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MEMORANDUM NOTE DE SERVICE

To
A

File:

- **Clinton Creek FCSAP**
- **Clinton Creek stream file**
- **CRE-06-07 file**

From
De

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RRB OHEB
Y&TBR Area
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Security Classification - Classification de sécurité	
Our file - Notre référence	
Your File - Votré référence	
Date	**January 16, 2009**

Subject
Object

Clinton Creek, tributary to the Fortymile River, Yukon River North Mainstem sub-basin – record of 2008 activities

Introduction

YG-INAC receive funding under FCSAP for remediation/risk mgmt of the abandoned Clinton ck asbestos mine. Fisheries and Oceans Canada (DFO) serves as an Expert Department under FCSAP. In the summer of 2005, DFO Oceans, Habitat and Enhancement (OHEB) commenced fish utilisation and habitat investigations at the minesite and in receiving waters. These were to support understanding of the potential long term effects of the mine site and related infrastructure. In 2006 and 2007 we continued to monitor fish and fish habitat in the area of the mine site and in potentially affected waters. This sampling also served to monitor and evaluate the Dawson District Renewable Resource Council's pilot Stream Stewardship project. This project facilitated access by jcs to high quality rearing habitat near and within the mine site.

Sampling continued in 2008. Fish sampling was conducted on four occasions during the open water period: May 30 – 31; July 10 – 11; August 10 - 11; and September 18 - 19. Stations sampled varied depending on the objectives of the sampling

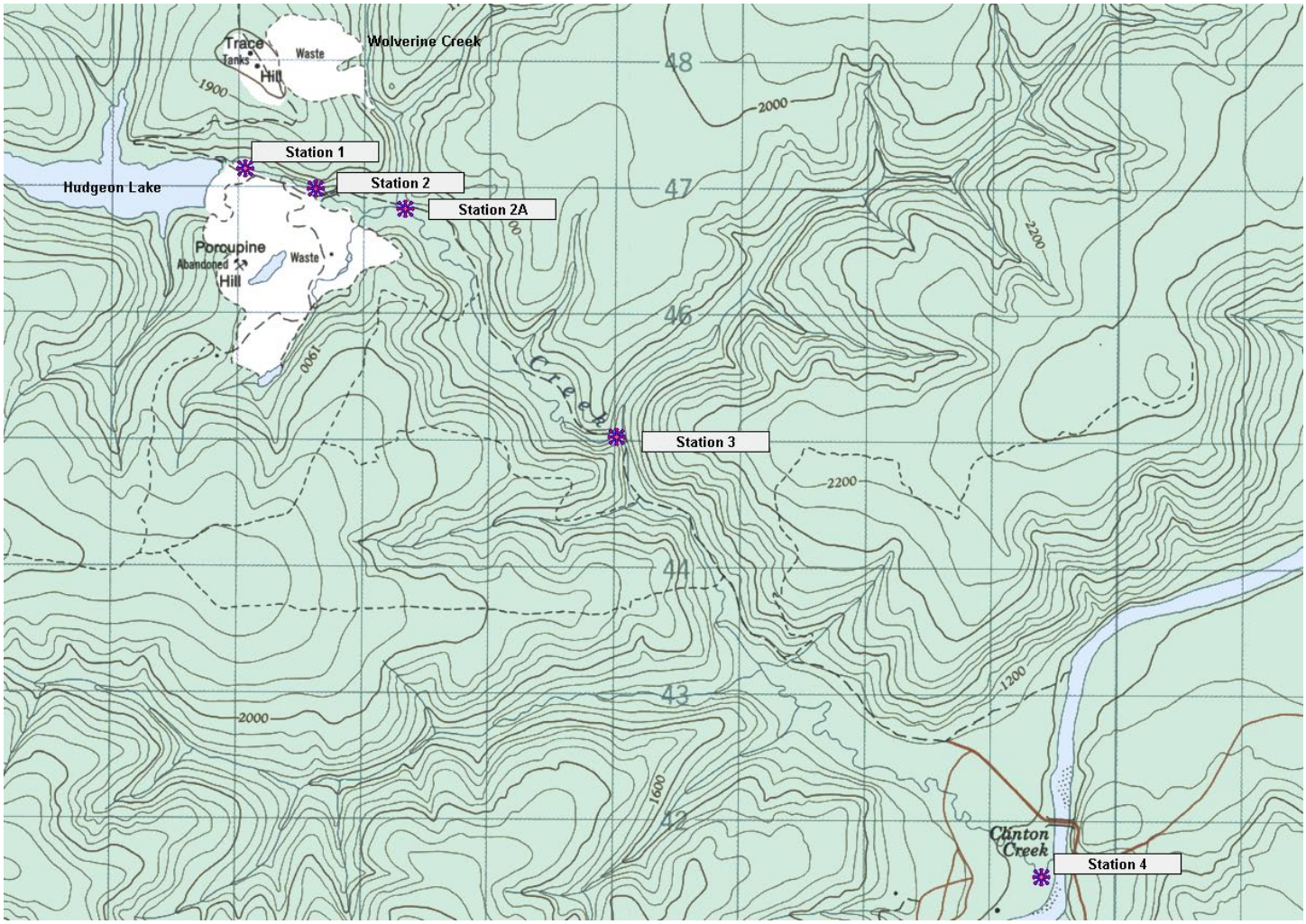
The Dawson District Renewable Resource Council (DDRRC) Stream Stewardship crew comprised of Heather Fraser and Sonny Parker and supervised by Hans Algotsson collaborated in the July and August DFO sampling. Angelina Buchar, University of Ottawa, provided assistance during the September DFO sampling.

For context, the following description of the drainage basin and the characteristics of the stream channel within the mine site are taken from our 2005 memo report:

> "Clinton Creek has a drainage area of 206 sq. km., a length of about 22 km. and a total relief of 760 m. From the mouth, the creek crosses valley bottom deposits that function as an alluvial fan. The valley narrows to a "V" shape and maintains this form until just downstream of the mouth of Wolverine Creek, when it widens. The creek has a low to moderate gradient. South-

facing slopes are dry and permafrost, if present, is deep. North facing slopes are moist and appear to have near surface permafrost.

The obvious direct effects of the mine start just downstream of the mouth of Wolverine Creek, with deposits of fine materials on the banks. Above this is the beaver dammed wetland area, which appears to be associated with ground water discharges from the minesite, and particularly from the infilled Porcupine Creek valley. Above the wetlands is an aggrading alluvial fan, over which the ford to the minesite crosses. Further upstream is the canyon. This is bounded on the south by the waste rock dump and to the north by the valley wall. Importantly, the canyon is in the process of incising into bedrock for much of it's length. At the head of the canyon is the lake outlet gabion structure, and beyond that Hudgeon Lake."



Map 2008 – 1. Long term sampling stations are shown.

2008 investigations

Methods:

Sampling was conducted primarily at stations established in previous years. The principal stations are shown on Map 1. Additional stations were established in 2008. Station G1 was established at the downstream end of the furthest upstream gabion structure, with G2 – G4 at the bases of the second through fourth gabion structures. These stations were sampled in September to determine the 2008 limit of juvenile Chinook salmon (jcs) or slimy sculpin (SS) upstream migration. Angling was conducted in each of the pools between the gabion structures in August and September.

With the exception of the angling, sampling was by Gee-type minnow traps. Baiting and deployment of the traps was in accordance with the DFO "Protocol for the baiting of G-type minnow traps for the capture of juvenile Chinook salmon in the Yukon River Drainage Basin". This method targets juvenile Chinook salmon, a socially, economically and culturally significant species, and slimy sculpin, which has been considered to be a sentinel species. Numbers of traps set varied between sampling events. The entrances of the ¼" mesh traps were enlarged to a diameter of ~40mm to allow the capture of larger fish. Traps with a 1/8" mesh size were used when it was considered possible that jcs of less than 50mm fl 0+ jcs might be present. All sets were at least 22 hours long, and included one period of decreased luminescence.

Catch per Unit Effort (CPUE) was calculated on the basis of jcs captured per trap per hour and averaged by station. As juveniles may both enter and leave the traps, the CPUE values imply rather than establish densities.

Flows were not measured. Observations of stage were made at the gabion structures, which function as over-flow/through-flow weirs. Digital images were taken at each sampling event and saved to H:HEB Photo library/Watersheds/Yukon River North Mainstem/Fortymile River/Clinton Creek.

Observations of the extent and intensity of beaver activity were made from the access road and at the sampling Stations during each sampling session. Observations were made during an overflight of the creek from the mouth to Hudgeon Lake on July 15, 2008.

All fish captured were anaesthetized, identified to species and measured to the nearest millimeter: total length (tl) for Slimy sculpin and burbot, and fork length (fl) for all others. Pectoral fins were clipped from all Chinook salmon in August and September and stored for eventual DNA analysis.

Observations of the bio/physical environment were made at each sampling session.

One of two Tidbit v2 data loggers deployed in September 2007 was successfully retrieved, downloaded, and replaced. The second could not be retrieved due to movement of streambed materials. A Tidbit v2 data logger was deployed within the gabion structure in August.

Sampling

May 30 – 31

The objectives of the sampling were to:

- determine whether 1+ jcs remained in Clinton Creek;
- determine the distribution of slimy sculpin;
- determine whether 0+ jcs had entered Clinton Creek;
- Make general observations of the bio-physical environment.

Effort and Captures were:

Station 1 (downstream of gabion structures) – 3 – 1/4" minnow traps

- No captures

Station 2B (new station, downstream end of canyon) – 3 – 1/4" minnow traps

- No captures

Station 2 (at mine site ford) – 3 – ¼" minnow traps

- 1 – Slimy Sculpin (SS)

Station 2A (near mouth of Wolverine Creek) 8 – ¼" minnow traps

- 14 – SS, range 47 – 96 mm tl.

Station 4 (immediately upstream of confluence with Fortymile River) – 4 – 1/8" MT

- 1 – juvenile Chinook salmon (jcs), 96 mm fl
- 1 – SS, 76 mm tl.

Notes and observations:

- the spring freshet had already occurred, and appeared to have been violent;
- most beaver dams visible from the road had been breached;
- Some dams had been catastrophically breached, with the channel open from bank to bank, and no sill logs remaining in the channel bed;
- at Station 4, several large spruce stems that had spanned the creek had been snapped or carried away;
- there was considerable bank erosion at Station 4;
- at the time of inspection the stream stage was approaching summer low flow conditions;
- At the outlet of Hudgeon Lake, gabion Structures 1 – 3 had overflow, Structure 4 was functioning as a through flow. This might indicate that the upstream structures are starting to seal;
- The pool downstream of Structure 4 looked smaller than in preceding years, inferring headwall regression from the canyon;
- The cable to the data logger at Station 1 was still in place, but the large (>1 cubic meter) boulders the logger had been deployed between in had shifted. This further raises doubts about the canyon's headwall integrity;
- I walked down the canyon, looking for grayling, but saw none;
- In the upper canyon, ice persisted as a fairly continuous shelf 1.5 – 2 metres above, and to the right of the channel. On left side, the high water mark was ~3 meters above creek level. It therefore appears that the freshet was routed over and around an ice plug in the canyon;
- there was much erosion of the waste rock face on the right side of upper mid canyon;
- the rock wall on the left side in the lower canyon was collapsing, with several recent rockfalls;

- spot water temperatures at the outlet of Hudgeon Lake were 13 and 11.8 on May 29 & 30th, and were 5.7 and 5.6 respectively at Station 4. The Fortymile River was at mid-stage, and was 8.4 and 7.8 degrees.
- Many waterfowl were seen in Hudgeon Lake and in the pools in the gabion structures.

July 10 – 11

The objectives of the sampling were to:

- determine whether 1+ jcs remained in Clinton Creek at the mine site;
- determine whether 0+ jcs had entered Clinton Creek from the Fortymile River in sufficient numbers to justify the start of the DDRRC project;
- determine the implied density of captured jcs;
- Provide training to the DDRRC staff in sampling juvenile fish;
- Make observations of the creek while conducting an overflight;
- Inspect the degree to which the gabion baskets had emptied and deformed since 2007;
- Make general observations of the bio-physical environment; and
- Retrieve and replace the data loggers.

Effort and Captures were:

Station 1 (downstream of gabion structures) – 2 – 1/4" minnow traps

- 1 – SS, 96 mm tl.

Station 2 (at mine site ford) – 2 – ¼" minnow traps

- 9 – SS, 90 – 105 mm tl.

Station 2A (near mouth of Wolverine Creek) 4 – ¼" minnow traps

- 38 – SS, range 56 – 95 mm tl;
- 1 – AG, 115 mm fl;
- 1 – Lake Chub (LC), 112 mm fl.

Station 4 (immediately upstream of confluence with Fortymile River) – 4 – 1/4" MT

- 1 – jcs, 53 mm fl

Notes & observations:

- water levels were much higher on July 10 than in May, and water rose further overnight;
- due to the high water, use of the mine site ford was becoming questionable by the 11th;
- all gabion structures were functioning as overflow weirs;
- the water in the creek was heavily stained, and was producing foam;
- the condition of the gabions could not be determined;
- The Fortymile River was high and rising, and starting to backflood the mouth of the creek;
- the DDRRC Stewardship Crew assisted in sampling Stations 4 – 2A;
- the data logger located downstream of Wolverine Creek was retrieved and replaced;
- water levels at the upper data logger site were too high to safely work in, and the logger was left in place;
- the boulders at the upper data logger site had further shifted;
- On July 10, spot water temperature at the outlet of Hudgeon Lake was 16.9 and was 12.2 at Station 4;
- fish were seen rising in the beaver dam complex immediately upstream of Station 2A. They appeared too large to be jcs, and were considered to be arctic grayling;
- the overflight was to have taken place on the 13, but was delayed until July 15 due to rain;

- on the flight, we counted 30 beaver dams between the mouth and the mine site, of which only 2 appeared to have survived spring high water.

August 11 & 12

The objectives of the sampling were to:

- determine the distribution of jcs in Clinton Creek;
- acquire genetic material for eventual DNA analysis;
- determine the implied density of captured jcs in stations sampled;
- determine the fork length of captured jcs in stations sampled;
- Inspect the degree to which the gabion baskets had emptied and deformed since 2007;
- Provide training to the DDRRC staff in sampling juvenile fish;
- Make general observations of the bio-physical environment; and
- Retrieve and replace the data logger located downstream of Station 1.

Effort and Captures were:

Station 1 (downstream of gabion structures) – 2 – 1/4" minnow traps

- 2 – AG, 115 – 118 tl

Station 2 (at mine site ford) – 4 – ¼" minnow traps

- 2 – jcs mean 70.1 mm fl, range 69 – 78 mm fl, CPUE 0.02 jcs/trap/hr;
- 2 – SS, 80 – 89 mm tl.

Station 2A (near mouth of Wolverine Creek) 2 – ¼" minnow traps

- 49 – jcs, mean 73.5 mm fl, range 62 – 89 mm fl, CPUE 0.94 jcs/trap/hr;
- 1 – SS, 75 mm tl.

Station 3 (app half way between the confluence with the Fortymile and the lake outlet) – 2 ¼" minnow traps.

- 11 – jcs, mean 71.9 mm fl, range 66 – 76 mm fl, CPUE 0.21 jcs/trap/hr;
- 2 – SS, 70 – 75 mm tl.

Station 4A – townsite ford – used as Fortymile River had backed up into lower Clinton Creek

- 12 – jcs, mean 73.1 mm fl, range 66 – 87 mm fl, CPUE 0.22 jcs/trap/hr;
- 1 – SS, 77 mm tl.

Station 4 (immediately upstream of confluence with Fortymile River) – 4 – ¼" MT

- 21 – longnose suckers (LNS), 51 – 86 mm fl.

Notes and observations:

- there had been one or more extreme flow events between the July 10 sampling and the August sampling;
- the high water mark along the pools between the gabion structures was ~ 0.5 meter above the water level at the time of sampling, and was higher than any other high water mark;
- this established that the flows had been the greatest during open water periods since the structures were built;
- all 4 gabion Structures functioned as over flow weirs;
- the condition of the gabions could not be determined;
- the water was heavily stained, and was producing foam as it flowed over and through the gabion structures;

- fish were rising between Structures 3 and 4. I angled and captured 3 AG, one ~35 mm fl, and two ~20 mm fl. The larger AG was missing many of the scales along the side of it's body. I released these AG in the same location they were captured in;
- I angled downstream of Structure 4 and quickly captured 6 AG, between ~200 – 250 mm fl. All were released in the same location they were captured in;
- I angled between Structures 2 and 3, 1 and 2, and above Stucture 1, with no captures and no hits;
- Beaver were constructing a compound dam (ie a series of small dams spanning the entire creek, but built between islands as segments rather than across a single thread channel) between Stations 2 and 2A;
- The Fortymile River was high and had backflooded the lowest section of Clinton Creek. This creek section was, essentially, a deep pool and could not be safely walked up. In sampling Station 4 we walked through the bush to access the stream approximately 100 meters above the mouth;
- The DDRRC Stewardship crew assisted me. They told me that high water had seriously affected their project, and that only 58 jcs had been restored to Clinton Creek at Wolverine Creek prior to my sampling;
- Traps were set at Station 3 to determine whether jcs were present;
- A pectoral fin was clipped from each jcs captured and has been stored for DNA analysis;
- On August 11, an attempt was made to retrieve the data logger at Station 1. The stream bottom was excavated to the extent possible, but the cable then passed between two large boulders;
- There was no sign of eagles at Station 1 – in the past presence of grayling has been associated with eagles, who would perch on boulders above the pool;
- A data logger was deployed above Structure 4, as there was considered to be little risk it would be lost from that location;
- On August 11, spot water temperatures at the outlet of Hudgeon Lake was 10.0 and was 9.3 in Clinton Creek immediately upstream from the mouth.

September 18 - 19

The objectives of the sampling were to:

- determine the distribution of jcs in Clinton Creek;
- acquire genetic material for eventual DNA analysis;
- determine the implied density of captured jcs in stations sampled;
- determine the fork length of captured jcs in stations sampled;
- Inspect the degree to which the gabion baskets had emptied and deformed since 2007;
- Make general observations of the bio-physical environment; and
- Retrieve and replace the data logger located downstream of Station 1.

Effort and Captures were:

Station G2 – near bottom end of Structure 2. 2 – ¼" minnow traps.

- No captures

Station G3 – near bottom end of Structure 3. 2 – ¼" minnow traps.

- No captures

Station 1 (downstream of gabion structures) – 4 – ¼" minnow traps

- 6 – AG, 120 – 163 mm fl.

Station 2 (at ford) – 4 – ¼" minnow traps

- 1 – jcs, 99 mm fl, previously clipped;
- 3 – AG, 120 – 152 mm fl;
- 4 – SS, 72 – 101 mm tl.

Station 2A (near mouth of Wolverine Creek) 4 – ¼" minnow traps

- 33 – jcs, mean 75.1 mm fl, range 67 – 87 mm fl, CPUE 0.33 jcs/trap/hr, 1 – previously clipped;
- 20 – SS, 64 - 110 mm tl.

Station 3 (app half way between the confluence with the Fortymile and the lake outlet) – 2 ¼" minnow traps.

- 4 – jcs, mean 77.0 mm fl, range 74 - 80 mm fl, CPUE 0.04 jcs/trap/hr;
- 5 – SS, 72 - 95 mm tl;
- 1 – AG, 103 mm fl.

Station 4 (immediately upstream of confluence with Fortymile River) – 4 – ¼" MT

- 33 – jcs, mean 75.3 mm fl, range 64 – 84 mm fl, CPUE 0.4 jcs/trap/hr,
- 1 – AG, 60 mm fl;
- 1 – LNS, 60 mm fl.

Notes and Observations:

- flows continued to be high, with all four gabion Structures functioning as over flow weirs;
- the condition of the gabions could not be determined;
- angling was conducted between all four gabion Structures and above Structure 1. An arctic grayling was captured between Structures 3 and 4. It was probably the larger of the grayling captured in August, as it had the same scale loss pattern;
- the large boulders at the 2007 upper datalogger site had not shifted, but the hole excavated in the stream bottom in August had filled with cobbles;
- the water was too high, and too dark, to be able to find the data logger located upstream of Structure 4;
- the Fortymile River was low enough to allow us to drive the DFO 4X4 onto the gravel bar;
- I was assisted by Angelina Buchar, of the University of Ottawa during the retrieval of the traps and processing of the captured fish;
- We re-captured two of the 74 jcs which had been fin-clipped in August, and clipped the 68 additional jcs captured in this session;
- One jcs captured at Station 4 had beak marks;
- The compound beaver dam between Stations 2 and 2A was significantly enlarged since August;
- The beaver dam immediately upstream of the mouth of Clinton Creek had been rebuilt. This is a simple dam, and spans the creek between steep banks;
- spot water temperatures at the outlet of Hudgeon Lake were 8.9 on Sept 18, and 6.1 in Clinton Creek immediately upstream from the mouth. The Fortymile River as 6.9 degrees.

Discussion

Beaver

The 2008 nival freshet and subsequent summer precipitation events essentially breached all of the dams on Clinton creek. As summer progressed new or replacement dams were constructed. Most

noticeable was the dam constructed in the autumn just upstream from the mouth, and the compound dam constructed across the developing alluvial fan between Stations 2 and 2A.

Flows

With the exception of the early summer, observed and inferred flows were greater in 2008 than in any previous year.

Temperature

Tidbit v2 data loggers were used exclusively. Data was recorded hourly.

A logger was deployed downstream of Station 1 on September 15, 2007. As flows in this portion of the stream may be violent, the logger was placed in a protected area and carefully secured to the bank. The logger was strapped to a brick. Metal cored clothes line was strung through the brick and the strap and tied off on a willow tree. The clothes line was buried, and the brick placed between large (> 1 cubic meter) boulders in the stream bed.

During freshet the boulders shifted. The clothes line remained tied to the willow and then disappeared into the substrate. A concerted effort was made to follow it down to retrieve the logger. This was unsuccessful and the attempt was abandoned. It is possible that the boulders will continue to shift and will free the logger, but it is probable that the logger will be crushed in the process.

On July 11, 2008 a logger was set upstream of gabion Structure 4. It was considered that this area would provide a stable substrate. The intent was to retrieve the logger during low water conditions in September and replace it. However, flows in September were such that the logger could not be retrieved.

A logger had been set downstream of Wolverine Creek on Sept 15, 2007. The same method of deploying the logger was used. It was retrieved on July 11, 2008 and replaced with a fresh logger in the same location. This is in a scour hole adjacent to a breached beaver dam, and far enough downstream from the confluence with Wolverine Creek that full mixing of the two creeks was likely. Data was successfully downloaded and is stored in the DFO SEP drive Y:Working/Temp data from loggers/YR North Mainstem watershed/Clinton.

During the deployment, sub-zero readings were limited to an 8 hour period between April 26 & 27, and a 3 hour period on April 28, 2008. It is likely that this was associated with the rotting of ice in the stream, and does not represent a freezing event. Mid day temperatures exceeding 10 degrees were first recorded on May 22, 2008. The maximum temperature recorded was 17.42 at 1800 hrs on June 26.

Fish

Juvenile Chinook salmon captures from 2005 through 2008 are summarized in Table 1. Numbers captured are in “n” column, and sampling sessions that resulted in no captures are indicated as “0”. The jcs/tr/hr means juvenile Chinook salmon per trap per hour, or CPUE (Catch per Unit Effort) and infers the density of Chinook salmon. Mean lengths of jcs captured at each station at each sampling session are in the fl column

Table 1 - Clinton Creek Juvenile Chinook Salmon captures, CPUE and mean lengths 2005 - 2008

Station 1 - d/s of all gabions	2005			2006			2007			2008		
	n	jcs/tr/hr	fl	n	jcs/tr/h r	fl	n	jcs/tr/h r	fl	n	jcs/tr/h r	fl
31-May										0		
7-Jul	0											
11-Jul										0		
27-Jul	0											
9-Aug				0			1		76			
12-Aug										0		
14-Sep				0								
15-Sep							13	0.25	99.8			
19-Sep										0		
Station 2 - at ford												
31-May										0		
7-Jul	0											
27-Jul	0									0		
12-Aug										2	0.02	73.5
15-Sep							18	0.346	93.4			
19-Sep										1	0.01	99
Station 2-A - mouth Wolverine Cr.												
31-May										0		
20-Jun				0								
11-Jul							0			0		
27-Jul	7	0.14	75									
9-Aug				43	0.716	75.3						
12-Aug										49	0.94	70.1
3-Sep	10	0.227	81.4									
14-Sep				11	0.196	88						
							12					
15-Sep							6	2.52	80			
19-Sep										33	0.33	75.5
Station 3 - mouth Eagle Cr												
7-Jul	4	0.08	65.4									
27-Jul	10	0.21	77.3									
12-Aug										11	0.21	71.9
19-Sep										4	0.04	77
Station 4	lowest reach Clinton Cr											
31-May										1+	0.01	96
20-Jun				13	0.135	51.9						
11-Jul							53	0.609	71.3	1	0.01	53
				17								
9-Aug				5	2.916	64.9						
12-Aug										0		
3-Sep	33	0.75	70.2									
				12								
14-Sep				0	2.069	70.1						
15-Sep							58	0.81	70.7			
19-Sep										33	0.4	75.3

The age 1+ jcs captured on May 30 is the first yearling Chinook captured in Clinton Creek by DFO. It is likely that the majority of salmon that may have successfully overwintered had left the creek prior to the sampling. This could have been due to the rising water temperature, the spring freshet, or a combination of the two. Of interest, two 1+ jcs were captured in nearby Mickie Creek in May, which is much cooler than Clinton Creek and to be utilised by lower numbers of jcs. With fl of 76 and 77 mm, they were also much smaller than the 96 mm fl jcs from Clinton.

Numbers of 0+ jcs captured at all Stations on all occasions were lower than in 2006 or 2007. This is likely due to a number of reasons, as the supply of jcs to Clinton Creek is considered to be predominantly from the Yukon River basin upstream of the Fortymile River. Possible reasons for a diminished supply to Clinton Creek in 2008 include:

- a low spawning escapement of Chinook salmon to the Canadian portion of the Yukon River in 2007, which would have negatively affected the potential supply of jcs;
- high summer flows in the majority of the upper Yukon River basin from early July to freeze up, which could have resulted in increased displacement of jcs downstream past the Fortymile;
- apparently cooler than normal water temperatures in the summer of 2008 compared to other years. However, a water temperature monitoring network does not yet exist in the upper Yukon basin to allow comparisons between sites or between years.

No 0+ jcs were captured in late May, despite 1/8" mesh traps being used. A single 0+ was captured at Station 4 on July 11.

The DDRRC captured a total of 58 0+ jcs near the mouth between July 17 and August 7. This was less than the 991 captured in 2006 and the 2070 in 2007. Again, this may be a reflection of the stream conditions and of the potentially low supply of 0+ juveniles. These 0+ salmon were immediately restored to the creek at Station 2A.

Sampling in August indicated that 0+ Chinook salmon had been able to migrate upstream to the minesite, as 51 jcs were captured there. This was confirmed in September, when only two of the 34 jcs captured at the mine site had been captured in August.

No salmon were captured at Station 1 in 2008, and only 3 were captured upstream of Station 2A. Of the three, only one was captured in September. This individual had a fin clip and was, at 99 mm, a full 12 mm longer than the next longest jcs captured.

Sampling on September 18 – 19 established that jcs had been able to migrate upstream to the minesite prior to the sampling. Two of the 34 jcs captured at the minesite had pectoral clips, indicating that they had been captured in August. The remainder did not. A single jcs was captured at Station 2A, and none at Station 1.

As is usual, Station 2A provided consistently high captures relative to other Stations. In September 2007, 2 traps captured 126 jcs, while in 2008, 4 traps captured 33 jcs, inferring much lower densities. Despite this, the mean fork length of the jcs captured in 2008 was, at 75.5 mm, 4.5 mm less than the jcs captured in 2007. At Station 4, the implied density in 2008 was half what it was in 2007, but the mean fl was 4.6 mm longer in 2008.

None of the cysts observed on jcs in September 2007 were seen in 2008.

Arctic grayling were captured at the minesite from July onward. This is in contrast to 2007, when no grayling were captured or observed upstream of Station 4. The lack of grayling in 2007 was probably a result of the cumulative effect of the beaver dams in the creek (and of the hydrologic conditions that allowed them to remain in place) and of the low effort in sampling intermediate locations. The abundance of grayling in 2008 is probably attributable to the breaching of the dams by the 2008 nival freshet and subsequent precipitation events.

Yearling (1+) grayling were captured in the traps, while two size classes of older grayling were angled immediately downstream of the gabion Structures and between Structures 3 and 4. The latter group appeared to have migrated above Structure 4 during the high water event(s) that occurred between the July and August sampling. This is the first time that grayling have been observed within any of the Structures since 2005, when two large grayling spent the majority of the summer in the pool between Structures 3 and 4. At least one grayling remained above Structure 4 as late as September 18, 2008 when it was angled (and released). No young-of-year grayling were captured at the minesite, and it is likely that spawning did not occur there in 2008. The single 0+ grayling was captured at Station 4 in September.

Angling above Structures 3 and 2, and within Hudgeon Lake, was unsuccessful, with no captures or bites by fish.

Slimy sculpin were much more commonly captured in 2008 than in 2007, particularly at Station 2A. They may have been more common than in 2005, when they were very easy to observe due to low water levels. In 2008 the water was generally high, stained, and slightly turbid in Station 2A. Still water areas tend to have flat water surfaces, allowing the best visibility into the water. These were partially or entirely foam covered during the July, August and September sampling sessions, and few fish were observed.

Only one sculpin was captured at Station 1 in 2008. This occurred during the July sampling. Of interest, the 3 largest sculpin yet caught in the DFO sampling of Clinton Creek were captured in September. Two had a total length of 109 mm, and one was 110 mm.

Recommendations for 2009

The following activities are recommended for 2009

- Overwintering success of juvenile Chinook salmon – conduct prefreshet sampling at the minesite;
- Thermal regimes – continue deployment of data loggers;
- Summer sampling – follow same general schedule and sampling plan as 2007;
- Canyon development – continue to monitor;
- Performance of gabion structures/baskets – continue to monitor.