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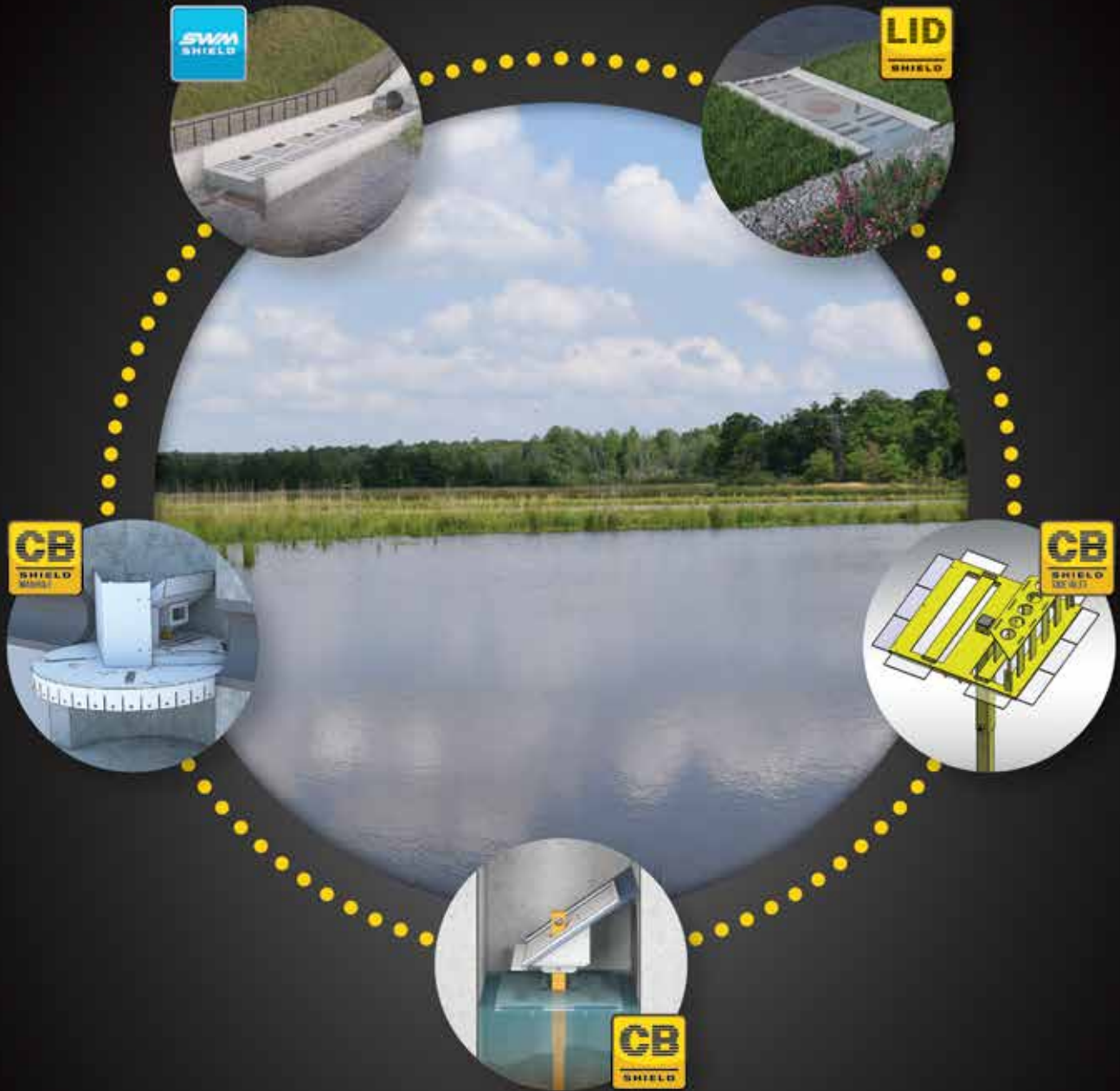
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**MANAGING EDITOR**

Andrew Macklin

**GROUP PUBLISHER**

Todd Latham

**PUBLISHER**

Nick Krukowski

**DIRECTOR OF BUSINESS DEVELOPMENT**

Jane Buckland

**ART DIRECTOR AND SENIOR DESIGNER**

Donna Endacott

**ASSOCIATE EDITOR**

Simran Chattha

**CONTENT AND MARKETING MANAGER**

Todd Westcott

**CONTENT CONTRIBUTORS**

Nicola Crowthall, Nancy Goucher, Marie Hoekstra, Katherine Lucas, Mark MacDougall, Brooke Northey, Barry Orr, Dave Sawyer, Rob Smith, Sara Teasdale, MK Whibbs, Nathan Wright

**ADVERTISING**

Jane Buckland jane@actualmedia.ca

**ADVISORS**

Nick Reid, James Sbrolla

**WATER AMBASSADOR**

Lee Scarlett

**actualmedia**

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**ACTUAL MEDIA INC.**

147 Spadina Avenue, Unit 208  
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Phone: 416-444-5842

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## Two Floods in Three Years

BY ANDREW MACKLIN

**IT HAS BEEN A FEW MONTHS** since the waters receded along the Ottawa River, following extensive flooding in low-lying areas throughout the region. The flooding in 2019 was, in some places, even worse than what hit in 2017, which saw the highest April rainfall recorded in 125 years.

The fallout from that severe flooding has been, in part, a provincial response that included the hiring of a special flooding advisor, Doug McNeil, back in July. The provincial government rightly recognized that something needed to be done in the wake of the flooding both in the Ottawa region, as well as in Muskoka, and the former chief administrative officer for the City of Winnipeg has been involved in many areas of water resource management.

That city might be a good place to start looking for solutions. I don't need to drum up a history lesson on flooding in the region and the damage it has caused. But the region has taken action with new infrastructure and, for the first time, put that infrastructure to the test. On October 9th, the Government of Manitoba announced it would open the gate to the Red River Floodway for the first time, in order to control water levels in the City of Winnipeg. By that afternoon, the level had reached 14.1 feet above normal winter ice level at James Avenue, the highest recorded level in the fall since 1970, when records began being kept by Environment Canada. With the expected rainfall in the days ahead, it was expected that the use of the floodway would reduce the Red River level in the city by just under two feet.

Winnipeg is not the only major city working on flood solutions. Planning of the \$432-million Springbank Off-stream Reservoir continues to move forward as the solution to prevent extreme flooding in Calgary, with increased support from the provincial government, and Toronto's \$1.25-billion Port Lands Flood Protection and Enabling Infrastructure project is well underway.

All eyes are now on the Ontario government, as McNeil and his team waded through public consultations and expert opinions to determine how to solve significant flooding in the Capital Region. Clearly a solution is needed, but the key question is whether or not a government as fiscally conscious as the Ford administration will accept findings that could suggest a solution with a cost in the hundreds of millions (similar to that of the Springbank project and the current outlet channel project under development in Manitoba). If it isn't prepared to cut the check itself, could the new federal government find itself pressured to pony up hundreds of millions of dollars? The short answer is yes. Imagine the political football this would have been had a solution been presented prior to the federal election.

Regardless of the politics involved, and the cost, a solution for Ottawa is needed. Let's hope that when McNeil provides a solution to prevent further widespread flooding in the nation's capital, the governments are ready and waiting with their checkbooks in hand. *wc*

Andrew Macklin is the managing editor of Water Canada.  
[andrew@actualmedia.ca](mailto:andrew@actualmedia.ca)



**NICOLA CRAWHALL**  
Nicola is the former deputy director of the Great Lakes and St. Lawrence Cities Initiative. Pg. 10



**MARK MACDOUGALL**  
Mark is a project coordinator and biologist with the River Institute. Pg. 12



**MARIE HOEKSTRA**  
Marie is a project manager at the University of Waterloo. Pg. 14



**NANCY GOUCHER**  
Nancy is a knowledge mobilization specialist at the University of Waterloo. Pg. 14

ABOUT THE COVER

Each drop of water contains valuable information, data that can help improve the quality of our operations. As the industry embraces digital solutions, the rippling effects can be felt in every household, business, and institution. For more, check out the story on page 25.

Coming up in the next issue:  
**JANUARY/FEBRUARY**



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Small System Implementation



The Economies of Clean Water



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## Richer Data Can Help Improve Flood Hazard Maps: Study

**RICHER DATA** can help improve the accuracy of flood hazard maps that are used by governments, insurers, and investors to determine the flood risk, according to a study by the Canadian Water Network (CWN) and Insurance Bureau of Canada (IBC).

“We need a proactive, cross-sector effort to continue to advance flood risk evaluation in Canada, one that reaps more value and effective actions from our collective expertise and knowledge,” said Bernadette Conant, chief executive officer of CWN.

Large-scale flood risk models currently rely on low-resolution (30-metre) topographical data of mixed quality that give limited consideration to municipal flood defences. The study found that five-metre grid spacing provided the optimal resolution to evaluate flooding from intense rain events.

“The study’s conclusions are important for insurers wanting to

expand flood coverage for consumers, particularly in areas identified as high risk on traditional flood hazard maps,” said Craig Stewart, vice president of federal affairs at IBC. “Improving access to richer information is a significant opportunity for Canadian municipalities, insurers, and homeowners to better understand flood risk and to take action.”

Stewart also said IBC is calling on governments to immediately invest in improving the quality of terrain data and to make that data available so that property-owners can identify their properties’ exposure to floods and take measures to protect themselves.

Flooding is a costly issue for Canadian homeowners, municipalities, and the insurance sector—and these costs have been growing. Property and casualty insurance payouts from extreme weather have more than doubled every five to 10 years since the 1980s. *wc*

Share your story about the Canadian water industry with Water Canada!

Email Managing Editor Andrew Macklin at [andrew@actualmedia.ca](mailto:andrew@actualmedia.ca)



## Researchers Studying Behaviour of Microplastics in the Great Lakes

**USING THE GREAT LAKES** as a laboratory, sedimentary petrologist Patricia Corcoran and her students at Western University in London, Ontario are studying the behaviour of microplastics as a geologic phenomenon.

What are the main sources of microplastics to Great Lakes sediment? What factors influence their distribution, and where do they concentrate?

To explore these questions, and shed light on implications such as which animals may be at risk from microplastics, Corcoran's team has analyzed offshore and nearshore sediment samples from Lakes Huron, Ontario, Erie, and St. Clair, and their tributaries. Abundances were as high as 4,270 microplastics particles per kilogram of dry weight sediment in lake sediment, and up to 2,444 microplastic particles per kilogram in river sediment.

The team found that the more organic debris in the sample, the more microplastics. Benthic microplastics—those incorporated into lake bottom sediments—were also more abundant near high population areas, which are also associated with plastics industry locations.

Surprisingly, not all plastic fibres

found in benthic samples were plastic after all. "When we chemically analyzed fibres only 33 per cent were plastic. The others materials like dyed cotton or cellulose," Corcoran said. "So we can't assume that every fiber we see under the microscope is plastic."

Corcoran's team also sampled pellets, microplastics about the size of a lentil, from 66 beaches across all five Great Lakes. They found a total of 12,974 pellets over 660 square meters of beach, about equivalent to an eighth the area of an American football field.

Except for the two beaches containing the most pellets, they found little relationship between population density or industry and number of pellets, said Corcoran. Instead, pellets were most concentrated near tributaries. "In other words," she said, "rivers and creeks are the main pathways used by pellets to reach the lakes."

Burial of microplastics in lake and river sediment is just one way Corcoran has explored how plastics are becoming part of Earth's future rock record. She's also investigated anthropogenic stones on a Hawaiian beach, which she and colleagues called "plastiglomerate." *wc*

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**NEWS:** Toronto City Council declares climate emergency. [bit.ly/TOClimate](https://bit.ly/TOClimate)



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**NEWS:** International Joint Commission appoints Montreal city councillor Suzie Miron to board. [bit.ly/SuzieMiron](https://bit.ly/SuzieMiron)



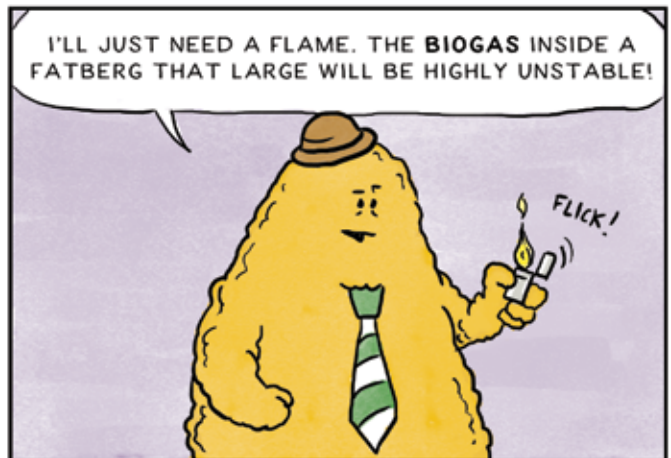
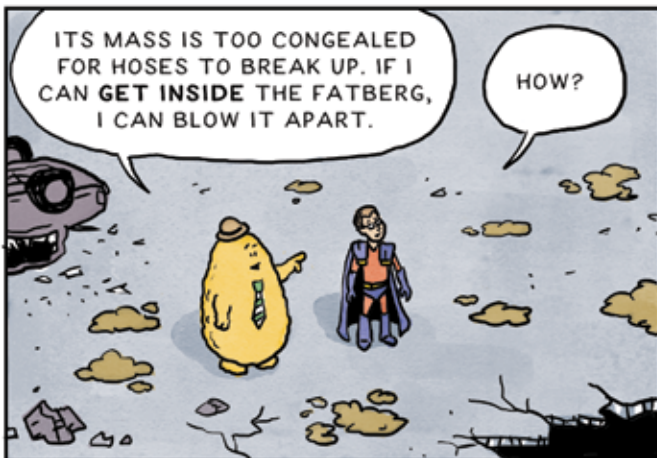
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# THE ADVENTURES OF FATBERG



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STORY & DRAWINGS BY NATHAN T. WRIGHT



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AND STRATEGIES TO COMBAT IT.

Nathan T. Wright is  
a freelance illustrator  
and artist based in  
Des Moines, Iowa, USA.





Low tide on the sandy beach at the popular quaint seaside community of White Rock surrounding Semiahmoo Bay near Vancouver in British Columbia

## Removing Arsenic and Manganese in White Rock

When the City of White Rock needed a solution to remove arsenic from the community's drinking water supply, they turned to AdEdge.

The City purchased the utility from EPCOR Utilities Inc. in 2015 and collaborated with RES'EAU-WaterNET to decide the best solution for removing arsenic and manganese from the community's groundwater supply. Arsenic and manganese are found naturally in groundwater in all regions of British Columbia. Concentrations that approach or exceed the drinking water quality guidelines can occur locally anywhere in the province.

Water that contains arsenic is only a health-related concern if it is used for drinking or cooking. There are short term or acute symptoms for exposure to high levels of arsenic, but the primary concern

is related to decades long exposure of even low levels of concentration in drinking water. This exposure can increase the risk of developing certain cancers.

Recent research is showing that manganese is more than an aesthetic annoyance and is actually a health and development related concern. Studies have proven that exposure to manganese can cause lower IQ and poor motor functions in young children, and also cause a disorder similar to Parkinson's disease in the elderly.

The process for removing manganese is a well-known and proven process that AdEdge efficiently and cost-effectively applies to dozens of projects across North America every year. The AdEdge Bayoxide E33 media for arsenic removal is particularly unique in that it is the highest

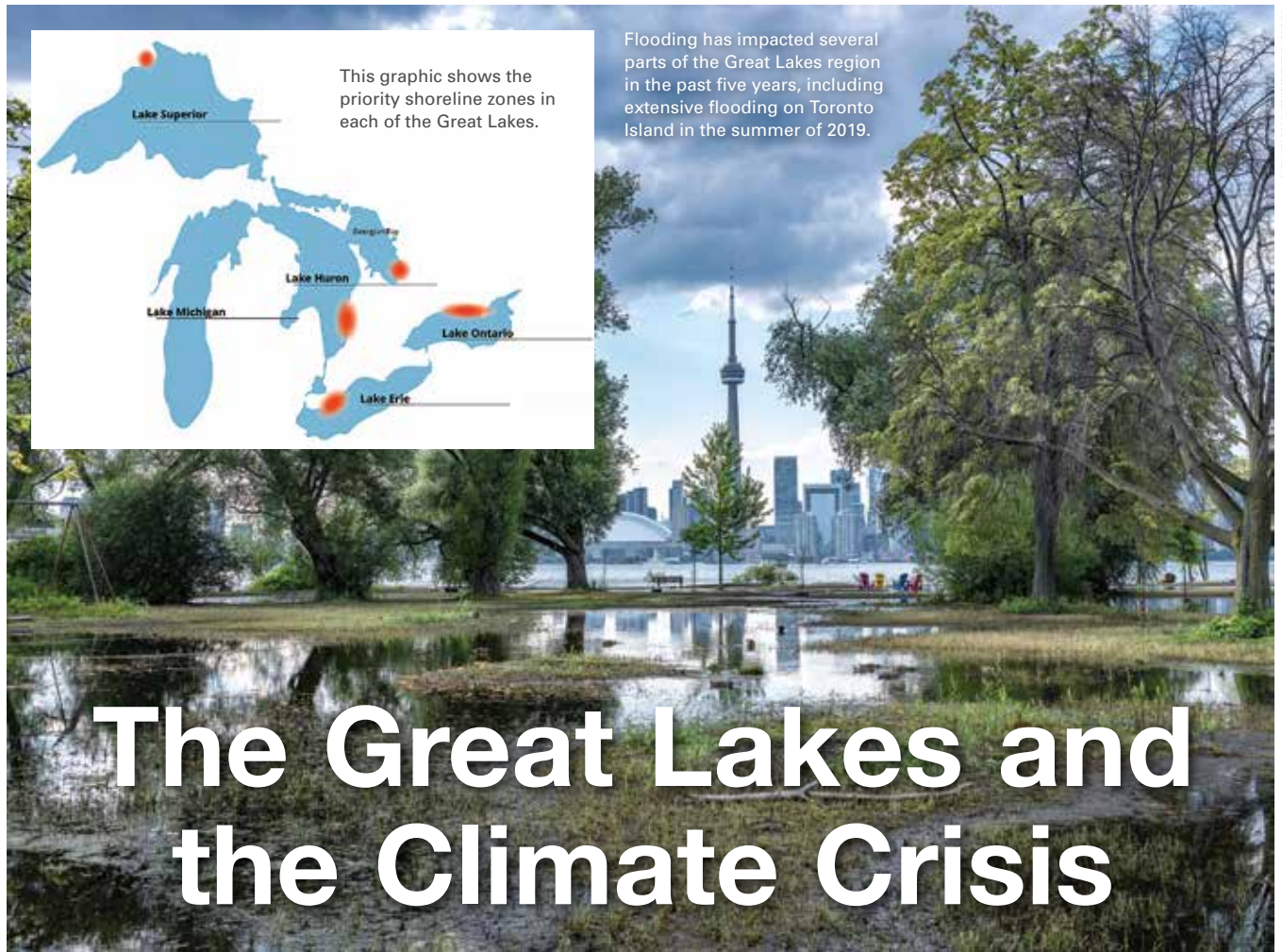
performing and longest lasting adsorption media available in the market. Using this media results not only in the most economical system for reaching the very low arsenic treatment targets set by White Rock on the project, but also the system with the lowest operating cost because media replacements are reduced as much as possible.

After the manganese is removed, the water goes through a second set of pressure vessels that contain a specialized media called AdEdge Bayoxide E33. This media is a granular ferric oxide (which means it is made mostly from iron) and the arsenic binds itself to the media through a process called adsorption.

Thanks to the introduction of the AdEdge's patented technology, residents of White Rock can feel safe in drinking water straight from the tap. ■



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This graphic shows the priority shoreline zones in each of the Great Lakes.

Flooding has impacted several parts of the Great Lakes region in the past five years, including extensive flooding on Toronto Island in the summer of 2019.

Image Credit: Great Lakes St. Lawrence Collaborative

# The Great Lakes and the Climate Crisis

Canada needs to be prepared for what comes next. BY NICOLA CRAWHALL

**HISTORICALLY HIGH WATER LEVELS,** shoreline flooding, torrential downpours, warming waters, freezing winters, sudden snow melts, wind storms, and powerful wave action eroding our shores. Climate change is already throwing its weight around the Great Lakes and St. Lawrence region. Gazing ten years into the future, what will we be facing, and how can we be prepared?

Answering that question was the task that five Great Lakes and St. Lawrence advocacy groups (Great Lakes St. Lawrence Cities Initiative, Council of the Great Lakes Region, Strategies Saint Laurent, Freshwater Future Canada, and the Great Lakes Fishery Commission) set for themselves. Inspired by the success of the U.S. Great Lakes Restoration Initiative that has delivered over \$2 billion in Great Lakes protection over the last ten years, the groups founded the

Great Lakes St. Lawrence Collaborative, a two-year project to develop a strategy with practical, forward looking recommendations on Great Lakes St. Lawrence protection in the face of climate change, urban and agricultural intensification, and diffuse non-point sources of pollution.

With financial support from Environment and Climate Change Canada, the Collaborative was launched in October 2018, and ably helmed by two pre-eminent environmental experts serving as co-chairs: Gord Miller, former Ontario environment commissioner, and Jean Cinq-Mars, former Quebec sustainable development commissioner.

Following an intensive eight month consultation process involving 200 experts, stakeholders and First Nation representatives, the Collaborative released its first report in June 2019,

Great Lakes Action Plan 2030 ([www.westbrookpa.com/gls/collab/reports/great-lakes](http://www.westbrookpa.com/gls/collab/reports/great-lakes)). It is a 10-year, \$100 million/year strategy that employs strategic and surgical interventions using new kinds of collaboration and technologies to help communities at greatest risk. A second report, focused on the St. Lawrence, will be released in the Spring of 2020.

Great Lakes Action Plan 2030 offers solutions to four challenges:

- 1 Create local collaboratives with federal and provincial support to help communities in the most vulnerable shoreline zones to prevent future flooding and build resiliency to high water levels.
- 2 Reduce our exposure to toxins in the water, air, and in products by proactively monitoring, investigating and responding to mixtures of

chemicals in areas where people and other organisms are most likely exposed.

- 3 Accelerate nutrient reduction that causes harmful algal blooms by harnessing the power of big data and precision technologies to identify hotspots and work with farmers to reduce phosphorus loss from those properties that contribute the most.
- 4 Make chronically contaminated beaches clean and safe by tracking and eliminating sources of fecal contamination, including untreated sewage.

Of these four critical challenges, it is the recommendations to protect shoreline communities from high water levels and flooding that have received the most attention to date. That is largely because the Great Lakes have seen historically high water levels this year, surpassing even 2017 high water levels. The Great Lakes Action Plan 2030 identifies five priority zones, one on each lake and Georgian Bay, that need special attention and funding to recover from flooding and to build resiliency before the next season of high water levels: Fort William First Nation on Lake Superior, the south-east corner of Georgian Bay, the northern stretch of shoreline from Grand Bend to Amberley on Lake Huron, the central northern shoreline of Lake Ontario from Toronto to Prince Edward County, and the northern shoreline on Lake Erie including Chatham-Kent- Leamington.

## Gazing ten years into the future, what will we be facing, and how can we be prepared?

Of these, the hardest hit has been the northern shore of Lake Erie. Chatham Kent has declared back-to-back states of emergency in 2018, and again at the end of August this year, after the water levels reached historic highs, 84 centimetres above the long term monthly average for Lake Erie. At risk were over 135 shoreline homes and cottages, of

which 50 evacuated voluntarily, as well as elevated roads and dykes that keep the rising water from washing over 1600 acres of prime productive agricultural land.

To date, Chatham-Kent has estimated over \$1 billion in flood prevention measures and \$18 million in annual maintenance costs. The federal government, through its Disaster Mitigation and Adaptation Fund, is contributing \$1.6 million per year for ten years. In collaboration with Natural Resources Canada, Chatham-Kent is conducting a Lake Erie Shoreline study and has held a series of public consultations, which will inform a shoreline strategy to be released next spring.

Chatham-Kent is adopting an approach to its shoreline protection that considers four broad strategies, depending on the site specific circumstances:

**AVOID:** do not allow development in areas vulnerable to flooding.

**ADAPT:** retrofit buildings and infrastructure to withstand flooding, like building homes with higher foundations.

**PROTECT:** where appropriate, harden the shorelike and building dykes and berms to keep the water back.

**RETREAT:** buyout properties in zones that have repeatedly flooded and cannot be protected, and naturalize the area.

Each of these options carries costs, particularly the politically sensitive 'retreat' option. According to Chatham-Kent officials, after repeated flooding episodes, some residents are expressing an interest in buy-outs, and in some cases, it may be cheaper to buy-out properties than to build and maintain protective structures. Notwithstanding the

favourable business case that could be made for the retreat option, an enormous public policy question hangs out there with no answer to date. To what extent should costs associated with damaged private property be socialized, that is, paid for with public funds? Given that the private property owners have no control over climate change

impacts, were given permits to build in these areas, and abided by provincial building standards, some are offering public monies on buying out homes that are now uninsurable and possibly un-mortgageable. Next door, the Quebec government has offered up to \$200,000 per household for buyouts in areas hardest hit by flooding. The Ontario government has so far not offered any compensation to homes in the highest flood risk areas. But it is sufficiently concerned that it has appointed a special advisor on flooding, Doug McNeil, to provide his best advice on how best to tackle the growing flooding problem. His report is expected to be submitted to the province later this year.

Chatham-Kent is calling on the federal and provincial governments and local interests to come together to develop a common strategy to shoreline flooding, which would consist of a funding model, updated building code and floodplain mapping, and technical assistance.

Action Plan 2030 has echoed Chatham-Kent's prescription, recommending that local Collaboratives with federal and provincial involvement be established in the five priority shoreline zones, to build on existing progress and partnerships and to agree on a strategy and funding formula to prevent flooding and build shoreline resiliency going forward.

On a panel discussion about shoreline flooding on TVO's the Agenda, Collaborative co-chair Gord Miller stated, "It hasn't sunk in how important the Great Lakes are to the economy. Successive governments have been stepping away from the lakes and getting away with it, so the problems and the damages have been accumulating." He continued, "we have to wake up, and turn our attention to the Great Lakes".

For the residents on the shoreline of Chatham Kent and the other priority zones, and the hundreds of participants in the Collaborative, their hope is that the Governments of Canada and Ontario do turn their attention to the Great Lakes, beginning with a commitment to implement Great Lakes Action Plan 2030. WC

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Nicola Crawhall is a principal at Westbrook Public Affairs.



Photo: Justin St. John

# Global Challenges, Local Concerns

How the world's water is impacting the St. Lawrence region. BY MARK MACDOUGALL

**THE DISCONNECT** between global environmental concerns and impacts felt at a local scale can be difficult to bridge. Recently, the United Nations Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) released a report warning of the threat of extinction facing a million species worldwide. This report, while attributing the global risk to a wide range of human factors, identified five of the most crucial drivers of environmental change. These drivers include changes in habitat and land use, exploitation, the global climate emergency, pollution, and the introduction of invasive species. While garnering a great deal of international media attention, this report and others like it warning of dire global consequences are plagued by their enormity. This is especially true in a country like Canada, where a large proportion of the population lives in urban areas, insulated from the already occurring effects of environmental change. The challenge which faces a call-

to-action of this magnitude is in making it personal.

However, global changes are often reflected in local concerns, and these global threats have not gone unnoticed to those living along the St. Lawrence River. The St. Lawrence River is a mesocosm for global influence driving local change. It is a pivotal link in global economic trade, connecting North America's commercial heartland in the Great Lakes Basin, with ports throughout the world, while also providing important freshwater habitat, stimulating the local economy through recreational activities and serving as a drinking water source for more than 2.5 million people. Additionally, as it drains the Great Lakes, many of the environmental and ecological challenges faced by residents along the St. Lawrence are dictated by what happens upstream.

## Bridging the gap between global and local issues

The River Institute, a non-profit research institute based in Cornwall, Ontario, in partnership with the Mohawk Council of Akwesasne and the Great River Network—a network of 43 community voices that support the health of the river—is in the process of developing

Many environmental and ecological challenges faced by residents along the St. Lawrence are dictated by what happens upstream.

the Great River Report. The report moves beyond the traditional ecosystem health report card approach by providing a platform for presenting a collective community understanding of the river, through science and community dialogue. It draws inspiration from the Haudenosaunee Words Before All Else,

which recognizes the interconnectedness of humans and the physical, biological, and spiritual environment to the river. By pairing western science with Indigenous knowledge and community stories, the rapport discusses the impacts and opportunities facing the river both on a small and large scale.

Residents from St. Lawrence River basin—including those from New York, Ontario, Québec, and Akwesasne—were asked to identify what concerns them most about the future of the St. Lawrence River. Respondents highlighted the long-standing concerns surrounding water quality and legacy pollution which derive from the region's industrialized past and agricultural present. Others focused on the need for clarity in water level management, with both high and low water levels ironically identified as concerns. Underpinning nearly everyone's concern for the river is understanding how manipulations—past, present, and future—influence what is natural or what is normal, two words which can be defined differently by everyone.

### Working together towards a healthy future

While the survey revealed that residents are concerned about a wide range of issues facing the river, these concerns are rooted in the five global drivers of environmental change identified in the UN report. The exception are two outliers that are important to paint a broader picture of how communities can effectively move forward to protect the environment both locally and globally:

- 1 Frustration surrounding the need for effective policy, regulation, and protection.
- 2 Apathic or misinformed views driving the need for effective communication and education.

Local problems often require local solutions. However, a system like the St. Lawrence River drains an area of more than 1,000,000 km<sup>2</sup> across multiple jurisdictions, with impacts upstream potentially not being realized until much further downstream. Effective management of local issues does require



High water levels in the St. Lawrence River are a concern for residents that live in communities surrounding the river.



Attendees at a workshop about the Great River Rapport.

stewardship at a local level, but it requires engagement and coordination at the provincial, national, and international levels. Moving beyond inaction for our shared environment will require compromise, communication, and effective environmental education. The St. Lawrence River is home to residents from a wide range of cultural and social perspectives and as a result, continued outreach and education initiatives are needed to maintain a dialogue of understanding between members of the community.

Although scientists are able to provide insight into the drivers of ecosystem change, it is those members of the community who live by the river,

use it, and are affected by it every day that hold the community's collective local knowledge. Ultimately, to tackle the environmental challenges of the future whether on a local scale or on a global scale, we will need to listen to the voices with our communities. Using this principle, the Great River Rapport continues to evolve and provide a platform for voices, however organizers recognize that this is only a jumping-off point for shared ecosystem protection. WC

---

Mark MacDougall is a project coordinator and biologist with the River Institute.

courtesy of freshwater research by



Researchers testing a radiometer near the shoreline.



Chione in a field.



Researchers testing a radiometer.

# Water Monitoring

Leading-edge technology emerges from Canadian study.

BY MARIE HOEKSTRA  
AND NANCY GOUCHER

**THE RANGE AND DIVERSITY** of Canada’s land mass makes it extremely hard for researchers and government to monitor changes to our water resources. Understanding and adapting to short and long-term water threats in the face of climate change will require a transformative enhancement in the way environmental data are collected and communicated.

Now, a \$1.1 million University of Waterloo-based study called Transformative Technologies and Smart Watersheds is using new tools and integrating data from a combination of sources to support and advance research on water issues throughout Canada. Funded by the pan-Canadian Global Water Futures program, a team of 52 researchers and students are collaborating with industry and government to develop, test, and implement various technologies including ground-based, drone, and airborne sensors. They are also using satellite remote sensing techniques to monitor water quality and quantity.

“The development of these tools and techniques will offer end-user communities enhanced methods to collect and deliver important environmental data from multiple scales,” stated Dr. Claude Duguay, the project’s lead investigator. “We expect that technology developers, government agencies, natural resource industries, and the overall water research community will benefit from the key deliverables of this project.”

One of the goals of the project is to design and build cutting edge instruments to measure environmental parameters in cold regions. For example, co-investigator Dr. John Pomeroy and research scientist Dr. Nicholas Kinar at the University of Saskatchewan are working on an instrument that measures multiple variables in a snowpack using sound waves.

The device, called Chione, sends an acoustic signal down through the snowpack where it is reflected back and sensed by microphones. The signal is then used along with mathematics to determine snow density, liquid water content, temperature, and importantly, Snow Water Equivalent (SWE). SWE is a key hydrological variable that can help predict streamflow and water infiltration to soils, which is important when forecasting flood risk and freshwater availability. Finding a way to quickly measure SWE has been a long term goal in the field of snow hydrology, as current methods can be time consuming and prone to human error. The instrument is currently being field-tested at sites across Canada, with plans to commercialize in the future.

The data collected with these new instruments will also help ground truth for airborne and satellite remote sensing

### Drones can provide a way to fill the critical data gap between ground-based field measurements and satellite imagery.

data. Another member of the team, Dr. Richard Kelly, will be employing a new Synthetic Aperture Radar (SAR) system called CryoSAR in an airplane to observe SWE and soil moisture over large and inaccessible areas of tundra, prairie, agricultural, and forested landscapes. This is a new approach that has not been used anywhere else in Canada, U.S.A., or Europe. As such, it will inform satellite design for snow and ice monitoring in the future. The request for proposals to build the CryoSAR has just been released, with delivery of the system expected for spring 2020.

“We’re intending to make CryoSAR a community instrument that other research groups can use in the future,” explained Kelly. “With scientists also interested in flying CryoSAR over sea ice, glaciers, frozen ground and lake ice, this measurement system will have the capability to provide data for a range of applications so we may better understand how these environments respond to environmental change. This is a key challenge for successful water resources management both now and in the future.”

Another aim of the study is to advance research on the use of drones and drone-based sensors to provide measurements needed for environmental monitoring and modelling. Drones can provide a way to fill the critical data gap between ground-based field measurements and satellite imagery. Researchers and grad students with the project are installing a variety of sensors onto drones including thermal, hyperspectral, and LiDAR. Flying much closer to the earth than a satellite, drones allow for incredibly high-resolution data to be collected—down to three centimeters with some sensors. Measurements can also be repeated several times within a day. The data collected has been used to study water level change, snow depth, agricultural hydrology, and algae blooms in water bodies.

Over the past two years the project partners have also collaborated with Environment and Climate Change Canada’s (ECCC) Canada Centre for Inland Waters, the National Research Council, and the U.S. National Oceanic and Atmospheric Administration (NOAA) to simultaneously gather data with surface, drone, and airborne hyperspectral sensors over Lake Erie. They plan to compare these techniques and ultimately learn about the spectral signatures of non-toxic and potentially-toxic algae. We can use this information to develop predictive algae bloom models and early-warning systems for risk associated with the size and toxicity of algal blooms.

“We’re exploring how this drone data can be integrated into hydrological models,” explained Duguay. “We also plan to share our experiences using these systems with the research community, so other groups can employ these techniques too”.

The project partners also plan to connect researchers with their data in near-real-time through the installation of ‘smart network’ modems at remote field sites across the country.

At present, environmental monitoring stations are few and far between in Canada’s north. Many of the stations are located in remote areas that are challenging and expensive to access.

This limits our ability to get real-time information which can let us know when flooding could occur, or when a lake is freezing or melting.

This project aims to optimize data collection and communication at these sites by using a network of small modems which will be installed on data loggers already in the field. This allows data to be transmitted via satellite directly to the desktop computers of researchers multiple times per day. The low-cost modems, which have been developed by an industry partner, can even be set up to send a signal when a specific event occurs, for example if a stream reaches a certain speed or water level.

“Even just knowing if your equipment has failed is valuable information,” Duguay said. “Many times, you will visit a remote site to download data only to find out you haven’t been collecting anything for months. It’s extremely frustrating.”

The first modems have been installed at a research site in Alder Creek, Ontario for initial testing, with plans to get these modems installed at other observatories in the Global Water Futures community within the next two years.

“Canada can be a pretty challenging environment for those who are trying to collect and transmit environmental data,” Duguay said. “Through this project, we hope to make available new game-changing technologies that not only function well in our cold climate but also get us measurements at a level of accuracy and scale that are meaningful to water managers and other researchers. Overall we want the water research community, not only in Canada but globally, to benefit from the advances being made by this project.” WC

Marie Hoekstra is a project manager at the University of Waterloo.

Nancy Goucher is a knowledge mobilization specialist at the University of Waterloo.



More information can be found on the project’s website at [uwaterloo.ca/ttsw](http://uwaterloo.ca/ttsw)

This rain garden, located at a school in Mississauga, includes 2,000 water tolerant plants and has the capacity to hold 263,000 litres of rain water.

Photo: Toronto Zoo

# Blue Schools

How the Toronto Zoo is working with students to tackle high water consumption.

BY KATHARINE LUCAS AND MK WHIBBS

**BLUE SCHOOLS**—a student-led, in-school water auditing and certification program—owes its origin to one small, elusive fish: the redbside dace. As far as freshwater minnows go, the redbside dace is colourful and charismatic. It sports bold red and yellow racing stripes up its sides and has the notable ability to leap out of the water to catch its prey. Unfortunately, it is also listed provincially and federally as an endangered species. The redbside dace was naturally selected as a feature conservation species by the Toronto Zoo, since it persisted in a creek close to the property. The Zoo joined the Redside Dace Recovery Team in the 1990's and participated in habitat rehabilitation projects, developed a redbside dace exhibit onsite, and initiated a public outreach campaign to raise awareness of this little known fish.

Fast forward to 2008 and the Zoo's redbside dace outreach program had grown to include multiple aquatic species at risk and was rebranded as the Great Lakes Program (GLP). By introducing local aquatic species at risk, their importance in the Great Lakes ecosystem and threats to their survival, the GLP connects participants

to their local waterways and calls them to take action to protect sensitive aquatic habitat. Five years later, the GLP was reaching an annual audience of 20,000 students and members of the public, and was recognized for its achievements in conservation by receiving the Minister's Award for Environmental Excellence in 2013. This momentum continues to push the GLP forward reaching an increasingly broad audience through in-class programing, public events, smartphone apps, and video conferencing. The redbside dace remains a consistent fixture in GLP programing, as does the core philosophy that individual actions can ultimately have a positive impact on individual species.

The GLP now branches into multiple programs, each with a different species focus. Great Lakes Outreach (GLO) represents the core of the GLP, delivering regionally tailored in-class outreach highlighting endangered aquatic species such as the pugnose minnow, spotted gar, and the redbside dace. Participants in the Aqua-Links program rear Atlantic

salmon in their classrooms and release them into the wild while they learn about similar conservation issues in the East African Great Lakes ecosystem. Freshwater Mussels are the star of the 'I am Important! I am Protected!' campaign to raise awareness of these highly imperilled, little known species. Blue Schools is the newest branch of the GLP and takes a different approach to

The data students collect is used to develop an action plan to reduce water consumption in their school.

aquatic conservation by taking students through an in-depth investigation of their own water footprint and that of their school. Whereas other GLP programs focus on species first as flagships to rally for conservation action, the Blue Schools program begins by introducing students to personal water-use first, then springboards into species and habitat conservation issues.

The first step in the Blue Schools program is for students to conduct a





# 3<sup>rd</sup> Annual AFN National Water Symposium and Tradeshow:

*First Nations Water Future Post-2021*

**November 20–22, 2019**

Fairmont Royal York in Toronto, Ontario

The Assembly of First Nations (AFN) invites you to its 3<sup>rd</sup> Annual National Water Symposium and Tradeshow: *First Nations Water Future Post-2021*, taking place November 20–22, 2019 at the Fairmont Royal York in Toronto, Ontario. The Government of Canada has made a commitment to end all Long-Term Drinking Water Advisories on-reserve by March of 2021...but what will happen after that?

The AFN Water Symposium will host plenary sessions, workshops and dialogue opportunities to hear your views on the long-term goals, objectives and strategies for First Nations water and wastewater future post-2021.

This Symposium will also provide an opportunity to update the existing AFN National Water Declaration and to convey to Canada and the world our goals, objectives and priorities as First Nations in the post-2021 water future.

## Who should attend?

- Chiefs and Councillors or their representatives, Public Works Managers, First Nations Water and Wastewater Operators, and individuals who are working in the field of water and wastewater management.
- First Nations organizations and technicians interested in improving the ways water and wastewater infrastructure is understood, managed and delivered.
- Consultants, industry, academia and other non-governmental entities involved or interested in First Nations water issues.

*\* Note that for water operators we are actively seeking accreditation so that this event will count towards your Continuing Education Units.*

The tradeshow promises to be exceptional. We look forward to hosting numerous water-related product and service providers as well as others engaged in the water and wastewater field.

**Please watch  
for updates at  
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**Contact:  
[Nov2019Water  
Symposium@afn.ca](mailto:Nov2019WaterSymposium@afn.ca)**

*We look forward to seeing you there.*

©2019 Toronto Zoo



A local teacher receives his Level 1 Blue School certification from Toronto Zoo staff.



A school water audit at Bayview Glen.

personal water audit at home followed by an in-school water audit. Students explore school washrooms, irrigation systems, cleaning practices, and much more to generate an estimate of the total water use in the school. The average Canadian uses 250 litres of water every day. Blue Schools uses curriculum-connected activities that highlight for students how they are consuming water and where it goes once it is down the drain. The data students collect is used to develop an action plan to reduce water consumption in their school and improve their water footprint. Once the action plan is implemented, the school becomes a certified Blue School, the level of which is determined by the type of actions completed. Schools can participate annually to progress through the four levels of certification, broadening the reach of their actions from local to international with each consecutive level.

It's through the action plan that students solidify their connection to local waterways. Participating schools collaborate with the Zoo, local conservation authorities and environmental NGOs to reduce their water footprint and support on the ground conservation. Students decide what water issues they want to tackle—ranging from school infrastructure improvements to aquatic habitat rehabilitation. Then they set targets for success and then get to work! For example, in 2019 and in collaboration with Ontario Streams, a group of participating high school students planted 400 trees and shrubs to support critical redbreasted blackbird habitat in Brampton, Ontario. This provided shoreline stability and habitat for the insects on which the redbreasted blackbird feeds. In another example, we partnered with Credit Valley Conservation who lend their expertise in

the design and construction of school rain gardens to connect students with natural water storage systems. The students are involved in selecting certain design elements of the rain gardens and which native plants to include in their garden. Our most recent rain garden collaboration is 1,000 m<sup>2</sup> and filled with 2,000 water tolerant plants carefully placed by students and community members. This rain garden has the capacity to hold 263,000 litres of rain water, filtering it of surface contaminants and slowing it down as it enters sensitive redbreasted blackbird habitat nearby.

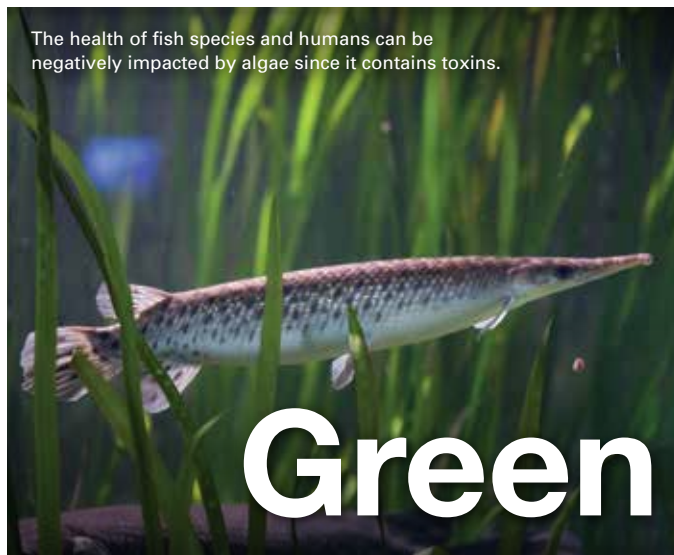
Thanks to the efforts of enthusiastic students and educators, and generous funding from the Royal Bank of Canada, Blue Schools also supports school water infrastructure improvements. To date rain barrels and water bottle refill stations have been installed at multiple participating schools and we have piloted low-flow flush valves—students lined up to give them a try! Students have also hosted fundraising campaigns to raise awareness about the importance of conserving water. We are excited to see what water actions 2020 will bring!

Canadian studies show that household water use had decreased by 27 per cent between 1991 and 2011 because of new technologies, more awareness, and better monitoring practices. Still, imminent threats including the spread of aquatic invasive species, microplastic pollution, and habitat destruction put sensitive species like the redbreasted blackbird in jeopardy. Blue Schools is a platform for students to take on these threats; this action-oriented approach to conservation results in measureable impacts and fosters a deeper appreciation for the importance of clean water for all living things from the very big, to the very tiny redbreasted blackbird. **wc**



Kat Lucas is the Aqua-Links program assistant at the Toronto Zoo.

MK Whibbs is the temporary manager of species recovery and program assessment at the Toronto Zoo.



# Green Goop

## The economic damages of harmful algae blooms on Lake Erie.

BY DAVE SAWYER AND ROB SMITH

**THE SUN IS SHINING** on a beautiful July morning. Sasha wakes up full of hope that today will be the day she can build sandcastles and hunt for critters at the beach. She hears mom awake and bolts downstairs to ask, “Mom, can we go to the beach today?”

Mom crinkles her nose and says, “Let me check the app and see what it has to say.”

“Ok Alexa, which Lake Erie beaches are swimmable today?”

“Good morning,” said Alexa. “Toxic algae blooms have been reported in the western basin of Lake Erie where all recreational activities are banned west of Erie Beach. In the central basin west of Long Point, the widespread presence of non-toxic algae blooms makes swimming and fishing not advisable. The water is boatable. Crystal Beach in Fort Erie reports the lowest shoreline coverage of algae matts, but caution is advised as prolonged exposure can irritate the skin.”

“Well Sasha,” said Mom. “it’s off to the pool again today.”

For anyone who knows Lake Erie, such a scenario is not some futuristic fantasy. Periodic outbreaks of harmful and nuisance algae blooms (HNABs), driven mainly by phosphorus loading from agricultural, have now given way to annual, summer long outbreaks. Many are experiencing the adverse effects of HNABs now, especially in the western

basin of the lake. As climate change continues to increase air temperatures, and thereby water temperatures, the frequency and intensity of HNAB episodes is expected to increase. Efforts by governments on both sides of the border have understandably kicked into action to address the challenge.

A first step in catalyzing action is to understand what is at stake. To this end, a group of Canadian researchers was tasked by Environment and Climate Change Canada to add an economic lens to the HNABs problem on the Canadian side of Lake Erie. The focus of the work was to identify and monetize the economic damages of HNABs. By revealing the economic value at risk, decision makers would be better informed about the benefits of taking action to arrest the lake’s decline.

The work started with satellite imagery to define the current ecological conditions that are driving algae blooms as well as the extent and frequency of the blooms. From this reference case based on current conditions, 30-year algae bloom intensity projections were made for two scenarios:

- ① Phosphorus loading continued unchecked and the lake continued its decline.
- ② Phosphorus loading was abated and the lake steadily improved.

Seven damage categories were identified where credible links could be made between changes in algae bloom intensity and economic costs:

### Commercial fishing

As water quality degrades, reductions in the quality and quantity of fish landed could push the economic value of the fishery downward. At the same time, operating costs could be expected to rise as fleets motor to different locations to avoid harvesting in the bloom areas.

### Water supply.

With the presence of toxic and harmful algae in the water, increased capital, and operating costs for wastewater treatment plants and industrial water users could be expected.

### Tourism

The level of business activity and therefore economic value could fall as the lake’s degradation reduces visitation.

### Property owners

There is a well-known relationship between surface water quality and adjacent property values. Reductions in property value could impact the wealth of households.

**Recreational users**

With the curtailment in recreational opportunities due to the presence of algae blooms, there could be lost economic value either through a lower level of enjoyment and the need to seek alternatives—as in the case of Sasha’s family above.

**Non-users with intrinsic values**

There could be a diminished level of well-being for households associated with the knowledge of the lake’s degraded condition. This is over and above any value held by households related to the recreational use of the lake.

**Health**

There could be value lost associated with the risk of adverse health outcomes due to the presence of harmful algae blooms.

After tumbling the numbers and factoring in a bunch of uncertainty, it

turns out that the continued decline of the lake on its current HNABs trajectory has an economic cost of \$300 million a year for the next 30 years or a total of \$5.7 billion in present value terms. In the scenario where phosphorus loading is controlled and the health of the lake gradually improves, the total cost of damage is about \$2.7 billion or \$147 million annually.

In the simple math of cost-benefit analysis, the implication is that a significant amount of abatement effort to reduce phosphorus loading, upwards of \$147 million annually, would pay out.

The distribution of the total cost is interesting for what it says about who is already paying for the damages and who is likely to pay more in the future. The main economic damages are borne by households (56 per cent) and tourism (40 per cent).

Economics is often derided for trying to value everything. But the flipside of that argument is that without valuing

something, it may seem as though it has no value. In the case of algae blooms in Lake Erie, economics helped reveal the magnitudes of the damages stemming from the green goop that is increasingly covering the lake and its shoreline. For decision-makers on both sides of the border, it becomes easier to justify action when the science is turned into cold, hard cash.

Importantly, Sasha might get to swim, fish, and boat more often. WC



Dave Sawyer is an environmental economist with EnviroEconomics. Rob Smith is a principal at Midsummer Analytics.

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# Peterborough & THE KAWARTHAS

Peterborough was ranked the #2 city in Canada for a water tech startup by Water Canada. Want to experience it yourself? We're inviting expressions of interest for a Cleantech Tour of the region. [peterboroughed.ca/cleantech-tour](http://peterboroughed.ca/cleantech-tour)



## Helping Water Companies Thrive

Peterborough & the Kawarthas offer extensive resources to help companies grow their business.

**Peterborough & the Kawarthas** is a region that has been shaped by three things: innovative minds, a commitment to sustainability and its connection to water. Not only are communities and industry built around water, the region has also established itself as one of the top water technology hubs in Canada and as a place where new companies can make their mark.

The support and speed of service a water technology company can expect in the region is impressive, and the access to research laboratories, state-

of-the-art equipment, venture capital, and global networks is world class. Peterborough & the Kawarthas also offers lifestyle perks like one of the shortest average commute times in Ontario, a competitive cost of living, and multiple health care and post-secondary education facilities. Individuals and families living in the region also have a strong connection to nature, including a significant portion of Ontario's historic Trent-Severn Waterway that connects Lake Ontario to Lake Huron.

Peterborough & the Kawarthas

Economic Development is working with partners—such as Trent University, Fleming College, Cleantech Commons, and the Innovation Cluster—to provide the resources needed to help water technology companies thrive. Thanks to the resources available, many water technology startups and established companies have seen notable results and are continuing to call the region home. Will your company join the cleantech industry in Peterborough & the Kawarthas?

[peterboroughed.ca/cleantech](http://peterboroughed.ca/cleantech)

## COMPANY SHOWCASE

### Aclarus Ozone Water Systems

Aclarus provides automated, chemical free, ozone treatment solutions that help improve operations, reduce costs, and protect the environment in both water and wastewater applications. **“Being a startup company in this region allowed us access to top notch facilities such as Fleming College’s Centre for Advancement of Water and Wastewater Treatment Technologies and Trent University for high end research and collaboration opportunities,”** said Adam Doran, vice president of marketing and sales at Aclarus. “This region has a wide range of suppliers and is in an ideal location close to the G.T.A., U.S.A., and the majority of the Canadian population. It is also affordable for living and for establishing businesses to grow quickly with lower overhead.”

### SGS Canada

SGS Canada provides a comprehensive range of services to its clients across the mining industry including water treatment solutions. Solutions include recycling or discharging treated process water after neutralizing the acid rock drainage, removing heavy metal contamination, and recovering contained metal value. These types of solutions help minimize the impact of mining operations on local water resources, which has become a top priority in the mining industry.

“Being in Peterborough and the Kawarthas has been extremely beneficial to our operations in Lakefield in several different ways,” said Zac Brown, marketing specialist at SGS Canada. **“Many of our clients are based in Toronto allowing for easy face to face meetings or site visits when needed. We find many of our clients like to escape the G.T.A. for a day or two and travel to our site to enjoy the quiet area of Lakefield, particularly in the summer. From an employee standpoint, we can draw upon a talented local work force to help fill out our staff requirements and allow our staff to live across the Kawarthas.”**

## MORE LOCAL RESOURCES

- Federation of Ontario Cottagers’ Associations
- Ontario Ministry of Natural Resources and Forestry
- Otonabee Conservation
- Parks Canada
- Rainmaker Worldwide

### Cambium Consulting & Engineering

Cambium is an employee-owned consulting and engineering company that offers environmental, geotechnical, and materials testing. The company’s water and wastewater team has extensive expertise in hydrogeology, water supply, drinking water system compliance programs, onsite wastewater treatment, and water treatment programs. Cambium’s team provides valuable advice to clients across Eastern and Central Ontario about how to ensure spaces are being developed, maintained, and/or remediated in balance with the needs of both the natural and built environments.

Cambium was recently named as one of Canada’s Top 400 fastest growing companies by the Globe & Mail. “Being located in Peterborough and the Kawarthas provided Cambium the opportunity to foster meaningful relationships that helped us understand the unique needs of our clients,” said John Desbiens, president and chief executive officer of Cambium. **“The location also served well with the ability to offer high calibre services without the costs typically associated with larger urban centers. Cambium has harnessed all of these strengths to bring about the success with three additional regional offices and new service lines.”**

### Siemens Milltronics Process Instruments, a division of Siemens Canada Limited

Siemens’ has based its process instrumentation factory in Peterborough. The factory designs and manufactures sophisticated measurement instruments and automated equipment for the process industries. Siemens equipment is used in a wide variety of applications—including water and wastewater—to help clients increase efficiency of projects throughout their lifecycle. For example, its level controllers can be programmed to avoid pumping during peak power times to save thousands of plant operating costs annually.

“The activities that the Kawarthas offer to our employees is a unique attraction to work in our location,” said Ian Almond, plant manager at Siemens Milltronics Process Instruments. **“We are able to attract talent that either wants to live in the cottage country atmosphere, or enjoy a short commute from the Greater Toronto Area. Our location has contributed to us hiring the best people in the industry for the success of our company.”**



Future Site of Cleantech Commons at Trent University.

## Cleantech Commons

at TRENT UNIVERSITY

Cleantech Commons is Canada's only Research and Innovation Park focused exclusively on clean, green, low-carbon, environmental, and climate technology research, innovation, entrepreneurship, and commercialization. Offering a unique and picturesque location adjacent to the main campus of Trent University in Peterborough, Ontario, Cleantech Commons is designed to be a point of convergence for academic and industry partners driving innovation in water technology, contaminant analysis, agro-biotechnology, and biomaterials.

“Our focus at Cleantech Commons is building a community of like-minded cleantech innovators and entrepreneurs who will benefit from being co-located alongside world-class academic research and expertise, technical facilities, value-adding business support, and incubation services, as well as other innovators and entrepreneurs.” *Martin Yuill, executive director*

**Cleantech Commons at Trent University is set to become Canada's Premier Cleantech Destination. View the Master Plan and Tenant Criteria by visiting [cleantechcommons.ca](http://cleantechcommons.ca)**



Peterborough Water Treatment Plant.

### INFRASTRUCTURE AND FACILITY HIGHLIGHTS

The City of Peterborough has one of the most sophisticated water treatment plants, with online analytical capabilities, that provides companies with an opportunity to test their water technologies in a real-world application.

The Millbrook Wastewater Treatment Plant for the nearby Cavan Monaghan Township—operated by the City of Peterborough—was upgraded in 2014 which resulted in the use of a smaller footprint, increased plant capacity, and better effluent discharge.



Students using Peterborough & the Kawarthas as a living lab for water research.



Little Lake, Peterborough, Ontario.

## Leading Expertise for Water Technology Companies

Academic institutions in Peterborough & the Kawarthas offer world-class research facilities and are active partners with local water technology startups. Over the past 50 years, **Trent University** has established itself as one of Canada's top postsecondary environmental institutions. Faculty members within the Trent School of the Environment include award-winning professors who are globally-recognized leaders in their fields of expertise. Trent also boasts world-class research facilities including the most comprehensive mass spectrometry facility in Canada in the Trent Water Quality Centre. The facility specializes in developing new and innovative techniques that can be used for measuring isotopes and trace amounts of organic and inorganic contaminants in water, along with the experts to support partners across sectors in research and analysis.

**Fleming College's Centre for Advancement of Water and Wastewater Technologies (CAWT)** is also located in the area. It is an internationally recognized water and wastewater institute that provides applied research and technology development services to the private sector, government, non-governmental agencies, and universities.

"Our location in Peterborough and the Kawarthas has been instrumental to our

success," said Barbara Siembida-Losch, manager of CAWT and senior scientist at Fleming College. **"From local breweries with wastewater management issues, to startups with technologies that detect pathogens in drinking water, our region is full of entrepreneurs with challenges we are equipped and eager to tackle."**

In addition to academic institutions, many organizations located in the region are available to help water technology startups find the best path to market. The **Innovation Cluster** launched the cleantech Trent Makerspace, a world-class lab facility located at Trent University for cleantech companies to produce, test, and commercialize their products. The Cluster's downtown incubator is home to the H2O Makerspace, a cleantech lab space with over \$50,000 of bench top watertech equipment available for companies to use. The Innovation Cluster's partnership with the Peterborough Utilities Group will also help expand Peterborough's market by attracting new technologies and startups through a vast network in the water and wastewater market in Ontario.

**The Ontario Onsite Wastewater Association (OOWA)** is another resource that is available to support water companies in the region. OOWA is a not-for-profit association

dedicated to promoting the value of onsite and decentralized wastewater management through education, improved standards of practice, and advocacy for sound policies. "We also provide a network for companies to share best practices and to learn about new regulations and policies," said Mike Gibbs, programs and outreach coordinator at OOWA. **"Being located in the Peterborough and Kawarthas region means we're working amongst a large number of our stakeholders."**

Peterborough  
&  
THE KAWARTHAS

ECONOMIC DEVELOPMENT

**Interested in learning how your company or organization can become part of the growing cleantech ecosystem in Peterborough & the Kawarthas?**

**Contact: Suzanne McCrimmon**  
director of business development,  
Peterborough & the Kawarthas  
Economic Development

**Email: [smccrimmon@peterboroughed.ca](mailto:smccrimmon@peterboroughed.ca)**

**Subject line: Water Canada Feature**





L-R: EMAGIN CEO Thouheed Gaffoor, Maid Labs Technologies president Benoit Beaudoin, Aquatic Informatics CEO Ed Quilty, and Real Tech CEO Jodi Glover.

# The Digital Future of Water

Industry leaders from across Canada discuss how digitization is changing the business of water for the better. BY ANDREW MACKLIN

**DATA IS CHANGING OUR WORLD.** Each day, some of the decisions we make will inevitably be because of data that has been collected, processed, and utilized to our advantage in order to make a sound decision.

In the water sector, data can and is playing a similar role, providing operations with the ability to make impactful, evidence-based decisions in real-time. Those decisions can improve operations in many different ways, such as reducing the impact of contaminants, decreasing energy consumption, or improving flow efficiency to name a few. For some water utilities and consumers, this digitization has already begun. But some still resist the need to spend the money on digital solutions, preferring to stick to traditional methodologies that, to this point, are still allowing these operations to meet their bottom-line objectives.

The concerns around digitization are legitimate. Some utilities, or the municipalities or private entities that

operate them, have a difficult time trusting a third-party with that much understanding of how the business operates. According to Ed Quilty, chief executive officer (CEO) of Aquatic Informatics, his early clients would want to run his software behind their own firewall, but that demand has subsided as data privacy and security fears have been quelled.

For Maid Labs Technologies president Benoit Beaudoin, whose company specializes in flow meter technology, the way to ease the concerns of potential new clients by simply demonstrating the product and what it can do for the operation. By showing that a new piece of technology can deliver in fixing an operational inefficiency, a utility or industrial user is more likely to embrace the investment, regardless of any trepidation towards the use of digitization.

So where does a utility or industry begin with its integration of digitization? By answering two very important questions, according to Real Tech CEO Jodi Glover: what is your problem, what

is keeping you up at night? Once that is established, a digital equipment or software provider can get to work on customizing a solution that meets that demand. It sounds obvious, but the integration of digital technologies can be a waste of an investment without a specific purpose in mind.

## Where we are now?

As stated earlier, digital solutions are already paying dividends both for water utilities and the industrial water sector.

From an industrial perspective, one example of how digital solutions are assisting with operational efficiency is with the use of membrane technologies. EMAGIN CEO Thouheed Gaffoor discussed how his company used a data solution to learn from the behaviour and performance of a membrane at a bottling plant by collecting and analyzing real-time data. Rather than shut down the system to clean the membrane on a static cycle, the data was able to discover exactly when cleaning needed to occur, reducing the

amount of downtime without hampering operational efficiency.

For Beaudoin, his company has worked with a municipality to change their approach on the use of pumps. Previously, pumps were engaged based on water reaching a preset level. Instead, Beaudoin's team introduced a pump cycle that was based on the need of fluoride, a more efficient use of the pumping system, which led to lower energy costs and likely a longer life for the installed equipment.

In Quilty's case, he cited a project that Aquatic Informatics worked on with Washington Sanitary. The solution was to help with tracking the need for inspections at the estimated 70,000 food and beverage providers. The technology tracks 'hot spots' of disposal, where excess amounts of food preparation by-products, such as grease, are detected. That allows better use of resources through targeted inspections, providing a savings of three or four full-time staff who can be used to perform important

duties elsewhere in the operation.

Glover's company worked with a pulp and paper company who was worried about the presence of certain compounds in the water. Real Tech developed 10 algorithms that it installed in its sensors to detect the compounds, such as COD and blue dye, which helped avoid costly spill events. The information the sensors provide, as well as other real-time data solutions, empower people to react when an issue occurs.

**Where are we going?**

Digitization still has a ways to go, and there are still solutions to be developed that will help the water sector even further. For Gaffoor, that solution is integration and API that allow different technologies to communicate with each other. Beaudoin suggests that a much-needed solution is an intelligent system that can use machine learning to identify abnormalities in operational water processes. Quilty discussed the need for

solutions that address widespread sewage overflows, as well as the need for legionella detection in private plumbing systems. Glover pointed to the need for advanced sensors for detection and eradication of emerging contaminants, sensors that can detect even lower parts per million than what is currently detected.

There is still much work to be done in the digitization of the water industry in Canada, but there are solutions already available to begin addressing many of the issues currently facing water utilities and industries across the country.

*The preceding article was based on how the panel discussion on smarter utilities are shaping the digital future of water, which took place as part of the Global Center programming at WEFTEC 2019 in Chicago, organized by Water Canada in cooperation with the Consulate General of Canada. WC*

Andrew Macklin is the managing editor of Water Canada.

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Stormwater management can help project proponents meet local needs while also protecting important habitats and species.

# All About That Dace

Stormwater management strategy helps the Region of Peel treat polluted runoff and protect a local reddsidedace population. BY SIMRAN CHATTHA

**UNDERSTANDING HOW** an infrastructure project affects a species or habitat is an important consideration, especially when the project could have an impact on an endangered species. This was the case for the Region of Peel when it was widening a portion of Mississauga Road—south of Bovaird Drive in Brampton, Ontario—to accommodate planned future growth, address operational and servicing deficiencies, and make intersection improvements.

“The road runs through a reddsidedace habitat, which is protected under the Endangered Species Act, so we knew that we needed to take steps to mitigate any impacts that the additional impervious area might cause,” said Samantha Paquette, project manager of infrastructure programming and studies at the Region of Peel.

Redside dace was listed as endangered under the Endangered Species Act because it experienced a significant population decline. The species was once found in 24 watersheds across Ontario but is now found in only 16 watersheds, according to Conservation Halton. One of the potential factors that has contributed to the species’ decline is urban development because stormwater entering streams has not always been handled effectively and this is negatively impacting the habitats where the reddsidedace lives.

Given the potential environmental risks of its road widening project, the Region of Peel started evaluating how low impact development could be incorporated into the design to minimise impacts on the reddsidedace population in the area.

## **Solution: living wall**

Once the Region of Peel completed an environmental assessment for the road widening project, it hired a consultant, Aquafor Beech, to prepare the detailed design of the road.

During the initial phases of the project, the Region of Peel considered incorporating bioswales or underground storage to manage the stormwater from the additional impervious surface area that was constructed as a part of the road widening. Ultimately, “the living wall was selected because we were able to reduce the footprint into the floodplain and provide stormwater benefits,” Paquette said. Benefits include cleaning and cooling stormwater before it enters Huttonville Creek.

Stormwater enters the living wall, which is 400-metres in length, through a double chamber manhole. “The first 25 millimetres of



The Region of Peel is mitigating the potential impacts of polluted runoff from an infrastructure project with a living wall.



The Region of Peel worked with Aquafor Beech, Varcon, and Credit Valley Conservation to minimise the impacts of a road widening project on the local redbreasted nuthatch population.

rain enters the [low impact development] LID through the first chamber,” Paquette said. “During larger events, stormwater overflows into the second chamber and into the storm sewer network to an oil and grit separator. Once the water filters through the wall, it is discharged through subdrains to the floodplain. It then flows slowly to Huttonville Creek.”

Once the design of the road was complete, the Region of Peel hired a general contractor, Varcon, to build the road. The general contractor started widening the road in 2016. The construction of the living wall started in the same year and was completed in the fall of 2018.

The Region of Peel also reached out to Credit Valley Conservation (CVC) to review the detailed design and document the construction with photos and videos. Once the road widening was complete, CVC helped the Region of Peel prepare standard operating procedures to maintain the living wall exfiltration

system and helped train the region’s maintenance staff.

### Proactive risk management

There are a number of mechanisms in Ontario to protect redbreasted nuthatch populations from the negative impacts of polluted runoff. Project proponents, like the Region of Peel, need to show how they are planning on incorporating stormwater management into their projects to obtain an Endangered Species Act permit from the Ministry of Natural Resources and Forestry.

Many municipalities are also undertaking LID projects to comply with a guidance document—developed by Ontario’s Ministry of the Environment, Conservation and Parks—for developments that are occurring in redbreasted nuthatch habitats.

More and more municipalities are incorporating LID into their projects to comply with provincial requirements. As a result, there are more opportunities for knowledge sharing about planning,

implementation, and maintenance so that projects can be undertaken as efficiently and effectively as possible.

One of the lessons the Region of Peel learned from its road widening project was to involve operations and maintenance staff throughout the project. This is so that they can comment on elements of the project such as the design of the infrastructure, how it will be cleaned out, how it will be maintained, and the cost implications.

Paquette also recommended that staff determine how the project is going to be incorporated into asset management and figure out how the project is going to be transferred digitally into Geographic Information System (GIS) mapping. [www.watercanada.net](http://www.watercanada.net)



Simran Chattha is the associate editor of Water Canada.

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**AdEdge Water Technologies, LLC**

Richard Cavagnaro  
Corporate Communications  
2055 Boggs Road  
Duluth, Georgia 30096  
Phone: 678-835-0052  
Toll-Free: 866-8ADEDGE  
Email: sales@adedgetechnologies.com

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Irene Hassas  
Vice President, Corporate Development and Partnerships  
5044 South Service Road  
Burlington, Ontario L7L 5Y7  
Cell: 416-459-8908  
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 VP Sales  
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Michael Agbeti  
 President  
 28 Stone Gate Drive  
 Halifax, Nova Scotia B3N 3J2  
 Phone: 902-425-8989  
 Cell: 902-401-8984  
 Email: magbeti@bio-limno.com

[bio-limno.com](http://bio-limno.com)

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 President & CEO  
 1624 Topsail Road  
 Paradise, Newfoundland and Labrador A1L1T9  
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 Director of Business Development,  
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Geoff Britnell  
 North American Business Development Manager  
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 Email: [geoff.britnell@ferpalinfrastructure.com](mailto:geoff.britnell@ferpalinfrastructure.com)

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Derek Davy  
 CEO  
 1305 Morningside Avenue,  
 Unit 12 & 13  
 Scarborough, ON M1B 4Z5  
 Phone: 416-606-5014  
 Email: [info@econse.com](mailto:info@econse.com)

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Sales and Support Manager  
1520 Eureka Road  
Roseville, California 95661  
Phone: 416-317-9872  
Email: stephen.elgie@kisters.net

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3521 Bathurst Street, Unit 201  
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Mike Near  
Business Development  
2015 Spinks Drive  
Kingsville, Ontario N9Y 2E5  
Cell: 519-465-9700  
Toll-Free: 800-265-0863

- [linkedin.com/company/liqui-force-services](https://linkedin.com/company/liqui-force-services)

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Kevin Litwiller  
Director of Marketing and Communications  
125 McGovern Drive, Unit 1  
Cambridge, Ontario N3H 4R7  
Phone: 226-440-1860 ext. 106  
Email: info@lystek.com  
Toll-Free: 1-888-501-6508

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N



**NCS Fluid Handling Systems Inc.**

Owen Gilbert  
President  
280 Portage Close, Unit 530  
Sherwood Park, Alberta T8H 2R6  
Phone: 780-570-0051

[twitter.com/ncsfuidsystems](https://twitter.com/ncsfuidsystems)

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NCS Fluid Handling Systems (NCSFHS) is comprised of a team of experts that serve municipal and industrial water management services. Services include sewer bypass, dewatering, storage tank hydrotesting and pipeline hydrotesting, water treatment and iron removal, river diversion, filtration, sand pointing, or well-point all supported by PEng designed handling systems. NCSFHS is a licensed member of APEGA dedicated to serving the industrial, construction, mining, and energy sectors in both planned and emergency situations. On all job sites, our focus is to offer the highest level of customer care and service, putting safety first and adhering to our commitment of strong quality for your projects.

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**Netzsch Canada**

George Balcerczyk  
President  
500 Welham Road  
Barrie, Ontario L4N 8Z7  
Phone: 705-797-8426  
Email: [george.balcerczyk@netzsch.com](mailto:george.balcerczyk@netzsch.com)

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Manufacturers of grinders, progressive cavity pumps, rotary lobe pumps, multi-screw pumps, sewage pumps, and polymer/chemical pumps. Netzsch is one of the few manufacturing companies that have a direct presence in Canada. We have in-house application engineering, assembly and testing, service, support, and stock to support the Canadian market.

P



**PICA Corp.**

Dave Russell  
President  
4909 75 Avenue  
Edmonton, Alberta T6B 2S3  
Phone: 780-468-6800  
Email: [info@picacorp.com](mailto:info@picacorp.com)

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[youtu.be/6B2VunC9tDo](https://www.youtube.com/watch?v=6B2VunC9tDo)

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V



**VIQUA**

Josh Richardson  
Director, North American Sales and Service  
425 Clair Road West  
Guelph, Ontario N1L 1R1  
Phone: 519-763-1032  
Email: [info@viqua.com](mailto:info@viqua.com)

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Toll-Free: 1-800-588-7867  
Email: [bridgett.rousselle@xyleminc.com](mailto:bridgett.rousselle@xyleminc.com)

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A shrinking snowpack can strain water availability for communities that live near mountains or a coast.

# Dry Spells

## How stakeholders are helping manage droughts in British Columbia.

BY SIMRAN CHATTHA

**MANY COMMUNITIES** in western North America dealt with a “decreasing amount of water in spring snowpack” between 1960 and 2002 as a direct result of climate change, according to the Intergovernmental Panel on Climate Change’s (IPCC) report for policymakers that was released in 2014.

A shrinking snowpack naturally has negative consequences. As it decreases, communities that are located close to mountains or the coast have less water available for drinking during the drier summer months.

This is something that communities are still dealing with. In as recently as June 2019, the Province of British Columbia (B.C.) announced a Level 3 drought, which indicates very dry conditions that can result in potentially serious ecosystem or socioeconomic impacts.

“Low snowpack over the winter months combined with a warm spring has led to a rapid and early shift from the spring melt season to low flow

conditions,” according to a press release from the Okanagan Basin Water Board (OBWB).

Given that this has been a long-standing issue, Water Canada recently spoke with representatives from OBWB to learn more about what is being done to help communities in B.C. better deal with droughts.

**Based on available predictive weather data for 2019, were you aware of the possibility for drought conditions in the region before they began occurring?**

“Yes,” said Kellie Garcia, a policy and planning specialist at OBWB. “2019 was amongst the lowest snowpacks observed in B.C. over the past 40 years. Persistent warm weather and the driest May on record brought the Okanagan’s snowpack to 4 per cent of normal by the beginning of June, leading to a rapid and early shift from freshet to low-flow conditions. Some upland reservoirs did not fill and Okanagan Lake did not

reach ‘full pool.’ Luckily, July turned out to be cooler and wetter than forecasted and many reservoir levels and streamflows rebounded.”

**What are the drought levels used in B.C.?**

“The province declares drought levels based on snowpack, average precipitation and streamflow measurements, critical flow thresholds for fish, and irrigation demand,” Garcia said.

“The B.C. Drought Response Plan is organized around four successive levels of drought targeted at the water basin and watershed/stream levels,” Garcia added. “Level 1 indicates that there is sufficient water to meet human and ecosystem needs. Level 2 provides the first indications of a potential water supply problem. Level 3 indicates that potentially serious ecosystem or socioeconomic impacts are possible, while Level 4 indicates that the water supply is insufficient to meet ecosystem and socioeconomic needs.”



**Once you have identified that you have entered into a different drought level, how are the stakeholders contacted?**

“Two years ago, in response to the 2016 drought, the OBWB developed an electronic Drought Bulletin,” Garcia said. “The use of the bulletin is triggered if the province moves the Okanagan region into a Level 2 drought or higher, and is distributed to Okanagan water suppliers and other local government staff, and elected officials.”

“We also send the bulletin to local media, and share the bulletin on social media making sure to include messaging for residents, referring them to our Make Water Work (MWW) website (*MakeWaterWork.ca*),” added Corinne Jackson, the communications director at OBWB. “MWW is a valley-wide residential outdoor water conservation campaign, developed and delivered in partnership with local government and utility partners throughout the valley.”

“It includes tips to conserve outdoors, watering restrictions for each utility, information about the Make Water Work Plant Collection, promoting plants that create beautiful yards that are easy to care for and use less water,” Jackson added. “Residents are also encouraged

to pledge to conserve for a chance to win WaterWise yard prizes, and more.”

**Are there any lessons you have learned, or things you would do differently, based on the stakeholder engagement?**

“As for the Make Water Work campaign, having a committee made up of utility and communications staff from across the valley has been key in developing messages and materials that work for each community,” Jackson said. “This is an ongoing process that we review and tweak each year.”

“Patience and persistence are key to getting the pieces of drought preparedness into place in the Okanagan,” Garcia added. “While drought management planning templates are helpful and necessary to support a more coordinated approach across the valley, water suppliers understand their systems the best and must be given the flexibility to make decisions that may not be the same as neighbouring jurisdictions, as long as they are defensible.” wc

Simran Chattha is the associate editor of Water Canada.

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Photo: Chris O'Leary, WaterCanada



Barry Orr, lead author of the report on Defining 'Flushability' for Sewer Use. He presented the results of the report at an event hosted by Ryerson University on April 4, 2019.



Removal of non-flushable material from a plugged check valve at a pumping station.

Photo: Chris O'Leary, WaterCanada



Barry Orr from the City of London holding a fatberg.

Photo: Chris O'Leary, WaterCanada

# Fatberg Education

Educating the public about the flushability of wipes.

BY BY BROOKE NORTHEY, SARA TEASDALE, AND BARRY ORR

**AS TWO 20-YEAR-OLD YOUNG WOMEN,** people are often surprised when we inform them that we work at a wastewater treatment plant as our summer job. Throughout our four months at Greenway Pollution Plant in the City of London, Ontario, we have learned a lot about the wastewater industry. Our experience was enhanced by the experience that Tony Van Rossum and Barry Orr shared with us. From watching someone self-clean a grease trap, to sampling hauled septic tank waste at a waste hauling receiving

facility, our summer has been one smelly, yet educational, evidence-based learning experience.

## Fatbergs and flushability

When grease interceptors are improperly maintained, household FOG is incorrectly disposed, and “unflushable” products are improperly discarded in the toilet, these elements conglomerate together within our sewers into one large rock-like mass called a Fatberg. What caught our attention from the

beginning was the amount of wipes that end up in these blockages. Upon further investigation, we learned that wipes are one of the primary issues plaguing wastewater plants.

One of the reasons for this is that there is no international flushability standard and the manufacturer’s guidance document number four is not representative of our real world sewer system. Currently the term flushable manipulates consumers into believing they can flush these products. When

these products are flushed, they get stuck in the pumps at municipal pumping stations and wastewater plants, costing a lot of money to remove these blockages.

Second, due to the inadequate size and format of “do not flush” symbols on baby wipes packaging, consumers will often flush these down the toilet as well. The industry allows product manufacturers to choose both the size and placement of the “do not flush” symbol, which means that a majority of wipes will have a small, difficult to read “do not flush” symbol.

Finally, these wipes can often be advertised as natural or made with paper substances. Upon further investigation, products that use things like regenerated cellulose and rayon do not break down better than plastic-fibre wipes.

Wipes companies continuously manipulate consumers into believing that their products are flushable, and without the adoption of a proper flushability specifications, this will keep happening.

After learning about the issues with flushability standards, and how the wipes industry takes advantage of these issues, we felt empowered to take action. Through our public outreach we showed and educated people how wipes do not break down which often came to a shock to the average person. The misconception was often attributed to the ‘flushable’ label on the package. In addition, many consumers admitted they flushed wipes down the toilet but once they spoke to us they vowed to never do it again.

### Experiments with wipes

The first research project we focused on involved the biodegradability of wipes, one of the standards currently used to determine “flushability.” The first test consisted of six vessels, each of which contains anaerobic digester sludge from a wastewater treatment plant diluted with untreated wastewater. Vessel one was a blank, vessel two and

three were cotton, and vessel four, five and six were flushable wipes. We let them sit for 28 days and ensured that the temperature remained within the 35 +/- 3°C temperature range.

After 28 days, we filtered the vessel contents through a one-millimetre sieve. In order to pass this criteria for “flushability,” the average percent of the initial dry mass that passes the one-millimetre sieve after 28 days should exceed 95 per cent.

In our first test, all of the flushable wipes in vessels 4,5, and 6 passed this criteria. Next, we repeated the exact same test using baby wipes. This time around, none of the baby wipes passed this criteria after the 28 days. This result lines up with the advertised “non-flushable” logo that baby wipes brands must put on their packaging. However, due to the lenient regulations on logo size, colour and placement, these “non-flushable” symbols are often missed by consumers.

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### Regenerated cellulose research

Many common brands of flushable wipes use regenerated cellulose fibres, such as lyocell and rayon, within their products. These brands claim that that the material is biodegradable because of their use of regenerated cellulose, and therefore, able to be incorporated in “flushable” wipes category. For example, rayon fiber manufacturing is a highly toxic process, where the workers on the factory floor wear gas masks due to the poisonous gaseous fumes emitted during production. Based on this fact, it is clear that rayon is not necessarily an environmentally-friendly substance.

In addition, a recent ocean survey found that rayon contributed to 56.9 per cent of the total fibres found in deep ocean areas, which clearly shows this material is not degrading at a microscopic level and further ties into the current micro plastics and microfibre issues within our waterways.

These fibres are also harmful

to animals within these marine environments. In a study done on the effect of microplastics on aquatic animal diets, amid the tiny bits of plastic found in the animals’ guts were fibres like rayon, lyocell, ramie, and nylon. Lyocell is a third generation rayon that has been recently used within “flushable wipes,” claiming to be completely degradable and safe to be flushed into our wastewater system. However, based on the evidence found within our research, it is clear this material is hazardous to the natural environment, and these wipes need to be relabelled as “Do Not Flush.” Yet again, this shows the need for proper flushability specifications, specifically the ones provided by the IWSFG.

### Conclusion

This summer was definitely a huge learning experience for both of us. We had little to no knowledge about wastewater at the beginning of this term, but we are leaving with more than we

ever bargained for because we gained a greater appreciation for issues such as the flushability of wipes.

Improper wipes disposal was one of the main issues that we came across this summer. This is in part because the current standard for flushability of wipes is not sufficient, and tricks consumers. The industry needs to adopt the IWSFG flushability specifications in order to consider a wipe product flushable. There needs to be further public education surrounding this topic, so that consumers don’t blindly buy products due to false labelling. **wc**



Brooke Northey and Sara Teasdale were summer students working for the City of London. Barry Orr is a sewer outreach and control inspector at the City of London.



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TOM MOLLENKOPF

The International Water Association (IWA) elected **Tom Mollenkopf** to serve as president from October 2020 to August 2022.

Mollenkopf has been an active member of the IWA for many years. He was deputy executive director of IWA in 2005. For the past five years, Mollenkopf has been a member of the IWA Board of Directors. He was elected senior vice president twice—once in 2014 and then in 2016.

Mollenkopf was invited to serve a further term on the Board in 2018. He took over the role of president from Diane d'Arras who served two terms.



ERIK DAVIES

**Erik Davies** joined the International Institute for Sustainable Development (IISD) as the director of reporting services.

Davies brings over 25 years of management experience in international development and a strong track record in communications to the role. He has worked globally on sustainability issues in a career that has included management consulting, engineering sector work, supporting eco-startups, and global policy work for the United Nations.

Davies will be based out of IISD's Toronto office and will lead all activities related to the publication of the Earth Negotiations Bulletin.



MAGGIE ROMULD

**Maggie Romuld** started her new role as the executive director of the Canadian Water Resources Association (CWRA).

Romuld has been a member of CWRA since 2005 and was a member of the board of the Alberta branch until her move to B.C. 2016. While on the Alberta board, she served as the ProjectWET liaison. She and two other individuals shared an award that recognized their role in bringing the program to Alberta.

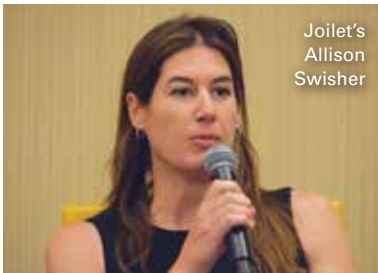


BRIAN BATES

The Walkerton Clean Water Centre (WCWC) announced that **Brian Bates** has joined the team as the manager of training and development.

Bates has worked in the water treatment industry for more than 20 years. He has experience working with a variety of technologies, including membranes, ballasted flocculators, and conventional sedimentation.

Photo: Water Canada



Joilet's Allison Swisher



Dr. Catherine O'Connor from the District of Greater Chicago.



Nestle's Vetter and Coca-Cola's Bowen have a discussion during the U.S. Opportunities breakfast.

**WEFTEC 2019 CHICAGO, III.**

More than 22,500 water industry professionals flooded Chicago's McCormick Place for the Water Environment Federation's (WEF) 92nd annual technical exhibition and conference, the world's largest annual water quality event. The five-day event included technical sessions, discussions featuring global experts, networking opportunities, and close to 1,000 exhibitors in just under 300,000 net square feet of space.

The show presents an opportunity for Canadian companies to meet with new colleagues and clients from across the United States and around the world, and includes exclusive business and networking opportunities with international buyers thanks, in part, to programming created by the Canadian Trade Commissioner Service in Chicago, in cooperation with additional service branches throughout the Americas.

One of the exclusive events offered

to Canadian companies was a U.S. Opportunities breakfast, featuring a panel presentation consisting of **Paul Bowen**, water/wastewater technology manager at Coca-Cola North America, **Dr. Catherine O'Connor**, director of engineering for the Metropolitan Water Reclamation District of Greater Chicago, **Allison Swisher**, director of public utilities for the City of Joliet, Ill. Water Department, and **Sven Vetter**, environmental sustainability manager at Nestle USA.

The discussion with an open conversation on the water challenges that each is currently focusing on in the months and years ahead. For Swisher, the focus is on asset management, and understanding what assets to invest in as a new water source is introduced to the community. O'Connor discussed the need for better operations and maintenance control over water equipment, after multiple instances of parts functioning poorly or outright

failing well before their expected shelf life. Bowen is concerned about how to react to emerging contaminants being found in their water supply, while Vetter looks to understand how infrastructure can impact changes in the products they produce. Both gentlemen also discussed the need to centralize incoming data, and be able to have it all presented on a single screen that can be formatted in a way that is understandable. O'Connor and Swisher also echoed Bowen's comment about emerging contaminants, suggesting it is a serious concern for both municipalities. The discussion also looked at reduction of their energy footprint, how they are using data and sensors to improve operations, and what they are able to take away from a show like WEFTEC.

The 2020 edition of WEFTEC will take place at the New Orleans Morial Convention Center October 3-7. For more information, visit [weftec.org](http://weftec.org).



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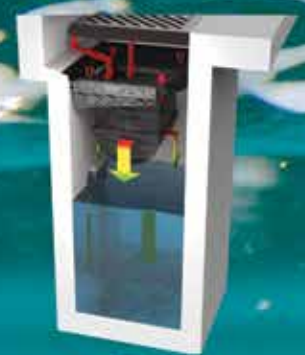
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