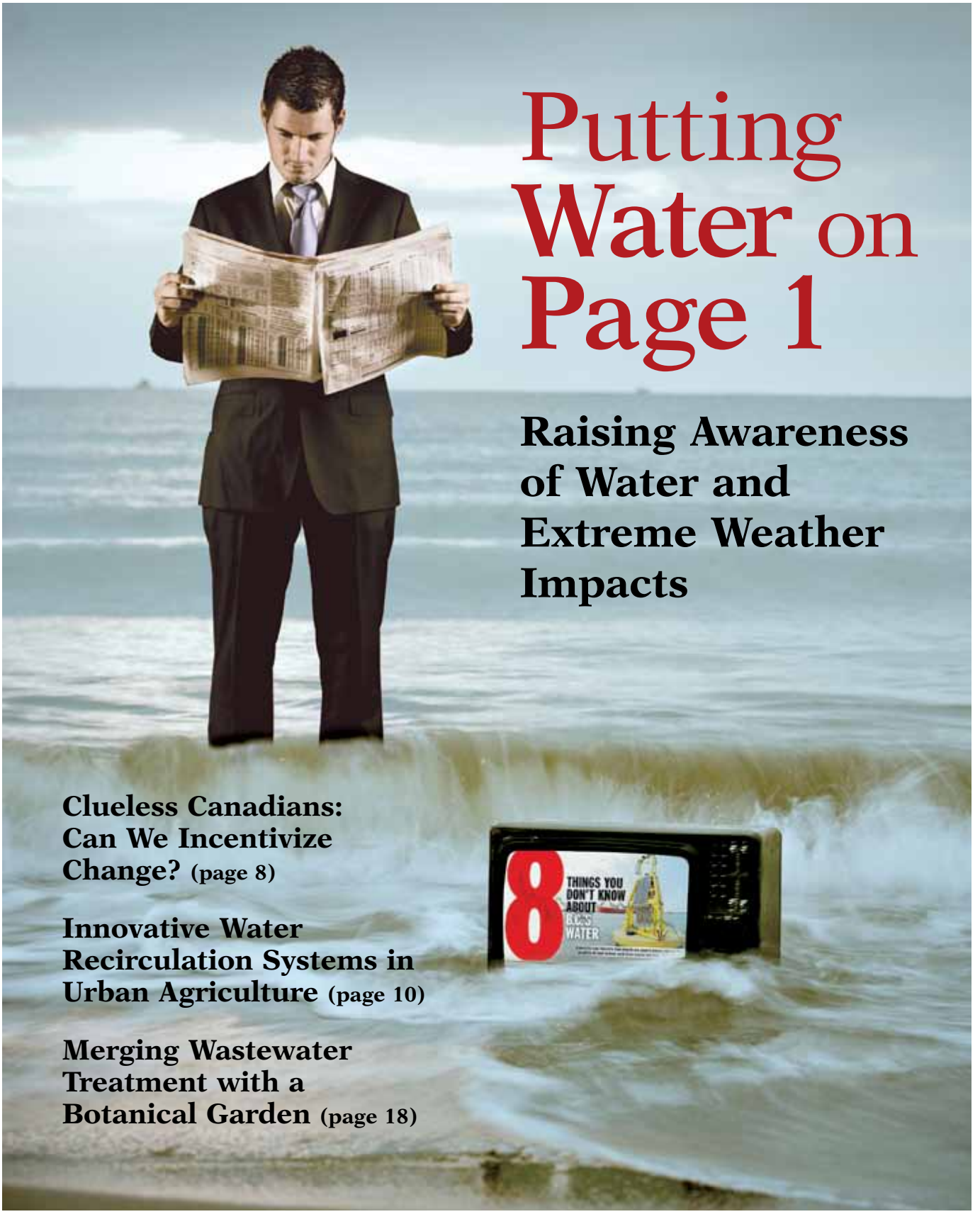
THE COMPLETE WATER MAGAZINE

MAY/JUNE 2014

WATER CANADA



Putting Water on Page 1

Raising Awareness of Water and Extreme Weather Impacts

Join us In The Trenches and Make a Difference.

We're fortunate to live in Canada, one of the world's great nations. Accordingly, it is incumbent upon all of us who work in water/soil management to protect our abundance of precious resources, for our children and for generations to come.

We can all participate in this stewardship by improving the products, innovations and technologies used to manage our infrastructures and other resource related sectors to maintain our standard of living, while ensuring Canadian industry remains globally competitive.

That underscores the importance of the jobs we all do, day in and day out. Which is why CSPI created *In The Trenches* – an online industry newsmagazine for sharing information and new ideas. For many of us, its title may be a metaphor; but, it also reflects the reality that, regardless of whether we operate a backhoe, analyze water and soil, or sit at a computer creating things, we really are all in this together.

That's why CSPI and its members encourage everyone in the industry to openly share their news, knowledge, successes and insights of how to do things better for less. Sharing knowledge empowers us all to succeed in making a better Canada.

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MAY/JUNE 2014
VOLUME 14 NUMBER 3

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THE COMPLETE WATER MAGAZINE

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THE COMPLETE WATER MAGAZINE

MAY/JUNE 2014
VOLUME 14 NUMBER 3

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Diving in Head First

BY RACHEL PHAN

IT'S BEEN SEVEN MONTHS since I've entered the water world and it's already been quite the journey.

I started my job as managing editor at Water Canada just three days after graduating with my master of journalism from Ryerson University. To say I was terrified, anxious, and nervous would have been an understatement. I had spent most of my post-secondary career preparing for a career in the newspaper industry, so I didn't know anything about magazine publishing and I certainly didn't know much about water.

"How much can you write about with water anyway?" my friends and family asked me. It turns out, there's a whole heck of a lot. From the technical conveyance side (tunnels and shafts and tanks, oh my!) to the drinking water and wastewater areas, there is no shortage of things to say and learn about water.

And I have definitely learned a tremendous amount in these past seven months. When I first started, my colleagues would throw out a shocking number of water puns related to my absorbing information like a sponge or diving head first in the water sphere, but as cheesy as these puns were, they were 100 per cent true. I've really submerged myself in all things water since taking on this job, and I consistently learn something new every day.

A major contributing factor to my learning success has been the countless events and conferences I've attended. From the Canadian Urban Institute's brownfields conference on my third day on the job to my sojourn to Banff for WaterTech 2014 in April, I've had the pleasure of meeting many wonderful, knowledgeable, and welcoming water professionals who have all taught me something about themselves, their work, and the industry itself. Most importantly, they've shared with me their fervent passion for the water sector and the ways they truly believe we can make a difference. Their passion has been contagious.

I look forward to continuing my learning curve by engaging with you—our loyal readers—so please feel free to reach out and email me whenever you have a water-related problem or solution you think should be addressed. Like they say, I'm here to soak in what you know. WC

Contact Rachel at 416-444-5842 ext. 116 or email rachel@watercanada.net

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PG 14

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PG 36

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PG 50

ABOUT THE COVER

Television, online news, and print media have the power to influence the public's support for water policy. Our cover shows how this sea of media has a tidal pull on the public's perception of water and why we're examining the ways artists and journalists can help boost public engagement and awareness about this critical resource (*see page 38*). Without proper media management, the current of opinion will be out of our control.

Photo on TV Courtesy of The Province

NEXT ISSUE: JULY/AUGUST

- **Changing Standards for Drinking Water Safety**
- **How Effective are Municipal Bans on Bottled Water?**
- **Thinking like a Watershed is the Newest Trend**

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Soundbite

"[We need to get over] the sense that business is Darth Vader. The private sector can very effectively run and manage a water system."
BCWWA's **Tanja McQueen** on P3s

Water Needs Independence from Taxpayers

BY CHRISTOPHER GASSON

ONE OF THE HIDDEN CASUALTIES of the global financial crisis has been the infrastructure financing model. Back in the 1930s, when things were going wrong, governments borrowed money to put people to work on construction projects with the expectations that this borrowed money would turn into wages, economic growth, and eventually, increased tax revenues. It seemed to be a magic formula for ensuring the economy never went into recession again. Indeed, throughout the '50s, '60s, and '70s, governments in Europe and North America used roads, bridges, transmission lines, and major water projects to maintain full employment and create the necessities for a successful modern economy.

It doesn't work that way anymore. The big infrastructure spending plans that followed the global financial crisis didn't lead to sustainable economic growth. There were two problems. Firstly, globalization means that spending on infrastructure quickly leaks out of the local economy to benefit exporting countries that don't contribute to the stimulus. Secondly, the marginal economic returns from investing in infrastructure decrease as that infrastructure becomes more sophisticated (and expensive).

For example, the World Health Organization suggests the economic return from spending $1 on improving water resources for people without access to safe drinking water is $7.43. However, when Ontario's Peel Region spent $200 million to retrofit the Lorne Park water treatment plant with ultrafiltration and UV disinfection, the local economies of Mississauga and Brampton did not enjoy a $1.49-billion boost, as you would expect if the economic multiplier was close to 7.43.

Since the broader economic benefits of investing in water diminish as the system becomes more sophisticated, this changes the nature of water-utility finance. Instead of being something that is a good bet for the taxpayer to chip in for, it becomes something more properly financed out of user charges alone. There is no doubt the Lorne Park treatment plant upgrades were necessary, but those improvements should have been paid for by the users of the system, not taxpayers in general.

Water does not look like a good investment from a taxpayer's perspective in many developed countries, but we should not despair. Overall, from the point of view of financial institutions, it is looking like a very good investment indeed.

The other impact of the financial crisis has been a period of very low interest rates and high stock market volatility. Investors, particularly pension fund investors like Ontario Teachers or OMERS, need steady income streams as never before. These investors look at the profile of the income streams water assets can generate and they want to invest as much as they can. Ontario Teachers has led the world in direct investment in water utilities.

This is the context of Canada's recent moves toward public-private partnerships in water: once you are independent of the taxpayer, a variety of financing options open up. It is an area where Canada is very much ahead of the United States—and the world is watching how it develops.

Christopher Gasson is the publisher of Global Water Intelligence

A New Approach to Flood Management

BY KENDRA FITZRANDOLPH

THE EFFECT OF the July 8, 2013 storm on the City of Toronto is proof positive that the city's urban centre remains ill-equipped to manage flooding, a phenomenon likely to become more common in upcoming decades.

In response, I am proposing a new approach to flooding, which transcends the existing theories behind the methods cities use to achieve resiliency. I call this approach "thrivability," and it will outline a new plan for flood management where a city can learn to live with its water.

The notion of thrivability for cities that respond positively to shocks and changes in their environment has been an emerging theory over the past few years. In recognition of the challenges posed by climate change, economic urbanization, and the limits of resiliency, a number of leading thinkers have been discussing how to clearly define thrivability and connect the conceptual framework and rationale of thrivability into practice.

Cities like Toronto face mounting challenges in responding to flooding. These cities need to accept implications of water on their landscape as water is increasingly unpredictable and its movement, duration, and volume is unprecedented. Current conceptualizations toward flood management are centred on the idea that climate change is the leading external event to which cities must design their methods. The theory of thrivability emphasizes that engineered land and rapid urbanization are the key external events increasing a city's vulnerability to water. This makes the engineered process of land formation the leading cause of flooding. Climate change has merely exacerbated the problem.

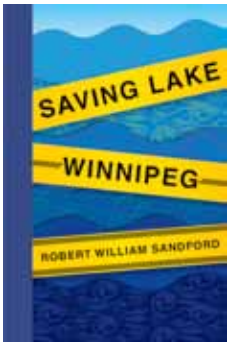
Thrivability seeks to emphasize that a leading cause of flooding is a lack of a hydro-social relationship. I highlight the limits of siloed approaches toward flood management and resolve this issue by following a system-based approach functioning within three different, but interdependent, components: systems, agents, and users. Thrivability aims to achieve six performance goals: educate, expose, collect, diversify, repeat, and reformulate. Methods to meet these goals must be discussed within all components and must be re-evaluated regularly. Under these guidelines, a city can go through a three-stage cycle-loop: cope, transition, and transform to learn to live with water.

To be thrivable, communities must be provided with the means to achieve the aforementioned performance goals and re-establish a positive hydro-social relationship. Communities must also be capable of consistent development, change, and growth. By applying a system-based approach, cities will be able to understand correlations and encourage cross-component communication and learning.

Thrivability is about limiting water's fluctuations on an environment and teaching systems, agents, and users to learn to thrive with water on dynamic landscapes.

Kendra FitzRandolph is a consultant in planning and design. She has a master's degree in urban planning and design and landscape architecture.

Winners!



Three lucky readers have won a copy of **Bob Sandford**'s book, Saving Lake Winnipeg. Congratulations to (from the top) **Samuel Graham**, superintendent of public works and water/wastewater services for the Town of Westville; **Don W. Thomas**, retired farmer and member of Clear Hills Watershed Initiative; and **Jordan McKinnon**, arborist and forester, who provided the best answers when we asked for ways to save our lakes.

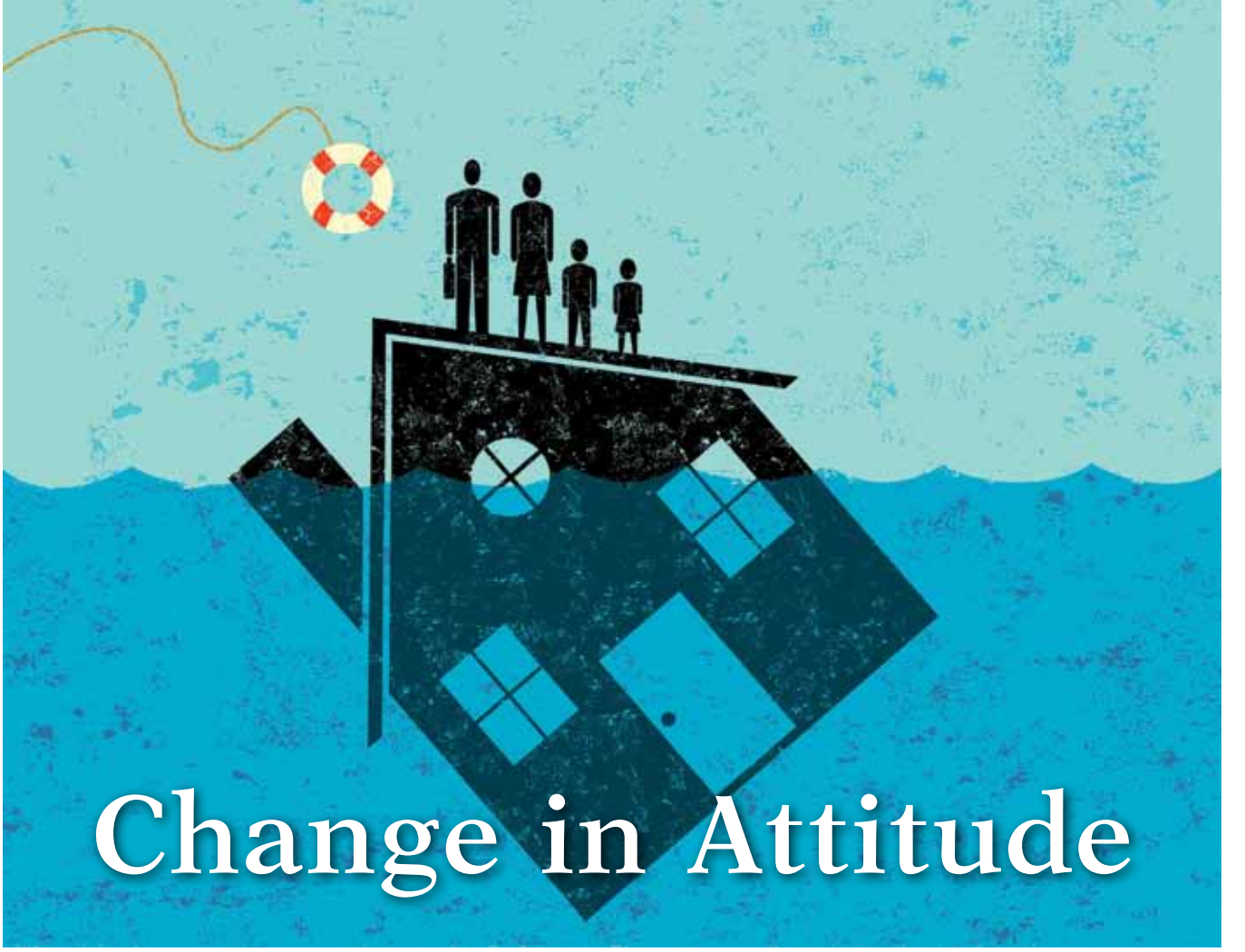
Online at WATERCANADA.NET

VIDEO: From GLOBE 2014
Water Canada publisher Todd Latham talks about how Canada needs to catch up on infrastructure spending.
bit.ly/toddglobe

Credit: Rodrigo Garcia Gonzalez

BLOG: A group of industrial designers have created an edible water bottle that will replace plastic with algae.
bit.ly/algaebottle

VIDEO: The Aqua Lauta project (*see page 38*) is an installation with a message: water conservation might be difficult, but it's incredibly important. See it in action: ***bit.ly/aqualauta***



Change in Attitude

Canadians continue to be clueless and complacent about their water. Can we incentivize change? BY RACHEL PHAN

WITH THE 2013 Calgary and Toronto floods still fresh in our minds, and the bone-chilling cold of the polar vortex lingering well into spring, Canadians have been walloped over the head with the realities of extreme weather. But rather than adapt and protect themselves from the potentially disastrous effects of this new reality, Canadians are instead opting to do nothing.

This finding comes from the seventh annual RBC Canadian Water Attitudes Study, which this year focused on extreme weather and flooding. According to the study, 74 per cent of the 2,074 Canadians polled—or three-quarters—agree that climate change will increase the frequency of extreme weather events, but only nine per cent of Canadians have actually taken precautionary measures to protect themselves and their homes.

"I was still astonished to see that, despite this awareness, individuals would not necessarily take measures to limit the impacts of extreme weather events by improving or restoring their water management systems and tools at home. This seems counterintuitive," said Jean-Patrick Toussaint, the science project manager at the David Suzuki Foundation.

These findings indicate there is room for municipalities to modify water policy and practices in order to enact and incent behavioural changes among Canadians. But with the increasing emergence of extreme weather events, those windows of opportunity are becoming smaller and smaller.

"Now's the time to move while the memory of [the] floods is vivid and before the next extreme weather event [occurs] because you run out of capacity if you're struck with these too often," said Bob Sandford, the chair of the Canadian Partnership Initiative of the UN Water for Life Decade. "I think it's fair to say that we have a pretty good idea of what the cost of doing nothing is, and it's mounting."

The costs are in fact staggering. The Calgary flood alone cost roughly $6 billion, and the Insurance Bureau of Canada indicated in the fall that insured costs are $1.7 billion and growing, making the flood the costliest insured natural disaster in Canadian history. Despite the costs, and the social, mental, and physical toll on Canadians who have been affected, the study found that people continue to be woefully ignorant of water-related issues.

The unaware water consumer

This year's study found that Canadians are exhibiting increasing anxiety about water issues and stormwater management, but only one per cent viewed stormwater management as a priority for funding.

This may be in part because Canadians are largely ignorant about where their water comes from and the systems required to move water from source to

BY THE NUMBERS

11 million: the number of Canadians **affected by flooding**, either personally or through someone they know

19%: the percentage of Canadians that said they believed **major immediate action** was needed to prepare for major floods

2 in 5: fewer than this number of Canadians **feel prepared for flooding**

1/3: the portion of Canadians not **confident they hold adequate insurance coverage** to protect them in the event of flooding

1%: the percentage of Canadians who said **stormwater management should be the highest priority** for government infrastructure spending

tap and back. In fact, two in five or more municipal water users said they were unaware of their water supply, sewage, and stormwater management systems. Not surprisingly, this correlates to the finding that water infrastructure and issues are consistently low priorities for Canadians who tend to place higher value on health care and hospitals.

"Not surprisingly, Canadians don't really have any awareness," said Lynn Patterson, director of corporate responsibility at RBC. "We're not seeing huge jumps in understanding, which seems to speak to the real difficulty in communicating about water in a country that looks so rich and where things go generally pretty well."

Educating the public about its water supply and the value of water is undeniably important, but awareness campaigns and tours of watersheds and treatment facilities may do little to shift public perception and incent significant behavioural changes. For example, even when some Canadians were made aware of the benefits of having permeable pavement, the study found the majority still did not care. Fifty-three per cent of Canadians said they prefer paved driveways, an increase from last year, and 55 per cent said they wouldn't change their preference for pavement even after learning that a water-permeable driveway would help mitigate the effects of flooding.

"When did we fall in love with paved driveways?" asked Anthony Westenberg, manager of public relations at Evergreen Brick Works. "Do Canadians think that once you get the water off your property, and it's on the municipal road, that it's someone else's problem?"

Incentives for change

Some experts believe the most effective way to get Canadians to value their water is to hit them where they'll notice: their wallets. "We need to communicate with water users that there is a value to the system, that water is not free," said Tanja McQueen, CEO of the British Columbia Water and Waste Association. "There is a cost to collecting it, treating it, and delivering it, and those systems need to be maintained and upgraded. We need to be willing to pay for that."

Carl Yates, general manager at Halifax Water, said, "I believe incentives are the best approach to change behaviour, especially through price signals." He added that this responsibility will ultimately fall on municipalities and utilities, who will have to raise water rates because he believes, "It's not an option to do nothing."

Halifax has recently introduced stormwater charges in the form of a service fee, which in Yates' words, means, "If you pave over paradise with a parking lot, you pay more." The city also expects to implement a credit system in the future where customers will pay less if they demonstrate reduced impact to the stormwater system—the most important being delayed runoff as a result of landscaping or on-site storage. (*For more Water Canada coverage on water rates, see bit.ly/CDNwaterrates*)

Westenberg added that the benefits of enforcing these service fees are that Canadians become "regulated, educated, and rewarded" into becoming more efficient and smart water users. "Taking steps to be efficient with the natural resources we have on hand can have a positive impact on their pocketbook," he said. "These things don't have to cost more. We should actually think of them as being ways to being efficient." WC

Rachel Phan is Water Canada's editor.

For more expert opinion on the 2014 RBC Canadian Water Attitudes Study, download the special report, which was created by RBC in partnership with Water Canada magazine. Visit **rbc.com/bluewater**


Credit: Connie Tsang, Fresh City

Inside the Fresh City greenhouse in Toronto.


Credit: Connie Tsang, Fresh City

A Fresh City worker waters sprouts.


Credit: Fresh City

A volunteer packs Fresh City produce into bags.


Credit: Fresh City

Fresh City founder Ran Goel poses with a bag of his farm's produce.

The Urban Food Cycle

How urban agriculture set-ups cultivate local produce with the help of innovative water recirculation systems.

BY SAUL CHERNOS

A NEW AGRICULTURAL ALTERNATIVE is sprouting up in some of North America's largest cities. Forget images of cattle grazing on a hot summer's day or row upon row of colourful, flowering soybeans and towering cornstalks. Consumers are now showing some resistance to practices such as chemical spraying and genetic modification. From New York to San Francisco, Montreal to Vancouver, urban farms are emerging as an almost-same-day antidote to rural-grown produce that spends weeks travelling thousands of kilometres to reach big-city supermarkets. Urban farming, if not certified organic, is largely accomplished *au naturel*, with water conservation and other environmental efforts as key drivers and potential cost-cutters.

While supermarket shoppers choose between plum, cherry, and plain old tomatoes, residential customers of Lufa Farms in Montreal have nearly two dozen heirloom varieties to consider, with names as unusual as Giant Brandywine, Cherokee Purple, Green Zebra, and Indigo Rose. Lufa grows these, along with three kinds of eggplant and an array of peppers, cucumbers, lettuces, and other greens in hydroponic greenhouses atop two low-rise commercial buildings amidst the hustle and bustle of metropolitan life. Commercial greenhouses can be considerable consumers of water and other resources, but Lufa's set-ups, at 31,000 and 43,000 square feet, recirculate water though closed-loop networks of tanks, pumps, pipes, and filters.

"We're trying to reduce our footprint on the environment as much as we possibly can," explains Lauren Rathmell, a founding member who oversees Lufa's greenhouse operations. She says Lufa's hydroponic greenhouses use up to 90 per cent less water than comparable ones that don't recirculate. "It's all automated. We irrigate most of our plants using drip lines set up where we water the plants from above. Water that's not taken up by the plants and doesn't evaporate is captured, sent down to our collection tank, filtered, and reused." Some plants, mostly the lettuces, grow with their roots submerged entirely in gently flowing water, continuously irrigated. Others sit in soilless coconut husk grow sacs.

Lufa also harvests rainwater and indoor condensation from its greenhouses using metal gutters. "Our actual water


Credit: Lufa Farms

An aerial view of the Lufa Farms greenhouse in Montreal.


Credit: Connie Tsang Fresh City

An array of plants in the Fresh City greenhouse.


Credit: Lufa Farms

Lauren Rathmell oversees Lufa's greenhouse operations.


Credit: Fresh City

Fresh City workers trim sprouts.


Credit: Lufa Farms

Johnny, a Lufa Farms greenhouse aide, plants a new tomato crop at the Laval site in summer 2013.

consumption is so low that we just have a regular waterline from the city," Rathmell says, adding that Lufa also composts on site, saves energy through biomass heating systems and semi-transparent energy curtains, and employs biological methods for pest control. Indeed, the greenhouses are pure joy for ladybugs brought in to prey on anything competing with humans for produce.

> "Farming uses a lot of water, no question. But we need farming to eat, so it's more of a question of how we farm." —Ran Goel

Lufa Farms isn't alone. In northwest Toronto, Fresh City maintains a 2.5-acre plot of land and coordinates other small-scale urban farmers on an additional 3.5 acres at Downsview Park, a military base converted into parkland with a mandate that includes supporting urban food production.

"We grow a diverse set of crops, pretty well any vegetable you can think of," says founder Ran Goel, estimating his local produce sales at $200,000 annually to roughly 1,400 households. As with Lufa, Fresh City grows using organic methods but is not certified. In Fresh City's case, it's because certification depends on long-term stewardship practices, and Fresh City leases its land. Still, Goel takes a similarly conservationist approach to his relationship with water. While Fresh City's modest 3,000-square-foot greenhouse is leased from Downsview Park and is a bare-bones structure without any water capture systems, the company uses drip tape irrigation to water its field crops.

"That's a pipe you lay along the rows of plants, and water comes out slowly through small perforations in the pipe," Goel says, adding that traditional spray systems are more susceptible to evaporation. "Drip tape feeds the roots directly because it sits right on the soil," he explains. Fresh City also covers the topsoil with mulch and the plants with tent-like fabric row covers to contain moisture and prevent evaporation, and each row of plants has its own valve which can be turned on or off manually according to the need for water.

Jeffrey Bruce, a Kansas City landscape architect who chairs Green Roofs for Healthy Cities, a North America-wide industry association, says these are early days for commercial urban agriculture. And while drip tape in fields and closed-loop systems in hydroponic greenhouses have become fairly standard, rainwater and condensate harvesting are considerably less common. Some office, government, and high-end commercial buildings are beginning to capture rainwater and condensate for non-potable uses such as landscaping. But Bruce says it's a challenge to use harvested water on crops because of the risk of contamination from air pollution as well as any bird feces and decaying organic matter that lands on the roof or surface.

To safely and effectively treat harvested rainwater for direct contact with food, Bruce recommends storage tanks, a pumping system, filters, and some form of disinfectant such as chlorination, ozonation, or ultraviolet system. "Getting it to potable is a much more intensive process, and adopting the technology to do this costs money," he says. "The challenge is that urban farming to a large degree is still a marginal business."

Rathmell says Lufa uses hydrogen peroxide systems for disinfection and screen filters to weed out non-organic contaminants like metals. The rainwater collection system is also automated to

kick in only after five to 10 minutes of consistent and significant rainfall, so outdoor surfaces received an initial rinsing. Lufa also samples its water periodically for contaminants. "The plants aren't soil based and we're not using any fertilizers so there's really no entry point for pathogens," she says.

Cost is indeed an issue for urban farmers. Earlier this year, Alterrus, a company operating a greenhouse atop a parkade in downtown Vancouver, filed for bankruptcy, owing more than $4 million to creditors. At the time, Alterrus blamed problems with crop production and a mechanical failure a month earlier. The business had hoped to supply pesticide-free veggies to local grocery stores and restaurants.

Rathmell says Lufa invested roughly $5 million on the infrastructure for its two greenhouses, including the water conservation systems, and is now finally reaching the break-even point, on track for profitability later this year. While the rainwater harvesting components represent just a small portion of the overall expense, greenhouses tend to be costly, especially when they're highly automated or when careful architectural engineering is needed so they can sit atop buildings. Recirculation further increases the costs because of additional tanks, pipes, and other plumbing. "Irrigation systems for greenhouses are high end because they need to be able to operate all the time, continuously, reliably, and efficiently, and then there's added cost for recirculation," she says. "There's definitely some investment there rather than just the run-to-waste system."

Ultimately, water conservation can help farmers, urban or otherwise, contain their costs. In fact, Jeffrey Bruce points out that, from his vantage point, water use in agriculture is far more sophisticated than it is in landscaping. "Most of the advancements in water distribution have come from the agriculture side because, technically, they're dealing in magnitudes of hundreds, if not thousands, of acres in size," he explains. "For your backyard, a quarter inch of extra water or another bucket of fertilizer isn't going to make or break you, but if you're farming almonds over 15,000 acres, it becomes expensive. So farmers know precisely how much water is needed during flower-set and the production of fruit, and during which periods you need to add more water or can draw back."

Goel says the desire to conserve water is one of the main drivers behind urban farms like his. "That's one of the reasons we farm organically—to avoid the impact of pesticides and other chemicals and also synthetic fertilizers like nitrogen running off into the water," he explains. "Farming uses a lot of water, no question. But we need farming to eat, so it's more of a question of how we farm." WC

Saul Chernos is a Toronto-based writer and frequent Water Canada contributor.

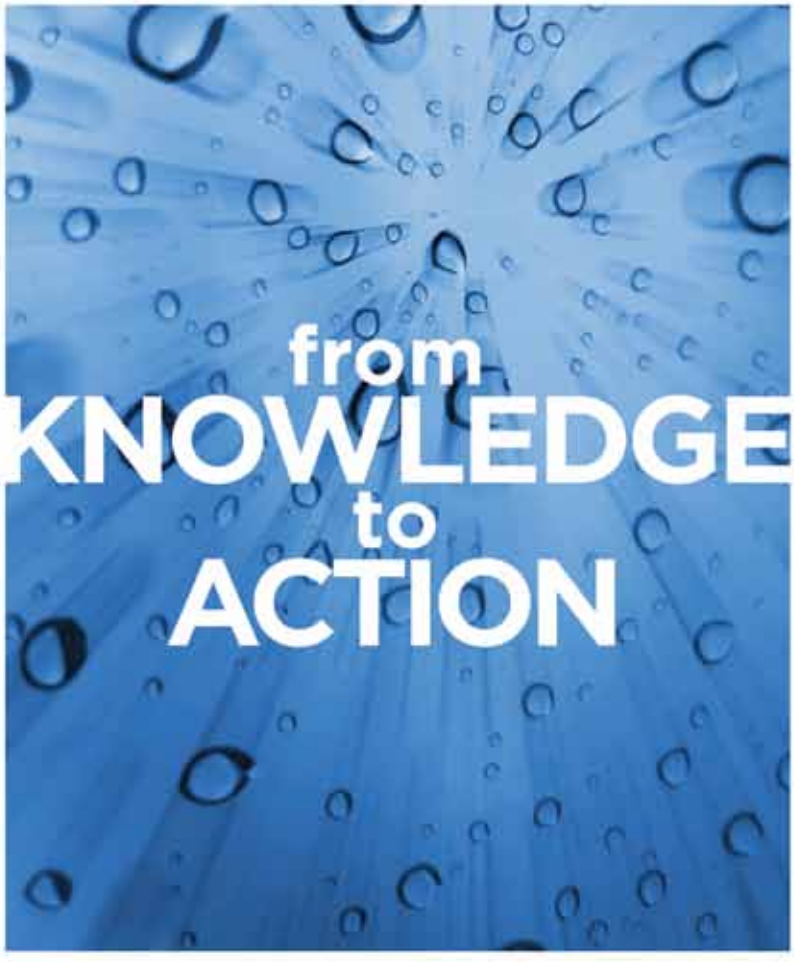
SAVE the **DATE**

Resource Development and Agriculture: Securing our future

Blue Cities: Moving to the systems we need

Small and Aboriginal Communities: Solutions that fit

CONNECTING water resources



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A Watershed Moment

Credit: SOWC

Seven complete weather stations have been installed in the Alder Creek watershed. A total of 120 sensors collect and transmit more than 150 data points every 15 minutes through wireless telemetry to a central recording location.

Researchers pilot sophisticated data-management technologies for real-time monitoring on Ontario's watersheds. BY STEPHEN D'ANGELO

WHAT HAPPENS WHEN data streams from an intensely instrumented watershed are combined with next-generation analytics in a high-powered computing environment? The answer is an unprecedented opportunity to manage watersheds in a smarter way for a diverse array of interested stakeholders. This is the idea behind the development of a new data integration platform spearheaded by several leading Ontario universities.

Researchers from the Southern Ontario Water Consortium (SOWC) are piloting a sophisticated data management platform for near real-time watershed monitoring—synthesizing numerous information sources and formats, and combining it with the analytical capacity of IBM's technology. A scalable system-of-systems is a foundation of IBM's Smarter Planet paradigm and allows for the capture, analysis, and interpretation of watershed data on an unprecedented scale. The information management and data visualization capabilities of this system can be used to enhance the decision-making ability of watershed managers while supporting innovation in tools, services, and technologies.

An intelligent watershed

One watershed node, led by the University of Waterloo, has installed instrumentation that acts as the backbone for smart-watershed capacity in several watersheds in southern Ontario. A central component of this capacity is a monitoring system developed in the Alder Creek watershed, a rapidly urbanizing area within the Regional Municipality of Waterloo. The solution is designed to ingest, manipulate, and visualize a near-limitless volume and variety of watershed data, but also to accommodate data from the other research nodes, as well as information sources from an extended network.

Throughout the watershed, there have been the installations of seven complete weather stations designed to collect spatially dispersed climatic data and seven surface water monitoring stations that track stream flow and water quality. There are also networks of groundwater monitoring wells and soil moisture probes to monitor the subsurface. In total, there are 120 sensors to collect and transmit more than 150 data points every 15 minutes through wireless telemetry to a central recording location.

Research work to strengthen the smart watershed concept is currently underway at the Alder Creek facility with SOWC,

Solinst Canada Ltd., and the Southern Ontario Smart Computer Innovation Platform (SOSCIP). The team is working toward automatic communication throughout the sensor network to permit data collection protocols to respond to various environmental triggers, such as flash flooding or heavy rainfall. Event-based sampling improves both the ability to capture the transient hydrologic response of the watershed, providing critical data that may otherwise go unrecorded and to optimize sensor power requirements and data storage. This will enable researchers to better understand and model how watersheds react to impactful environmental events.

"The focus of the project is to take smart watershed monitoring to the next level by designing a network that captures sensor data from remote locations and uses sophisticated communications software to transmit it into a high-performance computing environment," says Dave Rudolph, professor at the University of Waterloo's department of earth and environmental sciences and the watershed node leader. "This software permits the collection and storage of tremendous amounts of near real-time information—allowing us to analyze and interpret a watershed like never before to make new discoveries."

Integration, collaboration, innovation

"[The] smart watershed capacity enables collaborative research and demonstration opportunities for companies with leading-edge technologies and services related to watershed monitoring," SOWC executive director Brenda Lucas says. "The data integration platform becomes a new way to support innovation and demonstration."

The data integration platform's capacity directly supports water management professionals by providing a level of detailed watershed monitoring information that has never before been available. For example, the platform provides users with the ability to incorporate real-time watershed data for analysis and modeling, enabling decision makers to make more informed conclusions based on more robust data sets, such as early flood detection or warning systems.

Focused on real-time sensor data, the data integration platform is available to support new products, technologies, and research applications, which the consortium can support by creating custom applications for users, expanding on existing data platform functionality through add-on features, and giving external users—companies, researchers, and the government—access to real-time data streams. WC

Stephen D'Angelo is the communications officer with the Southern Ontario Water Consortium.

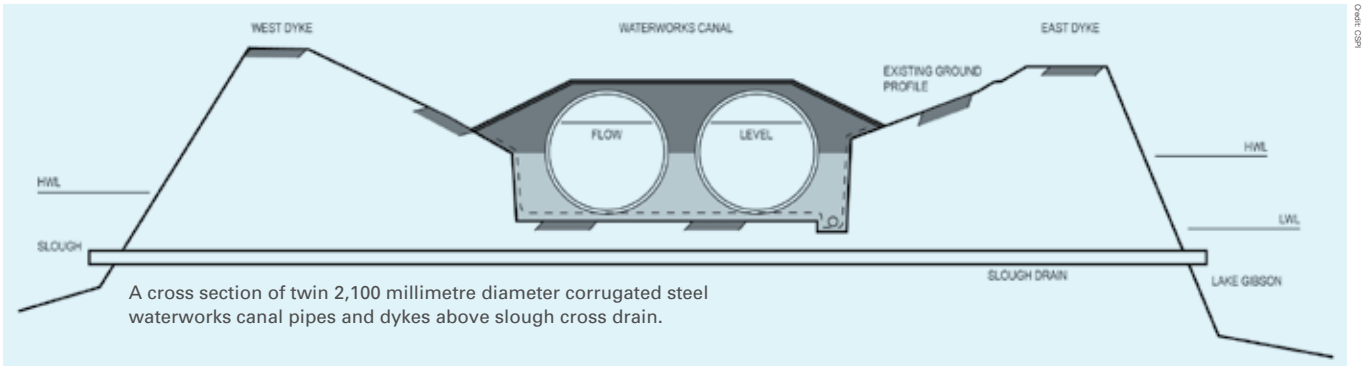
Credit: CSPI

The new enclosed waterworks canal ensures water tightness, isolating raw drinking water from surface drainage and lake water.

Credit: Rankin Construction

With Lake Gibson in the background, installers apply neoprene gaskets and couplers to ensure watertight seals when joining sections of the 2,100-millimetre twin corrugated steel pipes.

Credit: CSPI



A cross section of twin 2,100 millimetre diameter corrugated steel waterworks canal pipes and dykes above slough cross drain.

Real Steel

Corrugated steel pipes key to upgrades for Niagara's waterworks canal.

BY DAVID PENNY

FOR MORE THAN A CENTURY, Ontario's Niagara region has effectively managed massive water volumes and elevation differentials to raise and lower cargo ships, generate hydroelectric power, and provide safe drinking water.

At the turn of the 20th century, the Cataract Power Company of Hamilton Ltd.—predecessor of Ontario Hydro and, later, Ontario Power Generation—constructed a 6.5-kilometre waterworks canal for the City of St. Catharines, which involved carving through hillsides, passing under roadways, and building elevated, bermed channels across the sloughs. Cross pipe drains carried surface water from the hills, roadside ditches, and sloughs into Lake Gibson. Ownership of the waterworks canal was later transferred to the Regional Municipality of Niagara. A 2011 inspection of the slough pipes running beneath the canal confirmed they were nearing the end of their service life and there were concerns regarding the integrity of the earth berms and reliability of the water supply.

Having collaborated on a number of projects over the years, Warren Hoyle of Hatch Consultants in Niagara Falls, Roger Armstrong of St. Catharines-based Rankin Construction, and Frank Mandarin, who works with corrugated steel pipe (CSP) manufacturer Armtec, combined their many decades of experience in soil and water management solutions to put together a comprehensive bid proposal to design and build the required upgrades.

After an intense review of all the necessary critical elevations and hydraulic capacities involved, the consortium proposed using twin 2,100-millimetre-diameter CSP lines at the slough crossing locations. While easily capable of handling the required 60-cubic-feet-per-second design flow, installation of the lower-profile design would also require less excavation below the water table; less backfilling material; and a completed cross section, below the top of berms, to maintain an overflow capture area with minimal visual or physical obstructions.

The pipes were set at an elevation that maintained 600 millimetres of free board above the water to ensure passage of ice and debris, and to provide air space for animals or persons that might accidentally enter the open canal. The Aluminized Type II CSP, featuring 125-by-25-millimetre corrugations, was supplied in eight-metre lengths, which were joined and sealed with closed-cell, neoprene-gasketed corrugated couplers, to ensure water tightness along the 120-to-160-metre-long pipe runs.

To manage external ground and surface water outside of the pipe, the backfill envelope used was a composite design, consisting of a geotextile base layer to screen out fine sediment materials; clear stone to the pipe spring line with perforated pipe sub-drains; compacted native soil to a depth of 200 millimetres over the pipe, and finally, 75 millimetres

of topsoil combined with hydra mulch to encourage fast regrowth of indigenous plant life on the berms.

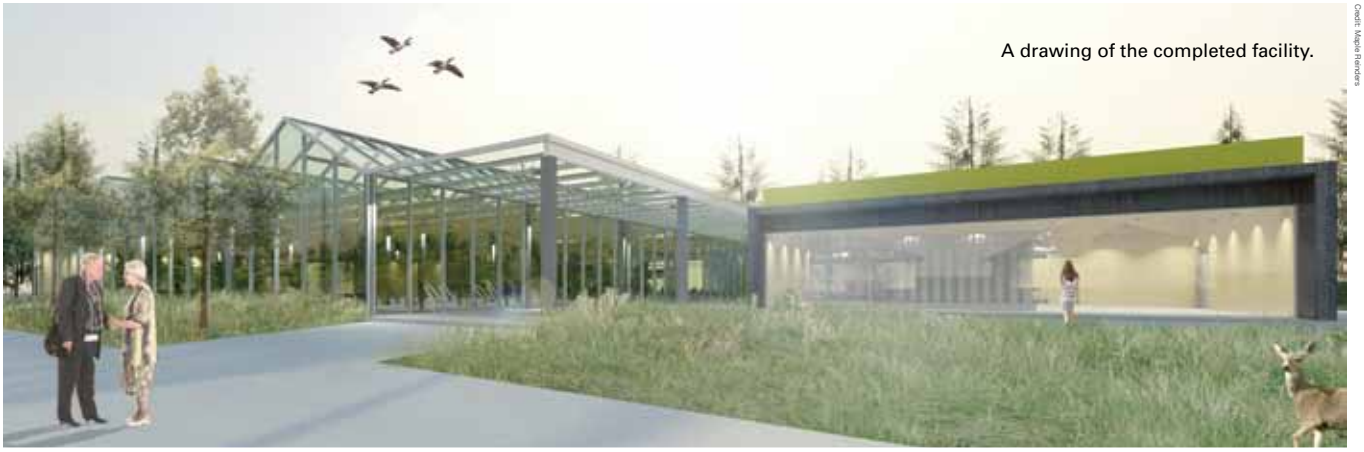
"The success of this project required that we remained diligent in staying focused on a great many details and installation innovations, which, together, enabled us to keep the municipal water supply flowing throughout the entire construction process," explains Craig Copping, project manager for Rankin Construction.

At one location, where even greater water tightness of the trench was required, a bentonite-geotextile clay shield was installed below the clear stone. Reinforced concrete headwalls and toe walls were also constructed at the ends of each pipe run, and clay seals were installed in the backfill, and at cold joints to ensure all of the canal water flowed into the pipes and was unable to enter the backfill zone.

At each slough crossing, a water-tight, 686-millimetre-diameter slough drain pipe was installed, under and across both the canal pipes and berms, to deliver surface water to Lake Gibson. At two locations, depressed elevation of the canal required surface drainage water be carried over and across the canal in elevated corrugated steel pipes. One of these is within the Ministry of Transportation's right-of-way for Highway 406, so the pipe was selected and designed in accordance with the Ontario Gravity Pipe Design Guidelines. Based on the environmental review and 75-year design-life requirements in the guideline, a 1,200-millimetre, polymer-laminated CSP pipe was selected for this elevated cross drain.

The operation of this entire system is driven by an abundance of source water from Lake Erie and gravity. These new system upgrades ensure the canals and pipes are now optimally aligned and elevated to manage differential head pressures of water, which will serve the needs of residents in the Niagara region. WC

David Penny is the executive director of the Corrugated Steel Pipe Institute. On July 1, 2014, David will become the director emeritus of the institute.



A drawing of the completed facility.

Credit: Maple Reinders

An aerial view of the Sechelt wastewater treatment plant, which is scheduled for completion in fall 2014.

Credit: District of Sechelt

Green Treatment

A new British Columbia wastewater treatment plant will have the beauty of a botanical garden.

BY CLARK KINGSBURY

COMMUNITY WASTEWATER treatment plants and botanical gardens generally don't have all that much in common. One is a noisy industrial facility while the other is an appealing community gathering place. A nearly completed wastewater facility in the District of Sechelt, British Columbia, located on the lower Sunshine Coast, will blur the line between the two.

The facility will utilize a fed batch reactor (FBR) solution by Organica, a Budapest-based water treatment provider. The process incorporates natural plant roots as a biofilm carrier to improve treatment efficiency and oxygen transfer characteristics. It combines traditional treatment technologies with natural, locally sourced vegetation in a greenhouse setting. Although in use at 30 to 40 sites abroad, Sechelt is set to become the first location in North America to utilize Organica's innovative technology.

Sechelt's new treatment plant in the community's core will bear little resemblance to the facility that had occupied the same spot for 35 years. It will include a greenhouse, an on-site learning centre and learning material, a meeting area, and a covered walkway. The facility will also be open for tours, and perhaps most importantly, it will be entirely noiseless and odourless.

> "I would encourage anybody in a decision-making role like mine to not be afraid of demanding that the industry get innovative." —John Henderson

Work on the $21.3-million project, which will be built to LEED certification, is being completed by Maple Reinders Inc., a consortium including Urban Systems Ltd., Technologies Canada, and Veolia Water Solutions. Veolia is supplying the technology that will make the plant possible.

"You have a wastewater treatment plant that doesn't look like a wastewater treatment plant," says Don Holland, VP of business development and infrastructure at Maple Reinders. "They wanted it to be more than just a wastewater treatment plant. So that's kind of why they picked us, because it's almost like a botanical garden."

The technology is particularly valuable given the plant's location in a residential area. When the district's old Ebbtide

wastewater treatment plant was built 35 years ago, the site was chosen because it was outside the village limits and at an extremely low elevation—about sea level. Today, the site is bordered on three sides by private residences. Although the district considered building the replacement facility at a more secluded location, a pumping station would still be necessary at the current site. As a result, the district began exploring ways to build a new facility on the original site, which would blend into downtown Sechelt and limit disruptions to neighbours.

"[We] made it very clear to the industry that we were committed to being innovative, that we wanted the proponents to stretch themselves in their approach," says Sechelt mayor John Henderson. "We told them the criteria we'd use to evaluate their submissions were things like it had to be noiseless, it had to be odourless, and higher marks for the more green the submission was."

Not only will the new facility be substantially more appealing to the eyes and the nose, the quality of treated water will also be very high. "It will be treated to such a standard where we can use it for agriculture," Henderson says. "Or it could be as basic as running a pipe across to the local baseball field, so we can water [it] in July, August, and September, when water's a bit scarce. We expect certainly through the summer months to reuse a great percentage of our effluent."

Henderson says he believes the town's openness to innovation has allowed it to find an ideal fit.

"For a small community like Sechelt, our willingness to embrace innovation, and indeed put it at the core of what we wanted the industry to supply us with, really gave industry the challenge to come up with something that was innovative, that was creative, and as a result is something that we're going to be very happy with," he says.

Holland agrees: "One of the most interesting things is that the district went out on a limb for this project. […] They wanted it to be a valued asset to the community—it's not something that's going to be put away in the corner. They wanted something that they could take pride in and show that they are doing the right thing."

In fact, the town has already received visitors from other communities interested in Sechelt's new approach to water management in a downtown setting. "We've already had a few visitors for that purpose," Henderson says. "I would encourage anybody in a decision-making role like mine to not be afraid of demanding that the industry get innovative." WC

Clark Kingsbury is Water Canada's assistant editor.

Scientists conduct testing and research in NSF International's Drinking Water Treatment Systems Laboratory.

Credit: NSF International

A Matter of Public Perception

A new international standard will soothe public concerns over emerging compounds and incidental contaminants in drinking water. BY RICK ANDREW

IN 2006, a number of pharmaceutical and personal-care products were detected at trace levels in the St. Lawrence River. Following media reports focused on chemical compounds in the water supply, a new standard—currently in the validation stage—takes aim at proving claims that point-of-use (POU) and point-of-entry (POE) treatment products can reduce the concentrations of many of these emerging compounds and incidental contaminants in drinking water.

NSF International is an independent global public health and safety organization that develops standards, and tests and certifies products for the water, food, and pharmaceutical-biotech industries. Testing to this draft standard in anticipation of the standards publication is currently available.

The new standard, NSF 401 – Drinking Water Treatment Units – Emerging Compounds/Incidental Contaminants, will establish testing requirements for POU/POE products designed to reduce emerging compounds and incidental contaminants. It addresses many personal-care products, pharmaceuticals, chemicals, and endocrine-disrupting compounds like bisphenol A (BPA) found in water. Although emerging compounds/incidental contaminants have no documented health effects when occurring at trace levels, their presence can affect the public perception and acceptance of the drinking water quality.

> Sixty-five percent of consumers are concerned about the quality and safety of public drinking water, with emerging contaminants in drinking water being a top concern.

NSF 401 will initially focus on 15 individual compounds, which represent pharmaceutical, personal-care, and endocrine-disrupting compounds identified in published studies as occurring in drinking water. These include BPA, meprobamate, phenytoin, atenolol, carbamazepine, TCEP, TCPP, DEET, metolachlor, trimethoprim, ibuprofen, naproxen, estrone, linuron, and nonylphenol. Of that list, BPA, ibuprofen, naproxen, estrone, and nonylphenol were all detected at trace levels in the 2006 study of the St. Lawrence River and its tributaries.

Claims are based on testing the efficacy of the treatment using the specific compounds for testing. Product configurations addressed in this standard include pour-through, under sink, faucet mount, countertop, refrigerator, plumbed-in, reverse osmosis, mouth drawn, and hand-squeezed sports bottle type filtration systems.

The NSF draft standard is currently being launched as NSF 401, although it will ultimately be finalized through

the American National Standards Institute's (ANSI) accredited consensus process and designated as an American National Standard: NSF/ANSI 401. ANSI administers and coordinates the U.S. voluntary standardization and conformity assessment system and accredits NSF to develop national standards impacting public health. Health Canada currently recognizes six other NSF/ANSI standards to help safeguard local drinking water. These health-based NSF/ANSI standards evaluate treatment products designed to reduce a wide range of potential compounds and contaminants, but do not address emerging compounds.

Developing the standard

According to an independent survey conducted on behalf of NSF International, 65 per cent of consumers are concerned about the quality and safety of public drinking water, with emerging contaminants in drinking water being a top concern. Through certification to NSF 401, manufacturers are now able to demonstrate the reduction of these compounds by meeting specific material, design and construction, performance, product literature, and labeling requirements.

NSF 401 was developed by members of a joint committee and task group with support from many other industry experts. Development included extensive review of scientifically published literature about compounds and their occurrence and detection in drinking water, as well as the examination of other unique issues. To determine which compounds to include, the task group looked for compounds that had been detected in drinking water at some level and for which product testing laboratories had analytical capability. Additionally, the group focused on compounds that manufacturers and consumers would have interest in treating.

The biggest question the group faced was whether to include these claims as part of an existing standard or to create a new stand-alone standard. Traditionally, contaminant claims have fallen into either a "health effect" or "aesthetic effect" category. Since emerging compounds/incidental contaminants claims are neither aesthetic nor health effects and there have been no documented health issues to date at their current detection levels, the group opted to create a new standard based upon consumer preference. Although these compounds are currently being detected at low concentrations, concern regarding pharmaceuticals and contaminants in drinking water continues to grow, making NSF 401 an important step toward helping improve the public's perception of its drinking water. WC

Rick Andrew is the global business development director of NSF International's water division.

The Wind River, one of Peel Watershed's major rivers, winds through Wernecke mountains.

Credit: Nadine Sander-Green

Escalating Tensions

The Yukon released its new Peel River watershed land use plan—and no one seems happy about it.

BY NADINE SANDER-GREEN

THE SIZE OF THE YUKON'S Peel Watershed is often compared to New Brunswick or Scotland, but the enormity of more than 67,000 square kilometres of land—or 14 per cent of the territory—is hard to digest by looking at a map. The watershed is home to the north end of the Rocky Mountain chain, a network of wild rivers that runs toward the Beaufort Sea, and populations of porcupines, caribous, grizzlies, and wolverines.

The debate over how much of the region should be open to industrial development has pinned northerners against each other since the land use planning process began a decade ago. Although the government manages more than 97 per cent of the Peel, there are four First Nations—Nacho Nyak Dun, the Gwich'in Tribal Council, Tr'ondek Hwech'in, and the Vuntut Gwitchin—with territory in the watershed.

Jimmy Johnny, a Nacho Nyak Dun elder, is worried about the water. He wants to make sure the rivers in the Peel are clean and pure for the communities upstream, like Aklavik and Fort McPherson in the Northwest Territories.

"The water is the most powerful thing. It gives us life, it gives us plants, animals, fish, everything," he said. "That's why I'm fighting this."

For 15 years, Johnny worked for Chris Widrig, a hunting outfitter whose concession is at the headwaters of the Snake, Bonnet Plume, and Stewart rivers. Widrig takes only 28 clients (at just under $20,000 a head for 10 days) out on horseback each summer. They hunt Dall sheep, caribou, grizzly bears, and moose and drink water straight from the river.

Although Widrig spends more time in the bush than most Yukoners, he's still embroiled in the land use planning debate. Everything, he admitted, is political when it comes to the Peel.

"Some people look at the land and all they see is emptiness. They think you need to build on it or dig it up," he said. "That's not the way I see it."

The Yukon's land use planning process is rooted in the Umbrella Final Agreement, the self-governing treaty signed in 1993 by the Yukon's First Nations. It was created to minimize conflict within settlement and non-settlement land.

> "They're telling Yukoners their values don't have any value. The government is thumbing their nose to their entire process." —Kate White

Conflict, though, has been at the core of the process. In 2011, after seven years of work, an independent, government-appointed commission released its final plan. They had already compiled a draft plan, and then a recommended plan, but were asked by the government to make it more "balanced." The commission, they believed, was favouring conservation over development.

First Nations said they wanted complete protection but would compromise to 80 per cent in the spirit of co-operation. The final plan stressed that four-fifths of the land should be protected to maintain the ecological integrity of the region. Existing oil and gas and mineral claims could remain, but no roads to access them would be allowed.

In January 2014, the Yukon Party government released the newest version of the plan, almost completely flipping the commission's work on its head: now, only 29 per cent of the watershed is protected while 71 per cent is open to claim staking. The new plan, the government said, is meant to maintain the ecological integrity of the region while allowing for carefully managed economic development.

The protected area is largely in the headwaters and corridors of the Wind, Bonnet Plume, Snake, Hart, and Peel rivers. No new staking is allowed in these areas, but roads to reach and develop existing mineral claims are permitted. The rest of the region is open to new staking, roads, and mines.

Nobody, it seems, is pleased with the new plan. Environmental groups say the government is ignoring the science of large-scale protection. The Yukon Chamber of Mines has said the plan is too restrictive and makes the region economically unviable. First Nations believe it's a violation to their treaty rights.

Environment Minister Currie Dixon explained the government modified

the plan because they wanted a better balance between conservation and responsible development. "The fact [that] various interest groups on either end didn't get everything they wanted points to the fact that we did find a balance," he said, stressing that people worried about the environment just need to look at the plan. The Yukon has more land-base protection—at 17 per cent—than any other province or territory.

The government argues that accepting the commission's plan could bankrupt the territory. Denying industry surface rights to their claims could result in costly lawsuits.

"We didn't want to expose Yukon taxpayers to that risk," Dixon said.

The claim in question is the Crest iron ore deposit along the Snake River, owned by Chevron and discovered more than 50 years ago. Premier Darrell Pasloski called the size of the deposit "astronomical." He said it would be irresponsible to declare this resource potential off-limits.

Chevron's project is still highly speculative. A feasibility study showed that building a mine would require a new rail line to Alaska. Getting enough power to the site would be another expensive and tricky problem.

NDP environment critic Kate White said the new plan is undemocratic and throws out seven years of the planning commission's hard work. "My problem is that they're telling Yukoners their values don't have any value," she said. "Not 100 per cent of people supported the final plan, but I can say close to 100 per cent support the process. Now everyone is shaking their heads."

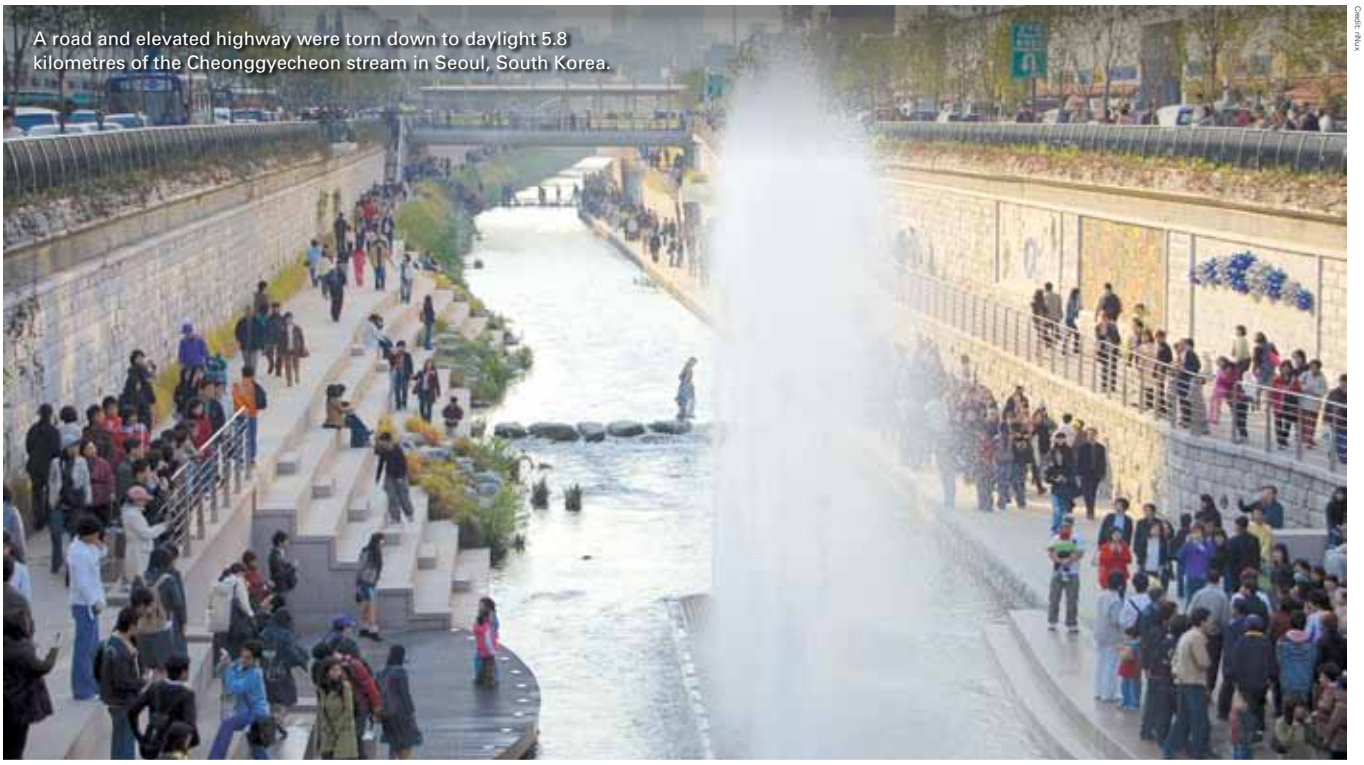
She explained that land use plans guarantee certainty and are supposed to be about citizen participation and transparency. "The government is thumbing their nose to their entire process," she said.

First Nations and environmental groups filed a lawsuit against the government a week after the plan was released. They claimed the government rejection of the commission's plan amounts to a violation to land-claim agreements. Thomas Berger, the lead lawyer, said he believes the case will be a profound test of whether or not the Yukon government is required to live up to its agreements.

"We didn't want to take this to court, but we felt like it was the only way," said Gill Cracknell, the executive director of the local Canadian Park and Wilderness (CPAWS) chapter, one of the plaintiffs in the case. CPAWS believes the government is missing a huge opportunity to protect a rare, intact watershed. "This is an industry plan not based on science and ecology," she said. "It's so much against what the public is asking for."

The court case to decide if the government's plan is legal will be heard in the Yukon Supreme Court at the beginning of July. Until then, Yukoners—and anyone with their heart in the north—will hold their breath. WC

Nadine Sander-Green is a writer based in the Yukon. She's currently working on her first book of essays.



A road and elevated highway were torn down to daylight 5.8 kilometres of the Cheonggyecheon stream in Seoul, South Korea.

Credit: iNux

Breathing Life into Urban Streams

Daylighting buried creeks can help mitigate the effects of floods and provide social benefits. BY CLARK KINGSBURY

Participants enjoy a Lost River Walk in 2012.

Credit: Jeremy Kai

THE CITY OF TORONTO has a complex relationship with water. The traditional Toronto Islands view of the skyline shows a daunting, ever-expanding wall of skyscrapers perched at the edge of Lake Ontario. Far beyond the shores of the lake, Toronto is a city built atop a vast, intricate system of "lost" streams and rivers—waterways that have been buried deep beneath the city's roads, office towers, and suburbs. In an effort to improve the city's overburdened stormwater systems, it may be time to resurrect some of these long-hidden streams.

The creeks have been buried for a number of reasons. For one, they were covered to accommodate development. In a rapidly growing urban centre, a natural body of water can be seen more as a hindrance than a positive landscape feature. This is especially true when it comes to suburban development and engineered landscapes.

The other dominant factor was a concern for public safety. In the late 1800s, downtown creeks were used as open sewers, and as water service was implemented, the creeks were gradually covered up. Larger waterways, like Garrison Creek, became sewers. "As we were building combined sewers, this was basically the model," says Michael Cook, who recently completed a master of landscape architecture at the University of Toronto and has spent a decade researching and photographing Toronto's hidden waterways. "You would cover over a creek and it would become your main trunk sewer."

Today, the City of Toronto's stormwater management system struggles as it attempts to keep up with heavy rains, as demonstrated by unprecedented rainfall and subsequent flooding on July 8, 2013. Pipes are sized based on models of storms, and when a storm larger than it's modeled for occurs, the pipe fills up with excess water that ends up in what is called the "major system," or road network. Additionally, the current sewer system doesn't effectively account for soil water and surface groundwater, which flows around the pipes. During a major storm, this water will enter pipes at their joints or through manholes and will add

to the flux of water the system is already experiencing.

Part of the solution for an overwhelmed stormwater system could be bringing waterways that were previously in pipes or culverts back to the ground surface, or "daylighting" them. When a creek is returned to a more natural state, stormwater is absorbed gradually through soil and plants, slowing the stormwater surge. The process also provides some natural filtration, meaning cleaner water in the system.

Cook puts daylighting projects into two classes: restoring major creeks, some of which are now storm sewers that are located below open spaces, and rebuilding headwater systems on the surface where there isn't enough space to daylight a creek. The latter focuses on rebuilding the function of the natural water network that flowed across the region on the surface.

> "We need to start to deal with the flow of water and the flux of water across entire subdivisions and neighbourhoods." —Michael Cook

"We have a history of projects that emerged in the wet weather master plan, but they haven't been put together in a way that can be deployed across the city," Cook says. "Instead we have tunnel projects and a basement flooding protection program that is expanding rapidly, but it's just concerned with building more volume into the existing sewer system."

He adds that, "This will only alleviate a certain portion of the basement flooding issue because so much of it is tied in to the landscape and terrain and location of the houses, where we need to start to deal with the flow of water and the flux of water across entire subdivisions and neighbourhoods."

Fully daylighting larger waterways is a more complicated task, but one that would nevertheless serve a valuable ecological purpose. "What that's really about," Cook says, "is improving the water quality of the rivers by slowing and treating the water that's now coming out at the end of the pipe and creating erosion and other issues in the rivers—the Humber, and Black Creek, and the Don."

Daylighting and other renaturalization projects may be beneficial for more than infrastructure-related purposes, though. Helen Mills is a founder of Lost River Walks in Toronto, a group that traces the courses of creeks that once flowed openly through Toronto in an effort to reconnect people to the wider ecosystem of which Toronto is a part. The group held 55 free walks in 2013, with a total of 2,410 people in attendance.

"Right from the very first walk, people came," Mills says, "and they kept coming for the last 15 years. So it obviously touches something fairly visceral."

While she has no delusion of downtown monuments being torn up to make way for daylighting projects, Mills, like Cook, believes that there is a benefit to "reworking the fabric of the urban landscape as a whole so that it functions in a way that more closely resembles the ecosystem that's been stripped away." She also believes that renaturalization projects can have a significant impact on the quality of life for those living in urban settings.

"A rain garden, even if it's not a daylighting project, or digging up a parking lot and putting in an area of infiltration, I think are self-evidently things that will improve people's daily experience," she says.

Perhaps the most notable daylighting example can be found in Seoul, South Korea, where a road and elevated highway were torn down as part of a process to resurrect 5.8 kilometres of the Cheonggyecheon stream. The restored waterway transformed a dreary strip of downtown Seoul into a popular public gathering space for locals and tourists, and has attracted new species of fish, birds, and insects. While no such major project appears likely in Toronto, the Cheonggyecheon may serve as an example of the benefits of renaturalization projects in large cities. WC

Clark Kingsbury is Water Canada's assistant editor.

Critical Lessons

What extreme weather events south of the border can teach Canadians about flood mitigation techniques. BY BENJAMIN HWANG

IN RECENT HISTORY, Canada has been hit with severe flooding, causing unprecedented damage to homes, businesses, and public infrastructure. These events include the 2011 Manitoba floods, which cost the province $1 billion, and the 2013 southern Alberta floods, which caused an estimated $5 billion in damages.

Similar natural disasters have occurred in the United States, including Hurricane Sandy, which devastated Long Island, New York in 2012 and caused 90 per cent of customers to be without power for as long as two weeks. The high, sustained winds combined with unprecedented flooding caused significant damage to electric utility assets. In addition, a nor'easter storm nine days later caused some customers to lose power once again. Aid from surrounding utilities poured into the area, but it still took 16 days from Hurricane Sandy's landfall to completely restore the customer base.

As for the utility's substation assets, at least 12 took on water, with some taking on as much as six feet at the substation's lowest grade elevation. Looking back at the design criteria, the utility was using Flood Insurance Rate Maps from 1997. Those maps were outdated and have since been revised.

The response

This utility retained WorleyParsons, a global engineering and consulting firm, to identify flooding hazards for various return periods, such as 100-year, 500-year, and 1,000-year floods. In order to best present the modelling results, the firm turned to WaterRIDE software to visualize the effects of those floods and help forecast flood damage on utility assets based on weather forecasts. Conceptual mitigation projects from current best practices were then provided after conducting a survey with coastal utilities.

In the initial stages, various public sources of data, including U.S. Federal Emergency Management Agency design guides and American National Standards Institute engineering standards, were reviewed. An independent assessment of flood levels and design standards was then conducted before the software was used to extrapolate more rare occurrences, such as a 1,700-year return period. This included stretching water surfaces, including wave heights, and considering sea level rise.

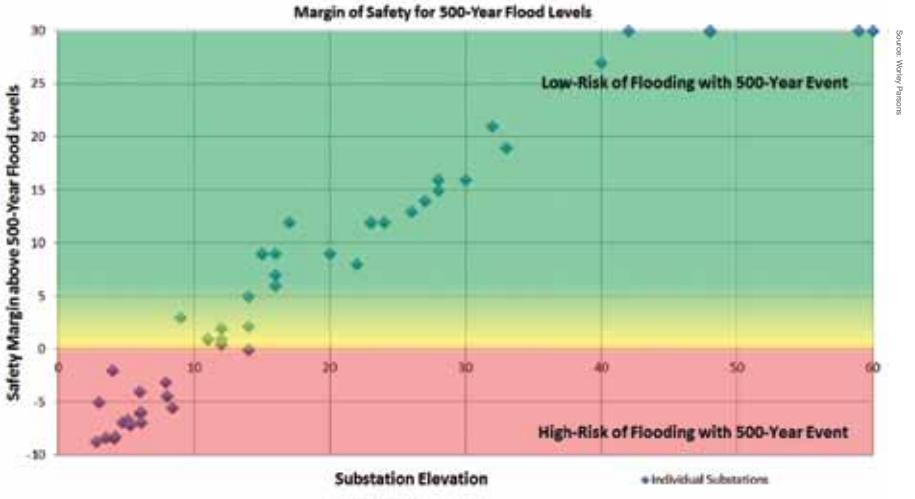
Fifty of the utility's assets were then plotted on a flood risk chart (Figure 1) to show the assets that were most susceptible to damage within a 500-year flood (0.2-per-cent chance per year). The horizontal axis represents the substation's grade elevation and the vertical axis represents the safety margin. Assets with a negative safety margin are in the red area and are at a high risk of flooding, whereas a majority of the assets that are in the green area are safe from a 500-year flood and have a low risk of flooding. The flood risk chart indicates how to best allocate capital for the most benefits. In addition, the utility could incorporate these assets into its long-term strategic plan to determine the best form of mitigation, whether it is a permanent solution (such as elevating equipment or relocating the substation) or a temporary solution (such as earth-filled bags).

A utility should ensure all assets have flood mitigation that meets a specific design criterion. For example, using a 500-year scenario, the utility can identify which assets would be flooded and then design solutions, such as flood walls, elevating equipment, or relocating assets, to ensure all assets are protected to that 500-year design criterion. In addition, software can provide granularity to one metre, so the utility can also see which roads would be flooded in each scenario to design evacuation routes for residents or safe driving routes for personnel that need to access equipment for repair.

Applying lessons learned to Canada

For any entity—whether a municipality, industrial asset owner, or public infrastructure owner—a few recommended tasks could be taken right now to start assessing the risk of flooding for any geographic area.

Figure 1: Flood Risk Chart



Source: Worley Parsons

1. Research public sources to have a starting data point of risk: For example, the Flood Hazard Mapping Project for Alberta communities provides 100-year flood levels (one-per-cent chance every year). While protecting assets to 100-year flood levels may be sufficient for residential communities, a more rare scenario (such as 500-year floods) may be needed for critical infrastructure, such as oil and gas production, power facilities, and first responder facilities.

2. Determine flood levels for critical equipment: Whatever the asset, the entity should identify at what flood level the equipment would be inoperable. For electric utilities, it may be the bottom of electrical switchgear, while for hospitals, it may be the bottom of the emergency generator.

In addition to immediate tasks, the following steps should be taken in the near future:

1. Independent assessment of flood levels: Since flood protection to the 100-year flood levels are often insufficient for critical infrastructure, it is important to have a third-party firm take on independent assessments of flood levels, especially at rarer occurrences (500-year and 1,000-year floods).

2. Annual emergency drills: In the United States, there has been more emphasis on emergency responses. These are often coordinated emergency exercises between municipal agencies, electric utilities, and first responders.

3. Update design standards: While it is important to mitigate existing assets to withstand floods, it is equally important to make sure new assets are not placed in floodplains. The entity should review their design and construction standards (such as for future substations, future municipal buildings, *et cetera*) to ensure this or have a more rigorous justification process if it is unavoidable. **WC**

Benjamin Hwang is a project manager for the WorleyParsons infrastructure division focusing on power system hardening and reliability.

Seeing Red Tape

Innovation in the Canadian water sector can only happen if we loosen our rigid conformity to the past. BY AARON ATCHESON

ACROSS TRADITIONAL and new media, stories now appear regularly about various advances in drinking water and wastewater treatment, water efficiency, water desalination, and more. In many jurisdictions across North America, both public and private enterprises will require significant updates in water and wastewater infrastructure in the near future, appearing to create a significant opening for new technologies. Unfortunately, there are a number of reasons why a potential golden age for advances is more likely to be a more moderate period of change. A necessary reduction in legal red tape is the endeavour that will require the most coordinated and sustained effort.

Readers of Water Canada will be familiar with the institutional constraints on technological adoption within the water field. This industry is remarkable for its low risk-taking behaviour; many would say such behaviour is appropriate given the potentially disastrous results if an immature technology is adopted to the detriment of public health or the environment. Politicians balk at the combination of a technology not yet universally accepted with the significant costs involved with a major infrastructure project. Essentially, the industry continues to struggle to make its case with many elected officials that the payoff from new technologies is worth the risk.

Another inhibiting factor is the cost of water. When water is almost free, with less than full cost recovery, any investment has an unusually long payback period compared to other infrastructure projects. The success of water conservation efforts is likely to exacerbate problems relating to cash flow unless utilities significantly restructure their water charges.

One major challenge in the sector is the considerable red tape that restricts the adoption of new technologies by all involved, including those private enterprises and citizens eager to innovate. We can categorize these restrictions as either those targeted at addressing emerging public-health and environmental risks, or those related to the inability of new technologies to fit within existing frameworks.

The first category of legal restrictions is closely tied to the history of failures of both legislation and existing industry systems to protect public health and the environment. For example, the tragedy in Walkerton, Ontario resulted in significant legal and regulatory changes. Fourteen years later, certain principles championed in the aftermath of the tragedy, such as source water protection, are still being translated into practical requirements for those living and working in the province. And while some have argued that the concentration should have been on greater enforcement of existing requirements, the public clearly demanded that the provincial government put new rules in place to significantly reduce the risk that such a tragedy might happen again. These restrictions are likely to remain a permanent part of the regulatory environment; few politicians would have the courage to press for the rollback of such regulations.

The second category of legal restrictions deals with how, in most circumstances,

the legislation put in place by our elected representatives is very good at institutionalizing the status quo and very bad at foreseeing the use of different tools and systems. Technology in place at the time a legislative system is structured has a huge unearned advantage because it fits within the current regulatory system. Over the years, modernization of regulation may occur, but this often only incorporates minor changes that do not allow for full-scale replacement of earlier technologies or systems.

Fortunately, due to the vast amount of information available to the public today, it is easier than ever to see that others are doing a better job at accommodating new technologies and trends. This can be used to press for changes in our own communities. For example, jurisdictions like Australia and Arizona have experienced severe drought conditions and have become the leaders in permitting and promoting the use of greywater. Arizonans no longer require permits for simple greywater systems so long as they follow a list of best practices. Pressing local governments to allow for similar changes, while learning from the missteps in those jurisdictions, is a necessary and important tool in facilitating innovation.

Another method of dealing with the inadvertently "sticky" nature of restrictions in such a regulated environment is to foster significant collaboration with government officials. Sector participants may have to invest significant resources to work collaboratively with government representatives to remove unnecessary barriers. For example, it has been reported that London, Ontario's Trojan Technologies worked with the Ontario Ministry of Environment to develop a multi-site permit system in order to assist in streamlining an application process necessary for their ultraviolet water disinfection systems. Not every government will welcome such an effort, but when an opportunity presents itself, sector participants need to be willing to invest time and other resources in order to communicate the challenges and the solutions to government representatives.

While governments across Canada seek to support the development of new technology to address modern risks to water quality and advocates demand investment to ensure innovation can be demonstrated and commercialized, all parties need to be mindful of the red tape that must be reduced. By demonstrating successes from other jurisdictions and working with governments to ensure risks are addressed while allowing for innovation, the water sector in Canada can move forward for the benefit of all concerned. WC

WC

Aaron Atcheson is a partner in the London, Ontario office of Miller Thomson LLP and the chair of the firm's National CleanTech Group.

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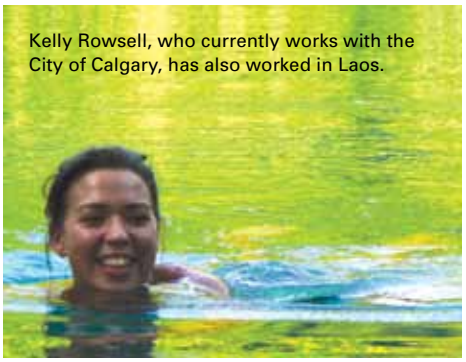


Credit: Kelly Rowsell

Kelly Rowsell, who currently works with the City of Calgary, has also worked in Laos.

Driven by Water

One Canadian young professional takes her fascination with water home and abroad.

FROM COMPLETING a master's at McGill University to spending three years working in Laos in Southeast Asia, Kelly Rowsell's fascination with water has allowed her to travel far and wide. The avid camper, canoer, and cross-country skier has also participated in numerous events with the Canadian Water Network (CWN) and Waterlution, and has been a regional representative on the CWN Students and Young Professionals committee over the past two years. Water Canada spoke with her about her time in Asia and the challenges she faces at her current position with the City of Calgary's water resources.

WC: What sort of work did you do during your time in Southeast Asia?

KR: During my first work placement in Laos, I worked with an international non-governmental organization through a Canadian International Development Agency-funded project. In this role, I had the opportunity to aid in the provision of clean drinking water by providing technical support and [the] transfer of household biosand water filter technology to the local partner and communities that had limited access to safe drinking water. I later returned to Laos on a two-year Cuso International contract. This time I was partnered with a provincial government office of Science, Technology and Environment in the role of environmental quality advisor. In this position, I was able to provide technical support for environmental quality assessment and planning, offer advice and assistance with project management and implementation, and conduct training and public awareness campaigns within the community on local environmental issues.

Could you describe your work at the City of Calgary?

As a part of the regulatory affairs and compliance team, I provide regulatory and water resource management issue support. I provide input into ensuring the long-term sustainability of water resources by aligning needs with available water resources within the City and its surrounding areas. I provide assistance in researching various aspects of municipal and regional programs and projects, such as water reuse, and [help] to establish a Drinking Water Safety Plan. Much of this research involves the analysis of external and internal scans to identify trends and issues related to water/wastewater to support the community.

What water resource and water sustainability challenges are the City of Calgary and the surrounding area facing?

When it comes to dealing with water resources for an entire city, there are numerous sustainability challenges. Cumulative impact factors like climate variability, population growth, and industry development require an understanding of the complexities and linkages within the whole system.

With Calgary's flood last year, there is a lot of focus on flooding, yet one of the largest challenges faced in this region is the finite water resource of the Elbow and Bow rivers, which supply our drinking water and support our aquatic and terrestrial ecosystems. Calgary is within the South Saskatchewan River Basin, the only area in Canada that has a closed basin. The quickly growing city is also having an impact on the river, with increasing sediment and pollution loads. To deal with these issues, water management is increasingly focused at the watershed scale, with the goal of conserving and protecting source waters, limiting pollution, and ensuring the overall health of our regional watersheds. WC —Staff

Credit: Ryerson University

University graduates should cultivate their "soft skills," including communication, creative thinking, and collaborative problem-solving, in order to become well-rounded water professionals.

Schoolin' Life

Are we doing enough to educate water professionals?

BY MICHAL BARDECKI

THE NEW YORK TIMES recently quoted a senior VP of Google as saying that of the five key attributes the company seeks in hiring, the least important is expertise. The sentiment is echoed widely, yet university students and most of their professors are generally convinced career development lies in developing a deep base of knowledge. The tradition of universities has been to develop individuals with highly specialized and deeply developed "I-shaped" expertise. However, in the 1990s, an alternative model recognizing the value of those with "T-shaped" skills in the workplace emerged within the field of computer technology.

From the point of view of the university, a "T-shaped" curriculum would be designed to provide problem-solving and research depth in one area while incorporating overall breadth in the understanding of a range of other fields. Students would develop complementary skills that are valuable to the development of their careers. Organizations as diverse as the World Bank and IBM have adopted the idea, and recent papers from two water centres in Europe and Australia have argued the case that the goal of shaping a "T-shaped" professional should guide program development and delivery of university programs in hydrology and water management.

University graduates moving into the job market in water management, hydrology, and related fields face dynamic and complex issues and situations that challenge their soft skills of communication and negotiation, creativity and innovation, independent thought, personal development, the ability

What is the Ryerson Urban Water Group?

BY LYNDA MCCARTHY AND IMOGEN COE

Ryerson Urban Water (RUW) is an interdisciplinary research and education collective that recognizes that healthy cities depend on healthy urban water strategies. The group understands that, in future decades, more than 70 per cent of the world's population will move toward urban centres where jobs, recreation, and support services—like health care and education—will be concentrated. One of the most critical support systems for future urban settings is a healthy urban water cycle that provides clean water for domestic and industrial use, protects human life and property, and promotes viable commercial fisheries and a sustainable tourism industry.

To address these upcoming challenges, RUW uses novel approaches that integrate engineered, scientific, economic, environmental, societal, and policy strategies into transformative solutions. RUW is composed of researchers that specialize in a variety of water and wastewater topics and fields.

These integrated research initiatives will provide new knowledge and innovative technologies leading to:

1. Commercialization;
2. Evidence-based recommendations to governments for policy and economic assessment;
3. New industries for novel solutions to urban water and wastewater management;
4. Enhanced relationships with First Nations to improve urban connections and engagement; and
5. Educational and training initiatives at all levels from grade school to corporate boardrooms. WC

Lynda McCarthy is a professor at Ryerson University's department of chemistry and biology. Imogen Coe is the dean of Ryerson's faculty of science.

to solve problems collaboratively, and a disposition for management and leadership. Universities can play their part relatively easily by incorporating modular add-ons to existing university programs. The development of social networks, internships and apprenticeships, team oriented projects, and peer assessments are each seen as positive elements in providing students a range of adaptable skills and perspectives that can stand graduates in good stead.

Water professions are fundamentally interdisciplinary: the skills and knowledge of analytical chemists, engineers, hydrologists, limnologists, microbiologists, economists, lawyers, and policy analysts, among others, may be brought to bear to address a problem. From an educator's perspective, it is often challenging to encourage students to develop a meaningful depth of expertise and yet also come to appreciate, understand, and apply knowledge from a range of disciplines. The great body of knowledge developed by and residing within individual academic disciplines is critical, but integrative learning needs to reach beyond traditional academic boundaries. Interdisciplinary thinking involves multiple areas of knowledge, albeit from established areas of expertise, to produce a broader, unscripted understanding more suitable for explaining and addressing real-world problems in credible and novel ways.

Institutional reform does not come easily for universities. They have not fully embraced the full value of interdisciplinarity learning in the water professions. For example, a recent review of water research institutes in universities in Canada and the United States by the Ryerson Urban Water group found most were examples of what might be called cognate interdisciplinarity (meaning, at best, they represented a linking of closely aligned disciplines) rather than associations of the broad domains of knowledge of relevance to understanding and managing water.

There is a broadly recognized sense that the solution to current and future water issues is not simply in accumulating more knowledge. What is required is a better understanding of the relations between all relevant fields of knowledge, a better means of translating knowledge between academia and society, and the development of professional understanding and practice reflecting the diversity of knowledge that must be brought to bear on those issues. Interestingly, research has shown that graduate students are more open to interdisciplinarity in their associations outside their own field than faculty members. Universities would do well to follow. WC

Michal Bardecki is the director of the graduate programs in environmental applied science and management at Ryerson University. He is also actively involved with the university's Ryerson Urban Water group.

At TSAG youth camps, First Nations students learn through hands-on activities about the importance of the watershed and environmental stewardship, as well as water science and technology.

Credit: TSAG

Putting First Nations First

An Alberta non-profit empowers First Nations communities with water and wastewater training.

BY WHITNEY MATUSIAK

ALBERTA IS HOME to a partnership that promotes environmental responsibility, water protection, and First Nations engagement—and there is no other service in the province that works under the same governance structure with the Treaty Areas. The Technical Services Advisory Group (TSAG) is a non-profit organization "by First Nations for First Nations" funded by the Alberta Region of Aboriginal Affairs and Northern Development Canada (AANDC). TSAG operates more than 12 specialized programs to assist First Nations in achieving and maintaining high technical standards and healthy communities. Its Circuit Rider Training Program (CRTP) offers specialized water and wastewater operator training programs for First Nations through a standing agreement with the Alberta Water and Wastewater Operators Association (AWWOA).

"It's a program that assists and enables First Nations water and wastewater system operators to obtain and maintain provincial certification," says Winslow Davis, TSAG's community infrastructure manager and the recently appointed president of the Circuit Rider Trainer Professional Association (Canada). He adds that, with the guidance of a full-time education officer, CRTP facilitates an adult education program that meets the educational quotient for a Grade 12 general equivalency diploma and prepares trainees for AWWOA's small-systems certification. The CRTP delivers portions of the AWWOA catalogued training process, as well as on-site, hands-on system training, mentorship, exam preparation, and value-added services including WHMIS and confined-space entry training.

TSAG's history began in 1998 when it was one of the first organizations to promote technical services and training for Alberta First Nations. Self-described as "cooperatively providing a sustainable future," TSAG is politically mandated by the First Nations' Chiefs of Alberta through a steering committee and a board of directors with equal representation from the Treaty 6, 7, and 8 regions.

Since its inception, the CRTP has continued to grow, but there are still gaps in operator service across the province. Focusing on the opportunity to empower and engage First Nations through the CRTP, Davis says his certified circuit rider trainers team offers technical oversight for uncertified trainees and communities without an operator. Compared to private companies that operate First Nations water and wastewater systems on contract, Davis says, "We're not financially motivated. We have a vested interest in the community, and we're there for development and capacity building. We're not there to get a paycheque at the end of the month." Chantelle Cardinal, TSAG's director of operations, adds, "We like to see ourselves trying to work our way out of a job." To achieve this goal, TSAG focuses on promoting integrity, ownership, and empowerment among Alberta's First Nations.

TSAG's circuit rider trainers and educators offer up to five operator-certification training sessions per year at various venues across the province. These sessions are open to all First Nations in Treaty 6, 7, and 8 regions but are limited to 12 participants each to ensure plenty of one-on-one contact and an overall benefit to the trainees. In addition to these hands-on-training opportunities for provincial certification, the CRTP has added the

Circuit Rider Training Program Plus (CRTP+) edition. The expansion focuses on an extended relationship with First Nations by providing troubleshooting and technical support, data storage capabilities, continuing education programs, and remote access to a water quality monitoring network. TSAG believes operators can more effectively manage their water and wastewater systems when they know how the water quality is at the source.

Not without its challenges, TSAG and the CRTP have had trouble retaining skilled operators in Alberta First Nations. It's especially challenging in northern Alberta where there are employment headhunters looking for operators to support the oil and gas industry. "It's becoming more of a challenge to bring home the point that when we work to get an operator trained and certified, the community needs to recognize the financial requirement on their end to retain this person," Davis says, adding that it is hard to accept when the CRTP trains these operators and they leave.

But, he says, there is a bright side. "We have a number of success stories. I can think of three people who have gone from not even having a high-school education to getting their Level 1 small systems certification. And it's a big success for them. One of our circuit rider trainers [Devin Meneen] started off as a water plant operator, and now he's one of our highest-trained circuit rider trainers."

Cardinal recalls what happened when she went to the area where Meneen is from. "It was so fascinating," she says. "You'd talk about the roles of what a water plant operator does, and all these kids knew who Devin was. [...] It was so empowering to see these young kids in grades 4, 5, and 6 really look up to Devin, and they wanted to grow up to be just like Devin and work in a water plant."

TSAG is doing its part in shaping young minds and promoting technical careers among future leaders. Interactive classroom presentations targeting students in grades 4 to 9 focus on the water cycle, pollution, and drinking water testing and treatment. And each summer, TSAG offers a weeklong environmental youth camp in the Rocky Mountains near Nordegg, Alberta, for students in grades 9 to 12. Students learn through hands-on activities about the importance of the watershed and environmental stewardship, as well as water science and technology. The annual youth camp is an integral part of TSAG's empowerment strategy among Alberta First Nations.

As for the CRTP, Davis and Cardinal have their sights set on expansion by bringing its "for First Nations by First Nations" approach to technical service to its easterly neighbours: the Manitoba First Nations. WC

Whitney Matusiak is a water resources engineer with GeoProcess Research Associates. She also works as a freelance writer and editor.

Investing to Save

Funding that favours efficiency could also bolster innovation. BY BRIAN MERGELAS

LIKE MANY JURISDICTIONS, Ontario is working to ensure the financial and environmental sustainability of municipal water, wastewater, and stormwater systems. While "doing more with less" is the reality for most utilities, one of the biggest challenges for water and wastewater utilities is raising additional funds to resolve growing infrastructure deficits.

As executive director of the University of Waterloo's Centre for Advancement of Trenchless Technologies, Mark Knight advocates for cost-effective solutions that extend the life of existing buried assets rather than big capital projects that require hauling and replacing old infrastructure, perhaps before the end of its useful life.

The question, he says, is where to find the money. "Eighty per cent of the cost of running a water or wastewater network is operational. If we spend money to do certain types of optimizing capital works, we can substantially reduce that cost. But in most municipalities, there's a political lack of will to raise rates."

Southern Ontario Water Consortium's Brenda Lucas agrees that new mechanisms are required to close the funding gap. Like Knight, she also wants to see cost-effective, innovative solutions at work.

Innovation in Ontario

While the water industry is inherently against taking risks—and for good reason since its job is to ensure the health and safety of drinking water—the Walkerton tragedy initiated a process that changed the attitude toward innovation in the province. Strict regulations have improved confidence in Ontario's water systems, but it has become more challenging to introduce approaches beyond conventional technology.

That said, there is a critical mass of technology companies, research institutes, and organizations that make water a big focus for Ontario. Recognizing the potential for Ontario to become a dominant player in the sector, the provincial government passed the *Water Opportunities Act* in 2010—an act to promote Ontario's expertise to the world.

The Water Technology Acceleration Project (WaterTAP) was formed as part of the act to be Ontario's water sector champion on the world stage and strengthen the province's environment of water technology innovation.

Changing the flow

Currently, infrastructure funds from the provincial or federal governments are earmarked for capital, rather than operational, expenditures. As part of its mandate, WaterTAP—as well as other stakeholders—is exploring ways to tweak how these funds flow to municipalities, and how those tweaks can better support innovation.

As chair of WaterTAP's Invest to Save working group, Lucas leads a collection of industry experts who are particularly interested in alternative ways to finance infrastructure improvements through investments in optimization and efficiency.

Lucas says public dollars should be directed to approaches that are cost effective and have multiple benefits. "A dollar invested in a different way could save municipalities from spending several times that amount on traditional capital infrastructure," she says. "We want to help open the door to funding non-capital approaches or capital approaches that offset traditional requirements."

Leading by example

After forming in 2013, the Invest to Save group began collecting case studies from Ontario to demonstrate the savings associated with innovation, whether it's the use of new technologies or, simply, a different approach to the problem. "The opportunities are endless," Knight says. "On the wastewater side, pipes are leaking into groundwater tables and causing issues with infiltration and inflow—sometimes contributing up to 30 or 40 per cent of the flow to plants. We're paying to treat that water! In some cases, we're spending millions building bigger plants when we could actually just work to reduce those flows." For example, he says, municipalities could invest in fixing and relining pipelines and gain tremendous capacity.

Programs like Ontario's Showcasing Water Innovation are a great source of these cases, and working group members have contributed stories from their own experience as well as gathering them from peers. From small town to large city, there are plenty of examples to share.

Perth, Ontario

When Ministry of Environment guidelines required the town's water treatment plant to treat its filtration residues before discharging into the Tay River, Perth, Ontario (population 5,840) was looking at a price tag of $2 million to $3 million for the conventional solution. Instead, the town invested $800,000 to construct a Geotube facility to help manage plant residue, saving 60 to 70 per cent of the possible cost. Additionally, the town preserved tax revenues by preventing the loss of lagoon capacity for 80 new homes.

North Grenville, Ontario

The slightly larger town of North Grenville has a Master Servicing Plan that required an additional costly activated sludge wastewater treatment plant capable of dealing with more stringent effluent requirements, particularly for phosphorus. The conventional solution, estimated to cost $9 million to $11 million, would include a tertiary treatment train for phosphorus. Instead, the town implemented a phosphorus trading program, funding inexpensive reduction infrastructure at the pollution source to reduce removal requirements at the plant, as well as a staged upgrade of the existing plant. For every dollar invested in that program, it's like saving $8 to $21.

Guelph, Ontario

The rated capacity of the City's wastewater treatment plant was too low to accommodate projected future growth, but an expanded facility would result in more stringent effluent requirements due to increase flow into the Speed River. Expansion and addressing effluent would cost up to $13 million, including anaerobic digestion and ultraviolet disinfection, but Guelph decided to take a different route.

The City implemented an optimization program for infrastructure and processes to re-rate the treatment plant, thereby deferring the need for expansion. A focus on "human infrastructure" resulted in investment in staff training and skills development, enabling staff to improve process control, including reduction of ammonia and chlorine residuals in the effluent, which eliminated the need for UV-disinfection costs.

Moving forward

The Invest to Save concept encourages municipalities to explore innovative solutions before seeking provincial funding. But there's more to the concept, and it involves a shift in the way we think about regulation and procurement.

"Performance-based regulation, rather than prescriptive regulation, means we can get the same outcomes using different technologies," says Lesley Herstein, a University of Toronto PhD student who has been working with the Invest to Save group. "To get to this point, we ultimately need a shift in procurement practices to qualifications-based selection versus price-based selection."

In other words, municipalities need more latitude to produce the required results. They need to have the opportunity to "do more with less" with a little more creativity.

To enable non-traditional approaches, there needs to be a shift in the way infrastructure programs are built and delivered, Lucas adds. "Currently, there is no mechanism in infrastructure funding programs that provides incentives or funding for implementing these types of approaches. It's also difficult to account for the return on investments in approaches that offset traditional requirements, such as green infrastructure, even though we know it provides real value."

In addition to gathering case studies, the group is assembling a set of recommendations and consulting with peers, as well as the regulatory bodies. It's clear that municipalities are starting to think long term—whether they're spending government or municipal funds, they must look for the most efficient ways to meet performance targets. WC

Brian Mergelas is WaterTAP's chief executive officer.

An image by Meaghan Ogilvie, part of her underwater photography and video exhibit for PANAMANIA, the arts and culture festival of the TORONTO 2015 Pan Am and Parapan Am Games.

Credit: Meaghan Ogilvie

Putting Water on Page 1

How we can place water front and centre in the public eye? BY RACHEL PHAN

WHEN IT COMES TO WATER perception and management, the public is the chief driver of change. Unfortunately, a shocking number of Canadians appear to be blissfully unaware of any water-related issues plaguing their municipalities and the country as a whole (*see coverage of the RBC Canadian Water Attitudes Study on page 8*). In attempts to encourage the public to seriously think about their water—and the role we all play in caring for it—more media professionals and artists are turning to less conventional methods to get their messages across.

Art as the teacher

The Aqua Lauta is a bizarre contraption. One part bike and one part water-filtration device, the portable structure was built by artist Christopher McLeod and three engineers from McMaster University to get people to engage in the production of potable water. Participants sit on the Aqua Lauta and power the peristaltic pump by pedalling. The pump then feeds into a biosand centrifuge and UV unit constructed from brass, copper, steel, and wood. At the end, the filtered water is safe enough to drink.

"The basic point of the whole project was to get people thinking about what happens when they turn their tap on because most people just don't even consider it," McLeod said. "I wanted to start a dialogue around the amount of energy that is required to move water around.

"I'm not going to hit them hard on the head and say, 'Don't use your water like that,' but I'm going to use my tools as an artist to implant in them ideas about conservation. I'm hoping that will have more of a lasting effect than just yelling at people."

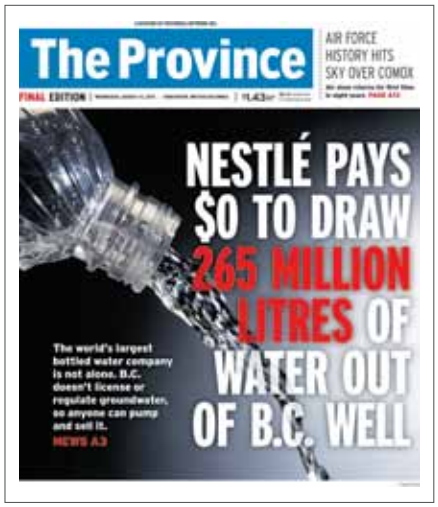
When participants take a seat on the apparatus, they will find pedalling to be a challenge. McLeod said it was always his intention to make it difficult for people to pump the water. "It's about making that connection. People realize they have to work hard to get this water and that we're lucky to live here," he said. "If we lived in a developing country, we might have to walk several miles to get a bucket of clean water." He added that the project is aimed at people who have a lot of water, don't take the time to think about it, and waste it.

"It's hard to get this message across about conservation when there's this general perception that we have such an abundance," he said. "There's a complacency that I'm trying to break people out of by physically engaging them."

McLeod has plans to tour the Aqua Lauta for two years. It has been showcased at the McMaster Museum in Hamilton, Ontario, and even appeared briefly at the Conestoga Mall in Waterloo, Ontario. At the mall, he said one person would start pedalling and instantly attract "40 other people, all trying to figure out what was going on."

"It was fantastic—a lot of dialogue happened that day in the community. People were asking where their water comes from because they didn't know, and we got the conversation going."

Credit: The Province



Above: B.C. water issues have made the front page of The Province newspaper under its "Our Water" series.

The Aqua Lauta project is art with a purpose. It aims to get people thinking about the difficulty—and importance—of conserving water.

Credit: Christopher Mcland

Using art to get people thinking and talking about water is one approach the Toronto 2015 arts and culture program team will be employing next summer during the 2015 Pan/Parapan American Games. From July 10 to August 15, 2015, AquaCulture: A Festival of Water will run along Toronto's waterfront as part of its PANAMANIA festival. It will include arts installations and video projections on water, underwater photography by artists like Meaghan Ogilvie and Edward Burtynsky, water sculptures, and more. There will also be an educational component to AquaCulture, including forums, lectures, and competitions for water conservation.

"I hope that it will show the magnificence of water beyond sports—its cultural possibilities," said Don Shipley, the creative director of arts, culture, and festivals for Toronto 2015. "At the end of the day, we are sufficiently blessed in terms of abundance of water, but we're facing serious issues. I hope AquaCulture will also shine some light on the serious side of water ecology."

Media matters

Since 2012, Alex and Tyler Mifflin have documented their travels around the world as they explore our relationship with water on their TVO show, The Water Brothers. They recognize that water problems are often complex, and it is up to them and their media counterparts to make the issues more accessible.

"We wanted to do something different, and we really wanted to make it fun," Alex said. "We didn't want it to be a traditional talking head documentary, although we have aspects of that. We really wanted to make an adventure travel show and do it in a short format so it's easy for people to get engaged in the issues and have fun with it."

Tyler added, "There are times we could be a little bit more fun, happy, and adventurous, but we always put the content and the issue first."

The brothers said the issues, at a first glance, can seem overwhelming to people, but it is their responsibility to make individuals realize that no problem is too big to tackle head on. "We try to show people that there are things they can do in their daily lives—the small little things that can actually help and make a difference," Alex said. "We're not preaching at people, 'Don't do this.' We give them hope that they can be a part of the solution."

Alex and Tyler, who also do speaking engagements, said the media needs to encourage people to take pride in their water, especially since so many Canadians feel they don't need to care for it—like the 30 per cent of Torontonians who said in the RBC Canadian Water Attitudes Study that they have no responsibility to protect drinking water.

"We should be really proud and want to make sure [our lakes] are as clean as possible. It's got to be something that's a source of national pride," Alex said. "We're all users of water. We're all polluters of water. So unless everyone participates, you can't actually solve the problem, yet many Canadians think their participation is irrelevant."

What's the role of print media?

Stephen Leahy has been a freelance environmental journalist for the past 20 years. He used to write for a prominent Canadian magazine and daily newspaper, but about a decade ago, both publications decided they no longer wanted regular environmental coverage. This continues to be the case in 2014, where traditional print media tend to prefer coverage on sports and business over science and environment.

"I used to write exclusively for Canadian media, but now I don't write for any Canadian media because there's no place for me to get published," he said. "There was never a lot of it anyway, and now there's hardly any. Generally speaking, Canadians are not very well served on that front by their media."

"We're all users of water. We're all polluters of water. So unless everyone participates, you can't actually solve the problem, yet many Canadians think their participation is irrelevant." —Alex Mifflin

But traditional media still plays an important role in informing the public about its water, albeit a shrinking one. After a few stories about water issues sparked public concern over British Columbia's century-old water laws, Vancouver's The Province daily newspaper began running a formal water series—"Our Water"—in the summer of 2013. At its peak, the newspaper ran one or two water stories a week.

"The newspaper had found an issue that we could rally behind and it was fairly uncontroversial because everyone wants to make sure our water is protected," said Province reporter, Dan Fumano, who has led the newspaper's coverage on water. The feedback, he said, has been positive from academics and experts who have been "trying for years to get the public to care about some of these issues." But the most encouraging feedback is the praise the newspaper has received from everyday Canadians.

The Province's coverage has largely been driven by the desire to change the province's outdated water laws, but Fumano said he's noticed people also respond strongly to money matters, specifically the case with Nestlé paying nothing to take millions of litres of fresh water. "Money issues resonate with people," he said. "People think, 'I pay a water bill for the amount of water I used in my house. Why doesn't this multi-billion dollar company pay for a resource they extract and put in bottles and sell back to us?' "

While it seems obvious why residents would take an interest in these issues, Fumano said journalists still have a clear role to play in getting more people engaged with water.

"Our job is to talk to the experts because we're not experts," he said. "I'm not an expert on anything but talking to people who are experts. My job is to be able to take what they say and distill it and present it in a way that will make the general public, who doesn't think about this stuff, care."

It's a domino effect. Once people are informed and care about water, it's easier for political decision-makers—those at the mercy of public opinion every election—to drive effective, potentially costly industry-wide change. WC

Rachel Phan is Water Canada's editor.

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Attitude Adjustment

Is it really possible to change public opinion?

BY ROBERT HALLER

AS AN ASSOCIATION of professionals, the Canadian Water and Wastewater Association (CWWA) has pooled its collective thoughts to respond to legislation, tackled difficult scientific questions, and worked to quantify the overwhelming challenges we face in infrastructure renewal, security, and climate change. But what we are increasingly learning is that we cannot get far without solid public support.

We are the professionals that present well-reasoned calculations and solutions to the political decision-makers, but they in turn are subject to their electorate. If the tax-paying voters don't understand what we are trying to achieve, it is nearly impossible for the locally elected councillor to justify the critical spending decisions that need to be made.

Herein lies our dilemma: how do we get the message out? As the national voice for water and wastewater in Canada, CWWA put a lot of effort into building awareness of itself and the issues of the industry. We are always working to make the media more aware of the issues and to make ourselves available for expert commentary. However, once the story is in journalists' hands, there is no saying how that story might play out. A simple wastewater regulation issue can easily become a story on uranium in drinking water sources. It seems that, on one hand, if we want to control our message, we are restricted to our own distribution channels—thus, we are left preaching to the converted. On the other hand, if we want to reach the general public, we have to work through the media and give up all control.

Or do we?

The City of Regina provides one of the greatest recent examples of engaging a community over water issues. As the city considered the potential of private-public partnerships (P3s) to finance and operate their infrastructure plans, they recognized the uncertainty of the public over this new approach. Through public education and transparency, they were able to assure citizens of the benefits of a P3 model and received public approval through a municipal referendum.

At the moment, many of us are responding to the targets of the new Wastewater Systems Effluent Regulations, and we want (and need) our communities to know where we rank on federal priority lists, the deadlines that have been set, and the estimated costs to meet the targets. We need the public to be aware of our inspection reports—the good, the bad, and the ugly—so they begin to appreciate the investments required to maintain safe drinking water systems and protected environments.

Meanwhile, much larger efforts are underway to figure out how we might change public attitudes around water. The Water Environment Federation, the American Water Works Association, the National Association of Clean Water Agencies, and several other U.S. partners have formed the Value of Water Coalition to tackle this concept.

Here in Canada, CWWA and regional association partners are developing strategies to educate both the decision-makers and the general public. Can we create a video that will go viral—or do we need James Cameron and a list of celebrities to produce a campaign? For now, we can't afford the stars. WC

Robert Haller is the executive director of the Canadian Water and Wastewater Association.

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The Walkerton Clean Water Centre is an agency of the Government of Ontario, established in 2004. WCWC's headquarters in Walkerton are LEED Gold certified and are well-equipped to meet the hands-on training, research and technology demonstration needs of Ontario's drinking water sector. More than 43,000 have participated in WCWC training across the province to date.

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Win A Book:
Flood Forecast

Hydro-climatic change is no longer an abstract or theoretical concept if you have been directly affected by the increase in the duration and intensity of extreme weather. Water Canada is giving away *Flood Forecast: Climate Risk and Resiliency in Canada* by Robert William Sandford and our former editor Kerry Freek. The book explores the increase in extreme weather in Canada and its impact on the hydrological cycle with emphasis on the flooding in Toronto and Calgary in summer 2013.

How were you affected by flooding last year?

Email your answer to **rachel@watercanada.net** and you'll be entered to win a copy of *Flood Forecast: Climate Risk and Resiliency in Canada*.

APPOINTED


Lorne Taylor

Lorne Taylor and **Greg Taylor** have been named chair and vice-chair of Alberta's new arm's-length environmental monitoring agency, the Alberta Environmental Monitoring, Evaluation, and Reporting Agency (AEMERA). The new agency will coordinate province-wide environmental monitoring and evaluation.


Ingrid Stefanovic

After a long career at the University of Toronto, **Ingrid Stefanovic** will be leaving to take up the position of dean of the newly-formed Faculty of Environment at Simon Fraser University in Vancouver.


Raymond Wilcock

The Corrugated Steel Pipe Institute named **Raymond Wilcock** as its executive director. "I am extremely excited about tackling this new challenge and I look forward to renewing relationships as well as establishing new ones," Wilcock said.

Golder Associates Ltd. announced the appointment of 66 principals and associates in Canada to join the company's network of senior owners.

JOINED


Craig Benson

Craig Benson has joined Hatch Mott MacDonald as a senior project engineer for water and wastewater.

WaterTAP CEO **Brian Mergelas** will join ACQUEAU's scientific committee, the world's first water cluster dedicated to financing water innovations.

CELEBRATED

Niagara, Ontario's Walker Environmental received the Exemplary Biosolids Management Award in the full-scale operating project category from the Water Environment Association of Ontario (WEAO).

The Water Research and Innovation Network (WRAIN) celebrated its one year anniversary. The organization is working to identify and solve water issues in the City of Kawartha Lakes, Ontario. The area's economy has been boosted as a result of the water-related projects employing local businesses, workers, and construction contractors.

Thirty-one Great Lakes clean-up projects were celebrated on behalf of federal Environment Minister **Leona Aglukkaq**. These projects were funded by the Government of Canada's Great Lakes Sustainability Fund, which has already supported more than 900 projects since 1989. The newest projects are valued at $1.88 million.

INTRODUCED

British Columbia's Environment Minister **Mary Polak** introduced legislation to update and replace the province's century-old Water Act on March 11. The act will respond to current and future pressures on B.C.'s freshwater and groundwater.

Credit: TK

Enrico Di Nino (centre) has been a perennial leader within Ontario's green economic machine and works the Ontario booth on the tradeshow floor.

Credit: TK

Geoff Britnell (left) and **Shaun McKaigue** of FER-PAL Infrastructure at the Ontario reception.

Credit: TK

L-R: **Brent Wootton**, Centre for Alternative Wastewater Treatment with **Brian Mergelas**, WaterTAP, and **Peter Halsall**, Canadian Urban Institute, gather for a paparazzi shot.

Credit: TK

L-R: **John Neate**, GLOBE Performance Group; **Donna Workman**, University of Toronto; **Olivier Cappon**, CSA Group, and **James Sbrolla**, Cleantech Capital Inc. celebrate successes at GLOBE 2014.

Credit: TK

Water Canada publisher **Todd Latham** (at podium) led a panel discussion on The Business of Water which explored the state of play in Canada's water sector. The panelists, from left: **Rich Cavagnaro**, Adedge Water Technologies LLC; **Albert Cho**, Xylem Inc.; **Jane Pagel** formerly of Ontario Clean Water Agency (OCWA); and **Shaun McKaigue**, FER-PAL Infrastructure Ltd. (not pictured).

GLOBE 2014 Vancouver, BC

Since 1990, the bi-annual GLOBE conference has been a must-attend event in the environment industry. This year, an entire stream of sessions was devoted to water, and one panel (see picture above) discussed a number of business topics including the advantages of P3s for municipalities, how innovative procurement models and technologies are transforming public works, the "true costs of water," and how industry can help municipalities with setting rates and public perceptions on water. The panel and tradeshow discussions also revolved around the progress of water technology: we are seeing movement from the experimental and disruptive to the mainstream and market-leading. *More info at 2014.globeseries.com*

Credit: Rachel Phan

L-R: **Lorrine Hamdon**, partner, TL2 Project & Event Management; **Joe Chowaniec**, ESAA Director, Program and Event Development; **Renee White**, ESAA President; **Joe Barraclough**, ESAA Director- Industry and Government Relations; and **Gavin Scott**, ESAA Past President.

WaterTech 2014 Banff, AB

The Environmental Services Association of Alberta (ESAA) held another successful WaterTech symposium on April 9 to 11, where 400 attendees sat in on a variety of sessions that touched on three key themes: wetlands management, flood response and management, and oil sands water management. Keynote speakers included **Shane Snyder** from the Arizona Laboratory for Emerging Contaminants, **Glenn Isaac** of the North Saskatchewan Riverkeeper, and **Mike Mullane**, a former space shuttle astronaut.

Credit: Le Luong

L-R: City of Brampton's **Dave McKee**, **John Maxwell**, and **Scott Beamish**.

L-R: **Ryan Darbyson**, Civica Infrastructure and **David Kenth**, City of Brampton.

TRIECA Brampton, ON

On March 25 and 26, the Toronto and Region Conservation Authority and the Great Lakes Chapter of the International Erosion Control Association held their third annual TRIECA conference.

Approximately 450 delegates from across North America participated in the two-day event which included a series of 24 presentation sessions and an industry tradeshow with more than 50 exhibitors. Presentation topics focused on the latest innovations, research, policy developments, best management practices, and case study findings related to stormwater management and erosion and sediment control. As always, the networking reception was a highlight of the conference with delegates enjoying live entertainment and the opportunity to network with fellow professionals and industry contacts.

A full list of the conference proceedings and presentations can be found at www.trieca.com. TRIECA 2015 will be held on March 25, 2015.

Managing Risks on High Profile Infrastructure Projects

Toronto, ON

Being transparent, having the right structure and incentives, reaching agreement on what project success looks like, and prioritizing risk management—these were some of the key messages delivered on April 10 at a seminar by GHD to project managers from around the GTA.

Those lessons from **Virginia Greiman**, former deputy counsel and risk manager from the Big Dig in Boston, were timely in light of the many large transit and water projects that GTA municipalities are working on, including the Hanlan Feedermain in Peel Region. **Matthew Bennett**, a project manager with the capital works water division at the region, emphasized the importance of setting contractors up for success, which includes sharing risk. He also highlighted the importance of including and implementing measures like value engineering as part of the bidding and design stages.

Matthew Mendelsohn of the University of Toronto's Mowat Centre (centre) led a luncheon discussion with Deputy Minister of Environment, **Paul Evans** (left) and Deputy Minister of Infrastructure, **Drew Fagan**.

Ontario Environment Minister **Jim Bradley** addresses the reception delegates.

L-R: **John Hill** of the Region of Waterloo, **Stephanie Sidler** of the Regional Municipality of Durham and **Lou Di Gironimo** of Toronto Water on the cleantech opportunities panel.

ONEIA 2014 Business & Policy Forum Toronto, ON

Attendees from a range of environment firms, financial and investment companies, and all levels of government participated in a day of panel and roundtable discussions that included remarks by City of Toronto Deputy Mayor **Norm Kelly,** the Deputy Minister of Environment **Paul Evans**, and Deputy Minister of Infrastructure **Drew Fagan**. The afternoon roundtable sessions on waste, water, air/approvals, green R&D, and brownfields brought company representatives together with senior ministry officials for collegial and off-the-record conversations that allowed both parties to share concerns and identify areas where they could work together. The day then concluded with a cocktail reception featuring the Minister of Environment **Jim Bradley**, who reiterated his ministry's appreciation of the work done by ONEIA companies.

L-R: **Alex Chik**, Canadian Water Network; **Andrew Wong**, University of Waterloo; and **Gemma Charlebois**, Stantec/University of Waterloo.

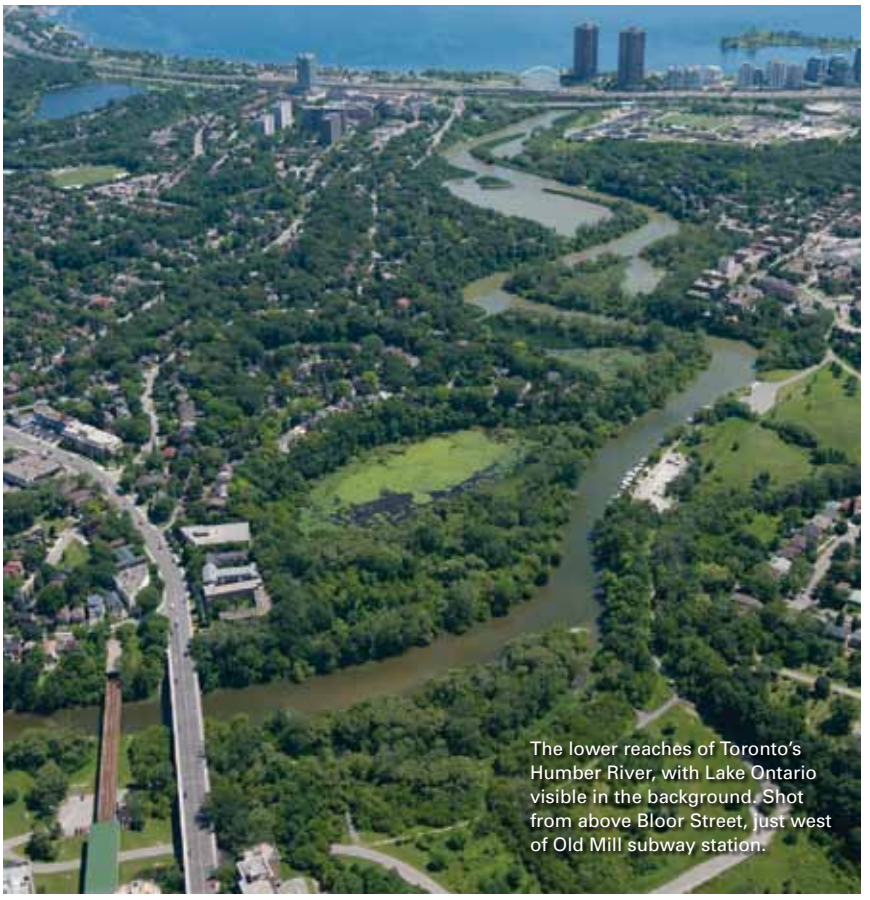
Credit: Anita Wilson

Robert Haller opens the 49th Central Canadian Symposium on Water Quality Research and Wastewater Management Conference.

49th Central Canadian Symposium on Water Quality Research and Wastewater Management Conference

Niagara-on-the-Lake, ON

CWWA and **CAWQ** joined forces again to host the CWWA's National Wastewater Management Conference and CAWQ's Central Symposium on March 5 to 8. As CAWQ president **Clayton Tiedemann** stated, "The event is designed to bring together academics, researchers and government regulators with the utility management leaders." In addition to the expert panels and presentations, the successful joint conference included a trade show, several student presentations. and a young professionals reception.



The lower reaches of Toronto's Humber River, with Lake Ontario visible in the background. Shot from above Bloor Street, just west of Old Mill subway station.

Help Urban Rivers Thrive to Support Nature and People

BY DAVID MILLER

URBAN RIVERS face unique pressures that too often leave them in an unhealthy state. The choices we make on land—including how we plan and build our cities and industries—impact our waters. And the needs of people and economies take priority over the needs of nature when we make choices in managing urban waters. As a result, we often take more than our rivers have to give.

But that doesn't mean urban waters are compromised beyond repair. Cities and their economies rely on nature, and nature can support cities. With a little help, nature can do even more, and with the right science and on-the-ground support, urban waters can thrive.

The Humber River in Toronto's west end is a great example of how an urban river can succeed. Recently, WWF released its Freshwater Health Assessment of the watershed that found the river was in fair health, with good or fair scores for water flow and quality as well as fish and bug populations. It's an impressive achievement by local organizations that have been working tirelessly to monitor and restore this river, the health of which was once very much in doubt. These efforts have been assisted by good public-policy choices by urban communities and provincial governments, although more must be done to achieve good overall health.

Reaching that goal will require more community-level engagement and efforts from local watershed organizations. Together, these groups can drive projects and policy to help make their waters healthier using science-based plans.

WWF is helping build essential community engagement through its Loblaw Water Fund (*www.wwf.ca/waterfund*), which contributes to critical projects that aim to conserve, protect, or restore freshwater and riparian habitats and the species living within them. One of the first projects the fund is supporting will engage the multicultural Humber community on urban water issues by creating educational materials in several languages and hosting interactive activities, including citizen fish tagging, water monitoring, and shore restoration efforts. This is the fund's first year of grants in a three year commitment, and the 2015 grants will open for submissions in fall 2014.

We're also providing insight to support science-based plans for Canada's rivers. Over the next three years, WWF will assess the health of and risks to more of Canada's urban rivers, including the entire St. Lawrence watershed in 2015. It's an ambitious undertaking that reflects our conviction that cities have a critical role to play in supporting and safeguarding nature.

This gives us a blueprint for action. We need a clear picture of how our rivers are faring to understand their most critical needs, which we can then work together to address. We need to understand how they fit into a national picture of water health so we can guide policy to secure their long-term health. Never has this purpose been more important than in the new era of changing climate, when we'll need to adapt to new conditions and help nature and people thrive.

Canada is home to around 20 per cent of the world's fresh water, and that gives us a special responsibility to steward this critical resource. Only once we know how healthy our rivers are, and what it will take to make them so in a changing future, can we effectively work to ensure our waters become and remain healthy. WC

David Miller is the president and CEO of WWF-Canada.

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