Mill Stream PIT Tagging Program Summary Report

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Background

The Mill Stream Watershed drains a 26 km^2 area from the Gowland Range in the Highlands, through Langford, and eventually drains into Esquimalt Harbour. Mill Stream itself is 12.5 km and is a unique system within the CRD as it is high gradient (average of 3% gradient) and contains many falls and cascades throughout the stream.

Mill Stream provides important habitat for resident and searun Coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) as well as both coho salmon (*Oncorhynchus kisutch*) and rainbow trout (*Oncorhynchus mykiss)*, though both have been historically introduced to the system from hatcheries. The first juvenile Coho salmon were introduced to the creek in the spring of 1993. They returned in 1995 and were physically brought past barriers to spawning locations (P. McCully, personal communication, February 9, 2024). Since 1993, approximately 5000 coho are released each year from Goldstream Hatchery.

Starting in 1998, the Goldstream Volunteer Salmonid Enhancement Association (GVSEA) constructed five small fishways (Figure 1) through barrier falls in the lower section of the watershed, which enabled fish to access over 3 km of habitat. In 2020-2021, Peninsula Streams and Shorelines (PSS) led and coordinated the construction of a large fishway at the Atkins Rd. culvert in Mill Hill Park in partnership with CRD Regional Parks. This fishway facilitated natural fish migration and gave spawning Cutthroat and Coho Salmon access to 7km of additional habitat in Mill Stream.

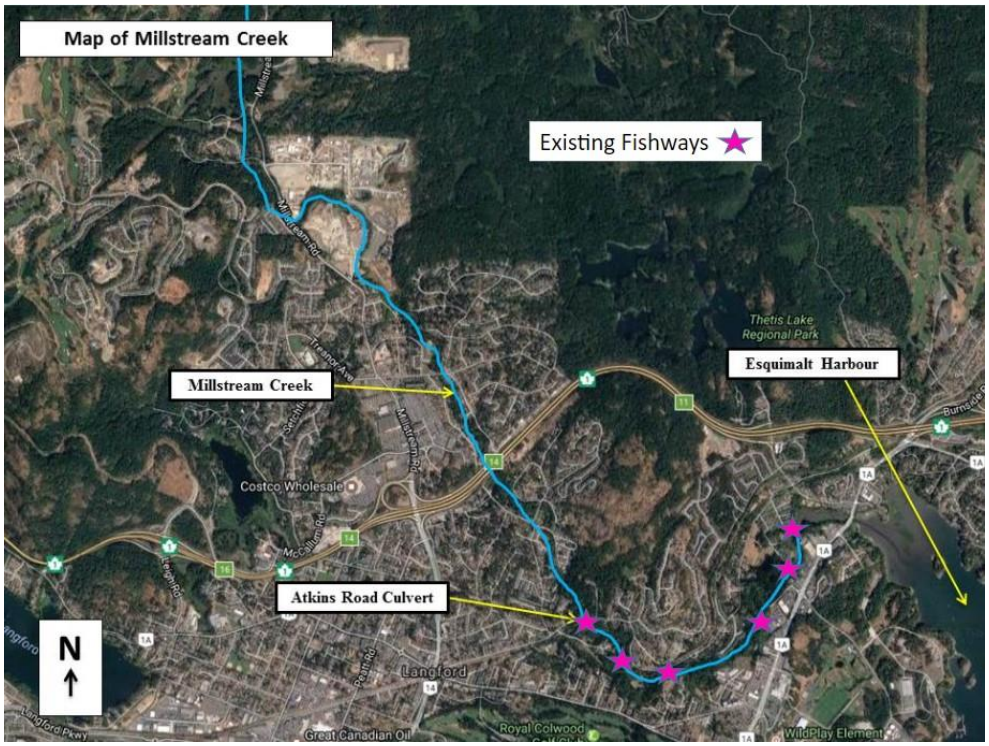

Figure 1: Location of constructed fish ladders allowing fish to access upstream habitat.

Additionally, PSS has conducted instream restoration in Mill Stream with support from Langford Parks and the Friends of Millstream Watershed, a local community stewardship group. A 50 m section of Mill Stream in Cedar Vale Park was restored in August 2023, where a riffle was constructed, as well as the riparian enhancement and additions of much needed spawning gravel, habitat boulders and large woody debris. More restoration work is currently being planned for the area.

There is currently a camera located in the first fish ladder nearest to the stream's outlet and is monitored by Goldstream Hatchery volunteers during the fall spawning season. This data has provided us with fish counts since 2014 (Figure 2). With increasing restoration work being done in the watershed as well as the recent construction of the newest fish ladder at Atkins Rd, our primary research questions are:

1) Are coho salmon able to access and utilize the restored habitats in the higher reaches of the system (above Ladder 6 at Atkins Rd)?

2) What is the migration timing of coho within this unique system where coho have been historically introduced?

3) What are the survival rates of the released hatchery fish , and what is the best time of year for release to maximize returns/minimize straying?

Figure 2: Coho salmon counts from 2014-2023. Data is taken by volunteers from camera footage at the first fish ladder in Mill Stream.

PIT Tagging Program

To answer the questions mentioned above, a PIT tagging program was started in Mill Stream in 2022 with collaboration with BC Conservation Foundation (BCCF) and Goldstream Hatchery. In early March 2022, 2000 coho fry were PIT tagged and released into two locations in the upper reaches of Mill Stream. A temporary antenna array was installed just upstream of the Atkins Rd fishway and remained in place March - May 2022. The data downloaded from the array showed a total of 729

fish had passes over Ladder 6, and interestingly, most tagged fish that passed through the ladder came from the upper release location (see Figure 3 for results). It is unclear why the first release site yielded better survival.

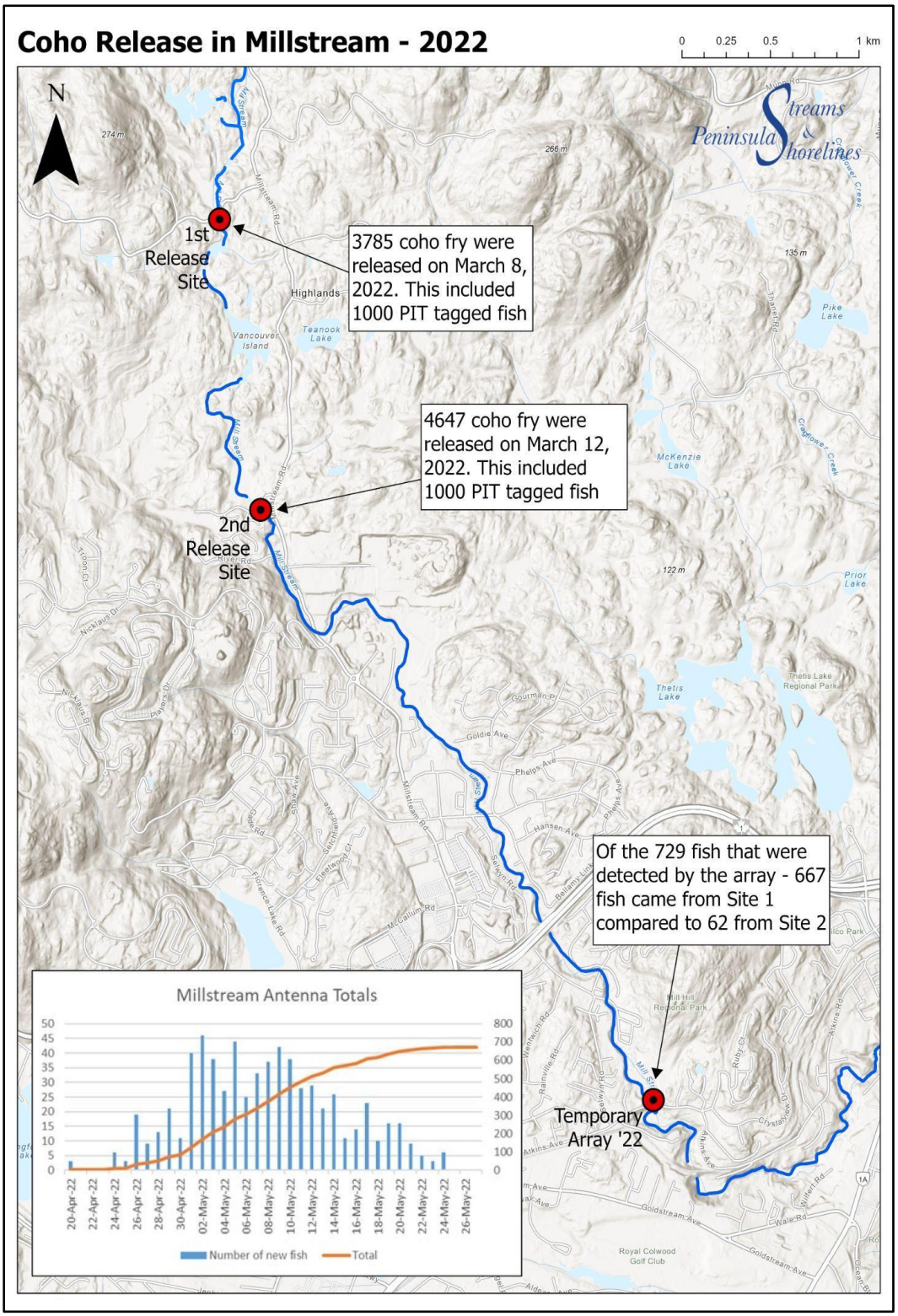

Figure 3: PIT tagging results from 2022. 2000 coho fry were tagged and released into 2 separate locations in the upper reaches.

In 2023, a permanent array was installed in Mill Stream just upstream of Ladder 2 (see Figure 4). The array consisted of a single 20' HDPE antenna and IS1001 board from BioMark. An additional 2000 tagged fish were released March 2, 2023 at the upper location from 2022 (Release Site 1).

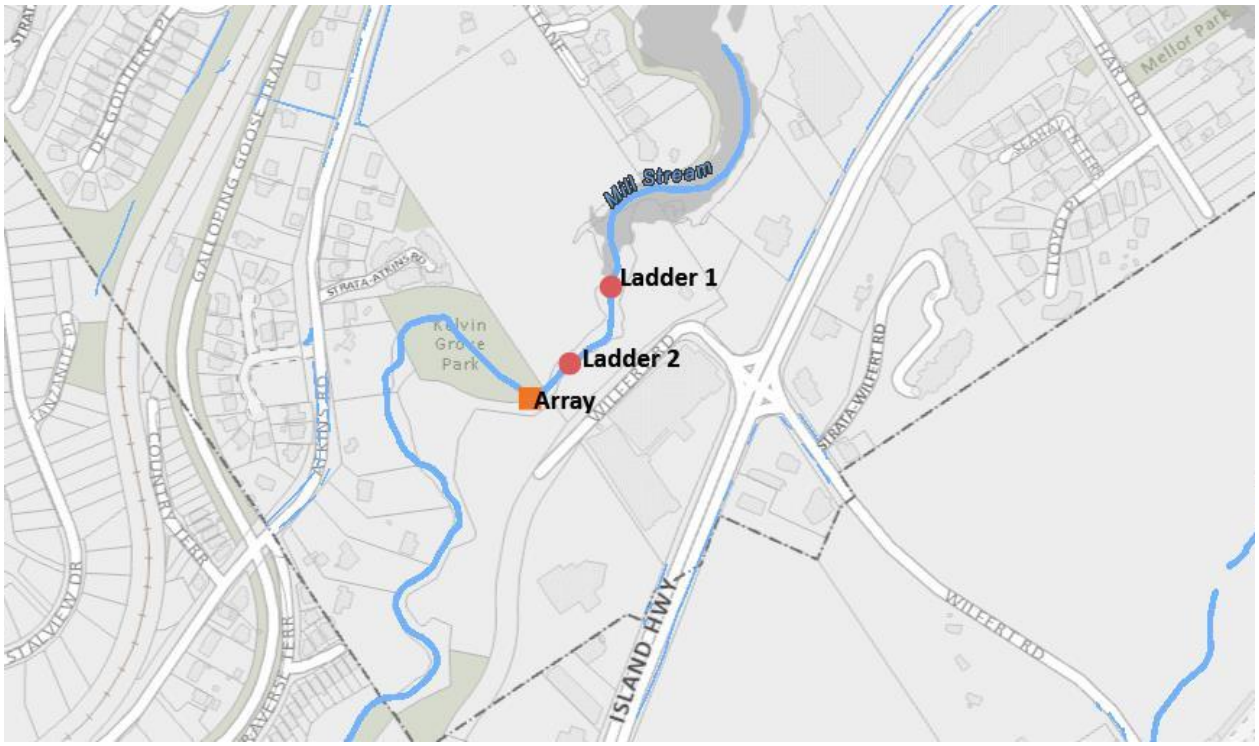

Figure 4: Location of the array in relation to Ladder 1 and 2 near the outlet of Mill Stream into Esquimalt Harbour.

Due to production and shipping delays, the array was only installed on May 24, 2023, which unfortunately resulted in most of the outmigrating fish being missed in the data. Figure 5 shows the results for the Spring outmigration data that was recorded by the array. A total of 105 coho were seen going over the array.

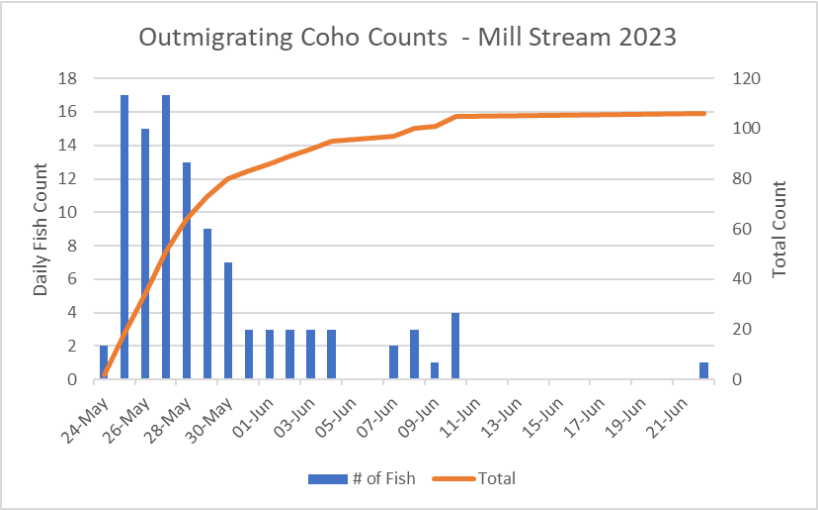

Figure 5: Daily and cumulative count of tagged coho in 2023. The final tally was 105 coho.

Results

The overall 2023 salmon returns for the system were poor, as was the case for most Southern Vancouver Island due to extended fall droughts and low flow conditions. The total number of coho coming up through the camera was counted at 90, and unfortunately no tagged fish was recorded going over the array. An additional 2000 tagged fish were released into the system in early December 2023.

Next Steps

With the installation of the permanent array and continued release of tagged fish into the Mill Stream Watershed, we will now be able to start working towards answering our questions as more data is gathered. The following are recommended next steps for this project:

1. Continue to release tagged fish - we need as many tagged coho to improve our chances of seeing fish return in the fall spawning season.
2. Try releasing fish at different locations in the upper watershed as well as different times of the year - we want to maximize the likelihood of survival for the fish to outmigrate and reduce the risk of straying between systems.
3. Install an array at the top of Ladder 6 to determine if coho are utilizing the newly constructed ladder.
4. Continue restoration to improve overall habitat quality.

References

Peter McCully, former Goldstream Hatchery Manager (personal communication, February 9, 2024)