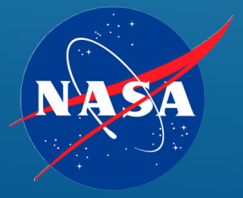
EFFECT OF TERRESTRIAL MICROPLASTIC PARTICLES ON SOIL PROPERTIES

Rachel Hamilton

Dr. Jeffrey Fehmi

University of Arizona School of Natural Resources and the Environment



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PLASTIC POLLUTION IN A GLOBAL CONTEXT

- Estimated 9 billion tons of plastic waste produced throughout history
- 280 million more tons of new plastic generated every year
- Plastic now comprises approx. 10% of waste but a larger percentage of debris- expected to keep increasing
- Rivers transport millions of tons of plastic to the ocean annually

Image source: Mohamed Abdularaheem / Shutterstock

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MICROPLASTIC

- Result of plastic photodegredation on a large scale
- Loosely defined as plastic pieces between 1µm and 5mm in longest dimension
- Comprise 70+% of plastic debris in some areas
- Aid in the transport of POPs (persistent organic pollutants)
- Easily ingested by animals
- Worth studying due to inevitable ubiquity in all environments, difficulty of removal, and high risk of impacts

Image source: 5Gyres Institute

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MARINE IMPACTS OF PLASTIC

- Since 2000, research concerning marine plastic pollution has exploded
- "Great Pacific Garbage Patch"
- Negative impacts demonstrated throughout the marine ecosystem
- More than 180 species with documented ingestion of plastic
- Microplastic pellets found in all levels of plankton food chains

Image source: NOAA

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PLASTIC IN DESERT ENVIRONMENTS: WHERE DOES IT GO?

- Not all plastic waste makes it to bodies of water
- Plastic debris photodegrades and integrates into the soil
- Malaysian scientists searched for plastic pieces in a remote mangrove forest and found plastics 5cm deep
- ***Since plastic is everywhere, what does this mean for the environment?***

Image source: 5Gyres.org

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KNOWLEDGE GAP

- Almost no terrestrial studies have been done to mirror marine findings
- Modest correlations found between microplastic ingestion and reduced activity and longevity in earthworms
- Evidence that pieces ingested by earthworms can spread deep into soil
- How does this affect plants and the terrestrial food chain?

Image source: Rillig, Ziersch, and Hempel (2017)

SOIL PROPERTIES: WATER HOLDING CAPACITY

- Soil water holding capacity: how much water the soil can retain—important to agriculture
- Experimented on the presence of polyethylene (PE) powder and pellets on soil water holding capacity
- Found that soil and plastic mix had water holding capacity reduced by 15% (plastic pellets) and 85% (plastic powder)

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SOIL PROPERTIES: CATION EXCHANGE CAPACITY

- Cation exchange capacity: ability of soil to hold positive cations
- Measure of nutrient availability and resistance to acidification of soil
- High cation exchange capacity implies fertile soil

WHAT NEXT?

- Investigation into effects on other soil properties
- Characterization of plastic in the environment and identification techniques for microplastic: separation and spectroscopy methods
- Further exploration of plastic in terrestrial systems: animals, plants
- Potential impacts on human health and agriculture- and how to mitigate them

This is just the beginning!

Image source: Spanish National Research Council

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THANK YOU