

**Lake Champlain Basin Program  
Technical Advisory Committee meeting  
Remote only – Microsoft Teams log in info below  
Wednesday, June 1, 2022, 8:45 AM – 2:30 PM**

**Approved TAC meeting summary**

**TAC Members:** Jennifer Callahan, Laura DiPietro, Peter Isles, Neil Kamman, Margaret Murphy, Bridget O'Brien, Michele Fafette, Oliver Pierson, Andrew Schroth, Jamie Shanley, Lauren Townley, Daniel Tremblay, Ryan Waldron

**LCBP Staff:** Lauren Jenness, Matthew Vaughan, Sarah Coleman, Katie Darr, Erin Vennie-Vollrath, Pete Stangel

**Guests:** MaryJo Feuerbach, Marli Rupe, Dave Braun, Lori Fisher, Connor Quinn, Tim Mihuc, Kim Jensen

**1. Updates, announcements, public comments**

- Neil: In Vermont, the budget that passed is favorable for clean water work in the State. It includes \$104 million in the water infrastructure fund, and there is substantial clean water board funding as well. It will be a substantial lift for the 3-acre permit, green schools, and municipal separate stormwater systems (MS4s) work that needs to be completed. The Department of Environmental Conservation (DEC) is engaged with LCBP regarding infrastructure funding as well.
- Oliver: Of broad interest for TAC, in VT, the state has been reviewing permit application from the Lake Bomoseen Association to use herbicide to treat/limit spread/control Eurasian watermilfoil. This has been picked up by the media, there has been a lot of local opposition and some concerns raised by professionals, which is common to this type of request. Update is that the Lake Bomoseen Association requested that DEC place the permit application review on technical hold, a step allowed in the guidelines that stops the clock on permit review. Also, DEC's new lake shoreland coordinator started, Amy Picottes' replacement. Her name is Alison Marchioni, and she is managing the LCBP Education and Outreach grant for Lake Wise work.
- Margaret: One of the fish culturists in Grand Isle is an avid bow hunter/angler. He was out one evening on Rouses Point and found grass carp, which would be a new invasive in the lake. Shawn Good and seasonal staff went up and did extensive surveying, but we are still waiting for the results on their analyses to get a better sense of where it came from. We are waiting to finalize these details before issuing a press release. We have put a call out to angler groups who target carp to keep an eye out for their presence.
- Andrew: Since the last TAC meeting, we deployed the monitoring platform at Lake Carmi. Data are available at: <http://epscor.uvm.edu/LakeCarmi/>. I wanted to add that I enjoyed the Lake Champlain Research Conference.
- Oliver: DEC, LCBP, and the Vermont Agency of Agriculture, Food, and Markets (VTAAFAM) had a meeting and agreed to resume pesticide monitoring this year in the

lake and its tributaries. Pete Stangel will resume collecting these samples. Thanks to everyone for being open-minded and approaching this topic sensitively.

- Jamie: For the glyphosate work that the US Geological Survey (USGS) is involved in, we are about to get the data release out in early June. It is taking time to sort through data, but the work merits a journal article. Another item - Jerry Butch in NY reports that the Lake Champlain environmental sensitivity index study is about to launch in FY23. The study will map the Lake Champlain shoreline and 5 miles inland to identify sensitive areas that could be at risk in the event of an oil spill. The LCBP Federal Partners Working Group is the main coordinator for that project.
- Matt: The LCBP Steering Committee on April 13th approved the largest LCBP budget in history - almost \$30 million total. This has been a big lift for LCBP committees and staff, and we are excited for the work to get started. Regarding the Bipartisan Infrastructure Law (BIL) funds, LCBP is anticipating receiving \$40 million over a 5-year period. For the first year, this includes funding for the aquatic organism passage (AOP) package, including a new position at LCBP to focus on AOP, dam removal, culvert replacement, and a new grant program for AOP also implementation funds. Some of the funds will go toward supporting technical AOP projects. The BIL funds will also go towards supporting wetland and floodplain restoration, tree nursery support, aquatic invasive species (AIS) management and spread prevention, and strategic land acquisition for clean water and healthy ecosystems restoration. For other updates, the Lake Champlain Research Conference was very successful. The Lake Champlain boat launch steward program is in full swing. Trainings went well and the stewards are at the launches. *Opportunities for Action* (OFA) has gone through stakeholder and public review. We will have the signing event on Friday at the Grand Isle office. We will be joined by many distinguished people, including Senator Leahy.

*Review and approve summary of previous TAC meeting*

Motion: to approve the minutes as drafted and modified by Margaret during review

- Motion By: Margaret
- Second: Jenn
- Discussion: Neil noted one edit, which was incorporated in real-time.
- Vote: All in favor
- Margaret abstained as she wasn't there.

## **2. Final report review: Tile Drainage System Monitoring in the Northern and Southern Lake Champlain Basin and Comparison of Two Reactive Media Filters to Remove Phosphorus from Tile Drainage Water** (Dave Braun, Stone Environmental)

- Dave: This project has been a multi-year effort. There is an extended monitoring piece of this study and a tile drain filter study, those two efforts were combined into a single study. In agricultural settings, we are primarily concerned with pattern tile drainage with close drainage pipes. These pipes radically change the hydraulic behavior of the field, with many benefits. Tile drainage bypasses edge of field buffers and can serve as a direct conduit of phosphorus (P) and nitrogen (N) to water bodies. P tends to accumulate in the surface horizon of no till systems. Macropores that develop to transport water sorb

P and become concentrated with P and release that to the tile drain network. Given the national concern and lack of knowledge in VT about what tile drains were discharging to streams, we started this project in the Jewett Brook watershed in 2017 to learn more about the impacts of tile drains. We selected 10 tile drains for intensive monitoring. The current study expanded monitoring sites to Addison County, and monitored total phosphorus (TP) and total dissolved phosphorus (TDP). Longer-term pattern where fields with lower soil test P and low inputs tend to have lower TP concentrations. Recent manure application has short-term impacts causing higher TP concentrations than baseline concentrations.

- MaryJo asked about the frequency of sampling to develop concentration values. Dave: We undertook weekly flow paced sampling. We added these values up through the year. Matt: to clarify, this is a more advanced and better way to sample because it is flow based. Frequency of 1x/week was an operational consideration. Sampling based on the amount of water provides greater power to determine load. It's a more useful method based on design. Dave: One operational reason for that is that when everything's working right, we get our sample in inclement weather. It's harder to coordinate that that with grab sampling.
- Dave: The current project extended monitoring at 5 sites in Jewett Brook and 5 sites in Addison County. We conducted detailed loading analysis for P. Selection was somewhat strategic, some farmers did not like the results of the first study and backed out. We installed similar monitoring stations in Addison County as those installed in Jewett Brook.
  - Neil: I found the soil test P results for the different soil types interesting.
    - Dave: Soil P availability on clays is a long-term concern, this is one reason farmers lime their fields to make existing P a little more available. Clays can have a low soil test P. In the field where we are running the filter experiment, the soil test P was in the low single digits in the nutrient management plan, but we measured it at 16. You should take the nutrient management plan numbers with a grain of salt, they are often based on 1 sample. Timing matters.
- Dave: Shared results of ambient P concentrations monitoring. Results were not radically different between the Addison County and Jewett Brook sites, likely having to do with soil conditions and farming practices. The site with sandy loam behaves very differently than the other clay sites. The Addison County sites also reflected high concentrations following manure application. Total Nitrogen (TN) and total suspended solids (TSS) concentrations were not insignificant, and there was not a major difference between Addison County and Jewett Brook. In our efforts to reduce tile drainage P, lots of field best management practices (BMPs) can matter. One of the common practices prescribed is not to apply manure when tile lines are flowing, it does not look like we can adopt that. In the spring and late fall when manure is applied, tile lines are flowing. Based on the timing of corn production, it doesn't work. At higher concentrations, the P filter removes a high percentage of P. At lower concentrations, there are diminishing returns. The current attempt to develop a P filter tested P removal capacity of different media. The St. George's black stone had good porosity and absorbs some phosphorus.

We installed 2 parallel filters, which divert water into 50-ft long drenches installed 2-3 feet below the tile installation. The filter performed better at higher in-flow concentrations. Filter B removed a higher percentage of influent P. The media was selected to reduce clogging and extend the life of the filter which does cut into the removal efficiency. The third generation of filter is planned for testing this summer at Lake Carmi. We are getting close to something that farmers could reasonably implement.

- Matt: I did some unit conversion on the flow units in case it's helpful: 1700 L/min = 1 cfs, which I think was around where those spikes were.
- Andrew: Looks like you caught a lot of events under the manure ban, I'm curious to see if you see a succession of dilutions following the application of manure. If you have the time, look for that in the data analysis.
  - Dave: We saw late fall manure applications in Jewett Brook. Composite samples of the week following manure application is high, even two weeks later it drops off quickly. It drops down fast to the baseline.
- Neil: N numbers are pretty substantial from those Addison County sites.

TAC designated a subcommittee including Marli Rupe, Laura DiPietro, Ryan Cunningham, Steve Kramer, and an EPA region 1 staffer who works on tile drains, to closely read the project's final report.

### **3. Final report review: Technical Feasibility Evaluation of a Treatment Train to Remove Phosphorus from Streamflow in the St. Albans Bay Watershed (Dave Braun, Stone Environmental)**

- Dave reviewed the phase 2 technical feasibility evaluation final report via presentation. He reviewed the rationale for the project, then provided an overview of Jewett Brook phosphorus loading and water quality trends and then talked specifically about the Lower Newton Rd gauge. The research team used loading estimates at the gauge to calculate concentrations and extrapolated them to the watershed scale. They used Grand Lake St. Mary's in Ohio as a model for the study as they have implemented a treatment train and reviewed another example in Morses Pond in Wellesley MA. Dave reviewed the treatment train site selection process, chosen site characteristics, and the conceptual designs that were created.
- Neil: On the total load reduction slide you state that 7% is a realistic operating scenario. For 286 kilos I calculated the costs, that would be just north of \$1000 per kilo. That would place this work somewhere between the municipal roads general permit and 3-acre stormwater costs in terms of cost efficiency.
  - Dave: There is a lot of dissolved P in this system.
  - Neil: The thinking about this is that someone would have to operate these systems, and a clear choice would be the clean water service providers, but they would need that direction in their formula award.
  - Dave: Is your gut sense that that this should be pursued further based on those numbers?
  - Neil: It would be good to see how the monitoring data bends the curve based on accelerated agricultural implementation. This will treat legacy P in the system;

legacy P in soils is inherently part of tile drain runoff, practice implementation won't get at it. I'm not ready to say yes or no, but this is the information we need in order to have a conversation as a community. This work might be a piece of an equation.

- Margaret: You said that in discussions about treating, Jewett Brook is a non-starter. Historically these were backwater wetlands, what if these landowners give up their land to create in line wetlands, thereby reducing the work of treatment, and start regenerating wetlands as a long-term sustainable solution?
  - Dave: I'm not sure I'm the right person to answer, both these systems are above base flood elevation. The VT Rivers program wouldn't approve of any diversion into a series of wetlands, they are sensitive about diversions. Pumps would actually have a better appeal in that way. We have this small watershed draining in which we are able to capture P. If it was constructed wetland, we'd only be dealing with the upslope area from the wetland. The efficiencies of that would be debatable. Direct stream treatment was not going to be acceptable, as agencies are now adopting a standards concern about creating an aluminum rich stream. If TAC wants to reopen this, it's something that can be done. We wouldn't have natural resource concerns and would likely see good removal rates for much lower costs, but there's a question of if that would work for resource agencies.
  - Neil: The new water quality criteria might present challenge.
- Matt: To frame next steps - this is a big deal, a big idea, and something that's new for the region. LCBP currently have an award drafted and sent to Stone to design this thing, but we will only move it forward if TAC and LCBP partners agree it is a suitable project. We have two issues to discuss here, first, is Dave and Stone's work done on this technical feasibility evaluation project? If so, they will wrap up the final report. The second is if this is recommended to move forward as a concept or not. The project advisory committee is also concurrently considering these questions, but it's important to hear from TAC as well.
- Laura: I don't know, but an important aspect to consider is the cost per kilogram of P removal. The data presented suggest it's not that widely expensive compared to other interventions. Other agricultural practices are definitely cheaper, but will those alone do anything? The idea that P can be deeper in soil profiles, and in the groundwater if it's beyond conservation practice to treat means we are never going to get at the bed or P reservoir unless we do something like this. This could be another piece of the puzzle to get at legacy P.
- Neil: This gets into policy, how we deal with it, how we use this information. We have a set of new interventions we are now thinking about, through the two projects TAC is reviewing today, plus the US Army Corps of Engineers (USACE) work. I tend to agree with Laura that conservation practices deal with surface runoff but legacy P requires different interventions. This decision involves a technical conversation at TAC and policy level discussions at the partner level.
- Laura: Tile drain treatment and research does have value. There are hundreds, thousands of tile drains drain into a site, if you can treat at one site that has to have efficiencies. It could be a better outcome over the long-term instead of dealing with individual tile drains, and you could also potentially tack on chemical treatments too.

- Marli: I agree with Laura about tile drain-related challenges. Treatments are expensive and having the Environmental Quality Incentives Program (EQUIP) pay for it is always challenging. I would be interested in looking at how conservation practices can reduce soil test P. There are different levels of legacy P. Soil test P is such a big issue, that would be interesting to evaluate as well.
- Andrew: Why was using gravity a non-starter? 7% is nice but far less than interannual variation. If you can capture more of a spring pulse with gravity, just use during high flow events, dig a trench that can be opened to use as high flows and then not use during peak events, would that give you a bigger peak reduction? It would be cheaper.
  - Dave: The pumping end of this is the most expensive by far. Two things - there is not enough relief in the lower Jewett Brook to do anything by gravity except to directly treat the stream. We would need a difference in stage in order to have any kind of diversion operate. Otherwise, you are below the stream level for an offline structure. 2.5 million gallons per day is a lot to pump and to think about treating. At that pumping rate, the Agency of Natural Resources is very resistant to creating diversions. The piece of it that is the least scalable is the pumping rate. The stream is scaling between dry and 416 cubic feet per second for flow. All we can do is 0 to 3.8 cubic feet per second, that is inherent in treatment facilities of any kind. We can't handle the extraordinary peaks of nature. It would be cool if the project did continue to question some of those fundamental questions, again. We have some ideas about how to design, but before we invest further, let's go back to assumptions. We are talking about directly treating streams, not allowing diversions, and constructed wetlands. Between the wetlands program and the Fish and Wildlife Department at the state and federal level, there are a lot of opportunities for constructed wetlands, that is happening, but the gains being made through those programs don't approach the metric tons-level reductions we would see here through this practice.
- TAC designated Neil, Oliver, and Laura to review and approve the final report.

#### **4. Discussion: Review and approval plan for FY22 workplans**

- Matt initiated a discussion on how TAC will handle the review and approval of fiscal year 2022 (FY22) workplans for projects that were recommended by TAC and approved by the Steering Committee. Last year, TAC reviewed 2 workplans in September, 3 in October, and 1 in November. For this upcoming round of projects, there are 16 total, and 13 of them fit the bill for projects TAC would typically review. Given the increasing number of projects, Matt proposed an alternate approach for TAC review. At least one point person on TAC would commit to closely read the workplan, QAPP (which would be a new area of participation from the TAC), and the final report, and would report-back to TAC on their reviews. Matt reviewed the list of FY22 projects and solicited input from TAC members on if they would like to be a point person for any projects, as well as whether a full TAC review or a PAC with a TAC point person or 15 min presentation with approval by subcommittee is best for each project.
- Matt: Discussing gameplan for TAC's review and approval for upcoming work that has been recommended by TAC and approved by the SC. Last year, 2 WP reviews in Sept, 3 in Oct, 1 in Nov. Looking at the suite of FY22 projects, there are 16 total and 13 fit the

bill for projects TAC would review. Spreadsheet in meeting materials listing projects with some draft ideas for TAC review and whether PAC is required. Idea is to have at least 1 point person on TAC commit to closely read WP, QAPP (new area of participation from TAC), final report, and share their views on final report with committee. Start to end have the point person involved in the whole process. A few things to go through: (1) decide who point people will be and (2) whether you'd like a full TAC review or if a PAC with a TAC point person or 15 min presentation with approval by subcommittee. Initial reactions?

**5. Annual report and workplan review: Lake Champlain Long-term Monitoring Program**  
(Peter Isles, Pete Stangel, VTDEC and Tim Mihuc, SUNY Plattsburgh)

- Peter Isles, Pete Stangel, and Tim presented on the 2021 field season of the Lake Champlain Long-Term Monitoring Program (LTMP) and the workplan for the 2022 field season.
- Due to low water levels due to lower than average snowpack, the number of sample events identified in the workplan were not met. Canadian border crossings also affected sampling events. Pete Stangel reviewed results of the data and how the website has been updated. The team reviewed the 2021 invasive species veliger densities. Tim reviewed sampling locations and protocols for AIS. The fishhook waterflea had high observed abundances. Tim reviewed the station 19 main lake phytoplankton datasets from 1970, 2003-2005 versus 2017-2021. There is additional analysis ongoing, but initial results suggest that there have been large shifts in the phytoplankton community over time.
- Margaret asked if the sampling was done at the lake surface.
  - Pete replied that water samples are taken from the epilimnion and are unstratified samples.
- Margaret: On the fishhook and spiny waterflea, what is different about the two of them?
  - Tim: There are some differences in population biology. The spiny is larger, and preys on larger organisms. It occupies a niche space in Lake Champlain, it had plenty of food for 1 year then started to decline. The fishhook does well in Lake Champlain, it feeds lower down on smaller plankton, and has plenty of food resources.
- Andrew: Are your metal samples unfiltered and acidified when collected in the tributaries?
  - Pete: Yes.
- Margaret: I'm curious about phytoplankton changes related to bloom toxicity.
  - Tim: Microcystin are good at producing toxins. Others are better at other toxins. A big part of the phytoplankton community change is not nutrients but temperature regime. Anabaena need temperatures to be below 30°C, whereas microcystin can tolerate mid-30°C temperatures.

*Motion to approve the annual report:*

- Motion by: Jenn Callahan
- Second: Andrew Schroth
- Vote: All in favor

*Brief update on Long-term Monitoring Program upgrade*

- Matt: Two monitoring buoys have been launched as part of a pilot program. The first was launched in the Lamoille River a few weeks ago, and yesterday the larger buoy was launched in Malletts Bay. Data are available on [data.lcbp.org](http://data.lcbp.org). Concerning the future of this program, the Steering Committee has approved the use of surplus funds through the LTMP to purchase a buoy to be deployed in the Northeast Arm of the lake if sufficient funds are available. Additionally, funding from the National Oceanic and Atmospheric Administration (NOAA) will likely support a buoy to be deployed in the Main Lake. We have funds set aside to continue to support the platform buoys that are currently operated by the University of Vermont (UVM). We have a list of TAC members who will provide input to optimize the design of any new buoys, please let me know if you would like to be on it.
- Sarah suggested proceeding with these conversations while funding determinations are being finalized, in order to be ready once funding is certain.
- Andrew noted that the Lamoille nitrate data looked abnormal.
  - Matt: The sensor may have to be recalibrated. We likely will not include nitrate from the tributary buoy in the final dataset, as there have been some issues with the sensor.
- two buoys in water as part of pilot program. Lamoille river buoy a couple weeks ago, been performing well with a few minor issues. Showed photos. Yesterday went out with SUNY crew to put buoy in Malletts Bay. Showed data.lcbp.org website. Future of upgrade - SC has approved use of surplus funds through LTMP to purchase NE arm buoy, not sure how much is available but if do, will move forward with purchase. Also pencil in funding for buoy in main lake with funding from NOAA to LCBP. also have funds set aside to support platform buoys owned by UVM.

**6. Annual report review: Lake Champlain Cyanobacteria Monitoring Program** (Peter Isles, VTDEC; Bridget O'Brien, VTDOH; and Lori Fisher, Lake Champlain Committee)

- Peter Isles provided an overview of the annual report for the Cyanobacteria Monitoring Program for the 2021 season. While it was not a remarkable year in terms of the number of blooms, there were relatively frequent blooms. Routine reports are measured at the same time each week by volunteers. The first reported bloom was in the beginning of May, but it was not confirmed through microscopy. We confirmed reports through November. There was a higher fraction of blooms occurring in the southern part of the Main Lake than has been observed in previous years, other areas are within the range of variability we have seen in the past. Supplemental reports are submitted by the general public when they see something of concern. The number of lakes monitored has increased over the last several years. Microcystin detection was below alert thresholds. There were a few microcystin detections at drinking water intakes, but no detections in treated water. We analyzed historical data at sites with a minimum of 5 years of data. Calculating the slope of the index over time shows geographical clustering showing an increasing aggregate trend around Burlington and Malletts Bay and decreasing aggregate trends in Missisquoi and St. Albans.



- Margaret: Question about observations people call in, have you noticed any changes based on increased education and outreach initiatives around harmful algal blooms (HABs)?
  - Peter: It's hard to determine what's an increase in bloom frequency or an increase in participation.
- Margaret: Based on observations, would you change any routine monitoring locations?
  - Peter: This year relative to last year, there was a small improvement in Missisquoi Bay, but we could still use more monitors there, especially on the Québec side. Collecting more quantitative data from locations without much quantitative data, particularly on the NE arm, would be good.
  - Matt: Monitoring is often opportunistic based on where we can get volunteer monitors.
- Andrew: I had a student analyze sentinel data in the NE arm. If you have good monitoring up there, that would be a good area of interest especially based on the satellite data. Index is trending lower for eutrophic bays, but I don't think we're seeing a decrease in cyanobacteria severity or occurrence.
  - Peter: The analysis just reflects the fact that there have been strong blooms there, with year-to-year variability there might not be a clear trend there.
  - Andrew: Do you think there is reporting/monitoring burn out? People are just used to seeing blooms there and don't report?
  - Peter: Not every data point necessarily represents the same subset of years, there could be some sites that collected data earlier on. Take that as a rough analysis.
  - Matt: For the State of the Lake report, I did another analysis that looked at the percentage of routine alerts for each type of alert level. For regions that the report looks at, the only one that had a trend was the NE arm and it was toward a higher frequency of alert level reports.
  - Bridget: In St. Albans we are not getting surface blooms as much as in other places, which make it trickier for volunteers to pick up on the blooms. It's interesting to think about the changing phytoplankton composition there and if blooms are displaying differently related to that.
- Lori provided an overview of the Lake Champlain Committee's (LCC) cyanobacteria monitoring program volunteer coordination. This is a year-round program that includes planning in the winter and spring, year-round recruitment, training, site monitoring, weekly reports, community outreach, report assessment, & analysis. Assessors are asked to submit a water sample if they suspect cyanobacteria. Reports are uploaded to the Vermont Department of Health's (VTDOH) Cyanobacteria Tracker and are vetted primarily by LCC. The Health Department and LCC collaborated on a public forum made available to anyone interested in cyanobacteria.
- Margaret: How many volunteers are there total?
  - Lori: 150 on Lake Champlain and over 70 on the inland lakes. We emphasize public sites for monitoring. That's the area where more people are going to congregate. LCC has started trying to differentiate different sites and categorize them as state park, municipal, quasi-private with multi-family access where people are members and have access to the beach that way. We want to cover

those areas, but prioritize public sites for monitoring/data longevity. We are working with LCBP to better identify and categorize beaches.

*Motion: to approve annual report and workplan for cyanobacteria monitoring*

- Motion by: Oliver Pierson
- Second: Andrew Schroth
- Vote: All in favor

**7. Annual report and workplan review: Water Chestnut Management Program** (Kim Jensen, VTDEC)

- Kim reviewed the VTDEC water chestnut harvesting operations including 2021 season data details and plans for the 2022 season, successes and challenges with hand pulling and mechanical harvesting efforts. Drone technology and surveys have been used in monitoring efforts, but relying on that technology is difficult, in part because you want to pull the water chestnut before they are fully emerged. A fleet of airboats is required as a long-term solution.

*Motion to approve the annual report and workplan:*

- Motion by: Andrew Schroth
- Second: Lauren Townley
- Vote: All in favor