

The impact of boat wake on submerged aquatic vegetation (SAV) in Bogue Sound, North Carolina

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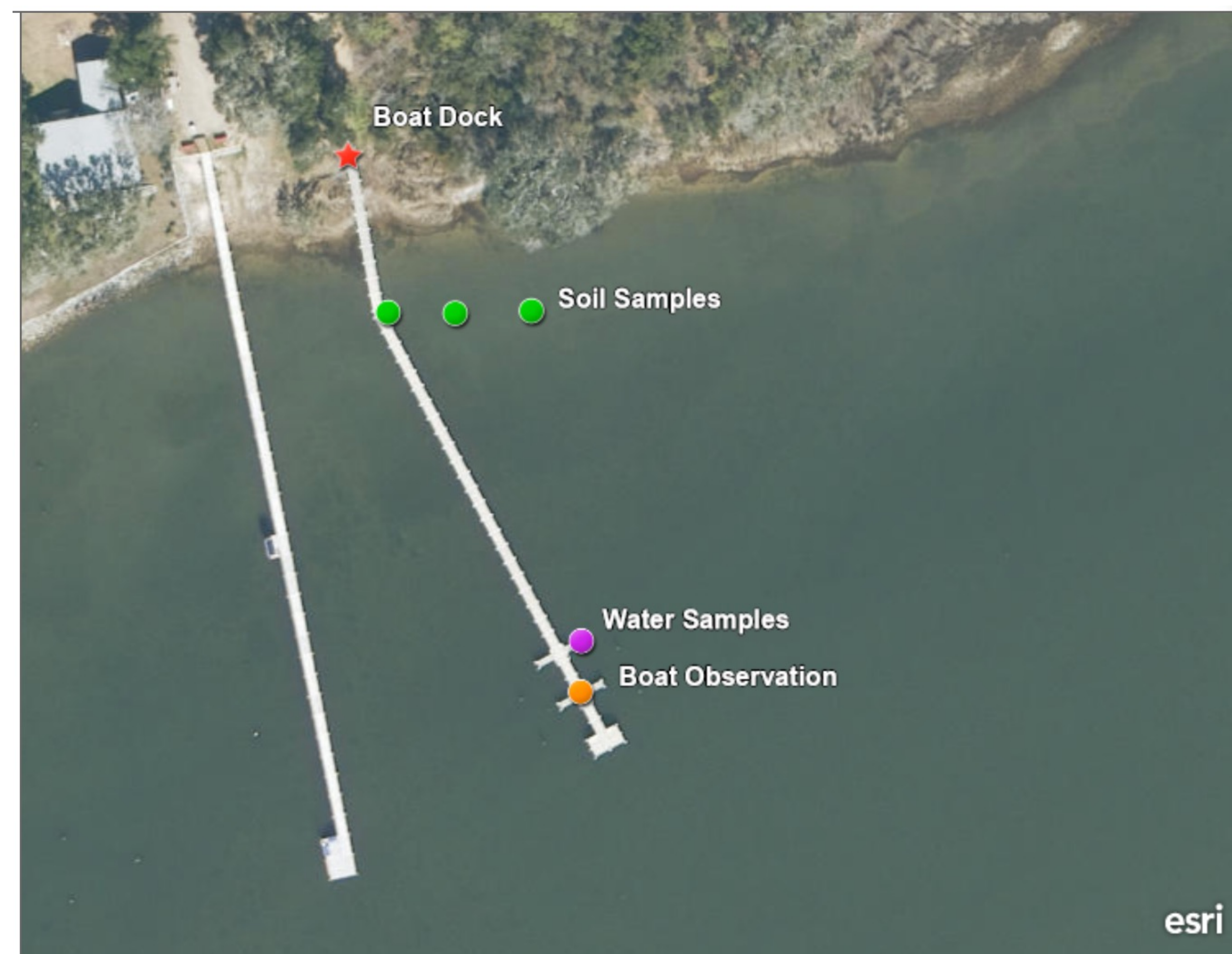


Figure 1. Location of samples

Introduction

- SAV is seagrass and attached algae that provides many ecosystem services
 - Its roots hold down sediment, so waves and currents do not wash it away
 - Its blades slow down waves before they hit the shore (Smith et al., 2019)
- Boat traffic is increasing as coastal populations grow causing indirect and direct impacts on SAV (NC Wildlife Commission, 2021)
 - Directly impacting SAV through propellers scarring or breaking off shoots
 - Indirectly causing turbulence and mixing up sediments reducing light clarity or smothering SAV (Hansen et al., 2019)
- Other factors affect SAV besides boats
 - Wind, currents, and tides
 - Shoreline characteristics like vegetation, slope, and sediment types (Bilkovic et al, 2017)

Hypothesis

Aim: Determine the cause of SAV decline in Bogue Sound, NC in the area in which a regional boat dock is going to be built

- Investigate historical changes in shoreline and SAV cover
- Examine chlorophyll-*a* and colored dissolved organic matter
- Determine sediment stability through size and shear strength of particles
- Examine turbidity as an effect of boat wake

Hypothesis: Turbidity caused by boat wakes in the Atlantic Intercostal Waterway is the main cause of SAV decline in this area.

Methodology

- Field sampling was done over Labor Day weekend (September 2021), weekends, and weekdays (October 2021) in the morning and evening (6 total visits)
- Observational data was collected for boat passages while turbidity was collected using a multiparameter YSI Sonde
- A bio-optical model using Chl_a, CDOM, and turbidity data was used to create light attenuation coefficients (Hall, 2022)

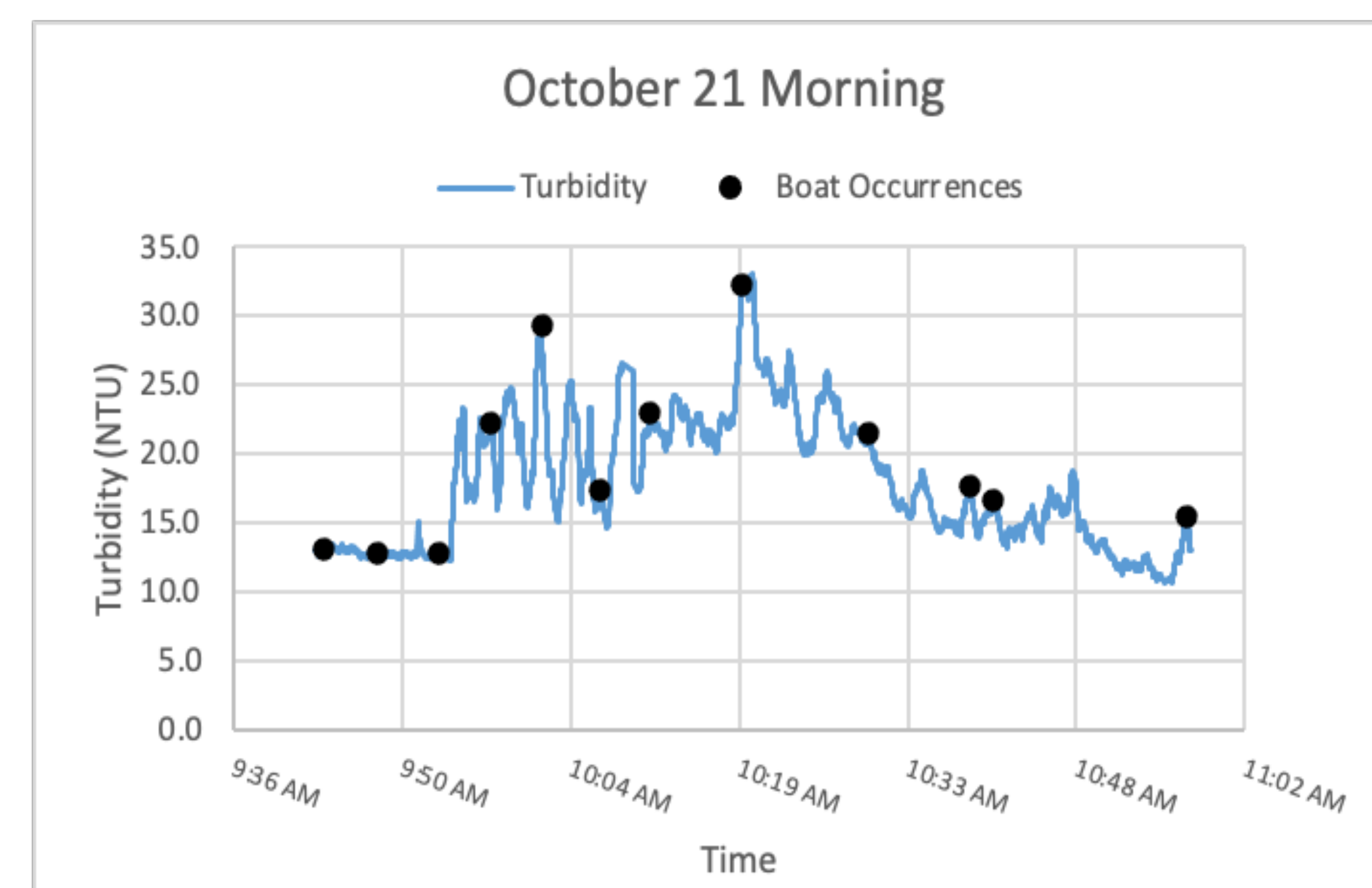


Figure 2. Turbidity and boat occurrences on a weekend morning

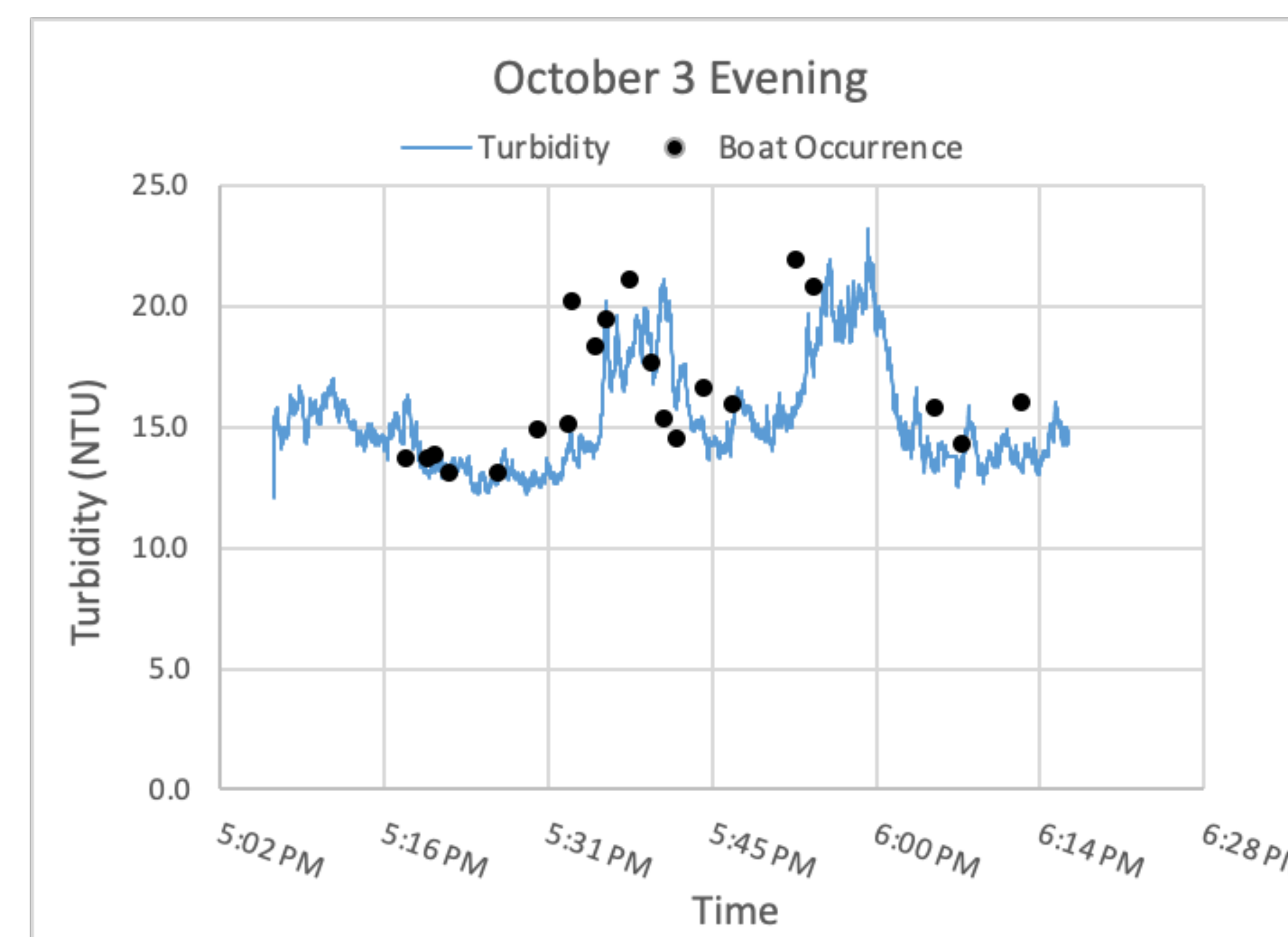


Figure 3. Turbidity and boat occurrences on a weekend evening

Results

- Turbidity spikes and boat observations do not always correspond (Fig 2 and 3)
- No trend is seen when comparing boat activity and average turbidity
- Sand is the most abundant material, but shear strength is highest where SAV is present
- Bogue Sound does not have ideal light clarity (>0.89 m⁻¹) for SAV growth
- A comparison of 2004 and 2012 shorelines shows regression landward
- A 2008 and 2013 SAV density and area comparison shows a decrease in density and area (NC Division of Coastal Management, n.d.)

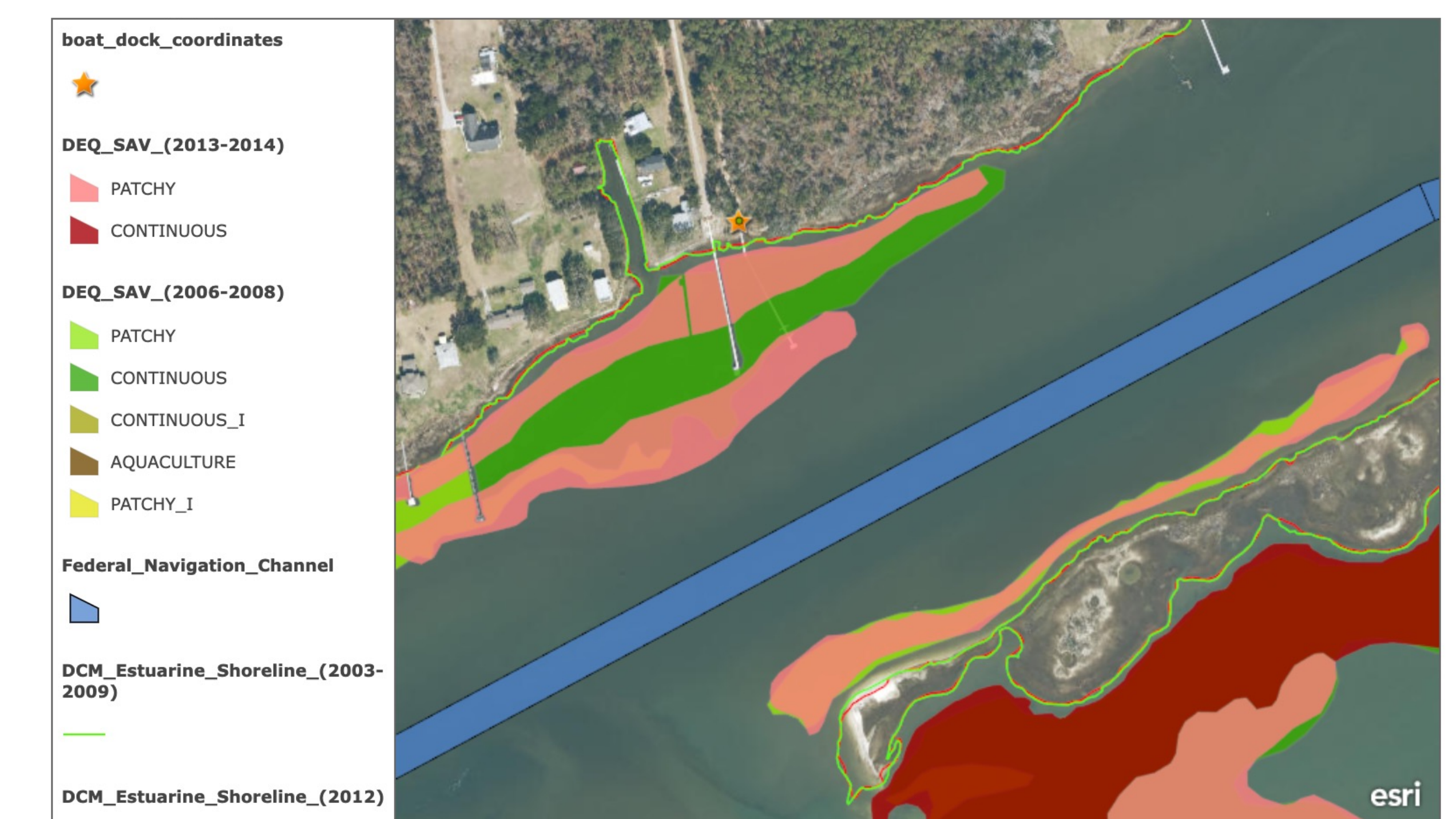


Figure 4. Shoreline and SAV area and density in the sampling area and compared to a reference site

Conclusion

Turbidity is not the most significant contributor to SAV decline in Bogue Sound, NC, as the passage of boats and spikes in turbidity do not always correspond and no trend in baseline turbidity activity can be seen.

As the sediment consists of finer, more easily eroded sand, actions like tide, current, waves, and turbidity can stir sediment up and carry it away causing a regression in shoreline and smothering SAV.

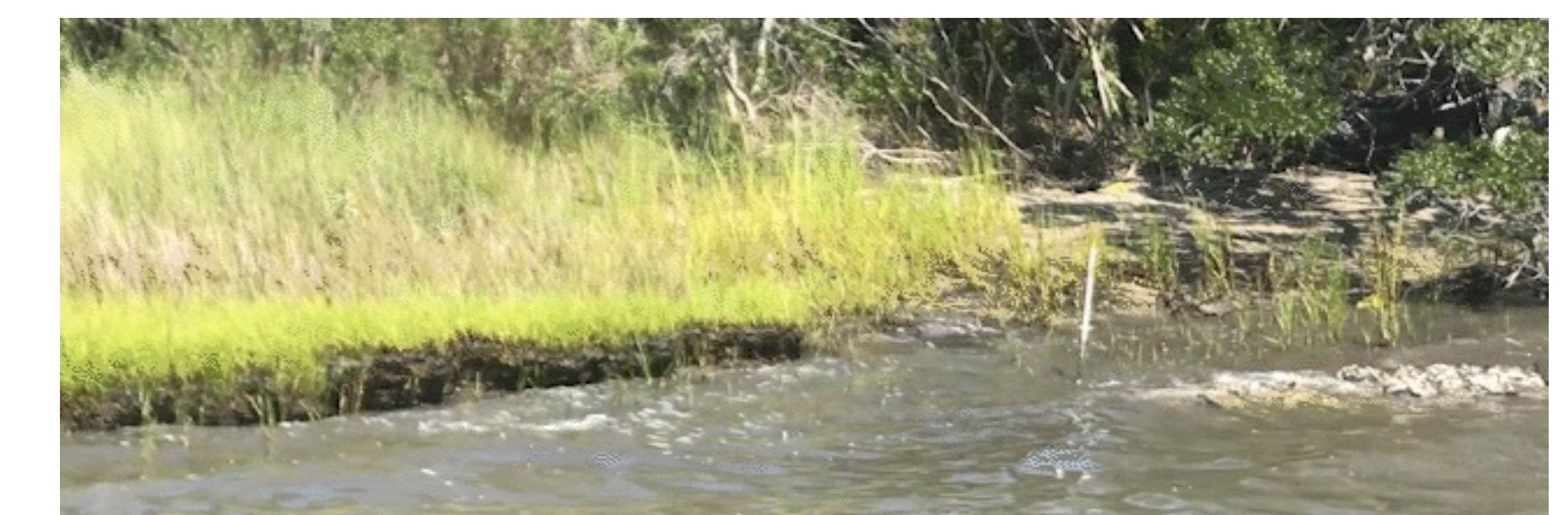


Figure 4. An image of the shoreline, SAV, and wave action at the sampling site

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References

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