Fisheries and Oceans | Pêches et Océans

MEMORANDUM NOTE DE SERVICE

To
A

File:

- **Clinton Creek FCSAP**
- **Clinton Creek stream file**

Security Classification - Classification de sécurité	
Our file - Notre référence	
Your File - Votré référence	
Date	**Dec 6, 2005**

From
De

Al von Finster
RRB
ESD OHEB
Y&TBR Area
Fisheries and Oceans Canada

Subject
Object

Clinton Creek, tributary to the Fortymile River, Yukon River North Mainstem sub-basin – record of 2005 sampling

The Clinton Creek Asbestos Mine receives funding under the Federal Contaminated Sites Action Plan (FCSAP). Fisheries and Oceans Canada serves as an Expert Department under FCSAP. In the summer of 2005 we conducted sampling in Clinton Creek to increase our understanding of the existing and potential effects of the mine on the creek.

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.

Other than a ford on the access to the former townsite, roadways are generally located away from the creek. There is a considerable amount of waste material in the creek which presumably has washed down from the minesite. There is also much cable in the creek, seemingly electrical. This is strong enough to hold significant quantities of debris, and to partially block the channel. In the few areas of the stream that were looked at collateral to the 2005 sampling, erosion of stream banks as a result of the debris accumulations was noted.

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.

Sampling was completed on three occasions during the summer of 2005: July 6 & 7, July 26 & 27, and September 2 & 3. All sampling was by minnow traps baited 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, a sentinel species.

Flows in Clinton Creek were low in early July and continued to decrease over the summer. The gabions at the lake outlet structure were already de-watered during the first sampling event on July 6 & 7. By the second sampling event, there was no surface flow in the lower part of the canyon section, and by the third sampling, there were several areas with no surface flow above the beaver dam complex at the Wolverine Creek confluence.

A helicopter over-flight of the Clinton Creek was conducted on August 9. Beaver dams were noted across the creek starting just upstream from the Clinton Creek Townsite Road, with colonies along the creek to the wetland area. Where visible from the mine access road, beaver activity increased over the summer, with new dams being constructed. During the final sampling event on September 2 & 3, new secondary (i.e., ponds did not contain a beaver lodge) dams were observed; these were under construction immediately downstream of the confluence of Wolverine Creek and Clinton Creek and downstream of the Townsite Road.

Ground water discharges entering Clinton Creek from the south were observed from the Wolverine Creek confluence upstream nearly to the lake outlet. Long, streaming, green filiform algae marked discharge locations.

An adaptive plan for fish sampling was implemented and is described below. Locations of sampling stations are shown in Figure 1.

July 6 – 7 sampling

This sampling set the context for the summer's work. DFO had not sampled upper Clinton Creek previously, but sampling had been conducted by others from the 1970's onward. In recent sampling (2003 & 2004) high numbers of fish had been captured between the lake outlet and the beaver dam complex. Arctic grayling and slimy sculpin were most common, with much lower numbers of long-nosed suckers and juvenile Chinook salmon.

Three stations were set:

> Station 1 – 8.5 km upstream from the mouth, and immediately downstream of the gabion structure at the lake outlet, to indicate Chinook and sculpin use above the canyon;
>
> Station 2 – 7.8 km upstream from the mouth, and immediately up- and downstream of the ford to the minesite, to indicate fish use below the canyon; and
>
> Station 3 – 4.8 km upstream from the mouth, and approximately half way between the minesite and the Fortymile River, to indicate fish use below the minesite.

Captures were:

> Station 1 – Arctic grayling (AG) – 2;
>
> Station 2 – slimy sculpin (SS) – 9;

Station 3 – Chinook salmon (CK) – 4; SS – 3; AG – 3

Observations & notes on captures:

- The CK were between 61 and 67 mm in fork length (FL); these were likely young-of-year that had migrated upstream from the Fortymile River;
- The AG at Station 1 were between 55 and 57 mm FL; these were probably young-of-year (0+);
- Between 30 and 50 sub-adult and adult AG were observed at Station 1;
- The AG at Station 3 were between 98 and 118 mm FL; these were probably 1+;
- No SS were captured at Station 1, although the habitat appeared to be appropriate;
- The SS captured at Stations 2 & 3 were between 54 – 76 mm in total length (TL);
- Water temperatures on July 6 were:
    - Station 1 – 1420hrs - 18.6˚C;
    - Station 2 – 1520hrs - 12.8˚C;
    - Station 3 – 1535hrs - 13.1˚C;
- No fish were seen rising in Hudgeon Lake.

July 26 -27 sampling

Station 1 was sampled again to try to capture SS. Station 2 was sampled, as there was a surface connection between it and the beaver dam complex near the Wolverine Creek confluence and Chinook could have ascended to the Station. A new Station (Station 2A) was set immediately downstream of the confluence with Wolverine Creek to determine whether juvenile Chinook salmon were present. Station 3 was sampled. Results were:

Station 1: AG – 5

Station 2: SS – 7; AG – 7

Station 2A: CK – 7; SS – 15; AG – 2

Station 3: CK – 10; AG – 3

Observations & notes on captures:

- Two large adult AG were observed in the second pool in the gabion structures, but none were observed at Station 1;
- AG captured at Station 1 were from 80 to 92 mm FL;
- no SS were seen at Station 1;
- AG between 100 and 150 mm were seen in a number of the small pools at Station 2; AG captured at this station were between 108 and 133 mm FL;
- Fish were highly visible at Station 2A. A number of beaver dams had been recently constructed or were in the process of construction and salmonids (CK & AG) were seen immediately downstream of each of these features. SS, some very large, were common;
- The CK captured at Station 2A were between 69 and 83 mm FL; these were likely young-of-year;
- The AG captured at Station 2A were between 110 and 113 mm FL;

- The SS captured at Station 2A were between 65 and 106 mm TL; the 106 mm individual is quite large for this species;
- The CK captured at Station 3 were between 72 and 84 mm FL; these are likely young-of-year;
- The AG captured at Station 3 were between 110 and 140 mm FL;
- No fish were seen rising in Hudgeon Lake.

September 2 – 3 sampling

Water levels had further decreased from late July levels. As a result Stations 1 & 2 were not sampled because there was no access to these sites from downstream. Station 2A was sampled to obtain data on juvenile Chinook salmon summer growth. Station 3 was not sampled as Chinook utilisation upstream of the station had been confirmed. The low numbers of Chinook salmon captured in Clinton Creek relative to Mickey Creek, (located across the Fortymile River) was a concern. Clinton Creek was warmer, had more stable flows and a smaller sediment load. On the basis of past experience, there should have been similar or greater densities of juvenile Chinook in Clinton Creek. A Station was therefore placed near the mouth of Clinton Creek and downstream of all observed beaver dams (Station 4). Hudgeon Lake was also sampled.

Clinton Creek captures were:

Station 2A – CK – 10; SS – 5; AG – 2

Station 4 – CK – 33

Observations & notes on captures:

- Station 2A had been extensively modified by beaver dams since the last sampling. Only a relatively small section of the Station was free flowing water. Few fish were seen;
- The SS were between 88 and 105 mm TL;
- The AG were between 109 and 115 mm FL; these were probably young-of-year nearing the end of summer growth;
- The CK captured at Station 2A were between 76 and 88 mm FL (mean FL = 81.4 mm) and those captured at Station 4 were between 62 and 80 mm FL (mean FL = 70.2 mm). These size ranges are consistent with those from other juvenile Chinook non-natal rearing streams. These data also suggest that densities tend to decrease with distance upstream and average size of individuals tends to increase; this is consistent with data from other non-natal rearing streams;
- Water temperatures on September 2 were:
    - Station 2A – 1800 hrs– 9.1˚C;
    - Station 4 – 1845 hrs– 8.2˚C;
- No fish were seen rising in Hudgeon Lake.

Two minnow traps were set in the outlet of Hudgeon Lake and two gill net gangs were set:

- at the upstream end of the lake, a sinking gill net gang with panels 14.5 m X 2 m X 50 mm; 13 m X 2 m X 70 mm stretched mesh gill net, set in drowned forest;

- near the outlet of the lake, a sinking nylon monofilament gill gang, 17 m X 2 m X 52 mm; 16 m X 2.2 m X 78 mm; 16 m X 2.2 m X 32 mm; 15 m X 2.2 m X 45 mm; 13 m X 2.2 m X 65 mm; 13 m X 2.3 m X 35 mm.

No fish were captured in the minnow trap or in the outlet gill net set. A single female Arctic grayling (280 mm FL), was captured in the upstream gill net set.

Discussion & conclusions

Hydrologic regime and consequences

High flows in Clinton Creek are buffered by Hudgeon Lake. Low creek levels are thought to be further reduced as a result of evaporation from the lake's 115 ha surface area. The extensive off-channel wetland area near the Wolverine Creek confluence provides stable habitat for beaver and their numbers are a reflection of this high quality habitat. Non-glaciated areas of the Yukon, including the Clinton Creek basin, are often associated with violent spring freshets that are thought to reduce the incidence of cross-valley beaver dams compared to glaciated regions where spring freshets tend to be less concentrated. The buffering effect of the lake on downstream flows is believed to reduce the risk of annual destruction of beaver dams by spring freshets, thus allowing beaver colonies in this area to thrive. Beaver should now be considered a permanent fixture of this creek and their activities will affect any fish or fish habitat related management or research activities.

Fish passage over gabion structures at outlet of Hudgeon Lake

In the past grayling have been seen rising in Hudgeon Lake near the outlet during open water periods and have been angled from this location. The overwintering habitats of these fish have not been confirmed, but must be in locations upstream or downstream of the lake outlet.

Hudgeon Lake was thought to be largely or totally anoxic in winter. There was speculation of an overwintering population of Arctic grayling using ground water discharge-fed habitats either within the lake or in the watershed upstream of it. If such habitats exist but are limited (given periodic changes in discharge quantity or quality), any overwintering fish stock could be vulnerable.

The gabion structures at the outlet of Hudgeon Lake were designed to allow the upstream migration of Arctic grayling during the spring freshet. In previous years grayling were seen rising at the outlet of Hudgeon Lake, although none were observed in 2005. Results of the 2005 sampling for fish habitat use and species presence/absence, where only one arctic grayling was caught, are inconclusive because the sampling effort was inadequate (too little fishing effort) and the sampling gear (sinking gill nets) was not suitable for the sampling conditions. The longest net was probably fishing anoxic waters, where fish are unlikely to be located. Further investigation is warranted to determine fish habitat use and species presence/absence in Hudgeon Lake.

Arctic grayling in Clinton Creek

The high numbers of Arctic grayling captured in minnow traps was unexpected, as they tend not to be attracted to bait. This result is likely a reflection of the high density of juvenile Arctic grayling in the creek. The high densities may be the result of low flow conditions and a high degree of beaver damming which limited the migration success of juveniles.

The single Arctic grayling captured in Hudgeon Lake was very fat, implying excellent habitat for any grayling that was able to access the lake in 2005. It was unlikely that any fish would be able to leave the lake in 2005 because low flow conditions in the creek prevented a surface water connection with the creek downstream. Such connection could only occur as a result of fall rains.

Slimy Sculpin

Slimy sculpin were very common in the Wolverine Creek confluence area, and large individuals were captured. This indicates that there is habitat (e.g., water) in the immediate area of sufficient quality and quantity to support aquatic life though the winter months.

Slimy sculpin were not captured in Clinton Creek above Station 2 or in Hudgeon Lake. Sampling effort in Hudgeon Lake was light, but the degree of sampling at Station 1 should have resulted in captures if sculpin were present. It is possible that Slimy sculpin are no longer present in the upper watershed, and further investigation is warranted.

Chinook Salmon

Chinook salmon were not captured as far upstream as expected. Numbers captured were low, especially in upper areas of the creek. It is likely that the timing and intensity of the upstream migration of juvenile Chinook salmon was affected by dams constructed and maintained by a series of beaver colonies, and by the general low flow conditions in the creek over the summer.

It is likely that beaver dams and low flow conditions will continue to limit upstream migration of both juvenile and adult fish in Clinton Creek. Juvenile trapping (near the mouth) and physical placement of individuals upstream in rearing and overwintering habitats, should be considered.

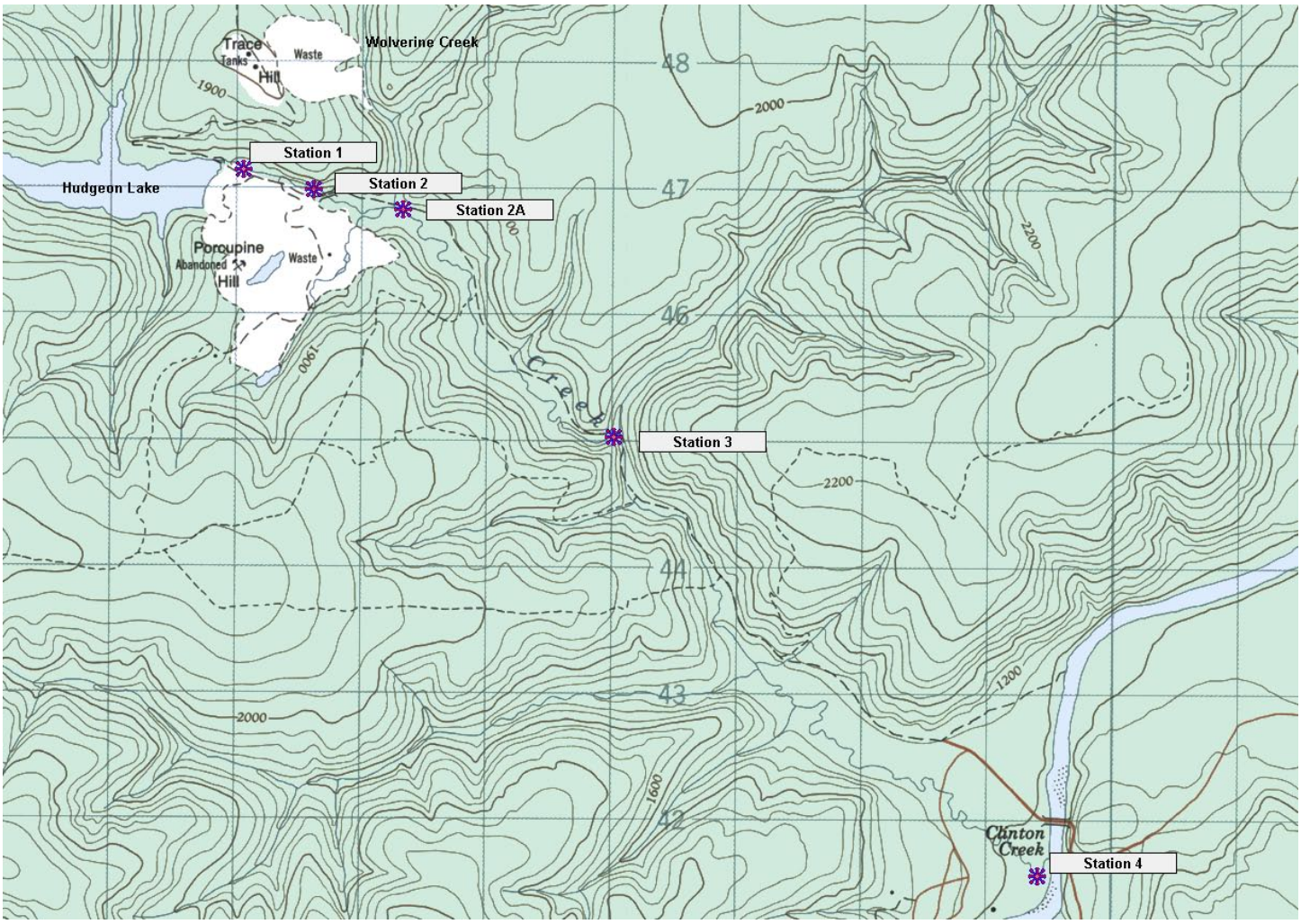

Figure 1. 2005 juvenile trapping stations on Clinton Creek

Table 1. Summary of fish trapping completed on Clinton Creek 2005.

			Chinook salmon	Slimy Sculpin *	Arctic grayling
July 6 & 7	station 1	n	0	0	2
		mean length (mm)			56
		length range (mm)			55-57
	station 2	n	0	9	0
		mean length (mm)		67	
		length range (mm)		58-76	
	station 2A	n	(not sampled)		
		mean length (mm)			
		length range (mm)			
	station 3	n	4	3	3
		mean length (mm)	64.5	58.7	105.3
		length range (mm)	61-67	54-64	98-118
	station 4	n	(not sampled)		
		mean length (mm)			
		length range (mm)			
July 26 & 27	station 1	n	0	0	5
		mean length (mm)			85.2
		length range (mm)			80-92
	station 2	n	0	7	7
		mean length (mm)		72	117.9
		length range (mm)		65-79	108-131
	station 2A	n	7	15	2
		mean length (mm)	75	80.5	111.5
		length range (mm)	69-83	65-106	110-113
	station 3	n	10	1	3
		mean length (mm)	77.3	75	122
		length range (mm)	72-84	75	116-140
	station 4	n	(not sampled)		
		mean length (mm)			
		length range (mm)			
September 2 & 3	station 1	n	(not sampled)		
		mean length (mm)			
		length range (mm)			
	station 2	n	(not sampled)		
		mean length (mm)			
		length range (mm)			
	station 2A	n	10	5	2
		mean length (mm)	81.4	96.4	112
		length range (mm)	76-88	88-105	109-115
	station 3	n	(not sampled)		
		mean length (mm)			
		length range (mm)			
	station 4	n	33		
		mean length (mm)	70.2		
		length range (mm)	62-80		

* slimy sculpin measurements in TL; all others in FL;