

Memorandum

To	Town of Wellesley	Pages	8
CC			
Subject	2009-2010 Morses Pond Management Update		
From	AECOM Environment, edited and expanded by WRS, Inc.		

October 10, 2011

This memorandum provides a progress update of the implementation of the 2005 Comprehensive Morses Pond Management Plan through 2010. From 2008 to 2010, AECOM has worked on the following pond management projects: 1) phosphorus inactivation, 2) plant harvesting, 3) low impact development demonstration, 4) education, and 5) dredging.

Phosphorus Inactivation

In the spring of 2008, AECOM assisted in the establishment of the phosphorus inactivation system in the north basin of Morses Pond. AECOM has operated the system in the spring and early summer of each year through 2010. The chemical pump station was established at the Town of Wellesley Dale Street Pump Station. General Environmental Systems, contracted by the Town, designed and installed the system with assistance from AECOM. Four chemical lines were run from the pump station into the north basin in 2008. The phosphorus inactivation chemicals used for the treatment are aluminum sulfate (alum) and sodium aluminate (aluminate). AECOM tested the system in 2008 and then operated the system as intended in spring of 2009 and 2010. After testing the system in 2008 and prior to operation in 2009, AECOM moved the two chemical lines with single diffusers from within the north basin to the mouth of the Boulder Brook and Bogle Brook inlets. This was done to facilitate inlet treatment. Figure 1 shows the current deployment locations of the four lines with approximate locations of the diffuser plates.

In the 2008 test year, AECOM treated the north basin during six storm events during the late spring and early summer (Appendix A, Table 2). Initially, treatment past early July was not planned, but since the system was not installed until mid-June, testing in 2008 proceeded later into the summer. A total of 2,000 gallons of alum and 1,000 gallons of aluminate were used in 2008 test treatments.

In the 2009 implementation year, AECOM treated the tributaries and north basin during or immediately after fourteen spring and early summer storm events (Appendix A, Table 3). The target alum to aluminate ratio of 2:1 was not achieved in early 2009 treatments, due to a malfunction within the aluminate pump. After the pumping system was repaired in May 2009, the alum to aluminate ratio dosage remained close to the 2:1 ratio. Based on estimated treatment delivery of chemicals, AECOM used the delivered total of 6,002 gallons of alum and 2,900 gallons of aluminate in spring 2009.

In 2010, AECOM treated the tributaries and north basin during or immediately after six spring storm events. Based on estimated treatment delivery of chemicals, AECOM used 4100 gallons of alum and 2080 gallons of aluminate. Table 1 provides a breakdown of recorded chemical usage by storm event.

Repairs to the distribution lines were necessitated in 2010 by damage done while harvesting the north basin to support sampling and measurement for dredging planning. Lines were cut in several places, and new hose sections were inserted where needed. It was assumed that a more major overhaul of the lines might be accomplished when the dredging was done, as lines would have to be moved out of the way, but in the interim the repairs facilitated continued treatment.

AECOM conducted water quality monitoring before and/or after storm events where alum treatment occurred. Water quality samples were collected for six storms in 2008, fourteen storms in 2009, and six storms in 2010. AECOM attempted to collect pre-treatment stormwater samples prior to the beginning of each storm event, but weekend and overnight storms often precluded pre-storm sampling. Water samples were collected at the inlets (Boulder and Bogle Brooks), within the area bounded by the north basin chemical lines, at the transition zone south of the islands, and at the Wellesley town beach. Figure 2 provides the sampling locations for 2008 and the changes made for the 2009 and 2010 phosphorus inactivation monitoring seasons. In 2009 and 2010, composite samples were created from discrete collection points in each of the following locations: the north basin, the transition zone, and the beach area. Water samples were sent to Berkshire Enviro-Labs, a Massachusetts State Certified Laboratory, and analyzed for dissolved aluminum as well as total and dissolved phosphorus. The 2010 water quality monitoring results are included in Table 2, and the previous years' data can be found in Appendix A.

The 2008 water chemistry results indicate a small difference in phosphorus concentrations before and after treatment, but there is a lot of variability in the data. Pre- and post-treatment total phosphorus concentrations can be found in Appendix A, Table 2. Elevated dissolved aluminum concentrations were observed shortly after treatment. The summer total phosphorus concentration (July 22) at the Wellesley Town Beach was relatively low at 12 ug/L. Phosphorus levels should have been influenced by treatment, however this is not likely the sole contributor to low phosphorus values. Flushing from storms can also lower phosphorus levels, and the summer of 2008 included multiple substantial storms. Total rainfall from May to July was 8.69 inches, with 5.03 inches falling in July alone. It cannot therefore be conclusively stated that the treatments reduced phosphorus to the observed levels, but the results are encouraging. Testing was conducted later in the summer than normally planned, and plant growths (especially water lilies) were dense in the north basin; even distribution of aluminum was not observed and efficiency of treatment is not believed to have been maximal. The re-alignment of two of the chemical feed lines at the inlets of Bogle and Boulder Brooks was intended to enhance the treatment. Implementing the treatment program earlier in the year, before dense plant assemblages form, was also expected to help improve treatment efficiency in subsequent years.

In 2009, the treatment resulted in variable phosphorus concentrations over the two month period, with high stormwater inflows overwhelming treatment capacity several times. However, recovery through treatment was also observed. Analytical results of the water chemistry are presented in Appendix A.

Within Bogle and Boulder Brooks, the post-treatment total phosphorus concentration results did not reflect treated water, but tributary water flowing into Morses Pond following a storm event. The treated water was observed in the North Basin rather than the tributaries during the post-treatment sampling, as continuous flow from the brooks flushes treated water through the basin. The similar inlet phosphorus concentrations before and after storm events suggest that the water quality is as nutrient rich before and after storm events, although the higher flows during storms indicate much

greater loading during storms. Within the North Basin, post-treatment total phosphorus concentrations were generally lower than pre-treatment concentrations for individual storm events. The results suggest a decrease in the dissolved fraction of the total phosphorus concentration following aluminum treatment. However, there is variability in the data. Overall, dissolved aluminum concentrations were higher after treatment (no change to an increase of 0.395 mg/L). Within the Transition Zone beyond the islands, pre- and post-treatment concentrations were similar. This is likely due to treated water in the North Basin not reaching the Transition Zone at the time of the post-treatment sampling.

Treatment during the last two weeks of June 2009 resulted in a total phosphorus concentration of 10 ug/L at the Wellesley Town beach, which was the target level for the end of treatment. No algal blooms were observed in the summer of 2009 and no algaecide treatments were necessary. Flushing by numerous storms in 2009 was a substantial factor in the condition of Morses Pond, and may have prevented algal blooms much as suspected in 2008. However, despite the high phosphorus levels in the stormwater discharging to Morses Pond in 2009, the water quality at the beach in early July, a week after the last treatment, was very desirable from the perspective of swimming and overall appearance. The aluminum treatment may not have been the sole factor controlling phosphorus levels and algae in 2009, but the apparent success of the treatment, even under difficult weather conditions, was again encouraging.

In 2010, treatment resulted in concentrations that varied by storm. Due to the abundance of vegetation within the North Basin and resulting lack of significant mixing through most of the area, chemical treatment took place almost exclusively at the two lines within the Brooks. The exception to this was the first treatment of the year, June 7th, which occurred after a weekend storm and before vegetation became abundant. Although treatment generally takes place from May into early July, in 2009 the chemical remaining beyond the 4th of July weekend was used to treat a large storm at the end of August (4.64" over 48 hours). It was originally intended that such a treatment be conducted in late July to offset inputs in that month, but it was not until late August that the treatment was performed. The results from this storm for the most part showed pre-treatment phosphorus levels elevated from the July 9th sampling event representing the end of the normal spring/early summer treatment period. The post-treatment concentrations were also for the most part elevated, suggesting limited impact from the single treatment in late August.

Throughout the treatment period, several samples in all locations showed highly elevated concentrations of total aluminum. Concentrations were particularly high in the post treatment samples taken on 6/10 in Bogle Brook and at L2, and on 6/23 in Boulder and Bogle Brooks (7700 mg/L, 1100 mg/L, 58000 mg/L, and 7500 mg/L, respectively). However, no fish or invertebrate mortality was observed during the post-treatment sampling rounds or on the following treatment days. It is very likely that nearly all of the total aluminum was in a non-reactive form, and therefore non-toxic. This is a common problem in evaluation of aluminum toxicity; only the reactive form is toxic, and this form does not last long in lakes and ponds at a pH range of 6-8 SU. Aluminum discharged to the inlets or north basin has not produced any observable impacts on animal life in Morses Pond, and with the pH maintained between 6 and 8 by adequate buffering, this is as expected. Movement of particulate Al during storms (by wind or high flows) is to be expected and will yield elevated total aluminum levels, but this does not represent a threat to the health of Morses Pond.

Visual observation of the channel leading from the inlet of Boulder Brook indicated a high amount of flocculent, as any stirring of the water that disrupted sediment resulted in a milky appearance. The amount of treatment residue in the channel is due to the slower flow out of Boulder Brook; the high volume of vegetation through which the flow from Boulder Brook must filter, and the shallow depth to sediment near the inlet. The shorter chemical delivery line length as compared to the line to Bogle Brook may also account for the appearance of the water, as less energy is needed to move

more chemical into the diffusers placed in the Boulder Brook inlet. Care must be taken to balance the chemical additions to the two main inlets. Overdosing Boulder Brook may not have any major negative impacts, but undertreating Bogle Brook is to be avoided.

Within the North Basin and at the transition zone (Figure 2), the ratio of dissolved phosphorus to total phosphorus dropped post-treatment throughout the season, with the exception of elevated levels in the western edge of the basin (L2) on the June 17th and 23rd treatment days. On the 17th, dissolved phosphorus rose 36 percent, though the overall concentration of dissolved phosphorus rose only from 23 ug/L to 25 ug/L.

As mixing in the North Basin is limited by dense plant growths by mid-June, chemical was distributed almost exclusively through the lines within the two brook inlets in 2009 and 2010. Exclusive treatment through these lines, and especially through Bogle Brook, was expected to more effectively treat incoming stormwater. Water flowing in from Bogle Brook (which includes outflow from Jennings Pond in Natick as well) encounters less interference on its way to the main basin of Morses Pond, running along the west side of the North Basin in an area of less dense plant growth, slightly greater water depth, and a larger gap between the islands. As Bogle Brook provides more flow than Boulder Brook, more effort is needed to ensure adequate treatment of the Bogle Brook inflow.

Results varied over time at the beach, but at the end of the 2010 treatment period in early July, the dissolved phosphorus concentration was 10 ug/L and the total phosphorus concentration was 15 ug/L. The dissolved phosphorus fraction varied greatly across the treatment storms, with the most significant events being a rise of 27 percent from the June 7th treatment and a drop of 38 percent from the August 25th treatment. At the end of spring treatment on July 9th, the dissolved phosphorus fraction was 67 percent.

In 2010, conditions were considered quite acceptable at the end of June, but by the end of July there had been enough untreated storm water inputs to foster an algal bloom, and a copper sulfate treatment was performed to abate an algal bloom in the beach area. Addition of aluminum later in August provides little benefit, as the beach closes at that time, but was attempted in order to use up the chemical and evaluate any response. It may be necessary to extend treatment further into July to maintain desirable conditions throughout the summer.

As observed in 2009 and 2010, the treatment is most effective when the two inlets can be treated from the beginning of the storm. Treatment in the northern basin can be effective in May, but by June the growth of plants is too thick to allow even dispersion of the aluminum when injected through the ports over the aeration diffusers in that basin. AECOM will watch, forecast, and time the treatment in 2011, focusing on June storms, to maximize effectiveness and achieve desirable conditions in early July. It appears that treatment of enough stormwater inflow to represent approximately the volume of Morses Pond is sufficient to achieve the desired phosphorus level in the southern basin of the lake going into summer. This is not an exact science due to the unpredictability of the weather, and adaptive management is warranted. Treatment during July may be necessary, and is allowable under the permit, but requires saving or ordering chemical in late June.

Low Impact Development Demonstration

In the spring of 2008, AECOM evaluated public sites within the Morses Pond watershed for future application of Low Impact Development (LID) techniques. A desktop analysis was conducted on the approximately 60 parcels identified. Out of the 60 parcels, 13 locations were identified for further field investigation. Based on the field investigation, LID practices at many of the sites would not be practical due to current drainage patterns, topography, cost, or space available. Out of the 13 sites

the Upham Elementary School and Bates Elementary School were chosen as the best properties where LID practices could be easily retrofitted.

The Upham Elementary School was selected for further design, and in 2009 preliminary design plans and specifications were prepared. The design included conversion of grassed islands and a portion of the paved play yard in front of the school to a series of water quality swales with added bioretention filtration of stormwater. The design also included a larger bioretention area behind the school by the ball field parking. AECOM worked with Wellesley DPW and the Natural Resource Commission (NRC) on fine tuning the design to provide a demonstration project that would provide water quality treatment with minimal maintenance requirements. As of the end of 2010, these plans were awaiting approval or further modification.

Plant Harvesting

Harvesting Strategy

The Town of Wellesley initiated the enhanced Morses Pond vegetation harvesting program in 2007. The zoned vegetation harvesting strategy originates from the 2005 pilot program and comprehensive management plan written that year. For the pilot program, Morses Pond was divided into seven zones in order to better track the harvesting process. Figure 3 shows these zones and Morses Pond bathymetry. Harvesting began later than desired in 2007 and various issues with the operation of the harvesting machine caused 2007 to be a training and testing year for the new approach to harvesting.

In 2008, plant harvesting occurred in June in the north basin, which is not typical of the harvesting program, but was done in order to facilitate the alum treatments. The main body of the pond was harvested in late June through the summer. Harvesting the north basin in June put the program behind the planned schedule. Both the old and new harvesting machines were used in 2008 in an effort to “catch up” in late spring. However, harvesting in Zone 6, the portion of the southwestern cove in Wellesley, resulted in substantial fragments of vegetation reaching the beach and east shore. The late timing of the harvesting is believed to have allowed greater plant growth before harvesting and more fragment generation, and was therefore less than ideal. Harvesting did keep plant growth under control and did not prevent recreational access to the pond in 2009, but with some accumulation of fragments along shorelines.

In 2009, adjustments were made to the harvesting plan based on observations and experiences in 2008. This revised strategy allowed generation of fewer plant fragments and overall greater success. The plant harvesting program began with harvesting in Zone 6, followed by harvesting in Zone 3, and finally harvesting in Zones 4 and 2. This first harvesting round was completed by July 4th weekend, with Zones 6 and 3 cut well before the beach opened for summer. The early harvesting timing eliminated the plant fragment issue during early swim season. A second round of harvesting in August was performed to maintain control and exert selective pressures that favor low-growing, seed-producing, more desirable species. There were no fragment complaints, even by passive users, in 2009. Due to the greater overall success in 2009, AECOM recommended that the Town of Wellesley repeat the plant harvesting strategy applied in 2009 again in 2010. The keys to successful harvesting include:

- Initiating harvesting by the Memorial Day weekend.
- Cutting the southwest cove (Area 6) first, then proceeding through Areas 2, 3 and 4 in order of apparent need.
- Cutting with or against the wind, but not perpendicular to the wind, to aid fragment collection.
- Limiting harvesting on very windy days (a safety concern as well as fragment control measure).

Harvesting Record

Records provided by the Town of Wellesley indicate the harvesting effort expended on Morses Pond. Although the record is not always complete, records have been kept since 2007. Between late May and early September, from 2007 through 2010, harvesting was conducted on a range of 43 to 61 days. This represents a range of 303 to 359 total hours devoted to some aspect of the harvesting program, and 223 to 255 hours of actual harvesting time, or an average of 5.1 to 5.4 hours per day of harvesting. Approximately another 2 hours per day are expended on hauling plants, harvester maintenance, and related tasks other than actual cutting or offloading, accounting for the larger total time commitment. The harvesting effort has resulted in the removal of 224,000 to 270,000 pounds of plants (wet weight) per year, excluding plant material removed by hydroraking.

We are missing plant weight data from 2007 and hourly activity data from 2008, and the identification of plants being targeted by harvesting is not always consistent with what has been observed by AECOM staff in the field, so some improvement in record keeping is needed. A more complete analysis will be conducted after the 2011 harvesting season. Overall, however, the plant harvesting program is proceeding well, achieving desirable results, and being adjusted to enhance performance as warranted.

Plant Surveys

AECOM conducted plant surveys in early May of 2008, 2009, and 2010 prior to plant harvesting to determine the assemblage features. These surveys also identify areas supporting very dense aquatic plant growths and helps set priorities for harvesting. Shoreline surveys were also performed to guide localized plant control by shoreline residents, including proposed hydroraking. A benthic barrier was installed at the swimming beach in 2008 as a pilot study, but no further application occurred. As of 2010, the original benthic barrier was still in place. Hydroraking of shallow areas was desired by many shoreline residents, and was planned for 2009. However, equipment problems precluded execution of hydroraking beyond the beach area. Hydroraking of peripheral areas was conducted in 2010, with residents paying for those services off their shoreline parcels.

Methods

The vegetation surveys occurred on May 7 and 8 of 2008; May 4, 6, and 8 of 2009; and May 4, 11, and 13 of 2010. During all surveys, AECOM used the point-intercept method, resulting in 306 survey points on Morses Pond (Appendix A, Figures Part 1 and 2). These same points were utilized during the 2005 vegetation survey. The point-intercept methodology is intended to document the spatial distribution and percent cover and biovolume of aquatic plants at specific re-locatable sites. At each point, AECOM recorded the following:

- The GPS waypoint.
- Water depth using a metal graduated rod or a mechanical depth finder.
- Plant cover and biovolume ratings using a standardized system.
- Relative abundance of plant species.

For each plant species, staff recorded whether the species was present at trace (one or two sprigs), sparse (a handful of the plant), moderate (a few handfuls of the plant), or dense (many handfuls of the plant) levels at each site. Plant cover represents the total surface area covered in plants (2 dimensions). For cover, areas with no plants were assigned a "0," areas with approximately 1-25% cover were assigned a "1," a "2" for 26-50%, a "3" for 51-75%, a "4" for 76-99%, and a "5" for 100% cover. Like plant cover, a quartile scale was used to express plant biovolume, defined as the estimated volume of living plant material filling the water column (3 dimensions). For biovolume, 0= no plants, 1= 1-25%, 2=26-50%, 3=51-75%, 4=76-100%, and 5= 100% of plants filling the water column.

AECOM also conducted shoreline surveys (Appendix A). For the 2008 shoreline survey, the shoreline was divided into 62 zones, representing different property owners. The 2009 survey consisted of only shoreline segments where property owners expressed interest in shoreline plant harvesting, around the northern islands, and along northern conservation areas of interest. The surveys were performed generally within the 0-5 ft depth range along the shoreline. For each zone, plants were identified, and the average density of each plant within the zone, was recorded. For example, if a plant was sparse in two areas within the zone, it was labeled as sparse, even though the plant may not necessarily be sparse throughout the zone. Similarly, if a plant species were very dense in one small area, but not present throughout the rest of the zone, this plant was recorded as sparse. Note that for early season surveys, values for cover and biovolume are expected to be much lower than might be encountered during summer, so some extrapolation is needed when assessing management needs.

Results

Overall, Morses Pond had moderate to dense vegetation cover and biovolume in all three survey years. With the exception of the deeper southern basin (Zone 7), plant cover had an average ranking of 3-5 (51-100% coverage) in 2008, 3 (51-75% coverage) in 2009 and 2-4 (25-99% coverage) in 2010. In all three years, the average biovolume for a majority of the pond was ranked as 2 to 3 (plants taking up about half of the water column), and this was for early season survey data. Vegetation coverage and biovolume in Morses Pond was densest in Zones 3 and 4 in 2008 and 2009, and in Zone 4 only in 2010. Harvesting has improved recreational conditions, and may have had some impact on coverage and biovolume in the 2010 survey year.

In the 2008 and 2009 shoreline surveys, the majority of Morses Pond's shoreline ranked as a 0 or 1 for both cover and volume. The cover and biovolume for no shoreline zones were categorized above a 3. However, because the survey was performed early in the growing season, there are many shoreline areas of the pond that may become overgrown later in the season due to the presence of the invasives *Myriophyllum spicatum* (Eurasian milfoil), *Myriophyllum heterophyllum* (variable milfoil), and/or *Cabomba caroliniana* (fanwort). In 2008, the southwestern cove had dense algae mats and the three invasive species throughout. The 2008 shoreline survey map is included in Appendix A. In 2009, AECOM acknowledged the appropriateness of shoreline hydroraking in front of several waterfront lots on the southern shore on College Road, the southeastern cove on Pickerel Rd and Pickerel Terrace, and the northwestern cove along Stoveclevé Road. The shoreline of the islands and Pickle Point Conservation area also had sparse to moderately dense patches of one or all three of the common invasive species. Early season shoreline surveys do not adequately capture the likely summer conditions along the shoreline.

For the point-intercept surveys, twenty plant species were encountered in the 2008 survey, twenty-two plant species in 2009, and twenty-four in 2010. The five invasive plant species encountered are:

- *Cabomba caroliniana* (Fanwort)
- *Lythrum salicaria* (Purple loosestrife)
- *Myriophyllum spicatum* (Eurasian watermilfoil)
- *Myriophyllum heterophyllum* (Variable watermilfoil)
- *Potamogeton crispus* (Curlyleaf pondweed)

Eurasian watermilfoil and fanwort continue to dominate the Morses Pond plant community. Only in the deeper southern basin of Morses Pond (Zone 7) were the two invasive species not dominant. Dominant species are defined as plant species that constitute 50% or greater frequency of occurrence (2010 frequency data is provided in Table 3). Another invasive, curly leaf pondweed, was a dominant in the northeast and northwest coves (Zones 2 and 4) in 2008, but it was not dominant anywhere in 2009 or 2010. Variable milfoil was a dominant in the northern basin (Zone 1)

in 2008 and in the southwestern cove (Zone 5, in Natick and not subject to management under the Wellesley program) in 2009. Variable milfoil was dominant in all zones except 6 and 7 in 2010. An invasive wetland species, purple loosestrife, was observed on the northern basin shoreline in all survey years. Frequency of occurrence data for previous years can be found in Appendix A.

Native species are also abundant in Morses Pond. *Nymphaea odorata* (white water lily) and *Ceratophyllum demersum* (coontail) were dominants at some survey sites in the northern basin (Zone 1) for all survey years. Coontail was additionally dominant at sites in zones 2 through 6 in 2010. Filamentous green algae mats were abundant in the northern basin and northeastern cove (Zones 1 and 2) in 2008 and 2009 with dominance also in zones 3, 4 and 6 in 2010. *Potamogeton robbinsii* (Robbins' pondweed) was dominant in the southwestern cove (Zones 5 and 6) for the 2008 and 2009 surveys, with dominance established in zone 6 in 2010. *Najas flexilis* (common naiad) was dominant in Zones 3 and 6 in 2008, but not in 2009, and nowhere was it dominant in 2010. Other native species not dominant in previous years but established in 2010 included *Potamogeton robbinsii* (Robbins' pondweed) in Zones 1, 5 and 6, *Potamogeton amplifolius* (Broadleaf pondweed) in Zones 3 and 4, and *Elodea canadensis* (Waterweed) in Zones 4 and 6.

Plant species that were not encountered during the 2009 and 2008 surveys, but were encountered in the 2005 survey include:

- *Potamogeton pulcher* (Spotted pondweed)
- *Utricularia gibba* (Bladderwort)
- *Wolffia columbiana* (Watermeal)
- *Spirodela polyrhiza* (Big duckweed)

Plant species encountered in 2010 but not in the previous two years' surveys include:

- *Cyanobacteria* (Blue-Green Algae, benthic mats)
- *Decodon verticillata* (Swamp Loosestrife)
- *Elodea canadensis* (Waterweed)
- *Potamogeton pulcher* (Spotted Pondweed)
- *Salix sp.* (Willow)
- *Utricularia geminiscapa* (Bladderwort)
- *Vallisneria americana* (Wild Celery)
- *Wolffia columbiana* (Watermeal)

Note that the 2005 survey was performed during summer, while the 2008, 2009, and 2010 surveys were conducted during spring. This shift can affect detection of some species. For example, spotted pondweed tends to bloom between June and August, which may be why this species was not encountered during the 2008 or 2009 survey. Likewise, curly-leaf pondweed usually dies back by early July, limiting its detection in summer surveys. For management purposes, however, the spring community is most important in guiding management efforts in Morses Pond. Later surveys would be impacted by harvesting efforts, so spring surveys are considered appropriate. See Appendix A for the tabular results of all years' plant surveys.

Conclusions Relating to Plants

Monitoring in 2011 and beyond will be necessary to determine if there are any lasting impacts of harvesting. In the 2010 survey, a decrease in vegetation coverage and biovolume was observed in Zone 4. Impacts are predicted to occur eventually, however three years may be too short of a time span to determine a shift in plant populations and any prolonged reduction in plant cover and biovolume.

Education

The Town of Wellesley produced an informative brochure on the importance of phosphorus control many years ago, and continues to use this tool in resident education. The brochure is not outdated, but the extent of distribution and the effectiveness of this mode of education are uncertain. The Town also has bylaws relating to lawn watering and other residential activities that affect water quality in streams and lakes, including Morses Pond. The extent to which residents understand these regulations is also uncertain. The right messages are being sent, but reception and reaction have not been gauged.

In 2006 a survey was conducted by AECOM on behalf of the Town to assess resident awareness and practices. It appeared that more people handled their own lawn care than expected, and that most were anxious to learn about approaches that might have less impact on water quality. Most homeowners had little background knowledge of issues relating to fertilizer use and other residential management practices.

It was determined that a website would be a better or at least effective additional means of communicating with residents on their role in protecting water quality through desirable residential practices. Morses Pond pages were constructed to be incorporated into the Town's website. Layout and content were adapted from existing materials and subject to review. As of the end of 2010, the latest iteration was awaiting further review and modification.

Dredging

The Town of Wellesley arranged for the North Basin to be dredged in the late 1970s; no dredging has been conducted since 1979, and both natural and anthropogenic sources of sediment have caused considerable infilling of the North Basin since that time. Dense growths of submergent and emergent vegetation limit recreational utility and habitat value in the North Basin, although some forms of water-dependent wildlife benefit from these conditions. While dense vegetation does provide some filtering capacity, the overall loss of depth limits detention time and facilitates resuspension during storms, threatening water quality in the main body of the pond. It was determined as part of the comprehensive planning process that the North Basin should be dredged again to restore detention capacity.

In 2009 the Town hired Apex Inc. to develop dredging plans and shepherd them through the dredging process. Sediment quantity and quality were assessed, plans were developed, and permits were secured. A number of complications arose, including the need to document yet again that Morses Pond was not a Great Pond under the laws of the Commonwealth and therefore not subject to Chapter 91, an additional regulatory process. That effort was ultimately successful.

More troublesome was the detection of metals and hydrocarbon contamination in the north basin, something not observed previously. However, dredging regulations and related contamination thresholds had changed since the previous sediment assessment in 2004, and not all the same tests were run in earlier sampling. The result was that the permitting process took longer than hoped and the cost to dispose of the sediment was considerably higher than initially expected. The targeted area was reduced to about two acres to both avoid areas of greater contamination and to attempt to keep the cost within the allocated amount.

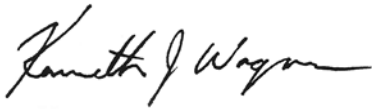
An agreement was secured from the Catholic Diocese of Massachusetts to utilize the parking lot of the "closed" Catholic Church on Rt 9 as a dredged material processing area. However, material had to be removed by March of 2011, and delays in the permitting process caused bids to be secured for the work in September, with an anticipated starting date of early November 2010. Contractors

were clearly uncertain about dredging in late autumn and achieving adequate dewatering over the winter to clear the parking area by spring. As a result, fewer bid, and the lowest bid was approximately twice the amount allocated for the dredging.

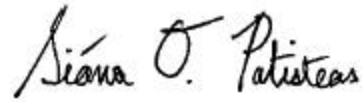
It was decided that no bid would be accepted and that the dredging project would be revisited in a year or two, when additional funds could be secured and when the timing of the project could be potentially made more advantageous.

This summarizes work through 2010 relating to the Comprehensive Management Plan for Morses Pond.

Sincerely yours,



Ken Wagner
Water Resource Services



Siona O'Flynn Patisteas
AECOM Environment