

# How microplastics are making their way into our farmland

August 14 2023, by Branaavan Sivarajah and Jesse Vermaire

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In Canada and around the world, biosolids are widely used to improve agricultural farmland soil. Biosolids being sprayed on an agricultural field. Credit: Branaavan Sivarajah, Author provided

Microplastic pollution is a global environmental problem that is ubiquitous in all environments, including [air](#), [water](#) and [soils](#).

Microplastics are readily found in treated [wastewater](#) sludge—also known as municipal biosolids—that eventually make their way to our agricultural soils.

[Our recent investigation](#) of microplastic levels in Canadian municipal biosolids found that a single gram of biosolids contains hundreds of [microplastic particles](#). This is a much greater concentration of microplastics than is typically found in air, water or [soil](#).

Given that hundreds of thousands of tons of biosolids are produced every year in Canada, we need to pay close attention to the potential impacts such high levels of microplastics might have on the environment and find ways to reduce microplastic levels in Canada's wastewater stream.

## **Municipal biosolids**

[Municipal biosolids](#) are produced at [wastewater treatment plants](#) by settling and stabilizing the solid fraction of the municipal wastewater inflow.

In Canada and around the world, municipal biosolids are used to improve agricultural farmland soil. This is because they are rich in nutrients needed for [plant growth](#), such as phosphorus and nitrogen.





Biosolids applied to an agricultural field. Credit: Branaavan Sivrajah, Author provided

Municipal biosolid applications are carefully [regulated in Canada](#) for [heavy metals](#), nutrients and pathogens. However, guidelines for emerging contaminants, such as microplastics, are not currently available.

While current wastewater treatment plants are not explicitly designed to remove microplastics, they are nevertheless efficient at [removing nearly 90 percent of microplastic contaminants](#). The removed microplastics are often concentrated in the settled sludge and eventually end up in the biosolids.

## Microplastics in municipal biosolids

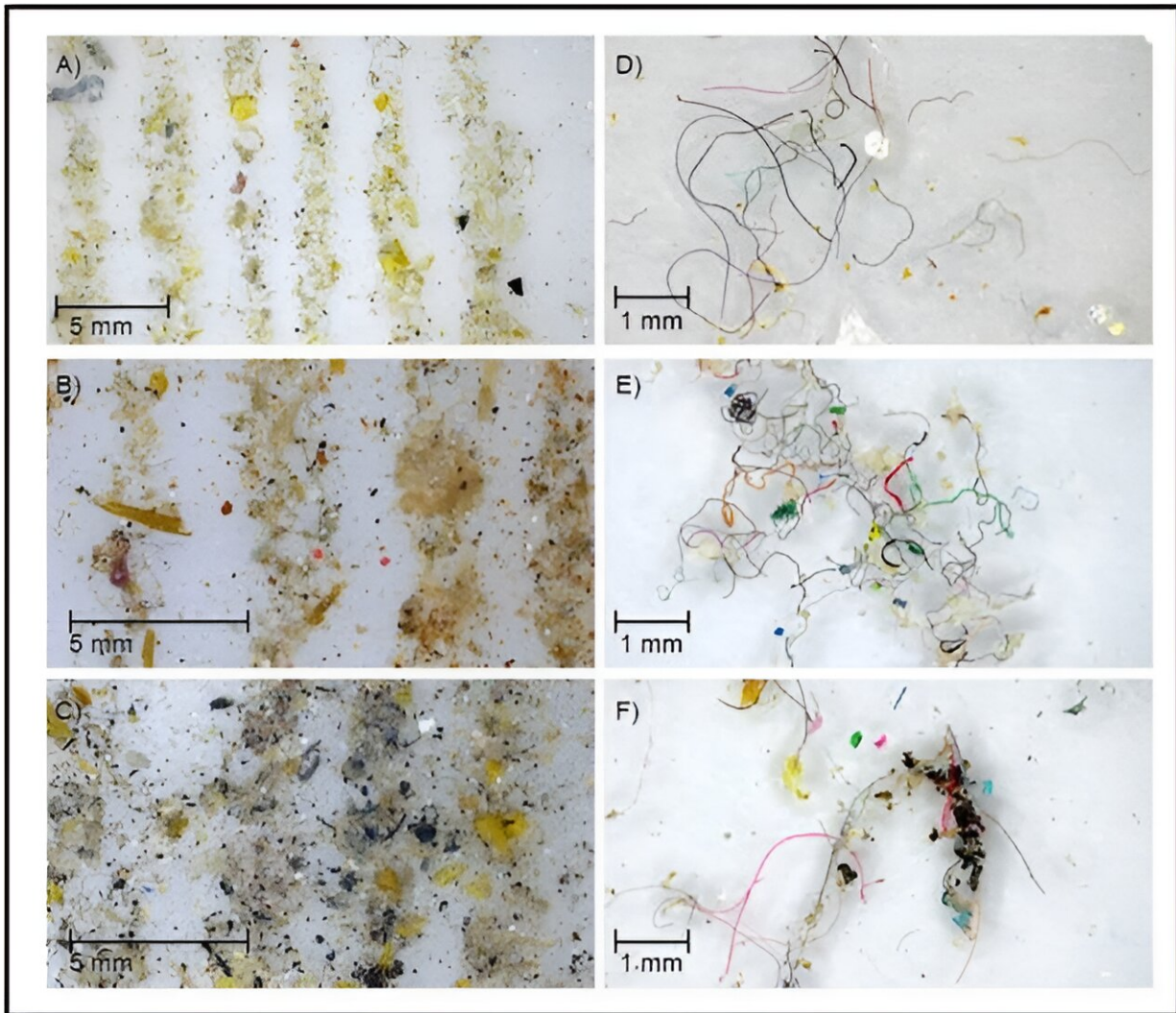
Previous studies have shown that municipal biosolid waste is an important pathway for microplastics to enter the broader [terrestrial ecosystems](#), including agricultural fields.

In collaboration with scientists from Environment and Climate Change Canada and Agriculture and Agri-Food Canada, we conducted the first pan-Canadian assessment of [microplastics in municipal biosolids](#). We analyzed biosolid samples from 22 Canadian wastewater treatment plants across nine provinces and two biosolid-based fertilizer products.

We found hundreds of microplastic particles in every gram of biosolids. The most common type of microplastic particles we observed were microfibrils, followed by small fragments. We found small amounts of glitter and foam pieces too.

Microplastic concentrations in municipal biosolids are substantially higher than other environmental networks in Canada like [water](#), [soil](#) and [river sediments](#). This provides further evidence that microplastics are concentrated in biosolids produced at wastewater treatment plants.





Microplastics in municipal biosolids. A-C: Processed biosolid samples; D-F: Assortment of microplastic particles in biosolids. Credit: Jesse Vermaire, Author provided

## Reducing microplastics

Wastewater treatment plants are well-equipped to remove large plastics like bottle caps and [plastic bags](#) from municipal wastewater. However, microplastic particles are so small they can't be caught by current

treatment infrastructure, so they end up concentrating in wastewater sludge.

As wastewater streams concentrate microplastics, they also offer an opportunity to reduce the plastic pollution that is entering the environment. While researchers across Canada are working to find insights on the short- and long-term ecological consequences of [microplastic pollution](#) on soil ecosystems, one solution is already clear.

Microplastics can be reduced at sources via systematic reductions in the use of single-use plastics, washing clothing with synthetic fiber less frequently and removing microfibrils using [washing machine filters](#). These approaches will help minimize the amount of microplastics that get into the wastewater stream and, ultimately, into the broader terrestrial and aquatic environments.

Building new technologies at our wastewater treatment plants to remove microplastics through physical or chemical means should also be explored.

We need to better understand the impact of high concentrations of microplastic on agro-ecosystems where biosolids are applied, including its impacts on [soil-dwelling organisms like earthworms and insects](#). We also need to start building national guidelines for [microplastic](#) levels in biosolids and agricultural soils.

**More information:** Branaavan Sivarajah et al, How many microplastic particles are present in Canadian biosolids?, *Journal of Environmental Quality* (2023). [DOI: 10.1002/jeq2.20497](https://doi.org/10.1002/jeq2.20497)

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