Brewery Creek and Beyond:

THE PROBLEM WITH COMBINED SEWER OVERFLOWS IN OTTAWA & GATINEAU

Ottawa RIVERKEEPER®
SENTINELLE Outaouais

Words from your Riverkeeper

Brewery Creek and the Ottawa River support diverse and amazing aquatic ecosystems and offer city dwellers a much needed nature retreat. Our rivers have become well-loved playgrounds, classrooms and sanctuaries of peace and reflection.

Unfortunately, our cities were designed to divert our sewage and wastewater into the rivers that flow through our communities. The sewage and wastewater end up in our playgrounds and our source of drinking water. The good news is that this problem can be fixed. However, it takes time, money and a commitment to make clean water a priority.

That's where you come into this story. It takes a watershed to protect a river and throughout our large, diverse watershed Ottawa Riverkeeper is building a diverse river constituency that will stand up when necessary and motivate our politicians and decision-makers to protect and restore our rivers.

No one wants to swim in sewage, or splash and play in the river with their kids when a combined sewer is releasing millions of litres of untreated sewage from our homes and businesses into it. That is why we launched our #WeWantToKnow campaign. We believe we all have the right to know what is being dumped into our river, when it is being dumped and where it is being dumped. Not only will this information help swimmers, fishermen, paddlers and explorers make informed decisions about when to have contact with the river, it will also help all of us understand the scope of the problem we are facing. We are asking our two biggest cities, Ottawa and Gatineau, to report in real-time to the public when untreated sewage is released into our shared river. Other cities such as Kingston and Sudbury notify their constituents when and where untreated sewage flows into nearby lakes and rivers.

If you have not yet joined our campaign by sending a letter to the mayors of Ottawa and Gatineau about reporting on sewage spills, it is not too late! Go to wewanttoknow.ca to send your letter and amplify our voice. Together we are stronger.

At Ottawa Riverkeeper we are grateful to work with community leaders like Sheila Jones, founder of The Friends of Brewery Creek, who take an interest in the health of their local river AND take action to protect it. About five years ago Ottawa Riverkeeper trained and equipped Sheila to monitor the water quality in Brewery Creek and every year she has been there with her husband John taking water samples weekly and bringing them to the lab, organizing clean-ups, community meetings and taking time to talk to city staff and politicians about her home waters, Brewery Creek. Sheila is amazing, but she needs help: consider getting involved if you too would like an urban creek protected.

Together, we can bring back Brewery Creek and one day explore its entire length without worrying about getting sick from contaminated water. Imagine a future paddling loop around the island of Hull, a living classroom for the students at École secondaire de l'Île; all a possibility, if we work together.

Executive Summary

Every year the cities of Gatineau and Ottawa release millions of litres of untreated wastewater into local creeks and rivers through combined sewer overflows. This occurs when sewers become full during rain and snow melt events, causing sewage to flow directly into local rivers and creeks. The discharge of untreated sewage into our rivers is no longer acceptable. Combined sewer overflows pollute our rivers and puts people at risk. It's time to take water protection seriously.

An important step would be to inform the public when and where a sewage overflow is occurring in real time so they can make an informed decision about how to use the river. This will help people avoid areas impacted by combined sewer overflows which contain sewage with bacteria, pathogens, viruses and parasites that can be harmful to the environment and human health.

One example of the effect of sewage overflows on our local waterways is through results of water quality testing carried out by the Friends of Brewery Creek and Ottawa Riverkeeper in Brewery Creek for the past five years. Brewery Creek is a 4.9 km long arm of the Ottawa River that forms the island of Hull beginning at Parc des Portageurs and re-entering the river beside Jacques Cartier Park. The creek has a rich aquatic environment within the downtown area of Gatineau. Since 2013, Ottawa Riverkeeper has worked with the Friends of Brewery Creek to analyse E. Coli levels in the creek to better understand the water quality of this waterway. The results of the current season of water testing continue to highlight the negative impact of untreated sewage entering the creek from combined sewers.

Water flowing into the creek from the Ottawa River consistently has water quality suitable for swimming and boating. However, further downstream below the dam below Montcalm St., water quality showed results show that E.Coli levels above 2000 CFU/100mL which is unsafe for most activities, including canoeing and kayaking. Of the ten weeks that water quality test were completed in 2017, only 4 results at the dam below Montcalm St. location showed E. coli levels that would be safe for boating and none that would be safe for swimming or wading. The two other downstream locations had fluctuating E. coli counts, highlighting the importance of informing citizens about combined sewer overflows so they can confidently access this waterway when E. coli levels are safe. This downstream area is also where a number of combined sewer overflow sites are located and these high concentrations of E. Coli in the creek are indicative of untreated sewage entering the creek.

Introduction

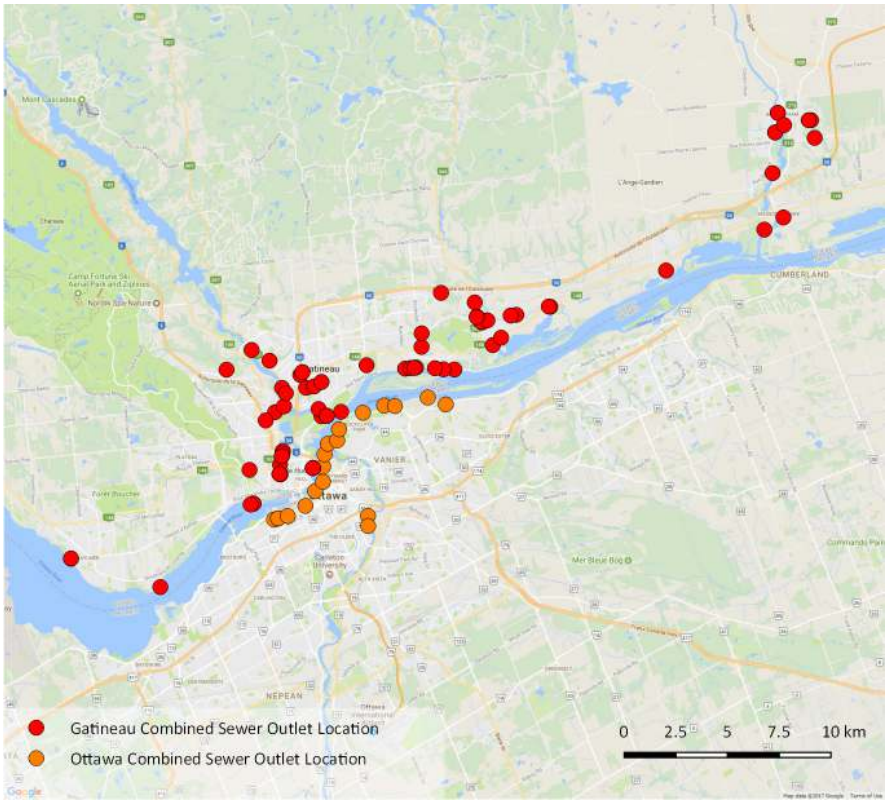
COMBINED SEWER OVERFLOWS: WHAT ARE THEY?

There are three kinds of sewers in use in Gatineau and Ottawa: wastewater, stormwater, and combined sewers. Wastewater sewers (also known as sanitary sewers) collect the wastewater from the drains and toilets in homes and businesses and transport it to the wastewater treatment facility. Stormwater sewers collect rainfall and surface water run-off and transport it, untreated, to creeks and rivers. Combined sewers in older parts of Ottawa and Gatineau collect wastewater and stormwater in one pipe and transport it to the wastewater treatment facility. (City of Ottawa, n.d.-b)

During heavy rain storms or spring snowmelt, the combined sewers often fill and the excess stormwater and wastewater mixture is released directly into the cites of Gatineau and Ottawa rivers as a combined sewer overflow bypassing treatment in a wastewater treatment facility. To reduce the number and volume of combined sewer overflows the infrastructure needs to be improved through separate pipes for stormwater and sewage, larger pipes or more storage tunnels, or reducing the volume of runoff through green infrastructure and better stormwater management.

GATINEAU

Quebec's Water Treatment Program, launched in 1978, calls for the construction of wastewater treatment plants in municipalities and industries across the province. Prior to that time only two percent of Quebec's population was tied into a sewage system that was connected to a wastewater treatment plant. Gatineau has two water treatment facilities that process a combined average of 164.4 million litres of wastewater per day. (Ville de Gatineau, 2017) Quebec does not adhere to the federal regulations for wastewater treatment facilities outlined by the Canadian Council of Ministers of the Environment. The city of Gatineau follows the regulations set out by the Minister of Sustainable Development, Environment and the Fight against Climate Change (MDDELCC) and voluntarily adheres to the new Program of Excellence in Waste Water, PEX StaRRE. (Ville de Gatineau, Vérificateur Général, 2012; Ville de Gatineau, 2017). Both of Gatineau's two facilities currently operate near capacity and cannot manage high volumes of stormwater during intense snow melts or heavy rainfall. When these events occur, untreated sewage, combined with stormwater, is often diverted into the Ottawa River (Ville de Gatineau, Vérificateur Général, 2012).



COMBINED SEWER OUTLETS IN GATINEAU AND OTTAWA, 2017

Gatineau continues to have a high number of combined sewer overflows. In 2012, the city had 129 km of combined sewers which constituted seven percent of its entire sewer system. (Ville de Gatineau, Vérificateur Général, 2012). Through an access to information request to the City of Gatineau, Ottawa Riverkeeper obtained the 2013 to 2016 annual reports on sewage overflows. The reports, along with the Plan for the Management of Water (Plan de gestion de l'eau 2017-2021) for the City of Gatineau, show that, as of 2017, the city has 90 combined sewer outlets, down from 118 in 2009. Of these combined outlets, ten were found to not conform to current regulations (Ville de Gatineau, b). On two occasions in 2016, they overflowed during dry weather. In 2013, dry weather overflows occurred 18 times. Combined sewer overflows in Gatineau are categorised according to when they occur–during rain, dry weather, snowmelt, an emergency, or other, They occur approximately 1,350 times each year; in 2016, the most recent year for which there is data, there were 1,327 overflows. (Ville de Gatineau, n.d-b).

In 2016, the City of Gatineau started installing measuring devices at 50 of the 90 combined sewer outlets to aid in developing a strategy for dealing with the problem of combined sewer overflows (pers. communication with Ardrè Turgeon, Febuary 24, 2016) The data from these devices has not yet been made public. The City's plan,for managing its combined sewer overflows is to be ready by December, 2017 (Ville de Gatineau, 2017).

OTTAWA

Ottawa has had underground sewers since 1876 but prior to 1962 all the city's wastewater was discharged untreated directly into the Ottawa and Rideau rivers. (Clark, 2012).

In 2010, the City of Ottawa approved the Ottawa River Action Plan and allocated 251.64 million dollars toward it. (Deputy City Manager's report, 2010) The Ottawa River Action Plan consists of 17 individual projects aimed at enhancing the health of the Ottawa River and protecting Ottawa's water environment for future generations. An early project of the Action Plan was to install a real-time control system at three of the sewer regulators with the most frequent overflows. Real time control has reduced combined sewer overflows by approximately 80 per cent between 2006 and 2015, preventing millions of litres of untreated sewage from entering the Ottawa River each year. The action plan also includes a Combined Sewage Storage Tunnel (CSST), currently under construction, that will provide additional storage capacity and help to reduce combined sewer overflows. The CSST project is a 232.3 million dollar investment and part of the Ottawa River Action Plan . Funding is being provided by the Government of Canada, the Government of Ontario, and the

City of Ottawa.

As of 2017, Ottawa still has 102 km of combined sewers. There are currently 16 combined sewer outlets on the Ottawa River and two on the Rideau River where untreated wastewater and stormwater can overflow into the environment. (City of Ottawa, n.d.b). In 2016, there were 28 combined sewer overflows resulting in the release of about 540 million litres of untreated wastewater and stormwater into the river. This is equivalent to the amount of water in approximately 217 Olympic swimming pools. Six of these overflows happened in July and five in August, when recreational use of the river is at its peak. (City of Ottawa, n.d.b). As of early September, there have been 33 such events in 2017 which released a total of 1,460 million litres of untreated waste and storm water into the river.

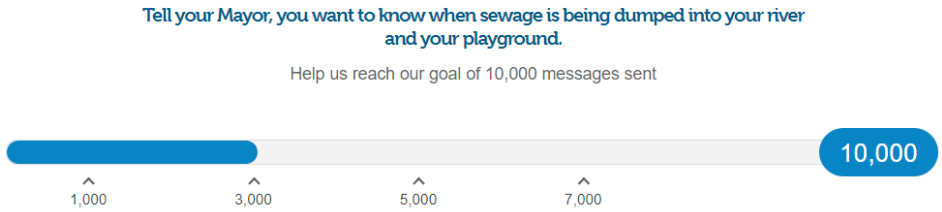
IMPACTS OF COMBINED SEWER OVERFLOWS

Whenever a combined sewer overflow occurs, sewage containing bacteria, viruses and parasites harmful to human health are released into freshwater environments. These pathogens can result in a number of different health issues. The most common for swimmers is gastrointestinal infection which can cause diarrhea, vomiting, and abdominal cramps and pain. Contact with water contaminated with sewage can also result in eye, ear, nose and throat infections, as well as skin rashes. In rare instances, more serious illnesses such as cholera, typhoid fever, dysentery, and hepatitis, can be contracted. (Cross, 2015)

Untreated wastewater is not only harmful to humans but also to aquatic ecosystems. Wastewater contains nutrients such as phosphorus, nitrogen and ammonia, all of which promote plant growth and, in turn, deplete the oxygen available for aquatic organisms. Significant volumes of nutrients, can cause eutrophication and lead to fish kills. In addition, the chlorine compounds and inorganic chloramines in treated drinking water can be toxic to fish, algae and aquatic invertebrates. (Environment and Climate Change Canada, 2014)

A growing list of new and potentially harmful pollutants can be found in wastewater. This includes pharmaceuticals, personal care products, flame retardants, microplastics, triclosan and endocrine disrupting substances. Some of these pollutants do not biodegrade, nor can they be removed during wastewater treatment. and They can persist in the aquatic environment (and our drinking water) for generations to come. (Yu et al., 2009; Giesy et al, 2010) One example is Bisphenol A (BPA). When found in freshwater environments, BPA disrupts the hormone balance of fish and frogs by,increasing estrogen activity. (Yu et al., 2009; Giesy et al, 2010) Other endocrine disruptors contained in cosmetics and personal care products end up in wastewater. Long-term exposure to these chemicals, even at low levels, can have adverse effects on the growth and reproduction of aquatic organisms. (Kleywegt, 2007) In addition, recent tests in the Ottawa River show that microplastics, which are carried in wastewater, are more prevalent in this waterway than other studied freshwater rivers (Vermaire et al., 2017). Reducing combined sewer overflows will help protect the water quality within the Ottawa River.

We Want to Know Campaign



The Ottawa River is a place of recreation for people who enjoy swimming, fishing, boating and more. Untreated sewage from many municipalities often flows into the Ottawa River especially when it rains or when snow melts. This poses a significant and an easily avoidable health risk to river users. We believe the public has a right to know when and where a sewage overflow occurs so they can make informed decisions about their recreational use of the river.

Governments providing timely notifications to the public on sewage overflows is not new and is currently in place in a number of cities in North America. New York State passed the Sewage Pollution Right to Know Law in 2012. This law gives the public the right to know when raw or partially treated sewage is discharged into New York waters, allowing the public to avoid unnecessary exposure to sewage pollution that may contain viruses and pathogens. In Canada, municipalities such as Sudbury and Kingston provide their citizens with real time reporting public notifications of sewage spills.

During the summer months of 2017, over 3,000 people sent a letter to the mayors of Ottawa and Gatineau, telling them **We Want To Know** when untreated sewage is released in the Ottawa River and its tributaries.

Working towards a better understanding of water quality in the case of Brewery Creek

BREWERY CREEK

Brewery Creek is a 4.9 km long arm of the Ottawa River which forms the island of Hull. It begins at Parc des Portageurs and re-enters the main river beside Jacques Cartier Park. The creek supports a rich biodiversity that been enjoyed by naturalists since the 19th century. However, historically, it has also been subjected to sewer outflows and industrial contamination. The steep shoreline along the upper reach of the Creek has been canalized. Infrastructure to control the water level has frequently been used by the City to abruptly and dramatically change the level and flow rate of the creek to facilitate work along its banks. .

In recent years, the community has begun to see the creek as a space that could be better used to connect people who live, work and visit Gatineau to the river and the natural environment. Brewery Creek is a unique ecosystem in the heart of the city with a variety of habitats that support a vast number of aquatic and riparian species. It is a potential recreational area for activities such as paddling during the warmer months and skating during the winter. In 2012, a group of citizens formed Les Amis du Ruisseau de la Brasserie a citizen voice for the creek. They have organized and taken part in public outreach events to educate the community about the creek's rich history, its health, and biodiversity.

FRIENDS OF BREWERY CREEK AND OTTAWA RIVERKEEPER

In 2013, wanting to improve access to the creek and encourage its use and appreciation by the community, the Friends of Brewery Creek shared their concerns with the Ottawa Riverkeeper. Water quality was a major concern.. On investigation, Ottawa Riverkeeper and Friends of Brewery Creek found that, despite the significant number of threats to water quality, including several sewers that discharge directly into the creek, there was no study on the water quality of the creek and therefore no way to determine if the creek is safe for recreation. The Friends of Brewery Creek and Ottawa Riverkeeper joined forces to set up a program to monitor the water quality of the creek in order to:

1. document the quality of water used for recreational purposes along the creek during the summer months, and
2. to raise community awareness about threats to the health of the creek in order to improve it.

Water quality sampling along Brewery Creek

SELECTION OF SITES

In order to understand what the water quality is throughout Brewery Creek, water sampling locations were selected in 2013 and then adjusted in 2014 to better distribute the sites across the creek. The current locations, in order, are: the headwater in Portageurs park, the outlet at dam below Montcalm St., the pedestrian bridge near Desjardins Park, and the mouth of creek near Jacques Cartier park.

WATER SAMPLING AND ANALYSIS

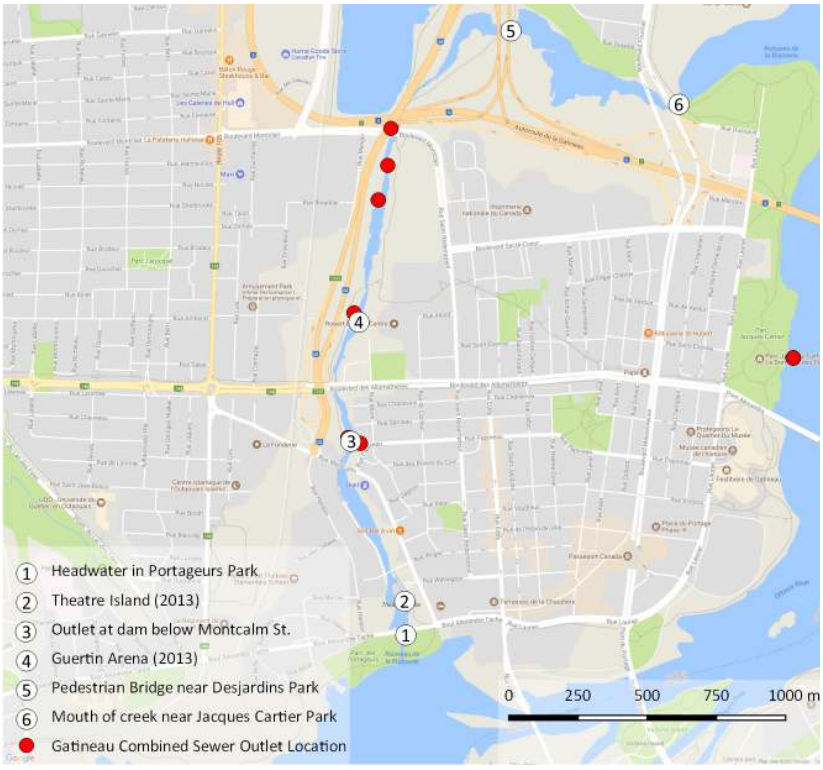
E. Coli bacterium was chosen to measure water quality because it is an indicator of fecal contamination from potential urban pollution sources such as combined sewers and stormwater outfalls. In addition, *E. coli* is used as a primary indicator of water quality for recreational purposes since it signals the presence of pathogens harmful to human health in the water column: if *E. coli* is present, there is a high likelihood that other pathogens and viruses are also present.

Ottawa Riverkeeper scientist trained volunteers to collect water samples using the Canadian Council of Ministers of the Environment (CCME) water sampling protocols (CCME, 2011). A water sample was collected at each of four locations weekly during the summer (June to August) from 2013 to 2017 and submitted to MicroB, an accredited laboratory (67, Blv. St-Raymond, Gatineau) for analysis of *E. Coli* bacteria. Sterilized bottles, supplied by the MicroB laboratory, were submitted to the laboratory for analysis within two hours of sampling. Water samples were stored and transported in a cooler with ice. The analytical results were received by e-mail to Ottawa Riverkeeper and reviewed and analyzed by the scientific expert.

DETERMINING WATER QUALITY GUIDELINES

Concentrations of E. Coli were compared to Health Canada's guideline values for fresh water recreational water quality, for primary and secondary contact activities. Primary contact activities are those, such as swimming, in which the person's entire body is frequently under water. If there is a chance of swallowing water, the activity is considered primary contact. A primary contact activity carries the highest risk of contracting an illness due to contaminated water. People coming into secondary contact with water (people boating, paddling, or fishing) are also at risk of contracting an illness due to contaminated water, even though they are not submerged in the water. (Parent-Doliner, 2016) Risks of experiencing adverse health effects increase in relation to the concentration of pollution and length of time of exposure to the polluted water. (Cross, 2015)

For the testing done on Brewery Creek, the single-sample maximum guideline for E.Coli was used as it indicates immediate water quality issues for a single sample every week at each location. To estimate secondary contact limits for a single sample, the sample values is multiplied 5: 400 CFUs/100 ml x 5 = 2000 CFUs/100 ml (Health Canada, 2012) Therefore, to determine water quality thresholds, the following guidelines were used for single-sample concentrations:



SAMPLING LOCATIONS AND COMBINED SEWER OUTLETS

- Primary contact recreational activities: ≤400 E. coli/100mL
- Secondary contact recreational activities: ≤2000 E. coli/100mL

RESULTS

The figure below shows the concentrations of E. Coli for 2017 in comparison to each sampling location. As shown on the figure the headwater sampling location had the lowest concentrations of E. Coli compared to the other sampling locations. The outlet at the dam below Montcalm St. appears to have the highest concentrations of E. Coli followed by the mouth and pedestrian bridge sample locations.

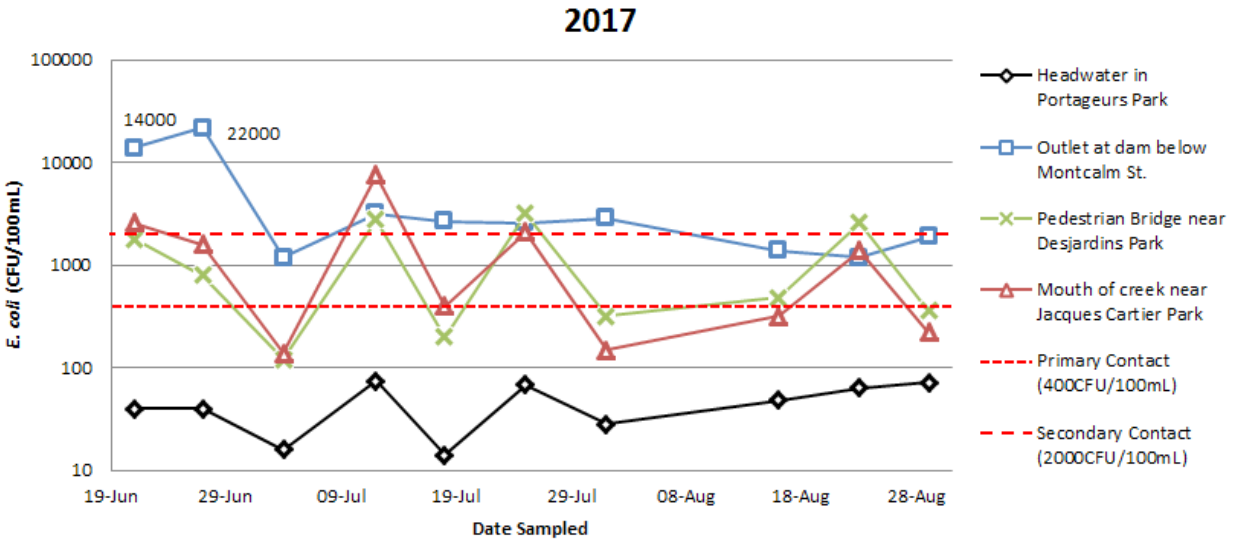


TABLE 5: SUMMARY OF E. COLI SAMPLE RESULTS FOR THE YEARS 2013-2017

Sample Location	*n*	Years	Geometric mean (min-max) (CFU/100mL)	Median (CFU/100mL)	% of samples that exceeded primary contact guideline (>400CFU/100mL)	% of samples that exceeded secondary contact guideline (>2000CFU/100mL)
Headwater in Portageurs Park	39	2014-2017	37 (6-200)	40	0	0
Island[1]	7	2013	137 (22-500)	84	29	0
Outlet at dam below Montcalm St	44	2013-2017	1910 (110-24000)	1400	93	47
Guertin Arena[1]	7	2013	393 (100-1800)	380	43	0
Pedestrian Bridge near Desjardins Park	46	2013-2017	563 (24-4800)	500	59	15
Mouth of creek near Jacques Cartier Park	39	2014-2017	683 (100-12000)	520	56	28

1. Sample locations were moved to better distribute them across the creek

DISCUSSION

Brewery Creek is home to a rich variety of plants, birds, fish, insects, amphibians and reptiles and provides valuable natural space to the citizens of Gatineau and Ottawa. To better understand this ecosystem, Ottawa Riverkeeper worked with the Friends of Brewery Creek and the Canadian Wildlife Federation to host a bioblitz in 2013 and identified over 390 species present in the creek during a 24 hour period. The sampling program carried out in the summers of 2013 to 2017 indicate that parts of Brewery Creek regularly experience high levels of E. Coli that threaten the health of the creek and the species that live there. It also highlights the need for people to be well informed before undertaking recreational activities such as canoeing, kayaking and fishing since water quality fluctuates dramatically.

Based on the results of the sampling program, the source for the E. Coli present in the creek is from points along the creek itself and not from the Ottawa River as the headwater samples had the lowest levels of E. coli in the creek. The highest concentrations of E. Coli are routinely located downstream from the dam at Montcalm St., where there is a known combined sewer outlet. Other combined sewer outlets are known to be located along the downstream reach of the creek. The varying results for the three sites below the dam could be attributable to them.

In 2016, the combined sewer outlet immediately downstream from the dam at Montcalm had 102 overflows, 68 of which were caused by rainfall. Forty-five combined sewer overflows were recorded at a combined sewer outlet located along the creek near the Guertin Arena. Two outflow locations close to Montclair Boulevard had a total of 52 overflows. Other locations along the creek had no combined sewer events in 2016.

The E. coli test results combined with data about the frequency and location of combined sewer overflows indicate that the water in Brewery Creek is not being appropriately protected. The actual volume of sewage being released into the creek during each overflow event would be valuable additional data. Hopefully, in the near future we will also know in real time when an overflow is occurring. Most importantly, a plan and action to reduce combined sewer overflows is needed so that Brewery Creek and its natural environment can be enjoyed safely by all.

Recommendations

Recommendation 1: Sewage system operators within the cities of Ottawa and Gatineau should implement real time public reporting of sewage spills; they should notify the public and health organizations within 4h of a dry weather or wet weather sewer overflow (ex. open data, city website, social media, text message, etc.).

Recommendation 2: The City of Gatineau should make it a priority to reduce and eliminate wastewater overflows in both dry and wet weather conditions, including through a rigorous and ambitious infrastructure funding plan.

Recommendation 3: The cities of Ottawa and Gatineau should harmonize the frequency of water quality testing as well as use similar thresholds for determining beach closures along the Ottawa River so citizens can make informed decisions on accessing the river.

Recommendation 4: The cities of Ottawa and Gatineau should systematically include green infrastructure whenever roads are repaired, as an efficient way to reduce the amount of stormwater runoff into the sewage system. New road designs should include effective green infrastructure to help manage stormwater flow efficiently and minimise any additional volume of existing infrastructure.

Recommendation 5: The cities of Ottawa and Gatineau should invest in decontamination and renaturalization of their urban streams and shorelines to improve not only river water quality and biodiversity, but also quality of life of the local neighborhoods.

Get Involved! Become a Riverwatcher

We are constantly faced with numerous social, environmental and economic challenges within our society and their solutions often seem daunting. There are many creative ways that people within a community can respond to those challenges. Friends of Brewery Creek is an amazing demonstration of what can happen when a caring group of dedicated members of a community come together. Throughout the existence of this group, they have organized many community events including shoreline cleanups, community presentations, educational days for youth, and more. They created opportunities for people in their community to get involved around the important issues affecting Brewery Creek. They have also worked hard to gain credibility as a community group able to discuss issues with their local elected officials.

"Never doubt that a small group of thoughtful, committed, citizens can change the world. Indeed, it is the only thing that ever has."
– Margaret Mead

For those of you looking for ways to get involved in your community, think of becoming a Riverwatcher and join a network of over 70 Riverwatchers throughout our watershed.

RIVERWATCHERS:

- can be an individual, or a local group of caring individuals (ex: Rowing Clubs, community groups, etc.)
- receive tools and resources to better engage community members in various ways.
- are citizen scientists and participate in regularly-scheduled water quality testing. Ongoing training is provided.
- advocate for the stretch of the river near their home along with local Riverwatchers (when applicable)

Become a Riverwatcher today!

To learn more about the Riverwatch Program contact:

Larissa Holman, Riverwatch Coordinator
lholman@ottawariverkeeper.ca

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Appendix A – Brewery Creek Sampling Methods

A water sample was collected at each location approximately once a week during the summer (June to August) for analysis of E. Coli bacteria. E. Coli bacterium was chosen to measure water quality because it is an indicator of fecal contamination from potential urban pollution sources such as combined sewers and storm outfalls.

Concentrations of E. Coli were compared to Health Canada's guideline values for fresh water recreational water quality, for primary and secondary contact activities. Primary contact activities are those, such as swimming, or wading. If there is a chance of swallowing water, the activity is considered primary contact. People coming into secondary contact with water (people boating, paddling, or fishing) are also at risk of contracting an illness due to contaminated water, even though they are not submerged in the water. (Parent-Doliner, 2016) Risks of experiencing adverse health effects increase in relation to the concentration of pollution and length of time of exposure to the polluted water (Cross, 2015)

For the testing done on Brewery Creek, the single-sample maximum guideline for E.Coli was used as it indicates immediate water quality issues for a single sample every week at each location. To estimate secondary contact limits for a single sample, the sample values is multiplied 5: 400 CFUs/100 ml x 5 = 2000 CFUs/100 ml (Health Canada, 2012) Therefore, to determine water quality thresholds, the following guidelines were used for single-sample concentrations:

- Primary contact recreational activities: ≤400 E. coli/100mL
- Secondary contact recreational activities: ≤2000 E. coli/100mL

RESULTS

Tables 1 to 4 summarize the results of the E. coli sampling at each sample location.

HEADWATER IN PORTAGEURS PARK

TABLE 1: SUMMARY OF E. COLI SAMPLING RESULTS AT HEADWATER LOCATION

Year	2017	2014-2017
# of Samples	10	39
Average (CFU1/100mL)	46	49
Min (CFU/100mL)	14	6
Max (CFU/100mL)	74	200
% of samples that exceeded primary contact guideline (>400CFU/100mL)	0%	0%
% of samples that exceeded secondary contact guideline (>2000CFU/100mL)	0%	0%

1. CFU – Colony forming unit

As indicated in Table 1 no samples obtained from 2014 to 2017 exceeded the guidelines for primary or secondary recreational activities at the Headwater location. The average concentration of E. Coli in all samples between 2014 and 2017 was 49 CFU/100mL which is below the guidelines for primary and secondary recreational activities.

OUTLET AT DAM BELOW MONTCALM STREET

TABLE 2: SUMMARY OF E. COLI SAMPLING RESULTS AT MONTCALM LOCATION

Year	2017	2013-2017
# of Samples	10	44
Average (CFU1/100mL)	3080	1910
Min (CFU/100mL)	1200	110
Max (CFU/100mL)	22000	24000
% of samples that exceeded primary contact guideline (>400CFU/100mL)	100%	93%
% of samples that exceeded secondary contact guideline (>2000CFU/100mL)	60%	47%

1. CFU – Colony forming unit

As indicated in Table 2, concentrations of E. Coli at the outlet at the dam below Montcalm St. exceeded the guideline for primary recreational activities in 100% of samples and for secondary activities

PEDESTRIAN BRIDGE NEAR DESJARDINS PARK

TABLE 3: SUMMARY OF E. COLI SAMPLING RESULTS AT PEDESTRIAN BRIDGE LOCATION

Year	2017	2013-2017
# of Samples	10	44
Average (CFU1/100mL)	733	563
Min (CFU/100mL)	120	24
Max (CFU/100mL)	3200	4800
% of samples that exceeded primary contact guideline (>400CFU/100mL)	60%	59%
% of samples that exceeded secondary contact guideline (>2000CFU/100mL)	30%	15%

1. CFU – Colony forming unit

As indicated in Table 4, concentrations of E. Coli exceeded the guideline for primary recreational activities in 59% of all samples and for secondary recreational activities in 15% of all samples analysed between 2013 and 2017. For the current year (2017) 60% of samples exceeded the primary recreational guideline, and 30% of samples exceeded the secondary recreational guideline.

MOUTH OF CREEK NEAR JACQUES CARTIER PARK

TABLE 4: SUMMARY OF E. COLI SAMPLING RESULTS AT MOUTH OF CREEK NEAR JACQUES CARTIER PARK

Location	Mouth	Summary (Mouth)
Year	2017	2014-2017
# of Samples	10	39
Average (CFU1/100mL)	1653	1719
Min (CFU/100mL)	140	100
Max (CFU/100mL)	7600	12000
% of samples that exceeded secondary contact guideline (>2000CFU/100mL)	60%	56%
% of samples that exceeded secondary contact guideline (>2000CFU/100mL)	40%	28%

1. CFU – Colony forming unit

As indicated in Table 4, concentrations of E. Coli for 2017 exceeded the guideline for primary recreational activities in 60% of samples and for secondary recreational activities in 40% of samples at the mouth of Brewery Creek.

Thank you

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