THE ROLE OF MICROPLASTIC TRANSPORT RESEARCH IN ENHANCING STORMWATER MANAGEMENT

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Background picture on top of the poster: "A Diet of Deadly Plastic" by Justin Gilligan (Australia) - Wildlife Photographer of the Year 2024 Winner, Oceans: The Bigger Picture category, documenting 403 plastic pieces recovered from a dead flesh-footed shearwater's digestive tract

INTRODUCTION

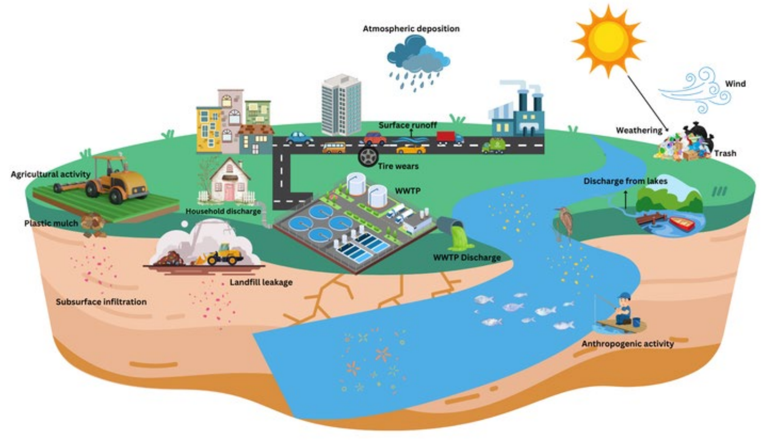


FIGURE: SCHEMATIC DIAGRAM OF SOURCES AND TRANSFERENCE OF MICROPLASTICS IN URBAN ENVIRONMENTS

- Microplastics (MPs) enter urban environments through multiple pathways.
- Stormwater runoff serves as a critical transport mechanism.
- Understanding MP transport pathways is crucial for developing integrated solutions that protect urban agricultural systems while improving stormwater management effectiveness

OBJECTIVE

- To quantify microplastic transport from urban areas to farms across different weather conditions
- To identify key environmental factors driving microplastic pollution in urban agricultural settings

STUDY AREA

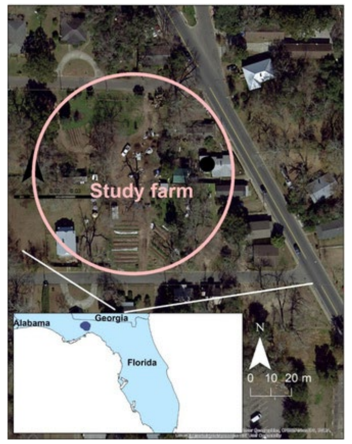


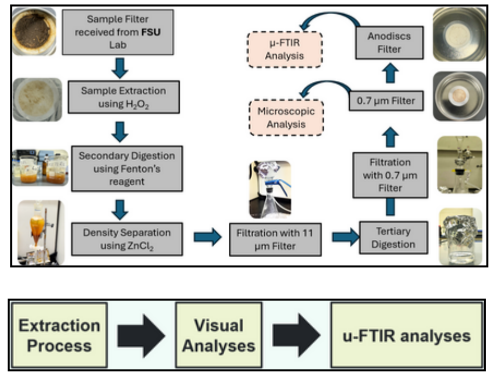
FIGURE: LOCATION OF THE STUDY AREA

FIGURE: DIFFERENT SOURCES OF PLASTIC WASTES AROUND THE STUDY AREA

Identified Plastic Sources:

- Degrading black plastic mulch in farming beds
- Weathered weed barrier fabrics along fences
- Adjacent roadway contributing tire wear particles
- Residential trash/debris carried by wind
- Stormwater runoff from surrounding impervious surfaces
- Atmospheric deposition

METHODOLOGY

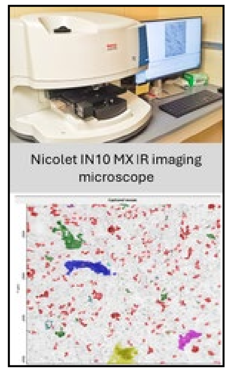


Collected duplicate stormwater samples from six locations at the start and 30 minutes into a moderate rainfall event (1.6-2.4 mm runoff depth) with initial dry antecedent conditions to assess first-flush effects

Sample Processing:

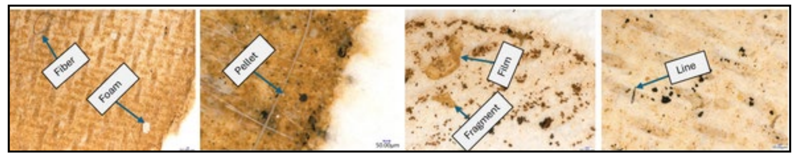
- Initial H_2O_2 digestion for organic matter removal
- Secondary digestion using Fenton's reagent
- Density separation with $ZnCl_2$
- Sequential filtration

ANALYSIS



Nicolet IN10 MX IR imaging microscope

VHX digital microscope (up to 200x)



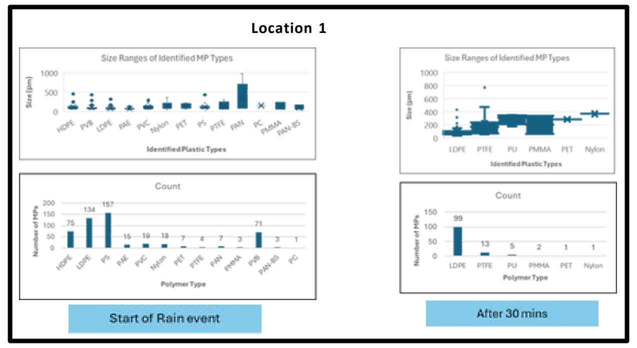
Visual Analysis:

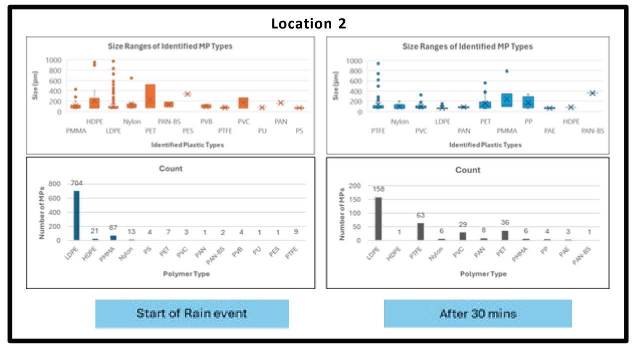
- Visual microscopy (VHX digital microscope up to 200x)
- µ-FTIR spectroscopy (Nicolet IN10 MX)

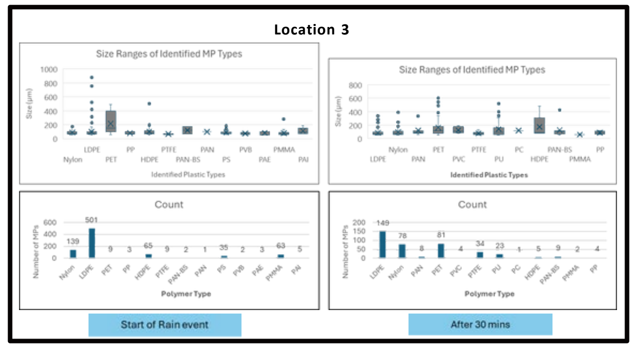
Morphological characteristics:

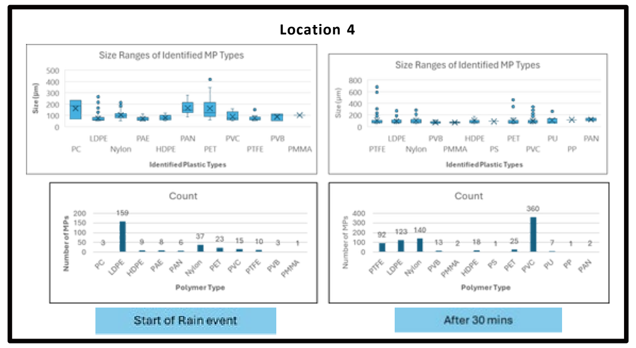
- Various shapes observed: fibers, films, fragments, lines, and pellets

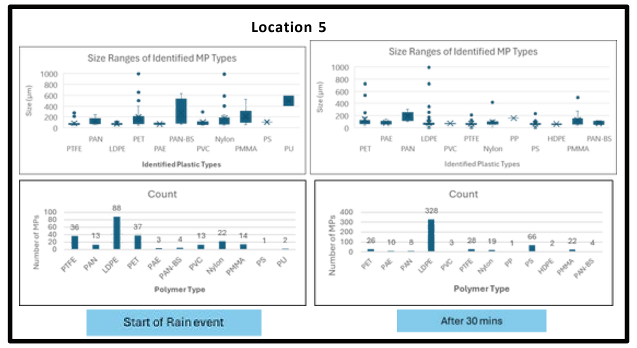
PRELIMINARY RESULTS

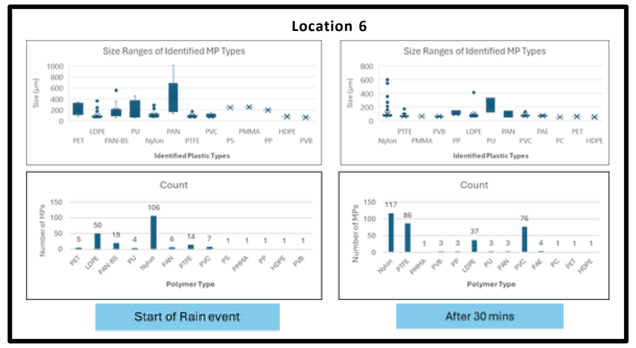












- **LDPE, Nylon, and PTFE** dominated polymer composition across all sites
- Microplastic concentrations increased 30 minutes after rain onset
- Most particles ranged **200-800 µm**, indicating **secondary microplastic** sources

ONGOING RESEARCH EFFORTS

- Continuing stormwater sampling and microplastic analysis under varying weather conditions
- Assessing rain garden performance through inlet-outlet sampling and analysis

ACKNOWLEDGEMENT

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For any feedback, comments and questions, contact: ai22h@fsu.edu