2018

Lower Ibex River Discharge Monitoring

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For Yukon Fish and Game Association

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Yukon Fish and Game Lower Ibex River Water Level/Discharge Monitoring Project

Background

In 2017, Kwanlin Dun First Nation (KDFN) worked with Fisheries and Oceans Canada (DFO) to set up a water level monitoring site on the lower Ibex River. The purpose of this project is a natural follow up project: the development a rating curve to determine the relationship between the water level and discharge in the Ibex River. The habitat in the Ibex River has been identified as Chinook Salmon (*Oncorhynchus tshawytscha*) spawning habitat; however, limited assessment of spawning has been conducted in the watershed and the numbers of salmon observed have been low. This project will help to build a better understanding of limiting factors for Chinook Salmon in this system, and assess options for stock restoration. In 2018, Yukon Fish and Game Association (YF&G) received funding from Patagonia to purchase a flow meter and conduct discharge monitoring in cooperation with KDFN. YF&G employed a KDFN student to work with KDFN technicians to develop their discharge monitoring capacity and to summarize the preliminary data for the station.

Figure 1 Lower Ibex River Water Level Monitoring Station

Objective

The objective of this study is to start to develop a rating curve for the water level monitoring station on the lower Ibex River, where Chinook salmon are known to spawn, and to develop KFN capacity to increase capacity in aquatic habitat monitoring, and particularly to develop a rating curve. Project activities included:

- Working with KFN personnel to develop competency in measuring water velocity using the Global Water flow probe and in using the data to estimate stream discharge
- Measuring lower Ibex discharge at a range of water levels to develop rating curve
- Summarizing the discharge measures and station water level data collected for the lower Ibex water station since its installation in 2017

Figure 2 Cheyenne Bradley (left) working with DFO to Ibex River discharge

Site

The Ibex discharge monitoring project was conducted on the Ibex River (60.81° N 135.76° W) in the Yukon Territory. The Ibex River is located on the traditional territory of the Kwanlin Dun First Nation (KDFN). A DFO project recorded adult Chinook salmon spawning in the reach downstream of the new water station in both 2017 and 2018.

Figure 3 Lower Ibex River water station location

Figure 4 DFO measuring discharge near an Ibex River Chinook salmon spawning site

Access to the site was through the Ibex Gravel pit. To get to the Ibex River site, we parked along the road to the Ibex Gravel Pit and then followed existing trails (old logging roads) on four-wheel drive. All-Terrain Vehicles to get to the site with our supplies. The site was about a five-minute quad ride past the gravel pit. At the site, there is an open gravel and cobble area with mostly shrubs surrounding the Ibex River. The river was mostly fast flowing and some areas where shallower and these are the areas where we took our readings with the flow meter.

Materials

- Global Water flow probe
- 50m tape measure across stream
- Ruler
- Throw Bag
- Waders with wading belt and/or Drysuit
- Personal floatation device
- Wading boots
- Zipper lube
- Pad to stand on to protect drysuit feet
- Camera
- GPS
- In-Reach and check-in plan
- Water proof Data sheets
- Pencils

Methods

Discharge was measured at the water station site,

- Site location: 60.81^{O} N 135.76^{O} W

Figure 5 Water level gauge at lower Ibex River station

Record Water Level at Staff Gauge (see Figure 2)

- Take photos upstream, downstream, across river

Figure 6 Cheyenne Bradley, KDFN citizen working on YF&G project, (left) measuring water velocity, and Bruce Wilson, KDFN Land Steward, recording measurements at the Ibex water station site

Figure 7 Bruce Wilson (left) measuring discharge and Cheyenne Bradley recording data

Once you arrive at the site, choose a spot upstream and downstream of the river with laminar flow (not eddies) also choose an area that you are able to cross. One person should be on the side of the river with a throw bag in case someone falls in the water while trying to cross the river. Once you are able to cross the stream use a measuring tape for upstream and downstream to record tape measurement across the river. Using the tape measure, measure every meter directly across (perpendicular to flow direction). Once you have recorded every meter across the river, record the tape measure reading, the depth at zero reading and velocity of zero at start shore. Measure at every 0.5 meters from measuring tape from the start shore to other side of river. Then measure every 0.5 meter from the first reading (=1 m from shore) and every meter across river. Measure halfway between the last depth measure and the shore on the end shore. Once you have measured halfway between the last depth, hold the probe perpendicular in the water and verify that the tube is parallel to the water flow (arrow on probe pointing downstream). Then take a reading with the probe by pressing the top right button. Record at each measuring point (0.5 meters) and take the reading of the water depth (measure at wetted depth= from bottom to top of the river) and water velocity at 0.6 of depth (calculate for each measure site) in m/s. Remember to reset (top right button) before starting each reading and then use the velocity average, after the velocity average stabilizes on the flow probe. Ensure the flow meter is in meters per second. After you have taken readings from upstream and downstream of the river then record the water level at water monitoring station gauge (take a photo of the water level too – in case need to verify).

Results

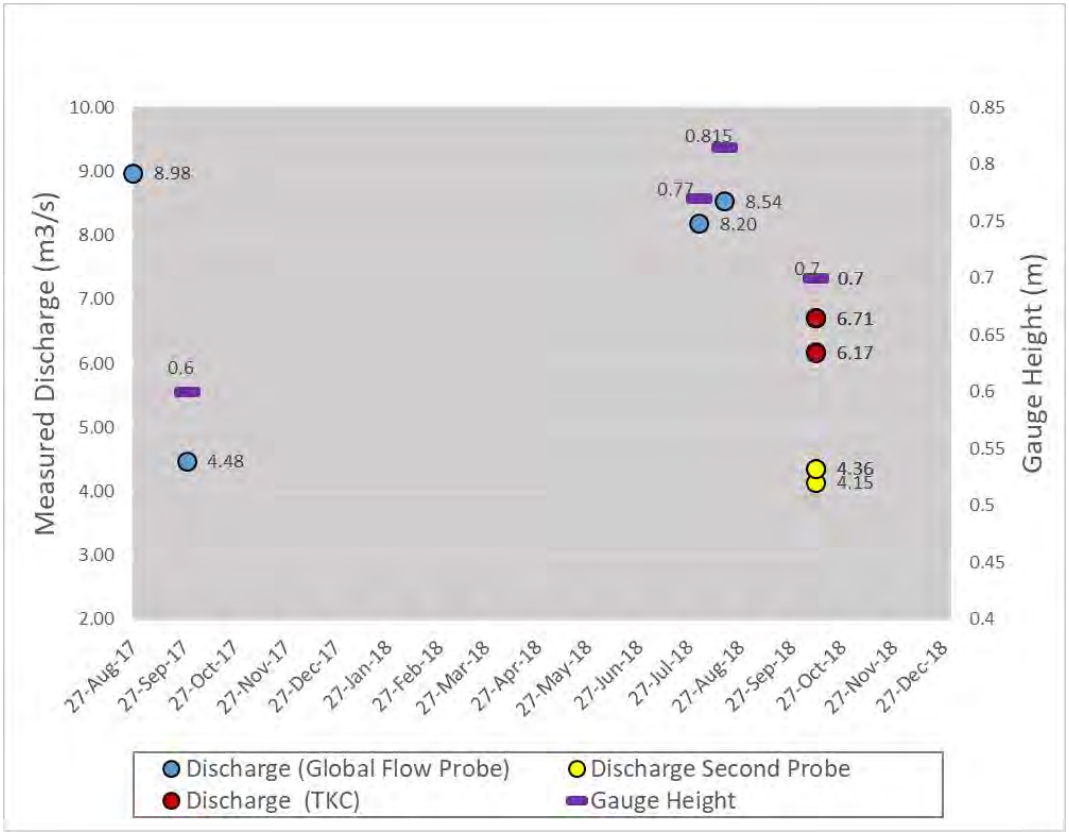

Figure 8 Lower Ibex River gauge height and measured discharge vs date

The discharge rate and gauge height was higher on August 27, 2017. On September 27th, 2017 the rate and height starts to decrease as temperatures start to get colder and ice starts to form. No readings were taken in winter (from October 27th, 2017 to June 27th, 2018). The next reading was taken on July 27th, 2018 and the discharge rate and gauge height were higher at the end of August. Therefore the discharge rate and gauge height increases in July and August and starts to decrease in September.

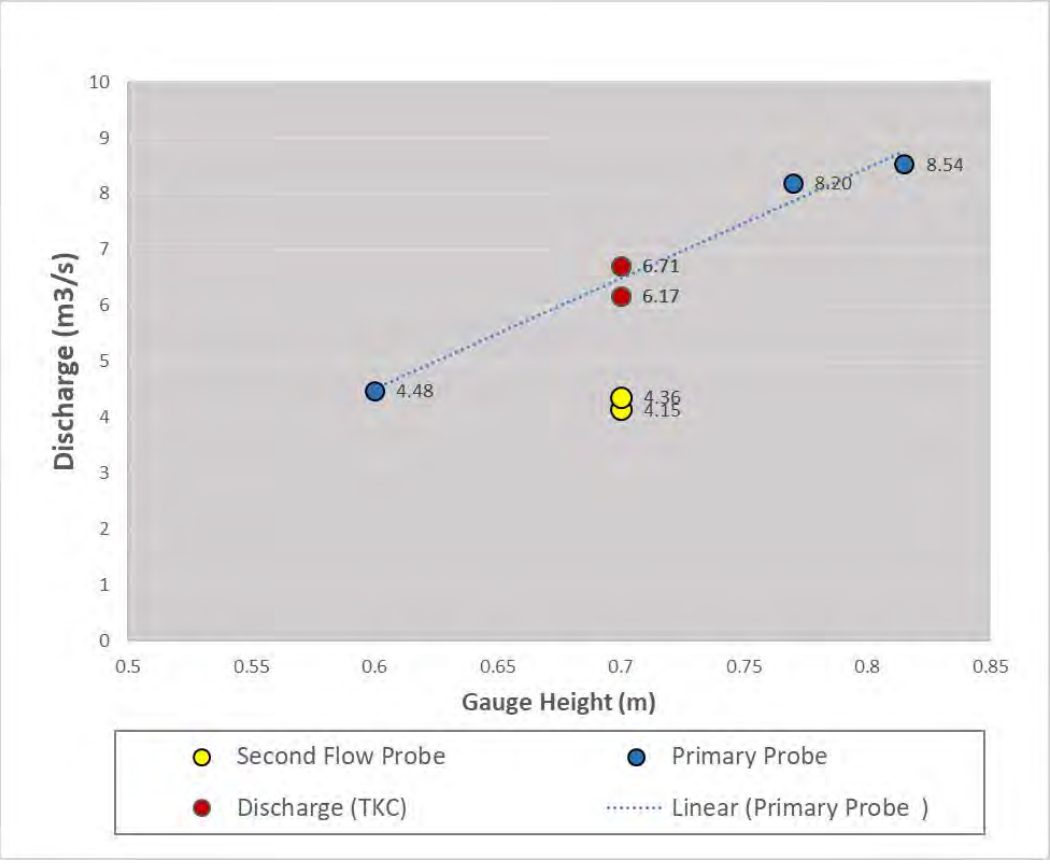

Figure 9 lower ibex River measured discharge vs. gauge height, 2017-2018

Two flow meter probes were used to take multiple readings in the Ibex River. The secondary flow meter probe most likely needs to be calibrated, because the data points (4.36 and 4.15) are outliers meaning the two data points are distant from the other points. The primary probe readings for the discharge rate (velocity) is gradually increasing as the gauge height increases (i.e. river is getting deeper).

Discussion

Discharge was measured under a range of conditions, and the highest flows were measured in August. However, discharge data for the high early summer periods and low flows in late winter or early spring have not yet been captured. The initial data appears to show a good relationship between the gauge height and the discharge for this site, but the shape of the curve will only be developed with more data points at higher and lower discharge rates (upstream and downstream).

There were attempts to take a reading in November and December, but the water level in the Ibex River was extremely high, due to part of the river being frozen, and the footing was treacherous. At the site there was ice surrounding the river which pushed the water in the river and made it difficult to cross the

river to get a discharge reading. Getting a discharge measurement in early spring, once the ice has melted off but before runoff, will be the next focus for monitoring of the Ibex river, as we were not able to get the low flows before the ice cover in 2018.

The test with the two flow probes showed that multiple measures (velocity) are useful for identifying problems with equipment or methods, and that the second probe likely needs to be calibrated. Flow probes used on the project should be checked for calibrated before being taken to the field to collect project data this year.

This data from this restoration project will be used with other data (i.e. substrate, temperature, fish distribution) collected over the Takhini Restoration project (DFO in partnership with KDFN, Champagne Aishihik, Ta'an Kwach'an Council) to characterize the suitability of Ibex River for adult Chinook salmon spawning and rearing of Chinook salmon fry.

Acknowledgements

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Yukon Fish and Game: providing necessary support to conduct discharge survey and administrative support including Flow Probe acquisition

Patagonia provided funding to YF&G for the Flow Probe, and for Cheyenne to report on this project