ACKNOWLEDGEMENTS

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The Swift Current Creek Watershed Stewards would like to thank the 2023 Summer Stewardship Coordinator, Shannon Sherk for her work on this project.

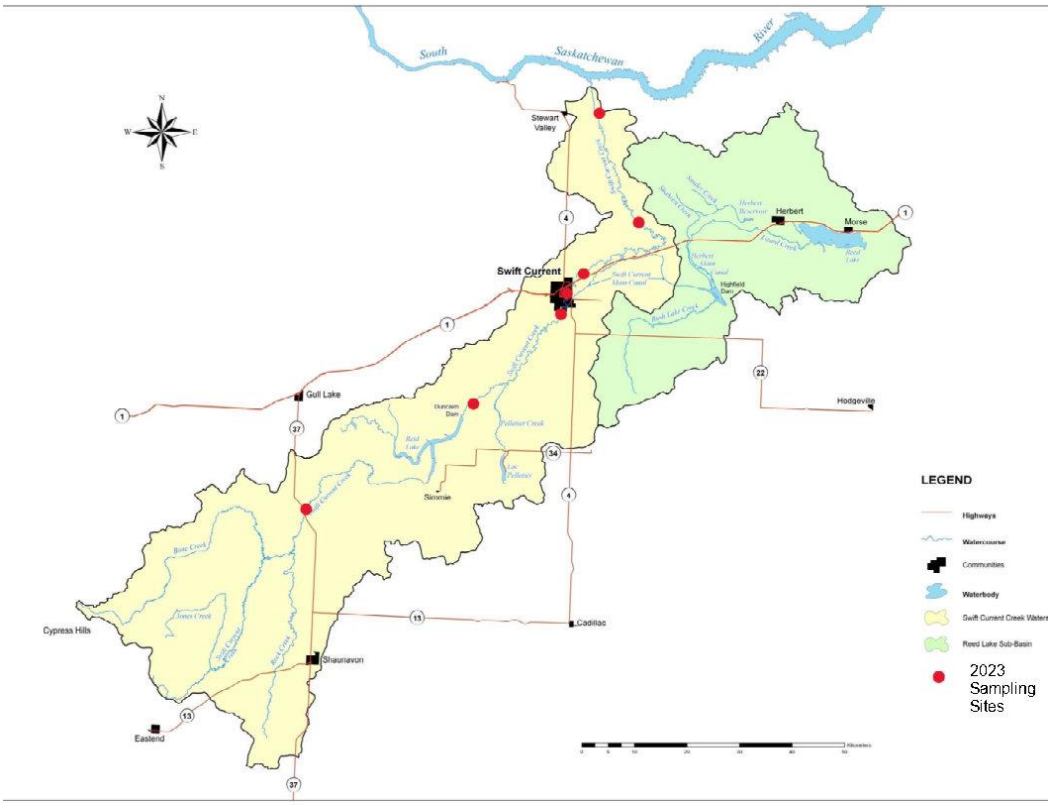

Figure 1: 2023 Monitoring Project Sampling Sites.

EXECUTIVE SUMMARY

The Swift Current Creek Watershed Stewards (SCCWS) Mission is to “Enhance water quality and stream health of the Swift Current Creek by promoting awareness and understanding among water users.” To help meet this mission the SCCWS monitors the health of the Swift Current Creek using various methods. The SCCWS had made plans in the winter of 2023 to assess the water quality and stream health of the creek in the summer of 2023 in response to several years of reduced moisture. The flooding that occurred in the spring of 2023 and its possible impact added another factor that could be looked at to help determine the health of the Swift Current Creek. Samples were taken at seven sites four times during the summer to help determine if and how water quality has changed from year to year and during the year.

The results show that the flooding in the spring of 2023 did impact some water quality parameters in spring and early summer, but that impact faded as the summer progressed. A thunderstorm with hail and heavy rain hit the City of Swift Current on July 22, 2023. The results from sites in the city and downstream of it show that the run-off from this event may have impacted water quality in these areas.

The results of the 2023 project show that the water quality in the creek is generally good for all uses and users. There are exceptions to this, but they are not significant and can be addressed. The results show that water quality has not changed significantly from prior monitoring projects. This is both good and bad. It is good that there has not been a decline in water quality but is bad in that there are still water quality issues that need to be addressed.

The results gathered in this project, can be used as markers for water quality in 2023 for comparison when future monitoring projects are completed. These results can also be used to educate water users about the actions they can take to enhance the water quality and stream health of the Swift Current Creek.

Figure 2: Water Sampling supplies

INTRODUCTION

When the Swift Current Creek Watershed Stewards (SCCWS) consulted with stakeholders in 2019, it was tasked to work to mitigate the impacts of Agriculture, Extreme Climate Events, and Invasive Species on water quality and stream health of the Swift Current Creek. To learn more about the water quality and stream health of the Swift Current Creek changes from year to year, during the year and at different locations of the creek the SCCWS regularly conducts water quality monitoring. This monitoring helps the SCCWS to determine if and how these stressors are impacting water quality and stream health.

This year seven sites were sampled four times each during the summer. The sites that were selected represent the different areas of the creek to compare water quality in these areas and help to determine changes in water quality as we move from the headwaters of the creek to the confluence with the South Saskatchewan River. The following seven sites were sampled:

- A10 - Upstream of Duncairn Reservoir and downstream of the confluence of the Swift Current Creek with the Bone Creek, Jones Creek, and Rock Creek.
- B30- Immediately downstream of Duncairn Reservoir.
- C50 - Just south of the city of Swift Current before the Water Treatment Plant.
- Riverdene (R.D.) - Within the city of Swift Current between the Water Treatment Plant and the Wastewater Treatment Plant.
- D70 - Just north of the city of Swift Current downstream of the city and the Wastewater Treatment Plant.
- I80 - North of the town of Waldeck, after the creek works its way east and then comes back west before going north.
- E90 - At the north end of the creek just before the confluence with the South Saskatchewan River.

Once collected, the samples were tested at the Roy Romanow Provincial Laboratory for parameters that are important to water quality within the Swift Current Creek Watershed. These include Ortho-Phosphorous, Total Coliform. E. Coli, pH, Chloride, Nitrate, Sulfate and Total Dissolved Solids (TDS). The results were then analyzed for exceptions to water quality guidelines, water quality changes along the creek and for differences due to time of sampling. The results were also compared to those observed in the 2022 monitoring project and other previous projects of the SCCWS. This report details these analyses. The spreadsheet containing all the results is included in this report as Appendix A.

This report compares the results to several standards to determine the suitability of the water in the creek for all uses and users. These standards include the Saskatchewan Drinking Water Standards and Objectives set by Water Security Agency, and three guidelines that the SCCWS have used to determine water quality in previous monitoring projects. These guidelines are from the Saskatchewan Ministry of the Environment and include Irrigation Water Use, Livestock Watering, and the Protection of Aquatic and Wildlife Habitat.

WATER QUALITY PARAMETER RESULTS AND CONCLUSIONS

Chloride

Increased levels of chloride are often an indication of increased urbanization along a creek. This is due to the use of road salts, effluent leaching, and the release of treated effluent. The results of the sampling in 2023 show that the levels are low before the city of Swift Current, increase just after the city and then level off, possibly demonstrating the impact of the city on the chloride levels in the water downstream of it.

Chloride levels were very high just north of the city in May, which is possibly still an impact from spring flooding carrying large amounts of road salts and other contaminants into the creek. Other than this result, there was no impact from the time of year on the concentration of chloride in the creek. The 2023 results are similar to the results from the 2022 and previous monitoring projects especially upstream of the city of Swift Current. The concentrations in 2023 are slightly higher, possibly due to the impacts of the spring flooding, washing more sources of chloride into the creek and then lower flows in later summer increasing concentrations in the water.

The guideline for chloride levels in drinking water is that concentrations are to be less than 250 mg/L and all samples tested are below that number. The guidelines for Aquatic Wildlife Habitat and General Water quality are below 100 m/L and all samples tested are less than that number except for the May sample taken north of the city.

Chloride levels in the Swift Current Creek are acceptable for all uses of water within the creek and show levels consistent with prior years and there is no impact on the time of year on concentrations.

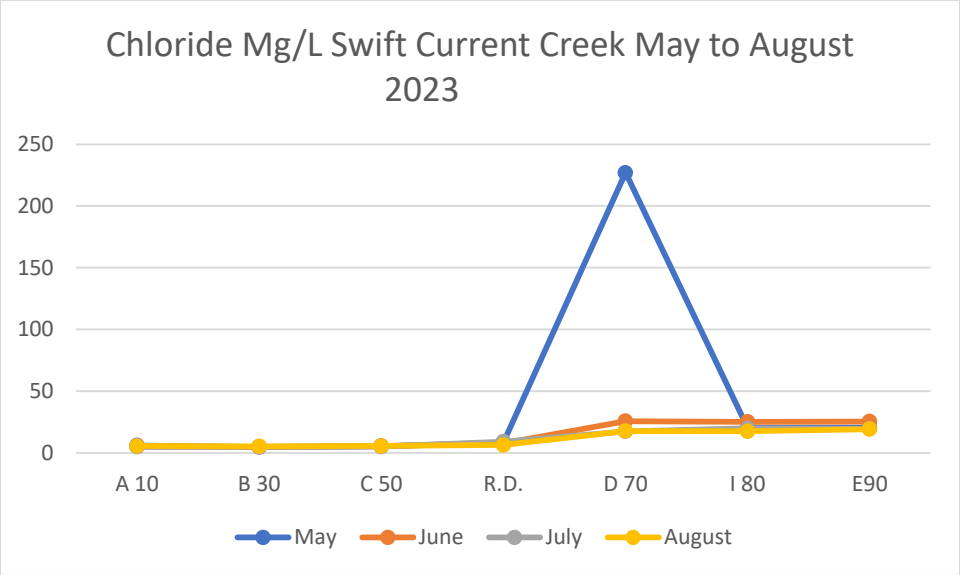

Figure 3: Chloride Levels in the Swift Current Creek May to August 2023

pH

pH measures the acidity or alkalinity of a solution. pH levels affect aquatic organisms by allowing basic regulatory exchange of gases and salts to function properly to sustain life. Factors that affect pH levels in the water include agricultural and industrial run-off and wastewater. It can also be affected by carbonate levels in surrounding rocks and minerals.

All samples taken in 2023 are between 7.3 and 8.6 pH units with no variations due to location and time of sampling. pH levels are similar to the results observed in the 2022 and previous years monitoring projects.

The Saskatchewan Drinking Water Guidelines state that the pH in the water is to be within a range of 7 to 10.5 pH units and all samples taken are within these guidelines. The guidelines for Aquatic and Wildlife habitat state that the pH be between 6.5 to 8.5. Most of the samples taken are within these guidelines except for June, July, and August just south of the City of Swift Current and June at the sampling site at the north end of the creek.

All samples taken show acceptable levels of pH for all uses, there is no impact on pH levels due to location along the creek or time of year. Levels are consistent with the results from the 2022 and previous monitoring projects and there is no discernable impact on pH due to the 2023 spring flooding.

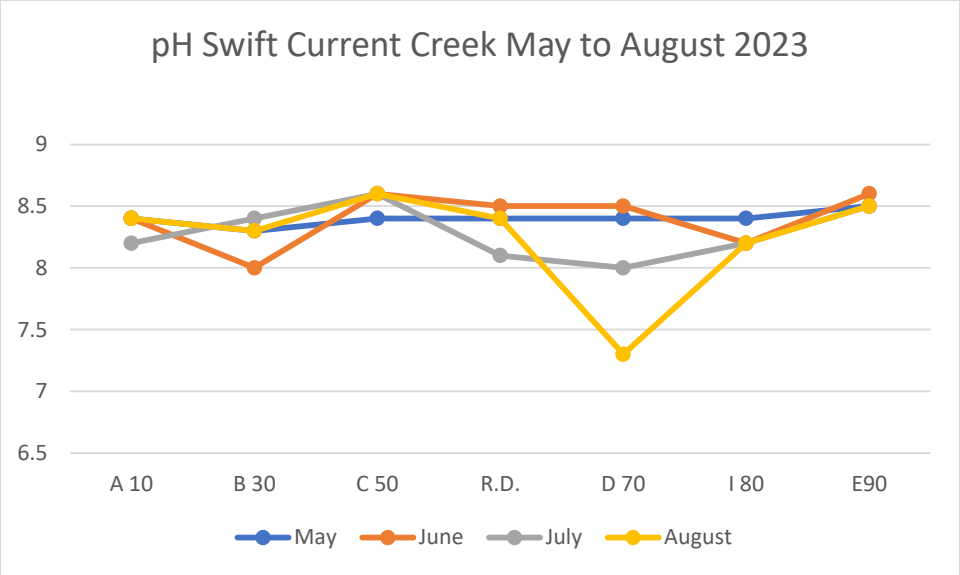

Figure 4: pH levels in the Swift Current Creek May to August 2023

Total Dissolved Solids (TDS)

Total Dissolved Solids (TDS) measures the concentration of inorganic substances in the water including minerals, salts, and metal cations and anions. This includes sodium, magnesium, potassium, bicarbonate, and sulfate. Sources contributing to TDS levels in the Swift Current Creek include minerals springs, urban run-off, road salts and water softener salts. Increased TDS levels indicate high levels of salts and minerals in the water and that further testing will be required to pin-point which minerals and salts are causing the high TDS numbers.

The TDS levels were higher at the site upstream of Duncairn Reservoir than the sites between the Reservoir and the City of Swift Current, which maybe due to the presence of livestock at this site or the

dilution of the minerals and salts in the water after it has been released from Duncairn Reservoir. The levels increase as sampling progressed north along the creek possibly due to run-off carrying more of these minerals and salts into the creek. This result is consistent with results from the 2022 and previous monitoring projects. The TDS levels observed in 2023 are slightly higher than 2022, which maybe due to increased flow over land containing these minerals and salts during the spring run-off.

The time of the year did not impact TDS concentrations in the water. TDS levels at the north end of the creek improved as the summer progressed. This is contrary to the results observed in 2022 and prior years. In prior years, TDS levels often increased as the summer progressed usually due to lower flows which lowered water levels and in turn increased TDS levels. The flooding this spring may have kept the water in the creek at sufficient levels to keep concentrations from increasing too much.

The Saskatchewan Drinking Water Guidelines are that TDS concentrations are below 1500 mg/L and all samples taken are below that amount. The guideline for irrigation use is below 1500 mg/L and all samples taken are below that amount. The Guideline for livestock watering use is concentrations below 3000 mg/L and all the samples are below that number. All the samples tested show acceptable levels of TDS for all uses.

There are slight increases in TDS concentrations as we moved north along the creek, which is similar to the results of 2022 and prior year monitoring projects. Time of year impacts are not like prior years results which generally showed that TDS concentrations increased during the summer. The results seen in 2023 maybe due to increased flows in the creek throughout the summer.

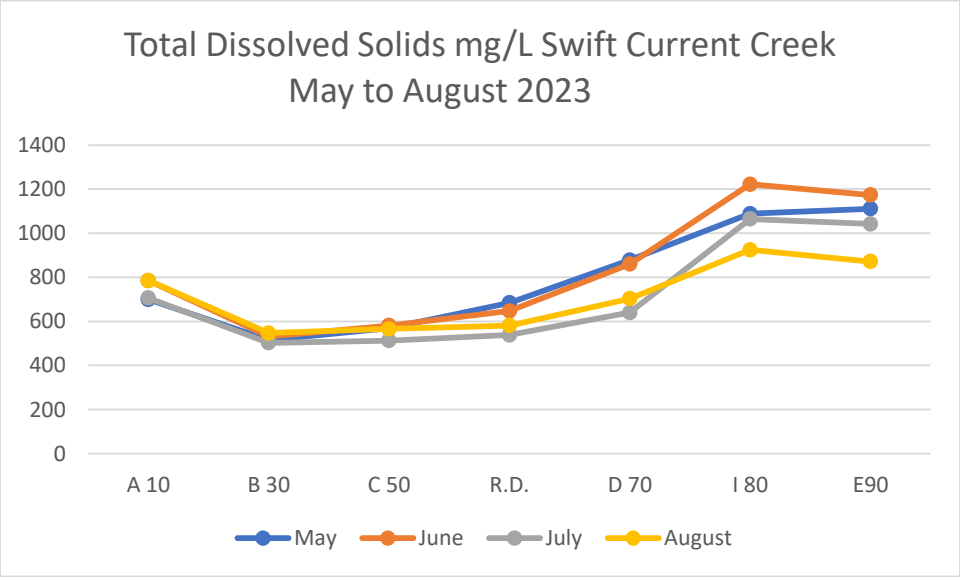

Figure 5: Total Dissolved Solids Levels in the Swift Current Creek May to August 2023

Sulfate

Sulfate is a naturally occurring substance containing sulphur and oxygen. It is present in various mineral salts in the soils in the watershed. Sources include leaching from soil, decaying plant and animal material and sulphur fertilizer. High concentrations of sulfates can be dangerous to livestock and wildlife who drink the water.

Sulfate levels increase as sampling moved north along the creek, possibly due to run-off from land that contained sulfate. Levels increased during the summer which may also be due to increased run-off into the creek or natural sources adding to the concentration of sulfate in the water. The results of sampling in 2023 are consistent with those observed in the 2022 and previous monitoring projects.

The Saskatchewan Drinking Water guidelines are for sulfate levels to be less than 500 mg/L, all samples taken are below that number except for the site north of Waldeck in June and August and at the north end of the creek in June. Livestock watering guidelines are for the sulfate levels to be less than 1000 mg/L and all samples taken are below that number.

In conclusion, most of the samples taken are suitable for all uses except for sites north of Waldeck in June and August and at the north end of the creek in June. The concentration of sulfates increases as sampling moved north along the creek, mostly due to increases in natural and man-made point sources in run-off adding to the concentrations. Concentrations increased during the summer possibly due to increased run-off. As results are consistent to prior year monitoring projects there does not appear to be any impact of the flooding in the spring of 2023 on sulfate levels.

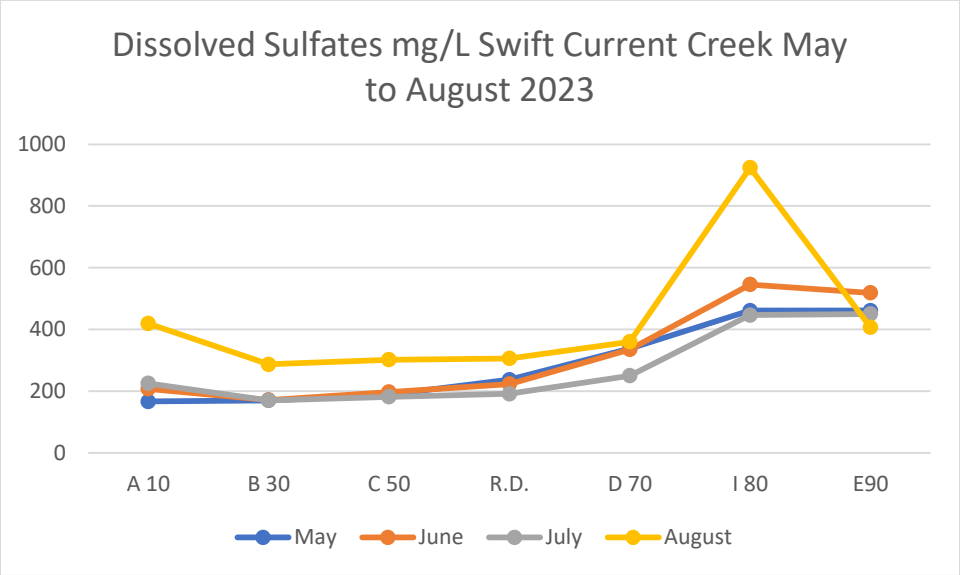

Figure 6: Sulfate Levels in the Swift Current Creek May to August 2023

Nitrogen as Nitrate

Nitrogen is essential for all organisms as it is an essential building block of protein. Sources in the water include fertilizer, sewage, manure and decaying plant and animal material. Excess rain can cause leaching and carry nitrate in the run-off into the creek.

Levels are generally low along the creek except for the site just north of Swift Current in July and August. Sampling in July occurred two days after a large thunderstorm with heavy rainfall in Swift Current that caused run-off into the creek that may have carried excess nitrates into the water. This may have also influenced the higher levels in August at this site. There is very little change in nitrate levels as sampling moved north along the creek and no impact on timing of sampling except for what was observed at the site just north of Swift Current in July and August. These results are similar to what was observed during the 2022 and previous years monitoring projects.

The Saskatchewan Drinking Water Guidelines are for concentrations less than 45 mg/L and all samples are below that number. The livestock watering guidelines are for concentrations less than 100 mg/L and all samples are below that number.

Nitrate levels in all samples are acceptable for all uses of the water, areas downstream from the city may have experienced increased levels due to flooding within the city from a large rainfall event. There are no impacts of location along the creek or from the time of year except for the large rainfall events. These are similar results to what was observed in prior years, the flooding in the spring of 2023 did not impact nitrate levels within the creek, but the heavy rainfall event in July may have.

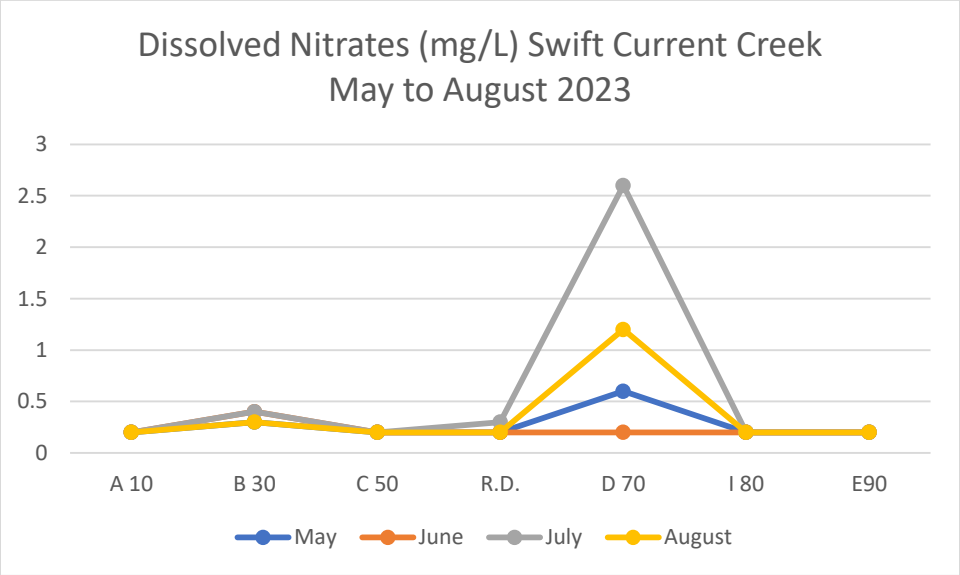

Figure 7: Nitrate Levels along the Swift Current Creek May to August 2023

Phosphorous

Phosphorous is required by all organisms for the basic processes of life and can be found in rocks, soil, and organic matter. It is produced by natural sources and can be found in sewage and fertilizer. Excess levels in the water can cause high levels of algae growth which can lead to the eutrophication of the water. It can also lead to increased growth of cyanobacteria (blue green algae). When cyanobacteria die it releases a toxin into the water which can be fatal to anything consuming it.

The 2023 results are consistent with sampling in prior years which show low concentrations before Duncairn Reservoir, higher between Duncairn and Swift Current and then generally decrease as sampling moved north along the river. Concentrations increased as sampling progressed during the summer.

The levels of phosphate observed in 2023 are suitable for all water uses in the watershed and not are at levels that would contribute to increased algae growth and eutrophication of the water. The results of sampling are similar to what was observed in prior years with some location and time of year impacts in 2023. The results of the sampling do not show any impact on water quality from the flooding in the spring of 2023.

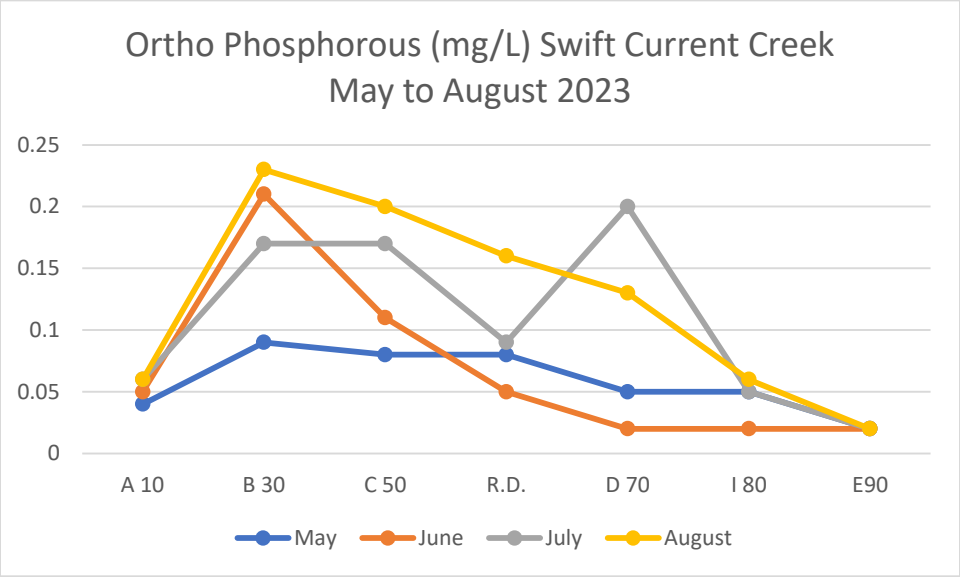

Figure 8: Ortho-phosphorous levels in the Swift Current Creek May to August 2023

Total Coliforms

Coliforms are bacteria that are present in the environment and feces of all warm-blooded animals and humans. They are not likely to cause illness, but their presence indicates that disease carrying organisms could be in the water. Therefore, the more coliforms in the water the greater the chance for the disease carrying organisms to be present. The total coliforms levels observed were generally low and tend to be very similar at all locations along the creek and during the summer. However, they do increase as sampling continued through out the summer. This may be due to run-off carrying the organisms into the creek or the lower levels seen in May maybe due to increased flows reducing concentrations in the water.

Very high coliform numbers were observed at the sampling site in Swift Current and at the site just north of it which maybe due to increased run-off during the large rainfall event on July 22, 2023, carrying

coliforms into the creek. There are also higher coliform numbers at the site upstream of Duncairn Reservoir which maybe due to the presence of livestock crossing the creek to access grazing and drinking water directly out of the creek.

In conclusion, the water is safe for all uses except for drinking water without treatment. There are impacts based on location and timing, especially from large rainfall events. The results observed in 2023 are similar to those observed in 2017, the last time that Total Coliforms were tested for by the SCCWS.

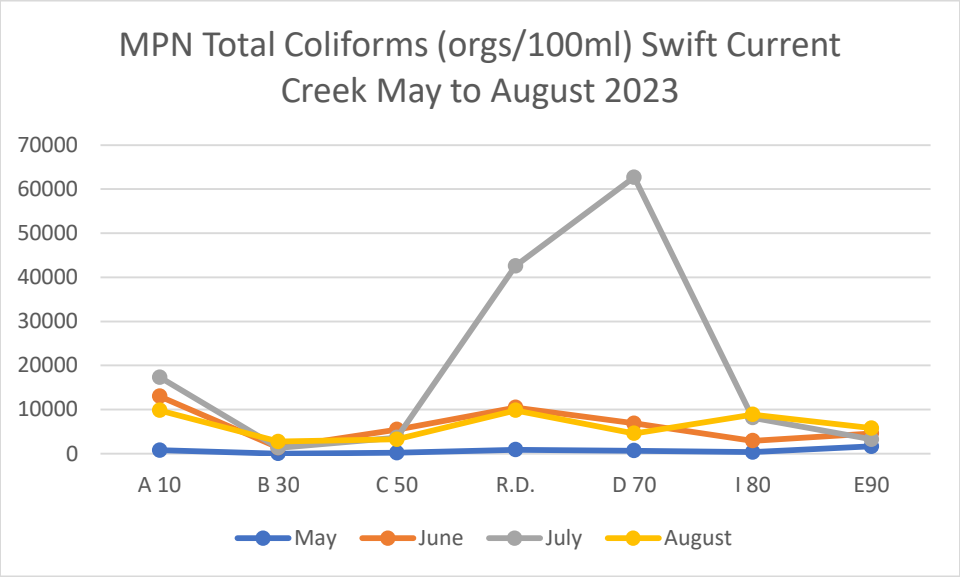

Figure 9: Total Coliforms level in the Swift Current Creek May to August 2023

Escherichia Coli, (E. Coli)

These are bacteria that normally live in the intestines of healthy people and animals, most are harmless, but some can cause severe illness with symptoms such as stomach cramps, bloody diarrhea, and vomiting.

The increased levels of E. Coli in June maybe due to the presence of animal feces which was carried into the creek during the spring run-off. The July and August numbers are likely due to run-off from the July 22, 2023, rainfall carrying the bacteria into the water. Sampling for a project in 2019 showed a similar response after a large rainfall event at these sites.

There is not much change in the numbers of E. Coli organisms as sampling moves north along the creek or from timing of sampling except for the effects of the heavy rainfall in Swift Current on July 22, 2023.

In conclusion, the water in the creek is safe to use for all uses, provided it is treated to drinking water standards when used for human consumption. There are no impacts of location along the creek or timing of sampling except for those created by the rainfall event in Swift Current on July 22, 2023. The results of sampling are similar to sampling done in 2019.

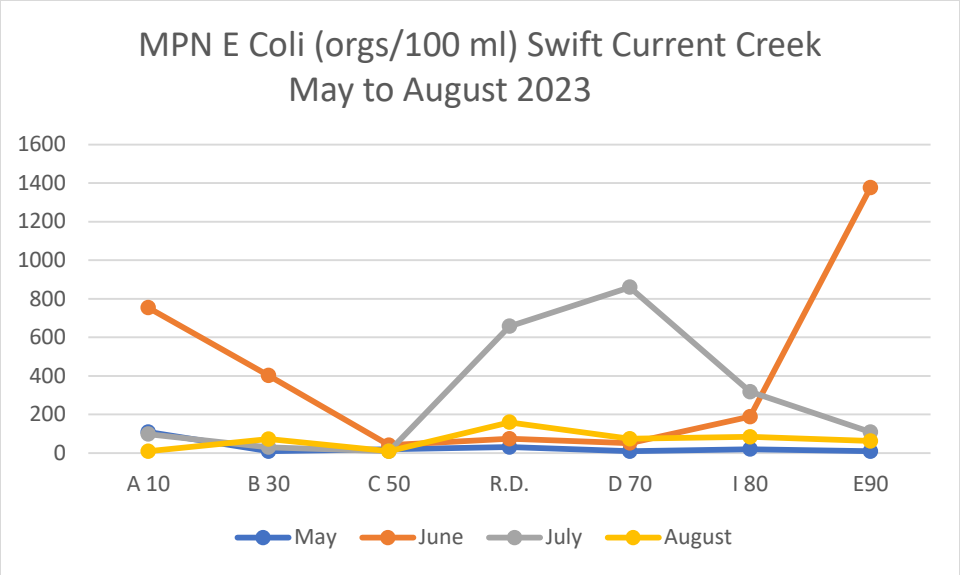

Figure 10: E. Coli levels along the Swift Current Creek May to August 2023

CONCLUSIONS FROM 2023 WATER SAMPLING

The results of this sampling are consistent with what the SCCWS has observed in prior monitoring projects. The water quality in the creek is generally good for all uses, except for a few exceptions at some locations. The results show little impact on overall water quality from the flooding that occurred in the spring of 2023. However, the results do show a negative impact within and downstream of the City of Swift Current due to the thunderstorm and heavy rainfall event that occurred July 22, 2023. This shows that steps need to be taken in both urban and rural areas to limit the impact of run-off events on stream health and water quality of the creek. This will ensure that the water quality within these areas will continue to be satisfactory for all uses and users into the future.

The SCCWS will use these results to compare to future monitoring projects to continue to learn more about the water quality and health of the creek. These results will also be used to determine the actions that stakeholders can implement to maintain and improve water quality and stream health.

The implementation of these actions will be communicated to all stakeholders to expand the knowledge of what residents can do to improve their watershed and ensure a safe and sustainable supply of water for all uses and users into the future.