

# 2022 CreekWatch Water Quality Monitoring Results

3/15/2023

LICA Citizen Science



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).

In 2021, LICA partnered with CreekWatch to conduct community water quality monitoring at an unnamed Creek flowing into Muriel Lake. With volunteers from Muriel Lake Basin Management Society (MLBMS), this Creek was monitored to support their ongoing initiatives to determine the quality of water flowing into Muriel Lake. Muriel Lake has been facing declining water levels and fish spawning habitat, in addition to water quality issues (MLBMS, 2023).

Following the success of the 2021 monitoring season, LICA decided to expand the CreekWatch program to include two additional Creeks to complement the CreekWatch monitoring efforts completed in 2021. In 2022, a second unnamed Creek flowing into Muriel Lake was sampled by the Muriel Lake Basin Management Society, and Jackfish Creek which flows from Tucker Lake to the Beaver River was sampled by additional community volunteers. The 2021 CreekWatch report can be found on the [LICA website](#).

## Methods:

Data recorded during the 2022 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 |                         |
|--------------------------|-------------------------|
| <b>Physics</b>           | Air Temperature (°C)    |
|                          | Water Temperature (°C)  |
|                          | Turbidity (NTU)         |
| <b>Chemistry</b>         | Dissolved Oxygen (mg/L) |
|                          | Ammonia Nitrogen (mg/L) |
|                          | Phosphorous (mg/L)      |
|                          | pH                      |
|                          | Chloride (mg/L)         |
| <b>Biology</b>           | Invertebrates           |

Each parameter has a sampling protocol and instructions for analysis, with pre-packed chemistry kits. Community volunteers were trained on the sampling protocol and safe handling of sampling equipment. Sample equipment for the CreekWatch program was provided by the Riverwatch Institute of Alberta. Sampling kits are housed at the LICA office.

Table 2. The number of sampling events and the total number of volunteer hours for 2022 CreekWatch monitoring.

| Item  | Amount |
|---|--------|
| Number of Sampling Events at Muriel Creek 1 | 8      |
| Number of Sampling Events at Muriel Creek 2 | 2      |
| Number of Sampling Events at Jackfish Creek | 5      |
| Total Number of Volunteer Hours             | 121    |

Muriel Creek was monitored to determine the quality of water flowing into Muriel Lake. With multiple sampling events, this data will be used to determine if seasonal variability plays a role in the concentration of the water quality parameters that are assessed: *Is there a relationship between the concentration of the water quality parameter and the time of year?*

Due to low stream flow at Muriel Creek 2, only Muriel Creek 1 will be analysed to answer the above-noted question.

Jackfish Creek was monitored to determine the relationship between parameter concentration and the spatial distribution of the sample sites: *Does stream health decrease downstream?*

Invertebrate sampling could not be used to draw conclusions, as not all sample sites could have the sampling performed at each sampling event. See *Appendix D* for a list of invertebrates found at select sample sites.



Figure 1. Volunteers conducting invertebrate sampling at Muriel Creek 1, on the June 4<sup>th</sup> training day.

## Sample Site Characteristics:

### Muriel Creek 1

Muriel Creek 1 is located on the south side of Muriel Lake (54.103387, -110.616030). The surrounding land use is made up of natural land, infrastructure (roads), industry, and is used for recreational purposes. In the riparian health assessments completed by Fiera Biological Consulting (2021), this creek was found to have high riparian intactness and is of high conservation priority. Located at this sample location, ATV use is prevalent resulting in a decrease in vegetation cover and a disturbance to the natural land.



*Figure 2. Muriel Lake Creek 1, sampled on June 4, 2022.*

### Muriel Creek 2

Muriel Creek 2 is located on the East side of Muriel Lake (54.163455, -110.605832). This unnamed creek flows north of the Beaumeaux subdivision, being the second-largest creek that flows into Muriel Lake. This creek has the surrounding land uses of agriculture, industry, infrastructure (roads), residence and natural lands. The sample site is located near a culvert that flows under HWY 657. Due to low water flow, this creek was only sampled 2 times during the 2022 season.



*Figure 3. Muriel Creek 2, sampled on June 4, 2022.*

### Jackfish Creek

Jackfish Creek was the third creek sampled in 2022. Four sample sites were monitored along the Creek that flows from Tucker Lake to the Beaver River. This Creek was chosen as it was found to have various changing land uses that surround the creek and decreased riparian area/ shoreline health. The Creek is approximately 131.4 km long, 16% is rated very low/low for shoreline intactness and 84% is rated moderate to high intactness (Fiera Biological Consulting, 2021). The surrounding land uses include agriculture, industry, infrastructure (roads), residence and natural land (forested).

#### Jackfish Creek Sample Site 1: Outflow of Tucker Lake

Jackfish Creek sample site 1 is located on the west side of Tucker Lake, as the outflow of the lake and the start of Jackfish Creek, (54.532445, -110.645658). This sample site was monitored north of the Tucker Lake Trail near the rock weir.



Figure 4. Jackfish Creek, sample site 1. Outflow from Tucker Lake. Photo taken during sampling event on June 8, 2022.

#### Jackfish Creek Sample Site 2

Jackfish Creek sample site 2 is located south of sample site 1 near Township Road 640 (54.500626, -110.669768). Between sample sites 1 and 2, this creek flows through natural forested land. This sample site was located on the north side of the gravel road (Twp 640).



Figure 5. Jackfish Creek sample site 2. Photo taken during sampling event on August 10, 2022.

#### Jackfish Creek Sample Site 3

Jackfish Creek sample site 3 is located at HWY 55, west of Range Road 53 (54.442271, -110.686434). From sample sites 2 to 3, this creek travels through/near the following land uses; agriculture, industry, infrastructure, residential and natural landforms. This sample site was located south of the HWY 55 bridge.





*Figure 6. Jackfish Creek sample site 3. Photo taken during sampling event on August 10, 2022.*

#### Jackfish Creek Sample Site 4

Jackfish Creek sample site 4 is located at Range Road 51A and is the last point before entering the Beaver River (54.417146, -110.637653). From sample sites 3 to 4, this Creek flows primarily through livestock and agricultural land uses. This creek was sampled on the east side of the RR 51A bridge.



*Figure 7. Jackfish Creek sample site 4. Photo taken during sampling event on June 24, 2022.*

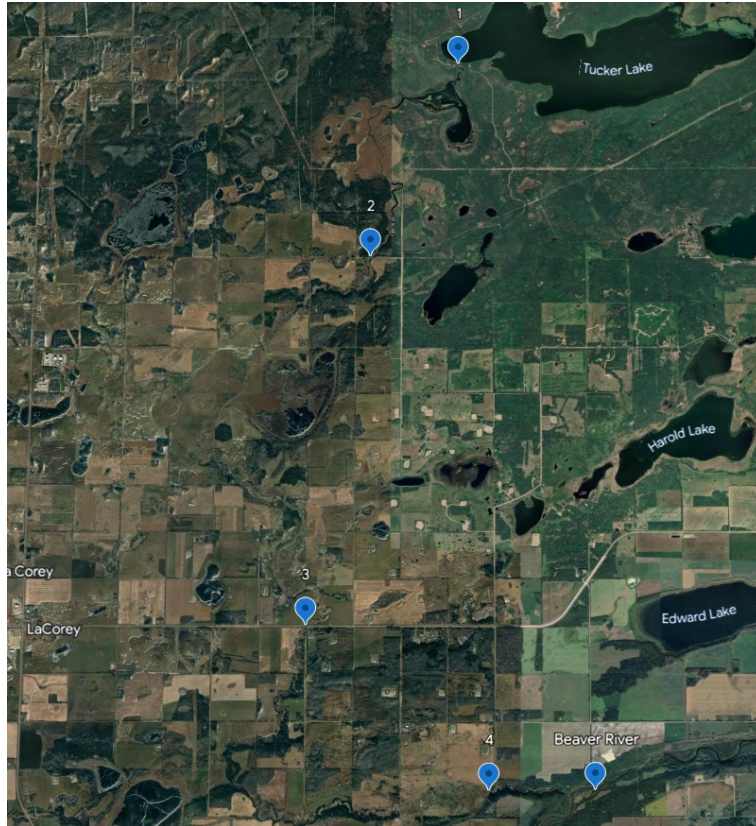


Figure 8. Spatial distribution of Jackfish Creek sample sites.

## Results: Muriel Creek 1

### Dissolved Oxygen

Dissolved oxygen was found to be the greatest at the first sample date; June 4, 2022. The lowest recorded level of dissolved oxygen was recorded on August 18, 2022. According to the Environmental Quality Guidelines for Alberta Surface Waters (2018), the short-term allowance for the protection of freshwater aquatic life is 5 mg/L. Data collected on August 18<sup>th</sup> and September 12<sup>th</sup> show 2 mg/L and 4 mg/L, respectively, indicating that the creek had levels of dissolved oxygen that were not within the allowable limit to support freshwater aquatic life. Throughout the sampling season from June to September, the dissolved oxygen levels did appear to decline (*Figure 9*).

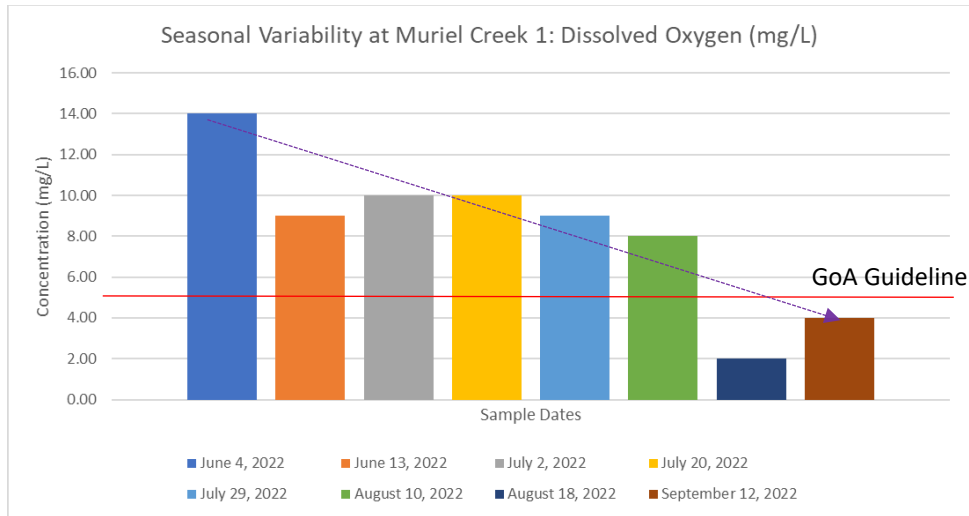


Figure 9. Dissolved Oxygen levels recorded at Muriel Creek 1 during the 2022 sample season.

### Ammonia Nitrogen

According to the Environmental Quality Guidelines for Alberta Surface Waters (2018), allowable levels of ammonia nitrogen may not exceed 1.0 mg/L at pH 8, 10°C. There was a fluctuation in the ammonia nitrogen found at Muriel Creek 1 throughout the season. Although, all recorded data is below the threshold of 1.0 mg/L. The highest concentration of 0.5 mg/L was recorded on June 4<sup>th</sup>, with relatively consistent levels throughout the season at ~0.25 mg/L. Comparative to the first data recording, the last one on September 12 was 0.4 mg/L.

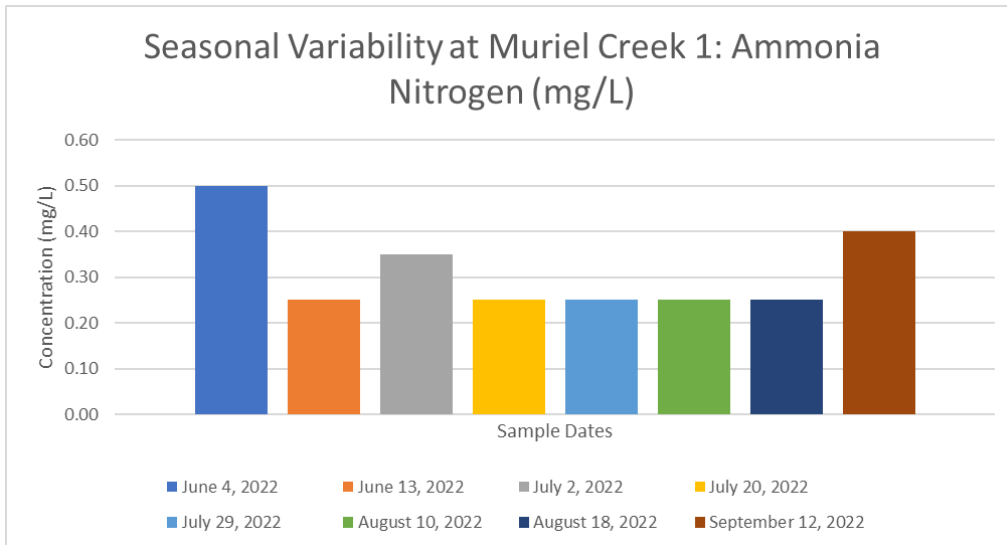


Figure 10. Ammonia Nitrogen (mg/L) concentrations recorded at Muriel Creek 1, during the 2022 sample season.

## Phosphorous

Phosphorous concentrations were found to be the greatest on June 4<sup>th</sup>, with a noticeable decrease by July sample dates. On September 12<sup>th</sup> a phosphorous concentration of 0 was recorded. See *Appendix A* for the raw data collected.

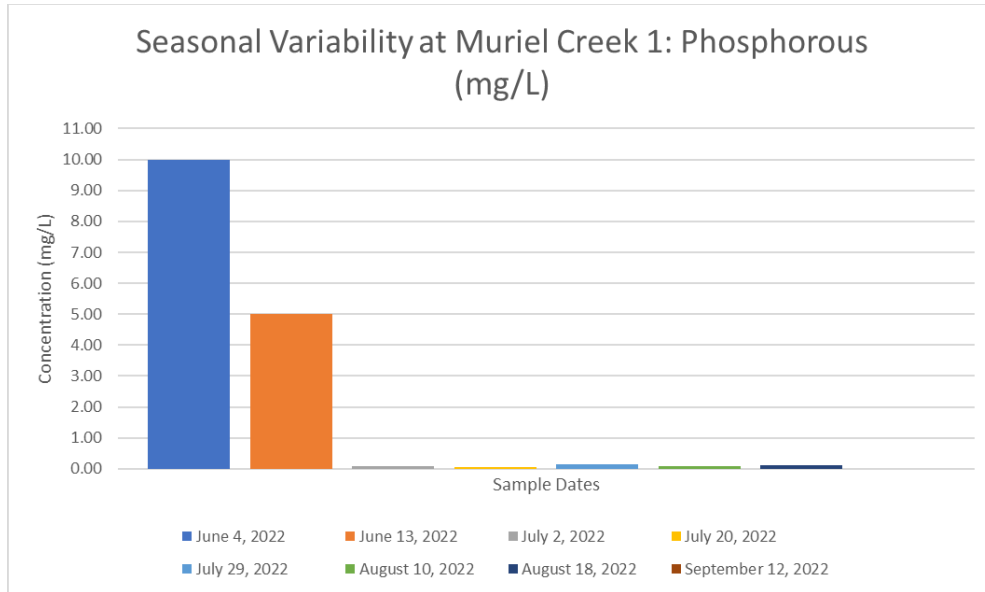


Figure 11. Phosphorous (mg/L) concentrations recorded at Muriel Creek 1, during the 2022 sample season.

## pH

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 this range with the most alkaline value being observed on July 29, 2022, with a value of 8.5, and the most neutral observation being recorded on August 18 and September 12 with a value of 7.5.

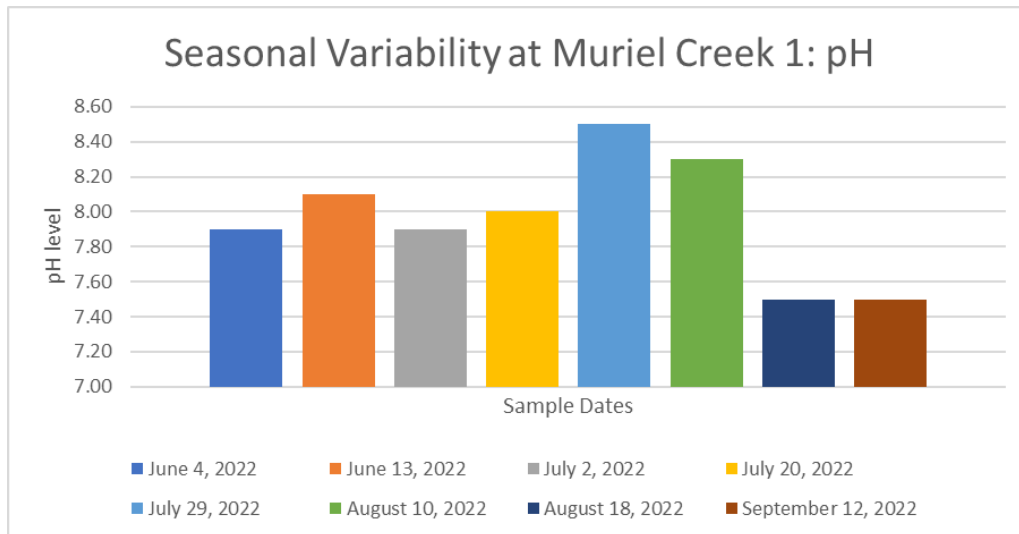


Figure 12. pH levels recorded at Muriel Creek 1, during the 2022 sample season.

### Chloride

Chloride concentrations were found to vary throughout the sampling season, with the lowest recorded value on June 13, 2022. Four sample events recorded 25 mg/L, being the highest recorded level (Figure 13). The Environmental Quality Guidelines for Alberta Surface Waters (2018), is a maximum of 120 mg/L. All data recorded falls within the guidelines.

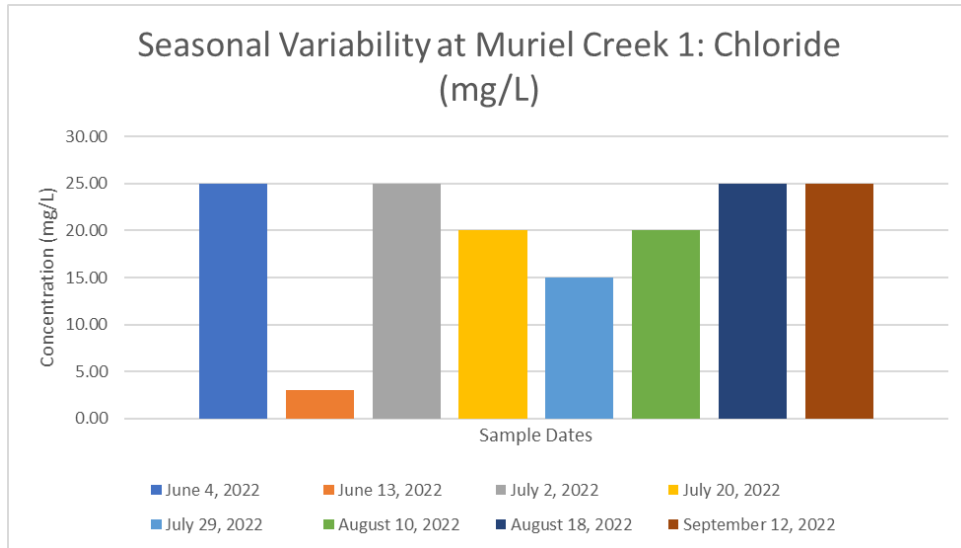


Figure 13. Chloride (mg/L) concentrations recorded at Muriel Creek 1, during the 2022 sample season.

### Turbidity

Turbidity was measured to determine the level of suspended matter within the Creek. The Creek was recorded to be most turbid on August 18, 2022, and clarity was consistent in July and September sample dates. A turbidity value of 0 was recorded during the June sample dates and on August 10<sup>th</sup>.

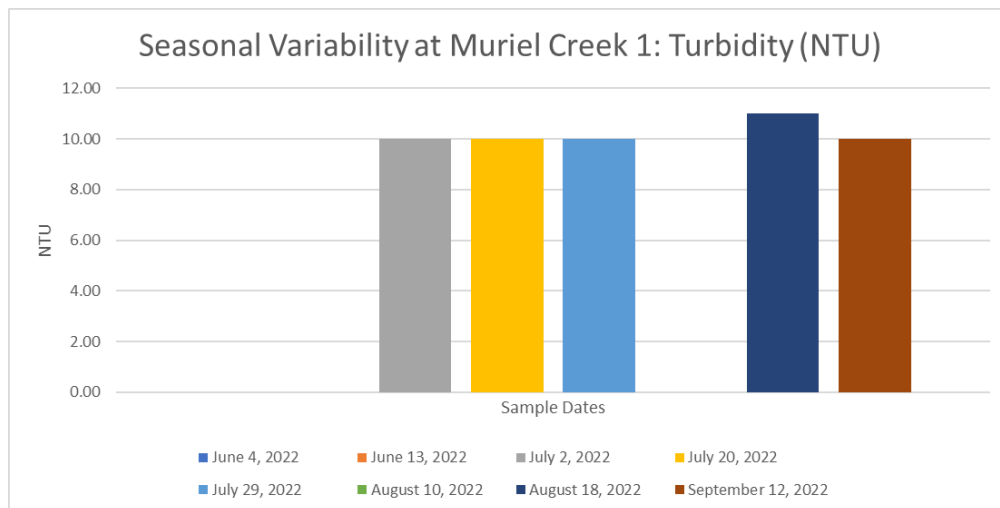


Figure 14. Turbidity recorded at Muriel Creek 1, during the 2022 sample season.

## Muriel Creek 2

Water quality data collected at Muriel Creek 2 was limited as there was only water flow in June. Due to this, comparative graphing was not completed. Please see *Appendix B* for the raw data collected.

## Results: Jackfish Creek

### Dissolved Oxygen

Jackfish Creek sample sites 1-4 were found to have varying levels of dissolved oxygen (DO). Overall, it is concluded that sample site 1, located at Tucker Lake, was found to have the highest recorded levels of DO, with levels decreasing downstream. According to the Environmental Quality Guidelines for Alberta Surface Waters (2018), the short-term allowance for the protection of freshwater aquatic life is 5 mg/L. On August 10, 2022, samples sites 2 and 4 documented the lowest dissolved oxygen levels of the samples season with 5 mg/L of oxygen present at each site. All other values were above this threshold with the greatest level being documented on July 18, 2022, at sample site 1 with 14 mg/L recorded. Figure 15 illustrates the findings of dissolved oxygen, during the 2022 sample season. Refer to *Appendix C* for the raw data collected.

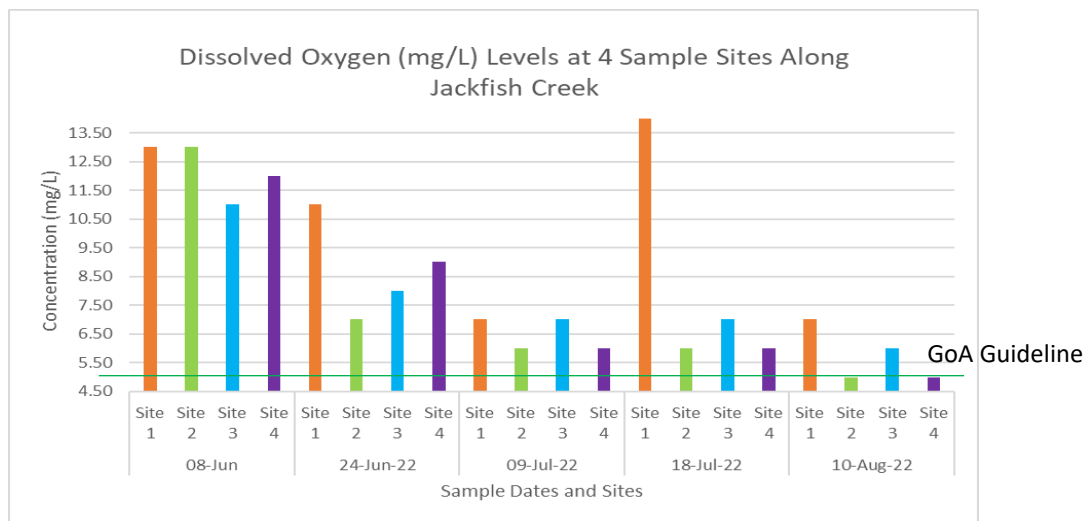


Figure 15. Dissolved Oxygen levels observed in 2022, at 4 sample sites.

### Ammonia Nitrogen

Varying levels of Ammonia Nitrogen were found between the four sample locations along Jackfish Creek. According to the Environmental Quality Guidelines for Alberta Surface Waters (2018), allowable levels of Ammonia Nitrogen may not exceed 1.0 mg/L at pH 8, 10°C. All levels were found to be below 1 mg/L with the exception of sample site 1 sampled on July 18, 2022. There are no trends identified that would suggest an increase or decrease in concentration in relation to the spatial distribution of the sample sites (Figure 16).

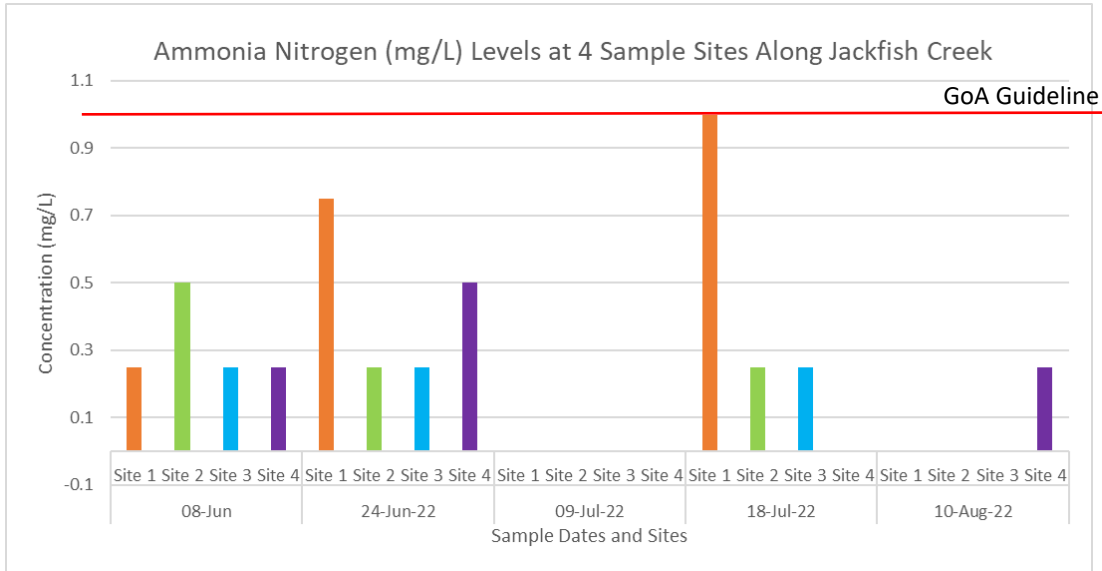


Figure 16. Ammonia Nitrogen levels observed in 2022, at 4 sample sites.

### Phosphorous

Phosphorus concentrations were recorded as 0 for all sample sites tested on June 24, 2022. During three sample events, Phosphorus was found to be in slightly greater concentrations further downstream (Figure 17), and during one sample event, site 4 was found to have no concentration of phosphorus detected where the other three sites did (refer to Appendix C for raw data).

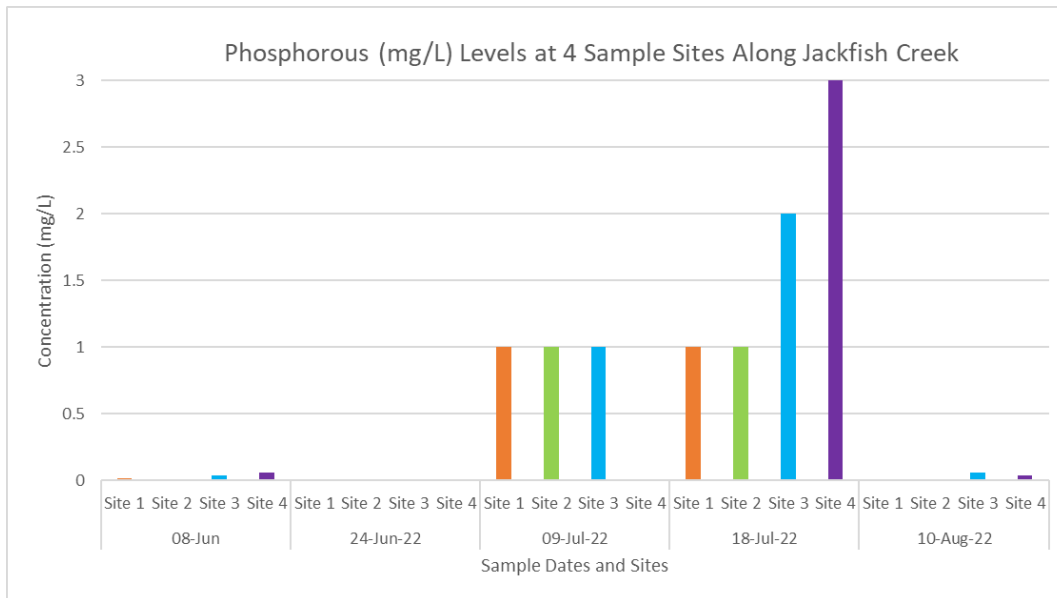


Figure 17. Phosphorous levels observed in 2022, at 4 sample sites..

### pH

pH levels differed between sites and sample events, although all remained within the Environmental Quality Guidelines for Alberta Surface Waters (2018) value range of 6.5-9. See Figure 18.

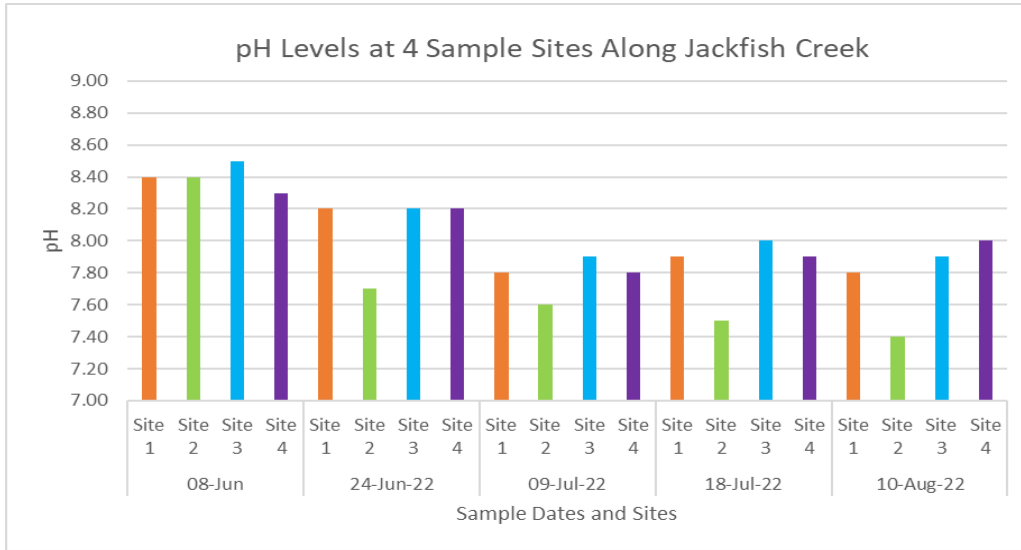


Figure 18. pH levels recorded at 4 sample sites along Jackfish Creek on five sample dates.

### Chloride

Chloride was found to vary between sample locations and sample dates. A conclusion cannot be drawn to infer that chloride concentrations found within the Creek increase or decrease based on downstream locations (Figure 19). The Environmental Quality Guidelines for Alberta Surface Waters (2018), is a maximum of 120 mg/L. The greatest recorded level of Chloride found in Jackfish Creek was recorded at site 1, on June 8, 2022, with a concentration level of 25 mg/L.

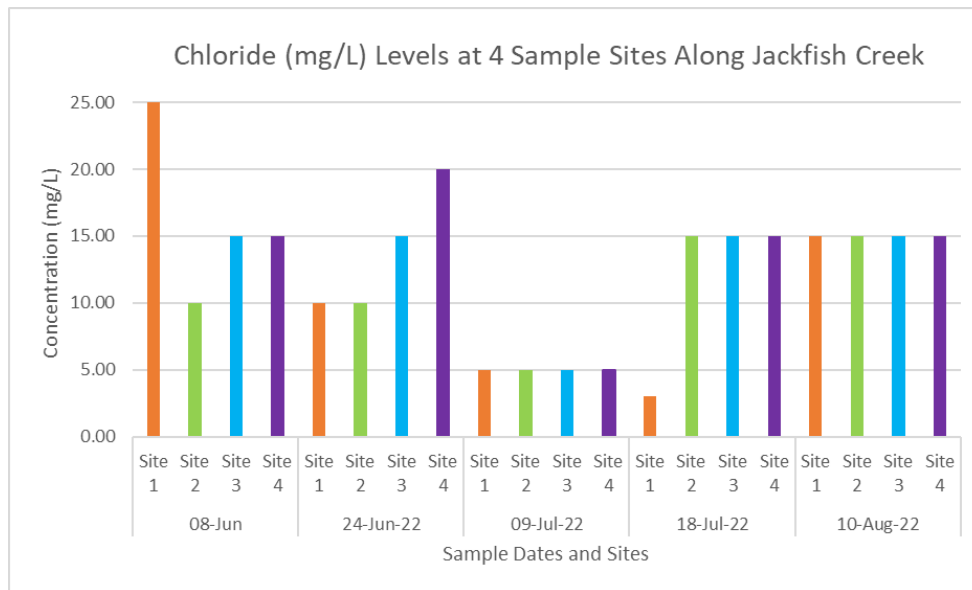


Figure 19. Chloride levels recorded at 4 sample sites along Jackfish Creek on five sample dates.



## Turbidity

Turbidity was measured to determine the level of suspended matter within the creek. It was found that the water turbidity increased downstream with the highest levels recorded at sample sites 3 & 4 (Figure 20).

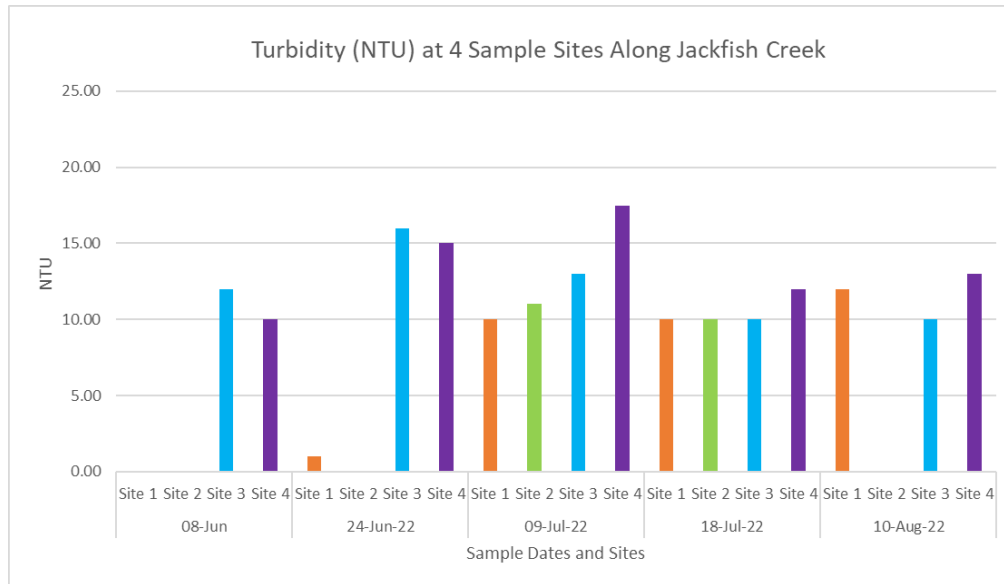


Figure 20. Turbidity recorded at 4 sample sites along Jackfish Creek, on five sample dates.

## Conclusion

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

Muriel Creek was sampled to show a relationship between the parameter concentration level and seasonal variability. Muriel Creek 1 was sampled 8 times during the 2022 season. Dissolved oxygen and phosphorous were found to decrease from June – September. But Ammonia Nitrogen, pH, and Chloride did not appear to be subject to seasonal variability. Although water turbidity was higher at a few sample times throughout the season, it is not anticipated that this is linked to the season and is likely due to an outside event.

Jackfish Creek was monitored to show a relationship between the concentration of select water quality parameters and the spatial distribution of the sample sites. The water quality did appear to decrease further downstream in terms of 1) Dissolved oxygen; found to be in a lower amount during three sample events downstream, 2) Phosphorus, as concentrations were at a slightly greater amount downstream, and 3) Turbidity; as the water became more turbid the further downstream. Ammonia Nitrogen and Chloride were not found to show a relationship between concentration level and spatial distribution of the sample sites.

It is recommended that the data collected should be used to form additional water monitoring programs that undergo lab analysis.

## Thank you to our CreekWatch volunteers!

CreekWatch with LICA is made possible by our amazing volunteers who gave countless hours to monitor the water quality of these creeks in the LICA region. 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 water quality data monitoring with our volunteers!

John Illchuk  
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Paul St.Amant  
Richard Bourgeois  
Alyssa Hellum  
Salum Katala  
Evelyn Mondares  
Tina Gladu  
Tina Johnson  
Mary Bourgeois  
Brenda Midgely  
Sharon Johnston  
Max Johnston  
Keatyn Bowen  
Parker Harrison

Peter Cordingley  
Louise White-Gibbs  
Miranda Zuk  
Scott Iron  
Kurt Franklin  
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Don Midgely  
Beverly Wilson  
Craig Holder  
Jeff Hlewka  
Jenson Kelly  
Seb Kelly  
Marley Johnston  
Denise Bowen  
Kayla Hellum



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**Appendix A: 2022 Muriel Creek 1 Raw Data**

| Parameters |                         | Muriel Creek 1 - 2022 Raw Data |           |          |           |           |           |           |           |  |  |
|------------|-------------------------|--------------------------------|-----------|----------|-----------|-----------|-----------|-----------|-----------|--|--|
|            |                         | 4-Jun-22                       | 13-Jun-22 | 2-Jul-22 | 20-Jul-22 | 29-Jul-22 | 10-Aug-22 | 18-Aug-22 | 12-Sep-22 |  |  |
| Physics    | Air Temperature (c)     | 22.00                          | -         | 20.40    | 23.20     | 25.00     | 17.20     | 21.50     | 11.00     |  |  |
|            | Water Temperature (c)   | 16.60                          | 22.30     | 16.40    | 21.70     | 21.10     | 18.20     | 17.50     | 10.50     |  |  |
|            | Turbidity (NTU)         | 0.00                           | 0.00      | 10.00    | 10.00     | 10.00     | 0.00      | 11.00     | 10.00     |  |  |
|            | Dissolved Oxygen (mg/L) | 14.00                          | 9.00      | 10.00    | 10.00     | 9.00      | 8.00      | 2.00      | 4.00      |  |  |
| Chemistry  | Ammonia Nitrogen (mg/L) | 0.50                           | 0.25      | 0.35     | 0.25      | 0.25      | 0.25      | 0.25      | 0.40      |  |  |
|            | Phosphorous (mg/L)      | 10.00                          | 5.00      | 0.08     | 0.05      | 0.14      | 0.10      | 0.12      | 0.00      |  |  |
|            | pH                      | 7.90                           | 8.10      | 7.90     | 8.00      | 8.50      | 8.30      | 7.50      | 7.50      |  |  |
|            | Chloride (mg/L)         | 25.00                          | 3.00      | 25.00    | 20.00     | 15.00     | 20.00     | 25.00     | 25.00     |  |  |
|            |                         |                                |           |          |           |           |           |           |           |  |  |

**Appendix B: 2022 Muriel Creek 2 Raw Data**

| Parameters |                         | Muriel Creek 2 - 2022 Raw Data |           |
|------------|-------------------------|--------------------------------|-----------|
|            |                         | 04-Jun-22                      | 13-Jun-22 |
| Physics    | Air Temperature (c)     | 24.70                          | -         |
|            | Water Temperature (c)   | 18.00                          | 22.00     |
|            | Turbidity (NTU)         | 0.00                           | 0.00      |
| Chemistry  | Dissolved Oxygen (mg/L) | 7.00                           | 4.00      |
|            | Ammonia Nitrogen (mg/L) | 0.50                           | 0.50      |
|            | Phosphorous (mg/L)      | 0.06                           | 8.00      |
|            | pH                      | 8.00                           | 12.00     |
|            | Chloride (mg/L)         | 20.00                          | 3.00      |

**Appendix C: 2022 Jackfish Creek Raw Data**



|            |                         | Jackfish Creek 2022 Raw Data |        |        |        |           |        |        |        |           |        |        |        |           |        |        |        |           |        |        |        |
|------------|-------------------------|------------------------------|--------|--------|--------|-----------|--------|--------|--------|-----------|--------|--------|--------|-----------|--------|--------|--------|-----------|--------|--------|--------|
| Parameters |                         | 08-Jun                       |        |        |        | 24-Jun-22 |        |        |        | 09-Jul-22 |        |        |        | 18-Jul-22 |        |        |        | 10-Aug-22 |        |        |        |
|            |                         | Site 1                       | Site 2 | Site 3 | Site 4 | Site 1    | Site 2 | Site 3 | Site 4 | Site 1    | Site 2 | Site 3 | Site 4 | Site 1    | Site 2 | Site 3 | Site 4 | Site 1    | Site 2 | Site 3 | Site 4 |
| Physics    | Air Temperature (c)     | 20.90                        | 21.80  | 20.30  | 23.50  | 18.40     | 17.20  | 18.50  | 18.40  | 17.20     | 19.90  | 20.20  | 18.70  | 26.60     | 26.40  | 25.90  | 26.80  | 24.00     | 23.50  | 21.80  | 21.30  |
|            | Water Temperature (c)   | 18.00                        | 20.40  | 20.00  | 19.30  | 17.20     | 16.00  | 16.50  | 16.50  | 18.80     | 22.50  | 21.50  | 18.60  | 23.50     | 24.00  | 23.60  | 22.80  | 21.50     | 18.90  | 18.50  | 17.80  |
|            | Turbidity (NTU)         | 0.00                         | 0.00   | 12.00  | 10.00  | 1.00      | 0.00   | 16.00  | 15.00  | 10.00     | 11.00  | 13.00  | 17.50  | 10.00     | 10.00  | 10.00  | 12.00  | 12.00     | 0.00   | 10.00  | 10.00  |
| Chemistry  | Dissolved Oxygen (mg/L) | 13.00                        | 13.00  | 11.00  | 12.00  | 11.00     | 7.00   | 8.00   | 9.00   | 7.00      | 6.00   | 7.00   | 6.00   | 14.00     | 6.00   | 7.00   | 6.00   | 7.00      | 5.00   | 6.00   | 5.00   |
|            | Ammonia Nitrogen (mg/L) | 0.25                         | 0.50   | 0.25   | 0.25   | 0.75      | 0.25   | 0.25   | 0.50   | 0.00      | 0.00   | 0.00   | 0.00   | 1.00      | 0.25   | 0.25   | 0.00   | 0.00      | 0.00   | 0.00   | 0.25   |
|            | Phosphorous (mg/L)      | 0.02                         | 0.00   | 0.04   | 0.06   | 0.00      | 0.00   | 0.00   | 0.00   | 1.00      | 1.00   | 1.00   | 0.00   | 1.00      | 1.00   | 2.00   | 3.00   | 0.00      | 0.00   | 0.06   | 0.04   |
|            | pH                      | 8.40                         | 8.40   | 8.50   | 8.30   | 8.20      | 7.70   | 8.20   | 8.20   | 7.80      | 7.60   | 7.90   | 7.80   | 7.90      | 7.50   | 8.00   | 7.90   | 7.80      | 7.40   | 7.90   | 8.00   |
|            | Chloride (mg/L)         | 25.00                        | 10.00  | 15.00  | 15.00  | 10.00     | 10.00  | 15.00  | 20.00  | 5.00      | 5.00   | 5.00   | 5.00   | 3.00      | 15.00  | 15.00  | 15.00  | 15.00     | 15.00  | 15.00  | 15.00  |

**Appendix D: 2022 Invertebrate Sampling Raw Data**

2022 CreekWatch Water Quality Monitoring Results

| Creek          | Sample Date | Invertebrate Type |                    |                 |            |            |                      |               |                  |                  |                     |             |   |   |             | Notes       |
|----------------|-------------|-------------------|--------------------|-----------------|------------|------------|----------------------|---------------|------------------|------------------|---------------------|-------------|---|---|-------------|-------------|
|                |             | Mayfly Nymph (PT) | Stonely Nymph (PT) | Amphipods (MPT) | Leech (PT) | Snail (PT) | Damselfly Nymph (PT) | Water boatman | Bristleworm (PT) | Midge Larva (PT) | Blackfly Larva (PT) | Small Fishz |   |   |             |             |
| Muriel Creek 1 | 04-Jun      | 0                 | 0                  | 4               | 0          | 0          | 0                    | 0             | 0                | 0                | 4                   | 0           | 0 | 0 |             |             |
|                | 13-Jun      | 0                 | 0                  | 1               | 0          | 0          | 1                    | 0             | 0                | 5                | 0                   | 15          | 1 |   |             |             |
|                | 02-Jul      | 1                 | 0                  | 2               | 0          | 0          | 1                    | 0             | 0                | 0                | 0                   | 0           | 0 |   |             |             |
|                | 20-Jul      | 1                 | 0                  | 18              | 3          | 0          | 0                    | 2             | 0                | 0                | 0                   | 0           | 0 |   |             |             |
|                | 29-Jul      | 2                 | 0                  | 8               | 0          | 0          | 0                    | 1             | 0                | 0                | 0                   | 0           | 0 |   |             |             |
|                | 10-Aug      | 1                 | 1                  | 12              | 6          | 1          | 0                    | 0             | 0                | 0                | 0                   | 0           | 0 |   |             |             |
|                | 18-Aug      |                   |                    |                 |            |            |                      |               |                  |                  |                     |             |   |   |             |             |
|                | 12-Sep      |                   |                    |                 |            |            |                      |               |                  |                  |                     |             |   |   |             | Not sampled |
|                | Totals      | 5                 | 1                  | 45              | 9          | 1          | 2                    | 3             | 9                | 5                | 15                  | 1           |   |   |             |             |
|                | 04-Jun      | 0                 | 0                  | 7               | 0          | 0          | 20                   | 0             | 0                | 10               | 0                   | 0           |   |   |             |             |
| Totals         | 0           | 0                 | 7                  | 0               | 0          | 20         | 0                    | 0             | 10               | 0                | 0                   |             |   |   |             |             |
| SS1            | 08-Jun      | 0                 | 0                  | 50              | 0          | 0          | 1                    | 0             | 2                | 0                | 0                   |             |   |   | Not sampled |             |
| SS2            | 08-Jun      | 0                 | 0                  | 2               | 0          | 0          | 10                   | 0             | 2                | 0                | 0                   |             |   |   | Not sampled |             |
| Jackfish Creek | 24-Jun      |                   |                    |                 |            |            |                      |               |                  |                  |                     |             |   |   | Not sampled |             |
|                | 09-Jul      |                   |                    |                 |            |            |                      |               |                  |                  |                     |             |   |   | Not sampled |             |
|                | 18-Jul      |                   |                    |                 |            |            |                      |               |                  |                  |                     |             |   |   | Not sampled |             |
|                | 10-Aug      |                   |                    |                 |            |            |                      |               |                  |                  |                     |             |   |   | Not sampled |             |
| Totals         | 0           | 0                 | 52                 | 0               | 0          | 11         | 0                    | 2             | 2                | 0                | 0                   |             |   |   |             |             |

PI - Pollution Intolerant Species, MPT - Moderately Pollution Tolerant Species, PT - Pollution Tolerant Species.

1 - Not necessarily useful as indicators of water quality because the adults breathe surface air.

2 - Not an invertebrate type, just an observation