Processes and Feedbacks Especially Important to Shallow Water Clarity

The Role of Benthic Microalgae In Stabilizing Sediment

STAC Workshop: Understanding and Explaining 30+ Years of Water Clarity Trends In the Bay's Tidal Waters

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Talk Purpose

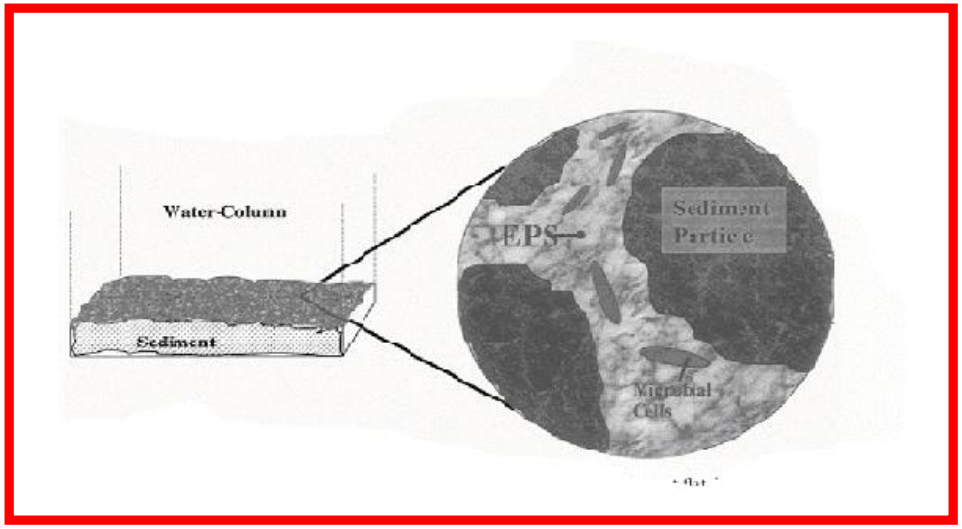
- Review literature on sediment stabilization by benthic microalgae
- Show the potential distribution of algae and benthic microalgal production in the Choptank River area
- My lab measures benthic microalgal production using dark/light core incubations

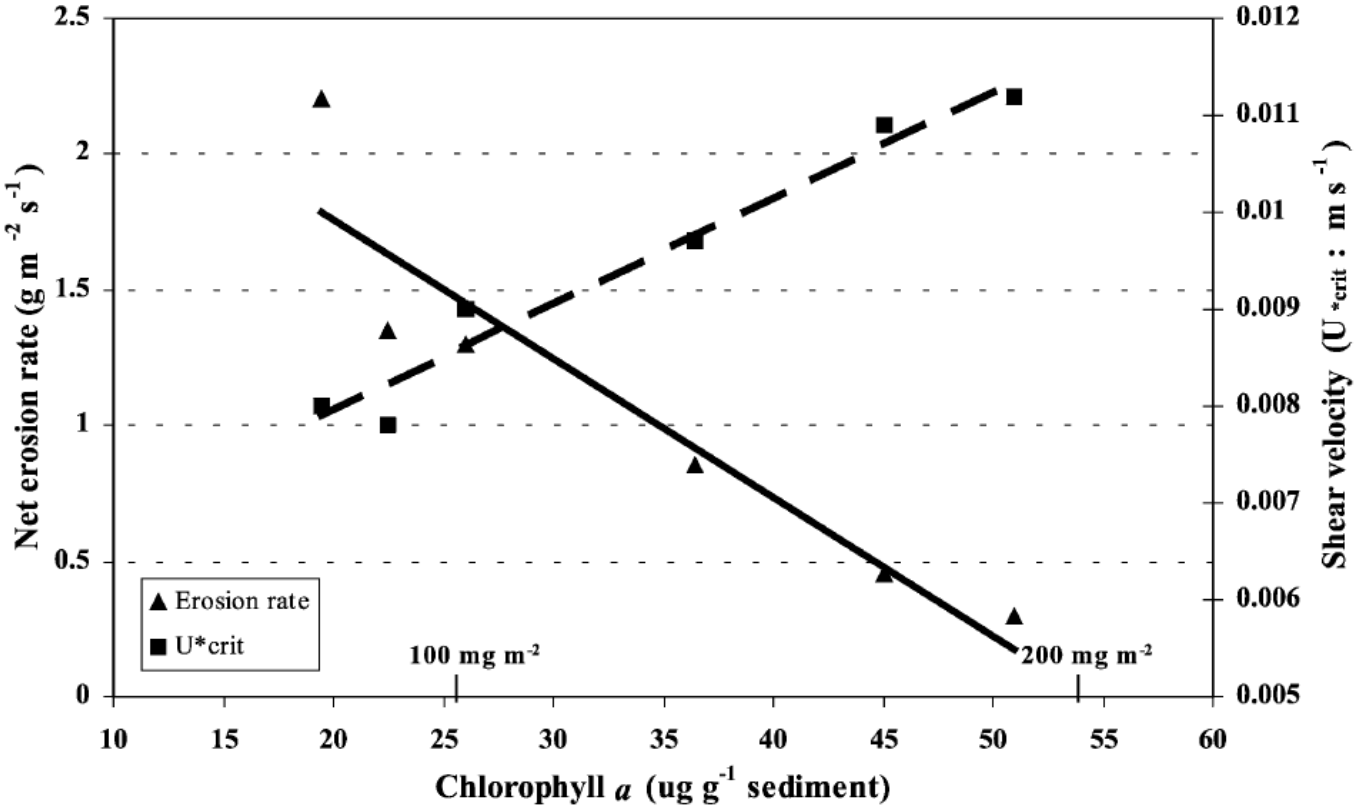
Benthic Microalgae or Microphytobenthos

- Photosynthetic algae at the sediment surface
- Known to secrete EPS – extracellular polymeric substances, especially diatoms

MPB's effect on erosion

- EPS acts as a binding agent between adjacent sediment particles
- EPS increases the force necessary to resuspend bed particles
- Some data and figures from Janet Krenn (REU) and Chris Chick (M.S. student)





Widdows and Brinsley, Journal of Sea Research, 2002

Sediment Erodability

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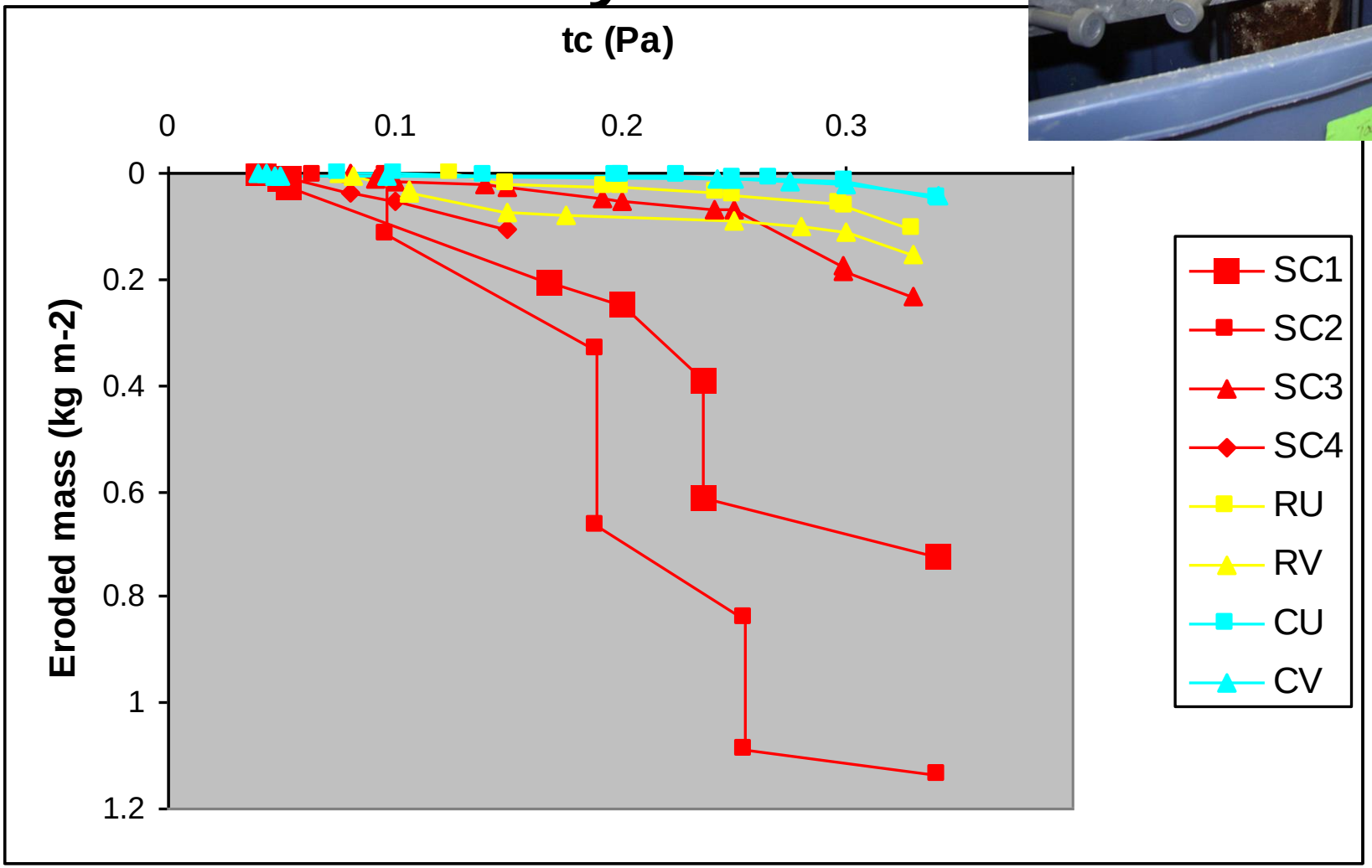
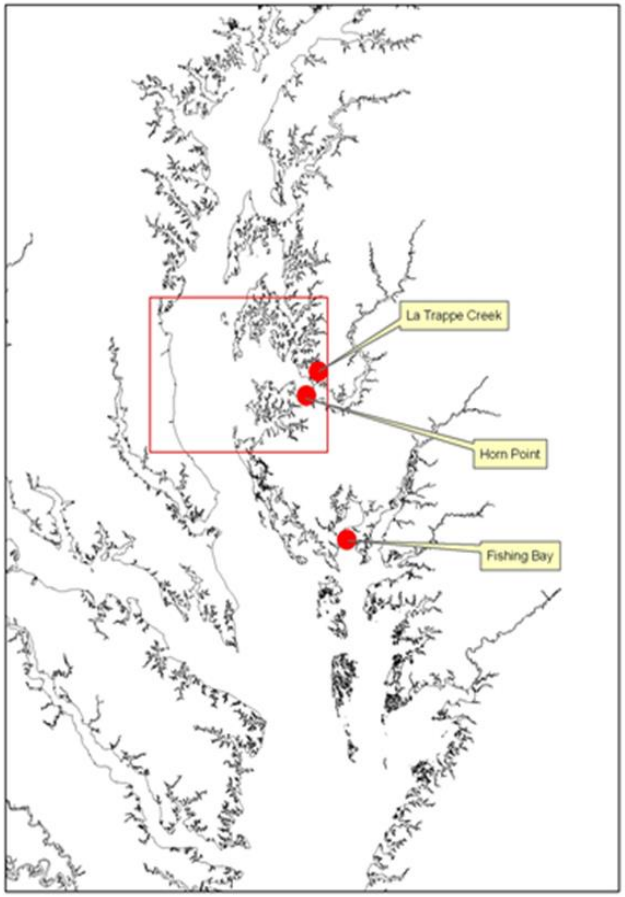
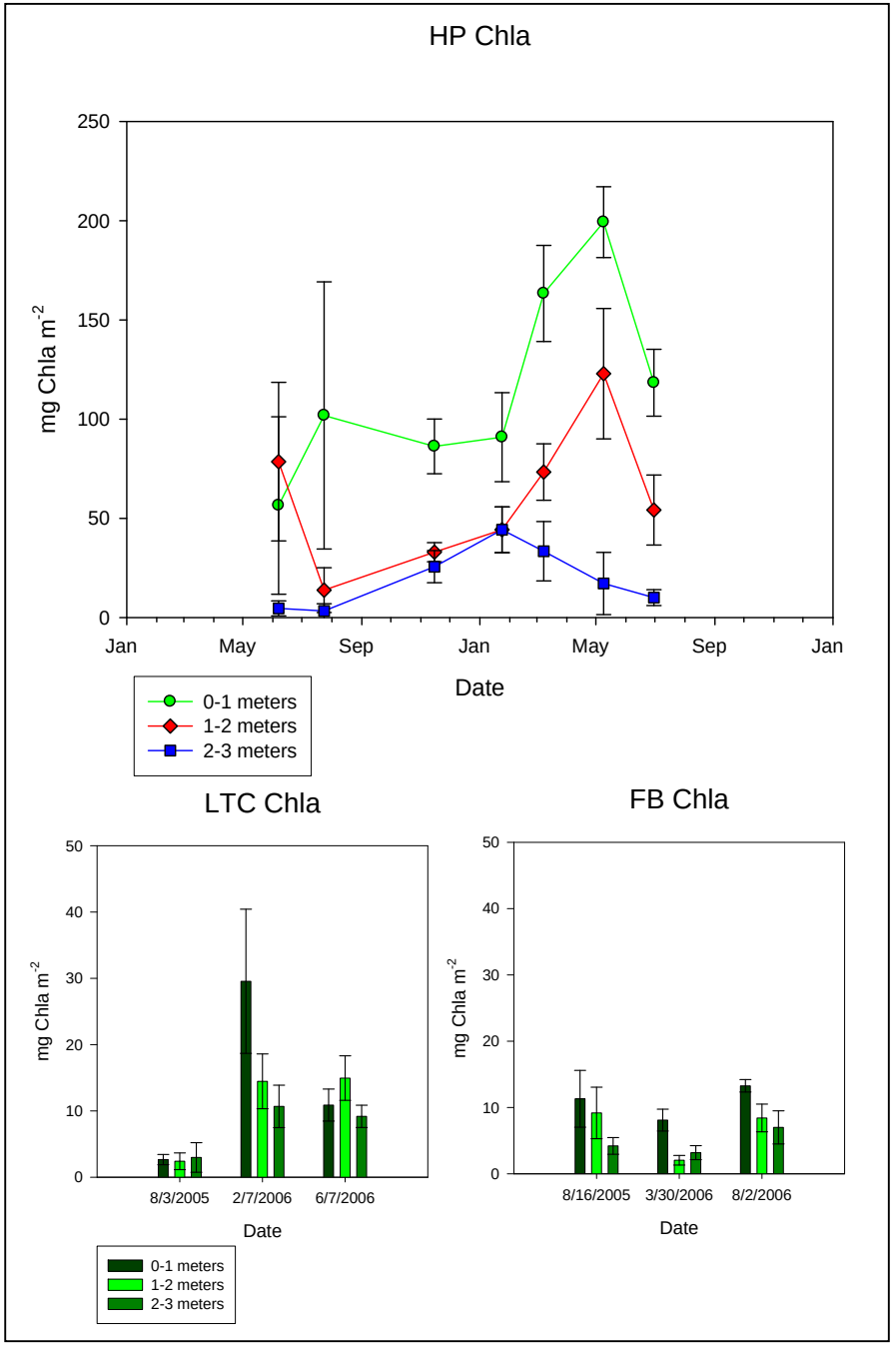


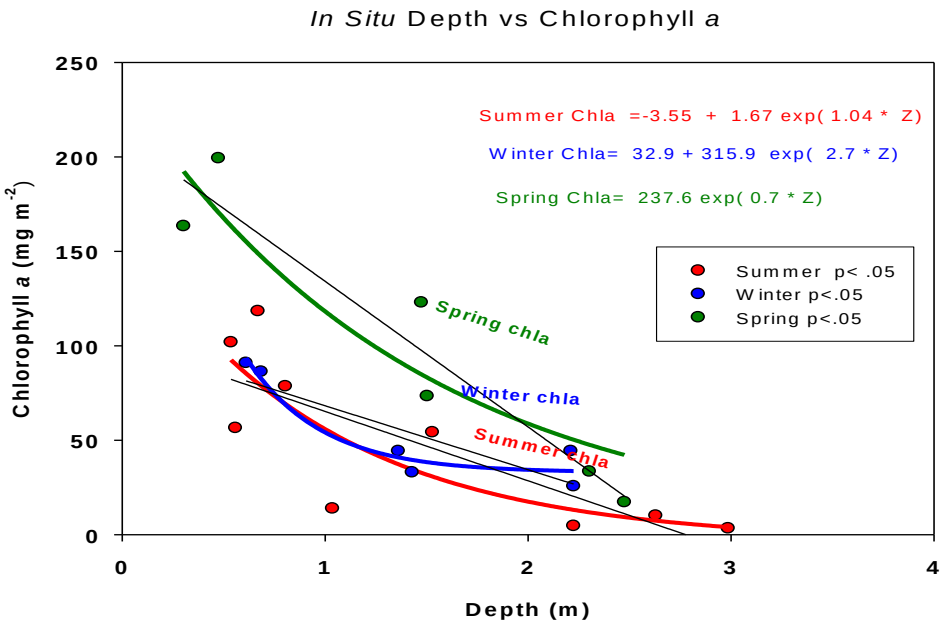
Sumer REU Project – Janet Krenn with assistance from Pat Dickhudt (Sanford Lab)

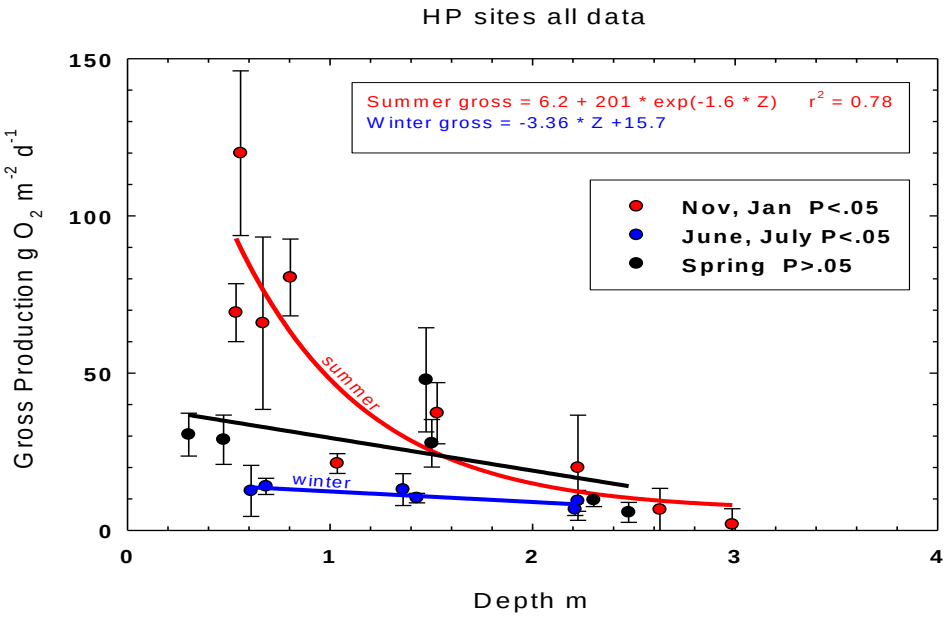
Areal sediment chlorophyll a in the Choptank River, La Trappe Creek, and Fishing Bay

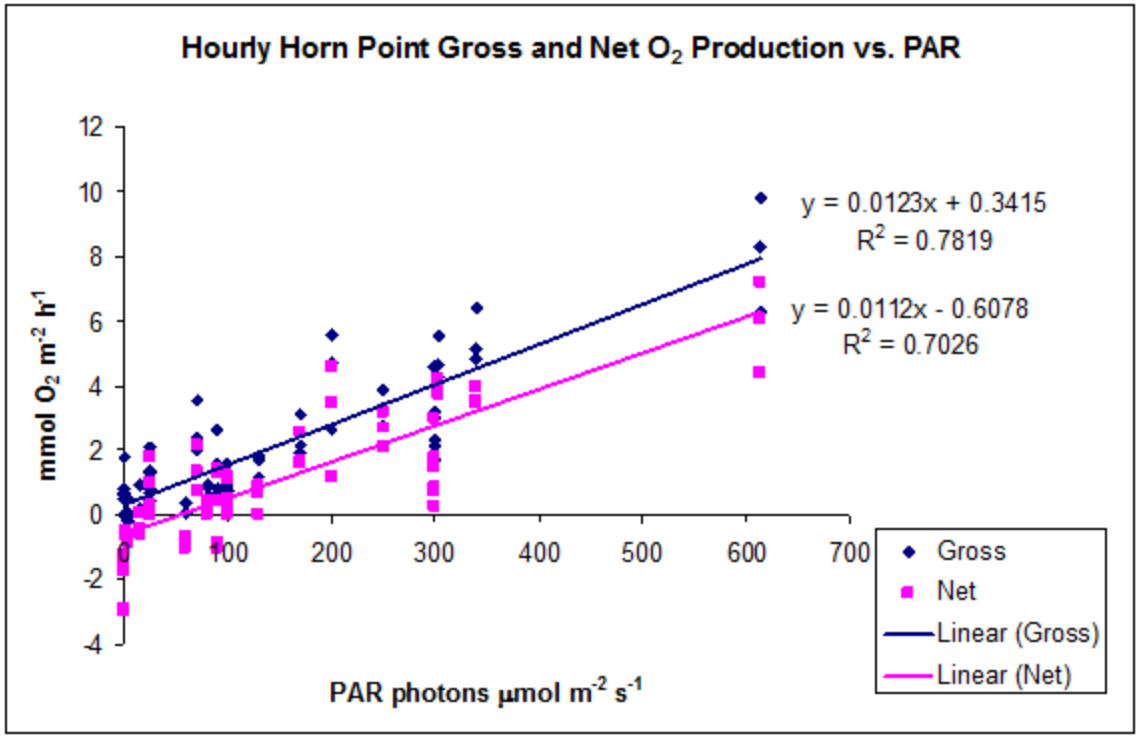




Chris Chick thesis data – used for developing GIS maps

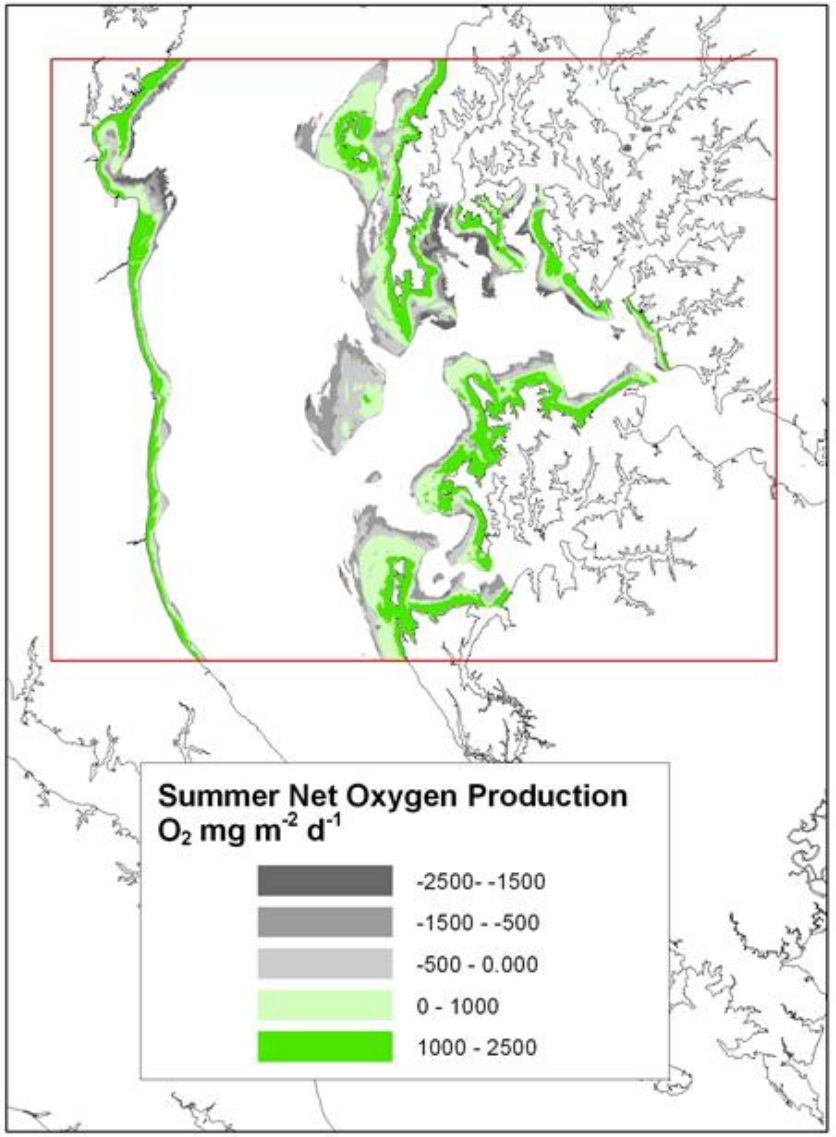




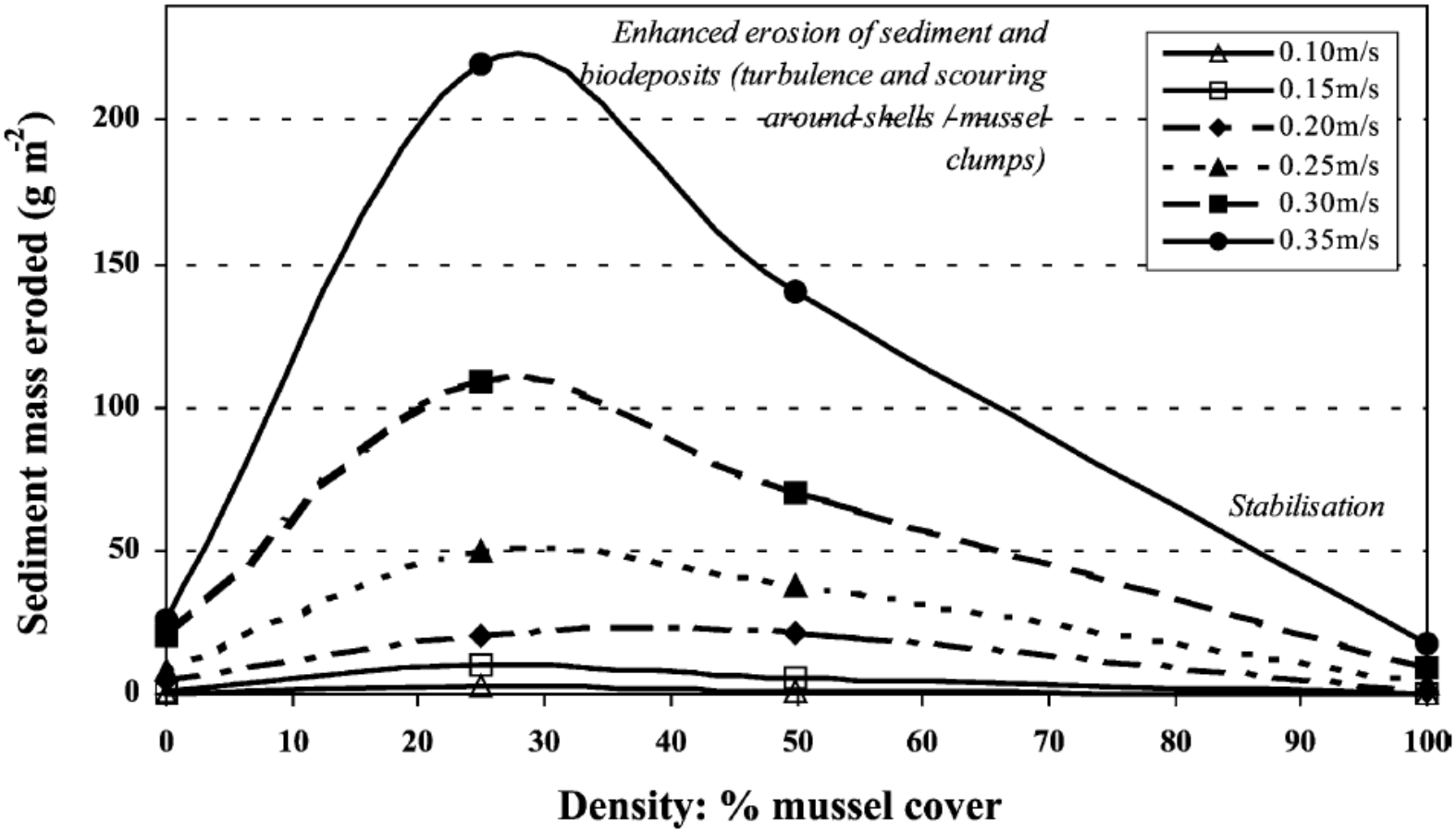

Hourly Horn Point Gross and Net O2 Production vs. PAR
mmol O2 m-2 h-1
PAR photons µmol m-2 s-1
y = 0.0123x + 0.3415
R2 = 0.7819
y = 0.0112x - 0.6078
R2 = 0.7026
Gross
Net
Linear (Gross)
Linear (Net)
12
10
8
6
4
2
0
-2
-4
0
100
200
300
400
500
600
700

Summer depiction of areas where benthic microalgae are productive. Chick thesis has other seasons….

Overall, we estimate about 10% of photosynthesis in this box is from benthic microalgae



Bivalves can enhance or minimize erosion!



Widdows and Brinsley, Journal of Sea Research, 2002

Conclusions

- Benthic microalgae are currently a small, but potentially important source of primary production
- Beyond photosynthesis, benthic microalgae also can make large changes in sediment-water exchange of nutrients
- While there is little direct measurement in the Chesapeake, or in most places, it appears benthic microalgae can play a role in stabilizing sediment.
- This could be an important feedback as we decrease nutrient loading and increase water clarity

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