



Unflood Ontario

PARK AND DROWN: WHY PARKING LOTS IN TORONTO NEED TO CHANGE



Unflood Ontario

ABOUT

Unflood Ontario. Together, Naturally.

Our name is our mission: reduce flooding through natural infrastructure.

A project of Community Foundations around Lake Ontario, we build public demand for Natural Infrastructure and promote its many benefits.

Learn about solutions, engage with your community, and take action.

Join us.

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1. INTRODUCTION

Toronto has a flooding problem.

Our aging infrastructure is now overwhelmed by storms that increasingly unleash heavy rains, sometimes 2.75 inches or more.

The City used to have more greenspace that could absorb rain. But Toronto is increasingly encased in concrete and asphalt, from roads, to condos and big box stores and acres of parking lots. So when it rains hard, these surfaces collect the water, ending up in our sewers.

But nearly one-quarter of Toronto has combined sewer overflow pipes under the ground. These pipes carry both raw human sewage and storm-water. When a big rain storm hits, our sewage treatment plants cannot handle the extra volume of the rain and the polluted water ends up in places it shouldn't go – into basements and directly into Lake Ontario.

This has several impacts according to U. of T. Professor Jennifer Drake:

“The increase in runoff generated by hardscapes increases the frequency and severity of flooding, increases erosion and decreases water quality. These effects are hazardous to both life and property and our aquatic ecosystems.”¹

That's why Toronto's beaches are often closed after heavy rain storms: the bacteria from the combined sewers exceed safe limits for swimming.

¹ Jennifer Drake, professor at the University of Toronto, Department of Civil and Mineral Engineering. Quoted in the Toronto Star, November 26, 2019.



Toronto's Mayor John Tory is well aware of the problem:

"Toronto is experiencing more severe storms, with more rain falling over a short amount of time. This increases pressure on the sewer system and drainage routes, which leads to basement flooding."²



Photo credit: Paul Swansen³

Urban development that relies on concrete and pavement has effectively turned cities into giant drains, so that even small storms can quickly overwhelm the sewer system.

² <https://www.newswire.ca/news-releases/canada-helps-protect-communities-across-the-greater-toronto-area-from-flooding-and-storms-829488305.html>

³ <https://www.flickr.com/photos/pswansen/5704173856>



2. THE PROBLEM WITH PARKING LOTS

2.1. POLLUTION AND STORM-WATER

Highly-used and busy parking lot are amenities that generates income and add value to the property being served. However, they are also a source of increased water pollution, and create high rates of storm-water runoff and negative effects on our lakes and rivers.

Seth Brown, a stormwater program and policy manager at the Water Environment Federation writes about these environmental impacts. He notes:

“...[p]arking and roadway surfaces play a significant role in how stormwater runoff affects our environment. These surfaces often collect [pollutants] associated with petroleum products, bacterial contamination, and metals associated with brake pad wear, among other pollutants.”⁴

As well, sometimes the pavement itself is the dominant pollutant due to the toxic pavement sealants used to resurface parking lots.

All these pollutants wash off the surface during rainfall and snowmelts, and flow into sewer systems without the chance to absorb into the ground as would happen under natural conditions. Yet, if the water were to end up in the ground, it would be filtered naturally.

⁴ <https://www.parking-mobility.org/2016/01/12/tpp-2012-12-calming-the-storm/>



Brown makes a point of highlighting the dramatic difference to water quality between an undeveloped site and a parking lot:

“On an undeveloped site with normal soil and vegetation, only between five and 10 percent of the rainfall that hits the ground will run off the surface; the remaining 90 to 95 percent is intercepted by vegetation or soaks into the ground. But if this site were covered by an impervious surface such as a parking lot, the amount of runoff increases by a factor of five to 10—possibly more—because very little, if any, water soaks in.”⁵

The end effect of this “redistribution” is a huge increase in the amount and rate of rain and snow melt entering Toronto’s stormwater systems.



Photo credit: Famartin⁶

Indeed, all the impermeable space in Toronto, including parking lots, creates a massive volume of runoff with nowhere to go but to follow the natural flow of water toward Lake Ontario. It rushes through waterways, like the Black Creek in west Toronto, into old combined sewers, where pressure builds until the excess explodes into basements, destroying homes and transportation infrastructure, interrupting traffic, streetcars and GO trains.

⁵ <https://www.parking-mobility.org/2016/01/12/tpp-2012-12-calming-the-storm/>

⁶ <https://commons.wikimedia.org/wiki/User:Famartin>



2.2. GETTING A FREE RIDE

In Toronto, the cost of managing storm-water runoff is borne by those who use water, through their City water bills - homeowners, businesses and industries. The more water they use, the higher the bill. The system does not take into account how much stormwater runoff is created by the property owner.

For example, an office tower may have a relatively small footprint on the ground, with only a small paved area around the building. As a result, the property generates little stormwater when it rains. However, the owner pays for stormwater based on the building's water bill, not how much stormwater it generates.

A parking lot, on the other hand, typically doesn't "consume" any water even though the property contributes to the problem of stormwater runoff because of the large paved areas on the property. So the owner doesn't get a water bill at all and doesn't pay anything for the stormwater their property creates.

In other words, owners of parking lots who aren't getting a water bill are getting a free ride. The City has to deal with the storm-water running off the lots, but doesn't charge the parking lots owners for that service.

How much stormwater is being collected by parking lots in Toronto? No one really knows. But we can estimate a range. In 2020 the City of Toronto presented data after undertaking a preliminary analysis of partial GIS data. They reported there are 2.42 million square metres of commercial parking lots in Toronto.⁷

Using Toronto's Open Data Catalogue, we calculated Toronto has 57.5 million square meters of surface parking.⁸ It's unclear what percentage of this surface parking is controlled by businesses that do not have water accounts with the City of Toronto. Based on these calculations, we can assume there are anywhere between 2.42 million to 57.5 million square meters of parking surfaces in Toronto, with an unknown percentage owned by businesses that do not pay anything for stormwater management.

⁷ <https://www.toronto.ca/wp-content/uploads/2020/12/8b47-Water-Users-Consultation-Discussion-Guide-2-Fees-Charges-and-SWM-In...pdf>, p. 9

⁸ To find the approximate amount of stormwater runoff, we needed to calculate the total area of parking lots. First, we used data from Toronto's Open Data Catalogue on the topographical area of parking lots in Toronto (see link below). This data is calculated from aerial mapping data, as such, it does not include the lower floors of parking garages, which is important for our analysis. After re-projecting the data in a GIS (QGIS 3) using the NAD83 projection system, we then used the field calculator to calculate the area of the polygons (in this case, parking lots) in the layer. NAD83 uses metres as its units. We then exported the data into Excel and added up the area of all parking lots (n = 18,605), which was calculated to be 57,545,007 m², or 57.54 km².

<https://open.toronto.ca/dataset/topographic-mapping-physical-area-of-parking-lots/>



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In 2019 Toronto received 95 cm of rain. If it was distributed equally over the 2.42 million to 57.5 million square metres of parking surfaces, this would have resulted in anywhere between 2.3 million cubic metres to 54.6 million cubic meter of stormwater for 2019. That is the equivalent of:

- 2,424 to 772,000 typical backyard swimming pools, or
- the run-off created by 26,796 to 638,600 typical Toronto houses, or
- 1.4 to 34 Rogers Centres.

That's a lot of water entering the stormwater system. And every year, the cost of collecting and dealing with this runoff is not being paid for by many parking lot owners who do not pay a cent in stormwater fees.

What's more, without paying fees that are tied to the volume of stormwater runoff created by the parking lots, there is no incentive for their owners to improve the problem of stormwater runoff.



The August 2018 downpour was classified as a 100-year storm, which means that the likelihood of that much rain falling in a single event is about one per cent in a given year.

Yet it was the sixth 100-year event in the GTA in the past two decades. In the next few years, intense downpours will continue to exceed the capacity of the City's stormwater infrastructure, which wasn't designed to handle such vast quantities of water. And many homeowners will be on the hook for the high costs of flooded basements.

Photo credit: Photo by Chris Gallagher on Unsplash



Indeed, Dianne Saxe, Ontario's former Environmental Commissioner, points out that City Hall politics have led to "gross under-investment" in green and stormwater infrastructure. This includes permeable surfaces in parking lots and landscaping that directs runoff toward trees and greenery built into the hard Cityscape.⁹

The "most egregious" political decision, she said, is the City's refusal to charge property owners for stormwater runoff that their homes or businesses create when paved property stops the natural absorption of rain.¹⁰

"A stormwater charge does two critical things. Number one, it gives property owners a financial incentive to keep the water on their property instead of just dumping it into the public realm at public expense," she said.¹¹

"And, it provides the money the City urgently needs to improve the infrastructure to cope with the growing problem... We need to not only slow the stormwater but also cool the air (with trees on parking lots, for example) as climate change gathers speed."¹²

Heather Marshall, a spokesperson for Toronto Environmental Alliance, said the current system is unfair because some major producers of storm-water runoff pay nothing at all. A new system, she adds, based on the size of a property and how much runoff it has would encourage better management practices.

⁹ As quoted in the Toronto Star, May 21, 2019

¹⁰ As quoted in the Toronto Star, May 21, 2019

¹¹ As quoted in the Toronto Star, May 21, 2019

¹² As quoted in the Toronto Star, May 21, 2019



Parking lot with permeable pavement and grade level rain garden medians.
Photo credit: Columbia University¹³

¹³ <https://blogs.ei.columbia.edu/2016/12/19/students-advise-county-on-permeable-pavement/>



3. HOW TO DEAL WITH THE MASSIVE WATER AMOUNTS FROM PARKING LOTS

The City of Toronto already has guidelines for “greening” parking lots that include natural infrastructure requirements:

“Greening’ the surface parking lot involves planting trees, providing good quality soil and generous landscaped areas, enhancing pedestrian and cycling infrastructure, managing stormwater on-site, reducing the urban heat island effect, and using sustainable materials and technologies.”¹⁴

They incorporate landscaped bio retention areas, pedestrian walkways, and water-sucking trees.

However, these are guidelines, not regulations. In other words, they are not rules but suggestions. While the planning department wants ‘green’ parking lots across the City, there are no municipal laws requiring them.

¹⁴ <https://web.toronto.ca/wp-content/uploads/2017/08/9642-Design-Guidelines-for-Greening-Surface-Parking-Lots.pdf>



Bio-retention median with trees in Millcreek Township, PA.
Photo credit: SeaGrant Pennsylvania¹⁵

3.1. DESIGN REQUIREMENTS

One of the first things City Hall can do is to make the voluntary green parking lots mandatory. That would follow many other jurisdictions in North America that have specific design requirements to minimize stormwater runoff.

For example, Toronto could follow the lead of New York City. With the introduction of such a policy in 2007, it started to reduce the impact of parking lots on the environment. One particular change was a stormwater by-law that established zoning standards for parking lots to make them less impactful. The zoning by-law requires that

“...most new and expanded lots require the use of planted areas both around the perimeter and inside the facility, with the paved areas graded so as to drain storm water into the planted areas (and away from overburdened sewers). It also requires shade trees, bicycle parking, and the screening of trash receptacles.”¹⁶

¹⁵ <https://seagrant.psu.edu/topics/land-conservation-and-public-access/projects/greener-parking-lots-millcreek-township-erie>

¹⁶ <https://www.Citylab.com/transportation/2012/03/how-make-better-parking-lot/1628/>



Design rules for parking lots could also include requirements for their surfaces to be permeable – allowing rainwater and snowmelt to enter the ground. Permeable pavement technology is readily available and even works to reduce run-off in Canadian winters by 45%.¹⁷

In sum, the options to design parking lots in environmentally friendlier ways are plentiful. The technology exists, and municipalities across North America have created laws leading to a new generation of parking areas that don't overload our sewer system.

CASE STUDY: EDWARD GARDENS

Owned by the City of Toronto, Edwards Garden has the largest parking lot in Toronto's park system.¹⁸ In the Spring 2012 the parking lot was transformed into a green parking lot, designed to address stormwater management concerns and complement the existing LEED® Silver certified building.

Prior to the retrofit, the parking lot was a major source of urban runoff to Wilket Creek during storm events, contributing to erosion, elevating flooding risk, and degrading water quality and aquatic habitat.¹⁹

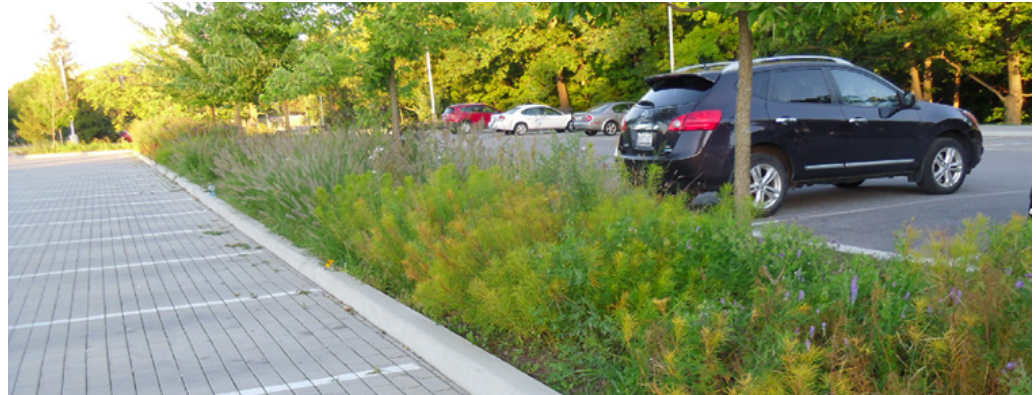
¹⁷ <https://sustainabletechnologies.ca/home/urban-runoff-green-infrastructure/low-impact-development/permeable-pavement/performance-evaluation-of-permeable-pavement-and-a-bioretenion-swale-seneca-college-king-city-ontario/>

¹⁸ <https://sustainabletechnologies.ca/app/uploads/2016/08/Edwards-Gardens.pdf>

¹⁹ <https://sustainabletechnologies.ca/app/uploads/2016/08/Edwards-Gardens.pdf>



The retrofit was designed to capture stormwater runoff and convey it through stormwater biofilters (combined bioretention and infiltration trenches). Permeable pavers were also installed to promote infiltration. These practices have reduced the volume and improved the quality of runoff discharged to Wilket Creek.²⁰



Edwards Garden parking lot retrofit with permeable pavement and stormwater biofilters
Source: <https://sustainabletechnologies.ca/app/uploads/2016/08/Edwards-Gardens.pdf>

3.2. STORM WATER FEES

Another way to reduce stormwater from parking lots is to charge parking lot owners for the use of the City's storm-water system. The more they use, the more they pay. Other businesses pay for water they use and, by fairness, parking lot owners should pay for their use of the City's stormwater system.

In 2017, Toronto Councillors tried to get a "stormwater management charge" applied to homes, shopping malls and other businesses. Following a very thorough consultation and investigation by City staff, the proposal went to Toronto City Council for a vote. With many Councillors supporting it, the Council as a whole was tied and the proposal lost on a tie.

Meanwhile, cities across North America as well as cities close to Toronto are adopting stormwater fees. Mississauga and Kitchener use these fees to pay for pipes or improvements to alleviate flooding. Mississauga fees are based on rooftop size and range from \$50 to \$170 per year. Roughly \$30 million a year is collected in a dedicated infrastructure upgrade fund. Before the implementation of the stormwater charge, the City of Mississauga spent \$14.7 million annually on stormwater management operations costs alone (not capital costs).²¹

²⁰ <https://sustainabletechnologies.ca/app/uploads/2016/08/Edwards-Gardens.pdf>

²¹ http://www7.mississauga.ca/Documents/TW/Environment/RPT_MississaugaStormwaterFinancingStudy_Apr2013_Final.pdf (page 14)



In December 2019, Toronto City Council finally decided to investigate charging a stormwater fee for industrial, commercial and institutional property owners, specifically mentioning parking lot owners. Council directed staff to consult with stakeholders and report back in time for the 2021 budget process.

This consultation is a great opportunity to not only come up with a more equitable stormwater fee structure, but also investigate how new potential revenues could be invested. For example, some City Councillors want to look into incentives for Toronto businesses and residents to undertake sustainable solutions to stormwater flooding: adding trees, greenspace, and rain gardens to get the water into the ground and away from the storm sewers.

CASE STUDY: GO TRAIN PARKING LOT

In 2017, Metrolinx, a Government of Ontario transportation agency, engaged PricewaterhouseCoopers (PwC) Canada to conduct a cost-benefit analysis of investments in natural infrastructure.²²

They focused on the Mount Pleasant GO station parking lot, located in Brampton, and the objective of the pilot was to compare the incremental value of the parking lot designed with natural infrastructure features relative to a baseline scenario without green features.

The cost-benefit analysis included site-level financial considerations and broader environmental and social impacts.

PwC found that investing in green infrastructure at the Mount Pleasant GO station parking lot would generate a value of \$225,777 over 60 years, compared to a base-case option without any green features.

Accordingly, the total economic case for green infrastructure design was compelling: the financial, environmental and social benefits for the green design of the parking lot were over 10 times higher than the additional financial investment required to support the marginally higher operating costs of natural infrastructure features.²³

²² PricewaterhouseCoopers. 2017. Assessing the Business Case for Green Infrastructure through a Total Economic Valuation Approach. Prepared for Metrolinx.

²³ <http://assets.ibc.ca/Documents/Resources/IBC-Natural-Infrastructure-Report-2018.pdf>, page 31.



4. RECOMMENDATIONS

Toronto Council already took an important step towards 'greening' parking lots to protect our stormwater system. In 2019 they directed City Staff to consult the public on a number of possible tools the City could use to ensure parking lot owners pay their way and have the incentives to upgrade their parking lots to become green parking lots. These possible tools include:²⁴

- dedicated stormwater management charge for owners of commercial and retail parking lots to recover the true cost of treating the stormwater from the parking lots;
- separating water use rates from stormwater costs for Industrial and Commercial customers to ensure their water consumption bills and stormwater bills reflect the true costs of these services; and
- incentives for industrial and commercial water customers to use green infrastructure technology.

While this public consultation is an important step forward, there are additional actions the City can take to ensure parking lots become part of the solution to managing stormwater:

- Require the Toronto Parking Authority to immediately start replacing hard surfaces on Green Ps with permeable surfaces, or other solutions recommended in the Green Streets Technical Guidelines, whenever a parking lot is repaired/updated.
- Create an "early starter" fund, with a focus on public institutions and community spaces, to reward parking lot owners who install permeable surfaces.

²⁴ <http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2019.BU11.1>



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**WE CAN UNFLOOD ONTARIO
TOGETHER, NATURALLY.**