

**TOWN OF HARVARD  
CONSERVATION COMMISSION AGENDA  
THURSDAY SEPTEMBER 7, 2023 @7:00PM**

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Pursuant to Chapter 2 of the Acts of 2023, An Act Making Appropriations for the Fiscal Year 2023 to Provide for Supplementing Certain Existing Appropriations and for Certain Other Activities and Projects, and signed into law on March 29, 2023, this meeting will be conducted via remote participation. Interested individuals can listen in and participate by phone and/or online by following the link and phone number below.

Hildreth Pro is inviting you to a scheduled Zoom meeting.

Join Zoom Meeting

<https://us02web.zoom.us/j/86911547939?pwd=L0NYZkhaM0NmMWkxOTRyeE81SDFmdz09>

Meeting ID: 869 1154 7939

Passcode: 415380

One tap mobile

+13052241968,,86911547939# US

+13092053325,,86911547939# US

Dial by your location

- +1 305 224 1968 US
- +1 309 205 3325 US
- +1 312 626 6799 US (Chicago)
- +1 646 931 3860 US

Meeting ID: 869 1154 7939

Find your local number: <https://us02web.zoom.us/u/kbjrj13xAb>

**New Business:**

1. Harvard Conservation Trust Request for the use of Conservation Land for the "Run for the Hills" Event
2. Review Input from Deer Management Annual Process and Procedures
3. Bare Hill Pond Watershed Management Committee Annual Report and Drawdown Request
4. Executive Session with Open Space Committee pursuant to Massachusetts General Law Chapter 30A, Section 21(a)(6) to consider the purchase, exchange, lease or value of real property because a public discussion of this matter could have detrimental effects on the negotiating position only to return to the open session of the public meeting
5. Discuss Wetland Violation – 19 Warren Ave
6. Harvard Climate Initiative Committee 2023/2024 Collaboration and Liaison
7. Approve Minutes
8. Approve Invoice – Oxbow Associates, \$525.00

**Public Hearings:**

- 7:30pm **Continuation of a Notice of Intent Hearing – Bare Hill Pond Watershed Management Committee, DEP#177-726, Harvard#0523-03**, for the drawdown of Bare Hill Pond in accordance with the Massachusetts Lake & Pond General Environmental Impact Report to control phosphorus and invasive plant species
- 7:45pm **Continuation of a Notice of Intent Hearing - John & Laura Hunt, 61 Stow Road, Harvard#0823-04**, for the addition of deck, porch, and patio to an existing single-family dwelling within the 200' riverfront area
- 8:00pm **Notice of Intent Hearing - Rachel Broadhurst, 41 Pinnacle Road, Harvard#0823-03**, for the construction of a paddock within 100' of a wetland resource area and the restoration of the resource area after enforcement
- 8:15pm **Request for Determination of Applicability Hearing – Girl Scouts of Central & Western Massachusetts, 69 Still River Road, Harvard#0823-05**, for the installation six-tiered seating and improvements to existing amphitheater within 200' of Bare Hill Pond

The listing of matters are those reasonably anticipated by the chair which may be discussed at the meeting. Not all items listed may in fact be discussed and other items not listed may also be brought up for discussion to the extent permitted by law.

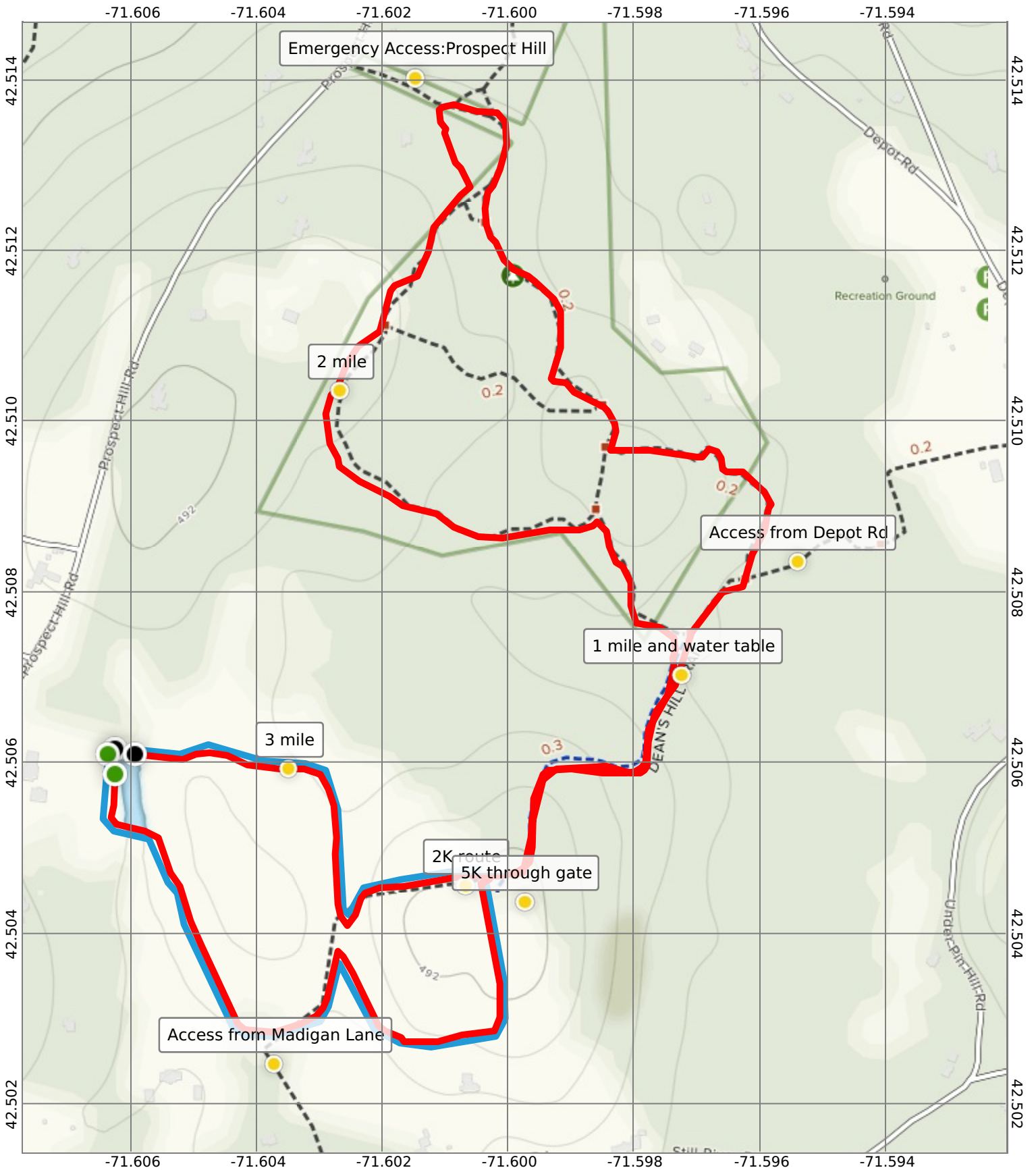
8:30pm **Abbreviated Notices of Intent Hearing – Harvard Conservation Commission, Mass Ave (Map 23 Parcel 35) and Stow Road (Map 32 Parcel 55), Harvard#0823-01 & 02**, for the management of invasive plant species within wetland resource areas and their associated buffer zone

**Old Business:**

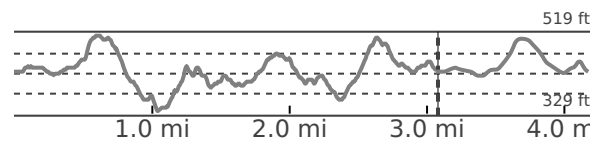
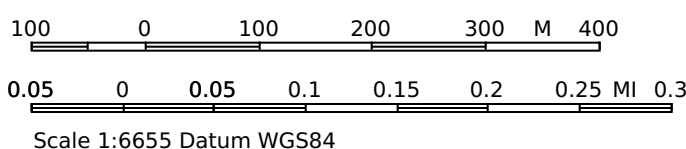
1. Discuss Land Stewardship Subcommittee Recommendations for Additional Deer Management Program  
Lands: Tripp Land, Stephenson West, Old Mill Land, Abbot-Reed-Powell Land, Clapp-Scorgie-Smith-Tufts Land, Gravel Pit and Warilla Land
2. ZBA Request for Comments – Village at Robin Lane (corner of Ayer & Old Mill Road)
3. Update on Enforcement Order – 320 Ayer Road
4. MEPA Site Walk and Remote Meeting Aug 30- Park at Beaver Brook
5. Update Pine Hill Village Status
6. Update on 90 Warren Ave, DEP#177-719, Harvard#1122-02

**NEXT MEETING: SEPTEMBER 14, 2023**

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14.5°W  
10/12/18



**Harvard Conservation Commission**  
**Policies and Procedures for Deer Management Subcommittee**  
**Approved: xx/xx/xxxx**

These policies and procedures outline the mechanisms by which the Deer Management Subcommittee (DMS) operates within the Conservation Commission (ConCom):

1. **Meetings:** a regularly-scheduling meeting date and time will be established; agendas and minutes will follow MA Open Meeting Law Regulations, 940 CMR 29.00.
2. **Communications:**
  - a. All communications with ConCom shall be conveyed to the Conservation Agent;
  - b. All communications from DMS with other Town of Harvard committees, subcommittees, commissions, staff, and officials shall be copied to the Conservation Agent;
  - c. Weekly reports on program shall be provided electronically between the start and end dates of state-permitted hunting in zones 9 and 10, including deer harvested, deer shot and not recovered, and parcels for both; and copy of complete hunter log data to date.
3. **Record-keeping:** all information collected by DMS, including but not limited to information on individuals participating in DMS-sponsored programs, shall be provided to the Conservation Agent for storage electronically on town-maintained computer servers and/or in hard copy in town files. This information includes but is not limited to:
  - a. The annual deer hunt logs;
  - b. Hunt participants' information including: name, address, date of birth, phone number (cell and/or land line), email address, copy of MA hunting license number, verification of archery deer season stamp, and antlerless deer permit(s), license plate number for vehicle to be parked at any parcels included in program, date of qualification test for Harvard program; and
  - c. All program records from qualification testing including requirements for qualification, dates and results of all tests conducted and person certifying results.
  - e.d. Add description of how the participant's personal data will be stored by the Town of Harvard.
4. **Equipment:** all equipment purchased by the ConCom for use in Deer management program shall be stored at the ConCom town office when not in use by the DMS.
5. **Hunter qualification testing:**
  - a. A member of the DMS and a DMS designee the Rangemaster of the club at which testing occurs shall be present at all qualifying tests;
  - b. Each participant shall have a poundage-pull check on each of their bows per MassWildlife regulations; and
  - c. Participants shall be required to hit a six-inch round target at 25 yards with at least three of five arrows
6. **Annual Checklist (first developed for 2022; see attachment A):** shall be updated no later than March 31<sup>st</sup> of each year; all tasks assigned to DMS will be confirmed completed by date indicated via communication with Conservation Agent.
7. **Mission:** DMS will report to the ConCom annually on progress toward the stated mission of the subcommittee specifically addressing:
  - a. Investigating options for monitoring and managing the population of deer in Harvard with the goal of protecting the ecological integrity of its forests;
  - b. Setting up the necessary structure to safely implement, supervise, and evaluate an ongoing deer management program;
  - c. Pursuing the MA Fish and Wildlife (now MassWildlife) goal for this region of 12-18 deer per square mile.

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

August 28, 2023

Conservation Commission  
Town of Harvard  
Town Hall  
Harvard, MA 01451

Re: 2022-23 Drawdown Report and Fall 2023 Drawdown Plans

Dear Commissioners:

On behalf of the Bare Hill Pond Watershed Management Committee, we are pleased to submit our 2023 annual report. The accompanying professional water quality assessment report and the invasive species monitoring survey was prepared by Wendy Gendron at ARC as in prior years. She completed her last data collection this past week. Ms. Gendron will also join us in addressing the outstanding questions pertaining to the Notice of Intent Filing. A copy of the response to DEP questions regarding the Notice of Intent filing was submitted last week. We have invited Ms. Gendron, to join us for the September 7, 2022 Commission Meeting. She has reviewed the monitoring activities over the past 10-15 years. We believe that the data continues to support an annual draw down. The control of the phosphorous continues to be very important to the maintenance of the health of Bare Hill Pond..



In summary, our observational data continues to provide us with useful information about the watershed to guide us in protecting the watershed. This year, as reported in December, we had an excessive draw down to approximately 7.5 feet due to operator error. A corrective action plan was put in place as discussed last December with the Commission. With a permanent steel apparatus now know to be present at the 6.5 foot level, the risk of an overshoot will be eliminated if the depth markers on the pipe are ever dislodged in the future.

The Pond refilled starting in November, as reported, and continued to refill above five feet during the winter freeze. This was due to a malfunction in a valve that prevented the pump from holding the level at 6.5 feet during December and January. The valve was repaired in early Spring. The Pond was full in March. While the draw down is likely to have reduced phosphorous levels in the water column, there was a limited freeze until January when the level was too high to be effective, and invasive species expanded this year with a healthy growth spurt. A draw down in the coming winter will be important to bring the invasive species back into control.

Recall that 2018-19, the drawdown was 4.5 feet due to heavy rainfall, limiting its impact significantly. In 2019-20, we achieved a 6 foot draw down but it had limited in impact due to weather on invasive resurgence but did appear to reduce the phosphorous to the prior year's level.

In 2020-21 the draw down of 6.5 feet was achieved and then the pump stopped in November. We had algal blooms following significant temperature rises in 2020 and 2021, but so far not this year.<sup>1</sup> .

We believe that the draw down this past year again contributed to a significant reduction in phosphorous ahead of the summer season, potentially creating greater resilience in the Pond to phosphorous in lake loading. As noted in the ARC Report, this was the case even though the levels of depleted oxygen and risks of internal loading were as high this past summer as in the years we had algal blooms. This summer like the previous two summers, temperatures were high in July, creating the risk of anoxic conditions were high, but the levels of phosphorous appeared to be lower than in the past two years and rainfall was plentiful which together may have avoided expansion of the anoxic zone. In the winters preceding the draw downs in 2020 and 2021, the draw downs were not as deep and did not last as long as their planned draw down period due to heavy rain one year in December and a pump failure the other year. While the season for algal bloom risk has not ended, we are thankfully not on the list of lakes and ponds in Massachusetts with listed cyanobacteria closures. Due to the earlier than planned refill and the absence of a very cold January this past Winter, we experienced substantial invasive plant growth.

. We continue to collaborate with the Board of Health by sharing data and samples to track cyanobacteria. We supplied samples from the depths of 20 feet and 12 feet to add to the weekly samples the Board of Health took at the Beach. While cyanobacteria was present at deeper depths, it was only present at higher levels in the 20 foot anoxic zone as of this submission and at one point in the 12 foot zone but only briefly. This is also consistent with the oxygen and phosphorous readings observed by Wendy Gendron in her report.

Our rate of draw down was normal this year and the refill was earlier this year due to the pump valve failure and regular rainfall last fall and in the winter and spring. The refill began early in December due to the pump valve malfunction and was completed in the first week of April. Attached as Exhibit A is the measurements of the draw down and refill.

The 100 feet shoreline photos of the draw down in early December are attached as Exhibit B.

In addition to the professional monitoring, we continue our volunteer monitoring program of frogs, fish, mussels and invertebrates. The Committee, now under Ben Baron's leadership, has carried out monitoring of seven frog species at three locations around Bare Hill Pond on 4 separate dates. The seven species monitored are the bull frog, green frog, wood frog, spring peeper, gray tree frog, American toad and pickerel frog. The three locations are Clapp's Brook, "tennis courts" a.k.a. beginning of Barba's Point Trail, and the end of Bowers Road (which had to be changed to Cove Drive). The four dates were 4/4/22, 5/4/22, 6/12/22 and 8/15/22. All species - except for American toads and wood frogs - were detected during monitoring. It was late in the season to capture wood frogs which were very plentiful in March. Some differences were observed this year. Greater numbers of frogs were observed in the multiple vernal pools in the

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woods adjacent to the Pond as a result of the prevalence of rain. The numbers counted in the Pond itself were reduced. This may be due to the opportunity to breed in vernal pools which have fewer predators. The frogs have been observed in their normal habitats after the breeding season during the year. See Exhibit C for the data.

Morey Kraus completed his annual turtle count this week and are attached as Exhibit D. receipt. We were particularly concerned that Turtles might have been impacted by the increase in the draw down depths for a few weeks. Morey found greater numbers of turtles this year and believes that it likely did not impact the turtle population. Informally, he has observed mostly North American Painted turtles sunning on rocks and branches and snapping turtles throughout the Pond.

Several fishing derbies registered with the Park and Recreation Commission this year and reported excellent results to us. We held a mussel count at the 5 foot stage to see if they are impacted and there continue to be many mussels as well as juveniles indicating their health.

Rick Dickson provided a report on water chestnut control to the Committee. He continues to monitor invasive water chestnut plants finding very small numbers (10's of them) which he and others pull. Due to his success over the past several years, he did not seek volunteer help for a weed pull, but just to encourage folks to pull them if they see them. The water chestnuts continue to be under control is low as reflected in how difficult it is to find them throughout the Pond.

### Draw Down Plan

Due to the growth in invasive species this summer, and the apparent avoidance of an algal bloom when there was a high algal bloom risk, we recommend a 6.5 foot draw down again. A 6.5 foot draw down would appear to be what is needed to reduce the excessive growth experienced this year and reduce to phosphorous to help avoid or delay algal blooms.

Our draw down plan would be the same plan as last year beginning on Oct 1 and would stop the pumping at 6.5 feet. If we do not achieve the 6.5 foot level by the end of November, we will stop at the level achieved. We anticipate that absence unusual precipitation or a hard freeze, we will achieve 6.5 feet by the end of November as we did last year. We continue to receive outstanding support from DPW in operating the pump and assisting with maintenance. This allowed for better timing of pumping, and reduced power costs. Assuming that there is not excessive rainfall again, the current level of the Pond should allow for a gravity draw down during most of October and then running the pump when the Pond level declines to the level of water in the wetlands. The removal of boards and the running of the pump would only occur as needed to achieve the depth targets based on the following table. Depth target is the maximum actual drawdown as of that date.

<u>Date</u>	<u>Depth Target</u> (Measured from the top surface of the dam)			
	2014	2015-19 Drawdown Depth*	2020-23 Drawdown Depth*	Actual Depth Target***
9/24	22"	22"	22"	0"
10/1	22"	34"	22"	0"
10/15	34"	46"	36"	14"
10/24	46"	52"	48"	26"
10/28	52"	56"	56"	34"
Nov 30 or freeze**	5.5' on pipe	6' on pipe	6.5' on pipe	6.5' on pipe

\* (measured from top surface of the Dam)

\*\* (measured on pipe marker)

\*\*\* (amount of water drawn down)

Currently the Pond is approximately 20" below the surface of the dam. Pumping would begin only when needed to achieve the target depth and maintain the rate during October but be necessary after reaching approximately 3 feet. The rate would not exceed 3 inches per day per the Order of Conditions but based on prior years experience, the gravity draw down rarely exceeds 2" per day and the pump is not able to pump more than 1.5" per day. We think this approach will preserve Pond levels in September and October for recreational use (including the rowing season), avoids excessive down stream flow and still achieve the beneficial draw down effects. If we are unable to achieve the 6.5 foot draw down by November 30, 2023 or a freeze occurs, we will stop and discuss it with the Commission if we have an alternative recommendation.

As in prior years, we would initiate the refill of the Pond on or before February 1, 2024 following notice to the Commission and the abutters. Because snowmelt timing is variable, it 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.



Conservation Commission

August 28, 2023

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We appreciate the time the Commission has taken, and the effort made to understand, and help manage the project. We look forward to the meeting on Thursday, September 1.

Sincerely,

A handwritten signature in blue ink, appearing to read "B. Leicher". The signature is fluid and cursive, with a long horizontal stroke extending to the left.

Bruce A. Leicher

Chair, Bare Hill Pond Watershed Management Committee

Cc: Conservation Commission Members  
Bare Hill Pond Watershed Management Committee Members  
Board of Selectmen

## Pond Draw Down and Refill Data Fall 2022 – Spring 2023

## Exhibit A

Note: 22” is average normal height of Pond (average range 16”- 28” from top surface of Dam); feet is draw down actual depth from pipe markers

<u>Date</u>	<u>Pond Level from Top of Dam</u>	<u>Wetlands Level</u>	<u>Notes</u>
9/3	35”	70”	Little rain
9/7	31”	69”	2” rain
9/10	31”	70”	No rain
9/17	32”	69”	No rain
9/23	30”	68”	1.5” rain
9/28”	30”	68”	0.5” rain
10/7	33”	56”	Board removed – Draw Down started late due to lower level of Pond
10/15	38”	53”	Board removed
10/22	46”	51”	Boards removed
10/27	53”	53”	Pump turned on 52Hz
10/29	56”	50”	52hz
11/3	68”	50”	52hz
11/5	74” ft	51”	52hz - 1 <sup>st</sup> pipe marker 4.5ft
11/11	5 feet	51”	52hz
11/22	6.5+ feet	52”	35 hz to hold the level (not really 6.5 feet) per December 22 report
11/23	7.5 feet	52”	Stopped Pump and informed Con Com of overshoot to approx. 7.5 feet
11/24	7.5 feet	60”	Pump stopped due to valve
12/2	7.25 feet	67”	Past Manhole apparatus –
12/10	7.0 feet	67”	Pump stopped
12/17	6.75 feet	64”	Pump stopped
12/23	6.25 feet	61”	Pond refilling early due to valve failure
12/31	5.5 feet	67”	Pump off
1/7	5.0 feet	67”	Pump off
1/16	4.5 feet	55”	Pump off
1/21	4.75	64”	Pump on to hold level
1/28	60” (3.8 feet)	62”	Pump off (end of draw down period)
2/7	52”	66”	Cold and warm up
2/18	48”	60”	Cold freeze
2/25	43”	63”	Warm and rain

Conservation Commission

August 28, 2023

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3/10	34"	62"	
3/18	22"	61"	12" snow and melting- Pond full
3/24	18"	57"	
4/1	17"	56"	
4/7	19"	57"	Heavy overflow
5/1	16"	51"	2" rain
6/3	22"	64"	2" rain
7/4	14"	51"	4" rain
7/8	17"	56"	0.5" rain
7/22	15"	50"	3" rain
8/13	20"	60"	High for August

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# 100' Shoreline Photos Nov 2022

## Exhibit B

Town Beach



Town Beach



# 100' Shoreline Photos Dec. 2021

## Exhibit B

Small Point South of Beach Opposite Sheep Island



Small Point South of Beach Opposite Sheep Island



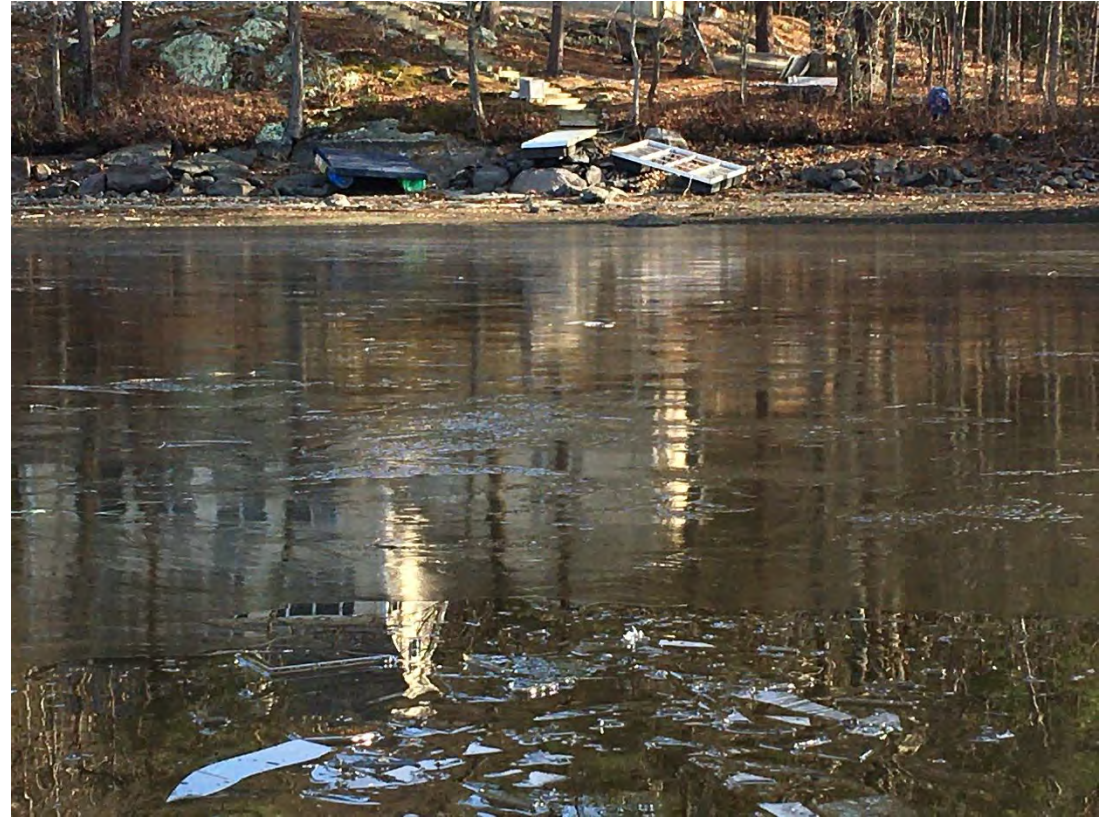
# 100' Shoreline Photos Dec. 2021

## Exhibit B

Shore in Thurston Cove



Shore in Thurston Cove



# 100' Shoreline Photos Dec. 2021

## Exhibit B

NE shore next to Thurston Cove



NE Shore next to Thurston Cove



# 100' Shoreline Photos Dec. 2021

## Exhibit B

Peninsula NE Side



Peninsula NE Side





# 100' Shoreline Photos

South end of Clinton Shore (Cove Road)



South end of Clinton Shore (Cove Road)



# 100' Shoreline Photos

Clapps Brook



Clapps Brook Minister Island



# 100' Shoreline Photos

Tuner Lane Cove Next to Girl Scout Camp



Turner Lane Cove Next to Girl Scout Camp



# 100' Shoreline Photos

Four Acre Island



Four Acre Island



# Picture of the Heron nesting on the Pond





## TOWN OF HARVARD

## BARE HILL POND WATERSHED MANAGEMENT COMMITTEE

### Frog Count 2023

The Frog Count for 2023 was lower than we have seen in past years. We believe that the drought from 2022 had an impact on the health of the frogs. While the greatly increased rainfall in spring 2023 caused the frogs to migrate out of the pond and into traditional vernal ponds. The Watershed Management Committee locations for counting frogs are focused on the pond. The majority of those vernal pools were dry last year. While the frog count numbers are down this year on paper. There is a possibility the frogs migrated to homes in the overflow vernal pools.

Date	Location	Bull	Green	Wood	Spring Peeper	Gray tree	American toad	Pickereel	Comment	time
4/13/2023	tennis courts				10				Heard Peeper in parking lot	7:30
4/13/2023	clapp's brook				0				not done- too few frogs	7:01
4/13/2023	bowers rd(cove drive)				0				not done - too few frogs	7:30
5/15/2023	tennis courts				10				Little to no frogs	7:30
5/15/2023	clapp's brook				Chorus			26		8:20
5/15/2023	bowers rd(cove drive)	20			Chorus			96		9:00
6/14/2023	tennis courts								Help from Brian	8:43
6/14/2021	clapp's brook	12	120					28	Sounds from pool near us	9:04
6/14/2023	bowers rd(cove drive)				192			60		9:34
7/24/2023	tennis courts								LoudP ickle ball game	8:53
7/24/2023	clapp's brook	8	20						Warm night	9:16
7/24/2023	bowers rd(cove drive)	10	5					16		9:42
8/6/2023	tennis courts					10			Cool evening	8:15
8/6/2023	clapp's brook	3	18						Cool evening	8:35
8/6/2023	bowers rd(cove drive)								Bug drama- did not go	

2023 Bare Hill Pond Turtle Report

Day/Date/Time: Thurs, Aug 3<sup>rd</sup>, 2023 between 12:50-2:00PM

Weather – sunny to partly cloudy, light breeze, water is still high water from unusually rainy season.

Note – Last fall-winter’s drawdown experienced an overshoot which led to exposure of mud bottom where turtles hibernate. They need mud covered with water, so they don’t freeze. I believe the water level last season was naturally restored prior to a significant freeze, but I was concerned. Happily, the turtles were abundant and looked great this year.

Method – same as pervious years.

Track and Observations: Similar route although I only had time to do from the shoreline across from the Town beach to just beyond the Girl Scout’s beach, including a couple of island shorelines.

The only species I saw on this day were American Painted Turtles (N=83). All appeared healthy and distributed in age/size.

The annual counting table is here updated. Also, a couple of pictures of our Bare Hill Pond friends.

Year	Painted Turtles Counted
2017	34
2018	64
2021	26
2022	39
2023	83



End 2023 Turtle Repot

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Day/Date/Time: Thurs August 25<sup>th</sup>, 2022 between 12:00PM-1:30PM

Weather – sunny, mid-80's, little to no breeze, drought year.

Method – same as previous years.

Track and Observations: Same path as previous years. This year I was not able to enter the inlet NW of the channel between Missionary Island and shore as the surface was covered extensively with Lily Pads. Most of the turtles I counted were on the NE shore. The only species I saw on this day were American Painted Turtles (N=39). All appeared healthy and distributed in age/size.

A table summarizing the number of American Painted Turtles Counted in recent years is provided below.

Year	Painted Turtles Counted
2017	34
2018	64
2021	26
2022	39

Photos available upon request.

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Day/Date/Time – Thurs September 2, **2021** between 10:30-12:00 PM

Weather – partly sunny, mid-70's, intermittent breeze out of the NE, following big Ida rain shower the previous night.

Method – Scout shoreline for fall-down branches, limbs, logs, etc. and rocks with low to the water profiles that allow quick escape for turtles when startled. Turtle shells may be shining in the light making them easy to see from 10-30 yards. Others may be showing orange/yellow markings that are visible to the trained eye for up to 50 yards. Approach the shoreline with possible subjects in a quiet drift and you may view and evaluate them from within 10 yards.

Track and Observations: Based on previous years of observation, I focused on the Northeast shoreline shown below on the map (black=2021). The North American Painted Turtles (N=26) were the only turtles I saw on this outing. No box-like turtles (Musk) as seen last year. I did see an ~10" Snapper on Pond Road in late July. All the turtles I saw had good healthy appearances based on their intact shells and vibrant red and orange markings.

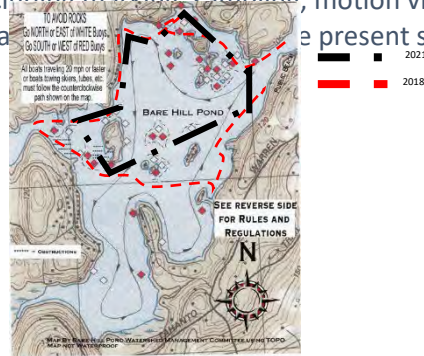
Comparisons: In 2018 I saw 64 Painted Turtles and 3 Musk Turtles and in 2017 I saw 34 Painted Turtles.

Year	Painted Turtles Counted
2017	34
2018	64
2021	26



As indicated on the map below my route in 2021 was ~60% of the shoreline I covered in 2017 and 2018. The 2021 survey was also earlier in the day, cloudy and the day following a large amount of rain (Hurricane Ida). The water level in the pond was very high for August/September as evidenced by the photo of the damn on the day of the survey. This high level appears to have decreased the amount of sunbathing habitat along the shore and on shallow stone outcrops offshore. Finally, the vegetative growth in the pond was very thick in some areas. This factor made it difficult to approach certain habitats for inspection due to significant drag on the bottom of the kayak, which makes noise and scares subject turtles to slip into the water before they can be confidently sighted. Given these factors I do not believe there is a significant difference in the Bare Hill Pond turtle population between 2017 and 2021, the three years I have conducted this survey. More quantitative techniques that would allow formal year-to-year comparisons including marking, sampling, motion videography, or others, could be considered in the future but are beyond the scope of the present study.

2021 route of survey:



Photos:

Weather was cloudy and in the 70's



The morning following Hurricane Ida rains and previous rains throughout the summer, evidenced by the high-water mark at the damn on the day of this survey.



One of our resident Eagles overlooking this year's survey - always a good sign relating to the health of the pond ecosystem – even knowing we are also experiencing a significant algae bloom.



3 of our resident North American Painted turtles sharing a log. Notice the healthy gleam on the turtle's shell.



A handful of sunbathers. Notice the distribution of individual sizes.



More turtles.



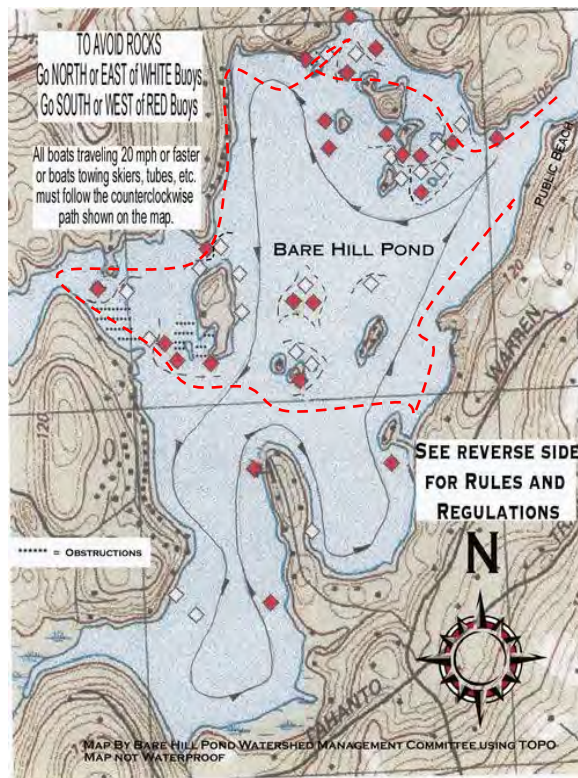
Parting shot.



Day/Date/Time - Sat Aug 19, **2018** between 1:00-3:00 PM  
Weather – sunny, mid-70's, steady breeze out of the NE

Method – Scout shoreline for fall-down branches, limbs, logs, etc. and rocks with low to the water profiles that allow quick escape for turtles when startled. Turtle shells may be shining in the light making them easy to see from 10-30 yards. Others may be showing orange/yellow markings that are visible to the trained eye for up to 50 yards. Approach the shoreline with possible subjects in a quiet drift and you may view and evaluate them from within 10 yards.

Track and Observations: I have had best results on the North by Northeast shoreline starting across from the town beach boat launch. Turtles I have seen by this method include primarily the North American Painted Turtle (N=64) and several box like turtles presumed to be Musk Turtles (N=3) based on photographic identification (see below last two photos). I have seen large Snappers from time to time but not on this out.



The sighted turtles ranged in normal size distribution from palm-to-hand sized with only one individual on each end of the spectrum. Smaller subjects may not survive to late August. Seasonal counts might be recommendable in the future to better understand the maturation rate of the species in Bare Hill Pond. All of the subjects appeared healthy. Brightly orange bottoms, yellow masking, and intact scales on their shells. Representative photos are below.





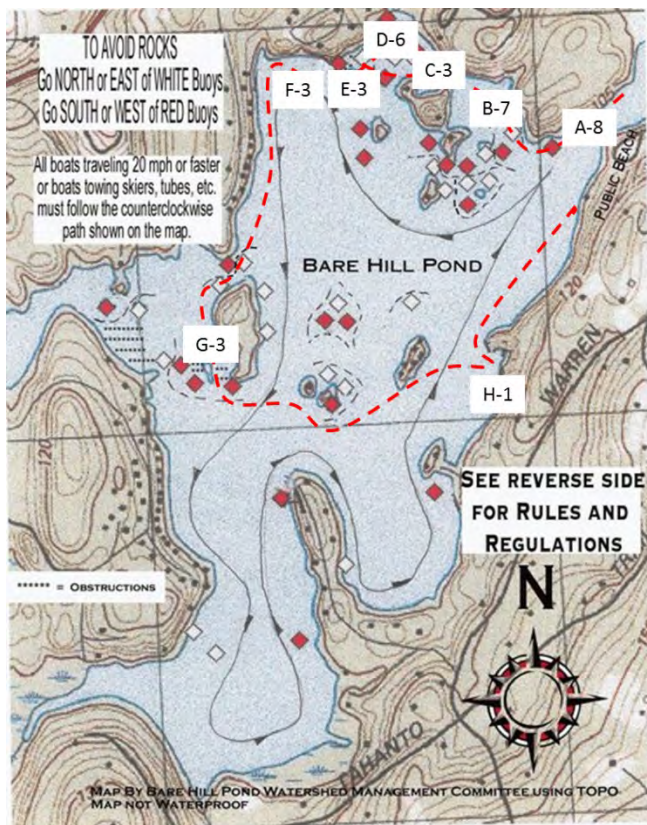


Day/Date/Time - Sat Aug 12, 2017 between 2:00-4:00 PM

Weather – mix of clouds and sun, low 80's

Method – Scout shoreline for fall-down branches, limbs, logs, etc. and rocks with low to the water profiles that allow quick escape for turtles when startled. Turtle shells may be shining in the light making them easy to see from 10-30 yards. Others may be showing orange/yellow markings that are visible to the trained eye for up to 50 yards. Approach the shoreline with possible subjects in a quiet drift and you may view and evaluate them from within 10 yards.

Track and Observations: I have had best results on the North by Northeast shoreline starting across from the town beach boat launch. I suspect this is because this shoreline sees maximum day long sun but do not know this to be the case, but I have not confirmed this as a fact. I have seen turtles on the other side of the pond but have not formally counted them. Turtles I have seen by this method have been exclusively North American Painted Turtles. I have seen large Snappers from time to time. And, also saw a clutch of baby Snappers along the shoreline of my property on the West by Southwest side of the pond. I proceeded counterclockwise as shown by the red dashed line on the map below. Designated on the map are the areas (A-H) I spotted and enumerated a total of 34 North American Painted turtles. Continued below...



The sighted turtles ranged in normal size distribution from palm-to-hand sized with only one individual on each end of the spectrum. Smaller subjects may not survive to late August. Seasonal counts might be

recommendable in the future to better understand the maturation rate of the species in Bare Hill Pond. All of the subjects appeared healthy. Brightly orange bottoms, yellow masking, and intact scales on their shells. Representative photos are below.



Typical North American Painted turtle at Bare Hill Pond.



Clutch of N.A. Painted turtles on log. Note closeness to water line.



Two turtles sunning. Note healthy shell scaling.





Above 2 photos of a baby Snapper found walking on my shoreline were taken in May.

Additional field note:

While counting another kayaker told me she had seen an adult bald eagle that afternoon. I saw an adult bald eagle at the pond in early spring right after the thaw.



## Report For:

Town of Harvard  
Bare Hill Pond Watershed Management Committee  
Harvard Massachusetts

# Bare Hill Pond In-Lake Water Quality and Plant Survey - 2023



**Prepared by:**  
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*August 2023*

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## Introduction

Aquatic Restoration Consulting, LLC (ARC) performed in-lake water quality monitoring and an aquatic plant survey within Bare Hill Pond in 2023. The intent of these surveys was to document 2023 summer conditions and compare these data to previous years, identifying any trends or concerns. This year we continued the expanded water quality monitoring program that was implemented in 2022. The expanded program adds the months of April, August, September, and October and three monitoring stations. The intent of the monitoring program expansion is to record temperature and dissolved oxygen depth profiles and measure phosphorus concentrations near the sediment during multiple seasons. We will utilize these data to evaluate the potential of phosphorus loading from sediments, which may be fueling the recent algal blooms, experienced in 2020 and 2021. Not all date and stations are sampled. The decision to include/exclude is made by scientist based on prior data. For example, the scientist may skip the October sampling if the lake has already undergone destratification and is in a completely mixed state.

The Bare Hill Pond Watershed Committee (Committee) has conducted winter water level drawdowns periodically since 2002. Early drawdowns were limited to the depth of the outlet (3.5-foot drawdown) but the installation of a pump system enables the Committee to increase the drawdown depth. Substantial reductions in plant cover and density were observed in association with initial extended water level drawdowns and these conditions have remained consistent following subsequent drawdowns. A shift in species dominance from tall growing vegetative propagators (spread through fragmentation or by rhizomes) to low growing seed producers was observed. A history of drawdown depth and summary of conditions reported by the Committee is provided in Table 1.

Given that non-native species growth regains community dominance in shallow water following cessation of winter water level drawdown<sup>1</sup> and the potential benefit of improved flushing (removing accumulated phosphorus), the Committee wishes to continue the drawdown program for nuisance aquatic plant management. This report summarizes data collected in 2023 and provides a comparison over several years, with an emphasis on the comparison within the last five years.

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<sup>1</sup> see comparison of 2014 data vs data post drawdown in prior reports (<https://www.harvard.ma.us/bare-hill-pond-watershed-management/pages/annual-other-reports>)

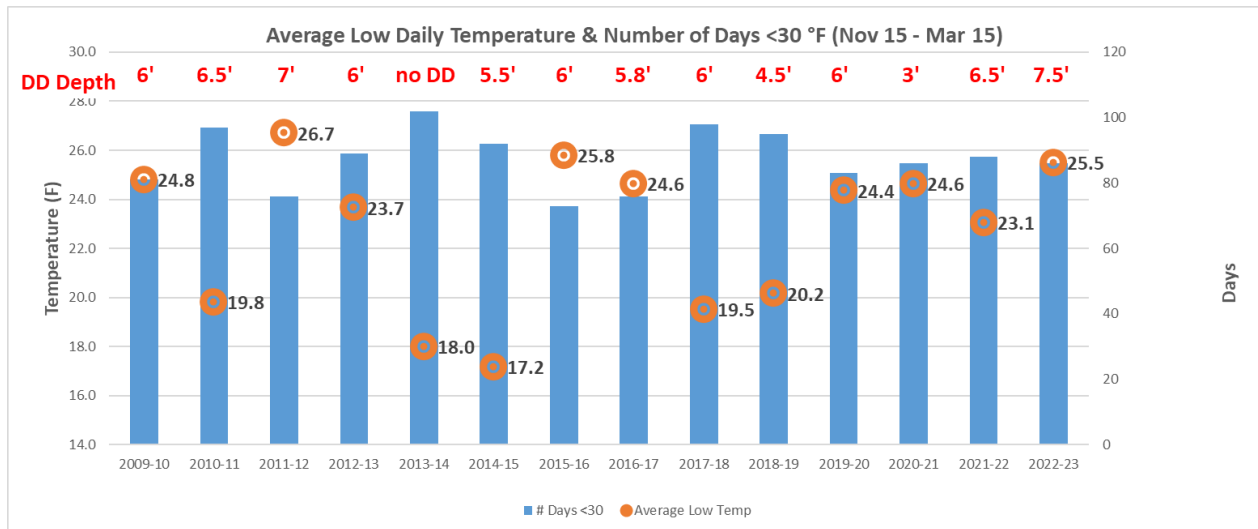
**Table 1. History of Bare Hill Pond Winter Drawdowns.**

<b>Winter Season</b>	<b>Water Level Reduction and Summary of Following Growing Season Observations</b>
2002-03	1.5 Feet
2003-04	3.5' gravity drawdown
2004-05	3.5' gravity drawdown
2005-06	3.5' gravity drawdown. These first few created evidence of efficacy in drawdown zone and no evidence of substantial issues
2006-07	5' gravity and pump drawdown. Some increase in efficacy
2007-08	5' gravity and pump drawdown. Good freeze and improvement
2008-09	3.5' gravity drawdown. Per request to see if a year off pumping would work - limited efficacy and rebound in plants
2009-10	6' gravity and pump drawdown. Planning started for beach excavation and the storm water rain gardens
2010-11	6.5' gravity and pump drawdown. Continued incremental efficacy and no harm detected
2011-12	7' gravity and pump drawdown. More efficacy and depth needed for the beach excavation project
2012-13	6' gravity and pump drawdown. Backed off partway through process to see if efficacy could be maintained
2013-14	No drawdown. Year off to see if lower frequency worked - phosphorous stable, some re-emergence in spots
2014-15	5.5' drawdown. Heavy snowfall runoff - phosphorous increase and increased observance of invasives by residents in 5 – 8 foot zone but overall reduction in plant volume and at transect sites
2015-16	6.0' drawdown. Very mild winter with an extended warm, dry and sunny growing season following
2016-17	5.75' drawdown. Very mild winter, even warmer than previous year. Wet spring and summer; water level higher than past years
2017-18	6' drawdown. Cold long winter with freezing temperatures into April. Period of hot humid weather leading to a pattern of extended wet weather. Water levels remained high throughout the summer.
2018-19	4.5' drawdown. While 6' was the goal, it was difficult to achieve the desired drawdown depth due to precipitation. The early portion of the summer was wet and overcast but come July it was warm and dry.
2019-20	6.0' drawdown. Warm November and March. Very low precipitation/snow cover
2020-21	Attempted 6.5'. Equipment issues prevented holding that depth beyond November. Lake was about 3.0' down during a short period of freezing
2021-22	6.5' drawdown. This season was typical in terms of temperatures and precipitation for most months except November which was below average. Snowpack was slightly below normal.
2022-23	7.5' due to operator error; Corrective actions were taken in as discussed with the Conservation Commission. Warmer & wetter winter.



## Influence of Weather

Ideal conditions for a winter water level drawdown to control rooted plants is a consistent cold winter (consecutive days below freezing) with little rain or snow. Snow insulates the ground preventing the hard freeze necessary to kill plant roots. Looking at the historic weather conditions recorded at Fitchburg Airport since 2009 during the Nov 15 through Mar 15 winter season, the winters of 2013-2014 and 2014-2015 had the lowest average minimum temperatures (18.0 and 17.2°F, respectively) (Figure 1). The number of days when the low temperature fell below 30°F was 102 during 2013-2014, representing 84% of the days during the period of analysis; similarly, 92 days experienced low temperatures below 30°F in 2014-2015 representing 76% of the time (Figure 2). The next two winters were milder with average lows in mid-20 degrees with fewer days below 30°F. 2017-2018 and 2018-2019 were cold years with 98 and 95 days with low temperatures (81% and 79% of the days) with an average low of 19.5 and 20.2°F, respectively. From the winters of 2019-2020 through 2023 the number of days below 30°F averaged 86. Average low temperature for the same period was 24.4°F, 1.7°F warmer than the average low since 2009. The number of low temperatures days were evenly distributed between December, January and February. The 2022-2023 drawdown period was wet with just under 19 inches of precipitation at the Fitchburg airport, like 2009-2010 and 2020-2021 (Figure 3).



**Figure 1. Average Low Air Temperature and Number of Days below 30°F during the Winter Season.**

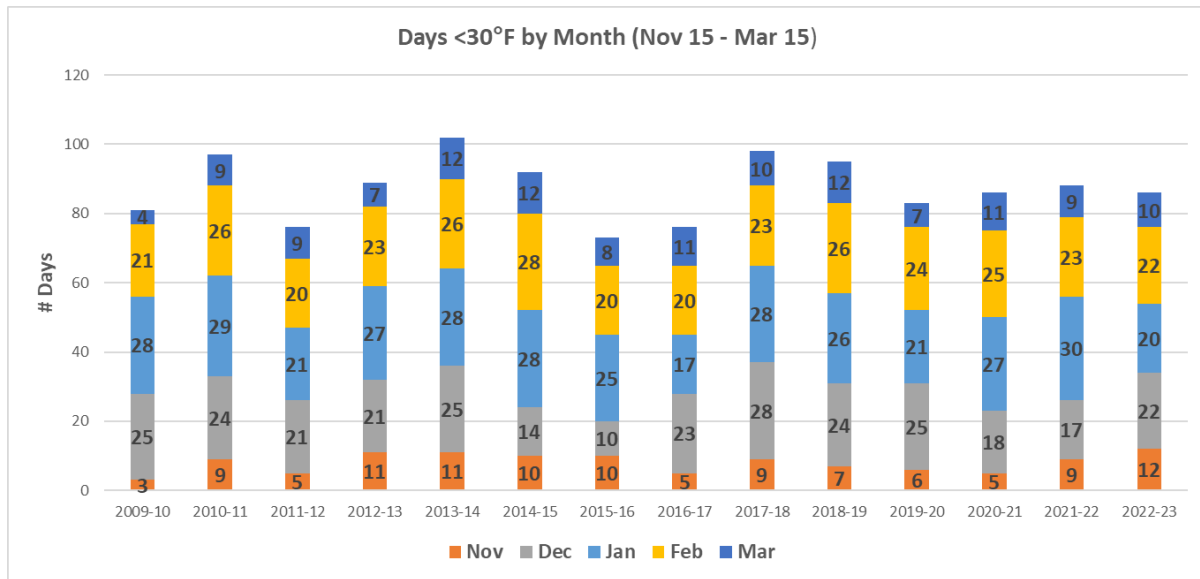


Figure 2. Number of Days with Air Temperatures below 30°F during the Winter Season.

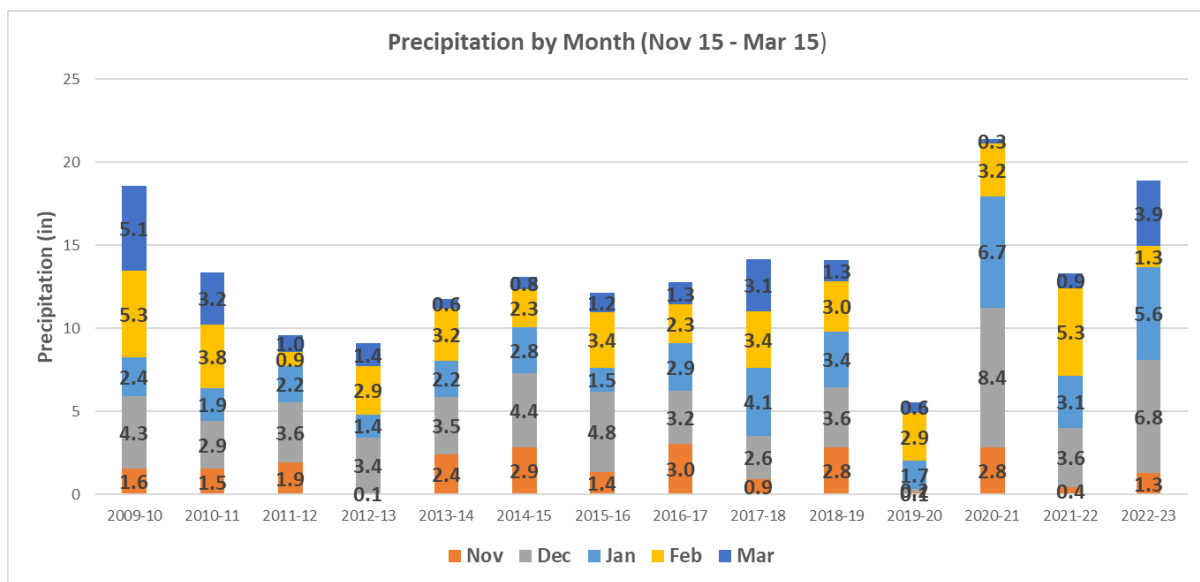


Figure 3. Precipitation during the Winter Season

## In-Lake Sampling

In-lake sampling was conducted at five stations (Figure 4) on May 30, June 29, July 20 and August 13, 2023 (September & October sampling not yet scheduled). ARC used the same sampling methods as prior surveys for data collection consistency (see prior reports for methodology). In-situ water depth profile measurements of temperature, dissolved oxygen (DO), and specific conductivity were recorded at all five locations. ARC collected samples for total phosphorus (TP), dissolved phosphorus (DP) and total suspended solids (TSS) at the surface and approximately 0.5 feet above the sediment water interface (bottom) at BHP-2, at the surface at BHP-1 and TP at the bottom at stations BHP-3, 4 & 5.

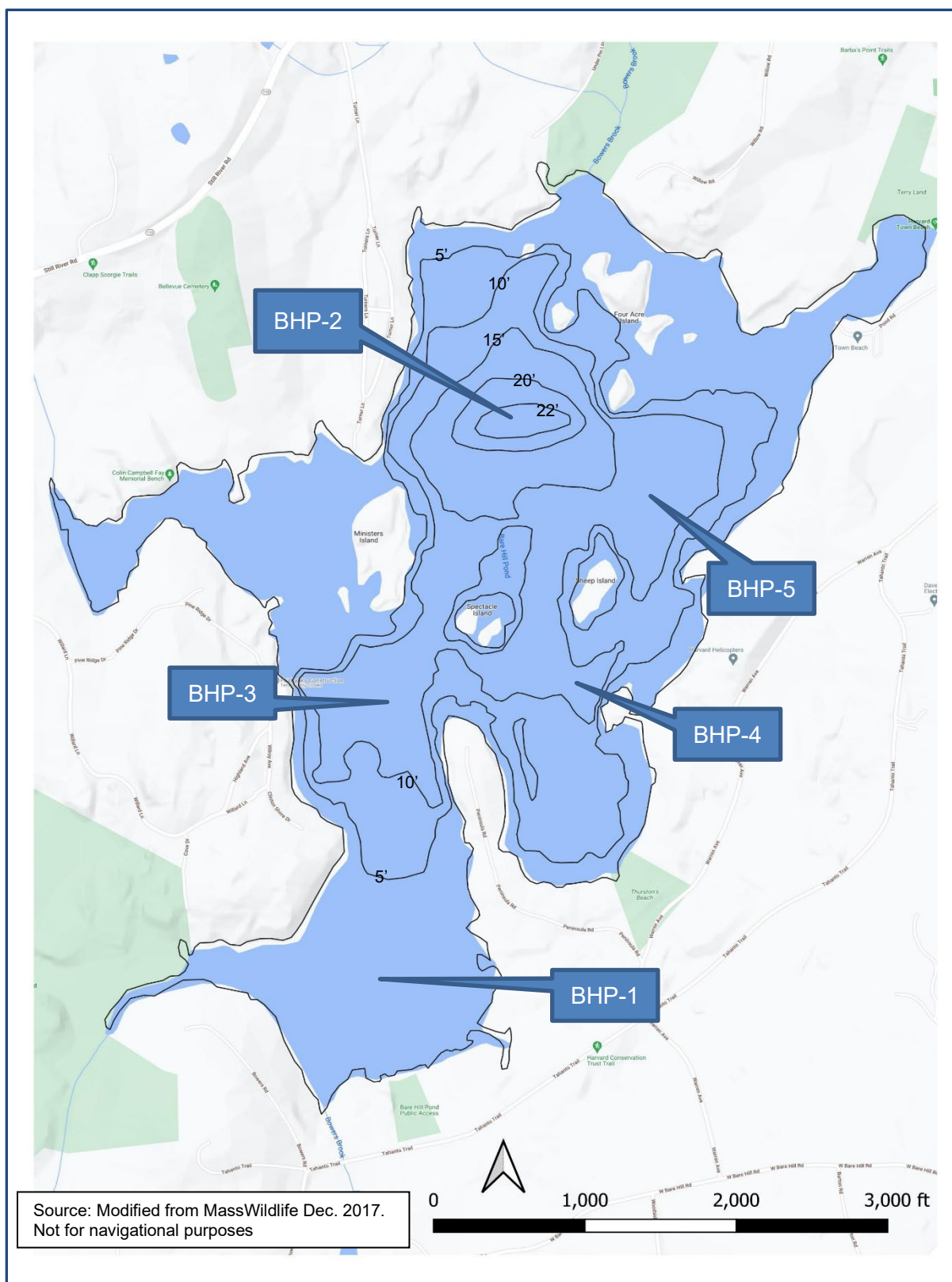
Five sample locations (Figure 4):

- BHP-1 shallow basin in the south
- BHP-2 deep hole in the north/main basin BHP-2
- BHP-3 between BH-1 & BHP-2 south of Ministers Island
- BHP-4 south of Sheep, east of Spectacle Islands
- BHP-5 southeast of BHP-1 between Sheep and Four Acre Islands

The temperature and DO profiles suggest that the lake was weakly thermally stratified in May. DO concentrations have declined substantially since 2010. The hypoxic (low oxygen) layer is expanding and resulting in less desirable habitat for aquatic biota. Waters below ten feet were historically below the 5.0 mg/L threshold considered to support aquatic life, but data recorded since 2022 suggest that supportive waters are limited to about eight feet. This condition also facilitates the release of phosphorus from sediments, resulting in ideal conditions (warm water and plenty of phosphorus) for cyanobacteria blooms. The lake was anoxic (<2 mg/L oxygen) at a depth of 10 feet in 2021 and 2023 vs 12-14 feet in the past (Table 2, Figures 5 & 6). The anoxic layer was slightly reduced come August with anoxia starting at about 12 feet. DO at the added stations also exhibited anoxia at ten feet in July 2023. These conditions allow phosphorus release from iron in the sediments. The lake typically regains oxygen in the hypolimnion after mid-September when fall turnover (mixing) occurs.

Table 2 provides depth profile data through August 13, 2023. Figures 5 & 6 provide a graphical representation of temperature and DO data for the deep station (BHP-2) in comparison with the last five years.

Lake pH ranges from slightly acidic [<7 standard units (SU)] to basic (>7 SU). Higher pH values (>8.0 SU) are likely due to primary productivity when plants (macrophytes and/or phytoplankton) are photosynthesizing. During this process, carbon dioxide is removed from the water raising the pH of water. Lake water pH is typically the highest in the afternoon.



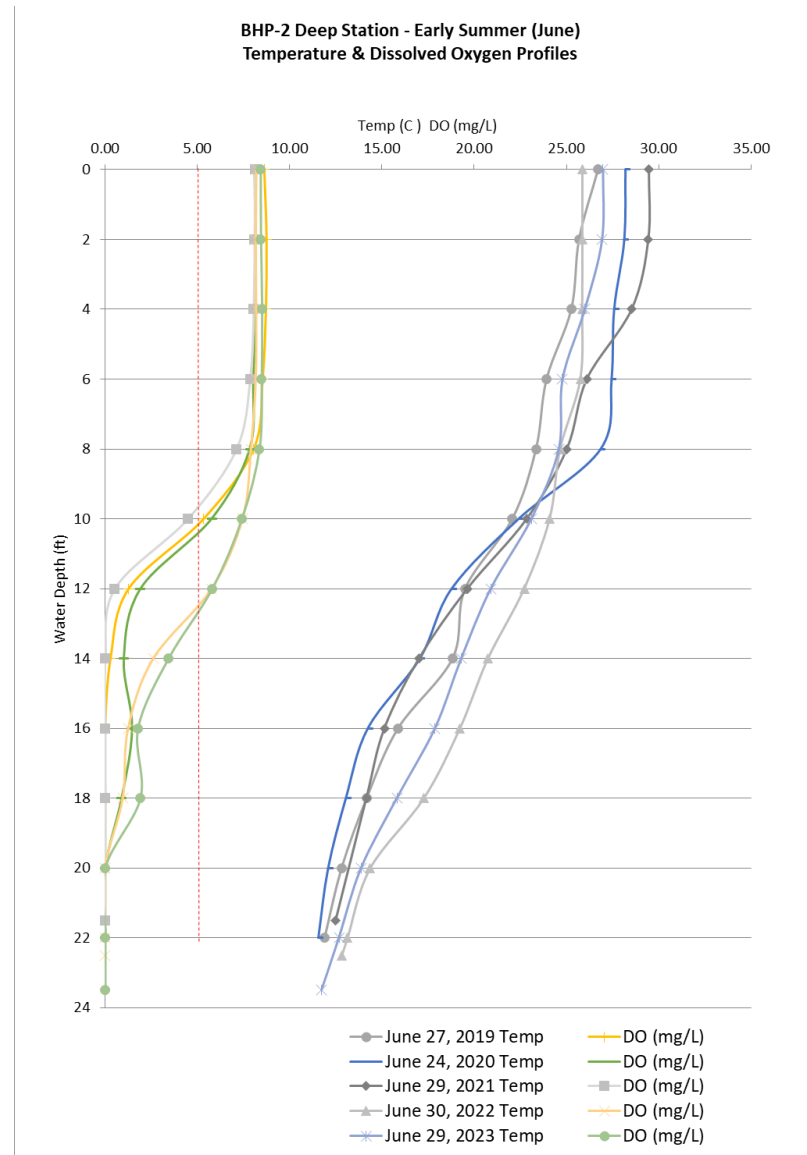
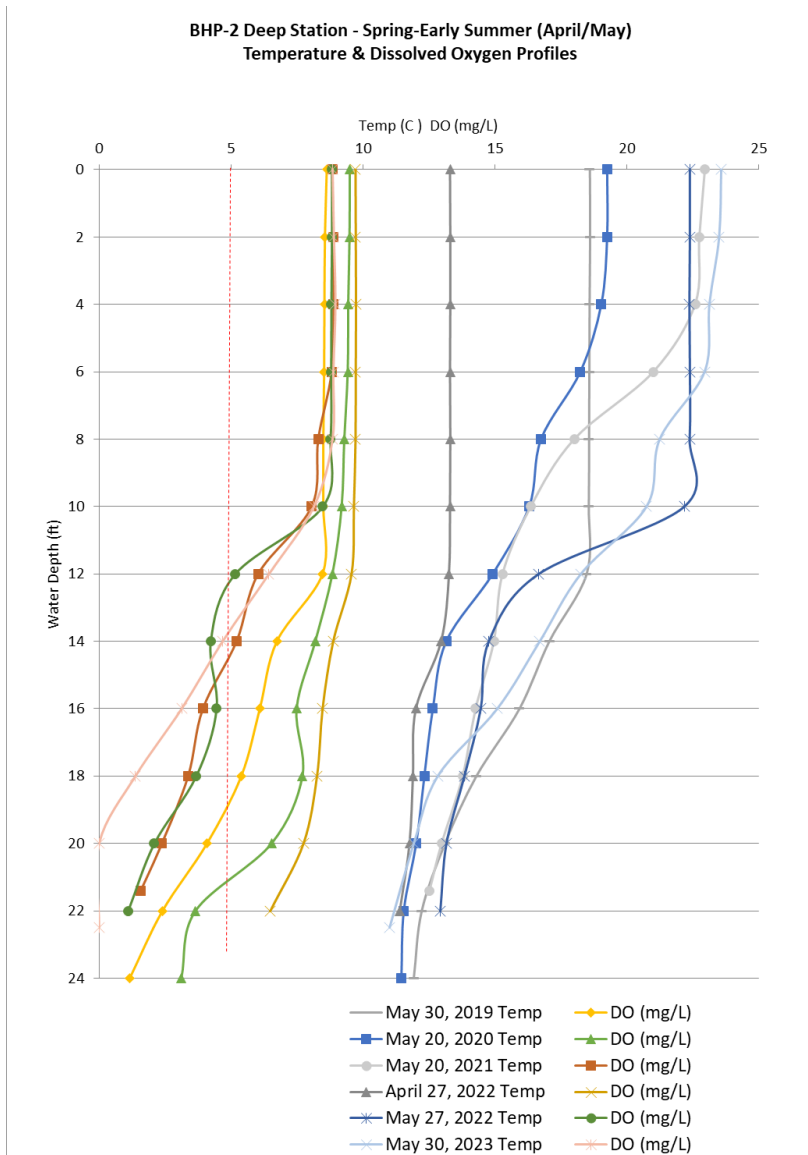
**Figure 4. Bare Hill Pond Monitoring Stations.**

**Table 2. Bare Hill Pond Water Depth Profiles 2023.**

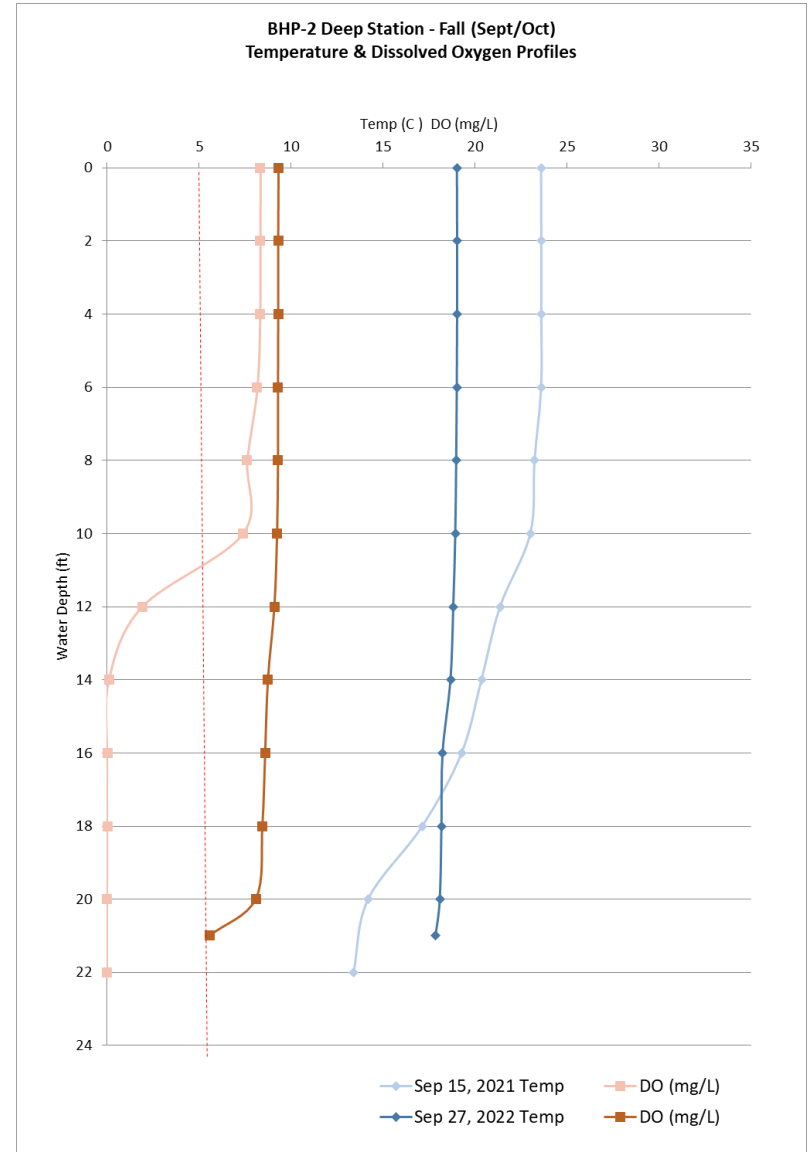
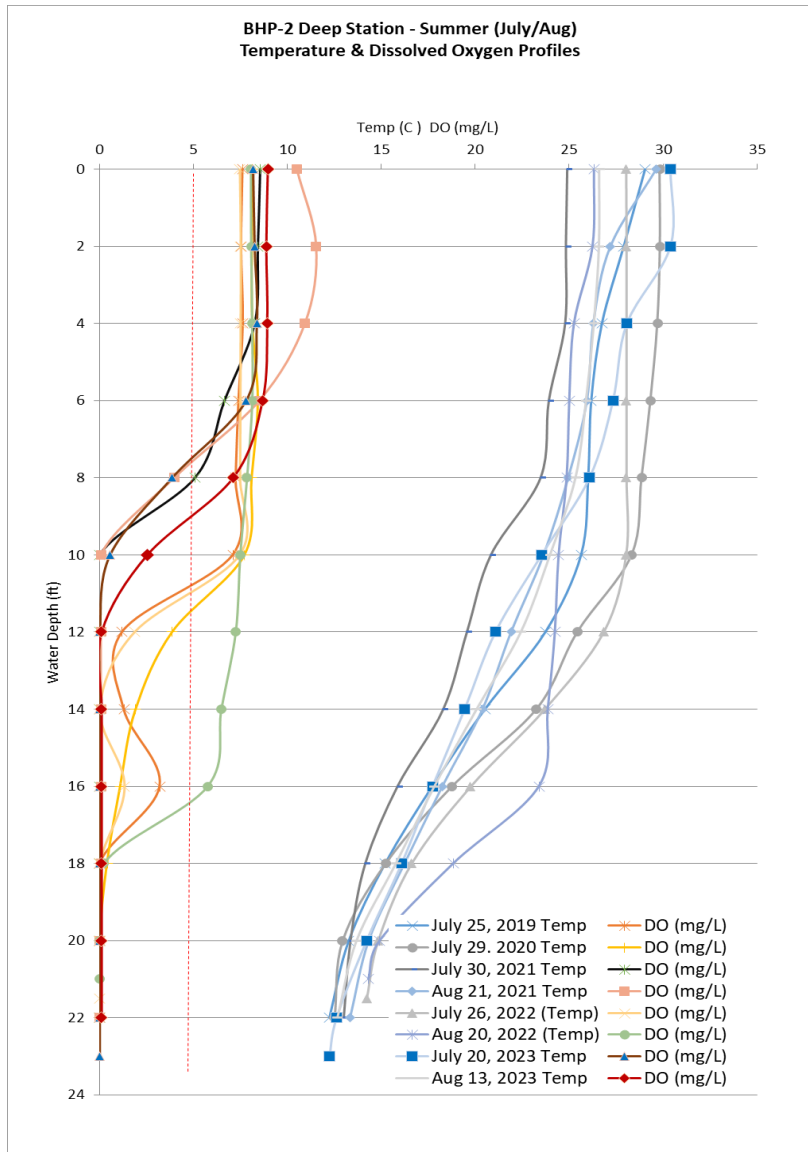
BHP-1						BHP-1					
May 30, 2023						June 29, 2023					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	22.41	9.23	7.2	222	0.4	0	27.07	8.15	7.0	212	2.0
1	22.45	9.19	7.2	222	0.6	1	27.07	8.12	7.0	212	1.5
2	22.00	9.01	7.2	220	0.8	2	27.05	8.20	7.0	213	1.6
3	21.58	9.17	7.2	221	1.0	3	25.22	8.25	7.0	216	1.8
4	21.61	9.20	7.2	221	1.2	4	24.78	7.45	6.7	213	2.0
5	21.59	9.19	7.2	221	15.0	5	23.37	7.60	6.6	196	2.4
BHP-2						BHP-2					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	23.58	8.84	7.3	223	5.2	0	26.97	8.41	7.4	218	2.6
2	23.50	8.89	7.3	223	3.5	2	26.92	8.43	7.4	218	2.8
4	23.13	8.95	7.2	222	2.2	4	25.99	8.49	7.4	218	3.0
6	22.95	8.87	7.2	222	2.4	6	24.78	8.47	7.3	217	3.3
8	21.25	8.84	7.1	222	2.6	8	24.58	8.35	7.2	217	3.6
10	20.75	8.14	6.8	221	3.0	10	23.10	7.40	6.8	223	4.2
12	18.26	6.44	6.5	218	3.3	12	20.90	5.80	6.6	223	5.1
14	16.70	4.68	6.4	217	3.9	14	19.30	3.43	6.4	224	6.3
16	15.09	3.13	6.3	217	4.9	16	17.88	1.77	6.3	221	8.3
18	12.83	1.38	6.2	217	6.6	18	15.82	1.90	6.3	220	8.4
20	11.92	0.00	6.3	220	10.3	20	13.88	0.00	6.4	224	11.4
22.5	11.00	0.00	6.4	239	189.9	22	12.68	0.00	6.7	245	4.4
						23.5	11.74	0.00	6.8	263	19.4
BHP-3						BHP-3					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	22.43	9.00	7.2	223	1.8	0	27.30	8.39	7.2	217	1.4
2	22.48	8.97	7.2	222	1.8	2	26.62	8.50	7.2	217	1.4
4	22.43	8.99	7.2	222	1.9	4	25.73	8.53	7.2	217	1.4
6	21.52	8.97	7.1	222	1.9	6	24.54	8.32	7.0	216	1.5
8	21.08	8.66	7.0	222	1.9	8	24.18	7.61	6.8	212	1.5
10	19.06	7.50	6.7	219	2.0	10	23.86	6.59	6.6	212	1.7
12	18.73	7.03	6.6	219	2.2	12	20.74	4.55	6.4	224	3.0
						13.5	20.09	2.44	6.4	226	13.2
BHP-4						BHP-4					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	22.11	9.11	7.3	222	1.7	0	27.30	8.50	7.4	221	0.9
2	22.14	9.05	7.2	222	1.7	2	26.69	8.57	7.4	219	0.9
4	22.10	9.06	7.2	222	1.8	4	25.53	8.78	7.3	217	1.0
6	21.65	9.00	7.1	222	1.8	6	24.76	8.56	7.2	217	1.1
8	21.13	8.78	7.0	221	1.9	8	24.58	8.42	7.1	218	1.2
10	20.74	8.10	6.8	222	2.2	10	23.45	7.66	6.8	224	1.3
11.5	18.71	7.76	6.8	218	84.5	12	21.15	6.52	6.6	224	1.7
						12.5	20.46	5.82	6.7	224	2.2
BHP-5						BHP-5					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	23.50	8.97	7.3	223	1.2	0	27.18	8.58	7.5	219	0.0
2	23.42	8.40	7.3	223	1.2	2	27.19	8.57	7.4	218	0.0
4	23.14	8.98	7.2	223	1.1	4	27.08	8.56	7.3	220	0.0
6	22.83	8.81	7.1	223	3.5	6	25.93	8.41	7.0	221	0.0
8	21.19	8.82	7.0	222	3.8	8	24.49	7.93	6.7	240	0.1
10	19.21	7.66	6.7	219	1.1	10	22.93	7.29	6.7	224	0.1
11.5	18.45	5.94	6.6	219	1.4	12	20.81	4.45	6.5	225	4.2

Table 2. Continued.

BHP-1						BHP-1					
July 20, 2023						August 13, 2023					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	29.18	8.60	7.3	202	1.2	0	25.07	7.80	6.6	198	1.0
1	28.46	8.60	7.2	201	1.2	1	25.07	7.84	6.6	198	1.4
2	28.30	8.52	7.0	200	1.1	2	24.99	7.86	6.6	198	2.1
3	27.73	7.33	6.6	196	1.3	3	24.35	8.21	6.7	200	2.4
4	26.81	6.06	6.4	190	1.8	4	23.79	7.15	6.4	199	2.5
5	26.11	7.84	6.6	187	1.5	5	23.42	4.43	6.0	198	2.4
BHP-2						BHP-2					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	30.41	8.17	7.4	205	2.2	0	26.61	8.96	7.9	204	3.6
2	30.41	8.25	7.3	205	2.4	2	26.60	8.88	7.8	203	3.6
4	28.09	8.37	7.2	202	2.9	4	26.33	8.93	7.7	203	3.7
6	27.35	7.80	6.9	201	3.8	6	25.91	8.68	7.3	203	3.6
8	26.10	3.86	6.2	184	4.6	8	25.35	7.12	6.9	202	3.8
10	23.55	0.55	6.2	215	4.8	10	23.99	2.54	6.3	205	4.1
12	21.09	0.00	6.3	226	5.0	12	22.44	0.10	6.4	213	5.0
14	19.45	0.00	6.3	226	5.2	14	20.08	0.10	6.6	242	3.9
16	17.74	0.00	6.2	234	5.7	16	17.83	0.10	6.6	246	3.0
18	16.10	0.00	6.4	216	5.6	18	15.78	0.10	6.6	256	2.8
20	14.23	0.00	6.7	243	4.1	20	13.68	0.10	6.9	275	5.7
22	12.63	0.00	7.0	277	9.0	22	12.66	0.10	7.0	318	5.9
23	12.25	0.00	7.0	288	14.5						
BHP-3						BHP-3					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	29.80	8.39	7.2	203	1.5	0	25.46	8.70	7.2	202	1.6
2	29.77	8.39	7.2	203	1.5	2	25.32	8.71	7.2	202	2.4
4	27.69	8.46	7.0	201	1.5	4	24.82	8.70	7.2	202	2.7
6	26.95	7.87	6.7	198	1.6	6	24.53	8.10	7.0	201	2.9
8	25.90	4.25	6.2	181	2.1	8	24.11	6.50	6.5	199	3.1
10	23.04	0.27	6.2	213	3.4	10	23.50	2.64	6.2	205	3.0
12	21.34	0.00	6.5	234	4.6	12	21.72	0.09	6.4	232	3.2
						12.5	21.45	0.10	6.4	232	4.6
BHP-4						BHP-4					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	29.86	8.26	7.0	205	1.2	0	25.98	8.85	7.5	203	3.5
2	28.46	8.42	7.2	205	1.3	2	25.46	8.77	7.3	203	3.6
4	27.61	8.32	7.1	205	1.4	4	24.83	8.68	7.2	203	3.6
6	27.21	7.39	6.8	203	1.6	6	24.61	8.52	7.1	203	3.6
8	26.22	4.38	6.3	192	1.8	8	24.33	6.96	6.6	202	3.3
10	23.94	0.29	6.1	212	3.7	10	23.86	3.65	6.3	203	3.0
12	21.79	0.00	6.5	231	5.2	11.5	22.69	0.09	6.3	212	3.7
BHP-5						BHP-5					
Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)	Depth (ft)	Temp (C)	DO (mg/L)	pH (SU)	Spec. Cond (us/cm)	Turbidity (NTU)
0	30.66	8.05	7.3	207	0.7	0	26.94	8.95	7.9	206	3.0
2	30.26	8.10	7.3	206	0.8	2	26.90	9.01	7.8	205	3.1
4	28.49	8.28	7.2	205	1.0	4	26.64	9.06	7.7	205	3.2
6	27.29	7.78	6.8	203	1.3	6	26.26	9.12	7.6	205	3.2
8	26.13	3.79	6.3	204	1.5	8	25.60	8.54	7.0	205	3.2
10	24.44	0.00	6.2	221	2.7	10	24.50	1.58	6.3	208	3.9
12	22.12	0.00	6.6	349	2.5	11.5	23.31	0.09	6.3	225	4.0



**Figure 5. Temperature & Dissolved Oxygen Profiles at BHP-2 during Spring & Early Summer for 2019-2023.**



**Figure 6. Temperature & Dissolved Oxygen Profiles at BHP-2 during Summer and Fall for 2019-2023.**



Specific conductivity in 2023 was similar to prior years around lower 200's just over the desirable range threshold [ $<200$  microsiemens per centimeter [ $\mu\text{s}/\text{cm}$ ]]; values above 200  $\mu\text{s}/\text{cm}$  can be indicative of elevated dissolved pollutants and high productivity. It is common to have increased conductivity near the water-sediment interface where suspended solids increase conductivity. Surface and mid-depth values were comparable between stations.

Turbidity is measured in-situ with a probe. The probe sends a beam of light and the amount of light that is reflected back is used to calculate particle density in the water. The more light reflected, the more particles there are in the water. Turbidity was variable between July and August. It is not known if the elevated turbidity measurements were caused by phytoplankton, suspended solids and/or bubbles generated by boat traffic. TSS numbers were less than detection at all surface water samples. The highest TSS was recorded in the bottom sample in August.

Table 3 provides the results of phosphorus, TSS and water clarity (measured by Secchi disk transparency) during 2023. A comparison of phosphorus concentrations in the main basin (BHP-2) over time is illustrated graphically in Figure 7. TP surface concentrations were above the Massachusetts Department of Environmental Protection (MassDEP) target concentration of 0.030  $\text{mg}/\text{L}^2$  at the surface during June (BHP-2) and August (BHP-1).

Bottom water samples exceeded MassDEP's threshold at multiple location on multiple dates. This can be the result of suspended solids or phosphorus being released and/or accumulating in the hypolimnion. DP, the dissolved fraction of phosphorus, was detected in June and August suggesting that there is phosphorus that is readily available for algal uptake in both the surface and bottom waters. It should be noted that algal blooms were observed in 2020 and 2021, when TP values were generally below the MassDEP threshold suggesting that the threshold isn't low enough to be protective against blooms or the algae are obtaining their nutrients from bottom waters where TP and DP concentrations are greater.

The Town of Harvard Board of Health (BOH) fluorometer readings and estimated cyanobacteria cell counts were generally below the 70,000 cells/mL advisory threshold in 2023, except the samples collected at 12 and 20 feet in July 2023 (Figure 8).

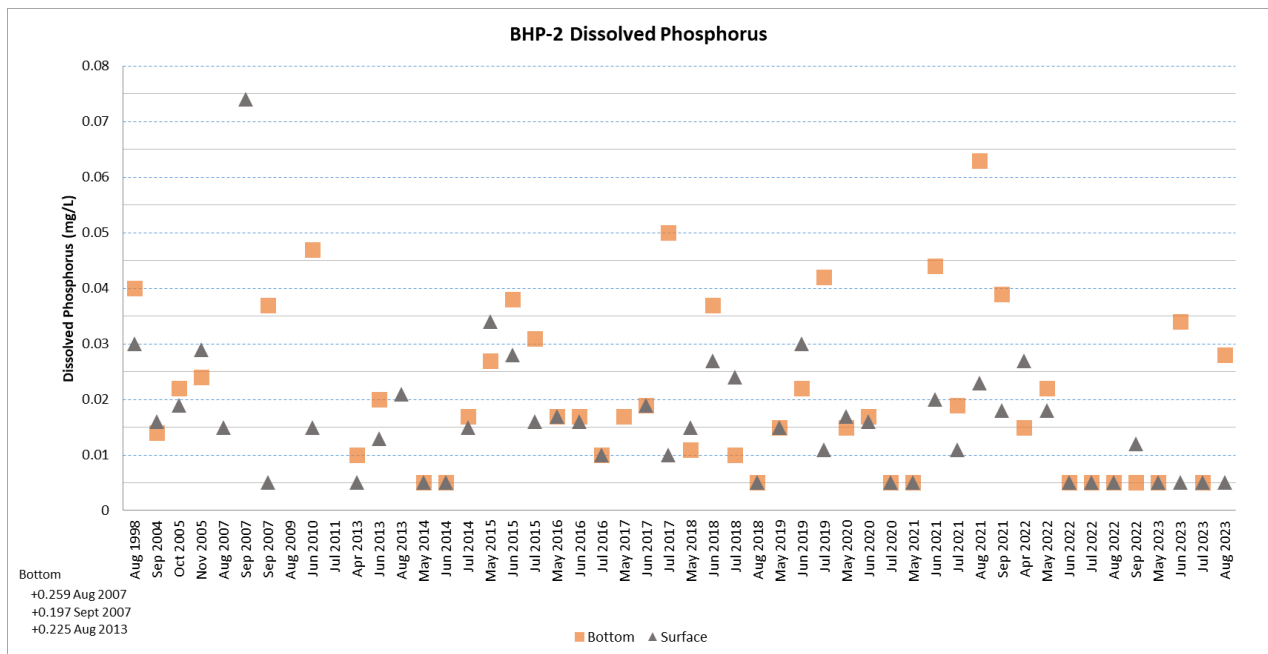
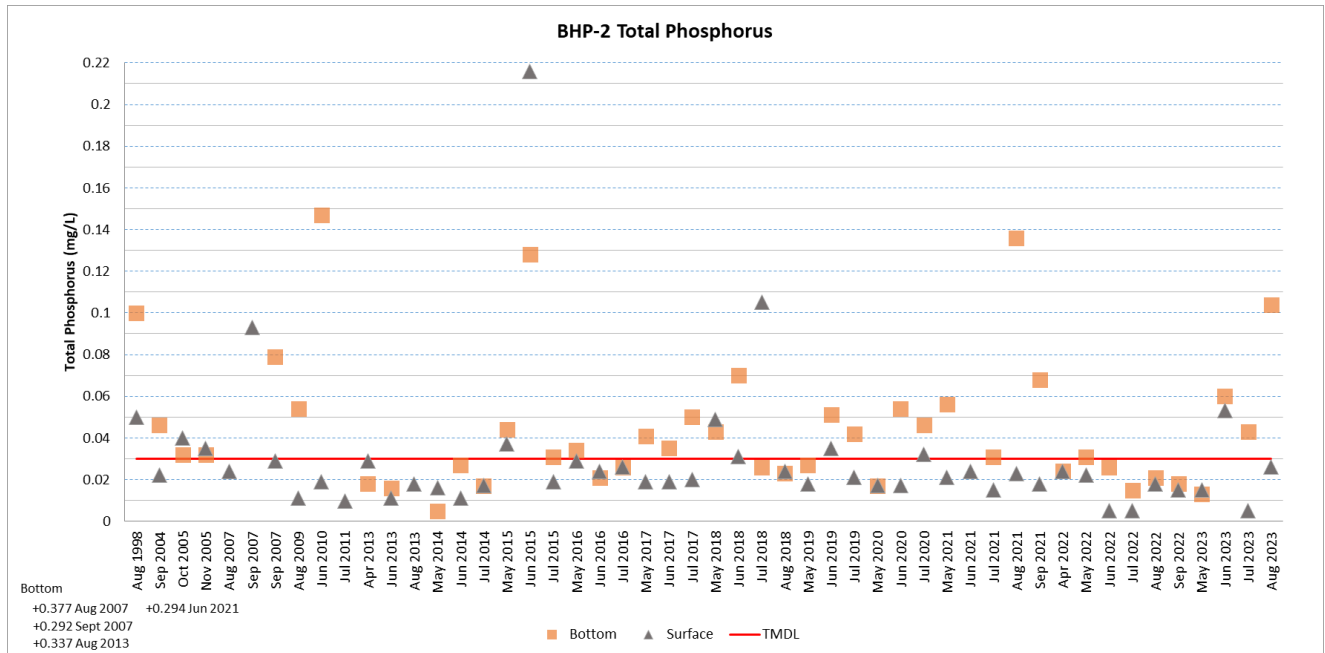
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<sup>2</sup> Bare Hill Pond Bare Hill Pond, Harvard, MA. TMDL Report MA81007-1999-001 July, 1999 Massachusetts Department of Environmental Protection [https://www.harvard.ma.us/sites/harvardma/files/uploads/bhp\\_tmdl.pdf](https://www.harvard.ma.us/sites/harvardma/files/uploads/bhp_tmdl.pdf)

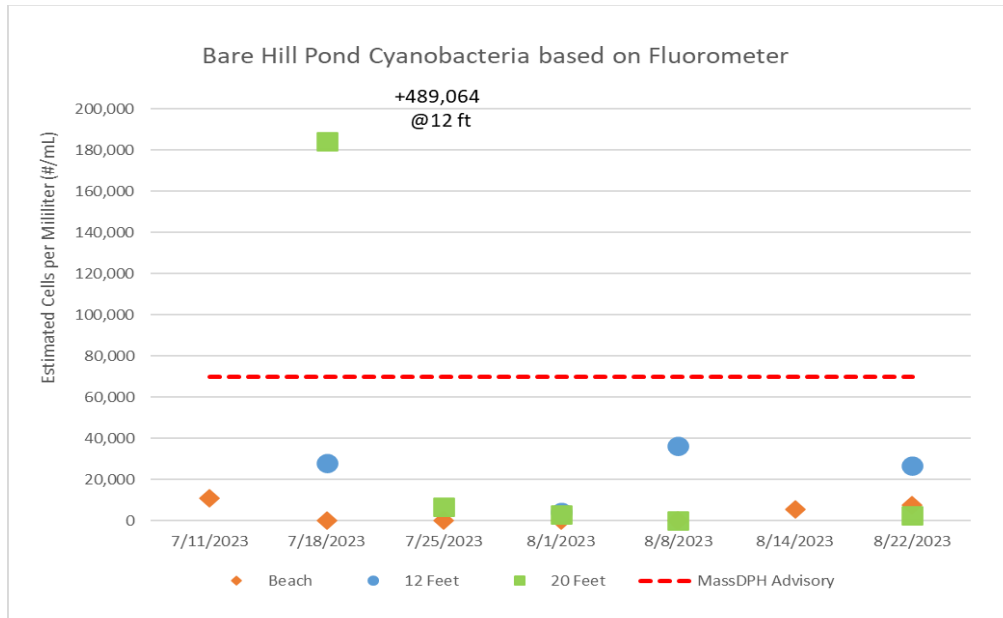
**Table 3. 2023 Bare Hill Pond In-lake Water Quality Data.**

Station	Date	Time	TP (mg/L)	DP (mg/L)	TSS (mg/L)	Secchi (ft)	
BHP-2 Surface	5/30/2023	18:00	0.015	<0.010	<5	12	
BHP-2 Bottom	5/30/2023	18:10	0.013	<0.010	5		
BHP-1 Surface	5/30/2023	18:35	0.017	<0.010	<5	5.2	bottom
BHP-3 Bottom	5/30/2023	18:40	0.020			12.1	
BHP-4 Bottom	5/30/2023	18:50	0.021			11.3	
BHP-5 Bottom	5/30/2023	19:00	0.022			11.8	
BHP-2 Surface	6/29/2023	16:30	0.053	<0.010	<5	11	
BHP-2 Bottom	6/29/2023	16:35	0.060	0.034	7		
BHP-1 Surface	6/29/2023	16:15	<0.010	<0.010	<5	5.5	bottom
BHP-3 Bottom	6/29/2023	17:05	0.047			10.3	
BHP-4 Bottom	6/29/2023	17:15	0.038			12.1	
BHP-5 Bottom	6/29/2023	17:40	0.042			11.4	
BHP-2 Surface	7/20/2023	17:15	<0.010	<0.010	<5	7.8	
BHP-2 Bottom	7/20/2023	17:20	0.043	<0.010	<5		
BHP-1 Surface	7/20/2023	17:40	0.012	<0.010	<5	5.5	bottom
BHP-3 Bottom	7/20/2023	17:50	0.011			8.2	
BHP-4 Bottom	7/20/2023	18:00	0.011			8.5	
BHP-5 Bottom	7/20/2023	18:10	<0.010			9.6	
BHP-2 Surface	7/26/2022	18:50	<0.010	<0.010	5	7.7	
BHP-2 Bottom	7/26/2022	18:55	0.015	<0.010	12		
BHP-1 Surface	7/26/2022	19:15	<0.010	<0.010	5	4.0	bottom
BHP-3 Bottom	7/26/2022	19:20	<0.010			7.5	
BHP-4 Bottom	7/26/2022	19:38	0.013			8.1	
BHP-5 Bottom	7/26/2022	19:50	<0.010			8.4	
BHP-2 Surface	8/13/2023	13:10	0.026	<0.010	5	6	
BHP-2 Bottom	8/13/2023	13:20	0.104	0.028	7		
BHP-1 Surface	8/13/2023	11:05	0.062	0.039	<5	5.0	bottom
BHP-3 Bottom	8/13/2023	11:30	0.028			6	
BHP-4 Bottom	8/13/2023	12:10	0.042			6.2	
BHP-5 Bottom	8/13/2023	14:30	0.031			6.6	

"Bottom" indicates the Secchi disk reached the pond bottom  
 Red shade – exceeded MassDEP recommended phosphorus threshold



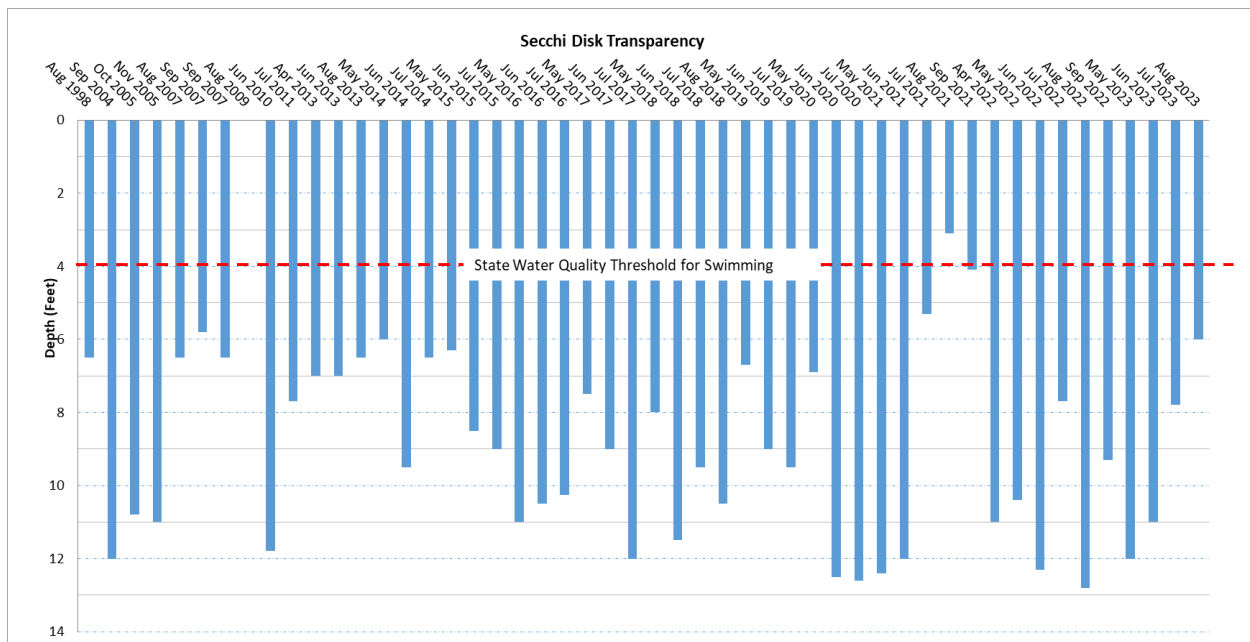
**Figure 7. BHP-2 Total and Dissolved Phosphorus Concentrations.**



Data provided by Town of Harvard Board of Health

**Figure 8. Estimate Cyanobacteria Cells.**

Secchi disk transparency (SDT) in 2023 was much improved from 2021 due to the absence of an algal bloom. SDT ranged from 6.0 to 12.1 feet (range in 2021 was 3.0 to 12.4 feet). The lowest values were recorded in August. Clarity was above the MassDEP State Water Quality Standard for swimming (4 feet; Figure 9) during all monitoring events (through August 13, 2023). Clarity was greatest in May.



**Figure 9. Bare Hill Pond (BHP-2) Secchi Disk Transparency.**

## In-lake Plant Survey

ARC conducted a plant survey on August 13, 2023. We used the same methods employed during the previous surveys conducted since 1998. ARC mapped pond aquatic vegetation along the five transects (A through E) established in 1998. We also repeated the eight points added in 2016 (F through I). Each transect was divided into a series of observation points and were located using Global Positioning System (GPS). A total of 60 points were assessed during the survey.

The plant survey focused on macroscopic fully submerged (e.g., milfoil), floating-leaved (e.g., pond lily), and/or free-floating plants (e.g., duckweed). At each transect point, we recorded the percent cover of all plants, the percent biovolume (as measured by the amount of the water column filled with plants) using a semi-quantitative (0-4) ranking system. Species observed in each transect were identified and assigned a relative density based on all species present (Table 4). Water depth was also recorded at each transect point. These data are presented in Table 5.

**Table 4. Plant Survey Categories**

<b>Rank</b>	<b>Cover &amp; Biovolume</b>	<b>Density Category</b>	<b>Description</b>
0	No plants	Trace	Single to a few plants
1	1-25%	Sparse	Multiple plants but not abundant, about a handful
2	26-50%	Moderate	Numerous plants but not dominate, about a plant rake full
3	51-75%	Dense	Very abundant, more than a rake full
4	76-100%		

**Table 5. 2023 Macrophyte Survey Data**

Point	Cover	Bio-volume	Bs	BG	Cc	Cd	Ec	Eleo	FG	Iso	Macro	Mega	Mh	Mhum	Nf	Nm	No	Nv	Pa	Pc	Poly	Prob	Pspir	Pot	Sg	Spar	Usp	Va	
A-1	3	2															D				D								
A-2	4	2	D						M						S		M	S										M	
A-3	4	2	D														S	D										S	
A-4	4	2	S		S	D			M						M		D											D	
A-5	4	2	T								S				S	T	T	S									M	S	
A-6	4	2							M		T				M		T	T					S				T	S	
A-7	2	1	S									S			M													S	
A-8	1	1									M											T						T	
A-9	1	1				S					S																		
A-10	0	0																											
A-11	0	0																											
A-12	0	0																											
A-13	1	1			T						T																	T	
B-1	4	3	T		S				S						M	S	D	S									M	D	
B-2	4	3			T										S		D											M	
B-3	4	2									D						M	T									S	D	
B-4	4	2										D				M	S										S	D	
B-5	4	2										D			M	S	M							T			S	D	
B-6	4	2									D					M											M	S	
B-7	4	2									D				S	S	M										S	S	
B-8	4	2									D				S	M	M	S						T				M	
B-9	4	2									D				S	S											M	D	
B-10	4	2									D						D											S	
C-1	4	3			D						D																	D	
C-2	3	1		S	S																		D						
C-3	3	2			M								T										S						
C-4	4	3			D																								
C-5	1	1			T																								
C-6	0	0																											
C-7	1	1			T																								
C-8	4	2			M										M									S				D	
D-1	4	4			D							S	M		S		D										S	D	
D-2	4	2									D				S		M	M										S	S
D-3	4	2			T						M				S	S		S									M	D	
D-4	4	2	T		S				S		D				S	S											T	D	
D-5	4	2	M		S						D							S										D	
D-6	4	2									D																S	S	
D-7	4	2									D																	S	
D-8	4	2									D																	S	
D-9	4	2			T						D				S	S								T				M	

Shaded cell indicates dominant species at observation point.

**Table 5 (continued). 2023 Macrophyte Survey Data**

Point	Cover	Bio-volume	Bs	BG	Cc	Cd	Ec	Eleo	FG	Iso	Macro	Mega	Mh	Mhum	Nf	Nm	No	Nv	Pa	Pc	Poly	Prob	Pspir	Pot	Sg	Spar	Usp	Va	
D-10	4	2									D																M	S	
D-11	4	2			T						D																		M
D-12	4	3			D																								
D-13	4	4			D																								
E-1	4	2			T				S		D					M													D
E-2	3	3			M								T				T												D
E-3	4	2			S																						T	D	
E-4	3	2			D																								
E-5	4	3			D								T																
E-6	4	3			D							T	T																
E-7	4	3			D								S														T		
E-8	4	3			D																								
F-1	2	2			D																								M
F-2	4	3			D								S																
G-1	4	4			D								S				T										S	S	
G-2	4	4			D												M												
H-1	4	2			S										M														D
H-2	2	2			M																						T	S	
I-1	4	2			S												S										M	D	
I-2	3	2			D								S																
Frequency of Occurrence	8	1	35	2	0	0	0	6	0	22	5	9	0	18	11	21	10	0	0	2	2	1	4	0	0	0	28	31	
Frequency Dominant	2	0	15	1	0	0	0	0	0	16	2	0	0	0	0	6	1	0	0	1	1	0	0	0	0	2	15		

Shaded cell indicates dominant species at observation point.

**Key to species**

Bs – <i>Brasenia schreberi</i> (watershield)	No – <i>Nymphaea odorata</i> (white-flower waterlily)
BG – <i>Cyanobacteria</i> (Bluegreen algae)	Nv – <i>Nuphar variegata</i> (yellow-flower waterlily)
Cc – <i>Cabomba caroliniana</i> (fanwort)	Pa - <i>Potamogeton amplifolius</i>
Cd - <i>Ceratophyllum demersum</i> (coontail)	Pc - <i>Potamogeton crispus</i>
Ec - <i>Elodea canadensis</i> (waterweed)	Prob – <i>Potamogeton robbinsii</i> (Robbins pondweed)
FG – filamentous algal mats	Pspir - <i>Potamogeton spirillus</i> (spiral pondweed)
Iso - <i>Isoetes</i> sp. (quillwort)	Pot – <i>Potamogeton</i> spp. (pondweeds)
Mega - <i>Megalondonta beckii</i> (water marigold)	Sg - <i>Sagittaria graminea</i> (duck potato)
Macro algae: Ni.f – <i>Nitella flexilis</i> and/or <i>Chara</i> (stonewort)	Spar – <i>Sparganium</i> sp. ( <i>bur-reed</i> )
Mh – <i>Myriophyllum heterophyllum</i> (variable-leaf milfoil)	Usp – <i>Utricularia</i> spp. (bladderwort)
Nf - <i>Najas flexilis</i>	Va - <i>Vallisneria americana</i> (tapegrass)
Nm - <i>Najas minor</i> (brittle waternymph)	

Table 6 provides a comparison between the last five surveys. The “IN” column in Table 6 represents the sample locations that were susceptible to the prior year’s drawdown (“in” the drawdown zone). One would expect to see changes in this column with variation of drawdown depth, provided the weather is ideal (exposed shoreline is subjected to freezing temperatures for a prolonged period without the insulating effect of snow cover). The “OUT” column represents data at sample locations where water depths are greater than the drawdown depth (“out” of the drawdown zone). No change related to the drawdown is expected in these cells. Ranks shaded green represent a change of two or more categories lower than the previous year and, in general, represent a desired outcome. Numbers shaded red indicate a two category change higher (an increase in plant cover or biovolume over the previous year). The prior year’s drawdown depth is shown in parentheses next to the year.

Data for 2022 were expected to be more desirable than 2021 given the lack of drawdown depth maintained in the prior year. The survey data indicate cover conditions were slightly higher than 2021 (increased at eight locations and decreased at three locations) but five of the eight locations with increased cover occurred outside the drawdown. Data in 2023 were expected to be lower given the deeper drawdown, but the temperatures were not excessively cold and there was a lot of precipitation. Plant cover did decrease at seven locations, but only two were within the drawdown zone. However, the locations outside the drawdown zone still could have been influence by the drawdown (e.g., ice movement, colder temps etc.). Cover increased at five locations. These locations had more bladderwort (*Utricularia* spp.) and tapegrass (*Vallisneria americana*) than in 2022.

Biovolume decreased at one location but increased at five locations (four within the drawdown zone) from 2022. Three of the four areas which showed increases inside the drawdown zone were attributable to more tapegrass. The remaining area showed an increase in bladderwort. Both species are native but can be nuisance.

The increased bladderwort was also apparent lake wide (Table 7 and Figure 9) with 30 more observation points containing bladderwort. Tapegrass frequency of occurrence was similar to last year, but perhaps it became denser in 2023. Fanwort frequency increased by 18% in 2023. Robbins pondweed (*Potamogeton robbinsii*) decreased for a second year in row, but only by 3%. The decline in this species is unexplained. This plant is a beneficial native species, but it is most frequently observed along Transects C and E. These areas are outside the drawdown zone are currently dominated by fanwort. Brittle naiad was present again in the southern portion of the lake. It was first observed in the southern end in 2022. Tapegrass increased in abundance in 2022 and continued to expand in 2023. Select plant species frequency data are shown in Figure 10.



**Table 6. Bare Hill Pond Cover and Biovolume Relative Change**

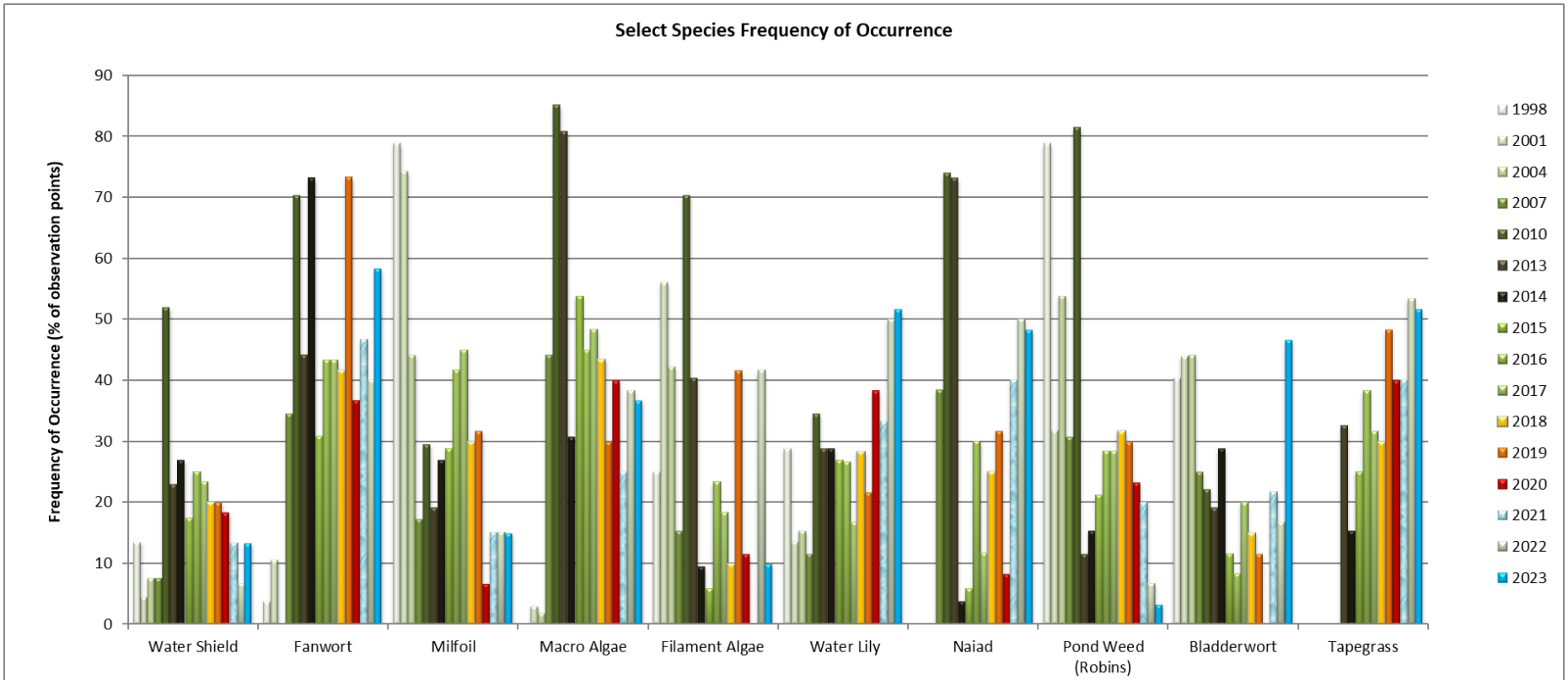
	Point	Cover								Biovolume								
		2020 (6.0')		2021 (3.0')		2022 (6.5')		2023 (7.5')		2020 (6.0')		2021 (3.0')		2022 (6.5')		2023 (7.5')		
		IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	
Transect A	1	4			2		4	3		4		1		3	2			
	2	2			3	2		4		1		2	2		2			
	3	4			4	4		4		1		2	3		2			
	4	4			2	4		4		1		2	3		2			
	5	4			3	4		4		1		2	2		2			
	6	4			3	4		4		1		2	2		2			
	7	1			4	2		2		1		1	2		1			
	8	2			3	4		1		1		1	1		1			
	9		1		3	3		1			1	1	1		1			
	10		1		0		4		0		1		0		1		0	
	11		2		0		2		0		1		0		1		0	
	12		0		0		1		0		0		0		1		0	
	13	2			1	1		1			1		1	1		1		
Transect B	1	4			4	4		4		3		4	3		3			
	2	4			4	4		4		2		2	2		3			
	3	5			4	4		4		2		2	2		2			
	4	5			4	4		4		2		2	2		2			
	5	5			4	4		4		2		2	2		2			
	6	5			4	4		4		2		2	2		2			
	7	5			4	4		4		2		2	4		2			
	8	5			4	4		4		2		2	2		2			
	9	5			4	4		4		2		2	2		2			
	10	5			4	4		4		2		2	2		2			
Transect C	1	1			4	4		4		1		1	1		3			
	2		4		4		4	3			1	2	2		2		1	
	3		4		4		4	3			2	2	2		2		2	
	4		3		3		3	4			2	3	2		3			
	5		1		0		0	1			1	0	0		1			
	6		4		0		1	0			2	0	0		1		0	
	7		4		0		4	1			2	0	0		2		1	
	8		4		3	4		4			3	1	2		2		2	
Transect D	1	4			5	4		4		2		4	1		4			
	2	4			4	4		4		2		4	1		2			
	3	4			4	4		4		2		4	1		2			
	4	4			4	2		4		1		3	1		2			
	5	4			4	4		4		1		3	2		2			
	6	4			4	4		4		2		2	1		2			
	7	4			4	4		4		2		3	1		2			
	8	4			5	4		4		2		1	1		2			
	9	4			5	4		4		1		1	1		2			
	10	4			4	4		4		1		1	1		2			
	11	4			4	4		4		1		1	1		2			
	12		4		2	4		4			2		1	2		3		
	13	0			2		4	4			0	2	2		3		4	
Transect E	1	5			2	4		4		2		1	3		2			
	2	5			4	4		3		2		1	2		3			
	3		5		4	4		4			2	2	3		2			
	4		4		2	3		3			2	2	1		2			
	5		4		3		4	4			2	2		3		3		
	6		4		4		4	4			2	2		4		3		
	7		4		4		4	4			2	2		3		3		
	8		3		2		4	4			2	2		1	3		3	
Supplemental	F-1	1			0	0		2		1		0	0		2			
	F-2		5		4	3		4			2	2				3		
	G-1	4			3	3		4		2		2	3		4			
	G-2		4		4		4	4			2		3	3		4		
	H-1	1			1	0		4			1		1	0		2		
	H-2		4		2	4			2			2	2				2	
	I-1	1			2	2		4			1		1	1		2		
I-2		4		1		0	3				1		1	0		2		

Increase by 2 or more ranks from prior year      Decrease by 2 or more ranks from prior year

**Table 7. Select Species Frequency of Occurrence (%)**

	Water Shield	Fanwort	Milfoil	Macro Algae	Filament Algae	Water Lily	Naiad	Pond Weed (Robins)	Bladder wort	Tapegrass
1998	13	4	79	0	25	29	0	79	40	0
2001	5	11	74	3	56	14	0	32	44	0
2004	8	0	44	2	42	15	0	54	44	0
2007	8	35	17	44	15	12	38	31	25	0
2010	52	70	30	85	70	35	74	81	22	0
2013	23	44	19	81	40	29	73	12	19	33
2014	27	73	27	31	10	29	4	15	29	15
2015	17	31	29	54	6	27	6	21	12	25
2016	25	43	42	45	23	27	30	28	8	38
2017	23	43	45	48	18	17	12	28	20	32
2018	20	42	30	43	10	28	25	32	15	30
2019	20	73	32	30	42	22	32	30	12	48
2020	18	37	7	40	12	38	8	23	0	40
2021	13	47	15	25	0	33	40	20	22	40
2022	7	40	15	38	42	50	50	7	17	53
2023	13	58	15	37	10	52	48	3	47	52
<b>Increase/Decrease from prior year</b>										
	7	18	0	-2	-32	2	-2	-3	30	-2

Naiad includes both native and non-native species occurrence.



**Figure 10. Bare Hill Pond Select Plant Species Frequency of Occurrence**

## Conclusion

Surface water total phosphorus concentrations were elevated in surface and in bottom waters of the in June and August. July was a wet month with low concentrations so some phosphorus could have been flushed out or diluted with higher water levels. With the sustained and expanding zone of low to no oxygen in portions of the lake deeper than 10 feet, internal loading remains a concern. The consecutive years of cyanobacteria blooms (2020 & 2021) are a symptom of warmer, low oxygenated, nutrient-rich waters. The Department of Health monitoring of photosynthetic pigments is helpful to track algal biomass and provide early warning of potential bloom. Secchi disk transparency was high early this year but declined over the summer, but still represents a substantial improvement over 2021.

The aquatic plant coverage was slightly increased over 2022 in the drawdown zone but decreased in deeper waters. The plant coverage reduction in deeper water could have been the result of the unintended deeper drawdown. Biovolume was slightly increased over 2022 with much of the plant volume attributable to two native species (bladderwort and tapegrass). Unfortunately, these species can become problematic for recreation even though they are native to New England. Many lakes have seen an increase in bladderwort this year; the cause is unknown. The density of fanwort has increased outside the drawdown zone but continues to be minimal in the drawdown zone. Non-native brittle naiad was comparable to last year and has not impeded recreation or reduce plant diversity in the lake. The lake has sustained a desirable coverage of low growing macroalgae and other native seed producing plants, such as pondweeds, in the drawdown zone following successful drawdown years.

We expanded the monitoring program in 2022 to better understand the cause of recent algal blooms. We suspect the lake may have reached a tipping point where the warming summers and increased availability of phosphorus from sediments will continue to result in more frequent and severe blooms. The sediment results from 2021 showed that phosphorus in the lake could increase by 0.02 mg/L if 20% of the sediment iron-bound phosphorus is released under anoxic conditions. Thankfully, the lake has been bloom-free thus far in 2023 and we may have avoided a potential bloom that was exhibited by the late July fluorometer readings. Although water clarity was low in August.

The pond's plant community is dense and diverse enough to support fish and wildlife, there are shifts in species composition between years, but the drawdown has proven to improve conditions; reduced dense monocultures of fanwort and milfoil in the drawdown zone and is encouraging growth of low growing beneficial plants that are less of a nuisance for recreation. The drawdown is likely improving flushing and ridding the lake of accumulated phosphorus from internal recycling over the summer. The weather may be the most influential factor as to whether the lake experiences a bloom or not. There is ample phosphorus available at the sediment water interface and whether cyanobacteria uptake that phosphorus and rise to the surface could be associated with weather patterns (light, temperature, precipitation, etc.) but this is still not well understood by phycologists. Conditions may become worse if algae and associated nutrients are not flushed out of the system.

## Recommendations

We have expanded the water quality monitoring program in 2022 to include early and late season data and have added three monitoring stations to evaluate conditions in areas deep enough to go anoxic. These data will reduce data gaps and will assist in evaluating options for oxygen mitigation, if warranted. This program should be continued in 2024, especially since the first year was an outlier weather year with a severe drought and we experienced a wet start to this summer.

Given the success of the drawdown over the years in minimizing non-native fanwort and milfoil density within the drawdown zone and improved flushing, the Committee wishes to implement a 6.5-foot drawdown this coming winter. This will reduce non-native species abundance and provide an added benefit of reduced phosphorus retention. The aquatic macrophyte survey, and other fauna surveys performed by the Committee will continue on an annual basis to assess year to year changes.

**HARVARD CONSERVATION COMMISSION  
MINUTES OF STRATEGIC PLANNING SESSION\*  
AUGUST 22, 2023**

Chair Don Ritchie called the meeting to order at 6:43pm in the Hildreth House under MGL Chapter 131 §40 Wetland Protection Act and Code of the Town of Harvard Chapter 119 Wetland Protection Bylaw

**Members Present:** Don Ritchie, Eve Wittenberg, Jaye Waldron, Joanne Ward, Jim Burns, Mark Shaw\*\*, Jessie Panek and John Lee (Associate Member)

**Others Present:** Liz Allard (Conservation Agent), Paul Willard and Wendy Sisson (Land Stewardship Subcommittee)

**Election of Officers**

Don Ritchie made a motion to elect Eve Wittenberg as chair of the Commission for fiscal year 2024. Joanne seconded the motion. The vote was unanimously in favor of the motion by a roll call, Don Ritchie, aye; Jaye Waldron, aye; Joanne Ward, aye; Jim Burns, aye; Jessie Panek, aye; and Eve Wittenberg, abstained.

Eve Wittenberg made a motion to elect Don Ritchie as vice chair of the Commission for fiscal year 2024. Joanne Ward seconded the motion. The vote was unanimously in favor of the motion by a roll call, Don Ritchie, abstained; Jaye Waldron, aye; Joanne Ward, aye; Jim Burns, aye; Jessie Panek, aye; and Eve Wittenberg, aye.

**Election of Representatives & Liaisons**

Jim Burns made a motion to appoint Jessie Panek to the Deer Management Subcommittee and John Lee to the Community Preservation Committee until June 30, 2024 as the Commission's representatives. Don Ritchie seconded the motion. The vote was unanimously in favor of the motion by a roll call, Don Ritchie, aye; Jaye Waldron, aye; Joanne Ward, aye; Jim Burns, aye; Jessie Panek, aye; and Eve Wittenberg, aye.

**Conservation Restrictions & Baseline Reports**

With the assistance of the chair of the Land Stewardship Subcommittee and the Conservation Agent, Joanne Ward has volunteered to assist in the process of completing the necessary conservation restrictions and developing a plan to complete the associated baseline reports.

**Town-wide Japanese Knotweed (JKW) Control**

The Commission agreed that being involved in a town-wide project for the control of Japanese Knotweed (JKW) is beyond their scope. However, as suggested by Wendy Sisson, chair of the Land Stewardship Subcommittee, the Commission will further investigate the use of Community Preservation Act (CPA) funds to conduct such a project. John Lee volunteered to investigate this further and will look at CPC funding options. There also may be opportunities for grant funding. Liz Allard suggested that, if allowed, CPA funding should be requested for the on-going treatment of the JKW along Mass Ave and Stow Road.

**Amendments to the Wetland Protection Bylaw and/or its Regulations, Chapters 119 and 147**

*Minor Activities* – The Commission agreed not to include minor activities as part of the proposed amendments but asked the Conservation Agent to provide the Commission with the process Lunenburg uses for Agent review along with the process in other communities.

*Waiver Process* – The Commission agreed to continue to issue or not issue waivers on a case-by-case basis. It was agreed that when waivers are voted upon the motion should be clear as to why the waiver is or is not being issued, to provide clarity for applicants as well as documentation in the minutes for future reference.

*Climate* – Liz Allard is working on revisions to the Bylaw and its Regulations as part of an MVP grant received by the Climate Initiative Committee, to be included on the warrant for the Spring town Meeting.

*Invasive Plant Management* – Liz Allard and Jessie Panek will work on these revisions to be included on the warrant for the Spring town Meeting.

### **Monitoring Conservation Restrictions**

Don Ritchie and Jim Burns volunteered to create a monitoring program for approval by the Commission. Once approved the Commission can determine which members will assist in the monitoring of these lands.

### **Deer Management Goals**

Don Ritchie and Jessie Panek volunteered to update the Mission of the Deer Management Subcommittee (DMS) with input from the members of the DMS and the Land Stewardship Subcommittee.

Jim Burns made a motion to stagger DMS membership terms starting with the July 1, 2024 (re)appointments in the following manner: two (2) three (3) year terms, two (2) two (2) years, and one (1) one (1) year term. Don Ritchie seconded the motion. The vote was unanimously in favor of the motion by a roll call, Don Ritchie, aye; Jaye Waldron, aye; Joanne Ward, aye; Jim Burns, aye; Jessie Panek, aye; and Eve Wittenberg, aye.

### **Wetland Protection Bylaw Fees**

John Lee volunteered to research previous Town Meeting votes to determine if terms for use of this fund were ever established. If not, the Commission will need to determine the use and submit a warrant article for the Spring Town Meeting.

### **Authorization of the Conservation Agent**

*Invoices* – Don Ritchie made a motion authorizing the Conservation Agent to include invoices that total less than \$500.00 on the bi-weekly bill warrant without prior approval from the Commission, except for mileage reimbursement for said Agent. Jaye Waldron seconded the motion. The vote was unanimously in favor of the motion by a roll call, Don Ritchie, aye; Jaye Waldron, aye; Joanne Ward, aye; Jim Burns, aye; Jessie Panek, aye; and Eve Wittenberg, aye.

*Comments for Planning Board (PB) and/or Zoning Board of Appeals (ZBA) Applications* - Jessie Panek made a motion authorizing the Conservation Agent to independently evaluate applications provided by the PB and the ZBA and to notify the PB and/or the ZBA when wetland resource areas are not impacted. In the case(s) where wetland resource areas are impacted, the Agent shall provide a written report to the Commission for their approval prior to submitting said report to the PB and/or ZBA. Jaye Waldron seconded the motion. The vote was unanimously in favor of the motion by a roll call, Don Ritchie, aye; Jaye Waldron, aye; Joanne Ward, aye; Jim Burns, aye; Jessie Panek, aye; and Eve Wittenberg, aye.

### **Public Outreach/Engaging Residents**

*Website News & Announcements* – The Conservation Agent is seeking suggestions from the Commission for monthly items that can be shared with residents under News & Announcements on the Town website. Current announcements include:

January: coyote breeding season

March: black bears becoming active, amphibian crossing, mud season

May: No mow May September: controlled archery hunting program

November: Snow mobile activity on conservation land

*Natural Heritage Endangered Species Program (NHESP)* - Joanne Ward and Eve Wittenberg volunteered to develop a plan using interns and volunteers to regain habitat under the State's Natural Heritage Endangered Species Program.

### **Involving Interns**

Eve Wittenberg volunteered to manage unpaid interns to assist the Commission with certain tasks such as those listed above under Public Outreach/Engaging Residents.

### **Meeting Logistics: In-person vs. Virtual**

Although not ideal for all, the Commission agreed to remain on a virtual platform for their public meetings. Assistance with these meetings, such as co-hosting and/or maintaining screen sharing, will be provided by the members on a rotating schedule.

### **Adjournment**

Jim Burns made a motion to adjourn the meeting at 8:59pm. Don Ritchie seconded the motion. The vote was unanimously in favor of the motion by a roll call, Don Ritchie, aye; Jaye Waldron, aye; Joanne Ward, aye; Jim Burns, aye; Jessie Panek, aye; and Eve Wittenberg, aye.

Respectfully submitted,

Liz Allard,  
Conservation Agent

\*The following items were listed on the posted agenda for this meeting for informational purposes only. No votes or action were taken on these items unless otherwise noted:

- Primary Objectives of the Commission
- Action Items of other Plans
- Funding
- Training and Continuing Education

\*\*Mark Shaw had not taken his oath of office as of the date of the meeting; therefore, he was unable to participate in any votes taken during this meeting.





Oxbow Associates, Inc.  
PO Box 971  
Acton, MA 01720

# Invoice 20926

**BILL TO**  
Harvard Conservation  
Commission  
13 Ayer Road  
Harvard, MA 01451

<b>DATE</b> 08/21/2023	<b>PLEASE PAY</b> <b>\$525.00</b>	<b>DUE DATE</b> 09/05/2023
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**JOB #**  
3081

**JOB LOCATION**  
Dean's Hill

DATE	SERVICE	DESCRIPTION	HRS	RATE	AMOUNT
07/03/2023	Senior Scientist	Field Work: Wetland delineation or Biological services: INVASIVE PLANT CONTROL	3:00	175.00	525.00

Subtotal: 525.00

We appreciate your business. Thank you for your prompt payment.

**TOTAL DUE** **\$525.00**

THANK YOU.

## Fw: Martin - Harvard Tripp Land (Conservation Restriction); Warilla Land & Gravel Pit (Town Properties).

robert douglas <drbobdouglas@yahoo.com>

Fri 09/01/23 12:52 PM

To: Jessie Panek <brumbydesign@me.com>

Cc: Liz Allard <lallard@harvard-ma.gov>; Don Ritchie <dsritchie@aol.com>; Margaret Sisson <mwsisson4@gmail.com>

Hi Jessie,

Below is the information from Biologist Dr. Feehan on the Tripp Parcel as well as the two town parcels (Warilla and Stow Gravel Pit). He backs up the Stewardship Committees recommendation that these parcels be placed in Management.

All the best, Bob

----- Forwarded Message -----

**From:** Feehan, Martin (FWE) <martin.feehan@mass.gov>

**To:** robert douglas <drbobdouglas@yahoo.com>; Crawford, Meghan (FWE) <Meghan.Crawford@mass.gov>

**Sent:** Tuesday, August 8, 2023 at 11:41:21 AM EDT

**Subject:** RE: Martin - Harvard Tripp Land (Conservation Restriction); Warilla Land & Gravel Pit (Town Properties).

Hi Bob,

I visited the properties yesterday. Tripp in particular should be a priority to open as it is facing significant damage and an almost complete loss of forest regeneration. If you look at photos I took (<https://photos.app.goo.gl/Zf5Jp3hRwMKRuNUq8>) the understory is predominantly barren. The few saplings that have persisted have been completely browsed bare within deer height. All but 1 break in the canopy on the property have no regeneration occurring and most are dominated by ferns which are a clear indicator of overabundant deer herds. The only break with regeneration occurring is dominated by invasive vegetation that is limiting deer access. The invasive vines will likely kill any of the young growth soon anyway. There are deer trails all over the place. There are great shooting lanes due to the loss in stand diversity that should aide in deer removal via archery hunting. There is still some ground vegetation persisting in patches and from what I saw the browse is indicative of deer densities between 25 and 30 deer/sq mile.

The other two properties are both good properties to add additional deer management. They have obvious limitations with both setbacks and with road access which make them a bit lower priority, but both also have significant deer impacts.

Let me know what details you have for the meetings.

### Martin Feehan

Deer & Moose Biologist

Wildlife Health Specialist

Massachusetts Division of Fisheries & Wildlife

1 Rabbit Hill Road, Westborough, MA 01581

p: (857) 289-2247

[mass.gov/masswildlife](https://mass.gov/masswildlife) | [facebook.com/masswildlife](https://facebook.com/masswildlife)



EXCERPT FROM THE:  
Land Stewardship Subcommittee Meeting  
07/25/23

Participants: Wendy Sisson, Brian McClain, Petri Flint, Pam Durrant, Peter von Conta, and Bob Douglas by Invitation.

4. Deer Management program (and background context for Petri). Town subcommittee has existed for 5 years and the actual hunting has happened for 3 years. Bob mentioned that the deer cull has resulted in deer movement out of areas where they may have stayed. Hunters are required to hit a small target, the size of a dollar bill.
  - a. Looking at more sites. A small number of additional sites have been added each year. 14 parcels and approx. 500 acres currently in the program.
  - b. Consideration of Tripp land: Conservation restriction held by HCT (Harvard Conservation Trust), wherein the Tripp family expressed desire for hunting only be allowed for management purposes. Houses are to the west of the land, and that portion would be off limits. East of red trail, facing RT. 495 and swamp could be considered as walkers/people would be very unlikely to go there. Bob mentions that this area is ideal and has many deer. This land has the recommendation of LSS. Approved. Policy considerations: Bob: Board of HCT will examine the conservation restriction. LSS recommends to ConCom, who then recommends to HCT. Who holds the restriction makes the final decision.
  - c. Consideration of Stevenson/West Land: Bob also mentioned this land, and Wendy stated that there are no trails or walkers there which could make it a good candidate. Approved.
  - d. Consideration of Old Mill Land: trail has been modified by LSS. Northern end has large wetland along Cold Spring Brook and the trail has been dead-ended on the NE corner. Setback along the RR tracks? Setback from roads is 150'. Consideration of the use of the snowmobile trail during the hunting season. Bob mentioned that all small areas have potential and are worthwhile. Similar to Maxant site in this way, where the first deer of the 2022 season was taken. Consideration of horses on adjacent farm property here in Old Mill. Concern for sensitive sandy soil in that pitch pine/scrub oak part of the site and desire to communicate this to hunters with a limit of one hunter at a time on the site. Approved for a single hunter.
  - e. Noting that if problems arise, areas can be rescinded.
  - f. Consideration of Abbot Reed Powell land: Portion of orchard and wooded pine canopy on the identified free area on map shown. High concentration of dwellings and therefore setbacks. Area is well used and probably too densely utilized. Orchard attracts deer regularly. Bob: area is rich in deer who love the apples. Noting that hikers and hunters can coexist where hunters are close to trails. Required deer stand setbacks are 75' from either side of a trail. Wendy expresses opposition wanting to wait longer before consideration of Powell land

approval due to the number of walkers and dogs. Extend consideration until next year and revisit. Not approved.

- g. Consideration of Clapp-Scorgie-Smith-Tufts Land: Wendy: would be beneficial to hunt here but area heavily utilized by walkers. Needs further exploration and consideration of possibilities on the less utilized Tufts-Smith portions, complying with setbacks. Bob will work with hunters to identify some areas that are outside of setbacks, and look like they have potential. Not approved at this meeting.
- h. Consideration of Harvard Gravel Pit land: Seems ok as there are no walkers in this area, though DPW use would need to be accommodated. Inclusion supported by group.
- i. Consideration of Warilla land (municipal): Land without trails suitable though access could be tight; access point from Stow Rd. is close to a family home who are opposed to seeing hunting activity. Not a concern if access from Daman-Stevenson is utilized. Question for town whether woods road access from Stow Rd. is on private land. Inclusion recommended by group.

Re: ENVISION HOMES- 90 WARREN AVE CONSTRUCTION SEQUENCE PHASE I-5

ENVISION <RNKody@envisionhomes.net>

Thu 08/31/23 9:26 AM

To:Liz Allard <lallard@harvard-ma.gov>

Hi Liz

Quick update attached. Also wanted to let you know that the homeowner has decided to have Envision do the driveway and septic system. Currently HUB is still planning on doing the bridge, although this may change. Still working through sequence of when the bridge will be installed.

Please let me know when you next plan to be on site, I would like to meet you there.

Call with any questions

Bob

c 508-868-2947

## Conservation Sequence of Work

90 WARREN AVE #177-0719

### Project Phases

#### POND SIDE

PHASE 1 Site Prep, DEMO, temp bridge, well drilling, foundation, backfill,  
 PHASE 2 Frame, house and decks  
 PHASE 3 Grade driveway, and install septic tanks, install propane tank

#### WARREN SIDE

PHASE 4 Driveway, SDS,  
 PHASE 5 Bridge

EXCAVATION CONTRACTOR for work on pond side of bridge

GT SMITH  
 GARY SMITH  
 978-874-2208

EXCAVATION CONTRACTOR for work on Warren side of Bridge

HUB FOUNDATIONS / RM RATTA  
 978-772-1600

#### PHASE I

- 1/3/23 site meeting with Liz and Homeowner
- 4/1/23 temporary electric service pole installed
- 4/3/23 post DEP signs at road and pond
- remove rocks next to bridge
- temporary silt fence around demo area installed
- silt fence at bridge installed
- LIZ inspection
- temporary bridge install
- national grid disconnect / reconnect
- DEMO existing cottage
- mark trees for removal
- review marked trees with Liz and Homeowner
- cut trees and remove from site
- install silt fence around project work area
- Liz inspection
- prep site for well rig access
- drill geo wells
- pipe and grout vertical wells
- excavate for foundation and utility trenches (LEDGE most likely)
- stone / form / pour footings
- form and pour foundation walls
- install perimeter drain to daylight
- underground geo to foundation
- drill water well
- install underground, water to foundation
- backfill / boulder walls / rough grade
- install deck footings
- install re-charge trench at front of foundation
- stone below decks
- final rough grade

#### PHASE II

- Start Frame

#### PHASE IV

- add new wattles to existing silt fence on warren side of bridge
- excavate septic leach field to bottom of bed
- rough grade septic and break out area

On Aug 21, 2023, at 11:10 AM, Robert Kody <[RNKody@envisionhomes.net](mailto:RNKody@envisionhomes.net)> wrote:

Yes

Sent from my iPhone

On Aug 21, 2023, at 9:48 AM, Liz Allard <[lallard@harvard-ma.gov](mailto:lallard@harvard-ma.gov)> wrote:

Thanks Bob,

Just want to confirm that Phase 2 is the framing of the house and decks?

Liz Allard  
Conservation Agent  
Town of Harvard  
13 Ayer Road  
Harvard, MA 01451  
978-456-4100 ext. 321

*The Commonwealth of Massachusetts Secretary of State has determined that e-mail is a public record. Privacy should not be expected.*

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**From:** ENVISION <[RNKody@envisionhomes.net](mailto:RNKody@envisionhomes.net)>  
**Sent:** Friday, August 18, 2023 8:37 PM  
**To:** Liz Allard <[lallard@harvard-ma.gov](mailto:lallard@harvard-ma.gov)>  
**Subject:** Re: ENVISION HOMES- 90 WARREN AVE CONSTRUCTION SEQUENCE PHASE I

Hi Liz

Wanted to give you a quick update. PHASE 1 is nearly complete. With approval of Board of Health (well) and final building permit we should be ready to start framing.  
Still working out how project will come together on Warren side of Bridge.

Bob

Call me if you have any questions.  
508-868-2947

<Screen Shot 2023-08-18 at 5.04.36 PM.png>

On Apr 3, 2023, at 11:40 AM, Liz Allard <[lallard@harvard-ma.gov](mailto:lallard@harvard-ma.gov)> wrote:

Thanks Bob,

According to the Order of Conditions the construction sequence need approval from the Commission. I have it on the agenda for Thursday. I see no reason for you to have to be there.

Cheers

Liz Allard  
Conservation Agent  
Town of Harvard  
13 Ayer Road  
Harvard, MA 01451  
978-456-4100 ext. 321

*The Commonwealth of Massachusetts Secretary of State has determined that e-mail is a public record. Privacy should not be expected.*

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**From:** ENVISION <[RNKody@envisionhomes.net](mailto:RNKody@envisionhomes.net)>  
**Sent:** Sunday, April 2, 2023 10:08 AM  
**To:** Liz Allard <[lallard@harvard-ma.gov](mailto:lallard@harvard-ma.gov)>  
**Subject:** ENVISION HOMES- 90 WARREN AVE CONSTRUCTION SEQUENCE PHASE I

Liz

WRT 90 Warren Ave,  
Below is sequence of operations for phase 1 of this project.

All items are subject to change due to site conditions, labor, weather, etc.  
As the project progresses I will update you on work to be done on the Warren side of the bridge

Please let me know if you need any additional information  
Bob  
c 508-868-2947



## Project Phases

## POND SIDE

PHASE 1 Site Prep, DEMO, temp bridge, well drilling, foundation, backfill,  
PHASE 2 Frame, house and decks  
PHASE 3 septic tanks

## WARREN SIDE

PHASE 3 Bridge  
PHASE 4 Driveway, SDS,

EXCAVATION CONTRACTOR for work on pond side of bridge

GT SMITH  
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EXCAVATION CONTRACTOR for work on Warren side of Bridge

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978-772-1600

## PHASE I

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- cut trees and remove from site
- install silt fence around project work area
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- prep site for well rig access
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- pipe and grout vertical wells
- excavate for foundation and utility trenches (LEDGE most likely)
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- underground geo to foundation
- drill water well
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- backfill / boulder walls / rough grade
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