

## Site Assessment of Lillooet River for Use of Imaging Sonar to Estimate Coho Salmon Escapement



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14 January, 2019

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## Acknowledgements

Thanks to Maxine Bruce, Lil'wat Nation fisheries and environmental monitoring manager, for her help planning and coordinating this study, and Fred Wells and Oliver James (OJ), Lil'wat Nation fisheries technicians, for their guidance and assistance in the field. Further thanks to the Pacific Salmon Commission Southern Fund for funding this project in 2018.

## Introduction

The absence of reliable escapement estimates for Coho salmon in the Lower Fraser River Management Unit (LFRMU) and its three component Conservation Units (Lillooet, Boundary Bay and Lower Fraser) represents a critical information gap for Southern Boundary Coho salmon management.

Funding from the Pacific Salmon Commission (PSC) in 2017 enabled the development of a simulation-estimation procedure which found that an index-style approach is the best method for aggregate escapement estimation for the LFRMU (LGL, 2017). However, due to the poor data and its limited time series, appropriate factors for in-filling cannot be estimated, thus a focused, long-term and dedicated strategy is required.

From our work in 2017, we found that Coho salmon escapement to the Lillooet CU is more variable than either the Lower Fraser CU or the Boundary Bay CU, and is thus more difficult to estimate through traditional stream survey assessments. The high underlying variability in abundance, coupled with the fact that Coho salmon returning to the Lillooet CU must transit through the Lower Lillooet River, provide the unique potential for a census-style assessment for the entire CU. A census method would negate the need to determine in-filling factors, would provide a consistent and repeatable escapement estimation methodology, and would not require additional effort to account for the CUs natural variability. Imaging sonar would be the most applicable census method for the purpose of estimating Coho salmon escapement to the Lillooet CU.

Funding from the PSC was secured in 2018 to conduct a site assessment of potential locations for establishing a sonar count station for estimating Coho salmon in the Lower Lillooet River. The overall goal of the study was pursuant to improving management of Southern Boundary Coho salmon, and better enabling the implementation of both the Wild Salmon Policy and the Pacific Salmon Treaty through improved stock assessment.

## Objective

The objective of this study was to survey the Lower Lillooet River and identify any sites that may be suitable for estimating Coho salmon escapement using imaging sonar.

## Methods

Potential sonar sites in the Lower Lillooet River were visually examined to characterize their suitability based on access and physical features, including wetted width, channel shape and confinement, presence/absence of obstructions within the sampling area, and presence/absence of turbulence that may confound the ability to collect high resolution imagery of up-migrating Coho salmon.

## Site Assessment

On 8 August 2018, biologists from LGL and Johnson Fisheries Science worked with fisheries technicians from the Lil'wat First Nation to conduct the site assessment survey of the Lower Lillooet River. The survey was conducted by accessing the river via the Forest Service roads that run north and south along both sides of the river (we initially drove south along the east side and then north along the west side of the river). A total of nine sites were assessed throughout the Lower Lillooet (Figure 1; Table 1).



Figure 1. Image from Google Earth showing the locations of each site surveyed on the Lower Lillooet River on 8 August 2018.

Table 1. GPS coordinates for each site assessed on the Lower Lillooet River on 8 August 2018.

Site Number	Road (km)	Latitude	Longitude
1	In-Shuck-ch Forest Service Rd (72)	49°47'20.20" N	122°13'22.70" W
2	In-Shuck-ch Forest Service Rd (72.2)	49°47'05.97" N	122°13'26.90" W
3	In-Shuck-ch Forest Service Rd (74.5)	49°46'16.59" N	122°13'12.80" W
4	In-Shuck-ch Forest Service Rd (80)	49°44'42.85" N	122°10'1.47" W
5	West Lillooet Lake Rd (60)	49°54'39.30" N	122°19'41.56" W
6	West Lillooet Lake Rd (48)	49°57'20.43" N	122°25'29.09" W
<b>7</b>	<b>West Lillooet Lake Rd (44)</b>	<b>49°59'19.14" N</b>	<b>122°27'29.24" W</b>
8	West Lillooet Lake Rd (43.7)	49°59'26.44" N	122°27'41.80" W
9	West Lillooet Lake Rd (40)	50°00'06.13" N	122°29'19.91" W

Many of the surveyed sites were too wide (> 50 m) for sampling with a single sonar unit and/or were too difficult to access given the elevation difference between the road and the river (see Appendix A for photographs and notes for each individual site surveyed).

Located near the mouth of Rogers Creek (Figure 2), site 7 stood out as a suitable location for use of imaging sonar to estimate the number of Coho salmon migrating up the Lillooet River and provide a census-style assessment of the entire Lillooet CU. This site features a relatively narrow wetted width

(approximately 50 m), absence of rapids or highly turbulent areas, absence of large boulders that would obstruct the ability to image across the river, ease of access from West Lillooet Lake Road, and presence of a community gathering structure that may be used to house electronic equipment and on-site technicians.



*Figure 2. Image from Zoom Earth of the Lillooet River at Rogers Creek showing a potentially suitable location for using imaging sonar to estimate the number of Coho salmon migrants.*

## Recommendations

Given that a suitable location for setting up an imaging sonar station to assess Coho salmon escapement on the Lillooet River has been identified we present the following recommendations towards refining the quality of Coho salmon escapement data that will lead to improved ability to assess stock status, plan and manage fisheries, and better implement the Southern Coho Management Plan.

- Setup a monitoring station at the Rogers Creek site using an ARIS 1200 system to assess Coho salmon migration up the Lillooet River;
- Monitor Coho salmon migration throughout a five to six week time frame that encompasses the typical peak period of Coho salmon movement up the Lillooet River; and
- Use sonar counts from the monitoring period to develop best estimates to characterize Coho salmon escapement on the Lillooet River.

## References

LGL 2017. Enumeration Strategy for assessing abundance of Coho Salmon within the Lower Fraser River Management Unit. Prepared for the PSC, 2017.

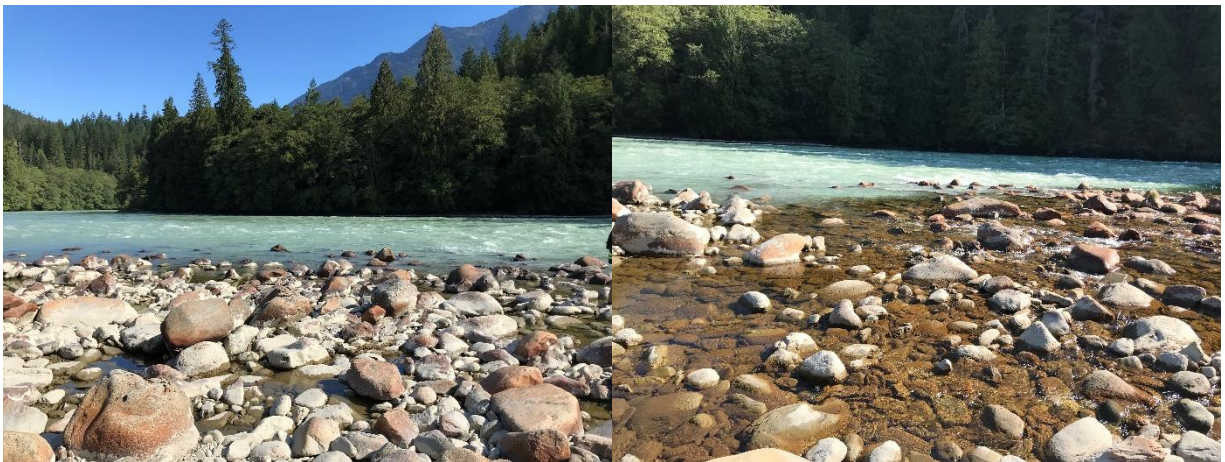
## Appendix A. Photographs and Descriptions of Surveyed Sites

### Site 1



- Upper bridge crossing on In-Shuck-ch Forest Service Rd at km 72
- Access from bridge to river difficult and dangerous
- Flows were high and turbulent
- Width of 35 m estimated from Google Earth imagery
- Site deemed unsuitable

## Site 2



- Mouth of Fire Creek
- Easy access along dirt path near abandoned house on In-Shuck-ch Forest Service Rd at km 72.2
- Flows were high and turbulent, with abundant rapids
- Large cobble and boulder fan along creek mouth
- Width of 90 m estimated from Google Earth imagery
- Site deemed unsuitable

### Site 3



- Km 74 on In-Shuck-ch Forest Service Rd
- Access extremely difficult with river much lower in elevation than road
- Flows were not turbulent, with no rapids
- Width of 55 m estimated from Google Earth imagery
- Site deemed unsuitable

## Site 4



- Near old airstrip south of community of Tipella
- Side channel of mainstem Lillooet River
- Gravel lot access from In-Shuck-ch Forest Service Rd at km 80
- Flows were not turbulent, with no rapids
- Width of 41 m estimated with range finder, width of 35 m estimated from Google Earth imagery
- Site deemed suitable but inferior given it is a side channel

## Site 5



- Km 60 on West Lillooet Lake Rd
- Easy access down short path from road
- Just below series of islands; gravel/cobble bar 20 m from west bank
- Flows with light turbulence, no rapids
- Width of 100 m estimated from Google Earth imagery
- Site deemed potentially suitable at low water when channel is assumed to be substantially more constricted

## Site 6



- Km 48 on West Lillooet Lake Rd
- Easy access down short dirt road to campsite on river's edge
- Flows with light turbulence, no rapids
- Width > 100 m estimated with range finder, width of 90 m estimated from Google Earth imagery
- Site deemed unsuitable due to great width

## Site 7



- Just below Rogers Creek
- Site assessed from km 44 on West Lillooet Lake Rd
- Easy access to site from Lillooet River Rd; cultural gathering hut located below creek mouth
- Flows with light turbulence on west side, no rapids
- Width 51 m estimated with range finder, width of 42 m estimated from Google Earth imagery
- Site deemed suitable

## Site 8



- Near km 44, 300 m upstream of Site 7
- Site assessed from km 44 on West Lillooet Lake Rd
- Access very difficult down steep hillside to river
- Flows highly turbulent
- Width of 55 m estimated from Google Earth imagery
- No additional photographs taken at Site 8
- Site deemed unsuitable

## Site 9



- Km 40 on West Lillooet Lake Rd
- Site includes gravel/cobble bar spit that encloses cove on east side of river
- Access easy after following long dirt path to river
- Flows moderately turbulent
- Width of 76 m estimated with range finder, width of 63 m estimated from Google Earth imagery to downstream tip of spit
- Site deemed unsuitable due to width