Ramsay Creek 2013 Summary Report

Watershed Features	
Area	22.60 square kilometres 0.53% of the Rideau Valley watershed
Land Use	59% agriculture 6% urban 30% forest 2% rural land-use 2% wetlands 1% unclassified
Surficial Geology	53% clay 3% organic deposits 44% sand
Watercourse Length and Type	*Watercourse Type:* 93% natural 7% channelized *Flow Type:* 100% permanent
Invasive Species	There were eight invasive species observed by CSW staff in 2013: purple loosestrife, garlic mustard, buckthorn, Manitoba maple, dog-strangling vine, Himalayan balsam, curly-leaf pondweed, yellow iris
Fish Community	25 fish species have been captured in Ramsay Creek. Four game fish species were present

Wetland Cover
2% of the watershed is wetland
Wetlands make up 8% of the vegetation cover

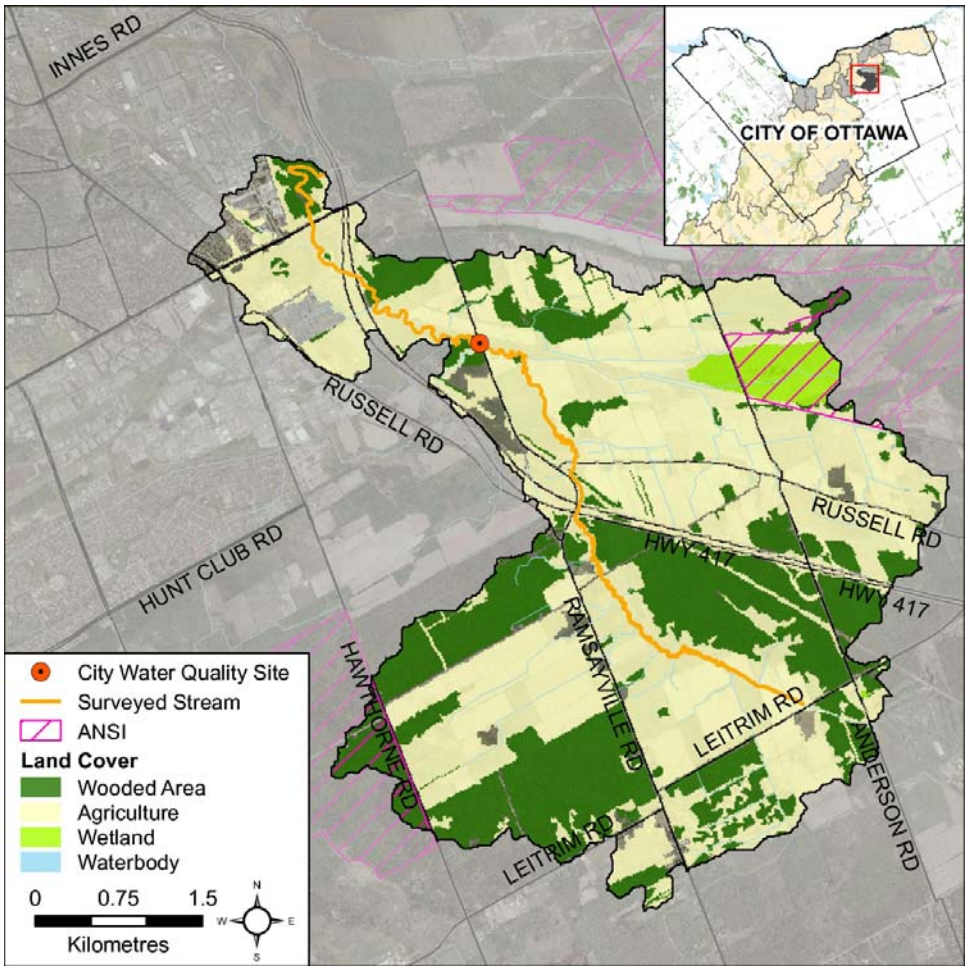


Figure 1 Land cover in the Ramsay Creek catchment

Vegetation Cover		
Types	**Hectares**	**% of Cover**
Wetlands	56	8
Wooded Areas	392	53
Hedgerow	7	1
Plantation	283	38
TOTAL COVER		**100%**

Woodlot Cover		
Size Category	**Number of Woodlots**	**% of Woodlot Cover**
<1 ha	124	4
1-9 ha	42	22
10-30 ha	15	36
>30 ha	4	38
TOTAL COVER		**100%**

The Rideau Valley Conservation Authority, in partnership with seven other agencies in Ottawa (City of Ottawa, Heron Park Community Association, Ottawa Flyfishers Society, Ottawa Stewardship Council, Rideau Roundtable, National Defence HQ - Fish and Game Club, and the National Capital Commission) form the 2013 City Stream Watch collaborative.

Introduction

Ramsay Creek is approximately ten kilometres long and joins with Borthwick Creek to form Greens Creek north of Walkey Road. The headwaters of Ramsay Creek begin near Leitrim Road. From there it flows along the east side of Ramsayville Road through property managed by the National Capital Commission before it crosses Highway 417 and Walkley Road.

As part of the City Stream Watch monitoring activities in 2013, 101 sections of Ramsay Creek were surveyed by staff and volunteers.

Ramsay Creek Overbank Zone

Riparian Buffer Width Evaluation

The riparian or shoreline zone is that special area where the land meets the water. Well-vegetated shorelines are critically important in protecting water quality and creating healthy aquatic habitats, lakes and rivers. Natural shorelines intercept sediments and contaminants that could impact water quality conditions and harm fish habitat in streams. Well established buffers protect the banks against erosion, improve habitat for fish by shading and cooling the water and provide protection for birds and other wildlife that feed and rear young near water. A recommended target (from Environment Canada's Guideline: How Much Habitat is Enough?) is to maintain a minimum 30 meter wide vegetated buffer along at least 75 percent of the length of both sides of rivers, creeks and streams. Ramsay Creek exceeds this target by having a buffer of greater than 30 meters along 84 percent of the right bank and 90 percent of the left bank. Figure 2 demonstrates the buffer conditions of the left and right banks separately.

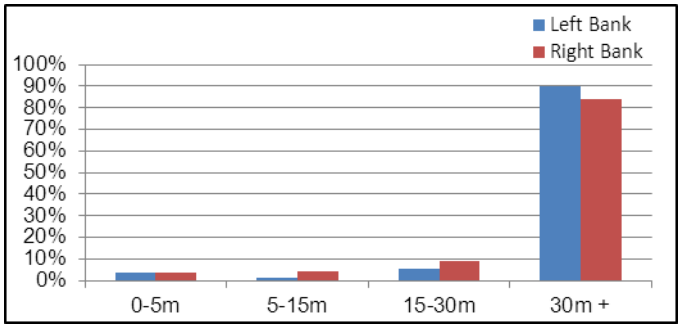


Figure 2 Vegetated buffer width along Ramsay Creek

Well vegetated buffer along Ramsay Creek

Adjacent Land Use

The RVCA's Stream Characterization Survey Program identifies seven different land uses beside Ramsay Creek (Figure 3). Surrounding land use is considered from the beginning to end of the survey section (100m) and up to 100m on each side of the creek. Land use outside of this area is not considered for the surveys but is nonetheless part of the subwatershed and will influence the creek. Natural areas made up 88 percent of the stream, characterized by forest, scrubland, meadow and wetland. Six percent of the land use was agriculture and abandoned field and the remaining five percent of the land use consisted of infrastructure.

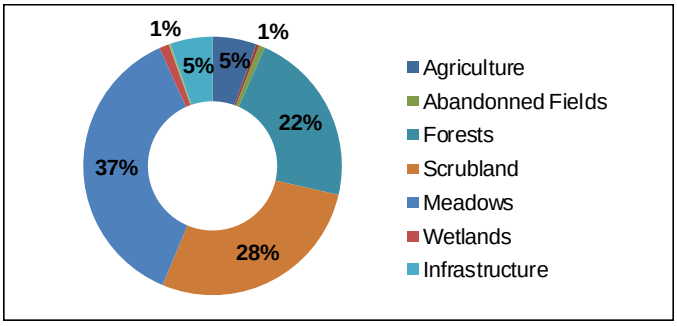


Figure 3 Land use along Ramsay Creek

Infrastructure along Ramsay Creek where it crosses Walkely Road

Shoreline Zone

Erosion

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 a detrimental effect on important fish and wildlife habitat. Poor bank stability can greatly contribute to the amount of sediment carried in a waterbody as well as loss of bank vegetation due to bank failure, resulting in trees falling into the stream and the potential to impact instream migration. Figure 4 shows that bank erosion ranged from low to high along much of Ramsay Creek. There were some areas of high erosion observed especially upstream of Highway 417 towards Ramsayville Road.

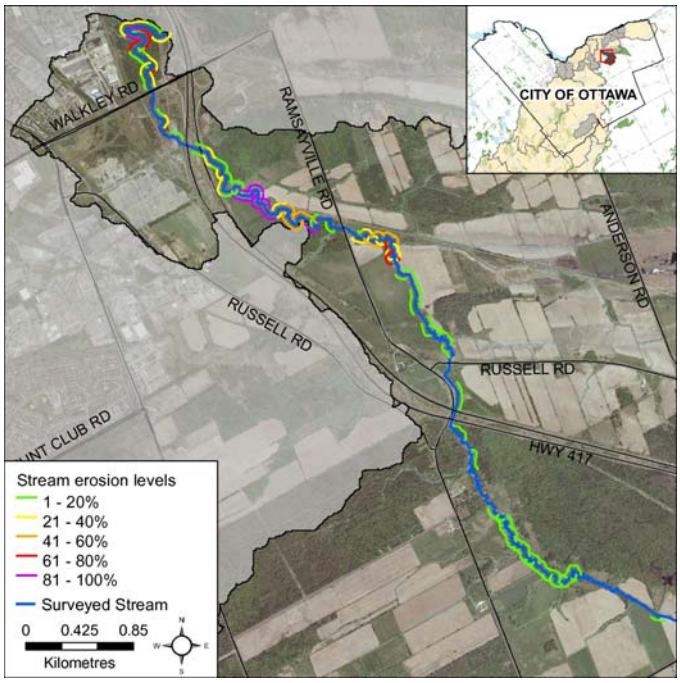


Figure 4 Erosion along Ramsay Creek

Undercut Stream Banks

Undercut banks are a normal and natural part of stream function and can provide excellent refuge areas for fish. Figure 5 shows that Ramsay Creek had low to high levels of undercut banks along most of the creek. High levels of bank undercutting were observed in the upper reaches of the creek.

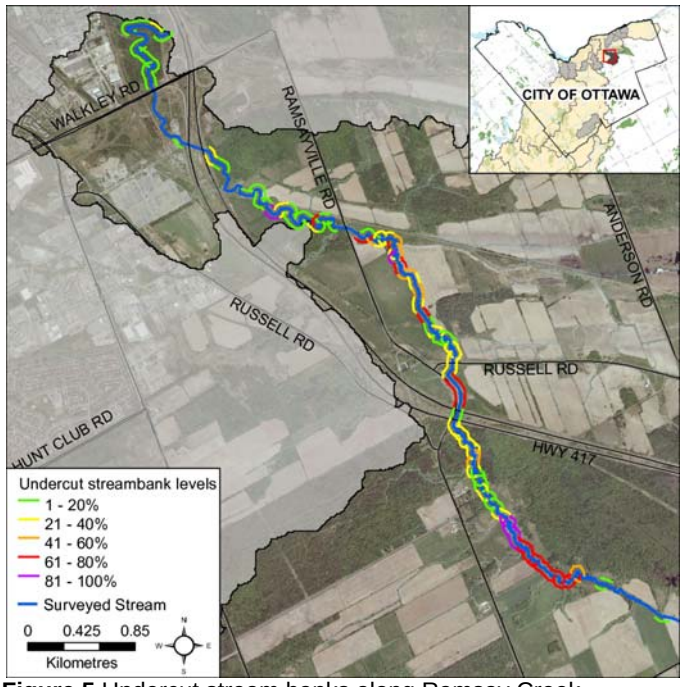


Figure 5 Undercut stream banks along Ramsay Creek

Stream bank erosion along Ramsay Creek

Stream Shading

Grasses, shrubs and trees all contribute towards shading a stream. Shade is important in moderating stream temperature, contributing to food supply and helping with nutrient reduction within a stream. Figure 6 shows stream shading along Ramsay Creek. Low to moderate levels were seen along most of the creek. High levels of shading were observed in forested pockets near the mouth of the creek as well as in the upper reaches where the creek narrowed and overhanging grasses provided shade.

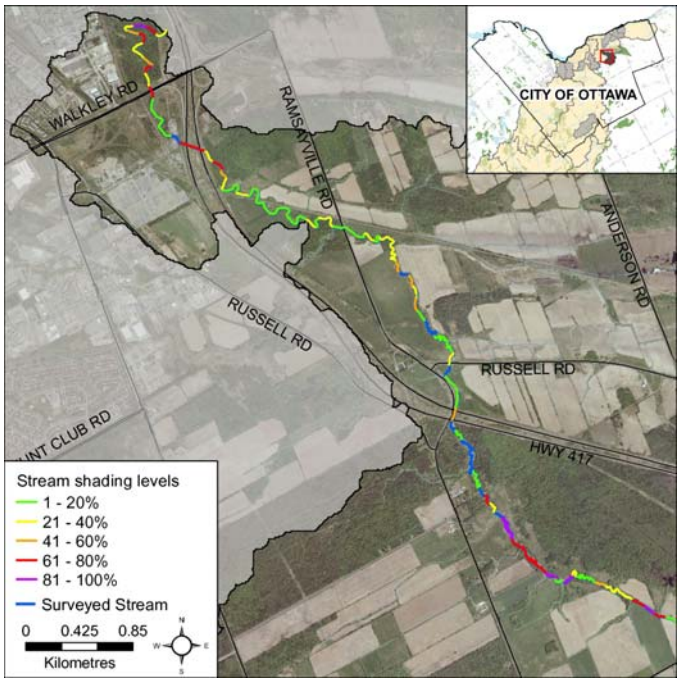


Figure 6 Stream shading along Ramsay Creek

Instream Woody Debris

Figure 7 shows that many sections along Ramsay Creek had low levels of instream woody debris in the form of branches and trees. Instream woody debris is important for fish and benthic habitat, providing refuge and feeding areas.

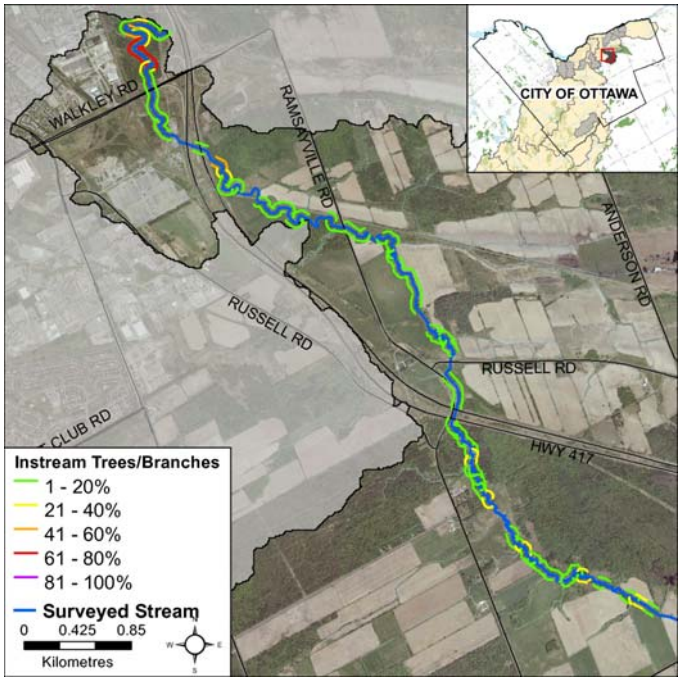


Figure 7 Instream woody debris along Ramsay Creek

Stream shade along Ramsay Creek

Instream woody debris on Ramsay Creek

Overhanging Trees and Branches

Figure 8 shows that overall Ramsay Creek had low levels of overhanging branches and trees with a few sections containing moderate levels. Overhanging branches and trees provide a food source, nutrients and shade which helps to moderate instream water temperatures.

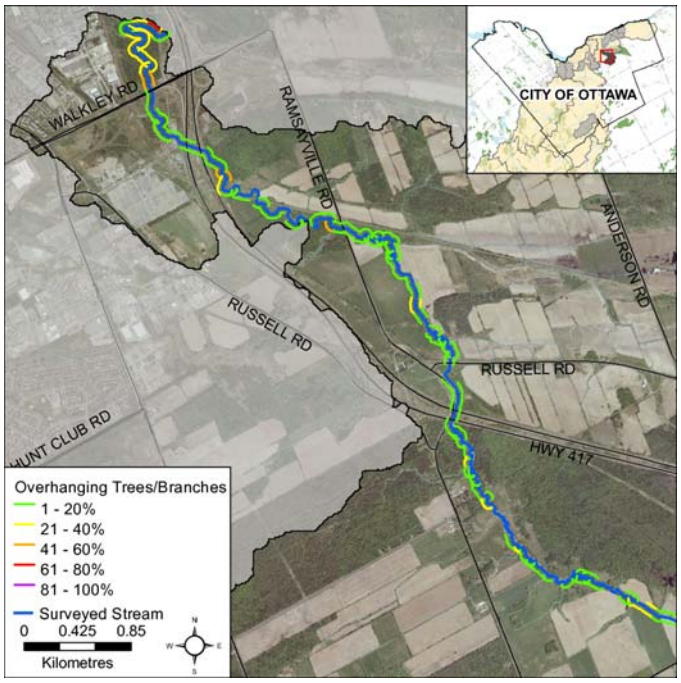
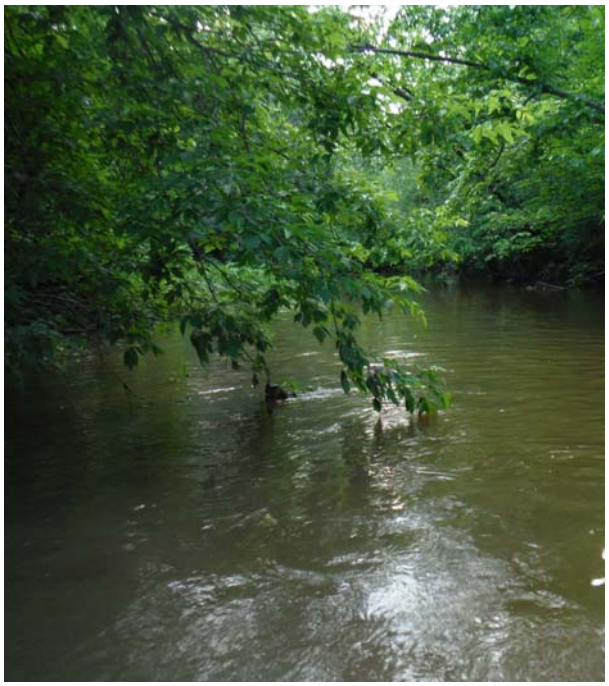


Figure 8 Overhanging trees and branches



Overhanging trees and branches on Ramsay Creek

Anthropogenic Alterations

Figure 9 shows that 86 percent of the sections on Ramsay Creek remain “unaltered” or "natural". Sections considered "altered" account for six percent of the stream, while eight percent of the sections sampled were considered “highly altered”. Areas classified as altered included existing road crossings, shoreline/instream modifications such as channelization and areas with little or no buffer.

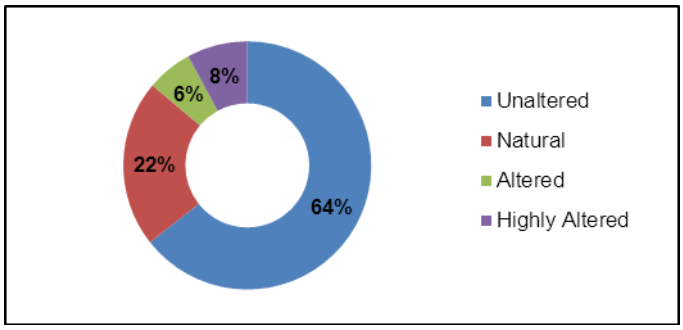


Figure 9 Anthropogenic alterations along Ramsay Creek

Road crossing along Ramsay Creek

Ramsay Creek Instream Aquatic Habitat

Habitat Complexity

Streams are naturally meandering systems and move over time; there are varying degrees of habitat complexity, depending on the creek. Examples of habitat complexity include variable habitat types such as pools and riffles as well as substrate variability and woody debris structure. A high percentage of habitat complexity (heterogeneity) typically increases the biodiversity of aquatic organisms within a system. Fifty -three percent of Ramsay Creek was considered heterogeneous, as shown in Figure 10.

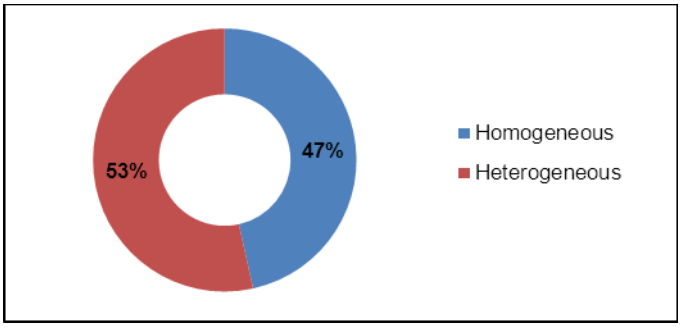


Figure 10 Instream habitat complexity in Ramsay Creek

Instream Substrate

Diverse substrate is important for fish and benthic invertebrate habitat because some species have specific substrate requirements and, for example, will only reproduce on certain types of substrate (figure 11).
Boulders create instream cover and back eddies for large fish to hide and/or rest out of the current. Cobble provides important over-wintering and/or spawning habitat for small or juvenile fish. Cobble can also provide habitat conditions for benthic invertebrates that are a key food source for many fish and wildlife species. Figure 12 shows where cobble and boulder substrate was found along Ramsay Creek.

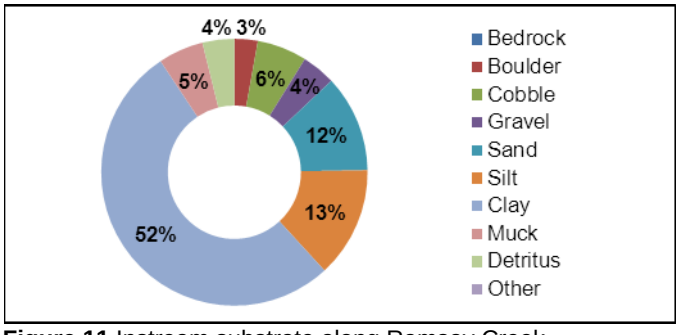


Figure 11 Instream substrate along Ramsay Creek

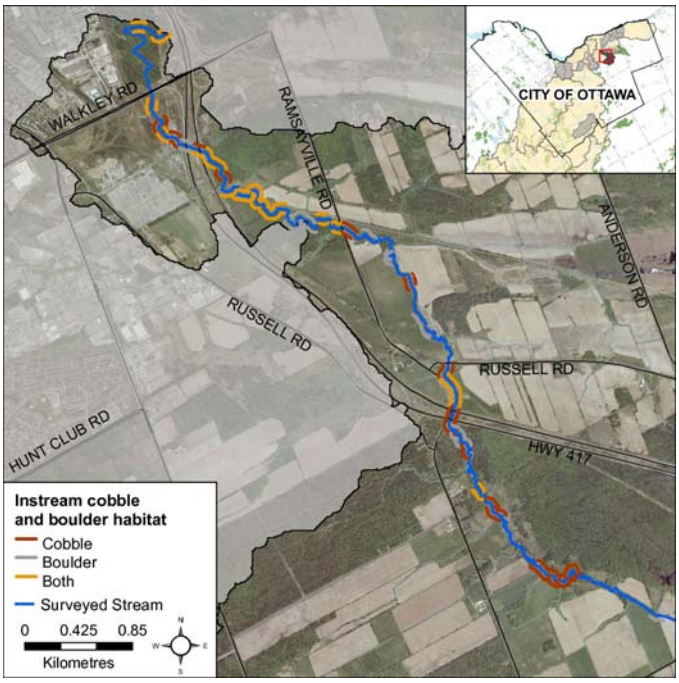


Figure 12 Instream substrate along Ramsay Creek

Instream Morphology

Pools and riffles are important habitat features for fish. Riffles are areas of agitated water and they contribute higher dissolved oxygen to the stream and act as spawning substrate for some species of fish, such as walleye. Pools provide shelter for fish and can be refuge AREAS in the summer if water levels drop and water temperature in the creek increases. Pools also provide important over-wintering areas for fish. 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.

Figure 13 shows that Ramsay Creek has minimal instream morphology variability; 92 percent consists of runs, seven percent consists of pools and one percent consists of riffles.

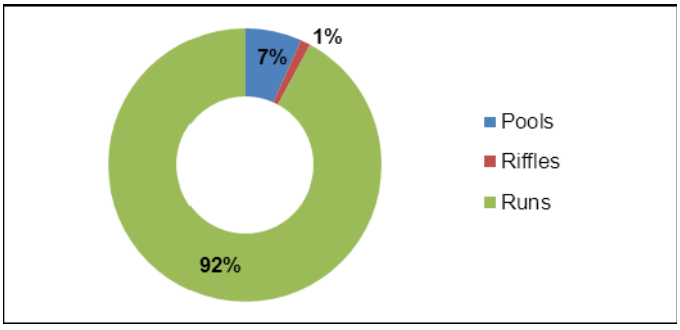


Figure 13 Instream morphology along Ramsay Creek

Vegetation Type

Instream vegetation provides a variety of functions and is a critical component of the aquatic ecosystem. For example emergent plants along the shoreline can provide shoreline protection from wave action and important rearing habitat for species of waterfowl. Submerged plants provide habitat for fish to find shelter from predator fish while they feed. Floating plants such as water lilies shade the water and can keep temperatures cool while reducing algae growth. Ramsay Creek has high diversity of instream vegetation. The dominant vegetation type, recorded at 36 percent, is submerged plants. Figure 14 depicts the plant community structure for Ramsay Creek.

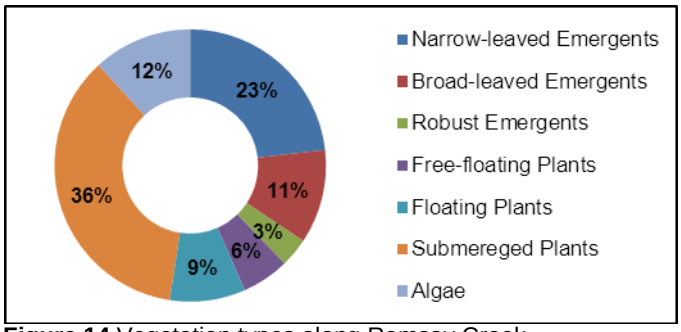


Figure 14 Vegetation types along Ramsay Creek

Instream Vegetation Abundance

Instream vegetation is an important factor for a healthy stream ecosystem. Vegetation helps to remove contaminants from the water, contributes oxygen to the stream, and provides habitat for fish and wildlife. Too much vegetation can also be detrimental. Figure 15 demonstrates that Ramsay Creek has realatively normal levels of instream vegetation with normal and low levels accounting for 64 percent.

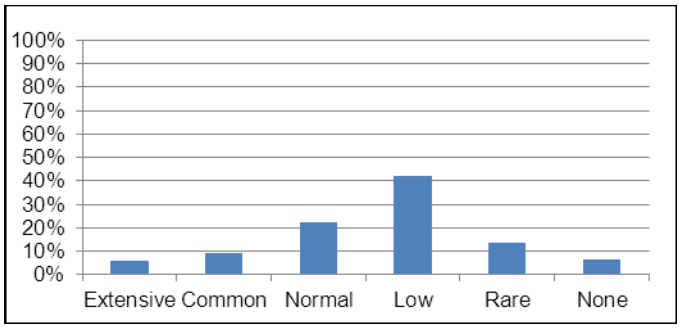


Figure 15 Instream vegetation abundance along Ramsay Creek

Invasive Species

Invasive species can have major implications on streams and species diversity. Invasive species are one of the largest threats to ecosystems throughout Ontario. They can outcompete native species, having negative effects on local wildlife, fish and plant populations. Seventy-seven percent of the sections surveyed along Ramsay Creek had invasive species (Figure 16). The invasive species observed along Ramsay Creek were Manitoba maple (*Acer negundo*), purple loosestrife (*Lythrum salicaria*), buckthorn (*Rhamnus),* garlic mustard (*Alliaria petiolata)*, dog-strangling vine *Cynanchum rossicum)*, Himalayan balsam (*Impatiens glandulifera)*, curly-leaf pondweed *(Potamogeton crispus)*, and yellow iris *(Iris pseudacorus)*.

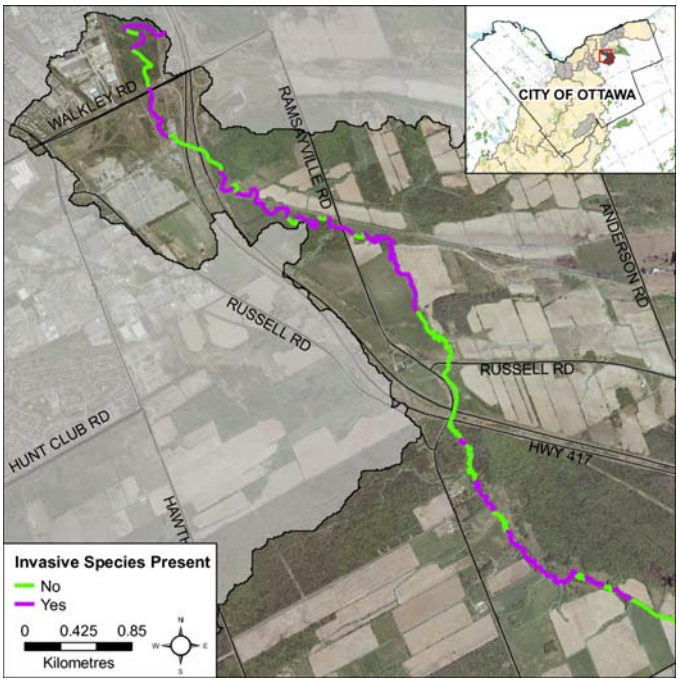


Figure 16 Invasive species along Ramsay Creek

Yellow iris, an invasive species found on Ramsay Creek

Wildlife

The diversity of fish and wildlife populations can be an indicator of water quality and overall stream health. Table 1 is a summary of all wildlife observed during stream surveys.

Wildlife	Observed
Birds	mallard, great blue heron, red-winged blackbird, chickadee, bluejay, goldfinch, robin, ovenbird, catbird, white-throated sparrow, red-eyed vireo, chipping sparrow, eastern pheobe, woodpecker, swallow, cedar waxwing, kingbird, tree swallow, cardinal, crow, hawk
Mammals	deer, raccoon tracks, beaver, mole, red squirrel
Reptiles/Amphibians	green frog, tadpoles, bull frog, toad, garter snake
Aquatic Insects	water strider, caddisfly, isopoda, blackfly
Other	mosquito, bumblebee, cabbage white butterfly, jewelwing damselfly, dragonfly, crayfish, snail, mollusc

Table 1 Wildlife observed along Ramsay Creek

Pollution

Figure 17 demonstrates the incidence of pollution/ garbage in Ramsay Creek. Pollution and garbage in the stream is assessed visually and noted for each section where it is observed. Fifty-eight percent of the sections on Ramsay Creek did not have any observable garbage. Twenty-seven percent had floating garbage, and 33 percent had garbage on the stream bottom, and two percent had discoloration of the channel bed. The majority of the garbage that was observed was found near major road crossings.

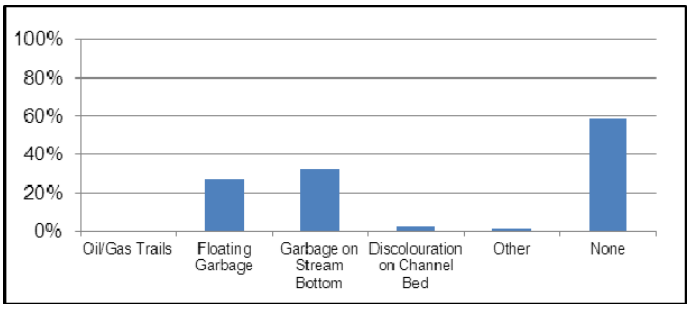


Figure 17 Pollution observed along Ramsay Creek

Water Chemistry

During the stream characterization survey, a YSI probe is used to collect water chemistry, as follows:

- Dissolved Oxygen is a measure of the amount of oxygen dissolved in water. The lowest acceptable concentration of dissolved oxygen is 6.0 mg/L for early stages of warm water fish and 9.5 mg/L for cold water fish (CCME, 1999).
- A saturation value (concentration of oxygen in water) of 90 percent or above is considered healthy. Saturation levels above one hundred percent are not uncommon in sections of stream where there are high amounts of algae and other aquatic plants.
- Conductivity is 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 is a measure of relative acidity or alkalinity, ranging from 1 (most acidic) to 14 (most alkaline/ basic), with 7 occupying a neutral point.

2013 data for these four parameters is summarized in Table 2.

Month	Range	DO (mg/L)	DO(%)	Conductivity (µs/cm)	pH
June 2013	Low	7.18	75.31	482.00	7.07
	High	10.91	114.43	1164.00	8.15
July 2013	Low	0.25	2.69	460.00	6.68
	High	11.61	124.71	773.00	8.96

Table 2 Water chemistry collected along Ramsay Creek

Volunteers measuring water chemistry parameters

Thermal Classification

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 Stoneman and Jones method) to classify a watercourse as either warm water, cool water or cold water.

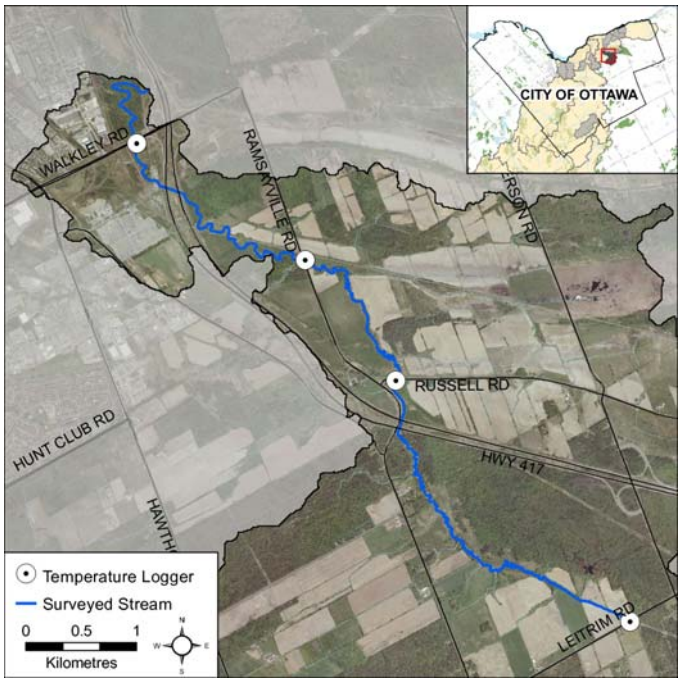


Figure 18 Temperature loggers along Ramsay Creek

There were four temperature loggers installed on Ramsay Creek from April until September. Logger 1 was installed at Walkley Road, logger 2 was installed at Ramsayville Road, logger 3 was installed at Russell Road and logger 4 was installed at Leitrim Road. Analysis of the data collected indicates that Ramsay Creek is classified as a warm water system with cool water reaches. The cool water reaches were recorded by logger 4 located in the upper reaches of the creek close to Leitrim Road. There was no evidence of groundwater inputs observed during surveys.

Temperature logger

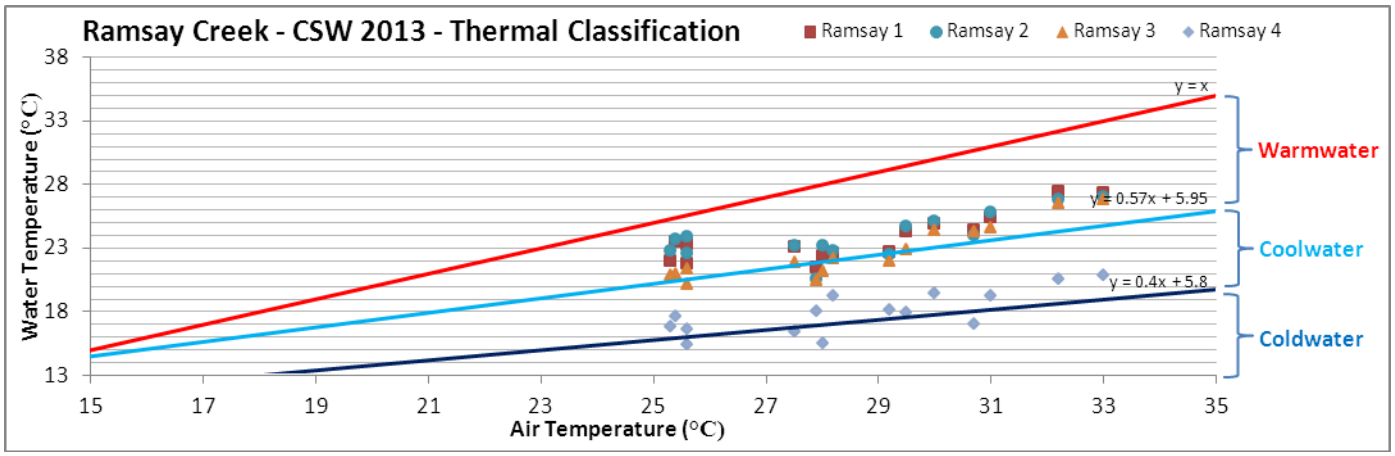


Figure 19 Thermal Classification for Ramsay Creek

Each point on the graph represents a temperature that meets the following criteria:

- Sampling dates between July 1st and September 7th
- Sampling date is preceded by two consecutive days above 24.5°C
- Water temperatures are collected at 4pm
- Air temperature is recorded as the maximum temperature for that day

Fish Sampling

Fish sampling sites located along Ramsay Creek are shown in Figure 20. The provincial fish codes shown on the following map are listed (in Table 3) beside the common name of those fish species identified in Ramsay Creek. Ramsay Creek is classified as a warm water system with cool water reaches with 25 fish species observed.

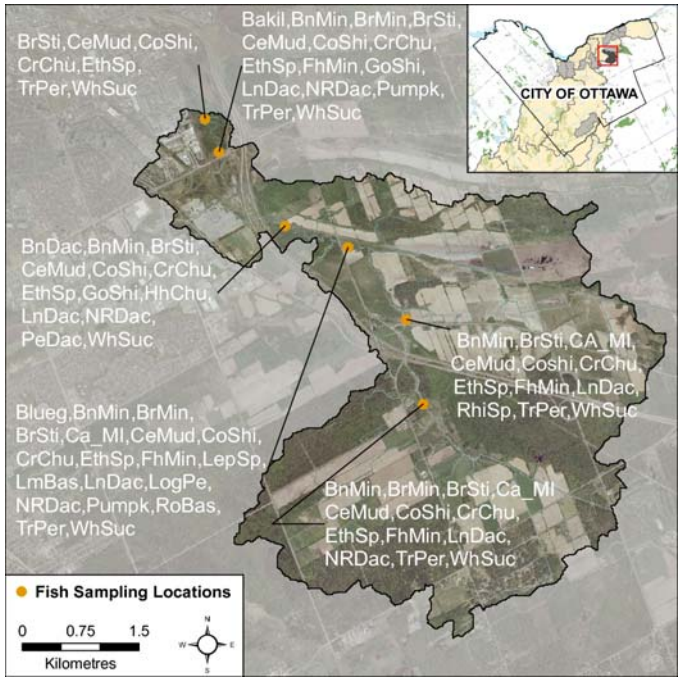


Figure 20 Ramsay Creek fish sampling

Species observed in Ramsay Creek (with fish code)			
brook stickleback.....	BrSti	northern redbelly dace	NRDac
central mudminnow...	CeMud	pumpkinseed.....	Pumpk
common shiner.....	CoShi	blacknose dace.....	BnDac
creek chub.....	CrChu	hornyhead chub.....	HdChu
Etheostoma sp.....	EthSp	pearl dace.....	PeDAc
trout-perch.....	TrPer	carps and minnows....	Ca_MI
white sucker.....	WhSuc	Rhinichthys sp.....	RhiSp
banded killifish.....	BaKil	bluegill.....	blueg
bluntnose minnow.....	BnMin	lepomis sp.....	LepSp
brassy minnow.....	BrMin	largemouth bass.....	LmBas
fathead minnow.....	FhMin	logperch.....	LogPe
golden shiner.....	GoShi	rock bass.....	RoBas
longnose dace.....	LnDac		

Table 3 Fish species observed in Ramsay Creek

Migratory Obstructions

It is important to know locations of migratory obstructions because these can prevent fish from accessing important spawning and rearing habitat. Migratory obstructions can be natural or manmade, and they can be permanent or seasonal. Figure 21 shows the location of two woody debris dams on Ramsay Creek.

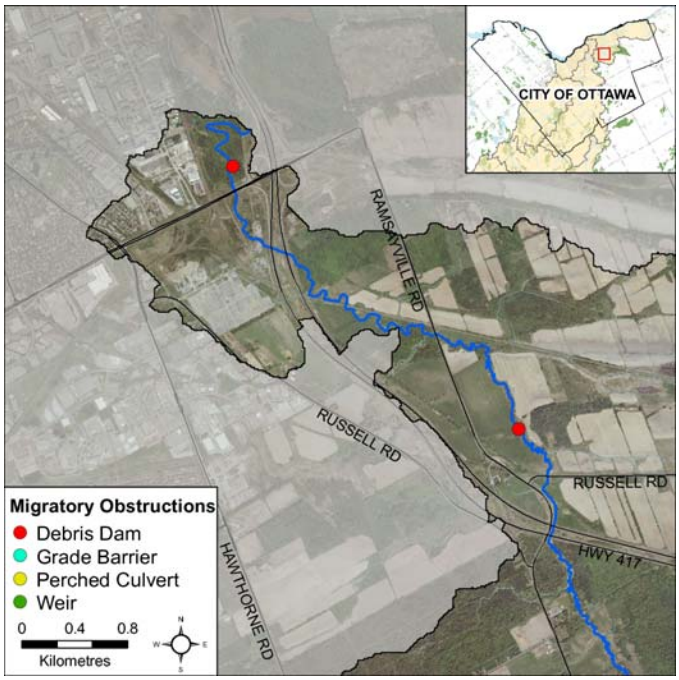


Figure 21 Migratory obstructions on Ramsay Creek

Headwater Drainage Feature Sampling

The Headwater Drainage Feature sampling protocol is a rapid assessment method characterizing the amount of water, sediment transport, and storage capacity within headwater drainage features (HDF). An HDF is a depression in the land that conveys surface flow. As a result of their importance and a lack of information for headwater drainage features the City Stream Watch program has incorporated monitoring of these systems at 24 sites in the Ramsay Creek catchment (Figure 22).

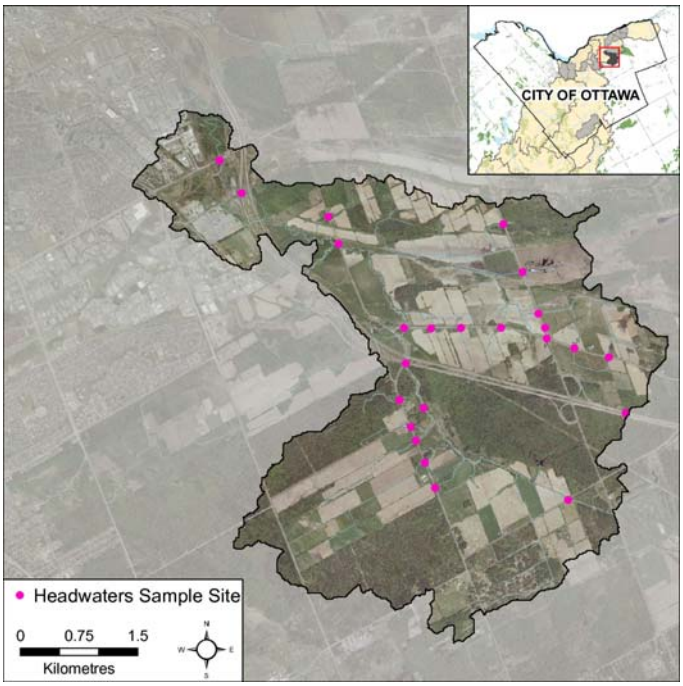


Figure 22 HDF sampling sites on Ramsay Creek

Stream Comparison Between 2007 and 2013

The following tables provide a comparison of Ramsay Creek between the 2007 and 2013 survey years. Given that the extent surveyed was different in each year, the comparison is made between the sections that were surveyed in both years.

Anthropogenic Changes

Table 4 shows that between 2007 and 2013 anthropogenic alterations along Ramsay Creek have decreased. In 2007 areas considered natural or those that had no alteration accounted for 73 percent of the creek. In 2013, that number has increased to 82 percent. It is important to note that in 2010 anthropogenic alterations were further defined in the protocol, which has caused some land uses to shift categories.

Anthropogenic Alterations	2007 (%)	2013 (%)
No anthropogenic alterations	31	71
"Natural" conditions with minor human alterations	42	11
"Altered" with considerable human impact but significant natural portions	27	8
"Highly altered" by humans with few natural portions	0	10

Table 4 Comparison of anthropogenic alterations along Ramsay Creek between 2007 and 2013

A stream section considered highly altered in 2013

Bank Stability Changes

According to observations bank stability has increased significantly overall since 2007. In 2007, 46 percent of the banks were considered stable. In 2013, 78 percent of both the left and right banks are stable.

Bank Stability	2007 (%)	2013 (%) Left Bank	2013 %) Right Bank
Stable	46	78	78
Unstable	54	22	22

Table 5 Comparison of bank stability between 2007 and 2013

An unstable stream section recorded in 2013

Changes in Instream Vegetation

Table 6 shows that there has been a decrease in instream vegetation in Ramsay Creek since 2007. The greatest percentage of the creek was classified as having normal levels of vegetation in 2007. In 2013 the greatest percentage of the creek is classified as having low levels of vegetation.

Instream Vegetation Abundance	2007 (%)	2013 (%)
Extensive	0	0
Common	23	5
Normal	34	27
Low	19	46
Rare	24	16
None	n/a	6

Table 6 Comparison of instream vegetation levels between 2007 and 2013

Changes in Pollution and Garbage

Overall the amount of pollution and garbage in Ramsay Creek has decreased since 2007. Table 7 shows that the number of sections surveyed that were free from garbage has increased from 28 percent in to 2007 to 54 percent in 2013. In addition, the percentage of sections that had floating garbage and garbage on the stream bottom has decreased since 2007.

Pollution/Garbage	2007 (%)	2013 (%)
None	28	54
Floating garbage	33	28
Garbage on stream bottom	38	36
Oil or gas trails	1	0
Discoloration of channel bed	n/a	2

Table 7 Comparison of pollution/garbage levels between 2007 and 2013

A pavement roller that was found on Ramsay Creek in 2007 and 2013

Fish Community Comparison

Fish sampling was conducted on Ramsay Creek by the City Stream Watch program in 2007 and 2013. In 2007, 11 species were caught at two different sites by electrofishing. In 2013, 18 species were caught using a variety of methods (electrofishing, seining, trapping) at four different sites. One species caught in 2007 was not found in 2013, which is largemouth bass. This does not mean the species have disappeared but could be influenced by location, weather or time of sampling.

Species	Code	2007	2013
brook stickleback.....	BrSti	X	X
central mudminnow...	CeMud	X	X
common shiner.....	CoShi	X	X
creek chub.....	CrChu	X	X
Etheostoma sp.....	EthSp	X	X
trout-perch.....	TrPer	X	X
white sucker.....	WhSuc	X	X
banded killifish.....	BaKil		X
bluntnose minnow.....	BnMin		X
brassy minnow.....	BrMin		X
fathead minnow.....	FhMin	X	X
golden shiner.....	GoShi		X
longnose dace.....	LnDac		X
northern redbelly dace	NRDac	X	X
pumpkinseed.....	Pumpk		X
blacknose dace.....	BnDac	X	X
carps and minnows....	Ca_MI		X
lepomis sp.....	LepSp		X
largemouth bass.....	LmBas	X	

Table 8 Comparison of fish species caught in 2007 and 2013

Monitoring and Restoration

Monitoring and Restoration Projects on Ramsay Creek

Table 9 below highlights the monitoring and restoration work that has been done on Ramsay Creek to date by the Rideau Valley Conservation Authority.

Accomplishment	Year	Description
City Stream Watch Monitoring	2007	74 stream surveys were completed by City Stream Watch volunteers and staff
	2013	101 stream surveys were completed by City Stream Watch volunteers and staff
City Stream Watch Fish Sampling	2007	Two sites were sampled on Ramsay Creek
	2013	Four sites were sampled on Ramsay Creek
City Stream Watch Thermal Classification	2007	Two temperature loggers were deployed from June to September
	2013	Four temperature loggers were deployed from April until September
City Stream Watch Headwater Drainage Feature Sampling	2013	24 headwater drainage features were sampled in the Ramsay Creek catchment

Table 9 Monitoring and Restoration on Ramsay Creek

Potential Riparian Restoration Opportunities

Figure 23 depicts the locations where City Stream Watch staff and volunteers made note of riparian restoration opportunities.

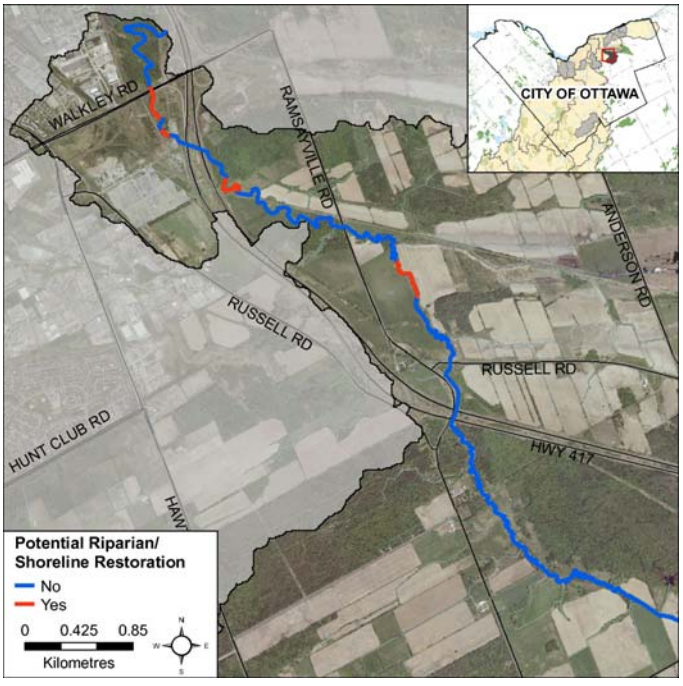


Figure 23 Potential riparian restoration opportunities

Potential Instream Restoration Opportunities

Figure 24 depicts the locations where City Stream Watch staff and volunteers made note of instream restoration opportunities such as invasive species removal, garbage clean-up and fish habitat restoration.

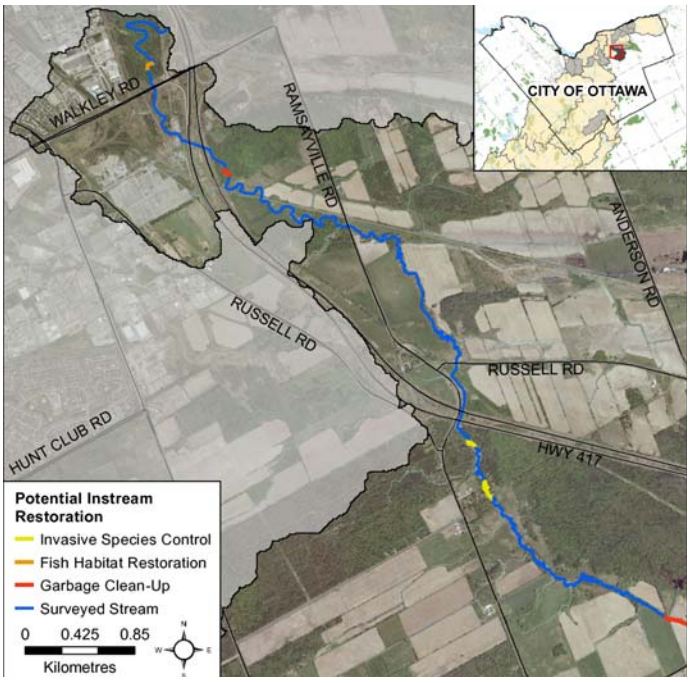


Figure 24 Potential instream restoration opportunities



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For more information of the overall 2013 City Stream Watch Program and the volunteer activities, please refer to the City Stream Watch 2013 Summary Report.

To view the stream characterization protocol used, please see the City Stream Watch website: http://www.rvca.ca/programs/streamwatch/index.html