

Hope College Advanced Environmental Seminar Presentation Abstracts

Surveying the presence of heavy metals in Lake Macatawa sediment samples

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Lake Macatawa is located in Ottawa County, Michigan. It is approximately 6 miles long and has a maximum width of about 1.2 miles. The lake eventually flows into Lake Michigan and is fed by the Macatawa River. The Lake Macatawa watershed itself covers around 175 square miles. For several decades, the lake has been generally undesirable to residents because of the overload of phosphorus it contains from surface runoff. More recently, heavy metal concentrations within the watershed have been of increasing concern. One study conducted on various species of fish within the lake found that chromium levels were above the recommended guidelines set by the World Health Organization (Peterson, 2019). This research project is a continuation of that heavy metal study and focuses on the heavy metal concentrations in sediments in seven different locations around Lake Macatawa. Sediment samples were collected along the north shore, south shore, and in the Window on the Waterfront recreational area. The north shore is a predominantly residential area while the south shore is in close proximity to industrial activity. This difference may contribute to discrepancies in metal concentrations. Microwave digestion and ICP instrumentation were employed to ascertain the concentration of arsenic, chromium, cadmium, and lead in the sediment samples. With these data, comparisons can be drawn between the presence of heavy metals in the north shore versus the south shore of Lake Macatawa.

Determination of heavy metal accumulation in Earthworms, Lumbricus rubellus, collected from the Macatawa watershed

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The purpose of this experiment is to determine heavy metal concentrations in earthworms, *Lumbricus rubellus*, within the Macatawa watershed, in order to estimate the potential exposure risk to the environment and the ecosystem via biomagnification. It is well known that earthworms play an integral role in the soil formation and contribute proportionally to macro fauna biomass (Hirano and Tamae 2011). Soil invertebrates have been suggested as indicators for determining soil health and quality (Edwards 1994). As worms are typical prey for terrestrial organisms, biomagnification of heavy metals and pesticides is a relevant concern (Katagi and Ose 2015). Metal analytes, lead (Pb), nickel (Ni), cadmium (Cd), and chromium (Cr) were chosen due to their biomagnification characteristics (Ali et al. 2019, Mann et al. 2011) and adverse effects on human health and the environment (Jaishankar et al. 2014). Biomagnification is the process in which a compound increases its concentration in the tissues of organisms as it travels up the food chain. Through this process, metals can be introduced to lower trophic levels and then magnify up the food chain. Biomagnification occurs as larger organisms consume proportionally larger quantities of biomass as a food source (Mann et al. 2011). Eleven sampling locations were selected in order to represent the entire Macatawa watershed, including sub-locations that represent industrial, agricultural, residential, and woodland areas.

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Assessment of Macro Plastic Pollution in Storm Drain Discharge due to Rain Events in the Holland Area

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Plastic pollution stands as one of the leading environmental issues our society faces today. Its deposition in hydrological systems is a pervasive problem at all geographic scales, given plastic's high persistence and negative impacts on environmental quality. This has led to an unprecedented rate of plastic materials entering the environment and collecting in our waterways and oceans, where it is physically weathered to a microscopic level and incredibly hard to remove. To mitigate this issue, plastic pollution must be better understood from its source upstream, before it has been broken down. This study will focus on observing the amount of macro plastic pollution that collects in the storm drain discharge in the Holland area after rain events, to better gauge the amount of plastic litter that runs through the city and enters into the Lake Macatawa watershed.