

# Wetland Flows and Sediment Fluxes at PHNWR

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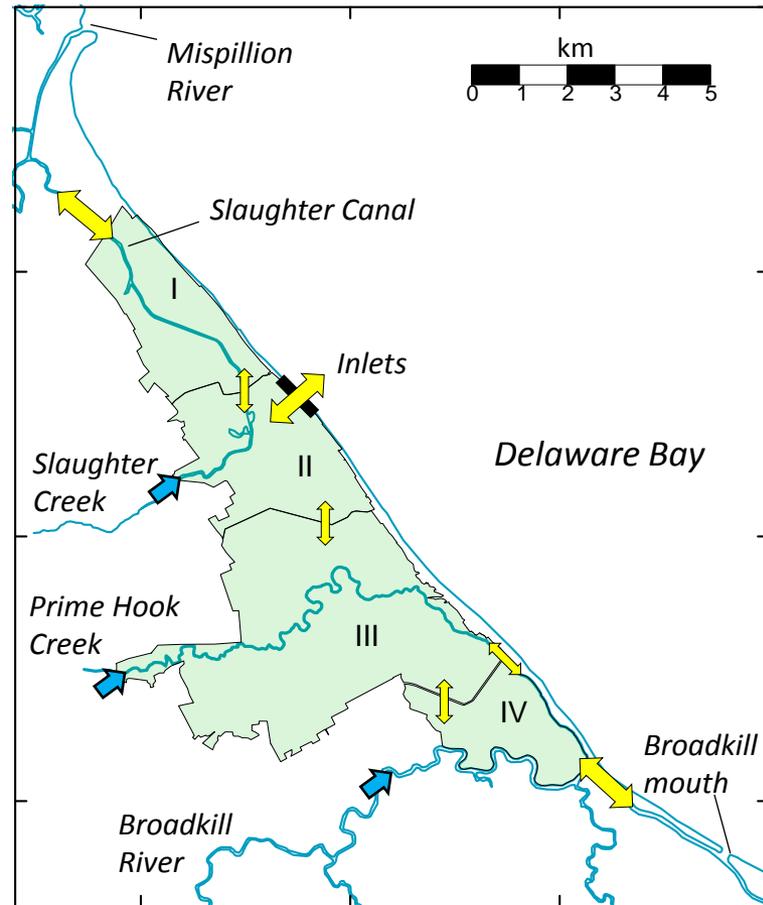
Zac Duval

*University of Delaware*

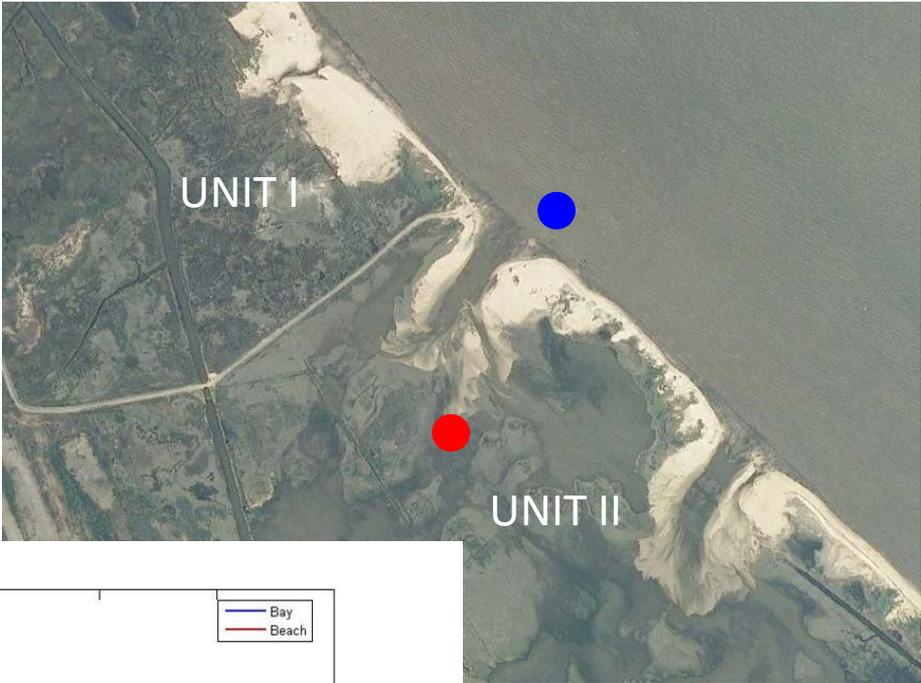
Mike Mensinger

Bob Scarborough

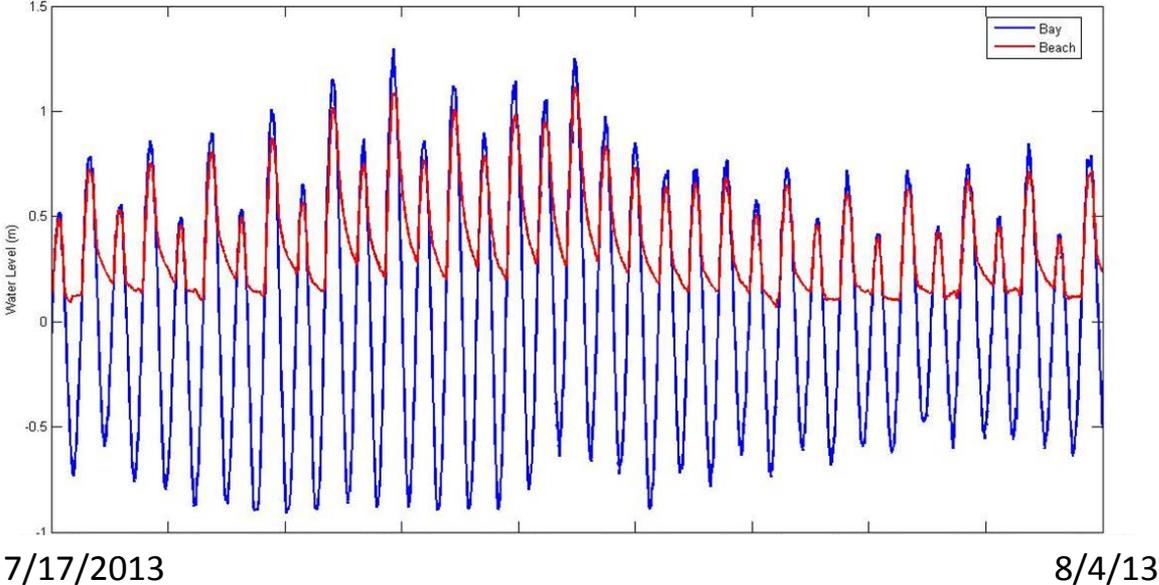
*DNREC Coastal Programs*



# Tidal pumping of bay water to Unit II



DNREC water level data

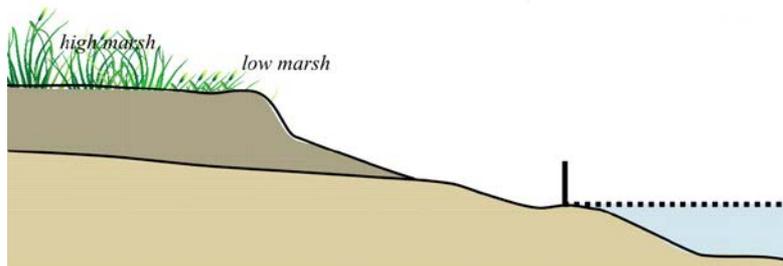
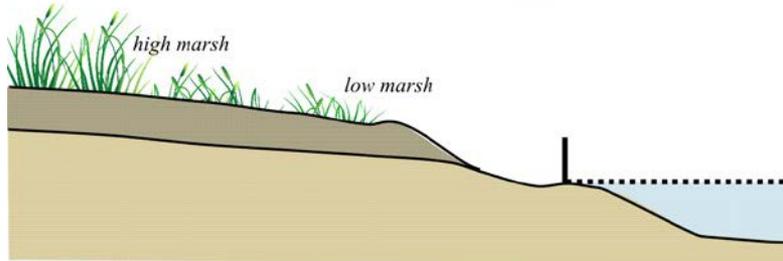
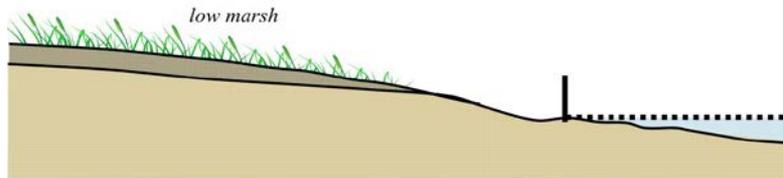
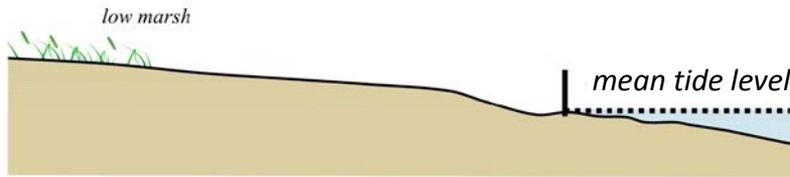


# Study Goals

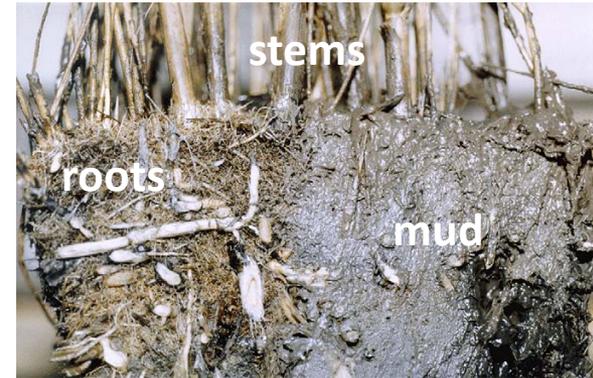
- Characterize concentrations and fluxes of suspended sediment in waterways
- Identify internal and external mechanisms of sediment production and transport
- Develop a sediment budget and conceptual model to inform the restoration



# Some background...



## Marsh core



Nyman et al (2006)

## Marsh math

$$S = \int_{year} \int_{Tide} \frac{W_s C}{\rho}$$

$S$  = sedimentation rate (L/T)

$W_s$  = settling velocity

$C$  = suspended sediment conc.

$\rho$  = dry bulk density



Data sondes  
Water level  
Salinity  
Temperature

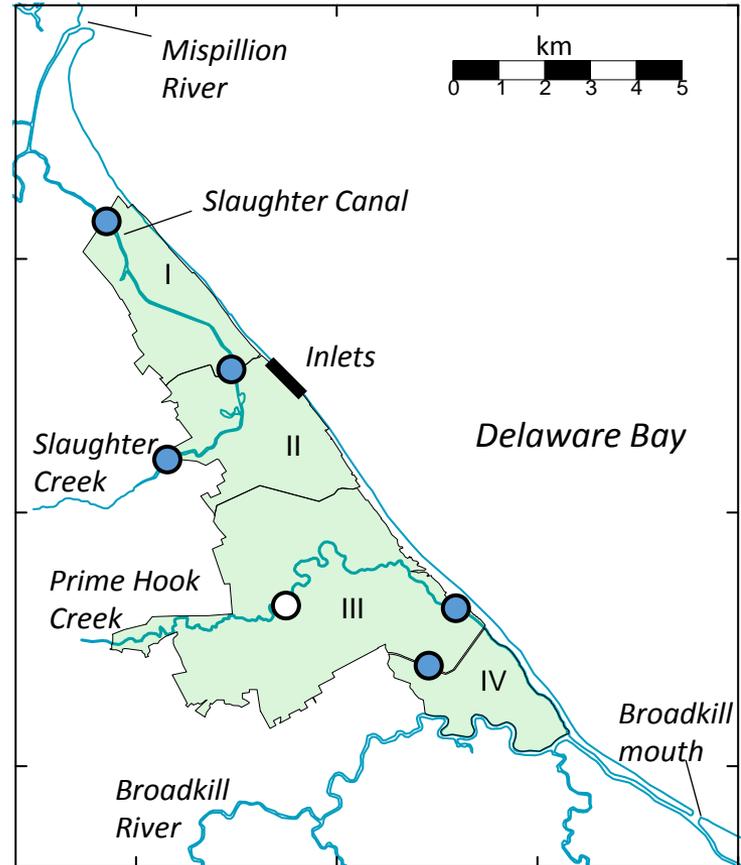
Acoustic Doppler Profiler (ADP)



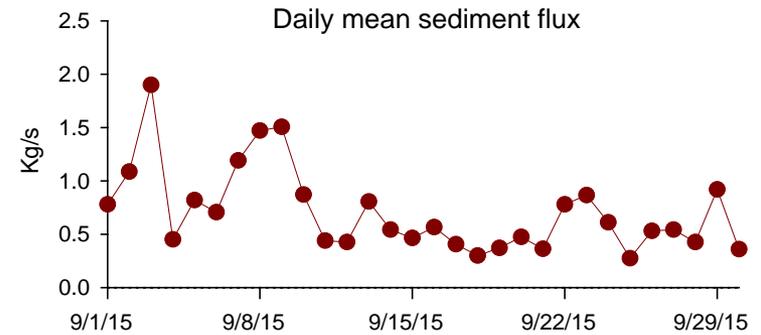
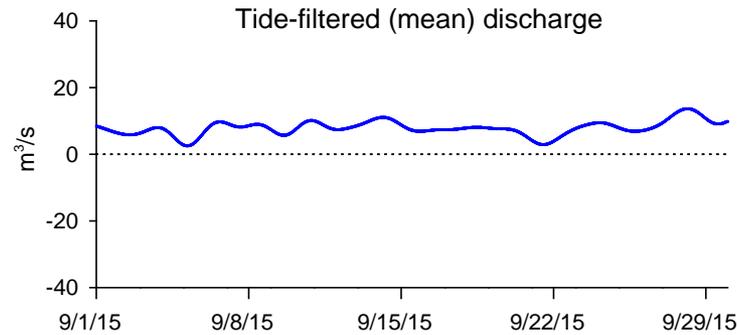
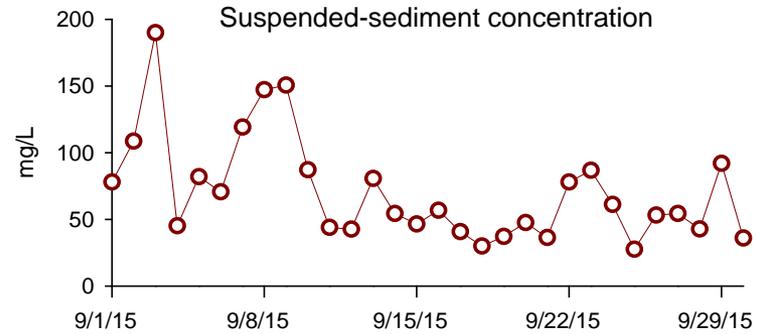
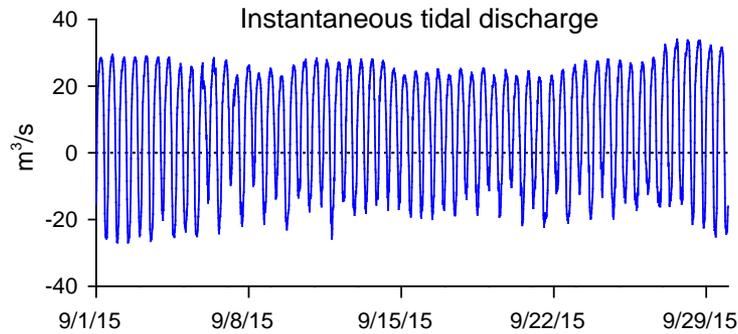
Automated water sampler (ISCO)



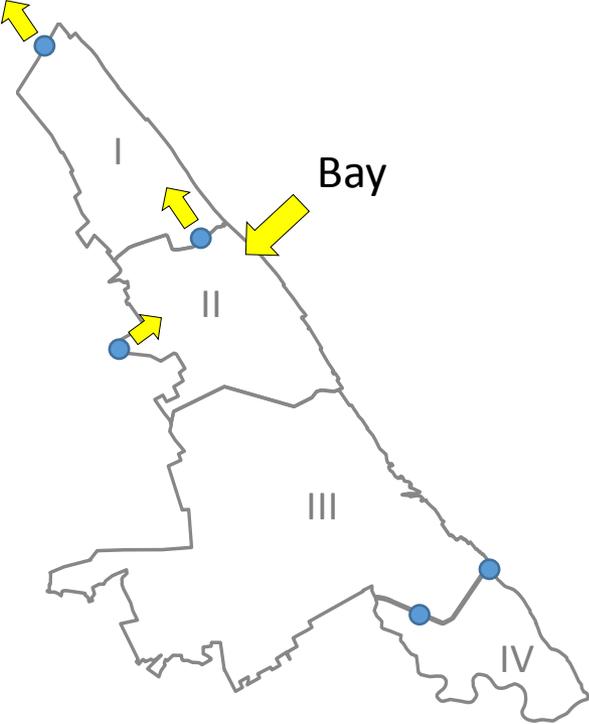
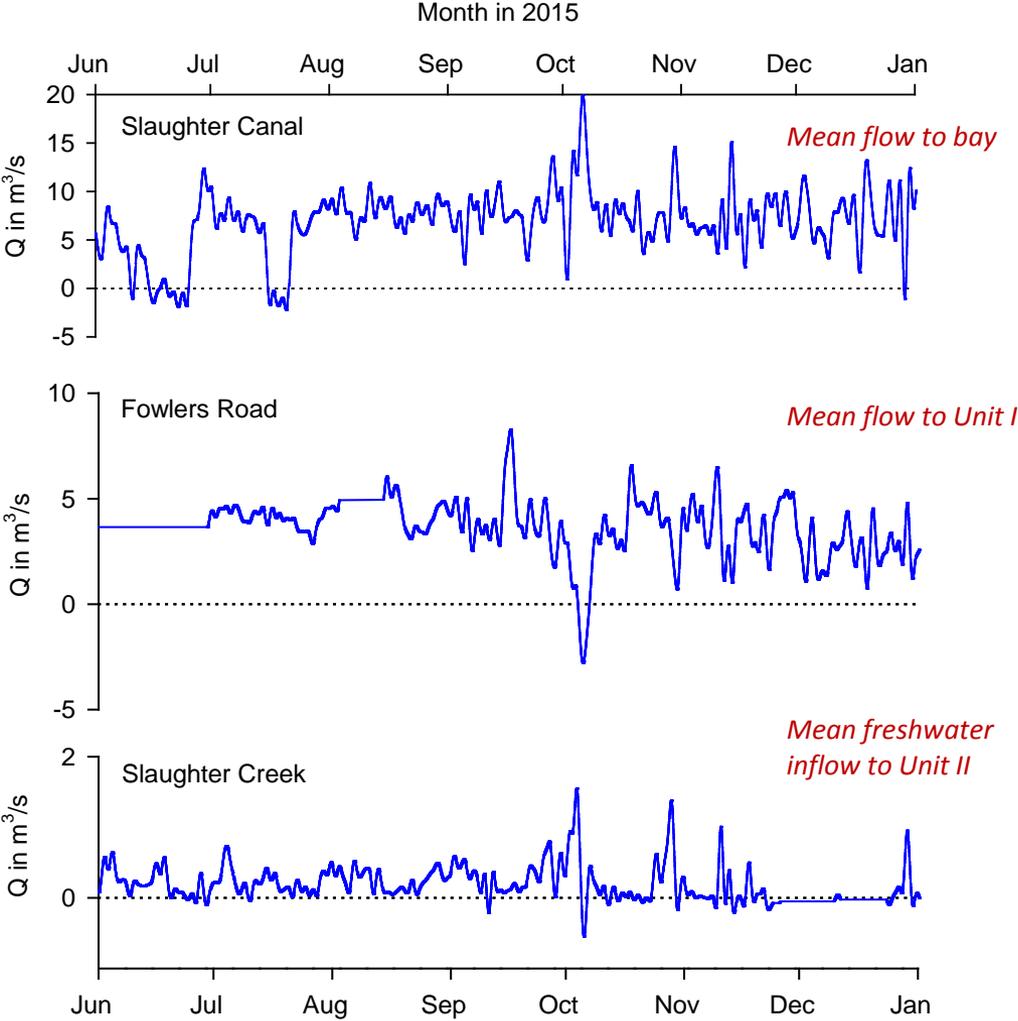
# Monitoring array



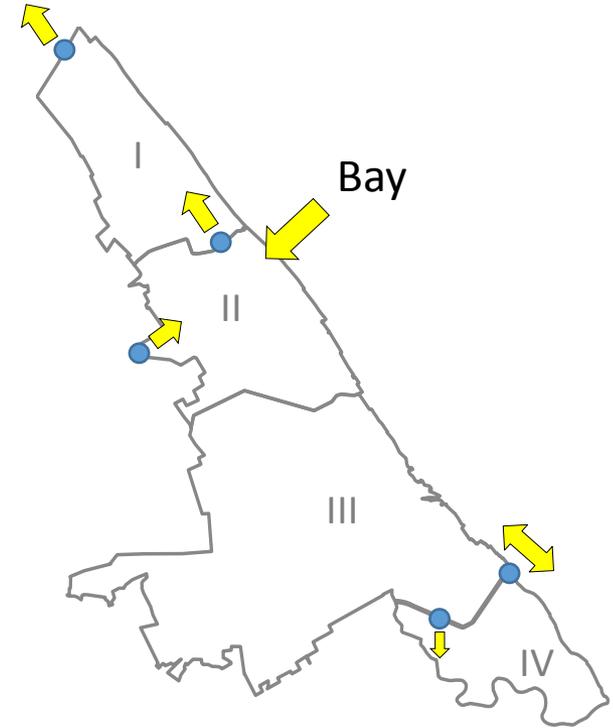
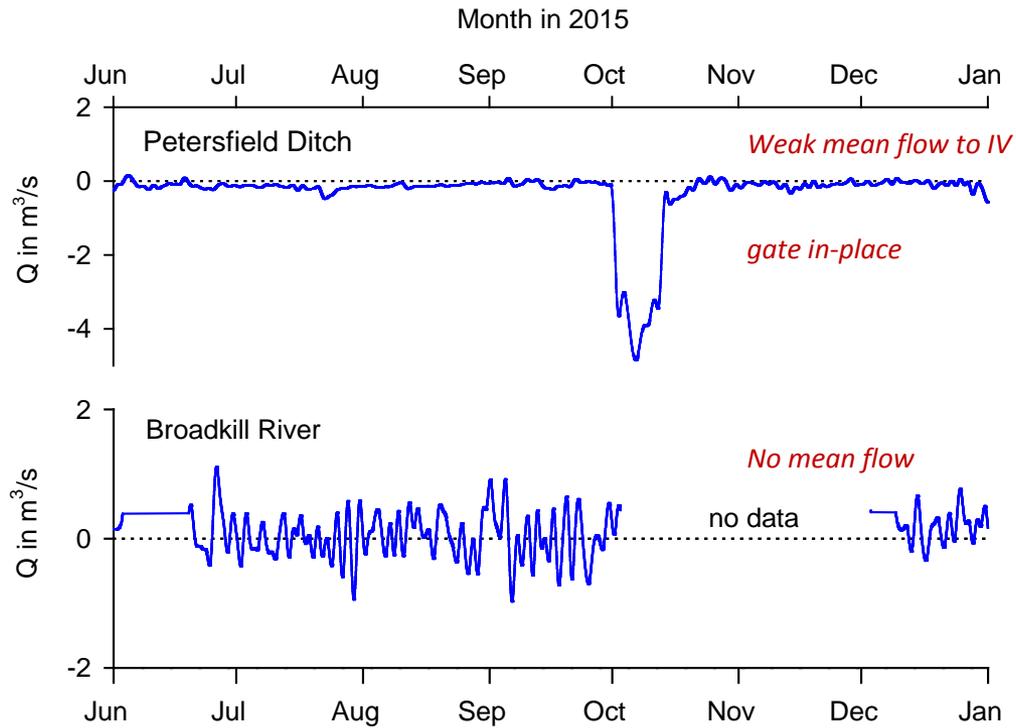
# Data analysis



# Units I-II waterway discharges

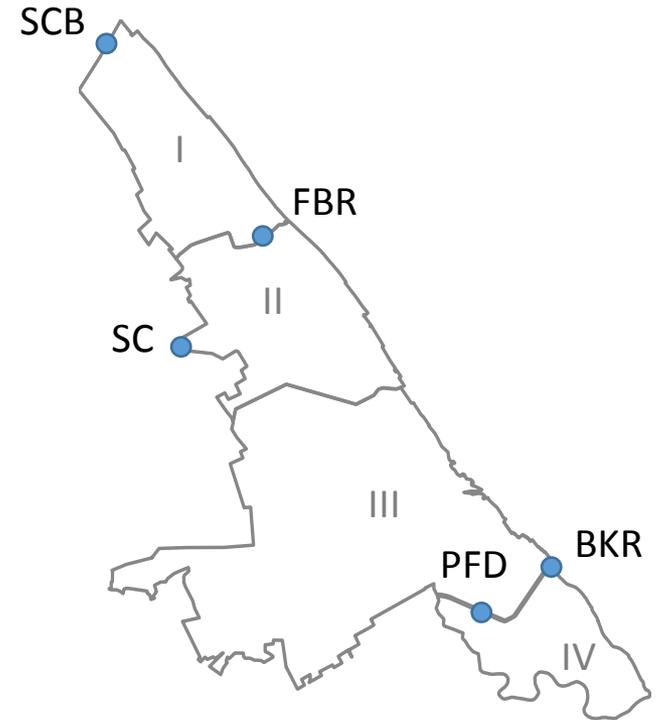
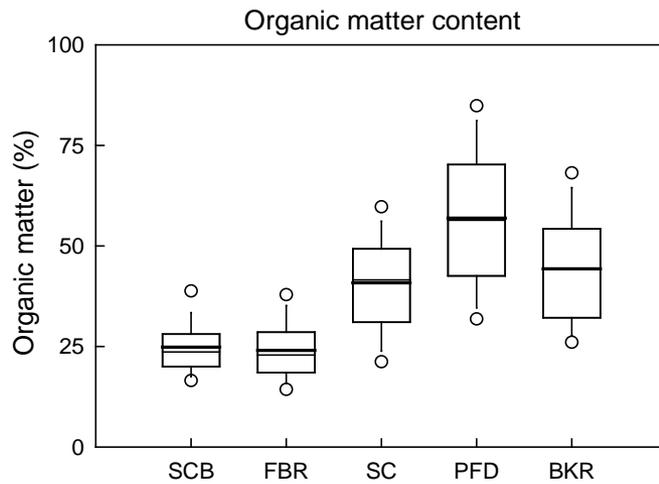
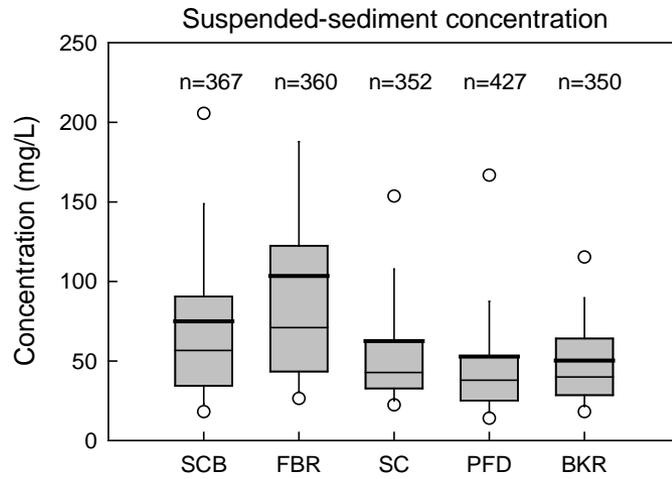


# Units III-IV waterway discharges

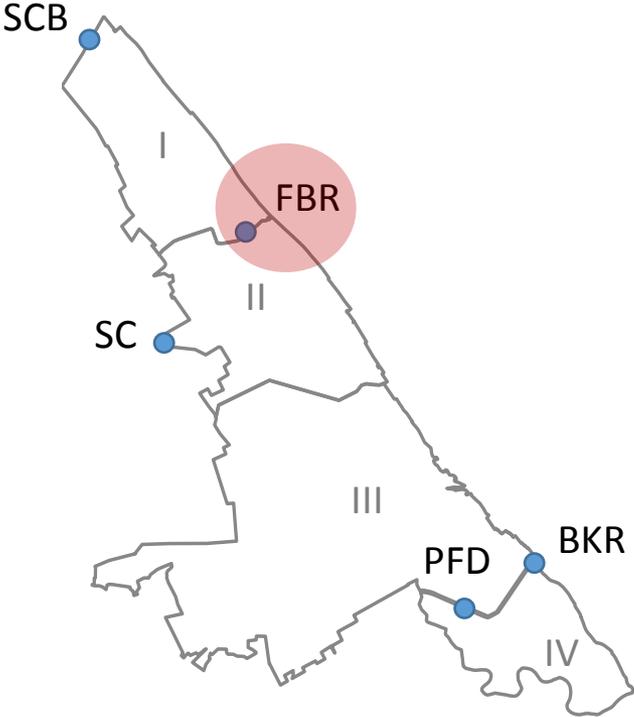
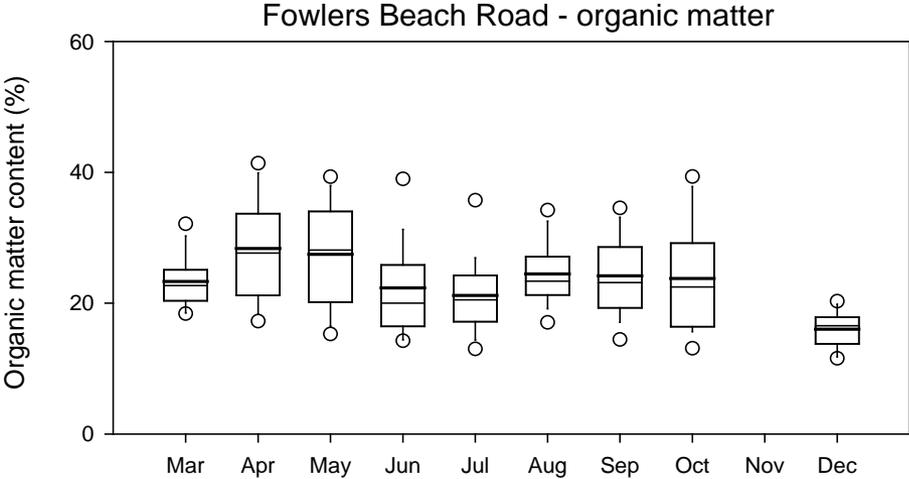
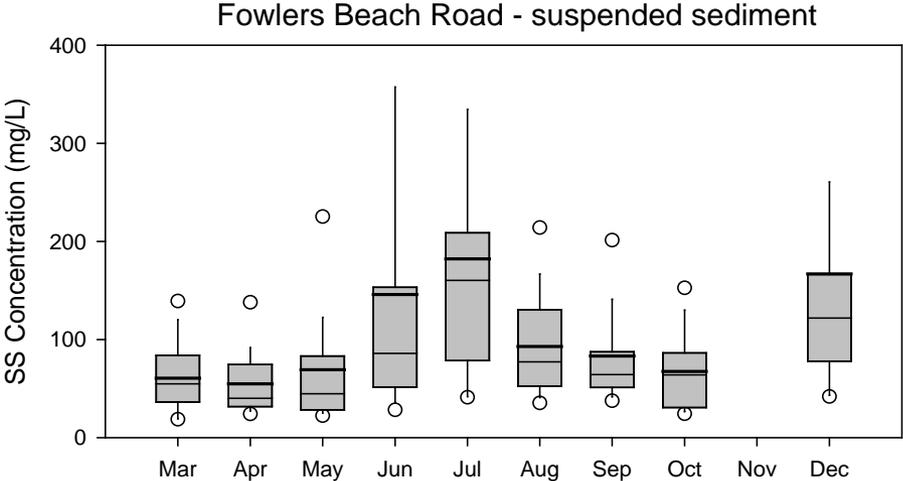


1856 samples total

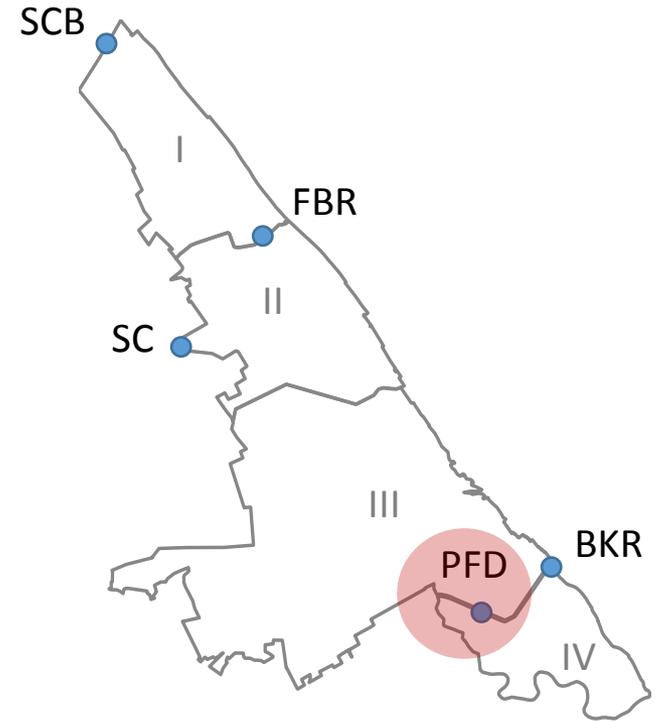
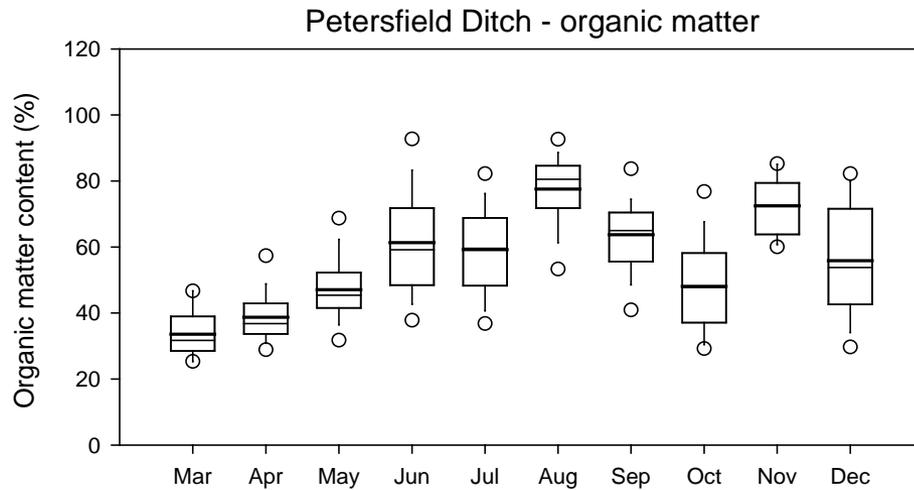
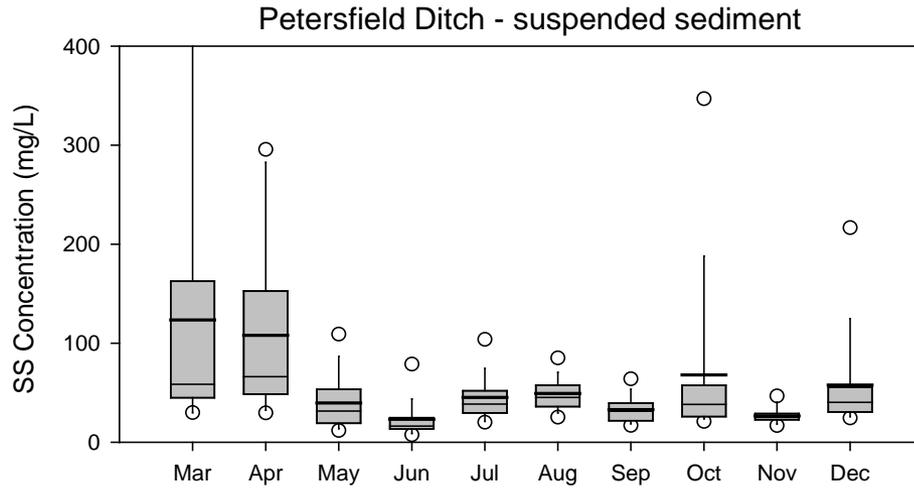
# Suspended sediment data



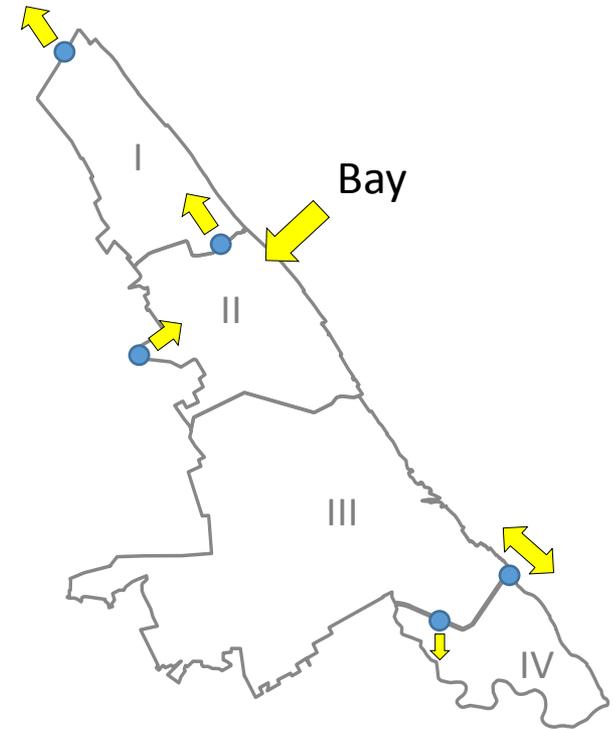
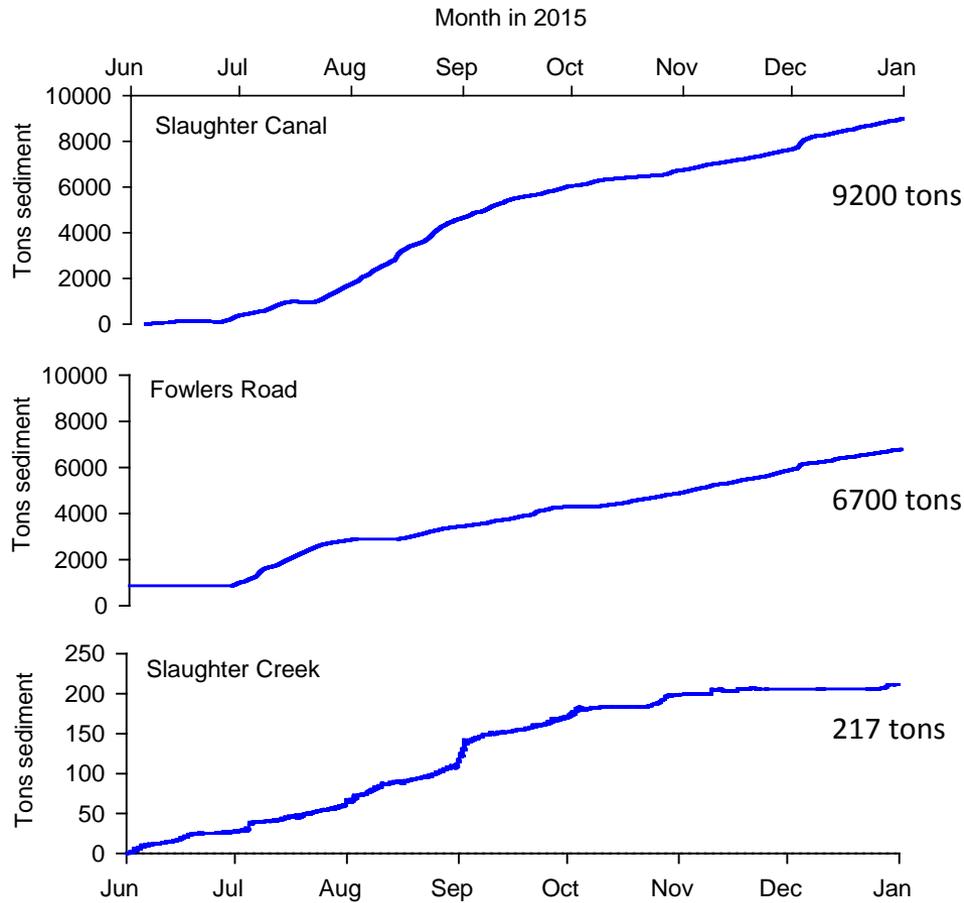
# Seasonality



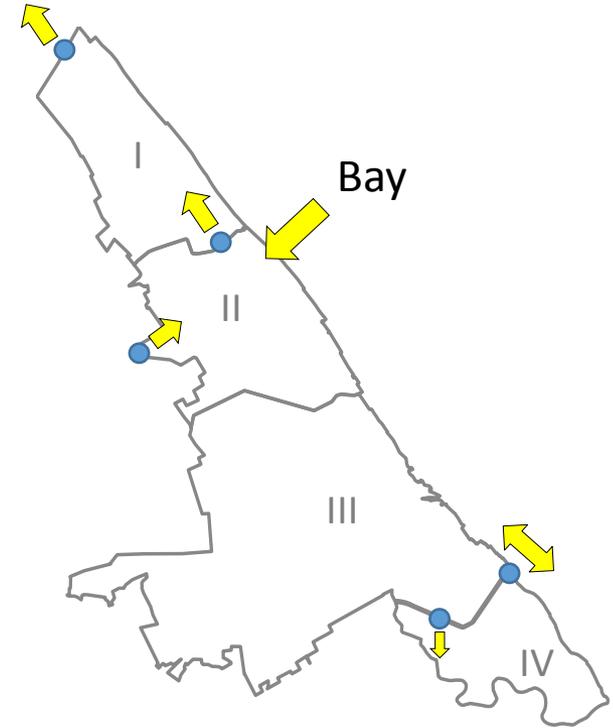
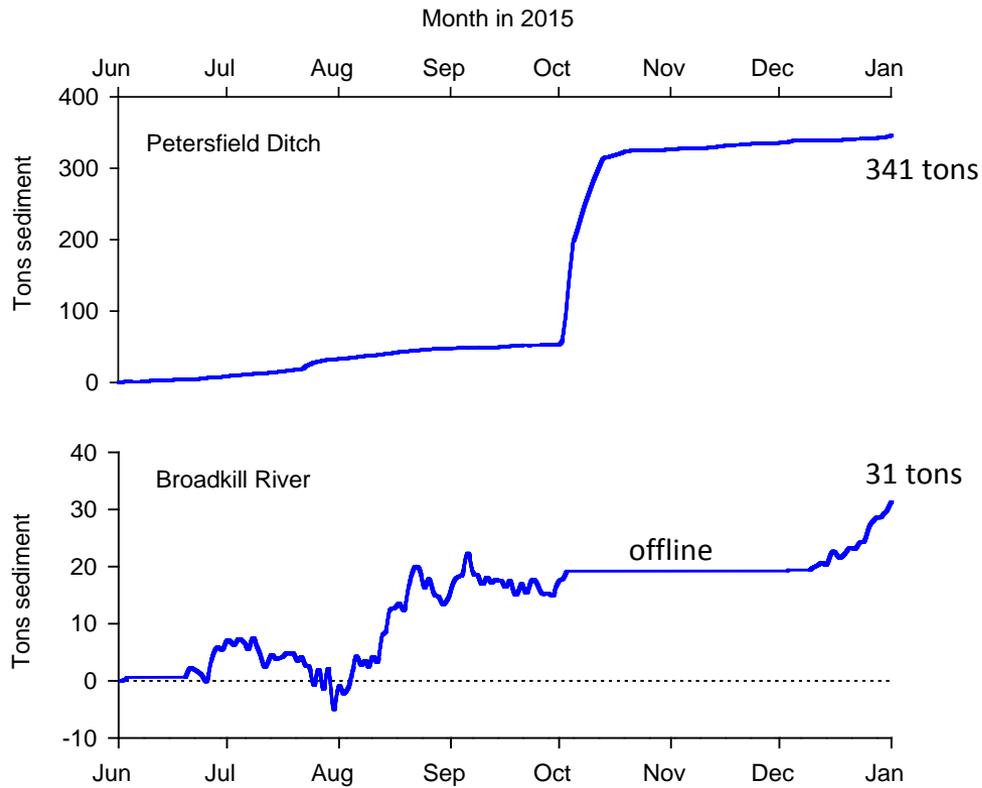
# Seasonality



# Units I-II suspended sediment flux



# Units III-IV suspended sediment flux



# Example sediment budget (Jun – Dec 2015)

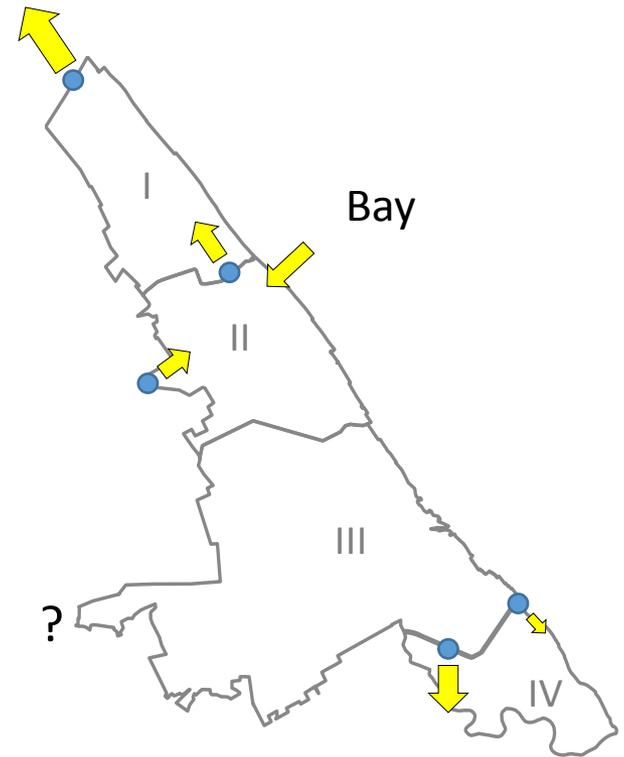
## INPUTS

- From bay
- From Slaughter Creek
- From Prime Hook Creek

## EXPORTS

- From Unit I
- From Unit IV

| <u>Tons</u>  |
|--------------|
| 6700         |
| 217          |
| ?            |
| -9200        |
| <u>-372</u>  |
| <b>-2655</b> |



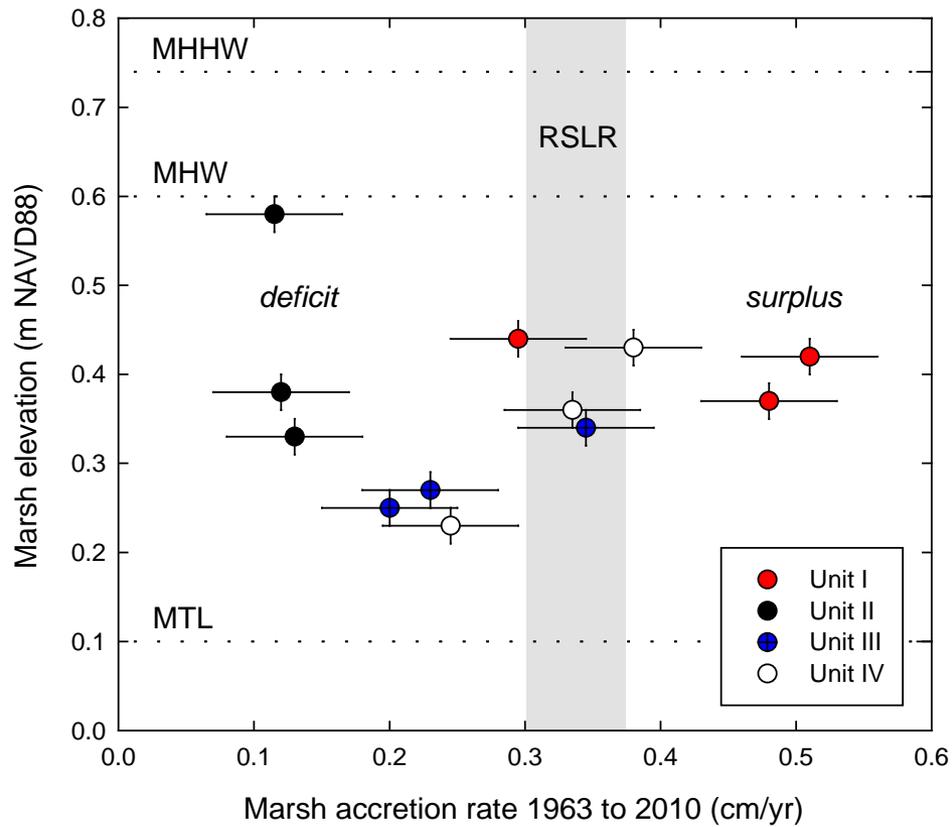
# Findings to date

- Inflow from DelBay produces a mean flow that increases during storm surges
- Sediment concentrations are generally  $\geq 40$  mg/L with organic content  $\geq 35\%$
- Sediment fluxes track the mean water discharges
- Units I and IV appear to be exporting sediment





# PHNWR marsh accretion rates



*from Boyd and Sommerfield manuscript in review*