Ohio's Current HABs Research Efforts

Dr. Chris Winslow, Director
Ohio Sea Grant and OSU's Stone Lab
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Diversified Portfolio (>70 @ $8.5 mil)

- OSU CFAES, 2015 “F2F” Projects = 5 ($1 mil) (Complete)
- ODHE (FY15) = 19 ($2 mil) (Complete)
- ODHE (FY16) = 14 ($2 mil) (Report in progress)
- ODHE (FY17) = 9 ($1.5 mil) (Started)
- ODHE (FY18) = 11 ($1.4 mil) (Started)
- Ohio Sea Grant = 18 ($1.8 mil) (Various degrees)
- ODHE remaining FY18 and FY19 (~$2.4 mil) (Still to come)
HAB Research Initiative has ......

- Provided new answers and practical guidance about producing safe drinking
- Started to fill critical knowledge gaps about the risks that algal toxins present for human health
- Identified how blooms behave and how to address nutrient runoff into aquatic ecosystems
- Driven information sharing and priority setting between universities and agencies, positioning Ohio to better prevent and manage future crises
Truly Collaborative
2016 report on 2015 efforts

2017 report on 2015 & 16 efforts

2018 report on 16 findings (Sept.)
Track Blooms From the Source

Monitoring tributaries for nutrients that cause algal blooms

Early warning systems for bloom activity

Understanding blooms better for smarter management
### Projects in this Focus Area

#### ROUND 1
- **HAB Detection, Mapping and Warning Network: Sandusky Bay**
  Lead: Bowling Green State University

- **HAB Detection, Mapping and Warning Network: Maumee Bay Area**
  Lead: University of Toledo

- **Identifying the Best Strategy to Reduce Phosphorus Loads to Lake Erie from Agricultural Watersheds**
  Lead: Heidelberg University

#### ROUND 2
- **Determining Sources of Phosphorus to Western Lake Erie from Field to Lake**
  Lead: Heidelberg University, The Ohio State University

- **HAB Avoidance: Vertical Movement of Harmful Algal Blooms in Lake Erie**
  Lead: University of Toledo

- **Seasonal Quantification of Toxic and Nontoxic *Planktothrix* in Sandusky Bay by qPCR**
  Lead: Bowling Green State University

#### An Investigation of Central Basin Harmful Algal Blooms
- **Lead:** The Ohio State University

- **How Quickly Can Target Phosphorus Reductions Be Met? Robust Predictions from Multiple Watershed Models**
  **Lead:** The Ohio State University

- **Early Season (March) Phosphorus Inventory of Offshore Waters of Lake Erie**
  **Lead:** Bowling Green State University
OHIO SEA GRANT AND STONE LABORATORY

Produce Safe Drinking Water

TREATMENT PLANT

RESERVOIR

INTAKE TO PLANT

PIPES FROM PLANT TO HOME

RESIDENTIAL FAUCET

Toledo Blade
The Bottom Line:

- Distribution system (fate of toxins)
- Biofilters and potassium permanganate
- Bioremediation (toxin eating and phages)
- PAC and algaecide; type and dose
- Ozone vs. UV
- Enzyme pathway for treatment
- Point-of-use reverse osmosis
Protect Public Health

Identifying pathways of exposure to harmful toxins

Detecting algal toxins in fish and produce exposed to HABs water

Detecting algal toxins in tissue samples

Assessing liver disease risks associated with algal toxins
Projects in this Focus Area

**ROUND 1**
Evaluation of Cyanobacteria and Their Toxins in a Two-Staged Model of Hepatocarcinogenesis
Lead: The Ohio State University

Fish Flesh and Fresh Produce as Sources of Microcystin Exposure to Humans
Lead: The Ohio State University

Impact of Microcystin on Pre-Existing Liver Disease
Lead: University of Toledo

Method Development for Detecting Toxins in Biological Samples
Lead: University of Toledo

**ROUND 2**
Characterization of Recreational Exposures to Cyanotoxins in the Western Lake Erie Basin
Lead: University of Toledo

A Comprehensive Approach for Evaluation of Acute Toxic Responses After Microcystin Ingestion
Lead: The Ohio State University

Development of the MMPB Method for Quantifying Total Microcystins in Edible Lake Erie Fish Tissues
Lead: The Ohio State University
Projects in this Focus Area

ROUND 1
Social Network Analysis of Lake Erie HABs Stakeholder Groups
Lead: Kent State University

Maumee Basin Lake Erie HABs Stakeholder Informed Decision-Making Support System
Lead: University of Toledo

Farmer/Farm Advisor Water Quality Sampling Network
Lead: The Ohio State University

Maumee Basin Lake Erie HABs Nutrient Management Options Comparative Analysis
Lead: The Ohio State University
Recently Initiated Projects and Content Experts

- Margaret Kalcic (OSU): Model improvements for tile-drained fields
- Mike McKay (BGSU): Viral activity within HABs to inform water treatment
- Tom Bridgeman (UT): Open Water HAB impairment sampling
- John Bratton (LimnoTech): HABs forecast modeler & ECOHAB
- Angelica Vazquez-Ortega (BGSU): N/P removal tile drainage
- Jim Hood (OSU): In-steam nutrient contributions
- Steve Wilhelm (Tenn): Microcystis response to varying lake conditions (Temp/N/P) and bloom virus activity
CFAES Water Quality Initiative (WQI)

Vision: College supports an integrated program of water-related research, teaching, and outreach to address water-quality issues in Ohio and beyond.

Water Quality Task Force (appointed Fall 2017)

Three parallel activities underway:

1. INREACH: gather input and ideas from CFAES faculty/staff
2. OUTREACH: gather input and ideas from key stakeholders, decision-makers
3. SYNTHESIS: Lake Erie HABS Science Working Group

Effort not unique to CFAES/OSU

WQI PROPOSAL TO DEAN DUE EARLY FALL 2018