Meadow Creek Spawning Channel

(COL-F22-F-3504-DCA)

2021-22 (F22) Activity Report

1 April 2021 to 31 March 2022

Prepared for: Fish & Wildlife Compensation Program (FWCP)

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Executive Summary

The Meadow Creek Spawning channel was managed and delivered through Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Nelson with financial support from the Fish and Wildlife Compensation Program.

BC Hydro built the Meadow Creek spawning channel in 1967 to compensate for lost natural Kokanee habitat due to the construction of Duncan Dam. The facility provides spawning for a large proportion of Kootenay Lake Kokanee, which are the primary prey species for both Bull Trout and Gerrard Rainbow Trout.

All required operations were completed for Meadow Creek spawning channel in the 2021-22 fiscal including Kokanee fry counts in the spring, settling pond and gravel cleaning in the summer, and adult Kokanee counts and sampling in the fall. Water monitoring and control to reduce sediment and optimize incubation conditions continued throughout the year. A fish salvage was completed prior to drying the channel in August.

Spring fry production in 2021 was 11.9 million. This was all from naturally spawning adults returning from Kootenay Lake, since there were no supplementary eggs planted into the channel (sources outside Kootenay Lake) in fall 2020. The egg to fry survival rate was estimated at 82%, which is the highest for naturally-spawned eggs in the history of the channel. This high egg to fry survival is partly due to the installation of electric fencing in the Fall, which protects spawning Kokanee in the channel from bear predation.

The total fall return of adult Kokanee to Meadow Creek was estimated at 14,407 in 2021, which is the third lowest return on record. A total of 11,051 adults reached the spawning channel resulting in a potential channel egg deposition of only 2.2 million. Another 1.1 million eyed eggs from Tyee Lake were planted in 2021, giving a total of 3.3 M eggs in the channel. Male and female kokanee length averaged 35.1 cm and 33.2 cm respectively. Average fecundity was 501 eggs/female, which is a significant drop from the previous year of 817 eggs/female. Age of spawners was not available at the time of reporting, but based on the size distribution, it is expected that the majority of adults will be age-3.

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Introduction

Spawning habitat for kokanee was inundated following the construction of Duncan Dam and Meadow Creek Spawning Channel (MCSC) was built to provide alternate spawning habitat. MCSC has been operated by the Province since then, and operational tasks associated with the spawning channel are funded by BC Hydro through the Fish and Wildlife Compensation Program (FWCP). Facility maintenance such as gravel scarification and settling pond cleaning are required annually.

The spawning channel plays an important role in sustaining Kootenay Lake kokanee, especially since the severe population decline in 2013. Kokanee are the primary prey species for both bull trout and Gerrard rainbow trout, and also supported a recreational fishery when numbers were higher. Kokanee carcass decomposition benefits natural nutrient levels in the creeks and lake, in addition to providing seasonal forage for other aquatic, terrestrial and avian predators. MCSC is recognized for its wildlife viewing opportunities and has also operated as a provincial source of kokanee eggs for the Freshwater Fish Society of BC.

This project implements and maintains ongoing operations at the MCSC to support kokanee fry production for Kootenay Lake. Operations include spring fry enumeration, scarification of the channel during July and August and fall adult spawner enumeration. Water control occurs year-round to minimize sediment inputs and ensure adequate flows are managed for the various life stages of egg to fry. Facility maintenance is an important aspect of this project, and includes vegetation and road management, bridge refurbishing, rip rap replacement, hazardous tree removal and flood protection improvements. An on-site cabin is maintained as an office and accommodation for Ministry staff.

Major maintenance and upgrades are required periodically and can include building maintenance; channel modifications; gravel, weir, bridge refurbishing; rip rap replenishment; hazardous tree removal and flood protection improvements.

Goals and Objectives and Linkage of FWCP Action Plans and specific action:

The work of Meadow Creek Spawning Channel project is focused on producing a targeted number of Kokanee fry that supplements fry production from the Lardeau River and smaller tributaries to maintain the abundance of Kokanee in Kootenay Lake. Kokanee are the primary forage species for Bull Trout and piscivorous Rainbow Trout. The project falls within Habitat Based actions in the Reservoirs and Large Lakes Action Plan; COLRLL.ECO.HB.09.01 Operation of Meadow Creek and Hill Creek Spawning Channels-P1.

Work activities completed 2021:

- Fry enumeration – April to June
- Scarification of the gravel in the spawning channel – July and August
- Fry salvage prior to drying – August
- Water flow maintenance – year round
- Installation of electric fencing to protect spawners - August
- Kokanee spawner enumeration – August and September
- Maintenance of grounds and facility – annual as needed
- Bear safety and management – August – November

Study Area

Meadow Creek Spawning channel is located at the north end of Kootenay Lake (Fig. 1).

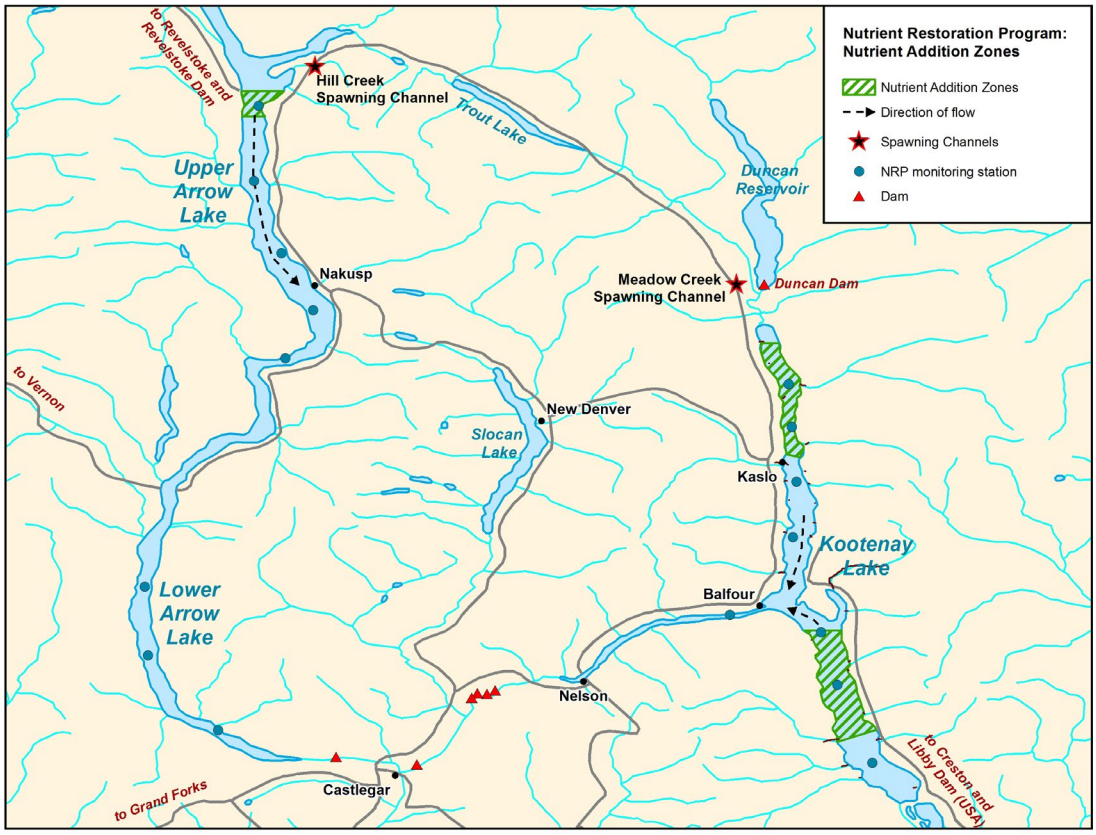

Figure 1. Map of location of Meadow Creek Spawning Channel.

Methods

Spring fry outmigration was monitored at the enumeration fence over 38 nights of sampling between April 6 and June 14, 2021. Mechanical gravel scarification and drying of the of the spawning channel occurred in July 2021. A fish salvage operation was completed on August 5 just prior to the drying period of the channel. Crews captured and transferred 67 Bull Trout juveniles, 35 Rainbow Trout juveniles and two sculpins to the creek. A concrete barrier (combined with metal screening) was built into the channel again to isolate a section for eyed egg stocking, and contain spawners within the portion of channel protected by electric fencing. The barrier is disassembled prior to gravel scarification and re-assembled prior to kokanee spawner timing. With the anticipation of low numbers of kokanee spawners, an electric fence was installed in 2021 prior to the escapement timing to provide protection them from bear predation in the channel. Note that bears have access to kokanee in the natural creek downstream. (Fig. 2)

Figure 2. Aerial view of Meadow Creek Spawning Channel showing location of the fish barrier in 2021. Water flow proceeds from the settling pond at the top of the photo towards the bottom. The spawning channel downstream of the barrier was surrounded with electric fencing to protect the low escapement of adult Kokanee from bear predation in the channel. The approximate start and end of buried eyed eggs is marked upstream of the barrier as well as the proposed location for a counting fence for fry from the eyed eggs. (Figure by A. Bendis, pers. comm.)

Kokanee spawners were counted through the downstream enumeration fence between August 21 and September 22, 2021. Weekend monitors for the month of September continued to be available during the visitor opening hours of 1000 to 1400 to answer questions from the public. To reduce sampling impact for the small return of adults, only 11 fish were killed for fecundity sampling. The number of eggs in relation to length was highly variable but clustered around the long term length-egg curve. Therefore the average fecundity for the year was based on the 11 sampled fish and the length-estimated eggs for all remaining length-sampled females.

Standard fish health testing of kokanee spawners at Meadow Creek in 2021 was done by the Freshwater Fisheries Society of BC.

Water level monitoring occurred all year at the channel ensuring flows are adequate to optimize egg incubation, to prevent channel bank erosion, reduce stop log scouring, to minimize sediment transport and deposition into spawning gravel and maintain channel habitat for other fish species and aquatic life.

Results

Fry Production in the spring of 2021 was estimated at 11.94 million for the spawning channel , and 12.11 million total for Meadow Creek assuming 5% egg-fry survival below the channel (Fig. 3). Egg to fry survival of wild eggs in the channel was estimated at 82%, which is the highest on record for naturally-spawned eggs within the channel.

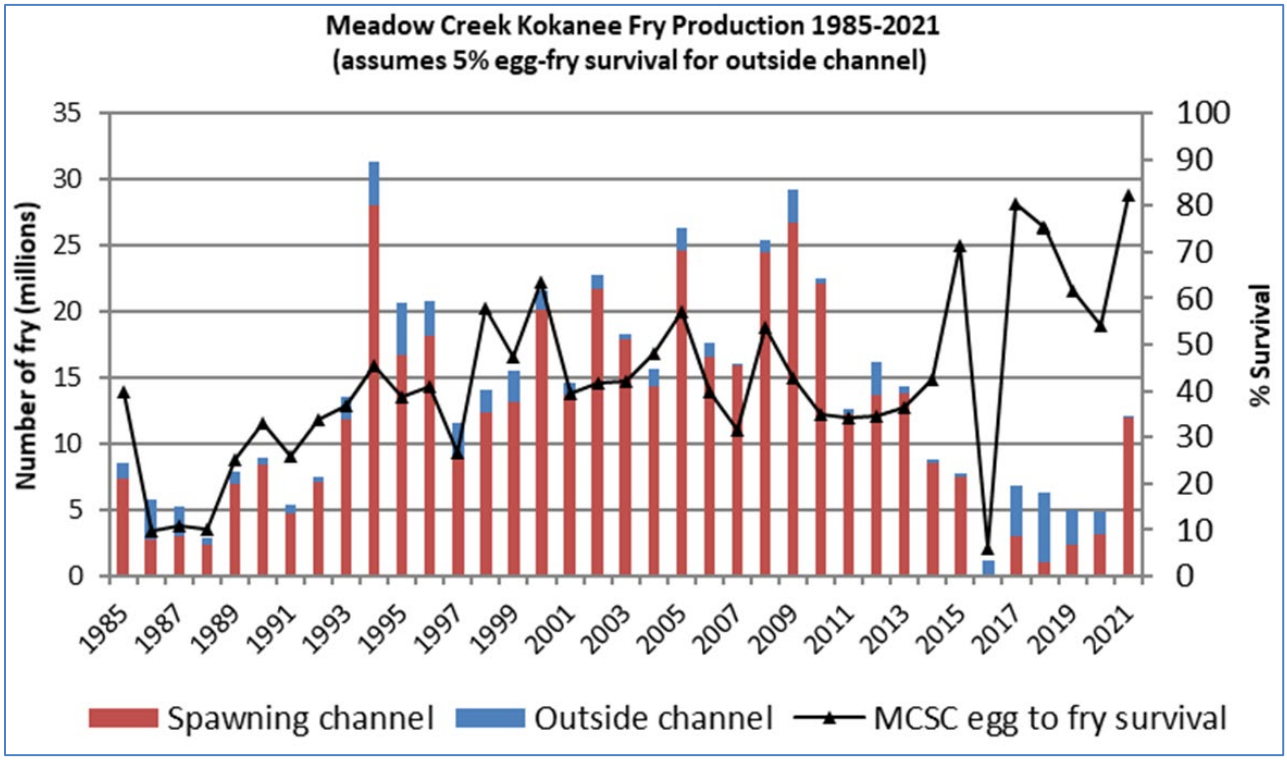

Figure 3. Meadow Creek Kokanee fry production, 1985 – 2021.

The Meadow Creek Kokanee run in Fall 2021 was estimated at 14,407 adults (Fig. 4), of which 11,051 came into the channel and 3,356 spawned downstream of the channel. Potential egg deposition from natural spawning was estimated at 2.22 million in the channel, and 2.90 million total including below the channel in Meadow Creek (Fig.4). In late October, an additional 1.12 million eyed eggs collected at Tyee Lake were provided by the Freshwater Fisheries Society and planted into artificial redds upstream of the natural spawning.

Of the 36 adult carcasses sent for testing, all tested positive for Infectious Hematopoietic Necrosis (IHNv) (S. Mead, Fish Health Unit Manager, Freshwater Fisheries Society of BC, pers. comm.).

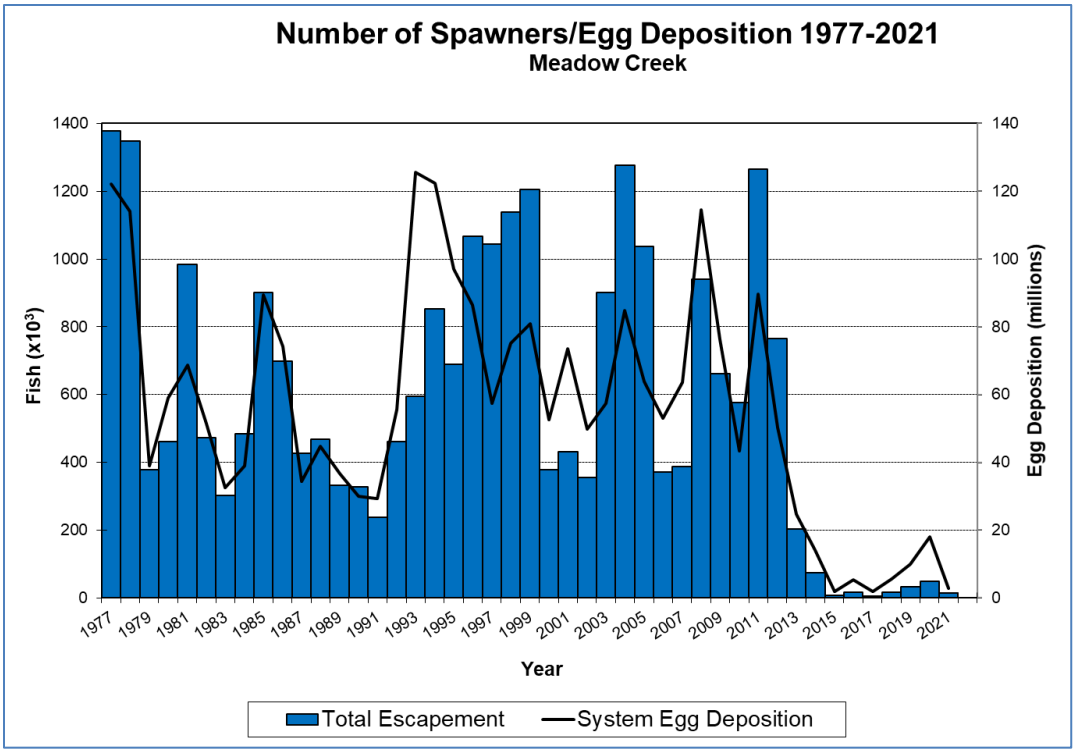

Figure 4. Kokanee spawner number (escapement) and estimated egg deposition in Meadow Creek spawning channel, 1977 – 2021.

Average size of the spawners (35.1 and 33.2 for males and females respectively) has been decreasing for last 5 years, and fecundity (501 egg per female) dropped by about 35% compared to 817 eggs/female in 2020 (Fig. 5).

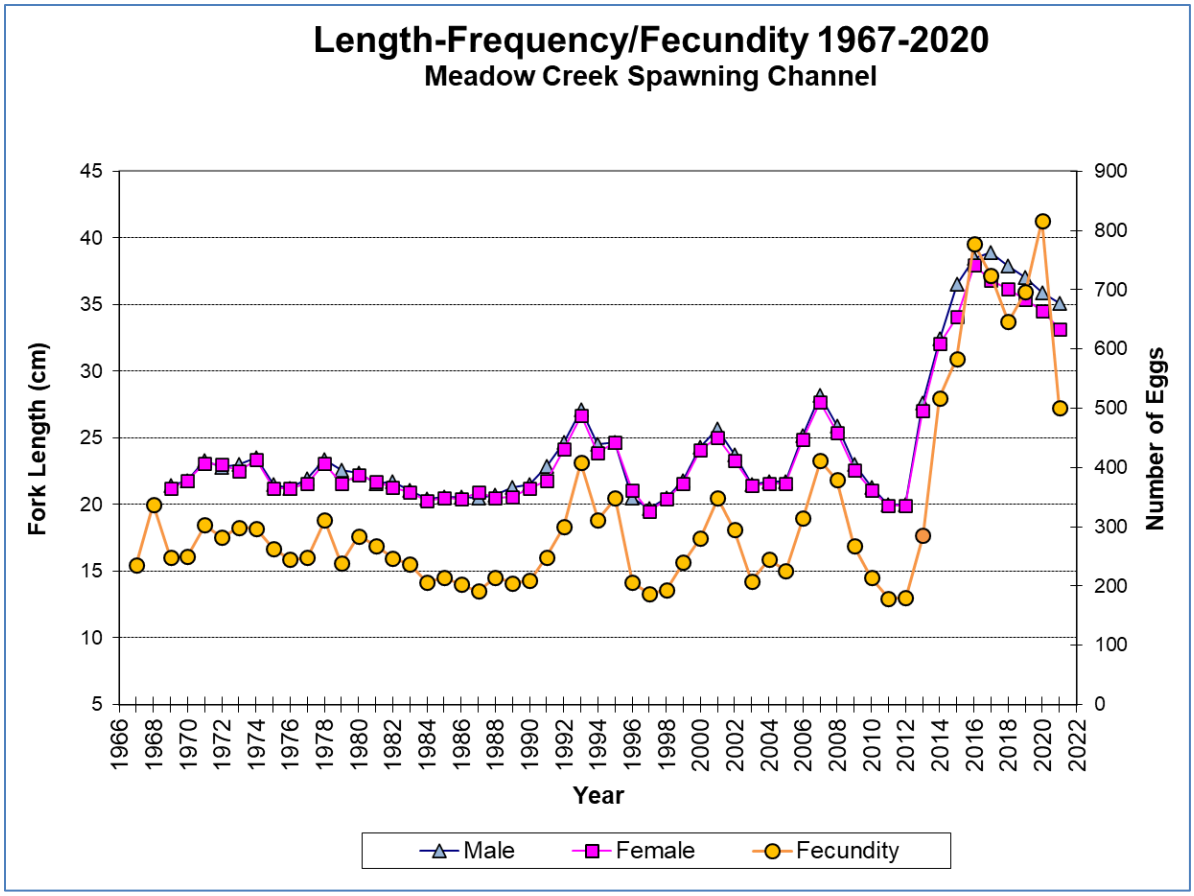

Figure 5. Average fork length for males and females, and average number of eggs (fecundity) for Kokanee spawning in Meadow Creek spawning channel, 1967 - 2021.

Discussion and recommendations

Spring kokanee egg to fry survival in the channel was very high in 2021 indicating that flow and sediment conditions were ideal during the incubation period from Fall 2020 to Spring 2021. Spawner returns in 2021 were very low, however, this was not unexpected given the hydroacoustic estimates for the previous fall.

The deposition of only 2.2 million eggs in 2021 remains well below the levels prior to 2012, and low spawner returns continue to limit fry production under the current Kootenay Lake population status. Hydroacoustic estimates suggest that 2022 will provide a stronger return of spawners than 2021 (≈60,000, T. Weir, pers. comm.) and this should lead to a better egg deposition next Fall.

The requirements to protect the lower number of spawners from bear predation requires daily checks to ensure the electric fencing is in place and working properly. Although labour-intensive, this is essential for maintaining high egg to fry survival in the channel. Electric fencing should be continued until spawner returns increase as is outlined in the Kootenay Lake Action Plan. As many spawners as possible should be admitted into the channel in the fall of 2022 to provide protection from bears and enhanced egg survival to assist in recovery efforts.

Acknowledgements

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References

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Kootenay Lake Action Plan
http://www.env.gov.bc.ca/kootenay/fsh/main/pdf/KLAP%20Kootenay%20Lake%20Action%20PLan%20final%209_May_2016.pdf