# Our Microplastic Problem

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*This article explores the growing threat of and the legal response to microplastic pollution. Microplastics–plastic particles smaller than five millimeters in size–are pervasive, persistent, and chemically diverse, making them particularly difficult to regulate using existing environmental statutes. Federal approaches, such as the Clean Water Act and the Toxic Substances Control Act, offer limited relief. At the same time, macro-scale proposals like the Break Free from Plastic Pollution Act and a Global Plastic Treaty remain stalled. In response, this article advocates for "micro-solutions"–targeted, state and local interventions that address microplastic pollution across the plastic lifecycle. These include targeted product bans, labeling requirements, and design modifications. By highlighting these bottom-up strategies, some of which prioritize health concerns, the article provides a roadmap for meaningful progress and practical solutions in the absence of sweeping federal or international reform.*

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## I. INTRODUCTION

As global awareness of plastic pollution increases, legal scholarship has yet to fully address one of its most pervasive and challenging forms: microplastic pollution. Microplastics—tiny plastic particles less than five millimeters in size—pose unique environmental and legal challenges due to their ubiquity, microscopic size, and complex chemical composition.[1] Found everywhere from the depths of the ocean to human organs, microplastics are pervasive, making them difficult to regulate. The limited regulatory efforts that do exist tend focus on macroplastics—visible debris such as plastic bottles and bags. As a result, microplastics have proliferated. Human exposure to microplastics is direct and ongoing, and studies have detected these tiny plastic particles in the water we drink, the air we breathe, and the food we eat. This growing health concern justifies prioritizing policies and regulations that target microplastics.

While key federal statutes such as the Clean Air Act, the Clean Water Act, and the Toxic Substances Control Act could limit certain forms of plastic contamination, these laws were not designed to combat microplastic pollution. Regulatory gaps persist: microplastics are largely nonpoint source pollutants, uniform monitoring standards do not exist, and there is no consistent federal definition for microplastics. Ambitious proposals such as the Break Free from Plastic Pollution Act and the United Nations Global Plastic Treaty envision regulating plastic at every stage of its lifecycle. Yet, both efforts remain unrealized, stalled in Congress and international negotiations. Federal inaction and slow-moving international negotiations make sweeping macro-solutions unlikely.

As a complementary strategy, this Article offers micro-solutions—narrowly tailored, smaller-scale interventions—to

1. Although some researchers distinguish *nanoplastics* (typically defined as plastic particles smaller than 100 nm) from larger *microplastics*, many authoritative sources adopt a broader definition that includes particles as small as one nanometer. *See, e.g.*, Maxi B. Paul et al., *Micro- and Nanoplastics - Current State of Knowledge with the Focus on Oral Uptake and Toxicity*, NANOSCALE ADVANCES 4350, 4350 (2020) (defining microplastics as particles ranging from 100 nm to 5 mm, with nanoplastics spanning 1 to 100 nm); *see also Everything You Should Know About Microplastics*, U.N. ENV'T PROGRAMME (June 2, 2023), https://www.unep.org/news-and-stories/story/everything-you-should-know-about-microplastics (defining microplastics as all fragments between 1 nm and 5 mm). In this Article, the term *microplastics* refers broadly to all plastic particles smaller than 5 mm—including nanoscale particles—unless otherwise specified.

address our microplastic problem. Targeted legislative efforts like the Microbead-Free Waters Act of 2015, which amended the Food, Drug, and Cosmetic Act to ban microbeads in rinse-off cosmetic products, could serve as a model for effectively addressing other forms of microplastic pollution. The swift passage of this law, which stemmed from state bans, supports the argument that the most effective near-term response lies in similar micro-solutions. States and municipalities are already demonstrating the viability of such measures. California is leading the way by implementing a *Statewide Microplastic Strategy*, which includes developing standardized testing methods for detecting microplastics in drinking water. Additionally, novel claims are being asserted, with state attorneys general using consumer protection and public nuisance laws to hold plastic manufacturers accountable for microplastic pollution.

This Article contends that micro-solutions offer the most politically feasible and legally effective tools available today and presents three categories of such interventions: (1) bans on intentionally added microplastics (e.g., glitter, turf); (2) product redesign (e.g., washing machine, tires); and (3) disposal regulations (e.g., no flush labels, construction controls). Given the mounting evidence that microplastics may pose risks to human health through inhalation and ingestion, broader efforts to achieve a circular economy and cap global plastic production should continue. The current political moment, however, calls for smaller-scale, immediately implementable measures. While legal scholarship on micro-solutions—whether local or state initiatives, targeted restrictions on specific products, or efforts to influence individual behavior—is not new, its application to microplastic pollution is. This Article advances environmental law scholarship by demonstrating how a series of micro-measures could work to mitigate the problem of microplastic pollution.

Part II provides background on the science, sources, and impacts of microplastic pollution, situating it within the broader problem of plastic pollution and highlighting its ecological, economic, and public health implications. Part III surveys the current legal landscape, assessing the capacity and limitations of federal statutes and litigation strategies to address microplastic pollution. Part IV turns to solutions, presenting a framework of micro-interventions across the production, use, and disposal phases of the plastic lifecycle. These targeted measures—drawn from state and local innovations—demonstrate how subnational

actors can advance meaningful environmental protection, raise public awareness, and steer conversations at the federal level.

## II. A PRIMER ON PLASTIC POLLUTION

Plastic pollution is one of the most pressing global problems of our time. Numerous talking points underscore the gravity of the situation, putting the severity of the issue in context. You may have heard, for example, the following. Some research suggests we eat a credit card's worth of plastic every week.[2] By 2050, there will be more plastic than fish in the world's oceans.[3] Every 60 seconds, a dump truck's worth of plastic enters the ocean.[4]

While garbage, waste, and "marine debris" have been a target since the enactment of environmental legislation in the 1970s, microplastics are a newer concern.[5] In 2004, marine biologist Richard Thomas first used the term microplastics to describe small plastic fragments he and other scientists found in the sands of British beaches.[6] After detecting rising plastic concentrations in archival samples of plankton, they published a paper in *Science* concluding that microplastics had increased over time.[7] Today, microplastics have been found nearly everywhere—in surface water, deep-sea sediment, farmland, mountain peaks, sea ice, and over 1300 species of animals.[8] Organisms throughout the food web,

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2. *Compare* Kala Senathirajah et al., *Estimation of the Mass of Microplastics Ingested - A Pivotal First Step Towards Human Health Risk Assessment*, J. HAZARDOUS MATERIALS, Feb. 2021, at 1, https://pubmed.ncbi.nlm.nih.gov/33130380 (finding that humans may ingest up to 5g of microplastics weekly), *with* Martin Pletz, *Ingested Microplastics: Do Humans Eat One Credit Card Per Week?*, J. HAZARDOUS MATERIALS LETTERS, Nov. 2022, at 1, 4, https://www.sciencedirect.com/science/article/pii/S2666911022000247 (finding 5g/week to be a considerable overestimate of microplastics ingestion).

3. WORLD ECON. F., THE NEW PLASTICS ECONOMY 14 (Jan. 2016), https://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf.

4. *Id.*

5. *See* Jessica R. Coulter, *A Sea Change to Change the Sea: Stopping the Spread of the Pacific Garbage Patch with Small-Scale Environmental Legislation*, 51 WM. & MARY L. REV. 1959, 1968-72 (2010) (describing federal laws relating to "marine debris" and noting that no federal law explicitly regulates marine debris generated on land).

6. Richard Thompson, '*Everywhere We Looked We Found Evidence': The Godfather of Microplastics on 20 Years of Pollution Research and the Fight for Global Action*, THE CONVERSATION (May 3, 2024, at 12:10 EDT), https://theconversation.com/everywhere-we-looked-we-found-evidence-the-godfather-of-microplastics-on-20-years-of-pollution-research-and-the-fight-for-global-action-226418.

7. Richard C. Thompson et al., *Lost at Sea: Where is All the Plastic?*, 304 SCIENCE, May 2004, at 838.

8. Richard C. Thompson et al., *Twenty Years of Microplastic Pollution Research–What*

from invertebrates to humans, ingest microplastics through water, air, and food.[9] Studies that have detected these tiny particles in humans have disturbing results.

A 2025 study published in *Nature Medicine* compared microplastics in brain and liver tissue samples between 2016 and 2024 and found that the 2024 samples had "significantly higher concentrations of [microplastic particles]."[10] The study found that the "total mass concentration of plastics in the brain analyzed in this study increased by approximately 50 percent in the past 8 years."[11] Alarming headlines like "You might have a spoon's worth of microplastics - in your brain"[12] appeared soon after.

While the potential health consequences of microplastics remain largely unknown, emerging research connects microplastics to negative health impacts such as reproductive issues,[13] inflammation,[14] and adverse cardiovascular events.[15] For example, a March 2024 study found that, among patients being treated for plaque in their carotid arteries, those with microplastics detected in the plaque were at a higher risk of heart attack, stroke, and death.[16]

Science now confirms what many had suspected—microplastics are everywhere, even in our brains, and their presence poses a serious threat not only to wildlife but also to human health.

The next section describes how a promising product became such a pervasive problem.

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*Have We Learned?*, 386 SCIENCE, Sep. 19, 2024, at 3-4 https://www.science.org/doi/10.1126/science.adl2746.

9. *Id.* at 3-6.

10. Alexander J. Nihart et al., *Bioaccumulation of Microplastics in Decedent Human Brains*, 31 NATURE MED. 1114, 1116 (2025).

11. *Id.*

12. Elizabeth Weise, *You Might Have a Spoon's Worth of Microplastics – In Your Brain.*, USA TODAY (Feb. 3, 2025, at 13:21 ET), https://www.usatoday.com/story/news/nation/2025/02/03/microplastics-brain-body-accumulation-study/78005554007/.

13. Nicholas Chartres et al., *Effects of Microplastic Exposure on Human Digestive, Reproductive, and Respiratory Health: A Rapid Systematic Review*, 58 ENV'T SCI. AND TECH. 22843, 22858 (2024).

14. Yicong Cheng et al., *Microplastics: An Often-Overlooked Issue in the Transition from Chronic Inflammation to Cancer*, J. TRANSLATIONAL MED., Oct. 2024, at 1-2.

15. Raffaele Marfella et al., *Microplastics and Nanoplastics in Atheromas and Cardiovascular Events*, 390 NEW ENG. J. MED. 900, 900 (2024).

16. *Id.* at 907.

### A. *A brief history: Plastic becomes a material of choice*

Plastic is a synthetic material mostly manufactured from fossil fuels.[17] Oil and gas are refined into ethane and propane and then processed at high temperatures, or "cracked," into ethylene and propylene. Ethylene and propylene monomers are further treated to become polymers that comprise plastic pellets or nurdles.[18] Nurdles are then shipped to factories where they are melted and molded into all kinds of products, including water bottles, food packaging, auto parts, and medical devices.

Initially developed as a substitute for scarce materials like ivory, plastic became crucial to wartime efforts during World Wars (WW) I and II. This period of innovation led to the rise of petrochemical companies such as Standard Oil and Dow Chemical, which expanded their influence through lobbying and industry coalitions.[19]

When WWII ended, and these powerful companies could no longer rely on the U.S. government and military to purchase their products, the public became their consumer.[20] Plastic used in planes and parachutes evolved into Tupperware, furniture, and polyester suits.[21] The post-war economic boom, characterized by stability and increased consumer spending, accelerated the widespread adoption of plastic. By the 1950s and 1960s, plastics had displaced wood, glass, paper, cotton, wool, and metal in many applications.[22] As famously predicted in the 1967 film *The Graduate*, "there's a great future in plastics."[23]

The shift toward single-use plastics occurred in the mid-to-late 1970s, after Congress had already enacted key environmental laws.

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17. *Where Does Plastic Come From?*, PLASTICS FOR CHANGE (Oct. 27, 2020), https://www.plasticsforchange.org/blog/how-plastic-is-made.

18. *Id.*

19. SARAH J. MORATH, OUR PLASTIC PROBLEM AND HOW TO SOLVE IT, 15-16 (Cambridge Univ. Press, 2022).

20. Susan Freinkel, *A Brief History of Plastic's Conquest of the World*, SCI. AM. (May 29, 2011), https://www.scientificamerican.com/article/a-brief-history-of-plastic-world-conquest/.

21. MORATH, *supra* note 19, at 17-18.

22. *See* MORATH, supra note 19, at 17-19; *Why We Need to Understand the History of Plastic Before We Can Tackle the Problem*, PLAINE PRODUCTS: BLOG, https://www.plaineproducts.com/why-we-need-to-understand-the-history-of-plastic-before-we-can-tackle-the-problem/ (last visited Mar. 23, 2025) (discussing consumers' preference for plastics over steel, glass, and wood in cars, packaging, and furniture).

23. THE GRADUATE, at 6:17 (Lawrence Turman Productions 1967).

In the United States, plastic soda bottles were introduced in 1975,[24] and plastic grocery bags were proliferating by 1979.[25] Initially met with consumer resistance, plastic manufacturers lobbied grocery stores to adopt plastic bags over paper alternatives.[26]

Plastic quickly became the material of choice because of its durability, versatility, and affordability. The chemical design of plastic aided in its widespread adoption and subsequent problems. All plastics are polymers—long chains of repeating monomers—derived from hydrocarbons. Differences in additives and structures produce various polymer types, each with distinct properties.[27] Take, for example, PET (polyethylene terephthalate), the plastic used in plastic soda bottles. PET is made of ethylene terephthalate monomers with alternating ($C_{10}H_8O_4$) units and has a resin identification code of one.[28] Resin codes, located within the recycling symbol on consumer products, reflect different polymers and help differentiate plastics' recyclability and applications.[29]

24. Gene Smith, *Coca-Cola Trying a Plastic Bottle*, N.Y. TIMES, June 4, 1975, at 65, https://www.nytimes.com/1975/06/04/archives/cocacola-trying-a-plastic-bottle-pepsicola-contends-it-will.html.

25. MORATH, *supra* note 19, at 18-19; *From Birth to Ban: A History of the Plastic Shopping Bag*, U.N. ENV'T PROGRAMME (Dec. 20, 2021), https://www.unep.org/news-and-stories/story/birth-ban-history-plastic-shopping-bag.

26. U.N. ENV'T PROGRAMME, *supra* note 25.

27. *Id.*

28. Amogha G. Paldhi et al., *Microalgae: a Promising Tool for Plastic Degradation, in* MICROBES AND MICROBIAL BIOTECHNOLOGY FOR GREEN REMEDIATION 576 (Junaid Ahmad Malik ed., 2022); *see also* MORATH, *supra* note 19, at 14–15 (discussing characteristics and uses of thermosoftening plastics, including PET).

29. MORATH, *supra* note 19, at 175; Chandhana Sathishkumar, *Just One Word – Plastics*, MEDIUM (Jan. 12, 2023), https://medium.com/@chandhanas/plastic-from-nowhere-to-everywhere-f99d60f7b93.

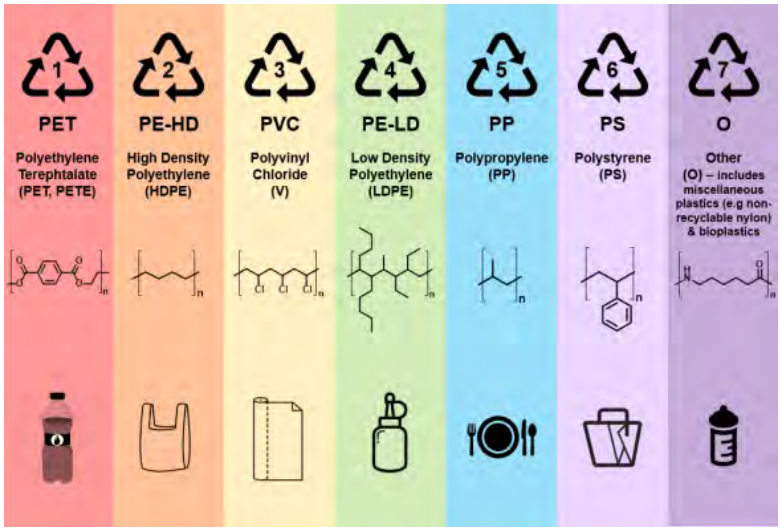


Figure 1: Common consumer plastics and their resin identification codes.[30]

Although some resins are more recyclable than others, all plastics have strong cross-linking bonds between polymer chains that are difficult to break.[31] As a result, plastic products persist in the environment long after their intended use.[32] This durability, while advantageous for manufacturers, complicates reuse, as recycled plastic remanufactured after bonds are broken is often of lower quality than virgin plastic.[33] Additionally, because virgin plastic remains cheaper than recycled alternatives, recycling has yet to become a widely adopted waste management solution, with rates still in the single digits in the United States.[34]

30. Sathishkumar, *supra* note 29.

31. *See* MORATH, *supra* note 19, at 37.

32. *See* David K. A. Barnes et al., *Accumulation and Fragmentation of Plastic Debris in Global Environments*, 364 PHIL. TRANSACTIONS ROYAL SOC'Y LOND. B BIOLOGICAL SCIS. 1985, at 1986 (2009) ("durability of plastic ensures that wherever it is, it does not 'go-away'").

33. Sarah Deweerdt, *Why It's So Hard to Recycle Plastic*, SCI. AM. (Dec. 13, 2022), https://www.scientificamerican.com/article/why-its-so-hard-to-recycle-plastic/; *see also* MORATH, *supra* note 19, at 177 (explaining traditional methods of recycling can only be applied to plastics once or twice before polymers break down completely).

34. *See* MORATH, *supra* note 19, at 172 (explaining only ten percent of plastic produced in the United States, and two percent produced globally, is recycled); *see also* Jan Dell, *Six Times More Plastic Waste is Burned in U.S. Than is Recycled*, Plastic Pollution Coal. (Apr. 30, 2019), https://www.plasticpollutioncoalition.org/blog/2019/4/29/six-times-more-plastic-waste-is-burned-in-us-than-is-recycled.

Plastic, once celebrated as a triumph of industrial innovation and consumer convenience, has become one of the most pervasive and unanticipated pollution problems. The durability and low cost of plastic fueled its exponential growth. The widespread introduction of single-use plastics in the 1970s and 1980s, after the passage of federal environmental laws, has significantly contributed to the current microplastic crisis. Because the term "microplastics" does not appear in existing environmental statutes, these pollutants have escaped regulation. The absence of legal oversight, combined with plastic's inherent characteristics, has allowed microplastics to proliferate globally, creating the microplastic problem of today.

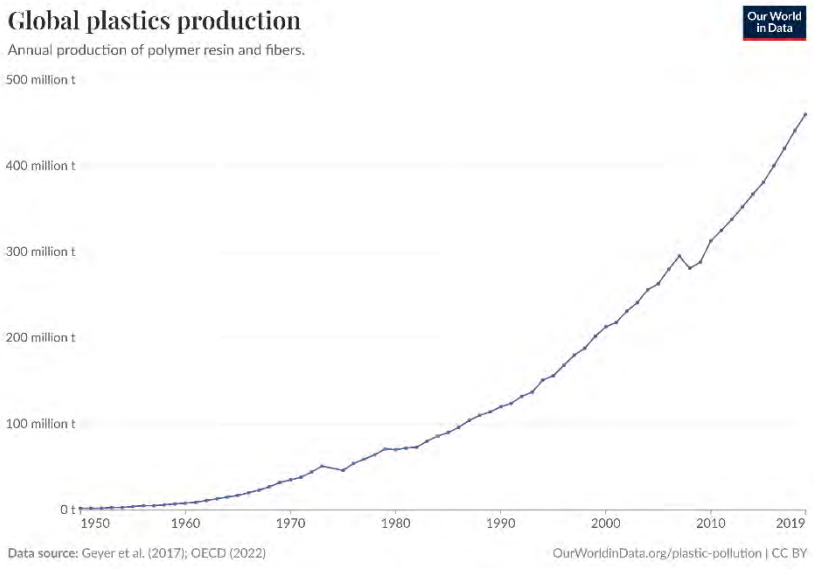


Figure 2: Annual plastics production.[35]

## B. *Microplastics: A multidimensional contaminant*

An estimated 10 to 40 million metric tons of microplastic particles are released into the environment every year, and if current trends continue, the number could double by 2040.[36]

35. Hannah Ritchie et al., *Plastic Pollution*, OUR WORLD IN DATA (2023), https://ourworldindata.org/plastic-pollution.

36. Katia Savchuk, *What's the Deal with Microplastics, the Material That 'Never Goes Away'?*, STANFORD REPORT (Jan. 29, 2025), https://news.stanford.edu/stories/2025/01/what-s-the-deal-with-microplastics-the-material-that-never-goes-away.

Microplastics—plastic particles less than 5 millimeters in size—originate from two primary sources: primary microplastics and secondary microplastics. Primary microplastics are manufactured at a microscopic scale for specific industrial or commercial purposes. Examples include nurdles (small plastic pellets used in plastic production) and microbeads (formerly common in personal care products). Secondary microplastics result from the fragmentation of macroplastics, such as plastic bags, bottles, fishing nets, and packaging materials.[37]

Unlike organic materials, plastic does not decompose. Instead, plastic breaks into smaller fragments through physical, chemical, and biological processes, and remains in the environment for decades or longer. These processes can include the sun (photodegradation), water (hydrolysis), or bacteria and fungi (enzymatic depolymerization),[38] as well as mechanical abrasion (e.g., wave action, vehicle traffic, washing), and chemical degradation.[39] Secondary microplastics are more diverse, smaller, and complex, and are the primary contributor to environmental microplastic pollution.[40] Some microplastics are intentionally added to products like cosmetics and paint. Both resin pellets and exfoliants are deliberately manufactured for specific uses and are therefore classified as primary microplastics, whereas secondary microplastics result from the degradation of larger plastic items.[41]

Microplastics are challenging to regulate for three reasons. First, microplastics are now ubiquitous. They have been found in oceans, rivers, soil, air, and humans.[42] Studies have detected them in drinking water, seafood, table salt, placental tissue, and chewing

37. MORATH, *supra* note 19, at 24; Khaled Ziani et al., *Microplastics: A Real Global Threat for Environmental and Food Safety: A State of the Art Review*, 15, NUTRIENTS 617 (Jan. 25, 2023), at 622.

38. Raffaele Porta, *Anthropocene, the Plastic Age and Future Perspectives*, 11 FEBS OPEN BIO 948, 949-50 (2021).

39. Joana Marie Sipe et al., *From Bottle to Microplastics: Can We Estimate How Our Plastic Products are Breaking Down?*, 814 SCI. TOTAL ENV'T, Mar. 25, 2022, at 1, 2

40. Yue Li et al., *Microplastics in the Human Body: A Comprehensive Review of Exposure, Distribution, Migration Mechanisms, and Toxicity*, 946 SCI. OF THE TOTAL ENV'T, Oct. 10, 2024, at 1, 8, https://www.sciencedirect.com/science/article/abs/pii/S0048969724043638.

41. MORATH, *supra* note 19, at 24.

42. Joe Myers & Madeleine North, *Microplastics: Are We Facing a New Health Crisis – and What Can be Done About it?*, WORLD ECONOMIC FORUM: NATURE AND BIODIVERSITY (Feb. 19, 2025), https://www.weforum.org/stories/2025/02/how-microplastics-get-into-the-food-chain/.

gum.[43] In 2025, scientists found that every gram of gum would release 100 microplastics, though some pieces released as many as 600.[44] Microplastics are so small that they cannot be filtered out of water through traditional wastewater treatment processes.[45] From tires to chewing gum, microplastics are everywhere, and their prevalence has generated concern about health and environmental impacts.

Second, microplastics come in a variety of sizes and shapes, including fibers (from synthetic textiles), fragments (from degraded packaging), films (from plastic bags), and spheres (from cosmetic exfoliants). The size and shape of microplastics impact how microplastics interact with organisms and ecosystems and can influence toxicity, persistence, and ability to be absorbed by living tissues.[46] For example, nanoplastics (smaller than 10 microns) can cross biological barriers like the intestinal lining and enter the bloodstream, potentially accumulating in organs.[47] Irregularly shaped microplastics are more likely to harm cells.[48]

Finally, the chemical composition of plastic varies widely and includes common polymers like polyethylene (PE) used in plastic bags, polypropylene (PP) found in bottle caps and food containers, and polystyrene (PS) used in foam packaging and disposable cups.[49] These materials may also contain additives such as flame retardants, plasticizers, and stabilizers, which can leach into the

43. *See* Stephanie Dutchen, *Microplastics Everywhere*, HARV. MED. (2023), https://magazine.hms.harvard.edu/articles/microplastics-everywhere.

44. *See* Kristin Toussaint, *Every Time You Chew Gum, You're Filling Your Mouth with Plastic*, FAST COMPANY (Mar. 25, 2025), https://www.fastcompany.com/91304646/every-time-you-chew-gum-youre-filling-your-mouth-with-plastic.

45. Ziani et al., *supra* note 37, at 622.

46. *See* Simon Wieland et al., *From Properties to Toxicity: Comparing Microplastics to Other Airborne Microparticles*, 428 J. HAZARDOUS MATERIALS, Apr. 2022, at 2 (noting that "microfibers interact with cells and tissues differently than microspheres, fragments, or films," resulting in "shape-specific toxicity of different microparticles.").

47. *See* Nell Hirt & Mathilde Body-Malapel, *Immunotoxicity and Intestinal Effects of Nano- and Microplastics: A Review of the Literature*, 17 PARTICLE & FIBER TOXICOLOGY 57, Nov. 2020, at 6 (discussing nanoplastics' ability to cross the blood-brain barrier, penetrating the brain among other organs).

48. *See* Evangelos Danopoulos et al., *A Rapid Review and Meta-Regression Analyses of the Toxicological Impacts of Microplastic Exposure in Human Cells*, 427 J. HAZARDOUS MATERIALS, Apr. 2022), at 1, 11 (finding predictive relationship between human exposure to irregular-shaped microplastics and cell death).

49. *See* MORATH, *supra* note 19, at 14–15 (discussing types of thermosetting and thermosoftening plastics and their common uses).

environment.[50] This complexity makes managing plastic waste challenging. For example, recycling rates are low, in part, because the recycling process, which often mixes the different types of plastic, produces material that is less useful anddurable.[51] The chemical complexity of plastic also increases its potential to harm human and environmental health. A 2024 report from the United Nations found that more than 13,000 chemicals are associated with plastics and plastic production.[52] Ten classes of chemicals (based on chemistry, uses, or sources) are identified as being of major concern due to their high toxicity and potential to migrate or be released from plastics.[53]

Microplastic pollution shares similarities with other environmental harms yet remains uniquely distinct. Like greenhouse gases, microplastics originate from human activities and have become ubiquitous, permeating all ecosystems. Their persistence and chemical composition parallel that of per- and polyfluoroalkyl substances (PFAS), including perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), often called 'forever chemicals' due to their resistance to degradation. Additionally, the small size and varied shapes of microplastics mirror the dispersal patterns of particulate air pollution, which can travel long distances and infiltrate both natural and built environments. Taken together, these characteristics underscore the complexity of microplastic pollution—simultaneously omnipresent, chemically persistent, and physically diverse—posing challenges for mitigation and regulation.

### C. *The global impacts of microplastic pollution: ecological, economic, and health*

Plastic is forever. Once seen as a technological triumph, plastic has become a defining environmental challenge. Today, plastic is not only long-lasting—it is the material of choice for manufacturers across the globe. But a linear, rather than circular-use model, means a never-ending disposal problem for plastic. In the United States, plastic constitutes the third largest category of municipal

50. *Id.*

51. *See* Sarah Morath, *Our Recycling Problem*, NAT. RES. & ENV'T (2024), https://www.americanbar.org/groups/environment_energy_resources/resources/natural-resources-environment/2024-spring/our-recycling-problem/.

52. UNEP, CHEMICALS IN PLASTICS: A TECHNICAL REPORT (2023).

53. *Id.*

solid waste by weight, accounting for 12.2 percent of total generation, trailing only paper (23.05 percent) and food waste (21.59 percent).[54] Plastic also dominates marine debris, comprising more than 80 percent of the waste found in oceans.[55] And, as noted, the production of plastic continues to rise at an exponential rate.

Because of its increasing presence in the environment, plastic has been proposed as a geologic indicator of the Anthropocene.[56] Plastic layers in rocks will identify the "plastic age"; with "[o]ur love for plastic [] being left behind in the geologic record."[57] In addition to altering the earth's surface with new layers and geologic formations, such as plastiglomerates,[58] plastic has transformed ecosystems, harmed economies dependent on those ecosystems, and impacted human health.

The permanence and pervasiveness of plastic affect ecosystems, economies, and public health, directly and indirectly harming wildlife, burdening local communities, and raising serious concerns about human exposure. As plastic pollution accelerates, the ecological, social, and economic costs of microplastics are just beginning to be understood.[59]

### 1. *Ecological Impacts*

Plastic in the environment invokes a visceral response. We might recoil when we see it landing on beaches, floating in rivers and oceans, and sailing through the air. Images of marine

54. *National Overview: Facts and Figures on Materials, Wastes and Recycling*, U.S. ENV'T PROT. AGENCY (Nov. 8, 2024), https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials.

55. Marta Fava, *Ocean Plastic Pollution an Overview: Data and Statistics*, UNESCO: OCEAN LITERACY PORTAL (May 9, 2022), https://perma.cc/3CJG-FGRK.

56. *See* Raffaele Porta, *Anthropocene, the Plastic Age and Future Perspectives*, 11 FEBS OPEN BIO 948, 949 (2021) ("[F]ossilized plastics will be probably considered the key markers of the epoch in which we humans lived.").

57. Damian Carrington, *After Bronze and Iron, Welcome to the Plastic Age, Say Scientists*, THE GUARDIAN (Oct. 29, 2021), https://www.theguardian.com/environment/2019/sep/04/plastic-pollution-fossil-record.

58. *See Plastic Rocks Discovered on India's East Coast*, NATURE INDIA: RESEARCH HIGHLIGHTS (July 3, 2024), https://www.nature.com/articles/d44151-024-00102-x.

59. Some studies have shown a direct link between the proliferation of plastic and negative impacts on most ecosystem services, the economy, and human wellbeing. *See* Nicola J. Beaumont et al., *Global Ecological, Social and Economic Impacts of Marine Plastic*, 142 MARINE POLLUTION BULL., 189, 193, 194 (2019).

mammals entangled in fishing nets and six-pack rings or impaled by plastic straws are even more distressing. Reading alarming stories of plastic bags in the stomachs of whales inspired my journey into researching our plastic problem.

While the harms from macroplastics are well-reported in news stories and images, the harms associated with microplastics are harder to detect and record. Fortunately, research on and stories about microplastics are now more common in the scientific literature and popular press.[60] In May 2023, scientists defined *plasticosis* as a new plastic-induced fibrotic disease.[61] Marine life has long been known to ingest plastic, often mistaking plastic for food.[62] One study of loggerhead turtles in Florida found that over 90 percent of the hatchlings had swallowed plastic.[63] Plastic ingestion by animals can lead to many harms, including malnutrition, internal injuries, and behavioral changes that impact survival and reproduction.[64] Plastic ingestion is also known to lead to tissue damage in affected animals.[65] For example, *plasticosis*, the newly identified plastic-induced fibrotic disease, was first documented in flesh-footed shearwaters (*Ardenna carneipes*), a seabird species that frequently consumes plastic debris from the ocean.[66]

The impact of microplastics extends beyond an individual organism, affecting entire systems and processes. For example, microplastics can "carry" environmental and bacterial pollutants—acting "as a reservoir for viral, bacterial, and eukaryotic human pathogens."[67] Microplastics could impact cloud formation,

60. This article does not address all the harms and provides a few notable examples.

61. Hayley S. Charlton-Howard et al., *'Plasticosis': Characterising Macro- and Microplastic-Associated Fibrosis in Seabird Tissues*, 450 J. HAZARDOUS MATERIALS (May 15, 2023) at 1, 2.

62. This happens for several reasons. For example, plastic bags floating in water can look like jellyfish. Some plastic emits an odor similar to bacteria or algae. Because plastic is lightweight, it stays suspended in the water, increasing the likelihood that marine life encounters it. *See* MORATH, *supra* note 19, at 43–45 (discussing driving factors of plastic ingestion for sea life).

63. Catherine B. Eastman et al., *Plastic Ingestion in Post-Hatchling Sea Turtles: Assessing a Major Threat in Florida Near Shore Waters*, 7 FRONTIERS MARINE SCI. (Aug. 24, 2020) at 1, 3.

64. *See* MORATH, *supra* note 19, at 40–43.

65. *Id.*

66. Charlton-Howard et al., *supra* note 61, at 2.

67. Michael J. Ormsby et al., *Can Plastic Pollution Drive the Emergence and Dissemination of Novel Zoonotic Diseases?*, 246 ENV'T RSCH., Apr. 2024, at 1 (first citing Gerasimos Gkoutselis et al., *Microplastics Accumulate Fungal Pathogens in Terrestrial Ecosystems*, 11 SCI. REPS. 1 (2021); then citing Rebecca Metcalf et al., *Quantifying the Importance of Plastic Pollution for the Dissemination of Human Pathogens: The Challenges of Choosing an Appropriate*

influencing "precipitation patterns, weather forecasting, climate modeling, and even aviation safety."[68] In 2025, microplastics were reported as harming plants,[69] "reducing photosynthesis by as much as 7 to 12 percent, on average."[70] Finally, greenhouse gases are emitted at all stages of plastics' life cycle, from production to use and disposal. The rapid increase in plastic production and the associated increase in emissions will further exacerbate the climate crisis.[71]

While our understanding of plastic in the environment continues to evolve, the evidence suggests long-term ecological impacts.

2. *Social Costs*

Humans are not immune to the impacts of plastic particles. The research has demonstrated that humans come into contact with microplastics through inhalation, ingestion, and dermal exposure. Given that microplastics have been found in soil,[72] food,[73] salt,[74] and drinking water,[75] including bottled water,[76] human ingestion estimates are high: between 39,000 and 52,000 microplastic

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*'Control' Material*, 810 SCI. TOTAL ENV'T 1 (2022); then citing Vanessa Moresco et al., *Binding, Recovery, and Infectiousness of Enveloped and Non-Enveloped Viruses Associated with Plastic Pollution in Surface Water*, 308 ENV'T POLLUTION 1 (2022); and then citing Emma Zhang et al., *Association of Zoonotic Protozoan Parasites With Microplastics in Seawater: Implications for Human and Wildlife Health*, 12 SCI. REPS. 1 (2022)).

68. Adrienne Berard, *Microplastics Impact Cloud Formation, Likely Affecting Weather and Climate*, PENN STATE: RSCH. (Nov. 7, 2024), https://www.psu.edu/news/research/story/microplastics-impact-cloud-formation-likely-affecting-weather-and-climate.

69. Ruijie Zhu et al., *A Global Estimate of Multiecosystem Photosynthesis Losses Under Microplastic Pollution*, 122 PROC. NAT'L ACAD. SCIS., Mar. 2025, at 1.

70. Joanna Thompson, *Microplastics are Messing with Photosynthesis in Plants*, SCI. AM. (Mar. 10, 2025), https://www.scientificamerican.com/article/microplastic-pollution-is-messing-with-photosynthesis-in-plants/.

71. *See* Maocai Shen et al., *(Micro)plastic Crisis: Un-Ignorable Contribution to Global Greenhouse Gas Emissions and Climate Change*, 254 J. CLEANER PROD., May 2020, at 1, 3

72. *See* Defu He et al., *Microplastics in Soils: Analytical Methods, Pollution Characteristics, and Ecological Risks*, 109 TRAC TRENDS ANALYTICAL CHEMISTRY 163 (2018).

73. *See* Madeleine H. Milne et al., *Exposure of U.S. Adults to Microplastics from Commonly-Consumed Proteins*, 343 ENV'T POLLUTION, Feb. 2024, at 1.

74. *See* Ali Karami et al., *The Presence of Microplastics in Commercial Salts from Different Countries*, 7 SCI. REPS., Apr. 2017, at 1.

75. *See* Albert A. Koelmans et al., *Microplastics in Freshwaters and Drinking Water: Critical Review and Assessment of Data Quality*, 155 WATER RSCH. 410 (2019).

76. *See* Sherri A. Mason et al., *Synthetic Polymer Contamination in Bottled Water*, 6 FRONTIERS CHEMISTRY, Sep. 2018, at 1.

particles annually.[77] Seafood is a particularly significant source of microplastics. Microplastics are known to accumulate in shellfish and filter-feeding organisms, and when consumed, these plastics enter the human digestive system.[78] In addition to ingestion, inhalation is a concern, particularly in urban areas where airborne microplastics from tire wear, synthetic textiles, and industrial emissions are prevalent.[79] Research has found microplastics in several human organs,[80] including the brain and lungs, blood, placentas, and breast milk.[81]

Emerging research has shown that microplastics can cause or exacerbate inflammation, oxidative stress, cellular damage, and cardiovascular events. For example, one study found that chronic inflammation caused by microplastics could aid in tumor development and catalyze cancer progressions.[82] Another study from 2024 published in the *New England Journal of Medicine* found that "the rate of heart attack, stroke, and death was 4.5 times higher in people with microplastics in their plaque than those without."[83] The ability of microplastics to act as vectors for pathogens and toxic chemicals has been shown to have adverse effects on antibiotic resistance.[84] Some studies suggest that particles smaller than microplastics, known as nanoplastics, can cross biological barriers such as the intestinal lining and the blood-brain barrier, posing additional risks.[85]

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77. Kieran D. Cox et al., *Human Consumption of Microplastics*, 53 ENV'T SCI. & TECH. 7068, 7071 (2019) (excluding inhalation).

78. *See* Madeleine Smith et al., *Microplastics in Seafood and the Implications for Human Health*, 5 CURRENT ENV'T HEALTH REPS. 375, 377 (2018), https://pmc.ncbi.nlm.nih.gov/articles/PMC6132564.

79. *See* Ashkan Jahandari, *Microplastics in the Urban Atmosphere: Sources, Occurrences, Distribution, and Potential Health Implications*, 12 J. HAZARDOUS MATERIALS, Nov. 2023, at 3, 4.

80. *See* Cheng et al, *supra* note 14, at 2-3.

81. *See id.*; Antonio Ragusa et al., *Raman Microspectroscopy Detection and Characterisation of Microplastics in Human Breastmilk*, 14 POLYMERS 1 (2022).

82. *See* Cheng et al., *supra* note 14, at 4.

83. Julie Corliss, *Microplastics in Arteries Linked to Heart Disease Risk*, HARV. HEALTH PUBL'G (June 1, 2024), https://www.health.harvard.edu/heart-health/microplastics-in-arteries-linked-to-heart-disease-risk.

84. *See* Neamatollah Jaafarzadeh Haghighi Fard et al., *Microplastics as Vectors for Antibiotic Resistance Genes and Their Implications for Gut Health*, 2 DISCOVER MED., Jan. 2025, at 1; Leonardo Trasande, *Making Invisible Chemicals Used in Plastic Materials Visible*, 109 eBioMedicine, Nov. 2024, at 1.

85. *See* Hirt & Malapel, *supra* note 47.

Indirect human health impacts, such as climate change, are also associated with plastic. Greenhouse gases are emitted across the plastic lifecycle—from production to disposal.[86] Plastic also degrades with heat; thus, an increase in plastic manufacturing coupled with a warming planet will likely lead to more microplastics released into the environment.[87] Those unable to leave areas threatened by increasing temperatures are, therefore, more likely to be exposed to microplastics.[88]

### 3. *Economic Considerations*

Plastic pollution also has associated economic costs.[89] The United Nations has estimated that globally, plastic pollution causes at least $13 billion of financial damage annually.[90] While precise amounts are difficult to calculate, a 2019 study reports a "substantial negative impact[] on almost all ecosystem services" as a result of marine pollution.[91] This decline results in an annual loss of $500–$2500 billion in the value of benefits derived from marine ecosystem services.[92] The two primary benefits impacted are: 1). provisions for fisheries, aquiculture, and materials for agricultural and cultural use, and 2). tourism.[93] For example, plastics pose a direct risk to fish stocks.[94] Additional costs include those associated with infrastructure harms, like repairing fishing and boating

86. *See* CTR. FOR INT'L ENV'T L., PLASTIC & CLIMATE: THE HIDDEN COSTS OF A PLASTIC PLANET 1 (2019).

87. *See* Xin-Feng Wei et al., *Plastic Pollution Amplified by a Warming Climate*, 15 NATURE COMMC'NS, Mar. 2024, at 1.

88. *See* Susana Lincoln, *Marine Litter and Climate Change: Inextricably Connected Threats to the World's Oceans*, 837 SCI. TOTAL ENV'T, Sep. 2022, at 7 (explaining the negative impact of increased presence of marine litter on marine ecosystem climate resilience).

89. *See generally* Beaumont, *supra* note 59, at 193 (conservatively estimating costs of marine plastic between $3,300 and $33,000 per ton of marine plastic annually).

90. UNEP, VALUING PLASTICS: THE BUSINESS CASE FOR MEASURING, MANAGING AND DISCLOSING PLASTIC USE IN THE CONSUMER GOODS INDUSTRY 7 (2014), https://www.unep.org/resources/report/valuing-plastic-business-case-measuring-managing-and-disclosing-plastic-use. While there is no uniform method for determining the social costs of plastic pollution, at one point, the National Oceanic and Atmospheric Association was working to develop a framework for determining the dollar value for avoided plastic pollution. *See* NOAA Marine Debris Program, *Determining the Social Costs of Plastic Pollution*, https://marinedebris.noaa.gov/research/determining-social-costs-plastic-pollution (last updated Sept. 17, 2023).

91. *See Beaumont*, supra note 57, at 193.

92. *Id.*

93. *See* Ziani et al., *supra* note 37, at 624–25 (discussing influence of plastic waste on economic sectors and society generally).

94. *See Beaumont*, supra note 57, at 190.

equipment damaged by plastic.[95] Plastic debris also makes coastal areas less attractive and impacts local economies.[96] Clean-up costs will increase, and tourism dollars will decrease as uncontrolled plastic pollution continues.[97]

There is also an economic cost associated with the social and health-related losses. A recent study calculated the cost associated with health-related economic losses from plastic to be more than $1.5 trillion annually.[98] A study looking at just cardiovascular diseases caused by DEHP, a plastic-softening phthalate found in food packaging and medical tubing, estimated between $510 billion and $3.74 trillion in social and health-related costs.[99] This study suggests that plastic is a net negative for the economy, given that the global plastic industry was only valued at $524.48 billion in 2024.[100]

A final, but critical consideration, is that many of these adverse impacts—ecological, health, and social—are felt by the most vulnerable communities. The harms are not evenly spread and disproportionately affect marginalized populations, including "fenceline communities" in the Global North and Indigenous groups in the Global South.[101] Burning plastic for fuel or to dispose of plastic is common in some countries.[102] Solutions to plastic pollution should consider these uneven burdens to ensure that no group bears a disproportionate share of the negative impacts of plastics.

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95. Alistair McIlgorm et al, *The cost of marine litter damage to the global marine economy: Insights from the Asia-Pacific into prevention and the cost of inaction*, 174 Marine Pollution Bulletin (January 2022), https://www.sciencedirect.com/science/article/pii/S0025326X21012017.

96. *Beaumont*, supra note 57, at 191.

97. *Id.*

98. Philip Landgrean, et. al., *The Lancet countdown on health and plastics*, 406 The Lancet 1044, 1050 (Aug. 3, 2025).

99. Leo Trasard, *Chemicals in plastic are literally killing us. Here is how we can break free*, Reuters (July 31, 2025), https://www.reuters.com/sustainability/society-equity/chemicals-plastics-are-literally-killing-us-heres-how-we-can-break-free-2025-07-31/.

100. *Id.*

101. *See* Philip J. Landrigan et al., *The Minderoo-Monaco Commission on Plastics and Human Health*, 89 Annals Glob. Health 1, 94 (2023), https://annalsofglobalhealth.org/articles/10.5334/aogh.4056; *see also* Sean Mowbray, *Open burning of plastic is an escalating public health threat, say experts*, Mongabay (July 17, 2025) https://news.mongabay.com/2025/07/open-burning-of-plastic-is-an-escalating-public-health-threat-say-experts/.

102. *Id.*

### D. *Consumers and Companies Respond*

Alarming news about the degree to which everyday lives and the environment are exposed to plastic continues to be reported. In August 2025, The Atlantic published an essay entitled *I fought plastic. Plastic won.* about one woman's efforts to rid her daily life of plastic.[103] In March 2025, *Sustainability*, a scientific journal, published a study that found microplastics in every fish sampled in seven freshwater streams in North Central Appalachia.[104] The lead author noted that 98 percent of the microplastics were microfibers.[105]

Given that plastic is everywhere and extremely difficult to avoid, consumer sentiment may finally be changing. A study published by The Wall Street Journal in July 2025 reflects consumer willingness to avoid products with excessive plastic packaging. The survey, conducted by a sustainability consulting firm, found that 37 percent of consumers surveyed across the United States and Canada and 42 percent of European consumers decided against buying something because it was unsustainably packaged.[106] Additionally, several shareholder proposals targeting plastic were considered in 2024. The proposals, sponsored by both more conservative and liberal-leaning organizations, targeted plastic packaging, with groups asking for stronger economic and scientific analysis in plastic packaging policies.[107] A push from shareholders is behind Amazon's cut in plastic packaging in the first quarter of 2024.[108]

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103. Anne Lowery, *I fought plastic. Plastic won.* The Atlantic (Aug. 2025). https://www.theatlantic.com/magazine/archive/2025/08/microplastics-exposure-health-risks/683249/

104. Isabella Tuzzio et al., *Widespread Microplastic Pollution in Central Appalachian Streams: Implications for Freshwater Ecosystem Sustainability*, Sustainability, 26 March 2025, at 1-17, https://doi.org/10.3390/su17072926.

105. Kyra Mccague, *West Virginia University Study Finds Microplastic Pollution in Appalachian Streams*, The Allegheny Front (July 8, 2025), https://www.alleghenyfront.org/west-virginia-university-microplastic-pollution/.

106. Yusuf Khan, *Shoppers are slowly turning away from plastic packaging*, The Wall Street Journal (July 14, 2025), https://www.wsj.com/articles/shoppers-are-slowly-turning-away-from-plastic-packaging-f106a737.

107. Maira Rachal, *How shareholders voted on plastics and packaging proposals in 2025*, Packaging Dive (June 13, 2025), https://www.packagingdive.com/news/plastics-packaging-shareholder-resolutions-nlpc-as-you-sow/750573/.

108. Jeff Young, *How a Nudge from Shareholders Helped Amazon Cut Plastic Waste*, Newsweek (July 24, 2025), https://www.newsweek.com/how-nudge-shareholders-helped-amazon-cut-plastic-waste-2103194.

Consumer and corporate behavior both respond to and shape the judicial and legislative responses, illustrating how public sentiment and private action can influence plastic regulation.

## III. LEGAL LANDSCAPE AND REGULATORY GAPS

This section surveys the current legal landscape, highlighting the range of public- and private-law approaches to address plastic pollution. These include regulatory interventions and litigation, as well as common law claims such as nuisance and deceptive trade practices. The federal government's effort to address plastic pollution is shaped by outdated statutes, symbolic bans, and ineffective programmatic coordination.

Notably, many of these legal approaches mirror those developed in response to climate change.[109] While a comprehensive comparison between the problems of climate change and plastic pollution is beyond the scope of this Article, it is worth observing that strategies for both problems reflect the Environmental Protection Agency's waste management hierarchy, which ranks management techniques from most to least environmentally preferred.[110] The preferred strategy for both is source reduction: reducing greenhouse gas emissions in the case of climate change and curbing virgin plastic production in the case of plastic pollution. Recognizing that production caps face political headwinds,[111] advocates have recommended product redesign in tandem with the preferred strategy. Replacing single-use plastics with reusable alternatives is a product redesign approach analogous to the transition from fossil fuels to renewable energy. Finally, downstream waste management techniques, such as improved recycling systems and microplastic capture, resemble climate-focused efforts like carbon capture and storage.

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109. Doug Rendleman, *Rehabilitating the Nuisance Injunction to Protect the Environment*, 75 WASH. & L. REV. 1859 (2019).

110. ENV'T PROT. AGENCY, *Sustainable Materials Management: Non-Hazardous Materials and Waste Management Hierarchy*, (last updated Feb. 3, 2025), https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy.

111. Olivia Le Poidevin & Valerie Volcovici, *Exclusive: Trump Administration Memo Urges Countries to Reject Plastic Production Caps in UN Treaty*, Reuters (August 6, 2025), https://www.reuters.com/sustainability/climate-energy/trump-administration-memo-urges-countries-reject-plastic-production-caps-un-2025-08-06/.


Figure 3: Environmental Protection Agency's Waste Management Hierarchy.[112]

If the status quo persists, the negative impacts of plastic will persist. The following section explores the legal responses that have emerged in the absence of a comprehensive federal law. As with climate change, regulatory responses to plastic pollution encompass a range of strategies, including state-led innovation and private litigation.

### A. *Legislation*

Not surprisingly, the U.S. federal approach to plastic pollution has been insufficient. In contrast to countries such as those in the EU and Canada[113] that embrace precautionary principles and upstream interventions, the United States has historically taken a reactive stance toward environmental harm.[114] Federal environmental law, as it evolved in the latter half of the twentieth century, prioritized point-source pollution, acute toxicity, and

112. ENV'T PROT. AGENCY *Sustainable Materials Management*, *supra* note 110.

113. Martin Miscia, *Microplastics and the Precautionary Principle: Warding off an Invisible Threat*, (May 31, 2022) (Master's thesis, University of Zurich) https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4741803.

114. *See* Sanne H. Knudsen, *The Exoskeleton of Environmental Law: Why the Breadth, Depth, and Longevity of Environmental Law Matters for Judicial Review*, 2023 UTAH L. REV. 1, 22 (2023). ("Given the individual stories of how federal environmental statutes were born of momentary awakenings, it is not very surprising that courts, scholars and others with an interest in the subject might see environmental law as a reactionary field.") This contrasts with a precautionary approach, which "would give agencies greater latitude to regulate in the face of scientific uncertainty if doing so were consistent with the commands of the statute." *See id.* at 56.

hazardous cleanups.[115] These priorities, while instrumental in reducing certain forms of industrial contamination, have proven ill-suited to the complex, diffuse, and emergent challenges posed by plastic pollution, particularly microplastics, a word that, until recently, did not appear in regulations or policy discussions.

Over time, federal policymakers have increasingly relied on non-regulatory, market-based strategies to address environmental degradation.[116] These "neoliberal" approaches—which favor voluntary action, self-regulation, and consumer choice—have found limited success (think recycling and canvas bag use), but they have not meaningfully curtailed the production, use, or environmental leakage of plastic.[117] Indeed, the overall volume of plastic waste generated in the United States continues to rise as data on microplastics grows more alarming.

As explained in Part II, plastic pollution occurs not only through improper disposal but across the entire lifecycle of plastic: its extraction from fossil fuels, its manufacture and use in short-lived products, and its inevitable breakdown into persistent particles. Yet federal regulation tends to treat plastic as a post-consumer waste problem, narrowly focused on end-of-pipe solutions such as landfill disposal and recycling. An outdated regulatory system has hindered effective federal action, particularly in addressing the less visible and growing problem of microplastics.

The federal government's stance on plastic pellets or nurdles is illustrative of this approach. As early as 1992, the Environmental Protection Agency (EPA) acknowledged the growing threat of

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115. *See* David M. Uhlman, *Back to the Future: Creating a Bipartisan Environmental Movement for the 21st Century*, 50 ENVTL. L. REP. 10800, 10801 (2020) (describing the events that led to the passing of two dozen environmental laws in the 1970s and 80s to include "the Santa Barbara oil spill in California and the Cuyahoga River on fire in Ohio, . . . the evacuation of the communities of Love Canal and Times Beach, and . . . thousands of hazardous waste drums lining open pits at the Valley of the Drums in Kentucky and Stringfellow in California.").

116. *See* Sanford E. Gaines, *Reimagining Environmental Law for the 21st Century*, 44 ENVTL. L. REP. 10188, 10197 (2014) (describing how, after the 1980s, business began to object to perceived overregulation and economic theory began to influence political leadership).

117. *See* Jason J. Czarnezki & Katherine Fiedler, *The Neoliberal Turn in Environmental Regulation*, 2016 UTAH L. REV. 1, 3 (2016) (describing neoliberalism as "evad[ing] any one specific definition [and] . . . expressed over the last thirty years through various forms of local, national, and international experiments in laissez-faire political economy around the world, using regulations that aim to deploy markets as the solution to environmental problems."), https://dc.law.utah.edu/cgi/viewcontent.cgi?article=1019&context=ulr.

nurdles to aquatic environments. In its report, *Plastic Pellets in the Aquatic Environment: Sources and Recommendations ("Plastic Pellet Report")*, the EPA undertook a comprehensive review of the sources, fate, and effects of plastic pellets and proposed legal and regulatory strategies to control their release.[118] The *Plastic Pellet Report* identifies a few statutes implicated by pellet pollution. One such statute is the Marine Plastic Pollution Research and Control Act of 1987 (MPPCRA), which implements Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL).[119] MPPCRA prohibits the discharge of plastics, including ropes, nets, and packaging, from vessels into U.S. waters and mandates EPA and NOAA research into marine debris. However, because MARPOL applies only to at-sea discharges, MPPCRA is inapplicable to the land-based sources responsible for eighty percent of the plastic entering marine environments.

By contrast, the Clean Water Act (CWA) offers more direct regulatory authority over land-based discharges. Section 402 of the Act prohibits the discharge of pollutants from point sources into navigable waters without a permit issued under the National Pollutant Discharge Elimination System (NPDES).[120] Although microplastics are not explicitly listed as pollutants under the CWA, the statute defines "pollutant" broadly to include solid waste and industrial discharges.[121] The *Plastic Pellet Report* identified stormwater runoff from plastic production and handling facilities as a major pathway for pellet pollution, raising the possibility that NPDES permits could be used to limit such discharges.[122] In recent years, environmental organizations have advanced this theory in

118. ENV'T PROT. AGENCY, PLASTIC PELLETS IN THE AQUATIC ENVIRONMENT: SOURCES AND RECOMMENDATIONS: A SUMMARY (1993).

119. *International Convention for the Prevention of Pollution from Ships (MARPOL)*, Nov. 2, 1973, Annex V, https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx.

120. *Clean Water Act, Section 402* (33 U.S.C. § 1342 (2018))*:* ENV'T PROTECTION AGENCY, *National Pollutant Discharge Elimination System* (last updated Jan. 7, 2025), https://www.epa.gov/cwa-404/clean-water-act-section-402-national-pollutant-discharge-elimination-system.

121. ENV'T PROT. AGENCY, *Toxic and Priority Pollutants Under the Clean Water Act* (last updated Apr. 22, 2025), https://www.epa.gov/eg/toxic-and-priority-pollutants-under-clean-water-act

122. *Id.*; see also Nicholas J. Schroeck, *Microplastic Pollution in the Great Lakes: State, Federal, and Common Law Solutions*, 93 U. DET. MERCY L. REV. 273, 286 (2016) (to explain how the CWA authorizes NPDES permits pursuant to the EPA or EPA-authorized state programs and could be used for wastewater treatment plants).

litigation against plastic manufacturers, with some success. Nonetheless, CWA enforcement remains limited by resource constraints, regulatory discretion, and the narrow definition of point sources.

The *Plastic Pellet Report* also identified two additional statutes with potential—yet underdeveloped—applicability to plastic pollution: the Toxic Substances Control Act (TSCA) and the Resource Conservation and Recovery Act (RCRA). Under TSCA, the EPA can review and regulate chemical substances that may pose unreasonable risks to health or the environment.[123] This includes polymers and chemical additives commonly found in plastics. Although historically TSCA has been used to regulate substances with acute or well-documented toxicity, its framework could theoretically be extended to nanoplastics, microfibers, and plasticizers—especially as new studies reveal pathways of human ingestion and bioaccumulation. The Biden administration signaled some willingness to use TSCA more aggressively in this context.[124] However, the Supreme Court's 2024 decision in *Loper Bright Enterprises v. Raimondo*, which curtailed judicial deference to agency interpretations, is likely to complicate such efforts and reduce the EPA's latitude in interpreting statutory authority under TSCA.[125]

RCRA, enacted in 1976, governs the generation, transport, treatment, storage, and disposal of solid and hazardous waste.[126] Its statutory definitions are broad enough to encompass plastic materials, particularly when improperly managed or persistently discharged.[127] Some advocates have argued that the release of

123. ENV'T PROT. AGENCY, *Actions under TSCA Section 5* (last updated Jan. 22, 2025), https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/actions-under-tsca-section-5.

124. Susan Richardson et al., *The Biden Administration Is Sharpening The TSCA's Sword*, Kilpatrick Townsend, (May 6, 2021), https://ktslaw.com/-/media/2021/Law360—The-Biden-Administration-Is-Sharpening-The-TSCAs-Sword.pdf.

125. Tracy Heinzman et al., *SCOTUS Overrules Chevron and Opens Door to More Challenges Under APA: Environmental Law Implications of Loper Bright and Corner Post*, WILEY (July 8, 2024), https://www.wiley.law/alert-SCOTUS-Overrules-Chevron-and-Opens-Door-to-More-Challenges-Under-APA-Environmental-Law-Implications-of-Loper-Bright-and-Corner-Post#:~:text=The%20U.S.%20Supreme%20Court%20issued,of%20Chevron%20deference%20are%20over.

126. ENV'T PROT. AGENCY, *Resource Conservation and Recovery Act (RCRA) Overview* (last updated Sept. 11, 2024), https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-overview.

127. *Id.*

plastic pellets into waterways constitutes "open dumping," which is prohibited under RCRA.[128] However, the EPA has generally construed its authority narrowly, focusing on industrial waste with defined chemical hazards.[129] As a result, RCRA has not been systematically used to address plastic pollution, despite legal scholarship and court decisions supporting its applicability.[130]

The *Plastic Pellet Report* was followed two years later by another EPA report. *The Status of Efforts to Control Aquatic Debris* reinforced the EPA's cautious and incremental approach, offering recommendations in five areas: continued federal leadership, public education campaigns, enforcement of existing laws, research and monitoring, and beach cleanups.[131] These priorities, though important, reflected the government's ongoing reliance on voluntary initiatives and existing regulatory tools, rather than the development of new statutory authority. Programs like Operation Clean Sweep, designed to encourage plastic manufacturers to voluntarily contain pellet loss, are emblematic of this approach.[132]

In 2006, recognizing the ongoing problem in addressing plastic pollution, Congress passed the Marine Debris Research, Prevention, and Reduction Act (later shortened to the Marine Debris Act), establishing NOAA's Marine Debris Program (MDP).[133] The MDP is organized around five pillars: prevention, removal, research, regional coordination, and emergency response. The Act also codified the Interagency Marine Debris Coordinating Committee (IMDCC), charged with coordinating federal efforts and producing biennial reports with policy recommendations. Although well-intentioned, the IMDCC was criticized in a 2008 National Research Council report for diffuse leadership, fragmented governance, and episodic implementation. Despite issuing a set of 25 recommendations—including enhanced regulatory mandates and referrals to the

128. Notice of Intent to Sue, from Carl Brzorad et al, Southern Environmental Law Center, to Jorge Cerecedo, Alpek Polyester USA, LLC, et al (Sept. 10, 2025) (https://www.selc.org/wp-content/uploads/2025/09/2025.09.10-Notice-of-Intent-to-Sue.pdf).

129. *See generally* Robert W. Adler & Carina E. Wells, *Plastics and the Limits of U.S. Environmental Law*, 47 HARV. ENVTL. L. REV. 1, 37 (2023).

130. *Id.*

131. ENV'T PROT. AGENCY, STATUS OF EFFORTS TO CONTROL AQUATIC DEBRIS (1994), https://nepis.epa.gov/Exe/ZyPDF.cgi/200050JJ.PDF?Dockey=200050JJ.PDF.

132. MORATH, *supra* note 19, at 140.

133. *Id.*

Department of Justice for enforcement—many of its suggestions have gone unheeded.[134]

In 2018, Congress amended the Marine Debris Act through the Save Our Seas Act, which reauthorized the Marine Debris Program and added provisions for international cooperation and emergency funding for severe marine debris events.[135] While important, the amended Act continued to focus on ocean-based sources and failed to address land-based discharges and microplastics. It was not until the Save Our Seas 2.0 Act, passed in 2020, that the federal government began to address microplastics and microfibers directly.[136] The law calls for the standardization of microplastic definitions, encourages research on microplastics in marine and drinking water, and expands the IMDCC's role.[137] Although supported by industry groups, environmental advocates criticized the Act's continued reliance on cleanup and recycling, rather than upstream regulation of plastic production.

The only federal statute to directly prohibit a form of microplastic pollution is the Microbead-Free Waters Act of 2015, which banned the manufacture and sale of plastic microbeads in rinse-off cosmetics.[138] These particles, designed for exfoliation, bypass water filtration systems and accumulate in aquatic ecosystems. Although the FDA found no evidence that microbeads posed a direct threat to human health, the Act acknowledged their environmental harm and amended the Federal Food, Drug, and Cosmetic Act to phase them out by 2019.[139] The Microbead-Free Waters Act is often cited as a model for effective federal action; it demonstrates how coordinated pressure from consumers, industry, and state governments can lead to national legislation. Yet the law is limited in scope, applying only to rinse-off personal care products. Furthermore, studies suggest that such products account for a small percentage of total microplastic pollution.[140]

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134. *Id.*

135. NOAA Marine Debris Program, *Marine Debris Act*, Nat'l Oceanic & Atmospheric Admin. (Feb. 27, 2024), https://marinedebris.noaa.gov/who-we-are/marine-debris-act.

136. Save Our Seas 2.0 Act, Pub. L. No. 116-224, 134 Stat. 1072 (2020).

137. *See id.*

138. Microbead-Free Waters Act of 2015, Pub. L. No. 114-114, 129 Stat. 3129 (2015).

139. *The Microbead-Free Waters Act: FAQs*, FDA (Feb. 25, 2022), https://www.fda.gov/cosmetics/cosmetics-laws-regulations/microbead-free-waters-act-faqs.

140. For example, a study in the United Kingdom reported that cosmetic products generated 0.01% to 4.1% of marine microplastic pollution. Matt McGrath, *Plastic microbead*

Recognizing the limitations of existing law, several members of Congress introduced the Break Free from Plastic Pollution Act in 2020.[141] The bill represents a more comprehensive and preventative strategy. It proposes amendments to RCRA to reduce single-use plastics, implement labeling and deposit requirements, and hold producers responsible for the lifecycle impacts of their products. The bill also includes a moratorium on new permits for plastic production facilities and mandates studies on plastic's environmental and health effects.[142] It embraces "polluter pays" principles, creates a national bottle bill, and would ban certain plastic items outright.[143] Despite support from environmental advocates, the bill has been reintroduced multiple times without advancing in Congress and faces strong opposition from the plastics and packaging industries.[144]

In tandem with these legislative proposals, the Biden Administration acknowledged the growing recognition of plastic's environmental impacts and, in 2023, released a National Strategy to Prevent Plastic Pollution along with a National Recycling Strategy.[145] However, these initiatives largely mirror earlier efforts in their emphasis on research, education, interagency coordination, and support for state-level innovation. They stop short of mandating significant reductions in plastic production or consumption.[146]

While measures such as the Microbead-Free Waters Act (2015) and the Save Our Seas Act 2.0 (2020) represent important steps, they fall short of addressing the full scale of microplastic pollution. Existing federal law remains ill-equipped to meaningfully stem the

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*ban: What impact will it have?* BBC (Jan. 9, 2018), https://www.bbc.com/news/science-environment-42621388.

141. Break Free from Plastic Pollution Act of 2020, H.R. 5845, 116th Cong. (2020)

142. *Id.* at Sec. 4, b.

143. *Id.* at Sec. 12201-12202 (the bans); Sec. 12104 (federal bottle bill); Sec. 12101 (EPR).

144. Megan Quinn, *Break Free From Plastic Pollution Act reintroduced, plastics industry ramps up opposition*, WASTE DIVE (Mar. 25, 2021), https://www.wastedive.com/news/break-free-from-plastic-pollution-act-reintroduced/597338/.

145. ENV'T PROT. AGENCY, *National Strategy to Prevent Plastic Pollution* (Feb. 14, 2025), https://www.epa.gov/circulareconomy/national-strategy-prevent-plastic-pollution.

146. In addition to these policies, the Infrastructure Investment and Jobs Act of 2021, passed during the Biden Administration, supported upgrades and improvements to recycling infrastructure, again emphasizing the post-consumer waste problem with plastic, rather than the production problem.

tide of microplastic contamination.

The limitations of this legislative landscape help explain the growing reliance on litigation and state action as strategies for addressing plastic pollution. The next section considers how environmental advocates have turned to the courts to fill the regulatory gaps, testing the reach of existing laws and seeking to hold plastic producers accountable.

| **Federal Law** (arranged by enactment date) | **Purpose** | **Plastic/Microplastic Relevance** | **Limitations** |
|---|---|---|---|
| **The Clean Water Act** (1972) | Regulates pollutant discharges into U.S. waters | Point source discharges of microplastics (e.g., pellets) may require permits | Limited to point sources; no specific microplastic criteria |
| **Toxic Substances Control Act** (1976) | Regulates risks from chemical substances | Could apply to polymers, additives, and plasticizers | Requires significant toxicity evidence; historically underused for plastics |
| **Resource Conservation and Recovery Act** (1976) | Governs solid and hazardous waste | Could regulate industrial plastic discharges as "open dumping" | EPA construes "hazardous waste" narrowly; does not currently include microplastics |
| **Marine Plastic Pollution Research and Control Act** (1987) | Implements MARPOL Annex V; bans plastic dumping from ships | Prohibits overboard plastic discharges; mandates research | No regulation of land-based pollution |
| **Marine Debris Act** (2006, as amended) | Authorizes NOAA to research and reduce marine debris | Supports plastic monitoring, research, funding, and coordination | No regulatory enforcement provisions |

| | | | |
|---|---|---|---|
| **Microbead-Free Waters Act** (2015) | Bans plastic microbeads in cosmetics | The only federal law to ban a type of microplastic | Applies to rinse-off cosmetics only |
| **Save Our Seas Acts** (2018, 2020) | Strengthens NOAA's marine debris role | Expands interagency coordination and global outreach | Primarily educational and research-based; no direct regulatory enforcement provision |
| **Break Free from Plastic Pollution Act** (Introduced 2020) | Comprehensive regulation of plastics | Would ban single-use plastics, establish producer responsibility, and amend RCRA | Not yet enacted; strong opposition from industry groups. |

Table 1: Federal Legislation Relevant to Microplastics

### B. *Litigation*

Whether from under-enforcement or regulatory gaps, existing federal law has not adequately addressed plastics, particularly microplastics. Self-regulation and voluntary programs by plastic producers and manufacturers have also proven to be lacking. Plastic producers and manufacturers have also sought to shift the blame for plastic pollution to consumers and have used their resources to promote recycling, a flawed waste management process for plastic.[147]

A weak federal regulatory approach, an overburdened municipal and state waste management system,[148] stalled efforts for a global plastic treaty and retreats by industry from plastic reduction and recycling goals have allowed litigation (by private and public entities) to come to the forefront. To date, the plastic litigation tracker, monitored by the State Energy and

147. *See* Morath, *supra* note 51 (explaining how recycling has been used to justify ongoing plastic production and deflect responsibility from manufacturers to consumers).

148. Wastewater treatment plants are considered one of the largest point sources of microplastics. *See* Avishek Talukdar et al., *Microplastic contamination in wastewater: Sources, distribution, detection and remediation through physical and chemical-biological methods*, 916 SCI. OF THE TOTAL ENV'T (Mar. 15, 2024), https://www.sciencedirect.com/science/article/pii/S0048969724003899.

Environmental Impact Center at the New York University School of Law, records sixty-nine lawsuits involving plastic litigation in state and federal courts.[149] Litigation often arises as a gap-filler.[150] When problems persist and the legislature fails to act, citizens can respond by suing the government or corporate actors. Through lawsuits, courts can enforce existing environmental laws and ensure that those responsible for environmental harm are held accountable. While litigation can raise awareness and punish plastics producers at the margins, to date, litigation alone has not significantly affected the amount of microplastics produced and dumped into the environment.

The following evaluates litigation involving plastic pollution. Like climate change litigation, plastic pollution claims are novel, targeting a variety of defendants.[151] Some plastic pollution claims are brought under well-established laws such as the Clean Water Act (CWA), while others include claims of first impression, like public nuisance. The defendants—plastic producers, pellet transporters, government agencies, and food and beverage companies—are as varied as the claims. Litigation efforts have produced mixed results. Advocates have secured large settlements and survived motions to dismiss. But as with climate change litigation, plaintiffs have struggled to demonstrate causation in the public nuisance cases, and defendants have asserted claims of preemption. That said, litigants seem unfazed by small setbacks; plaintiffs continue to file plastic pollution complaints across the country, particularly at the state level, with attorney general actions.

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149. *Plastics Litigation Tracker*, STATE ENERGY & ENVTL. IMPACT CTR., N.Y.U. SCH. OF LAW (Nov. 12, 2025), https://plasticslitigationtracker.org/.

150. Shi-Ling Hsu, *A Realistic Evaluation of Climate Change Litigation Through the Lens of A Hypothetical Lawsuit*, 79 U. COLO. L. REV. 701, 718 (2008) ("Directly suing greenhouse gas emitters, especially deep-pocketed private emitters, has an analog, if not a precedent, in the American history of mass tort litigation. Mass tort litigation has served as a judicial gap-filler where conventional lawmaking and legislating has fallen short for some reason. Mass tort litigation for liability for tobacco products, asbestos, handguns, lead paint, and dangerous pharmaceutical products all took place in a vacuity of Congressional and administrative inaction.")

151. *See e.g.*, Randall S. Abate, *Automobile Emissions and Climate Change Impacts: Employing Public Nuisance Doctrine As Part of A "Global Warming Solution" in California*, 40 CONN. L. REV. 591 (2008) (discussing "public nuisance suits against power companies and automobile manufacturers for the climate change impacts caused by emissions from those entities").

1. *Environmental Enforcement: Citizen Suit Provisions of the Clean Water Act, the Resource Conservation Act, and the Endangered Species Act.*

Perhaps the most well-known example of plastic pollution litigation is *San Antonio Waterkeepers v. Formosa Plastics Corp.*, brought under the citizen suit provision of the CWA.[152] Using the citizen suit provision, a native-Texan, Diana Wilson, along with the San Antonio Bay Estuarine Waterkeeper, sued Formosa Plastics Corporation, a plastics pellet manufacturer.[153] The plaintiffs alleged that Formosa violated its Texas Pollutant Discharge Elimination System (TPDES) permit, and, therefore, violated the CWA by exceeding its discharge limits for nurdles.[154]

At trial, the plaintiffs presented evidence of permit violations from January 2016 through March 2019.[155] Relying on extensive evidence compiled by citizen-plaintiffs, the U.S. District Court for the Southern District of Texas found that Formosa Plastics had engaged in persistent and egregious violations of the Clean Water Act (CWA).[156] Judge Kenneth Hoyt concluded that the company's pollution control strategies—including source control measures, remediation protocols, manual removal efforts, and third-party contractor interventions—were collectively "ineffective and impractical."[157] Notably, the court found that Formosa, a member of Operation Clean Sweep, had discharged plastic pellets and powder in violation of its permit on more than 1,000 separate days. Characterizing the company as a "serial offender" of federal environmental law, Judge Hoyt emphasized the chronic nature of Formosa's noncompliance.[158] The case culminated in a $50 million consent decree, the largest settlement ever reached in a citizen suit brought under the CWA.[159] This case illustrates the failure of self-

152. 33 U.S.C. § 1365

153. Complaint, San Antonio Bay Estuarine Waterkeeper v. Formosa Plastics Corp., No. 6:17-cv-00047 (S.D. Tex. July 31, 2017).

154. *Id.* at 16.

155. San Antonio Bay Estuarine Waterkeeper v. Formosa Plastics Corp., 2019 U.S. Dist. LEXIS 108082, 2019 WL 2716544 (S.D. Tex. June 27, 2019).

156. *Id.*

157. *Id.*

158. *Id.*

159. *Formosa Plastics Agrees to Pay $50 Million Settlement for Polluting Texas Waterways*, PLASTIC POLLUTION COALITION (Oct. 15, 2019), https://www.plasticpollutioncoalition.org/blog/2019/10/15/formosa-plastics-agrees-to-pay-50-million-settlement-for-polluting-texas-waterways.

monitoring programs and the importance of everyday citizens in fighting plastic pollution.

The Clean Water Act also served as the basis for *Charleston Waterkeeper v. Frontier Logistics, L.P.* In this case, nonprofit organizations again used the citizen suit provision of CWA and the Resources Conservation and Recovery Act (RCRA) to sue the plastic resin packaging company Frontier Logistics. The plaintiffs claimed Frontier violated the law by releasing plastic pellets into the Cooper River, Charleston Harbor, and other Charleston waterways.[160] Between July 2019 and March 2020, the date of the filing, the Waterkeeper had collected more than 14,000 nurdles.[161]

During the pre-trial stage, Judge David C. Norton of the U.S. District Court for South Carolina concluded that the plaintiffs could maintain simultaneous claims under both RCRA and CWA.[162] Although an individual plastic pellet may not, in isolation, constitute "solid waste" under the Resource Conservation and Recovery Act (RCRA) or a "point source discharge" under the CWA, the court acknowledged that a facility's broader handling and release practices could implicate both statutory regimes.[163] The court found that the company's operations could be both discharging plastic pellets into waterways—potentially triggering CWA liability—and releasing pellets onto land, thus triggering the RCRA. As with Formosa, Frontier was a member of Operation Clean Sweep, an industry initiative purporting to prevent pellet pollution, yet denied any responsibility for the substantial number of pellets discovered in Charleston Harbor.[164] The case concluded in March 2021 with Frontier agreeing to a $1.2 million settlement.[165]

The citizen suit provision of the Endangered Species Act was used in a recent case against tire manufacturers. In *Institute for Fisheries Resources v. Bridgestone Americas, Inc.*, commercial fishing organizations sued several major tire manufacturers under Section

160. Complaint for Injunctive & Declaratory Relief, *Charleston Waterkeeper v. Frontier Logistics, L.P.*, No. 20-cv-01089-DCN (D.S.C. Mar. 18, 2020).

161. *Id.*

162. Charleston Waterkeeper v. Frontier Logistics, No. 2:20-cv-1089-DCN, 2020 WL 5629717 (D.S.C. Sept. 21, 2020).

163. *Id.*

164. *Id.*

165. *Frontier Logistics agrees to $1.2 million settlement in pellet-pollution lawsuit*, S. ENVTL. L. CTR. (Mar. 3, 2021), https://www.selc.org/news/frontier-logistics-agrees-to-1-2-million-settlement-in-pellet-pollution-lawsuit/.

9 of the Endangered Species Act (ESA), alleging the unlawful "take" of ESA-listed coho salmon, Chinook salmon, and steelhead trout.[166] The plaintiffs contend that the defendants' continued use of 6PPD—a tire additive that transforms into 6PPD-quinone (6PPD-q), an acutely toxic chemical to aquatic life—has caused mass mortality events in protected salmonid populations.[167] The complaint details how 6PPD-q enters aquatic ecosystems via stormwater runoff, killing fish within hours of exposure, and documents widespread contamination across West Coast watersheds.[168] Plaintiffs seek declaratory and injunctive relief, arguing that the discharge of 6PPD-q constitutes a "take" under the ESA due to the harm, harassment, and mortality it causes to threatened and endangered species.[169] The case, which is pending in the Northern District of California, represents a novel application of the ESA to microplastic-related pollution from synthetic chemicals in consumer products.[170]

While the individual and localized "wins" described above are worth celebrating, plaintiffs have followed the trend in climate change litigation and expanded their litigation strategy to include public nuisance and consumer protection actions for greater impact. Despite the extensive environmental regulatory framework that exists today, tort law continues to fill important gaps in situations where environmental law does not address the harm at issue, or where the political will to regulate or enforce certain environmental harms is lacking.[171] These lawsuits have targeted

166. Complaint for Declaratory and Injunctive Relief, Inst. for Fisheries Res. v. Bridgestone Ams. Inc., No. 3:23-cv-5748, (N.D. Cal. Nov. 8, 2023).

167. *Id.* at 1-2.

168. *Id.* at 19.

169. *Id.* at 23.

170. In July 2024, the court denied the defendant's request to stay the litigation while the EPA undergoes rulemaking of 6PPDQ under the Toxic Substances Control Act (TSCA). The Court noted that the ESA and TSCA are different statutes. The Court explained: "Congress did not assign regulatory authority for Section 9 of the ESA to the EPA. Consequently, the EPA's determination of whether 6PPD poses an unreasonable risk under the TSCA will not answer the question at the heart of this lawsuit, namely whether defendants' use of 6PPD in tires caused a taking of protected salmonid species in West Coast fish populations. . . . The controlling legal issue is whether defendants have violated Section 9 of the ESA, which the EPA's rulemaking under the TSCA will not, and cannot, adjudicate. Delaying this case while the agency's wheels are turning makes little sense." Inst. for Fisheries Res. v. Cont'l Tire the Ams., LLC., No. 3:23-cv-05748-JD, 2024 WL 3381032 (N.D. Cal. July 10, 2024) (order denying stay).

171. Graham C. Zorn et al., *Going Backward: Environmental Regulation through Tort Litigation*, 33 NAT. RES. & ENV'T 22 (Spring 2019).

packaging, bottling, and oil and gas companies and have been brought by private plaintiffs and state and local governments.

2. *Public Nuisance*

Public nuisance lawsuits argue that the production and disposal of plastic products, especially single-use plastics, unreasonably interfere with the public's right to a clean environment. One of the first microplastic lawsuits alleging public nuisance arose in November 2023, when New York Attorney General Letitia James sued PepsiCo in New York state court.[172] The complaint focuses on the Buffalo River, where plastic manufactured, sold, and distributed by PepsiCo is the largest contributor to plastic waste.[173] This waste contaminates public drinking water, threatens public health, harms freshwater species, and endangers the ecosystem. While the complaint alleged deceptive trade practices for failure to warn consumers of known risks associated with single-use plastic, it also alleged public nuisance. James' alleged that PepsiCo has created a public nuisance through its acts and omissions. The plastic pollution from PepsiCo products has interfered with "the public's use and enjoyment of the Buffalo River and its environs, and adversely affects the aesthetic value of the river and its shoreline."

In dismissing this complaint, the court explained in its December 2024 order that the Plaintiff failed to provide evidence that Defendant knew or should have foreseen that its products would pollute the Buffalo River and its shores.[174] It noted that "[w]hile no one doubts the harm litter and waste cause in our ecosystem, this does not create a civil cause of action from which to punish Pepsi/Frito Lay," explaining that "[p]lastic packaging is used by more than just Pepsi and Frito Lay."[175] AG James filed a notice of appeal but has yet to file a brief with the Appellate Division of the Supreme Court of the State of New York, Fourth Judicial Department.

A similar lawsuit was filed by the city of Baltimore in June 2024 against PepsiCo, Coca-Cola, and other companies, alleging these companies used deceptive business practices and created a public

172. Complaint, New York v. Pepsico, Inc., No. 814682/2023, (N.Y. Sup. Ct. Erie County Nov. 15, 2023)

173. *Id.*

174. People v. PepsiCo, Inc., 85 Misc. 3d 969 (N.Y. Sup. Ct. Erie County 2024).

175. *Id.*

nuisance with their plastic products.[176] According to the complaint, plastic wrappers and bottles are breaking down into micro- and nanoplastics and polluting the city's water supply, putting Baltimore residents at risk of ingesting these plastics and associated chemicals. This case is pending with the court, currently considering the defendants' separate motions to dismiss.

Nonprofits have also used public nuisance claims to address plastic pollution. One of the earliest plastic pollution complaints was filed by Earth Island Institute in 2020 in California state court, against Clorox, Nestlé, Pepsi Co., Mars, Danone, and others.[177] Like many of these complaints, the complaint alleges public nuisance along with negligence, strict liability, and breach of warranty claims. To the public nuisance claim, the complaint alleges that "[m]arine plastic pollution impacts a substantial number of residents and citizens living in Plaintiff's community, and they are reasonably annoyed and disturbed by marine plastic pollution," and these harms outweigh the benefits of the product.[178] Efforts to dismiss the complaint were denied, and in April and May 2025, Earth Island entered into settlement agreements with the defendants, who agreed to support the organization's efforts to reduce plastic pollution.[179]

3. *Consumer Protection Claims*

There are various state and federal consumer protection laws that prohibit fraudulent, deceptive, and misleading statements. Claims brought under these laws assert deceptive statements about the recyclability and likelihood of products being recycled, the nature of their contributions to microplastic pollution, and the toxicity of certain plastics. As seen in the Earth Island example, plaintiffs often assert consumer protection claims with public nuisance arguments.

Keurig's assertion about the recyclability of its plastic coffee pods provides an example of misleading claims. In 2018, the

176. Christine Condon & Baltimore Sun, *Baltimore sues Coke, Pepsi and other producers of plastic, citing pollution concerns*, PHYS (Jun. 21, 2024), https://phys.org/news/2024-06-baltimore-sues-coke-pepsi-plastic.html.

177. Complaint, Earth Island Inst. v. Crystal Geyser Water Co. et al., No. 20-CIV-01213 (Cal. Super. Ct. Feb. 26, 2020).

178. *Id.* at 51-52.

179. *Taking on Big Plastic*, EARTH ISLAND (May 16, 2025), https://www.earthisland.org/index.php/advocates/suit/taking-on-big-plastic#%23.

company was sued under California's Unfair Competition Law and the Consumer Legal Remedies Act.[180] The case was later certified as a class-action law suit in the Northern District of California, where the court evaluated the plaintiff's claim that the pods were not recyclable because: "less than 60 percent (or a "substantial majority") of facilities will accept the [pods], (b) the [pods'] size prevents them from being properly sorted by recycling programs, and (c) there is a lack of end markets to recycle the [pods].[181] A second amended complaint was filed in 2022.[182] The parties ultimately settled that year[183] when Keurig agreed to pay $10 million to the certified class and to modify its labeling to reflect that recycling might not be available in certain areas.[184]

In late fall 2024, Ford County, Kansas, filed a class-action lawsuit against ExxonMobil, Chevron, Dow, and the American Chemistry Association, alleging that the defendants have "created, contributed to, and maintained a public nuisance by deceptively advertising and marketing that plastics were recyclable when in reality less than 10 percent of Plastics are recycled."[185] As recently as December 16, 2024, a class-action lawsuit was filed in Missouri against ExxonMobil and ten other entities, alleging a violation of federal antitrust and state consumer protection laws.[186] Specifically, the complaint alleges that the defendants artificially increased the demand for single-use plastics and contributed to the plastic pollution crisis by lying about the recyclability of plastics.[187]

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180. Complaint, Smith v. Keurig Green Mountain, Inc., No. RG18922722 (Cal. Super. Ct. Alameda County Sep. 28, 2018).

181. Order Granting Class Certification, Smith v. Keurig Green Mountain, Inc., No. 18-CV-06690-HSG, 2020 WL 5630051 (N.D. Cal. Sep. 21, 2020).

182. Amended Complaint, Smith v. Keurig Green Mountain, Inc., Case No. 4:18-CV-06690-HSG (N.D. Cal. July 13, 2022).

183. Order Granting Preliminary Approval, Smith v. Keurig Green Mountain, Inc., Case No. 18-cv-06690-HSG (N.D. Cal. July 7, 2022).

184. Order Granting Final Approval, Smith v. Keurig Green Mountain, Inc., No. 18-CV-06690-HSG, 2023 WL 2250264 (N.D. Cal. Feb. 27, 2023).

185. Complaint, Ford County, Kansas vs. Exxon Mobile Corp., Case 2:24-cv-02547-KHV-GEB (D. Kan. Nov. 27, 2024). https://climateintegrity.org/uploads/media/Ford_County_v_Exxon.pdf. In February 2025, the Kansas State AG filed a limited motion to intervene to prevent Ford County (and others) from litigating public welfare claims with statewide impacts. Motion for Limited Intervention, Rodriquez v. Exxon Mobil Corp., Case No. 4:24-CV-00803-SRB (W.D. Mo. Feb. 4, 2025).

186. Complaint, Rodriquez v. Exxon Mobil Corp., Case No. 4:24-CV-00803-SRB (W.D. Mo. Dec. 16, 2024).

187. Order, Rodriquez v. Exxon Mobil Corp., Case No. 4:24-CV-00803-SRB (W.D. Mo. Apr. 7, 2025).

Attorneys general are also initiating consumer protection claims against plastic producers and manufacturers by focusing on recycling claims.

In April 2022, California Attorney General Rob Bonta launched an investigation into fossil fuel and petrochemical companies for a "decades-long plastics deception campaign."[188] The investigation focused on the companies' role in perpetuating myths around recycling. After more than two years, in September 2024, Bonta filed suit against the companies, including ExxonMobil, in state court, alleging both public nuisance and deceptive trade practices.[189] Los Angeles County, California, filed similar lawsuits against plastic manufacturers and bottling companies, alleging these firms have misrepresented the harm of plastic.[190]

In June 2023, Keith Ellison, the Attorney General of Minnesota, sued Reynolds Consumer Products, the maker of Hefty garbage bags, in state court.[191] The complaint alleges that the defendant's garbage bags misled consumers into believing that their plastic bags were recyclable in violation of a series of Minnesota consumer protection acts, including the Prevention of Consumer Fraud Act, the Deceptive Trade Practice Act, the False Statement in Advertising Act, and Deceptive Environmental Marketing Claims. The Connecticut AG brought a similar case against Reynolds in state court.[192] In April 2024, Reynolds settled with Minnesota.[193] In Connecticut, a May 2026 trial is scheduled if mediation is

188. Press Release, Cal. Dep't. of Just., Attorney General Bonta Announces Investigation into Fossil Fuel and Petrochemical Industries for Role in Causing Global Plastics Pollution Crisis (Apr. 28, 2022), https://oag.ca.gov/news/press-releases/attorney-general-bonta-announces-investigation-fossil-fuel-and-petrochemical.

189. In May 2024, the American Chemical Society (ACS) and Plastic Industry Association (PIA) filed a separate lawsuit in federal court in Washington D.C., objecting to some of Bonta's subpoenas. ACS and PIA withheld documents containing confidential industry data and communications related to public policy and advocacy matters, claiming that California is infringing on their First Amendment rights.

190. Complaint, People v. PepsiCo., (Cal. Super. Ct. Oct. 29, 2024), https://file.lacounty.gov/SDSInter/lac/1169727_FiledPlasticsComplaintAgainstPepsiCoandCoke.pdf.

191. Complaint, Minnesota v. Reynolds Consumer Prod. Inc., (D. Minn. June 6, 2023), https://stateimpactcenter.org/files/Reynolds_Walmart_Complaint-1.pdf.

192. Complaint, Connecticut v. Reynolds Consumer Prod. Inc., CV-22-6156769-S (Conn. Super. Ct. June 14, 2022).

193. Press Release, Minn. Att'y Gen. Keith Ellison, Attorney General Ellison reaches settlement with Reynolds, Walmart over deceptive marketing of 'recycling' bags that are not recyclable (Aug. 1, 2024), https://stateimpactcenter.org/files/August-1-2024-Press-Release.pdf.

unsuccessful.[194]

Misleading claims about microplastics in bottled water have met with less success. For example, in *Plastic Pollution Coalition vs. PepsiCo*,[195] plaintiffs alleged that Aquafina's plastic bottle packaging, which contains both plastic and BPA, is misleadingly labeled as "pure water, perfect taste." Plaintiffs have also sued Danone,[196] BlueTriton, and Nestle over misrepresentations that the bottled water from these manufacturers was "natural spring water," "100% spring water," and "purified water," despite containing microplastics.[197] The courts found these complaints were preempted by the federal regulation of the term "spring water."[198]

The microwaveable nature of plastic has also become a consumer protection issue. In another example of false advertising specific to microplastics, S.C. Johnson was sued in a class-action lawsuit filed in California federal court in April 2025.[199] The complaint took issue with Ziploc bags and the labeling that stated that the bags were "Microwave Safe" and suitable for freezing. Specifically, the complaint alleges that these statements create the "reasonable impression that they are fit for use in the microwave and freezer. . . . In reality, these products are made from polyethylene and polypropylene—materials that scientific and medical evidence shows release microplastics when microwaved and frozen—making them fundamentally unfit for microwave and freezer use."[200]

Some attorneys have called these microplastic lawsuits the "canary in the coal mine" comparing these consumer protection claims to asbestos and PFAS litigation.[201] Others believe that litigation could follow the PFAS trend and result in personal injury,

194. Plastics Litigation Tracker, (last updated Nov. 12, 2025) (filtering by keyword "Connecticut") https://plasticslitigationtracker.org/?keywords=Connecticut.

195. Complaint, Plastic Pollution Coal., A Project Of Earth Island Inst. v. PepsiCo, Inc., Case No. 2025-CAB-002131 (D.C. Super. Ct. Apr. 4, 2025).

196. Daly v. Danone Waters of America, LLC, No. 24 C 2424, 2024 WL 4679086 (N.D. Ill. Nov. 5, 2024).

197. *See id.* (summarizing complaints against Blue Triton and Nestle).

198. *See* 21 C.F.R § 165.110(a)(2)(vi).

199. Complaint, Cheslow v. S.C. Johnson & Son, Inc., Case No. 3:25-CV-03655 (N.D. Cal. Apr. 25, 2025).

200. *Id.* at 16-17.

201. Charles Reynolds, *Ziploc Bags: The Plastic Canary in The Coal Mine?*, TYSON & MENDES (July 14, 2025), https://www.tysonmendes.com/ziplock-bags-the-plastic-canary-in-the-coal-mine/.

class action, and MDL suits, as has happened with lawsuits involving forever chemicals.[202] While plaintiffs, including sovereigns, may recover sizeable settlements and awards, there is no guarantee that those recoveries will result in better environmental outcomes.

While litigation alone is unlikely to solve the microplastic problem, these cases help to raise public awareness. Public concern can put pressure on companies and signal to regulators that this is a problem that demands action. Litigation can close regulatory gaps and ineffective industry self-regulation.

## IV. PROMISING PATHWAYS

The many sources and types of plastic pollution necessitate a multimodal response.[203] This response will require governmental actors, private industry, and individuals across the plastic lifecycle—production, use, and disposal—to engage with this problem. While some policymakers and advocates have sought comprehensive reforms through singular statutes or international agreements, such as the Break Free from Plastic Pollution Act[204] or the United Nations Global Plastic Treaty,[205] these macro-scale efforts have, to date, been unsuccessful. Large-scale legislative proposals have stalled, international treaty negotiations have collapsed, and plastic pollution continues.

While federal and international efforts should not be abandoned, the reality is that smaller-scale alternatives could be

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202. Eleanor Bragg et al., *Line of Thought: Are Microplastics a Serious Commercial Liability Risk? Plaintiff Legal Theories May Point the Way*, VERISK (Jan. 9, 2025), https://core.verisk.com/Insights/Emerging-Issues/Articles/2025/January/Week-1/Microplastics-Liability-Risk.

203. *See generally*, MORATH, *supra* note 19 at 53 (describing a multimodal approach to solving our plastic problem).

204. Break Free From Plastic Pollution Act of 2020, H.R. 5845, 116th Cong. (2020); Sarah J. Morath, *Moving from awareness to action on plastic pollution*, The Hill (July 5, 2021). https://thehill.com/opinion/energy-environment/561539-moving-from-awareness-to-action-on-plastic-pollution/.

205. Press Release, UN Env't Programme, Historic day in the campaign to beat plastic pollution: Nations commit to develop a legally binding agreement (Mar. 2, 2022), https://www.unep.org/news-and-stories/press-release/historic-day-campaign-beat-plastic-pollution-nations-commit-develop; *see also* Sarah J. Morath, *Plastic Pollution Is a Global Problem – Here's How to Design an Effective Treaty to Curb It?* The Conversation (Mar. 2, 2022). https://theconversation.com/plastic-pollution-is-a-global-problem-heres-how-to-design-an-effective-treaty-to-curb-it-176226.

pursued right away.[206] Bottom-up measures targeting discrete products, practices, and industries can complement top-down reforms.[207] Such targeted interventions—although modest in isolation—can, when pursued by multiple stakeholders at various governance levels, aggregate into meaningful reductions in microplastic pollution.[208] They can also spur industry innovation and greater federal action.

### A. *Microplastics: Sources and Types*

Policymakers and scientists often distinguish between primary and secondary microplastics, a classification with significant implications for regulatory design. Primary microplastics are those plastics designed to be small—cosmetic beads, glitter, seed coatings, and pellets or nurdles—while secondary plastics are those that come from larger plastics, including plastic packaging and containers, fibers from synthetic textiles, and particles from

206. Thinking about plastic pollution at the federal and global level can be overwhelming. Literature on eco-anxiety supports action (in whatever form and at whatever size) as a way of dealing with despair. *See e.g.*, Robert Feder, *Psychotherapy for Eco-Anxiety: Shifting From Catastrophizing to Action*, 57 PSYCH. NEWS (Sept. 2022) (stating "[t]he most effective method to reduce anxiety and depression and sustain hope in the face of the climate crisis is to engage in purposeful action within one's community and take individual action.") https://psychiatryonline.org/doi/full/10.1176/appi.pn.2022.09.9.29; *see also* Zoe Loftus-Farren, *Parenting in the Plasticine*, EARTH ISLAND J. (Summer 2024) (describing ways to turn plastic anxiety into action) https://www.earthisland.org/journal/index.php/magazine/entry/navigating-plastic-exposure-and-eco-anxiety-as-a-parent/##.

207. By top-down, the author means centralized decision-making by a federal government. By bottom-up, the author means decentralized decision-making by state and local governments, industry, and individuals.

208. Other legal scholars have discussed local or small-scale solutions for other environmental harms. For example, in *Individual Carbon Emissions: The Low-Hanging Fruit*, 55 UCLA L. REV. 1701 (2008), Michael P. Vandenbergh et. al. argue that individuals and household actions represent an untapped opportunity for significant, low-cost, greenhouse gas (GHG) reductions. *See also* John R. Nolon, *In Praise of Parochialism: The Advent of Local Environmental Law*, 23 PACE ENVTL. L. REV. 705, 706 (2006) (describing a "a grassroots level of policy making...that incorporates the historical function of local governments in protecting the public from the perils of pollution and environmental degradation.").

Existing federal laws do not holistically address the full lifecycle of plastics—much like carbon—leaving local actors, citizens, and small interventions to fill the void. Just as household energy use can be reduced through targeted "low-hanging," "grassroots" actions, so too can microplastic pollution be reduced through practical, local-level, and product-specific measures. This bottom-up approach buys time and can grow public support for bigger systemic policy shifts to occur. For inclusion in this article, the micro-solution needed to focus specifically on microplastics, implementable (as shown through action in the US or abroad), and micro in its regulator (e.g., state, local, individual) or target (e.g., glitter).

tires.[209] The relative contribution of these categories varies. Textiles are the primary contributor of secondary microplastics, followed by tire dust.[210] The solutions offered below focused on personal care products, textiles, tires, and specific industry practices.

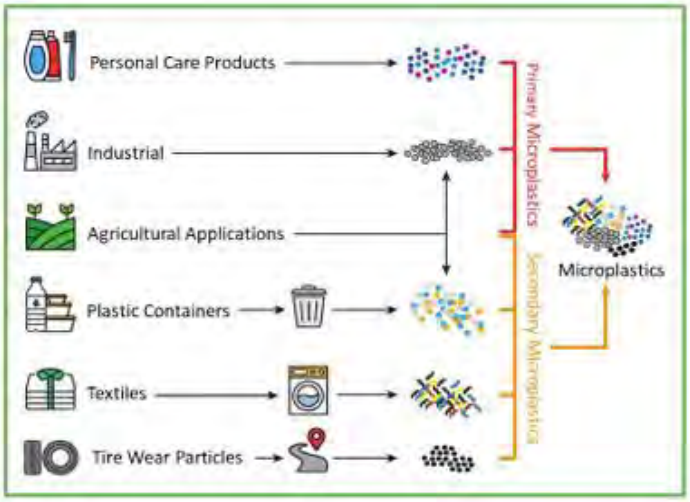


Figure 4: Primary and Secondary Microplastics and Associated Sources.[211]

209. There is some disagreement in this classification. Some scientists and organizations classify fibers from textiles and tires as primary. *See Sources of microplastics and their distribution in the environment*, FIRST SENTIER MUFG SUSTAINABLE INVESTMENT INSTITUTE (last visited Aug. 14, 2025), https://www.firstsentier-mufg-sustainability.com/insight/sources-of-microplastics-and-their-distribution-in-the-environment.html.

210. Julien Boucher & Damien Friot, *Primary Microplastics in the Oceans: A Global Evaluation of Sources*, INT'L UNION FOR CONSERVATION OF NATURE (2017), https://portals.iucn.org/library/sites/library/files/documents/2017-002-En.pdf.

211. INTERSTATE TECHNOLOGY REGULATORY COUNCIL, *Types of Microplastics: Primary & Secondary*, https://mp-toolkit.itrcweb.org/wp-content/uploads/2024/06/18-Microplastics-Outreach-Fact-Sheet-Types-of-Microplastics-Primary-and-Secondary-1.pdf (last visited Feb. 15, 2026).


Figure 5: Global Releases of Microplastics into the Oceans.[212]

## B. *Production*

Researchers at the University of California, Berkeley, and the University of California, Santa Barbara, have developed the Global Plastic Policy Tool, an open-source, AI-powered model designed to evaluate effectiveness. Their analysis suggests that capping virgin plastic production is the most effective interventions for reducing the amount of plastic waste that enters the environment.[213] Yet, in treaty negotiations, production caps have proven highly divisive: "high ambition" nations have advocated for caps, while oil-producing countries, including the United States, resist such constraints.[214]

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212. Boucher and Froit, *Primary Microplastics*, *supra* note 210, at 21 (note how the authors of this publication treat textile and tire fibers as primary, rather than secondary microplastics).

213. A. Samuel Pottinger et al., *Pathways to Reduce Global Plastic Waste Mismanagement and Greenhouse Gas Emissions by 2050*, 386 Science 1168 (2024) DOI:10.1126/science.adr3837.

214. Michelle Langrand, *Ambition or compromise? Geneva plastics treaty talks test global*

If production caps remain politically unattainable, policymakers can draw lessons from the Microbead-Free Waters Act of 2015, which amended the Food, Drug, and Cosmetics Act to ban microbeads in rinse-off cosmetics.[215] Specifically, the law prohibits the manufacturing, packaging, and distribution of rinse-off cosmetics containing plastic microbeads. One scholar explains the ease with which the Microbead-Free Waters Act passed as being the result of a process that: set a reasonable scope and focus; built a broad stakeholder coalition that includes, rather than demonizes, industry; eliminates "patchwork" regulation to the extent possible; and emphasizes the public health aspects of proposed legislation.[216] For support of these strategies, the author points to another law that also had a health focus and broad stakeholder consensus: the TSCA reform bill of 2015.[217]

Several recent state and local measures have found success with this approach, lending further support for a targeted, health-oriented approach to banning specific microplastics.

1. *Banning Intentionally Added Microplastics: Glitter and Turf*

Like microbeads, glitter appears in a variety of cosmetics, including eye shadow, powder, and nail polish.[218] Human exposure to these widely used products can occur through ingestion and inhalation—such as when the products are applied—or, to a lesser extent, through dermal contact.[219] California's proposed Plastic Microbeads Nuisance Prevention Law would prohibit the sale, distribution, or promotional offering of "a personal care product containing plastic glitter, or a personal care product in a non-rinse-off product or a cleaning product containing one ppm or more by weight of plastic microbeads that

*resolve*, GENEVA SOLUTIONS (Aug. 15, 2025), https://genevasolutions.news/climate-environment/ambition-or-compromise-geneva-plastics-treaty-talks-test-global-resolve.

215. *See supra* Part III.A.

216. David A. Strifling, *The Microbead-Free Waters Act of 2015: Model for Future Environmental Legislation, or Black Swan?*, 32 J. LAND USE & ENV'T. L. 151, 166 (2016).

217. *Id.*

218. Alex Lai, *California could ban plastic glitter in cosmetics under new bill*, CBS8 (July 24, 2025), https://www.cbs8.com/article/news/local/california/california-could-ban-plastic-glitter-in-cosmetics-under-new-bill/509-516ab1fc-174f-4334-8068-814560dfc50e.

219. Anna Kukkola et al., *Beyond Microbeads: Examining the Role of Cosmetics in Microplastic Pollution and Spotlighting Unanswered Questions*, J. HAZ. MATER., SEPT. 5, 2024. https://doi.org/10.1016/j.jhazmat.2024.135053.

are used as an abrasive."[220] While no state has adopted such a ban, some municipalities have banned the use of plastic in confetti.[221] The California law is similar to a 2023 European Union ban on all glitter and all intentionally added microplastics to cosmetics.[222]

The comments to the California law start by explaining that plastic pollution is not "just an environmental issue," but a "public health emergency."[223] They also note that there are alternatives, many of which are naturally occurring, already on the market, such as oats, jojoba seeds, and mica minerals.[224]

Artificial turf, also known as "plastic grass," presents a distinct yet related concern. Widely used on sports fields, playgrounds, and in landscaping, synthetic turf is durable, water-efficient, and low-maintenance, but it sheds microplastics and contains chemical additives, including per- and polyfluoroalkyl substances (PFAS).[225] The EU Chemical Society (ECHA) reports that "[m]icroplastics used as performance infill in synthetic turf sport pitches are the largest contributor at a European level in terms of both quantities of intentionally-added microplastics used and released to the environment" with an estimate of 16,000 tons/year.[226] In 2023, the *Philadelphia Inquirer* reported on a possible link between a rare brain cancer—glioblastoma—that killed six outfielders for the Philadelphia Phillies and the chemicals found in artificial turf.[227]

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220. Solid waste: plastic microbeads: plastic glitter, Assemb. B. 823, 2025-2026 Leg., Reg. Sess. (Cal. 2025), https://calmatters.digitaldemocracy.org/bills/ca_202520260ab823.

221. Victoria Villanueva-Marquez, *Why you'll see fewer balloons and confetti in Boca Raton's outdoor spaces*, THE PALM BEACH POST (June 22, 2021), https://www.palmbeachpost.com/story/news/local/boca/2021/06/22/why-you-will-see-fewer-balloons-and-confetti-in-boca-ratons-outdoor-spaces/7717085002/.

222. Commission Regulation (EU) 2023/2055 of 25 September 2023 amending Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as regards synthetic polymer microparticles, 2023 O.J. (L 238) 67.

223. AB 823, *supra* note 220.

224. *Id.*

225. Iman S. Cumberbatch et al., *Artificial Turf Versus Natural Grass: A Case Study of Environmental Effects, Health Risks, Safety, and Cost*, SUSTAINABILITY, July 9, 2025, https://doi.org/10.3390/su17146292.

226. *Opinion on an Annex XV dossier proposing restrictions on intentionally-added microplastics*, EUROPEAN CHEMICALS AGENCY 54-60 (June 11, 2020), https://echa.europa.eu/documents/10162/23665416/restmicroplasticsopinionrac16339en.pdf/b4d383cd-24fc-82e9-cccf-6d9f66ee9089.

227. Barbara Laker & David Gambacorta, *Six Former Phillies died from the same brain cancer. We tested the Vet's turf and found dangerous chemicals.*, THE PHILADELPHIA INQUIRER (Mar. 7, 2023), https://www.inquirer.com/news/inq2/astroturf-vet-artificial-turf-pfas-

Another informal study looked at cancers appearing in soccer players, particularly goalkeepers.[228]

In response to growing concerns about turf, many municipalities, including those in Connecticut[229] and Massachusetts,[230] have banned or are considering banning turf. Nevada has taken a slightly narrower approach, banning all "non-functional turf" by 2026.[231] Governor Gavin Newsom signed legislation that permits cities and counties to ban synthetic grass in neighborhoods by excluding it from the definition of drought-tolerant landscaping.[232] The 2023 European Union ban on intentionally added microplastics also includes "granular artificial turf infill."[233] While there are several concerns with artificial grass, local bans on its use could help reduce the amount of microplastics that enter waterways.[234]

Finally, in February 2025, the *Microplastics Reduction Act* (S0406) was introduced in Rhode Island.[235] This law would ban the sale of products containing intentionally added synthetic polymer microplastics by January 1, 2029,[236] making it illegal to sell, distribute, or offer for sale any product containing intentionally

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forever-chemicals-glioblastoma-cancer-phillies-1980-20230307.html.

228. Stephen Howie, *Does playing soccer on artificial turf increase cancer risk, especially in kids?*, KUOW (Feb. 8, 2024, 1:23 PM), https://www.kuow.org/stories/does-playing-soccer-on-artificial-turf-increase-cancer-risk-especially-in-kids.

229. Sophie Vaughan, *RTM proactively bans crumb rubber artificial turf*, CT INSIDER (last updated Dec. 13, 2018, 2:27 PM), https://www.ctinsider.com/news/article/RTM-proactively-bans-crumb-rubber-artificial-turf-13464197.php.

230. Liz Neisloss, *More games or more grass fields? Turf wars play out across Massachusetts*, GBH (last updated Aug. 7, 2023), https://www.wgbh.org/news/local/2022-05-10/more-games-or-more-grass-fields-turf-wars-play-out-across-massachusetts.

231. Ben Winslow, *With the drought getting worse, new Nevada law bans all 'nonfunctional' turf by 2026: Can solutions for the Great Salt Lake be found in Sin City?*, THE SALT LAKE TRIBUNE (Nov. 15, 2022, 5:00 AM), https://www.sltrib.com/news/2022/11/15/with-drought-getting-worse-new/.

232. Local ordinances and regulations: drought-tolerant landscaping, S.B. 676, 2023-2024 Leg., Reg. Sess. (Cal. 2023). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240SB676

233. Philip Zuccaro et al., *The European Union Ban on Microplastics Includes Artificial Turf Crumb Rubber Infill: Other Nations Should Follow Suit*, 58 ENV'T SCI. & TECH. 2591 (2024). https://pubs.acs.org/doi/full/10.1021/acs.est.4c00047

234. *Id.*

235. Microplastics Reduction Act, S.B. 406, 2025 Gen. Assemb., Reg. Sess. (R.I. 2025). https://legiscan.com/RI/bill/S0406/2025

236. Willow Kennedy, *Rhode Island Proposes Statewide Ban on Intentionally Added Microplastics*, ENVIRONMENT+ENERGY LEADER (May 2, 2025, 12:00 PM), https://www.environmentenergyleader.com/stories/rhode-island-proposes-statewide-ban-on-intentionally-added-microplastics,75370.

added synthetic polymer microparticles in Rhode Island.[237] This law, which also mentions growing water quality concerns with respect to microplastics, could theoretically be used to address glitter and turf.

Although these measures focus on primary microplastics, bans on single-use plastic products such as bags, cutlery, and containers can also indirectly reduce secondary microplastics by limiting the plastic debris available to fragment into smaller particles.[238] Taxes on single-use products like bags have also successfully reduced the amount of plastic debris and subsequent secondary microplastics in our environment.[239]

The success of laws focused on the production phase often hinges on narrowing the scope of regulation to products with clear, documented harms and readily available substitutes. Microbead bans succeeded where broader proposals failed because they coupled public health rationales with industry cooperation. Glitter and turf bans appear poised to follow a similar trajectory, suggesting that product-specific prohibitions can build momentum for broader regulatory change.

### C. *Use*

Laws around the "use" stage of the plastic lifecycle address consumer behaviors and products that release microplastics into the environment. The activities of individual households generate around 77 percent of the microplastics released, while industry is responsible for the remaining 23 percent.[240]

California has been a leader in addressing microplastics at the "use" stage. In 2022, it became the first state to release a *Statewide Microplastic Strategy* (*The Strategy*). *The Strategy* is a result of a 2018 state law requiring the California Ocean Protection Council (OPC) to adopt a statewide research strategy to address microplastics in the environment.[241] In addition to standardizing definitions, sampling methodology, and preparation protocols, *The Strategy*

237. Microplastics Reduction Act, S.B. 406, 2025 Gen. Assemb., Reg. Sess. (R.I. 2025).

238. Anna Papp & Kimberly L. Oremus, *Plastic bag bans and fees reduce harmful bag litter on shorelines*, 388 SCIENCE (2025), https://doi.org/10.1126/science.adp9274.

239. *Id.*

240. Boucher & Froit, *supra* note 210.

241. California Ocean Protection Act, S.B. 1263, 2017–2018 Leg., Reg. Sess. (Cal. 2018), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB123.

identifies early actions and a multi-year roadmap to manage microplastic pollution in the marine environment.[242] While it is not a regulatory instrument, *The Strategy* lays the groundwork for future rulemaking by recommending sector-specific interventions. Among the sectors singled out for immediate attention in California are textiles and tires.

1. *Reducing Secondary Microplastics: Textiles and Tires*

Both textiles and tires are everyday products that generate microplastic fibers, which are significant contributors to the microplastic problem. It is estimated that globally, between 0.2 and 0.5 million tons of microplastics from synthetic textiles are discharged into the oceans each year.[243] One study estimates that approximately 35 percent of microplastics released to oceans globally originate from washing synthetic textiles.[244] Another estimated the annual global emission of microplastic fibers from laundry at 5.69 million tons.[245] Of this total, 93.7 percent came from machine washing, while hand washing only contributed 6.3 percent.[246] Common synthetic fiber polymers found in the marine environment include polyester, acrylic, polypropylene, and nylon.[247] The rise of fast fashion is expected to exacerbate microfibers in our environment.[248]

Given these facts, the *Statewide Microplastic Strategy* recommends requiring washing machines to incorporate filters "with a filtration rate of 100 microns or smaller and develop a program to

242. *Statewide Microplastics Strategy*, OCEAN PROTECTION COUNCIL (Feb. 2022), https://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20220223/Item_6_Exhibit_A_Statewide_Microplastics_Strategy.pdf.

243. *Microplastics from textiles: towards a circular economy for textiles in Europe*, EUROPEAN ENV'T AGENCY (Feb. 9, 2022), https://www.eea.europa.eu/en/analysis/publications/microplastics-from-textiles-towards-a-circular-economy-for-textiles-in-europe.

244. Francesca De Falco et al., *The contribution of washing processes of synthetic clothes to microplastic pollution*, 9 SCI. REP. (Apr. 29, 2019), https://www.nature.com/articles/s41598-019-43023-x.

245. Chunhui Wang, et al., *Global microplastic fiber pollution from domestic laundry*, 477 J. OF HAZARDOUS MATERIALS (Sep. 15, 2024).

246. *Id.*

247. Sinem Hazal Akyildiz et al., *Release of microplastic fibers from synthetic textiles during household washing*, 357 ENV'T POLLUTION (Sep. 15, 2024).

248. Beverley Henry et al., *Microfibres from apparel and home textiles: Prospects for including microplastics in environmental sustainability assessment*, 652 SCI. TOTAL ENV'T 483, 494 (Feb. 20, 2019).

incentivize post-market retrofits or purchases by 2024."[249] In 2023, the California Legislature passed Assembly Bill 1628, which would have required new washing machines for residential and state use sold in the state after 2029 to be equipped with microfiber filtration systems.[250] However, Governor Gavin Newsom vetoed the bill, citing concerns about consumer costs and insufficient research.[251]

However, the legislative findings show that adoption of washing machines with filters in California would decrease "annual synthetic microfiber emissions to natural environments by almost 80 percent."[252] And France has recently enacted a law requiring filters in washing machines by 2025.[253] Given that washing machine filters are an effective and available way to reduce microfiber pollution, several states, including Oregon,[254] Illinois,[255] New York,[256] New Jersey,[257] and Pennsylvania,[258] are considering similar legislation that mandates filters on washing machines.

Other strategies include consumer labeling and collaborative industry efforts. For example, California's Assembly Bill 2379[259] would require clothing made from fabric that is more than 50 percent polyester to carry a label stating: "This garment sheds plastic microfibers when washed. Hand washing recommended." A

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249. *Statewide Microplastics Strategy*, *supra* note 240.

250. Microfiber filtration, A.B. 1628, 2023–2024 Leg., Reg. Sess. (Cal. 2023).

251. Allison Guy, *California governor vetoes bill that would require microplastic filters on washing machines*, ENVIRONMENTAL HEALTH NEWS (Oct. 26, 2023), https://www.ehn.org/microplastic-filter-for-washing-machine.

252. *Id.*

253. *Id.*

254. Relating to microfibers, S.B. 526, 2025 Leg., Reg. Sess. (Or. 2025). https://olis.oregonlegislature.gov/liz/2025R1/Measures/Overview/SB526#:~:text=Oregon%20State%20Legislature&text=Catchline%2FSummary%3A,small%20fibers%2C%20starting%20in%202030.

255. H.B. 4269, 103rd Gen. Assemb. (Ill. 2025). https://www.ilga.gov/ftp/legislation/103/BillStatus/HTML/10300HB4269.html#:~:text=Provides%20that%2C%20on%20and%20after,2)%20bears%20a%20conspicuous%20label

256. Washing Machine Microfiber Filtration Act, S.B. S5605C, 2025–2026 Leg., Reg. Sess. (N.Y. 2025). https://www.nysenate.gov/legislation/bills/2025/S5605/amendment/C

257. Requires filtration system to capture microfibers and microplastics on washing machines sold on or after January 1, 2030, S.B. 3619, 221st Legis. (N.J. 2024). https://legiscan.com/NJ/text/S3619/id/3021682.

258. Microfiber, H.B. 2568, 2023–2024 Gen. Assemb., Reg. Sess. (Penn. 2024). https://www.palegis.us/legislation/bills/text/PDF/2023/0/HB2568/PN3619

259. Waste management: plastic microfiber, A.B. 2379, 2017–2018 Leg., Reg. Sess. (Cal. 2018). https://legiscan.com/CA/text/AB2379/id/1730641

similar bill introduced in New York would require clothing that is more than fifty percent synthetic material to have a label stating: "This garment sheds plastic microfibers when washed. Hand washing is recommended to reduce shedding."[260] Instead of passing a labeling law, Connecticut formed the Microfiber Pollution Working Group, made up of apparel industry and environmental representatives, to create a consumer awareness and education program about the presence of synthetic microfiber pollution.[261]

Examples of industry efforts include Patagonia's collaboration with Samsung to develop a filter that can attach to washing machines[262] and Lululemon's partnership with Samsara Eco, a company that recycles nylon and polyester using enzymes, to include more recycled nylon and polyester in its products.[263]

Tire wear is another major source of microplastics. When it rains, stormwater carries particles from vehicle tires and brake pads – such as zinc, copper, and microplastics—from streets into rivers and streams, and ultimately the ocean. Estimates suggest that tire wear releases anywhere between 1 and 3.5 million tons of microfibers into the environment each year.[264] Another study suggests that tires are 28 percent of all microfibers released into the environment.[265] Research in the San Francisco Bay found that fibers from tires were responsible for 59 percent of the

260. A. 10599, 2017–2018 Leg., Reg. Sess. (N.Y. 2017). https://www.nysenate.gov/legislation/bills/2017/A10599

261. Public Act No. 18-181 (Conn. 2018). https://www.cga.ct.gov/2018/ACT/pa/2018PA-00181-R00HB-05360-PA.htm

262. Vincent Stanley, *Toward an End to Microfiber Pollution*, PATAGONIA (Aug. 9, 2023), https://www.patagonia.com/stories/toward-an-end-to-microfiber-pollution/story-141340.html.

263. Laurel Deppen, *Lululemon grows circular sourcing ambitions, expands partnership for recycled fibers*, ESG DIVE (June 16, 2025), https://www.esgdive.com/news/lululemon-samsara-eco-circularity-recycled-polyester-nylon/750796/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202025-06-18%20Waste%20Dive:%20Recycling%20%5Bissue:74207%5D&utm_term=Waste%20Dive:%20Recycling.

264. Laurie Winkless, *Tires Shed Millions Of Tonnes Of Microplastics Into The Environment*, FORBES (Dec. 18, 2024, 1:25 PM), https://www.forbes.com/sites/lauriewinkless/2024/12/18/tires-shed-millions-of-tonnes-of-microplastics-into-the-environment/.

265. Henry Obanya, *Car tyres shed a quarter of all microplastics in the environment – urgent action is needed*, THE CONVERSATION (Nov. 27, 2024, 7:37 AM), https://theconversation.com/car-tyres-shed-a-quarter-of-all-microplastics-in-the-environment-urgent-action-is-needed-244132.

microplastics in water samples.[266] As mentioned, tire particles create 6PPD-quinone (6PPD-q), an acutely toxic chemical to aquatic life. Mass mortality events in protected salmonid populations have prompted litigation and petitions for regulation.[267]

In 2023, California's Department of Toxic Substances Control (DTSC) added tires containing 6PPD-q to its Priority Products List under the state's Safer Consumer Products Regulations.[268] Manufacturers of tires with 6PPD-q must now notify DTSC whether they plan to remove the product, remove the chemical, or use an alternative.[269] Washington state, in 2025, added 6PPD to its list of priority chemicals under its Safer Products program.[270]

California's DTSC is looking more broadly at microplastics. In June 2025, DTSC proposed adding microplastics to the Candidate Chemicals List, allowing the agency to evaluate other consumer products as microplastic sources.[271] While listing microplastics does not create an immediate regulatory burden, it is a precursor to analysis that could result in future regulations, including requiring additional product information for consumers, among other things.[272]

Efforts at the "use" stage include both consumer-facing interventions, such as labeling and product design, and upstream manufacturing changes. While mandates for filters have yet to take

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266. Rebecca Sutton et al., *Understanding Microplastic Levels, Pathways, and Transport in the San Francisco Bay Region*, 950 SAN FRANCISCO ESTUARY INSTITUTE (Oct. 2019), https://www.sfei.org/sites/default/files/biblio_files/Microplastic%20Levels%20in%20SF%20Bay%20-%20Final%20Report.pdf.

267. *See infra* Part III.B.

268. *Adopted Priority Product: Motor Vehicle Tires Containing 6PPD*, Cal. Dep't. of Toxic Substance Control (last visited Aug. 14, 2025), https://dtsc.ca.gov/scp/motor_vehicle_tires_containing_6ppd/.

269. *Id.*

270. Addressing 6PPD in motorized vehicle tires through safer products for Washington, S.B. 5931, 68th Leg., Reg. Sess. (Wash. 2023), https://app.leg.wa.gov/billsummary/?BillNumber=5931&Year=2023&Initiative=false#documentSection

271. Press Release, Dept. of Toxic Substance Control, DTSC Proposes Adding Microplastics to its Candidate Chemicals List (June 20, 2025), https://dtsc.ca.gov/2025/06/20/dtsc-proposes-adding-microplastics-to-its-candidate-chemicals-list/.

272. Ryan Carra, Allyn Stern & Maxwell Bradley, *California Proposes Listing Microplastics Under Safer Consumer Products Program*, BEVERIDGE & DIAMOND (July 7, 2025), https://www.bdlaw.com/publications/california-proposes-listing-microplastics-under-safer-consumer-products-program/.

hold and harms from tires are just beginning to be studied and regulated, industry-led innovations and consumer pressure may bridge the gap until mandatory measures become politically viable. For example, CLEARN is a filter that attaches directly to the washing machine hoses, removing up to 90 percent of microfibers released during a load of laundry. Developed by alumni at Case Western Reserve University, the product has been installed in washing machines across the university and other institutions in the region.[273] Consumers are placing pressure on tire companies, like Goodyear, through shareholder proposals, asking the company board to adopt policies that result in setting tire wear shedding reduction goals and timelines.[274] Industry efforts and consumer pressure can further signal to lawmakers that microplastics are an important issue.

### D. *Disposal*

State and local governments have also begun targeting disposal-related microplastic pollution through measures addressing both point and nonpoint sources. Like bans, labeling is a regulatory strategy that can be used to achieve environmental goals.[275] Shifting liability and responsibility to producers and industries creating microplastics is another method being used to address microplastics.[276]

#### 1. *No-flush Laws, Construction Controls, and Extended Producer Responsibility Laws*

Products like baby wipes and wet wipes cause problems when improperly flushed down the toilet, clogging the sewers and releasing microfibers and additives into the environment.[277] To

273. Zaria Johnson, *Case Western Reserve University Alumni Roll Out Microplastic Filtration System for Washing Machines*, IDEASTREAM PUBLIC MEDIA (June 3, 2025), https://www.ideastream.org/environment-energy/2025-06-03/case-western-reserve-university-ins.

274. GOODYEAR TIRE & RUBBER CO., *Reduce Automobile Tire Microfiber Shredding*, As You Sow (November 7, 2024), https://www.asyousow.org/resolutions/2024/11/7-goodyear-reduce-automobile-tire-microfiber-shedding. (last visited Nov. 9, 2025).

275. *See generally* Steph Tai, *Environmental Health, Public Health, or Individual Health? The Complications of Using Eco-Labels for Food Governance*, 31 Health Matrix 369, 370 (2021) (exploring the use of food eco-labels); *see also* MORATH, *supra* note 19, at 135 (describing eco-labels as regulation by information).

276. *See* MORATH *supra* note 19, at 193.

277. Tommaso Nacci, *Disposable wet-wipes as potential source of pollution: Multi-analytical*

address this, some states have introduced regulations requiring clearer labeling of disposable wipes to discourage flushing, while others are considering bans on products containing certain plastic additives. For example, New York[278] and California[279] have enacted legislation requiring labeling on non-flushable wipes to reduce strain on wastewater systems. Michigan's law, enacted in March 2025, requires baby wipes and other non-flushable wipes to display a "do not flush" symbol on packaging.[280] No-flush laws also help to preserve pipes and wastewater treatment plants, which can be damaged by these products.[281]

Microplastics from construction site runoff, though less significant than textile or tire sources, are locally important, particularly in coastal communities. In 2024 and 2025, more than sixteen towns along the Jersey Shore enacted local ordinances to address microplastic pollution from construction sites.[282] These ordinances would require contractors to use certain equipment and processes to minimize the amount of microplastics and dust released at construction sites.[283] They also prohibit the blowing of microplastics into storm drains.[284]

Stormwater runoff is a significant pathway for microplastic pollution.[285] Engineered solutions like stormwater retention ponds, bioretention facilities, and rain gardens have also proven

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*investigation of the composition of fibres and additives*, J. OF ANALYTICAL & APPLIED PYROLYSIS, Oct. 2025, https://doi.org/10.1016/j.jaap.2025.107200.

278. S.B. 9105, 2021 Senate Leg. Sess. (N.Y. 2021), https://www.nysenate.gov/legislation/bills/2021/S9105.

279. Solid Waste: Premoistened Nonwoven Disposable Wipes, A.B. 818, 2021 Cal. Assemb. (Cal. 2021), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB818

280. *Id.*

280. H.B. 4596, 102d Legis. (Mich. 2023). https://legiscan.com/MI/text/HB4596/id/2843930

281. *Michigan law goes into effect requiring "Do Not Flush" symbol on wipes to protect infrastructure*, SMART WATER MAGAZINE (Jan. 30, 2025), https://smartwatermagazine.com/news/smart-water-magazine/michigan-law-goes-effect-requiring-do-not-flush-symbol-wipes-protect.

282. María Paula Rubiano, *How New Jersey's towns are tackling microplastic pollution from construction*, ENVIRONMENTAL HEALTH NEWS (June 3, 2025), https://www.ehn.org/microplastic-pollution-construction-new-jersey.

283. BOROUGH OF MONMOUTH BEACH, CNTY. OF MONMOUTH, ORDINANCE § 3-22 (June 18, 2024), https://ecode360.com/MO3812/laws/LF2129136.pdf.

284. *Id.*

285. L.M. Werbowski et al., *Urban Stormwater Runoff: A Major Pathway for Anthropogenic Particles, Black Rubbery Fragments, and Other Types of Microplastics to Urban Receiving Waters.* 1 ACS ES&T Water 6, 1420–1428 (2021). doi:10.1021/acsestwater.1c00017.

effective in reducing microplastic discharges.[286] Collectively, these localized efforts reflect a growing recognition that waste disposal systems must be updated to account for the unique risks posed by microplastics and that regulation at the municipal level can be a powerful tool in reducing their release.

Some states have also expanded Extended Producer Responsibility (EPR) laws—laws that make manufacturers responsible for the full lifecycle of their product—to encompass products that contribute to microplastic generation. For example, California's EPR law for plastic packaging includes obligations for producers to reduce plastic waste that can fragment into microplastics.[287] Oregon[288] and Colorado[289] have also enacted EPR programs targeting packaging materials, many of which are common sources of secondary microplastics. These programs aim to shift the cost and responsibility for managing waste to the producers, incentivizing design changes that reduce environmental impacts. As states expand EPR laws to include more product categories, they represent a promising mechanism for addressing upstream contributors to microplastic generation.[290]

Disposal-focused interventions demonstrate the versatility of municipal authority in addressing microplastic pollution. By targeting specific disposal pathways—such as wastewater systems or construction site runoff—local governments can enact low-cost, high-impact measures that complement broader producer responsibility regimes.

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286. Heléne Österlund et al., *Microplastics in urban catchments: Review of sources, pathways, and entry into stormwater*, 858 J. OF THE TOTAL ENV'T 7-8 (Feb. 1, 2023).

287. Plastic Pollution Prevention and Packaging Producer Responsibility Act, S. 54, Reg. Sess. (Cal. 2022).

288. Plastic Pollution and Recycling Modernization Act, S. 582, 81st Leg. (Or. 2021), https://olis.oregonlegislature.gov/liz/2021R1/Downloads/MeasureDocument/SB582/Enrolled.

289. Producer Responsibility Program for Statewide Recycling Act, H.B. 22-1355, 75th Gen. Assemb., 1st Sess. (Colo. 2022), https://leg.colorado.gov/bills/hb22-1355.

290. See Eugene Cheigh, *Towards a Global Plastic Treaty: Exploring the Civil Liability Elements in Addressing Plastic Pollution*, 39 CONN. J. INT'L L. 17, 39 (2023) (asserting "extended Producer Responsibility (EPR) is an environmental protection strategy that aims to reduce the negative environmental impact of a product by making manufacturers responsible for the full life cycle of their product with a particular emphasis on take-back, recycling, and final disposal of the product. EPR correlates with the polluter pays principle and can be operated in the form of liability for environmental damage caused by the usage or disposal of the product").

### E. *From Micro to Macro: Ripple Effects and Broader Change*

The success of these micro-efforts can be measured both substantively—by fewer microplastics entering the environment—and structurally—by shifts in norms, markets, courts, and legislation making larger reforms possible. While it's too early to determine whether micro-efforts will result in fewer microplastics in the environment, the ripple effects have begun to emerge through shifts in norms and laws.

The unrelenting filing of plastic pollution lawsuits and successful settlements continues to put pressure on plastic-related businesses. In September 2025, the city of Philadelphia filed a lawsuit against Bimbo Bakeries and S.C. Johnson (the makers of Ziplock bags), alleging their deceptive marketing on recycling was a violation of the city's consumer protection ordinance.[291] Earlier in the month, Danone settled two lawsuits alleging misleading recycling claims and the presence of microplastics in bottled water. As part of the settlement, Danone will nevertheless "alloc[ate] corporate funds over the next three years towards the research and development of solutions that reduce plastic packaging and/or provide plastic-free alternatives to plastic packaging for evian® products in the U.S."[292] As a final example, in September 2025, a plastic pellet manufacturer settled with Pennsylvania environmental groups over plastic pellet discharges that violated the Clean Water Act.[293] As part of the settlement, the pellet manufacturer is required to install technology that would bring discharges to zero, and pay $2.6 million to the defendant to help with watershed restoration.[294] There seems to be no slowing down when it comes to plastic pollution litigation, which has been deemed a "growing area of litigation."[295]

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291. City of Philadelphia v. Bimbo Bakeries, No. 250902524 (Phila. Cnty. Ct. filed Sep. 24, 2025), https://www.phila.gov/media/20250924115338/Plastic-Film-Recycling-Deception-Complaint.pdf

292. *Plastic Pollution Coalition and Danone Waters Settle Lawsuit Regarding Plastic Recycling Claims, Microplastics and BPA*, PLASTIC POLLUTION COALITION (2025), https://www.plasticpollutioncoalition.org/wp-content/uploads/PPC-Press-Release-10-September-2025.pdf (last visited Nov. 13, 2025).

293. Pennenvironment, Inc. v. BVPV Styrenics LLC, No. 2:23-cv-02067-NR (W.D. Pa. filed Sep. 3, 2025), https://www.nelc.org/wp-content/uploads/2025/09/Proposed-Consent-Decree-Styropek.pdf.

294. *Id.*

295. Megan R. Brillault et al., *Public Nuisance Claims Continue to Gain Traction in Plastics Litigation*, 15 NAT'L LAW REV. 324, (2025), https://natlawreview.com/article/public-

The steady drumbeat of litigation and state and local legislation has caught the eyes of federal legislators in bipartisan ways. For example, a federal bipartisan bill called the WIPPES Act was introduced and passed by the House of Representatives in June 2025.[296] Like the state laws, the federal law would require wipe manufacturers to label their products as non-flushable to protect wastewater infrastructure from damage.[297] Though not bipartisan, the Fighting Fibers Act of 2025, introduced by Senator Merkley (D-OR), would require all washing machines sold in the United States to have microfiber filtration systems.[298]

Another bipartisan example is the Microplastic Safety Act, introduced in July 2025.[299] This law would evaluate the human health impacts of microplastics in food and water.[300] The bipartisan bill, introduced by Rep. Janelle Bynum (D-OR), Senators Jeff Merkley (D-OR) and Rick Scott (R-FL), and Rep. Greg Steube (R-FL), would direct the U.S. Food and Drug Administration to compile information about the impacts of microplastic exposure on human health.[301] The agency would be required to submit a report to Congress outlining risks to children's health, the endocrine system, and reproductive health, and detail any associations between microplastic exposures and cancer and other chronic illnesses.[302] Analysts note that the lack of standardization for definitions, sample collection, and preparation procedures, among other things "may present significant obstacles to satisfying the bill's objectives and truly understanding any risks associated with microplastics exposures."[303]

These concerns about standardization and sampling

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nuisance-claims-continue-gain-traction-plastics-litigation.

296. Wastewater Infrastructure Pollution Prevention and Environmental Safety Act, H.R. 2269, 119th Cong. (2025), https://www.congress.gov/bill/119th-congress/house-bill/2269.

297. *Id.*

298. Fighting Fibers Act, S. 2435, 119th Cong. (2025), https://www.congress.gov/bill/119th-congress/senate-bill/2435/text.

299. Microplastics Safety Act, S. 2353, 119th Cong. (2025), https://www.congress.gov/bill/119th-congress/senate-bill/2353.

300. *Id.*

301. *Id.*

302. *Id.*

303. Peter N. Coneski, Natalie E. Rainer & Elisabeth M. Lewis, *Microplastics Under the Microscope: Federal and California Proposals Target Microplastics*, MONDAQ (July 30, 2025), https://www.mondaq.com/unitedstates/healthcare/1657222/microplastics-under-the-microscope-federal-and-California-proposals-target-microplastics.

techniques were one of the primary drivers behind California's adoption of the *Statewide Microplastic Strategy*, which required the California State Water Resources Control Board to develop a testing method to measure microplastic particles in drinking water by 2021.[304] The development of a statewide testing procedure for microplastics in drinking water was also proposed and adopted in Virginia, New Jersey, and Illinois.[305] Similar bills have been introduced in Rhode Island and New York City.[306]

The spread of state and local initiatives across the United States, and their percolation into federal policy discussions, was seen with microbeads. As with the enactment of the Microbead-Free Waters Act, early state action both identified emerging harms and generated political momentum for broader intervention, particularly as scientific evidence and public attention increasingly focus on human health impacts. This bottom-up effort framed microplastics not merely as an environmental nuisance but as a public health concern that spurred a coordinated regulatory response. Contemporary microplastic regulation appears to be following a similar pathway from state and local experimentation to federal legislative action.

The spread of state and local microplastic efforts to other states and upward into federal conversations, and the increased emphasis on health-related concerns, is similar to what was seen when the Microbead-Free Waters Act was enacted.

## V. CONCLUSION

A July 2025 study found that 79 percent of consumers agree that microplastics are a human and environmental health crisis.[307] Americans are most concerned about microplastics' impact on human health (90 percent) and are looking for both a private sector response and government action on the issue.[308] Mounting

304. *California Becomes First State to Adopt Statewide Testing Requirement for Microplastics in Drinking Water*, KING & SPALDING (Mar. 14, 2024), https://www.kslaw.com/news-and-insights/california-becomes-first-state-to-adopt-statewide-testing-requirement-for-microplastics-in-drinking-water.

305. *Id.*

306. *Id.*

307. *Grove Collaborative Announces U.S. Microplastics Survey Results*, BUSINESS WIRE (July 22, 2025), https://www.businesswire.com/news/home/20250722455914/en/Grove-Collaborative-Announces-U.S.-Microplastics-Survey-Results

308. *Id.*

litigation and growing consumer awareness reflect concern about the risks posed by microplastic exposure. Health care providers now advise patients on mitigation strategies,[309] and the medical industry is beginning to assess the implications of plastics in clinical settings and advocate for action.[310] Macro-level policy reforms, essential for long-term systemic change, can be slow to develop and difficult to achieve. In the interim, micro-level interventions—targeted product bans, labeling requirements, and design modifications—are proving both effective in reducing plastic inputs and politically feasible.

As explored in Section III, these interventions map onto each stage of the plastic lifecycle. At the production phase, narrow bans on intentionally added microplastics, such as glitter and turf, demonstrate how targeted legislation could reduce microplastics by reducing the amount of microplastics on the marketplace. At the use phase, consumer labeling laws and product design requirements—such as washing machine filters or identifying priority chemicals—could reduce the harm from high-shedding products like textiles and tires. Finally, at the disposal phase, no-flush labeling laws, stormwater controls, and extended producer responsibility programs could mitigate downstream releases.

These decentralized strategies are particularly significant given the protracted pace of federal and international action. State, local, and individual initiatives can spur innovation, elevate public awareness, and create momentum for more comprehensive reform, as demonstrated by the Microbead-Free Waters Act. Indeed, several federal proposals have followed state-level action, including no-flush labeling requirements and washing machine filtration mandates. Congress is now considering a bipartisan bill to study the effects of microplastic exposure.[311] The micro-solutions discussed here illustrates how state and local regulators can deploy existing legal tools—such as product bans, disclosure mandates, and design standards—to target discrete sources of microplastic pollution.

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309. *Microplastics and Your Family's Health: What You Need to Know*, NATIONWIDE CHILDREN'S (Apr. 24, 2025), https://www.nationwidechildrens.org/family-resources-education/700childrens/2025/04/microplastics.

310. Press Release, Health Care Without Harm, Over 6 Million Health Professionals Urge Plastics Treaty Negotiators to Protect Planet, Patients in Open Letter (Apr. 29, 2025), https://healthcareclimateaction.org/node/192.

311. *See supra* note 299.

Taken collectively, these micro-level interventions offer a pragmatic and scalable path forward. By incrementally reducing microplastic inputs across the production–use–disposal spectrum, they not only address immediate environmental and public health risks but can also lay the political and practical groundwork for a more comprehensive and enduring approach to combating plastic pollution.