Sediment Transport and Deposition in the Upper Chesapeake Bay

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but retired

STAC Workshop

Conowingo Infill Influence on Chesapeake Water Quality

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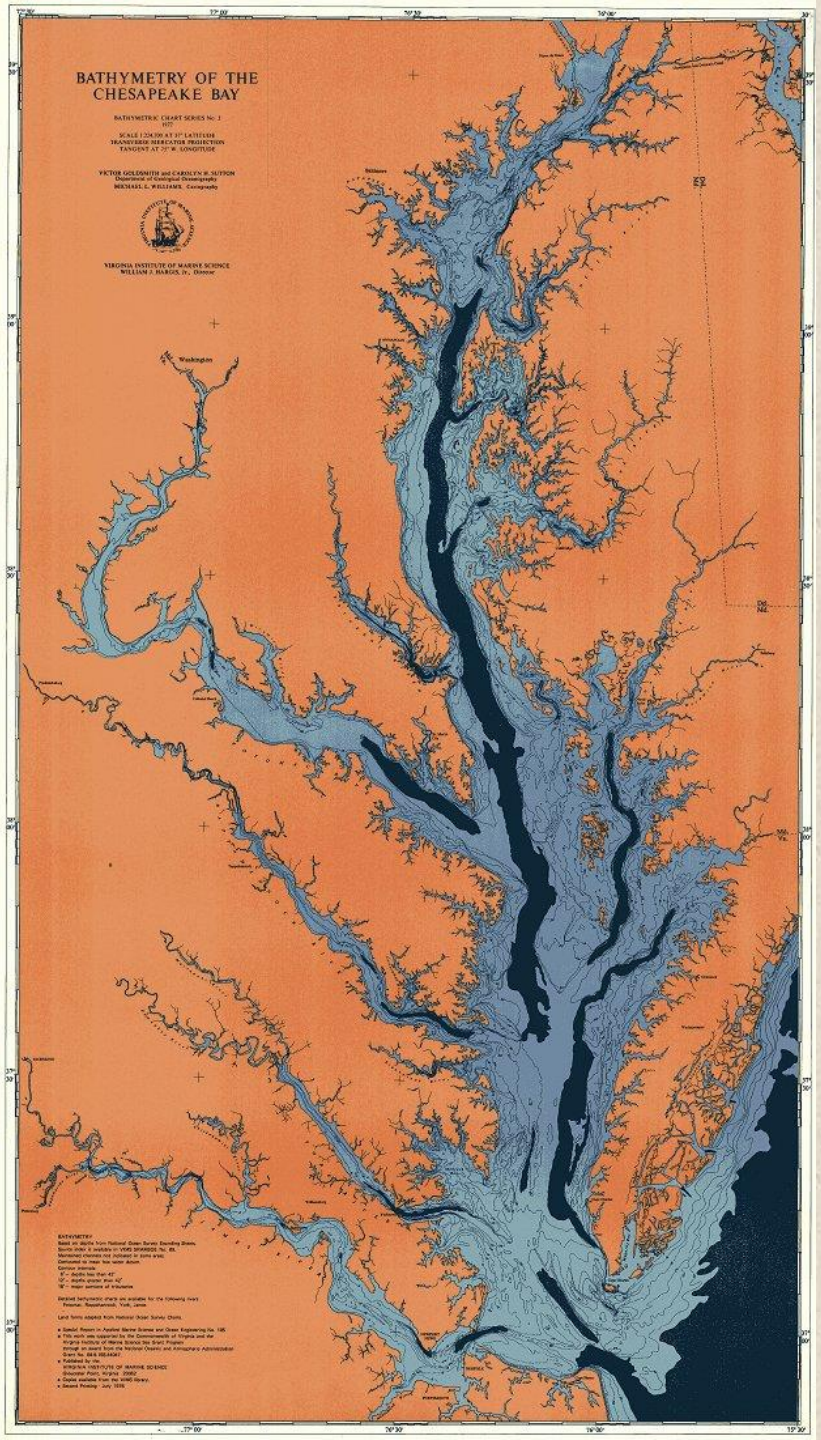
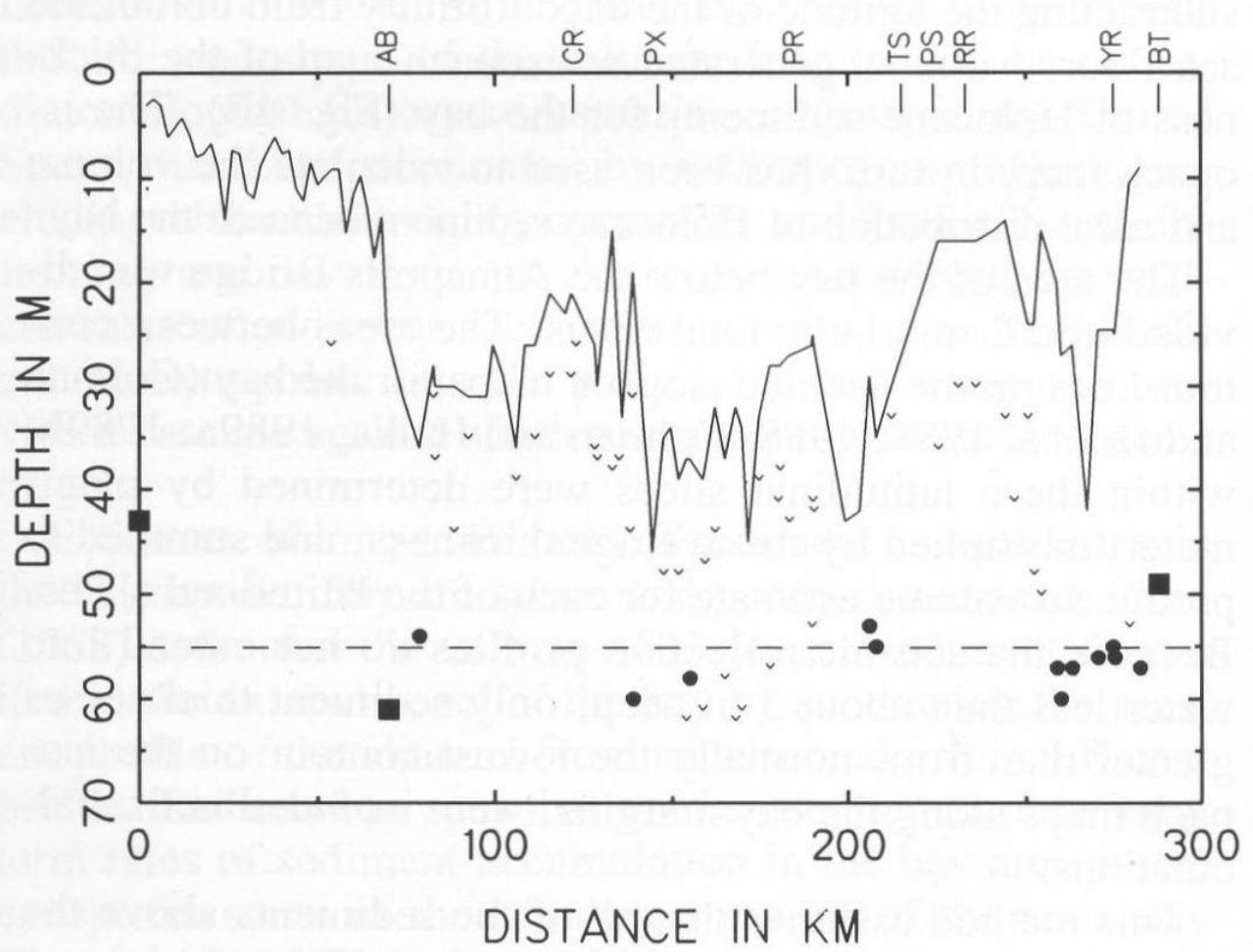
Chesapeake Bay Bathymetry



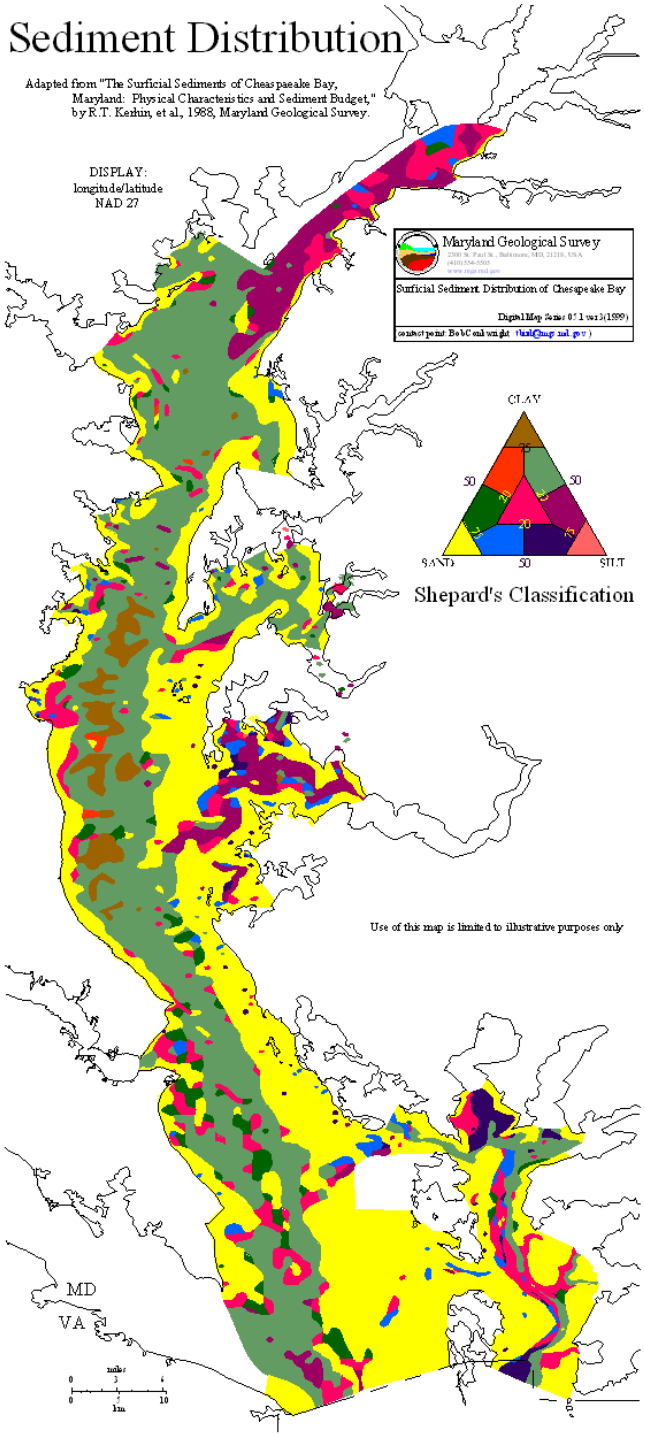
Source: VIMS

Axial channel depths plotted over Susquehanna River axial paleochannel

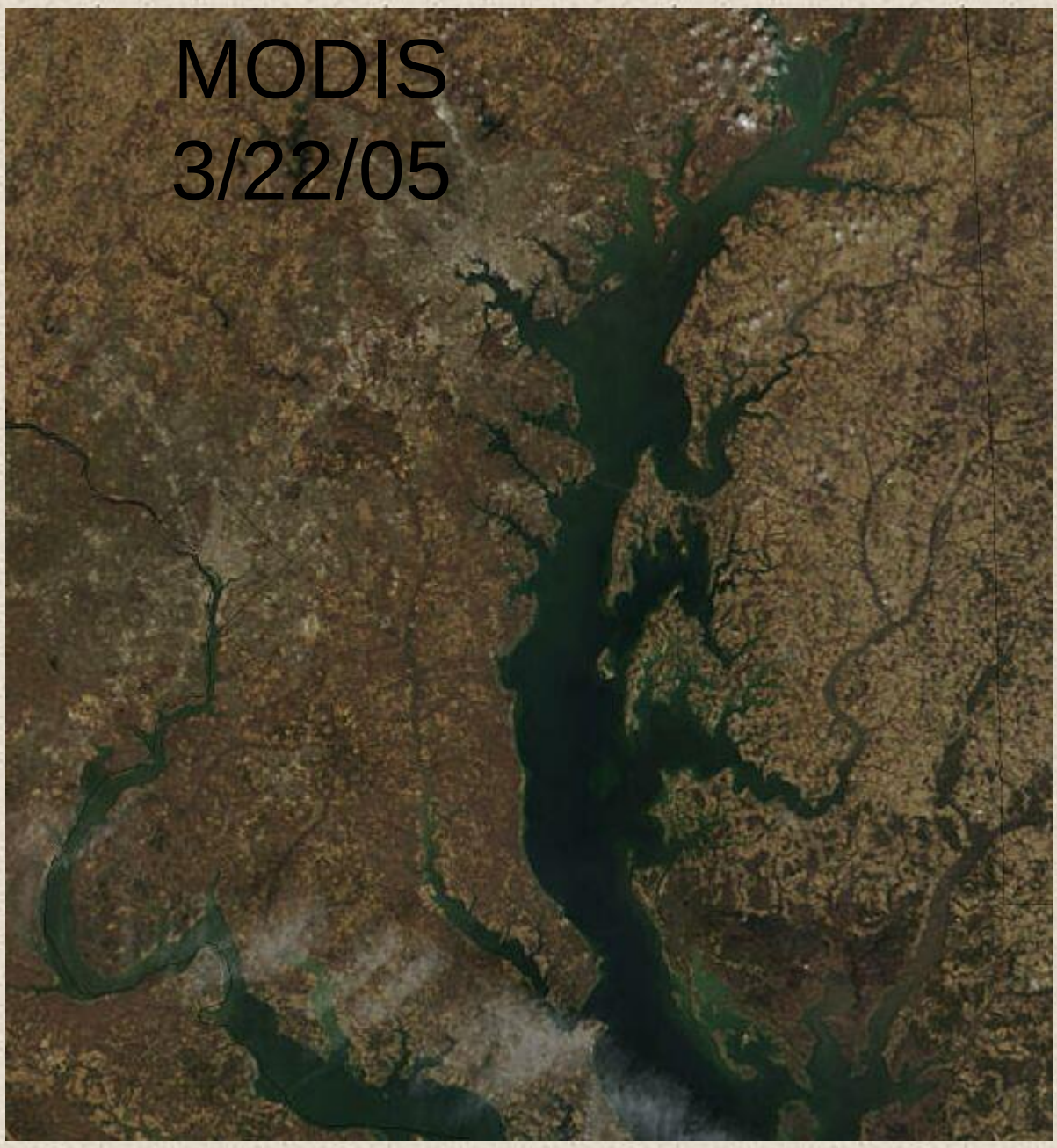


Source: Colman, Halka and Hobbs, 1992; SEPM Spec. Pub. 48

Surficial Sediments - MD



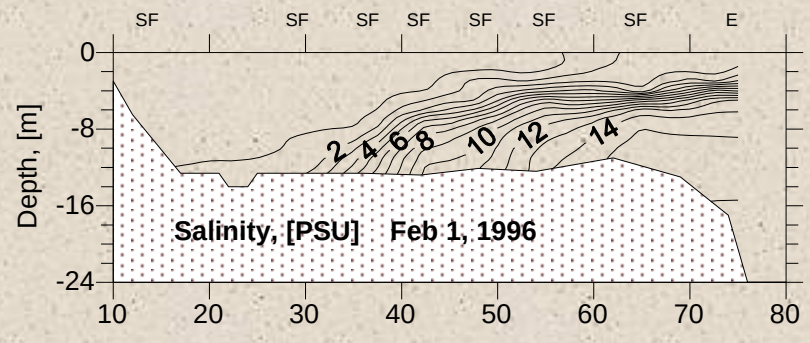
Source: Maryland Geological Survey; Report of Investigations 48

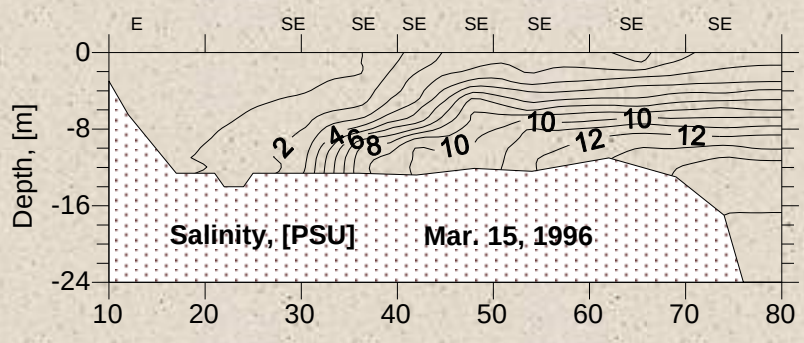

MODIS
3/22/05

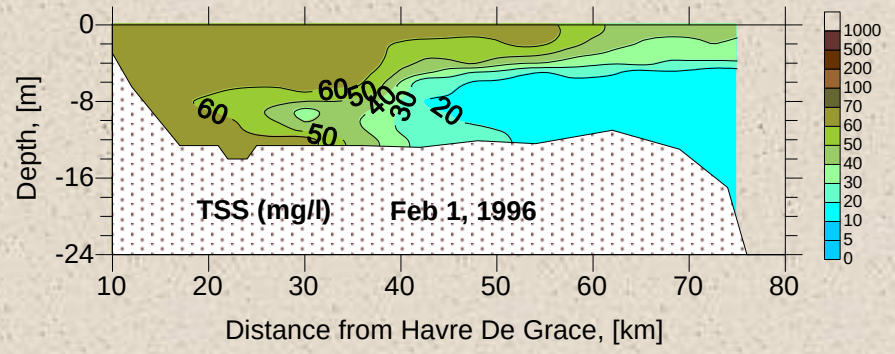

MODIS 4/09/05

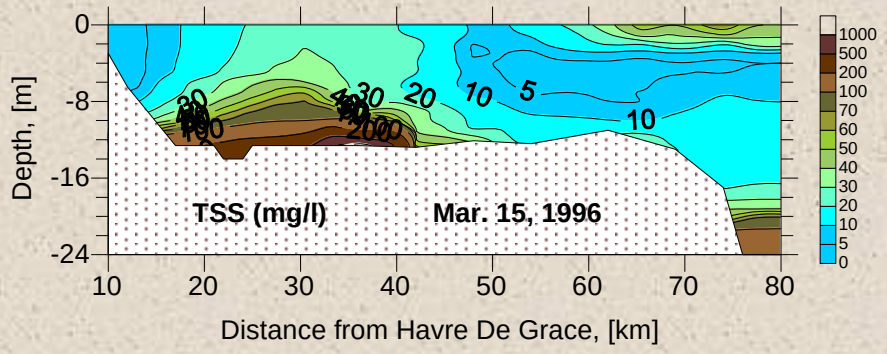
ETM Salinity and Suspended Sediments

Winter/Spring 1996



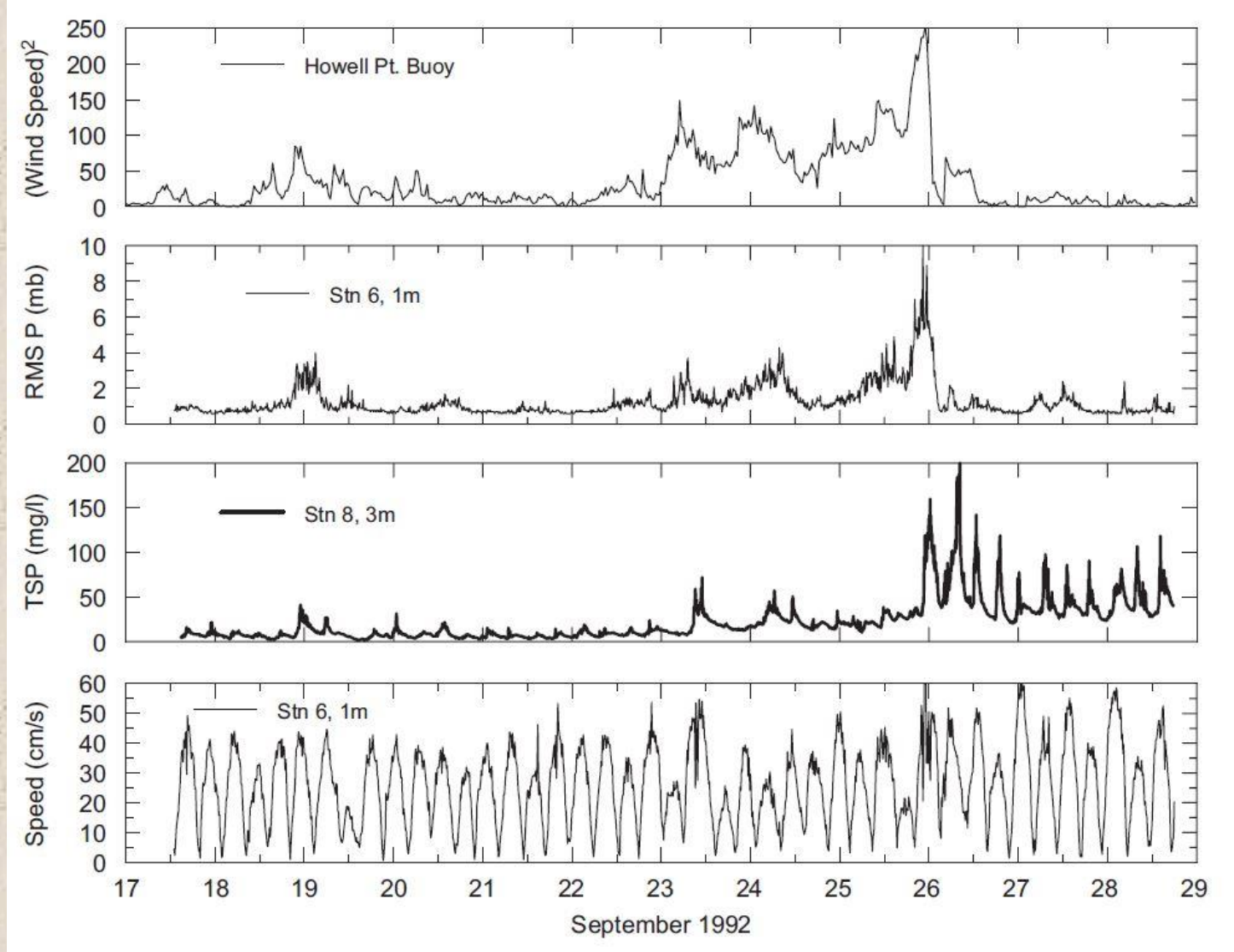






Source: L. Sanford

Wind effects on sediment suspension and subsequent resuspension



Source: Sanford, 2008; Computers & Geosciences

Approximation of Sediment Resuspension in the Upper Bay Related to Susquehanna River input

Volume	4×10^9 m^3	CBP Segments CB1TF, CB2OH, CB3MH
Average depth	5.05 m	
Approximate bottom area	0.79×10^9 m^2	CBP Segments CB1TF, CB2OH, CB3MH
Typical resuspended sediment concentration	30 mg/l (0.03 kg/m^3)	0.125 kg/m^2 of bottom
Typical background sediment concentration	15 mg/l (0.015 kg/m^3)	0.063 kg/m^2 of bottom
Typical mass of resuspended sediment	119×10^6 kg	1 mm of bottom sediment at 95% porosity
Typical mass of background sediment	60×10^6 kg	
Typical total suspended sediment mass	179×10^6 kg	
Average recent Susquehanna River sediment load	2.0×10^9 kg/y (5.5×10^6 kg/d)	Langland (pers comm)
Typical sediment resuspension load	**238×10^6 kg/d**	= **8.7×10^{10} kg/yr**

Annual Resuspension is >40x annual sediment load

Northern Bay Sediment Budget

ANNUAL SEDIMENT INPUT

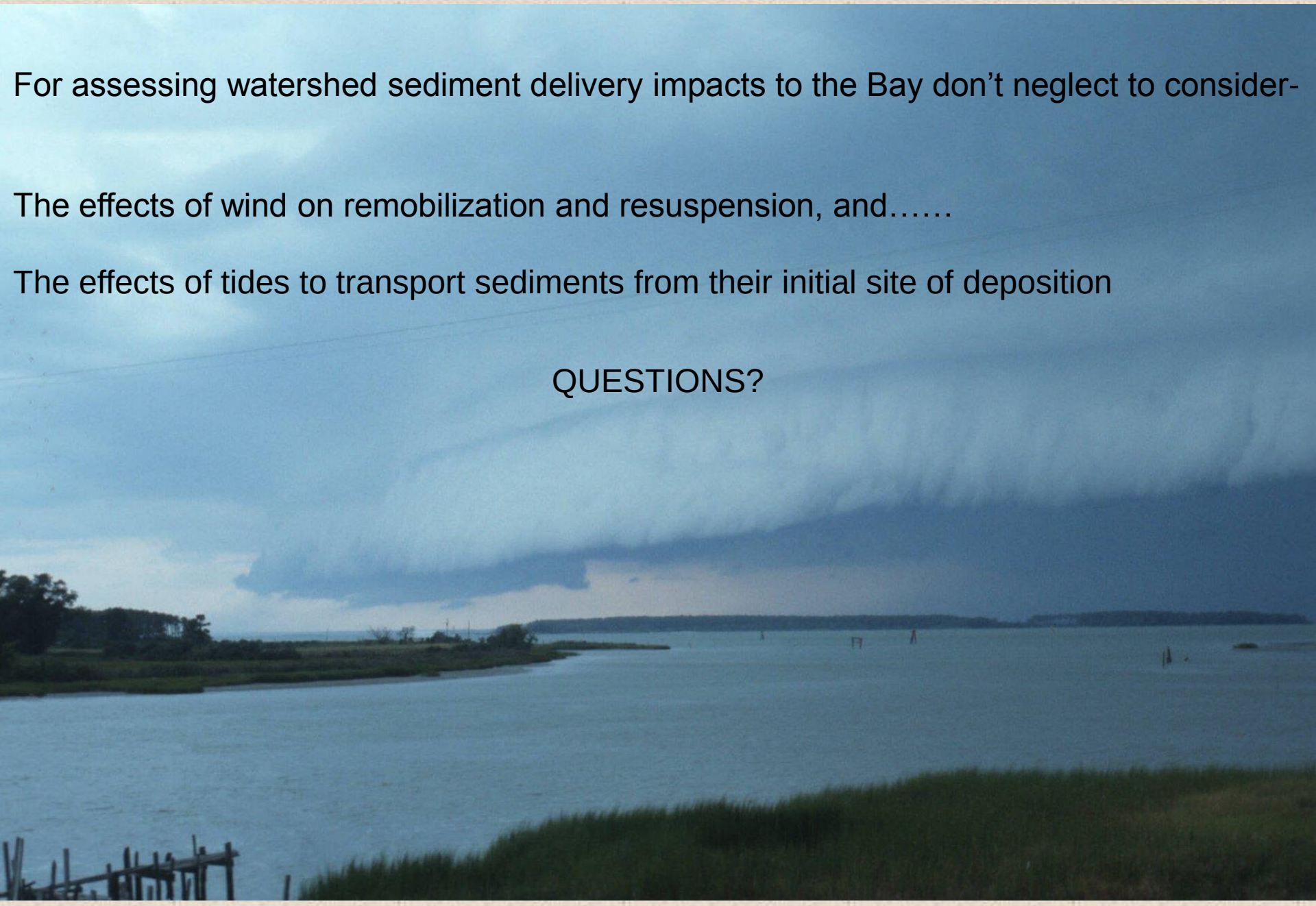
Susquehanna River	2.00×10^9 kg/yr
Shore Erosion (silts and clays)	0.15×10^9 kg/yr
Internal Primary Productivity	0.01×10^9 kg/yr
Total	2.16×10^9 kg/yr
Shore Erosion (sands)	0.12×10^9 kg/yr
TOTAL	2.28×10^9 kg/yr

VOLUME

Surficial Sediment Characteristics	Water Content = 58% Bulk Density = 1.35 g/cc Porosity = 79%
Mass of Sediment Particles	570 kg/m^3
Volume of Fine Grained Sediment	3.79×10^6 m^3
Thickness of Fine Grained Sediment	4.8 mm/yr

Upper Estuary Sediment Transport and Deposition Characteristics

- The watershed is the dominant source of fine-grained suspended sediments
- Coarser sands are not transported far beyond the river mouths or shorelines
- Turbidity maximum serves as a partial trap for much of the sediment from the watershed
- Finest particles transported beyond the turbidity maximum, particularly during high riverine flow periods, but may be returned to the turbidity maximum area during subsequent more normal flows
- Resuspension processes can dominate sediment transport on a tidal cycle basis
- Wind events can result in resuspension and remobilization of initially deposited bottom sediments, resulting in redistribution
- Sedimentation rates in the northern Bay have been high in the long term and continue to be relatively high



For assessing watershed sediment delivery impacts to the Bay don't neglect to consider-

The effects of wind on remobilization and resuspension, and……

The effects of tides to transport sediments from their initial site of deposition

QUESTIONS?