Hill Creek Spawning Channel

(COL-F20-F-3008-DCA)

2019-20 (F20) Activity Report

1 April 2019 to 31 March 2020

Prepared for: Fish & Wildlife Compensation Program

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Prepared by: Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Resource Management (FWCP – Section)

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Executive Summary

All required operations were completed for Hill Creek spawning channel in the 2019-20 fiscal including Kokanee fry counts and Rainbow Trout redd counts in the spring, settling pond and gravel cleaning in the summer, and adult Kokanee counts and sampling in the fall. Winter monitoring and ice removal ensured adequate flows during incubation. Water monitoring and control to reduce sediment and optimize incubation conditions continued throughout the year. Fry production in 2019 was 3.26 million with an egg to fry survival of 58%. Rainbow Trout redd counts totaled 114 of which 30 were classed as "large" piscivore redds. The total fall return of adult Kokanee to Hill Creek was 130,000, with 63,030 adults admitted into the spawning channel for a potential egg deposition of 6.3 million. The average size of Kokanee (22 cm) was small leading to a low fecundity (<250 eggs/female). The majority of spawning fish were age-3 (80%) with the remainder mostly age-2. The channel was also used by the Freshwater Fisheries Society of BC for an egg collection station (45,206 adults), and 5000 adults from Hill Creek were given to Okanagan Nation Alliance.

Table of Contents

Introduction

The Hill Creek Spawning Channel project is ongoing since the early 1980's as compensation for lost kokanee and rainbow trout spawning habitat above Revelstoke Dam. It helps sustain Arrow Reservoir kokanee abundance, which provides a forage base for bull trout and larger rainbow trout. Healthy fish stocks provide angling opportunities and economic benefits. In recent years, the channel has also been a source of Kokanee eggs collected by the Freshwater Fish Society of BC for stocking into Kootenay Lake.

Hill Creek Spawning Channel provides a targeted number of kokanee fry to Arrow Lakes Reservoir that supplements the natural production from other spawning tributaries in Upper and Lower Arrow. Kokanee are the main forage species for Bull Trout and piscivorous Rainbow Trout. Hill Creek provides spawning and rearing habitat for a piscivorous ecotype of Rainbow Trout.

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

The work of Hill Creek Spawning Channel project is focused on producing a targeted number of Kokanee fry that supplements fry production other tributaries in Upper and Lower Arrow tributaries to maintain the abundance of Kokanee in Arrow Lakes Reserovir. 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 2019:

- Fry enumeration – April to June
- Rainbow Trout Redd surveys – May and June
- Scarification of the gravel in the spawning channel – July and August
- Water flow maintenance – annual
- Kokanee spawner enumeration – August and September
- Maintenance of grounds and facility – annual

Study Area

Hill Creek Spawning channel is located at the north end of Upper Arrow Lakes Reservoir

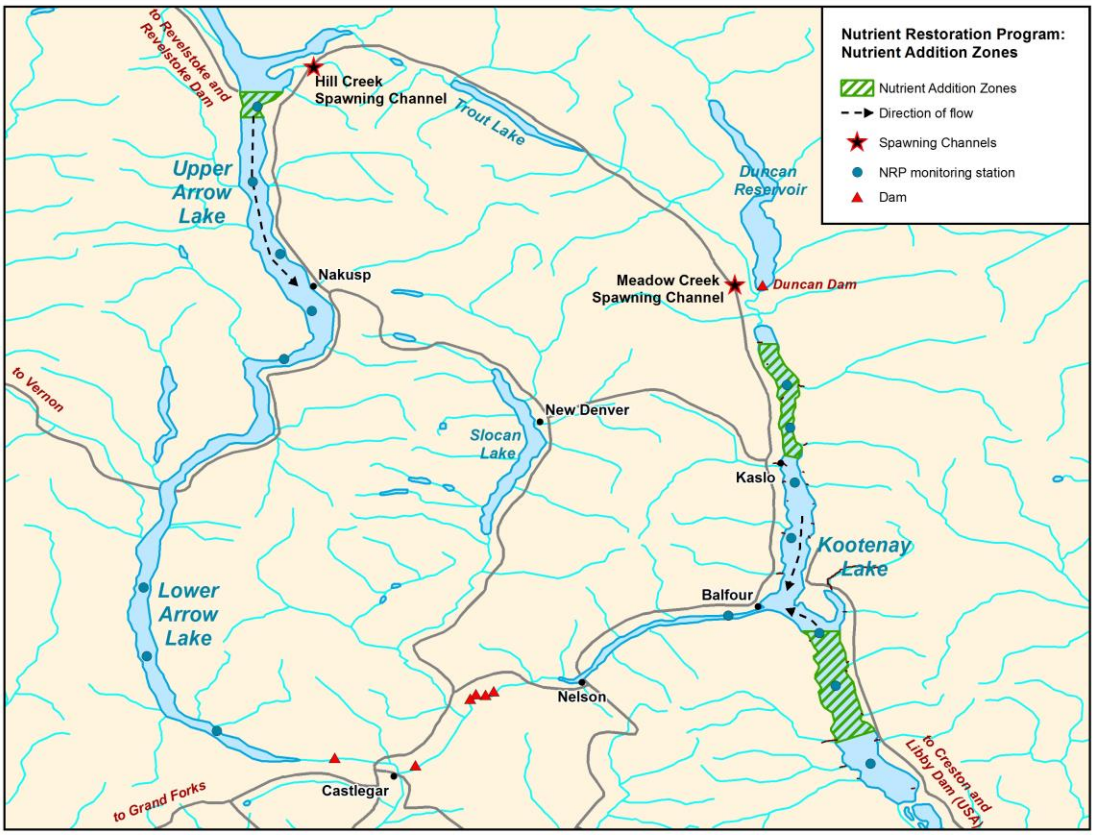

Figure 1. Map of location of Hill Creek Spawning Channel.

Methods

Kokanee fry enumeration occured at night from 2100 to 0200 for varying periods of time. Three nets are used to collect fry across the width of the channel at a specific fence location. Fry collections occurred from April 27th through June 16th 2019.

Rainbow trout redds were visually counted by walking through the channel once a week from May 23rd to June 22nd, 2019 noting distribution and redd size.

Gravel scarification of the channel began on July 29th, 2019 and was completed by August 12th 2019. Turbidity measurements were taken and recorded during the scarification process. The machines used to conduct the scarification took a ten minute break every hour to allow a reduction of turbidity to occur.

Kokanee spawners were counted through an enumeration fence and the first date of counted spawners occurred on August 30th 2019. Fish were counted for two hour periods and sex-ratio sampling of one hundred kokanee was conducted prior to each counting period. Sampling for length, weight, fecundity and otolith extraction also occurred. When the egg target of 75% was met, the Freshwater Fisheries Society of BC (FFSBC) conducted a kokanee egg take on September 10th. The FFSBC also let kokanee into

the channel to ensure the channel kokanee egg target was met. The egg take by the FFSBC was completed on September 21st. The Okanagan Nation Alliance (ONA) collected 5,000 kokanee on September 10th 2019 for ceremonial purposes. On September 26th, 2019 the fence was removed as no fish were present.

Kokanee spawner enumeration in Hill Creek (downstream of the channel) occurred on September 22nd;2019; the survey could not be completed earlier due to water levels being too high to count safely.

Water level monitoring occurs all year at the channel – this is to ensure 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 Spring 2019 was estimated at 3.26 million for the spawning channel, and 3.40 million for Hill Creek in total assuming 5% egg-fry survival below the channel. The egg to fry survival was 58% (Fig. 2).

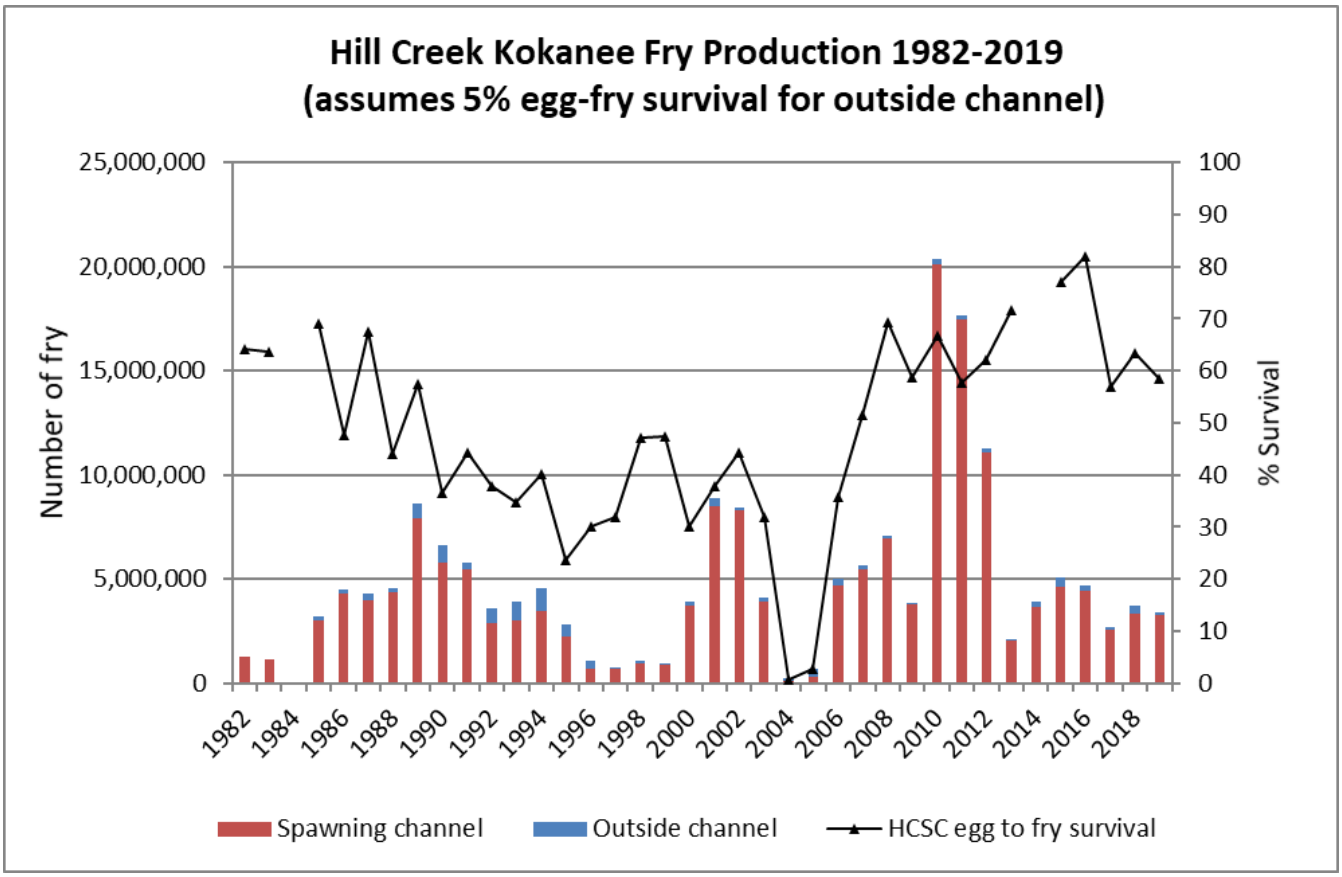

Figure. 2. Kokanee fry production from Hill Creek and egg to fry survival in the spawning channel from 1982 to 2019.

Rainbow Trout spawning in the channel took place from May 23rd to June 6th , 2019 and a total of 114 redds were counted over that period, of which 30 were large (piscivore) redds > 2 m^2 (Fig. 3).

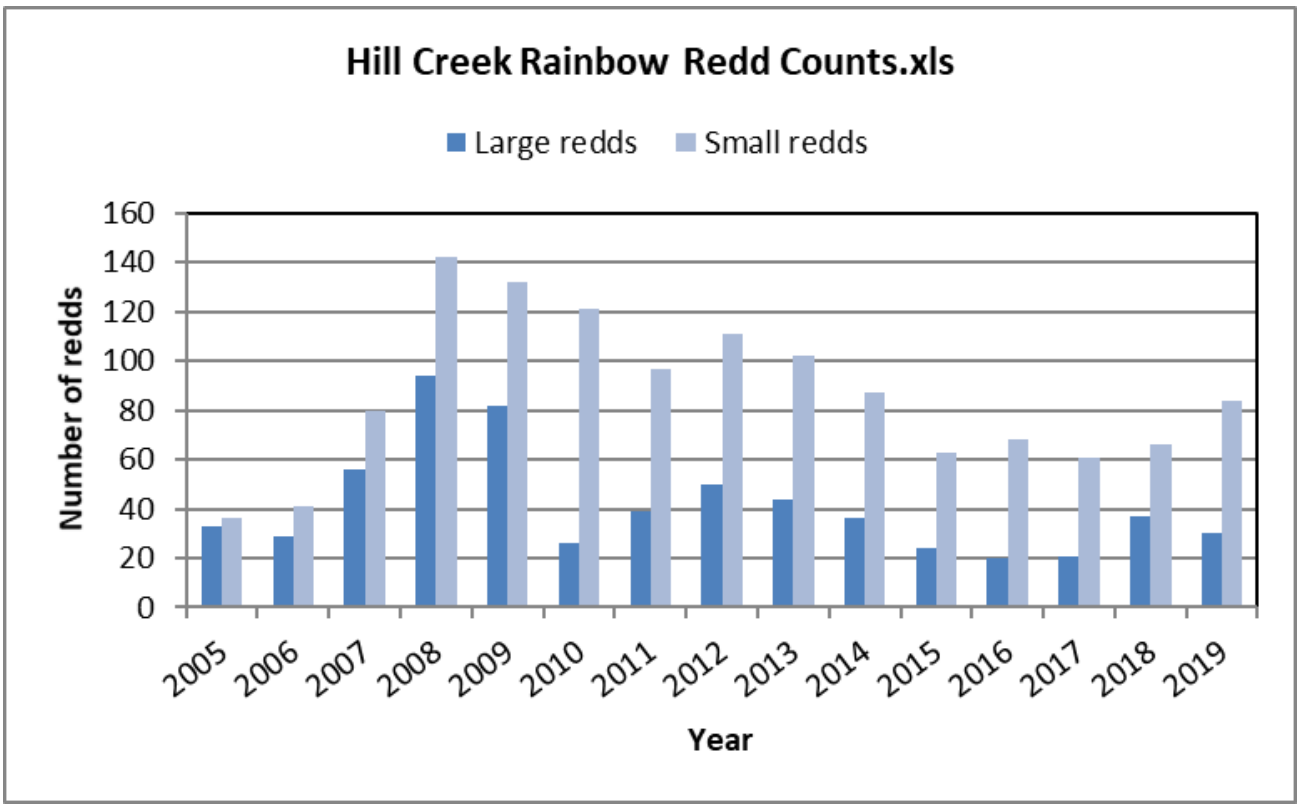

Figure 3. Number of Rainbow Trout redds counted in Hill Creek spawning channel since 2005. Large redds are > 2 m^2 and are used as an index of the piscivorous ecotype.

The adult Kokanee spawner escapement in the fall of 2019 was estimated at 129,766. The following is the breakdown of the numbers (Fig. 4).

- 63,030 were admitted to the channel (seventh year where the number of kokanee allowed in the channel was capped) (potential egg deposition was 6.3 million),
- 16,530 spawned downstream of the channel,
- 45,206 were used for egg collections (FFSBC)
- and 5,000 were provided to First Nations.

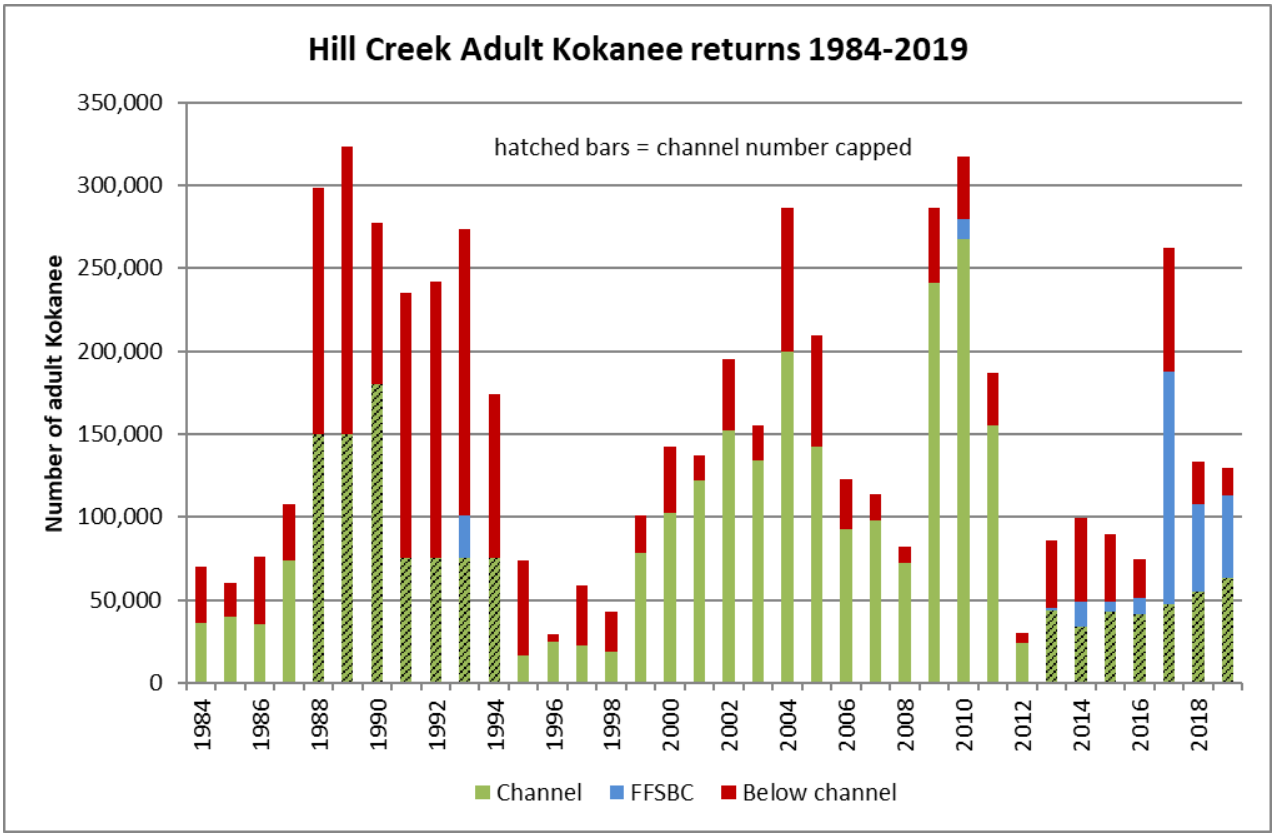

Figure 4. Number of adult Kokanee returning to Hill Creek and their location of spawning (in the channel, downstream of the channel, or used by the Freshwater Fisheries Society BC for egg collections).

The average size of kokanee spawners in 2019 remained small at just over 22 cm in length with an average fecundity of 242 eggs (Fig. 5).

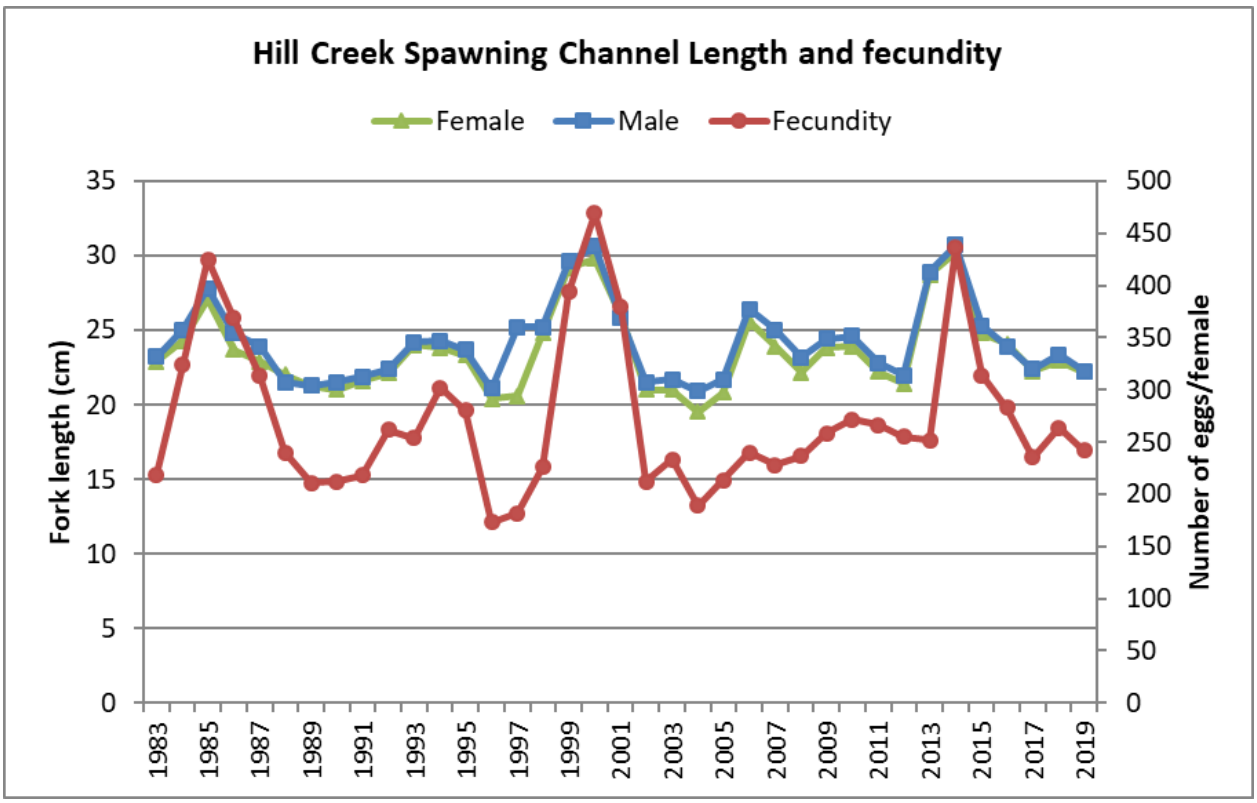

Figure 5. Average fork length for male and female Kokanee, and average number of eggs (fecundity) in Hill Creek 1983 – 2019.

Discussion and recommendations

Kokanee Egg to fry survival in the channel has exceeded 50% since 2006. The fry production target has been maintained (± 30%) since the spring of 2014. FFSBC egg collections and holding pens for kokanee require logistical adjustments for the spawner run. Draft Arrow fisheries management objectives completed by FLNRORD Resource Management (currently under review by First Nations) recommend maintaining a fry target of 3.8 million for next year. Future kokanee fry targets should be reviewed/modified as part of an adaptive management strategy to better understand interactions of kokanee between the spawning channel and other populations of kokanee in Arrow Lakes Reservoir.

Acknowledgements

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References

Barney, Brian. 2020. Hill Creek Spawning Channel Operations and Monitoring Fiscal Year 2019/20 Annual Summary of Work Report. Prepared by Kingfisher Silviculture Ltd. for BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development.