



City Stream Watch 2019 Summary Report





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MVCA RVCA SNC

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SOUTH NATION
CONSERVATION
DE LA NATION SUD



La table ronde sur la Rivière
Rideau
River Roundtable



GLOSSARY OF ACRONYMS

CSW	City Stream Watch	OBBN	Ontario Benthos Biomonitoring Network
DUC	Ducks Unlimited Canada	OFAH	Ontario Federation of Anglers and Hunters
FCR	Friends of the Carp River	OFS	Ottawa Flyfishers Society
MNRF	Ministry of Natural Resources and Forestry	OSAP	Ontario Stream Assessment Protocol
MVCA	Mississippi Valley Conservation Authority	RVCA	Rideau Valley Conservation Authority
NCC	National Capital Commission	SNC	South Nation Conservation
NHIC	Natural Heritage Information Centre	TRCA	Toronto and Region Conservation Authority
NRVIS	Natural Resources and Values Information System		

Introduction

The City of Ottawa encompasses three separate watersheds: Mississippi Valley to the west, South Nation to the east, and Rideau Valley in between, each of which are monitored by respective conservation authorities. The City Stream Watch program, created in 2003, is a joint effort among these three conservation authorities. The program aims to do the following:

- Provide consistent data collection, data management and reporting of urban and rural stream health across the City of Ottawa
- Target restoration initiatives and landowner stewardship actions based on monitoring results

City Stream Watch would not be possible without the help of our dedicated volunteers, some of whom return year after year to assist with monitoring and stewardship.



Area monitored by City Stream Watch. Photo courtesy of South Nation Conservation (modified).

Mississippi Valley, Rideau Valley, and South Nation Conservation Authorities have partnered with municipal and environmental organizations to form the City Stream Watch Collaborative. Together, we share information and exchange ideas related to the program in order to make informed decisions regarding watershed health.

City Stream Watch monitoring initiatives include stream characterization assessments, fish community sampling, headwater drainage feature surveys, and water temperature monitoring. Stewardship and restoration activities include bioengineering, shoreline naturalization (planting native trees and shrubs), stream garbage clean-ups, invasive species removals, educational workshops, and habitat creation, enhancement, or restoration projects. Detailed descriptions of our monitoring activities and a summary of projects for 2019 can be found on the following pages.



MVCA volunteers and staff completing a stream survey



SNC staff doing a demonstration for volunteers about fish species in their watershed



RVCA volunteer at a creek garbage cleanup

Stream Habitat Assessment Methodology

The City Stream Watch program uses a stream characterization assessment protocol for surveying streams. The protocol was originally developed by the Ontario Ministry of Natural Resources and Forestry (MNR) but was modified by the RVCA to increase monitoring efficiency and to be more volunteer-friendly.

The program monitors creeks within the City of Ottawa throughout the Mississippi, Rideau Valley and South Nation watersheds. Many of these creeks are monitored on a six-year cycle to track long term changes, measure the effectiveness of past projects, and identify new threats. Staff and volunteers will survey 100m segments of a stream at a time, starting from the mouth and ending at the headwater reaches whenever possible. The following parameters are assessed and/or identified:

- General land use (agricultural, residential, forest, etc.).
- Stream morphology (wetted width, bankfull width, maximum depth, and flow velocity).
- Water chemistry (water temperature, dissolved oxygen, pH, and conductivity).
- Weather conditions (overhead cloud cover, air temperature).
- Photographs (upstream and downstream of section and any other notable features).
- Stream inputs (tributaries, groundwater sources, storm water drains and tile drains).
- Habitat type (pool, riffle or run).
- Instream habitat (substrate type, vegetation community, presence of organic debris, bank undercutting, overhanging riparian vegetation, and shade cover).
- Riparian habitat (extent of vegetated buffer, vegetation type).
- Migratory obstructions (presence of beaver dams, man-made dams and weirs, perched culverts, and natural features that impede fish migration).
- Bank composition, steepness, and stability.
- Human alterations/impacts (channelization, shoreline structures, culvert crossings, livestock access, garbage/pollution, etc.).
- Presence of fish and wildlife species.
- Enhancement and restoration opportunities (areas with garbage or invasive species to be removed, degraded shorelines in need of native vegetation, banks in need of erosion control, and areas requiring of wetland/fish habitat enhancement).



CSW volunteers measuring a 100 meter section for the survey



CSW volunteer measuring hydraulic head, a measurement of surface flow velocity



RVCA staff member recording measurements during a canoe survey

Headwater Drainage Feature Protocol

Headwater drainage features (HDFs) are depressions in the landscape in which water flows. HDFs include small streams, springs, wetlands, swales, and ditches, and they have variable flow conditions from perennial to ephemeral. Some HDFs are natural while others may be modified as with channelized drains. Regardless of their form, science is suggesting that they play an important role as the interface between land and water for water and sediment transport and as corridors for the migration of biota (Stanfield et al., 2017).

HDFs have not traditionally been a component of monitoring efforts, and as such, little is known about their form and function in the landscape (Stanfield et al., 2017). These features may directly provide habitat for fish by the presence of refuge pools, seasonal flow, or groundwater discharge. They also provide indirect habitat contributions through the export of food in the form of detritus and invertebrates (Wipfli and Gregovich, 2002). These features are important sources, conveyors, or stores of sediment, nutrients, and flow (Stanfield et al., 2017).

As a result of their importance and a lack of information for headwater drainage features, City Stream Watch has incorporated monitoring of these systems for each catchment starting in 2013. The HDF protocol is one of several modules in the Ontario Stream Assessment Protocol (OSAP), which provides a framework for standardized stream assessment throughout Ontario. The HDF protocol is a rapid assessment method which characterizes the amount of water, sediment transport, and storage capacity within HDFs. Sites are visited first in spring and then again in summer to determine if the feature is permanent, intermittent or ephemeral. RVCA is working with other Conservation Authorities and the MNRF to implement the protocol with the goal of providing standard datasets to support science development and monitoring on headwater drainage features.

Additionally, this module provides means of characterizing the connectivity, form, and unique features associated with each HDF (Stanfield et al., 2017). An initiative is underway to evaluate how these data can help in understanding the cumulative contributions of individual HDFs on the downstream watershed state (see Stanfield et al., 2013).



Volunteers measuring the wetted width of a headwater drainage feature



RVCA staff member using a YSI probe to measure the water chemistry of a headwater drainage feature during a summer site visit



Difference between seasons for one site that only flows during the spring and is dry during summer in the Cranberry Creek catchment

Fish Sampling Methodology

City Stream Watch staff use a variety of fish sampling methods depending on the habitat being sampled. With all sampling types, fish that are collected are identified to species (or lowest taxonomic rank possible), counted, weighed, and game fish are measured for length. Fish sampling is done in accordance with protocols and best practices in order to live-release fish after sampling is complete.

The following types of sampling methods are used:

Seine Net (OSAP module)

- Rectangular, with a three-dimensional box, or “purse” in the middle.
- The net is actively moved through the water, creating a wall.
- Fish are directed toward the purse in the middle and collect there.
- Ideal for pool habitat.



Electrofishing (OSAP module)

- Effective way to sample fish in a variety of habitats.
- Using an electrofishing “backpack”, the crew leader creates an electrical field in the water which causes a muscle response in fish, temporarily stunning them.
- Netters collect these fish using dip nets and place them in a recovery bucket.
- Electrofishing very seldom kills fish if the correct procedures are used.
- Electrofishing is completed by staff that have been certified according to provincial standards.



Fyke Net

- Modified hoop net (series of hoops covered in mesh), with a lead line and wings that funnel fish inside.
- Depending on size, can be used in shallow or deeper waters and are good alternatives in places that are difficult to seine or electrofish.
- Nets can be set up from 24 hours to multiple weeks, but are checked every 24 hours to release any fish that have been caught.



Windermere Trap

- Resembles a lobster trap but has a metal frame covered in mesh.
- Mesh funnels at either end guide the fish into the trap.
- Used in shallow areas, with slow or fast moving water.
- Used on electrofishing sites in peak spawning periods.



Thermal Classification Methodology (OSAP module)

Temperature is an important parameter in streams as it influences many aspects of physical, chemical, and biological health. Temperature data loggers are deployed in each of the monitored streams for the sample year from April to late October to give a representative evaluation of how water temperature fluctuates. Many factors can influence fluctuations in stream temperature, including: springs, tributaries, precipitation runoff, discharge pipes, and stream shading from riparian vegetation. Water temperature is used along with the maximum air temperature (using the revised method in Stoneman and Jones, 1996) to classify a watercourse as either warm water, cool-warm water, cool water, cold-cool water or cold water.

Water temperature range classification based on a standardized air temperature of 25 °C

Status	Water Temperature °C
Cold	< 15
Cold-cool	15-17
Cool	17-20
Cool-warm	20-23
Warm	> 23

Data Management/Users

All data collected is maintained in databases at MVCA, RVCA, and SNC. Data collected is used in a variety of applications. Various agencies and community organizations throughout the City of Ottawa use City Stream Watch data for:

- Watershed reporting.
- Identifying potential rehabilitation and restoration projects (riparian and instream).
- Subwatershed studies.
- Background data for planning and regulations reviews.
- Sharing information with other agencies (NCC, City of Ottawa, Fisheries and Oceans Canada, MNR, Ministry of the Environment, Conservation and Parks, etc.), community groups, and non-governmental organizations.
- Reports to public landholders on potential projects, important issues, and current conditions.
- Consultant information requests.
- Fish community information sent to MNR; stored in National Heritage Information Centre (NHIC) and Natural Resource and Values Information System (NRVIS) databases.
- Species at risk information sent to MNR (stored in NHIC database).
- Academic partners.



An RVCA staff member installing a temperature logger in Cranberry Creek in April



HOBO temperature logger

Pollinators

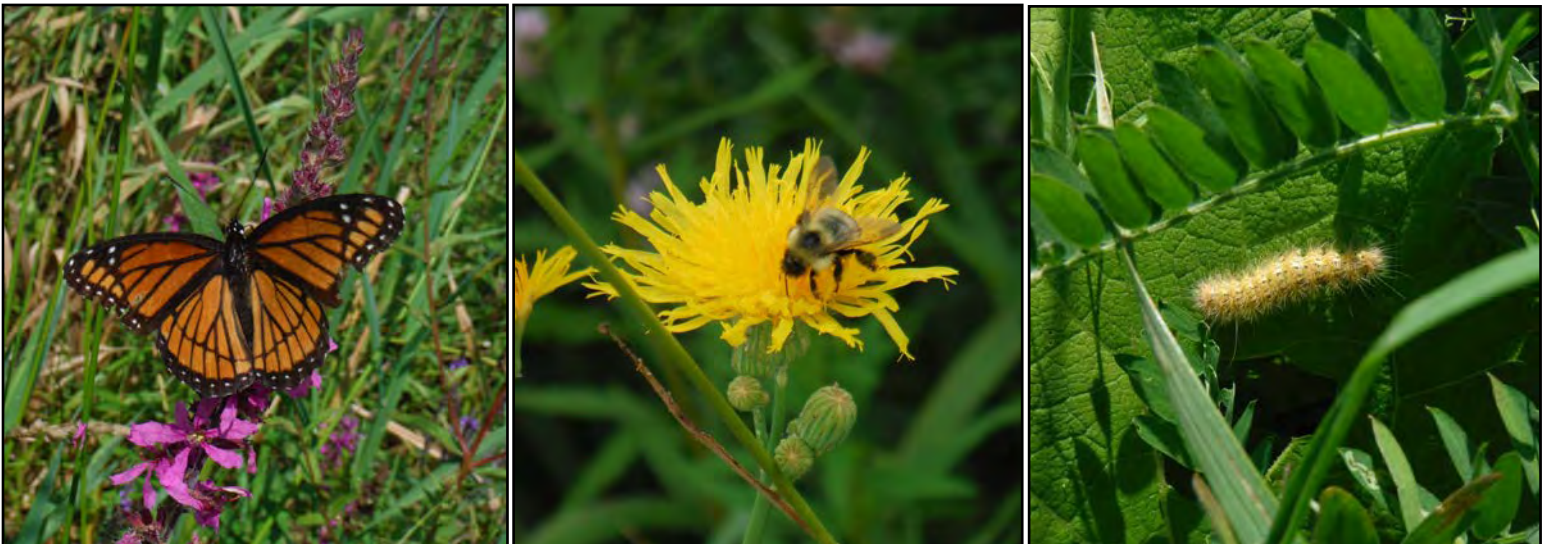
The declining health and population of pollinators has become a serious problem, and causes concern not only in Ontario, but globally. The symbiotic relationship between plants and pollinators is necessary for flowering plants to seed and reproduce. Without pollinators, many plants would be unable to reproduce and consequently many animal populations would also decline, resulting in a domino effect among species of all classes (Ollerton et al., 2001). Not to mention, pollinators work to help plants reproduce so they can provide food, produce oxygen, and provide habitat and erosion control.

Many people think of bees as the primary pollinators of our ecosystems. However, birds, bats, butterflies, moths, flies, beetles and even small mammals are also all important pollinators. The decline in these species is likely due to a number of compounding factors but can be linked to a reduction in pollinator habitat, pesticide exposure, disease and introduction of alien/invasive species, and climate change and changing weather patterns. (Potts et al., 2010)

City Stream Watch plays a role in pollinator conservation, typically by planting native plant species that attract pollinators. The pollinators will assist with plant reproduction and this in turn attracts more pollinators. This practice is used often during wetland restoration and creation projects, where native seed mixes are planted as a part of construction. Invasive species removals can also be helpful for pollinators, as this allows for native vegetation to establish naturally.

How can the public help pollinators?

Helping pollinators can be as simple as planting a few native wildflowers to attract them and provide a food source. Planting flowers that bloom at different times can also help spread out the growing season and provides pollinators with a longer, more continuous supply of food and shelter. It is also strongly encouraged that the public eliminate or at least reduce the amount of pesticides used for lawn and garden. These small changes can have a huge impact on pollinators and can create natural gardens that will be full of life.



Some of the pollinators observed at RVCA wetland restoration projects: (from left to right) viceroy butterfly, bumblebee species, Virginia tiger moth caterpillar

RVCA City Stream Watch Monitoring Summary

The RVCA City Stream Watch program monitors 25 tributaries of the Rideau and Ottawa Rivers on a 6 year cycle. Approximately 20.2 kilometers of streams were surveyed and 28 fish sampling sites were visited as part of the 2019 cycle on Cranberry Creek, Hunt Club Creek, Ramsay Creek and Borthwick Creek. In addition, a total of 42 headwater drainage features were surveyed along these systems. For more detailed findings for each tributary monitored in 2019, please see their individual catchment reports that are shared on our website at rvca.ca (Monitoring & Reporting > Reporting > City Stream Watch Reports).

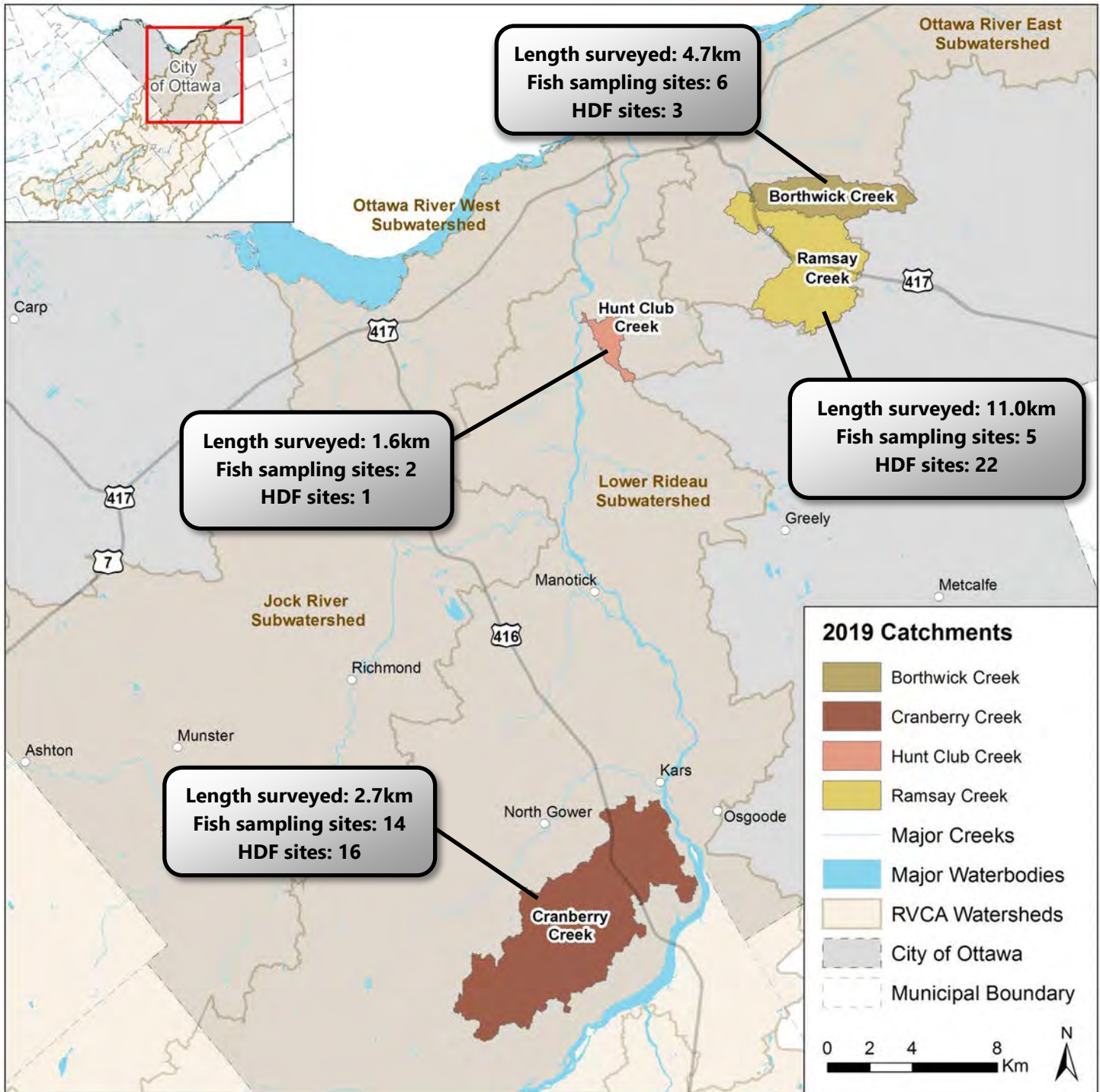


Figure 1 2019 RVCA CSW creek catchment areas with summary monitoring statistics

RVCA City Stream Watch 2019 Summary

Stream Study and Comparison

Two of the systems studied this year are tributaries of the Rideau River and two are tributaries of Greens Creek which is a tributary to the Ottawa River. Tributaries of the Rideau River include: Hunt Club Creek, which was previously surveyed in 2013, and Cranberry Creek, surveyed in 2007 and 2013. Borthwick and Ramsay Creek, tributaries of Greens Creek, were previously surveyed in 2007 and 2013. Table 1 is a comparison summary of monitoring activities for the reporting cycles.

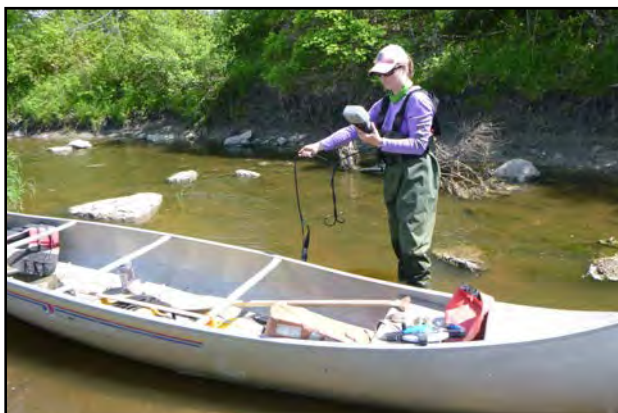
Each year the number of sections surveyed for each creek is different depending on the number of sections where permission to access the creek is granted by landowners, the number of tributaries and branches surveyed, as well as whether or not water is flowing in the upper reaches of the creek at the time of surveying. On Hunt Club and Cranberry Creek, limited access permission resulted in fewer sections surveyed in 2019. Both Borthwick and Ramsay Creek were surveyed entirely from their mouths at Greens Creek to their headwaters in Mer Blue Bog and at Leitrim Road, respectively. The number of fish sampling and temperature probe sites has been similar for each year of survey. This is useful for data comparison between survey years.

With the exception of Borthwick Creek, the number of volunteers and volunteer hours has increased in 2019. This can be attributed to an increase in stewardship events along the systems, such as invasive species removals and garbage cleanups. Since 2007, focus and knowledge on identification of invasive species has increased. This increased effort accounts for some of the increased observations, but overall, invasive species appear to be increasing on the streams surveyed. City Stream Watch will continue to host invasive species removals on these creeks to help with the management of these species.

Table 1 Stream study comparison by cycle year

Activities	Hunt Club Creek		Cranberry Creek			Borthwick Creek			Ramsay Creek		
	2013	2019	2007	2013	2019	2007	2013	2019	2007	2013	2019
Number of Sections Surveyed	28	16	61	43	27	32	47	47	74	101	110
Number of Volunteers	16	26	N/A	2	5	N/A	19	12	N/A	36	43
Total Volunteer hours	53	69	37	21	22	31	92	51	69	140	206
Number of Fish Sampling Sites	2	2	6	8	14	1	4	6	2	4	5
Number of Temperature Probes	2	1	3	4	3	2	2	1	2	4	1

N/A: in 2007 volunteer numbers were not tracked by creek



City Stream Watch volunteers measuring water chemistry (left) and removing invasive species (right)



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RVCA Community Response

This year, 422 volunteers from the community participated in the program, contributing a total of 1307 hours toward stream surveys, restoration activities, and workshops. The following table demonstrates the distribution of volunteer effort in 2019.

Table 2 RVCA 2019 CSW program accomplishments

Metric	Ramsay Creek	Borthwick Creek	Hunt Club Creek	Cranberry Creek	Jock River	Rideau River	Ottawa River	Other Creeks **	RVCA	Baxter Conservation Area	Black Rapids Wetland	Stillwater Wetland	TOTAL
Headwater Drainage Feature Sites Surveyed	22	3	1	16				52					94
Number of Stream Sections Surveyed	110	47	16	27									200
Number of Fish Sampling Sites	5	6	2	14							4	5	36
Number of Temperature Probes	1	1	1	3									6
Demonstration/ Training Events					1	1	1	1	1				5
Number of Garbage Clean-up Events	1					1		7					9
Kilometers (km) of Stream Cleaned	0.487					0.525		3.48					4.49
Invasive Species Removal Events	1		2		1	2		5		1	1		13
Squared Meters (m ²) of Invasive Plants Cleared	414		109		246	28		2796		120	75		3798
Shoreline Planting Events						1		1				2	4
Number of Trees & Shrubs Planted						65		500				456	1021
Number of Volunteers	43	12	26	5	34	50		150	15	5	2	80	422*
Number of Volunteer Hours	206	51	69	22	131	100		449	45	15	4	215	1307

*Many volunteers participated in more than one activity, in total 315 individuals were counted more than once in this table

**Other creeks includes Nepean, Taylor, Pinecrest, Sawmill, Mosquito, Mud (Manotick), Black Rapids, Stevens and Brassils

RVCA Volunteer Projects

Volunteer projects are carried out either for educational or rehabilitation purposes. City Stream Watch in the Rideau Valley watershed carries out the following types of volunteer projects:

- Removing invasive species that will outcompete native plants
- Stream garbage clean-up events
- Planting trees and shrubs along stream corridors
- Habitat restoration and rehabilitation (bioengineering, habitat creation, wetland restoration)
- Learning about and participating in fish sampling sessions and species identification
- Learning about and participating in benthic invertebrate sampling sessions and taxonomic identification
- Learning about fly fishing

The following is a summary of volunteer projects carried out by the RVCA in 2019. Over the course of the field season, City Stream Watch ran 28 special events outside of regular sampling activities.

RVCA Invasive Species Removal

Invasive species can be introduced into the environment through a variety of human and natural influences including aquarium and horticultural activities, pet trades, live bait industry, recreational boating, global shipping containers and ballast water. These species are known to have major implications for stream habitat as they can outcompete native species thereby negatively effecting local wildlife, fish and plants.

There are a number of invasive species that have been observed along creeks in the City of Ottawa. Many are known to be very prolific and can be found along an entire stream length. In response to the growing number of invasive species observed during stream surveys, the City Stream Watch program began removing targeted species in 2010. Removal efforts have been focused on certain species in targeted areas where volunteer removal efforts can halt the spread along the shoreline and make a significant difference in stream habitat. Special effort is made to return to targeted areas for additional removals in subsequent years and to encourage repopulation of the area by native plant species by spreading native seed mixes where appropriate.



CSW volunteers and staff removing invasive species (from left to right): Water Chestnut in the Rideau River, Flowering Rush in the Baxter Conservation Area Pond and Himalayan Balsam in Taylor Creek

RVCA City Stream Watch Targeted Invasive Species in Ontario

European Water Chestnut (*Trapa natans*)

Originating from Eurasia and Africa, it was introduced in North America as an ornamental plant in 1874 (Hummel and Kiviat 2004). Aside from displacing native floating plants, dense mats block sunlight and prevent growth of submerged vegetation. It has detrimental effects on wildlife that relies on submerged plants as a food source and shelter; and it depletes dissolved oxygen which can negatively impact sensitive fish species (Hummel and Kiviat 2004). Management includes chemical, biological and physical control. Physical is one of the best ways to manage its growth, as with its removal it includes the heavy metals and nutrients it had filtered.



Japanese Knotweed (*Fallopia japonica*)

An indigenous plant of Eastern Asia, Japanese knotweed, was brought over to North America as an ornamental and livestock forage in the late 18th century (Anderson 2012). Although its distribution has not been extensively documented in Canada until recent years, there have been many confirmed sightings in Ottawa. This perennial plant degrades riparian habitats resulting in not only reduced native plant diversity, but also a decline in invertebrate, amphibian, reptile, bird and mammal communities (Anderson 2012). Knotweed is one of the most aggressive plant invaders, so its control requires substantial amounts of labor.

Himalayan Balsam (*Impatiens glandulifera*)

Native to the western Himalaya's, Himalayan balsam is a prolific invasive species found throughout many Ottawa creeks. Introduced as a garden ornamental, this aggressive annual is highly capable of out-competing many native riparian plants. It is also a bountiful nectar producer, and could be detracting pollinators from surrounding native flowering species (Clements et al 2008). This, along with the displacement of native riparian plant species, have negative ecological impacts resulting in a reduced biodiversity in riparian plant communities. When dense patches of Balsam die off in the fall, large areas of soil are exposed contributing to bank erosion in higher winter and spring flows (Clements et al 2008).



RVCA Invasive Species Removals

July 20 Japanese Knotweed Removal, Sawmill Creek at Towngate Mall

This is the fifth year that CSW volunteers and staff have tackled this patch of Japanese knotweed, and progress has been made. Last year, we observed that the patch no longer appeared to be spreading. This year, native species are moving into the area that was previously barren following removals. In total, an area of 286m² was cleared of knotweed. CSW staff will continue to monitor this patch in the coming years in the hope of removing it completely.



Volunteers digging up roots of Japanese knotweed in Sawmill Creek



Figure 2 Location and range of Japanese knotweed removal on Sawmill Creek

June 15 and July 27 Himalayan Balsam Removal, Taylor Creek

This is the second year that CSW volunteers and staff have removed Himalayan Balsam on Taylor Creek after observations of it being widespread during 2018 surveys. This area showed displacement of native plants, as the Himalayan Balsam had taken over as the dominant plant. Two rounds of removals took place and with the help of CSW volunteers and RVCA staff, 100m of shoreline was cleared.



CSW volunteers and staff members after removal in Taylor Creek



Figure 3 Location and range of Himalayan balsam removal on Taylor Creek

RVCA Invasive Species Removals continued

July 13 Himalayan Balsam Removal, Ramsay Creek

During surveys on Ramsay Creek, a patch of Himalayan Balsam was identified. In an effort to tackle the plant before it spread, a crew of three volunteers and two staff removed all visible plants upstream of Ramsayville Road. A total of 207m of shoreline was cleared and a total area of 414m².



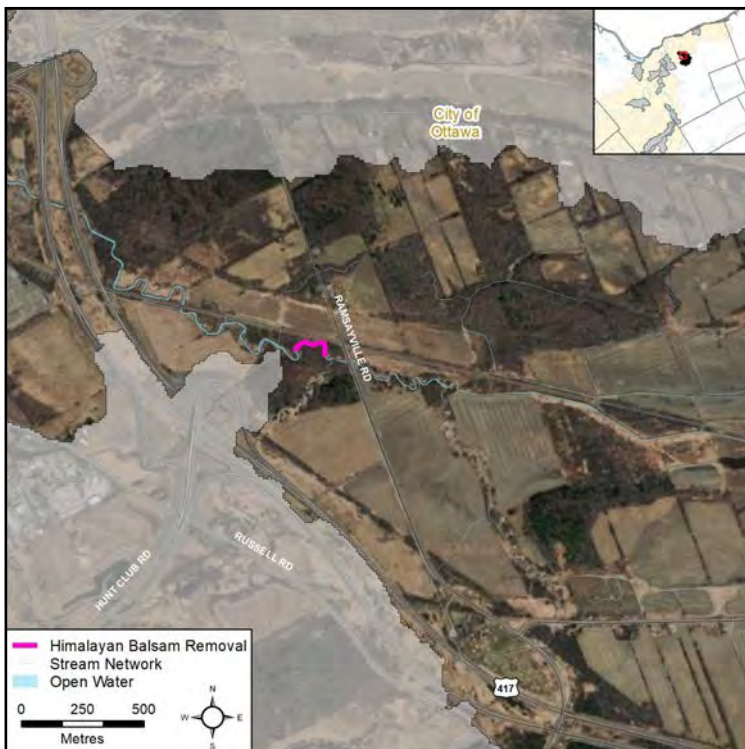
Volunteer at the removal event on Ramsay Creek with a Himalayan Balsam plant

August 10 European Frogbit and Garlic Mustard Removal, Jock Embayment

The Jock Embayment was an RVCA project in 2014 which involved an existing grassy area being converted into a small wetland embayment to provide new spawning and feeding habitat for fish that reside in the Jock River. While there are many native species thriving here, invasive European frogbit and garlic mustard have also managed to move their way into the habitat. CSW volunteers and staff removed all visible European frogbit and garlic mustard to stop their spread and make room for native species. An area of 357m² was cleared.



Jock Embayment at Richmond Conservation Area



RVCA Invasive Species Removals continued

July 31 and August 27 European Water Chestnut Removal, Rideau

RVCA, Ducks Unlimited Canada (DUC) and Parks Canada joined forces this year to prevent the spread of European water chestnut on the Rideau River. The invasive plant was first found along the Rideau in 2014. The next few summers, City Stream Watch assembled volunteers and staff to help pull out as many plants as possible. By 2018, we began to notice an overall decline in the number of plants found along this section of the Rideau. This year, the trend continued and fewer plants were found compared to 2018. On July 31st, staff members in five canoes scoured 3586m of river and cleared all remaining plants. On August 27th, staff members in one canoe and one motor boat returned to the site to clear any remaining plants and determine if the plants were establishing in other areas on the Rideau. The plants appear to be confined to the target area. However, City Stream Watch will continue to monitor this stretch of the Rideau for the plants in the future.



An RVCA summer student and a member of Parks Canada with some of the European water chestnut removed from the Rideau

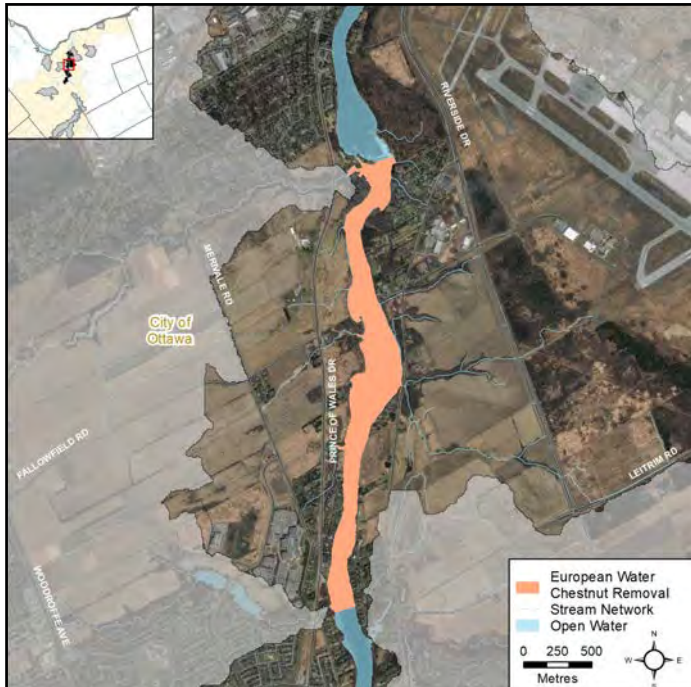


Figure 6 Area along the Rideau that was inspected for European water chestnut

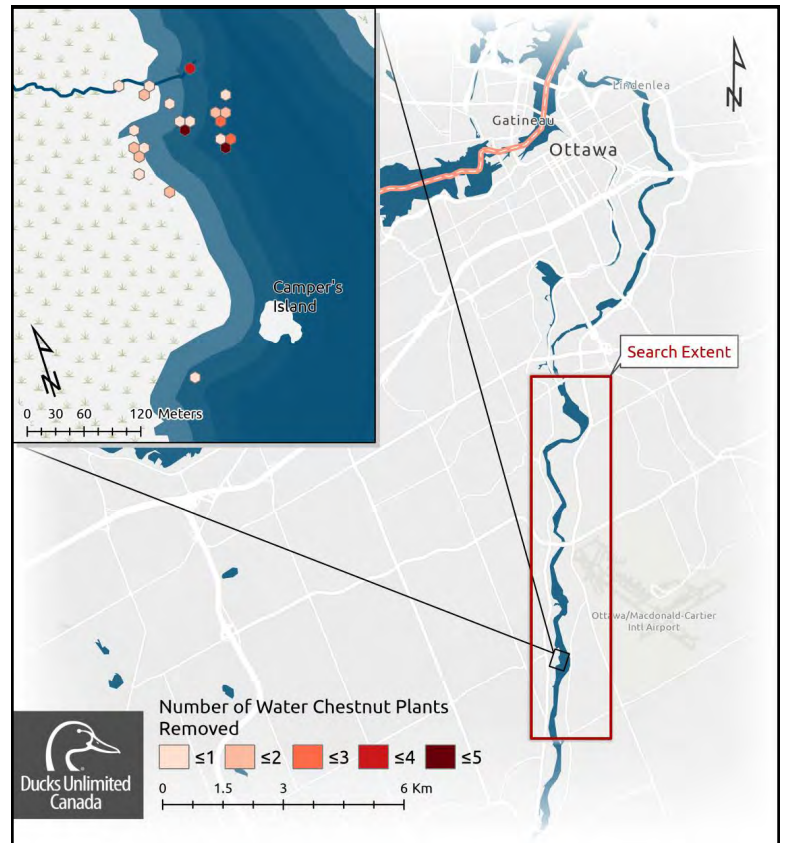


Figure 7 Location and range of European water chestnut. (Map courtesy of Ducks Unlimited Canada)



European water chestnut after first removal from the Rideau River

RVCA Invasive Species Removals continued

August 24 Flowering Rush Removal, Baxter

The pond at Baxter Conservation Area is visited annually by over 5000 students all of ages to learn about freshwater pond ecology. In 2017, the pond at Baxter was enhanced by deepening the bottom, installing wood structure and increasing plant diversity. Part of that restoration also included the removal of flowering rush, an invasive plant that was previously established in the pond. To continue with the management of this project, City Stream Watch hosted an event to remove the flowering rush that has come up in the pond since its restoration in 2017. City Stream Watch volunteers and staff cleared 21m of shoreline, filling the bed of one pickup truck with the invasive species.



RVCA staff and volunteers with flowering rush that was removed from the Baxter ASL Pond

September 18 & 30 Yellow Iris Removal, Hunt Club Creek

During this year's surveys on Hunt Club Creek, staff and volunteers noted several areas along the creek where yellow iris has spread. Yellow iris can form dense stands with very thick mats of rhizomes that not only displace native plants but can also dry out wet environments and change habitats completely. City Stream Watch hosted two removals on the creek; one near the mouth with students from John McCrae Secondary School, and one in the upper reaches of the creek at the Ottawa Hunt and Golf Club with some help from both City Stream Watchers and Golf Club staff. This is a particularly tough plant to remove due to its extensive rhizomes, but volunteers and staff were still able to clear 109m².



Volunteers and Golf Club staff removing yellow iris in Hunt Club Creek at the golf course



Figure 8 Location and range of flowering rush removal at Baxter Conservation Area



Figure 9 Location and range of yellow iris removals on Hunt Club Creek

RVCA Invasive Species Removals/Shoreline Planting Events

August 21 Buckthorn Removal, Black Rapids Wetland

This 7000m² wetland feature was designed and constructed in 2016 by the Rideau Valley Conservation Authority in partnership with the National Capital Commission. Glossy buckthorn was previously established in this area but have been kept under control by RVCA efforts. To continue with this maintenance, four RVCA staff members removed any visible plants that were found within the feature this year. An area of 75m² was cleared.



RVCA summer students with removed buckthorn at Black Rapids Creek Wetland

May 11 Black Rapids Creek Planting

City Stream Watch and the Shoreline Naturalization Program partnered up with volunteers to help plant approximately 500 trees along Black Rapids Creek. Volunteers and staff were working to regenerate an area by planting native trees and shrubs where invasive buckthorn was previously removed. This is the third area along the creek that has been regenerated and RVCA will continue to work to remove buckthorn here and replace it with native plants.



Volunteers hard at work planting along Black Rapids Creek



Figure 10 Location and range of buckthorn removal at Black Rapids Wetland



Figure 11 Location of Black Rapids Creek planting event

RVCA Shoreline Planting Events

May 9 and Oct 9

Stillwater Creek Wetland Planting

In fall 2018, RVCA and the National Capital Commission created 10 000 square meters of new wetland habitat along a tributary of Stillwater Creek to improve the hydrology and function of the original wetland and to encourage biodiversity. Part of wetland creation involves planting trees and shrubs to provide shade and shoreline habitat. In May, fifty-three volunteers including City Stream Watchers, members of the Crystal Beach Lakeview Community Association and students from the Ottawa-Carleton Wildlife Centre, came out to plant approximately 440 trees and shrubs.

A second planting was organized in October, this time with the Kanata Scouts who came out to learn about wetland restoration and to help plant some trees along the ponds in the wetland. Twenty-four scouts participated in the event and planted 16 native trees and shrubs.



Volunteers at Stillwater Creek Wetland after a successful day of planting in May



Kanata Scouts planting along the West pond at the Stillwater Creek Wetland in October

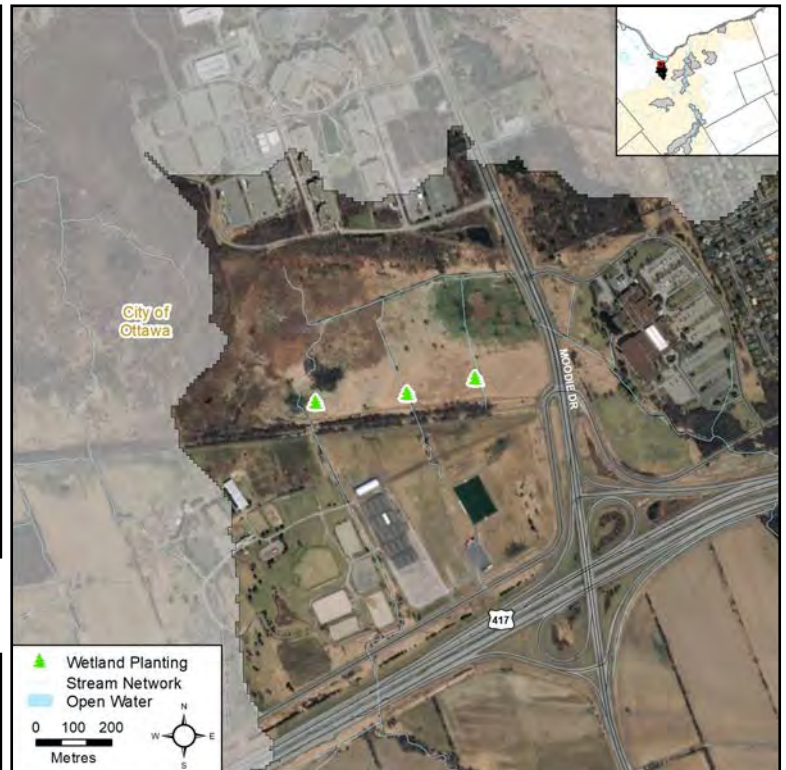


Figure 12 Location of Stillwater Creek Wetland planting event



Volunteers planting along the new wetland feature at Stillwater Creek in May

RVCA Garbage Cleanups

April 27 2019

GLAD Cleaning the Capital on Pinecrest Creek

Since 1994, GLAD and their partners have helped clear Ottawa's shorelines of garbage with their program *Cleaning the Capital*. In its twenty-five years, more than a million volunteers have removed an estimated 930 tons of trash which would otherwise lay to waste in our rivers or float into the ocean. City Stream Watch participated in the cleanup once again this year this time on Pinecrest Creek. The focus was downstream of Highway 417. There was a substantial amount of garbage found on the banks of the creeks from the high water that occurred during the spring freshet. Staff and volunteers were able to clear a total of 700m of shoreline.



Pinecrest Creek cleanup CSW volunteers

May 4

Sawmill Spring Cleanup

Once again, City Stream Watch hosted a spring cleanup on Sawmill Creek. This is a highly urbanized tributary of the Rideau River that has been notorious for dumping and can always use a clean up. Thirteen volunteers and two staff members cleared an impressive 45 bags of garbage including a toilet, shopping cart, a table, chairs and several large pieces of metal. City Stream Watch will continue to monitor this area for garbage dumping in the future.



CSW volunteers after Spring Sawmill Creek cleanup

April 30

Rideau River Cleanup and Planting Event at Chapman Mills

This spring, a local girl guide group joined City Stream Watch for a spring cleanup at Chapman Mills Conservation Area. Forty three local girl guides, pathfinders and scouts came out to plant a few trees along an eroded bank and cleanup up any garbage that accumulated over the winter. In total, the group cleared 525m of shoreline and planted 65 trees and shrubs at the conservation area.



Local girl guides, pathfinders and scouts who came out to help with the cleanup on the Rideau River

August 22

Tire Cleanup on Ramsay Creek

While surveying Ramsay Creek this year, it was noticed that the creek was littered with tires at its crossing with Russell Road. The amount of tires observed was so excessive that City Stream Watch organized a cleanup specifically to get these tires out of the creek. Four staff members and one dedicated volunteer pulled a total of 21 tires and one tractor tire out of the creek.



CSW volunteers and staff after the tire cleanup on Ramsay Creek

RVCA Garbage Cleanups continued

September 27 Pinecrest Creek Cleanup and Invasive Species

A group of environmental science students from Carleton University teamed up with City Stream Watch to clean up a section of Pinecrest Creek near the intersection of Baseline and Woodroffe. Along with this, students and RVCA staff members also removed invasive Himalayan balsam and dog strangling vine. In total, 362m of shoreline was cleared of garbage and 410kg of invasive species was removed.



Carleton University students after the cleanup and invasive species

September 28 Sawmill Fall Cleanup at Towngate Mall

Due to the immense amount of garbage at this site at in the spring, City Stream Watch volunteers and staff went back to this location for another cleanup. Once again, dumping and overflow from nearby dumpsters has littered this area of the creek. Four volunteers and two staff members cleared 340m of shoreline behind Towngate Mall which mostly consisted of plastics. Several tires were also pulled out of the creek upstream of the site, which were observed a couple days prior by a member of our Adopt-A-Stream program.



Some of the materials and garbage removed by the CSW cleanup of Sawmill Creek

October 3 Community Action Day with Health Canada at Sawmill Creek

As part of the Health Canada Communities campaign, Health Canada employees are given the chance to give back to their communities and volunteer with local groups. This year, they selected City Stream Watch, and helped cleanup and remove invasive species along Sawmill Creek. Twenty-two volunteers came out and removed 35 bags of invasive Himalayan balsam and dog strangling vine, as well as, 4 bags of garbage. A total of 662m of shoreline was cleared of garbage and invasive plants.



Health Canada Employees and garbage removed by the cleanup and invasive species removal on Sawmill Creek



RVCA CSW Adopt-A-Stream

The City Stream watch program relies on and encourages the interest, commitment and participation of volunteers from the community, guided by an experienced coordinator, in learning and conducting macro stream assessments and assisting in stream cleanup and rehabilitation programs. Adopt-A-Stream allows for certain individuals or organizations to become certified “City Stream Watchers” where they take responsibility for either a complete stream, or defined portions thereof. The “Watchers” work with the CSW Coordinator to monitor their defined stream or stream portion during non-survey years and identify areas of concern such as new erosion sites or areas that are in need of a cleanup or planting event. A brief “State of the Stream” report, is submitted to the CSW Coordinator for consideration and/or action. Currently, sections of Greens Creek, Sawmill Creek, Mosquito Creek and Hunt Club Creek are all monitored by certified City Stream Watchers

This year, Adopt-A-Stream volunteers held “creek walks” on the above mentioned creeks, and helped cleanup garbage along these systems. On Mosquito Creek, volunteers from the Riverside South Community Association (RSCA) helped City Stream Watch with headwater drainage feature assessments within the Mosquito Creek catchment. Adopt-A-Stream Volunteers from Mosquito Creek also indicated several areas along the creek in need of riparian planting. These volunteers teamed up with RVCA’s Shoreline Naturalization Program for two planting events along Mosquito Creek. In total, 850 native trees and shrubs were planted over the two events. This will help rehabilitate and stabilize Mosquito Creek’s natural shoreline.



Adopt-A-Stream volunteers after a tree planting event in May on Mosquito Creek



Members of the Riverside South Community Association taking measurements of a headwater drainage feature in the Mosquito Creek catchment during the spring



Volunteers from the Riverside South Community Association, 2317 Artillery Cadets, and Ashbury College who came to the planting event on Mosquito Creek in October (Photo courtesy of RSSCA)



Volunteers helping out at the Mosquito Creek planting event (Photo courtesy of RSSCA)

RVCA Restoration Projects

Black Rapids Wetland Restoration Project 2019 Monitoring Results

In 2016, the Rideau Valley Conservation Authority (RVCA) partnered with the National Capital Commission (NCC) to design and reconnect a wetland adjacent to Black Rapids Creek. The wetland feature is located close to the Fallowfield Road and Woodroffe Avenue intersection. The feature was expanded from an area of 3500m² to 7000m² and involved creating a variety of slopes and swales, as well as the installation of wood structure (root wads, basking logs and sweeper trees). This wetland restoration improves water quality, provides rare wetland habitat within the catchment and increases the overall biodiversity of the system.



Black Rapids wetland post construction, in Sep-

Since 2016, monitoring of the project has been underway. Black Rapids is scheduled for post-effective monitoring years 1,3 and 5 following its construction. As part of this monitoring, RVCA staff visit the wetland every month during the field season to collect water chemistry data and conduct visual assessments. Other monitoring activities such as invasive removals and amphibian surveys were also carried out. Now three years after construction, the wetland is home to a variety of species. This includes species at risk such as barn swallows, bobolinks, monarch butterflies and black-crowned night herons.

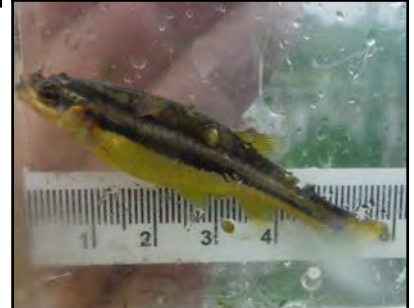


Figure 13 Location of Black Rapids wetland

Wildlife observed at Black Rapids wetland in 2019. From top to bottom; green frog, wild bergamot and blue vervain, northern redbelly dace, barn swallow

RVCA Restoration Projects

Stillwater Creek Wetland Project 2019 Monitoring Results

In the fall of 2018, the Rideau Valley Conservation Authority (RVCA) partnered with the National Capital Commission (NCC) and created 10 000 square meters of wetland habitat in the Stillwater Creek catchment area, just south of the new DND headquarters off Moodie Drive and Highway 417. The Ottawa-Carleton Wildlife Centre, which is located nearby, observed that the wetland habitat in the area was suffering annually from extreme low water conditions. The project involved expanding the pervious habitat by creating three large, wetland cells and installing wood structure within them.

This year was the first year of post-effective monitoring for the project. Similar to Black Rapids wetland, Stillwater Creek wetland is also visited once a month by RVCA staff. Monitoring for wildlife observations, amphibian surveys and the collection of water chemistry data is conducted for each of the three wetland cells. Although the wetlands are only about a year old, animal and plant species have quickly started to establish. The wetland is currently home to several species of birds, fish, amphibians, and pollinator species.



Stillwater Creek Wetland, June 2019; from top to bottom; west, central and east cells



Figure 14 Location of Stillwater Creek wetland cells



Wildlife observed at Stillwater Creek wetland in 2019; top from left to right: monarch caterpillar, Killdeer on nest; bottom from left to right: young American toad, twelve-spotted skimmer

RVCA Workshops and Demonstrations

Workshops and demonstrations are an important and popular part of the City Stream Watch program because they give volunteers the opportunity to learn about the importance of monitoring and stewardship events in which they participate. The following workshops and demonstrations were held in 2019:

May 25 Spring Volunteer Orientation

In the spring, City Stream Watch held its annual pre-season volunteer orientation where volunteers are taught about the importance of the program and are introduced to the survey equipment and protocol they will be using in the field. This is a great event for first-timers to the program as well as those who have little to no experience with field work. This year, the orientation was held at Sawmill Creek where it outlets into the Rideau River. Nine volunteers joined us for the event.



Discussion on invasive species with volunteers during the spring volunteer orientation on Sawmill Creek

August 17 Invasive Species Workshop

This was the third year City Stream Watch has put on this event. A presentation style format, this workshop provides an opportunity for volunteers to learn about the threat of invasive species in Ontario and what can be done to prevent their spread. There were also several live displays of common invasive species to give volunteers a chance to practice their identification.



Workshop participants learning about invasive species in Ontario

June 29 City of Ottawa Beginners Shore Fishing Clinic

During license-free fishing week, Ottawa City Councillors Jeff Leiper and Catherine McKenney organized this event at Remic Rapids for participants to experience fishing in the Ottawa River and to learn about its ecosystem. City Stream Watch also participated, giving participants an opportunity to learn about benthic invertebrates in a hands-on workshop setting.



RVCA staff members showing benthic invertebrates collected from the Ottawa River at Remic to participants of the fishing clinic offered by City Councillors Jeff Leiper and Catherine McKenney Rapids (Photo courtesy of Ottawa Riverkeeper)

RVCA Workshops and Demonstrations continued

The Ultimate Aquatics Workshop

Our longstanding Ultimate Aquatics Workshop once again proved to be one of our most popular events. On a sunny day in late October, 29 volunteers joined the Ottawa Flyfishers Society (OFS) and RVCA City Stream Watch at the Jock River Landing. The goal of this workshop is to learn about the relationship between conservation and recreation. Volunteers are given the unique opportunity to learn about fish and invertebrate identification and fly fishing all in the same day. Below is a summary of workshop activities.

Rideau Valley Conservation Authority staff:

- Introduced the basics of the OBBN protocol (Ontario Benthos Biomonitoring Network) used by RVCA to sample invertebrates
- Demonstrated seine netting, a method used by RVCA staff to sample fish
- Assisted volunteers in collecting and identifying fish and benthic invertebrates

Ottawa Flyfishers Society members:

- Explained the relationship between stream habitat, invertebrates and fish and how they all relate to fly fishing
- Gave an introduction to fly fishing including theory and technique
- Displayed samples of hand-made flies
- Provided one-on-one instruction in casting and retrieving

“The [Ottawa Flyfishers] Society is dedicated to fostering and furthering the practice of activities associated with the art of fly fishing, conservation and resource renewal, and recreational activities.”



Volunteers learning about fish, invertebrates, and the art of fly fishing with the Ottawa Flyfishers Society and CSW staff on the Jock River

RVCA Plans for 2020

In 2020 as part of our City Stream Watch program we will be monitoring the following creeks:

- Black Rapids Creek
- Cardinal Creek
- Mud Creek
- Sawmill Creek

There will be opportunities to assist with:

- Stream habitat assessment surveys
- Fish community sampling
- Stream garbage cleanups
- Invasive species removals
- Riparian tree and shrub planting
- Workshops and demonstrations
- Habitat enhancement and restoration

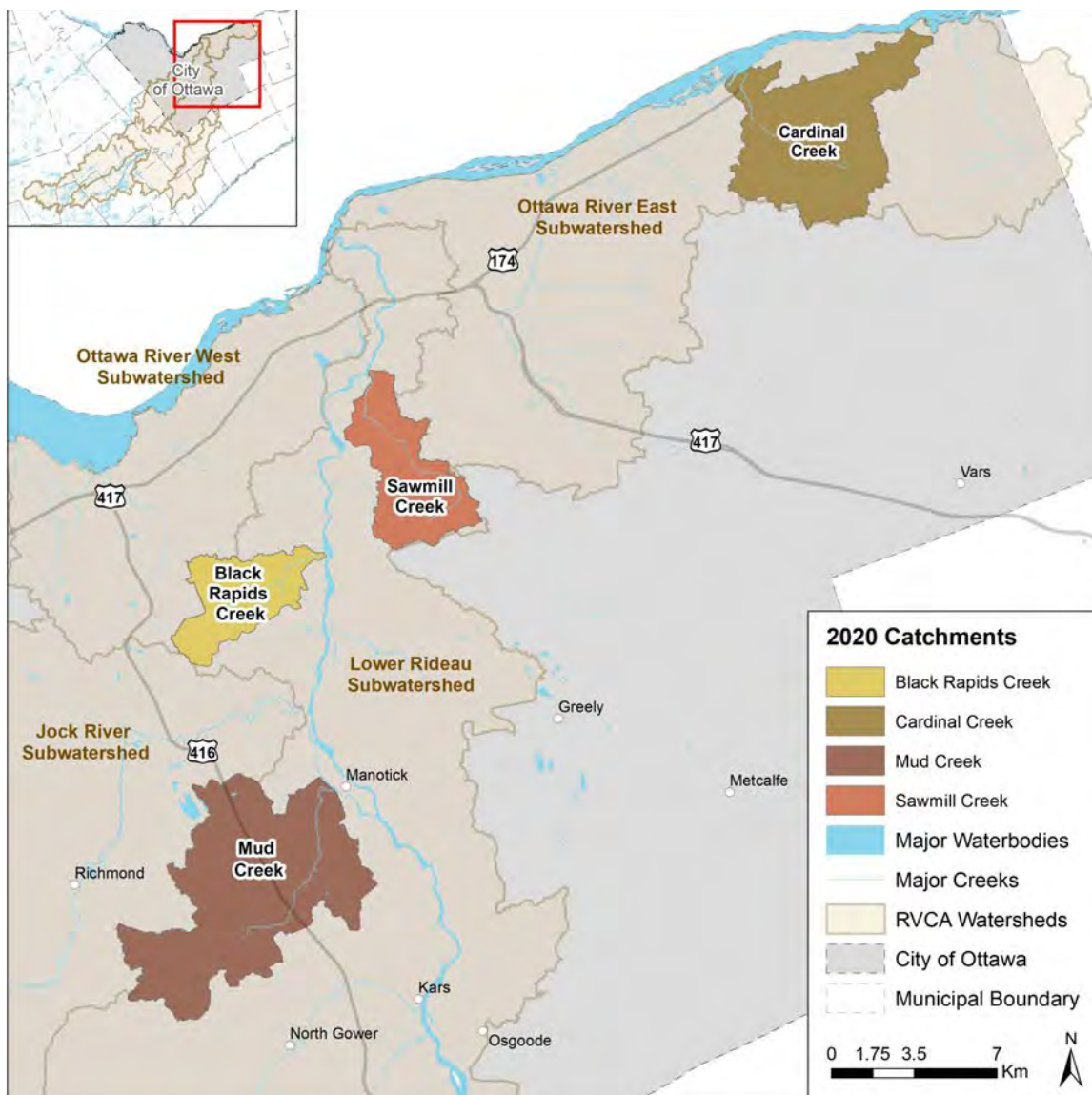


Figure 15 Catchments to be monitored by RVCA City Stream Watch in 2020

To volunteer with RVCA's City Stream Watch program, please visit rvca.ca or contact:
 City Stream Watch Coordinator
 (613) 692-3571
citystreamwatch@rvca.ca
<https://www.rvca.ca/volunteer/city-stream-watch>

RVCA City Stream Watch Monitoring Schedule

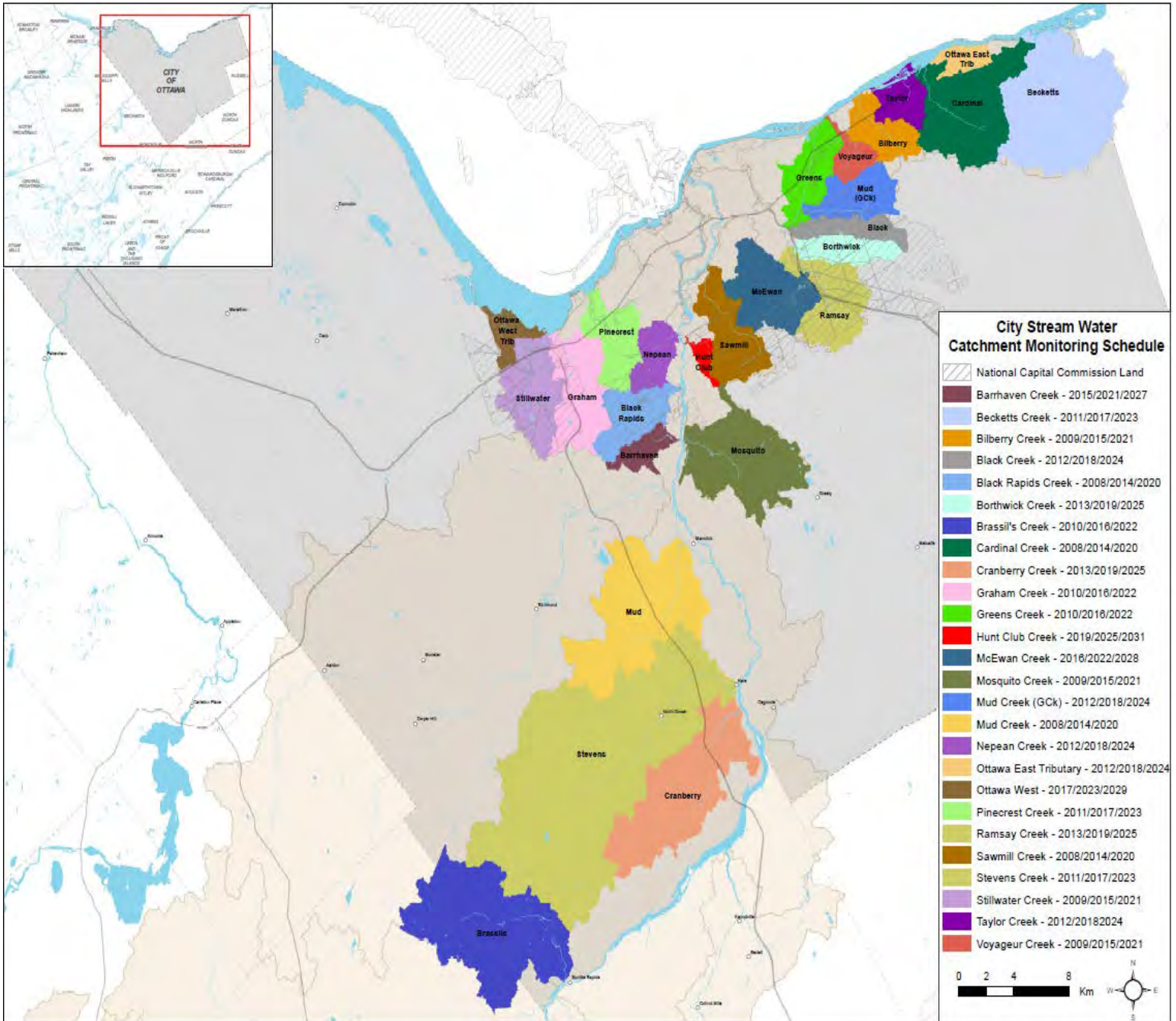


Figure 16 RVCA City Stream Watch catchment locations and monitoring schedule

MVCA City Stream Watch Monitoring 2019 Summary

The MVCA City Stream Watch (CSW) program monitors watercourses within the City of Ottawa boundaries in detail by wading the stream where possible and filling out survey sheets every 100 m. Our CSW rotation involves visiting 7 tributaries to the Carp River, 4 tributaries to the Ottawa River and 1 tributary to the Mississippi River within a 5 year rotation.

In 2019, 4.5 km of stream was surveyed in the Carp A, B and C subwatersheds of the Carp River. To support these surveys, 4 temperature loggers were launched and one site was electrofished. 12 sites within these three subwatersheds were sampled using the Headwater Drainage Feature protocol. One temperature logger was launched in Constance Creek and 18 headwater sites were surveyed in the Harwood and Casey Creek catchments of the Constance Creek subwatershed.

For more detailed information on the sampling conducted in 2019, please refer to the individual catchment reports found on our website (<http://mvc.on.ca/city-stream-watch/>).

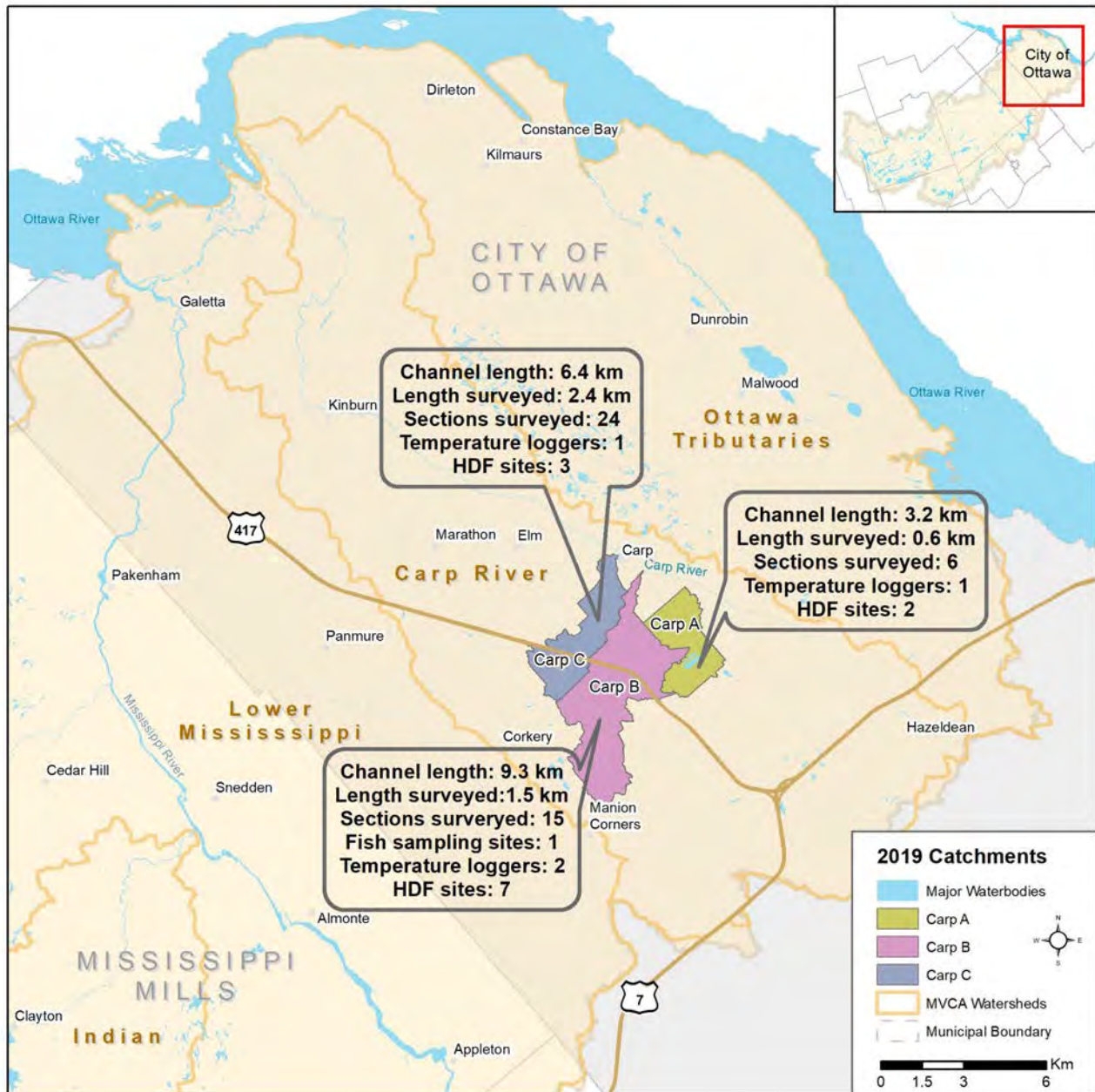


Figure 17 2019 MVCA CSW creek catchment areas with summary monitoring statistics



MVCA City Stream Watch 2019 Summary

Headwaters

In 2019 MVCA sampled 30 headwater sites within the City of Ottawa, 12 of which were in this year's CSW catchments. Under the Headwater Drainage Feature Monitoring protocol 2 sites were assessed in the Carp A catchment, 7 sites in the Carp B catchment and 3 sites in the Carp C catchment. All sites were visited twice, in both April/May and July, to better understand their function in high and low water seasons.

An additional 18 sites were visited in the Harwood and Casey Creek subwatersheds of the Constance Creek catchment. 11 sites were visited along Casey Creek and 7 sites along Harwood Creek.

While almost half of the features assessed were channelized or constrained, about one third were natural channels and one quarter were roadside ditches. Only 1 feature visited was considered to be a wetland.

Based on flow conditions observed at each feature, a decrease in flow rates was observed during the second visit.



Biological Surveys

Seven sites within City Stream Watch catchments were electrofished in 2019.

Three sites contained the cool-cold water fish species Mottled Sculpin (Carp B, Feedmill Creek and Upper Poole Creek).

Juvenile Northern Pike were captured at the downstream end of Poole Creek and Shirley's Brook. They were also observed in the lower reach of Feedmill Creek. The observations of Northern Pike in the lower reaches of Poole Creek and Feedmill Creek are significant as these are new observations and the portion of the Carp River where both these creeks outlet has recently undergone major habitat restoration. The presence of juveniles in August indicates that adults were able to successfully navigate the restored section of river and find suitable spawning habitat in or near the outlets of these creeks in the spring.

Temperature Monitoring

Six seasonal temperature loggers were successfully launched in City Stream Watch catchments in 2019. The seventh site is a permanent logger and flow gauge station in Poole Creek.



Photos

Left and below: HDF site visits to a Carp B site in April and July, respectively

Upper right: Young of year Northern Pike

Lower right: Crew electrofishing Poole Creek



Table 3 Stream Thermal Classification of 2019 CSW

Creek	Location	Thermal Classification
Carp A	Downstream	Cold-cool
Carp B	Upstream	Cool-warm
Carp B	Downstream	Cool-warm
Carp C	Downstream	Cold-cool
Constance Creek	Downstream	Cool
Poole Creek	Middle	Cold-cool
Poole Creek	Downstream	Cool-warm





MVCA City Stream Watch 2019 Summary

Stewardship

Poole Creek was the focus of MVCA's stewardship efforts in 2019. A variety of tasks including shoreline planting, garbage and invasive species removals and fish habitat improvements were undertaken (**Table X**). In total, approximately 240 trees/shrubs were planted along Poole Creek in 2019. MVCA also undertook community engagement and outreach activities for stormwater management, resulting in communication with approximately 100 residents. This included the opportunity for landowners living along Upper Poole Creek to order plants for their property and raise awareness of the importance of riparian buffers. This direct outreach will result in private plantings in 2020.

Table 4 Poole Creek stewardship summary

Project	Details	# Volunteers	Volunteer hours
Shoreline Restoration	90 trees and shrubs planted along the upper reaches		
TD Tree Day	150 trees and shrubs planted at the outlet	25	25
Garbage and Invasive Species Removal	14 bags of garbage	13	40
	12 bags of Garlic Mustard		
Other Invasive Species Removal	3 bags of Multiflora Rose		
Fish Habitat Improvement	7 blockages removed, 1 luncker installed		

Volunteers

8 volunteers attended multiple days of stream surveys and contributed a total of 52 hours to monitoring our streams. A further 38 volunteers contributed 65 hours to stewardship projects.

MVCA plans to work with volunteers on maintaining and furthering invasive species removals along Poole Creek and Carp Creek in 2020.

Invasive Species

10 invasive species were identified along the Carp A, B and C tributaries during the 2019 CSW surveys.

Species identified include; Bull Thistle, Common Buckthorn, Dog-strangling vine, Garlic Mustard, Glossy Buckthorn, Honey Suckle, Manitoba Maple, Poison Parsnip, Purple Loosestrife, and Rusty Crayfish.



Volunteers helping to plant 150 trees/shrubs along the outlet of Poole Creek; MVCA plans to continue planting efforts in 2020 along the shoreline of the Carp River



MVCA summer students removing multiflora rose near Poole Creek; the site will be reassessed in 2020



MVCA Plans for 2020

Our plans for 2020 will be to survey Feedmill Creek as well as Kizell Drain and Watts Creek. The surveys will be enhanced with water temperature loggers and fish sampling as well as headwater drainage feature assessments where possible. It is also our intent to engage the local community to help us with a number of stewardship tasks identified for Poole Creek and Carp Creek.

There will be opportunities for volunteers to help with stream surveys, shoreline planting, as well as possible invasive species removal and garbage clean up events.

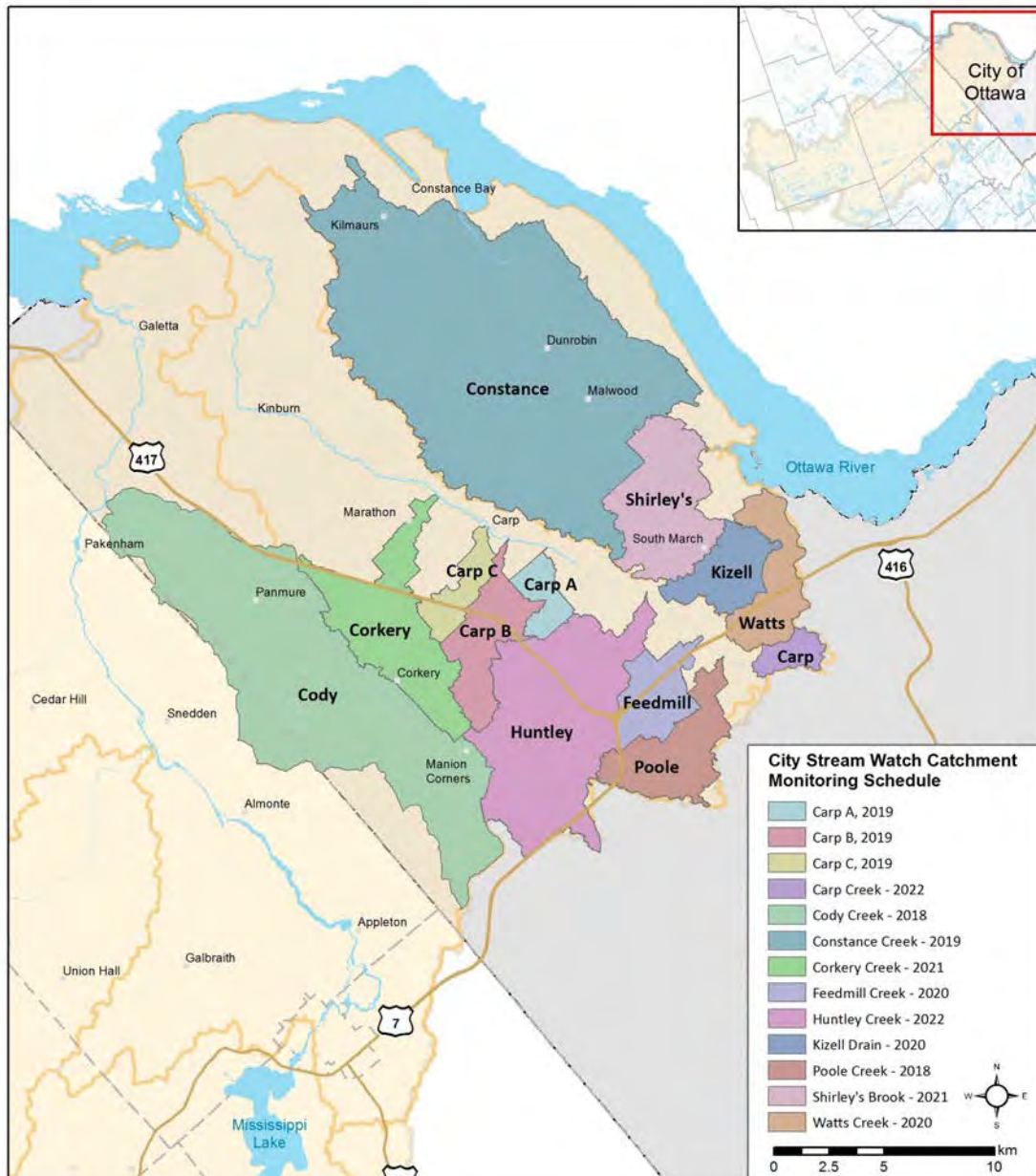


Figure 18 MVCA City Stream Watch catchment locations and monitoring schedule

For more information or to volunteer with MVCA's City Stream Watch program, please contact Kelly Stiles at:

kstiles@mvc.on.ca

613-253-0006

<http://mvc.on.ca/city-stream-watch>

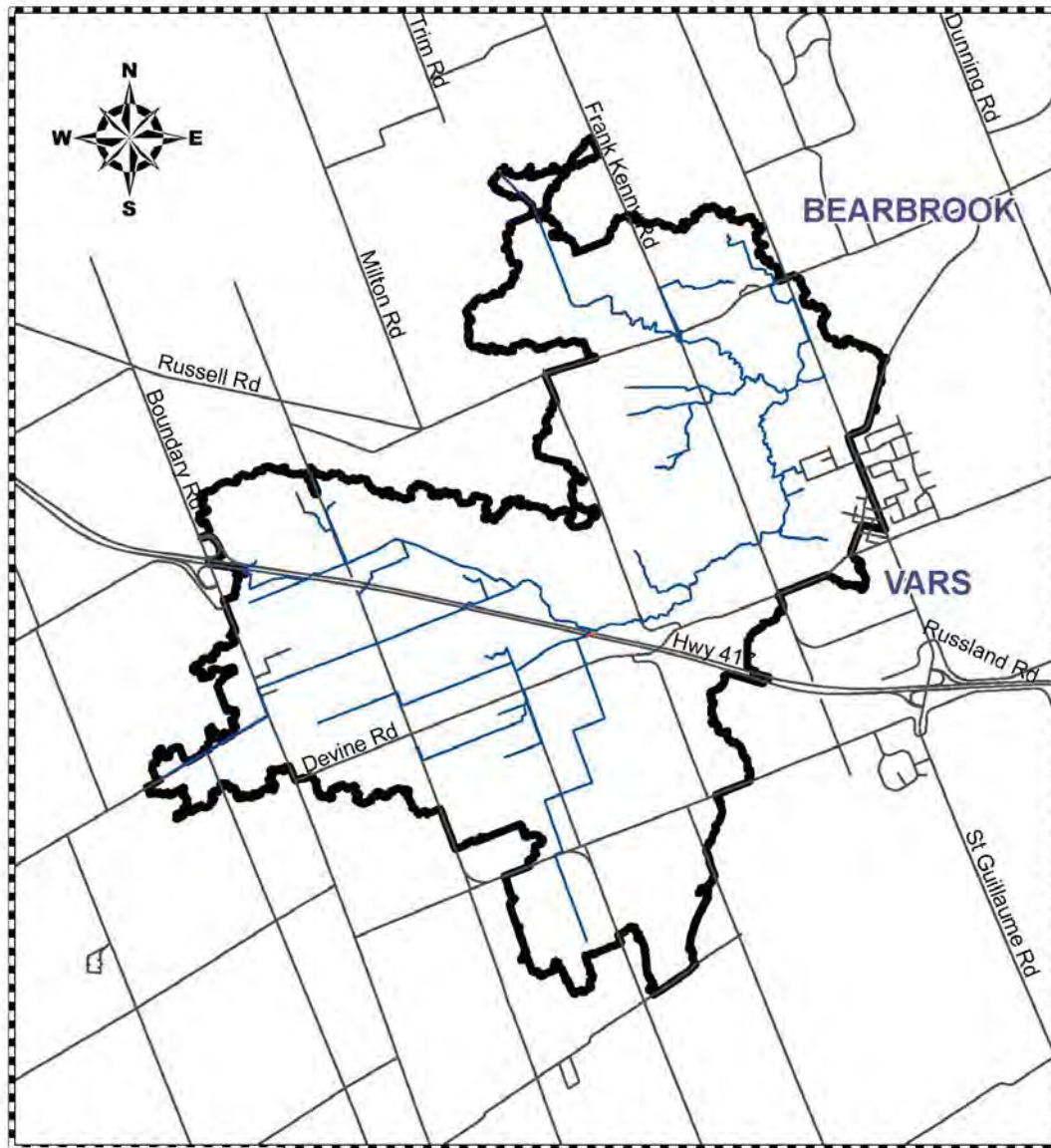


SNC City Stream Watch Monitoring 2019 Summary

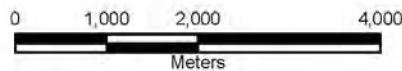
South Nation Conservation (SNC) chose Shaw's Creek as its target for City Stream Watch in 2019. Shaw's Creek begins in Russell Township just south of Highway 417 and flows north past Vars. The creek outlets into the Bear Brook just east of Trim Road in the City of Ottawa. The watercourse itself is approximately 14 km in length and has a drainage area of 3,520 hectares, including all its tributaries. A total of 200 meters of the stream was monitored with volunteers.

A total of the stream was the help of 12

Shaw's Creek Catchment



SOUTH NATION
CONSERVATION
DE LA NATION SUD



Watershed Boundary

This map and the associated information displayed thereon are to be used for general illustrative purposes only, and is not suitable or intended for navigation, legal, engineering or surveying purposes. Although best efforts have been made to create accuracy, due to the complex and extensive nature of the data, all representations and/or information provided herein are approximate and users should consult the primary data and information sources to confirm the accuracy of the map. The Municipality and the South Nation Conservation Authority, their employees and agents, do not guarantee the accuracy of the map, and will not be liable for any claims for damages or loss arising from its use. The user hereby accepts and assumes all inherent risks associated with the use of this map. This map is produced in part with data provided by the Ontario Geographic Data Exchange under



SNC City Stream Watch Monitoring 2019 Summary

Headwater Drainage Features

SNC completed 30 headwater drainage feature assessments in 2019 within the City of Ottawa, which adds to baseline information used to make informed decisions in the Planning Review process. This data undergoes further analysis to identify stewardship opportunities and ranking of ecological functions.



Spring (left) and summer (right) photos of a headwater drainage feature

Biological Monitoring

Biological data is collected from streams to provide additional baseline information on important ecological functions. In 2019, nine Ontario Stream Assessment Protocol sites within the City of Ottawa were sampled to assess stream morphology and the fish community.

In total, 277 fish were captured representing eight different species. The array of species found in a watercourse can provide information on the overall health of the system as some species are more sensitive to impairments in the quality of the water.

For example, Trout-Perch is one species of fish that was captured and it is classified as a cold-water species. This means that it requires cooler water temperatures to survive and is therefore more sensitive to increased water temperatures that result from a lack of riparian cover along streams. It is not likely to be found in streams where there is less canopy cover providing shade.

The photo at right depicts SNC staff electrofishing a stream to capture fish

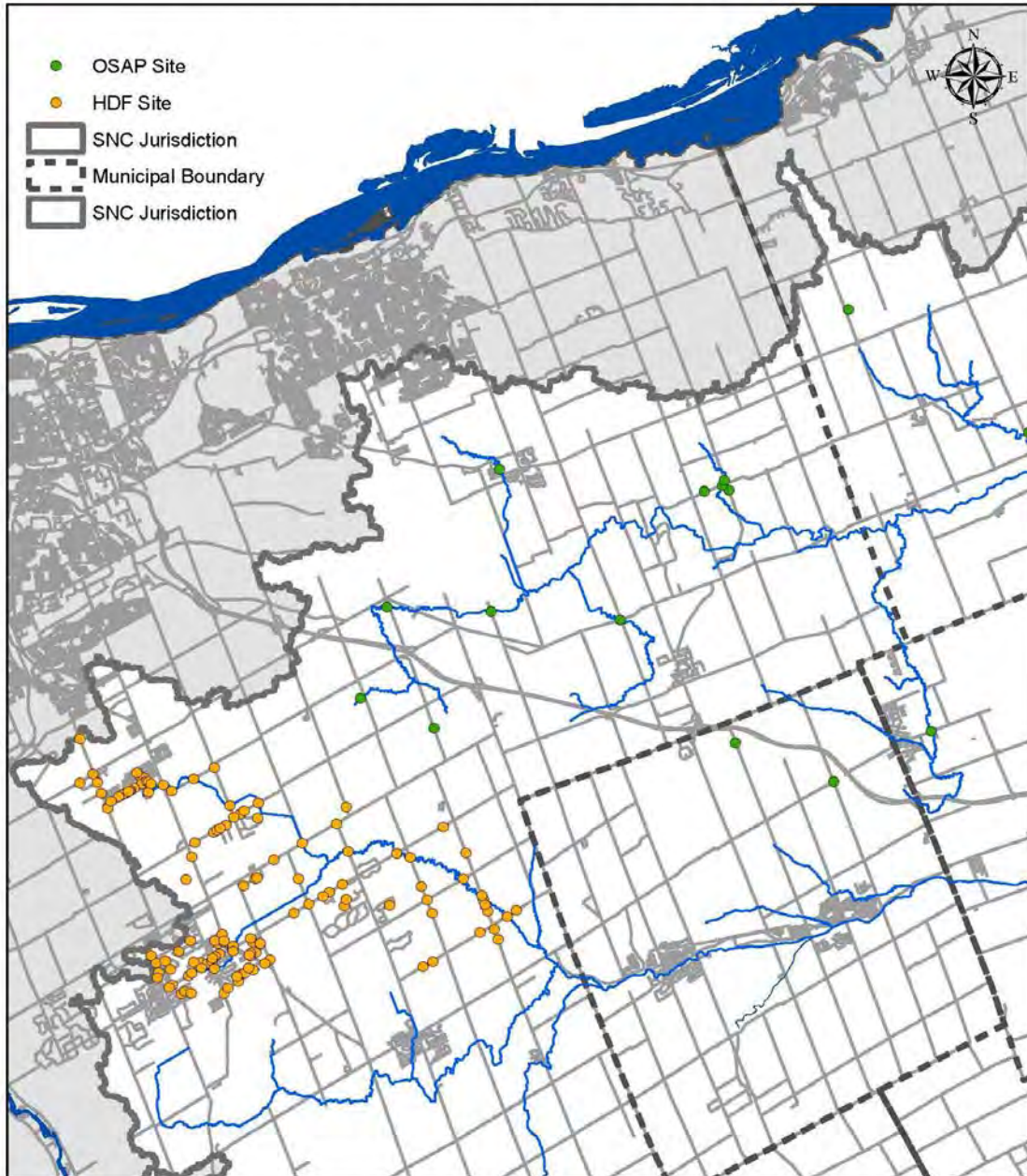


SNC City Stream Watch Monitoring 2019 Summary

Biological Monitoring Continued

The figure below depicts all the locations within the City of Ottawa where SNC completed headwater drainage feature assessments and biological monitoring.

Watercourse Monitoring within City of Ottawa



0 2,500 5,000 10,000 15,000 20,000 Meters

Figure 20 Watercourse Monitoring Within City of Ottawa

Figure 20 Watercourse Monitoring Within City of Ottawa

SNC Invasive Species Removals

European and Glossy Buckthorn are non-native shrubs that are detrimental to the ecology of North American forests and landscapes. They outcompete our native vegetation because they have few, if any, predators to keep their numbers in check.

In the Leitrim Wetland, a Provincially Significant Wetland, this shrub has infested some of the very sensitive areas of the wetland. Removal efforts are on-going with cutting of the Buckthorn in sensitive areas and re-planting with native species.

The photo at right shows an area where the Buckthorn was cut and native cedar and tamarack trees were planted.

SNC will continue to monitor and control the Buckthorn in key sensitive areas within the Leitrim Wetland annually.



SNC Garbage Clean-Ups



SNC hosted the annual Cache-In-trash-Out garbage clean-up event at the Greely Community Centre on April 27, 2019 with about 70 volunteers in attendance.

A second event was held in Greely as part of the Findlay Creek Community Spring Clean up held on April 28, 2019 with approximately 12 volunteers participating.

SNC Shoreline Restoration



A municipal drain in the Navan area received a face-lift using fruit trees through the Riparian Buffers and their Role in Climate Change Adaptation - Pilot Project & Teachable Moment Program. Landowner Basil Staal was happy to provide shoreline on his property for the edible buffer upgrade. Students assisted with the tree planting of edibles which include blueberries, hazelnuts, apples and cherries, among several other native nut and fruit-bearing species.

Area high school students enrolled in the Specialist High Skills Major program were able to earn a certificate as part of this project.

In the photo at left, the students are learning about some of the fish species that are present in the stream and how to complete proper identification.

SNC Education and Outreach

SNC provided learning opportunities at the Environmental Student Summit held on April 25th and 26th at the MacSkimming Outdoor Environmental Centre. Over 40 students in the Specialist High Skills Major Program at the Ottawa-Carleton District School Board were in attendance.

SNC provided sessions on GPS, cartography and mapping to teach students about orienteering using a GPS unit, map reading and mapping products. A geocaching event got the students excited about finding hidden packages containing information.

Another session was geared towards water quality and ecological functions. Students learned how to catch and identify benthic macro invertebrates and understand how their diversity and numbers can offer insights about the health of the water body.

And a third session instructed students on fisheries management, setting traps and fish identification. The emphasis on monitoring helps youth understand how ecological health is measured and how it impacts humans.



SNC Education and Outreach Continued

SNC hosted tree giveaways with member municipalities, including the City of Ottawa's Cumberland, Osgoode and Gloucester-South Nepean wards all taking part. Hundreds of bare root and small, potted native trees and shrubs were eagerly taken home by Ottawa residents.

The annual SNC bus tour made a stop at an Ottawa farm to showcase a grass buffer and erosion control project, completed in partnership with the City of Ottawa, ALUS Ontario-East, the Ottawa Rural Clean Water Program, and SNC. Participants were provided with an overview of the project with focus placed not only on the environmental benefits of the grass buffer, but also the economical benefits for the farmer.

Bottom Left: Councillor Carol Anne Meehan gives away trees in Gloucester-South Nepean.
 Bottom Right: Bus tour participants learn about the importance of riparian buffers along streams.



Another successful program offered to residents of the City of Ottawa saw the replacement of 469 ash trees infected with the invasive Emerald Ash Borer. Infected Ash trees were replaced through a cost-share program funded by the City of Ottawa and administered by SNC.

Through the Stream of Dreams Program, SNC delivers in-class workshops teaching youth the importance of protecting local waterways and drinking water sources and about the integrated watershed management approach of Conservation Authorities. To follow classroom learning, students work through a visioning exercise and then paint their own wooden "Dreamfish" to be hung on their school's outer fence for years to come.

The recently completed mural at Vimy Ridge Public School in Findlay Creek is SNC's largest; nearly 800 Dreamfish are attached to the school's outer chain-link fence.

SNC Plans for 2020

The focus area for 2020 will be the South Bearbrook. Along with regular City Stream Watch monitoring, SNC will be carrying-out detailed data collection activities in the catchment as part of an in-depth 2 year study. Data visualization software (TecPlot) will be used to determine potential groundwater-surface water interactions. The output will guide field validations and delineation of important baseflow areas in the South Bear Brook catchment.

There will be opportunities for volunteers to help with stream habitat assessment surveys, fish and benthic community sampling, water quality sampling, and baseflow sampling. There is also the potential for volunteers to participate in garbage clean-ups, invasive species removals and riparian buffer planting projects.

South Bear Brook Catchment Study Area

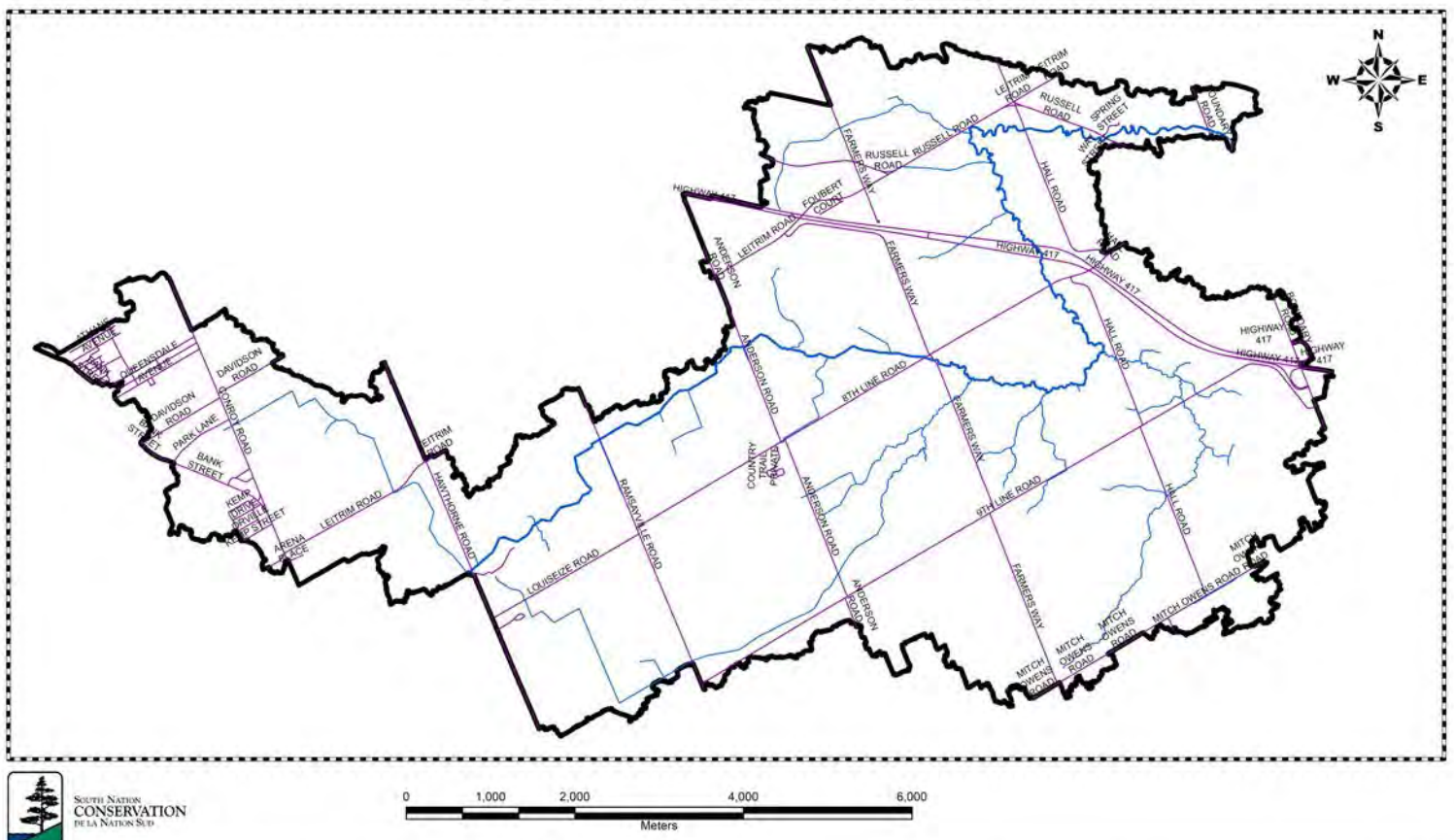


Figure 21 South Bear Brook Subwatershed

For more information or to volunteer with SNC's City Stream Watch program, please contact Naomi Langlois-Anderson at:

nlanglois-anderson@nation.on.ca

613-984-2948

<http://mvc.on.ca/city-stream-watch>



Acknowledgements

A big thank you to all of our 2019 **volunteers**. You continue to make the program a success and contribute to important data collection and rehabilitation projects along our urban and rural streams within the City of Ottawa.

Thank you to all the **landowners** that granted us access to the creeks that flow through their properties.

Thank you to the **TD Friends of the Environment Foundation** for sponsoring CSW events in 2019.

Thank you to the **City Stream Watch collaborative** for continuing with their program guidance, ideas, volunteer recruitment, and general help.

Thank you to all media outlets for helping to spread the word about the City Stream Watch program and events.

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