

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 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.



Why is it important to study microplastics?

Article | Open Access | Published: 27 March 2023

Current levels of microplastic pollution impact wild seabird gut microbiomes



Journal of Hazardous Materials Letters Volume 2, November 2021, 100014



Microplastics as hubs enriching antibioticresistant bacteria and pathogens in municipal activated sludge

Dung Ngoc Pham,



Environmental Pollution Volume 185, February 2014, Pages 77-83



Ingestion and transfer of microplastics in the planktonic food web

Outi Setälä 🝳 🖂 , <u>Vivi Fleming-Lehtinen</u>, <u>Maiju Lehtiniemi</u>



Source: Science, 2021

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

- 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.





Sampling Locations





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 Houston



Particle Size Distribution





Morphology











Morphology Comparison





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 Not for Citation or Distribution.







Polymer Characterization





Polymer Characterization





Unidentified polymers

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





Organic Matter

Example Size fractions <1.00mm



1-ethyl-3-methylimidazolium acetate





Organic Matter





Source: OptoKhemia Analytical, LLC



Next Steps

- Test samples containing microplastics and plant matter to determine the difference in the ability to quantify and characterize microplastic contamination.
- Treat real-world samples containing microplastics with ionic liquids and optimize sample preparation for analysis.
- Start analysis of phase 2 samples.





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.
- Additional work needed to quantify smaller size fractions.
- 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.







Thank You!

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