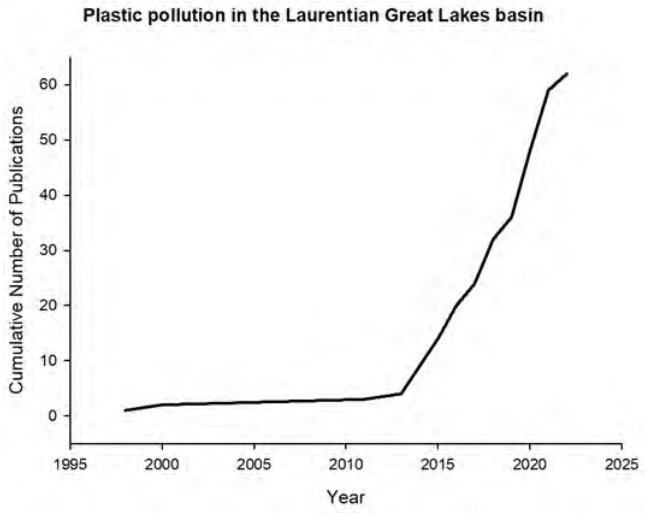
An International Joint Commission initiative

Developing frameworks for monitoring and assessing the ecological risk of microplastics in the Laurentian Great Lakes

by EDEN HATALEY, KAREN KIDD, CHELSEA ROCHMAN & REBECCA ROONEY

IT IS NOW UNDERSTOOD that plastics, particularly microplastics, are present across the Laurentian Great Lakes basin, on shorelines and in surface waters, sediments, and biota, including birds, fish, and mussels. Over the past decade, the scientific body of literature on plastic pollution in the region has grown to over 60 publications. Studies report on levels of contamination across the Great Lakes and their watersheds, the effects on local wildlife, the sources, transport, distribution, and fate of plastics in the basin, and the use of policies and guidelines to address the issue. What remains less well understood are long-term and spatial trends in contamination levels, real-time and future risk, and the best approach for managing plastics accordingly. The International Joint Commission's (IJC) Great Lakes Science Advisory Board is increasing its efforts to tackle these gaps in understanding and addressing the issue of microplastics in the Great Lakes, specifically.

In 2015, the IJC's Great Lakes Water Quality Board started a Microplastics Watching Brief, which summarizes points of interest related to microplastics and plastics more broadly in the region, spanning science, policy, and media. In 2016, the IJC hosted a workshop on microplastic pollution in the Great Lakes, its purpose to compile local progress and gaps and develop recommendations for addressing the challenges posed by microplastics in the region. The workshop was attended by 33 experts from the United States and Canada representing diverse sectors, including academia, government, industry, and non-governmental organizations. Together they developed 10 recommendations spanning actions related to science and research, policy and management, and education and outreach for the IJC to review and present to Canadian and American federal departments for consideration.



The cumulative number of publications on plastic pollution in the Laurentian Great Lakes basin, including papers published until June 2022. Data from McIlwraith et al., 2023.

Today, in response to and with consideration of the outcomes of the 2016 workshop (as well as global progress on the issue), the Great Lakes Science Advisory Board has put together a workgroup focusing on the environmental monitoring and ecological risks of microplastics in the Great Lakes. The workgroup, co-led by the authors of this article, began in early 2023 and comprises subject matter experts from the United States and Canada. The general objective of the workgroup is to develop and propose coordinated frameworks for microplastics monitoring as well as ecological risk assessment and management in the Great Lakes.

As a first task, the workgroup has drafted a literature review to synthesize recent advances and knowledge in plastics science, including current knowledge on Great Lakes-specific monitoring data, field and lab methods used for measurement, and toxicity data for relevant species, as well as the associated knowledge gaps. In support of this, the workgroup held a session at the 2023 IAGLR annual conference in Toronto, Ontario, to bring together researchers to share the latest information on plastics in the Great Lakes. The session comprised 22 presentations and 17 posters

covering diverse topics, including monitoring, method development, and toxicity testing.

Additionally, the workgroup is hosting two workshops, one to create a framework for monitoring microplastic pollution in the Great Lakes and another to develop a framework for ecological risk assessment and management. The first workshop, held in Ann Arbor, Michigan, this past September, was a success, and products will include harmonized monitoring guidelines for field methods, quality assurance and quality control, and reporting requirements for microplastics in water, sediments, and biota in lakes and tributaries. The workshop participants also discussed key considerations in monitoring program design, including capturing spatial and temporal variability and enabling source apportionment and opportunities to incorporate microplastics into existing Great Lakes monitoring programs.

The second workshop, which will be held this coming January in Windsor, Ontario, will focus on adapting existing ecological risk assessment and management frameworks for microplastics in surface water and sediments for application with Great Lakes monitoring data.

The workgroup has been fortunate to have the opportunity to learn from and collaborate with other groups doing similar work on microplastics monitoring harmonization and ecological risk assessment from across the United States, in California (the Southern California Coastal Water Research Project) and Chesapeake Bay (the Chesapeake Bay Plastic Pollution Action Team).



Participants at the first workshop on microplastics monitoring held in Ann Arbor, Michigan, in September 2023.

The project of this workgroup will run until early 2024. Products will include tools needed to initiate a long-term monitoring program for microplastics in the Great Lakes and a risk assessment framework for understanding how contamination may impact local resources and wildlife. The project report will be submitted to the IJC commissioners to inform the commission's advice to the governments of the United States and Canada. If adopted, these tools will provide information on tracking the extent of microplastic pollution and its impact as a contaminant.

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