



Analyzing how Precipitation Affects Microplastic Concentrations in the South River



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Research Question

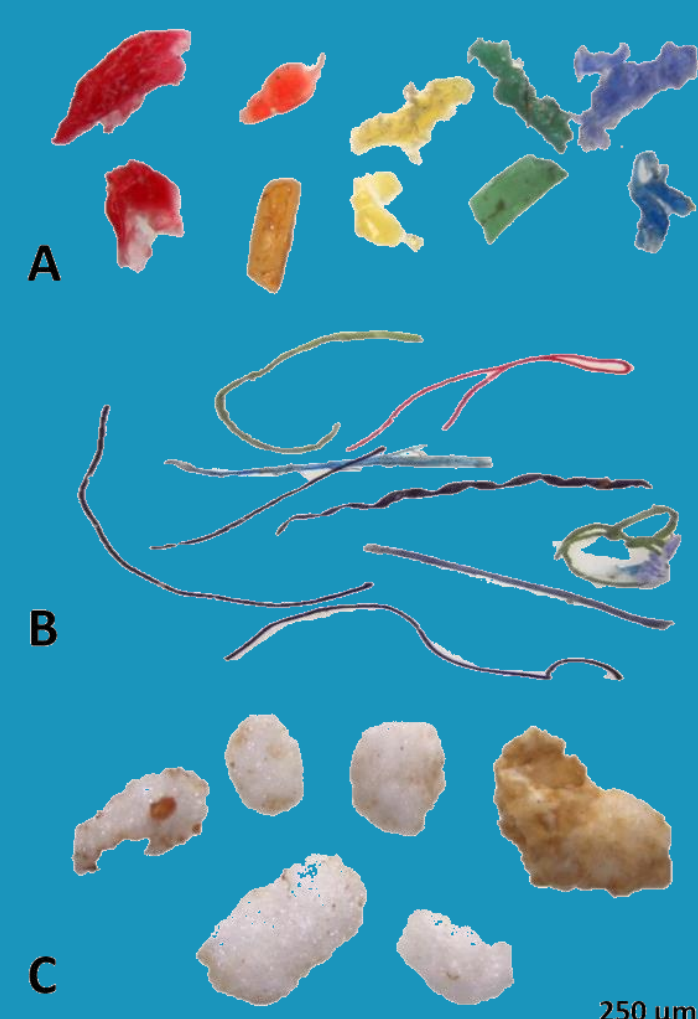
How does precipitation affect the concentration of microplastics in the South River?

Background

Microplastics are plastics that are smaller than 5 mm in diameter (Environment Maryland). The majority of the microplastics originate from larger plastic objects put under environmental stressors such as ultraviolet light. Microplastics are already known to be ubiquitous in bodies of water as well as the air. However, the concentration is unknown and largely unstudied. Microplastics can enter important organs, cause inflammations, and incite immune responses (Song et al.). The dangers posed by these miniature plastics are still unknown, however, an even greater question is how these plastics enter our water systems and how they interact with our ecosystem.

Plastic Classification

Most common types of microplastics found in samples
Bright Fragments,
Thin Microfibers,
and Styrofoam Particles.



Methodology



1. Delineate portions of South River into 3 transects to be sampled (transects based on area & population density).



2. Conduct a tow test with the net trailing behind the vessel. Tow the net for about 500 meters for each sample.



3. After each test empty the net into the sieves to separate the sample from biomass. Then store samples for analysis.



4. Samples placed in drying oven for approximately 24 hours at 100 °C at Naval Academy Hendrix Lab.



5. Burn off biomass using peroxide oxidation. Use pipette to place plastics in filter and use vacuum pump to separate sample.



6. Use gravimetric analysis to isolate and weigh the microplastics.

Acknowledgments

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Data and Findings

When looking at the microplastic concentrations for each transect we found that the range of concentrations did not have any significant abnormalities and that the pre-rain and post-rain samples were similar. This was further supported by our comparison of microplastic mass by area. We compared our data with fellow research groups from the USNA and UMD and found no significant differences in our data ranges.

Site Name	Microplastic Concentrations g/km ² (Mean ± SD)
Pre Rain Lower	33.735 ± 23.189
Pre Rain Middle	13.192 ± 11.386
Pre Rain Upper	45.731 ± 42.109
Post Rain Lower	75.143 ± 118.447
Post Rain Middle	42.738 ± 36.886
Post Rain Upper	11.665 ± 9.0481

	Site	Date Range	Plastic Mass by Area (g/km ²)
Yonkos et al. (2014)	Patapsco River	July – Nov 2011	10.6 – 238.1
	Magothy River	July – Nov 2011	5.2 – 245.7
	Rhode River	July – Nov 2011	3.2 – 56.1
	Corsica River	July – Nov 2011	2.7 – 19.2
USNA Projects	Severn River	Sept – Dec 2020	2.3 – 326.0
	Severn River	Sept – Nov 2021	0.05 – 148.9
	Annapolis Harbor	Feb 2022	10.2 – 95.5
Capstone Project	South River (Pre Rain)	March 2022	0.99 - 84.59
	South River (Post Rain)	March 2022	1.31 - 211.82

Conclusion

Results show that microplastics exist in the South River and are comparable to other rivers in the region. Results also show that there is no correlation between the concentration of microplastics before and after precipitation. Due to the countless external factors that impacted this experiment, more testing needs to be done to rule out potential sources of contamination and possible sources of error.