

**Central Queens Branch of the PEI Wildlife Federation 2022  
Water Quality Report on the West and Clyde River**



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## **Introduction**

In 2022, the Central Queens Branch of the PEI Wildlife Federation (CQWF) monitored parameters that influence water quality aspects. The information included in this report discusses data collected by CQWF in 2022 (and also historical data) along with research gathered from online sources. Some aspects that influence water quality include surface water nitrate levels, stream water temperature, fish kill events, siltation events, and estuary anoxic events.

The quality of water in our freshwater and estuary environments directly influences productivity and can act as a limiting factor when surpassing certain thresholds. For example, the temperature can limit productivity for salmonids when it reaches temperatures over 20 degrees.

By gathering information on key aspects of water quality, CQWF can identify issues and implement management tactics. The main objective of this report is to determine the general health of water quality flowing through both the West and Clyde Rivers. Along with this report, CQWF also has a West River Watershed Management Plan (2008).

## **Methods**

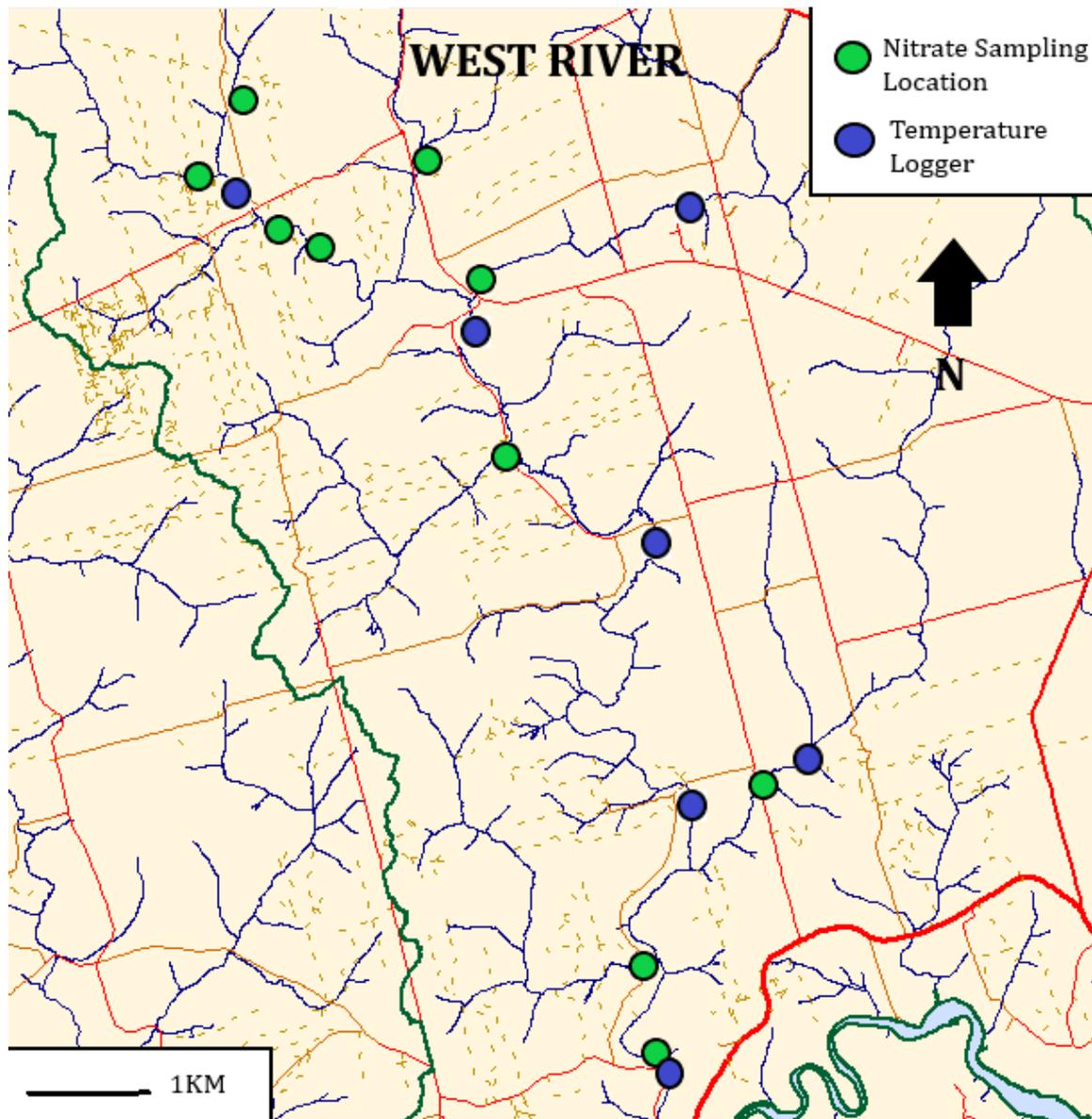
Data was collected for certain aspects of water quality monitoring during 2022. Surface water was sampled for nitrate concentrations by collecting a water sample at ten sites on the West River, and six on the Clyde River (Figure 2&3). Samples were analyzed at the PEI Analytical Lab. The results of these water samples are paired with flow measurements taken on the same day using a Flowmate. A formula is used to yield a quantitative measurement of the nitrate loading (kg per day) at the time of monitoring.

Stream water temperatures were recorded on the West River with HOBO data loggers at four locations (Figure 4). However, one of those loggers was lost due to being dislodged. The logger on the main West River was located at Bolger Park Rd, Riverdale Rd on Howell's Brook and below Carragher's Pond on Quinn's Brook. Loggers were programmed to record a temperature reading each hour of the day. One logger was deployed on the Clyde River and an additional logger was deployed in Brookvale on the West River.

It is difficult to get an accurate measurement of how much siltation is actually occurring in a river. Data was collected using a manta turbidity logger from November 2020 to June 2021 on the main branch of the West River for the purpose of a UPEI graduate study (Figure 5). It is difficult and expensive to determine the quantity of silt moving in our systems. However, in the case of the West and Clyde Rivers, it is apparent that siltation is a major issue.

Information regarding fish kill events was gathered from online sources <https://www.princeedwardisland.ca/en/information/environment-water-and-climate-change/fish-kill-information-and-statistics>.

Information regarding anoxic events in the West River estuary was gathered from online sources also <https://www.princeedwardisland.ca/en/information/environment-energy-and-climate-action/anoxic-events>.



**Figure 1.** Nitrate sampling and water temperature logger locations on the West River.

## **Results/Discussion**

### **Nitrate Concentration**

Overall the Clyde River has higher nitrate concentrations in surface water compared to the West River. Higher concentrations of nitrates in the system can be related to land usage and more specifically the amount/type of agriculture present. The Clyde River area contains more agriculture than the West River, and also lacks adequate forest cover. The total amount of forest cover on the West River is 52% (2008 data). Sites monitored in 2022 during spring flow conditions had an average surface water nitrate of 3.8 ppm on the Clyde River (n=5) while the West River had an average of 1.4 ppm (n=10). However, when flow measurements are incorporated into the daily loading calculations the West River has a greater average loading rate of 31.0 kg/day vs the Clyde River average of 24.1 kg/day (see Figures 2&3). This is relative to the size of the river with the West River has a much greater daily discharge than the Clyde River.

### **Stream Water Temperature**

Stream temperatures are not an issue on both the West and Clyde Rivers due to the abundance of springs and the lack of open wetlands. Warm temperatures (over 20 degrees) in a river can cause stress to the salmonids forcing them to seek cold water refuge. Temperatures did not exceed 18 degrees in 2022 (Figure 4). The peak temperature reached 17.9° on a single occasion at Riverdale Rd on Howell's Brook. The highest record temperatures at Bolger Park were 16.3° and 16.8° on Quinn's Brook. Average temperatures were 8.3° on Quinn's Brook, 7.5° at Bolger Park Rd, and 7.6° on Howell's Brook.

### **Siltation Events**

Siltation occurs in the events of spring snowmelt, or in cases of heavy rain throughout the year. The relationship between an increase in water levels and increased nephelometric turbidity units (NTU) is displayed in Figure 5. This illustrates the challenges climate change may pose in upcoming years as it is predicted that weather patterns will favor an increase in intense rainfall events which will increase the likelihood of siltation events.

During heavy rains, CQWF has gone to problematic clay roads to assess runoff. It is evident that there is significant runoff from these secondary roads. CQWF has strong relationships with the DTIE and a number of structures have been installed in recent years to mitigate runoff from these secondary roads. During extreme siltation events sediment is deposited over the streambottom cobble and gravel which is essential for salmonid spawning habitat. After repeat events, the once loose gravel becomes cemented with sediment making redd construction difficult for the trout and salmon. This can starve the incubating eggs of the required oxygen to emerge successfully thus limiting habitat productivity. It is evident that farmers' fields are another major source of runoff. CQWF works with farmers to reduce the amount of sediment being introduced in our rivers and to promote more responsible farming practices.

## **Fish Kills Related to Pesticide Runoff**

The only recorded fish kill for the West River was on June 19, 1971. The cause was a barrel of endrin that spilled into the upper reaches of Howell's Brook. The Clyde River has 3 recorded fish kill events, July 21 1999, July 19 2002, and July 25 2016. Similar to siltation due to runoff, the frequency of fish kills due to runoff is also an issue when it comes to water quality in our rivers. A fish kill can occur when a farmer sprays pesticides on a field near a river or stream before the instance of heavy rain. Farmers are supposed to avoid spraying pesticides on their fields before heavy rain, but sometimes the rain is unexpected, and other times farmers are negligent.

## **Anoxic Events in Estuaries**

Anoxic events in an estuary are to be taken into consideration when water quality is being assessed. In 2021 there were no recorded anoxic events on the West or Clyde River. Since 2011 the only recorded anoxic event was in 2018 on the West River. Due to the lower water temperature and higher amplitude of tides (greater flushing), rivers along the south shore tend to have a lower frequency of anoxic events when compared to north shore rivers. Anoxic events are not of primary concern. They occur infrequently and it occurs in the estuary, which is shared with multiple other rivers, so it is beyond the scope of the West River management plan.

An anoxic event occurs when dissolved oxygen levels in the water are near zero. It will cause the water to turn a milky, green color, and release H<sub>2</sub>S which gives off a sulfuric, rotten egg smell. These anoxic events are rare in the shared estuary of the West and Clyde River, but they still occur occasionally, so they must be taken into consideration.

## **Pathogens**

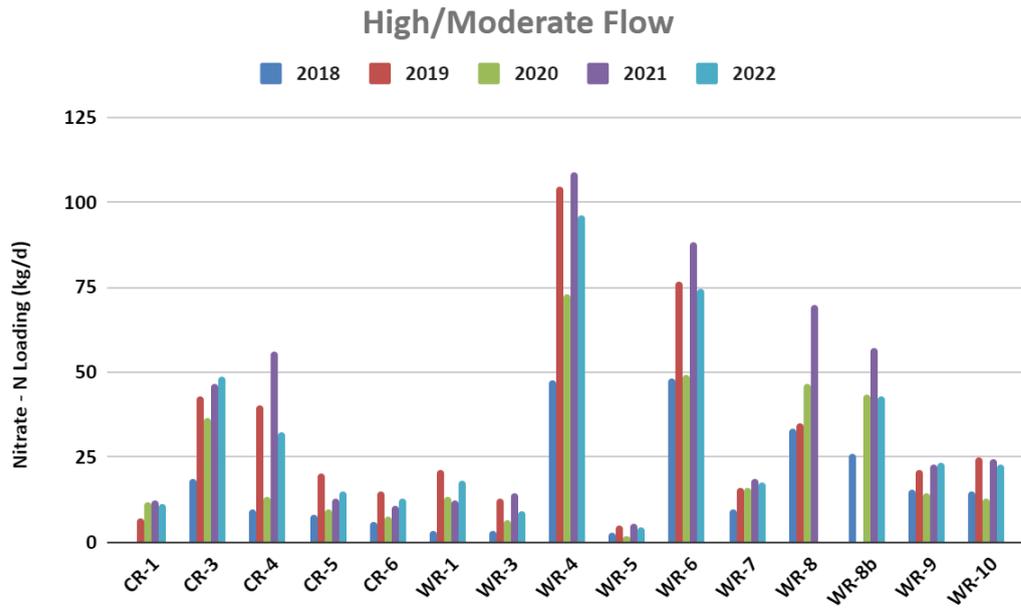
The most noted pathogen affecting salmonid populations on the West River is Saprolegnia and Ulcerative Dermis Necrosis (UDN). Several necropsy reports have been submitted for brook trout and came back positive for Saprolegnia. In recent years an abnormal amount of infected salmonids have been recorded. In 2022, 2021, and 2020, Atlantic salmon were found with UDN (Ulcerative dermal necrosis) and Saprolegnia infections. Atlantic salmon, brook trout, and rainbow trout are affected by Saprolegnia during their spawning season as the stress from spawning compromises the immune system making them susceptible to infection. The largest concern with Saprolegnia and UDN is the effects and reduction of the broodstock population. Further investigations should occur to obtain reasons for the abnormal levels of recorded infections. CQWF has begun keeping a record of reported and observed infected fish and in 2022 CQWF recorded 53 infected fish and 14 dead while in 2021 there were 59 fish infected and 26 dead with obvious signs that they died from severe infection. This will be monitored on an annual basis.

## **Final Comments**

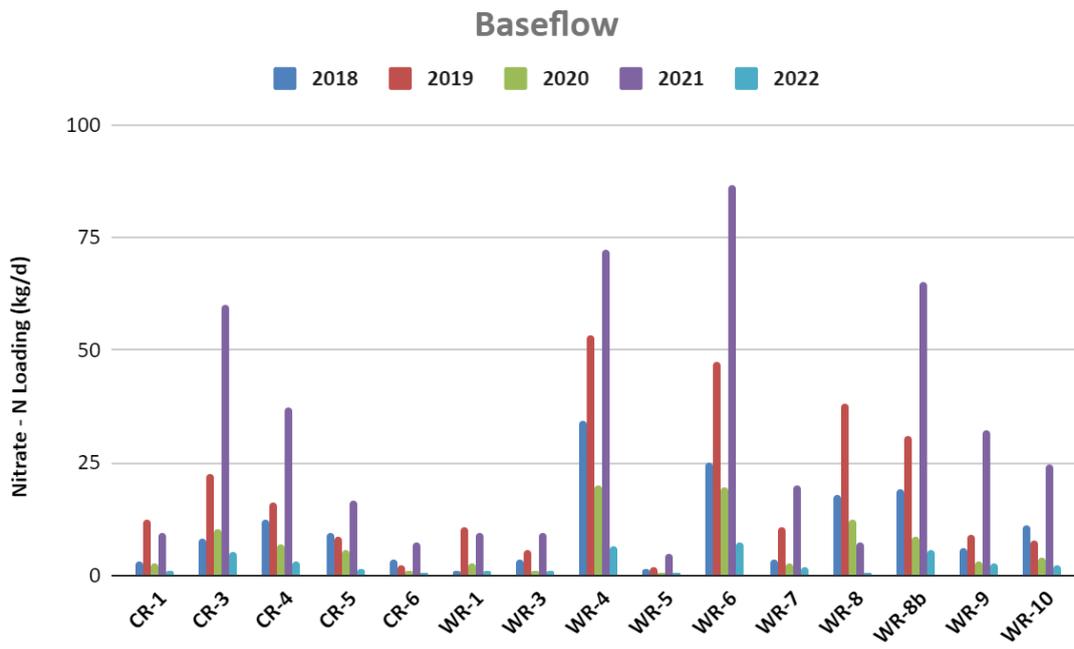
Overall the West River has relatively healthy water qualities. Water temperatures that do not exceed 18 degrees are ideal for salmonids, which very rarely happen on the West

River. The West River is in the mid-range for forested landscape which is reflective of the nitrate levels present in surface water samples. Spring flow in 2022 measured surface water nitrate levels ranging 0.4- 2.7 ppm, which is considered low to moderate. It has been 50 years since the last fish kill on the West River but siltation events are still very common during spring melts and rainfall events. The largest water quality issues on the West River is the abnormally high rates of Saprolegnia and excessive siltation.

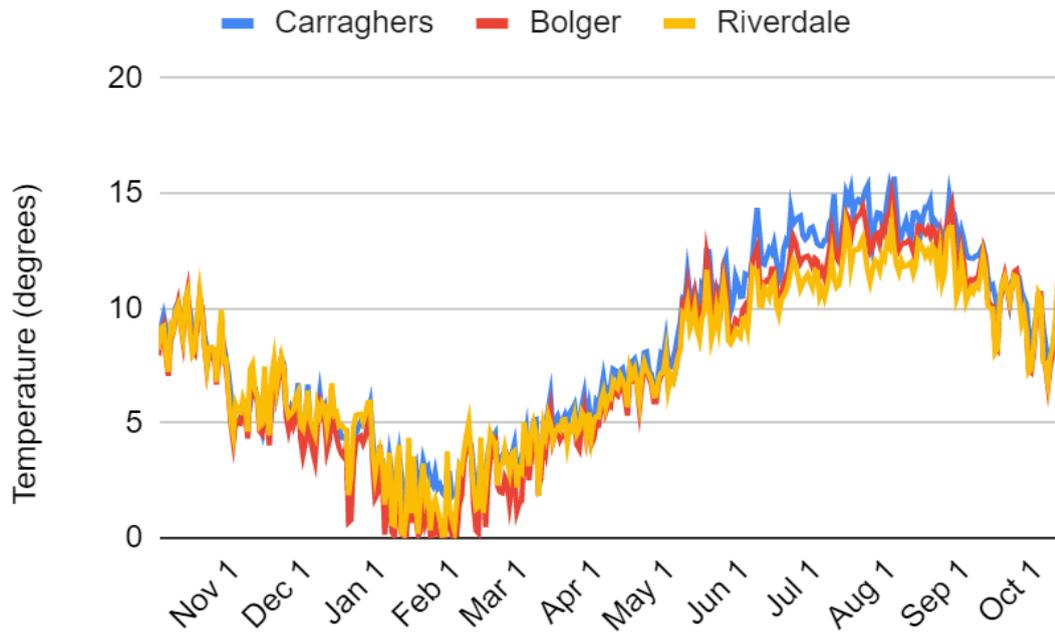
The Clyde River has moderate water quality. Although there is no data to represent temperatures on the Clyde, it is expected to be relatively similar to the West River due to its geographical landscape and a high number of springs which help regulate temperatures. The forest cover for the Clyde River is low (~25%), which is reflective of the surface water nitrate levels. The range of surface water nitrate levels is moderate to high for PEI standards (3.0 - 5.1 ppm). A good portion of the land is farmland, although this is not ideal, it is primarily pasture rather than row crops. Pasture lands contribute little soil erosion when compared to row crops as there is no exposed soil during the spring freshet. There have been three fish kills since 1999, the most recent in 2016 and with present agriculture practices the risks of another fish kill occurring is high. The biggest water quality issue on the Clyde River would be the amount of siltation and poor land usage, which also results in elevated nitrates in surface water. Anoxic events are infrequent in the Clyde Rivers estuary.



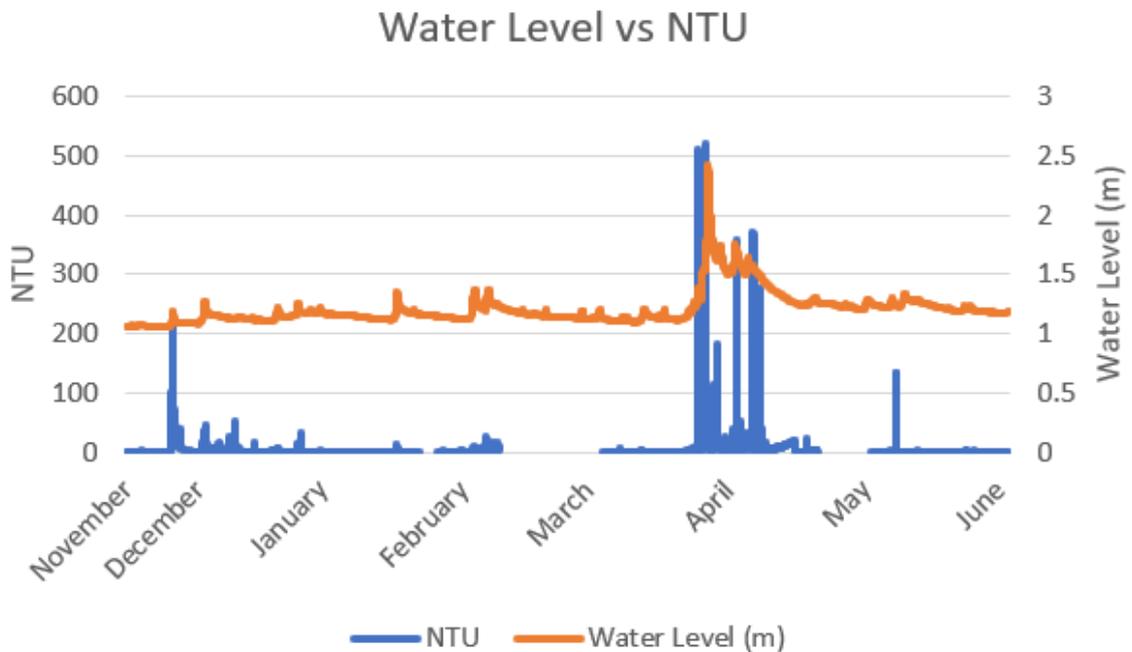
**Figure 2.** Daily nitrate loading was calculated for the West River (WR) and the Clyde River (CR) during high/moderate flows in 2022.



**Figure 3.** Daily nitrate loading was calculated for the West River (WR) and the Clyde River (CR) during base flows in 2022.



**Figure 4.** Stream water temperature from October 2021 to October 2022 on the West River.



**Figure 5.** Nephelometric Turbidity Unit (NTU) or suspended particles from November to June 2021 in relation to water level (m) on the West River.