# Stream Assessment of Microplastics in Quad City Watersheds

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## Introduction

Microplastics are small particles created by the breakdown of larger plastic waste that are commonly measured as being >5mm in diameter. (Barnes et al., 2009). There has been a lot of research done in marine environments compared to freshwater environments. But, many of these studies have focused on the digestion of microplastics in marine life (Wager et al., 2014). Microplastic pollution of aquatic ecosystems is widespread and poses problems to affected areas (Rebelein et al., 2021). Studies have shown that microplastics can be ingested by organisms which can damage their health negatively. (Wright et al., 2013) Plastics find their way through urban streams through direct disposal, airborne, animal interference, and impervious surface runoff. (Stoval et al., 2022) In these streams, these plastics are subjected to fluctuations in temperature, microorganisms, water flow, and possibly chemical properties causing them to break down. (Wager et al., 2014). Literature about the relationship of watershed type and microplastics is extremely limited, though some details as to why abundance would be more prevalent on certain watersheds. (Stoval et al., 2022) The purpose of this study was to investigate microplastic abundance across tributary watersheds of the Mississippi River dominated by different land uses.

## Methods

Surface water quality samples were collected from 17 different sites representing natural, agricultural, urban, and mixed land use watersheds in the Quad City Region of Iowa and Illinois (Figure 1). Three samples were collected at each site. Collection was done in base flow conditions (> 48 hours after measurable precipitation). After collection, samples were digested and filtered using a modified version of the one pot method (Cizdziel 2020). After filtration the Nile Red method (Bagshaw 2020) was adopted for analyzation of the samples. A custom flashlight shining 470 nm of light is also used to shine directly on the sample, allowing us to easily quantify fragments and fibers present (Figure 2 and 3). Values of microplastics over the three samples at every site were then averaged for analysis.

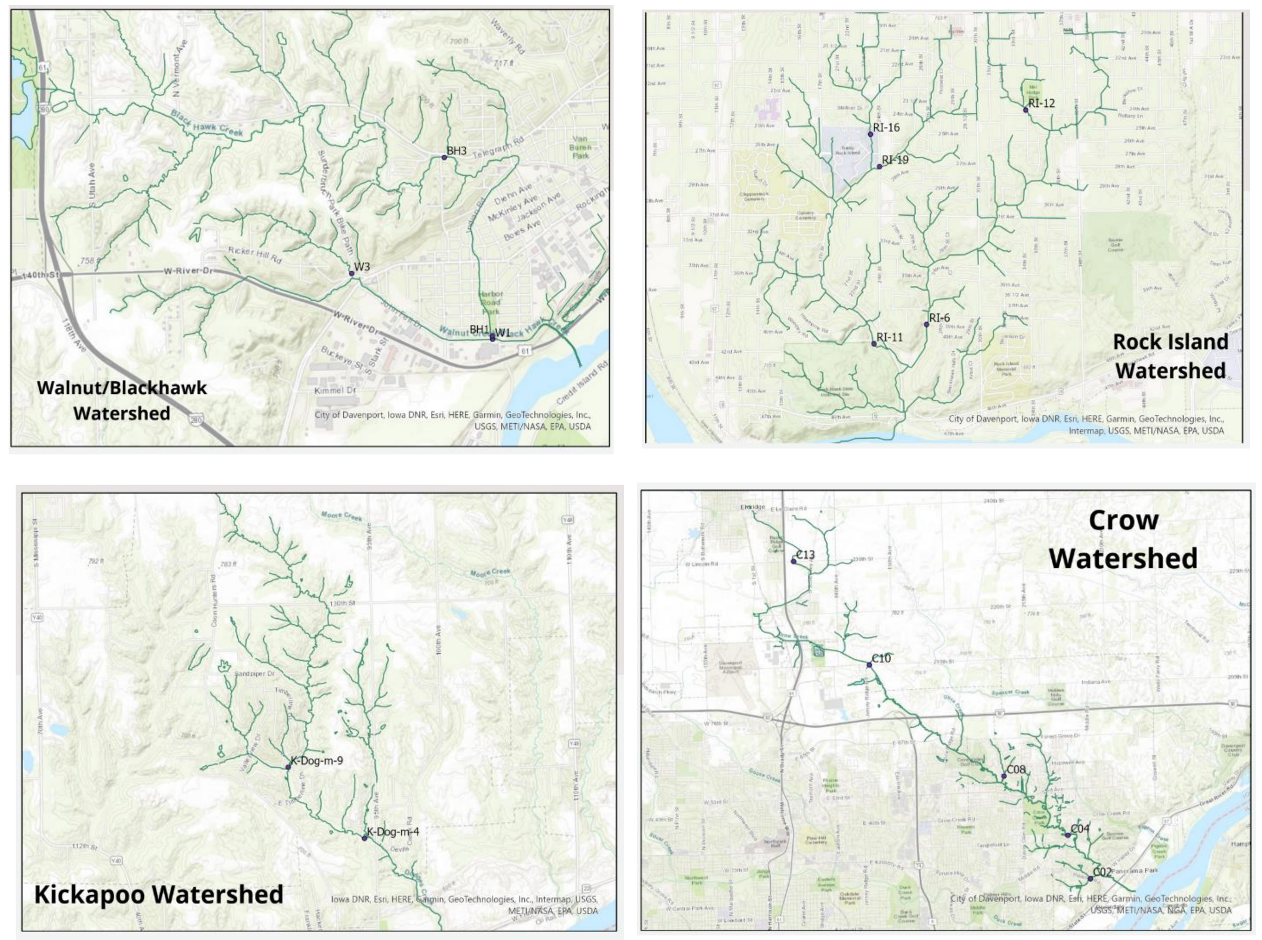



Figure 1. Study area and sampling site locations.

## Methods

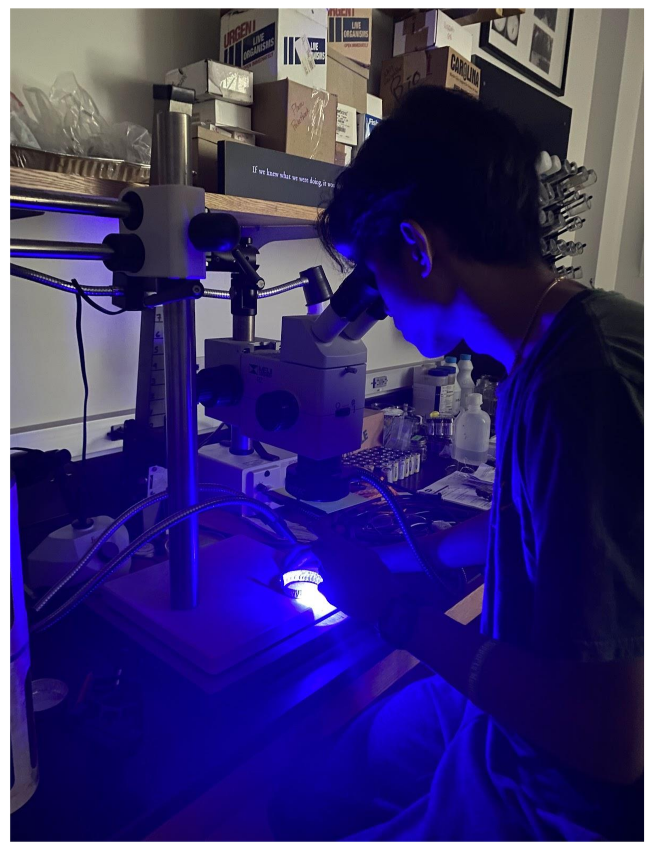


Figure 2. Using a modified microscope to detect microplastics in a sample

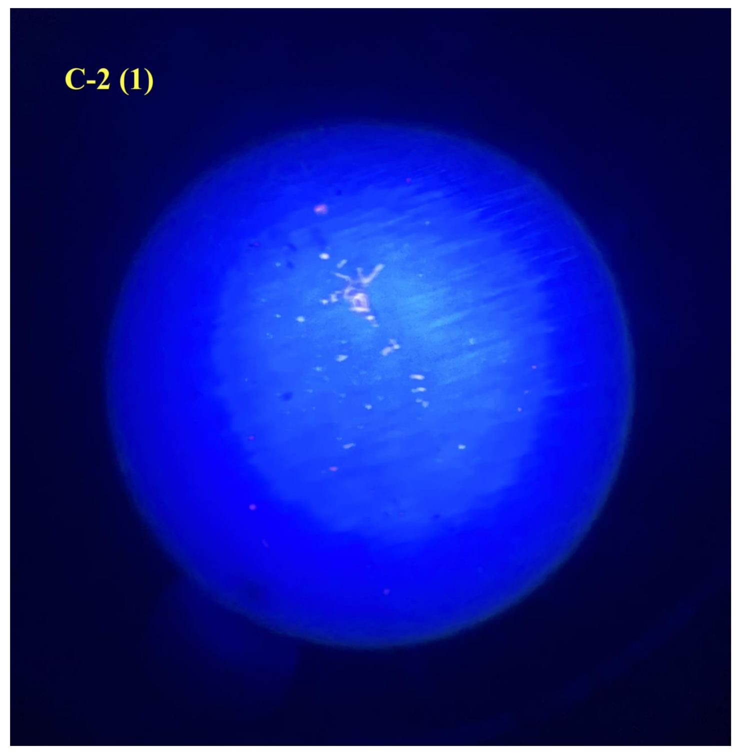


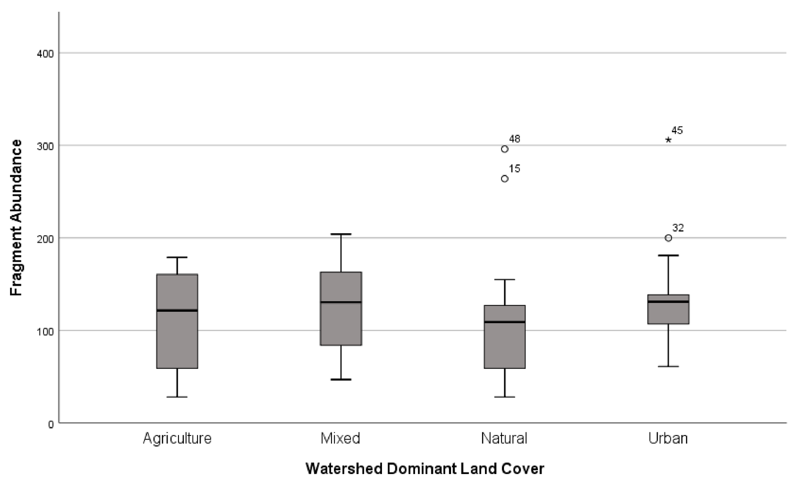

Figure 3. An sample showing microplastics

## Results

The mean abundance of microplastic fibers was 2.04 with a minimum average of .66 at site K-Dog- M-4 and maximum average of 6 at site RI-16. The mean abundance of microplastic fragments was 122.22 with an average minimum of 57 at site W-3 and average maximum of 178 at site RI-6. The mean abundance of total microplastic pieces was 121.81 with an average minimum of 58 at site W-3 and average maximum of 180 at site RI-6.

Total microplastic abundance was highest in urban and mixed land use watersheds (ANOVA F-Statistic of 2.40, p-value = 0.048; Figure 6). Similarly fragment abundance was highest in urban and mixed land use watersheds (ANOVA F-Statistic of 4.285, p-value = 0.027; Figure 4) In fiber abundance it was highest in urban land use (ANOVA F-Statistic of 2.78, p-value = 0.083; Figure 5)

Figure 4. Fragment abundance in different dominant land cover of watersheds. Error bars are standard errors



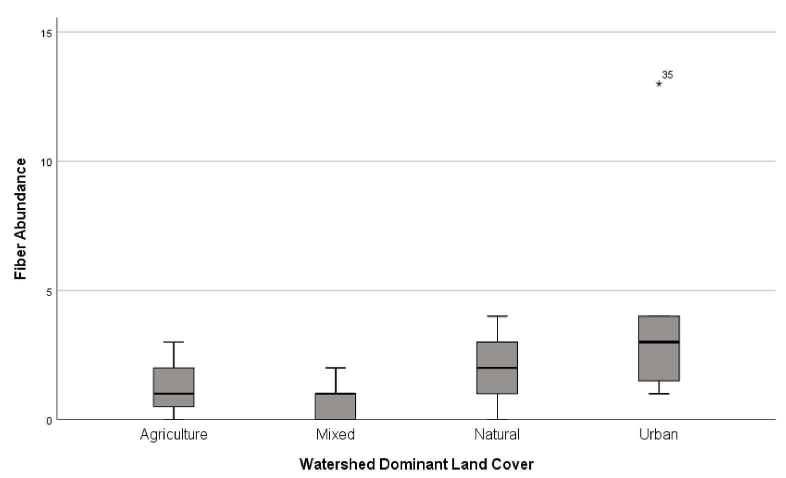




Figure 5. Fiber abundance in different dominant land cover of watersheds. Error bars are standard errors

## Results

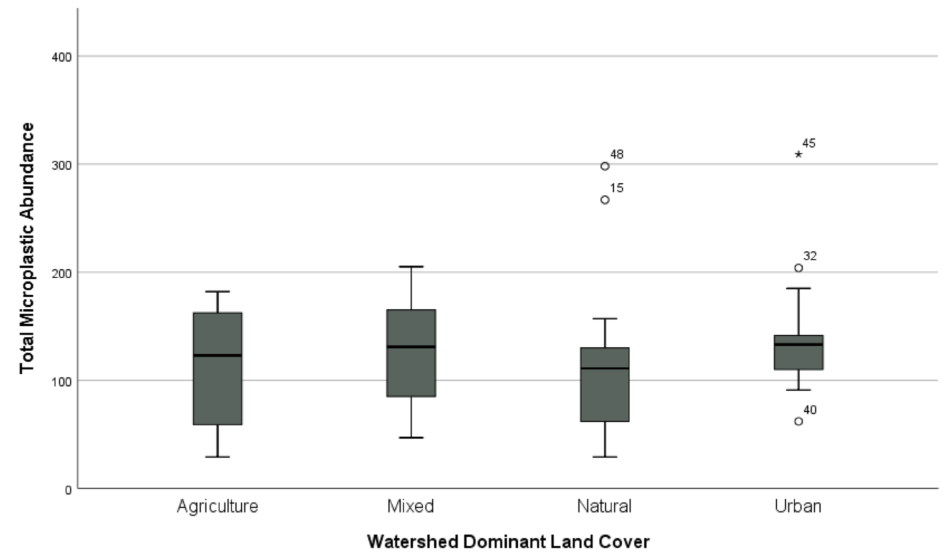



Figure 6. Mean total microplastic abundance across watersheds with different dominant land uses. Error bars are standard errors.

## Discussion

With our results we were able to find trends that showed that areas containing higher urban land use have higher fragments, fiber, and overall microplastic levels. Though, our results yielded a different pattern compared to other microplastic studies of similar nature. Most aquatic based microplastic research had more fiber findings than fragments, (D'Hont et al.,) majority of our microplastic findings were fragments. Though we are not certain as to why we believe it could have something to do with the study area. Further research with more samples at these locations can help solidify this result as well. Using this information we can predict where higher levels of pollution is occurring, and it can help future researchers where microplastic contamination is occurring the highest, and potentially help reduce levels. Reduction of microplastic pollution flowing into the Mississippi River can help further avoid ecological and environmental issues that these plastics enable.

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