2017

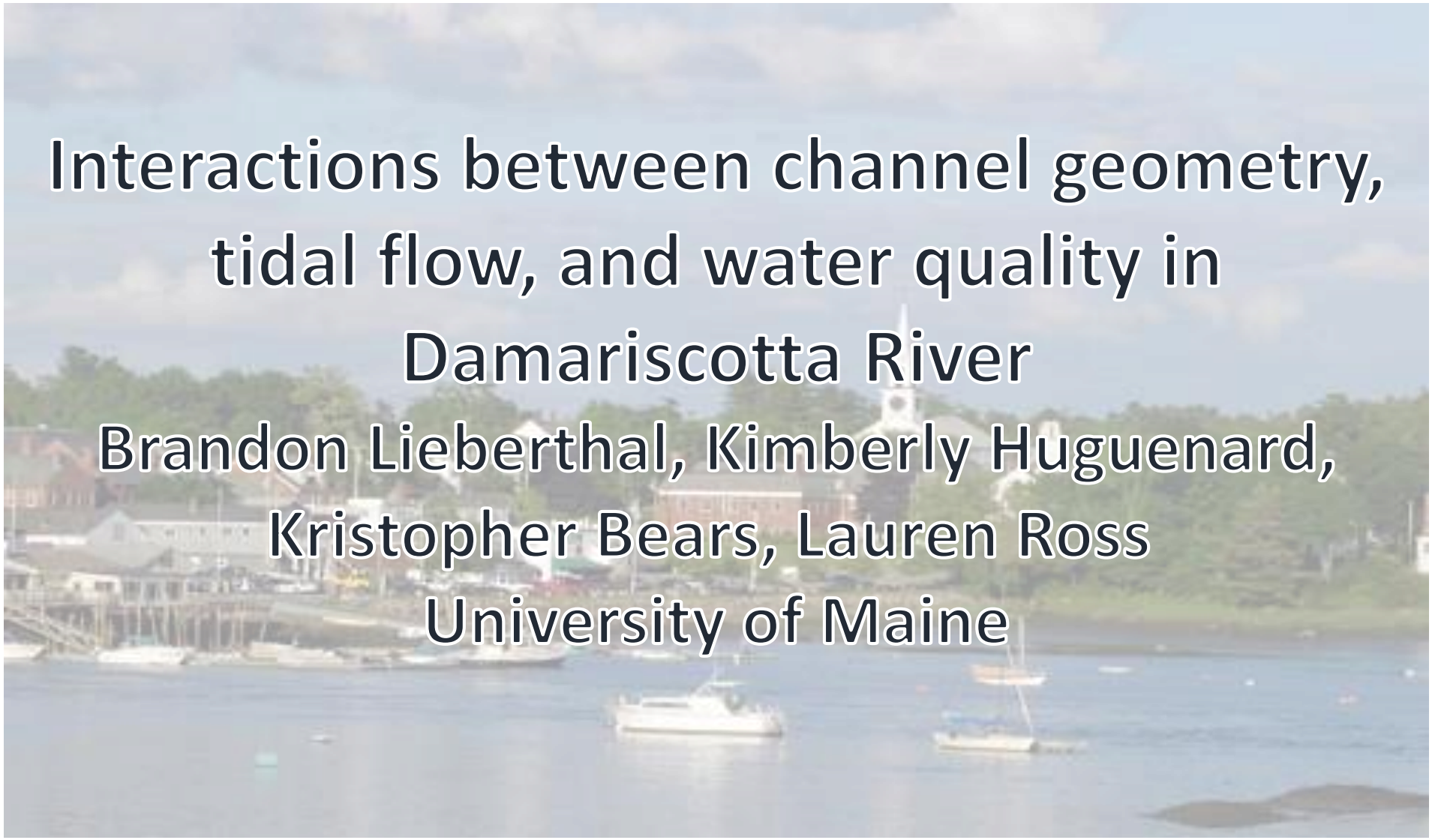
Interactions Between Channel Geometry, Tidal Flow, and Water Quality in Damariscotta Estuary

Brandon Lieberthal

Kimber Huguenard

Kristopher Bears

Lauren Ross



Interactions between channel geometry, tidal flow, and water quality in Damariscotta River

Brandon Lieberthal, Kimberly Huguenard, Kristopher Bears, Lauren Ross
University of Maine

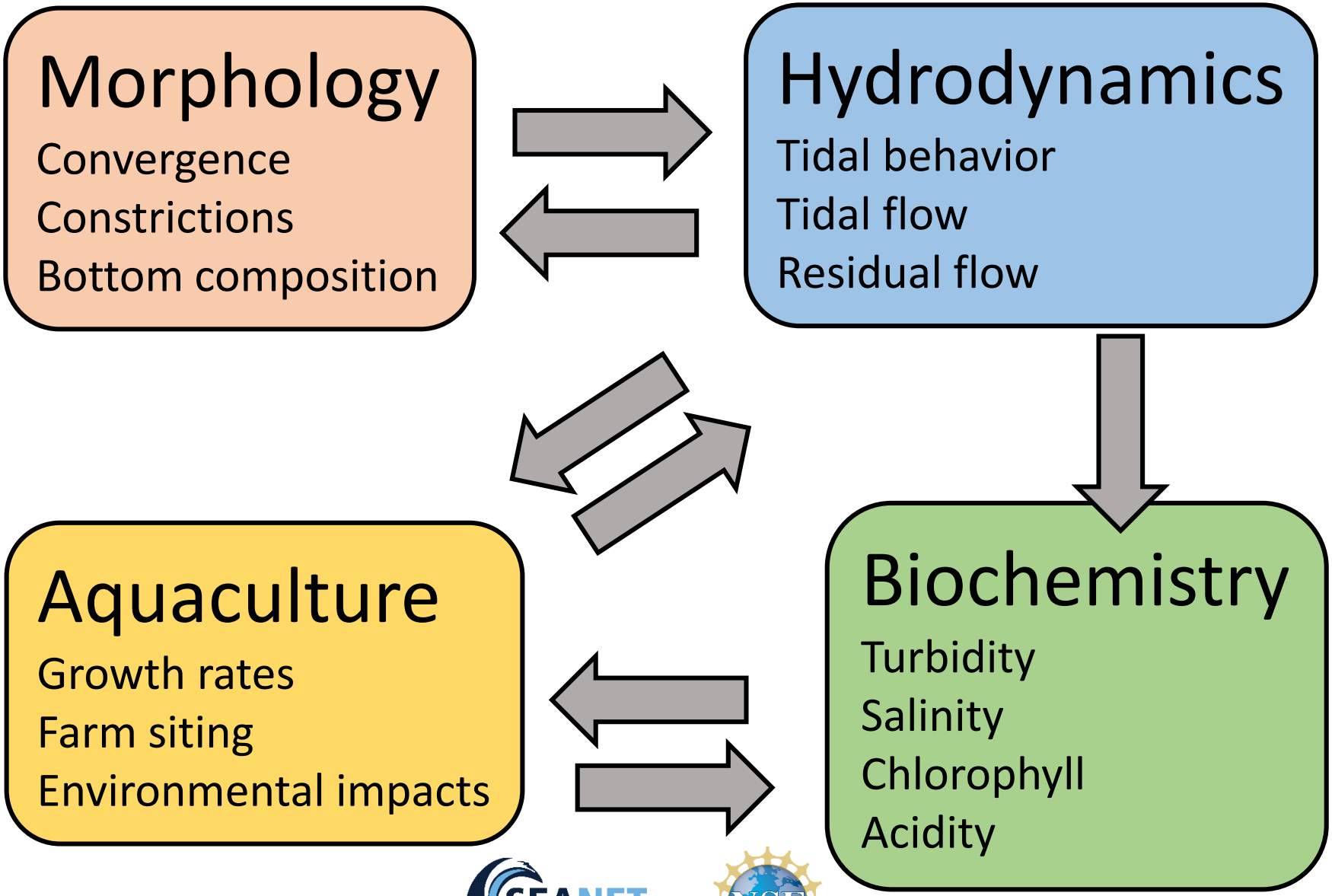
Research Goals and Objectives

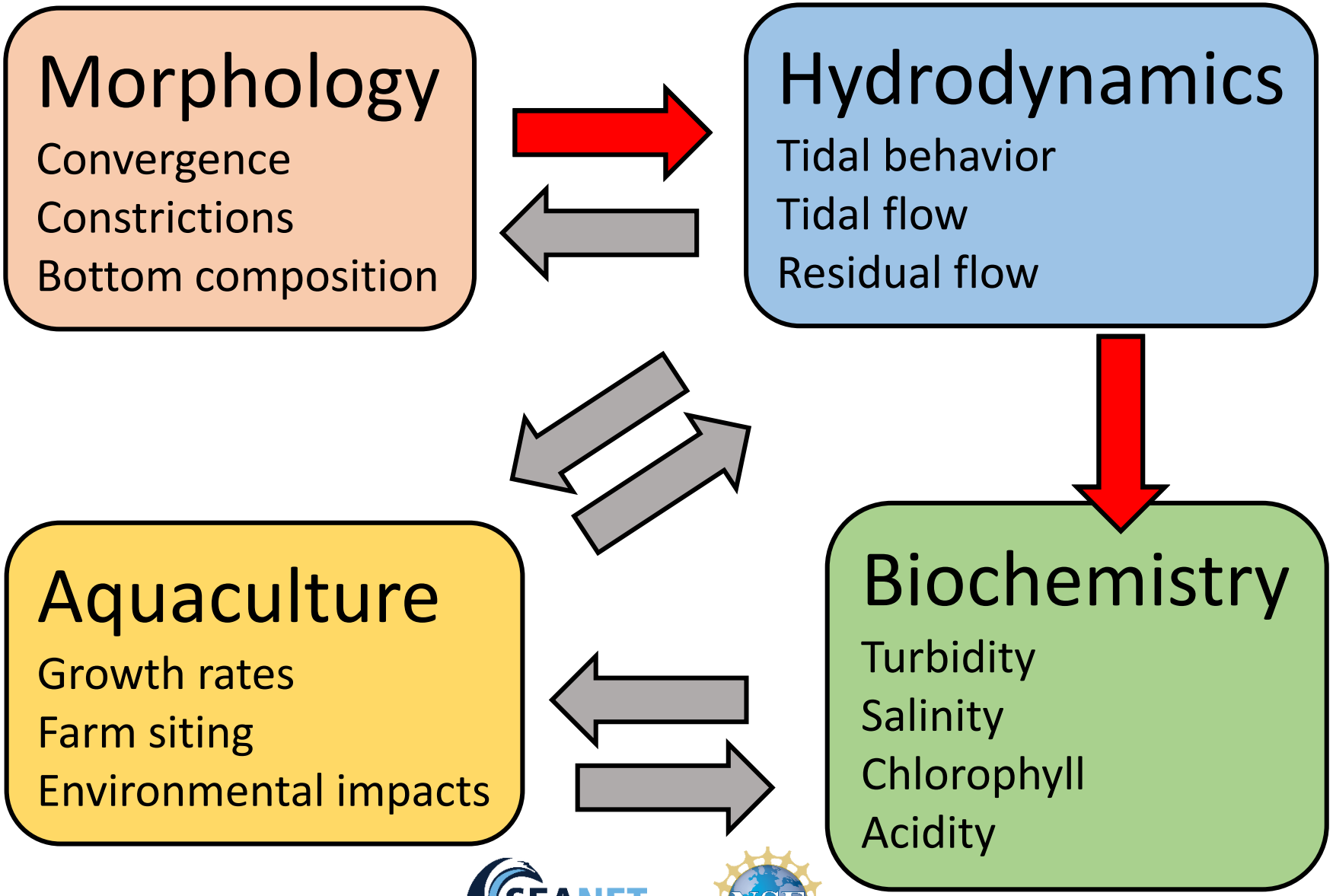
Goals:

1. Understand how tides move material and influence water quality important to aquaculture
2. Provide considerations for future aquaculture by predicting how present day conditions will alter from a environmental change

Research Objectives:

1. Characterize tidal behavior throughout estuary
2. Investigate how tides affect water quality
3. Determine how a storm event will change those water quality patterns


Morphology
Convergence
Constrictions
Bottom composition
Hydrodynamics
Tidal behavior
Tidal flow
Residual flow
Aquaculture
Growth rates
Farm siting
Environmental impacts
Biochemistry
Turbidity
Salinity
Chlorophyll
Acidity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Methodology

- HOBO U20L Water Level Logger deployed at 13 sites from July 22 to November 12

The HOBO U20L Water Level Logger

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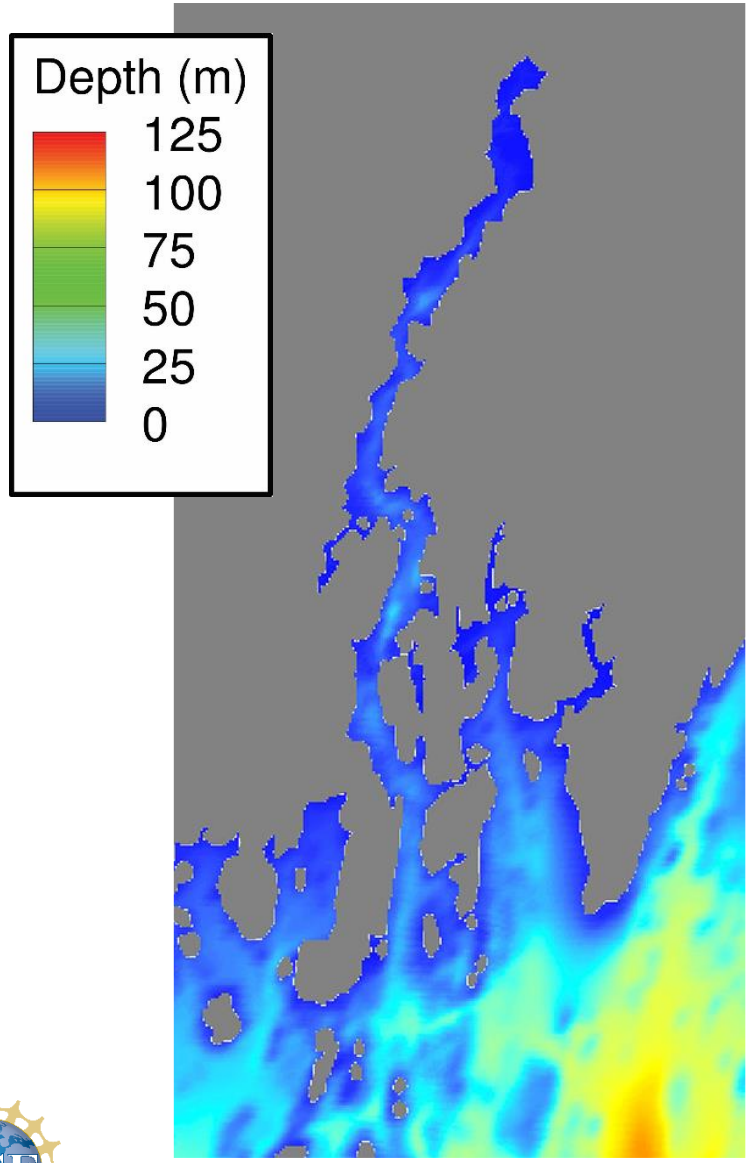
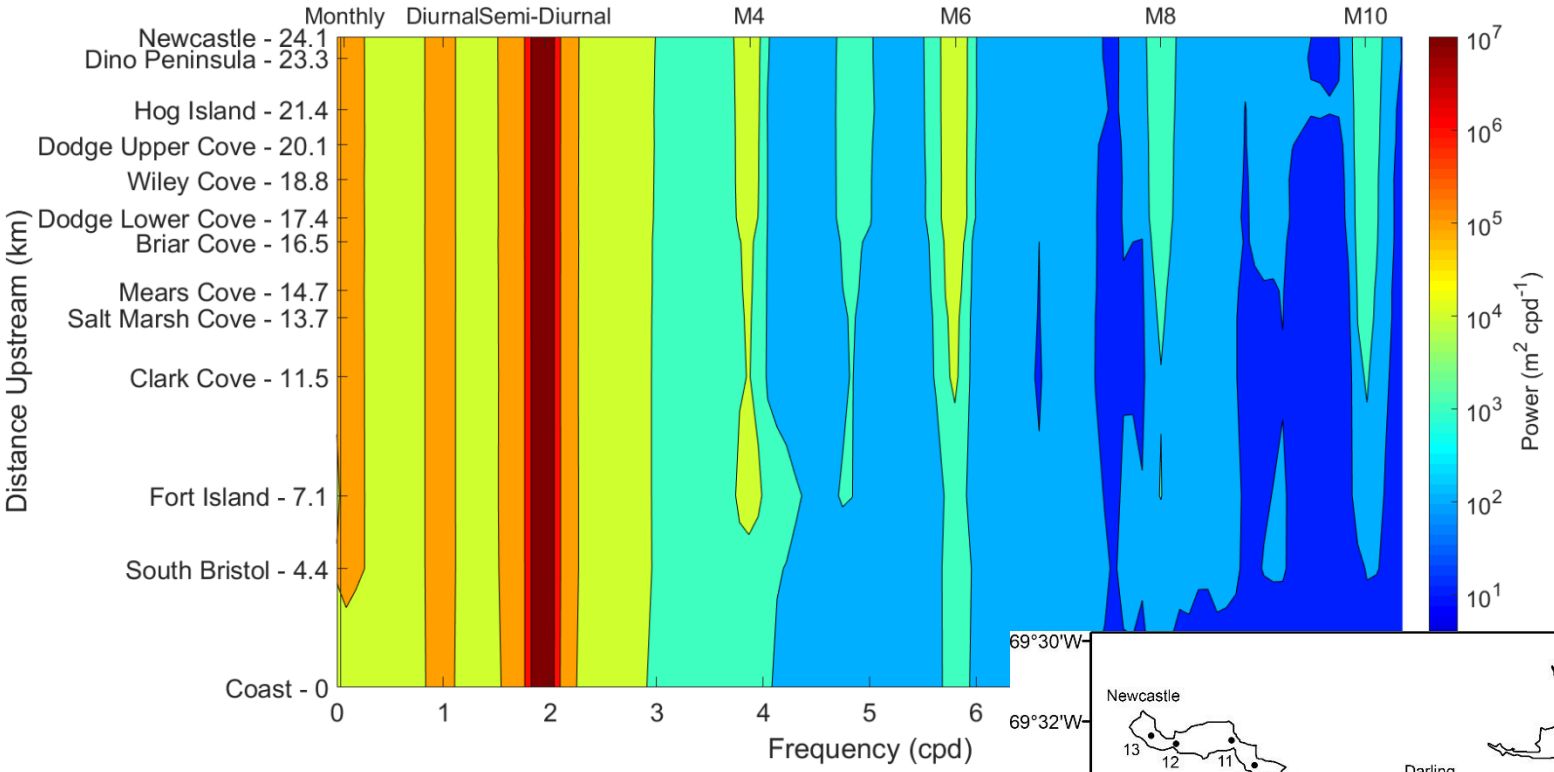
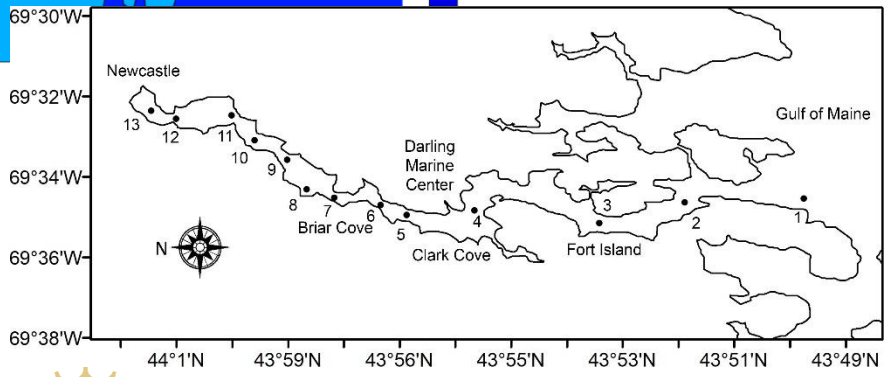
- Bathymetry data (Chandler 2016) and National Geophysical Data Center

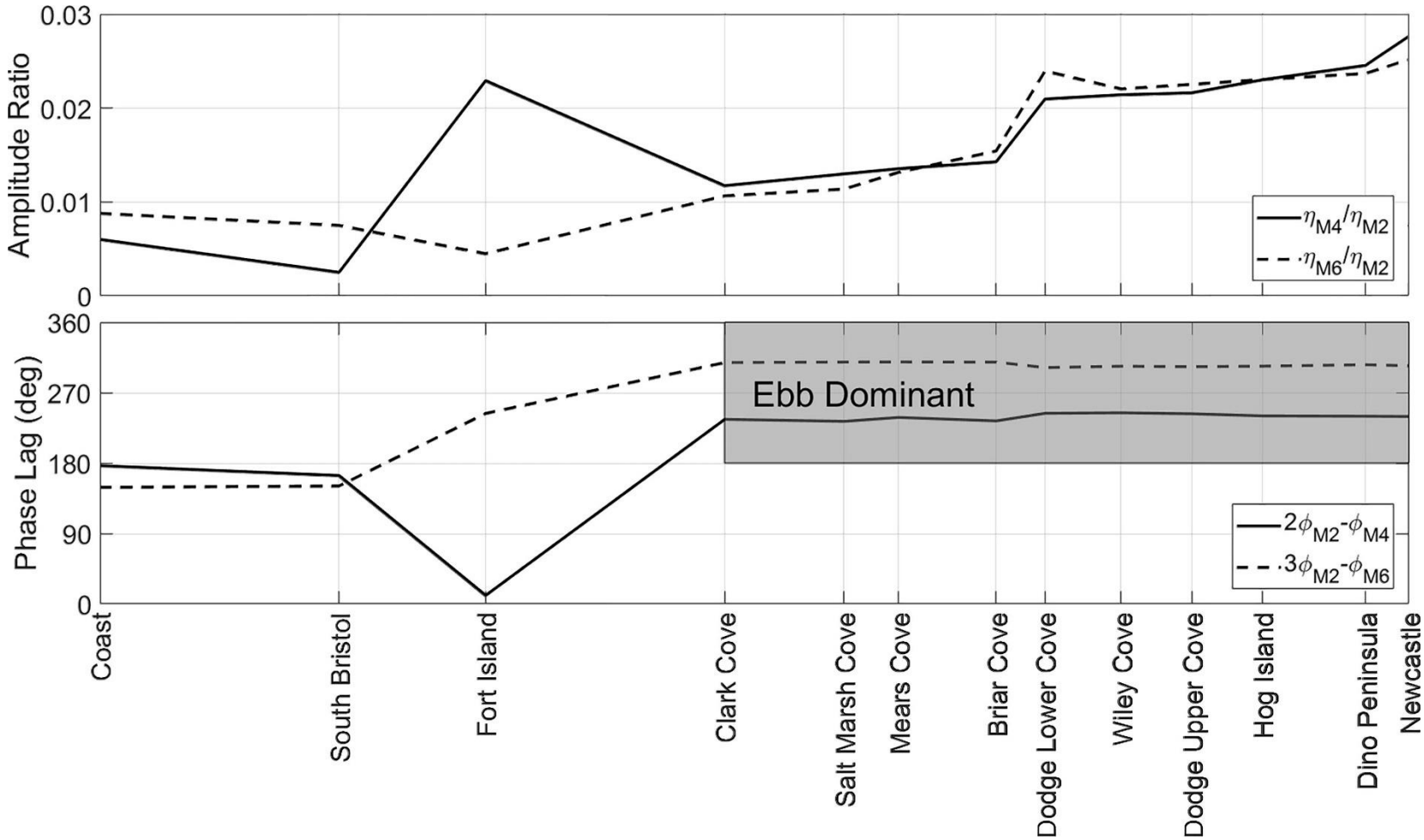


How do the tides change up the river?



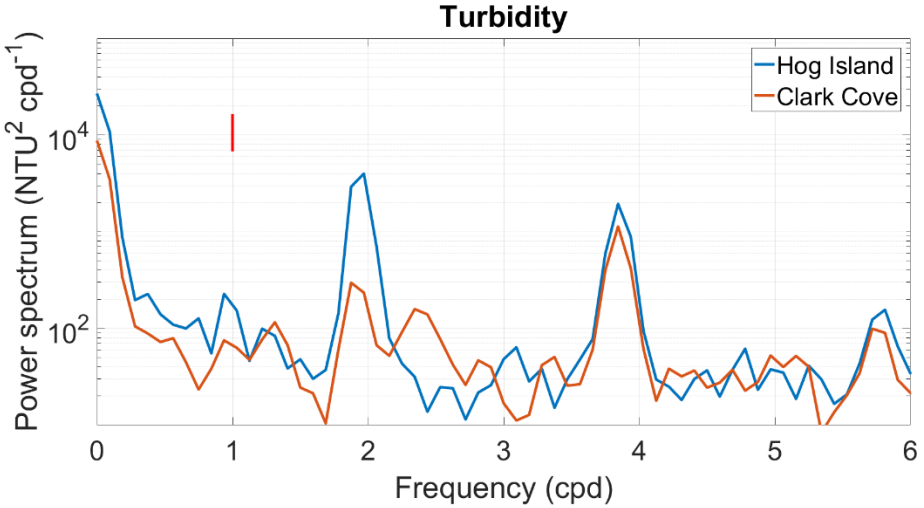


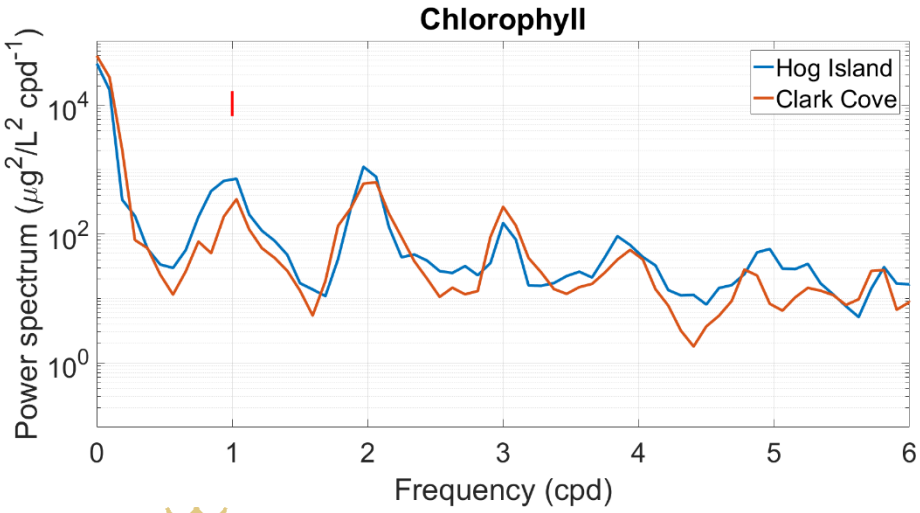
How do overtides interact with geometry?



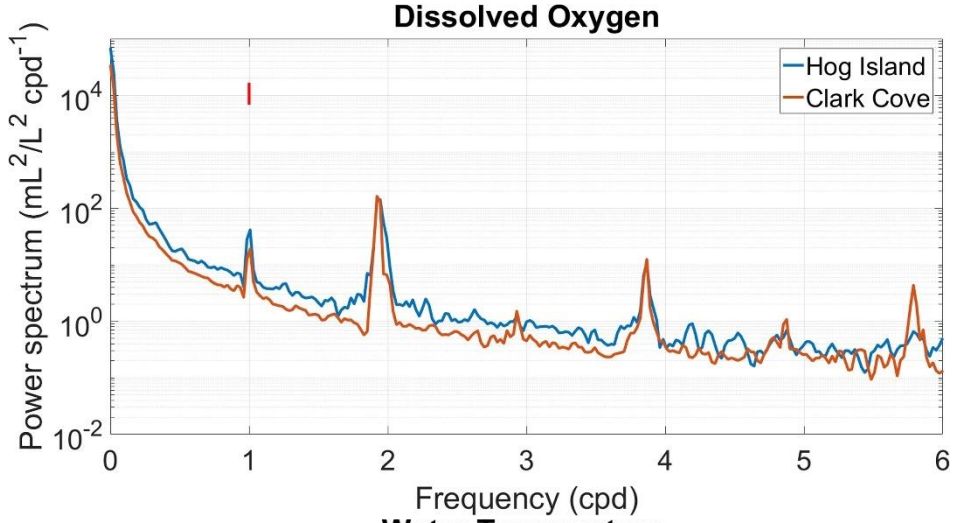
How do overtides influence water quality?

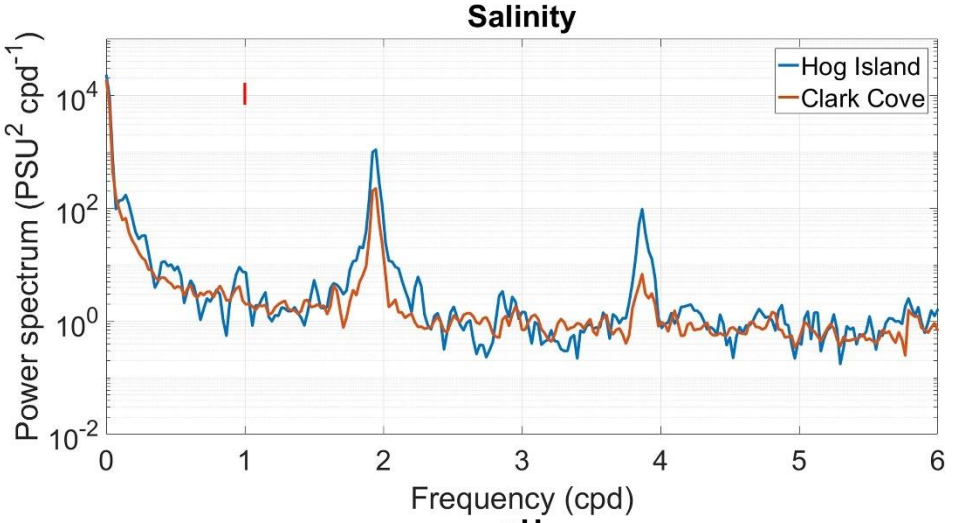
- Turbidity
  - Influenced equally by M2 and M4 tides
- Chlorophyll
  - Diurnally dependent
  - Turbidity oscillation influences chlorophyll oscillation

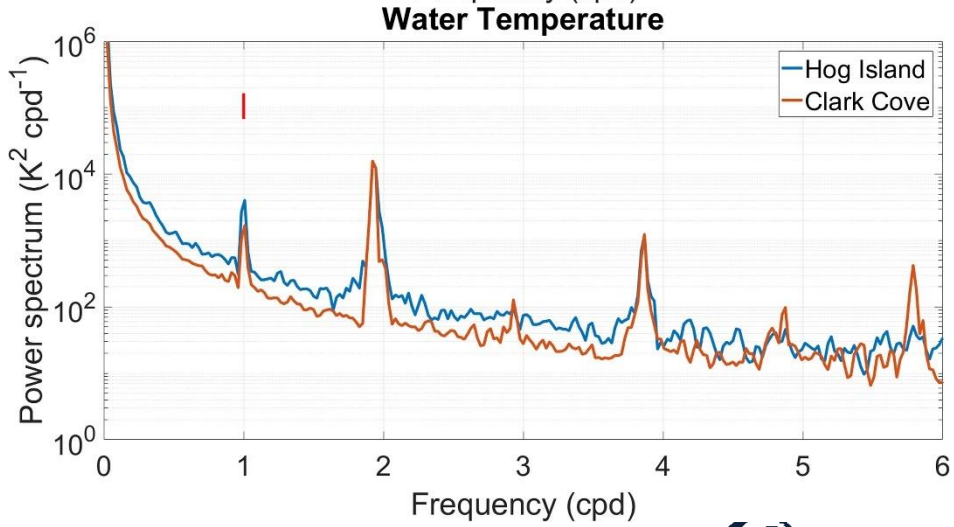


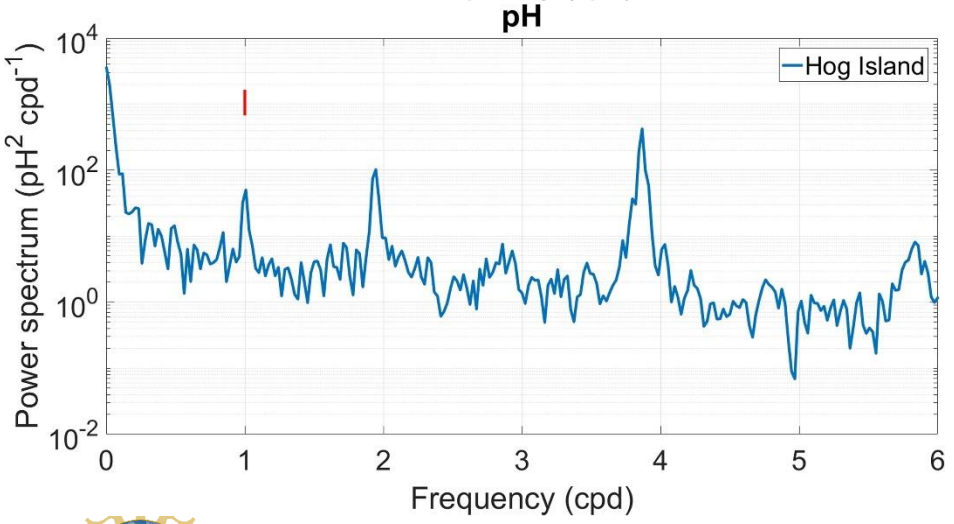


What about other water quality parameters?









Main Message

- The narrowness of the constrictions combined with the shallowness of the upper estuary enhance overtides
- The overtides increase turbidity, chlorophyll, salinity, oxygen, and pH

What to expect in the future?

- Rising sea levels will reduce friction and decrease exchange rates and transport distances
- Higher turbidity, oxygen
- Lower salinity, acidity