



**Credit Valley  
Conservation**  
inspired by nature

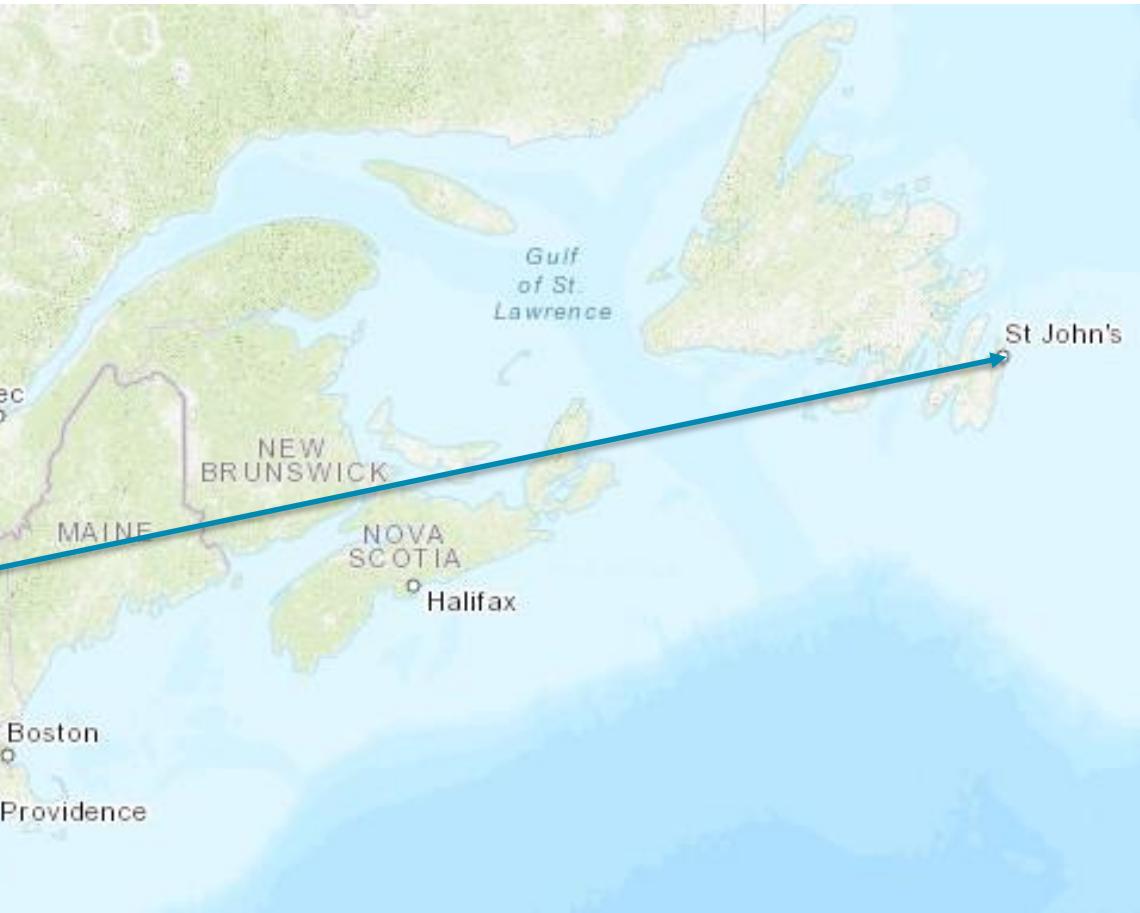
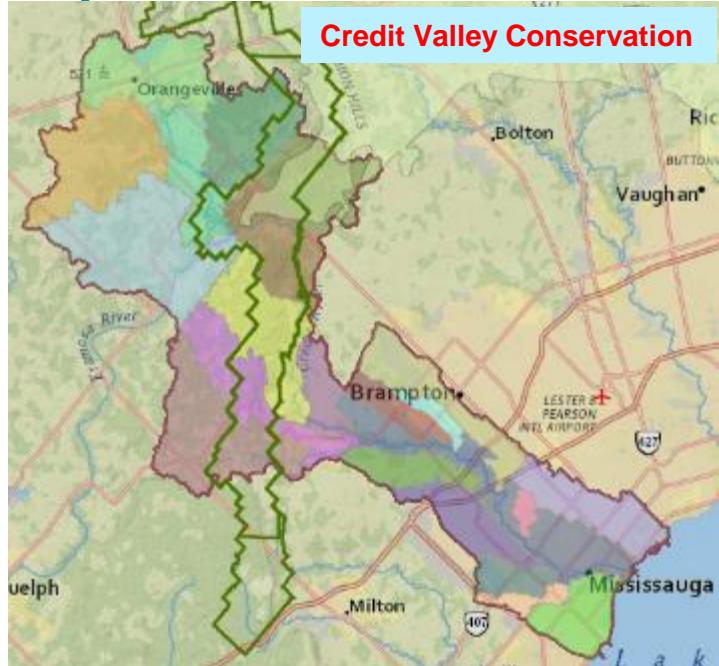
# **Credit Valley Conservation's Real-Time Water Monitoring Network**

Amanjot Singh, Ph.D., P. Eng.  
Sr. Engineer, Water Quality

Real-Time Water Monitoring Workshop, NL  
November 7th – 8th, 2023



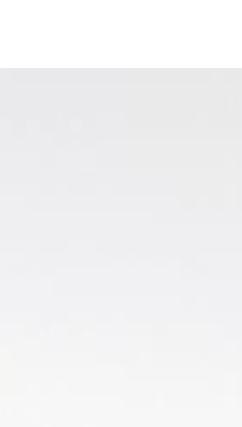
# About Credit Valley Conservation ([www.CVC.ca](http://www.CVC.ca))



## Water Quality



# Water Quality – An Integrator of Many Disciplines

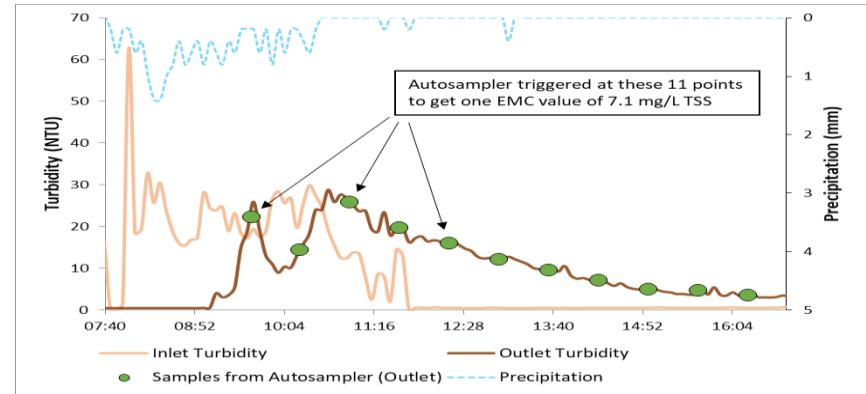
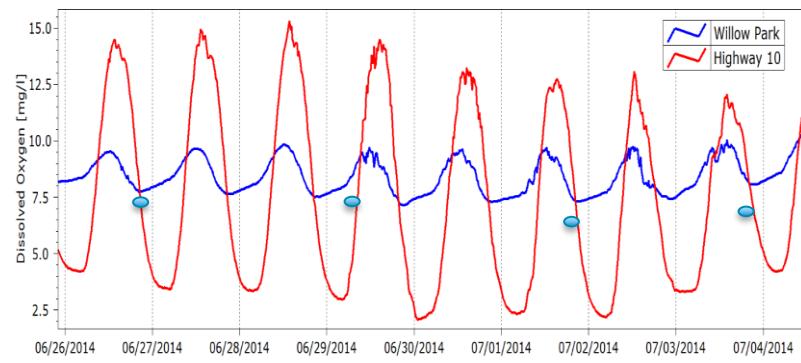


# **First Step to Evaluate Water Quality**

**-Monitoring-**

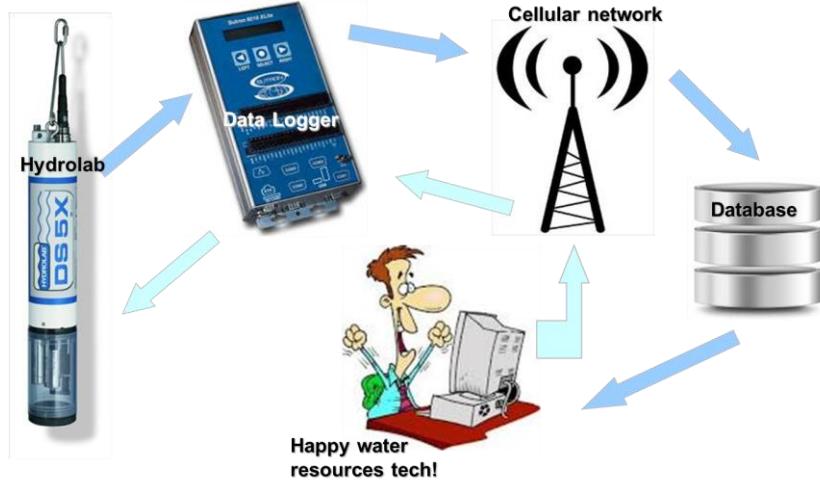


# Journey from Traditional to Real-time WQ Monitoring

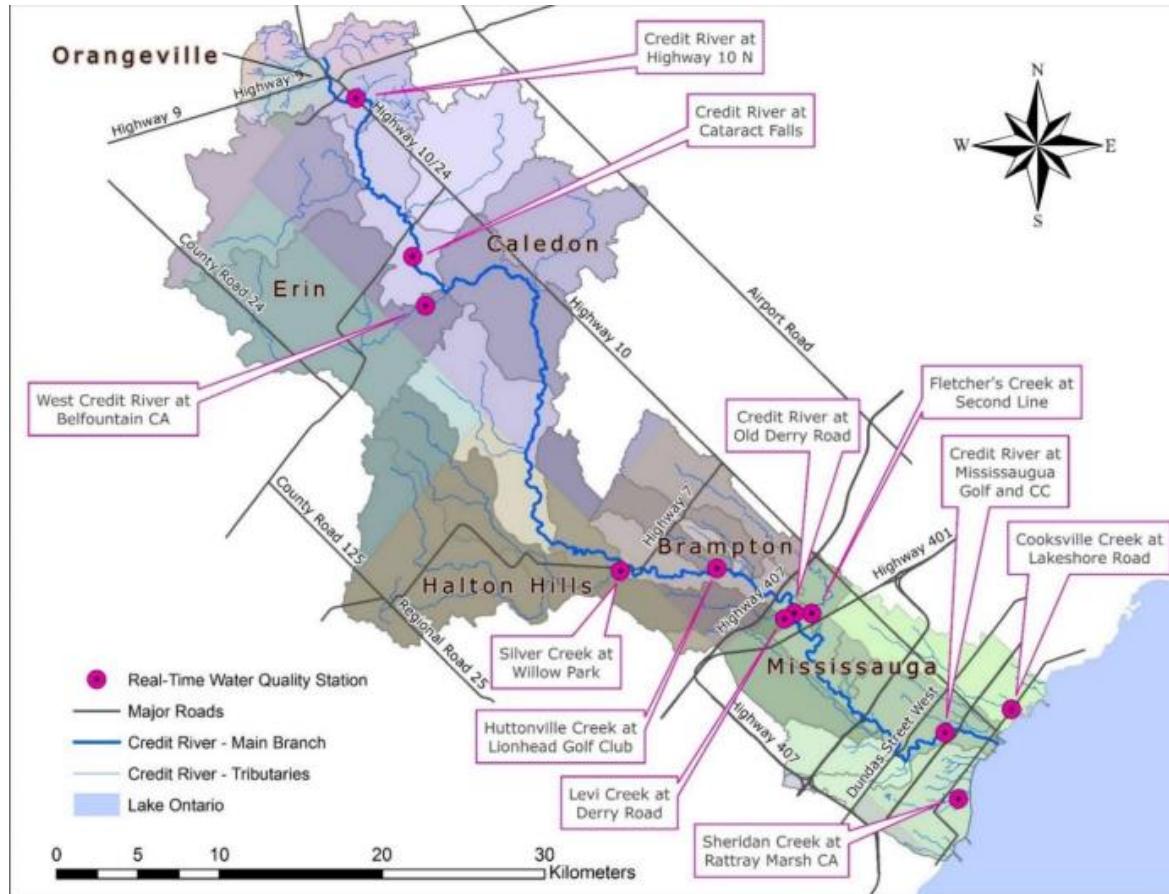


# Thanks to Region of Peel for Funding the Real-time Water Quality Program

First Station Installed in **2009**



# Eleven Stations Across CVC's Jurisdiction Installed between 2010-2013



## Parameters

- Turbidity
- pH
- Dissolved Oxygen
- Chloride
- Conductivity
- Water Temperature
- Air Temperature
- Flow/water level

Data Available at: <https://cvc.ca/real-time-monitoring/>

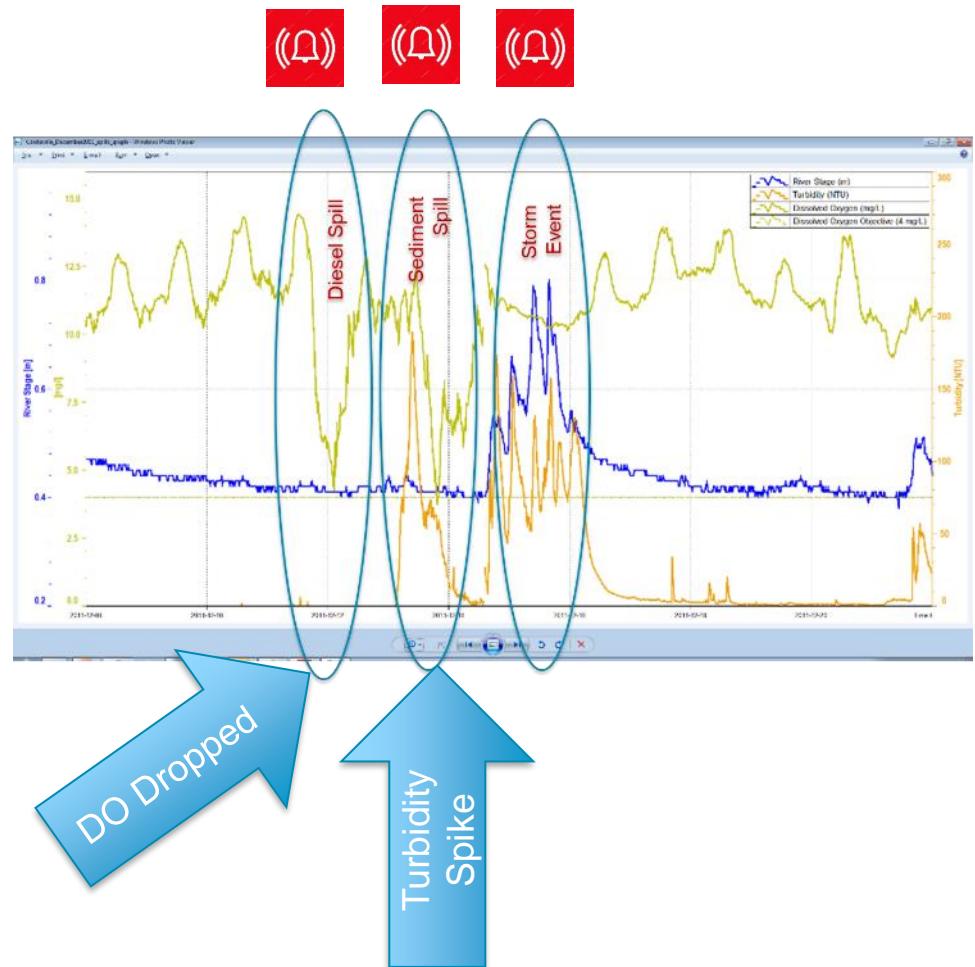
## **Some Unique Observations Recorded Since 2009**



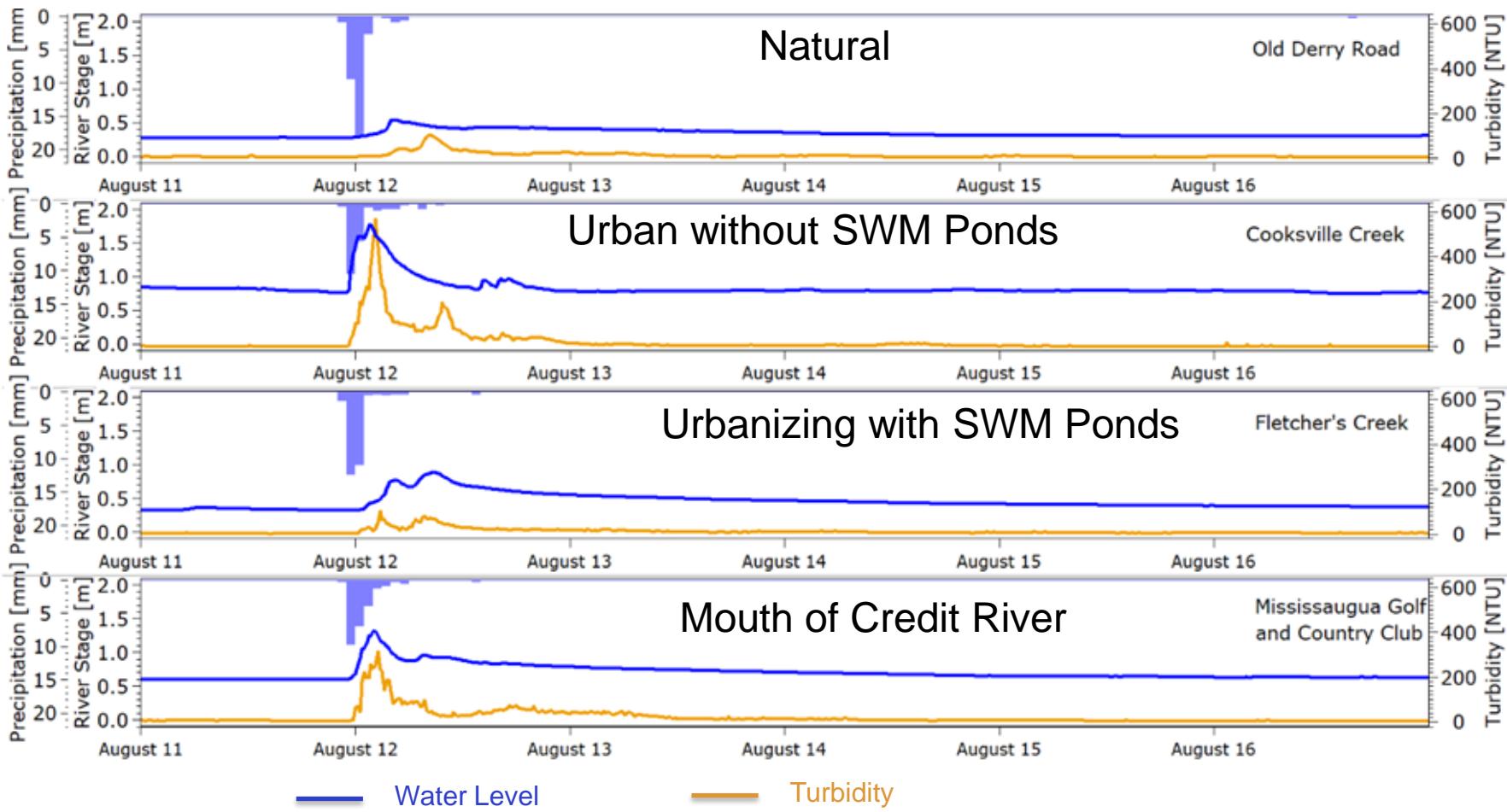
## After first storm: August 2009



# Spills Captured at Cooksville Creek Station

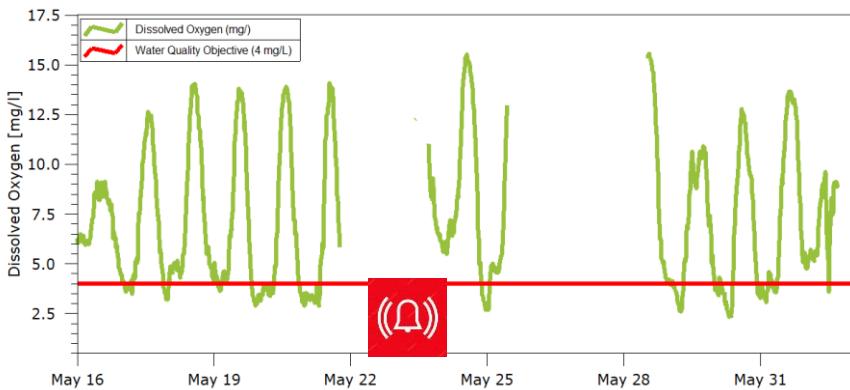


# Flow and Turbidity Responses Urban, Urbanizing and Natural Catchments

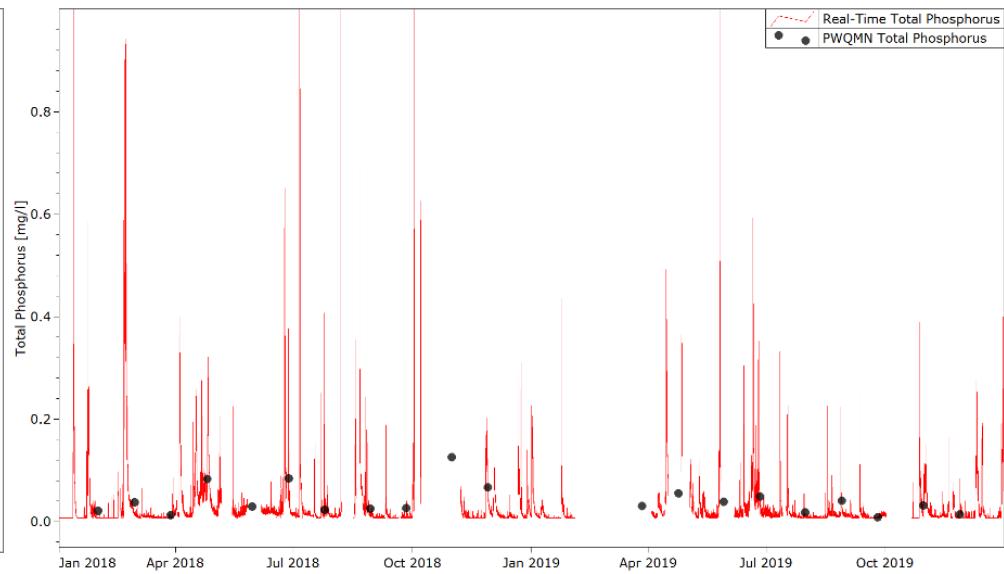
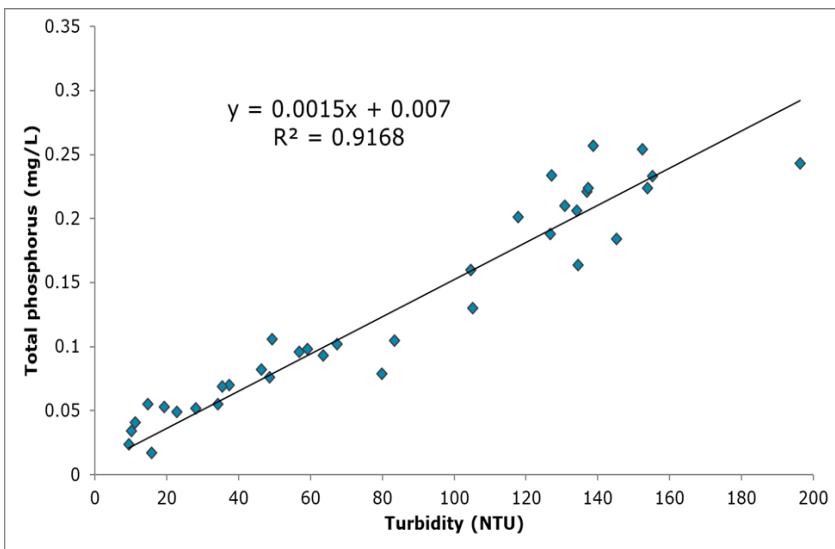


# Algae Bloom – Reflecting Climate Change

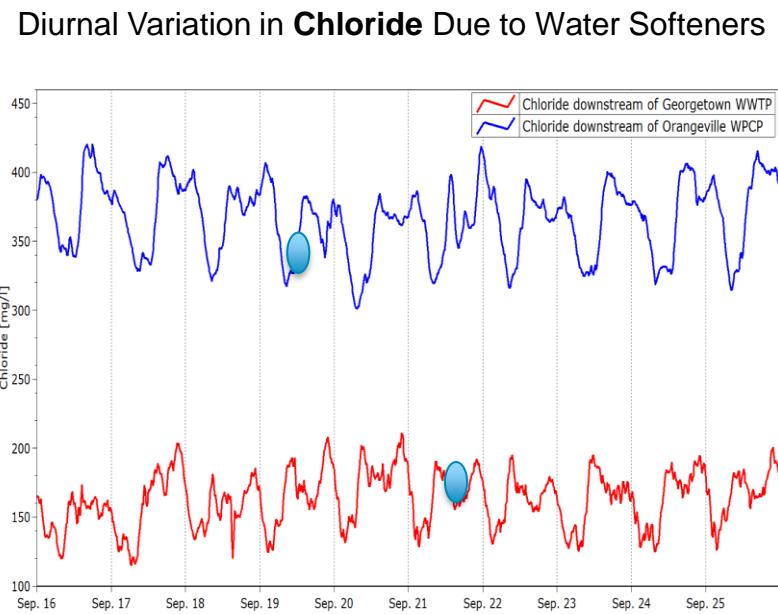
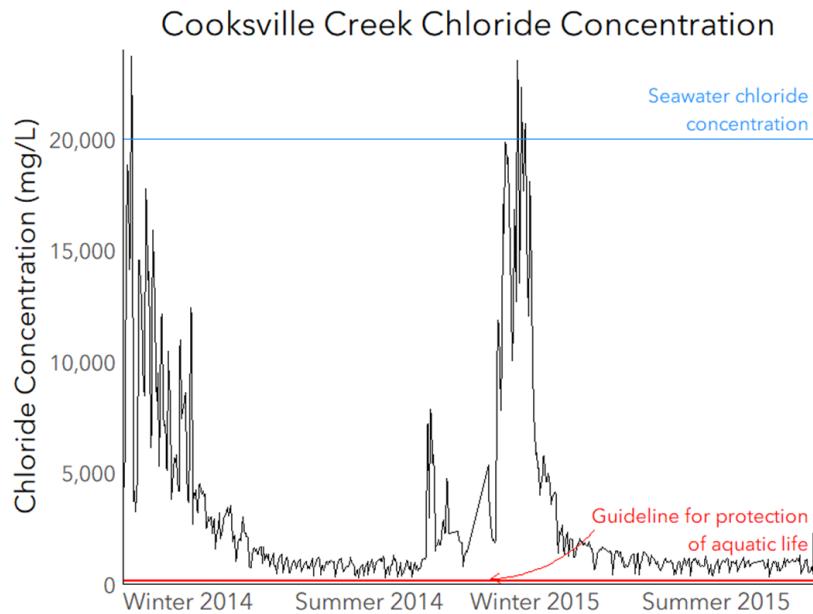
## High Dissolved Oxygen Diurnal Variation



# Capturing Event Turbidity for Estimating TSS and TP Loadings

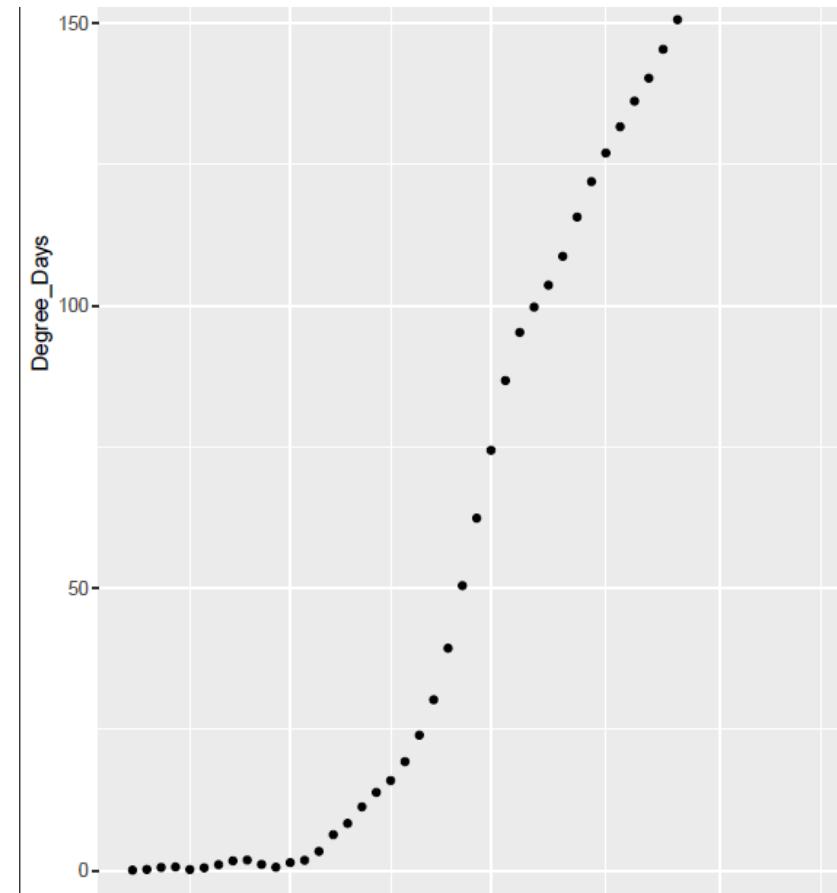


# And of course, Eye Opening Chloride Concentrations Captured



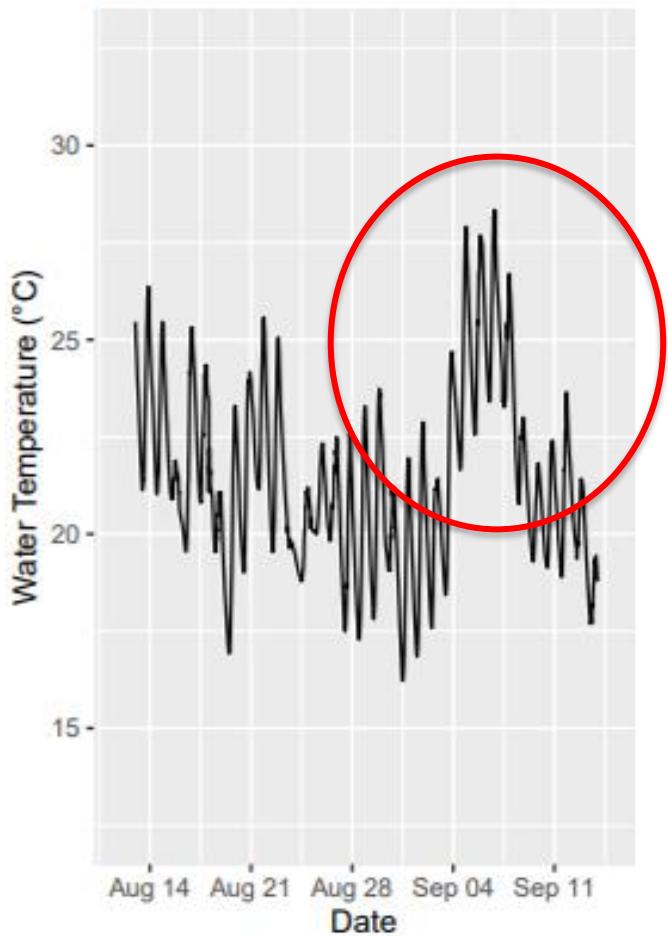
# Supporting Redside Dace Research – Degree Days

Identifying spawning period initiation

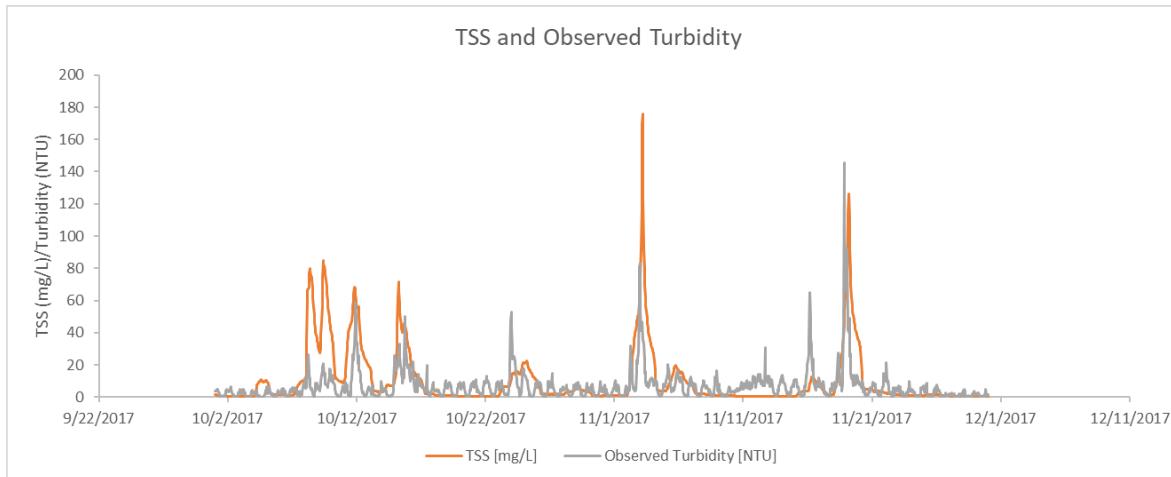
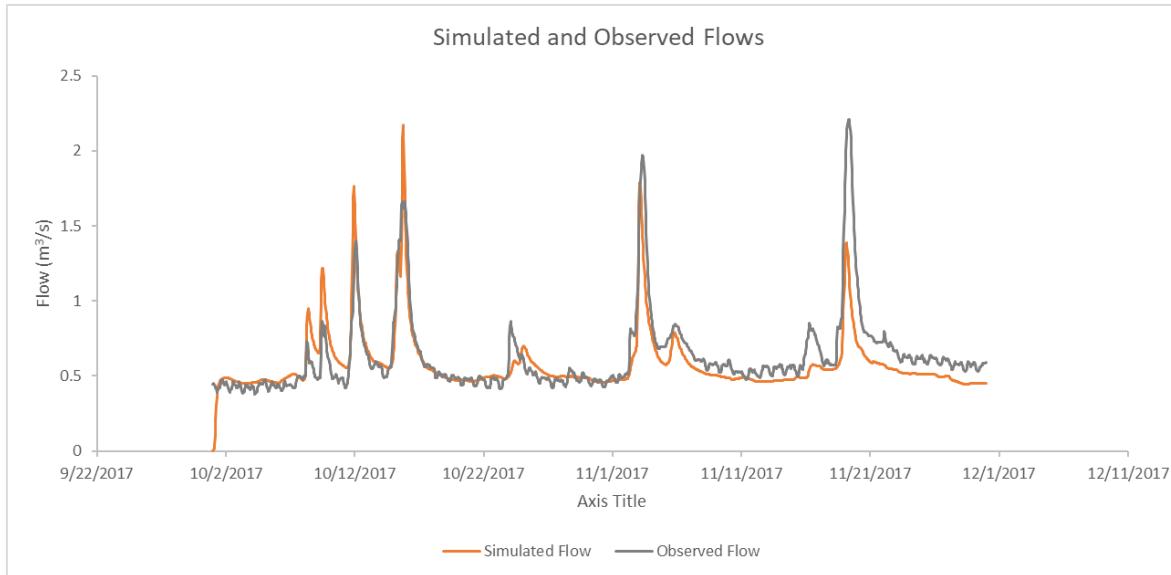


# High fall temperature and Chinook Salmon

2023



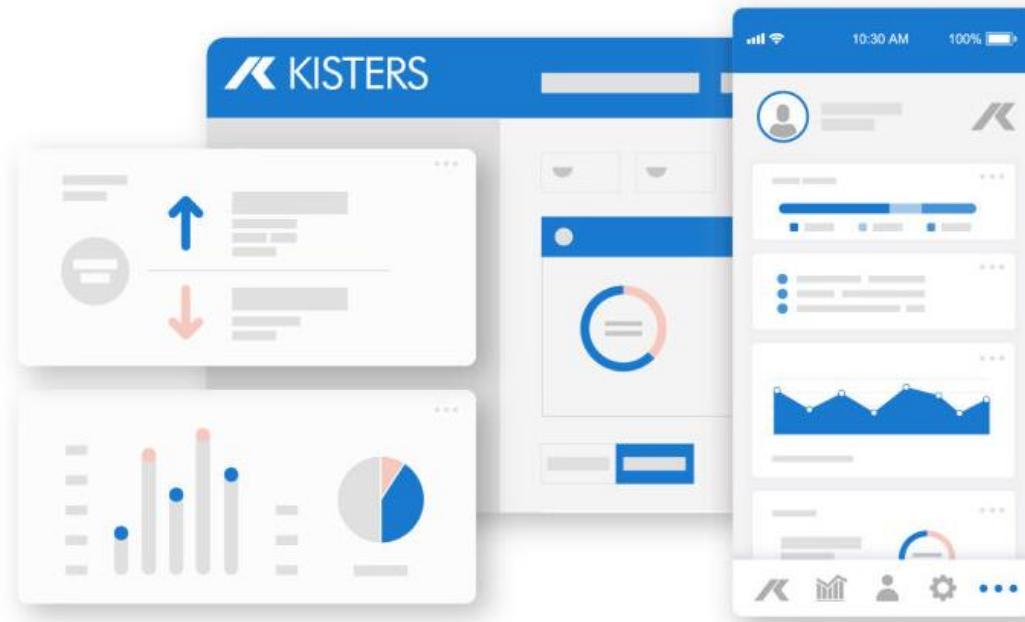
# We use this Real-time data for model calibrations



## **Data Hosting and QA/AC**



We are using **KISTERS Wiski** since 2013



# Data Quality Assurance Quality Control



EDIT LINKS

## RTWQ Network Operation Wiki

### Updated Pages

Secondary QAQC

Sensor Purchasing Options

RTWQ Network Operation Wiki

Quality Codes and Standard Remarks

Dissolved Oxygen and pH QAQC

### Site Contents

Real-time Network - Operation

### Recent

10-Year Report

Teams Wiki Data

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049cb054a10795@threadd.tacv2\_wiki

App\_Links

wiki\_documents

Recycle Bin

EDIT LINKS

## RTWQ Network Operation

The real-time water quality (RTWQ) response program operates a network of 11 real-time water quality monitoring stations. The program was established in 2010 with the broad goal of using real-time technology to gain a comprehensive understanding of watershed stressors including climate change and land-use change.

The real time water quality network accomplishes this by collecting high temporal resolution data for key water quality indicators. Additional benefits of the program include identifying spills, understanding seasonal and diurnal variations in water quality, estimating pollutants loads to Lake Ontario, and developing tools and models

This Wiki will guide CVC staff and other stakeholders through the operations of the RTWQ network. Follow the links below and the table at the bottom of each page to navigate through the documents.

## 1.0 Station Setup and Equipment

### 1.1 Hydrolab Calibration

## 2.0 Station Access and Maintenance

### 2.1 Troubleshooting Station Issues

### 2.2 Battery Voltage Data

## 3.0 Parameters

## 4.0 Data Management

### 4.1 RTWQ Data QAQC

#### 4.1.1 RTWQ QAQC Process

##### 4.1.1.1 Daily Check

##### 4.1.1.2 Primary QAQC

##### 4.1.1.3 Secondary QAQC

#### 4.1.2 Parameters QAQC

##### 4.1.2.1 Air and Water Temperature QAQC

##### 4.1.2.2 Turbidity and Water Level QAQC

##### 4.1.2.3 Specific Conductivity and Chloride QAQC

# Real-time data is available to the public on our website

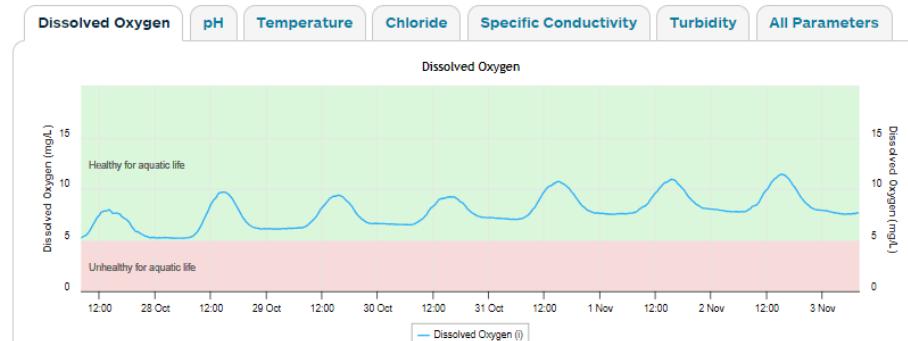
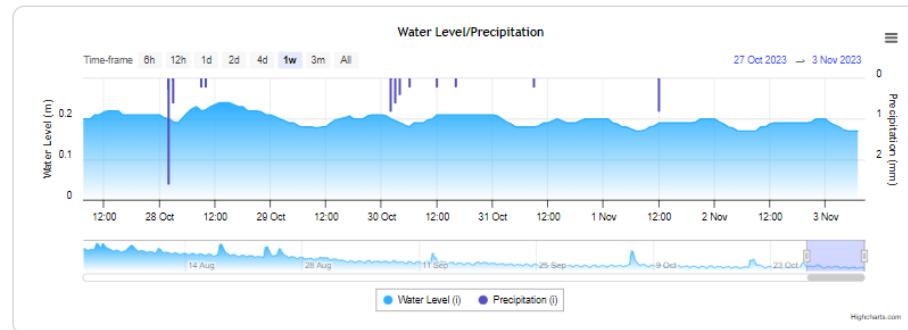
## Credit River at Highway 10 N

Station Number: 8190005

Station Type: Water Quality

Municipality: Caledon

Agency/Owner: n/a



### How to read this chart

The blue line shows the amount of dissolved oxygen in the water. The vertical axis shows dissolved oxygen in milligrams per litre. The horizontal axis shows time. Measurements are taken every 15 minutes.

The green shaded area shows the healthy range of dissolved oxygen values according to provincial water quality guidelines for the protection of aquatic life. The red shaded area shows dissolved oxygen values that are outside of this range and could be harmful for long durations. Dissolved oxygen is heavily influenced by water temperature.

<https://cvc.ca/real-time-monitoring/>

# What is coming!!

## 10-Year Report

The Real-Time Water Quality team (RTWQ) is preparing a 10-year report to summarize continuous, real-time data collected at our monitoring stations.

### Parameters

The parameters that will be examined in this report include:  
-Water temperature

### Software

All data analysis is completed in R, using data extracted from the online KiWIS server. Information for this project is stored in the W drive, at the following location - W:\RTWQ\project\_DataAnalysis\10-YrReport\KiWIS\_query\_KHH. All [scripts](#) used in the analysis are in the folder "scr" and the raw data files extracted from KiWIS web query service are located in the "data" folder.

### Data extraction

RTWQ data is stored in WISKI. The data used in the 10-year report is extracted from KiWIS, an online server that allows you to access data stored in WISKI. Data is extracted from KiWIS via the [CVC\\_Kisters\\_API\\_query\\_KHH\\_v2.R](#) script in R. You can also access the same data through the [online KiWIS server](#), following these instructions. However, loading the data through R is more efficient, as multiple datasets for different stations can be extracted at once. It is also easier to perform data interpolation, perform calculations on large volumes of data, extract other metrics from the data, and graph the data once it is in R.

## Questions

