Pennsylvania's Pristine Waterways and Microplastics

A Survey of Exceptional Value, High Quality, and Class A Trout Rivers and Streams

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Contents

Executive Summary

PLASTIC IS EVERYWHERE AND IN EVERYTHING. It's used as packaging, it's in food service products, and it's in clothing. All told, Americans generate over 35 million tons of plastic waste every year, but less than 6% is recycled.[1,2] In fact, the U.S. throws out enough plastic every 16 hours to fill the Dallas Cowboys stadium, and that amount is increasing annually.[3]

Roaring Brook Photo: Staff

Often when talking about plastic pollution, the images that come to mind are sea turtles and birds ensnared in bags or straws, massive trash gyres in the Pacific Ocean, or whales washed ashore with hundreds of pounds of plastic waste in their stomachs. So it may not be surprising that 60% of all seabird species have ingested plastic, with that number expected to rise to 99% by the year 2050.[4] Studies have also estimated that by 2050 there will be more plastic in our oceans than fish.[5]

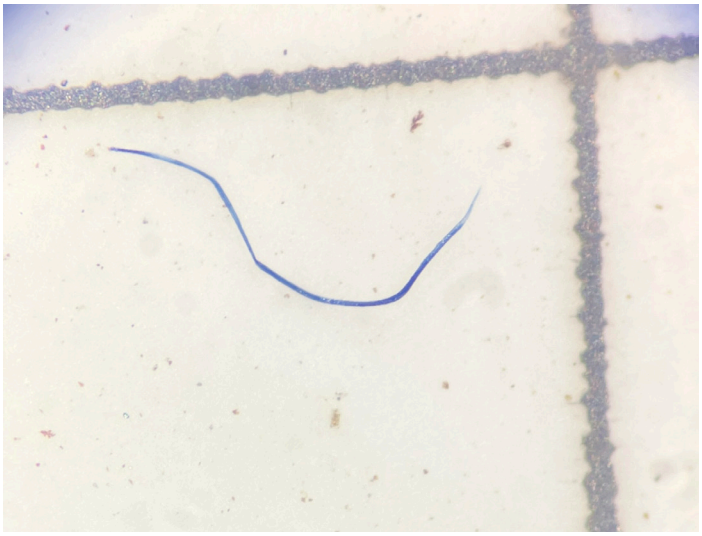
Plastic pollution is also a pressing issue right here in Pennsylvania. For example, in a single year, the Philadelphia Water Department removes 44 tons of trash from a 32 mile stretch of the Schuylkill and Delaware rivers, 56% of which was plastic waste.[6] In Pennsylvania, plastic is the most common form of visible litter.[7] In fact, the Department of Transportation spends over $13 million every year cleaning up just roadside litter.[8] The problem is so widespread that nine of the largest cities in Pennsylvania spend over $68.5 million every year on litter and illegal dumping, with $46.7 million of that going toward litter abatement.[9]

But litter alone doesn't capture the full scope of plastic pollution. Research suggests that we could be not counting 99% of the plastic that makes its way into the environment.[10] That's because plastic doesn't degrade in the environment like an apple or a piece of paper, instead it breaks into smaller and smaller pieces of plastic called microplastics. Microplastic is plastic less than 5mm in length, or smaller than a grain of rice.[11] They've now been found in the deepest depths of the ocean and on the highest mountains in the world.[12, 13]

A growing area of concern regarding our plastic waste is the environmental and public health threat posed by these microplastics. They are severe suffocation and starvation hazards to wildlife and have been found in our air, food, and bodies. [14, 15, 16] Microplastics also attract pollutants that may already exist in the environment at trace levels, accumulating toxins like DDT & PCBs and delivering them to the wildlife that eat them, often bioaccumulating through the food chain.[17] And the evidence is mounting that humans not only ingest microplastics, but that those plastics remain in the body and cause harm. It's estimated that on average, humans ingest 5 grams of plastic every week, roughly equivalent to the weight of a credit card or single-use plastic bag.[18] Microplastic has been found in human blood and even the lungs of living patients.[19] And although not too much is known about the full scope of health effects of microplastics in humans, plastic, and the chemicals it contains, can cause endocrine disruption, hormonal effects, and reproductive disorders.[20]

And microplastics don't arrive in the environment from just one source. Plastic littered on roads, in streams, or in the ocean can release tons of microplastics, but plastic waste disposed of in landfills can also release microplastics into the environment through wind, rain, and landfill leachate.[21] The burning of plastic or other waste can also create airborne microplastic particles.[22] Microbeads from cosmetic and personal care products can enter the environment at their manufacture or through sinks and drains.[23] Nurdles, the raw plastic feedstock that are used to make new plastic items, are lost by the millions every year.[24] Synthetic materials in car tires release microplastics onto roads that are swept into stormwater infrastructure.[25]

Clothing and other textiles are also a major source of microplastics. Fibers are one of the most commonly found types of microplastic and they're sourced from synthetic and hybrid materials like fleece.[26] Normal wear and tear will release microplastics into the air, and cleaning these textiles in a washing machine releases millions of microfibers into wastewater infrastructure that treatment plants are unable to fully filter out.[27]



Microplastic fibers from a sample of Philadelphia tap water

To better understand the scope of the microplastic problem in Pennsylvania, the PennEnvironment Research & Policy Center sampled 50 of Pennsylvania's Exceptional Value (EV), High Quality (HQ), and Class A Cold Water Trout Fishing (Class A) streams. We found microplastics in 100% of our samples. Unfortunately, these samples come from waterways that are considered among the cleanest and of the highest ecological value in the Commonwealth.

Our project took samples from the identified waterways from winter 2021 through spring 2022 and tested them for four types of microplastic pollution:

1. Fibers: primarily from clothing and textiles;
2. Fragments: primarily from harder plastics or plastic feedstock;
3. Film: primarily from bags and flexible plastic packaging;
4. Beads: primarily from facial scrubs and other cosmetic products.

The results found were troubling:

- **100% of EV, HQ, and Class A Trout streams sampled had microfibers;**
- **84% of sites sampled had microfragments;**
- **84% of sites sampled had microfilm;**
- **Only 2% of sites had microbeads.**

It's clear that the scope of plastic pollution in Pennsylvania extends far beyond what was previously thought. These are the cleanest and best protected waterways in the Commonwealth. And while many of the waterways sampled had little to no visual litter at the point of access, our samples found that Pennsylvania's most pristine waterways continue to be contaminated with plastic pollution.

Monocacy Creek *Photo: Staff*

In order to address the environmental crisis being caused by our overreliance on plastics, our leaders at the federal, state, and local levels should immediately implement the following policies:

1. **Municipalities should pass local bans and other restrictions on hard to recycle single use plastics, such as bags, polystyrene, bottles, straws, and utensils.**
2. **Cities should develop green infrastructure and stormwater programs to help stem the tide of plastics and microplastics being washed into our waterways and surrounding environment.**
3. **State legislators should defend against any proposals meant to preempt or restrict the ability of the Commonwealth's municipalities from implementing local plastic ordinances.**
4. **The Pennsylvania General Assembly and United States Congress should pass bottle deposit requirements and producer responsibility laws to shift the burden of waste onto those who create the pollution in the first place.**
5. **The General Assembly should modernize Pennsylvania's cornerstone recycling law, Act 101, in order to bring the Commonwealth's waste management into the 21st century.**
6. **State and local legislators should oppose any proposed subsidies or other incentives that will continue to promote society's reliance on single-use plastics and double down on the fossil fuel-to-plastics pipeline.**
7. **State and federal officials should pass policies that prevent overstock clothing from being sent to landfills so that clothing manufacturers and retailers stop producing more clothing than we could ever need.**

Introduction

EVERY DAY, AMERICANS THROW AWAY TONS of plastic "stuff" -- cups, plates, bags, containers, forks, knives, spoons and more.[28] Sadly, much of this plastic waste never makes it to the trash can and ends up soiling our parks and public lands, where it also washes into our rivers, harming wildlife. Once in our environment, plastic does not biodegrade.[29] Instead, it breaks into smaller and smaller pieces known as microplastics.

Microplastics can enter our environment through a myriad of pathways. Litter, illegal dumping, and plastic waste are all obvious culprits. Microfibers are another prevalent type of microplastics and are introduced into the environment through clothes washing as well as usual wear and tear.[30] With wastewater treatment plants unable to fully filter these plastic fibers out, they can end up washed into waterways and ultimately in drinking water.[31, 32] The creation of new plastic products uses small pellets called nurdles which are easily lost and frequently enter waterways.[33] Packaging and the factory processes in the creation of products like bottled water can even cause microplastic contamination.[34]

The small size of microplastics makes it easy for them to be carried by wind and rain and deposited in the environment far from their source. Meaning, plastic disposed of in a landfill or an incinerator can still contaminate waterways.[35]

For a bird or fish, it's easy to mistake these small pieces of plastic for food -- especially when there are billions of pieces of microplastic floating in our waterways. Scientists have found that ingesting even tiny particles of plastic can alter the behavior and metabolism of fish – and people can ingest these pollutants as they make their way up the food chain.[36, 37]

In March 2020, the PennEnvironment Research & Policy Center released a study of 53 Pennsylvania waterways titled "Microplastics in Pennsylvania: a Survey of Waterways". The study found one or more

A plastic bag by Little Bushkill Creek Photo: Staff

types of microplastic in every waterway sampled. This may not have been a surprise, given the presence of litter, macroplastics, and the proximity of many of these 53 waterways to urban population centers.

This report is a follow up to our 2020 study. To better understand the spread of plastic pollution in Pennsylvania, in our new 2022 report, the PennEnvironment Research & Policy Center tested for potential microplastic pollution in 50 rivers and streams categorized by the Pennsylvania Department of Environmental Protection (DEP) as Pennsylvania's cleanest and best maintained waterways. These waterways are categorized by the DEP as "Exceptional Value", "High Quality", and "Class A Cold Water Trout" streams. The waterways sampled represent a collection of the most pristine and untouched waters that Pennsylvania has to offer.

A Widespread Problem

Scientists are still documenting the scope of plastic pollution and investigating its effects in freshwater ecosystems and on human health, but there is a growing field of data showing that microplastics are spreading across the planet and becoming more pervasive in our daily lives:

- Microplastics have been found in global and domestic samples of **tap water, sea salt, and beer**;[38]
- Microplastics have been found in a study of some of the most popular **bottled water** brands across several countries that point to contamination from packaging and manufacturing;[39]
- U.S. Geological Survey (USGS) researchers found microplastic in 90% of rainwater samples collected from sites in **Rocky Mountain National Park** and the Denver-Boulder urban corridor;[40]
- Researchers from Utah State and Cornell University found that microplastics are taken up by the air and carried around the globe through **atmospheric currents**;[41]
- Plastic pollution has now been found in isolated marine environments in **the Arctic and Antarctic**;[42]
- Research from the Chinese Academy of Sciences has shown that microplastics in the soil can be taken up by the roots of **wheat and lettuce crops** and transferred to the edible portions of those plants;[43]
- Recent studies from Utah State University and the University of Strathclyde among others have found high concentrations of microplastics in **fog, dust, and ocean air**;[44, 45]
- In Oregon, a recent study from Portland State University found microplastics in the stomachs of oysters and razor clams off the Oregon Coast. In fact, only two out of the nearly 300 mollusks tested were found to be plastic-free;[46]

Plastic litter in Aquetong Creek Photo: Staff

- Microplastic pollution has been recorded at the highest elevation on Earth, **Mt Everest**, and the lowest, **the Marianas Trench** at the very bottom of the Pacific Ocean;[47, 48]
- Microplastics have been found in **human fetuses**, potentially meaning that microplastics enter the human body before birth.[49]
- Microplastics from plastic bottles, polystyrene containers, and LDPE film have been found in samples of **human blood.** [50]
- Microplastics have been found deep in the **lung tissue of living patients**, demonstrating that the plastic does not pass through our bodies but lingers.[51]

Frighteningly, it's estimated that humans ingest about 5 grams of plastic every week, roughly the weight of a credit card or single-use plastic bag.[52] While the body of research on the effects of microplastics on human health is growing almost daily, recent studies raise a red flag for the health risks likely posed by microplastic ingestion.[53]

Research from the National Oceanic and Atmospheric Administration (NOAA) has shown that microplastic particles can attract heavy metals and chemical contaminants which are then consumed by fish, birds, and humans (among other organisms).[54] These can include PCBs and pesticides which can pose significant health risks when consumed by animals and humans.

Methodology

Sampling

THE GOAL OF THIS SURVEY WAS TO EXAMINE the presence and type of microplastics in some of Pennsylvania's cleanest and best protected waterways. The 50 study sites (Table 1) selected had to be classified by the PA DEP as Exceptional Value (EV) or High Quality (HQ), or they had to qualify as a Class A Coldwater Trout Fishing Stream. Waterways fitting these classifications were chosen for sampling to capture a range of regional geographies across the Commonwealth, urbanization, and importance to local watersheds, recreation, and fishing organizations. A full map of where samples were taken can be found at https://environmentamerica.org/pennsylvania/center/resource/microplastics-found-in-pennsylvanias-cleanest-streams.

For water sampling and processing, the *Microplastics: Sampling and Processing Guidebook* protocol developed by NOAA, Mississippi State University Extension, Dauphin Island Sea Lab, and Sea Grant was used.[55] To aid in the identification of microplastics, the *Guide to Microplastic Identification* by the Marine & Environmental Research Institute (now Shaw Institute), was also used.[56] A video guide to sampling was also developed and can be viewed at https://environmentamerica.org/pennsylvania/center/resources/microplastics-sampling-video-guide.

Water samples were collected from the 50 sites in six glass quart jars from October 2021 to May 2022. Jars were sealed during storage, transport, and before sampling. At each site before collecting samples, jars and their lids were triple-rinsed with the source water.

State Representative Joe Webster collects samples from Valley Creek Photo: Staff

PennEnvironment staff collect samples from Quebec Run Photo: Staff

To fill the jars, samplers walked to a water access point with a water depth of approximately two feet (where possible), and drew water samples from this point to avoid collecting sediment. For sites with no access to a depth of two feet, samples were taken at the deepest accessible depth. When taking samples from moving water, samplers sampled upstream from themselves to minimize the potential for contamination. Samplers were instructed to avoid wearing fleece and other synthetic clothing materials to minimize the risk of contamination by clothing fibers.

Six quarts were drawn at each site. All jars were labeled with the site name, date, sample number, and initials of the sampler. The jars were stored at room temperature away from direct sunlight before being transported to the Academy of Natural Sciences of Drexel University in Philadelphia for analysis.

Analysis

The analysis of all the samples was done under laboratory conditions at the Academy of Natural Sciences of Drexel University's Patrick Center for Environmental Research.

All lab materials, including the filter funnel, petri dishes, forceps, and tweezers were rinsed with deionized water between samples to minimize potential contamination from outside sources.

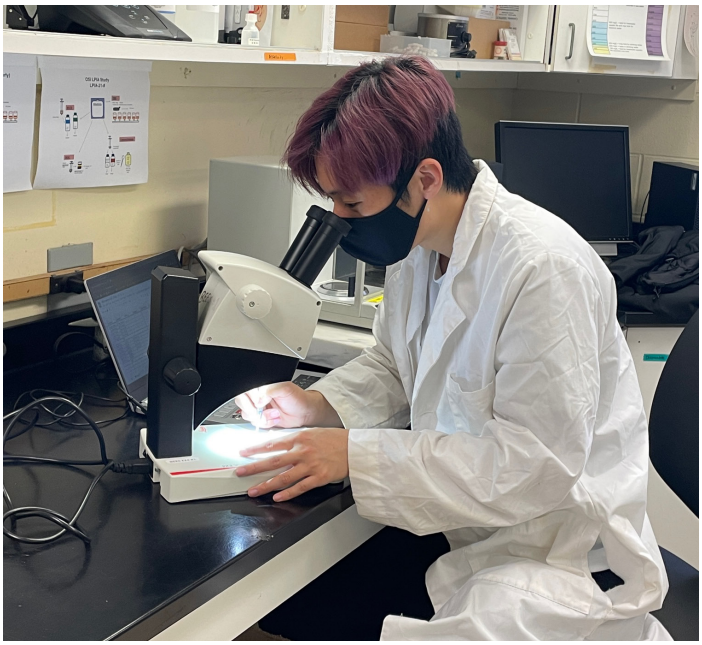
Samples were processed using a filter flask and motorized pump to pass water through 47 mm diameter, 0.45 µm gridded membrane filters. Each 1-quart sample was filtered through its own membrane filter. Some samples with heavy sedimentation had to be broken into multiple filters per jar.

The filter was then transferred to a petri dish for visual inspection under a dissecting microscope at 56x magnification.

To aid in visual identification, additional "squeeze tests" (the use of fine-tipped tweezers or forceps to apply pressure and test durability) were performed on any potential microplastic pieces. Any pieces that could not be positively identified through both a visual and squeeze test were not recorded.

Filtration of samples at the Academy of Natural Sciences

Photo: Staff



Examination of a filter at the Academy of Natural Sciences

Photo: Staff

Identified microplastics were categorized into four types:

- **Fibers** from synthetic fabrics and filaments, such as fleece, fishing line and bailing twine;
- **Fragments** from rigid plastics, including polystyrene and clear plastic containers;
- **Film** from plastic bags and food wrappers; and
- **Microbeads** from older cosmetics and personal care products.[57, 58]

Totals for each type of microplastic in each sample from each site were recorded in a data table along with the date the sample was drawn and the names of the sampler and the person performing analysis. For a breakdown of this data see Appendix 1.

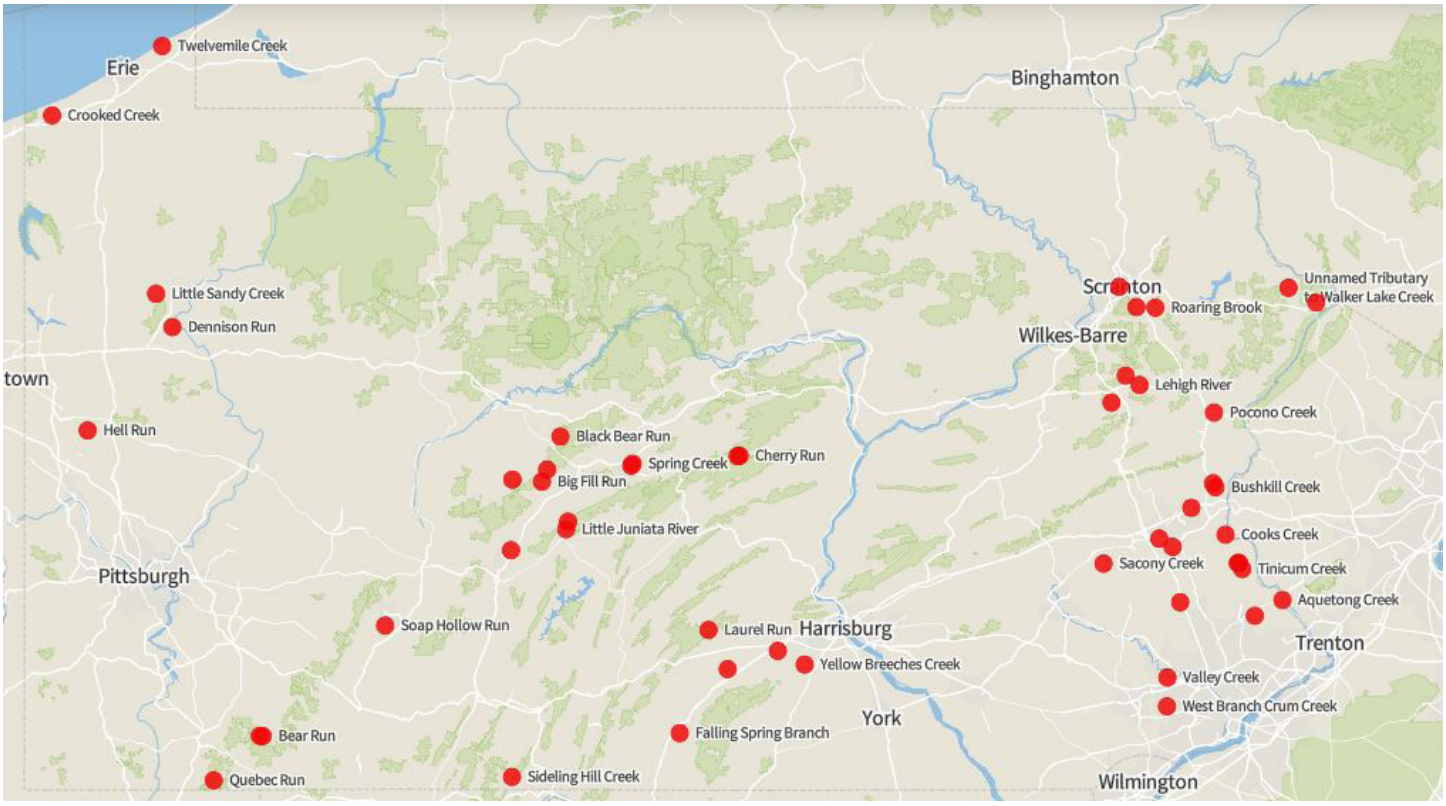
Quality Control

Because of the prevalence of microplastics in the air and on surfaces, steps consistent with the *Microplastics: Sampling and Processing Guidebook* were taken to reduce contamination of the samples. Every jar and lid used in sampling was triple-rinsed with source water from the sampling site, downstream from where the samples were to be collected. Once filled, samples were immediately sealed and remained so until their analysis. Those taking samples were instructed not to wear fleece or other synthetic clothing to avoid shedding fibers that could contaminate samples.

The filter flask, tweezers, forceps, and other analysis equipment was triple-rinsed with deionized water between samples to reduce contamination. Filter paper remained sealed and packaged until use and was transferred to the filtering set-up with forceps to avoid human contact. Sample jars were sealed in between the transfer of water to the filter apparatus.

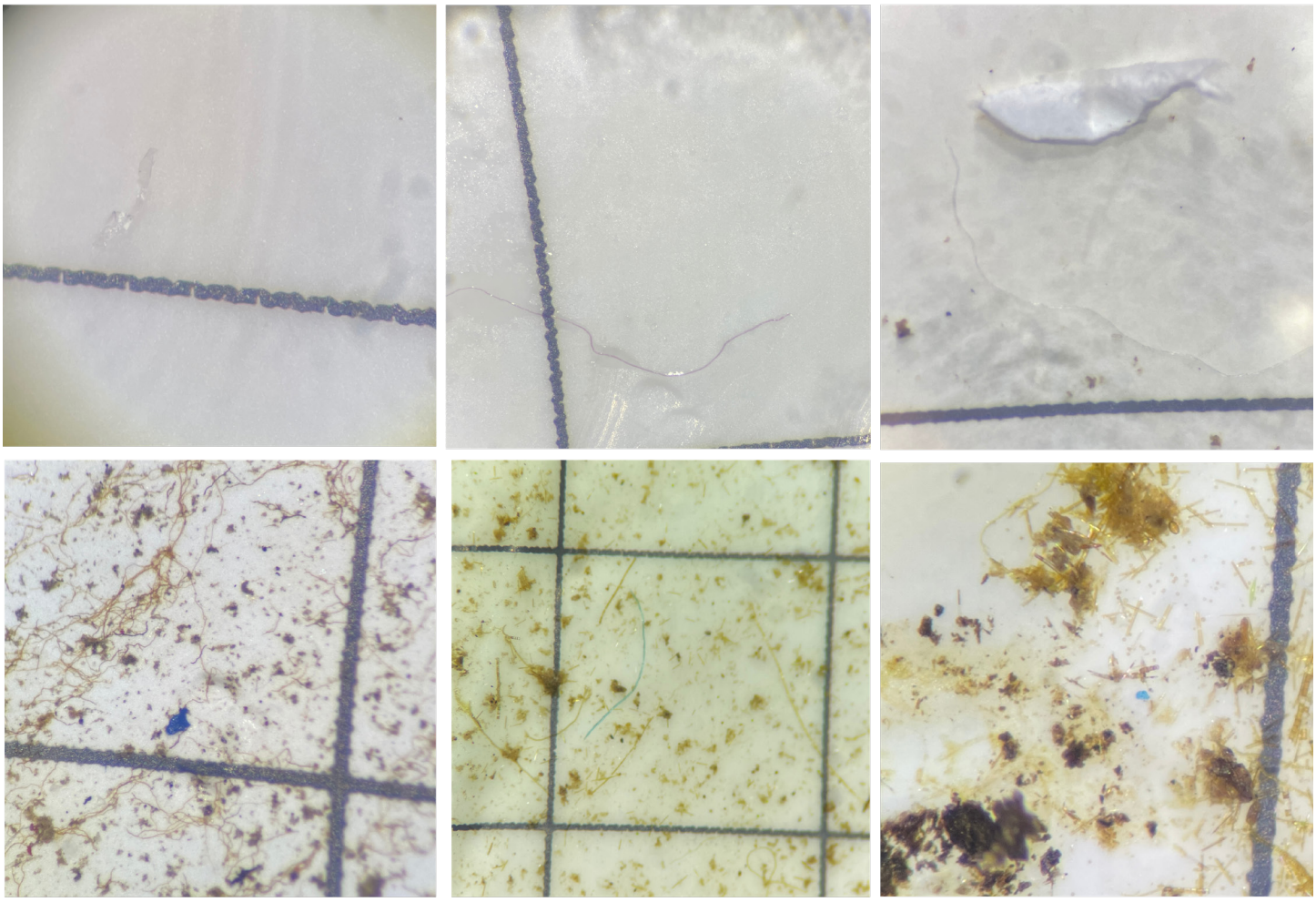
Once filtered, filter paper was transferred to a triple-rinsed petri dish by the forceps. The petri dish was then covered and was only uncovered during analysis to allow for squeeze tests.

To ensure that microplastic contamination was within the waterways themselves, two sets of six quart-sized samples of deionized water were run through the analysis process to provide a baseline for contamination. All samples met or exceeded the baseline contamination for average plastics per sample.



Map of sampling locations

Examples of Observed Microplastics



Clockwise from left: microplastic film, microplastic fiber, microplastic fiber and fragment, microplastic fragment, microplastic fiber, microplastic fragment. For scale: grid lines are spaced 3.1 mm apart

Results

OF THE 50 SITES TESTED, ALL 50 (100%) contained one or more types of microplastic.

More specifically, all 50 sites (100%) contained fibers; 42 sites (84%) contained fragments; 42 (84%) contained film; and microbeads were found at only 1 site (2%). One site (2%) had all four types of microplastics present; 33 sites (66%) had three types of microplastics present; 16 (32%) had two types of microplastics present.

Table 1: Results

Location	Counties	Date Sampled	Microplastics Present?	Fragments	Fibers	Film	Beads
Sacony Creek	**Berks**	4-8-22	Yes	•	•	•	
Kettle Creek	**Blair**	4-19-22	Yes	•	•	•	
Big Fill Run	**Blair,** Centre	2-11-22	Yes	•	•	•	•
Aquetong Creek	**Bucks**	10-31-21	Yes	•	•	•	
Tinicum Creek	**Bucks**	12-4-21	Yes	•	•	•	
Beaver Creek	**Bucks**	12-8-21	Yes	•	•	•	
Watson Creek	**Bucks**	1-23-22	Yes	•	•	•	
Cooks Creek	**Bucks**	1-23-22	Yes	•	•	•	
Rapp Creek	**Bucks**	12-4-21	Yes		•	•	
Soap Hollow Run	**Cambria**	4-20-22	Yes		•	•	
Dennison Run	**Carbon**	11-21-21	Yes	•	•		
Hickory Run	**Carbon**	11-28-21	Yes	•	•	•	
Cold Stream	**Centre**	2-11-22	Yes	•	•		
Black Bear Run	**Centre**	2-11-22	Yes	•	•	•	
Spring Creek	**Centre**	4-19-22	Yes	•	•		
Slab Cabin Run	**Centre**	4-19-22	Yes		•	•	
Moshannon Creek	**Centre,** Clearfield	2-11-22	Yes	•	•		
Valley Creek	**Chester**	2-14-22	Yes	•	•	•	
West Branch Crum Creek	**Chester**	3-22-22	Yes	•	•	•	
Letort Spring Run	**Cumberland**	4-10-22	Yes	•	•		

Location	Counties	Date Sampled	Microplastics Present?	Fragments	Fibers	Film	Beads
Big Spring Creek	**Cumberland**	4-10-22	Yes		•	•	
Laurel Run	**Cumberland,** Perry	4-10-22	Yes	•	•	•	
Yellow Breeches Creek	**Cumberland,** York	4-10-22	Yes	•	•	•	
Twelvemile Creek	**Erie**	11-16-21	Yes	•	•		
Crooked Creek	**Erie**	11-16-21	Yes	•	•		
Quebec Run	**Fayette**	11-25-21	Yes	•	•	•	
Bear Run	**Fayette**	11-24-21	Yes	•	•	•	
Youghiogheny River	**Fayette,** Allegheny, Westmoreland, Somerset	11-24-21	Yes	•	•	•	
Falling Spring Branch	**Franklin**	12-4-21	Yes	•	•	•	
Sideling Hill Creek	**Huntingdon**	11-22-21	Yes	•	•	•	
Spruce Creek	**Huntingdon**	3-14-22	Yes	•	•	•	
Little Juniata River	**Huntingdon,** Blair	3-14-22	Yes	•	•	•	
Roaring Brook	**Lackawanna**	5-18-22	Yes	•	•	•	
Green Run	**Lackawanna**	5-18-22	Yes	•	•	•	
Lackawanna River	**Lackawanna,** Luzerne, Susquehanna, Wayne	5-18-22	Yes	•	•	•	
Hell Run	**Lawrence**	11-21-21	Yes		•	•	
Little Lehigh	**Lehigh, Berks**	4-8-22	Yes	•	•	•	
Saucon Creek	**Lehigh, Northampton**	4-8-22	Yes		•	•	
Pocono Creek	**Monroe**	5-10-22	Yes	•	•	•	
Tobyhanna Creek	**Monroe**	5-10-22	Yes		•	•	
Lehigh River	**Monroe,** Wayne, Lackawanna, Luzerne, Carbon, Lehigh, Northampton	11-28-21	Yes	•	•	•	
Ridge Valley Creek	**Montgomery,** Bucks	4-23-22	Yes	•	•	•	
Bushkill Creek	**Northampton**	4-8-22	Yes	•	•	•	
Little Bushkill Creek	**Northampton**	4-8-22	Yes	•	•		
Monocacy Creek	**Northampton**	4-8-22	Yes	•	•	•	
Unnamed Tributary to Walker Lake Creek	**Pike**	2-22-22	Yes	•	•	•	
Vandermark Creek	**Pike**	3-22-22	Yes	•	•	•	
Cherry Run	**Union,** Centre	3-21-22	Yes		•	•	
Penns Creek	**Union,** Centre, Snyder	3-21-22	Yes	•	•	•	
Little Sandy Creek	**Venango,** Mercer	11-21-21	Yes	•	•	•	
Blank 1	**N/A**	5-13-22	Yes	•	•	•	
Blank 2	**N/A**	8-10-22	Yes		•	•	
Total			**50**	**42**	**50**	**42**	**1**

Counties in bold mark where the sample was taken.

Policy Recommendations

GIVEN HOW WIDESPREAD THE THREAT OF PLASTIC and microplastic pollution is, there is no silver bullet solution to address this pervasive problem. Multiple policy changes at the local, state, and federal level are needed to combat this problem. Below are several recommendations and a chart of specific fixes.

Phase out single use plastics

Nothing society uses for a few minutes should be able to pollute our environment for hundreds of years. Congress, Pennsylvania state officials, and municipalities should pass laws that phase out unnecessary single-use plastics such as polystyrene food service products, single-use plastic bags, and plastic utensils. Cutting off the source of some of the most prevalent forms of plastic pollution will help curtail the tide of microplastics entering the environment. At the state level, this includes implementing policy solutions proposed in the Zero Waste PA legislative package such as a statewide ban on polystyrene containers and a statewide bottle deposit.[59]At the local level, municipalities should continue to pass bans on single-use plastic items such as bags, polystyrene, straws, and utensils. As of October, 2022, 12 municipalities in the Commonwealth have passed legislation tackling single-use plastic bags, covering over 16% of the population, with the potential to eliminate over 766 million plastic bags, or about 4,200 tons of plastic waste each year.[60]

Develop green infrastructure

A recent study from the San Francisco Estuary Institute found that car tire debris from stormwater runoff may be a significant contributor of microplastic pollution.[61] To keep this debris out of our water, municipalities need to reduce combined sewage overflow and ensure runoff is treated. Green infrastructure projects, such as Philly's *Green City, Clean Waters program*, can reduce the amount of stormwater -- and the plastic it contains -- from washing directly into our waterways.[62]

Prevent Pennsylvania's preemption on local action to address plastic pollution from being reinstated

State legislators should defend against any proposals meant to preempt or restrict the ability of the Commonwealth's municipalities from implementing local plastic ordinances. Pennsylvania's Act 32 of 2020 extended the previous 1-year preemption on local plastic ordinances.[63] It was met with swift litigation, the manner in which it was passed is likely against the commonwealth code, and preemption was allowed to expire in December 2021. Local governments feel the effects of plastic pollution the most, dealing with litter, fielding constituent complaints, and negotiating trash and recycling contracts. Local leaders should have all the tools possible to tackle plastic pollution in their backyards.

Pass "Producer Responsibility" laws

Bottle bills, laws establishing refundable deposits on beverage containers, and other producer responsibility laws are proven effective at keeping waste out of landfills and out of our environment. Producer responsibility is a mechanism to shift the costs and management of postconsumer waste from local governments and consumers and onto producers themselves, requiring producers of plastic products to design, manage, and finance waste and recycling

programs. The Pennsylvania General Assembly should pass statewide producer responsibility laws as quickly as possible. Additionally, Congress should pass federal measures like the *Break Free From Plastic Pollution Act (H.R.2238/S.984)* to make these programs more widespread and shift the burden onto those who create the pollution.

Update Pennsylvania's "Act 101" and modernize waste infrastructure

When passed in 1988, Pennsylvania's Act 101 was one of the foremost recycling laws in the country. But while the amount and types of waste we generate have changed greatly over the past 35 years, Pennsylvania's cornerstone recycling law has largely stayed the same. In order to bring recycling in the Commonwealth into the 21st century, Act 101 should be updated to include mandatory recycling programs for all municipalities, not just the largest; expanding and standardizing the list of commonly used materials that are required to be collected for recycling; increased funding for recycling programs; and comprehensive programs should be developed to handle hard to recycle materials like organic waste or electronic waste.

Halt policies that promote increased manufacture & use of single-use plastic

Communities and legislators across the Keystone State should oppose subsidies and tax breaks for new petrochemical infrastructure that doubles down on the fossil fuel-to-plastics pipeline. This includes opposing proposals to subsidize or give tax breaks to bring facilities online explicitly to make new plastics, or policies that will promote plastics incineration under the guise of "advanced" or "chemical" recycling. Sadly, over the past two legislative sessions, similar policies have passed the General Assembly with bipartisan support. State legislators need to reduce plastic production, not incentivize it.

Fight fast fashion

Clothing production and use is responsible for up to 22 million metric tons of microplastics that could end up in our oceans between 2015 and 2050.[64] To fight synthetic textile waste, retailers must stop sending overstock, unsold and unused clothing, to landfills and incinerators. State and local governments should pass laws preventing this practice so that clothing manufacturers and retailers stop producing more clothing than society needs and uses. Retailers and clothing manufacturers should also move away from making products containing synthetic plastic fibers which inevitably become microplastic pollution.

Table 2: policy solutions

Easing the burden on the overall waste system is imperative to mitigating plastic pollution. Minimizing various waste streams and creating systems to better prevent waste from being created will make it easier to deal with sources of plastic and microplastic pollution.

Reduce	Reuse	Recycle
Ban unnecessary single use plastics such as plastic bags and polystyrene foam (commonly called Styrofoam) food containers.	Pass Right to Repair Laws, giving consumers and independent repair shops the ability to fix their appliances and consumer goods when they break.	Pass Producer Responsibility Laws that make manufacturers responsible for dealing with the waste their products will become.
Require unnecessary single-use plastic accessories such as straws, utensils, and condiment packets, to be given only upon customer request.	Encourage the use of reusable bags and bottles through customer rebates.	Expand curbside recycling, municipal composting, and e-waste recycling programs.
Oppose the creation of new plastic production infrastructure.	Require sit-down restaurants to use reusable plates and foodware.	Mandate that new products contain a certain percentage of recycled material.
Enact “Pay As You Throw” programs that charge consumers less if they throw out less trash.	Facilitate textile recycling and reuse programs to prevent clothing from becoming waste and disincentivize new clothing manufacture.	Ban food waste from landfills and encourage the creation of a comprehensive composting system.

Appendix

The total plastics counts for each waterway can be viewed on our website.

State Legislators and Staff collect samples from Valley Forge National Historic Park Photo: Staff

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