

A photograph of a person's hand held palm up, showing a collection of small, white, spherical microplastic beads. The background is a beach with sand and waves under an overcast sky.

Occurrence of Microplastics in Tributaries to Galveston Bay

Zulimar Lucena

zlucena@usgs.gov

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Microplastics 101



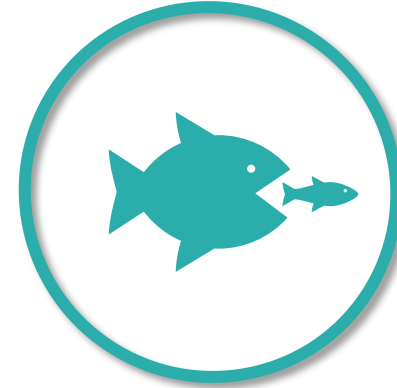
Microplastics are plastic particles smaller than 5 mm in diameter.



Microplastics are directly released to the environment or derived from degradation or mechanical breakdown of larger plastic objects or particles.

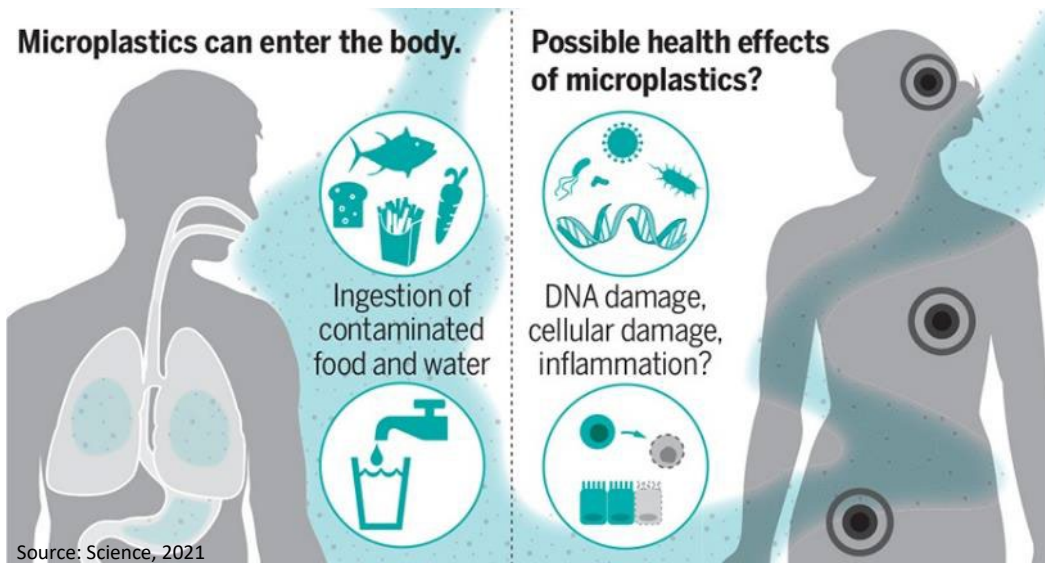


Microplastics are introduced to waterways through urban runoff and wastewater effluent.



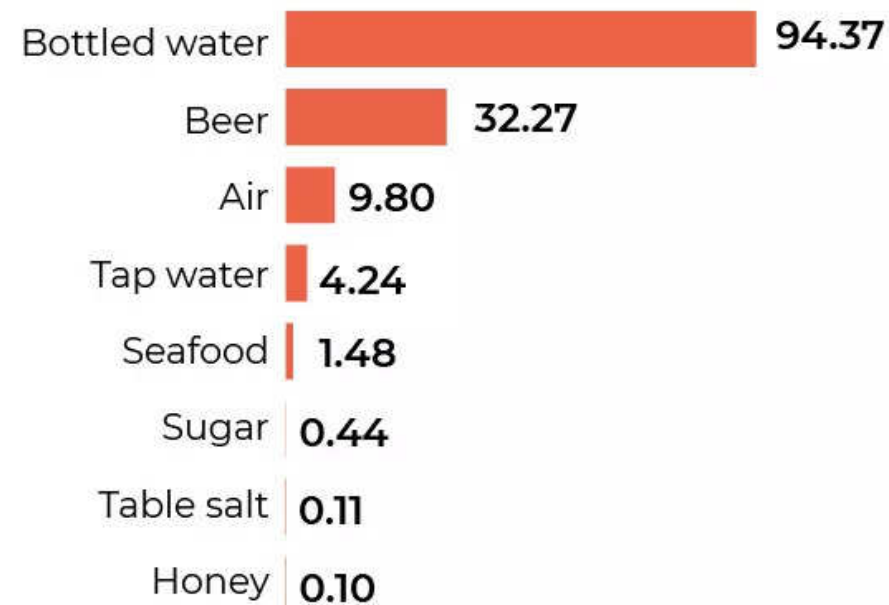
Microplastics ingested by living organisms can have effects on their health, including obstructions in the digestive system, malnourishment, and impaired reproduction and growth.

Microplastics are everywhere



The many ways we consume microplastics

Average number of microplastic particles found in selected consumables (per gram, litre or cubic metre)



Sources: Environmental Science & Technology, Statista

Microplastics in Galveston Bay

Project Objectives

- Microplastics accumulation in Galveston Bay could affect the health of marine organisms, including oyster reefs and fish.
- Limited information available on occurrence and abundance of microplastics in tributaries of Galveston Bay.
- USGS, in cooperation with Galveston Bay Estuary Program, is currently conducting a microplastics assessment in Galveston Bay and its tributaries.

Investigate the occurrence of microplastics in tributaries to Galveston Bay.

Identify the types of microplastics present in watersheds draining into Galveston Bay.

Sampling Locations

Watershed Characteristics

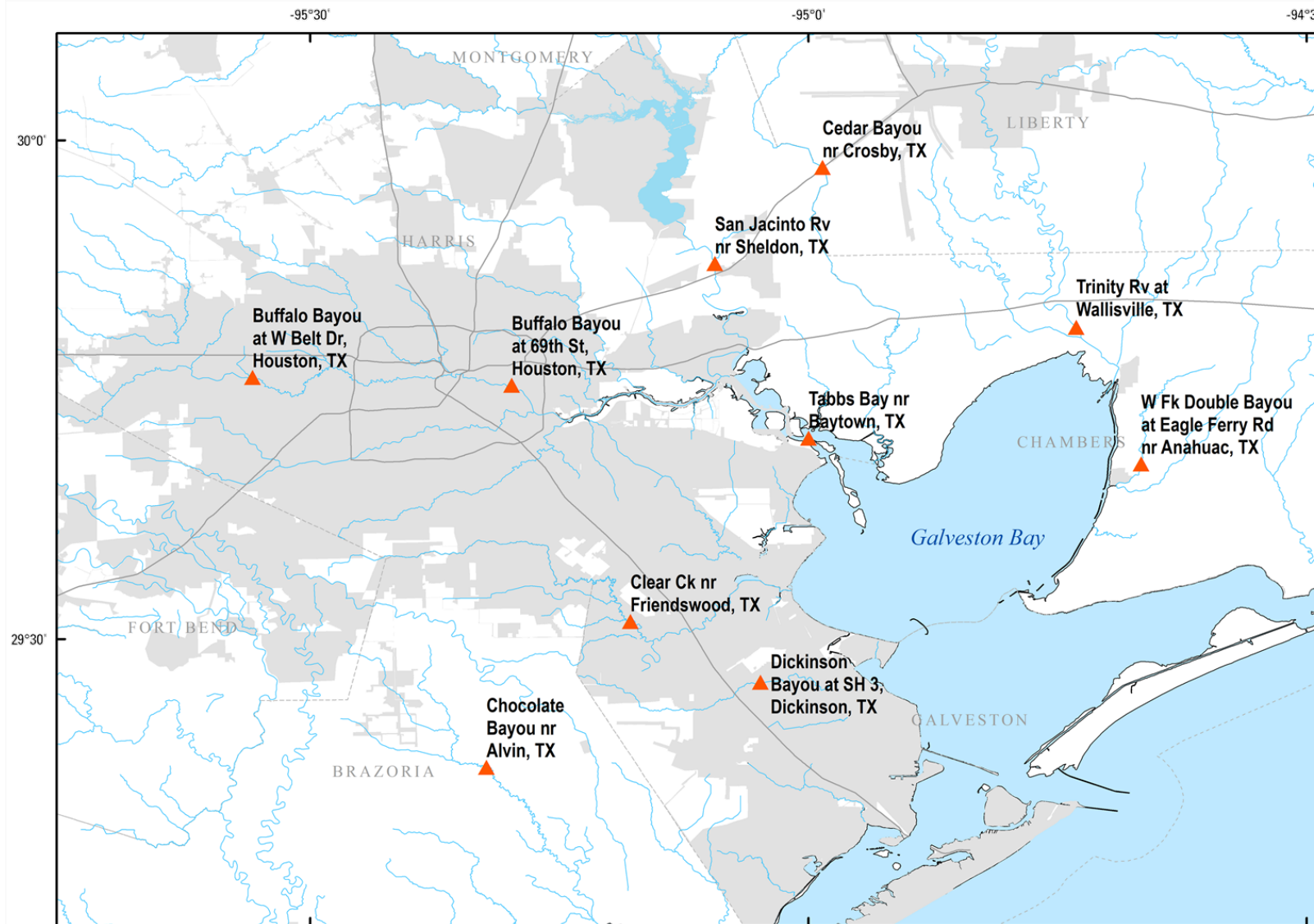
Drainage area:
33 to 3,970 mi²

Land cover characteristics:

- 6-72% urban
- 1-37% forested
- 18-76% agricultural

Hydrology:

- Baseflow
- Stormflow



Field Methods

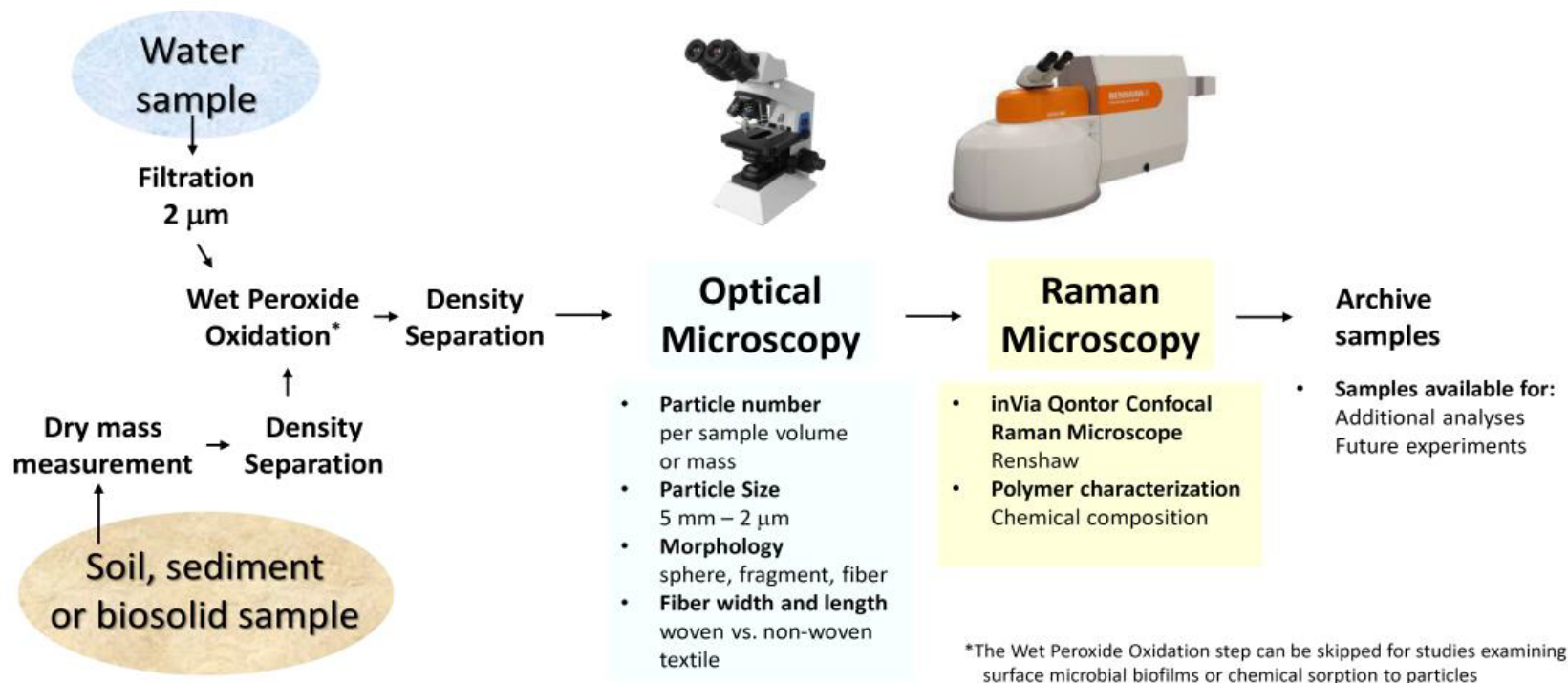


Field Methods



Laboratory Analysis

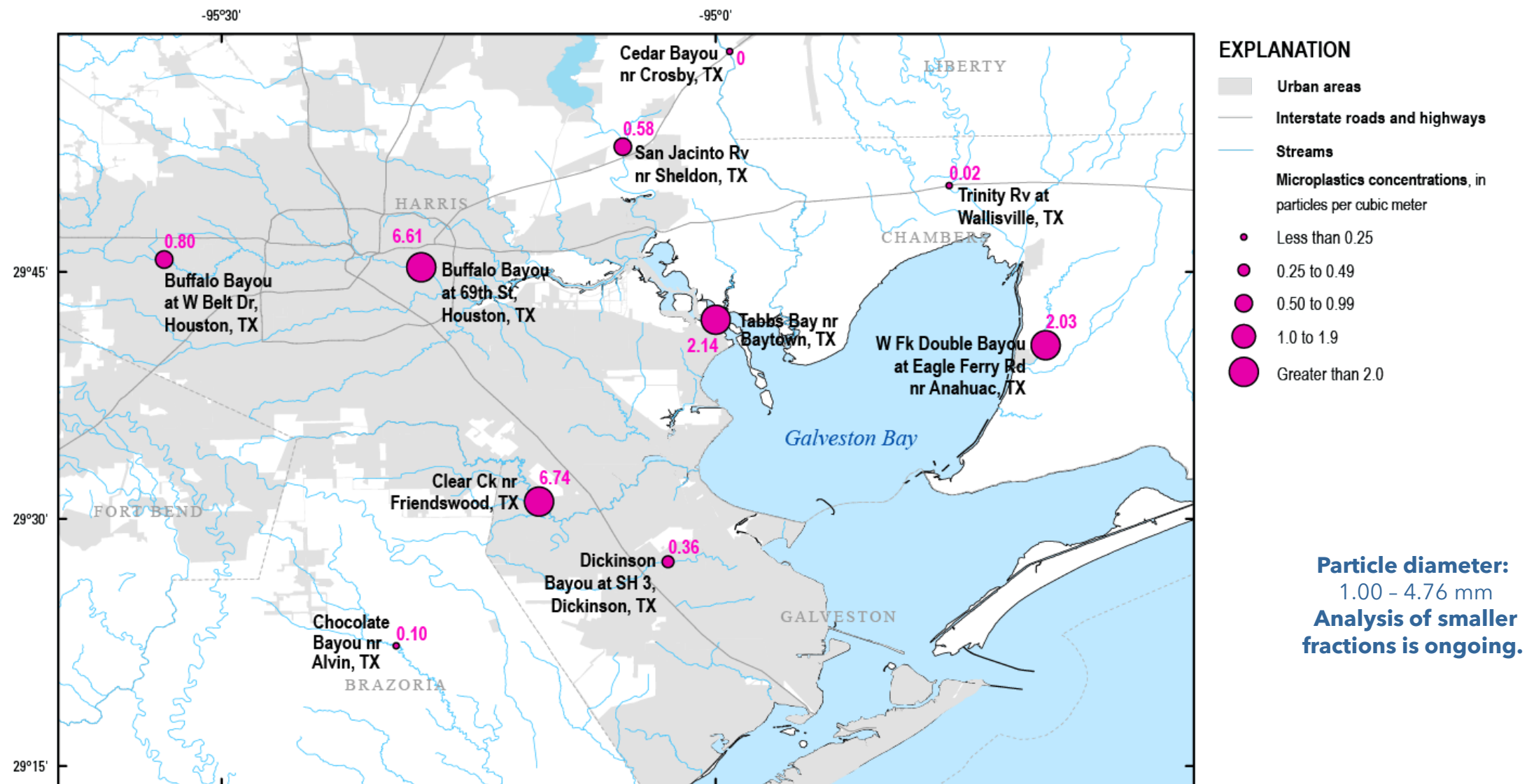
Plastic Microparticle Extraction and Characterization Methodology



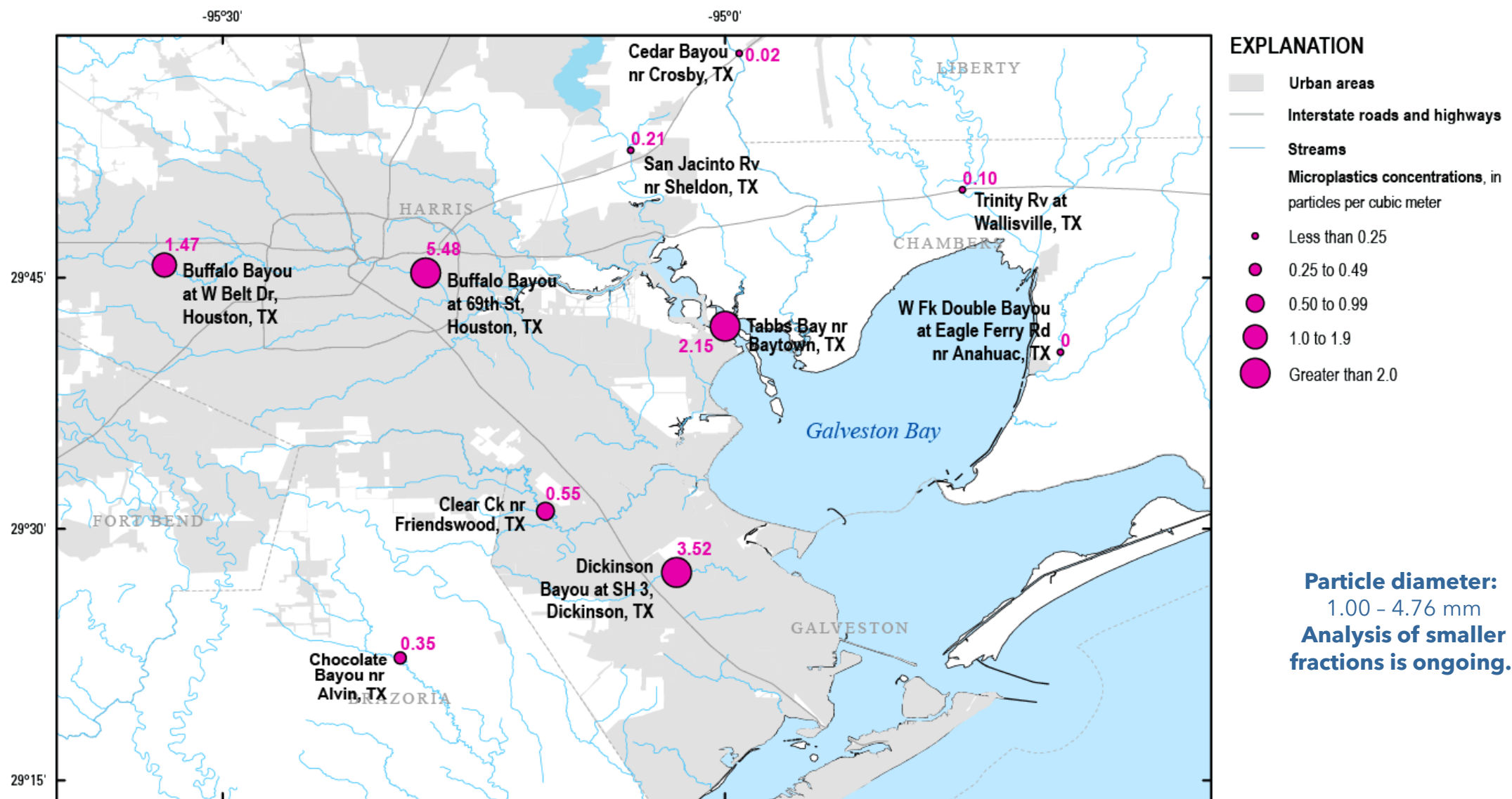
Source: OptoKhemia Analytical

Current data:
1.00 – 4.76 mm
Analysis of smaller fractions is ongoing.

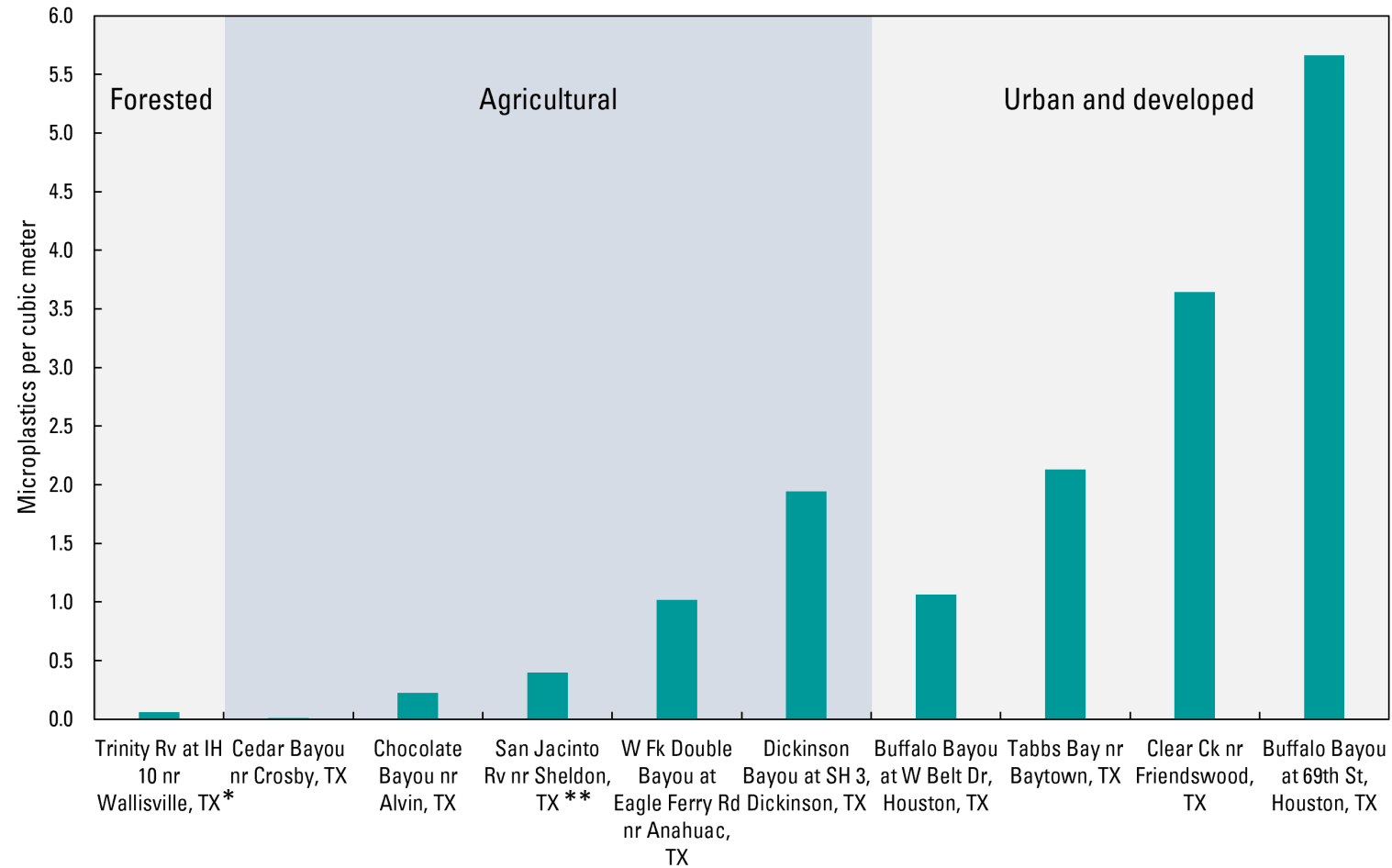
Baseflow Samples



Stormflow Samples



Land Cover

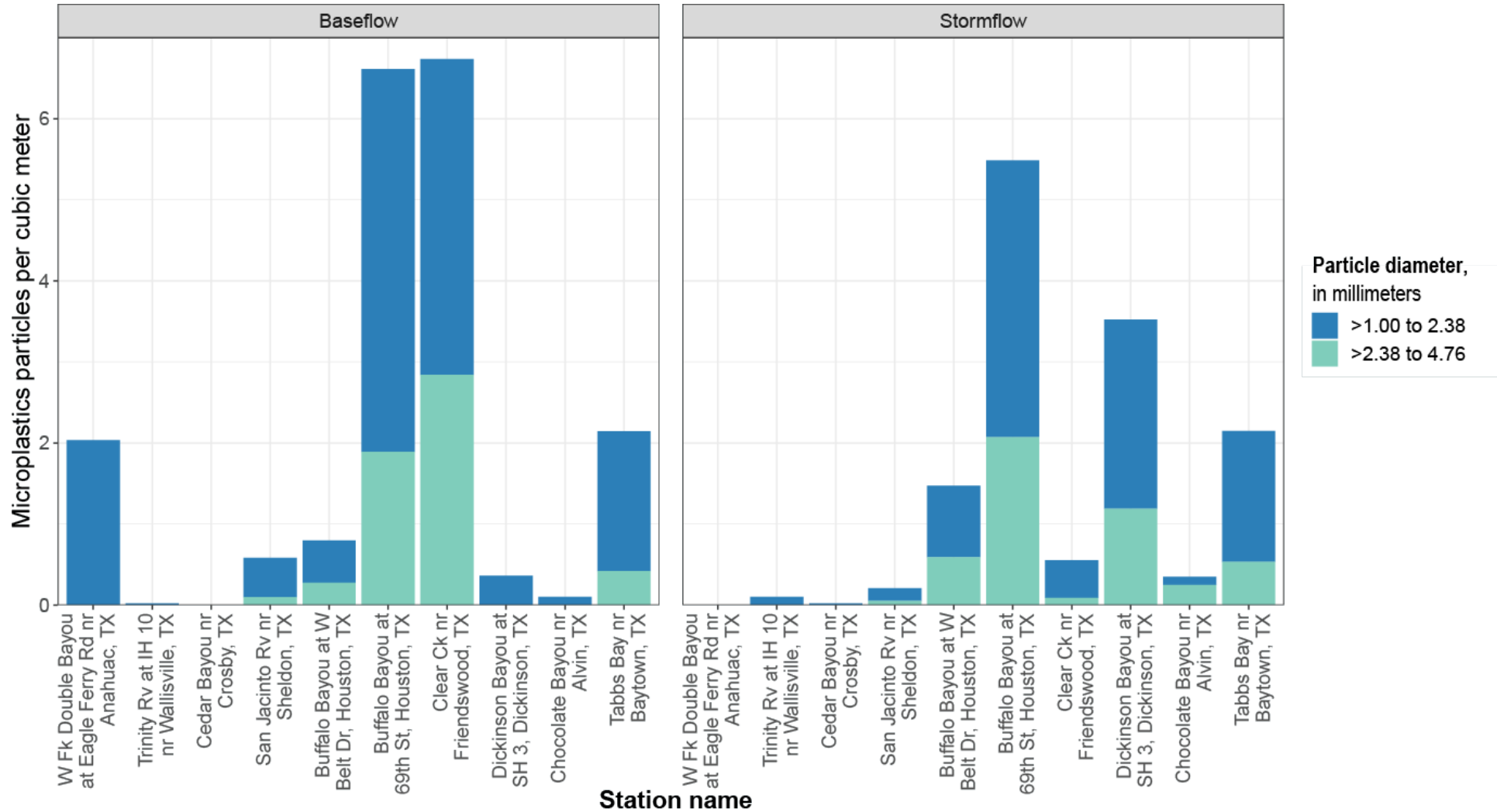


* Based on land cover below Lake Livingston

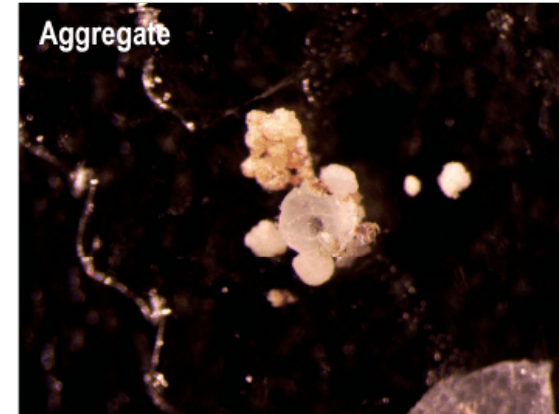
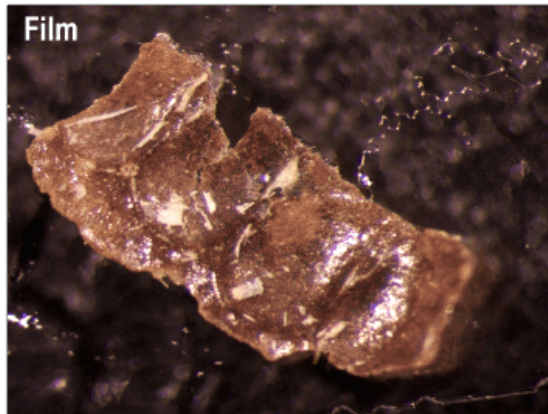
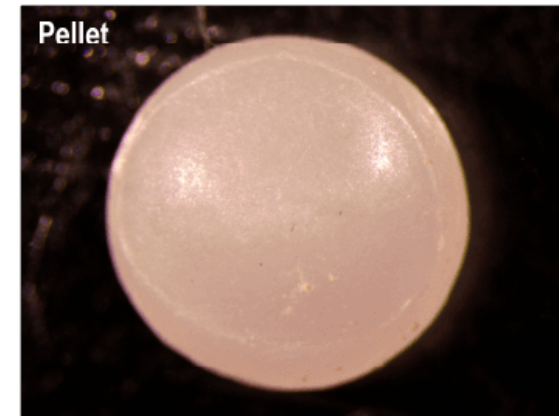
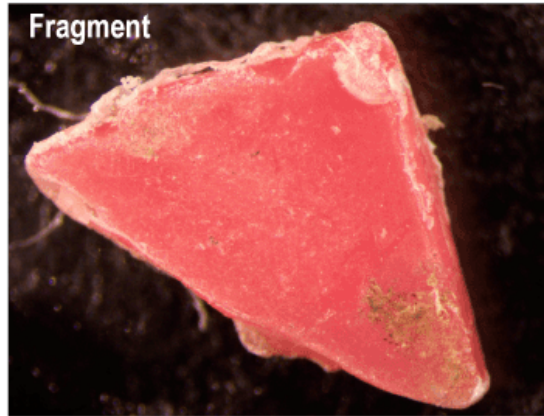
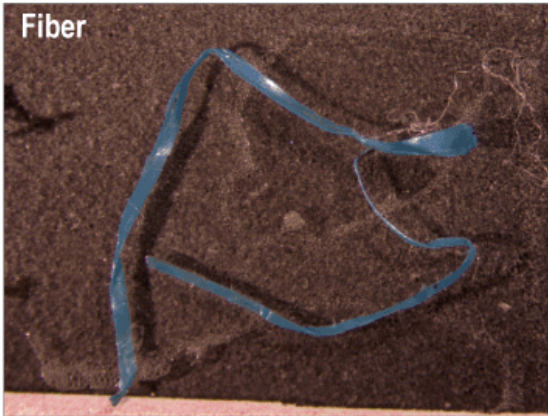
** Based on land cover below Lake Houston

Preliminary Information-Subject to Revision. Not for Citation or Distribution.

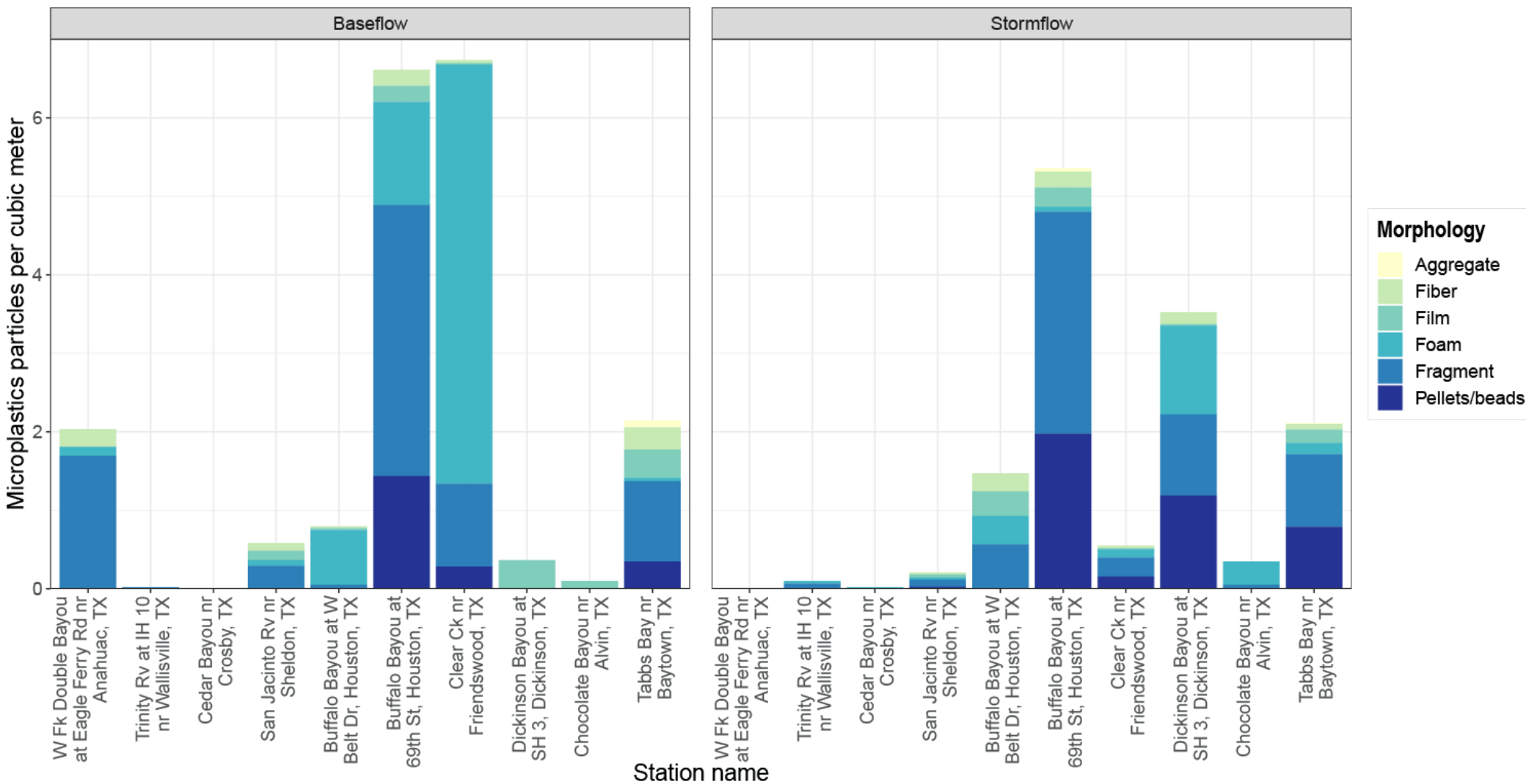
Particle Size Distribution



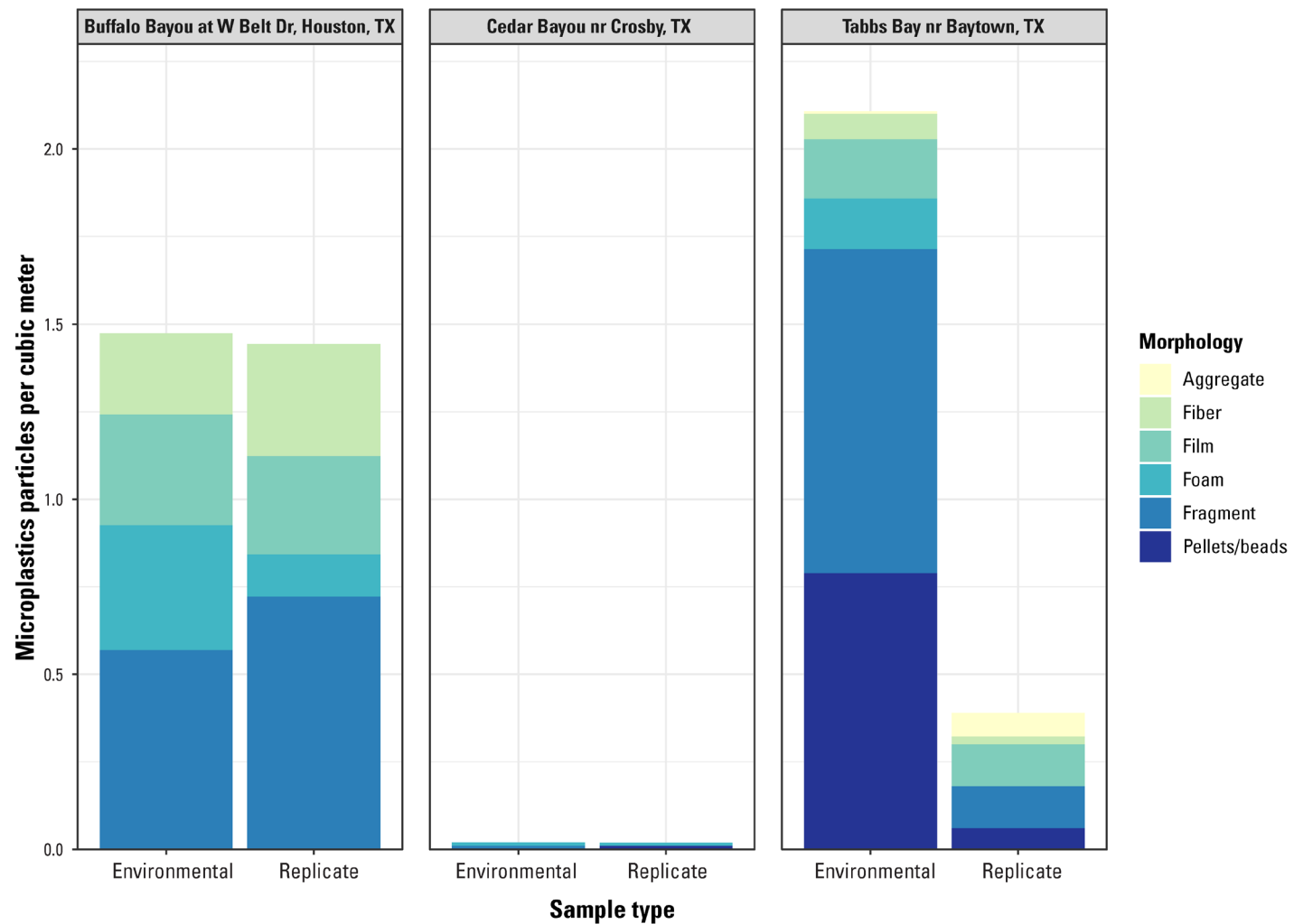
Morphology



Morphology



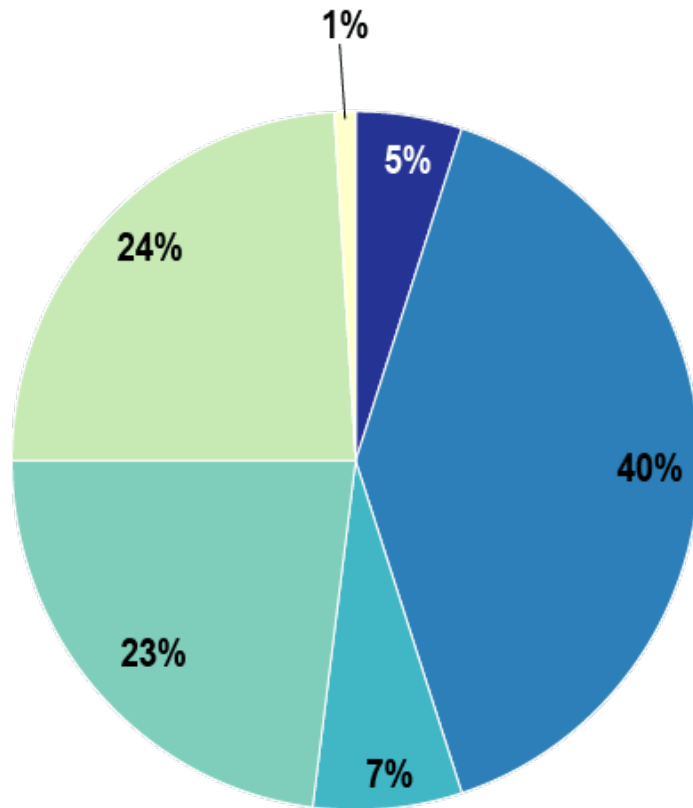
QA/QC data



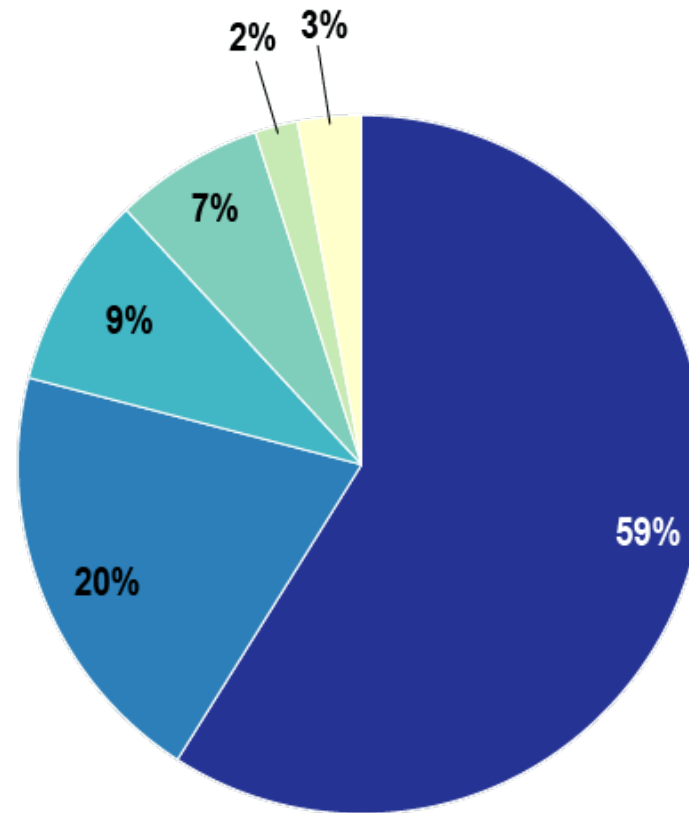
No detections in field blanks

Morphology Comparison

Galveston Bay tributaries



Li and others (2020)

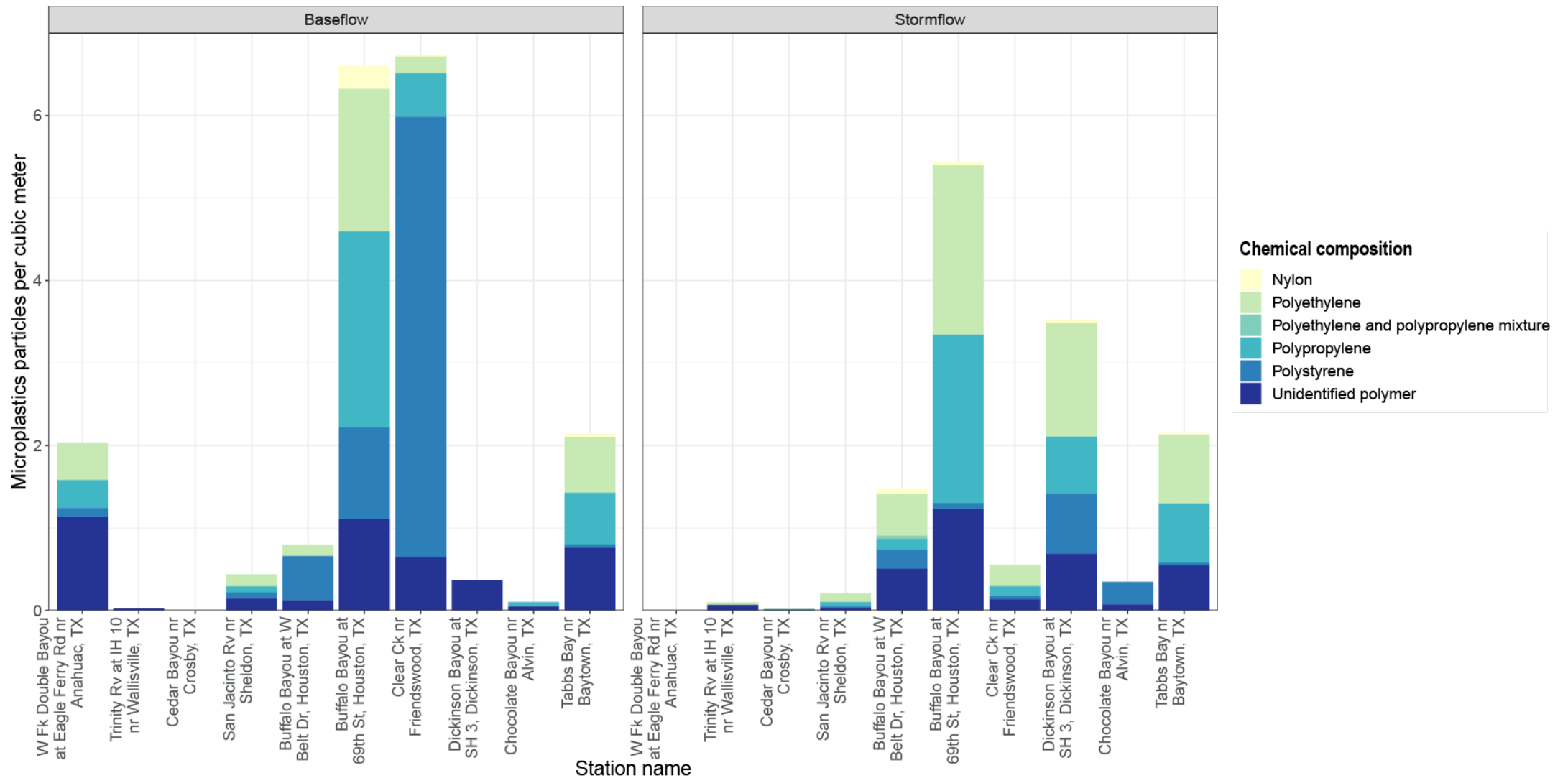


EXPLANATION

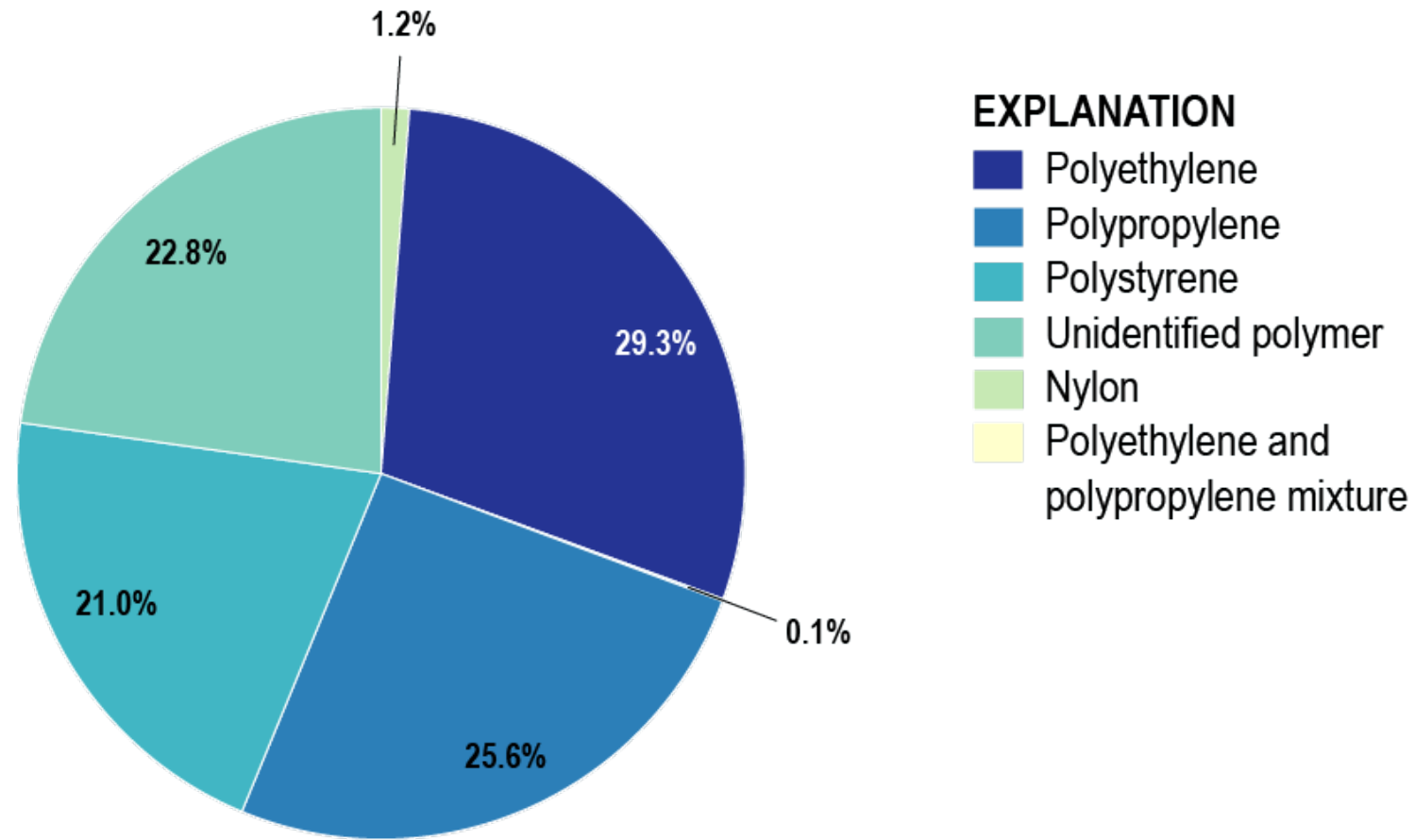
- Fibers
- Fragments
- Films
- Pellets or beads
- Foams
- Other

Source: Li, C. Busquets, R, C, L.C., 2020, Assessment of microplastics in freshwater systems— A review: Science of The Total Environment, Vol. 707

Polymer Characterization

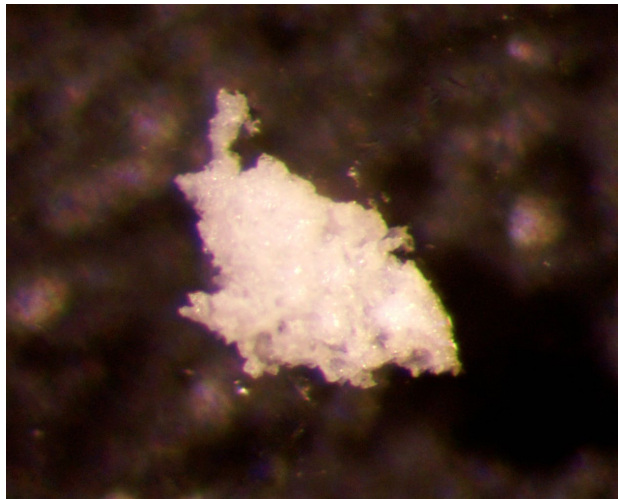


Polymer Characterization



Unidentified polymers

- ~23% of polymers could not be identified by Raman spectroscopy
- Color pigments and weathering affected Raman spectra
- Most particles could be confidently considered a microplastic, such as colored fragments, pellets/beads and weathered foams.



Summary

- High spatial and temporal variability of microplastics concentrations in tributaries to Galveston Bay.
- Microplastics abundance generally increased as urban land cover increased.
- Preliminary results show that the distribution of the various types of microplastics is variable and not consistent with studies in other locations.
- The results of this study may help close gaps in our knowledge of microplastics in Galveston Bay and provide information that can be used by decision-makers to develop and implement mitigation strategies in the future.



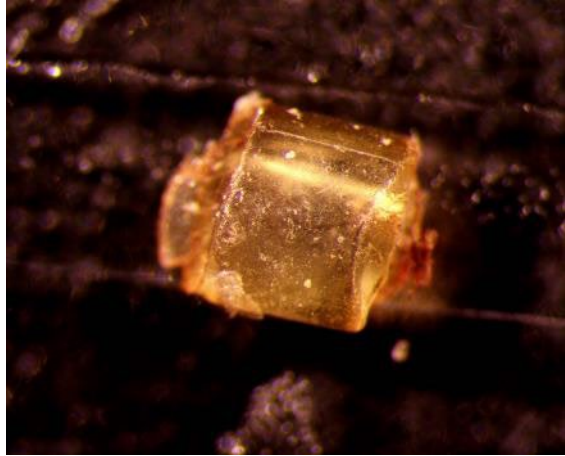
Next Steps

Analyze size fractions
<1.00mm



Analyze phase 2
samples





Thank You!

Zulimar Lucena
zlucena@usgs.gov

