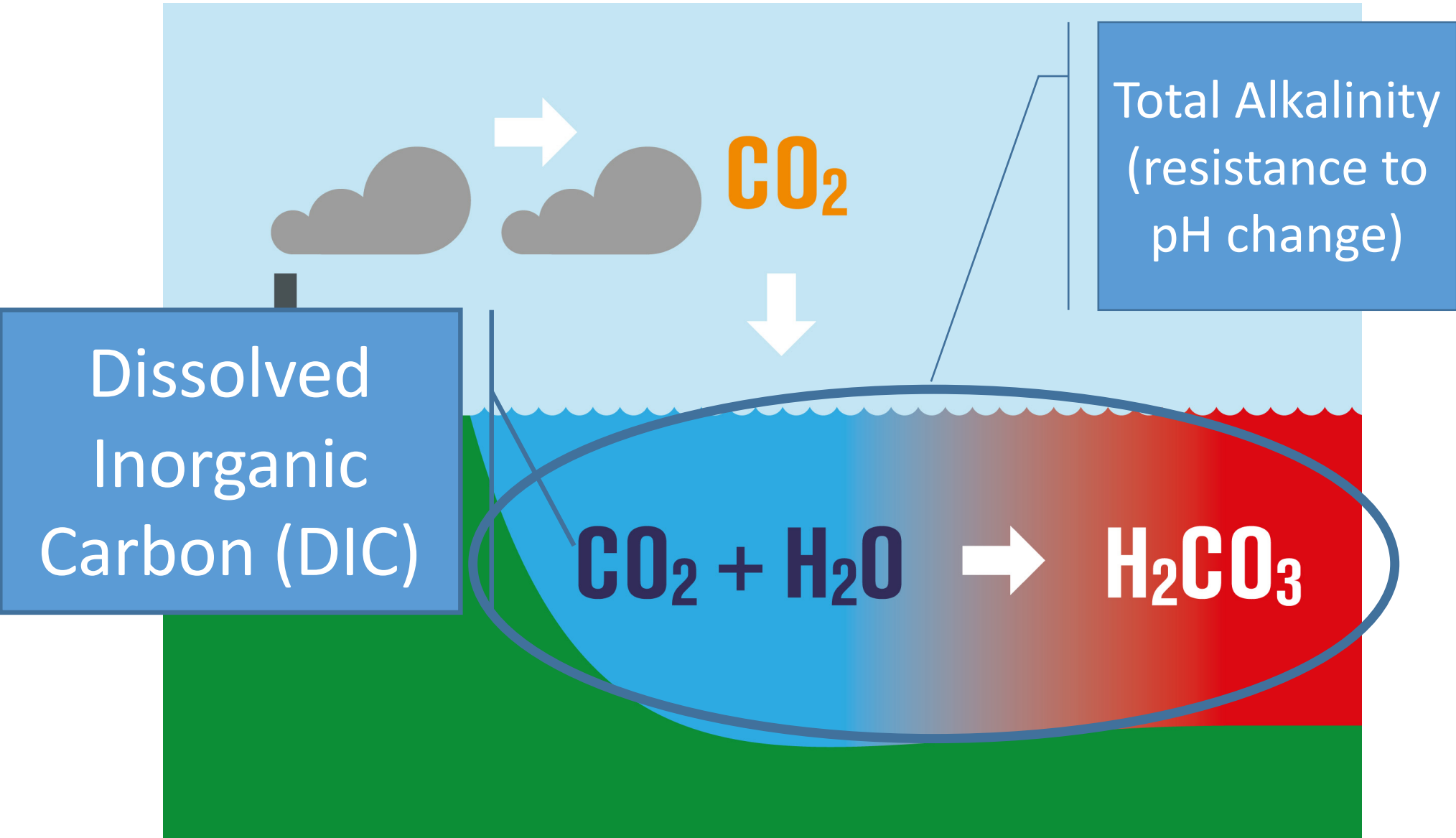




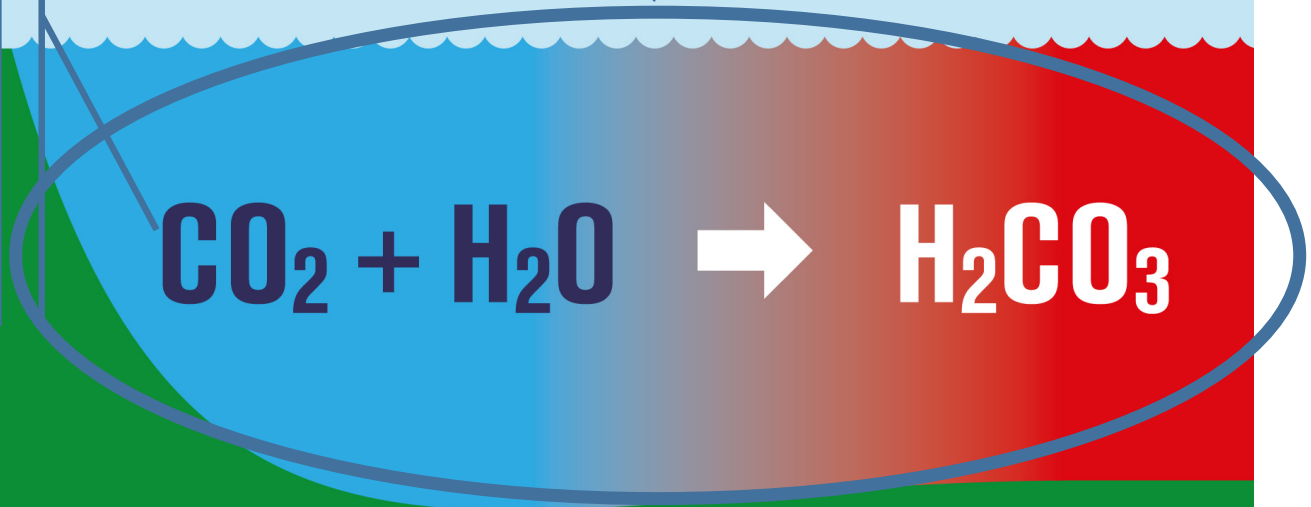
Nutrients and Acidification

Damian C. Brady
University of Maine
School of Marine Science
Maine Sea Grant

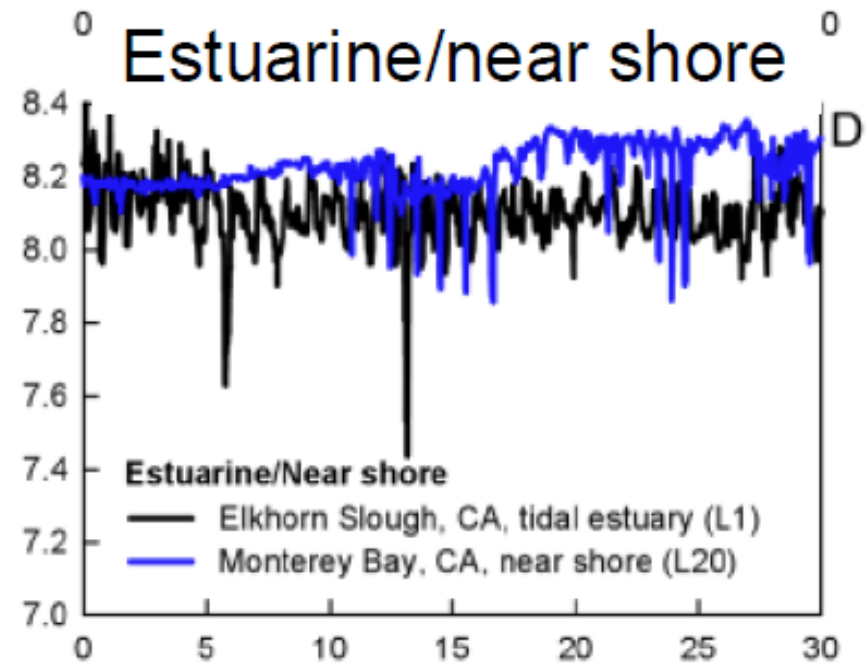
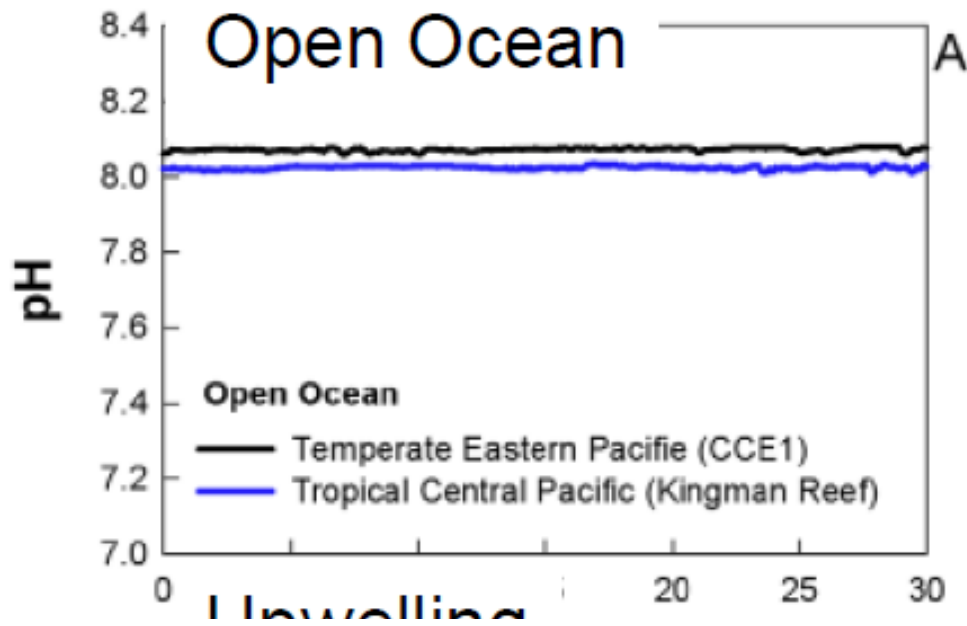


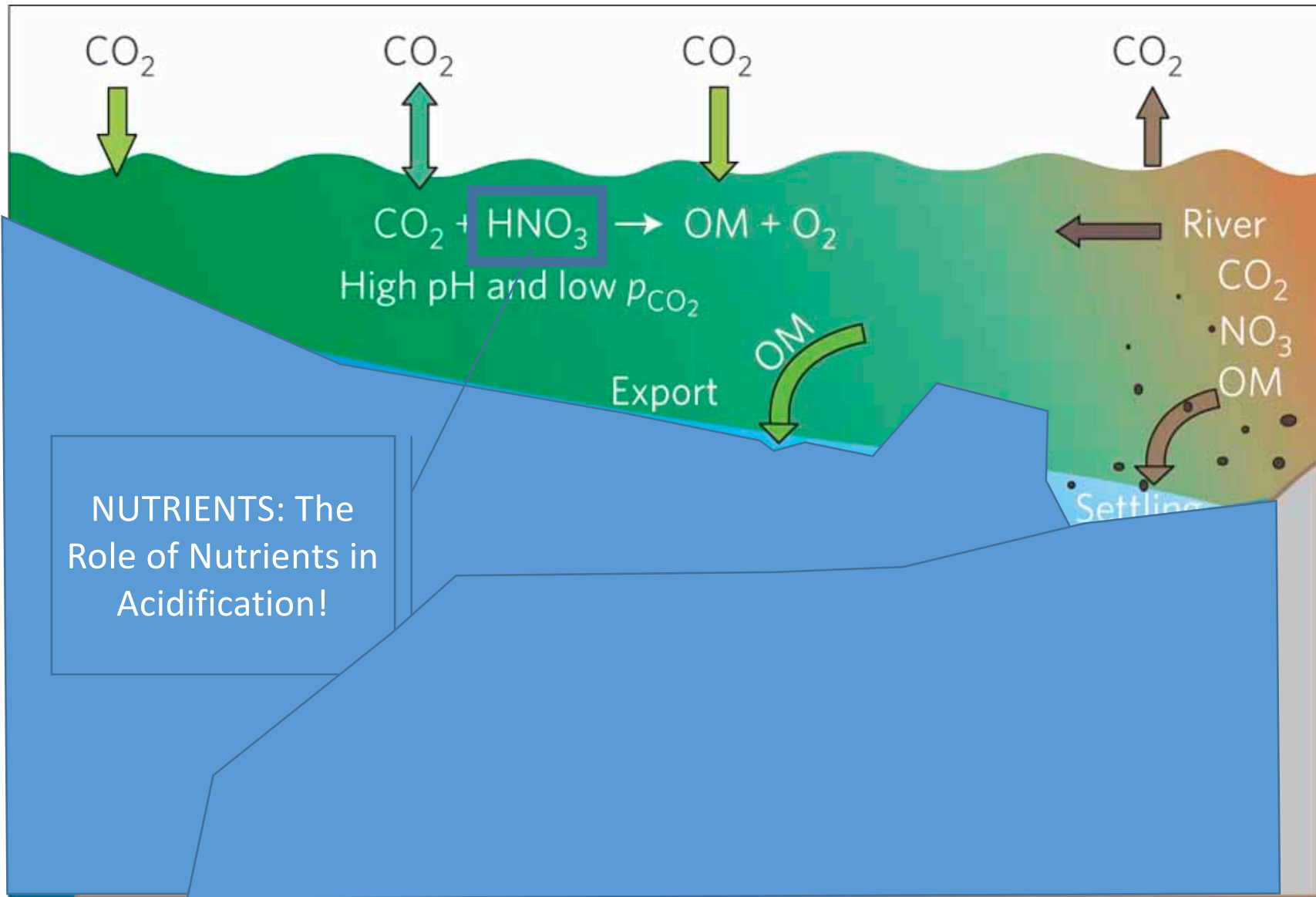
Dissolved Inorganic Carbon (DIC)

Total Alkalinity (resistance to pH change)



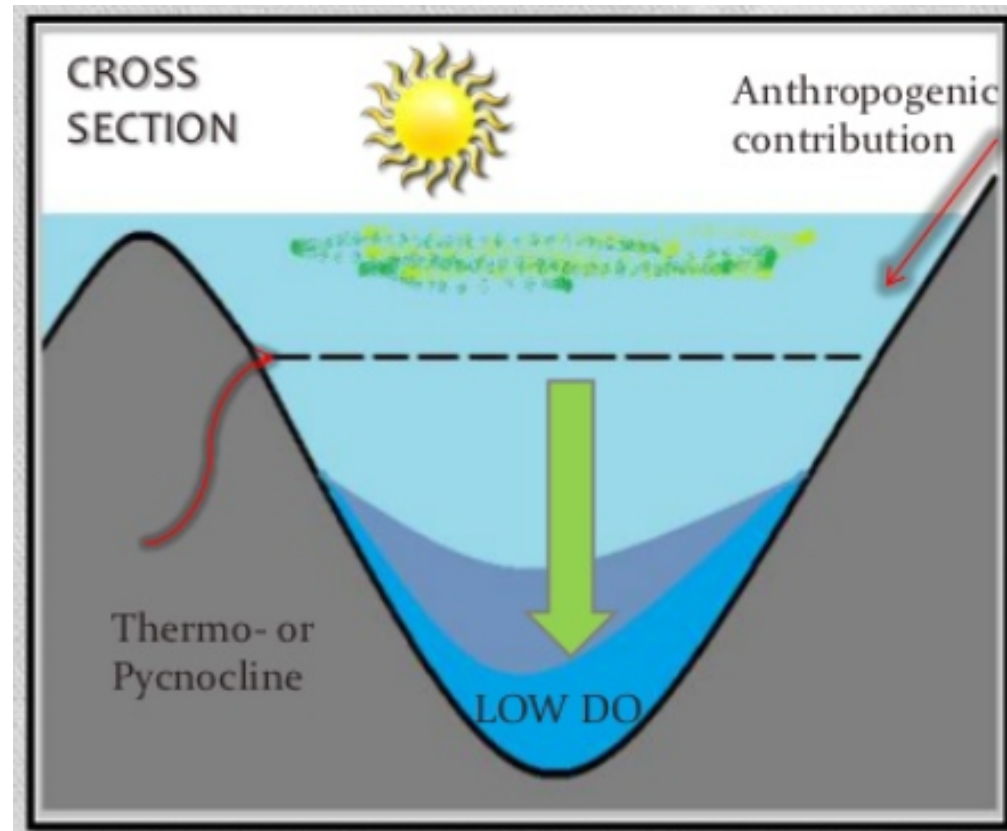
Ocean versus Coastal Acidification



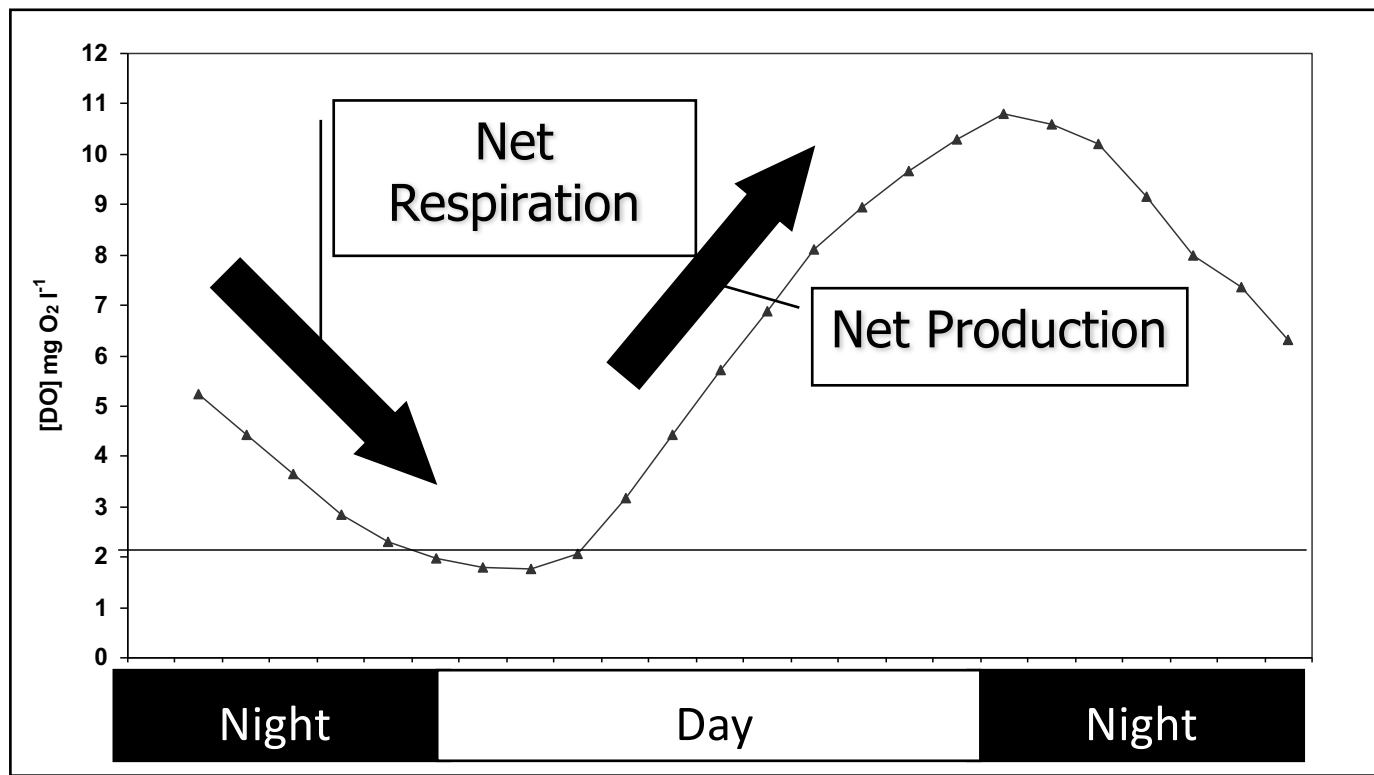


When do we decouple Photosynthesis and Respiration/Decomposition of Organic Matter?

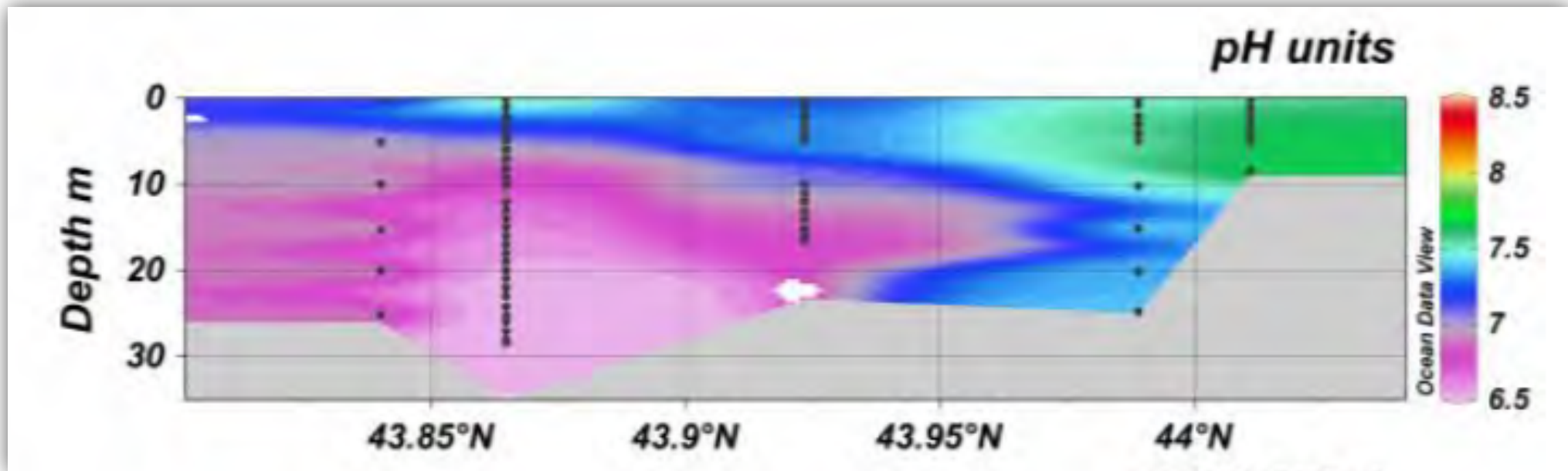
- Classically, we do this vertically...
- Chesapeake
- Long Island Sound
- Gulf of Mexico



When do we decouple Photosynthesis and Respiration? In Time...



Maine Coastal Observing Alliance



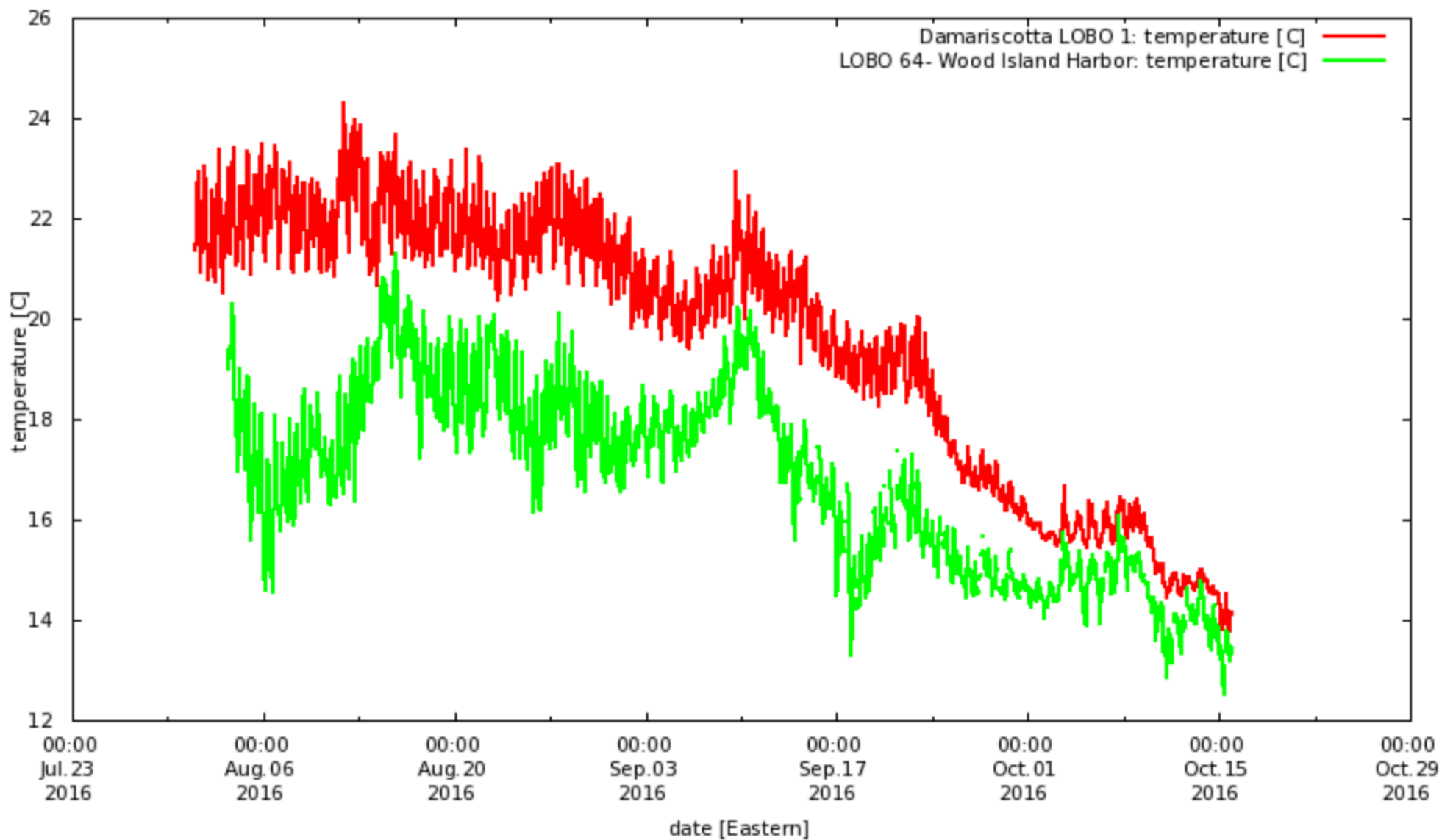
Ocean



Sheepscot Estuary

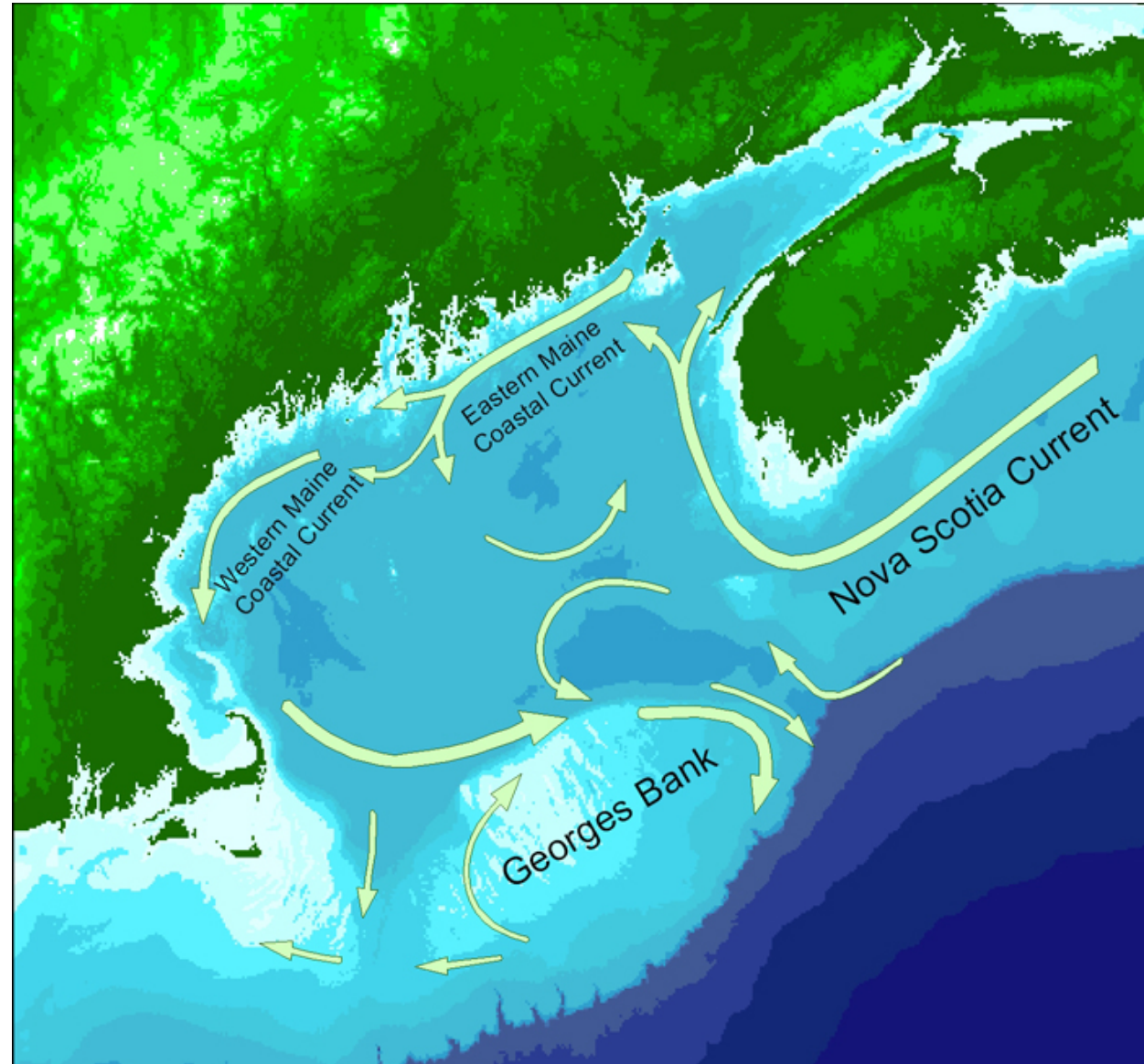


Sheepscot River



Townsend

- EASTERN MAINE – Well mixed
- WESTERN MAINE – Stratified
- Is well mixed Eastern Maine subducted under western Maine stratification?



We NEED to get a better handle on sources



One if by land

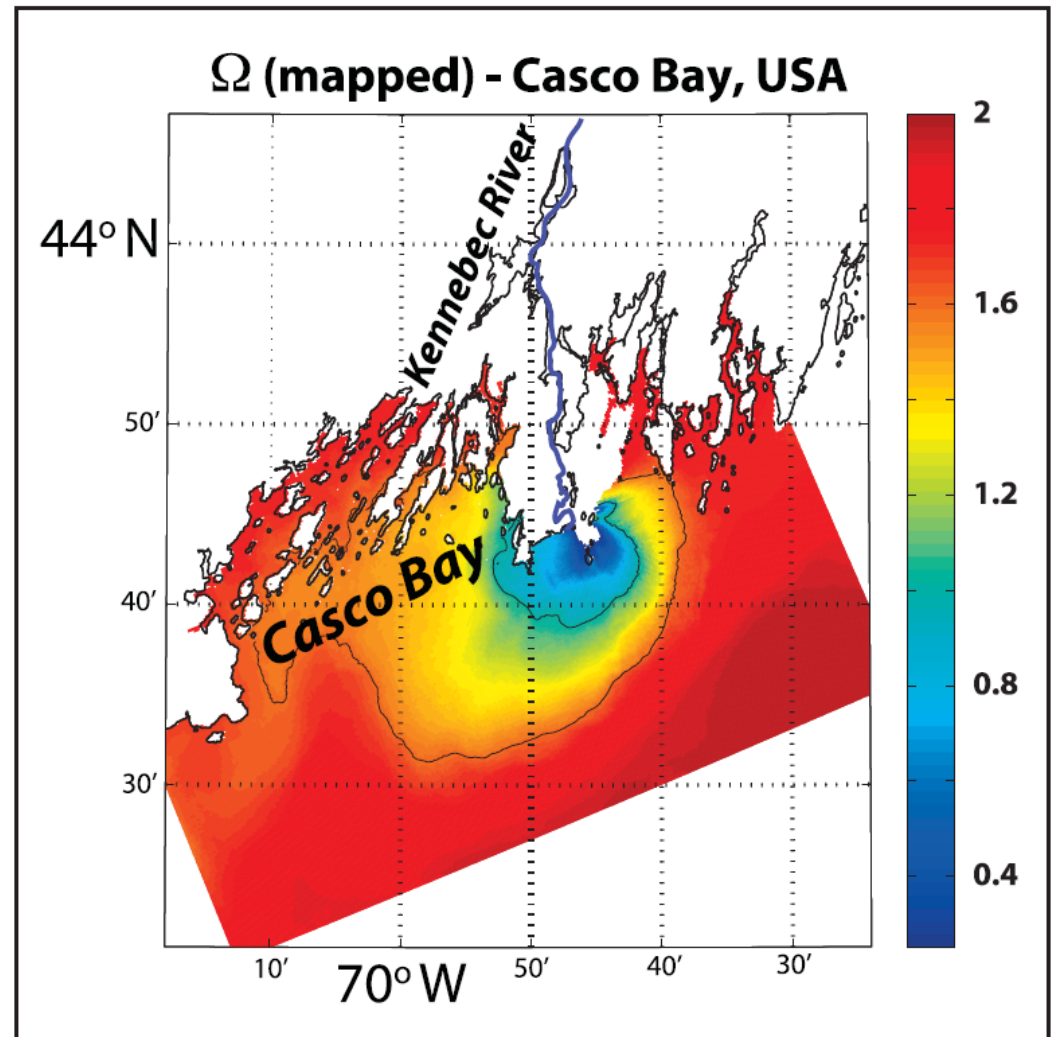
Two if by sea

Not sure
Paul Revere
knew about
this

One if by Land:

Rivers can increase our susceptibility by changing our Total Alkalinity

- Salisbury – EOS 2008



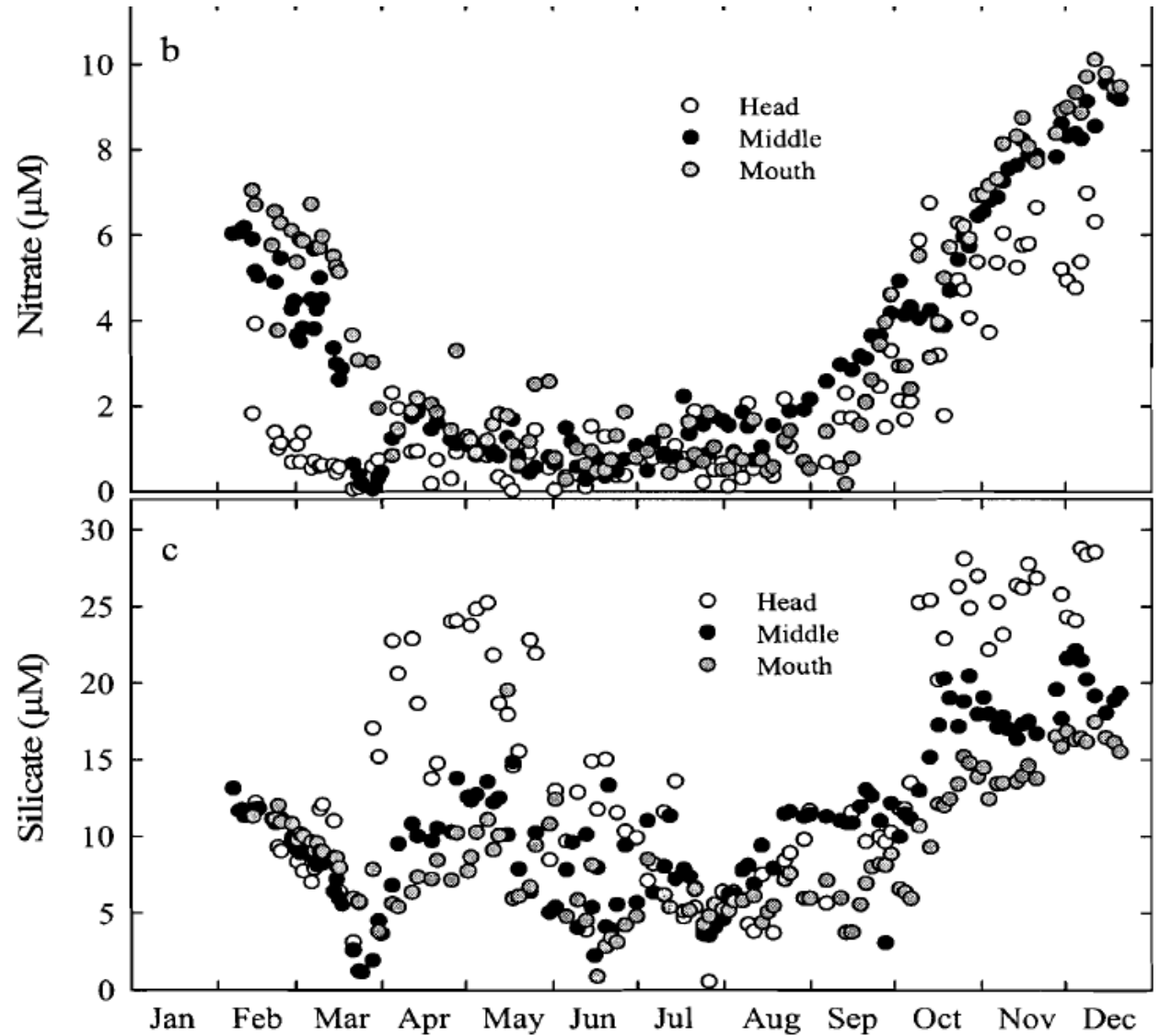


Non-point Sources

- River Flow *
Nutrient
Concentration =
Nutrient Loading

Two if by Sea: The Gulf of Maine is a major source for many estuaries in Maine

- Thompson 2009



Sediments...

- “Most of the parameters and processes (i.e. mineralization, denitrification) investigated showed no relationship with the overlying seawater pH, suggesting that ocean acidification will have limited impacts on the microbial activity and associated sediment-water fluxes...”

OPEN ACCESS Freely available online

 PLOS ONE

Impacts of Ocean Acidification on Sediment Processes in Shallow Waters of the Arctic Ocean

Frédéric Gazeau^{1,2*}, Pieter van Rijswijk³, Lara Pozzato³, Jack J. Middelburg^{3,4}

HOWEVER! Shallow Estuaries are STRONGLY COUPLED TO BENTHIC PROCESSES in LOTS of OTHER WAYS

- Sulfate reduction is a source of Total Alkalinity
- Decomposing organic matter can increase sediment oxygen demand



Last Recommendations

- Start doing a better job of tracking sources of
 - Nutrients
 - Total Alkalinity
 - Dissolved Inorganic Carbon
- Can we start thinking about nitrogen forms and not just TOTAL NITROGEN?
- This stuff is complex...if we really want to determine sources of nutrient pollution, models are necessary