WATER & WETLAND

LAKE, POND & WETLAND MANAGEMENT

December 15, 2022

Arlington Conservation Commission
Attn: David Morgan, Conservation Agent/Environmental Planner
730 Mass. Ave. Annex
Arlington, MA 02476
Sent via email: dmorgan@town.arlington.ma.us

Re: Menotomy Rocks Park Pond (Hills Pond), Arlington, MA – 2022 Year End Report

Dear Mr. Morgan and Commission Members:

Figure 1: Menotomy Rocks Park Pond (Hills Pond) - Arlington, MA

It is our pleasure to present a year end summary report to Arlington Conservation Commission regarding the 2022 aquatic management program at Menotomy Rocks Park Pond (Hills Pond - pictured in Figure 1 to the right). Hills Pond is approximately 2.5 acres and located in Arlington, MA. This waterbody is found within the property of Menotomy Rocks Park, which is a popular recreational Park for hiking, fishing, and dog walking. Hills Pond is primarily surrounded by woodlands with a walking path around the perimeter of the Pond. Access to Hills Pond is gained from the gated dirt road off of Jason Street, which leads to the Pond. There is an aeration unit within the Pond, with power to the unit found within the woodlands on the northwestern shoreline.

Historically, Hills has battled a couple different invasive species including curly-leaf pondweed *(Potamogeton crispus)* and water chestnut *(Trapa natans),* in addition to nuisance pondweeds and algae blooms. The goal of the 2022 program was to manage the invasives species, algae blooms, and nuisance densities of pondweeds while monitoring basic water quality through a proactive monthly monitoring schedule. This would be accomplished by implementing an aquatic management program that focused around performing all applicable tasks, including planning, permitting, surveys, treatments, and reporting.

All permitting, treatment and survey tasks were completed without issue and at the proper times. The table below provides the specific dates of each task. Below the table, each visit/task performed is described in additional detail.

Summary Of 2022 Management Activities

Date	Task/Description
May 20th, 2022	A pre-treatment survey was conducted to document baseline conditions of the Pond, note the current vegetation species/densities present, and to guide upcoming 2022 management; An algaecide treatment was completed;

	E. Coli sample collected; An aeration diffuser was installed to the existing system
June 1st, 2022	A brief survey was completed to confirm treatment areas; The follow-up herbicide and algae treatment was performed
July 12th, 2022	A post-treatment survey was conducted to evaluate the effectiveness of the previous treatments
August 9th, 2022	A survey was performed
September 12th, 2022	A post-treatment inspection was completed to evaluate the effectiveness of the 2022 aquatic management program and to help guide recommendations for 2023; Algae samples were collected; The aeration system was inspected

May Monitoring Site Visit/Install Aeration Diffuser/Algaecide Treatment/Water Sample Collected

On May 20th, Senior Environmental Scientist, James Lacasse, and Field Assistant, Grace Adams, completed a site visit to Hills Pond in Menotomy Rocks Park. The visit consisted of performing a survey, collecting basic water quality data, installing a diffuser, and conducting a treatment. Conditions during the visit were sunny and partly cloudy.

Figure 2: Dense filamentous algae documented within Hills Pond

Upon arrival, a survey was conducted using visual observation. The entire shoreline had dense densities of filamentous algae (see Figures 2 and 3). In addition to the algae, there was moderate densities of curly leaf pondweed (curly-leaf pondweed visible in Figure 2).

While on-site, basic water quality was collected using calibrated meters. The pH was 7.3, which is within a standard range for freshwater and is considered neutral. The water temperature was consistent with other similar waterbodies we manage in the area. The dissolved oxygen was sufficient to support fish and aquatic organisms and is aided by the submersed aeration system. Water clarity was also assessed using a Secchi disk. A Secchi disk is a disk with alternating black and white quadrants. It is lowered into the water of a lake until it can no longer be seen by the observer. This depth of disappearance, called the Secchi depth, is a measure of the transparency of the water. The Secchi reading was 5'2", which is average.

Figure 3: Algae and cattails noted during the site visit

As planned, and based on the survey, a treatment was conducted for the control of filamentous algae (illustrated in Figures 2 and 3). Given the condition of the pond during this initial visit, we proceeded with an abundance of caution. To limit the chances of oxygen depletion, from too much biomass die-off at one time, only the algae was targeted during this treatment. The perimeter of the Pond was treated, and the middle was left untreated. The liquid algaecide (Captain XTR), which is copper based, was applied using a treatment boat equipped with a calibrated subsurface injection system, in addition, foliar methodology was used to target areas of floating filamentous algae mats. This application methodology allows for even coverage within the treatment areas. Neon signs noting treatment and no restrictions were posted around the Pond. Arlington Conservation Commission, as well as the Friends of Menotomy Rocks Park were notified of this visit. Given

that the curly-leaf pondweed was not at a problematic density, and to limit biomass die-off (as described above), we planned an early June visit specifically to target the invasive curly-leaf pondweed. This window was still within the prime curly leaf treatment window.

Figure 4: A trench was created from the power box to the shoreline of the Pond for the aeration hosing

Also, while on-site, a fourth diffuser was added to the existing three diffuser aeration system. This was completed without issue, and proper placement was ensured. To distribute the air from the aeration system equally, the third diffuser, closest to the new fourth diffuser, was relocated. The system was also calibrated to insure even airflow to each diffuser (aeration tubing buried within the trench in Figure 4). Lastly, while on-site, at the request of Friends of Menotomy Rocks Park, an E. Coli sample was collected, properly preserved, and dropped off at the State Certified Laboratory.

Surface Temp (℃)	Surface Dissolved Oxygen (mg/l)
20.0	8.4

<u>June Monitoring Site Visit/Herbicide and Algaecide Treatment</u>

On June 1st, Senior Environmental Scientist, James Lacasse, completed a site visit to Hills Pond. The visit consisted of performing a survey, collecting basic water quality data, and conducting a follow-up treatment from the initial treatment. Conditions during the visit were partly cloudy and calm.

Figure 5: Overlooking Hills Pond post-treatment

Upon arrival, a survey was conducted using visual observation paired with a standard throw-rake, as applicable. The first observation during the survey was the drastic algae reduction following the previous treatment on May 20th (great results from the treatment pictured in Figure 5). Only trace densities of algae were noted along portions of the shoreline, specifically along the northern shoreline. Clasping-leaf pondweed *(Potamogeton perfoliatus)* and curly-leaf pondweed were noted in varying densities throughout the Pond, with several areas reaching dense densities. These species were documented growing throughout the water column as well as surfacing. Three water chestnut plants were noted (see Figure 6 to the left), hand-pulled, and disposed of off-site in an approved upland area. The aeration system was inspected and was working properly. The system was inspected and calibrated during the previous visit as the additional diffuser was being installed. Water clarity was above average and much improved from the previous visit.

Figure 6: A water chestnut plant from Hills Pond, with the seed attached

While on-site, basic water quality was collected using calibrated meters (pictured in Figure 7 below). The pH was 7.0, which is within a standard range for freshwater and is considered neutral. The water temperature was consistent with other similar waterbodies we

manage in the area, and the dissolved oxygen was sufficient to support fish and aquatic organisms. Water clarity was also assessed using a Secchi disk. The Secchi reading was 6'7" (to the bottom).

Figure 7: Equipment and meters used during the site visit to collect basic water quality data

As planned, and based on the survey, a treatment was conducted for the control of curly-leaf pondweed, clasping leaf pondweed, and filamentous algae. This treatment was planned as high densities of vegetation and algae observed during the previous visit restricted us to only treating smaller portions of the Pond. This best management practice is also required on the product labels to limit chances of dissolved oxygen depletion. There was a five-day irrigation restriction associated with this treatment. The liquid herbicide and algaecide was applied using a treatment boat equipped with a calibrated sub-surface injection system. This application methodology allows for even coverage within the treatment areas. Posters stating the restrictions were posted around the Pond prior to the treatment, and the Arlington Conservation Commission was notified prior to treatment.

Surface Temp (℃)	Surface Dissolved Oxygen (mg/l)
20.3	8.5

July Monitoring Site Visit

Figure 8: Post-treatment survey conducted at Hills Pond

On July 12th, Co-Owner/Senior Aquatic Biologist, Colin Gosselin, and Field Assistant, Grace Adams, completed a site visit to Hills Pond. The visit consisted of conducting a survey and collecting basic water quality data. Conditions during the visit were warm and sunny.

Upon arrival, a survey was conducted using visual observation. There was no filamentous algae observed throughout the Pond (see Figure 8), and a healthy amount of duckweed *(Lemnoideae)*, a native species, was seen along the shoreline. In addition, bryozoans, which are the jelly-like blobs floating in the water (made up of tiny invertebrates), were noted. These bryozoans indicate that the Pond was clean and healthy, and they are generally a sign of good water quality. They are not harmful. The aeration system was inspected and was running properly.

While on-site, basic water quality was collected using calibrated meters. The water temperature was consistent with other similar waterbodies we manage in the area, and the dissolved oxygen was sufficient to support fish and wildlife. Water clarity was also assessed using visual observation and was deemed above average.

Based on the survey, no treatment was necessary. By providing regular monitoring visits, it allows us to treat only when necessary. This limits over-treating or under-treating. Overall, the Pond looked excellent (illustrated in Figure 8).

Surface Temp (℃)	Surface Dissolved Oxygen (mg/l)
25.3	8.34

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August Monitoring Site Visit

On August 9th, Senior Environmental Scientist, James Lacasse, completed a site visit to Hills Pond. The visit consisted of conducting a survey and collecting basic water quality data. Conditions during the visit were sunny and hot.

Figure 9: Very low water levels within Hills Pond

Upon arrival, a survey was conducted using visual observation paired with a standard throw-rake, as applicable. The first noticeable observation while on site was that the water level was very low (low water levels pictured in Figure 9 to the left). There is now a significant berm of land between the Pond and the northwestern wetland basin. Overall, the Pond looked great as no nuisance plant or algae growth was observed. There was a small microscopic algae bloom occurring, however it was very minor and did not appear to be concerning. This was visible within the water column and on the surface of the water, especially within the windblown shorelines. Cattails *(Typha sp.)* were noted growing along the northern/northwestern shoreline. The aeration system was inspected and was running per normal. Plants were documented flowering within the vegetation islands. Duckweed was documented within the wetland basin area, as well as scattered in healthy densities around the shoreline. We were unsure as to whether or not the Health Agent mistook this lime green color for possible cyanobacteria. It is best seen scattered around the shoreline and appears concerning from afar, but upon inspection it was just duckweed.

The water temperature was consistent with other similar waterbodies we manage in the area, and the dissolved oxygen was sufficient to support fish and aquatic organisms. Water clarity was also assessed as average.

Surface Temp (°C)	Surface Dissolved Oxygen (mg/l)
28.9	7.19

September Monitoring Site Visit/Algae Sample Collected/Aeration System Inspected

On September 6th, Senior Environmental Scientist, James Lacasse, completed a site visit to Hills Pond. The visit consisted of performing a survey and collecting basic water quality data, in addition to collecting an algae sample. Conditions during the visit were cloudy with steady rain.

Figure 10: Small microscopic algae bloom visible throughout the Pond

Upon arrival, a survey was conducted using visual observation paired with a standard throw-rake, as needed. There appeared to be a small, microscopic algae bloom within the water column as the water clarity had decreased from the previous site visit (see Figure 10). An algae sample was collected and shipped on ice via FedEx overnight to the SePro Lab for analysis of algae identification and enumeration (as directed by David Morgan, Arlington Conservation Agent). Minimal vegetation was documented (primarily duckweed scattered around the shoreline and in the small, ponded area).

Figure 11: Aeration diffuser not working properly

Prior to the visit, Friends of Menotomy Rocks Park asked Water and Wetland to check on the Vertex aeration system as one of the diffuser patterns did not appear normal (aeration diffuser not properly running in Figure 11). Upon inspection, it was determined that two diffusers did not appear normal. Each of these diffusers was retrieved from the Pond and inspected. Upon inspections, two diffusers were broken, with one plate on each broken off (see Figure 12 below). This is not unusual given the age of the diffusers and the fact that they are plastic, which can get brittle over time. The other two diffusers were working well, including the additional diffuser which was added this Spring. The two broken diffusers were shut down in the cabinet, and the other two diffusers were lowered to allow for even and proper distribution of air. The broken diffusers/lines were dragged to the shoreline near some cattails so that they can be repaired when requested. As discussed, when adding the additional diffuser (AquaMaster) earlier this year, we are not a Vertex distributor but can replace the broken diffusers with either AquaMaster or Kasco and place them in their designated spots.

Figure 12: One of two broken aeration diffusers within Hills Pond

The water temperature was consistent with other similar waterbodies we manage in the area, and the dissolved oxygen was sufficient to support fish and aquatic organisms. Water clarity was also assessed using a Secchi disk. The Secchi reading was 2'8", which illustrates below average water clarity. The water level was still documented as below average for Hills Pond.

Surface Temp (℃)	Surface Dissolved Oxygen (mg/l)
20.3	6.7

Water Quality

During the May 20th and September 6th survey events, water samples were collected to analyze specific water quality at Hills Pond. Samples were collected from the middle of the Pond, preserved, and immediately taken to a State certified laboratory where they were analyzed for the specific contracted parameters. As noted above, the samples were analyzed for E. coli enumeration and algae identification. All samples collected were "surface grabs." Dissolved oxygen, temperature, and pH were measured using a calibrated meter throughout the season.

Water quality in ponds and lakes is constantly changing and is altered by many environmental factors. The samples collected during the two site visits provide a baseline and the results depict a "snap-shot" of the results specific to the sampling date. The results from the two sampling events, as well as a description of each parameter are included in the tables below.

Water Quality Parameter	Results (5/20/2022)
E. Coli (MPN/100ml)	8.6

WATER & WETLAND
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Water Quality Parameter Table
E. Coli: E.Coli is a potentially harmful fecal coliform bacteria that can be harmful to humans and pose a health threat *>235 colonies/100 ml is potential harmful*

September 6th Algae Sampling Results

Algae ID Results
Hills Pond

Identification	Classification	Description	Density/Biomass (cells/mL)
			★★
***Aphanizomenon* sp.**	Cyanophyta- Blue-green algae	Filamentous, scum-former, planktonic, potential toxin and taste/odor producer	27,200

Other algae observed at densities less than 40 cells/mL: *Aulacoseria* (Bacillariophyta); *Desmodesmus, Pediastrum* (Chlorophyta); *Cuspidothrix, Dolichospermum* (Cyanophyta); *Trachelomonas* (Euglenophyta)

Some particulate matter observed

SeSCRIPT* ALERT INDEX	EXPOSURE RISK	CYANOBACTERIA LEVELS (cells/mL)
★	Low	<20,000
★★	Moderate	20,000 to 100,000
★★★	High	>100,000
★★★★	Extreme	>100,000 with scums/mats
See the following Cyanobacteria Alert Guide for additional information		

Blue-green algae / cyanobacteria occur in aquatic ecosystems and have the ability to produce toxins. These toxins can pose a risk to human and animal health. The Massachusetts Department of Public Health (MA DPH) recommends an advisory when cell counts exceed 70,000 per ml of water. Dense blooms and scums can contain millions of cells/ml and toxin levels in the parts per million. They can form near embankments and in areas suitable for swimming and other forms of recreation. They can also move around in the water body and grow quickly, making management of them difficult. The sampling results returned from the September 6th noted counts below the 70,000 cell/ml threshold set by MA DPH, but above 20,000 cells/ml which would be a concerning threshold. The Town Health Department had implemented a health advisory well before this sample was collected, although at that time we noted no visual signs of cyanobacteria. Unfortunately, MA State Pesticide Use Permits (WM04) prohibit treatment

when a public health advisory is in effect. The rationale behind this limitation is that MA DPH fears that potential toxins may go airborne if the algae is killed off too quickly. Because of this limitation, no treatment was possible to control the bloom even though it was below the threshold of 70,000 cells/ml.

The lab results above contain the full algae sampling results from both the September 6th site visit. As seen in the results, the algae composition was dominated by blue-green species. Algae is a necessary part of the ecosystem and food chain; however, measures should be taken to address water quality issues in an effort to shift algae composition to more desirable species. Recommendations are included within the summary/recommendations section below.

Summary / 2023 Recommendations

2022 marked the first year in which Water & Wetland, LLC took over management of Hills Pond. Conditions documented both in 2021 when we made a complementary site visit simply to assess the pond, and during the first visit of 2022 documented dense curly-leaf pondweed and filamentous algae. Following the initial treatments in 2022, the invasive aquatic plants and algae were well under control. Friends of Menotomy Rocks Park were concerned about possible E. Coli so a sample was collected and analyzed for this parameter. While this is just a snapshot in time (as described in the water quality section above), results were well below a concerning threshold. Despite the great condition of the Pond, the Arlington Health Department noted a possible cyanobacteria bloom and quickly implemented a public health advisory late in the Summer. Our records indicate that this may have potentially been duckweed, which is an aquatic plant. Because an advisory was in place, we were legally not allowed to treat later in the season despite the need for an algaecide treatment in September. The September algae counts warranted algae treatment so ideally a treatment would have been completed at this time. The September counts were well below the threshold which would trigger a shutdown so if an advisory was not in place, it would have been the ideal window to treat at that time.

Looking forward to 2023 we recommend a similar program to that of 2023. This approach is ideal as it is centered around monitoring. By regularly monitoring Hills Pond throughout the growing season, we can make real-time decisions specific to management. We can also consider any feedback received from either Arlington Conservation Commission or Friends of Menotomy Rocks Park. Based on 2022, we will definitely need to apply an early season curly-leaf pondweed treatment. Clasping leaf pondweed has also gotten increasingly dense and may warrant a small spot application in June or July. Aside from this, algae is always a wildcard. It is important to have open-lines of communication between Arlington Conservation Commission, Arlington Health Department, and Water & Wetland. If notified of a possible siting of cyanobacteria this year, we could have quickly created an action plan which includes a site visit by a biologist and/or collection of algae sample(s). This process may have prevented a shutdown while not jeopardizing safety. This means that when a treatment was needed in September it could have been implemented. As always we recommend that best management practices always be used when landscaping the grounds, this includes but is not limited to use of non-phosphorus fertilizers when fertilizing is necessary, encouraging beneficial buffers, and limiting leaf debris from entering the Pond.

Lastly, implementation of a water sampling program is recommended at Hills Pond during the 2023 season, as budget allows. At a minimum, we recommend sampling total phosphorus and free reactive phosphorus. You can think of free reactive phosphorus as “future algae.” This parameter can help us predict a bloom so that we are able to be as proactive as possible. Based on the phosphorus levels additional recommendations can be made which may include the use of phosphorus binding products

WATER & WETLAND

LAKE, POND & WETLAND MANAGEMENT

such as aluminum sulfate, polyaluminum chloride, or EutroSORB WC. By understanding sources of phosphorus, possible low-cost improvements could be implemented such as application of EutroSORB phosphorus filtration technology. In addition to phosphorus sampling, regular algae sampling can help positively identify a bloom and ideally identify a bloom when counts are nearing a concerning threshold but below the threshold which would prohibit us from treating. As a small business we try to help our clients maximize budgets. With that said, we are happy to assist with logistics to set the Town of Arlington up for sampling and we can simply interpret and process this data. This may help offset the costs of sampling.

We hope that you were impressed with the level of communication, expertise, and follow-through provided by Water & Wetland, LLC during the 2022 season. We look forward to working with the Town of Arlington in 2023 and beyond.

Sincerely,

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