Salt Marsh Restoration in the Harlem River Creates Healthy Urban Coastlines

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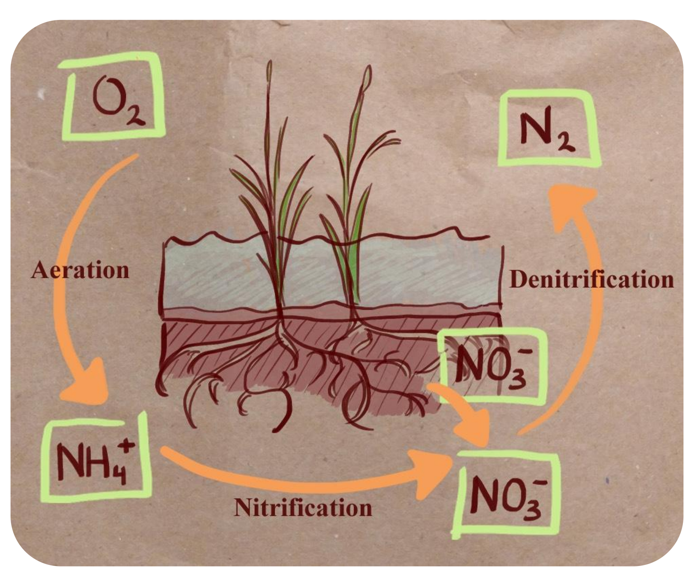
Introduction

- Salt marshes play an important role in coastal ecosystems. They reduce flooding, provide habitat for fish and wildlife, sequester carbon, and reduce nutrient pollution.
- Salt marshes are being lost in New York City and elsewhere, depriving human communities of the services they provide.

Objectives

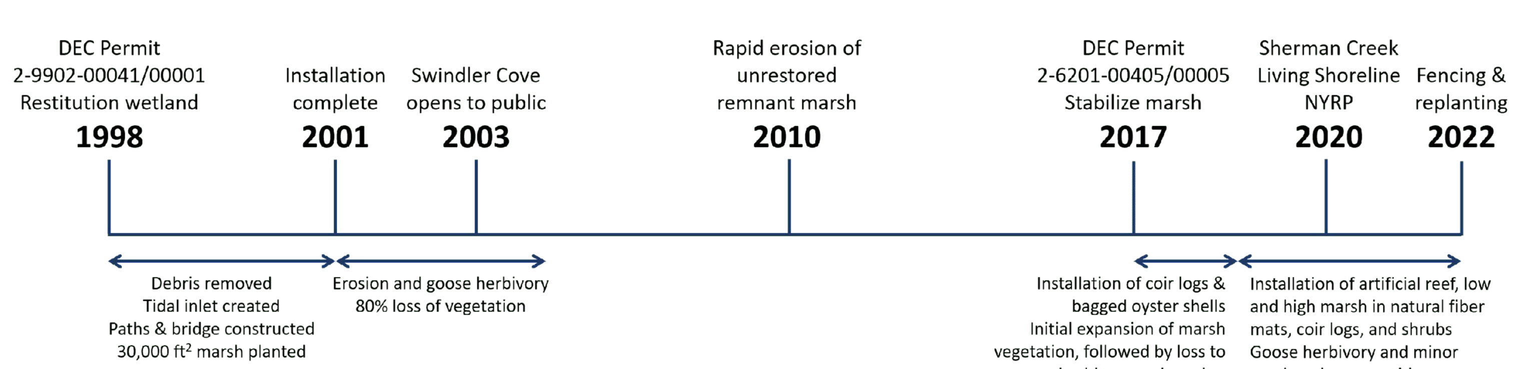
Problem: Due to their importance, coastal cities invest in restoring salt marshes. However, it is unclear if restored marshes provide the same benefits as the existing marshes. This study quantified denitrification, a microbial process that turns nitrate into nitrogen gas, which improves water quality.

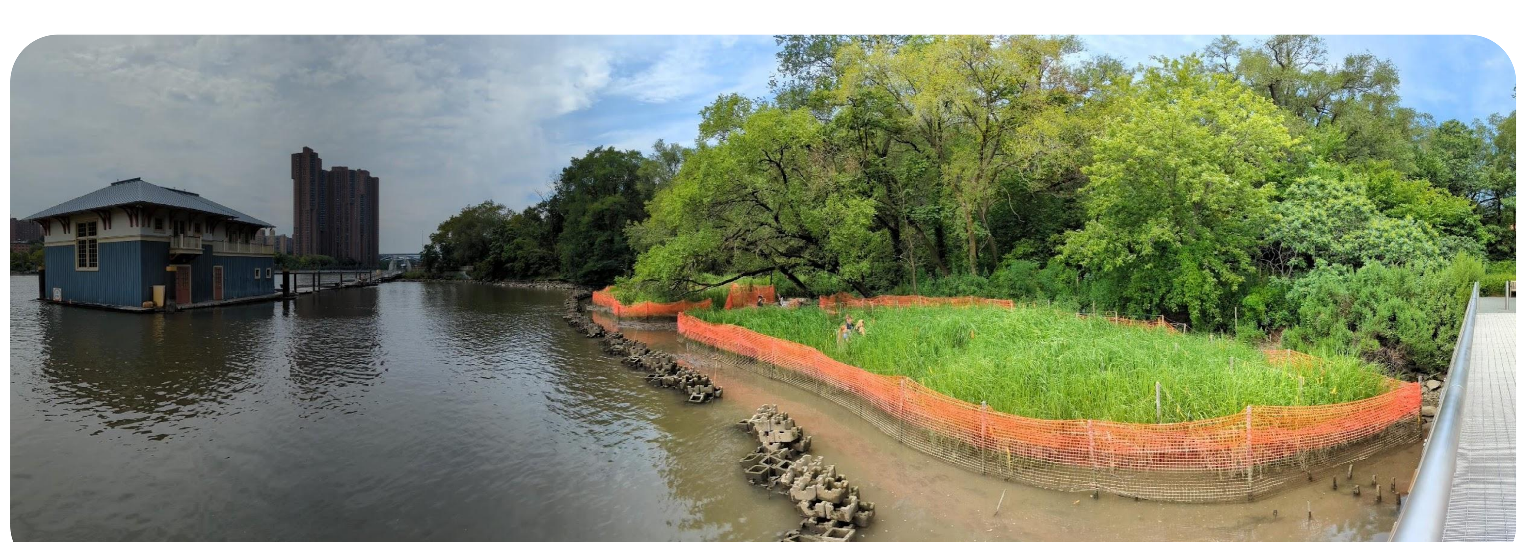
Hypothesis: We predicted the existing marsh would support the highest rates of denitrification, but the restored marsh would support higher rates than mudflat and riprap sites it replaced.



Study Site

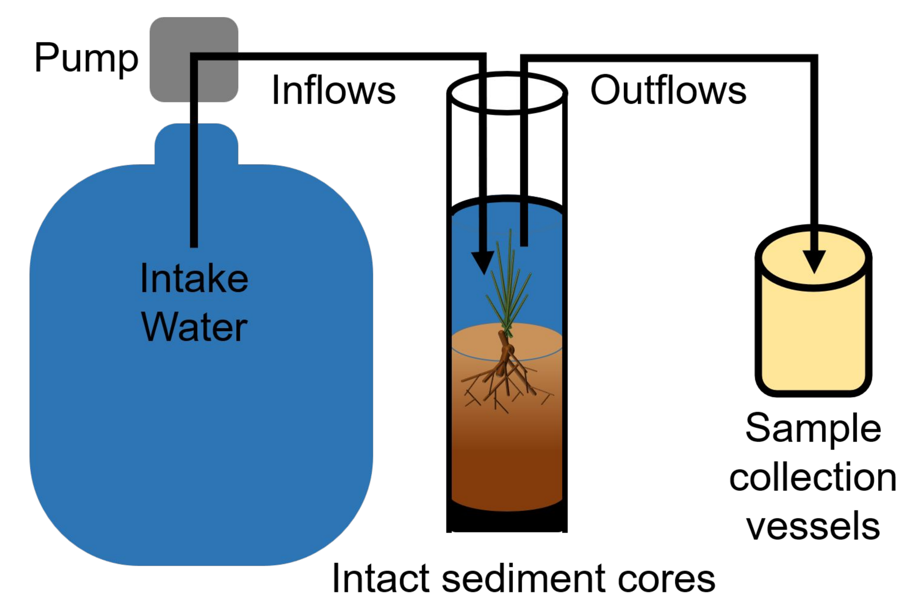
Sherman Creek Park is located on the Harlem River in the Inwood section of Manhattan.





Methodology

We collected 16 sediment cores, with 4 cores from each habitat type (existing marsh, restored marsh, mudflat, and rip rap). Cores were brought to the lab and used in a continuous flow core incubation. We measured nutrients and gases going in and out of each core, and the difference tells us about the processes the habitats are performing.



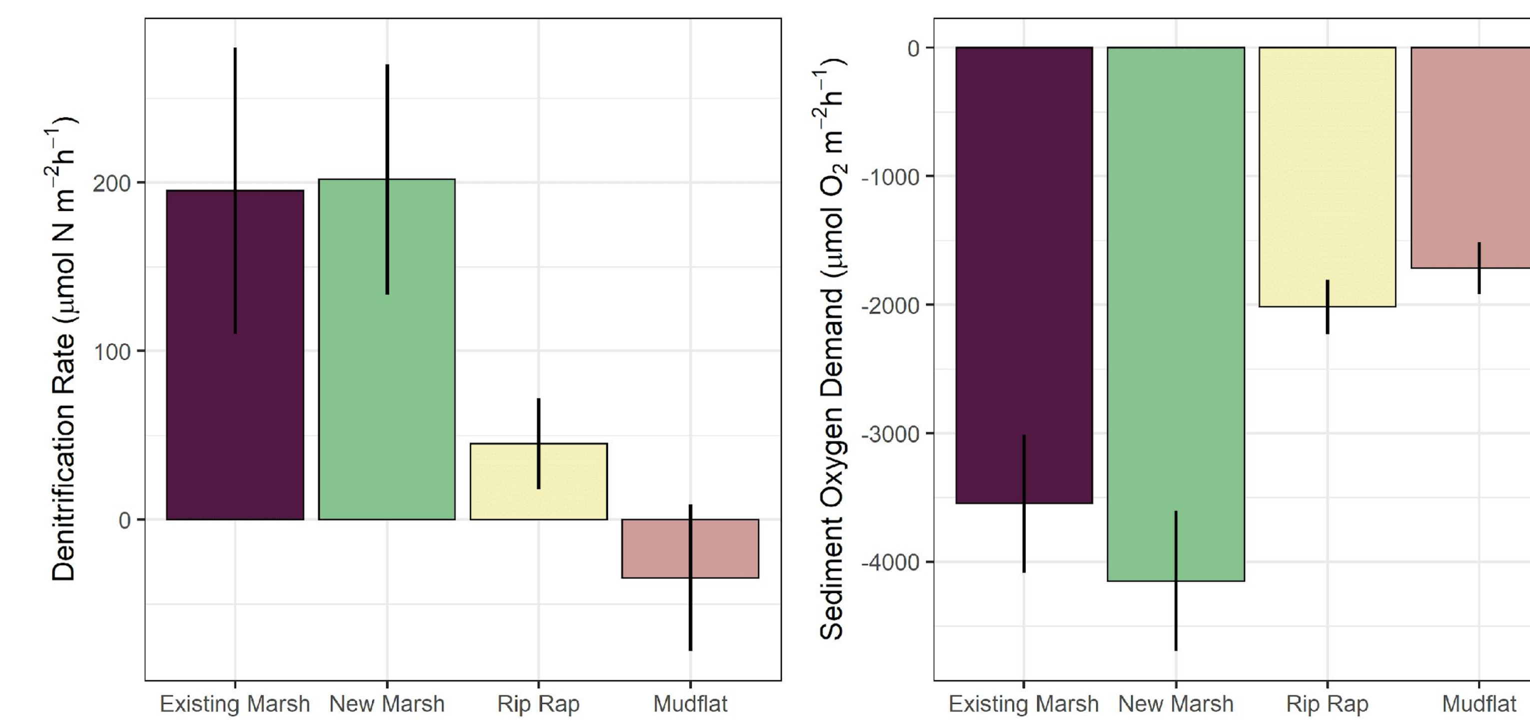
We collected sediment from each core to measure organic matter, carbon and nitrogen, and plant material to measure belowground and aboveground biomass from the restored and existing marshes.

Water samples were collected from the cores in gas-tight vials and measured on a membrane-inlet mass spectrometer.

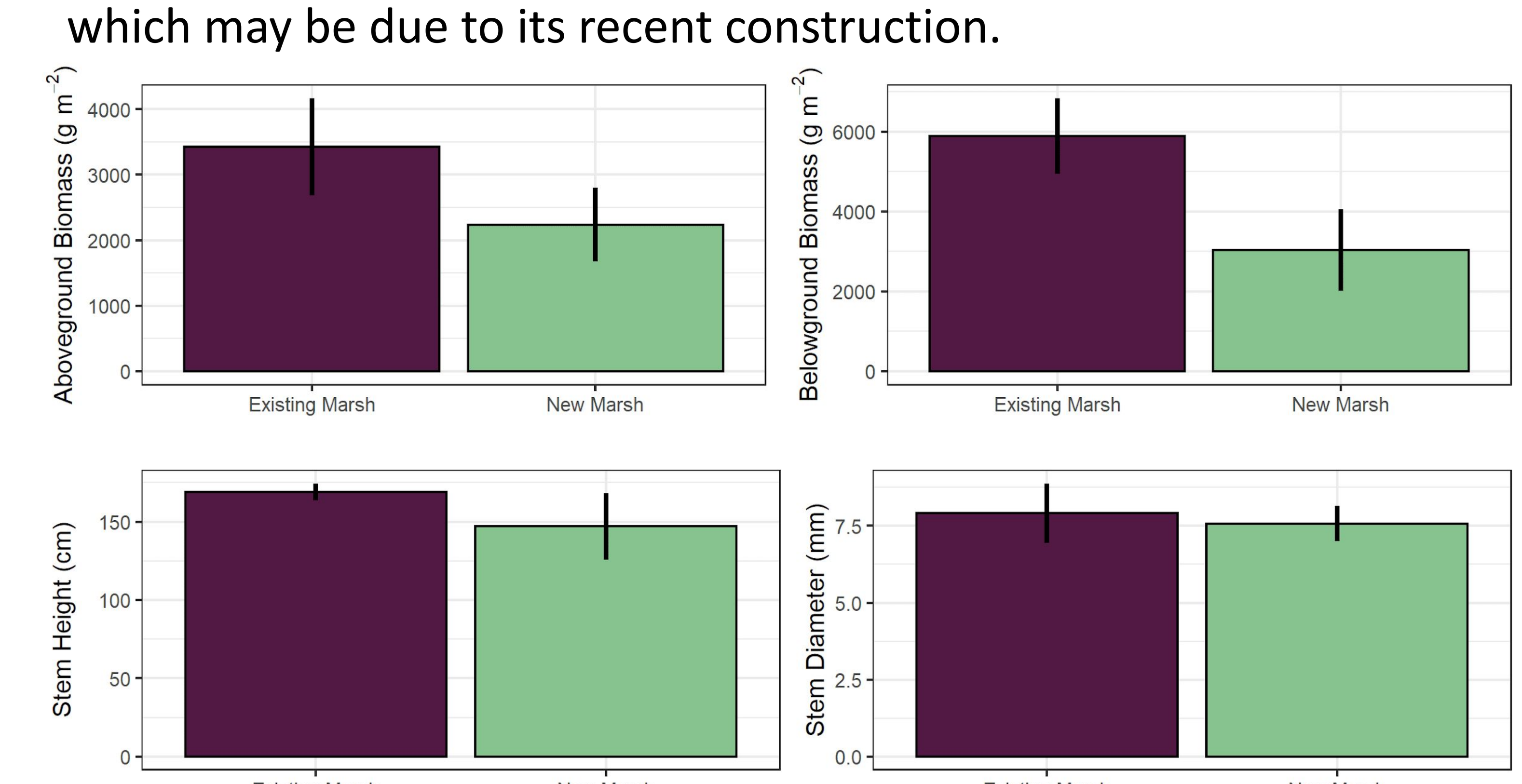
Sediment and plant samples were processed, dried, and weighed in the lab to quantify plant traits.

Results

Gas Fluxes: The restored marsh had similar rates of denitrification and oxygen demand as the existing marsh. Both marsh sites had higher rates than the mudflat and rip rap sites.



Plant Traits: Both marshes show a similar statistic of stem height and stem width, however the restored marshes biomass is lower, which may be due to its recent construction.



Conclusions

We expected the existing marsh would support higher rates of denitrification than the restored marsh. However, we found similar rates within one year of successful plant growth. Efforts to restore nitrogen-removal services appear to be successful in this site.

Acknowledgements

We would like to thank the staff members of RISE for this opportunity to work on a research project. We would like to thank Beryl Kahn, Shannon Cooper, Maddie Frank, Caroline Morris, Amanda Flores, and Julia Greer for their help in the lab.