Potential Sources of Cyanobacteria to the Chequamegon Bay Region

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• Linking science and communications to support decisions

• Applied learning for undergraduates
Flood Events and Water Quality

NOAA MODIS – 7/16/16
Vulnerable to Erosion
Land Cover Change

Northern Wisconsin landscape post-cutover.
Historical Land Cover Change Drives Excess Erosion and Sedimentation

Fitzpatrick and Knox, 2001
Bluff & Valley Wall Erosion

Photo: Ben Lee
Sediment Plumes

Photo: Bob Gross
Increase in Precipitation: 1950-2006

WICCI, 2009
Increase in Event Magnitude

Sediment & Nutrients in the Lake

NOAA – MODIS, 6/19/18
Cyanobacteria Blooms

• Common in areas with heavy ag and urban land use.
• Can produce dangerous toxins.
• Affect ecosystem & human health, tourism, industry.

Lake Superior inhospitable for these blooms, right?

2018 Bloom in Cornucopia, WI. Photo Credits: Brenda Moraska Lafrancois –NPS.
Why Not in Chequamegon Bay?

http://www.mappingspecialists.com/store/enhanced-chequamegon-bay-wall-map/
Water Quality Driven by Flood Events

Suspended Sediment Load

Total Phosphorus Load

South Fish Creek

2016  2018  2014-18 Other

X = Discrete Samples

red = Per Trip Chl-a Average

red-dashed = Median

Sample Date

Chlorophyll-a Concentration (ug/L)
Experimental Approach

• Replicate UMD-LLO 2017 Experiments
• Where might cyanobacteria blooms come from and under what conditions will they grow?
• Sample tributary, estuary, and lake
• Water bath incubation at two temps: 15C & 25C
• High & low N:P
• 12 Combinations of Location x Nutrient x Temp
Sample Collection, 8/5/19
Culture Experiments
Cyanobacteria-derived Chlorophyll a (µg/L ±SE) (phyto-pam measurements on living samples)

Experiment 1

Day of incubation

Chlorophyll a (µg/L)

Estuary, Low N:P, 25C

Estuary, High N:P, 25C
Tweak Experimental Set-Up

• Re-sample all locations on 9/4/19.
Cyanobacteria-derived Chlorophyll a (µg/L ±SE) (phyto-pam measurements on living samples)
Chlorophyll a (µg/L ±SE)
(all groups combined, phyto-pam measurements)
Preliminary Conclusions

• Lake not a source for cyanobacteria propagules – same as UMD-LLO
• Only cyanobacteria response from estuaries. Still suggests land-lake connection similar to UMD-LLO
• In general, growth response less than UMD-LLO. Does this matter?
• Waiting for algal taxonomy results and summary of water chemistry to further clarify results
Next Steps

• Submit proposals for Phase II experiments to further investigate propagule source areas and bloom risk in Chequamegon Bay
  – Synoptic survey of coastal habitats
  – Culture experiments from coastal habitats with highest cyanobacteria signal
  – Further culture experiments to look at bloom potential & typical conditions in Chequamegon Bay
Questions?