

**Lake Champlain Basin Program
Technical Advisory Committee meeting
Wednesday, October 4, 2023, 9 AM – 1 PM**

TAC Members: Jennifer Callahan, Ryan Cunningham, Bryan Dore, Laurie Earley, Peter Isles, Neil Kamman, Steve Kramer, Margaret Murphy, Bridget O'Brien, Ryan Patch, Andrew Schroth, Jamie Shanley, Lauren Townley, Daniel Tremblay

LCBP Staff: Mae Kate Campbell, Meg Modley, Matthew Vaughan, Sarah Coleman, Sarita Croce, Erin Vennie-Vollrath

Guests: Molly Costanza-Robinson, Eric Moody, Brendan Wiltse, Mark Henderson, Laura Klaiber, Carol Adair, Heather Pembroke, Justin Lesser

Approved TAC meeting summary

1. Updates, announcements, public comments

- Margaret: For those interested, the salmon run in the Winooski River is coming in hot. 111 fish have been captured at the fish lift and moved upstream. It could be a record year for salmon returns to the Winooski.
- Laurie: We are trapping on the Boquet and the Saranac. We've gotten high numbers on the Saranac, and are seeing things start to trickle in on the Boquet and Ausable. Sea lamprey treatments have been completed on the Putnam and Poultney River. We plan to treat the mouth of the Ausable in a couple weeks, and Lewis Creek.
- Neil: Oliver started his role with the Department of Forests and Parks. I am sure the Department of Environmental Conservation (DEC) Commissioner will be appointing someone to serve on TAC soon. DEC has a new commissioner, Jason Batchelder.
- Jamie: I usually have announcements at the start of a new water year about stream gauges being discontinued, but that is not happening this year! Things seem stable.
 - Neil: There has been some chatter about the end of the Saxon River gauge.
- Matt: The new LCBP Request for Pre-Proposals (RFPP) for Clean Water and Healthy Ecosystems Research has been released, thank you TAC for work on that. The Steering Committee liked TAC's recommendations, and they added one track on native species and their habitats. The RFPP is open until Nov. 10. We will provide instructions to TAC members on the review process once the RFPP closes. The Clean Water and Healthy Ecosystems Planning and Implementation RFP is open through Oct 12, please spread the word to partners. I completed an analysis on the impacts of the July flood, which I presented to the Steering Committee and am excited to share with TAC at a later date.
- Meg: This is the last weekend for the boat launch stewards.

Review and approve summary of previous TAC meeting

Motion: To approve the summary from the September TAC meeting

By: Jenn

Second: Laurie

Discussion: Neil: +1 to Matt's remarks about the research priorities that went to the Steering Committee, they were really reflective of what we worked on together and the needs.

Vote: All in favor

Abstentions: Margaret, Ryan Patch, Bridget

2. Workplan review: Sources and consequences of stream salinization in the Lake Champlain Basin (Dr. Molly Costanza-Robinson and Dr. Eric Moody, Middlebury College)

- Molly introduced the project and shared a presentation. Eric provided the background that increasing concentrations of chloride have been observed in Lake Champlain. Streams deliver chloride to the lake, however little is known about the impacts of chloride concentrations in headwater basin streams. The research goals of this project are to:
 - Characterize salinization, including its primary source(s), at 8 sites within the Lake Champlain Basin that represent a gradient in urban land use percent.
 - Characterize the knock-off effects of salinization related to the release of elements from soil into streams and bioaccumulation of elements in benthic invertebrates.
 - Separate the effects of salinization and other urban stressors on benthic invertebrate communities.
 - Determining the relative toxicity of various deicers on salt-sensitive Lake Champlain Basin invertebrates.
 - Examining the relationships between weather dynamics, stream salt concentrations and fluxes, and other water quality parameters.
- Molly reviewed major project deliverables and methods. The analysis will involve characterization of land use metrics in 8 headwater stream watersheds, 2+ years of high-frequency physicochemical stream water parameters, 2+ years of biweekly water quality sampling, sampling the benthic macroinvertebrate community 3x/year for 2 years, and elemental composition of stream benthic invertebrates (annually, 2 years).

Discussion

- Heather: We worked with Molly and Eric and are excited about this project. We had the opportunity to review the workplan and noted a couple of suggestions. It might be helpful to touch base with our hydrologist, Blane Hastings, to talk about winter measurements. Stone Environmental has done a study on Municipal Separate Storm Sewer System streams that might be helpful on some of the questions you all are looking at. We are excited about you trying to parse the impacts of chloride from other sources. Adding flow measurements may be helpful. I will submit written comments. It would be helpful to have the Quality Assurance Project Plan (QAPP) done prior to sampling beginning. Is iron one of the metals you will be doing?
 - Molly: Eric is working on a paper on the influences of hydrologic flow regimes.
- Jamie: I had some of the same concerns about winter measurements and how data quality will be assured. It seems like it would be a challenge to get out there as often as you want since there are not many good times to get high flow measurements due to the flashiness of flows. I agree Blane would be a great person to talk to. When you talk

about computing budgets, you don't talk about the chloride sensor. I wonder if the chloride data will be good enough from the sensor.

- Eric: We've been talking to folks about chloride sensors specifically. We've heard mixed reviews on the YSI sensor. We've gotten good relationships between conductivity and measured chloride concentrations in previous work. Even if the sensors don't perform super well, we can use the conductivity samples as a backup.
- Matt: Based on my experience with proprietary sensors, the chloride sensor might just be a dressed-up conductivity sensor. You can do that calculator yourself.
 - Eric: I've never used one, but I know that the chloride sensor is different from a conductivity sensor. How good the data will be is the question. A lot of people do just use regressions between conductivity and chloride.
 - Molly: It's a non-linear relationship in low regions.
- Neil: Heather, if you are going to continue to work with these folks, I'm really interested about the bioaccumulation of metals that may be released from soils aspect. My question for the future is what particular invertebrates you will be using for that? To be answered at a later date. I am excited to see how this work turns out.

Motion: To approve the workplan conditional on the response to review comments and TAC point people sign off

By: Jamie

Second: Jenn

Vote: All in favor

3. Workplan review: Using climate models to predict future use of de-icing salts in the Lake Champlain Basin (Dr. Brendan Wiltse, Adirondack Watershed Institute)

- Brendan introduced the project and shared a presentation. Brendan's team at the Adirondack Watershed Institute (AWI) has been working on deicing salt related research for several years with LCBP support. Brendan reviewed trends in the use of deicing salts and climate change, showing the use of deicing salts have increased substantially since the 1940s, and some winter months are warming. Next, Brendan showed the melting capacity of different types of deicers, and a plot that shows that the number of days that cross the freezing point is projected to increase. For road salt application, this means warmer temps means less salt could be applied, but more freeze-thaw events mean more could be applied. Brendan gave an overview of project tasks. This grant will support a graduate student, to be onboarded in late April- early May 2024. Tasks include the development of a secondary data QAPP, completion of a literature review, analysis of historical climate data, summarizing data from downscaled climate models, estimating changes in de-icing salt application based on future climate projections, and reporting.

Discussion

- Margaret: This is a great project and continuation of the work you've been doing. It's largely a modeling exercise. How will you incorporate the variability to managers who will need to understand the range of variability when making plans?

- Brendan: We can represent that as a range instead of just presenting a mean. We would like to include the full model output as an appendix of the report, so anyone can look at the different model outputs in more detail. It is important for us to ask questions if there is one model that has a significantly different output and to understand the implications of that.
- Margaret: I had a few more questions, some will be addressed in the QAPP, but a little more detail in the workplan in a few places would be helpful.
 - Matt: I agree and will work with Brendan to incorporate that feedback. The workplan is mostly to outline what the team will be doing, but not necessarily all the details on the analysis.
- Margaret: Great job, looking forward to it.

Motion: To approve the workplan pending revisions from the TAC point person and LCBP

Project Officer

By: Margaret

Second: Jennifer

Discussion: Matt: Would you like to be included in final review? Margaret: Only if questions come up on my comments.

Vote: All in favor

4. Workplan review: Investigation of Cyanobacterial Blooms in Inland Lakes of the Lake Champlain Basin (Dr. Brendan Wiltse, Adirondack Watershed Institute)

- Brendan introduced the project and shared a presentation. This research was spurred out of findings from ongoing AWI work on lakes in New York that show more harmful algal blooms (HABs) being reported. This increase in reporting is likely due to the New York State Department on Environmental Conservation (NYSDEC)'s focus on HABs and an overall increase in monitoring, but there have been concerns about persistent cyanobacteria blooms being reported in largely undisturbed watersheds. Two types of blooms have been reported in these cases: persistent July-October blooms, and primarily fall blooms. These blooms raise questions about internal loading, prolonged stratification, and the implications of climate change, including warming water temperatures and increases in precipitation in October and November. This project will focus on 6 waterbodies: Copperas Pond, Whey Pond, Little Polliwog Pond, Horseshoe Pond, Upper Saranac Lake, and Mirror Lake. Field work will include sampling each pond bi-weekly during the field season, including vertical profiles, integrated tube sampling, Secchi depth, observed bloom conditions, and paleolimnological data. Outcomes of this work include an improve understanding of cyanobacteria blooms and cyanotoxin presence, and a better understanding of the role of climate change in driving blooms.

Discussion

- Peter: The bi-weekly sampling regime might require additional eyes on the water in-between sampling because of the rapid nature of blooms to appear and disappear. The paleo work is limited, I'm curious about the preservation of samples and how much they

can tell us. Could some funding be put towards more pigment analysis and also thinking about atmospheric deposition impacts for blooms?

- Brendan: We can talk to our collaborator to determine the level of confidence we can have in the paleo data. I will add atmospheric deposition data to the analysis. I am hopeful that lake associations can assist us with keeping an eye on bloom conditions in the more remote lakes; we will work with local partners to get the most accurate information.
- Bridget: I am curious about the lake and pond selection, particularly in thinking about capturing the worst-case scenarios. Some small shoreline blooms might not reflect the worst scenarios that are out there. The post bloom microcystin sampling timeline is also very interesting in regard to how long they last and where you are capturing the samples during blooms.
 - Brendan: Short lived, localized blooms along the shorelines are characteristic of other bodies of water in the area. There are some lake-wide open water blooms that do last later into the season in a few places, and that is why Whey Pond was selected. Barnum Pond is another example that is near the AWI campus with high levels of microcystin. We might be able to consider expanding fieldwork to look at after-bloom sampling as well, but that might impact the number of sampling events we can capture.

Motion: To approve the workplan pending the incorporation of comments from TAC point people with Matt

By: Peter

Second: Margaret

Vote: All in favor

5. Workplan review: Not just a needle in a haystack: using models to understand the potential impact of a round goby invasion on the Lake Champlain ecosystem (Dr. Mark Henderson and Justin Lesser, University of Vermont)

- Mark introduced the project and shared a presentation. Mark reviewed the history of round goby invasions to North America. Round goby compete with native species for food and habitat and show predation of native fish eggs. However, they can also serve as an additional prey source for adults of some native fish and can consume zebra mussels. Round goby has been detected in neighboring water bodies to Lake Champlain. This project will use a species distribution model and food web model to understand potential impacts of round goby invasion to Lake Champlain. The study's objectives are to (1) identify locations with the highest probability to be inhabited by round goby if they did invade Lake Champlain, (2) estimate the impact of a round goby invasion on trophic interactions in Lake Champlain, and (3) estimate the impact of climate change, in combination with a round goby invasion, on the biomass of multiple taxonomic groups in Lake Champlain. Mark reviewed methodology for the development of the species distribution model, drawing on existing models and datasets. Justin reviewed the food web model, with examples from past aquatic invasive species (AIS) invasions to Lake Champlain. Mark reviewed updates to the workplan since the proposal

stage including identification of the CMIP5 model as the climate model targeted for use in this project.

Discussion

- Laurie: One general comment I have is about the amount of information in the workplan. It would be great to add some of the details that were included in this presentation and to highlight outcomes and how these results can be useful to managers would be helpful.
- Margaret: Detail for each of those tasks would be nice. The presentation was really helpful. Incorporating our current knowledge of goby in the Richelieu River and the Champlain Canal, and also baitfish restrictions, that background would be important.
- Neil: Interesting project. It will be great to see the results of the modeling.

Motion: To approve the workplan pending incorporation of revisions received from TAC point people

By: Margaret

Second: Laurie

Vote: All in favor

6. Workplan review: Agricultural Drainage Research Plots for the Evaluation of Conservation Practices (Laura Klaiber and Steve Kramer, Miner Institute)

- Laura introduced the project and shared a presentation. This study is motivated by the need for regionally specific research on the impacts of agricultural best management practices on water quality. The primary project output is the establishment of 12 fully instrumented drainage research plots (surface and tile monitoring) on Miner Institute cropland, which would enable the identification of field crop production practices to reduce nutrient loading to Lake Champlain and its tributaries & enhance resilience to climate change. Laura reviewed site characteristics, study design, and proposed sampling methods and data analysis methodology. Plot treatment and data analysis will be determined in consultation with the project advisory committee, following a 2-year baseline period.

Discussion

- Ryan C: Have you considered the influence of existing subsurface drainage on installation?
 - Laura: There is only surface drainage in the field currently.
- Ryan C: I am interested in the variety of treatments you could test, including fall manure application, cover cropping etc. Have you considered multi-species cover crop or different planting dates, use of an interseeder, etc.? There are tons of variables here, I'm wondering how many things you can test in these plots.
 - Laura: We are interested in testing multi-species crops. Cereal rye is commonly used and overwinters, but for other species that winter kill, are we seeing nutrients make their way to tile? Comparing multi-species to just cereal rye would be useful. We have done some work with interseeding. It might be tricky with the

small plots (90x90ft), but I think we will be able to utilize + implement some of these practices.

- Ryan C: What type of fall manure application are you planning?
 - Laura: On most corn ground, the typical treatment is fall liquid application that gets incorporated. We don't currently have injection equipment, but that might be in our future. In the initial monitoring period, business as usual would be most useful. We plan to do some spring application of solid bed / pack manure, but for these plots we're just planning fall application.
- Ryan C: Are there any concerns with surface freezing and sample collection?
 - Laura: The monitoring system will have an outlet into the manhole, which is below ground and will keep things a bit warmer. We can insulate the top of the well and install it below the surface. We won't see runoff during times of deep freeze.
- Ryan C: Excited to see the results.
- Mae Kate: Laura DiPietro sent written comments. Will share these with the project team. Laura also had comments on winter sampling.

Motion: To approve the workplan pending response to TAC comments

By: Ryan C

Second: Margaret M.

Discussion: Laura noted that she is in contact with Josh Faulkner considering the equipment enclosures to learn from those lessons

Vote: All in favor

7. Workplan review: Consequences of warming winters on nutrient export to Lake Champlain across land uses, phase 2 (Dr. Carol Adair and Dr. Andrew Schroth)

- Carol introduced the project and shared a presentation. She reviewed recent climate data showing increases in winter snow melt events, rain on snow events and an overall increase in winter discharge of 50-60% across Vermont since 1929. Preliminary data suggests that winter nutrient data is more pronounced in agricultural vs. forested watersheds. The overall objective of this project is to determine how nutrient loading, sources, and flow paths are impacted by (1) land use, (2) interannual variability in winter events and watershed conditions, and (3) season (winter vs. spring-fall). Carol reviewed existing monitoring infrastructure in Hungerford and Wade Brooks. Similar infrastructure will be installed in Potash Brook to expand this research to an urban watershed site. This project will maintain and collect year-round data from in-stream samples from all 3 sites, riparian transect data at Hungerford and Wade Brooks, and riparian resin data collection at all 3 sites.

Discussion

- Neil: Essentially, this is continuing the existing project for 2 years and expanding to the new site on Potash. So, we will end up with the passable data from the first year and then additional years of data that have benefitted from the learning from that first year.

- Andrew: Year 1 data are good, though there were some gaps where the sensors went down.
- Jamie: I share Carol's depression about the winters we're having. I felt a bit more detail could be devoted to how you're getting end numbers (precipitation, meltwater, soil water, etc.). I feel like the resin strips, that work is not really well integrated into the workplan. The motivation for that work was much clearer in this presentation. You mention transects in the workplan; I was unclear on what that meant. Does it look at how nutrient movement changes along the flow path? I do not see how the nutrient availability piece enters into the analysis, it seems self-standing. It would aid in the interpretation for sure.
 - Carol: The data help us better understand the effects of variations in freeze-thaw across a watershed. If the soils are frozen or if there is a lot of snowpack, what does that mean for nutrient availability? How can we use that to inform, in a more interpretive way, what we are seeing coming out of a watershed?
 - Andrew: An interesting angle in that space also is on comparing the availability of nutrients over time under snow to the nutrients we are seeing in the stream. Not a lot of work has done that, so it's a space for us to look deeper.
- Ryan: Great proposal, I'm interested to see this monitoring continue. I am thinking about how we can adjust agricultural practices in the fall and spring accordingly.
 - Carol: Andrew has a fun story about how management has changed in Hungerford and how we are seeing changes in response, so there is potential to bring that connection into the interpretation of our results.
- Peter: One technical question I wanted clarification is that when using the ISCOs, are you using site-specific calibrations that were previously developed, or have you developed new ones? It would be interesting to validate those estimates on winter fluxes.
 - Andrew: Great point Pete. The calibration process is ongoing, and we are continuously building our calibration library. With phosphorus where you are tracking things phosphorus is following, that may vary in the winter vs. other seasons. It's important to continue to build that library, and continue that as best management practices are implemented.

Motion: To approve the workplan

By: Jamie

Second: Ryan Patch

Vote: All in favor

Abstentions: Andrew