# Carp A Tributary Catchment Report 2019

## *Monitoring Activity in the City of Ottawa*

The City Stream Watch program (CSW) is an in-depth survey of a watercourse where data is collected by wading through the stream and taking detailed observations every 100 meters (m). In 2013, Mississippi Valley Conservation Authority (MVCA) joined the CSW working group and adopted the program. Since implementing the CSW program, MVCA staff and volunteers have surveyed 542 sections across 12 watercourses. This information has been utilized for the planning of riparian planting sites, habitat improvements, stream garbage pick-ups in Poole Creek and the Carp River, and invasive species removal events.

The CSW Program has three main goals:

- To provide long-term documentation of the aquatic and riparian conditions in our watershed.
- To enhance public awareness about the condition and value of freshwater streams through volunteer engagement and the creation of catchment reports.
- To use the information collected to encourage community driven restoration projects.

When possible, each CSW assessment is enhanced with the application of other monitoring programs such as benthic biomonitoring, fish community sampling, temperature monitoring and assessing headwater drainage features.

Seasonal weather conditions in 2019 resulted in an above average spring flood followed by a hot summer and a late season drought, which lasted until the end of October. Given the atypical seasonal conditions in 2019, all assessments were subject to the effects of low water and may not reflect the overall health of the systems. With the efforts of the MVCA staff and the volunteers, 45 sections in three catchments were assessed in 2019. This report will focus on the Carp A Tributary.

Figure 1 shows the location of the Carp A subwatershed within MVCA's City Stream Watch program area.

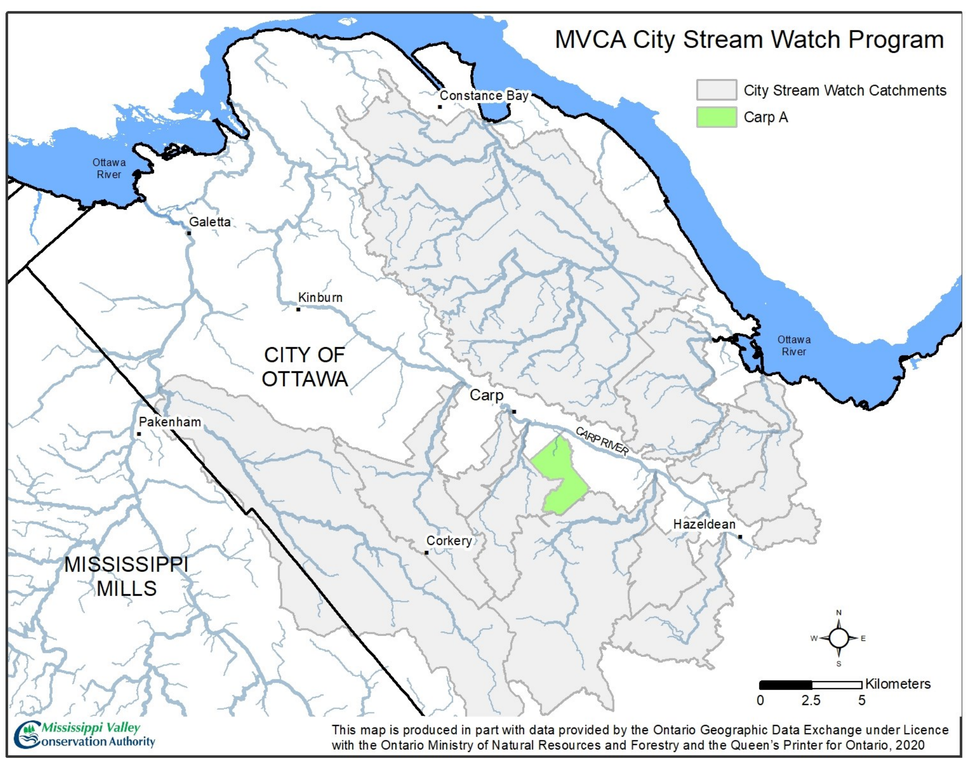


***Figure 1:*** *MVCA's City Stream Watch area highlighting the location of the Carp A subwatershed.*

## *Carp A*

Located along the western edge of the City of Ottawa, Carp A is a tributary to the Carp River. With a length of 3.2 kilometers (km) and draining an area of 5.74 km$^2$, it is a contributor of cool flows, sediment and nutrients to the Carp River just upstream of the village of Carp.

Carp A's headwaters originate west of Thomas Argue Road and north of McGee Side Road. It flows north and east past the Carp Airport and through agricultural lands. Table 1 presents a summary of some key features of the Carp A Subwatershed.

| Table 1: Subwatershed Features | |
|---|---|
| **Area** | 5.74 Square Kilometers |
| | 1.9% of the Carp River watershed |
| **Length** | 3.2 Kilometers |
| **Type** | 100% Permanent |
| | Cold-cool water habitat |
| **Land Use** | 37.3% Agriculture |
| | 15.0% Aggregate sites |
| | 10.3% Wooded area |
| | 22.2% Rural land-use |
| | 7.8% Wetlands |
| | 0.7% Grassland |
| | 3.3% Roads |
| | 3.4% Water |
| **Surficial Geology** | 26.2% Clay |
| | 0.5% Diamicton |
| | 0.0% Organic deposits |
| | 0.8% Bedrock |
| | 66.9% Sand |
| | 5.6% Gravel |

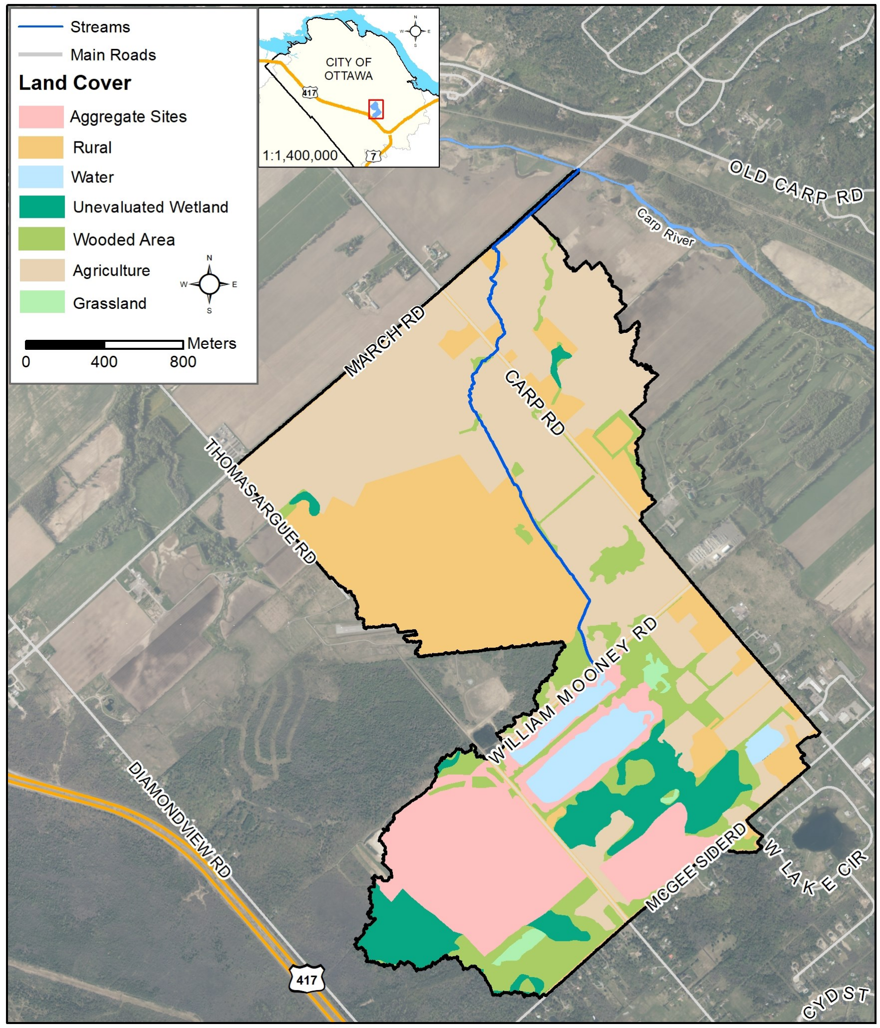


***Figure 2:*** *Land Use in the Carp A subwatershed.*

## *The Carp A Subwatershed*

As shown in Figure 2, the Carp A subwatershed is dominated by rural and agricultural land uses such as tilled crops, hay fields or livestock pastures. The next most dominant land cover classifications are woodlands (10.3%) and aggregate sites (15%).

Crossing a mixture of wetland, woodland, farmland and rural residential areas, the creek and its tributaries provide a natural corridor and habitat for a range of aquatic and terrestrial species. Page 17 elaborates on the variety of species, or signs of species, that were observed during the 2019 survey.

## *Monitoring Carp A*

In 2019, permission was obtained to survey 6 sections of Carp A, shown on Figure 3, which cover approximately 600 m of the Tributary.

While these sections provide a good representation of the overall condition of Carp A, it should be noted that there are sections of the creek that are not represented in this assessment. These areas provide an additional diversity of habitat with valuable natural functions.The portions of the creek that were not sampled represent areas we did not have time to access, wetland areas that could not be assessed using the macro stream assessment protocol and/or areas where permission was not granted.

Table 2 shows some basic assessment measurements for Carp A. The surveyed sections had an average stream width of 2.10 meters (m), an average depth of 0.36 m, and an average hydraulic head of 11 millimeters (mm) which is an indicator of surface water velocity.

| Table 2: Carp A Assessment Facts | | | |
|---|---|---|---|
| | **Minimum** | **Maximum** | **Average** |
| **Stream Wetted Width (m)** | 0.90 | 5.03 | 2.10 |
| **Stream Depth (m)** | 0.06 | 0.96 | 0.36 |
| **Hydraulic Head (mm)** | 0 | 35 | 11 |

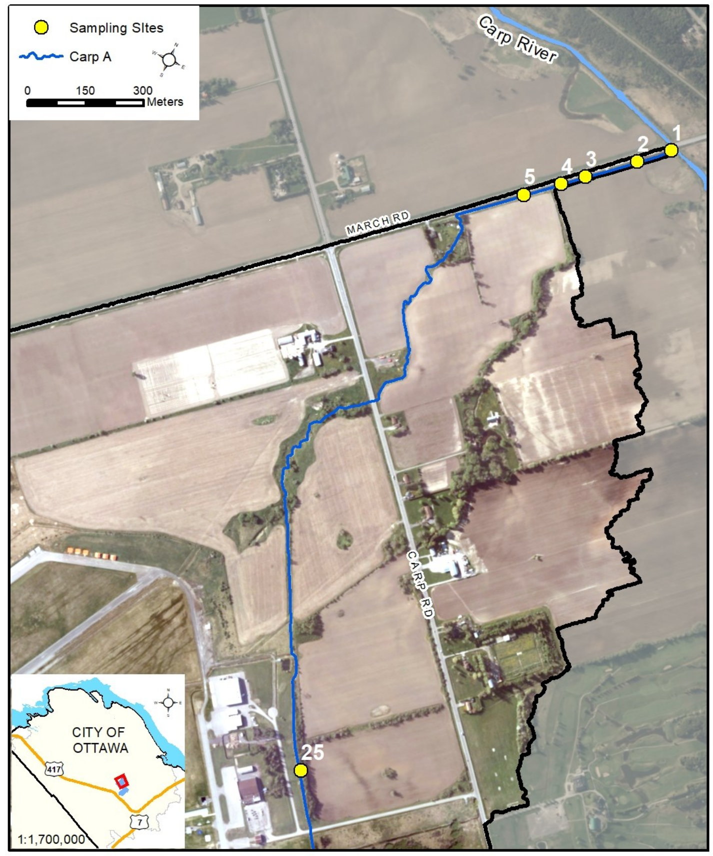


***Figure 3:*** *Locations of the monitoring sites along Carp A*

## *Methodology*

The macro stream assessment is completed using a protocol that divides the entire length of the creek into 100 meter (m) sections. Starting at the downstream end, a monitoring crew wades the creek and completes a detailed assessment of every 100 m section. If a section of the creek is unwadeable, that section is bypassed and the assessment is continued once the creek becomes wadeable again. The parameters assessed include general land use, in-stream morphology, human alterations, water chemistry, plant life, and other features presented in this report.

## *General Land Use Adjacent to Carp A*

General land use along each surveyed section of Carp A is considered from the beginning to the end of each survey section (100 m) and extending outward 100 m on each side of the creek. Land use outside of this area is not included in the surveys but is nonetheless part of the subwatershed and will influence the creek (Castelle et al, 1994).

The categories of land use include infrastructure, active agriculture, pasture, abandoned agricultural fields, residential, forests, scrubland, meadow, and wetland. Figure 4 shows the overall percent of land use that was observed adjacent to the Carp A tributary.

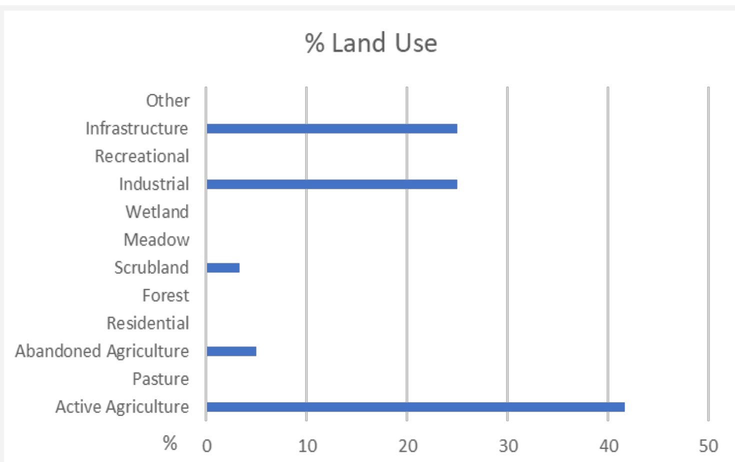


***Figure 4:*** *Land use alongside Carp A.*

Of the eleven categories, seven were not found to be present along surveyed sections. At 42%, active agriculture represents the most prominent category of land use followed by infrastructure and industrial both at 25%.

As described on page 2, the land use in the watershed is dominated by agriculture. This is reflected well in the percentages seen in Figure 4 (42% active, 5% abandoned). However, the aerial imagery in Figure 3 shows that along some of the un-surveyed portions of the creek there are wider buffers from the agricultural fields and portions of woodland. This is a benefit to the creek, as well as the surrounding landscape as this forest cover provides shade, habitat and food for a wide variety of animals, cools the water and protects the banks from erosion.

## *Human Alterations to Carp A*

In this assessment, human alterations refer to artificial changes to the actual channel of the watercourse either by straightening or relocation. Such alterations can be made in streams and rivers for many reasons including to accommodate development, such as road crossings and culverts, to make more land available for agriculture, and to minimize natural erosion caused by the meandering pattern of flowing water. As seen in Figure 5, of the surveyed sections none were classified as unaltered or natural and 17% were classified as altered, and 83% of surveyed sections were considered highly altered. This is largely due to the tributary running parallel to March Road for the lower 600 m of its channel length. Large portions of the water feature have also been channelized through agricultural fields and around the Carp Airport.

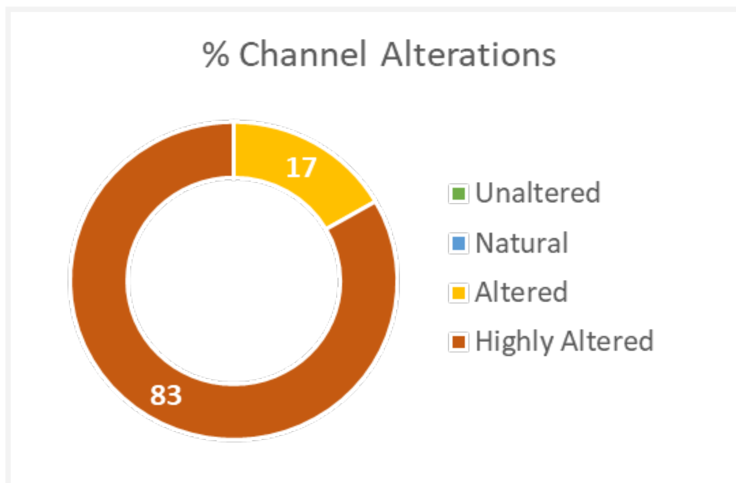


***Figure 5:*** *Extent of human alterations to the shoreline of Carp A.*

### *Riparian Buffer along Carp A*

The riparian buffer refers to the amount of vegetated area along the edges of the stream banks. It can consist of a variety of vegetation types, including trees, shrubs, grasses and other plants. Vegetated buffers are important for protecting water quality and creating healthy aquatic habitats. They intercept sediments and contaminants as well as protect the stream banks against erosion. Buffers also improve habitat for aquatic species by shading and cooling the water and providing protection for birds and other wildlife that need to be near water for feeding or rearing young. Riparian buffers along the creek corridor also provide a natural area for wildlife movement and dispersal. While it is not the only factor affecting stream health, studies assessing adjacent land use largely show a positive relationship between buffer size and stream health (Stanfield and Kilgour, 2012).

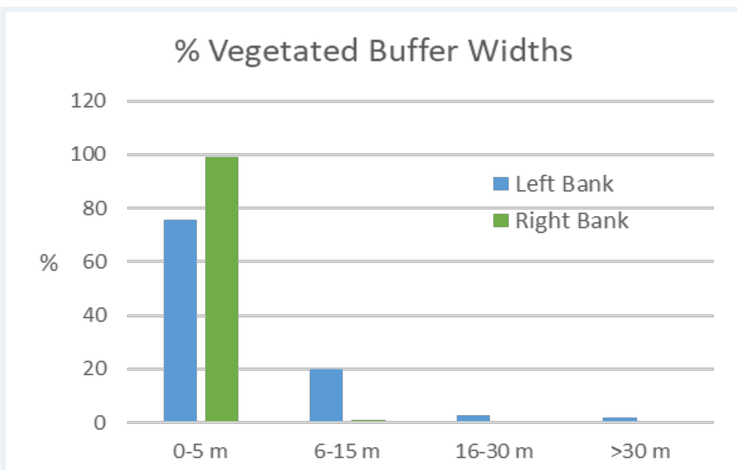


***Figure 6:*** *Riparian buffer widths along Carp A.*

Environment Canada's Guideline: *How Much Habitat is Enough?* recommends a minimum 30 m wide vegetated buffer along at least 75% of the length of both sides of a watercourse. Therefore, for this assessment, we record the width of the riparian buffer within 30 m of either side of the watercourse. As summarized in Figure 6, most of the surveyed sections of Carp A had less than a 5 m wide riparian buffer since they were beside March Road. In the area surveyed closer to the airport the vegetated buffer was wider.

Figure 7 shows the differences in riparian buffer widths along the surveyed reaches of Carp A.

### ***Shoreline Classification***

Two distinct areas were surveyed along the Carp A corridor. The first was a predominantly degraded ecosystem along March Road (83%), and the other was a regenerating ecosystem (17%) near the Carp Airport where the buffers along one bank were slightly wider and consisted of shrub and tree cover for the watercourse.

Natural and ornamental shorelines were not identified in the surveyed portions of Carp A.

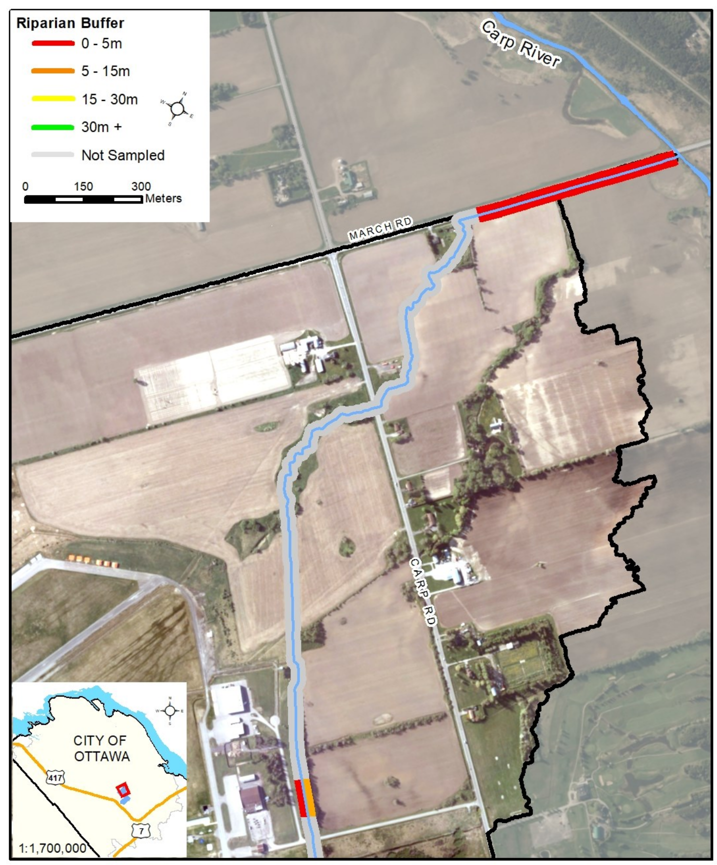


***Figure 7:*** *Vegetated buffer widths along Carp A.*

### *Overhanging Trees and Branches*

Overhanging branches and trees are a byproduct of a good riparian buffer. They provide crucial nutrients, in the form of coarse particulate organic matter (leaves, insects, seeds etc.), to small streams (Vannote et al. 1980). This organic matter is broken down and eaten by aquatic insects, phytoplankton and zooplankton, which are an important food source for fish and other wildlife. Overhanging branches also provide stream shading, and fallen logs create excellent habitat for fish and turtles.

Overall, Carp A has a low percent coverage of overhanging trees and branches, as seen in Figure 8 with 80% of the reaches having no overhanging cover. This reflects the surrounding natural vegetative community, where the creek flows between an agricultural field and March Road. The majority of these areas are dominated by tall grasses.

Figure 8 shows the data quantified as the percent of creek sections classified according to the various amounts of overhanging trees and branches.

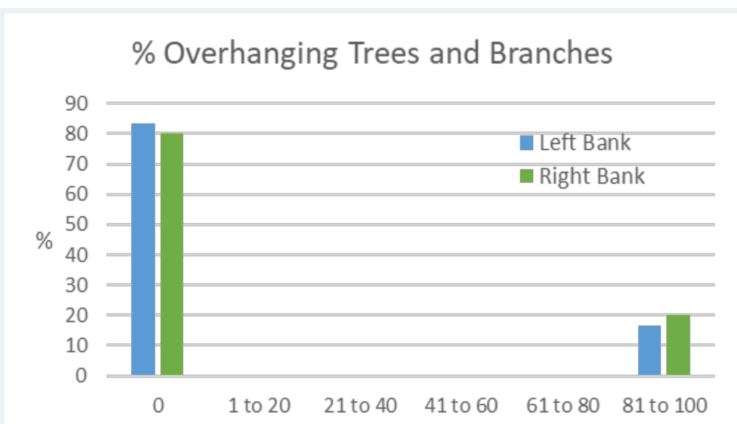


***Figure 8:*** *Percentage of each surveyed section of Carp A with overhanging trees and branches.*

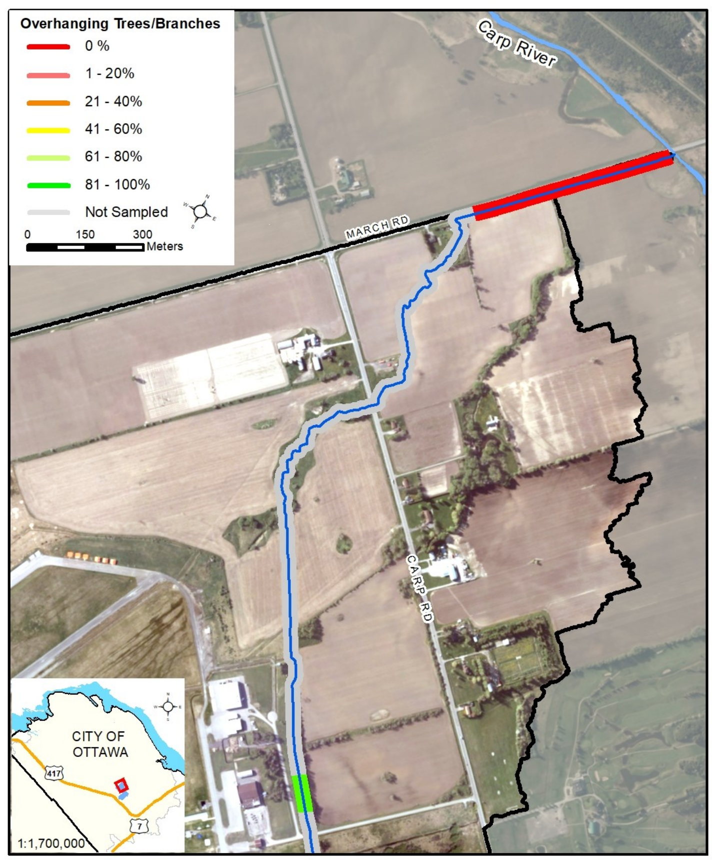


***Figure 9:*** *Overhanging trees and branches along Carp A.*

## *Stream Shading*

Shade is important in moderating stream temperature, contributing to food supply and helping nutrient reduction within a stream. Grasses, shrubs and trees can all provide shading to a stream, however, trees provide more full coverage and grasses provide much needed shade directly along the edges of the channel where shading from trees may not be available.

Figure 10 shows the variability in the amount of stream shading along different sections of Carp A. We can see that the shading is low (<40% coverage). This is due to the riparian vegetation types along the creek, with large sections of open meadow, pasture land or scrub land along the banks.

Figure 11 shows the data quantified as the percent of creek sections classified according to the various levels of shading. For example, 20% of the 6 sections that were surveyed were classified as having between 21 and 40% shade coverage.

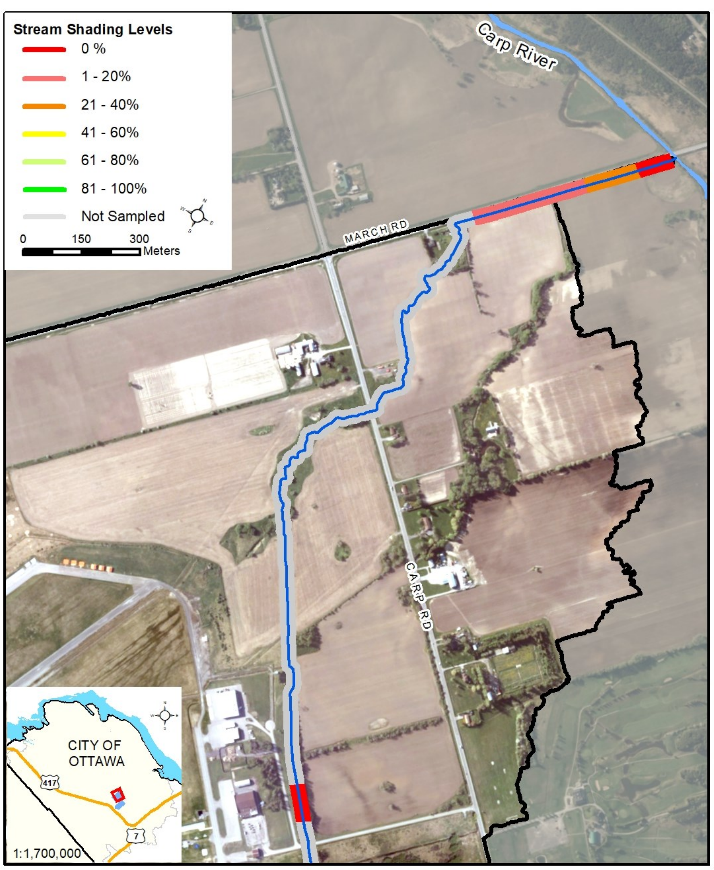


***Figure 10:*** *Stream Shading along Carp A.*

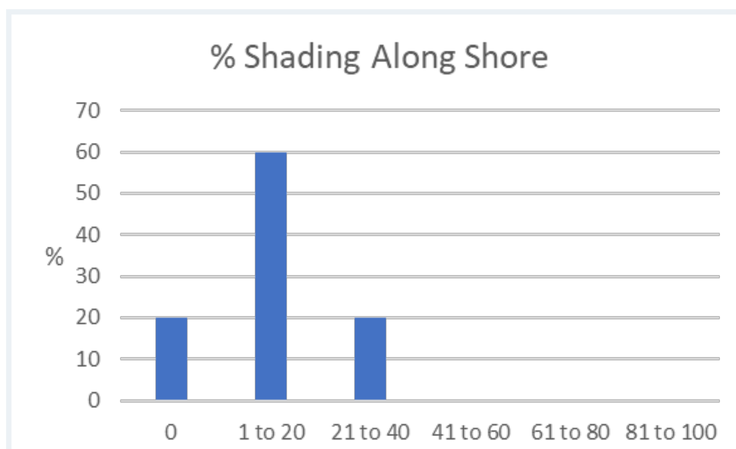


***Figure 11:*** *Shading along Carp A.*

### *Erosion and Streambank Undercutting*

Rivers and streams are dynamic hydrologic systems, which are constantly changing in response to changes in the watershed. Streambank erosion is a natural process that can produce beneficial outcomes by helping to regulate flow and shape a variety of habitat features. When the natural rate of erosion is accelerated or changed through human activities, such as stream straightening and over-clearing of catchment and stream bank vegetation, the system is thrown off balance. The acceleration of the natural erosion process can lead to stream channel instability, land loss, sedimentation, habitat loss and other adverse effects that negatively impact water quality and important fish and wildlife habitat.

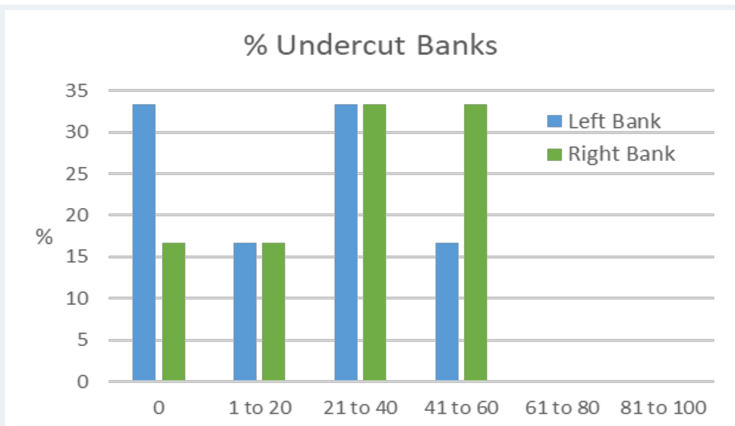


***Figure 12:** Percent undercut stream banks along Carp A.*

One of the features created by erosion is undercutting of banks, where the creek is then able to flow underneath of the banks. While some undercutting of stream banks can provide excellent refuge for fish, too much undercutting can become harmful if it results in bank instability, erosion and sedimentation.

Figure 12 shows the percentage of undercut stream banks along each surveyed section of Carp A. Overall, the sections of Carp A that were surveyed along March Road were found to have low to moderate undercutting. The reach surveyed near the airport had no observable undercutting.

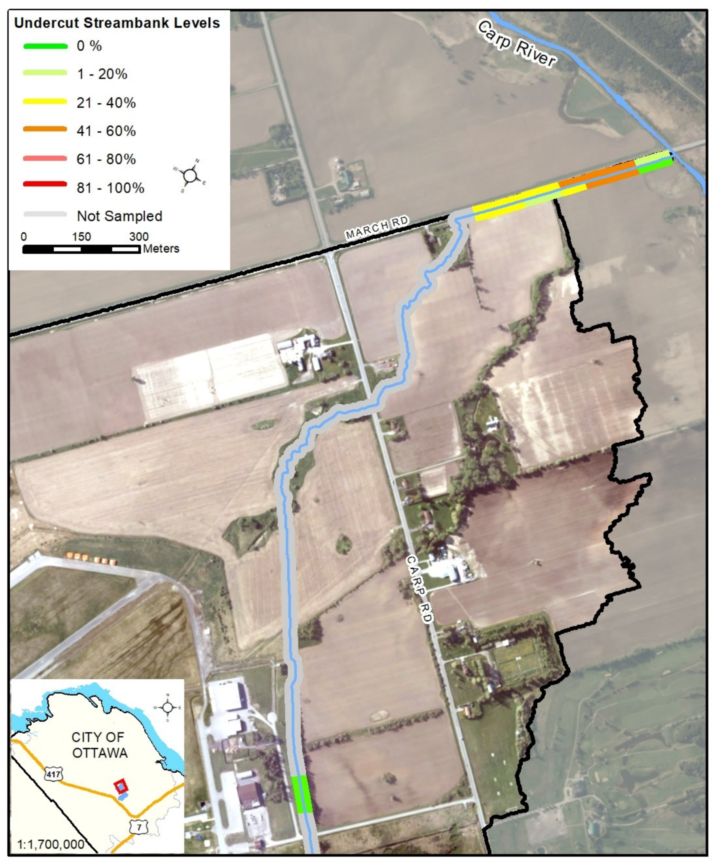


***Figure 13:** Map of undercut banks in Carp A.*

### *In-stream Substrate*

In-stream substrate describes the composition of the bed of the watercourse. A diversity of substrates is important for fish and benthic invertebrates because some species have specific habitat requirements and will only reproduce on certain types of substrate. A healthy stream will generally have a large variety of substrate types which will support a greater diversity of organisms.

Figure 14 summarizes the different types of substrate which make up the bed of Carp A.

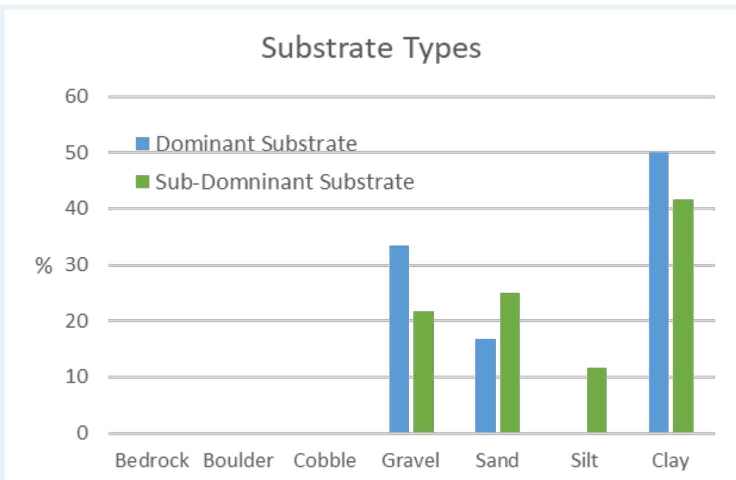


***Figure 14:*** *Percentages of in-stream substrate types in Carp A.*

Carp A is composed of high percentages of clay, with smaller percentages of gravel, sand and silt. Clay, which makes up 50% of the dominant and 42% of the sub-dominant in-stream substrate, is prone to disturbance and erosion. Gravel which makes up 33% of Carp A's dominant and 22% sub-dominant in-stream substrate, provides spawning habitat for fish and invertebrates. It also provides habitat for benthic invertebrates (organisms that live on the bottom of a water body or in the sediment) which are a key food source for many fish and wildlife species.

### *Cobble and Boulder Habitat*

Cobble and boulders can both provide important fish habitat. Figure 15 shows that none of the surveyed sections of Carp A contained cobble or boulder habitat. Other sections of Carp A, particularly those associated with road crossings, may provide some gravel, cobble or boulder habitat.

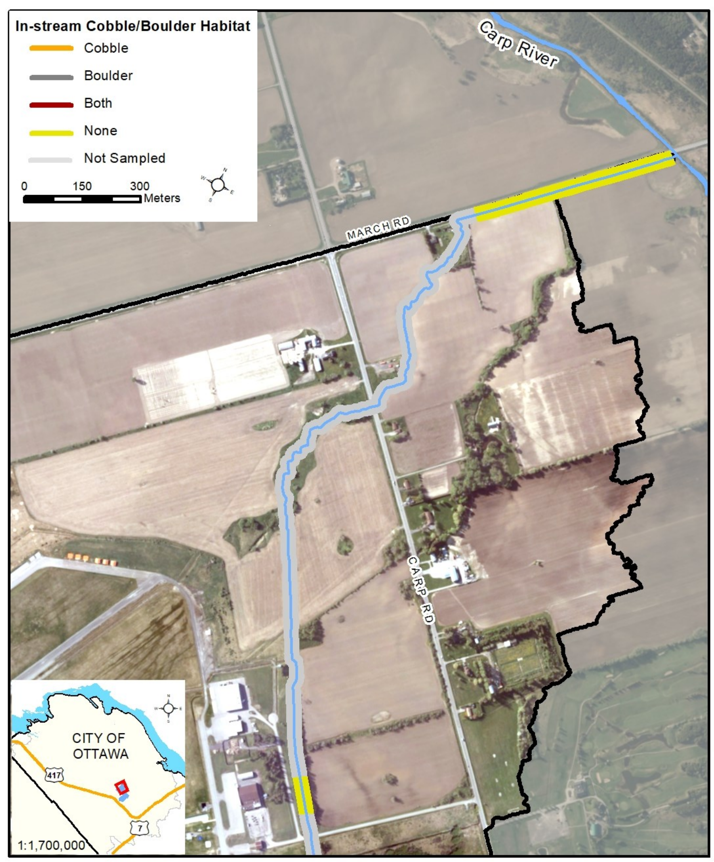


***Figure 15:*** *Cobble and boulder habitat along Carp A.*

## In-stream Morphology

In-stream morphology is categorized as pools, riffles, and runs. Pools and riffles are both particularly important for fish habitat. Pools, which are deeper and usually slower flowing sections in the stream, provide shelter for fish, especially when water levels drop or when water temperatures increase. Riffles are sections of agitated and fast moving water that add dissolved oxygen to the stream and provide spawning habitat for some species of fish. Runs are areas along a creek that are typically shallow and have un-agitated water surfaces.

It is beneficial for the health of the ecosystem if there is a variety of these in-stream features to allow oxygen flow through the creek, to provide habitat, and to have a well-connected watercourse.  As seen in Figure 16, Carp A was found to consist of 90% runs, 9% riffles and 1% pools. Stewardship efforts could include creating more in-stream pool/riffle sequences to enhance fish habitat diversity and oxygenation.

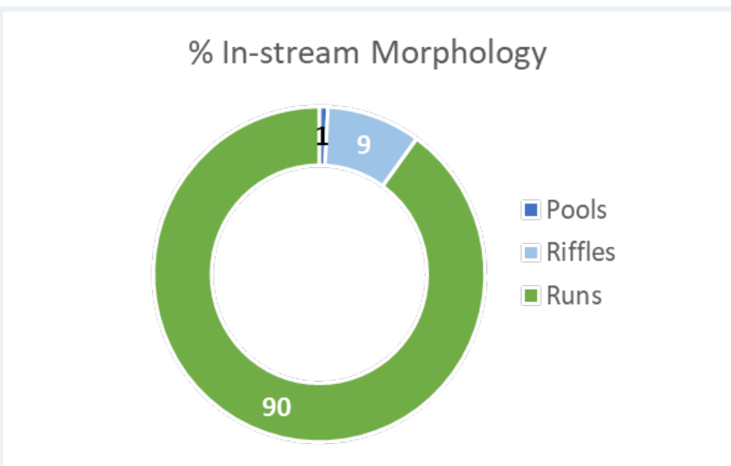


***Figure 16:*** *In-stream morphology along Carp A.*

## Habitat Complexity

Habitat complexity is a measure of the overall diversity of habitat types and features within a stream. Streams with high habitat diversity support a greater variety of species niches, and therefore contribute to a greater potential for species diversity. Factors such as substrate, flow conditions, and cover material all provide crucial habitat functions for aquatic life.

The habitat complexity score seen in Figure 17 is based on the presence of gravel, cobble, or boulder substrates as well as the presence of woody or vegetative material in each surveyed reach of Carp A. The presence of one of the variables carries a score of 1. A reach with all five features receives a score of 5 for high habitat complexity.

Since there is no cobble or boulder habitat present in the surveyed reaches and there are very few woody plants growing along the banks, the habitat complexity scores are low for Carp A.

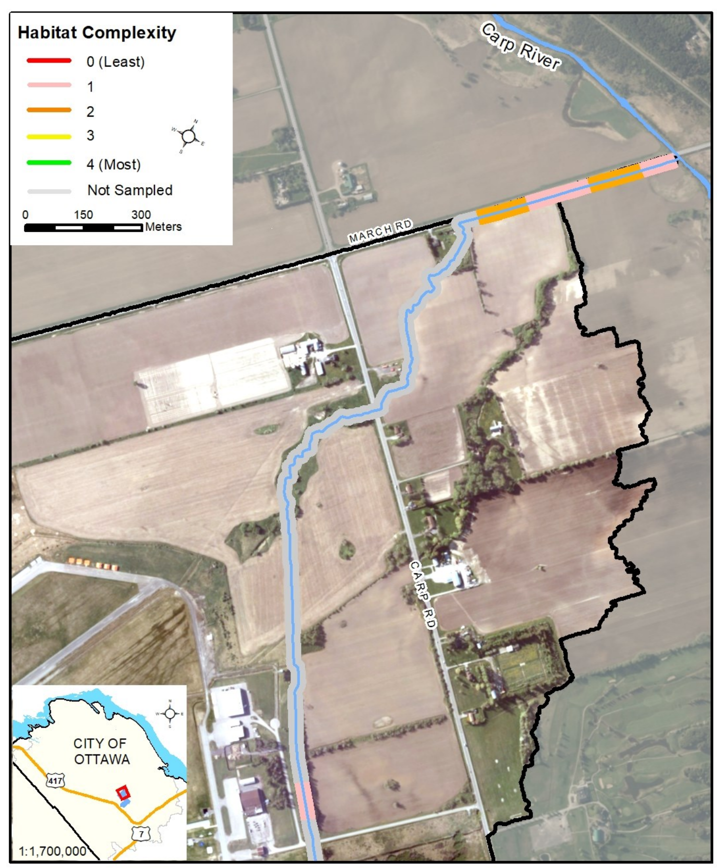


***Figure 17:*** *Habitat Complexity Scores for Carp A.*

### *In-Stream Vegetation*

A well-balanced amount and suitable variety of in-stream vegetation is important for a healthy stream ecosystem. Aquatic plants provide habitat for fish and wildlife, contribute oxygen to the stream, and help to remove contaminants from the water. However, too much in-stream vegetation can be detrimental and can signify an unhealthy stream. Certain types of vegetation, such as algae, can also be indicative of poor stream health, as it is often seen in streams with high nitrogen and phosphorus inputs (from runoff or wastewater).

### *Types of In-stream Vegetation*

There are many factors that can influence the presence of aquatic plants, some of which include the substrate type, increases in air and water temperature, and the time of year the assessment was completed. As seen in Figure 18, the in-stream vegetation that was observed in each surveyed section was divided into eight categories; narrow-leaved emergent, broad-leaved emergent, robust emergent, free floating plants, floating plants, submerged plants, algae and no plants. 68% of the surveyed reaches had no in-stream vegetation. Algae (17%) and narrow-leaved emergent (13%) were the most prominent in-stream vegetation types in Carp A.

### *Amount of In-stream Vegetation*

For this assessment, the amount of in-stream vegetation is measured according to five categories, ranging from "extensive", where the stream is choked with vegetation, to "rare", where there are very few plants.

Figure 19 shows the amounts of in-stream vegetation in Carp A. The surveyed portions of the creek were found to have a low abundance of vegetation.

Low in-stream vegetation levels in Carp A could be due to substrate type, water depths and/or water velocities making it hard for aquatic plants to become established. A lack of in-stream vegetation in the surveyed reaches may also be the result of ditch clearing activities along March Road.

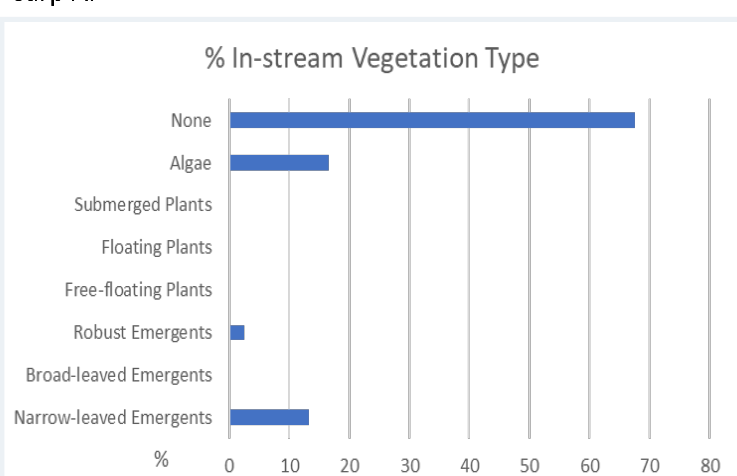


***Figure 18:*** *Types of in-stream vegetation in Carp A.*

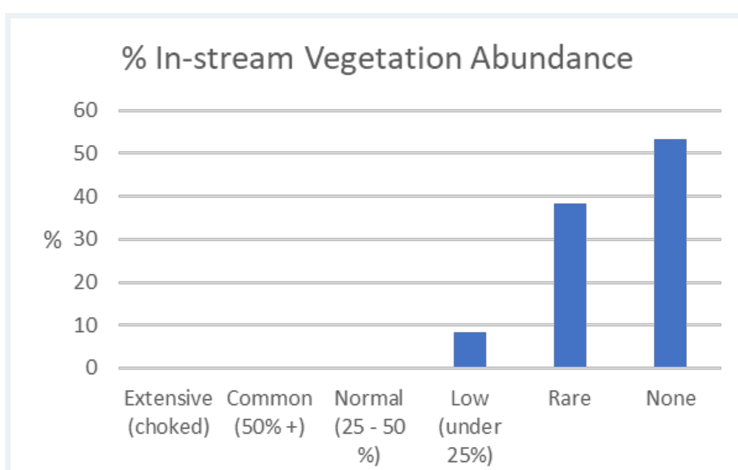


***Figure 19:*** *Abundances of in-stream vegetation in Carp A.*

## *Water Chemistry and Quality*

A YSI probe was used to collect water quality data including pH, dissolved oxygen, and conductivity, at each site assessed. The maximum, minimum and average readings for each of those parameters are presented in Table 3 and are discussed further on page 14.

**Conductivity** is defined as the ability of water to pass an electrical current, and is an indirect measure of the saltiness of the water caused by dissolved ions. Fish cannot tolerate large increases in ion concentrations in the water. Factors that can change the conductivity of freshwater include climate change and human activity. Warmer climate conditions increase the evaporation of water, leaving existing water with higher concentrations of dissolved ions (higher conductivity). Use of road salts and fertilizers around the stream can also elevate ion levels, along with industrial and human wastewater. Because of all these factors, conductivity of a stream can fluctuate greatly with readings between 0 and 10,000 microSiemens/centimeter (µS/cm). Environment Canada (2011) sets a target of 500 µS/cm as part their Environmental Performance Water Quality Index. The average specific conductivity of Carp A is 525.1 µS/cm, putting it just above the target level. The highest reading was at the outlet to the Carp River where some mixing of waters may occur.

Since background conductivity can vary between systems, the 2019 results have been compared to the surveyed average for Carp A as seen in Figure 20.

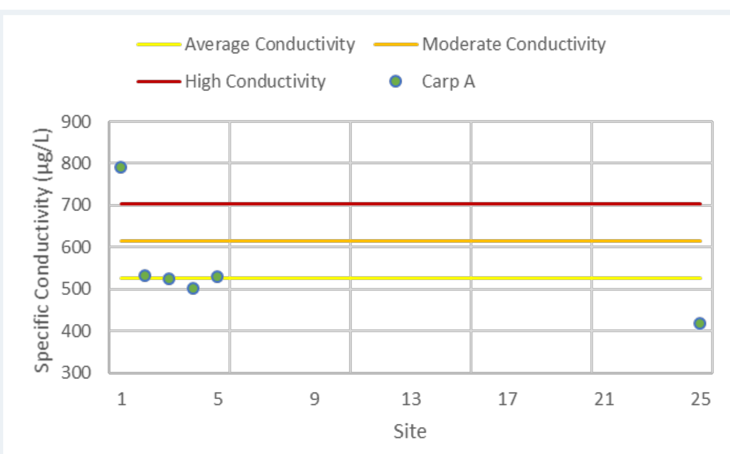


***Figure 20:*** *Specific conductivity results from Carp A.*

**pH** tells us the relative acidity or alkalinity of the creek. The scale ranges from 1 (most acidic) to 14 (most basic) and has 7 as the middle and most neutral point. A range of 6.5 to 8.5 should be maintained for the protection of aquatic life. As can be seen in Table 3, the pH values found in Carp A stay within this ideal range. The average pH in the Carp A tributary is 7.80, a nearly neutral condition, which is ideal for many species of fish to thrive.

**Table 3: Carp A Water Quality Data**

| | Minimum | Maximum | Average |
|---|---|---|---|
| Water Temperature (˚C) | 15.0 | 21.3 | 17.2 |
| Specific Conductivity (µS/cm) | 417.8 | 790.0 | 525.1 |
| pH | 7.43 | 8.05 | 7.80 |
| Dissolved Oxygen Concentration (mg/L) | 5.71 | 10.22 | 9.42 |

**Dissolved oxygen concentration** measures the amount of oxygen available within the water that is useable by wildlife. According to the Canadian Water Quality Guidelines for the Protection of Aquatic Life, the guideline value for dissolved oxygen in freshwater for early life stages is 6.0 milligrams/liter (mg/L) for warm water ecosystems and 9.5 mg/L for cold water ecosystems.

The average amount of dissolved oxygen in Carp A measured at 9.42 mg/L, indicating that large reaches of the creek have adequate dissolved oxygen levels for most warm water fish to thrive. There is only 1 section that is just below the ideal dissolved oxygen concentrations for warm water fish, and this occurred at the junction with the Carp River. When water depths and channel connectivity permit, fish may migrate away from low oxygen areas such as this one.

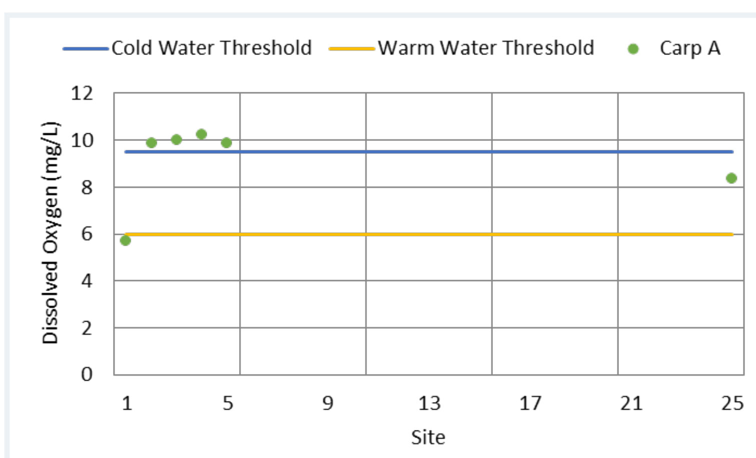


***Figure 21:*** *Dissolved oxygen concentration results from Carp A.*

**Dissolved Oxygen Saturation** is measured as the ratio of dissolved oxygen relative to the maximum amount of oxygen that will dissolve depending on the temperature and atmospheric pressure. Well oxygenated water will stabilize at or above 100% saturation, however the presence of decaying matter and pollutants, which consume oxygen, can drastically reduce these levels. Oxygen input through photosynthesis has the potential to increase saturation above 100% to a maximum of 500%, depending on the productivity level of the environment.

Combining the dissolved oxygen concentrations with the saturation values provides us with 6 categories to classify the suitability of the stream for supporting various aquatic organisms. Results are shown in Figure 22.

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.
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.
6) >100% Saturation / >9.5 mg/L Concentration
   Oxygen concentration and saturation levels are optimal for warm and cold water biota.

As seen in Figure 22 the lower reach of Carp A had good concentrations and percent saturation levels for dissolved oxygen. However, at the junction with the Carp River the oxygen levels were quite low.

In the upper reach oxygen concentrations were acceptable for warm water fish, however the saturation levels were less that 100%. This could have been due to the low flow conditions experienced at that time of the summer.

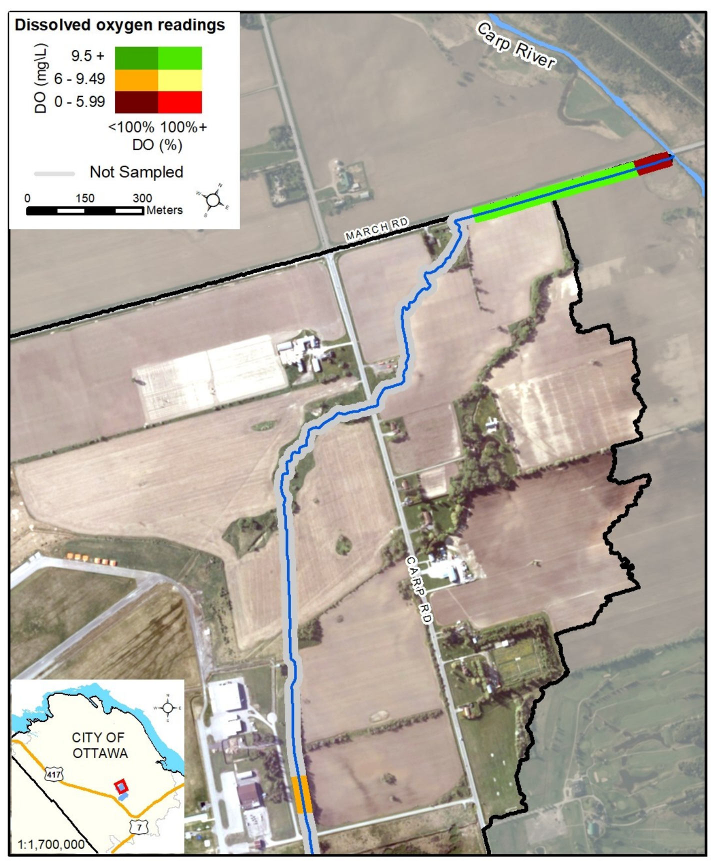


***Figure 22:*** *Dissolved oxygen concentration and saturation results for Carp A.*

## *Areas of Water Quality Concern*

This is a summary of areas that are potentially under stress due to one or several water chemistry factors. Three water quality factors, oxygen saturation score, pH, and conductivity, are used to classify the areas of water quality concern.

As shown on page 12, Carp A's pH values did not exceed the ideal range and therefore don't impact the ranking for Areas of Concern.

Conductivity values were fairly low throughout the creek with values increasing at the outlet.

Dissolved oxygen concentration levels and saturation levels were typically high throughout the surveyed reaches with a moderate saturation at the upper reaches and low concentration and saturation values at the outlet as shown on page 13. This indicates that some reaches have less than ideal conditions for aquatic organisms.

The poor score shown in Figure 23 reflects an area where lower oxygen concentration and saturation scores combine with high conductivity readings.

The sections receiving a good score reflect the areas that had low to moderate oxygen concentration and saturation scores combined with average or slightly above average conductivity scores.

The sections with an excellent score had moderate to low conductivity readings and high dissolved oxygen and concentrations values.

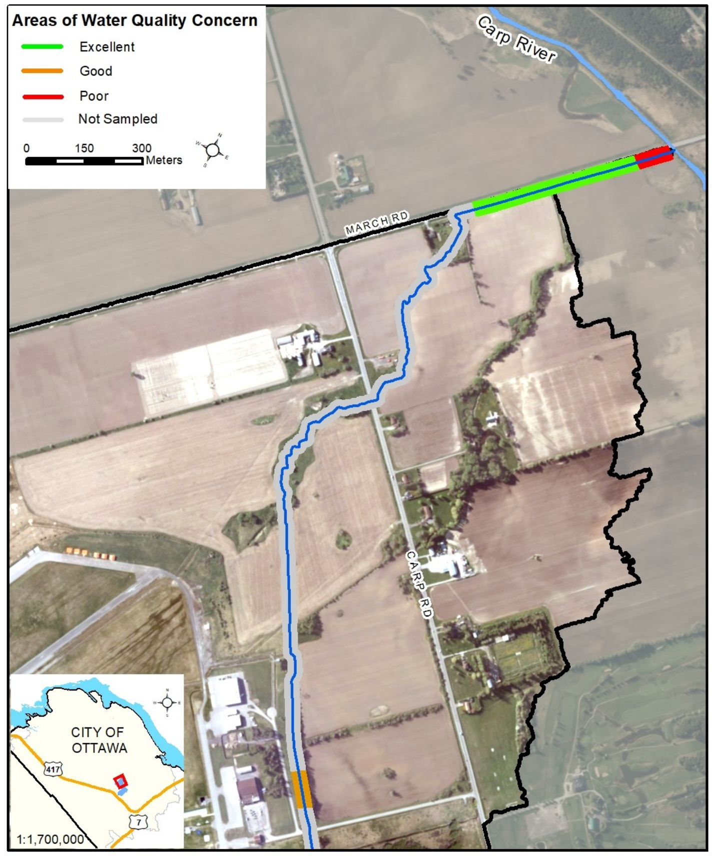


***Figure 23:*** *Areas of Water Quality Concern in Carp A.*

## *Potential Stewardship Opportunities*

Naturally vegetated shorelines help reduce erosion, filter pollutants from entering the watercourse and assist in flood control while also providing food and habitat for a variety of wildlife.

98% of left bank and 100% of the right bank of surveyed reaches have less than a 30 m vegetated buffer. Additionally, 80% of the stream surveyed has less than 20% shade cover.

Stewardship activities can include but are not limited to; restoring eroded banks and enhancing stream shading by planting trees within 5 meters of the top of bank (particularly the east or south banks to increase shade). Or widening and improving riparian buffers through reduced tilling near the top of bank and planting the area with native species of trees, shrubs, grasses or wild flowers.

Only a small portion of Carp A was surveyed (19%). However, it can been seen in the aerial photography that the majority of the water feature flows through active agricultural lands. The next steps will be to contact landowners in these areas and explore the potential for collaboration with them on a voluntary basis to enhance their shorelines.

City of Ottawa programs such as the Rural Clean Water Program and the Green Acres fund are available to help financially support some of these undertakings. For more information about these programs, please contact the Stewardship Coordinator at MVCA.

## Thermal Classification

Temperature is an important parameter in streams as it influences many aspects of physical, chemical and biological health. Figure 24 shows where the temperature datalogger was deployed in Carp A from May to October 2019 to give a representative sample of how water temperature fluctuates throughout the summer season.

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 revised Stoneman and Jones method by Cindy Chu *et al*), to classify a watercourse as either warm, cool-warm, cool, cold-cool, or cold water. Figure 25 shows the thermal classifications of Carp A for 2019.

Analysis of the data collected indicates that Carp A should be classified as a cold-cool water stream.

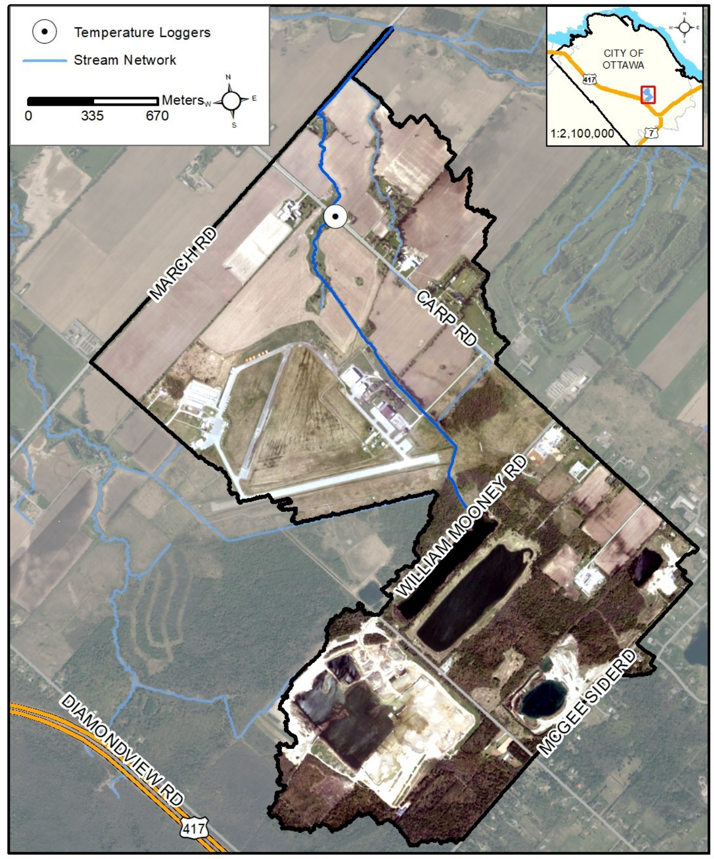


***Figure 24:*** *Location of the temperature logger site in Carp A.*

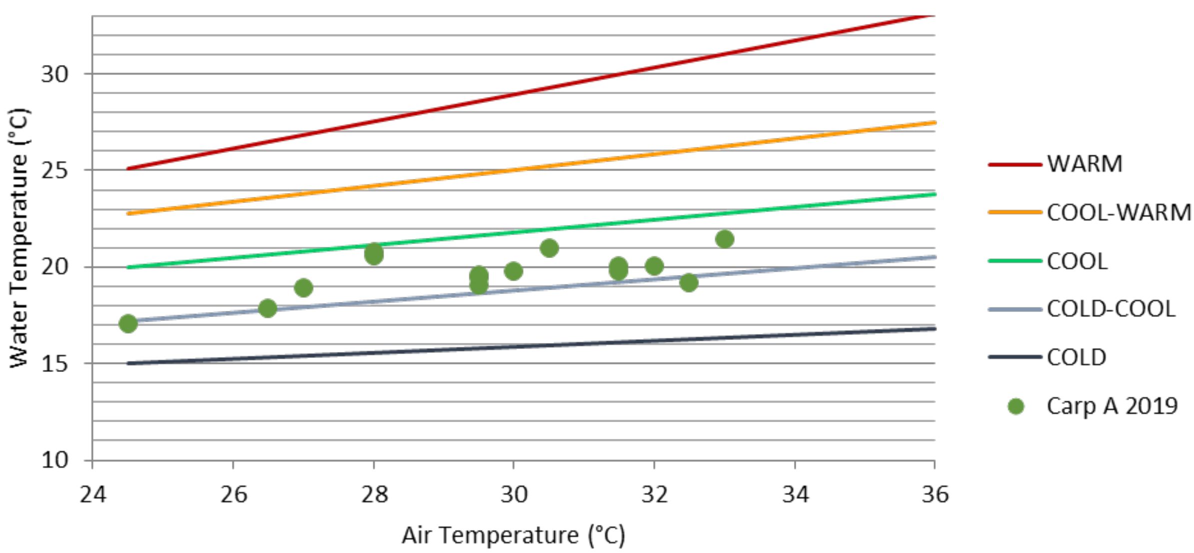


***Figure 25:*** *Thermal classification of Carp A.*

Each point on the graph represents a water temperature that was taken under all the following conditions:

- Sampling dates between July 1 and August 31,
- Sampling date has a maximum air temperature ≥ 24.5 °C and was preceded by two consecutive days with a maximum air temperature ≥ 24.5 °C during which time no precipitation occurred, and
- Water temperature at 4:00 pm

## Fish Sampling

Unfortunately MVCA was unable to perform a fish survey on Carp A in 2019. However, MVCA has records of past fish sampling efforts within Carp A and has been able to compile a fish species list shown in Table 4. (Thermal classes from Coker, 2001)

| Table 4: Fish Species Found In Carp A | |
|---|---|
| **Species Common Name** | **Thermal Class** |
| Creek Chub | Cool |
| Finescale Dace | Cool |
| Northern Redbelly Dace | Cool |
| White Sucker | Cool |

## Wildlife Observed

There were many species of wildlife observed during this assessment of Carp A. A complete list of species observed during the 2019 survey is shown in Table 5.

| Table 5: Carp A Wildlife Observed | |
|---|---|
| **Birds** | Mallards, Ducks, Geese, Crows, Song Sparrow, other various birds |
| **Mammals** | Deer tracks and racoon tracks |
| **Reptiles and Amphibians** | Leopard Frogs, unidentified tadpoles |
| **Aquatic Insects** | Water Striders |
| **Fish** | White Sucker, Cyprinids, various unidentified young of year |
| **Other** | Dragonflies, Damselflies |

## Migratory Obstructions

Migratory obstructions are features in a water way that prevent fish from freely swimming up and downstream. This can negatively effect migration to breeding or foraging habitats as well as restrict a fish's ability to access deeper, cooler water refuges when summer droughts come. These obstructions can be anthropogenic such as perched culverts or debris dams at road crossings, or they can be natural features such as waterfalls and beaver dams.

No migratory obstructions were observed within the surveyed reaches of Carp A.

## Pollution

Pollution in the form of litter, such as plastic bottles and bags were found in the reach along March Road. The distribution of the types of pollution found is shown in Figure 26. A potential steward activity would be to have a ditch clean up event to improve and maintain the road-side portion of the stream.

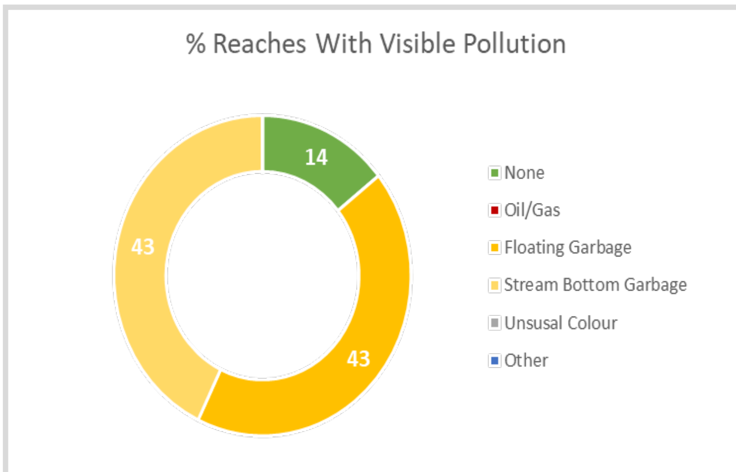


***Figure 26:*** *Percentage of reaches with visible pollution in Carp A.*

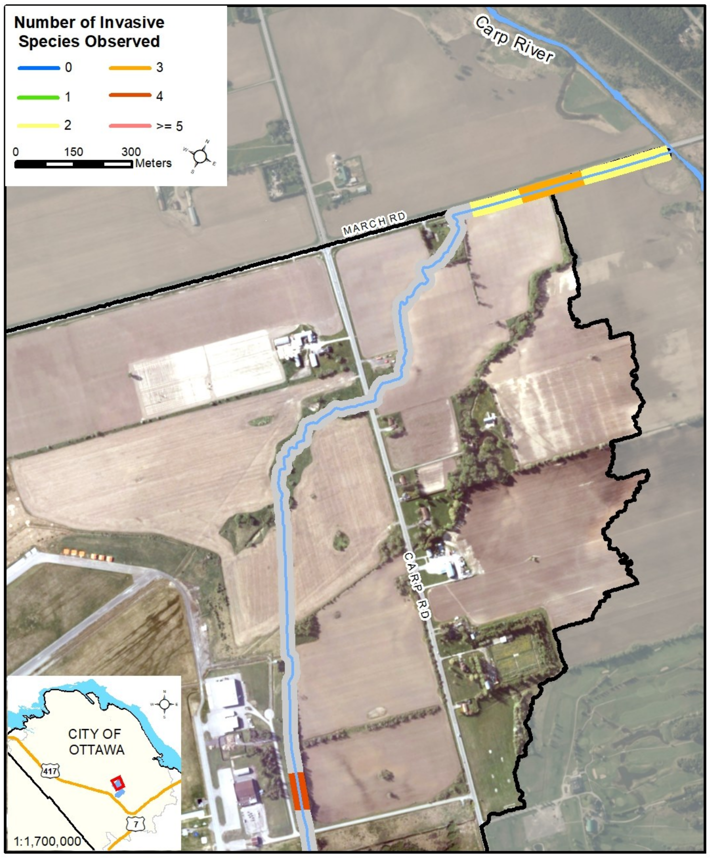


***Figure 27:*** *Abundance of identified invasive species along Carp A.*

## *Invasive Species*

Invasive species are a concern as they can impact local species diversity and richness by outcompeting native species. This can result in the reduction of available food and habitat that our native plants and animals rely upon. Species such as Giant Hogweed and Poison Parsnip are also a human health concern as the sap from these plants can cause chemical burns to skin.

Figure 27 shows that there are 6 identified invasive species in the Carp A corridor. All 6 reaches surveyed had at least two invasive species, and the upper reach had the most at four species identified.

Invasive species identified while surveying Carp A are: Bittersweet Nightshade, Common Buckthorn, Manitoba Maple, Phragmites, Poison Parsnip and Purple Loosestrife.

Consistent identification and mapping of invasive species will aid in improving our understanding of these results.

For more information on identifying and reporting invasive species visit www.invadingspecies.com managed by the Ontario Federation of Anglers and Hunters.

For information on choosing local native species as part of your gardening and landscaping choices please read the Ontario Invasive Plants Council Document “Grow Me Instead” found here: www.ontarioinvasiveplants.ca

For information about promoting pollinators with local native plant species refer to: www.pollinator.org/canada

The purple flowers are Purple Loosestrife growing along Carp A.

The yellow flowers are Poison Parsnip growing along Carp A.

## *Headwater Drainage Features*

The City Stream Watch program assessed two Headwater Drainage Features in the Carp A subwatershed in 2019 (Figure 28).

This Ontario Stream Assessment Protocol module measures zero, first and second order headwater drainage features (HDF). An HDF is defined as a depression in the land that conveys surface flow. The protocol used is a rapid assessment method for characterizing the amount of water, sediment transport, and storage capacity within HDFs. Site visits are performed twice, once during the spring melt (high-water conditions) and once in mid-summer once the vegetation has grown in and water levels have receded. Assessing a feature in multiple seasons provides a broader understanding of the HDF's flow capacity and habitat variability.

This stream monitoring module provides a means of characterizing the connectivity, form and unique features associated with each HDF (Stanfield, 2017).

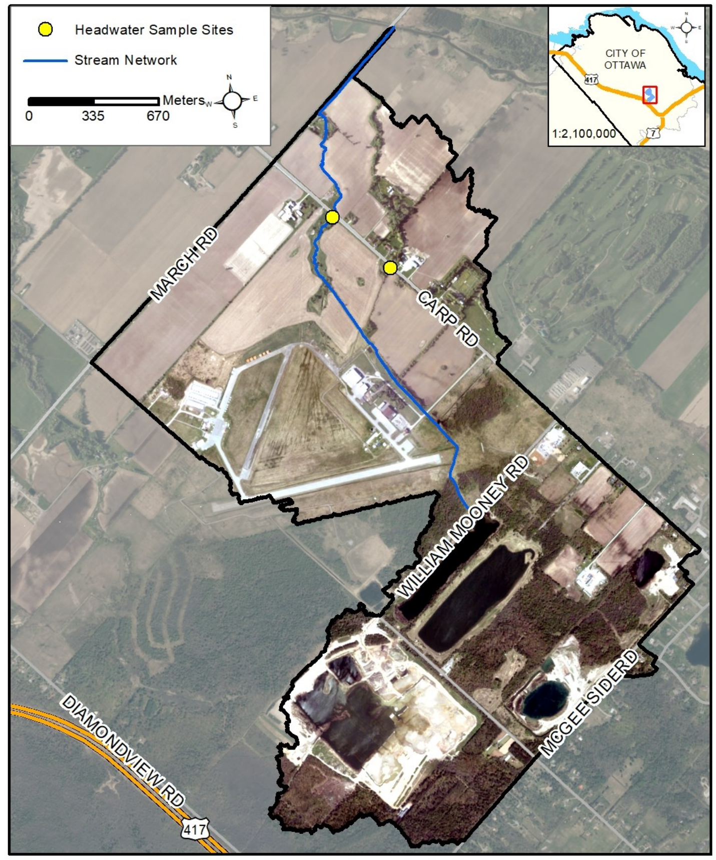


***Figure 28:*** *Headwater drainage feature sampling sites in the Carp A watershed.*

## HDF Feature Types

The HDF sampling protocol assesses the feature type in order to understand the function of each feature. The evaluation includes the following classifications: defined natural channel, channelized or constrained, multi-thread, no defined feature, tiled, wetland, swale, roadside ditch and pond outlet. By assessing the conditions associated with the headwater drainage features in the catchment area, we can understand the ecosystem services that they provide to the watershed in the form of hydrology, sediment transport, and aquatic and terrestrial functions.

The two headwater sites surveyed in the Carp A watershed consist of 3 of the 9 feature types. The three feature types are channelized features, roadside ditches and defined natural channels.

## *HDF Feature Flow*

Flow conditions within a HDF can be highly variable as a result of changing seasonal factors. Flow conditions are assessed in the spring and summer to determine if features are perennial (flowing year round) or if they are intermittent (drying up during the summer). Flow conditions in headwater systems will change year-to-year depending on local precipitation patterns.

During the July visit the most upstream site had a reduction of flows from substantial to minimal. The second site, at March Road, had substantial flows during both site visits.

### *HDF Channel Modifications*

Channel modifications are assessed at each headwater drainage feature site. Modifications include dredging, hardening, realignment, entrenchment and anthropogenic on-line ponds.

Channel modifications noted at the two Carp A HDF sites include channelization and roadside ditch maintenance.

### *HDF Vegetation*

Feature vegetation type evaluates the dominant vegetation type found directly within each headwater feature channel, whereas riparian vegetation type is evaluated as the dominant vegetation within 3 zones from the shoreline of each headwater feature (0-1.5 m, 1.5-10 m and 10-30 m).

There are 7 vegetation classifications; None, Lawn, Crops, Meadow, Scrubland, Wetland, and Forest.

Meadow and Scrubland were the dominant feature vegetation types. Meadow, Scrubland and Lawn were the dominant riparian vegetation types.

### *Land Owners & Volunteers*

A big **"Thank You!"** needs to go out to the landowners as well as the dedicated volunteers, three summer students and 1 co-op student who came out in 2019 and helped make this monitoring program happen.

### *Report Summary*

The results in Table 6 are a summary of the highlights from each of the report sections. The surveyed reaches of the Carp A tributary are highly altered and channelized with little stream shading. This is the result of the tributary flowing through active agricultural lands and being channelized along March Road. The stream is classified as cold-cool water fish habitat. The reach near the headwaters had moderate oxygen readings and a moderate water quality concern score while the reach at the confluence with the Carp River had the lowest oxygen readings and the highest conductivity results.

The main cause of the water quality concern rating at the upper reach is that flows were quiet low during the summer survey reducing the oxygenation of the water. The area where the Carp A tributary outlets to the Carp River likely experiences some mixing of waters which resulted in the low oxygen reading and high conductivity results. Within 100 m upstream of this point levels were more suitable. Further assessment for trends and potential causes will have to be done on a variety of water chemistry variables as MVCA continues to monitor the Carp A Tributary.

**Table 6: Summary Of City Stream Watch Results for Carp A 2019**

| Sample Variable | Results Summary |
|---|---|
| Number of Sections Surveyed | 6 |
| Average Stream Width (m) | 2.10 |
| Average Stream Depth (m) | 0.36 |
| Average Hydraulic Head (mm) | 11 |
| Average Water Temperature (˚C) | 17.2 |
| Average Conductivity (µS/cm) | 525.1 |
| Average pH | 9.42 |
| Average Dissolved Oxygen Concentration (mg/L) | 9.41 |
| Average Dissolved Oxygen Saturation (%) | 97.35 |
| # of Areas of Water Quality Concern with a Poor Score | 1 |
| Dominant Adjacent Land Uses | Active Agriculture |
| % Channel Alterations | 83% Highly Altered |
| % Vegetated Riparian Buffer Width (>30 m) | Left Bank 2%, Right Bank 0% |
| % Overhanging Trees & Branches >40% Section Coverage | Left Bank 17%, Right Bank 20% |
| % Stream Shading >40% Section Coverage | 0% |
| % of Undercut Banks >60% Section Coverage | 100% |
| Dominant Substrate Type | Clay, Gravel |
| Sub-Dominant Substrate Type | Clay, Sand |
| # Sections with a Habitat Complexity Score ≥3 variables | 0 |
| Dominant In-stream Morphology | 90% Runs |
| Dominant In-stream Vegetation Types | Narrow-leaved Emergent |
| Dominant Amount of In-stream Vegetation | None |
| Thermal Class | Cold-Cool |
| Migratory Obstructions | 0 |
| # of Identified Invasive Species | 6 |
| Potential Stewardship Activities | Garbage clean ups, buffer enhancements |
| # Head Water Drainage Features Sampled | 2 |

### *How Does This Information Get Used?*

The City Stream Watch Program is an excellent monitoring program that allows MVCA to assess the condition of subwatersheds over time. Stewardship activities in areas that need further work are completed and improve the health of the ecosystem.

MVCA uses stream surveys to target specific areas that need restoration work. Stream garbage clean ups are carried out, blockages are removed, and shoreline planting, erosion control and habitat enhancements are organized.

**MVCA is always looking for volunteers to help with monitoring and stewardship programs!**

**Call 613-253-0006 ext. 234, if you are interested.**

Volunteer projects that are carried out as a result of the City Stream Watch Program are:

- Planting trees and shrubs along the shoreline
- Removing invasive plant species
- Stream garbage clean ups
- Learning about and participating in monitoring the streams
- Learning about and participating in fish sampling and wildlife identification
- Learning about and participating in benthic invertebrate sampling and identification
- Participating in nature photography

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The City Stream Watch Collaborative is made up of: Rideau Valley Conservation Authority, Mississippi Valley Conservation Authority, South Nation Conservation Authority, The City of Ottawa, National Capital Commission, Ottawa Flyfishers Society, Ottawa Stewardship Council, Rideau Roundtable, and the Canadian Forces Fish and Game Club.