

# Monitoring and Reducing Microplastics in the Delaware River Estuary

***SWEP Emerging Contaminants Seminar***

Eurofins

August, 28 2025

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**Delaware River Basin Commission**

DELAWARE • NEW JERSEY  
PENNSYLVANIA • NEW YORK  
UNITED STATES OF AMERICA





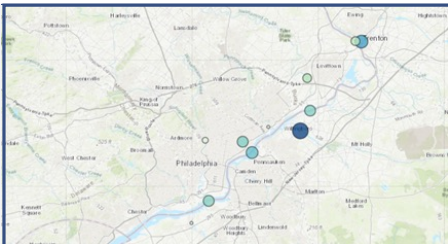
## Who is the Delaware River Basin Commission?



## Why study microplastics in the Delaware Estuary?



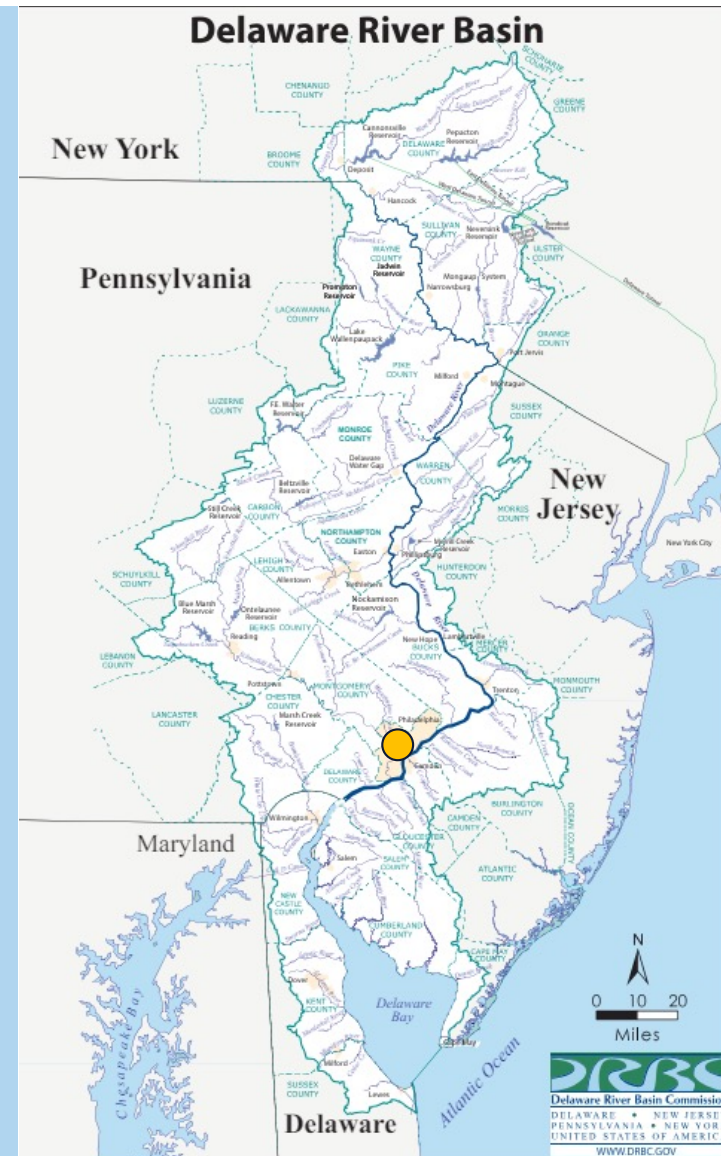
## How did we study microplastics in the Delaware Estuary?



## What did we find?



# Who is the Delaware River Basin Commission?



# The Delaware River

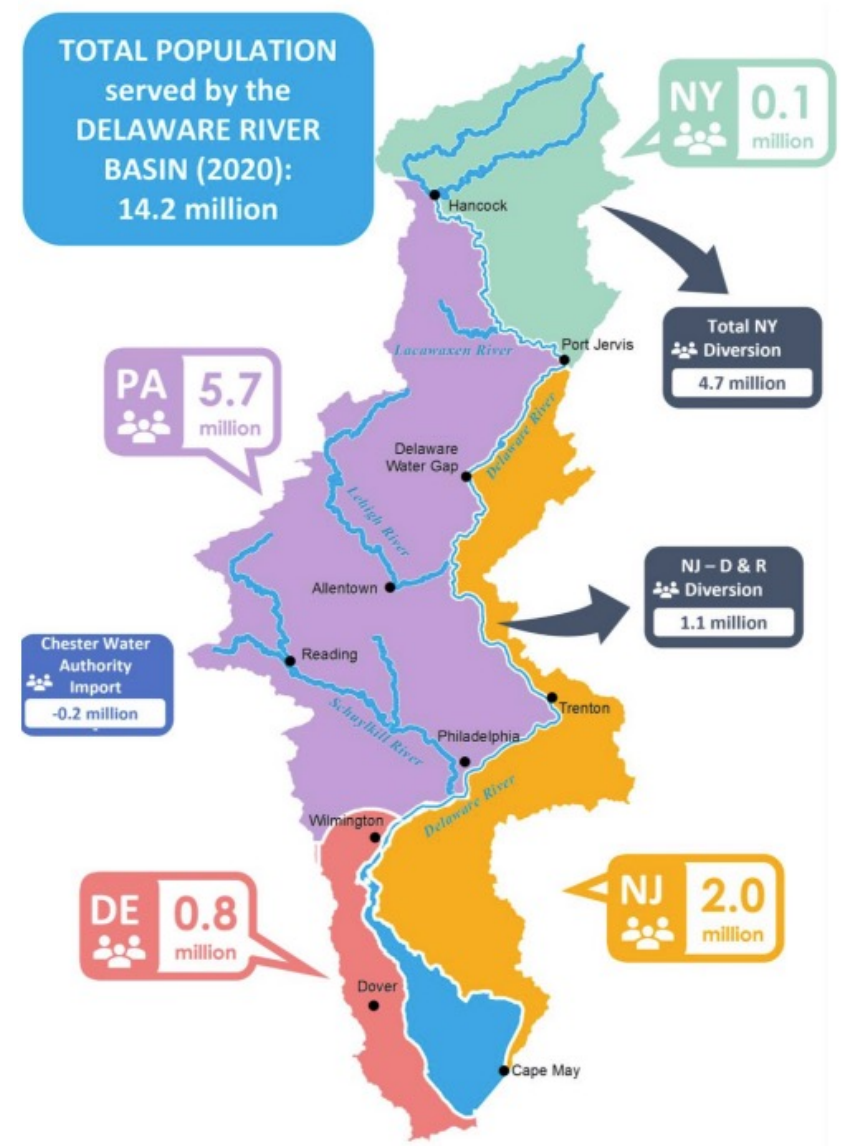
- 330 miles
- 13,500 mi<sup>2</sup> watershed
- Free-flowing mainstem
- Schuylkill is largest tributary
- Tidal from ocean to Trenton
- Unique habitats & communities





# The Delaware River meets our needs.

- >14 million people in four states
- Half of NYC drinking water
- Four states
- >\$21 billion in economic value
- Interstate boundary



# The Delaware River Basin Commission is a federal-interstate government agency.



Keith Balderston

## *Our Mission*

Manage, protect, and improve the water resources of the Delaware River Basin.

## *Our Vision*

Provide trusted, effective, and coordinated management of the Basin's shared water resources.



DRBC's programs fall into two general categories.

**FLOW**

**1**

**An adequate  
and sustainable  
supply of water**

**WATER QUALITY**

**2**

**Clean and  
healthy water  
resources**





# Why study microplastics in the Delaware Estuary?





# Plastic is an Ecosystem & Public Health Threat

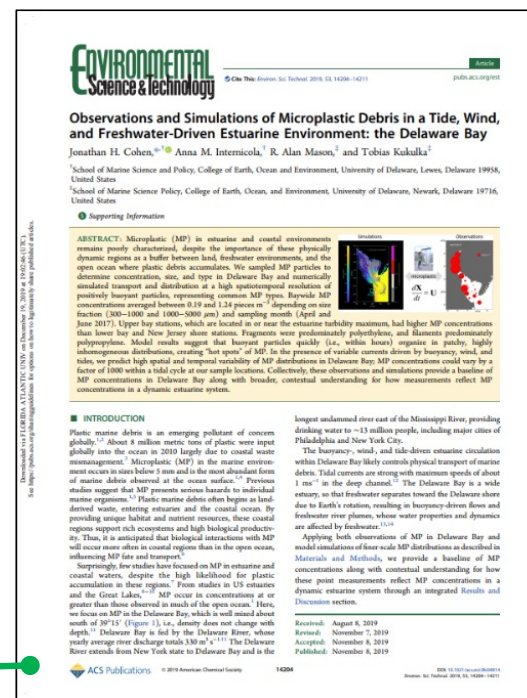
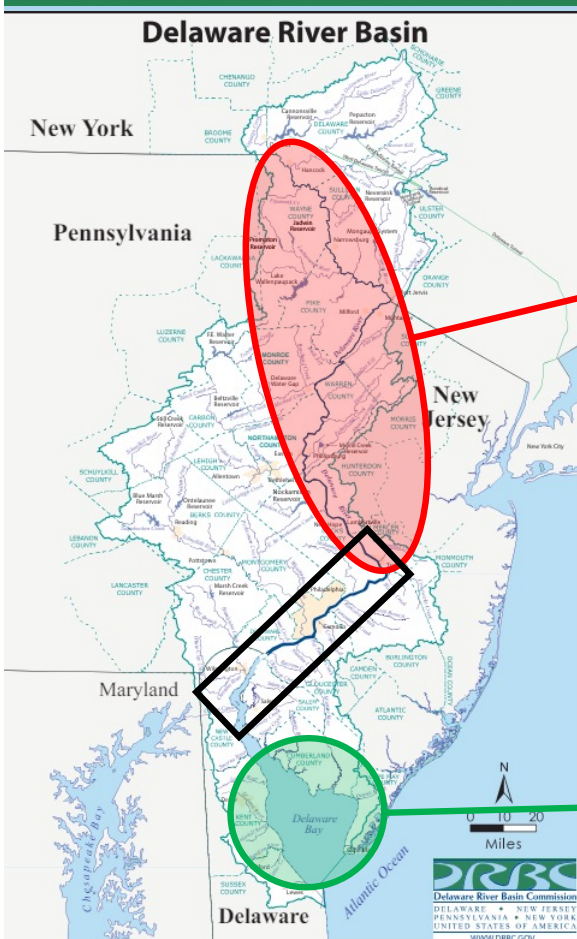


- Plastic contains toxic chemicals (PFAS, UV inhibitors, etc.)
- Bacteria hitchhike on plastics
- Organisms actively and passively consume plastics
- The Delaware River and tribs are the main source of drinking water in the basin.

How Microplastics  
Infiltrated our Food  
CNBC 8/20/25  
16:29 min



# Previous studies left the Upper Portion of the Delaware Estuary understudied





# Develop a baseline for microplastic concentrations

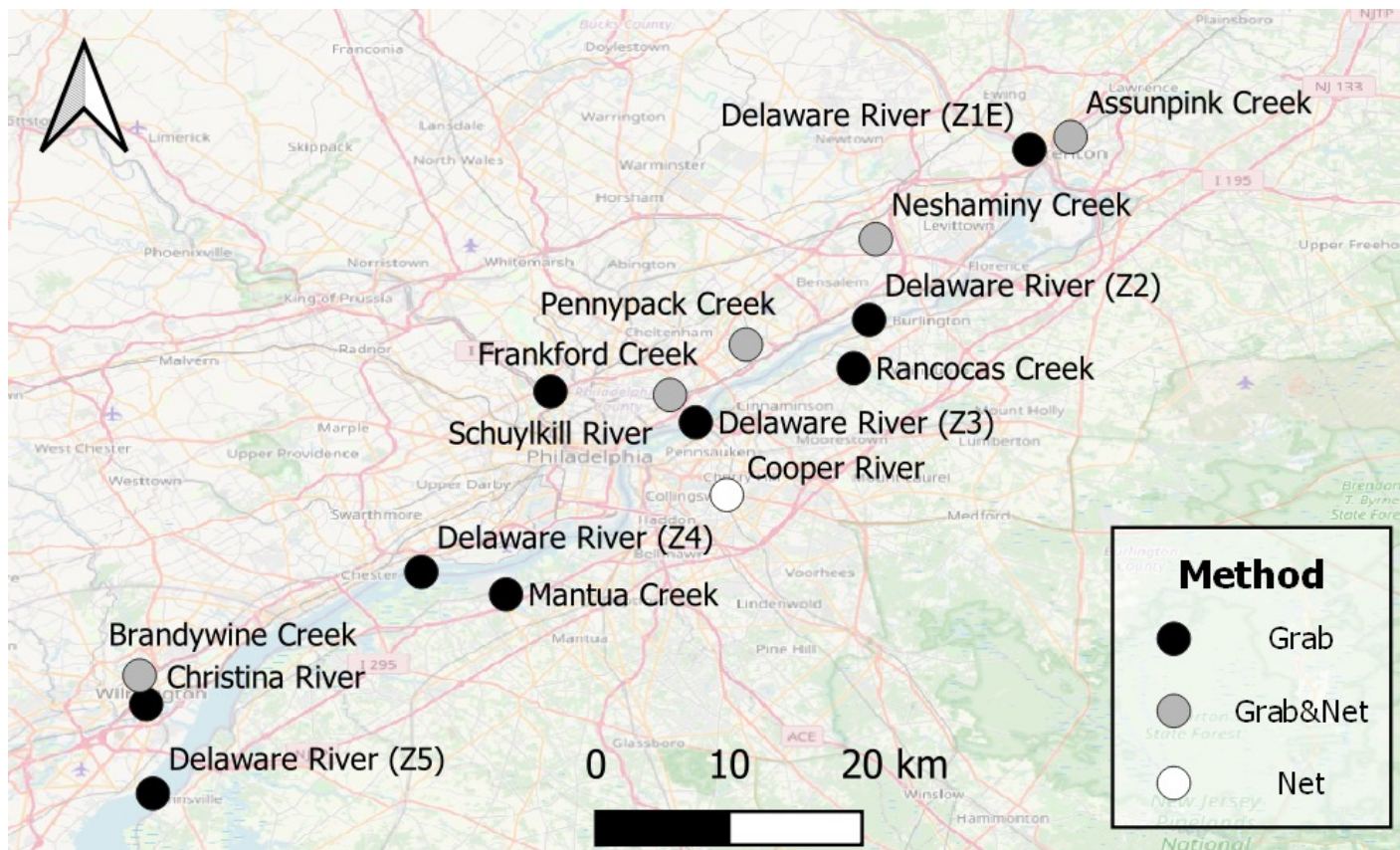




# How did we study microplastics in the Delaware Estuary?



# Sampling Locations



- Delaware Mainstem
  - 4 tidal
  - 1 non-tidal
- Tributaries
  - 9 tidal
  - 1 non-tidal



# Sample Collection Methods



## 153 $\mu$ m Net Sampler

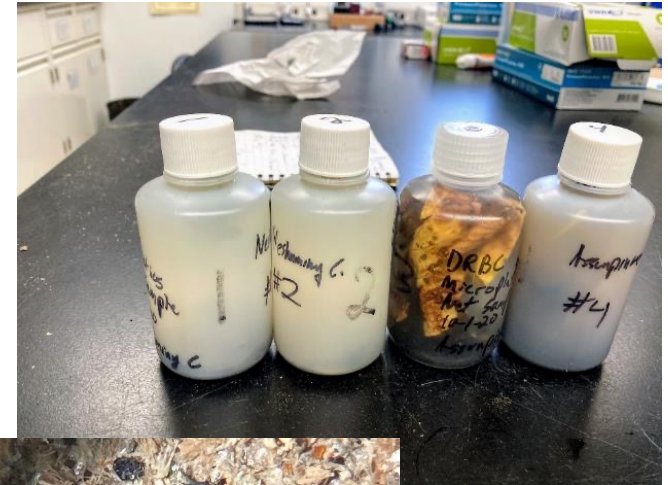


## Niskin Sampler



# Sample Processing

- Analysis by Temple University – Water and Environmental Technology Center
  - Sequentially sieved at 90, 250, 500, 1000  $\mu\text{m}$
  - Wet peroxide (30%) digestion of organic matter
  - Visual sorting of microplastics w/ and w/o a microscope
- QA/QC
  - Sample equipment rinsing w/DI water
  - Field, Equipment and Lab blanks





# Sample Analysis

## ■ Characterization:

### ○ Shapes

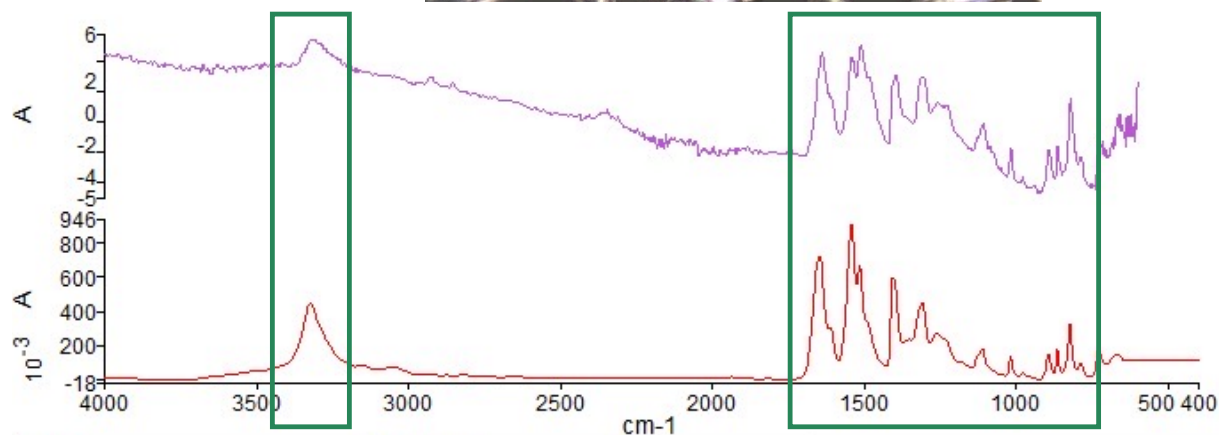
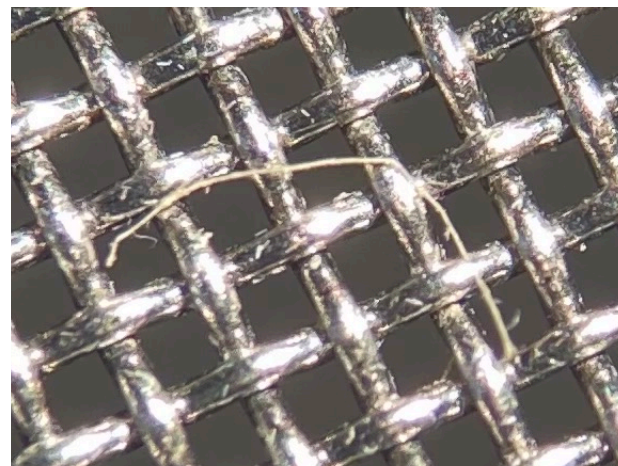
- Fibers & fiber bundles
- Films
- Fragments
- Spheres

### ○ Color

### ○ Size

### ○ Polymer w/FTIR spectroscopy

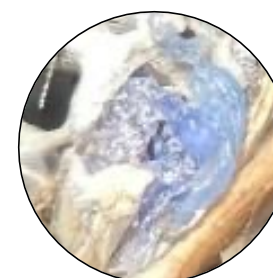
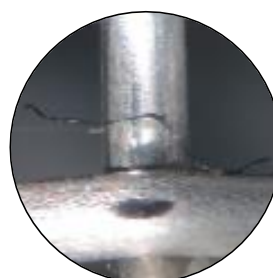
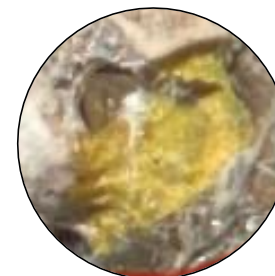
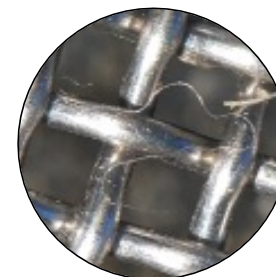
### ○ Plastic concentration



Name	Description
AssunpinkNet_30_250um...	Sample 698 By PEService Date Wednesday, ...
FB0031	ARAMID [KEVLAR]



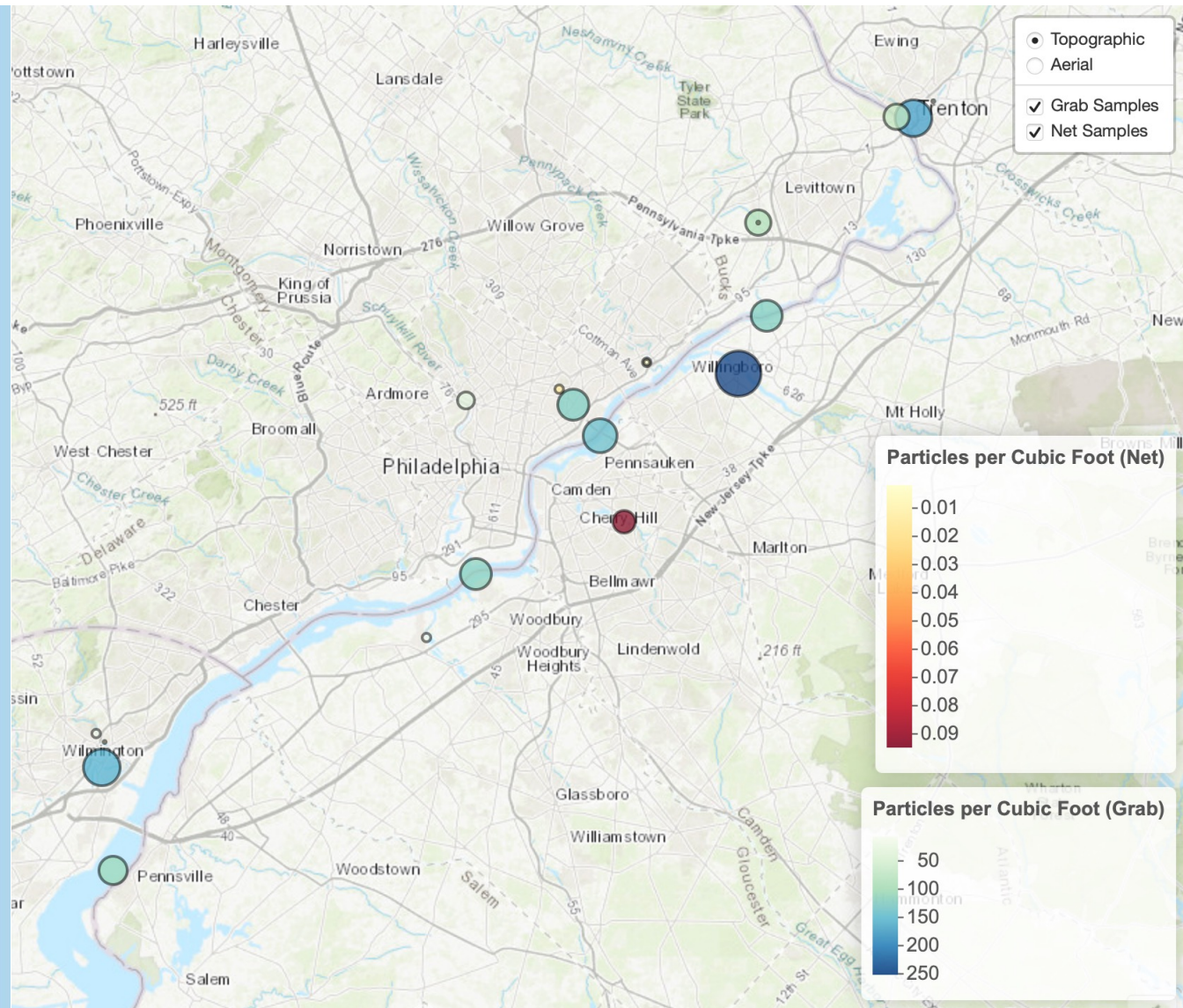
# What did we find?



Microplastics  
were present in all  
samples

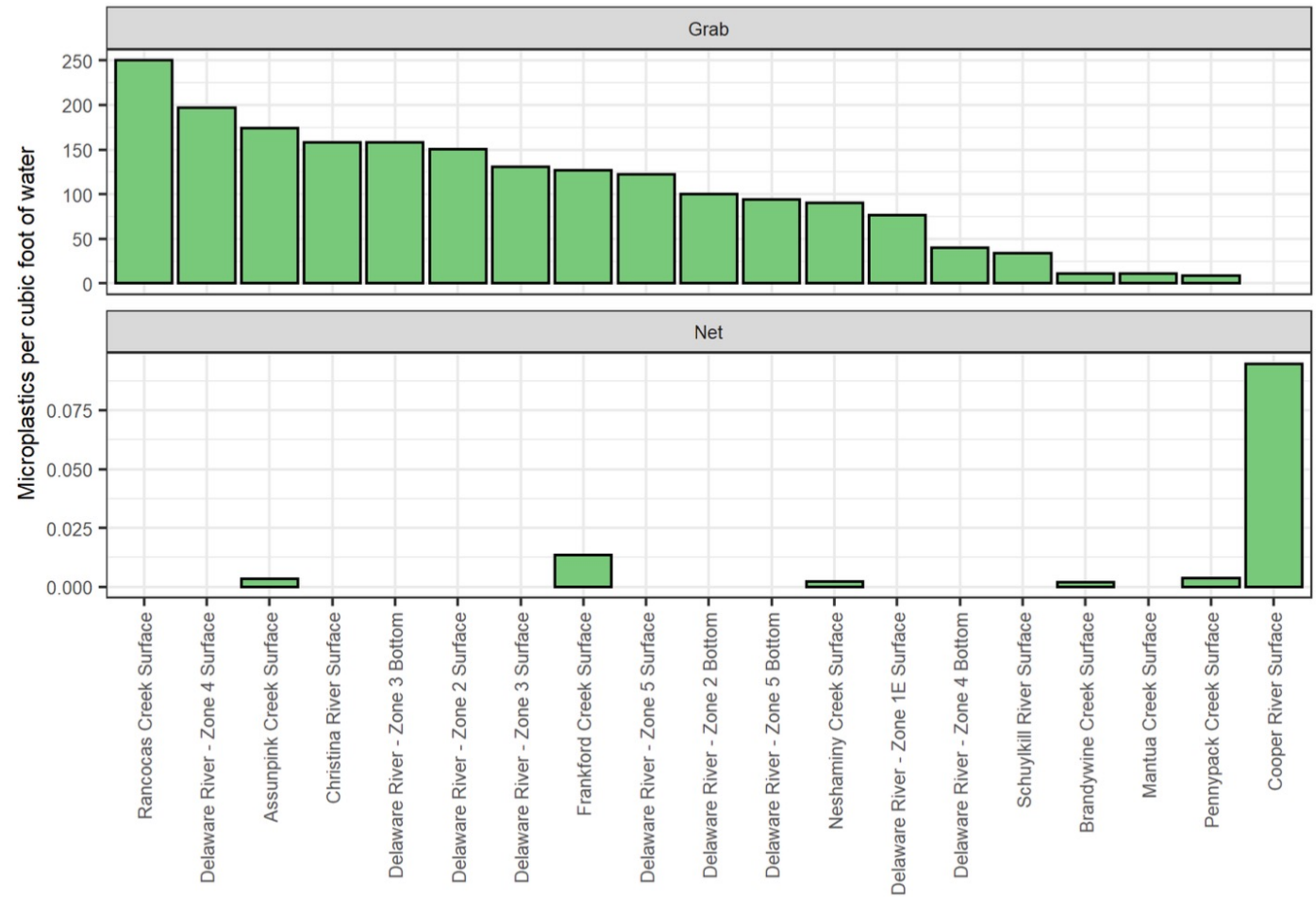


<https://rpubs.com/jwb5096/860798>

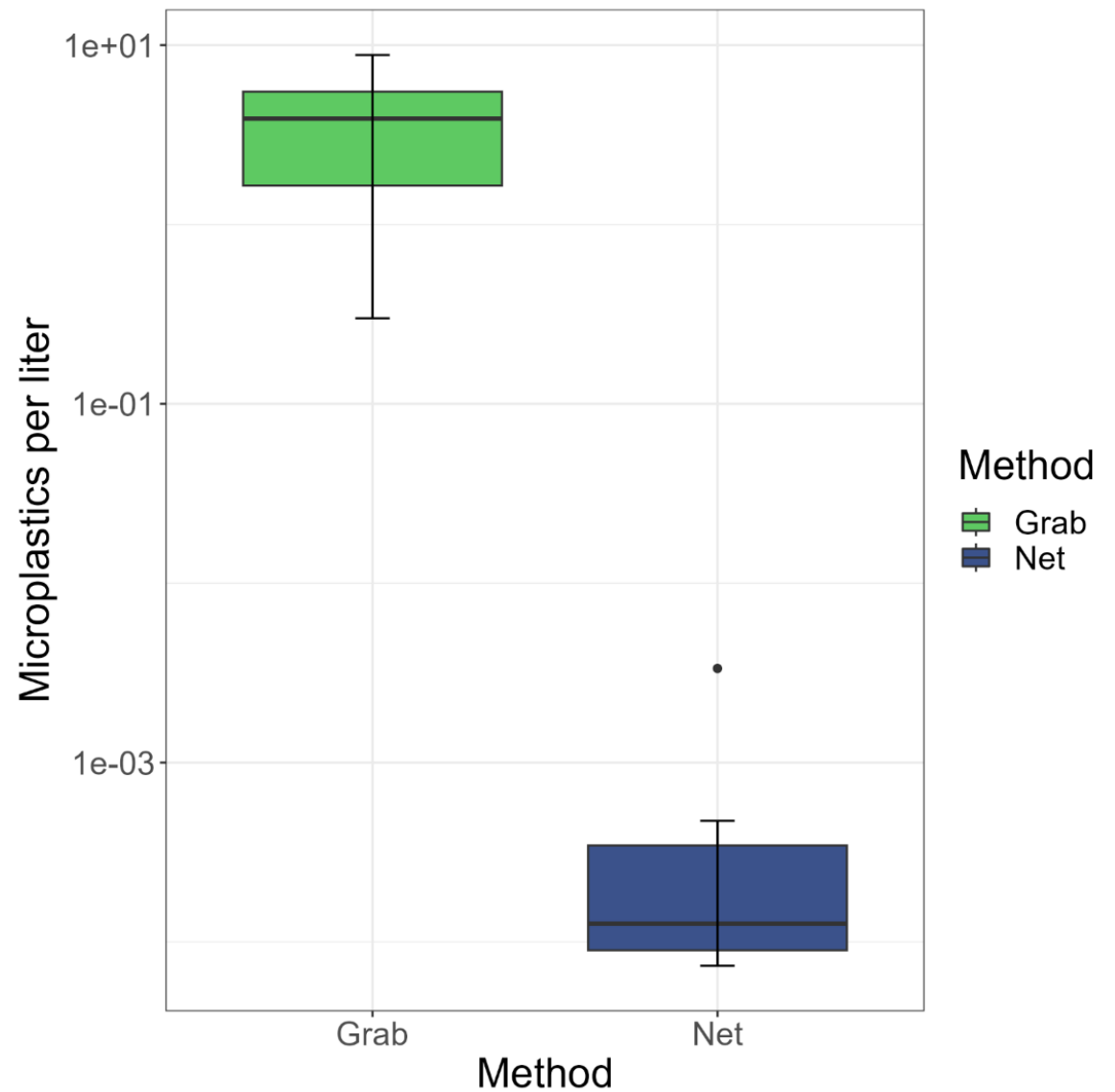




Microplastic concentrations were higher in grab samples than net samples



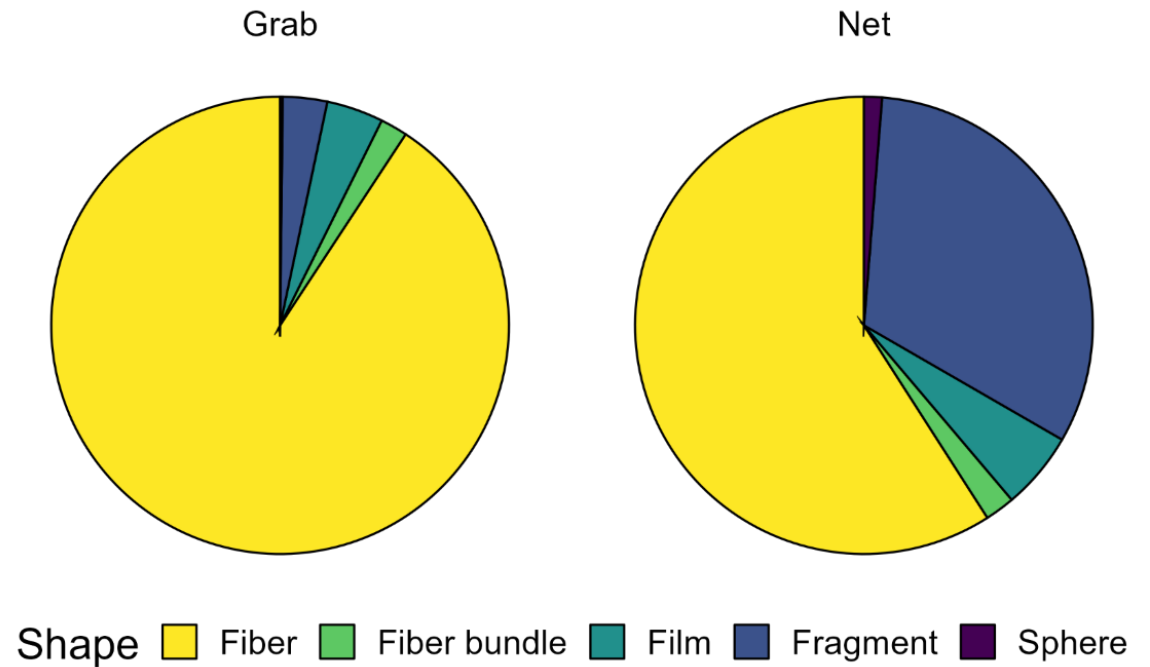
Microplastic concentrations were higher in grab samples than net samples





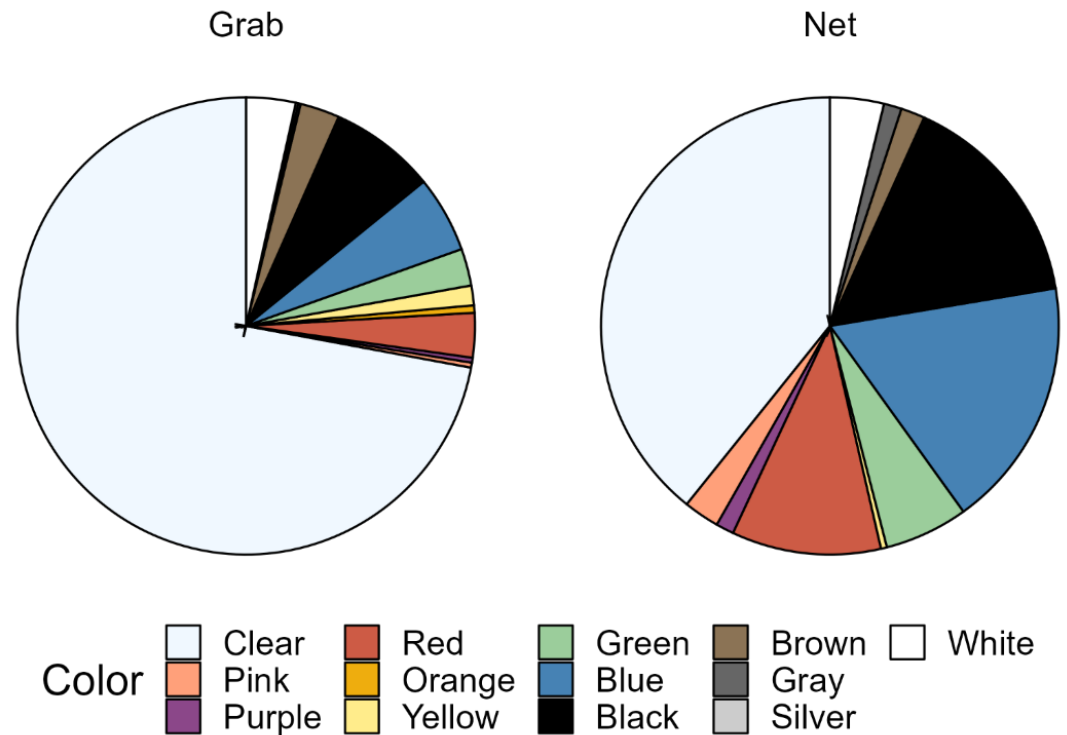
## Shape

Fibers were common in both types of samples, but dominated grab samples



## Color

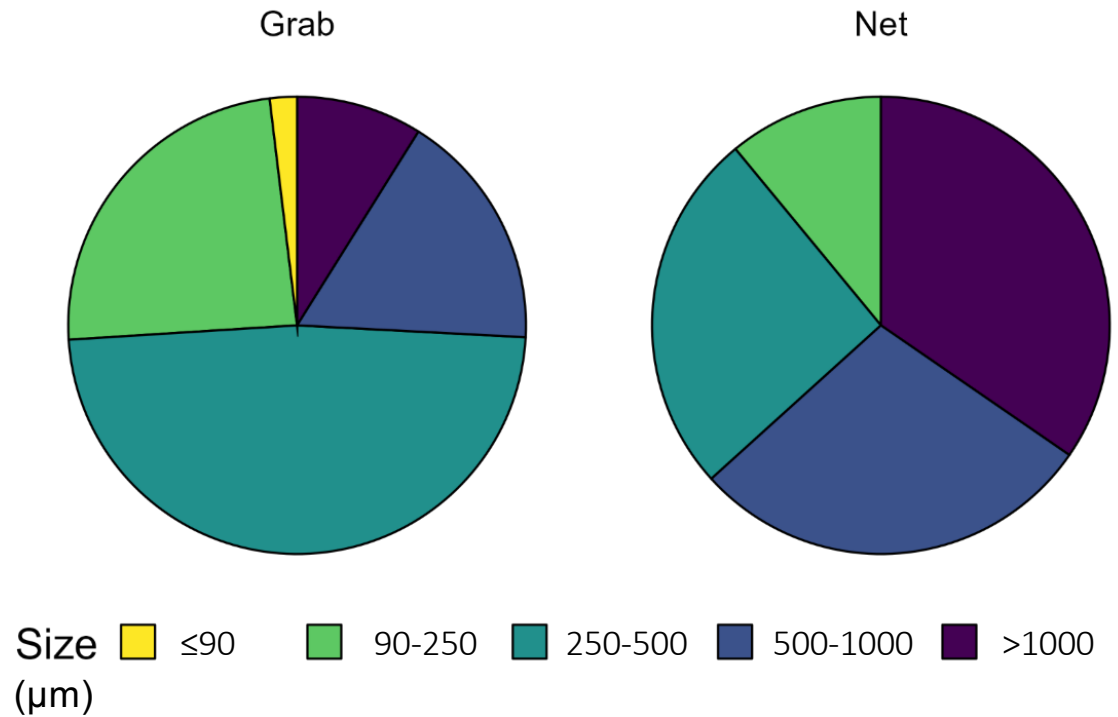
Net samples  
showed a greater  
diversity of colors





## Size

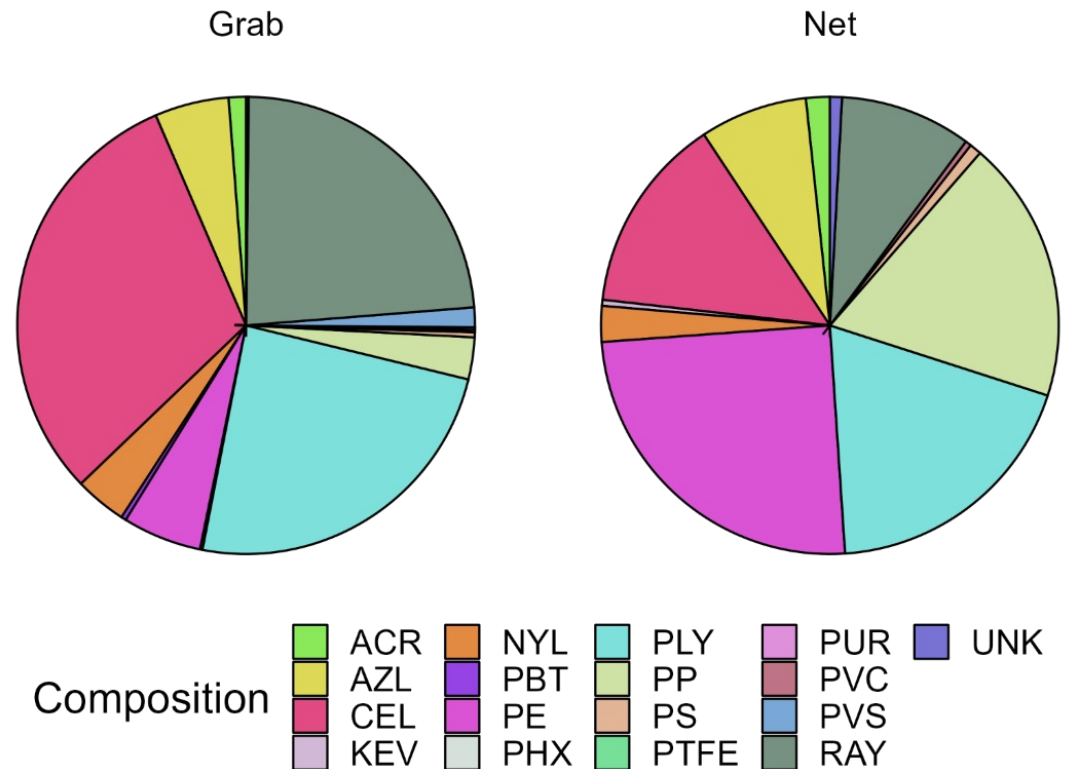
Plastic particles collected in net samples were larger



## Composition

Grab samples dominated by clothing derived fibers like polyester and rayon.

Net samples more diverse.

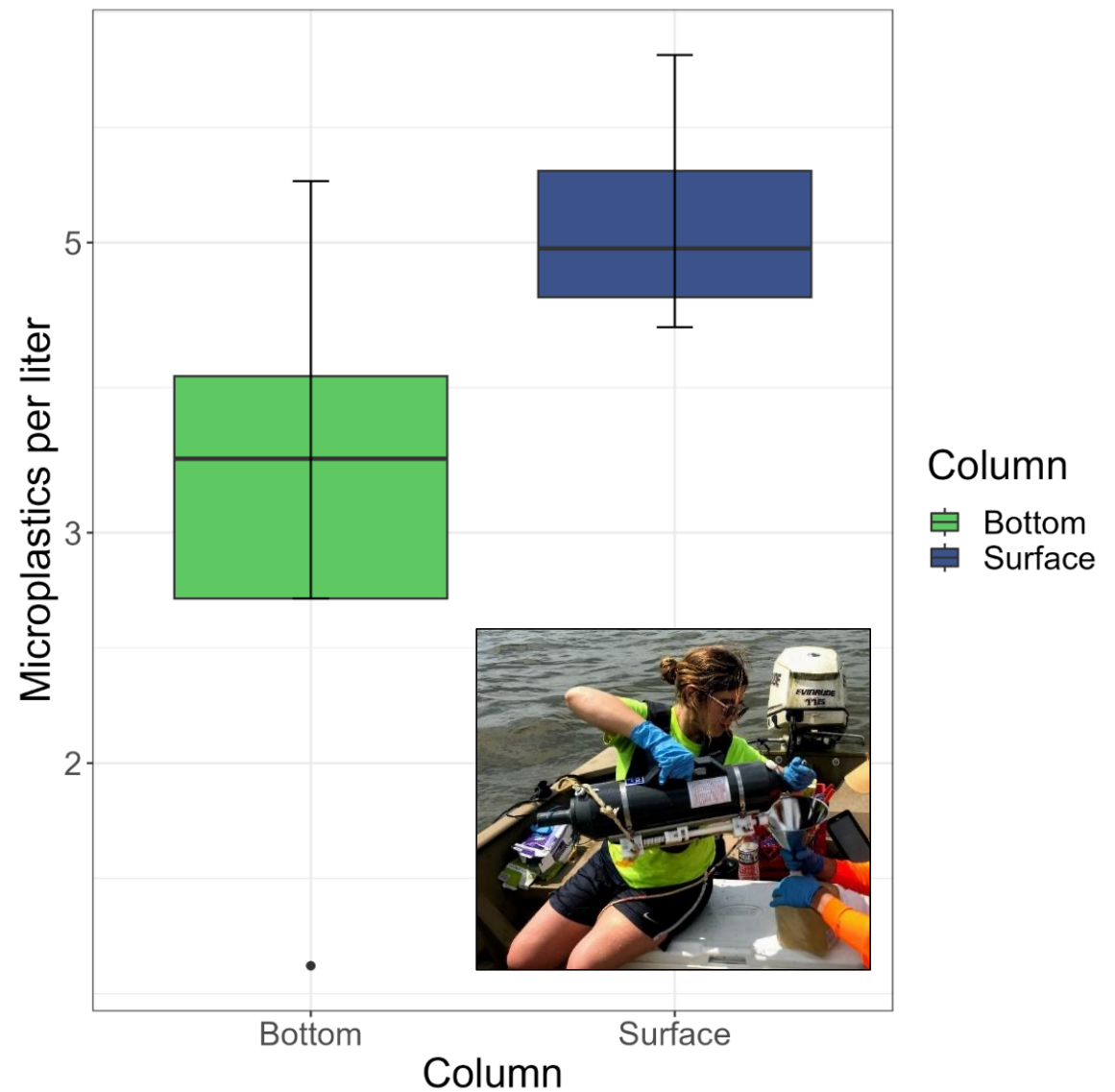


ACR = Acrylic, AZL = Azlon, CEL = Cellulosic, KEV = Kevlar, NYL = Nylon, PBT = Polybutylene Terephthalate, PE = Polyethylene, PHX = Polyhexamethylene, PLY = Polyester, PP = Polypropylene, PS = Polystyrene, PTFE = Polytetrafluoroethylene, PUR = Polyurethane, PVC = Polyvinyl Chloride, PVS = Polyvinyl Stearate, RAY = Rayon, UNK = Unknown.



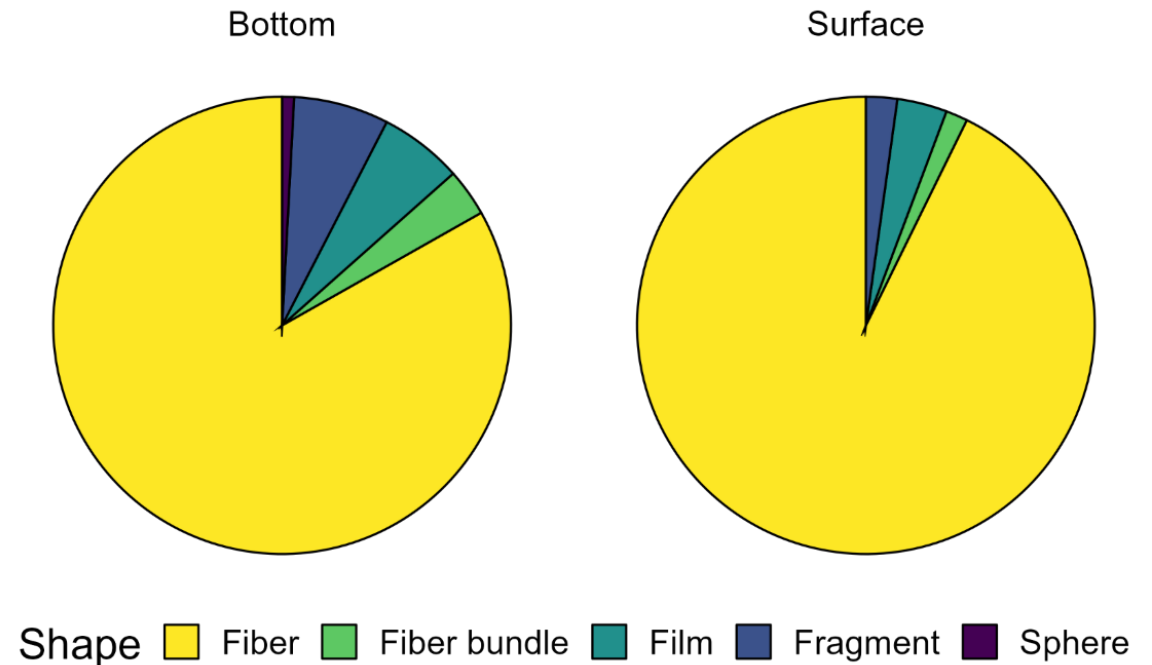
## Sample Depth

Microplastic concentrations were higher in surface samples than bottom samples



## Sample Depth

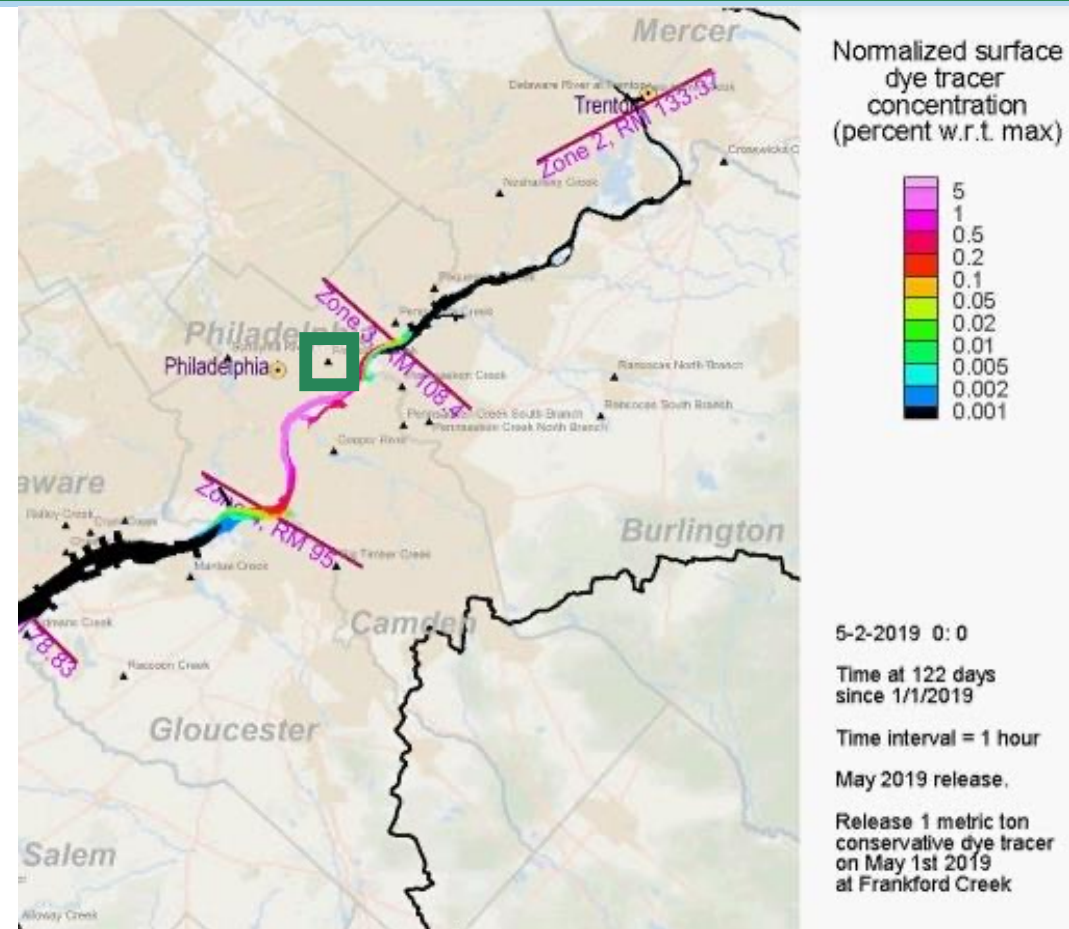
Surface and bottom grab samples were composed of similar types of plastics.





# How Do Microplastics Move through the Estuary?

- Tracer simulations to model microplastic dynamics in the Estuary
- Releases from Christina River, Frankford Creek, Mantua Creek, Neshaminy Creek, Pennsauken Creek, Pennypack Creek, and Schuylkill River
- High flow and low flow simulations

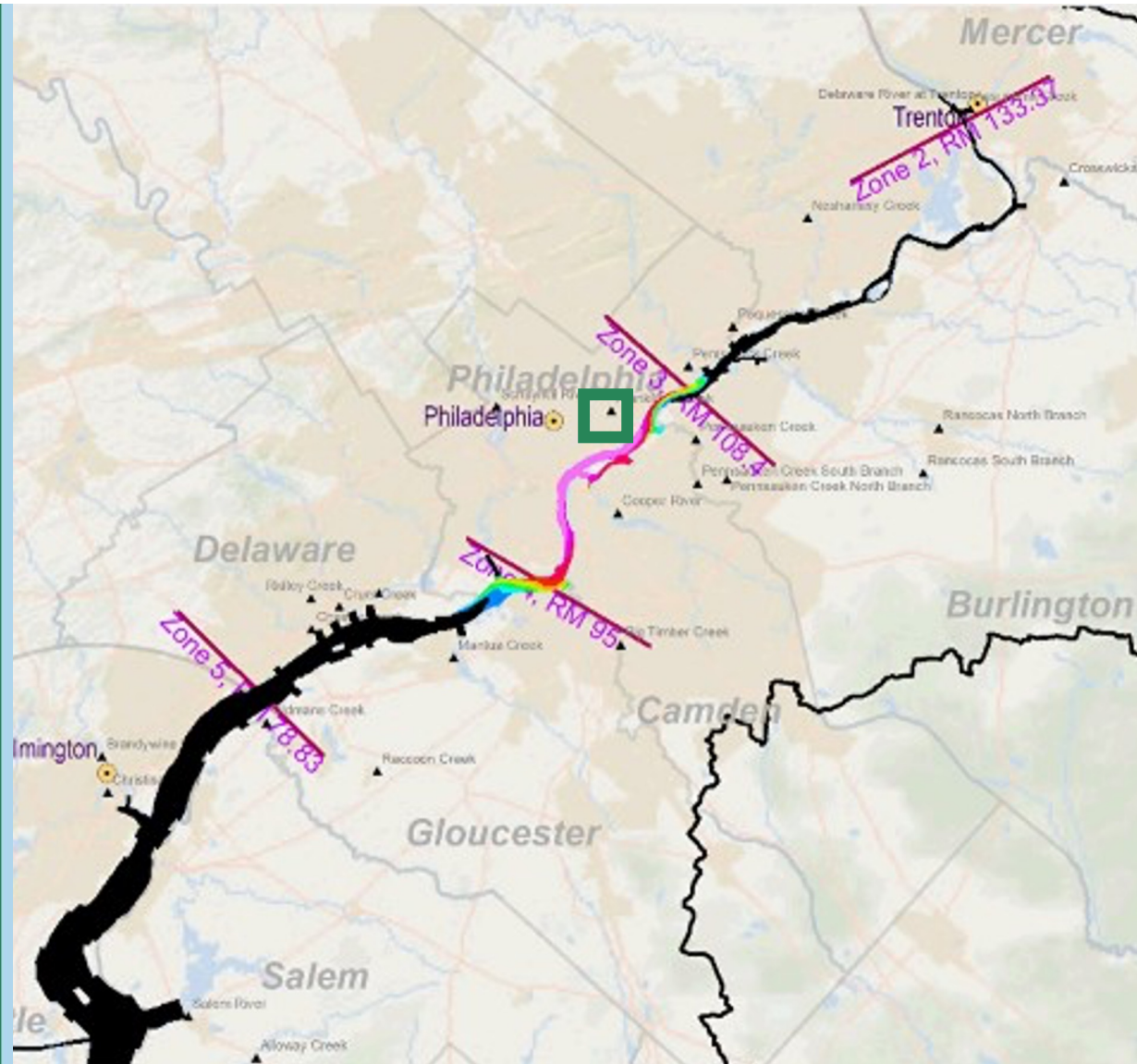


Release from:

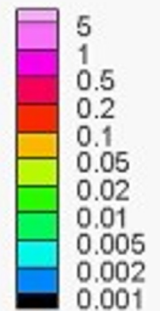
Frankford Creek

High Flow

1d post release



Normalized surface  
dye tracer  
concentration  
(percent w.r.t. max)



5-2-2019 0:0

Time at 122 days  
since 1/1/2019

Time interval = 1 hour

May 2019 release.

Release 1 metric ton  
conservative dye tracer  
on May 1st 2019  
at Frankford Creek

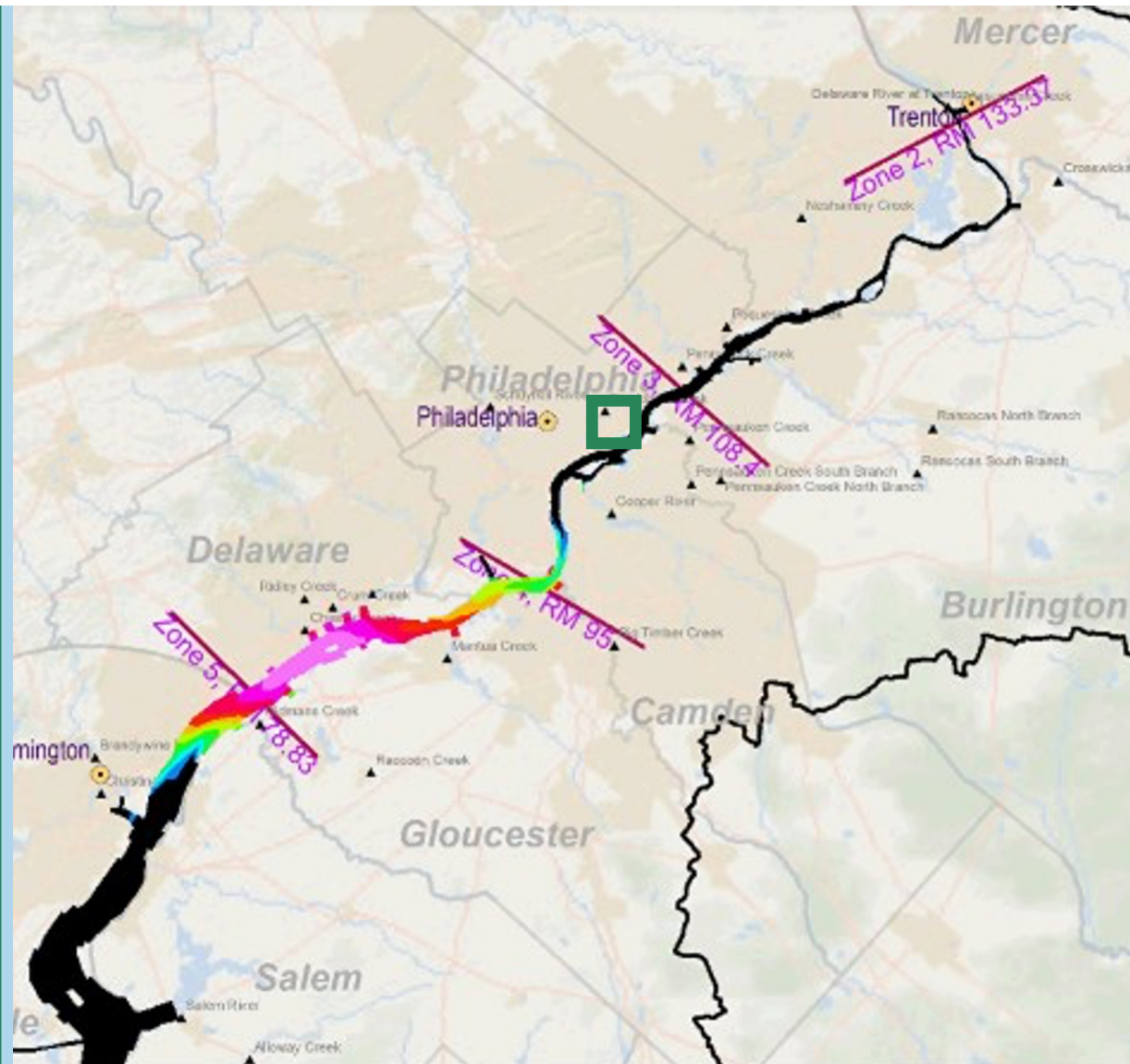


Release from:

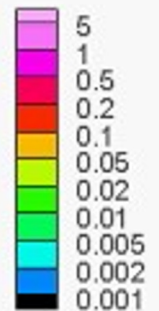
Frankford Creek

High Flow

5d post release



Normalized surface  
dye tracer  
concentration  
(percent w.r.t. max)



5-6-2019 0:0

Time at 126 days  
since 1/1/2019

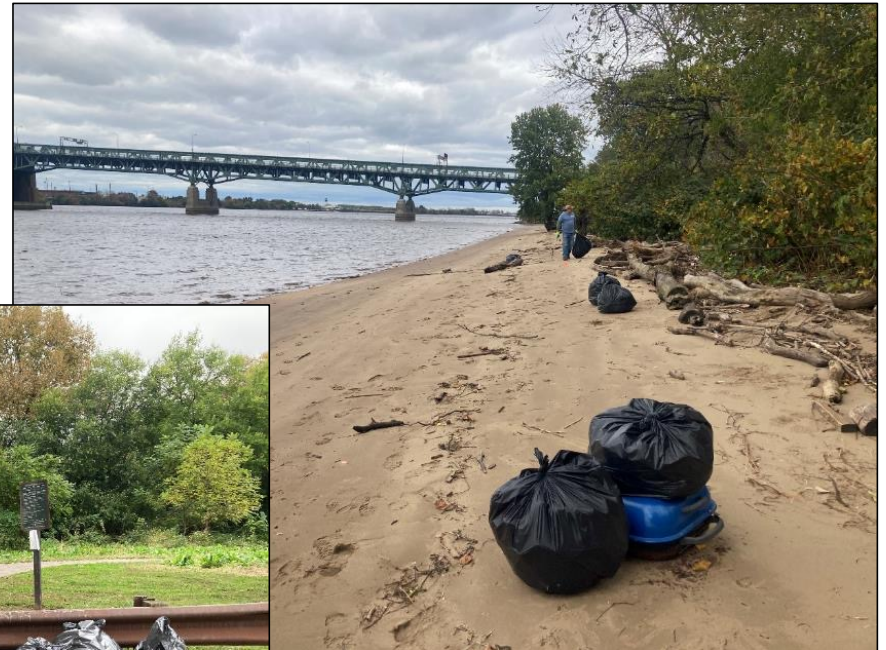
Time interval = 1 hour

May 2019 release.

Release 1 metric ton  
conservative dye tracer  
on May 1st 2019  
at Frankford Creek

# What is DRBC doing to help?

- Cleanup efforts focused on high plastic loading tributaries and plastic collection points in the Estuary

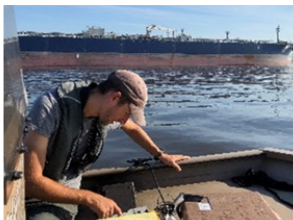
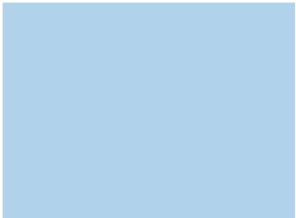




## Summary

- Microplastics found in all samples throughout the Upper Delaware River Estuary
- Results were dependent on sampling methodology
- River flow affects residence time of microplastics in the Estuary





# Acknowledgements

Funding : NFWF Delaware Watershed Conservation Fund

Laboratory Analysis: Temple University Wet Center

DRBC Staff: Dr. Fanghui Chen, Elaine Panuccio, Dr. Ron MacGillivray, Scott Jedrusiak







**Delaware River Basin Commission**

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# Questions?

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For more information,  
follow the QR Code to  
DRBC's microplastics page

