THE IPA NEWSLETTER

Mystic Lake, Middle Pond, and Hamblin Pond in Marstons Mills, MA

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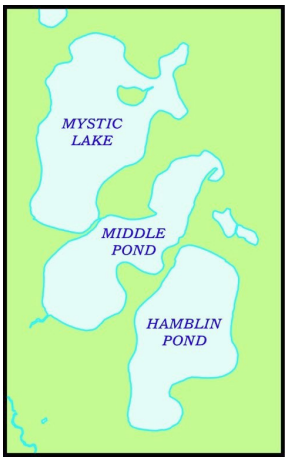

MEASURING POND HEALTH

Introduction

Indian Ponds Association volunteers continued their monitoring efforts in 2024. Measurements were collected roughly every two weeks between April and October (13 days on Mystic Lake and Middle Pond and 11 days on Hamblin Pond). Results from the three key measurements — water clarity, dissolved oxygen, and temperature — are discussed below.

Water clarity

Water clarity is a key indicator of pond health. Low clarity may be a sign of excess nutrients such as phosphorus in the water that can lead to algae blooms. To measure clarity, a volunteer lowers a black-and-white "Secchi" disk into the water and records how deep the disk can be seen. This reading measures the depth that sunlight can penetrate the water and indirectly measures the amount of suspended material such as algae present.

2024 water clarity: Table 1 summarizes the clarity readings for the three ponds. Average clarity was highest on Hamblin Pond (5.2 m), followed by Middle Pond (4.8 m), and then Mystic Lake (3.1 m). The highest clarity reading on any of the three ponds (7.5 m) was recorded on Middle Pond on May 24. The lowest clarity reading (2.3 m) was recorded on Mystic Lake on June 21 and again on September 26.

Table 1. Water clarity summary.

2024 Water Clarity (m)			
	Avg.	**Max.**	**Min.**
Hamblin	5.2	6.2	3.9
Middle	4.8	7.5	3.5
Mystic	3.1	5.1	2.3

Water clarity trends: Figure 1 shows the average annual clarity readings from 2014-2024. In 2024, Mystic Lake's average water clarity (3.1 m) was the lowest for any pond since Hamblin Pond's 2.4-m average in 2014. Middle Pond's 2024 clarity (4.8 m) was in line with recent years, just below its 2023 reading. The trend line for Hamblin Pond shows the effects of the highly effective alum treatment in 2015, where clarity jumped from 2.4 m in 2014 to an average of 5.9 m in 2015–2024. It also shows Hamblin's 2024 clarity (5.2 m) was its second lowest since 2015. Whether this is the result of normal variability or the beginning of a decline will need to be monitored closely.

Dissolved oxygen (DO): All life in the ponds requires dissolved oxygen to survive. For example, freshwater fish such as trout thrive in water with DO above 5 mg/l and are stressed below that level. DO below 2 mg/l represent a "dead zone" where water cannot support life. Low levels of DO are common at the bottoms of deeper ponds such as Hamblin (max. depth = 19.2 m) and Mystic (14.3 m). However, unhealthy levels of DO can also occur at shallower depths. In ponds with excess nutrients, algae can grow out of control as the water warms. When the algae die off, bacteria consume the DO in the process of decomposing the algae.

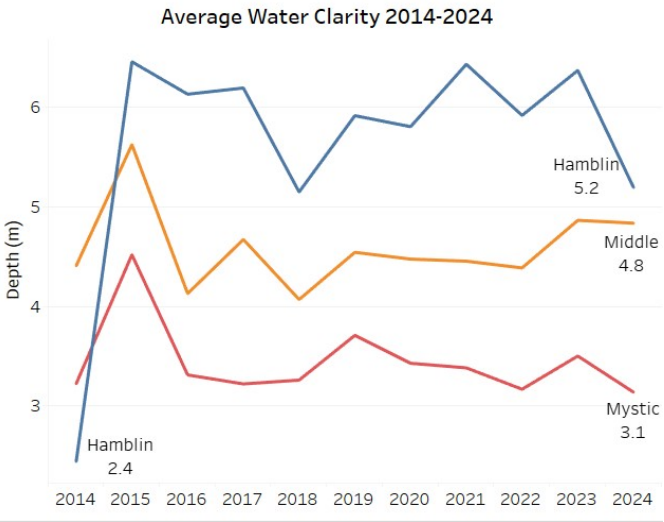

Figure 1. Water clarity trends show the persistent differences between the ponds since Hamblin's alum treatment in 2015, although the gap between Hamblin and Middle closed in 2024.

Figure 2 shows the average dissolved oxygen levels on the three ponds, by depth. As shown, the average DO levels were similar across the three ponds down to a depth of about 5 m, with readings around 9 mg/l. From there, the DO levels diverged. Mystic Lake's DO levels began to decline at 6 m, entered the "stress zone" (above 2 mg/l, but less than 5 mg/l) at 8 m, and were in the "dead zone" (below 2 mg/l) from 11 to 14 m. On Middle Pond, the decline in DO began at 9 m.

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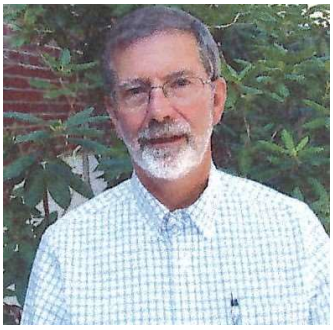
MESSAGE FROM YOUR PRESIDENT



We're ending the calendar year with some particularly good news re Mystic Lake. As most of you know, the lake has had a long-standing problem with phosphorus, which no doubt began with the former Hord dairy farm situated north of Mystic Lake that had fertilizer runoff into the lake and had their 150 dairy cows use the lake for "waste discharge". The Town agreed last year to provide an alum treatment to address the issue, but the amount appropriated was insufficient to cover the cost of the recommended level of alum. On October 10, there was a subsequent Town Council meeting at which time an additional $75,000 was approved to increase the amount of alum to the recommended level. The alum treatment will be done the week of December 2.

The IPA is appreciative of our membership which is important as a vehicle for getting information about the ponds and our natural habitat. However, we need more people willing to serve as Board members and assist with our various activities. This is an effective way to make new friends and be involved in some remarkably interesting activities. You can take on any role that feels comfortable! We have expertise in lots of areas, but will always need more help. If you want to learn more about the role of the Board, please call (508-264-1587) or email me (bjoymm@comcast.net) or any current or former Board member and we can talk!

This year, we added a Board member (Kelly Barber), who works for the Barnstable Land Trust. I'm hoping she can add a perspective from her job as a steward for the various conservation properties overseen by the BLT. Additionally, Kelly lives on Wheeler Road and her home abuts Middle Pond!

Barry Schwartz

THE CASE FOR A BARNSTABLE PONDS COALITION

The Town of Barnstable is fortunate to have 184 ponds and lakes covering nearly 1,892 acres, the most ponds of any of the Cape Cod towns. Of these, 25 are over 10 acres in size, placing them under public ownership as Great Ponds under Massachusetts law, and 93 are larger than one acre. Wequaquet Lake at 654 acres is the third largest lake on the Cape. Freshwater ponds are home to varied ecosystems and numerous endangered species. They provide recreational value, and, if healthy, a significant boost to the property value of neighboring properties and local economies.

All of the ponds on Cape Cod are kettle ponds, most without streams flowing in or out of them. This means that the primary source of the water in these ponds is groundwater. As a lens into the groundwater, they reflect the level of the groundwater as well as the contaminants therein.

Pond monitoring and management is inadequate
For decades, we have known the importance of monitoring the water quality of the ponds on the Cape because we sit upon what is called a "single source" aquifer. Pollutants in that aquifer end up in our drinking water and our ponds. In 2000, the Cape Cod Ponds and Lakes Stewardship program (PALS) was begun. Since that time, this program has continued to test ponds at least annually. Currently, only 40 of the 184 ponds in Barnstable receive annual PALS monitoring.

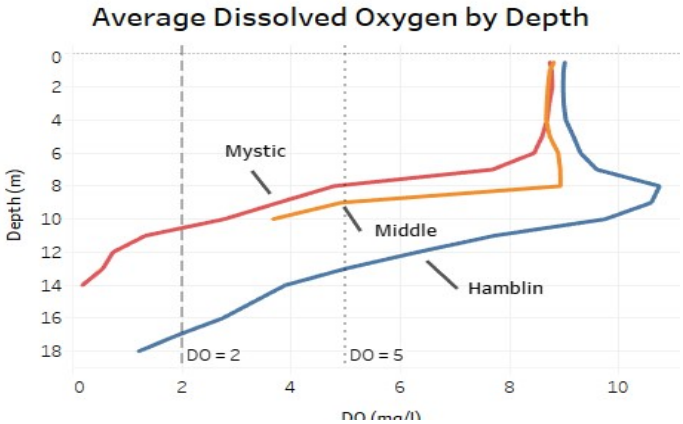
In 2021, the Town of Barnstable reviewed 32 ponds and concluded: "Most of these ponds had water quality impairments associated with nutrient enrichment, including associated high phytoplankton levels, low water clarity and bottom water hypoxia".

(Continued on page 4)

MEASURING POND HEALTH (Continued from page 1)

On Hamblin Pond, surprisingly, the highest average DO levels were in the middle depths (7–10 m). From there, DO levels declined with depth as expected, dropping below the 5-mg/l level at 13 m and below 2 mg/l at 17 m.

Figure 2. Average DO levels by depth for the three ponds. Vertical reference lines show where DO levels cross into the "stress zone" (2-4.99 mg/l) and "dead zone" (< 2 mg/l).



Water temperature

Surface temperatures: Table 2 shows the normal seasonal cycle of warming and cooling at the surface of the ponds. Temperatures averaged 15.0°C (59.0°F) in early May, rose to 27.2°C (80.9°F) in mid-July, and then dropped again to 17.9°C (64.3°F) in the final reading in October.

Table 2. Surface temperatures started off cool in May, peaked in July, and then cooled again into October.

Pond Surface Temperatures °C (°F)			
	Early May	**Mid July**	**Early October**
Hamblin	15.0 (59.0)	26.9 (80.4)	18.2 (64.8)
Mystic	14.7 (58.5)	27.1 (80.8)	17.5 (63.5)
Middle	15.3 (59.5)	27.5 (81.5)	18.1 (64.6)
Avg.	15.0 (59.0)	27.2 (80.9)	17.9 (64.3)

Temperature profiles by depth: Figure 3 shows the temperature profiles of the ponds from April to October. As seen, water temperatures varied significantly from top to bottom as well as over time. Depending on a pond's depth, it may have three distinct layers: i) a warm upper layer where the temperature changes significantly with the season, ii) a middle layer where temperatures drop rapidly as depth increases, and iii) a bottom layer with uniform low temperatures that vary little over the season.

Top layer: All three ponds had a warm upper layer that extended to a depth of at least 4 m throughout the season. In this upper layer, temperatures rose rapidly through late July and then cooled again going into the fall. Wind action mixed the water in this top layer to create the fairly uniform top temperature band that we see.

Middle layer: Below the top layer, temperatures drop rapidly with depth while continuing to show significant warming and cooling during the season. If a pond is deep enough, this region can form what's called a thermocline, a region that isolates the warm upper layer from a cold bottom layer that prevents mixing between the two.

Bottom layer: For deeper lakes like Hamblin and Mystic, a colder and denser water layer exists at the bottom. In 2024, this layer started at a depth of around 13 m and showed little temperature variation over the course of the season. Middle Pond, with a maximum depth of just 10.4 m, was too shallow to have a cold bottom layer.

Cyanobacteria testing was done by the Town in collaboration with the Association to Preserve Cape Cod (APCC). The good news is that none of the three ponds tested positive for levels of cyanobacteria toxin in 2024.

Summary: 2024 pond monitoring again confirmed that Hamblin Pond and Middle Pond are in good condition. Mystic Lake, which had the lowest water clarity and dissolved oxygen readings, had the poorest water quality. Fortunately, the alum treatment scheduled for December should reduce the excess phosphorous available to fuel algae growth, greatly improving the health of Mystic Lake in 2025. We look forward to experiencing (and measuring) the improvement.

Acknowledgments

We are indebted to our volunteers, Emory Anderson, Geri Anderson, Peter Atkinson, Scott Borden, Luke Cadrin, Greg Cronin, Bob Derderian, Tom Hamilton, Butch Roberts, Cathie Tessier, Cameron White, and Brooke Withers. Thanks again for their contributions to improving our understanding of the health of the Indian Ponds.

Tom Hamilton

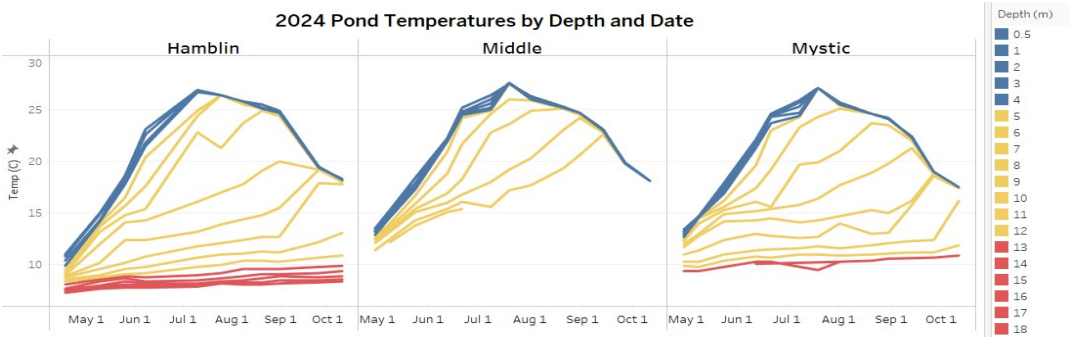


Figure 3. Temperature profiles. All three ponds showed a warm top layer with uniform temperature down to at least 4 m. In the middle layers, temperatures drop rapidly with depth. Both Hamblin and Middle are deep enough to also have a bottom layer at 13+ meters that shows little temperature variation over the

THE CASE FOR A BARNSTABLE PONDS COALITION *(Continued from page 2)*

Pond monitoring activity	% of ponds
PALS snapshot (annual)	22
Impaired by 2021 study	87.5
Ponds with comprehensive management plan	6
Cyanobacteria monitoring	15

Ponds have complex and unique ecosystems. In order to develop a management plan for a pond, one must measure multiple aspects of the pond's ecosystem. This includes creating a water budget, a phosphorous budget, mapping the flow of groundwater through the pond, both its direction and speed, measuring the volume of the various land uses around the pond, and mapping the ecosystem within the pond. Only 11 ponds have had such a management plan developed. Currently, the Town has embarked on a project of commissioning one pond study per year. At this rate, it will be 2039 before even the Great Ponds in the town will have the benefit of such a plan.

Cyanobacteria is dangerous

We have a significant cyanobacteria threat to all of the Cape Cod ponds because of excess nutrients. Cyanobacteria blooms are extremely toxic to both humans and animals. Only 27 of the 162 ponds in Barnstable are monitored regularly for cyanobacteria.

80% of excess groundwater nutrients come from septic systems

Though it varies from pond to pond, it is pretty well established that about 80% of the excess nutrients in the waters on the Cape come from Title 5 septic systems. The Town's Comprehensive Wastewater Management Plan (CWPM) is designed specifically to meet the State's regulation for nitrogen discharge into Barnstable's three south-facing estuaries and one on the north side. As a result, it only covers about 80% of the households in the Town and will take 30 years to be fully implemented. This leaves many ponds outside of this plan and a large portion of the other ponds not to be addressed for 10–20 years. None of our ponds can wait that long for the excess nutrients to be corrected.

So what can we do

The Town needs a town-wide pond coalition focusing on water bodies and groundwater protection. As a volunteer nonprofit organization, we can draw strength from the entire Town and utilize its residents to present science and education to the entire community on the value and sensitivity of our water bodies. Together, we can advocate for policies that help protect our water bodies.

As a larger Town-wide organization, we can:

- accept non-taxable donations to raise money for projects,
- apply for and accept grants,
- solicit business sponsors for projects and events,
- solicit volunteers from throughout the Town,
- enlist professionals to serve in advisory capacities on its board of directors,
- take advantage of economies of scale
  - in developing education and information strategies,
  - in orchestrating events to bring attention to our cause.

This organization will work to become an asset both to the Town's government and to the individual pond organizations already in place with some of the following ideas:

- **Science** – working with the Town to pilot new technology that might mitigate the impact of excess nutrients:
  - barley bags,
  - bio-char filters,
  - I/A systems for phosphorus removal.
- **Education** – bring knowledge of the ponds' ecosystems to the public by:
  - website and newsletters,
  - citizen scientist training programs to facilitate pond testing,
  - educate the public on urine diversion systems and their potential,
  - share ideas and experiences from other pond organizations both within and outside of the Town.
- **Advocacy** – become a public voice for the ponds in Barnstable:
  - at Town Council and Conservation Commission meetings:
    - for allocation of more human and financial resources,
    - for trialing new and emerging technologies.
  - at the State and County levels for more grants and resource.

A group has started forming this coalition. We have been canvassing the other pond coalitions on the Cape for best practices. We are looking for a wide variety of skill sets to help create a board of directors. We plan to have a public organizational meeting in early spring. If you have an interest or questions, please contact me.

Butch Roberts, 401-439-1093 or broberts2591@gmail.com.

TO VIEW THIS NEWSLETTER IN FULL COLOR, GO TO THE IPA WEBSITE: www.indianponds.org

WHY A SECOND ALUM TREATMENT FOR MYSTIC LAKE

EXECUTIVE SUMMARY

This is the story explaining why there will be a second alum treatment for Mystic Lake in December 2024. It all started in spring 2004 when the IPA Board of Directors decided to launch a study of the three Indian Ponds in collaboration with the Cape Cod Commission and the Town. The report concluded that Mystic Lake was clearly impaired because of excess phosphorus in the sediments and recommended that the Town address the problem. In 2007–2008, the Town Council approved funds for the treatment. A contracted environmental firm developed a treatment plan which included an alum dosage of 40–50 g/m^2 over areas of the lake >25 feet and 75 g/m^2 in areas of very high phosphorus concentrations. However, in late 2008, the Massachusetts Natural Heritage & Endangered Species Program (NHESP) rejected the project thinking that the proposed alum treatment would adversely affect the rare mussels living in the pond. In 2009, following several unsuccessful attempts by the IPA and Town, including proposing a lower dosage of alum, to convince the NHESP to reverse its decision, a massive cyanobacteria bloom in late summer killed millions of mussels. This tragedy finally convinced the NHESP to approve the treatment, but only with a dosage of 25 g/m^2. Further negotiations in early 2010 finally resulted in a dosage of 20–50 g/m^2. The treatment was finally completed in September–October 2010. Monitoring and surveys in subsequent years indicated that the treatment had not caused harm to the mussels, that the mussel populations were rebuilding, and that water quality had improved somewhat. However, by spring 2020, results from IPA's ongoing bi-weekly pond testing and the annual "snapshots" taken by PALS water samples strongly suggested that the lake was still suffering from unacceptably high levels of phosphorus. The IPA Board of Directors voted to fund a study of the lake to evaluate the type, amount, and sources of phosphorus, and assess options for controlling the phosphorus. The study concluded that conditions in Mystic Lake had not improved as much as hoped for following the 2010 treatment, that periodic issues with lower clarity and visible cyanobacteria accumulations remained, and that the situation appeared to stem from an inadequate treatment in 2010. Over the next several years, the IPA lobbied Town officials to fund a second treatment. Funding was finally authorized for a second treatment, based on a dosage of 50 g/m^2, with the treatment scheduled for December 2024.

Barry Schwartz, in his president's report on page 2, mentions that extra funding for an alum treatment for Mystic Lake, approved recently by the Town Council, will allow the treatment to be done the week of December 2. His report did not point out that the forthcoming alum treatment will, in fact, be the second such treatment for the lake. Therefore, it is appropriate to tell the story as to why there will be a second alum treatment for Mystic Lake.

The story begins in 2001 when the Indian Ponds Association experienced a rejuvenation of sorts at its annual meeting held in July, Discussion focused mainly on concerns associated with the recent approval by the Town's Conservation Commission to lower the concrete ladder structure of the Middle Pond herring run. It was felt that this could have the potential to adversely lower the water level in Middle Pond and Mystic Lake and be detrimental, in a variety of ways, to the health and ecology of the lakes. A severe drought at that time had resulted in the marked lowering of the water level of all the Cape's lakes and ponds.

Over the next several years, the new Board of Directors elected at that July 2001 annual meeting began to realize that little was known about the ponds. Discussions with experts culminated in a decision in spring 2004 to launch a study of the three Indian Ponds in collaboration with the Cape Cod Commission and the Town. The study was a first-order assessment of the physical and chemical characteristics of the three ponds as well as a water budget study and delineation of the watersheds for each pond. Funding was provided by the IPA and the Town. Field work was done in 2004, and a verbal report was given at the 2005 IPA annual meeting by Ed Eichner, the lead investigator from the Commission's Water Resources Office. The final report was completed and published in 2006 and concluded that Mystic Lake was clearly impaired as a result of excess phosphorus entering the lake from its watershed and being regenerated from its sediments. The report recommended that the Town take steps to address the problem by means of either an alum treatment, aeration of the deep portion of the lake, or dredging.

The pond study report was presented to Town officials in March 2006. In late June, Town Manager John Klimm promised that the Town would remediate the problem of excess phosphorus in Mystic Lake. The likely course of action would be an alum treatment done probably in summer 2008. In April 2007, the Town Council voted to authorize the expenditure of $80,000 for the design and permitting of an alum treatment for Mystic Lake. ENSR Corporation (later merged with AECOM) was selected by the Town to conduct this first phase of the treatment, with Dr David Mitchell as the lead ENSR investigator. Following testing of bottom sediments to determine the concentrations of phosphorus in various sections of the lake, ENSR/AECOM filed a Notice of Intent in which it recommended a dosage of 40–50 g/m^2 of alum over areas 25 feet and deeper, and 75 g/m^2 in areas of particularly high phosphorus concentration. In May 2008, the Town Council authorized an additional expenditure of $275,000 to fund the second phase or actual application of the treatment.

In November 2008, the Massachusetts Natural Heritage & Endangered Species Program (NHESP), the agency responsible for the protection of animals and plants officially listed as endangered, threatened, or of special concern, after reviewing the Letter of Intent, announced its refusal to approve the project based on their opinion that the proposed alum treatment would result in short- and long-term adverse effects on the three species of rare mussels living in the pond, particularly that the reduction in phosphorus would reduce the food supply available to the mussels.

In May 2009, representatives of the IPA and the Town met with the NHESP scientists responsible for NHESP's decision to explain the seriousness of the water quality of Mystic Lake, using the 2006 pond study report as supporting information. Astonishingly, the NHESP scientists questioned the pond study report and its conclusion that the pond was degraded saying that even if the lake were dying, they were still obligated, by law, to protect the endangered mussels. They asserted that the evidence presented wasn't "good enough" for them to find that a "benefit" to the species would come about if the lake were treated.

At a follow-up meeting in June 2009, IPA and Town representatives proposed a revised treatment plan, including a reduced alum dosage of only 25 g/m^2. The NHESP concerns raised earlier that i) the alum treatment might reduce the phosphorus, and accordingly the production of algae, to the point where there might be an insufficient food supply for the mussels, and ii) the alum treatment itself could be toxic to the mussels, were refuted by data and results from previous published studies presented by the IPA. However, NHESP refused to change its position. According to Dr Ken Wagner, who replaced Dr Mitchell as the lead ENSR/AECOM investigator on the project, a treatment with a dosage of only 25 g/m^2 would most likely only be effective in inactivating the phosphorus for 5–7 years, whereas a higher dosage of about 50 g/m^2 should neutralize the phosphorus for 15–20 years or longer.

Several months later, catastrophe struck Mystic Lake and part of Middle Pond. Beginning in mid-August and continuing into September, a massive cyanobacteria bloom, triggered by unusually warm water temperatures and excessive concentrations of phosphorus in the upper water layers, resulted in the death of millions of mussels, possibly as high as 24 million. Subsequent surveys funded by NHESP confirmed that some species suffered 94–100% mortality, including some of the rare endangered species that NHESP was trying to protect. Scientific analyses were unsuccessful in identifying the specific cause of death for the mussels, but the most likely cause was toxins released by cyanobacteria. Finally, in late August, NHESP notified the Town that it would allow Mystic Lake to be treated with alum, but with a dosage of only 25 g/m^2. Ironically, the mussel deaths occurred because the NHESP was most concerned with saving them. If the treatment had been authorized and done in 2008, as originally proposed, the massive cyanobacteria bloom would most likely not have occurred. NHESP prohibited the alum treatment because they were trying to preserve the habitat that had nurtured such a magnificent assemblage of mussel species, even though that habitat (Mystic Lake) had exhibited unmistakable signs of becoming inhospitable, even harmful.

On February 2, 2010, the Town's Conservation Commission voted its approval of the alum treatment. A major component of the long list of conditions associated with the Commission's unanimous approval of the treatment was the following: "Alum dose shall be 20–25 g/m^2 (reduced from the originally proposed 45–50 g/m^2). In the event that NHESP should conclude, based upon recommendations, that a higher dose is better for improving the pond, their higher dose would be allowed under this Order, up to maximum permittable 50 g/m^2."

A subsequent meeting was held on March 9, 2010 with representatives from the Town, IPA, AECOM (Dr Wagner), NHESP, and MA Division of Fisheries and Wildlife for the purpose of presenting and discussing all relevant information for justifying a higher dosage. Following the 2½-hour meeting, NHESP approved a dosage ranging between 20 and 50 g/m^2 depending on the amount of phosphorus determined to be in the sediment in each small treatment area of the lake.

The subsequent treatment was done over several days in late September and early October 2010, but not before a second smaller cyanobacteria bloom killed additional mussels. A required study of the impact of the treatment on mussels, conducted by Biodrawversity in 2011, found no mortality or behavioral anomalies, but mussel populations remained very low compared to pre-2009 levels. Mystic Lake was then monitored through 2011 by Dr Wagner (Water Resource Services), and a report was prepared in 2012 detailing pre- and post-treatment water quality and biological resources. Conditions improved markedly, but not to the extent observed in Hamblin Pond (see below).

In a 2018 report to the Town by Dr Wagner, it was stated that the decline of Mystic Lake during 2005–2010 appears related to loss of oxygen in water deeper than about 30 feet and the release of phosphorus bound to iron from the sediments due to chemical reactions that occur in the sediments when oxygen is absent. The alum treatment in 2010 was intended to inactivate the phosphorus bound to iron in the sediments, minimizing release if and when oxygen was depleted by bacterial decomposition of organic matter in deeper water. A decline in phosphorus concentration was observed after the treatment, but not as pronounced as desired. A combination of lower-than-recommended dosage of alum, due to the constraints imposed by NHESP, and lower efficiency of the treatment done in late summer after so much phosphorus had already been released from the sediments, was suspected

as the cause. Overall, conditions improved in Mystic Lake and Middle Pond after the treatment, but not to where they were several decades earlier. It was recommended that further improvement of these ponds was desirable,

In spring 2020, the IPA Board of Directors voted to fund a study of Mystic Lake which would i) sample water and sediments to determine the type and amount of phosphorus present, ii) evaluate the sources of phosphorus based on the data collected, and iii) assess options for improved control of phosphorus in the lake relative to its role in supporting the growth of planktonic algae. This study was conducted by Dr Wagner who had participated in previous studies and treatments of all three Indian Ponds as well as other ponds in the Town and on the Cape. The need for the study was deemed necessary in view of the Board's ongoing concern for the lake's water quality, as determined from results of the IPA's ongoing bi-weekly pond testing of all three ponds and the annual "snapshots" taken by PALS water samples. These results, coupled with the 2019 report by the Association to Preserve Cape Cod (APCC) State of the Waters: Cape Cod 2019 which graded the quality of Mystic Lake as "unacceptable", strongly suggested that the lake was still suffering from unacceptably high levels of phosphorus, the principal nutrient that fuels the growth of algae in the lake.

In his report to the IPA, Dr Wagner pointed out that, in the 1980s and early 1990s, Mystic Lake and Middle Pond were considered to be in excellent condition, with high water clarity and other positive attributes, including large populations of seven species of freshwater mussels, three of which were listed as rare species in Massachusetts.Hamblin Pond, in comparison, had suffered from cyanobacteria blooms for decades [as a result of fecal waste deposited in the pond from a commercial duck farm that operated from 1920 to 1955]. Hamblin Pond was treated with alum in 1995 to inactivate phosphorus in the sediments that was responsible for high internal loading and support of algae blooms. That treatment greatly enhanced conditions in Hamblin Pond for 18 years, after which internal loading resumed rather abruptly and algae blooms returned. In 2015, Hamblin Pond was retreated, and cyanobacteria blooms were again minimized while water clarity was maximized. The mussel survey of 2011 was repeated by Biodrawversity in 2017, the same contractor from all previous mussel surveys of the Indian Ponds. Quantitative sampling revealed a major recovery of mussel species that were greatly depressed by the mortality events of 2009 and 2010. While a full recovery is still some years away, the progress made since the treatment in 2010 has been remarkable. Onsite wastewater disposal is a potential human source of nutrients for Mystic Lake via groundwater. Yet internal loading of phosphorus represents a recycling of this nutrient after input from the watershed over many years (with fecal waste and fertilizer from the nearby Hord dairy farm from 1919 to 1962) and was the dominant source of phosphorus to Mystic Lake prior to inactivation with alum in 2010. From the available data, it appears that internal phosphorus loading is still the dominant phosphorus source. Based on recent costs of similar projects and an apparent need for 25 g/m^2 over an area of 82 acres, project costs should be no more than $100,000. The dose and cost could be doubled to provide a margin of safety, or additional sediment testing could be conducted to narrow the range.

Wagner's 2020 report concluded that conditions in Mystic Lake had not improved as much as hoped and periodic issues with lower clarity and visible cyanobacteria accumulations remain. The Mystic Lake situation appears to be one of inadequate treatment (in 2010) coupled with higher susceptibility to algae accumulation brought on by a minimal summer zooplankton community controlled by alewife predation.

Armed with Wagner's 2020 report, the IPA, over the next several years, made repeated requests to Town officials to consider a second alum treatment. Repeatedly told that other Town ponds were in worse condition than Mystic Lake and that the funding for a second treatment would need to be prioritized against the needs of other ponds, it wasn't until early 2023 that the Town Manager finally included funding for the treatment in the Fiscal Year 2024 - Fiscal Year 2028 Capital Improvement Plan. In April 2023, the Town Council authorized the expenditure of $195,000 for a Mystic Lake alum treatment. Dr Wagner was again contracted by the Town to handle the design and permitting phase of the treatment. The Notice of Intent document prepared by Wagner indicated that a slightly larger area would be treated than was done in 2010, probably at 25 g/m^2 based on available funds, although a dose of up to 50 g/m^2 should be allowed. This project would represent a supplemental treatment of Mystic Lake, both as a function of the lower-than-ideal alum dose in 2010 and the 14 years of elapsed time since the 2010 treatment, with ongoing external loading and increasing internal loading. A slightly larger area would also be treated, extending phosphorus inactivation to areas >7 m deep, compared to >9 m in the 2010 treatment, covering 77 acres in 2024 vs. 58 acres in 2010.

When bids were solicited from potential contractors to do the actual alum treatment, the sole bidder indicated that the available funds were only sufficient to cover the cost of a lower-than-preferred dosage of alum. Town officials, preferring a treatment at the preferred dosage of 50 g/m^2, requested an additional $75,000 in order to cover the cost of the desired dosage. Accordingly, the Town Council approved this request on October 10, 2024. The treatment is now scheduled for the week of December 2, 2024.

Emory D. Anderson, PhD

"To preserve and protect the natural environment and ecological systems of the Indian Ponds and surrounding parcels of land and watershed and to participate in studies and work with other agencies, individuals, and groups to educate the public, serve the community, and promote and preserve the Indian Ponds and surrounding areas." IPA Mission Statement

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FORWARDING SERVICE REQUESTED