

2024 Water Quality Sampling Program Report to Hatch & Bradley Brook Residents Results and Discussion

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This report to the resident covers the 2024 sampling activity by HBBLA volunteers. Included are conclusions derived in direct cooperation with UFI.

There are 2 sections – a Summary, and a Detailed Description.

SUMMARY:

From June 2023 to January 2024, a Harmful Algae Bloom (HAB) of unusual intensity and duration covered the entirety of Bradley Brook Reservoir. In response, the Hatch-Bradley Brook Lakes Association contracted with the Upstate Freshwater Institute (UFI) to provide analysis of the limited water quality data covering the period of the bloom and develop strategies for prevention and mitigation of future blooms. On the recommendation of the UFI team, the Water Quality Committee initiated an expanded water sampling/testing program in the spring of 2024. The goal of the new testing program was to provide scheduled monitoring of phosphorus levels and temperature, factors known to contribute to algae growth, in both Bradley Brook Reservoir and Hatch Lake. Additionally, the program included the monitoring of tributaries into both lakes, in an effort to identify and mitigate injection of nutrients into the lakes.

Over the summer and fall of 2024, total phosphorus, total suspended solids and temperature data were collected weekly and as dictated by unusual weather events. In January of 2025, members of the Water Quality Committee met with the UFI team to discuss the collected data. The following conclusions emerged from the discussion:

- During the summer months, Hatch Lake typically exhibits phosphorus levels below the threshold that promotes widespread algae growth.
 - Lake stratification results in localized HABs in the late fall, repeating a pattern seen in previous years.
 - Phosphorus levels in the lake are low in the spring, rising during the summer months and returning to low levels in the winter.
 - The measured inflow of phosphorus from tributaries does not account for the increase in lake phosphorus levels observed during the summer months.
 - The most likely source of this discrepancy is human related, probably septic systems.
 - Increased phosphorus accumulates in the lake over time, such that HABs could be triggered in the future given the right environmental conditions.
 - Heavy rainfall brings in significant amounts of phosphorus and silt from rapid runoff in the watershed and roadways.

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- During the summer months, phosphorus levels in Bradley Brook Reservoir regularly exceed the threshold associated with rapid algal growth
 - Bradley Brook does not stratify uniformly during the summer, removing internal cycling as a potential source of the higher phosphorus levels.
 - A majority of Bradley Brook is mixing continually due to its shallow depth, geometry and orientation to the prevailing winds.
 - Bradley Brook's phosphorus is consistently higher than Hatch Lakes levels indicating that Hatch lake is not the sole cause of high phosphorus levels in Bradley Brook.
 - The measured inflow of phosphorus from tributaries does not account for the observed summer increase in phosphorus levels.
 - The most likely source of this discrepancy is human related, probably septic systems.
 - Increased phosphorus accumulates in the lake over time, such that HABs could be triggered in the future, given the right environmental conditions.
 - Heavy rains bring in undesirable amounts of phosphorus and silt from rapid runoff in the watershed, and specifically roadways

DETAILED DESCRIPTION:

In 2023 Bradley Brook experienced a months-long harmful algal bloom (HAB) that was long lasting and lakewide. It interfered with recreation on the lake and caused an extensive aquatic plant dieoff. Hatch Lake did not experience this event. In late 2023, HBBLA contracted with consultants from Upstate Freshwater Institute(UFI) to investigate possible causes of the bloom and suggest measures to prevent a recurrence. The UFI team used available environmental data, including lake measurements taken by HBBLA and CSLAP, in their investigation and issued a report in April, 2024. The underlying cause(s) of the bloom were not conclusively identified, but aspects of lake ecology that contribute to a HAB event were identified. Nutrient inflows from streams and roadsides, septic systems and fertilizers in conjunction with climate impacts and dam design were identified as contributors to rapid algal growth, based on the best scientific information available for small lakes in a NYS climate. The UFI consultants recommended the collection of additional data on phosphorus levels in sources such as streams and culverts and the lake itself, to supplement the existing CSLAP database. This program, initiated in the spring of 2024, was expanded with additional resources to gather data that would allow identification of key nutrient inflows adding phosphorus to the lakes. Under the new program, Hatch and Bradley were both sampled every 3 weeks to establish a solid nutrient inflow baseline. The sampling procedures and processes were developed, tested and documented to assure a consistent process and result across each sampling event.

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Water samples were submitted to UFI's NYS certified lab in Syracuse, NY for analysis. Results were typically available three weeks after submission.

A field microscope was also purchased for use in digital imaging of algal samples for species identification by Dr. Greg Boyer at the SUNY College of Environmental Science and Forestry (ESF). The rapid response identification of toxic algae species has allowed the Water Quality Committee to more quickly communicate potentially hazardous conditions to the lake communities.

In January 2025, members of the WQC met with the UFI team to review the enhanced dataset collected in the summer and fall of 2024. The UFI consultants' look-forward recommendation was to continue sampling in 2025 at the same extent and frequency and to begin sample collection as early as possible to get a full year additional baseline. Additionally, they recommended a continued emphasis on septic system maintenance by lake residents.

Over the summer and fall of 2024, 217 individual water samples were collected from tributaries and culvert discharge points around both lakes, in an effort to identify significant sources of phosphorus, an established nutrient contributing to algal blooms. Samples were analyzed at the UFI labs for total phosphorus (TP) and, where appropriate, total suspended solids (TSS). Water column temperatures for both lakes were measured throughout the summer and fall to determine if and when mixing of the upper and lower water levels occurred, a phenomenon known to transport phosphorus from the bottom sediments of a lake to the surface, providing food for algal growth.

Environmental phosphorus exists in a number of chemical forms; some (bioavailable phosphorus derivatives) are more important for the growth of HABs. Primary sources of bioavailable phosphorus include decaying plants, septic runoff, fertilizer runoff, and the internal cycling of phosphorus between the lake sediment and surface water noted above.

Non-bioavailable phosphorus comes mainly from soil runoff. Bioavailable phosphorus is available immediately as a nutrient and a much more powerful fertilizer for algae.

For our collections, we elected to analyze for the total amount of phosphorus (TP) in each sample, a decision made based with deference to economic considerations.

Note that the DEC level of TP that triggers further monitoring is 20 ug/l (micrograms per liter)

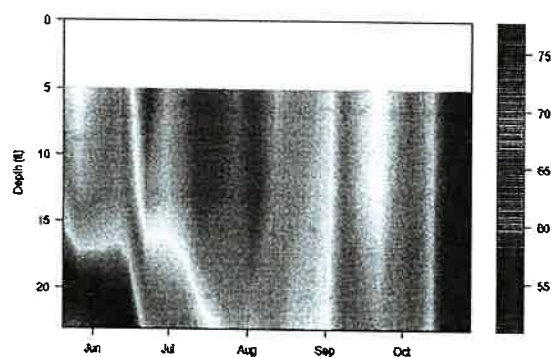
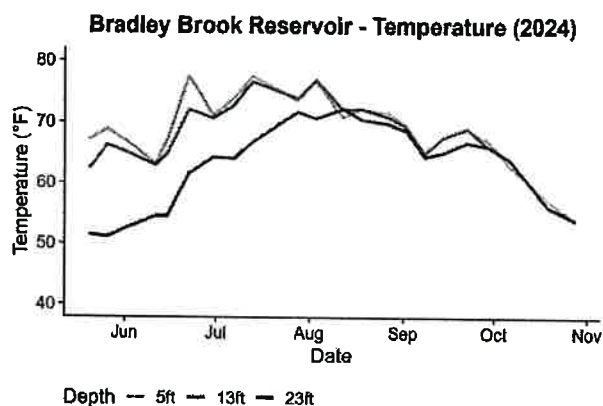
The nutrients that fuel HAB formation can come from both internal and external sources. The sampling program for 2024 was designed to look at both loading scenarios.

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External loading comes from sources external to the lakes: streams and culverts running into the lake, groundwater (springs), runoff from lawns and construction sites, and septic systems. The 2024 sampling program focused on the identifiable, measureable sources of streams and culverts; and on occasion, construction site-based erosions were sampled.

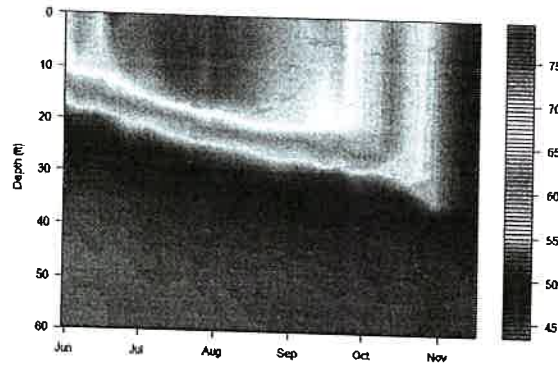
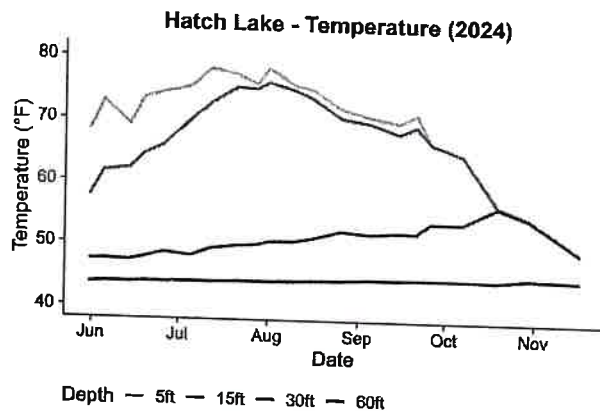
Internal loading comes from the cycling of phosphorus between the bottom sediments and the lake water. Phosphorus typically adheres to soil that is washed into the lakes. Soil sediments rich in iron and other minerals bind phosphorus, rendering it unavailable for plant growth. Phosphorus remains tightly bound to these sediments until certain conditions occur. Under anoxic conditions (limited oxygen availability) phosphorus is released from the sediment into the lake waters and becomes bioavailable. Anoxic conditions occur when a lake stratifies: when warm, surface water floats atop a layer of cold, denser bottom water with no mixing of the layers. Over time the oxygen in the bottom water layer is depleted by bacteria and fish, establishing the anoxic conditions that allow bioavailable phosphorus to be released from the sediments. When the surface water cools, the top and bottom water mix bringing bioavailable phosphorus to the surface where it can fuel algal growth.

The water column temperature of both lakes was measured through the summer and fall of 2024 to determine if, and when, the colder bottom water mixes with the warmer upper layer. Mixing also occurs due to surface wind, currents and boat traffic. Results for 2024 showed that the relatively shallow (28 feet maximum depth) Bradley Brook did not stratify during the course of the summer, while the significantly deeper (62 feet maximum depth) Hatch Lake stratified very strongly over the summer.



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Hatch Lake bottom water samples showed elevated phosphorus levels as the summer progressed, consistent with anoxic phosphorus release. Hatch had small HABs in the fall (late September through November), likely fueled by phosphorus brought to the surface when the lake temperature equalized.

Stream and culvert samples were collected by two person teams from both lakes using a sampling protocol and collection kits developed by the WQC. Collection kits allow the gathering of physical samples as well as the measurement of stream velocity and flow rates. Process documentation and field training on sampling protocol was conducted by Don Bigelow and Ken Masker.

Members of the 2024 sampling teams were:

Hatch

Linda Hoxie
Sue Benfield
Stephanie Eiger
Marybeth Masker
Ken Masker

Ed Keplinger
Jeanne Keplinger
Doc Marra
Gary Diana

Bradley Brook

Don Bigelow
Jim Kallmerten
Kevin Hall
Keith May

Michael Johnston
David Turner
Jim Clarey

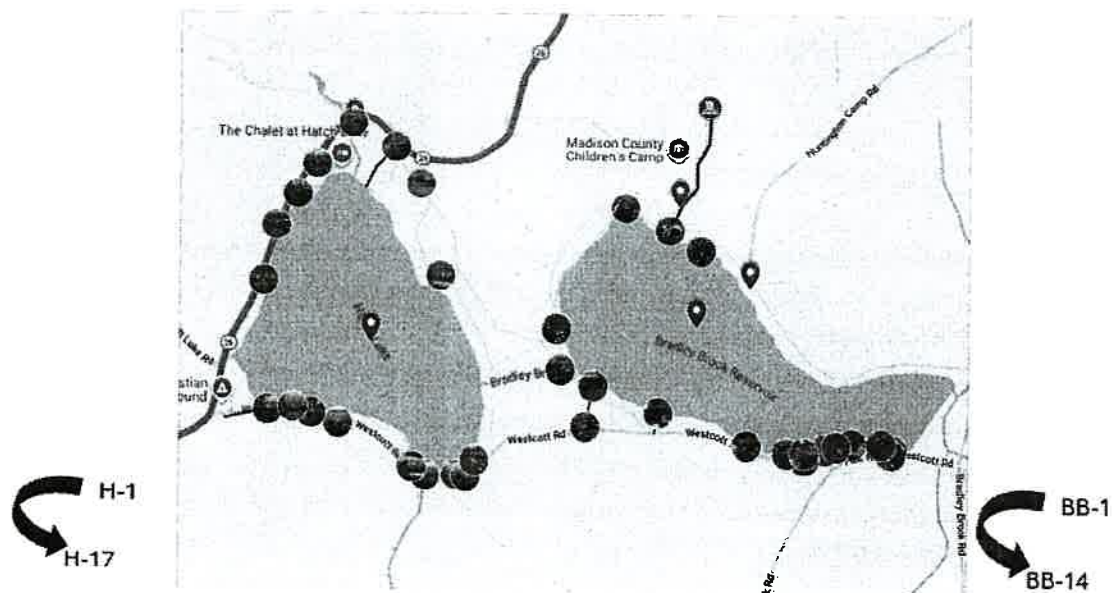
In addition to the tributary collections teams, weekly lake sampling/testing of surface and deep water was carried out by Ken and Jan Walterick (Hatch) and Jim Kallmerten (Bradley) using CSLAP equipment and protocols.

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Conclusions drawn from the tributary sampling program:

(Map shows approx. sampling locations and direction of numbering)



1. There are continuously flowing tributaries into Bradley Brook Reservoir and Hatch Lake. These were systematically sampled.
 - a. Three Hatch Lake tributaries run continuously with increased flow during storms. All are significant total phosphorus contributors.
 - i. Malloy Rd drains from ponds and from upland to the NW
 - ii. The Culvert near Conrad which drains a ravine and hillside across Westcott Rd from the south.
 - iii. The Culvert near Barde drains the wetland across Westcott Rd to the SE.
 - b. Two Bradley Brook tributaries run continuously and are significant total phosphorus contributors.
 - i. The Hatch Lake connector drains directly from the Hatch spillway and is affected mostly by the Hatch Lake level. Both Canal Corp valve adjustments and strong rain events increase the flow. The channel of the connector is steep, with banks that have little vegetation and erode during heavy rain events, washing nutrients into the waterway. The data shows that the TP measured from the inlet(Hatch) to the outlet(Bradley) only differed modestly.
 - ii. The Beaver Dam tributary collects water from the north of Bradley from an active beaver pond that has recently increased in area due to beavers raising the height of the dam across the stream. The stream drains through a hemlock-forested watershed with springs and eroding stream banks. It sees increased flow during rain events.

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2. Around the two lakes there are thirty-five culverts that drain water from roadway ditches, roadways, lawns, forest, roof drains, and foundation drains. These culverts were sampled where appropriate and practical. See appendixes 4 & 5.
 - a. Several culverts test for high total phosphorus during rain events.
 - b. Most culverts only run sufficient water for sampling following heavy rain events and in the spring. In 2024, many remained too dry to sample, even after moderate rains.
 - c. Some show visible soil plumes & high total suspended solids during heavy rains.
 - d. In 2025 we will anticipate a more typical rainfall pattern and will continue to sample culverts when possible.
 - e. Hatch Lake culverts that consistently exhibit high flow during rain events:
 - i. H-1, Malloy Road
 - ii. H-10 Westcott next to Conrad
 - iii. H-14 Westcott next to Barde
 - f. Bradley Brook culverts that consistently exhibit high flow during rain events:
 - i. BB1 Paddleford near 4936 Huntington Camp -near Olivers
 - ii. BB-2- Huntington Camp near 4912 Huntington Camp -near Faheys
 - iii. BB-5 - Westcott above 3069 CR3 -near Werners
 - iv. BB-6 - Westcott across from 5041 Westcott -near Wrights
 - v. BB-9 = Westcott near 5142 Westcott - near Hills & Ulatowskis
 - vi. BB-14- Westcott across from 5212 Westcott - near Careys
3. There is significant roadway runoff into the lake in several areas; sample collection was not practical at these sites, but sediment plumes were clearly visible after storms.
 - a. Tollerup Road on the eastern (Bradley Brook) slope, where there is little woodland to absorb the water. This runoff can also flood some septic fields.
 - b. Tollerup Road on the western (Hatch Lake) side near the Cookshore cutoff and farmers ditches. Rain drains into a swampy area, but runoff needs better control.
 - c. Westcott Road runoff from the Shiloh Campground driveway.
4. Erosion from construction and soil disturbance on lakeside properties during heavy rain events.
 - a. Samples were taken in the lake near these locations where possible and practical during rain events.
 - b. Sampling events were infrequent as sampling was deemed hazardous during major storms with significant rainfall..

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5. Septic and other property specific impacts (i.e., fertilizers):
 - a. No reliable protocol is available for site specific septic sampling without direct cooperation from the property owner.
 - b. Phosphorus from septic runoff is bioavailable phosphorus which is a component of the measurements of total phosphorus. One septic system leaking can generate more bioavailable phosphorus than many culverts and/or streams.
 - c. The small lakeside lots generally contain septic systems and water wells nearer to each other than are recommended by the health dept. A leaking septic near a shallow well, or a poorly grouted casing, can easily pollute the well (a health issue).
6. Animal Feces - Geese and Amish horse dung and dog manure. Not measurable, but also not helpful. Resident geese were removed for ecology and health reasons.

Proposed steps to reduce total phosphorus in Bradley Brook Reservoir and Hatch Lake:

1. To the extent possible redirect, or limit erosion, and/or filter inflows to reduce the amount of phosphorus laden soil being washed into the lake.
 - a. Continue projects on Tollerup and Westcott Rd.
 - i. Camp Rd. 4 drainage redirection
 - ii. Shiloh Campground Rd. drainage redirection
 - iii. Tollerup Rd. Erosion control project (partially completed)
 - iv. Retention pond on BB-9 culvert upland water source
 - v. Possible redirect of Fisk road drainage from BB-14 culvert.
 - b. Encourage the Town of Eaton to enforce the existing (since 1997) zoning permitting requirements on development on steep slopes.
 - c. Modernize old, failing septic systems.
2. Work with the Town of Eaton (TOE) and the Madison County health Department to ensure that existing septic laws are being enforced. Continue to press TOE for mandatory septic inspections..
3. Educate local realtors to ensure they are disclosing the Septic Law inspection requirements to their clients(with TOE).
4. Continue sampling on key nutrient sources and possible O2 measures in the lakes.

Missing Phosphorous from Hatch lake

1. Looking at the inflows measured vs. the outflows measured indicates the amount of phosphorus entering and leaving the lakes is roughly equal.
2. However a large amount of the inflow phosphorus is in the form of soil and silt. This soil and silt settles out on the bottom of the lake and doesn't flow out of the lake discharge. Due to the stratification of the lake we wouldn't expect to see any contribution to outflow until late fall when the lake turns over if at all. Note that Bradley only receives the upper 10-15 feet of the Hatch water column as the dam valve only reaches down to an approx 10 foot depth.

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3. Where is the extra Phosphorus coming from? Possibilities include.
 - a. Ground Water
 - i. This is largely unmeasurable but we could do some well water sample to gauge the likelihood that this is a major contributor.
 - ii. However it is unlikely to be a contributor since the under ice samples indicate very low phosphorus levels. Which would not be expected if groundwater was a significant contributor
 - b. Culvert that were under sampled
 - i. Unlikely since most didn't flow due to the dry summer.
 - ii. Since the major portion would be from silt, this should not show up in outflow anyway.
 - c. Non-point sources
 - i. Septic systems
 1. The more we have learned about septic systems, the more we learn about the inadequate US standards. Design requirements for systems in the US do not address removing Phosphorus. In other countries special equipment is used to remove Phosphorus. These are largely not used in the US.
 - a. Lacking this equipment the leach fields should be placed as far as possible from the lake since soil will bond to Phosphorus if given enough exposure.
 - i. However no real standards for lakeside placement exist.
 - b. Also, over time the soil around a septic leach field becomes saturated with Phosphorus. When replacing a septic system the leach field should be relocated to a fresh location or the soil around the leach field replaced to allow it to absorb additional Phosphorus. The excavated soil should be removed from the site away from any waterways
 - c. Also enriching the soil around a leach field with iron oxide or aluminum oxide enhances the ability of soil to absorb phosphorus.
 - d. Work with County DOH to reconsider holding tank usage.
 - i. Properly installed and leak tested Holding tanks would remove phosphorus from the lake area
 - ii. Now they can only be used for hardship situations

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Fertilizers

2. Runoff from fertilizer can be a significant source of Phosphorus.
 - a. NYS state law prohibit sale of Phosphorus containing fertilizers on lawns
 - b. Agricultural fertilizers on lawns is prohibited in NYS
 - c. Don't fertilize within 20 ft of a waterway or near drainage pathways. Especially for steep lots (DEC guidance)
- ii. Construction Runoff
 1. Construction runoff can carry a significant amount of Phosphorus into the lakes as soil erodes off the site..
 2. Town Zoning regulations require a special permit for construction on slopes >15%. Virtually all lots on both lakes Have slopes of >15%
 3. Properly installed erosion control measures can significantly reduce the amount of soil erosion from construction sites.
 4. SWCD can and has assisted in erosion control plans

4. Phosphorus Prevention/Control strategy

1. This past year sampling and our discussion with the scientists at UFI about the result has drawn the tentative conclusions
 - i. Hatch Lake appears to be in a stable condition with regards to Phosphorus levels and is generally below the Phosphorus levels which establish the condition for BG Algae Blooms
 1. The exception is when the lake turns over in the fall resulting in internal cycling of Phosphorus to the surface causing localized blooms. This has been the observed condition on Hatch for many years.
 - ii. Bradley Brook is in a state where it is much easier to establish the conditions for BG Algae blooms.
 1. Bradley Brook has considerably less water volume than Hatch and is much shallower.
 2. This results in an effect considerably greater for the same nutrient input(Phosphorus in its various forms):
 - a. One failed septic system will have a much greater effect on BB than it would on Hatch.
 3. The cause of elevated Phosphorus levels in Bradley Brook is not Hatch outflow since the levels in Hatch are consistently lower than Bradley Brook.

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4. Since both lakes are in close proximity to each other it is unlikely groundwater is the cause of elevated Phosphorus levels in Bradley Brook. Also the low Phosphorus level measured in the winter tend to eliminate ground water as a significant source of Phosphorus
5. Most of the silt washed into Bradley Brook likely settles out on the bottom. Construction sites runoff and erosion silt from tributaries is likely not the major contributor to TP elevation. This is due to Bradley Brook likely not experiencing the extent of hypoxic(oxygen starved) conditions like Hatch. Hence less internal TP cycling. Monitoring deep water O2 depletion through the year is the standard method to confirm this. That tool is unavailable.
6. This process of elimination leaves Septic systems, lawn runoff, and Geese(animal feces) as the likely main contributors.

Other lake water quality issues of importance:

1. Invasive Species

- i. Eurasian Milfoil is endemic in Hatch lake and returning to Bradley Brook after the 2023 complete die off from the BG algae bloom.
 1. Floating Milfoil material is regularly blocking the grates on the Hatch dam. This is preventing the Canal Corporation from effectively controlling lake level despite several cleanings of the grates. As of March 2, 2025 the Hatch Lake level is still higher than the top of the spillway. This will likely lead to Ice damage to docks and seawalls around the lake during breakup.
 - a. This plugging is much worse than in previous years.
 - b. Effects on recreation are also a major effect. Large mats of Milfiol are impacting boat navigation and swimming.
 - c. Boat propellers are shredding the milfoil and promoting its spread.
 - d. HBBLA had the Town of Madison Highway department weed harvester cut weeds in July of 2024. About 20 tons of weed material was removed. This provided some temporary relief but doesn't address the underlying issue.
 - e. New DEC wetland regulations may complicate the ability to use the weed harvester in the future in addition to any possible chemical control strategy.
 - i. The Board is monitoring regulation development to assess the impact on the lake association members, but this issue is very much in flux.

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- ii. Nets were placed in the Hatch -Bradley stream to capture milfoil fragments during 2024 while harvesting. The one closest to the Hatch dam was very effective and left in till the end of year. Consider this again for 2025.
- iii. Other potential invasives
 - 1. Starry Stonewort. This is already present in Lake Moraine. It forms dense beds in water up to 30 feet deep. These beds choke out native vegetation with adverse effects on native fish populations. Essentially the entire lake bed is covered.
 - 2. Hydrilla. This form mats so dense that boats cannot navigate them. It has been identified in NY since 2008 and continues to spread. Introduction into the H/BB lake ecosystem would be catastrophic.

2. Invasive Species Control

- 1. Prevent addition introduction of Invasive Species
 - i. The way that aquatic invaders spread is by hitchhiking on boats and trailers from contaminated water bodies. This is the main way that invasives have been proven to spread in NYS. Prevention is key to prevent the nearly impossible job of removing invasives once established.
 - 1. All the launches on the lake have at least some control. Invasive species warning signs should be placed at all the locations
- 2. Controlling Existing Invasive Species
 - i. Several Techniques exist to control invasives, unfortunately none of them will completely eliminate invasives
 - 1. Weed Mats/blankets are suitable for small areas or for isolated invasive patches.
 - a. Used to keep dock clear or eliminate small patches after other treatments
 - b. Expensive for the area treated
 - 2. Hand Pulling/raking are suitable for small areas or for isolated invasive patches
 - a. Used to keep dock clear or eliminate small patches after other treatments
 - b. Cheap but very labor intensive
 - 3. Mechanical Harvesting suitable for large areas
 - a. Can temporarily clear areas, some machines pull the weeds which has a longer term effect.
 - b. Removes some nutrients from the lake.
 - c. Moderately Expensive/may require special permitting in the future
 - d. Requires mapping of beds and prioritization for best results

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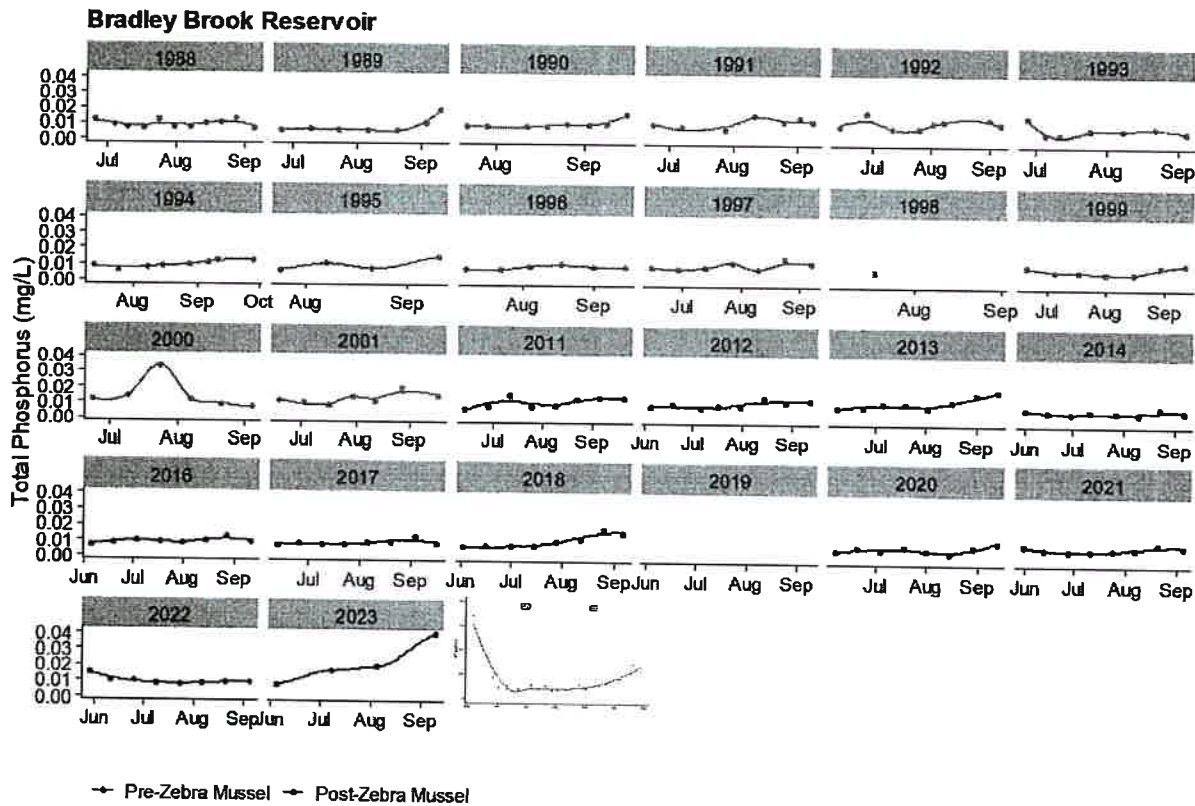
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4. Chemical Control suitable for large areas
 - a. New herbicides target only Milfoil
 - b. Permitting required/Professional application
 - c. Expensive/Periodically needs reapplication
5. Biological Control
 - a. Milfoil Weevil
 - i. Feeds selectively on Milfoil
 - ii. Native to NYS
 - iii. Currently unable to determine effectiveness ahead of time. In some lakes they have been effective in others they have not been effective
 1. Reasons for the difference are not known
 - b. Sterile Grass Carp
 - i. Eat everything with Milfoil being a less preferred food
 - ii. Too many destroy habitat- ie. Crane Lake
 - iii. Too few are ineffective
 - iv. Die out after 10-15 years
 - v. Cheap

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Appendix:

- Bradley Brook Phosphorus trends Since 1988 via CSLAP data volunteers collected:

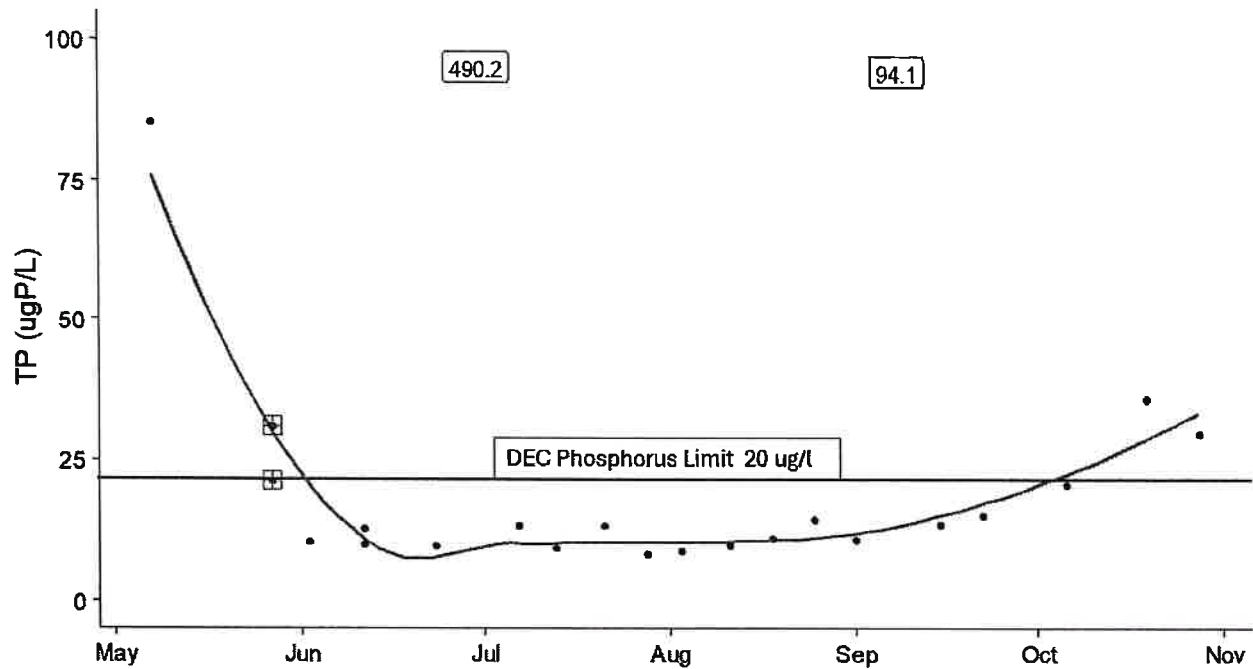


Note that in 2013, 2018, 2023 and 2024 (Post Zebra mussel invasion) there was an uptick in TP at the end of the season. This corresponds to a bloom recorded in 2018, 2023, and in 2024(mid Sept). The 2023 increase was significant. No record was found for 2013, or for Pre-Zebra 1989 or 1990 when a similar uptick occurred.

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2. Bradley 2024 TP Readings

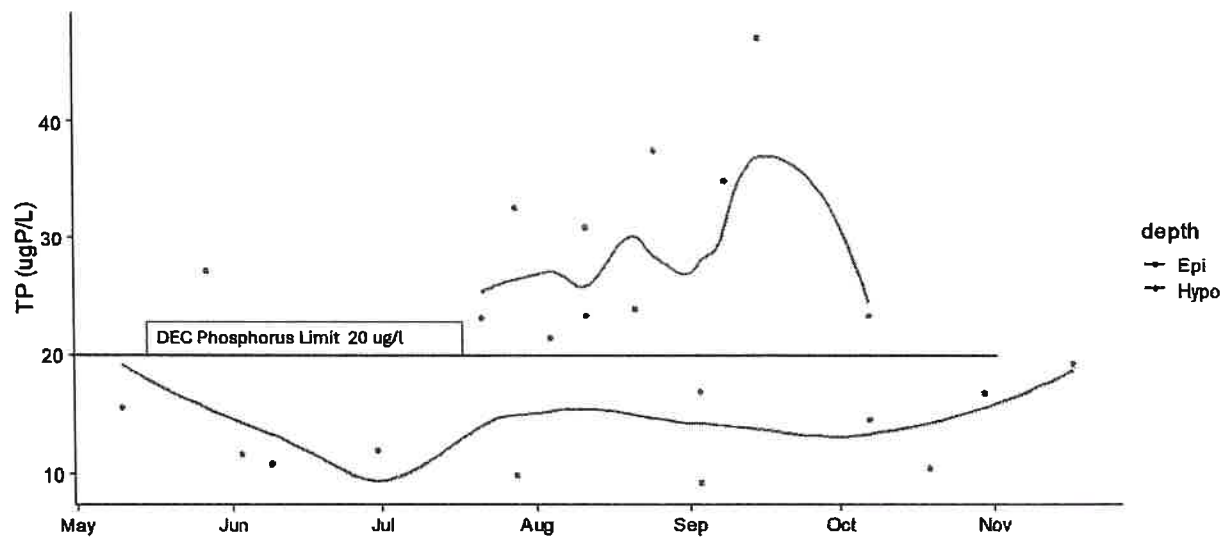
Bradley Summer TP



3. Hatch 2024 TP readings

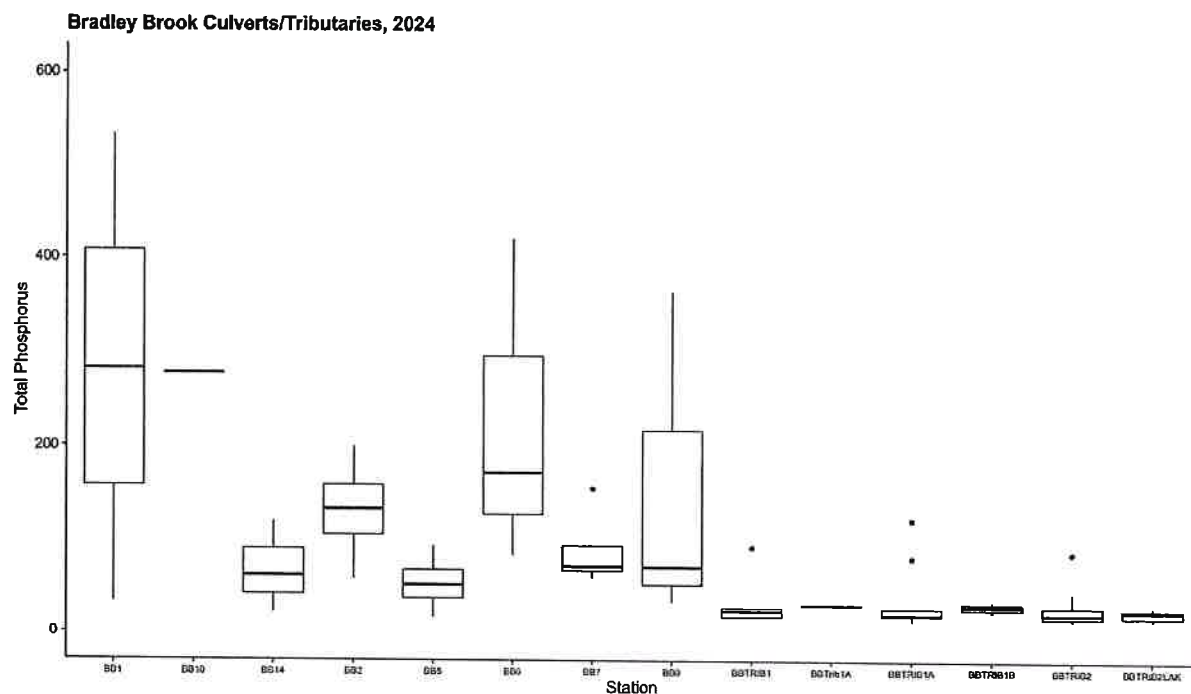
Lake Bottom in Blue – Lake Surface in Red

Hatch Summer TP

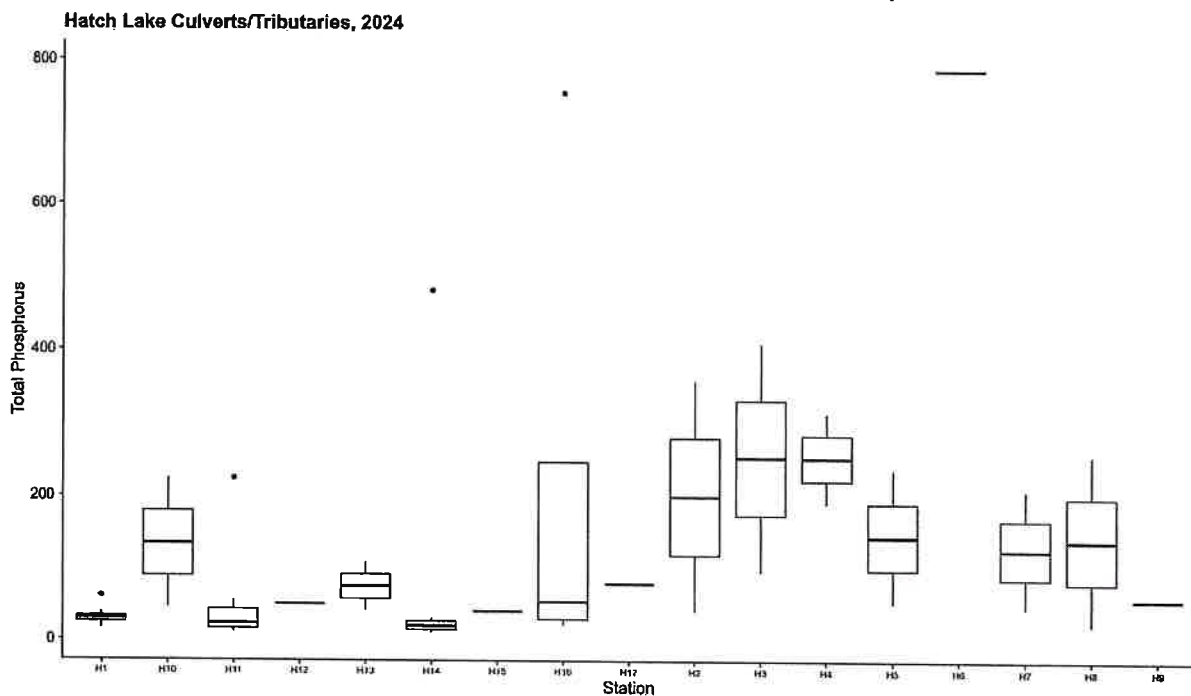


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4. Bradley Culvert TP Spreads-Variation in Data– Note, number of samples for each location varies.



5. Hatch -TP Spreads- Variation in Data– Note: number of samples for each location varies.



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Hatch outlet/ Bradley Inlet Typical Sampling TP Levels for 2024. Shows a pretty consistent TP outflow from the Hatch dam downstream to Bradley. Generally less than 15 ug/l

