Cranberry Creek 2013 Summary Report

Watershed Features

Area	52.01 square kilometres 1.23% of the Rideau Valley watershed
Land Use	29% agriculture 2% urban 40% forest 9% rural land-use 19% wetlands 1% unclassified
Surficial Geology	24% clay 21% diamicton 1% gravel 7% bedrock 29% organic deposits 18% sand
Watercourse Length and Type	*Watercourse Type:* 69% natural 31% channelized *Flow Type:* 100% permanent
Invasive Species	There were six invasive species observed by CSW staff in 2013: purple loosestrife, buckthorn, Manitoba maple, curly-leaf pondweed, European frogbit, phragmites
Fish Community	21 fish species have been captured in Cranberry Creek. Eight game fish species were present

Wetland Cover

18% of the watershed is wetland

Wetlands make up 32% of the vegetation cover

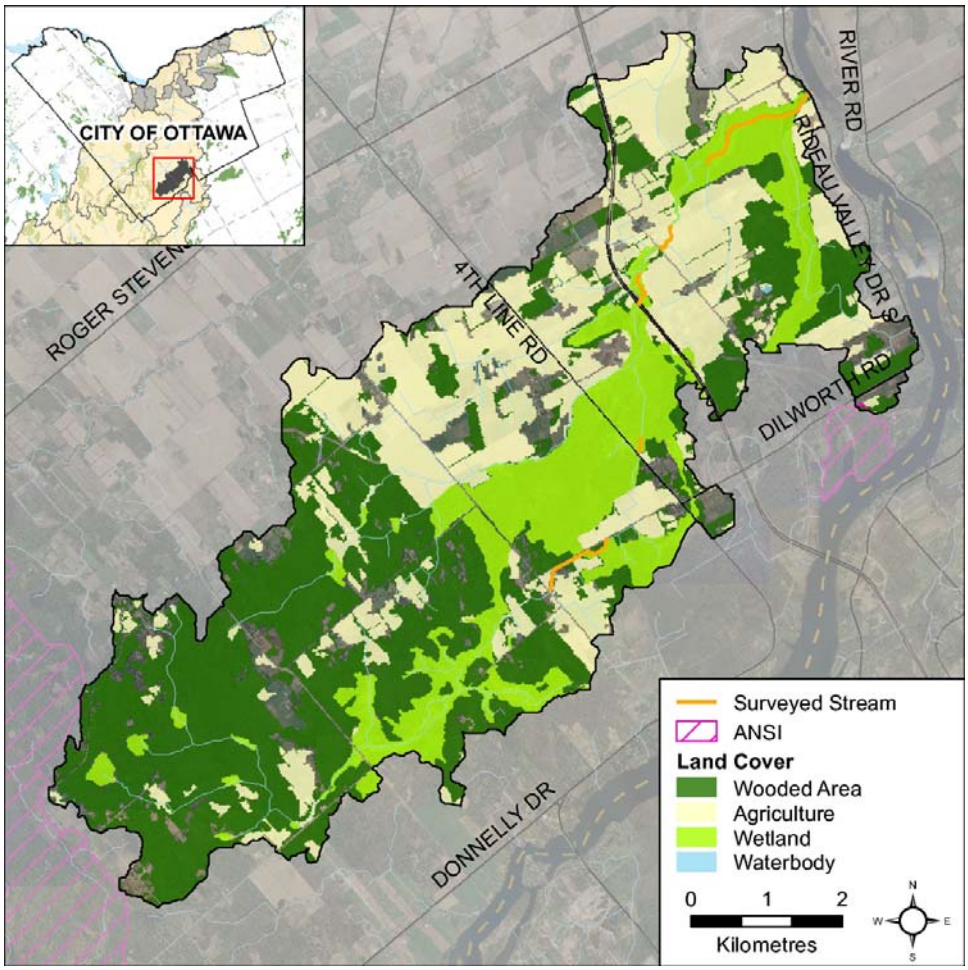

Figure 1 Land cover in the Cranberry Creek catchment

Vegetation Cover

Types	Hectares	% of Cover
Wetlands	980	32
Wooded Areas	1937	63
Hedgerow	24	1
Plantation	113	4
TOTAL COVER		**100%**

Woodlot Cover

Size Category	Number of Woodlots	% of Woodlot Cover
<1 ha	519	3
1-9 ha	85	14
10-30 ha	15	13
>30 ha	6	70
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

Cranberry Creek is approximately 19 kilometres long and runs through areas dominated by naturally occurring woodlands and wetlands as well as agricultural lands. The watershed supports a provincially significant wetland called Cranberry Creek wetland. The headwaters of Cranberry Creek begin west of Malakoff Road and it crosses many roads including Highway 416 before it empties into the Rideau River south of Kars.

In 2013 permission was granted to survey 43 sections of Cranberry Creek. The following is a summary of the observations made along those 43 sections.

Cranberry 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. Cranberry Creek exceeds this target by having a buffer of greater than 30 meters along 80 percent of the right bank and 75 percent of the left bank. Figure 2 demonstrates the buffer conditions of the left and right banks separately.

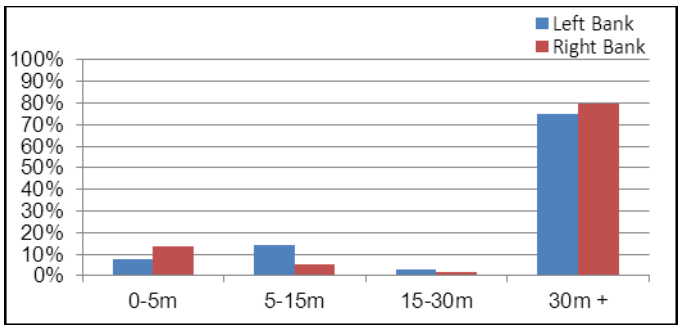

Figure 2 Vegetated buffer width along Cranberry Creek

Adjacent Land Use

The RVCA's Stream Characterization Survey Program identifies eight different land uses beside Cranberry 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 77 percent of the stream, characterized by forest, scrubland, meadow and wetland. Thirteen percent of the land use was agriculture and abandoned field and the remaining eight percent of the land use consisted of infrastructure and residential.

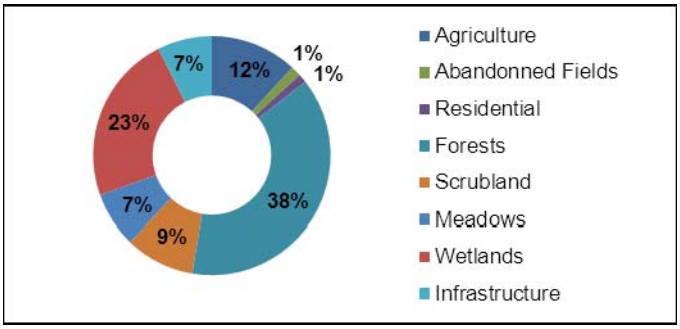

Figure 3 Land use along Cranberry Creek

Vegetated buffer along Cranberry Creek

Infrastructure along Cranberry Creek

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 no bank erosion was observed along the surveyed sections of Cranberry 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 there was almost no undercutting observed along the surveyed sections of Cranberry Creek. The lack of stream bank undercutting is resulting from well vegetated banks as well as wetland plants that buffer the banks along most of the surveyed length of the stream.

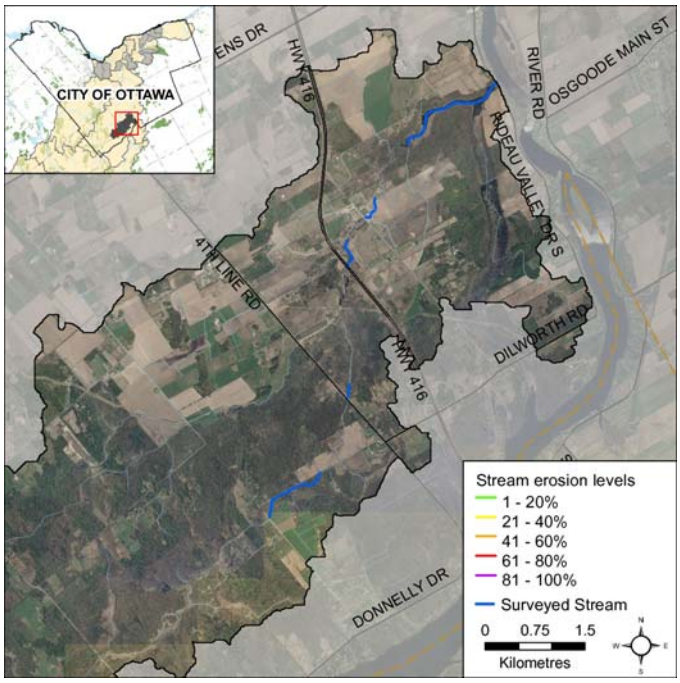

Figure 4 Erosion along Cranberry Creek

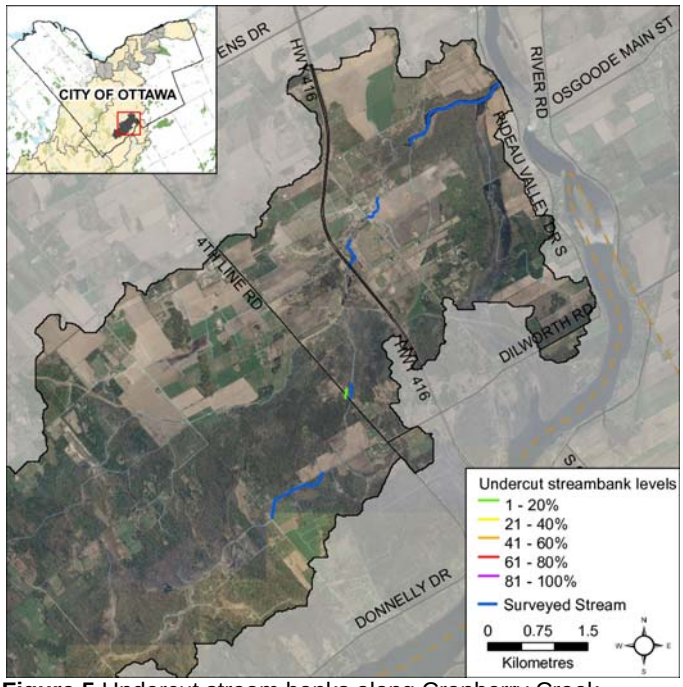

Figure 5 Undercut stream banks along Cranberry Creek

Wetland plants buffering stream banks on Cranberry 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 Cranberry Creek. Low to moderate levels were seen along most of the surveyed sections of the creek. The creek is extremely wide in the lower reaches which is a reason why stream shading is low in in those areas.

Instream Woody Debris

Instream woody debris is important for fish and benthic habitat, providing refuge and feeding areas.
Figure 7 shows that many sections along Cranberry Creek had low levels of instream woody debris in the form of branches and trees. Low levels are predominant because the surveyed sections of the creek are dominated by wetland habitat with little woody vegetation nearby.

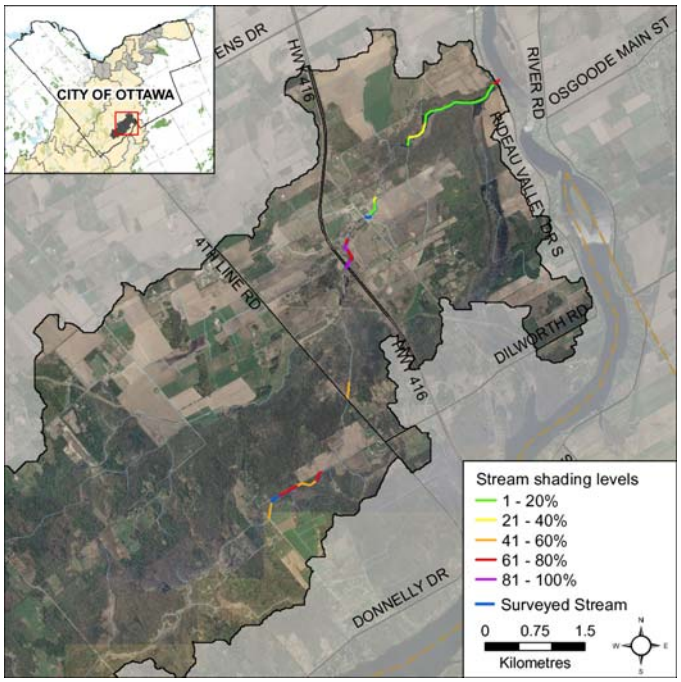

Figure 6 Stream shading along Cranberry Creek

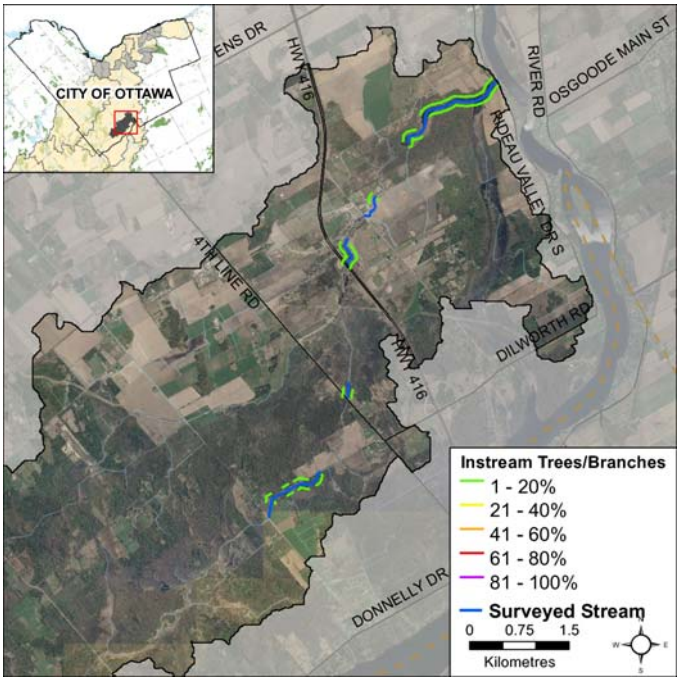

Figure 7 Instream woody debris along Cranberry Creek

Stream shading from emergent grasses along Cranberry Creek

Low levels of Instream woody debris on Cranberry Creek

Overhanging Trees and Branches

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

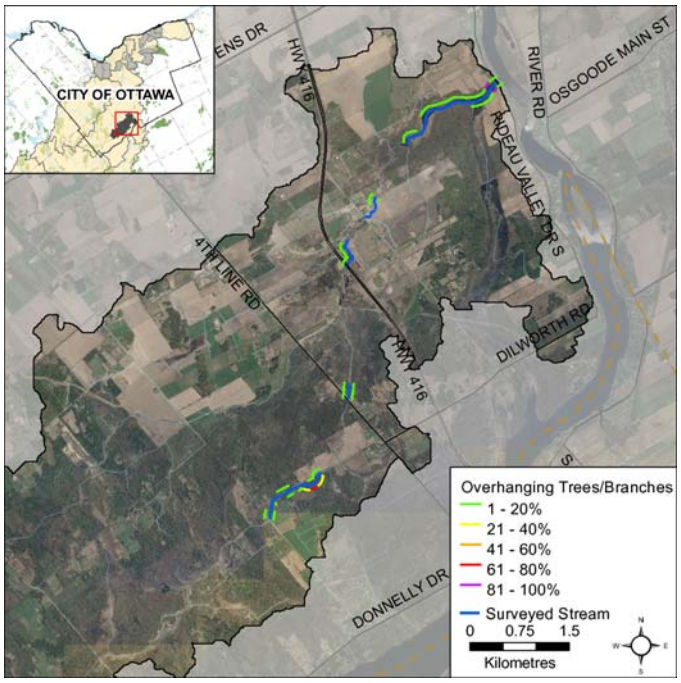

Figure 8 Overhanging trees and branches

Overhanging trees and branches on Cranberry Creek

Anthropogenic Alterations

Figure 9 shows that 86 percent of the sections surveyed on Cranberry Creek remain “unaltered” or "natural". Sections considered "altered" account for ten percent of the stream, while five 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.

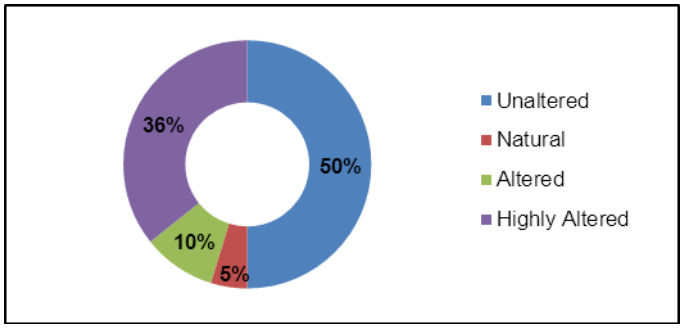

Figure 9 Anthropogenic alterations along Cranberry Creek

Stream channelization along Cranberry Creek

Cranberry 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. Only 12 percent of the sections surveyed on Cranberry Creek were considered heterogeneous, as shown in Figure 10.

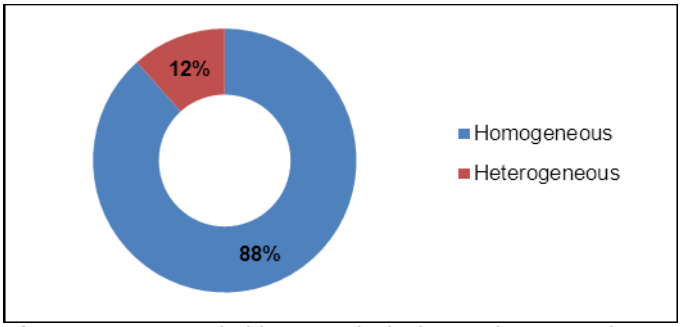

Figure 10 Instream habitat complexity in Cranberry Creek

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 shows the instream substrate types along Cranberry Creek. The surveyed sections of the creek were dominated by wetland habitat so detritus is seen in high amounts.
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 Cranberry Creek.

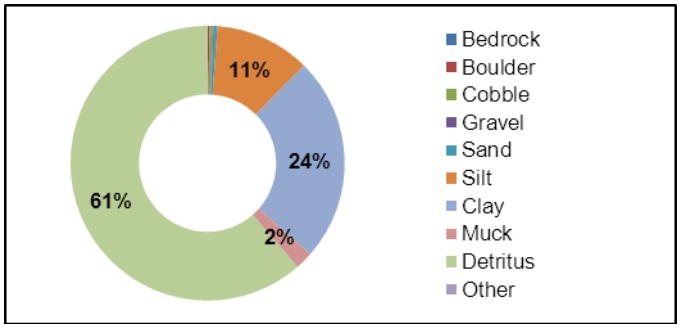

Figure 11 Instream substrate along Cranberry Creek

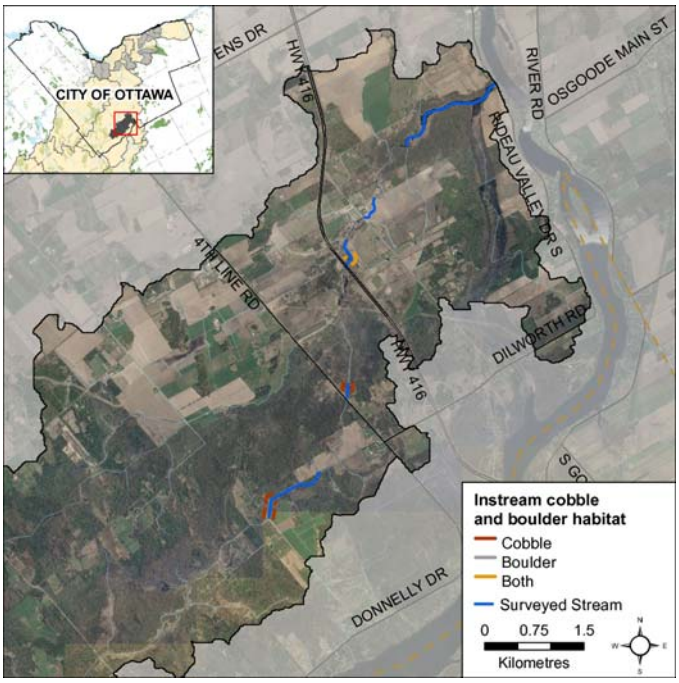

Figure 12 Instream substrate along Cranberry Creek

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 Cranberry Creek has moderate instream morphology variability; 65 percent consists of runs, 34 percent consists of pools and one percent consists of riffles.

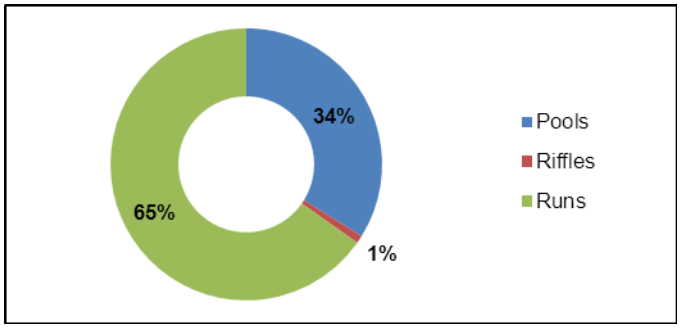

Figure 13 Instream morphology along Cranberry Creek

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. Cranberry Creek has high diversity of instream vegetation. The dominant vegetation type, recorded at 32 percent, is narrow-leaved emergents. Figure 14 depicts the plant community structure for Cranberry Creek.

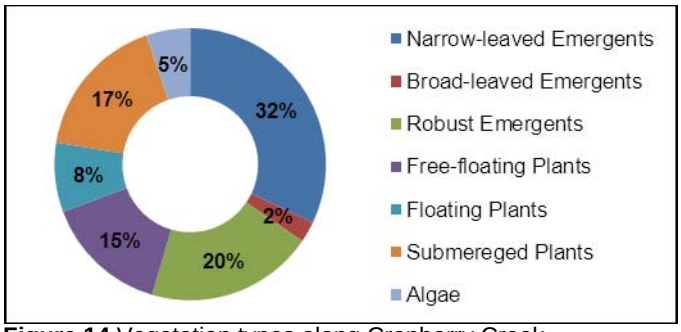

Figure 14 Vegetation types along Cranberry Creek

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 Cranberry Creek has high levels of instream vegetation with extensive levels accounting for 62 percent. Although the presence of invasive European frogbit does account for some of the vegetation abundance, the high levels were evident throughout the surveyed sections of the stream and were mostly due to the fact that it is dominated by wetland habitat.

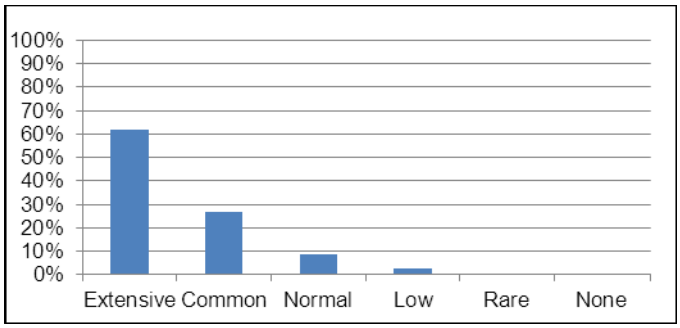

Figure 15 Instream vegetation abundance along Cranberry Creek

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 Cranberry Creek had invasive species (Figure 16). The invasive species observed along Cranberry Creek were Manitoba maple (*Acer negundo*), purple loosestrife (*Lythrum salicaria*), buckthorn (*Rhamnus),* curly-leaf pondweed *(Potamogeton crispus)*, European frogbit *(Hydrocharis morsus-ranae)*, and phragmites *(Phragmites australis)*.

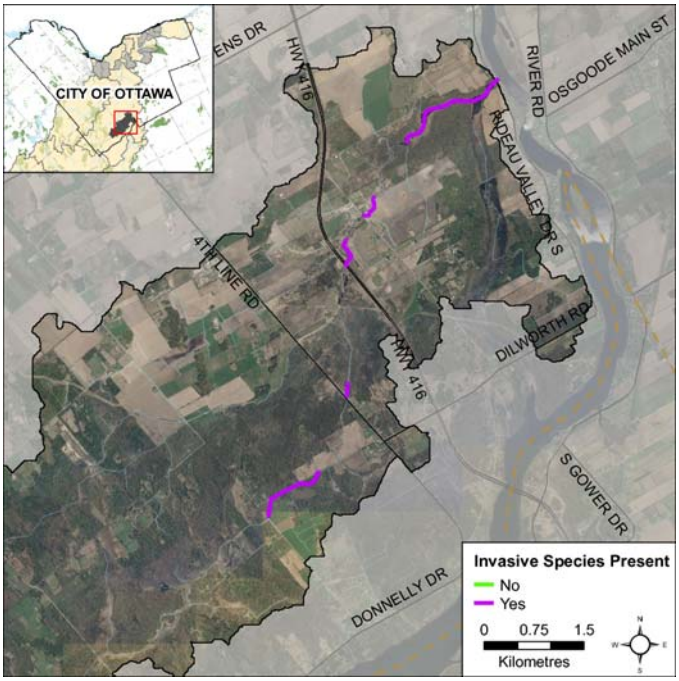

Figure 16 Invasive species along Cranberry Creek

European frogbit, an invasive species found on Cranberry 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, green heron, great blue heron, wood duck, turkey vulture, red winged blackbird, catbird, redtail hawk, waxwing, osprey, robin, cardinal, bluejay, crow, kingfisher, goldfinch, mourning dove
Mammals	deer tracks, raccoon tracks, river otter
Reptiles/Amphibians	leopard frog, tree frog, green frog, bull frog, tadpoles, eastern musk turtle
Aquatic Insects	water strider, amphipod, hemiptera, megaloptera, water boatmen, snail, whirlygig beetle, giant water bug, water scorpion
Other	dragonfly, damselfly, cabbage white butterfly, sulphur butterfly, monarch butterfly, mosquito, horsefly, deerfly, ladybird beetle, bumblebee, cicada, pollinators

Table 1 Wildlife observed along Cranberry Creek

Pollution

Figure 17 demonstrates the incidence of pollution/ garbage in Cranberry Creek. Pollution and garbage in the stream is assessed visually and noted for each section where it is observed. Eighty-one percent of the sections on Cranberry Creek did not have any observable garbage. Twelve percent had floating garbage, and two percent had garbage on the stream bottom.

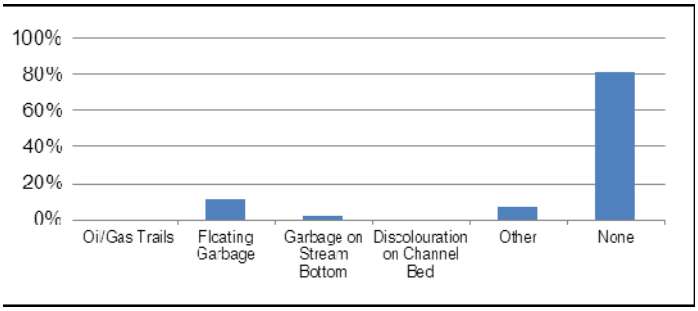

Figure 17 Pollution observed along Cranberry Creek

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. Table 2 shows that very low dissolved oxygen levels were observed on Cranberry Creek. This may be due to the extensive levels of organic materials and detritus in the creek.
- 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
July 2013	Low	0.75	8.6	351	6.83
	High	3.69	42.1	576	7.74
Aug 2013	Low	0.15	1.7	549	6.94
	High	7.10	79.2	635	7.87

Table 2 Water chemistry collected along Cranberry Creek

A volunteer 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.

Four temperature loggers were installed on Cranberry Creek from April until September. Logger 1 was located at Malakoff Road, logger 2 was located at Highway 416, logger 3 was located at Rideau Valley Drive and logger 4 was located at McCordick Road. Analysis of the data collected indicates that Cranberry Creek is classified as a cool water system with warm water reaches. The warm water reaches were recorded by logger 3 located at Rideau Valley Drive near the mouth of the creek.

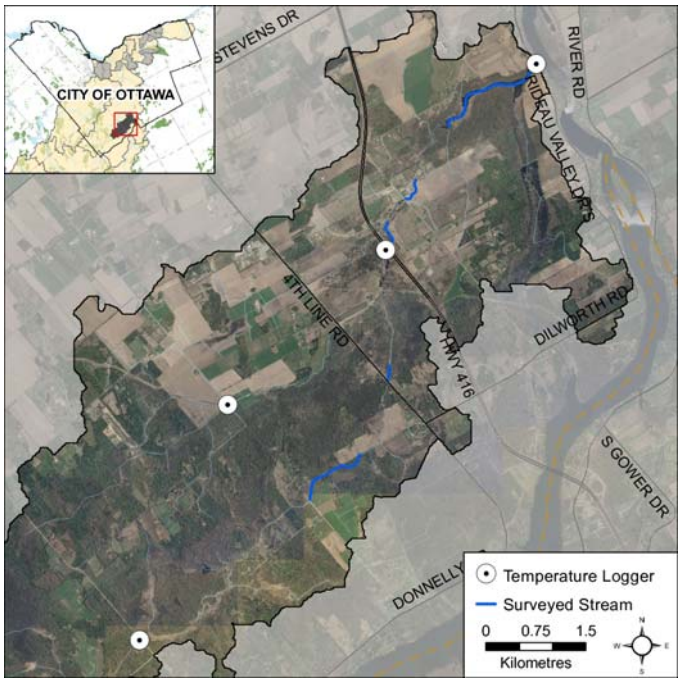

Figure 18 Temperature loggers along Cranberry Creek

Temperature installation along Cranberry Creek

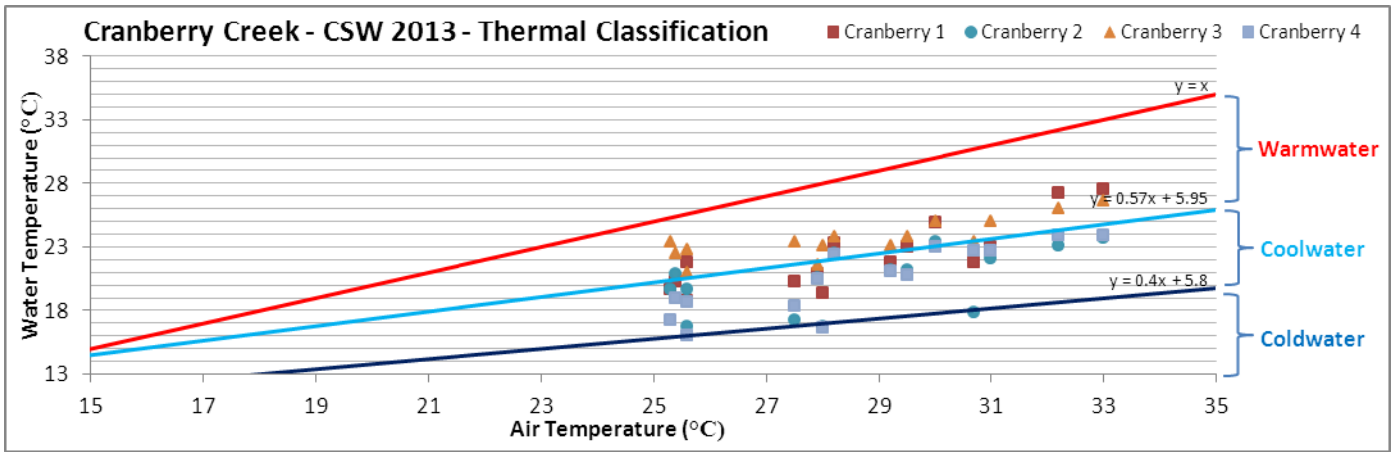

Figure 19 Thermal Classification for Cranberry Creek

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 Cranberry 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 Cranberry Creek. Cranberry Creek is classified as a cool water system with 21 fish species observed.

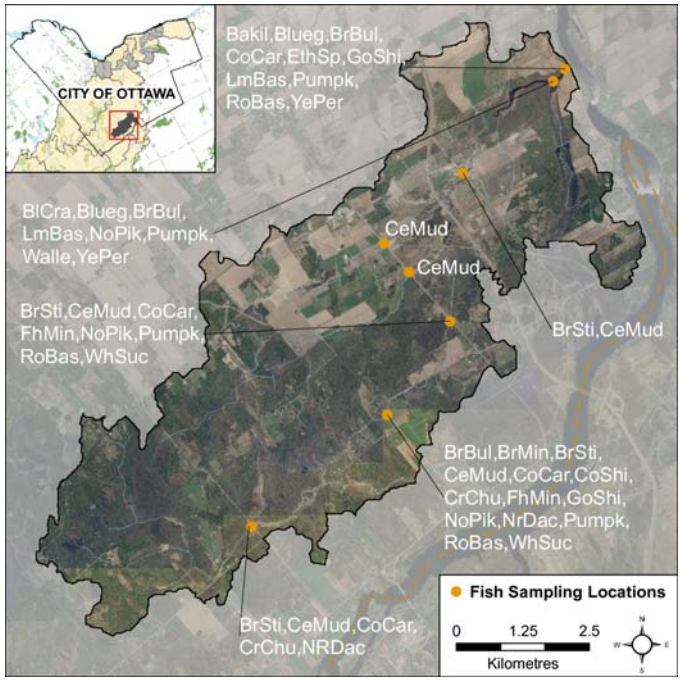

Figure 20 Cranberry Creek fish sampling

Species observed in Cranberry Creek (with fish code)			
banded killifish.....	BaKil	northern pike.....	NoPik
bluegill.....	Blueg	walleye.....	Walle
brown bullhead.....	BrBul	central mudminnow....	CeMud
common carp.....	CoCar	brook stickleback.....	BrSti
Etheostoma sp.....	EthSp	fathead minnow.....	FhMin
golden shiner.....	GoShi	white sucker.....	WhSuc
largemouth bass.....	LmBas	brassy minnow.....	BrMin
pumpkinseed.....	pumpk	common shiner.....	CoShi
rock bass.....	RoBass	creek chub.....	CrChu
yellow perch.....	YePer	northern redbelly dace	NRDac
black crappie.....	BlCra		

Table 3 Fish species observed in Cranberry Creek

Black crappie captured on Cranberry 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. No migratory obstructions were observed in the sections that were surveyed on Cranberry 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 City Stream Watch has incorporated monitoring of these systems at 19 sites in the Cranberry Creek catchment (Figure 21).

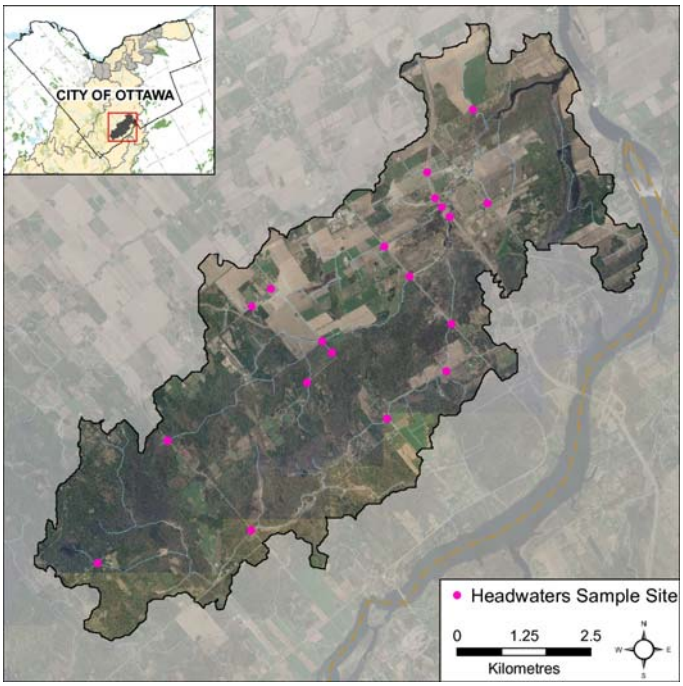

Figure 21 HDF sampling sites on Cranberry Creek

Spring HDF sampling at a site along Dilworth Road

Stream Comparison Between 2007 and 2013

The following tables provide a comparison of Cranberry Creek between the 2007 and 2013 survey years. Given that the extent surveyed was different in each year, the comparison is made between the approximately 30 sections along Cranberry Creek that were surveyed in both survey years.

Anthropogenic Changes

Table 4 shows that between 2007 and 2013 anthropogenic alterations along Cranberry Creek have increased slightly. In 2007 areas considered natural or those that had no alteration accounted for 87 percent of the creek. In 2013, that number is 77 percent. In addition, areas considered highly altered have increased from three percent to ten 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	67	71
"Natural" conditions with minor human alterations	20	6
"Altered" with considerable human impact but significant natural portions	10	13
"Highly altered" by humans with few natural portions	3	10

Table 4 Comparison of anthropogenic alterations between 2007 and 2013

A highly altered section of Cranberry Creek that runs through a culvert under highway 416

Bank Stability Changes

According to observations bank stability has not changed significantly overall since 2007. In 2007, 98 percent of each bank was considered stable. In 2013, 100 percent of both the left and right banks are stable.

Bank Stability	2007 (%) Left Bank	2007 (%) Right Bank	2013 (%) Left Bank	2013 %) Right Bank
Stable	98	98	100	100
Unstable	2	2	0	0

Table 5 Comparison of bank stability between 2007 and 2013

The banks of Cranberry Creek are dominated by wetland plants making them very stable

Changes in Instream Vegetation

Table 6 shows that there has been a slight increase in instream vegetation in Cranberry Creek since 2007. In 2007, 63 percent of the creek was classified as having extensive levels of vegetation. In 2013 that number has increased to 74 percent.

Instream Vegetation Abundance	2007 (%)	2013 (%)
Extensive	63	74
Common	37	13
Normal	0	10
Low	0	3
Rare	0	0
None	0	0

Table 6 Comparison of instream vegetation levels between 2007 and 2013

Changes in Pollution and Garbage

Overall the amount of pollution and garbage in Cranberry Creek has decreased slightly since 2007. Table 7 shows that the number of sections surveyed that were free from garbage has increased from 70 percent in to 2007 to 74 percent in 2013. In addition, the percentage of sections that had floating garbage has decreased from 27 percent to 16 percent since 2007.

Pollution/Garbage	2007 (%)	2013 (%)
None	70	74
Floating garbage	27	16
Garbage on stream bottom	3	3
Oil or gas trails	0	0
Discoloration of channel bed	30	10

Table 7 Comparison of pollution levels between 2007 and 2013

Cranberry Creek crossing at Rideau Valley Drive—one of the sites where people are accessing the creek and floating garbage was found

Fish Community Comparison

Fish sampling was conducted on Cranberry Creek by the City Stream Watch program in 2007 and 2013. In 2007, 19 species were caught at six different sites by electrofishing, trapping and seining. In 2013, 17 species were caught by a electrofishing, trapping and seining at eight different sites. Four species caught in 2007 were not found in 2013, which are Etheostoma sp, yellow perch, walleye, and common shiner. This does not mean these species have disappeared from the creek but could be influenced by location, weather conditions or time of sampling.

Species	Code	2007	2013
banded killifish.....	BaKil	X	X
bluegill.....	Blueg	X	X
brown bullhead.....	BrBul	X	X
common carp.....	CoCar	X	X
Etheostoma sp.....	EthSp	X	
golden shiner.....	GoShi	X	X
largemouth bass.....	LmBas	X	X
pumpkinseed.....	pumpk	X	X
rock bass.....	RoBass	X	X
yellow perch.....	YePer	X	
black crappie.....	BlCra	X	X
northern pike.....	NoPik	X	X
walleye.....	Walle	X	
central mudminnow.....	CeMud	X	X
brook stickleback.....	BrSti	X	X
fathead minnow.....	FhMin		X
white sucker.....	WhSuc	X	X
brassy minnow.....	BrMin		X
common shiner.....	CoShi	X	
creek chub.....	CrChu	X	X
northern redbelly dace	NRDac	X	X

Table 8 Comparison of fish species caught in 2007 and 2013

Monitoring and Restoration

Monitoring and Restoration Projects on Cranberry Creek

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

Accomplishment	Year	Description
City Stream Watch Monitoring	2007	61 stream surveys were completed by City Stream Watch volunteers and staff
	2013	43 stream surveys were completed by City Stream Watch volunteers and staff
City Stream Watch Fish Sampling	2007	Seven sites were sampled on Cranberry Creek
	2013	Eight sites were sampled on Cranberry Creek
City Stream Watch Thermal Classification	2007	Three 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	19 headwater drainage feature sites were sampled in the Cranberry Creek catchment

Table 9 Monitoring and Restoration on Cranberry Creek

Potential Riparian Restoration Opportunities

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

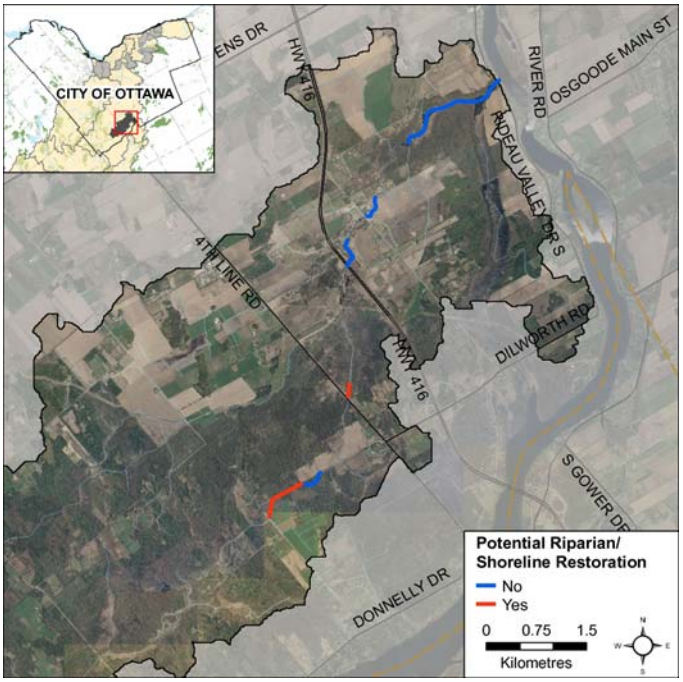

Figure 23 Potential riparian restoration opportunities

Potential Instream Restoration Opportunities

No instream restoration opportunities were noted for Cranberry Creek as seen in Figure 24 below.

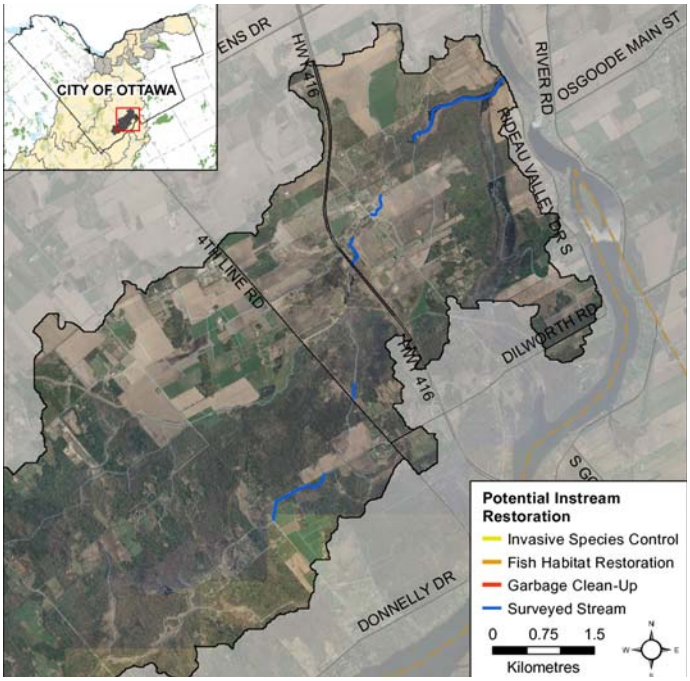

Figure 24 Potential instream restoration opportunities



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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