ROAD SALT PILOT SUMMARY

Community-based Monitoring of Chloride in Urban Streams

Ottawa RIVERKEEPER®
GARDE-RIVIÈRE des Outaouais

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Fondation

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INTRODUCTION

Winter 2020 marked the pilot of Ottawa Riverkeeper's Road Salt Monitoring program. Running from January 16th to March 31st, the goal of the program was to establish if chloride levels in Ottawa and Gatineau creeks are reaching harmful levels as a consequence of road salt use.

> ***Chloride is particularly toxic to aquatic animals like fish, amphibians and small invertebrates***

Chloride is particularly toxic to aquatic animals like fish, amphibians and small invertebrates, with even small concentrations leading to adverse affects on their growth and reproduction. Not only is chloride toxic, but it is known to be quite persistent once introduced into the environment as there are no biological processes to degrade it. As such, historic chloride loading can have an effect on the environment even years after it is introduced. In an effort to protect our sensitive freshwater environments and the species that call them home, the Canadian Council of Ministers of the Environment (CCME) have established chloride guidelines.

CCME Chloride Toxicity Guidelines for Freshwater Environments:

above 120 mg/L = chronic toxicity
(long-term/sustained exposure)

above 640 mg/L = acute toxicity
(short-term/sudden exposure)

> ***historic chloride loading can have an effect on the environment even years after it is introduced***

Over the course of our pilot season road salt monitoring volunteers regularly collected conductivity data and water samples from five creeks: Pinecrest, Graham, Green and McKay creeks in Ottawa; and Moore Creek in Gatineau (Hull). Based on results

INTRODUCTION

obtained over the course of the program all creeks monitored experienced chloride concentrations in excess of CCME guidelines for the protection of

> ***our local waterways are already experiencing chloride concentrations that pose a threat***

aquatic life, for both chronic and acute exposure to chloride. In other words, our local waterways are already experiencing chloride concentrations that pose a threat to freshwater environments and the species that live in them.

WHAT WE DID

Following the protocol developed by **Milwaukee Riverkeeper**, volunteers were provided with a conductivity meter (a hand held device used to measure the electrical conductivity of water) and sampling equipment, and were asked to monitor a creek site following weather-based "trigger events". Trigger events included any significant snow or freezing rain event (that would trigger the use of road salts), or any rainfall or major thaw, that would in turn result in increased runoff from roads to streams.

> ***volunteers were provided with a conductivity meter and sampling equipment***

Within 48 hours of the trigger event, volunteers measured the conductivity of water at their assigned monitoring site. If the conductivity at their site exceeded 2100 µS/cm, volunteers would then collect a water sample to be analysed at a local lab for chloride. In this case, follow up sampling was conducted within 24 hours, and for up to four days if elevated conductivity persisted.

WHY MEASURE CONDUCTIVITY?

Volunteers monitored their sites by collecting conductivity data following weather trigger events. Conductivity is the measure of how well water can carry an electrical flow and is directly related to the concentration of dissolved ions. When road salt (sodium chloride; NaCl) dissolves in water it breaks down into positively charged sodium ions (Na+) and negatively charged chloride ions (Cl-). As more road salt dissolves, into the water the concentration of ions, and likewise the water's conductivity, increases. Given this relationship, conductivity was used as a proxy for chloride concentrations.

> ***"As more road salt dissolves into the water, the concentration of ions, and likewise the water's conductivity, increases***

Over the course of our pilot program volunteers monitored and collected conductivity data for their sites a combined total of 82 times. Of these 82 times, conductivity levels were high enough to trigger a sample collection 48 times at monitoring sites located on Pinecrest, Graham and Moore creeks. Not only did these two data sets provide us valuable information on the health of these streams, but they also allowed us to refine our protocol for our 2020-2021 season.

WHY MEASURE CONDUCTIVITY?

Modelling of the conductivity versus chloride data we obtained in our pilot study helped us to make updates to our protocol. The direct relationship observed between the two (with chloride concentrations increasing linearly with conductivity). From this we were able to redefine our conductivity trigger to better capture those equally high occurrences of chloride that were missed with our previous trigger. Our modelling showed that a conductivity of 1015 µS/cm more accurately reflected a chloride concentration of 120 mg/L (the chronic toxicity threshold). Therefore, volunteers in our 2020-2021 program are now collecting water samples when conductivity measures 1015 µs/cm and higher.

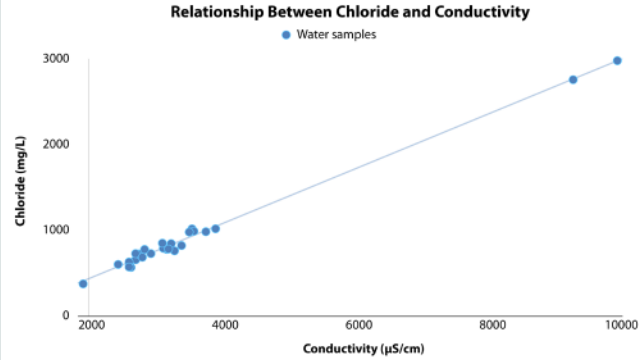


Figure 1. Water samples collected from urban streams during this study revealed that there is a very strong and reliable linear relationship between conductivity levels and chloride concentrations.

WHERE WE MONITORED

Road salt monitoring sites were chosen based on their proximity to major roadways or other areas where significant road salt use is expected (e.g. near shopping plazas, residential areas, community centres, schools). More specifically:

Monitoring Locations

- The Pinecrest Creek monitoring site was located just off the OC Transpo pedestrian walkway, in proximity to the Transitway and the Queensway (exit 127).
- The Moore Creek monitoring site was located in Parc des Noisetiers, in proximity to Boulevard Saint-Raymond and downstream of Hwy 148
- The Graham Creek monitoring site was located in Andrew Haydon Park, off Carling Road.
- Green's Creek location 1 was located in proximity to the Queensway (exit 174), to the west of the Sinclair Plaza, while location 2 was located off the Greenbelt East Pathway and the Sir George-Étienne Cartier Parkway.
- The McKay Creek site was located in the Rockcliffe community, near the New Edinburgh Club, along the Sir George-Étienne Cartier Parkway.

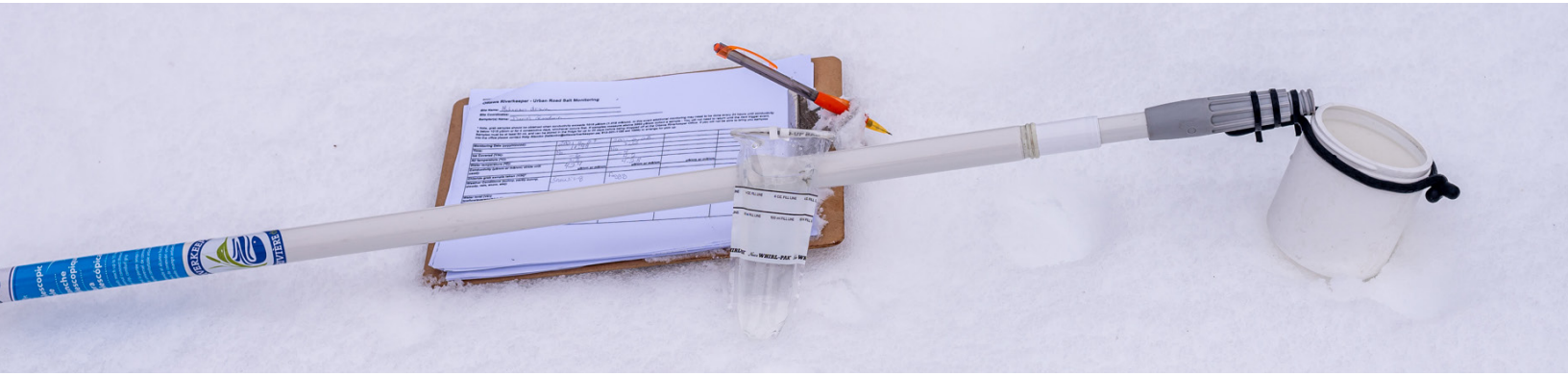
WHAT WE LEARNED

Volunteers collected data from Pinecrest Creek and Graham Creek between January 16th and March 30th 2020, Moore Creek between January 29th and March 3rd 2020, and Green's Creek (two locations) and McKay Creek between March 11th and March 31st. Water samples were collected and analysed for chloride from Pinecrest, Graham and Moore creeks, however in light of the Covid19 pandemic sampling at Green and McKay Creek was cut short and no samples from these sites were processed. While no chloride results exist for these sites, the conductivity readings measured were consistent with those seen at the other 3 sites under chronic chloride toxicity conditions.

Location	Number of Times Monitored	Number of Times Chloride Grab Samples were Collected (1,2)	Maximum Chloride Concentration Measured (mg/L);[date measured]	Average Chloride Concentration Measured Over Monitoring Program (mg/L)
Pinecrest Creek (Ottawa, ON)	34	29 (2)	3454 [Feb 12]	1326.6
Graham Creek (Ottawa, ON)	25	10	2759 [Jan 16]	1130.8
Moore Creek (Gatineau, QC)	10	8 (2)	980 [Feb 17]	724.7
Green's Creek 1 (Ottawa, ON)	3	0	n/a	n/a
Green's Creek 2 (Ottawa, ON)	5	0	n/a	n/a
McKay Creek (Ottawa, ON)	5	1 (2)	n/a	n/a

(1) Chloride grab samples were only collected when site conductivity exceeded 2100 µS/cm
(2) Chloride grab samples collected/submitted after March 12th, 2020 were not analysed for chloride concentration

WHAT WE'RE DOING NOW

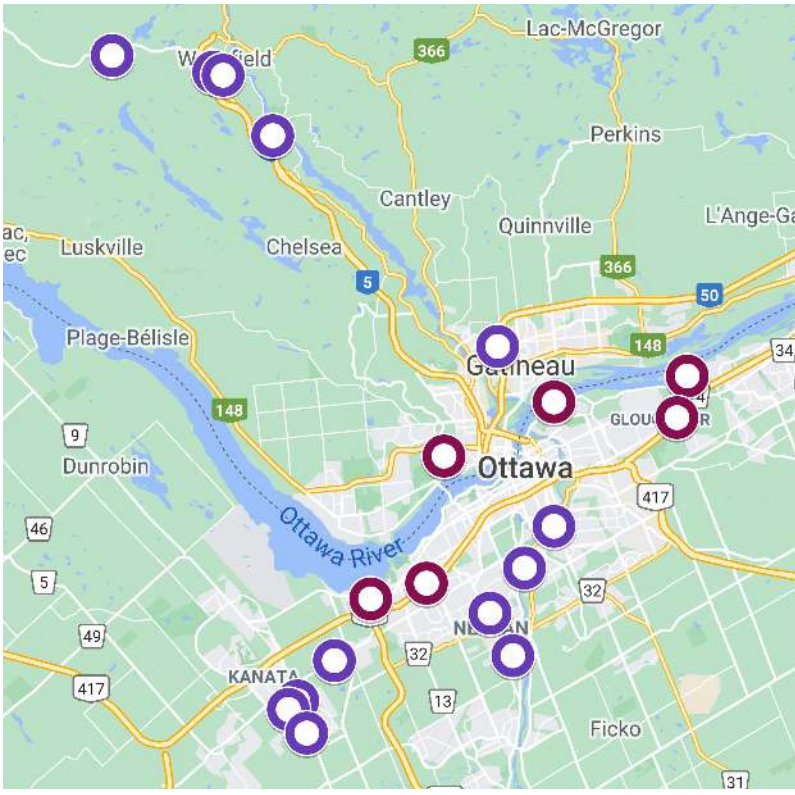


Since its pilot season our Road Salt Monitoring Program has grown, welcoming new and returning volunteers! Building on relationships with our partners throughout the watershed, we have been able to expand the scope of the project and collect data for streams outside of the National Capital Region. This has allowed us to learn more about the effects of road salt use on local streams, as well as provide us opportunities to refine our program.

> ***creeks in Ottawa and Gatineau are already experiencing chloride levels well above CCME guidelines***

From these early results alone we can see that creeks in Ottawa and Gatineau are already experiencing chloride levels well above CCME guidelines for the protection of freshwater life! Not only is this a threat to the plant and animal species in these creeks, but also to the overall health of the Ottawa River into which these creeks ultimately drain.

> ***our Road Salt Monitoring Program has grown***



Pilot Locations New Locations

WHAT YOU CAN DO

One way you can help limit the amount of chloride making its way into the river is to start using less road salt. Alternative strategies for dealing with snow and ice abound, as do the reasons not to use salt.

> ***road salt becomes ineffective at temperatures lower than -10 °C***

For example, road salt becomes ineffective at temperatures lower than -10 °C, and our watershed regularly sees temperatures much lower than that. When it is that cold outside, skip the salt and try an alternative, such as gravel, sand, ashes, or even cat litter. Or just keep up to date with the shoveling to prevent ice buildup!

There may be times when you have to use salt, in which case keep in mind this simple rule - one coffee mug full is about all you need to clear a standard driveway.

> ***one coffee mug full is about all you need to clear a standard driveway***

While changes in individual use will help, the greatest impact for freshwater ecosystems will come from an institutional and cultural shift away from our dependence on road salt. To that end, you can help by raising awareness about the harmful consequences of chloride in the environment, and encourage your friends, family and community to limit their use of road salt.