Black Creek 2012 Summary Report

Watershed Features	
Area	10.27 square kilometres 0.24% of the Rideau River watershed
Land Use	23% agriculture 1% urban 10% forest 66% wetlands
Surficial Geology	27% clay 52% organic deposits 21% sand
Watercourse Length and Type	*Total length:* *Watercourse Type:* 65% natural 35% channelized *Flow Type:* 100% permanent
Invasive Species	There were six invasive species observed by CSW staff in 2012: purple loosestrife, Manitoba maple, garlic mustard, dog-strangling vine, European frogbit, yellow iris
Fish Community	12 fish species have been captured in Black Creek. Game fish species present include brown bullhead

Wetland Cover
66% of the watershed is wetland
Wetlands make up 87% of the vegetation cover

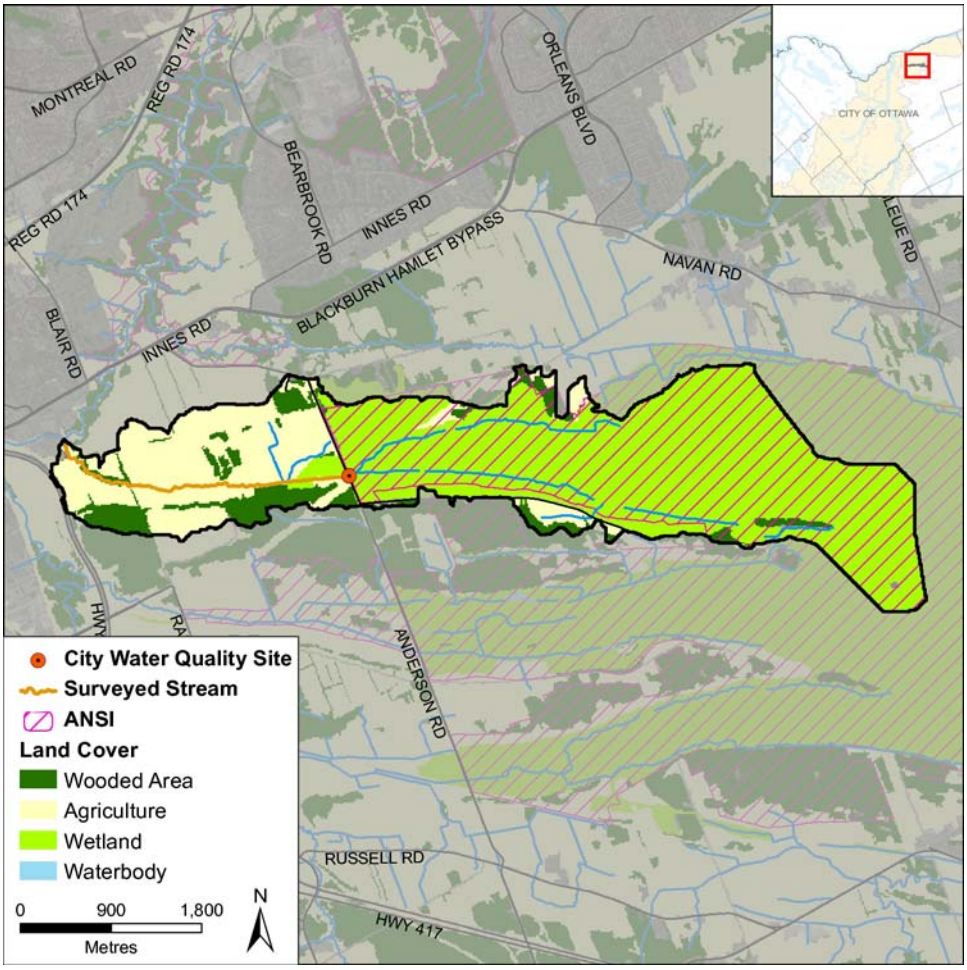

Figure 1. Black Creek catchment land cover

Vegetation Cover		
Types	**Hectares**	**% of Cover**
Wetlands	675	87
Wooded Areas	85	11
Hedgerow	1	0
Plantation	12	2
TOTAL COVER		**100%**

Woodlot Cover		
Size Category	**Number of Woodlots**	**% of Woodlots**
<1 ha	29	4.8
1-9 ha	13	41.1
10-30 ha	3	54.1
>30 ha	0	0

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 2012 City Stream Watch collaborative.

Introduction

Black Creek is approximately four kilometers long and is one of five major tributaries of Greens Creek in the east end of the City of Ottawa. The headwaters of Black Creek begin in the Mer Bleue Wetland, which is a popular recreation destination as well as being recognized as a wetland of International Importance by the Ramsar convention, an Area of Natural and Scientific Interest (ANSI) and a Provincially Significant Wetland. From it's headwaters Black Creek flows through property owned by the National Capital Commission (NCC), before it empties into Green's Creek just south of Innes road.

As part of the City Stream Watch monitoring activities in 2012, 36 sections along Black Creek were surveyed. Surveys were completed up to Anderson road where the stream morphology changes to a wetland for the remaining length of the stream. As some wetland environments have no defined channel, this area could not be surveyed using the macro stream assessment protocol.

Low Water Conditions in the Rideau Valley Watershed

The Government of Ontario has set up the Ontario Low Water Response (OLWR), which ensures that the province is prepared for low water conditions in the future. The response plan is intended to help co-ordinate and support local response in the event of drought. Local teams are established in areas experiencing low water conditions so that the local community can carry out actions to reduce and better manage water use. As an important part of the Low Water Response Team for the watershed, the Rideau Valley Conservation Authority (RVCA) measures precipitation, stream flow and water levels which indicate the severity of low water conditions in the watershed. In 2012, the Rideau Valley Watershed was impacted by low water conditions. RVCA first declared Level 1 low water status on April 5, 2012. Level 1 status continued until July 13, 2012 when the status was increased to Level 2. On October 3, 2012 the Level 2 low water status was lifted for most of the watershed except for the Kemptville Creek subwatershed which remained at Level 1 status. This information is important to highlight as the drought impacted aquatic habitat conditions in the Rideau watershed in 2012.

Droughts are natural events that occur periodically over time. In the past, periods of dry weather and low water levels were relatively uncommon happening every decade or so. But with changing weather patterns, low water levels may occur more often, especially with increasing demand for water. It can be argued that "many species of biota, both terrestrial and aquatic, have evolved many different adaptations to contend with drought" (Humphries, 2003). However it is important to keep in mind that drought conditions can "enhance siltation, change the composition of aquatic vegetation, alter channel shape and affect water chemistry" (Lake, 2003). These changes may result in direct and indirect impacts on vegetation, fish species, invertebrates and amphibians (Lake, 2003).

Overbank Zone

Riparian Buffer along Black Creek

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.
Figure 2 demonstrates the buffer conditions on Black Creek for the left and right banks separately. Results show that 54 percent of the left bank and 39 percent of the right bank of Black Creek has a buffer width greater than 30 meters.

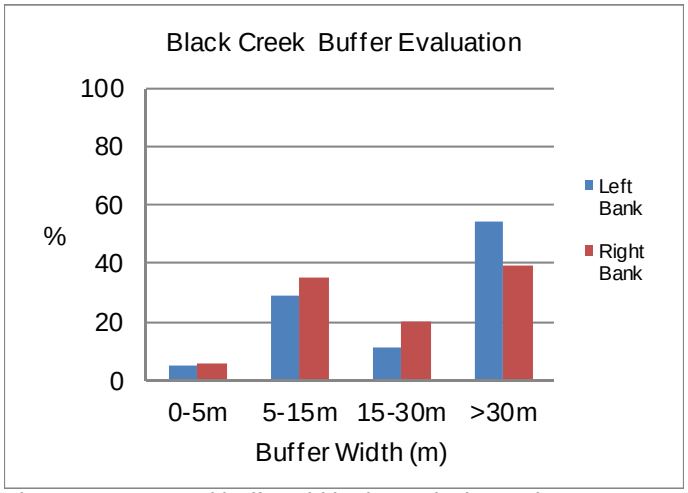

Figure 2. Vegetated buffer width along Black Creek

Land Use beside Black Creek

Figure 3 demonstrates nine different land uses identified along the banks adjacent to Black Creek. 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 they surveys but is nonetheless part of the subwatershed and will influence the creek. Natural areas made up 52 percent of the stream, characterized by wetland, forest, scrubland and meadow. Forty-two percent of the land use was active agriculture and the remaining land use consisted of abandoned fields, industrial/commercial, infrastructure, and recreational.

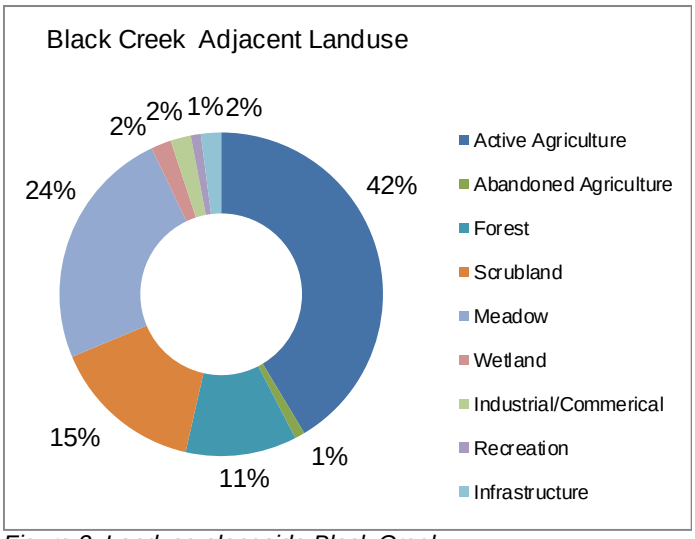

Figure 3. Landuse alongside Black Creek

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. Bank stability indicates how much soil has eroded from the bank into the stream. 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 the observed erosion locations along Black Creek. Eighty-three percent of the left bank and 82 percent of the right bank was considered stable but there are a few sections that are displayed high levels of erosion.

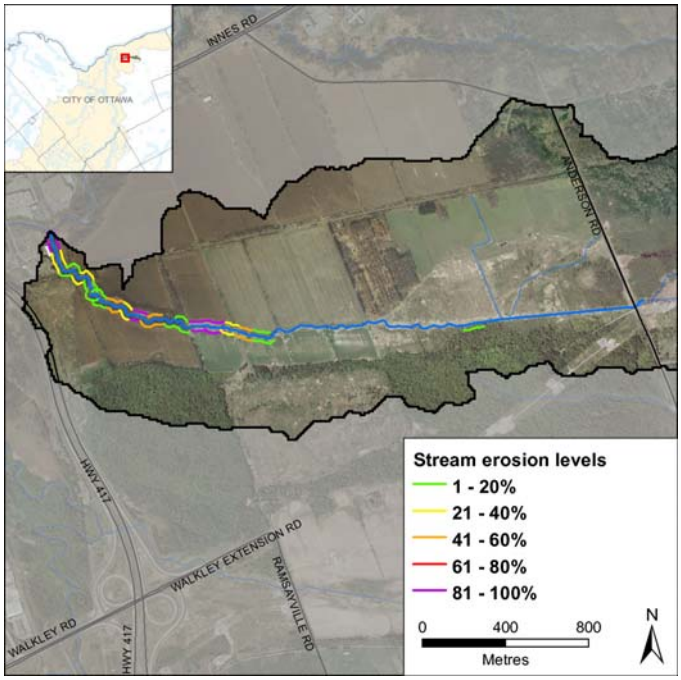

Figure 4. Erosion along Black Creek

Streambank Undercutting

Undercut banks are a normal and natural part of stream function and can provide excellent refuge areas for fish. Figure 5 shows that Black Creek has several locations with identified undercut banks.

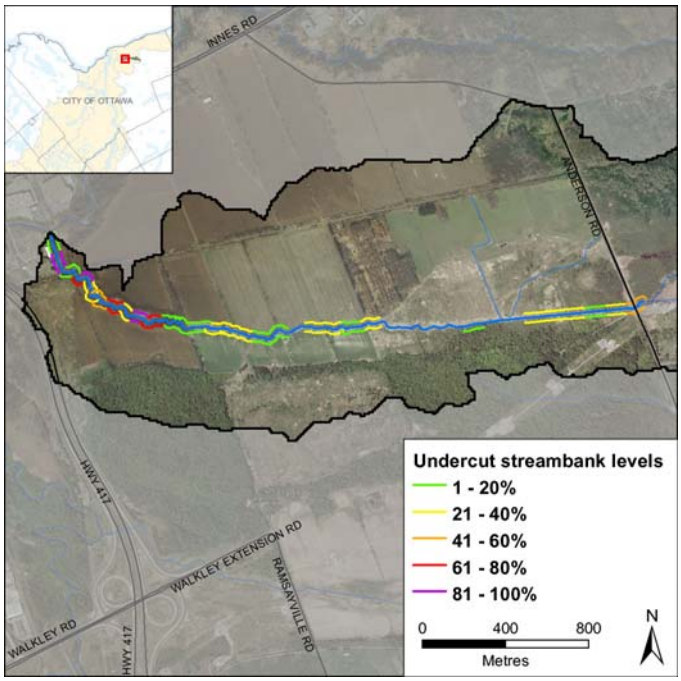

Figure 5. Undercut streambanks along Black Creek

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 the stream shading locations along Black Creek.

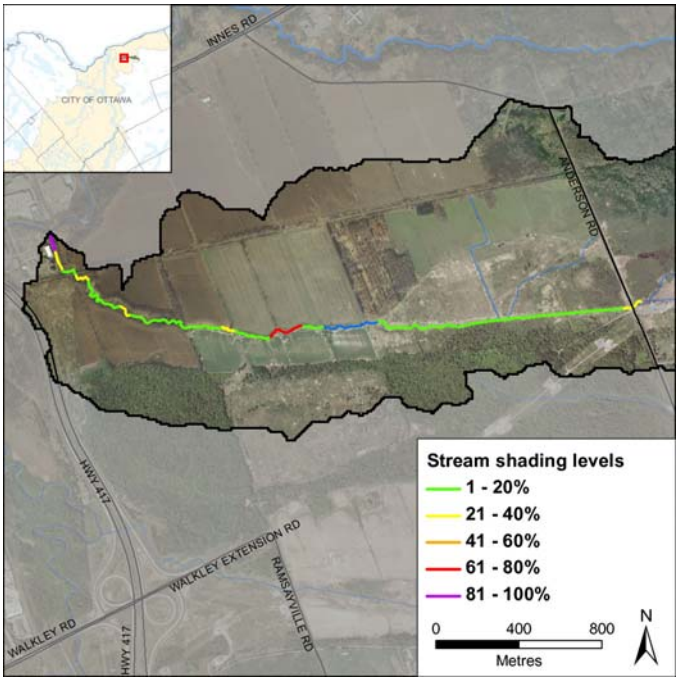

Figure 6. Stream shading along Black Creek

Human Alterations

Figure 7 shows eight percent of Black Creek remains "unaltered." Sections considered "natural" with some human changes account for 22 percent of sections. "Altered" sections accounted for 35 percent of the stream, with the remaining 35 percent of sections sampled being considered "highly altered" (e.g. include road crossings, shoreline/instream modifications and little or no buffer).

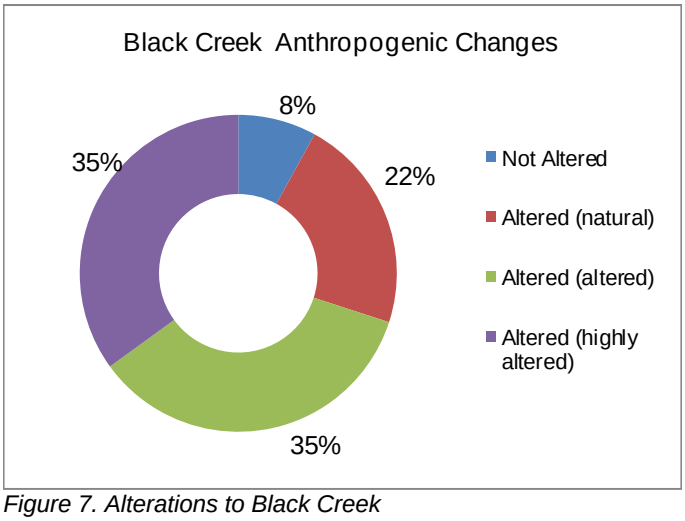

Figure 7. Alterations to Black Creek

Overhanging Trees and Branches

Figure 8 shows that most of Black Creek has very limited levels of overhanging branches and trees. Overhanging branches and trees provide a food source, nutrients and shade which helps to moderate instream water temperatures.

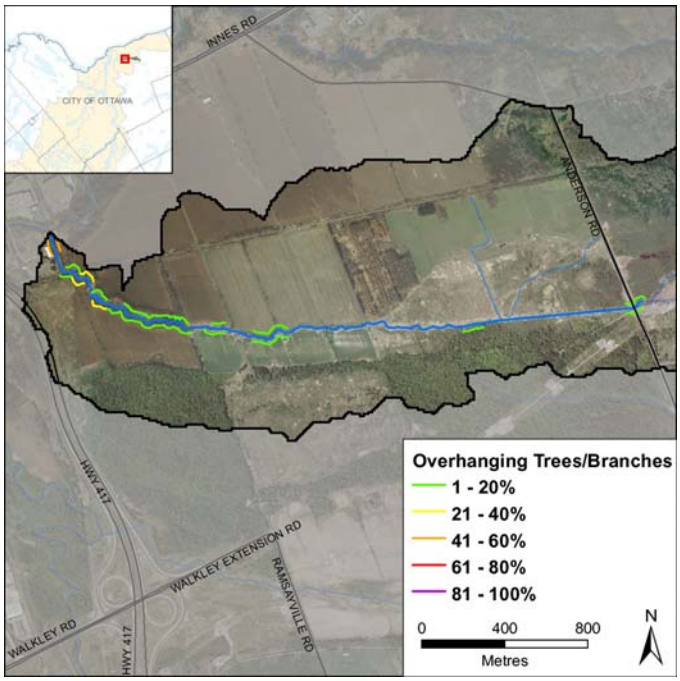

Figure 8. Overhanging trees and branches

Photo 1. One of the few areas of Black Creek with overhanging trees and branches

Instream Woody Debris

Instream woody debris is important for fish and benthic habitat, by providing refuge and feeding areas. Figure 9 shows that the majority of Black Creek has fairly low levels of instream woody debris in the form of branches and trees. The highest amount of instream woody debris seems to be located in the area starting from the mouth of the creek to approximately 1km upstream.

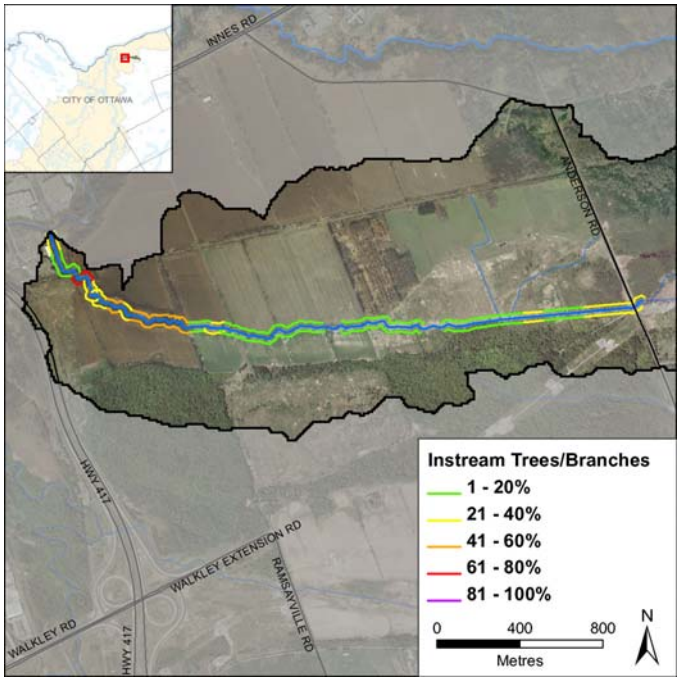

Figure 9. Instream trees and branches along Black Creek

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. A high percentage of habitat complexity (heterogeneity) typically increases biodiversity of aquatic organisms within a system. Seventy-eight percent of Black Creek was considered homogeneous as shown in Figure 10.

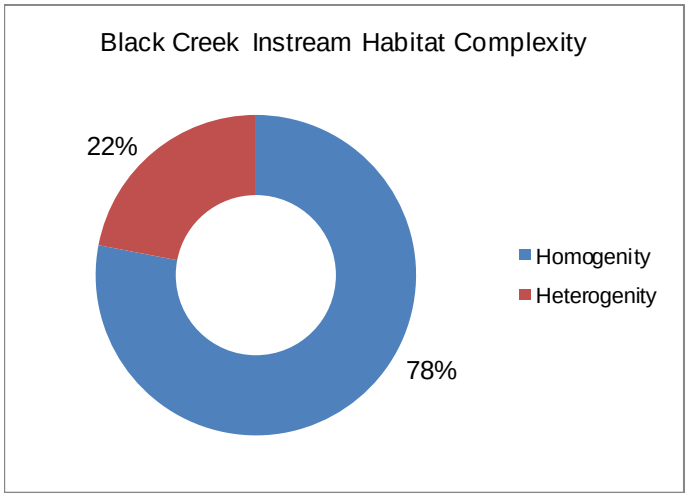

Figure 10. Instream habitat complexity in Black Creek

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 demonstrates that the substrate in Black Creek is mainly composed of a mix of sand, silt, clay, muck and detritus.

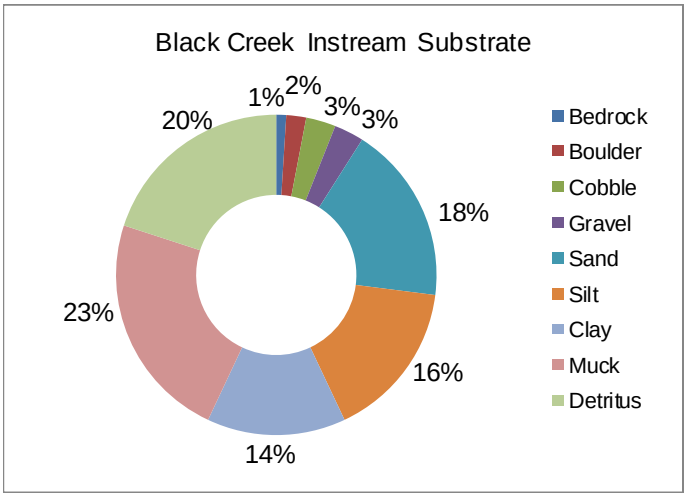

Figure 11. Instream Substrate in Black Creek

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 is found in Black Creek.

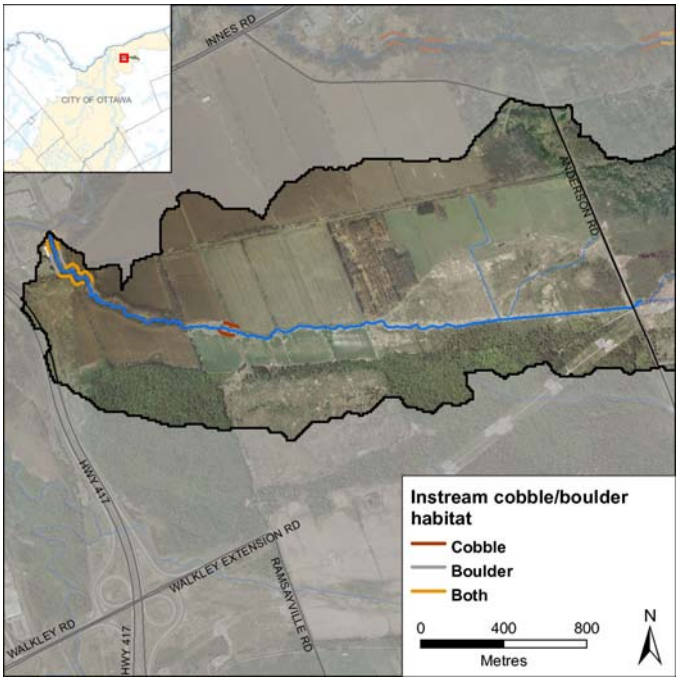

Figure 12. Instream cobble and boulder along Black Creek

Instream Morphology

Pools and riffles are important features for fish habitat. Riffles are areas of agitated water that contribute higher dissolved oxygen to the stream. They act as spawning substrate for some species of fish, such as walleye. Pools provide shelter for fish and can be refuge pools 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 Black Creek is very uniform; 91 percent consists of runs, six percent pools and three percent riffles.

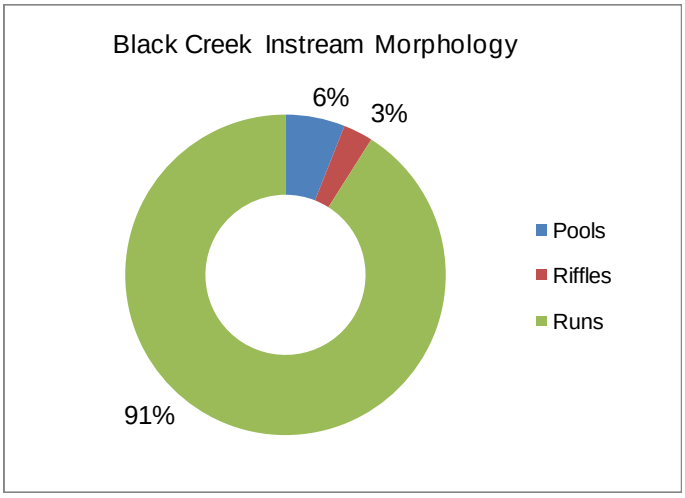

Figure 13. Instream morphology in Black Creek

Types of Instream Vegetation

Black Creek has good diversity in types of instream vegetation as shown in Figure 14. The dominant vegetation type recorded at thirty percent consisted of floating plants. Narrow-leaved emergents and submerged vegetation were both recorded at 24 percent. A total of 13 percent of the vegetation community was recorded as algae. Broad-leaved emergents were recorded at five percent and robust emergents and free floating plants made up the remaining five percent of the vegetation community.

Photo 2. A variety of instream vegetation in Black Creek

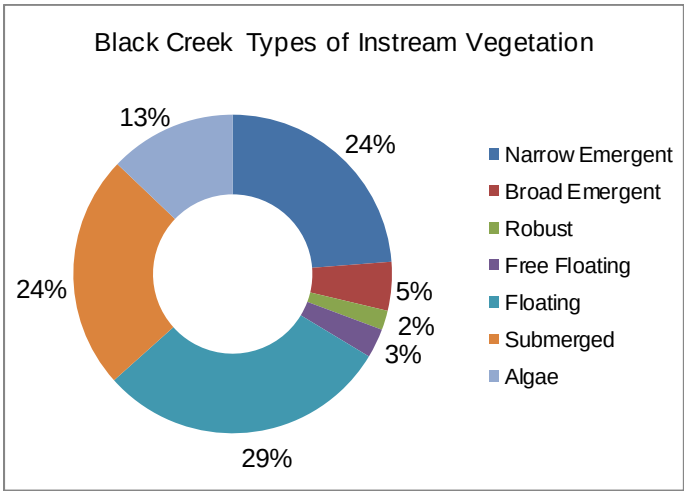

Figure 14. Instream vegetation types in Black Creek

Amount of Instream Vegetation

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 Black Creek had high levels of instream vegetation. Forty-two percent of the creek had extensive (choked) levels of vegetation, and 17 percent had common levels. Thirty percent of the creek had low levels of vegetation and 10 percent had normal levels. The percentage of extensive levels of vegetation may have been elevated in this case as the creek transitioned in to the Mer Bleue Wetland.

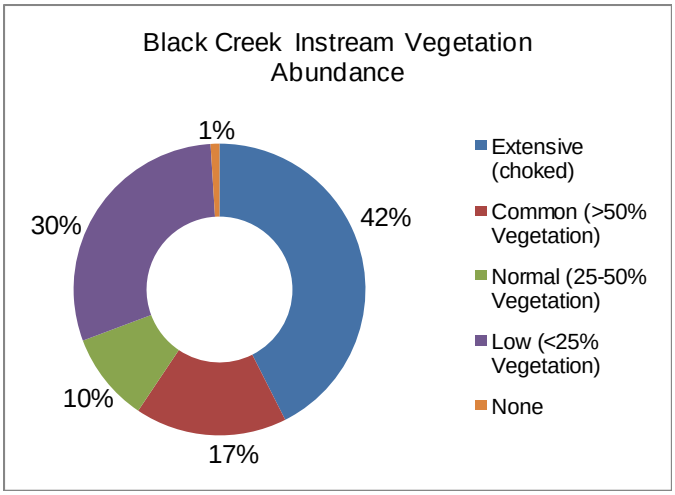

Figure 15. Vegetation abundance in Black Creek

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 and can outcompete native species, having negative effects on local wildlife, fish and plant populations. In Black Creek, invasive species were observed in 50 percent of the sections surveyed and often more than one species was present in the same area (Figure 16). The species observed in Black Creek are purple loosestrife (*Lythrum salicaria)*, manitoba maple (*Acer negundo)*, garlic mustard (*Alliaria petiolata)*, dog-strangling vine (*Cyanchum rossicum*), European frogbit (*Hydrocharia morsus-ranae)*, yellow iris (*Iris pseudacorus*).

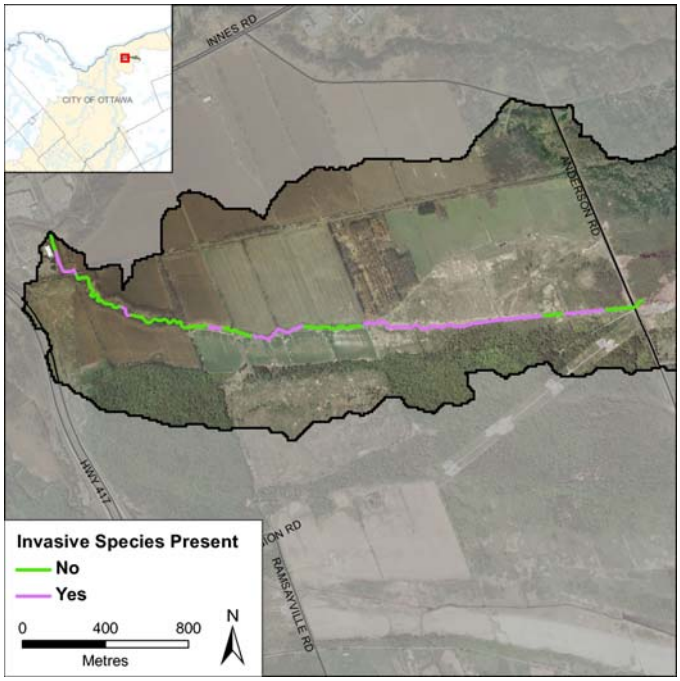

Figure 16. Invasive species along Black Creek

Photo 3. A patch of invasive European frogbit at the base of a beaver dam on Black Creek

Wildlife

The diversity of fish and wildlife populations can be an indicator of water quality and overall stream health. Table 5 is a summary of all wildlife observed during stream surveys.

Wildlife	Observed
Birds	catbird, swallow, sparrow, redwing blackbird, goldfinch, downey woodpecker, crow, robin, starling, great blue heron, malard
Mammals	raccoon, white tail deer, mouse
Reptiles/Amphibians	green frog, tadpole, snapping turtle, american toad, bullfrog
Aquatic Insects	water strider, *coleoptera sp*., water scorpion, damselfly larva, *belostomatid sp*.
Other	damselfly, jewelwing, monarch, dragonfly, moth, caterpillar, cabbage white, swallowtail sp., mosquito, horsefly, ladybug, deerfly, bumblebee, hornet, snail, leech, spider

Table 5. Wildlife observed along Black Creek

Pollution

Figure 17 demonstrates the incidence of pollution/ garbage in Black Creek. Pollution and garbage in the stream is assessed visually and noted for each section where it is observed. Black Creek is relatively clear of garbage as 61 percent of the sections did not have any garbage. Fourteen percent had floating garbage, 22 percent had garbage on the stream bottom and 14 percent of the sections had discoloration on the channel bed.

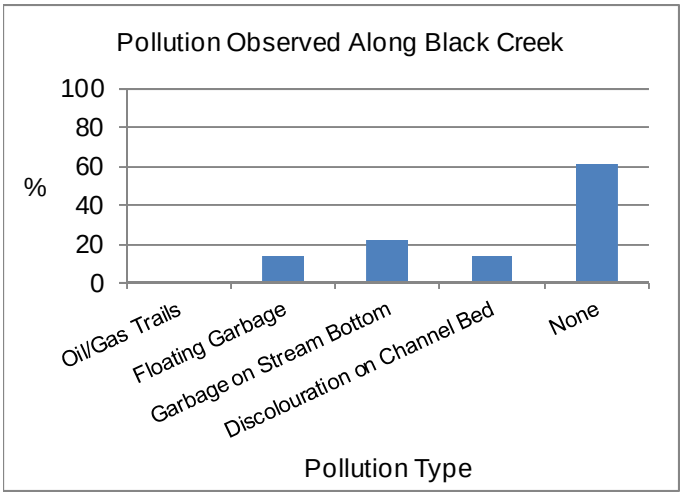

Figure 17. Pollution observed along Black Creek

Thermal Classification

Temperature is an important parameter in streams as it influences many aspects of physical, chemical and biological health. Figure 18 show the locations where two temperature dataloggers were deployed in Black Creek from April to late September 2012 to give a representative sample of how water temperature fluctuates.

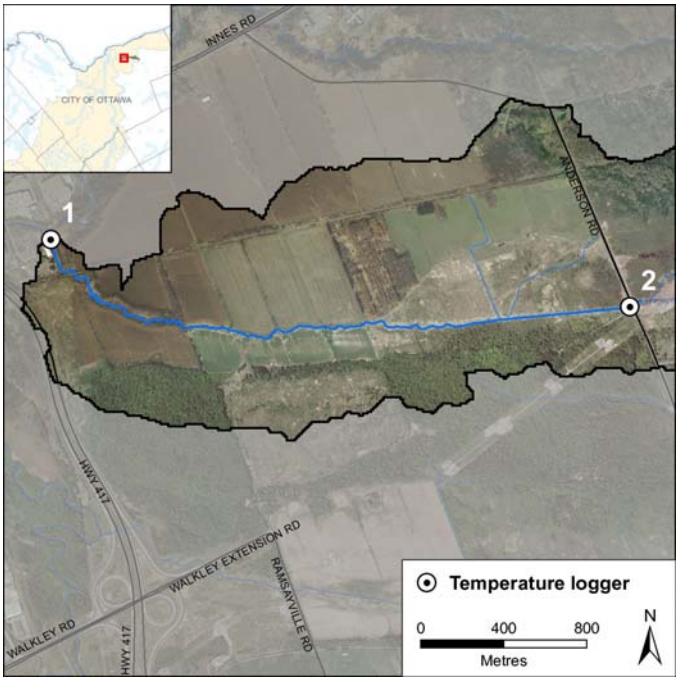

Figure 18. Temperature dataloggers along Black Creek

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 warmwater, coolwater or cold water. Analysis of the data collected indicates that Black Creek is a coolwater system with coldwater reaches.

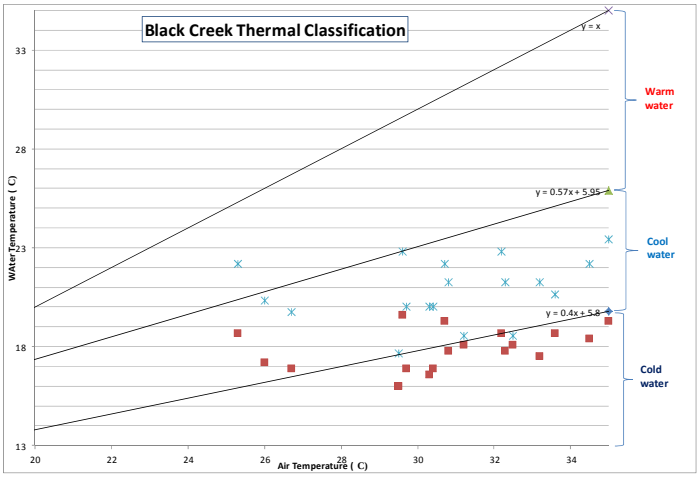

Figure 19. Thermal Classification for Black Creek

Fish Sampling

Fish sampling sites located along Black Creek are shown in Figure 20. Results are from fish sampling conducted by the Rideau Valley Conservation Authority and the City of Ottawa. The provincial fish codes shown in figure 20 are listed (in Table 6) beside the common name of those fish species identified in Black Creek.

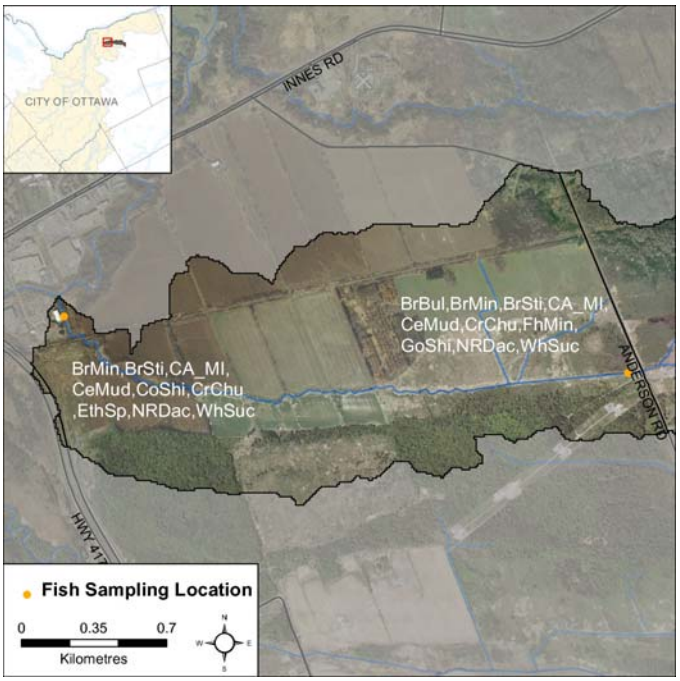

Figure 20. Fish species observed in Black Creek

Species Legend	
BrBul	brown bullhead
BrMin	brassy minnow
BrSti	brook stickleback
CA_MI	carps and minnows
CeMud	central mudminnow
CoShi	common shiner
CrChu	creek chub
EthSp	*Etheostoma sp.*
FhMin	fathead minnow
GoShi	golden shiner
NRDac	Northern redbelly dace
WhSuc	white sucker

Table 6. Fish species observed in Black 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 locations of migratory obstructions observed along Black Creek. All the migratory obstructions observed were close to the mouth of the creek which may be preventing fish from moving up the stream during low water conditions.

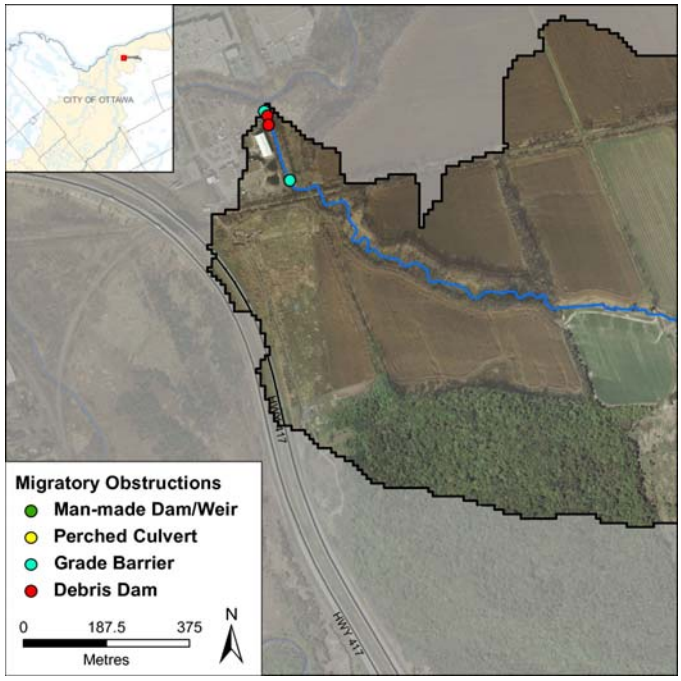

Figure 21. Migratory obstructions in Black Creek

Photo 4. A debris dam on Black Creek

Water Chemistry

During the macrostream 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 warmwater fish and 9.5 mg/L for cold water fish (CCME, 1999). A saturation value of 90% or above is considered healthy
- 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 2012
- 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

2012 data for these three parameters is summarized in Table 7.

Month	Range	DO (mg/L)	DO (%)	Conductivity (µs/cm)	pH
May	low	-	-	-	-
	high	-	-	-	-
June	low	3.42	13.48	203	6.92
	high	8.28	93.02	513	7.65
July	low	3.3	2.76	155	6.53
	high	9.75	112.01	965	7.34
August	low	-	-	-	-
	high	-	-	-	-

Table 7. 2012 Water chemistry collected along Black Creek

Photo 5. Recording water chemistry data on Black Creek

Comparison Between 2007 and 2012

The following tables provide a comparison of Black Creek between the 2007 and 2012 survey years.

Anthropogenic Changes Between 2007 and 2012

Table 8 shows that between 2007 and 2012 anthropogenic alterations along Black Creek have increased. The percentage of sections with no anthropogenic alternations has decreased significantly from 40 percent to 8 percent. In addition, 35 percent of the sections in 2012 were classified as “highly altered”. Some of this change can be related to changes in the macro stream protocol that is used. In 2010 anthropogenic alterations were further defined in the protocol, which would have caused some land uses to shift categories.

Anthropogentic Alterations	2007 (%)	2012 (%)
None	40	8
"Natural" conditions with minor human alterations	27	22
"Altered" with considerable human impact but significant natural portions	33	35
"Highly altered" by humans with few natural portions	n/a	35

Table 8. Comparison of anthropogenic alterations along Black Creek between 2007 and 2012

Bank Stability Changes Between 2007 and 2012

According to observations bank stability has not changed significantly since 2007. In 2007, 83 percent of the banks were considered stable. In 2012, 83 percent of the left bank is stable and 82 percent of the right bank is stable.

Bank Stability	2007	2012 Left Bank	2012 Right Bank
Stable	83	83	82
Unstable	17	17	18

Table 9. Comparison of bank stability between 2007 and 2012

Changes in Instream Vegetation Between 2007 and 2012

There has been a shift in the amount of instream vegetation found in Black Creek between 2007 and 2012.The percentage of extensive levels of vegetation has increased from 21 percent to 43 percent but the amount of common levels of vegetation has decreased from 58 percent to 17 percent since 2007. The amount of low levels of vegetation has increased from 3 percent to 30 percent while the amount of normal levels has remained relatively the same. The increase in the extensive levels of vegetation is likely due to the increase presence of invasive species like European frogbit.

Instream Vegetation	2007 (%)	2012 (%)
Extensive	21	43
Common	58	17
Normal	12	10
Low	3	30
Rare	6	0
None	n/a	1

Table 10. Comparison of instream vegetation levels between 2007 and 2012

Changes in Pollution and Garbage Between 2007 and 2012

Overall the amount of garbage and pollution in Black Creek seems to have increased only slightly since 2007. The number of sections surveyed that were free from garbage has decreased slightly since 2007. However, the number of sections that had floating garbage has increased from 9 to 14 since 2007.The amount of garbage on the stream bottom has also increased from 15 sections in 2007 to 22 sections in 2012. In addition, 14 sections displayed discoloration of the channel bed in 2012.

Pollution/Garbage	2007	2012
None	73	61
Floating Garbage	9	14
Garbage on Stream Bottom	15	22
Oil or Gas Trails	3	0
Discoloration of Channel Bed	n/a	14

Table 11. Comparison of pollution/garbage levels between 2007 and 2012

Monitoring and Restoration

Past Monitoring and Restoration Projects on Black Creek

Table 12 below highlights the monitoring and restoration work that has been done on Black Creek to date by the Rideau Valley Conservation Authority.

Accomplishment	Year	Description
City Stream Watch Monitoring	2007	33 macro stream surveys were completed by City Stream Watch staff and volunteers
City Stream Watch Fish Sampling	2007	One site on Black Creek was sampled for fish on Black Creek
City Stream Watch Monitoring	2012	36 macro stream surveys were completed by City Stream Watch staff and volunteers
City Stream Watch Fish Sampling	2012	Using an electrofisher, two sites on Black Creek were sampled three times each from May to July
City Stream Watch Thermal Classification	2012	Two temperature data loggers were deployed in Black Creek from April to September

Table 12. Monitoring and restoration projects on Black Creek

Potential Riparian Restoration Opportunities

Figure 22 depicts the locations where City Stream Watch staff and volunteers made note of opportunities for future riparian restoration activities. The creek runs through agricultural land that has very little shoreline buffer so there is high potential for riparian planting along most of the creek.

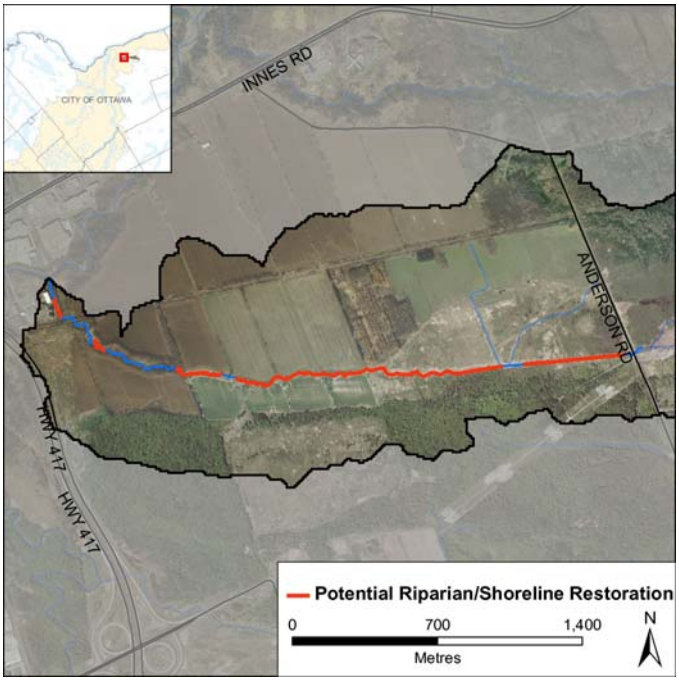

Figure 22. Riparian restoration opportunities

Potential Instream Restoration Opportunities

Figure 23 depicts the locations where various instream restoration activities can be implemented as a result of observations made during the stream survey assessments.

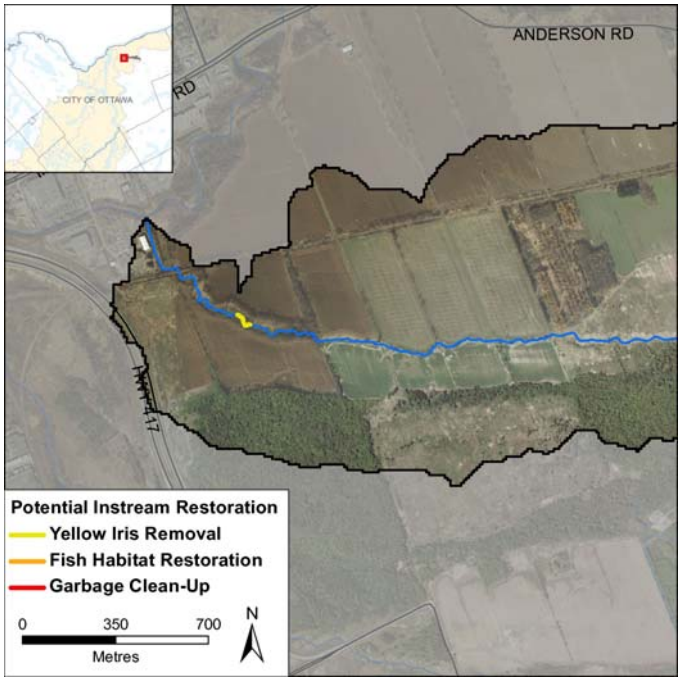

Figure 23. Potential instream restoration opportunities



References

1. Canadian Wildlife Service (CWS), Environment Canada. 2004. *How Much Habitat Is Enough? Second Edition* Retrieved from: http://www.ec.gc.ca/Publications/1B5F659B-B931-4F37-A988-3DD73DF656B7/CWSHowMuchHabitatisEnoughAFramework.pdf
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For more information of the overall 2012 City Stream Watch Program and the volunteer activities, please refer to the City Stream Watch Summary Report 2012.

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