entities, evaluation criteria, and the application process. This event will also include a Q&A portion for attendees. The same presentation material will also be covered on December 7 as an alternative time slot.

WasteCon 2022

December 5-8, San Diego, CA

WASTECON is The Solid Waste Association of North America's (SWANA) executive leadership summit. The solid waste industry is going through exciting changes that bring both challenges and opportunities. With a mix of keynotes addressing the hot topics in the industry, development and learning sessions, and lots of networking time, this event will provide you and your team with what you need to best respond to change, seize the opportunity, and keep stakeholders aligned and supportive.

Webinar I: EPA Recycling Education and Outreach Grant Program Overview

December 6 (6 PM), virtual

During this webinar, EPA will provide an overview of the Recycling Education and Outreach Grant request for applications, eligible entities, evaluation criteria, the application process, and the model recycling program toolkit. This event will also include a Q&A portion for attendees.

Briefing on Model Packaging Reduction Law

December 7 (4 PM), virtual

Extended producer responsibility (EPR) for packaging is heating up in state capitals across the US. The essential function of EPR is to shift the cost of packaging disposal from consumers to the companies that produce the products. Join Beyond Plastics and Just-Zero for a briefing on a new model bill designed to reduce packaging and therefore prevent plastic pollution, improve recycling, decrease toxic additives, and reduce greenhouse gas emissions.

Webinar I: EPA Political Subdivisions SWIFR Grant Program Overview (Alternative Timing)

December 7 (6 PM), virtual

During this webinar, EPA will provide an overview of the Political Subdivisions Solid Waste Infrastructure for Recycling Grant request for applications, eligible entities, evaluation criteria, and the application process. This event will also include a Q&A portion for attendees.

5th Annual Virginia Stormwater and Plastic Pollution Workshop

December 7 (1-2:30 PM), virtual

Clean Virginia Waterways is excited to announce the 5th Annual Stormwater and Plastic Pollution Workshop for stormwater, plastic pollution, and litter-prevention professionals. This workshop will address urban trash pollution and strategies employed to intercept a piece of trash before it becomes part of stormwater runoff and is conveyed to and through the storm sewer system. Registration will open soon.

Exploring the Intersections of Environmental Justice and Equitable Development in Infrastructure Investments

December 8 (1-2:30 PM), virtual

Are you interested in learning more about the process of defining disproportionately impacted communities for federal and state policies? Or, how large investments – like from the Bipartisan Infrastructure Law – will tie to equitable development and anti-displacement practices in disproportionately impacted communities that receive the funding because of the Justice 40 Initiative? Join the Urban Waters Learning Network Equitable Development and Anti-Displacement Collaborative to engage in further conversation on the intersections of environmental justice policy and equitable development and anti-displacement practices.

Webinar II: EPA Political Subdivisions SWIFR Grant Program Overview

December 13 (2-3:30 PM), virtual

During this follow-up event, EPA will cover procurement and subawards for the Political Subdivisions Solid Waste Infrastructure for Recycling Grants. This event will also include a Q&A portion for attendees. The same presentation material will also be covered on December 19 as an alternative time slot.

Webinar II: EPA Recycling Education and Outreach Grants

December 15 (2-3:30 PM), virtual

During this follow-up event, EPA will cover procurement and subawards for the Recycling Education and Outreach Grant. This event will also include a Q&A portion for attendees. The same presentation material will also be covered on December 20 as an alternative time slot.

Webinar II: EPA State and Territories SWIFR Grant Program Overview

December 19 (2-3:30 PM), virtual

During this follow-up event, EPA will cover the program guidance and work plans for the States and Territories Solid Waste Infrastructure for Recycling Grants. This event will also include a Q&A portion for attendees. The same presentation material will also be covered on January 3 as an alternative time slot.

Webinar II: EPA Political Subdivisions SWIFR Grant Program Overview (Alternative Timing)

December 19 (6 PM), virtual

During this follow-up event, EPA will cover procurement and subawards for the Political Subdivisions Solid Waste Infrastructure for Recycling Grants. This event will also include a Q&A portion for attendees.

Webinar II: EPA Recycling Education and Outreach Grants (Alternative Timing)

December 20 (6 PM), virtual

During this follow-up event, EPA will cover procurement and subawards for the Recycling Education and Outreach Grant. This event will also include a Q&A portion for attendees.

Save the dates for future months...

Webinar II: EPA State and Territories SWIFR Grant Program Overview (Alternative Timing)

January 3 (6 PM), virtual

During this follow-up event, EPA will cover the program guidance and work plans for the States and Territories Solid Waste Infrastructure for Recycling Grants. This event will also include a Q&A portion for attendees.

Gulf of Mexico Alliance (GOMA) Marine Debris Cross-Team Initiative Mid-Year Meeting

January 10-11, 2023, Gulfport, MS or virtual

The goal of this mid-year stakeholder meeting is to strengthen regional effectiveness by bringing the Gulf of Mexico Alliance Marine Debris Cross Team Initiative community together to work on regional marine debris actions that address both everyday marine debris and debris generated by severe weather. During this workshop, participants will work on actions in the new Marine Debris Cross Team in the Governors' Action Plan IV for Healthy and Resilient Coasts, update Tier 2 project plans and metric trackers for the next 5 years, and develop a priority project plan for GOMA Infrastructure Investment and Jobs Act funding.

GreenBiz 23

February 14-16, 2023, Scottsdale, AZ

Join more than 1,600 sustainable business leaders for GreenBiz 23 to harness the knowledge of experts, peers, and new voices to help you achieve net zero, advance the circular economy, elevate social justice, safeguard biodiversity, build resilient supply chains, and more.

ICSW 2023: International Conference on Solid Waste

March 20-21, 2023, Tokyo, Japan

The International Conference on Solid Waste aims to bring together leading academic scientists, researchers, and research scholars to exchange and share their experiences and research results on all aspects of solid waste. It also provides a premier interdisciplinary platform for researchers, practitioners, and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the solid waste field.

Texas Plastic Pollution Symposium

April 5, 2023, Houston, TX

The purpose of the annual Texas Plastic Pollution Symposium is to bring scientists together to discuss plastic research being conducted in the state of Texas and to bring awareness to the issue of plastics in the environment. This meeting consists of oral research presentations and posters, time for collaboration about new projects, and meeting new partners to fill the gaps in our understanding of the impacts of plastics.

In case you missed it...

Upstream's Indisposable Podcast Series

Upstream has a podcast series dedicated to celebrating solutions to plastic pollution and featuring heroes of the reuse movement. Dozens of podcasts are accessible via their website and highlight an impressive breadth of reuse-relevant topics, including episodes dedicated to zero-waste stadiums, venture capital, plastic-free alternatives, and coalition building.

The Microplastics Breakdown

HUMAN HEALTH IMPLICATIONS OF EXPOSURE TO MICROPLASTICS

Microplastics in Human Food Chains: Food Becoming a Threat to Health Safety

Abdullah Al Mamun, Tofan Agung Eka Prasetya, Indiah Ratna Dewi, Monsur Ahmad

The goal of this literature review was to enlighten future research into the core component of microplastics (MPs), their exposure to human food, and biological reactions in the human body. The article described the array of aquatic biota in which MPs were found: coral, phytoplankton, and other marine animals; and highlighted the widespread abundance of MPs in freshwater and the marine environment. The authors observed that MPs are transferred up the food chain with a high level of absorbed pollutants and may be destined for human consumption. Food sources affected by MP contamination in the food chain include fish, shellfish and crustaceans, canned fish, sugar, salt, honey, beer, drinking water, and fruits and vegetables. Some of the complexity in understanding the risks to human health associated with exposure to MPs was discussed. For example, it was noted that variance in type, size, and shape of plastic particles may lead to several health problems including oxidative stress, immune disease, and risk of cancer. It was also observed that MPs may release different additive chemicals and act as a vector for other harmful microorganisms. The article included a discussion of some of the effects on human organs and systems that are exposed to MPs via food, e.g., the gastrointestinal tract and the liver. The authors highlighted existing data gaps, including investigating MP and related contaminants in different foods and also in food additives; research into the final destination and implication of MP in the human body, and the question of how the size and shape of particles affect the toxicity level.

Potential Risk of Microplastics In Processed Foods: Preliminary Risk Assessment Concerning Polymer Types, Abundance, And Human Exposure of Microplastics

Qianhui Lin, Shasha Zhao, Lihua Pang, Cuizhu Sun, Lingyun Chen, Fengmin Li

This literature review focused on the available data for MPs in 11 types of processed foods and conducted a preliminary risk assessment. The authors collected data on the abundance, size range, and polymer types of MPs directly from charts or texts of relevant studies. Three indicators were selected and examined: chemical risk, pollution load, and estimated daily intake (EDI). The three most common polymer types found in processed foods were polyethylene (PE) (23%); polyethylene terephthalate (PET) (22%), and polypropylene (PP) (19%). Among all types of processed foods examined, nori was found to have exhibited the highest chemical risk and pollution load. In terms of the EDI of MPs from different processed foods, MP intakes through bottled water and milk were found to be significantly higher than that of the other foods. The authors referenced study results showing that PP and PET accounted for nearly 80% of detected MPs found in human excrement and observed that the presence of MPs in human feces and their chemical similarity with that found in processed foods suggest that the risk of MP exposure from processed food consumption cannot be neglected. According to the authors' probabilistic estimation of MP daily intake, children are at a higher health risk than adults. However, based on the overall findings, the authors concluded that MPs in processed foods only carry limited risk. Nori, canned fish, beverages, and table salt were classified as high hazards, while bottled water, milk, and beer were identified as medium hazards. Packaged meat and honey were classified as low and very low hazards, respectively. The authors asserted that their review could provide the basis for risk management of MPs in processed food products.

Microplastics in Food and Agriculture

B. Pavan Kumar Naik, D. Saritha, J. Sam Ruban, Venkatraj N., and M. Nandinidevi

This article explored how agricultural soils serve as sinks for MP particles and described some of their potential negative impacts. The authors pointed out that plastic materials are used in various farming practices, including plastic mulching, using plastic ropes as staking, and plastic fruit coverings. As described, when MPs are deposited on topsoils, fragmentation occurs by solar UV radiation in addition to raised oxygen availability and temperature. These fragmented MPs can migrate vertically through the soil profile and horizontally along the surface of soils, potentially leading to the spread of plastic over a wide range including deep soil, groundwater, and then to aquatic ecosystems. The authors described the soil as becoming the largest reservoir of MPs; which may be 4 to 23 times that of the ocean. Soil samples from farming areas in India were taken at different depths. MPs in the samples were extracted and then counted. MPs were found in all soil samples: upper soil (top 5 cm) and lower soil (deep 20 cm) at different depths ranging from 12 to 117 items/m², with the mean concentration of 53.2 items/m² in upper soil and 34.3 items/m² in lower soil. Some of the potential impacts of MPs discussed included effects on nutrient and substrate availability and MPs' competition for physicochemical niches with microorganisms. The interaction of soil pH and the MP chemical compounds was thought to potentially change the biota in the soil.

FATE AND TRANSPORT OF MICROPLASTICS

Concentrations of Tire Wear Microplastics and Other Traffic-Derived Non-Exhaust Particles in the Road Environment

Ida Järlnskog, David Jaramillo-Vogel, Juanita Rausch, Mats Gustafsson, Ann-Margret Strömvall, and Yvonne Andersson-Sköld

This study focused on tire wear particles (TWP), described as one of the major sources of MP pollution in the environment. The article noted many existing published studies on this topic are based on theoretical estimations rather than field measurements. Thus, the goal of this study was to help increase the knowledge regarding the concentrations of TWP in the environment. Samples from different matrices were collected at a research station used as a case study area located on a rural highway between Västerås and Enköping, Sweden. According to the article, the road was surrounded by fields; the speed limit was 120 km/hr, and the annual average daily traffic was estimated at 11,000 vehicles. The road was composed of stone mastic asphalt with a maximum stone size of 11 mm with polymer-modified bitumen (PMB) as the binder. The

matrices examined included road dust (from the curb and in-between wheel tracks), runoff (water and sediment), and air. In addition, airborne deposition was determined in a transect with increasing distance from the road. Samples were categorized into subclasses: glass beads, metallic particles, paint particles (i.e., road markings), bitumen wear particles (BiWP), tire wear particles (TWP), mineral particles, and organic undifferentiated particles (e.g., pollen, spores, and other organic matter). Runoff was found to contain the highest proportion of TWP (up to 38%). The share of TWP in curb samples tended to be higher than BiWP. However, a seasonal increase of BiWP was observed in coarse curb samples during winter, which was attributed to the use of studded tires. The concentration of the particles in the air was found to decrease with increasing distance from the road, which the authors described as evidencing road traffic as the main emission source. Road dust and the surrounding environment were found to contain traffic-derived MPs in both size fractions: 2-20 μm and 20-125 μm . Finer particles (2-20 μm) were found to be the most prevalent in all sample matrices. The authors noted that these sized particles have a high potential to be transported in water and air far away from the source and can contribute to the inhalable particle fraction (PM10) in air, which they asserted highlighted the importance of including finer particle fractions in future investigations.

Microplastics in the Great Lakes: Environmental, Health, and Socioeconomic Implications and Future Directions

Claire Fuschi, Haihui Pu, Margaret MacDonell, Kurt Picel, Maria Negri, and Junhong Chen

MP pollution was identified as an important issue that needs to be addressed in the Great Lakes because plastics comprise most of the litter found, and according to the authors, the Great Lakes serve as a source of drinking water for 40 million people, they account for 84% of North America's surface fresh water and 21% of all surface fresh water in the world, and their maritime economy supports more than 300,000 jobs, translating to \$8.8 billion in wages. It was also observed that the Great Lakes' commercial, recreational, and tribal fisheries are valued at over \$7 billion annually and support over 75,000 jobs. Furthermore, the article referenced calculations by the Rochester Institute of Technology indicating that nearly 22 million pounds of plastic debris enter the Great Lakes every year, with most (11.6 million pounds) entering Lake Michigan; followed by Lake Erie (5.6 million pounds), Lake Ontario (3.2 million pounds), Lake Huron (1.4 million pounds), and Lake Superior (more than 70,000 pounds). Potential solutions to mitigate the risks posed by MPs were discussed along with suggestions for future research, including standardizing detection and removal methods and assessing the health risk of MPs in the Great Lakes. While the article acknowledged that the understanding of MP pollution across the Great Lakes is very limited, the authors also highlighted that research and public awareness of MPs in the environment have increased. For example, the authors summarized a recent study of 20 sediment samples from Lake Michigan and 12 samples from Lake Erie. According to the description, this research identified PET, HDPE, and semisynthetic cellulose as the most common among the 37 particles analyzed from Lake Michigan sediment; and synthetic cellulose, PP, and PVC as the most common among the 44 particles analyzed from Lake Erie sediment. The authors asserted that MPs can currently be viewed as a pollution prevention and waste management issue rather than something to be done away with entirely, especially because there are currently no detailed standards about different types of MPs.

Abundance and Effects of Microplastics in Terrestrial Environments

F. Olcay TOPAÇ, Chapter 2 of "Theory and Research in Engineering," October 2022

This chapter explored MPs in soil ecosystems and attempted to address knowledge gaps, explain the environmental effects of MPs in terrestrial systems, and recommend further research. The author observed that large temperature fluctuations on the soil surface and UV radiation from sunlight are major factors in plastic fragmentation in terrestrial environments. These fragments, some of which are attributed to the tilling of soil containing plastic mulching material, may accumulate in the soil as secondary micropollutants. The improper disposal of packaging of soil fertilizers and agrochemicals and MPs in wastewater sludge applied to agricultural lands are also cited as potential sources of MP fragments in the

soil. The article referenced an estimate that 44,000-300,000 and 63,000-430,000 tons/year of MPs enter the cultivated farmland in North America and Europe, respectively, by sewage sludge application. Research regarding the distribution and types of MPs in agricultural soil was discussed. For example, a study found that MP levels in mulched and unmulched soils were found to be 571 particles and 263 particles per kilogram of soil, respectively. Other research was described indicating that MP fibers and films are more abundant in mulched soils. The most prevalent kind of polymer in the examined field was identified as polyethylene, followed by polystyrene and polypropylene. This chapter acknowledged that the potential impacts on terrestrial habitats have not been fully demonstrated but that because of the low level of light and oxygen in the soil, it is expected that MPs could persist in the soil ecosystem for over 100 years. Some of the possible impacts of this persistent presence of MPs were described, including its effects on soils' bio-physicochemical properties and the mobility of other pollutants in the soil matrix, which in turn could have impacts on the functions of the soil ecosystem – including biota – with eventual possible negative effects on human health.

MICROPLASTIC REMOVAL

A Community of Marine Bacteria with the Potential to Biodegrade Petroleum-Based and Biobased Microplastics

Nuria Fernández de Villalobos, Maria Clara Costa, and Isabel Marín-Beltrán

This study assessed the biodegradability of low-density polyethylene and biobased polyethylene terephthalate MP films by marine bacteria. Six samples of marine organisms were collected from two marine caves in July 2020, close to the city of Sagres in southern Portugal. Bacterial communities were then recovered from these samples. Plastic polymers used in this study came from commercially available plastic bags: one plastic bag from a supermarket made of petroleum-based, low-density polyethylene (LDPE), and a plastic bag from a local shop labeled as “biodegradable”, made of polyethylene terephthalate (BPET). The authors described this local shop bag as being composed of “biobased” PET, which presents the same chemical structure as conventional PET. Biobased plastics may contain additives that accelerate the oxidation process so they can still be more prone to biodegradation in the natural environment than their conventional counterparts. Both plastic bags were cut into MP films under sterile conditions and then further sterilized under UV radiation, which also served to mimic photodegradation. Particles of LDPE and BPET were exposed to control and experimental conditions. During experimental treatments, 10 LDPE or BPET MPs were immersed in marine waters enriched with bacteria. Bacterial growth and pH were found to be higher in the samples inoculated with bacteria, compared to the controls. Changes were found in the chemical functional groups, and fractures and biofilms were detected on the surface of both plastics exposed to the bacterial community. The chemical oxygen demand further indicated signs of biodegradation of both polymers. Specific groups of bacteria showed a preference for each type of MP. Biobased PET was determined to be no more prone to biodegradation than conventional, petroleum-based LDPE. The authors suggested that the metabolic pathways of additional bacteria groups be further studied to assess their potential for bioremediation purposes.

Removal of Microplastics in Water: Technology Progress and Green Strategies

Wei Gao, Yalin Zhang, Aoyun Mo, Jie Jiang, Yuqing Liang, Xiaomu Cao, Defu He

This review discussed existing technologies for the removal of MPs, including physical, chemical, and biological approaches, and described some of their attributes, challenges, and downsides. For example, filtration technology was found to have removal efficiency but is also associated with relatively high costs due to membrane fouling and replacement of filter membranes. Magnetic Adsorption Separation (MAS) was described as a simple removal method; however, additive sorbents employed in this method were found to potentially result in secondary pollution, therefore limiting the large-scale application of these technologies. The article concluded with a discussion of environmentally friendly approaches and priorities for future action. For example, the authors suggested that environmentally friendly or biology-

based materials and reagents, such as starch and biochar, are encouraged for use as adsorbents and coagulators. The article also highlighted the importance of source control and the reduction of the amount of plastic waste, which the authors suggest could be achieved via reducing the production of conventional nondegradable plastic, using alternative materials such as recycled or biodegradable products, and recycling and reusing plastic products. Additionally, it was asserted that legislation on plastics production, waste management, and the use of alternative materials should be reinforced in the future.

If you'd like to see your posting in this email, please email Nandi.Romell@epa.gov with any suggestions!

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