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Estimating the abundance of microplastics in sediment of Galveston Bay

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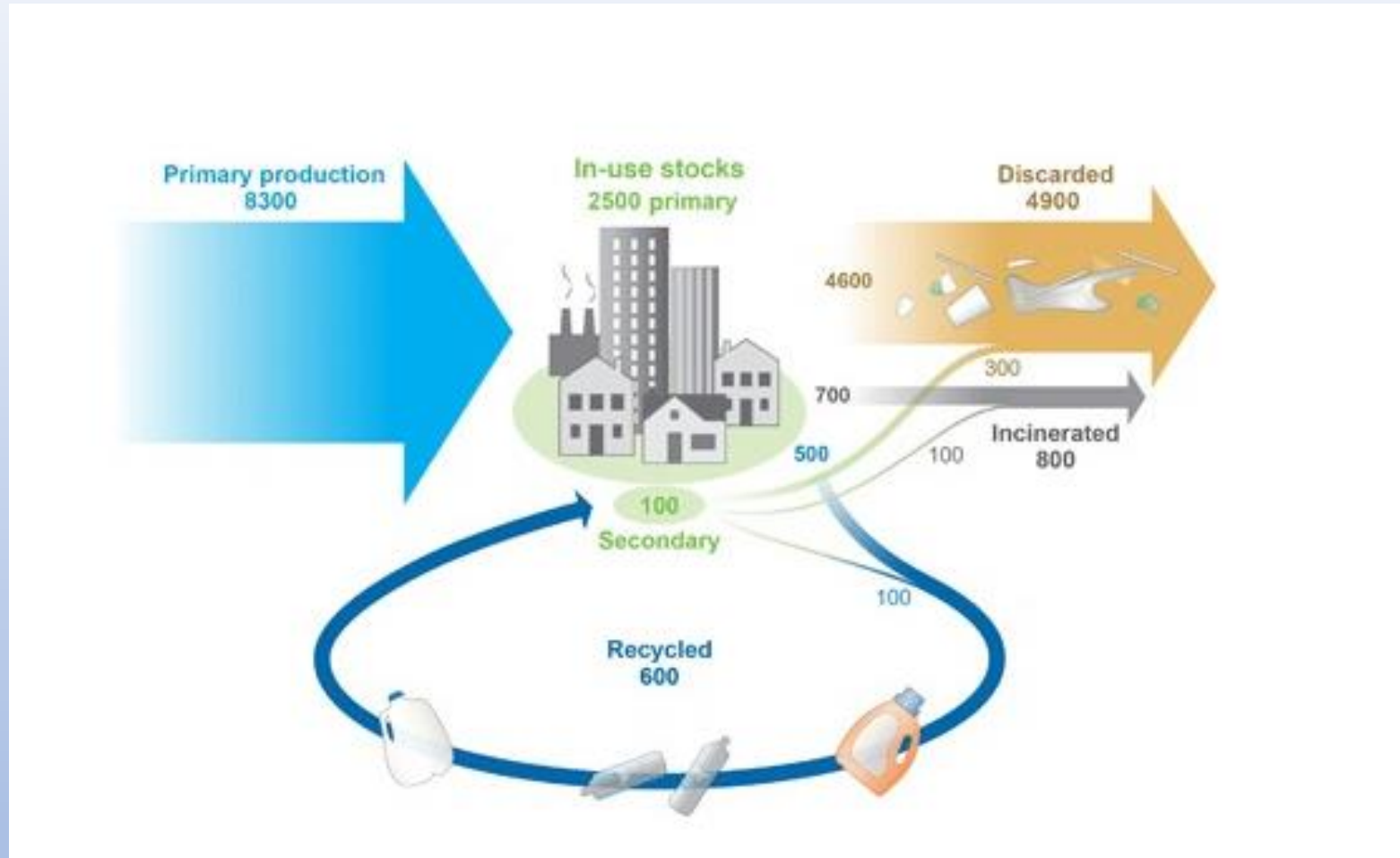
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University of Houston-Clear Lake

Introduction

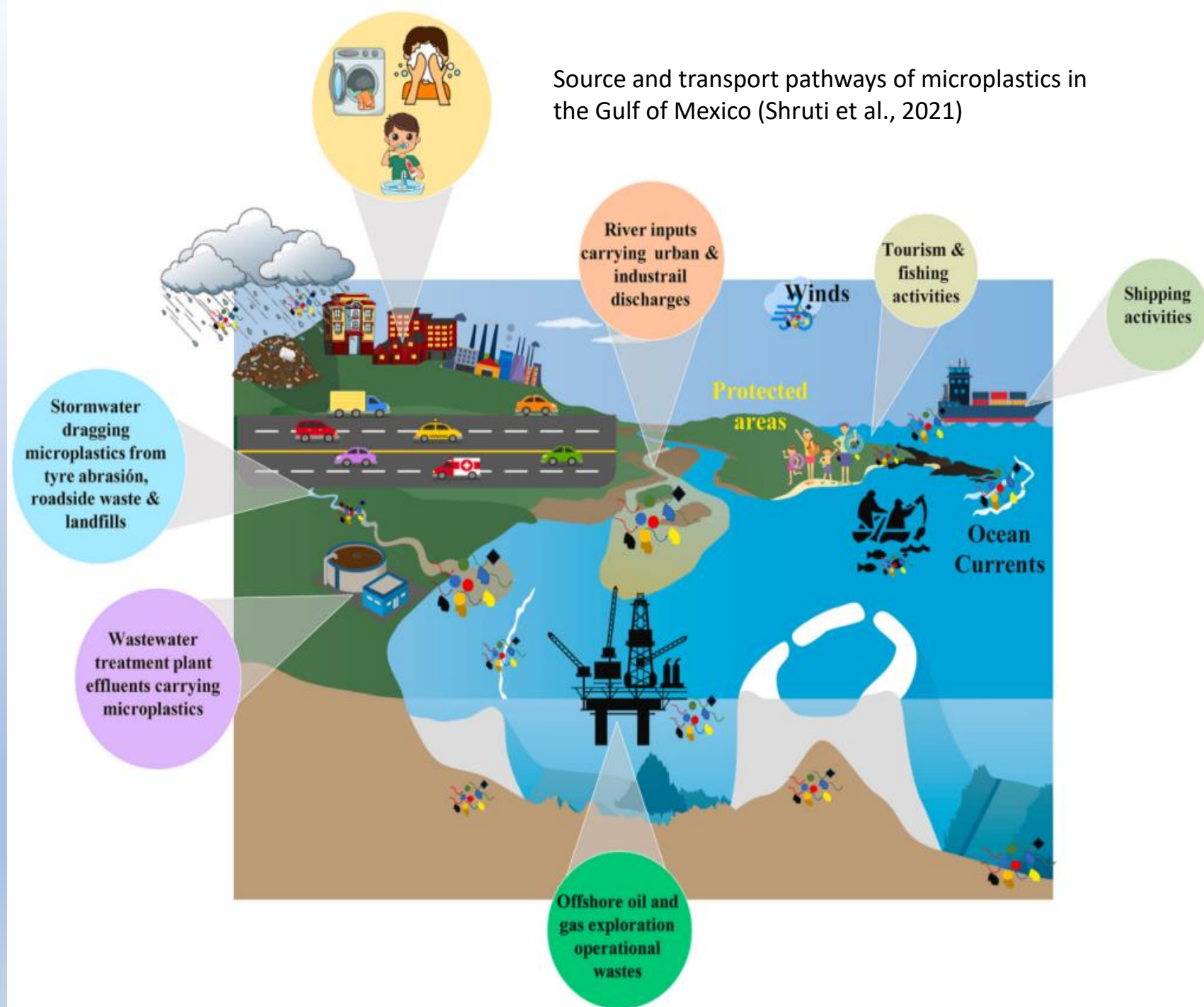
- **Microplastics** – small plastic particles <5 mm in size
- Classified as fragments, synthetic fibers, microbeads, nurdles, and film pieces
- >5.25 trillion microplastic particles currently floating in the world's oceans (Eriksen et al., 2014)



Production, use, and fate of all plastics made from 1950 – 2015 in million metric tons (Geyer et. al)

- Galveston Bay is the second largest estuary along the northern Gulf of Mexico coast (Mukaimi et al., 2018)
- Supports one of the largest petroleum and chemical industries globally

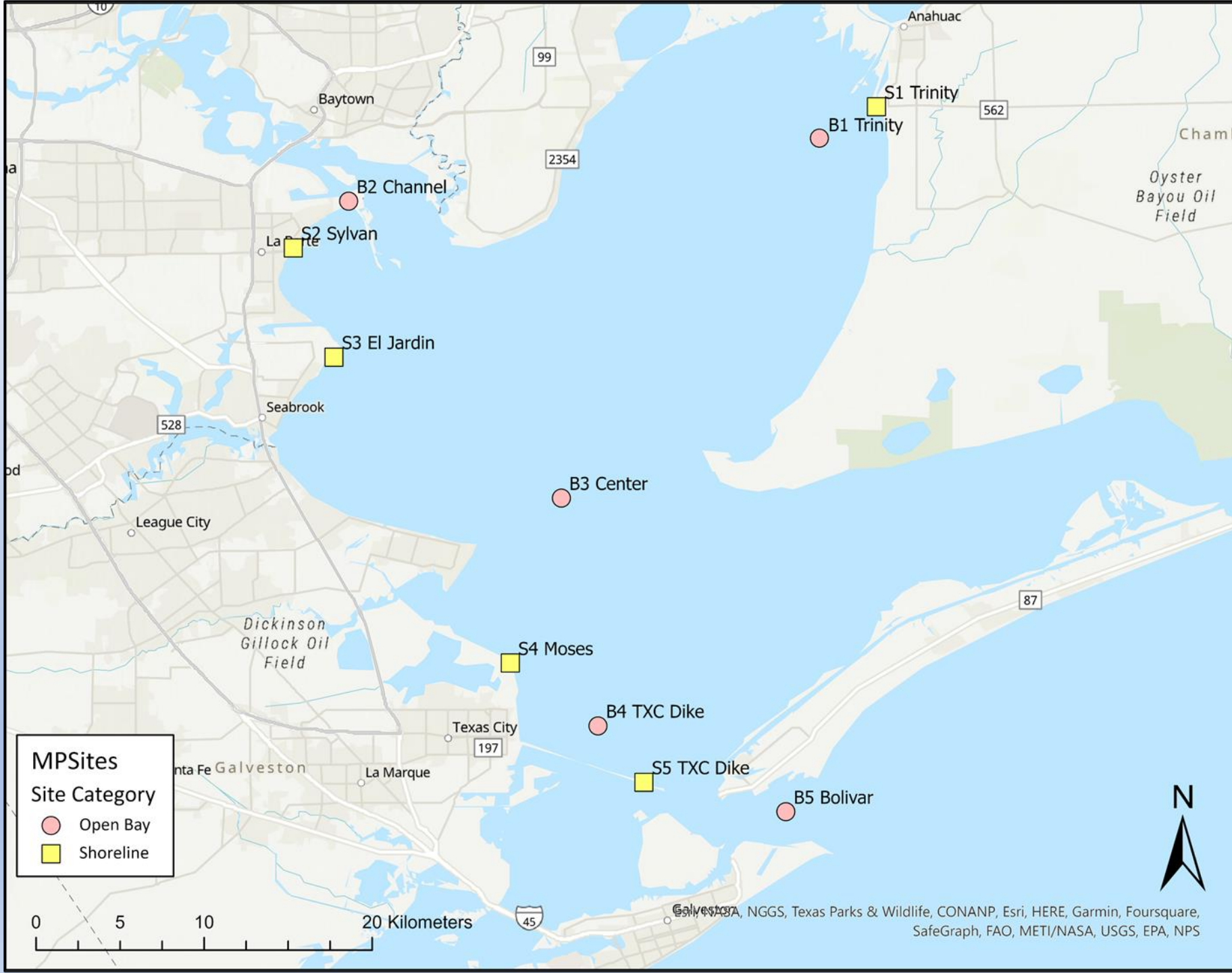
Source and transport pathways of microplastics in the Gulf of Mexico (Shruti et al., 2021)



Objective

- Estimate the concentration and types of microplastics present in Galveston Bay
 - Shoreline vs. Open Bay
 - Sediment
 - Water





MPSites
Site Category

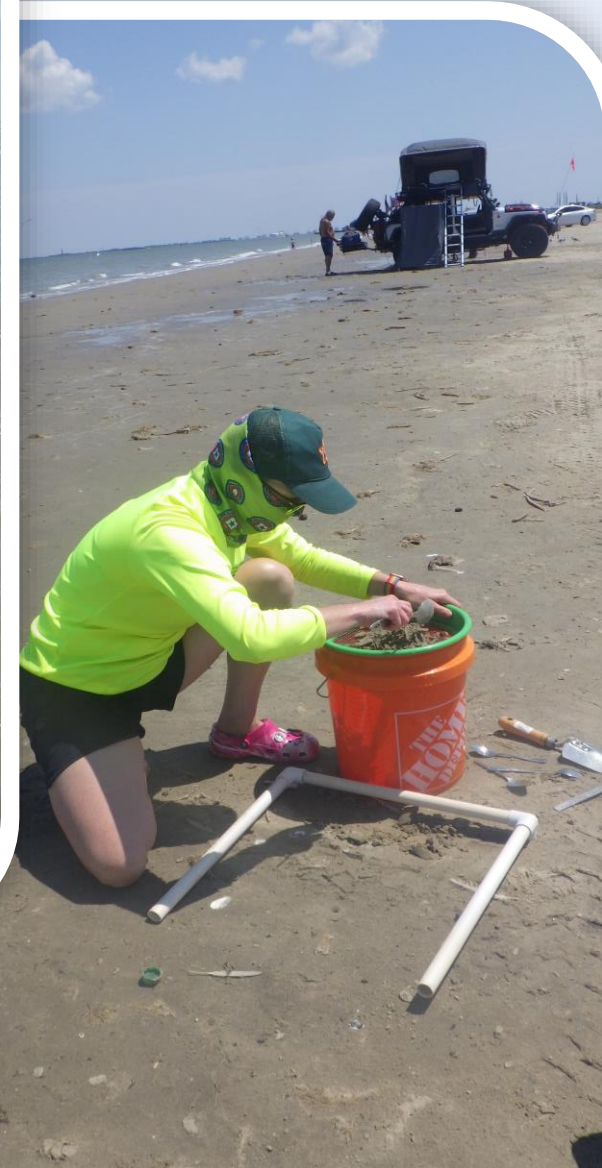
- Open Bay
- Shoreline

0 5 10 20 Kilometers

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Sample Collection

- 2 sampling events: March 2022 & September 2022
- 5 shoreline and 5 open bay sites
 - Shoreline sites
 - Collected using a 0.25 m² quadrant at a depth of 3 cm
 - Open Bay sites
 - Collected using an Ekman or a Petite Ponar at a depth of 5 cm
- 2 replicates per event



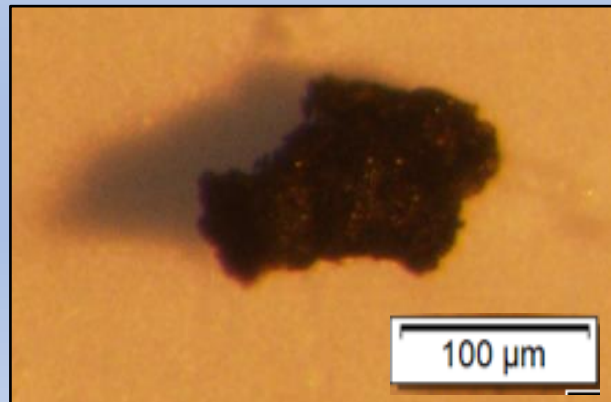
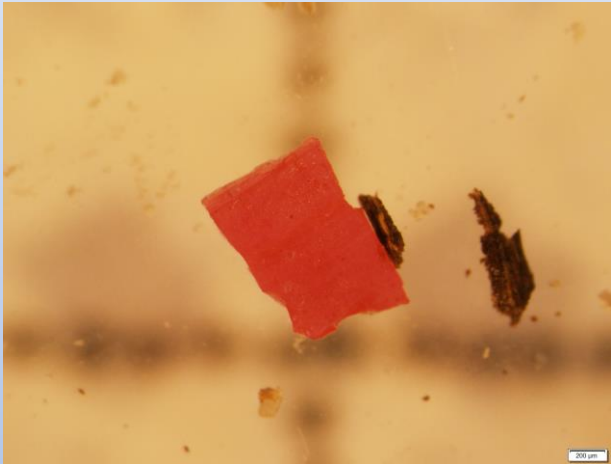
Density Separator

- Solution of sodium chloride (NaCl) was prepared at a salinity of 40 ppt
- Saline water helps separate plastics and more buoyant objects from the more dense sediment
- An aerator was used to help facilitate bubbling of water
- Submersible pump help facilitate water flow through processing
- A 55-micrometer sieve was used to help catch microplastics

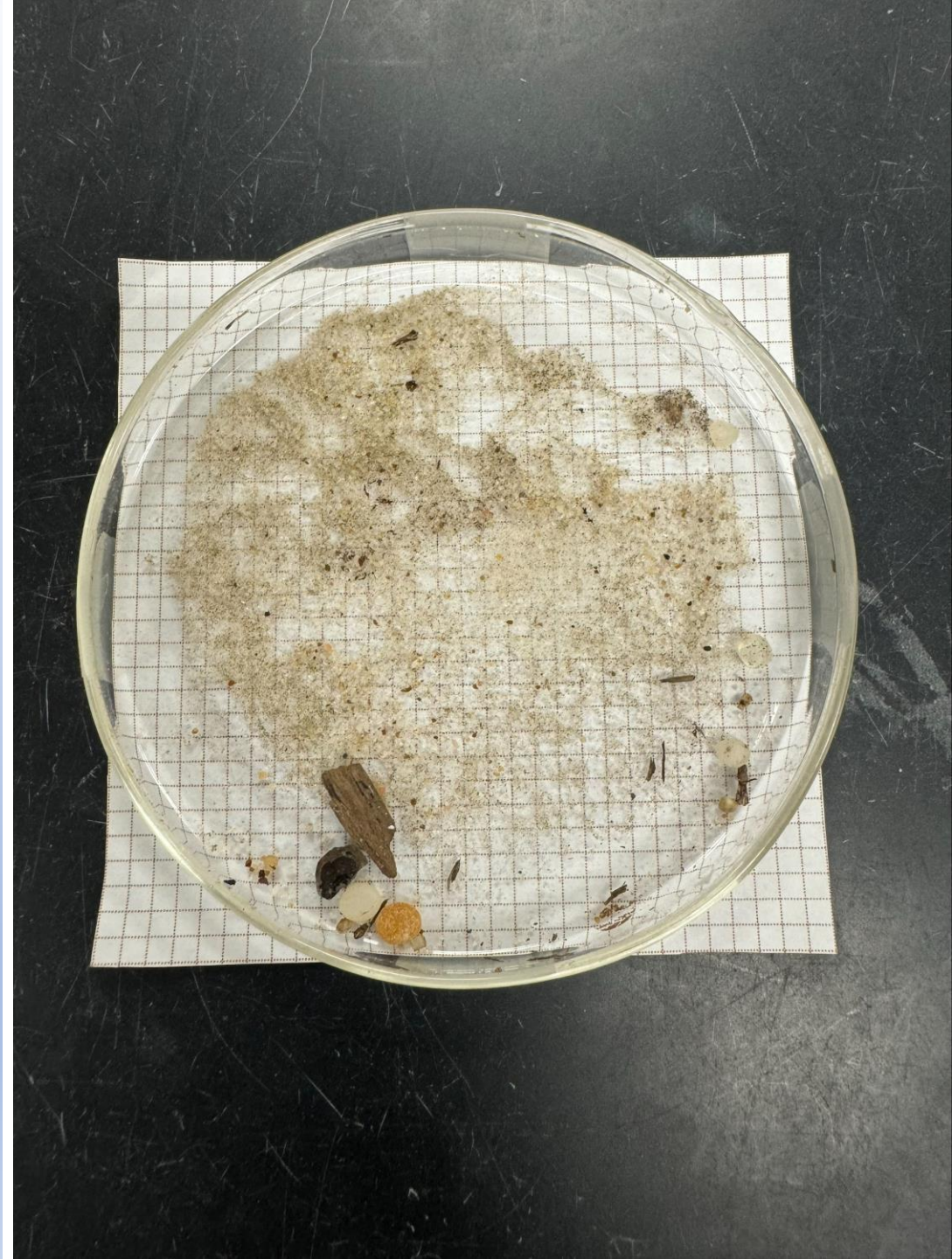


Microscope Analysis

Fragment



Film

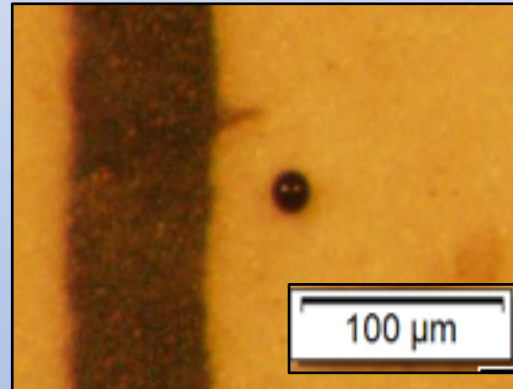


Microscope Analysis

Nurdle



Microbead



Fiber



Microplastics per m²

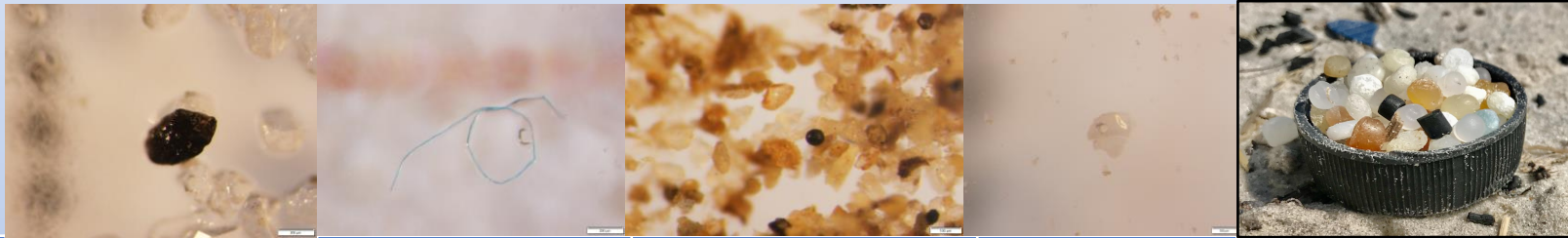
- Sample volume (cm³)

- Ponar = 1162.81
- Ekman = 1163.00
- Quadrat = 1875.00

Count / sample volume = # per cm³ * 10,000 cm² = # per 1 m²



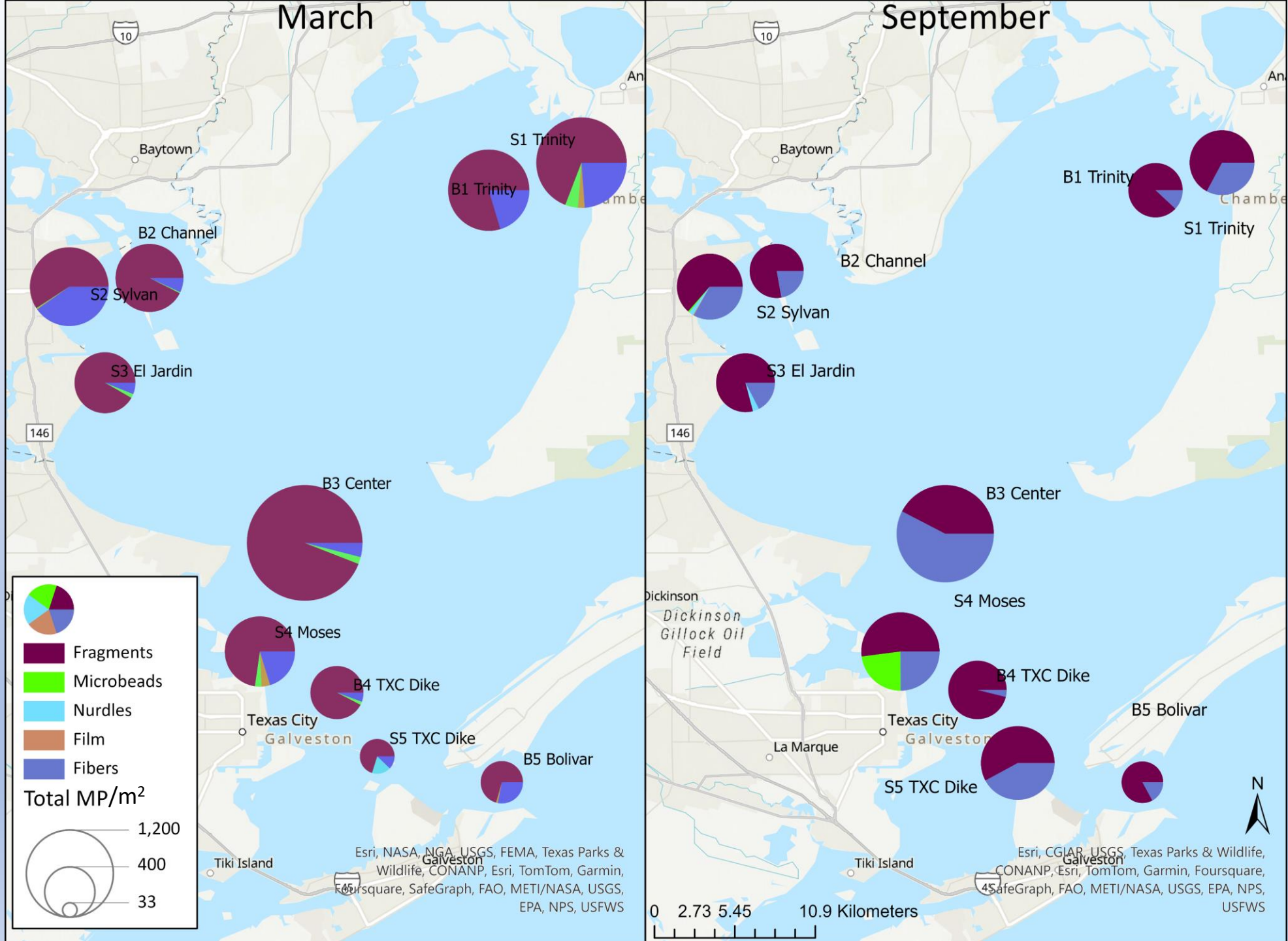
Results



Event	Site Type	Avg # fragments/m ²	Avg # fibers/m ²	Avg # microbeads/m ²	Avg # film pieces/m ²	Avg # nurdles/m ²	Avg # total/m ²	Totals
Mar	Open Bay	846	93	11	1	0	951	851
	Shoreline	559	189	20	13	7	789	
Sept	Open Bay	432	218	0	0	0	650	710
	Shoreline	465	229	46	1	7	748	
Grand Total		561	189	23	4	4	781	

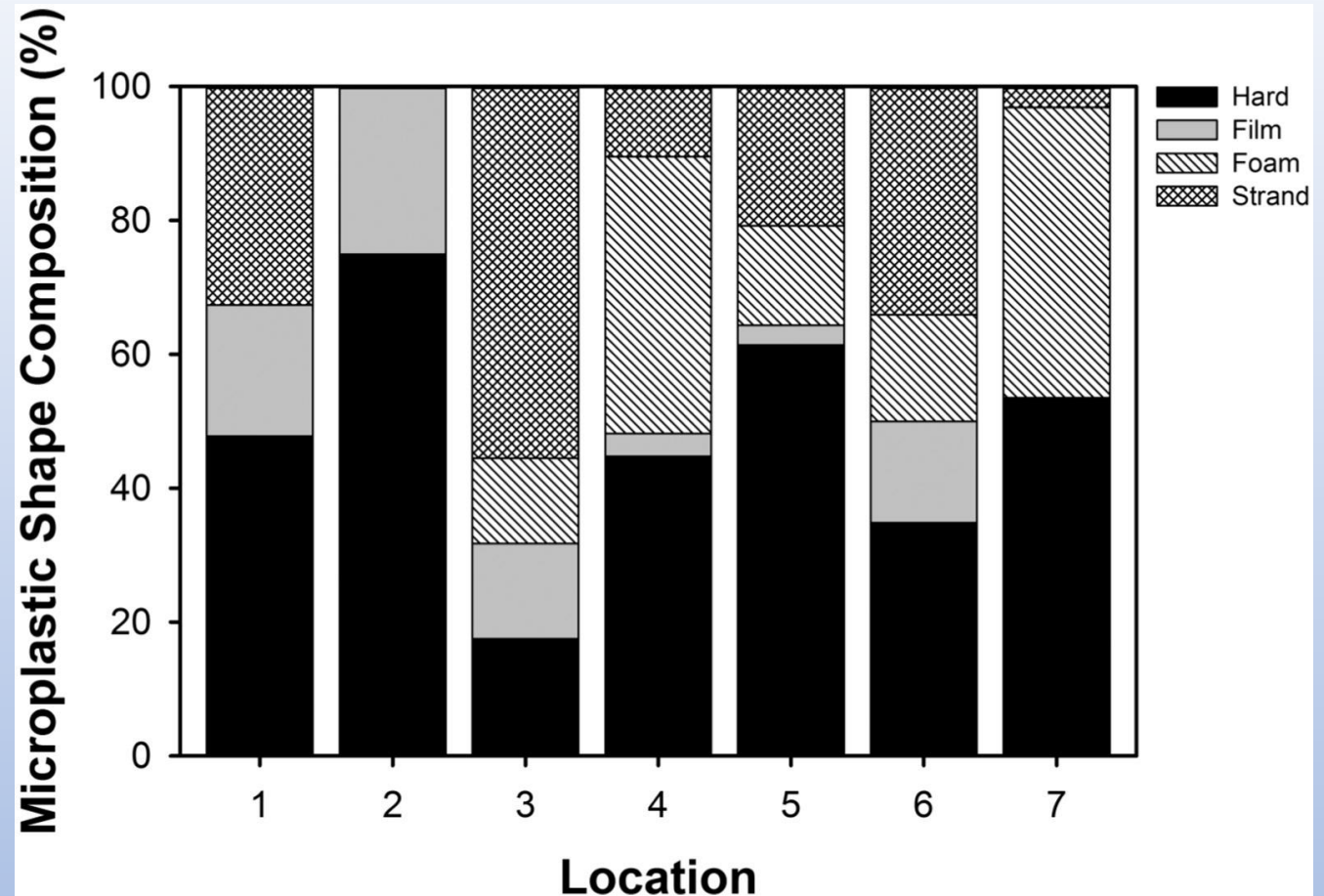
March

September



Discussion

- Shoreline sediment samples collected from Mobile Bay (Wessel et al. 2016)
- Microplastics were found in all quadrants
- Mobile Bay: 5 to 11.7/m²
- Our study: 197 to 1331/m²



The average microplastics found at each location. Hard plastics were the most abundance, followed by strand (fibers), foam, and film. (Wessel et al. (2016)

Conclusion

- This study is the first snapshot evaluation of microplastic types and concentration in Galveston Bay sediments
- It can provide a baseline to compare future monitoring to
- The impacts of these microplastics to the environment and organisms in Galveston bay is unknown

Questions?

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To learn more about our study
please visit this website:



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