Microplastic Survey 2018
**Purpose**

Hudson River Park’s Estuary Lab conducts an annual microplastic survey in the surface waters of Hudson River Park’s Estuarine Sanctuary. This study aims to quantify the concentration of microplastics in Park waters. Microplastics are pieces of plastic smaller than 5mm in size that can originate from the breakdown of larger plastics or are created deliberately for cosmetic use and other purposes. After three years of conducting the survey, the Estuary Lab has developed a baseline understanding of the concentration, distribution, and identification of microplastics in the Hudson River.

**Key Research Questions**

1. How does the presence of microplastics change from year to year?
2. Is there a correlation between the presence of microplastics and combined sewage over flow (CSO) events?
3. How are microplastics impacted by weather changes and tidal fluctuations?

**Methods**

- Between June and October, the Estuary Lab conducts monthly microplastic surveys. Two samples are collected downtown near Vestry Street and two samples are collected in midtown near 34th street. At each site, a near-shore sample and a channel sample is taken.
- Samples are collected by attaching a 1-liter bottle to a 0.3mm mesh Neuston net and trawled along the surface of the water for 15 minutes at an average speed of 3-5 knots.
- After the samples have been collected, they are filtered through a series of stacked sieves and dried at 90 °C.
- Organic matter is degraded using a wet peroxide oxidation process. The samples are then divided using salt gradient separation process. Plastics are further separated using a 0.3mm nitrex sieve, creating one sink sample and one float sample.
- All processed samples are counted using a dissecting microscope and categorized into six different categories: These categories include: fragment, foam, line, pellet, film and nurdles.
- Microplastic concentrations are then statistically analyzed using Microsoft Excel and R Statistics Version 3.5.1.

**Fig. 1** | Map of microplastics sample collection locations.

**Fig. 2 (Left)** | Neuston net during microplastic sample collection.
**Fig. 3 (Right)** | Processed microplastics sample under a microscope featuring a number of microplastic types.
Major Findings

In 2018, the Estuary Lab found an average concentration of 578,333 microplastics per km² in Hudson River Park’s estuarine sanctuary (Fig. 4) making this year’s concentration the highest the Park has seen since the survey began. This concentration is three times greater than 2016 findings and five times greater than 2017 findings. (Fig. 4). A possible explanation for this increase in plastics could be related to the increase in rainfall in 2018. Wet weather in NYC can trigger combined sewers to overflow, and untreated waters to enter local waterways, which is a common source of microplastics.

Despite the slight variation in monthly average concentration between channel and near shore samples (Fig 5), statistical tests revealed that there was no significant difference in quantities of plastic found between the two sites sampled in 2018 (Welch T-test, p-value = 0.1498), (Fig 5). There was also no significant difference in quantities of plastic collected between the midtown sampling location and the downtown sampling location (Welch T-test, p-value = .3071).

The most common type of microplastics identified in Estuary Lab’s 2018 samples was fragments (Fig. 6). Fragments are formed as larger pieces of plastic are broken down. The second most common type seen was foam. This is consistent with the Estuary Lab’s Macroplastic survey, where foam is the dominant marine debris found in shoreline clean ups. A decrease in the quantity of foam is expected in future sampling of the estuary, due to the Styrofoam ban passed in January of 2019. Similarly, this study also expects to see a decrease in pellets in connection to the 2018 and 2019 summer implementation of the FDA Microbead-Free Waters Act of 2015.
Take Aways

The results of this year's study suggest that the presence of microplastics is increasing in the estuarine sanctuary, likely due to the influence of high rain fall and because the use of plastics in New York is not slowing down. The prevalence of fragments in our microplastics samples indicates that larger plastics are not being disposed of properly; instead, these plastics are ending up in local waterways after rain fall and CSO events, where they continue degrade into smaller pieces. It is likely that this year’s field season’s overall high rain fall added microplastics to the estuarine system, although no significant correlation between rain fall and microplastic concentration was found. Continuing to collect information on microplastics in the Hudson River creates a deeper understanding of how the estuarine system and the city’s sewer system are connected. This information is valuable in creating an overarching understanding of the health of the River. By monitoring the annual fluctuations in plastic concentration in the River, the Estuary Lab is able to track how rain, tidal and other environmental impacts alter the conditions of the Hudson River.

Future Directions

The Estuary Lab intends to continue this survey in future summer seasons. Microplastics research is a field of study in which data is lacking, particularly in the Hudson River. The Estuary Lab hopes to continue creating strong records of microplastics concentrations in the Estuarine Sanctuary. Hudson River Park also aims to narrow down sources of contamination and create goals towards rehabilitation.

References: