



# New Hampshire's Cyanobacteria Plan: A Statewide Strategy

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**Presented By:**

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# Presentation

Outline: A curvy path outlining the statewide cyanobacteria plan, progress, and future

The importance of self-risk assessments

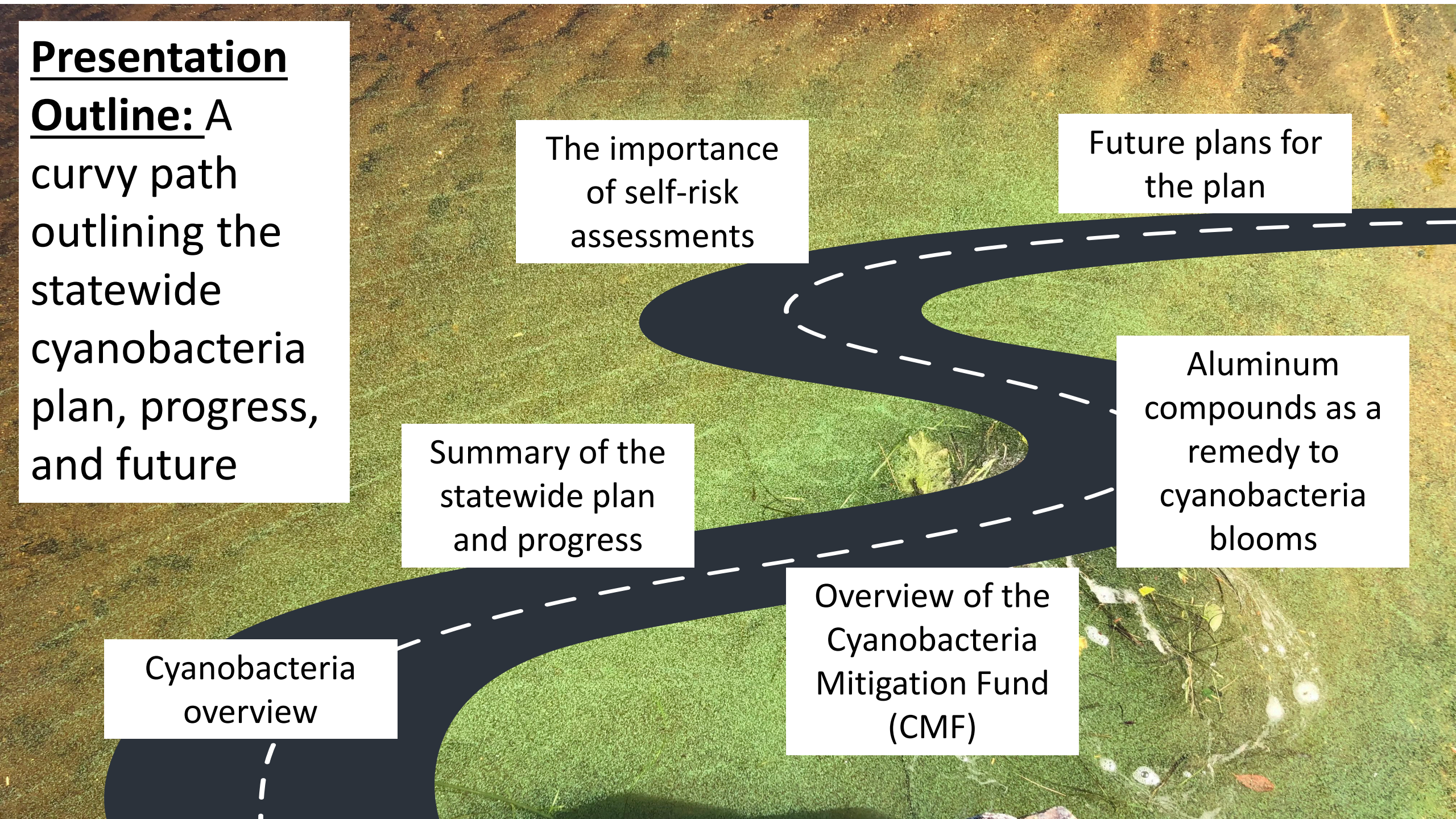
Future plans for the plan

Summary of the statewide plan and progress

Aluminum compounds as a remedy to cyanobacteria blooms

Cyanobacteria overview

Overview of the Cyanobacteria Mitigation Fund (CMF)





# What is Cyanobacteria & Why is it a Problem?

## Cyano Facts:

- Formerly known as “Blue-Green Algae.”
- Photosynthetic bacteria, they are not actually algae.
- Inhabitants of Earth for over 3.5 billion years.
- Thousands of species and hundreds of **toxins**.
- Ubiquitous in the environment and globally.
- Thrive when excess nutrients are available.

## Toxicity affects:

- Respiratory system irritation/Sore throat.
- Skin rash.
- Vomiting/Diarrhea/Abdominal Pain.
- Fever/Headache.
- Tingling, burning, numbness sensation.
- Acute neurological system failure.
- Liver/kidney damage (ingestion/long term exposure).
- Potential to cause neurodegenerative diseases such as ALS (Long term exposure).

# Connection to Use of Public Waters

## Restricted Recreational Opportunities and Economic Impacts



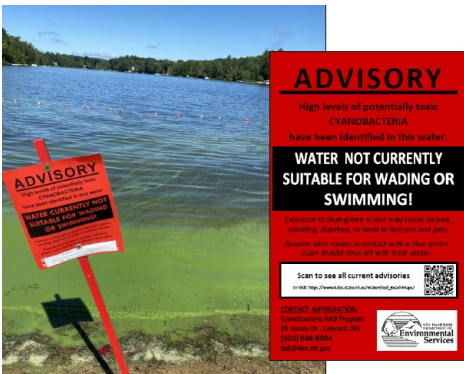
Boating



Reduced Business



Impacts to waterfront property



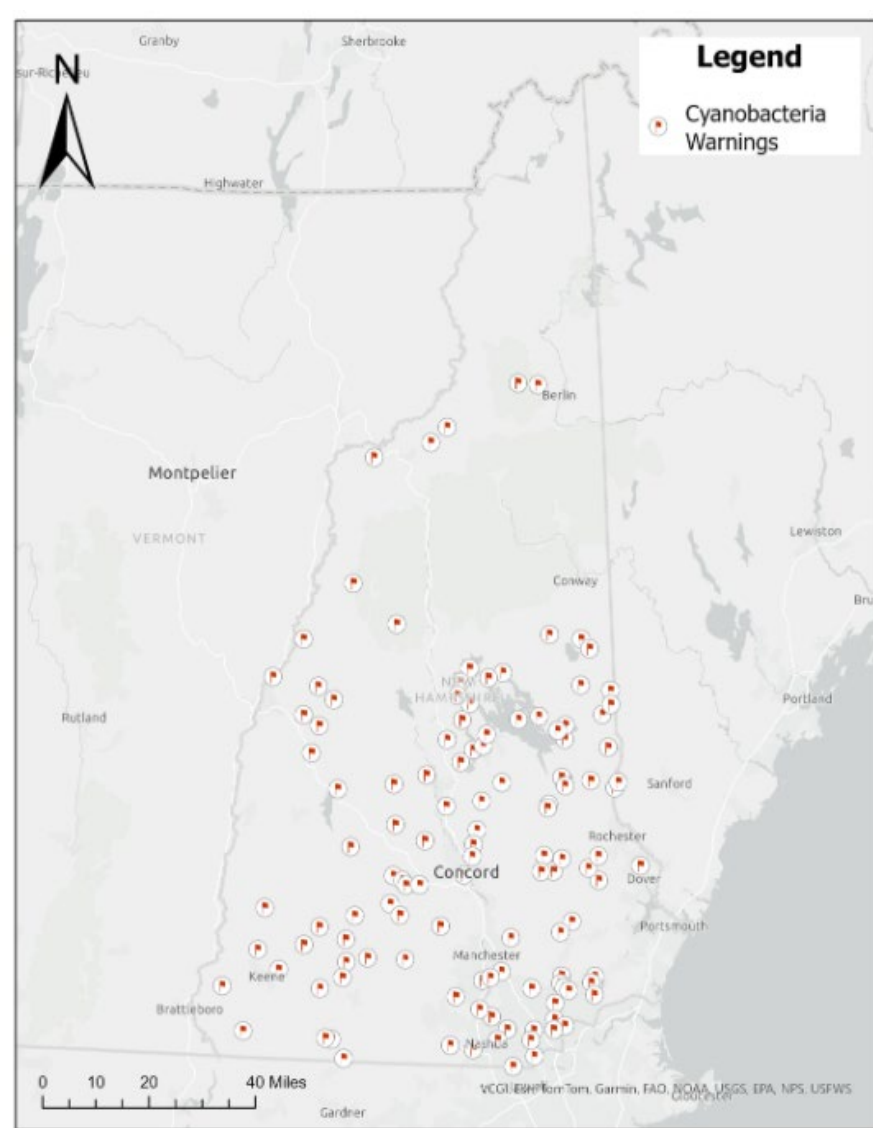
Swimming

**Cyanobacteria Warnings (advisories):** Issued when cyanobacteria density exceeds that considered safe for recreational use.

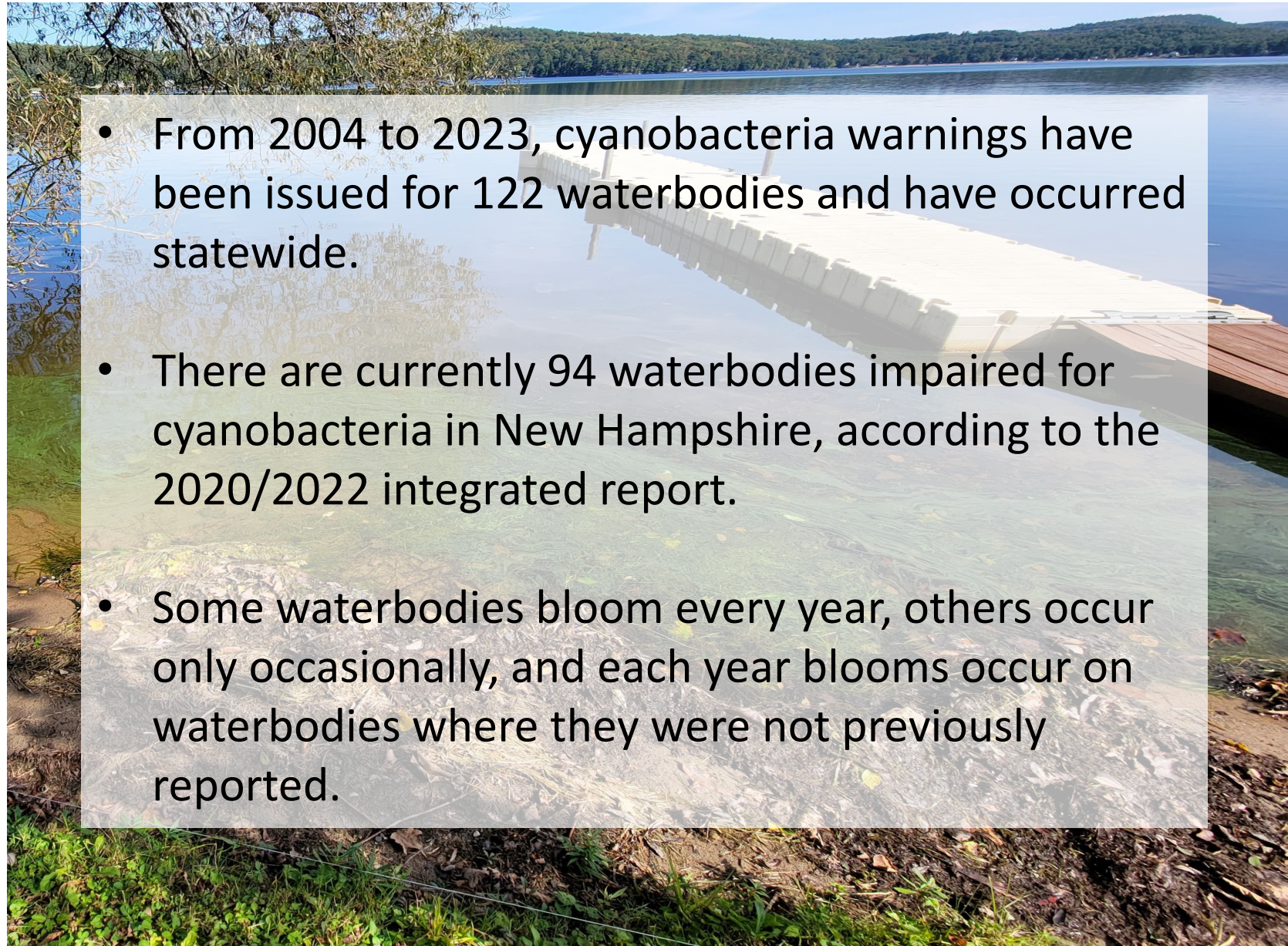
Warnings can last from a few to over 100 days depending on bloom severity.



# Cyanobacteria in New Hampshire's Inland Surface Waters



New Hampshire Cyanobacteria Bloom Warnings  
(2004-2023)



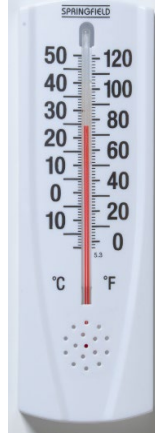
- From 2004 to 2023, cyanobacteria warnings have been issued for 122 waterbodies and have occurred statewide.
- There are currently 94 waterbodies impaired for cyanobacteria in New Hampshire, according to the 2020/2022 integrated report.
- Some waterbodies bloom every year, others occur only occasionally, and each year blooms occur on waterbodies where they were not previously reported.



# Simplified Cyanobacteria Bloom Equation



+

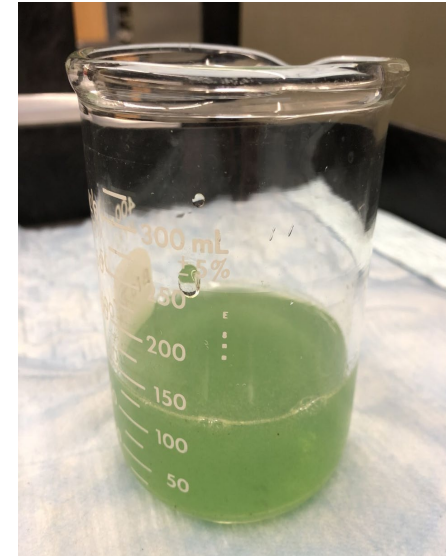


+

Phosphorus (P)

Nitrogen (N)

=



Light

Heat

Nutrients

Boom!

Things we can't  
control at the  
local level

Things we can  
control at the  
local level

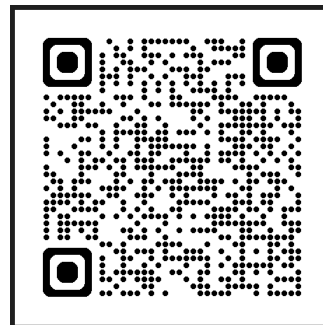
What we want  
to AVOID



**New Hampshire's Cyanobacteria Plan:  
A Statewide Strategy**



November 2023



## Plan was completed in November 2023

- 2022 legislative requirement
- Included a 17-member advisory committee
- HB 1066 Provided \$30,000 for plan development

### Legislative goal:

- 1) Prevent the increase of, and eventually control, cyanobacteria blooms in New Hampshire's waterbodies.

### Additional goals added:

- 2) Reduce the risks of cyanobacteria blooms to humans, pets and livestock.
- 3) Better understand the causes of cyanobacteria blooms and develop methods to monitor their occurrence.

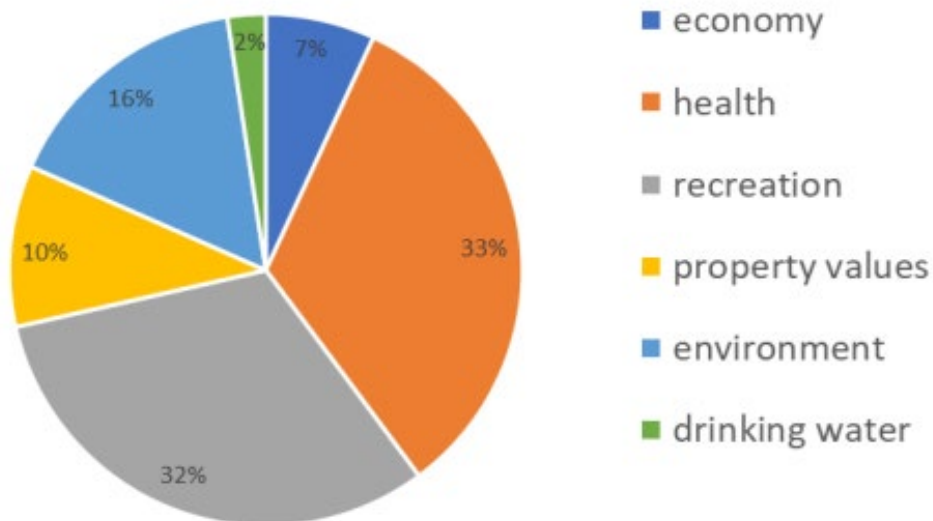


# Legislative Funding Informs Cyanobacteria Plan Importance

## Public Outreach Survey

- NH LAKES organized and executed survey
- 687 respondents
- Included business, industry, municipal stakeholders; lake associations; general public
- 96% expressed concern regarding impacts of cyanobacteria

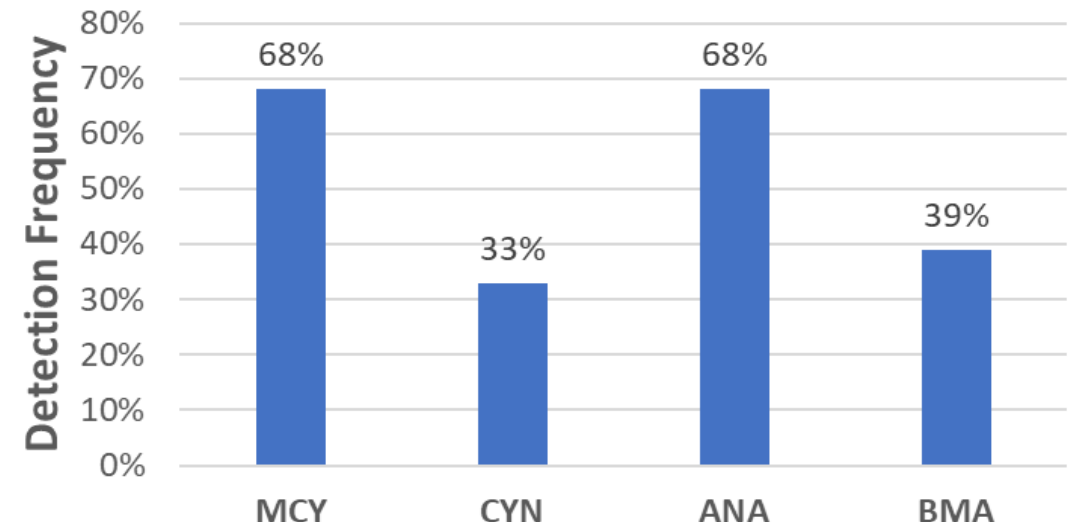
Stakeholder Cyanobacteria Concerns



## Cyanotoxin Prevalence Research

- UNH analyzed 245 bloom samples from 2022
- 20% of samples exceeded EPA drinking water health advisory for microcystin
- 11% of sample exceeded EPA rec. use guideline (RUG) for microcystin (MCY)
- 17% risk of exceeding RUG for MCY if cell density >70,000 cells/mL.

2022 NH cyanotoxin detection frequency



# Summary of NH's Statewide Cyanobacteria Plan Strategies



## **Nutrient Reduction**

To develop the policies and practices to reduce, control, and prevent nutrient inputs that cause cyanobacteria blooms.

1

## **Education and Outreach**

To advance education and outreach efforts that allow individuals who recreate or use surface waters to assess the cyanobacteria risks and respond accordingly.

2

## **Drinking Water**

Establish policies and procedures for prevention, early detection and response, and treatment of cyanobacteria blooms and cyanotoxins in surface waters that serve as public drinking water supplies to minimize risks to customers.

4

## **Monitoring**

Enhance cyanobacteria monitoring to track when and where blooms occur and clearly communicate current conditions to the public.

3



# Plan Implementation Progress Report (Legislatively Speaking)

## Strategy 1: Policies and Practices to control nutrients

### **HB1143: Control of cyanobacteria blooms under NH Clean Lakes Program**

- Adds language specifying the need to diagnose and remediate cyanobacteria blooms.
  - Provides mechanism for granting funds to control blooms
  - Adds authority to develop rules overseeing the issuance of permits for in-lake management projects.
- 

### **HB1103: Modification of the Shoreland Protection Act for the purposes of enforcement of unlawful activities.**

- Removes language requiring proof of damages to a public waterway
  - Requires restoration of site to meet standards
  - Allows Department to impose fines if restoration not completed within one year of notification
- 

### **HB1113: Strengthens assessment requirements for shoreland septic systems upon waterfront property sale.**

- Requires inspection by licensed septic system evaluator upon sale of property within protected shoreland
- Notification of the department and local health officer of failed evaluations
- Requires upgrade of unregistered systems or systems approved prior to 1989 if standards not met

# Plan Implementation Progress Report (Legislatively Speaking)

## Strategy 1: Policies and Practices to control nutrients (con't)

### HB1293: Relative the use of fertilizers on turf

- Establishes application rates of fertilizers
  - Establishes “conditions” (rain, frozen ground, etc.) and locations (drains, pavement) when/where fertilizer cannot be applied
  - Requires signs to be posted in retail locations stating negative impacts of fertilizers on the environment, especially surface waters.
- 



Each of the items above were tied to the plan in some fashion.

Additionally, legislative actions led to an additional \$500,000 contribution to cyanobacteria bloom remediation.



# Plan Implementation Progress Report

## Strategy 2: Advance education and outreach efforts

- **Completed:**

- NHDES Cyanobacteria Webinar Series: 4 parts from January through May, 2024
- Updated NHDES cyanoHABs webpage; Revised FAQs, subscribe to weekly updates, etc.
- Healthy Swimming Mapper updated with waterbody-specific cyano histories
- Update illness report for public reporting of cyano-related illnesses

- **In-progress:**

- Annual cyanobacteria report
- Online dashboard with statewide cyano vitals
- Development of formal self-risk assessment guidance
- Expansion of online video “clips” – NHDES cyanobacteria YouTube page

- **Future:**

- Educational signage at all public access points
- Provide hardcopy outreach materials at state welcome centers
- Develop “consumable goods” with self-risk assessment information

# Plan Implementation Progress Report

## Strategy 3: Enhance cyanobacteria monitoring

### Completed:

- NHDES Healthy Swimming Mapper update
- Implementation of automated bloom notification message system
- Standardized bloom reporting for the public and individual waterbody reports
- Additional intern for summer 2024
- Additional full-time staff trained to assist with sample processing

### Ongoing:

- Consideration of sample processing efficiency options

### Future:

- Add additional dedicated staff to increase monitoring capacity
- Include volunteer and sentinel monitoring for cyanobacteria
- Invest in research of advanced monitoring and modeling



# Plan Implementation Progress Report

## Strategy 4: Policies and practices to prevent and detect cyanobacteria in drinking water supplies

- Established a three-year contract with Greenwater Lab for expedited cyanotoxin analysis for PWS, if needed.
- “Go-kits” provided to 12 PWS to sample raw/finished water if a bloom occurs
- RFPs issued for consulting services for bloom monitoring plan development and implementation
- Multi-state staff program meeting participation to discuss PWS monitoring programs
- Template “do-not-drink” public notice produced for use by PWS if needed
- Expanded staff support to monitor five public surface drinking water sources
- In total, ~\$900,000 will be spent through end June 2025.

# NEW! – Cyanobacteria Mitigation Fund (CMF)

## What

- Established \$1 million fund in 2023 State Budget HB2.
- Provides grants and loans to assist with the cost of reducing the occurrence of chronic and extended cyanobacteria blooms.

## Why

- Growing number of waterbodies impaired for recreational use due to cyanobacteria blooms.
- Funds watershed projects specifically focused on reducing and controlling nutrient pollution that propose to achieve a water quality target.

## How

- Interim rules adopted – NH Admin. Rules Env-Wq 2300.
- Fund “shovel ready” projects that significantly reduce external or internal nutrient loads to the waterbody.

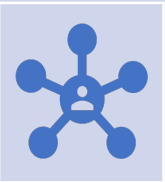


# Additional CMF Funding

**\$500,000 in additional funding provided in 2024. Funding comes from the American Rescue Plan Act (ARPA).**

To date 3 CMF applications have been received requesting a total of \$876,321.

One grant requested fund: Lake Kanasatka Aluminum Treatment Project, \$500,000



The CMF provides critical funding to address waterbodies with chronic and extended blooms



There is no current mechanism that provides a continuous source of funds

# CMF Funding Put to Use: Lake Kanawatka Aluminum Treatment Project



Size: 380 acres

Depth: 40 ft Max.; 18 ft Avg.

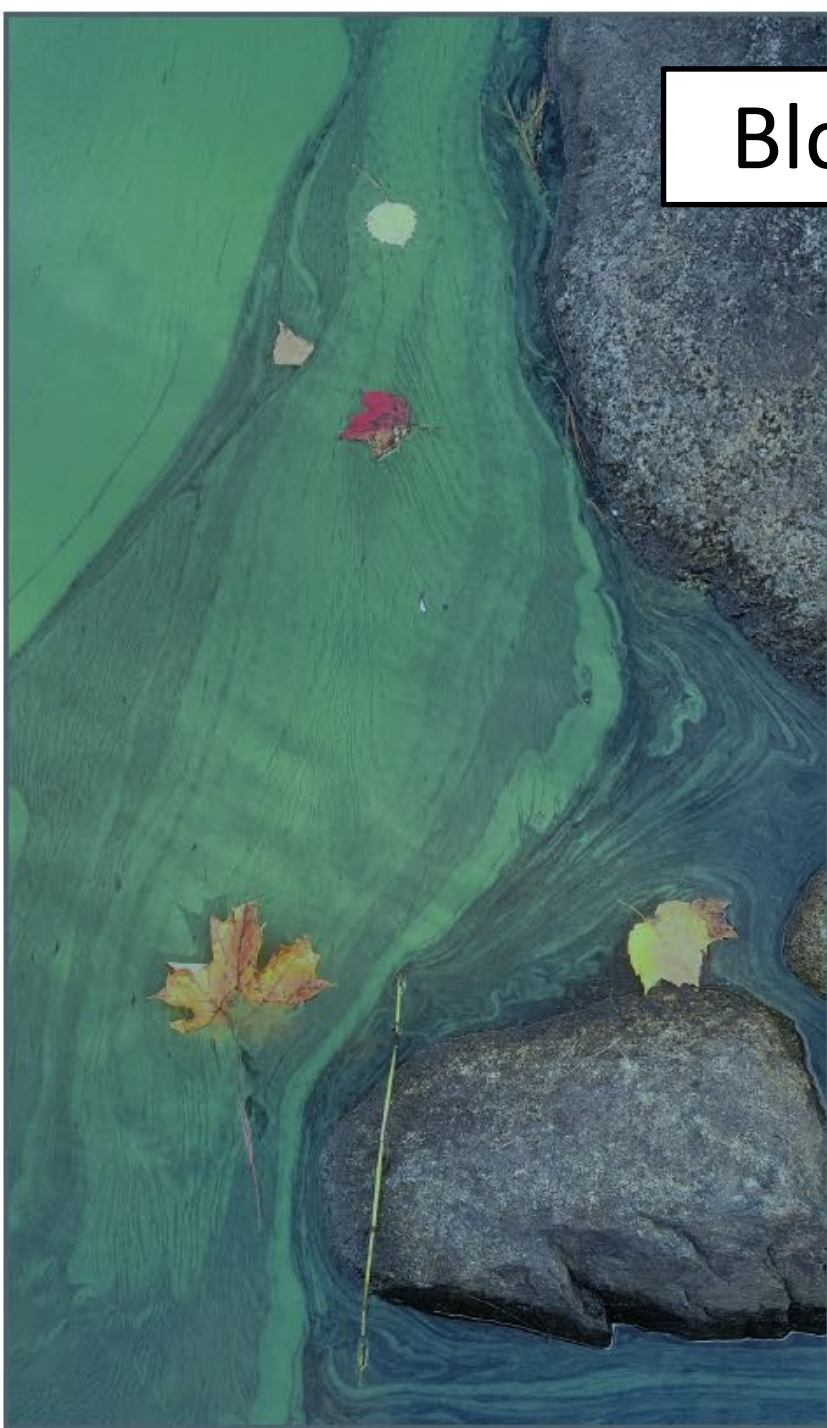
Volume: 2 billion gallons

Flush Rate: 1.5x / yr.

Oligotrophic – low productivity



Blooms first reported in 2020





2023 NHDES Issued Bloom Warnings Issued lasted 121 days

**LAKE K**



**LAKE WINNI**

# Lake Kanasatka Aluminum Treatment

## Why was a treatment needed?

- Chronic and severe cyanobacteria blooms from 2020 – 2023
- Nutrient loading model identified “internal loading” as contributing 20% of the phosphorus load annually
- A watershed-based plan completed in 2022 concluded internal load reduction required to minimize bloom severity

## How does alum work?

- Aluminum compounds combine with phosphorus in the bottom sediments and reduces the amount of phosphorus released into overlying waters.

## How was Lake Kanasatka chosen for an alum treatment?

- NHDES worked with LKWA to review a fully-developed treatment plan
- The watershed-based plan established a reasonable in-lake phosphorus target and identified nutrient load reduction projects
- LKWA demonstrated significant progress towards reducing external nutrient loads prior to the treatment and a future commitment.



# Lake Kanasatka Aluminum Treatment

CHEMICALS: Aluminum Sulfate (alum):  $\text{Al}_2(\text{SO}_4)_3$   
Sodium Aluminate (aluminate):  $\text{NaAlO}_2$

DOSE: 50g Al/m<sup>2</sup>

AREA: 153 acres; All areas  $\geq$  24.5 feet deep).

TREATMENT PLAN:

- Pilot (Completed April 30)
- Phase 1 (May 15-17), Phase 2 (May 20-22)

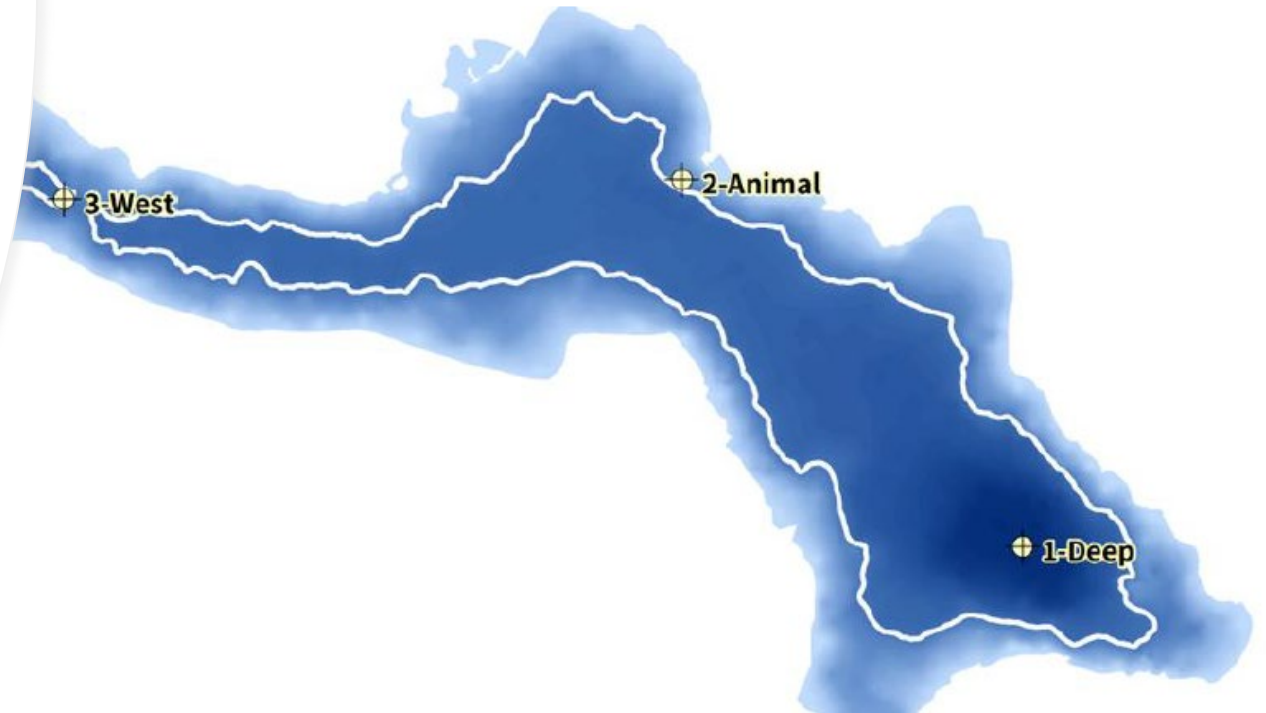
EXPECTED LONGEVITY: 15 years

COST: ~\$550,000 (CMF grant for \$500,000)

PERMIT: NHDES surface water discharge permit



Photo Credit: Bill Gassman



# “In-Lake” Treatment: A last resort to lake management

- Only applicable in certain situations
- Expensive
- Has a life-span of effectiveness
- Can require continuous maintenance
- No guarantees
- Is a band-aid to other “problems”

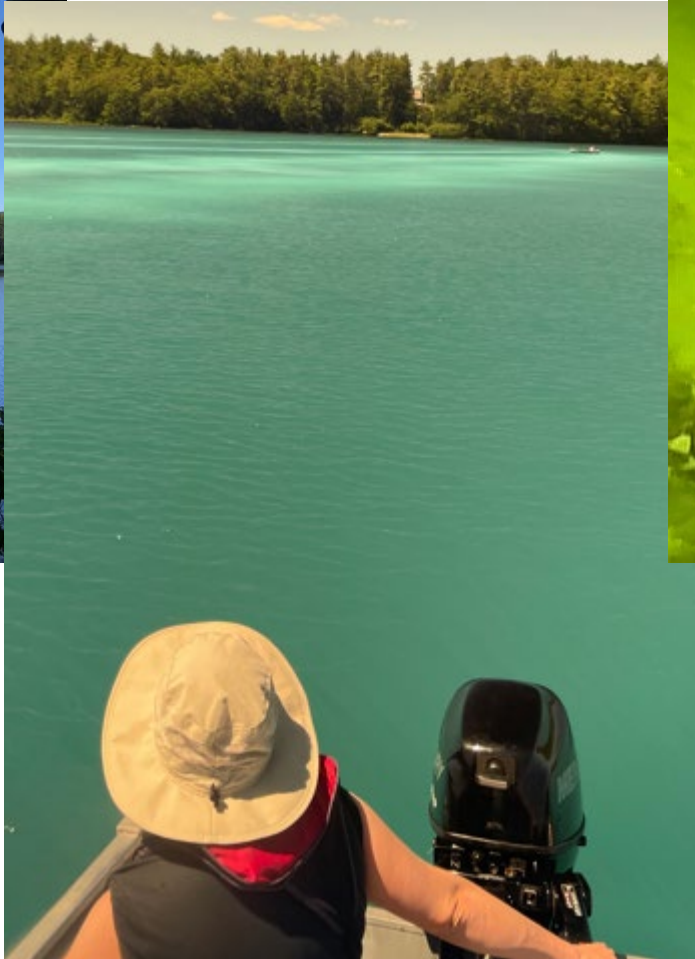


# Aluminum Treatments As A Lake Management Tool in NH

3 in NH in 39 years!



Kezar Lake, Sutton  
1984



Nippo Lake, Barrington  
2021



Lake Kanasatka,  
Moultonborough  
2024



# Aluminum Treatments Have Limited Applicability

NH DES Interim Criteria:

- 1) Waterbody is impaired by recurrent and severe cyanobacteria blooms
- 2) Watershed-based plan completed and includes nutrient load estimates, a numeric water quality target, and a plan for reducing nutrient loads
- 3) Internal nutrient load is 20% or greater of total load
- 4) External nutrient load is or will be reduced to a reasonable level
- 5) A reduction in the internal is required to achieve the water quality target
- 6) The total external and internal nutrient load reductions meet or exceed what is needed to meet the water quality target
- 7) A long-term commitment to nutrient load reductions is evident



# REALITY CHECK

**Blooms In Some Lakes are / will be UNAVOIDABLE**

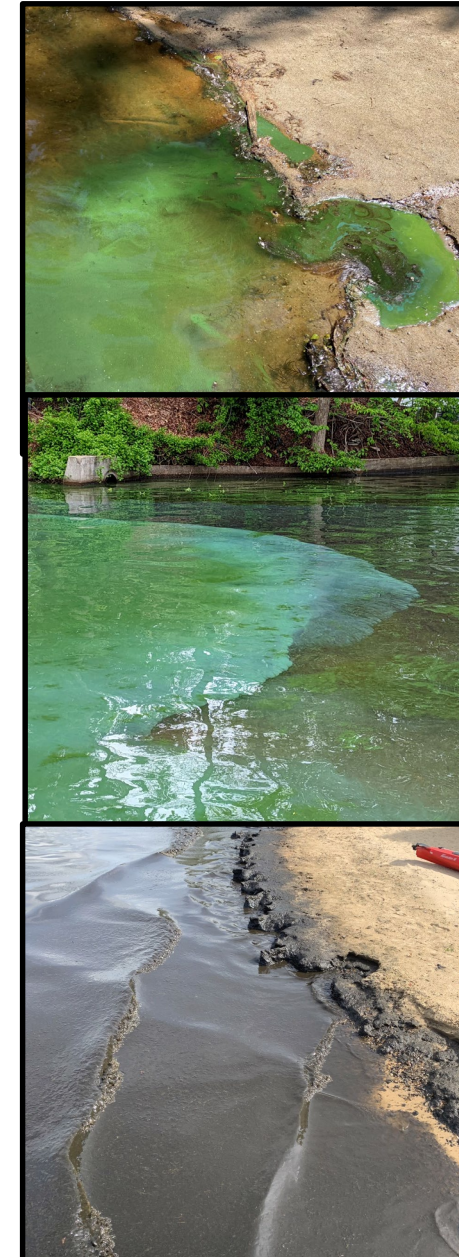
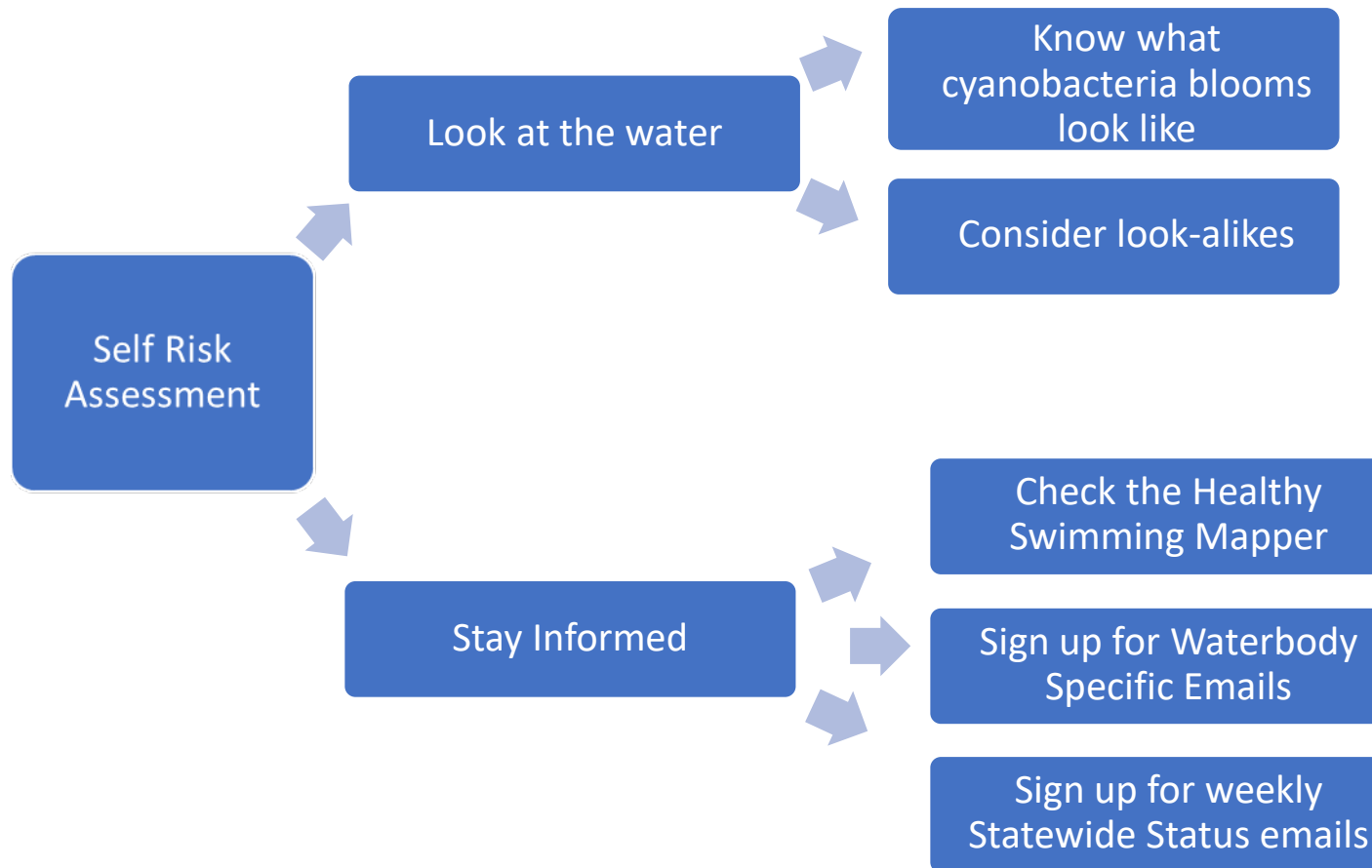
- 1) Development around some lakes prevent control of external nutrient loads to the extent necessary.
- 2) Lake characteristics do not lend themselves to In-Lake treatments
- 3) Climactic conditions are conducive to blooms

So How Can You Protect Yourself?

**Education / Awareness is Key**



# Learn How to Complete a Self Risk Assessment



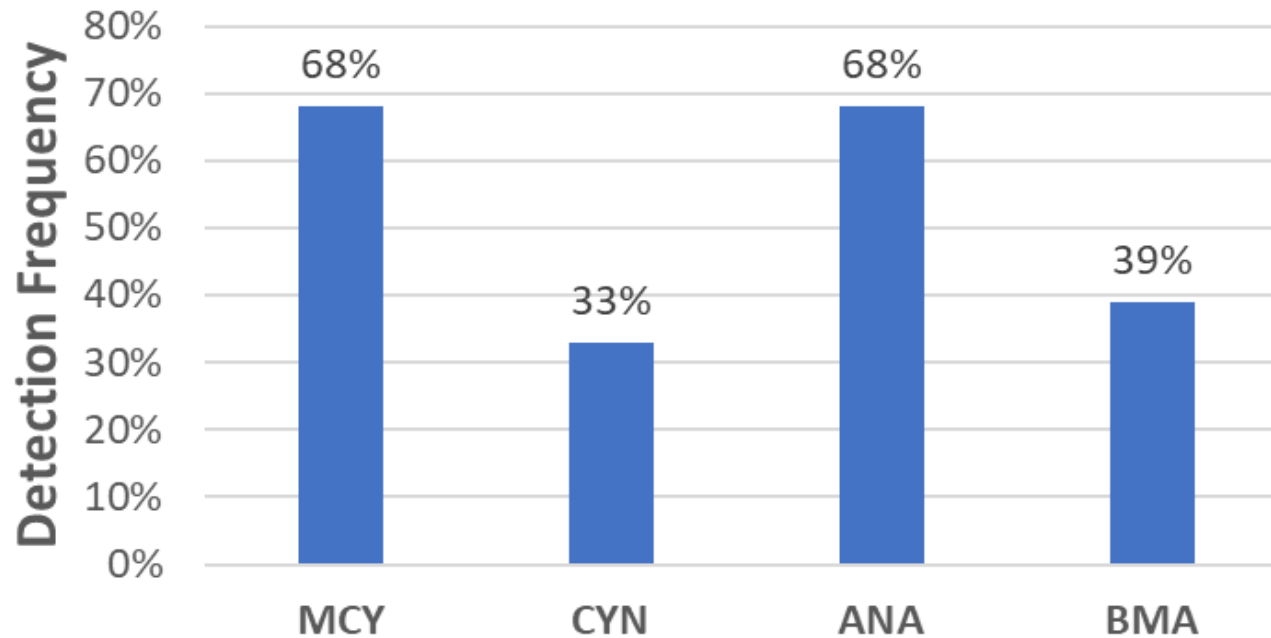
Blooms Are Dynamic:

- Appearance
- Severity
- Location
- Duration
- Timing



# Why is a self risk assessment important?

2022 NH cyanotoxin detection frequency



- Monitoring will never be comprehensive
- Bloom conditions are too variable
- Our body of knowledge on toxins is still limited on NH waterbodies
- Everybody has a different level of risk they are willing to assume

2022 UNH Analysis of 245 samples

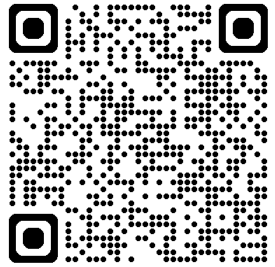
## Remember:

- Toxin detection frequency was common
- 20% of samples exceeded EPA drinking water health advisory for microcystin
- 11% of sample exceeded EPA rec. use guideline (RUG) for microcystin (MCY)
- 17% risk of exceeding RUG for MCY if cell density >70,000 cells/mL.

## However,

- Avg. microcystin conc. = 3.85 ug/L (below EPA RUG)
- A large majority of samples (83%) over the cyano warning threshold had toxin levels BELOW the EPA RUG

# Where do we go from here?



- Acceptance that blooms have become a regular occurrence in NH waterbodies
- Review and award CMF grant/loans
- Completion of cyanobacteria dashboard and annual report
- Development/adoption of administrative rules that guide in-lake management funding awards and actions
- Commitment to plan items that require additional funding
- Curtailing nutrient inputs is our best “tool” to prevent and control blooms
- Immediate control of blooms in most waterbodies is impractical and just a band-aid
- Partnerships and collaboration is key to making progress



# NH Surface Waters Are A Vital And Spectacular State Resource...Lets Work Together To Keep Them Healthy



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