MICROPLASTICS IN THE TIDAL FRESHWATER POTOMAC RIVER

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INTRODUCTION

Microplastics (MPs) are pieces of plastic between 0.33mm and 5mm and represent a near ubiquitous type of pollution and have been found in almost all bodies of water sampled[1]. MPs represent both an ecological and a public health threat, as vectors of toxic chemicals[2]. Only one peer-reviewed paper quantifies the microplastics issue in the Chesapeake Bay region[3], with no published findings regarding microplastics in tidal freshwater Potomac River. Yonkos et al. (2015) considers population density of a watersheds in the Bay region as a factor influencing MP concentrations. This study investigates MPs in the Potomac River basin and the impact of land development on MP concentrations.

Hypothesis 1

$H1_0$: The concentration of MPs is unrelated to land development

$H1_a$: The concentration of MPs will increase as land development increases

Hypothesis 2

$H2_0$: The percentages of each type of MP is the same at each site

$H2_a$: The percentages of each type of MP is different between sites

SAMPLING SITES

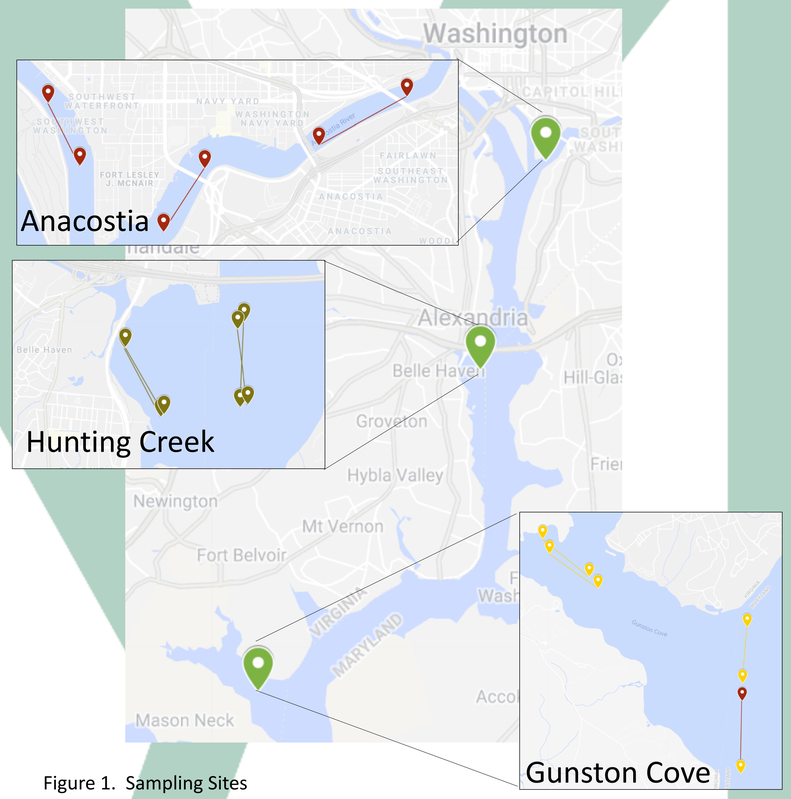
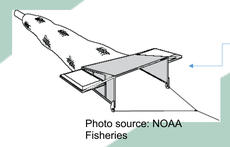


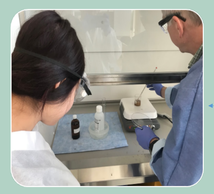
Figure 1. Sampling Sites

METHODOLOGY



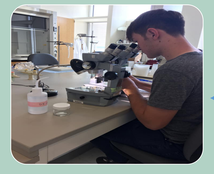
Collecting microplastics using a buoyant manta net

Wet sieving



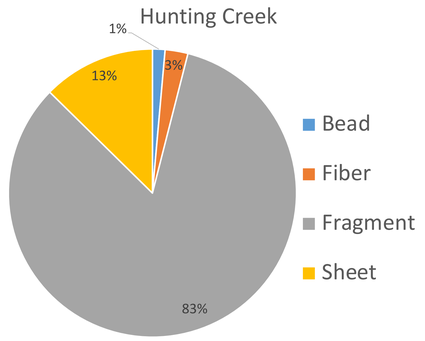
Wet peroxide oxidation

Density separation



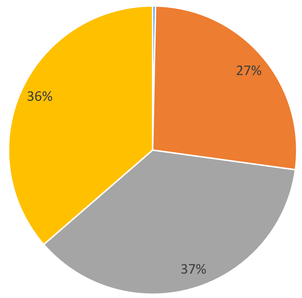
Microscope exam

Figure 2. Methods



Gunston Cove

Anacostia River



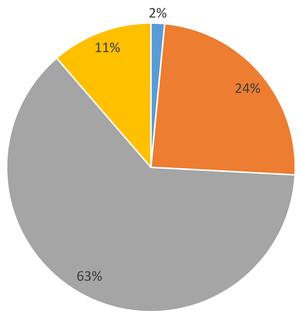


Figure 4. Average percentage of each plastic type found at each sampling location. Anacostia River n=3, Hunting Creek n=4, Gunston Cove n=4
Fibers and Fragments were found to be significantly different between all sites (Kruskal-Wallis ANOVA, < p 0.05)

RESULTS

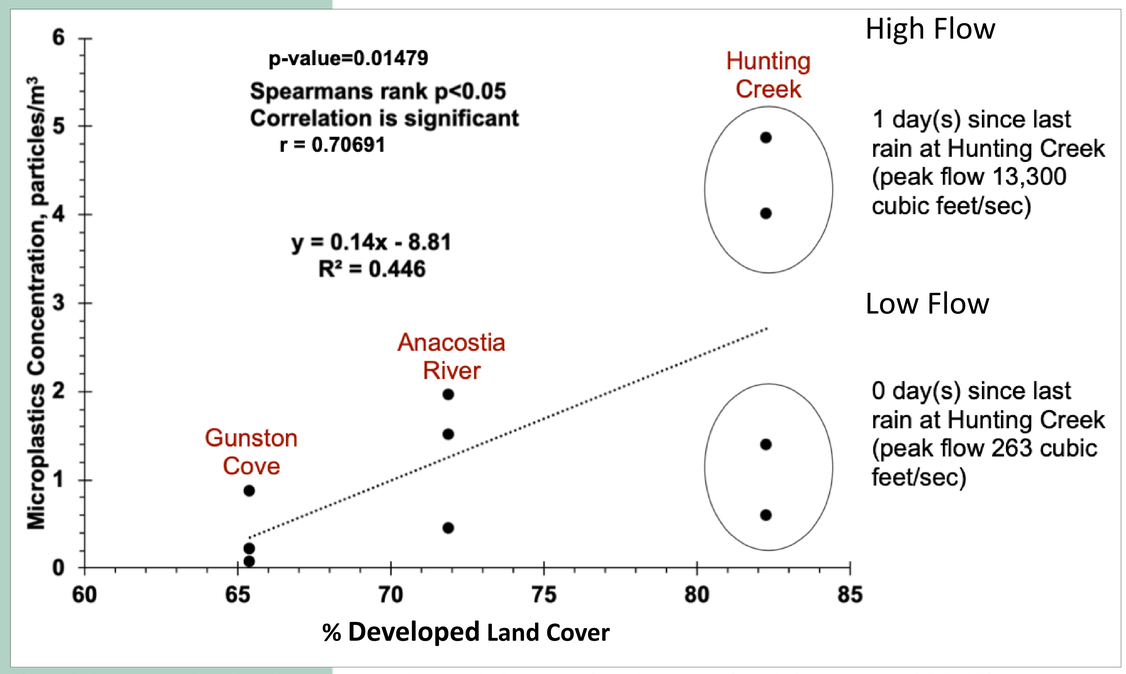


Figure 3. Percentage Developed Land versus Microplastic Concentration with annotations. With a p-value of 0.01479, the correlation of percentage of developed land in a watershed to concentration of MPs was found to be significant (Spearman's Rank Correlation, p=0.05).

CONCLUSIONS

- Microplastics were present in all sampling sites
- Concentrations of microplastics amongst all sites is positively related to land development (Spearman Rank Correlation)
- Sites differed in fragment and fiber abundance amongst sites (Kruskal-Wallis ANOVA) with a high fragment portion at Hunting Creek and a high fiber portion at Gunston Cove

ACKNOWLEDGEMENTS

- Thanks to GMU OSCAR and the Patriot Green Fund for funding our project
- Special thanks to Doreen Peters, Tom Hutchinson, the de Mutsert Fish Lab, Dr. Joris van der Ham, Anacostia Riverkeeper (Robbie O'Donnell), and D.C. DOEE (Matt Robinson)

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