2023 CreekWatch Water Quality Monitoring Results

Kikino Métis Settlement

LICA Citizen Science

03/21/2024

LICA Environmental Stewards

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LICA ENVIRONMENTAL STEWARDS

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Background

CreekWatch is a Citizen Science program by the non-profit RiverWatch Institute of Alberta. CreekWatch connects communities with science and stewardship relevant to their local natural areas and streams of interest. Since 2014, CreekWatch has worked with corporate and community volunteers to collect water quality data, improve habitat, and contribute to a meaningful understanding of the management of our local waterways (RiverWatch Institute of Alberta, 2023).

LICA has been a part of the CreekWatch program since 2021. By partnering with different organizations and communities over the last 3 seasons, 8 creeks of interest have been monitored in the LICA Region. Summary reports from previous years can be found on the LICA Website.

On August 3, 2023, LICA partnered with Kikino Métis Settlement to sample three sites of community interest. Those who participated were trained in CreekWatch safety protocols and sampling techniques. As a result, community members gained a greater understanding of local waterways. Located in northeast Alberta, Kikino Métis Settlement is home to 1,100 people and consists of 44, 000 hectares of land. This report will cover the processes used in this sampling, in addition to the water quality results of the three sites on Kikino Métis Settlement.

Methods

Data recorded during the 2023 summer sampling program was collected utilizing the CreekWatch Citizen Science water quality monitoring kits. The following parameters were assessed:

Table 1. Water Quality Parameters of Interest.

Water Quality Parameters	
Physics	Air Temperature (°C)
	Water Temperature (°C)
	Turbidity (NTU)
Chemistry	Dissolved Oxygen (mg/L)
	Ammonia Nitrogen (mg/L)
	Phosphorous (mg/L)
	pH
	Chloride (mg/L)
Biology	Invertebrates [1]

[1] Not able to collect due to site conditions.

Each parameter has a sampling protocol and instructions for analysis, with pre-packed chemistry kits. Sample equipment for the CreekWatch program was provided by the Riverwatch

Institute of Alberta. For safety practices followed during CreekWatch monitoring, please see Appendix B.

Table 2. The number of sample events, volunteers, and time committed to the sampling conducted on August 3, 2023.

Item	Amount
Number of Sampling Events at Site 1	1
Number of Sampling Events at Site 2	1
Number of Sampling Events at Site 3	1
Number of Volunteers	7
Number of Volunteer Hours	21

Sample Site Characteristics

Site 1

Site 1 (54.456182, -112.120208) is located in the central area of Kikino Métis Settlement. This creek flows between an unnamed waterbody and the Amisk River. Site 1 was sampled before a beaver dam, due to accessibility and volunteer access. The water was deep and flowed through the dam in the center area. This stream is surrounded by native vegetation cover, areas with agricultural land, infrastructure (roads), and residences.

Figure 1. Sample site 1, facing southeast across the beaver dam.

Site 2

Site 2 (54.464202, -112.097878) is located on Kikino Métis Settlement, north of the community center. This sample site is along the Amisk River and is located at a bridge built for access to a gravel pit. Samples were taken upstream of the bridge. This area is surrounded in natural lands with the pressure of gravel extraction and infrastructure (roads). In the riparian intactness assessments completed by Fiera Biological Consulting Ltd., (2021), the portion of the Amisk River with the Settlement was found to have 14 km of shoreline of high restoration priority, 6 km of shoreline of moderate restoration priority, 14 km of shoreline moderate conservation priority, and 51 km of shoreline of high conservation priority.

Figure 2. Sample site 2, facing east downstream.

Site 3

Site 3 (54.374702, -111.954338) is located on the southeast side of Kikino Métis Settlement and west side of Whitefish Lake. This creek is spring fed and is an inflow area to Whitefish Lake. The natural spring is surrounded by forested land, infrastructure (roads) and recreational facilities near the lake. There was little flow at this site, and the immediate surrounded area was dominated in undesirable species indicating ground disturbance likely in relation to the culvert and road.

Figure 3. Sample site 3, facing west upstream.

Figure 4. Sample site distribution map.

Site Results

Dissolved Oxygen

Dissolved Oxygen (DO) concentrations were measured using a Hach Kit with a drop-by-drop titration to show a change in water colour until clear. The red line in Figure 5 indicates the Environmental Quality Guidelines for Alberta Surface Waters (2018) minimum exceedance value of 5 mg/L for instantaneous value as the short-term allowance for the protection of freshwater aquatic life.

Dissolved oxygen at Sites 2 and 3 were 8 mg/L and 13 mg/L, respectively, and are therefore within the allowable limit to support freshwater aquatic life. Site 1 was recorded at the minimum allowable threshold. Lower levels of DO at site 1 are likely in relation to where the sample was taken in terms of low flow from the beaver activity. Further monitoring is recommended to determine if DO levels collected during this sample event reflect actual stream conditions particularly at Site 1.

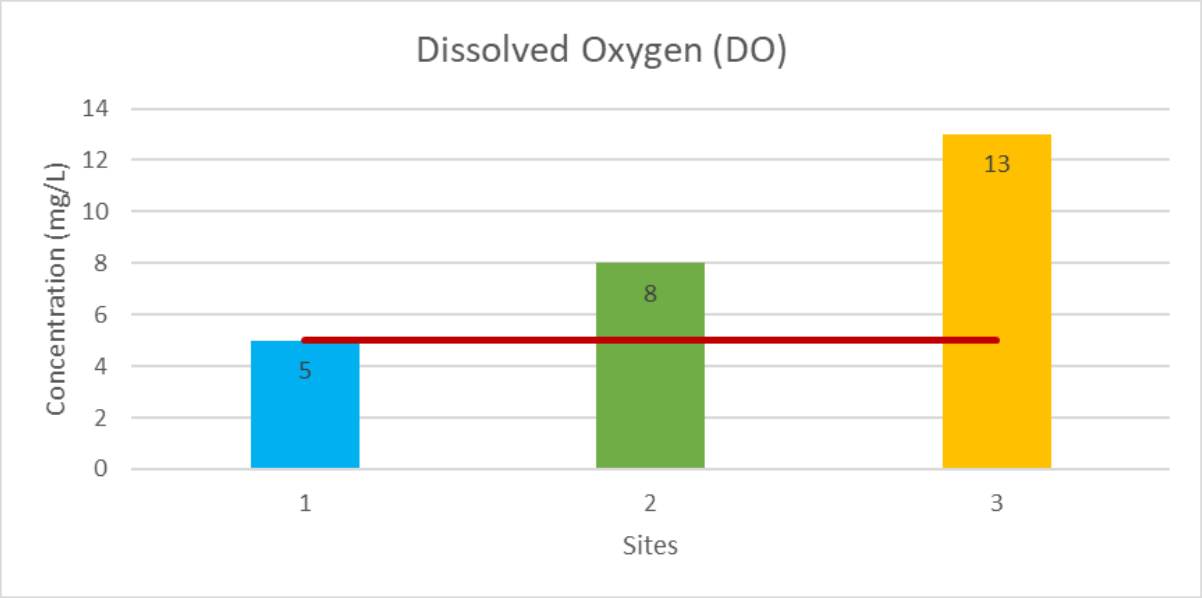

Figure 5. Dissolved Oxygen concentrations (mg/L) recorded at the three sites.

Ammonia Nitrogen

Ammonia Nitrogen concentrations were measured by dipping Hach test trips into water and noting the colour change.

The red line in Figure 6 indicates the Environmental Quality Guidelines for Alberta Surface Waters (2018), for exceedance is maximum 1.0 mg/L at pH 8.0, 10 °C. Ammonia Nitrate levels were recorded at the same concentration at all three sites. Results of these sites were within the allowable limit for healthy freshwater aquatic systems.

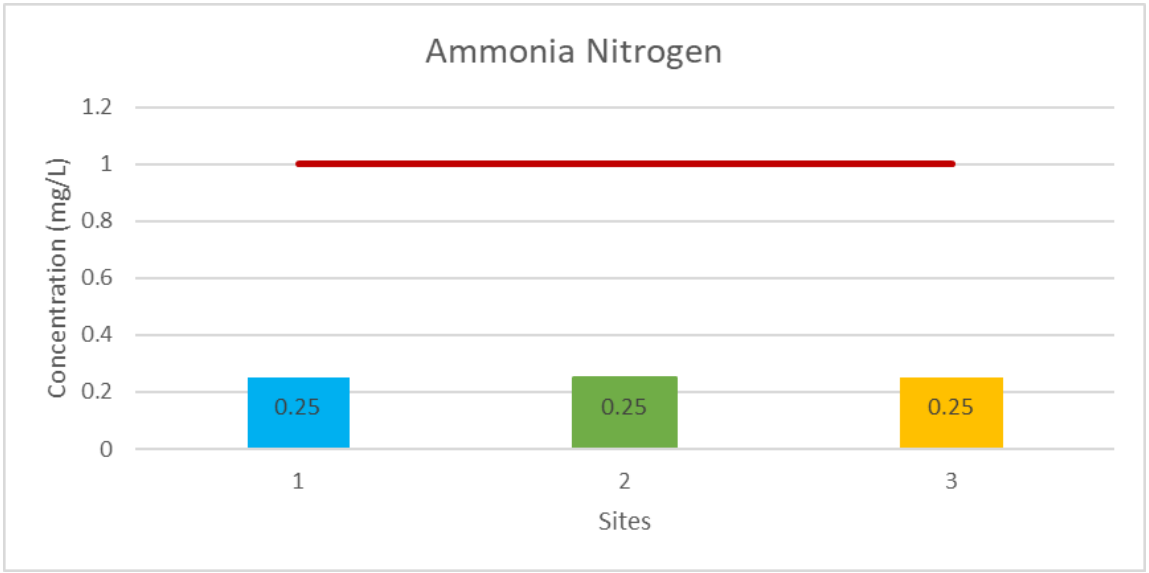

Figure 6. Ammonia Nitrogen concentrations (mg/L) recorded at the three sites.

Phosphorus

Phosphorus concentrations were measured using a Hach kit that compare a change in water colour.
Phosphorous combines readily with oxygen to form oxides, phosphates, and a mineral called apatite. Living organisms require phosphorus to survive and obtain it in the form of phosphates (PO_4^{-3}) when combined with oxygen. Phosphorus is typically dissolved in such low concentrations that it becomes a limiting nutrient for the growth of aquatic plants. However, even the slightest increase in phosphorus can increase plant and algae growth.

The phosphorous concentration was recorded at 0.06 mg/L at site 1 and 0.10 mg/L at Site 2 and 3 (See Figure 7).

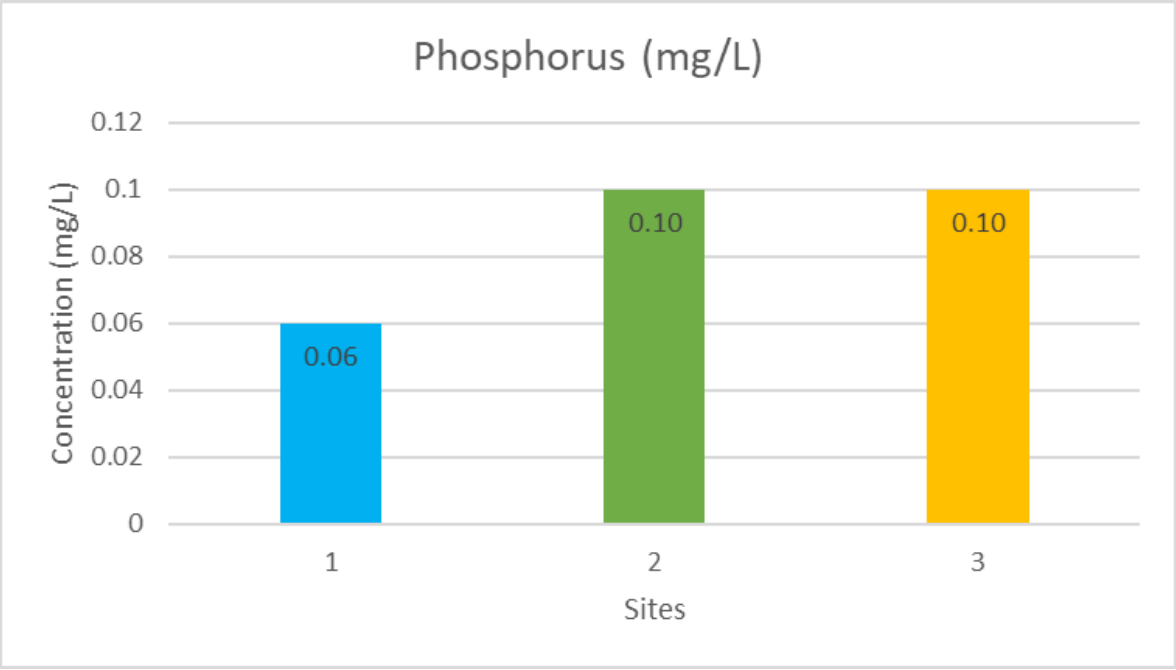

Figure 7. Phosphorus (mg/L) concentrations recorded at the three sites.

pH

pH was measured using a Hach kit that compares the change in water colour to determine the water pH value.
The pH scale ranges from 0 - 14, which is derived from the concentration of protons measured in solutions. On the pH scale, solutions where a pH = 0 are the most acidic and become less acidic when moving towards a pH = 7. In the middle of the pH scale, pH = 7 is considered a neutral solution, neither acidic nor basic. Solutions with a pH greater than 7 are considered basic, with solutions becoming increasingly basic as they approach a pH = 14.
The Environmental Quality Guidelines for Alberta Surface Waters (2018) for exceedance is a pH value outside the range of 6.5 - 9.

All pH data collected falls within the guidelines for Site, 1, 2 and 3, being 7.6, 7.6, and 8.2, respectively (Figure 8).

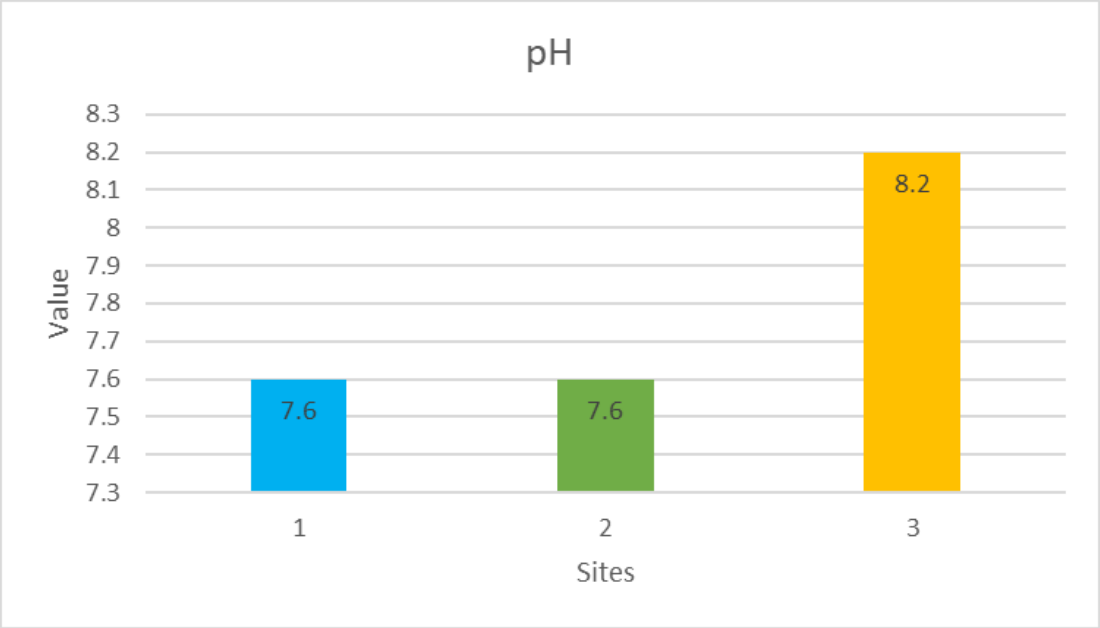

Figure 8. pH values recorded at the three sites.

Chloride

Chloride concentrations were measured using Hach Kits with a drop-by-drop titration to show a change in water colour from yellow to orange. The Environmental Quality Guidelines for Alberta Surface Waters (2018) is a maximum of 120 mg/L of Chloride.

Site 1 and 2 recorded concentration levels of 25 mg/L, and Site 3 recorded slightly lower Chloride concentrations of 20 mg/L. Data collected at all three sites fall within the allowable guideline limits (Figure 9).

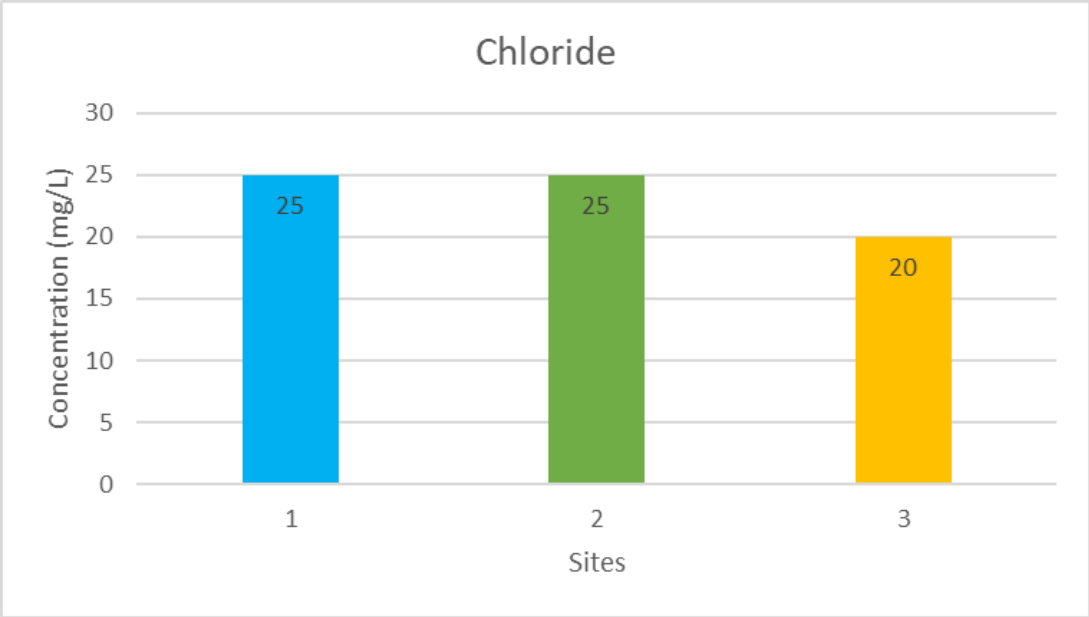

Figure 9. Chloride (mg/L) concentrations recorded at the three sites.

Turbidity

Turbidity was measured by slowly pouring water into a type of graduated cylinder marked with a 'Nephelometric Turbidity Units' or NTU's. It is used to determine the level of suspended matter within a water column. Suspended sediment levels in a waterway can be influenced by several factors, including high rainfall or snow runoff, as well as urbanization and development along shorelines that reduce the amount of natural sediment filtering of riparian zones by removing riparian areas.
Site 1 and 2 recorded 0 NTU, whereas Site 3 measured 12 NTU and therefore was found to have suspended matter within the water column (Figure 10).

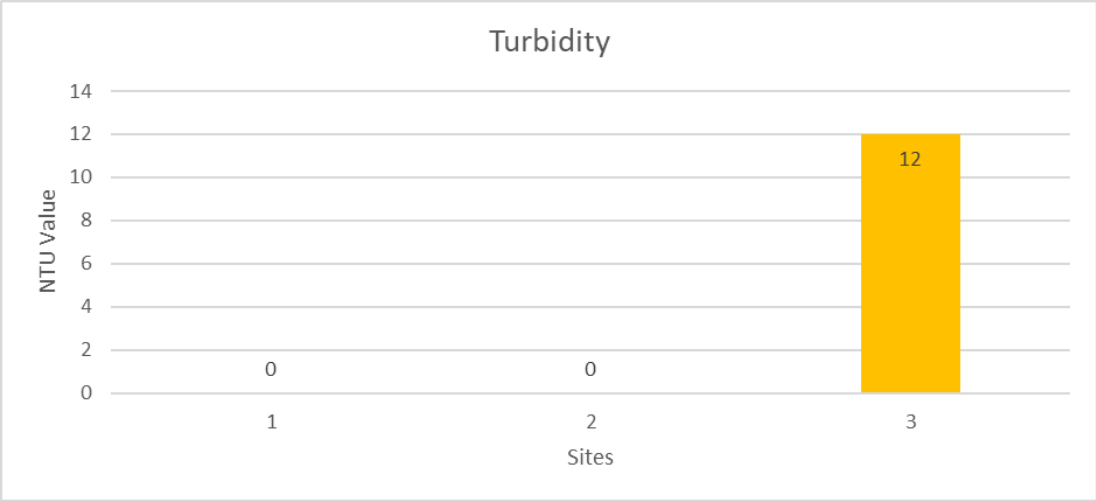

Figure 10. Turbidity measurements of the three sites sampled.

Temperature

Water temperature was measured using a non-mercury glass thermometer, placed in flowing, shallower water near shore.
Temperature can play a significant role in the rate of chemical reactions that affect the physical characteristics, such as the solubility of dissolved oxygen and the growth and development of organisms such as bacteria, algae, and fish.
The water temperature was similar between Sites 1 and 2. Site 3 had a lower temperature reading which can be hypothesized due to being spring fed (Figure 11).

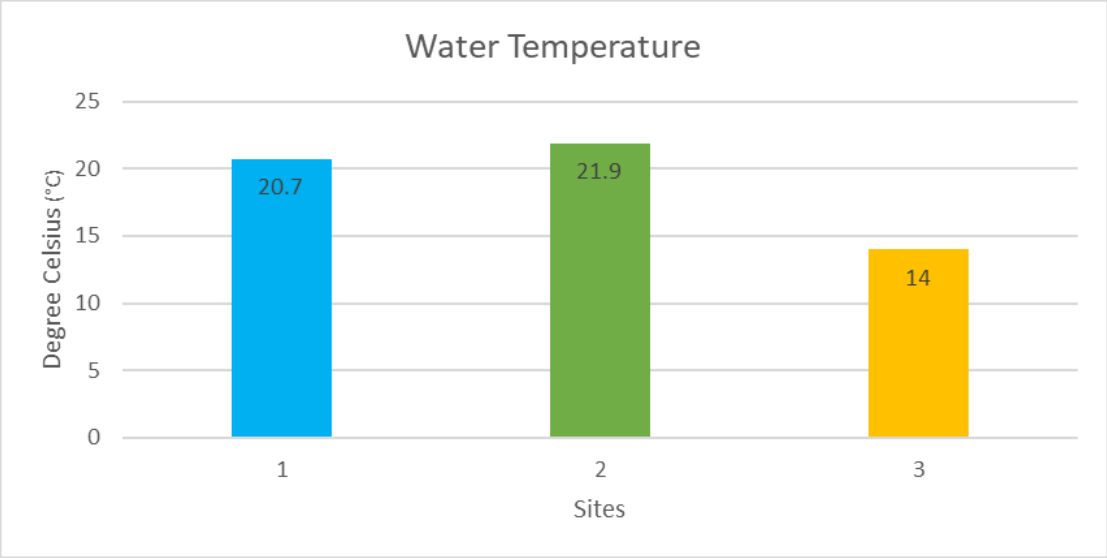

Figure 11. Water temperature (°C) recorded at the three sites.

Conclusion

A variety of factors may have influenced that accuracy of the water quality data collected. These factors are, but not limited to; sampler experience, unforeseen variance in sampling protocol, field testing (not conducted in a controlled laboratory), weather, etc. CreekWatch is a Citizen Science program where all tests are conducted in the field, by volunteers. Analysis was not completed at a laboratory.

The results of tests conclude that all parameters are within the allowable limits of the Environmental Quality Guidelines for Alberta Surface Waters (2018).

These sites were sampled to provide a general understanding of the health of creeks selected based on community interest at Kikino Métis Settlement. It is recommended that this study be used to inform additional water monitoring programs that undergo lab analysis for sites of community interest.

Thank you, CreekWatch Volunteers!

CreekWatch with LICA is made possible by volunteers who took time to monitor the water quality of these three sites. Thank you to the RiverWatch Institute of Alberta for providing the sampling equipment to enable LICA to take part in this program. LICA is proud of another great season of Citizen Science water quality data monitoring!

Mikhail Pruden

Alma Erasmus

Bonnie Stevenson

Lacey Thompson

Sheila Pruden

Mark Blyar

Wade McAdam

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Fiera Biological Consulting Ltd. 2021. Upper Beaver Watershed Riparian Area Assessment. Fiera Biological Consulting Report #2132.Prepared for the Lakeland Industry and Community Association, Athabasca, Alberta. Pp. 157.

Government of Alberta (2018). Environment Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Alberta Environment and Parks. Edmonton, Alberta

Kikino Metis Settlement website. https://msgc.ca/kikino-metis-settlement/ [accessed on August 15, 2023].

The RiverWatch Institute of Alberta (2023). Stewards of our Waterways, CreekWatch. Available from CreekWatch Tributary Stormwater Monitoring: https://creekwatch.ca/#about [accessed August 15, 2023].

Appendix A: 2023 Raw Data Tables

August 3, 2023 CreekWatch Raw Data				
Parameters		Sites		
		Site 1	Site 2	Site 3
Physics	Air Temperature (°C)	24.10	21.80	22.00
	Water Temperature (°C)	20.70	21.90	14.00
	Turbidity (NTU)	0.00	0.00	12.00
Chemistry	Dissolved Oxygen (mg/L)	5.00	8.00	13.00
	Ammonia Nitrogen (mg/L)	0.25	0.25	0.25
	Phosphorous (mg/L)	0.06	0.10	0.10
	Chloride (mg/L)	25.00	25.00	20.00
	pH	7.60	7.60	8.20

Appendix B: CreekWatch Safety Practices

Creek Access Best Practices

- Closed toed shoes are the best footwear for sampling.
- While sampling, carry a cell phone when within 911 EMS call areas.
- Avoid sampling alone and especially if young children accompany you.
- Always inform someone where you are sampling and your expected return times.
- Conduct monitoring with at least one other adult, group, or family member.
- Do not stray too far away from the group and keep the other participants within eyesight.
- If sampling with children, always keep them within reach.
- Conduct monitoring in safe public areas and within open view.
- Collect water samples and then retreat further back from the waterway to conduct testing.
- Do not wade into creeks and avoid sampling on the outer bank where it drops off into deep and swift water.
- Traverse uneven ground and creekbanks only if physically able to do so.
- Use common sense to avoid risk in times of inclement weather, or swollen creek flows.
- Modify or reschedule monitoring activities in the event of rain, snow, cold, or wind.
- Consult the CreekWatch Program Manager when increased creek flow rates could temporarily suspend monitoring activities.
- Do NOT sample if conditions are unsafe (higher and swifter water movements than usual, issued extreme weather alerts, lightning, suspicious people or unusual activities in an area, dangerous wildlife reports, and weed spraying).
- Be alert and look both ways before stepping onto paved pathways used by cyclists and skateboarders.
- Notify the CreekWatch program manager of any unsafe conditions or injuries.

Chemical Use Best Practices

- For each water quality testing kit, follow the procedures, step-by-step.
- Avoid touching your eyes, nose, and mouth during and after handling all chemicals.
- Wear safety glasses while using all wet or dry chemicals.
- Keep in mind the direction of wind when opening dry chemical packets and keep them below eye level.
- Do not eat or drink while conducting water quality testing.
- If dry or wet chemical contact or irritation is a concern, refer to the Workplace Hazardous Materials Information System (WHMIS) Summary Sheets and follow the first aid procedures.
- Please refer to the MSDS overview sheets before handling chemicals, and if feeling unwell.
- Store wastewater in bottles supplied and do not dump it onto the ground or into the waterway.
- Do not use the pH paper strips for testing water pH; these strips are used when emptying wastewater bottles.
- Use the WHMIS warranted content, first-aid kit, insect repellant, emergency response plan, wastewater container, broken glass container, and sharps needle container included in each portable lab.
- Use hand sanitizer when sample testing is completed and wash your hands immediately after each sampling session concludes.