Old Lake Issues? The EPA National Lakes Assessment and funding new experimental solutions

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Introduction - Chris L. Mikolajczyk, CLM

- ✓ Senior Manager –Aquatics PH Colorado office
- ✓ NALMS Certified Lake Manager
- ✓ PH 25+ years
- ✓ 35+ years experience
- ✓ A.A.S., B.S., M.S. degrees
- ✓ NALMS Past-President
- ✓ CLRMA President-Elect
- ✓ Board Member - PPCTU

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What are some of the most common issues with regards to Lake Management? (*AKA – Eutrophication)*

- ✓Excessive nutrients
- ✓Harmful Algal Blooms (HABs)
- ✓Excessive vegetation (Submerged/Floating)
- ✓Invasive Species (Plants/Fish/Mussels/etc)
- ✓Excessive sedimentation
- ✓Stratification/Anoxia
- ✓Other specific lake/watershed issues

National Lakes Assessment

-The National Lakes Assessment (NLA) is a statistical survey of the condition of our nation's lakes, ponds, and reservoirs. It is designed to provide information on the extent of lakes that support healthy biological condition and recreation, estimate how widespread major stressors are that impact lake quality, and provide insight into whether lakes nationwide are getting cleaner. – Environmental Protection Agency

https://www.epa.gov/national-aquatic-resource-surveys/nla

National Lakes Assessment

The NLA is designed to answer the following questions about lakes across the United States:

- ✓ What is the current biological, chemical, physical and recreational condition of lakes?
- ✓ What is the extent of degradation among lakes?
- ✓ Is degradation widespread (e.g., national) or localized (e.g., regional)?
- ✓ Is the condition of lakes getting better, worse, or staying the same over time?
- ✓ Which environmental stressors are most associated with degraded biological condition in lakes?

NLA field season sampling is conducted every five years. Previous field seasons were conducted in 2007, 2012, 2017 and 2022.

National Lakes Assessment – Survey Design

The sampling design for the NLA is a probability-based network which provides statistically-valid estimates of the condition of all lakes with known confidence. Lakes are selected randomly using a statistical survey design to represent the population of lakes in their ecological region – the geographic area in which climate, ecological features, and plant and animal communities are similar.

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National Lakes Assessment – Survey Design

The NLA sampling is comprised of natural lakes, ponds, and reservoirs across the lower 48 states. Starting with the NLA 2012, to be included in the survey, a water body had to be a natural or man-made freshwater lake, pond or reservoir, greater than 2.47 acres (1 hectares), at least 3.3 feet (1 meter) deep, and with a minimum quarter acre (0.1 hectare) of open water. Lakes had a minimum retention time of 1 week. The Great Lakes and the Great Salt Lake were not included in the survey, nor were commercial treatment and/or disposal ponds, brackish lakes, or ephemeral lakes. The NLA 2007 assessed only those lakes greater than 10 acres (4 hectares) in size.

National Lakes Assessment – Indicators

Lake ecosystems are dynamic and indicators selected to characterize them should represent their varied aspects. For the NLA 2022, a suite of chemical, physical and biological indicators were chosen to assess biological integrity, trophic state, recreational suitability, and key stressors affecting the biological quality of lakes. Although there are many more indicators and/or stressors that affect lakes, NLA analysts believe these to be among the most representative at a national scale.

National Lakes Assessment – Indicators

Trophic State - the level of biological productivity in a water body, specifically a lake or reservoir, determined by the amount of nutrients, primarily nitrogen and phosphorus. It's a classification system ranging from oligotrophic (low productivity) to eutrophic (high productivity). Trophic state essentially describes how much plant life, algae, and other organisms a water body can support.

Oligotrophic: lakes have low nutrient levels and thus low levels of algae, zooplankton, and other organisms. The water is typically clear.

Eutrophic: lakes have high nutrient levels, leading to abundant plant life, algae, and other organisms. They may exhibit algal blooms and water can be murky.

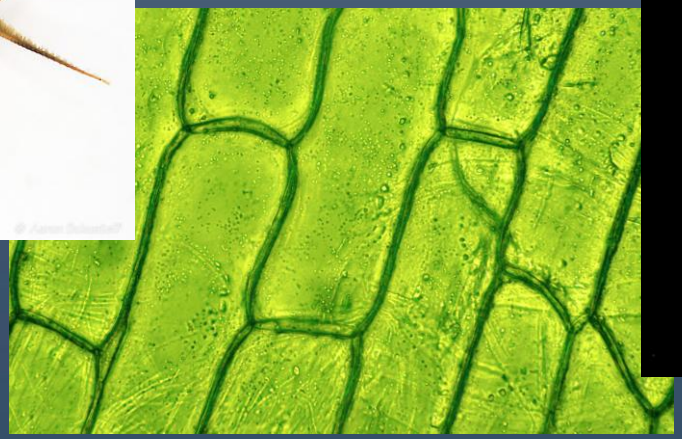
National Lakes Assessment – Indicators

Biological

Benthic macroinvertebrates - Benthic (meaning "bottom-dwelling") macroinvertebrates are small aquatic animals and the aquatic larval stages of insects.

Chlorophyll a - a specific form of chlorophyll used in oxygenic photosynthesis

Zooplankton - the heterotrophic component of the planktonic community having to consume other organisms to thrive



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National Lakes Assessment – Indicators

Chemical

Acidification - the process by which aquatic ecosystems become more acidic

Atrazine - an herbicide widely used for control of broadleaf and grassy weeds

Dissolved oxygen - the amount of oxygen that is present in water

Nitrogen - Nitrogen is a critical nutrient required for all life. The most common forms of nitrogen used by biological organisms include ammonia, nitrates, and nitrites.. These forms of nitrogen occur naturally in the environment at various points of the nitrogen cycle.

Phosphorus - Phosphorus is a critical nutrient required for all life. The common forms of phosphorus used by biological organisms are phosphate (PO4) and soluble reactive phosphate (SRP).

National Lakes Assessment – Indicators

Physical

Drawdown – the lowering of a waterbody

Human disturbance - a measure of the vulnerability of aquatic resources to a variety of harmful human activities

Lakeshore habitat - the physical features that make up the banks of rivers and shorelines of lakes

Physical habitat complexity - measures the amount and variety of all types of cover, both living and non-living, at the water's edge in lakes

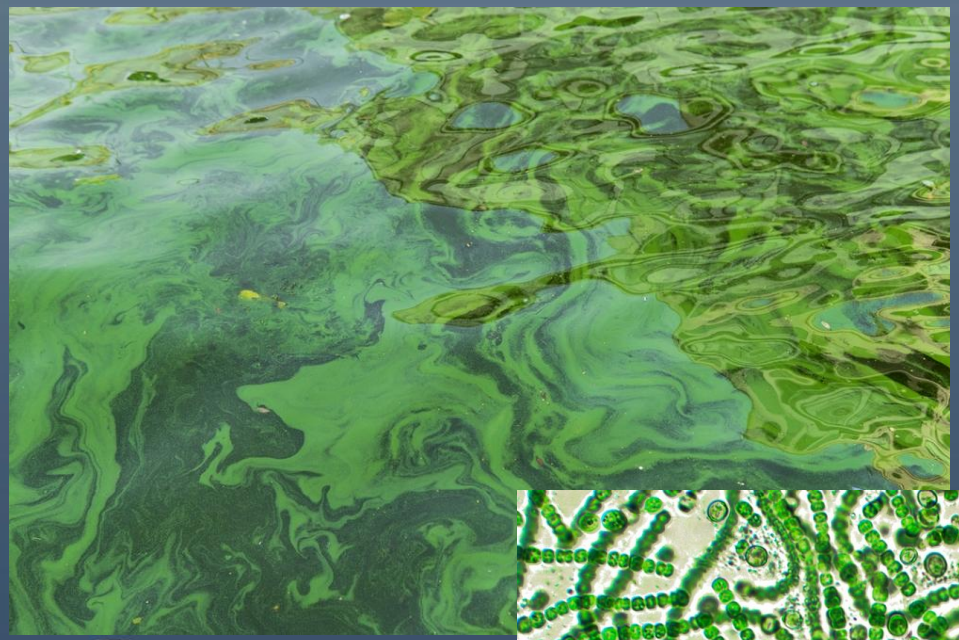
Shallow water habitat - areas that fish and other aquatic organisms need for concealment, breeding and feeding

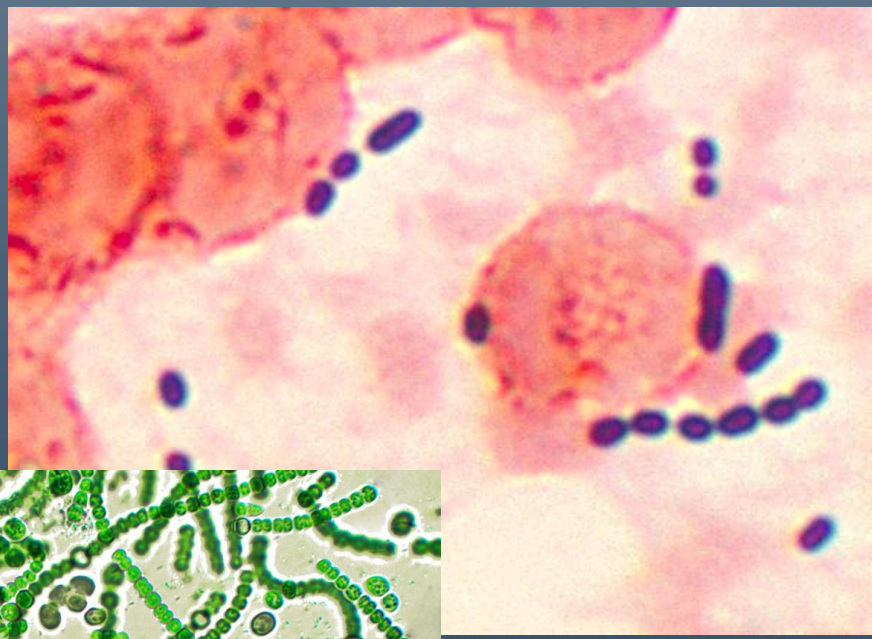
National Lakes Assessment – Indicators

Recreational/Human Health

Cyanobacteria – aka "blue-green algae" and the toxins they may produce

Enterococci- bacteria that live in the intestinal tracts of warm-blooded animals, including humans, indicating potential human waste

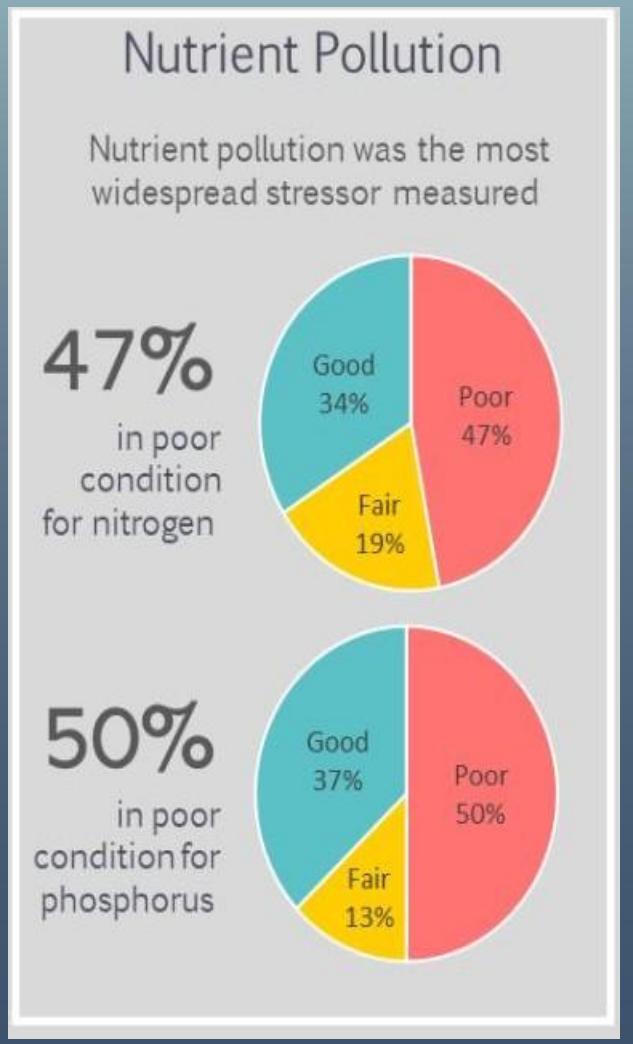




National Lakes Assessment – Results

Nutrient pollution was the most widespread stressor measured.

- ✓ **Across the country, 50% of lakes were in poor condition with elevated phosphorus, and 47% were in poor condition with elevated nitrogen.**
- ✓ **Excess nutrients can contribute to algal blooms and low oxygen levels, affecting ecological health, public health and recreation in lakes.**



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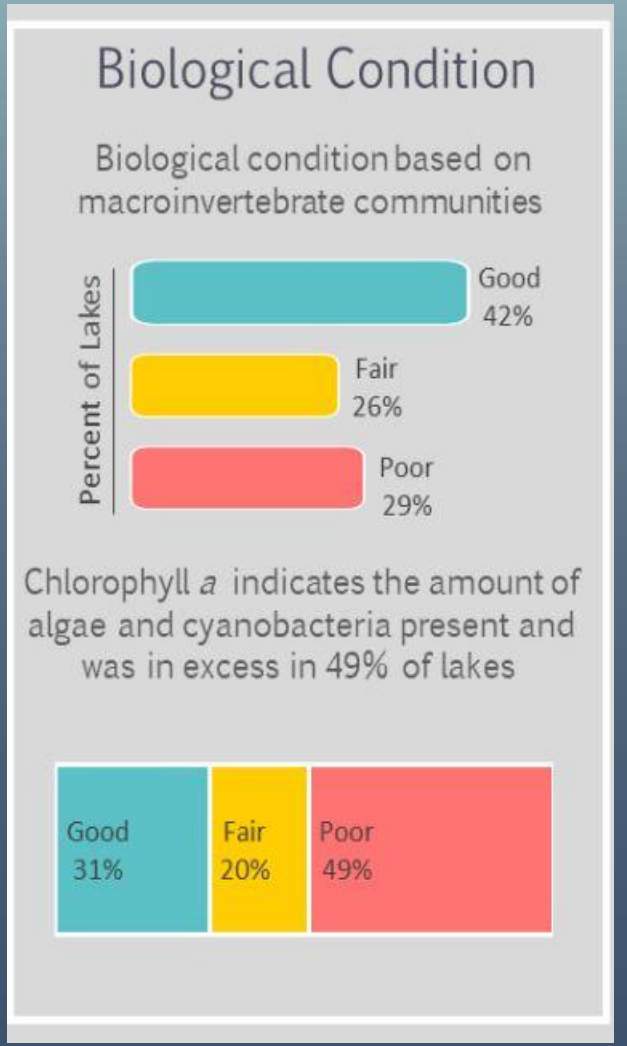
National Lakes Assessment – Results

High levels of algae and cyanobacteria growth were observed.

- ✓ **Hypereutrophic conditions, typically characterized by excess nutrients high levels of algae growth and low transparency, were observed in 30% of lakes.**
- ✓ **Chlorophyll a, which indicates the amount of algae and cyanobacteria present, was in excess and rated poor in 49% of lakes.**



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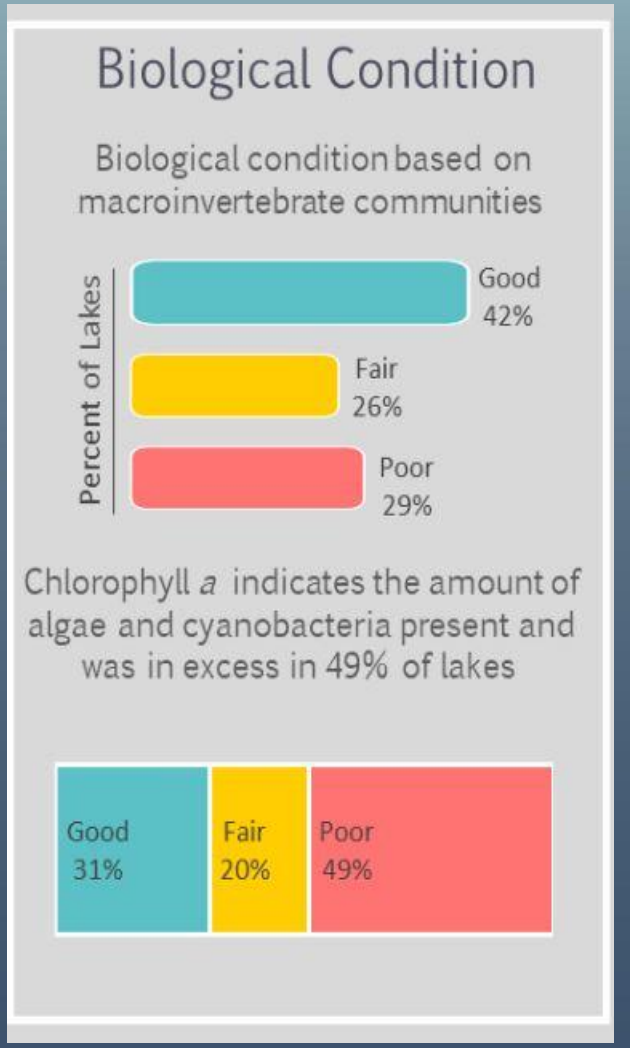
National Lakes Assessment – Results

Poor biological condition was more likely when lakes were in poor condition with respect to nutrients.

- ✓ **Nationally, in lakes where phosphorus was elevated, benthic macroinvertebrate communities (e.g., insect larvae, snails and clams living on the lake bottom) were 1.7 times more likely to be in poor condition. In natural lakes (i.e., excluding reservoirs), this risk increased to 2.2.**
- ✓ **Based on benthic macroinvertebrates, the EPA found that 29% of lakes were in poor condition and 26% of lakes were in fair condition.**
- ✓ **Based on zooplankton (microscopic animals in the water column), 25% of lakes were in poor condition and 25% of lakes were in fair condition.**



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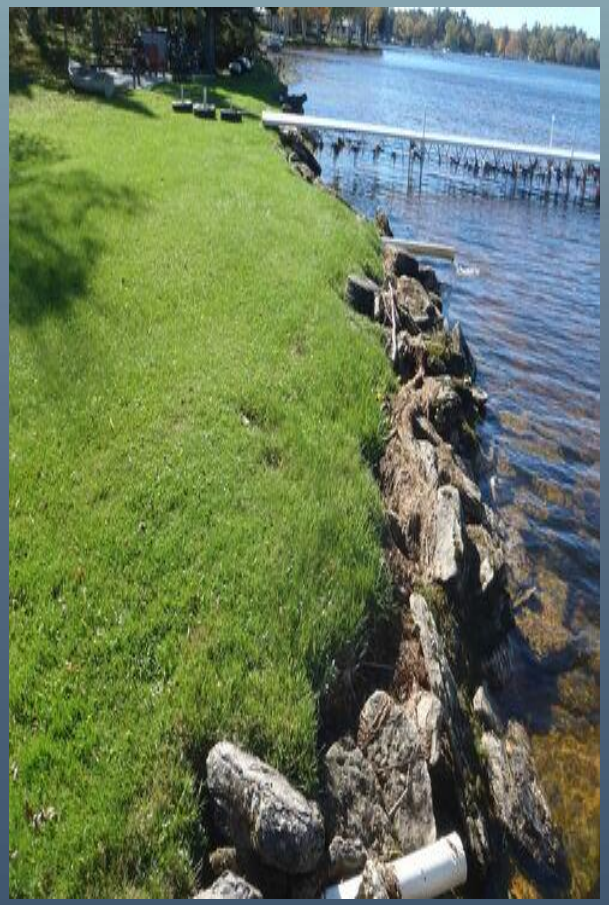
National Lakes Assessment – Results

Lakeshore disturbance was widespread, yet other physical habitat conditions were rated good in more than half of all lakes

- ✓ Only 16% of lakes were in good condition based on lakeshore disturbance measures, indicating moderate to high levels of human activity and shoreline alterations in 84% of lakes.
- ✓ Drawdown was poor in 5% of lakes, representing 13,400 lakes. The drawdown indicator measures water levels and their fluctuation; large drawdown indicates poor habitat condition.
- ✓ Most lakes were rated good for shallow water habitat (55%), riparian (lakeshore) vegetation cover (52%), and habitat complexity (51%) conditions.
- ✓ Poor biological condition was twice as likely when riparian vegetation cover or lake habitat complexity were in poor condition.



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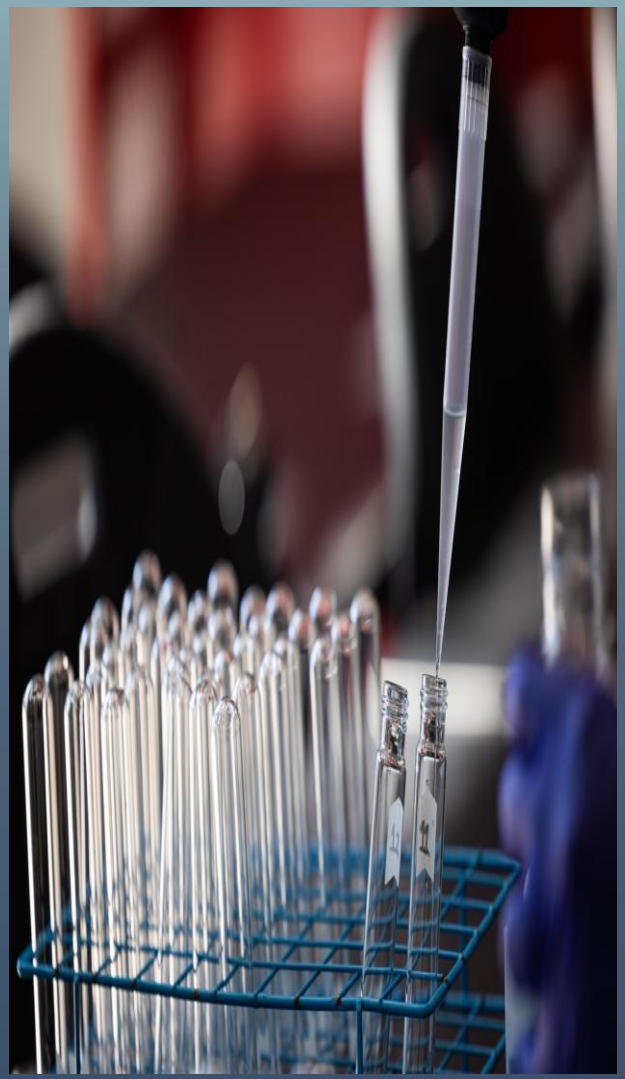
National Lakes Assessment – Results

Microcystins, a type of cyanobacterial toxin, were detected in 50% of lakes.



- ✓ Microcystins measured in the open waters exceeded the EPA recreational criterion in 2% of lakes, representing 5,360 lakes across the nation.
- ✓ Cylindrospermopsin, another cyanobacterial toxin, was detected in 12% of lakes but did not exceed the EPA recreational criterion in any lakes during the 2022 survey.
- ✓ For information on cyanotoxins in specific lakes, people should check with state, Tribal or local governments before swimming, boating or fishing.

National Lakes Assessment – Results

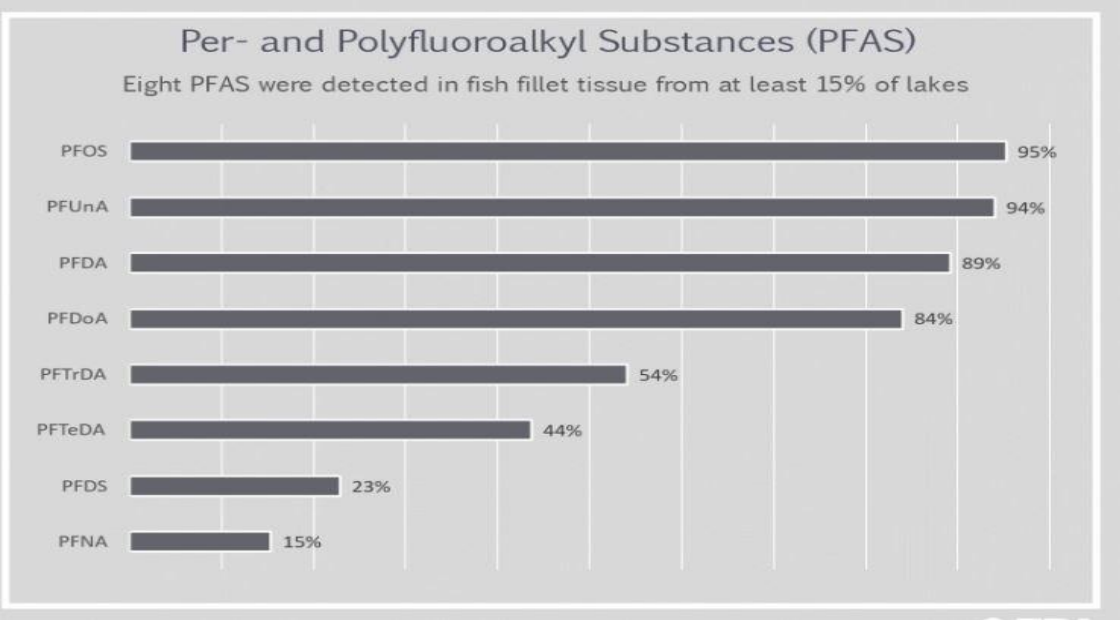
The herbicide atrazine was detected at low levels in 41% of lakes.

Atrazine levels exceeded the EPA benchmark, the "concentration equivalent level of concern" for aquatic plant communities, in 0.9% of lakes, representing 2,430 lakes.

National Lakes Assessment – Results

Contaminants were present in all fish tissue, but risk varied by contaminant and by fish consumption level.

- ✓ **Every fillet tissue sample contained detectable levels of mercury and polychlorinated biphenyls (PCBs), which corresponds to an estimated 58,747 lakes containing fish with detectable levels of these contaminants.**
- ✓ **In the lakes assessed for per- and polyfluoroalkyl substances (PFAS), an estimated 95% contained fish with detectable levels of perfluorooctane sulfonic acid (PFOS). In addition, seven other PFAS were detected in fish collected from at least 15% of lakes. Sixteen of 40 tested PFAS were not detected in any of the tissue samples.**



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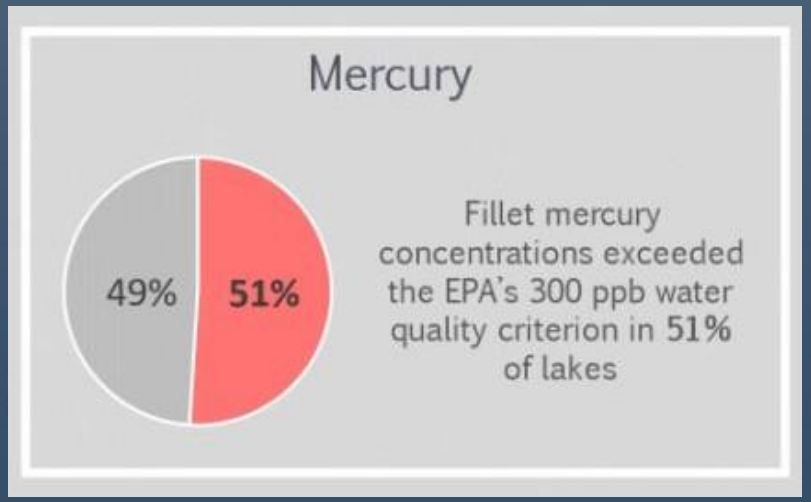
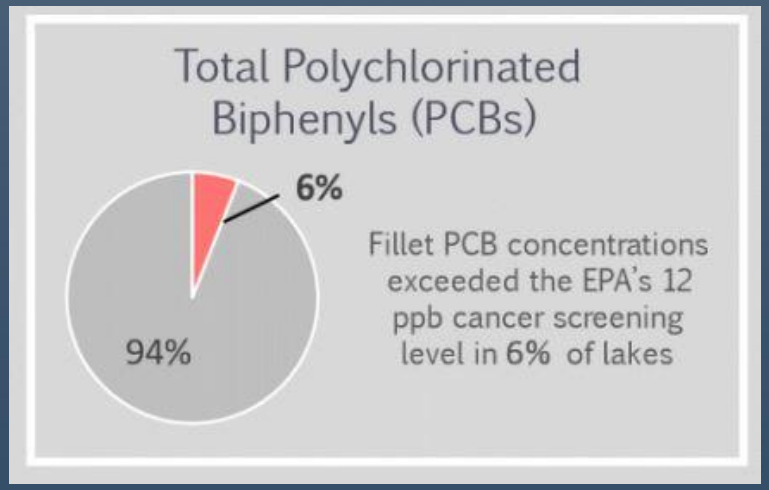
National Lakes Assessment – Results

Contaminants were present in all fish tissue, but risk varied by contaminant and by fish consumption level.

- ✓ **The percentage of lakes that contained fish exceeding mercury and PCB screening levels in fillet tissue is as follows:**
- ✓ **Mercury: 51% exceeded the EPA's tissue-based water quality criterion for mercury.**
- ✓ **Total PCBs: 23% exceeded the cancer screening level for high-frequency fish consumers, who eat four or five 8-ounce meals per week, and 6% exceeded the cancer screening level for general fish consumers, who eat just one 8-ounce meal per week.**
- ✓ **People who eat locally caught freshwater fish should consult state and Tribal agencies responsible for issuing fish advisories.**





National Lakes Assessment – Results

Key Findings on Change from 2017 to 2022

- ✓ For both nutrients and biological indicators, there was little change between surveys at the national level.

- ✓ For both microcystins and atrazine, the small percentage of lakes with concentrations that exceeded the human health (2%) and aquatic life (0.9%) risk benchmarks, respectively, did not change significantly.

National Lakes Assessment – Results

Key Findings on Change from 2017 to 2022

There were significant changes in some chemical and physical habitat measures.

- ✓ The number of lakes with good shallow water habitat decreased by 9 percentage points, to 55%.
- ✓ The number of lakes with good ratings for lakeshore disturbance decreased by 9 percentage points, to 16%.
- ✓ Detection of microcystins increased by almost 30 percentage points, to 50%.
- ✓ Detections of atrazine increased by 11 percentage points, to 41%.

National Lakes Assessment – Results

EcoRegion Results – Northern Appalachians

- ✓ An estimated 20,219 lakes in the Northern Appalachians ecoregion are represented in the National Lakes Assessment (NLA). Of these lakes, 60% are natural and 40% are man-made.
- ✓ 11% of lakes are rated as hypereutrophic while 41% are eutrophic, 37% are mesotrophic and 11% are oligotrophic.
- ✓ The most widespread stressors assessed are phosphorus and nitrogen with 39% rated poor for phosphorus and 30% rated poor for nitrogen. Atrazine was also detected in 31% of lakes.
- ✓ Based on microcystins, detections occurred in 39% of lakes and no lakes were above the recreational benchmark.

National Lakes Assessment – Results

EcoRegion Results – Northern Appalachians

- ✓ The Percent of lakes in good condition for benthic invertebrates decreased by 38 percentage points and the percent in good condition for chlorophyll a decreased by 31 percentage points between 2012 and 2017.

- ✓ The percent of lakes with microcystin detections increased by 37 percentage points.

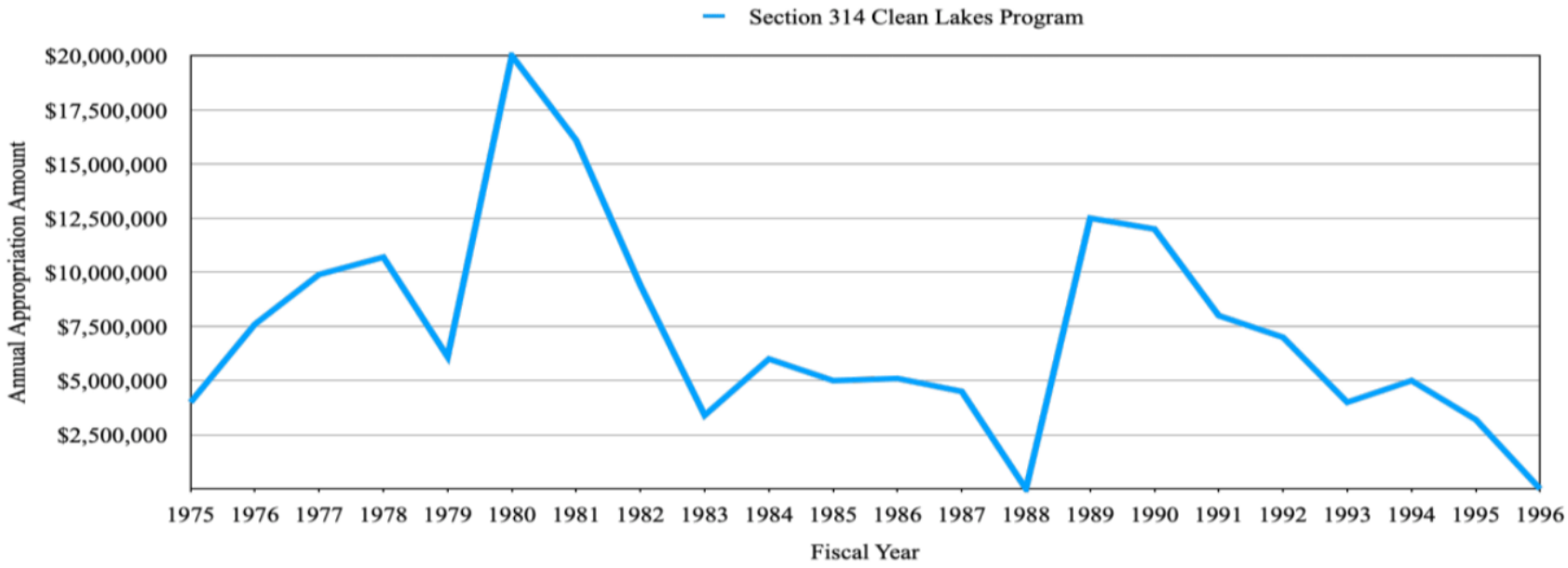
Clean Lakes Program – Section 314

-The Clean Lakes Program was created in 1972 and was established under Section 314 of the Federal Water Pollution Control Act, later known as the Clean Water Act. The Clean Lakes Program grant provided funds to help conduct identification surveys and diagnostic feasibility studies so that lake managers could identify issues in the lake and watershed and address them in later phases of the project.[1]

-Section 314 propagated funds to the Clean Lake Program specifically for lake classification surveys, diagnostic feasibility studies, and lake remediation projects.

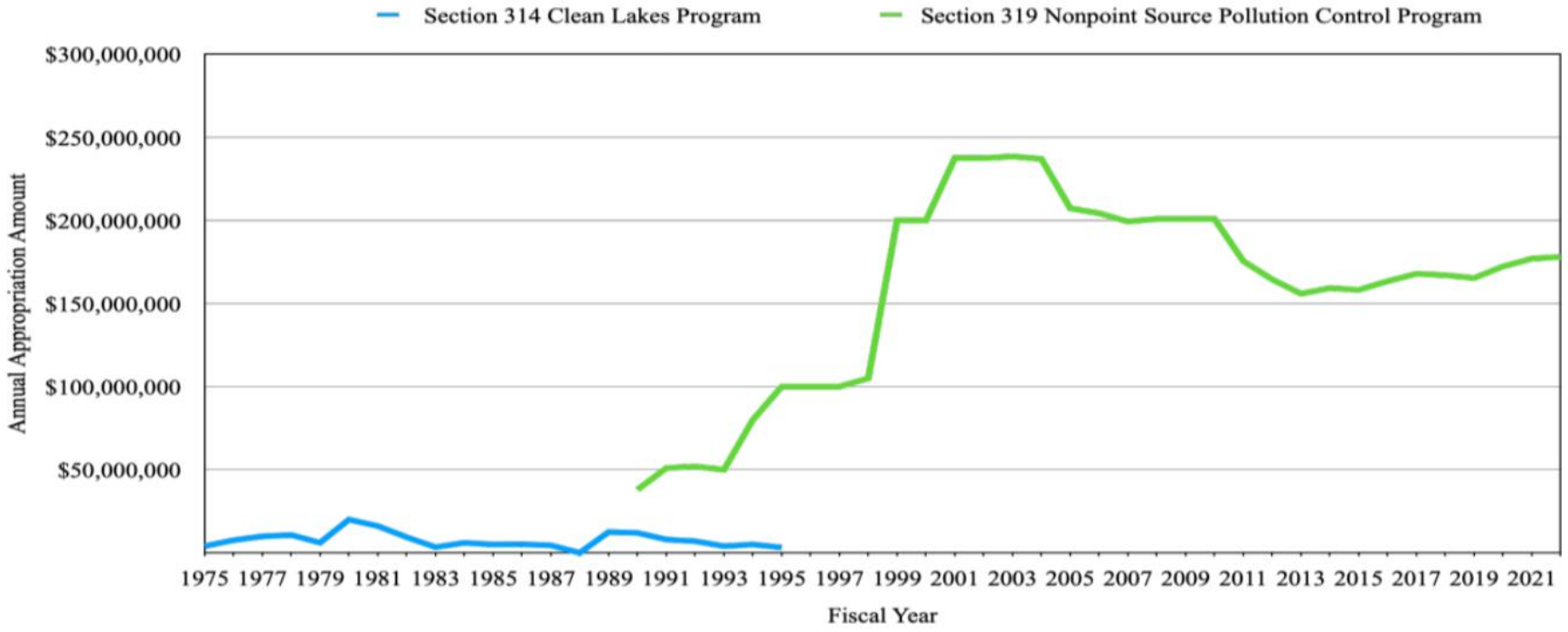
Authorizations & Appropriations

-Between 1976 and 1995. the Clean Lakes Program awarded approximately $145 million in grants; however. the program has received no funding since 1995, despite reauthorizations in 2000 and 2002.



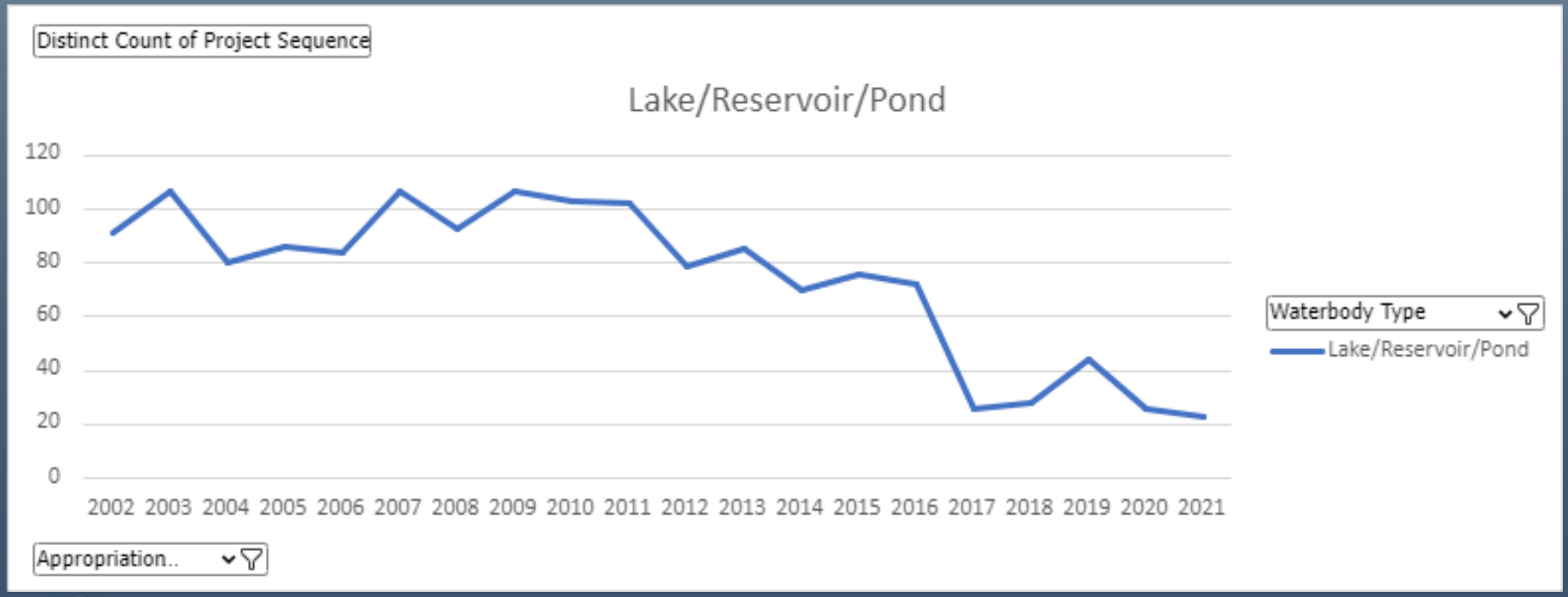
The Issue – Current Lakes Funding

-The 314 Clean Lakes program funding was discontinued and reallocated to Section 319 of the Clean Water Act, which provides funds for implementing projects that address non-point source water solution pollution. However, the Congress Committee on Appropriations recommended only five percent of 319 grant funds were used to facilitate lake-related projects compared to other water sources contaminated by non-point sources. [3]



The Issue – Current Lakes Funding

-Section 319 funds are not properly allocated to restoration projects that deal with the most current and specific lake-related issues that involve climate change, harmful algal blooms, invasive species and continued nutrient pollution.



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The Issue – Current Lakes Funding

What are some other sources?

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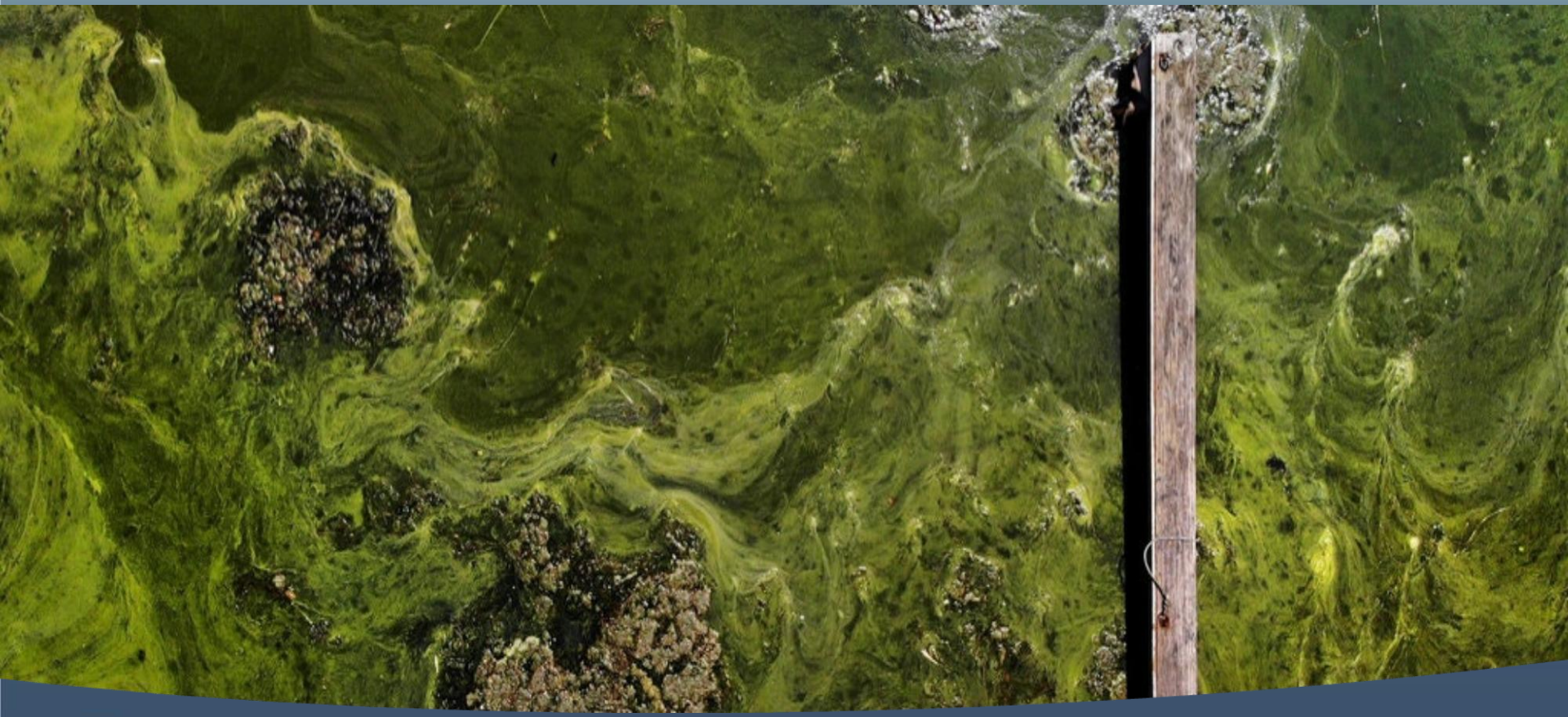
Economic Study
Lake Hopatcong

- In 2019 a lake-wide HAB event occurred in mid-June due to a series of short but intense storms.
- These HABs continued through the rest of 2019 growing season, perpetuated through internal phosphorus loading.
- The LHC will be submitting a proposal to the Highlands Council to conduct an economic study to quantify the economic value of Lake Hopatcong in 2019 dollars.

Lake Hopatcong, NJ, Summer of 2019. Photo credit: Rick Loomis, New York Times



Economic Study
Lake Hopatcong

- Once the 2019 value is quantified, the loss associated with the HAB event will be quantified.
- The study will focus on the property value of the shoreline homes, as well as the impact on local businesses, particularly during the "high summer season," between Memorial Day and Labor Day Holiday weekends.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BEACH CLOSED NO SWIMMING
DANGER

Natoinal Fish and Wildlife Foundation

- ✓ Monitoring Harmful Algal Blooms in the Delaware River Watershed Using Drones & Spatial Analysis

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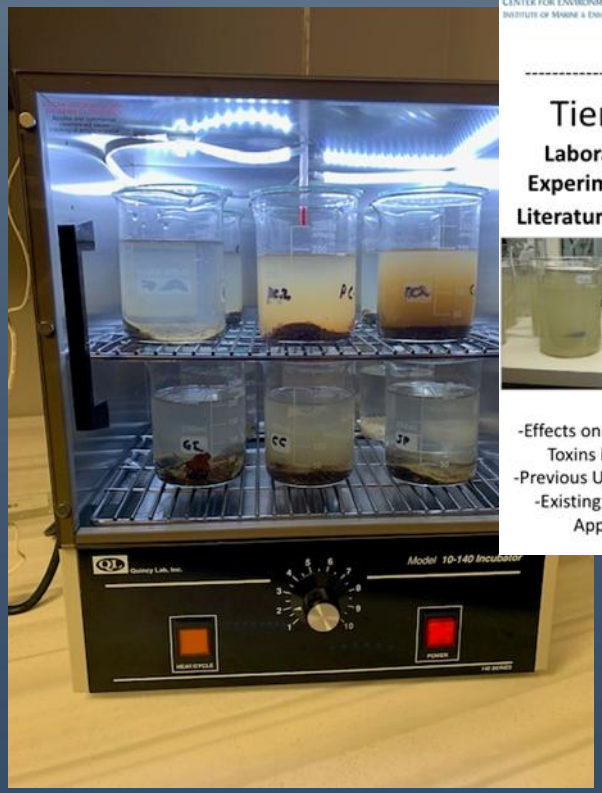
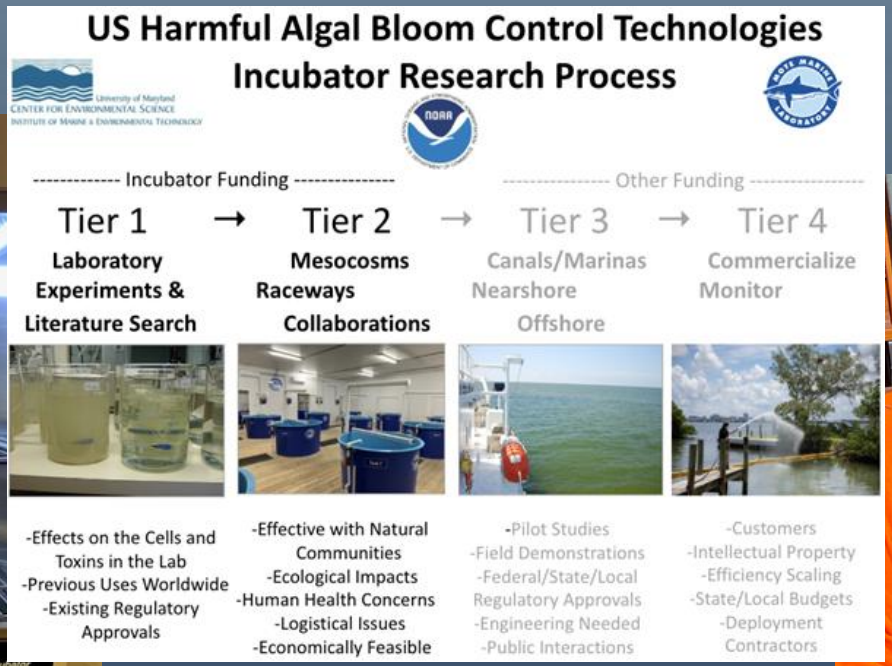
National Fish and Wildlife Foundation

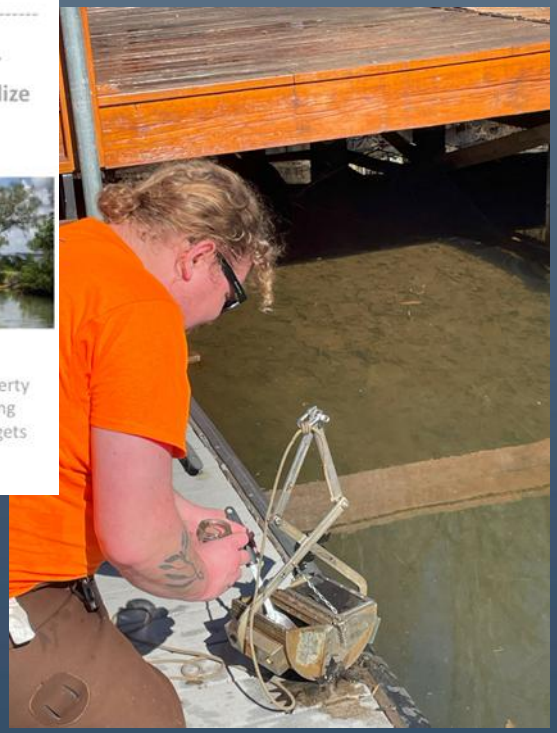
- ✓ 24+ locations in the Delaware River watershed (NY/NJ/PA)
- ✓ Preliminary Iteration of Field Methodologies and Review of Existing Data
- ✓ Field Events (Spring 2025 – Summer 2026)
- ✓ Volunteer Data Collection (In-Situ)
- ✓ Data Analysis

United States Army Corps of Engineers – Environmental Research and Development Center (ERDC)

- ✓ Experimental HAB treatment and control







ERDC

- ✓ Formal Workplan
- ✓ Permitting
- ✓ Pre-Treatment Incubations (Sediment Focus)
- ✓ Treatments (Early Spring – Late Summer)
- ✓ Monitoring
- ✓ Data Analysis
- ✓ Final Reporting

United States Army Corps of Engineers – Environmental Research and Development Center (ERDC)

- ✓ Experimental HAB treatment and control

Beverly Hudnut – 1959/2024

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QUESTIONS?

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THANK YOU!

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