

Exploratory Investigation of Microplastic Detection in Municipal Organic Waste

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Introduction

What are microplastics?

- Smaller than 5mm¹
 - **Primary:** small plastics made for commercial use
 - **Secondary:** small plastics from the breakdown of larger plastics
 - Polyethylene (PE) 36%²
 - Polypropylene (PP) 21%²

Morphology³

Fibers, Fiber bundles, Fragments, Spheres, Pellets, Films, Foams

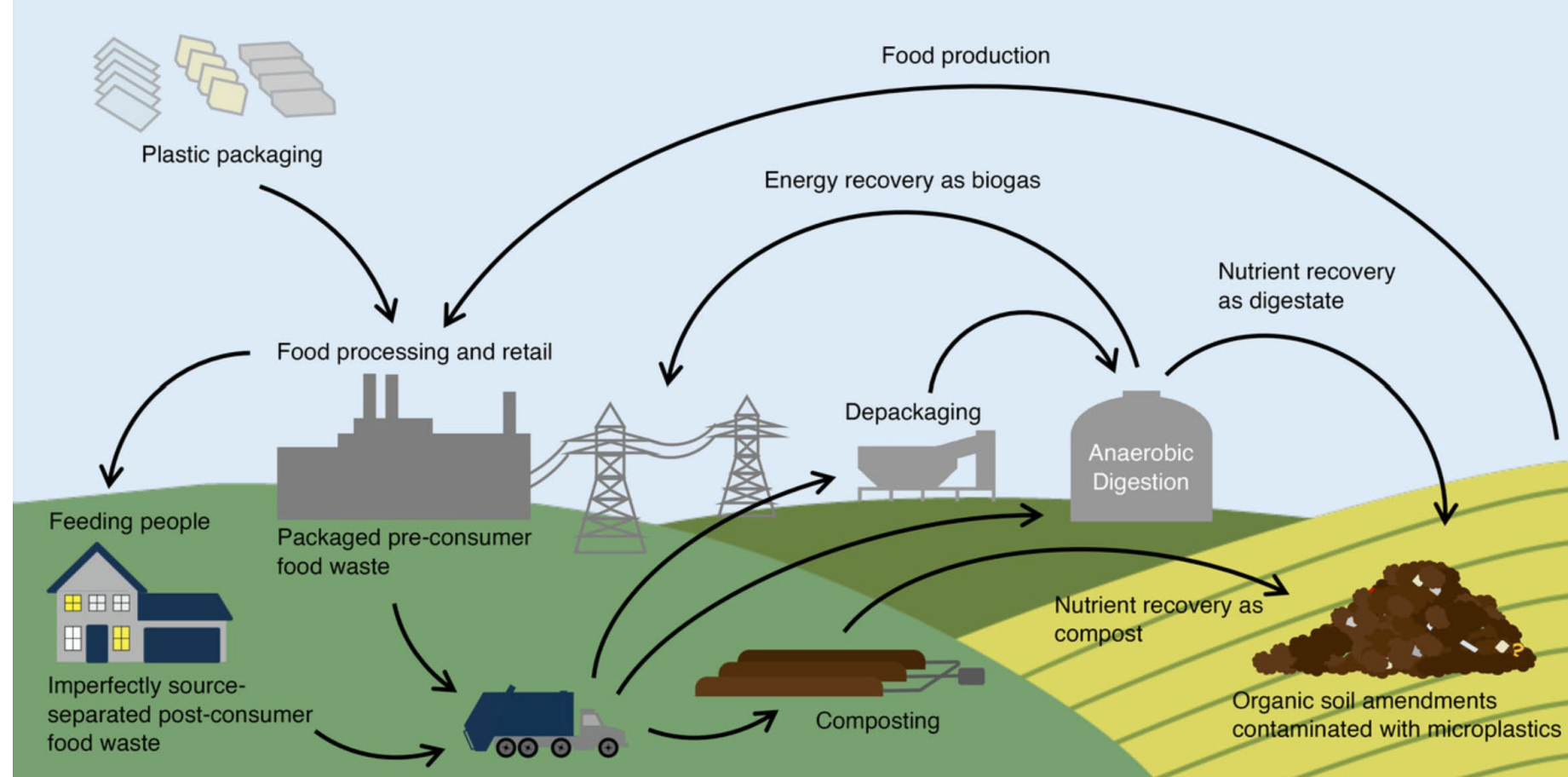


Figure 1: Diagram of food waste and microplastic flows to composting, digestion, and soils.⁴

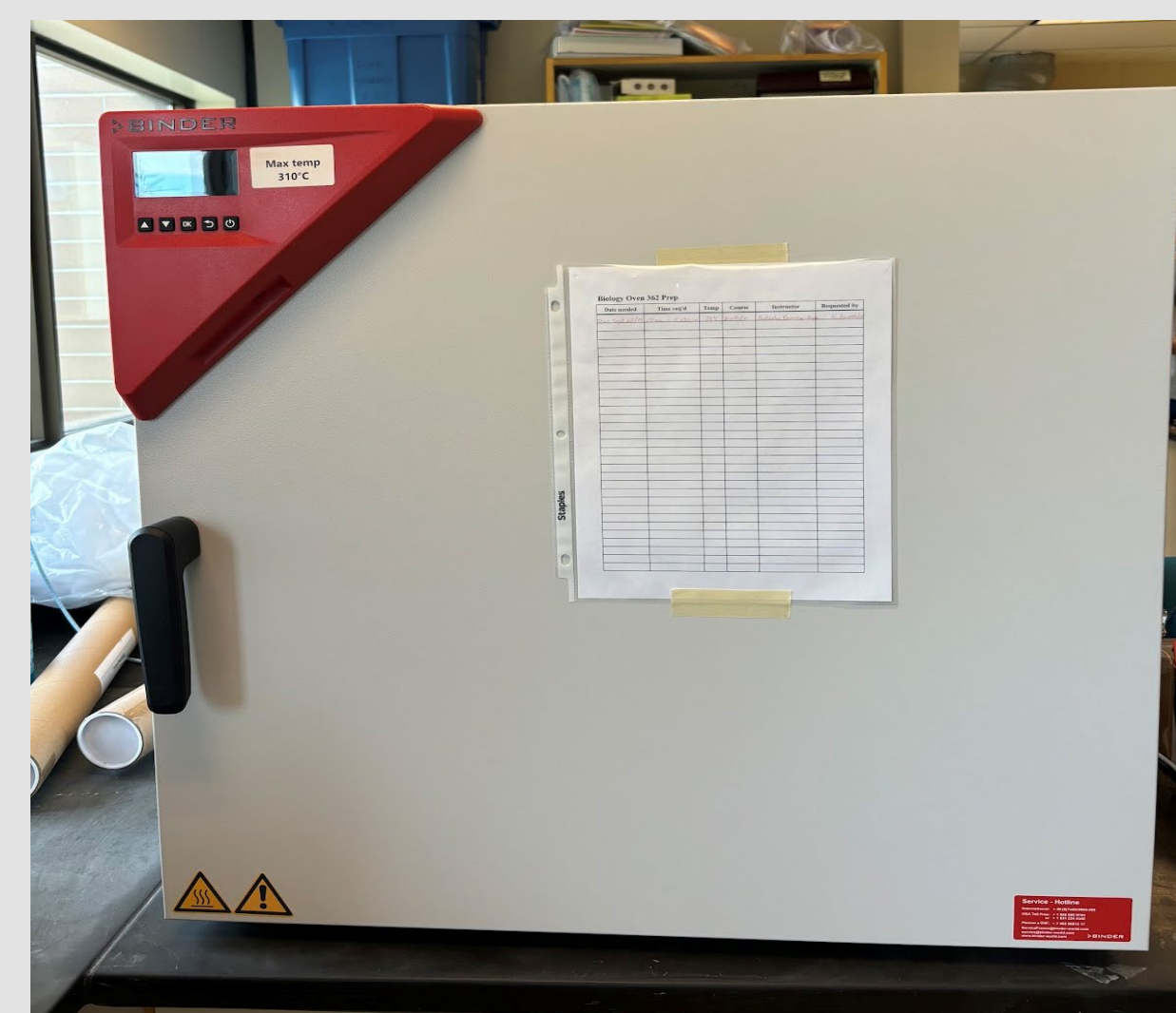
Objectives

The departments of Physical and Biological Sciences aim to assist the City of Kamloops in detecting and characterizing microplastic contamination in municipal compost.

Sample Collection and Preparation



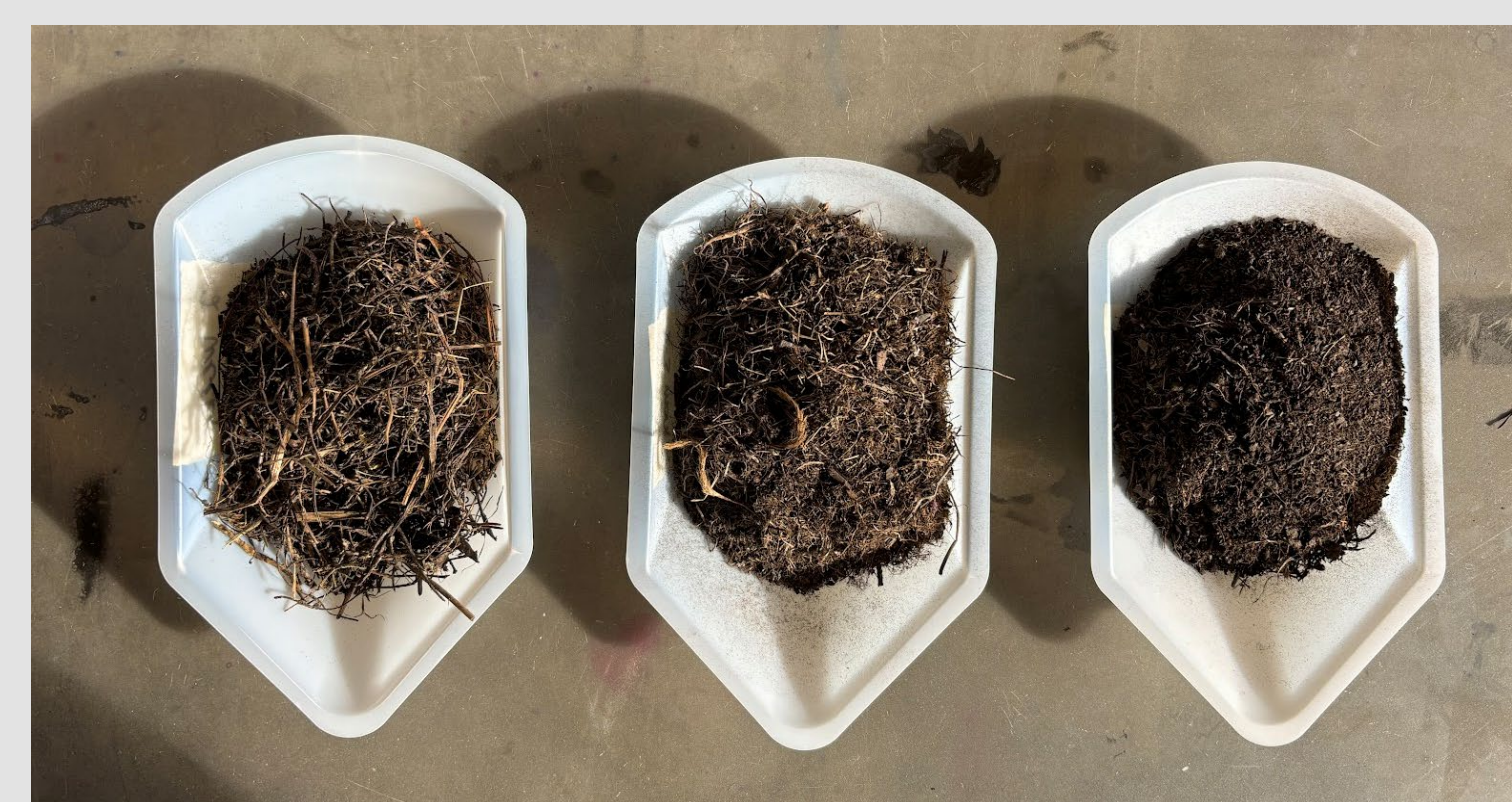
Samples collected from Grasslands Organics



Incubator at 60°C for 24 hours



Dried compost



Samples filtered and weighed



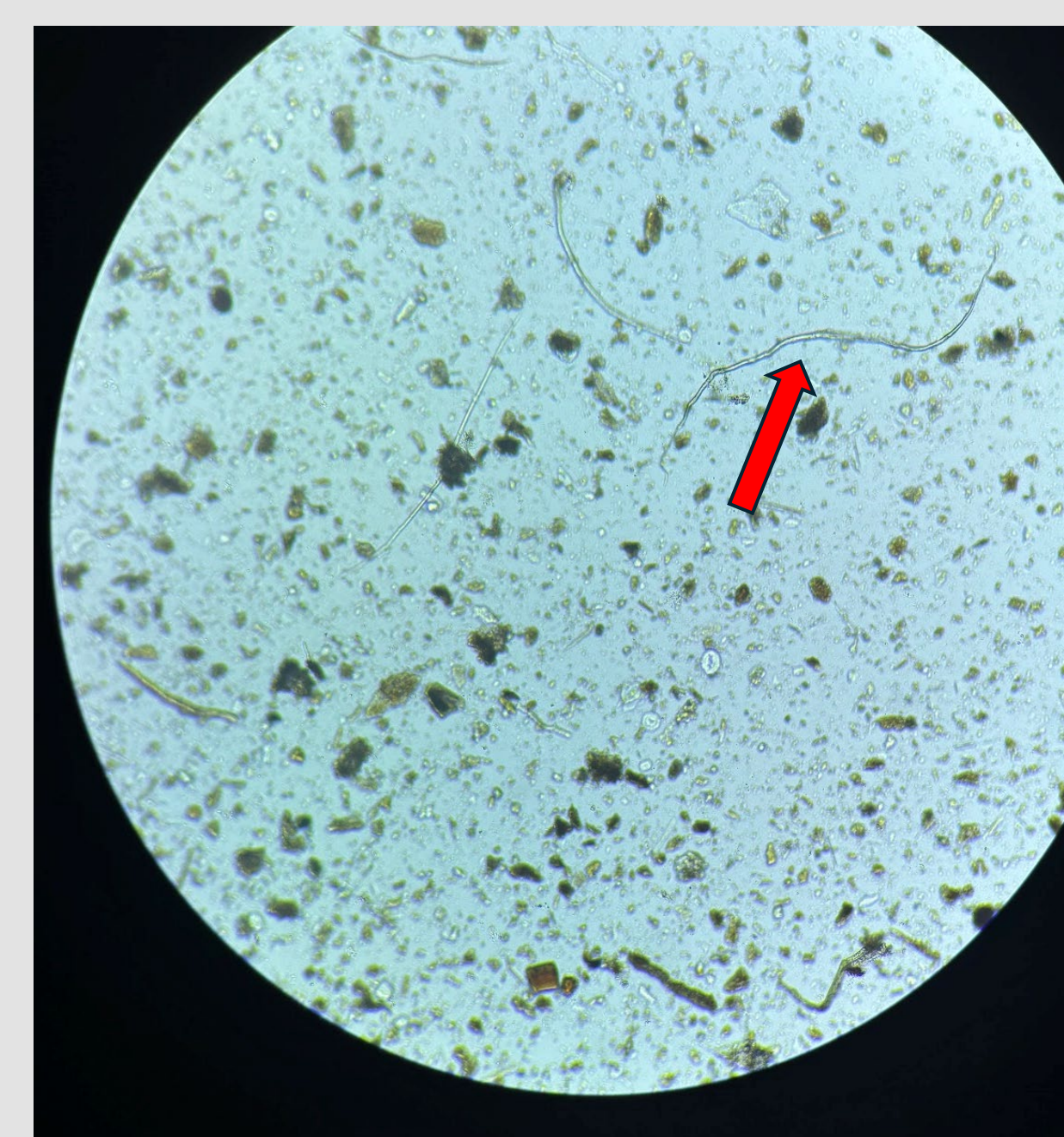
Particles larger than 5mm



Compost sieved through a 5mm filter



1 gram of the compost samples digested in 30% H₂O₂ for 24 hours



7-month mature compost under 10x optical microscope – an arrow indicates a fiber microplastic



Unstained fluorescent microscopy of 7-month mature compost with TRANS UV - an arrow indicates a film microplastic

Microplastic Detection Methods from Literature Review



References



Work in progress

We are currently conducting further analysis of the samples using Raman spectroscopy and fluorescent microscopy, with additional UV-Vis analysis planned for the detection, quantification, and identification of microplastics.

Raman spectroscopy

- To detect and identify microplastics down to <20 um.⁵
- Accurately determine chemical structure including complex hydrocarbon chains.

Fluorescent microscopy

Nile Red dye is specific to observing microplastics under blue fluorescent light. The dye is absorbed by the plastic polymers however, the challenge is that the dye can sometimes be absorbed by organic molecules as well.⁶

Future Work

Native bacterial species will also be looked at to see if they contribute to the breakdown of plastics in compost.

Acknowledgements

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