

Bare Hill Pond Watershed Management Committee
Town of Harvard
Harvard, MA 01451

August 22, 2012

Conservation Commission
Town of Harvard
Town Hall
Harvard, MA 01451

Re: 2012 Report and Fall 2012 Drawdown Plans

Dear Commissioners:

On behalf of the Bare Hill Pond Watershed Management Committee, we are pleased to submit our annual report under our current Order of Conditions. As discussed last year, we engaged Wendy Gendron to visit the Pond this summer to supplement our volunteer monitoring efforts. Windy Sisson was also able to join us for the visit. Her report is attached.

This has been another busy year for the Committee as it works to improve the collection of information regarding the draw down, monitors the overall health of the Pond and its watershed, worked with the Park and Recreation Commission excavate and remove sediment from the swimming area during the last draw down, and then design the last two BMPs for collection of storm water at the boat ramp and beach area at the end of Pond Road. We also continue to engage in outreach and education activities to encourage best management practices by watershed residents, and through these collective activities reduce invasive species and phosphorous in the Pond.

Draw Down Observations

The draw down in Fall 2011 was a challenging one given the need to achieve the seven foot depth for the excavation project, the significant precipitation in the fall (hurricane in Sept. and significant snowfall and melt in October), the loss of power for a week and the wet weather lasting through the first half of December. That said, with coordination with the Commission and continued pumping prior to a freeze, we achieved the seven foot level on December 17 and the separately permitted excavation project proceeded. Significant pumping was necessary to maintain the level during December and January due to the level of precipitation, and we believe the increased water table recharge rate as a result of the lower depth. A table showing the Pond levels during the draw down and refill is attached as Exhibit B. The depth below 5' was measured with the pipeline markers set at 6" intervals below the 4 foot level (photos of the pipe and markers are included with the 100 foot photos in Exhibit D. Levels above 5' were measured from the top surface of the dam. (22" from the top of the dam is the average normal pond height).

Despite a warm early December and generally snow free and warm winter, there was a hard freeze in late December and for almost 2 weeks into the first half of January with intermittent days of warmth during those freezes causing the exposed areas to freeze and re-freeze. This appears to have facilitated an effective invasive aquatic plant kill.

The refill was initiated on January 21 to attempt to ensure that snow melt, which turned out to be very limited, was captured. There was limited snow precipitation on January 21 and almost no rainfall during the winter and very limited precipitation in March and April.

Despite the very unusual precipitation levels, the Pond refilled by approximately two feet by the end of February; in prior years it increased by far lower amounts (4-6") absent snow melt. During March it rose another 10" to approximately 3' below the normal height. At this point the refill slowed compared to prior years. In prior years, Spring rain in April and early May had overfilled the Pond above normal height by mid-May. This year, the absence of rain caused it to rise another 10" in April to 2' below normal height, and 12" in May to about 1' below normal height. In June and early July there was some rain and it rose within 3" of normal height and then during July and August fluctuated between 3-7" below normal height. This range is consistent with prior readings at the end of prior summers and we are now at a level that compares with prior summers where rainfall in August was limited. The data suggests that the recharge of the Pond below 3' is primarily spring fed refill from the water table and that the refill above 3' is more precipitation based. It also explains why maintaining the level at a 7 foot draw down required significant pumping.

The effects of the draw down appear to continue to be positive in reducing invasive species and phosphorous levels. By this we mean that there continues to be a reduction of invasive aquatic species in the draw down zone, an increase in the diversity and prevalence of nature species, an improvement of water clarity. The absence of rainfall appears to have impacted some observations. We and others did observe some algal growth in Clapps Brook although Ms. Gendron indicated that in prior years there were algal mats in much of these areas and now the water was clearer and the bottom visible in most areas. The areas of algal growth appear to represent a decline in the algal growth in those areas.

July Survey: On July 22, Wendy Gendron, Tom Gormley, Megan Glew, Tom Gormley, Morey Kraus, Wendy Sisson and myself toured the Pond to observe the draw down effects on the Pond and its surrounding wetlands. A copy of Wendy Gendron's written report is attached as Exhibit A. As noted in the report, the prevalence of invasive milfoil is reduced compared to prior years, the continued shift from milfoil to invasive fanwort was observed, although the overall prevalence of fanwort may be reducing. Replacing the invasive milfoil and fanwort appear to be native bottom growing species such as Nitella or stonewort (which removes nutrients from the water column (a good thing), pondweed, bladderwort, and watershield. Water chestnut was limited a few stray plants in Clapps Brook and in the Great South Bay. Water clarity was consistent with prior secci disk measurements taken in June and early July at 7 feet; an excellent level. While Wendy notes this is typical for a healthy Pond, it is significantly improved from prior years where secci disk readings were commonly in the 5.5-6 foot range. Wendy noted 2 areas of potential concern that deserve monitoring: the continued expansion of

native yellow iris (along shoreline areas in the Clapps Brook and Inner Great South Bay) and cattail in the downstream wetlands. While these are native species, they are seed bearing and the drawdown may be selecting for their dominance over other species. She recommends that we consider adding transects to better understand their impact over the next few years. We also observed a few isolated Purple Loosestrife which she recommended be removed from shorelines when observed.

100 Foot Segments and Additional Photos: Exhibit D contains the site photos showing the 100' segments post draw down. Also included are photos showing mussel observations, Clapps Brook and pictures of the pipe with the level markers.

EPA Report: Attached as Exhibit C is a January 2012 report of the phosphorous testing conducted by the EPA last year. This confirms the positive improvement we observed last year and shows a significant reduction in phosphorous since the initial testing in 1998 that resulted in Bare Hill Pond being designated by EPA as endangered. The results show that both the total and ortho phosphorous are markedly lower than prior years. The reported concentrations of the relevant measurements were between 7-12 ug/l. The 1998 TMDL findings that put us in danger were 44 ug/l and our goal for the draw down project grant was to reduce it to 30 ug/l. Our hypothesis is that the draw down dilution effect is primarily responsible for the reduction and that the storm water treatment and other activities in the watershed will help prevent an increase over the long term. These reduced levels are now below a level that puts the Pond at a high risk for eutrophication.

Volunteer Monitoring:

During the draw down process we stopped at 5' to check mussel counts. We found a comparable number of mussels this year as compared to prior years as well as juveniles. See the photos in Exhibit D. This suggests that the mussels are adapted to the draw down. The improvement in water clarity also suggests that the mussel population is being maintained. This is consistent with the advice we received last year at the Concord Conservation Commission meeting where we spoke with a mussel biologist who identified our mussels as a very common species that is well adapted to changing water levels and which would be present at all depths in our Pond.

Downstream wetlands continue to appear healthy with the one observation being an increase in the prevalence of cattails. There are healthy sedges and wetlands plants and the draw down pumping site does not appear to be gauging or impairing plant growth.

Jeff Ritter continued to organize teams for annual frog counts. He noted that a very dry spring with limited snowfall and melt may have impacted the frog counts. Normally the frog population is awakened and made active by heavy rains; there were none in March. On March 21, 4 counters in 2 teams counted large number of spring peepers but not choruses as in prior years. It was 68 degrees which may have reduced the count being much higher than normal for peepers. Four nights later, Jeff returned after a light rainfall and found full choruses of peepers in multiple Pond wetlands and along edges of the Pond. On April 22, 7 counters in 3 teams

covered the counting sites at the Pond. It was cooler (48 degrees) and it had been quite dry. All teams reported significant peeper activity again, although a lower level of pickerel frog counts than prior years. The teams believe the draught appears to have impacted the counts by delaying annual migration and mating. Next year will be important to see if this was a draught related event.

Morey Kraus conducted turtle observations during his regular early evening kayaking. Unlike earlier years, with the growth of the Iris along the shoreline in Clapps Brook which either obscures their view or removes their sunning locations, that no longer is a suitable site for observing turtles. Morey reports that he reliably sees turtles along the Still River side of the Pond. He sees them in groups of up to 4 turtles in sizes from 2" to 6" and will count between 12-18 turtles on a pass. He reports that this is consistent with his observations in prior years. We will utilize this approach going forward so that we have additional years of data.

Several fishing derbies reported results. Merrimack Valley Bass Tournament is a regular derby. In that derby they had 15 anglers weighing bass who caught 71 bass and returned 69 alive. One was 6 lbs. This compared to 24 bass last year. In conversations with fishermen, they continue to report that Bare Hill Pond is one of their favorite Ponds for fishing.

Rick Dickson continues to pursue invasive water chestnut plants with support from the Pond Committee water chestnut pulls. Like last year, there were so few plants, mechanical harvesting was not necessary. This year, Rick placed small floating markers where he pulled isolated plants so that he or others could return later to catch any re-growth. We conducted one water chestnut pull to help reduce the limited volume and it ended early in a couple of hours due to the low prevalence of plants pull. The number of plants remains very low and they are hard to find at this point. This is an amazing success story.

In summary, we believe the draw down is having a positive effect. We need to keep an eye on the frog counts next year to ensure there is not a reason for concern that is draw down related. We also should monitor the seed bearing iris and cattails in the wetlands and encourage the pulling of shoreline purple loosestrife. We believe our hypothesis that the draw down effect is incremental in nature and that as a result it allows for the restoration of the habitat as native species replace invasive species and as water quality improves. We are particularly pleased to see the improvement in water clarity this year.

Drawdown Plan

In 2011, we conducted an incrementally deeper draw down to 7' in order to enable the excavation of the beach area. The reports this summer from the beach were excellent. Swimmers appreciate the absence of invasive species and the increased depth.

We also believe that after 8 years of incremental increases of draw down depth, and with the limited rainfall this year, we should not seek to do another 7' draw down. We believe that the incremental approach was appropriate as we increased depth. We also believe that an incremental approach would be best to see if we can find a shallower depth that maintains

control over the invasive species. Our recommendation and proposal is to reduce the draw down to 6 feet next year.

With the new metal slats in the dam, and the reduced depth of the draw down, we believe that we will have additional flexibility to address recreational needs of the Rowing Association. We discussed our prior plan with them, which as you recall involved holding the draw down at 3.5 feet until the end of rowing season. We now believe we can hold it to 3 feet until the end of rowing season and still achieve a 6 foot drawdown by the end of November or the first freeze. In addition, given that the current level of the Pond is now (and could likely be below the average normal height in September), we thought it would be prudent (now that we have more experience with draw down and pumping rates) to set depth objectives so that boards would not be removed or pumping operated unless the depths targets were not achieved. In other words, we will not get ahead of a targeted schedule, as follows:

<u>Date</u>	<u>Depth Target</u>	<u>Draw Down Depth</u>
9/24	Initiation if above target	0"
9/24	22" below top surface of dam (average normal height)	0"
10/1	34" below top surface of dam	12"
10/15	46" below top surface of the dam	24"
10/24	52" below top surface of the dam	30"
10/28	58" below top surface of the dam	36"
Nov 30 or freeze	104" from the top surface of the dam	up to 6'

Pumping would begin only when needed to meet the targets during October but be necessary after reaching approximately 3 feet. The rate would not exceed 2" per day per the Order of Conditions. If the Pond remains at 4-6" below average normal height in September, then we would not pull a board on 9/24 but wait till later in that week. We think this approach will avoid reducing Pond levels below those in prior years and will allow us to incrementally reduce the draw down. If we are unable to achieve the 6' draw down by November 30 or a freeze we will stop or discuss it with the Commission if we have an alternative recommendation.

As in prior years, we would initiate the refill on or before February 1, 2013 following notice to the Commission and the abutters. Because snowmelt timing is variable and is important to timely refilling of the Pond, our experience indicates that deferring the refill beyond February 1 is unwise to ensure the habitat is restored for amphibians, fish and reptiles.

We appreciate the time the Commission has take, and the effort made to understand, and help manage the project. We look forward to the meeting on September 6.

Sincerely,

Conservation Commission

August 22, 2012

Page - 6 -

A handwritten signature in blue ink, appearing to read "B. Leicher", is positioned above the printed name.

Bruce A. Leicher

Chair, Bare Hill Pond Watershed Management Committee

Cc: Conservation Commission Members
Pond Committee Members
Selectmen



18 Sunset Drive
Ashburnham, MA 01430
Phone: 508-397-0033

July 29, 2012

Bare Hill Pond Watershed Management Committee
Bruce Leicher
Town of Harvard
99 Ann Lee Road
Harvard, MA 01451

Mr. Leicher,

On July 22, 2011 we performed a visual inspection of the pond and downstream wetlands, specifically looking for any qualitative changes in vegetation associated with the extended water level drawdown. Members of the Watershed Management Committee (Morey Kraus, Tom Gormley and Megan Glew) and Wendy Sisson from the Harvard Conservation Commission attended the pond tour.

Shoreline Observations:

As in the past, the shoreline contained a variety of emergent wetland species. No new species were encountered. The shoreline contained lush vegetation with no evidence of impairment, such as bare patches, dead or unhealthy plants. Two non-native invasive emergent plants were observed: purple loosestrife (*Lythrum salicaria*) and yellow iris (*Iris pseudacorus*). Both plants were introduced to North America from Eurasia.

Ship ballast may be responsible for the first introduction of purple loosestrife, but it was further spread by horticulturists for its showy flowers. Purple loosestrife reproduces by seed in great number. The seeds are small, light and easily transported with the wind. Seeds are viable for two to three years. Loosestrife rapidly germinates in sunny, wet, exposed soil areas and has the ability to form dense monospecific stands choking out native vegetation thereby reducing biodiversity. The presence of loosestrife does not always result in reduced diversity, however; some studies suggest that loosestrife can colonize and maintain high density in areas of high species richness (number of different species). Loosestrife appeared in isolated areas in Bare Hill Pond with small patches of a half dozen stems.

Similarly, yellow iris was brought to North America for its showy flowers and ability to control erosion. Yellow iris reproduces by seed and vegetatively. Iris spreads vegetatively by fragmenting its rhizomes (underground stem/root). Each one of these fragments can form a new plant. Seeds are numerous and spread by floating on water. Germination occurs in sunny, warm moist areas along the shore; too much water will limit growth. This plant can rapidly colonize the shoreline because of its effective reproductive methods. Like loosestrife, dense monospecific stands of iris can limit plant diversity. Yellow iris growth was dense in Bare Hill Pond and appears to have spread based on comparisons to visual observations from the last three years; although no quantitative measurement was conducted.

Downstream Wetland Observations:

The wetland immediately downstream of the pond contained dense healthy wetland plants. We did not walk into the wetland, but observations from the dam suggest that the hydrology of the wetland is not altered such that obligate wetland species are declining. Some species observed included bur-reed (*Sparganium sp.*), rush (*Juncus sp.*), cattail (*typha sp.*) and several sedges and grasses. We did not see any *Phragmites*, a species of concern of residents. Although native, cattail appears denser than in the past three years. Like yellow iris, cattail can reproduce via seeds and rhizomes and is capable of choking out sedges and other wetland plants. Cattails tolerate both flooding and drought conditions, making them well suited to rapidly increase in number with any environmental change.

There was no observable scouring or erosion at the outlet suggesting that the process of dewatering is impacting the area. The scour protection downstream of the pump house is functioning properly and does not appear to need maintenance.

Open Water Habitat:

Similar submerged and floating aquatic species were encountered as in the past. The pattern of reduced biomass of high growing plants topping out at the surface and increased coverage of low growing bottom cover species continue. Variable-leaf watermilfoil (*Myriophyllum heterophyllum*), a non-native species, was sparse in areas toured. Fanwort (*Cabomba caroliniana*) was dense in places, but a marked decline in plants reaching the water surface in the northern cove between the outlet and town beach was observed. This area contained dense mats of stonewort (*Nitella sp.*). Stonewort is a macroalga that resembles vascular plants because it appears to have stems and slender leaves. Stonewort is rarely found in the water column and stays close to the pond bottom. The plant has no roots but can anchor to the sediment via holdfast structures. This is generally a desirable species because it stabilizes sediment and withdraws nutrients from the water column, unlike vascular plants like fanwort and milfoil which primarily draw nutrients from sediment with roots and can grow to great heights reaching the water surface.

We also observed those species whose abundance has remained relatively consistent, pondweeds (*Potamogeton spp.*), bladderwort (*Utricularia spp.*), watershield (*Brasenia schreberi*), water lilies (*Nymphaea odorata* and *Nuphar variegatum*) and several others. The southern coves, however, appeared to contain less algae and water smartweed (*Polygonum sp.*). We observed a few water chestnut (*Trapa natans*) plants in the western and southwest coves. Volunteers continue to aggressively hand pull this non-native invasive species.

Water clarity was above the Massachusetts State Standard (four feet) at Bare Hill Pond with a Secchi disk transparency of seven feet. Transparencies during July and August typically range between 6.5 to 7.7 feet. Although typical, it seemed like less sediment was visible throughout the water column and less sediment accumulated on plants. Anecdotal evidence also suggests that the water appears clearer; several lake users have commented to the Committee regarding the water clarity. Clarity was markedly reduced in the southeast cove proximal to the inlet.

Potential Effects of Drawdown:

The drawdown continues to limit nuisance growth of fanwort and milfoil within the drawdown zone. These areas are not devoid of plants however, and contain dense mats of stonewort (and likely naiad but not encountered on our tour). Of concern is the continued expansion of yellow iris and cattail. It is difficult to conclude a cause and effect, but certainly these events appear correlated.

Given the dispersal mechanism of yellow iris, it is likely that the drawdown is producing fragments of rhizomes allowing additional plants to grow from each piece. Additionally, drawdowns are known to provide a competitive advantage to seed producers. The exposed drawdown zone allows unimpeded seed germination before rooted plants impacted by freezing become established. Drawdowns can also stimulate seed production.

The expansion of cattail can be attributed to both flood and drought events. Dry summers and overly wet springs like we've experienced in New England recently, could promote cattail growth. Reduced flow during refill could also exacerbate the issue. It is difficult to separate these events and conclude a cause and effect.

Given the potential expansion of cattail and iris, I suggest that we include some new observation transects/wetland plots in the 2013 (and future) plant surveys to track the growth of these species. Loosestrife should also be watched by the Committee and hand pulled where appropriate, but I do not see a need to target this species for formal tracking at this time.

It was a pleasure to accompany the Committee and Wendy on the shoreline inspection. I look forward to assisting the Committee with continuing improvements and outreach activities for Bare Hill Pond.

Sincerely,

A handwritten signature in black ink, appearing to read "W. Gendron", with a stylized, cursive script.

Wendy C. Gendron, CLM
Aquatic Ecologist/Owner

Exhibit B – Draw Down Depth Table

Date	Pond Level*	Wetland Level	Notes
9/17	21"	66"	Above average and normal Sept Level
9/20	24"	62"	1 st Board removed on 9/19
9/22	27"	59"	Board removed on 9/21
10/1	32"	62"	Home made board removed (put in by crew team?)
10/2	33"	56"	
10/8	42"	56"	
10/15	46"	53"	
10/22	50"	60"	
10/29	56"	60"	Start pump
10/30-11/3	-	-	Power Outage
11/4	56"	56"	
11/12	66"	56"	
11/19	72"	76"	Pond now below Dam
11/25	5'3"	-	Using Pipe Markers
11/30	5'2"	-	
12/1	5'4"		
12/3	5'8"		
12/10	6'3"		Heavy rain with significant pond rise during the week
12/17-1/15	7'		Hold level
1/21	6'9"		Initiate Refill
2/3	6'1"	74"	Water flowing in wetland when above 84" nadir
2/8	5'11"	78"	
2/10	5'8"	77"	
2/16	5'8"	78"	
2/18	5'7"	78"	New metal boards installed
2/25	5'1"	76"	
3/3	68"	76"	
3/10	64"	72"	
3/14	61"	71"	
3/17	60"	73"	
3/24	58"	74"	
3/29	58"	66"	
4/6	57"	64"	
4/13	56"	61"	
4/21	57"	58"	
4/23	52"	55"	2" rain
4/27	48"	59"	0.5" rain
4/28	48"	58"	Light rain
5/2	47"	70"	
5/5	46"	72"	Light rain
5/9	44"	73"	0.5" rain
5/12	41"	72"	
5/17	38"	74"	
5/26	36"	72"	0.5" rain
6/2	35"	72"	
6/3	32"	69"	rain
6/5	31"	72"	
6/9	29"	72"	
6/16	26"	73"	Some rain
6/22	25"	71"	Some rain
7/6	24"	74"	
7/20	29"	77"	
7/29	29"	75"	
8/10	30"	73"	1" rain
8/19	27"	74"	1-2" rain

*When measured in inches (depth from top surface of dam), when measured in feet and inches, using the marker on the pipe which is actual draw down depth.

Bare Hill Pond Nutrient Sampling July 2011



Prepared by:

United States Environmental Protection Agency,
New England Region
Office of Environmental Measurement and Evaluation
Ecosystem Assessment Unit
11 Technology Drive
North Chelmsford, Massachusetts 01863

Prepared for:

Bruce Leicher
Bare Hill Pond Watershed Management Commission
Town of Harvard
99 Ann Lee Road
Harvard, MA 01451

Sig M'Carthy 1/4/12
Prepared by Date

Diana Santoro 1/4/12
Reviewed by Date

Katrina 1/5/12
Approved by Date

BACKGROUND

The need for the monitoring of Bare Hill Pond is described in the associated *319 Grant Sampling Protocol* and has four overall objectives:

1. To provide data to evaluate effectiveness of 319 grant projects implemented in Bare Hill Pond
2. To provide data to determine if a water body should be listed as Category 4 or 5 on the Integrated List of Waters
3. To provide data that is consistent with existing MassDEP and EPA requirements and guidance while allowing for innovative solutions to limited resources for assessment
4. To provide data that may be used by MassDEP to develop protocols and standards for delisting water bodies that meet Massachusetts Water Quality Standards.

Bare Hill Pond in Harvard is listed as a Category 5 water body for non-native aquatics plants and classified as a Class B water body suitable for secondary contact recreation use. It was listed on the Massachusetts Integrated List of Waters in 1998 following the Diagnostic/Feasibility Study of Whitman and Howard (1987). Subsequent to the 1998 listing, a TMDL for Phosphorus (DEP, DWM TMDL Report MA81007-1999-001) was created for Bare Hill Pond. The 1999 TMDL described the testing activity that precluded its creation:

*The Massachusetts Division of Water Pollution Control (MDWPC) conducted a baseline survey of the pond in 1983. Their findings suggest that the pond is mesotrophic, displaying elevated nutrient levels and moderate hypolimnetic dissolved oxygen concentrations and transparency. However, a more detailed analysis is presented in the Diagnostic/Feasibility report of Whitman and Howard (1987), which concludes that in terms of phosphorus concentrations and macrophyte growth, the pond is eutrophic. The Whitman and Howard (1987) report shows the lake to have very dense or moderately dense aquatic vegetation over about 40-45 percent of the lake area, mostly in protected shallow coves and bays. *Myriophyllum heterophyllum* (Watermilfoil) is the dominant species, followed by *Polygonum* sp. and *Brasenia schreberi*. Recent surveys in 1998 by DEP staff and by ENSR (1998) reported slightly less extensive plant coverage (about 30%), but noted the presence of the non-native water chestnut (*Trapa natans*), as well as Fanwort (*Cabomba caroliniana*) which adds to the problem. The pond was listed on the 1998 Massachusetts 303d list for Nuisance Aquatic Plants (DEP, 1998).*

ENSR completed in-lake vegetative assessments for the Bare Hill Pond Watershed Management Committee in 1998 and 2001 and completed in-lake macrophyte and water quality surveys in 2004 and 2006. Sampling will allow a reassessment of the original listing and provide a quantitative evaluation of the effectiveness of nonpoint pollution reduction BMPs installed with 319 grant funds.

SAMPLING

The 2011 monitoring focused on obtaining water quality information from Bare Hill Pond (Segment MA81007). This will build on sampling of Bare Hill Pond that supported its listing on the Massachusetts Integrated List of Waters in 1998; and 1999 TMDL for Phosphorus.

The specific objectives of this monitoring were to:

- Evaluate the pond to determine if Massachusetts's water quality standards are met
- Provide data to determine if Bare Hill Pond should be delisted from Category 5 of the Massachusetts Integrated List of Waters
- Provide data in support of the phosphorus TMDL

Table 1. Sampling and Analytical Summary Table (for aquatic samples)

Parameter	Matrix	Sample # (field QC)	Name of Analytical Laboratory	Analytical Methods	Sampling SOPs	Container	Preservation	Maximum Holding Time
Total Phosphorus	Water	5 (1)	OEME Lab	EIASOP- INGIC11	ECASOP- Ambient Water Sampling 2	250 ml HDPE	1-6 C	48 hrs
Ortho-phosphate	Water	5 (1)	OEME Lab	EIASOP- INGIC11	ECASOP- Ambient Water Sampling 2	250 ml HDPE	1-6 C	48 hrs

All nutrient sampling took place on July 19th, 2011. Mark Mattson, MA DEP, performed a vegetation survey and Liz McCarthy, EPA, collected water samples. Total phosphorous and ortho phosphorous were the analytes being measured. For the most part, sample locations were chosen randomly although it was suggested to sample at a recreational ski run area. All five samples collected were surface grab samples during dry weather. The map in Figure 1 illustrates sample locations and in-situ sample collection information is provided in Table 2.

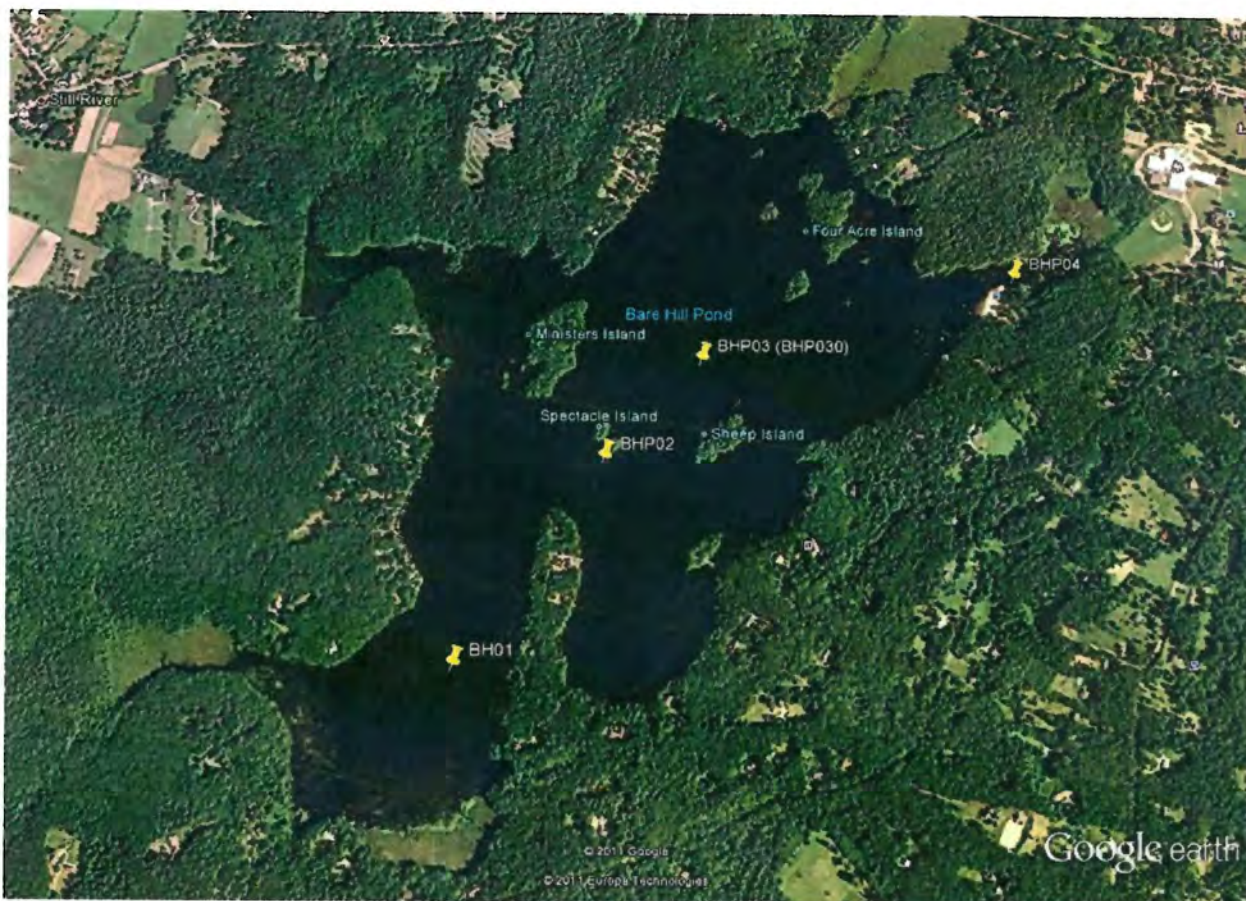


Figure 1. Site Map

Table 2. Sample Collection Information

Site ID	Date	Time	N	W	Comments
BH01	7/19/2011	14:29	42° 29.003	71° 36.001	@ Southern end of ski run
BHP02	7/19/2011	14:48	42° 29.292	71° 35.892	Spectacle Island
BHP03	7/19/2011	15:06	42° 29.450	71° 35.796	Mid lake
BHP030	7/19/2011	15:06	42° 29.450	71° 35.796	Duplicate of BHP03
BHP04	7/19/2011	15:15	42° 29.685	71° 35.342	North Bay

2011 RESULTS AND CONCLUSIONS

Based on the laboratory results, both total and ortho phosphorous are markedly lower than years prior. The usage of this data will be determined by Bare Hill Pond Watershed Management Committee in support of Bare Hill Pond's Phosphorous TMDL.

Please see the attached for OEME laboratory results. If there are any questions, Liz McCarthy can be contacted at 617-918-8342 or at mccarthy.liz@epa.gov.



United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Results

August 2, 2011

Liz McCarthy - ECA / OEME
US EPA New England R1

Project Number: 11070038
Project: Bare Hill Pond - Harvard, Ma
Analysis: Total Phosphorus in Water as P
Analyst: Inna Germansderfer 8/2/11

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-INGTP9.

The SOP is based on the Lachat Method 10-115-01-1-F and EPA method 365.1 "Determination of Phosphorous by Semi-Automated Colorimetry", Revision 2.0, August 1993 .

The method used for digestion of soil samples was developed at NERL.


Samples were analyzed on a Lachat Automated Ion Analyzer.

Date Samples Received by the Laboratory: 07/19/2011

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

 8/3/11
Daniel N. Boudreau
Chemistry Team Leader

US ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND LABORATORY

Bare Hill Pond - Harvard, Ma

Total Phosphorus in Water as P

Matrix: Water

Sample Number	Lab ID	Collected	Extracted	Analysis	Concentration ug/L	RL ug/L	Qualifier
BH01	AB19703	07/19/2011	07/25/2011	07/26/2011	7.0	5	J
Comments: J- closing CCV was not run with this set of 10 samples due to mistake in the sequence. Rest of all QC samples came within SOP acceptance range.							
BHP02	AB19704	07/19/2011	07/25/2011	07/26/2011	5.6	5	J
Comments: J- closing CCV was not run with this set of 10 samples due to mistake in the sequence. Rest of all QC samples came within SOP acceptance range.							
BHP03	AB19705	07/19/2011	07/25/2011	07/26/2011	8.6	5	
Comments:							
BHP03D	AB19706	07/19/2011	07/25/2011	07/26/2011	11	5	
Comments:							
BHP04	AB19707	07/19/2011	07/25/2011	07/26/2011	12	5	
Comments:							
Blank			07/25/2011	07/26/2011	ND	5	
Comments:							

US ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND LABORATORY

MATRIX SPIKE (MS) RESULTS

Bare Hill Pond - Harvard, Ma

SAMPLE ID	PARAMETER	SPIKE ADDED ug/L	SAMPLE CONCENTRATION ug/L	MS CONCENTRATION ug/L	MS % REC	QC LIMITS (% REC)
AB19705	Total Phosphorus in Water as P	97.8	8.64	113	106.7	85 - 115

Comments:

MATRIX SPIKE DUPE (MSD) RESULTS

SAMPLE ID	PARAMETER	MSD SPIKE ADDED	MSD CONCENTRATION ug/L	MSD % REC	RPD %	QC LIMITS RPD
AB19705	Total Phosphorus in Water as P	97.8	119	113	5	20

Comments:

Laboratory Duplicate Results

SAMPLE ID	PARAMETER	SAMPLE RESULT ug/L	SAMPLE DUPLICATE RESULT ug/L	PRECISION RPD %	QC LIMITS (%RPD)
AB19704	Total Phosphorus in Water as P	5.58	5.6	0	20

Comments:

Laboratory Fortified Blank (LFB) Results

SAMPLE ID	PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
AB19705	Total Phosphorus in Water as P	97.8	98.2	100.4	90 - 110

Comments:



CHAIN OF CUSTODY RECORD

1-17389



United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Results

July 25, 2011

Liz McCarthy - ECA / OEME
US EPA New England R1

Project Number: 11070038
Project: Bare Hill Pond - Harvard, Ma
Analysis: Ortho Phosphate in Water as P
Analyst: Bhavita Patel

B. P. 7/25/11

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-INGTP9.

The SOP is based on the Lachat Method 10-115-01-1-B and EPA method 365.1 "Determination of Phosphorous by Semi-Automated Colorimetry", Revision 2.0, August 1993 .

Samples were analyzed on a Lachat Automated Ion Analyzer.

Date Samples Received by the Laboratory: 07/19/2011

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Daniel N. Boudreau 8/2/11
Daniel N. Boudreau
Chemistry Team Leader

US ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND LABORATORY

Bare Hill Pond - Harvard, Ma

Ortho Phosphate in Water as P

Matrix: Water

Sample Number	Lab ID	Collected	Analysis	Concentration ug/L	RL ug/L	Qualifier
BH01 Comments:	AB19703	07/19/2011 14:29	07/21/2011 8:47	ND	5	
BHP02 Comments:	AB19704	07/19/2011 14:48	07/21/2011 8:48	ND	5	
BHP03 Comments:	AB19705	07/19/2011 15:06	07/21/2011 8:49	ND	5	
BHP03D Comments:	AB19706	07/19/2011 15:06	07/21/2011 8:50	ND	5	
BHP04 Comments:	AB19707	07/19/2011 15:15	07/21/2011 8:54	ND	5	
Blank Comments:			07/21/2011 8:46	ND	5	

US ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND LABORATORY

MATRIX SPIKE (MS) RESULTS

Bare Hill Pond - Harvard, Ma

SAMPLE ID	PARAMETER	SPIKE ADDED ug/L	SAMPLE CONCENTRATION ug/L	MS CONCENTRATION ug/L	MS % REC	QC LIMITS (% REC)
AB19706	Ortho Phosphate in Water as P	97.8	ND	93.7	95.8	85 - 115

Comments:

MATRIX SPIKE DUPE (MSD) RESULTS

SAMPLE ID	PARAMETER	MSD SPIKE ADDED	MSD CONCENTRATION ug/L	MSD % REC	RPD %	QC LIMITS RPD
AB19706	Ortho Phosphate in Water as P	97.8	94.6	96.7	1	20

Comments:

Laboratory Duplicate Results

SAMPLE ID	PARAMETER	SAMPLE RESULT ug/L	SAMPLE DUPLICATE RESULT ug/L	PRECISION RPD %	QC LIMITS (%RPD)
AB19706	Ortho Phosphate in Water as P	ND	ND	NC	20

Comments:

Laboratory Fortified Blank (LFB) Results

SAMPLE ID	PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
AB19706	Ortho Phosphate in Water as P	97.8	95.9	98.1	90 - 110

Comments:



CHAIN OF CUSTODY RECORD

1-17389

Location Ten 100' Segment Sites

WILDLIFE, HABITAT AND VEGETATIVE ASSESSMENT
OF BARE HILL POND, HARVARD (MA)

ENSR
ENVIRONMENTAL
NATURAL SCIENCE
RESEARCH

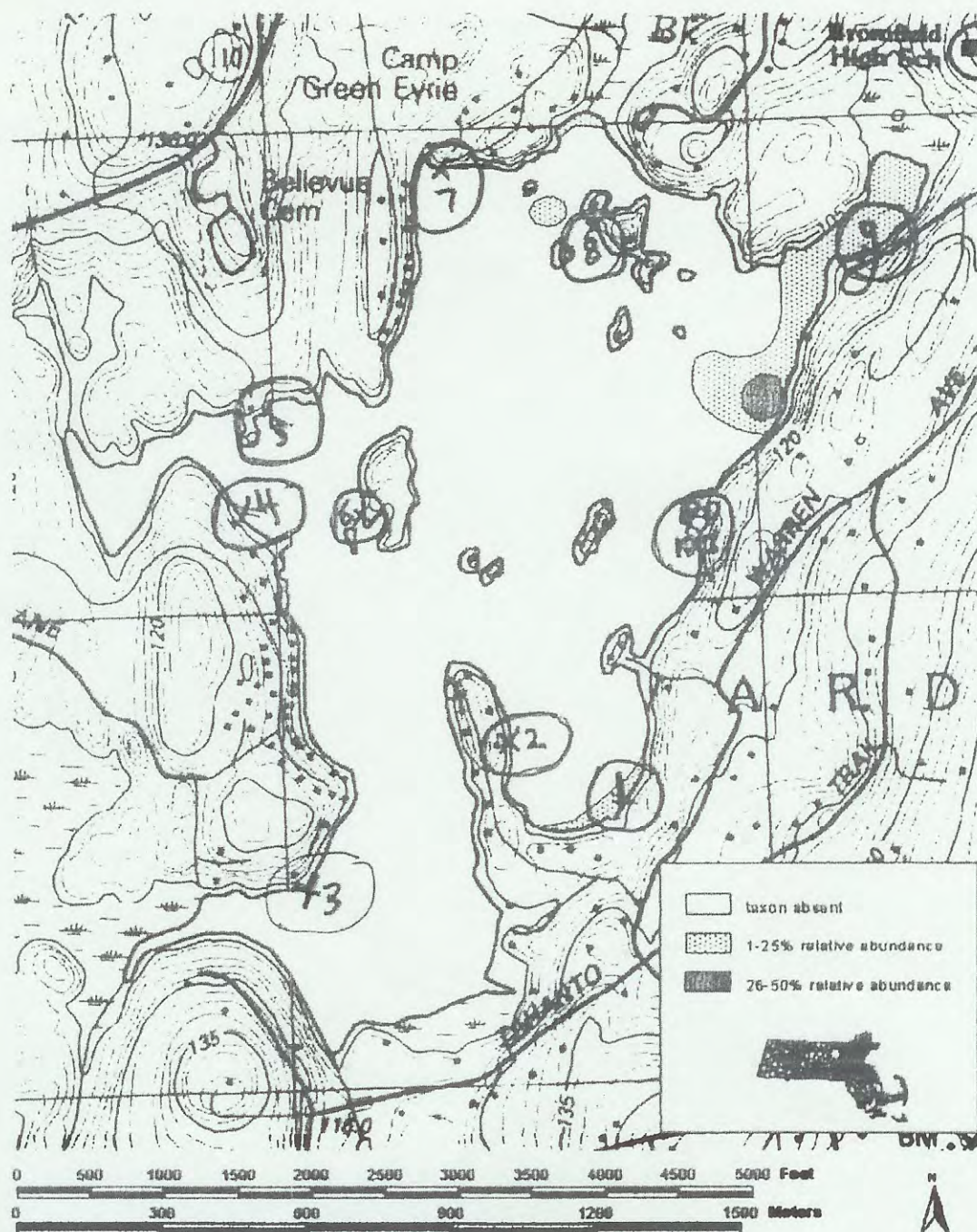


Figure 5. Distribution and relative abundance of fanwort (*Cabomba caroliniana*) in Bare Hill Pond in October 2001, from data in Appendix A.









