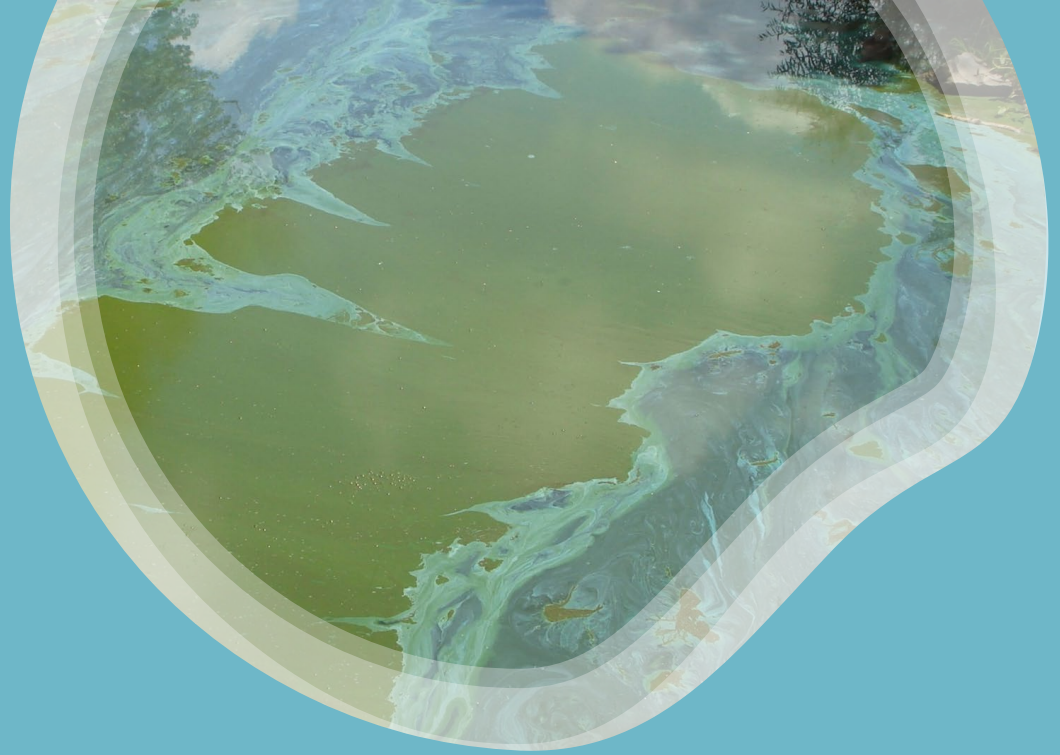
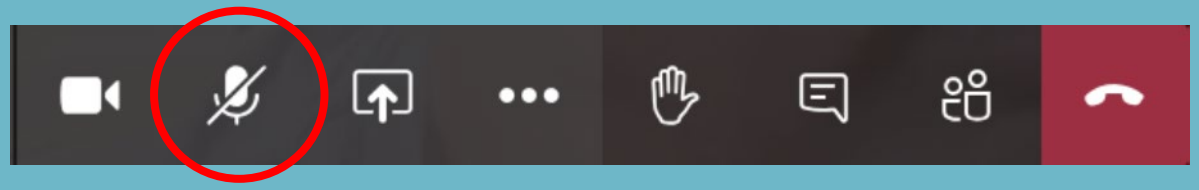


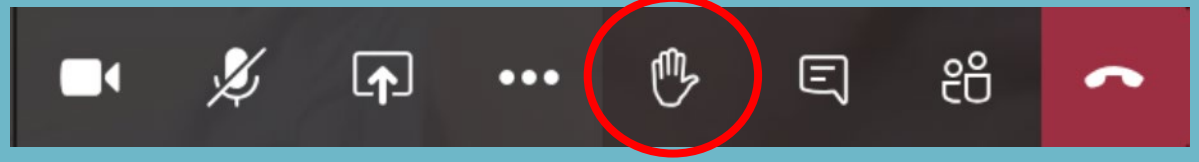
6th Annual Harmful Algal Bloom Summit

Welcome!

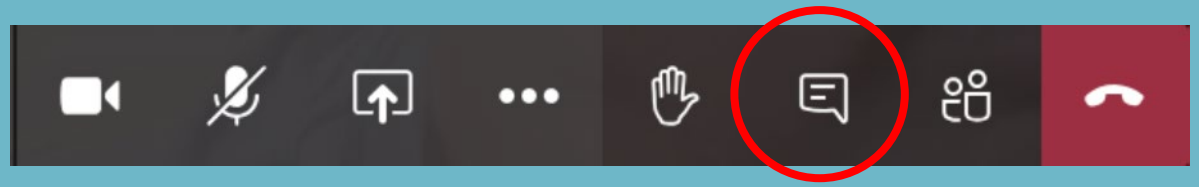
- Please mute your line to avoid feedback and background noise

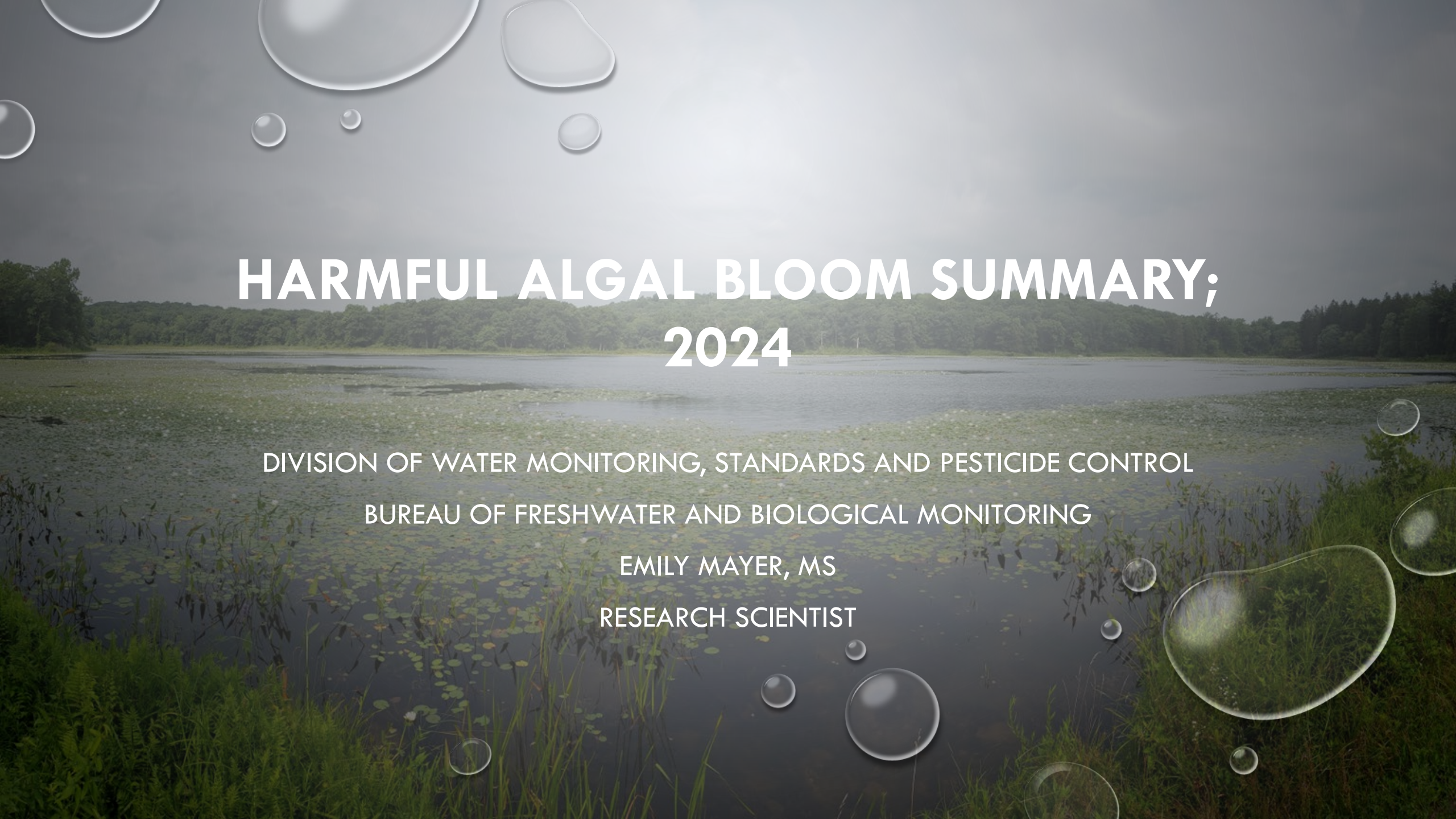


- Use the “hand raise” function to ask a question. Unmute your line when called and re-mute when done.



- You can also ask a question in the chat.





HARMFUL ALGAL BLOOM SUMMARY; 2024

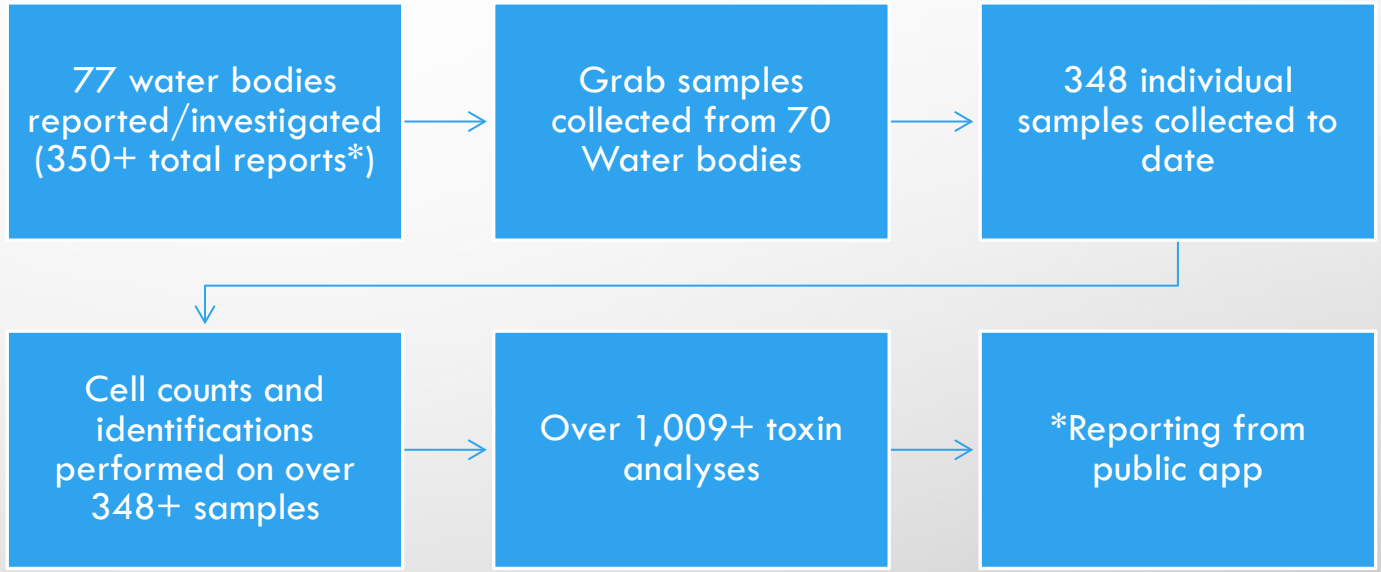
DIVISION OF WATER MONITORING, STANDARDS AND PESTICIDE CONTROL

BUREAU OF FRESHWATER AND BIOLOGICAL MONITORING

EMILY MAYER, MS

RESEARCH SCIENTIST

HARMFUL ALGAL BLOOM STATUS UPDATE



HAB Alert Level	Criteria	Recommendations
HAB Not Present	**HAB reported and investigated. No HAB present.**	**None**
WATCH *Suspected or confirmed HAB with potential for allergenic or irritative health effects*	Suspected HAB based on field survey **OR** Confirmed cell counts ≥20K - <80K cells/mL **AND** No known toxins above public health thresholds	**Public Bathing Beaches Open** Waterbody Accessible: Use caution during **primary contact (e.g. swimming) and secondary (e.g. non-contact boating)** activities Do not ingest water (people/pets/livestock) Do not consume fish
ADVISORY *Confirmed HAB with moderate risk of adverse health effects and increased potential for toxins above public health thresholds*	Lab testing for toxins Microcystins: ≥2 µg/L Cylindrospermopsin: ≥5 µg/L Anatoxin-a: ≥15 µg/L Saxitoxin: ≥0.6 µg/L **OR** Confirmed cell counts ≥80K cells/mL	**Public Bathing Beaches Closed** Waterbody Remains Accessible: Avoid primary contact recreation Use caution for secondary contact recreation Do not ingest water (people/pets/livestock) Do not consume fish
WARNING *Confirmed HAB with high risk of adverse health effects due to high toxin levels*	Toxin (microcystins) ≥20 - <2000 µg/L	**Public Bathing Beaches Closed** Cautions as above May recommend against secondary contact recreation.
DANGER *Confirmed HAB with very high risk of adverse health effects due to very high toxin levels*	Toxin (microcystins) ≥2000 µg/L	**Public Bathing Beaches Closed** Cautions as above. Possible closure of all or portions of waterbody and possible restrictions access to shoreline.

WATERBODY:

www.state.nj.us/dep/hab/

WATCH

HEALTH EFFECTS RISK

HARMFUL ALGAL BLOOM (HAB)

FLORACIONES DE ALGAS NOCIVAS

Always keep children and pets away from areas with blooms or scums.

*Public Bathing Beaches will be closed under the authority of NJDOH regulation, New Jersey State Sanitary Code Chapter IX Public Recreational Bathing N.J.A.C. 8:26.

POSTED BY:

WATERBODY:

www.state.nj.us/dep/hab/

ADVISORY

MODERATE HEALTH RISK

HARMFUL ALGAL BLOOM (HAB)

FLORACIONES DE ALGAS NOCIVAS

Always keep children and pets away from areas with blooms or scums.

*Public Bathing Beaches will be closed under the authority of NJDOH regulation, New Jersey State Sanitary Code Chapter IX Public Recreational Bathing N.J.A.C. 8:26.

POSTED BY:

WATERBODY:

www.state.nj.us/dep/hab/

WARNING

HIGH HEALTH RISK

HARMFUL ALGAL BLOOM (HAB)

FLORACIONES DE ALGAS NOCIVAS

Always keep children and pets away from areas with blooms or scums.

*Public Bathing Beaches will be closed under the authority of NJDOH regulation, New Jersey State Sanitary Code Chapter IX Public Recreational Bathing N.J.A.C. 8:26.

POSTED BY:

WATERBODY:

www.state.nj.us/dep/hab/

DANGER

VERY HIGH HEALTH RISK

HARMFUL ALGAL BLOOM (HAB)

FLORACIONES DE ALGAS NOCIVAS

Always keep children and pets away from areas with blooms or scums.

*Public Bathing Beaches will be closed under the authority of NJDOH regulation, New Jersey State Sanitary Code Chapter IX Public Recreational Bathing N.J.A.C. 8:26.

POSTED BY:

BEACH CLOSED

PLAYA CERRADA

HARMFUL ALGAL BLOOM (HAB)

No Swimming • No Wading

FLORACIONES DE ALGAS NOCIVAS No nadar • No vadear

Contact can make people and animals sick.

El contacto puede enfermar a personas y animales.

www.state.nj.us/dep/hab/

*Public Bathing Beaches are closed under the authority of NJDOH regulation, New Jersey State Sanitary Code Chapter IX Public Recreational Bathing N.J.A.C.8:26.

POSTED BY:

WATERBODY:

www.state.nj.us/dep/hab/

WINTER WATCH

A HAB was previously confirmed at this waterbody and may persist or reoccur.

HEALTH EFFECTS RISK

HARMFUL ALGAL BLOOM (HAB)

FLORACIONES DE ALGAS NOCIVAS

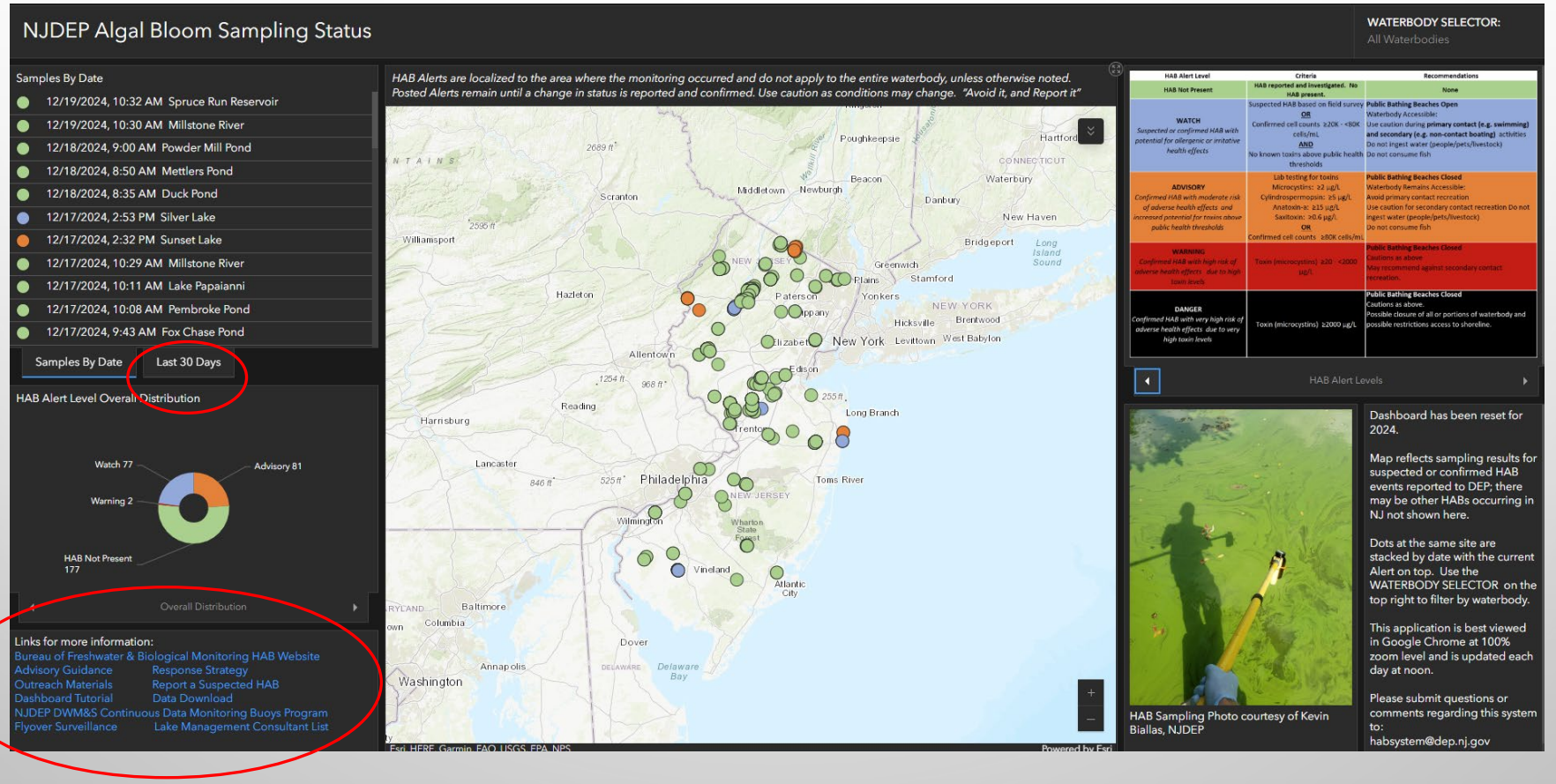
Always keep children and pets away from areas with blooms or scums.

Avoid it & Report it

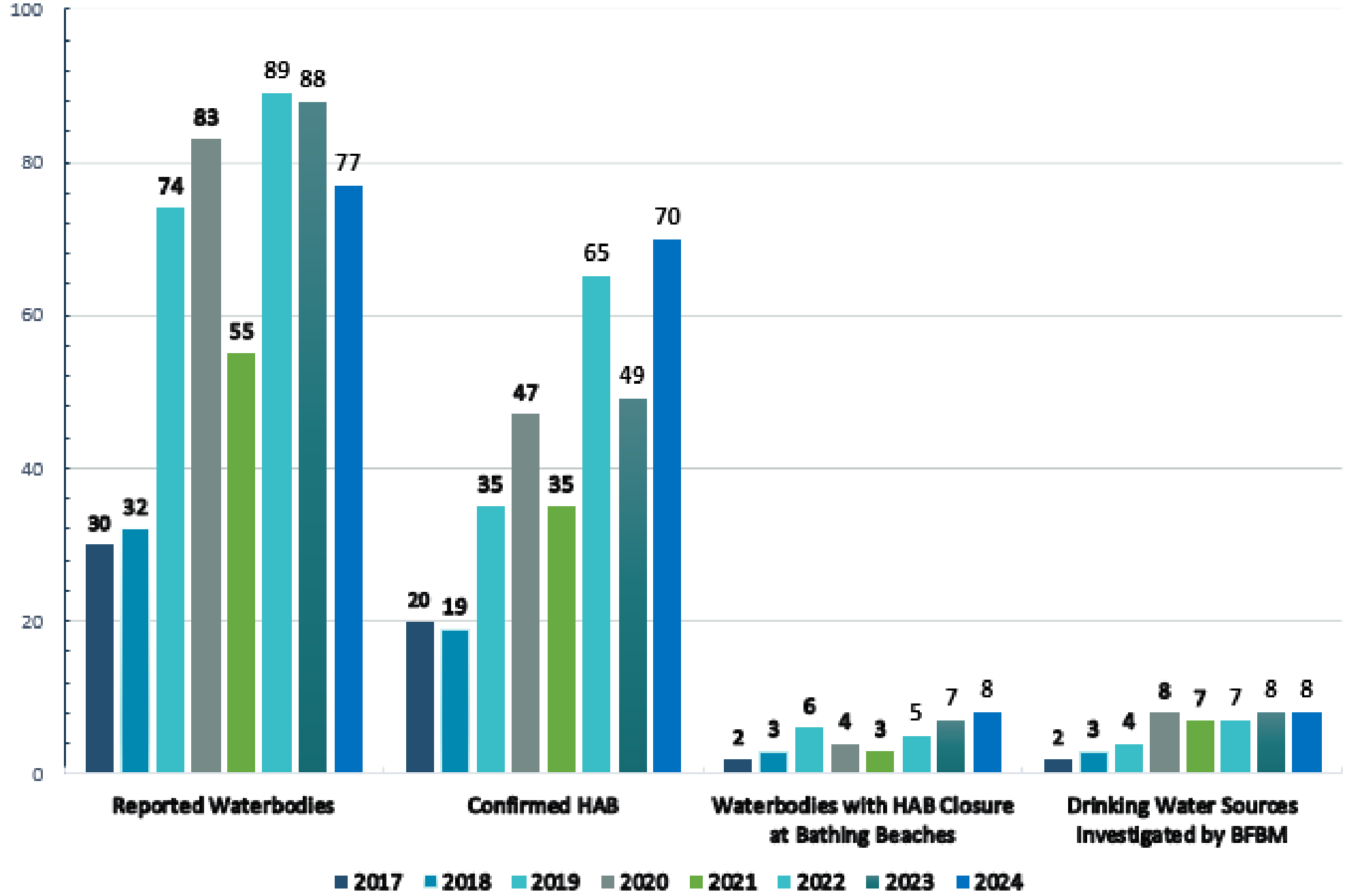
*Public Bathing Beaches will be closed under the authority of NJDOH regulation, New Jersey State Sanitary Code Chapter IX Public Recreational Bathing N.J.A.C. 8:26.

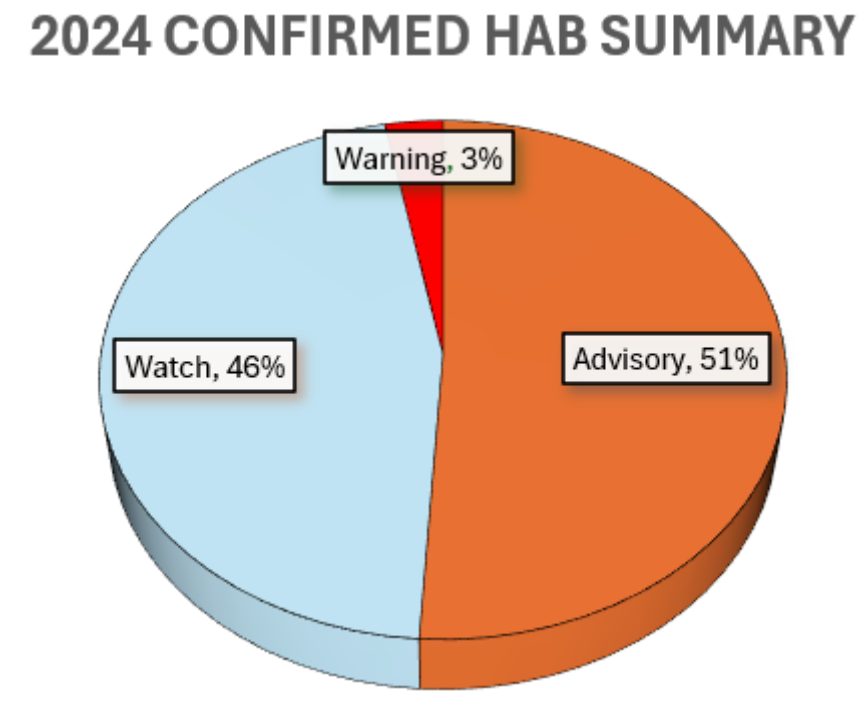
POSTED BY:

HAB DASHBOARD



2017-2024 HAB Event Summary





70 water bodies have confirmed HABs (Watch, Advisory or Warning)

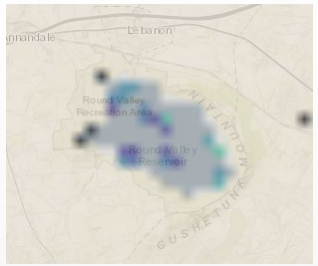
2 Water Bodies with Highest HAB Alert Tier of Warning

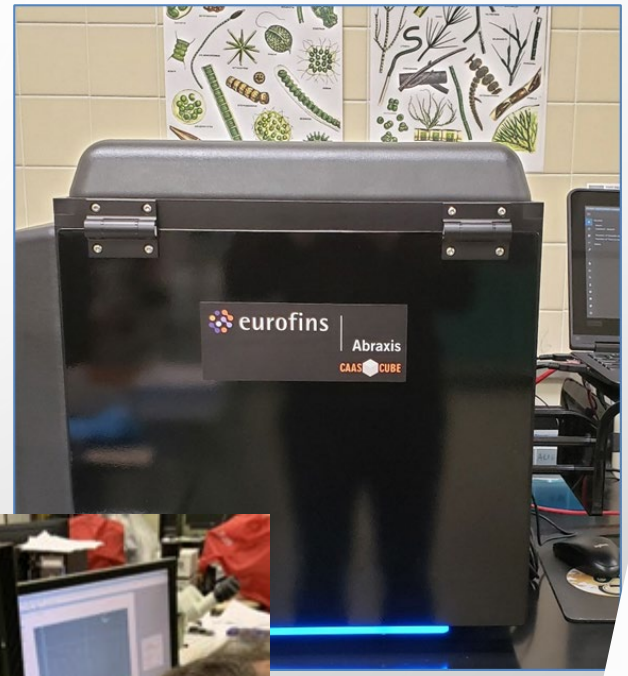
36 Water Bodies with Highest HAB Alert Tier of Advisory

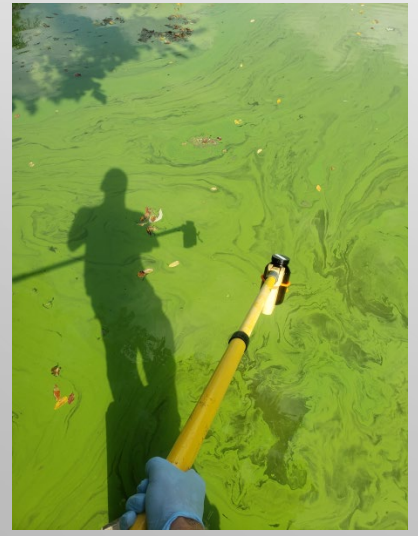
32 Water Bodies with Highest HAB Alert Tier of Watch

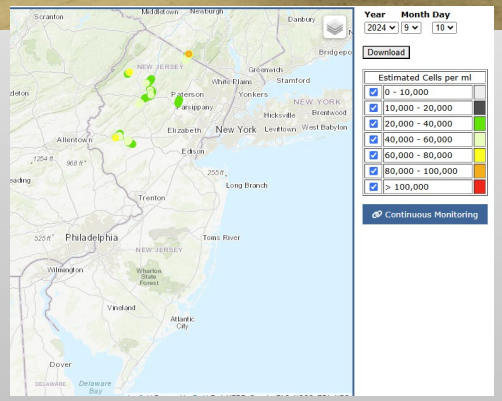
First confirmed HAB on 3/26 at Sunset Lake

MONITORING TECHNOLOGIES



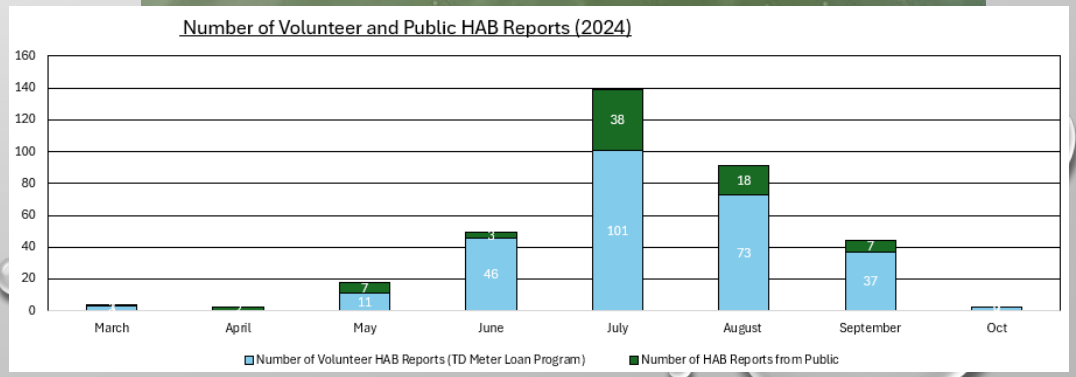




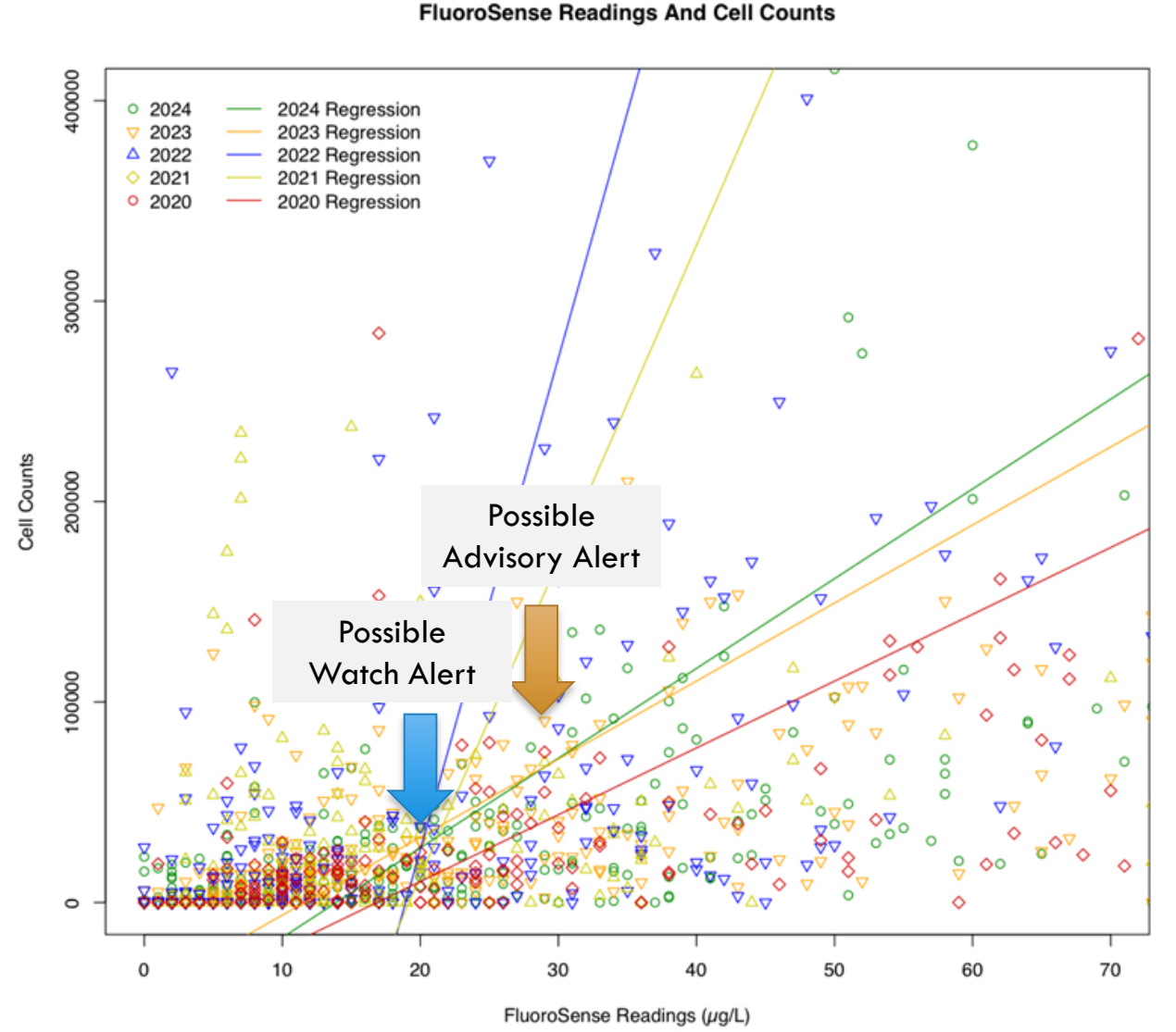


METER LOAN PROGRAM

- LEND OUT METERS TO HELP SCREEN FOR HABS
- LAKE ASSOCIATIONS, WATER SUPPLIES, ETC.
- REMINDER TO PLEASE SEND YOUR DATA IN
- LIMITED NUMBER OF METERS
- IF NOT AVAILABLE, PLACED ON WAITING LIST UNTIL MORE METERS ARRIVE
- FUNDED BY EPA
- ****TURNER DESIGNS HAS DISCONTINUED THE PRODUCT****
- **PROGRAM ON HOLD**

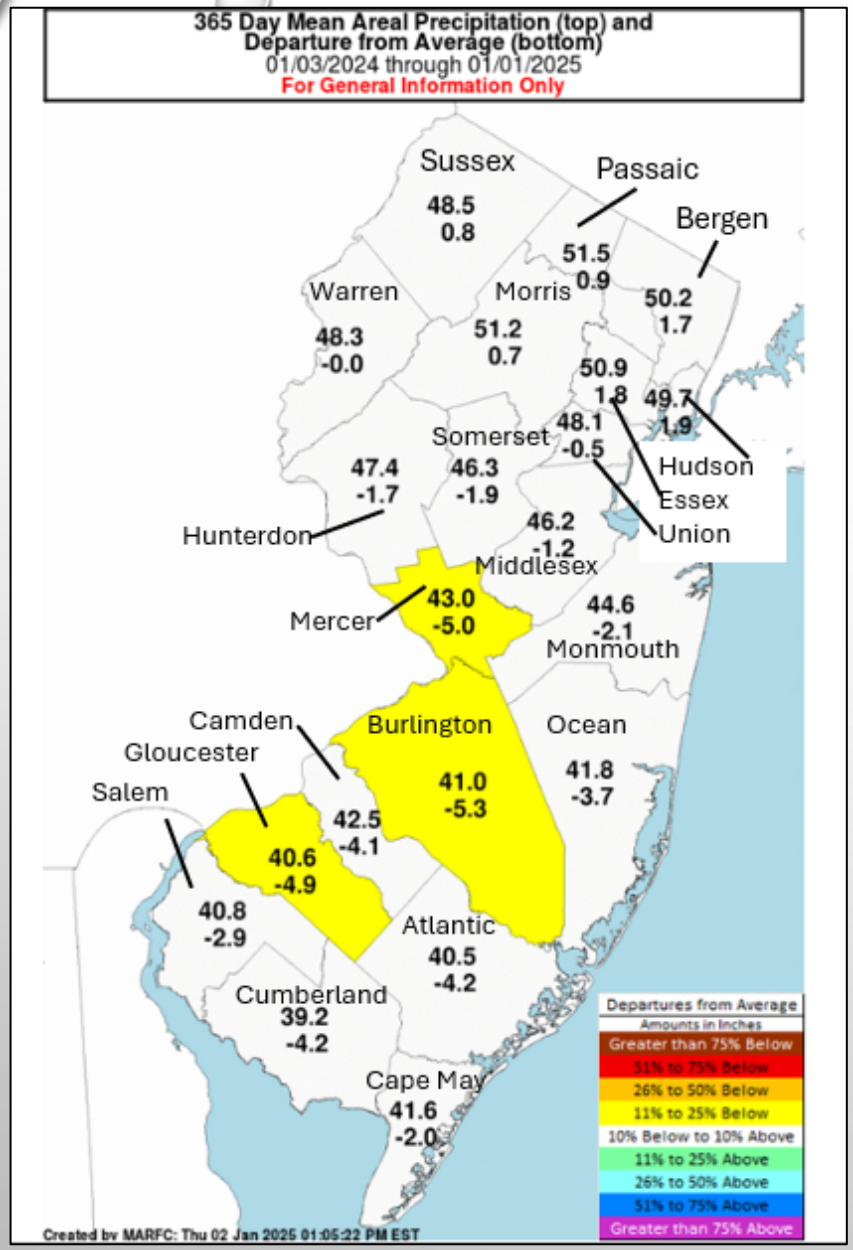


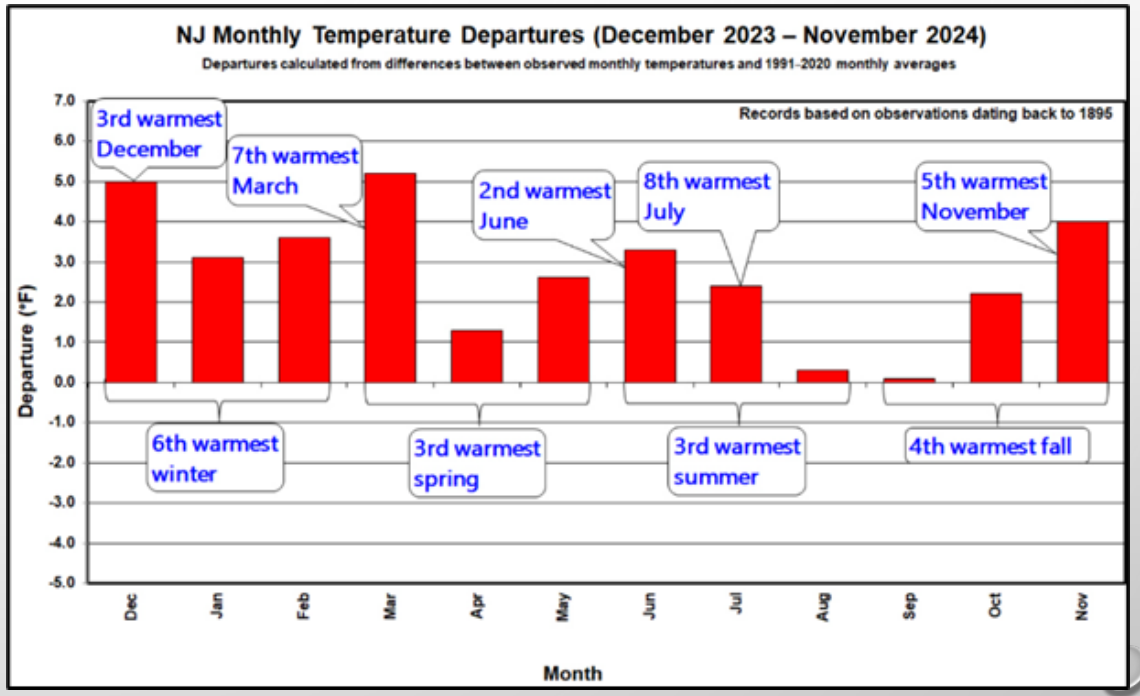
FLUOROSENSE GUIDANCE

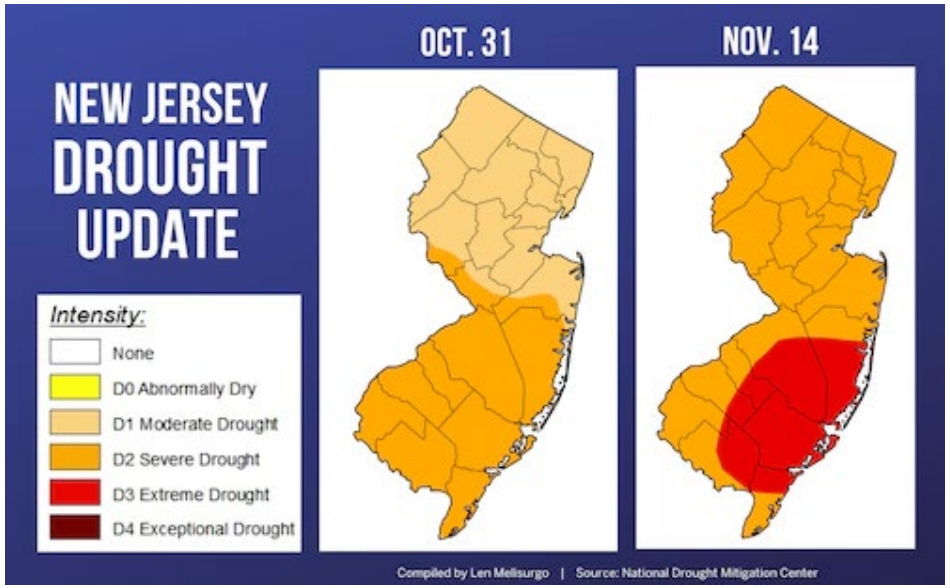


Cell Count Ranges (Cells/ml)	Median FluoroSense Reading (µg/L)
20,000 to 39,999	20
40,000 to 79,999	29
80,000 to 99,999	43
>100,000	72

Note: Estimated readings based on data collected from 2019-2023, generalized to the state of New Jersey. Individual water bodies may have different readings due to their unique characteristics..


365 Day Mean Areal Precipitation (top) and
Departure from Average (bottom)
01/03/2024 through 01/01/2025
For General Information Only
Sussex
48.5
0.8
Passaic
Bergen
51.5
0.9
50.2
1.7
Warren
48.3
-0.0
Morris
51.2
0.7
50.9
1.8
49.7
1.9
48.1
-0.5
Somerset
47.4
-1.7
46.3
-1.9
Hudson
Essex
Union
Hunterdon
46.2
-1.2
Middlesex
43.0
-5.0
Mercer
44.6
-2.1
Monmouth
Camden
Gloucester
Burlington
Ocean
41.0
-5.3
41.8
-3.7
Salem
42.5
-4.1
40.6
-4.9
40.8
-2.9
Atlantic
40.5
-4.2
Cumberland
39.2
-4.2
Cape May
41.6
-2.0
Departures from Average
Amounts in Inches
Greater than 75% Below
51% to 75% Below
26% to 50% Below
11% to 25% Below
10% Below to 10% Above
11% to 25% Above
26% to 50% Above
51% to 75% Above
Greater than 75% Above
Created by MARFC: Thu 02 Jan 2025 01:05:22 PM EST


NJ Monthly Temperature Departures (December 2023 – November 2024)
Departures calculated from differences between observed monthly temperatures and 1991-2020 monthly averages
Records based on observations dating back to 1895
3rd warmest December
7th warmest March
2nd warmest June
8th warmest July
5th warmest November
6th warmest winter
3rd warmest spring
3rd warmest summer
4th warmest fall
Departure (°F)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Month



Water Supply Status and Actions

Normal ☑

Routine monitoring of water supply and meteorological indicators. All conditions normal.

Watch 👁

Focus placed on voluntary reductions in demand through increased public awareness.

Current Status **Warning** 🚨

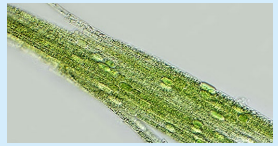
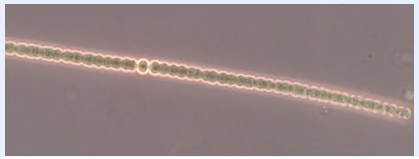
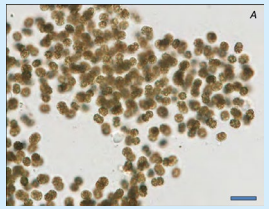
DEP Commissioner issues order urging public to voluntarily use water sparingly; DEP may issue orders to purveyors to manage supplies in most affected regions.

Emergency 🚨

Governor orders mandatory restrictions on certain uses of water, usually phased in as conditions deteriorate.

As of 4/7/25

HARMFUL ALGAL BLOOM STATUS UPDATE 2024

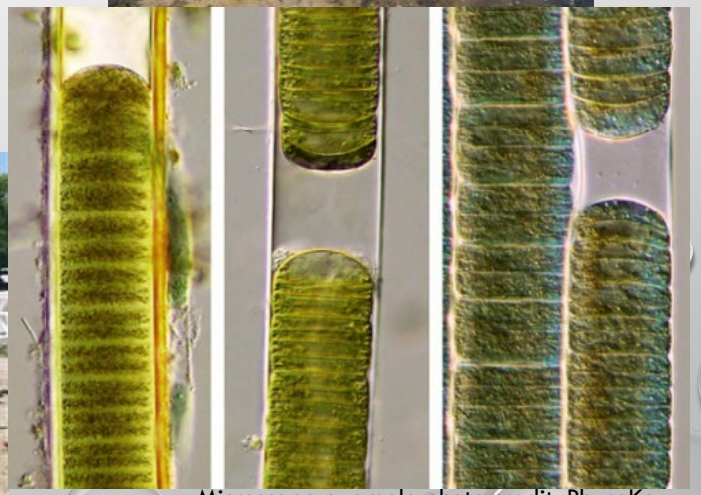
Most Common Dominant Cyanobacteria Taxa Found	
Aphanizomenon	
Dolichospermum	
Microcystis	
Aphanizomenon/ Cuspidothrix	 
Highest Cell Count	*Lake Papaianni (9,400,000) cells/ml*

Highest Toxin Concentrations

Toxin	Lake	Toxin Level (µg/L)	Date
Microcystins	Lake Papaianni	1,943.6	9/5/24
Cylindro-spermopsin	Mountain Lake (Liberty)	2.21	12/4/24
Anatoxin	Weequahic Lake	1.31	10/15/24
Saxitoxin	Parvin Lake	14.40	8/21/24

PARVIN LAKE: BENTHIC HABS

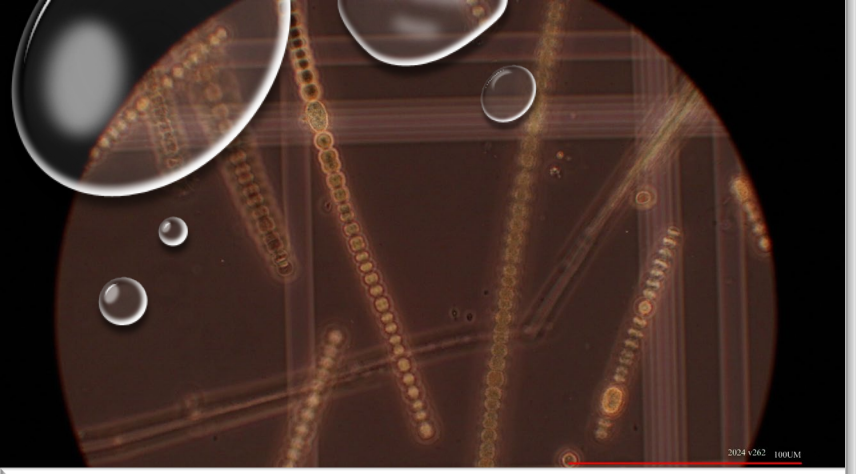
- LYNGBYA BENTHIC MATS
  - CAUSE ODOR ISSUES, DERMATOXINS, SAXITOXINS, ETC.
- WAVE, WIND ACTION TO UPROOT MATS
- HIGHEST SAXITOXIN FOR 2024 (8/21/24): 14.40 UG/L
- CHALLENGING TO SAMPLE, NOT YOUR TYPICAL UNICELLULAR BLOOM
- PARTNERED WITH STATE PARKS



Microscope example photo credit: PhycoKey

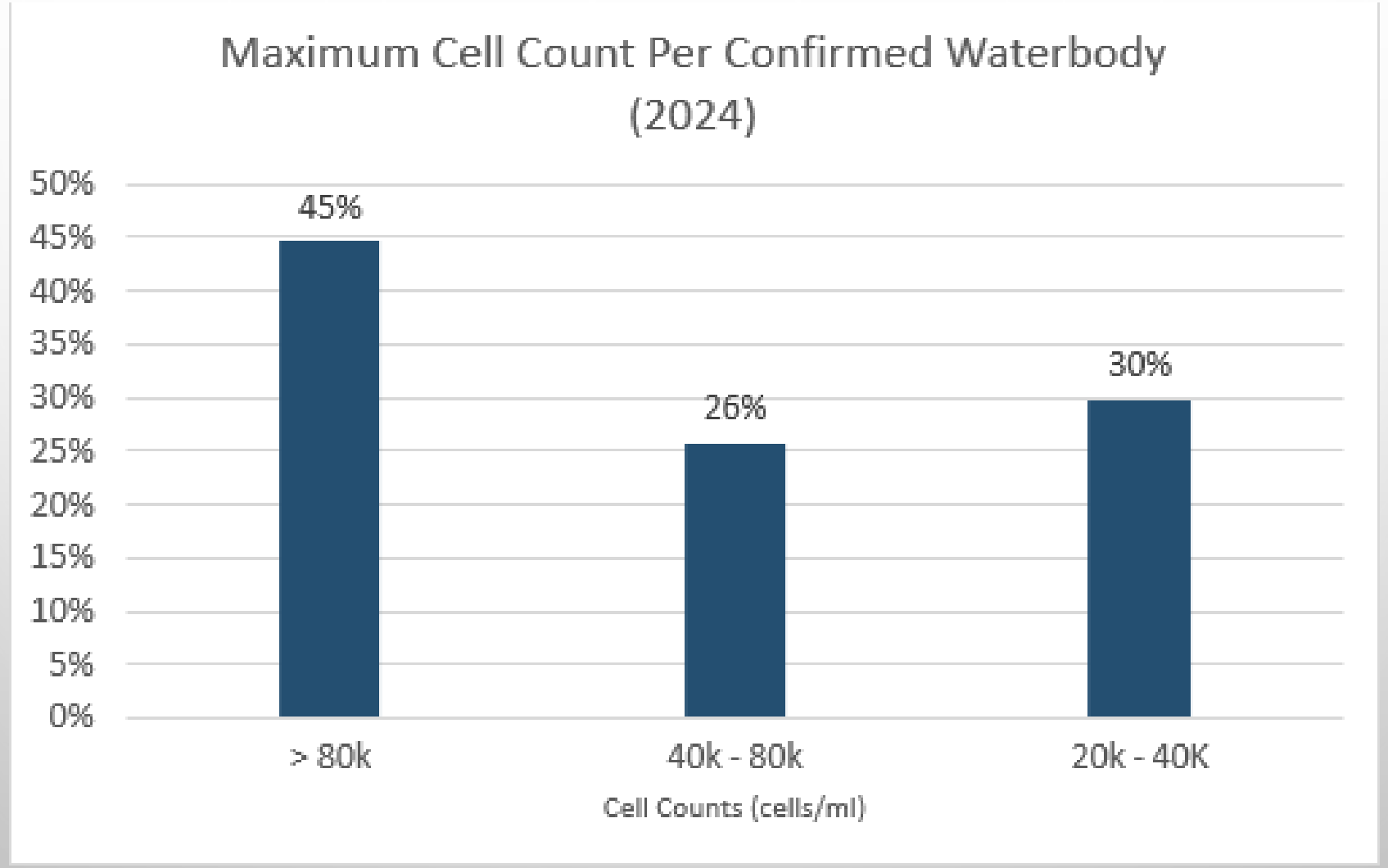
HOPEWELL QUARRY

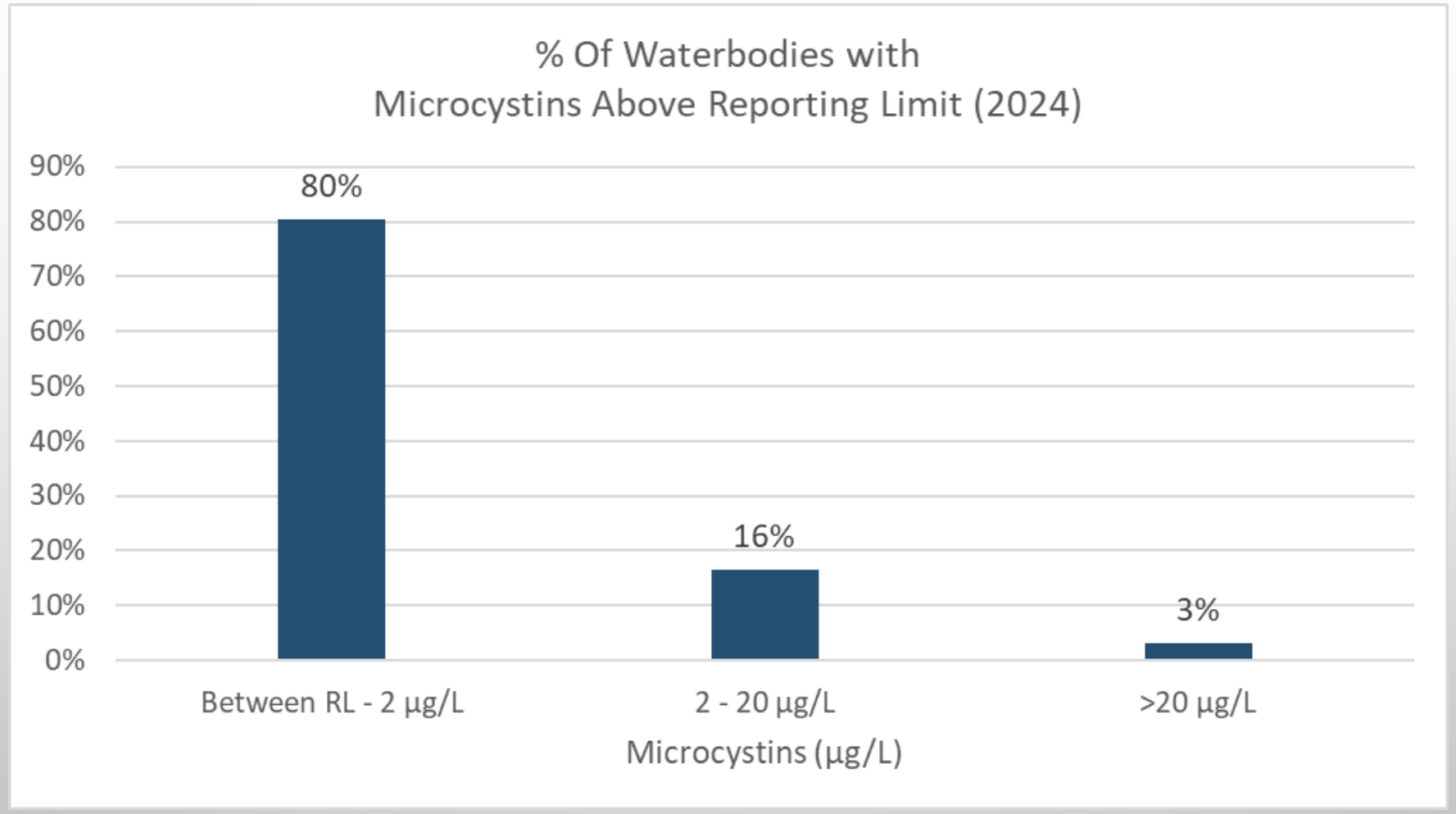
- ENCLOSED QUARRY
- USED RECREATIONALLY FOR SWIMMING
- GROUP USES A LAKE MANAGEMENT CONSULTING FIRM, AND IS PART OF THE HAB LAB WITH MSU
- PROLONGED MCT SURFACE READINGS
- RE-TESTED FOR MCT AND METHOD 544 (PESTICIDE STANDARDS GROUP – THANK YOU!)
- NEEDED TO DETERMINE WHERE TOXIN WAS COMING FROM
  - BENTHIC HAB?
  - COMING FROM SOMEWHERE ELSE IN QUARRY?
  - RESIDUAL FROM RECENT ALGICIDE APPLICATIONS?
- LIKELY RESIDUAL FROM RECENT APPLICATION



MANASQUAN RESERVOIR

- PROLONGED DRY SPELL AND DROUGHT WATCH = WARNING CONDITIONS
- LED TO A LATE SEASON CYANO HAB
- PARTNERSHIP WITH NJWSA TO GET SAMPLES COLLECTED
- NJWSA USED CONTRACT WITH CONSULTANT TO PERFORM TREATMENT
- CONTINUED MONITORING AND COMMUNICATION AMONG PARTNERS


Maximum Cell Count Per Confirmed Waterbody (2024)
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
45%
26%
30%
> 80k
40k - 80k
20k - 40K
Cell Counts (cells/ml)


% Of Waterbodies with
Microcystins Above Reporting Limit (2024)
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
80%
16%
3%
Between RL - 2 µg/L
2 - 20 µg/L
>20 µg/L
Microcystins (µg/L)

WATER BODIES WITH PERSISTENT HABS 2024

Lake	Alert	Date
Budd Lake	Watch	11/19/24
Greenwood Lake	Advisory	10/2/24
Mountain Lake (Liberty)	Advisory	12/4/24
Delaware Lake	Advisory	12/4/24
Sunset Lake (Asbury Park)	Advisory	12/17/24
Silver Lake Belmar	Watch	12/17/24
Lake Hopatcong – Crescent Cove*	Watch	11/13/2024
Parvin Lake – Dam*	Watch	11/19/2024
McCormack Lake*	Watch	10/31/2024

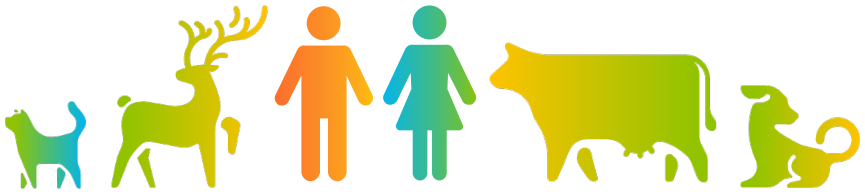
CONTACT INFO:

BUREAU CHIEF + HAB RESPONSE COORDINATOR:

CHRIS.KUNZ@DEP.NJ.GOV

RESEARCH SCIENTIST:

EMILY.MAYER@DEP.NJ.GOV



ONE HEALTH IN NEW JERSEY

Andrea Egizi, PhD

One Health Coordinator, NJDA

HAB Summit - April 9, 2025

NEW JERSEY DEPARTMENT OF AGRICULTURE

ONE HEALTH

What is “One Health”?

- Communication
- Coordination
- Collaboration

- Disciplines
- Sectors
- Communities

One Health History

"Everything Depends on Everything Else"
Haida matriarchs of the land, air, and water
Amanda Phingbodhipakkiya
Seattle, WA (2021)

- **Theory and approach existed long before the term "One Health" came into use in early 2000s**
- **It is central to Indigenous values, worldviews, and practices**
- *"My Ancestors, on the other hand, saw themselves and nature as being linked, much like the strands of a spider's web. Animals, plants, and people each represented an integral part of the whole system. Animals and plants were seen as social beings, and were not to be separated from people. This was the natural order."*

- Muin'iskw, of the Mi'kmaq people

One Health History

- **In Western medicine:**

  "Between animal and human medicine there are no dividing lines—nor should there be. The object is different but the experience obtained constitutes the basis of all medicine."

  -Dr. Rudolf Virchow, 1858
  "Father of modern pathology"

- **Credit for first use of term granted to William Karesh in 2003 Washington Post interview about Ebola**

- **2004: WCS symposium "One World, One Health" established 12 recommendations known as the "Manhattan Principles" to prevent outbreaks and maintain ecosystem integrity**

US Federal Definition (2017)

One Health is a collaborative, multisectoral, and transdisciplinary approach

– **working** locally, nationally, regionally, and globally–

with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and our shared environment.

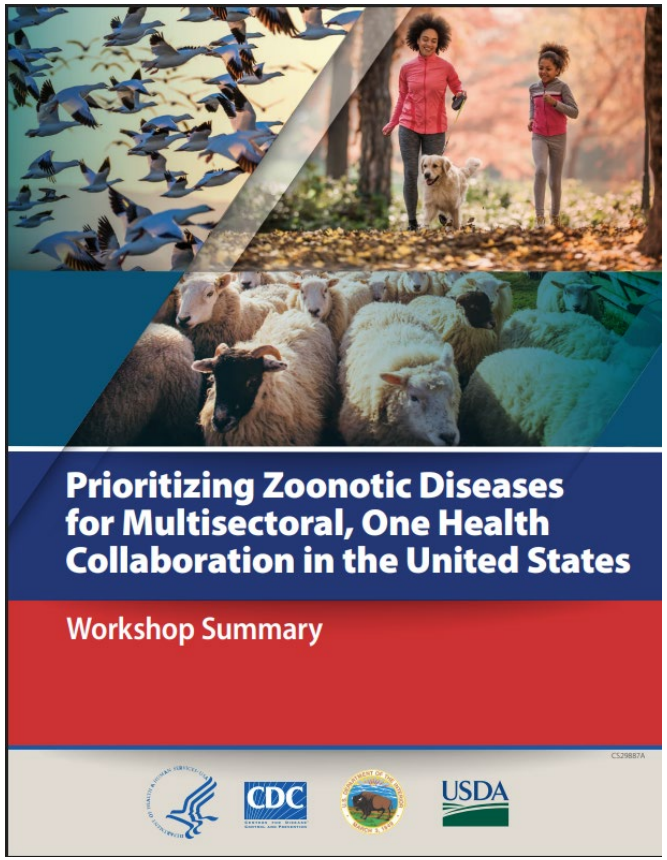
(US Government Definition, 2017; www.cdc.gov/onehealth)

Examples of issues requiring One Health coordination

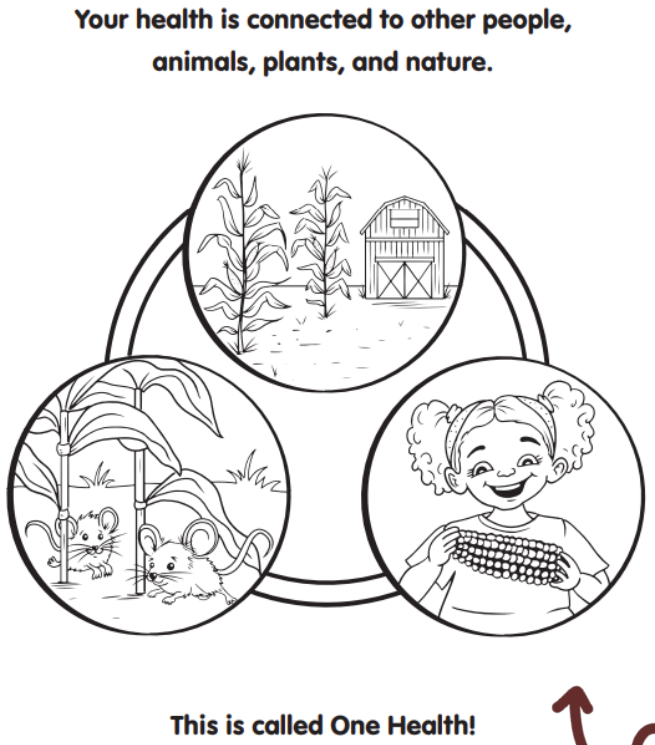
- Vector-borne and zoonotic diseases
- Antimicrobial-resistant germs
- Mental health benefits of animals and nature
- Food safety and security
- Environmental contamination
- Harmful algal blooms

One Health Zoonotic Disease Prioritization Workshop (2017)

- **Participants:**
  - Centers for Disease Control and Prevention (CDC)
  - Department of the Interior (DOI)
  - Department of Agriculture (USDA)
- **Voted on 8 priority zoonotic diseases in US**
- **Recommendations include formalization of federal One Health coordination**



US One Health Coordination



One Health Coordination Unit or OHCU (Jan 2024)

- Core Leadership Team: CDC, DOI, USDA
- Working Groups: Interagency Communication, Global One Health Coordination, NOHF-Zoonoses Implementation Plan
- 23 federal agencies represented including EPA and Depts of Energy, Defense, Homeland Security, and Commerce

ZOHU (Zoonoses & One Health) Update Calls

- Next one May 7

cdc.gov/onehealth

Graphics and literature on CDC One Health website

National One Health Framework released Jan 2025

National One Health Framework

1. **Establish a standing formal One Health coordination mechanism (OHCU)**
2. **Prevention:** Information exchange (surveillance, research); joint messaging; identify and mitigate risk of zoonosis emergence (ecosystem health, animal management practices, etc.)
3. **Preparedness:** Integrate One Health into preparedness and response plans, trainings, exercises; develop modeling and risk-prediction tools; evaluate research, development & supply chain needs; foster community & environmental resilience
4. **Outbreak:** best practices for coordinated outbreak investigation and response; integration of One Health into after-action review & revision of response and recovery plans; SOPs for interagency collaboration during outbreak
5. **Surveillance:** strengthen coordinated surveillance efforts and information sharing across sectors
6. **Laboratory:** formalize laboratory partnerships to share protocols, samples, assay development; strengthen laboratory capacity, reporting processes, & timely data sharing; advanced pathogen detection technologies; biosafety and biosecurity innovation
7. **Workforce:** collaborative development of trainings; integrate One Health into sector-specific trainings; enhance recruitment and retention of qualified staff; integrate One Health into curriculums across all relevant disciplines

NJ One Health Task Force

- **NJ Rev Stat § 4:1-50 (2024):** There is established the "New Jersey One Health Task Force" in the Department of Agriculture. The purpose of the task force shall be to develop a strategic plan to promote inter-disciplinary communication and collaboration between physicians, veterinarians, and other scientific professionals and State agencies, with the goal of promoting the health and well-being of the State's residents, animals, and environment.

Inaugural meeting – February 21, 2025

1st legislatively established One Health Task Force in USA!!

NJ OHTF: Members

	Task Force position	Member name
Agency Designees	NJ Dept of Agriculture	Dr. Amar Patil
	NJ Dept of Environmental Protection	Christine Schell
	NJ Dept of Health	Dr. Darby McDermott
Public Appointees	1 licensed physician	Dr. Gloria Bachmann
	2 licensed veterinarians, one with expertise in farm animals	Dr. Matthew Edson
		Dr. Heather Fowler
	1 medical research expert	Dr. Vincent Silenzio
	1 zoonotic disease expert	Dr. Alison Stout
	2 experts in epidemiology or biomedical science	Dr. Ashley DeNegre
		Dr. Michael Zwick
	3 professors with expertise in public health, ecology, natural resources, environmental or biological science	Dr. Michael Taylor
		Dr. Nicole Fahrenfeld
		Vacant- appointment pending

NJ OHTF: Goals

1. Develop a plan to promote inter-disciplinary communication and collaboration
2. Protocols for response and recovery from zoonotic disease outbreaks
3. Better diagnostic tests for zoonotic, vector-borne, and environmental diseases
4. Xenosurveillance to identify genetic signatures of pathogens in vertebrates
5. Educate about judicious antibiotic use
6. Investigate antibiotic alternatives
7. Develop new approaches to reduce hazards to human and animal health
8. Promote the One Health approach across NJ government agencies, academic institutions, NGOs, and private entities

NJ OHTF: Current Status

Inaugural meeting February 21st 2025

- **Elected officers**
  - Chair: Dr. Amar Patil, NJDA
  - Vice-Chair: Dr. Gloria Bachmann, RWJMS
  - Secretary: Dr. Andrea Egizi, NJDA (*not appointed member)
- **Passed by-laws & set meeting dates for the next year**
- **Established 3 subcommittees**

NJ OHTF: Committees

Strategic Planning

- Draft a Strategic Plan to satisfy requirements of legislation, including promoting inter-disciplinary communication and collaboration between human, animal, and environmental health professionals

Education, Training, & Workforce Development

- Work with NJ educators and universities to promote interdisciplinary training and develop a future generation of One Health mindful professionals; promote One Health awareness in NJ

Research & Innovation

- Facilitate research into better diagnostic tests, pathogen surveillance, antibiotic alternatives; Seek and apply for funding; Improve data accessibility

Watch this space…

- ✓ **Next public meeting May 23, 2025 (Teams link on NJDA website)**
- ✓ **Committees developing surveys of target groups**
- ✓ **Report to Governor and Legislature due Feb 2026**
  - Recommendations for legislative or regulatory action
- ✓ **NJDA creating OneHealthConnect, an email listserv for individuals interested in connecting across disciplines**
  - Find research collaborators
  - Ask questions and locate data
  - Share One Health related news, events, webinars, etc.

Thank You!

Contact info:

Andrea Egizi, PhD
One Health Coordinator, NJDA
Andrea.Egizi@ag.nj.gov

https://www.nj.gov/agriculture/one-health/

Do's & Don'ts of Risk Communication

Risk Communication Lessons from the Frontlines:
What Local Health Departments Wish Everyone Knew

April 9, 2025

Devangi Patel, MPH, MCHES, HO
Health Officer
Montgomery Township Health Department

Basics of Risk Communication

CDC
U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

- Communicate Early & Often
- Involve the Local Health Department ASAP
- Provide Clear, Consistent, and Actionable Messaging
- Address Misinformation Proactively
- Have a Pre-Planned Communication Strategy and Updated Contact Lists

- Communicate Early & Often
- Involve the Local Health Department ASAP
- Provide Clear, Consistent, and Actionable Messaging
- Address Misinformation Proactively
- Have a Pre-Planned Communication Strategy and Updated Contact Lists

- Don’t Withhold Information
- Don’t Rely Solely on State or Federal Agencies
- Don’t Assume One-Size-Fits-All Messaging Works
- Don’t Forget Two-Way Communication

Keep Local Health Departments In the Loop

- Keep updated contact lists of local health departments in every jurisdiction you cover
- Loop LHDs in early – even if the situation is evolving
- Share draft messaging before if goes out publicly

Thank You

Devangi Patel, MPH, MCHES, HO
Health Officer
Montgomery Township Health Department
dpatel@montgomerynj.gov
(908)533-9331

Break

See you @ 11am for our Keynote Speaker.

A NATIONAL PERSPECTIVE ON HABS

Moving from Monitoring and Mitigation to

Prevention and Remediation

Wayne Carmichael
Prof. Emeritus
Wright State University
Dayton, OH
wayne.carmichael@wright.edu

DIVISION OF SCIENCE & RESEARCH
NJDEP

CyanoHABs

It is just over 50 years since the term eutrophication, linked to cyanobacteria blooms entered the common language.

- **1974 - Cyanobacteria identified as producers the neurotoxin Anatoxin-a**
- **1988 - Naming and general structure of the peptide liver toxins, the Microcystins**
- **1990s - ELISA test for Microcystins first developed**
- **1998 - Harmful Algal Bloom and Hypoxia Research and Control Act led to the establishment of a federal interagency working group led by NOAA and the EPA.**
- **2005 - 75 different cyanotoxins identified**
- **2015 - 300 different cyanotoxins identified**
- **2014 - Toledo, OH, Microcystins in drinking water - no supply to 500,000 for 5 days**
- **2020 - US Government Accountability Office (GAO) tasked to investigate and report**
- **2022 - GAO Report GAO-22-104449**

700 square mile toxic algae bloom on Lake Erie

ewg

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Hundreds of potentially toxic algae outbreaks have plagued water in 2021

Fall typically marks the end of the algae outbreak season for most of the U.S. This year, news reports of the potentially toxic blooms in bodies of water have soared to at least 476, an eight percent increase over the 439 outbreaks reported last year.

EWG tracks news reports of algae outbreaks annually with our interactive map, which includes reports reaching back to 2010. As of October 14, this year has already seen the second highest number of outbreaks since we started tracking them

Vox

BIDEN ADMINISTRATION · CORONAVIRUS · RECODE · THE GOODS · FUTURE PERFECT · THE HIGHLIGHT · MORE

A toxic algae scare has left 500,000 people in Ohio without drinking water

By Brad Plumer | @bradplumer | brad@vox.com | Aug 3, 2014, 11:10am EDT

Nearly 500,000 people in northwestern Ohio have been warned not to drink or boil their tap water since Saturday..

The reason for the ban? Water officials in Toledo found evidence of microcystin — a toxin created by blue-green algae that can cause nausea and liver damage.

Officials are still conducting tests to figure out what happened, but the most likely source of the toxin would be the large algae bloom that's parked itself on the western edge of Lake Erie — where Toledo gets its drinking water.

A LARGE ALGAE BLOOM IS PLANTED ON THE WESTERN EDGE OF LAKE ERIE

OPB NOV. 17, 2021

In The News · Oregon unemployment · Portland police body cams · Hemp as feed · Oregon Democrats · Food bank challenges

SCIENCE ENVIRONMENT

Oregon Governor Deploys National Guard, Declares Salem Water Situation Emergency

By Dirk VanderHart (OPB)
June 29, 2018 5:50 p.m.

UPDATE (May 31, 2:00 p.m. PT) — Gov. Kate Brown is declaring an emergency and mobilizing Oregon National Guard soldiers in response to an ongoing water quality situation in and around Salem.

Brown's office said Thursday the troops would bring large portable water tanks — known as water buffaloes — to the Salem area to ease a shortage of bottled water. On Tuesday evening, the city of Salem announced officials had detected low levels of cyanotoxins in the city's drinking water supply.

Related: Agencies Taking 'Abundance Of Caution' After Toxins Found In Salem Water

WPTV WEST PALM BEACH

Central PBC · North PBC · South PBC · Martin · St. Lucie · The Glades · Indian River · Okeechobee · Broward

NEWS > REGION C PALM BEACH COUNTY > WEST PALM BEACH

West Palm Beach begins water distribution

Toxin produced by blue-green algae detected in drinking water

WPTV NewsChannel 5 reporter Todd Wilson said that the distribution center has run out of water twice but the city was bringing more. One resident complained, "So they was not expecting a crowd when they put the advisory out?"

The City of West Palm Beach information line spokesperson told WPTV NewsChannel 5, "If you pay your water bill to the City of West Palm Beach you are affected."

> *"If you pay your water bill to the City of West Palm Beach you are affected."*

Photo by: Todd Wilson

Toledo's 2014 Drinking Water Crisis: What Has Changed and What Hasn't

Published on August 1st, 2024 by FLOW Editor - Blog Posts

USA

Harmful Algal Blooms and Drinking Water in Oregon

ACTIVE

By Oregon Water Science Center February 2, 2018

Ireland

Ireland

Public health risks of foul-smelling algal blooms on Lough Neagh detailed in new study

Algal mats banked up around shore of lake consist of bacteria associated with livestock faeces or human effluent, Queens University Belfast research finds

England

'It stinks': Windermere plagued by blue-green algae as 'toxic as cobra venom'

Pakistan

DAWN

E-PAPER | MARCH 29, 2025

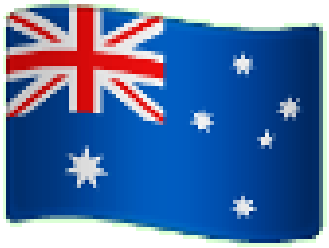
Slowly dying dams supply unsafe water

Published September 17, 2005

Brasil

The Rio Times
since 2009

Brazil: Pollution stain in São Paulo's Tietê River increased 40%, extends for 122 kilometers



Riotact

Local voices. Stronger communities.

Breaking News Public Sector Opinion Business Property Sport Lifestyle

Australia

Can Lake Burley Griffin's blue-green algae problem be fixed with ultrasound? Um, not really

A blue-green algae warning on Lake Burley Griffin – that's how you know it's summer in Canberra.

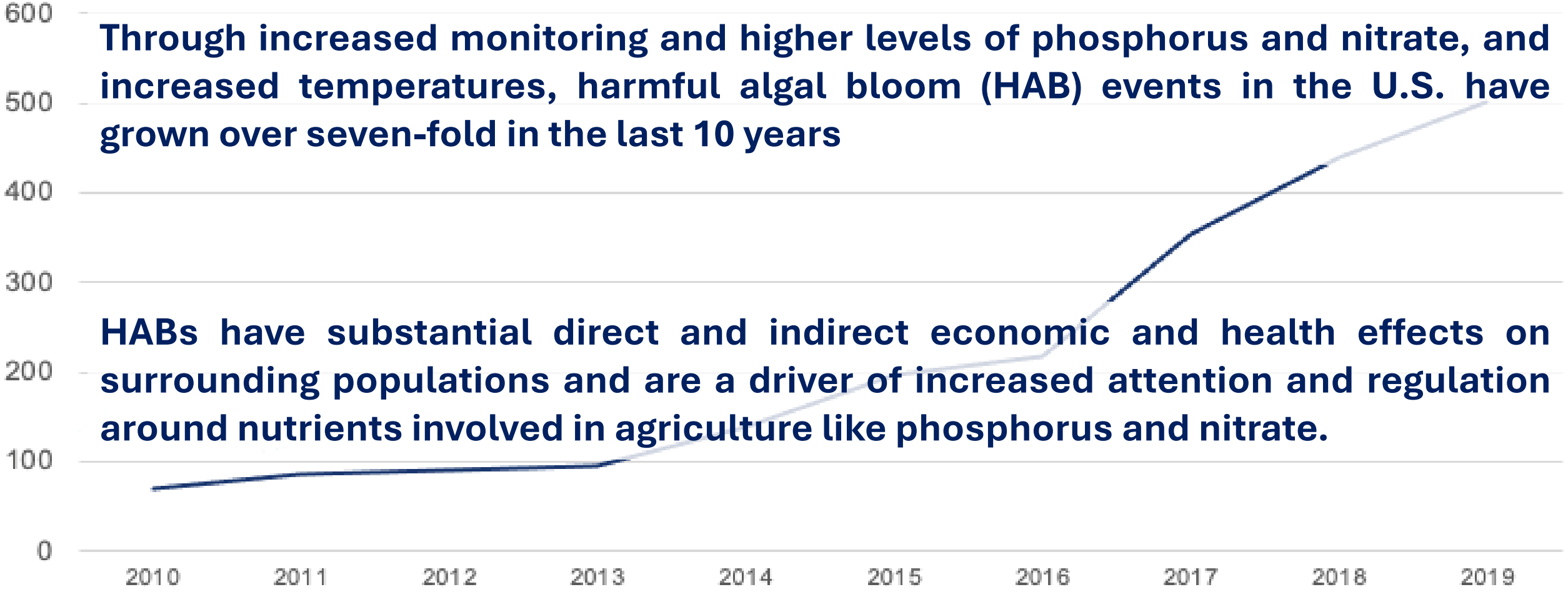
South Africa

DAILY MAVERICK

OUR BURNING PLANET

Harties vs the hyacinth (Part 1) – The toxic dangers lurking under cover of an invasive weed

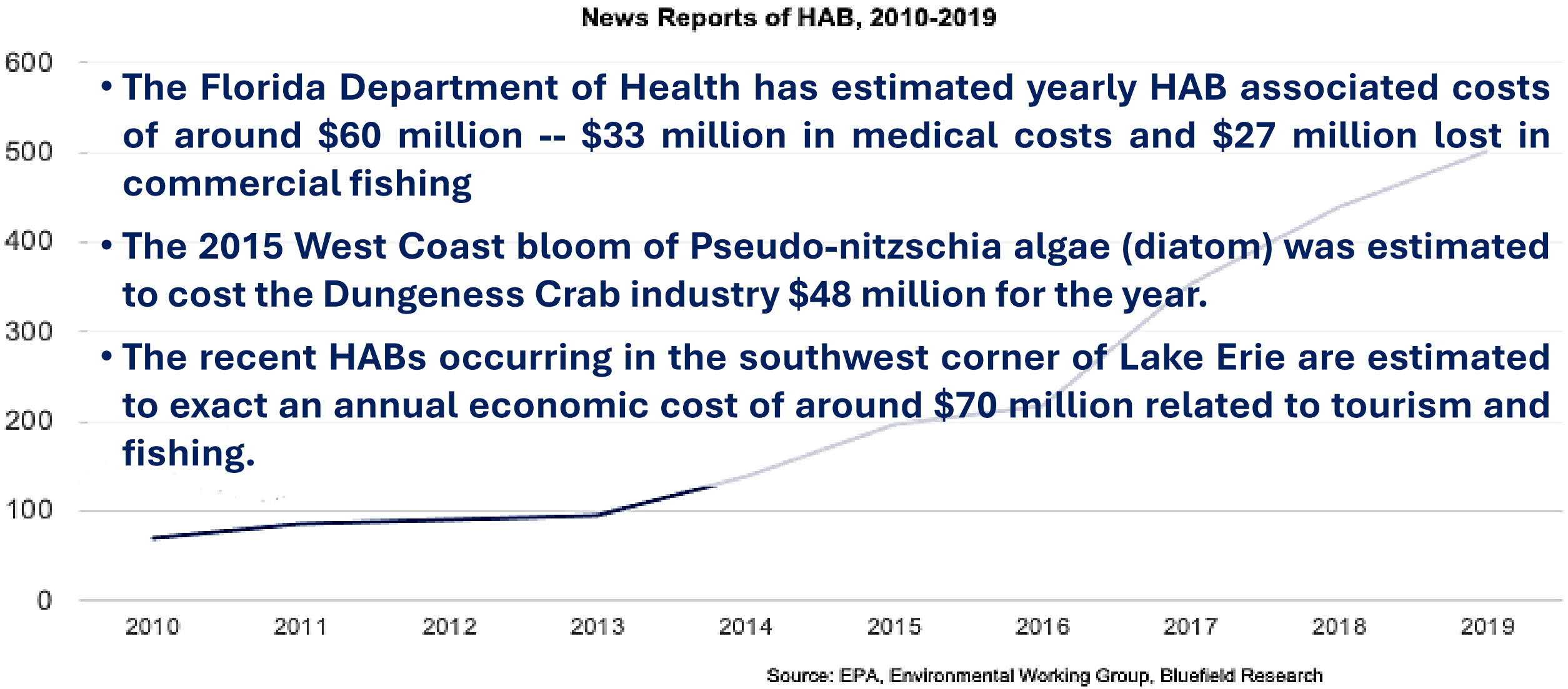
News Reports of HAB, 2010-2019



Through increased monitoring and higher levels of phosphorus and nitrate, and increased temperatures, harmful algal bloom (HAB) events in the U.S. have grown over seven-fold in the last 10 years

HABs have substantial direct and indirect economic and health effects on surrounding populations and are a driver of increased attention and regulation around nutrients involved in agriculture like phosphorus and nitrate.

Source: EPA, Environmental Working Group, Bluefield Research



- The Florida Department of Health has estimated yearly HAB associated costs of around $60 million -- $33 million in medical costs and $27 million lost in commercial fishing
- The 2015 West Coast bloom of Pseudo-nitzschia algae (diatom) was estimated to cost the Dungeness Crab industry $48 million for the year.
- The recent HABs occurring in the southwest corner of Lake Erie are estimated to exact an annual economic cost of around $70 million related to tourism and fishing.

Current Approaches Involve the 3-M's

Monitoring = Remote Observation, Sampling, Taxonomy, Cyanotoxin Detection - **All Inform the Process of Setting HAB:**

1. **Advisory Guidance**
2. **Management**
3. **Mitigation**

Management / Mitigation = Attempt to reduce/control existing cyanoHAB effects:

These approaches serve mainly, to minimize bloom effects.

****True prevention involves maintaining high water quality, failing that, prevention involves remediation.**

Lake/Reservoir Management/Mitigation Tools

1. Physical controls
   - manipulation of the intake location or depth, aerators (destratification), mechanical mixers (long distance circulation) and barriers (sand, carbon).
2. Biological controls
   - manipulation of the lake ecology to favor cyanobacteria grazers (top-down) and increased competition for nutrients (bottom-up)
3. Chemical controls
   - phosphorus treatments (e.g. lime, aluminum sulfate, ferric chloride, lanthanum and clay particles) Used to both bind nutrients and flocculate cells, algaecides (e.g., copper-sulfate, hydrogen peroxide, potassium permanganate, herbicides)

Ref: Solutions for Managing Cyanobacterial Blooms: A scientific summary for policy makers. 2019. M.A. Burford et al. IOC/UNESCO, Paris (IOC/INF-1382).

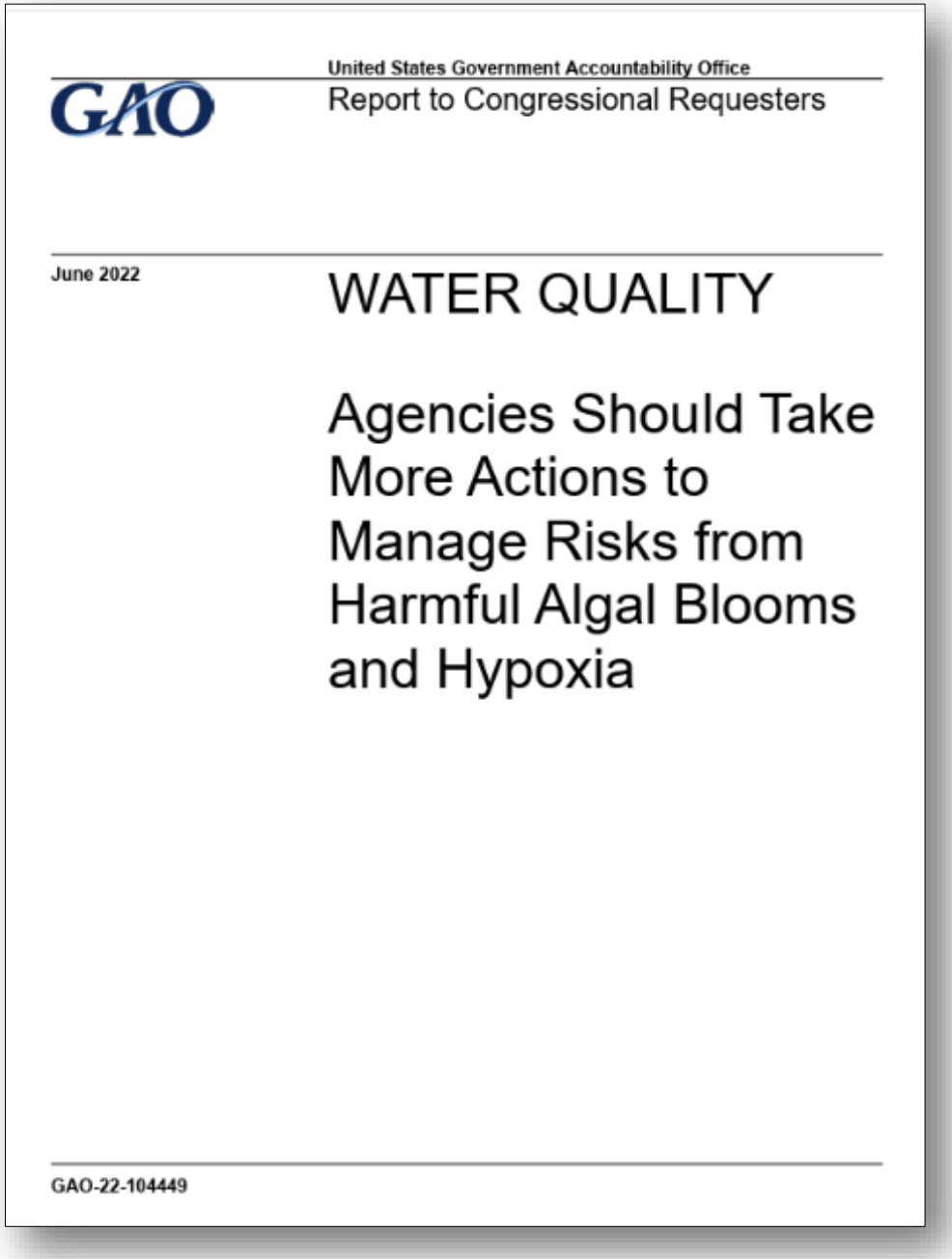
The Working Group Has Not Implemented a **National HAB and Hypoxia Program**

The Working Group Has **Not Developed Performance Measures** to Assess Results

Federal Agencies Help State, Local, and Tribal Governments Respond to HAB and Hypoxia Events but **Lack a Prevention Goal**

Federal Agencies and State Officials Have Identified a **Need for More Actions to Prevent HABs and Hypoxia**

Federal Agencies Have Developed Limited Cost and Benefit Information to Help Select Among Mitigation, Control, and **Prevention Actions**


United States Government Accountability Office

GAO

Report to Congressional Requesters

June 2022

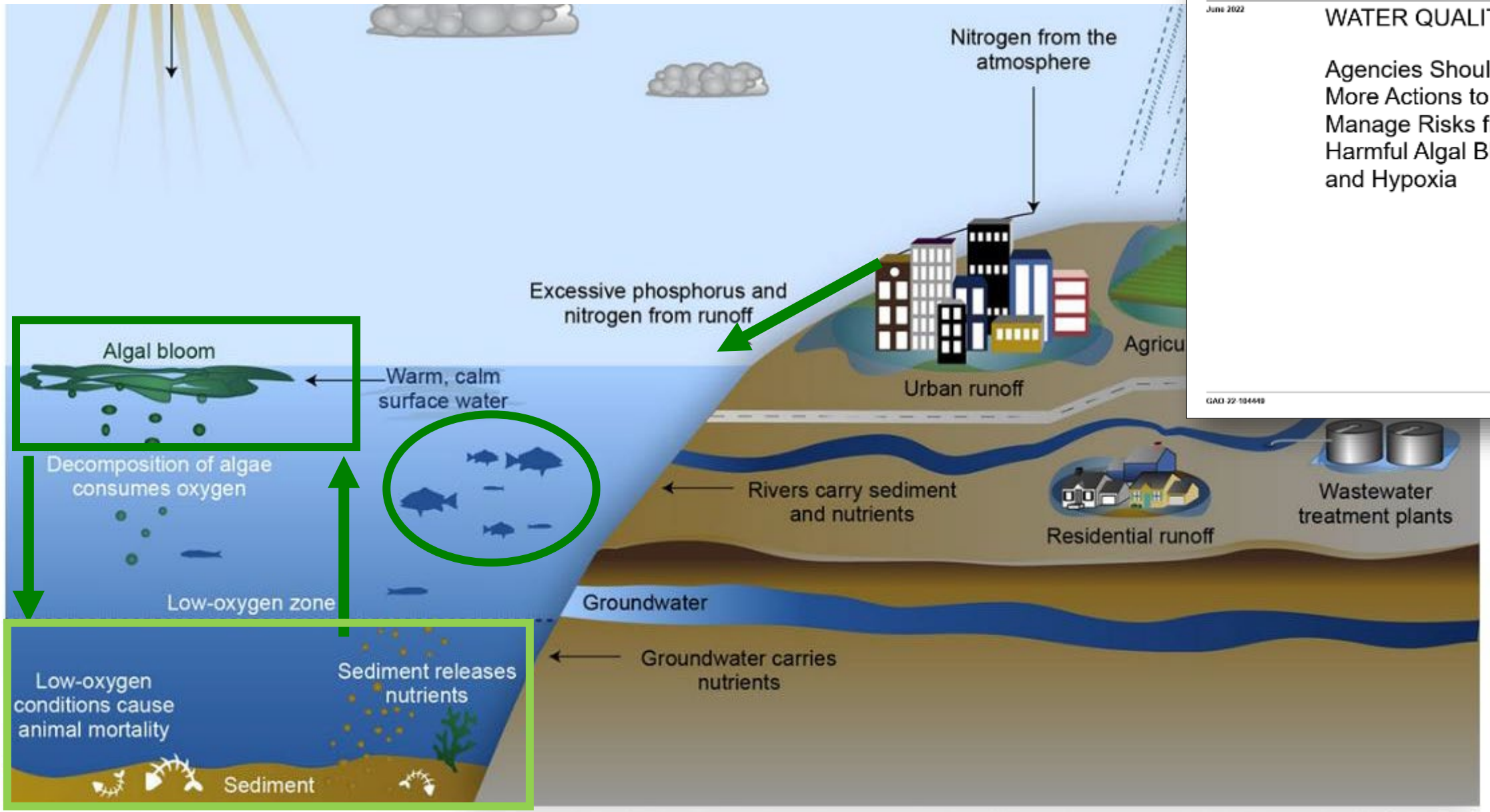
WATER QUALITY

Agencies Should Take More Actions to Manage Risks from Harmful Algal Blooms and Hypoxia

GAO-22-104449

Figure 3: Some Factors That Contribute to Harmful Algal Blooms and Hypoxia

Factors Contributing to HABs and Hypoxia



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GAO 22-104449

Source: GAO analysis of information from the Interagency Working Group on the Harmful Algal Bloom and Hypoxia Research and Control Act and the Lake Champlain Basin Program. | GAO-22-104449

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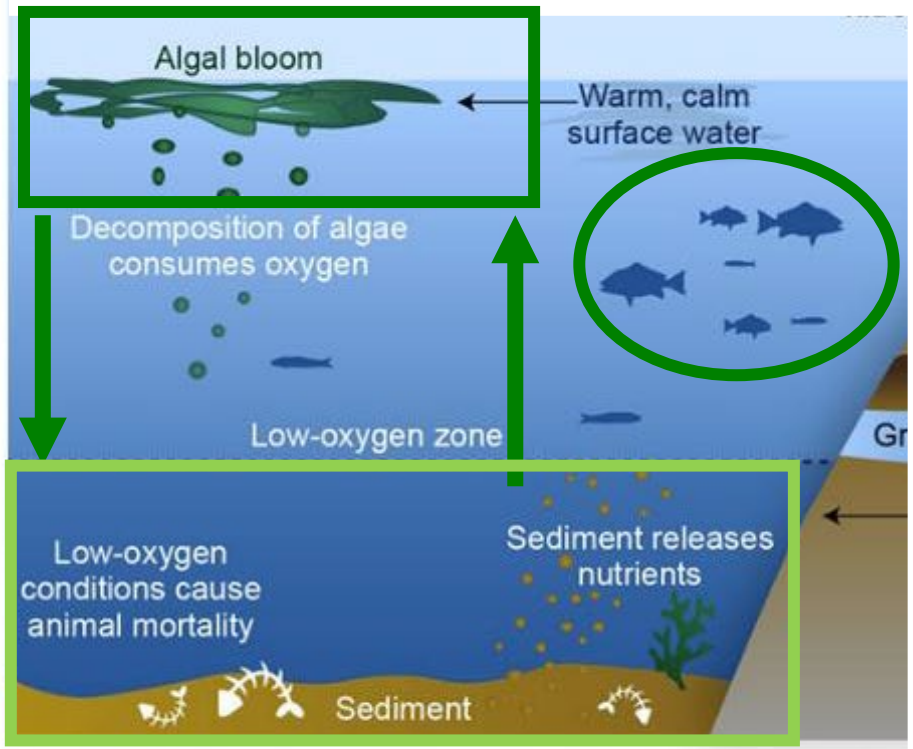

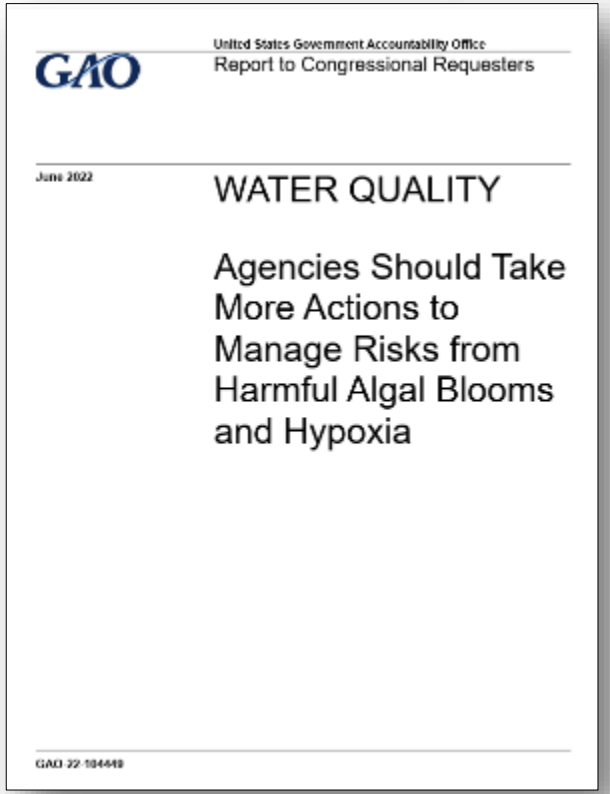
United States Government Accountability Office

GAO

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Agencies Should Take More Actions to Manage Risks from Harmful Algal Blooms and Hypoxia

GAO-22-104449

Complex Adaptive System – Systems Theory

- Ecosystem habitat change
- Biological – not physical water chemistry
- Feedback Loops & Tipping Points

Source: GAO analysis of information from the Interagency Working Group on the Harmful Algal Bloom and Hypoxia Research and Control Act and the Lake Champlain Basin Program. | GAO-22-104449

Systems Theory can help explain the process

In Systems Theory "attractors" describe the main determinants of system behavior.

In a healthy lake, the main attractors are:

- an ***oxygen-rich environment***,
- a ***productive biodiverse food web***,
- achieving ***nutrient clearance*** from the aquatic ecosystem.

For cyanobacteria to dominate attractors must be changed to:

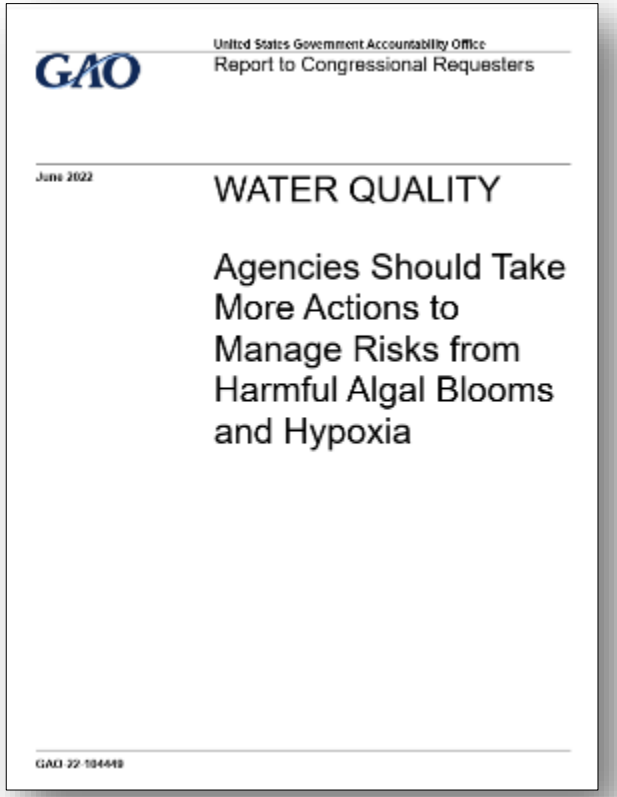
- an ***anoxic benthic environment***,
- a ***constrained food web,***
- ***nutrient recycling*** to fuel blooms.

Feedback, Tipping Points etc

Cottingham et al. (2015) used the Systems Theory paradigm to describe and model cyanobacteria's ability to single-handedly transform an ostensibly low-nutrient lake into a eutrophic state within which they can bloom and dominate. This process is far too complex to be countered with chemical treatments or single management methods that only lower nutrient levels in the water or kill off phytoplankton.

Factors Contributing to HABs and Hypoxia

- Hypoxia: The critical factor in Ecosystem Habitat Change
- Decomposing Organic Sediments cause Hypoxia
- Hypoxia constrains aquatic Food Webs and drives Nutrient Cycling
- Feedback Loops: **Algal blooms** → Decompose → Hypoxia → Nutrient Recycling → **Algae blooms**
- The Progression to Cyanobacteria Harmful Algal Blooms (HABs) “Ecosystem Habitat Change”
- The Need for Proactive, Prevention-Oriented Approaches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Report to Congressional Requesters

June 2022

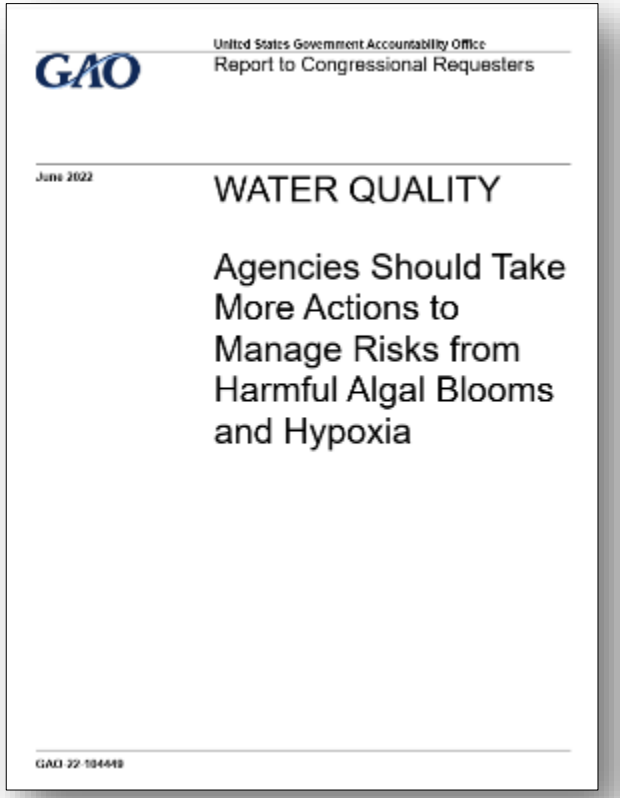
WATER QUALITY

Agencies Should Take More Actions to Manage Risks from Harmful Algal Blooms and Hypoxia

GAO-22-104449

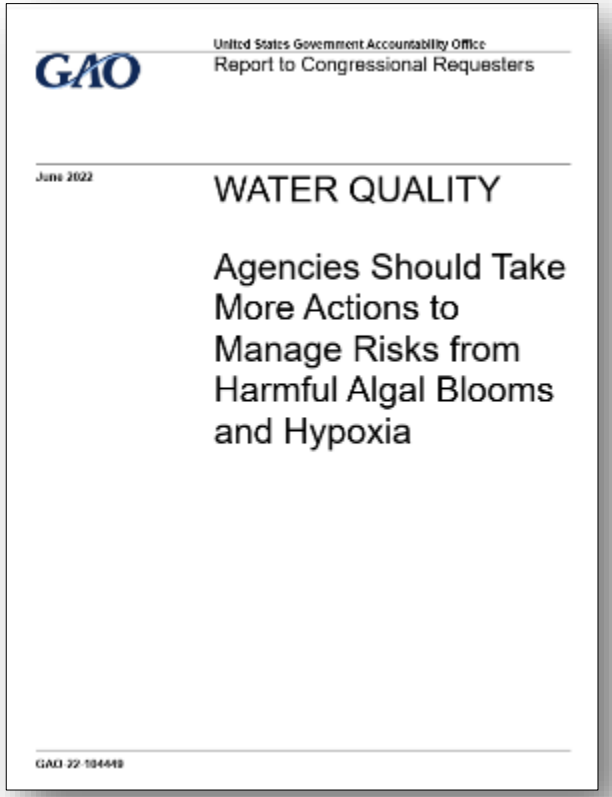
GAO Recommendations

- Document and define a national HAB and hypoxia program
- Develop performance measures for the working group
- Develop an interagency framework to expand *monitoring* and *forecasting* of freshwater HABs and hypoxia to *prioritize* water bodies for *prevention and remediation*
- Develop a national goal focused on preventing HABs and hypoxia.
- Development of a more comprehensive body of information on the costs and benefits of mitigation, control, and prevention actions for use by state, local, and tribal governments.

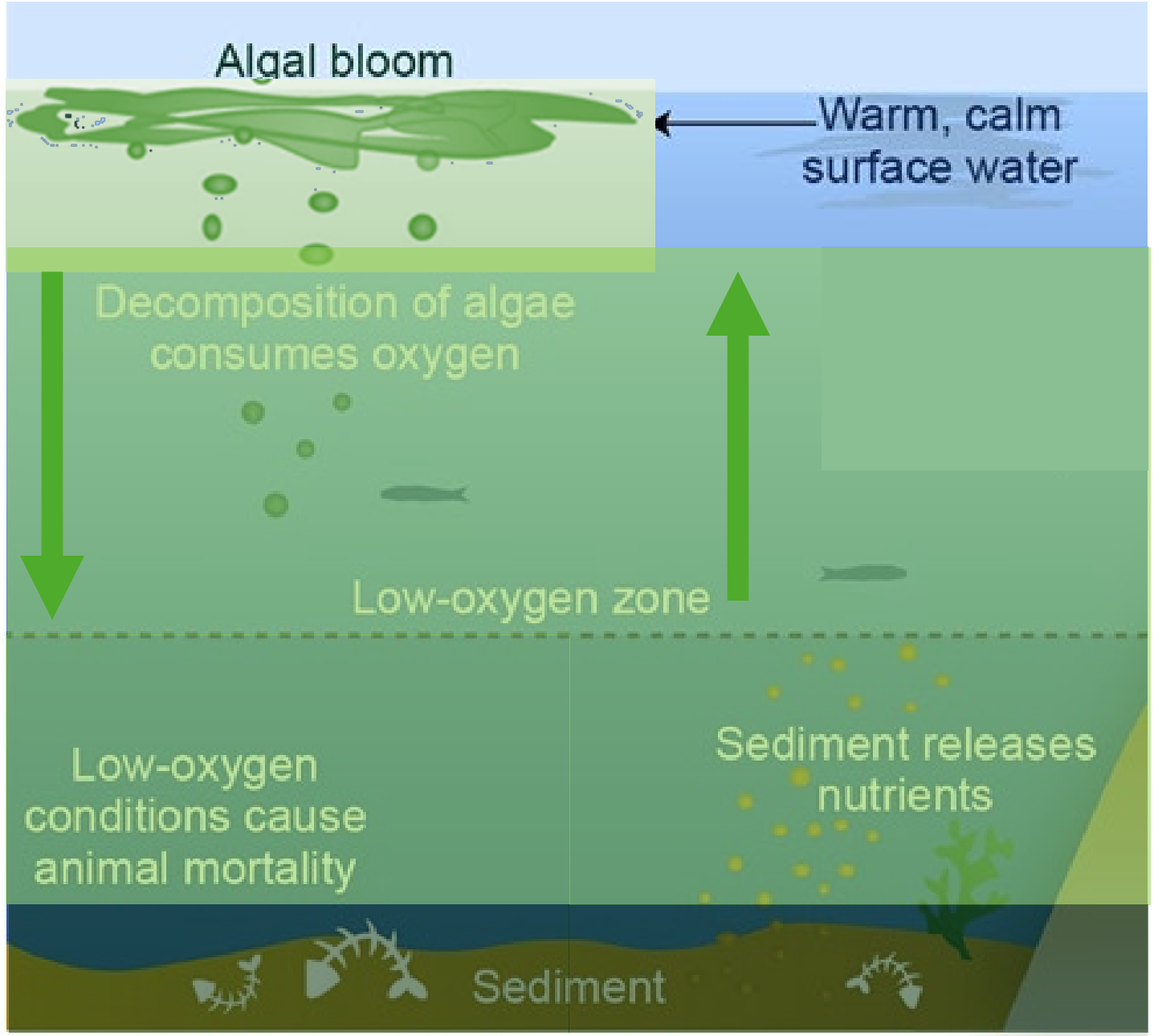


GAO Recommendations

- Develop a **national HAB and hypoxia program**
- Develop **performance measures**
- Develop ways to **monitor, forecast and prioritize** freshwater HABs and hypoxia
- Focus on costs and benefits of **preventing HABs and hypoxia**.



Prevention & Remediation of HABs



Food Web Disruption

Hypoxia

Decomposition

Nutrient Recycling

Cyanobacteria's Competitive Advantages

Cyanobacteria - one of first lifeforms to photosynthesize – are highly adaptable & agile.

They retain these abilities, which they use to exploit nutrient availability in eutrophic environments at the benthic margin to outcompete and dominate other phytoplankton:

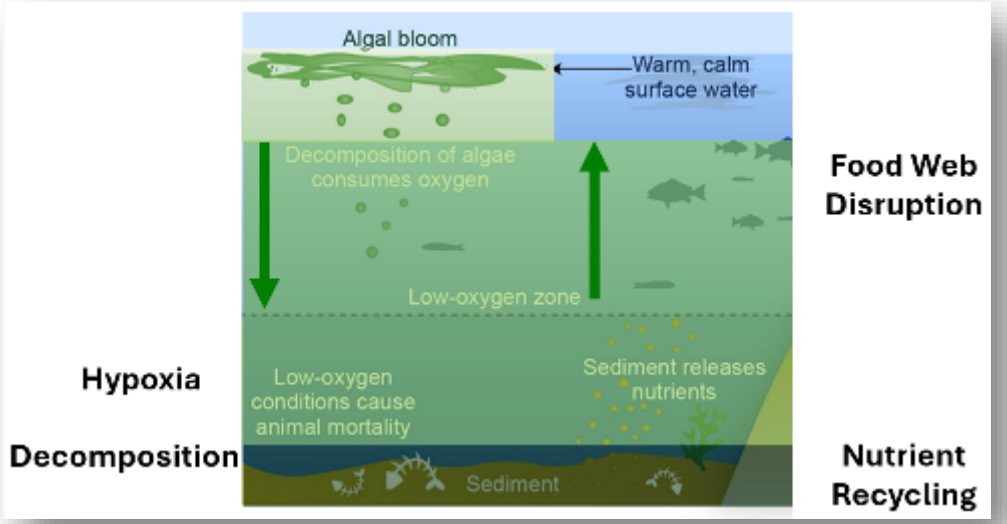
1. **Nitrogen assimilation**: Dissolved gas & ammonia supply in hypoxic benthic margin.
2. **Buoyancy control**: Control their buoyancy to dive to the bottom and to load up on nutrients and rise to the top of the water column to bloom.
3. **Mobilization of sediment nutrient stockpiles**: Cyanobacteria can actively mobilize nutrients in the sediment and extracellular microbiome aids nutrient uptake.
4. **Toxin production**: Cyanobacteria species can produce toxins that make them unpalatable and may also be used as a defense mechanism.

Cyanobacteria utilize these tactics to exploit eutrophic conditions ("Ecosystem Habitat Change") and dominate.

To summarize:

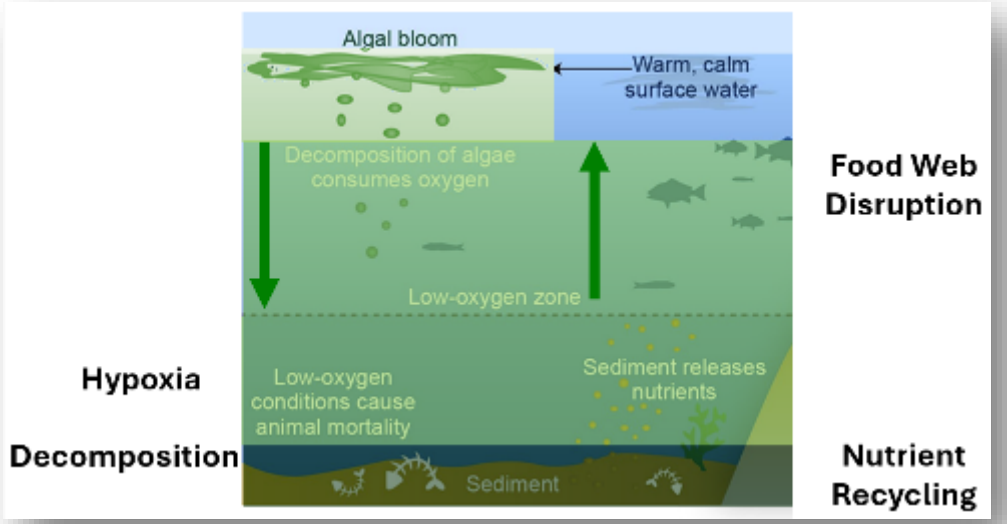
Root causes that drive the process:

- Organic sediment accumulation
- Organic sediment decomposition causes
- Hypoxia
- Anaerobic benthic margin recycles nutrients
- Cyanobacteria dive to dominate nutrient uptake
- Hypoxia wipes out food web (from benthic zooplankton upwards)
- Nutrient clearance capacity of food web is constrained
- Nutrient recycling replaces nutrient clearance
- Internal nutrient recycling becomes self-sustaining
- Cyanobacteria exploit the Ecosystem Habitat Change



To Prevent HABs:

1. Eliminate Hypoxia
2. Deplete sediment nutrient stockpiles
3. Restore phytoplankton balance – “beneficial algae”
4. Restore food web to restore nutrient clearance channels



SIS.BIO -

1. RADOR sy
   - Differe

State to remove Lake Carmi aeration system after determining it made cyanobacteria blooms worse

By Corey McDonald

May 15, 2024, 5:30 pm

The aeration system was installed to try and mitigate cyanobacteria blooms, which is sometimes called blue-green algae. Officials found it had "unintended consequences" of mixing phosphorus-rich bottom water with the rest of the lake, according to minutes from an April 16 meeting of the state's Lake Carmi Coordination Team. That led to higher levels of phosphorus in the Franklin County lake's surface water and "stronger, more protracted cyanobacteria blooms."

"We have seen high levels of bloom reports every year since the original system has been on now," Peter Isles, an environmental scientist with the Vermont

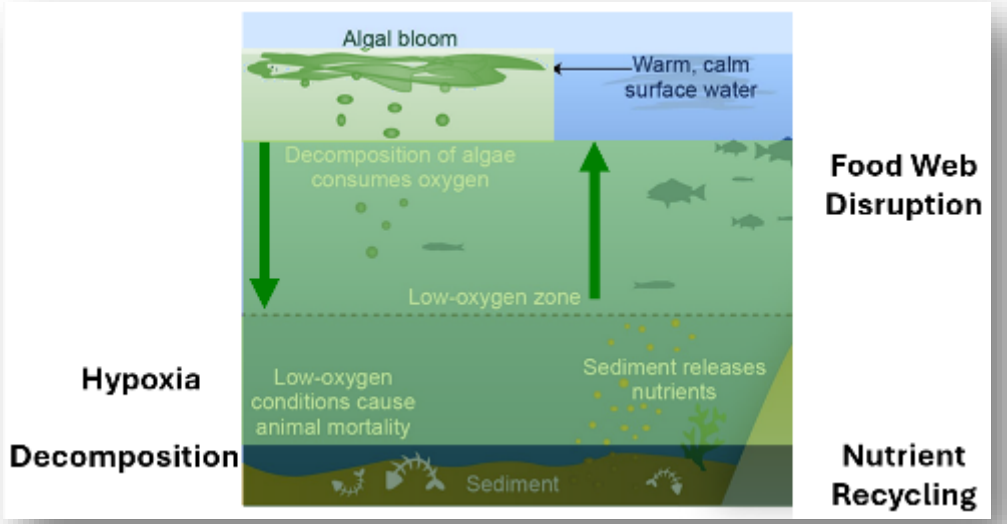
SIS.BIO - 2017

1. RADOR systems oxygenate the whole water column
   - Different to “aeration”
2. Enzymatic “Bio-Dredging” of organic sediments*
3. Micronutrient supplementation* as bioaugmentation/biostimulation to boost base levels of the foodweb (“beneficial algae” and zooplankton)

*enzyme mix = Clean and Clear (mercaptases, amylases, proteases, lipases and water) and micronutrient mix = Bio Booster LQ (Fe, Mn, Co, Mo, Ca, Mg, Zn, Si, B, Cu).

To Prevent HABs:

1. Eliminate Hypoxia



Indian Lake, MO

- 320 acres
- average depth of 15 feet
- maximum depth of 43 feet.

For many years the Indian Lake has been threatened by the effects of eutrophication on recreational enjoyment, esthetics, property values and the environment in general.

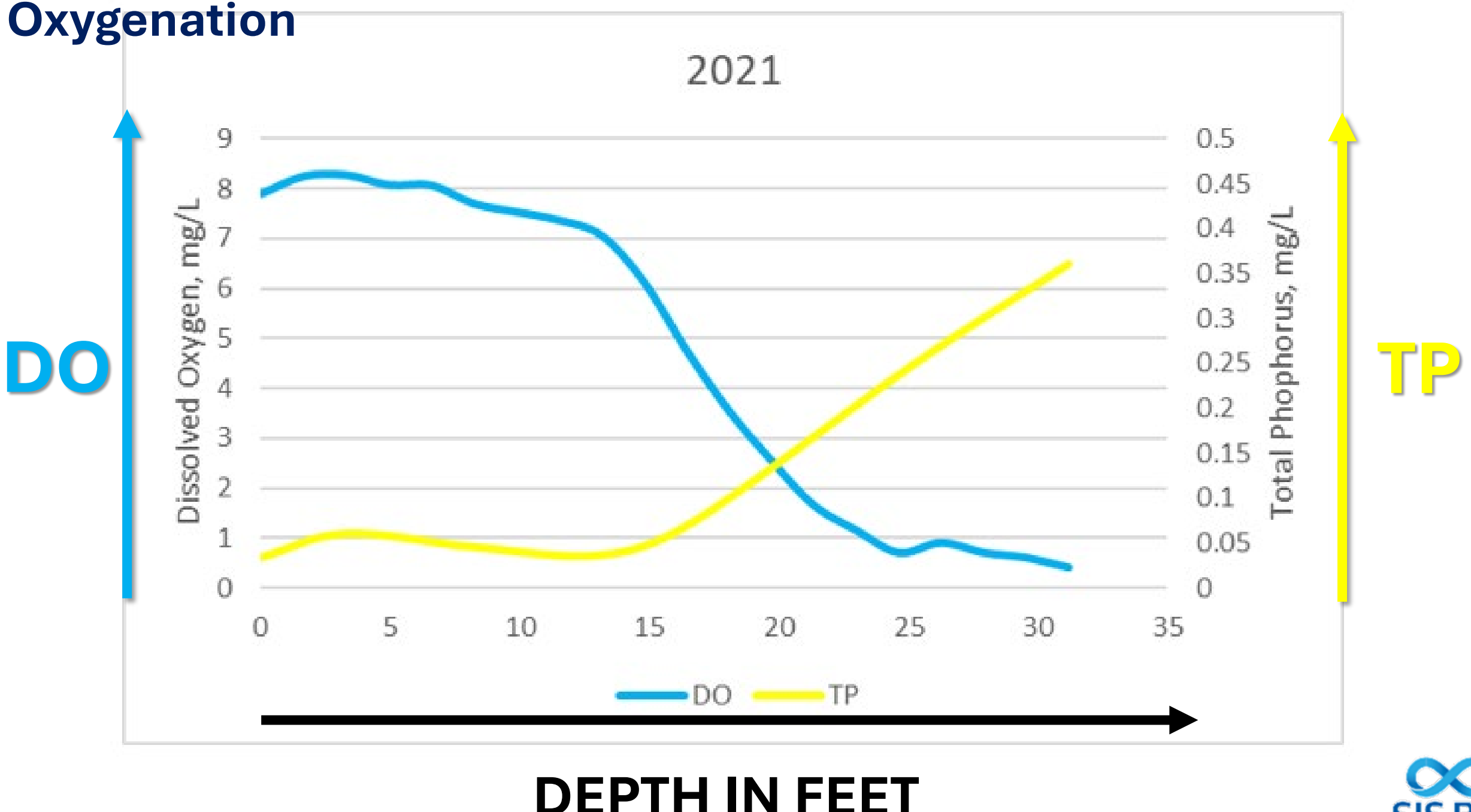
Although the lake's deterioration had taken place over many years, a tipping point was reached with the first confirmation of HABs in summer 2020 (although HABs had likely been present for many years prior), escalating the need for responsible decision making to save the Indian Lake lifestyle.

The situation worsened rapidly and by 2021 the lake experienced high levels of toxic cyanobacteria all summer.

The remediation program was started in late April 2022.

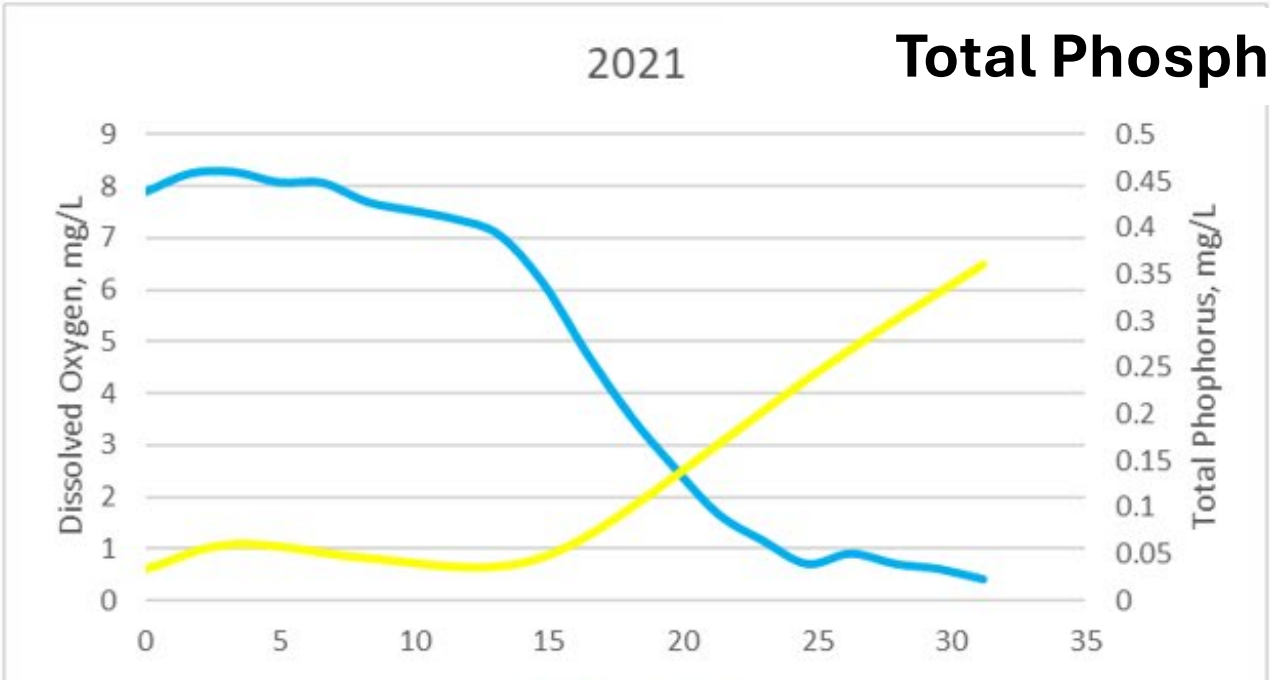
SIS.BIO

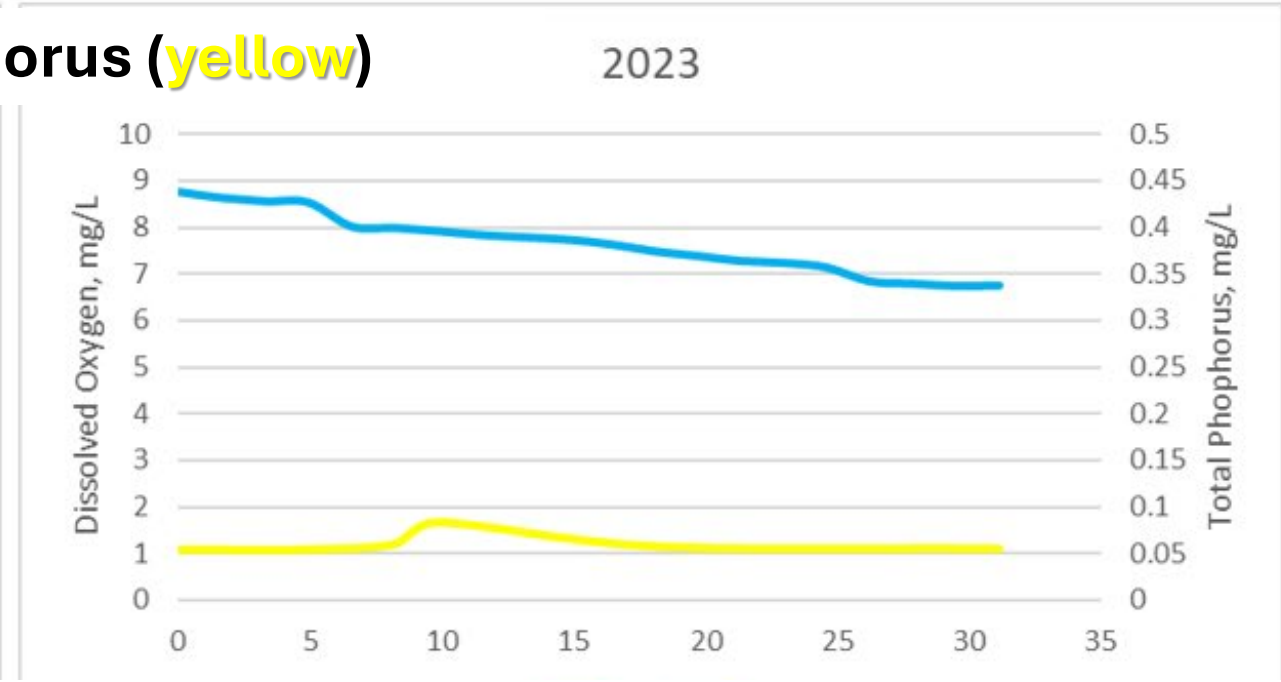
Oxygenation



SIS.BIO

Total Phosphorus (yellow)





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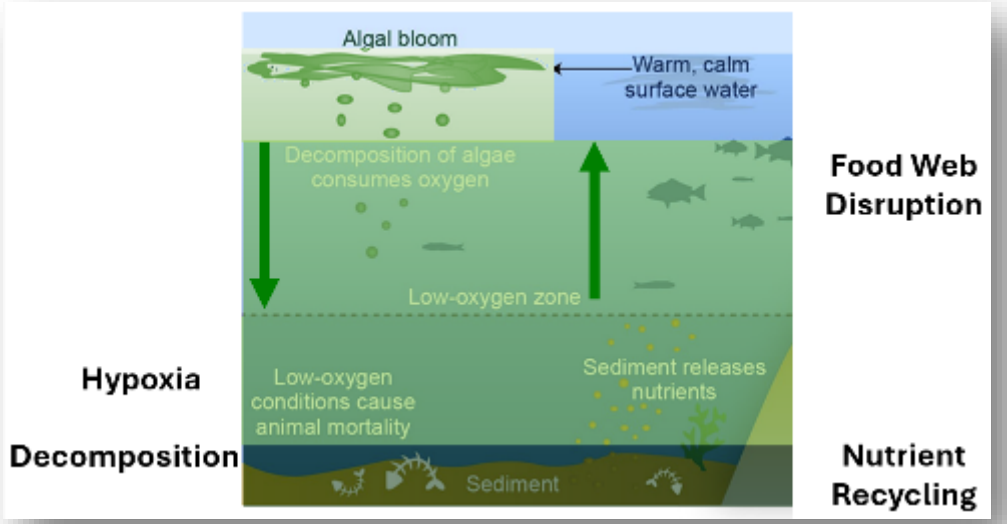


Roland Lake, VA

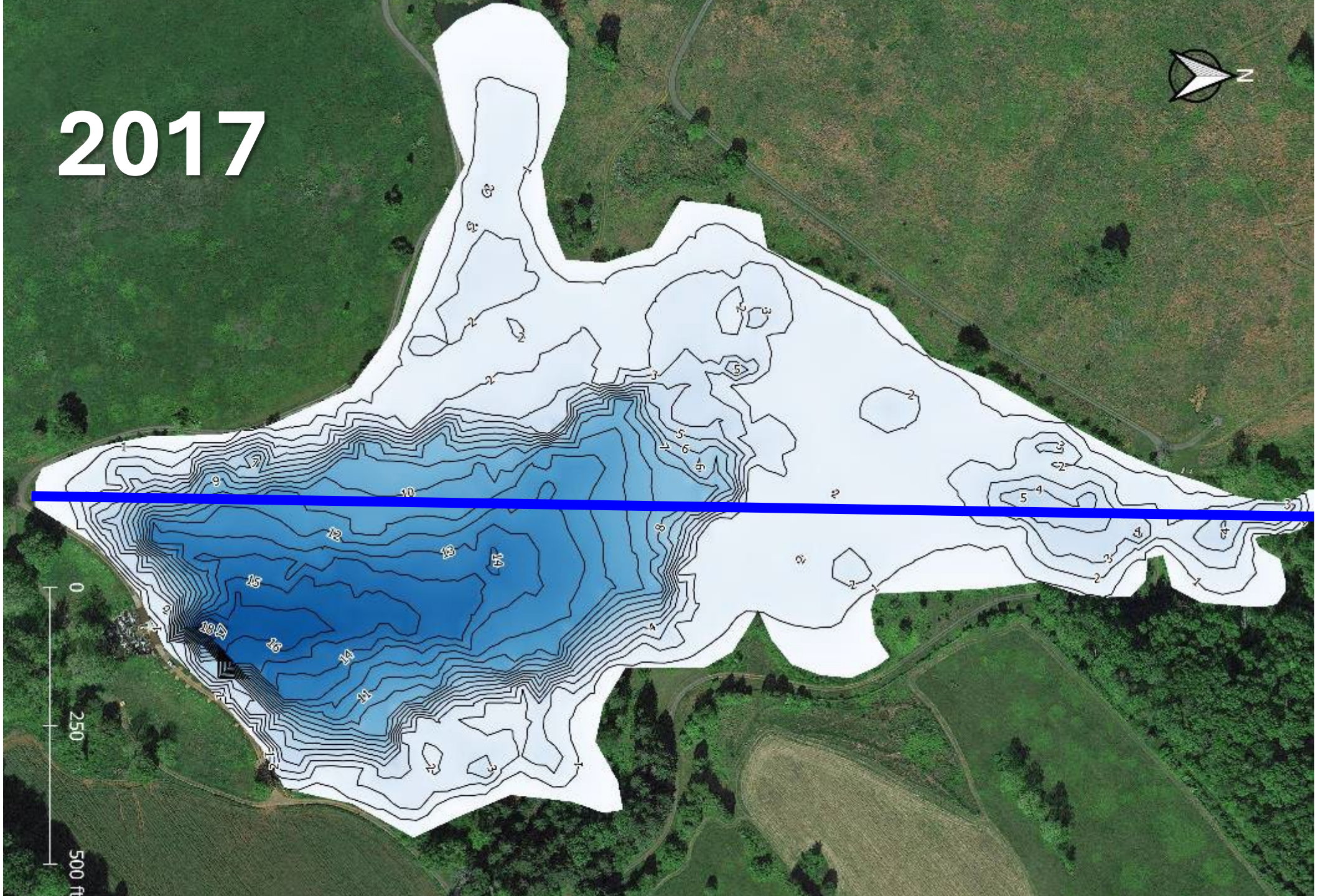
- 30 acres
- average depth of 5.1 feet
- maximum depth of 17 feet.

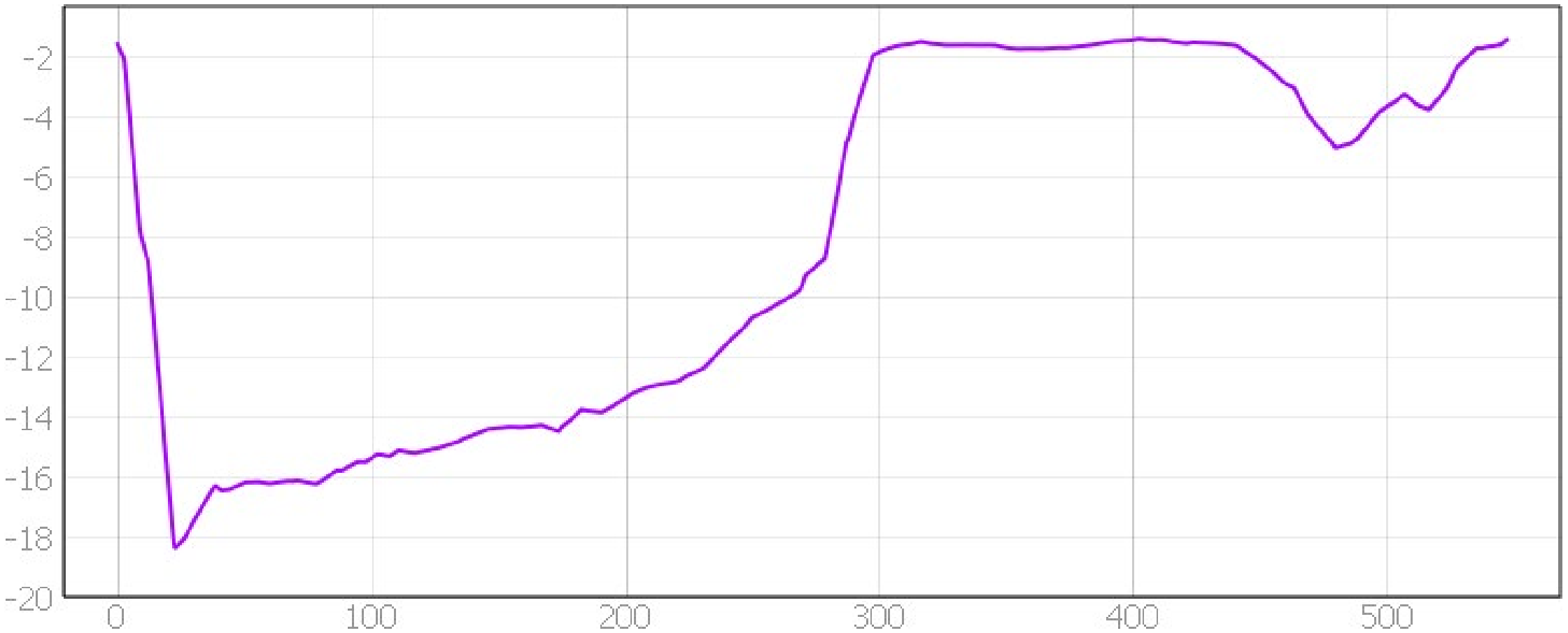
Irrigation reservoir for a farm.

Storage capacity lost due to sediment accumulation.

Invasive weed growth made lake inaccessible for recreational purposes .

The remediation program was started in late April 2018.


2017
N
0
250
500 ft



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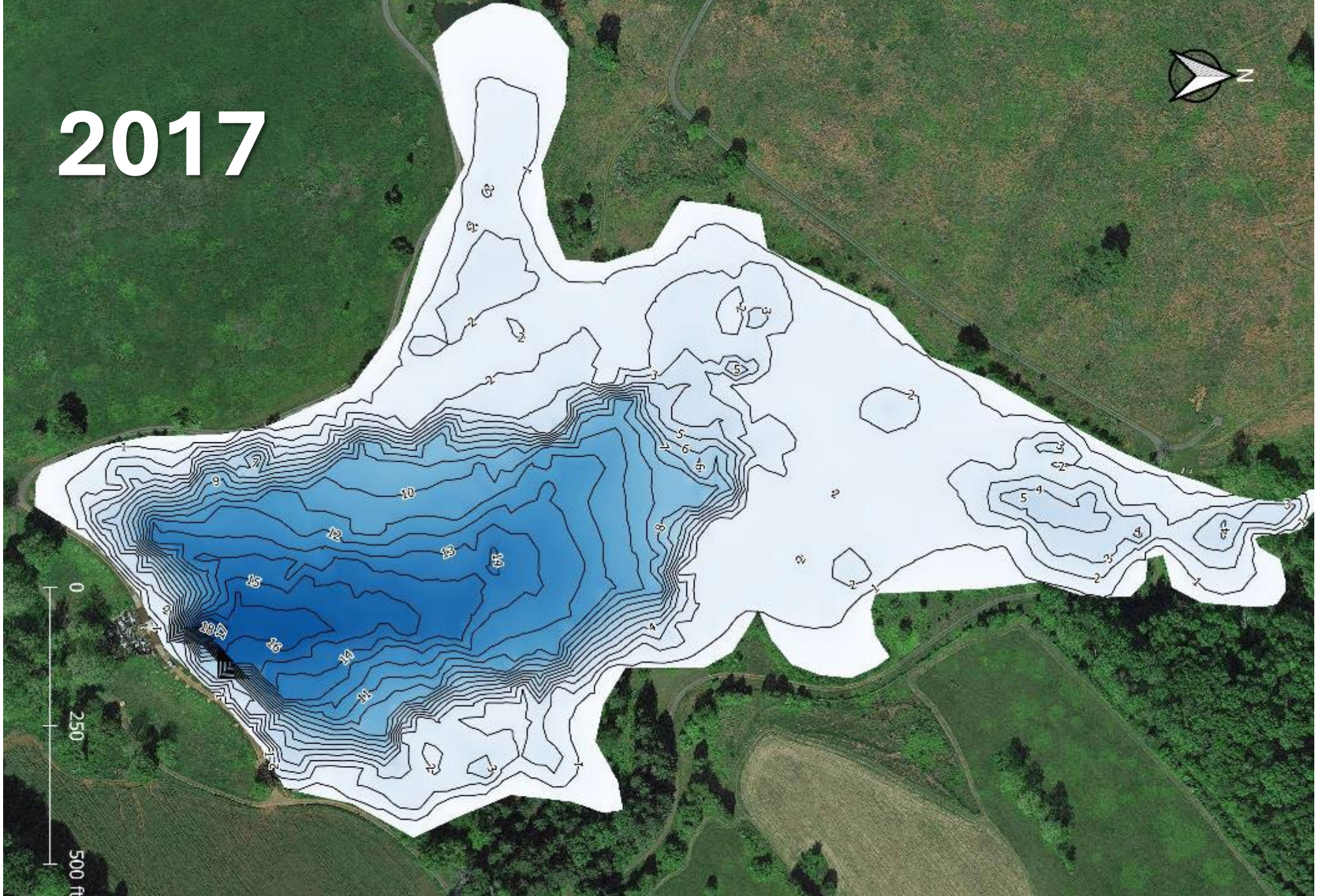
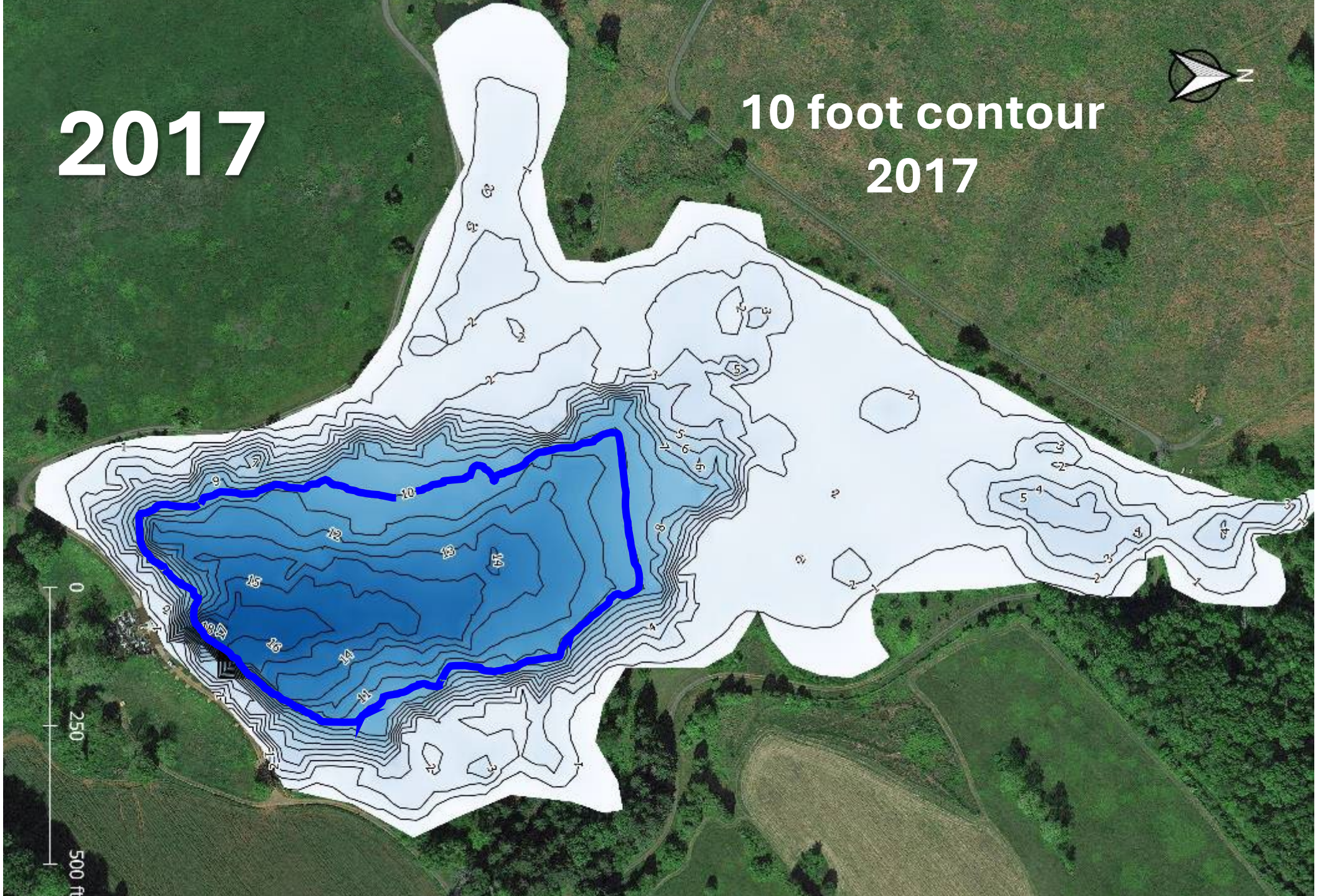
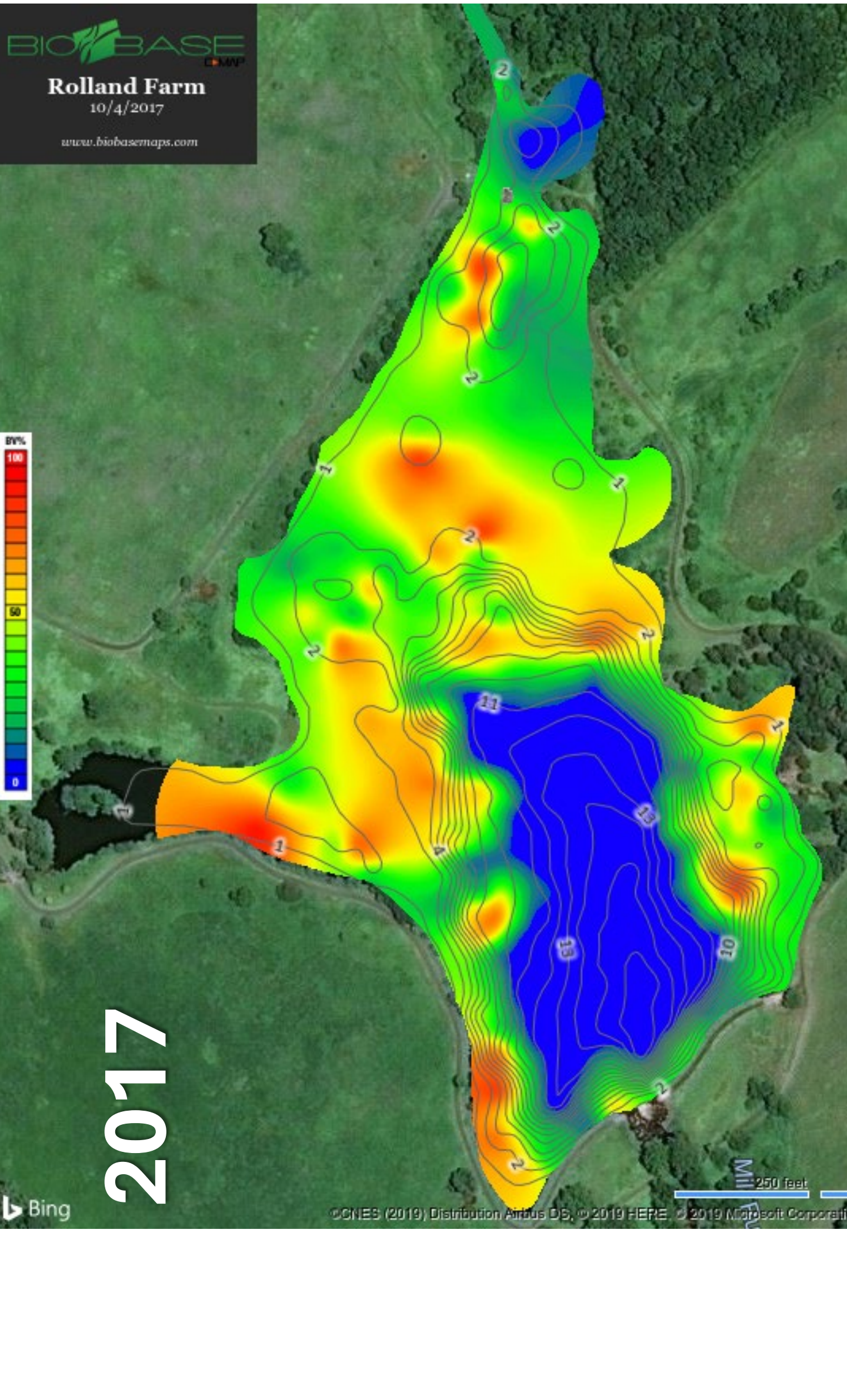
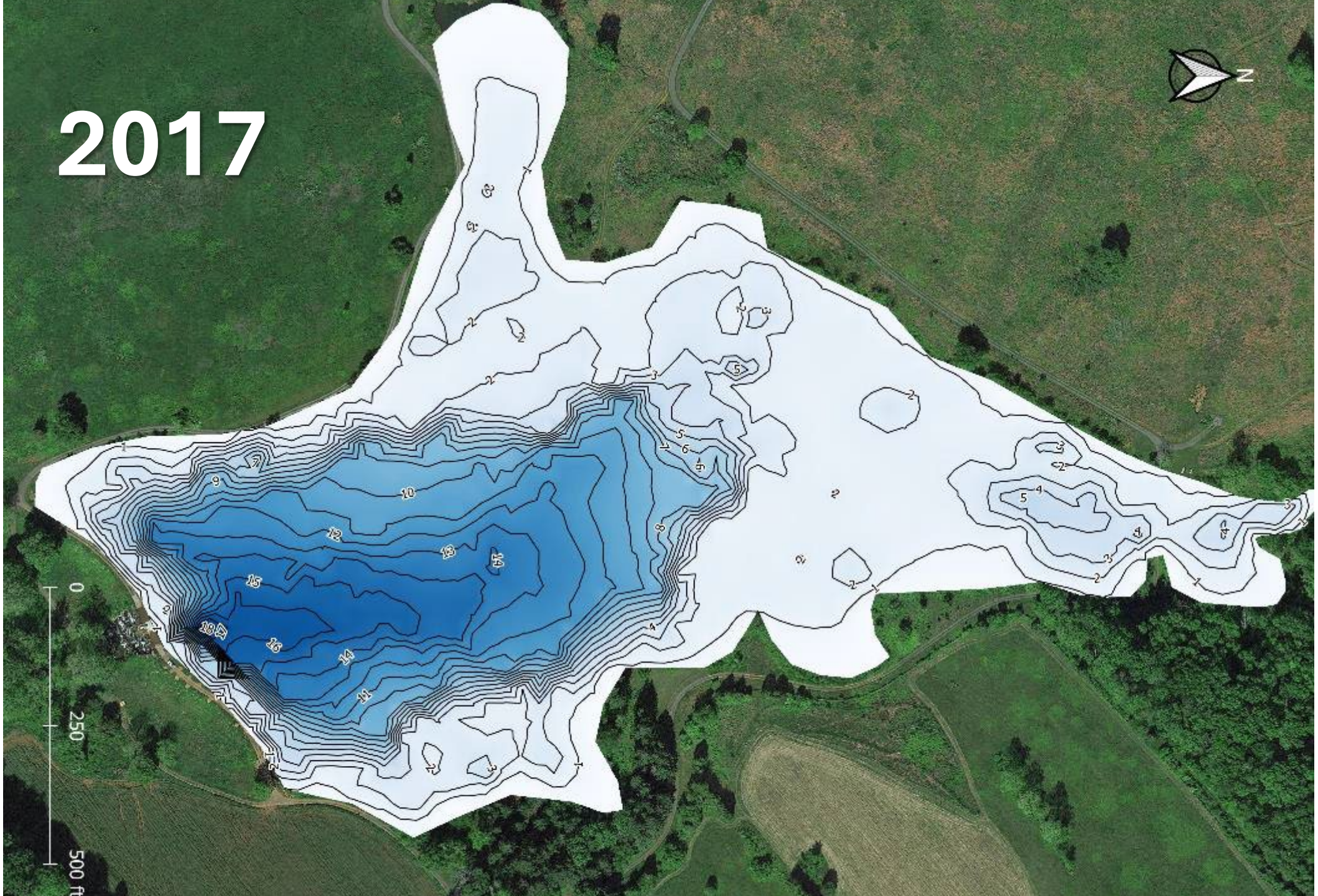
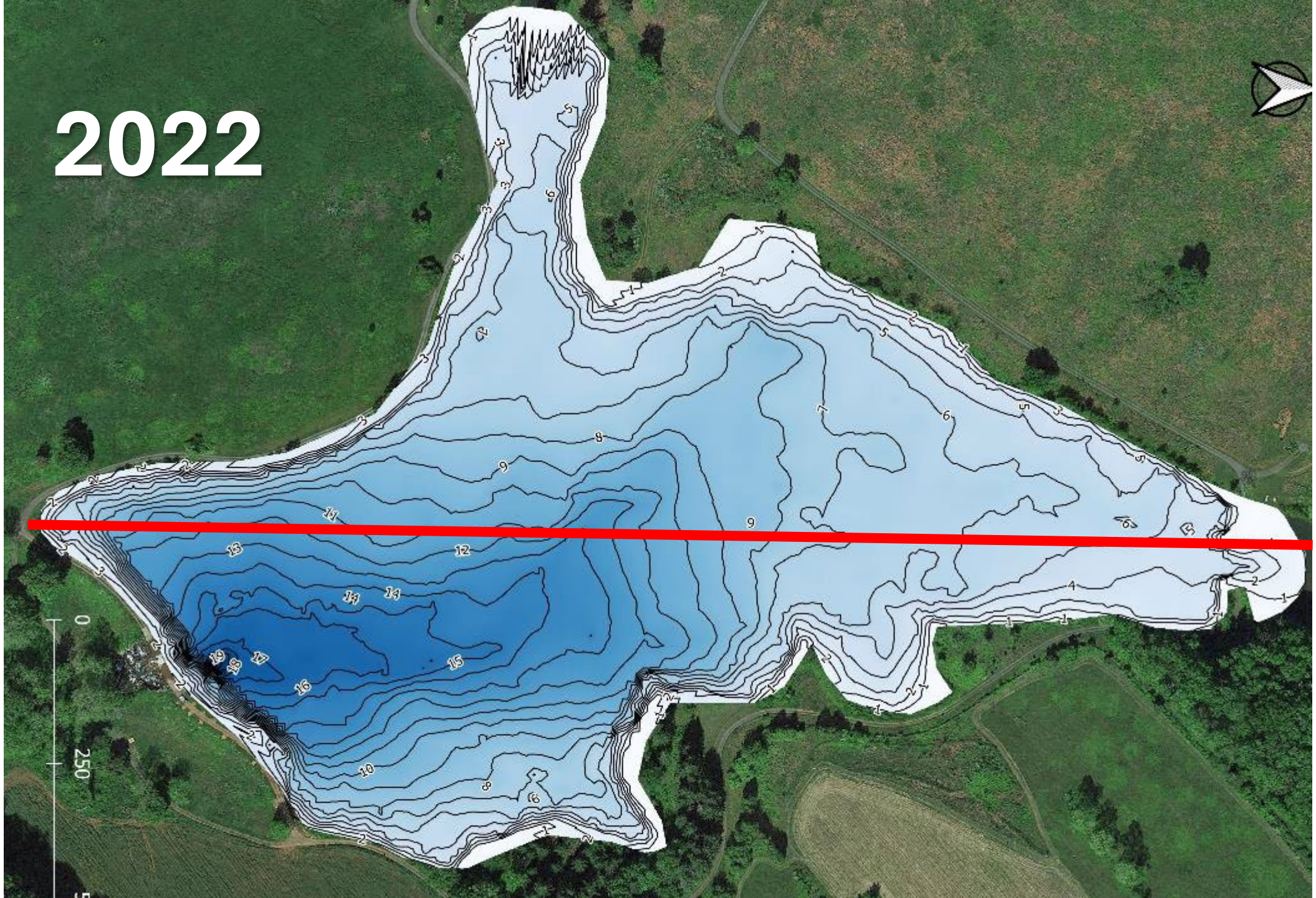
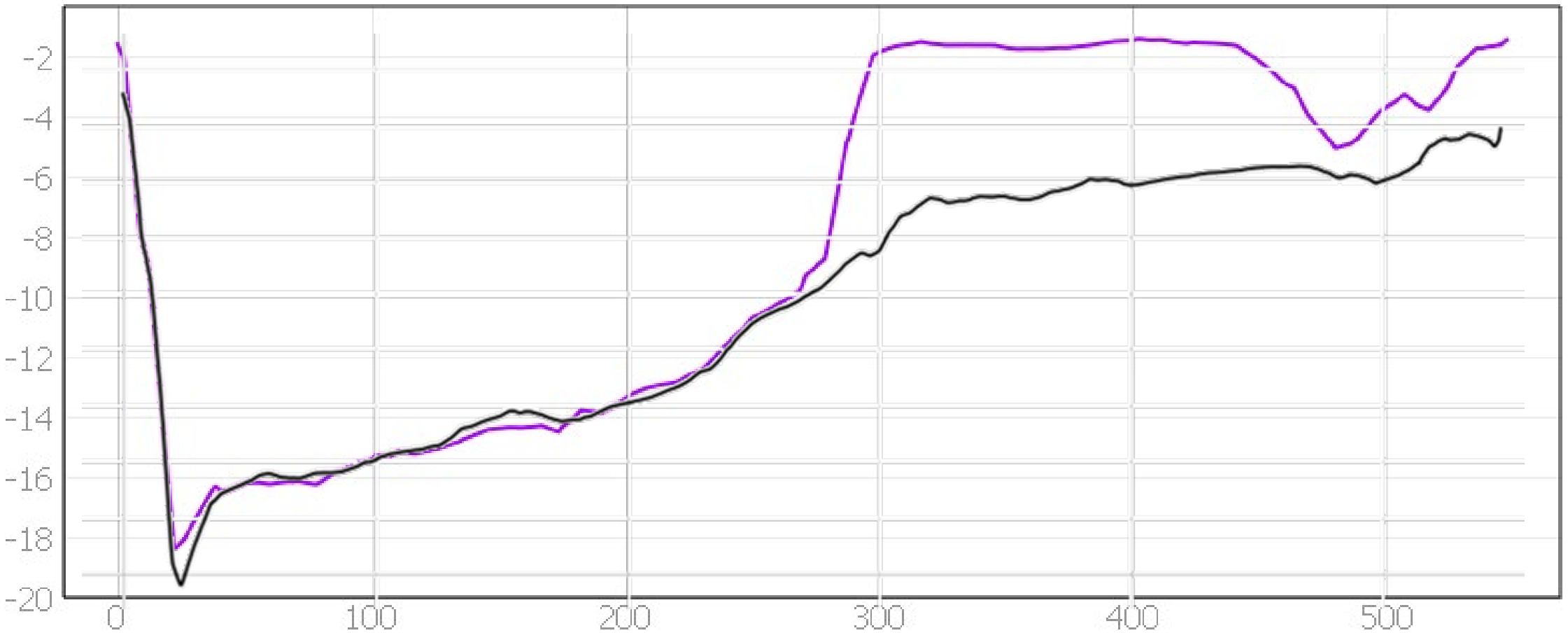

2017
N
0
250
500 ft


2017
10 foot contour
2017
N
0
250
500 ft


BIOBASE
Rolland Farm
10/4/2017
www.biobasemaps.com
BV%
100
50
0
2017
250 feet
Bing
©CNES (2019) Distribution Airbus DS, © 2019 HERE, © 2019 Microsoft Corporati


2017
N
0
250
500 ft


2022
0
250



Lake Transect 2017 (lavender)

Lake Transect 2022 (black)

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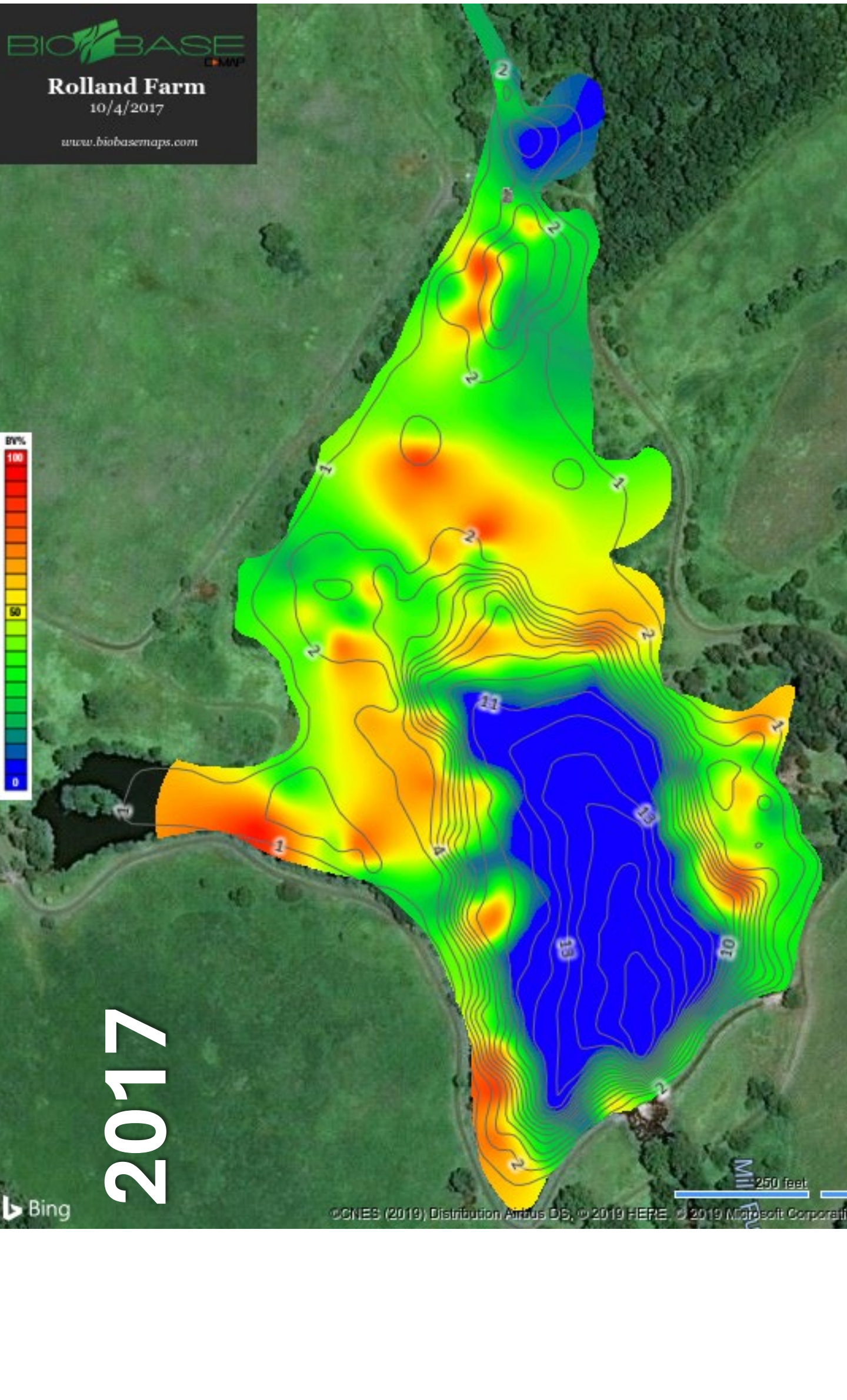
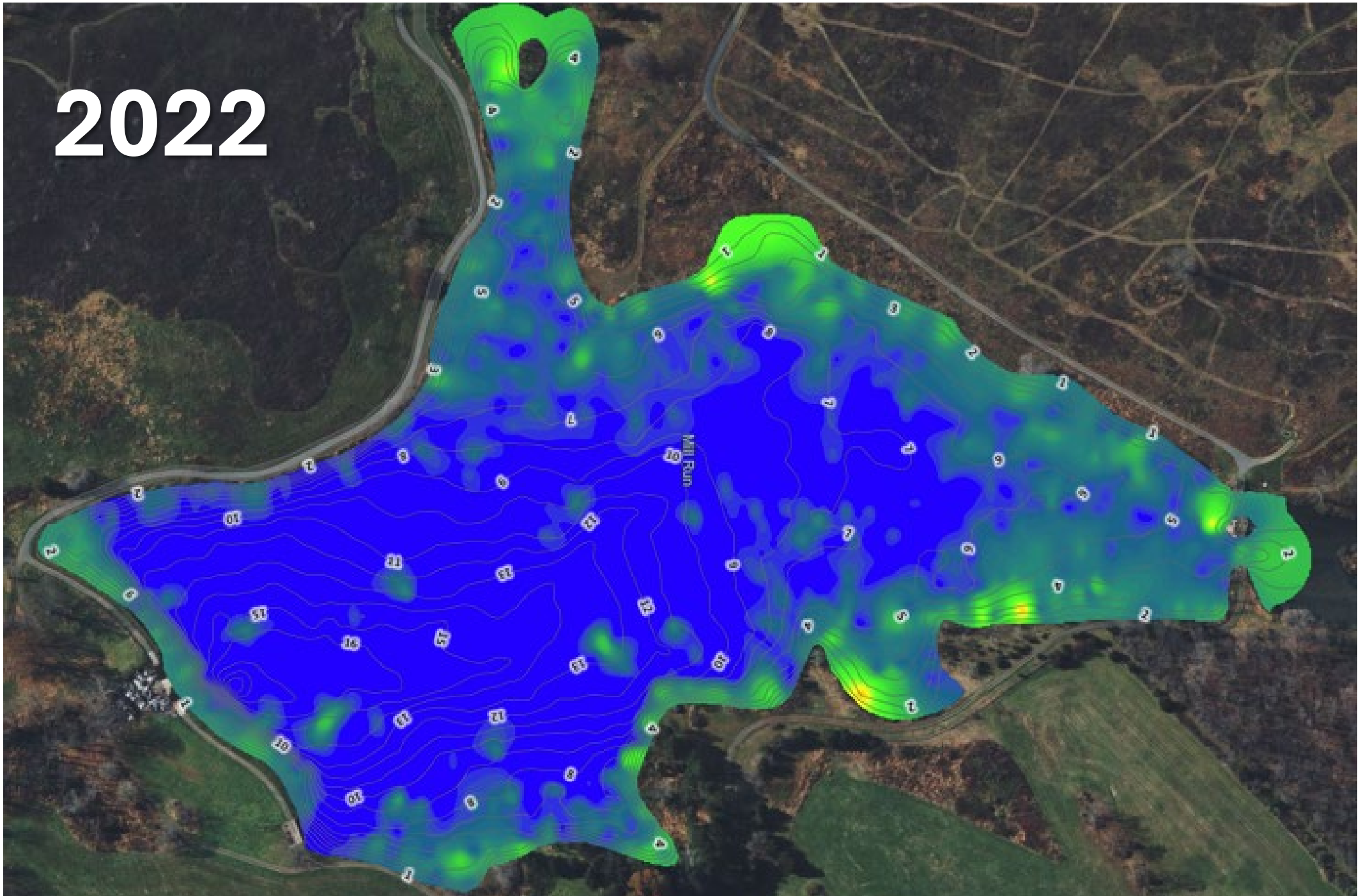
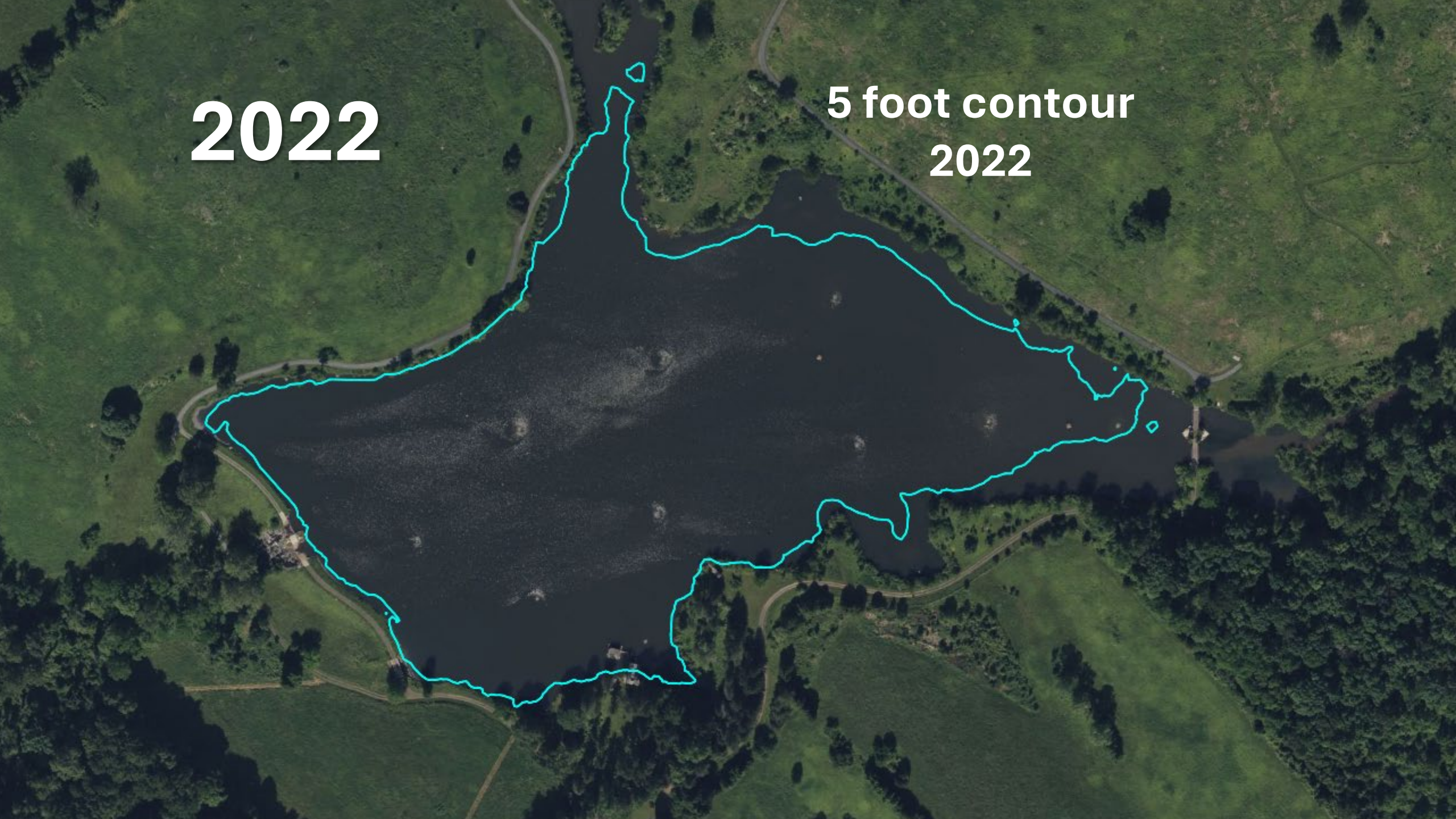

BIOBASE
Rolland Farm
10/4/2017
www.biobasemaps.com
BV%
100
50
0
2017
250 feet
Bing
©CNES (2019) Distribution Airbus DS, © 2019 HERE, © 2019 Microsoft Corporati


2022
Mill Run


2017
5 foot contour
2017

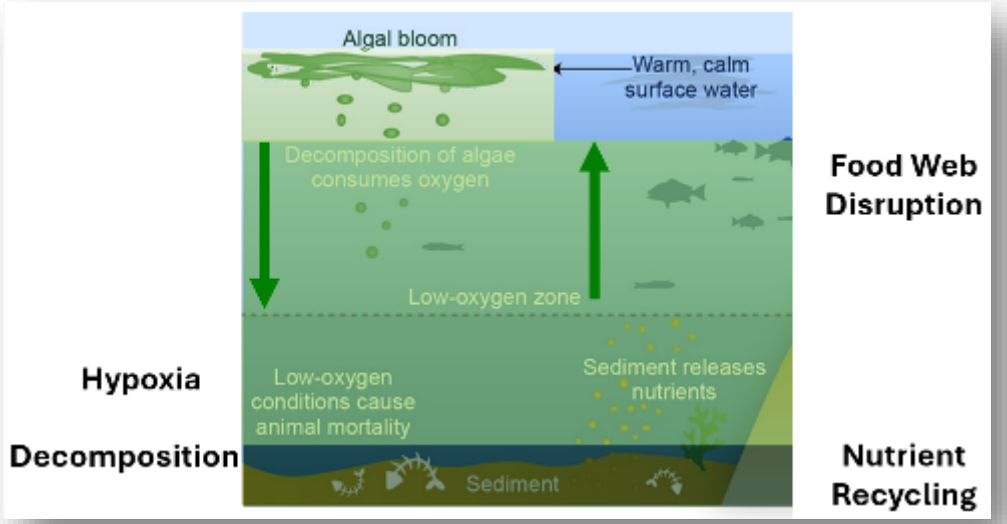

2022
5 foot contour
2022

ROLAND LAKE VA 2017 - 2022

	October 2017	October 2018	October 2019	October 2020	October 2021	October 2022	Overall Change
DEPTH							
Average (ft)	5.1	6.1	7.3	7.3	7.6	7.9	2.8
Maximum (ft)	17.0	16.7	18.0	18.0	19.1	20.5	3,5

To Prevent HABs:

1. Eliminate Hypoxia
2. Deplete sediment nutrient stockpiles
3. Restore phytoplankton balance – “beneficial algae”



Indian Lake, MO

- 320 acres
- average depth of 15 feet
- maximum depth of 43 feet.

For many years the Indian Lake lifestyle has been threatened by the effects of eutrophication on recreational enjoyment, esthetics, property values and the environment in general.

A tipping point was reached with the first confirmation of HABs in summer 2020 (although HABs had likely been present for many years prior).

The situation worsened rapidly and by 2021 the lake experienced high levels of toxic cyanobacteria all summer.

The remediation program was started in late April 2022.

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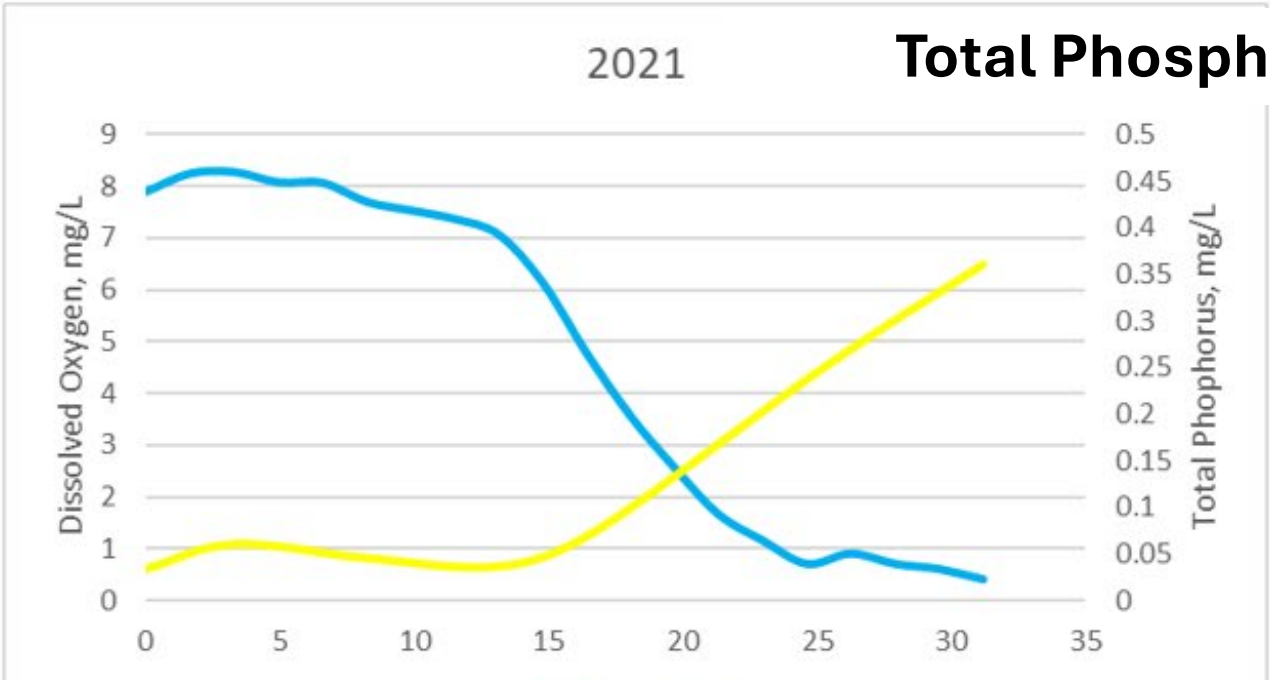
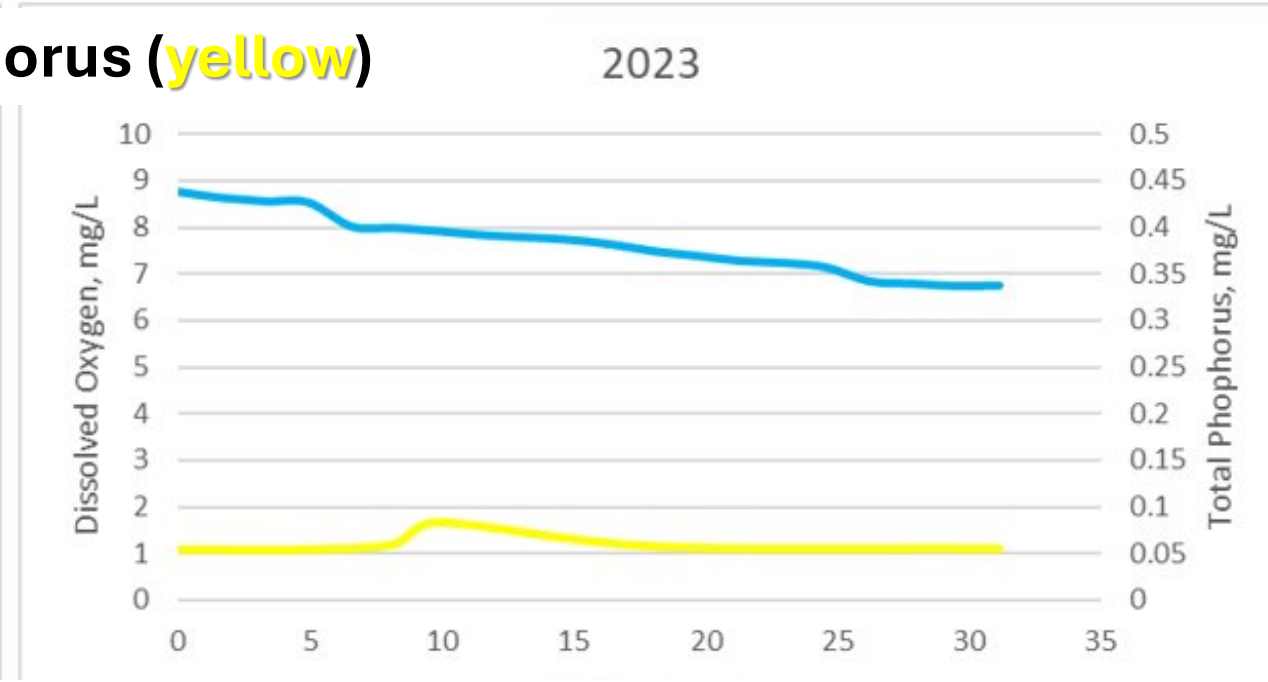
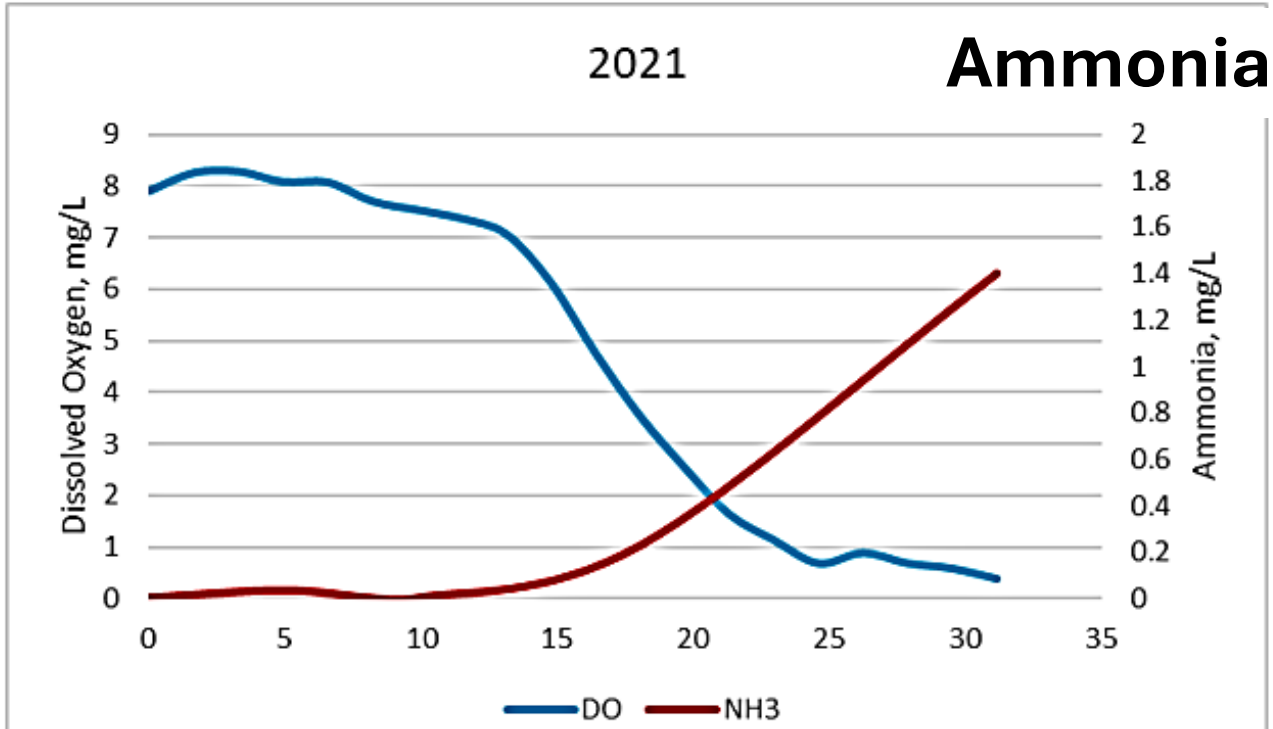
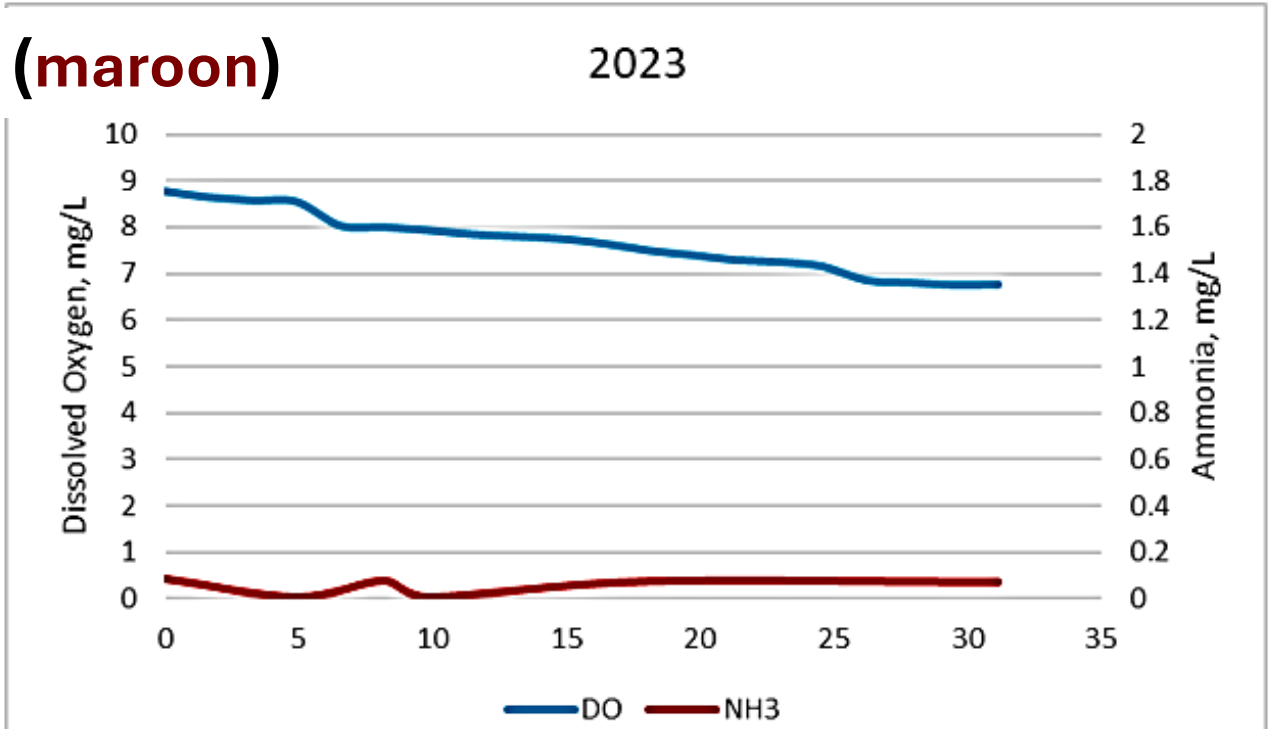
Total Phosphorus (yellow)

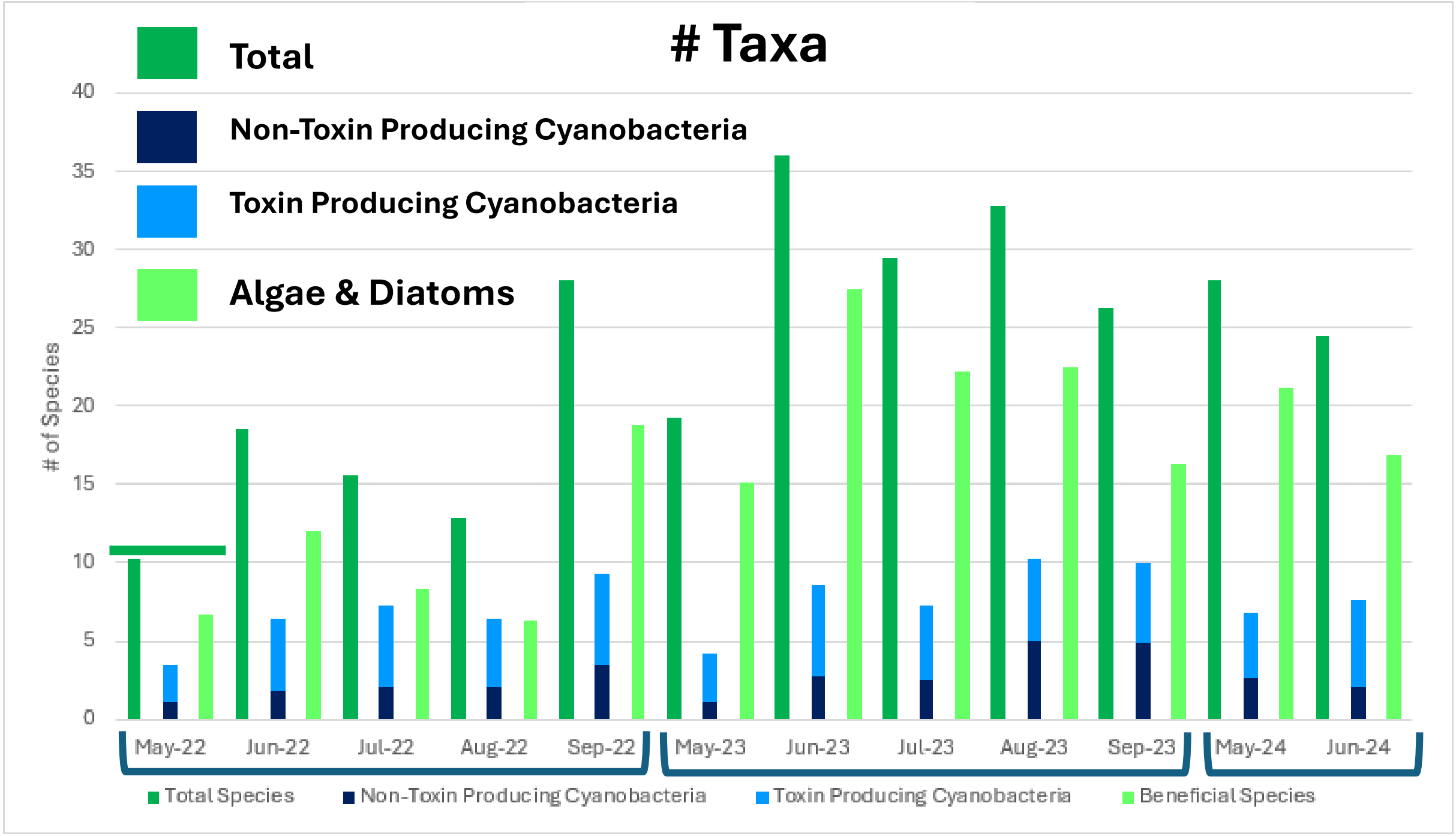


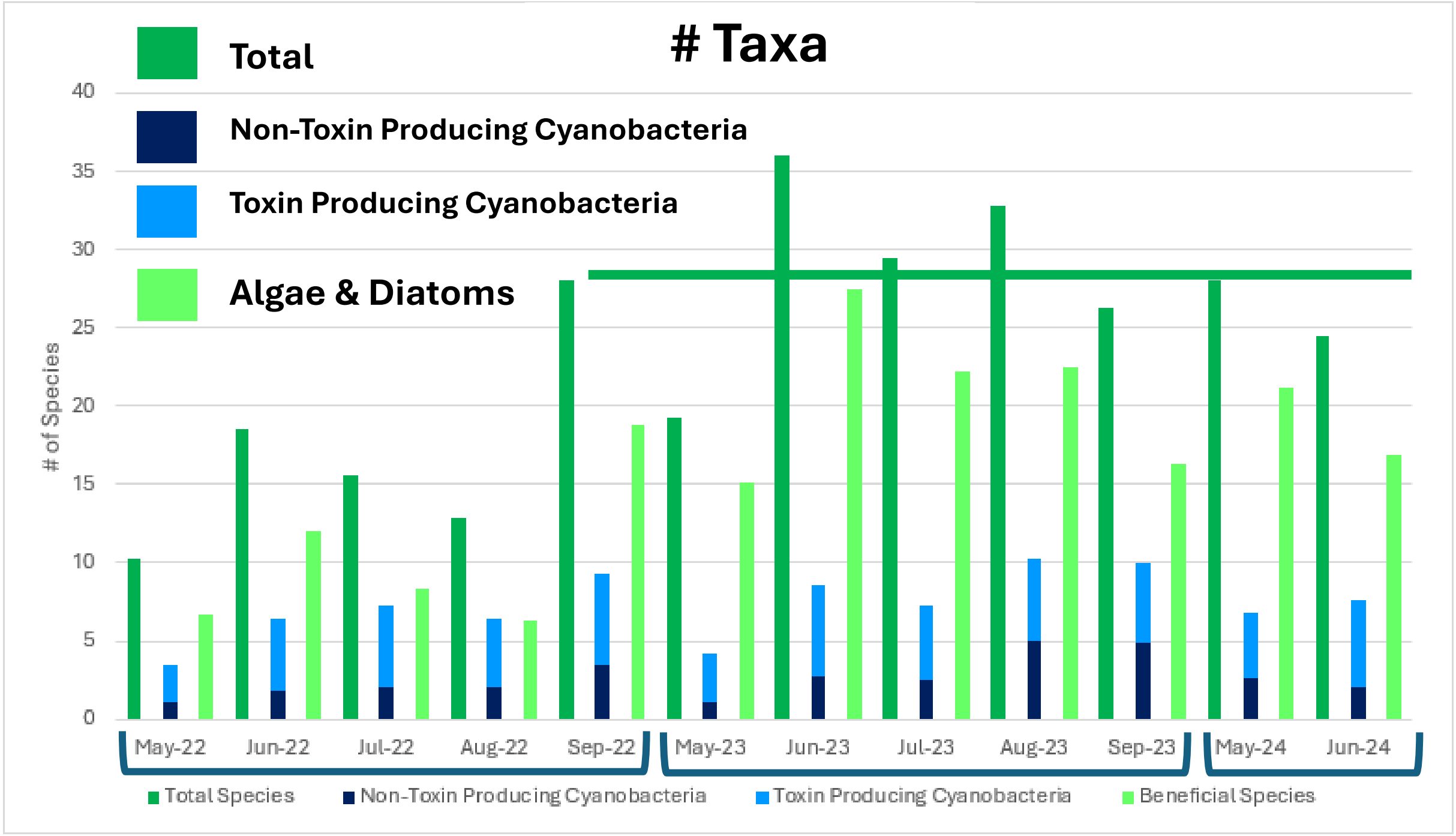


Ammonia (maroon)






Taxa
Total
Non-Toxin Producing Cyanobacteria
Toxin Producing Cyanobacteria
Algae & Diatoms
# of Species
40
35
30
25
20
15
10
5
0
May-22
Jun-22
Jul-22
Aug-22
Sep-22
May-23
Jun-23
Jul-23
Aug-23
Sep-23
May-24
Jun-24
Total Species
Non-Toxin Producing Cyanobacteria
Toxin Producing Cyanobacteria
Beneficial Species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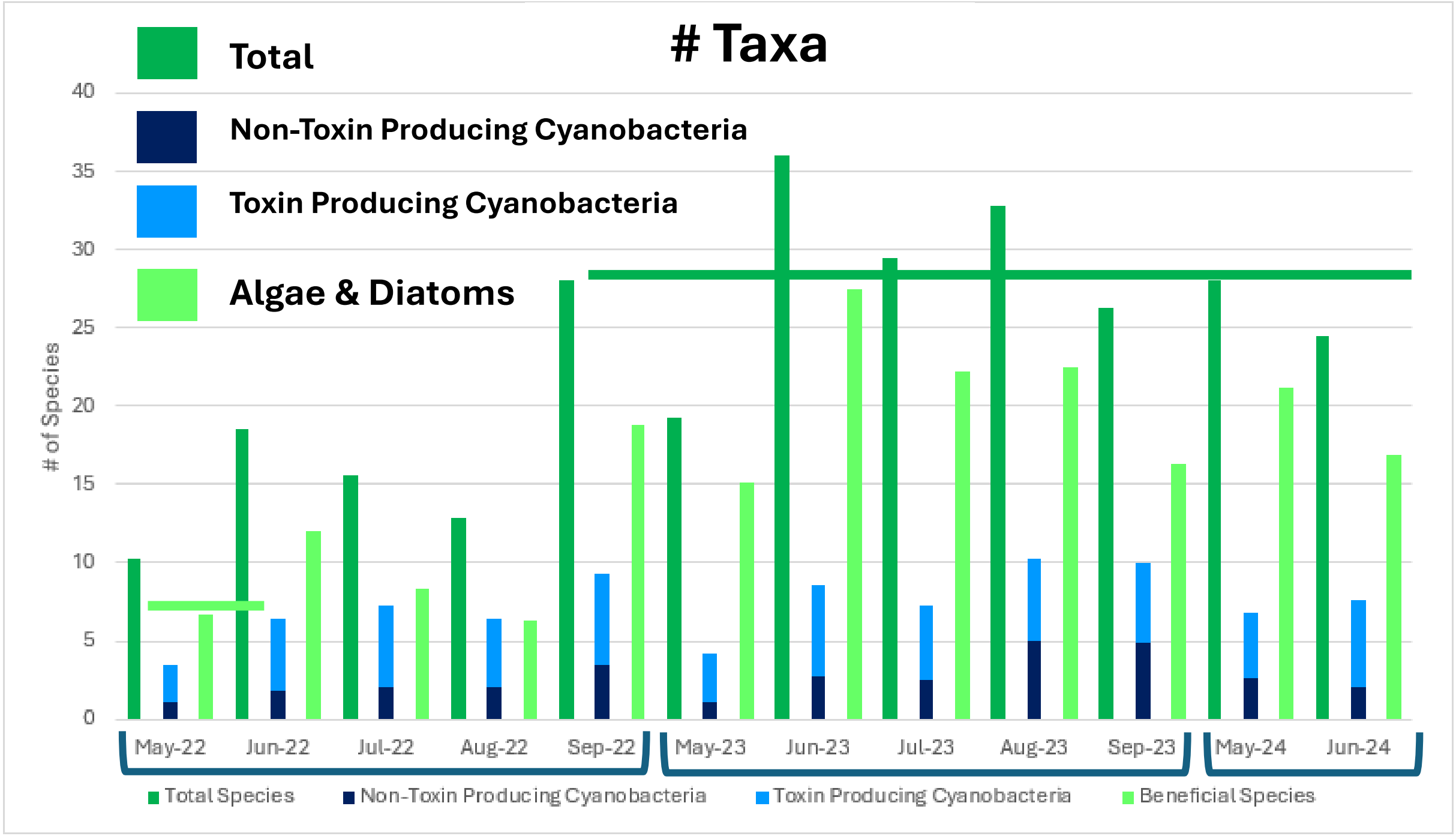
Toxin Producing Cyanobacteria
Beneficial Species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Sep-23
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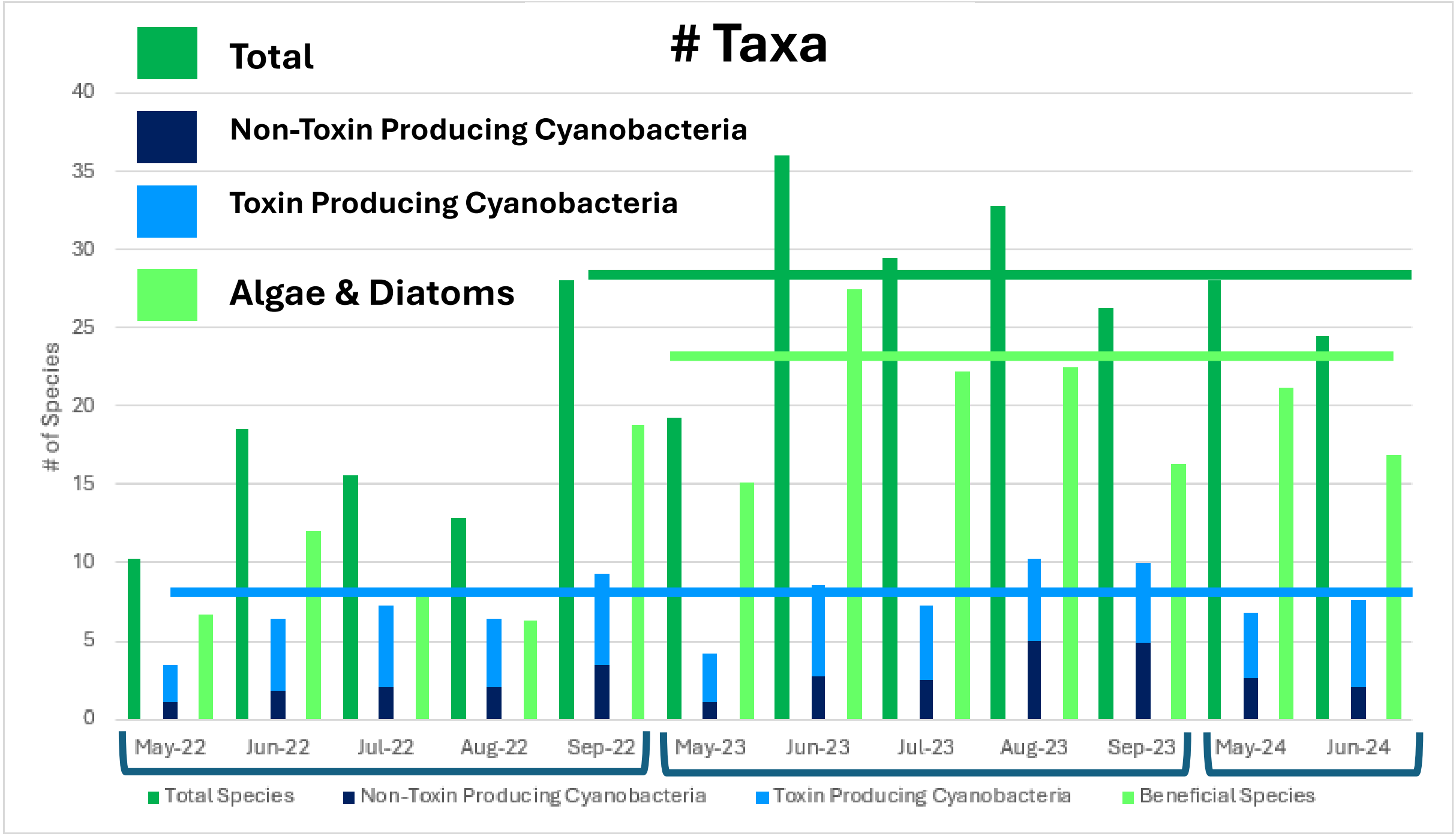
Taxa
Total
Non-Toxin Producing Cyanobacteria
Toxin Producing Cyanobacteria
Algae & Diatoms
# of Species
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30
25
20
15
10
5
0
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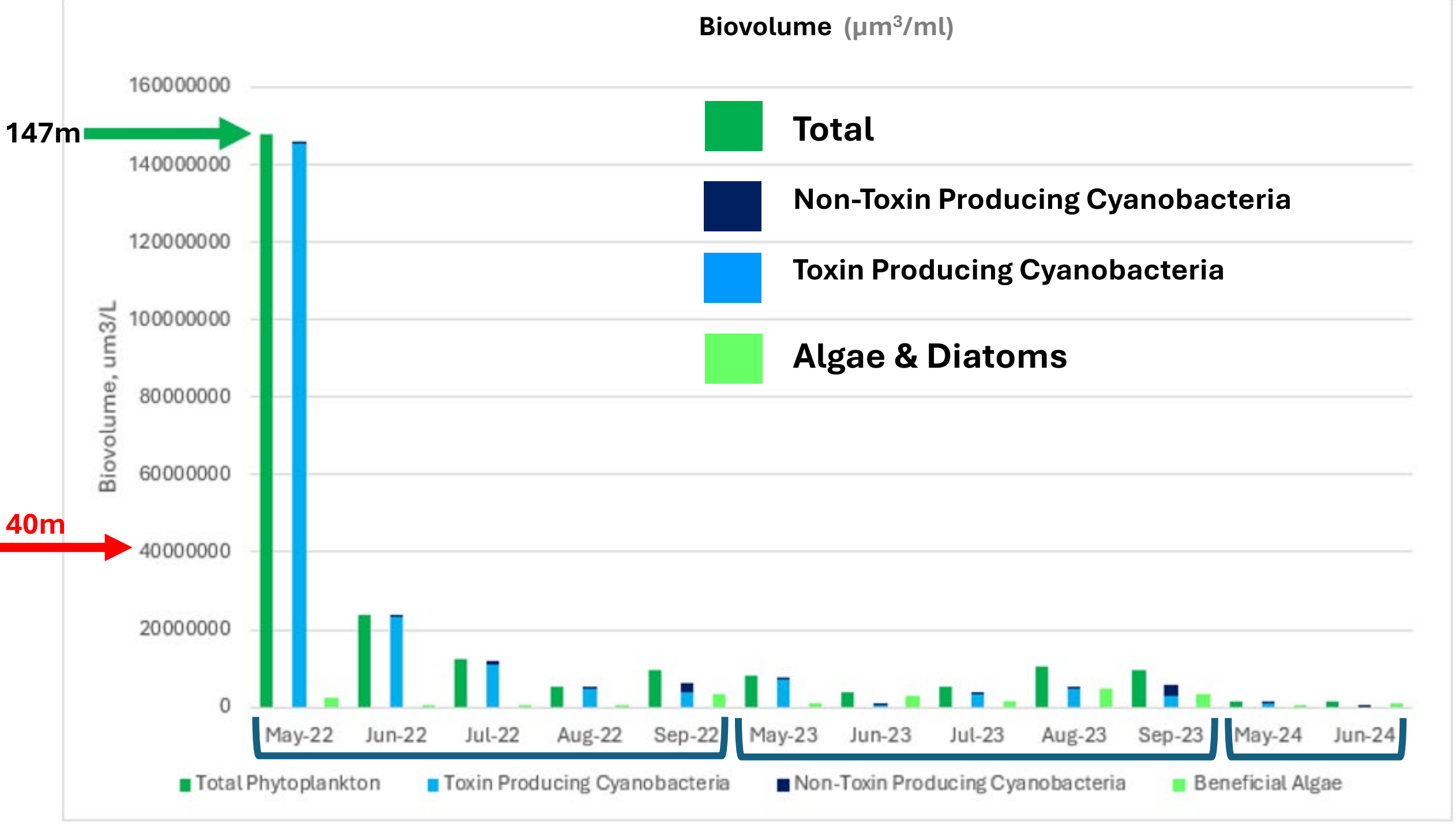
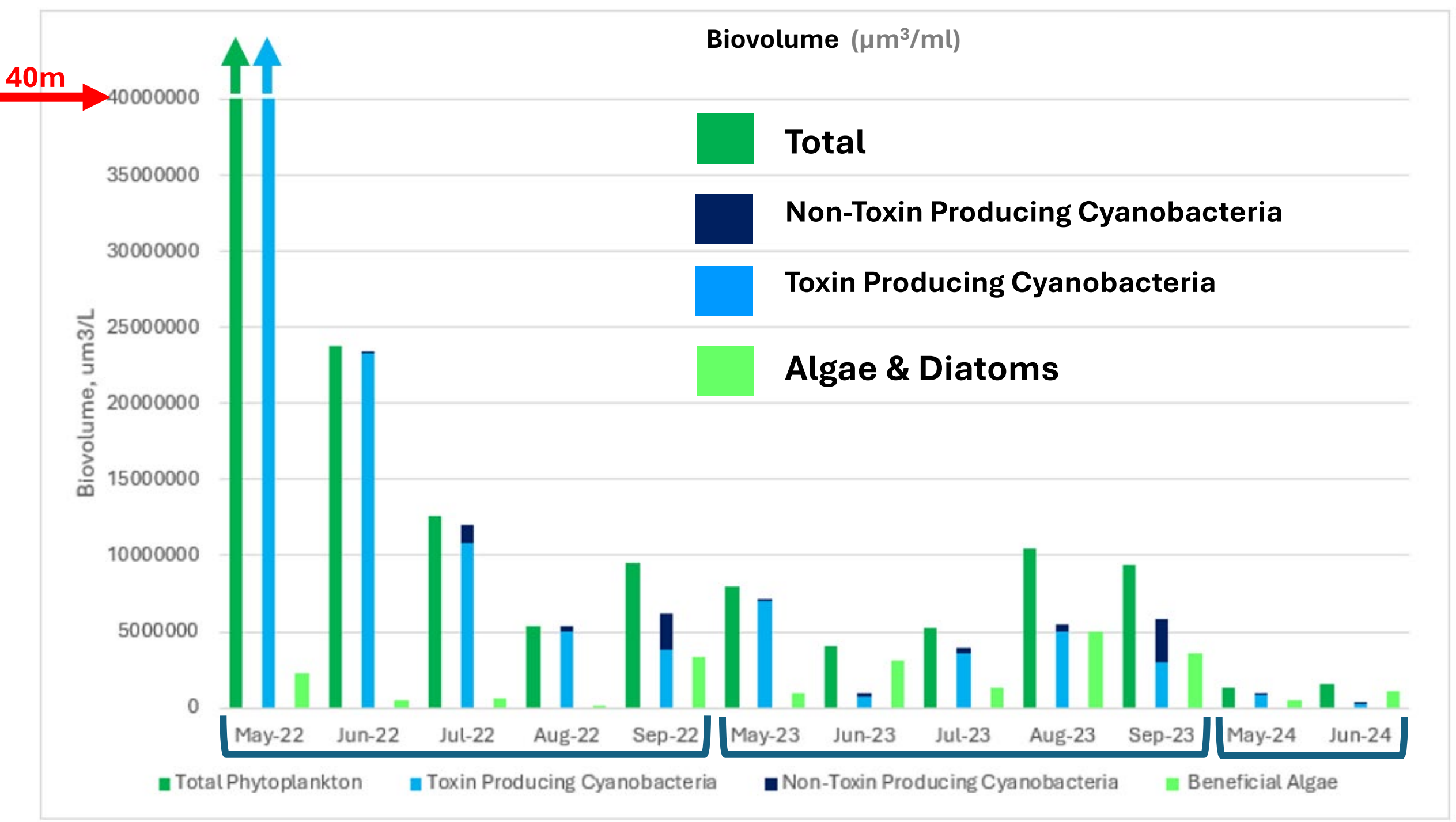
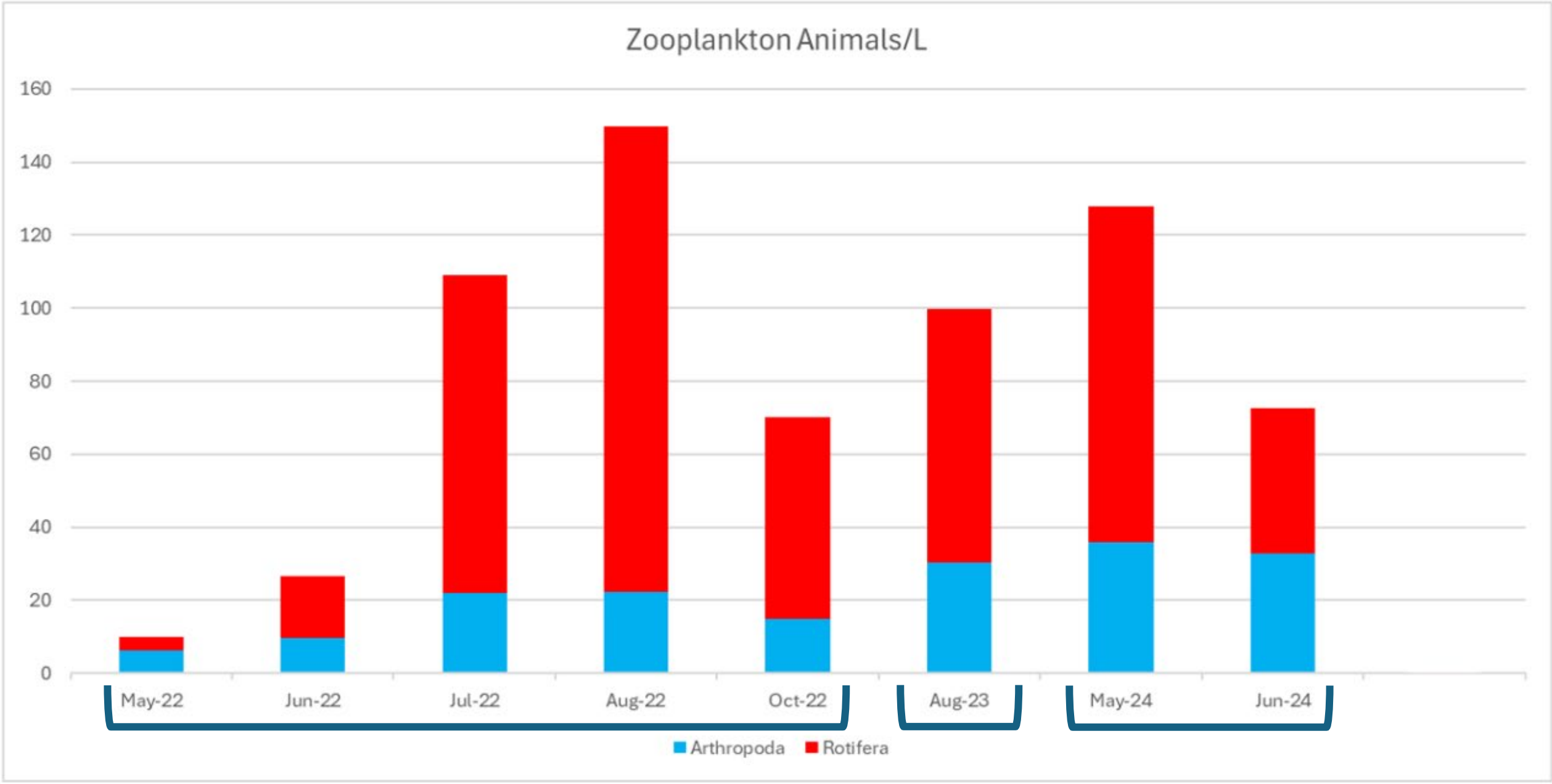
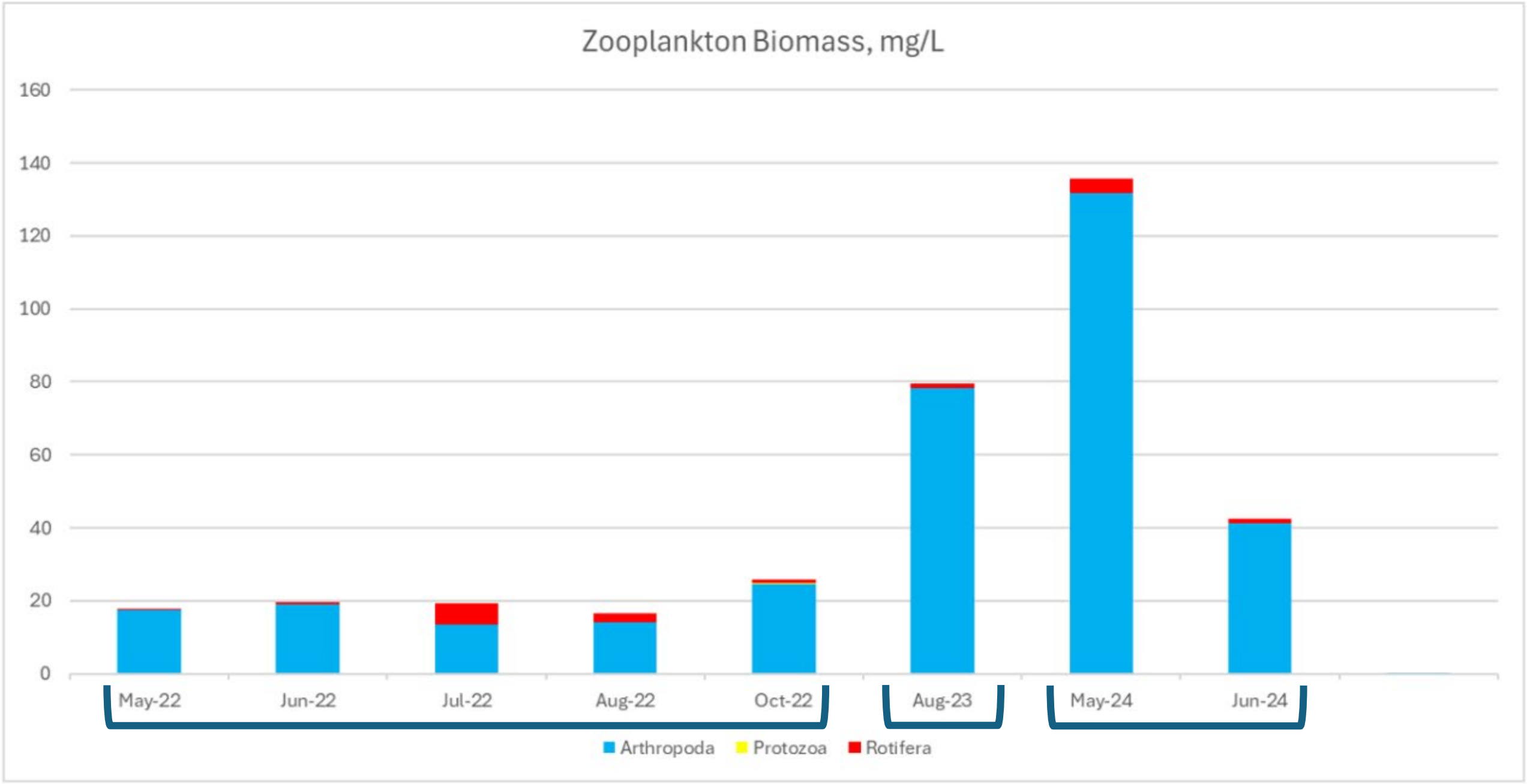
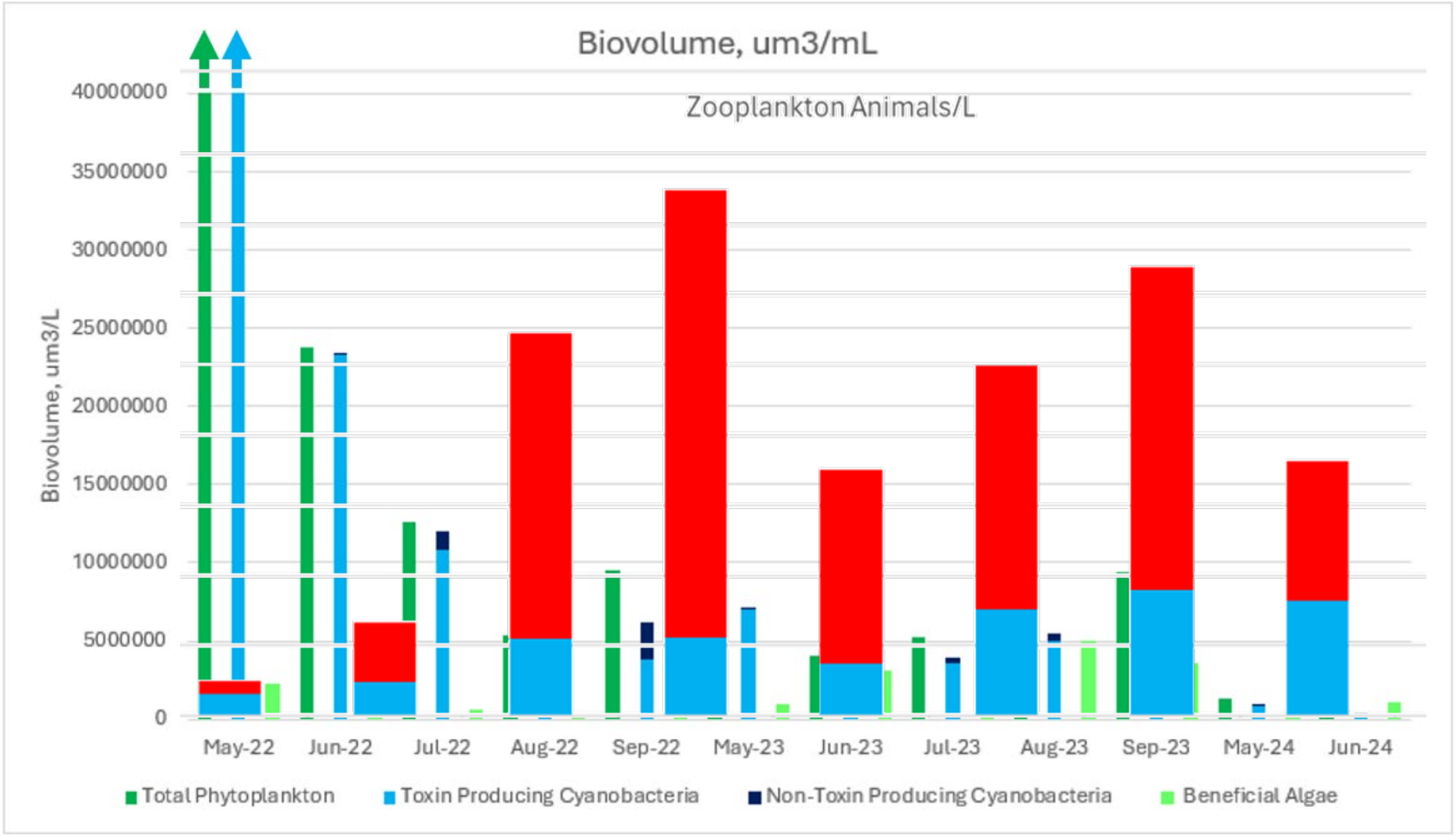
Jun-22
Jul-22
Aug-22
Sep-22
May-23
Jun-23
Jul-23
Aug-23
Sep-23
May-24
Jun-24
Total Species
Non-Toxin Producing Cyanobacteria
Toxin Producing Cyanobacteria
Beneficial Species


Biovolume (µm³/ml)
147m
40m
Total
Non-Toxin Producing Cyanobacteria
Toxin Producing Cyanobacteria
Algae & Diatoms
Biovolume, um3/L
160000000
140000000
120000000
100000000
80000000
60000000
40000000
20000000
0
May-22
Jun-22
Jul-22
Aug-22
Sep-22
May-23
Jun-23
Jul-23
Aug-23
Sep-23
May-24
Jun-24
Total Phytoplankton
Toxin Producing Cyanobacteria
Non-Toxin Producing Cyanobacteria
Beneficial Algae


Biovolume (µm³/ml)
40m
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
Biovolume, um3/L
Total
Non-Toxin Producing Cyanobacteria
Toxin Producing Cyanobacteria
Algae & Diatoms
May-22
Jun-22
Jul-22
Aug-22
Sep-22
May-23
Jun-23
Jul-23
Aug-23
Sep-23
May-24
Jun-24
Total Phytoplankton
Toxin Producing Cyanobacteria
Non-Toxin Producing Cyanobacteria
Beneficial Algae

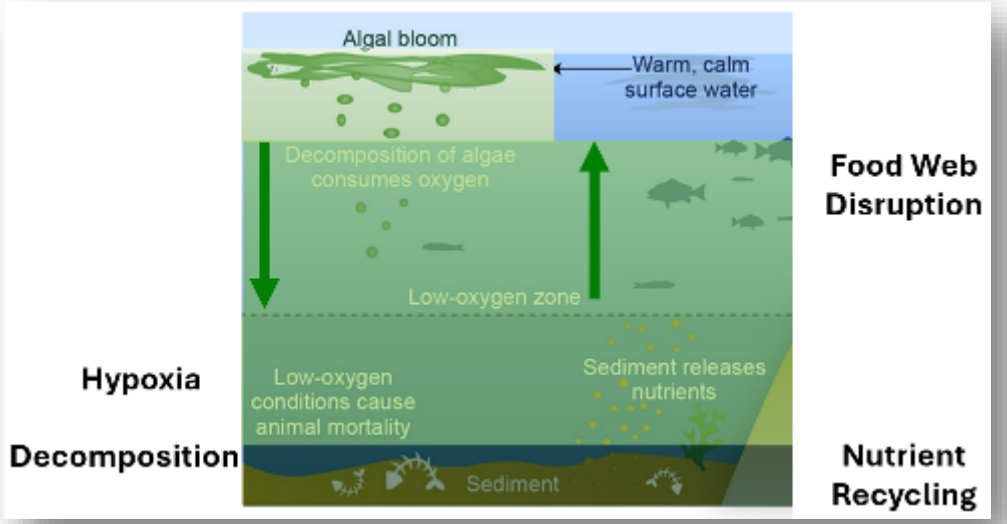

Zooplankton Animals/L
160
140
120
100
80
60
40
20
0
May-22
Jun-22
Jul-22
Aug-22
Oct-22
Aug-23
May-24
Jun-24
Arthropoda
Rotifera


Zooplankton Biomass, mg/L
160
140
120
100
80
60
40
20
0
May-22
Jun-22
Jul-22
Aug-22
Oct-22
Aug-23
May-24
Jun-24
Arthropoda
Protozoa
Rotifera


Biovolume, um3/mL
Zooplankton Animals/L
Biovolume, um3/L
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
May-22
Jun-22
Jul-22
Aug-22
Sep-22
May-23
Jun-23
Jul-23
Aug-23
Sep-23
May-24
Jun-24
Total Phytoplankton
Toxin Producing Cyanobacteria
Non-Toxin Producing Cyanobacteria
Beneficial Algae

To Prevent HABs:

1. Eliminate Hypoxia
2. Deplete sediment nutrient stockpiles
3. Restore phytoplankton balance – “beneficial algae”
4. Restore food web to restore nutrient clearance channels



Toa Vaca Reservoir – Puerto Rico

Toa Vaca Reservoir – Puerto Rico

Fish kills stopped

Fish populations restored

Pelicans were 5, now 28

Fish Eagles were 2, now 10

“Restore food web to restore nutrient clearance channels”

Bowling Green Reservoir, OH

Week 31: 2016 v 2017

(HAB Program commenced April 2017)

River 3rd Aug 2016

Total Phycological Count	**150,840**	
Diatoms	3,555	2%
Algae	44,538	30%
Cyanobacteria	102,747	68%

Reservoir 1st Aug 2016

Total Phycological Count	**123,950**	
Diatoms	6,636	5%
Algae	32,102	26%
Cyanobacteria	85,212	69%

River 31st Jul 2017

Total Phycological Count	**159,065**	
Diatoms	46,000	29%
Algae	45,745	29%
Cyanobacteria	67,320	42%

Reservoir 31st Jul 2017

Total Phycological Count	**41,645**	
Diatoms	21,800	52%
Algae	19,545	47%
Cyanobacteria	300	<1%

Summary:

1. Understand cyanobacteria's competitive advantages & adopt Systems Theory approach to managing biological ecosystems
2. Study the individual water body and design custom prevention & remediation program:
    1. **Eliminate Hypoxia**
    2. **Deplete sediment nutrient stockpiles**
    3. **Restore phytoplankton balance – "beneficial algae"**
    4. **Restore food web to restore nutrient clearance channels**
3. Biodegradable organic sediments are mostly generated within a lake and have increased over the last 100 years due to eutrophication. These sediments are susceptible to aerobic digestion. This is the principal method in thousands of activated sludge waste treatment plants which oxidize the mass of human organic waste to CO_2.
4. ***These multilevel methods have been successful in lakes nationally - Michigan, Pennsylvania, New York, NJ, Colorado, Virginia, Utah - and can be applied worldwide.***

Acknowledgement: Lake case study data - Dave Shackleton. www.SIS.BIO

Key References

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- ITRC. Strategies for Preventing and Managing Benthic Harmful Cyanobacterial Blooms (HCB-2). March 2022. https://hcb-2.itrcweb.org/
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- Toxic Cyanobacteria in Water: A Guide To Their Public Health Consequences, Monitoring and Management. 2nd Revised Edition. 2020 in press. World Health Organization
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- US Government Accountability Office, GAO-22-104449, "Water Quality: Agencies Should Take More Actions to Manage Risks from Harmful Algal Blooms and Hypoxia"
- **Cyanobacterial Harmful Algal Bloom (HAB) Freshwater Response 2023 Summary Report. https://dep.nj.gov/wp-content/uploads/bfbm/cyanohabs/2023annualhabreportfinal.pdf**

Wayne Carmichael
Prof. Emeritus
Wright State University
Dayton, OH
wayne.carmichael@wright.edu

SIS.BIO
Leading the Way to Renewable Water

Located just across the river from New Jersey in PA !

Lunch Break

Please be back by 1pm

Panelists

6th Annual Harmful Algal Bloom Summit

Trish Ingelido

Director

Division of Water Supply & Geoscience

Gabe Mahon

Manager

Bureau of NJPDES Stormwater Permitting

Debra Millikin

Business Administrator

Jefferson Township

Susan Bristol

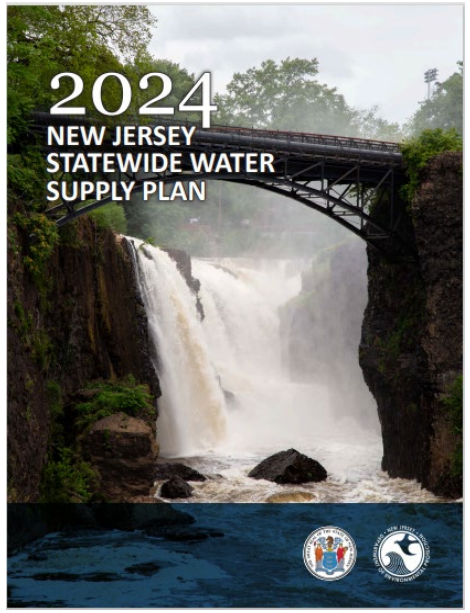
Municipal Policy Specialist

The Watershed Institue

Water Resource Management

Courtesy of NJ American

Courtesy of USEPA



Ensuring the Provision of Safe Drinking Water

- 2024 NJ Statewide Water Supply Plan outlines policy, regulatory, and statutory updates
- Addresses risk posed by climate change, and potential mitigation options
- Addresses emerging (PFAS, HABs) and legacy contaminants, and incorporates environmental justice considerations

Protecting and Enhancing NJ's Watersheds

- Clean Water Act - Safe Drinking Water Act Harmonization
- Revitalizing Source Water Protection Program
- Enhance funding opportunities for watershed restoration

The Watershed Institute

Mission

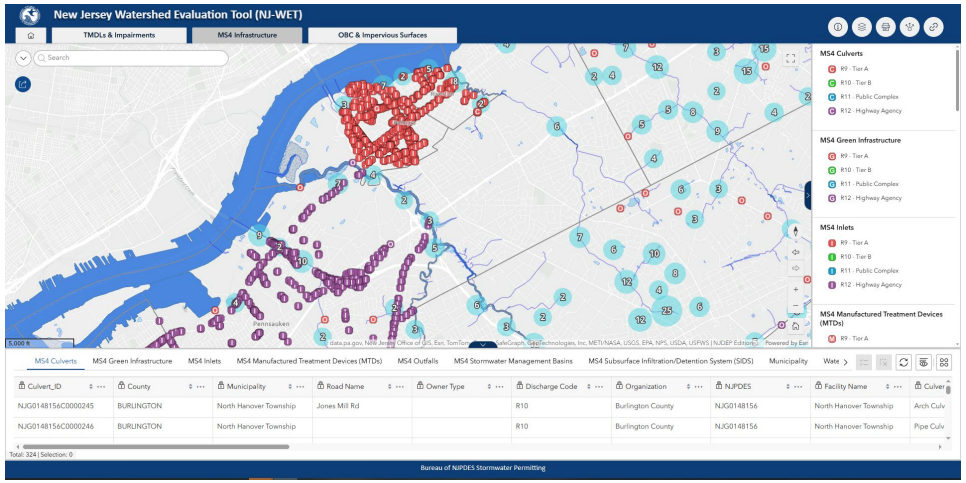
- Keeping water clean, safe and healthy
- We work to protect and restore our water and natural environment in central New Jersey through conservation, advocacy, science and education.

Regional Watershed Planning

- Identify issues across municipal boundaries
- More efficient to study entire watershed (less $, less time, better solutions)
- Identify regional solutions
- More effectively address EJ issues
- Coordinated efforts = less repeated work
- Avoid inconsistent plans among municipalities

Rules and Permits

https://dep.nj.gov/njreal/



https://dep.nj.gov/njpdes-stormwater/municipal-stormwater-regulation-program/watershed-improvement-plan-resource-page/

Resilient Environment and Landscapes (REAL)

- Accounting for Climate Change
- Water Quality for Redevelopment
- Volume Reduction

Municipal Separate Storm Sewer Permitting (MS4)

- MS4 Infrastructure Mapping
- Watershed Improvement Plans
- Funding – SW Utilities and Grants

Jefferson Township

Lake Hopatcong 2019 Harmful Algal Bloom

- Spring was very wet in 2019, and the summer was dry and very hot
- HAB started right before July 4th weekend, the closing of swimming had a major economic impact on Lake Hopatcong

Sewers Around Lake Hopatcong

- Roxbury, Mount Arlington, and Hopatcong have sewer systems in place, while Jefferson has no sewers

Funding of Jefferson Sewer Project

- In 2023, Congress appropriated $750,000 to design this sewer project
- Jefferson has partnered with the Army Corp of Engineers for the design work

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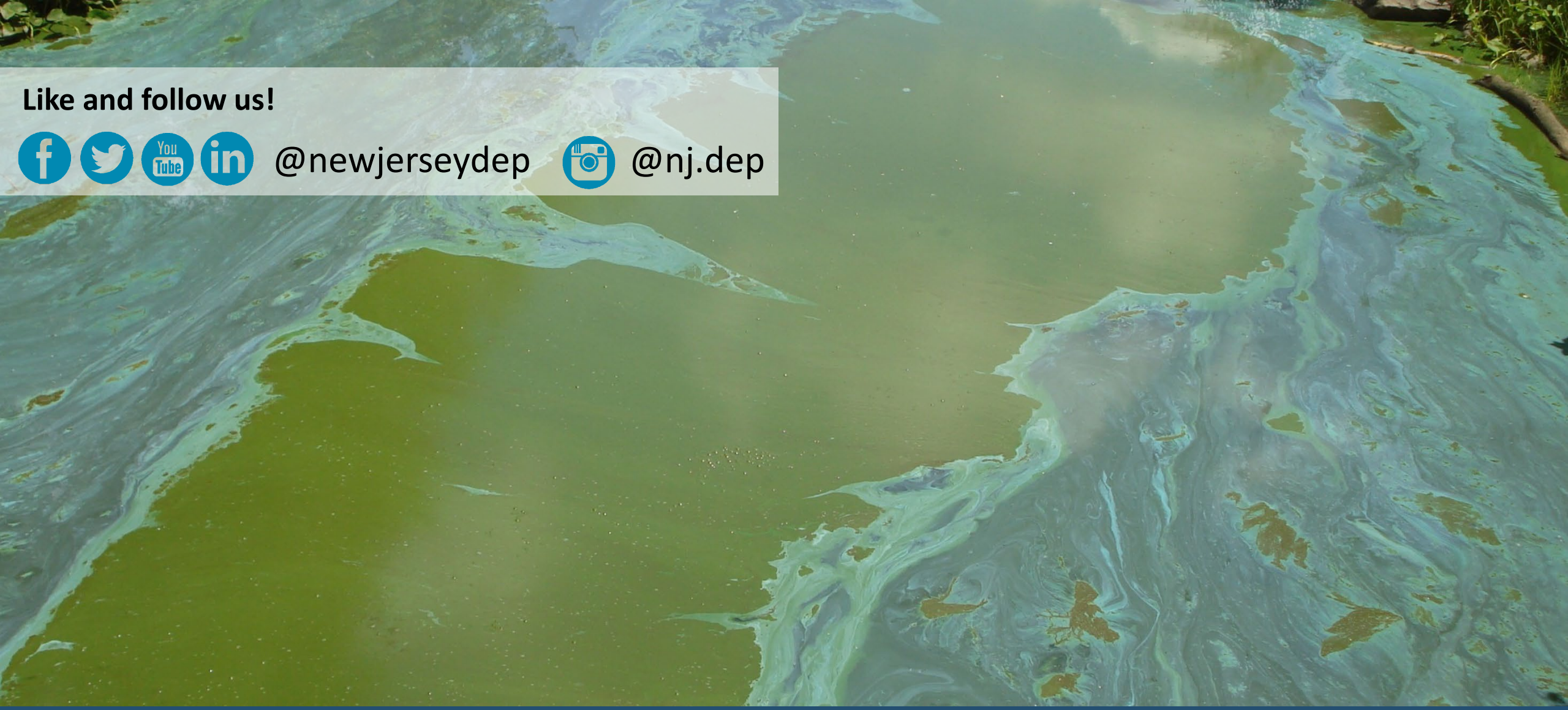


Like and follow us!

@newjerseydep @nj.dep

Thank you!

Chief Strategy Officer Kati Angarone

HAB Threats to Drinking Water - Two Case Studies

How emergent threats led to proactive and collaborative response

April 9, 2025

Agenda

Event Overview

- Millstone River 2022
  - Significance
  - Risk Evaluation
  - Emergent Actions
- Cozy Lake 2023
  - Significance
  - Risk Evaluation
  - Emergent Actions

Event Comparison

After Actions


08:21
Millstone River HAB 2022
Photo Credit: New Jersey American Water Company

The 2022 Millstone HAB

- 9 miles long
- On a “moving” water body
- 12th Highest Level of Microcystin Toxin
- 8th Highest Cell Count
- Upstream of a drinking water intake for a system that serves approximately 800,000 people.

Initial Source Water Data From the River
(flows south to north)

Site Location	Microcystins (µg/l)
Blackwell Mills	**32.98**
Griggstown	**417.00**
Rt 518	**50.20**
Carnegie Faculty dock	**6.64**

EPA's Health Advisory (based on short term – 10-day ingestion) for Microcystin for finished drinking water - for children under 6

EPA Health Advisory	
Reference Dose (µg/kg/day)	**Health Advisory (µg/L)**
0.05	**0.3**

This would result in a
DO NOT DRINK

HIGH RISK SITUATION

Emergent Actions

New Jersey Water Supply Authority Releases Water Upstream

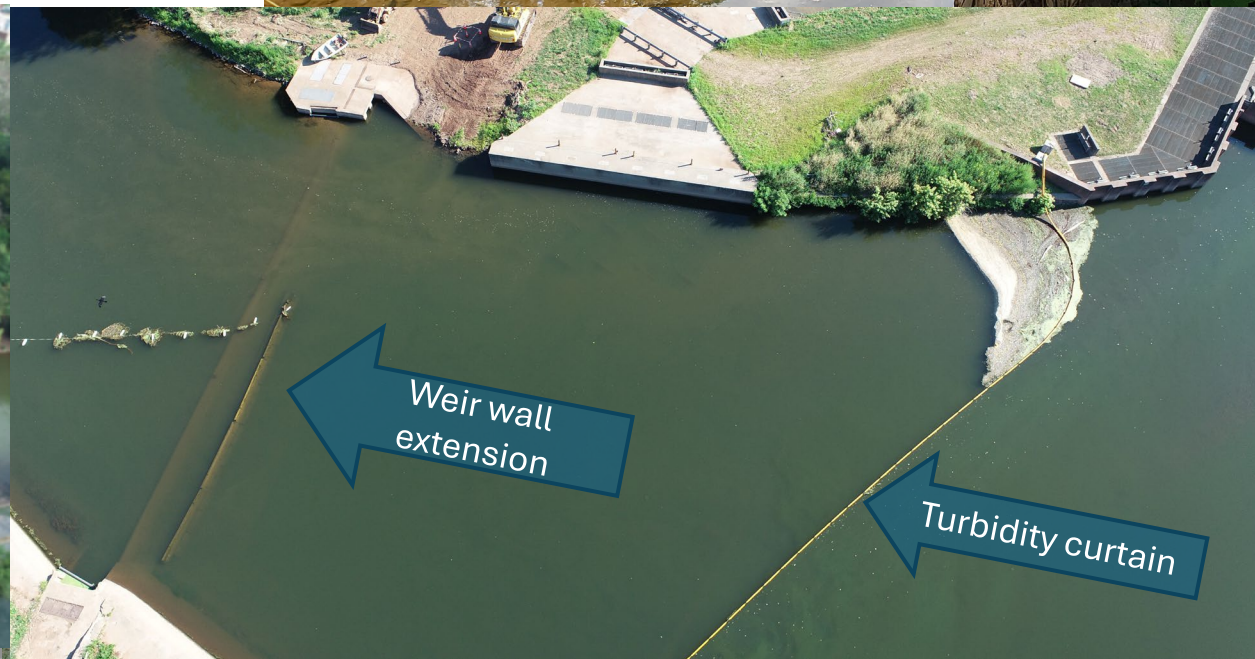
- Increase Flow and Velocity
- They Released 5 Billion Gallons of Water

New Jersey American Installs Engineering Controls

- Increase Velocity of River - Weir wall extension
- Physical Barrier – Turbidity Curtain

NJDEP Contracted Pilot - Toxin/Cell Destruction/Treatment

- Eget Liber – remotely operated vehicle deployment



Cozy Lake HAB 2023

2023 Cozy Lake HAB

What DEP Knew After Initial Response

- All Four Cyantoxins Measured Were Present
- Highest Level of Microcystin Ever Recorded 1266.80 µg/L
- Potential Drinking Water Risk

After Well Records Review

- Unknown Number of Wells
- Improperly Constructed Wells Along the Lake
- Limited Regulatory Authority for Drinking Water

Private Well Sampling Data – Wells With Detections

Home	Location	Level of Microcystin Detected (µg/L)
1	Well (pre-treatment or no treatment)	0.03
	Well (post treatment)	No sample taken
2	Well (pre-treatment or no treatment)	0.03
	Well (post treatment)	0.02
3	Well (pre-treatment or no treatment)	Non-detect
	Well (post treatment)	0.02
4	Well (pre-treatment or no treatment)	0.1
	Well (post treatment)	0.05
5	Well (pre-treatment or no treatment)	0.02
	Well (post treatment)	No Sample
6	Well (pre-treatment or no treatment)	Non-Detect
	Well (post treatment)	0.02
7	Well (pre-treatment or no treatment)	Non-detect
	Well (post treatment)	0.02
8	Well (pre-treatment or no treatment)	Non-Detect
	Well (post treatment)	0.02
9	Well (pre-treatment or no treatment)	0.02
	Well (post treatment)	0.02
10	Well (pre-treatment or no treatment)	Non-detect
	Well (post treatment)	0.02
11	Well (pre-treatment or no treatment)	0.04
	Well (post treatment)	Non-Detect
12	Well (pre-treatment or no treatment)	0.02
	Well (post treatment)	Non-Detect

EPA's Health Advisory (based on short term – 10-day ingestion) for Microcystin for finished drinking water - for children under 6

EPA Health Advisory	
Reference Dose (µg/kg/day)	**Health Advisory (µg/L)**
0.05	**0.3**

HIGH RISK SITUATION

Emergent Actions

Homeowner Result Notification

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

8.3.2023

Notice of Cyanobacterial/Cyanotoxin Testing Results

[redacted]

Thank you for your assistance in sampling your private well for cyanobacterial cells and cyanotoxins. New Jersey Department of Environmental Protection (NJDEP) and the Jefferson Township Health Department have been working together to more accurately identify the risk that may be associated with the wells along Cozy Lake. The NJDEP and the Health Department appreciate your participation. As part of this process, sample(s) have been collected on July 25, 2023, from your home 108 Wildwood Road, Jefferson Township, NJ.

The following table shows the results of the water samples that were collected at your property during the week of July 23, 2023.

Sampling Results					
Location	**Microcystin Concentration Exceeds Drinking Water Level Guidance Y/N**	**Level of Microcystin Detected (µg/L)**	**EPA's Drinking Water Health Advisory Level (ug/L)**	**Laboratory Reporting Level (µg/L)**	**Laboratory Method Detection Level (µg/L)**
Well (pre-treatment or no treatment)	N	0.03	0.3	0.05	0.016
Well (post treatment)	N	No sample taken	0.3	0.05	0.016

Findings Based on Sampling:

Your well had a detection of cyanotoxins, but the level was below EPA's Health Advisory. Because cyanotoxins are present in your well water, it is likely that your well is under the direct influence of lake water (i.e., pulling water from the lake) and is at risk. Although samples were only collected for cyanotoxin analysis, if your well is pulling lake water, it is also susceptible to other contaminants in the lake that were not specifically investigated during this sampling event. Septic fields or cesspools on your property may also pose a risk of contamination to private wells. Microorganisms (e.g., bacteria and viruses) may exist naturally or be introduced to the lake by stormwater runoff or failing septic and/or cesspool systems. These sources of contamination can also contribute to the growth of cyanobacteria and algae in the lake.

General Community Notification

DRINKING WATER ADVISORY

CYANOTOXINS HAVE BEEN DETECTED IN COZY LAKE

IF YOU HAVE AN OLDER SHALLOW OR POORLY CONSTRUCTED WELL* IN CLOSE PROXIMITY TO COZY LAKE, OR DRAW YOUR WATER DIRECTLY FROM COZY LAKE - IT IS RECOMMENDED THAT YOU DO NOT DRINK THE TAP WATER OUT OF AN ABUNDANCE OF CAUTION

You may be at risk if your well:

- Was constructed prior to 1996 (prior to current protective construction standards)
- Is a hand-dug well composed from brick, stone or concrete rings
- Has significantly lower water levels or dries up when nearby lake levels decline

Date Distributed 07/22/2023

Microcystin, a toxin produced by cyanobacteria, was detected at Cozy Lake. DEP is working to determine potential impact of the lake water to private wells along the lake. Samples collected 07/05/2023 at Cozy Lake show Microcystin in the drinking water supplied by the lake at 1268 µg/L, which are above the Environmental Protection Agency's microcystin health advisory 1.6 µg/L for individuals greater than 6 years old and 0.3 µg/L for children 6 years old and

Saxitoxin, another toxin produced by cyanobacteria, was found at 0.85 µg/L, which is New Jersey Department of Environmental Protection (NJDEP) Division of Science a (DSR) guidance value of 0.11 µg/L for individuals greater than 6 years old and 0.02 children 6 years old and younger.

Anatoxin-a, another toxin produced by cyanobacteria, was found at 1.11 µg/L NJDEP DSR guidance value of 0.7 µg/L for children 6 years old and younger NJDEP DSR guidance value of 3.3 µg/L for individuals greater than 6 years

Cylindrospermopsin, another toxin produced by cyanobacteria, was detected above the NJDEP DSR guidance value levels of 0.2 µg/L for children 6 year for individuals greater than 6 years old.

WHY IS THERE AN ADVISORY?

- Cyanobacterial Harmful Algal Blooms (cyanoHAB) is the name given to excessive growth of cyanobacteria (known as blue-green algae) which occurs under suitable conditions (light, temperature, nutrients, etc.). The cyanobacteria can produce highly potent toxins, known as cyanotoxins, which can cause adverse health effects consumed.
- The US Environmental Protection Agency (EPA) has developed health advisory levels for microcystin and cylindrospermopsin that, if exceeded, are considered not safe for consumption. The NJDEP DSR drafted guidance values for microcystin, saxitoxin, anatoxin-a, and cylindrospermopsin that, if exceeded, are considered not safe for consumption.
- Cozy Lake in Jefferson Township is currently experiencing a severe HAB (all 4 cyanotoxins present with microcystin toxins that was confirmed on July 7, 2023, subsequently, in accordance with the Cyanobacterial Harmful Algal Bloom Freshwater Recreational Response Strategy, a recreational warning was issued. The Jefferson Township Health Department was contacted on July 7, 2023, and warning signs were posted along the lake. Samples were collected

*Water Quality Concerns for Lakefront Communities: https://www.state.nj.us/dep/hab/download/HAB_Lakes_Factsheet.pdf

Water Quality Concerns for Lakefront Communities

Sources of Contamination

Microorganisms may exist naturally or be introduced to surface waterbodies by stormwater runoff or septic systems. These sources of contamination can also feed microorganisms and result in an overgrowth (i.e. harmful algal blooms). Some examples of waterborne microorganisms are:

- ***E. coli***
- ***Cryptosporidium* and *Giardia* Parasites**
- **Viruses (Adenovirus)**
- **Cyanobacteria/Harmful Algal Blooms (HAB)**

HABs can overgrow in nutrient rich environments. Signs of overgrowth may include a blue-green or green discoloration to the water or a "spilled paint" or "pea soup" like consistency on the surface.

Harmful Algal Bloom

Surface Water

Untreated surface water should never be used for any potable use, showering, handwashing, dishwashing, drinking, or preparing food, especially for infants or children. Even with various types of home treatment some risks remain. While water may often appear to be "clean," one drop of water can contain thousands of microorganisms, some of which could be potentially dangerous or make you ill.

Poorly Constructed Wells

An older shallow or poorly constructed well located near a water body may be at higher risk because it is connected to surface water through the groundwater. Wells with inadequate casing length, or casing and grout deterioration are also at higher risk to contamination from septic tank leaching or other contaminants. **Make sure your well has been properly installed, maintained, and is undergoing routine testing.** You may be at risk if your well:

- Was constructed prior to 1996 (prior to current protective construction standards)
- Is a hand-dug well composed from brick, stone, or concrete rings.
- Has significantly lower water levels or dries up when nearby surface water levels decline.

Hand-dug Well

NEVER USE UNTREATED SURFACE WATER FROM THESE SOURCES

- **Identify** your water source.
- **Test** for possible contamination.
- **Seek an alternate water source**, if needed.

HABs: If you suspect a HAB, call 1-877-WARNDEP. *Boiling untreated HAB waters will not remove the toxin and may worsen the contamination.*

Source Water Treatment

Millstone HAB

River

Public Water Threat

DEP Regulated

800,000 people

No Impact to Tap Water

Point & Non-Point Nutrient Cause

Recreational Threat

Severe HAB

Drinking Water Threat

Interim Treatment

Significant Risk Averted due to Collaboration

Cozy Lake HAB

Lake

Private Well Threat

Local HD Regulated

~200 people

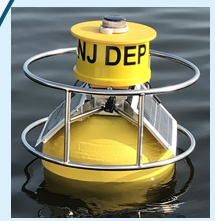
Impact to Tap Water

Non-Point Nutrient Cause

Millstone HAB After Action

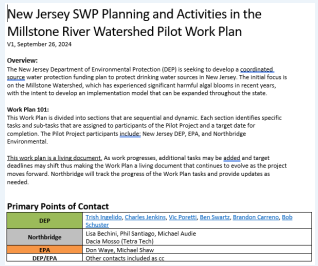
Cozy Lake HAB After Action

Collaboration with Partners



Continued Monitoring

Data Sharing



New Jersey SWP Planning and Activities in the Millstone River Watershed Pilot Work Plan

V1, September 26, 2024

Overview:

The New Jersey Department of Environmental Protection (DEP) is seeking to develop a coordinated source water protection funding plan to protect drinking water sources in New Jersey. The initial focus is on the Millstone Watershed, which has experienced significant harmful algal blooms in recent years, with the intent to develop an implementation model that can be expanded throughout the state.

Work Plan 101:

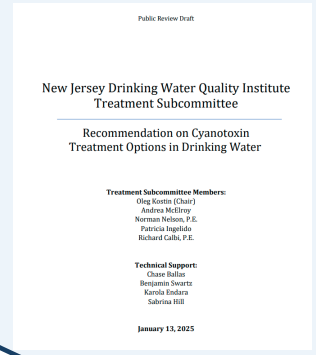
This Work Plan is divided into sections that are sequential and dynamic. Each section identifies specific tasks and sub-tasks that are assigned to participants of the Pilot Project and a target date for completion. The Pilot Project participants include: New Jersey DEP, EPA, and Northbridge Environmental.

This work plan is a living document. As work progresses, additional tasks may be added and target deadlines may shift thus making the Work Plan a living document that continues to evolve as the project moves forward. Northbridge will track the progress of the Work Plan tasks and provide updates as needed.

Primary Points of Contact

DEP	Trish Ingelido, Charles Jenkins, Vic Poretti, Ben Swartz, Brandon Carreno, Bob Schuster
Northbridge	Lisa Bechini, Phil Santiago, Michael Audie
	Dacia Mosso (Tetra Tech)
EPA	Don Weyer, Michael Shavi
DEP/EPA	Other contacts included as cc

Long-Term Planning & Prevention



Public Review Draft

New Jersey Drinking Water Quality Institute
Treatment Subcommittee

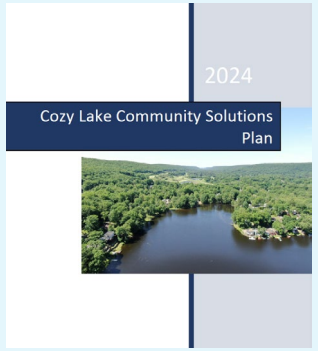
Recommendation on Cyanotoxin
Treatment Options in Drinking Water

Treatment Subcommittee Members:
Oleg Kostin (Chair)
Andrea McElroy
Norman Nelson, P.E.
Patricia Ingelido
Richard Calbi, P.E.

Technical Support:
Chase Ballas
Benjamin Swartz
Karola Endara
Sabrina Hill

January 13, 2025

Policy Making



Contact

Chelsea Brook

Executive Assistant for Policy

Water Resource Management

Chelsea.Brook@dep.nj.gov

Additional Resources

NJDEP HAB Website

HABs in Drinking Water

Water Quality Concerns for Lakefront Communities

CyanoHABs & Drinking Water Fact Sheet

Drinking Water Quality Institute

Like & follow us!

@DEPWRM

@njwatermonitoringandstandards

Lake Ketchum Restoration: 10 Years of Success Preventing HABs & Restoring Lake Health

Shannon Brattebo, PE

Marisa Burghdoff

Jen Oden

TETRA TECH

SNOHOMISH COUNTY
Conservation & Natural Resources

Surface Water Management

April 9th, 2025

NJDEP's 2025 Virtual HAB Summit

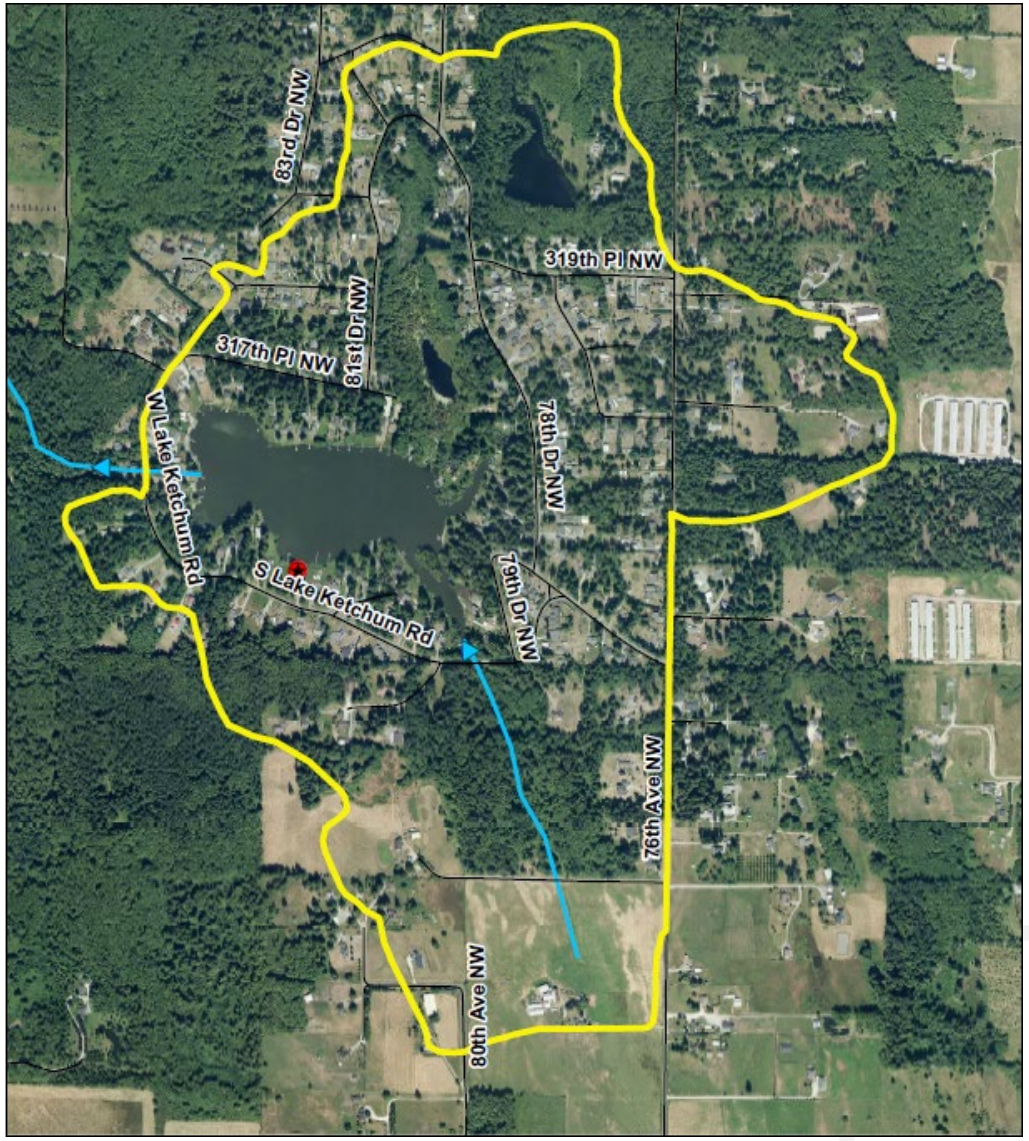
Kicking the HAB-it Together:
Collaborating to Get Ahead of HABs

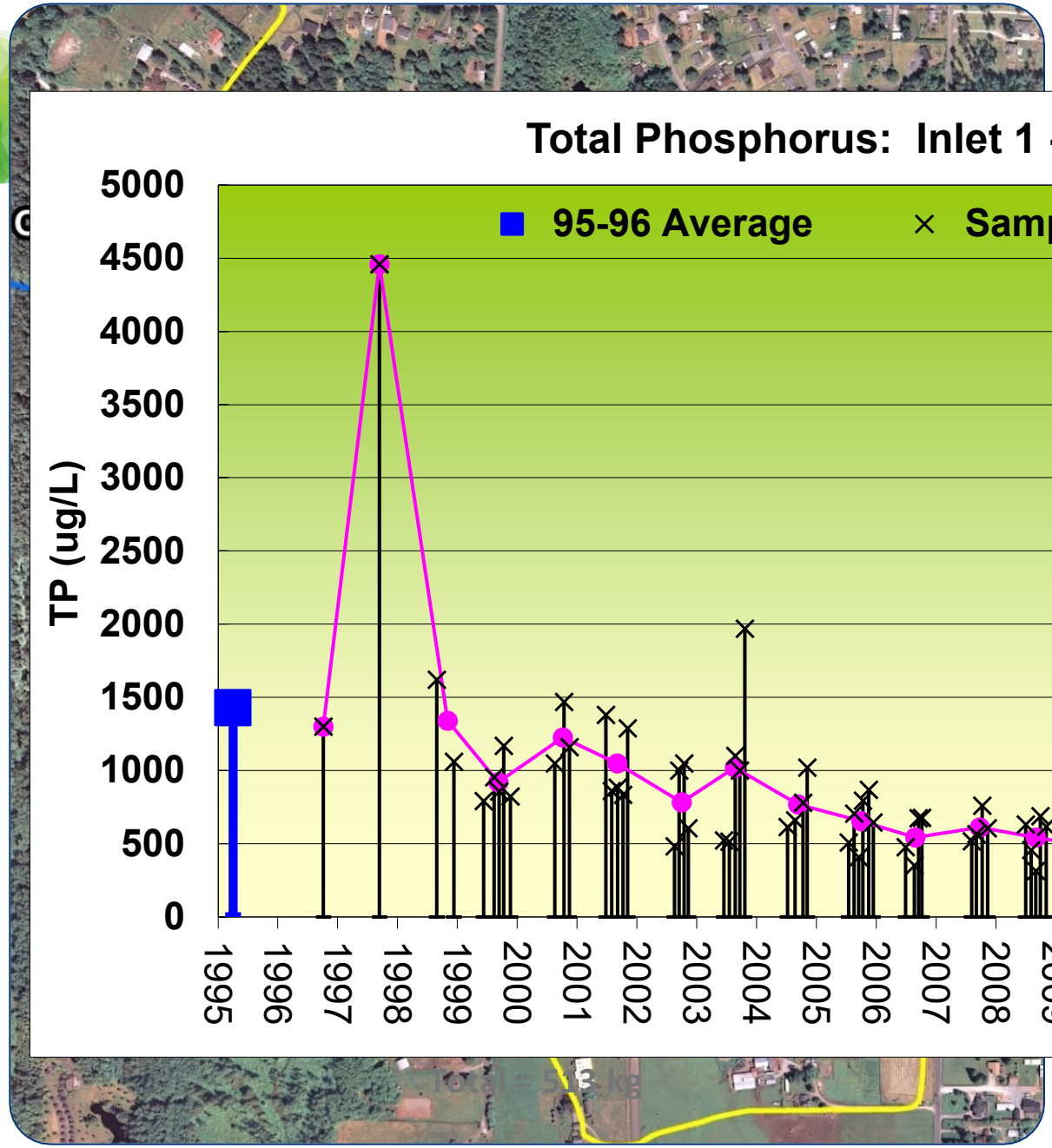
A Restoration Story…

SNOHOMISH COUNTY Conservation & Natural Resources | Surface Water Management | TETRA TECH

Background

- Small, 26 acres, lake in northwest Snohomish County
- Relatively shallow, max depth = 6.4 m, mean depth = 3.7 m
- Strongly stratified in the summer, May to September/October
- Low DO – Anoxic Hypolimnion
- Most eutrophic lake in Snohomish County, most likely in the region
- Plagued by toxic blooms of cyanobacteria
  - 2000, 2005, 2006, 2008-2013





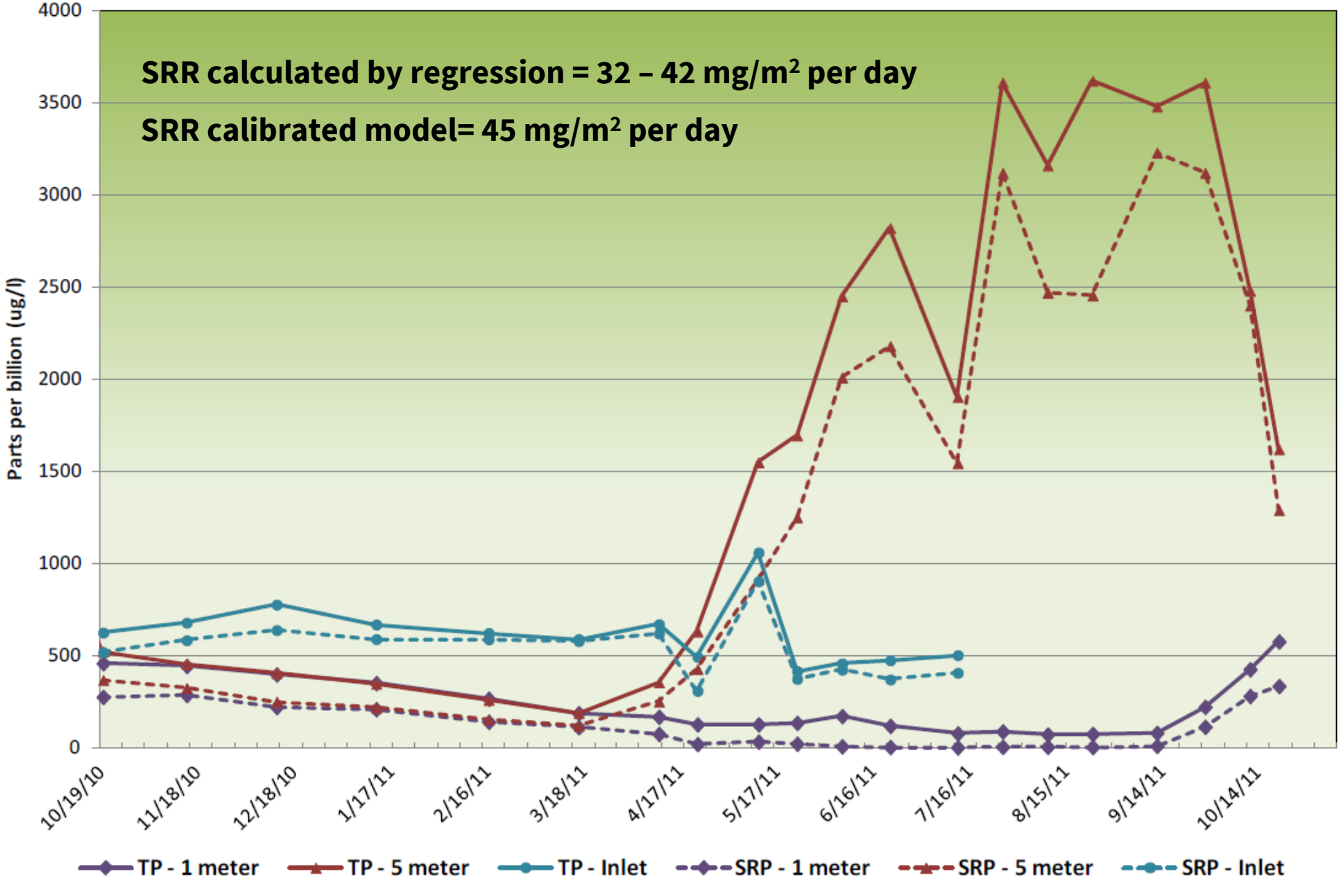
Total Phosphorus: Inlet 1 -- stream as it enters the lake

Total = 5[illegible] kg

the lake bottom sediments

Lake Ketchum Phosphorus Levels

October 2010 - October 2011



TETRA TECH

SNOHOMISH COUNTY Conservation & Natural Resources | Surface Water Management

Ketchum Algae Control Plan Goals

Surface Water Management

- Reduce total phosphorus (TP) by 85%
- Decrease epilimnetic TP to 40 µg/L (summer average)
- Reduce algae blooms and toxic algae

The Plan

ELEMENTS OF RECOMMENDED ALGAE CONTROL PLAN

Element 1
Large - Scale Lake Alum Treatment for Lake Sediments

Element 2
Annual Maintenence Alum Treatments

Element 3
Continue to protect wetlands around inlet

Element 4
Implement changes in residential practices

Element 5
Monitor lake water quality and adapt as needed

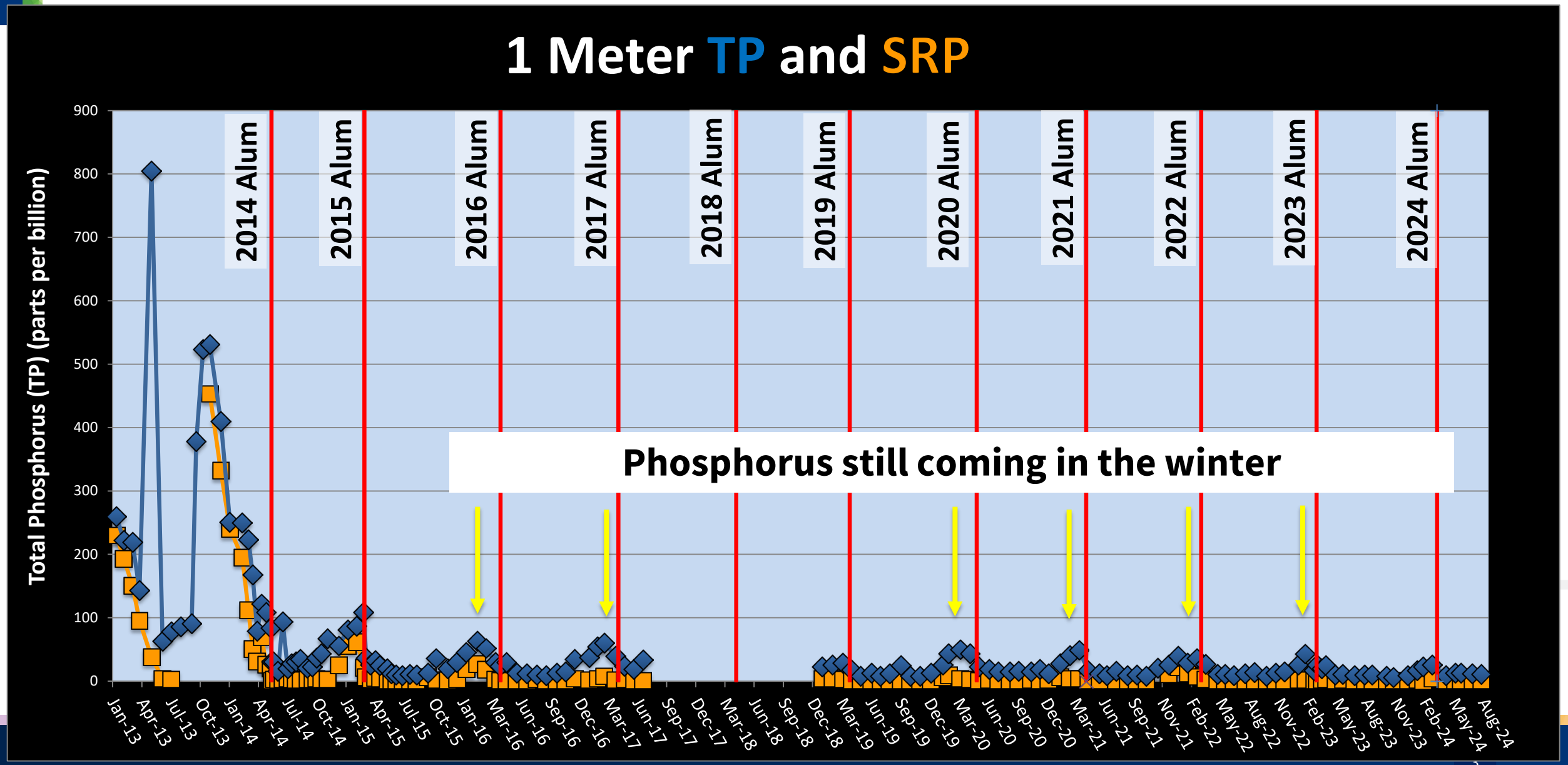
Neutralize Phosphorus from inlet each year

Inactivate Phosphorus in Sediments

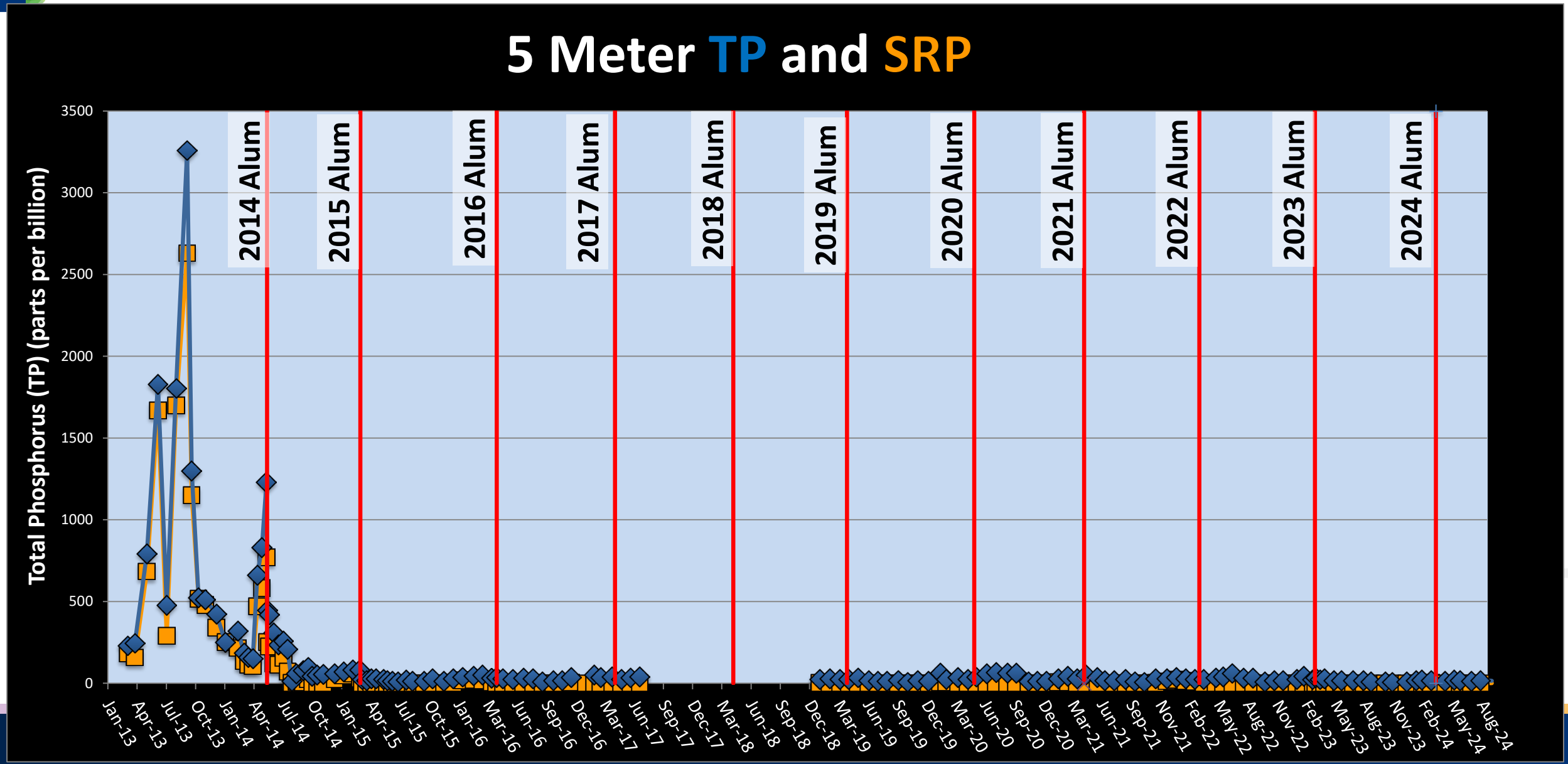
Alum Treatment History

TYPE	YEAR	DOSE (MG/L)	GALLONS OF ALUM	GALLONS OF BUFFER
Large Treatments	2014	19.5	13,484	7,415
	2015	20.4	13,000	8,118
Maintenance Treatments	2016	4.4	2,900	1,705
	2017	6.1	4,050	2,380
	2018	4.4	3,000	1,764
	2019	4.4	3,000	1,764
	2020	4.4	3,000	1,764
	2021	4.4	3,191	1,572
	2022	3.1	2,629	1,430
	2023	3.0	2,480	1,370
	2024	3.0	4,960	0

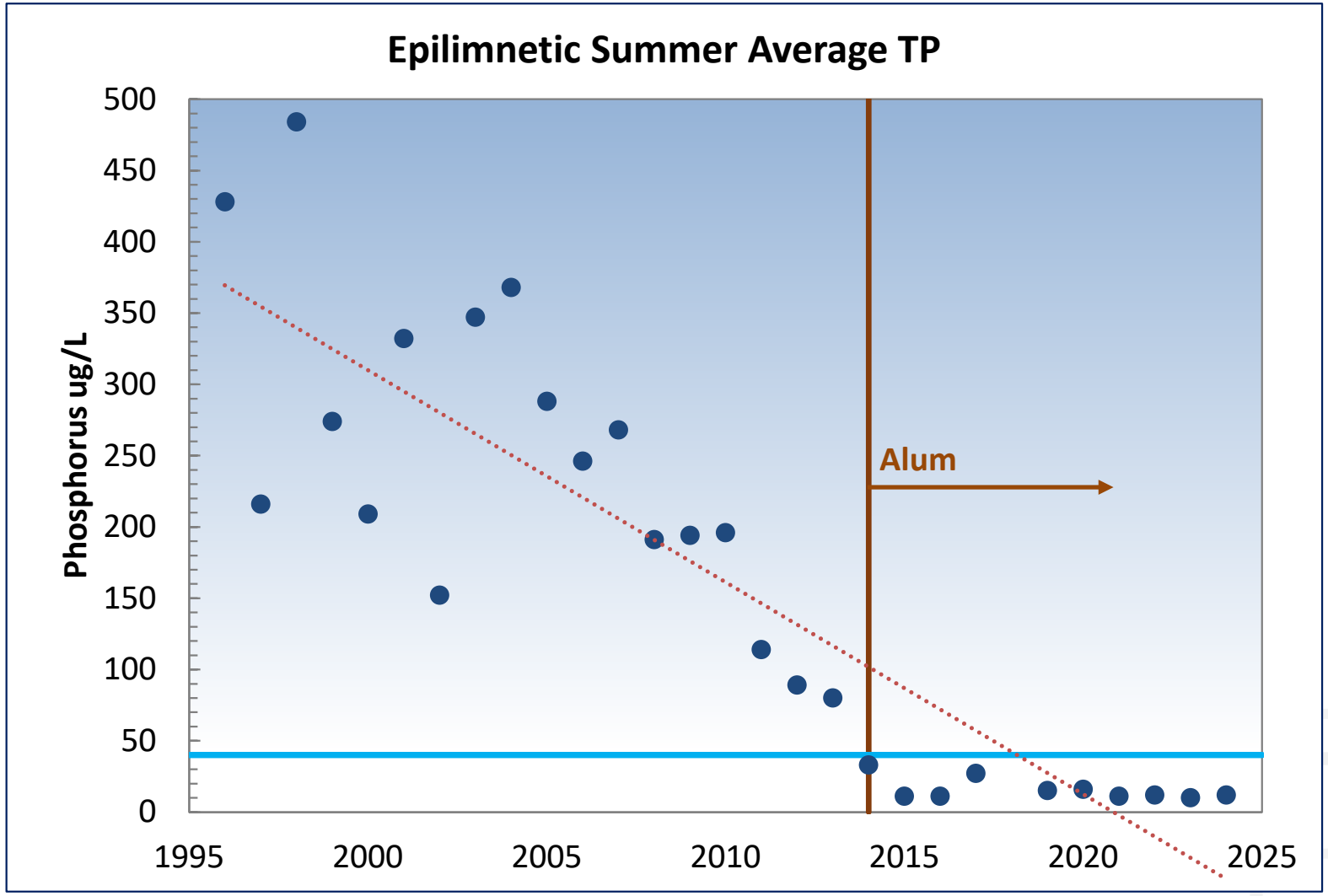
Water Quality Impact – Goal #1 Reduce TP by 85%



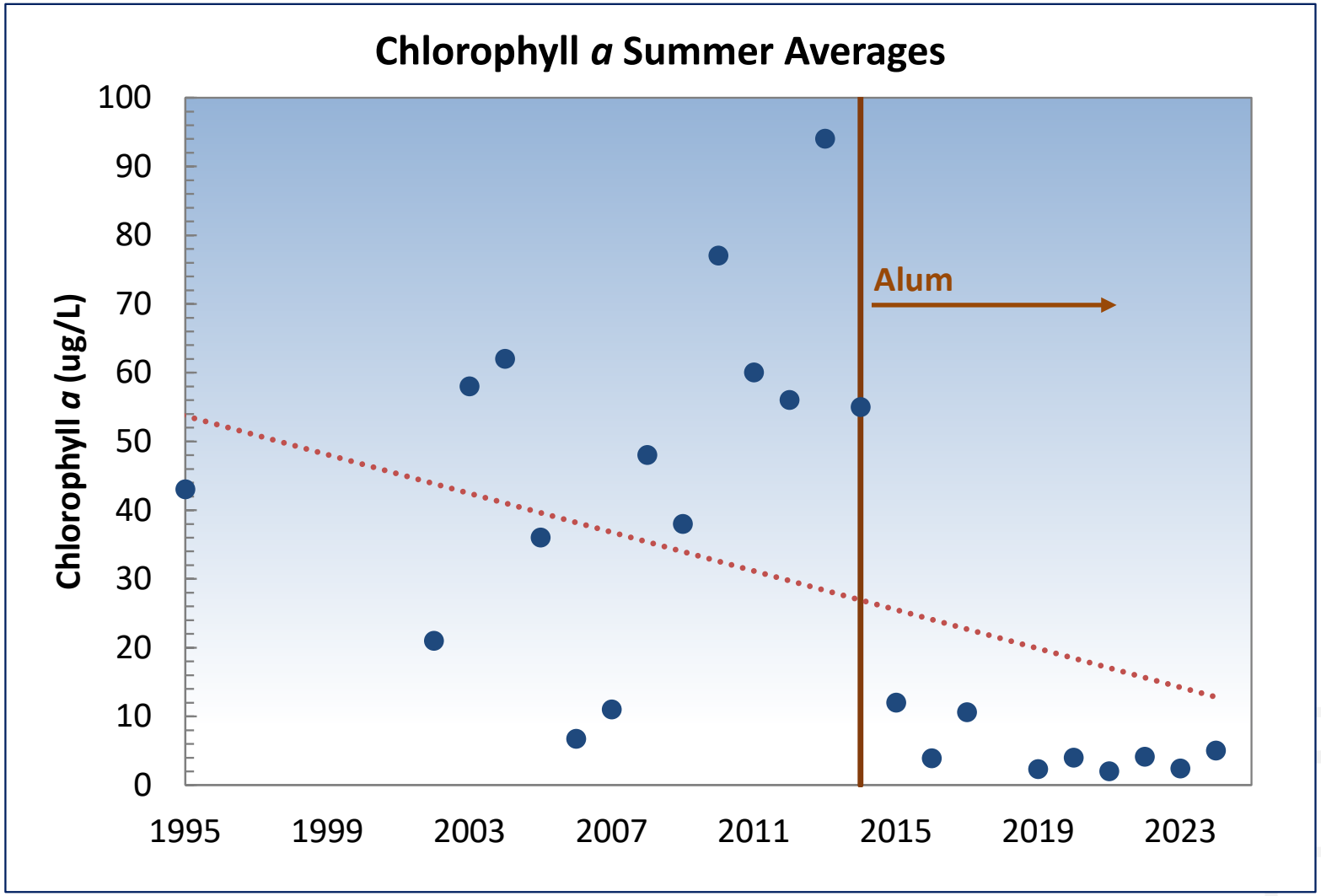
Water Quality Impact – Goal #1 Reduce TP by 85%



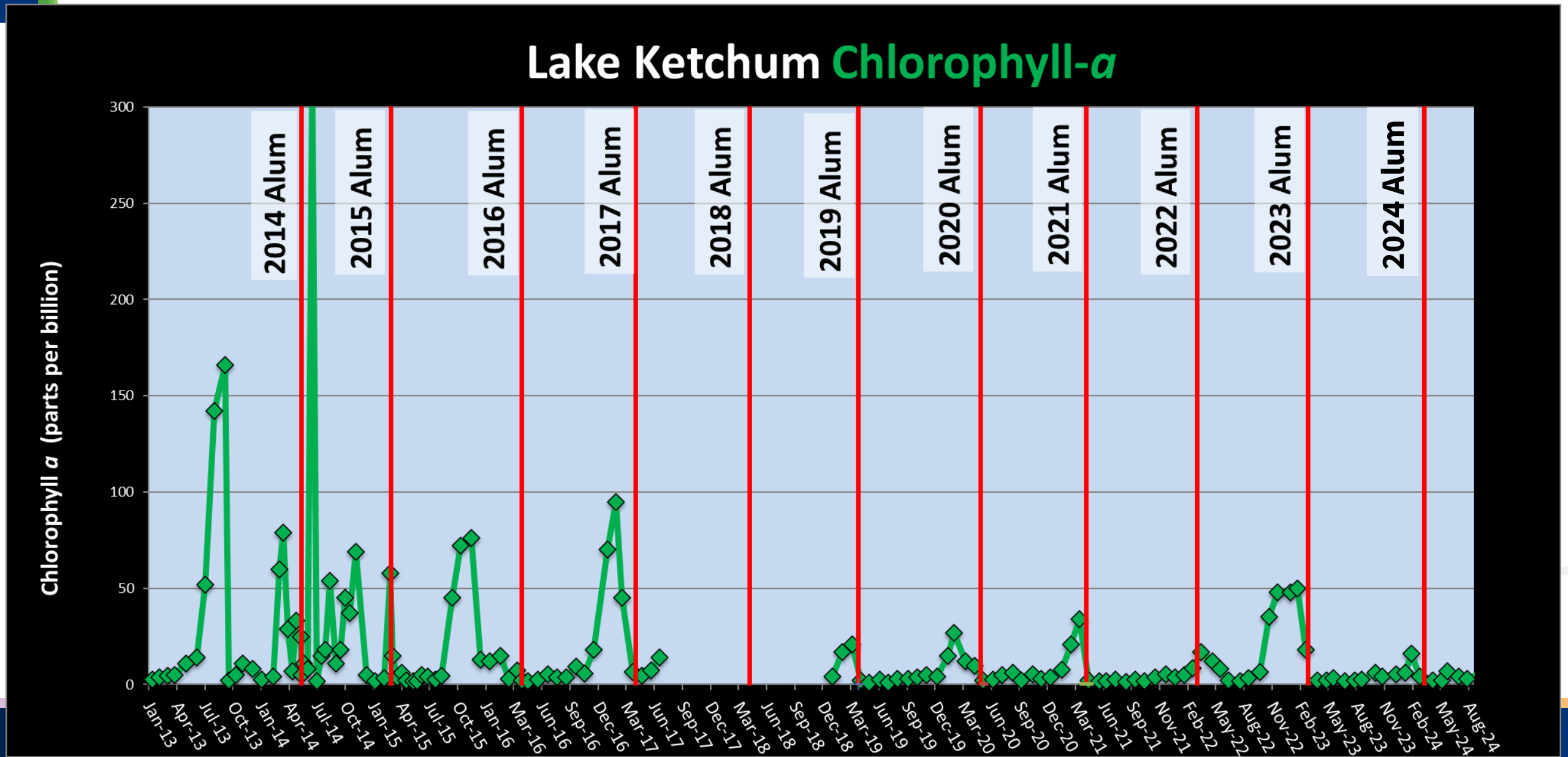
Goal #2 – Summer TP average of 40 µg/L



Goal #3 – Reduce algae blooms and toxic algae



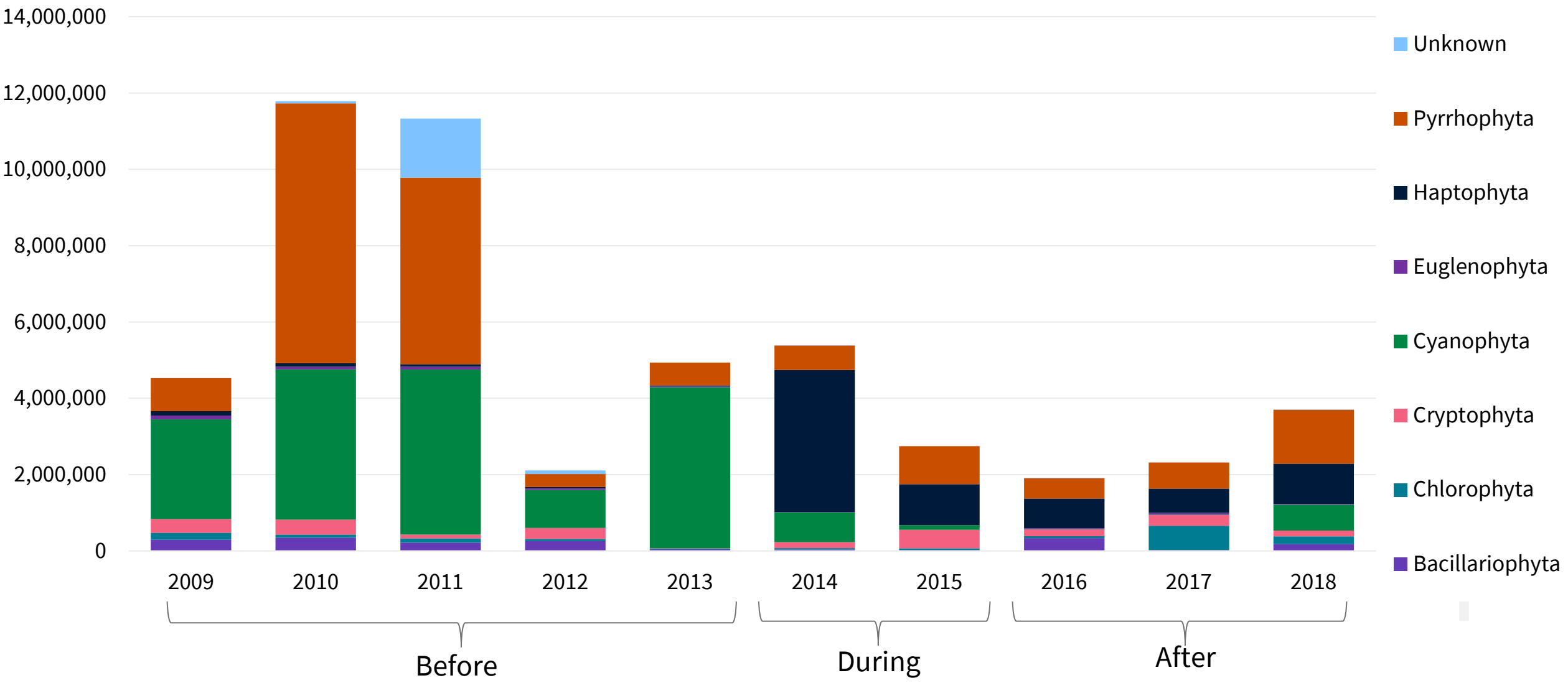
Winter Peaks in Chl – But not typically Cyanobacteria



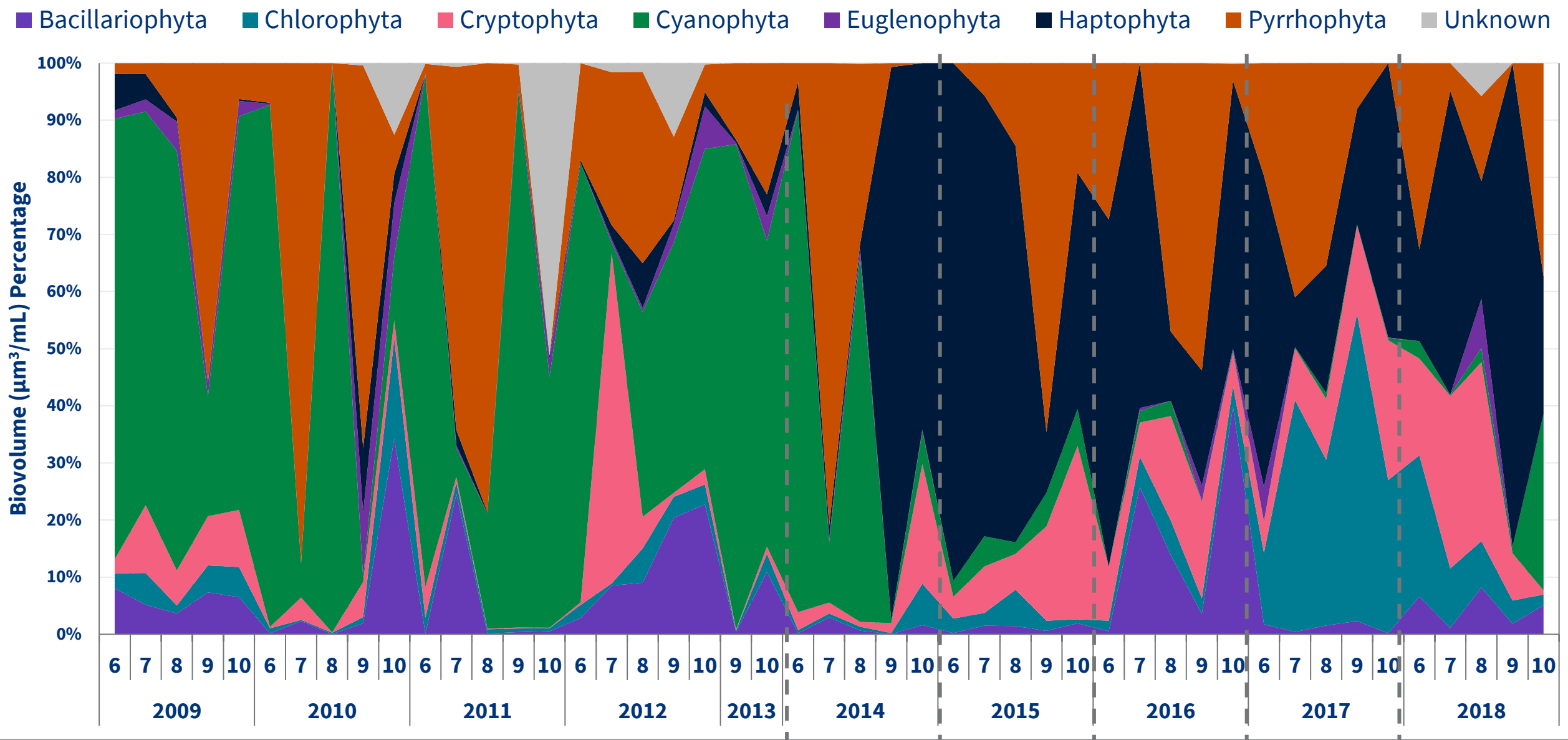
Goal #3 – Reduce algae blooms and toxic algae

Year	Weeks Posted	# of Weeks Toxic	Microcystin (µg/L)	Anatoxin (µg/L)
2008	11	8	1.5 - 309	0.3 – 12.9
2009	21	0	0.06 – 0.29	-
2010	22	11	0.05 – 329	0.04
2011	25	8	0.06 – 551	0.02 – 0.03
2012	15	5	0.07 – 417	0.02 – 0.06
2013	19	12	0.06 – 539	0.66
2014	15	7	16.1 – 675	-
2020	4	0	0.44	-

Biovolume (µm³/mL)– June through Sept Average



Biovolume (µm³/mL) – June to May 2009 to 2018



Biological Impact – Aquatic Plants

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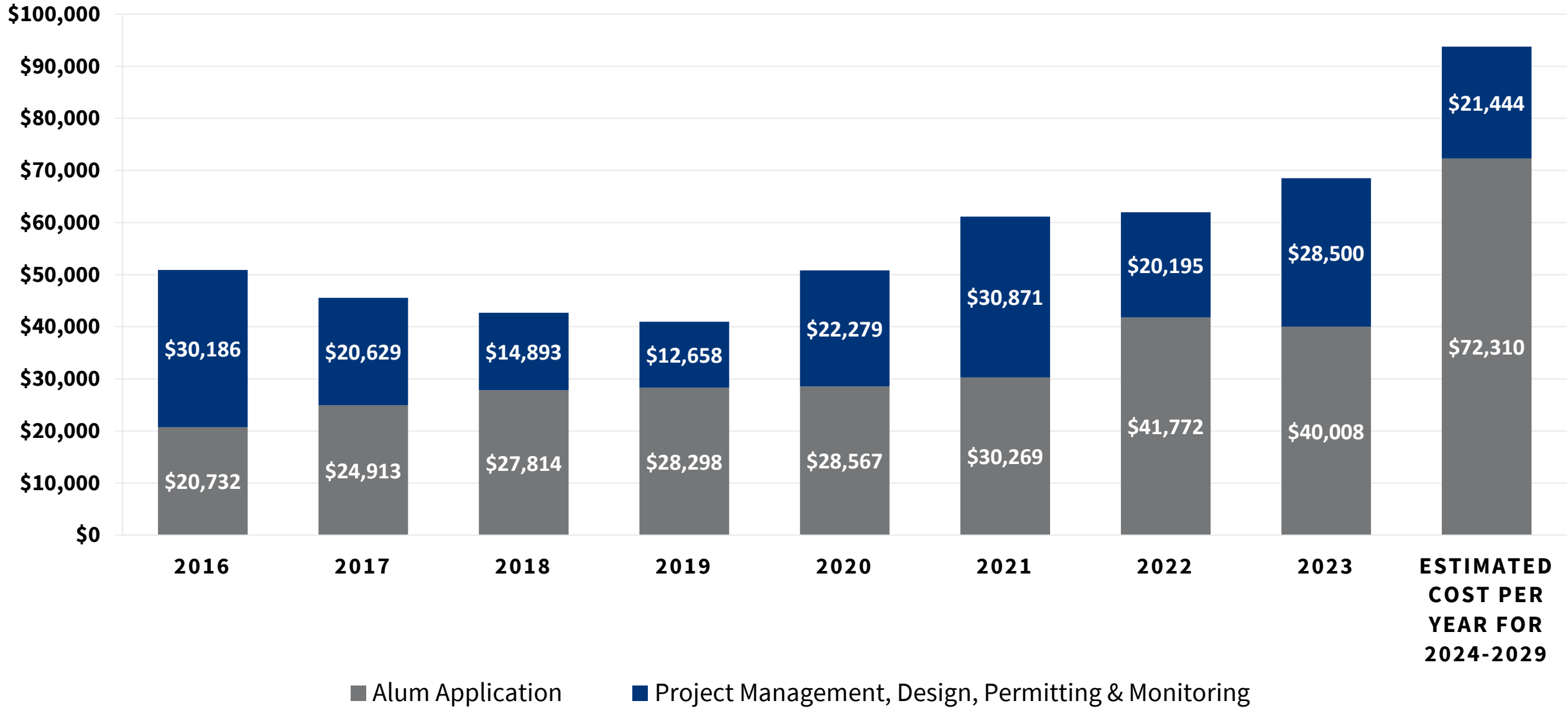
Biological Impact: Lake Residents



Annual Lake Ketchum Restoration Costs by Type

It takes a village!

SNOHOMISH COUNTY Conservation & Natural Resources | Surface Water Management | TETRA TECH

Snohomish County

- Gene Williams
- Jen Oden
- Katie Ruthenberg
- Dominick Leskiw

Tetra Tech

- Dr. Harry Gibbons
- Dr. Gene Welch

Alum applicators

- Aquatechnex
- HAB Aquatic Solutions/SOLitude Lake Management

Lake Ketchum Shores Improvement Club

Volunteer Lake Monitors

State agencies

- WA Department of Ecology
- WDFW
- WA Department of Health

Questions?

SNOHOMISH COUNTY Conservation & Natural Resources | Surface Water Management | TETRA TECH

Shannon.Brattebo@tetratech.com

Break

Please be back by 3pm

Evaluating the Cost Effectiveness of Various Innovative Treatment Strategies to Proactively or Reactively Control Near-Shore HABS

Lake Hopatcong, New Jersey

Funding Provided by the United States Army Corps of Engineers – Engineer Research and Development Center

2025 Harmful Algal Bloom Summit

April 9th, 2025

PRINCETON HYDRO
SCIENCE ENGINEERING DESIGN

Patrick Rose and Fred S. Lubnow, Ph.D.

USACE ERDC HAB Demonstration Program

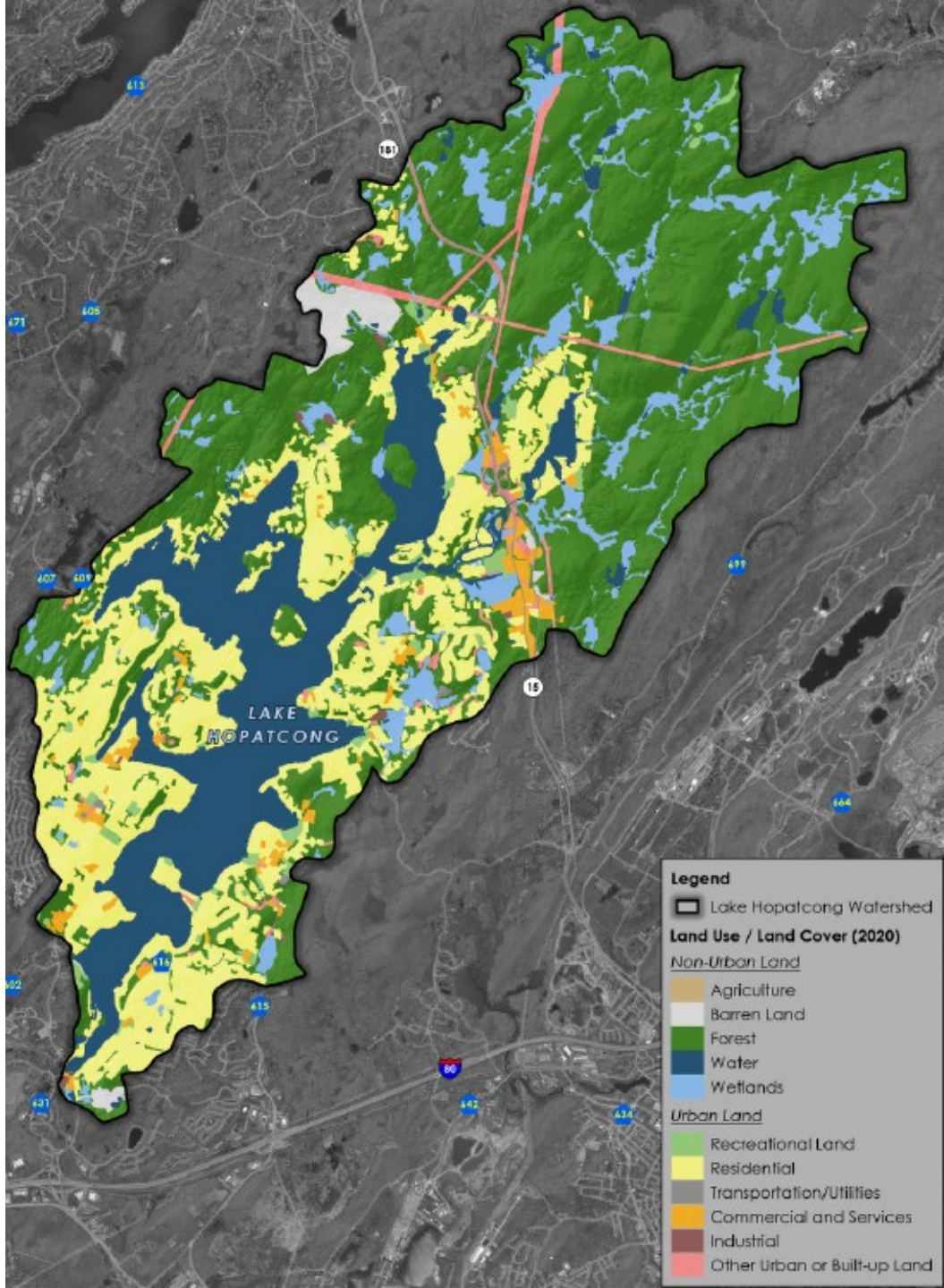
- “Harmful Algal Blooms (HABs) represent a significant and costly threat to our Nation’s economy and natural resources. The U.S. Army ERDC seeks innovative, cost-effective, and scalable technologies for early detection, prevention, and management of HABs”

USACE ERDC HAB Demonstration Program

- ✓ **Objectives**
  - Significantly reduce the frequency of HABs associated with water resources development projects
  - Demonstrate innovative technologies or combinations of technologies for HAB prevention or management at large field scales
  - Generate field-scale cost and technology performance data to guide informed technology use and support technology transfer

Lake Hopatcong, Sussex and Morris Counties, New Jersey

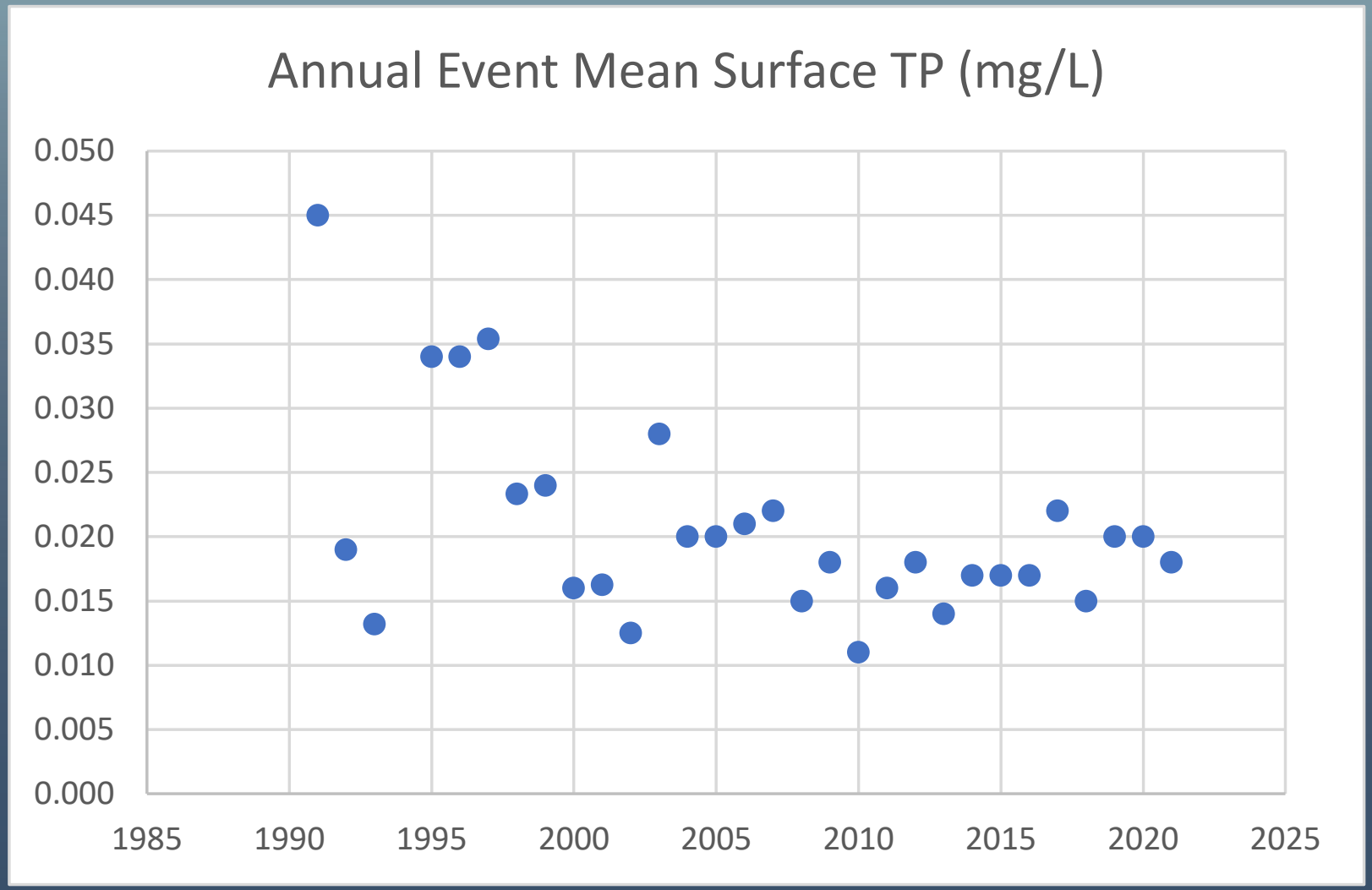
- Largest lake in NJ (2,686 acres)
- 16,215-acre watershed (6:1)
- Maximum depth: 16.7 meters
- Average depth: 5.6 meters
- Recent increase in HABs



Factors That Lead to Cyanobacterial Blooms

- High seasonal temperatures
- Still water conditions / thermal stratification
- Elevated phosphorus concentrations
- Total phosphorus concentrations 0.03 mg/L or greater can generate nuisance blooms / scums

Annual Mean Surface Total Phosphorus



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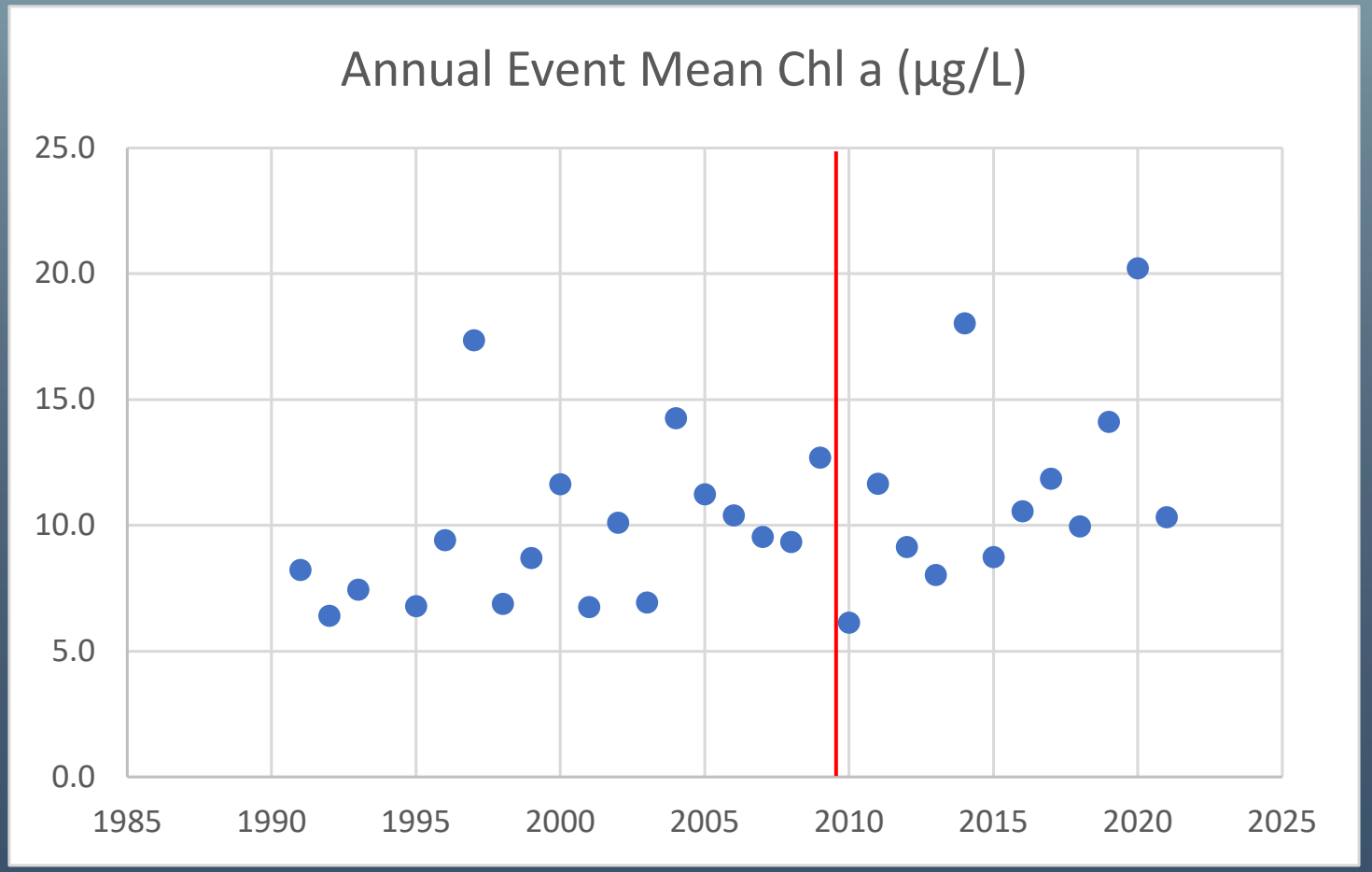
DESIGN

Annual Mean Surface Chlorophyll *a*

- ✓ Increasing trend over the last 30 years
- ✓ 1991-2009: 9.74 µg/L
- ✓ 2010 – 2021: 11.55 µg/L
  - 18.5% increase
- ✓ Surface TP decreased 26% from 1991 - 2021



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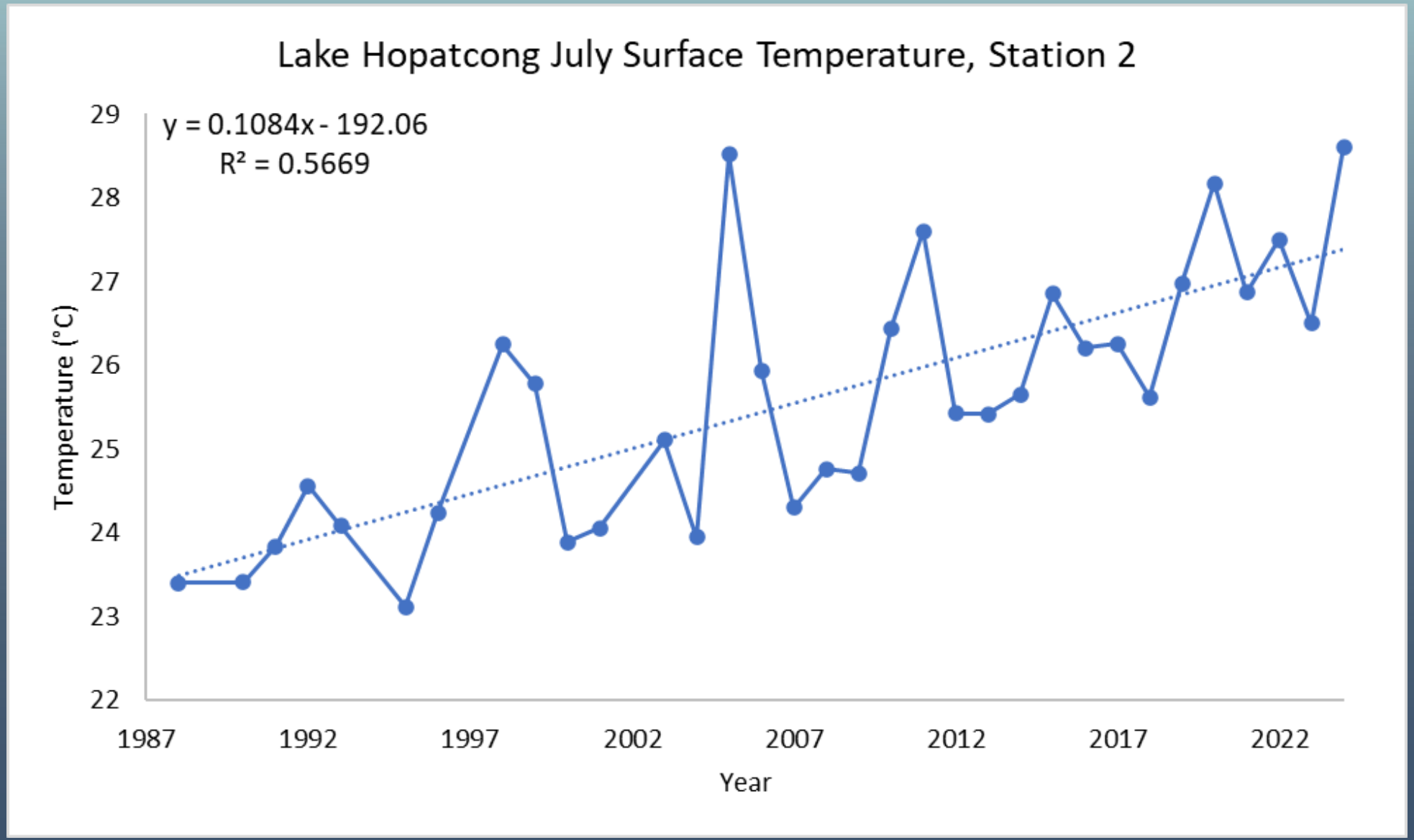

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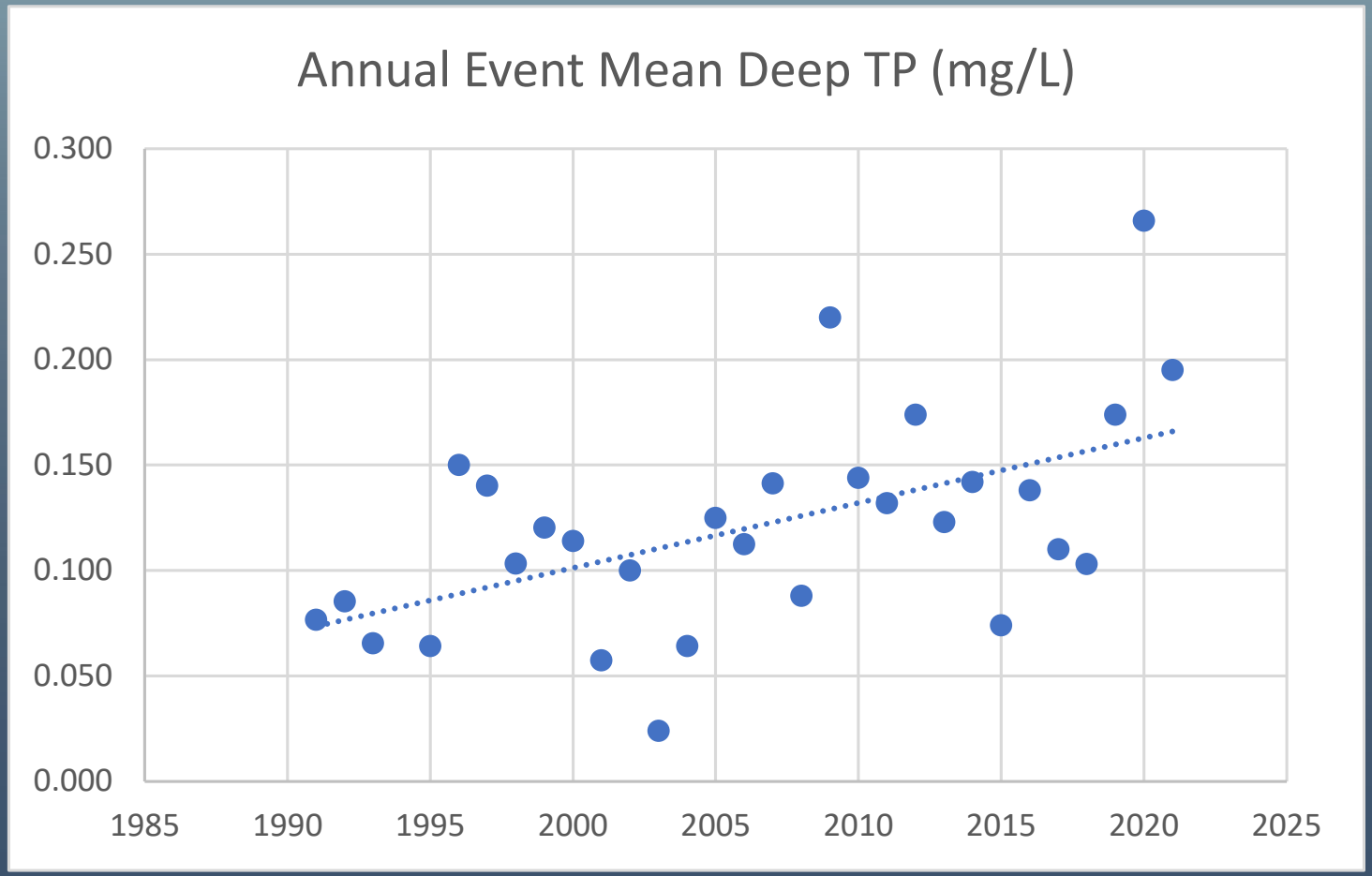
Annual Mean Deep Total Phosphorus

- ✓ Mean hypolimnetic TP concentrations
- ✓ Annual variability but increasing trend
  - 1991 – 1995: < 0.10 mg/L
  - 1996 – 2021: > 0.10 mg/L (81%)
  - 2019 – 2021: 0.208 mg/L



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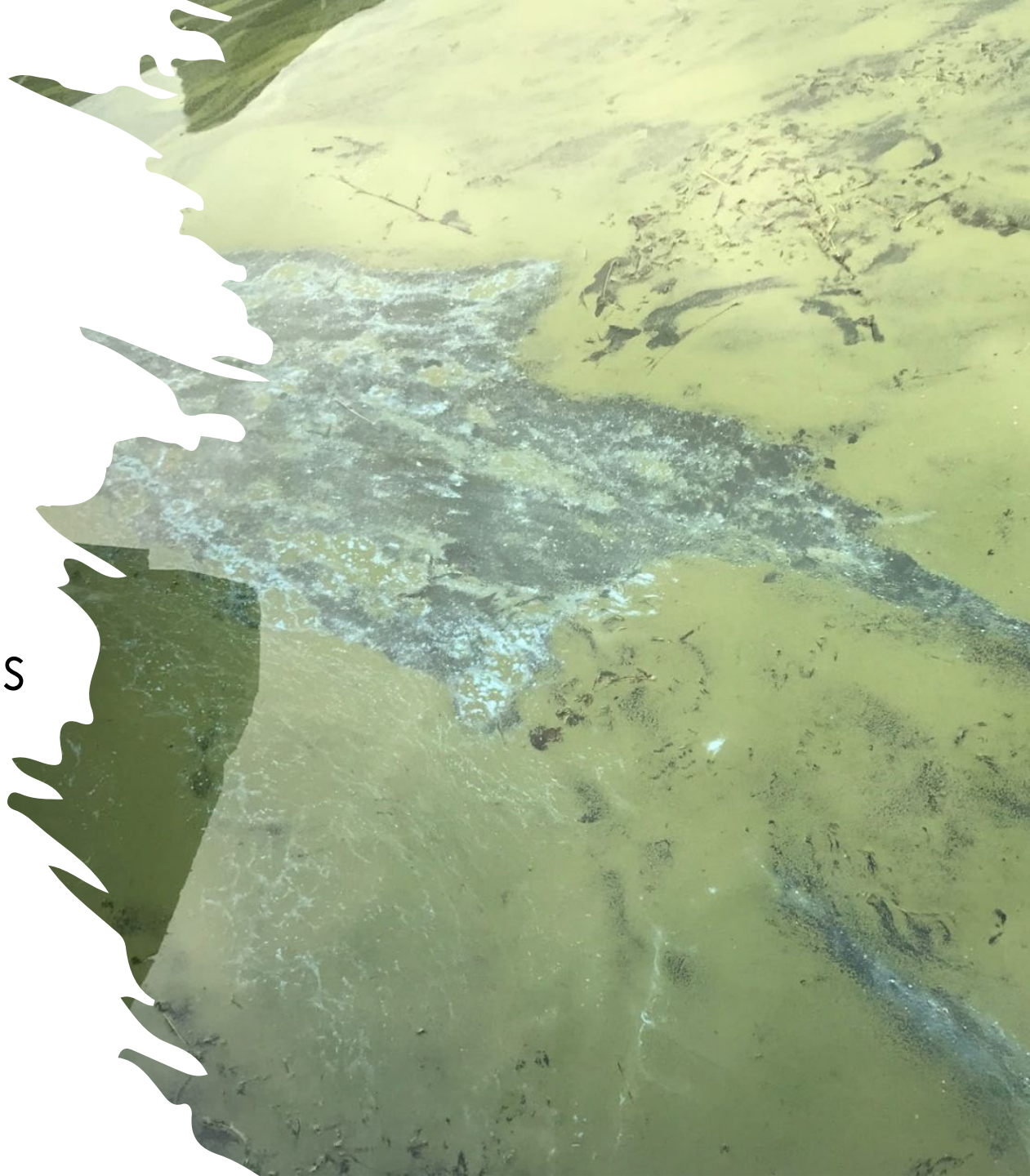
DESIGN

Problem Statement

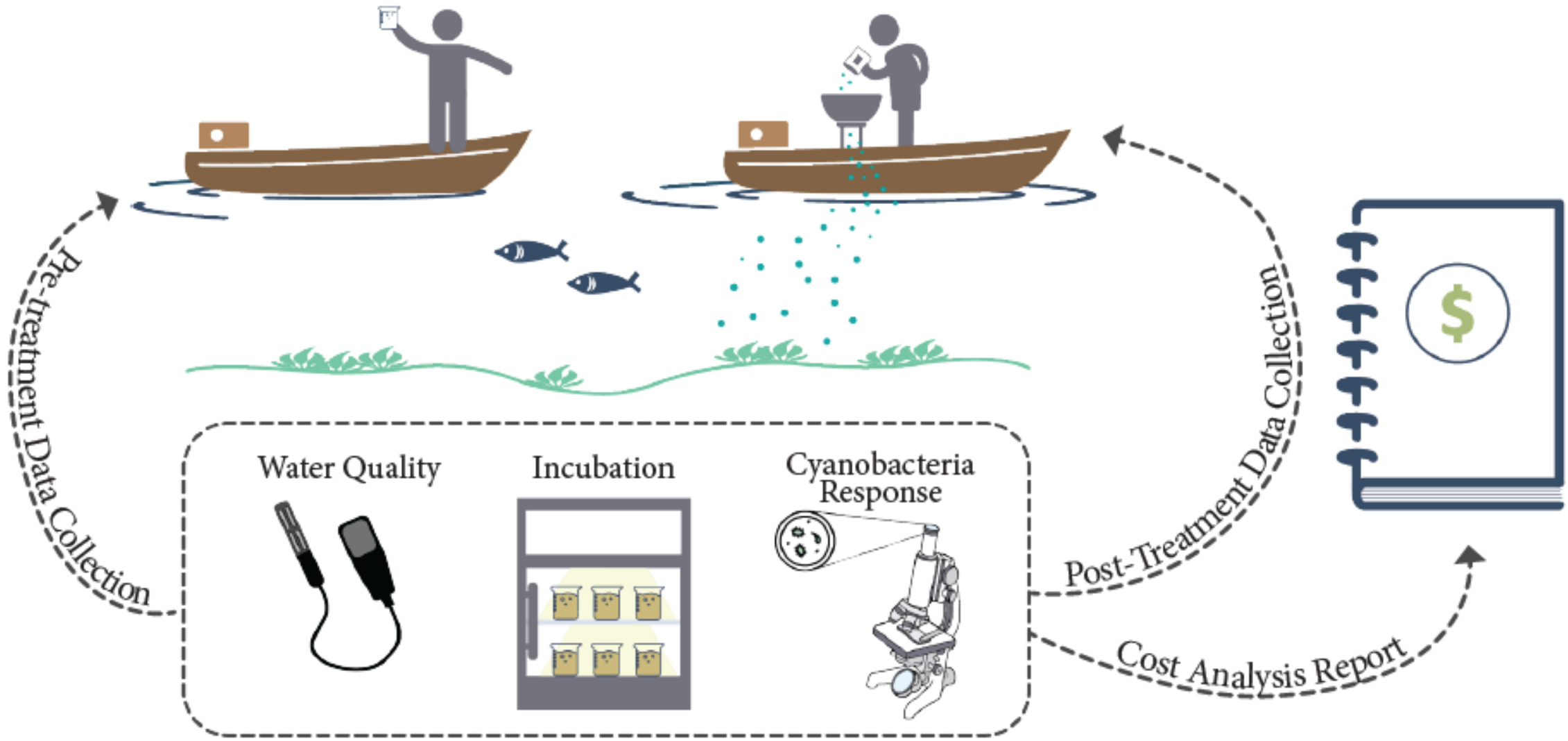
- ✓ Problem: External nutrient loading
  - Solution: Watershed management
- ✓ Problem: Internal nutrient loading
  - Solution: Aeration, oxygenation, nutrient inactivation
- ✓ **Problem: Shallow, nutrient-rich sediments**
  - **Solution: ???**
  - **This project will focus on addressing cyanobacteria that originate from the shallow sediments of a lake**

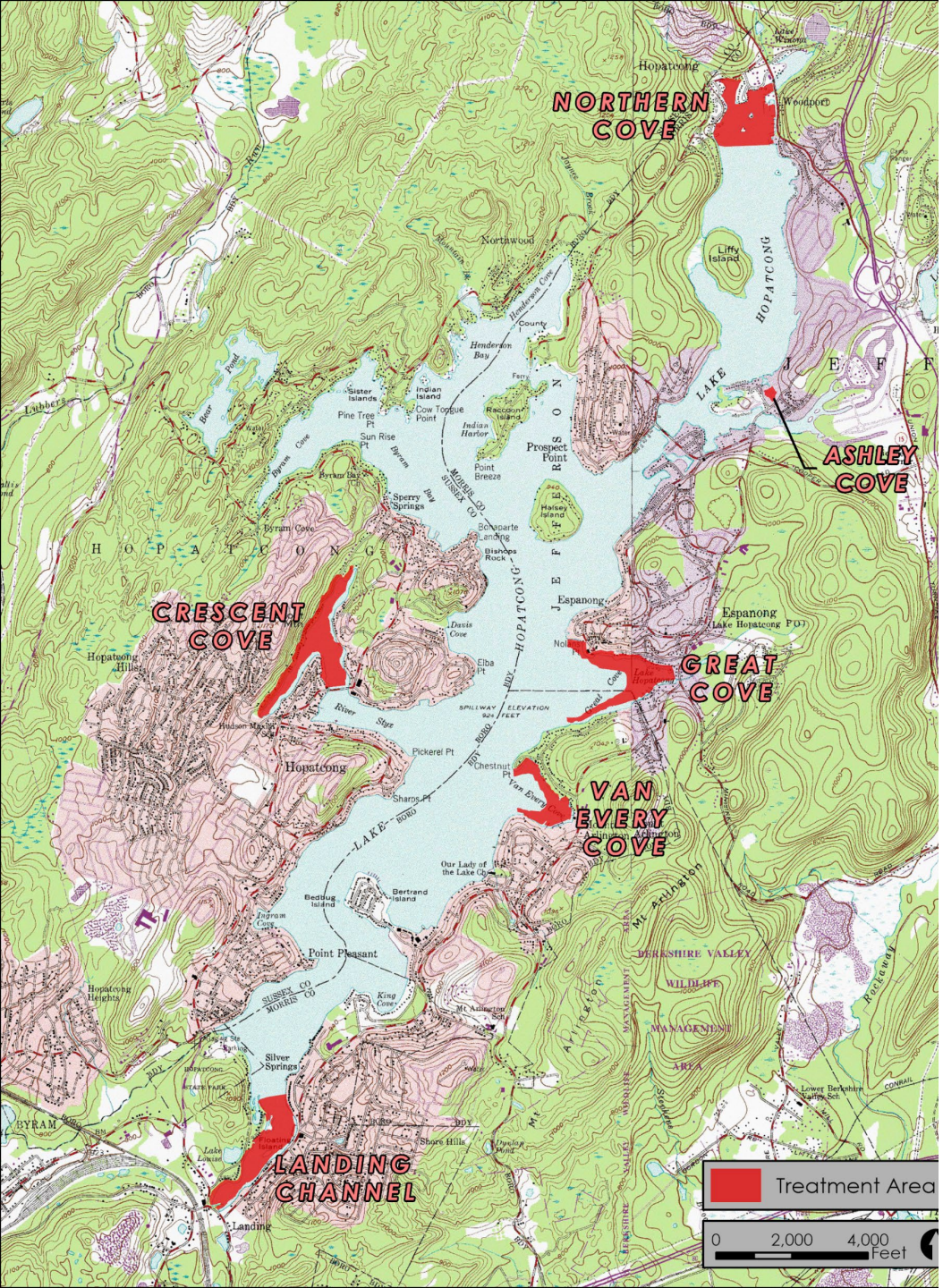
Objective

Evaluate if innovative treatments, using a combination of non-pesticidal products and early season benthic applications of algaecides, can proactively and reactively control near-shore HABs



Approach


Pre-treatment Data Collection
Water Quality
Incubation
Cyanobacteria Response
Post-Treatment Data Collection
Cost Analysis Report


NORTHERN COVE
ASHLEY COVE
CRESCENT COVE
GREAT COVE
VAN EVERY COVE
LANDING CHANNEL
Hopatcong
Woodport
Nortawood
Liffy Island
HOPATCONG
LAKE
JEFFERSON
Henderson Bay
Indian Island
Sister Islands
Cow Tongue Point
Raccoon Island
Pine Tree Pt
Sun Rise Pt
Indian Harbor
Prospect Point
Point Breeze
Sperry Springs
Byram Cove
Bonaparte Landing
Bishops Rock
Halsey Island
Espanong
Lake Hopatcong P.O.
Davis Cove
Elba Pt
Hopatcong Hills
Pickerel Pt
Chestnut Pt
Sharps Pt
Van Every
Arlington
Our Lady of the Lake Ch
Bertrand Island
Bedbug Island
Ingram Cove
Point Pleasant
King Cove
Mt Arlington
Silver Springs
Shore Hills
Landing
BERKSHIRE VALLEY WILDLIFE MANAGEMENT AREA
Mt Arlington
Rockaway
CONRAIL
Treatment Area
0 2,000 4,000 Feet

Locations

Pre- and Post-Treatment Incubation Studies

- Spring 2025 and spring 2026
- Sediment and water samples collected from inside (treatment) and outside (control) each treatment area
- Water samples filtered in lab
- Incubate beakers with lake sediment and filtered water for 14 days
- Collect data after 7 and 14 days
- Does cyanobacteria bloom from sediment?


DARWIN CHAMBERS
Off / On
Silence
Temperature
Lights

Pre- and Post-Treatment Field Monitoring

- ✓ **Pre-Treatment:** One-week pre-treatment
- ✓ **Immediate:** One-week post-treatment
- ✓ **Short Term:** One-month post-treatment
- ✓ **Long-Term:** One-year post-treatment
- ✓ **Parameters:**
  - In-situ, water clarity, phycocyanin (blue-green pigment), phycoerythrin (reddish pigment), chl a
  - Cyanobacteria, cyanotoxins (Abraxis and qPCR)
  - Various lab parameters (TP, TSS, etc.)
  - Submerged Aquatic Vegetation (SAV) biomass

Spring Treatments

Ashley Cove and Crescent Cove

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ENGINEERING
DESIGN

PRINCETONHYDRO.COM

Ashley Cove

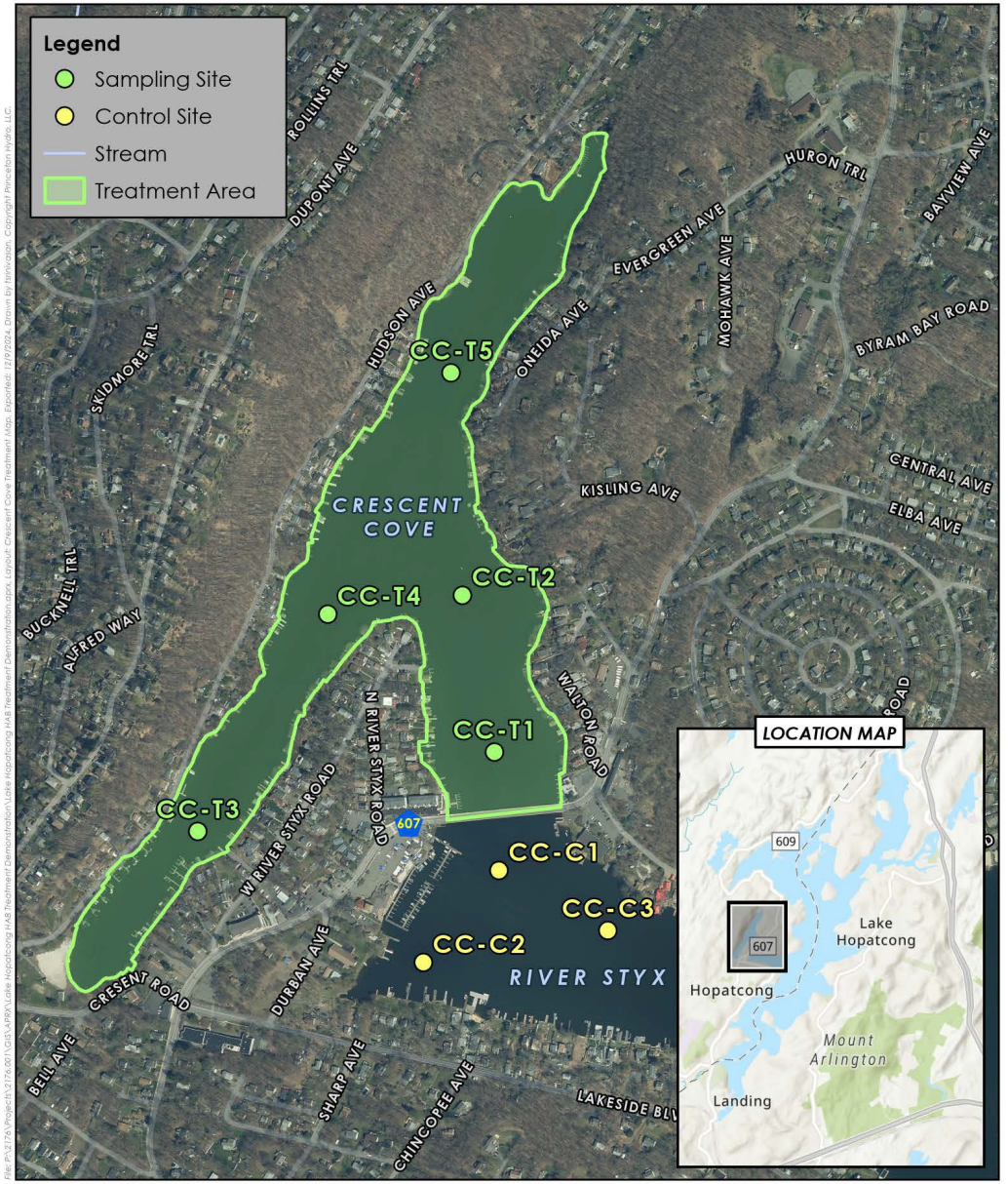
- ✓ **Size:** 2 acres
- ✓ **Product:** Cutrine-Plus Granular Algaecide
- ✓ **Rate:** 60 lbs per acre
- ✓ **Application:** Directly over the sediments
- ✓ **Applicator:** Princeton Hydro
- ✓ **When:** April 2025

SCIENCE
ENGINEERING
DESIGN

Crescent Cove

- ✓ **Size:** 57 acres
- ✓ **Product:** PAK 27
- ✓ **Rate:** 100 lbs per acre
- ✓ **Application:** Directly over the sediments
- ✓ **Applicator:** Princeton Hydro
- ✓ **When:** April 2025

SCIENCE
ENGINEERING
DESIGN



NOTES:
1. Sampling sites, control sites, and treatment areas are approximate.
2. Streams obtained from the United States Geological Survey's (USGS) National Hydrography Dataset (NHD).
3. Roads and 2020 orthoimagery obtained from the NJ Geographic Information Network (NJGIN) Open Data portal: https://njgin.nj.gov/

0 300 600 Feet

Spatial Reference: NAD 1983 2011 StatePlane New Jersey FIPS 2900 Ft US

CRESCENT COVE TREATMENT MAP

HAB TREATMENT DEMONSTRATION PROJECT
LAKE HOPATCONG
SUSSEX AND MORRIS COUNTY, NEW JERSEY

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Early Summer Treatments

Landing Channel and Northern Cove

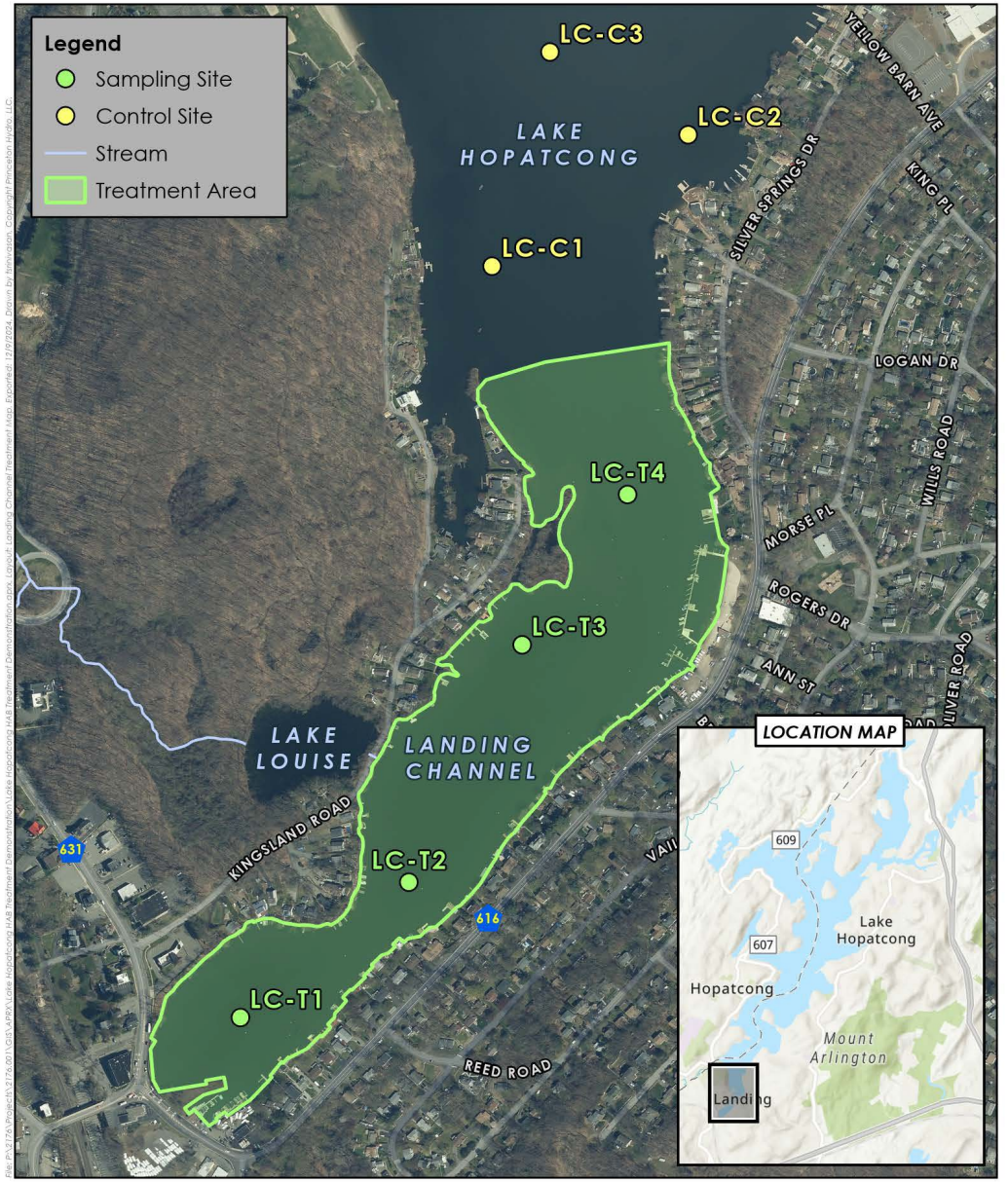
SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

Landing Channel: Floc and Lock

- ✓ **Size:** 50 acres
- ✓ **Products:** Chitosan (floc) and EutroSORB G (lock)
- ✓ **Rates:**
  - Chitosan: 0.5 mg/L
  - EutroSORB G: 250 lbs per acre
- ✓ **Applicator:** Princeton Hydro
- ✓ **When:** June 2025

SCIENCE ENGINEERING DESIGN



NOTES:
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2. Streams obtained from the United States Geological Survey's (USGS) National Hydrography Dataset (NHD).
3. Roads and 2020 orthoimagery obtained from the NJ Geographic Information Network (NJGIN) Open Data portal: https://njgin.nj.gov/

0 250 500 Feet

Spatial Reference: NAD 1983 2011 StatePlane New Jersey FIPS 2900 Ft US

LANDING CHANNEL TREATMENT MAP

HAB TREATMENT DEMONSTRATION PROJECT
LAKE HOPATCONG
SUSSEX AND MORRIS COUNTY, NEW JERSEY

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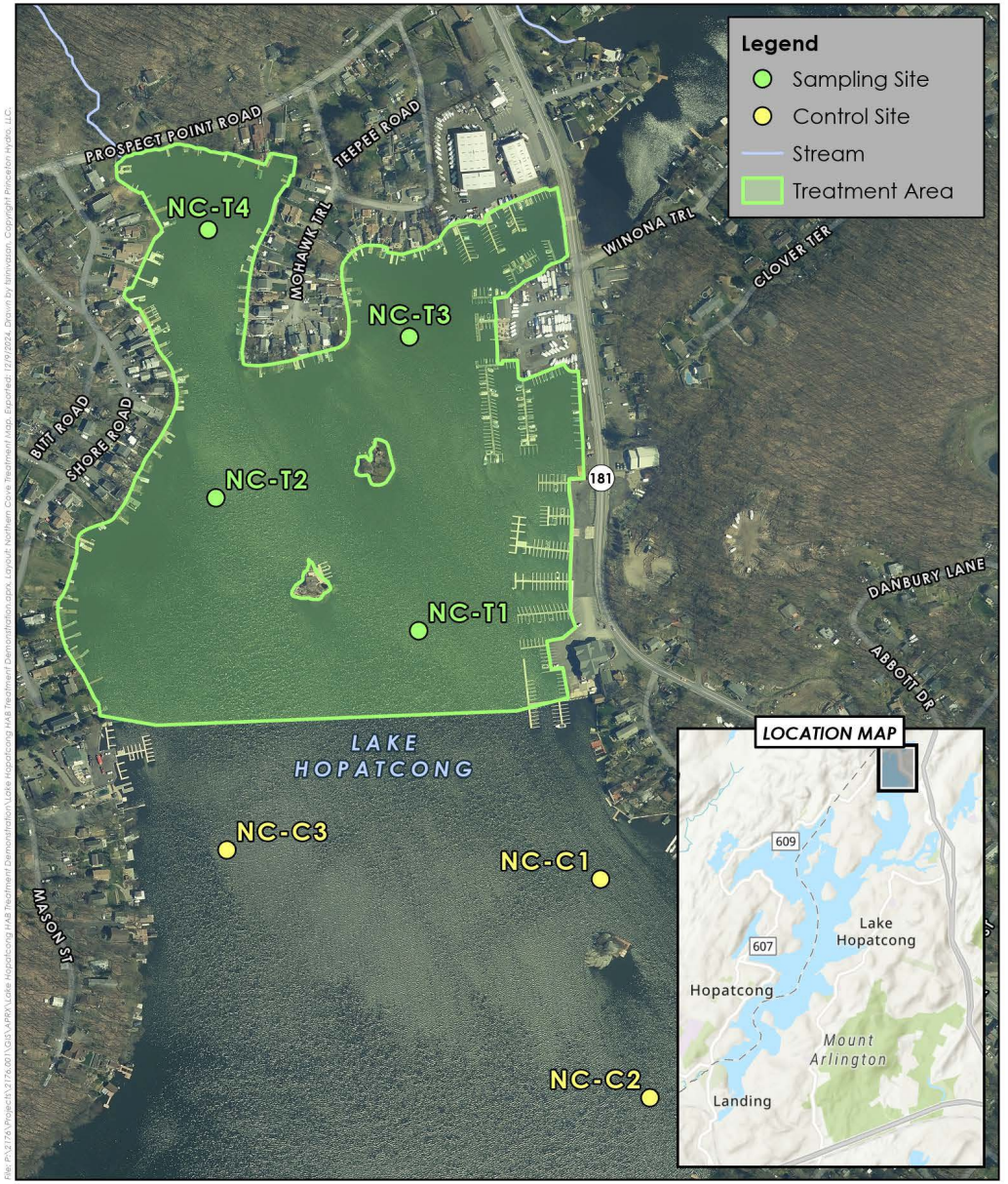
SCIENCE DESIGN ENGINEERING
www.PrincetonHydro.com

Northern Cove: Floc and Sink

- ✓ **Size:** 47 acres
- ✓ **Products:** Alum (floc) and EutroSORB G (sink)
- ✓ **Rates:**
  - **Alum:** 100 gal per acre
  - **EutroSORB G:** 500 lbs per acre
- ✓ **Applicator:** Princeton Hydro
- ✓ **When:** June 2025

SCIENCE ENGINEERING DESIGN



NOTES:
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3. Roads and 2020 orthoimagery obtained from the NJ Geographic Information Network (NJGIN) Open Data portal: https://njgin.nj.gov/

0 200 400 Feet

Spatial Reference: NAD 1983 2011 StatePlane New Jersey FIPS 2900 Ft US

NORTHERN COVE TREATMENT MAP

HAB TREATMENT DEMONSTRATION PROJECT
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SUSSEX AND MORRIS COUNTY, NEW JERSEY

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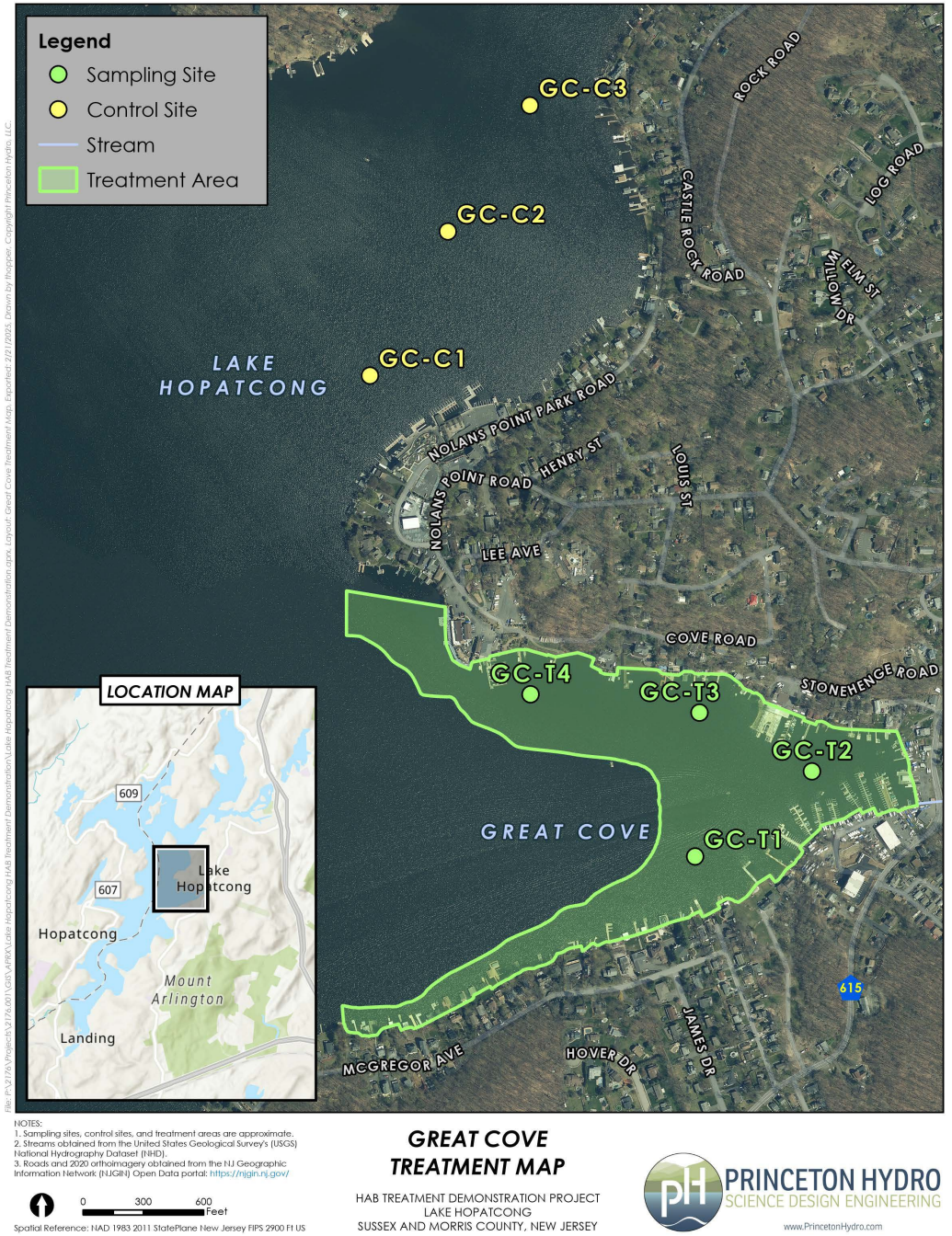
Mid- to Late-Summer Treatments

Great Cove and Van Every Cove

Great Cove: Kill, Floc, and Sink

- ✓ **Size:** 44 acres
- ✓ **Products:** GreenClean (kill), Chitosan (floc), and EutroSORB G (sink)
- ✓ **Rates:**
  - **GreenClean:** 2.8 gal per acre-ft
  - **Chitosan:** 0.5 mg/L
  - **EutroSORB G:** 500 lbs per acre
- ✓ **Applicator:** Ready Scout (GreenClean) and Princeton Hydro (chitosan and EutroSORB)
  - Coordination between both parties
- ✓ **When:** July – September (reactive treatments)

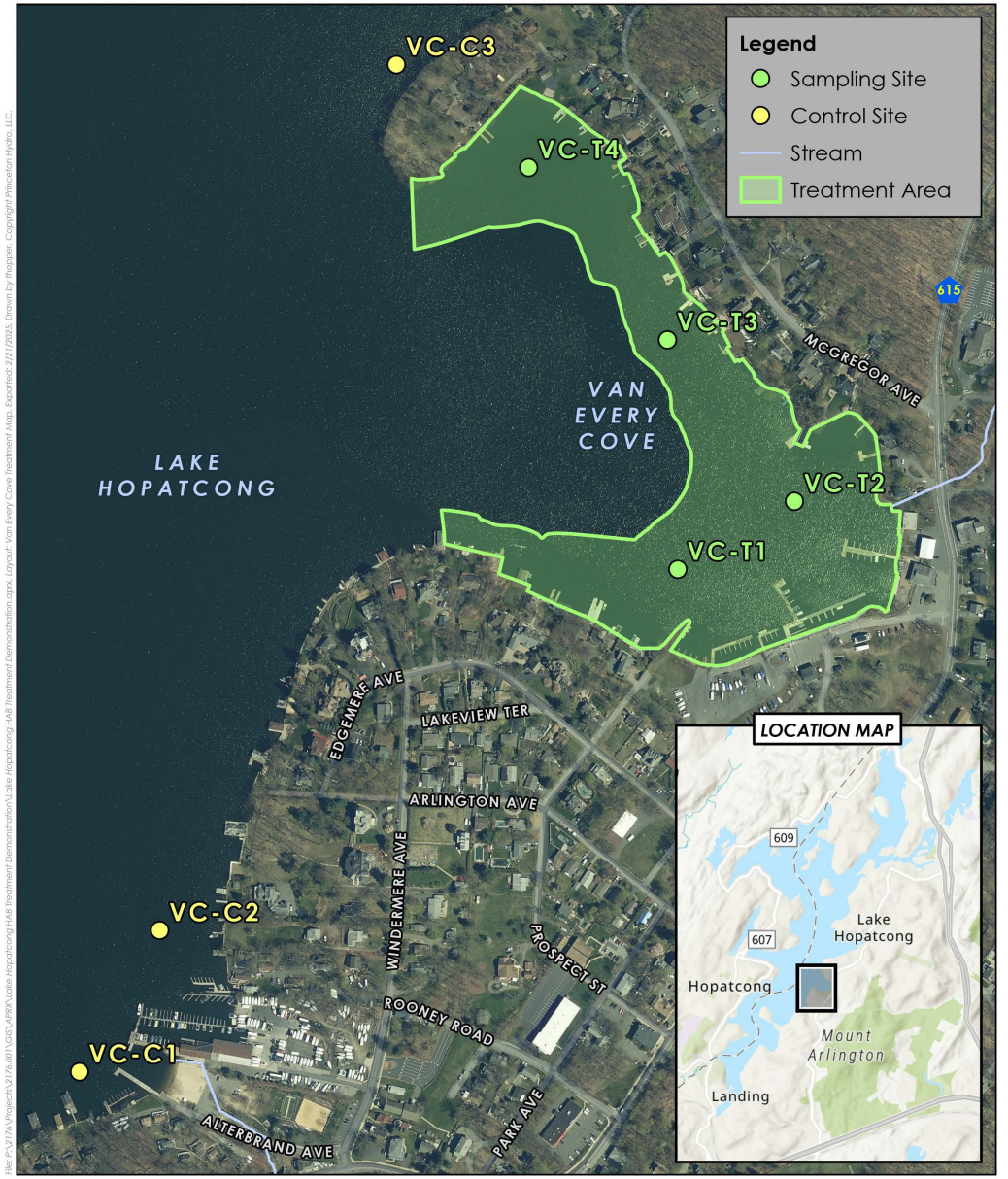
SCIENCE ENGINEERING DESIGN



Van Every Cove: Kill and Sink

- ✓ **Size:** 23 acres
- ✓ **Products:** GreenClean (kill)and EutroSORB G (sink)
- ✓ **Rates:**
  - **GreenClean:** 2.8 gal per acre-ft
  - **EutroSORB G:** 500 lbs per acre
- ✓ **Applicator:** Ready Scout (GreenClean) and Princeton Hydro (EutroSORB)
  - Coordination between both parties
- ✓ **When:** July – September (reactive treatments)

SCIENCE ENGINEERING DESIGN



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0 200 400 Feet

Spatial Reference: NAD 1983 2011 StatePlane New Jersey FIPS 2900 Ft US

VAN EVERY COVE TREATMENT MAP

HAB TREATMENT DEMONSTRATION PROJECT
LAKE HOPATCONG
SUSSEX AND MORRIS COUNTY, NEW JERSEY

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Data Analysis and Cost Effectiveness

- ✓ **Incubation data will be analyzed temporally:**
  - 2025 (pre-treatment) vs 2026 (post-treatment)
  - Do we see a reduction in cyanobacteria densities?
- ✓ **Field data will be analyzed temporally:**
  - Pre- and post-treatment at immediate, short-term, and long-term intervals
  - Do we see a reduction in relevant metrics?
- ✓ **Field data will be analyzed spatially:**
  - Treatment zones vs control zones
  - Do we see a reduction in treatment zones relative to control?
- ✓ **Cost effectiveness study on a per-acre basis**

QUESTIONS?

Patrick Rose
Environmental Scientist
Princeton Hydro, LLC
prose@princetonhydro.com

THANK YOU!

PRINCETONHYDRO.COM

Practical Approaches to HAB Solutions

"A How To" Guide

Rob Newby, Ph.D.
Research Scientist - Microbiology
Division of Science and Research, NJDEP

The "W"'s

- What is happening?
- Where is my problem?
- Who does my problem involve?
- Why did this happen?
- What can be done?

The "What" - Crash Course in HABs

ITRC (Interstate Technology Regulatory Council)
Harmful Cyanobacteria Blooms – 1

EPA – Basic Info on HABs

NJDEP – Bureau of Freshwater and Biological Monitoring

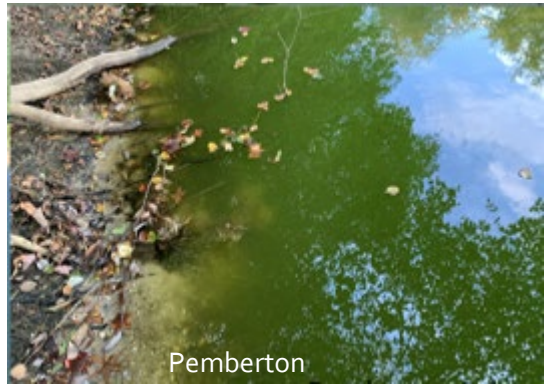
The "Where"

- Blooms can be localized or they can be wide-spread across the entire waterbody.
- To make matters worse cyanobacteria move up and down the water column throughout the day.


Swartswood


Budd Lake


Mt. Lake


Pemberton


Spruce Run Reservoir


Lake Hopatcong

The “Where”

Where starts usually with you

- Your eyes are the best on the ground tools to spot where HABs are

“Where” allows us to monitor blooms

Monitoring!

NJDEP Loan Program

NJDEP Buoy Network

Field

FluoroSense

EXO Sonde

Benchtop

AquaFluor

Triology Fluorometer

UV-VIS Spectrophotometer

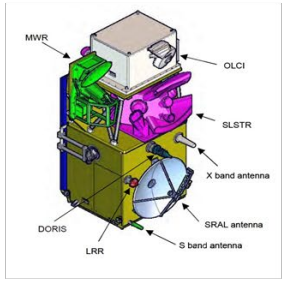
NJDEP Fly Overs

EPA CyAN

Remote

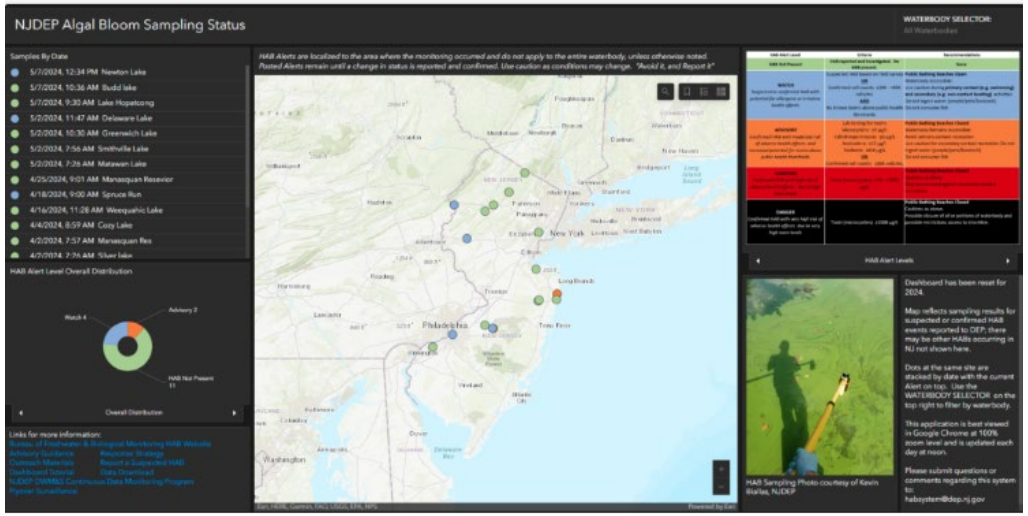
Continuous Monitoring Buoy

Hyperspectral Fixed Wing Camera



OLCI - Sentinel3 Satellite

Resources



NJDEP BFBM

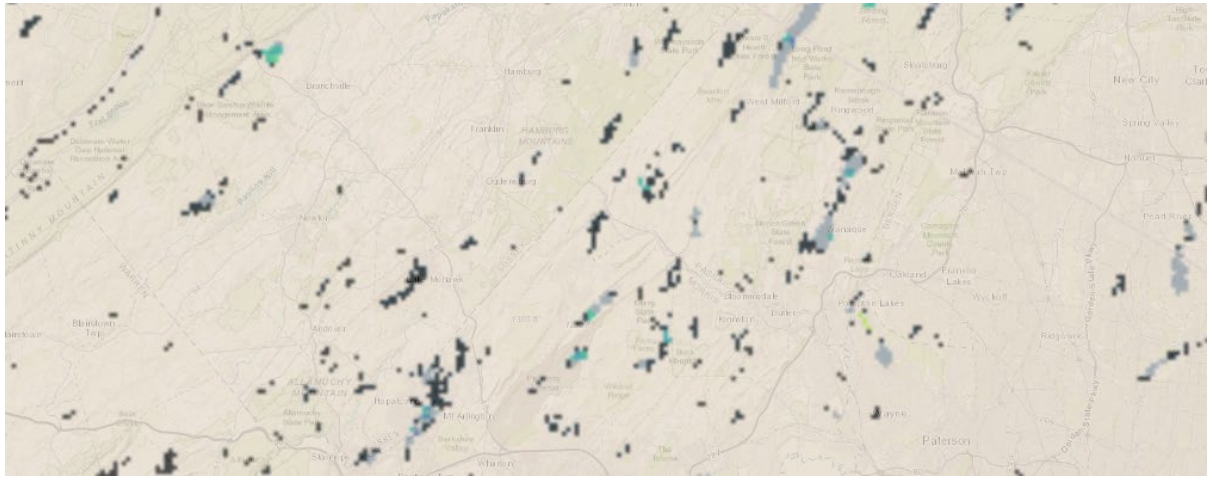
- Phycocyanin Loan Program
- HAB Dashboard

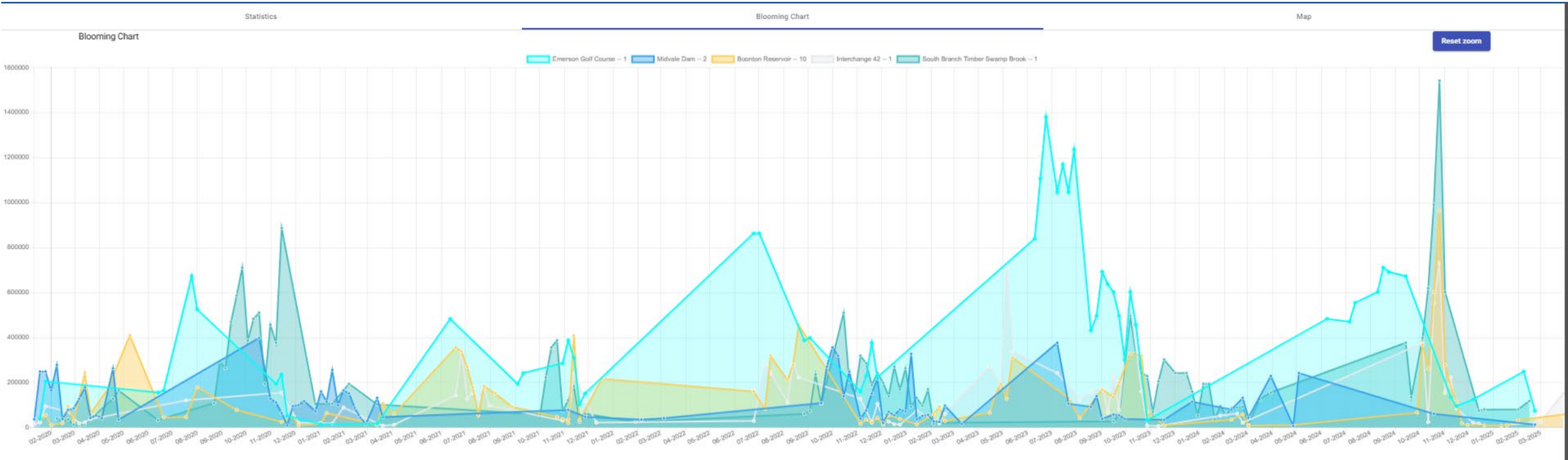
NJDEP

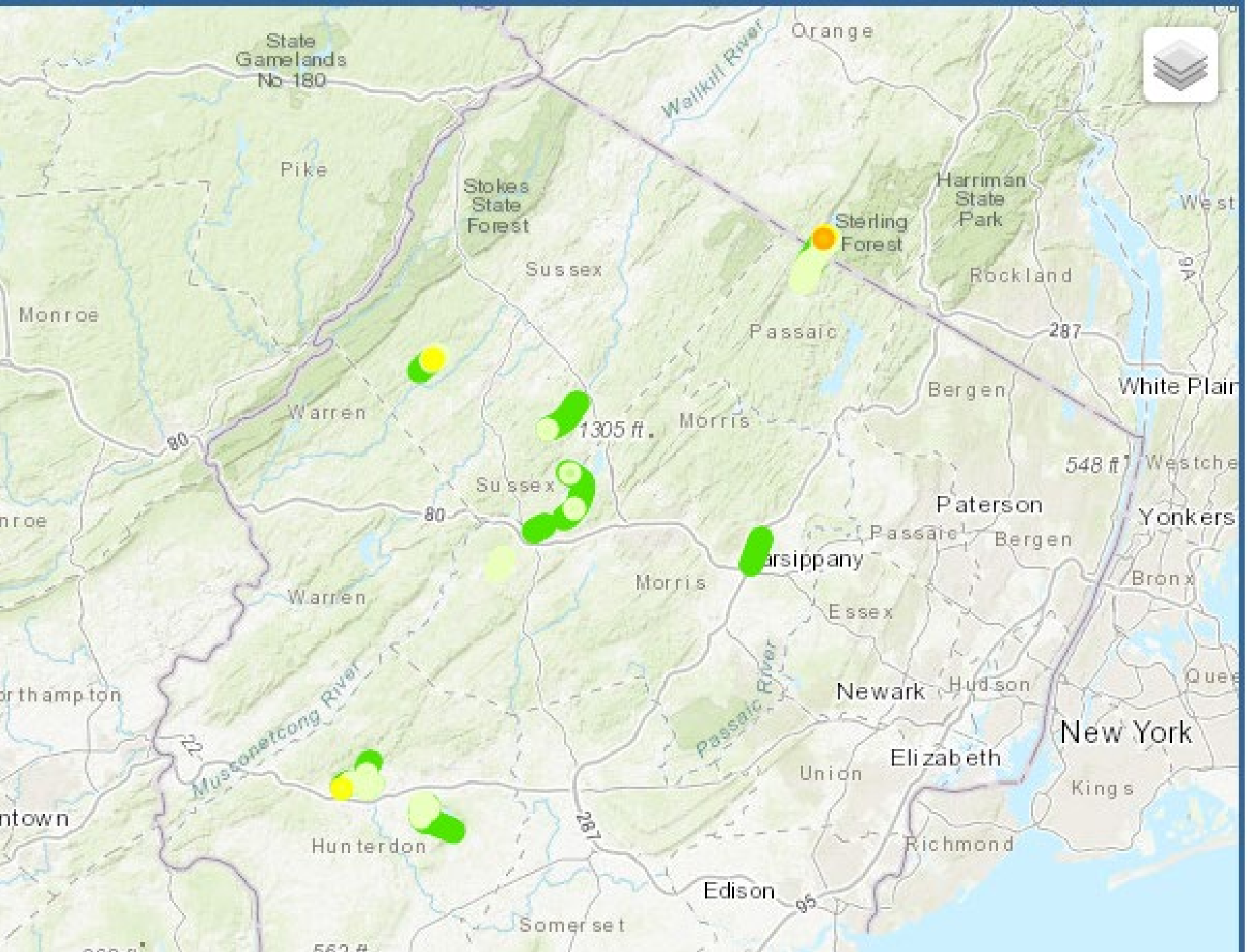
- Flyover Page
- Continuous Monitoring Buoy Network

EPA CyAN App

EPA CyAN




Statistics
Blooming Chart
Map
Blooming Chart
Reset zoom
Emerson Golf Course -- 1
Midvale Dam -- 2
Boonton Reservoir -- 10
Interchange 42 -- 1
South Branch Timber Swamp Brook -- 1
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0



Year **Month** **Day**

2024 | 9 | 10

Download

Estimated Cells per ml	
0 - 10,000	
10,000 - 20,000	
20,000 - 40,000	
40,000 - 60,000	
60,000 - 80,000	
80,000 - 100,000	
> 100,000	

Continuous Monitoring

Fly Overs

Resources

- dep.nj.gov/wms/bfbm/cyanohabs/
- njdep.rutgers.edu/aircraft_phyco/
- njdep.rutgers.edu/continuous/
- qed.epa.gov/cyanweb/account


The Who

The "Who"

When you suspect a bloom, alert NJDEP!

Report a HAB (Avoid It and Report It!)

NJDEP responds to all bloom reports where there is public access or drinking water concerns; and through upwards notification, alerts any additional parties (County Health, State Health, State Parks, etc.)

Link to NJDEP's Report a HAB

The “Why”

Just like a fingerprint – each bloom is unique and what factors caused the bloom are complex.

Some overlapping factors are well known:

- Nutrients (especially nitrogen and phosphorous)
- Still water
- Increased temperature

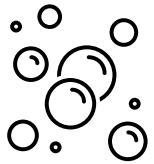
It’s likely a combination of one or more of these things leading to a bloom in your waterbody.

Bloom science is complex, and there isn’t a one size fits all approach for understanding the “why” just yet.

Waterbodies that experience a bloom are more likely to experience blooms again.

This can happen in the same season, or happen year after year.

The "What" pt. 2

Management of blooms boils down to 2 strategies 

Prevention

- Prevention works when you want to stop a bloom from happening (or happening again).

Intervention

- Intervention work when you already have a bloom.

Strategies for HABs

ITRC – HCB	• A great in-depth resource for guiding you in what strategies have been deployed against cyanobacteria blooms
EPA – Managing HABs	• A "higher level overview" which discusses similar topics to ITRC

Strategies for HABs

Questions you should be asking before using any technique:

1) What is the end goal?

If you're using an algaecide, you'll need a permit and a licensed applicator to apply the algaecide.

- There is no "one size fits all" algaecide. Algaecides also only stop the problem now, what caused the problem to happen in the first place?

You should try to have a long-term and short-term plan in place.

2) What are my risks of deployment?

What happens if what I am planning doesn't work? What is my plan B? Do I have a "circuit breaker" in place?

3) Where has this been done before?

Ask for examples of where this treatment or technique has been used before!

Strategies for HABs

Questions you should be asking before using any technique (continued):

4) How long will the effect last (if using an intervention method) or what is the expected deployment life of the system (if using a prevention method)?

What are some site considerations you need to plan for? E.g., Aeration systems need compressors and electricity; Maintenance needs to be a factor for any “system”

5) What are some other changes that can be made locally?

Stormwater controls, septic management, impervious surface coverage, etc.

Some changes can be made in the immediate; like restoring water flow if there is a blockage; some might be long-term changes to nutrient control and management.

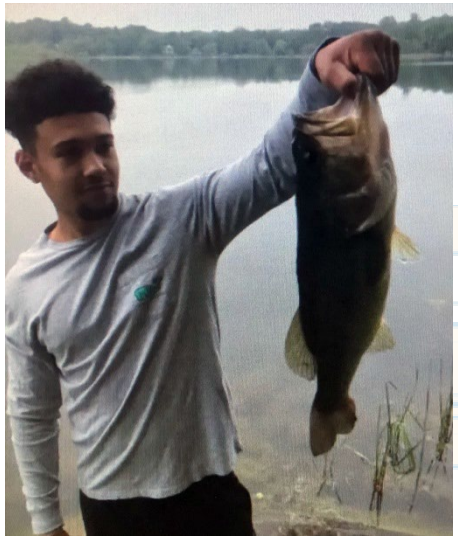
Resource Links

- ITRC - hcb-1.itrcweb.org/
- EPA Cyanobacteria Hub - epa.gov/habs/basic-information-habs
- EPA CyAN - qed.epa.gov/cyanweb/account
- NJDEP BFBM - dep.nj.gov/wms/bfbm/cyanohabs/
- NJDEP Flyover Portal - njdep.rutgers.edu/aircraft_phyco/
- NJDEP Continuous Monitoring Portal - njdep.rutgers.edu/continuous/
- NJDEP HAB Dashboard - njdep.maps.arcgis.com/apps/dashboards/7b91233096fc4b9ea5ef2de1a2280359
- NJDEP Report A HAB - survey123.arcgis.com/share/993bfe45dc494666af762b5397c12b9c

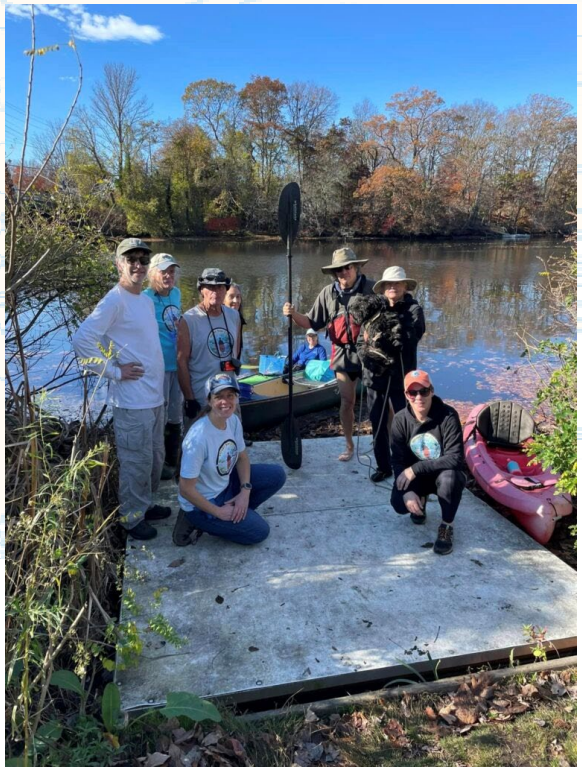
Thank you!

Rob Newby, Ph.D.

robert.newby@dep.nj.gov



Public Lakes Alliance of New Jersey



Lakes Are One of NJ's Greatest Resources

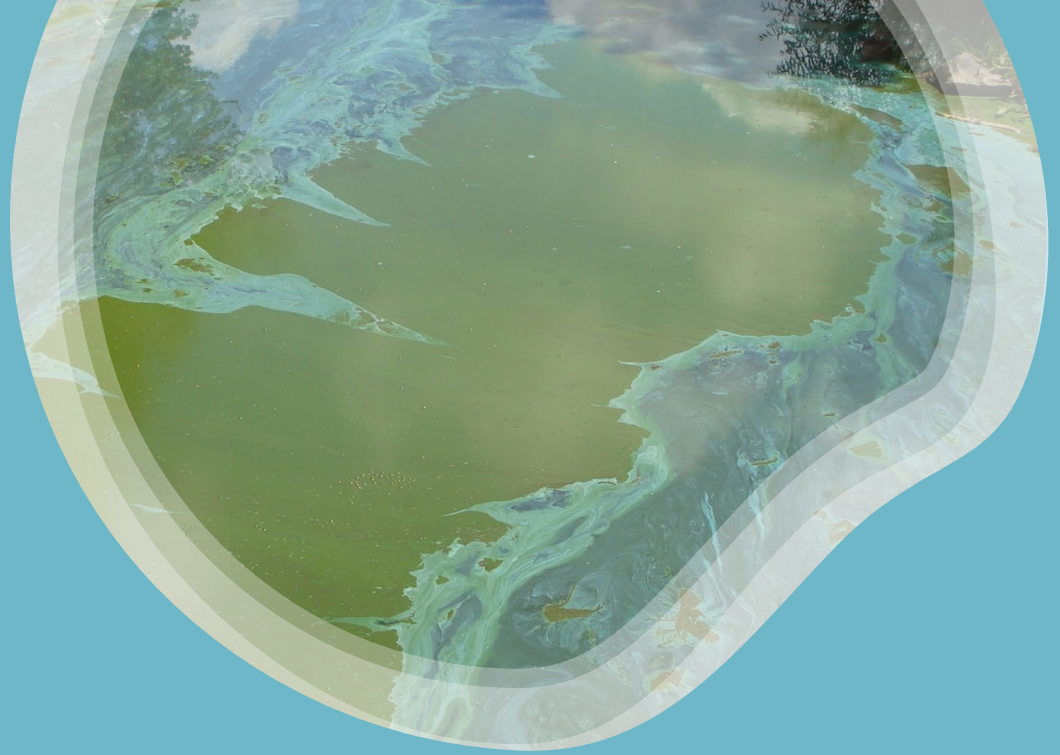
- 1700+ Lakes in NJ
  - 400+ Are Publicly Accessible
  - Used By Millions Each Year
  - Driver of Tourism
  - Major Source of Drinking Water
    - Greenwood Lake Feeds Monksville & Wanaque Reservoirs - 3.5M People & Thousands of Businesses
  - Marine Trades Association Estimates Boating in NJ Supports 12,000 Jobs + $2.B in Spending
  - American Sportsmen's Association Estimates Some 984,000 Anglers Spend Over $800M in NJ

Our Lakes Are Challenged As Never Before

- Harmful Algal Blooms (HABS)
- Road Salt
- Invasive Species
- Stormwater
- Increased Water Temperatures
- Internal Phosphorous Loads

Public Lakes Alliance of NJ

- Public Lakes from Around NJ Have Organized to Share Information & Help Each Other
- Larger Lakes like Hopatcong, Greenwood, Deal, & Swartswood and smaller like Strawbridge, Mountain, & Cranberry
- Monthly Virtual Meetings With Lake Experts
- Yearly Meeting With the Commissioner
- Recent Discussions-Lake Oxygenation, HABs Treatments, Grant Administration Problems, Advocacy, Hydroraking & Dredging
- Welcome Additional Participants - It Takes a Team!



Thank you for coming!