



Testing new wetland stability metrics in Forsythe NWR

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Role of sediment fluxes in wetland trajectory

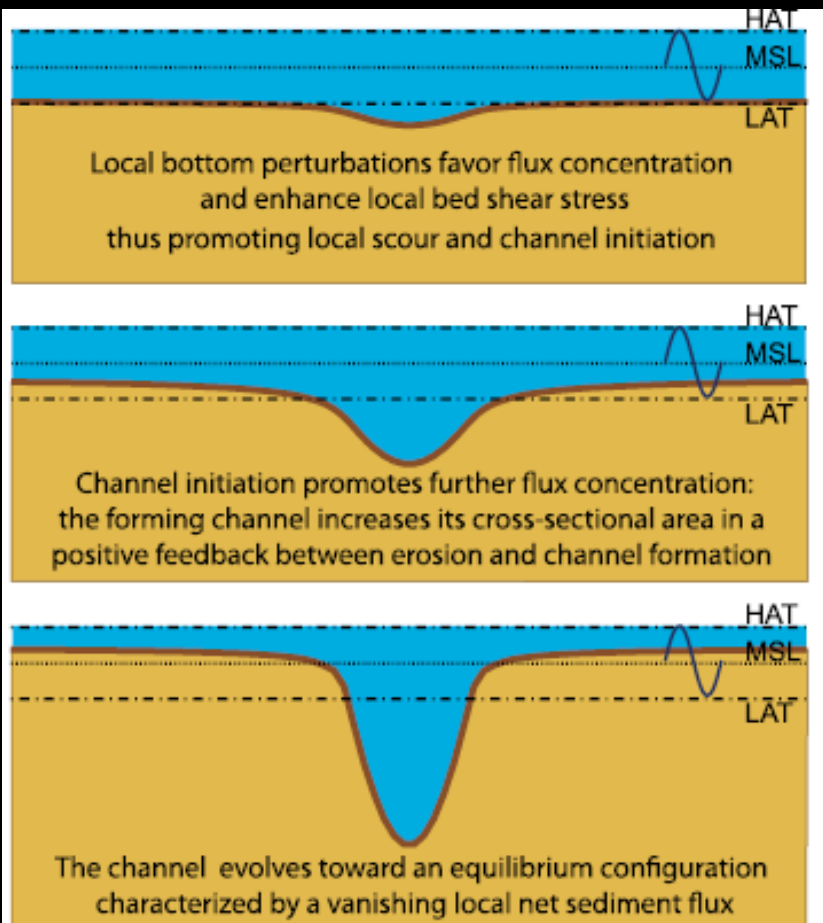
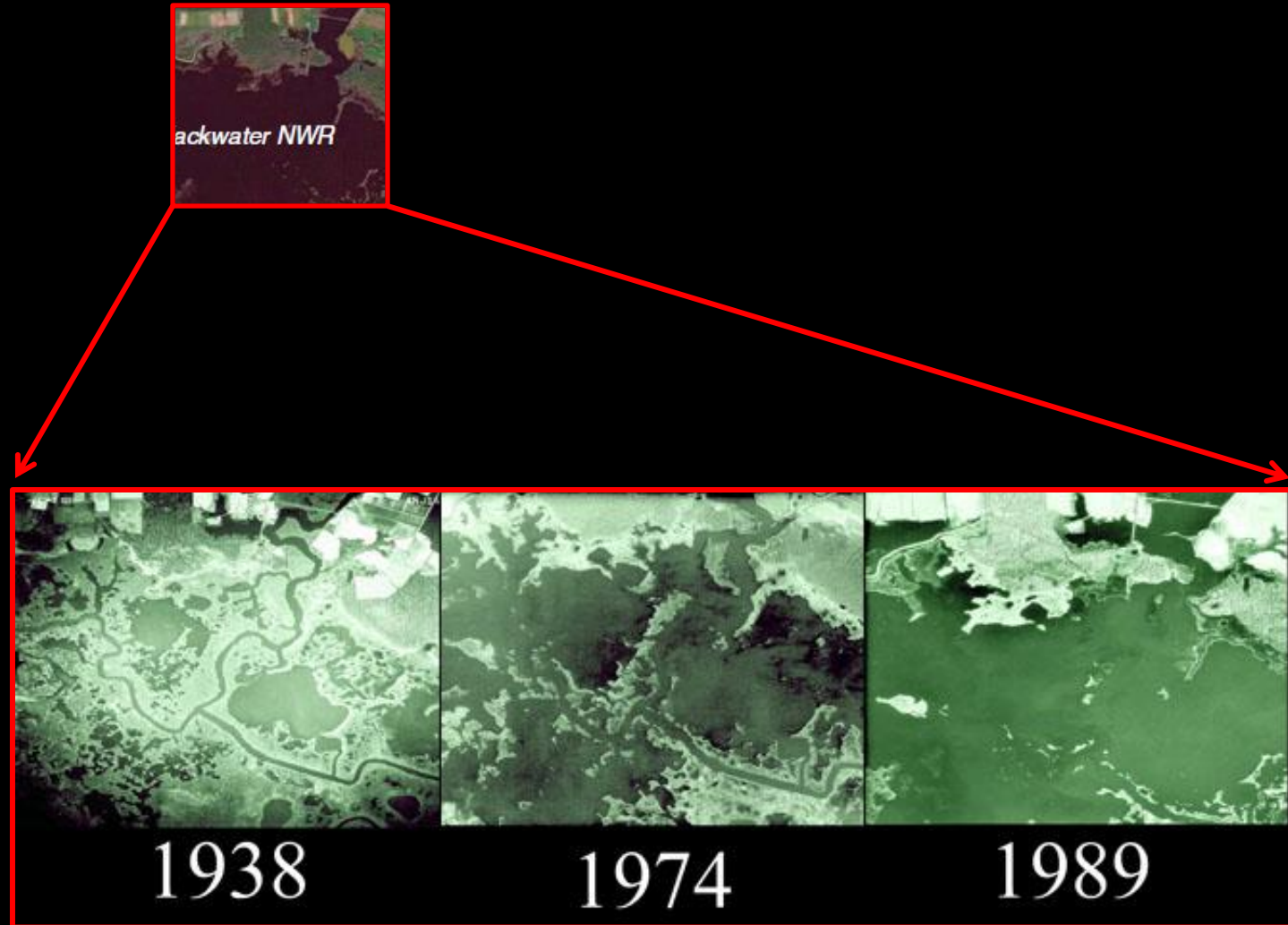


Figure 7. Sketch of the process of channel formation starting from a nearly flat bottom configuration. Small perturbations of bottom elevations enhance flux concentration, leading to bottom erosion and the initiation of a channel in which tidal fluxes further concentrate, thus increasing channel dimensions in a self-sustained process.

- Channel the main conduit for sediment flux to wetland complex
- Stability of entire geomorphic planform a function of sediment flux
- Under conditions of SLR, wetland complexes must import sediment to maintain structure of planform
- Identifying sediment flux mechanisms and budget tells us about trajectory

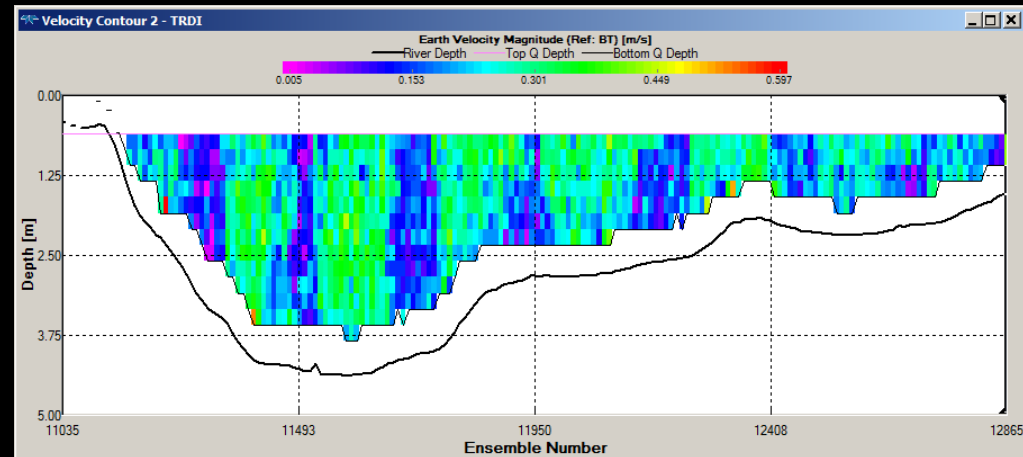
Blackwater NWR: poster child for wetland instability



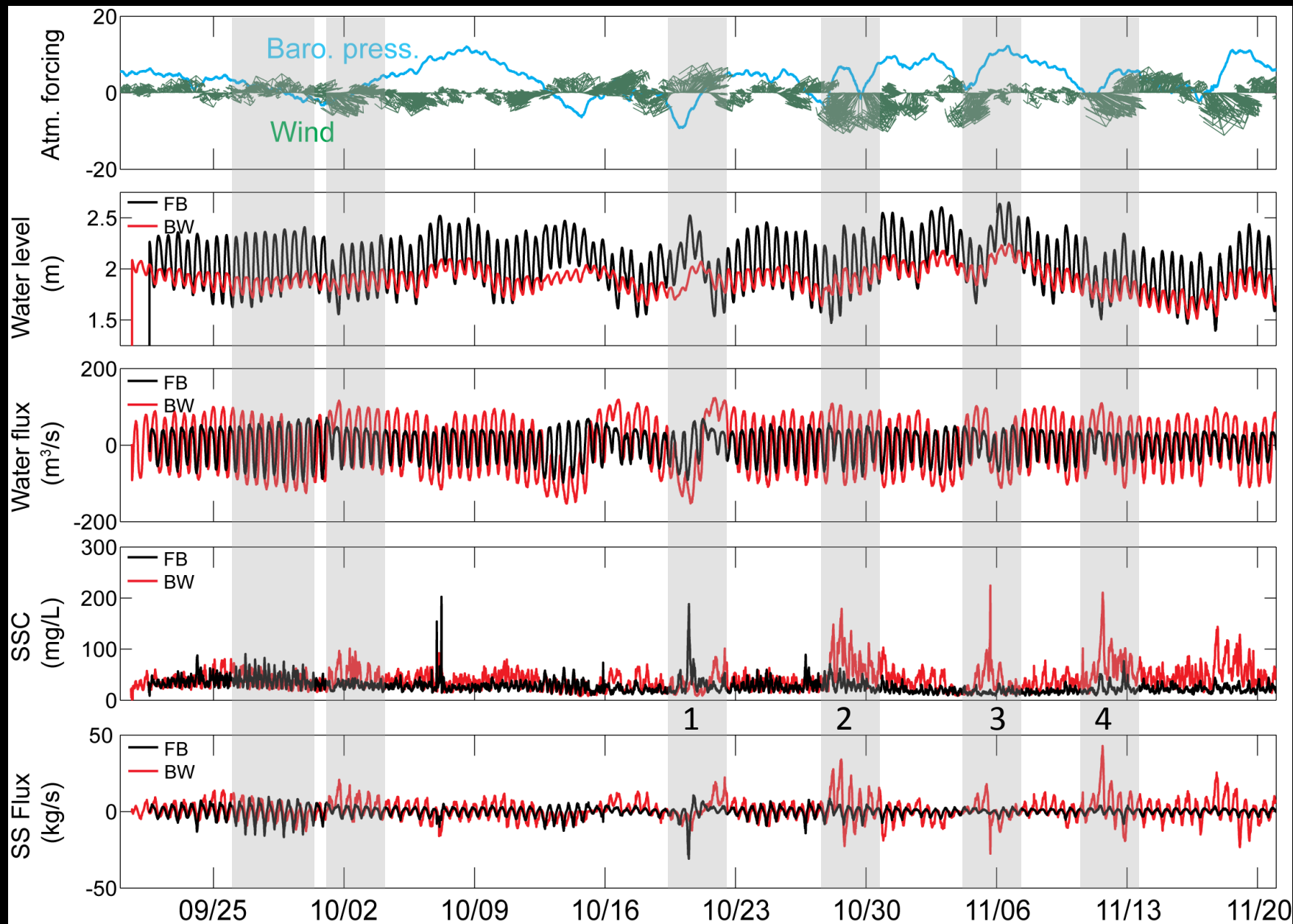
Measuring sediment fluxes

Continuous data: velocity, turbidity

Cross-sectional data: discharge, SSC



Time-series of forcing and flux: positive flux = seaward



Can we distill these processes into simpler metrics?

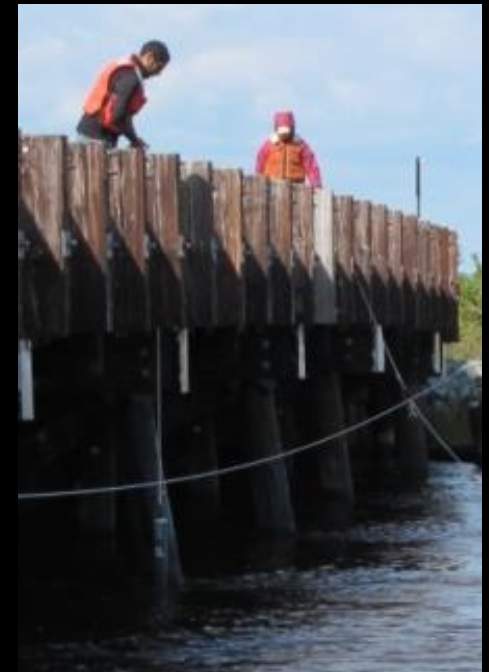
Continuous monitoring provides high-resolution SSC and flow direction

- Can we infer trajectory from some SSC metric?



Periodic water sampling provides organic fraction and provenance

- Can we infer trajectory by properties of suspended material?



Mean SSC not a predictor of trajectory, but SSC differential is!

Table 1. Suspended Sediment Concentration (mg/L) Statistics for the Fall 2011 Period (Mean Values From Combined Spring and Fall Deployments in Parentheses)^a

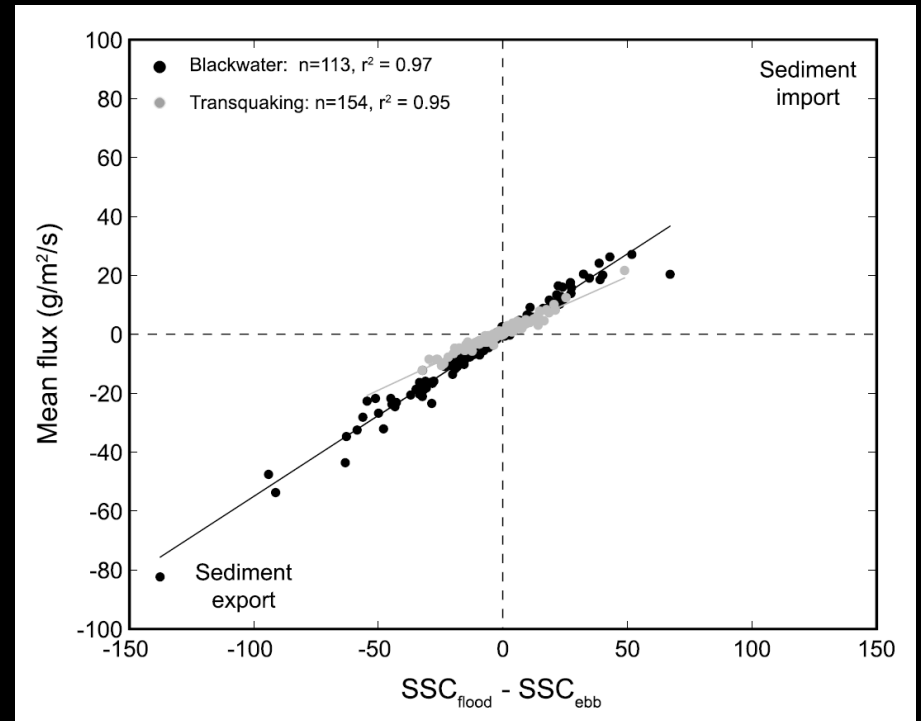
Site	Mean SSC	Mean SSC Flood	Mean SSC Ebb	Flood/Ebb Differential
BWR	63	54	72	-18
BW3	41 (52)	42	41	+1
FB1	39 (55)	41	36	+5
FB3	28 (33)	34	22	+12

^aFlood and ebb were separated using continuous velocity measurements at sites BWR and FB1.

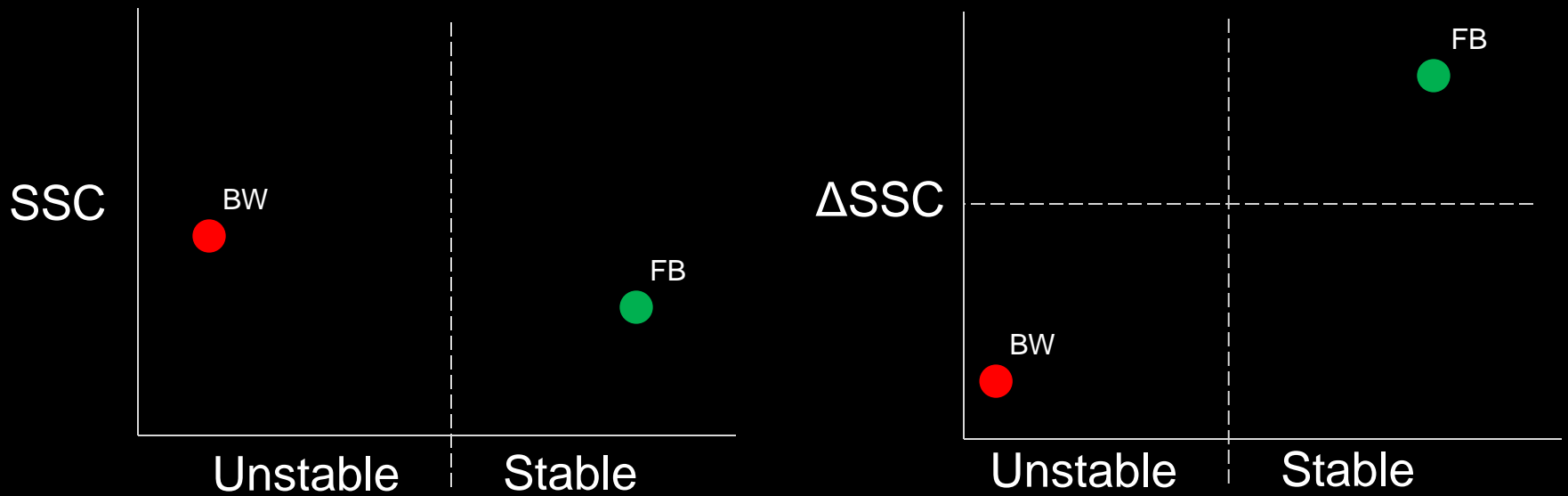
Higher SSC in degraded BW complex

Negative flood-ebb SSC differential in degraded BW complex

Flood-ebb SSC differential scales well with fluxes: simpler data to collect



Conceptual diagram of SSC and stability

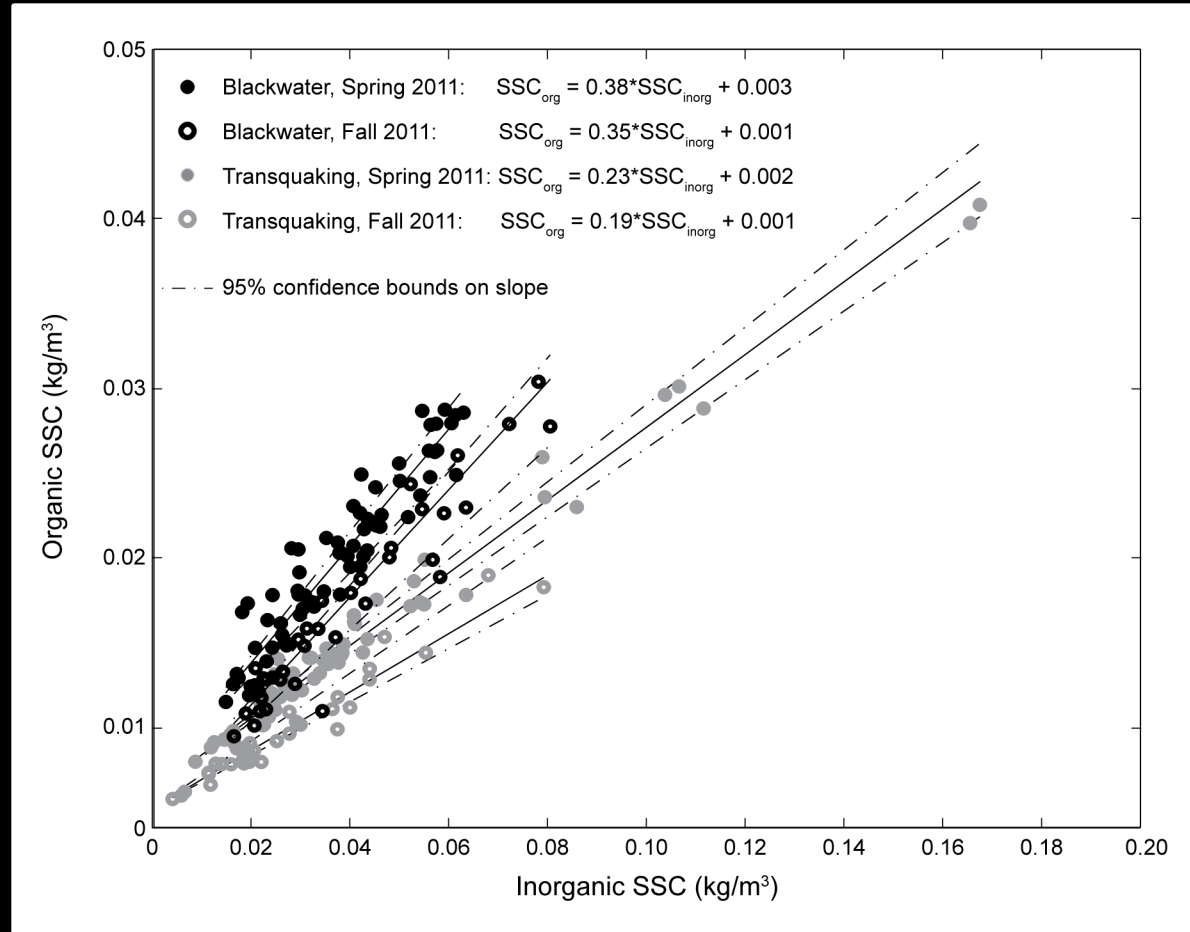


Ratio of organic to inorganic mass in suspension

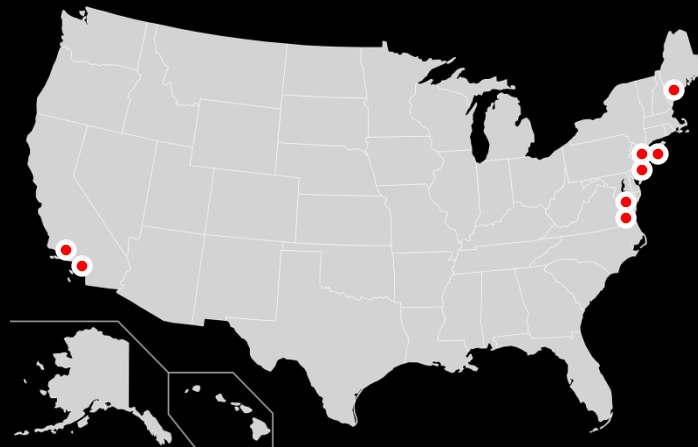
Organic-to-inorganic ratio twice as high in degraded BW complex

Organic material in both complexes associated with C3 plant source ($-25 \delta^{13}\text{C}$), likely *Schoenoplectus*

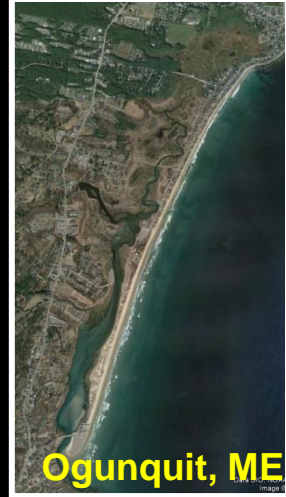
Reflects erosion of marsh edge in BW, import of that same material to FB



Testing the metrics?



Pt. Mugu, CA



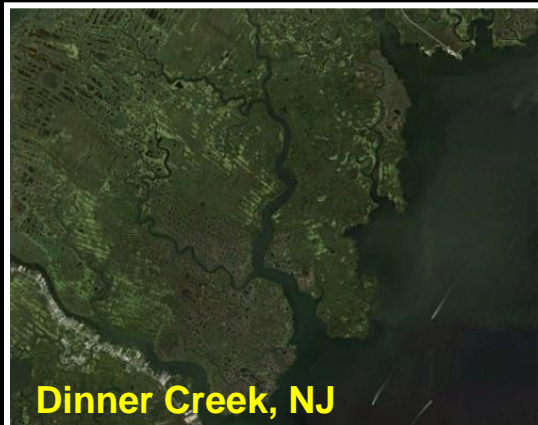
Ogunquit, ME



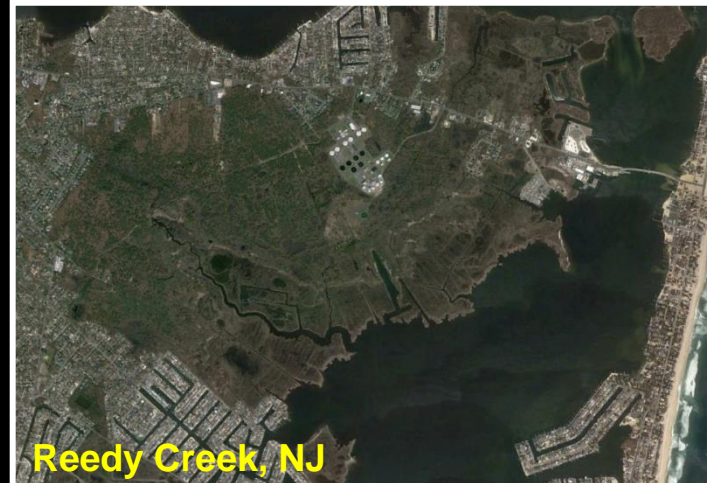
Seal Beach, CA



Jamaica Bay, NY



Dinner Creek, NJ



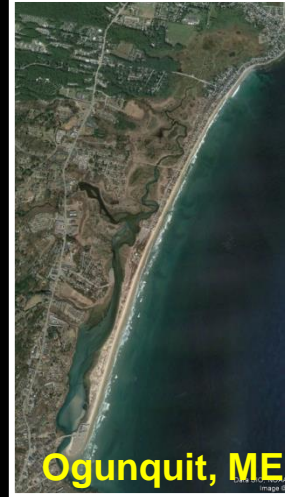
Reedy Creek, NJ



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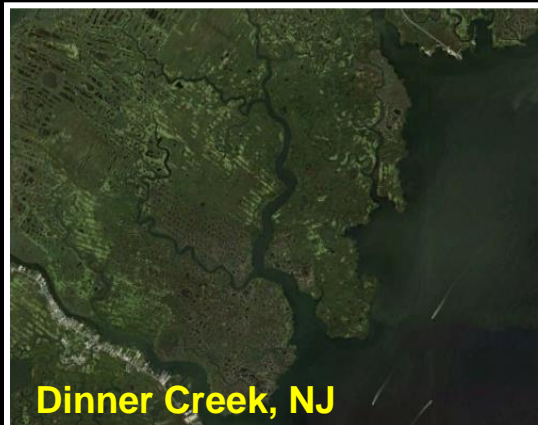
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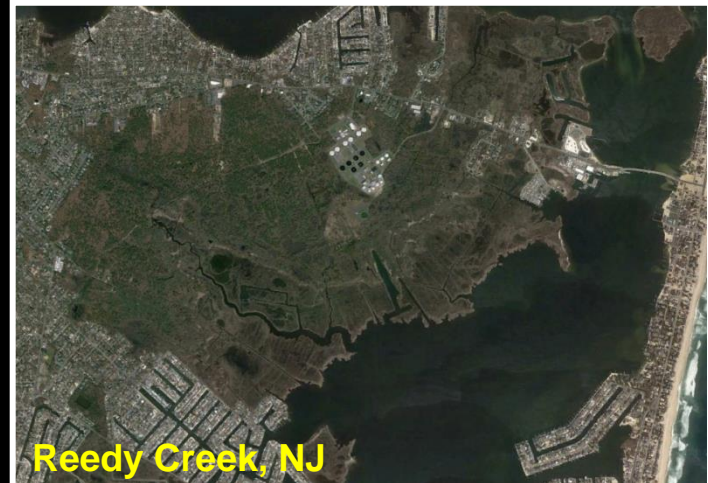
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