

# Pharmaceuticals and Personal Care Products of Emerging Concern in Waishkey Bay, Michigan

Jessica Elrod<sup>1</sup>, Jocelynn Preville<sup>1</sup>, Diana Cryderman<sup>1</sup>, Brian Wesolek<sup>2</sup>, Aubrey Maccoux-LeDuc<sup>2</sup>  
<sup>1</sup>Bay Mills Community College, <sup>2</sup>Bay Mills Biological Services

## INTRODUCTION

Bay Mills Indian Community (BMIC), is a federally-recognized Anishinaabe Tribe located along the Waishkey Bay, Brimley, MI, about 20 miles from Sault Sainte Marie, MI. Most of the area's tourism and fishing industry are linked to the Bay.

Due to the surrounding land use, there is a risk of potential contamination by personal care products (PCPs), pharmaceuticals, and other chemicals. Some of these are also endocrine disruptors which are concerning to human and wildlife health. The suspected sources of the chemicals present within watershed are four NPDES permitted discharges. Chemicals of particular interest include:

- Caffeine – a stimulant that may reduce size and reproduction rates of mussels.
- Metformin – a diabetes medication that may cause endocrine-disruption in fish.
- Sulfamethoxazole – a common antibiotic which can alter ratios of bacteria, leaving behind mostly antibiotic-resistant bacteria.
- Triclosan – a antibacterial/antifungal product which degrades into dioxin, a highly toxic carcinogen.

There are no current data regarding pharmaceutical or person care product contamination within Waishkey Bay. The bioaccumulation and toxicity within aquatic biota is also not well characterized. The human exposure to these chemicals via the foodweb is not well understood.

## OBJECTIVES

- Gather baseline monitoring data for a variety of emerging chemicals of concern within the Waishkey Bay
- Identify personal care products and pharmaceuticals present within the Waishkey Bay
  - Target tributaries of the Bay
  - Broad qualitative analysis of 22 chemicals



Figure 2. A) Collecting water quality data at Waishkey Bay sampling sites. B) Collecting water samples for lab analysis at Waishkey Bay sampling sites.

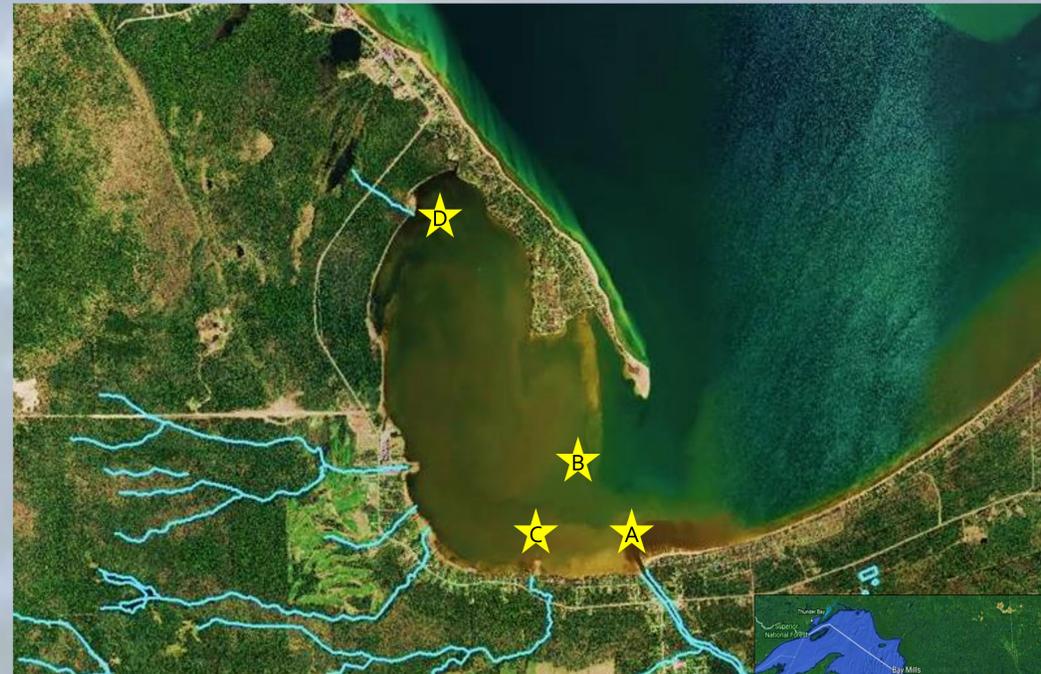


Figure 1. Map of Waishkey Bay, Brimley, MI. The stars represent the sites where water samples were taken and correspond with the results table.

## PRELIMINARY RESULTS

Table 1. Water quality data for sample sites collected in November 2017.

Site	Water			
	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Waishkey River (A)	0.91	6.77	87.5	18.6
Open Bay (B)	2.49	7.50	92.3	6.8
Little Waishkey River (C)	1.72	7.28	88.8	15.9
Deep Creek (D)	2.55	6.65	62.8	7.4

Some variation was present in water quality data between sites:

- Higher pH in Little Waishkey River and the Open Bay
- Higher turbidity in Waishkey River and Little Waishkey River
- Deep Creek had lowest pH and conductivity

Results from pharmaceutical analyses were not available at the time of this poster.

## DISCUSSION

Although lab results on PCPs have not come in yet, we hypothesize a number of common chemicals will be present in the water including metformin, triclosan, caffeine, and sulfamethoxazole. We expect these compounds will be found in higher concentrations at sites A and C due to discharges from NPDES discharges on those tributaries. We expect to see the lowest concentrations of PCPs at site D because it drains undeveloped wetlands.

These data will be used to inform future phases of this study. This includes rigorous qualitative analysis of sediment, investigation of the tissues in local aquatic wildlife, and an investigation of freshwater mussels.

Possible implications may include consumption recommendations for the local community and subsistence fishermen and development of wastewater treatment standards. Area biologists already advocate for environmentally-safe drug disposal and these education efforts may be increased based on findings from this study.

## METHODS

Sample collection in November 2017

- Surface water grab
- 2 liters water collected from each site
- TraceClean amber glass bottles
  - 1 liter collected for general pharmaceuticals and personal care products
  - 1 liter collected for endocrine disrupting pharmaceuticals
    - 65 mg/L microbial inhibitor (2-mercaptopyridine-1)

Qualitative laboratory analysis

- Pharmaceuticals and personal care products
  - EPA method 1694
  - Solid-Phase Extraction
  - Liquid Chromatography Tandem Mass Spectrometry
- Endocrine disrupting pharmaceuticals
  - EPA method 539
  - Solid-Phase Extraction
  - Liquid Chromatography Electrospray Ionization Tandem Mass Spectrometry

## ACKNOWLEDGEMENTS



Miigwetch to Bay Mills Indian Community's Biological Services Department for partnering in this project. This project is funded by USDA National Institute of Food and Agriculture (2018-00021)