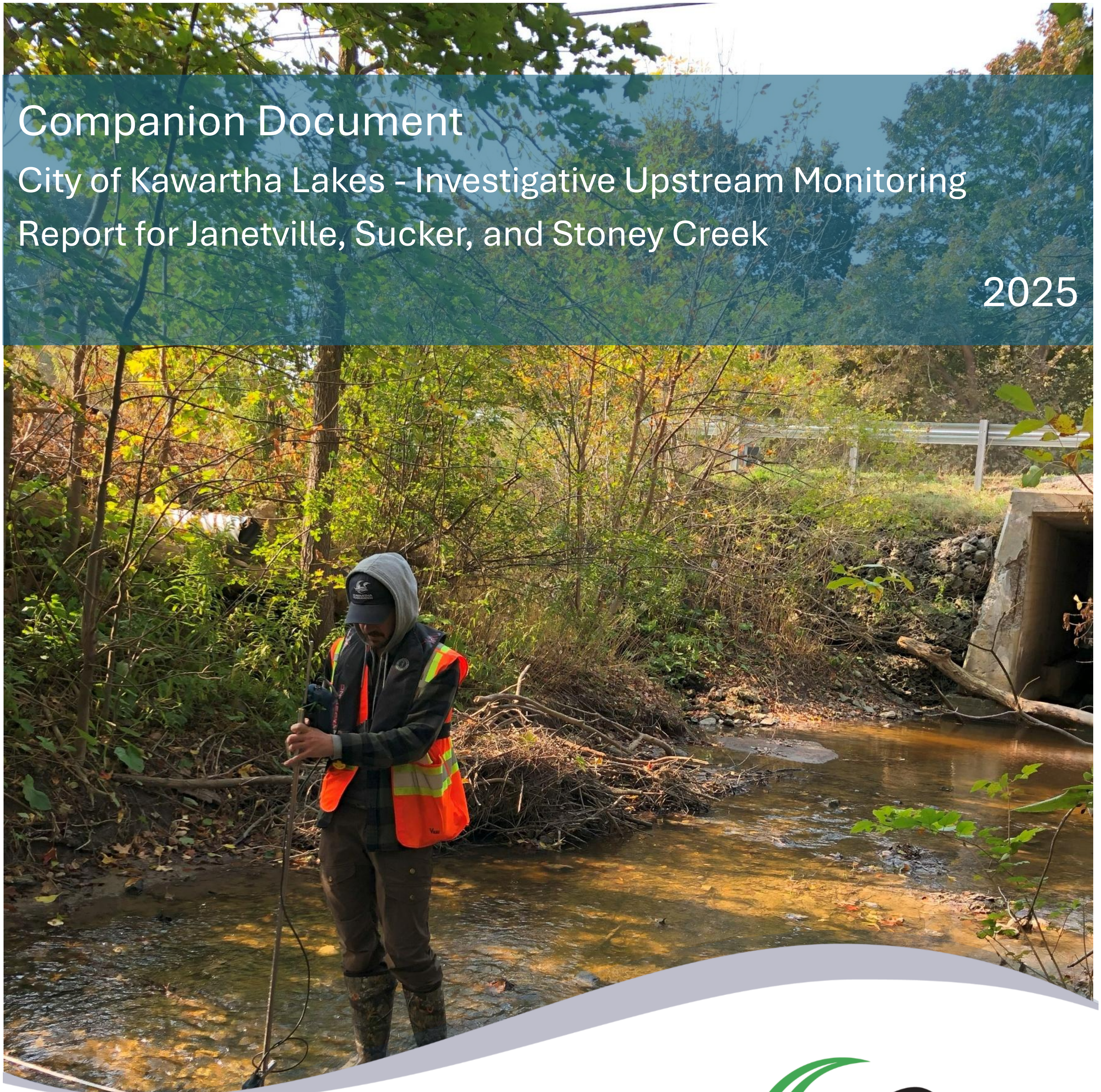
Companion Document

City of Kawartha Lakes - Investigative Upstream Monitoring Report for Janetville, Sucker, and Stoney Creek

2025



KAWARTHA CONSERVATION

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About Kawartha Conservation

Who we are

We are a watershed-based organization that uses planning, stewardship, science, and conservation lands management to protect and sustain outstanding water quality and quantity supported by healthy landscapes.

Why is watershed management important?

Abundant, clean water is the lifeblood of the Kawarthas. It is essential for our quality of life, health, and continued prosperity. It supplies our drinking water, maintains property values, sustains an agricultural industry, and contributes to a tourism-based economy that relies on recreational boating, fishing, and swimming. Our programs and services promote an integrated watershed approach that balance human, environmental, and economic needs.

The community we support

We focus our programs and services within the natural boundaries of the Kawartha watershed, which extend from Lake Scugog in the southwest and Pigeon Lake in the east, to Balsam Lake in the northwest and Crystal Lake in the northeast – a total of 2,563 square kilometers.

Our history and governance

In 1979, we were established by our municipal partners under the *Ontario Conservation Authorities Act*.

The natural boundaries of our watershed overlap the six municipalities that govern Kawartha Conservation through representation on our Board of Directors. Our municipal partners include the City of Kawartha Lakes, Region of Durham, Township of Scugog, Township of Brock, Municipality of Clarington, Municipality of Trent Lakes, and Township of Cavan Monaghan.

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Acknowledgements

We would like to acknowledge that many Indigenous Nations have longstanding relationships, both historic and modern, with the territories upon which we are located.

Today, this area is home to many Indigenous peoples from across Turtle Island. We acknowledge that our watershed forms a part of the treaty and traditional territory of the south-eastern Anishinaabeg.

It is on these ancestral and Treaty lands that we live and work. To honour this legacy, we commit to being stewards of the natural environment and undertake to have a relationship of respect with our Treaty partners.

The region of Kawartha Lakes was referred to as Gau-wautae-gummauh, a glistening body of water, in anishinaabemowin. We are thankful to have an opportunity to work with Indigenous Peoples in the continued stewardship and care of this beautiful region.

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Introductions

Project Background

The goal of the Investigative Upstream Monitoring program is to monitor multiple locations across a stream of concern to look for sites with abnormal levels of nutrients, salts, or other contaminants, which could then be a focal point for stewardship.

Kawartha Conservation started this program in Jennings, McLarens, and Reforestation Creek and has published the results in 2023. To continue the program, Kawartha Conservation (in collaboration with Trent University) moved on to Janetville, Sucker, and Stoney Creek. Thus, this report aims to identify hotspots of elevated contaminant inputs for Janetville, Sucker, and Stoney creek. Opportunistic monitoring occurred for Fleetwood and Jennings Creek thus was also incorporated in this report.

Methods

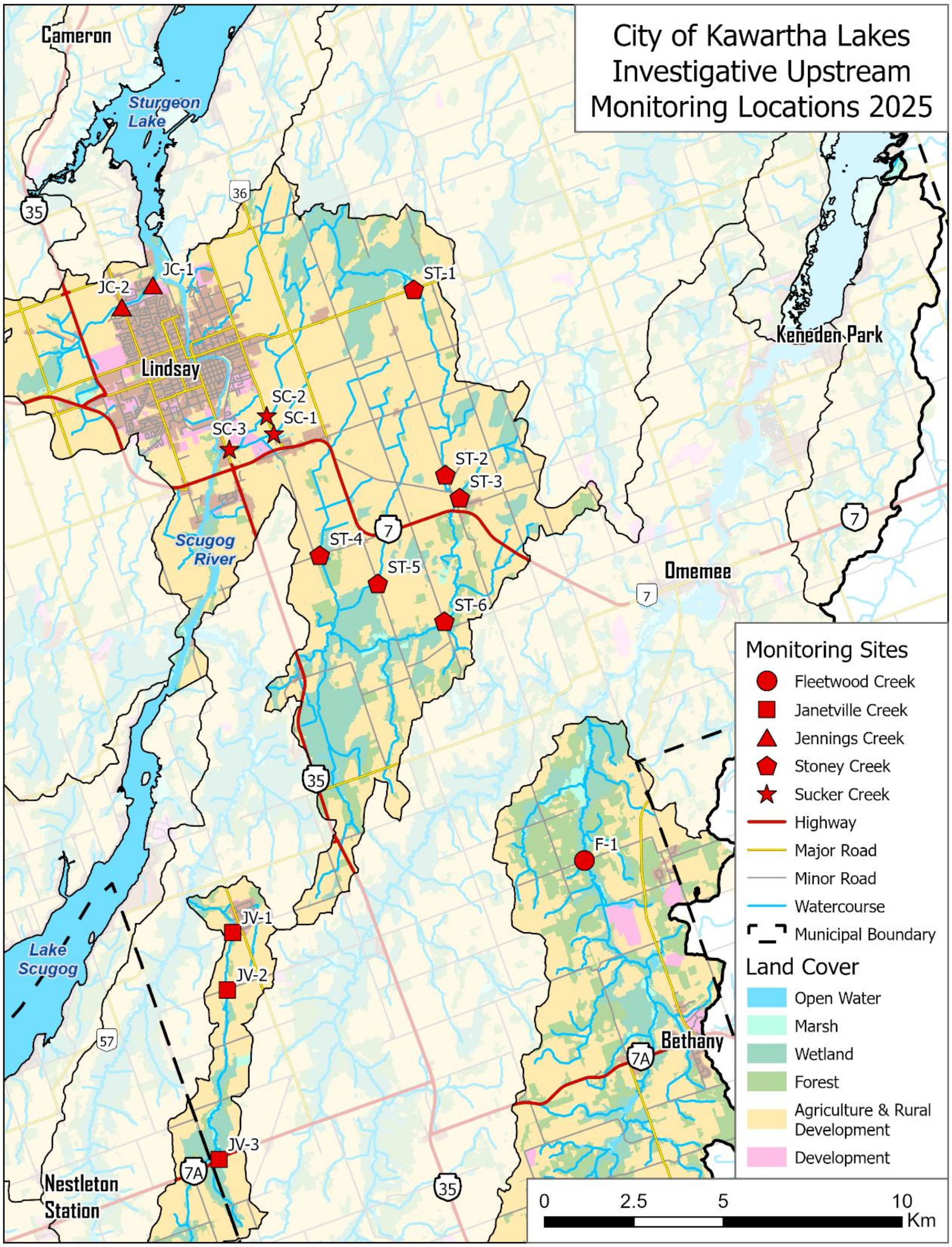
Study Area

The monitored creeks (Janetville, Sucker, Stoney Creek, Fleetwood and Jennings Creek) are all within the City of Kawartha boundary of the Williams Treaties in southcentral Ontario (**Figure 1**). Janetville, Stoney, Sucker, and Jennings Creek drain into the larger Scugog River. Fleetwood Creek flows into the Pigeon River which eventually discharges into the Pigeon Lake.

Water Quality

Water quality monitoring at each site occurred from 2022 to 2024 and were generally sampled during the ice-free period of April – November. At each site, the grab method was used to collect surface water samples. Field parameters were measured using a water quality meter (YSI ProDSS). Chemical analysis was performed at Trent University.

A total of 15 sites were monitored for this iteration of the City of Kawartha Lakes - Investigative Upstream Monitoring: Jenetville Creek (*n* = 3), Sucker Creek (*n* = 3), and Stoney Creek (*n* = 6) watersheds, and at opportunitic locations within the Fleetwood Creek, (*n* = 1) and Jennings Creek (*n* = 2) watesheds (**Figure 1**). Sites on Fleetwood and Jennings Creek were only monitored for one season in 2022. Overall, 518 samples were collected from 2022 to 2024.



[NA1]

Figure 1. Map of monitoring locations at Jenetville Creek, Sucker Creek, Stoney Creek, Fleetwood Creek and Jennings Creek. General land cover is shown: water = blue, agriculture = yellow, natural = greens, and development = red.

Results and Discussion

Land use

All monitored watershed were dominated by agricultural land cover (land cover percentage range = 40.1-96.6%, mea*n* = 71.5%) followed by natural land cover with little development (**Table 1**). The monitoring site Fleetwood Creek (F-1) was found to have the highest natural cover (45.1%), while SC-1 (Sucker Creek) had the highest agricultural cover (96.6%), and JC-2 (Jennings Creek) had the highest development cover (13.8%, located in the city of Lindsay) (**Table 1**).[NA2]

Table 1. Site location (latitude and longitude), identification code, and site description of the fifteen monitoring sites. General land cover information, as a percentage (%) of the watershed, and watershed size (km^2) for each monitoring location are shown.

					(km^2)	Percentage of watershed (%)		
Watercourse	**SID**	**Site Description**	**Latitude**	**Longitude**	**Watershed**	**Development**	**Agricultural**	**Natural**
Janetville Creek	JV-1	Pigeon Creek Rd	44.2125	-78.7277	18.6	5.6	64.0	30.4
	JV-2	Fleetwood Rd	44.1981	-78.7301	17.3	5.1	63.2	31.7
	JV-3	Hwy 7A	44.1554	-78.7346	3.0	4.3	62.2	33.5
Sucker Creek	SC-1	Hwy 36 - South	44.3379	-78.7084	2.7	4.9	87.8	7.3
	SC-2	Hwy 36 - North	44.3425	-78.7107	5.7	5.6	69.4	25.0
	SC-3	Lindsay St South	44.3343	-78.7241	11.2	12.8	68.5	18.7
Stoney Creek	ST-1	Pigeon Lake Rd	44.3734	-78.6579	12.4	4.3	36.7	59.0
	ST-2	Settlers Rd	44.3265	-78.6487	20.1	4.8	54.0	41.2
	ST-3	Settler Rd	44.3205	-78.6439	4.7	3.9	70.4	25.7
	ST-4	River Rd. E	44.3071	-78.6935	10.6	7.6	80.5	11.9
	ST-5	Hillhead Rd	44.2996	-78.6734	7.8	4.6	88.7	6.7
	ST-6	On Post Rd	44.2896	-78.6505	35.3	5.7	58.9	35.4
Fleetwood Creek	F-1	Fleetwood Rd	44.2281	-78.6039	55.0	8.4	37.2	54.4
Jennings Creek	JC-1	Williams St.	44.3764	-78.7494	15.2	24.5	61.5	14.0
	JC-2	Angeline St.	44.3711	-78.7605	15.2	22.0	63.9	14.1

Water Quality

Water Quality Index

The CCME Water Quality Index (2017) was used to compile all water quality results into a digestible format. This is done by looking at the number of parameters that fail the guideline/objectives, the number of failed tests, and how much each test is failed by.

Water quality results of pH, turbidity, dissolved oxygen, chloride, nitrate, and total phosphorus were used to compare against the Provincial Water Quality Objective and/or the Canadian Water Quality Guideline for the protection of aquatic life.

Generally, most sites were scored below 64, meaning that these sites had *marginal* water quality (CCME, 2017). Higher scores were obtained for the site on Fleetwood, at 80.4 indicating good water quality (**Table 2**). The lowest score was found for Sucker Creek (SC-1 at 36.1 and SC-3 at 37.1), Stoney (ST-2 at 39.4) which are considered to have poor water quality (**Table 2**). Drivers of low scores were nutrient based – higher nitrate and phosphorus exceedances, followed by failure to meet dissolved oxygen thresholds (**Table 2**).

Table 2. Water Quality Index (WQI) scores and category per monitoring site. Exceedance percentages are also shown by parameter and site.

Site	Score	Category	pH	Turbidity	Dissolved Oxygen	Chloride	Nitrate	Phosphorus
F-1	80.6	GOOD	0	8.3	0	0	0	20
JC-1	59	MARGINAL	0	50	16.7	58.3	0	16.7
JC-2	59.5	MARGINAL	0	16.7	8.3	75	0	20
JV-1	48.4	MARGINAL	9.7	22.6	7.4	0	44.4	58.1
JV-2	56.6	MARGINAL	9.4	14.7	0	0	42.9	50
JV-3	59.7	MARGINAL	7.1	0	23.8	0	3.1	59.4
SC-1	36.1	POOR	12.5	17.1	27.6	3.8	73.1	76
SC-2	54.7	MARGINAL	0	45.5	18.8	0	51.9	57.7
SC-3	37.1	POOR	5.3	48.8	42.4	6.9	37.9	68
ST-1	39.4	POOR	8.2	4.3	43.2	3.8	17	42
ST-2	49.1	MARGINAL	13.3	23.3	19.4	0	25.5	41.7
ST-3	57.3	MARGINAL	0	8.7	12.5	0	48.3	58.6
ST-4	48.7	MARGINAL	0	13	12.5	7.1	42.9	40.7
ST-5	54.1	MARGINAL	0	21.7	13.3	0	53.8	60
ST-6	48.5	MARGINAL	6.8	19.6	21.1	0	20.8	56

Water Temperature and Dissolved Oxygen

Water temperature of streams can be governed by shade, groundwater influence, flow rate, air temperature, and depth. For example, faster flowing water in a shaded environment tends to be colder than stagnant water in an open area. Continuous water temperature collected from 2023 to 2024 at Janetville, Sucker, and Stoney Creek indicate that water rarely reaches 25°C (**Figure 2**).

The temperature of the water affects its ability to hold dissolved oxygen. Where colder water can hold more dissolved oxygen than warmer water. Most measurements of dissolved oxygen were found to be within the 6.0 or 6.5 mg/L Canadian Water Quality Guidelines (1999) (**Table 2**). Sites with higher failure rates were ST-1 and SC-3, 43.2% and 42.4%, respectively (**Table 2**). The rest of the monitoring sites had failed percentages below 30% (**Table 2**).

All streams showed a season pattern where higher dissolved oxygen is found during the spring and fall months while lower dissolved oxygen levels are found during the summer period. When streams are colder during the spring and fall, they are able to hold more oxygen when compared to warmer conditions.

[NA3]

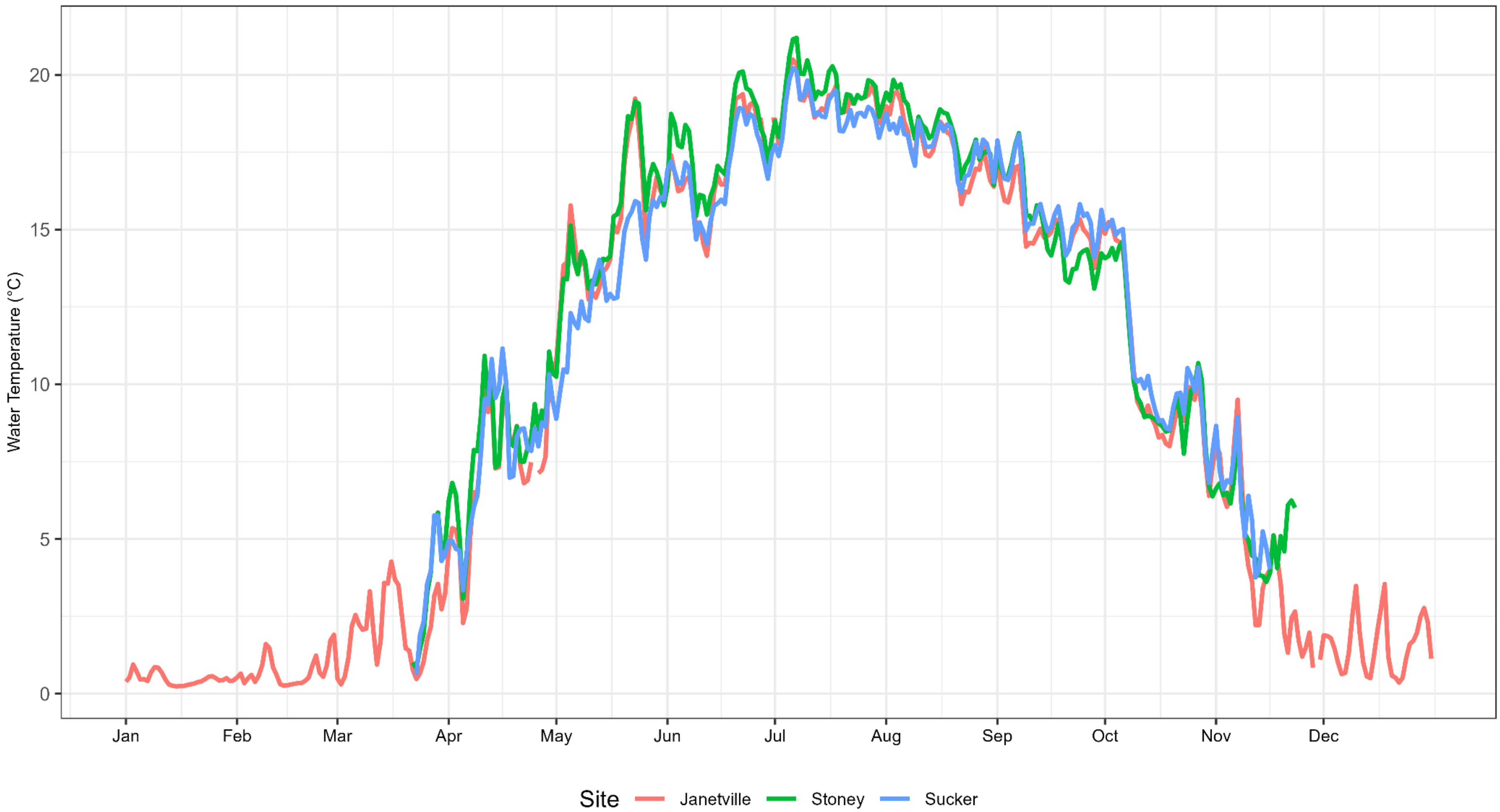


Figure 2. Averaged daily water temperature by month and creek (Janetville = Red, Stoney = Green, and Sucker = Blue).

pH

Due to the underlaying geology of the study area (limestone bedrock), it was expected that much of the stream's pH were more alkaline than acidic. When compared to the Provincial Water Quality Objectives (MOEE, 1994), exceedances (10.7%, *n* = 44; **Table 2**) were mostly due to higher pH (more alkaline) values. No significant concerns of pH were identified.

Conductivity and Chloride

Conductivity is a measurement of the water ability to conduct electricity. This can be seen as a proxy for the amount of dissolved salts in the water, where higher levels can be associated with the type of bedrock or input from human activity (soil, winter salt, fertilizer). In this report, higher conductivity readings at Jennings Creek sites which are expected as these sites were found within the urban area of Lindsay - higher salt application rate. However, agricultural dominated watersheds can also have higher conductivity readings through fertilizers and exposed soils in field, e.g., Stoney Creek max agricultural cover = 92.3% (**Table 1**).[NA4]

Higher levels of chloride are common signals of human activities, i.e., winter salt. Although humans have used winter salt for many decades, freshwater organisms such as freshwater fish, amphibians, and insects have not evolved to withstand high amounts of salt. Chloride levels above 120 mg/L (CCME, 2011) were generally isolated to site near the Town of Lindsay and represent only 5.3% of all chloride results. Where most results (63%) are within the natural ranges found across Canada i.e., 10-30 mg/L (McNeely *et al.*, 1979). Seasonal chloride patterns were not found for Fleetwood and Stoney whereas seasonal higher chloride results were found for Janetville, Sucker, and Jennings for the month of September where higher chloride was found. This may be driven by reduced flow and an increase in contaminated groundwater input.

[NA5]Phosphorus

Phosphorus is an essential nutrient for plants which are the foundation for food webs. However, when too much phosphorus is put into the ecosystem, it can cause rapid eutrophication where it can lead to a loss of fish, habitat, and drinking water. To control the rapid expansion of algae, the Provincial Water Quality Objectives for phosphorus is set at 30 µg/L for streams and rivers (MOEE, 1994).

Phosphorus characteristics of all monitored streams suggest that these streams are nutrient enriched and are productive systems. When compared against the Provincial Water Quality Objectives, 51.4% of all samples were found to exceed the objective. Generally, Sucker Creek had higher failure rates, while Fleetwood Creek had lower failure rates. Seasonally, total phosphorus levels trended with the growing season and usually peaked in September and were generally lowest during the spring, suggesting phosphorus leaching from the surrounding land (agricultural soils) to nearby streams (Staden *et al.*, 2022).

Nitrate

Following phosphorus, nitrogen is the secondary limiting nutrient for plants in aquatic system and can contribute to rapid eutrophication. The most common form of nitrogen in water is nitrate, where higher levels can cause low levels of dissolved oxygen and can be toxic to humans and animals, thus for the protection of aquatic life, the threshold is set at 13.0 mg/L (CCME, 2012).

Of the 454 samples 32.2% of samples exceeded the threshold with the most concerning results at SC-1 (73.1%), ST-5 (53.8%), and SC-2 (51.9%) (**Table 2**). Seasonal trends involve higher levels in the spring during the spring melt, and lower values in the summer period where there is less water flow (**Figure 3**).

Turbidity

Turbidity refers to how much light is scattered in the water from small particles or dyes. Generally, it refers to the murkiness of the water where poorer water quality is associated with high murkiness due to eroded banks, effluent discharge, rapid eutrophication, and other environmental disasters. Turbidity thresholds are determined through the Canadian Water Quality Guideline for the Protection of Aquatic Life (CCME, 2002).

Of the 362 turbidity measurements, 20.6% exceeded the Canadian Water Quality Guideline and were generally isolated to Jennings Creek (JC-1) and Sucker Creek (SC-2 and SC-3) (**Table 2**). These watersheds are used for agriculture (row crops) with exposed soils and have recently begun their transformation to development with even more exposed soils. Other sites across Stoney, Janetville, and Fleetwood Creek had lower exceedance (<25%) suggesting better water clarity (**Table 2**).

Nutrient Limitation

Because nitrogen and phosphorus are essential for plant growth, identifying which is limiting is key to prevent uncontrolled algae bloom. In our calculations, we found that these systems are phosphorus limited. These results recommend that remedial and stewardship should generally focus on improving phosphorus sources while at site specific areas focus on nitrate and phosphorus sources.

Conclusion

In collaboration with Trent University, the City of Kawartha Lakes – Investigative Upstream Monitoring program, monitored twelve core sites across Janetville, Sucker, and Stoney Creek between the period of 2022 to 2024. Three sites located on Jennings and Fleetwood were opportunistically monitored in 2022 only by Trent University.

Monitoring results showed nutrient rich streams surrounded by agricultural dominated landscapes. Elevated levels of phosphorus and nitrates were the main cause of marginal water quality scores across monitoring sites. Total phosphorus and nitrate levels were generally highest in Sucker, followed by Janetville, Stoney, Jennings, and lastly, Fleetwood creek. Chloride levels across the monitoring sites were generally found to be within natural ranges except for those in Jennings Creek.

Amongst sites of concerns, SC-1, SC-3 (Sucker Creek), and ST-5 (Stoney Creek) due to higher failure rates for phosphorus, nitrate, and dissolved oxygen. These sites share higher agriculture cover (range = 73.5-96.6%) and are relatively smaller watersheds (range = 2.2 – 9.7 km^2). Remedial actions should focus on reducing agricultural runoff (where soils hold legacy excess phosphorus).

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