Coho Spawner Surveys, Broodstock Capture and Beaver Dam Management in the Upper Bulkley River and Buck Creek in 2023

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Executive Summary

The 2023 drought conditions in British Columbia presented many challenges to both people and fish. Steelhead, chinook and coho adult spawners in the Upper Bulkley River watershed were all impacted by low water conditions. Log jams and beaver dams restricted fish passage. This report details coho spawner observations, broodstock capture activities and beaver dam management actions for coho spawner passage undertaken by staff and volunteers of the Buck Creek Hatchery and Nature Centre in Houston, BC, in September and October of 2023.

From a single day count of coho spawners on October 5, at least 387 coho spawners returned to the Upper Bulkley in 2023. Seventeen impassable beaver dams within the first 30 km of the Upper Bulkley hindered coho spawners from efficiently migrating upstream to their spawning grounds. Beaver dam management actions throughout September and October were required to assist fish passage. Five dead coho spawners were found on beaver dams, including two pre-spawn females, the number of which likely would've been higher without beaver dam management.

Other salmon species observed during coho surveys included chinook spawners at the tail end of their spawning season, one sockeye, and three steelhead.

The Buck Creek Hatchery performed successful coho broodstock capture during this time, collecting 10,672 eggs for the hatchery and the Stream to Sea program at Houston schools.

Introduction

The Upper Bulkley River and its tributaries is one of the most negatively impacted basins in the larger Skeena watershed. Populations of sockeye, steelhead, chinook and coho have been of concern for several decades.

In 2023, British Columbia faced a very challenging drought season, with two thirds of watersheds in the province at drought level 4 or 5 by the end of July. The Upper Bulkley basin was no exception. A fast snowmelt period caused a rapid freshet in early May which was followed by a sudden drop in water levels and flows. Data from the Water Survey of Canada, collected at the “Bulkley River Near Houston” station and shown in Figure 1 demonstrates the rapid freshet and high water temperatures that occurred.

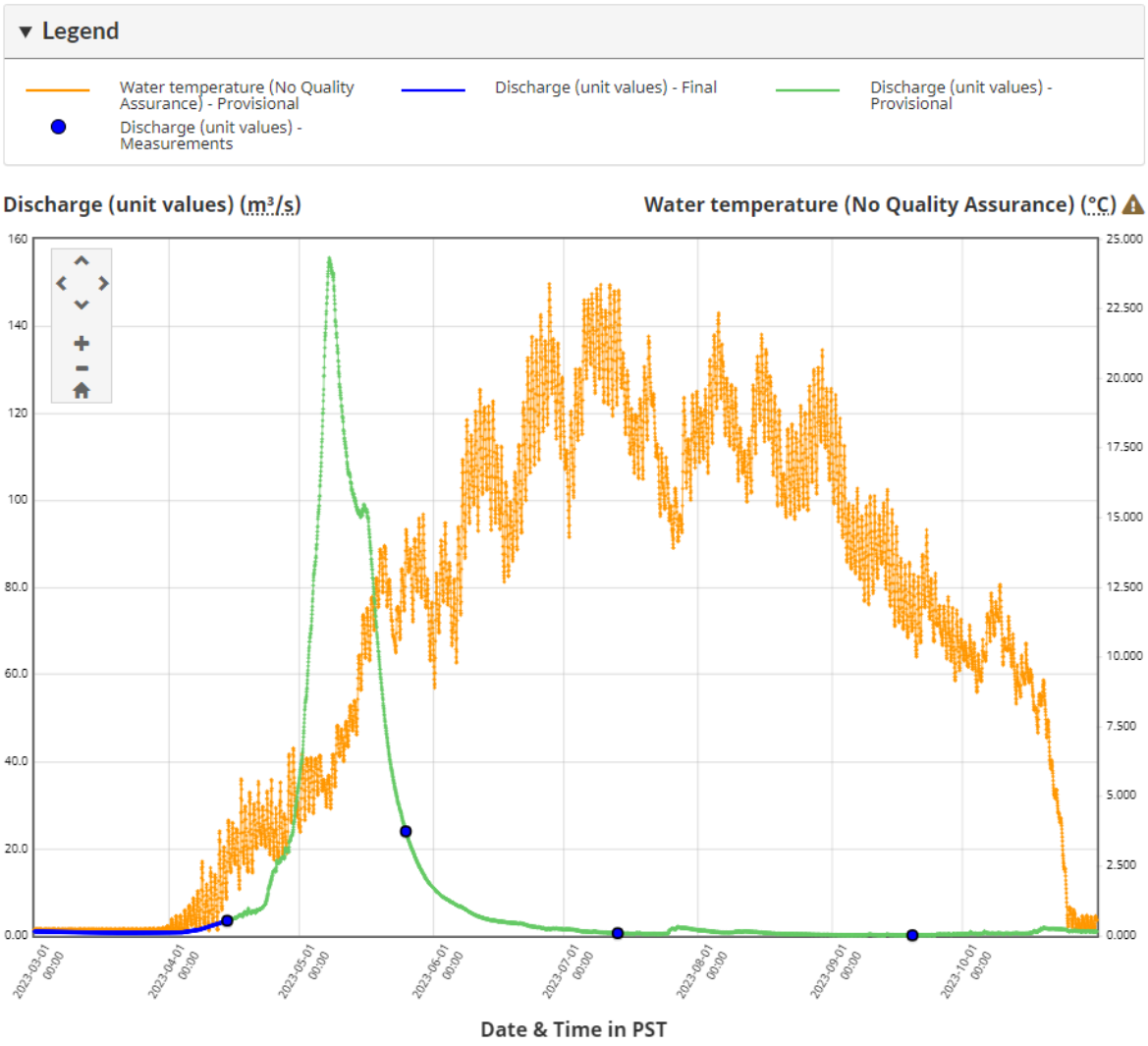


Figure 1. Water discharge and temperature data from the Water Survey Canada Station 08EE003 (Bulkley River Near Houston) from March 1 2023 to November 1 2023.

These conditions left 70 adult steelhead kelts stranded in Buck Creek within the town of Houston, due to a log jam obstructing their passage out of the creek after spawning in the higher reaches. Staff from A Rocha Canada, the Province, Toboggan Creek Hatchery and local volunteers caught and transported 50 of the kelts to the Morice River in late June. Steelhead and chinook spawners and juvenile salmon also faced the stress of warm stream temperatures in the months of June to August.

This report focuses on the coho salmon spawning season in the Upper Bulkley basin during September and October 2023. By this time, water temperatures had returned to the ideal range for salmon but low water levels remained a concern. Forecasts predicted little precipitation for these months.

The Upper Bulkley watershed has a healthy beaver population and beaver dams conserved large amounts of water within the system in 2023 (Figure 2). Several beaver dams had already been observed during chinook spawning season in July and August, and it was anticipated that the number of dams would have increased before coho spawners were due to return.

While we recognize that the presence of beaver activity is a very positive factor and a contrast to other watersheds in the province, it poses certain challenges. As the Upper Bulkley River has been impacted by linear developments including a railway and highway, channel complexity has decreased and the space constraints have placed beavers and salmon in some conflict. Generally, the only way salmon can migrate past dams is after large rainfall events that swell the river level sufficiently to cause it to flow beside the dam. In the absence of high water, coho are typically unsuccessful in jumping over a beaver dam. If they do attempt to jump over the dam, they often become trapped in it.

Figure 2. Contrast of Upper Bulkley river volume in a beaver pond (left) to an extremely low section (right).

Due to the high level of beaver activity and conservation concerns surrounding Upper Bulkley coho salmon, we obtained support from the Pacific Salmon Foundation's Emergency Drought Response Fund to assist coho spawner migration through the beaver dams. We began at the

confluence of the Upper Bulkley and Morice Rivers, walking up the Upper Bulkley with the migrating coho. Video from drone flights provided useful information about beaver dam locations. We located 17 impassable beaver dams within the first 30 km of the river which required management (Table 1). We located 11 additional passable dams, which were old or small and did not require management (Table 2).

Once coho spawners were close to an impassable dam, we created 1 meter wide notches, removing the majority of sticks and some rocks (Figure 3). In most cases we would leave the base layer of the dam intact to keep the dam stable and prevent complete blowout. This layer is typically made of rocks and horizontal sticks that fish can jump or swim over. Then we created plunge pools at the base of the dam by digging rocks or sediment away to allow the fish to gain enough momentum to jump through the notch.

Figure 3. Sample photo of a notch that has been created in a beaver dam to assist fish passage.

This method proved to be very effective. Coho spawners typically respond on the same day and migrate through the dam. The beavers usually close up the notch with new sticks and rocks during the night. In most cases we revisited a dam several times to reopen it until satisfied that the majority of spawners had migrated past.

Due to capacity constraints, our efforts were targeted toward ensuring fish passage, and therefore, the majority of our spawner counts are of migrating spawners (Tables 3 and 4). We collected data on spawning activity, including redds observed near beaver dam locations, but did not return to perform dissections on carcasses to estimate spawning success. Therefore, the counts of dead spawners are only of those found at beaver dams, with the exception of one prespawn female found on September 18.

Table 1: Locations of Impassable Beaver Dams on the Upper Bulkley River in 2023

Beaver Dam ID	Latitude	Longitude	General Location description
IBD1	54.40881	-126.73941	Near Austin's cabin; about 1 km upstream of Morice/Upper Bulkley confluence
IBD2	54.39654	-126.71038	Seinen's swimming hole; about 500 m upstream of North Rd bridge over Highway 16
IBD3	54.39347	-126.69087	Barden's equipment/storage yard
IBD4	54.39054	-126.68068	Across Highway 16 from Buck Flats Road turnoff
IBD5	54.39366	-126.67245	Westland Helicopter helipads
IBD6	54.40442	-126.64092	East Highway 16 bridge leaving Houston
IBD7	54.40988	-126.62842	Keegstra/Riverside Gardens Dam 1
IBD8	54.41200	-126.62465	Keegstra/Riverside Gardens Dam 2
IBD9	54.41301	-126.61771	Keegstra/Riverside Gardens Dam 3
IBD10	54.41758	-126.61309	Keegstra/Riverside Gardens Dam 4
IBD11	54.42541	-126.60465	Rouw dam, walk 1 km south of Willow Grove Golf Course along railway tracks
IBD12	54.43086	-126.59999	Downstream of the log jam near Willow Grove Golf Course
IBD13	54.43255	-126.59834	Dam on channel adjacent to Willow Grove Golf Course log jam
IBD14	54.43547	-126.59704	Willow Grove Golf course
IBD15	54.43973	-126.58762	Himech field just upstream of Willow Grove Golf Course
IBD16	54.44437	-126.56048	Knockholt bridge
IBD17	54.45298	-126.53446	Meints far end of Knockholt hay field

Representative Photos of Impassable Beaver Dams

Photo credits to Marjorie Lieuwen, Regina Meints and Cody Meints (drone photos).

Impassable beaver dam 1

Impassable beaver dam 2, with the photo on the right showing side channel we created.

Impassable beaver dam 3

Impassable beaver dam 4, a complex of 3 dams which generally remained passable as long as we kept the middle section free of debris as shown in the middle photo.

Impassable beaver dam 5, one of the largest dams, notched in the photo.

Impassable beaver dam 6, notched. Repeated notching evidenced by the mounds on either side.

Impassable beaver dam 7. Drone photo showing the dams on each channel.

Impassable beaver dam 8, interestingly constructed around a felled tree.

Impassable beaver dam 9.

Impassable beaver dam 10.

Impassable beaver dam 11.

Impassable beaver dam 12.

Impassable beaver dam 13, log jam seen behind.

Impassable beaver dam 14.

Impassable beaver dam 15.

Impassable beaver dam 16 view from Knockholt Bridge, open in middle, arrows point to dams.

Impassable beaver dam 17, open on the side.

Table 2: Locations of Passable Beaver Dams on the Upper Bulkley River in 2023

Beaver Dam ID	Latitude	Longitude	Location description
PBD1	54.40476	-126.74139	About 500 m upstream of IBD1
PBD2	54.39361	-126.70217	Between IBD2 and IBD3
PBD3	54.39306	-126.70151	Between IBD2 and IBD3
PBD4	54.39103	-126.70250	Between IBD2 and IBD3, Across Highway 16 from Finning
PBD5	54.39865	-126.67198	District of Houston sewage lagoons
PBD6	54.43932	-126.58502	About 200m upstream of IBD15
PBD7	54.43984	-126.58273	About 300m upstream of IBD15
PBD8	54.44364	-126.57621	About 1 km downstream of IBD16
PBD9	54.44279	-126.57253	About 800m downstream of IBD16
PBD10	54.44391	-126.56230	About 200m downstream of IBD16
PBD11	54.44850	-126.55258	Upstream of IBD16, near CN barrels

Table 3: Upper Bulkley River Salmon Counts from September 18 to October 19 2023

Click on a date to be taken to the relevant section of the report describing locations, observations and activities on that date. View the Google Earth kml file for exact locations of observations.

Date	COHO					CHINOOK		STEELHEAD	SOCKEYE
	# holding/ migrating	# spawning	# redds	# dead		# dead	# redds	# live	# live
				Male	Female				
Sept 18	32	-	-	-	1[1]	2	2	-	-
Sept 19	50	-	-	-	-	11[2]	1	-	-
Sept 25	100	3	1	-	-	-	-	-	-
Sept 26	60	-	-	-	-	-	-	-	-
Sept 27	100	4	2	1[3]	1[1,3]	-	-	1	1
Sept 28	20[4]	-	-	-	-	-	-	-	-
Oct 2	15	-	-	-	-	-	-	-	-
Oct 3	93	14	7	1[3]	1[1,3]	-	-	-	1
Oct 4	246	-	-	-	-	-	-	-	-
Oct 5	387[5]	-	-	1[3]	-	-	-	-	-
Oct 6	250[4]	33	15	-	-	-	-	-	-
Oct 10	26	-	-	-	-	-	-	2	-
Oct 11	29	-	2	-	-	-	-	-	-
Oct 12	29	19	14	-	-	-	-	-	-
Oct 18	6	27	15	-	-	-	-	-	-
Oct 19[6]	75	50	20		-	-	-	-	-

1 = prespawn mortality, dissected
2= one of these dissected and found to be a dead prespawn hatchery female.
3 = dead on beaver dam
4= counted through a beaver dam
5 = 294 counted through beaver dam, other 62 an estimate seen in other locations
6=Oct 19 likely includes the same seen on Oct 18 with the additional new ones seen on 19th

Table 4: Buck Creek Coho Salmon Counts on September 19 and October 18 2023

	COHO				
Date	# holding/ migrating	# spawning	# redds	# dead	
				Male	Female
Sept 29	52	7	3	-	-
Oct 18	4		5	-	-

Summary of Key Daily Observations and Photos

September 18, 2023

Crew Initials	ML, MK, SS
Method	Streamwalk
Start to Finish coordinates	54.40286, -126.73328 to 54.41118, -126.74551
General location description	From Austin's upstream hay field access point to Morice/UBR confluence
Start & Finish Time	10:00 AM to 1:30 PM

The first impassable beaver dam IBD1 was located about 1 km upstream of the Morice/UBR confluence and was notched. Approximately 30 coho were holding in a pool downstream of the dam. In this location 1 dead coho female was found (fork length 64 cm and POH length 53.5 cm) and upon dissection the female was determined to be a pre-spawn mortality, with 100% of eggs still tightly inside the skeins.

Approximately 500 m upstream of IBD1 we located passable beaver dam PBD1. This area is made up of braided channels, a log jam and beaver dam on river left, and very slight damming on most of the upstream ends of the channels. Upstream of the braided section is a very large pool. The channel on river right was the most passable but it was very shallow and skinny and we dug out some sections but didn't have sufficient equipment.

2 dead chinook and 2 chinook redds were located just upstream of the confluence. There were numerous dead pink salmon on the banks of the Morice at the Morice/UBR confluence and many pink redds dotting the Morice River.

IBD1 notched (top left) and PBD1 (top right). Dead pre-spawn coho female (bottom images.

September 19, 2023

Morning Crew Initials	ML, CV
Method	Streamwalk
Start to Finish coordinates	54.40286, -126.73328 to 54.398675, -126.718125
General location description	Austin's upstream hay field access to North Rd bridge rest stop
Start & Finish Time	8:30 AM to 10:00 AM

No fish or sign of spawning observed. At the pool downstream of IBD1 there were still about 50 coho holding and we reopened IBD1.

Afternoon Crew Initials	ML, RM
Method	Streamwalk
Start & Finish coordinates	54.398675, -126.718125 to 54.39048, -126.68055
General location description	North Rd Bridge rest stop to Buck Flats Rd access
Start & Finish Time	11:30 AM to 3:00 PM

No coho were observed but several beavers dams were found. We opened up the dam IBD2 on the side. PBDs 2-4 were partial dams and passable, although we removed a small amount of sticks to make passage easier. IBD3 was located and breached, though no coho were observed below it.

Upstream of IBD3 we found and dissected a dead pre-spawn hatchery chinook female (pictured on the right). This dead female was found in an area where chinook had been holding for a long time in very warm water temperatures in July and August. There were 10 additional dead chinook observed in this area, either too decomposed or inaccessible to dissect.

IBD4 was already present in the summer. It is made up of two dams on river left and right. It was somewhat passable in the middle but we removed some debris that had accumulated.

September 20, 2023

We carried out an educational spawner survey with a high school class on Buck Creek from the confluence with UBR to the Buck Creek forest channel outlet, about 300 m. No fish were observed.

September 25, 2023

Crew Initials: MK, ML

At least 100 coho were holding in the pool downstream of IBD1. We opened up IBD1 on the side this time, on river right where the dam ends at the gravel bar.

We found evidence of coho spawning activity between IBD1 and PBD1, including a coho pair and 1 jack on a redd. We opened up most of the small beaver dams at PBD1 as a precaution.

We re-opened IBD2 on the side and notched IBD3 again in the same location. At IBD4 we cleared out the debris from the middle again and opened up the dam on the river left channel.

Sept 25: IBD1 side channel created, 2 coho spawners and their redd.

September 26, 2023

Crew Initials: CV, JY, MK, ML, NN, TE

We began attempts at coho broodstock capture for the Buck Creek Hatchery. Only a few salmon remained in the pool downstream of IBD1. The coho were likely prompted to migrate by the 9.2 mm of rain that fell on September 25. The river was still flowing around the side of IBD1, and had eroded some gravel away.

About 10 coho were seen upstream of IBD2, none were caught by angling. At least 50 coho were found holding below IBD3. We caught 2 males which were stuck in the sticks of the beaver dam and held them in tube bags overnight, planning to return the next day to capture more and transport them to the holding tank location.

IBD5, a very large beaver dam, was located near Westland Helicopters.

September 27, 2023

Crew Initials: CV, MF, MK, ML, MR, MV, PA, RM, RV, TE

We revisited IBD3 to perform broodstock capture. Kristen Peck and Victoria Chicatun with DFO stock assessment were also present to capture coho for DNA sampling.

Two coho pairs were spawning below IBD3. Approximately 100 coho were holding below IBD3 or attempting to swim under the dam. One dead male and one dead prespawn female were found on the rocks downstream of the dam (one pictured to the right).

We captured 22 coho in a gill net on our first attempt. Four females and eight males were kept and transported to the broodstock holding tank location.

We opened IBD3 for the remaining coho.

We notched IBD5 and observed one sockeye in the beaver pond upstream. Helicopter pilot Dylan de la Mere informed us he had seen a large number of coho swim through IBD5 after we left.

September 28, 2023

Crew: JY, MK, ML

IBD6 below the East Highway 16 bridge leaving Houston has been in place for several years. We observed coho holding below the dam and after notching we watched about 20 coho swim through.

We revisited IBD5 and notched it, though no coho were below it at that time. IBD4 was still mostly passable but we opened the dam on river left again. At IBD3 there were 3 coho attempting to get under the dam. We were able to remove two and lift them overtop. The other one swam back downstream.

September 29, 2023

Morning Crew: LD, MK, ML, RM, SS

About 30 coho were holding at the broodstock holding tank location, likely waiting to go up Buck Creek.

IBD6 was notched again. We visited Willow Grove Golf Course where a dam had been located in 2022. The dam was still there, and we notched it. This dam ended up being named IBD14. There were no coho downstream of it. We walked downstream and located two more dams, IBD13 and IBD12, and notched them but did not observe any coho.

Afternoon Crew: ML

On Buck Creek, 1 coho was observed along the dike near the Buck Creek Hatchery upstream of the log jam, which is generally impassable during low water. There were 50 coho holding at the lower log jam downstream of the forest channel, likely waiting for rain to allow migration under the impassable log jam. There were 7 coho spawning in the forest channel and downstream.

September 30, 2023

Crew: CM, ML, RM

Cody Meints carried out a drone flight of the river between IBD6 and Willow Grove Golf Course. Five more impassable dams were located, IBD7-11.

Sept 29: Coho spawners and redd on Buck Creek.

October 2, 2023

Crew: MK, ML, RM

IBD7 is composed of two dams, one on river left and one on river right. Five coho were holding below IBD7 in a very large deep pool. We opened up IBD7 on the side of the dam on river left.

When we arrived at IBD8 there were two dead chinook hatchery smolts just below the dam. These would have been released by Toboggan Creek Hatchery in Spring 2023. We then notched IBD8, but the notch was too large with too much of the base removed, and the resulting water flow was higher than ideal. We walked upstream to IBD9 and along the way observed

some small sucker fish stranded from the water level decrease. We were able to move most of them back into the river. This was the only occurrence of a “notch failure” that we experienced, but highlights the importance of caution in this process.

We then notched both IBD9 and IBD10. On the return walk we observed about 10 coho upstream of IBD8.

Oct 2: IBD7 opened on the side (top left). IBD8 notched (top right) which eventually broke away a bit more than pictured. Two dead chinook hatchery smolts were found below IBD8 before notching (bottom photos).

October 3, 2023

Crew: JY, MK, ML

About 30 coho were still present at the broodstock holding tanks.

IBD6 was notched again. A dead prespawn female coho and dead male were found on the rocks just below the dam.

IBD7 was still flowing on the side. At IBD8 the beavers had created a new arm of the dam due to the damage caused on October 2. We opened a notch in this new section and the notch remained stable.

We observed 13 coho upstream of IBD8. We notched IBD9 and IBD10 again.

We revisited IBD5 and made a notch on the far side of the dam on river right since there were 8 coho spawning above the riffle downstream. There were about 30 holding just downstream of the dam. Another 50 were holding farther downstream along with 1 sockeye, and 6 coho spawning.

Oct 3: Coho redd downstream of IBD5 (top left). Dead coho female and male below IBD6 (top right), dam re-notched after finding the dead spawners. IBD8 had been closed up with a new section of dam and we created a new notch (bottom images).

October 4, 2023

Crew: DV, MK, ML, RM, TE

We performed broodstock capture downstream of IBD5, capturing 16 females and 18 males. All were released as none of the females were closer to being ready for egg take than those we already had in holding.

IBD5 was reopened in the original notch location as we judged there was sufficient distance between the dam and the redds on the downstream riffle. There was still spawning activity downstream.

At IBD3 the river had begun to flow around the edge of the dam on river left and was passable to fish. No more coho were observed in the area.

At least 200 coho were holding below IBD6 and the dam was reopened.

Finally, we checked IBD11. There were 12 coho holding downstream of it and we notched the dam.



Oct 4: Broodstock capture downstream of IBD5, reopening IBD5, and coho spawners observed below IBD6.

October 5, 2023

Crew: JY, MK, ML

IBD5 was notched as there were about a dozen coho still holding immediately below the dam. The rest were spawning downstream. IBD6 was notched, as there were still about 50 coho downstream.

IBD7 was still open. IBD8 had been closed, and there were about 30 coho coming up the riffle when we arrived. There was 1 dead male in the dam at our notch location. Unfortunately as we had created a plunge pool the coho were able to gain momentum to jump up onto the dam but not all the way overtop. Another coho jumped onto the dam when we reached it, we picked it up and put it over the other side. Then we notched the dam again.

There were about 100 coho in the pool downstream of IBD9, which had been closed by beavers. We notched the dam, then walked upstream to IBD10 and notched it again. While returning to IBD9 we did not observe any coho but upon reaching IBD9 there were coho migrating through that notch. We counted 283 in the course of an hour, and 11 more were swimming up to it when we left.

At the broodstock holding location there were still about 30 coho holding outside Buck Creek. On Buck Creek no coho were observed upstream of the log jam.

Oct 5: Dead male coho on IBD8, and approximately 100 coho holding below IBD9

October 6, 2023

Crew: JY, ML, RM

Anticipating that the coho were making a migration push we checked IBD11, which was still open. We walked up the railroad tracks to where the river comes alongside the tracks again. We began seeing coho spawning. We walked upstream to IBD12 which was still open on the side. More spawning activity was observed up to IBD13 and IBD14. The notch in IBD13 was still sufficiently open for coho to migrate through.

At IBD14 there were a large number of coho holding below the dam, which had been closed by the beavers. As we approached a coho jumped from the plunge pool we had created and made it overtop of the dam. Another tried but fell back down. While we reopened the notch there were coho swimming into our legs in the plunge pool. We counted 200 coho swimming through the notch in the course of an hour. There were still about 50 coming upstream as we left.

Oct 6: Coho spawner on redd downstream of IBD12 (left) and coho spawner jumping through our notch in IBD14 (right).

October 7, 2023

We performed our first egg take, from coho broodstock female 1.

October 9, 2023

We performed our second egg take, from coho broodstock female 2.

October 10, 2023

Crew: CV, KV, MK, ML, RM

We performed broodstock capture by seining at the broodstock holding location as the group of about 30 coho were still holding there. We captured 9 males and 17 females as well as 2 steelhead.
A number of them had blue tags from the Witset canyon (Males 8751, Females 8467, 52001, 52596, and 44989).

We kept 2 of the males and one female to perform our final egg takes on females 3 and 4.

October 11, 2023

Crew: MK, ML

We checked IBD15 which was discovered during chinook spawning season. There were no coho downstream. We breached the dam and checked the two old dams 200 and 300 m upstream which were still passable.

We notched IBD14 again. Walking upstream we observed about 25 coho holding in the beaver pond. We walked through the field to get some views further upstream, which appeared to be mostly deep pools and glides. There were 4 coho moving upstream about halfway between IBD14 and IBD15.

October 12, 2023

Crew: JY, MK, ML

We reopened IBD15, then drove up to the Knockholt bridge. IBD16 is just below the bridge and has been there for several years. It is composed of two dams now, on river left and right with a gravel bar in the middle. The dam on river left is passable on the side. There is a large tree trunk blocking the downstream outlet of this channel on river left, but there was enough room underneath it for coho.

About 100 m downstream was a passable dam, PBD10, and another 800 m downstream was PBD9. There were 4 coho below PBD9 and a possible redd. Another 500 m downstream was PBD8, which had been impassable for chinook but was now flowing around the side. There was spawning activity just above the dam and in the 500 m stretch downstream of the dam.

IBD14 was still open, and about 10 coho in the beaver pond upstream.

October 18, 2023

Morning Crew: CV, ML, SS

We walked Buck Creek from the confluence with the Upper Bulkley to the forest channel outlet, where there were 5 redds and 4 coho. Then walked along the dry creek bed to the forest channel inlet/log jam. The log jam still appeared impassable.

Afternoon Crew: ML, RM

Rainfall on October 17th and 18th (4.6 and 3 mm) resulted in IBDs 15, 16 and 17 being blown out on the side. At IBD15 a few coho swam past the dam in the side channel when we were there.

Upstream of IBD16, from access locations in the Meints hayfield we observed about 26 coho spawning. This area has some ideal riffle habitat. We observed a beaver in one of the side channels. At IBD17, 3 coho swam past the dam and there were 2 coho spawning upstream of it.

Oct 18: IBD15 and IBD16 both blown out on the side following rainfall.

October 19, 2023

Marjorie Lieuwen hosted a site visit with Jane Pendray, Pacific Salmon Foundation's Salmon and Climate Adaptation Program Manager.

IBD6 was starting to overtop in a couple of places but was notched for demonstration purposes. We then revisited the locations upstream of IBD16. There was more spawning activity compared to the previous day. There were also about 100 coho migrating upstream. As the coho seemed to be sufficiently spread out, spawning activity was increasing, and rainfall was assisting passage past beaver dams we decided to conclude our beaver dam passage monitoring efforts.

November 8, 2023

Marjorie did a quick survey in the lower sections of the UBR to see if any more late coho were migrating in. At IBD2, the dam was flowing around the side, and no fish were observed in the 500 m stretch downstream.

No coho were observed at the North Road bridge rest stop.

At IBD1 the river was still flowing around the side. No coho were observed downstream to the Morice/UBR confluence. At two river access points along the hayfield upstream there were no coho observed. River dissolved oxygen just downstream of a riffle was 101.2% and 13.1 mg/L. , River temperature was 1.5°C.

Conclusions & Recommendations

Through our conservation efforts of a coho hatchery, beaver dam management and habitat restoration we are working towards the goal of increasing the number of spawners returning to the Upper Bulkley basin. It remains crucial to ensure spawners are spread out throughout the river to have sufficient spawning habitat availability. This also increases the overall chance of success for the next generation. For example, if a negative event occurs in one area of the river it will only impact a portion of eggs that were deposited that year. It is also important to ensure coho spawners are able to access high quality spawning habitat higher up in the watershed such as the Knockholt and McQuarrie areas.

In 2023 we gained some new insights. One is that coho salmon do not have infinite patience. In previous years we have observed coho holding in pools until a pulse of rain signals them to migrate, or they are encouraged by a pulse of water after we've notched a beaver dam. However in the 2023 drought conditions coho eventually began attempting migration even though beaver dams were still impassable. Upon arriving at a beaver dam we would observe coho jamming underneath the sticks of a dam or attempting to flop over but becoming trapped. We found five dead coho spawners on beaver dams. Without our efforts to assist coho passage through notching beaver dams, the number of mortalities would likely have increased.

We had access to a drone for one day in this particular year, which demonstrated how we could increase our efficiency in monitoring beaver dams, and have applied for funding to purchase our own.

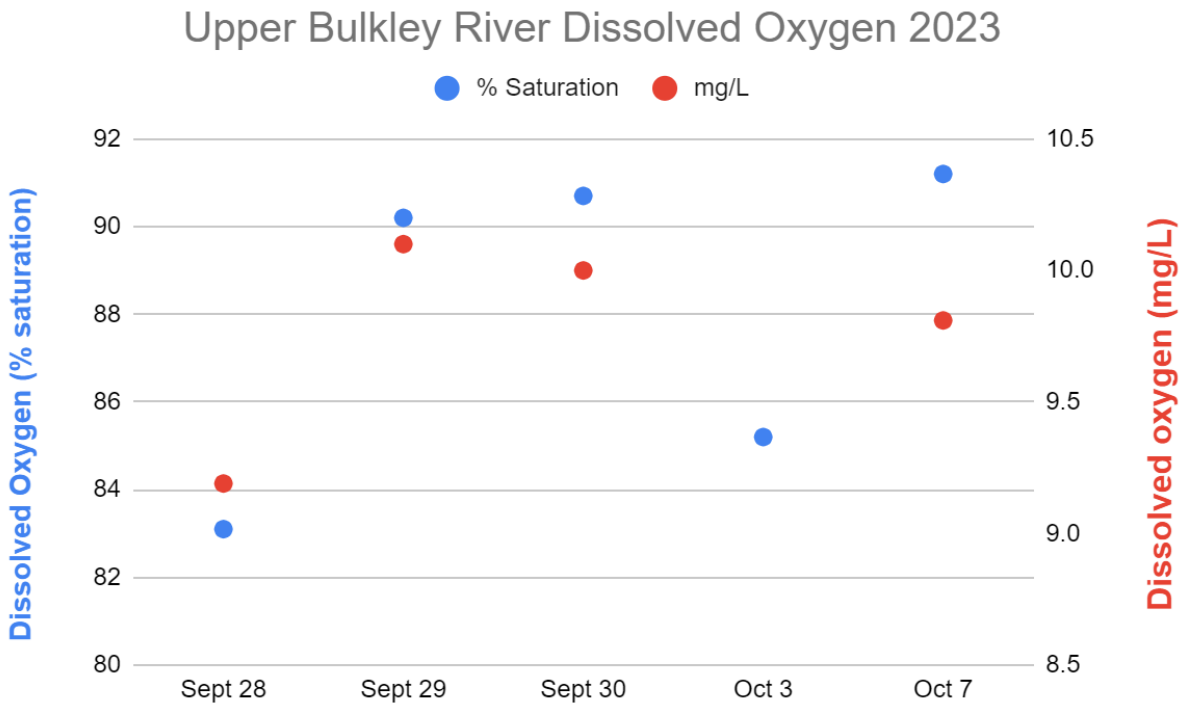
2024 is predicted to be another drought year. Early warm spring temperatures in February and March 2024 melted the small amount of snow present in low elevation areas. The remaining snowpack in higher elevations is lower than average. Depending on the speed of the final melt we may experience a quick increase in stream flows, however this is unlikely to seriously affect the existing dams on the river. Typically the beavers need to start from scratch with building dams year to year, but this may not be the case in 2024. Fish passage efforts may be required to assist out-migrating steelhead kelts, and in-migrating chinook and coho spawners.

Upper Bulkley River restoration is underway, with riparian restoration projects re-establishing vegetation along clearcut hayfields. Future restoration strategies include reconnecting the river to its floodplain. Linear development in the Upper Bulkley basin including a railway and highway restrict the level of possible floodplain connection that can be achieved. However, pursuing reconnection where possible could sufficiently slow and spread the river and create channel complexity which could reduce the level of conflict between beavers and fish. In the Chilako watershed, reconnecting the river to side channels encouraged beavers to move into side channels, freeing up the river for spawner migration.

We aim to complete reporting on coho spawner migration yearly, with observations of the impact of beaver dams. As restoration activities progress it will be important to monitor the effects on beaver behavior and the relationship to salmon spawners.

Appendix 1: Upper Bulkley Dissolved Oxygen

Dissolved oxygen measurements were taken in the Upper Bulkley River at the broodstock holding tank location, in a slow-moving pool. Battery-powered aerators were required to maintain satisfactory oxygen levels inside the broodstock holding tanks. The chart below shows the measurements taken in the river outside the tanks.



Dissolved oxygen measurements taken in the Upper Bulkley River at the holding tank location for coho broodstock in 2023.

Appendix 2: Crew Initials Key and Associations

CM: Cody Meints (Volunteer)
CV: Cindy Verbeek (A Rocha Canada)
DV: Dennis Verbeek (Volunteer)
JY: Joanne Yeker (Volunteer)
KV: Kimm Verbeek (Volunteer)
MF: Michelle Finch (Volunteer)
MK: Marcy Kuruak (Contractor)
ML: Marjorie Lieuwen (A Rocha Canada)
MR: Marcel Rousseau (Volunteer)
MV: Monica Vandenbrink (Volunteer)
NN: Natalie Newman (Department of Fisheries and Oceans)
PA; Patrick Arkesteyn-Vogler (Department of Fisheries and Oceans)
RM: Regina Meints (Volunteer)
RV: Ron Vandenbrink (Volunteer)
SS: Sarah Sutton (A Rocha Canada)
TE: Tasheena England (Department of Fisheries and Oceans)