

**Lake Champlain Basin Program
Technical Advisory Committee meeting
Held remotely over Microsoft Teams
Wednesday, April 6, 2022, 8:45 AM – 12:00 PM
Approved TAC meeting summary**

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

LCBP Staff: Mae Kate Campbell, Eric Howe, Lauren Jenness, Elizabeth Lee, Meg Modley, Matthew Vaughan, Sarah Coleman, Erin Vennie-Vollrath

Guests: Ben Jessup, Sam Blake, Jesse Gourevitch

1. Updates, announcements, public comments

- Oliver: I'll share some updates from the Vermont Department of Environmental Conservation (VTDEC). The Lake Carmi crisis response plan has been revised with updated critical path projects. We are working on re-issuing the municipal roads general permit (MRPG) and will be requiring compliance with road maintenance conditions to protect water quality. We are working on establishing a 'lakeshore exception', which would allow municipalities not to mow along lakeshores. The proposed stream reclassification in Ripton is moving forward to rulemaking to reclassify 3 reaches to 1A status. In the agricultural water quality space, there is a petition requesting the Environmental Protection Agency (EPA) to de-delegate the National Pollution Discharge Elimination System permit in Vermont. There is a hearing upcoming regarding agricultural tile drains and other agricultural water quality issues in the legislature. Our annual spring phosphorus monitoring program kicks off next week. DEC received a petition requesting that the state regulate wake boats in public waters. The public comment period on the petition begins in May, public info meetings will be held in June.
- Lauren T: NYDEC is working on an update to the implementation plan for the NY Lake Champlain total maximum daily load (TMDL). We've been holding partner meetings ahead of the partner release. We are hoping to release the plan for public comment in the next month. The plan includes a summary of existing water quality information. We completed some land cover analysis to target implementation to higher loading areas and included a list of potential implementation projects from regional planning boards. We are working on a request for applications for state water quality projects.
- Andrew: Nancy Matthews is leaving the University of Vermont (UVM) Department of Natural Resources this summer. There will be a new dean, there will probably be an interim dean in the meantime.
- Neil: I'll share some VT State budget updates. In American Rescue Plan Act (ARPA) appropriations, the state will be applying \$105 million across a variety of infrastructure projects (wastewater, stormwater, 3-acre permitting, investment in lower-income populations). The Governor has proposed \$15 million for a buyout program for vulnerable communities in floodplains. LCBP will be receiving infrastructure funding as

well, we need to be coordinated. In addition, the State clean water budget is coming in at \$46.5 million.

- Matt: LCBP updates: The Lake Champlain Research Conference will be held May 23rd-24th, registration is open now through May 6th. The Steering Committee will be meeting next week to review/approve the LCBP budget for FY22. This is the largest budget in our history, so it's an exciting year. The pilot program for Long-Term Monitoring Program (LTMP) upgrade will be deployed in the coming weeks. The website to host the data in real time is ready to go. Next meeting, we will probably have a discussion on how to handle TAC's workload going forward. We have many projects beginning, so we need to consider review capacity. We could consider having 1 TAC member point person for each research project we are funding. Under that model, a TAC member with expertise in the project area will be the one to closely read the workplan, review the quality assurance project plan (QAPP), serve on the project advisory committee, and follow-up on the final report. If you have feedback on that idea, please share.
 - Neil: We're not losing the opportunity for TAC members to hear from the project team, correct? This would cover detailed analysis.
 - Matt: Correct – everything about the current process would stay the same, but one person would be asked to closely read everything. That way, we can expect at least thorough feedback from one person. We will have a broader discussion after we have a public list of approved projects for funding.
- Meg: The Champlain Canal Barrier Phase 1 study is wrapped up, the US Army Corps of Engineers (USACE) is working on a press release. We are hiring for the 2022 boat launch steward field season, and are close to our target number of stewards, but spread the word. We are excited to continue with online virtual trainings, but will resume in-person training to practice using decontamination stations as well. The US Fish and Wildlife Service (USFWS), in collaboration with the state fish and wildlife department, held a state of the lake fisheries meeting to provide an update on fisheries management going on in Lake Champlain, and highlight the threat of round goby. The New York State Canal Corporation and NYDEC released a press release on taking action to prevent round goby from getting to Lake Champlain. They highlighted technologies that may be used. The Aquatic Invasive Species Rapid Response Task Force has worked to mobilize funds for early detection of round goby using eDNA and trawling. They are working on outreach campaign messaging for avoiding bait bucket transfer. LCBP is reviewing applications for an Aquatic Invasive Species Outreach Specialist around round goby threat and bait bucket transfer. The Task Force will be meeting with USACE representatives to discuss stopgap measures to prevent round goby spread.
- Eric: The LCBP Steering Committee is meeting next week to approve the LCBP budget for fiscal year 2022. We will also have an hour in that meeting to cover the round goby threat, featuring presentations from Meg, NYDEC and Québec Fisheries about the Champlain and Chambly Canals. The Steering Committee will also discuss/approve *Opportunities for Action* (OFA). From there, LCBP will be working with the states and EPA to prepare the plan for their signatures. June 3rd is the planned release of OFA at the Grand Isle office.

- Meg: Vermont Fish and Wildlife Department is collecting and tagging mudpuppies, relocating them above the Arrowwood dam. They have collected 68 so far (target was 50-150), and observed a good split between male and female.

Review and approve summary of previous TAC meeting

- Motion: to approve the minutes
- By: Jenn
- Second: Ryan Cunningham
- Discussion: Neil: One proposed edit, reference to project having benefit for a particular program.
- Vote: All in favor

2. Update: Lake Champlain Research conference agenda (Mae Kate Campbell and Lauren Jenness, LCBP)

- Mae Kate and Lauren provided an overview of the agenda for the 2022 Lake Champlain Research Conference.
- Neil: What is the objective of the concurrent Vermont Agricultural Water Quality Partnership meeting?
 - Lauren: Debriefing from other meetings, in person engagement and planning next steps.

3. Update: VTDEC line item and TMDL projects (Dr. Sarah Coleman, VTDEC)

- Sarah provided an update on current projects and highlighted the proposed continuation of projects in fiscal year 2022. She shared an overview of TMDL projects in the State Line-item requests. Requests include:
 - Agricultural initiatives, including the Farm Agronomic Practice Program, the Conservation Reserve Enhancement Project, best management practice and engineering services, and the Enhanced Agricultural Riparian Wooded Buffers program.
 - Initiatives addressing developed lands, including the Green Schools Initiative, municipal stormwater assessment, green stormwater infrastructure to reduce combined sewer overflows, wastewater treatment facility, and private roads.
 - Forestry initiatives, including forestry accepted management practices and forest load allocation.
 - Support for nature-based solutions, including wetland acquisition and restoration and the Functioning Floodplain Initiative.
 - New line items, including flood resiliency capacity building and implementation, organizational support, and aquatic organism passage.
- Neil: For stormwater public private partnerships, there are several of these projects going to construction. Almost \$5 million in projects were funded via the State using ARPA funding. It's a really cool use of the investment. We should give Jim Pease a round of applause for getting projects to construction.
- Andrew: There's a lot of interest here in Moretown around green stormwater infrastructure and the school. Would you be contact person?

- Sarah: Is if that is a 3-acre site? If not, it's not required to meet permit requirements and not eligible for funding under this program. There are other opportunities for non-regulatory funding. I'd be happy to connect offline.
- Neil: I recommend pointing Andrew to the Clean Water Service Provider in the area.

4. Discussion: Potential monitoring funds from Congressionally Directed Spending (Dr. Eric Howe, LCBP)

- Eric: LCBP is receiving \$750,000 from the National Oceanic and Atmospheric Administration (NOAA) for monitoring. The direction we've received is that those funds should be distributed through grants and should cover lake monitoring in real-time. Biden's priorities include addressing climate change and underserved communities. I want to share ideas LCBP and Leahy staff have brainstormed for these funds:
 1. Lake Champlain Contaminants Monitoring. There are many contaminants that we are not monitoring currently. If they look like they are present at concerning levels, we could identify source and mitigation options.
 - Neil: I'm happy to see the inclusion of polybrominated diphenyl ethers (PBDEs) in fish.
 2. Upgrades to Lake Champlain water quality monitoring program. We could work with watershed groups and researchers to ensure we are supporting monitoring that will inform management decisions.
 3. Aquatic invasive species early detection monitoring. A grant program to watershed groups for early detection monitoring. This likely wouldn't include eDNA monitoring, but there are other approaches that watershed groups can take (surveys at boat launches, etc.).
 4. Monitoring that would support designating Lake Champlain as a NOAA marine sanctuary. Benthic monitoring for particular species of interest.
 5. Using an existing grant program and making monitoring equipment a priority.
 6. Issuing a general request for proposals for monitoring-related projects. Watershed groups submit concept for monitoring for water quality, aquatic invasive species, contaminants.
- Eric: TAC feedback? These are ideas, we don't need to support all 6.
- Matt: The Long-Term Monitoring Program will be discussed more specifically during our next topic.
- Andrew: This sounds like a wonderful opportunity. Some sub-themes don't seem to lend themselves to real-time monitoring. Do I understand the objective?
 - Eric: This is a brainstorm.
 - Andrew: Neat ideas, I'd like to be involved to help flesh them out.
- Matt: Is real-time dissemination a requirement or just an idea?
 - Eric: I think that's something Tom had in mind; I don't believe it's written into the request. We are still waiting for guidance from NOAA; they may reserve some funds for overhead or have constraints on how we can spend them. We will work with the Executive Committee to move this forward, it likely won't be ready for the

Steering Committee next week. I would like to provide the Steering Committee with a general direction.

- Bridget: What's the timeframe for using these funds? I'm thinking about cyanotoxin monitoring; that's not currently included in the Long-Term Monitoring Program or the cyanobacteria monitoring program. If there's a way to build that into this monitoring funding, that would make it more sustainable.
 - Neil: Am I correct that beginning next year, the regulatory program in DEC is going to be requiring cyanotoxin monitoring of public water systems?
 - Bridget: I don't have the exact date, but the drinking water program is moving towards that. I was thinking more for recreational and shoreline monitoring. LCBP funds the drinking water testing.
 - Eric: These funds wouldn't be available at least until October 1 this year. Unsure how long NOAA funding agreements last. At least, they would be available for next year's field season.
- Neil: This is a 1-time appropriation, yes?
 - Eric: Correct. We did submit a request for this again in for fiscal year 2023, but there's no guarantee that it will go through. So, we could get one more year, but right now will treat it as a 1-time opportunity.
- Matt: Increased cyanotoxin monitoring is included in OFA 2022, I know there is support from the Steering Committee. That could be a good use for these funds.
 - Neil: It would be more nuanced information to communicate to the public.
- Neil: I'd like to add a +1 for additional emerging contaminant monitoring in fish. We could do targeted sampling informed by the mercury in fish work that is being completed right now.
 - Jamie: I support mercury monitoring. I like the direction of additional contaminant monitoring in fish, but don't have specific recommendations.
- Neil: I like the idea of supporting volunteer monitoring networks in VT and NY. It would be good to make sure it's complementing and not conflicting with state programs. I love to see the equipment grant category, EPA used to have a program like that. Volunteer citizen science monitors could access equipment, but they had to write a QAPP, which ensured data quality. If we want to go that direction, we should coordinate a conversation with the states and the UVM watershed alliance.
 - Oliver: It would be good to have a more detailed discussion with TAC members interested in monitoring. The LaRosa program is moving in the direction of lake tributary focus, lay monitoring is also ongoing. Mark Mitchell is already working to get additional equipment to monitors to improve the quality of monitoring, which would be great. Things like dissolved oxygen monitors, thermometers. I'm not sure if this would cover buoys, but I could see if that's a good continued role for VTDEC to keep pursuing. I'd like to be part of the discussion of how to fine-tune that programming.
- Matt: To make the best use of this feedback, so far, I've heard feedback on what stands out as good ideas. Is there anything TAC thinks we should focus on, or thoughts on prioritization?

- Neil: I'm not seeing a lot of additional input on these good ideas. Should we arrange a workgroup to begin after the Steering Committee?
 - Eric: We could target the May Executive Committee meeting. I'm not sure when we are receiving funding information from NOAA.
 - Matt: Sounds like folks want to have a focused conversation. We do have the Long-Term Monitoring Program upgrade subcommittee. We can start with that list. Any additional folks?
 - Neil: Feel free to reach out to additional folks with expertise in these topics to invite them.

Update and action requested: FY22 investments for Long-term Monitoring Program Upgrades

- Matt: A TAC subcommittee met to outline a shared vision of upgrading the LTMP. Since the early 1990s, the LTMP has undertaken traditional sampling of key parameters. Lots of new technology has come on the scene since then – and there's an interest in high-frequency, real-time monitoring. The pilot buoys will be coming online this spring, and we have an opportunity to expand the buoy network further. The committee discussed a vision for the first 5-years and priorities for next steps:
 1. Deploy 6 in-lake buoys and have an additional buoy available for rapid deployment for short-term questions or evolving conditions, extra equipment to minimize downtime.
 2. 4-6 buoys in major tributaries.

That would constitute an upgrade that would complement the traditional program. We brought that vision to the Executive Committee and Steering Committee. The Committees were generally in support, but a few members were concerned about the investment in upgrades since it was not specifically focused in understanding phosphorus loads to support updates to the TMDL. We want to make sure that need is addressed as well. We had a separate meeting to discuss their questions and outline how an upgraded LTMP would inform those questions. In response, we created a primer on the recommendation TAC formed. This was discussed at the last Executive Committee meeting. After review, most of the committee was in support to move forward with the upgrade. Now, I want to circle back to TAC to discuss a possible resolution and to re-affirm the recommendation.

- Matt shared a resolution which includes the following priorities: to continue to support pilot deployments, to leverage existing resources to support UVM buoys, to deploy a new buoy in the Northeast Arm segment using surplus funds from the LTMP, to purchase and deploy a new buoy in the main lake segment, then to purchase and deploy a new buoy in the south lake segment.
- Neil: I would like to reflect back to the Steering Committee TAC's sense of support—aggressive or tempered. With the resourcing we have available to us now, it would be the easiest time to go all-in. However, this investment does carry with it the responsibility to operate and maintain equipment, which carries work with it. This is stock and trade with large-scale monitoring programs in other parts of the country. Lake Champlain has a more mature water quality testing program, but a less mature automated setup.

- Peter: I think it might be useful to try to articulate what specific questions we will be able to answer with buoy data in specific parts of lake, how we will address setup challenges, and how this program design is most appropriate for answering targeted questions. Having a tangible proposal for what we are going to get out of each installation could go a long way towards articulating the value.
- Jamie: Monitoring will probably help us formulate new questions. However, the data will be so rich, we will see things in the data that will inspire new questions we aren't thinking about now. The proposal here would only request a subset of the total monitoring program envisioned, correct?
 - Matt: Correct. The reason being that the pilots haven't gone out yet, so we only have limited experience currently. We don't want to move too fast without learning. Short term, high value opportunities and using short term funds are logical next steps to me. The next step after that would be buying a new buoy with new funds.
 - Jamie: If we show results, we could gain more support. I like Neil's point that we are ahead on traditional monitoring but behind on sensors. We can make a good case that we are in a good position for sensor approach because we have such good traditional monitoring. You need both. This could tie in well with the NOAA funds. One thing that's hard to get is high-flow samples. We could tie in citizen monitoring to collect high-flow samples.
 - Matt: Increased traditional sampling is listed as an option in the primer, it's not mutually exclusive to doing the upgrade. Thinking about timing, we could take these suggestions of when it would happen out and just have it be priority based.
 - Neil: I would support taking out the times. Or we could designate fiscal years instead of calendar years to trigger decision points. That would give the technical program the discretion to move forward with priority 2 given dollars in hand or move more slowly based on what we learn.
 - Oliver: There are some who support the taking it slow approach. I'm excited about priority 1, but I know there is skepticism above us in DEC for going above that. Some that hold the viewpoint of why are we going to spend these funds on monitoring if we don't know what we are going to learn? A phased approach gives us some credibility. Show what we learn, build from there to make the case of how to expand. I'm wondering about priority 3, why the south lake? Is it an equity issue? I would argue to keep the phased approach, it let us build credibility.
- Neil: For folks from both states that are wrestling with what questions this monitoring should answer, this is a chicken and egg problem in research management agencies to articulate what the questions are. One of the difficulties I found at the Executive Committee level is that there wasn't a clear answer to what questions we want answered regarding resource management. Without that, we fall back on the value of developing an automated system.
- Andrew: I think there's probably nobody better to articulate how these tools can answer questions related to OFA than Matt and Peter. Do we have ISCO flow monitoring infrastructure? One thing that might appeal to TMDL focused Executive Committee

members would be to supplement tributary monitoring with ISCOs. I would think there would be a lot of buy-in for modernizing the traditional sampling collection methods.

- Matt: We don't have ISCOs as part of the LTMP. Everything you mentioned is in the primer that we provided to the Steering Committee. These are all options that are not mutually exclusive to deploying buoys. They are waiting to hear what are the questions we want to answer, how much do we have to reduce uncertainty in phosphorus, and what is needed for TMDL monitoring.
- Andrew: One suggestion would be to have example research questions that tie into OFA that we think could be more thoroughly addressed using these tools, and a 2nd series of ideas around things that we don't know, research questions that could come up as we increase monitoring.
- Matt: We aimed at doing that and have research questions in the primer. It could be improved. We can follow-up offline.
- Sarah: Clarifying question, one part of the DEC proposal was to expand monitoring temporally. Is that still on the table?
 - Matt: It's not on table right now, but it is in the primer as something else we could use funds for. It could be done in concert to improve the traditional part of the LTMP. The thought is that there aren't enough existing surplus funds to do buoys and expand monitoring temporally. We can add a priority to also expand traditional portion of the LTMP if we want.
 - Sarah: In terms of capturing availability and with climate change, it could be a responsive step.
 - Matt: LCBP is also funding a project to characterize winter loading for the next few years, but it's not supported in the long term.
- Peter: Going back to the debate about whether we should collect monitoring data and form questions vs the opposite, we should consider questions for when we design an optimal buoy layout. In some areas just a temperature chain is fine, but in some cases, we will need chlorophyll in deep sections. It would be a shame to put out sub-optimally designed buoys. I'm supportive of getting as many of the right buoys in the lake as we can, but I think we could benefit from more discussion about design.
- Neil: That speaks to running priority 1 and having a conversation about flexibility to being able to implement on priority 2, pending additional discussion about how to do it optimally. Here, the conversation has gotten accelerated because of the opportunity for resources. The path forward on priority 2 would give us flexibility to tailor and expand when ready.
 - Matt: I think that's a good approach, and that's why we created this draft of priorities. We would definitely need additional discussion on priorities 2-3.
 - Neil: I think we should make the budget reasonably sufficiently accommodating, put some uncertainty, advocate to secure budget but pending additional conversation about optimal deployment. Priority 1 is well-understood now.
- Matt: So, I am hearing we should put FY22-3 back in priority 2, add more funds, qualify with additional technical discussion.
 - Neil: Agree, and we would bring findings back to the Executive Committee.

- Matt: For the capital cost, that would be a question of how many sensors we want to put on a chain. Maybe bumping our estimate up to \$75K to give us wiggle room for capital investment would be wise?
- Peter: I expect that would cover it.
- Neil: I think it's okay to acknowledge the uncertainty. We will be asking the Steering Committee to give us the flexibility to accommodate design and address questions that are most pertinent to the program.
- Jamie: We need data with and without questions. I think we could also give examples of where just collecting data has raised questions. The Keeling Curve is a great example. Are there other examples for Lake Champlain? I'm concerned about these things adding up to an even higher price tag. I support getting as many high-flow samples as we can.
 - Matt: There is nothing on tributaries in this part.
- Neil: We should move forward as we've been discussing.
- Erin: I agree with Oliver's proposal to build slowly. I think that would be taken well. The priorities as laid out make a lot of sense to me. Getting data will really help our cause.
- Neil: Thank you team for this discussion.

5. Presentation: Quantifying the social benefits and costs of reductions in phosphorus pollution under climate change (Dr. Jesse Gourevitch, Wharton Risk Management and Decision Process Center)

- Jesse Gourevitch provided an overview on a study that aimed to quantify the social benefits and costs of reductions of phosphorus pollution under climate change. The study focused on the towns of Swanton and Highgate on Missisquoi Bay. The study examined estimates of future tourism revenue, property sale values, and human health outcomes (amyotrophic lateral sclerosis (ALS) incidence) under a variety of water quality scenarios.
- Neil: This is super interesting, a nice dive into the economics world.
- Matt: Thinking about equity and distribution of benefits, you focused on things you are able to quantify. For property tax value, tax payers are benefitting but the benefits are going to leaving the area, that's something interesting to think about. I liked this approach, you didn't make decisions, just gave options for projections. I wonder if you can do that with more unquantifiable benefits, for instance, the value of sitting by the lake on a hot day. If this many people on a July day go to the lake, how much would they pay?
 - Jesse: Great points. From the property markets side, hedonic analysis is the commonly used method, however in doing that we are definitely biasing our results toward places with higher property values. Maybe lower income residents implicitly value the resource more than higher income residents. There is a concern that any improvement of environmental amenity can lead to gentrification. I don't have a good solution, but it's important to consider. To your last point, you're right that are unquantified benefits here. Doing some sort of stated preference, like a willingness to pay survey, would be valuable to capture the ways in which people value water quality. However, using that type of

approach, you're again biasing toward preferences with those who have higher wealth. We need to normalize across income groups.

- Matt: I wonder about not surveying people to quantify willingness to pay, but creating an interactive tool for use.
- Neil: I am curious about the effect of calculation of marginal cost to the study. I observed in data plots the assumption of growth in the marginal rate, and being familiar with the performance report, there's going to be a period of time during the onset of implementation where the marginal rate will increase but at same time, they are required to be implemented over a short time period as regulatory. Then the marginal cost will stabilize or shrink. Were you using linear growth in marginal cost or something else? I wonder if it has an effect on the cost-benefit ratios.
 - Jesse: We used cost estimates based on constant marginal costs (blue line). When we used linear model costs, it's not pretty.
 - Neil: It also wouldn't be an accurate reflection.
 - Jesse: With 4 datapoints there's not a lot to go from, but it represents upper and lower bounds of cost.
 - Neil: To be realistic I think using constant predicted modeling costs may underestimate total costs, and the effect on the cost benefit ratio would be undesirable.
 - Jesse: That would assume that marginal costs and regular costs are between the red and blue lines.
 - Neil: Imagine the blue line on the right. I would anticipate greater costs as 3-acre sites are addressed. The performance report doesn't take into consideration costs to comply funded by others who aren't State and Federal agencies. It's interesting to see it with the seat I sit in, since it's common to see undesirable cost benefit ratios in this work.
 - Jesse: That gets into the political realm. These estimates are systematically biased toward underestimating. There is broad political and public support for the policies. Have a continued desire to improve benefit cost methods. Used during Regan to justify de-regulation. Now used in Obama and Biden admins to justify environmental policy. Then in Trump see degradation of policies and methods.
 - Neil: Data are available in more granular fashion than in the VTDEC Clean Water Performance report, the exist in a database. If you are interested, I'd be happy to partner on that.
 - Jesse: That would be great, and also great to get more up to date information.