

Debris Dynamics: Assessing Marine Debris Accumulation Patterns on Randall's Island

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Introduction

Marine debris refers to discarded materials, including plastic, paper, metal, glass, rubber, and other miscellaneous items, found in water. The rapid increase in processed material production has led to a growing accumulation of marine debris in coastal ecosystems. This study investigates the influence of geographic factors on marine debris abundance on Randall's Island. I aim to address two questions:

1. How do saltmarshes and beach shorelines collect marine debris differently?
2. What type of marine debris is most common throughout each site?

I hypothesize that the saltmarsh ecosystem has more marine debris present compared to the shorelines due to its geographic factors which help filter marine debris out of the waterway. Due to these characteristics, I predict that single-use plastics will be in higher abundance in this area.

Methods

- Lay out 4 transect lines perpendicular to the water, with each transect line laid 5 m apart using stakes. Within each transect line, 4 square quadrats (1×1 m) were placed at 0m, 3m, 6m, and 9m.
- Within each quadrat, marine debris (> 2.5 cm) was recorded and categorized into material from July to August 2024.
- Collected water quality, which includes dissolved oxygen (DO), salinity, temperature, enterococcus levels during field sampling times.
- Evaluate data in terms of differences in debris distribution per quadrat per site and water quality fluctuations.

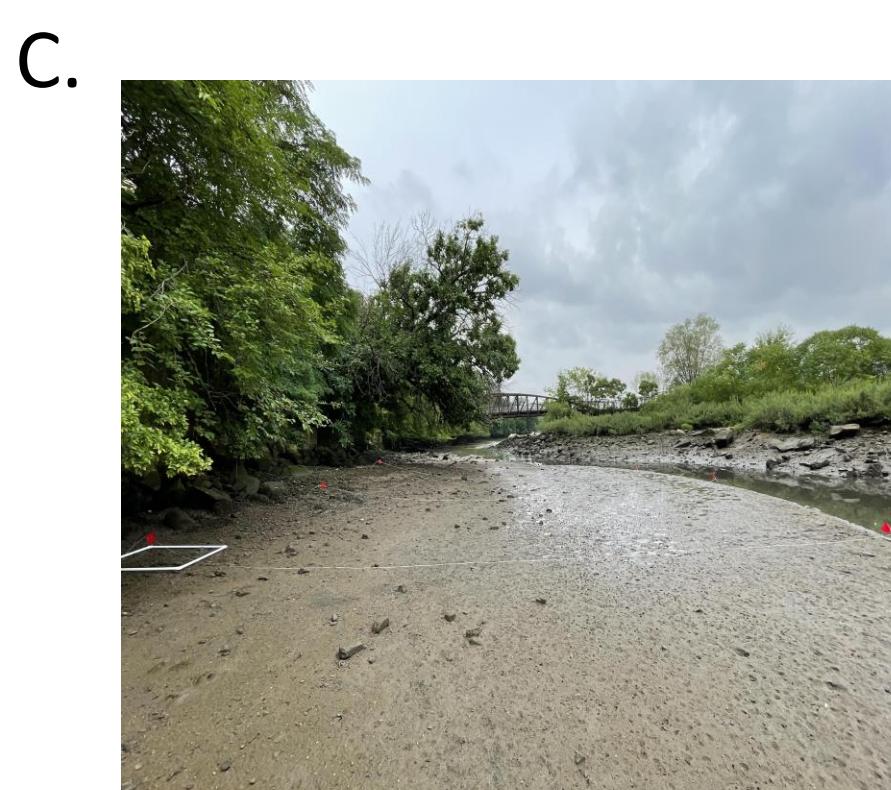
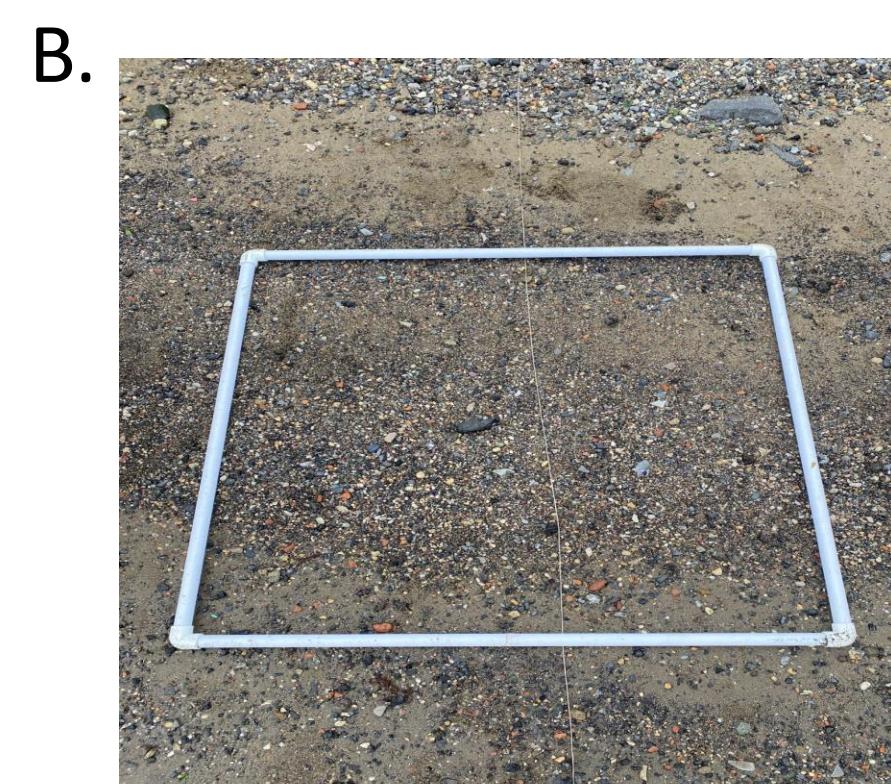
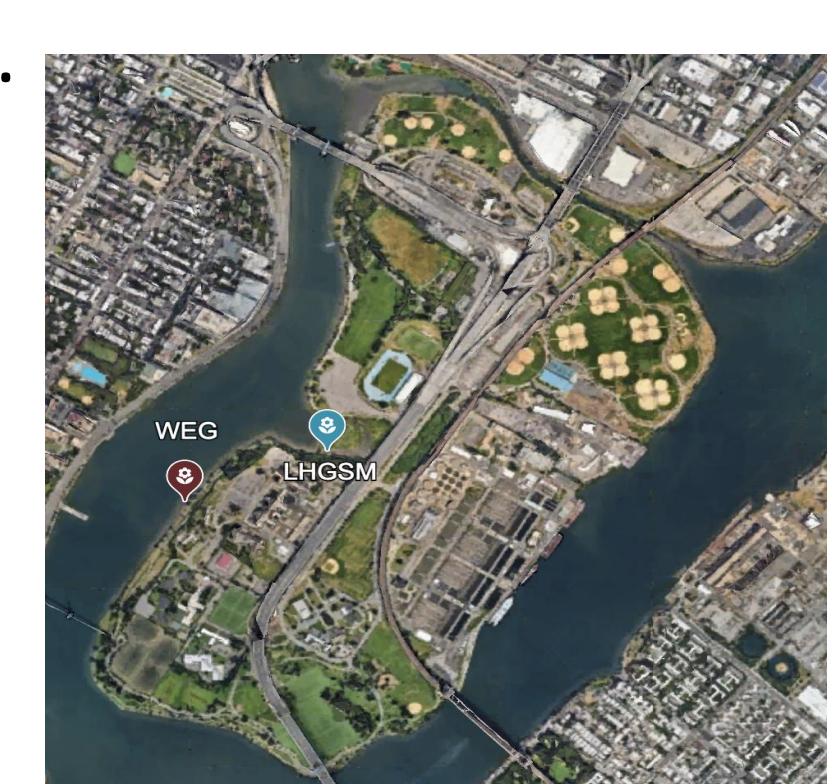


Figure 1. A. Map of Randall's Island. B. Example of sampling transect. C. Little Hell Gate Salt Marsh. C. Water's Edge Garden.

Results

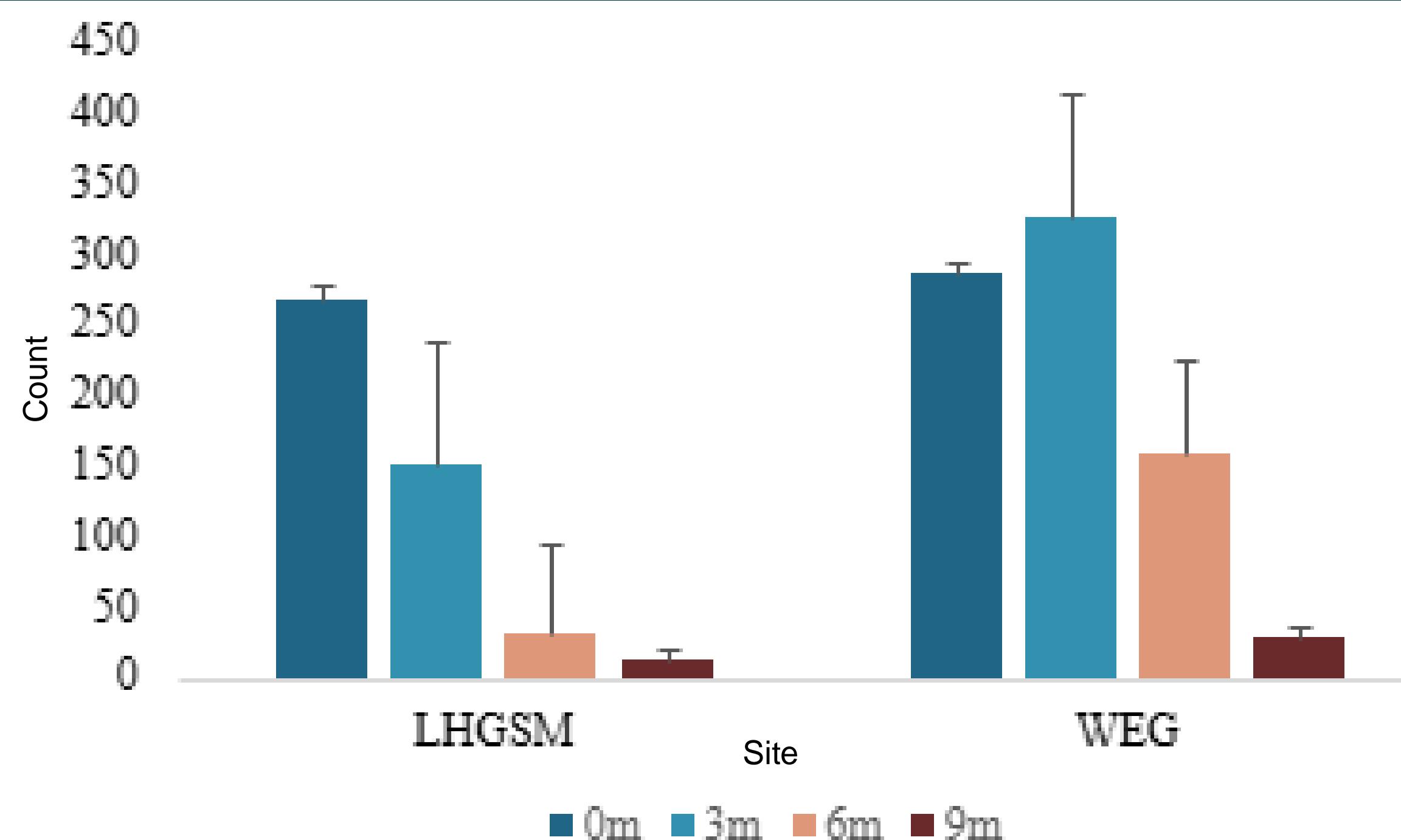


Figure 2. Count of debris at different distances (0m, 3m, 6m, and 9m) at two sites: Little Hell Gate Salt Marsh and Water's Edge Garden. Meter 0 is closest to the shore, while 9m is nearest to the water body. The bars represent the raw counts of debris, with standard error indicated.

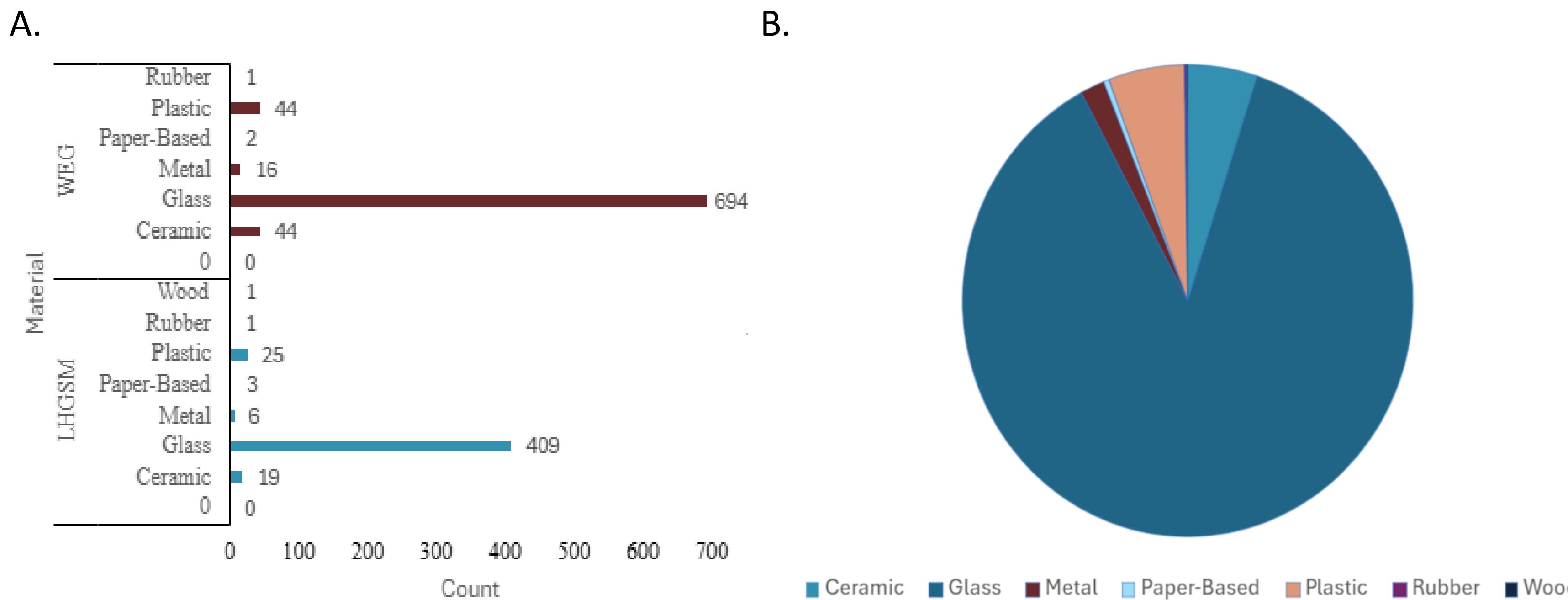


Figure 3. A. Count of different material per site, categorized by type, from marine debris survey. Sites include Water's Edge Garden and Little Hell Gate salt marsh. B. Total marine debris collected during the survey categorized by material type.

Date	Location	Low Tide Time	Sampling Time	With/Against Tide
7/25/2024	LHGSM	7:56	8:55	against
7/25/2024	WEG	7:56	9:27	against
7/26/2024	LHGSM	8:44	9:26	against
7/26/2024	WEG	8:44	8:49	against
7/30/2024	LHGSM	12:18	11:50	with
7/30/2024	WEG	12:18	11:05	with
7/31/2024	LHGSM	1:14	1:27	against
7/31/2024	WEG	1:14	1:57	against
8/8/2024	LHGSM	7:19	8:20	against
8/8/2024	WEG	7:19	8:44	against
8/9/2024	LHGSM	8:27	8:37	against
8/9/2024	WEG	8:27	9:10	against
8/13/2024	LHGSM	11:07	11:40	against
8/13/2024	WEG	11:07	11:17	against
8/14/2024	LHGSM	12:01	11:21	with
8/14/2024	WEG	12:01	11:58	with

Table 1. Record of date, location, low tide time, sampling time during sampling period.

Results

- According to predictions, more marine debris accumulated consistently at starting points 0m and 3m, where the high-tide line reached, at both Little Hellgate salt marsh and Water's Edge Garden (Fig. 2).
- Contrary to predictions, Water's Edge Garden had a higher abundance of marine debris than Little Hellgate Salt Marsh (Fig. 3A). Additionally, the primary marine debris in our survey was glass, not plastic as originally hypothesized (Fig. 3B).

Discussion

- There was a site difference in marine debris amounts. The bustling activity at WEG likely contributes to increased littering, while LHGSM's dense plant growth restricts access and debris removal.
- The lack of strong prevailing winds typically leads to greater accumulation of marine debris along the high tide line. At WEG, more debris was found at the 0 m and 3 m points, while less debris was present at 6 m and 9 m due to lighter materials remaining afloat near the low tide line.
- As data collection continues and trash is removed, the number of marine debris collected may decrease over time due initial amounts of litter being removed.
- Future studies will investigate the effect of environmental factors on the distribution of marine debris at different sites.

Works Cited

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Figure 4. A. Salinity (ppt) and B. Dissolved oxygen (ppm) taken at each site during the sampling period.