

**2019 Cowichan Lake Pumping
Weekly Report #3
September 14 – 20, 2019**

Prepared For

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1 INTRODUCTION

This report describes the environmental monitoring observations and lamprey survey/salvage efforts implemented between September 14-20, 2019 – i.e. the third week of pumping. Cowichan Lake lamprey salvage efforts, as per the SAR permit for the Cowichan Lake Pump-Out Project (the Project), focused on nine sensitive sites determined by Fisheries and Ocean Canada (DFO) based on previous studies on the lamprey population and one additional site at the confluence of Cottonwood Creek with the lake.

Environmental monitoring requirements are provided in greater detail in the *Environment Monitoring Plan for the Pump Out of Lake Cowichan during Drought Conditions*¹ (EMP) including monitoring of water quality, fish and fish habitat, aquatic resources, riparian vegetation, and wildlife.

Table 1. Site visit summary

Date (dd/mm/yy)	Sites Inspected	Lead QEP	Monitoring Activities
17/09/19	Catalyst weir Cowichan River Cowichan Lake	Leo Chira, R.P.Bio.	<ul style="list-style-type: none"> - Inspected the weir and pumps. - Collected in-situ water quality data from river and lake. - Inspected the 9 potential lamprey salvage sites as per DFO. - Inspected one potential lamprey site – Cottonwood Creek.
18/09/19	Catalyst weir Cowichan River Cowichan Lake	Leo Chira, R.P.Bio.	<ul style="list-style-type: none"> - Inspected the weir and pumps. - Collected water quality samples for lab analysis.

2 MONITORING

Monitoring of the weir operations and fish/fish habitat sites are conducted in accordance with the EMP for the project at a frequency that allows identification of noticeable changes in fish habitat to inform any salvage activities that would be needed to prevent stranding of lamprey within the littoral zone of Cowichan Lake and that verifies fish are not at risk of being impinged on the pump screens. Recent heavy rain events have produced flow in most of the streams around Cowichan Lake and also raised the lake volume above the zero storage level. This allowed for the shutdown of the pumps which occurred at approximately 4:00 PM on September 18, 2019. Flows in the Cowichan River are now provided over the weir crest at a discharge of 4.5 m³/s. Due to an increase in water level, previously exposed shoreline areas are now inundated, which minimized the fish stranding risk to levels existing prior to pumping operations beginning.

¹ LGL Limited. 2016. Environmental Management Plan – Supplementing Cowichan River Flows During Drought Conditions by Pumping Water from Cowichan Lake.



2.1 WEIR OPERATIONS

To maintain a relatively constant instream flow in Cowichan River, 12 pumps were operating prior to shutdown this week. Two of the remaining eight pumps were damaged and were not operated. During an inspection on September 17, 2019 the Environmental Monitor (EM) noted some possible misalignment or damage to a screen which may have been caused by large woody debris. While there was no visible gap in the screen the EM requested that it be shutdown and a replacement pump started as a precautionary measure. The remainder of the pumps onsite were ready to be operated if needed in the event of a pump failure or some other pumping issues.

No significant issues were recorded at the weir. The cleaning activities previously conducted by North Pacific Diver Inc. removed most or all of the Eurasian watermilfoil (*Myriophyllum spicatum*) plugging the pump screens. However, small organic fragments and watermilfoil were again observed on the screens on September 17, 2019. The amount of organic matter deposited on screens did not appear to affect the pumping efficiency and likely did not significantly increase the risk for impingement.

As the lake level increased above the zero storage level, pumps were shut down on September 18, 2019. The shut down procedure was similar to the start up one, though in reversed order. To maintain a relatively constant flow in the stream, pumps were shut down a few at a time while the weir gates were lowered. No large instream flow variation was observed by the EM during the site visit and Catalyst was to continue monitoring the stream level to ensure an adequate flow is maintained during the post-operations period.

The weekly checklist for the pumps is provided in Table 2.

Table 2. Weekly pump-out checklist for Cowichan Lake based on observations from September 17 and 18, 2019.

Item	Good condition	Needs work	Notes
Fish screens clear	X		Fish screens are partially plugged with organic matter – no indication the impingement risk increased. Implement cleaning activities on a weekly basis will likely be required but the level of material was deemed acceptable during the site visit.
No debris around pump floats	X		One piece of large woody debris at pump #10 may have damaged the screen. The operator was informed, and the pump was shut down. Further inspection of the screen is needed to confirm if it is damaged.
Pump discharge piping intact	X		No concerns with pump discharge points noted.
No excess pump noise	X		All pumps are electric.
Pump tethers acceptable	X		
No sediment entrainment	X		No visible discharge of sediments from the lake.
Pumps in acceptable water depth	X		



Item	Good condition	Needs work	Notes
Pump discharge is controlled	X		12 pumps worked concurrently during this monitoring period.
No environmental hazards	X		

2.2 WATER QUALITY

In-situ water quality sampling was conducted in the river and lake during pumping operations using a calibrated WTW 3410 multi-meter. Surface water sampling took place near the river staff gauge (downstream) and at the lake boat ramp upstream of the weir (Table 3).

Table 3. Weekly in-situ water quality variables above and below the Cowichan Lake weir.

Variable	Sep 17	Sep 18
Water Temperature (°C)		
Above weir (lake site)	19.1	20.2
Below weir (river site)	18.7	19.6
Dissolved oxygen (mg/L)		
Above weir (lake site)	8.85	9.50
Below weir (river site)	8.75	9.15

On August 28, 2019, two HOBO V2 model temperature loggers were installed at the two sample sites to monitor temperature variations continuously, at 15 minute intervals. Temperature data for the first two week interval was downloaded on September 12, 2019 and a figure summarizing the results was provided in the previous report (Week #2). The upcoming two week data will include temperature values logged after the pump shutdown event.

Water sampling for laboratory analysis was conducted at the two previously established locations upstream and downstream from the weir. The results will be available in the next report.

2.3 FISH AND FISH HABITAT

The pump setup was visually inspected to ensure the fish screens function properly and the risk for fish impingement remains low. Fish impingement was not observed during any of the site visits.

Table 4. Fish impingement observations at the end-of-pipe fish screen on pump intakes in Cowichan Lake.

Date	Reason	Observations
17/09/19	Operations	12 pumps operating, pump screens partially blocked; no impingement visible.
18/09/19	Operations	12 pumps were operating until 4:00 pm when they were shut down and natural flow from the lake was re-established; no impingement visible.



Assessment of the previously determined sites where Cowichan Lake lamprey were observed (free swimming forms and ammocoetes) – as per DFO and BC Conservation Foundation (BCCF), continued on September 17, 2019. Relatively large precipitation events were recorded prior and during these site assessments, which raised the lake waterline to a level slightly higher than recorded on August 28, 2019, when pumping operations began. With the exception of Robertson and Meade creeks, all other streams around Cowichan Lake were flowing on September 17, 2019. The confluence of Cowichan Lake and Sutton Creek could not be assessed during the site visit due to fast flowing water and restricted access.

Because previously dewatered areas or isolated pools along the shoreline were submerged or directly connected to the lake, no sampling or salvage activities for Cowichan lamprey occurred during this reporting period. Lamprey larvae found in a previously isolated pool at Nixon Creek had direct access to the lake via the stream, which was flowing during the site visit.

On September 17, potential stranding locations for lamprey were assessed at the confluence of Cottonwood Creek and Cowichan Lake as well. At that site, the spawning habitat for lamprey was considered limited and the rearing habitat was lacking as the substrate in the confluence zone was dominated by cobble size rocks and large gravels with very little to no organics.

The stranding risk for free swimming lamprey forms remained low during the pumping operations – Table 6. No free swimming forms were observed during the site assessments.

Table 5. Cowichan lamprey salvage and stranding observations at nine sites around Cowichan Lake.

Site	Aug 28, 2019 (pre-pumping)	Sep 17, 2019 (during pumping)
Meade Creek (N)	Good lamprey habitat – small gravels and organics. No risk for stranding due to steep lake banks. No swimming lamprey observed.	Lake waterline was above the Aug 28 level. No lamprey sampling/salvage activities conducted.
Miracle Creek	Poor lamprey habitat – compact or organics dominated. Low risk for stranding – gently sloped banks; no isolated pools. No swimming lamprey observed.	Lake waterline was above the Aug 28 level. No lamprey sampling/salvage activities conducted.
Sutton Creek	Poor lamprey habitat – compact or organics dominated. Low risk for stranding – gently sloped or steep lake banks. No swimming lamprey observed.	Not accessed due to fast instream flow and restricted access.
Robertson Creek	Good lamprey habitat – small gravels and organics. Little risk for stranding – steep banks, one lake area that may become isolated. No swimming lamprey observed.	Lake waterline was above the Aug 28 level. No lamprey sampling/salvage activities conducted.
Utility Creek	Poor lamprey habitat – compact or organics dominated. Low risk for stranding due to gentle slope; no isolated pools. No swimming lamprey observed.	Lake waterline was above the Aug 28 level. No lamprey sampling/salvage activities conducted.
Hawes Bay	Sub-optimal/poor lamprey habitat– sand/organics and cobbles dominated. Low risk for stranding due to gentle slope; no isolated pools. No swimming lamprey observed.	Lake waterline was above the Aug 28 level. No lamprey sampling/salvage activities conducted.



Site	Aug 28, 2019 (pre-pumping)	Sep 17, 2019 (during pumping)
Shaw Creek	Good lamprey habitat on the lake shoreline, small gravel and organics. Low risk for stranding in a pool near the confluence with Shaw Creek. No swimming lamprey observed.	Lake waterline was above the Aug 28 level. No lamprey sampling/salvage activities conducted.
Nixon Creek	Good lamprey habitat on the lake shoreline, small gravel and organics. Low risk for stranding, steep banks. No swimming lamprey observed.	Lake waterline was above the Aug 28 level. No lamprey sampling/salvage activities conducted.
Nixon Float House	Mostly poor and suboptimal lamprey habitat on the lake shoreline near and behind the float house – organics dominated. Good lamprey habitat found closer to Nixon Creek. No risk for stranding – steep banks. No swimming lamprey observed.	Lake waterline was above the Aug 28 level. No lamprey sampling/salvage activities conducted.

2.4 AQUATIC RESOURCES AND WILDLIFE OBSERVATIONS

Monitoring of the riparian vegetation, aquatic plants, and erosion/bank stability issues was also conducted during the monitoring of the nine sites along the Cowichan Lake shoreline. Sites were photo-documented for reference.

Notable wildlife sightings included two Great Blue Heron (*Ardea herodias*) near the lake weir location and Utility Creek, as well as a black bear sow (*Ursus americanus*) and two cubs walking along North Shore Road between Hawse Bay and Shaw Creek.

No significant signs of stress or die-off in trees or shrubs within the lake riparian area were observed to date. The lake water line increased due to recent precipitation events and flooded all areas with aquatic and semi-aquatic plants that became exposed during the pumping operations.

Photographs of a selection of sites inspected are provided in Section 3 below.



3 PHOTOS



Photo 1. Looking west at the Cowichan Lake shoreline near Nixon Creek. Aug 29, 2019.



Photo 2. Looking west at the Cowichan Lake shoreline near Nixon Creek. Sep 17, 2019.



Photo 3. Isolated pool on the lake shoreline near Nixon Creek. Sep 3, 2019.



Photo 4. Nixon Creek flowing over the previously isolated pool found to contain lamprey. Sep 17, 2019.



Photo 5. Looking southwest at the lake shoreline near the Nixon Creek float house. Aug 29, 2019.



Photo 6. Looking southwest at the lake shoreline near the Nixon Creek float house. Sep 17, 2019.



Photo 7. Looking east at the lake shoreline near Shaw Creek. Aug 28, 2019.



Photo 8. Looking east at the lake shoreline near Shaw Creek. Sep 17, 2019.



Photo 9. Looking west at the lake shoreline near Robertson Creek. Sep 3, 2019.



Photo 10. Looking west at the lake shoreline near Robertson Creek. Sep 17, 2019.



Photo 11. Looking south at the vegetated lake shoreline near Robertson Creek. Aug 28, 2019.



Photo 12. Looking south at the vegetated lake shoreline near Robertson Creek. Sep 17, 2019.



Photo 13. Looking north at the lake shoreline near Meade Creek. Aug 28, 2019.



Photo 14. Looking north at the lake shoreline near Meade Creek. Sep 10, 2019.



Photo 15. Looking west at the lake shoreline near Utility Creek. Sep 10, 2019.



Photo 16. Looking west at the lake shoreline near Utility Creek. Sep 17, 2019.



Photo 17. Looking west at the lake shoreline - mud flats and riparian vegetation near Miracle Creek. Aug 28, 2019.



Photo 18. Looking west at the lake shoreline - mud flats and riparian vegetation near Miracle Creek. Sep 17, 2019.



Photo 19. Looking east at the lake shoreline near Hawse Bay. Aug 28, 2019.



Photo 20. Looking east at the lake shoreline near Hawse Bay. Sep 17, 2019.



Photo 21. Looking southwest at the lake shoreline near Cottonwood Creek. Sep 17, 2019.



Photo 22. Looking west at the lake shoreline near Cottonwood Creek. Sep 17, 2019.



Photo 27. Looking east at the lake shoreline near Cottonwood Creek. Sep 17, 2019.



Photo 28. Looking south at the confluence of Cottonwood Creek and Cowichan Lake. Sep 17, 2019.



4 REPORT LIMITATIONS

This report was prepared exclusively for Catalyst Paper Corporation. The quality of information, conclusions and estimates contained herein is consistent with the level of effort expended and is based on: i) information available at the time of preparation; ii) data collected by EDI Environmental Consulting Inc. and/or supplied by outside sources; and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used only by Catalyst Paper Corporation. Any other use or reliance on this report by any third party is at that party's sole risk.