Submersed Resources: sediment management in the coastal bays

Beyond Light: Physical, Geological, and Geochemical Parameters as Possible Submersed Aquatic Vegetation Habitat Requirements

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SAV/seagrasses and the sediments they colonize
Do seagrasses in the Coastal Bays have a sediment habitat requirement?

In collaboration with:
Lee Karrh
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Sediment characteristics in vegetated versus unvegetated areas off Isle of White, Coastal Bays
Silt + clay levels above 35% seem to be limiting to seagrass distribution in Chincoteague Bay.
Data: Darlene Wells,
Figure: Lee Karrh, Cathy Wazniak
Observed data

Predicted

$R^2 = 0.98855545$

Equation $\%\text{Total Area} = 96.31(1-e^{-0.07526(\%\text{Silt + Clay})})$

Source: Lee Karrh
Seagrass habitat requirements in the Coastal Bays:

< 1.5 m depth (light)
< 35% silt + clay (sediment)
Shoreline retreat affects seagrasses/SAV via:

- turbidity of the water
- sediment composition
Turbidity generated at eroding shorelines contributes to seagrass/SAV loss...
... but we still have a lot to learn!

Sediment type being eroded matters
erosion of mud leads to higher turbidity than erosion of sand
Shoreline-generated turbidity varies over space...

Mills Island, Chincoteague Bay, MD
... and time.
Breakwater-protected areas can also be a main source of turbidity on windy days.
Shoreline retreat affects seagrasses/SAV via:

- turbidity of the water
- sediment composition
As sea level rises, marshes are stressed and seagrasses may move landward...
... but when compacted peat becomes exposed in the subtidal as a result of shoreline retreat, seagrasses can no longer follow.
In the Chesapeake Bay and Coastal Bays, that is where we are today!
Why can’t seagrasses colonize the compacted peat?

Little or no seed recruitment into sediment

Because seagrass seeds are carried away by currents and waves without being recruited into the sediment!
Sea Level Rise → Marsh
Marsh → Shoreline Retreat
Shoreline Retreat → Waves
Waves → Turbidity
Turbidity

Sediment Peat × Sand

Seeds

Sediment transport → seed recruitment
Peat → No seed recruitment
The compacted peat is not suitable for seagrass growth either...

Disproportionate biomass allocation; higher drag
NO seed recruitment and disproportionate biomass allocation for local hydrodynamic conditions

Seed recruitment if sediment transport, plants that can withstand local currents and waves
What is the future of seagrasses?
If sand is covering the compacted peat, then seagrasses can migrate landward with shoreline retreat!
What is the source of sand?

Mills Island, Chincoteague Bay
How much sand is needed?
CONCLUSION

Sand is of the essence for seagrasses in the Coastal Bays!

Port Isobel, VA
Sand can be used to restore compacted peat areas where seagrasses are no longer growing...

...but the sand needs to be stabilized (little erosion or continuous supply of sand)
Where has the **sand** gone?

Present SAV habitats seem to have less sand than historic habitats.
got sand?