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The Influence of Storms on Tidal Wetland Sediment Budgets

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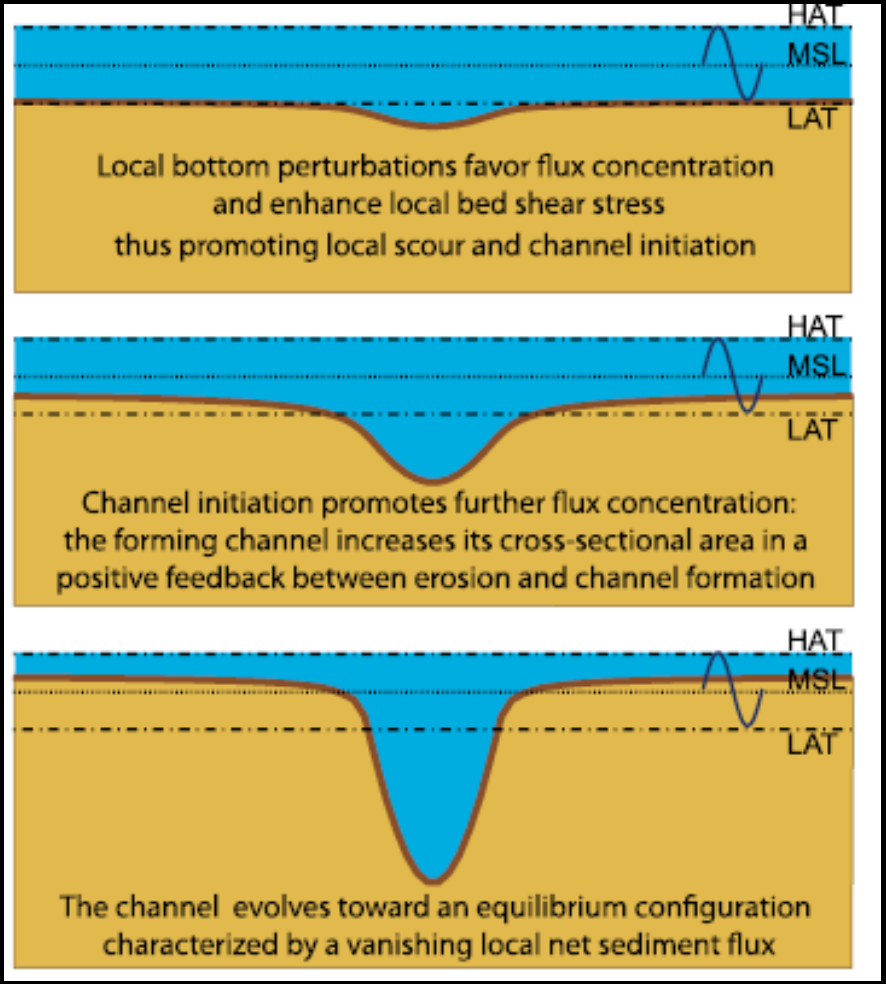
Importance of sediment supply



Fagherazzi et al., 2012

- Channel and flats the main conduit for sediment to marsh plain
- Stability of entire system a function of sediment budget
- Under conditions of SLR, wetlands must import sediment to maintain geomorphic structure
- Marsh plain cannot survive in place on vertical accretion alone: slumping and undercutting inevitable

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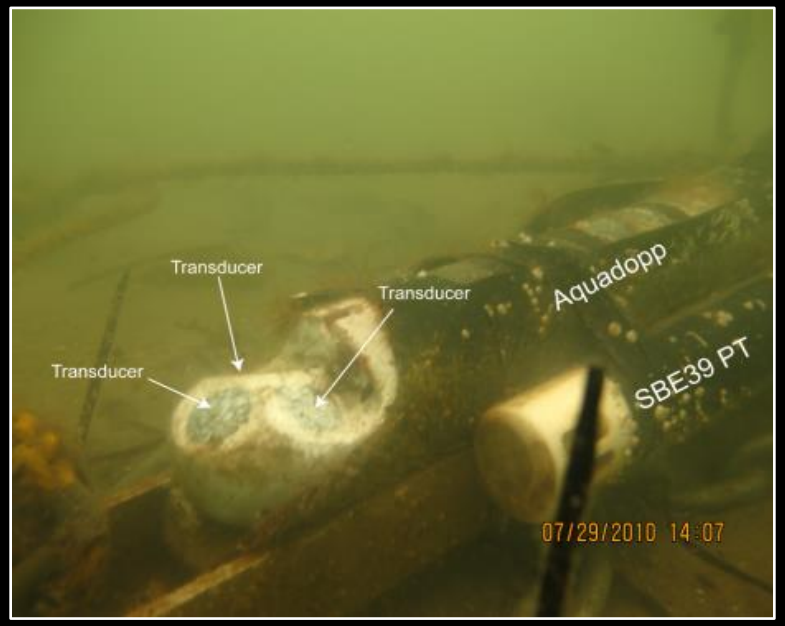
Measuring sediment supply

- Moored velocity and turbidity station
- Tidal-cycle surveys of velocity, suspended-sediment concentration (SSC)
- Lots of calibration samples for turbidity-SSC
- The longer the period, the better…



Intricacies of sediment supply: Seal Beach NWR (CA)

	Seal Beach1		
Sediment flux component (g/s)	Storm	Non storm	Total
Mean advective (<u><a><c>) (g/s)	-17	-11	-11
Mean dispersive (<u'><a><c'>) (g/s)	23	0.39	1.4
Mean stokes drift (u'a'<c>) (g/s)	26	9.3	10
Mean total flux (g/s)	39	-1.3	0.50
Mean total flux normalized by channel area ($g/m^2/s$)	0.71	-0.024	0.0091
Advective (<u><a><c>) (kg)	-5400	-73000	-78000
Dispersive (<u'><a><c'>) (kg)	7100	2600	9800
Stokes drift (u'a'<c>) (kg)	7900	61000	69000
Total flux (kg)	12000	-8700	3400

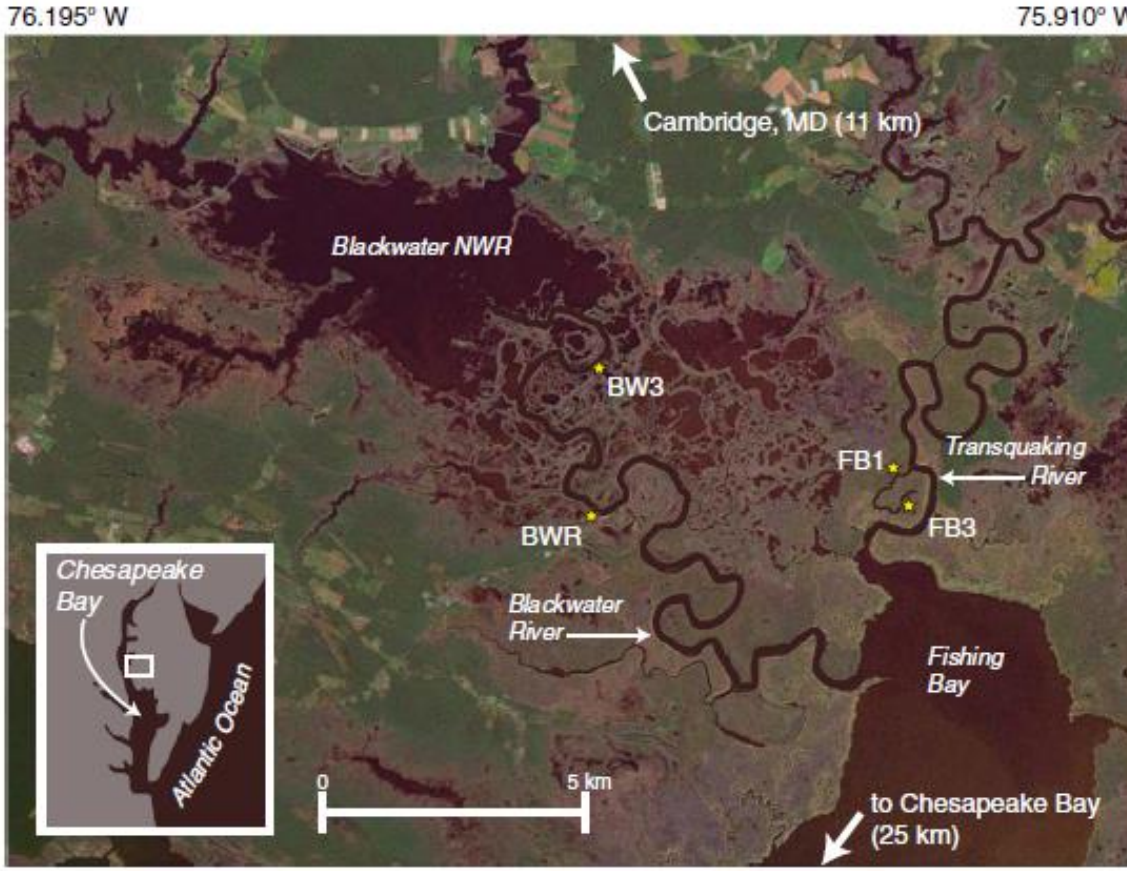
Sediment import during one 3-d storm offset 60-d of fair-weather sediment export

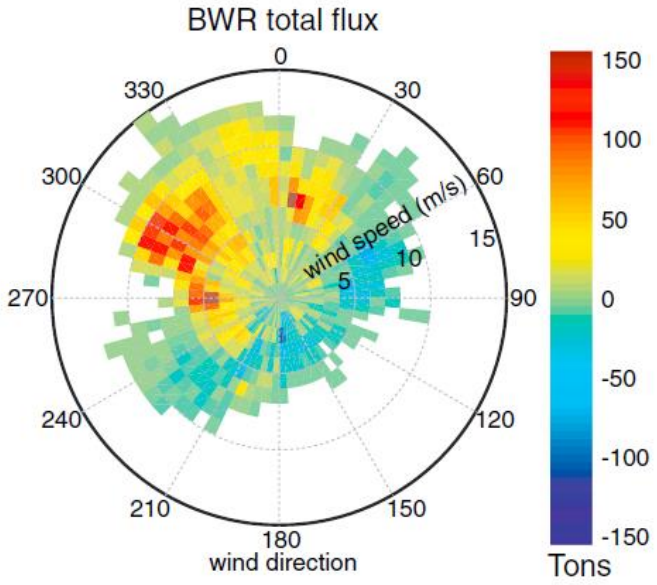
Net fluxes essentially zero, same goes for nearby Pt. Mugu wetland

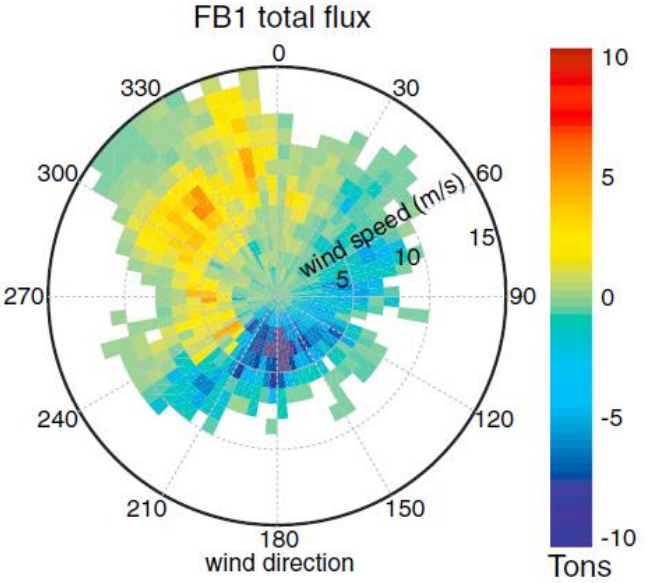
Lack of external sediment source and lack of internal erosive forces

Rosencranz et al., in review

Intricacies of sediment supply: Blackwater NWR (MD)







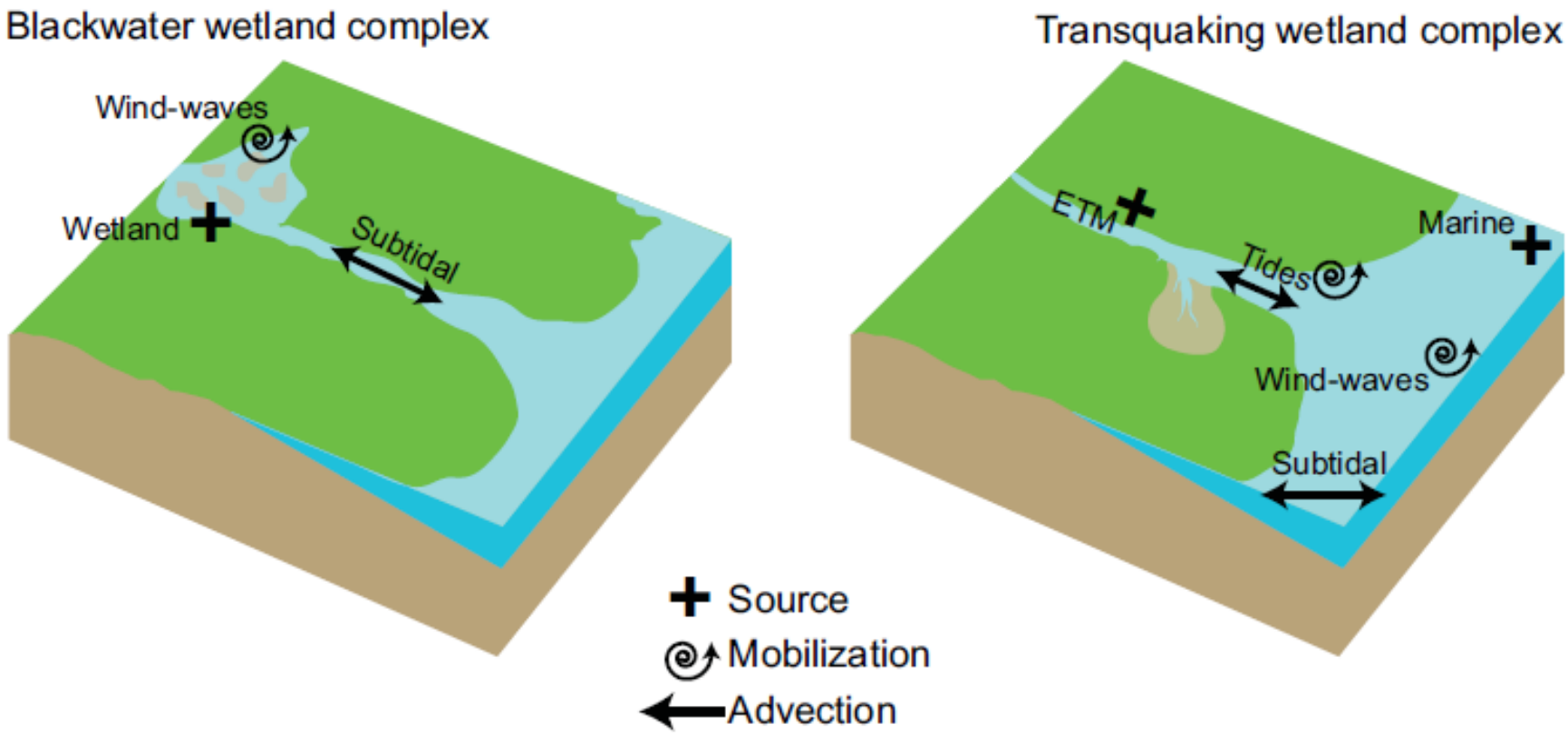
At BWR, northwest winds resuspend sediment, and cause subtidal water export in CB

At FB1, proximity to source (Fishing Bay) leads to sediment import during weak southerly winds

Ganju et al., 2013

Conceptual model of sediment supply: Chesapeake Bay

UNSTABLE! **~STABLE**



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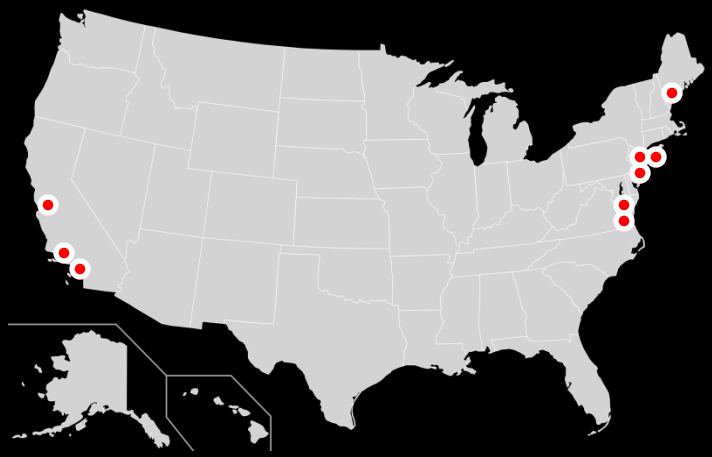
Ganju et al., 2013

Sediment supply sites



Sediment supply sites: Forsythe NWR

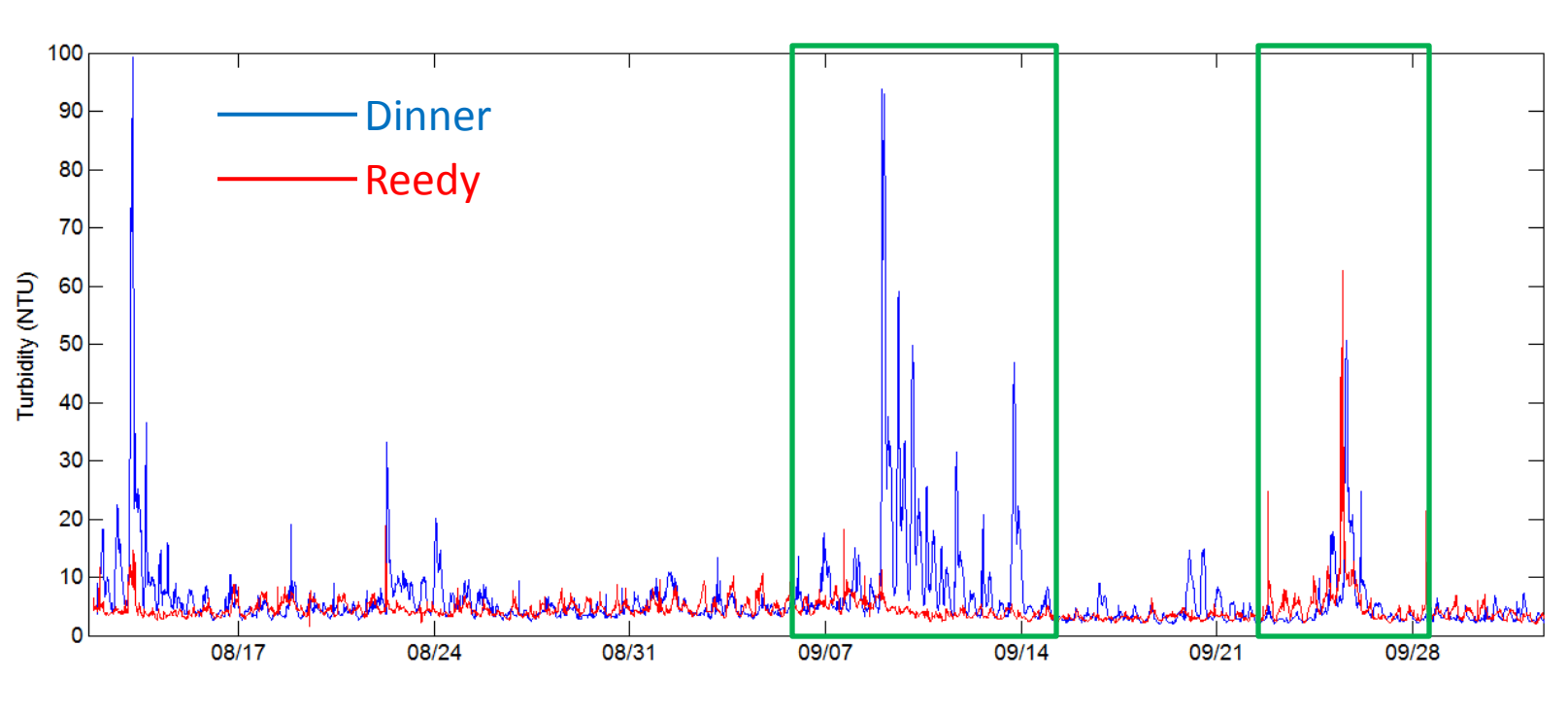
Small tide range
Low salinity
Low sediment input

Larger tide range
Higher salinity
Sediment input?

Diverse response to wind events

Storm 1:
Cold front passage,
net water import

Storm 2:
Offshore low pressure,
net water export



Preliminary interpretation:
- sediment import to Dinner Creek
- sediment export from Reedy Creek

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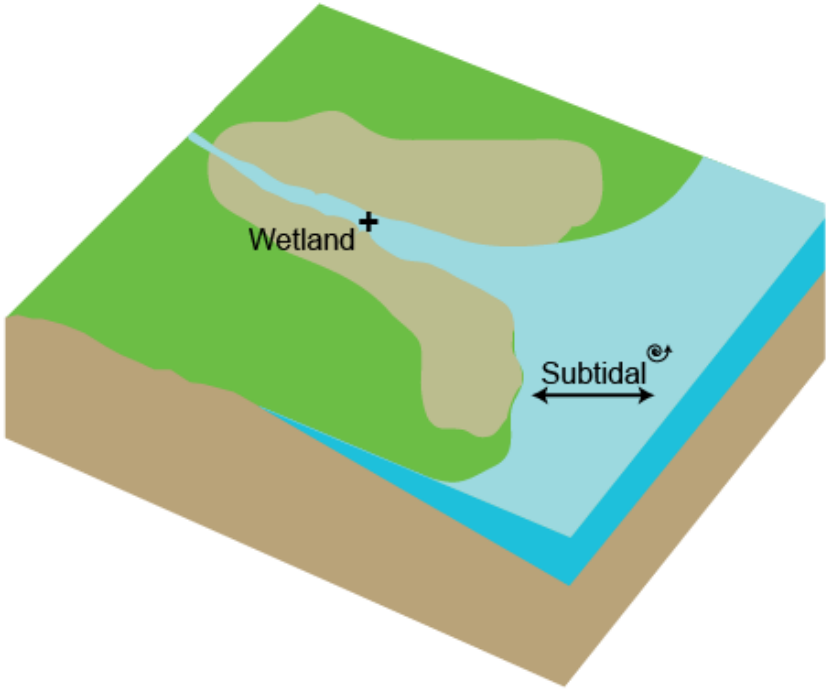
Barnegat conceptual model: bleak outlook

Reedy Creek wetland complex

+ Source
Mobilization
← Advection



Dinner Creek wetland complex

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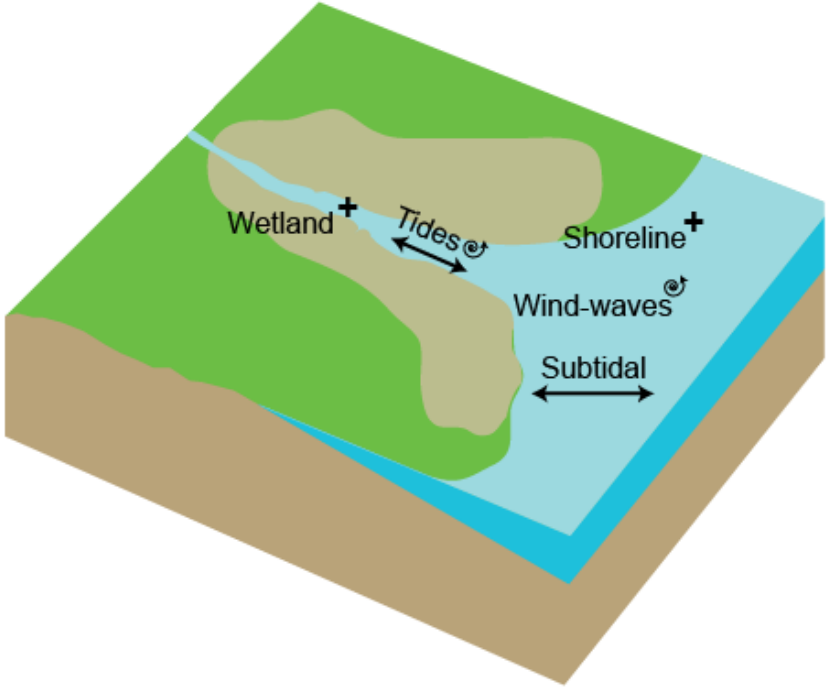

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Questions?

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