THE IPA NEWSLETTER

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

Fall 2019 **A quarterly publication of the Indian Ponds Association, Inc.** **Vol. 19 No.4**

IN THIS ISSUE

STATE OF THE WATERS: CAPE COD 2019

A major report on the water quality of Cape Cod's coastal embayments, lakes and ponds, and public water supplies was recently completed by the Association to Preserve Cape Cod (APCC). This report includes (i) why it was done, (ii) an overview explaining why we need clean water, how water quality was graded, data sources, results, and maps, and (iii) recommended actions to protect our water. All of this information can be accessed at https://capecodwaters.org/. In short, Cape Cod's saltwater embayments and freshwater ponds are suffering from the negative effects of too many nutrients, water quality is in decline due to pollution from septic systems, stormwater, and fertilizers, but drinking water quality is excellent due to efforts made to protect land and water sources. Most of the text that follows is taken verbatim from the APCC report.

Summary

The report's summary states that more than two-thirds of the Cape's coastal embayments and more than one-third of the ponds are suffering from unacceptable water quality due to excess nutrients. As most of the Cape is served by Title 5 septic systems and only small areas are served by publicly-owned wastewater treatment facilities, the main cause of unacceptable water quality in both coastal embayments and freshwater ponds is excess nutrients due to inadequately treated wastewater, followed by poorly treated stormwater runoff and fertilizers. More water quality monitoring data are needed for most ponds. **Only 149 (15 percent) of the 996 ponds and lakes on Cape Cod are monitored for water quality.** APCC's Cyanobacteria Monitoring Program has been monitoring 30+ ponds and lakes for harmful cyanobacteria blooms, and most of these ponds have experienced cyanobacteria blooms this summer. Harmful cyanobacteria blooms occur in ponds when there are excess nutrients and warm temperatures, conditions which are likely to occur more frequently as climate change continues. In contrast, 20 public water supplies in 15 towns across the Cape were all graded as excellent based on existing drinking water quality standards. However, emerging contaminants are of concern and need to be monitored. It is important to note that for most of these contaminants, no drinking water standards have been established. Examples include PFAS, endocrine-disrupting compounds, pharmaceuticals, and microplastics.

Grading freshwater ponds and lakes: the Carlson Trophic Index

To grade freshwater ponds and lakes, APCC chose a scoring method that evaluates the trophic state of the water body in terms of nutrients, chlorophyll, and water transparency. **The Carlson Trophic Index** was developed in 1996 to assess the trophic state of a freshwater pond or lake, where trophic state refers to the ecological response (algal biomass) to nutrients (Carlson, R.E. 1977. A trophic state index for lakes. Limnology and Oceanography, 22: 361–369).

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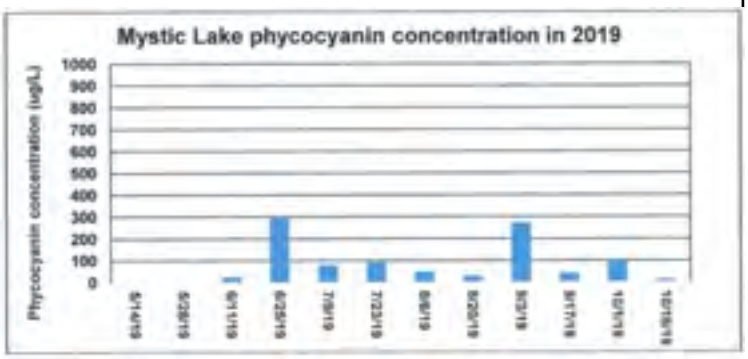
YEAR-END UPDATE ON CYANOBACTERIA MONITORING IN THE INDIAN PONDS

IPA's joint monitoring project with the Association to Preserve Cape Cod (APCC) documented that cyanobacteria levels in the Indian Ponds were generally low to moderate during the period May 14–October 16, 2019. These results are heartening, given the rather large number of Cape Cod ponds that have had warnings or full beach closures this year because of high levels of these toxic algae. Within Barnstable alone, Bearse Pond-Holly Point, Crystal Lake, Hinckley Pond, Shubael Pond, Long Pond (Marstons Mills), Long Pond (Centerville), Lovells Pond, and Lake Wequaquet had warnings or posted beach closures for cyanobacteria this year. Gooseberry Pond and Middle Pond had postings with the lower "Pet Warning".

For those unfamiliar with the IPA's effort this year, please see the spring and summer 2019 issues of our newsletter (www.indianponds.org/) for a description of our monitoring effort and sample station locations.

From mid-May to mid-October, cyanobacteria abundance varied greatly from month to month, and conditions differed noticeably among the Indian Ponds. The following summarizes the findings of APCC's draft year-end report submitted to the IPA.

Mystic Lake: Microscopic analysis identified three different genera of cyanobacteria, each being potential toxin producers. Average percent dominance of each genus for the season was: 61% *Dolichospermum*, 20% *Microcystis*, and 10% *Woronichinia*, with different species being numerically dominant on different sampling dates. Knowledge of the species composition is important because it is used to evaluate potential concentrations of various toxins. The total abundance of all cyanobacteria, measured as phycocyanin pigment concentration, was relatively low in Mystic Lake throughout the sampling season (see figure). No warnings or advisories were recommended by APCC or posted by the Town of Barnstable at Mystic Lake this season. APCC's cyano map indicated that levels were low throughout the season, aside from moderate levels on June 25 and September 3. However, we did establish that Mystic Lake supports a significant population of *Microcystis*, a highly toxic species that could potentially multiply and bloom in future seasons.



Middle Pond: Microscopic analysis identified five different genera of cyanobacteria, the greatest diversity found in the Indian Ponds this season. Each is a potential toxin producer. Average percent dominance of each genus was: 65% *Dolichospermum*, 25% *Microcystis*, and collectively 10% of other genera including *Woronichinia, Aphanizomenon*, and *Aphanocapsa*. Total cyanobacteria levels in Middle Pond were generally low throughout the summer except for two spikes observed on

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STATE OF THE WATERS: CAPE COD 2019

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Using the Carlson Trophic Index, a pond with high nutrient concentrations (**eutrophic to hypereutrophic**) would be characterized by high concentrations of algae, algal scums, poor water clarity due to dense algae, and low to no dissolved oxygen. A eutrophic to hypereutrophic pond would have scores from 50 to 100. At the opposite end of the spectrum, a pond with low nutrient concentrations (**oligotrophic**) would be characterized by clear well-oxygenated water, healthy aquatic plants, and little to no algal growth. An oligotrophic pond would have scores from 0 to 40. A pond with intermediate nutrient concentrations (**mesotrophic**) would be characterized by moderately clear water, intermediate amounts of aquatic plants and algae, and low dissolved oxygen during the summer. A mesotrophic pond would have scores from 40 to 50. The Carlson Trophic Index is analogous to the Buzzards Bay Eutrophic Index in that it can be used to evaluate the degree of eutrophication in freshwater.

APCC adopted a grading system that assigns the following grades to Carlson Trophic Index scores:
Scores of less than 50 are graded as: Acceptable: requires ongoing protection;
Scores of 50 and above are graded as: Unacceptable: needs immediate restoration.

Waters that are graded as "**Acceptable: requires ongoing protection**" are waters that are healthy and free of excess nutrients. These waters need ongoing protection to remain healthy and free of pollution. Waters that are graded as "**Unacceptable: requires immediate restoration**" are waters that are suffering from excess nutrients. These waters need immediate restoration in order to improve water quality. Of the 996 ponds on Cape Cod, Pond and Lake Stewardship (PALS) monitoring data were available for only 15% or 149 of the ponds. Of these 149 monitored ponds, over one-third (58 ponds or 39%) had Unacceptable water quality and less than two-thirds (91 ponds or 61%) had Acceptable water quality.

The three Indian Ponds were among the 15% of the Cape ponds monitored for water quality. The IPA has faithfully participated in the PALS program, the data from which provided the basis for the grading system used. Middle Pond, with a score of 42.4301, and Hamblin Pond, with a score of 44.7187, were both graded as **Acceptable**. Mystic Lake, however, with a score of 50.0207, was graded as **Unacceptable**. For the 149 ponds that were graded, the average score was 47.8334, the highest was 78.3302, and the lowest was 31.3948. Based on this, Middle Pond and Hamblin Pond would be considered better than average in terms of their scores, while Mystic Lake is slightly poorer than average. However, it should be noted that the score of 50.0207 for Mystic Lake is barely above the score of 50 and, therefore, barely in the category of **Unacceptable** (Note: see the article on page 10 on Why Mystic Lake is Graded Unacceptable).

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UPDATE ON HYDRILLA TREATMENT

In late August just as the summer issue of this newsletter was about to go to press, we were informed by Darcy Karle, the Town Conservation Administrator, that the Town Manager had granted a waiver to his ban on the use of chemicals in Town lakes and ponds and had authorized the annual treatment of Mystic Lake and portions of Middle Pond with fluridone to combat the invasive weed *Hydrilla*. Accordingly, SOLitude Lake Management conducted a treatment on September 18 and a follow-up treatment on October 16.

An annual review and update of the waiver request will be required each year before further waivers will be considered. As pointed out in the article on this subject in the summer newsletter, fluridone treatments repeated every year for up to 10 years were necessary to totally eliminate *Hydrilla* in several lakes in the state of Washington. We hope that Town officials here will be equally relentless in continuing to authorize and fund treatments of *Hydrilla* in our ponds for as long as necessary.

Emory D. Anderson, PhD

OVERVIEW OF 2019 POND WATER TESTING

The annual testing of water quality of the three Indian Ponds was completed on October 4, concluding the routine testing done at roughly two-week intervals that began on May 15. The testing included measurements of (i) dissolved oxygen and temperature at 1-meter intervals from the surface to the bottom and (ii) water clarity as determined using a Secchi disk. In addition to these routine measurements, water samples were collected at various depths on August 22 in all three ponds for subsequent analysis for nitrogen, phosphorus, alkalinity, chlorophyll *a*, and pH at UMass Dartmouth's SMAST laboratory as part of the Cape Cod Commission's Pond and Lake Stewardship (PALS) program. Volunteers who assisted in 2019 included Bob Derderian on Hamblin Pond, and Emory and Geri Anderson, Barry and Joyce Schwartz, Butch Roberts, John Kayajan, Elisabet and Kristina Norgard, Nate and Cole Anderson, and Greg Cronin on Mystic Lake and Middle Pond.

Temperature

In mid-May when testing began, the surface temperature in all three ponds ranged from 13.5 to 14.2°C (56.3–57.6°F). Peak temperatures occurred in early August ranging from 26.6 to 27.2°C (79.9–81.0°F). At the final testing in early October, temperatures had dropped to 19.5–20.8°C (67.1–69.4°F). Compared with the highest temperatures observed in the previous two years (80.1°F in 2018 and 77.5°F in 2017), 2019 was clearly the warmest at a maximum of 81.0°F. Warmer water temperatures are more conducive to the production of cyanobacteria (see related article on page 2).

Bottom temperatures differed in the three ponds, mainly because of differences in depth. Middle Pond (maximum of 33 ft) averaged 18.4°C (65.1°F), only moderately lower than at the surface (average of 22.6°C or 72.7°F) because the entire water column is continually mixed by wind and wave action. The situation is different in Mystic Lake and Hamblin Pond because of their greater depth (48 and 63 ft, respectively) and because thermoclines develop at around 6–7 m (20–23 ft), with temperatures becoming progressively cooler with increasing depth. Bottom temperatures in Mystic Lake averaged 12.6°C (54.7°F), while in the deeper Hamblin Pond they averaged only 8.9°C (48.0°F).

Dissolved oxygen

Fish and other organisms in the ponds require oxygen to live. Oxygen is produced by photosynthesis and is consumed by respiration and decomposition of organic material. Oxygen in the ponds comes both from the air (where it is much more concentrated than in the water) and from the water itself (aquatic vegetation and algae). Dissolved oxygen in all three ponds is generally at concentrations of 7.5–10 mg/l (parts per million) most of the time from the surface down to the thermocline (6–7 m or 20–23 ft), below which it steadily declines to nearly zero at or near the bottom. This is because below the thermocline, oxygen cannot be replenished after it is consumed by bacteria that eat dead organic material that falls to the bottom. The absence of oxygen encourages the release of phosphorus from the bottom sediments, which fuels the growth of algae.

In Middle Pond, because the water column is well mixed by wind and wave action, oxygen was detected at the bottom during all testings except in July–early September. In Mystic Lake, except for the May 15 testing when oxygen was seen at every depth from surface to bottom, measureable amounts were generally absent deeper than 10 m (32.8 ft) and even below 8 m (26.2 ft) in mid-August. By comparison, in Hamblin Pond, oxygen was generally sufficient until reaching 14 m (45.9 ft).

Clarity

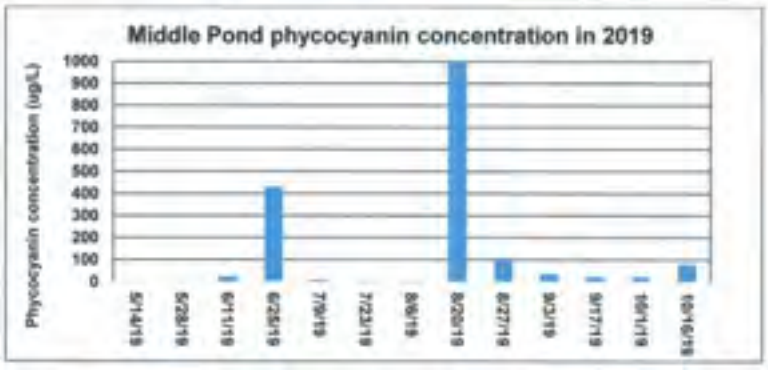
Water clarity, as measured by Secchi disk, provides a general measure of pond condition. Clarity is influenced by suspended or dissolved material in the water column generally due to phytoplankton (algae). Although readings can be influenced by weather conditions (wind, clouds, etc.), Hamblin Pond consistently exhibited the greatest clarity, averaging 5.9 m (19.4 ft), with Middle Pond next averaging 4.5 m (14.8 ft), and Mystic Lake the lowest averaging 3.7 m (12.1 ft).

Emory D. Anderson, PhD

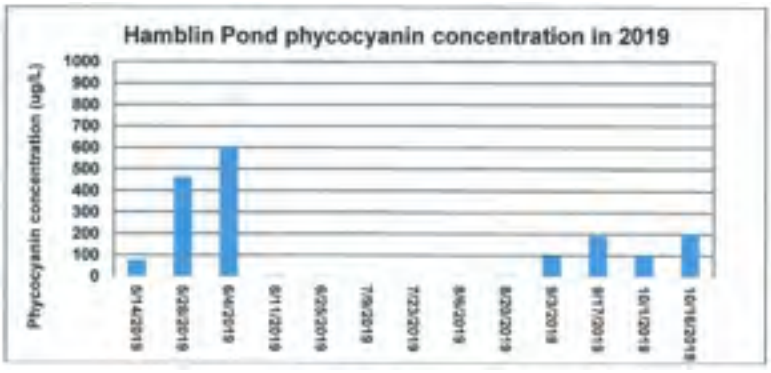
YEAR-END UPDATE ON CYANOBACTERIA MONITORING IN THE INDIAN PONDS

(Continued from page 2)

June 25 and August 20. The latter event saw a phycocyanin concentration of 2,862 ug/l (note: for the sake of maintaining the same scale on all three graphs, the y-axis range does not depict the 2,862 ug/l reading on August 20.) This high concentration was associated with a *Dolichospermum* bloom that resulted in a two-week Pet Advisory posting for Middle Pond.



Hamblin Pond: Sampling in Hamblin Pond identified only two genera of cyanobacteria, each a potential toxin producer. *Dolichospermum* was the dominant genus present throughout the season, aside from one sample containing a 50/50 mix of *Dolichospermum* and *Gloeotrichia*. Spring began with an early, steady rise in *Dolichospermum* which gained the attention of our monitoring crew, but then this population crashed. On three sample dates, June 11, July 9, and August 20, no cyanobacteria were identified in Hamblin Pond. The seasonal trend in Hamblin Pond shows moderate concentrations during spring and fall, suggesting a possible link to seasonal pond mixing and associated nutrient increases in the pond's surface waters at those times. No warnings or advisories were recommended by APCC or posted by the Town at Hamblin Pond this season.



This first season of collaborative monitoring by the IPA and APCC was a success in terms of collecting and analyzing samples on every intended date throughout the field season. This was done in part with the excellent help of IPA director Butch Roberts and IPA member Christine Bizinkauskas, who conducted field sampling when Bill Hearn was unavailable in September and early October. The IPA board will soon be receiving a final year-end report from APCC. That report will examine abundance trends of cyanobacteria, provide recommendations for limiting nutrient inputs that promote cyanobacteria blooms, and thoughts for future monitoring actions.

Bill Hearn, PhD

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GO TO THE IPA WEBSITE: www.indian-ponds.org

THE CHIP MONK AND THE FISH FRIAR

As a lead-in to my story, I thought the following joke would be fitting. *A monastery in the English countryside has fallen on hard times, and the monks decide to open a fish-and-chips restaurant. The establishment soon became very popular, attracting people from all over. One city fellow, thinking himself clever, asked one of the brothers standing nearby, "I suppose you're the fish friar"? "No", answered the brother, straight-faced. "I'm the chip monk".*

This month, my epistle is not going to be about birds, but one of my favorite backyard rodents, the chipmunk. The topic was suggested, so hopefully you will enjoy it.

I get a bit of amusement from watching the chipmunks try to monopolize my deck and bird feeders. Usually, one tries to be the "owner" and, therefore, must defend the area from any interloper looking for a free meal. This can result in a screaming match and, occasionally, some serious rough and tumble. Sometimes, the owner comes out on top and sometimes he is defeated. They are small enough so that when one of them raids my bird feeder, he is quite capable of getting himself entirely inside, much to the surprise of the next one that comes along.

Chipmunks are primarily found in North America, with the exception of the Siberian chipmunk, which is found in Asia. For those few who are unacquainted with the animal, chipmunks are small, brown, and white-striped rodents. They are all classified as members of a single genus (*Tamias*) or, just to be confusing, as members of one of three genera: *Tamias* - the eastern chipmunk, *Eutamias* - the Siberian, and *Neotamias* - the other 23, mostly western species.

Over the years, chipmunks have been referred to as chip squirrels, chipping squirrels, striped squirrels, timber tigers, minibears, and ground squirrels, although "ground squirrel" has been adopted to refer to other squirrels.

Chipmunks have an omnivorous diet, consisting of seeds, nuts, fruits, and buds. They commonly eat grass and many other forms of plant matter. They will sometimes eat insects, small frogs, worms, and bird eggs. Chipmunks mostly forage on the ground, but are perfectly capable of climbing trees to acquire preferred nuts or acorns. They cache their food in a larder in their burrows and remain in their nests until spring.

Eastern chipmunks mate in early spring and again in early summer, producing litters of four or five twice a year. Western chipmunks mate only once a year.

Chipmunks are prey for various predatory mammals and birds. They typically live about three years, but have lived as long as nine in captivity. In captivity, they have been observed to sleep about 15 hours per day.

I think by now that you know more about chipmunks than you really wanted to know, so I guess I'll quit for now.

Dave Reid

STATE OF THE WATERS: CAPE COD 2019

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Recommended actions for homeowners/business owners for ponds

The following actions by homeowners/business owners are recommended by the APCC to deal with the threat to water quality by nutrient pollution from septic system wastewater and from fertilizers, stormwater runoff containing roadside pollutants, including nutrients and pathogens, and contaminants of emerging concern such as pharmaceuticals, personal care products, and industrial chemicals:

- Organize locally and demand action by town officials to restore and protect ponds.
- At town meeting and the ballot box, support municipal investments to restore and protect pond water quality.
- Support the adoption of local bylaws and regulations that increase protections of ponds.
- Upgrade septic system so that it is at least 300 feet back from the edge of a pond when located on the upgradient side of groundwater flow toward a pond.
- Eliminate the use of fertilizers and pesticides. Reduce, or better yet, eliminate turf grass lawns. Encourage your town, local schools and golf courses to reduce or eliminate fertilizer and pesticide use.
- Don't dump contaminants down the drain. Household chemicals, paints, thinners, solvents, pharmaceuticals and other hazardous materials can leach into groundwater and pollute water bodies. Dispose of hazardous wastes during designated collection days at local transfer stations.
- Work to achieve zero stormwater runoff from your property. Direct roof runoff from downspouts away from paved areas. Install rain gardens or rain barrels to collect water. Maximize permeable areas and native plantings that help absorb stormwater and prevent water runoff to roads.
- Establish protective vegetative buffers of native vegetation at least 100 feet wide along pond shorelines to reduce the potential for stormwater runoff to a pond.
- Support town and local land trust open space acquisitions of property with pond frontage or within pond watersheds.

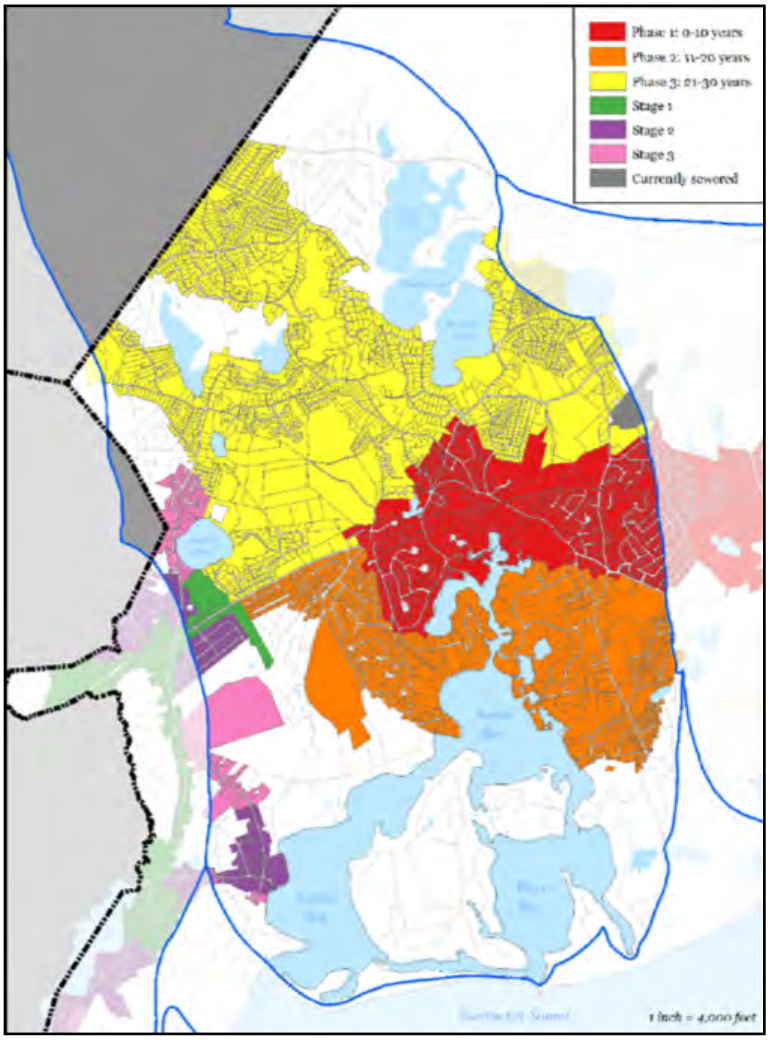
  Help organize and participate in citizen water quality monitoring projects for area ponds, including monitoring for cyanobacteria blooms.
- For homeowners, become active in your local pond association, or if there isn't one for your pond, start one.
- Encourage your town to use more pervious surfaces in place of pavement and to allow roadside vegetation to grow instead of mowing it so it can filter pollutants from stormwater.
- Pick up after pets and deposit waste in the trash. Pet waste can introduce harmful bacteria and other pathogens into ponds.
- Do not wash cars on paved driveways or parking lots, which allows oil, fuel and soap to make their way into ponds.
- Be a responsible boater. Never dump trash or debris overboard.
- Attend education workshops to learn more about pond issues and how you and your community can protect ponds.
- If using an on-site septic system, maintain it properly by having it pumped regularly—every three years is recommended. Consider an advanced wastewater treatment system to treat nutrients.

Emory D. Anderson, PhD

TOO LITTLE, TOO LATE

The development of the Town of Barnstable Comprehensive Wastewater Management Plan (CWMP) is the product of a long process of governmental and public involvement that can be traced back to the implementation of Section 208 of the Clean Water Act, as amended in 1972. It is not the purpose of this article to explore the history of this development. Suffice it to say, one of the results of this effort was the establishment of a Total Maximum Daily Load (TMDL) for nitrogen that can legally be discharged into the estuaries on Cape Cod. The CWMP is the Town of Barnstable's response to meeting these requirements for each of the various watersheds within the town.

A lot of very careful and thorough analysis has gone into the development of this plan. It is the result of a collaborative effort by federal, state, and local governments as well as several non-profit advocacy organizations. There has also been a significant amount of public input throughout its development and more specifically in several public meetings since 2017. In developing the plan, the Town was able to leverage its "highly qualified technical staff, with a number of licensed engineers, many of whom have previously worked as consultants addressing wastewater issues for communities." The Town created the Water Resources Advisory Committee (WRAC) which, along with the Department of Public Works and other Town staff members, created the plan that was presented to the Town Council in August 2017. There have been several modifications of that plan as a result of public input.



In addition to addressing the regulatory requirements (TMDLs) for nitrogen, which are a priority, the plan seeks to address sanitary needs, convenience and aesthetics, protecting groundwater and water supplies, and enabling sustainable economic growth.

The current plan is to be implemented in three phases, each covering a 10-year span. It leverages the existing Town's current secondary wastewater treatment facility and concentrates on building a collection infrastructure to transport the wastewater to that facility. It also looks at piloting some non-traditional and management solutions, particularly in the Three Bays Watershed, which includes the three Indian Ponds.

From here, I will concentrate on the Three Bays Watershed, as shown on the map taken directly from Figure 5-39 in the published plan. This figure shows the three implementation phases as they apply to the watershed. As you can see, Phase 1 extends the wastewater collection system to pick up a large part of the development along Route 28. Phase 2, starting 10 years later, picks up those parcels on the south side of Route 28. It is not until 20 years later that the plan extends the system to pick up the heavy developments around the south and east sides of the Indian Ponds. And even at that, the developments north and west of the Indian Ponds are not even on the radar for inclusion in the plan.

During the needs assessment development process of this plan, the parcels within the Three Bays Watershed listed in the table below had problems with their Title 5 Septic System that also needed to be addressed by the plan. As you can see, even after 30 years, some of these issues will not have been addressed by the Comprehensive Wastewater Management Plan.

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TOO LITTLE, TOO LATE

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Furthermore, of the 12 ponds in the watershed for which data had been collected, six of them had been classified as impaired or eutrophic. Fortunately, according to this data, Hamblin Pond and Middle Pond were classified as oligotrophic (low nutrients) and Mystic Lake as mesotrophic (intermediate nutrients). However, the data used for this plan did not incorporate the results of the cyanobacteria testing that was performed this past summer. In that testing, both Hamblin Pond and Middle Pond showed signs of cyanobacteria growth and resulted in a "Pet Advisory" status on Middle Pond for two weeks.

Issues for Title 5 septic system compliance	No. of parcels	No. of parcels addressed	No. of parcels not addressed
Parcel is less than ¼ acre	336	208	128
Parcel is within 4 ft of groundwater	143	63	80
Parcel has septic variance	36	12	24
Parcel has failed septic system	2	2	0
Parcel within 100-year flood and/or velocity zone	718	481	237

The plan does call for several non-traditional solutions to be attempted in this watershed, specifically Mill Pond dredging, cranberry bog conversions, alternative septic systems, aquaculture, dredging of the Cotuit Bay cut, and nutrient regulation. All of these solutions will need to be tested to determine if they will be effective in lowering the nitrogen discharge levels into the watershed.

No discussion of this plan would be complete without discussing cost. Currently, the total plan cost is estimated at $1.06 billion, of which 44% would come from rooms and meals tax, while the remainder would come from Barnstable taxpayers and system users. As the plan currently stands, the heaviest assessment occurs on those parcels that abut the distribution system. This excludes most of the parcels within the Indian Pond Association area. Our tax bills would be impacted by the 7% that is planned to come from the Town's general fund contribution.

Clearly, the price tag has been a factor in limiting the scope of the project, and well it should be. However, the Cape has been characterized as having a "blue economy". In other words, it lives and dies economically based on the quality of the many bodies of water within the Cape and surrounding the Cape. Having witnessed the warming of the waters as a result of climate change and the impact of that warming on the quality of the water, one wonders if we can afford not to be more aggressive.

Maurice "Butch" Roberts

NEW WEBMASTER

IPA member Wendy Bierwirth has volunteered to take over the IPA's website (www.indianponds.org/). Wendy is newly retired, has considerable computer expertise, and is anxious to update and modernize the website. She takes over from Maggie Fearn, who has served as webmaster since spring 2018.

By way of history, the original IPA website was created and activated in summer 2001 by John Anderson, son of Emory and Geri Anderson, who was living off Cape. In fall 2010, the IPA board agreed on the need to revamp the old website in order to be able to add various features that necessitated a local person being the webmaster. Tamar Haspel, then a member of the board, volunteered in winter 2010/2011 to assume responsibility for the website. In doing so, she created a new website on wordpress.com/. Tamar served in this capacity until spring 2018 when she felt it was time for someone else to take over.

The IPA is grateful to John, Tamar, and Maggie for their service as webmaster. We now look forward to seeing the new changes that Wendy will initiate, and we encourage members and other readers of this newsletter to make full use of all that the website will offer.

Emory D. Anderson, PhD

WHY MYSTIC LAKE IS GRADED UNACCEPTABLE

The recently released APCC report on the state of the Cape's waters (see article on page 1) graded Mystic Lake as **Unacceptable: needs immediate restoration**. The numerical score given to Mystic Lake was determined using the **Carlson Trophic Index, a system based on values of Secchi disk water transparency and concentrations of chlorophyll *a,* and total phosphorus in the lake water.** These data, which were obtained from PALS monitoring data for 2012–2016 collected by the IPA, resulted in a score of 50.0207, a value only slightly above 50, the dividing line between **Acceptable** (score ≤50) and **Unacceptable** (>50). The latter category is for waters that are suffering from excess nutrients (i.e. phosphorus and nitrogen). The APCC recommendation is for immediate restoration in order to improve water quality.

Pond	Year	Secchi	Chl*a*	TP
Mystic	2012	4.90	1.29	2.27
	2013	4.40	3.63	1.83
	2014	2.50	14.85	4.05
	2015	4.25	13.99	1.51
	2016	3.70	11.84	0.76
	2012–2016 ave.	**3.95**	**9.12**	**2.08**
Middle	2012	6.10	4.77	0.90
	2013	6.20	2.30	0.78
	2014	5.45	6.67	0.70
	2015	6.85	2.22	0.52
	2016	4.05	1.65	0.64
	2012–2016 ave.	**5.73**	**3.52**	**0.71**
Hamblin	2012	4.80	4.12	0.79
	2013	4.70	2.40	0.77
	2014	1.20	17.73	2.96
	2015	6.35	0.82	0.47
	2016	6.90	7.02	0.28
	2012–2016 ave.	**4.79**	**6.42**	**1.05**

So, why was Mystic Lake graded **Unacceptable**, while both Middle Pond and Hamblin Pond were graded **Acceptable**? To answer this question requires an examination of the 2012–2016 PALS data as well as past restoration efforts on all three ponds. This examination will not attempt to fully explain how the numerical score for each pond was derived from the three categories of PALS data (the methodology is explained on the APCC website for the State of the Waters: Cape Cod 2019 (https://capecodwaters.org/), but will compare the respective data values among the three ponds for the five years in question.

The PALS data were collected each year on a single day in late August (see the article on the Overview of 2019 Pond Water Testing on page 4). In the table shown here, the Secchi disk value (i.e. water transparency) for each year for each pond is a single measurement in meters (m). The chlorophyll *a* (Chl*a*) value (micrograms per liter) for each year for each pond is an average from three or four (depending on the pond's depth) water samples taken just below the surface, 3 m and/or 9 m down, and 1 m above bottom. The total phosphorus (TP) value (micromoles per liter) for each year for each pond is also an average from three or four water samples at the same depths as for the chlorophyll *a* values.

Comparing the Secchi disk values among the three ponds indicates that water transparency was generally lowest for Mystic Lake, with the 2012–2016 average being 3.95 m. Middle Pond had the highest values in most years, with an average of 5.73 m. Hamblin Pond had somewhat low values in 2012–2014 (1.20–4.80 m), but much higher values in 2015–2016 (6.35–6.90 m), resulting in a 5-year average of 4.79 m. The substantial increase in water transparency in Hamblin in 2015–2016 resulted from an alum treatment in spring 2015.

The chlorophyll *a* and total phosphorus values are closely correlated because phosphorus is a nutrient that stimulates the growth of algae, which contains chlorophyll *a*. Both of these values were consistently highest in Mystic Lake and lowest in Middle Pond. It is interesting to note that the chlorophyll *a* and total phosphorus values in Hamblin Pond in 2014 were very high, but dropped dramatically in 2015 because of the alum treatment that year (which suppressed the availability of phosphorus and hence the growth of algae and the production of chlorophyll *a*).

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WHY MYSTIC LAKE IS GRADED UNACCEPTABLE

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By examining the values for these three parameters, particularly the 5-year averages, it is clear why Mystic Lake was graded more poorly than either Hamblin Pond or Middle Pond. Water transparency in Mystic was the lowest of the three ponds, and both chlorophyll *a* and total phosphorus were the highest in Mystic.

Why were these three parameters worst for Mystic Lake? The answer most likely relates to the alum treatment administered to Mystic Lake in 2010. A brief account of the process leading up to the treatment is needed to fully understand why it is now deemed to have been inadequate. Following completion of the 2004-2005 Pond Study report (www.indianponds.org/?page_id=126) and its presentation to Town officials in spring 2006, the Town committed to treat the lake. A subsequent multiyear effort, chronicled in numerous newsletter articles archived on the IPA website (www.indianponds.org/), included further testing of sediments and the design and permitting for an alum treatment by the ENSR Corporation (now AECOM) contracted by the Town. The Mass. Natural Heritage & Endangered Species Program (NHESP) initially denied the request for a permit. In a May 2009 meeting with Town and IPA representatives, the NHESP questioned the Pond Study Report and our claim that the pond was degraded. They said that even if the lake was dying, (i) they were still obligated by law to protect the endangered mussels, (ii) the evidence in support of an alum treatment wasn't good enough for them to find that a "benefit" to the species would come about if the lake were treated, and (iii) it would take a long time for the lake's condition to become detrimental to mussels. The concerns raised by NHESP personnel were that (i) the alum treatment might reduce phosphorus to the point where the amount of algae produced might be insufficient to provide an adequate food supply for the mussels, and (ii) the alum treatment itself could be toxic to the mussels. The IPA argued that if an alum treatment were denied, there was concern that conditions in Mystic Lake would worsen and endanger the very welfare of the mussels that NHESP was trying to protect. Because of the reluctance of the NHESP to approve the treatment, an estimated 24 million mussels (ca. 80% of the total) died in Mystic Lake in mid-August 2009 as a result of a massive cyanobacteria bloom. A second die-off occurred in July 2010 because of a second such bloom. Following the 2009 mortality, the NHESP finally granted approval for the treatment, but only at an alum dosage smaller than that recommended by AECOM. The initial recommended dosage by AECOM's expert, Dr Ken Wagner, based on the amount of phosphorus found in the lake's sediments, was 50 g of alum per m^2, but NHESP wanted a dosage of only 25 g per m^2. Wagner warned that the lower dosage would most likely be effective in inactivating the phosphorus for only 5–7 years, whereas a dosage of about 50 g per m^2 should neutralize the phosphorus for 15–20 years or longer. In the end, a compromise was reached allowing a dosage between 30 and 50 g per m^2, depending on water depth. The treatment was eventually done in September–October 2010. Incidentally, there was no evidence that mussels or fish were killed by the treatment.

However, conditions in Mystic Lake improved for only a few years (see Secchi, chlorophyll *a*, and total phosphorus values from 2014 onward in the table). It now appears evident that Dr Wagner's prediction was correct and that the inadequate alum dosage applied in the 2010 treatment is responsible for the **Unacceptable** grade for Mystic Lake. Therefore, **there is a strong argument for another alum treatment for Mystic Lake in the near future** using an alum dosage commensurate with the levels of phosphorus in the sediments to be determined by qualified lake management experts. In addition to reducing phosphorus levels via alum treatments, we encourage landowners to help by reducing nutrient runoff from their properties using techniques described in the State of the Waters Report (see article on page 1).

Emory D. Anderson, PhD

CAPE COD AIRFIELD CELEBRATED ITS 90TH ANNIVERSARY!

With a light breeze, clear skies and hot sun, the late-summer day could not have been more welcoming or more fitting for the celebration of our historic airfield's 90th birthday on September 21, 2019. By 10 o'clock that morning, both Route 149 and Race Lane were already choked with parked vehicles and families walking in, even though there was plenty of parking set aside on the field itself. Just the sight of so many cars lined up facing the field, all the way from the roundabout to the golf course entrance, was remarkable. Volunteers working the event estimated the crowd at well over 3000 – a tribute to the airfield's founders, the Town, and especially to the Siderwicz family who have worked unbelievably hard to be good neighbors while preserving the last grass airfield on Cape Cod.

The day was billed as a traditional "fly-in", but was so much more. Indeed, there were modern and vintage aircraft from around the region visiting on the field that day, keeping company with the resident DC-3s, Waco biplanes, Piper tow planes, and local private aircraft that call the airfield home. But, there were also classic and antique automobiles, motorcycles, and even a small collection of early farm machinery, evoking the field's pre-1929 potato farm heritage.

It was above all a family event, and parents with kids were everywhere, lining up for the food trucks, face-painting, balloon art, and to board a COMM ladder truck that was right in the middle of things proudly flying a huge American flag. One of the most popular attractions was the big red and white DC-3, which was available for boarding and had a crowd around it all day.

Members of the Discover Flying RC Club, the group that operates radio-controlled model aircraft on a small field next door, were on hand to talk about the world of RC aircraft and to help staff the day's event with volunteers. Cape radio station 106 WCOD broadcast live from the airfield all morning.

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CAPE COD AIRFIELD CELEBRATED ITS 90TH ANNIVERSARY!

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Randy Charlton, who had offered glider instruction at the airfield for 21 years before retiring, returned for the day and a celebratory glider flight; and a bright yellow USCG Jayhawk helicopter made a low, slow flight over the length of runway 27 in honor of the airfield's birthday.

Inside the main hanger were tables and booths set up to explain the airfield's history, to sell 90th anniversary t-shirts (which sold out that day, but are back in stock!), and book biplane rides. One table staffed by The Ninety-Nines: International Organization of Women Pilots, offered scholarship information for young women interested in becoming pilots.

Skydivers had performed an elegantly executed demonstration jump early in the day, but as the afternoon unfolded, Sid Siderwicz, who flew DC-3s for PBA (*Provincetown–Boston Airlines*) many years ago, thrilled the crowd by flying the operational DC-3 as a jump plane for one run with several very enthusiastic skydivers!

Originally opened in July 1929 and for many years operated as "Cape Cod Airport", the name of the field was modified to "Cape Cod Airfield" in 2003 to reflect its new status as a recreational landing area when the Town of Barnstable purchased it and the surrounding land from the Danforth family using Massachusetts Land Bank funds. IPA strongly supported that purchase as well as preservation of the historic operational airfield, believing that its relatively low-impact use of the land protected the quality of our local environment, especially the adjacent Indian Ponds. This is as true today as it was in 2003.

More of the airfield's interesting history can be found in the pages of "Marston's Grist" (Summer and Fall 2013), the newsletter of the Marstons Mills Historical Society, available online at www.marstonsmillshistorical.org.

Bob Frazee
Photos by 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

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FORWARDING SERVICE REQUESTED