



MUNICIPALITY OF NORTH COWICHAN SERVICE AGREEMENT WITH
THE SOMENOS MARSH WILDLIFE SOCIETY
PARROT'S FEATHER CONTROL PROJECT REPORT 2024



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Somenos Marsh Wildlife Society

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2 Executive Summary

Parrot's feather (*Myriophyllum aquaticum*) is an invasive aquatic weed which originates from the Amazon basin and has colonized most of Somenos Creek over the 10 years since its introduction. Due to potential negative impacts on the creek, the Somenos Marsh Wildlife Society completed a two-phase control project, with the second phase of the project occurring from May 29th to October 16th, 2024.

- The project took place in a 1.44km section of Somenos Creek, upstream of the Lakes Road Bridge.
- All work was completed from two boats in the creek, from which the Society cut the leading edge of the parrot's feather, then removed it from the creek and disposed of it above the high-water mark.
- Between May 29th and October 16th, the Society completed seven cutting events and 23 collection events. Volunteers contributed 185 and staff contributed 620 hours to the project.
- The Society removed 58.45m³ or 573 102-litre totes of parrot's feather and was able to maintain a 2-to-4-meter channel clear in most of the creek.
- Once discarded, the parrot's feather began decomposing and, based on results from phase one, will be mostly gone after overwintering.
- Turbidity was monitored for most activities in the creek with before, during and after samples taken. While variable, results show no lasting changes in turbidity in the project area.
- Water quality was monitored by two dissolved oxygen and temperature data loggers, one at the end of the project area at the Lakes Road bridge and the other below the project area at the Tzouhalem Road bridge. The data indicated a statistically significant difference between the project and control location, with the Lakes Road location having slightly higher temperatures and dissolved oxygen levels.

The Somenos Marsh Wildlife Society was able to maintain an open channel in Somenos Creek over a 1.44 km section from Lakes Road upstream towards the lake. The full benefit of controlling Parrots Feather will require the project to be extended to cover the entire creek.

3 Introduction

Based on the recommendations from a 2019 report on parrot's feather (*Myriophyllum aquaticum*) management options (Preikshot, 2019), the Somenos Marsh Wildlife Society (the Society) proposed a two-phase control program. This was done in partnership with the Municipality of North Cowichan and with the support of Cowichan Tribes to determine the effectiveness and benefits of cutting parrot's feather to maintain a channel clear of the aquatic weed in Somenos Creek.

Parrot's feather is an invasive aquatic plant that was first seen in Somenos Creek in 2014 (Preikshot, 2019). It is native to the Amazon River basin and is commonly found in relatively

shallow, warm, slow-moving water and is well adapted to nutrient-rich environments (Washington State Department of Ecology, 2001). Unfortunately, these conditions exist in Somenos Creek for parrot's feather growth in the summer months. Parrot's feather has spread through the majority of Somenos Creek in part because much of the watershed is urbanized and host to extensive agriculture, leading to nutrient-rich runoff that ends up in Somenos Lake and Somenos Creek. The concern is that parrot's feather may have negative impacts on water quality in Somenos Creek, infringe on recreational use, and may create a barrier to salmon migration. Populations of Coho (*Oncorhynchus kisutch*) use the watershed's upper tributaries (Richards Creek, Averill Creek, and Bings Creek) as their spawning grounds (Burns 2002), chum (*Oncorhynchus mykiss*) salmon and coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) have also been seen in the watershed by Society staff. Somenos Creek is the only access to the rest of the Somenos watershed. Mats of parrot's feather in the creek may present annual physical and water quality barriers to fish migration until fall break-up occurs and the rainy season begins. At that time, high flows and colder temperatures cause the parrot's feather to die off and get flushed down the creek. Drier and hotter summers attributed to anthropogenic climate change, will most likely extend the growth season of parrot's feather, thus leading to greater coverage, thicker mats, and more permanent changes to the ecology of the creek system, threatening fish habitat, recreational use and water quality. In the summer of 2023, the society completed phase 1 of the Parrot's Feather Control Project (the project). In the summer of 2024, the society began phase 2, which expanded the project length and frequency. This report will outline the methodologies and results from phase 2 of the control project.

4 Methods

4.1 Project Location

The project took place in Somenos Creek, extending downstream from where parrot's feather is established for a total distance of 1.44 km to Lakes Road bridge (Figure 1), extending the project length by 844m from phase one in 2023. The Society started clearing operations 300m from the head of the creek, where the parrot's feather begins growing. Surveys by the Society from 2021 to 2023 show that the dense growth of other aquatic plants, including great yellow pond-lily (*Nuphar polysepala*) and smartweed (*Polygonum* spp.) at the head of the creek appear to be a barrier to the spread of parrot's feather into the lake. The section of the creek in which the project took place is relatively wide, measuring about 4-5 meters in most sections, with few sections any narrower than 3 meters during the dry season. The banks are steep, and the water is approximately 1.5 to 2 meters deep. The creek has very limited observable flow, if any, during dry summer months (Preikshot, 2019), and riparian and aquatic vegetation cover most of the creek in some sections.

4.2 Procedures

The Society received letters from the Municipality of North Cowichan, Sonia Furstenau MLA, and Larry George with Cowichan Tribes in 2023 in support of the proposed 2 phase mechanical removal of parrot's feather in Somenos Creek. Applications were sent to Federal and Provincial regulators and were approved to support cutting operations in 2023 and 2024. Letters of support, permits and other documents can be requested from the Society if required. Residents of

Seine Road and other nearby residents were informed of the work to be done in the Creek through a letter and a staff canvas in 2023. Signs informing passersby of the project were placed at the boat launch and next to the parrot's feather drop sites to ensure community members were informed of the work being completed.

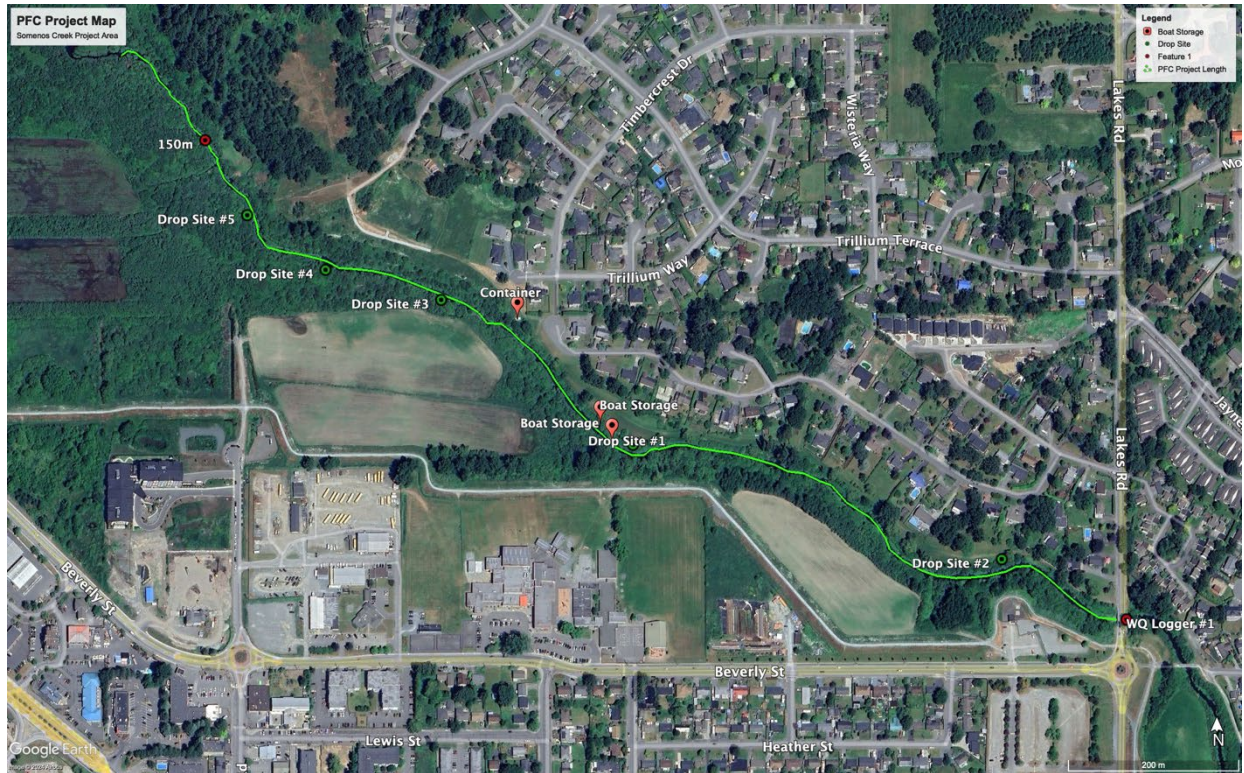


FIGURE 1: PARROT'S FEATHER CONTROL PROJECT AREA AND OTHER IMPORTANT LOCATIONS ON SOMENOS CREEK.

The project consisted of three main aspects: cutting, collecting and water quality monitoring. The leading edge of the parrot's feather was cut with the aquatic mower; the cut sections were then collected with the boat and then removed from the Creek to dry and compost on the bank above the high-water mark. Water quality monitoring of the creek was completed to catch any temperature differences and dissolved oxygen between the control site and the project site. Turbidity was also monitored to ensure instream work stayed within guidelines to prevent impacts on fish. Two boats (one purchased in 2024 with a Pacific Salmon Foundation grant) were equipped with electric motors and batteries for all work in the creek. To prevent the downstream movement of parrot's feather fragments during periods of flow, a containment boom was installed across the creek under the Lakes Road bridge and remained in place for the duration of the project. The boats were stored in the creek, tied, and locked to shore. All other tools and equipment were stored in a 20' shipping container placed at the end of Seine Road, except for the batteries, which were brought back to the Society's office to be charged. The dissolved oxygen loggers will be left in the creek until December to capture data on the fall flush.

The Society worked in the creek 1-2 times a week from May 29th to October 16th, totaling 26 events, averaging 3.5 hours per event. Volunteers contributed 185 hours to the project and participated in

the majority of the in-stream operations. Society staff contributed 620 hours to the project; this included communications, planning and reporting.

4.3 Cutting

Parrot's feather cutting took place on the dates shown in Table 1, with a total of 7 cutting events from May 29th to September 4th. Tools used during cutting events included one 14” aluminum boat, electric motor, gunwale mounted aquatic mower, life jackets, waterproof shoes and paddles. Personnel included a boat driver, the aquatic mower operator, and one to two extra personnel to keep the boat steady, on course and collect turbidity samples.

TABLE 1: DATES DURING THE SUMMER OF 2024 WHEN CUTTING ACTIVITIES OCCURRED IN SOMENOS CREEK.

| Cutting Dates | |
|---------------|-----------|
| 29-May-24 | 18-Jul-24 |
| 5-Jun-24 | 31-Jul-24 |
| 12-Jun-24 | 4-Sep-24 |
| 20-Jun-24 | |

The aquatic mower was mounted on the starboard side of the boat onto the reinforced gunwale (see Figure 2). This meant the NE side of the creek was cut while moving upstream and the SW side while moving downstream. Most of the cutting was completed using the aquatic mower; however, in some sections where growth was encroaching on the cleared channel, hand-cutting tools were used during collection events to remove sections of the parrot's feather.



FIGURE 1: THE AQUATIC MOWER ATTACHED TO THE GUNWALE OF THE BOAT.

4.4 Collecting

The collection of parrot's feather took place on the dates shown in Table 2, with a total of 23 removal events from May 29th to October 16th. Tools used during collection events included one to two boats, electric motors, 5-8 plastic totes for parrot's feather collection, a hand saw to cut any parrot's feather that was still partially attached, and pitchforks and rock rakes for collection. Life jackets, waterproof gloves, and waterproof shoes were also needed. Personnel for each boat included a driver and two to four other personnel to collect the parrot's feather and maintain balance in the boat.

TABLE 2: DATES DURING THE SUMMER OF 2024 WHEN COLLECTING ACTIVITIES OCCURRED IN SOMENOS CREEK.

| Collection Dates | | | | |
|------------------|-----------|-----------|-----------|-----------|
| 29-May-24 | 10-Jul-24 | 31-Jul-24 | 28-Aug-24 | 26-Sep-24 |
| 12-Jun-24 | 11-Jul-24 | 1-Aug-24 | 29-Aug-24 | 9-Oct-24 |
| 19-Jun-24 | 17-Jul-24 | 8-Aug-24 | 11-Sep-24 | 16-Oct-24 |
| 27-Jun-24 | 24-Jul-24 | 14-Aug-24 | 12-Sep-24 | |
| 4-Jul-24 | 25-Jul-24 | 21-Aug-24 | 18-Sep-24 | |

Previously cut parrot's feather was collected from the creek using the rakes and pitchforks, drained of as much water as possible, and then placed in the totes (Figure 3), once the totes were full, they were brought to a drop of point on the bank, see Figure 1 for all drop-off locations. The totes were tipped over the side of the boat to remove any excess water and then hauled onto the bank. The parrot's feather from each tote was inspected for any fish, invertebrates, or other aquatic life before being spread out to dry.



FIGURE 3: PARROT'S FEATHER COLLECTION IN SOMENOS CREEK.

4.5 Water Quality Testing

Water quality was monitored by the data loggers (U26 probe) that measured temperature and dissolved oxygen every 10 minutes throughout the project's duration. The first data logger was installed at Lakes Road bridge, 0.5 m under the surface, mid-channel, to capture the impact of the project on the water quality. The second data logger was installed at the Tzouhalem Road bridge, 0.5m below the surface, mid-channel, and served as a control site for water quality in the Creek (Appendix A, Figure 1). Data was collected from both loggers weekly. The data loggers will be left until December 2024 to monitor water quality through the fall flush.

Turbidity was tested before, during and after work was completed to monitor changes in turbidity levels and ensure the activities in the Creek did not produce turbidity levels that exceeded water quality guidelines outlined by the British Columbia Approved Water Quality Guidelines (Singleton, 2021). Water samples were collected and tested using a YSI 9300. Regular testing began on July 10th and continued until the end of the project.

5 Results

5.1 Mitigations

To meet requirements laid out in the 2024 permits for work in the creek, certain mitigations were undertaken by the Society. A boom was left in the Creek to catch any parrot's feather fragments that may have floated downstream between work events during times when the creek was flowing. Accumulation of the parrot's feather at the boom was only observed during the early stages of the project in June and when the Creek began flowing again in October. Most notably, the collection of common duckweed (*Lemna minor*) was quite significant. The collection of plant material when the Creek was flowing shows that the boom was effective at stopping material from being carried downstream from the project area. A seine net was not utilized this year as results from phase one deemed it unnecessary, and no parrot's feather was seen moving past the boom.



FIGURE 4: BOOM PLACEMENT UNDER LAKES ROAD BRIDGE WITH A CHUNK OF CUT PARROT'S FEATHER.

Precautions were taken to ensure that the parrot's feather was not accidentally carried offsite to potentially contaminate other waterbodies when the equipment was removed from the project area. This involved visually inspecting, washing, and disinfecting any equipment that had to be taken off-site during the project. At the end of the project, all equipment used was thoroughly washed and inspected before being removed from the site. Additional precautions included draining and drying both boats before their use in other waterbodies, signage on the site of the project, and staff and volunteer education on limiting potential contamination.

5.2 Cutting, Collecting and Drying

Using the gunwale mounted aquatic mower, the Society cut the leading edge of the parrot's feather, once cut, the Society returned with the boat to collect and remove the cut parrot's feather and bring it to shore. This process was successful at creating a 2-to-4-meter-wide channel (depending on the width of the creek and overhanging riparian vegetation) free of parrot's feather in the creek. For each cutting event completed in the creek, on average, three removal events were needed to remove all cut material. In some reaches of the creek, cutting by hand was needed during collecting events to maintain a clear channel. By mid-August, the top 150 meters of the project area had grown over completely, leading to the boats being unable to move upstream beyond the 150m mark, see Figure 1. As the Society was focusing on collecting material that had been cut in June and July, by the time the upper 150 m section was reached, the cut parrot's feather had reattached itself and continued growing in the cleared area, making the reach inaccessible by boat, and therefore the Society was unable to return to the area to cut. In total, the society removed 58.45m³ of parrot's feather from Somenos Creek, measured by 573 102-litre plastic totes. All collected parrot's feather was discarded at the drop sites, shown in Figure 1. No fish species were observed caught in the cut and removed parrot's feather, only green (*Lothobates clamitans*) and bull (*Lithobates catesbeianus*) frog tadpoles, aquatic snails, and a few species of benthic invertebrates such as unidentified dragonfly nymphs. All species caught in the cut parrot's feather were removed carefully and placed back in the creek. After being discarded, the parrot's feather was observed as decomposing well over the project duration. Based on the first phase results from 2023, the Society believes that all discarded parrot's feather will be decomposed and not biologically viable for regrowth in the spring of 2025.

Parrot's feather surveys were not completed monthly as they were in 2023. However, the Municipality did conduct an aerial drone survey of the creek on the 12th of September 2024. Results from the September survey demonstrate the outcome of the project as less coverage of parrot's feather on the project section of the Creek compared to survey results from below the project area, see Figure 5, where, in previous years, the society's surveys indicated similar coverage of parrot's feather in the creek. Based on these data, it is shown that the project had a substantial impact on the growth and coverage of parrot's feather in the project area. See Appendix A, Figure 2, for the full parrot's feather survey results.



FIGURE 5: IMAGES OF PARROT'S FEATHER COVERAGE IN THE PROJECT AREA (LEFT) AND BELOW PROJECT AREA (RIGHT). THE CLEARED CHANNEL CAN BE SEEN CLEARLY IN THE PROJECT AREA PHOTO.

5.3 Water Quality

5.3.1 Turbidity

Turbidity was recorded before, during, and after the cutting and removal activities to monitor the effects of operations in the creek, see Table 3. The Society began testing on July 10th as equipment for the turbidity testing was slow to arrive. It was observed by the Society that due to lack of flow in the dry months, background turbidity appears to be variable and localized, this may be due to groundwater influences, aquatic plant growth, and animal activity in the creek. Samples were taken in different locations of the creek, coinciding with where work was being completed. Both cutting events and removal events caused organic material disturbance, leading to increased turbidity levels during work in the creek. This could have been caused by disturbance of the decomposed material and/or algae that was attached to the root masses of the parrot's feather when the plant material was removed. The material would be released, creating higher turbidity levels, but would quickly dissipate, as shown in the 'after' results. Sediment from the creek's bottom or banks was rarely disturbed. The BC turbidity guidelines for aquatic life require no change over 5 NTU at any time when background turbidity is between 8 – 50 NTU (Singleton, 2021). The majority of after samples were taken within 1 – 2 hours of the 'during' sample and show a return to the starting turbidity levels or are within the recommended ranges. There were, however, two outliers, 'during' removal events on September 11th and 18th, where turbidity guidelines were exceeded, turbidity did return to below the 'before' levels two hours after work in the affected areas was completed.

TABLE 3: RESULTS OF ALL TURBIDITY SAMPLING COMPLETED FOR THE PARROT'S FEATHER CONTROL PROGRAM.

| Date | Action | Before NTU | During NTU | After NTU (taken within 24 hrs) |
|-----------|---------|------------|------------|---------------------------------|
| 10-Jul-24 | Removal | 6 | 6 | 4 |
| 17-Jul-24 | Removal | 0 | - | 2 |
| 18-Jul-24 | Cutting | 2 | - | 0 |
| 24-Jul-24 | Removal | 4 | 8 | 4 |
| 25-Jul-24 | Removal | 6 | 12 | 6 |
| 31-Jul-24 | Cutting | 6 | 10 | 8 |
| 8-Aug-24 | Removal | 2 | 3 | 1 |
| 14-Aug-24 | Removal | 6 | 6 | 6 |
| 28-Aug-24 | Removal | 4 | 6 | 6 |
| 29-Aug-24 | Removal | 8 | 6 | 10 |
| 4-Sep-24 | Cutting | 0 | 12 | 6 |
| 11-Sep-24 | Removal | 10 | 16 | 6 |
| 12-Sep-24 | Removal | 4 | 10 | 6 |
| 18-Sep-24 | Removal | 10 | 98 | 8 |
| 26-Sep-24 | Removal | 12 | 16 | 11 |
| 9-Oct-24 | Removal | 2 | 10 | 0 |

5.3.2 Temperature and Dissolved Oxygen

Two data loggers were installed in Somenos Creek, which measured dissolved oxygen content and temperature every ten minutes for the project's duration. The first data logger was placed at the Lakes Road bridge to capture water quality directly below the project area. The second data logger was placed at the Tzouhalem Road bridge (Appendix A, Figure 1), around 660m downstream from the Lakes Road bridge, to act as a control site and capture any differences in water quality between sections of the creek where parrot's feather removal was undertaken and where it was growing freely. Data from the loggers were collected, and sensors were cleaned weekly as algal growth on the sensors was noted to impact the data quality. The outliers that occurred when the probe was taken out of the water were removed from the dataset. The graphs in Figures 6 and 7 show the average daily temperatures and dissolved oxygen levels.

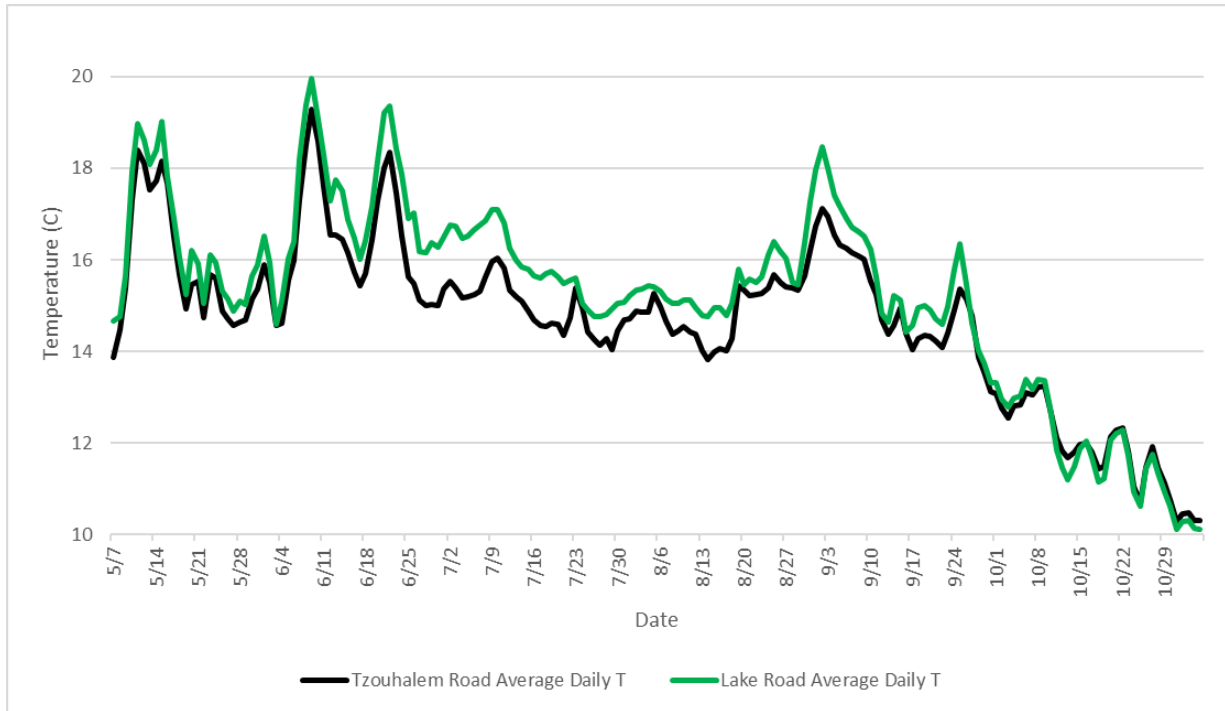


FIGURE 6: AVERAGE DAILY TEMPERATURES OF SOMENOS CREEK AT THE CONTROL (TZOUHALEM ROAD) AND PROJECT SITE (LAKES ROAD)

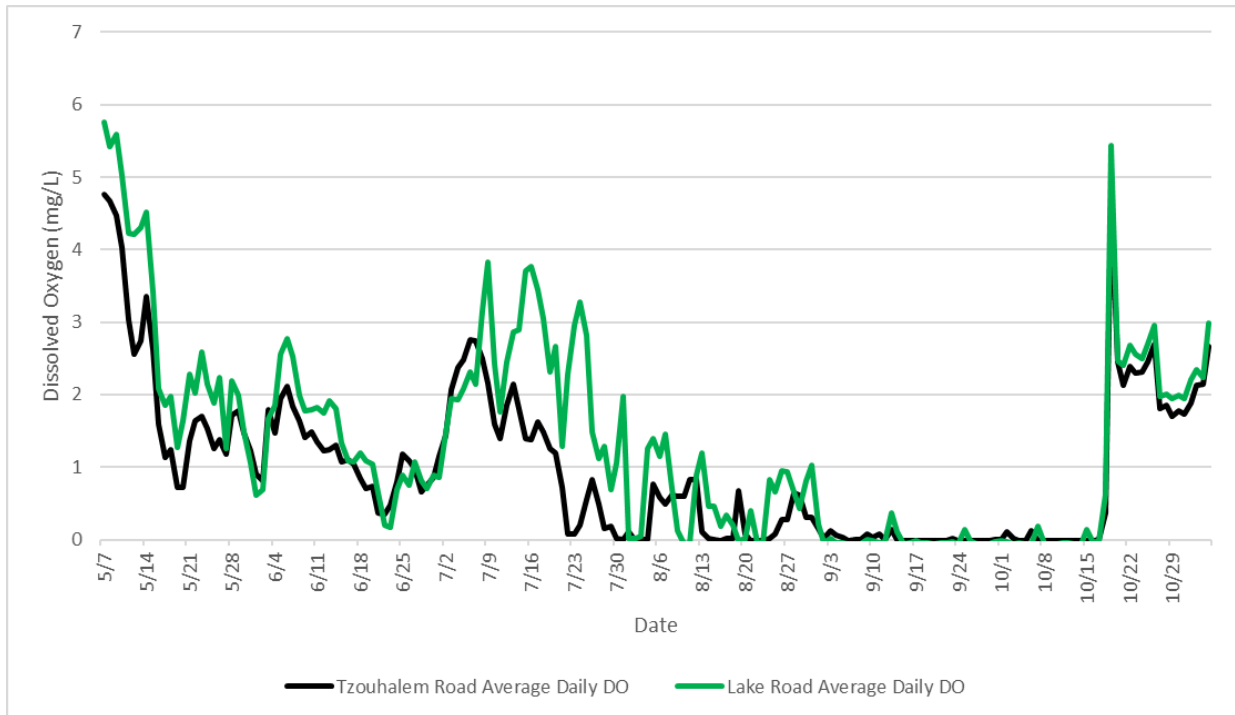


FIGURE 7: AVERAGE DAILY DISSOLVED OXYGEN OF SOMENOS CREEK AT THE CONTROL (TZOUHALEM ROAD) AND PROJECT SITE (LAKES ROAD)

Water quality measurements in Somenos Creek have shown to be highly variable during the summer months since the Society began regularly recording data. Low flow, groundwater influence, decomposition and aquatic vegetation likely play important roles in the Creek leading to uncertain results. Even with these variables, the logger at Lakes Road appears to regularly have higher dissolved oxygen and temperature readings within the parrot's feather control project area than at the control site at Tzouhalem Road (see Figures 6 and 7). T-tests were run on the temperature and dissolved oxygen data to determine if the observable differences between sites were statistically significant, both results were $P < 0.05$ which shows that they were significantly different. It is difficult to determine if this significant difference is due to natural causes or from clearing the parrot's feather biomass out of the creek. More baseline data could be collected to determine the cause of the difference. Detailed water quality data is available at Somenos Marsh Wildlife Society upon request.

6 Conclusions

Removal of parrot's feather proved to be effective in Somenos Creek at this scale. The Society was able to navigate instream in the boat, cutting and removing the parrot's feather and depositing it above the high-water mark to decompose. For the majority of the project length, the Society maintained a 2-to-4-meter-wide channel, clear of parrot's feather, which resulted in 58.45m³ of biomass being removed and discarded on the bank to desiccate overwinter. The results can be seen in the creek survey completed by the Municipality on September 12th, where a channel is visible through the project area. Society staff and volunteers contributed 805 hours to the project, increasing efforts in both project area and the frequency of work completed compared to phase one in 2023. Work in the creek did not increase turbidity levels for more than two hours or disrupt fish populations. While water quality did show a statistically significant difference between the project and control sites, it is not clear whether this is due to the project impact or natural processes. If the project is expanded to the entire creek, the Society recommends a significant increase in funding, staff, effort, and equipment. The support of Cowichan Tribes will be essential to allow work on the lower section of the creek from Tzouhalem Road to the confluence with the Cowichan River. The Society believes that there will not be conclusive data on the effects of maintaining a clear channel unless the entire creek is cleared, particularly during the fall when water begins to flow through Somenos Creek.

7 Appendix A – Additional Images

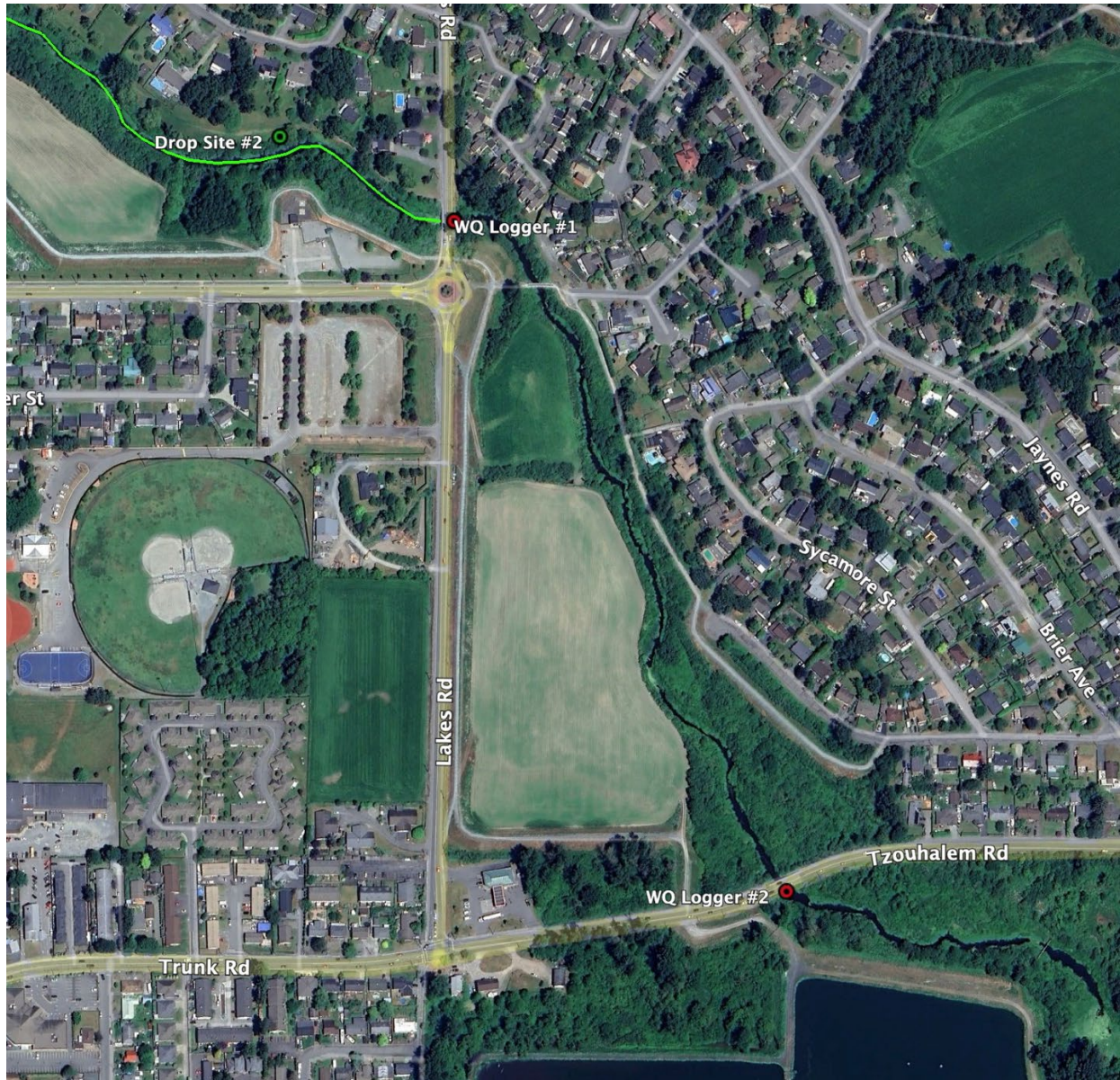


FIGURE 1: SATALITE IMAGE SHOWING WATER QUALITY LOGGER LOCATIONS IN SOMENOS CREEK.



FIGURE 2: FULL IMAGE OF PARROT'S FEATHER SURVEY COMPLETED BY THE MUNICIPALITY OF NORTH COWICHAN ON SEPTEMBER 12TH, 2024.

8 Appendix B – References

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