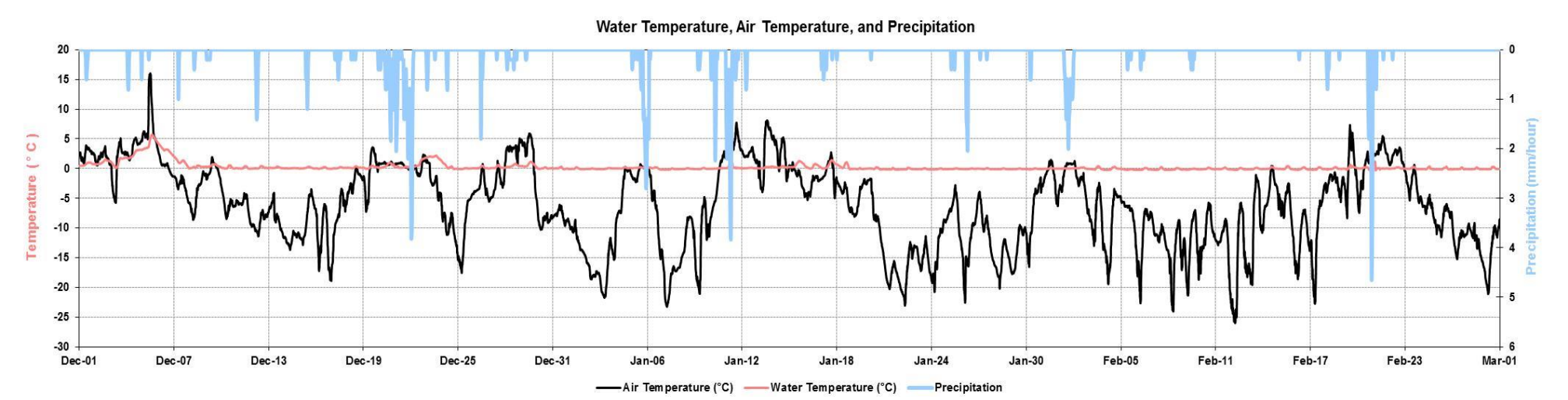
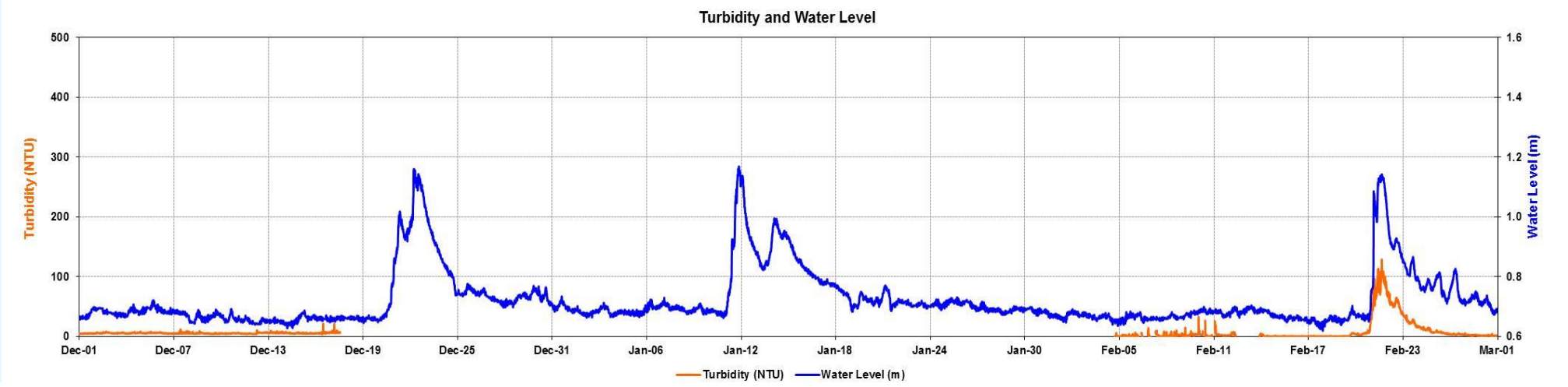
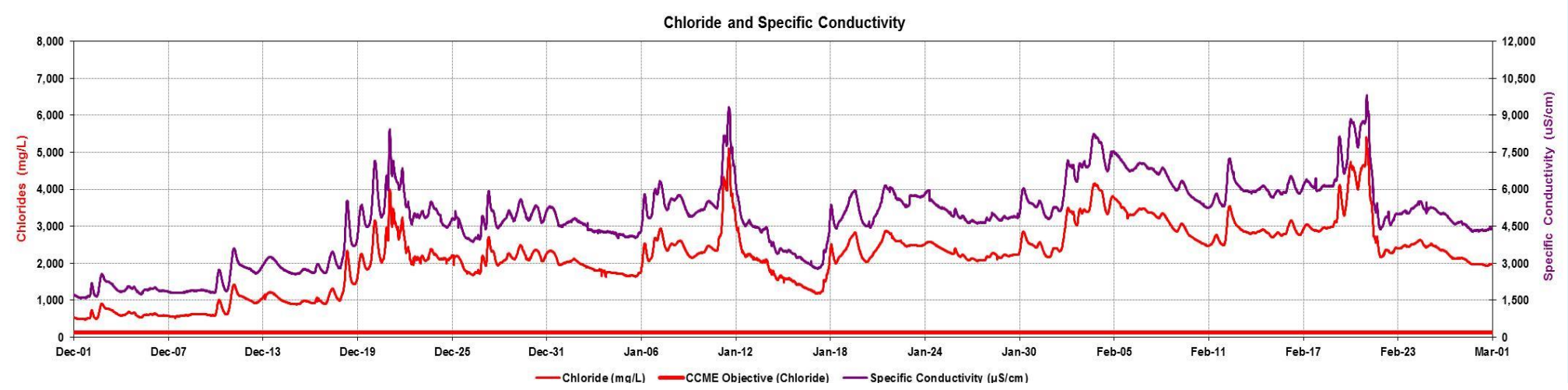
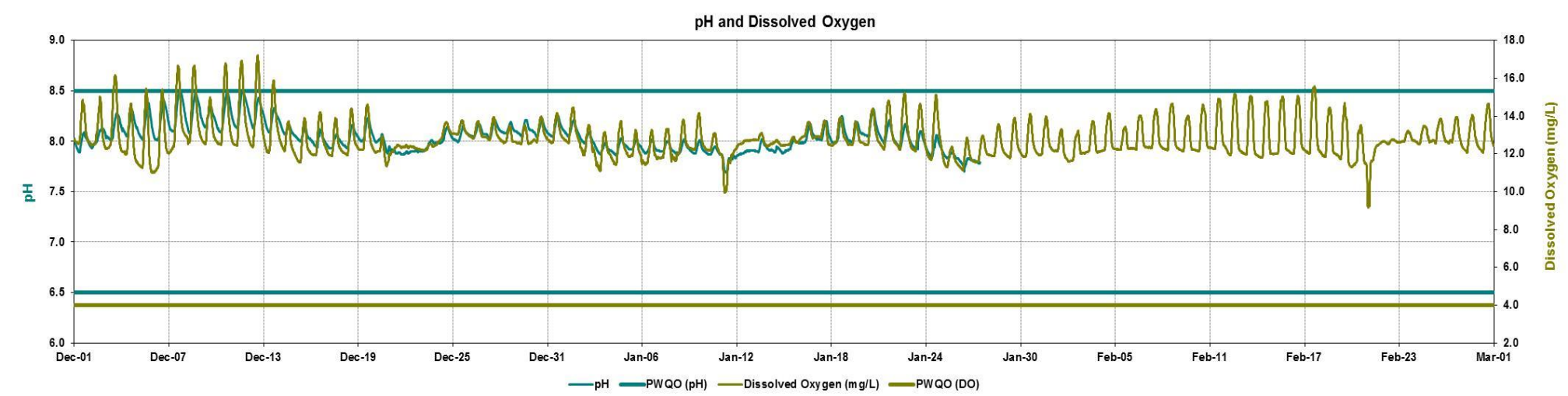
# Real-Time Water Quality: Winter 2014

## **Fletcher's Creek** at Second Line




↑ ↓ Coloured arrows indicate whether the given parameter should be above or below the indicated Water Quality Objective. Objective may be off-scale for some graphs.

## Seasonal Exceedance of Water Quality Objectives

| | Water Temperature | | | Dissolved Oxygen | | pH | | Chloride |
|---|---|---|---|---|---|---|---|---|
| | Cold | Mixed | Warm | Cold | Warm | Lower limit | Upper limit | Upper limit |
| Objective/Guideline | 26 ºC | 28 ºC | 30 ºC | 5 mg/L | 4 mg/L | 6.5 | 8.5 | 120 mg/L |
| Number of Days | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 90 |
| Percent of Readings | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 | 0.00 | 0.13 | 100.00 |

**Water Temperature** — Aquatic organisms, especially fish, are sensitive to extreme highs in river water temperature. If the water temperature exceeds CVC's maximum objective, fish will suffer. CVC has set an absolute maximum water temperature objective of no greater than 28 °C for mixed water streams such as Fletcher's Creek.

**Water Level** — The water level at each site is essential to translate parameter concentrations to loadings. Water level also allows us to determine when a rain event has occurred and how fast the water level increased, and returned to normal during and after a storm, respectively.

**Dissolved Oxygen** — Aquatic habitats need sufficient oxygen in water to survive and thrive. DO fluctuates over a diurnal cycle; high during the day and lower during the night, and with temperature (colder water holds more oxygen). Provincial Water Quality Objective for cold water fish is greater than 5 mg/L, and for warm water fish is greater than 4mg/L. In terms of DO, Fletcher's Creek is considered a warm water fish habitat.

**Turbidity** — Turbidity is a measurement of water clarity. A high turbidity indicates the presence of solids, sediments, or pollutants. Turbidity is used to estimate total suspended solid concentration.

**Specific Conductivity** — Conductivity measures the ability of water to pass an electrical current. Higher conductivity indicates a higher concentration of salts and other ions in the water.

**Chloride** — Chlorides are often elevated in highly urbanized areas as a result of road salt application and the drainage of swimming pools, or water softeners. The CCME guideline for chlorides is 120mg/L.

**pH** — pH level is a measurement of the acidity or alkalinity of water. The pH scale ranges from 0 to 14. Extreme levels of both alkalinity and acidity can be detrimental to aquatic life. The MOE has set a Provincial Water Quality Objective of in between 6.5 and 8.5 units.

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## Water Temperature, Air Temperature, and Daily Precipitation

- Air temperature ranged from -26.02°C to 16.01°C. The lowest air temperature was observed on February 12th.
- Air Temperature dropped below freezing on 90% of the days measured this winter.
- Water temperature ranged from -0.29°C to 5.68°C and reached it's lowest point on February 12th.
- Water temperature dropped to or below freezing on 75% of the days measured this winter.
- At this location*, from December 19th to 22nd as part of the "ice storm" in southern Ontario, 38.6mm of rain, snow, and freezing rain (snow water equivalent) was recorded.
- At this location* a total of 156.8mm of precipitation (snow water equivalent) was recorded this season.

*Measured at the CVC head office climate station, roughly 2km from the water quality station, and outside its drainage area.

## Water Level and Turbidity

- Ambient water level was around 0.6 to 0.7m. Small fluctuations in water level may be the effect of ice formation on the creek.
- Large increases in water level seen on December 22nd, January 12th, and February 21st are the result of precipitation events coinciding with above freezing temperatures.
- Ambient turbidity was 5NTU. Much of the turbidity data from the middle of the season were removed due to a sensor error.
- It is likely that turbidity increased on December 22nd, and January 12th, in response to water level increases, but data are not available to confirm this.

## Chloride and Specific Conductivity

- Chloride ranged from 477mg/L to 5,405mg/L.
- Peak chloride was measured on February 20th, coinciding with a large rain event and temperatures above the freezing point resulting in road salt-rich run-off.
- Increases in chloride and specific conductivity occur when road salt is washed into the creek after application, and when temperatures increase allowing salt-rich snow to melt and flow into the creek.
- Decreases in chloride and specific conductivity are the result of relatively large precipitation events diluting existing concentrations, or occur during periods of dry weather, when existing concentrations are diluted by baseflow.

## pH and Dissolved Oxygen

- Dissolved oxygen ranged from 9.17mg/L to 17.2mg/L this winter, staying above the 4mg/L Provincial Water Quality Objective (PWQO) 100% of the time.
- pH remained within the PWQO of 6.5 to 8.5 for most of the season, with values ranging from 7.69 to 8.52. pH exceeded the upper limit on 2 occasions for a total duration of less than 2 hours.
- After January 27th, pH values became unreliable and were removed. This was the 103rd day of the deployment, while the station was inaccessible, and the sensor likely lost its calibration.

## Quality Control Issues

- Turbidity data have been removed from the middle of the season. Values were erratic for an unknown reason possibly ice build-up or other interference with the turbidity sensor.
- Access to this station during the winter is hazardous because of its location at the bottom of a slope. As a result, an extra long deployment was required, resulting in invalid pH data towards the end of the season.

## Deployment Information

- Deployment Period: October 16th, 2013 to April 16th, 2014 (182 days)
- Monitoring equipment used:
  - Water quality parameters: Hydrolab DS5X
  - Air temperature: 5600-0025-1 Thermistor
  - Water level: Hydrolab DS5X
  - Precipitation: CVC head office climate station

## Questions or Comments?


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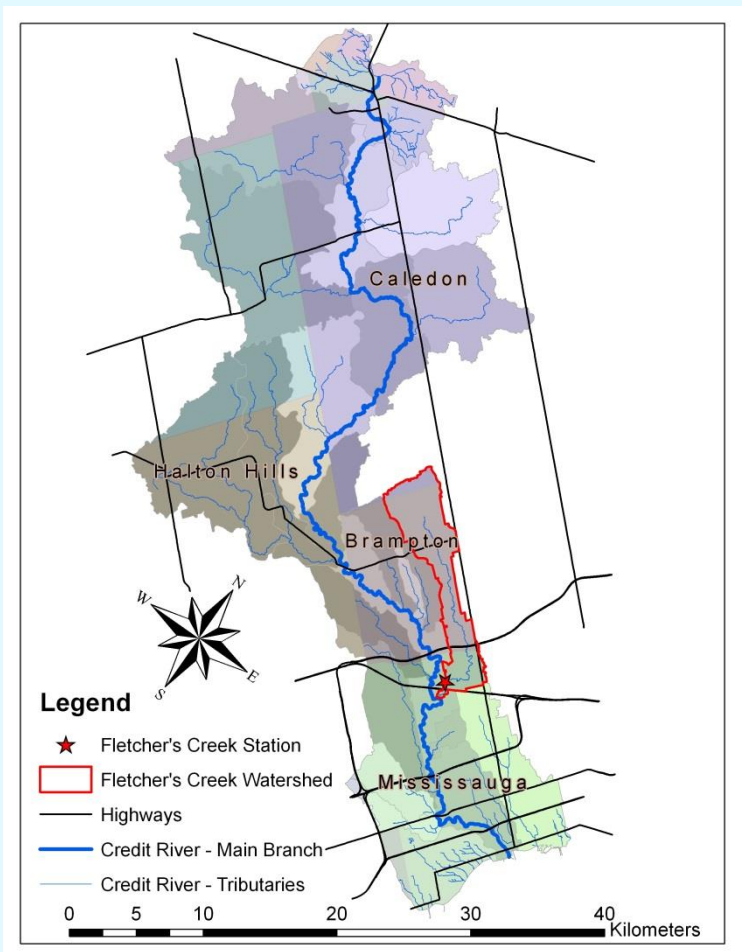


Figure 1, Right: Map of Fletcher's Creek sub-watershed within the entire Credit River watershed.