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Remote Sensing for Oyster Aquaculture in Maine

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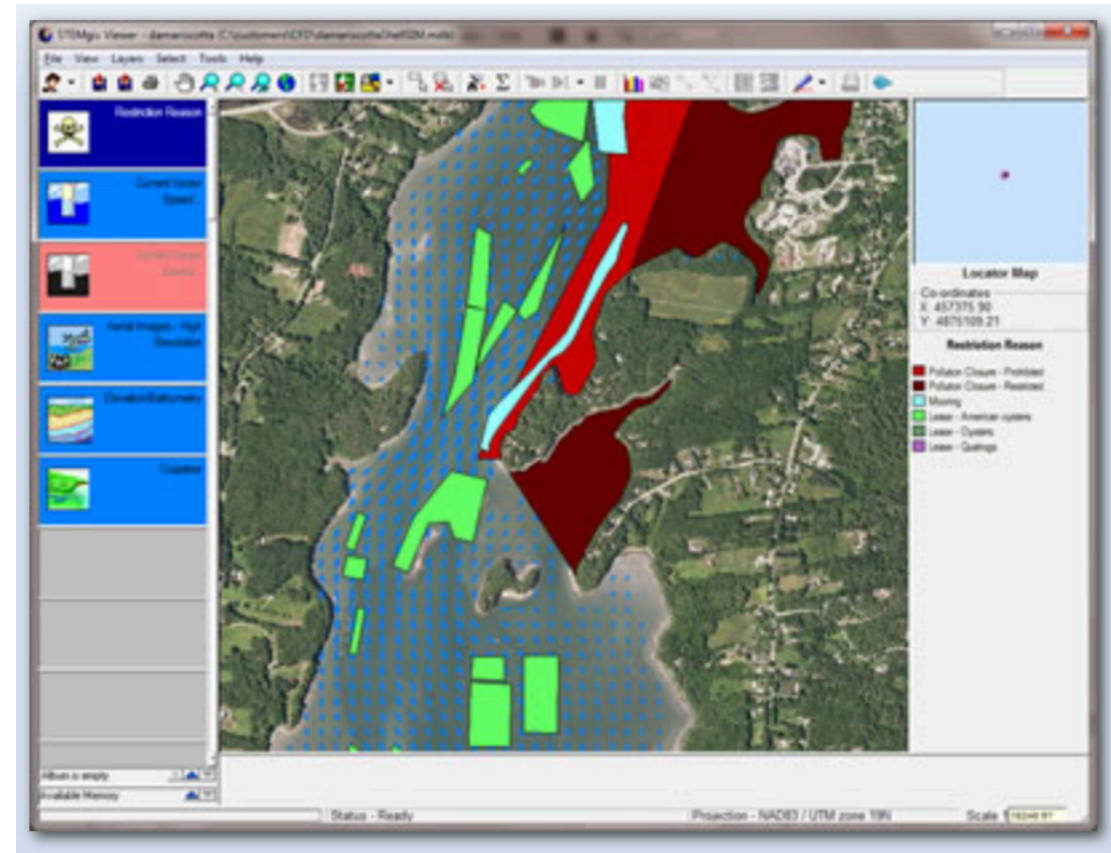
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Remote Sensing for Oyster Aquaculture in Maine

Jordan Snyder
University of Maine
April 1, 2016

Project Goal

- Create a user-friendly tool to advise shellfish farmers on dependable site selection



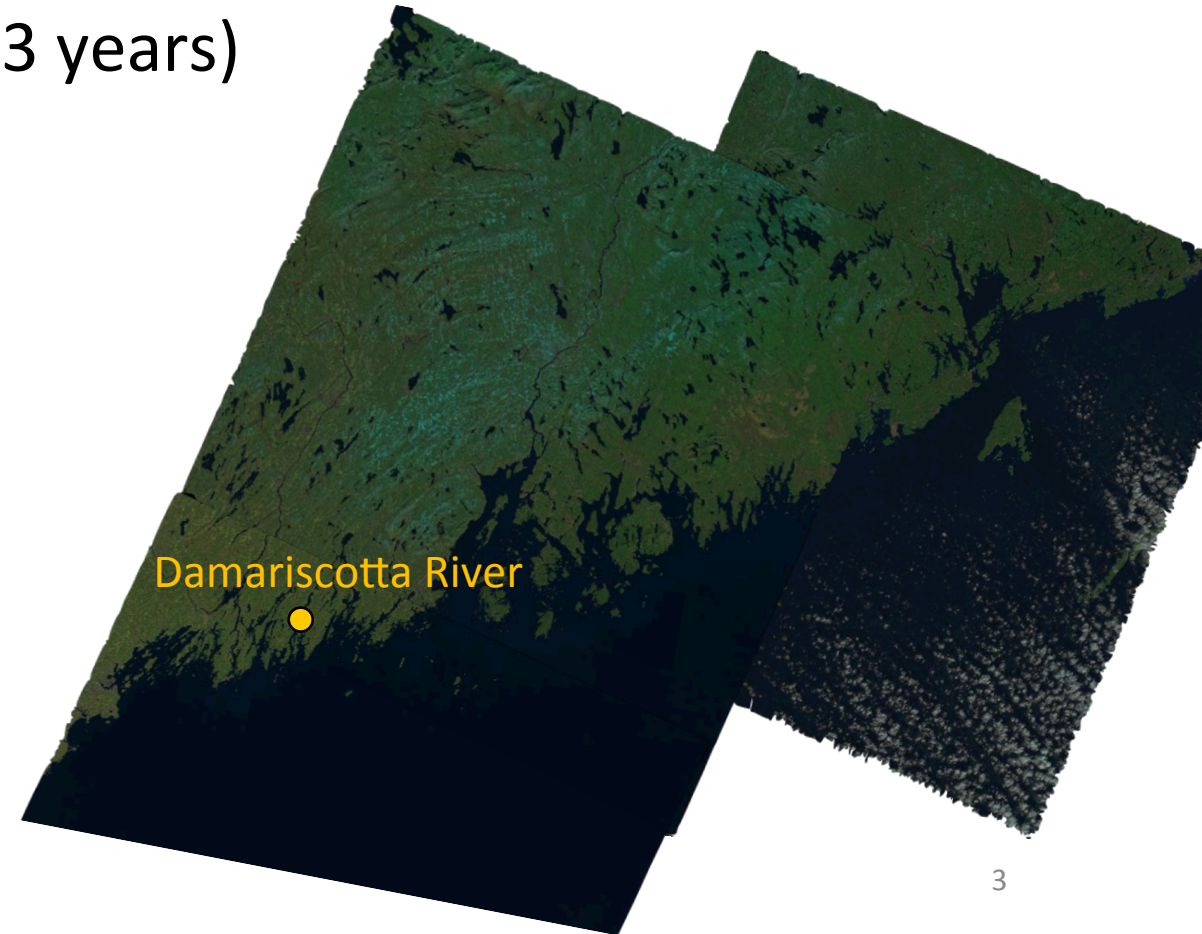
www.shellsim.com

Why use Satellite Remote Sensing?

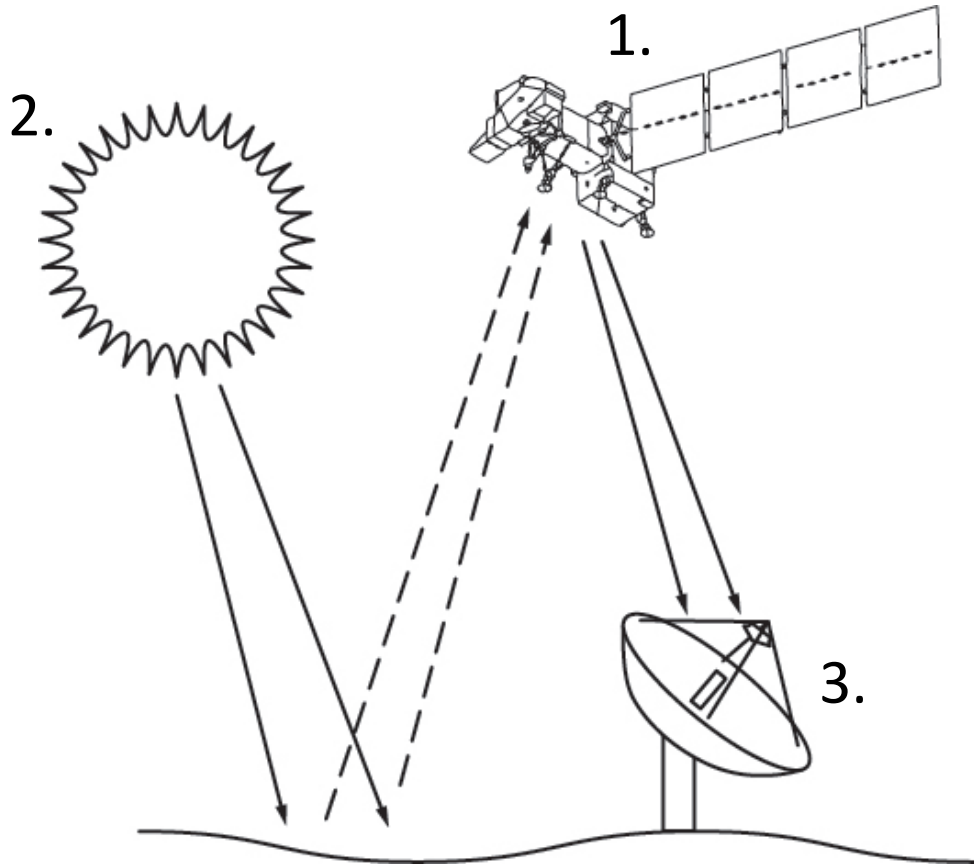
- Covers a **large** study area (the entire coast of Maine)
- Provides a **long** time series (the past 3 years)
- Has **fine-scale**: 30 – 100 m² per pixel



landsat.usgs.gov



How does it work?

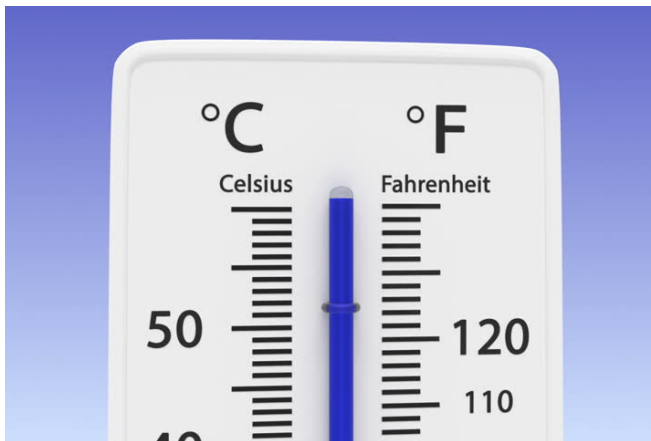


- The satellite Landsat 8 captures a picture of Maine every 2 weeks.
- Sensors measure the amount of **sunlight** that **reflects** off the earth's surface and travels back through space.
- We can use these pictures and information to measure different **physical characteristics** on the Earth's surface.

Characteristics Measured for Farm Site Selection

Temperature

- above 20°C during summer



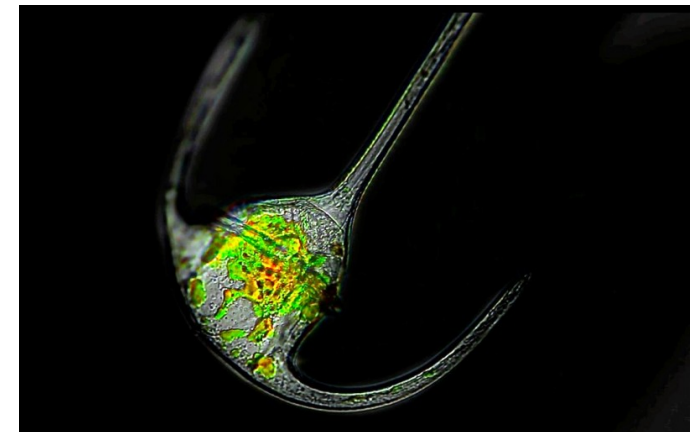
Turbidity

- low enough to allow light penetration

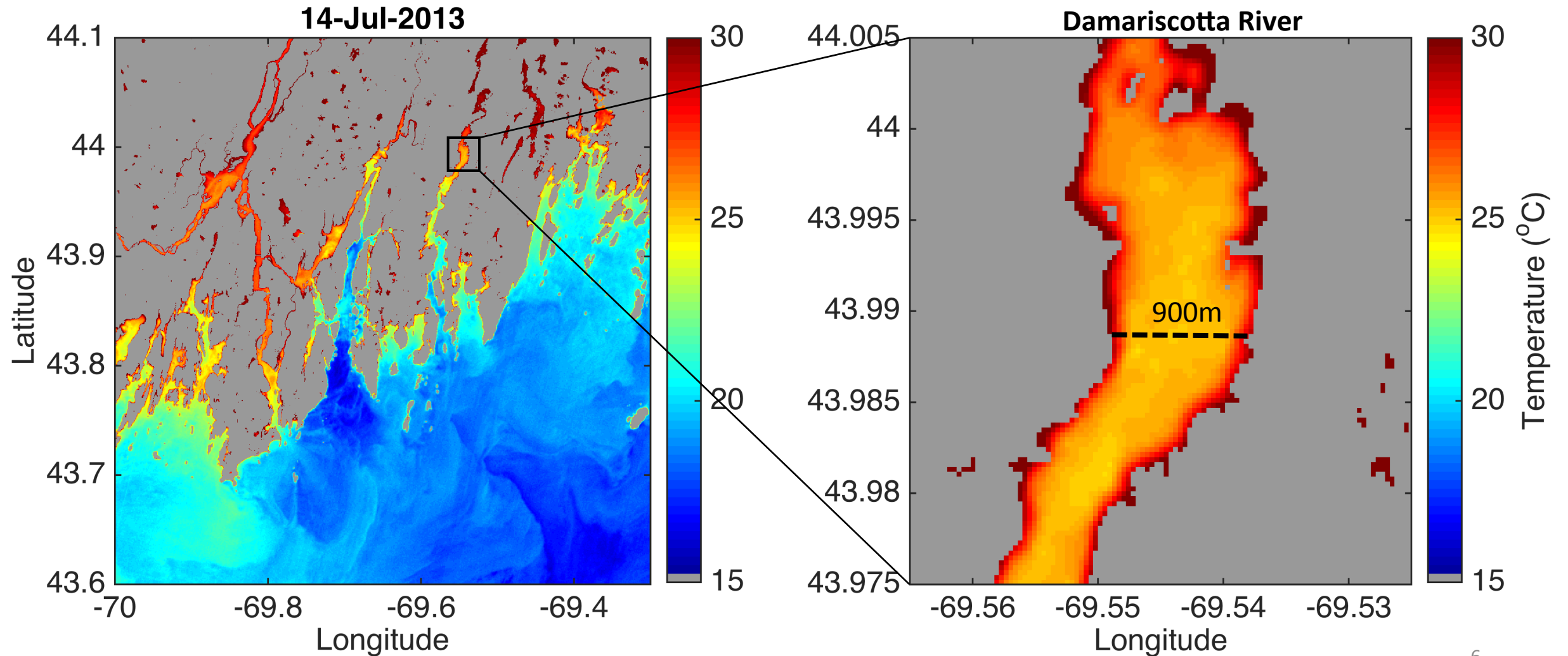


Chlorophyll

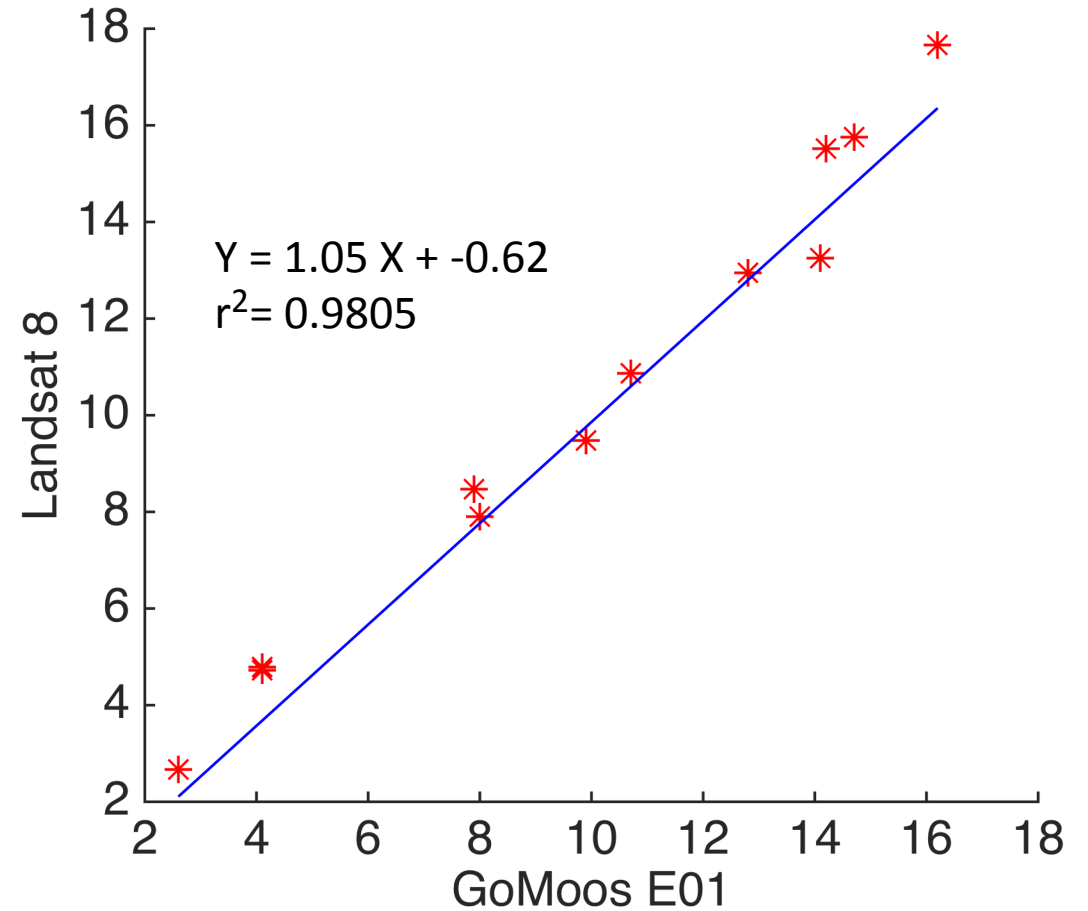
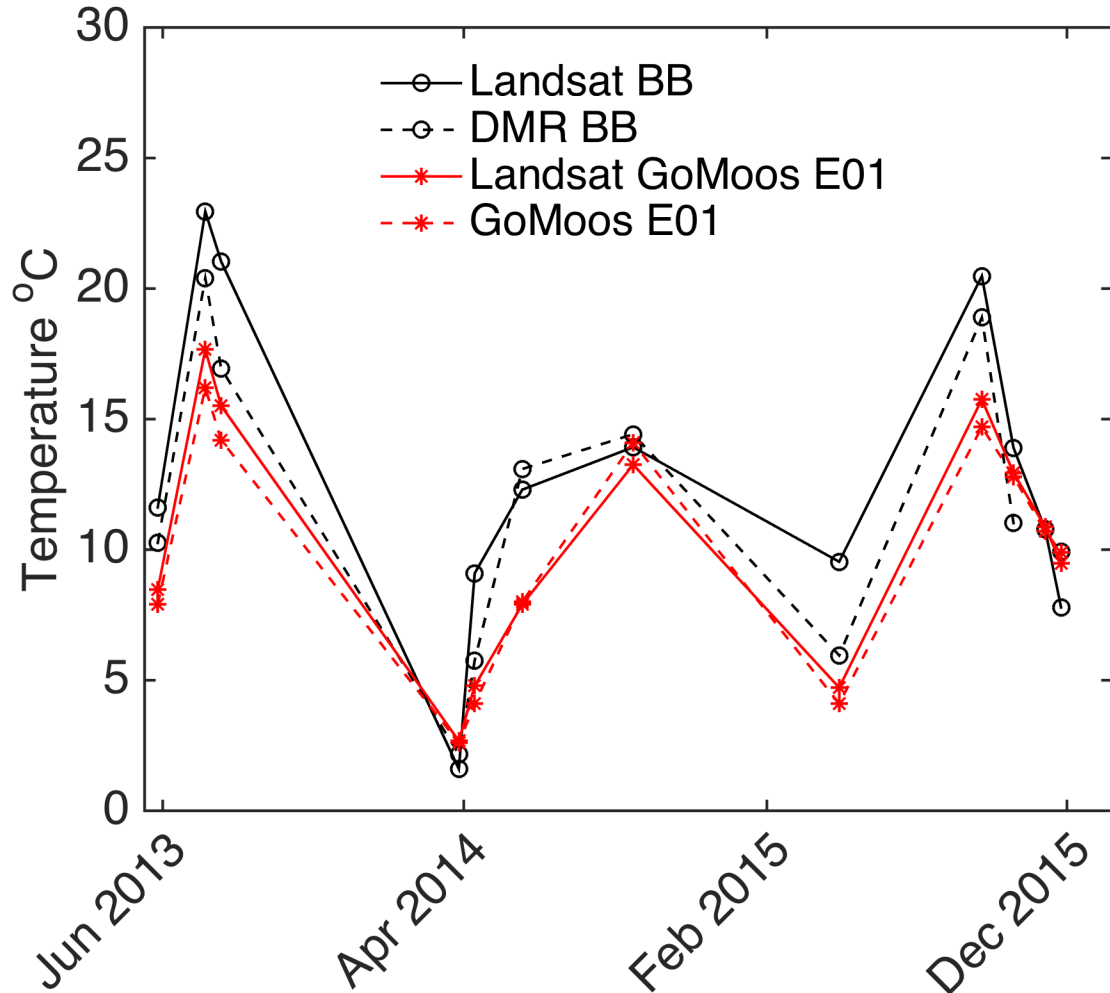
- high enough to provide nutrients/food for growth



Temperature Images

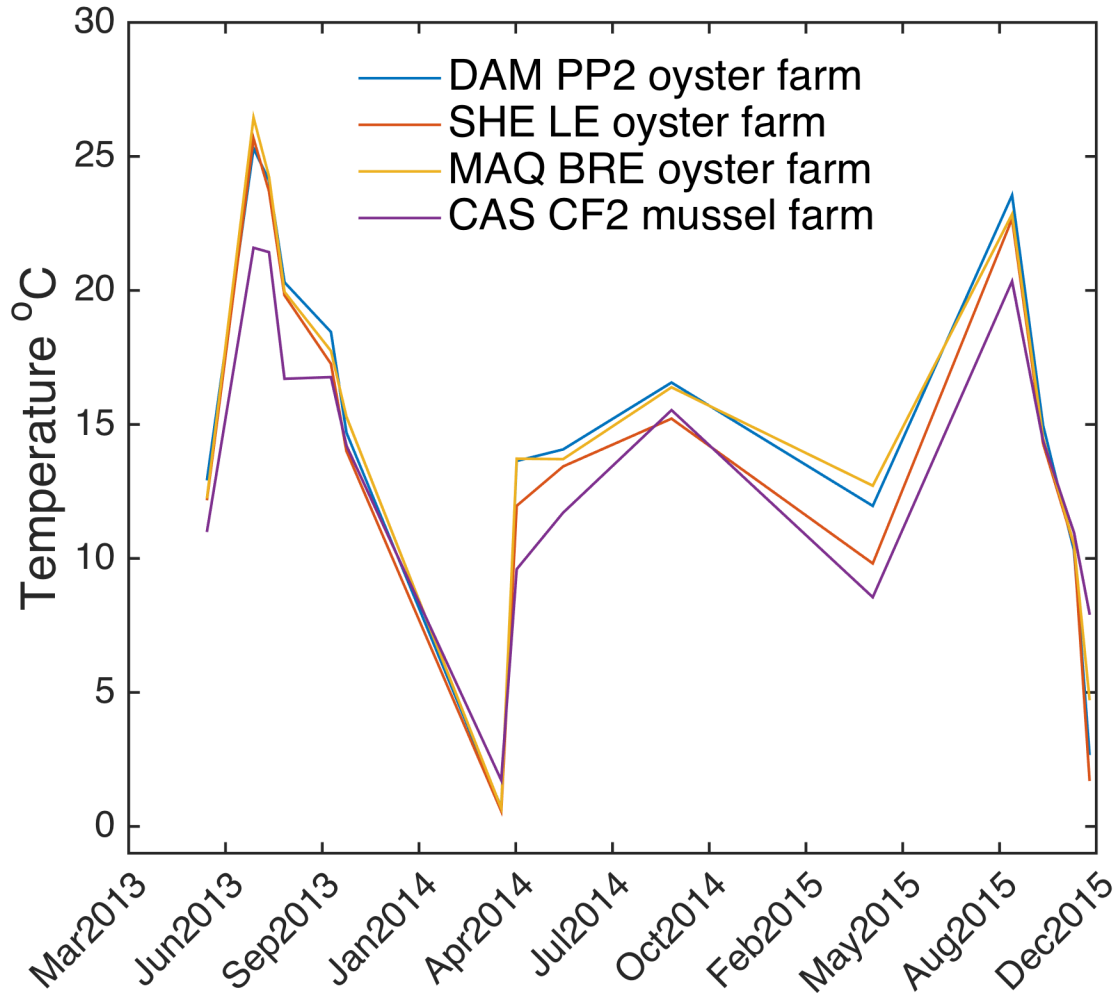


Validation with buoy measurements

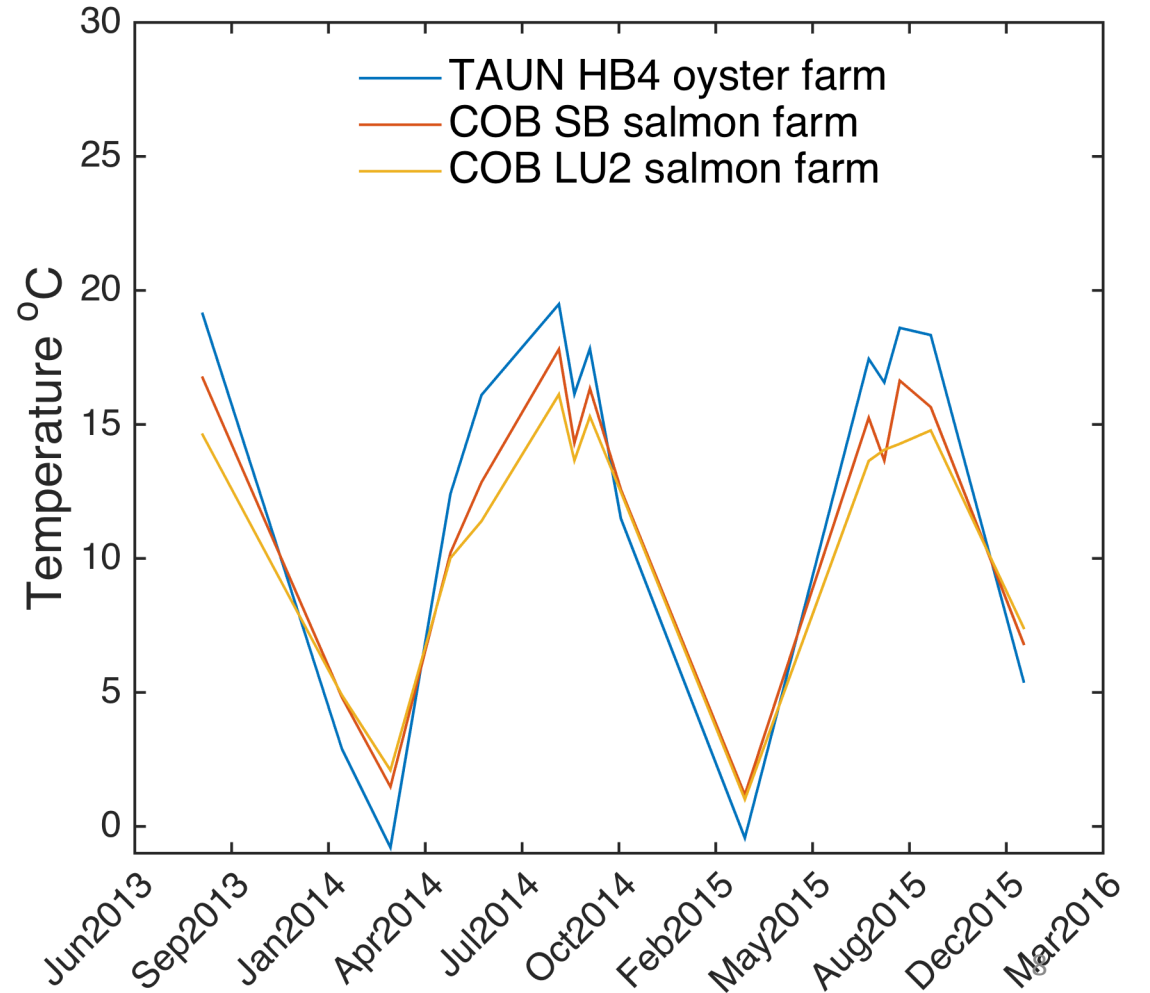


Temperature Time Series at Lease Sites

Mid Coast



Downeast



Limitations

- **Few images:** about 7 per year - only gives a '**snapshot**' in time, not entire seasonal trend
- **Cannot** be used to model shellfish growth (data is too sparse) – need for continuous monitoring of buoys, loggers, etc.
- Only goes back to 2013 - does **not indicate** long term/future warming conditions/predictions

Next Steps

- Create **turbidity** and **chlorophyll** maps and time-series
- Temperature **loggers** and hanging oyster **baskets** in 10 prospective sites
- **Water sampling** in the Damariscotta River for calibrations

Next Steps: Sentinel 2

- **Turbidity** and **chlorophyll** measurements (no temperature)
- Satellite that has a **10 day** repeat time
- **5 day** repeat coming **this Fall** with Sentinel 2b launch

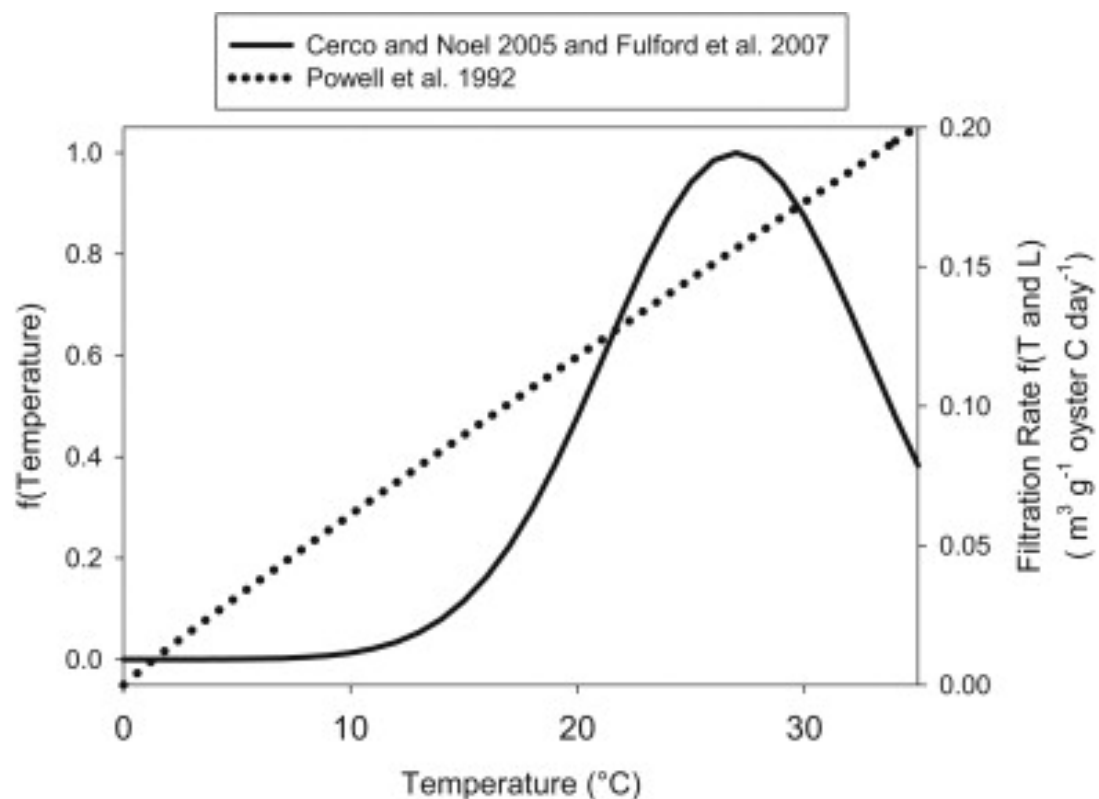


Thank you!

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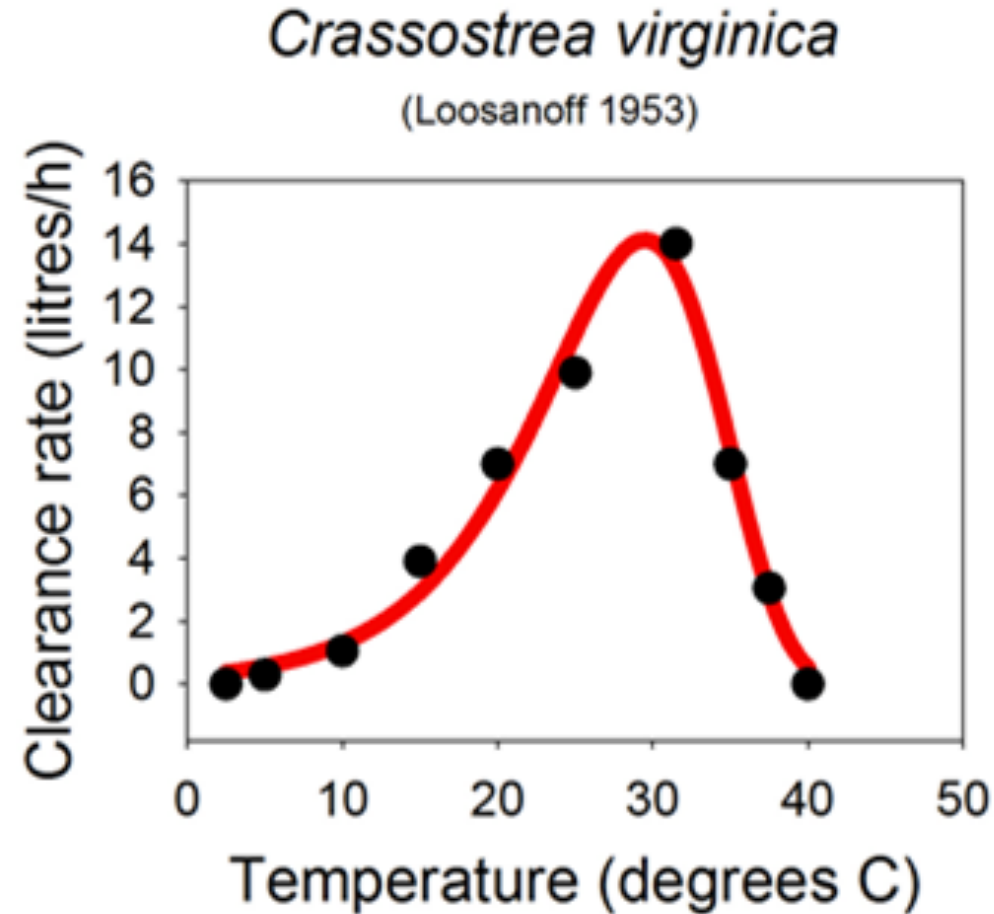


Ideal Temperature for Oyster Growth

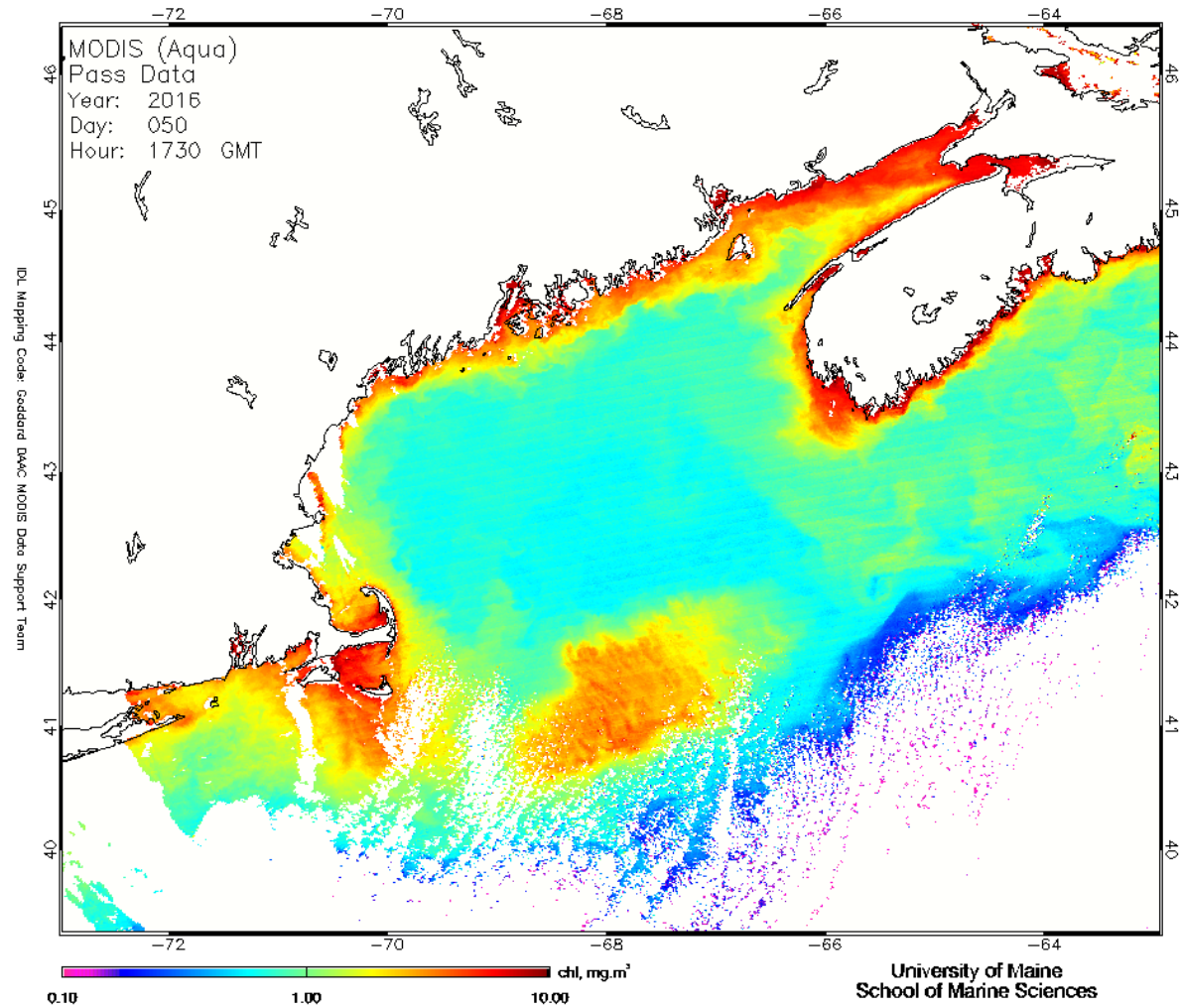


Model temperature limitation functions.

Ideal Temperature for Oyster Growth



Chlorophyll



Turbidity



Quinten Vanhellemont, Kevin Ruddick **Advantages of high quality SWIR bands for ocean colour processing: Examples from Landsat-8** Remote Sensing of Environment, Volume 161, 2015, 89–106 <http://dx.doi.org/10.1016/j.rse.2015.02.007>