Microplastics within the Waishkey Bay, Lake Huron Watershed

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Introduction

The Waishkey Bay is located on the St. Marys River—the sole outflow of Lake Superior—which connects Lake Superior to Lake Huron. The Bay serves as an important Native economic and cultural resource for the Bay Mills Indian Community (BMIC). Waishkey Bay supports fisheries as well as tourism. Like waterbodies world-wide, the Bay is at risk of anthropogenic contributions of pollutants. One such contaminant is microplastics. The ubiquitous and seemingly continuous use of plastic materials and polymers creates multiple path of entry into waterbodies. Once established, plastics may remain in the system indefinitely and their ability to enter the food web is multifaceted. Moreover, the organic nature of plastic compounds makes it a host for concentration of other persistent organic pollutants (POPS). Human exposure to plastics and plastic-bound POPS through aquatic food chains is not well-defined.

Objectives

1. Quantify microplastic pollution within sediments of Waishkey Bay and its tributaries.
2. Determine if microplastic pollution in Waishkey Bay poses a threat to aquatic life.

Methods

- Sample collection, May and June 2018
  - Ponar sampler from open bay locations
  - Stainless steel spade and gloved hand within stream locations
- Samples separated into fractions:
  - Fraction 1: ≥ 5.6mm
  - Fraction 2: 1.0mm - 5.6mm
  - Fraction 3: 0.3mm - 1.0mm
  - Fraction 4: ≤ 0.3m
- Digest sediment
  - 20mL of 30% hydrogen peroxide
  - 20mL of aqueous 0.05M Fe(II)
    - 7.5g $FeSO_4$ + 500mL H_2O + 3mL H_2SO_4
  - Heat and agitate at 70°C for 30 minutes
- Rinse with deionized water then dried at 35°C
- Microplastics were enumerated under 10x magnification

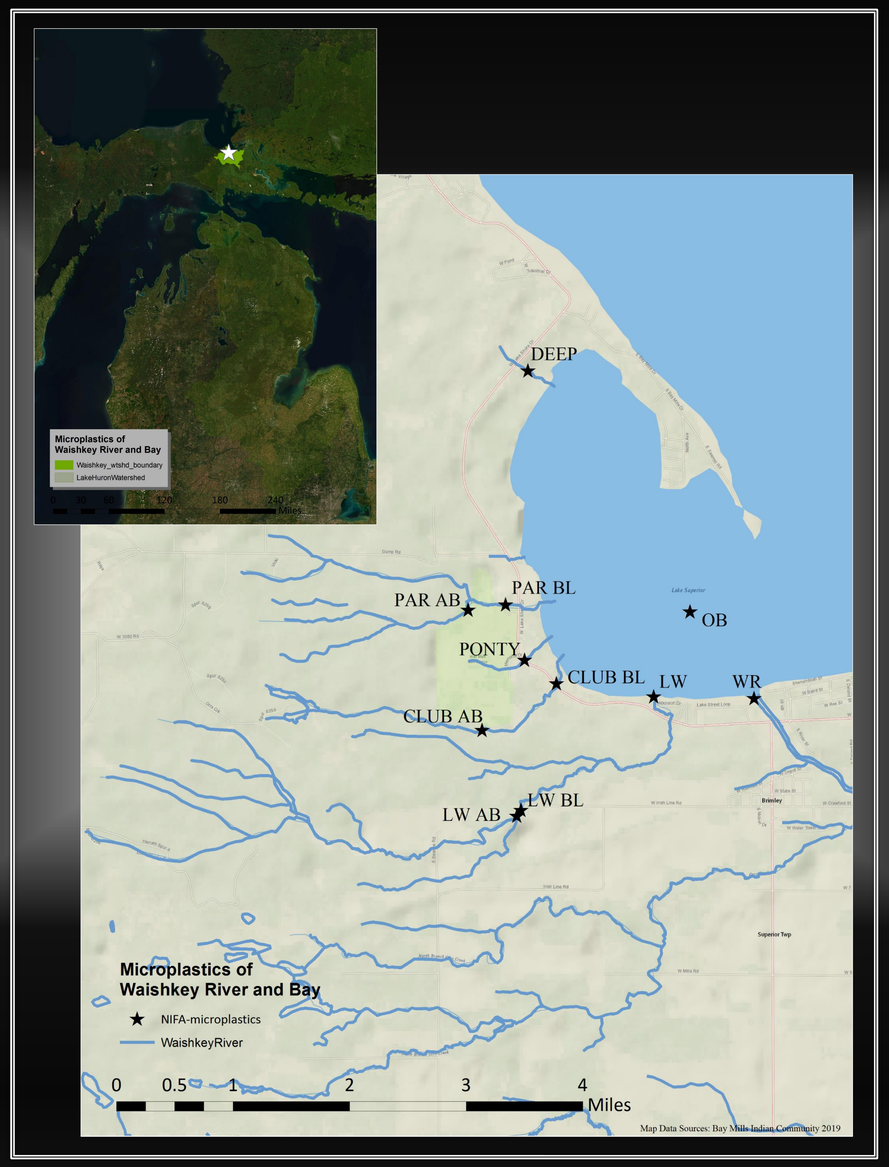

Figure 1. The Waishkey Bay is located at the junction of St Marys River and Lake Superior. Sediment samples where collected within the Bay and its tributaries. Sites were chosen upstream and downstream of possible pollution sources. Map layer source: Bay Mills Biological Services Department.

Table 1. Sample site ID, location coordinates, and site description.

SITE ID	Site Description
PAR AB	Parish Creek upstream of Wild Bluff Golf Course
PAR BL	Parish Creek, down stream of golf course, adjacent to Bay Mills Resort and Casino parking lot
OB	Waishkey Bay open water
WR	Waishkey River mouth into Waishkey Bay
CLUB AB	Club Creek upstream from Lakeshore Drive
CLUB BL	Club Creek near mouth down stream from road
LW	Little Waishkey mouth into the Waishkey Bay
LW AB	Little Waishkey upstream of municipal sewage lagoon
LW BL	Little Waishkey downstream of municipal sewage lagoon
DEEP	Deep Creek mouth into Waishkey Bay
PONTY	Ponty Creek upstream from mouth

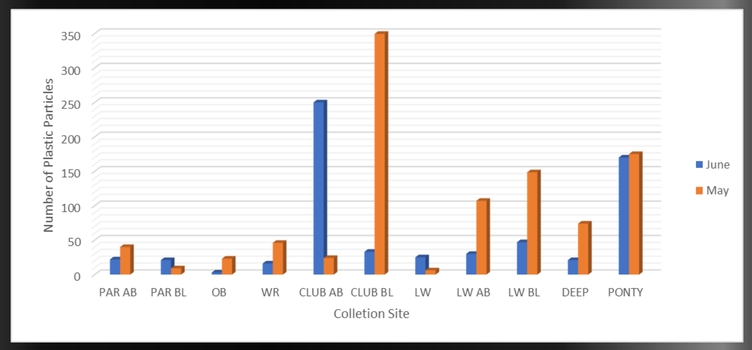

Figure 2. Average abundance of particles among all fraction sizes for each site during June (blue) and May (orange) 2018.

Results & Discussion

In all, 11 sites within the Waishkey Bay watershed were investigated for plastics abundance. Among them, fractions two and three contained the highest average counts of microplastics. Throughout both sample dates, an average of 83.5 fibers were collected. Club Creek contained the highest count of microplastic overall with CLUB BL containing an average of 349 microplastic pieces. The proximity of CLUB AB and CLUB BL, may show general movement of plastic particles downstream overtime (May to June). Ponty Creek contained highest average levels of microplastic contamination with an average of 172 plastic pieces at both sampling events.

Next, BMCC will explore the presence of microplastics in the Waishkey Bay food web. Ongoing work seeks to measure particles within predatory fish species and freshwater mussels.