

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

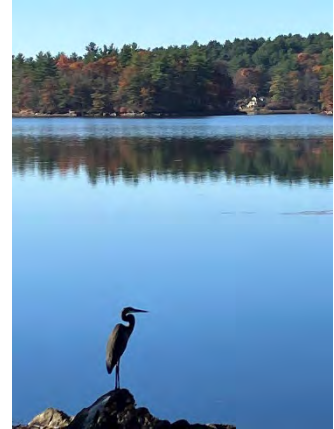
Dear Commissioners:

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.¹ .

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

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.

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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', with a stylized flourish at the end.

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 2023Exhibit 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 st 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

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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
6/14/2023	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								Loud Pickle 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 3rd, 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 previous 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 25th, 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.

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.

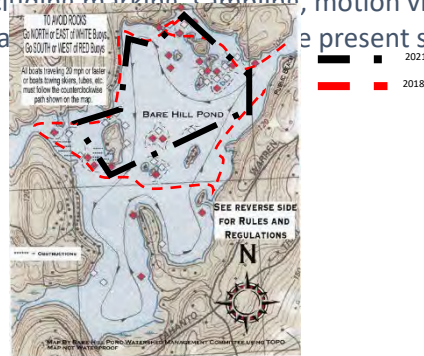
Track and Observations: Based on previous years of observation, I focused on the Northeast shoreline shown below on the map (black=2021). The North American Painted Turtles (N=26) were the only turtles I saw on this outing. No box-like turtles (Musk) as seen last year. I did see an ~10" Snapper on Pond 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 dam 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.

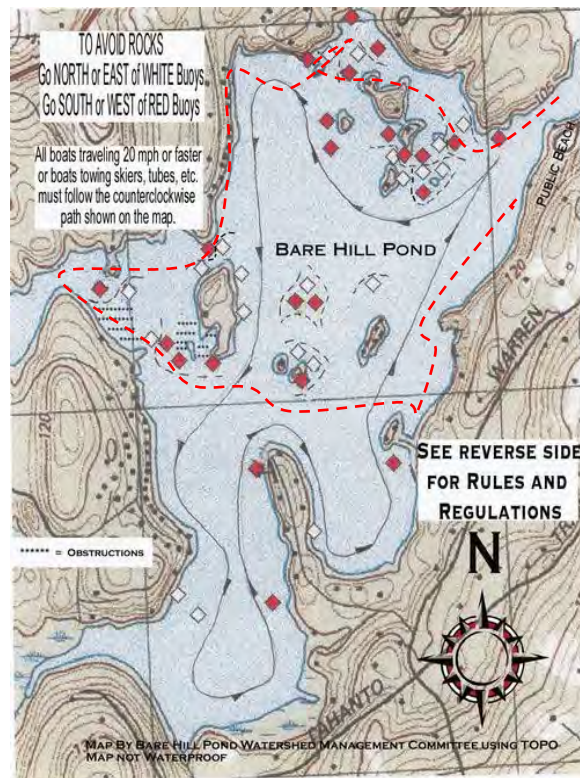


Day/Date/Time - Sat Aug 19, **2018** between 1:00-3:00 PM

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.



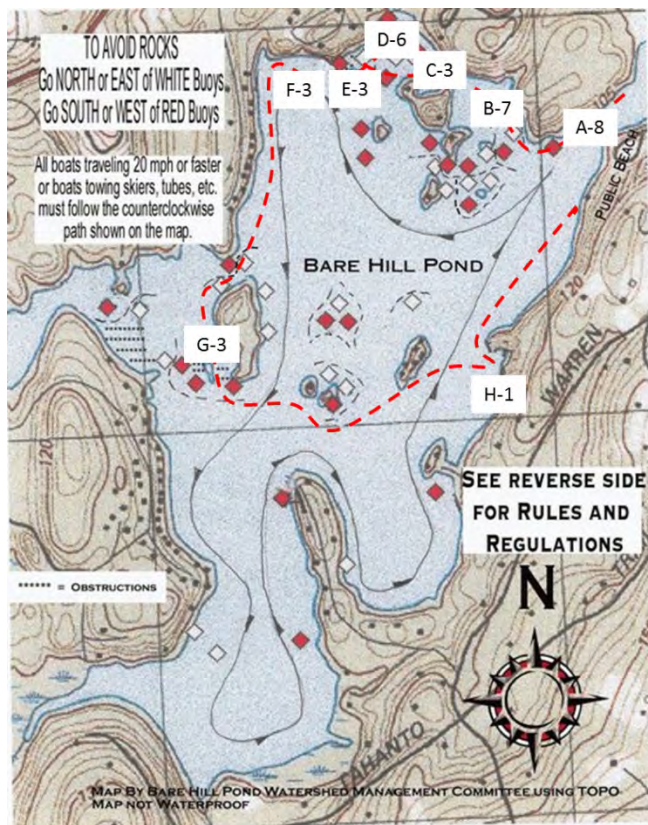


Day/Date/Time - Sat Aug 12, **2017** between 2:00-4:00 PM

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.