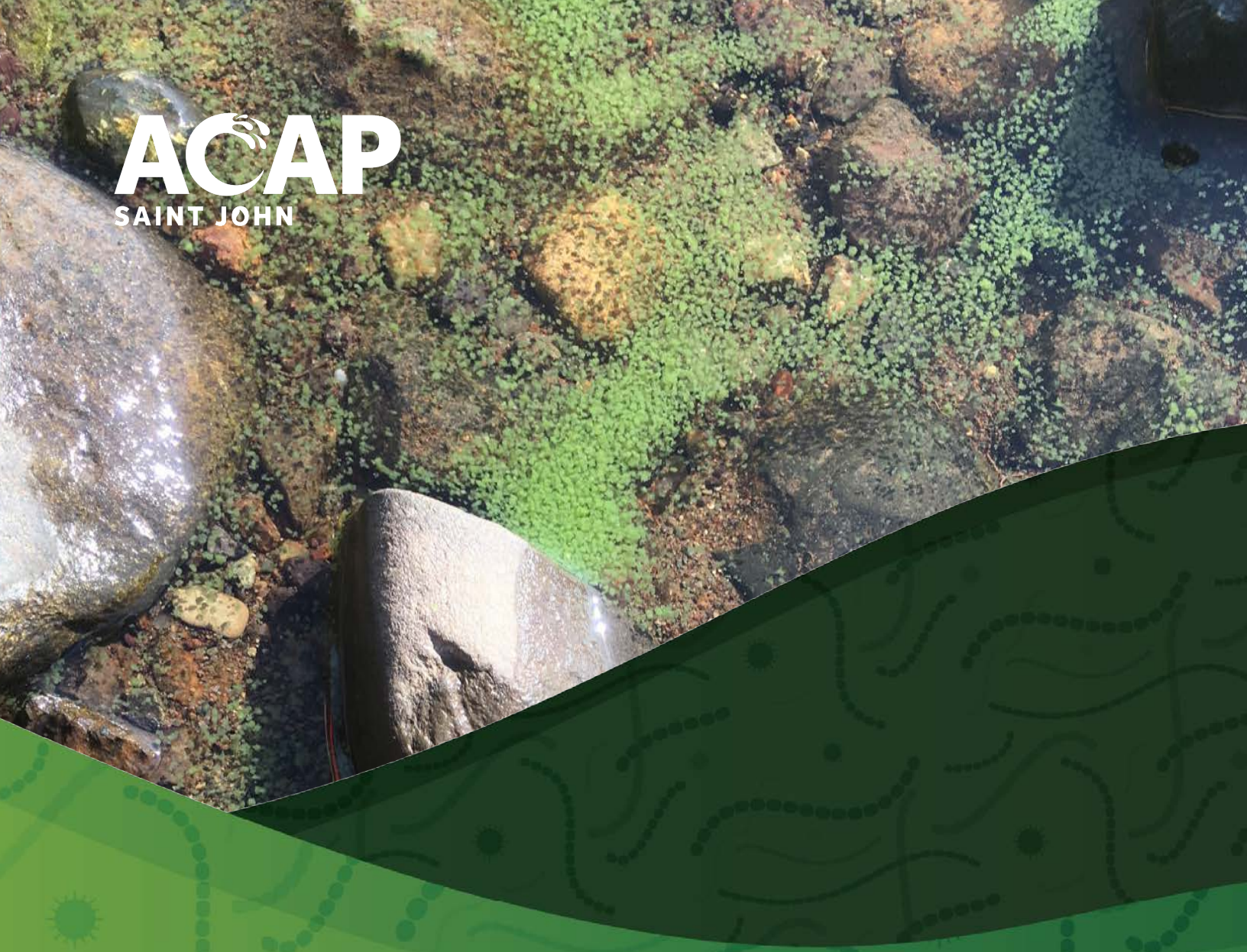


ACAP SAINT JOHN

Cyanobacteria in New Brunswick

Exploring Current and Future Monitoring Efforts

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Introduction

Growing concerns about cyanobacteria blooms and benthic mats in New Brunswick and specially along the Wolastoq [St. John River] have triggered an influx in research and monitoring programs in the watershed and throughout the province. The issues driving this research include the observation of blooms in drinking water reservoirs and recreational areas, as well as the deaths of domestic dogs in the Fredericton area. The webinar delivered in February 2022, provided insight into various sectors of research, monitoring, and results that have been ongoing in the region. Speakers included the leading non-profit in cyanobacteria monitoring, a government representative, academic researchers, and experienced municipal staff. The following report provides a summary of the presentations and the next steps for each sector.

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"Collaborative Cyanotoxin Monitoring in the Wolastoq"

Roxanne MacKinnon
ACAP Saint John

After the deaths of dogs along the river in Fredericton, ACAP Saint John submitted a successful grant application to the Atlantic Ecosystems Initiative *(AEI)* program and in 2019 began working on monitoring and education in the Wolastoq watershed. ACAP Saint John partnered with researchers and watershed groups in the watershed to complete a cyanotoxin monitoring program that supports research and decision making, while also identifying hot spots where potential toxic mats has been observed. This monitoring was completed using Solid Phase Adsorption Toxin Tracking *(SPATT)* collectors that are made by ACAP Saint John and distributed to partner organizations for monitoring throughout the river and tributaries. These SPATTs are deployed into the waterway for one month at a time and will adsorb any toxins from the water column as they flow through the resin component of the SPATT. Due to COVID-19 restrictions, the analysis of the data has been postponed and no data is available beyond a small trail deployment in 2019. Analysis of SPATTs from 2020 and 2021 will happen as the laboratory and technology capacity becomes available.



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To deliver education about cyanobacteria, ACAP worked with the Government of New Brunswick *(GNB)* and partners to create multiple public outreach pieces to increase education and awareness. The partnership with GNB ensured that key messages would be the same across all ACAP Saint John and GNB pieces to reduce further public confusion.

Education pieces include:

- ACAP Saint John website *(www.acapsj.org/cyano)*
- Cyanobacteria factsheet*
- Visual guide*
- Pet safety brochure*
- A three-minute video about cyanobacteria, what to look for, risks, and risk reduction created in collaboration with the St. John River Society and GNB *(https://www.youtube.com/watch?v=X-FDCyp9Erk)*
- Training module on cyanobacteria monitoring for the Atlantic Water Network's wet-pro water quality monitoring training *(https://wet-pro.ca/courses/)*

**These education pieces are printed and available in both languages. If interested, contact Roxanne for copies.*

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"GNB's Approach to Responding to Cyanobacteria Blooms"

Erin Douthwright
Department of Envrionment & Local Government

The Government of New Brunswick has developed responses for both surface blooms and benthic mats in the province. The Department of Environment and Local Government *(DELG)* are seeing a large increase in the number of public reports for suspected cyanobacteria sightings. These reports are screened by asking for pictures to be sent before the department will send someone out for sampling. This allows staff to eliminate misreported aquatic vegetation and green algae before heading out in the field. If a field visit is warranted, staff from one of 6 regional offices will visit the site, collect a water sample, and send it to a taxonomist for species identification and cell counts. If the identified species is confirmed to be cyanobacteria, then it is assumed it has the potential to produce toxins . Health advisory signage will be posted to inform the public of the risk and the waterbody will be placed on the blue-green algae advisory list. To educate the public on what to look for, signage has been installed at popular access points along the river from Woodstock to Fredericton where benthic mats have been found. Looking into the future, GNB staff are exploring updates to the existing algae webpage *(www.gnb.ca/algae)* including an online reporting tool that will allow the public to report sightings and submit photos through the website or app.

At the present time, GNB is challenged by the prevention of cyanobacteria as there are no feasible known responses that can be taken to eliminate an identified bloom or mat. To ensure the health of shared waterways, recommendations suggest that the public reduce nutrient runoff and maintain healthy riparian areas on waterfront properties. Since surface blooms are driven by water column nutrients, ensuring that these nutrients are not surpassing normal amounts will help reduce the risk of cyanobacteria blooms.



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"What we're learning about toxin producers in the Wolastoq using genetic methods"

Dr. Janice Lawrence
University of New Brunswick

Research began after the dog deaths in 2018 were confirmed to the result of cyanotoxin anatoxin-a. Due to the high cost of sampling using LCMS-MS technologies, Dr. Lawrence and her team began looking at the genetic ability of the cyanobacteria to produce toxins. To do this, they looked at the production of the anaC gene via PCR *(polymerase chain reaction)* within mat samples. The samples were collected by the Canadian Rivers Institute *(CRI)* and watershed partners from ACAP Saint John's project. Once samples have tested positive for the anaC gene *(that allows the production of toxins)* can then be analyzed via LCMS-MS for anatoxin concentration to quantify the amount. This method reduces the number of samples being put through the costly LCMS-MS procedure.

The analysis is showing high variability in timing and location including fluctuations between sites, within a site, and within a single mat. They are also finding that mats can be made up of both toxin and non-toxin producing variants and are recommending that any mat is assumed to be toxic. This assumption, that all mats are toxic and to stay away will reduce the risks of lethal ingestion for people and pets. The results identify a potential hot spot in the Fredericton region that will be further explored in future research. It is significant to note that research from New Zealand demonstrates that benthic mats can appear in pristine, low nutrient rivers. Researchers believe that the mats can get their nutrients from sediments as opposed to in the water column, identifying another area of research to be explored for the Wolastoq.



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Dr. Meghann Bruce
Canadian Rivers Institute

"What we are learning about cyanobacterial mat proliferation from field studies in the Fredericton region of the Wolastoq"

Dr. Bruce leads six field teams for the Canadian Rivers Institute *(CRI)* that are out collecting ecological data in the river. In 2018 *(when they began looking for cyanobacteria mats)* they did not know what to look for and sampled all sort of slimy things in the river. Since then, they have a much better idea of what to look for!

The monitoring of cyanobacteria has identified that benthic mats thrive in clear, flowing water and are usually dark in colour *(green, brown, gray, gold, cow patty looking)*. They have found a large proliferation of mats in the Fredericton region in highly dynamic areas where the mats are frequently dried out for hours at a time then rehydrated. The mats are observed to be present in the river at their earliest sampling *(May)* and can grow throughout the warmer seasons to be hundreds of metres long. One of the largest issues with benthic mats is that they lift off from the bottom of the river *(usually around July)* and will flow downstream where they washup in areas where people and pets might encounter them. For this reason, advisories have been issued for a large geographical area.

Upon returning from monitoring, CRI researchers have found mat material attached to their boats and shoes, providing an urgent reminder that clean, drain, dry practices are very important to ensure pieces of toxic mats are not being brought home *(https://canadainvasives.ca/programs/clean-drain-dry/)*. To build more awareness around the issues, and to understand where cyanobacteria is found, CRI is working on an online app that would allow the public to easily report suspected sightings.



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"History of Cyanobacteria in various City of Moncton Watersheds""

Heather Fraser
City of Moncton

In Moncton and surrounding areas, there are a number of municipally owned reservoirs that are used either for recreation or drinking water, but never both. In 2009, the Irishtown Nature Park reservoir had its first observed surface bloom. Since then, the municipality has begun monitoring in all its reservoirs for water quality parameters and cyanobacteria. The water quality monitoring program runs from May to November and includes measurements for temperature, dissolved oxygen, conductivity, pH, turbidity, chlorophyll-a, and phycocyanin *(cyanobacteria pigment)*. When a cyanobacteria bloom has been detected, the city will immediately post signage and update their website indicating that the water is closed for recreational use.

A trial of Phoslock was completed in the recreational reservoir *(Irishtown Nature Park)*. Phoslock is a chemical technology which binds phosphorus and sinks it to the sediment, therefore reducing the potential for cyanobacteria blooms *(i.e., less nutrients, less likelihood for cyanobacteria bloom)*. The trial was a success, and the city is now going through the permitting process to use Phoslock in drinking water sources.



In the drinking water reservoirs, municipal staff are frequently sampling to ensure they are being proactive about cyanobacteria. Fortunately, no blooms have been detected in the main drinking water reservoir *(Turtle Creek)*, however there was a bloom detected in Tower Road Reservoir *(upstream of Turtle Creek)* and in McLaughlin Reservoir *(back-up, not used)*.

To increase sampling efforts within the watershed, they created a school program with Moncton High School to undertake nutrient sampling within the watershed both during rain events and dry periods. Additionally, municipal staff have been working with landowners within the watersheds to help with land management and nutrient reduction/control. This includes working with stakeholders to ensure they are prioritizing water quality over forestry operations, and with private landowners where education about ecosystem connectivity and nutrient management is extremely important. The city will distribute educational packages to new landowners to ensure they are aware that they live within the watershed and provide examples of how to be good land stewards.

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Conclusion

Overall, the webinar provided an overview of the various sectors working on cyanobacteria monitoring and research including perspectives from non-profit organizations, government departments, academic researchers, and municipal staff. As the issues of cyanobacteria are incredibly widespread, the opportunity to provide this range of work being done in the watershed is significant. Further webinars and information will be a useful way to share monitoring results and research analysis that are ongoing in the watershed.

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