

# **Engineering with Nature: Breakwaters for the creation of Submerged Aquatic Vegetation (SAV) habitat**





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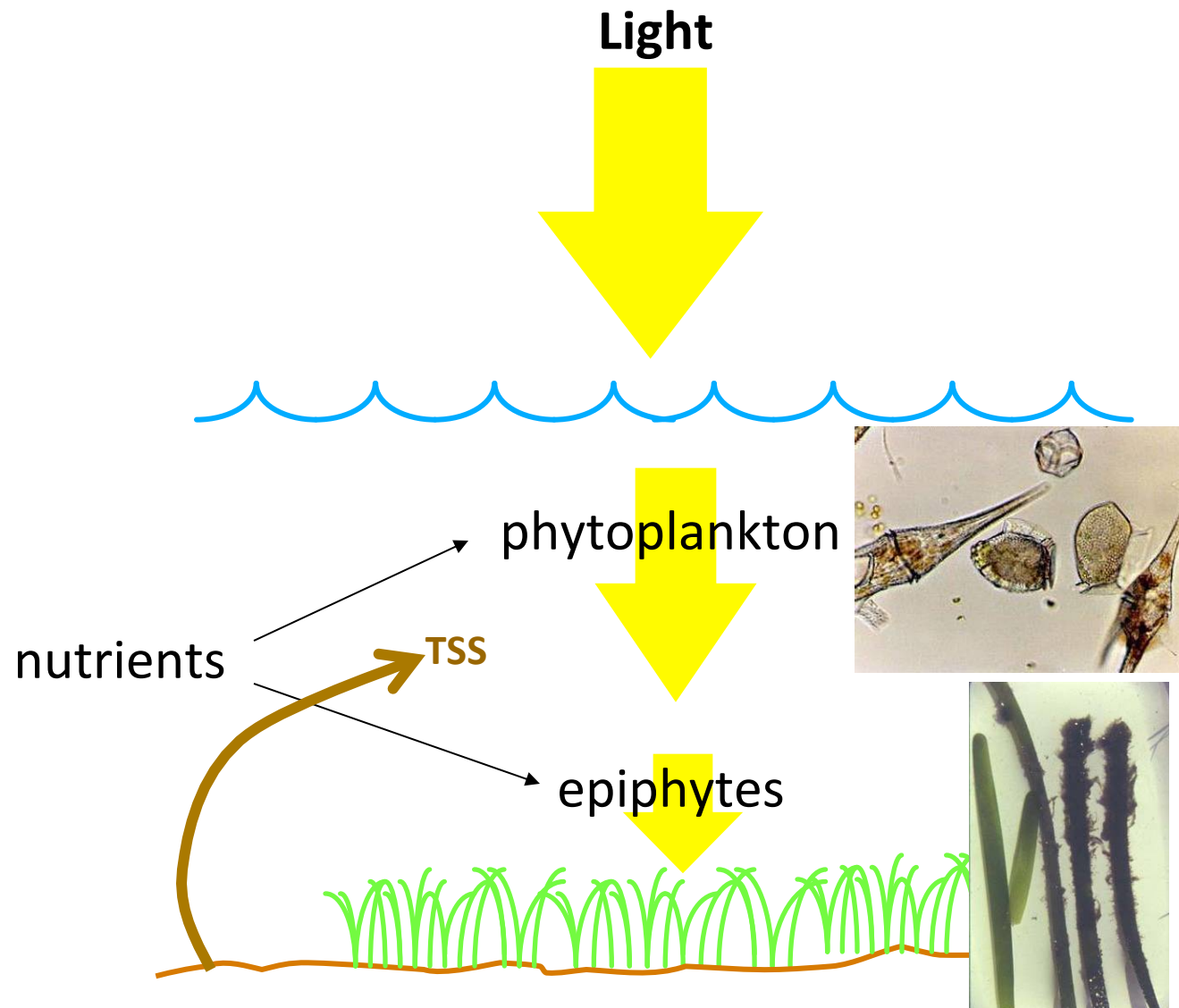
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**SAV** - flowering, rooted aquatic (submersed) plants  
One of the most important coastal habitats.

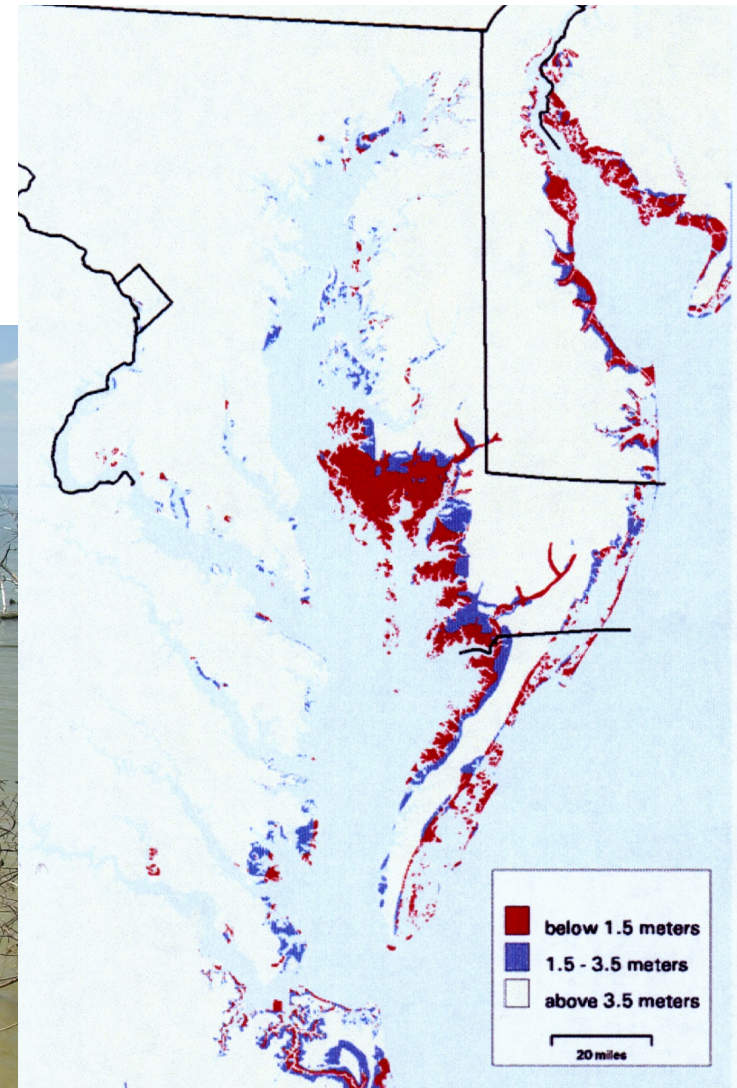


SAV have been disappearing at an alarming rate.  
**Causes:** eutrophication = lack of light.



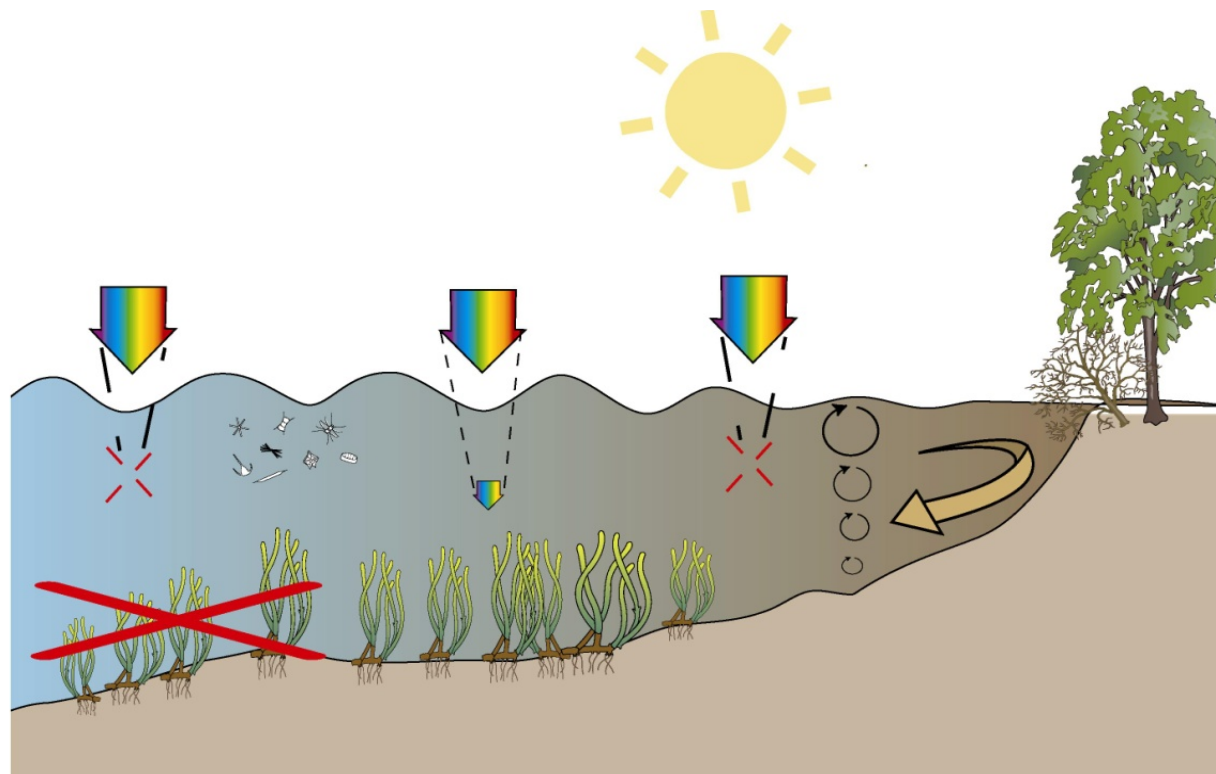
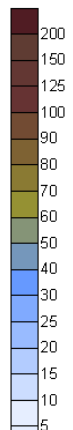
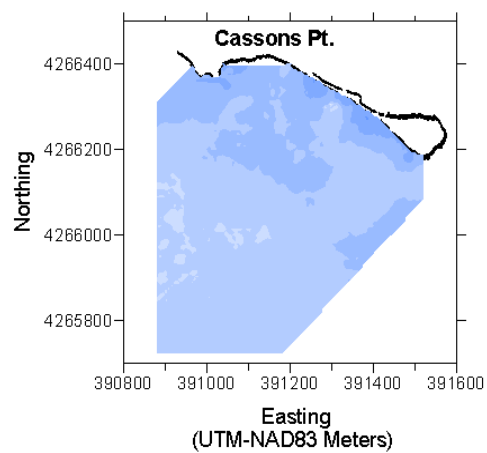


## Another cause of water turbidity: shoreline erosion





CTD Survey: SGLC3S1: June 20, 2006





But not all sediments are equal. Sediment type  
being eroded matters!

Erosion of mud leads to higher turbidity - bad for SAV.

Erosion of sand - to a certain extent, good for SAV

Mason Neck State Park, Potomac River

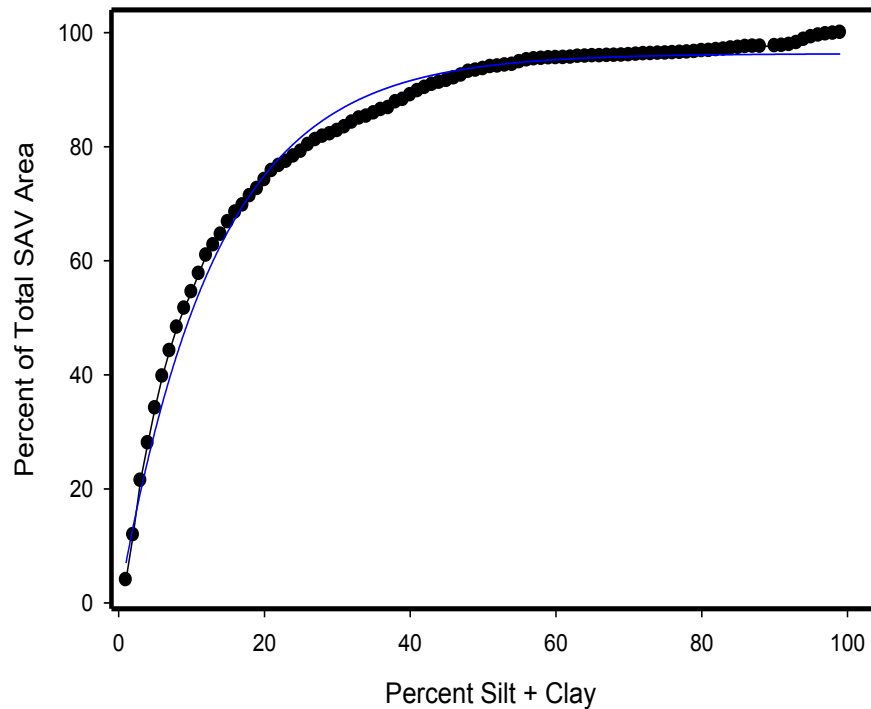


Cook's Point, Choptank River

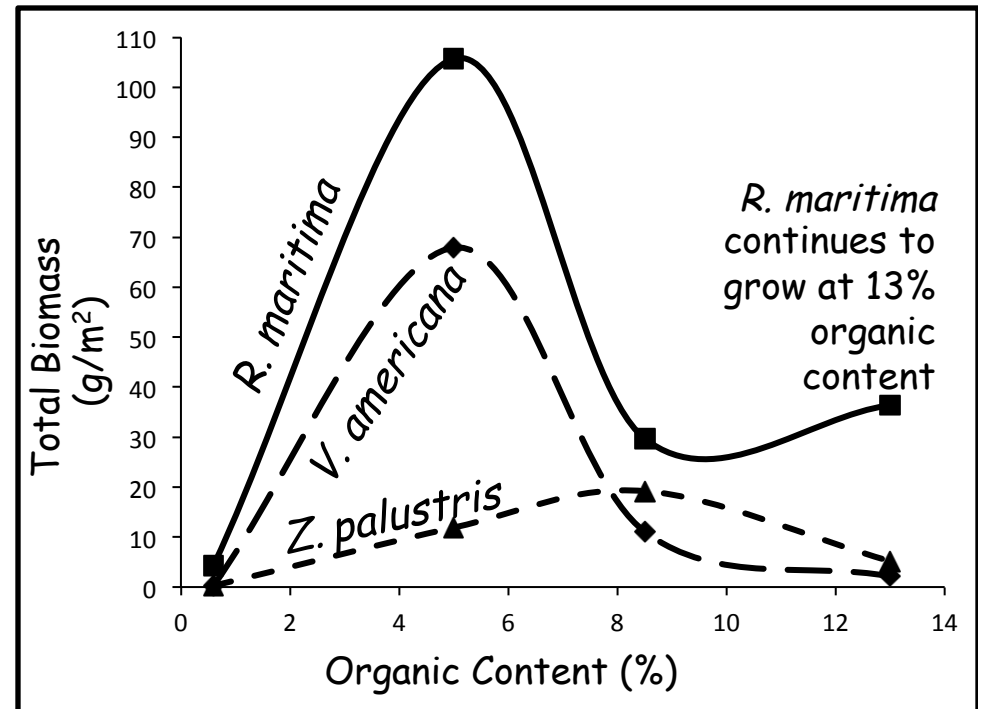




SAV need > 65% sand, < 5% organic matter



—●— Observed data  
— Predicted  
 $R^2 = 0.98855545$   
Equation %Total Area =  $96.31(1 - e^{-0.07526(\% \text{Silt} + \text{Clay})})$

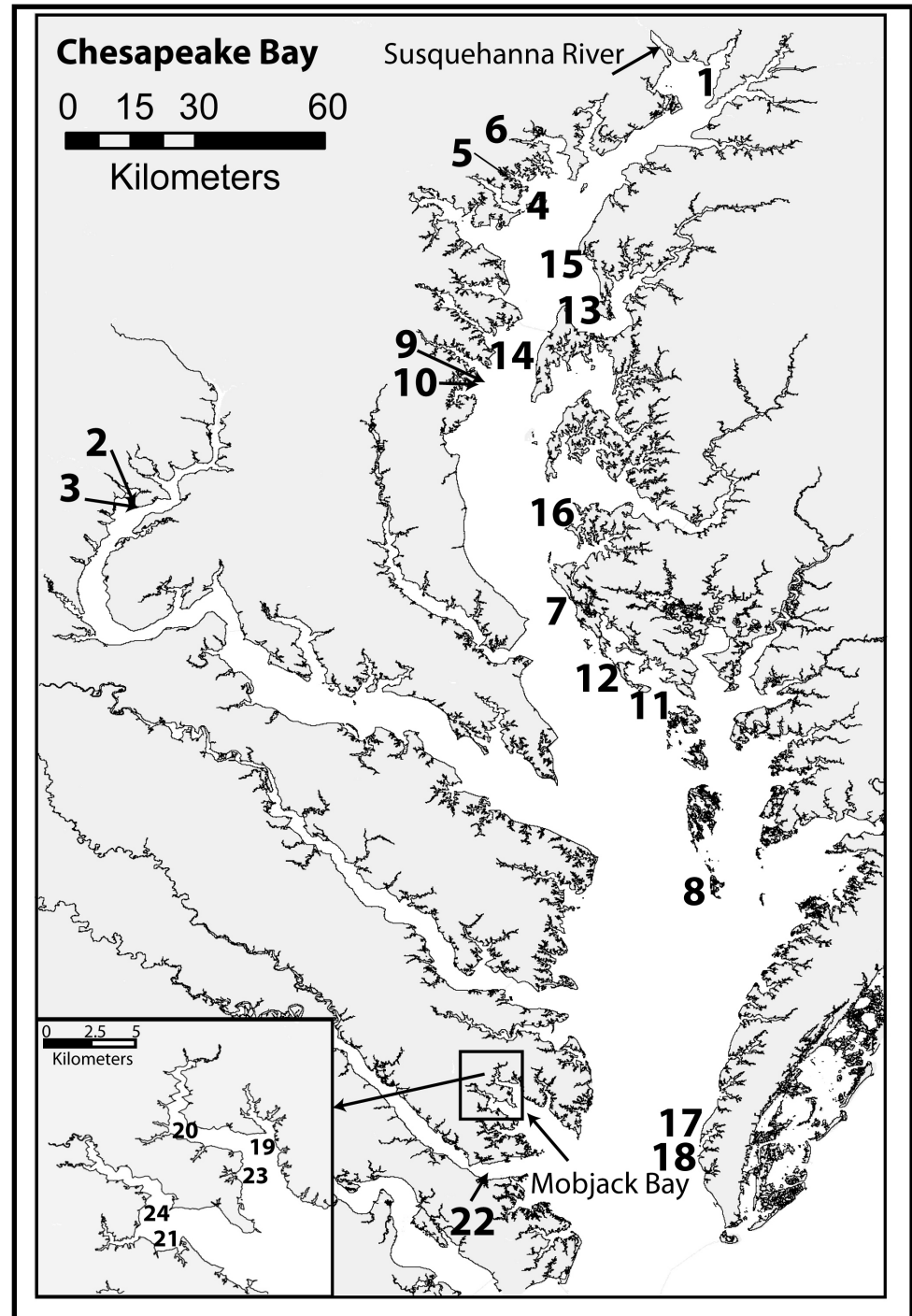




Sand is of the  
essence  
in the creation of  
viable SAV habitat!

Can breakwaters  
create suitable  
SAV habitat?

- ages from 0 to 20 yrs old



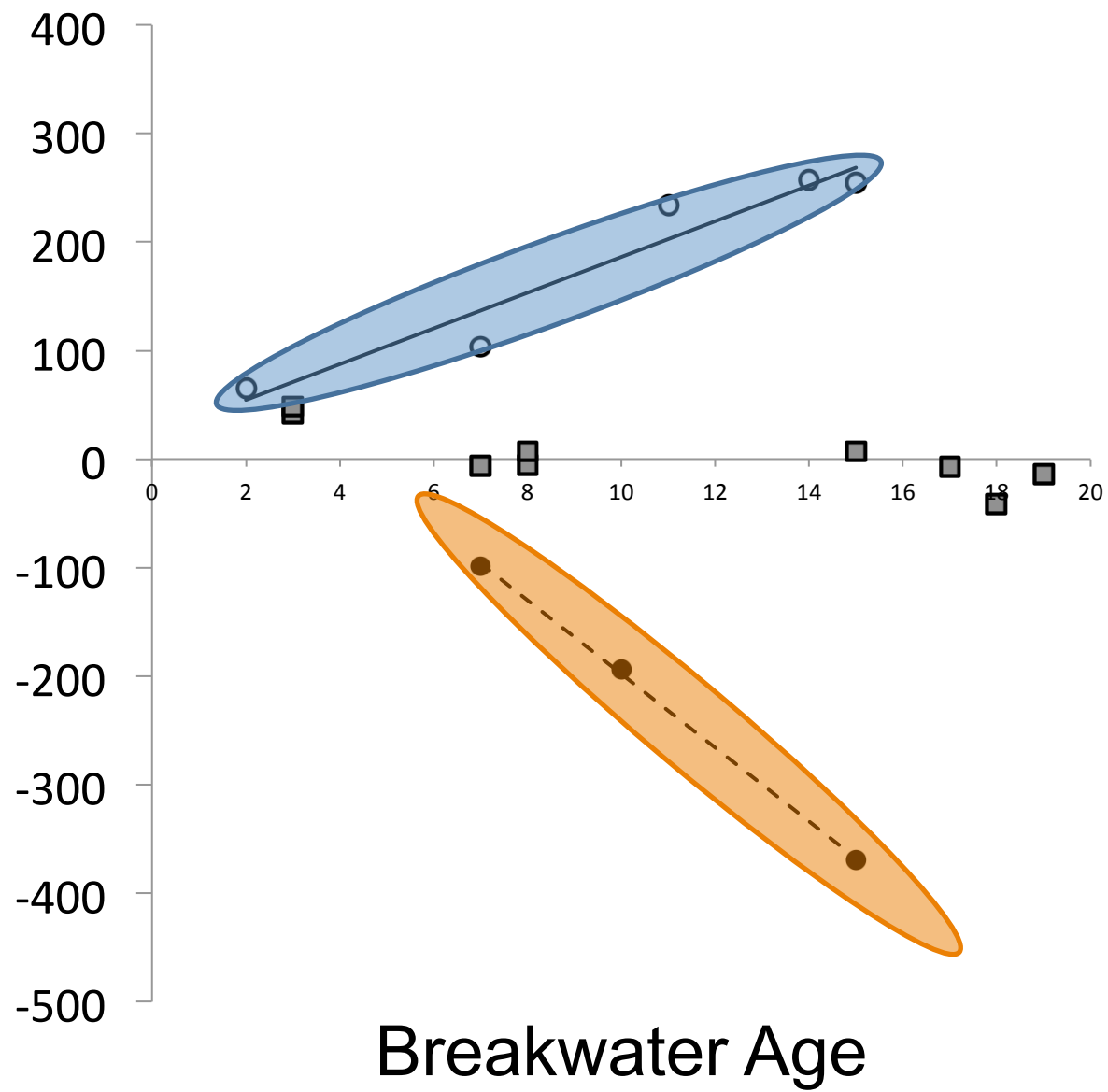




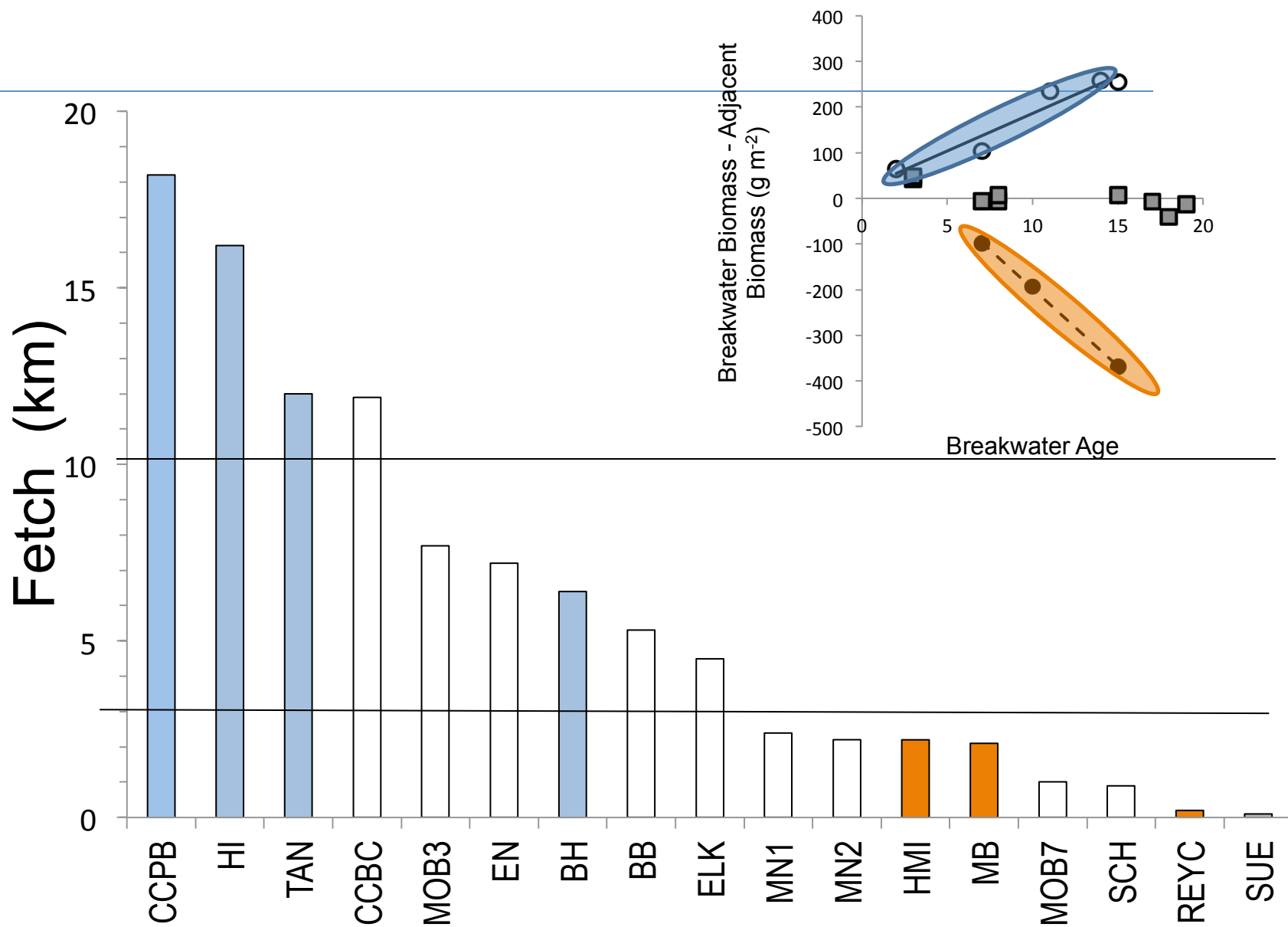
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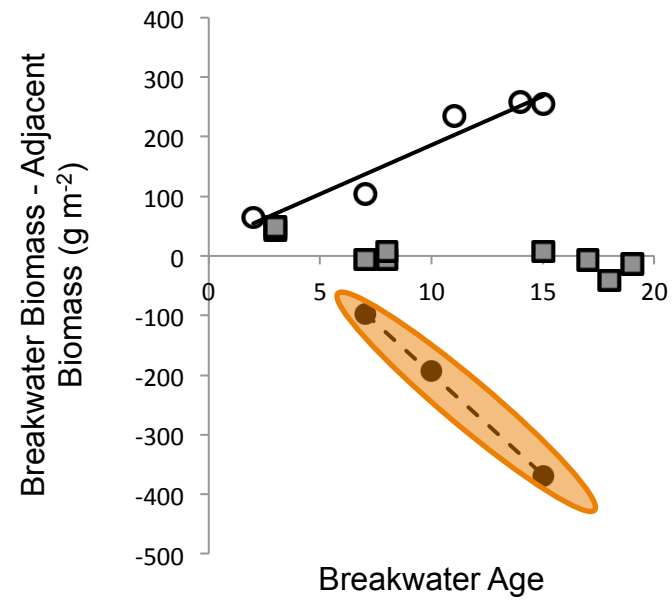
Breakwater Biomass -  
Adjacent Biomass ( $\text{g m}^{-2}$ )

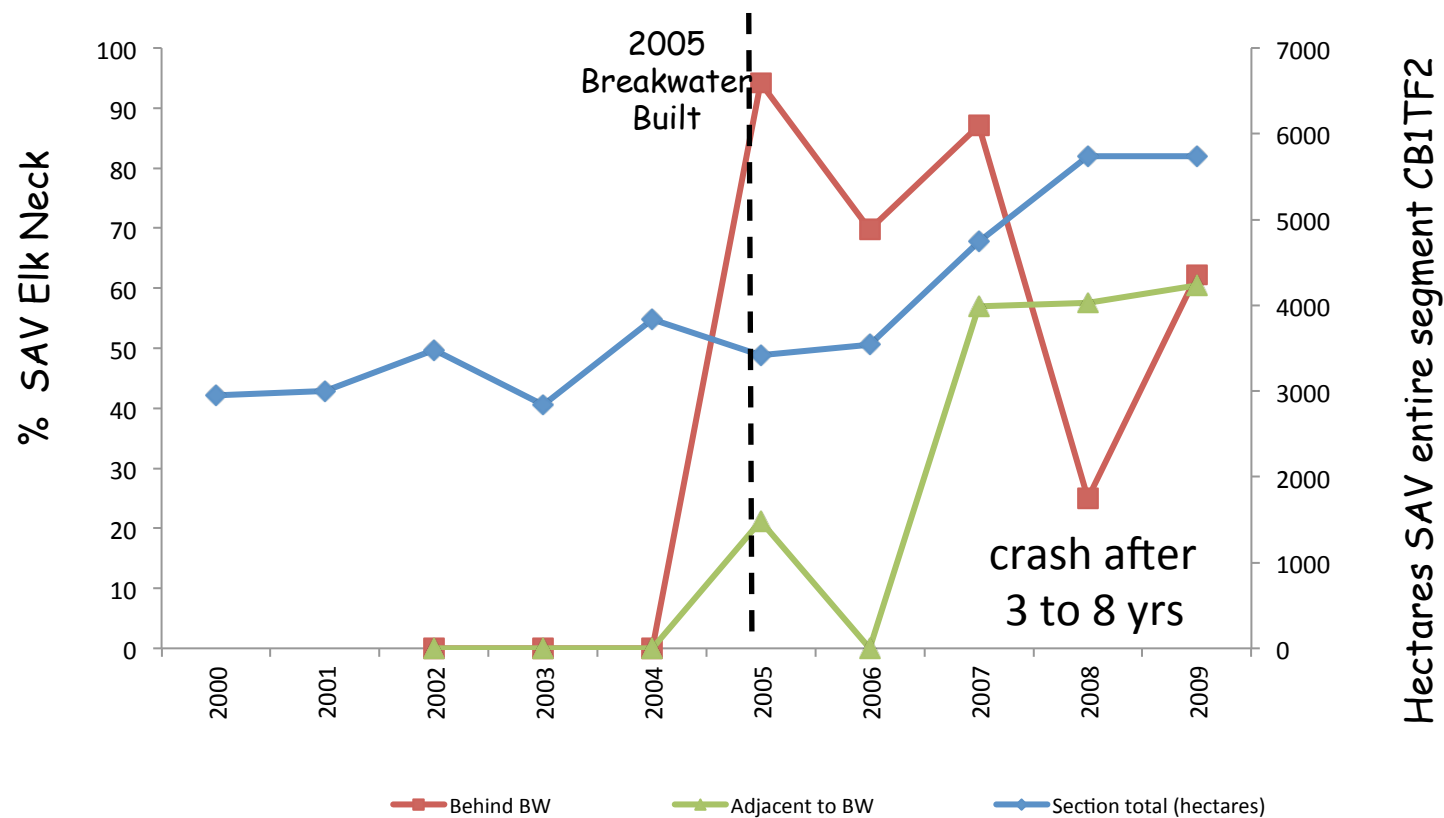
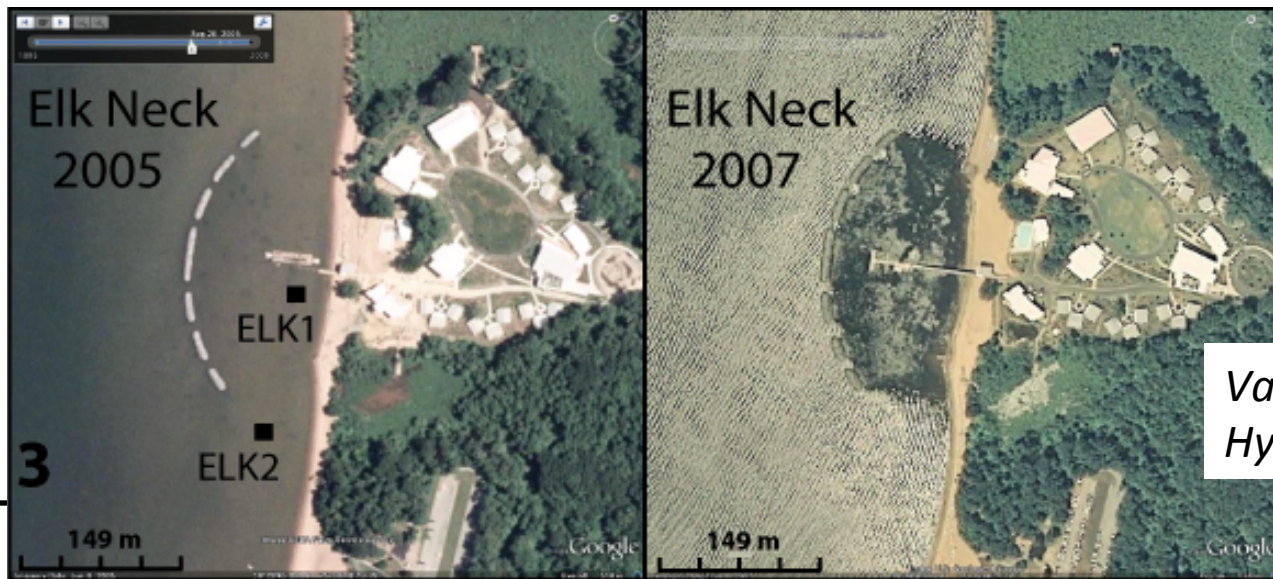








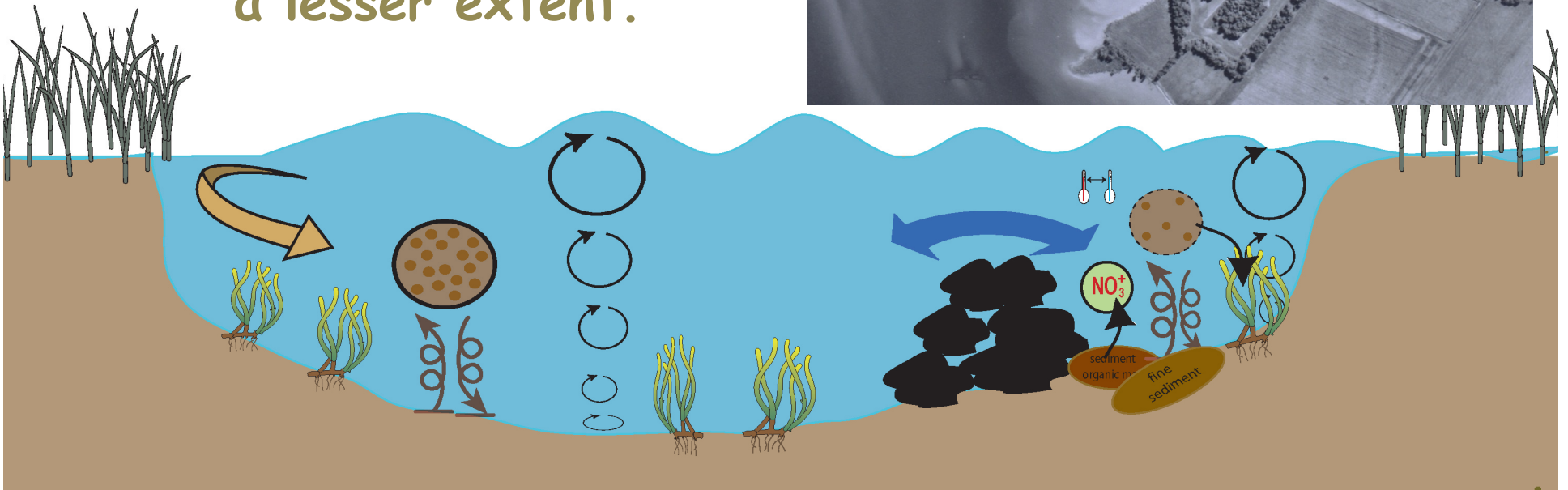
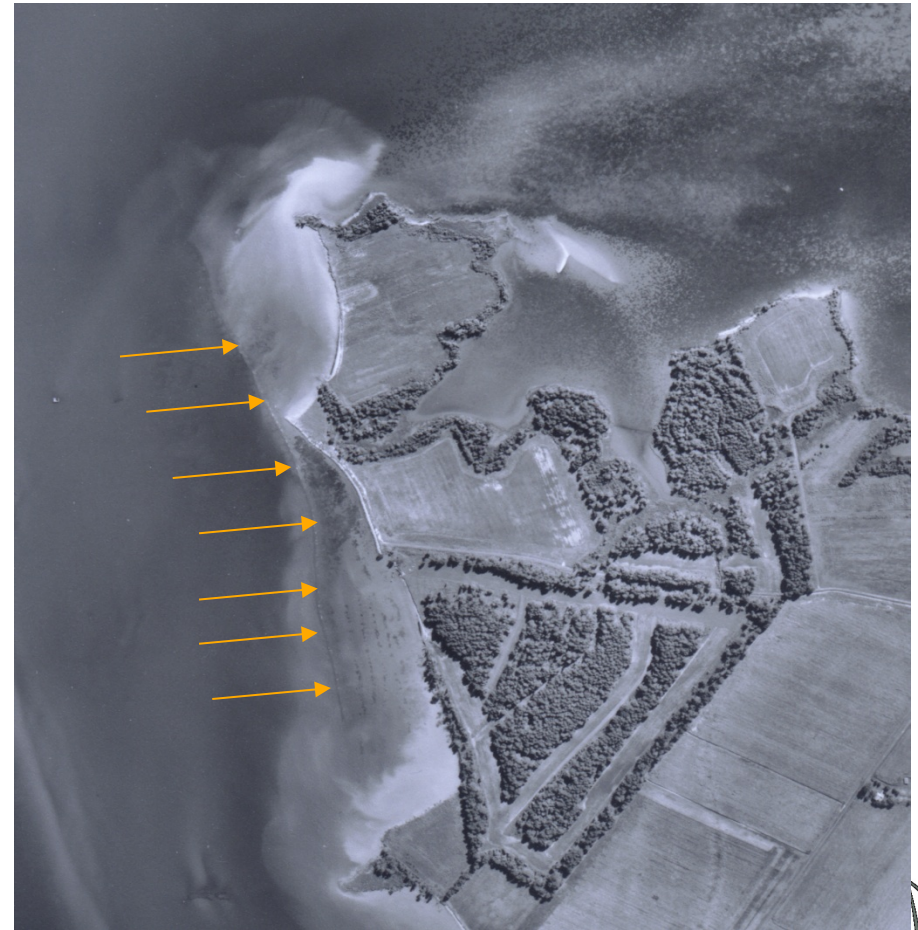


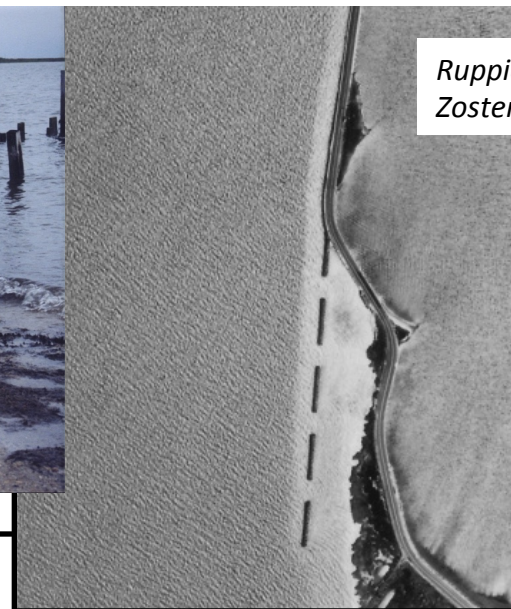
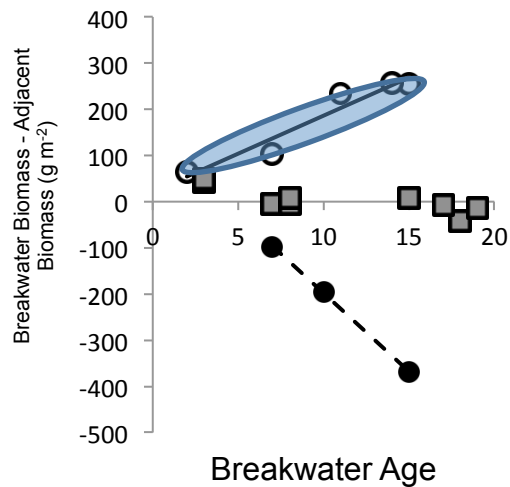






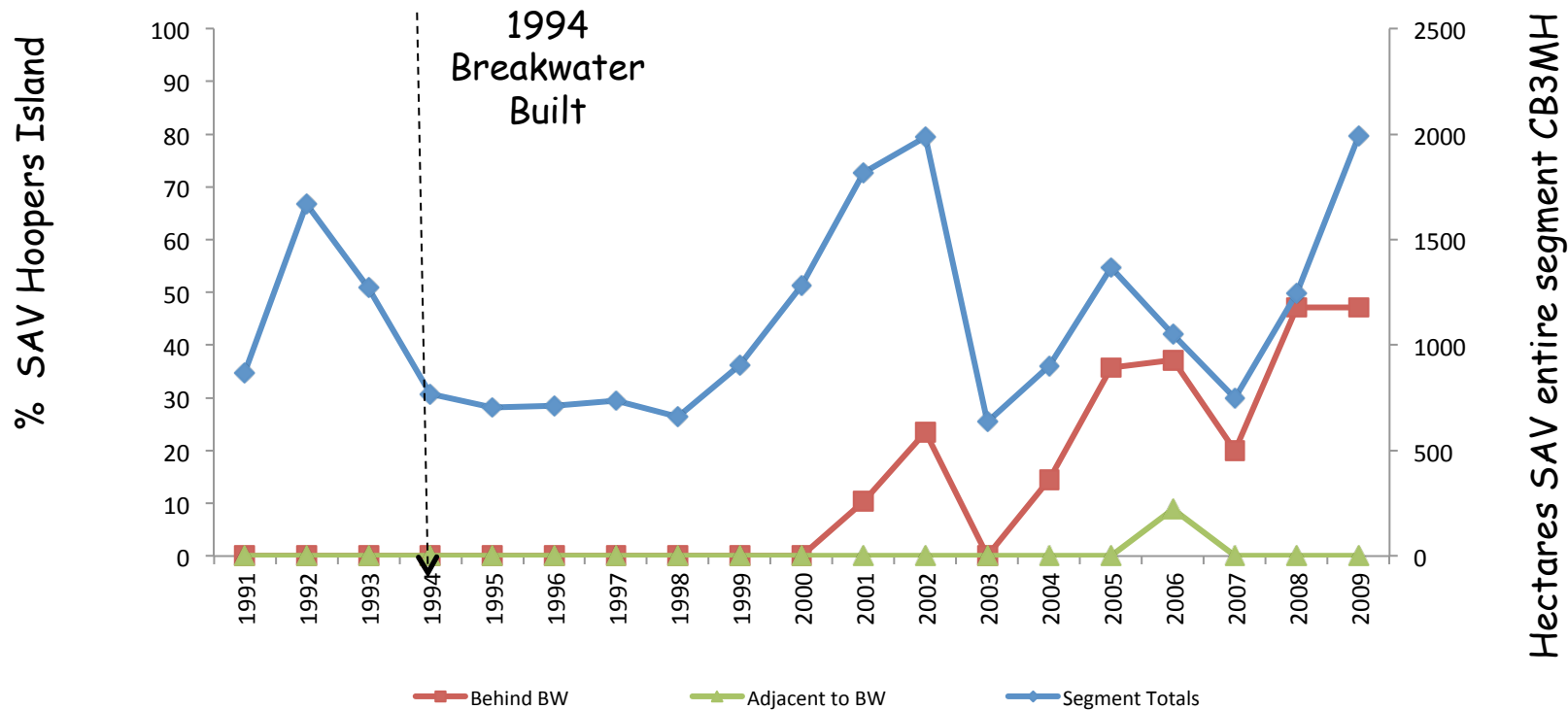
SILLS still have the same detrimental effects as some breakwaters, just to a lesser extent.





*Ruppia maritima*  
*Zostera marina*

## Segment SAV coverage vs. Hoopers Island





Learning from nature:  
what is the right sediment accumulation rate to create  
SAV habitat?

Estuaries and Coasts  
DOI 10.1007/s12237-012-9542-7

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**Sediment Accumulation Rates and Submersed  
Aquatic Vegetation (SAV) Distributions in the Mesohaline  
Chesapeake Bay, USA**

Cindy M. Palinkas • Evamaria W. Koch

Depositional rates  $> 9$  mm/yr are beneficial for SAV

# Conclusions

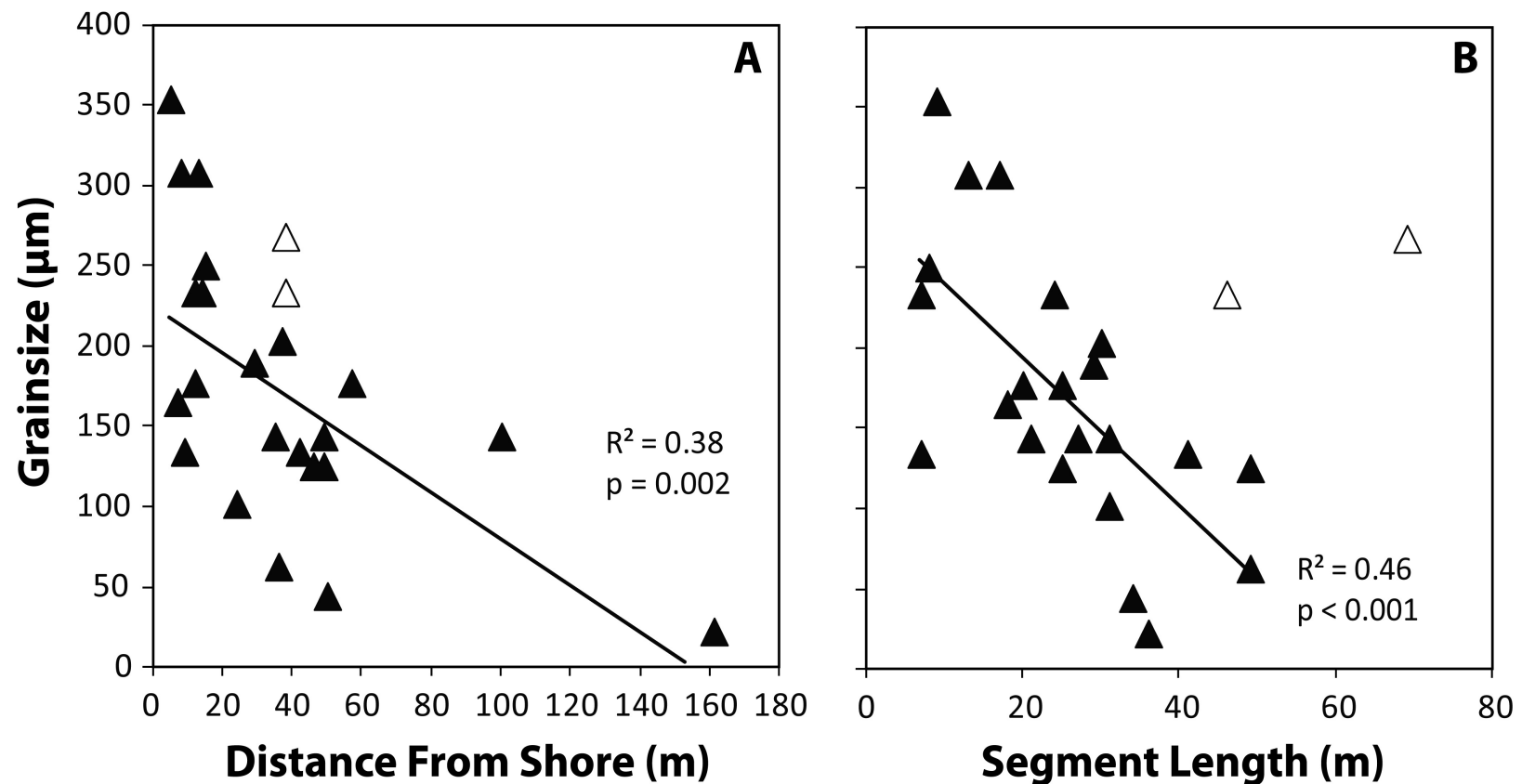
Breakwaters can sustain SAV populations as long as some habitat requirements are met:



- **Water quality** - regional water quality needs to be good enough to support SAV growth
- **Water depth** - deep enough so SAV can remain submersed at low tide
- **Sediment** - needs to remain sandy (<35% silt+clay) with low organic matter (<5 to 8% organic matter) over time. Sedimentation rates >9mm/yr are also beneficial but no infilling (habitat becomes intertidal)
- **Fetch** - breakwaters are most beneficial to SAV in long fetch areas (> 10 km)



# Management Recommendations breakwater construction for SAV conservation and/or restoration







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Shoreline characteristics also need to be considered:



- **Eroding Marshes** - a layer of sand\* needs to be added to cover the marsh peat in the sub-tidal (\*>2cm, Wicks et al. 2009)



- **Sandy Beach** - breakwater beneficial to SAV especially when fetch > 10 km



- **Cliffs** - base of cliff needs to be stabilized to reduce sediment input and shoaling breakwater-protected area



Questions for Evamaria Koch?

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Learning from nature:  
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