NEW YORK STATE | Department of Environmental Conservation

Honeoye Lake Alum Application

SPDES Draft Permit

Public Information Session

Dr. Lewis McCaffrey, NYSDEC Div. of Water, Finger Lakes Hub

September 27, 2022

What We'll Cover

- Project Objectives
- Honeoye Lake water quality
- TMDL – a phosphorus diet for a lake
- How does alum work?
- Determining the Alum dose
- Dosing alum in Honeoye Lake
- What are the likely effects?
- How we will monitor
- Your next steps - how to comment

Project Objectives

Honeoye Lake will be 3rd lake treated as part of NYSDEC's nutrient inactivant (alum) pilot program since 2019

1. Implementation of a safe and effective dose
2. Evaluating efficacy of alum – spring and fall
3. Establish criteria around future treatments
4. Inform potential statewide permitting pathway on nutrient inactivants

Inactivants in New York State

Use of nutrient inactivants is currently not *permittable* beyond the pilot project.

Peach & Mohegan lakes treated in 2019

- Pilot studies, with much monitoring

NYSDEC is continuing to explore the development of a broad nutrient inactivant permitting pathway, through pilot studies.

Honeoye Lake

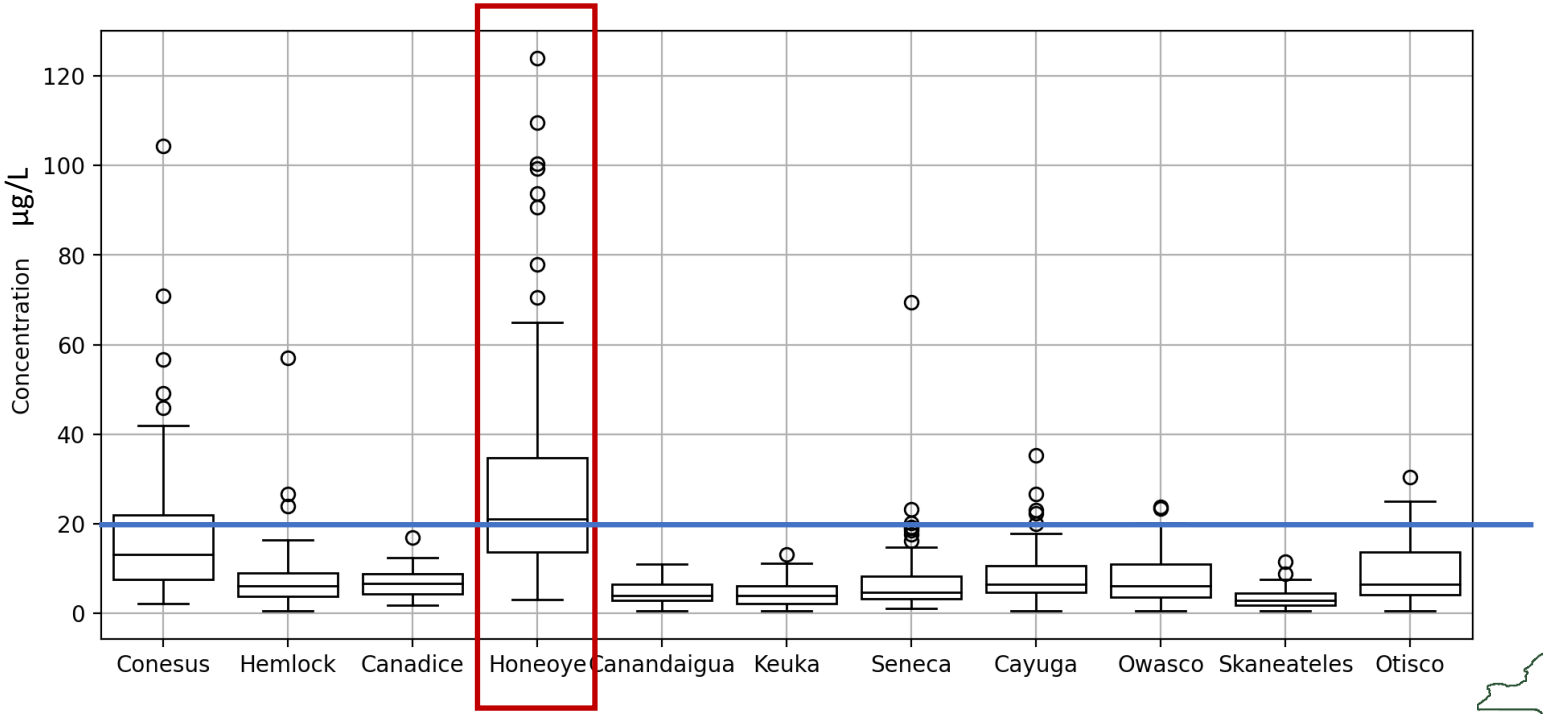
Background and water quality

Water Quality in Honeoye Lake

Honeoye Lake is classified as ‘AA’ with best uses:

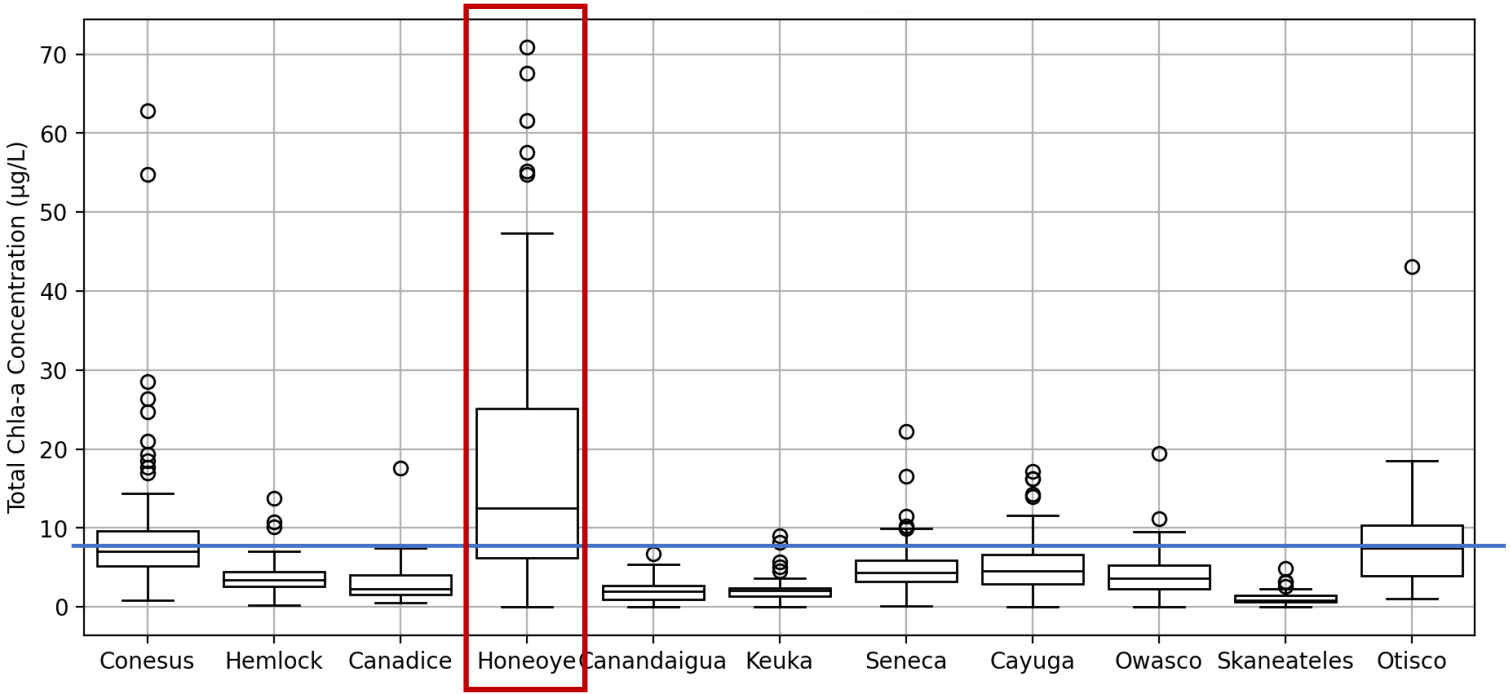
- As a source of water supply for drinking, culinary or food processing;
- Primary and secondary contact recreation
- Suitable for fish, shellfish and wildlife propagation and survival.

Phosphorus – a Critical Nutrient



NEW YORK STATE Department of Environmental Conservation

Chlorophyll-a – the Green Algae Pigment



'Eutrophic' boundary

NEW YORK STATE Department of Environmental Conservation

Water Quality Problems

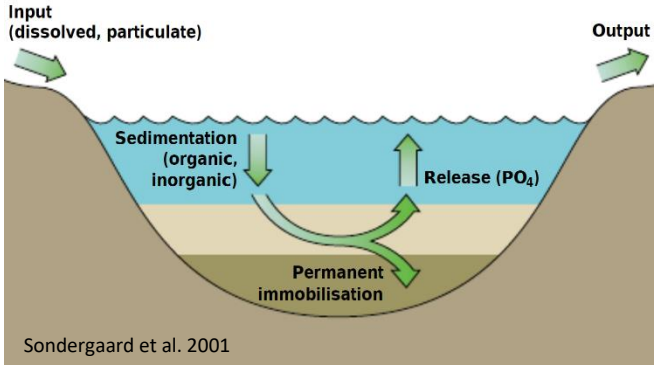
- Harmful Algae Blooms common
- Beach closures – HABs/clarity
- Fish kills
- Low oxygen
- Analyses showing high nutrients

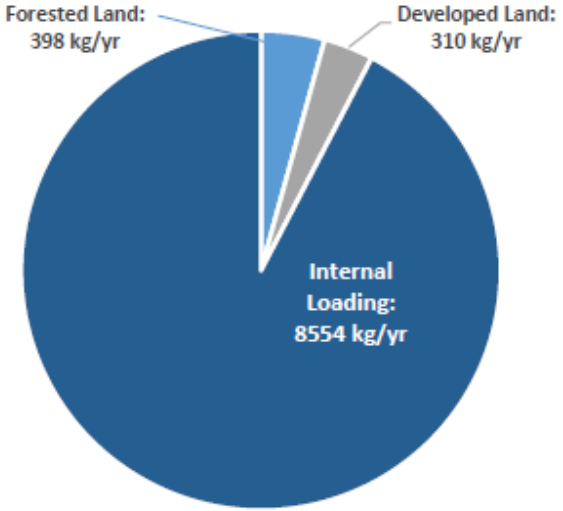
In 2002 the lake was put on Section 303(d) list of impaired waters for phosphorus and low dissolved oxygen, meaning a ‘TMDL’ is required

Clean Water Planning

Total Maximum Daily Load (TMDL), 2019 - showed the maximum amount of phosphorus (P) that can be delivered to the lake from all sources to maintain good water quality

- External sources = from the land
- Internal sources = release of P from the sediments in low oxygen conditions
  - **~93 % internal load in Honeoye**





Clean Water Planning continued

HAB Action Plan, 2018

- Recommended numerous actions
- Identified internal loading as the significant phosphorus source and key factor in HABs

At least $4.5m spent in the watershed

- BMPs, monitoring, vegetation control, shoreline stabilization, sanitary sewer improvements, UV disinfection

Options for In-lake Management of Sediment P Release in Honeoye Lake

3 well-established management techniques:

- Dredge and remove P-rich sediments
- Aeration of the bottom waters to maintain oxygen levels high enough to prevent release of P from sediments
- Phosphorus inactivation using alum or similar P-binding coagulant

Images: Solitudelakemanagement.com

Why Alum?

TMDL, HAB Action Plan, and Honeoye Feasibility Study all indicate combination of nutrient inactivation and aeration to control sediment phosphorus release and impacts to water quality

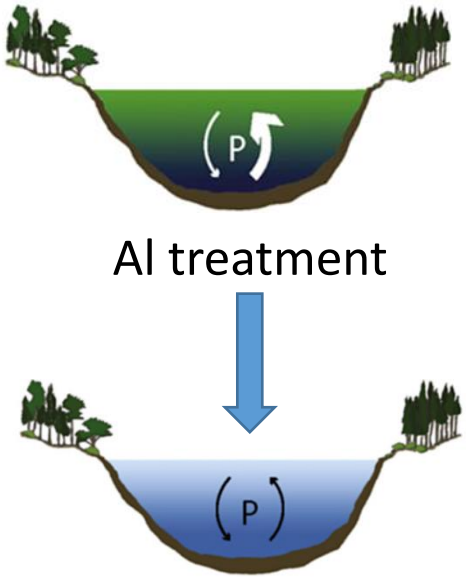
- Use of alum does not exclude aeration – literature supports combined strategies
- Alum has previously been used in Honeoye Lake, but at a low dose (150 gal/acre) – not effective over long term

Alum

A way of controlling P

Nutrient Inactivation using Alum

- Liquid Alum (Aluminum sulfate) applied below the surface of water from a boat
- Forms a “fluffy” non-toxic substance, or floc, called Aluminum hydroxide
- As the floc settles, it removes P from the entire water column
- Forms a barrier on the bottom sediments, thus preventing P entering water column
- Improved water quality: Better clarity, color, less available P



NEW YORK STATE Department of Environmental Conservation

Nutrient Inactivation using Alum

Why Alum?

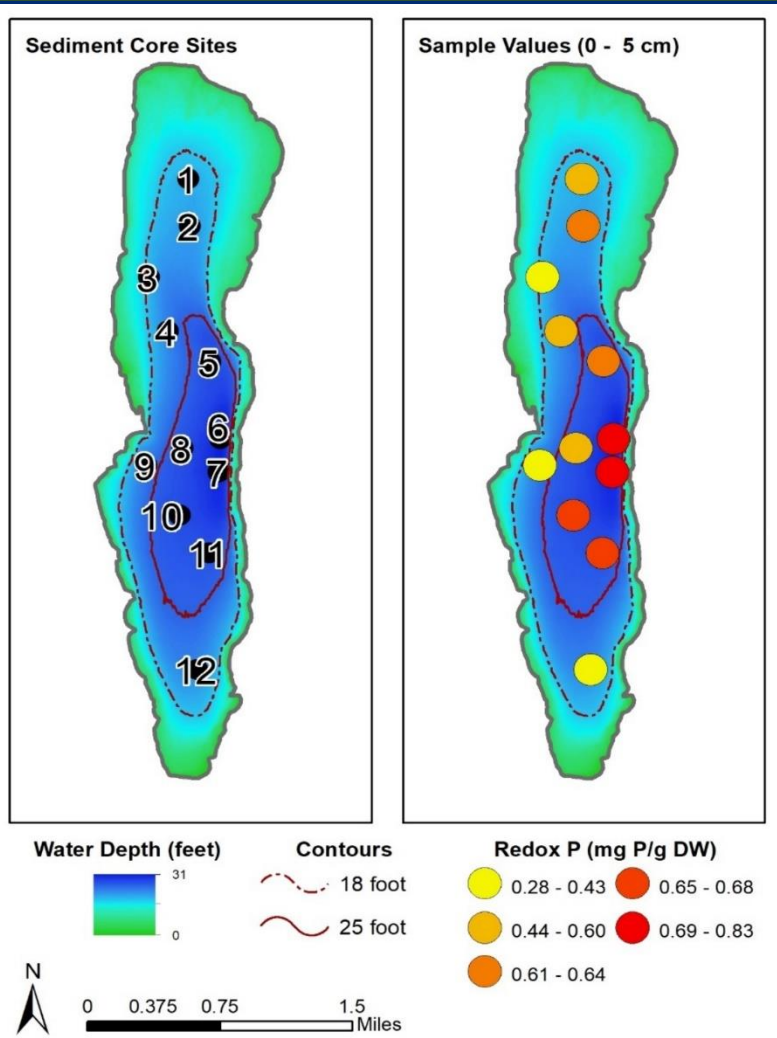
- Easy to obtain – produced in bulk
- Safe for humans, pets and other aquatic wildlife
- Rapid and effective removal of available P in the water column
- Can effectively bind P under a wide range of pH and oxygen levels
- Authorized for using in drinking water treatment
- Liquid alum can be precisely dosed

Honeoye Lake

Determining Alum dosage

Alum Dose Determination

- Amount of alum to apply was determined by measuring the amount of P in lake sediments
- Sediment samples were collected from multiple locations throughout the lake in April 2022
- P concentrations were generally higher in areas of greater water depth, which is typical of most lakes



Alum Dose Determination

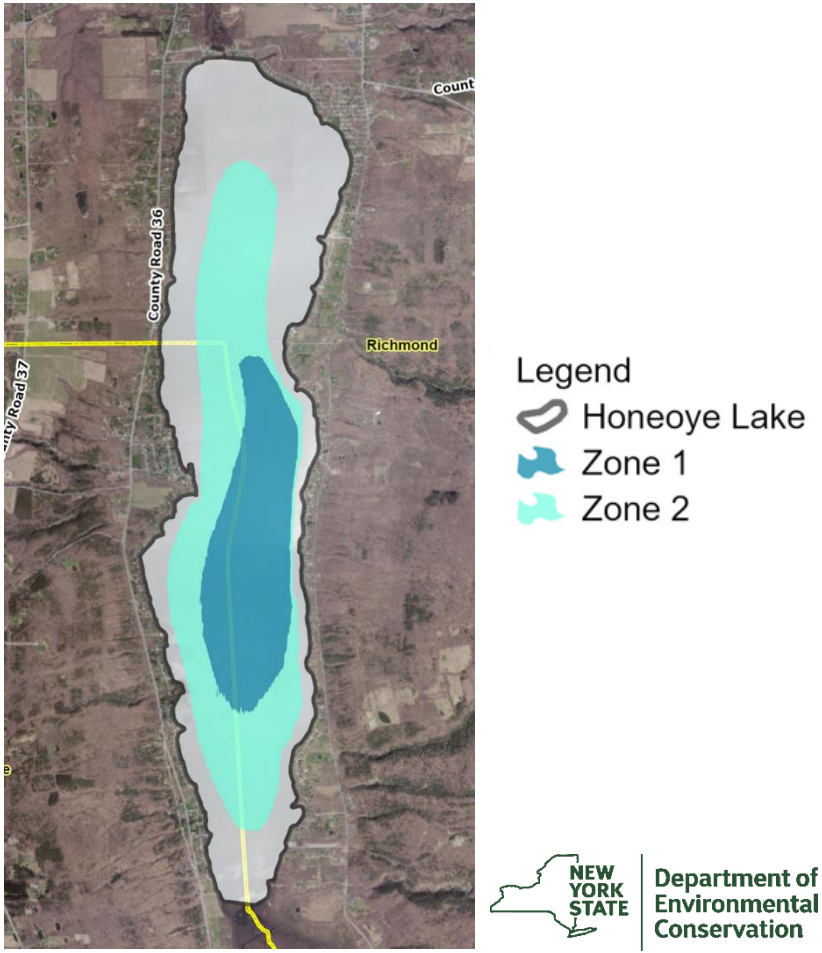
Higher dose of alum is needed in the deeper zone

- Zone 1 - deeper than 25 ft
- Zone 2 - 18-24 ft

Zone 1: 410 gals/acre
Zone 2: 276 gals/ acre

Total volume 315,700 gallons over 965 acres

NB 2006 dose was 150 gal/acre



NEW YORK STATE | Department of Environmental Conservation

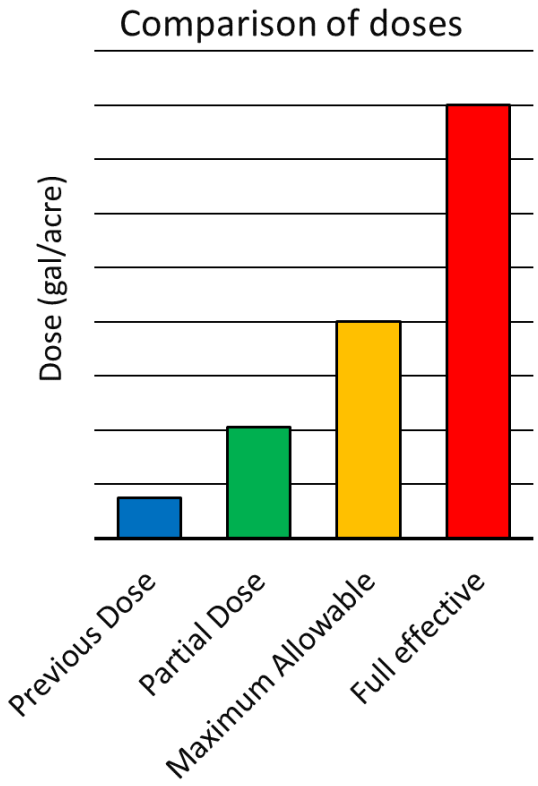
Full Effective Dose *versus* Partial Dose

A full, effective alum dose was calculated based on P measurec in the water and sediments

A **maximum allowable dose** was also calculated to confirm effect of alum on pH

A partial dose will be applied in fall 2022,

- Partial dose is about 1/4 of the full effective dose
- Partial dose is approximately 1/2 of the maximum allowable dosage
- Partial dose is roughly double the amount applied in 2006
- Common to split alum doses into multiple applications, especially in large lakes



Application in Honeoye Lake

What would it look like?

How is Alum Applied?

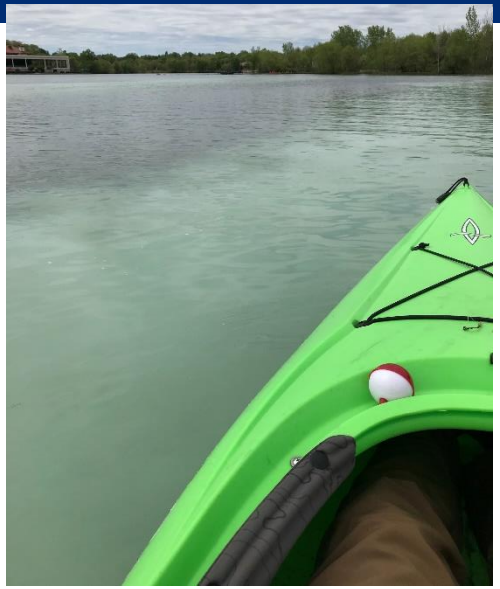
- Tanker trucks refill large holding tanks on the shore
- Tanks will be at State Boat Launch
  - Launch will remain open for use

- Barge tanks are refilled throughout the day
- Spill response measures
- Security measures

NEW YORK STATE | Department of Environmental Conservation

How is Alum Applied?

- Large barge with tanks on board to hold liquid alum

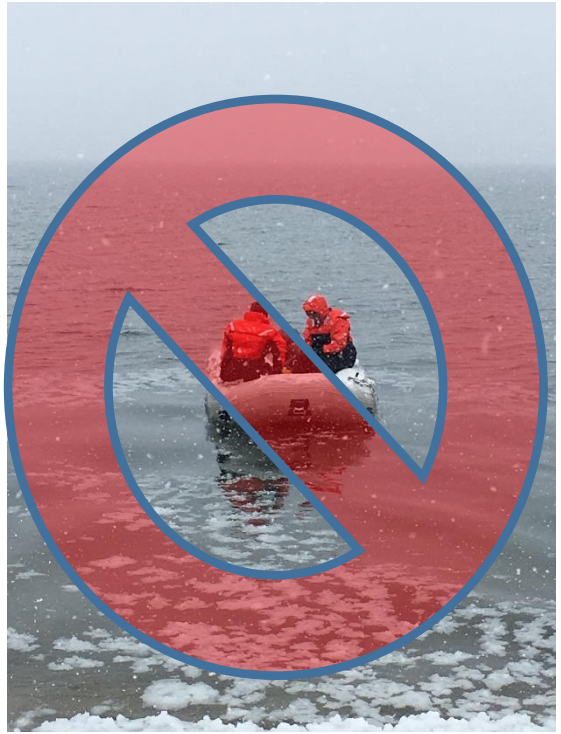


- Alum is applied to the lake through hoses that reach a foot or more below the water surface.
- Applied over about 20 days
- Lake remains fully accessible and usable

NEW YORK STATE | Department of Environmental Conservation

Required Lake Conditions for Alum Treatments

- Acidity (pH) must be between 6.5 and 8.5
- Water temperature warmer than 40°F
- Wind speeds less than 15 mph
- No heavy rain 48 hours before or 72 hours after the alum application



NEW YORK STATE | Department of Environmental Conservation

Intensive Daily Monitoring

Each day measurements are taken before, during and after treatment:

- Dissolved Oxygen, pH, Temperature, conductivity (x5, and hourly)
- Clarity, user perception (x5)
- Nutrients (TP, SRP, TDP, Total Al, Diss Al) (x1)
- Biology (phytoplankton, zooplankton) (x1)
- Any wayward results would halt application

https://tinyurl.com/ph5zfyma

NEW YORK STATE | Department of Environmental Conservation

Honeoye Lake

Likely effects

Possible Chemical Response with Full Effective Dose

- Reduction in open water P concentration for years
- Decrease in color
- Increase in water clarity
- Increase in oxygen levels

Possible Biological Response with Full Effective Dose

- Improvement to ecosystem health
- Decrease in weed growth
- No toxic impact on fish
- Fishery impact measured via Big Panfish Initiative

Honeoye Lake

Monitoring

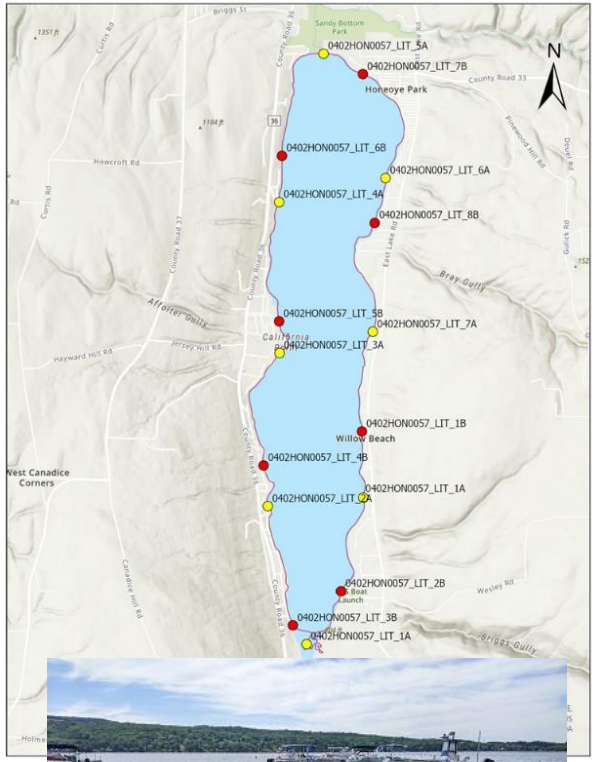
Water Quality Monitoring

- Pre-treatment monitoring was conducted in June 2022.
  - User-perception data, discrete water chemistry samples, and vertical profile measurements collected.
  - This data will supplement data collected at sites in the north and south, bi-monthly from June-September since 2017

NEW YORK STATE Department of Environmental Conservation

Biological Monitoring – Benthic Macroinvertebrates

- Kick-net and ponar composite samples collected at 2 sets of 8 equidistant sites around the lake.
  - Each site sampled in triplicate
  - Following NYSDEC protocols
- Physical habitat observations collected at each site



Biological Monitoring – Zooplankton & Sediment Diatoms

- Duplicate 5-meter tows collected at deepest location in lake in June 2022 – following a National Lakes Assessment (EPA) protocol
- Sediment diatom core collected at the same location

Project Outcomes and Deliverables

Improved water quality

- Increased clarity
- Improved color
- Reduction of available P

A report on

- Sediment P calcs
- Dosing calcs
- Biological & chemical effects

Evaluation of a potential permitting pathway for nutrient inactivants to address internal loading

Honeoye Lake

Questions

Thank You

Dr Lewis McCaffrey PG
Research Scientist 2
615 Erie Blvd W, Syracuse, 13204
Lewis.mccaffrey@dec.ny.gov
(315) 426-7514

Connect with us:
Facebook: www.facebook.com/NYSDEC
Twitter: twitter.com/NYSDEC
Flickr: www.flickr.com/photos/nysdec

Daily sample information:
https://tinyurl.com/ph5zfyma

NEW YORK STATE | Department of Environmental Conservation

Your Next Steps

- For more information: https://tinyurl.com/ph5zfyma
- Written comments may be submitted until 10/7/22 by email or by mail.
- Send written comments by mail to:
  Thomas Haley, Regional Permit Administrator
  NYS DEC Division of Permits
  6274 E Avon-Lima Rd, Avon, NY 14414
- Email comments to: Thomas.Haley@dec.ny.gov. Include “Honeoye Lake Alum Application 2022" in the subject line.
- All written comments will be responded to in the ‘Responsiveness Summary’

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation