Timothy Davis
Associate Professor, Department of Biological Sciences and Director of the Center for Great Lakes and Watershed Studies

Research expertise

- Cyanobacterial harmful algal bloom ecology, Integrated monitoring of harmful algal blooms, Advanced, in-lake technologies for detecting harmful algae and their toxins, Impacts of climate change on harmful algal blooms

Most relevant research summary and findings

- **Reductions of nitrogen & phosphorus needed to reduce HABs**
  - Nitrogen is critical for controlling bloom growth & toxicity (Davis et al, 2015, Gobler et al., 2016, Chaffin et al., 2018, Newell et al., 2019)
  - P-only reduction strategies may lead to smaller blooms but similar or possibly higher toxin concentrations (Gobler et al., 2016)
- **Developed the first quantitative impairment decision framework for cyanobacterial harmful algal blooms**
  - First quantitative framework to be developed anywhere in the country (Davis et al., 2019)
  - Demonstrates the important of long-term monitoring by state, federal and academic partners
  - Shows the strength of university-state-federal collaboration (BGSU, UT, OSU, NOAA, OEPA)
  - Provided the information needed for Ohio to label it's open waters of western Lake Erie as 'Impaired'
- **Climate change will cause longer, larger, and likely more toxic blooms**
  - Warmer spring and fall temperatures will initiate bloom earlier and cause blooms to last later (Davis et al., *in prep*)
  - Warmer waters will promote the growth of toxin-producing cyanobacteria (Davis et al., 2009)

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Current knowledge gaps and challenges

- Different bloom-forming cyanobacteria dominate in different environments
- Toxins of emerging concern occurring throughout Ohio
- Currently cannot forecast bloom toxin concentrations
- Long-term monitoring needed to assess the impact of watershed management actions and impacts of climate change on bloom formation and toxicity
- Need of more expansive toxin monitoring with improved in-field & user-friendly instruments

Solutions and paths forward

- NIH/NSF funded 5-year/$5M award to BGSU (lead PI: Dr. George Bullerjahn)
- When and where do these toxins occur and who is responsible for producing them (Collaboration between BGSU, OSU, UT, Defiance Coll. and Kent State U., OEPA)
- Initial model being developed for microcystin through NOAA ECOHAB grant
- Collaborations between state, federal and university partners as well as sustained funding is critically important
- Investing in technology development and citizen science initiatives