Black Creek Water Quality Report

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Friends of Fort Erie's Creeks

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2024: Serenity Poirier

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Executive Summary

Introduction

Friends of Fort Erie's Creeks (FOFEC) is a non-profit organization dedicated to the preservation and restoration of ecosystems fostering continuous resilience within the fragile ecosystems found within and adjacent boundaries of the Fort Erie Watershed. FOFEC follows within their mandate to achieve continuous environmental monitoring, restoration, and education. Interventions, awareness, and cooperative efforts amongst government agencies, and peer organizations, industry, and people help FOFEC to protect and serve the community year after year.

Creeks and other waterways, particularly headwater streams, are vital components of a healthy hydrological system. Headwater streams makeup for most (~70-80%) river networks and are critical components of biodiversity, ecosystem functions, and human society and culture (Wohl, 2017). Furthermore, it is emphasized that small streams have significant influence on downstream rivers by influencing sediment and nutrient transportation mechanisms, providing habitat, and creating migratory corridors for both aquatic and semi aquatic biota (Wohl, 2017). This is relevant to the local area, formerly known as the Bertie Township—now a part of the Town of Fort Erie, this area "lack[s] in local relief" whereas the topography is described to be a level lake plain. Paired with these areas dominant clay and loam soil type this highlights the poor drainage and essential role that creeks play in managing water flow (Lewis, 1964).

Black Creek is a significant waterway that flows through Fort Erie, and its health is crucial for the local ecosystem. As the largest stream in the area, it is part of a complex drainage system that includes other tributaries—Beaver Creek, Frenchman's Creek, Miller Creek, and Six Mile Creek, all which drain into the Niagara River. This report, conducted as part of the Canada Summer Jobs program, presents the findings of a focused water quality study on Black Creek during the summer of 2024 and 2025. The data collected will provide a baseline understanding of the creek's current conditions, which will inform future conservation and restoration efforts.

Purpose of Study

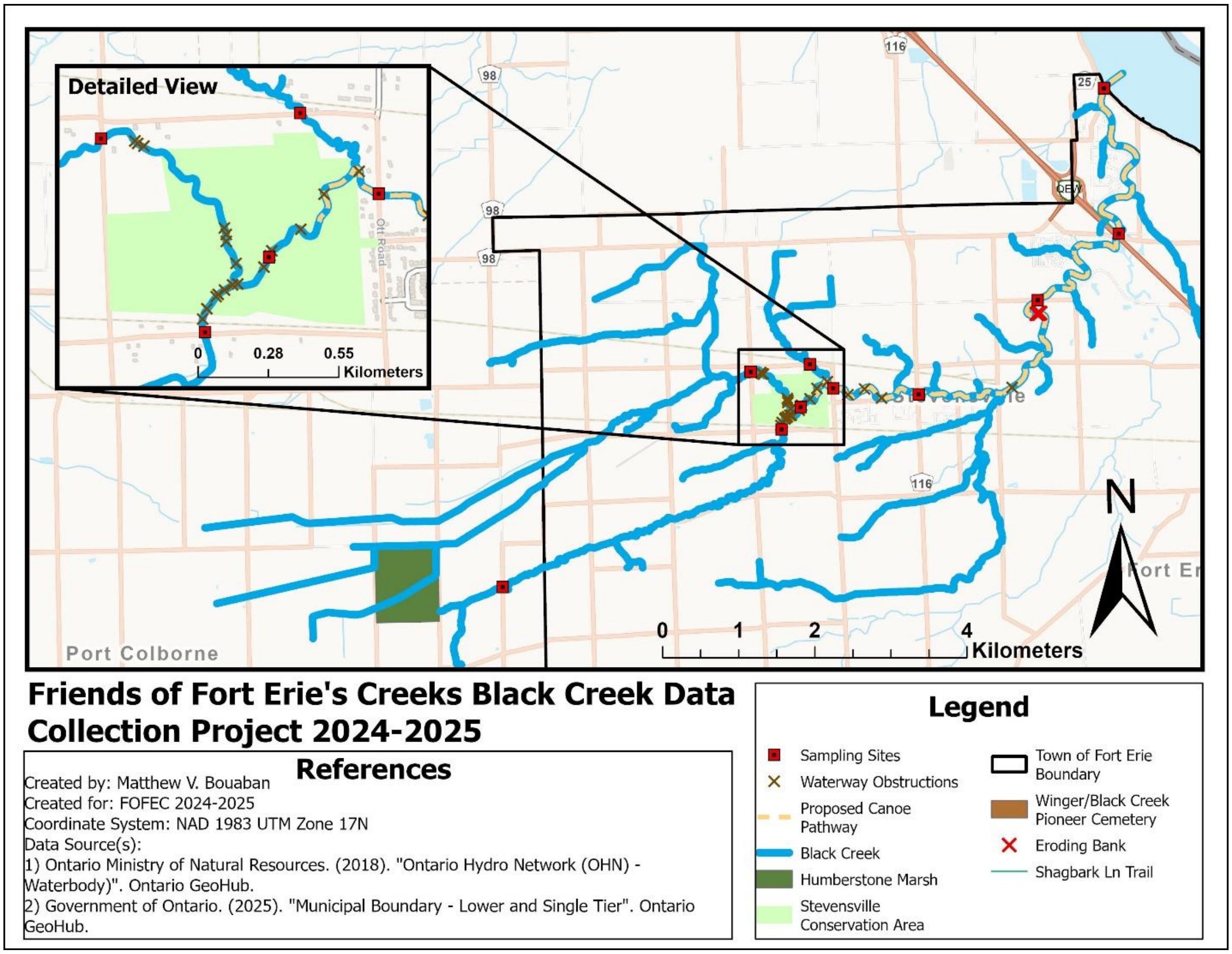
The Friends of Fort Erie's Creeks (FOFEC), as part of a larger community initiative, conducts yearly monitoring of local waterways. The purpose of this 2024-2025 Black Creek Water Quality Report was to monitor contaminants, document physical blockages, and gather supplementary data on physical parameters and water chemistry. The information gathered will be used as supporting evidence in future proposals for the restoration of Black Creek to its natural state, including potential development of recreational canoeing pathway, and long-term monitoring and management of the Creek.

Scope of Study

Weekly field observations were conducted on sites along the primary pathway of Black Creek, from its source to its mouth. Additionally, three sites were chosen at the entry point of the Stevensville Conservation Area (SCA) to gather data on potential long-term impact and significance of conservation areas on water quality.

SECTION 1

Site Location and Description



This section provides a detailed description of the ten sites selected for the Black Creek study during the 2024 and 2025 field seasons. The site selection was based on a variety of factors including accessibility and the presence of distinct environmental characteristics. It is important to note that due to the dynamic hydrological conditions of the creek and limitations in time and resources, not all sites were revisited in the 2025 field season. The data presented will therefore reflect observations from the year(s) in which each site was surveyed.

Section one covers the geographical location of the selected sites, in addition descriptions of primary observations and supplementary information

1.1 Site 1: Source Waters (2024-2025)

Site 1 is the furthest southwest sampling point, located on Zavitz Road Port Colborne, Ontario. Situated within the Humberstone Marsh, this location is the source of the water of Black Creek (Niagara Peninsula Conservation Authority, 2008). This site is approximately 5 km upstream from the next designated sample site near the Stevensville Conservation Area. The original plan to sample 800m further upstream within the Humber Marsh Conservation Area was abandoned after initial site visits revealed no water present.

Site Details

This site can be accessed just north of 2703 Zavitz Rd at the culvert.

Geospatial Coordinates: NADA83(CSRS) 42.9234460, -79.1222326

Location: Zavitz Road, Port Colborne, Ontario

Environmental Observations

Hydrological Dynamics: Significant variation in water depth and flow were observed between initial measurements and subsequent sampling after extreme rain fall events on July 9-10, 2024. This suggests water flow is highly susceptible to weather-related changes. Blockages and obstructions were also noted within the culvert, which may impede natural water flow. The following 2025 summer the wetted width and bankfull width were the same level suggesting slow drainage.

Flooding & Land Use: Residents have reported issues with flooding in the area and regional discussions about converting the natural creek into a 3m x 3m municipal drain to manage water flow and support future development.

Flora and Fauna: The site is characterized by dense vegetation, typical of a wetland environment. Tree coverage is minimal, with prominent growth of grasses, shrubs, and herbaceous plants. The presence of invasive phragmites and duckweed was noted, though the specific species of duckweed requires further investigation. The area provides habitats for various wildlife, with observations of painted turtles and frogs, and muskrat sightings.

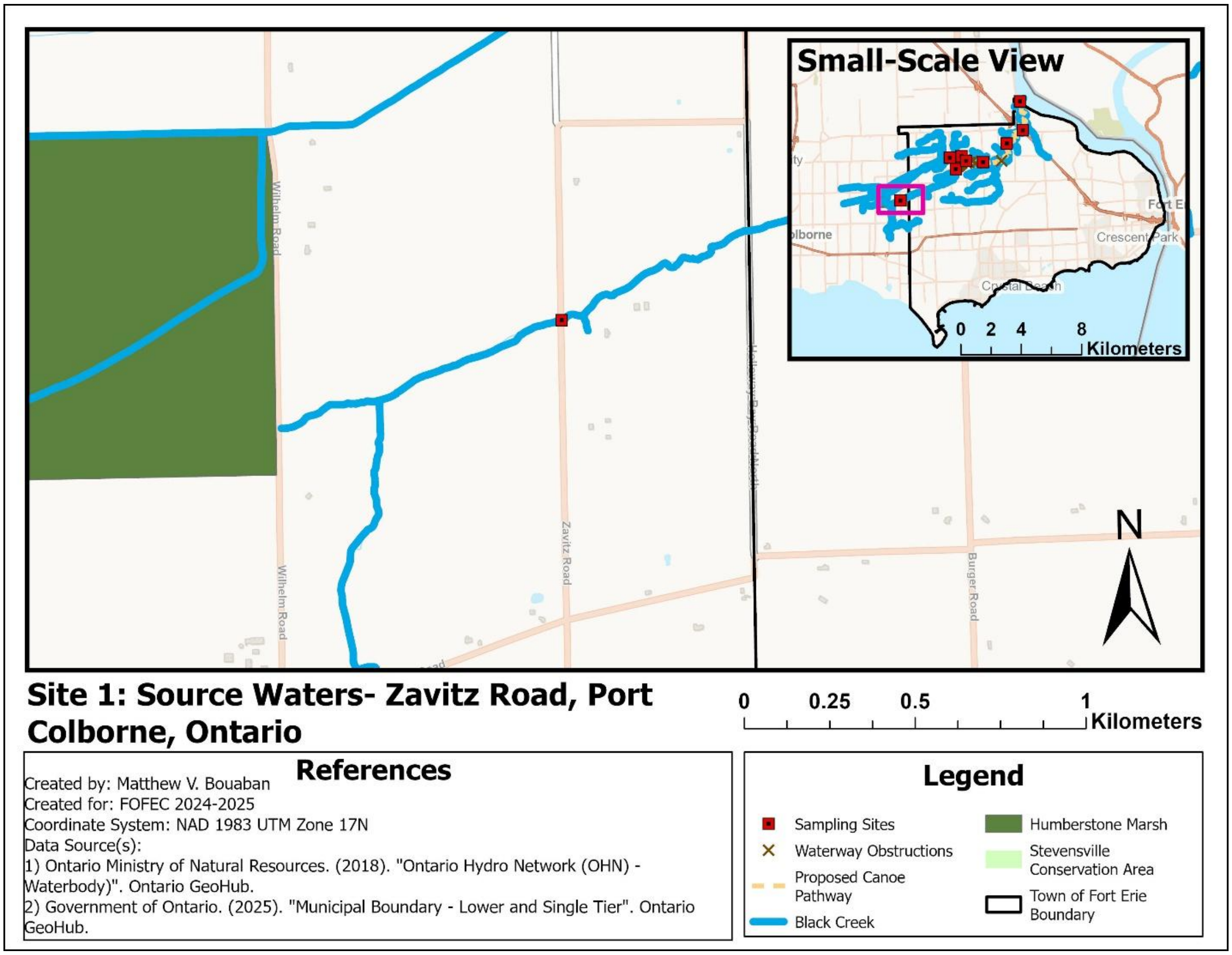


Figure 1. *This map displays Site one the source waters adjacent to the Humberstone Marsh and right outside the Township of Fort Erie.*

1.2 Site 2: Stevensville Conservation Area West Point (2024-2025)

Site 2 is located on House Road, just outside the northwest corner of the Stevensville Conservation Area (SCA). This site is on a tributary of Black Creek that connects directly to the headwaters in Humberstone Marsh. The creek segment at this site flows northeast, meandering south to connect with the main watercourse flowing toward the Niagara River.

Site Details

The access point for this site is located adjacent and in between 2700 House Road and 4475 Fox Road. There is a high culvert and a steep slope downhill to the creek.

Geospatial Coordinates: NADA83(CSRS) 42.948251, -79.081535

Location: House Road, Stevensville, Ontario

Environmental Observations

Watercourse Obstructions: During a creek walk, the team encountered significant blockages starting approximately 150m downstream from the site and recurring every ~20m. These consisted of three major obstructions, beyond which the creek became impassable, limiting further observations.

Flora and Fauna: The site features a variety of short and tall grasses, which quickly transition into a tree-covered landscape further downstream towards the SCA. There was a presence of Round Goby (*Neogobius melanostomus*) jumping into the canoe. A few deceased Round Goby were also observed floating in the culvert near the sample site.

2025 Observations: In 2025, a sign was placed at the sample site indicating pesticide spraying in the area (Refer to Appendix B, Figure 25). Additionally, the team observed that there was no water flowing across the culvert into the SCA.

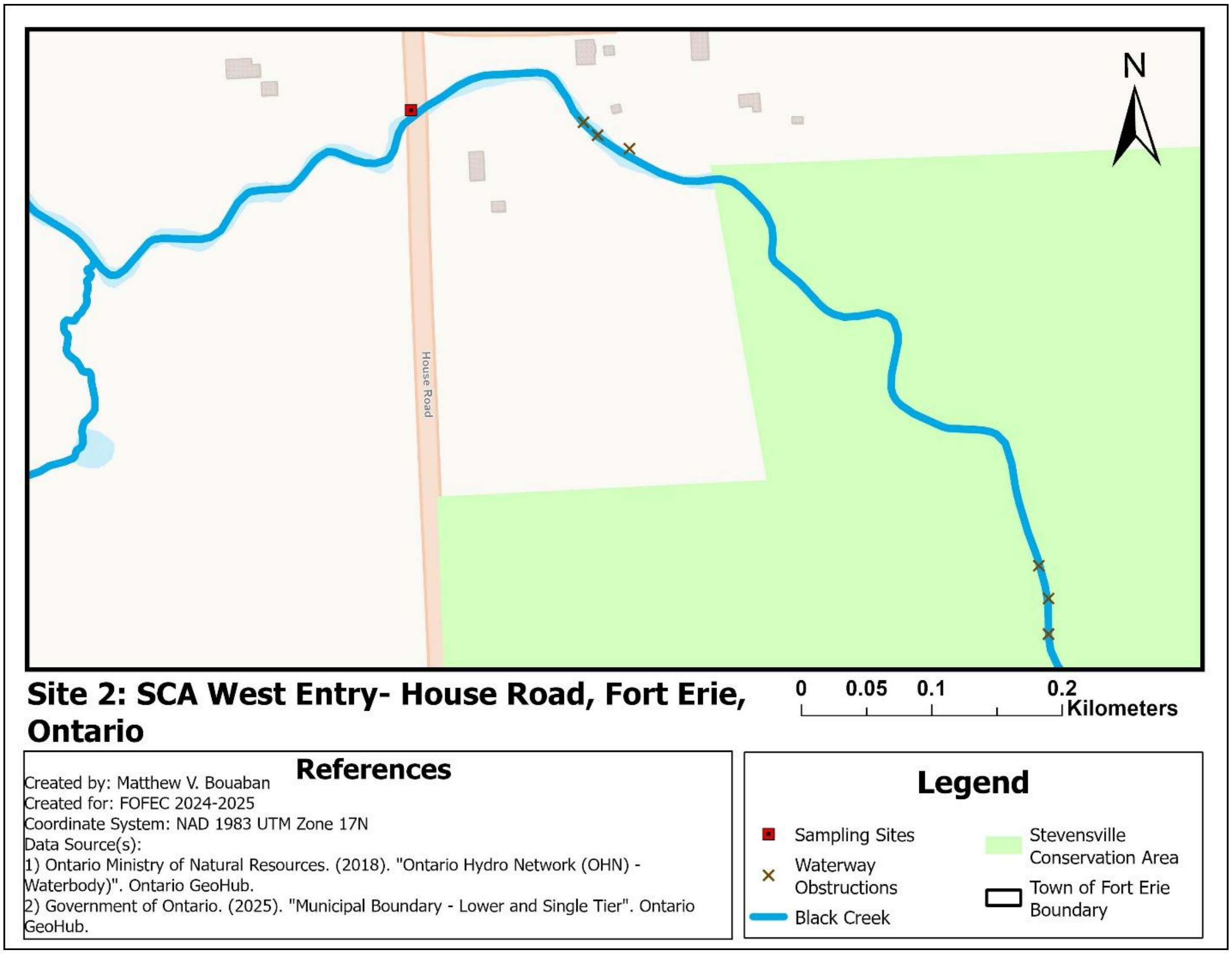


Figure 2. *West Entry to the SCA this segment of Black Creek was heavily obstructed and could not be accessed beyond the first three obstructions*

Note: The Round Goby (Neogobius melanostomus) is a highly invasive species in Southern Ontario. It is known to cause significant ecological impacts by out-competing native species and altering ecosystems (Government of Ontario, 2024).

1.3 Site 3: Stevensville Conservation Area South Point (2024-2025)

Site 3 is located on Church Road in Stevensville, south of the SCA.

Site Details

Access to this site requires carefully descending a steep incline from the roadside. Across from 4335 Church Road.

Geospatial Coordinates: NADA83(CSRS) 42.941354, -79.07677

Location: Church Road, Stevensville, Ontario

Environmental Observations

Adjacent Landscape: The creek runs south through residential properties (4335 and 4265 Church Road), connecting to the same segment of the main watercourse that originates in Port Colborne. The landscape is divisible by the road: the south side features short grass fields and rural residential area, while the north side is a typical forest environment.

Flora and Fauna: The site exhibits diverse wildlife. Noteworthy observations include a variety of fauna—birds, frogs, turtles, and snakes. As summarized in the table below, the presence of invasive species like Goldmoss Stonecrop (*Sedum acre*) and Common Buckthorn (*Rhamnus cathartica*) was also noted.

2025 Observations:

Hydrological Dynamics: At the beginning of the summer on July 15, 2025, the creek had sufficient water to observe a Yellow Perch (*Perca flavescens*). However, when the team returned to the site directly after slight precipitation on August 11, 2025, to collect water samples, there was almost no water running through this stream segment into the conservation area.

Fauna: In addition to the newly observed Yellow Perch there were several Round pigtoe (*Pleurobema sintoxia*) an endangered status freshwater mussel of Ontario (Government of Ontario, 2014).

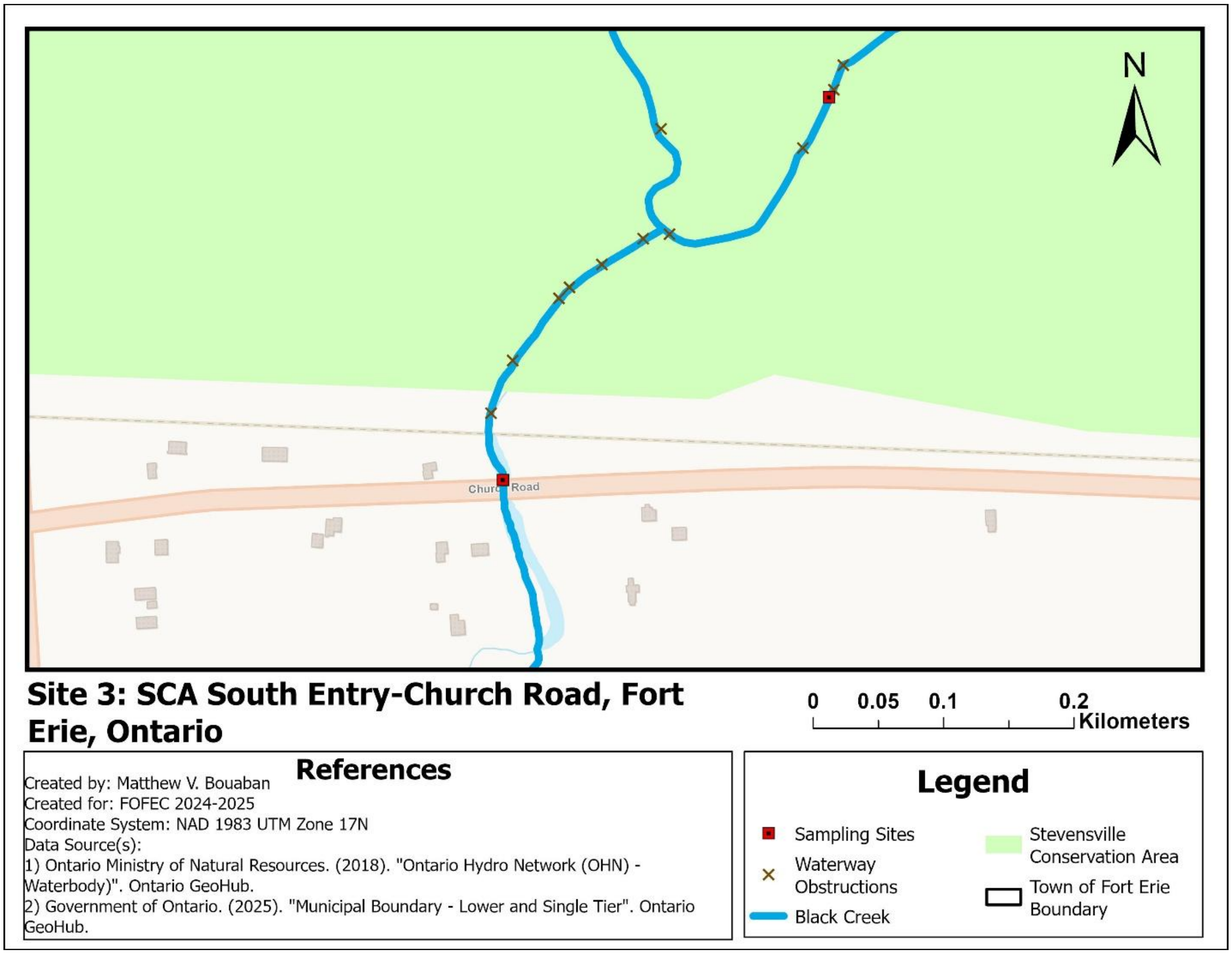


Figure 3. *The south entry point to the SCA is part of the main watercourse directly connected to the source waters.*

1.4 Site 4: Stevensville Conservation Area North Exit Point (2024)

The fourth sample site is located on Fox Road, north of the SCA. This site is on a short tributary of Black Creek that spans to the north and ends near Netherby Road.

Site Details

This site can only be accessed through dense brush and down a steep slope. Additionally, this site is very hard to locate as it is not directly visible from the road. It is found directly adjacent to 4200 Fox Road property line.

Geospatial Coordinates: NADA83(CSRS) 42.948986, -79.071974

Location: Fox Road, Stevensville, Ontario

Environmental Observations

Observed Water Absence: Due to the absence of water during the mid-project survey (late July-August 2024), the team could not conduct a second round of water quality tests. The cause, whether drought or obstruction of this tributary, is unknown. Further investigation of the north is advised.

Note: This site was not selected for the 2025 field season due to the persistent lack of water, making it unsuitable for continued hydrological observation.

1.5 Site 5: Stevensville Conservation Area East Exit Point (2024-2025)

Site 5, on Ott Road, is part of the main waterway that flows out of the SCA towards the mouth of Black Creek.

Site Details

This site is extremely difficult to access, located beneath the road bridge only way to access is descending loose rocks into the creek.

Geospatial Coordinates: NADA83(CSRS) 42.946083, -79.068305

Location: Ott Road, Stevensville, Ontario

Environmental Observations

Hydrological Dynamics: The creek at this site becomes notably shallow as it exists the SCA. In the 2025 season, there was sufficient water at the start of the study. However, after conducting water quality analysis following a period of slight precipitation, there was little to no water running through this segment of the direct watercourse.

Creek Bed: Unlike the other eastern sample sites, which had clay and loose sediment creek beds, this site’s creek bed is composed of dense stone and rock material.

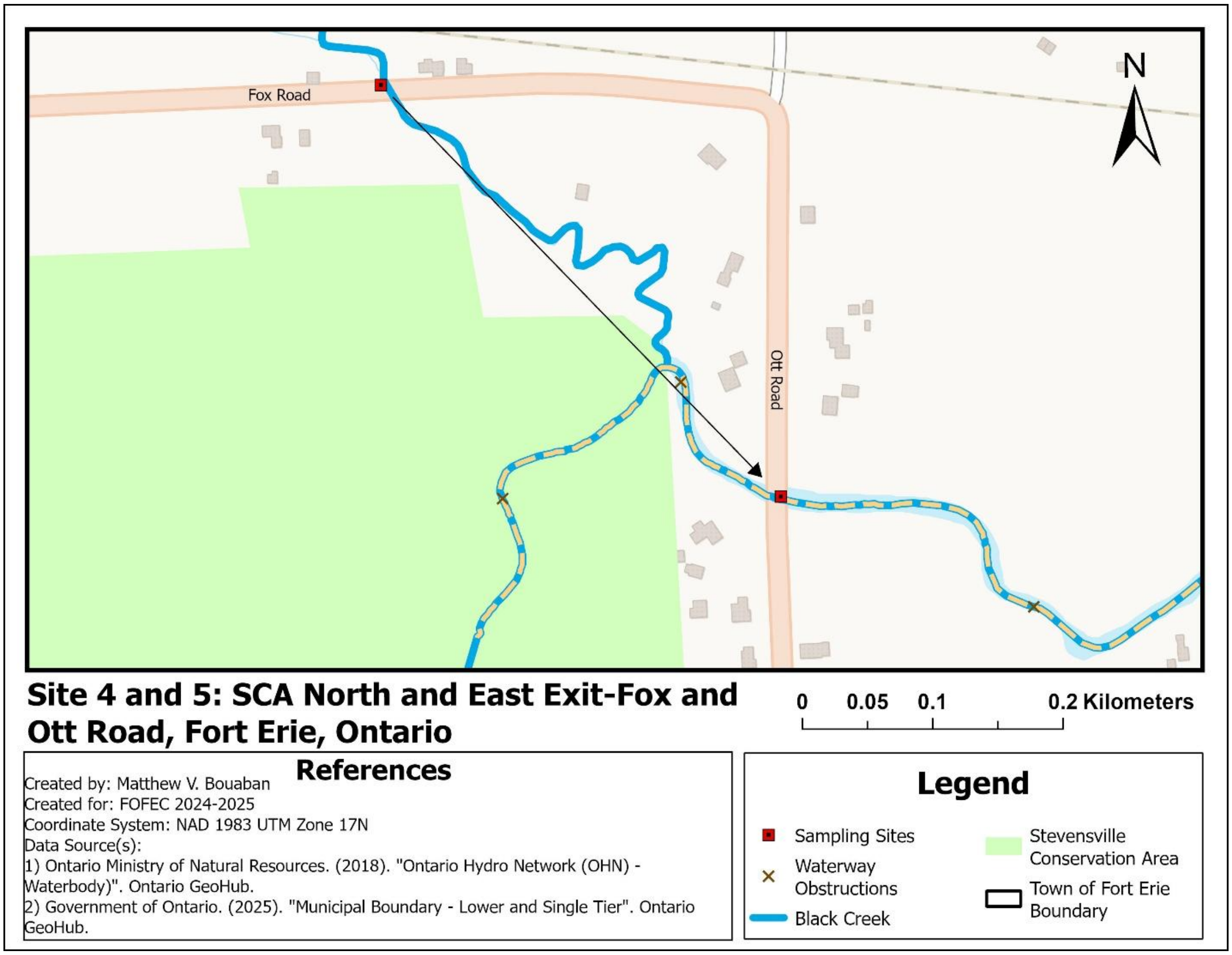


Figure 4. *Site 4, on Fox Road half-way through the 2024 season had no water, sampling took place on Ott Road instead of Site 5. Revisiting in 2025 there continues to be an absence of water on Fox Road.*

1.6 Site 6: Stevensville Road (2024)

Located in the heart of Stevensville, Black Creek runs beneath Stevensville Road.

Site Details

Physical access to this site is easy, with a direct path from the road down to the creek.

Geospatial Coordinates: NADA83(CSRS) 42.945131, -79.05457

Location: Stevensville Road, Stevensville, Ontario

Environmental Observations

Adjacent Land Use: Given its public location, this site is easily accessible and has noticeable amount of residential and commercial activity along the creek.

Surrounding Features: Just north of the sample site, a Black Creek tributary runs into Safari Niagara Zoo, while the Stevensville Wastewater Station is to the east.

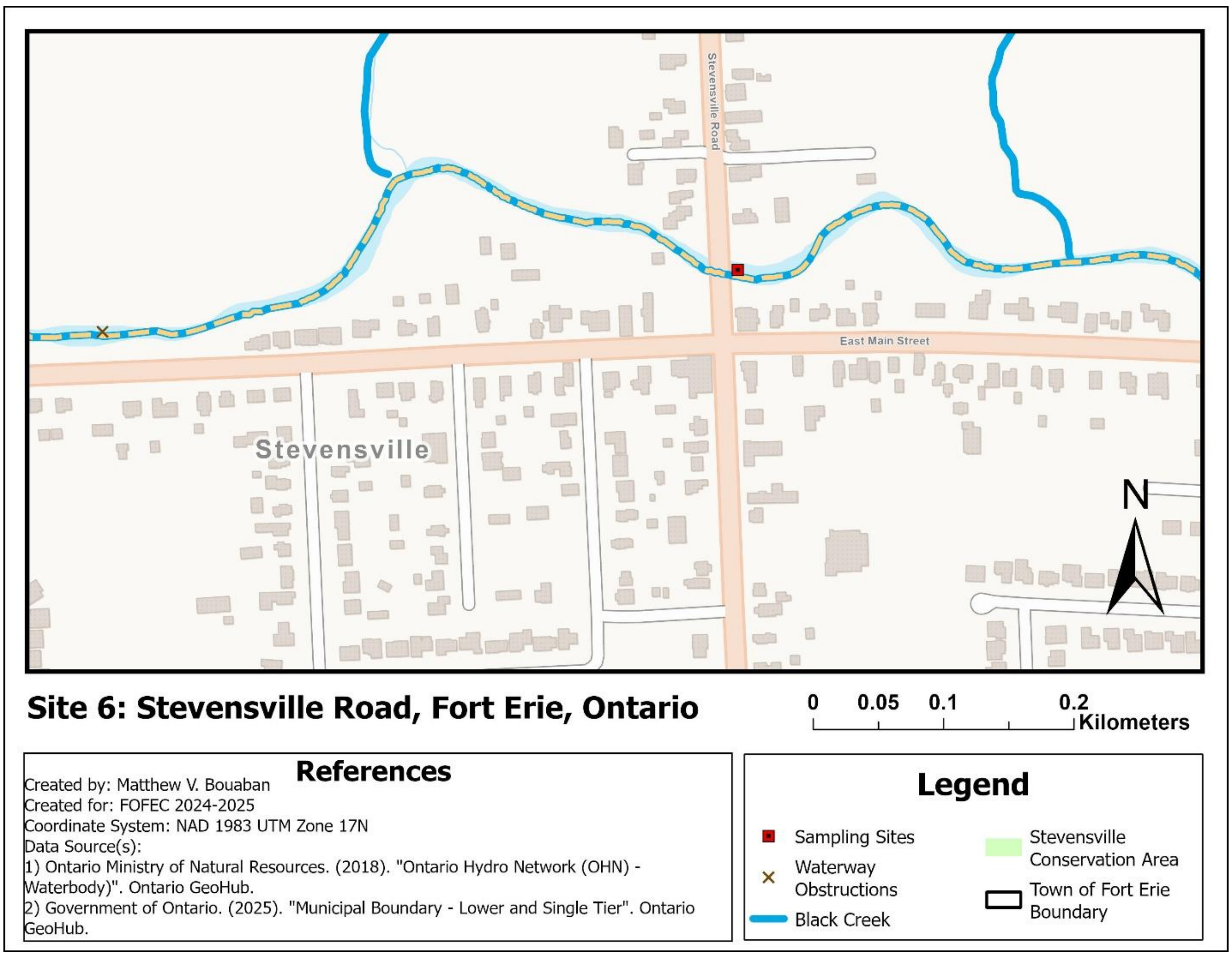


Figure 5. *Due to limited time and resources during the 2025 field season, and therefore, only the 2024 data will be used for this location.*

1.7 Site 7: College Road (2024-2025)

Site 7 is adjacent to the Niagara National Golf and Country course. The creek at this location was notably deep, requiring the use of a canoe for the collection of physical parameters in 2024.

Site Details

Water sample collection is possible by following the path through the field of the south-side of the road across from the golf course.

Geospatial Coordinates: NADA83(CSRS) 42.955953, -79.035053

Location: College Road, Fort Erie, Ontario

Environmental Observations

Hydrological Dynamics: This was one of the few sites on the creek that was too deep to be walked, requiring the use of a canoe for parameter records.

Creek Bank Erosion: A significant observation was the presence of a small cemetery tucked in the back of the field adjacent to the creek bank, with noticeable erosion.

Adjacent Land Use: This site's proximity to the Niagara National Gold and Country course indicates recreational land use, in addition the neighboring grass fields along the creek are also maintained with routine grass cutting.

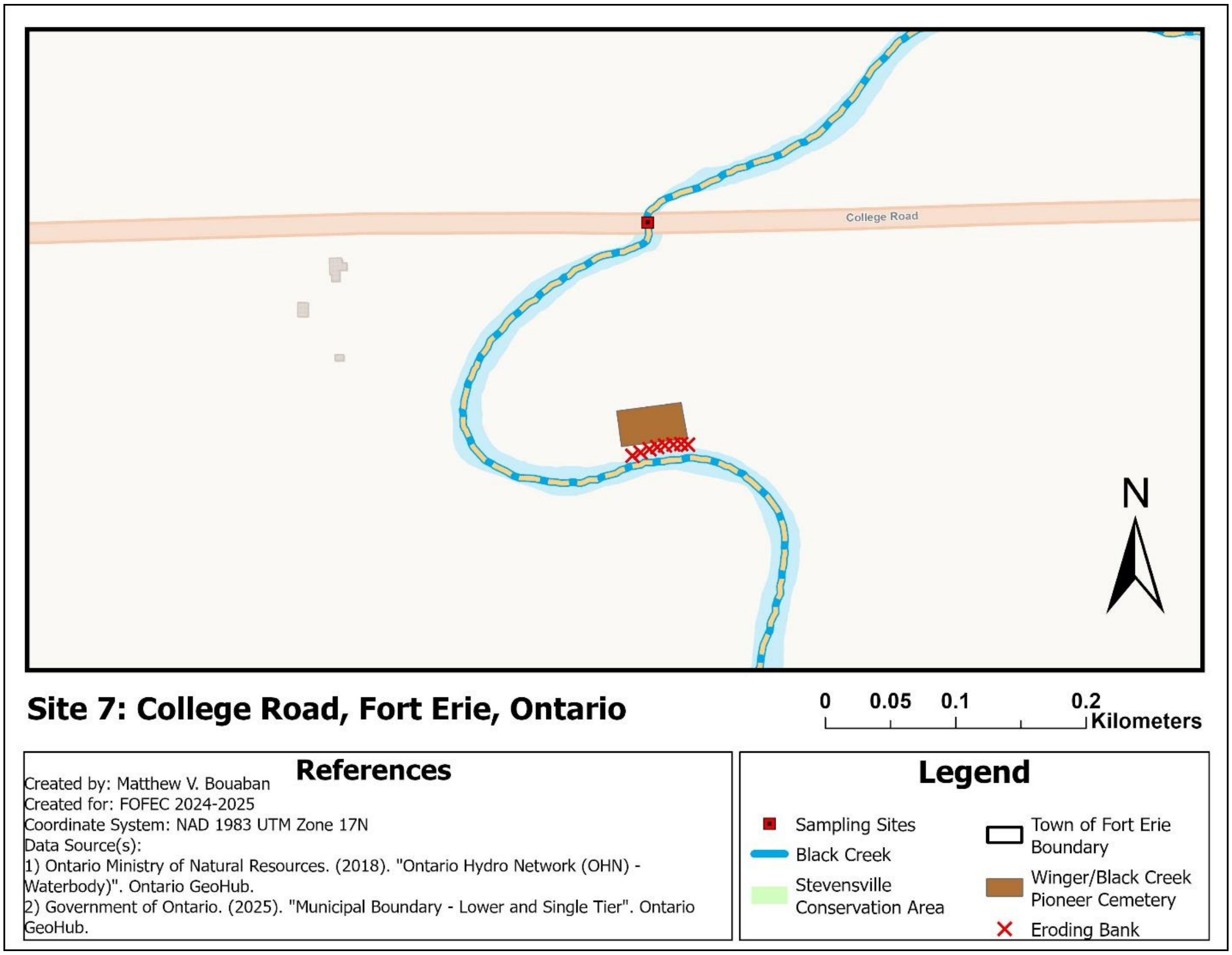


Figure 6. *South of the Black Creek Cemetery there is heavy bank erosion.*

1.8 Site 8: Shagbark Lane (2024-2025)

Site 9 is in an area with a trail (Shagbark Ln trail) running alongside the creek. This site shows a significant amount of residentials and recreational activity, as evidenced by numerous docks and boats. The creek at this location runs directly under and alongside the Queen Elizabeth Way (QEW).

Site Details

This site can be easily accessed from the trail next to the parking lot.

Geospatial Coordinates: NADA83(CSRS) 42.963597, -79.021741

Location: Shagbark Ln, Fort Erie, Ontario

Environmental Observations

Adjacent Land Use: This site is heavily influenced by human activity, with many residential properties, docks, and boats directly on the creek's edge. A public trail also runs along the waterway.

Infrastructure: The creek's proximity to the Queen Elizabeth Way (QEW) is a notable environmental factor for this site.

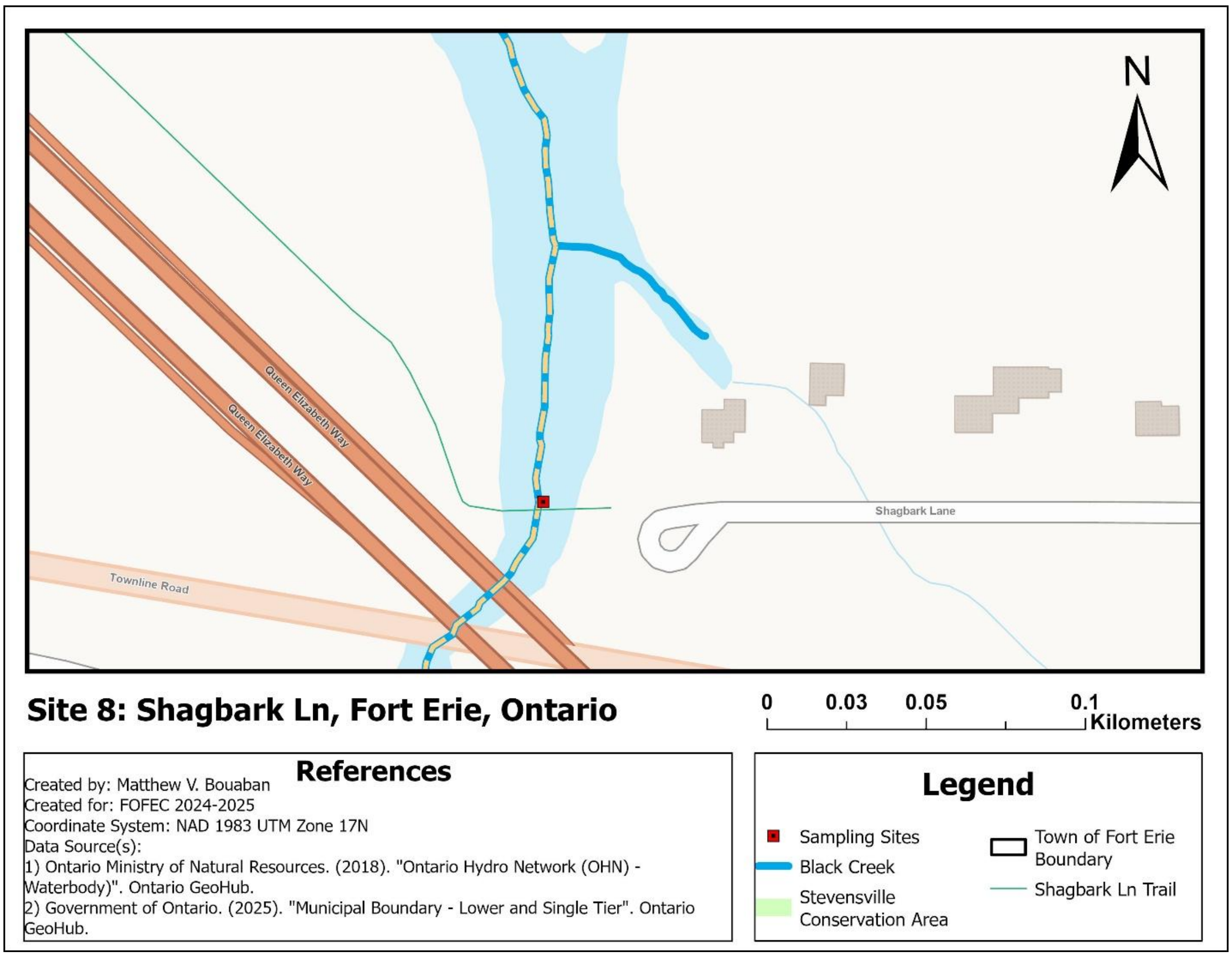


Figure 7. *Shagbark Ln site has heavy agricultural and residential land use adjacent.*

1.9 Site 9: Niagara Parkway—Mouth and Niagara River (2024-2025)

This site is the final point of the creek before it drains into the Niagara River, making it a crucial confluence in the watershed. The location is heavily used for recreational purposes, with a significant amount of fishing activity observed.

Site Details

This site can be accessed from a short distance from the parking lot along the Niagara River Parkway.

Geospatial Coordinates: NADA83(CSRS) 42.980843, -79.023578

Location: Niagara River Parkway, Fort Erie, Ontario

Environmental Observations

Water Quality: A notable observation at this site was the significant difference in water appearance. In contrast to the murky, cloudy, brown water observed throughout the rest of the creek, the water at this mouth was significantly clearer and had a transparent blue-green hue.

Recreational Use: The site experiences heavy recreational use, primarily for boating and fishing.

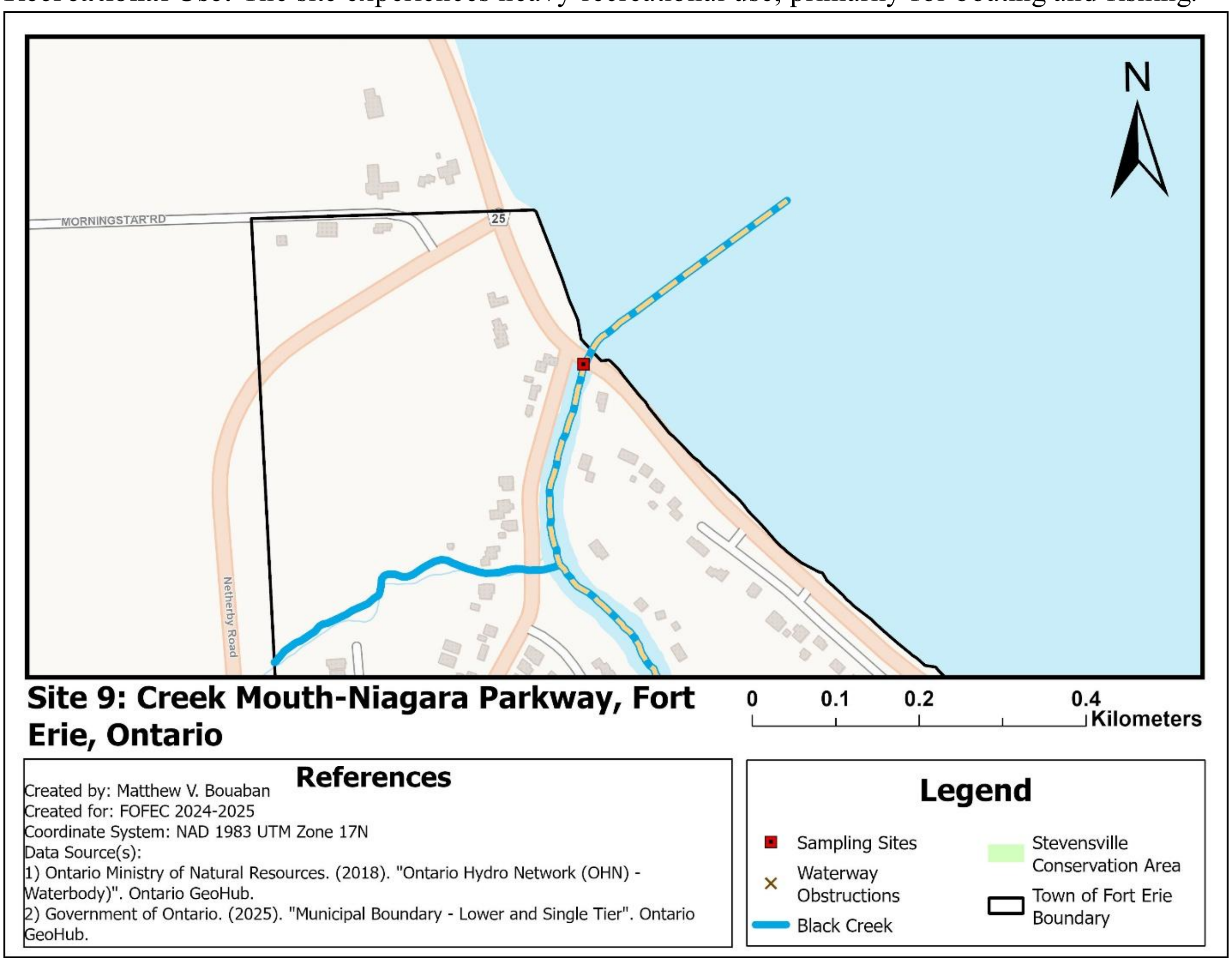


Figure 8. *The site is the final point of Black Creek that enters Lake Erie.*

1.10 Site 10: Stevensville Conservation Area (SCA) (2024-2025)

Site Details

Geospatial Coordinates: NADA83(CSRS) 42.943657, -79.073861

Location: 2555 Ott Rd, Fort Erie, Ontario

Environmental Observations

Located within the Stevensville Conservation Area, Site 10's stream characteristics include numerous fallen trees and debris within the channel. Water depth variations were observed at this site following storm events in 2024. The surrounding area features a man-made pond parallel to the creek.

2025 Observation: A significant new waterway obstruction was completely restricting flow, resulting in an absence of water under the bridge at the time of sampling.

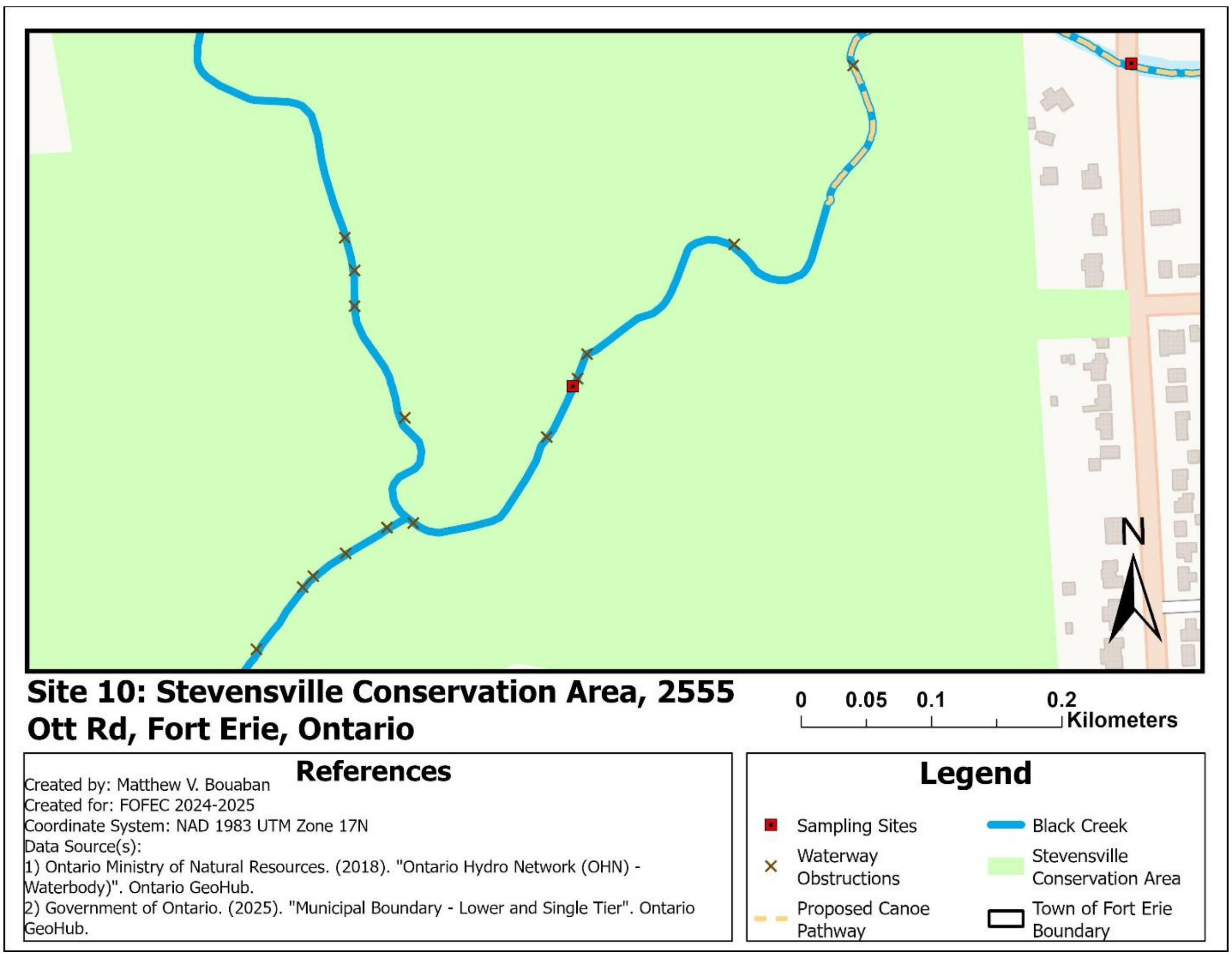


Figure 9. *All segments of Black Creek that run throughout SCA are difficult to maneuver caused by soft clay beds, sudden variation and change in depth, and fallen logs and trees.*

SECTION 2

Methodology and Literature Review

This section outlines the procedures, methods, and parameters focused on during this study. In addition, there is a brief literature review that explains the importance of each parameter on the overall creek ecosystem.

2.0 Research Methodology

This longitudinal field-based study assessed water quality and collected environmental observations at ten sites along Black Creek, ranging from its source waters to its mouth at the Niagara River, and mid-way points such as Stevensville Conservation Area (SCA). The project involved repeated sampling during two-month period from July to August in both 2024 and 2025 field seasons. The assessment focused on both physical and chemical parameters.

2.1 Physical Parameters

An examination of each site's physical parameters was conducted at the beginning of the two-month water analysis study. These parameters helped to establish a baseline condition for the creek and provided insight into the factors influencing the chemical results and differentiating between natural and human-induced impacts. The data collection was divided into three primary procedures which include: the use of a ProDSS Multiparameter Digital Water Quality Meter to measure multiple parameters simultaneously, a velocity meter to measure depth and velocity, and direct measurements of wetted and bankfull width at each creek site.

2.2 ProDSS Multiparameter Digital Water Quality Meter

The ProDSS Multiparameter Digital Water Quality Meter is field instrument that measures specific water quality parameters based on its equipped sensors. During this study, the following parameters were measured:

2.2.1 Conductivity and Temperature

Conductivity was measured using ProDSS Multiparameter Digital Water Quality Meter and recorded in microsiemens per centimeter (μS/cm). For the purpose of comparing the data to Canadian guidelines, the conductivity readings were converted to a Total Dissolved Solids (TDS) using a general conversion:

$$TDS\left(\frac{mg}{L}\right) = k \times EC\left(\frac{\mu\text{S}}{\text{cm}}\right)$$

Where the conversion factor, k, is 0.64 for unknown chemical composition of natural waters. This formula allows for the comparison of field data to the Canadian guideline for TDS, which as an aesthetic objective (AO) of ≤ 500 mg/L (Health Canada, 2025).

Temperature was also measured simultaneously, as it is a fundamental parameter that affects other variables, such as the magnitude for the water to dissolve ions, intensity of pH, and a shared relation to dissolved oxygen (DO).

2.2.2 pH

pH is the measurement of hydrogen ion activity within a solution, expressed on a negative logarithmic scale. The pH scale ranges from 0-14, with a pH of 7.0 being neutral (refer to Figure 9). Solutions with a pH <7.0 are acidic, while those >7.0 are alkaline (basic).

pH is a crucial parameter because it directly impacts the health and stability of aquatic ecosystems. A change of just one pH unit represents a tenfold change (x10) in acidity or alkalinity, making pH levels outside the 6.5 to 9.0 range detrimental to freshwater ecosystems. Furthermore, pH influences the solubility and toxicity of many substances, such as heavy metals, which can become more dangerous in either highly acidic or highly alkaline conditions (Canadian Council of Ministers of the Environment, 1999).

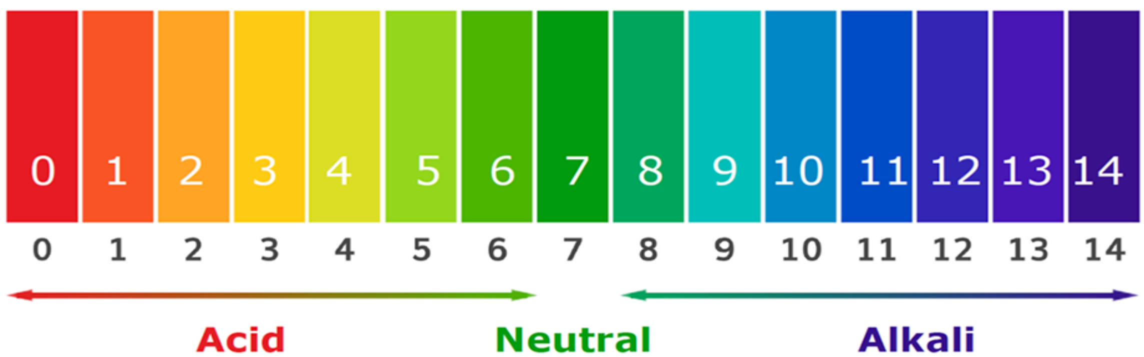


Figure 10. *pH scale retrieved from Water Quality Solutions Team (2018).*

2.2.3 Dissolved Oxygen (DO)

Dissolved Oxygen (DO) is the dissolve atmospheric oxygen within water. This is the primary source of oxygen for all aquatic life and serves as one of the most crucial parameters to be monitored. DO is heavily dependent on multiply factors including the flow of water, aquatic vegetation, and temperature. Dissolved oxygen can be measured as both a percent (%DO) and as mg/L, and the range of a healthy freshwater ecosystem should acquire concentrations 6.5-8 mg/L and/or 80-120% (Government of Northwest Territories, n.d.; Canadian Council of Ministers of the Environment, 1999).

2.2.4 Turbidity

Turbidity is the measurement of clarity, determined by the amount of suspended particulate matter in the water. High turbidity is characterized by cloudy or murky water and restricts sunlight from penetrating the water column. This parameter is a significant indicator of ecosystem health because it can cause hypoxic conditions by reducing photosynthesis in aquatic plants, and it can physically harm aquatic organisms by clogging gills or impacting their ability to find food. Turbidity is commonly measured in Formazin Nephelometric Units (FNU) or Nephelometric Turbidity Units (NTU), which quantify the scattering of light by these suspended particles (YSI, n.d.).

2.3 Nutrient Sampling

Nutrient samples were collected at various points at each of the ten sites. All materials used for sampling were pre-rinsed and sterilized. Samples were either immediately tested on-site or transported in a dark cooler with ice for later analysis within the hour.

The chemical parameters examined were phosphate, nitrate, and chloride—measuring concentrations relative to the creek's ambient water. Each chemical was test duplicated, and the average of the two measurements was used for the analysis. The YSI 9300 Photometer was zeroed using an unaltered creek sample from the same location to serve as a blank, ensuring accuracy and consistency in the readings.

2.3.1 Chloride

Chloride ions, such as those found in sodium chloride (NaCl) and potassium chloride (KCl), are naturally occurring and are present in the lithosphere and underground salt deposits in Canada. While the lowest concentrations of chloride in Lake Ontario and Lake Erie were recorded in 1985 and 1995, there has since been steady increase in chloride concentrations since (Health Canada, 2024).

While chloride is a naturally occurring ion, high levels of chloride in waterways can be related back to intensive erosion—often because of unmanaged and altered natural riparian zones; extensive development of impermeable landscapes affecting the natural hydrological cycle and leading to significant flash flooding. And/or paired with runoffs from road salts, industrial waste, sewage, or agricultural fertilizers.

While chloride is a naturally occurring ion, high levels in waterways can be a significant health concern for aquatic ecosystems and plant life due to increased water salinity. Elevated salinity can be toxic to freshwater wildlife (British Columbia Ministry of Environment, 2017) and can hinder a plant's ability to absorb water. High chloride levels are often linked to human activities such as road salt runoff, industrial waste, and sewage, and agricultural fertilizers. Additionally, they can be caused by increased erosion from unmanaged riparian zones and extensive development of impermeable landscapes, which alter the natural hydrological cycle and leads to significant flash flooding.

2.3.2 Chloride Procedure

To measure chloride levels, colorimetric measuring was used with reagent tablets and observed using a spectrophotometer. This method helped us assess the potential human impact on the water ways. Chloride concentrations were determined using a photometer with the Phot 51 method. Due to the high sensitivity of the instrument, samples were subjected to a 1:10 dilution prior to analysis. This resulted in an effective detection limit of 10mg/L for field samples. Values below this limit were record as "less than" (<<), and a proxy value of 5mg/L (half the detection limit) was used for data analysis and graphing.

2.3.3 Phosphorus

Phosphorus is a crucial nutrient for all living organisms and is often the limiting nutrient in freshwater—nutrients that are in low supply, reducing the productivity of organisms. This means that the availability of phosphorus in the surface waters has a direct correlation and control on the growth of aquatic plants and most importantly algae. While essential for a healthy ecosystem, excessive amounts of phosphorus can lead to eutrophication, a process where a body of water becomes overly enriched with nutrients. This can result in algal blooms, which consume dissolved oxygen as they die and decompose creating hypoxic (low oxygen) zones that increase fish mortality and disrupt the entire food web. Sources of excess phosphorus in waterways often include runoff from fertilizers and manure, urban areas, and wastewater discharges (Environment and Climate Change Canada 2023).

2.3.4 Phosphate Procedure (Phosphate to Phosphorus)

Phosphate concentrations were measured using a YSI 9300 Photometer with the Phot 28 method. The test procedures involved filling a test tube with a 10mL sample and adding one YSI Phosphate No 1 LR Tablet and one YSI Phosphate No 2 LR Tablet. The mixture was then allowed to stand for 10 minutes to ensure full color development before reading was taken. This method provided phosphate (PO_4) levels over a range of 0 – 4.0 mg/L, with detection limit of 0 mg/L. For later analysis, the phosphate (PO_4) values were converted to phosphorus (P) by multiplying the reading by 0.33 (YSI Inc., 2023).

Total phosphorus was measured in milligrams per liter (mg/L). For the purpose of this analysis, these values were converted to micrograms per liter (µg/L) by multiplying them by 1000. This conversion was necessary to compare the collected data against the historical baseline established by the Niagara Peninsula Conservation Authority (NPCA) for Black Creek.

The Canadian guidance framework for phosphorus states that concentrations should not increase more than 50% over baseline levels (Canadian Council of Ministers of the Environment, 2004). This study utilizes the NPCA's average total phosphorus concentrations of 180 µg/L (recorded between 2007-2011) as a baseline to evaluate the water quality from 2024 and 2025. This approach allows for direct comparison to determine if the creek's phosphorus levels have increased over time, indicating a potential environmental issue (Niagara Peninsula Conservation Authority, 2012). Phosphorus in Black Creek was consistently graded "D" after 2012 until the most recent 2023 report, suggesting minimal change in baseline.

2.3.5 Nitrate

Nitrate ions derived from multiple anthropogenic discharges, which can be classified as point-source (e.g., wastewater) and non-point source (e.g., agricultural runoff, feedlots, septic beds, and fertilizers). Alternately, there are organic forms of nitrogen produced through natural processes like decomposition of organisms. These organic forms are broken down into inorganic nitrogen compounds, such as ammonia (NH_3) or ammonium (NH_4^+), through a process called ammonification (Canadian Council of Ministers of the Environment, 2012). These then undergo nitrification to become nitrite and eventually (NO_2^-) nitrate (NO_3^-).

Although nitrate is less toxic than other nitrogen compounds, it can still be toxic to aquatic life through two different mechanisms: first, by reducing the capacity for blood to carry oxygen, and second, by altering an aquatic organism's ability to regulate its body's salt content (Canadian Council of Ministers of the Environment, 2012).

2.3.6 Nitrate Procedure

To measure nitrate levels, colorimetric measuring was used with reagents tablets and distillation, and the results were observed using a spectrophotometer.

2.4 Velocity, Width, and Discharge

To assess the hydrological dynamics of the creek, measurements of water velocity and channel morphology were conducted at each site. This data is critical for calculating water discharge and for characterizing the physical conditions of the waterway.

Discharge is the volume of water moving past a specific point a within a stream it can be calculated by the following:

$$Q = A \times V$$

$$Q = Discharge\left(\frac{m^3}{s}\right)$$
$$A = cross\ sectional\ area\ (m^2) = depth\ \times width$$
$$V = average\ velocity\ (\frac{m}{s})$$

Discharge is a significant calculation of any hydrological system; it can provide vital information about the speed and dispersal of contaminants within the water as well as significant differences that can relate to possible blockages or obstruction impeding water flow.

2.4.1 Velocity

A Global Water Flow Probe was used to measure the average velocity of the water. For each cross-section of the creek, a series of measurements were taken at two specific depths: 0.2 and 0.8 (20% and 80% of the total depth). These measurements from all segments were then averaged to obtain a precise average velocity for each segment. The instrument's equipped measurement scale also allowed for simultaneous depth reading.

Water velocity was measured using a Global Water Flow Probe with a range of 0.1-6.1m/s (Global Water Instrumentation Inc., 2009). For sites where flow was below the instrument's detection limit, a proxy value of 0.05 m/s (half the detection limit) was used for data plotting.

2.4.2 Width

Two distinct width measurements were taken at each site using a standard measuring tape:

Bankfull Width: This measurement determines the full channel capacity of the creek, representing the width of the channel at the highest point of flow before water spills.

Wetted Width: This measurement reflects the current level of the water and provides insight into the short-term hydrological conditions of the creek during the time of sampling.

2.5 Ontario Benthos Biomonitoring

Benthic invertebrates serve as important indicators of ecosystem health. To access the benthic community, invertebrates were collected at two specific sites: SCA and one site just outside the park on Ott Road (site 5). A fine D-net and the Kick-and-Sweep method were used to collect multiple samples by dislodging organisms from the stream and allowing them to drift into the net. The collected sediment was then passed through a tiered sieve. According to the *Ontario Benthos Biomonitoring Network (OBBN)*

Protocol Manual (2007), a minimum of 100-animal count is the target for successful samples. Due to an insufficient number of observed benthic invertebrates to meet this protocol, all remaining material was released back into the creek. Benthic analysis was not the primary focus of this study, as the low count suggested potential indicators of low productivity or environmental stressors.

SECTION 3

Results

This section presents the data collected during the 2024 and 2025 field-seasons for FOFEC's monitoring and data collection project on Black Creek.

3.0 Physical Parameters

3.0.1 pH

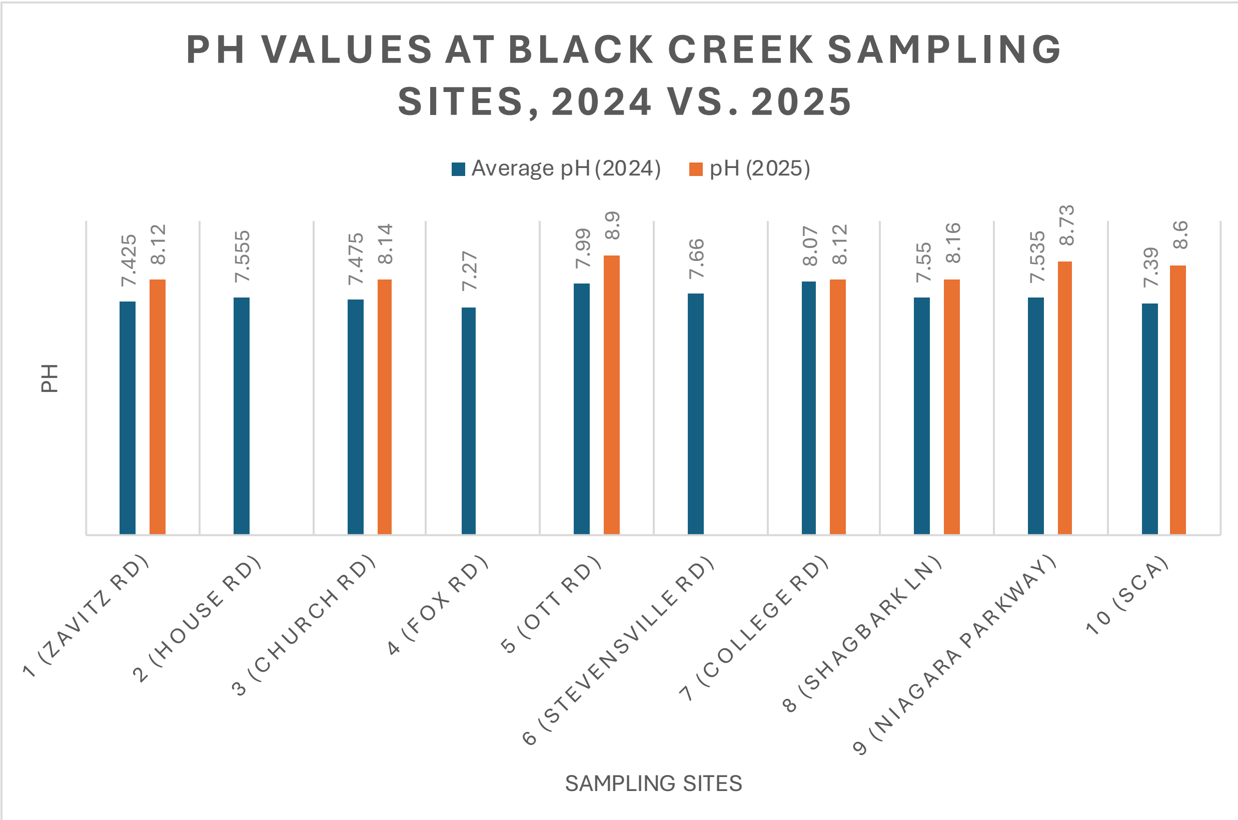


Figure 11. *pH Values at Black Creek Sampling Sites, 2024 vs. 2025. Data for site 4 (Fox Rd) was recorded as having no flow during 2025 and the second half of the 2024 season. Data for Site 6 (Stevensville Road) was not collected during the 2025 field season.*

The pH values measured at the ten sites along Black Creek showed a general increase in 2025 compared to 2024. In 2024, the pH ranged from 7.27 to 8.07, while in 2025, the range was 8.12 to 8.9. The Highest pH values for both years were recorded at Site 5 (Ott Road) and Site 9 (Niagara Parkway).

3.0.2 Dissolved Oxygen (mg/L)

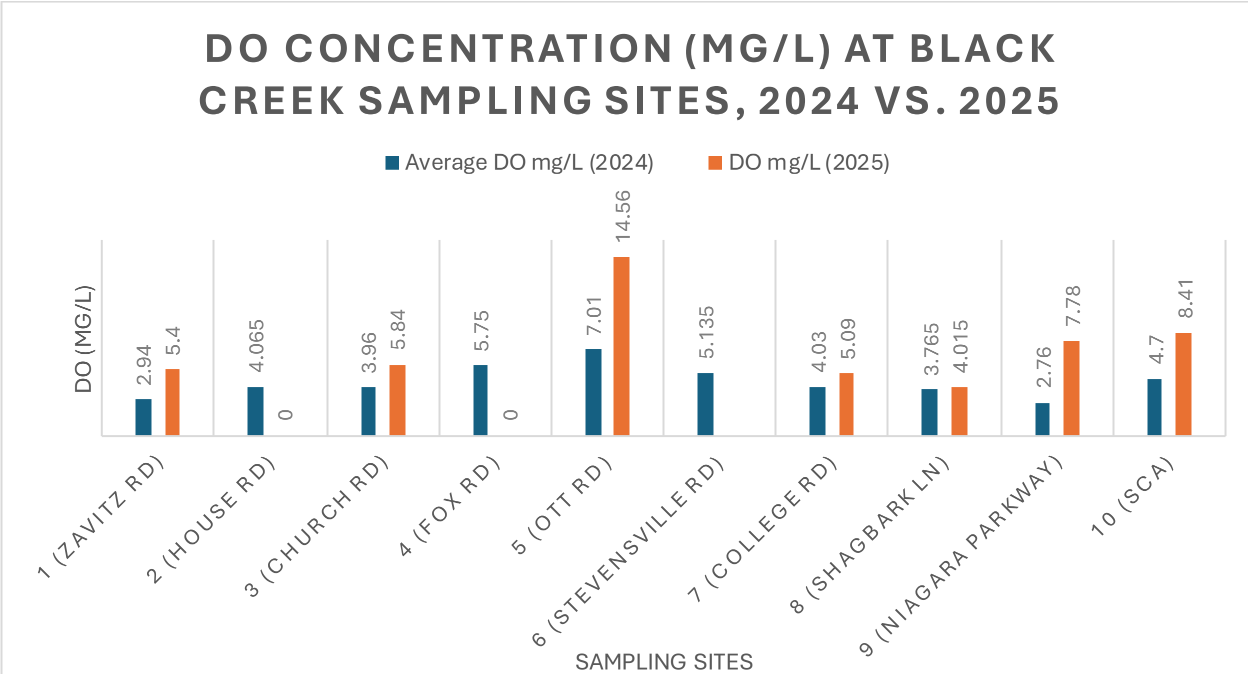


Figure 12. *DO concentration (mg/L) at Black Creek Sampling Sites, 2024 vs. 2025. This chart displays the average DO concentrations, showing a general increase in 2025 with a notably high record at Site 5 (Ott Rd). No data was collected for sites 2 and 4 in 2025 due to lack of flow.*

The dissolved oxygen (DO) concentration in Black Creek showed an increase in 2025 compared to 2024. In 2024, DO concentration ranged from a low of 2.94 mg/L at Site 1 to a high of 7.01 mg/L at Site 5. In 2025, the DO concentration was notably higher, ranging from a low of 5.09 mg/L at Site 7 to a high of 14.56 mg/L at Site 5/ No DO data was recorded at sites 2, 4 (no flow), and 6 (not a sample site) in 2025.

3.0.3 Dissolved Oxygen (%)

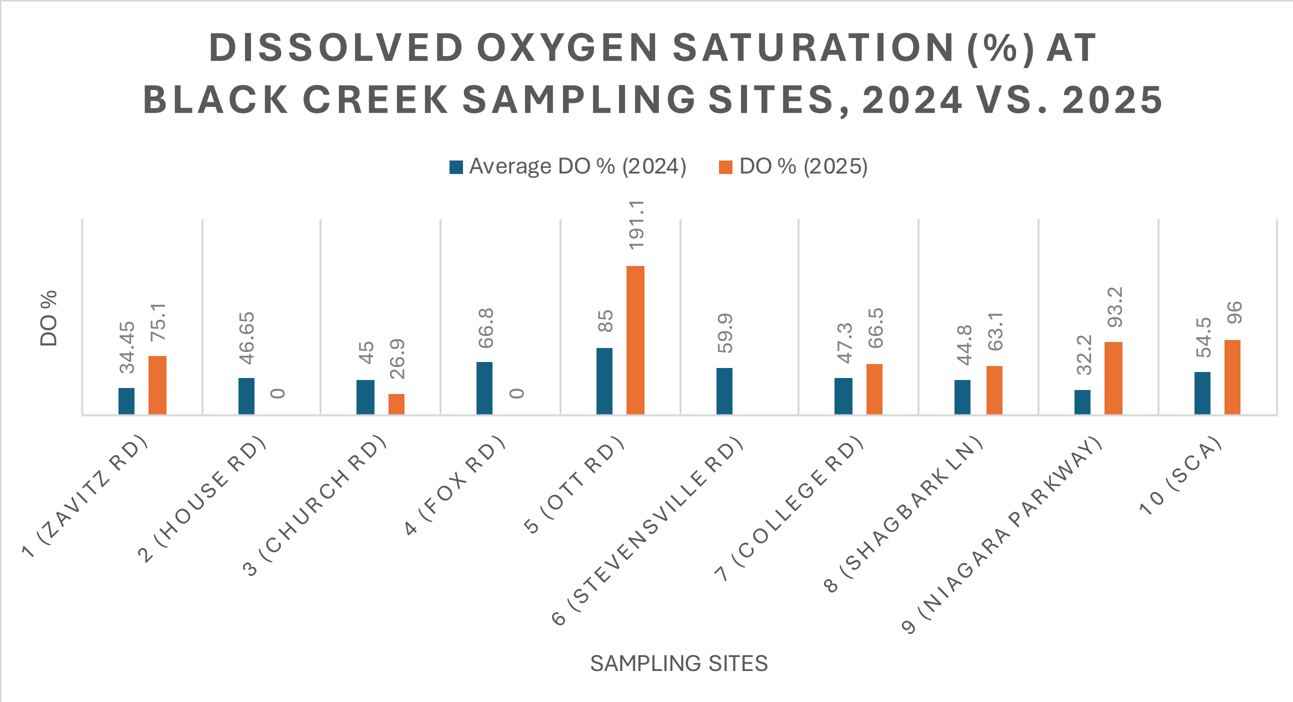


Figure 13. *Dissolved Oxygen Saturation (%) at Black Creek Sampling Sites, 2024 vs. 2025. This chart compares DO saturation levels, which also displayed a general increase in 2025. The measurement at Site 5 (Ott Rd) for 2025 is considered an outlier. No data collected at sites 2 and 4 in 2025.*

The DO oxygen saturation in Black Creek also showed a general increase from 2024 to 2025. In 2024, the saturation levels ranged from 32.2% at Site 9 to a high of 85% at Site 5. In 2025, the values were significantly higher, ranging from 26.6% at Site 3 to an extreme high of 191.1% at Site 5. As with the concentration data, no DO saturation was recorded for sites 2, 4, and 6 in 2025. The 191.1% value at Site 5 is considered a significant outlier and was excluded from the analysis due to potential error in the field.

3.0.4 Turbidity

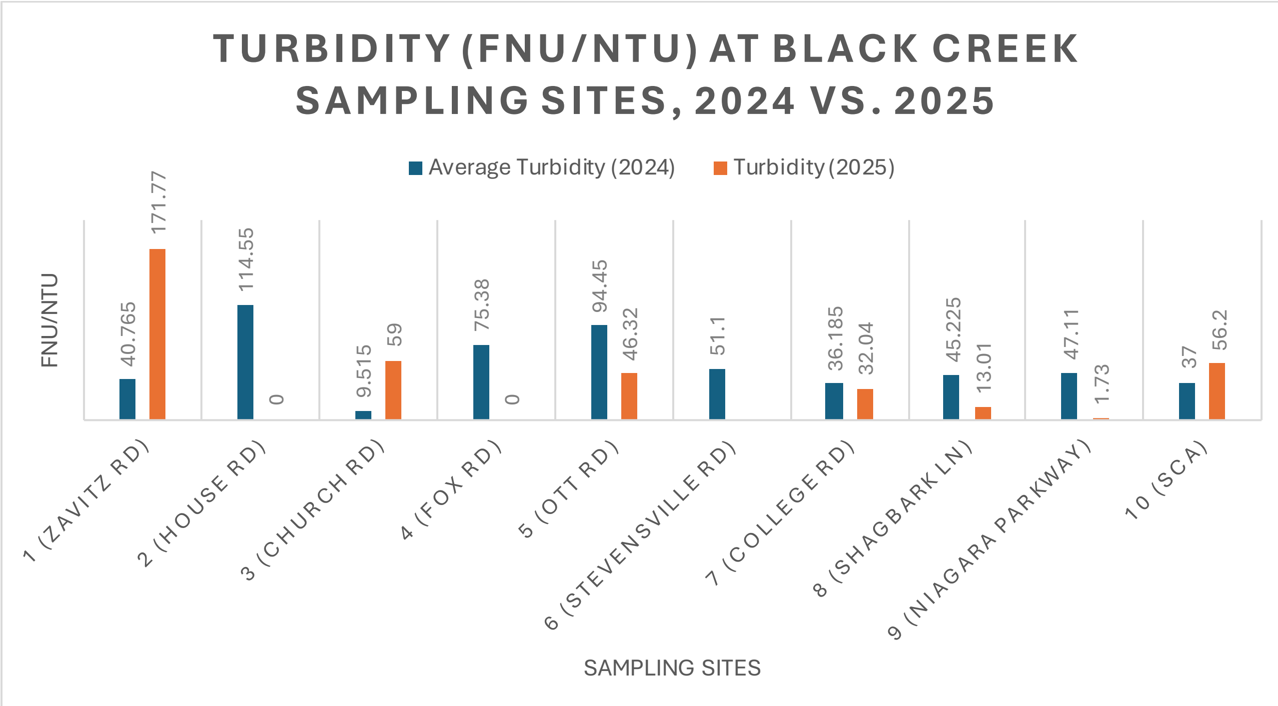


Figure 14. *Turbidity (FNU/NTU) at Black Creek Sampling Sites, 2024 vs. 2025. The chart displays the average turbidity, highlighting the wide range of values and significant year-to-year fluctuations. A dramatic increase was observed at Site 1 (Zavitz Rd), while turbidity dropped significantly at Site 9 (Niagara Parkway). No data for Sites 2 and 4 for 2025.*

Turbidity levels at the sampling sites showed significant variability and substantial changes between 2024 and 2025. In 2024, the average turbidity ranged from a low of 9.5 FNU/NTU at Site 3 (Church Rd) to a high of 114.55 FNU/NTU at Site 2 (House Rd). In 2025, turbidity ranged from 1.73 FNU/NTU at Site 9 (Niagara Parkway) to 171.77 FNU/NTU at Site 1 (Zavitz Rd). Notable decreases were observed at Site 5 (Ott Rd) and Site 9, while Site 1 had significantly increased.

3.0.5 Temperature

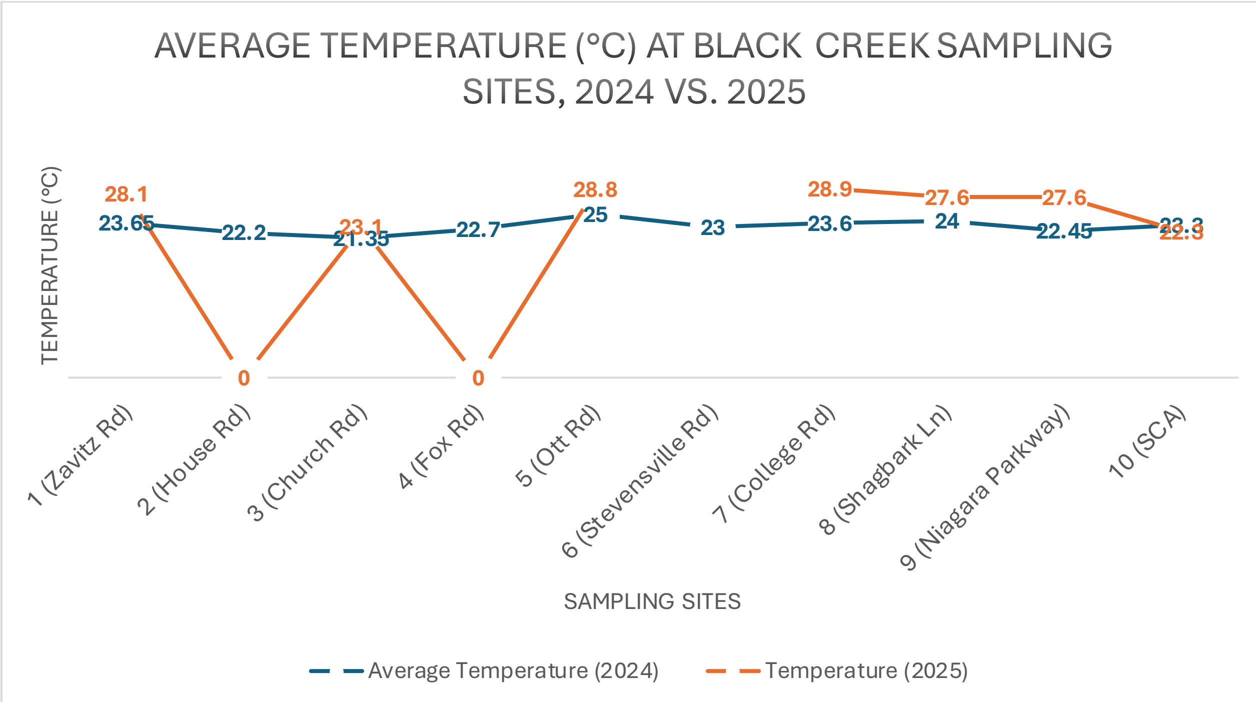


Figure 15. *Average Temperature (°C) at Black Creek Sampling Sites, 2024 vs. 2025. This chart displays the average water temperature, showing a consistent increase in 2025 values across most sites. The highest temperatures for both years were recorded at sites in the upper reaches of the creek. Zero-degree readings are representative of the Sites skipped and had no flow.*

The water temperature in Black Creek was generally higher in 2025 than in 2024. In 2024, the average temperature ranged from a low of 21.35°C at Site 3 (Church Rd) to a high of 25°C at Site 5 (Ott Rd). In 2025, the temperatures were consistently higher across most sites, with a range from 22.3°C at Site 10 (SCA) to a high of 28.9°C at Site 7 (College Rd.) Sites 2, 4, and 6 were not measured.

3.0.6 Conductivity

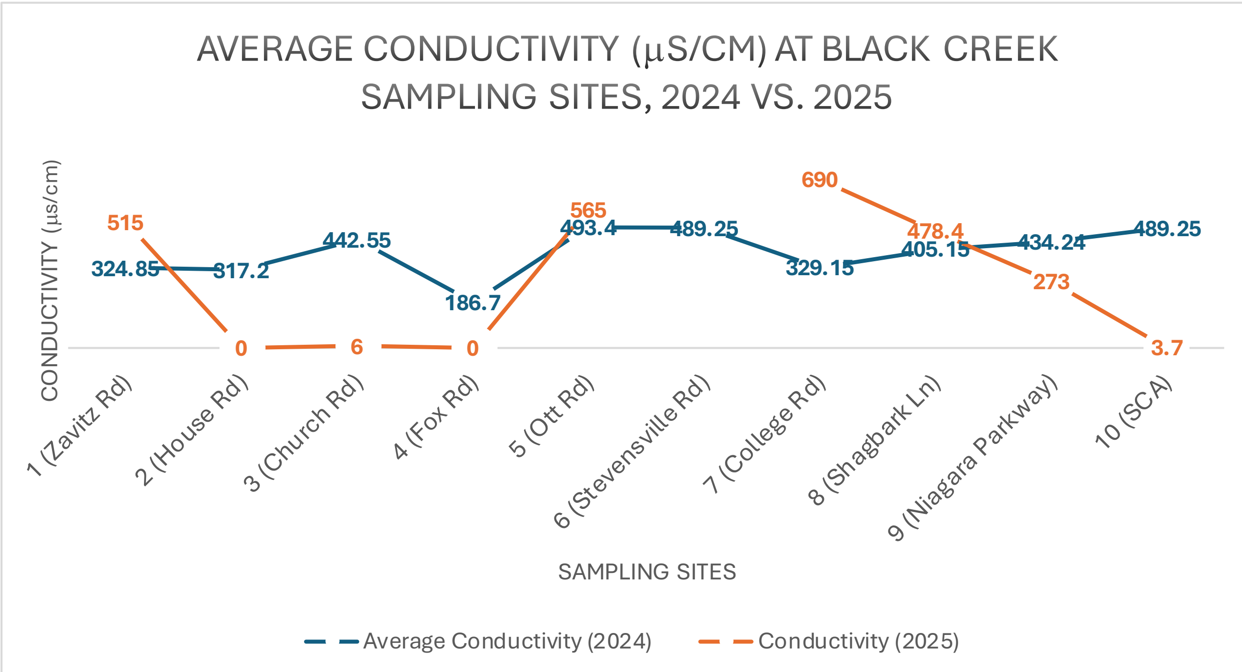


Figure 16. *Average Conductivity (µS/cm) at Black Creek Sampling Sites, 2024 vs 2025. This chart displays the average conductivity values, showing significant fluctuations between two years. A dramatic increase was observed at Site 7 (College Rd), while sites 2 and 4 readings were zero due to no waterflow.*

The electrical conductivity of Black Creek shoe significant changes between 2024 and 2025 field seasons, with a highly varied range in 2025. In 2024, the average conductivity ranged from a low of 186.7 µS/cm at Site 4 (Fox Rd) to a high of 439.4 µS/cm at Site 5 (Ott Rd). In 2025, the range was from 3.7 µS/cm at site 10 (SCA) to a high of 690 µS/cm at Site 7 (College Rd). Notable increases were observed at sites 1 and 7, while a significant decrease was recorded at Site 9.

3.1 Nutrient Sampling

3.1.1 Chloride

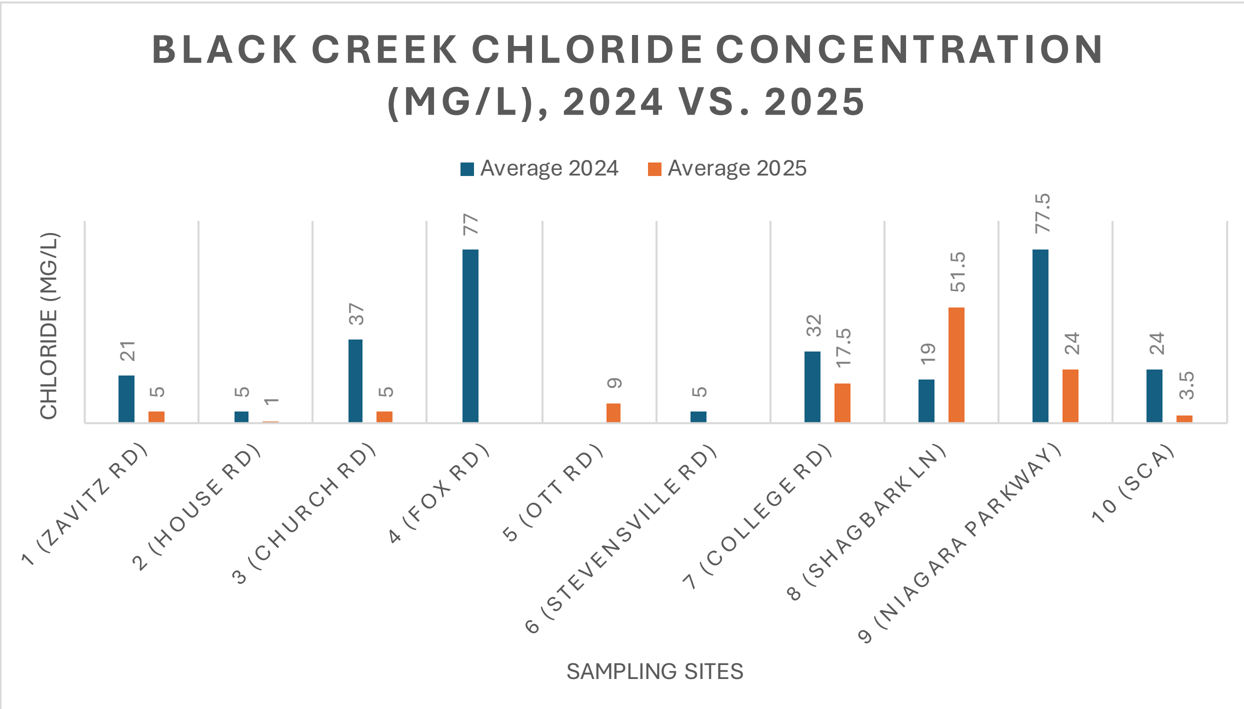


Figure 17. *Average Chloride Concentration (mg/L) at Black Creek Sampling Sites, 2024 vs. 2025. This chart displays chloride concentrations, which showed a general decrease in 2025 compared to 2024. A significant increase was observed at Site 8, while notable decreases were recorded at sites 1, 3, and 10.*

Based on the provided data, chloride concentrations in Black Creek generally showed a decrease from the 2024 to 2025 period. In 2024, chloride concentrations ranged from a low of 5 mg/L at Sites 2 and Site 6 to a high of 77.5 mg/L at Site 9. In 2025, a majority of the site showed lower concentrations, with significant decreases observed at Site 1 (from 21 mg/L to 5 mg/L), Site 3 (from 37 mg/L to 5 mg/L), and Site 10 (from 24 mg/L to 3.5 mg/L). However, Site 8 showed an increase in chloride concentration from 19 mg/L to 51.5 mg/L.

3.1.2 Phosphorus

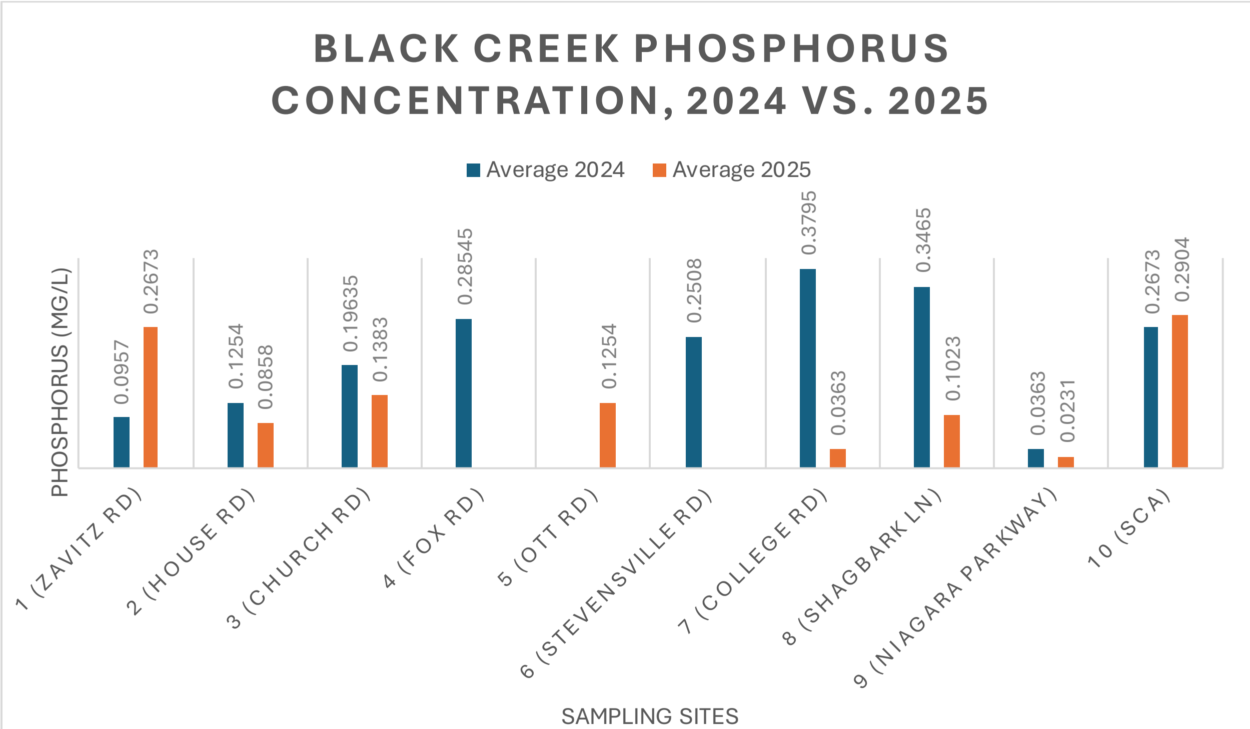


Figure 18. *Average Phosphorus Concentration (mg/L) in Black Creek, 2024 vs. 2025. This chart displays phosphorus concentrations, highlighting the dramatic variation between the two years. A significant increase was observed at Site 1, while notable decreases were recorded at sites 7, 8, and 9.*

Phosphorus concentrations in Black Creek varied significantly between sites and years, with no clear trend of overall increase or decrease. In 2024, concentrations ranged from a low of 0.0957 mg/L at Site 1 to a high of 0.3795 mg/L at Site 7. In 2025 there were dramatic variations. Site 1 saw a significant increase to 0.2673 mg/L, while sites 7, 8, and 9 showed decreases. Site 2 remained at a low concentration.

3.1.3 Nitrate

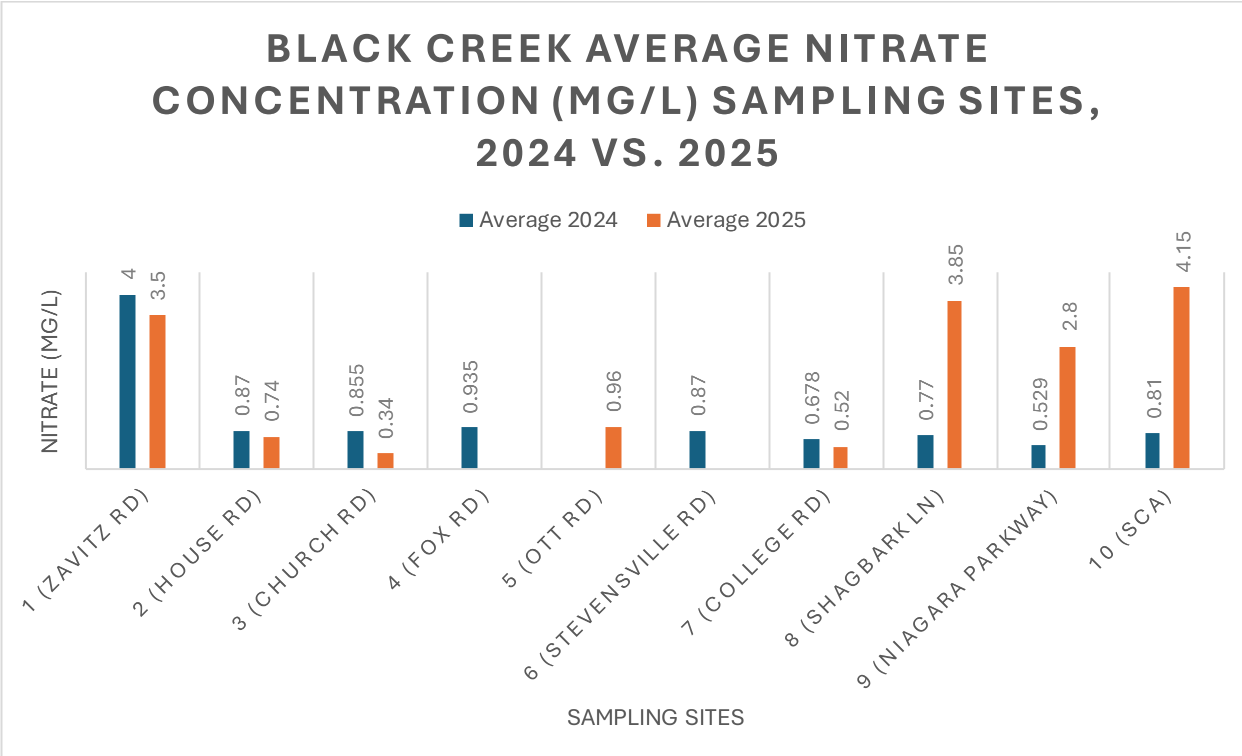


Figure 19. *Black Creek Average Nitrate Concentration (mg/L) Sampling Sites, 2024 vs. 2025. This chart displays nitrate concentrations, which showed general trend of increase in 2025 for most sites compared to 2025. Most notable observations were found at sites 8, 9, and 10 with the most significant increases in nitrate concentrations.*

Nitrate concentrations in Black Creek showed a general increasing trend from 2024 to 2025 at most sites. In 2024, concentrations ranged from a low 0.529 mg/L at Site 9 to a high of 4.0 mg/L at Site 1. In 2025, three sites experienced the most dramatic increases in nitrate concentrations: Site 8 increased from 0.77 mg/L to 3.85 mg/L, like Site 9 from 0.529mg/L to 2.8 mg/L, and Site 10 from 0.81 mg/L to 4.15 mg/L.

3.2 Hydrological Measurements

3.2.1 Velocity

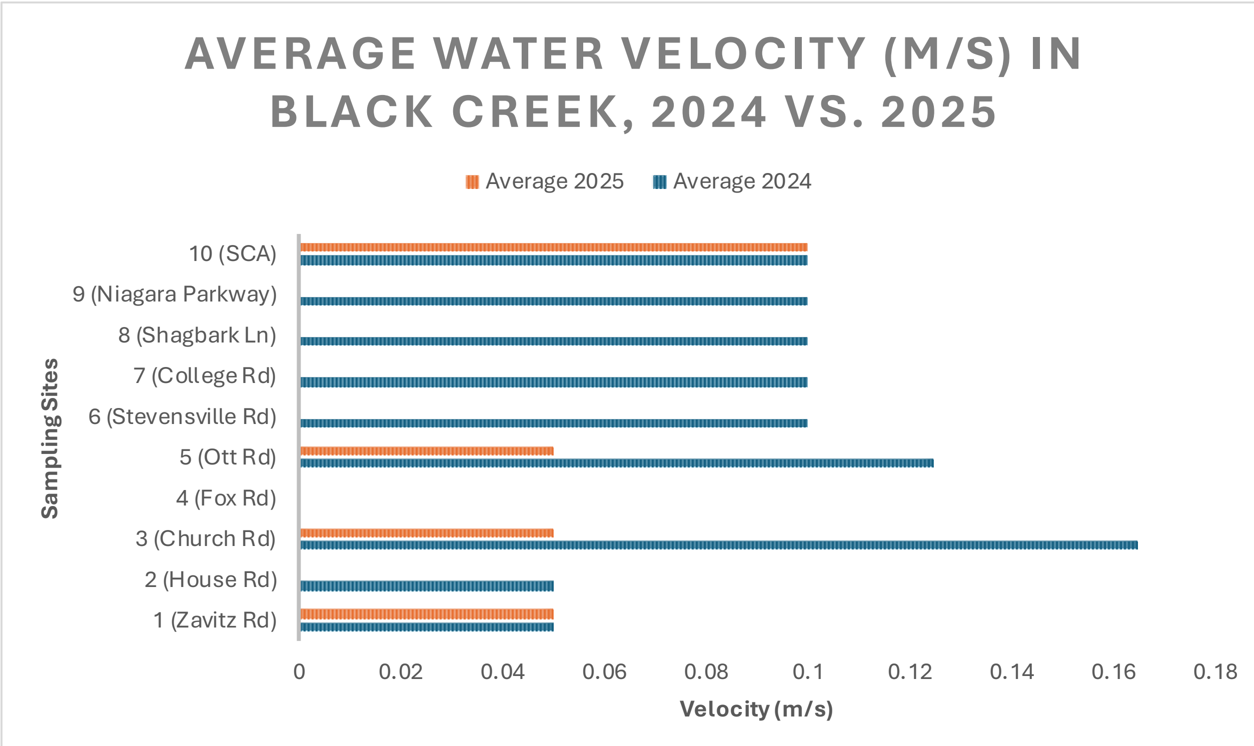


Figure 20. *Average Water Velocity (m/s) in Black Creek, 2024 vs. 2025. This chart displays the average water velocity, which showed a general decrease across most sites from 2024 to 2025.*

Water velocity in Black Creek showed a general decrease from 2024 to 2025 at the sites that were measured. In 2024, the highest velocities were recorded at Site 3 (0.165 m/s) and Site 5 (0.125 m/s). In 2025, those same sites showed a significant drop in velocity, with both recording a value of 0.05 m/s. Several sites were not accessible for measurements in 2025 due to a lack of access to water transportation. Sites 1 and 10 showed consistent, low velocities of 0.05 m/s in both years.

3.2.2 Depth

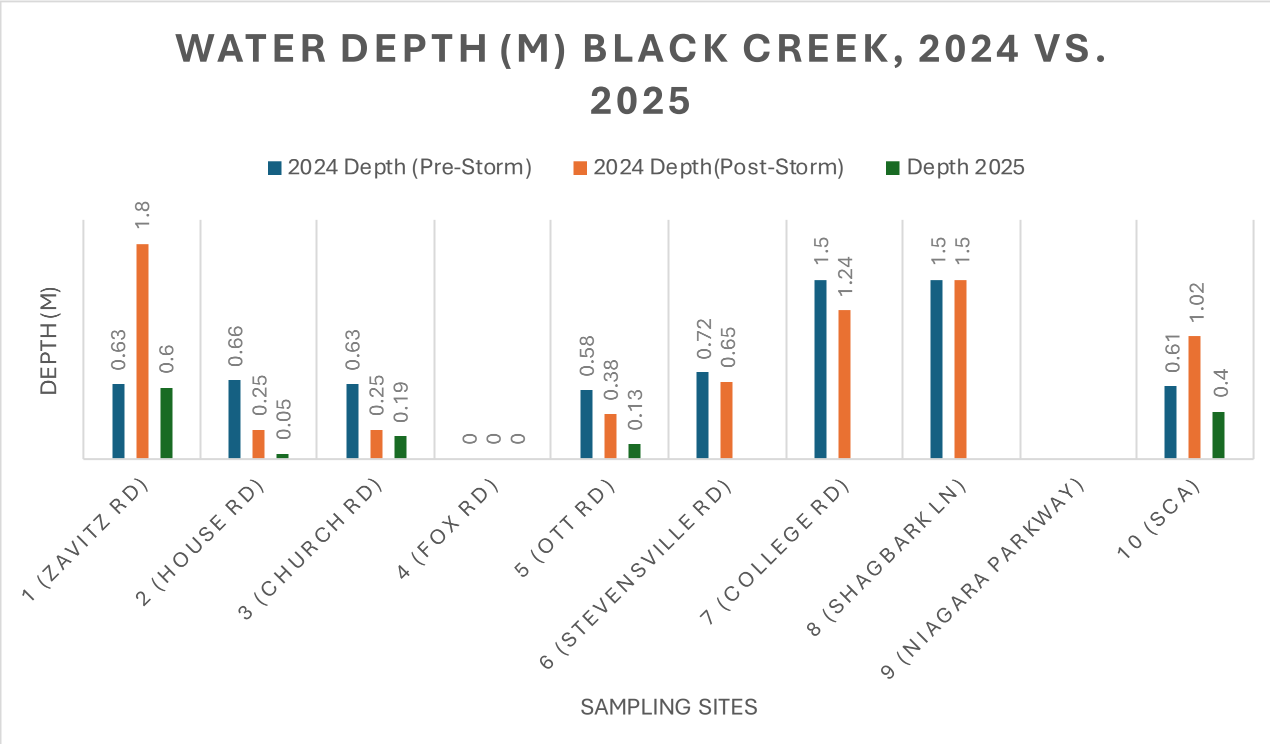


Figure 21. *Water Depth (m) Black Creek, 2025 vs. 2025. This chart displays the average water depth, highlighting the significant increase in depth following a storm event in 2024. Overall, depth in 2025 was lower across all measured sites compared to the previous year.*

The depth of Black Creek showed a significant response to a storm event during the 2024 sampling period, while 2025 measurements were generally lower. The post-storm depth measurements were notably different from the pre-storm values at most sites. For example, at Site 1, the depth increased from 0.63m to 1.8m following the storm. Overall depth measurements in 2025 were consistently lower across all measured sites compared to the 2024 sampling periods. Site 9 had no data for either year.

3.2.3 Bankfull and Wetted Width

Wetted width measurements showed a significant response to a storm event during the 2024 sampling period, while bankfull widths displayed a longer-term change. At sites where both pre- and post-storm measurements were taken, wetted widths generally increased. For example, Site 5 saw an increase from 5.02 m (pre-storm) to 9.1 m (post-storm). In contrast, a long-term comparison of bankfull width revealed a general decrease between 2024 and 2025. This change could be a result of long-term erosion or slight variation in the sampling location. A notable example is Site 1, where bankfull width decreased from 20m to 18.7. Data for Site 4 was not available for any sampling period.

Table A.2. Wetted and Bankfull Widths (m) of Black Creek, 2024 vs. 2025 This table presents the wetted width of the creek for the 2024 pre- and post-storm periods, and 2025, as well as bankfull widths for all sampling periods. *The full table (Table A.2) can be found in Appendix A.*

3.2.4 Discharge

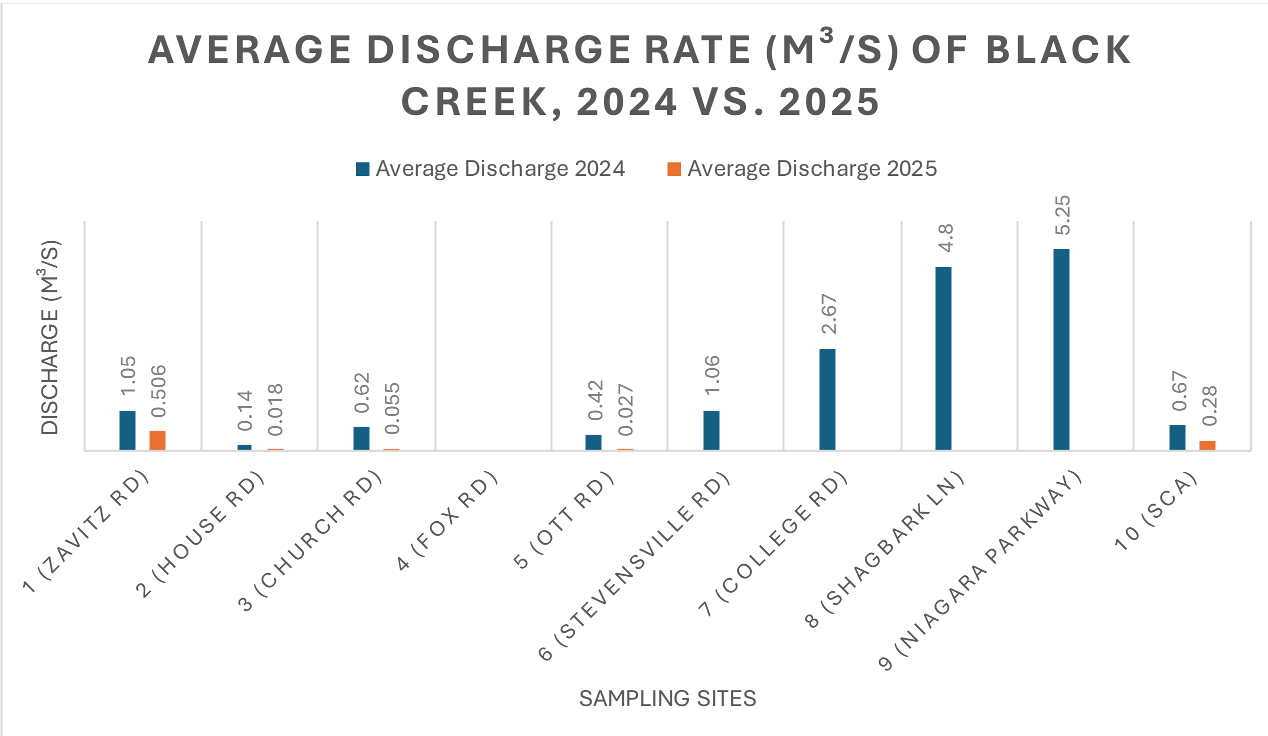


Figure 22. *Average Discharge Rate (m³/s) of Black Creek, 2024 vs. 2025. This chart displays discharge, which generally decreased from 2024 to 2025 across most sites.*

The average discharge rate of Black Creek generally decreased from 2024 to 2025 across all measured sites. In 2024, the highest discharge was recorded at sites in the upper portion of the creek, with Site 9 (the mouth) showing the greatest flow at 5.25 m³/s. By 2025, the overall discharge at most sites had significantly dropped. For example, Site 1 experiences a decrease from 1.05 m³/s in 2025 to 0.506m³/s in 2025, and Site 2 dropped from 0.14m³/s to 0.018m³/s. Sites 6, 7, 8, and 9 were not measured in 2025 due to a lack of water-based transportation.

SECTION 4

Summary of Findings

Summary of findings highlights the most significant trends and observations found during the 2024 and 2025 study period.

4.0 Physical Parameters

Overall, the physical parameters of Black Creek showed minor fluctuations between 2024 and 2025. Dissolved Oxygen (DO) concentration and saturation generally increased at most sites where data was available. For example, DO concentration at Site 5 rose from 7.01 mg/L in 2024 to 14.56 mg/L in 2025. pH values also increased across most measured sites, rising from an average of 7.27 in 2024 at Site 5 to 8.9 in 2025. In contrast, average temperature showed a general increase in 2025, reaching a high of 28.8 °C at Site 5. Conductivity and turbidity showed a mix of increase and decreases, with some sites experiencing a significant increase in turbidity from 2024 to 2025. For example, Site 1's turbidity value increased from 40.756 FNU/NTU to 171.77 FNU/NTU in 2025.

4.1 Nutrient Sampling

Nutrient sampling showed mixed trends. Chloride concentrations generally decreased across most sites, with a notable drop at Site 4 from 77 mg/L in 2024 to 9 mg/L in 2025. Nitrate concentrations, however, generally increased at most sites. Phosphorus concentrations also showed varied results, increasing at some sites and decreasing at others. For instance, Site 1 showed an increase from 0.0957 mg/L in 2024 to 0/2673 mg/L in 2025.

4.2 Hydrological Measurements

The average discharge rate generally decreased across all measured sites from 2024 to 2025. The bankfull width also showed a general decrease between 2024 and 2025, suggesting a long-term change in the creek's channel. A notable example in Site 1, where bankfull width decreased from 20m to 18.7 m. Wetted width and depth measurements showed a significant response to a storm event during the 2024 sampling period, with values generally increasing post-storm. For instance, the depth at Site 1 increased from 0.63 m pre-storm to 1.8 m post-storm and wetted width from 17.7 m pre-storm to 20 m equal to the bankfull width or max capacity post-storm.

SECTION 5

Discussion and Conclusion

This section's discussion refers to parameter comparative data charts which are found in the Appendix A section.

5.1 Discussion

5.1.1 Temperature

Based on the temperature data collected in both 2024 and 2025, the Black Creek sampling sites had an average range within mid-20 °C classifying these sites as warm-water ecosystems according to Jones and Schmidt (2022) *Aquatic ecosystems classification for Ontario rivers and streams, version 2.* This classification further supported by the presence of a Yellow Perch (*Perca flavescens*) during the observation period, a species indicative of warm-water habitat. As such, all water quality parameters were compared again the Canadian Council of Ministers of the Environment (CCME) guidelines for warm-water aquatic life.

5.1.2 pH

The pH values for Black Creek generally fall within the Canadian Freshwater Guideline range of 6.5 to 9.0. However, a closer look at the data reveals that several sites, including Site 5, 9, and 10, exceed the Ontario Drinking water Guideline of 6.5 to 8.5 in 2025. These findings suggest that while the pH levels are generally suitable for aquatic life, they may pose a risk to drinking water quality. Fluctuations in pH can be a sign of increased urban runoff or other environmental factors, like the leaching of alkaline material from bedrock or soil. Additionally, levels outside the optimal range can impact the health of aquatic ecosystem and affect the effectiveness of water treatment processes. Sites 5, 9, and 10 are on the high-end values of the safe range, suggesting an increased need for monitoring within those areas of Black Creek.

5.1.3 Dissolved Oxygen

Dissolved oxygen is a critical indicator of freshwater ecosystem's health, as adequate levels are necessary to support a diverse range of aquatic life. The Canadian Freshwater Guideline for dissolved oxygen is 5.5 mg/L. The data shows that in 2024 almost all the sites fell below the freshwater guideline, and in 2025, there were slight improvements with some sites remaining within the guideline standards or just falling short.

These low levels are significant concern, as they can harm fish and other aquatic organisms. Low levels of DO are often caused by factors such as elevated water temperature and increased organic matter from runoff, which consumes oxygen as it decomposes. A general increase in the creek's temperature between 2024 and 2025, combined with consistently high phosphorus levels, likely contributed to the low DO concentration observed during this period and the Niagara Peninsula Conservation Authority's (NPCA) (2012) report card. This underscored a need for continued monitoring and management initiatives to improve the creek's overall water quality.

5.1.4 Turbidity

The turbidity data collected in 2024 and 2025 revealed a varied and significant finding related to water clarity. While the Canadian guideline for turbidity is based on an increase from background levels, several sites, including Sites 1, 3, and 10 exceeded the short-term guideline of 8 NTU increase, likely due to sediment disturbance through rapid variation of water within at these sites. In contrast, Sites 5, 8, and 9 indicated significant improvements in water clarity. It is important to note that these raw water findings do not directly apply to drinking water quality, as the Canadian guidelines for drinking water turbidity (which recommend levels of ≤ 1.0 NTU) are for treated water that has undergone purification (Health Canada, 2025).

5.1.5 Chloride

The chloride data provides a significant positive finding for the creek's water quality, as the concentrations at all the sampling sites were well below the Canadian long-term guideline for the protection of aquatic life. With the highest record at 77.5 mg/L, the chloride levels were also well below the Canadian drinking water aesthetic objective (AO) of ≤ 250 mg/L, which based on taste. These findings suggest that despite the potential of urban runoff, the Black Creek's chloride levels are not at a concentration that would cause long-term harm to the aquatic ecosystem or be an aesthetic concern for human consumption (Canadian Councils of Ministers of the Environment, 2011; Health Canada, 2025).

5.1.6 Phosphorus

The phosphorus data indicates that this remains a significant concern for Black Creek, which has been consistently graded with a "D" by the NPCA for this parameter. The Canadian guidance framework for phosphorus states that concentrations should not increase more than 50% over baseline levels, which for Black Creek is 270 µg/L (Canadian Council of Ministers of the Environment, 2004). The data collected in 2024 and 2025 support the NPCA's findings, as several sites exceeded this guideline. Specifically, Site 4, 7, and 8 in 2024, and Site 10 in 2025, recorded concentrations above the 270 µg/L guideline. These elevated levels of phosphorus contribute to excess algae and low DO in streams and rivers, indicating a creek's water quality is impaired and in need of management initiatives to reduce nutrient contamination.

5.1.7 Nitrate

The nitrate data indicates a positive finding for Black Creek's water quality, as well sampling sites recorded values well below the Canadian Council of Ministers of the Environment (2012) guideline for the protection of aquatic life. The long-term exposure guide for freshwater is 13 mg/L to protect against chronic toxic effects on aquatic species. The low values found within Black Creek from 2024 and 2025 had a low of 0.5 mg/L and the highest value of 4 mg/L suggesting that nitrate is not a critical concern within Black Creek.

Furthermore, the data collected also shows nitrate levels well below the Maximum Acceptable Concentration (MAC) of 45 mg/L for safe drinking water. This is an important public health standard that has been achieved within Black Creek (Health Canada, 2025).

5.2 Limitations

Despite the valuable data collected, this study faced a few key limitations that should be considered when interpreting the results. A primary constraint was the lack of access to water transportation during the 2025 field seasons, which prevented the team from taking certain measurements at deeper sites, such as those that were successfully sampled in 2024.

Additionally, as a longitudinal study conducted over a two-month period, the findings provided a snapshot of the creek's conditions rather than a full annual picture. Factors such as seasonal weather patterns could have a significant impact on water quality, and these were not fully captured. Finally, the instruments used had specific measurement limitations, such as the flow probe's lower detection limitation, which meant that slow flow conditions below 0.1 m/s could only be recorded as a proxy value.

Furthermore, a limitation of the methodology was that sampling was conducted within a 5–10 m stretches of the marked points, rather than s single, exact location. This spatial imprecision could introduce some measurement error, particularly parameters like bankfull width. However, within the 5-10m stretches creek width was consistent with only slight differences.

5.3 Conclusion

Based on the data collected in 2024 and 2025, the water quality of Black Creek presents a mixed picture. The most significant concerns identified were low dissolved oxygen (DO) and consistently high phosphorus levels. Most sites showed DO concentrations below the Canadian freshwater guideline of 5.5 mg/L. These findings are supported by the creek's consistently poor "D" grade for phosphorus from the Niagara Peninsula Conservation Authority and our data showing several sites exceeding the guidance framework's 270 µg/L guideline.

Conversely, the data revealed several positive findings. The chloride level across all sites was well within both aquatic life and safe drinking water guidelines, suggesting that road salt and other sources are not a major concern for this parameter. Similarly, nitrate concentrations were found well below the guideline for both aquatic life and safe drinking water. While pH values were generally within the safe range for aquatic life, some sites exceeded the drinking water guidelines, while it is not recommended to drink creek water and comparison to drinking water is less significant, this still indicates a need for continued monitoring.

Overall, the findings suggest that Black Creek is a warm-water system facing significant challenges from nutrient contamination, which is likely to continue to impact its DO levels and ecosystem health. Further research, including continuous monitoring and a focus on nutrition sources, is recommended to support initiatives aimed at improving the creek's water quality and ecological integrity of itself and adjacent habitats.

SECTION 6

Appendix A

Appendix A provides data the comparative values against the Canadian Council of Ministers of the Environment (CCME) freshwater guidelines and where applicable the Canadian safe drinking water standards.

Table A.1

Flora and Fauna Observations

Fauna	**Common Name**	***Scientific Name***	**Flora**	**Common Name**	***Scientific Name***
1	Painted Turtle	*Chrysemys picta*	***1**	Goldmoss Stonecrop	*Sedum acre*
2**	Snapping Turtle	*Chelydra serpentina*	***2**	Common Buckthorn	*Rhamnus cathartica*
3	Gartner Snake	*Thamnophis sirtalis*	**3**	Wild Grape Vine or Riverbank Grape	*Vitis riparia*
4	American Bullfrog	*Lithobates catesbeianus*	**4**	Eastern Cottonwood	*Populus deltoides*
5	Green frog	*Lithobates clamitans*	**5****	Green Ash	*Fraxinus pennsylvanica*
6	Mink Frog	*Lithobates septentrionalis*	**6**	Swamp Oak	*Quercus bicolor*
7	American Robins	*Turdus migratorius*	**7**	Pin Oak	*Quercus Palustris*
8	Blue Jay	*Cyanocitta cristata*			
9	Northern Cardinal	*Cardinalis cardinalis*			
10	Gray Catbird	*Dumetella carolinensis*			
11	Yellow Perch	*Perca flavescens*			
12**	Round pigtoe	*Pleuro sintoxia*			

Note: Species marked with (-) are invasive species in Ontario while species marked with (**-) are species at risk in Ontario. The listed species are the most notable at sites around the SCA during 2024 and 2025, although a wider variety of flora and fauna are present.*

Table A.2

Wetted and Bankfull Width Measurements, Black Creek 2024 vs. 2025

Site	Wetted Width 2024 (Pre-Storm)	Wetted Width 2024 (Post-Storm)	Wetted Width 2025	Bankfull Width 2024	Bankfull Width 2025
1 (Zavitz Rd)	17.7	20	16.85	20	18.7
2 (House Rd)	5.14	7.1		7.83	N/A
3 (Church Rd)	7.9	9.2	5.75	7.9	7.17
4 (Fox Rd)	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW
5 (Ott Rd)	5.02	9.1	4.16	5.33	4.16
6 (Stevensville Rd)	15.8	15.2		16.15	
7 (College Rd)	19.6	19.4		20.1	
8 (Shagbark Ln)	32	32		32	
9 (Niagara Parkway)	35	35		35	
10 (SCA)	7.34	9.2	7	9.2	8.5

Table A.3

Black Creek pH value Comparison of Standards Freshwater and Ontario Drinking Water

Site	Average 2024	Average 2025	Canadian Freshwater Guideline (6.5-9.0)	Ontario Drinking Water Guideline (6.5-8.5)
1 (Zavitz Rd)	7.425	8.12	Within Standards	Within Standards
2 (House Rd)	7.555	NO FLOW	Within Standards (2024)	Within Standards (2024)
3 (Church Rd)	7.475	8.14	Within Standards	Within Standards
4 (Fox Rd)	7.27	NO FLOW	Within Standards (2024)	Within Standards (2024)
5 (Ott Rd)	7.99	8.9	Within Standards	Exceeds Standards
6 (Stevensville Rd)	7.66		Within Standards (2024)	Within Standards (2024)
7 (College Rd)	8.07	8.12	Within Standards	Within Standards
8 (Shagbark Ln)	7.55	8.16	Within Standards	Within Standards
9 (Niagara Parkway)	7.535	8.73	Within Standards	Exceeds Standards
10 (SCA)	7.39	8.6	Within Standards	Exceeds Standards

Note: This table is a comparison of pH level within Black Creek for each site of 2024 vs 2025 to the safe standard for aquatic life in freshwater ecosystems and Ontario safe drinking water standards. Compariative data retrieved from CCME, 1987; and Ontario Ground Water Association, 2006.

Table A.4

Black Creek DO concentration (mg/L) Comparison to Canadian Freshwater Guideline, 2024 vs 2025

Site	Average 2024 DO (mg/L)	2025 DO (mg/L)	Canadian Freshwater Guideline (5.5 mg/L)
1 (Zavitz Rd)	2.94	5.4	Below Standards
2 (House Rd)	4.065	NO FLOW	Below Standards
3 (Church Rd)	3.96	5.84	Below Standards (2024); Within Standards (2025)
4 (Fox Rd)	5.75	NO FLOW	Within Standards 2024
5 (Ott Rd)	7.01	14.56	Within Standards
6 (Stevensville Rd)	5.135		Below Standards 2024
7 (College Rd)	4.03	5.09	Below Standards
8 (Shagbark Ln)	3.765	4.015	Below Standards
9 (Niagara Parkway)	2.76	7.78	Below Standards (2024); Within Standards (2025)
10 (SCA)	4.7	8.41	Below Standards (2024); Within Standards (2025)

Note: Guideline data retrieved from CCME, 1999.

Table A.5

Conductivity (EC) Convert to Total Dissolved Solids (TDS) A Comparison of AO Standards for Drinking Water

Site	Average 2024 TDS (mg/L)	2025 TDS (mg/L)	Safe Drinking Water (AO: ≤ 500 mg/L)
1 (Zavitz Rd)	207.904	329.6	Within Standards
2 (House Rd)	203.008	NO FLOW	Within Standards (2024)
3 (Church Rd)	283.232	3.84	Within Standards
4 (Fox Rd)	119.488	NO FLOW	Within Standards (2024)
5 (Ott Rd)	315.776	361.6	Within Standards
6 (Stevensville Rd)	313.12		Within Standards (2024)
7 (College Rd)	210.656	441.6	Within Standards
8 (Shagbark Ln)	259.296	306.176	Within Standards
9 (Niagara Parkway)	277.9136	174.72	Within Standards
10 (SCA)	313.12	2.368	Within Standards

Note: Black Creek compared to the Health Canada (2025) safe drinking water guidelines, overall TDS falls within the standards of an AO: ≤ 500 mg/L.

Table A.6

Black Creek Turbidity Change 2024 and 2025

Site	Average 2024 Turbidity (NTU)	Turbidity 2025 (NTU)	Change from Lower Background	Comparison to Short-Term Guideline (8 NTU Change)
1 (Zavitz Rd)	40.765	171.77	(+) 131.005	Exceeds Short-Term Guideline
2 (House Rd)	114.55	NO FLOW	N/A	N/A
3 (Church Rd)	9.515	59	(+) 49.485	Exceeds Short-Term Guideline
4 (Fox Rd)	75.38	NO FLOW	N/A	N/A
5 (Ott Rd)	94.45	46.32	(-) 48.13	Within Guidelines
6 (Stevensville Rd)	51.1		N/A	N/A
7 (College Rd)	36.185	32.04	(-) 4.145	Within Guidelines
8 (Shagbark Ln)	45.225	13.01	(-) 32.215	Within Guidelines
9 (Niagara Parkway)	47.11	1.73	(-) 45.38	Within Guidelines
10 (SCA)	37	56.2	(+) 19.2	Exceeds Short-Term Guideline

Note: Guidelines retrieved from CCME, 2002. This table displays the water quality per site by examining the change in turbidity in accordance with the short-term guidelines.

Table A.7

Black Creek Chloride Ion Canadian Freshwater and Safe Drinking Water Standards 2024 and 2025

Site	Average 2024 (mg/L)	Average 2025 (mg/L)	Canadian Freshwater Guideline (Long-term 120 mg/L)	Safe Drinking Water (AO: ≤ 250 mg/L)
1 (Zavitz Rd)	21	5	Within Guideline	Within Guideline
2 (House Rd)	5	1	Within Guideline	Within Guideline
3 (Church Rd)	37	5	Within Guideline	Within Guideline
4 (Fox Rd)	77	NO FLOW	Within Guideline (2024)	Within Guideline (2024)
5 (Ott Rd)		9	Within Guideline	Within Guideline
6 (Stevensville Rd)	5		Within Guideline (2024)	Within Guideline (2024)
7 (College Rd)	32	17.5	Within Guideline	Within Guideline
8 (Shagbark Ln)	19	51.5	Within Guideline	Within Guideline
9 (Niagara Parkway)	77.5	24	Within Guideline	Within Guideline
10 (SCA)	24	3.5	Within Guideline	Within Guideline

Note: Black Creek Chloride Ion Canadian Freshwater and Safe Drinking Water Standards 2024 and 2025. This table represents that all sites have chloride that falls within Canadian standards. Data retrieved from CCME, 2011; and Health Canada, 2025.

Table A.8

Black Creek Phosphorus Level 2024 and 2025 Canadian Freshwater Guideline

Site	Average 2024 (µg/L)	Average 2025 (µg/L)	Canadian Freshwater Guideline (270 µg/L)
1 (Zavitz Rd)	95.7	267.3	Within Guideline
2 (House Rd)	125.4	85.8	Within Guideline
3 (Church Rd)	196.35	138.3	Within Guideline
4 (Fox Rd)	285.45	NO FLOW	Exceeds Guideline (2024)
5 (Ott Rd)		125.4	Within Guideline (2025)
6 (Stevensville Rd)	250.8		Within Guideline (2024)
7 (College Rd)	379.5	36.3	Exceeds Guideline (2024)
8 (Shagbark Ln)	346.5	102.3	Exceeds Guideline (2024)
9 (Niagara Parkway)	36.3	23.1	Within Guideline
10 (SCA)	267.3	290.4	Exceeds Guideline (2025)

Note: Black Creek Phosphorus Level 2024 and 2025 Canadian Fresh Water Guideline. This chart follows the guideline and framework retrieved from CCME, 2004, and utilizes the NPCA (2012) baseline values for phosphorus in Black Creek.

Table A.9

Black Creek Nitrate Ion Canadian Freshwater and Safe Drinking Water Standards, 2024 and 2025

Site	Average 2024	Average 2025	Canadian Freshwater Guideline (Long-term 13 mg/L)	Safe Drinking Water (45 mg/L)
1 (Zavitz Rd)	4	3.5	Within Guideline	Within Standards
2 (House Rd)	0.87	0.74	Within Guideline	Within Standards
3 (Church Rd)	0.855	0.34	Within Guideline	Within Standards
4 (Fox Rd)	0.935	NO FLOW	Within Guideline (2024)	Within Standards (2024)
5 (Ott Rd)		0.96	Within Guideline (2025)	Within Standards (2025)
6 (Stevensville Rd)	0.87		Within Guideline (2024)	Within Standards (2024)
7 (College Rd)	0.678	0.52	Within Guideline	Within Standards
8 (Shagbark Ln)	0.77	3.85	Within Guideline	Within Standards
9 (Niagara Parkway)	0.529	2.8	Within Guideline	Within Standards
10 (SCA)	0.81	4.15	Within Guideline	Within Standards

Note: Black Creek Nitrate Ion Canadian Freshwater and Safe Drinking Water Standards, 2024 and 2025. This chart exemplifies the low nitrate ion concentrations in Black Creek for the years 2024 and 2025

SECTION 7

Appendix B

Appendix B provides any additional supplementary observation collected during the 2024 and 2025 field seasons.

Figure 23. *Larger waterway Obstructions within the Stevensville Conservation Area. (Coordinates: 42.944897, -79.072076)*

Figure 24. *Waterway Obstruction Stevensville Conservation Area. (Coordinates: 42.944163, -79.073482)*

Figure 25. *Site 2 House Rd. Waterway Obstructions west access point of flow into the SCA.*

Figure 26. *Site 2 House Rd. Pesticide Usage directly next to the creek and sample site.*

Figure 27. *Site 1. Source waters this picture was captured after the Storm event this picture shows the depth of the water at the same level as the road, a significant increase in depth refers to Figure 21.*

Figure 28. *Residential Property Placed a personal bridge across Black Creek, Obstructs the pathway of water-based transportation*

Figure 29. *Uknown pipe directly in Black Creek, possibly an irrigation pump for the Niagara National Golf & Country, 2900 College Rd, Stevensville, Ontario. (Coordinates: 42.957691, -79.029249).*

Figure 30. *Large Obstruction forming at coordinates 42.945625, -79.039540 under the railway bridge.*

Figure 31. *Site 3 Church Rd, low water levels during the 2025 field-season (refer to Figure 21 for 2024 depth).*

Figure 32. *Site 5 Ott Rd, extremely low water depth, this is the main waterway that passes through the SCA.*

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