SLOWING THE SPREAD OF HARMFUL ALGAL BLOOMS

DR. KEN WAGNER

NCFAR Virtual Lunch-n-Learn

Food and Ag Research Seminar

National Coalition for Food and Agricultural Research

Seminar sponsored by WSSA and organized by APMS and WSSA

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- Now in its sixteenth year, NCFAR regularly presents leading-edge researchers working to provide science-based answers to pressing issues confronting the nation.
- The Hill seminar series provides timely information to Hill staff and other policy stakeholders and helps demonstrate the value of public investment in food and agricultural research- investment that returns 45% per year on average, and $20 in economic benefit from every $1 of investment in food and ag research.

Nearly 10,000 attendees at over 150 seminars to date!

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DR. KEN WAGNER

Dr. Wagner holds degrees from Dartmouth College and Cornell University, with his Ph.D. earned in Natural Resource Management in 1985.

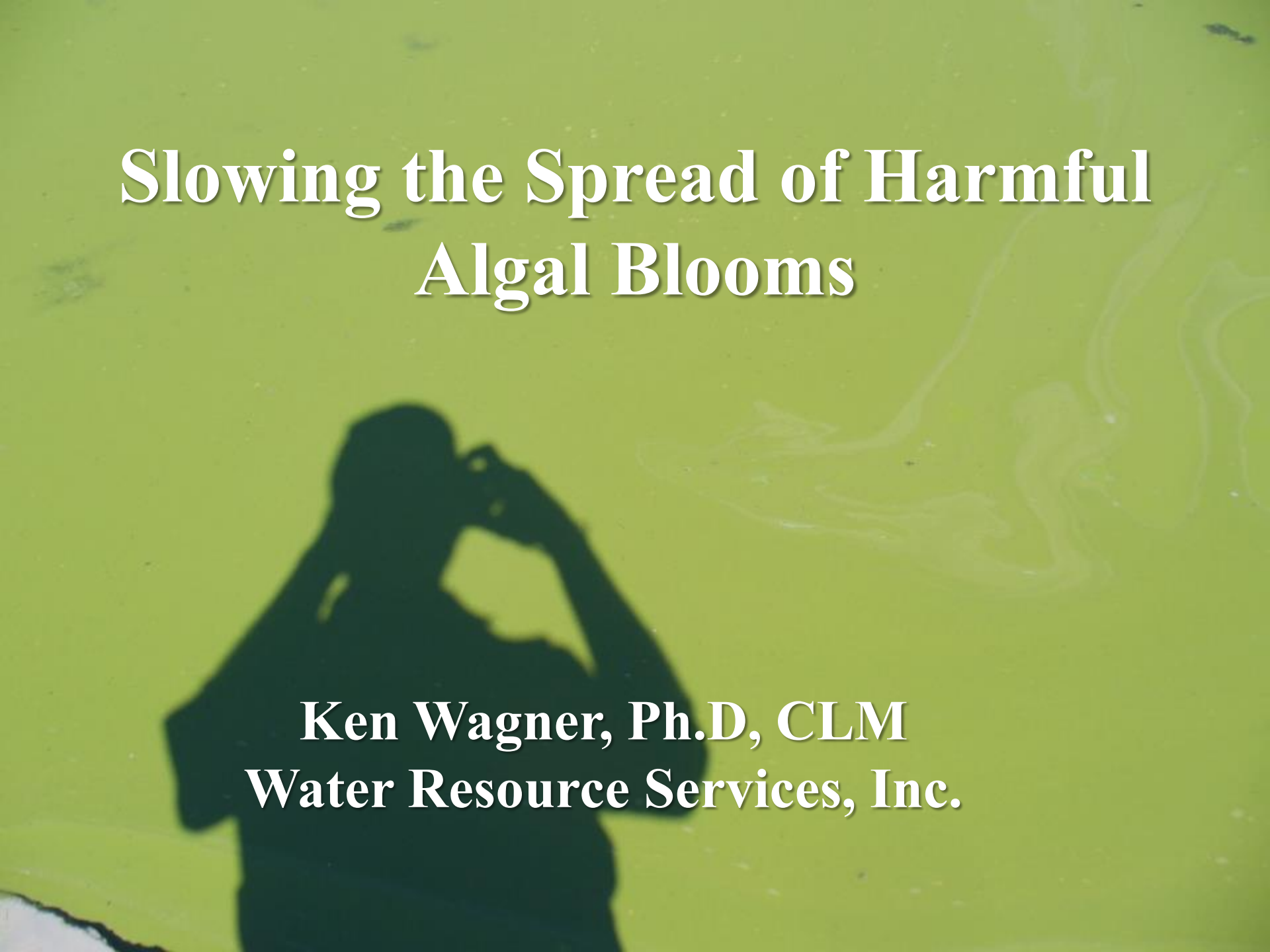
He has over 40 years of experience working on a variety of water resources assessment and management projects, including lake, reservoir, river and watershed assessment, rehabilitation, and management, regulatory processes, and educational programs.

In 2010 he started Water Resource Services, a small company with a focus on water supply protection and lake management consulting.

He is a former President of the North American Lake Management Society and former Editor in Chief of Lake and Reservoir Management, a peer-reviewed journal.

National Coalition for Food and Agricultural Research

Slowing the Spread of Harmful Algal Blooms



Ken Wagner, Ph.D, CLM
Water Resource Services, Inc.

What is a Harmful Algal Bloom?

- Any elevated concentration of algae that can negatively impact a waterbody or its uses
- Can be saltwater or freshwater, but responsible algae differ

What is a Harmful Algal Bloom?

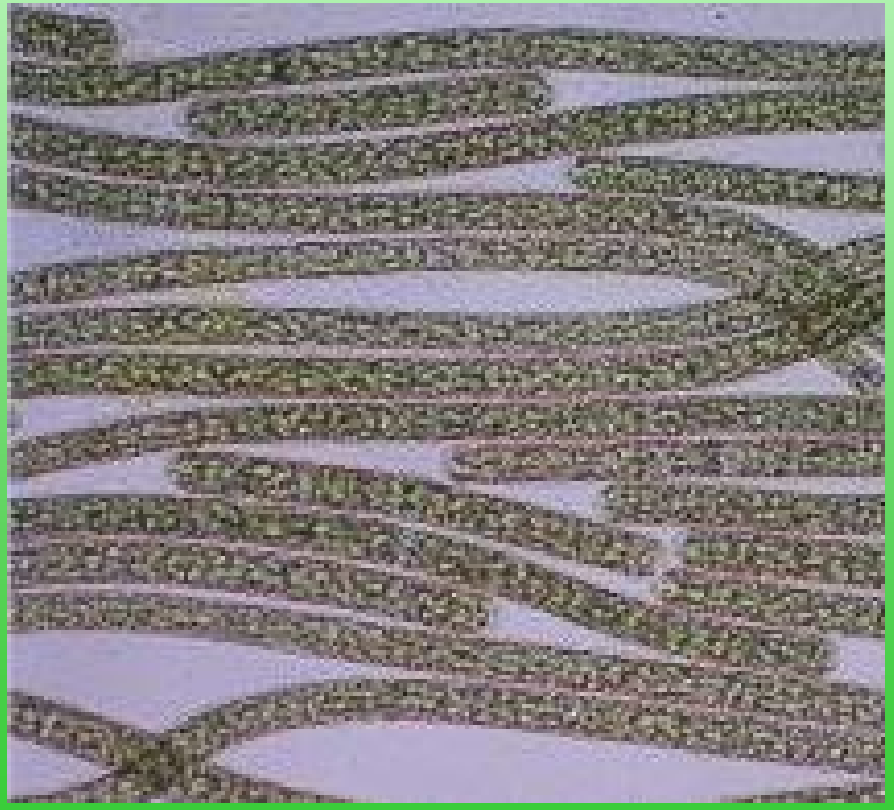
- Toxicity is a primary concern, but non-toxic blooms can depress oxygen, alter pH, add taste/odor, and provide organic compounds that can become carcinogens in water treatment facilities
- While any group of algae could form a HAB, the greatest risk is associated with cyanobacteria (aka blue-green algae)

What are cyanobacteria (blue-green algae)?

- Photosynthetic bacteria, 2 billion year old group
- Native, natural, part of functioning aquatic system
- Mostly small cells in large aggregations
- Prefer warmer water, elevated phosphorus concentrations, higher pH

What are cyanobacteria (blue-green algae)?

- Most are capable of producing toxins
- Many can control buoyancy, form surface scums
- Resting stages fall to sediment, germinate later

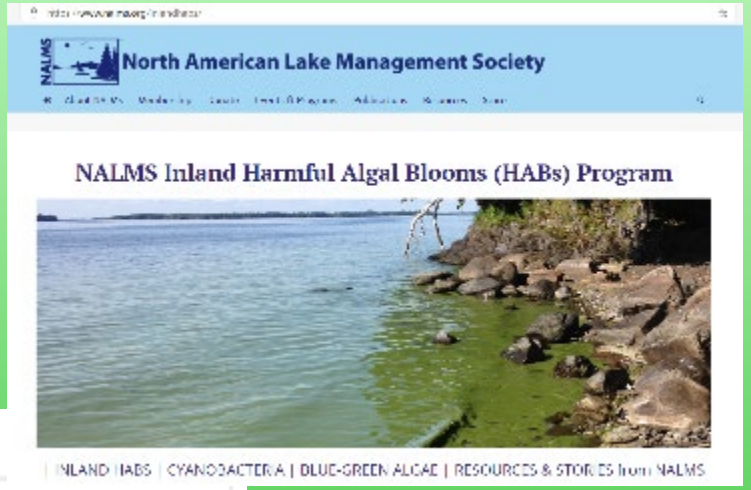


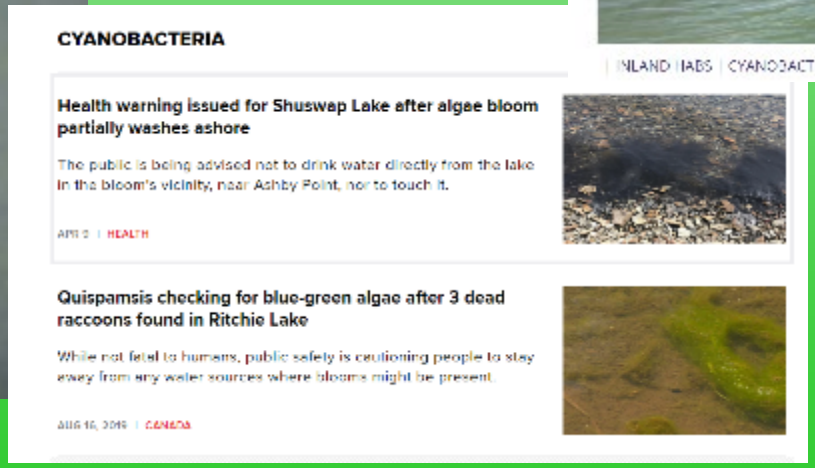
Increasing attention to HAB

- Blooms are becoming more frequent and more severe
- The health impacts are becoming better understood
- Management techniques have advanced to greater applicability
- Standard treatment is not always enough to avoid problems

Increasing attention to HAB

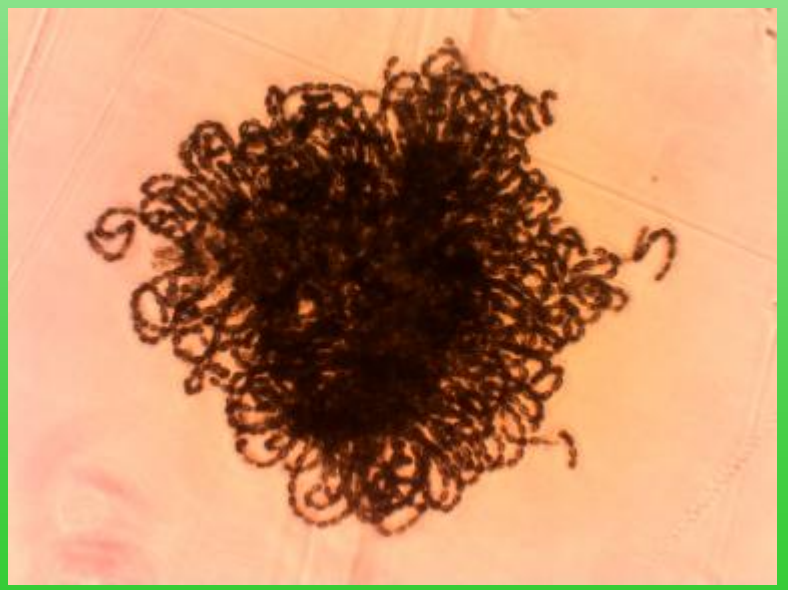
- The cost of bloom control is significant
- The cost of not controlling blooms may be higher
- Federal and state governments have created regulations
- Media outlets have created greater “awareness”





Cyanotoxins

- **Dermatotoxins**
  - **produce rashes and other skin reactions, usually within a day (hours)**
- **Hepatotoxins**
  - **disrupt proteins that keep the liver functioning, may act slowly (days to weeks)**
- **Neurotoxins**
  - **cause rapid paralysis of skeletal and respiratory muscles (minutes)**



Cyanotoxins

- Recent research has confirmed that most cyanobacteria can produce toxins
- Toxin production is not continuous or guaranteed; triggers not well understood

Cyanotoxins

- Visible blooms present risk that needs to be quantified (about 20% exceed toxin guidelines)
- Lower concentrations may be indicators of upcoming risk
- Monitoring of algae types, quantities and toxins is therefore important to public and ecological health

HAB Impacts

- Contaminated water supplies, increased health risk and/or treatment cost
- Impaired recreational uses and/or associated health risk

HAB Impacts

- Decrease in mussels, fish, birds, other water dependent wildlife, also farm animals and pets
- Loss of property value and decreased tax base

There are very real ecological, human health and financial threats from HAB

Factors that Spread HAB

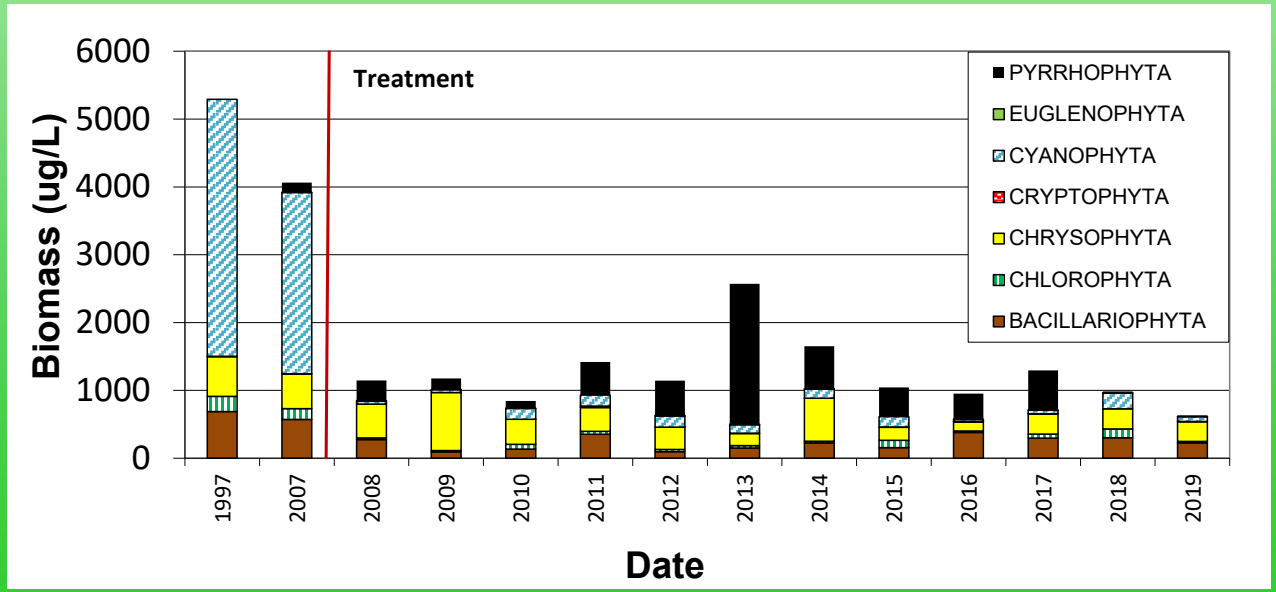
- Increased temperature – faster growth rates, cyanobacteria metabolically favored
- Increased nutrient inputs – more fertile water
- Internal recycling – legacy inputs can become main source for HAB

How to Limit HAB

- Watershed management to limit nutrient inputs
- Techniques advanced through federal research

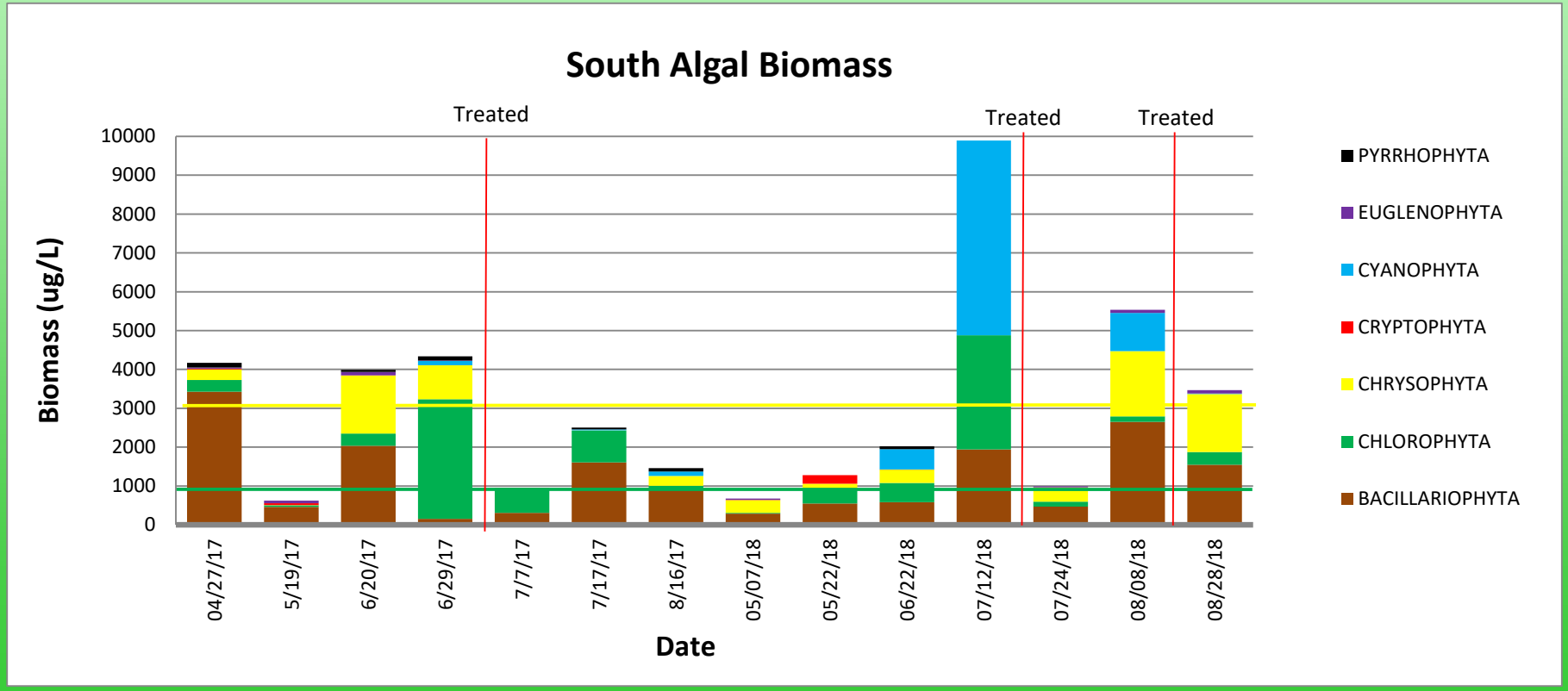
How to Limit HAB

- Control of legacy nutrient sources –
  - Dredging – removes legacy sources
  - Oxygenation – keeps P bound in sediment
  - Phosphorus inactivation – lowers P availability
- Federally supported research of the last 3 decades has advanced these approaches to reliable application status



How to Limit HAB

- Targeted algaecide use with appropriate monitoring
- Climate change initiatives relevant, but won't solve HAB problem in short run



Need for National Action

- HAB do not respect local or state boundaries
- Watersheds represent logical management units but are not coincident with political boundaries
- Impacts are the same across the USA, federal leadership and guidance desirable

Need for National Action

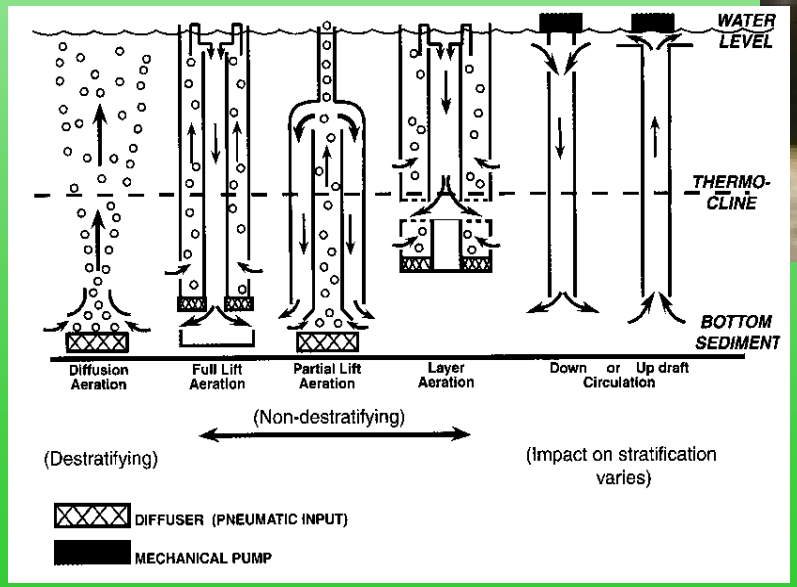
- Considerable expertise at national level (e.g., USEPA, NOAA, USGS, USACE)
- Expertise at state and local level is varied
- Professional organizations supporting science-informed management are national in scope (e.g., APMS, NALMS).

Steps We Can Take

- Support monitoring efforts – many now in place, some being coordinated at regional to international levels (e.g., USEPA Monitoring Collaborative, GLEON, NLA); critical to monitor results of management actions
- Promote watershed management – prevention always preferable to remediation, but recognize limits (land use predisposes waterbodies to problems)

Steps We Can Take

- Recognize and support in-lake methods of control –
  - Legacy inputs are often a major part of the problem and can be addressed
  - Proper use of algaecides can prevent damage
- Enhance collaboration across levels of government (ITRC HCB example)



Organizing for Success

- Some states have active programs that can serve as examples (New York, Vermont, Ohio, New Jersey); federal assimilation of state level initiatives and dissemination of information to other states is needed
- NOAA has the lead for saltwater and Great Lakes HAB efforts; aid from USACE useful on Great lakes (also Okeechobee in FL)
- Need to expand inland assessment and management efforts; NOAA/USACE collaboration may be most advantageous

Conclusions

- HAB are an increasing concern for lakes, representing multiple threats to water quality and uses
- There are real and substantial costs imposed by HAB
- Key factors promoting HAB include warmer water, higher nutrient inputs, internal recycling

Conclusions

- Successful controls for HAB now available involve management of watershed nutrient inputs and legacy phosphorus accumulations, plus targeted algaecide use
- National initiatives and coordination are needed beyond current emphasis on monitoring; watershed controls and in-lake methods need greater recognition and application

SLOWING THE SPREAD OF HARMFUL ALGAL BLOOMS

QUESTIONS? (SUBMIT VIA CHAT)

PRESENTATION WILL BE POSTED ON WWW.NCFAR.ORG.

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NATIONAL COALITION FOR FOOD AND AGRICULTURAL RESEARCH

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Next NCFAR Seminar
Noon Wednesday, June 17

The Plant Science Decadal Vision

Reimagining the Potential of Plants for a Healthy Future

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