

# THE IPA NEWSLETTER

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

Winter 2026

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## IS MYSTIC LAKE STILL PROBLEMATIC?

The lead article in the fall 2025 issue of this newsletter authored by Tom Hamilton and Emory Anderson reported that **water clarity in Mystic Lake in 2025 had remained about the same as in 2024**. This was in spite of the alum treatment in December 2024 intended to suppress phosphorus and reduce the production of algae. Water clarity, as measured by a Secchi disk, is generally a fair indicator of water quality, even though measurements of temperature and dissolved oxygen in the water column, especially when accompanied by data on the amount of phosphorus and nitrogen in the water, provide a more definitive indication of water quality.

In any pond or lake, one would be able to see as deep as light permits if the water were completely free of any particles, such as what you get from your faucet. However, this is not the case, because ponds and lakes have minute suspended particles throughout the water comprised of small organisms called **phytoplankton**. These organisms consisting of microscopic bacteria (e.g. cyanobacteria) and algae (e.g. diatoms) are photosynthetic (use light to produce oxygen) and form the basis of the food chain in the lake or pond. In addition to producing oxygen, phytoplankton serve as food for **zooplankton** (tiny crustacean-like floating or weakly swimming animals, the most common being copepods) which are food for small fish which are eaten by larger fish, and so on; hence the term "food chain", where the energy gained by one link in the food chain is passed on to the next organism in the chain.

**The amount of phytoplankton in a pond or lake dictates its clarity;** i.e. more phytoplankton = less clarity, and vice versa. The amount of phytoplankton is generally related to the quantity of nutrients (i.e. phosphorus) available to fuel the growth of cyanobacteria and algae.

The above-mentioned fall 2025 article contained a figure showing average water clarity during 2014–2025 for the three Indian Ponds (Figure 1). Of the three ponds, Mystic Lake consistently exhibited the lowest clarity, while Hamblin Pond consistently had the highest clarity. The important point is that the 2015 alum treatment in Hamblin Pond was followed by a significant increase in clarity, whereas the 2025 alum treatment in Mystic did not result in any comparable increase. **Why this difference in water clarity between the two ponds following alum treatments?** Is there an explanation?

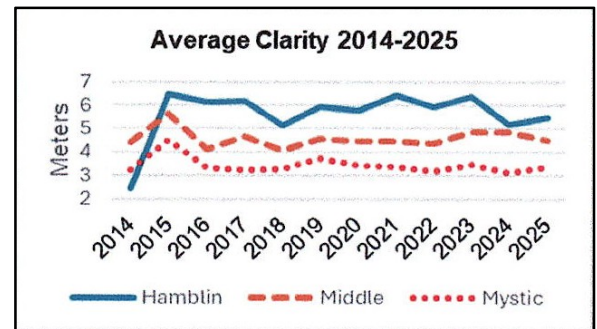


Figure 1. Long-term clarity readings for the three Indian Ponds.

Dr. Ken Wagner, Water Resource Services, Inc., who helped plan the alum treatments administered to Hamblin Pond (1995 and 2015) and Mystic Lake (2010 and 2024), recently contacted this writer noting that Mystic Lake had not done all that well in 2025 after the December 2024 alum treatment, based on his interpretation of the 2025 IPA Secchi disk data. Wagner's observation is identical to what is said above about Mystic Lake water clarity not improving in 2025 from the previous year and is an appropriate segue into what he reported in his 2020 Mystic Lake status update funded by the IPA.



Stella says: "Time to pay your dues!"

In that report, Wagner drew specific attention to the fact that many young-of-the-year alewives (river herring) are present in Mystic Lake through summer and are actively consuming zooplankton. As a result, the zooplankton community peaks in spring, but is usually minimal from late June into October. His 2020 sampling data correspond to this pattern. In May, zooplankton biomass was very high, algae abundance was very low, and water clarity was rather high (8.5 m). (Continued on page 5)

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## MESSAGE FROM YOUR PRESIDENT

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The IPA is a 501(c)(3) organization and a registered public charity. All dues and contributions are tax deductible. This newsletter, with a circulation of over 800, is a forum for the exchange of ideas on matters concerning the IPA mission, and the views expressed by authors of articles do not necessarily represent official IPA policy.



The return of a more typical winter has brought our Indian Ponds to life in sparkling, ice-bound glory. For the first time in years, we see skaters and sledders, ice-fishers and coyotes traversing their temporary hunting routes. This off-peak vibrancy is both a marvel and reminder of the seasonal cadence that marks another year; just around the corner are spring rains, herring spawning, and crystal-clear waters that greet the thaw.

For the Indian Ponds Association board, winter is a time to finalize our agenda for the new year and call on our valued supporters to help us progress our mission. 2026 will see us build on the successful campaign for an alum treatment for Mystic Lake, as we give the Town of Barnstable every possible assistance with their nutrient study of Hamblin Pond, anticipating it will identify the source of phosphorus that sparked algal bloom alerts last summer. Once the results are available, we'll be advocating for prompt and appropriate treatment to confront that threat.

Since 1958, the Indian Ponds Association has been the *only* organization exclusively devoted to and focused solely on the welfare of Hamblin and Middle ponds, and Mystic Lake. ***This is crucial to all of us, whether we live on or off the waterfront, as all our lifestyles and property values hinge on clean and healthy pond waters.*** In the past decade alone, the IPA has supported projects as diverse as the reconstruction/re-routing of the herring run – preserving a vital source of freshwater mussel and pond health; combated invasive plants such as *Hydrilla* and grey willows; and – in a huge win – lobbied the Town to treat Mystic Lake with alum in late 2024.

More than ever, we need residents and friends to support us in preserving our rare and natural homescape. Your modest \$35 annual household dues fuel our **Pond Restoration** efforts, to proactively respond to threats to the health of our three ponds. For example, we've funded pond studies to promote and support investments in pond health by the Town of Barnstable, and we conduct bi-weekly sampling of water temperature, clarity and oxygen concentration in all three ponds from May to October each year. Your donation also underwrites **two annual scholarships** awarded to local students seeking to further their education in environmental sciences, and ongoing education and outreach through the IPA's **quarterly newsletter, website and Facebook page.**

In 2025, 65% of the IPA members made additional contributions towards pond health and/or scholarships. **Please consider giving more than the base dues amount if you are able.** That said, all contributions are welcome and valuable. Committed to reaching every household in the IPA's catchment area – as our mission mandates – the IPA's annual newsletter printing and postage costs now exceed \$7000, despite comparison shopping. Your board, therefore, feels it fiscally prudent to raise annual dues by \$10 to \$35: the first increase in six years.

**There are two easy ways for you to pay your tax-deductible dues and contribution.** IPA-addressed payment envelopes are included in this newsletter, so you can simply mail back a check made out to the *Indian Ponds Association, Inc.*, or go to our website (<https://www.indianponds.org/>) and make a payment through PayPal. Either way, we greatly appreciate your support.

Thank you for reading. Enjoy our ponds' winter vista and stay warm and safe!

*Barry Schwartz*

## MEMBERSHIP RENEWALS AND DONATIONS TIME!

Our rare and precious Indian Ponds survive only with active preservation and protection efforts. Please join us in maintaining their health and vibrancy.

***Your modest \$35 annual household dues – the price of a few coffees, or a pizza! – underpins:***

**Your lifestyle.** Every one of us benefits from clean, gentle, and safe pond waters, whether we're in or on them, or simply watching the wildlife. Even bald eagles built their home here!

**Your property value.** The health and vibrancy of our ponds enhance the desirability of our area, underpinning property values for homeowners *on and off the water*.

**The tax base,** which flows directly back to our area in municipal support – e.g., the Town's \$270,000 alum treatment for Mystic Lake in late 2024, which directly resulted from the IPA's concerted 2-year lobbying campaign.

**Cape Cod's vital blue economy,** on which our home survives and thrives. From drinking water to coastal ecosystems, the desirability of Cape Cod as a place to live, work, play, build a business, raise a family, or visit hinges on clean, accessible water.

***Your small investment in the IPA benefits not just you, but your family and future generations too.***

### How To Donate?

- **Mail a check** to the IPA in the enclosed IPA-addressed envelope (PO Box 383, Marstons Mills, MA 02648)
- **Via PayPal** on the IPA website: (<https://www.indianponds.org/>)

**Did you know?** 65% of IPA members made additional contributions towards Pond Health and/or Scholarships last year. Please consider giving more than the base dues amount if you are able.

**Double the impact of your gift!** Does your employer match donations? If so, that's an easy way to make your gift go even further!

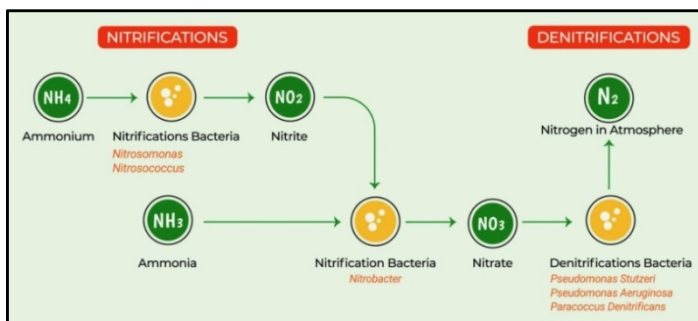
***Five generations of bald eagles can't be wrong: c'mon, they could choose to live anywhere, and they decided to live HERE!***



## PONDS AND THE NITROGEN CYCLE

The planet we live on is a diligent recycler of many materials. Water, carbon, hydrogen, oxygen, and phosphorus all exist on Earth in limited quantities and are all recycled and reused over time by the action of natural processes. One of the most important of these processes is the nitrogen cycle, whereby nitrogen in the air is made available to plants as fertilizer by the processes of *fixation* and *nitrification*, and the excess is returned to the atmosphere by the process of *denitrification*.

Nitrogen gas ( $N_2$ ) comprises 78% of our atmosphere. It exists in the atmosphere as two nitrogen atoms held together by a triple bond, one of the strongest chemical bonds found in any diatomic molecule. Prying apart these two atoms is necessary to enable nitrogen to combine with other substances. This requires either blasting with an immense force such as lightning, or stepwise molecular disassembly by the protein catalyst *nitrogenase*, which is found in certain bacteria and archaea. The nitrogenase route, which happens in fresh- and salt water, is powered by the organic molecule *ATP*, which stores energy in the cells of organisms and makes that energy available on demand to the cell. In ponds, the process of nitrogen *fixation* produces the ion *ammonium* ( $NH_4^+$ ), a precursor of nitrates and nitrites, which are plant food. Ammonium is oxidized aerobically into nitrites ( $NO_2^-$ ) and finally into nitrates ( $NO_3^-$ ) by the two-step process of *nitrification*.



The fixing of nitrogen in nature by the catalyst *nitrogenase* is carried on in freshwater ponds, in oceans, in the soil, in tree roots, and in decaying organic matter. In aquatic environments, both fresh- and salt water, cyanobacteria are major players in the production of fixed nitrogen. They've been doing this job for about three billion years.

Nitrogen is a primary constituent of the 20 amino acids, the structural units of which all proteins are composed. Proteins are essential to all known forms of life. They act as catalysts or binders or structural elements in cells. They also transport materials and participate in the functioning of immune systems. They are the "Swiss army knives" of the cellular world.

The residue of nitrogen processing is released back into the environment by excretion and becomes sewage. (It is

also found in food waste.) Nitrogen is a primary component of animal urine, including human. Nitrogen travels rapidly (about 1 ft. per day) in groundwater in the sandy soils of Cape Cod on its way to salt water; phosphorus travels much more slowly (about 3 ft per year).

The nitrogen cycle is completed in nature, including in ponds, by *denitrification*, a separate microbial process employing different organisms, which converts various forms of nitrified nitrogen back into atmospheric nitrogen gas, which wafts into the air. The interesting thing about denitrification is that it must happen anaerobically (i.e. without oxygen) in environments such as mucky soil and deep sediments at the bottoms of ponds or the ocean.

There is an important difference between the amount of denitrification that takes place in salt water and in freshwater. In many salt water ecosystems, nitrogen is the "limiting factor", i.e. the nutrient that is depleted first, without which the plant cannot grow, regardless of how much other plant food is available. The amount of the limiting factor available to plants determines the quantity of plant material, including algae, that a water body can grow or produce.

The Haber-Bosch process, invented in 1909 by German chemist Fritz Haber, makes it possible to produce ammonia from nitrogen and hydrogen on an industrial scale. It is one of the most important inventions of all time, as it has enabled the Earth to support larger human populations through intensive agriculture. The Haber-Bosch process uses heat, pressure, and a catalyst to split off hydrogen atoms from methane ( $CH_4$ ) and react them with atmospheric nitrogen to make ammonia in various forms that can be used to grow plants. This artificially-produced agricultural nitrogen has flooded the world and contributes to an oversupply which causes environmental problems, especially algae blooms in salt water estuaries around the world.

In most freshwater systems, including Cape Cod kettle ponds, phosphorus, not nitrogen, is the limiting factor. When the phosphorus is depleted, no additional amount of nitrogen will grow more plants. Ponds with low phosphorus content have the ability, via denitrification, to waft their excess nitrogen into the air, completing the denitrification process and returning nitrogen to the atmosphere. In most salt water systems, especially coastal estuaries, where phosphorus is plentiful and nitrogen is the limiting factor, excess nitrogen remains in the water and promotes the growth of algae blooms.

The Indian Ponds take nitrogen from the air by fixation and nitrates from groundwater (as determined by the availability of phosphorus), and return the excess nitrates and nitrites to the atmosphere by the process of denitrification.

(Continued on page 5)

## PONDS AND THE NITROGEN CYCLE *(Continued from page 4)*

The more phosphorus in the water, however, the more algae it can grow. Algae blooms consume dissolved oxygen when they decompose, which can kill mussels, fish, and other aquatic animals, and may create a smelly mess. Most of the excess nitrogen in Cape Cod groundwater comes from septic leachate containing both nitrates and phosphates, which travel through the soil in the groundwater and eventually to the sea where they cause algae blooms in estuaries and coves that smother eelgrass and

destroy habitat for many organisms, besides being unpleasant for people.

Modern sewage treatment can remove 70–90% of nitrogen from sewage by adopting specific treatment steps beyond basic treatment. Removal is not automatic. Removing excess nitrogen from wastewater is costly, but greatly helps in preventing algae blooms in estuaries and on beaches. This is now a worldwide problem.

*Holly Hobart*

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## IS MYSTIC LAKE STILL PROBLEMATIC? *(Continued from page 1)*

In contrast, once the young-of-the-year alewives hatched and began feeding, zooplankton biomass plummeted to a very low level, and water clarity in July, September, and October averaged only 3.5 m. **He concluded that Mystic Lake, because of the presence of alewives, does not have enough zooplankton during summer to provide any significant grazing capacity for phytoplankton control.** Other lakes with alewife populations, even those without serious fertilization (phosphorus) issues, often experience lower water clarity during summer. There are always enough nutrients to support at least moderate algae production and almost nothing (i.e. zooplankton) to consume it, so water clarity declines. Other lakes treated with alum that also have alewife have demonstrated the same pattern.

This fairly long explanation of the situation in Mystic Lake, with its alewives during part of the year, helps to clarify **why Hamblin Pond has much better water clarity than Mystic. It's because Hamblin does not have alewives,** and its zooplankton population is able to adequately con-

trol the abundance of algae throughout the year and hence maintain much higher water clarity. To quote Wagner, "while hosting alewife reproduction and juvenile growth in a lake is of high benefit to the marine environment, it does predispose those host lakes [like Mystic Lake] to algae issues if nutrients are not kept at very low levels." In other words, **Mystic Lake will probably never enjoy the same high level of water clarity as Hamblin Pond.**

However, this does not mean that the December 2024 alum treatment was unsuccessful and that water quality is not good. To the contrary, until future testing for phosphorus and cyanobacteria would indicate unacceptable levels of either or both, we have to assume that Mystic Lake is in satisfactory condition. Nevertheless, periodic alum treatments will still be required to suppress phosphorus and prevent unacceptably high concentrations of unwelcome algae and harmful cyanobacteria.

*Emory D. Anderson*

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## WINTER OBSERVATIONS

This winter has been the coldest and snowiest in many years, with the ground still covered in white and more forecasted to come. Those of us living around the Indian Ponds have witnessed all three ponds being completely iced over, a phenomenon that doesn't occur every winter. Ice fishermen have had ample opportunities to test their skills.

Many residents have bird feeders and have enjoyed seeing many hungry cardinals, bluejays, woodpeckers, chickadees, and a host of other species feasting on the food made available to them.

We often wonder how our feathered friends fare at times like this. Director Bob Kohl provided this photo of a great blue heron standing on the ice near his dock. He also observed three dead Canada geese along the shoreline, and was advised by a Town official that their deaths were most likely due to bird flu.



## ARE THE INDIAN PONDS AT RISK TO SEPTIC SYSTEMS?

Phase 1 (0–10 years) of the Town's Comprehensive Wastewater Management Plan is well underway, but will provide sewer hookups only to properties south and east of the Indian Ponds area. Not until Phase 3 (21–30 years) will sewers be extended to homes east, south, and west of the Indian Ponds. Even then (Figure 1), waterfront homes around Mystic Lake and Middle Pond and the northwest side of Hamblin Pond will not be included. In addition, homes north and northwest of Mystic Lake located within the Indian Lakes watershed (Figure 2) will not be included. **Since septic system discharges enter the groundwater and can thus carry phosphorus into the lakes, is this likely to be a major problem sometime soon?**

The 2006 First Order Assessment of the Indian Ponds indicated that **phosphorus already in the pond sediments was the major source for Mystic Lake and Hamblin Pond** at that time (77% and 69%, respectively), while **septic input accounted for only 8%** in each lake. The primary sources of phosphorus for Middle Pond, with totally different physical characteristics than Mystic and Hamblin and hence less subject to algae blooms caused by excess phosphorus, were waterfowl feces (22%) and septic discharge (16%). The flow rate in groundwater of phosphorus from septic effluent is only about 3 ft/year. Data collected during this study from homes within the 300-ft buffer zone around each lake on average age and distance from the waterfront of septic leaching fields showed that it would take, on average, ~60, ~57, and ~47 years, respectively, for phosphorus from the average home to reach Mystic Lake, Middle Pond, and Hamblin Pond. With 20 years having now passed since the 2006 study, one might guess that ~40, ~37, and ~27 years, respectively, still remain before the phosphorus from those average septic systems would reach those lakes.

Whether such estimates might be realistic is uncertain, it is much **more certain that Hamblin Pond and Mystic Lake owe their heavy sediment loads of phosphorus to agricultural activities** that began over 100 years ago. For Hamblin, it was the Clear Lake Duck Farm (1920–1955) and fecal waste created by about 10,000 white and Muscovy ducks raised in cages extending over the water. For Mystic, it was the 92-acre Mystic Lake Dairy Farm (west side of Cape Cod airfield, 1919–1962) and manure from 150 cows plus superphosphate fertilizer (600 lb/acre/year) applied to the farm's fields that leached phosphorus into the groundwater and eventually into the lake.

Even though evidence suggests that phosphorus from septic systems will never impact the Indian Ponds to the extent of the above-mentioned agricultural activities, more septic phosphorus will, sooner or later, leach into lake waters. To address this concern, responsible homeowners would be advised to upgrade old or failing systems with I/A

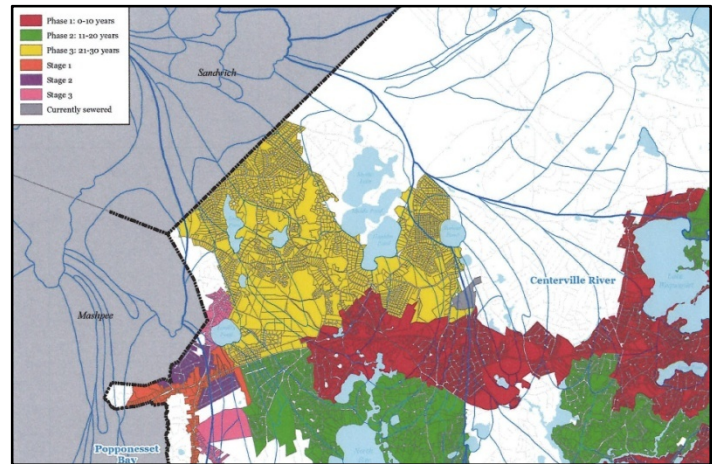


Figure 1. Town of Barnstable Comprehensive Wastewater Management Plan

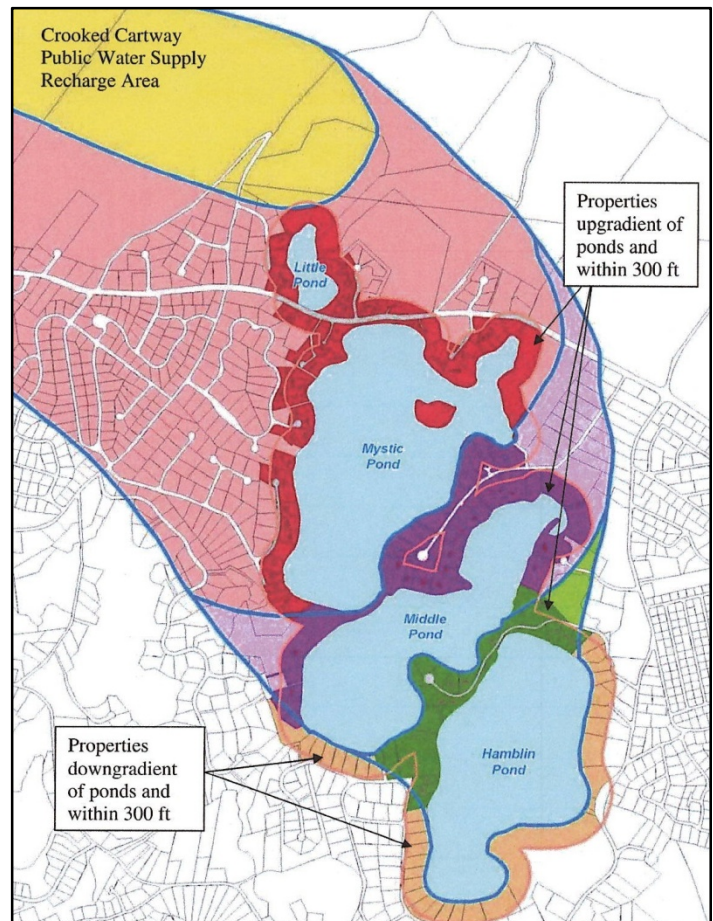


Figure 2. Indian Ponds watershed

(innovative/alternative) systems designed to reduce the amount of nitrogen and phosphorus entering the lakes. Available technology currently favors nitrogen reduction, but ways to reduce phosphorus are being developed.

Emory D. Anderson

## HAMBLIN POND NUTRIENT STUDY

The Town of Barnstable has retained the Coastal Systems Program at the University of Massachusetts Dartmouth School for Marine Science and Technology (UMassD SMAST) to conduct one year of intensive water quality monitoring of Hamblin Pond and subsequently develop a nutrient management plan. The monitoring phase of this project began in spring 2025 and includes monthly water quality monitoring during April–October in both Hamblin Pond and Middle Pond for nitrogen, phosphorus, chlorophyll-a, pH, alkalinity, dissolved oxygen, temperature, and water clarity. Middle Pond is included in the analysis because Hamblin Pond's water quality is, in part, affected by groundwater inputs, some of which come from Middle Pond. The water quality data on Middle Pond will serve to inform these groundwater inputs to Hamblin Pond.

In addition, SMAST deployed continuous water quality loggers in the surface and bottom waters of Hamblin Pond to provide nearly continuous measures of dissolved oxygen, temperature, and chlorophyll, monthly phytoplankton

(including cyanobacteria) sampling, monthly stream monitoring for one year of nutrients and flows at the outlet of Middle Pond leading to the herring run, measurement of direct storm water discharges and cranberry bog water release, collection of sediment cores to determine sediment nutrient regeneration, and surveys for bathymetry, mussels, and rooted plants. Water from the Middle Pond outlet needs to be monitored so that the flow data can be addressed in the water budget. The results from this targeted data collection will be compiled and incorporated with an assessment of the watershed and phosphorus-loading analysis into the nutrient management plan report.

The report will review alternatives to address water quality concerns. It is anticipated that this report will be delivered to the Town in fall 2026 and be followed by a public presentation to discuss results and the recommended management approach for Hamblin Pond.

*Amber Unruh  
Senior Project Manager – Special Projects  
Town of Barnstable DPW*

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## TRIBUTE TO JOHN KAJAJAN



John Kayajan, a long-time member and former Director of the Indian Ponds Association (IPA), passed away on November 26, 2025. John was not only a valuable friend to the IPA and to the Regency Drive Owners Association where he lived, but to many other organizations. He helped create the Barnstable YMCA and was president of the Oyster Harbors Club. Profes-

sionally, John earned a degree from the Wharton School of Business at the University of Pennsylvania and was president and owner of Coca-Cola Bottling of Cape Cod. John devoted many hours to various organizations; he assisted in making improvements and provided his perspective which was typically “on the mark”. For a number of years, John and his wife Deidre hosted the IPA Annual Meeting in their lovely back yard, overlooking Mystic Lake, providing outdoor tables and chairs for participants. Deidre famously insisted on ironing table cloths for the tables on which refreshments were served. Even if meetings were

held elsewhere, John always volunteered the use of his many white chairs.

Living on Mystic Lake, John enjoyed riding around on his pontoon boat with family and friends. He always had a keen interest in the ponds and was always eager to learn. For example, he signed up for and attended a three-hour seminar in July 2021 conducted by Emory Anderson and Bill Hearn, both retired PhD fisheries scientists and IPA directors at the time, which addressed topics normally covered in a college-level course in limnology (the study of biological, chemical, and physical features of lakes, ponds, and other freshwater bodies). When asked why he attended the seminar, John simply said, “You’re never too old to learn”.

John will be sorely missed by all the people and organizations he touched. The IPA is grateful for his many contributions both large and small.

*Barry Schwartz and Emory Anderson*

*“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*

**INDIAN PONDS ASSOCIATION, INC.**  
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**MARSTONS MILLS, MA 02648**  
FORWARDING SERVICE REQUESTED

