Impact of Strategic, Unconfined, Dredged Material Placement on Turbidity within a Shallow Back Bay System: Observations from Seven Mile Island Innovation Laboratory, NJ

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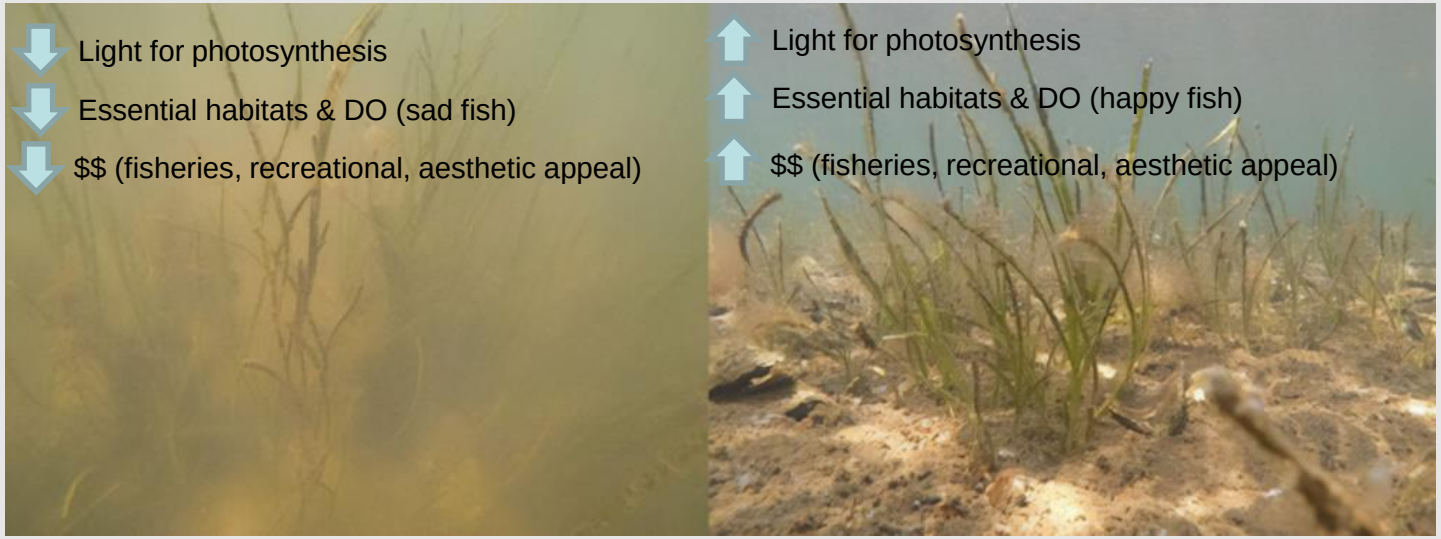
Problem: Lack of sediment availability to vulnerable coastal areas.
Solution: Strategic placement of fine sediments dredged from navigation channels is a promising method for increasing marsh accretion rates…..

But a significant challenge for unconfined sediment placement in shallow water areas is concern related to the degree of and persistence of associated turbidity.

Turbidity=measure of the degree to which water loses its transparency due to the presence of suspended particles.



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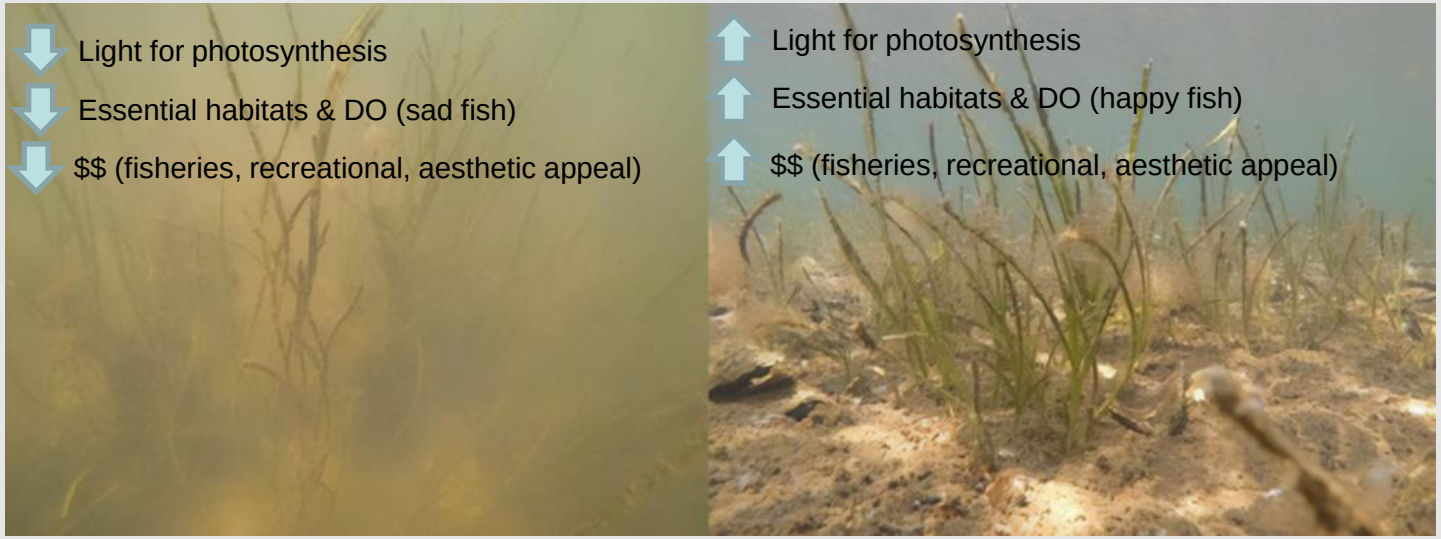
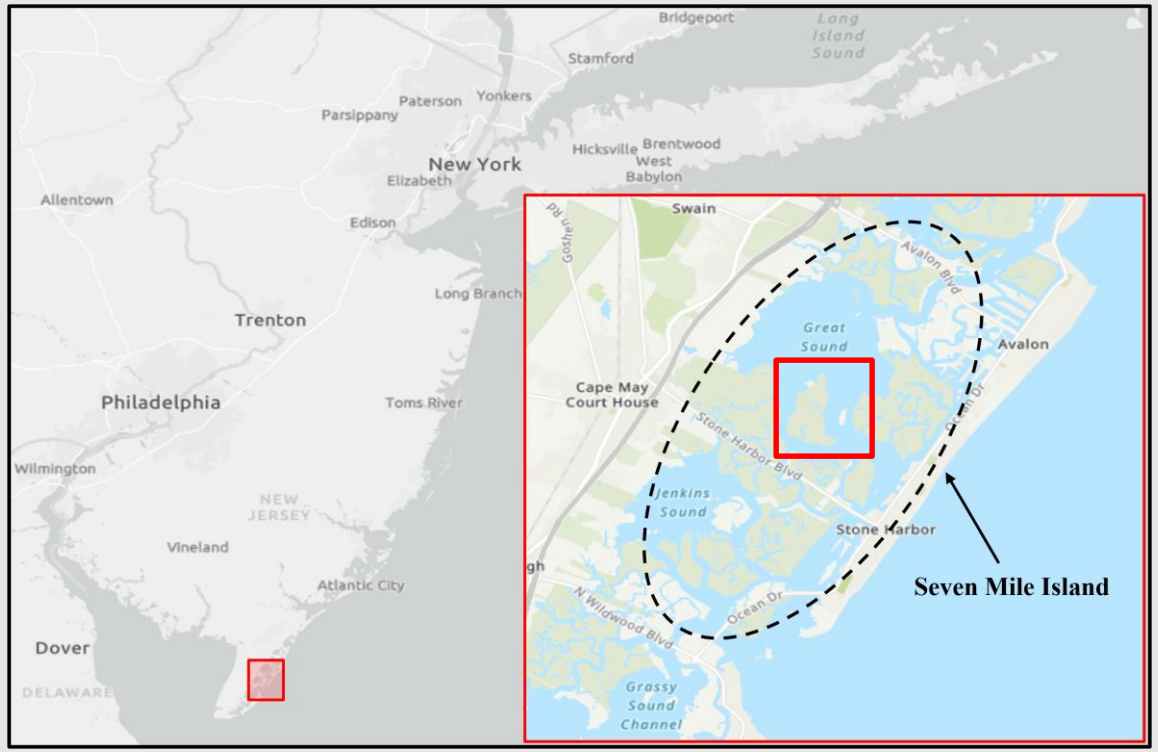


The objective of this work was to **document turbidity resulting from placement** in nearshore areas and on marshes from beneficial use projects designed to enhance marsh resilience.

Seven Mile Island Innovation Laboratory (SMIIL)

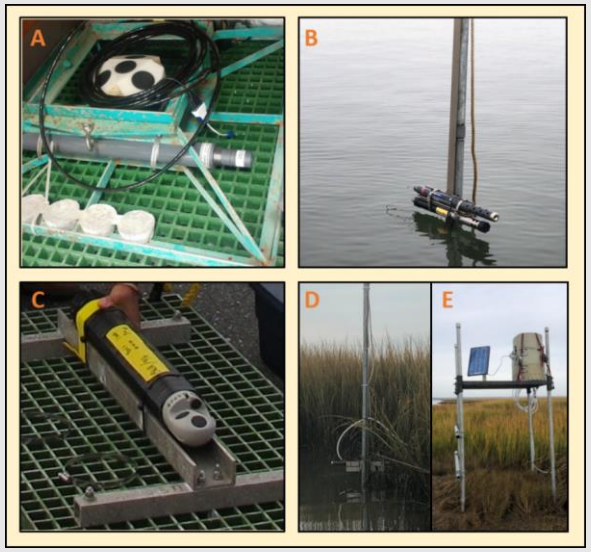


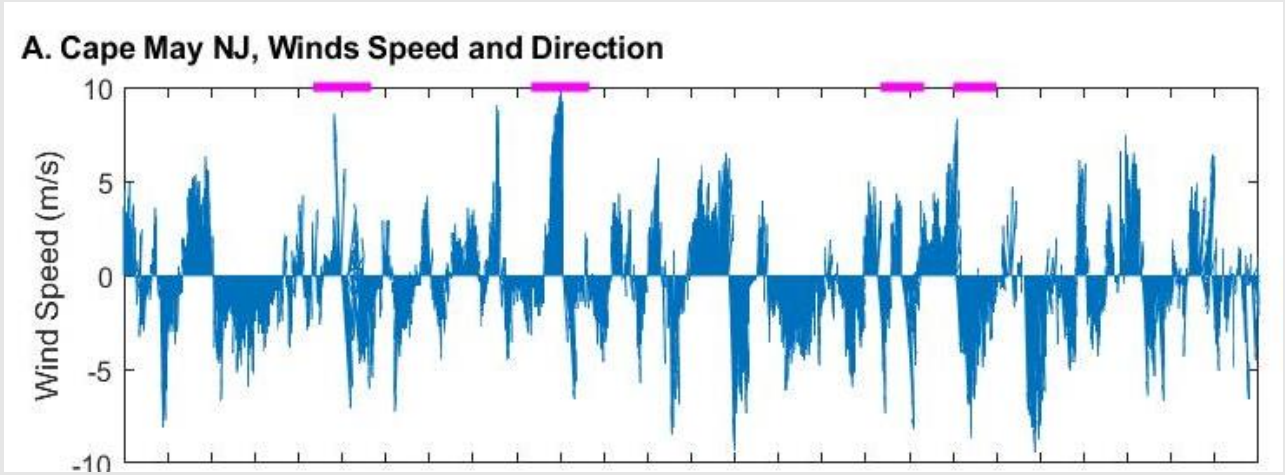
- Launched in 2019 (NAP+ERDC+NJ+TWI) to advance and improve dredging, beneficial use, and marsh restoration techniques.
- Located along the southern coast of New Jersey in Cape May County.
- Encompasses 24 mi^2, and15,000 acres of Back Bay Tidal Marshes, Shallow Bays, and Inlets

In 2020, NAP, ERDC,TWI and NJDEP, undertook a series of beneficial use projects on Gull and Sturgeon Islands, to address marsh and wading bird colony vulnerability.

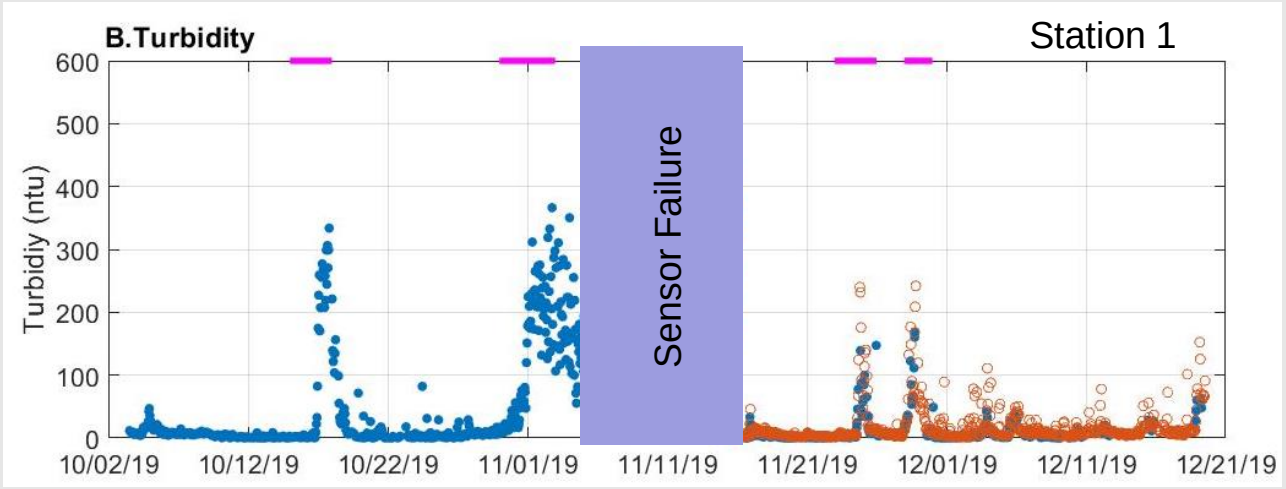
Pre-placement monitoring of hydrodynamics, turbidity, and total suspended solids at SMIIL

October-December 2019





*Wind arrow points to direction wind is blowing towards



Spikes in turbidity (250-380 ntus) during periods of winds >5m/s, correspond to passage of Nor'easter and southerly wind event.

Apart from punctuated wind events, the area is generally calm and waters are clear.

Generally:

- Small waves, <0.25 m
- Weak current (~0.1 m/s),
- Low turbidity (~10 ntus)
- Low SSC (~10–20 mg/L).

Turbidity Monitoring of 2020 Placements at Gull and Sturgeon.


Vessel mounted turbidity sensor


Vessel completing turbidity survey during Gull 2020 placement.


Dredge Fullerton (Barnegat Bay Dredging Co.)

Sturgeon: March 2020

Material was pumped onto marsh platform on northern part of island.

Gull: September-October, 2020.

Material was pumped from a floating discharge pipe, along the southern edge.

Placement on northern Sturgeon in March 2020

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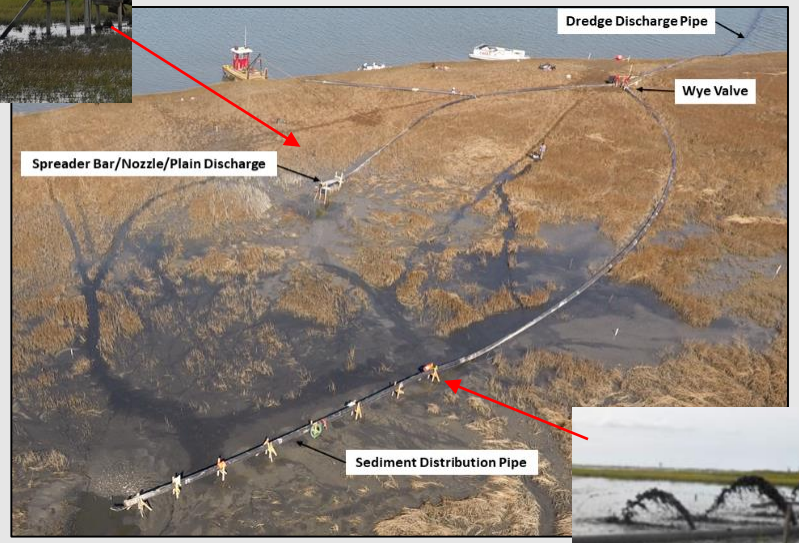
March 2020 Placement: Sturgeon Island (on Marsh)



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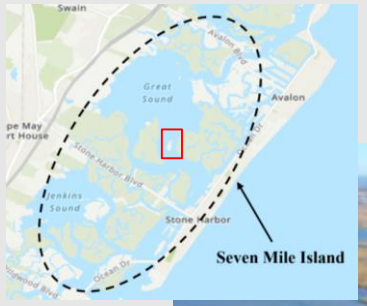
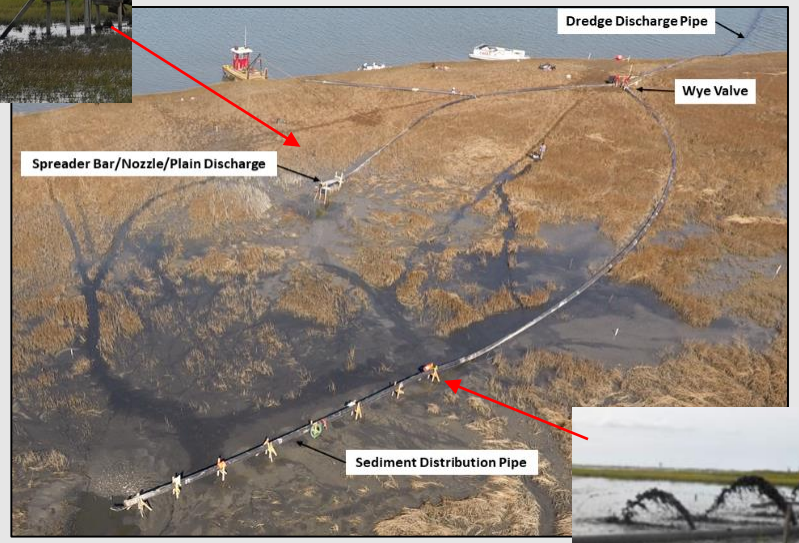
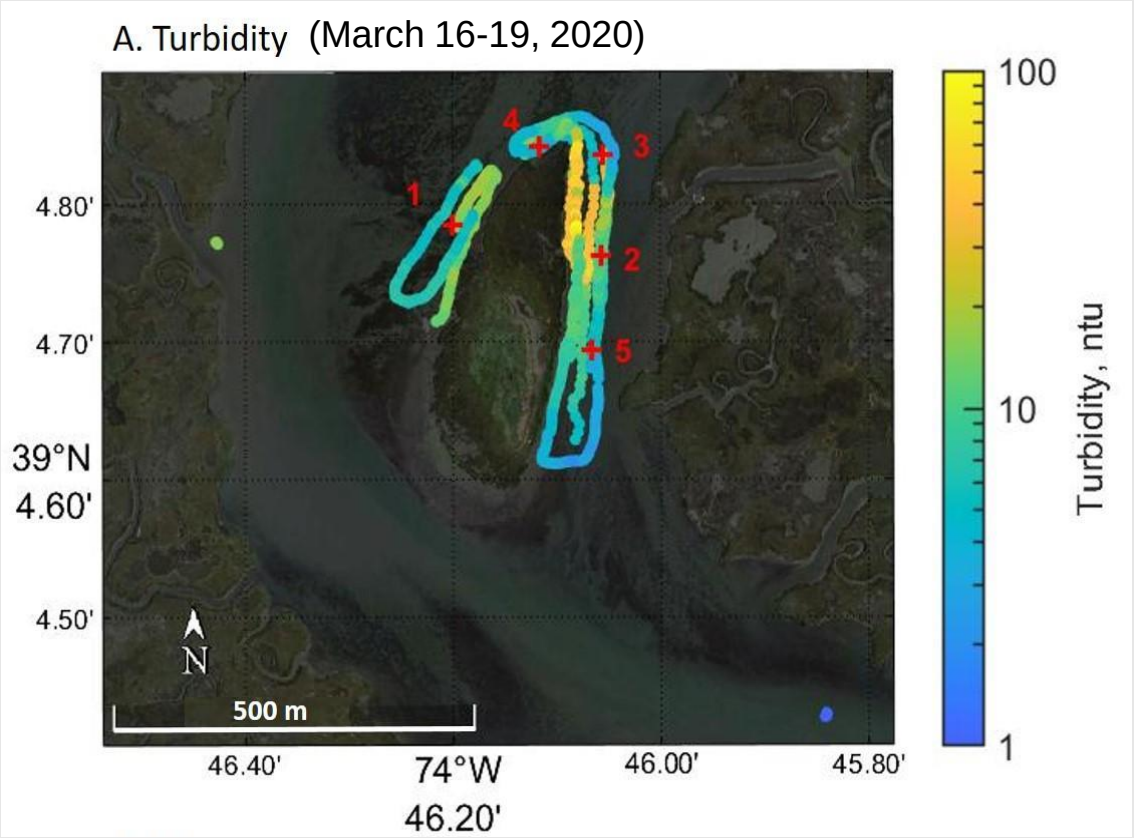
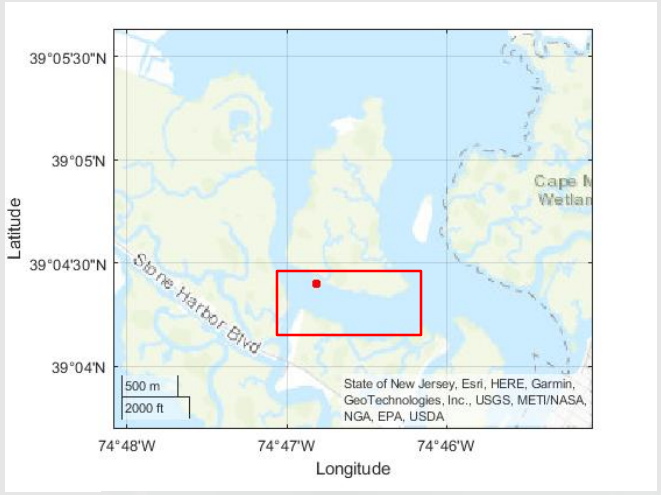






Little to no turbidity plume, outside of the tidal creek mouth on NE side of island.

September- October 2020 Placement: Gull Island (in water near marsh edge)



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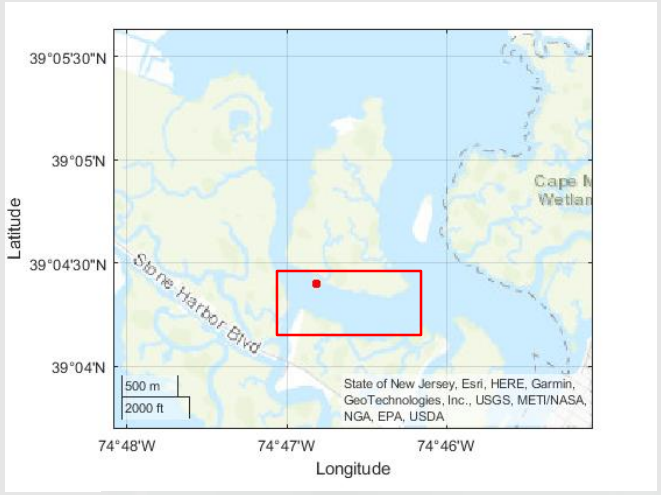

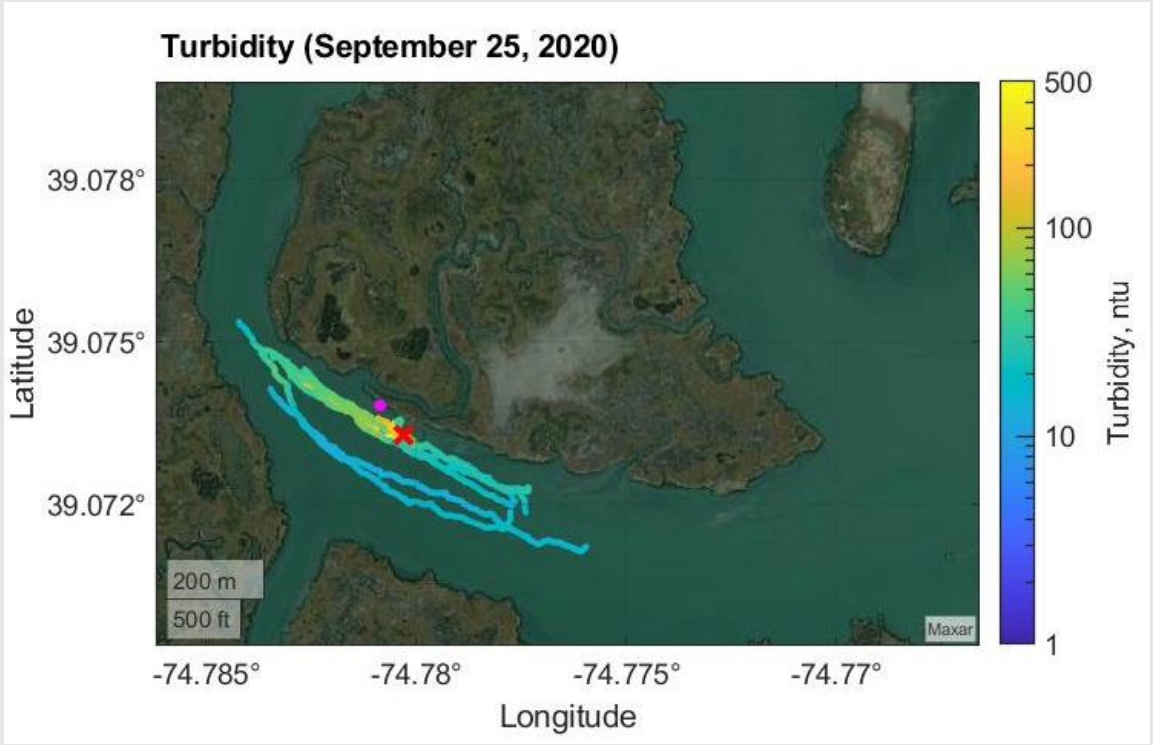

Turbidity plume was localized, only extending about 50 m off the marsh edge and <200 m along shore.

Direction of plume related to the tide.

Conclusions

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In calm, back bay systems, strategic placement practices are a promising method for increasing marsh and near marsh accretion rates, while having minimal far-field turbidity impacts.