

# WIND AND SALINITY AS DRIVERS OF DISSOLVED ORGANIC CARBON OUTWELLING IN TWO BRACKISH COASTAL MARSHES

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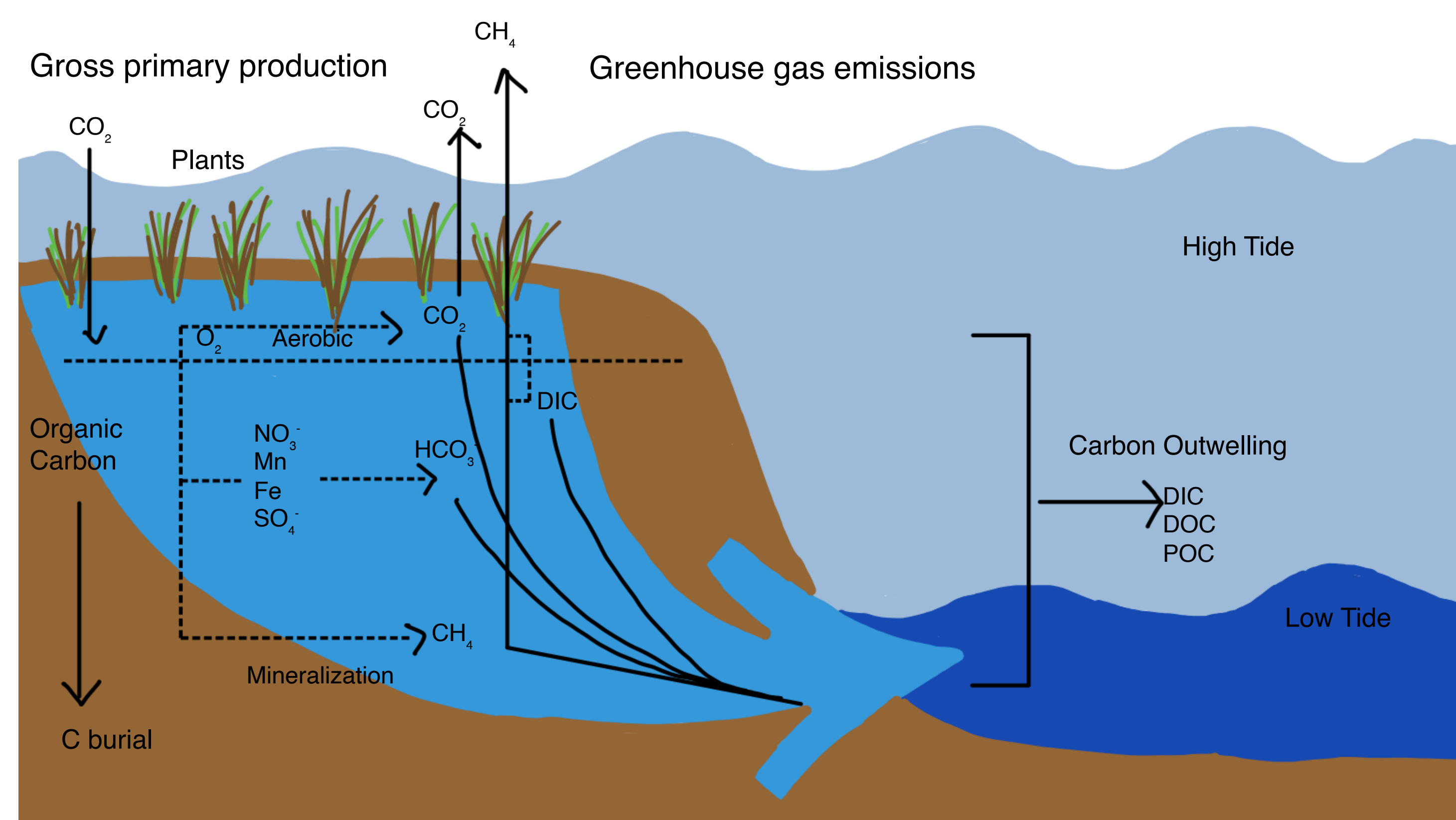
## BACKGROUND

- Brackish coastal marshes provide a variety of ecosystem services and play a major role in the global carbon cycle (Xin et al., 2022).
- Marshes are sinks of CO<sub>2</sub> and sources of dissolved organic carbon (DOC) (Fig. 1).
- Outwelling is the export of carbon and it supports coastal ocean productivity (Wolanski, 2007).
- Tides move water and solutes in marshes. Tides are wind-driven in the Albemarle Sound (Sincock et al., 1965).

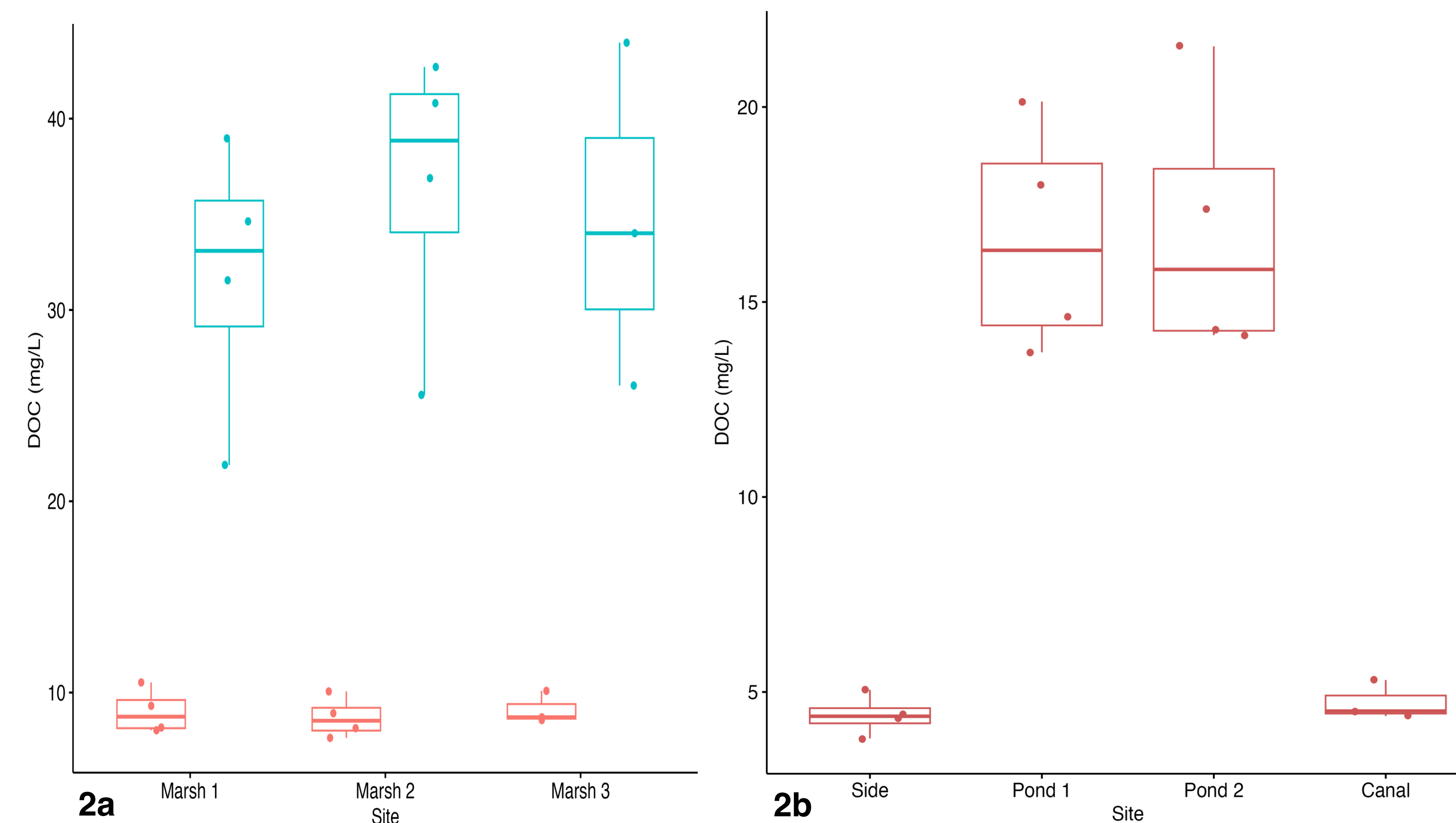
### Study Sites:

1. Pine Island Audubon Sanctuary (PIS)
  - 2-6 ppt salinity, protected
2. Coastal Studies Institute (CSI)
  - 15-26 ppt salinity, isolated

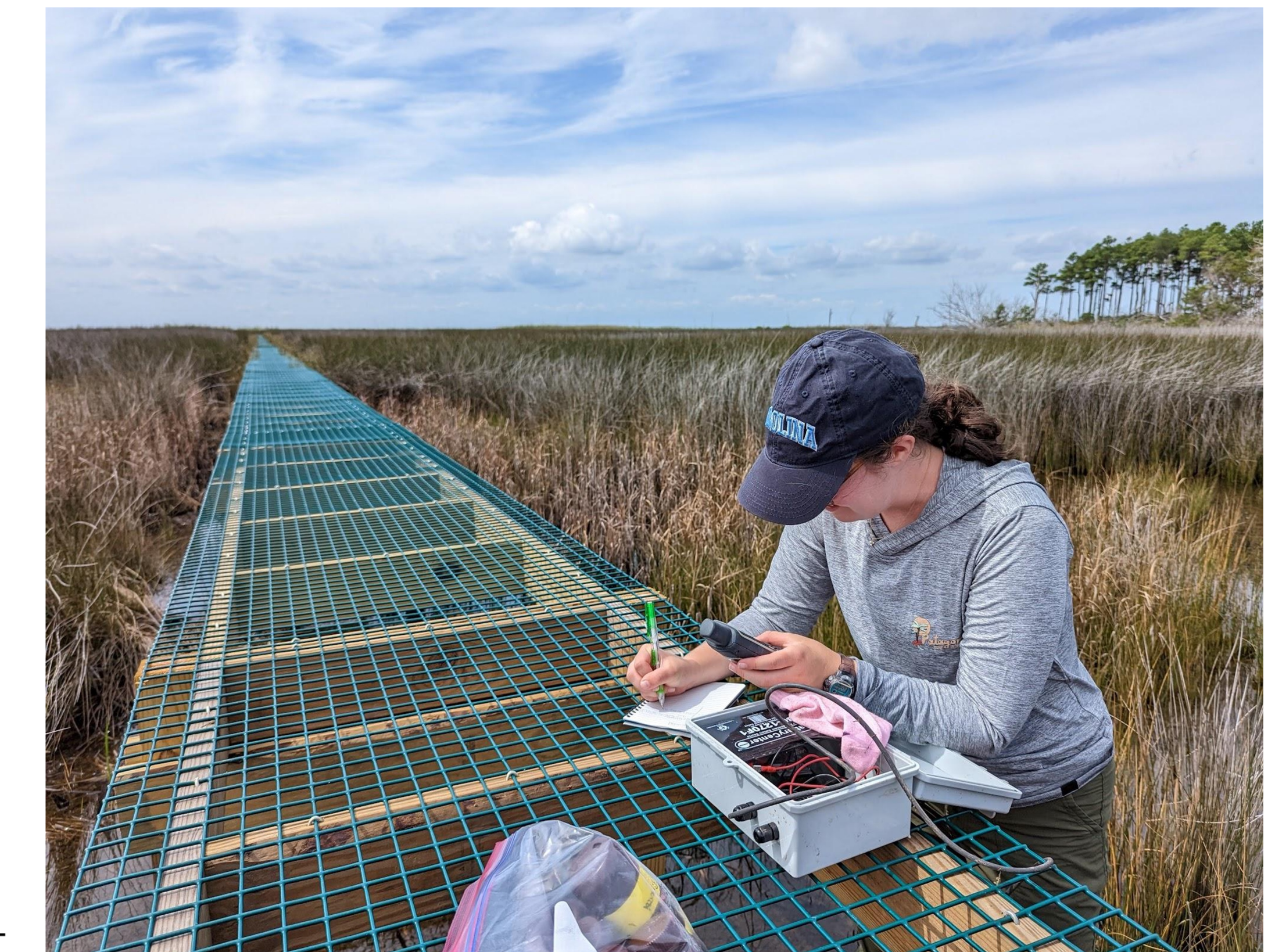
**Purpose:** Document and assess the influence of wind-driven inundation and salinity on DOC outwelling in two different brackish coastal marsh systems in the Albemarle Sound.



**Figure 1.** Carbon horizontal and vertical fluxes in coastal marshes, adapted from Xin et al., 2022



**Figure 2a–b.** Distribution of DOC (mg/L) concentration in both groundwater (blue) and surface water (red) at PIS (left) and CSI (right) represented as a box and whisker plot.



Sampling at CSI marsh in September 2022

## METHODS

- From August - November 2022, water samples and *in situ* measurements were collected at PIS and CSI (n = 4)
- Groundwater and surface water samples collected from three different marshes at PIS
- Surface water samples collected from four locations at CSI
- PIS well sensors measured water level, conductivity, and temperature

## RESULTS

- Consistently higher wind speeds at CSI than PIS
- Correlational relationship between high wind events and both high salinity and high water level at PIS
- Higher average DOC concentrations in PIS wells (34.28 mg/L) than surface (8.92 mg/L) (Fig. 2a)
- Higher surface water DOC concentrations at PIS (7.63 -10.53 mg/L) than CSI (4.41-16.84 mg/L) (Fig. 2)

## DISCUSSION

- Carbon is leaving PIS and CSI marshes through outwelling
- PIS is likely inundated less frequently
- No evidence of a correlation between salinity and DOC concentration in groundwater
- DOC concentrations in the sampled marshes are higher than global averages
- Rate at which outwelling is occurring could be concerning, accelerated by eroding marshes (McTigue et al., 2021).
- Future studies should quantify vertical and horizontal carbon fluxes in marshes

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