THE IPA NEWSLETTER

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

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MYSTIC LAKE ALUM TREATMENT COMPLETED WITHOUT INCIDENT

On a very windy September 20, Aquatic Control Technology launched their large paddle wheel treatment barge at the southwest corner of Mystic Lake. The following day, the long-awaited Mystic Lake alum treatment began, with an initial treatment of 6 acres at the north end of the lake (see video at http://www.youtube.com/watch?v=ffLOxiYqhuE). This was followed by a mandated 3-day monitoring period to watch for any deleterious effects on pond life. None were observed, so treatment continued on Monday September 27. The treatment was completed on Tuesday October 5, after a couple of days of cancellation because of high winds.

Attached to the lifting mechanism at the bow of the barge are two long pipe distribution headers, one for alum and one for sodium aluminate. During treatment application, the headers are submerged about10 ft underwater and distribute the chemicals in a wide swath.

The alum was applied in liquid form in a specific ratio with sodium aluminate, a buffering agent, to ensure that the pH of the lake water would not be altered significantly in order to protect pond life. Once injected into the lake, these compounds formed a flocculent precipitate (floc; aluminum hydroxide) that fell to the lake bottom like snowflakes and permanently bonded with the phosphorous in the sediments to form an insoluble compound (aluminum phosphate). A short video of the falling floc can be viewed at http://www.youtube.com/watch?v=iR_jN7Mrn8Q.

During the 3-day monitoring period and during each treatment day, the project's lake management consultant, Dr Ken Wagner, monitored the water chemistry, looked for signs of distressed pond life, and used underwater video to observe the alum floc fall to the sediment. The pH measured throughout the entire treatment period ranged from 6.5 to 7.4 and was between 6.8 and 7.2 most of the time, well within the accepted range of 6 to 8 to prevent aluminum toxicity. The large fish kill that occurred during the 1995 alum treatment of Hamblin Pond resulted from a failure to maintain the proper pH.

(Continued on page 4)

IPA VOLUNTEERS REMOVE *HYDRILLA* FROM MYSTIC LAKE

After getting approval from the Barnstable Conservation Commission on September 7, the following morning, eight IPA volunteers, along with three people from the Massachusetts Department of Conservation and Recreation, began to remove the invasive weed *Hydrilla* from Mystic Lake. During the three weeks between discovery and removal, the IPA purchased materials and volunteers built benthic barriers and were trained in the *Hydrilla* removal procedure. Within three days after obtaining permission, all of the known patches of *Hydrilla* were removed from the lake and barriers had been placed over the areas to prevent regrowth.

In mid-August, a total of twelve patches of the highly invasive weed *Hydrilla* were found in four widely separated areas of Mystic Lake. The patches were all in 2–4 ft of water and ranged in size from a couple of feet in diameter to the largest, which was about 30 × 40 ft. Fast remediation is necessary because *Hydrilla* can rapidly take over a lake, choke out native species, and render it unsuitable for recreational use.

The removal procedure, specifically designed to prevent further spread of the *Hydrilla*, was developed with Dr Ken Wagner, the lake management consultant involved with the alum treatment. *Hydrilla* can spread by broken fragments taking root, so the removal procedure involved sequestering each patch with a fine-mesh seine net before raking out the *Hydrilla*.

(Continued on page 5)

– IN THIS ISSUE –

TWO NEW BOARD MEMBERS

At the July 11 IPA Annual Meeting, two new Directors were elected to two-year terms on the Board of Directors: Bob Nichols and Emily Wheeler.

Bob Nichols

Bob Nichols and his wife Annette moved full time to their house on Regency Drive this summer, after many years of seasonal use while living in New Jersey and, more recently, in Brookline. Bob has a masters degree in civil engineering from Cornell and is retired from a career as a mechanical engineer with Exxon. He loves to fish and swim and has been around lakes all his life, spending summers growing up at a family cottage on a lake in New Hampshire, and then spending time on Mystic Lake the past 35 years. Bob has been deeply involved in the Mystic Lake alum treatment. He also discovered the invasive weed *Hydrilla* in Mystic Lake this summer and led the IPA effort to remove it. Bob is now serving as Vice President of the IPA.

Emily Wheeler

Emily Wheeler is the third generation of her family living on Middle Pond and Wheeler Road. Her father, Rick Wheeler, recently (2003–2009) served three 2-year terms on the Board. Emily's love of the ponds and surrounding land makes her appreciate greatly the leadership of the Indian Ponds Association in stewarding the ponds. Trained as a lawyer, Emily is active in land conservation and climate action initiatives in Concord, where she also lives. Emily says she is honored to join the Indian Ponds Association Board of Directors and to serve as its Clerk.

HOW CRITICAL IS THE LOSS OF MUSSELS TO MYSTIC LAKE?

The professional mussel survey of Mystic Lake conducted in early June (reported in the Summer 2010 issue of this newsletter) estimated that the overall mussel population was reduced by about 80% as a result of the catastrophic die-off in the summer of 2009 that was triggered by a massive cynanobacterial (blue-green algae) bloom. The survey concluded that as many as 24 million mussels died as a result of that bloom. In July and August of this year, a second severe blue-green algal bloom killed additional mussels in Mystic Lake, but even larger numbers in Middle Pond as a result of a comparable bloom in that pond. Subsequent checking in both ponds after the blooms and prior to the recently completed alum treatment of Mystic Lake revealed that live mussels still remain in both ponds, although the numbers in Mystic Lake appear to be few. Since no additional quantitative mussel surveys have been done in either pond since early June, no reliable estimates of the remaining live mussels, particularly in Mystic Lake, are available.

Ever since the massive mussel kill in the summer of 2009, many people have expressed concern over the impact of this loss to the ecological well-being of Mystic Lake. As filter feeders, mussels feed on microscopic phytoplankton, bacteria, and other suspended organic material that they extract from the water that passes over their gills. In so doing, mussels improve water quality. Individual freshwater mussels have been known to filter as much as 0.5–1.25 gallons of water per hour.

In an article in the Fall 2009 issue of this newsletter, an estimate was given of the filtering capacity of the Mystic Lake mussel population. At that time, the best estimate of the pre-kill mussel population was 250,000–500,000, which implied that the entire volume of the lake would be filtered every 68–340 days. Now, in light of the estimate from a professional mussel survey of 24 million killed in 2009, and given that the volume of Mystic Lake is 1.02 billion gallons, this many mussels would have filtered the entire lake every 1.4–3.5 days. Assuming the 24 million estimate to be valid, and knowing that additional mussels perished as a result of the 2010 algal bloom, the loss of filtering capacity would be even greater.

In addition to their role as filter feeders, mussels also constitute an important food source for various animals, such as muskrats, raccoons, otters, and great blue herons. Small juvenile mussels are eaten by crayfish, waterfowl, and fish. Furthermore, mussels improve lake bottoms for other aquatic life by gently mixing, churning, and filtering the sediments and adding nutrients where they live. Scientists have found that some aquatic animals can be more abundant in the vicinity of mussel beds and that mussels can increase growth rates of submerged vegetation. *(Continued on page 7)*

PRESIDENT'S REPORT

Bright leaves are falling and the flooded cranberry bogs outside my window are mirrors that reflect every nuance of cloud. The frogs and birds have gone quiet; the squirrels are hustling to collect every last acorn. The world of the Indian Ponds is getting ready for winter. It is a good time for us to reflect on what the IPA has accomplished this past year and to think ahead about the many things still to be done.

All three ponds have undergone their fall "turnover"—the thermal process whereby the cooler, denser water at the surface displaces the water in the depths, bringing nutrients from the deep water to the top of the water column. An algal bloom at this time of year is not uncommon.

The long-awaited **alum treatment** of Mystic Lake was completed the first week of October. Things went smoothly and were done with great care; pH was well controlled throughout. There was no treatment-induced mortality observed for fish, mussels, or any other pond animals. The treatment covered six carefully delineated areas, with specific concentrations of alum applied to each, depending on the amount of phosphorus in the sediments at that location. Monitoring and water sampling was continuous throughout the process. All in all, I believe we could describe this alum treatment as "exemplary".

A huge "thank you" is due to the Town of Barnstable for funding this costly treatment and for working cooperatively and collegially with the IPA throughout the long process of making it happen. Town Manager John Klimm and Conservation Director Rob Gatewood deserve particular thanks.

The question is, did it work? While we are pleased to have done no apparent harm to the pond's animal life, the real objective has always been a dramatic improvement in water quality and elimination of nutrient-fueled cyanobacterial blooms. We won't know until next summer to what extent these desired results have been achieved.

Looking farther down the road, we need to keep phosphorus from building up in all three ponds. The IPA cannot do this—it has to be done by those who live near the ponds. We need to create barrier plantings that prevent runoff from our property from reaching the ponds. If we have lawns, we should be using phosphate-free fertilizers. And, ultimately, we must make the move from septic systems to sewers.

A professional **mussel** survey of Mystic Lake was performed in June. The results turned out to be worse than anybody had predicted. The survey estimated that 80% (or as many as 24 million) of the mussels had died in the cyanobacterial blooms of 2009. Loss of so many filter-feeders is not going to help water quality going forward.

Making matters worse, another cyanobacterial bloom in Middle Pond this past summer devastated a thriving mussel population there. While there has not yet been a professional survey in Middle Pond, snorkeling confirms that the bottom is littered with dead mussels, most of them still "dug in".

We are currently awaiting the results of tissue analysis of mussels sent to the University of New Hampshire and the State University of New York at Syracuse that we hope will identify what killed them, assumed by most to be a cyanobacterial toxin. Your IPA contributions will fund this important effort.

There will be a followup mussel survey of Mystic Lake next summer as part of the monitoring specified for the alum treatment. The IPA would like to arrange for surveys of mussel populations in both Mystic and Middle in future years. We will also explore the possibility of restocking mussels in both ponds as soon as the effect of the alum treatment on water quality is determined.

The discovery of ***Hydrilla*** in Mystic Lake in August was both bad and good news. Bad, because *Hydrilla*, once established, is extremely costly to control, and eradication efforts are seldom, if ever, successful. The good news is that Bob Nichols discovered it before it had a chance to become widely established, and developed a plan of action. Hard-working IPA volunteers removed the twelve patches and covered the tubers and roots with special screening to prevent re-sprouting. **Many generous donors contributed to the cost of the effort.** Searching has not disclosed any *Hydrilla* plants in the other two ponds.

Lake scientist Dr. Ken Wagner said, "this could be the first case in all of New England where a *Hydrilla* infestation was found and addressed quickly enough to make a difference." It was another exemplary effort. All who contributed to it, in either money or labor, deserve a huge "thank you" from everyone who values the Indian Ponds.

Unfortunately, this is not the end of the *Hydrilla* story. The places where plants were removed and the roots covered up will need to be monitored for years to come, because the tubers remain viable for a long time. Also, judging from the distribution of the patches, the plant was probably transported into Mystic Lake by birds, and if they did it once, they can do it again. So, we're not out of the woods yet on *Hydrilla*, and perhaps never will be.

People wonder why more isn't said about **Hamblin Pond** in the newsletter. It's not that we aren't interested, but water quality in Hamblin continues to be excellent. People who weren't able to swim in the other two ponds this summer, because of algal blooms, tried Hamblin and were delighted with the clarity of its water and the scenic beauty of its vistas. Hamblin's principal problem is invasive shoreline plants; gray willow, *Phragmites*, and purple loosestrife are all gaining ground. Hamblin Pond property owners are respectfully requested to monitor their own properties for invasives and take action if any are found. In the spring, we will plan a Derelict Boat Cleanup Day for Hamblin Pond to remove any rubbish along its shores.

Thank you again for the tremendous support you have given the IPA during this eventful year. Please feel free to contact me (info@indianponds.org) if you have questions or comments. I wish you all the best for the coming holidays.

Holly Hobart

MYSTIC LAKE ALUM TREATMENT COMPLETED WITHOUT INCIDENT

(Cont'd from page 1)

The Aquatic Control Technology paddle wheel barge applying the alum treatment to Mystic Lake.

Fish were observed in underwater video swimming in the treatment area without signs of distress (see video at http://www.youtube.com/watch?v=6J4YAT8Ik5k). Mussels monitored in the treatment area at the north end of the lake appeared to be unaffected two days after the area was treated. Of the half dozen dead fish observed during the two weeks of the treatment, only two could possibly be related to the treatment, as the others had signs of physical injury or were decomposed and had died earlier.

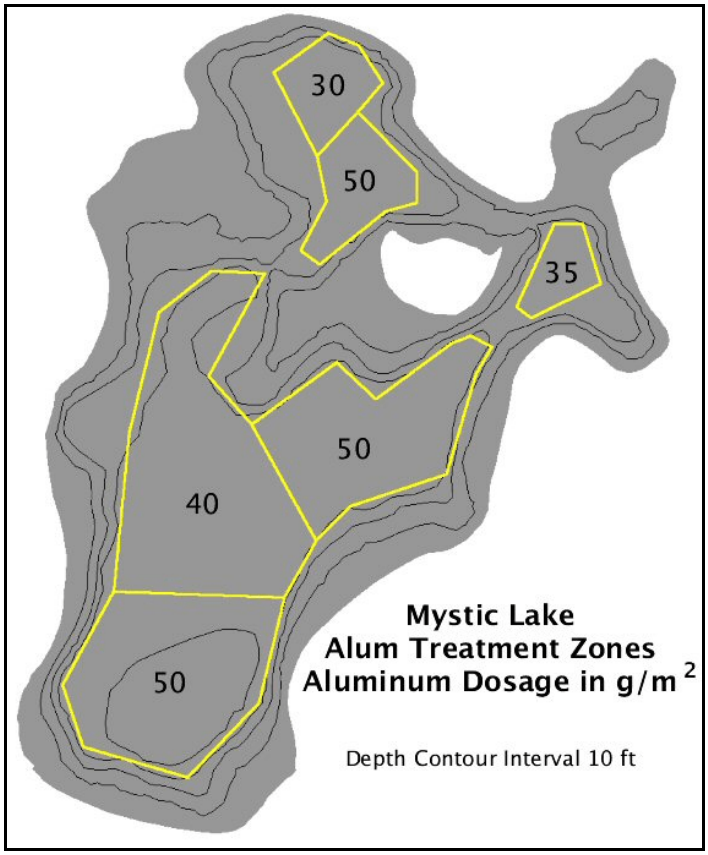
It appears to have been a very successful application of alum to the intended treatment areas without noticeable adverse impact to pond life. Time will tell how well it prevents future harmful algal blooms. As of mid-October, water clarity had not improved. This is not entirely unexpected since only about one-third of the pond area was treated and another algal bloom was underway at the time of the treatment. The main benefit of the treatment is expected to be a reduction in the sediment phosphorous available to be transferred into the water column next summer, resulting in less "fuel" for future algal blooms.

This treatment is the culmination of many years of effort, beginning with the 2004-2005 Pond Study of the Indian Ponds by the Cape Cod Commission's Water Resources Office. The pond study was a collaborative effort by the IPA, the Cape Cod Commission, and the Town of Barnstable. The study concluded that Mystic Lake was clearly an impaired pond, with water quality problems related to excessive phosphorous. While the watershed contributes some phosphorous, the greatest source of in-water phosphorous was attributed to internal regeneration from the phosphorous-laden pond sediments.

ENSR Corporation (now AECOM) was hired by the Town in 2007 for the design and permitting of a nutrient inactivation project to address the problem with Mystic Lake. Extensive water and sediment sampling by ENSR in 2007 and 2008 confirmed and quantified the high levels of sediment phosphorous. ENSR recommended an alum treatment to inactivate the phosphorous and prevent it from mixing into the water column during summer, when the deep sections of the lake are depleted of oxygen, causing the release of sediment phosphorous.

The Natural Heritage & Endangered Species Program (NHESP) of Mass Wildlife initially rejected the alum treatment on the basis that it could harm the mussels in the lake. NHESP had jurisdiction because three of the seven species of mussels in the lake are state listed as being of "special concern". In the summer of 2009, 80–90% of the mussel population died, coincident with a severe cyanobacteria bloom. The IPA and Town then negotiated with NHESP and obtained approval for a 50% reduced dosage alum treatment.

This past spring, further negotiation with NHESP by the IPA and an ENSR/AECOM consultant (Ken Wagner), resulted in an expanded treatment zone and mutual agreement to use a variable alum dosage of from 50 to 100% of the original dosage. The actual dosage for each area of the lake would be based on the amount of alum found necessary, by laboratory assay, to inactivate the level of phosphorous in the respective sample. Based on additional sediment sampling this summer, and the associated laboratory assays, the lake was divided into six treatment zones (see figure), with each zone having a dosage of between 30 and 50 g Al/m^2.



Under the project contract, quarterly sampling and detailed testing of the pond water will be performed over the next year. The results of this testing will quantify the effects of the treatment. The IPA will continue with periodic water clarity and dissolved oxygen testing next summer. Hopefully, we will see a dramatic improvement over what has been experienced the past two summers.

Bob Nichols

IPA VOLUNTEERS REMOVE *HYDRILLA* FROM MYSTIC LAKE (Cont'd from page 1)

IPA volunteers Bob and Alex Frazee, Betsey Godley, Don Houghton, Bob Nichols, and Lew Solomon raking Hydrilla *inside the seine net. Not pictured: John Kayajan and Annette Nichols.*

At each site, the *Hydrilla* was raked out and deposited in a canoe for transport to shore, where it was bagged for disposal. A total of 7 full canoe loads of *Hydrilla* were removed from the lake over three days. After raking, the seine net was then carefully drawn in, collecting all the loose plant fragments, while people patrolled the perimeter with dip nets to capture any escaping pieces.

Another canoe load of Hydrilla *is brought to the shore of Mystic Lake.*

Once the *Hydrilla* was removed, the area was covered by a benthic barrier made from fine-mesh fiberglass screen, attached to a PVC pipe frame, and held down by sand bags. These barriers kill off any remaining *Hydrilla* plants and prevent tubers from sprouting. The barriers will have to be maintained and cleaned of accumulated silt once or twice a year, for many years, to guard against *Hydrilla* resprouting. The barriers are easily visible in shallow water, 2 –4 ft deep, and must not be disturbed or moved out of position.

A benthic barrier deployd over an area where Hydrilla *was removed.* ***These barriers must not be disturbed or moved.***

The IPA is developing an informative brochure on *Hydrilla* that will show what to look for, how to identify it, and who to contact if any suspected *Hydrilla* is found. The brochure will be distributed in spring 2011 and will allow all users of the Indian Ponds to be vigilant in spotting any additional outbreaks. Next summer, everyone using Mystic Lake and Middle Pond should be on the lookout for the development of any new *Hydrilla* patches or any that may have been overlooked this year. It could take years, but if we monitor closely and act quickly, this could become the first case in New England where a *Hydrilla* infestation was completely remediated without the use of expensive herbicide treatments.

Bob Nichols

LATEST ON FULLER FARM PURCHASE

A grant of $500,000 to the Town from the State's Local Acquisitions for Natural Diversity Grant program, to be used for the purchase of the 23-acre Fuller Farm property on Route 149 in Marstons Mills, has been approved. The Town's Community Preservation Committee had earlier committed $500,000 towards the purchase. The expected purchase price is about $1.65 million, leaving approximately $650,000 yet to be raised by the Barnstable Land Trust before June 30, 2011, which is the expiration date for the State grant. If purchased, the Fuller Farm land, part of which borders on Middle Pond, would be used for conservation purposes and would include the possibility of community gardens. For more details, please call Jaci Barton, Barnstable Land Trust (BLT) Executive Director, at 508-771-2585 or contact the BLT at P.O. Box 224, Cotuit, MA 02635.

CORRECTING MISINFORMATION ABOUT MYSTIC LAKE

The purpose of this article is to correct some misinformation that the IPA has become aware of regarding (i) the supposed major source of phosphorus in Mystic Lake and (ii) the role of residential septic systems bordering Mystic Lake in contributing nitrogen to the Three Bays embayment system .

A member of the IPA Board of Directors attended the Cape Cod Commission's "Getting to Know Your Watershed" session on the Three Bays watershed held September 23. At the session, he obtained a brochure prepared by Three Bays Preservation, Inc. entitled "Understanding Nitrogen Pollution and Wastewater Management at Three Bays and Cape Cod". **The following statement was on page 5 of that brochure:**

> "*The Cape Cod Commission has recently completed a detailed assessment of phosphorous impacts to the Indian Ponds (Mystic Lake, Middle Pond, and Hamblin Pond) in the three bays watershed (CCC, 2006). Phosphorous from septic systems appears to be causing over-fertilization (eutrophication) of the ponds, subsequently causing water quality problems. This report can be viewed and downloaded from the web at http://indianponds.org/pond_stdy_results.htm*."

The above URL for the report is wrong; the correct URL is: http://www.indianponds.org/pond_study_results.htm. **Contrary to what the above paragraph says,** the assessment in question, which was initiated by and funded in large part by the IPA, stated that "there is too much organic matter in the sediments of Mystic", "anoxic conditions allow phosphorus that is otherwise bound in the sediments to be released back into the overlying water", and "this release is the primary source of phosphorus in Mystic Lake." The assessment quantified the various sources of phosphorus in the lake and reported that **septic discharge accounted for only 8% of the total**, whereas internal regeneration of **phosphorus already in the lake's sediments contributed 77%**.

An article on page 3 of the October 22 edition of *The Barnstable Enterprise* about Lindsey Counsell (Executive Director of Three Bays Preservation, Inc.) and Three Bays stated, **"...it was documented that most of the nitrogen in the groundwater that flows from Mystic Lake in Marstons Mills to the three bays comes from wastewater from individual septic systems".** There is no argument that residential septic systems are the primary source of nitrogen entering the Three Bays system, but *The Barnstable Enterprise* statement implies that septic systems bordering Mystic Lake are the major source.

First of all, the Marstons Mills River, not Mystic Lake, is an important source of nitrogen in the Three Bays embayment. Mystic Lake has no outlet to the river, although adjoining Middle Pond has an outlet via the 1000-ft herring run sluiceway that empties into the river. However, the sluiceway is only open for a few months each year, in spring and fall, to facilitate the upstream and downstream migration of river herring. The river has its origin in springs southwest of Mystic Lake.

The nitrogen being carried downstream by the Marstons Mills River comes from septic systems in homes bordering the river and located in the river's watershed, not from septic systems surrounding any of the Indian Ponds. In addition, there are many hundreds if not thousands of septic systems distributed throughout the Three Bays watershed, all contributing nitrogen to the groundwater that eventually reaches the Three Bays estuary.

The land around Mystic Lake and the other Indian Ponds became the first 1-acre zoning on Cape Cod almost 50 years ago, at the urging of the Indian Ponds Association, to reduce the impact of septic systems on the environment.

Instead of being a major contributor of nitrogen to the downstream Three Bays area, **lakes and ponds like Mystic Lake actually remove nitrogen from the water**. They act as a form of secondary treatment to aid in the removal of nitrogen from groundwater by denitrification (natural attenuation), a biological process that results in nitrogen gassing off to the atmosphere. Biological attenuation (reduction) of nitrogen (natural attenuation) or denitrification occurs primarily in surface aquatic ecosystems such as streams, wetlands, and ponds. The freshwater ponds on Cape Cod, including the Indian Ponds, provide important environments for biological attenuation of nitrogen. Freshwater ponds are mainly kettle hole depressions that are directly connected to the groundwater system. The ability of ponds to remove nitrogen from the groundwater system is related to the residence time of water within the pond. Residence time in ponds is essentially the volume of the pond divided by the rate of water flow through the pond. Generally, the larger the pond, the longer the residence time and, therefore, the larger the nitrogen removal. A relatively large lake like Mystic Lake can typically remove more than 50% and sometimes as much as 100% of the nitrogen entering it. Therefore, the Indian Ponds remove significant amounts of nitrogen from the water as it moves through them on its way to the Three Bays estuary.

Therefore, **instead of contributing nitrogen to the Three Bays estuary, Mystic Lake, and the other two Indian Ponds, remove nitrogen from their water.** This process is described in the Massachusetts Estuaries Project reports available at http://www.oceanscience.net/estuaries/. The **septic systems close to the Three Bays, whose nitrogen contribution to the groundwater does not pass through an intermediate body of water, actually contribute the most nitrogen to the bays.**

Both Three Bays Preservation and the Indian Ponds Association have comparable missions of preserving and protecting their respective aquatic environments and supporting watersheds. Both organizations have cooperated in the past on water sampling activities. Further close cooperation in the future to reduce the adverse impacts of excessive nutrients, be they nitrogen or phosphorus, is necessary.

Emory D. Anderson and Bob Nichols.

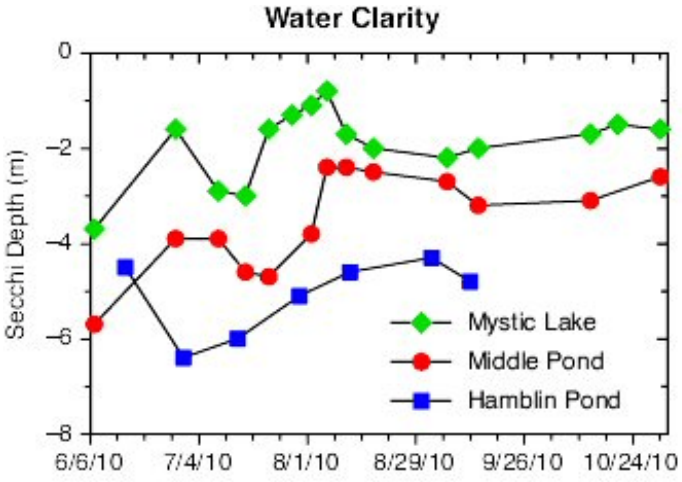
INDIAN PONDS 2010 WATER QUALITY SUMMARY

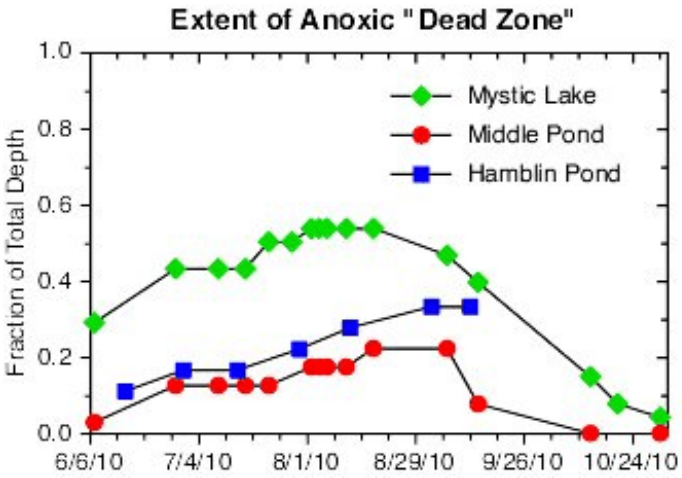
The two plots shown here summarize the water quality measured in the Indian Ponds over the 2010 season. The water clarity plot shows how far down into the lake visibility extends from the surface. Three algal blooms during the season in Mystic Lake and Middle Pond are depicted, with peaks around the end of June, early August, and late October. Hamblin Pond started off with a bloom in early June, with another bloom peaking in late August, but neither of these were nearly as severe as the blooms in the other two ponds. Hamblin Pond was not sampled after September 12.

The anoxic dead zone plot shows how much of the water column at the deepest part of each pond is without oxygen during the season. The dead zone in each pond is that portion of the water column below the curve for each pond. It typically rises during the summer as oxygen is depleted by biological decay of organic matter in the thermally stratified deepest area of each pond. In Mystic Lake, the dead zone in mid-summer comprised over 50% of the water column. Middle Pond, being the shallowest of the three ponds, had turned over (de-stratified) completely by mid-October and, therefore, was well oxygenated from top to bottom of its water column.

Overall, these plots show that Hamblin Pond continues to have the best water quality of the three ponds, followed by Middle Pond, with Mystic remaining quite impaired. Next season, we expect to see a dramatic improvement in Mystic Lake as a result of the alum treatment, which has inactivated much of the phosphorous in its sediments, thereby reducing the principal nutrient that fuels algal blooms and submerged plant growth. IPA volunteers will continue to collect water quality data each season, and we will publish these plots every fall, to provide a simple year-to-year comparison of how the ponds are doing.

Bob Nichols





HOW CRITICAL IS THE LOSS OF MUSSELS TO MYSTIC LAKE? *(Cont'd from page 2)*

The big question being asked is what effect is the loss of this filtering capacity? Obviously, there has to be an effect, but data are unavailable to gauge how great. Not every lake or pond on Cape Cod has a mussel population, so it is unclear whether a lake or pond, like Mystic Lake, which once had a thriving mussel population, can survive without that population. Simply said, only time will tell.

A number of IPA members have asked about the possibility of restocking mussels. The IPA Board of Directors has been discussing this issue for the past year and has raised this question with the Mass. Natural Heritage & Endangered Species Program (NHESP), which has jurisdiction over fish and aquatic life in the lake.

Staff at NHESP have indicated their willingness to work with the IPA on the mussel restoration issue. Scientists have been studying ways to restore and recover freshwater mussel populations. Although Massachusetts presently does not have a mussel restoration program, a number of other states have been actively pursuing mussel introductions, and there are at least 15 federal and state facilities that propagate mussels. Unfortunately, there is still a lack of information on mussel biology and ecology, host-fish relationships, and genetics. Consequently, relocation and propagation/release of mussels are methods that remain works in progress and, if deemed necessary, should be used with great caution and planning.

There are various issues of concern with relocation and propagation/release, such as: (i) the importance of maintaining genetic diversity within and among mussels; (ii) genetics may play a role in mussel host-fish recognition and selection; therefore, a relocated population may not be able to sustain itself in its new environment; (iii) the spread of disease causing pathogens and parasites to relocated or resident mussels; and (iv) the spread of invasive and/or exotic species.

In summary, the possibility of restocking Mystic Lake with mussels is being investigated. Progress on this issue will be reported in subsequent newsletters.

Emory D. Anderson

IF IT'S BLACK, IT MUST BE A CROW

The Cape, and our yards, are overrun with black birds, and they're not all crows. And not many of them are blackbirds.

The greater number of them are European starlings, which, as my wife says, look all grackley. The next most numerous are the common grackles, which are truly black and resemble crows.

European starling

The **European starling** is an introduced bird, as opposed to an endemic bird. It was first brought to the United States in 1890–1891 by a group of Shakespeare aficionados. A group of 100 were released in Central Park in New York City and all starlings in the US are descended from that group. It's bold, aggressive nature soon led to its spread throughout the continent. They are usually found in towns and villages and are not open-land birds. They fly in great mobs and can cover a lawn when they land to feed. They will eat almost anything, but prefer insects when they are available. They will also eat berries when available. They nest in cavities, which could be in trees, buildings, or light fixtures.

Female common grackle

The next most numerous bird is the **common grackle**. There are two other types of grackles in the US, but they stay pretty much in the South. At first, the grackle appears to be solid black, but after you look at it for a while, you'll begin to notice a purplish sheen to it. Some grackles, especially in New England, may have a bronzed sheen about the head and back. Grackles are true blackbirds, but are taller and longer-tailed than typical blackbirds. Common grackles thrive around open land, but are also common in open woodlands. They also like lawns and feeders, where they tend to be the dominant bird (read bully). More often then not, if you have a flock of grackles at your feeder, you will find a **red-winged blackbird** flying with them. Grackles will literally eat anything, up to and including garbage. In the fields, they catch mice. They wade into the water to catch small fish. They are a huge menace to a corn field because first they eat the shoots, and if the corn grows, they eat the kernels.

Red-winged blackbird

The **red-winged blackbird** is one of the most abundant birds across the continent. Although they are not particularly migratory they are most often seen on the Cape after the spring thaw and after the ponds have become ice-free. They are most often noted hanging around the edges of ponds, on cattails around marshes, and sitting on telephone lines. Males are extremely territorial during breeding season and a single male may have numerous female mates nesting in his territory. They attack and try to chase off anything viewed as a rival or nest raider, up to and including people who stray too close to their nests. They are ground foragers and feed mainly on insects during summer and on seeds and grain during winter.

American crow

Next up the scale is the **American crow**, which is the largest type of crow in the US, although noticeably smaller than a raven. Crows are found everywhere. They are found in treetops and the center of town, from open woods to beaches. They feed on the ground and will eat almost anything: earthworms, insects, small animals, road kill, or seeds and fruits. They may travel in large groups or with only one or two companions, but they are rarely alone. They are big birds and are usually around 17 inches long. They are solid black. Even their legs and bills are black.

Fish crow

They have short, rounded tails. Although it's really hard to tell apart, we also have the **fish crow** on Cape Cod, which has all of the same characteristics as the American crow.

Common raven

And finally, the **common raven**. Although Cape Cod is included in its range, it is on the very southern and eastern edge of it. In other words, it's probably not a raven you're seeing. They are large, massive birds with shaggy throat feathers and a huge beak. They are entirely black; legs, beak, and eyes. Ravens are not as social as crows and may be seen alone or in pairs. They build their nests, which can be 5 feet across, in trees and on cliffs or utility poles. Like the crows, they are completely omnivorous.

Dave Reid