# Harmful Algal Blooms

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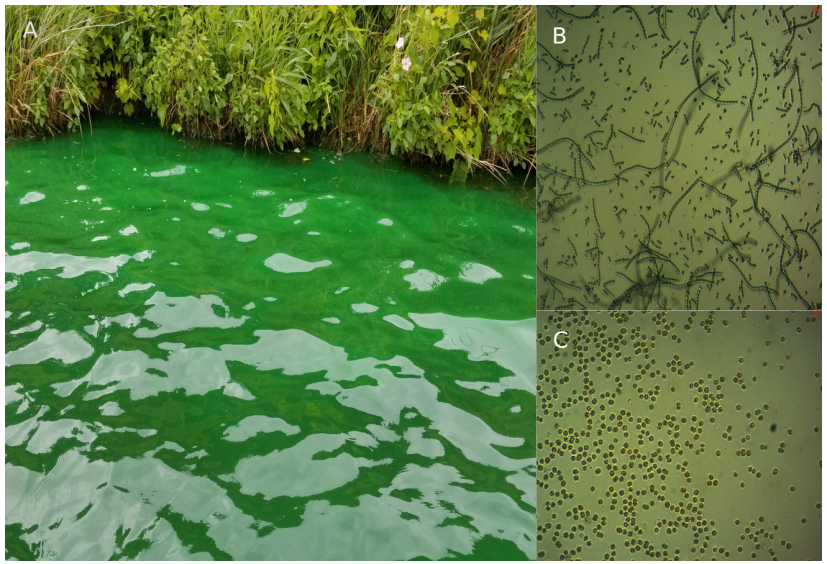
# Outline

# Harmful Algal Blooms



- Increase in primary productivity and
- growth of microspopic algae and cyanobacteria
- Toxin-producing genera
- Decrease biodiversity
- Anoxic environment [a]




[a] Test

# Occurance



- Naturally occuring
- Exacerbate from anthropogenic causes

# Lake Erie 2014

# Possible causes

# Toxicity



- Irritant
  - Lipolysacharides[1]
- Toxins
  - Microcystin and nodularin [1]
  - Cylindrospermopsin[2]
  - Anatoxin[3]
  - Saxitoxin [1]

[1] Moore, Richard and Ohtani, Ikuko, "Cyanobacterial Toxins".

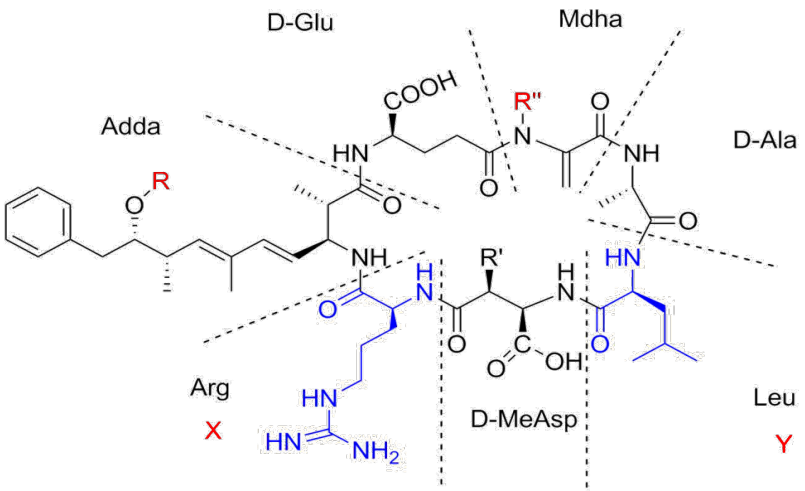
[2] Dittmann, Fewer, and Neilan, "Cyanobacterial toxins".

[3] Codd et al., "Cyanobacterial toxins, exposure routes and human health".

# Microcystin



- Cyclic peptide
- 1000 Da
- Hepatoxin and carcinogenic
- Inhibits protein phosphotase
- Diverse structures



# Cylindrospermopsin

# Anatoxin

# Saxitoxin

# Exposure Route



- Direct contact
- Aerosols
- Ingestion
  - Seafood/Fish
  - Drinking water
  - Algal supplements

# Law and Regulation

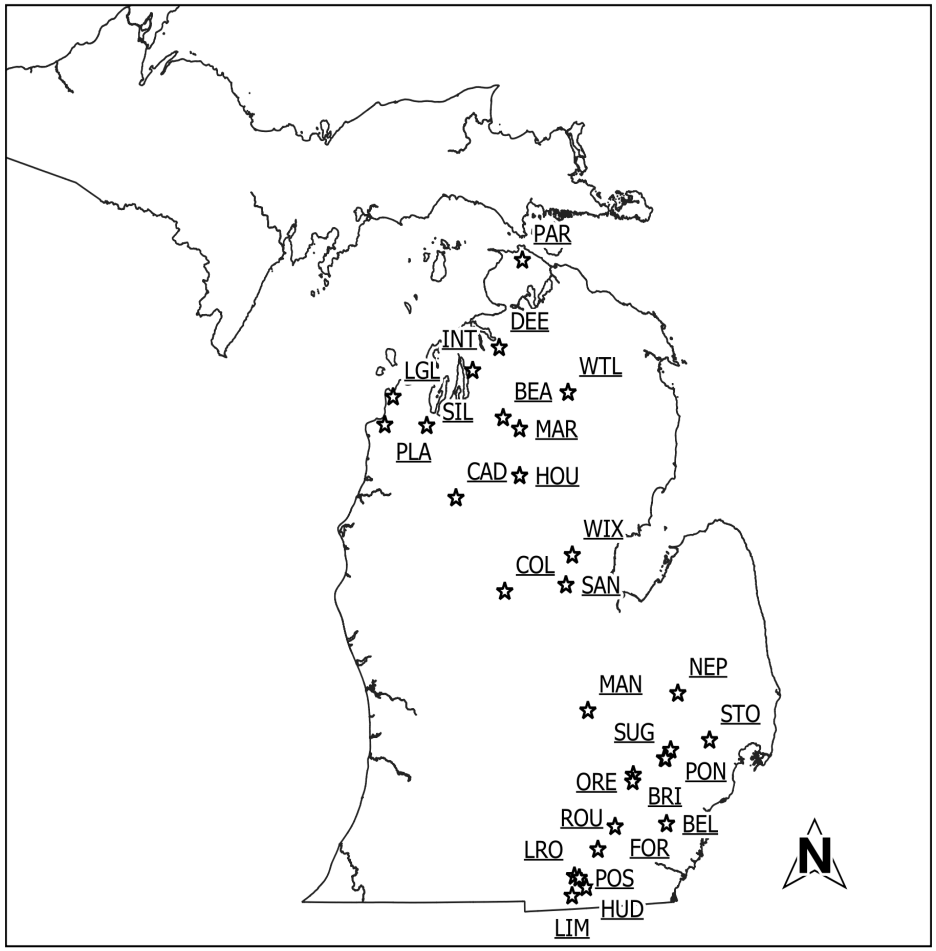


- Safe Drinking Water Act
- Maximum Contaminant Level
  - Regulated and enforced
- Contaminant Candidate List
  - "More like guidelines"

# Objectives

# Surveyed Lakes





# Water Sampling



- Sampled each lake once a month
- Collected water
- Quickly transported back
- Analyzed ASAP

# SPATT



- Solid phase adsorbtion toxin tracking
- Sachet filled with resin
- Left for one month

- test

# Analysis

# Coloremetric

# LC-MS/MS



- Freeze/Thaw
- Filter

# SPATT



- Solid phase adsorbtion toxin tracking
- Similiar to the stationary phase

# ELISA

# Geospatial Analysis

# Results

# Could we predict HABs?

# Acknowledgment



- My lab partners Brian Spies and Andrew Herrpich
- Jason Sckrabulis, Ryan Mcwhinnie, Melissa Ostrowski
- Dr.David Szlag and Dr. Thomas Raffel
- Michigan Department Environmental Quality
- Oakland University and the Chemistry Department

# References I

Codd, Geoffrey A. et al. "Cyanobacterial toxins, exposure routes and human health". In: *European Journal of Phycology* 34.4 (Oct. 1999), pp. 405–415. ISSN: 0967-0262.

Dittmann, Elke, David Fewer, and Brett Neilan. "Cyanobacterial toxins: Biosynthetic routes and evolutionary roots". In: *FEMS microbiology reviews* 37 (Sept. 2012). DOI: 10.1111/1574-6976.12000.

Moore, Richard and Ohtani, Ikuko. "Cyanobacterial Toxins". In: *Gazzetta chimica Italiana* 123.6 (1993), pp. 329–336.