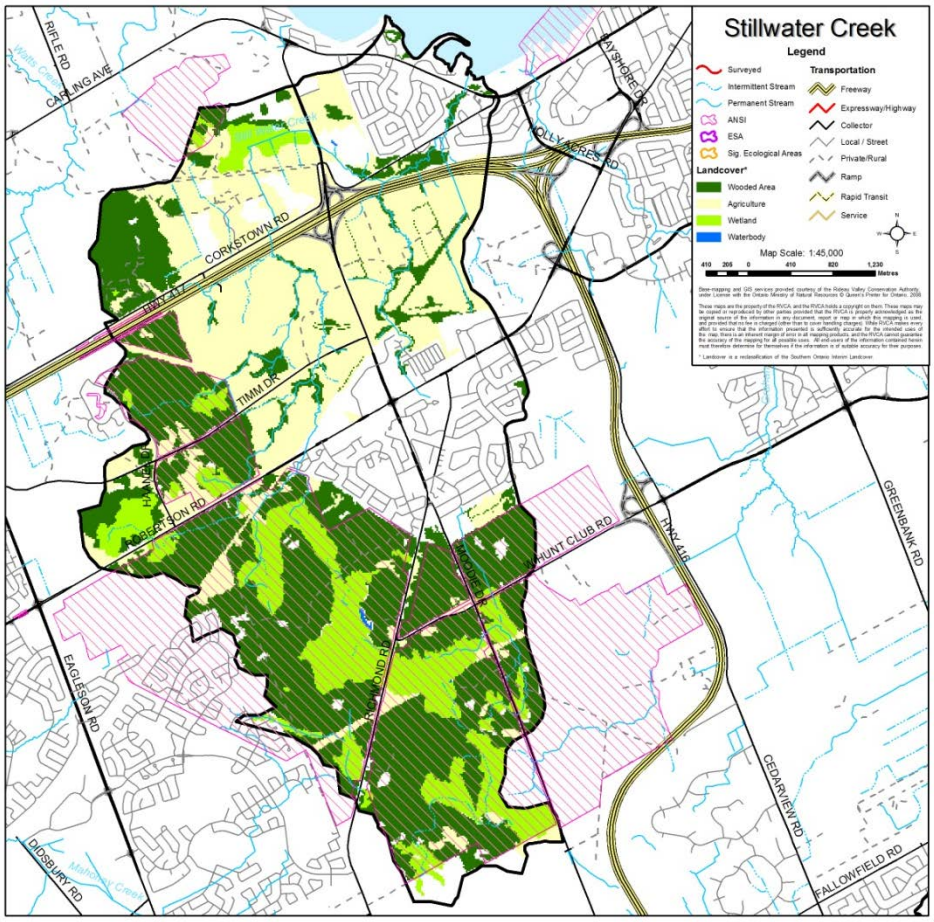
Stillwater Creek 2009 Summary Report

The Rideau Valley Conservation Authority, in partnership with six other agencies in Ottawa (City of Ottawa , Heron Park Community Association, Ottawa Flyfishers Society, Ottawa South Community Association, Rideau River Roundtable and National Defense HQ – Fish and Game Club) initiated the City Stream Watch program in 2003.

Watershed Features

Area	25 sq. km, 0.6% of the Rideau River Watershed
Land Use	19.2% urban, 0.1% hedgerow, 0.8% licensed pits and quarries, 17.1% mixed agriculture, 10.8% monoculture, 0.9% plantation, 1.8% rural land use, 2.5% transportation, 1% unclassified, 12% wetland, 33.7% wooded area
Surficial Geology	36% clay, 10% diamicton, 2% gravel, 14% organic deposits, 36% bedrock, 2% sand
Watercourse Length & Type	*Total length*: 8 km *Watercourse type*: 61% natural, 39% channelized *Flow type*: 99% permanent, 1% intermittent
Dams & Fish Barriers	There are a total of 7 seasonal or permanent fish migratory obstructions along Stillwater Creek ranging from accumulated woody material to a perched culvert and a collapsed or sunken culvert.
Spills	There were no spills reported by CSW staff in 2009.
Fish Community	16 fish species were sampled in 2009. Game fish present include yellow perch and northern pike.
Species at Risk	There were no species at risk observed during stream surveys in 2009, although there is designated Life Science Site adjacent to Stillwater containing regionally uncommon and regionally significant species



Vegetation Cover Types

Types	Hectares	% of Cover
Wetlands	30	26.5
Wooded Lands	83	73.3
Hedgerow	0.3	0.3
Total Cover	**113.3**	**100**

Woodlot Size

Size Category	Number of Woodlots	% of Woodlots
<1 ha	91	69
1-9 ha	28	21
10-30 ha	5	4
>30 ha	8	6

Wetland Cover

- 30% of the watershed is in wetland cover
- Wetlands make up 26.5% of the vegetation cover

Figure 1. Skullcap wildflower along Stillwater Creek

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The headwaters of Stillwater Creek begin in Stony Swamp, owned by the NCC. Stony Swamp is almost 2000 hectares in size, and is a mix of woodland, wetland and regenerating fields. Over 700 plant species have been recorded in the conservation area. From Stony Swamp, Stillwater Creek runs through a heavily channelized and impacted area adjacent to Roberston Road. The creek returns to its natural morphology downstream of Robertson Road until the Highway 417 crossing. It then becomes channelized again, as it runs through the Equestrian Park on Corkstown Road. The creek flows through another large wetland before the Moodie Drive crossing, and from there runs parallel between the 417 and Corkstown Road until it turns north and empties into the Ottawa River between the Nepean Sailing Club and Andrew Haydon Park. There are some smaller sections in that stretch that have been channelized. Although parts of Stillwater Creek are quite natural, it still has many impacts, mainly road crossings and little forest cover. The mouth of Stillwater is highly impacted, with little to no buffer. The section of Stillwater Creek that flows between Corkstown Road and Highway 417 was designated a Life Science Site by the OMNR containing regionally uncommon and regionally significant species, although there is a transitway expansion that may cause further impacts to that reach. This area is one of the least impacted areas of the stream, and measures should be taken to ensure this area is not negatively impacted, given that many sections of Stillwater are impacted by human activity.

Anthropogenic Alterations to Stillwater Creek

Of the 79 sections of stream surveyed, volunteers identified that 28 percent displayed no human alterations or disturbances. These areas include the headwaters in Stony Swamp and the large wetland west of Moodie Drive. Of the remaining sections, 18 percent were considered natural with some human alteration. 31 percent of the creek was considered altered but with some natural portions. The remaining 23 percent was considered highly altered with few natural portions. These areas were sections of Stillwater that had been straightened, armoured or had little or no buffer. The altered and highly altered areas include the sections downstream of Stony Swamp across Robertson Road, the Highway 417 crossing, the Equestrian Park and the area adjacent to Abbott Laboratories.

Anthropogenic Alterations to Stillwater Creek

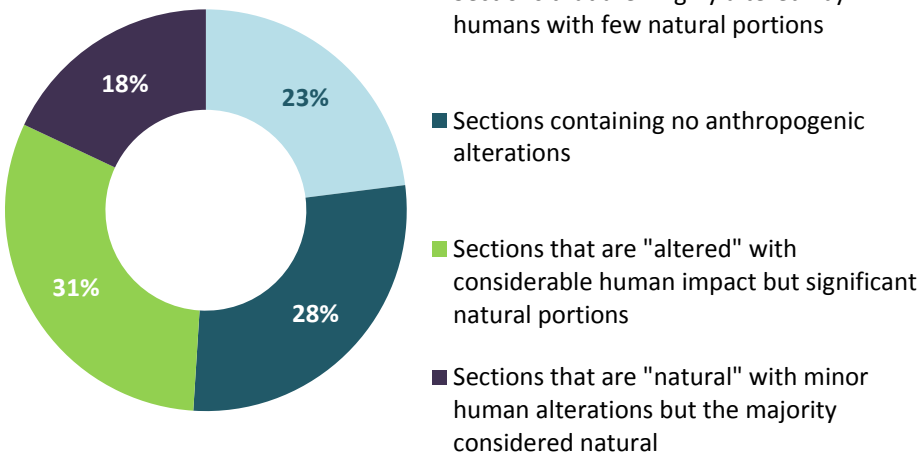


Figure 2. Shoreline alteration along Stillwater Creek

Land Use Adjacent to Stillwater Creek

Ten different land uses adjacent to Stillwater Creek were observed by volunteers. Forty-seven percent of the area surveyed still consists of natural areas, which are classified as five percent scrubland, six percent wetland, 20 percent meadow and 16 percent forest. Ten percent of the creek is considered recreational, including the Equestrian Park and where NCC paths were observed along the banks of the creek (at the mouth, along Corkstown Road and on the west side of Moodie Drive). Residential areas made up seven percent of the land use adjacent to the creek and industrial/commercial accounted for four percent. Eighteen percent of the land use is active agriculture, observed between Highway 417 and Robertson Road, and three percent was pasture. Stillwater Creek has many road crossings; infrastructure accounts for 11 percent of the creek's surrounding land use.

Land Use Adjacent to Stillwater Creek

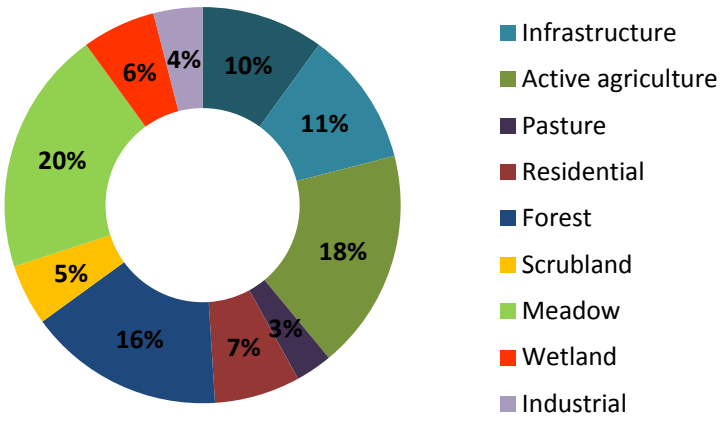


Figure 3. Wetland cover adjacent to Stillwater Creek

Buffer Evaluation of Stillwater Creek

Natural buffers are extremely important for filtering excess nutrients running into the creek, infiltrating rainwater, maintaining bank stability, maintaining baseflow levels, keeping water temperatures cool and providing wildlife habitat. According to the document *How Much Habitat Is Enough*, a stream should have riparian areas of 30 metres minimum or more, depending on the site conditions. Stillwater only meets this requirement for 40-42 percent of its stream length. Twenty percent of the left bank and 23 percent of the right bank had a buffer of only zero to five metres, 28-30 percent had a buffer of five to 15 metres and seven to ten percent had 15 – 30 metres.

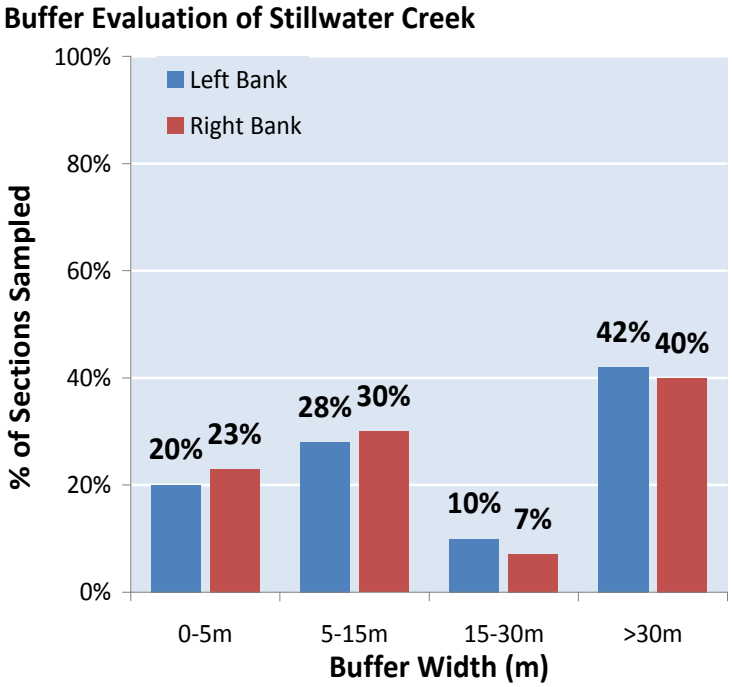
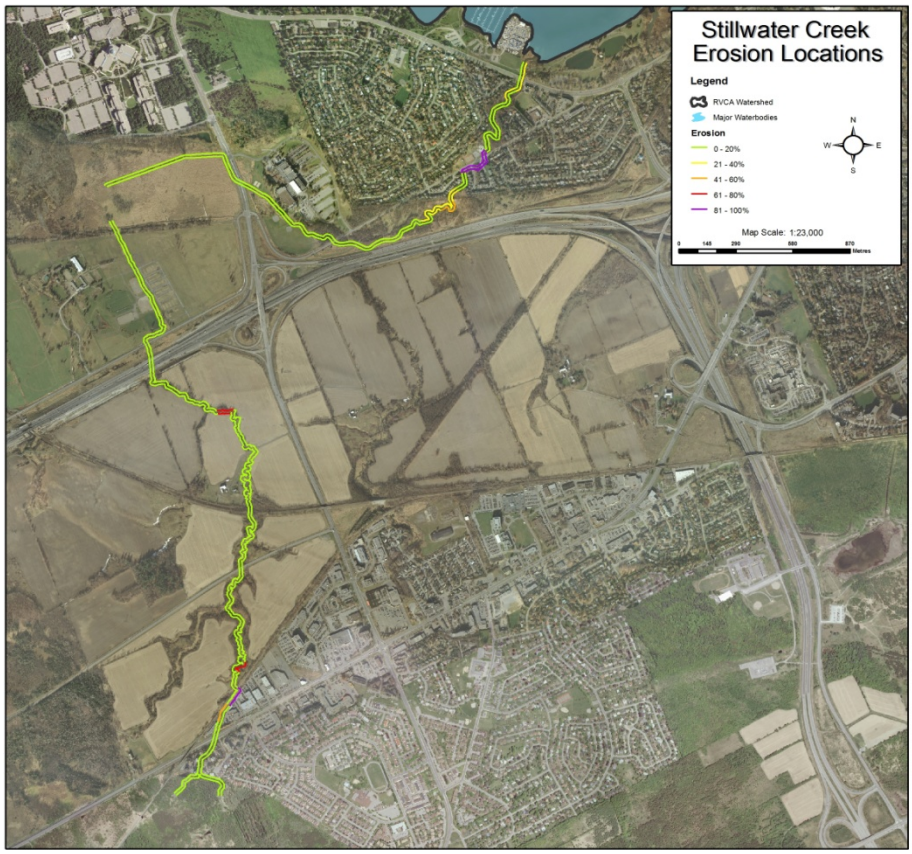


Figure 4. Alterations to the natural buffer alongside Stillwater Creek

Erosion on Stillwater Creek

Erosion is a normal, important stream process and may not affect actual bank stability; however, excessive erosion and deposition of sediment within a stream can have detrimental effects to important fish and wildlife habitat. City Stream Watch has recorded bank stability separately for left and right banks to obtain greater detail on the areas experiencing erosion. The majority of Stillwater Creek was stable (90 percent), and left and right banks were equal overall. Although active erosion was observed in many areas, it did not appear to be threatening bank stability. The mouth of Stillwater Creek is experiencing erosion, and it would be a good site to apply bioengineering methods to help mitigate those effects.

Figure 5. Eroded shoreline along Stillwater Creek



Instream Morphology of Stillwater Creek

Pools and riffles are important features for fish habitat. Riffles contribute higher dissolved oxygen to the stream and act as spawning substrate for some species of fish and pools provide shelter for fish and can be refuge areas. Runs are usually moderately shallow, with unagitated surfaces of water, and areas where the thalweg (deepest part of the channel) is in the center of the channel. Instream morphology along Stillwater Creek is fairly homogeneous, consisting of large runs with 16 percent pools and seven percent riffles.

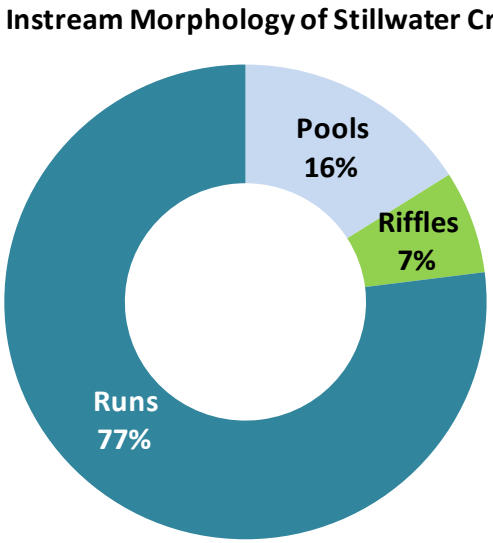


Figure 6. Instream morphology along a section of a Stillwater Creek

Types of Instream Substrate

Diverse substrate is important for fish and benthic macroinvertebrate habitat for spawning, resting, over wintering and feeding. A variety of substrate can be found instream along Stillwater Creek. Clay and muck were observed along many parts of Stillwater Creek, and muck was abundant in the sections surveyed in the wetland adjacent to Moodie Drive. Bedrock was observed in the section running north of Highway 417 and south of Corkstown Road. The "other" substrate noted was metal culvert, on which there was no other substrate deposited.

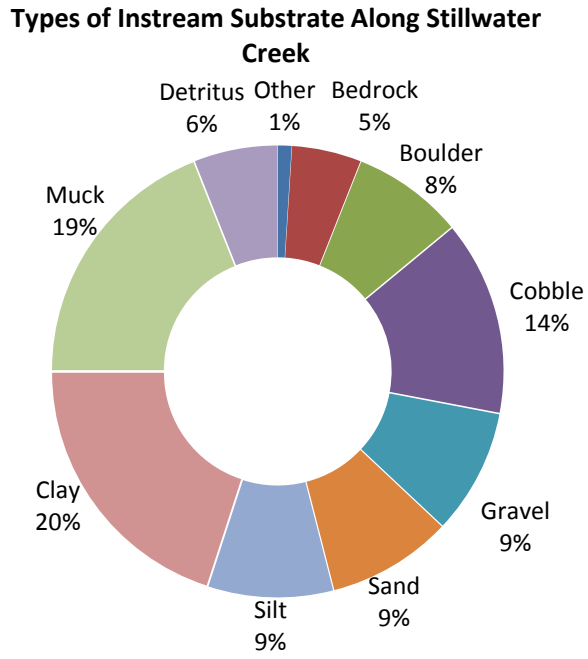


Figure 7. Various substrate types found throughout Stillwater Creek (Top: Bedrock - Bottom: Gravel/Cobble)

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Instream Vegetation of Stillwater Creek

Instream vegetation is an important factor for a healthy stream ecosystem; it helps to remove contaminants, contributes oxygen and provides habitat for fish and wildlife, although extensive vegetation can have negative impacts. Stillwater Creek does not appear to have a healthy variety of instream vegetation and very few types were found. The majority Stillwater Creek did not have a healthy amount or variety of instream vegetation. Instream vegetation was categorized as being common for 16 percent of the stream and 19 percent normal. Low vegetation made up 18 percent of the creek. For 15 percent of the sections surveyed, vegetation was rare, and in 13 percent there was none. Nineteen percent of the creek was considered to have extensive vegetation; this occurred at one of the Corkstown Road crossings and in the wetland adjacent to Moodie Drive.

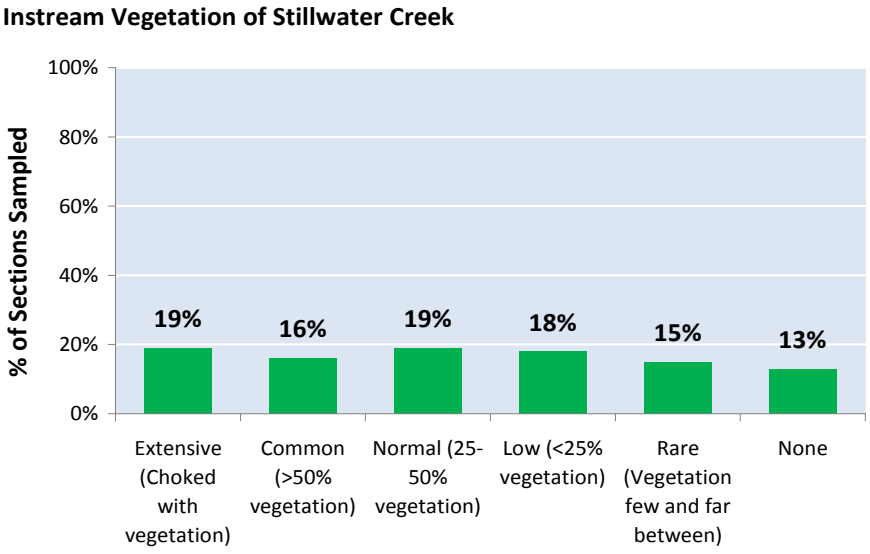
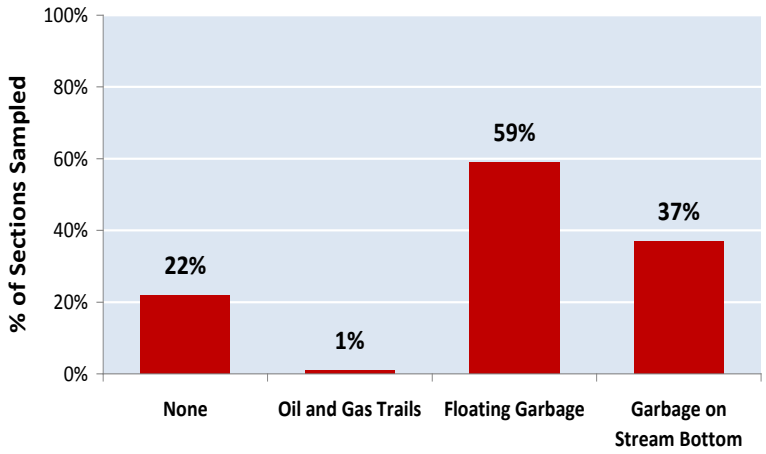


Figure 8. Instream vegetation along a section of Stillwater Creek

Pollution/Garbage Along Stillwater Creek

Pollution and garbage along Stillwater Creek was assessed visually and noted for each section where it was observed. Only twenty-two percent of Stillwater did not have the occurrence of garbage. Oil and gas trails were recorded for one percent of the sections surveyed. On many surveys, both floating garbage and garbage on the stream bottom were observed. A wide variety of pollution was recorded along Stillwater Creek, although the most abundant was plastic. A cleanup was organized for the fall as part of the TD Great Canadian Shoreline Cleanup, and some of the worst areas were addressed.



Wildlife Observed While Sampling

Wildlife	Observed While Sampling
Birds	ducks, mallards, Canada geese, green heron, great blue heron, grackle, crows, chickadee, red-winged blackbirds, phoebe, yellow finch, goldfinch, sparrows, song sparrows, woodpecker, cedar waxwing, robin
Mammals	red squirrel, chipmunk, raccoon, beaver, deer, muskrat
Reptiles/Amphibians	green frog, northern leopard frog, tadpoles
Aquatic Insects	crayfish, water striders, snails, leeches, amphipods, mollsucs
Other	slugs, spiders, crickets, cicada, caterpillars, ants, dragonflies, damselflies, jewelwing spp., darner spp., meadowhawk spp., bluet spp., butterflies, monarch

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Highlights of Progress

YEAR	ACCOMPLISHMENT	DESCRIPTION
2001	Fish sampling, Ecotech	Ecotech completed its Environmental Monitoring Program at Moodie Drive.
2001	OSAP (Ontario Stream Assessment Protocol) sampling, City of Ottawa	The City of Ottawa sampled Stillwater Creek using the OSAP protocol.
2004	65 macro stream surveys completed along Mosquito Creek	Volunteers began at the mouth of the creek and worked their way upstream, taking measurements and making observations on instream habitat, bank stability, land use, etc.
2004	Fish sampling, City Stream Watch	Five sites were sampled during 2004 at the mouth of Stillwater Creek by seine netting. A total of 16 species were caught.
2009	79 macro stream surveys completed along Mosquito Creek	Volunteers began at the mouth of the creek and worked their way upstream, taking measurements and making observations on instream habitat, bank stability, land use, etc. for a total of 7.9 kilometers.
2009	Fish sampling, City Stream Watch	RVCA staff and volunteers carried out fish sampling on Mosquito Creek at four different sites. Each site was sampled once per month from April to July. A total of 16 species were caught.
2009	Stream garbage cleanup	As part of the TD Great Canadian Shoreline Cleanup, a garbage cleanup was held on Stillwater Creek. 25 volunteers spent a total of 75 hours picking up garbage from the mouth of Stillwater to upstream of Corkstown Road. Volunteers included members of the 19 Nepean Scout Group and the local Stillwater River Keeper.
2009	Temperature profiling	RVCA staff placed four temperature probes at different locations along Stillwater Creek to give a representative sample of how temperature fluctuates and differs throughout the system.

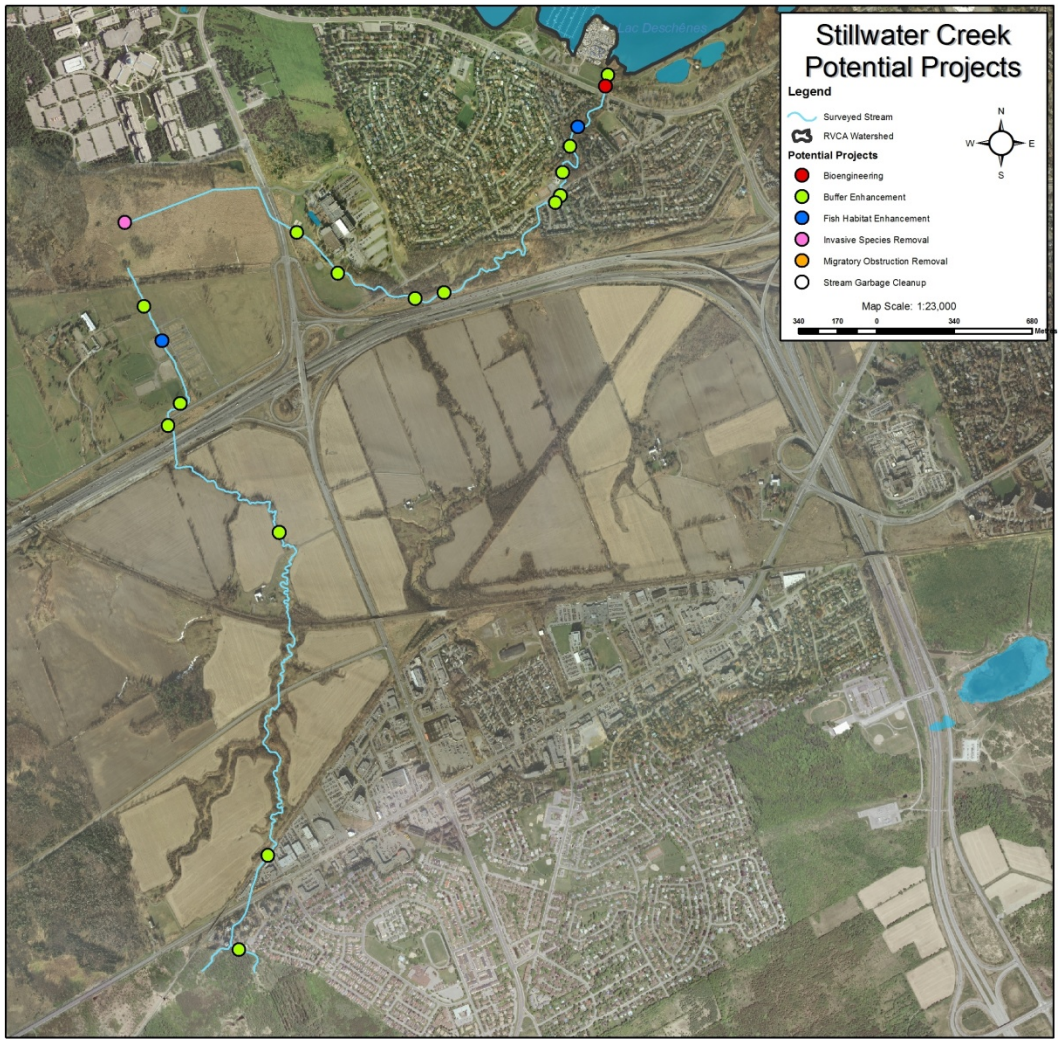

Figure 9. Various program highlights to date. (Top: Fish sampling session, Middle: Garbage cleanup event, Bottom: Fish Identification workshop with volunteers)

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Summary of Water Quality Data for Stillwater Creek

During the surveys, a YSI probe was used to collect values on dissolved oxygen, conductivity and pH. The data from the 2009 season is summarized in the following chart.

Dissolved Oxygen: A measure of the amount of oxygen dissolved into a medium, such as water
Conductivity: The ability of a substance to transfer electricity. This measure is influenced by the presence of dissolved salts and other ions in the stream.
pH: A measure of relative acidity or alkalinity, ranging from 1 (most acidic) to 14 (most alkaline/basic) , with 7 representing a neutral point.

Month	Range	DO (mg/L)	Conductivity (µs/cm)	pH
April	low	8.58	550	8.25
	high	10.66	625	8.28
May	low	8.22	325	7.91
	high	11.25	991	8.29
June	low	5.13	415	7.99
	high	12.03	1085	8.36
July	low	4.29	236	6.98
	high	11.37	1172	8.01
August	low	4.04	565	7.15
	high	12.53	842	8.17
September	low	N/A	N/A	N/A
	high	N/A	N/A	N/A

Figure 10. Water chemistry sampling along a section of Stillwater Creek

Temperature Profiling

Temperature is an important parameter in streams as it influences many aspects of physical, chemical and biological health. Four temperature dataloggers were placed in Stillwater Creek at the three crossings of Corkstown Road and one was placed at Timm Road. Water temperature values from July, August and September are colour coded for cold, cool and warm water classification and are listed in the chart under “max”. Classification is based on the Ontario Stream Assessment Protocol, for which the temperature data is taken between 4 and 4:30pm, anywhere between July 1 and September 10, on days where maximum air temperature exceeds 24.5 C and after two previous days without precipitation and temperatures surpassing 24.5 C. Based on water temperature and fish community data, it appears that Stillwater Creek is a cool water stream with cold water reaches. Only one warm water species was captured on Stillwater.

Month	Range	Datalogger 1 (°C) Corkstown (pool)	Datalogger 2 (°C) Corkstown (Abbott)	Datalogger 3 (°C) Corkstown Equestrian Park	Datalogger 4 (°C) Timm
April	low	1.79	0.78	1.27	1.32
	high	18.22	18.99	29.56*	18.77
May	low	7.13	6.45	2.76	6.68
	high	22.8	23.63	38.15*	20.88
June	low	8.53	9.08	4.34	9.32
	high	33.86	34.34	38.15	36.52
July	low	14.26	14.67	9.02	13.99
	high	23.14	25.37	38.15*	22.89
	max	no days	no days	no days	no days
August	low	13.49	13.89	12.75	13.83
	high	25.54	26.07	25.62	22.39
	max	24.16	22.7	24.67	21.05
September	low	11.01	10.94	8.55	10.26
	high	20.82	19.8	19.09	17.16
	max	20.01	16.2	16.73	17

Blue values represent coldwater (<19°C), green values coolwater (19-25°C) and red values (>25°C) warm water temperatures
*Likely that water levels dropped below the temperature datalogger, and air temperature was being recorded
September
**Temperature loggers were removed September 22, therefore temperatures recorded do not include the entire month

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Fish Sampling

Fish sampling was carried out at four sites along Stillwater Creek, and sampled multiple times between April and July. Capture methods included seine netting, electrofishing, fyke net and windemere traps. A total of 16 different fish species were collected: banded killifish, blackchin shiner, blacknose shiner, brook stickleback, central mudminnow, common shiner, creek chub, fathead minnow, logperch, mottled sculpin, northern pike, northern redbelly dace, spottail shiner, white sucker and yellow perch. The majority of the species within Stillwater Creek are significant to the recreational or baitfish fisheries; there are mainly insectivores with some piscivores and herbivores. Most of the species found are somewhat tolerant to sediment and turbidity for reproduction and feeding with the exception of game fish species. Species diversity was highest downstream of Moodie Drive, closer to the Ottawa River.

Figure 11. Northern pike captured along Stillwater Creek

Ontario Benthic Biomonitoring Network (OBBN) Data Summary for Stillwater Creek

Freshwater benthic macroinvertebrates are animals without backbones that live on the stream bottom and include crustaceans such as crayfish, molluscs and immature forms of aquatic insects such as stonefly and mayfly nymphs. Benthos represents an extremely diverse group of aquatic animals and exhibit wide ranges of responses to stressors such as organic pollutants, sediments and toxicants, which allows scientists to use them as bioindicators. Rideau Valley Conservation Authority does not monitor Stillwater Creek for benthic macroinvertebrates, but the City of Ottawa did sampling along the creek in 2001, using the Ontario Biomonitoring Benthic Network (OBBN) method. Identification of the benthic macroinvertebrates is taken down to order level. The following table is a summary of those results. Stillwater Creek has a very poor to fairly poor index, indicating that there is substantial pollution to severe organic pollution in that system.

Family Biotic Index (Hilsenhoff):	2001	Rating
Stillwater Creek at Carling Ave	6.35	fairly poor
Stillwater Creek at community pool	6.18	fairly poor
Stillwater Creek adjacent to Science Life Site	6.4	fairly poor
Stillwater Creek adjacent to Abbott Industries	6.73	poor
Stillwater Creek adjacent to Equestrian Park	6.69	poor
Stillwater Creek at Hwy 417	6.46	fairly poor
Stillwater Creek at Timm Dr	6.2	fairly poor
Stillwater Creek downstream of Robertson Rd	6.58	poor
Stillwater Creek downstream of Robertson Rd	7.88	very poor
Stillwater Creek downstream of Stony Swamp	7.15	poor

*City of Ottawa data; benthos i.d. taken to order level

Figure 12. RVCA staff collecting benthic macro-invertebrates

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Family Biotic Index (Hilsenhoff)

Family Biotic Index	Water Quality	Degree of Organic Pollution
0.00 - 3.75	Excellent	Organic pollution unlikely
3.76 - 4.25	Very Good	Possible slight organic pollution
4.26 - 5.00	Good	Some organic pollution probable
5.01 - 5.75	Fair	Fairly substantial pollution likely
5.76 - 6.50	Fairly Poor	Substantial pollution likely
6.51 - 7.25	Poor	Very substantial pollution likely
7.26 - 10.00	Very Poor	Severe organic pollution likely

Local Actions for Improvement of Stillwater Creek

TYPE OF PROJECT	DESCRIPTION
Stream Garbage Cleanups	Regular garbage cleanups could be held on Stillwater Creek to ensure that fish and wildlife habitat is not being negatively impacted and that stream aesthetics are not being affected.
Riparian Planting/Buffer Enhancements	Riparian Plantings and buffer improvements could be implemented in several locations. The mouth of Stillwater Creek is part of Andrew Haydon Park and has very little buffer downstream of Carling Avenue, and shrubs and trees could be planted in this area. Buffer areas along the Equestrian Park and areas between Highway 417 and Robertson Road need to be enhanced.
Bioengineering	Many parts of Stillwater Creek were stable; however, the mouth of Stillwater Creek has had erosion issues. Bioengineering could be installed at this site, along with additional shrub and tree plantings to improve the stream habitat in this area. Because it is part of Andrew Haydon Park, it would be an excellent location for a buffer demonstration area.
Invasive Species Control	Invasive species were observed along Stillwater Creek for over half its length. The types varied in severity, though. The most common invasive species found along Stillwater was purple loosestrife (*Lythrum salicaria*), which did not seem to be having a negative effect on the surrounding vegetation in the majority of places. Near the mouth, common buckthorn (*Rhamnus cathartica*) was observed. Buckthorn presence is an issue because it forms large, dense canopies and crowds out native species, leading to a monoculture of buckthorn. Other invasive species found were common reed (*Phragmites australis*), European frogbit (*Hydrocharis morsusranae*), Eurasian milfoil (*Myriophyllum spicatum*), and wild parsnip (*Pastinaca sativa*). Although all of these species are a concern, if the common reed becomes established in the wetland where it was observed, it will outcompete many of the native species found there. The patch of common reed should be removed and monitored in future years. If you see an invasive species, you can report it to the **Ontario Federation of Anglers and Hunters invading species hotline: 1-800-563-7711**

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Figure 13. City Stream Watch volunteers along Stillwater Creek

2009 City Stream Watch Sponsors

A very large and sincere thank you to our program sponsors in 2009:

~Monterey Inn Resort and Conference Centre for donating sandwiches and drinks for hungry volunteers
~Fisheries and Oceans Canada for their financial contribution
~RBC Blue Water Project for their financial contribution
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