

Meeting Minutes
Lake Carmi Coordination Team Meeting
9/16/2021 – Virtual Teams meeting
60 + people signed in



1. Oliver - opened with reminder of purpose of meetings

- Overview of docs on website for re-information
- Review of agenda
 - Other items - Paul Stanley - mediator project
- Review of 2021/2022 data - P, chlorophyll, secchi
 - Good news: missed peak. Interesting is Chlorophyll a, a response to P levels. Much higher values.
 - Lay monitoring data suggests better summer in 2021 than 2020
 - Summary of cyanobacteria monitoring data over last couple of years - Low alert similar to last year and this year; but high alert bloom (green scummy); much fewer this year, thus better summer in terms of blooms. Hopefully that tracks with peoples experience on lake
 - UVM platform buoy, measures phycocyanin, measure same thing - see higher last year (June and July.) Also chlorophyll - a slow start, but last couple months higher, seen on lake
 - Overall data suggests better year than 2020.
- Rob - has seen better water quality this year, but also know that there wasn't as much rain. He has seen a lot of people trying to make the aerator work ; but reminded that work continues. Reminded attendees that lot to cover, and he is happy to respond, use chat
- Peter B - making progress, appreciate everyone's efforts, but still a lot of work to be done

2. Oliver - Updates of Lake in Crisis Response Plan - Critical Path project Section

- 2018 - VTrans, AAFM and ANR put out initial list. Currently updating list of critical path projects in 5 sectors (roads, agric., Lake management, etc.); We did receive comments on draft and appreciate effort. Some address topic, others may be directed towards other areas, but worthy of discussion. We picked up sense of frustration about pace of recovery.
- General Questions / Comments addressed below:
 - I. Vermont Water Quality Standards Criteria of 18 PPB for in-land lakes vs the 22 PPB in the Lake Carmi TMDL: currently lake concentrations are higher than 22, so this may be a future problem to determine how low to go. TMDL is a refined calculation to determine how much nutrient loading can happen to meet goals. When the VWQS are revised around lake criteria, this could be conversation.
 - II. Legacy P - how to measure. Won't be project in this plan. But modeling originally found that internal loading was 6%, but certain times of year, might be higher, especially when lake turns over. Our understanding of how P released from bottom sediments has evolved, and based on current data, it may have been higher during summer and been driver of blooms
 - III. Critical path to keep track of project P reduction (?)s. The other report - looks at P reduction. Agricultural activities could be accounted for - achieved 250 kg/yr which is 40 % of goal. Will be updated this winter. Under Act 76 - requires the P accounting methods be developed for projects across all sectors. New methods could be used to update P reduction achieved based on all projects completed.

- IV. What is daily P load from last summer - don't have ability to measure loads because there's no gauge on tributaries to measure flow. We can just measure concentration. AAFM may be able calculate loads in future. This could help us direct resources to areas with higher P loading.
 - V. Roads - will address in final version
 - VI. Aeration - how to determine true contribution to P reduction - Andrew's report will help here
 - VII. Appropriate to transfer aerator system to town ? Current planning to transfer to town, Everblue has contract to end of 2022 and will include training to town. Continued funding from state depends on legislature
 - VIII. Dam rehabilitation including vegetation removal needed - perhaps ARPA funding
 - IX. UVM monitoring continued? - will look at costs and if funding can be found
 - X. Aquatic survey done? Yes, 2018
- Agriculture Sector Questions / Comments addressed by Ryan Patch, AAFM
 - I. Comments range from AAFM regulatory program, states non-point source program, and acres of agric., manure spreading, so wanted to frame some thoughts in general sense and then answer specific questions and great work that farmers have been doing since Lake in Crisis plan adopted and before. A forthcoming meeting will focus on their achievements
 - II. Achievements - improvements seen. Our accountability framework - based on meeting regulatory requirements, which can be quantified based on modeling or using P accounting methodologies for specific practices. Agric community has been very open about their work to help inform what's happening on land. But proof in pudding, need to know that meeting water quality goals. Supported study by Stone Environmental to determine if water quality in tribs could be associated with management of agric. land, and it can be (because we can establish flow monitoring on tribs). The practices have been document to be implemented that will be needed. In summary, Compliance with state standards is seen, see farmers adopting voluntary practices as well.
 - III. Farmers conscientious about applying manure, and adoption of voluntary practices. and the injector is to help them get that extra mile. Some work regulatory and AAFM does inspections to ensure compliance, as said, compliance with no discharge is the standard. We have had deintensification of agric. in watershed over years, and lakes sediment cores suggest lake has experienced algal blooms over long term.
 - IV. Oliver - will put Stone study on Lake Carmi webpage. Some of question about manure spreading, outside scope of critical path report, but worth discussion
 - Agriculture Sector Questions / Comments addressed by Jeff Sanders, UVM and Marli Rupe, DEC
 - I. Ryan gave a balanced over view of what's going on the ground. Jim has been working closely with farmers over last 3 summers. Can provide a rundown of what's been happening on farms (see III).
 - II. Wetland restoration, river corridor assessments are nonagricultural projects, that are being funded. A UVM study is finishing up to identify opportunities. How to determine success: we track, but don't have methodologies for associating P reduction with all practices, so can't account for P loading reduced for all work completed in watershed. Currently developing methodologies to address those gaps. Including showing how much P reduction can be obtained from wetland restoration, Floodplain, and river corridor restoration. This is part of the Agency's functioning floodplain initiative. Within next year, we will have results and can

show how previous work may have contributed. Also developing methodology for forest land practices, like logging roads.

- III. In August Jeff did demos for Manure injectors. It is being repaired and he is working on that now. The technology is new to this country. This is an innovative practice and so there will be setbacks. Covid has also complicated repair. Current problem - first fix resulted in a breakdown of hydraulic systems. But have done close to 500 acres, and have other land scheduled for fall. Those people who would have had injector if not broken, they are waiting for injector to be repaired. Says a lot that they are willing to hold off on broadcasting of manure. There was broadcasting of manure in watershed in other situations when they couldn't get injector when expected. Other projects: A stack pack was in a risky area, and that was removed with UVM equipment. On another farm - UVM worked with them to get a water quality grant to get truck with manure tank to haul manure out of the watershed, which they will continue to do.
- IV. Jeff continued, that farms continue to do conservation practices that they always have. Even though the no till fields didn't do as well with the drought, they continued to use it. There is also grass waterway that was put in. Farmers are engaged. They did spread on Towle Neighborhood and State Park Road. This was good year to spread because of lack of rain but will continue to make improvements. Soil health wise - UVM took soil tests on 17 fields, for carbon sequestration, for greenhouse gas emissions and some WQ related data. A grant will help to identify appropriate conservation practices.

- Discussion on Critical Path Section Update

- I. Landscape analysis used? - Oliver showed [most updated land use data](#). Our findings that 32% of watershed is used for agric. , and much less than when TMDL developed.
 - a. Diane LaRose - asked about Oliver's figures on landcover analysis and differences - he repeated - 2748 acres based on survey - UVM did using Nutrient management plan, where fields are inventoried as well as discussions with farmers, not remote sensing that was used by other land use analysis. Some pasture might not be included because it wasn't being used. But still on same page with the remote sensing work.
 - b. NMP - is it mandated by size of farm? - Ryan responded - The required agricultural plan requires a formal written plan for all small farms, Med farms and large farms. IF smaller than those, still need to keep required. Jeff - says all farms in watershed are compliant with NMP.
- II. Rob Evans - appreciate updates. Because lake in crisis, could the broadcasting be stopped until phosphorus levels under control?
 - c. Oliver - statue for Lakes in Crisis is limited. It doesn't go into agency authorities, other than that agency will report to legislature of what they are doing.
 - d. Ryan - Required Agric. practices (RAP)- require certain actions, but assumes surface application of manure are congruent with wq goals.
 - e. Rob E. - just wanting to creatively think about all the options at their disposal.
- III. Paul - regarding manure injector systems - When working properly on day to day basis, would have more acceptance of it in watershed. We see tremendous agronomic response with injectors: it improved yields, but cognizant that NMP needs to be followed as well to lower P in soils of fields
 - f. Need to look at rented land that is being used by farms and make sure that it's under a NMP. He hears that farms hesitate including field in NMP, because not

know if they would use it in following years. And landowner may not rent land if it has to be in NMP.

- g. Jeff - injector pushes too hard into ground, and so it won't float across the land, so too much torque and sheers inch and half lynch pins between two parts. The solution is not easy to find in the world that we live in, but he's working on it. Would be nice to have people from Netherlands that sold them machine and where it's used visit to discuss solution. And regarding the rented land - UVM mapped all the farms and the fields. When land wasn't in a plan, they went out and sampled fields and put them into plan. So all the fields have "homes." Rented land wasn't always included at beginning of project, but UVM helped get them into plan. All the manure is tracked on computer system on tractor to meet NMP. There is some variability, but we haven't seen where injector has put down more than what is required.

IV. Oliver - remind people about [Lake Carmi webpage](#) - and reports are included there

3. UVM 2020 Aeration Monitoring Report- Andrew Schroth

- Study to show how lake responding to aeration - looking biology, chemistry, using sensors that move down water column on daily timescale - we know when and how P is coming out of the sediment. Also can see changes in phytoplankton, cyanobacteria.

Take home points

- Aeration dramatically decreased water column stability making it highly susceptible to wind mixing, under those conditions, DO profiles can be extremely dynamic
 - Turning the aeration system earlier seemed effective at preventing internal loading derived P from reaching the surface (mix before the bottom water becomes P enriched)
 - July system failures promoted internal loading of P, which likely triggered the initial bloom when mixed. Blooms are resilient to aeration once established (saw very different weather conditions in 2019 vs. 2020, but blooms persisted in both).
 - Aeration seems to have impacted the composition of the bloom, but more analysis is needed to confirm (e.g. how did 2019, 2020, and 2021 compare?).
 - Sensor platform as positioned does not capture shore-focused blooms well
 - Can a consistently and continuously functioning aerator keep the P concentration similar to low levels of late spring (~22 ppb target), and if so, to what extent is the bloom further suppressed?
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- What's next - synthesize data and work on model. Next meeting should be able to provide 2021 analysis. The final report will include a lay person version. Need to discuss potential for continuing at least a bare bones effort next year. The Platform would be available, but need to find funds.
 - Oliver - would like to fund monitoring. What was used for this year, isn't available next year. Looking for potential to do bare-bones monitoring, if can find funding.
 - Rob E - We need to continue to support the science. Let them know what they can do to support work. Had question about results - if dialed back system to reduce temperature on bottom, is this an option? Andrew - it's a natural "evil" and if system is working well, regardless of heat, it will drive down P .

- Oliver - Will be good to learn how aeration may drive community composition of cyanobacteria
- Andrew - One example, looked like one species was dormant in sediment, and perhaps aeration could drive it out. And will work up this data with Prof. Morales.

4. Update on 2020 Aeration System Functioning, John Tucci, EverBlue Lakes

- Problems caused by simple reasons, but hard to be at cutting edge. This is a scale of use that hasn't been done, or frequently. He has looked at those other examples, and they are having similar problems.
- To address Schroth's Key findings of increased bacterial at bottom, can happen when warmer, but also if more oxygen. But also want increased activity because these organisms eat and then move nutrients moved into food chain (and out of water column)
- The goal is to keep oxygen present at bottom.
- Main problem - heat that compressed air produces affects the lines that run from compressor to lake. In 2018, problem was resolved through their invention of cooling system that depended on ground temperatures. They learned in 2021 that that piece of engineering dried up ground moisture, and so was no longer able to cool. They then designed an air-cooling system for state park system. They obtained an after cooler device, Rob arranged for local contractor to build platform, and excavator to do work. This solved problem. The system at Rob's, also failed because of heat. The system used at State Park is very noisy, and wouldn't have been acceptable to people. The fixes they implemented, did work for a month, then another failure addressed with another fix. The after cooler will be altered to work here, to address noise. Timing - get it installed this fall so that it's ready for spring. The after coolers do have to be removed for the winter. He is not satisfied with functioning. He knows the system well. They have funded changes. They have concerns about ability of town to manage system. It will continue to need professional management. Everblue is happy to discuss how they can continue to provide service to system regardless of availability of funding.
- Jeff S. - Thank you for standing behind your product and putting in sweat and effort. Its appreciated.
- Oliver - will be working to find resources to continue Everblue's assistance.
- Paul S - ditto Jeff's comment. Use of steel piping?
 - John - agrees that would be better able to deal with heat, but would be difficult to install with digging required. Would like to solve problem by continuing to focus on cooling area around pipe.
- Has questions about Schroth's results - aeration, pushes air to bottom, that then pushes water up from bottom to reduce surface's resistance to wind, to allow mixing of oxygen there too. But with warming of water, less oxygen held by water. Is there a water temperature that is so warm, it won't be possible to get enough oxygen in system?
 - Andrew - suggested possibly modeling could answer question about temperature.

5. Update Presentation on Carmi Watershed Private Roads Study, Linda Blasch, NRPC

- Linda, NRPC - update on Lake Champlain Basin Program grant to do road erosion inventory on private roads and state park roads. Completed this summer, similar to what DEC developed for municipal roads. Appears to have worked well. 240 (100 meter) road segments were assessed to determine if segment met road standards, including does road shed water off because it is crowned, are road ditches present, are culverts stabilized.
- About 80 segments meet; 60 are in middle, and 63 segments didn't meet standards. Across the board, didn't have appropriate road surface, like crown or peak in middle, and slope allowing for

roads to drain, resulting in potholes. Also roads didn't have the ditches that collected water that shed off the roads. OF those also further prioritized segments, and made map and looked for clusters, also prioritized roads versus driveways, where landowner had shown interested in participating, IN end following areas will be focus: Sandy bay and Blackwoods road, initial conversations were positive, and in next few weeks will meet with residents and engineers to talk about project; Mullen Shore road - engaging with Mullens, and hope to get agreement; and Patten shore road between Scottish lane drive and ledge Drive. In addition, a few segments in the State Parks that agency staff will pursue independently. They expect that they will have design work and landowner agreement before work happens in spring.

- See [here](#) for GIS of results

6. DEC Ground water study from Jon Kim

- Showed map that covered groundwater and surface water sampling sites so far. Two funded programs with the first by LCBP/EPA and the second by DEC/Lakes in Crisis:
 - 15 bedrock well samples, ground water/springs samples and lake water and tributary samples for total of 40 sites. - to see interaction of ground water and surface water around lake.
 - 8 Shallow monitoring wells - sampled end of July
- Plan to finish sampling for LCBP/EPA study this fall, will be making a bedrock map of rock formations to finish field work for this grant, so need a few more landowner to agree to access (cracks and layers in bedrock can control groundwater and surface water flow).
- To respond to question about use of just taking sample over a year - will be taking 50 samples, and looking at 40 different parameters, so lots of data. AAFM will fund at least two more sampling events for each study to make both longitudinal. Will take some next spring. We are "contact tracing" the other chemical parameters that come in with groundwater and surface water. Some of phosphorous may be natural and from bedrock formations based on specific trace elements.
- Both groundwater studies will be continued by the Vermont Geological Survey in collaboration with Middlebury College professor and students with AAFM funding
- There is a Middlebury college student who has completed her senior thesis on the availability of phosphorous in sediments around Lake Carmi, as well as preliminary modeling of phosphorous in groundwater, this will be on website. Another senior thesis will be available next May.
- Questions:
 - Why not earlier? - were invited to apply for funding to work on Lake Carmi phosphorous issue in 2019, after large groundwater contamination projects in Bennington and Rutland.
 - Too dry this year? - will be getting a good ground water signature as it becomes more dominant relative to surface water when conditions are dry.
- Needs – Permission to map on large land parcels with large ledges along State Park Road and Route 20 (from Lake Carmi to Franklin) and along Riley Road, would like to know who to contact to go on their land. Large parcels of farm property are easier to map the bedrock ledge on. Rob E. asked him to provide info and he would send out their distribution list. Dean, NRPC could help. Paul Stanley also able to help.

7. Summer Surface Water Monitoring

- Tucker Wehner did summer tributary monitoring, appreciates all the help. Its been so dry, no complete set of flows (15 tributaries) to sample since June.

- Oliver - we'll analyze for dissolved P and total P to see if trends from last summer continue.

8. UVM Agricultural intervention Meeting – Jeff Sanders.

- Jeff - Plan on getting together to share results of agric. work that has been completed, first with farmers and then with the larger community. The work will include information gathered from UVM researcher on value of wetland restoration and also P reduction achieved.
- We will publicize dates of meeting through the carmi list-serv website

9. Any Other Business

- VTrans Work - Route 236 culvert replacement - working with landowners to get necessary easements, construction work will start in 2022
- Communication - use of Moderator to facilitate discussions
 - Paul Stanley - provided overview of mediation project that FWC supported with grant last year. Thinks it would be beneficial to continue, especially as we come out of COVID. FWC will look for grants over winter.