



City Stream Watch 2017 Summary Report





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MVCA SNC RVCA

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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:

- Seamlessly gather data and report on the state of the City of Ottawa's rivers and tributaries
- Carry out stewardship and restoration initiatives with the help of volunteers from the community

City Stream Watch would not be possible without the help of our hard-working 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, fish community sampling, headwater drainage feature surveys, and water temperature monitoring. Stewardship and restoration activities include shoreline naturalization (planting native trees and shrubs), stream garbage clean-ups, invasive species removals, educational workshops, and habitat creation, enhancement, or restoration projects using bioengineering techniques. Detailed descriptions of our monitoring activities and a summary of projects for 2017 can be found on the following pages.



MVC volunteer at Huntley Creek (left), SNC volunteer holding a Tamarack tree at a planting event (center), and RVCA volunteers at an invasive flowering rush removal event (right).

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 (MNRF) but was modified by the RVCA to increase monitoring efficiency and to be more volunteer-friendly.

The program monitors creeks throughout the Mississippi, Rideau Valley and South Nation watersheds. Each 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:

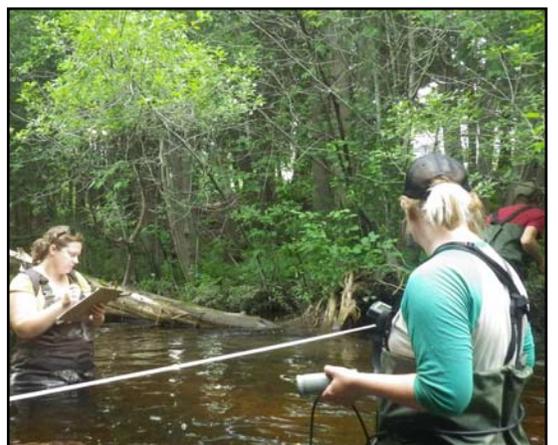
- General land use (agricultural, residential, forest, etc.)
- Stream morphology (wetted width, bankfull width, maximum depth, and flow velocity)
- Water chemistry (water temperature, dissolved oxygen, pH, and conductivity)
- Weather conditions (overhead cloud cover)
- Photographs (upstream and downstream 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, dumping, etc.)
- Presence of fish and wildlife species
- Enhancement and restoration opportunities (areas with excessive garbage or invasive species to be removed, degraded shorelines in need of native vegetation, banks in need of erosion control, and areas in need of fish habitat enhancement).



CSW volunteers measuring maximum depth



RVCA staff measuring water chemistry using a YSI multi-parameter water quality meter



MVC staff recording bankfull width measurements taken by CSW volunteers

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 piped as with tile 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. HDF protocol is a rapid assessment method which characterizes the amount of water, sediment transport, and storage capacity within HDFs. 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).



Volunteer collecting water chemistry data in a headwater drainage feature during spring freshet (period of snow melt).



Headwater drainage feature with heavy nutrient load.



CSW volunteers collecting data at a headwater drainage feature in the summer.

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 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 September 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.

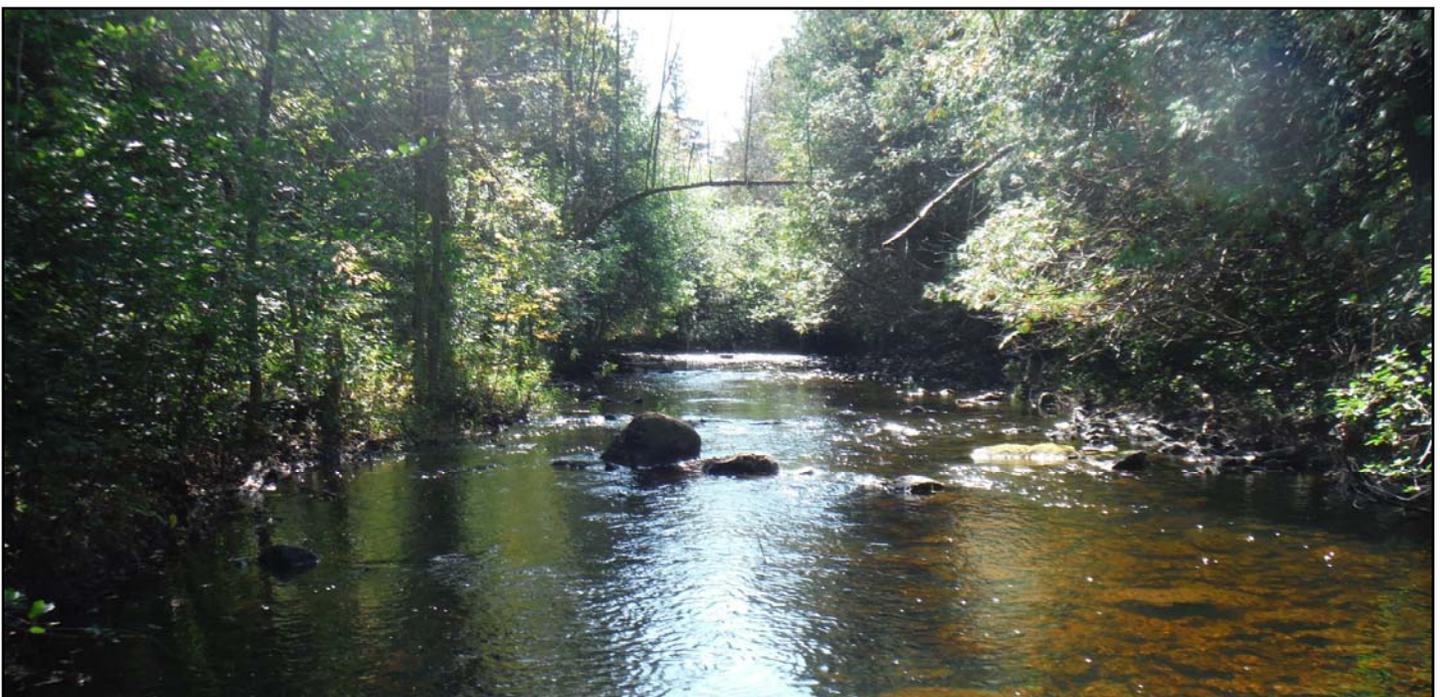
Water temperature range classification based on a standardized air temperature of 25 °C

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 valuable and used on a variety of levels. 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, MNRF, Ministry of the Environment and Climate Change, 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 MNRF; stored in National Heritage Information Centre (NHIC) and Natural Resource and Values Information System (NRVIS) databases
- Species at risk information sent to MNRF (stored in NHIC database)
- Other projects



Stevens Creek in Ottawa's south end.

Invasive Species

Invasive species are animals, plants, or other living organisms that are introduced to environments in which they are not native, and thrive due to favourable conditions. Their success may result from a lack of predators, limited competition from other organisms, or from filling a niche that has otherwise been unfilled. Invasive species can be introduced to an area through a variety of human activities that involve transportation of organisms and seeds from one location to another. This includes recreational boating, bait dumping, live-release of pets, planting non-native species, and commercial shipping. Once introduced, these species can easily spread via natural and human-induced methods. Invasive species can have major negative impacts on ecosystems by overcrowding, out-competing or even directly killing native organisms, which can often have major implications on industries and the economy. (Rutledge *et al.*).

There are a number of invasive species that have been observed along creeks in the City of Ottawa. Many invasive species are prolific and can be found along an entire stream length. In response to the growing number of invasive plants 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 to maintain control of these species and to encourage repopulation of the area by native plant species by spreading native seed mixes where appropriate.

City Stream Watch Targeted Invasive Species



European Water Chestnut (*Trapa natans*)

Originating from Eurasia and Africa, it was introduced to North America as an ornamental plant in 1874. Aside from displacing native floating plants, dense mats of water chestnut 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). Furthermore, European water chestnut produces large seeds with pointed barbs which can wash up on shore and cause injury to beach-goers (OFAH and OMNRF Invading Species Awareness Program, 2012a).



Japanese Knotweed (*Fallopia japonica*)

An indigenous plant of Eastern Asia, Japanese knotweed was brought to North America as an ornamental and livestock forage in the late 18th century. 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 by reducing native plant diversity which also leads to a decline in invertebrate, amphibian, reptile, bird, and mammal communities (Anderson 2012). Japanese Knotweed is one of the most aggressive plant invaders, so controlling it requires substantial amounts of labor.

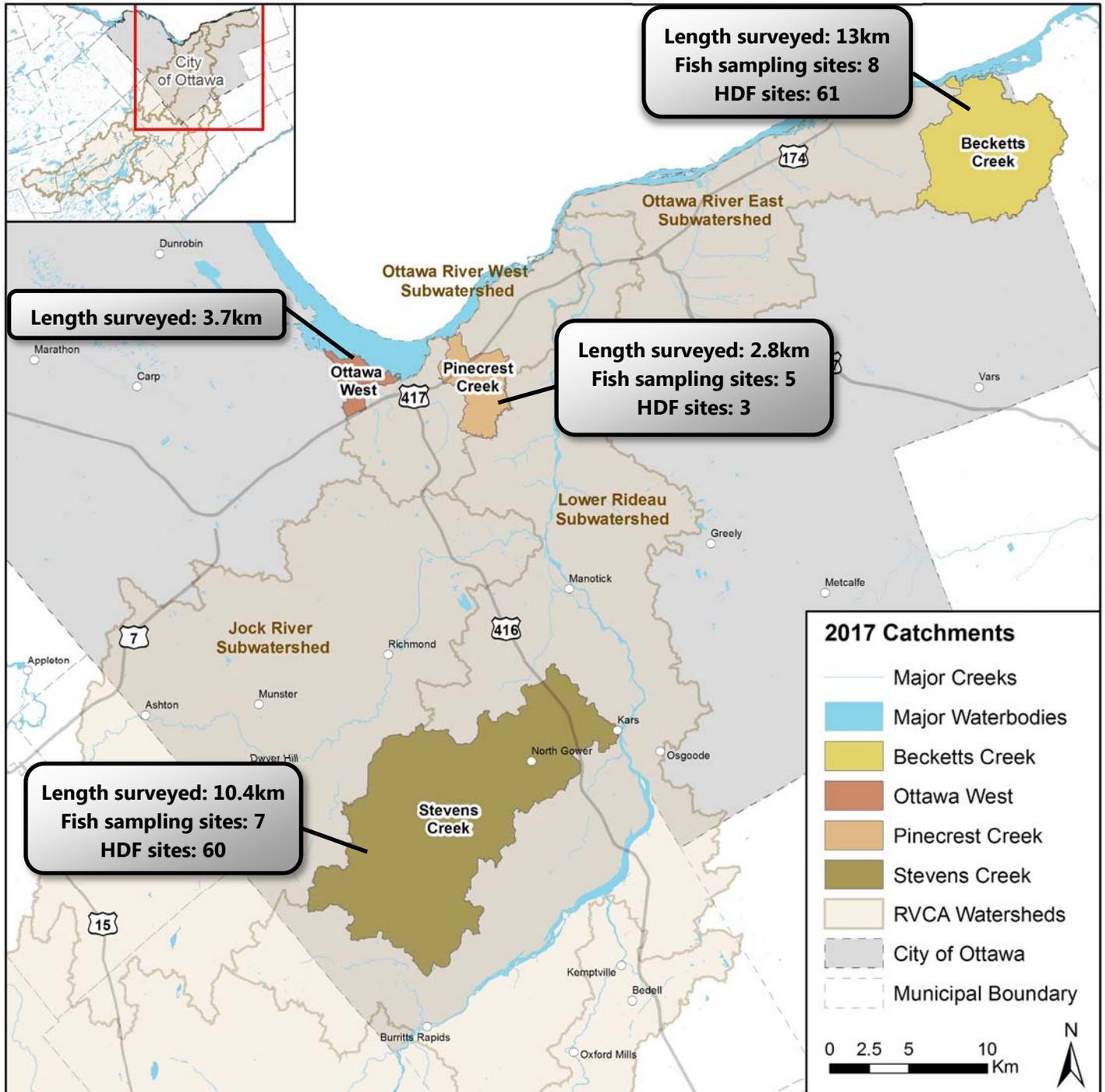


Himalayan Balsam (*Impatiens glandulifera*)

Himalayan balsam has been introduced around the world as a garden ornamental. It produces large amounts of nectar which attracts a disproportionate number of pollinators, and has a highly effective seed dispersal method: capsules that "explode" when touched, which can propagate seeds up to 5m away. This, along with the plant's large size and high seed count, help this plant take over shorelines (OFAH/OMNRF Invading Species Awareness Program, 2012b). In addition to reducing plant diversity, banks are susceptible to soil erosion as a result of Himalayan balsam's shallow root system, particularly when the plants die off in the fall (Clements *et al* 2008).

RVCA City Stream Watch Monitoring Summary

The RVCA City Stream Watch program monitors 27 tributaries of the Rideau and Ottawa Rivers on a 6 year cycle. Nearly 30 kilometers of streams were surveyed as part of the 2017 cycle on Becketts Creek, Pinecrest Creek, Stevens Creek, and Ottawa West tributaries. In addition, a total of 20 fish sampling sites and 124 headwater drainage features were surveyed. For more detailed findings for each tributary monitored in 2017, please see their individual reports that are shared on our website at rvca.ca (Monitoring & Reporting > Reporting > City Stream Watch Reports).



2017 Creek catchment areas with monitoring statistics.

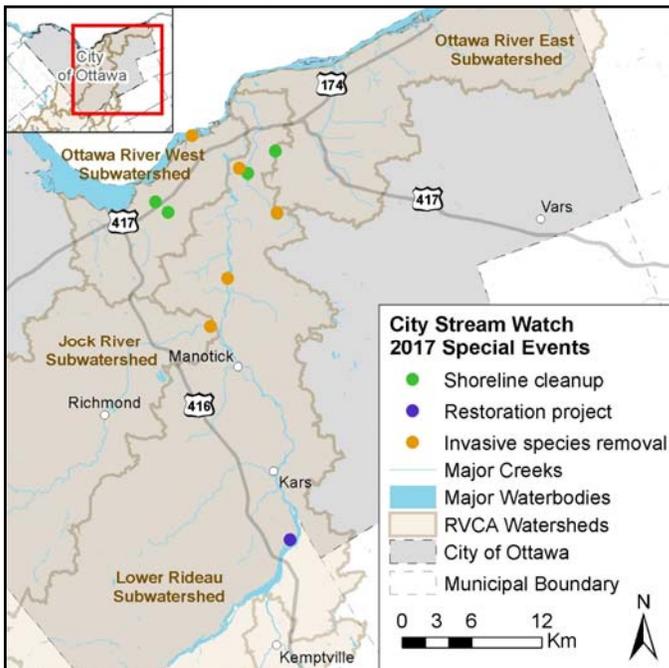


RVCA Community Response

This year, 262 volunteers from the community participated in the program, 149 of which were new to the program, contributing a total of 1191 hours toward stream surveys, restoration activities, and workshops. The following table demonstrates the hard work and dedication of our volunteers in 2017.

Metric	Becketts Branch	Becketts Creek	Pinecrest Creek	Stevens Creek	Sawmill Creek	Ottawa West Tributaries	Black Rapids Wetland	Remic Rapids	Brewer Park	Jock River	Rideau River	Billing's Park	Baxter Pond	RVCA Office	Total
Headwater Drainage Feature Sites Surveyed		61	3	80											124
Number of Stream Sections Surveyed	67	63	27	104		38									269
Number of Fish Sampling Sites	2	6	5	7											20
Number of Fish Sampling Sessions	2	10	5	19			2								38
Number of Temperature Probes		5	3	5											13
Fishing/Demonstration Events									1	1					2
Training Sessions					1									1	2
Number of Garbage Clean-up Events			2		2							1			5
Kilometres (km) of Stream Cleaned			0.743		1.223							0.646			2.612 km
Shoreline planting Events													2		2
Number of trees and Shrubs Planted													150		150
Number of Aquatic Plant Installations													1		1
Invasive Species Removal Events					1			2	1	1	1				6
Area Cleared of Invasive Species (m ²)					475			1320	310	30					2135 m ²
Number of Restoration Projects													1		1
Number of Volunteers (total for all events)	3	40	36	64	37	6	4	9	34	31	1	6	53	21	344
Number of Volunteer Hours	16	212.5	102.5	271	96.5	45.5	13	26	63	104	4	12	181	42	1191*

*Many volunteers participated in more than one activity and thus were counted more than once in this table.



Volunteers removing garbage from Pinecrest Creek

Locations of RVCA City Stream Watch stewardship events in 2017.

Invasive Species Removals



Japanese knotweed removal at Sawmill Creek.

July 21 and July 31 Remic Rapids Invasive Species Removal

This 0.15 hectare wetland feature was designed and constructed in 2015 by the Rideau Valley Conservation Authority in partnership with the National Capital Commission. Situated alongside the Ottawa River, the wetland provides habitat for amphibians and birds and acts as a water supply for wildlife.

In 2016, garlic mustard was found growing in its vegetative (i.e. first year) state, so volunteers tackled the area and removed any visible plants. Monitoring in 2017 showed that garlic mustard was still present, along with other invasive species.

Two rounds of invasive removals took place with the help of CSW volunteers and RVCA summer students. They targeted garlic mustard, purple loosestrife, giant mullein, common reed (*Phragmites australis*), invasive buckthorn and invasive honeysuckle. A total of 73 garden waste bags were filled, amounting to 570kg of plant material. In order to restore natural vegetation, a native seed mix of grasses and sedges was spread throughout the area, particularly in patches of now barren soil. The wetland will continue to be monitored in future years.



RVCA summer students conduct an invasive species blitz at Remic Rapids Wetland (left). City Stream Watch volunteers return to finish the job (right).

July 15 Sawmill Creek Japanese Knotweed Removal, Towngate Mall

This is the fourth year that CSW volunteers and staff have tackled this patch of Japanese knotweed, and progress has been made! The density of this patch has diminished since 2016, and it no longer appears to be spreading. This year, all above-ground biomass was removed as usual, but volunteers focused their efforts on digging up as many rhizomes as possible, in essence, getting to the “root” of the problem. In total, 480kg of knotweed material was removed, clearing an area of 475m². CSW staff will continue to monitor this patch in the coming years in the hope of removing it completely.





Japanese knotweed removal on the Jock River from start to finish.

August 10 Jock River Japanese Knotweed Removal

During the planning process of the Hearts Desire weir decommissioning, a large patch of Japanese knotweed was located on the bank of the Jock River. Volunteers and staff from City Stream Watch and RVCA's Shoreline Naturalization Program (SNP) cleared an area of roughly 30m², pulling out stems and digging up roots and rhizomes. The crew filled 108 garbage bags—over one ton of material! SNP staff then covered the exposed area with black sheeting which blocks sunlight and prevents further growth, a control method recommended by the Ontario Federation of Anglers and Hunters (OFAH).



Japanese knotweed removal crew, including RVCA staff and volunteers.

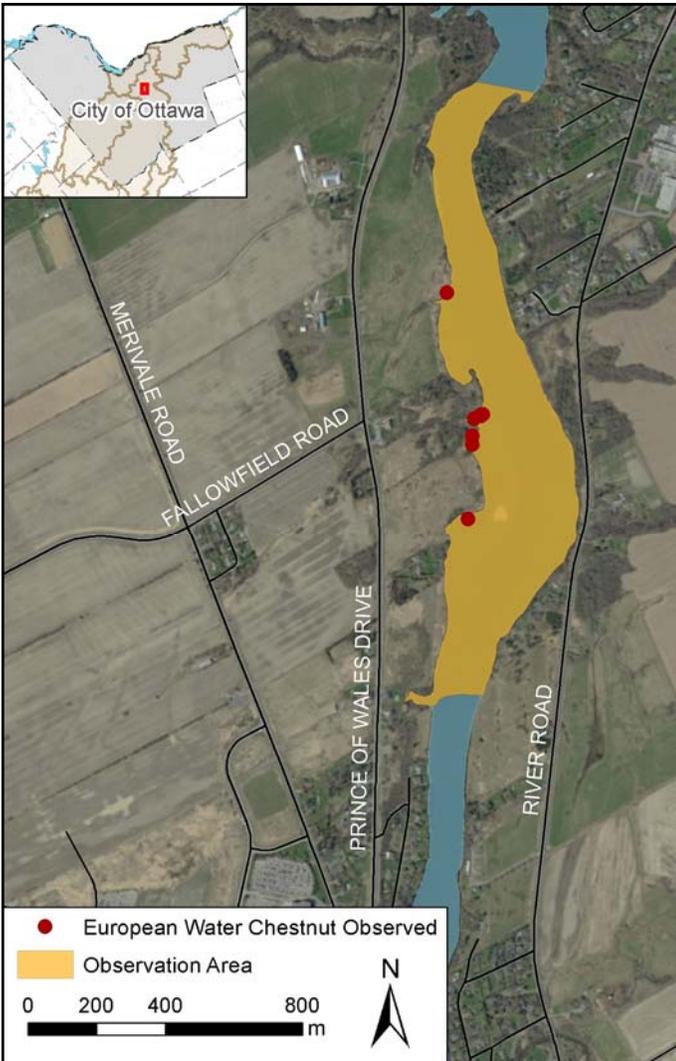
September 24 Tree Fest Ottawa—Flowering Rush Removal

2017 marks the second year that City Stream Watch has partnered with Tree Fest Ottawa, a fall festival that celebrates trees and inspires citizens of Ottawa to help protect the environment they live in. After exploring Brewer Pond on Day 1 of the festival, Day 2 saw participants help restore the native plant community surrounding the pond by removing the invasive flowering rush (*Botomus umbellatus*). This plant disrupts aquatic ecosystems by growing in dense patches and crowding out native plants, and it is becoming increasingly prevalent in Ontario, partly due to its various methods of reproduction (Invasive Species Council of BC, n.d.). Volunteers strapped on chest waders and dug out plants in the water and on shore, covering an area of roughly 310m². This is the second year we returned to control flowering rush at Brewer Pond monitoring will continue.



Volunteers tackling flowering rush on the shoreline of Brewer Pond.

August 10
European Water Chestnut Removal, Rideau River



Area monitored for European water chestnut on the Rideau River in 2017.

RVCA and Ducks Unlimited Canada (DUC) joined forces once again 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 summer, City Stream Watch assembled volunteers to help pull out as many plants as possible, which amounted to 2700kg of plant material. In 2016, with some plants still in the area, efforts were repeated and more plants were removed. Thanks to everyone's hard work, monitoring efforts in 2017 showed a marked decrease in plant density, providing evidence that mechanical removal of above-ground material is sufficient for eradicating the plant. Monitoring will continue to ensure that the plant remains under control, with hopes it won't be present in future years.



City Stream Watch coordinator harvesting the few remaining European water chestnut plants on the Rideau River in 2017.



From left to right, amount of European water chestnut material located and removed within the same area on the Rideau River in 2015, 2016 and 2017, respectively.

Garbage Cleanups

April 29 & September 30 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-four 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 in both the spring and fall, cleaning up Pinecrest creek with some dedicated volunteers. Shopping carts, furniture, and an entire tent are just a few of the 'treasures' we found in the creek and on the banks. In total, 25 industrial garbage bags were filled, numerous large items were removed, and 743m of shoreline were cleaned, a significant portion of Pinecrest Creek.



A significant amount of trash removed from Pinecrest Creek.



Members of the Canadian Forces Ottawa Fish and Game Club and CSW volunteers at Sawmill Creek.

May 13 Sawmill Creek Spring Cleanup

In partnership with the Canadian Forces Ottawa Fish and Game Club, City Stream Watch hosted an event to clean up Sawmill Creek, a highly urbanized tributary of the Rideau River. Ten volunteers helped to clear 428m of shoreline behind an Ottawa South shopping center and fill 25 large garbage bags. City Stream Watch has hosted cleanups in this area in the past and will continue to monitor for garbage dumping.

May 18 Billings Park Garbage Cleanup

Several concerned citizens contacted the RVCA in the spring with regard to an increasing amount of litter in Billings Park, just south of the General Hospital. In response, City Stream Watch organized a cleanup to tackle the issue. Staff and volunteers covered an area of 6047 square meters, picking up bottles, cups and wrappers.



Volunteers remove garbage from a small wetland feature in Billings Park.

June 3 100In1 Day—Heron Park Cleanup

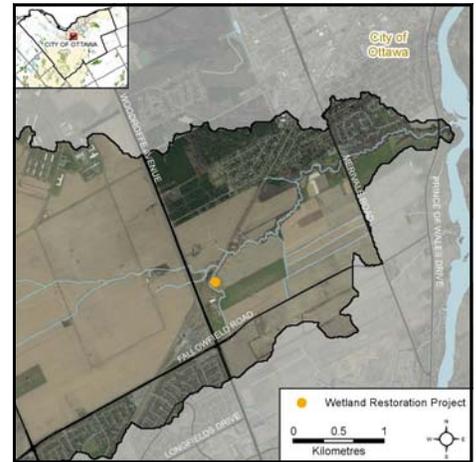
For the first time, in 2017, City Stream Watch took part in *100In1 Day*, a day on which citizens come together to improve their city in any way they can. CSW staff and volunteers joined forces to clean a portion of Sawmill Creek which runs through Heron Park between the transitway and the Airport Parkway. Though the crew was small, they covered a 795m length of the creek and hauled out tires, a bicycle, and a toboggan, among other things.



Restoration Projects

Black Rapids Wetland Restoration Project 2017 Monitoring Results

In 2016, RVCA partnered with the National Capital Commission (NCC) to restore and reconnect a wetland adjacent to Black Rapids Creek. The newly enhanced wetland feature is located near the intersection of Fallowfield Road and Woodroffe Avenue alongside NCC recreational trails. The wetland was expanded from an area of 3500 m² to 7000 m² and now features a variety of slopes, as well as woody structures for fish and wildlife, including root wads, basking logs, and sweeper trees. The goal of this wetland enhancement was to improve water quality, provide rare wetland habitat for sensitive species, increase flood storage, and improve the overall biodiversity of the local ecosystem.



Location of Black Rapids Wetland



Black Rapids wetland post-enhancement with erosion matting, 2016 (top), and in October, 2017 (bottom).

Since last year, regular monitoring of the project has been underway. In addition to data loggers tracking daily changes in temperature and water levels, 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 fish sampling and amphibian surveys were also carried out. A year later, species observed at the wetland include painted turtles, treefrogs, killdeer, great blue herons, mallards, and waxwings. Another welcome visitor seen at the wetland is the monarch caterpillar, a species at risk, which feeds on the bountiful milkweed in the area.



Wildlife observed at Black Rapids wetland in 2017. From left to right: treefrog tadpole with front and hind legs; killdeer protecting its nest; Cedar waxwing perched on root wad installed during wetland enhancement.

Baxter Pond Restoration

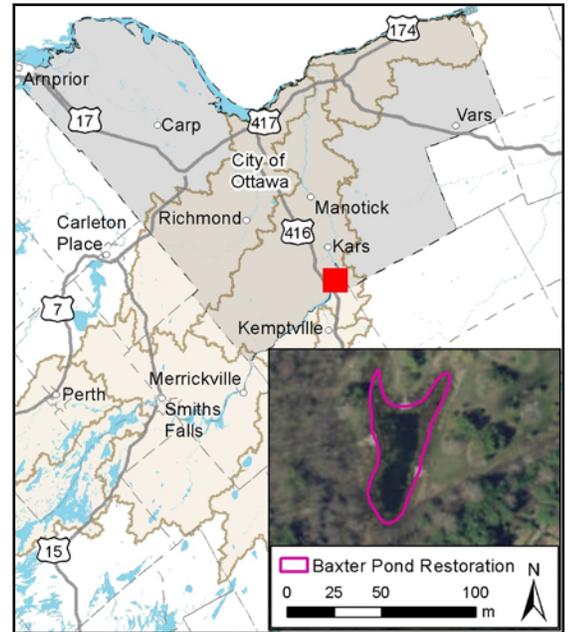
Baxter Pond is located beside the interpretive center at RVCA's Baxter Conservation Area near Kars, Ontario. It was created thirty years ago as a refuge for wildlife and today the pond sees roughly 5000 young visitors annually who have the opportunity to learn about aquatic habitat and biodiversity. However, over the years, the water levels in the pond have diminished. This has had cascading effects on the pond, from increased water temperature to extensive plant growth to oxygen depletion. In order to solve this problem, RVCA staff redesigned the pond to be excavated deeper and hired a contractor to carry out this work. However, this did not happen over night! There were many steps involved in restoring Baxter Pond.

1) Draining the Pond

This required a large pump and several days to reduce water levels.

2) Fish Salvage

Before the excavation could move forward, the pond needed to be free of fish and other animals in order to prevent them from being injured or killed in the process. A team of technicians and volunteers worked tirelessly to relocate over 4000 fish, frogs, tadpoles, and turtles to the nearby Baxter Wetland over the course of two days. A combination of seine nets (pictured below) and dip nets were used to collect the animals.



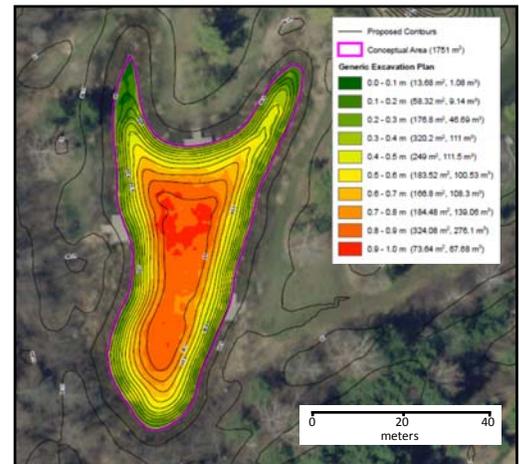
Location of Baxter Conservation Area.



RVCA aquatic resource technicians and volunteers use a seine net to remove fish from Baxter Pond (left). Volunteers assist technicians in sorting and identifying fish being collected (right).

3) Excavation

Once the pond had been fully drained, Agrodrain Systems Limited (ASL) began digging according to plans drawn up by RVCA staff, as shown in the diagram (right). Saturated upper-layer soils, known as hydric soils, were carefully removed and set aside to be reused, while the underlying clay was excavated. A total of 88 truckloads of fill were removed from the bed of the pond.

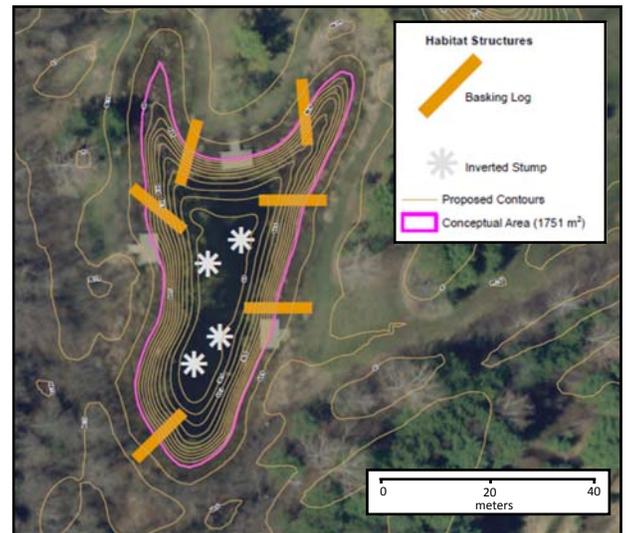


Left: Excavation begins on Baxter Pond. Right: Aerial view of Baxter Pond with plans for excavation from deepest point (red) to shallowest point (dark green).

Baxter Pond Restoration (cont'd)

4) Habitat Creation

Now a blank slate, the pond was ready to become a pond again. The construction crew began by re-laying the rich hydric soils which contain vital nutrients for plants as well as aquatic plant seeds. They also installed natural habitat features: logs and overturned root wads will provide basking areas for turtles as well as perching sites for birds, while sweeper trees (small, laterally-oriented trees) provide additional woody structure along the banks, attracting fish, big and small. Next, volunteer groups assisted the RVCA's Shoreline Naturalization staff in planting native trees and shrubs along the banks of the pond, as well as spreading a native seed mix to encourage native plant growth. Finally, a group of high school students helped install some aquatic plants in the bed of the pond and spread more seeds along the banks to build a strong foundation for a flourishing pond.



Aquatic habitat features installed in Baxter Pond.



Volunteers working hard to plant Baxter Pond's new shoreline (left, center). High school students installing water lilies and arrowhead (right).

5) Refilling the Pond

In keeping with our wet year, a heavy rain event occurred in late October which naturally refilled Baxter Pond, rendering the project complete! The pond will be monitored in the coming years by students at Baxter Conservation Area to determine the effectiveness of the habitat enhancement.



Baxter Pond after being drained (left) and flooded once again (right).

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 the monitoring and stewardship events in which they participate. The following workshops and demonstrations were held in 2017:

May 27

Spring Volunteer Orientation

In the spring, City Stream Watch held its annual pre-season volunteer orientation where volunteers are taught about 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 may have never partaken in field work. This year, the orientation was held at Sawmill Creek.



City Stream Watch volunteer learning how to measure water chemistry.

August 26

Invasive Species Workshop

This was the first year City Stream Watch has put on this event, and it was a big success! Twenty-one volunteers came to our main office near Manotick to learn about the threat of invasive species in Ontario, how to identify some of the more common species, and what they can do help prevent their spread.



Workshop participants learning about invasive species in Ontario.

September 23

Tree Fest Ottawa - Brewer Pond Exploration Day

Day 1 of Tree Fest saw City Stream Watch volunteers and other festival attendees get up close and personal with nature by wading into Brewer Pond and sampling some of its aquatic residents to learn a bit about biodiversity. Participants also learned about the ecological benefits that resulted from reconnecting Brewer pond with the Rideau River in 2014.



City Stream Watch volunteers and Tree Fest attendees explore Brewer pond and meet some of their residents (Photos obtained from Tree Fest Ottawa, n.d.).

The Ultimate Aquatics Workshop

Our longstanding Ultimate Aquatics Workshop once again proved to be one of our most popular events. In late October, 28 volunteers enjoyed a beautiful sunny day at the Jock River Landing with the Ottawa Flyfishers Society (OFS) and City Stream Watch. 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, topped off with a complimentary lunch. Below is a summary of workshop activities.

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



Volunteers learning about fish, invertebrates, and the art of fly fishing with the Ottawa Flyfishers Society and City Stream Watch staff.

RVCA in the News 2017

Flood Conditions

Heavy rains throughout the summer and into the fall made 2017 the wettest year in Ottawa in recorded history (Scotti, 2017). This resulted in flooding across the City of Ottawa, in some places severe. North Gower, at the south end of Ottawa, experienced a 190mm rainfall in a single day; water infiltrated many homes and took a large toll on crops in the area (RVCA, 2017). While surveying Stevens Creek, which runs through North Gower and into the Rideau River, water levels were markedly high. This year was quite a contrast to 2016, when the city experienced moderate to severe drought conditions throughout most of the year.



Flooding in North Gower.

Volunteer Appreciation

On June 3, a select group of City Stream Watch volunteers were honoured for their hard work and dedication throughout the years. Bruce Clarke of the Ottawa Flyfishers Society and Peter Stewart-Burton of the Canadian Forces Ottawa Fish and Game Club both celebrated over 12 years of volunteer service with City Stream Watch, both of whom sit on the City Stream Watch collaborative and are important voices for our community. Peter Melvin, Sidney Arnold, and François Yvon Deslauriers celebrated 5+ years of service with the program, contributing to a multitude of projects throughout the city and giving up many hours of their time. Rebecca Cameron, a recent graduate in Environmental studies, was recognized for the “Youth Commitment” category for spending her summers volunteering with the program. A special thank you to these esteemed stewards and to all of our CSW volunteers!



From left to right: Sidney Arnold, Peter Melvin, Rebecca Cameron, and Peter Stewart-Burton.

Japanese knotweed

Summer of 2017 saw growing concern over the highly invasive Japanese knotweed, a plant native to eastern Asia that has been introduced to Canada and other areas around the world. RVCA staff were interviewed by CBC and Metro News to help spread information on the threat of this plant and what to do if the plant is spotted. Brady McGlade (pictured left) and Fiona Chapman, summer students with RVCA, were trained by the Ontario Federation of Anglers and Hunters in identifying and controlling the spread of invasive species and were invaluable resources throughout the summer, contributing to invasive species removal events as well as putting on a workshop for City Stream Watch volunteers.



RVCA's Brady McGlade and volunteers tackling a patch of Japanese knotweed on the banks of Sawmill Creek.

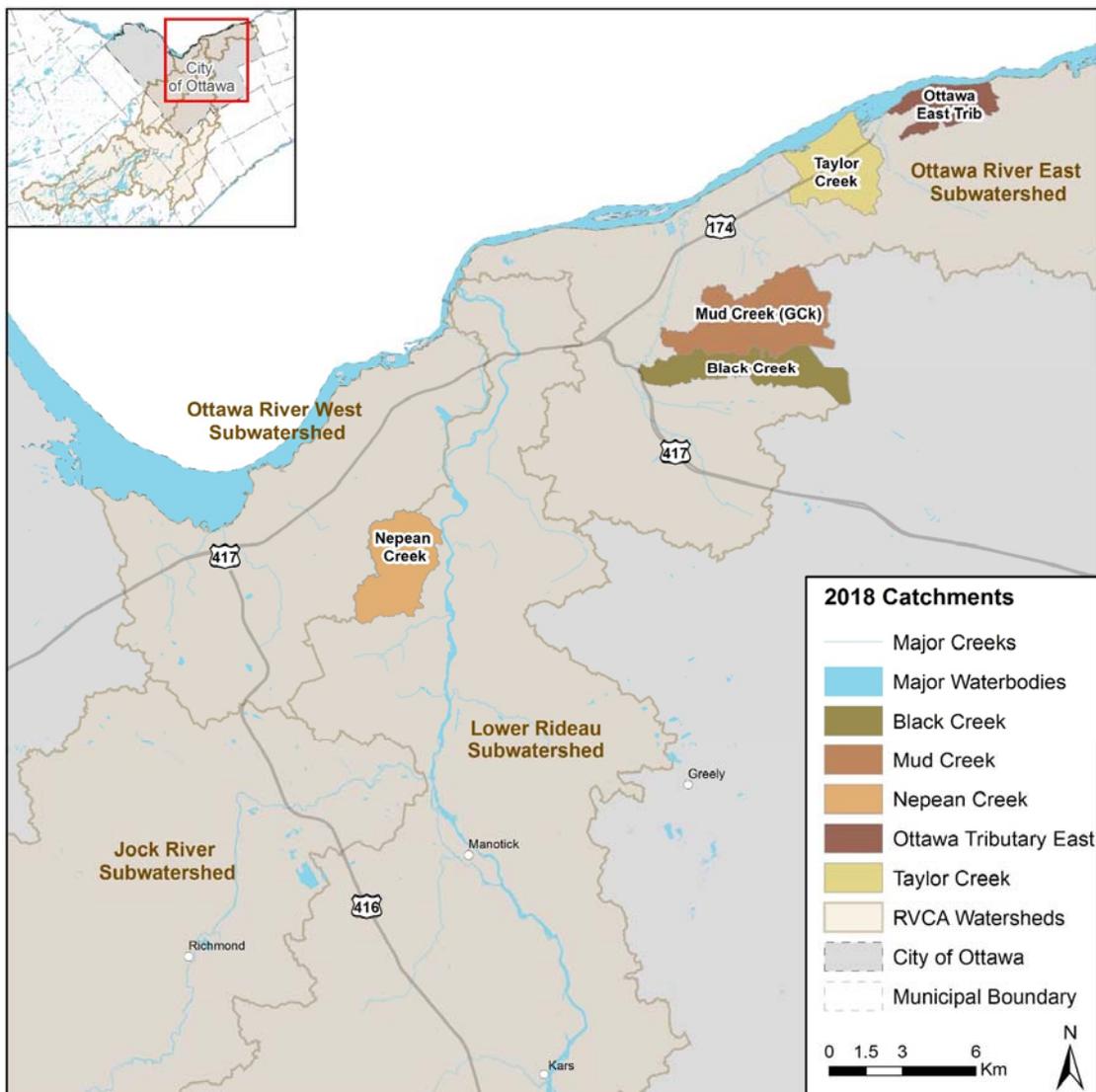
RVCA Plans for 2018

In 2018 as part of our City Stream Watch program we will be monitoring the following creeks:

- Black Creek
- Mud Creek (East)
- Nepean Creek
- Ottawa East Tributary
- Taylor 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



Catchments to be monitored in 2018.

To volunteer with RVCA's City Stream Watch program, please visit rvca.ca or contact:

City Stream Watch Coordinator

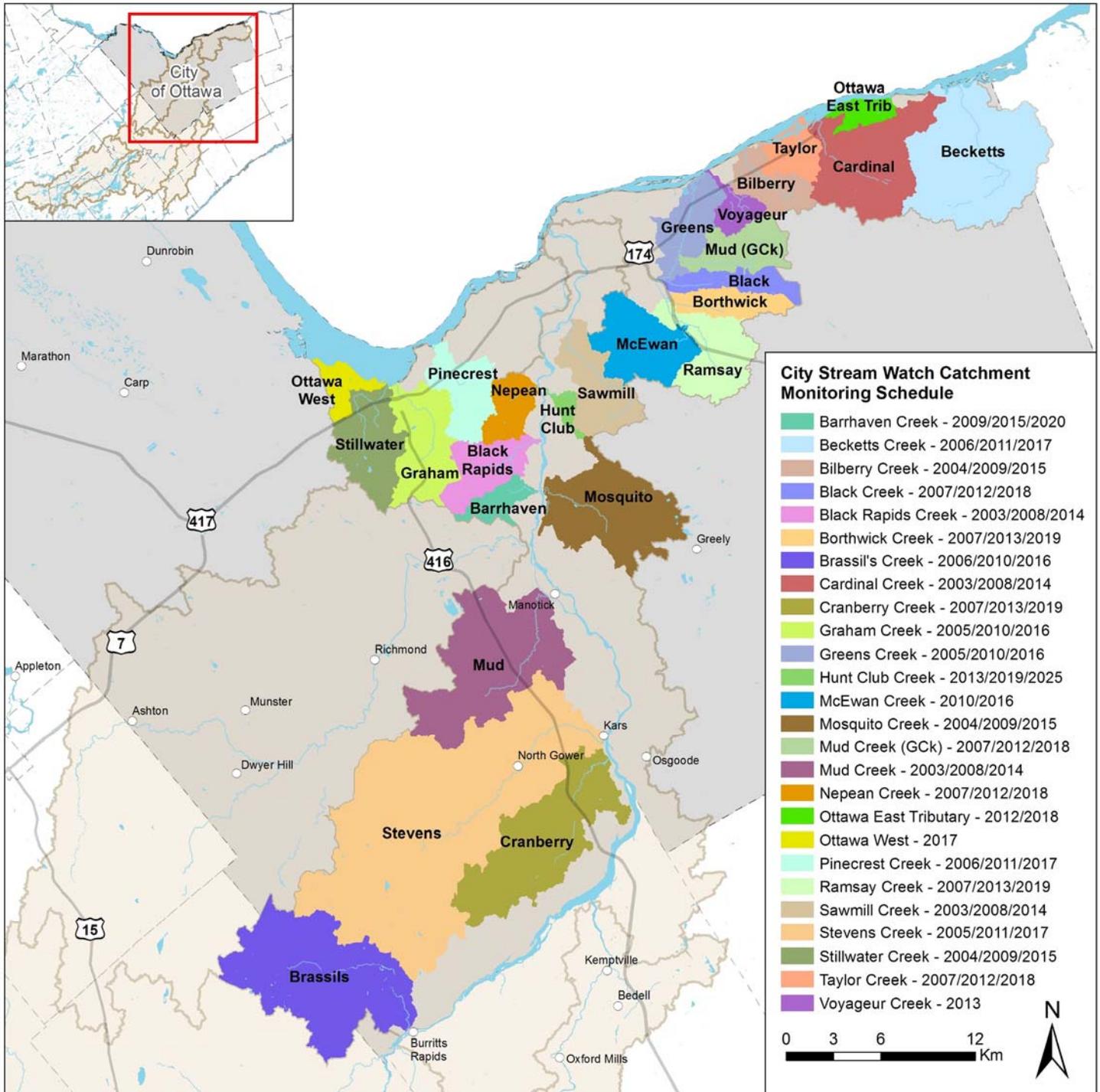
(613) 692-3571

citystreamwatch@rvca.ca

<https://www.rvca.ca/volunteer/city-stream-watch>



RVCA City Stream Watch Monitoring Schedule



RVCA City Stream Watch catchment locations and monitoring schedule.



Mississippi Valley Conservation Authority

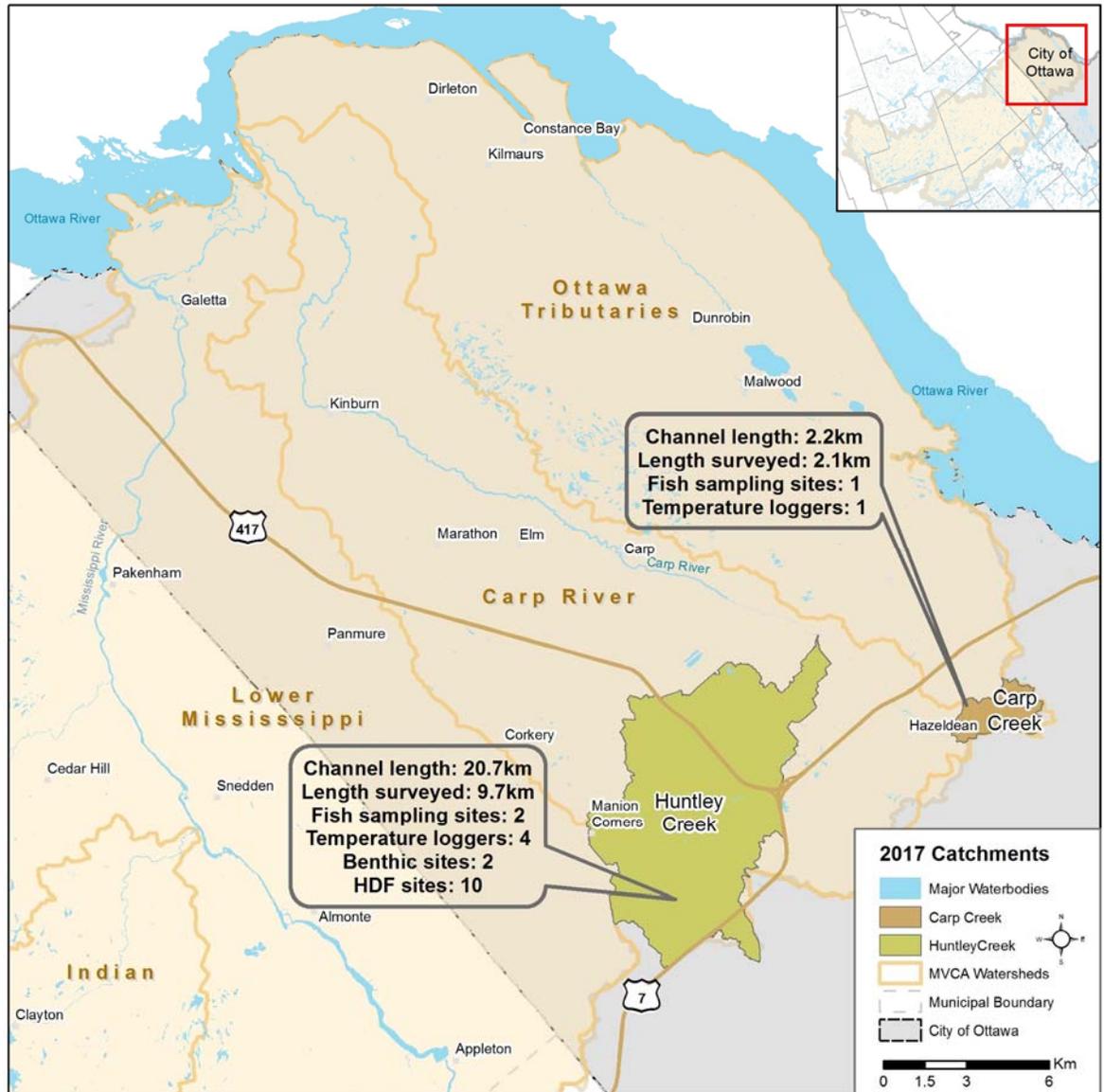
City Stream Watch Monitoring Summary

The MVCA City Stream Watch (CSW) program monitors watercourses within the City of Ottawa boundaries in detail by wading the stream where possible and completing a detailed survey of each 100m segment. 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 2017 over 11 km of stream was surveyed in the Carp Creek and Huntley Creek Watersheds. To support these surveys, 6 temperature loggers were launched, 3 sites were electrofished, and 2 sites were sampled for benthic population analysis. Additionally, 26 sites across Constance Creek, Huntley Creek and other Carp River tributaries were sampled using the Headwater Drainage Feature protocol.

For more detailed information on the sampling conducted on Carp Creek and Huntley Creek in 2017, please refer to their individual reports found on our website (mvc.on.ca/city-stream-watch/).

Our sampling efforts were challenged this year with frequent rain events causing high water levels and flows. This caused many adjustments to the sampling schedule and unfortunately we were not able to survey Constance Creek in detail as we had planned.



Below: Photos from surveying Carp Creek. Above: Summary map of MVCA's City Stream Watch watersheds targeted in 2017.





MVCA

Invasive Species

The following invasive species were identified during our surveys of Huntley Creek and Carp Creek in 2017. Continued efforts to ID and note these species will improve our understanding of the extent of their spread in our watershed and aid in planning stewardship actions to tackle them.

Invasive Species	Huntley Creek	Carp Creek
Banded Mystery Snail	•	
Buckthorn - Common	•	•
Buckthorn - Glossy	•	
Dog Strangling Vine		•
Curly Leaf Pondweed	•	
European Frogbit	•	
Garlic Mustard	•	•
Himalayan Balsam	•	•
Norway Maple	•	
Poison Parsnip	•	•
Purple Loosetrife	•	•
Rusty Crayfish	•	



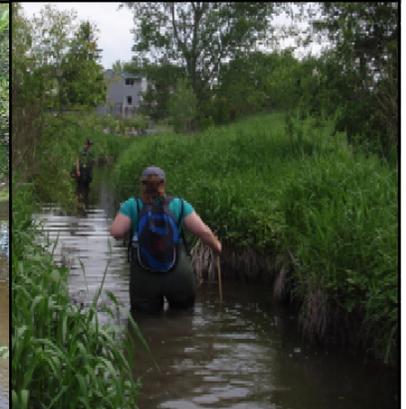
Stewardship

In 2015, MVCA undertook two shoreline planting events along Huntley Creek. One was a community project where 20 volunteers planted 200 trees and shrubs along the banks of the creek. The second was a site where we had previously planted 107 native species of shrubs at a private property and in 2017 we returned to 22 more shrubs to their shoreline.



Volunteers

In 2017, MVCA was fortunate to have the support of 15 dedicated volunteers who would come out on multiple sampling runs for a total of 116 volunteer hours. If you are interested in volunteering with us, please contact the office at info@mvc.on.ca or 613-253-0006.

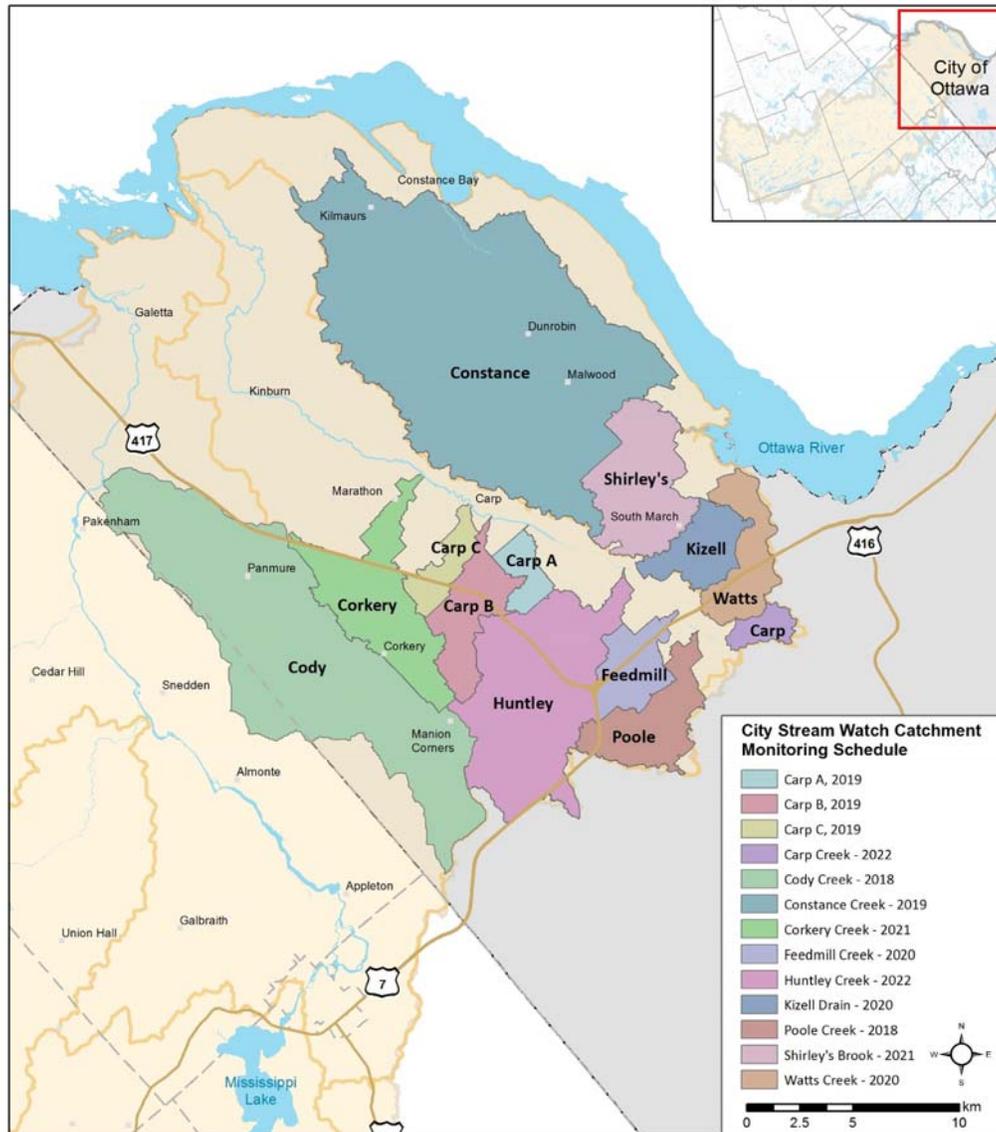




MVCA

Plans for 2018

Our plans for 2018 are to survey Poole Creek and Cody Creek. Poole Creek was last surveyed in 2013, and Cody Creek has not been surveyed before following the CSW protocol. The surveys will be enhanced with water temperature loggers, fish and benthic sampling as well as targeting headwater drainage features for assessment. It is our intent to engage the local community to help us with a garbage clean up event, and a shoreline planting event along Poole Creek.



Above: Map of MVCA's City Stream Watch program rotation. Below: Photos from surveying Huntley Creek.





SNC City Stream Watch Monitoring Summary

South Nation Conservation chose the Bear Brook River system as its target for City Stream Watch in 2017. The Bear Brook system begins east of Leitrim in the City of Ottawa and flows east towards Edwards. Eventually, the tributaries that meet near Carlsbad Springs become the Bear Brook River and flow further east to the South Nation River. The Bear Brook River enters the South Nation River near Ettyville.

The Bear Brook River is a medium-sized river fed by a flashy system with extensive floodplains. Consequently, the weather and heavy rainfall in 2017 provided difficult conditions for City Stream Watch monitoring to take place in the Bear Brook system in a safe manner. However, 3 sections were completed along the Bear Brook River and 300 meters of the stream was monitored. 25 headwater drainage feature sites were surveyed and a total of 12 water temperature data loggers were deployed within this system in 2017. McKinnon's Creek, a tributary of the Bear Brook River, was monitored under the City Stream Watch Program in 2016 by South Nation Conservation.



The Bear Brook River system caused significant flooding in 2017 after heavy rainfall and snow melt runoff.

Invasive Species Removals

Leitrim Wetland Fen Buckthorn Removal

South Nation Conservation received funding from Patagonia in 2017 to undertake a wetland rehabilitation within the Leitrim Wetland Fen. This project involved the removal of glossy buckthorn from the fen area and the planting of native trees and shrubs in its place. The project has the goals of increasing species diversity, increasing the percent cover of native species, increasing the presence of rare fen species, and providing opportunities for education and outreach within the community. This project site will be monitored in 2018 to evaluate project success so that further work can be planned and coordinated to fully rehabilitate the fen.



The Findlay Creek Fen once covered a much larger area than it currently does. Invasive glossy buckthorn has overtaken much of the understory and canopy and is threatening to completely outcompete native fen species in the area. Here, South Nation Conservation staff and volunteers are working to remove small and juvenile buckthorn plants in addition to larger mature plants forming the upper canopy. Species native to wetlands in Eastern Ontario were planted in the area to replace the removed buckthorn. Species planted include eastern white cedar, tamarack, and alder.



A panoramic view of the fen area and forested wetland in the background post-project. Native fen grasses, forbs, and shrubs can be seen in the foreground followed by newly planted wetland tree species in the background.

Restoration Projects

In 2017, SNC, with funding from the City of Ottawa, completed 2 stream restoration projects along tributaries of the South Nation River. Both projects aimed to recover and protect water resources and water quality at the source so that the water environment is improved downstream. The Stoodley Grass Buffer Demonstration Project came as a result of a willing landowner who wanted to improve water quality and slow soil loss along agricultural areas. The Shield's Creek Naturalization Project was the direct result of City Stream Watch monitoring that was completed in 2015 which identified potential areas for stream restoration within The City of Ottawa.

Stoodley Grass Buffer Demonstration Project

A large farm situated along the South Castor River was identified as an ideal demonstration site for best management practices. SNC worked in partnership with the landowner, the City of Ottawa Municipal Drainage Program, Ottawa Rural Clean Water Program (ORCWP), and Alternative Land Use Services (ALUS) Ontario East. This project involved the creation of a 25-acre grass buffer within the riparian corridor of the South Castor River and bank stabilization of 400-meters of eroding banks. In addition, over 800 native perennial plants and shrubs were planted along the riparian corridor to increase pollinator species and shrub diversity in the area. Prior to project construction, pre-monitoring of water quality, benthic invertebrates, fish, and vegetation was completed. Post-project monitoring will be completed to quantify improvements to water quality and impacts on biological communities.



Shrub planting along the South Castor River



The South Castor River (left) had over 800 native shrubs and plants (right) planted along its banks in the riparian zone

Restoration Projects

Shield's Creek Naturalization

A corridor of land owned by the City of Ottawa was identified as an excellent area for environmental enhancements and restoration in 2015 by the City Stream Watch Program and monitoring activities. At the time, elevated levels of erosion and sedimentation were identified along with open space that had the potential to be naturalized. With assistance from the City of Ottawa's Water Environment Strategy funding program, South Nation Conservation stabilized 4 stream meanders with coir logs to return the banks to less steep slopes in 2017. Exposed soils were protected with erosion control matting and seeded with a native seed mix. Further, the corridor's diversity was enhanced through the planting of over 800 native trees, shrubs, and perennial forbs. To establish stream shading and forest cover swiftly, 50 large caliper trees were installed along the banks of the stream and they will add instant cover and organic matter inputs to the aquatic system.



Coir logs were installed (top left) and the protected bank (bottom left) was stabilized with large caliper trees (top right, bottom right)



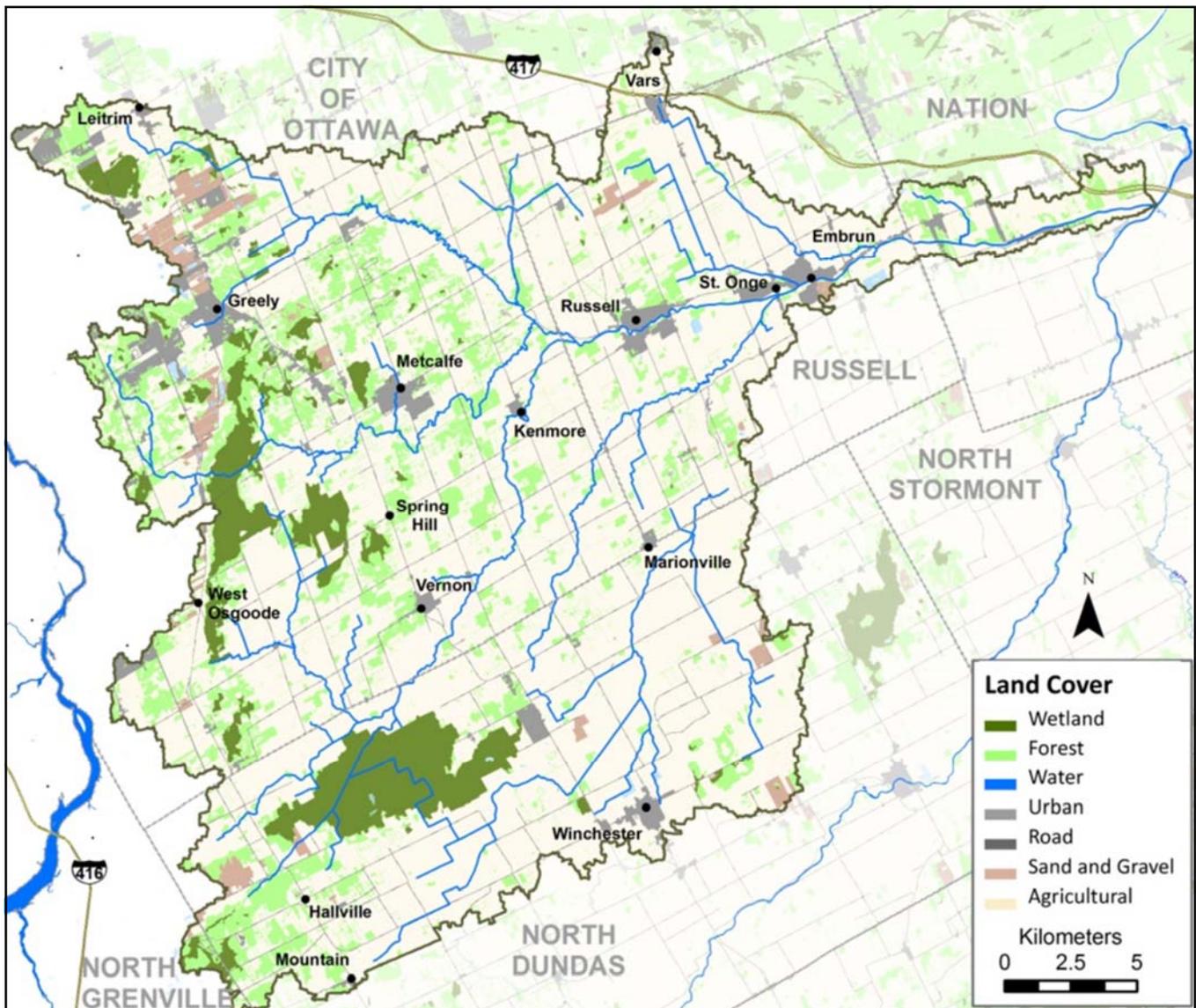


SNC Plans for 2018

In 2018, South Nation Conservation plans to target the Castor River Subwatershed for City Stream Watch Monitoring. Within this subwatershed, the North Castor River, Shield's Creek, parts of Findlay Creek, and a tributary of the Castor River have been monitored. However, several other tributaries of the Castor River have not been monitored and will be priorities for 2018.

South Nation Conservation will have opportunities for volunteers to assist with the following activities:

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



The Castor River Subwatershed

To volunteer with SNC's City Stream Watch program, please contact:

City Stream Watch Coordinator
South Nation Conservation

613-984-2948



Acknowledgements

A big thank you to all of our 2017 **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 **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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