Black Creek 2018 Catchment Report

Watershed Features	
Area	10.27 square kilometres 0.24% of the Rideau Valley watershed
Land Use	11.53% agriculture 1.79% urban 10.42% forest 8.76% meadow 0.16% rural 0.24% waterbody 67.11% wetland
Surficial Geology	27.14% clay 52.34% organic deposits 20.52% sand
Watercourse Type	2018 thermal conditions **Cool-warmwater** to **coolwater** system
Invasive Species	Ten invasive species were identified in 2018: banded mystery snail, common buckthorn, European frogbit, glossy buckthorn, Himalayan balsam, Manitoba maple, phragmites, wild parsnip, purple loosestrife, yellow iris
Fish Community	13 species of fish have been observed from 2007-2018.

Wetland Catchment Cover
65.17% evaluated wetland
1.94% unevaluated wetland

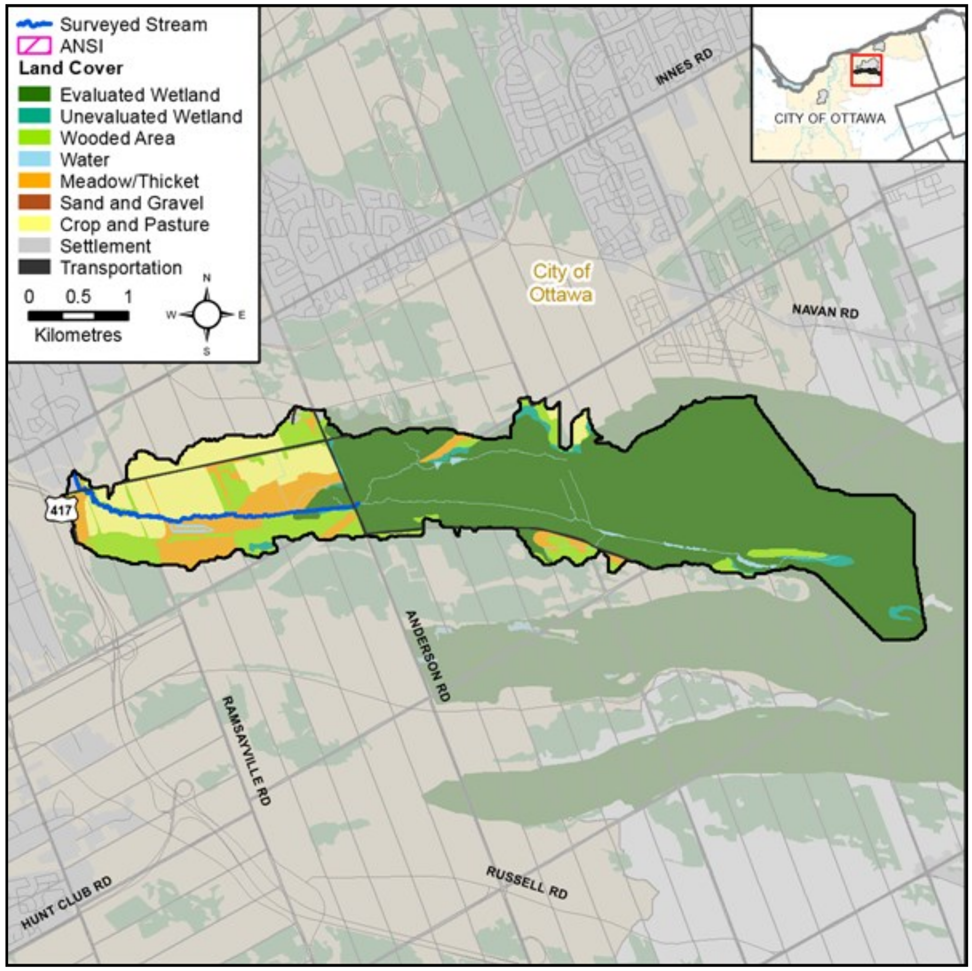


Figure 1 Land cover in the Black Creek catchment

Black Creek downstream of Anderson Road

The Rideau Valley Conservation Authority, in partnership with eight other agencies in Ottawa, form the 2018 City Stream Watch Collaborative: South Nation Conservation Authority, Mississippi Valley Conservation Authority, City of Ottawa, Ottawa Flyfishers Society, Ottawa Stewardship Council, Rideau Roundtable, Canadian Forces Fish and Game Club, and the National Capital Commission.

Introduction

Black Creek is approximately four kilometers long and is one of five major tributaries to 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 Greens Creek just south of Innes road.

In 2018, the City Stream Watch program surveyed thirty 100 meter sections of Black Creek. Surveys were completed to just upstream of Anderson road where the stream morphology changes to a wetland for the remaining length of the system. As some wetland environments have no defined channel, this area could not be surveyed using the stream assessment protocol. Two sites were sampled for fish community composition.

Low Water Conditions - Rideau Valley Watershed

Low Water Conditions

Prolonged periods of hot dry weather punctuated by heavy rainfall events characterized 2018. The year began close to normal however March had less than normal precipitation. The spring freshet in early April was significant but the forecasted rain didn't materialize and peak flows were only slightly above average. The dry weather came on through May, continued through June and as of July 10th 2018, the conditions in the Rideau Valley Watershed were declared to be at the minor low water status. At this time, stream flows were below normal but still above critical thresholds. (RVCA, 2018) Twenty five days with temperatures above 30 degrees, 15 of those in July, contributed to the overall drought condition in the watershed. As of July 19th the status within the watershed reached moderate severity.

On August 2nd this status was reduced back to minor severity with significant rainfalls measured through eastern Ontario in late July. Rain in the lower reaches of the watershed continued through August and into September. As of September 27th 2018, the low water status in the lower Rideau River Watershed returned to normal.

Black Creek Overbank Zone

Riparian Buffer Width Evaluation

The riparian buffer is the adjacent land area surrounding a stream or river. Naturally vegetated buffers are very important to protect the overall health of streams and watersheds. Natural shorelines provide buffering capacity of contaminants and nutrients that would otherwise run off freely into aquatic systems. Well established shoreline plant communities will hold soil particles in place preventing erosion and will also provide the stream with shading and cover. Environment and Climate Change Canada recommends a guideline of 30 meters of natural vegetation on both sides of the stream for at least 75 percent of the stream length (Environment Canada, 2013).

Figure 2 demonstrates buffer conditions along the left and right banks of Black Creek. Buffers greater than 30 meters were present along 66 percent of the left bank and 64 percent of the right bank. A five meter buffer or less was present along 29 percent of the left banks and 27 percent of the right bank. A fifteen to thirty meter buffer was present along four percent of the left banks and eight percent of the right bank. A five to fifteen meter buffer was present along one percent of both banks.

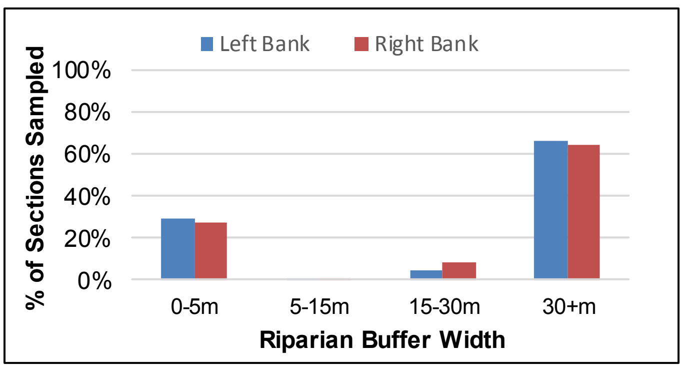


Figure 2 Vegetated buffer width along Black Creek

Riparian Buffer Alterations

Alterations within the riparian buffer were assessed within three distinct shoreline zones (0-5 m, 5-15 m, 15-30 m), and evaluated based on the dominant vegetative community and/or land cover type. The percentage of anthropogenic alterations to the natural riparian cover are shown in Figure 3.

Black Creek riparian zones have primarily natural vegetative communities; alterations are associated with channel straightening, culverts and reduced buffer zones along agricultural areas.

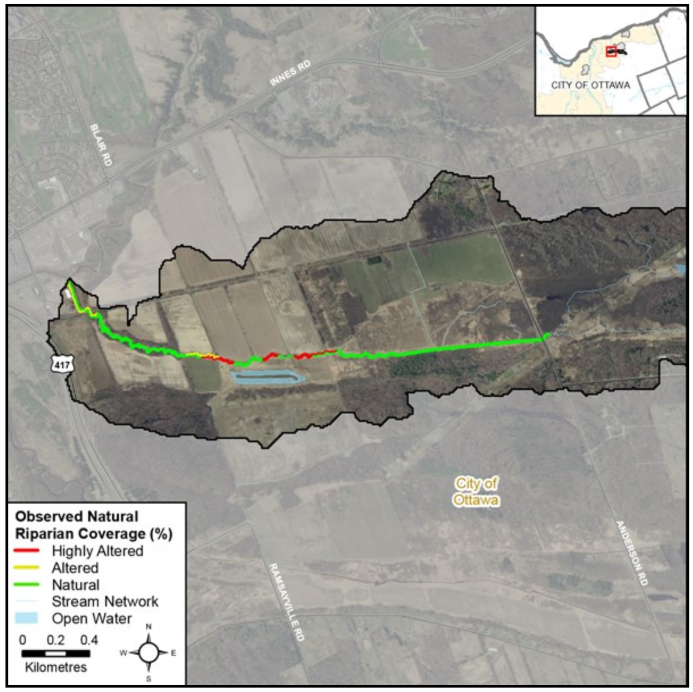


Figure 3 Riparian buffer alterations in Black Creek

Vegetated buffer along Black Creek

Area where Black Creek flows through a culvert

Adjacent Land Use

Surrounding land use is considered from the beginning to the end of the survey section (100 m) and up to 100 meters on each side of the river. Land use outside of this area is not considered for the surveys but is nonetheless part of the subwatershed and will influence the creek. Figure 4 shows the percent of surveyed sections that contain each type of land use.

The most common land use found was meadows, present in 73 percent of sections. Scrubland and wetland was present in 40 percent of the sections and forests were present in 37 percent of sections.

Aside from the natural areas, the most common land uses in the catchment were active agriculture, present in 37 percent of sections; and industrial/commercial land uses, present in 13 percent of sections. Other uses observed included seven percent of surveyed areas with abandoned agriculture, and three percent of sections containing pasture and infrastructure.

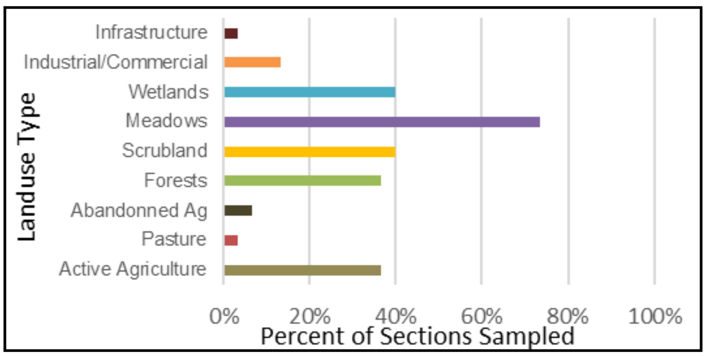


Figure 4 Adjacent land use 100 meters from each shoreline and percentage of presence along Black Creek

Section along Black Creek with meadow, scrubland and forest land uses

Black Creek Shoreline Zone

Anthropogenic Alterations

Stream alterations are classified based on specific functional criteria associated with the flow conditions, the riparian buffer and potential human influences.

Figure 5 shows the level of anthropogenic alterations for Black Creek, with 23 percent remaining without any human alteration. Seventeen percent fell in the classification of natural. Natural sections have not been straightened or diverted, have a riparian buffer greater than 15 meters, contain few lawns, ornamental gardens, beaches, rip rap or constructed wooden structures.

Altered sections account for 13 percent of surveyed areas, they may contain small diverted or straightened sections and riparian buffers of five to 15 meters.

Highly altered sections accounted for 47 percent of Black Creek. The majority of these sections were found in areas where the buffer between the stream and cultivated agricultural fields was less than 5m, as well as in the upper reaches of the stream which was historically straightened.

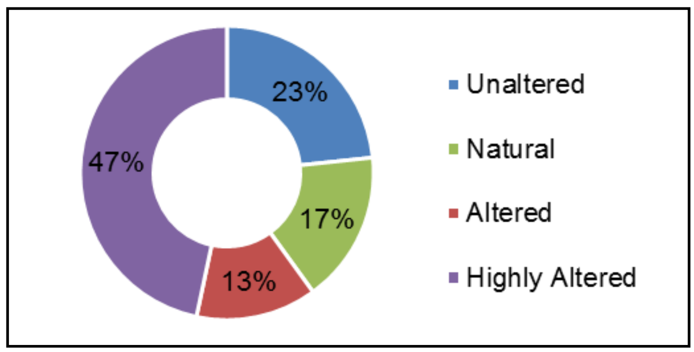


Figure 5 Anthropogenic alterations along Black Creek

A highly altered straightened section along Black Creek

Erosion

Stream erosion is the process by which water erodes and transports sediments, resulting in dynamic flows and diverse habitat conditions. Excessive erosion can result in drastic environmental changes, as habitat conditions, water quality and aquatic life are all negatively affected. Bank stability was assessed as the overall extent of each section with "unstable" shoreline conditions. These conditions are defined by the presence of significant exposed soils/roots, minimal bank vegetation, severe undercutting, slumping or scour and potential failed erosion measures (rip rap, gabion baskets, etc.). Figure 6 shows the levels of stream erosion observed across the surveyed portions of Black Creek.

Higher erosion levels were observed at the mouth of the creek where it feeds into Greens Creek. Low levels of erosion were observed where the stream meanders through agricultural areas. No erosion was observed in the upper reaches of the system.

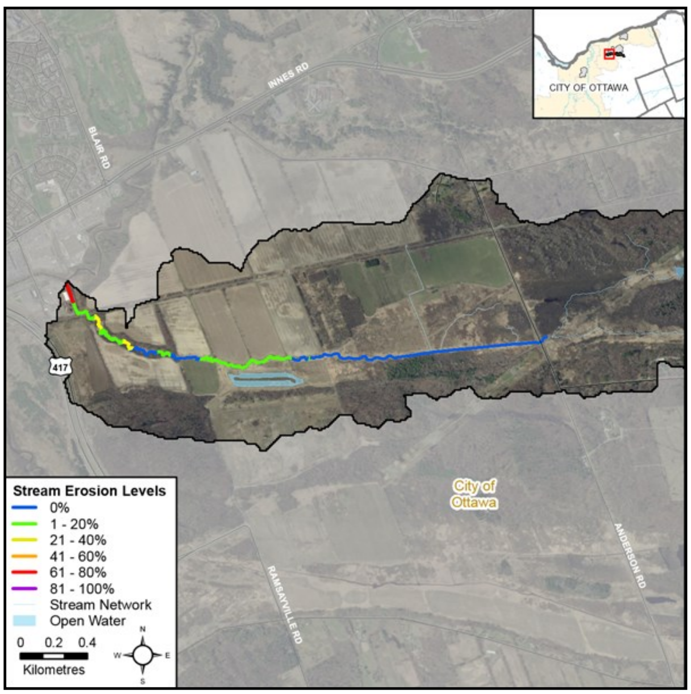


Figure 6 Erosion levels along Black Creek

Erosion observed along Black Creek

Undercut Stream Banks

Stream bank undercuts can provide important cover habitat for aquatic life, however excessive levels can be an indication of unstable shoreline conditions. Bank undercutting was assessed as the overall extent of each surveyed section with overhanging bank cover present.

Figure 7 shows that undercut banks were present in over half of the sections surveyed in Black Creek. Seventy-seven percent of the creek had undercutting along both the left and right banks.

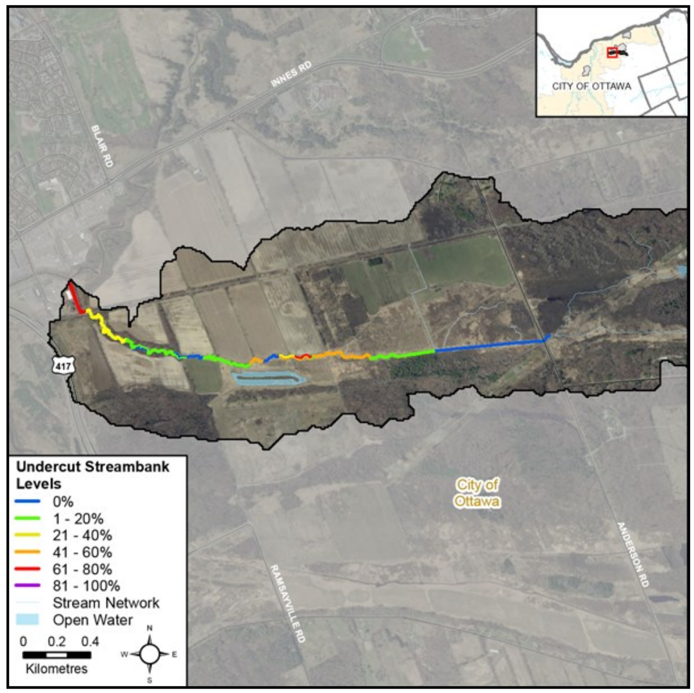


Figure 7 Undercut stream banks along Black Creek

Bank undercutting 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. Stream shading is assessed as the total coverage area in each section that is shaded by overhanging trees/grasses and tree canopy, at greater than one meter above the water surface.

Figure 8 shows the percentage of sections surveyed with various levels of stream shading. The majority of sections (30%) had a shade cover of one to 20 percent. The highest levels of shading (81 to 100 percent, and 61 to 80 percent) were each only observed in three percent of the sections. Shading of 41 to 60 percent was present in 10 percent of the sections; and 27 percent of the sections had 21 to 40 percent shading. Twenty seven percent of sections had no shading. Figure 9 shows the distribution of these shading levels along Black Creek.

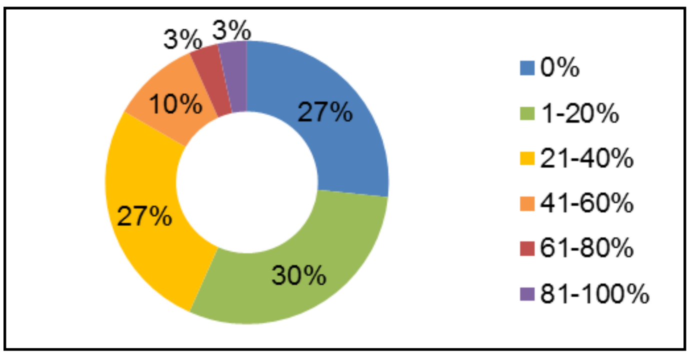


Figure 8 Stream shading along Black Creek

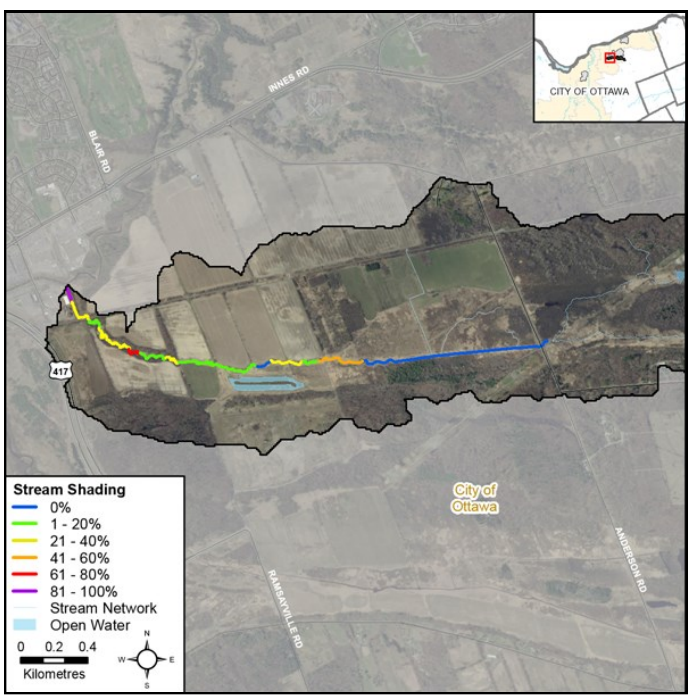


Figure 9 Stream shading along Black Creek

A mix of trees in the first sections of the creek and grasses in the later sections comprised the majority of shading. Overhanging plants, mainly grasses were seen in 100 percent of the left bank and 100 percent of the right bank.

Overhanging Wood Structure

Trees and branches that are less than one meter from the surface of the water are defined as overhanging. Overhanging wood structure provides a food source, nutrients and shade which helps to moderate instream water temperatures.

Figure 10 shows the presence of overhanging wood structure observed along Black Creek. Forty-seven percent of the sections had overhanging trees and branches on the left bank, and 50 percent of the sections had overhanging trees on the right bank.

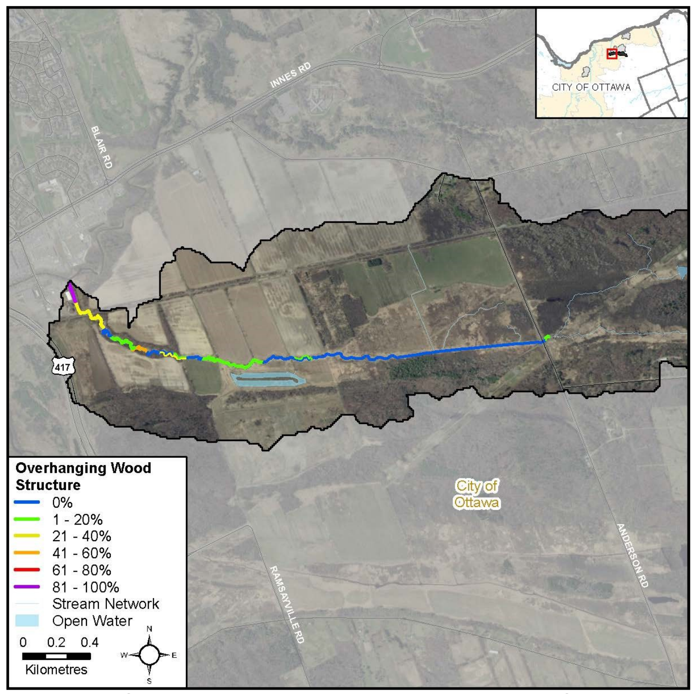


Figure 10 Overhanging wood structure along Black Creek

Overhanging trees and grasses along Black Creek

Black Creek Instream Aquatic Habitat

Habitat Complexity

Habitat complexity is a measure of the overall diversity of habitat types and features within a stream. Streams with high habitat complexity support a greater variety of species niches, and therefore contribute to greater diversity. Factors such as substrate, flow conditions (pools, riffles) and cover material (vegetation, wood structure, etc.) all provide crucial habitat to aquatic life. Habitat complexity is assessed based on the presence of boulder, cobble and gravel substrates, as well as the presence of instream wood structure. A higher score indicates greater complexity where a variety of species can be supported. Figure 11 shows habitat complexity of the sections surveyed: ten percent had no complexity; 60 percent had a score of one; 17 percent scored two; 10 percent scored three; and 3 percent, or just one section, had high habitat complexity.

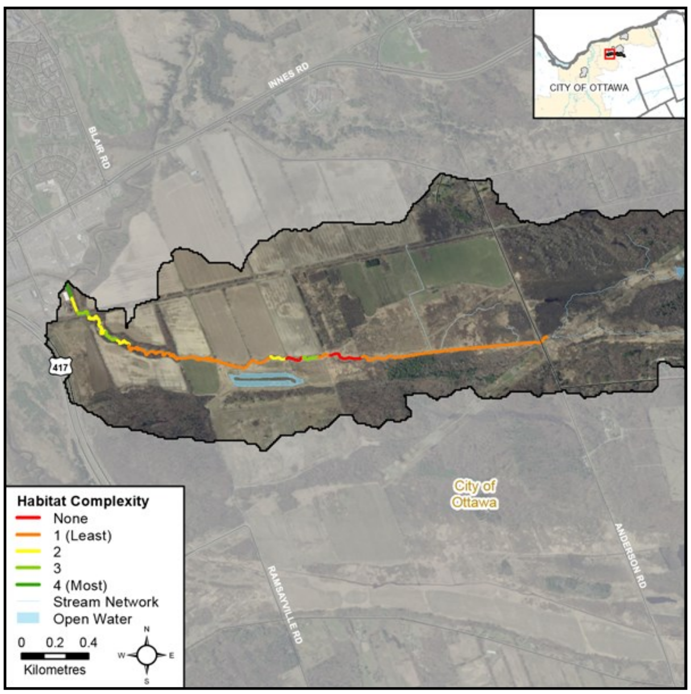


Figure 11 Instream habitat complexity along Black Creek

Section of Black Creek featuring run and pool habitat

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. The absence of diverse substrate types may limit the overall diversity of species within a stream.

Figure 12 shows the substrates present in the sections of Black Creek. It is a system dominated by silt, with 97 percent of sections containing this type of substrate. It also has substantial amounts of clay and sand. Gravel, boulders and cobble are present in small amounts mainly at the beginning of the creek near Greens Creek.

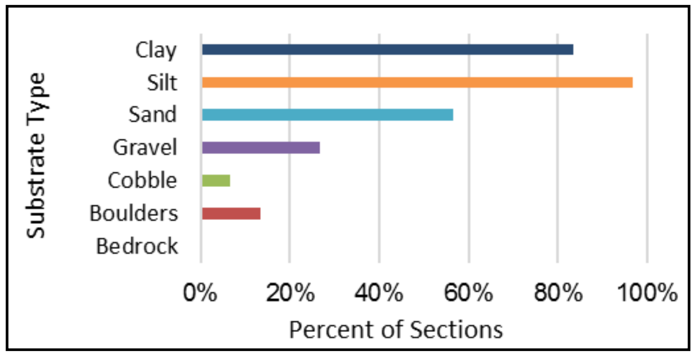


Figure 12 Instream substrate along Black Creek

Figure 13 shows the dominant substrates along the creek. Silt was the dominant substrate type in 57 percent of sections. Clay was dominant in 27 percent of sections. Sand was dominant in 13 percent of sections and cobble was dominant in three percent.

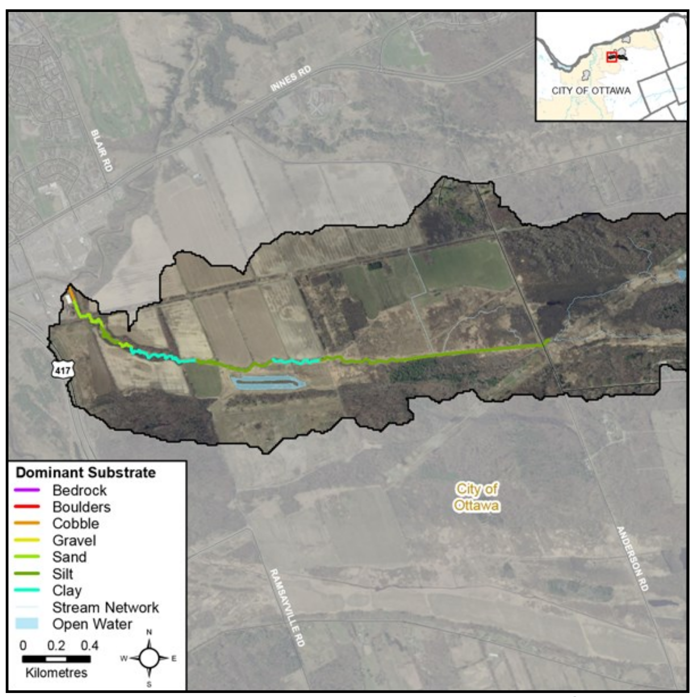


Figure 13 Dominant instream substrate along Black Creek

Instream Morphology

Pools and riffles are important habitat features for aquatic life. Riffles are fast flowing areas characterized by agitation and overturn of the water surface. Riffles thereby play a crucial role in contributing to dissolved oxygen conditions and directly support spawning for some fish species. They are also areas that support high benthic invertebrate populations which are an important food source for many aquatic species. Pools are characterized by minimal flows, with relatively deep water and winter and summer refuge habitat for aquatic species. Runs are 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 14 shows that Black Creek has a diversity of morphological conditions, suitable for a variety of aquatic species and life stages; 63 percent of sections contained pools, 30 percent contained riffles and the majority, 87 percent, contained runs. Figure 15 shows the locations of riffle habitat along Black Creek.

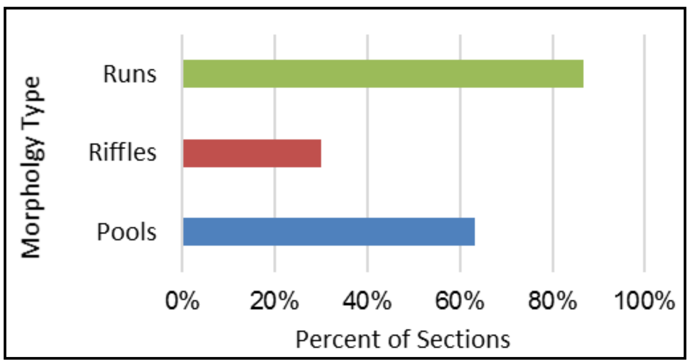


Figure 14 Instream morphology along Black Creek

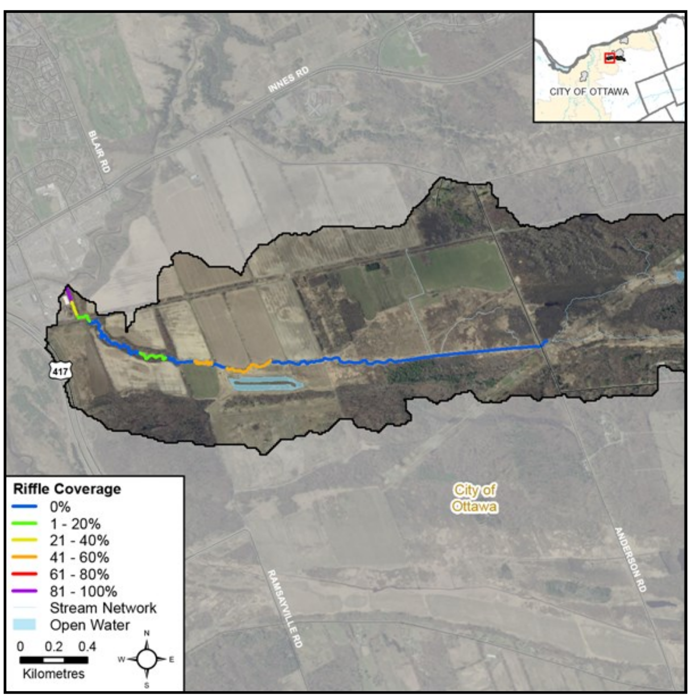


Figure 15 Riffle habitat locations along Black Creek

Instream Wood Structure

Figure 16 shows that the majority of Black Creek had low levels of instream wood structure in the form of branches and trees. Instream wood structure is important for fish and wildlife habitat, by providing refuge and feeding areas. Excessive amounts can create migration barriers.

Instream wood structure found along Black Creek

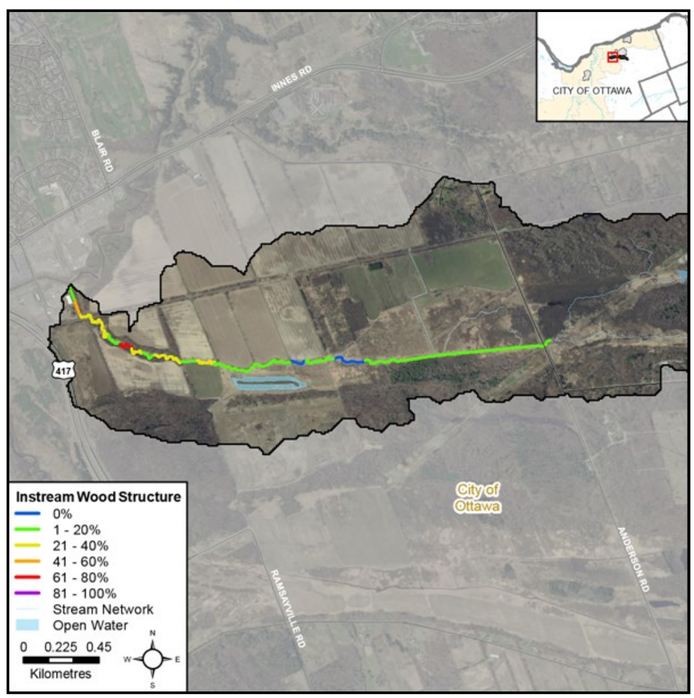


Figure 16 Instream wood structure along Black Creek

Instream Aquatic Vegetation Type

Instream vegetation is a key component of aquatic ecosystems. It promotes stream health by:

- Providing riparian and instream habitat.
- Maintaining water quality by erosion control, nutrient cycling, and pollutant absorption.
- Stabilizing flows and reducing shoreline erosion.
- Contributing dissolved oxygen via photosynthesis.
- Moderating temperatures through shading.

Figure 17 shows the aquatic vegetation community structure. Surveys showed that Black Creek had a good diversity of aquatic vegetation. Areas with no vegetation were found in 53 percent of sections. The most common type of vegetation present was narrow-leaved emergents found in 97 percent of sections. Submerged and floating vegetation types were each found in 63 percent of sections. Broad-leaved vegetation was in 50 percent of sections and robust emergents were in 37 percent. Finally, algae and free-floating vegetation were each present in 27 percent of sections surveyed. Figure 18 shows dominant vegetation type distribution.

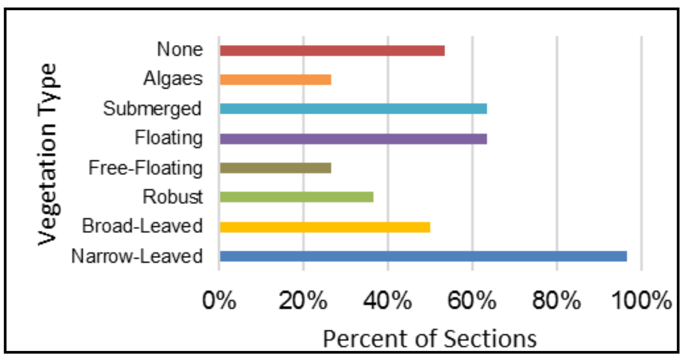


Figure 17 Aquatic vegetation presence along Black Creek

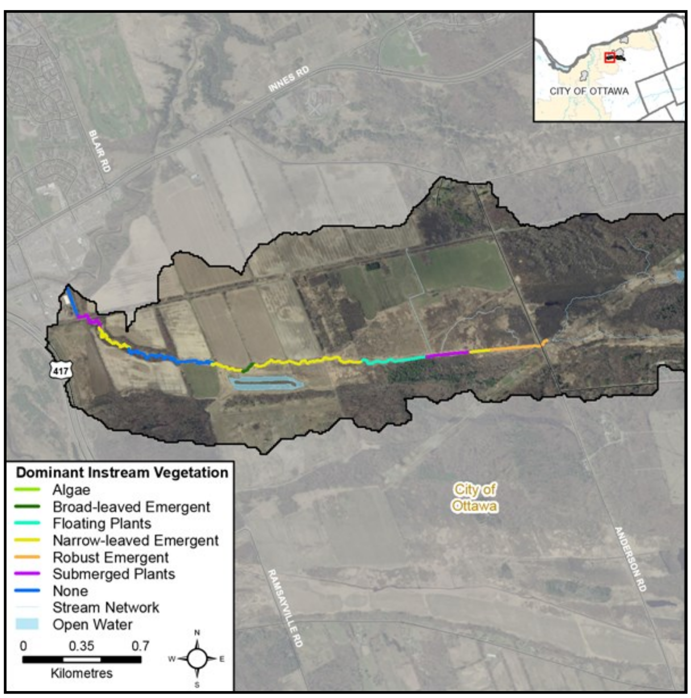


Figure 18 Dominant instream vegetation distribution in Black

Instream Vegetation Abundance

The abundance of instream vegetation is also crucial for overall aquatic ecosystem health. Lack of vegetation, rare or low abundances can impair the ability of plants to contribute adequately to dissolved oxygen, provide habitat, and remove nutrients and contaminants. Extensive amounts of vegetation can also have negative impacts by lowering dissolved oxygen levels. It can act as a physical barrier for humans and wildlife, and it leads to a reduction in plant diversity. Invasive species in particular tend to have this extensive mode of growth.

As seen in Figure 19, rare and low levels of vegetation were each found in 37 percent of sections. Normal and common levels were each found in 33 percent of sections, and 53 percent of sections had areas with no vegetation present.

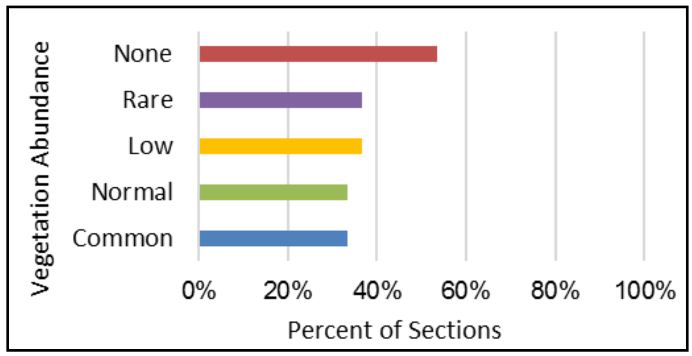


Figure 19 Instream vegetation abundance along Black Creek

Narrow leaved, submerged and floating vegetation found along Black Creek

A section on Black Creek with low levels of vegetation

Black Creek Stream Health

Wildlife

The diversity of fish and wildlife populations can be an indicator of water quality and overall stream health (Table 1). Wildlife observations are noted during monitoring and survey activities; they do not represent an extensive evaluation of species presence or absence in the Black Creek catchment.

Table 1 Wildlife observed along Black Creek in 2018

Birds	mallard ducks, red-winged blackbird, song birds, American robin, great blue
Reptiles & Amphibians	green frog, bullfrog, American toad
Mammals	deer tracks, raccoon, beaver activity
Benthic Invertebrates	water striders, leeches
Other	monarch butterfly, dragonflies, damselflies, mosquitoes, snails, mussels

Invasive Species

Invasive species are harmful to the environment, the economy and our society. They have high reproduction, quick establishment of dense colonies, tolerate a variety of environmental conditions and lack natural predators. They can have major implications on stream health and reduce species diversity (OMNR 2012). They can be difficult to eradicate, however it is important to continue to research, monitor and manage them.

Figure 20 shows abundance of species observed per section. Ten invasive species were observed in 2018:

- Manitoba maple (*Acer negundo*)
- purple loosestrife (*Lythrum salicaria*)
- Himalayan balsam (*Impatiens glandulifera*)
- yellow iris (*Iris pseudacorus*)
- European frogbit (*Hydrocharis morsus-ranae*)
- glossy buckthorn (*Rhamnus frangula*)
- *Phragmites* (*Phragmites australis*)
- wild parsnip (*Pastinaca sativa*)
- banded mystery snail (*Viviparus georgianus*)
- common buckthorn (*Rhamnus cathartica*)

To report and find information about invasive species visit

http://www.invadingspecies.com

Managed by the Ontario Federation of Anglers and Hunters

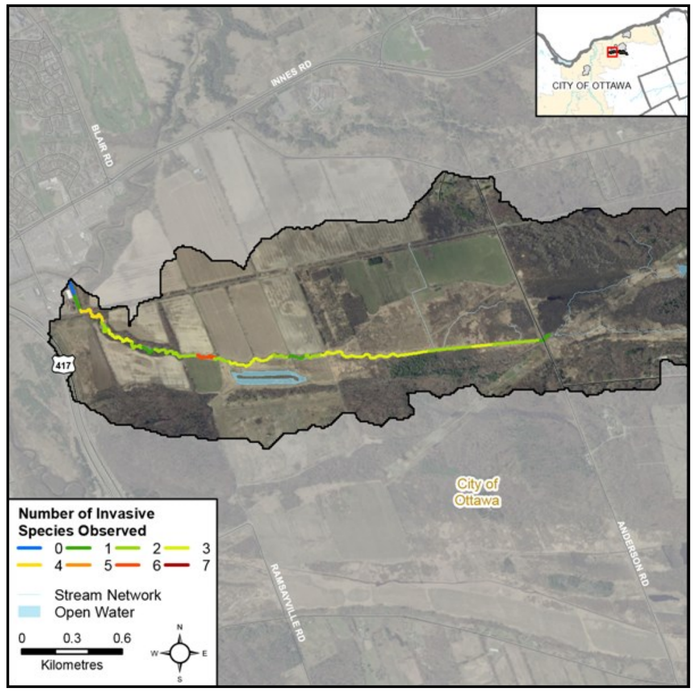


Figure 20 Invasive species abundance along Black Creek

Pollution

Figure 21 shows the types of pollution observed in Black Creek. The levels of garbage found in Black Creek are low, with floating garbage and garbage on the stream bottom present in ten percent of sections and oil or gas trails and other types of garbage were observed in three percent of sections.

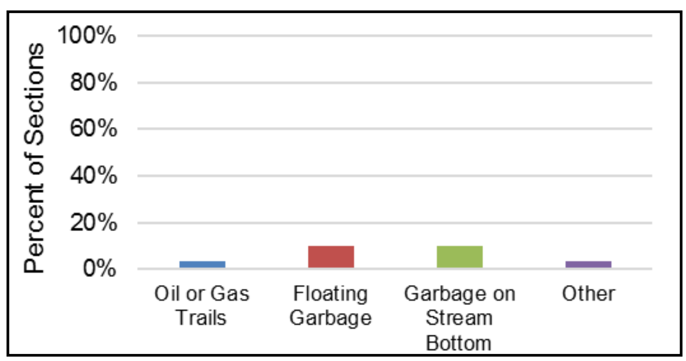


Figure 21 Types of pollution observed in Black Creek

European frogbit collecting near a beaver dam along Black Creek

Black Creek Water Chemistry

Water Chemistry Assessment

Water chemistry collection is done at the start and end of each 100 meter section with a multiparameter YSI probe. The parameters monitored are: air and water temperature, pH, conductivity, dissolved oxygen

A volunteer measuring water chemistry with a YSI multi-

Dissolved Oxygen

Dissolved oxygen is essential for a healthy aquatic ecosystem, fish and other aquatic organisms need oxygen to survive. The level of oxygen required is dependent on the particular species and life stage. The lowest acceptable concentration for the early and other life stages according to the Canadian water quality guidelines for the protection of aquatic life are: 6.0 milligrams per liter in warm-water biota and 9.5 milligrams per liter for cold-water biota (CCME 1999).

Figure 22 shows the concentration levels found in Black Creek. The two dashed lines depicted represent the Canadian water quality guidelines. None of the surveyed portions had average oxygen levels adequate to support warm-water aquatic life. This is typical for a system that has wetland features that have naturally lower oxygen levels, however these can be further limited by extensive vegetation growth of invasive species, and anthropogenic nutrient input. Average levels across the system were 2.9 milligrams per liter.

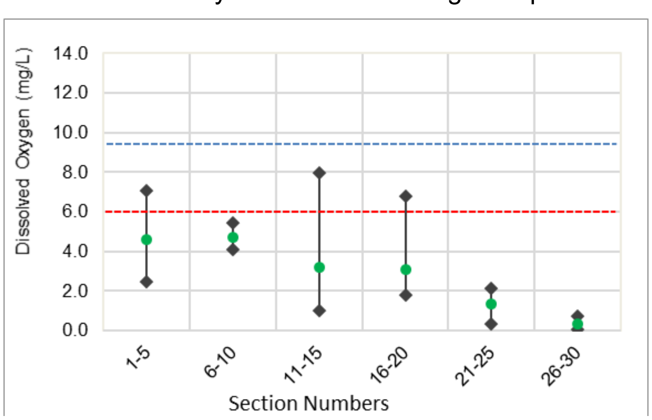


Figure 22 Dissolved oxygen ranges along Black Creek

Conductivity

Conductivity is a measure of water's capacity to conduct electrical flow. This capacity is dictated by the presence of conductive ions that originate from inorganic materials and dissolved salts. Water conductivity in natural environments is typically dictated by the geology of the area, however anthropogenic inputs also have a profound effect. Currently there is no existing guideline for stream conductivity levels, however conductivity measurements outside of normal range across a system are good indicators of anthropogenic inputs including unmitigated discharges and storm water input.

Figure 23 shows specific conductivity levels in Black Creek, the average level is depicted by the dashed line (380 µS/cm). Notable variability was observed in the upper reaches of the creek at the culvert crossing at Anderson Road.

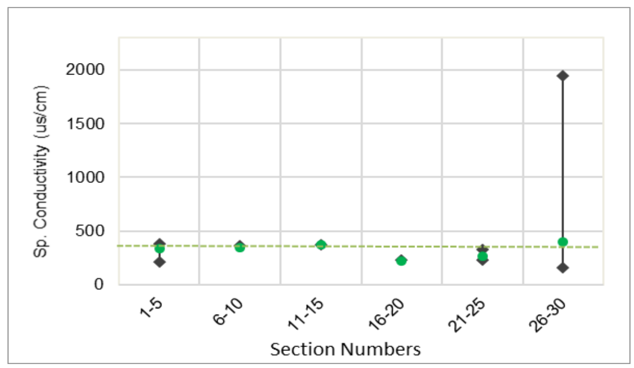


Figure 23 Conductivity ranges along sections of Black Creek

pH

pH is a measure of alkalinity or acidity. This parameter is also influenced by the geology of the system but can also be influenced by anthropogenic input. For pH, the provincial water quality objective (PWQO) is the range of 6.5 to 8.5 to protect aquatic life (MOEE 1994).

Figure 24 shows that most of Black Creek had pH levels that meet the PWQO, depicted by the dashed line. However, as the creek approached Mer Bleue close to Anderson Road, pH levels dropped to those more typically found in bog environments. Average levels across the system were pH 6.78.

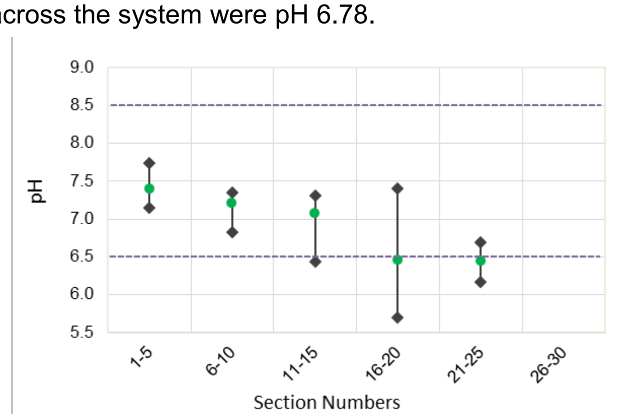


Figure 24 pH ranges along Black Creek

Oxygen Saturation (%)

Oxygen saturation is measured as the ratio of dissolved oxygen relative to the maximum amount of oxygen that will dissolve based on the temperature and atmospheric pressure. Well oxygenated water will stabilize at or above 100 percent saturation, however the presence of decaying matter/pollutants can drastically reduce these levels. Oxygen input through photosynthesis has the potential to increase saturation above 100 percent to a maximum of 500 percent, depending on the productivity level of the environment. In order to represent the relationship between concentration and saturation, the measured values have been summarized into 6 classes:

1) <100% Saturation / <6.0 mg/L Concentration

Oxygen concentration and saturation are not sufficient to support aquatic life and may represent impairment.

2) >100% Saturation / <6.0 mg/L Concentration

Oxygen concentration is not sufficient to support aquatic life, however saturation levels indicate that the water has stabilized at its estimated maximum. This is indicative of higher water temperatures and stagnant flows.

3) <100% Saturation / 6.0—9.5 mg/L Concentration

Oxygen concentration is sufficient to support warm-water biota, however depletion factors are likely present and are limiting maximum saturation.

4) >100% Saturation / 6.0—9.5 mg/L Concentration

Oxygen concentration and saturation levels are optimal for warm-water biota.

5) <100% Saturation / >9.5 mg/L Concentration

Oxygen concentration is sufficient to support cold-water biota, however depletion factors are likely present and are limiting maximum saturation.

6) >100% Saturation / >9.5 mg/L Concentration

Oxygen concentration and saturation levels are optimal for warm and cold-water biota.

Site on Black Creek with **impaired** oxygen conditions (Dissolved oxygen levels of 4.11 mg/L and 41.3% saturation)

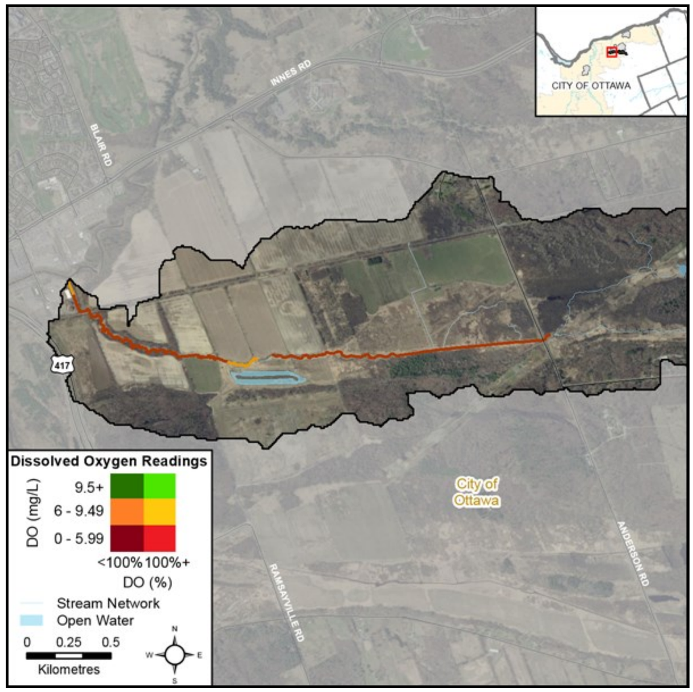


Figure 25 Bivariate assessment of dissolved oxygen concentration (mg/L) and saturation (%) along Black Creek

Figure 25 shows the oxygen conditions across the areas that were surveyed in 2018. Overall dissolved oxygen conditions in Black Creek show significant levels of impairment both in concentration and percent saturation. The system is dominated by wetland features that have naturally lower oxygen levels, however these can be further limited by extensive vegetation growth of invasive species, and anthropogenic nutrient input.

There are some areas along the system where oxygen concentration is sufficient to support warm-water biota. These areas are shaded and contain riffle habitat that is conducive to oxygenation.

Site on Black Creek with **sufficient** oxygen conditions (Dissolved oxygen levels of 7.98 mg/L and 89.8% saturation)

Specific Conductivity Assessment

Specific conductivity (SPC) is a standardized measure of electrical conductance, collected at or corrected to a water temperature of 25°C. SPC is directly related to the concentration of ions in water, and is influenced by the area geology and anthropogenic input as it contributes to the presence of dissolved salts, alkalis, chlorides, sulfides and carbonate compounds. The higher the concentration of these compounds, the higher the conductivity. Common sources of elevated conductivity include storm water, agricultural inputs as well as commercial and industrial effluents.

In order to summarize the conditions observed, levels were evaluated as either normal, moderately elevated or highly elevated. These categories are defined by the amount of variation (standard deviation) at each section compared to the system's average.

Average levels of conductivity in Black Creek (301.1 µS/cm) are within the federal guidelines for freshwater (500 µS/cm) used for the Canadian Environmental Performance Index (Environment Canada 2011). Figure 26 shows relative specific conductivity levels in Black Creek. Normal levels were maintained for most of the surveyed portions. Highly elevated conditions were present directly upstream and downstream of Anderson Road. These conditions are also observed adjacent to active agricultural fields along the creek. These areas receive upstream wetland discharge, have road runoff influences, and adjacent agricultural land usest; all of these factors can lead to elevated conductivity levels.

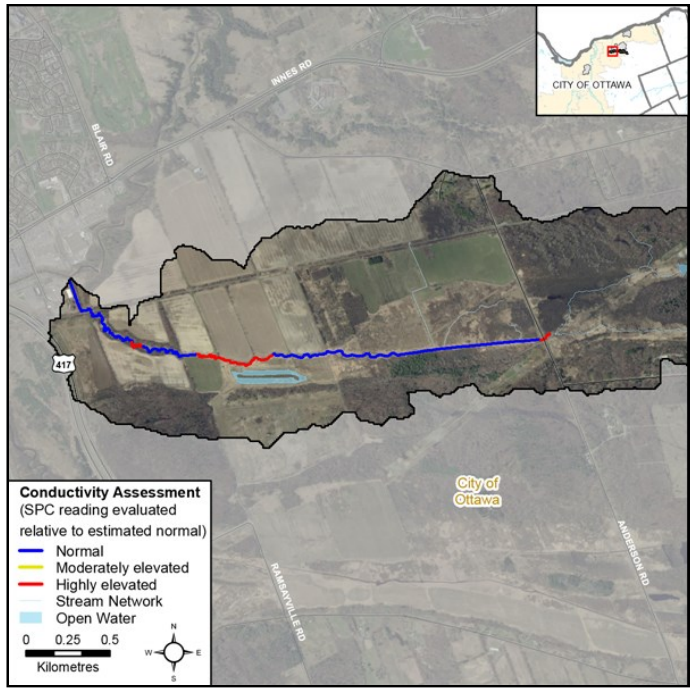


Figure 26 Relative specific conductivity levels along Black Creek

Section of Black Creek adjacent to agricultural fields with highly elevated levels of specific conductivity

Section of Black Creek near Anderson Road with highly elevated levels of specific conductivity

Black Creek Thermal Classification

Thermal Classification

Instream water temperatures are influenced by various factors including, season, time of day, precipitation, storm water run off, springs, tributaries, drains, discharge pipes, stream shading from riparian vegetation and artificial shade created by infrastructure. To monitor water temperatures in Black Creek, two temperature loggers were placed in April and retrieved in October.

Figure 27 shows where thermal sampling sites were located. Analysis of data from two loggers (using the Stoneman and Jones, 1996, method adapted by Chu et al., 2009), Black Creek is classified as **Cool-warmwater** at the mouth and **coolwater** in its upper reaches (Figure 28).

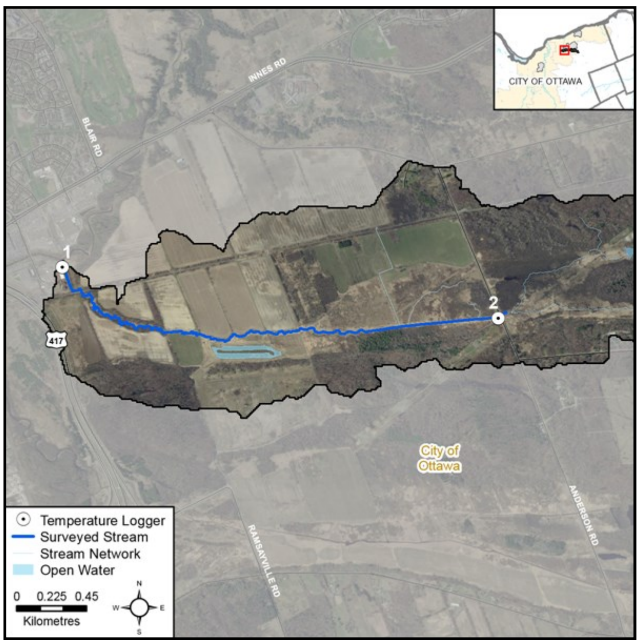


Figure 27 Temperature logger locations on Black Creek

Within those two sites, cool water and warm water fish species were present, with fish thermal preferences indicated by Cocker at al. (2001).

Groundwater

Groundwater discharge areas can influence stream temperature, contribute nutrients, and provide important stream habitat for fish and other biota. During stream surveys, indicators of groundwater discharge are noted when observed. Indicators include: springs/ seeps, watercress, iron staining, significant temperature change and rainbow mineral film. Figure 29 shows areas were one or more groundwater indicators were observed during stream surveys.

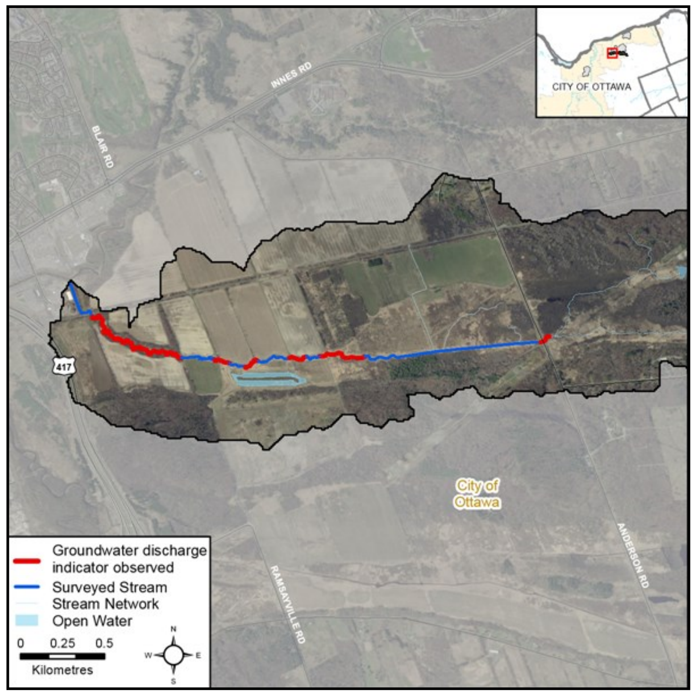


Figure 29 Groundwater indicators observed in Black Creek

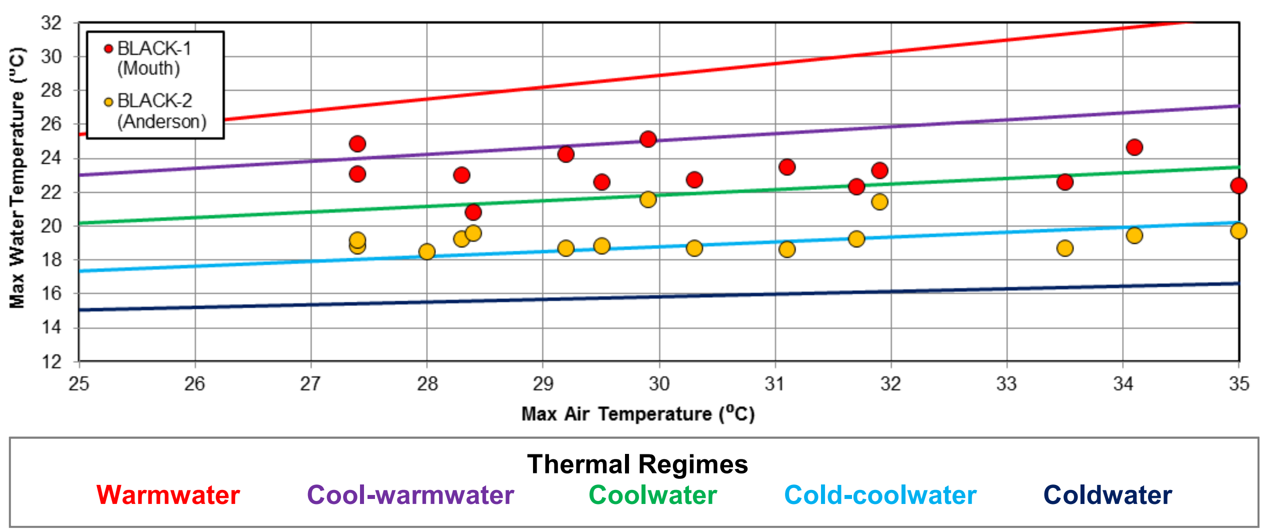


Figure 28 Thermal Classification for Black Creek with the five thermal regimes adapted from Stoneman and Jones (1996) by Chu et al. (2009): **cool-warmwater** category for Site 1 and **coolwater** category for Site 2 sampled on Black Creek

Black Creek Fish Community

Fish Community Summary

Two fish sampling sites were evaluated between May and July 2018. One site was sampled using a backpack electrofisher, near Cyrville Road and closer to the mouth of the creek. The second site was at Anderson Road and was sampled using a seine net.

Table 2 Fish species observed in Black Creek

Species	Thermal Class	MNRF Species Code
brassy minnow *Hybognathus hankinsoni*	Cool	BrMin
brook silverside *Labidesthes sicculus*	Warm	BrSil
brook stickleback *Culaea inconstans*	Cool	BrSti
central mudminnow *Umbra limi*	Cool	CeMud
common shiner *Luxilus cornutus*	Cool	CoShi
creek chub *Semotilus atromaculatus*	Cool	CrChu
johnny/tessalated darter *Etherostoma spp.*	Cool	EthSp
northern redbelly dace *Phoxinus Eos*	Cool	NRDac
white sucker *Catostomus commersonii*	Cool	WhSuc
Total Species		**9**

Northern redbelly dace captured in Black Creek at Anderson Road

Nine species were captured in 2018, they are listed in Table 2 along with their thermal classification preferences (Coker et al., 2001) and MNRF species codes. The fish community within Black Creek is mostly cool water species with the exception of one warm water species; brook silverside. The sampling locations where these species were observed, as well as RVCA historical sites, are depicted in Figure 30. The codes used in the figure are the MNRF codes provided in Table 2. For comparisons across sampling years and a complete list of RVCA historical fish records from Black Creek refer to page 17 of this report.

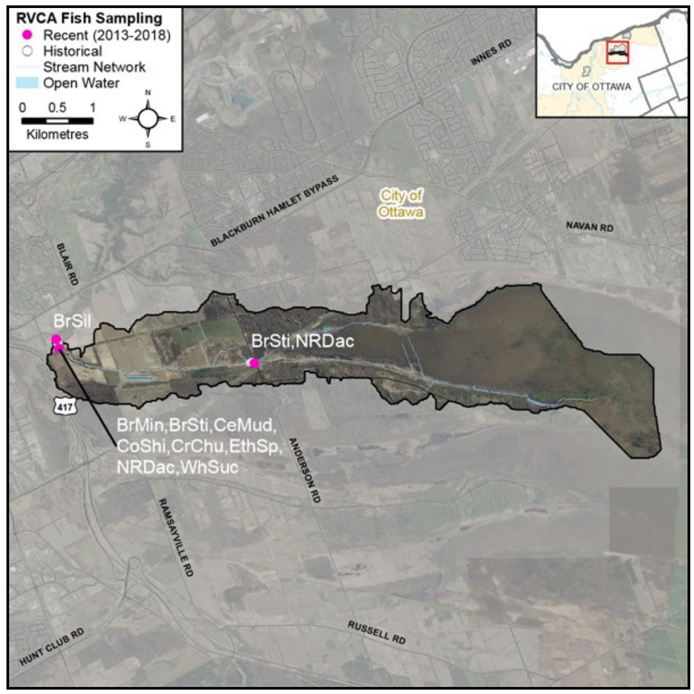


Figure 30 Black Creek fish sampling locations and 2018 fish species observations

Fish sampling site on Black Creek located near Cyrville Road

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.

One migratory obstruction was observed; a perched culvert located adjacent to an agricultural field. The location of this migratory obstruction is shown in Figure 31.

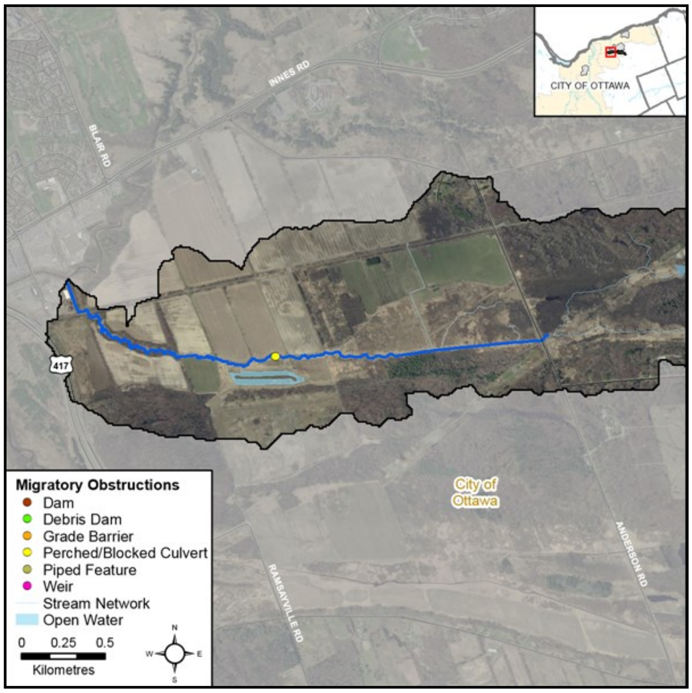


Figure 31 Locations of migratory obstructions along Black

Perched culvert observed along Black Creek

Beaver Dams

Overall, beaver dams create natural changes in the environment. Some of the benefits include providing habitat for wildlife, flood control, and silt retention. Additional benefits come from bacterial decomposition of woody material used in the dams which removes excess nutrient and toxins. Beaver dams are also considered potential barriers to fish migration.

In 2018, a total of 11 beaver dams were identified. This included one abandoned dam, three breached dams, three submerged dams and four active dams. The locations of the identified dams are shown in Figure 32.

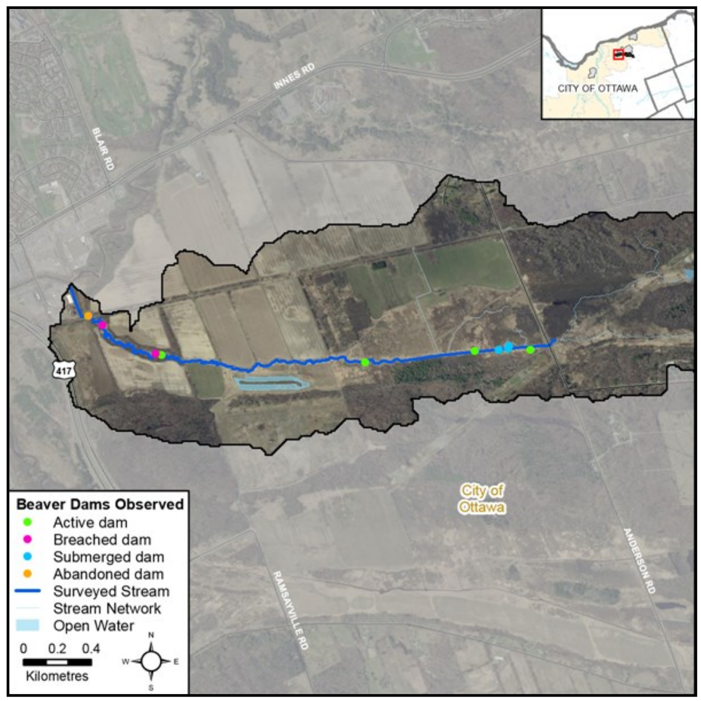


Figure 32 Locations of beaver dams along Black Creek

Active beaver dam on Black Creek

Stream Comparison Between 2007, 2012 and 2018

The following tables provide a comparison of observations on Black Creek between the 2007, 2012 and 2018 survey years (RVCA 2007, RVCA 2012). Monitoring protocols from 2007 were modified and enhanced, so data from that year cannot be compared to the later years (there are some exceptions). In order to accurately represent current and historical information, the site data was only compared for those sections which were surveyed in both reporting periods. This resulted in changes to our overall summary information, averages presented here differ from ones in this report. This information is therefore only a comparative evaluation and does not represent the entirety of our assessment.

Water Chemistry

Water chemistry parameters are collected throughout all sections surveyed in the stream. This criteria reflects the overall conditions and changes in the environment. Variation in these conditions can be attributed to environmental and ecological changes. Some can be in part due to natural variability within the system from various weather, seasonal and annual conditions.

Table 3 shows a comparison of these parameters between 2012 and 2018. Average summer water temperatures range from cooler water in 2018 (19.3°C) to warmer values in 2012 (21.4°C), with 2.1 degrees centigrade of variation. Aside from these general temperature observations, loggers provide a detailed summary of stream thermal conditions.

Standardizing stream temperature accounts for climatic factors including air temperatures and precipitation. With the data collected from temperature loggers, standardized stream temperatures are calculated and summarized in Table 3. These values decreased by 0.9°C for every degree of air temperature from 2012 to 2018.

Table 3 Water chemistry comparison (2012/2018)

Water Chemistry (2012—2018)				
YEAR	**PARAMETER**	**UNIT**	**AVERAGE**	**STND**
2012	pH	-	7.24	± 0.05
2018	pH	-	6.78	± 0.10
2012	Sp. Conductivity	us/cm	-	-
2018	Sp. Conductivity	us/cm	301.1	± 11.9
2012	Dissolved Oxygen	mg/L	5.1	± 0.39
2018	Dissolved Oxygen	mg/L	2.9	± 0.42
2012	Water Temperature	ºC	21.4	± 0.43
2018	Water Temperature	ºC	19.3	± 0.38
2012	Standardized Stream Temperature[1]	ºC Water /	1.60	± 0.59
2018	Standardized Stream Temperature[1]	ºC Water /	.70	± 0.04

[1] ***Standardized Stream Temperature:*** Temperature data is collected via logger and standardized based on the following conditions:

- Daily maximum air temperatures must exceed 24.5 ºC
- No precipitation for 2 days preceding measurement
- Measurements to be taken between 4:00PM—6:00PM
- All temperatures points to be collected in July/August
- Logger must be deployed in flowing waters

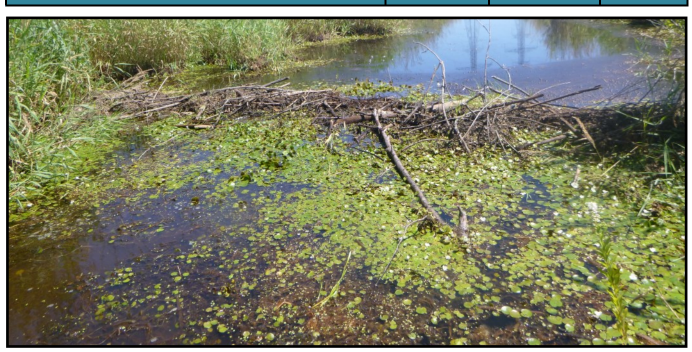
Average dissolved oxygen levels were found to have decreased by 2.2 milligrams per liter from 2012 to 2018. These changes can also be attributed to weather patterns and warmer temperatures which are conducive to the stream's ability to hold less oxygen.

Invasive Species

The overall percentage of sections surveyed where invasive species were observed had an increase of 41 percent (Table 4). Dog-strangling vine and garlic mustard were both not recorded in 2018, this decline may be associated to management efforts (OMNR 2012). Other invasive species have expanded their range, most notably European frogbit which increased by 34 percent. The range of yellow iris remained the same at three percent. There are also five invasive species newly reported in 2018.

Table 4 Invasive species presence observed in 2012 and 2018 (NR are Not Reported species)

Invasive Species	2012	2018	+/-
banded mystery snail	NR	7%	▲
common & glossy buckthorn	NR	13%	▲
dog strangling vine	3%	NR	▼
European frog-bit	36%	70%	▲
garlic mustard	6%	NR	▼
Himalayan balsam	NR	50%	▲
Manitoba maple	6%	17%	▲
Phragmites	NR	7%	▲
poison/wild parsnip	NR	7%	▲
purple loosestrife	47%	67%	▲
yellow iris	3%	3%	-
Total	**56%**	**97%**	▲



Invasive European frogbit observed along Black Creek

Pollution

Garbage accumulation on Black Creek was found to decrease from 2012 to 2018. In 2018 the polluted sections contained garbage, such as plastics, cans and styrofoam. There was also larger items such as old farm equipment found along the banks nearest to the agricultural fields.

Table 5 Pollution levels (presence in % of sections)

Pollution/Garbage	2012	2018	+/-
floating garbage	28%	10%	▼
garbage on stream bottom	22%	10%	▼
other	39%	3%	▼
Total	**39%**	**20%**	▼

Instream Aquatic Vegetation

Table 6 shows instream aquatic vegetation decreases from 2012-2018. Free floating plants (e.g. frogbit), floating plants (e.g. water lilies), and submerged plants (e.g. pondweed) had lower observations in the number of sections surveyed. Broad-leaved emergent plants (e.g. arrowheads) and robust emergent plants (e.g. cattails) both showed slight increases in the number of observations. The percentage of narrow-leaved emergent plants remained the same between 2012 and 2018

Table 6 Instream aquatic vegetation (presence in % of sections)

Instream Vegetation	2012	2018	+/-
narrow-leaved emergent plants	97%	97%	-
broad-leaved emergent plants	44%	50%	▲
robust emergent plants	31%	37%	▲
free-floating plants	47%	27%	▼
floating plants	86%	63%	▼
submerged plants	72%	63%	▼
algae	58%	27%	▼
none	6%	53%	▲

Fish Community

Fish sampling was carried out by the City Stream Watch program in 2007, 2012 and 2018 to evaluate fish community composition in Black Creek (see Table 7). In total 13 species have been observed in Black Creek. In 2007 eight species were captured at one site; 13 species were found at two sites in 2012; and nine species were observed at two sites in 2018. The majority of species observed in 2018 had been captured in previous years, with the exception of brook silverside as a new record.

Table 7 Comparison of fish species caught between 2007-2018

Species	2007	2012	2018
brassy minnow *Hybognathus hankinsoni*		X	X
brook silverside *Labidesthes sicculus*			X
brook stickleback *Culaea inconstans*	X	X	X
brown bullhead *Ameiurus nebulosus*		X	
central mudminnow *Umbra limi*	X	X	X
common shiner *Luxilus cornutus*	X	X	X
creek chub *Semotilus atromaculatus*	X	X	X
Cyprinid *spp.*		X	
Etheostoma spp.	X	X	X
fathead minnow *Pimephales promelas*		X	
golden shiner *Notemigonus crysoleucas*		X	
longnose dace *Rhinichthys cataractae*	X	X	
northern redbelly dace *Chrosomus eos*	X	X	X
white sucker *Catostomus commersonii*	X	X	X
Total Species 13	**8**	**12**	**9**

The common shiner has been observed in Black Creek in all three sampling years

Monitoring and Restoration

Monitoring and Restoration Projects on Black Creek

Table 8 highlights recent and past monitoring that has been done on Black Creek by the City Stream Watch program. Monitoring activities and efforts have changed over the years. Potential restoration opportunities are listed on the following page.

Table 8 City Stream Watch monitoring and restoration on Black Creek

Accomplishment	Year	Description
City Stream Watch Stream Monitoring	2007	3.3 km of stream was surveyed
	2012	3.6 km of stream was surveyed
	2018	3.0 km of stream was surveyed
City Stream Watch Fish Sampling	2007	one fish community site was sampled
	2012	two fish community sites were sampled three times each
	2018	two fish community sites were sampled
City Stream Watch Thermal Classification	2012	two temperature probes were deployed
	2018	two temperature probes were deployed

Temperature probe installation in Black Creek downstream of Anderson Road

Potential Riparian Restoration Opportunities

Riparian restoration opportunities were assessed in the field and include potential enhancement through riparian planting, erosion control, invasive species management and/or wildlife habitat creation (Figure 33).

Riparian Planting

Some sections of Black Creek riparian area can benefit from riparian planting. These sections run through an agricultural area, with minimal buffers between the stream and agricultural fields. Additional planting would increase shading, enhance wildlife habitat and reduce soil erosion.

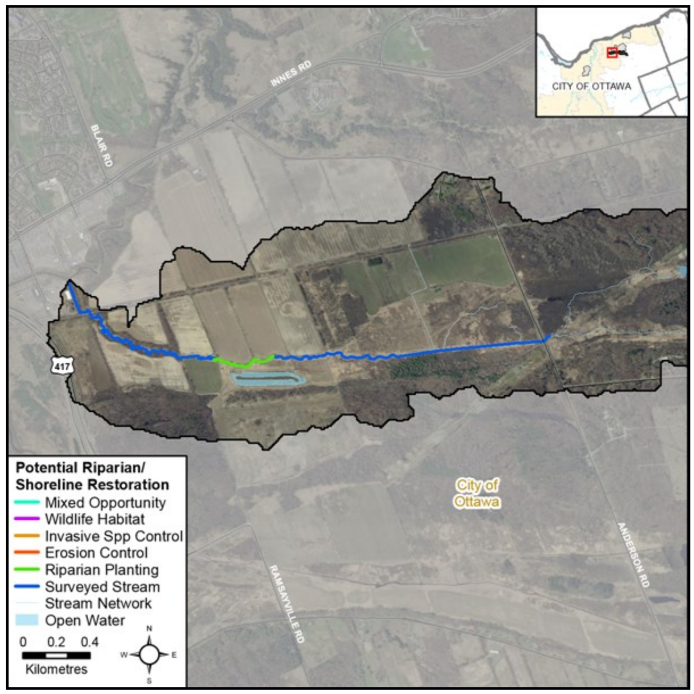


Figure 33 Potential riparian/shoreline restoration opportunities along Black Creek

Area next to agricultural fields that could benefit from riparian planting along Black Creek.



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    https://www.rvca.ca/watershed-conditions-statements

For more information on the overall 2018 City Stream Watch Program and the volunteer activities, please refer to the City Stream Watch 2018 Summary Report: https://www.rvca.ca/rvca-publications/city-stream-watch-reports

RVCA City Stream Watch would like to thank all the **volunteers** who assisted in the collection of information; as well as the many **landowners** who gave us property access to portions of the stream; and to our **City Stream Watch Collaborative members**: South Nation Conservation Authority, Mississippi Valley Conservation Authority, City of Ottawa, Ottawa Flyfishers Society, Ottawa Stewardship Council, Rideau Roundtable, Canadian Forces Fish and Game Club, and the National Capital Commission