Litter to pollution in Great Lakes: Levels and factors

by Varun Kasaraneni, Gannon University

Urban litter is one of the primary sources of litter and plastic pollution in surface waters, though quantifications of this pathway are limited. For this study, storm runoff samples were collected for eight events over spring, summer, and fall seasons (0.14–1.29 inches of rain) from seven locations (two commercial, two industrial, three residential). Macro-litter (>5 mm) from the samples was separated into nine categories (smoking-related materials, paper, textile, plastic, metal, glass, wood, construction material, and others). Samples were also analyzed for microplastics in the size range of 300 µm to 5 mm.



Our research data indicates that low-income and commercial locations contribute significantly higher amounts of macro-litter (3–20 times more) and macro-plastics (6–11 times more) compared to other locations. Microplastics counts per 10,000 gallons of runoff range from 43 to 58,512, with commercial and industrial locations having the highest quantities. Higher amounts of litter were found in samples collected in spring and fall seasons. The spring and summer samples had significantly more microplastics.

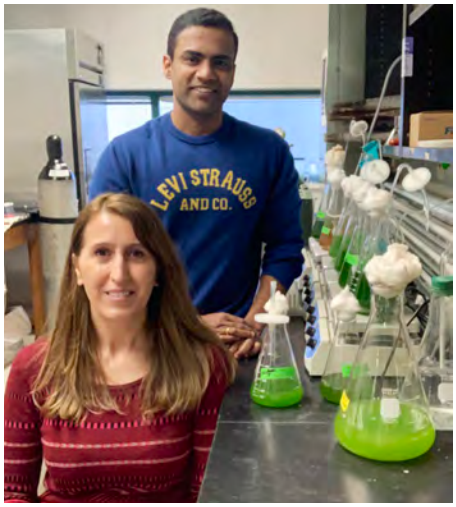
Future efforts related to marine debris should put emphasis on reducing and preventing the debris from entering the Great Lakes. This could be achieved by developing solutions to capture and remove litter and microplastic in stormwater infrastructure, implementing better waste management practices, and providing additional resources to areas that contribute higher quantities of litter. Placing more trash receptacles and signage at commercial locations and having industries develop and implement best practices to prevent raw materials from entering the environment are also solutions.

Research unearths microplastics and algae nexus in the Great Lakes

Wayne State University's Kishore Gopalakrishnan, a bioprocess engineer, is diving deep into an exploration of microplastics and harmful algal blooms (HABs) within the Great Lakes. With his academic foundation from the University of Canterbury in New Zealand, Gopalakrishnan is working in Donna Kashian's ecotoxicology lab to unravel the environmental fate of microplastics.

Gopalakrishnan's research uncovers the interplay between cyanobacteria and microplastics. In part, microplastics can trigger the release of extracellular polymeric substances (EPS) in cyanobacteria, altering its buoyancy and positioning in the water column. Kishore also delves into how microplastics affect the growth of HAB-forming cyanobacteria, which use microplastics as platforms for biofilm growth and as a source of carbon. These biofilms provide a sheltered environment for cyanobacteria, potentially fueling HABs. These interactions lead to microplastics aggregating and sinking and can provide pathways for microplastics to enter the food chain when mistaken for food.

Gopalakrishnan's research illuminates the complex interaction between microplastics and cyanobacteria, shedding light on potential consequences for the Great Lakes ecosystem. His research raises concerns about plastics entering the aquatic food chain through their intricate connections with algae, which could ultimately impact human health. This research carries implications for policy makers and the general public, guiding decisions on plastic waste management, pollution control, and food safety. It underscores the urgency of developing strategies to combat the harmful effects of microplastics and HABs while deepening our understanding of the mechanisms at play.



Kishore Gopalakrishnan and Donna Kashian in the lab at Wayne State University.