Microplastics in the Environment

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Environmental Educator of the Year, NMEAC 2024
Imogene Wise Faculty Excellence Award 2022-2023

Northwestern Michigan College

Who is Involved?

- Grand Traverse Conservation District
- Benzie Conservation District
- Duck/Green Lake Association
- Ann Lake Owners Association
- The Watershed Center
- Inland Seas Education Association
- NMC Office of Possibilities
- City of Traverse City
- Water Treatment & Wastewater Treatment

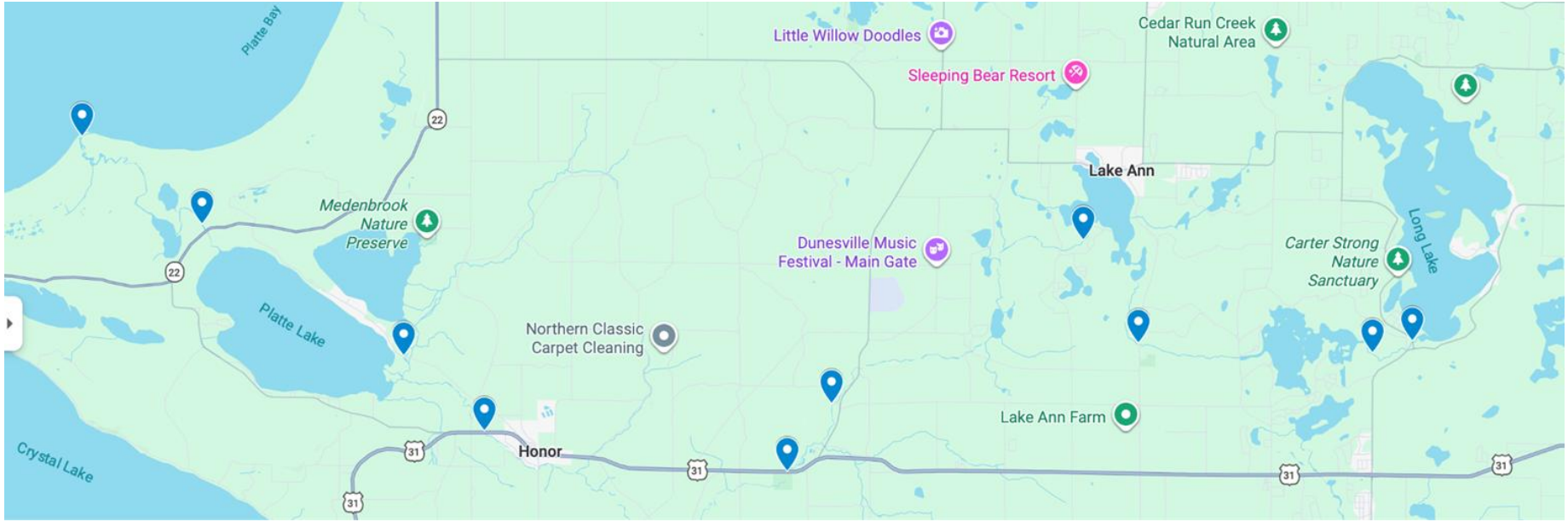




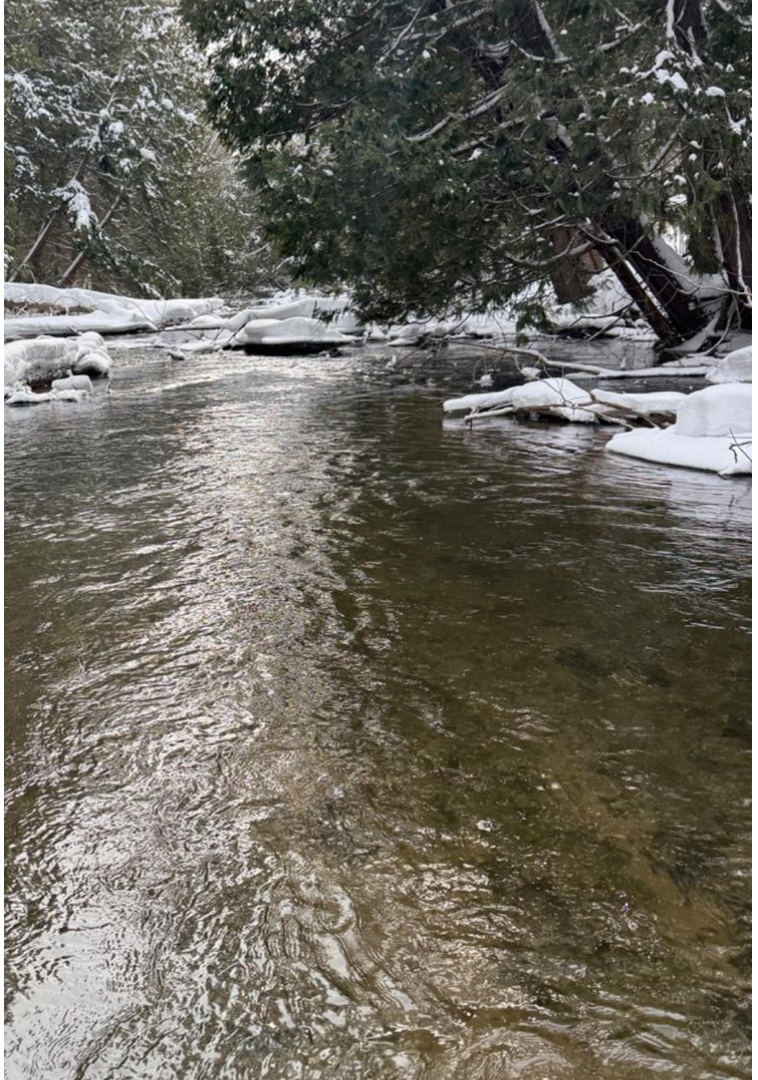




Platte River Sample Sites







NORTHWESTERN MICHIGAN COLLEGE · RIVER MICROPLASTICS

The Boardman and Platte rivers both average about 7 microplastics per liter

Particles per liter, per site-visit

Boardman

22 sites, Nov 2023 – Feb 2025 · 324 site-visits

7.0 mean

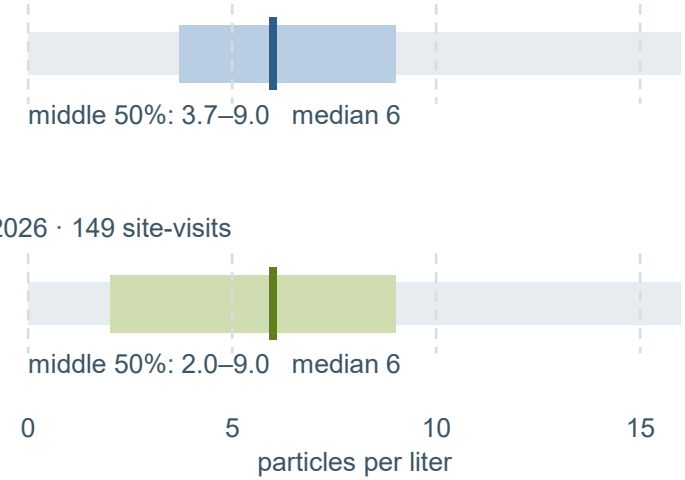
middle 50%: 3.7–9.0 median 6

Platte

9 sites, Mar 2025 – Oct 2026 · 149 site-visits

7.1 mean

middle 50%: 2.0–9.0 median 6



p = 0.21

No significant difference between the rivers (Mann-Whitney).

2× spread

Platte monthly means range 0.2–15.9; Boardman stays within 3.4–11.2.

6× zeros

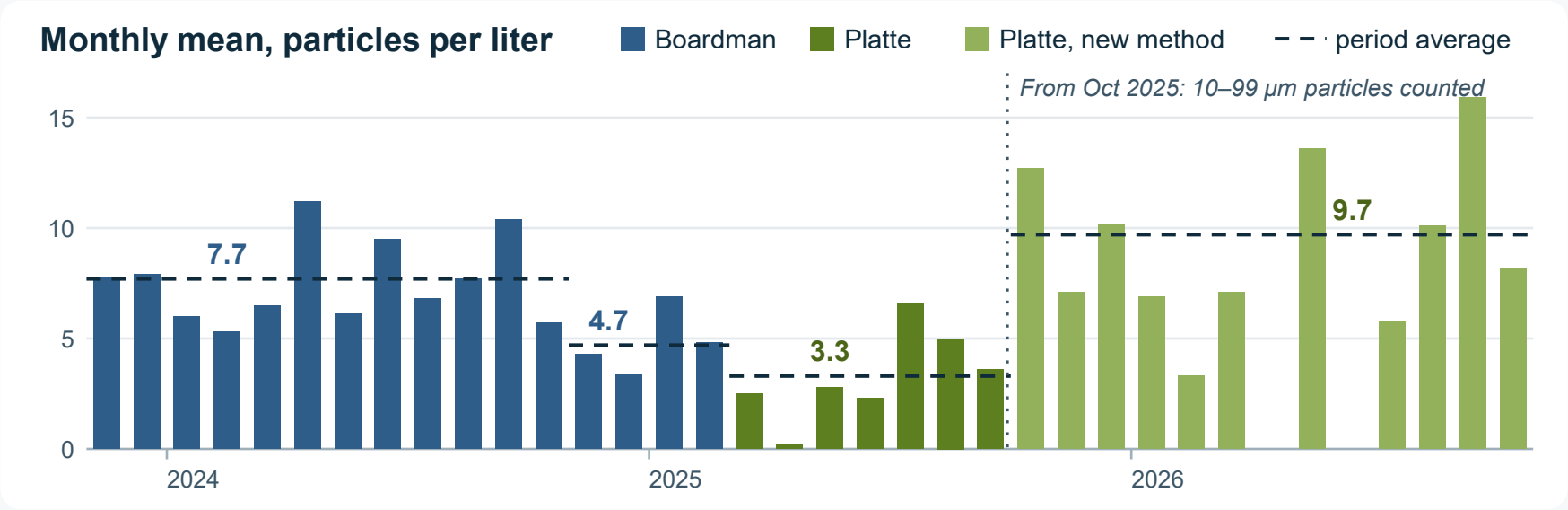
Zero counts: Platte 8.7% of samples, Boardman 1.5%.

Within each river, sites do not differ, and Boardman left, middle and right readings match.

Boardman: left/middle/right readings averaged per site-visit; 7 of 708 readings ≥ 40 excluded. Platte: one sample per site-visit. Source: NMC student research.

NORTHWESTERN MICHIGAN COLLEGE · RIVER MICROPLASTICS

The Boardman declined, while the Platte's rise follows a change in counting method



	Fall	Winter	Spring	Summer
Boardman	7.1	**5.7**	8.0	8.0
Platte	9.5	7.7	5.4	6.0

Boardman: lowest in winter; down 39% in its last 4 months.

Platte: without 10–99 µm particles, the rise is only 1.5×.

Rivers sampled in different years. No Platte data Apr or Jun 2026. 1.5×: Platte sites 1–8, 10–99 µm removed (not significant, p = 0.17). Source: NMC student research.

Green Lake Sampling Sites

Inlet
Mid-Lake
Outlet



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Average of 2.5 particles per 1L

37 billion liters

92,500,000,000 particles

46,250,000,000 particles with outlier removed

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Green Lake

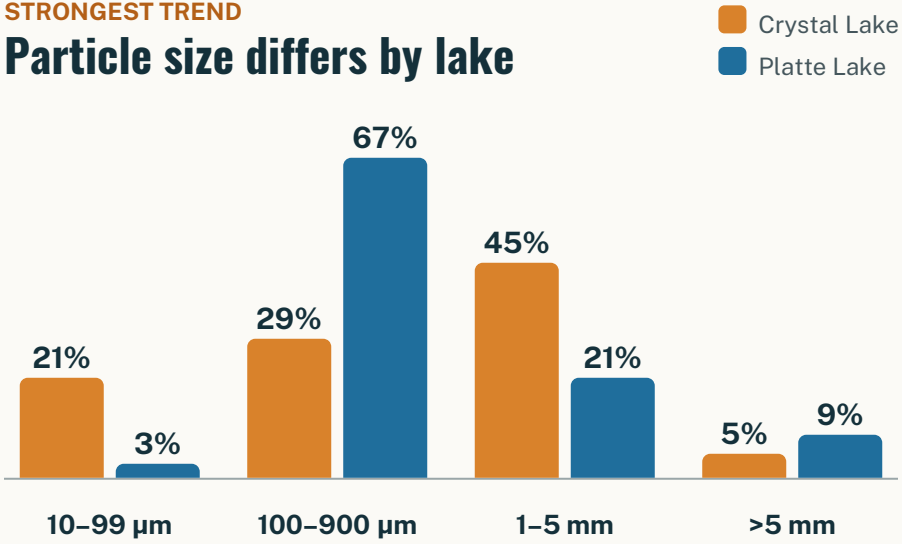
Inlet: 0 meters	3 particles
Inlet: 2 meters	3 particles
Mid-lake: 0 meters	1 particle
Mid-lake: 5 meters	22 particles
Outlet: 0 meters	2 particles
Outlet: 4 meters	1 particle
Outlet: 9 meters	5 particles

CRYSTAL LAKE & PLATTE LAKE · SAMPLED SEPT. 15, 2025 · 8 SAMPLES, 71 PARTICLES

Microplastics in Two Northern Michigan Lakes

STRONGEST TREND

Particle size differs by lake



Crystal Lake has more of the tiniest and largest particles. Platte Lake is dominated by 100–900 µm. Share of each lake's particles; chi-square p ≈ 0.004.

9.5
8.25

Particles per liter
Crystal vs. Platte: no real difference.

62%

Fibers
74% white or clear.

7 → 12
9.5 → 7

Surface → below
Opposite patterns in each lake. Too few samples to confirm.

17 | 16

Platte inlet | outlet
No difference: the lake isn't trapping particles.

Source: samples, Sept. 15, 2025 (4 per lake). Depth and inlet/outlet patterns are hypotheses for next season.

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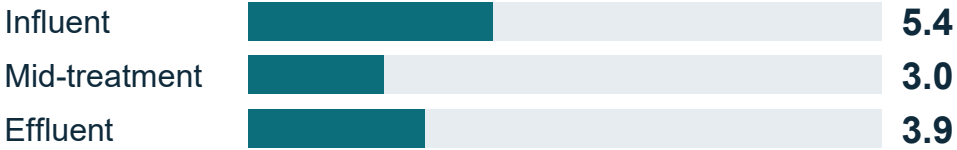
How many microplastics per liter?

Drinking-water treatment plant vs. wastewater treatment plant

Drinking water (WTP) Wastewater (WWTP)

Particles per liter (mean)

Drinking-water plant · 21 dates, Apr 2025 – Feb 2026



Wastewater plant · 27 one-liter samples after final filtration, 2026



2–3×
more per liter in wastewater effluent than in drinking water (in or out)

−29%
drinking-water plant, influent → effluent (significant, p = 0.02)

Particle type

wastewater plant

Fibers Fragments



Fibers outnumber fragments 3 to 2. Type was not recorded at the WTP.

Particle size

< 1 mm 1–5 mm > 5 mm



10% of WWTP particles were < 1 mm (counted only from Feb 25, 2026).

WTP: 21 sampling dates, Apr 2025 – Feb 2026. WWTP: 27 one-liter samples, Feb and Aug 2026. Source: NMC student research.

Air Sampling



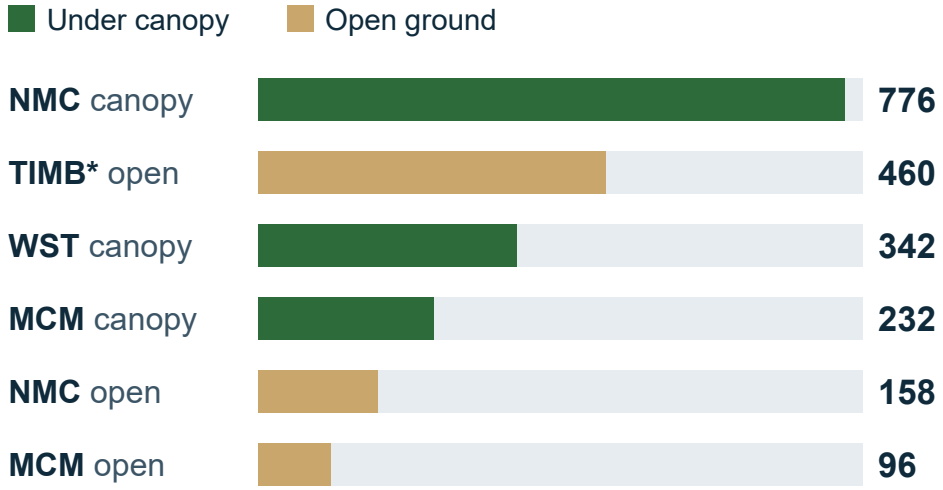



TIMB-02
NMC

NORTHWESTERN MICHIGAN COLLEGE · AIRBORNE MICROPLASTICS

At paired sites, collectors under tree canopy caught 2–5× more airborne microplastics than open ground

Mean particles per collector, per 2-week sample



Kruskal-Wallis across the six sites: $p < 0.001$. *One TIMB collector ran 6–20× higher than its partner on 7 of 15 dates.

4.9× and 2.4×

Canopy vs. open at NMC and MCM; canopy higher on 27 of 30 dates.

Windier = more

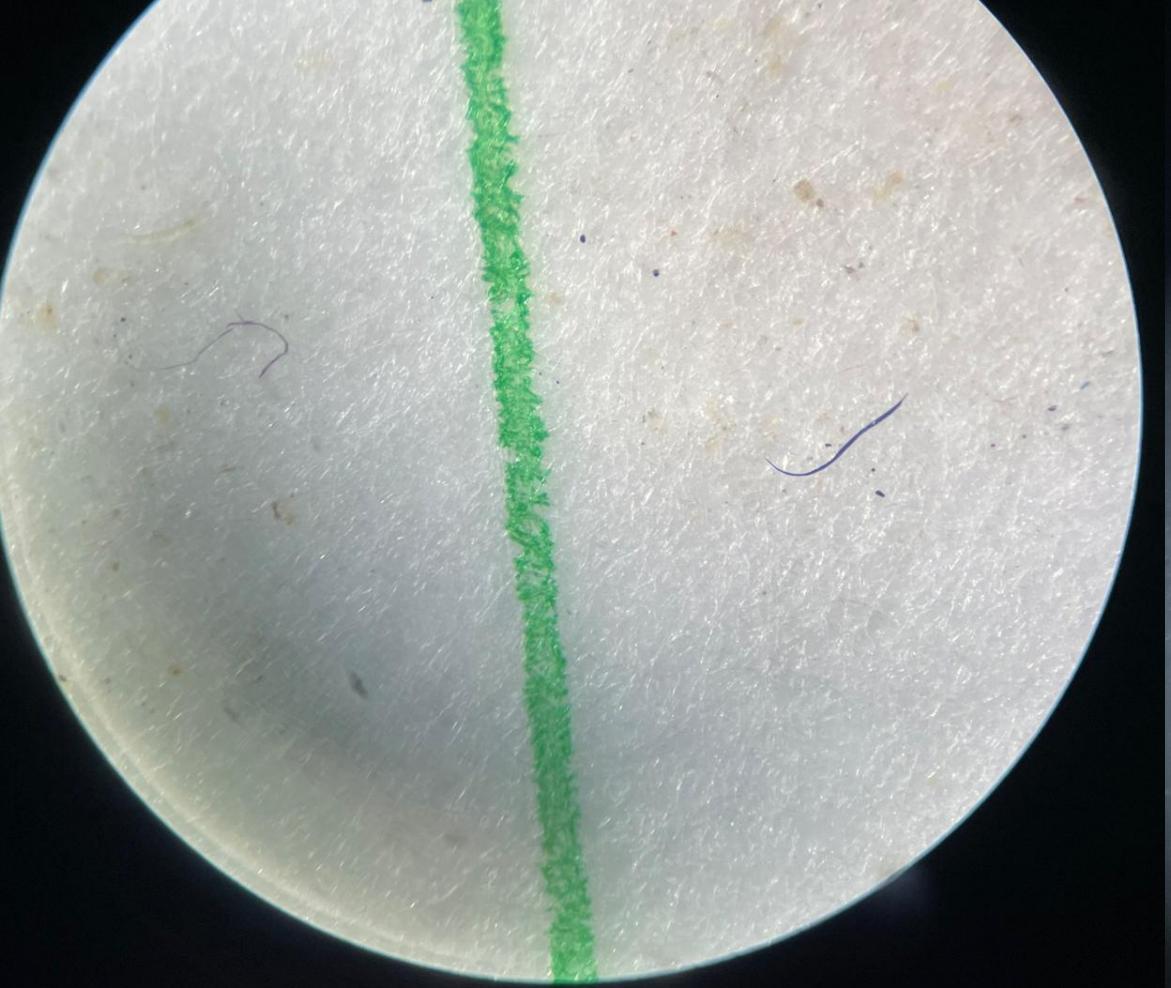
Windier periods had higher counts ($\rho = 0.65$); rainfall showed no link.

99% non-fiber

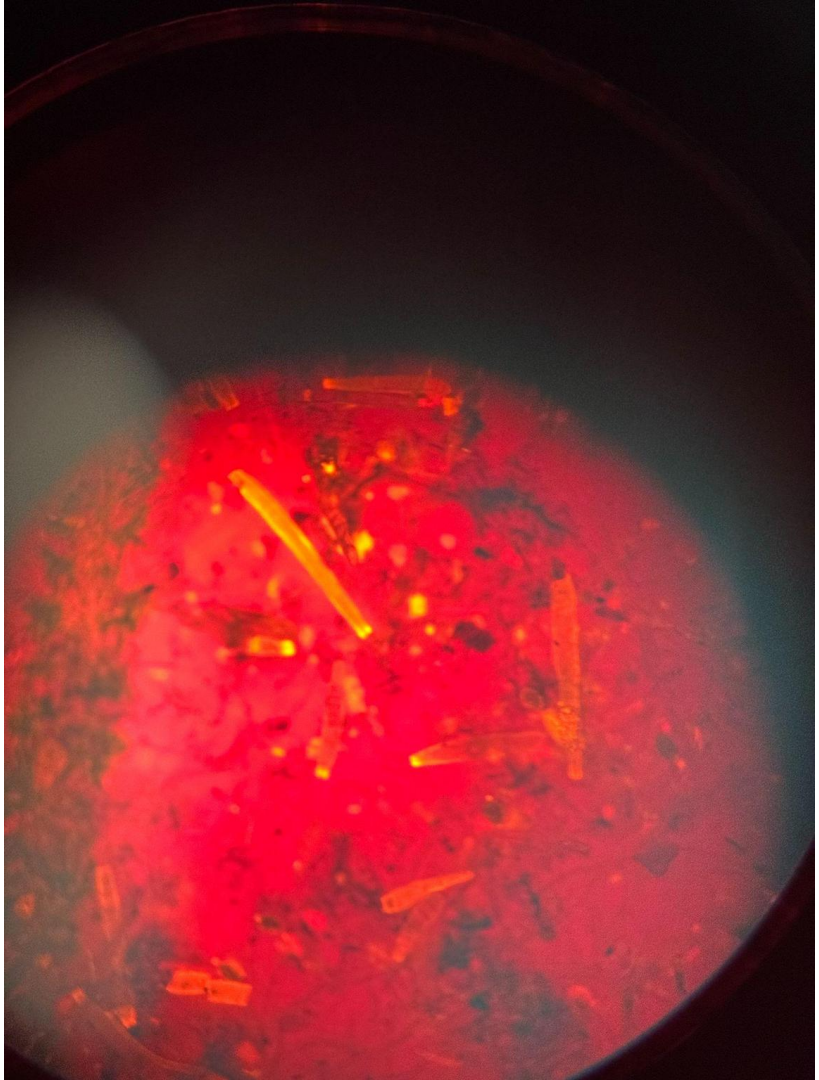
And 98% of particles fall in the smallest size class (A).

Fall had the highest mean per sample, but seasons do not differ significantly ($p = 0.28$).

15 sampling dates, Jun 18, 2024 – Jan 3, 2025; 2 collectors per site; 61,879 particles counted. Source: NMC student research.







Why is this Important?

- Plastics are an emerging, forever, pollutant.
- Plastics continually degrade to smaller particles.
- Shown to bioaccumulate.
- Health effects are as yet unknown.
- Recent article with first ever possible link between microplastics in the blood and heart health.

Article

https://doi.org/10.1038/s41565-023-01534-9

Microplastic fragmentation by rotifers in aquatic ecosystems contributes to global nanoplastic pollution

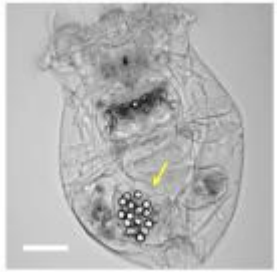
Jian Zhao[1,2], Ruyi Lan[1], Zhenyu Wang[3], Wenli Su[1], Dongpo Song[4], Runze Xue[1], Zhuomiao Liu[1,5], Xia Liu[1], Yanhui Dai[1], Tongtao Yue[1] & Baoshan Xing[5]

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b



Giving students real research experience on a real-world problem.

Why?

The Impact of Discharge Rate and Other Environmental Factors on Microplastics Concentration in the Platte River.

Haiden Luna, Finn Sutherland, Nathaniel Dion, Konrad Kuźma

BIO 116

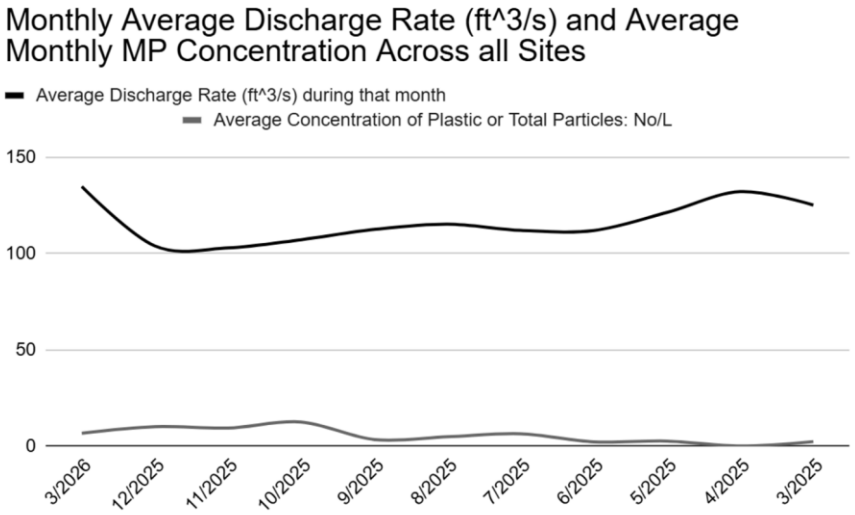
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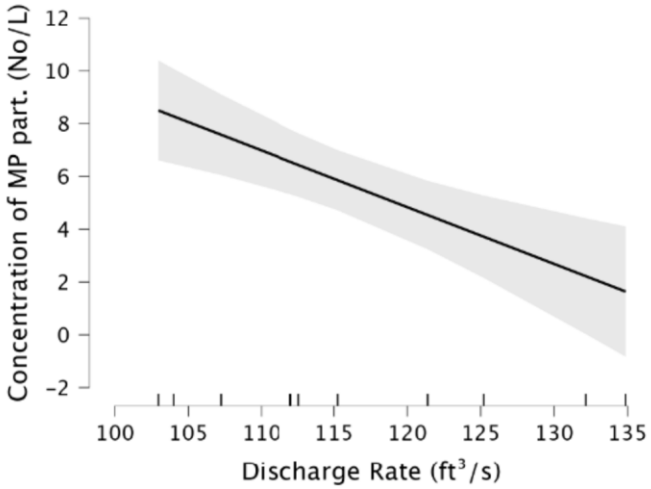
04/17/2026

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Figure 1

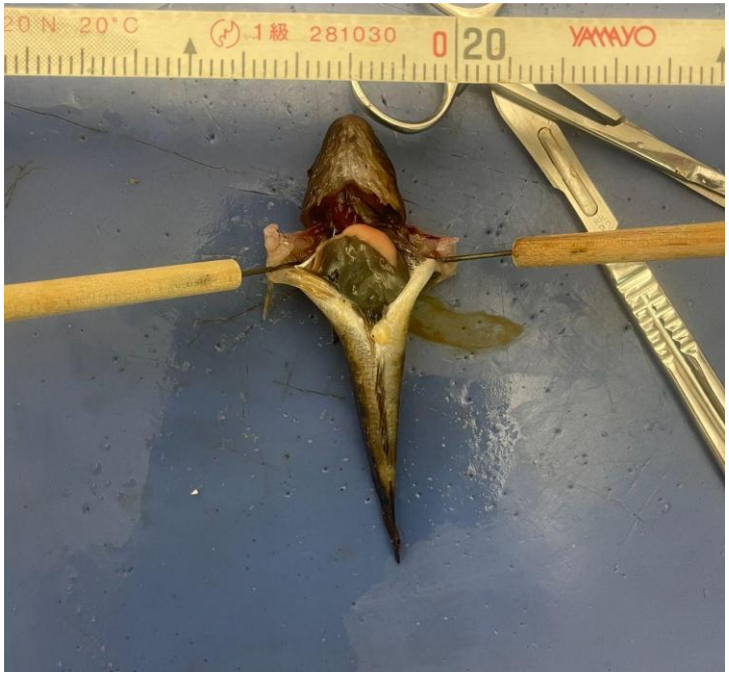


The Association Between Discharge Rate and Concentration of Plastic Particles



Two Non-Native Species

Round Goby: Bottom Feeders



Rainbow Trout: Mid Column Feeders

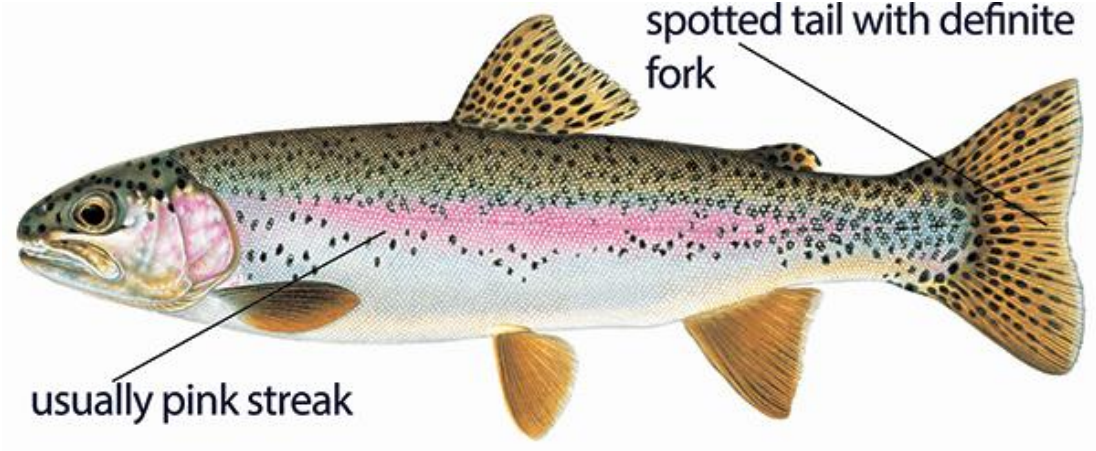
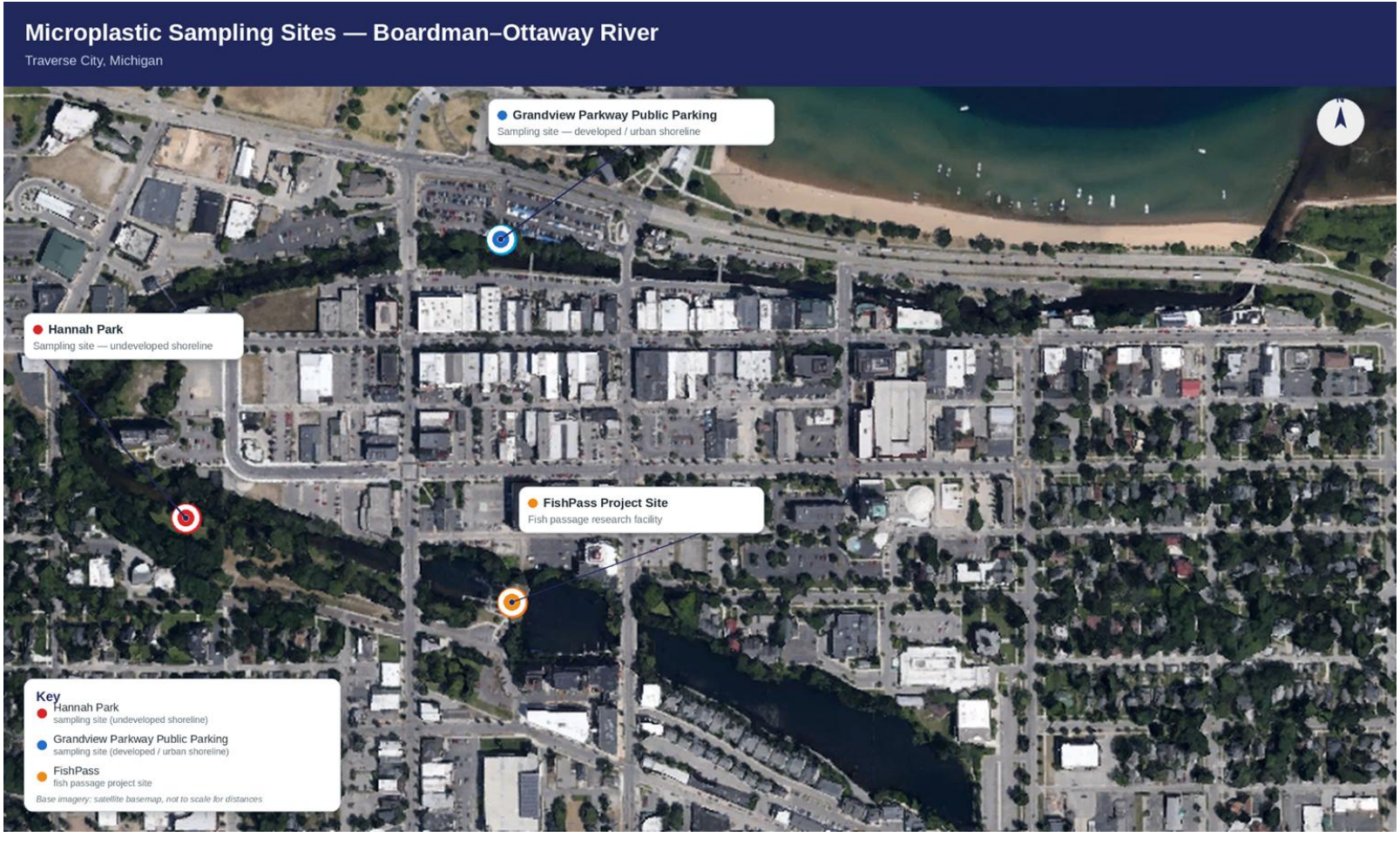


Photo credit: State Of Michigan

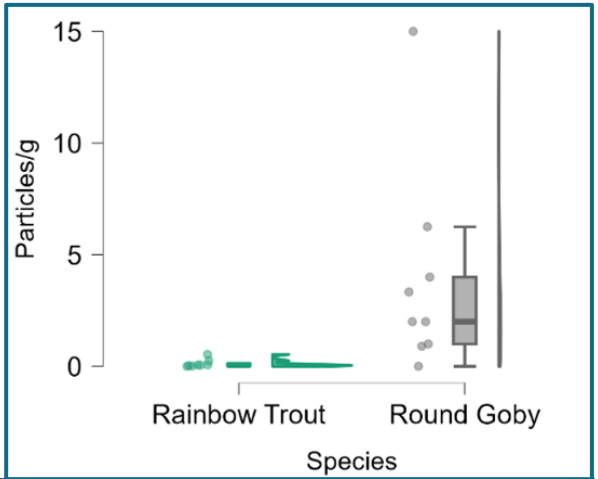
The Lower Boardman–Ottaway River



Species Comparison — Significant Result (weight normalized)

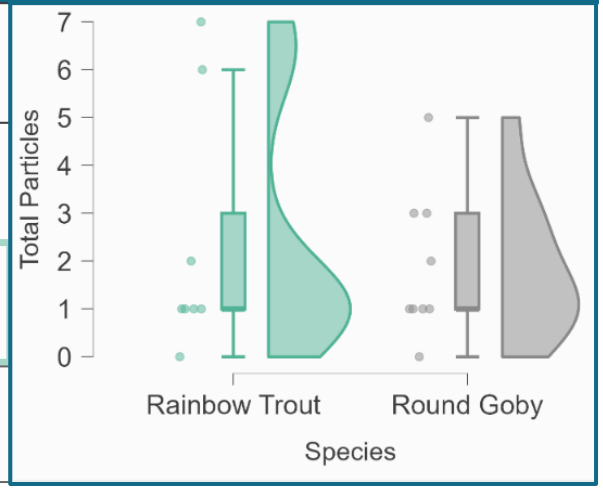
p = .007

Mann-Whitney



Other tests: (no significance)	Result	
Water-column MP vs. round goby stomach MP	Spearman rank correlation	**p = .578**
Organ type (stomach vs. liver), both species, raw count	Wilcoxon signed-rank	**p = 1.00**
Species, raw particle count (not weight-normalized)	ANOVA	**p = .112**
Procedural blanks (n = 2)	Microscopy	**No MPs identified**

Species, raw particle count (not weight-normalized) Rain Cloud plot



What to do?

- Find products that don’t use plastic (or use less):
- Bar Soap
- Bar Shampoo
- Toothpaste Pellets
- Mouthwash Pellets
- Deodorant in paper tubes
- Ventless dryer

Paper bags

Keep your clothes - older shed less plastic

Michigan’s Ban on Bans????

Recycle milk jugs & pop bottles

Laundry strips? - polyvinyl chloride

Replace cook and bakeware with metal or glass

Be okay with having a little less convenience

Thank You.

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