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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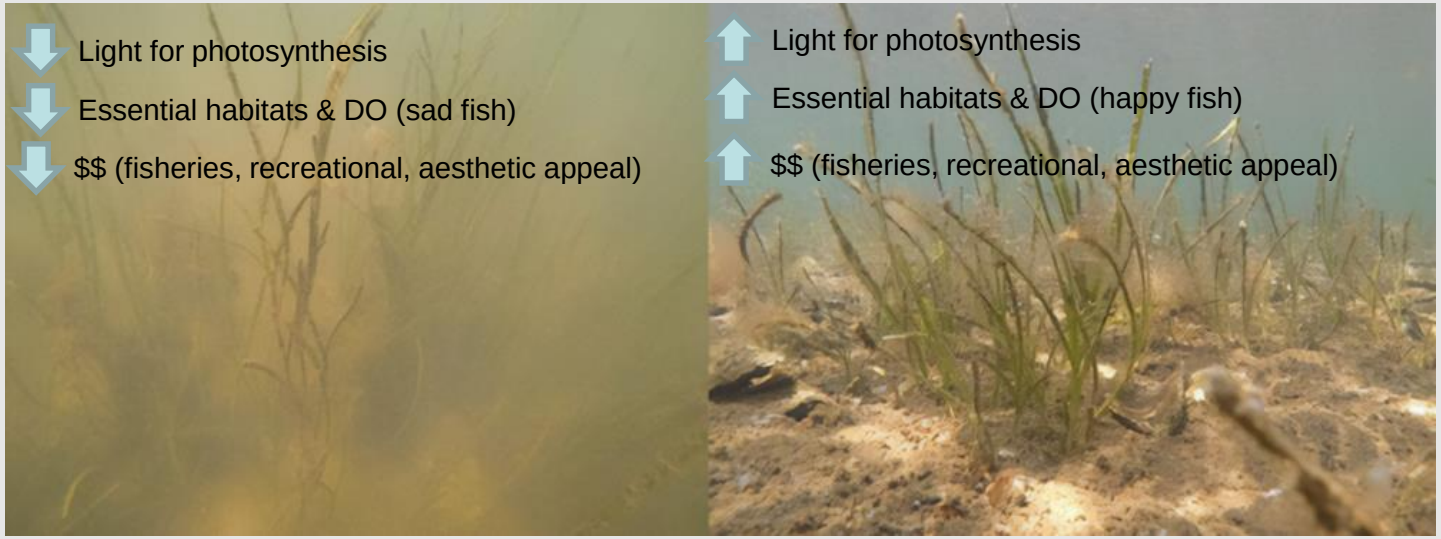
ERDC ENGINEER RESEARCH & DEVELOPMENT CENTER
CHL COASTAL & HYDRAULICS LABORATORY
Wetlands INSTITUTE

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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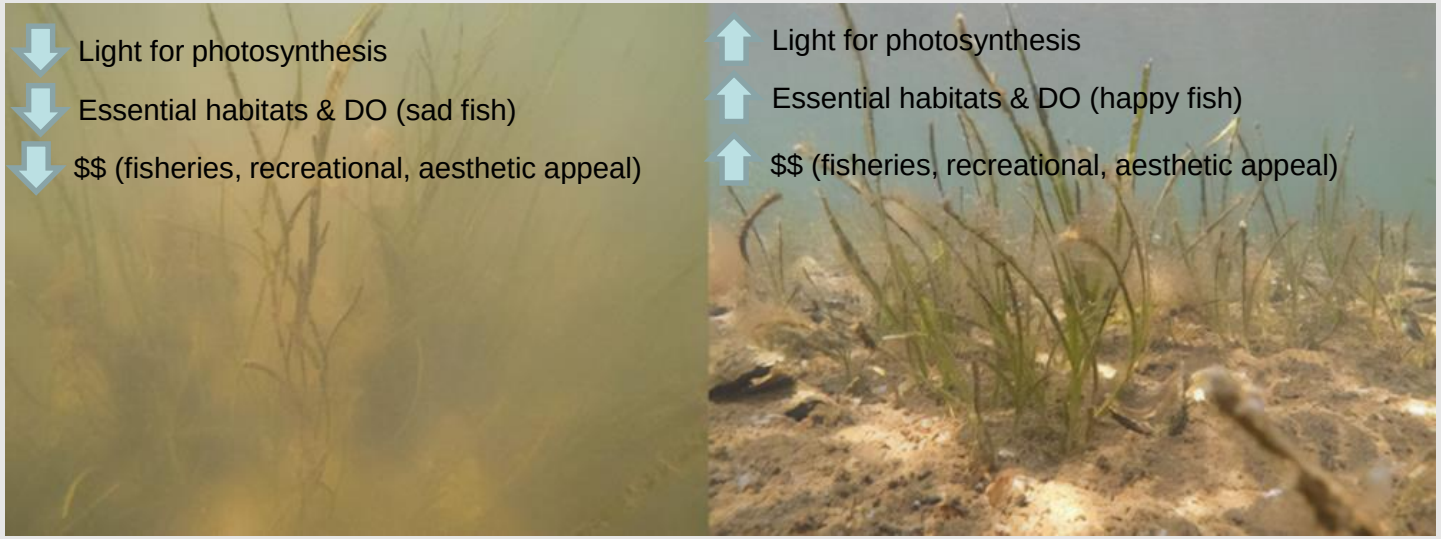
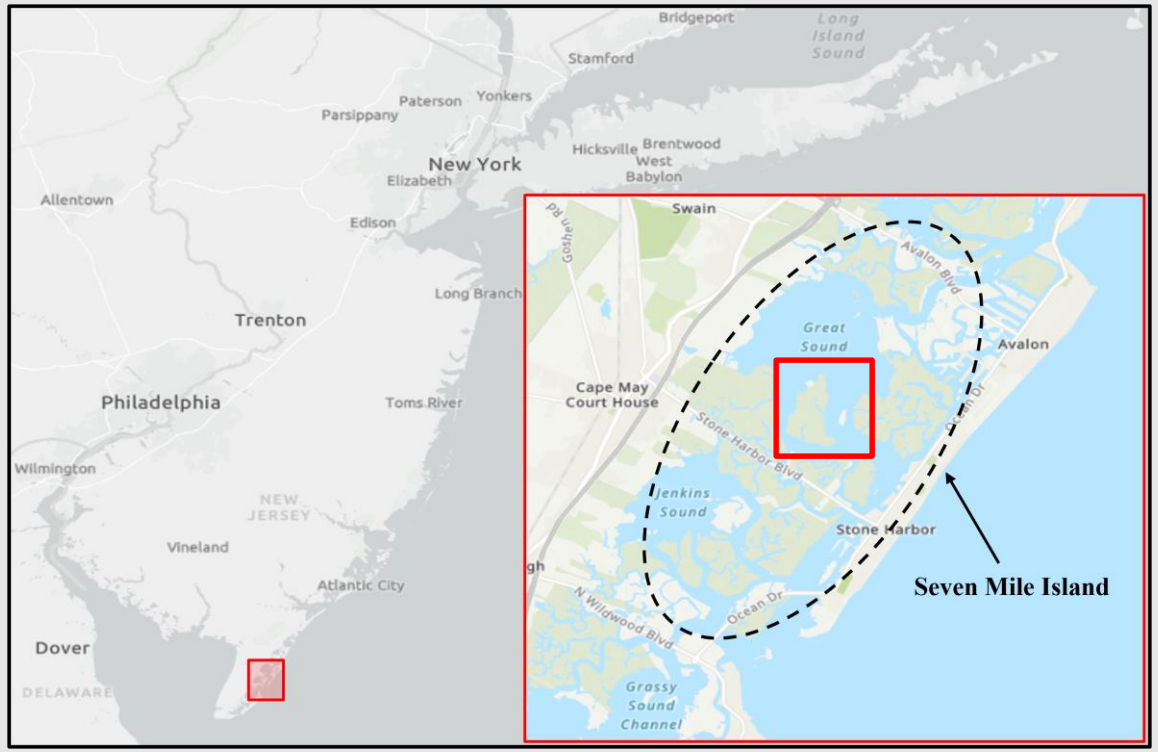


The objective of this work was to **document turbidity resulting from placement** in nearshore areas and on marshes from beneficial use projects designed to enhance marsh resilience.

Seven Mile Island Innovation Laboratory (SMIIL)

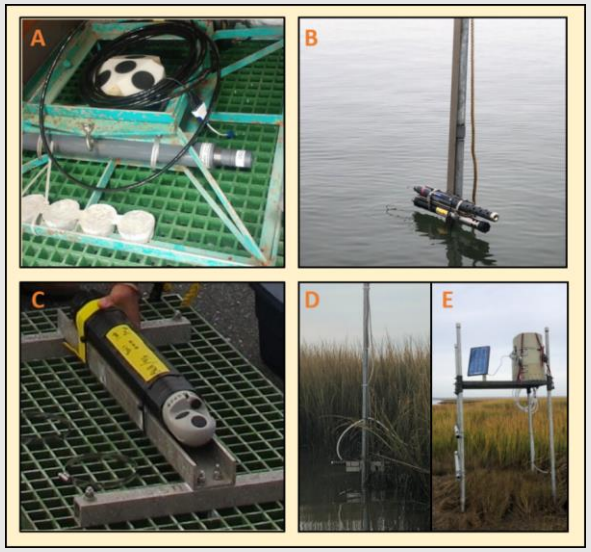


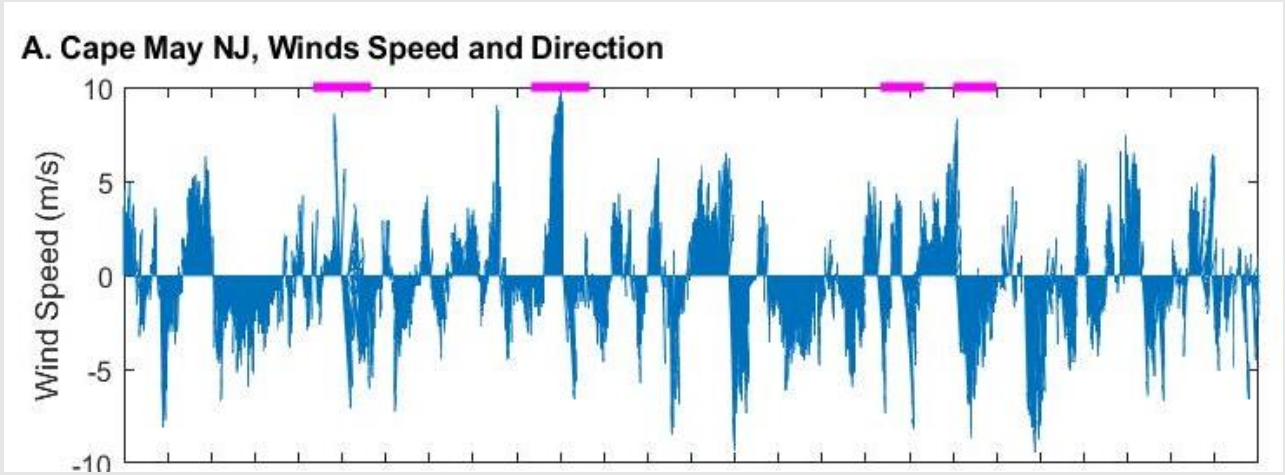
- Launched in 2019 (NAP+ERDC+NJ+TWI) to advance and improve dredging, beneficial use, and marsh restoration techniques.
- Located along the southern coast of New Jersey in Cape May County.
- Encompasses 24 mi^2, and15,000 acres of Back Bay Tidal Marshes, Shallow Bays, and Inlets

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.

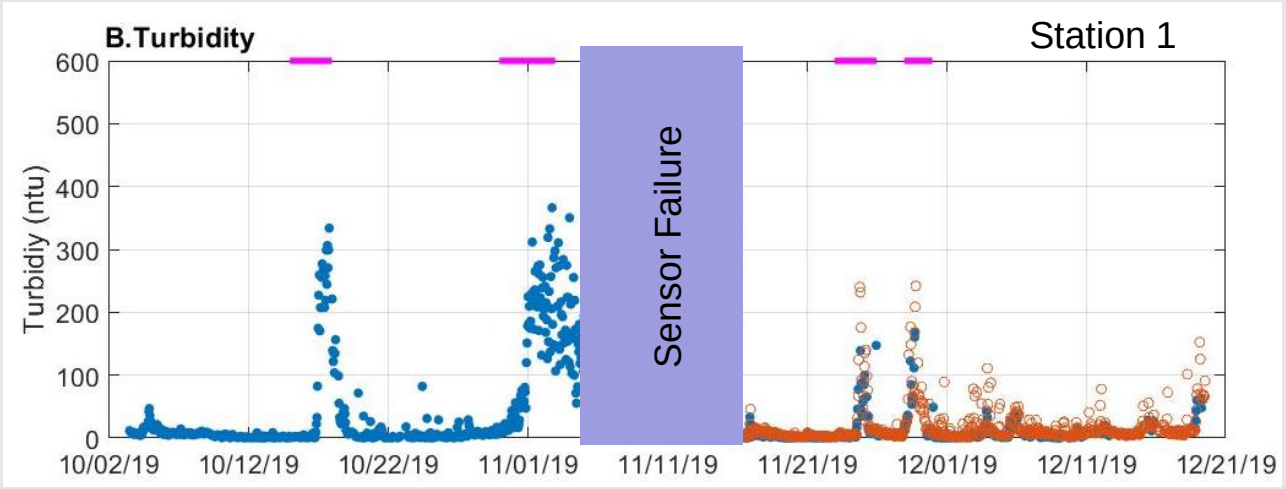
Pre-placement monitoring of hydrodynamics, turbidity, and total suspended solids at SMIIL

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.

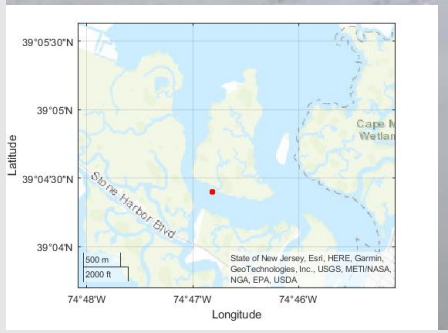
Generally:

- 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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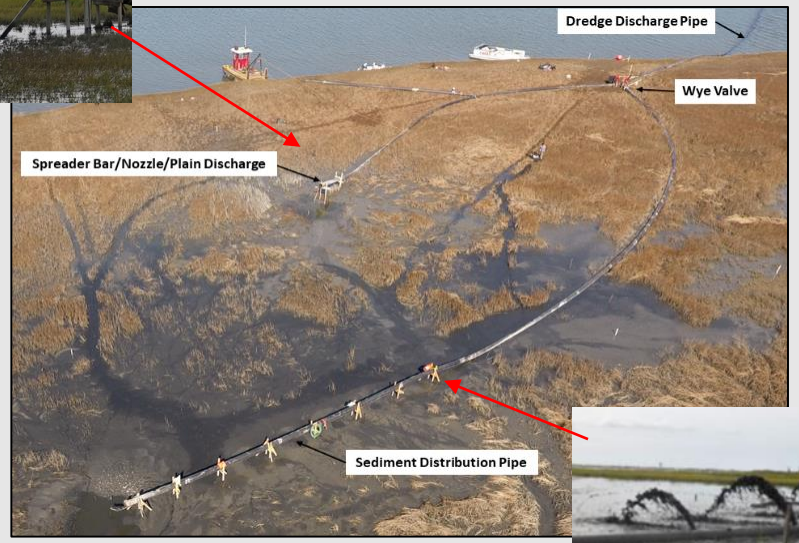
March 2020 Placement: Sturgeon Island (on Marsh)



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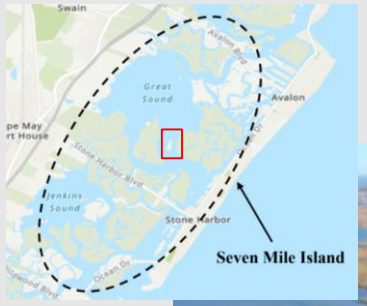
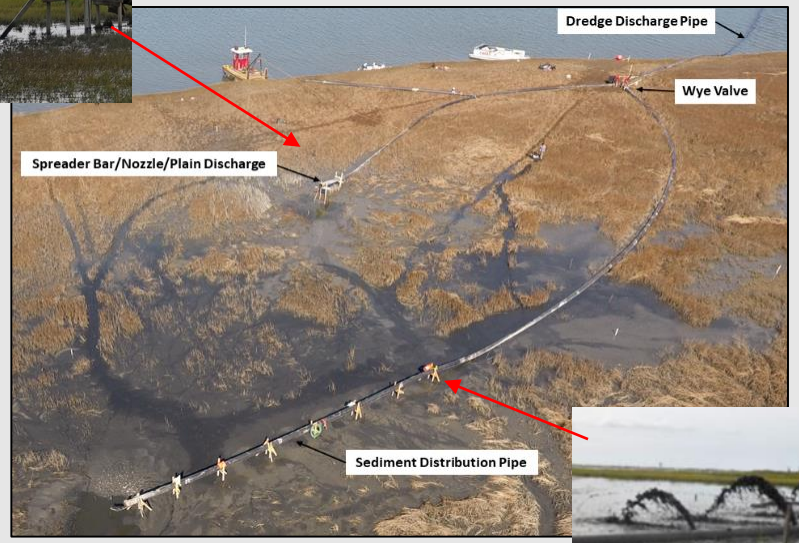
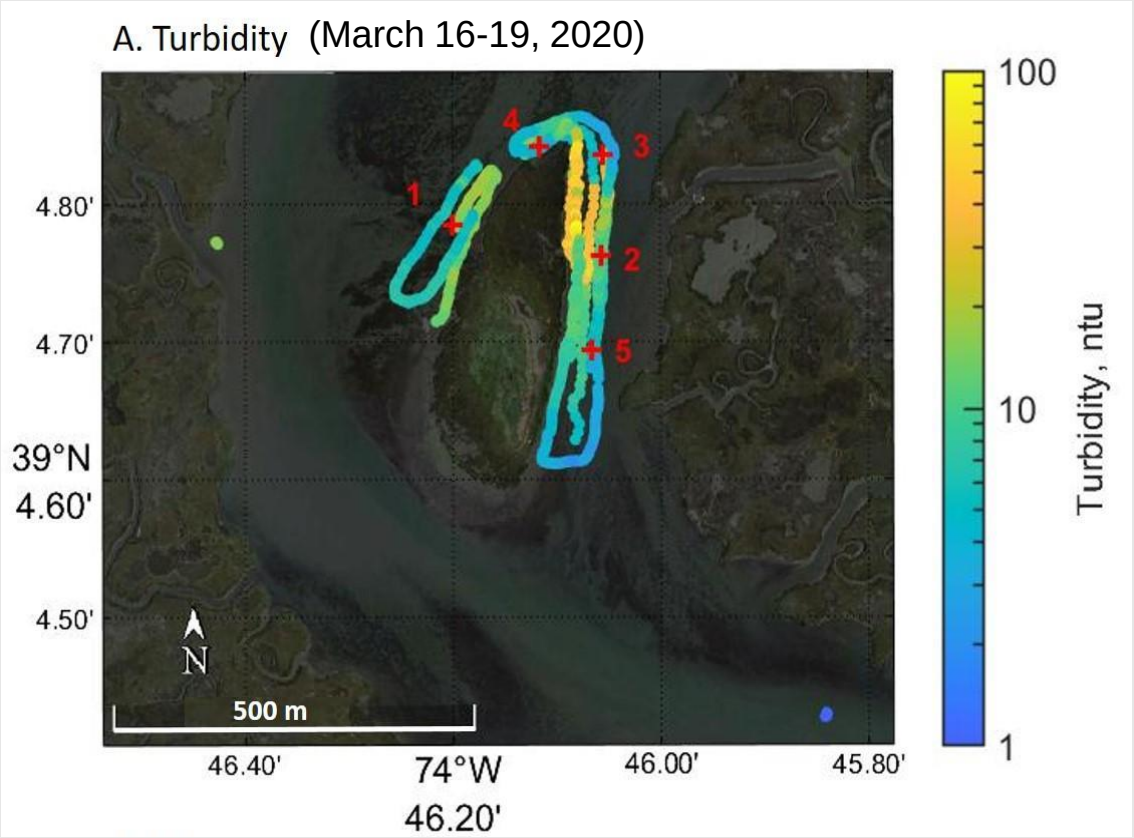
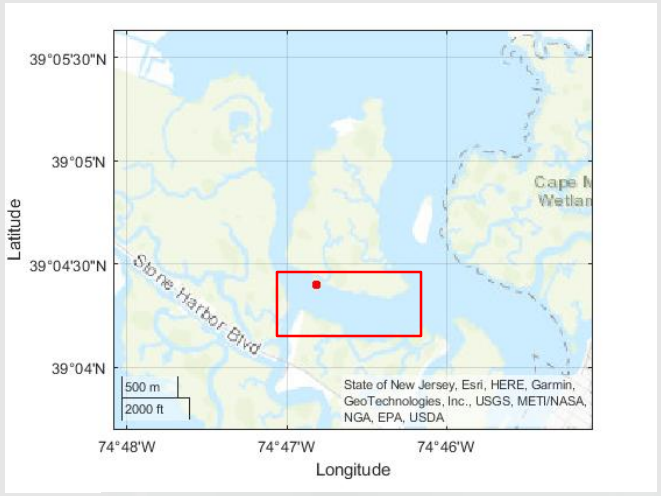






Little to no turbidity plume, outside of the tidal creek mouth on NE side of island.

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



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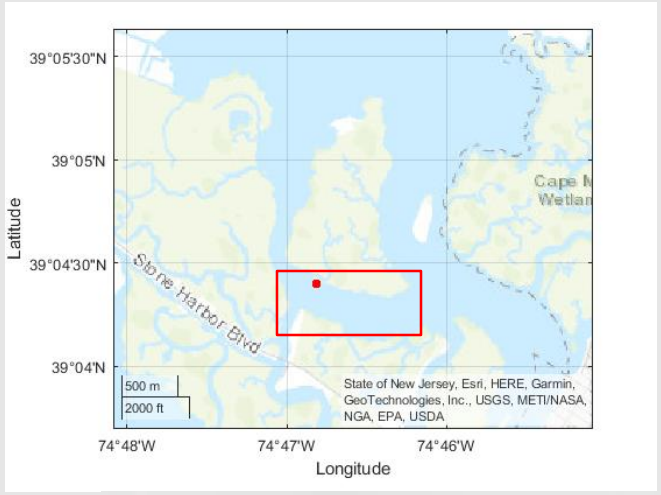

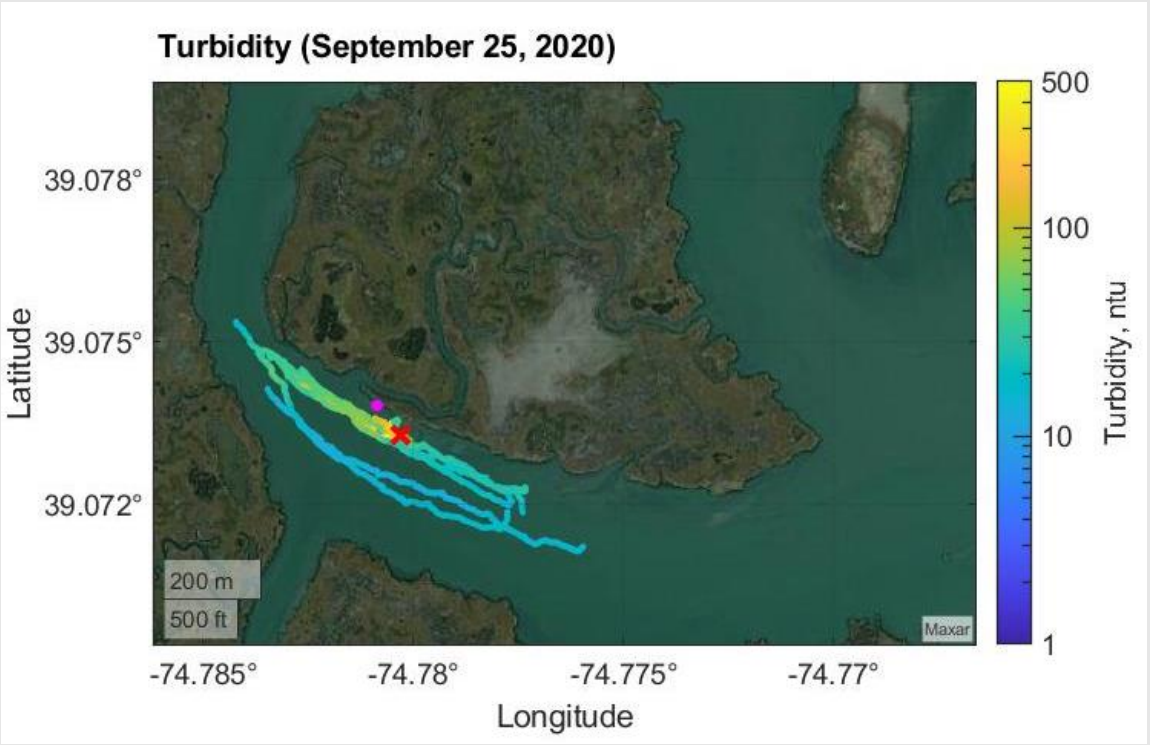

Turbidity plume was localized, only extending about 50 m off the marsh edge and <200 m along shore.

Direction of plume related to the tide.

Conclusions

Turbidity monitoring suggests the influence of excess turbidity associated with unconfined placement was minimal (temporally and spatially) and levels were not significantly different from conditions previously observed during storm or high wind conditions.

In this environment during placement in the nearshore, the direction of plume was related to the tide. This is very helpful in planning future strategic placements.

Created berm feature along marsh edge at Gull (Dave Perkey will describe next)

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.