APPENDIX C

AQUATIC VEGETATION SURVEY INFORMATION AND MAPS

Table 1. Lake Maspenock Aquatic vegetation Survey Monitoring Stations: 6/30/16					Aquatic Species Observed						Aquatic Veg. Cover	SDT
#	Latitude	Longitude	Depth (ft)	Station General Description	BW	EN	FW	LLP	VMf	WW	Relative Cover	Depth (ft)
1	N 42° 12' 22"	W 71° 33' 19"	6.5	North Basin: East Cove / West Main St.	-	X	-	-	-	-	Sparse	
2	N 42° 12' 09"	W 71° 33' 36"	8.0	North Basin: West Bank / cove	X	-	-	-	X	-	Sparse	
3	N 42° 12' 01"	W 71° 33' 20"	6.0	North Basin: southeast corner	-	X	-	X	-	-	Sparse	
4	N 42° 11' 57"	W 71° 33' 26"	8.0	Cove between Sandy Beach and Woody Island	-	-	X	-	X	-	Moderate	4.5
5	N 42° 11' 40"	W 71° 33' 12"	10.0	South Basin; West Bank	X	-	-	-	X	-	Sparse	10.0
6	N 42° 11' 48"	W 71° 33' 11"	11.0	South Basin; South Bank. Sandy Beach	X	-	-	X	X	-	Sparse	7.5
7	N 42° 11' 19"	W 71° 33' 22"	8.0	South Basin; East Cove, north of rock pile	X	X	-	X	-	-	Sparse	
8	N 42° 11' 11"	W 71° 33' 14"	8.0	South Basin; East Cove, south of rock pile	-	-	X	X	-	X	Sparse	
9	N 42° 11' 10"	W 71° 33' 23"	8.0	South Basin	X	-	-	-	-	-	Sparse	
10	N 42° 10' 57"	W 71° 33' 21"	8.0	South Basin; north of dam	X	X	-	X	-	-	Sparse	
X	N 42° 12' 27"	W 71° 33' 34"	7.5	North Basin: West Main St. Cartop Launch	-	-	-	-	-	-	Sparse; spp. not noted	
Y	N 42° 11' 13"	W 71° 33' 19"	6.0	South Basin; South Piney Island	X	X	-	X	X	-	Moderate	

Aquatic Vegetation Species Code

Code	Common Name	Scientific Name	Indigenous?	Invasive?
BW	Bladderwort spp.	*Utricularia spp.*	Yes	No
EN	European naiad	*Najas* spp.	No	Yes
FW	Fanwort	*Cabomba carolinia*	No	Yes
LLP	Largeleaf Pondweed	*Potamogeton amplifolius*	Yes	Opportunistic
VMf	Variable milfoil	*Myriophyllum heterophyllum*	No	Yes
WW	Waterweed	*Elodea canadensis*	Yes	No

Table 2. Lake Maspenock Aquatic vegetation Survey Monitoring Stations: 9/10/16					Aquatic Species Observed								Aquatic Veg. Cover	SDT
#	Latitude	Longitude	Depth (ft)	Station General Description	BW	EN	FW	LLP	RLP	TG	VMf	WW	Relative Cover	Depth (ft)
1	N 42° 12' 22"	W 71° 33' 19"	5.5	North Basin: East Cove / West Main St.	-	X	-	-	-	-	-	-	Moderately- Dense	
2	N 42° 12' 09"	W 71° 33' 36"	6.3	North Basin: West Bank / cove	X	X	-	-	-	-	-	-	Sparse	6.25 (TB)
3	N 42° 12' 01"	W 71° 33' 20"	7.0	North Basin: southeast corner	-	X	-	-	-	-	-	-	Sparse	
4	N 42° 11' 57"	W 71° 33' 26"	7.5	Cove between Sandy Beach and Woody Island	X	X	X	X	-	-	X	-	Moderate	
5	N 42° 11' 40"	W 71° 33' 12"	10.0	South Basin; West Bank	-	-	-	-	-	-	-	-	Sparse; spp. not noted	TB
6	N 42° 11' 48"	W 71° 33' 11"	11.0	South Basin; South Bank. Sandy Beach	X	X	-	X	-	-	X	-	Moderate	TB
7	N 42° 11' 19"	W 71° 33' 22"	9.0	South Basin; East Cove, north of rock pile	-	-	-	X	X	-	-	-	Sparse	
8	N 42° 11' 11"	W 71° 33' 14"	7.0	South Basin; East Cove, south of rock pile	-	-	X	X	-	-	-	X	Sparse	
9	N 42° 11' 10"	W 71° 33' 23"	12.0	South Basin	X	-	-	-	-	-	-	-	Sparse	
10	N 42° 10' 57"	W 71° 33' 21"	5.0	South Basin; north of dam	-	-	-	X	-	-	-	-	Sparse	
W	N 42° 11' 88"	W 71° 33' 29"	6.5	North Sandy Island	-	-	-	X	-	X	-	-	Dense	
X	N 42° 12' 27"	W 71° 33' 34"	7.5	North Basin: West Main St. Cartop Launch	-	-	-	-	-	-	-	-	Sparse; spp. not noted	
Z	N 42° 12' 01"	W 71° 33' 37"	4.0	North of Woody Island	X	X	-	-	-	X	-	-	Moderate	

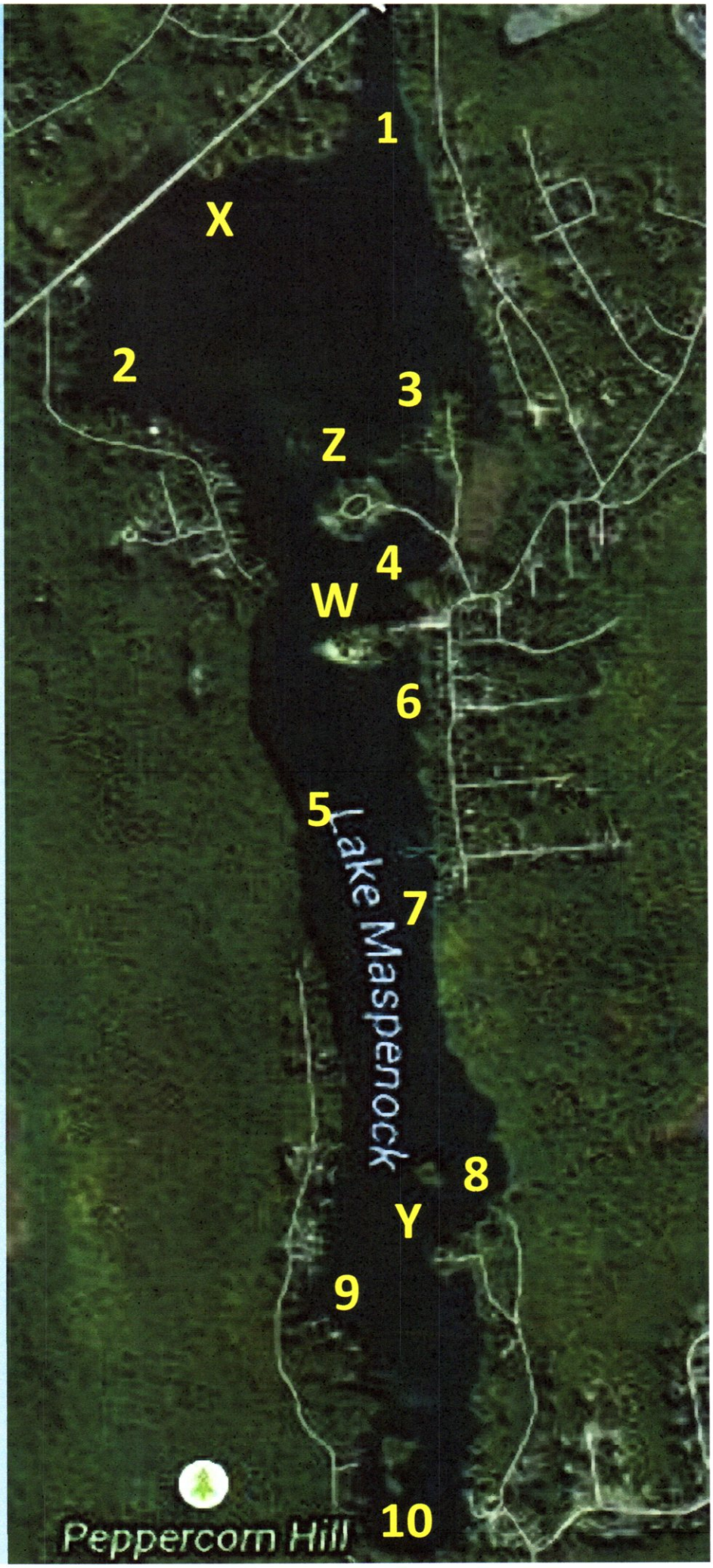
Aquatic Vegetation Species Code

Code	Common Name	Scientific Name	Indigenous?	Invasive?
BW	Bladderwort spp.	*Utricularia spp.*	Yes	No
EN	European naiad	*Najas* spp.	No	Yes
FW	Fanwort	*Cabomba carolinia*	No	Yes
LLP	Largeleaf Pondweed	*Potamogeton amplifolius*	Yes	Opportunistic
RLP	Ribbonleaf Pondweed	*Potamogeton epihydrus*	Yes	No
TG	Tape grass	*Valisnaria americana*	Yes	No
VMf	Variable milfoil	*Myriophyllum heterophyllum*	No	Yes
WW	Waterweed	*Elodea canadensis*	Yes	No

Note: STD measured at 13.2 ft in 16 ft water S. Basin

Lake Maspenock Aquatic Vegetation Survey Sampling Locations: 2016

This figures indicates the approximate locations of the aquatic vegetation surveys conducted in June and September 1016. For exact GPS locations refer to Tables 1 and 2



Monitoring Site No:_____ Sampler(s) Name:_____ Survey Date:_____

Lake Maspenock Aquatic Vegetation Survey Monitoring Form

Common Name	Scientific Name	Code	Areal Coverage 1	2	3	4	Vegetation Biomass 1	2	3	4	Recreational Impact 1	2	3	4	Plant Observations
Epiphytic algae	*Algae growing on plant*	A(e)													
Filamentous algae	*Unattached algal mat*	A(m)													
Watershield	*Brasenia schreberi*	WS													
Fanwort	*Cabomba carolinia*	FW													
Brazilian elodea	*Egeria densa*	ED													
Waterweed	*Elodea canadensis*	WW													
Variable milfoil	*Myriophyllum heterophyllum*	VMf													
European naiad	*Najas* spp.	EN													
Nitella spp.	*Nitella spp.*	Ni													
Yellow Waterlilly	*Nuphar lutea*	YWL													
White Waterlily	*Nymphaea odorata*	WWL													
Largeleaf Pondweed	*Potamogeton amplifolius*	LLP													
Ribbonleaf Pondweed	*Potamogeton epihydrus*	RLP													
Bladderwort spp.	*Utricularia spp.*	BW													
Tape grass	*Valisnaria americana*	TG													
Unknown species A		UNK(a)													
Unknown species B		UNK(b)													
Unknown species c		UNK(c)													

Category ranges:

Areal Coverage: 1 = 5-25% of area; 2 = 25-50% of area; 3 = 50-75% of area; 4 = 75-100% of area

Vegetation Biomass: 1 = low height, near bottom; 2 = near middle of water column; 3 = near top of water column; 4 = at or breaking surface

Recreational Impact: 1 = negligible impact; 2 = low nuisance level; 3 = impairs recreation somewhat; 4 = recreation difficult or impossible

Sheet ___ of ____

March 30, 2016

Lake Maspenock Preservation Association
c/o Malcolm Page
74 Pine Island Road
Hopkinton, MA 01748

Re: 2015 Biological Survey of Lake Maspenock (North Pond) - Hopkinton, MA

Dear Mr. Page:

Please accept this as our report on the 2015 Biological Survey of Lake Maspenock. The goal of the survey, completed on August 31st, is to provide updated data on the assemblage of aquatic vegetation in the lake. This updated data is, in part, required by the Conservation Commission to comply with the most recent permit for winter drawdown. The lake was previously surveyed by Solitude Lake Management (formerly Aquatic Control Technology) in 2003, 2007, and 2012 allowing for comparisons where appropriate.

A significant effort was undertaken in the spring of 2015 to initiate an herbicide treatment program at the lake to manage nuisance weed growth. Despite successfully obtaining an Order of Conditions from the Conservation Commission however, the project did not receive approval by the Board of Selectman. The Town and Lake Association continue to work towards assessing and planning for future management of the lake and data on the lake's assemblage of aquatic vegetation will be an integral part of that endeavor.

Although no herbicides or other active management has been conducted at the lake, winter drawdown is carried out annually and results in changes to the plant assemblage. Past and current data shows this technique is providing a desired effect by reducing the extent and density of nuisance plants like variable milfoil (*Myriophyllum heterophyllum*) and fanwort (*Cabomba caroliniana*). The level of plant biomass reduction is dictated annually by the depth of drawdown and the favorability of weather conditions (i.e. preferably cold & dry) while the lake level is lowered. Following deeper drawdown, which occurs every third year, species of plants that are typically resistant to drawdown, like largeleaf pondweed (*Potamogeton amplifolius*) and naiad (*Naiad sp.*), both native & seed-producing species, have been observed to increase. During the years of shallower drawdown, the fanwort and milfoil increase in abundance and the assemblage becomes more mixed. For Lake Maspenock, both non-native and native species are problematic.

General Lake Characteristics

Lake Maspenock, also known as North Pond, is a roughly 260-acre waterbody located in the Towns of Hopkinton and Milford. The average depth in the lake is about 8-feet, while the maximum reported depth is approximately 20-feet. The northern end of the pond, through to the south of Sandy Island, exhibits water depths of about 8-feet or less and contains the most abundant weed growth. Two smaller basins are separated from the lake to the north by West Main Street. These basins are generally shallow and contain abundant amounts of the same plants as in the main lake.

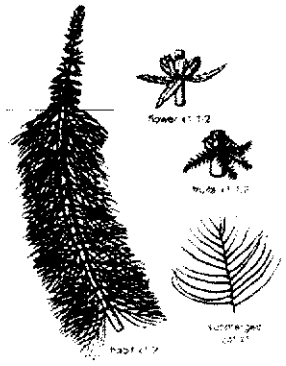
The watershed of Lake Maspenock is relatively small as compared to the size of the lake. There are no major tributaries to the lake and most of the surface inflow to the lake is comprised of numerous small streams which drain the surrounding hillsides as wells as direct inflow from surrounding areas. Lake Maspenock serves as the headwaters for the Mill River and outflow exits the lake via a ~25-foot wide stone spillway at its south end. The dam is equipped with a low-level outlet, which allows for control of the lake's water level.

Distribution of Aquatic Vegetation

On August 31st, the aquatic vegetation in Lake Maspenock was surveyed from a JonBoat using visual observations both from the surface and using our Aqua-Vu underwater camera system along with periodic "drags" with a throw rake. Figure 1 shows the approximate distribution of aquatic vegetation in the lake at the time of the survey.

The lake continues to support abundant plant growth in areas where water depths are ~8-10 feet or less and we again observed the same species as seen in the past, dominated by variable watermilfoil, fanwort and largeleaf pondweed. A majority of the plant growth around the perimeter lake and in other shallow areas was within 1-2 feet of the surface and clearly visible. Several large areas of the lake, especially in the north end exhibited "topped-out" growth. As you are probably already aware, milfoil and fanwort are considered invasive, non-native plants in this region and they have the ability to outcompete beneficial, native vegetation and adversely affect fish & wildlife habitat, water quality and recreational pursuits. Although considered native species, both largeleaf pondweed and naiad are also problematic in many areas of the lake, especially in the years immediately following a deeper drawdown.

Fanwort (Cabomba caroliniana)



Variable Milfoil (Myriophyllum heterophyllum)

The relative proportion of species has changed from year to year. In 2003, milfoil and fanwort were "co-dominant" in some areas, but milfoil had the upperhand in many of the most dense areas of growth. Looking back to 2007, the proportion of fanwort had increased in most areas and although milfoil continued to be more dominant in the north end of the lake, the southern areas of the lake were now dominated by fanwort. Overall density and biomass in 2007 appeared to be noticeably less that in 2003; however the survey that year was conducted later in the season (November). In 2012, fanwort was clearly dominant in the lake and milfoil growth was observed only in scattered patches or as a sparse growth of single plants dispersed through the fanwort. The 2012 survey also noted a significant increase in naiad and largeleaf pondweed, likely a result of the previous winter's deeper drawdown.

The survey in 2015 revealed a mixed assemblage of plants with no clearly dominant species, although qualitatively it appeared that largeleaf pondweed was the most commonly observed plant. Both fanwort and milfoil growth was also prominent and exhibited several dense and moderate areas of growth. Also prevalent in the lake were native species bladderwort, (*Utricularia spp)* and tapegrass (*Vallisneria americana*). Naiad distribution was more limited than in the 2012 survey, but still showed abundant growth in shallow areas of the lake, especially along the northwest shoreline.

A sizeable patch of *Egeria* was observed just to the south of Sandy Island in 2003 but only scattered specimens were observed in 2007 and 2012. No *Egeria* was observed during this year's survey. Fortunately, for whatever reason, whether water chemistry, bottom type or competition from other species, it appears that conditions are not generally favorable for *Egeria* in the lake.

Filamentous algae was commonly observed along the bottom of the lake and attached to plants, but did not appear problematic. The lake water was fairly clear during the survey, indicating a low density of suspended, microscopic algae.

Management Recommendations

Our understanding of the current drawdown practice is that the lake is lowered by at least 4 feet in the fall and that every third year, the lake is lowered a maximum of 8 feet. The 4-foot drawdown had been a practice for many years but only since 2011 has the Association been approved to conduct the periodic, deeper drawdown level.

The continuation and assessment of the current drawdown practice, insofar as nuisance plant control, is recommended as it is providing desirable control of nuisance plants, especially non-native fanwort and milfoil and allows for homeowner waterfront maintenance. The Association may want to petition the Conservation Commission to allow some flexibility in timing/scheduling the deeper drawdown, especially given the difficulty in implementing it successfully due to environmental conditions.

While the drawdown is working well on the non-native species, there continues to be some areas of the lake where their growth persists and there has clearly been an increase in drawdown resistant species, especially largeleaf pondweed and naiad. The growth and mix of species changes from year to year due to the drawdown and other environmental factors, however all species have been and will likely continue to be problematic during the recreational season. We understand that the Town has formed a Committee to evaluate the management goals and options for the lake and we have already been involved in some of the discussions to provide insight and information on various management techniques. The following is a brief review of the management options that we believe may be practical to implement at the lake and summarizes many of the points we have already presented to the various parties involved.

In the 1987 Diagnostic/Feasibility Study of Lake Maspenock, a primary recommendation was to selectively dredge over 200,000 cubic yards of material from the lake. Current dredging costs are likely to run in the range of $20-$30 per cubic yard or roughly 4-6 million dollars for a project of this magnitude. Since this has proven to be economically impossible without state or federal funding, other techniques have been proposed and implemented at the lake. The three primary techniques recommended in the early 90's were winter drawdown, cutting/harvesting and hydro-raking. Winter drawdown has been adopted as an annual practice at the lake but we are not aware if any significant harvesting has ever been conducted. Some limited hydro-raking was conducted in the past, but we have no information on the amount or duration of the work.

Mechanical methods, including harvesting and hydro-raking are generally not the method of choice when dealing with large infestations of milfoil, fanwort and bladderwort. Harvesting can be used to provide some relief from nuisance plants in high-use areas, but can become very costly (~$800-$1,000/acre plus disposal and mobilization) for larger areas. Control of plants through harvesting is short-term and two cuttings per season may be required to maintain desirable conditions. Cutting and harvesting can also increase the spread of plants like milfoil and fanwort, which propagate through vegetative fragmentation.

Harvesting has been discussed as an alternative to herbicide treatment and may be appropriate to provide relief to residents near dense areas of growth, especially if largeleaf pond and naiad are the predominant problematic species in those areas.

Hydro-raking can be used on a small-scale basis to control nuisance plants and remove debris from individual waterfront properties. It is not recommended or economical on a large-scale or in cases where control of milfoil/fanwort is the only goal. Contract hydro-raking has

been used effectively at Lake Maspenock in the past could be beneficial for individual waterfronts and other high use areas of the lake to remove built-up debris and old decaying plant growth. The cost of contract hydro-raking is $1,750 per day depending on the size of the total project (24 hr. aggregate minimum project). There is also a lump sum mobilization charge of $1,500. Disposal would be the responsibility of the individual homeowners and/or the Association.

To address the problem of nuisance weed growth on a larger scale, we continue to recommend treatment with USEPA/State registered aquatic herbicides. Herbicide treatment is typically the most cost effective way to manage nuisance weed growth on a lake-wide basis. In most cases, treatment will provide at least seasonal and possibly 2-3 years of good control of the target plants. When used prudently by a licensed applicator according to the product label, aquatic herbicides present a negligible risk to the environment and human health.

Based on recent conditions, the primary target plants at Lake Maspenock are likely to be variable watermilfoil, fanwort and largeleaf pondweed. There are systemic and contact herbicide options as well as herbicides that are best used on a lake-wide basis or are also suitable for use on partial lake approaches. The development of an herbicide treatment program should be based on the management goals and distribution/density of target species. While management goals are generally set, plant assemblages can change from year to year and as a result of other management actions.

The systemic herbicide of choice for fanwort is Sonar (fluridone). At a dose required for control fanwort, fair control of the variable milfoil and largeleaf pondweed may also be achieved, however a follow-up partial treatment with another herbicide Reward (diquat) and/or Aquathol-K (endothall) may be required. The Sonar herbicide would be applied initially in the late spring (depending on outflow) followed by 1-2 "booster" applications to maintain the target dose for the required exposure time. The dose and timing of the booster applications is guided by periodic fluridone residual analysis (FasTEST) every 2-3 weeks following the initial treatment. Control of the target plants should be achieved in ~60 days.

Since the presence of fanwort is widespread at Lake Maspenock and because Sonar is a very soluble chemical, it may be more economical to treat the entire lake, however the pellet formulations of Sonar herbicide do allow partial lake treatment as well. The cost to treat the entire lake would be in the range of $150,000-$175,000, while partial treatments will carry a higher per acre cost. This includes the herbicide cost and application services as well as pre & post treatment inspections and herbicide residual monitoring.

If specific treatment of the milfoil and/or largeleaf pondweed is desired, the cost would be in the range of $300-$400/acre. The herbicide of choice for milfoil is Reward (diquat) and will also work to control areas of naiad. For largeleaf pondweed, the use of Aquathol-K (endothall) alone or in combination with Reward, is required for effective control.

A relatively new herbicide, Clipper (flumioxazin) has been available since 2013, which will provide a partial lake treatment option for both milfoil and fanwort at a cost of ~$600-$800 per acre. This herbicide has been successfully utilized in recent years at other New England waterbodies to provide seasonal control of nuisance weed growth. Annual treatment would be needed, however extended control of some species may be achieved after multiple years of treatment. While Clipper provides excellent control of fanwort, Reward or Aquathol-K may also be needed to improve the control on milfoil and largeleaf pondweed. There are also restrictions currently imposed on the use of Clipper by the MassDEP in terms on how often it can be used and on the size of the treatment area.

Permitting

Permits for any of the above management techniques must be filed with the Hopkinton and Milford Conservation Commissions. Last Spring, Orders of Conditions for treatment were obtained from both Commissions and are valid for several years with further extensions possible. For treatment, a "License to Apply Chemicals" must be filed with the MA DEP – Office of Watershed Management. This site-specific permit must be filed on an annual basis

and pertains to the type and quantity of herbicide applied to the lake. The cost to prepare and file this permit is $250.

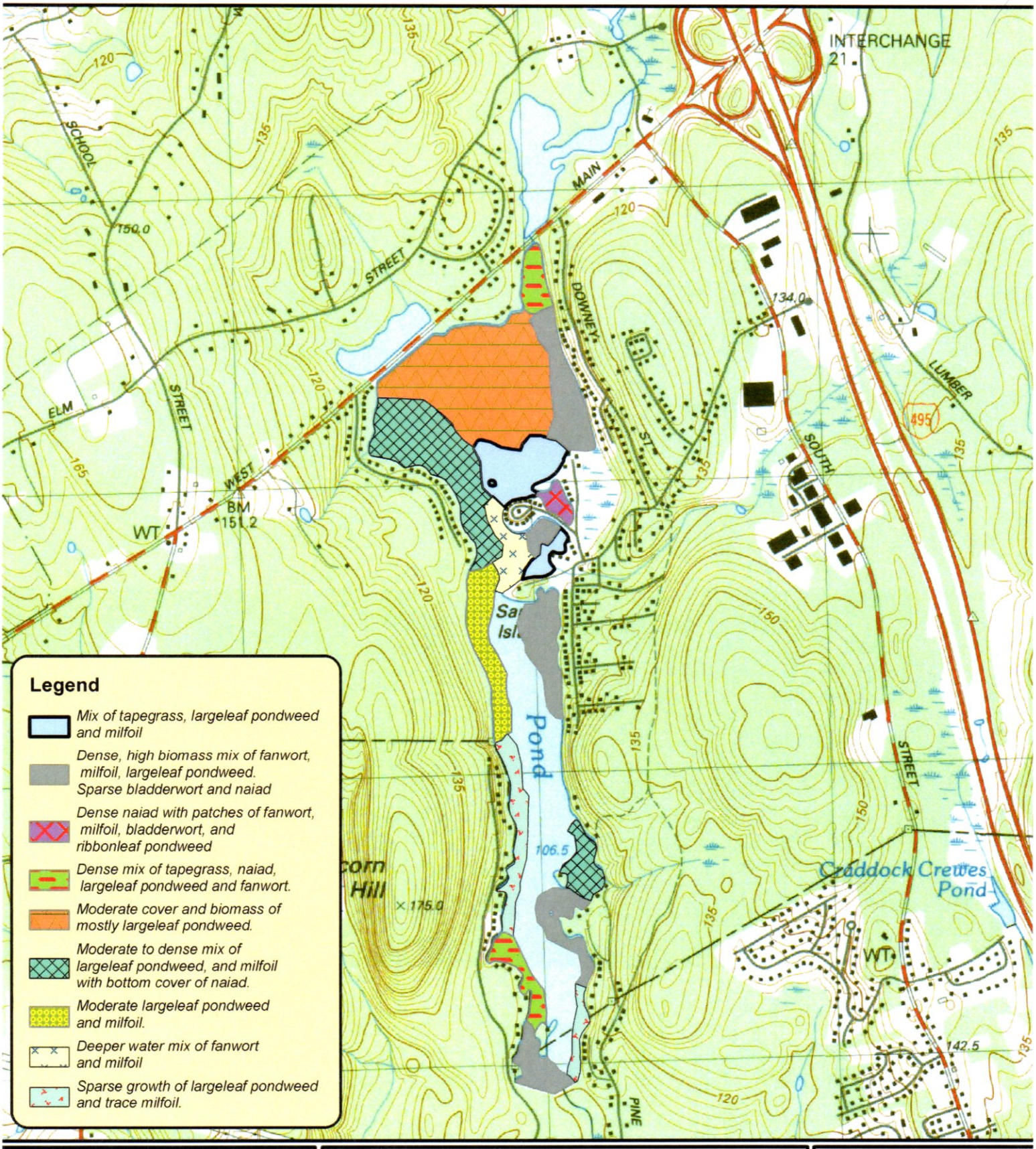
Monitoring

While we continue to recommend periodic vegetation surveys such as this be conducted, we also recommend implementing water quality monitoring, especially if the Town and Lake Association decide to pursue additional management work. We also recommend expanding the vegetation monitoring to include the collection of more quantitative data that will enable better measurement and more definitive description of the lake's vegetation as well as allow for better comparisons in the change of the plant assemblage from year to year. This would involve establishing a number of fixed data points through the lake and the collection of quantitative measurements of plant cover and biomass for each species present. We would be happy to assist the Association with developing a more comprehensive vegetation and water quality monitoring program if desired.

We trust this report will help the Association and Town to make an informed decision regarding the future management of Lake Maspenock. We would be happy to further discuss any of the recommendations with you as well as attend an upcoming meeting of the Association. If you have any questions, please feel free to give us a call.

Sincerely,
SOLITUDE LAKE MANAGEMENT

Dominic Meringolo
Senior Environmental Engineer



Lake Maspenock

Hopkinton/Milford, MA

Vegetation Distribution

FIGURE:	SURVEY DATE:	MAP DATE:
1	8/31/2015	3/9/2016

Legend:

N

0 600 1,200 2,400 3,600 4,800 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
590 Lake Street
SHREWSBURY, MASSACHUSETTS 01545
PHONE: (508) 865-1000
WEB: WWW.AQUATICCONTROLTECH.COM

November 5, 2012

AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

Lake Maspenock Preservation Association
c/o Malcolm Page
74 Pine Island Road
Hopkinton, MA 01748

Re: 2012 Biological Survey of Lake Maspenock (North Pond) - Hopkinton, MA

Dear Mr. Page:

Please accept this as our report on the 2012 Biological Survey of Lake Maspenock. The goal of the survey, completed on August 22nd, is to provide updated data on the assemblage of aquatic vegetation in the lake. This updated data is, in part, required by the Conservation Commission to comply with the most recent permit for winter drawdown. The lake was previously surveyed by Aquatic Control in 2003 and 2007, allowing for comparisons where appropriate.

We understand that the lake is currently drawn down on a regular basis to provide nuisance weed control. The survey data shows this technique is clearly providing a desired effect by reducing the extent and density of nuisance plants like variable milfoil (*Myriophyllum heterophyllum*) and fanwort (*Cabomba caroliniana*), with the level of improvement dictated annually by the depth of drawdown and the favorability of weather conditions (i.e. preferably cold & dry) while the lake level is lowered. Species of plants that are typically resistant to drawdown, like largeleaf pondweed (*Potamogeton amplifolius*) and naiad (*Naiad sp.*), both native & seed-producing species, are observed to be increasing as a result of the drawdown.

General Lake Characteristics

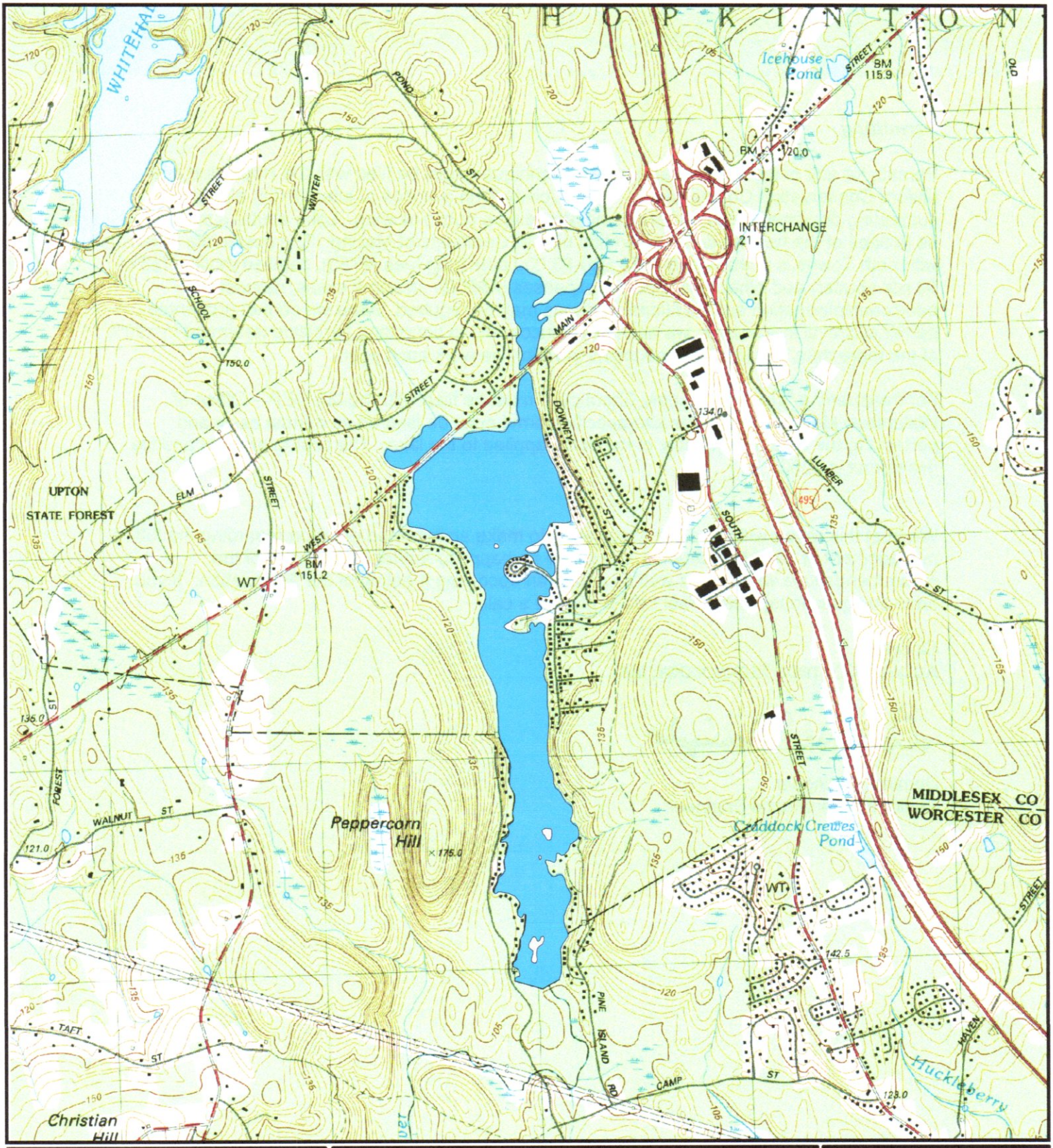
Lake Maspenock, also known as North Pond, is a roughly 260-acre waterbody located in the Towns of Hopkinton and Milford (See Figure 1). The average depth in the lake is about 8-feet, while the maximum reported depth is approximately 20-feet. The northern end of the pond, through to the south of Sandy Island, exhibits water depths of about 8-feet or less and contains the most abundant weed growth. Two smaller basins are separated from the lake to the north by West Main Street. These basins are generally shallow and contain abundant amounts of the same plants as in the main lake.

The watershed of Lake Maspenock is relatively small as compared to the size of the lake. There are no major tributaries to the lake and most of the surface inflow to the lake is comprised of numerous small streams which drain the surrounding hillsides as wells as direct inflow from surrounding areas. Lake Maspenock serves as the headwaters for the Mill River and outflow exits the lake via a ~25-foot wide stone spillway at its south end. The dam is equipped with a low-level outlet, which allows for control of the lake's water level.

Distribution of Aquatic Vegetation

On August 22nd, the aquatic vegetation in Lake Maspenock was surveyed from a JonBoat using visual observations both from the surface and using our Aqua-Vu underwater camera system along with periodic "drags" with a throw rake. Figure 2 shows the approximate distribution of aquatic vegetation in the lake at the time of the survey.

11 John Road, Sutton, MA 01590 • (508) 865-1000 • Fax (508) 865-1220 • info@aquaticcontroltech.com



Lake Maspenock

Hopkinton/Milford, MA

Locus Map

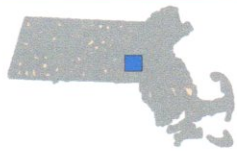
FIGURE:	SURVEY DATE:	MAP DATE:
1	8/22/12	11/2012

Legend:

N

0 700 1,400 2,800 4,200 5,600 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



pusilus), ribbon leaf pondweed (*Potamogeton epihydrus*) and tapegrass (*Vallisneria Americana*) were also observed.

Filamentous algae was commonly observed along the bottom of the lake and attached to plants, but did not appear problematic. The lake water was fairly clear during the survey, indicating a low density of suspended, microscopic algae.

Management Recommendations

Our understanding of the current drawdown practice is that the lake is lowered by at least 4 feet in the fall and that every third year, the lake is lowered a maximum of 8 feet. The 4-foot drawdown had been a practice for many years but only recently has the Association been approved to conduct the periodic, deeper drawdown level.

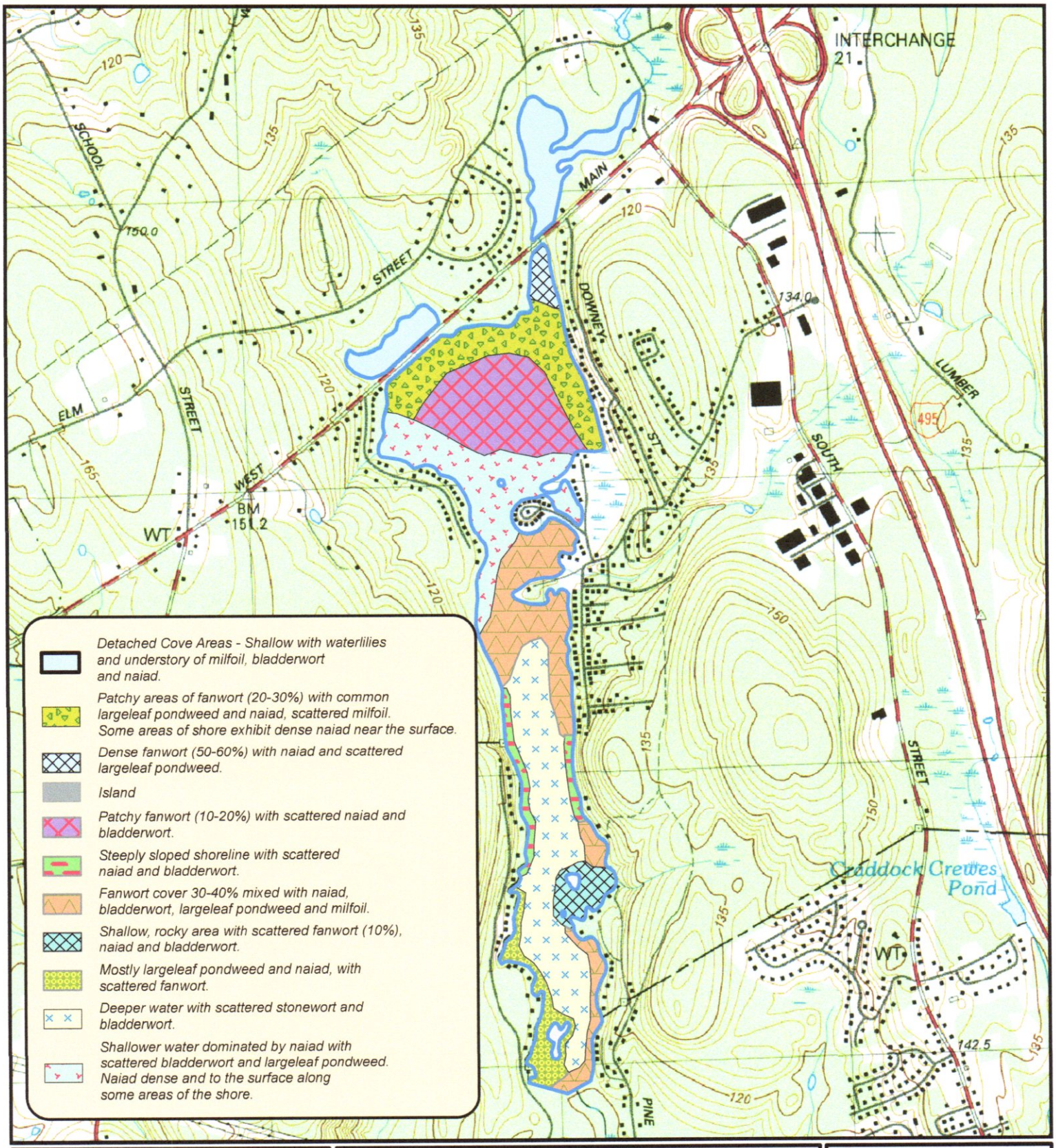
This past winter was a deeper drawdown year, however the weather was not ideal either for lowering or freezing/drying of the exposed sediments. Reportedly the maximum drawdown that was sustained this past winter was about 6.5 feet. Nonetheless, the survey work this year indicates that the winter drawdown of the lake is having a positive effect, by reducing nuisance growth of milfoil and fanwort while promoting an increase in native species, specifically naiad and largeleaf pondweed. Reportedly, no adverse effects have been observed as a result of the drawdown.

The continuation and assessment of the current drawdown practice, insofar as nuisance plant control, is recommended as it is providing desirable control of nuisance plants and allows for homeowner waterfront maintenance. The Association may want to petition the Conservation Commission to allow some flexibility in timing/scheduling the deeper drawdown, especially given the difficulty in implementing it successfully due to environmental conditions.

While the drawdown is working well, there continues to be some areas of the lake where nuisance growth persists during the recreational season. Should the Association wish to address and manage this growth, we recommend considering the following options.

In the 1987 Diagnostic/Feasibility Study of Lake Maspenock, a primary recommendation was to selectively dredge over 200,000 cubic yards of material from the lake. Current dredging costs are likely to run in the range of $20-$30 per cubic yard or roughly 4-6 million dollars for a project of this magnitude. Since this has proven to be economically impossible without state or federal funding, other techniques have been proposed and implemented at the lake. The three primary techniques recommended in the early 90's were winter drawdown, cutting/harvesting and hydro-raking.

Mechanical methods, including harvesting and hydro-raking are generally not the method of choice when dealing with large infestations of milfoil, fanwort and bladderwort. Harvesting can be used to provide some relief from nuisance plants in high-use areas, but can become very costly (~$800-$1,000/acre including disposal) for larger areas. Control of plants through harvesting is short-term and two cuttings per season may be required to maintain desirable conditions. Cutting and harvesting can also increase the spread of plants like milfoil and fanwort, which propagate through



Lake Maspenock

Hopkinton/Milford, MA

Vegetation Distribution

FIGURE:	SURVEY DATE:	MAP DATE:
2	8/22/2012	11/2/2012

Legend:

N

0 600 1,200 2,400 3,600 4,800 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM

Permitting

Permits for any of the above management techniques must be filed with the Hopkinton and Milford Conservation Commissions. This involves filing a Notice of Intent (NOI) along with supporting documents and drawings and attending a public hearing. Lake abutters must also be notified of the hearing data by certified mail or Certificate of Mailing. The cost to file a NOI with both Towns is in the range of $2,000-$3,000 plus filing fees ($750), certified mailing ($3 of $6 per abutter) and other reimbursable expenses (~$500). In some cases, requests for additional information and additional hearings may be required. While we cannot guarantee permit approval in all cases, we have been successful in permitting herbicide treatment in >90% of the more than 75 MA cities and towns in which we work each year.

For treatment, a "License to Apply Chemicals" must be filed with the MA DEP – Office of Watershed Management. This site-specific permit must be filed on an annual basis and pertains to the type and quantity of herbicide applied to the lake. The cost to prepare and file this permit is $250.

We trust this report will allow the Association to make an informed decision regarding the future management of Lake Maspenock. We would be happy to further discuss any of the recommendations with you as well as attend an upcoming meeting of the Association. If you have any questions, please feel free to give us a call.

Sincerely,
AQUATIC CONTROL TECHNOLOGY, INC.

Dominic Meringolo

Dominic Meringolo
Senior Environmental Engineer

March 17, 2008

AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

Lake Maspenock Preservation Association
c/o Meg Tyler
36 Downey Street
Hopkinton, MA 01748

Re: 2007 Biological Survey of Lake Maspenock (North Pond) - Hopkinton, MA

Dear Peter:

Please accept this as our report on the 2007 Biological Survey of Lake Maspenock. The field survey of the lake was conducted on November 28th. This occurred late in the growing season and overall biomass may have been somewhat lower than would be typical for the summer. Also, the lake level was already drawn down 4-5 feet for the winter, which may have also affected the results of this survey. The lake was last surveyed by Aquatic Control in the fall of 2003.

We understand that the lake is currently drawdown on regular basis to provide some weed control, however nuisance plant growth continues to be problematic in many areas of the lake during the recreational season. Historically, some hydro-raking had been conducted at the lake in the early 1990's but no active management has been attempted since. The goal of this assessment work is to document the current distribution of aquatic vegetation in the lake and formulate management recommendations that the Association can review and act on in the future.

General Lake Characteristics

Lake Maspenock, also known as North Pond, is a roughly 260-acre waterbody located in the Towns of Hopkinton and Milford (See Figure 1). The average depth in the lake is about 8-feet, while the maximum reported depth is approximately 20-feet. The northern end of the pond, through to the south of Sandy Island, exhibits water depths of less than 8 feet and contains the most abundant weed growth. Two smaller basins are separated from the lake to the north by West Main Street.

The watershed of Lake Maspenock is relatively small as compared to the size of the lake. There are no major tributaries to the lake and most of the surface inflow to the lake is comprised of numerous small streams which drain the surrounding hillsides as wells as direct stormflow from surrounding paved surfaces. Lake Maspenock serves as the headwaters for the Mill River and outflow exits the lake via a ~25-foot wide stone spillway at its south end. The dam appears to be equipped with a low-level outlet, which allows for some limited control of the lake's water level.

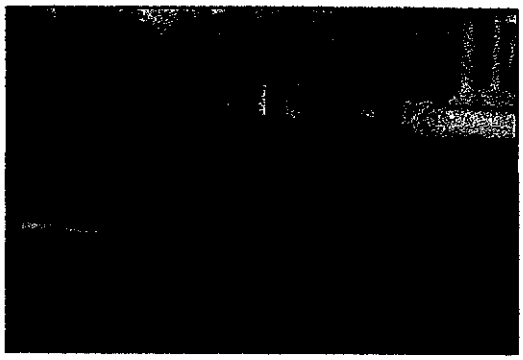
Distribution of Aquatic Vegetation

The aquatic vegetation in Lake Maspenock was surveyed from a JonBoat using visual observations both from the surface and using our Aqua-Vu underwater camera system along with periodic "drags" with a throw rake. Figure 2 shows the approximate distribution of aquatic vegetation in the lake at the time of the survey.

some limited control of plants close to shore (1-3 feet of water) in sandy/gravelly areas. The Town of Hopkinton, via the Department of Public Works, currently manages the drawdown at Lake Maspenock. We would encourage the Lake Association to request 1) records of past drawdowns, 2) documentation of the current operating procedure for drawdown, and 3) the current Order of Conditions (if any) pursuant to the drawdown practice. This information will be important to further assess how well drawdown is working and if any improvements are possible.

The lake would need to be lowered by 8-10 feet to expose a majority of the weed infested bottom to freezing and drying. We are not aware that this level of drawdown has been attempted, nor would it likely be permittable or recommended based on possible adverse impacts to fish, wildlife and adjacent shallow wells, if any currently exist. The continuation and assessment of the current drawdown practice is recommended as it is providing some near-shore control of nuisance plants and allows for homeowner waterfront maintenance.

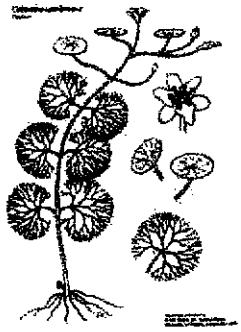
Mechanical methods, including harvesting and hydro-raking are generally not the method of choice when dealing with large infestations of milfoil and bladderwort. Harvesting can be used to provide some relief from nuisance plants in high-use areas, but can become very costly (~$800-$1,000/acre including disposal) for larger areas. Control of plants through harvesting is short-term and two cuttings per season may be required to maintain desirable conditions. Cutting and harvesting can also increase the spread of plants like milfoil and fanwort, which propagate through vegetative fragmentation, although this is not much of a concern at Lake Maspenock given the current widespread distribution of these invasive species.

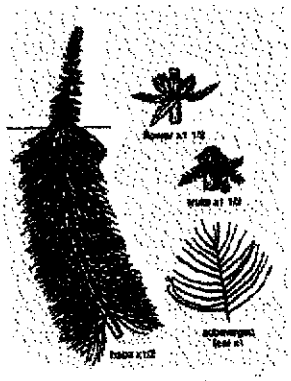


Hydro-raking can be used on a small-scale basis to control nuisance plants and remove debris from individual waterfront properties. It is not recommended on a large-scale or in cases where control of milfoil/fanwort is the only goal. Contract hydro-raking has been used effectively at Lake Maspenock in the past and we recommend its use for individual waterfronts and in other high use areas of the lake. The cost of contract hydro-raking is $180-$190 per hour depending on the size of the total project (24 hr. aggregate minimum project). There is also a lump sum mobilization charge of $1,000. Disposal would be the responsibility of the individual homeowners and/or the Association. Should the Association determine that a herbicide treatment is not desired nor economically feasible at this time, then Hydro-Raking paid for by individual property owners whom choose to participate is an alternate course of action. An example Hydro-Raking "sign-up" form used at other MA ponds/lakes is attached for your referral.

To address the widespread problem of nuisance weed growth we recommend treatment with a USEPA/State registered aquatic herbicide. Herbicide treatment is typically the most cost effective way to manage the nuisance weed growth on a lake-wide basis. In most cases,

As in 2003, variable watermilfoil (*Myriophyllum heterophyllum*) and fanwort (*Cabomba caroliniana*) continue to be the two dominant species of submersed plants in the lake. The relative densities of these two species change in different sections of the lake and the milfoil is more dense and dominant in the north end. In the southern end of the lake the fanwort is more dominant. Biomass was still high, especially in the north end of the lake, but appeared to be on the downturn due to the time of the year. As you are probably already aware, both milfoil and fanwort are considered invasive, non-native plants in this region and they have the ability to outcompete beneficial, native vegetation and adversely affect fish & wildlife habitat, water quality and recreational pursuits.


Fanwort (Cabomba caroliniana)


Variable Milfoil (Myriophyllum heterophyllum)


Brazilian Elodea (Egeria densa)

Other plant species present in significant amounts were naiad (*Najas sp.*) and bladderwort (*Utricularia sp.*). Both of these species were present in most areas of the lake but at a lower density than the milfoil and fanwort. While these species are considered native and are usually beneficial, they can become problematic under certain conditions. Sparse amounts of curlyleaf pondweed (*Potamogeton crispus*), largeleaf pondweed (*Potamogeton amplifolius*) and Brazilian elodea (*Egeria densa*) were also observed. The largeleaf pondweed was localized in several dense patches in the south end of the lake, while the curlyleaf pondweed and Brazilian elodea were scattered across portions of the north end of the lake. In the 2003 survey a sizeable, moderately dense area of *Egeria* was found just to the south of Sandy Island. We were unable to final any observable growth of *Egeria* this year in the same area. As mentioned in the earlier report, Brazilian elodea in considered a non-native plant in Massachusetts and is still fairly uncommon, with only a handful of know infestations in the State.

Filamentous algae was commonly observed along the bottom of the lake and attached to plants, but did not appear problematic. The lake water was fairly clear during the survey, indicating a low density of suspended, microscopic algae.

Management Recommendations

In the 1987 Diagnostic/Feasibility Study of Lake Maspenock, a primary recommendation was to selectively dredge over 200,000 cubic yards of material from the lake. Current dredging costs are likely to run in the range of $20-$30 per cubic yard or roughly 4-6 million dollars for a project of this magnitude. Since this has proven to be economically impossible without state or federal funding, other techniques have been proposed and implemented at the lake. The three primary techniques recommended in the early 90's were winter drawdown, cutting/harvesting and hydro-raking.

The winter drawdown of the lake, while providing some limited benefit in shallow water, has not proven effective for controlling a majority of the nuisance weed infestation found in water depths of 4-10 feet. Currently, the lake is being drawdown about 3-4 feet on an annual basis, providing

treatment will provide at least 2-3 years of good control of the target plants. When used prudently by a licensed applicator according to the product label, aquatic herbicides present a negligible risk to the environment and human health.

The primary target plants at Lake Maspenock are variable watermilfoil, fanwort and *Egeria*. The herbicide of choice for fanwort and Egeria is Sonar AS (fluridone). At a dose required for control these plants, fair control of the variable milfoil may also be achieved, however a follow-up partial treatment with another herbicide Reward (diquat) may be required. The Sonar herbicide would be applied initially in the late spring (depending on outflow) followed by 1-2 "booster" applications to maintain the target dose for the required exposure time. The dose and timing of the booster applications is guided by periodic fluridone residual analysis (FasTEST) every 2-3 weeks following the initial treatment. Control of the target plants should be achieved in ~60 days.

Since the infestation is so widespread at Lake Maspenock and because Sonar is a very soluble chemical, the entire lake must be treated. The cost to treat the entire lake would be in the range of $110,000-$130,000. This includes the herbicide cost and application services as well as pre & post treatment inspections and FasTEST monitoring. If additional treatment of the milfoil is required, the cost would be in the range of $300-$400/acre.

Permitting

Permits for any of the above management techniques must be filed with the Hopkinton and Milfoil Conservation Commissions. This involves filing a Notice of Intent (NOI) along with supporting documents and drawings and attending a public hearing. Lake abutters must also be notified of the hearing data by certified mail. The cost to file a NOI with both Towns is in the range of $2,000-$3,000 plus filing fees ($750) and certified mailing ($6.00 per abutter). In some cases, requests for additional information and additional hearings may be required. While we cannot guarantee permit approval in all cases, we have been successful in permitting herbicide treatment in >90% of the more than 75 MA cities and towns in which we work each year.

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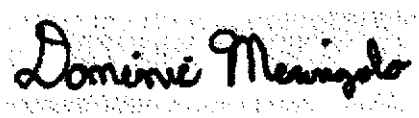
We trust this report will allow the Association to make an informed decision regarding the future management of Lake Maspenock. We would be happy to further discuss any of the recommendations with you as well as attend an upcoming meeting of the Association. If you have any questions, please feel free to give us a call.

Sincerely,
AQUATIC CONTROL TECHNOLOGY, INC.



Dominic Meringolo
Senior Environmental Engineer

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FINAL REPORT TO TOWN OF HOPKINTON ON DIAGNOSTIC FEASIBILITY STUDY OF NORTH POND HOPKINTON, MASSACHUSETTS

November, 1987

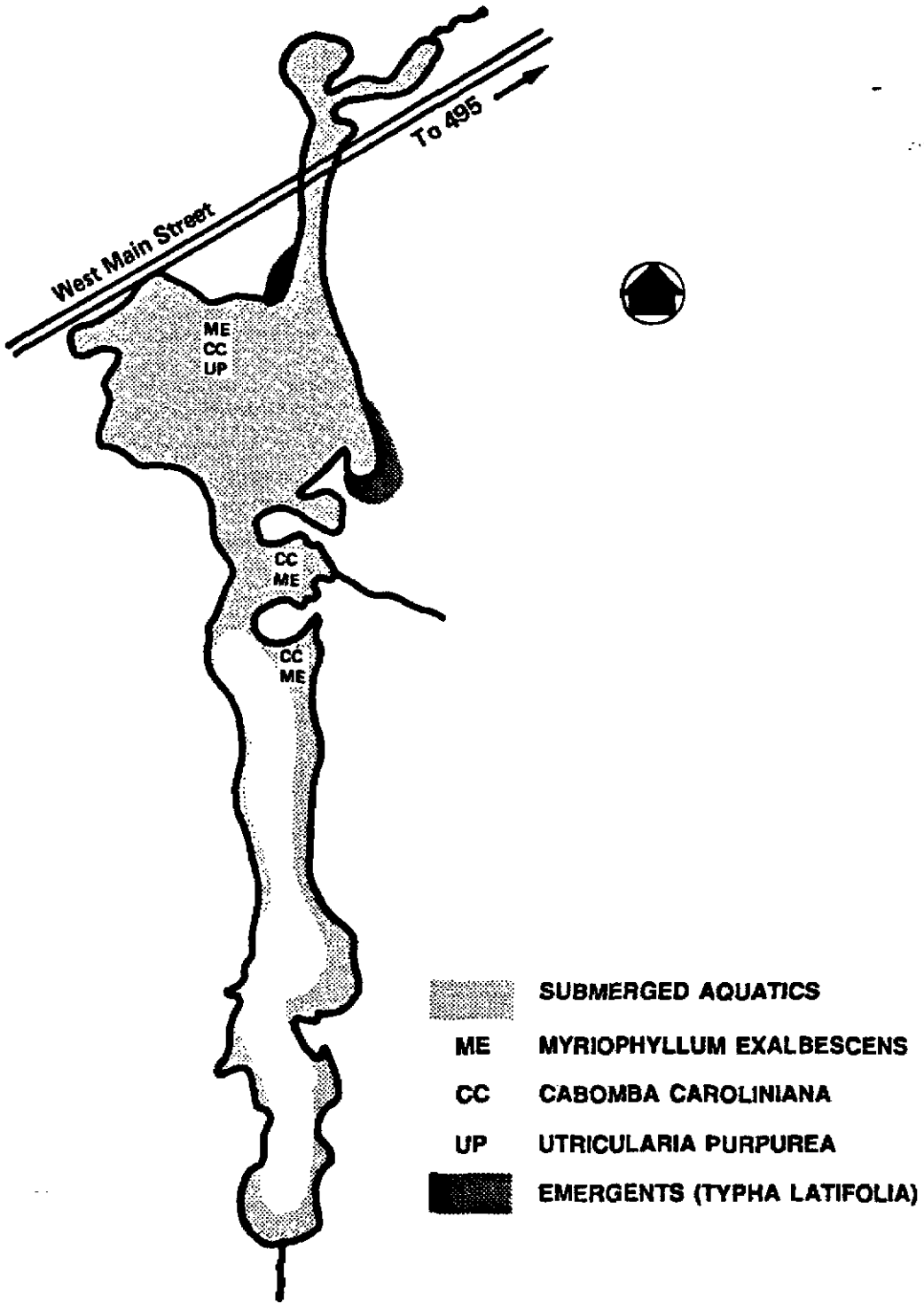

FIGURE 3-11. MACROPHYTE SURVEY OF NORTH POND, AUGUST, 1984

JASON M. CORTELL
AND ASSOCIATES INC.

244 SECOND AVENUE
WALTHAM MASSACHUSETTS 02154
617/890-3737

FINAL REPORT

A BIOENGINEERING STUDY OF LAKE MASPENOCK HOPKINTON, MASSACHUSETTS

PREPARED FOR:
HOPKINTON CONSERVATION COMMISSION
HOPKINTON, MASSACHUSETTS

PREPARED BY:
JASON M. CORTELL AND ASSOCIATES INC.
244 SECOND AVENUE
WALTHAM, MASSACHUSETTS

SUBMITTED:
MAY 8, 1979

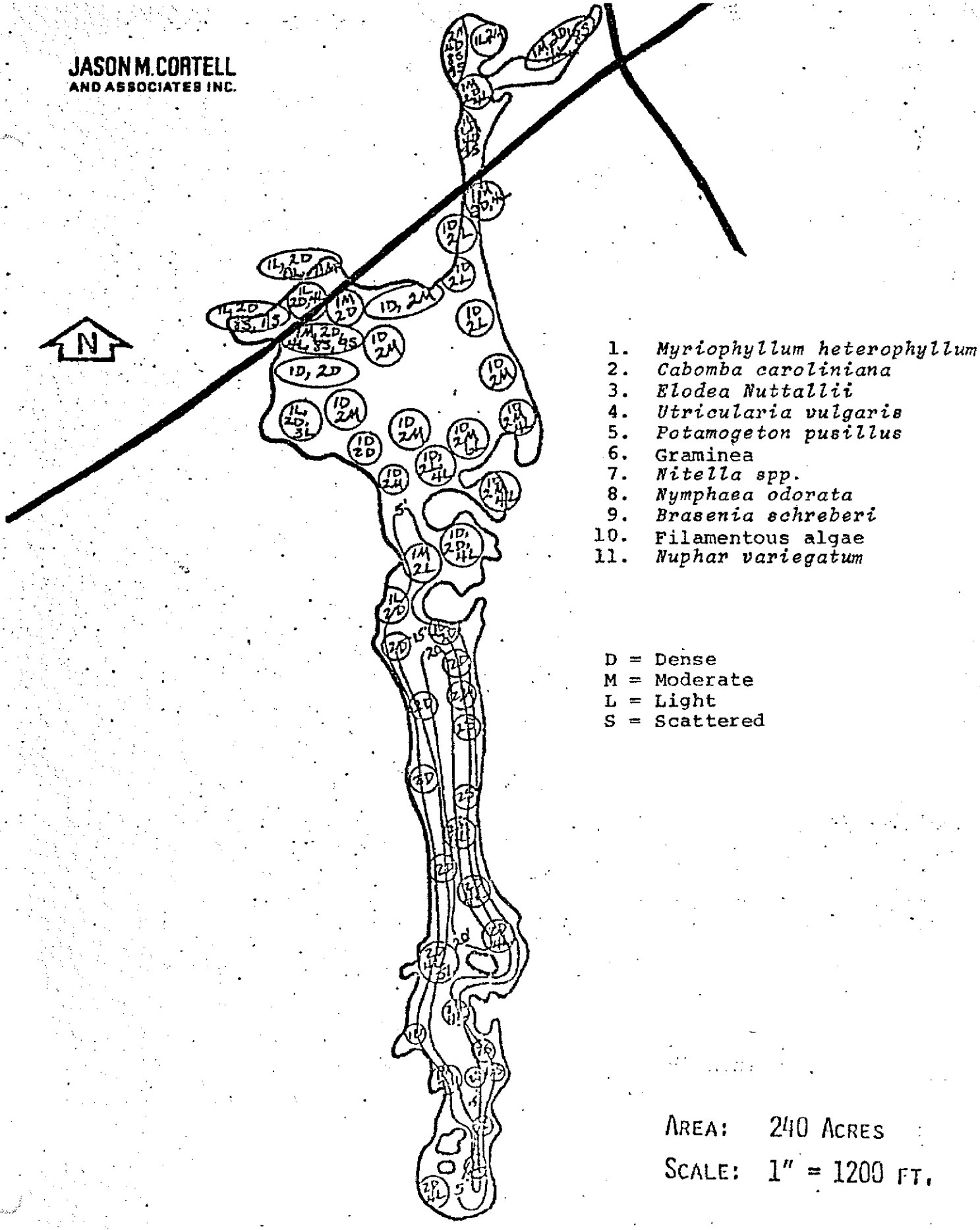

FIGURE 3. DISTRIBUTION OF AQUATIC VEGETATION DURING 1974.