



## YUKON RIVER NORTH MAINSTEM STEWARDSHIP

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## **ABSTRACT**

The primary goal of this project was to build community capacity to maintain and protect salmon and their habitats in the Dawson region through involvement and education of local youth. Two local high school students were hired as Student Stewards and supervised by an experienced Field Supervisor. Hands-on training was provided to the youth as they carried out meaningful activities. These included restoring Chinook salmon to productive rearing habitats, salvaging juvenile Chinook from isolated pools, conducting juvenile Chinook salmon growth monitoring, investigating the timing and extent of juvenile Chinook salmon presence and abundance, ground-truthing GIS-based mapping, collecting DNA samples, and learning about bio-engineering techniques. Project planning was conducted in consultation with DFO and informed by our record of past activities. The crew started field work on July 4 and ended on August 5, 2016. Weather and river conditions posed some challenges to the project. Most planned activities were completed but were affected by low numbers of juvenile Chinook in the Klondike watershed. The Public Day, an open invitation to local residents, was held at the Germaine Creek Avulsion Channel on August 5. The Student Stewards demonstrated the skills they had acquired and shared their knowledge with the 49 participants. Despite the low numbers of juvenile Chinook in the Klondike, the project was a success. We believe it will contribute significantly toward meeting our long term goal for the future of salmon in the Dawson area.

## **ACKNOWLEDGEMENTS**

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## **INTRODUCTION**

In the early 2000s Tr'ondëk Hwëch'in elders and other Dawson locals voiced concerns that salmon rearing and spawning habitat had been diminishing within the Tr'ondëk Hwëch'in traditional territory. Technical investigations by the YFWMB Dawson Area Community Steward and the Department of Fisheries and Oceans Salmon Enhancement Program (SEP) staff on non-spawning streams in the Dawson area were conducted. They confirmed that beaver dams and other non-permanent barriers had obstructed the upstream movement of salmon fry into known rearing and overwintering habitat. (Jones 2005, von Finster 2005b & 2005c) Additionally, significant numbers of fry were found after the spring freshet in isolated pools in the Klondike River valley (von Finster 2004b & 2005a).

This provided an opportunity for the DDRRC to initiate a project where local youth could be engaged in salmon habitat restoration, conservation and management activities. The model we chose was to hire two local high school students and an older, experienced local Field Supervisor. A pilot project took place in 2006, and provided important information for the planning of the 2007 project. The project has been conducted every year since. Annual pre-season planning and in-season implementation builds on the results of past seasons. These results are recorded in the "Record of Activities" which is updated at the conclusion of each field season. The Record is provided in Appendix C.

## **PROJECT GOAL AND IMPLEMENTATION STRATEGY**

The goal of the 2016 project was to continue to develop and maintain community capacity in the Dawson City region to protect, maintain and restore salmon stocks and habitats. We concentrated on Chinook salmon due to the priority that Dawson residents afford this species. The presence of the juvenile life stage throughout the summer provided opportunities for the Stewards to carry out meaningful activities in non-hazardous waters. Our strategy was to hire two local high school students from early July to early August. Both Student Stewards were new to the project. They worked under the direction of a Field Supervisor and the guidance of a Technical Advisor. The Student Stewards were provided with a wide range of hands-on training through participation in a variety of salmon and salmon habitat management and research activities. The planned project activities reflected the expected juvenile salmon supply and environmental conditions. The implementation reflected the actual juvenile salmon supply and field conditions during the project. The context of all activities undertaken was explained to the students: they learned both *how* and *why* the activity was undertaken. The youth demonstrated their acquired skills and knowledge to children and community members during the Public Involvement Day. The existing "Record of Activities" was updated.

Two monitoring and assessment sampling events were planned. Spring sampling was conducted in partnership with DFO on May 25 & 26, 2016 to determine whether juvenile Chinook salmon had successfully overwintered in the areas to which they had been restored to in 2014. Autumn sampling occurred on September 18 & 19 in the Klondike River drainage. Assessment sampling could not be conducted in Clinton Creek due to construction activities at the sampling site. Assessment sampling was conducted as in-kind contributions to the project.

## **RELEVANCE AND SIGNIFICANCE**

The annual delivery of this project is both relevant and significant to the maintenance of the constituency for salmon and salmon habitat in the Dawson area. In the Dawson community, “maintain” is a critical concept: although the cultural value of salmon is widely recognized, the community realizes little economic benefit from the salmon fishery. Significant economic benefit is realized from mining and related activities. Salmon are seen by many in the mining industry as an impediment to development and an added expense that they must bear as they work hard to support their families. Children in Dawson are raised in this social environment. Many or most will enter the mining or associated industries early in life, and pursue the occupation either as a career or as seasonal work to fund their educations. Our annual projects continue the work of ourselves and others in raising public awareness as a critical, local component in building and maintaining a constituency for salmon. We are extending a process that started in the early 1990s and has continued through community projects funded by a wide range of programs, agencies and entities. Funders have included the Yukon River Panel under the both the Interim and Final agreements; the Yukon-Canada Economic Development Agreement and other joint federal-territorial funding programs; DFO under the Habitat Conservation and Stewardship Program (HCSP), the Habitat Restoration and Salmon Enhancement Program (HRSEP) and various funding sources within the Salmon Enhancement Program (SEP); and others. Notably, the high school students we now hire had not been born when the Dawson community first sought funding to invest in the future of our salmon.

In our 2006 Pilot Project we selected the local community of Dawson City as our target group. We chose local high school students as the most effective means of reaching the larger community. As Student Stewards, they inform their peers, parents and neighbours of their activities during the course of the project and the following winter. They also explain their activities and the value of the Klondike River to salmon at the Public Involvement Day. This is of particular importance to the younger children who attend the event. Children tend to look up to teenagers and accept them as role models. Having youth as positive role models and educators at the Public Involvement Day is a powerful means of transferring information to, and wakening interest in, the younger children. These children are our future.

The Student Stewards’ exposure to salmon and salmon habitat and related research activities may influence the educational and career paths they will follow. We recognize that most youth will leave Dawson and travel to Whitehorse or much further for their education or to experience the larger world. This is expected of young people. However, we anticipate that many or most will return to Dawson. They will then contribute to and perhaps provide leadership to our community in the management of our lands, waters, and the salmon that depend upon them. They will become the constituency of the future for Yukon River salmon.

## **PLANNING**

Most project planning took place during the Detailed Proposal stage of the application process. The “Yukon River North Mainstem: 2015 Record of Activities” was reviewed, and the recommendations reviewed.

A primary consideration was being in compliance with the Yukon Government’s Code of Practice for Young and New Workers. The Code recognizes the vulnerability of young workers to injury and reinforces the principles of employer responsibility to both protect and to develop the young workers. It also compels us to carefully consider potential activities for the Stewards to ensure that societal values and thresholds regarding risk are not exceeded. Unfortunately, it constrains our ability to conduct boat-supported field work or work in or near deep and/or swift water. We therefore concentrate on juvenile Chinook related activities, or observations of adults from shore or overhead (ie Dempster Bridge) structures.

A number of Field activities were planned for the Student Stewards in 2016. These included:

- conducting juvenile Chinook salmon growth and habitat utilization monitoring.
- conducting juvenile Chinook salmon overwintering habitat monitoring.
- collecting field information to allow or contribute to ground truthing of placer habitat suitability maps.
- restoring juvenile Chinook salmon to productive habitats.
- salvaging juvenile Chinook salmon from ponds isolated from surface flows
- collecting DNA samples from juvenile Chinook salmon in lower Clinton Creek and the lower Klondike River
- supporting the delivery of the Public Involvement Day by demonstrating and explaining what they have learned to children and community members.

Outcomes for most of the planned activities were identified in our Detailed Proposal and are included in the “Summary” section of each activity. Reports of additional activities follow.

## **IMPLEMENTATION**

Funding was confirmed on April 20-16, and the contract with the PSC was signed on May 24-16/

Key Personnel identified in our Conceptual- and Detailed Proposals were available. Hans Algotsson returned as the Field Supervisor, Al von Finster as the Technical Advisor and Andrea Oppen as the Public Involvement Day Co-ordinator. Project coordination and communication was provided by the author in her role of Dawson District Renewable Resource Council Executive Secretariat.

A 4 x 4 SUV was provided by Hans Algotsson.

Equipment was taken out of storage, checked and serviced. New equipment was prepared for field deployment.

On May 5, 2016 an application was made to DFO for a Scientific Collection License to authorize fish sampling. License XR 130 2016 was issued on May 15. A summary report was submitted to DFO Licensing on April 24, 2016, fulfilling all requirements of the license.

On May 9th the hiring process began. Council received four very good resumes and out of these chose Joy Morin and Teresa Procee.

The Field Work component of the project commenced on July 4, 2016. The Student Stewards were briefed in accordance with the Orientation requirements of the Yukon Government's Code of Practice for Employers of Young and New Workers. This included identification of the Field Supervisor, location of First Aid facilities, procedures for the reporting of illnesses and injuries, emergency procedures and the rights and responsibilities of both workers and employers to maintain a safe workplace. The Training requirements of the Code took place throughout the project. It included instruction and demonstration of tasks and work processes, observation of the Student Stewards performance and feedback where necessary. Hazards were identified to the Stewards, and personal protective equipment was provided.

The Schedule was generally followed, although some modification was required due to persistent high water conditions and the low numbers of juvenile Chinook salmon captured in the Klondike River in 2016.

The spring snow melt was early and did not result in extreme river and stream flows. July was moist, with precipitation at Dawson being recorded on all but 3 days. August was wet, with 4 major precipitation events. The final major precipitation event occurred in early September.

Each of our proposed activities is reported below. The title is followed by the metrics we proposed to report our "outcomes". The Summary section provides the data or a summary statement. Where the activity was scientific or technical in nature a short report follows the Summary section. The Public Involvement Day report is provided as Appendix A.

**Student Stewards** – outcomes reported as days worked.

The Student Stewards worked a total of 25 days each.

Neither Student had worked for us in past years. Both Teresa Procee and Joy Morin had completed Grade 9. Both returned to school in Dawson this autumn. Prior to the project commencing, both received Bear Awareness- and Standard First Aid training. After orientation they received a combination of hands-on training and stream-bank seminars in aspects of salmon sampling and salmon habitat management, mapping, and research. Each of the following activities contributed to their education.

**Public Involvement Day** – outcomes reported as numbers of participants.

A total of 49 persons participated in the Public Involvement Day. Please see Appendix A for a report on this activity.

**Salvage of salmon from isolated pools** – outcomes reported as the total number of fish, by species.

Summary: 501 juvenile Chinook salmon were salvaged.

Introduction: Salvage occurred in isolated pools in the Germaine Creek Avulsion, and the “Tourist Pullout Pool” (63.95287/138.67220). The “Fence Site” identified in 2015 downstream of the confluence with All Gold Creek (63.945308/138.634014) remained connected to the Klondike River due to the relatively high flows. The Germaine Creek avulsion is a section of Klondike River channel that carries surface flow during the spring freshet and summer high water events. Surface flows generally cease in late May or early June. Shallow pools remain and are isolated from surface flows. Large numbers of 0+ juvenile Chinook may be trapped in the pools: in 2007, for example, 1297 were salvaged (Smart, 2007). Annual numbers salvaged since 2006 are presented in Table 1. The pools heat up during the long days of early summer, with temperatures above 25 degrees during periods of warm and clear weather. During these periods the salmon congregate around cooler ground water seeps in the upstream end of the pools. The salvage component of the project is generally our first activity as it provides a good opportunity to train the Students in the capture of juvenile Chinook salmon and in the respectful handling of captured fish. It also provides an early indication of the general abundance of juvenile Chinook salmon in the Klondike River. The Tourist Pullout Pool is a deep scour pool that is isolated from the Klondike after freshet. The “Fence Site” developed during the 2015 freshet. A fence of large organic debris formed across the upstream end of a side channel. The fence filled with sediment, closing the upstream end of the channel at summer flows. The side channel was fed by overland flows in May and early June. Scour pools remained but were not isolated from surface flows in 2016.

Methods: The salvage commenced on July 4 and extended to July 15. Minnow traps were baited as per the Fisheries and Oceans Canada “Protocol for the baiting of Gee-type minnow traps for the capture of juvenile Chinook salmon in the Yukon River Drainage Basin” (the DFO protocol). All fish captured were enumerated and placed in buckets. The buckets were carried by hand to the Klondike River or into waters that have surface flow into the Klondike River throughout the summer.

Results: A total of 501 juvenile Chinook salmon were salvaged, with 494 from the Germaine Creek Avulsion and 7 from the Tourist Pullout Pool.

Discussion: Table 1 shows the number of juvenile Chinook salvaged from the Germaine Creek Avulsion Channel (GAGC) since salvage began in 2007. The 494 juvenile Chinook salmon salvaged in 2016 was the second highest recorded to date and well above the average of 292.

Year	Number
2007	1297
2008	8
2009	419



2010	268
2011	51
2012	299
2013	3
2014	8
2015	77
2016	494

Conclusion: This demonstrated to the Student Stewards the variability characteristic of natural systems, and the need to use of standard methods to generate comparable data.

**Overwintering habitat access** - outcomes reported as result of the activity

Summary: The Viceroy Channel was inspected from the North Fork Road to the confluence with the North Klondike River. No obstructions were noted.

Introduction: This channel has a measured usable length of 1359.5 meters and a wetted area of 5854 m<sup>2</sup> (Taylor, 2012). It does not flood during summer. The channel was identified as valuable overwintering habitat during construction of the Viceroy Road. In late October of 1995 a total of 196 0+ juvenile Chinook salmon were salvaged from the footprint of the road immediately prior to construction. This area was approximately 30 square meters, giving a calculated density of 6.5 juvenile Chinook salmon per square meter. This is high: densities estimated elsewhere in the Yukon River drainage seldom exceed 1 juvenile per square meter (Bradford, 2001). Monitoring of the Viceroy Channel by DFO and DDRRC has indicated that the intensity of utilization by juvenile Chinook salmon varies. It has reflected both the apparent strength of the brood year and the accessibility of the channel to juveniles. A beaver dam was constructed near the mouth of the channel in late 2006. No 0+ Chinook were captured in 2007, 2008 or 2009. The dam was abandoned by the beaver in the winter of 2008-09, and was breached by the DDRRC in 2009. The 2009 Chinook escapement to the Klondike River was strong, at an estimated 5147 (Mercer, 2010). In 2010, captures of juvenile Chinook salmon approached pre-beaver dam levels at the monitoring site, with 55 captured on August 8 and 36 on September 15. Water temperature monitoring in the channel is ongoing. The channel becomes ice covered but does not freeze. Temperatures of ground water supplying the channel have been monitored by the Tr'ondek Hwech'en. Preliminary results indicate strongly that the water feeding the channel are hyporheic flows from the North Klondike River (von Finster, 2011). Chinook salmon have been captured in the channel in the spring, confirming successful overwintering.

Methods: The crew walked beside the channel from the North Fork Road to the confluence with the North Klondike River on July 12. Minnow trapping was conducted on July 12/13, July 19/20 and September 16/17 at the monitoring Station at the North Fork Road Crossing.

Results: The channel was clear of obstructions on July 12. No juvenile Chinook salmon were captured at the North Fork Road Crossing in July sampling and a single juvenile Chinook Salmon was captured in September. The channel was not frozen at the data logger site during the winter of 2015/16.

Discussion: The Viceroy Channel is ground water fed and has stable flows and the demonstrated potential to support large numbers of juvenile Chinook salmon. This potential was not realized in 2016. The reasons for this are unclear, but may be related in part to a low escapement to the Klondike River in 2015. Unfortunately escapements are no longer monitored on either the Klondike or North Klondike Rivers.

Conclusion: The Student Stewards were exposed to the need to keep access to important habitats unobstructed.

**Klondike River juvenile Chinook implied abundance and growth monitoring** - outcomes reported as numbers of salmon captured, numbers sampled, basic statistical analysis and provision of raw data to interested agencies

Summary: The Boat Launch Monitoring Station (BLMS) is no longer suitable for monitoring and was replaced by stations at the Airport Access and the Klondike River at the head of the Germaine Creek Avulsion. The Airport Access was sampled on three occasions and the Klondike River at head of Germaine Creek Avulsion was sampled twice.

Introduction: The Airport Access and the Klondike River at the head of the Germaine Creek avulsion offer the best combination of safety and ease of access for sampling. Sampling takes place during the field season and in September with a desired sampling size of 30 or more salmon per sampling period. The objective of the sampling is to determine implied abundance through numbers captured and an index of growth through comparison of the mean lengths and weights between mid-July and mid-September.

Methods: Minnow traps were baited and set as per the DFO protocol. All fish captured were enumerated by species. All 0+ juvenile Chinook salmon captured were sampled until the goal of 30 salmon per site/per sampling event was met. Fork lengths were measured to the nearest 1 mm, and weights were determined to 0.1 gram with an Ohaus HH120D digital scale.

Results: Captures of juvenile Chinook salmon were low, and at no time achieved the desired 30 per sampling event. At the Airport Access, 28 were captured on July 22, 24 on August 5, and 9 on September 19. Mean fork lengths were 67.5, 72.5 and 75.3 mm respectively, and mean mass was 3.0, 3.0, and 4.1 grams. At the Klondike River at the head of the Germaine Creek Avulsion, 20 were captured on July 22 and 24 on August 5. Mean fork lengths were 62.8 and 70.0, while mean mass was 2.5 and 3.7.

Discussion: The implied abundance was low throughout the season, with a marked reduction between early August and mid-September sampling. The numbers captured were insufficient to calculate meaningful length or mass increase rates.

Conclusion: The results of this component of the project were supported by all other sampling conducted in the Klondike River in 2016, and emphasized the variability of natural systems.

**Yukon Placer Fish Habitat Suitability (YPFHS) Map - Klondike River ground truthing**  
- outcomes reported as locations and numbers of sites investigated and the results reported to DFO.

Summary: In 2012 nine water courses were identified from the YPFHS map as having potentially questionable Classifications. Eight of the 9 water courses were located where they crossed the Dawson Road and one could not be found. Seven of the 8 identified in 2012 were sampled in 2016. Fish were only captured in 1 of the 7 streams. 1 juvenile Chinook Salmon was captured upstream of the Klondike Highway.

Introduction: The YPFHS classifications were computer-generated and based on existing 1:50,000 maps (Yukon Placer Secretariat, 2007). Many or most of the 1:50,000 base maps were drawn from aerial photographs taken in the 1940s and 1950s. The YPFHS classification model uses stream gradient and distance from a Chinook salmon spawning or migration route as primary determinants of habitat suitability. The classifications were not ground-truthed in the lower Klondike valley. Many were believed to be inaccurate, as other inaccuracies have been identified. As an example, the first series of maps showed the North Klondike River as flowing down the Klondike ditch instead of in its real location.

The inaccurate classifications are most apparent in small streams with limited watershed areas. Contour lines and drainage courses on all original 1:50,000 maps were hand drawn decades ago by technicians using the aerial photographs as a guide. Channels were drawn where none existed at the time or currently exist. The computer-generated placer classification maps show many small tributaries as being valuable Chinook rearing streams. These are considered as: “Moderate-high suitability habitats...defined as watercourses...highly suitable for rearing juvenile Chinook salmon”. However, many streams with this classification have ephemeral or intermittent flows. Others drain to ground or flow overland (i.e. no defined stream channels) through wetlands before entering the Klondike River. Neither type is likely to have been used in the past or to be used in the foreseeable (21<sup>st</sup> century) future by juvenile Chinook salmon. Restrictive conditions may be needlessly placed on placer miners or others conducting legitimate activities. The miners may be faced with added expense and delay in preparation of applications etc. They may be denied access to gold to which they have the right to mine. Although the Fish Habitat Suitability maps were only to be applied to the Placer industry, they have been used much more widely. They may affect the activities of other users, such as Highways, Forestry, etc. or contribute to Land Use Planning processes.

Methods: Streams were identified in 2012, which became Year 1 of the investigation. The creeks were:

Alki Cr.	64 03.67/138 59.43
Germaine Cr.	64 03.062/138 54.819
Goring Cr.	64 02.549/138 53.066
Leroy Cr.	64 01.975/138 47.601
Un-named Cr.at Dempster turnoff)	64 00.087/138 45.405
Leotta Cr.	63 58.477/138 44.398
Too Much Gold Cr.	63 57.477/138 42.664

Between July13-15, 2016, two minnow traps were set at each of the above crossings of the Klondike Highway. One trap was set downstream of the Highway and the other was set upstream of it. The traps were baited and deployed as per the DFO protocol, which is effective for the capture of juvenile Chinook salmon and Slimy Sculpin. These are two of the three most likely fish species to be present in smaller streams. Minnow trapping is ineffective for the capture of Arctic Grayling, which is the third species. The traps were set for two nights, with a total of 4 trap nights per stream crossing.

Results: 1 juvenile Chinook Salmon was captured upstream of the Klondike Highway at Germaine Creek, and another at the outlet. No fish were captured at any of the other creeks.

Discussion: No fish of any kind were captured in 2012. Fish were only captured in Un-named Creek and Germaine Creek in 2013, and then only at the downstream side of the Germaine Creek crossing. In 2012 sampling was negatively affected by an intense rainfall immediately preceding the investigation. In 2013, 2014 and 2015 the number of juvenile Chinook salmon in the Klondike River were so low that captures of salmon in these small streams were considered unlikely had the streams at the road crossings been accessible to the juvenile salmon. Accessibility is mentioned due to the general absence of fish and particularly juvenile Chinook salmon captured in past sampling at certain of the creeks listed above. This included an investigation of Germaine Creek by DFO in 1991. No fish of any kind were captured or observed in the mid reaches of the creek, and no defined channel could be observed across the alluvial fan between the Germaine Creek valley and the Klondike Highway (Department of Fisheries and Oceans 1991a). Goring Creek was also investigated by DFO in 1991. No fish were captured or observed at the Dawson Road Crossing. The juvenile Chinook Salmon captured above the Klondike Highway at Germaine Creek were no unexpected as it is only 50 meters from the Germaine Creek Ground Water Channel, the creek has a defined channel between the two points and the culvert is flat.

Conclusion: The Student Stewards were introduced to the challenges of applying computer generated models based on mapped products to the actual, physical world. It also provides insight into the risks that limited numbers of samples will not

**Restoration of Chinook salmon to productive habitats upstream of non-permanent obstructions** – outcomes reported as numbers of Chinook salmon restored to productive habitat, numbers sampled, basic statistical analysis and provision of raw data to interested agencies.

Summary: A total of 547 juvenile Chinook salmon were restored to productive habitat upstream of beaver dams on Clinton Creek, and 27 were restored to productive habitat above the Clinton Road culvert on Mickie Creek.

Introduction: The Clinton Creek watershed contains the abandoned Clinton Creek Asbestos Mine. The creek is unique in that it drains unglaciated terrain yet has a number of beaver colonies that are able to build and maintain cross-creek dams. Individual dams may remain active for up to 3 years. On August 10, 2006, for example, 17 beaver dams were observed between the mouth of Clinton Creek and the mine site during an over flight (von Finster, 2006). Beaver are usually not able to maintain colonies on creeks in the “V” shaped valleys typical of the unglaciated portion of the Yukon. This appears related to the violent spring freshets and rapid response to summer rainfall events characteristic of the streams flowing through these valleys. Beaver dams are quickly destroyed by these processes. Beaver are able to dam Clinton Creek, presumably due to buffered stream flows resulting from an artificial lake in the upper watershed. This feature, Hudgeon Lake, formed when approximately 60 million tonnes of waste rock that had been deposited on the ridge top slid across the valley. Hudgeon Lake is 2100 metres long, has a surface area of 64 hectares and a volume of approximately 10 million cubic metres of water (AECOM, 2011). It provides temporary storage for water flowing from the upper valley and reduces the intensity of flows downstream. The lake provides a thermal subsidy to the creek below the outlet during the open water period. Water temperatures may be significantly elevated. The maximum hourly temperature at the lake outlet recorded to date was 26.75 in July 2007. The high temperatures may be sustained: in 2007, for example, temperatures over 20 degrees were recorded on every day between July 11 and 30, and on 11 days in August (von Finster, 2007). Aquifers have formed in the waste rock deposits and in granular material transported downstream from them. This material is forming an alluvial cone that is currently about 700 meters long. Ground water discharges from the aquifers at a cooler temperature than surface waters during the summer months. It both mediates high stream temperatures and provides a wide range of thermal habitats that small fish such as juvenile Chinook salmon can use for various activities such as feeding, resting, refuge, etc. The result is a highly productive habitat complex extending from the lake outlet downstream for about 1.5 km. Young-of-year juvenile Chinook salmon were first restored to the creek in this area in 2006 (Smart, 2006). The activity has been conducted annually since. Mid-September sampling has been conducted to monitor and evaluate the growth of juvenile salmon at the restoration site. In some years the growth of juvenile Chinook salmon has been remarkable. The summer of 2007 had near perfect conditions: the creek had, and maintained, low/moderate flows. It was warm, increasing invertebrate productivity. The ground water discharge areas appear to have provided adequate thermal refuge for fish. There was an ample supply of juveniles in lower Clinton Creek. A total of 2070 juvenile Chinook salmon were restored to productive habitats in July and early August (Smart, 2007). Some juveniles migrated upstream from the release site: in mid-September 2007, 13 were captured at

Station 1, which was then the upstream limit of migration. The mean fork length of this group was 99.77 mm, and the maximum length was 111 mm (von Finster, 2007). This shattered the old record for a 0+ Yukon River Chinook of 100 mm fork length. The past record had been established in the Fortymile River in late August, 1987 (Jaromovic & von Finster, 1988).

The lake and several smaller water bodies formed by tailings and other waste rock failures in tributary valleys now provide reservoirs for surface runoff and recharge areas for aquifers. Some groundwater discharges continue throughout the winter. Yearling Chinook have been captured at the restoration site in May (Mackenzie-Grieve, 2011, Taylor 2014 & 15) confirming successful overwintering.

Mickey Creek is crossed by a culvert on the Clinton Creek road. The culvert was poorly designed, and the outlet is generally perched above the downstream plunge pool. The creek is unregulated. In 2004 approximately 85% of the watershed area was burned by wildfire. A significant number of slope failures soon followed (Lipovsky et al, 2005). The upper watershed further destabilized during catastrophic precipitation events in early August, 2010. One or more sediment wedges is moving down the creek resulting in variable pool depths and degree of obstruction. In early August 2016 juvenile Chinook appeared unable to migrate upstream through the culvert and 27 juvenile Chinook were restored to the creek upstream of the culvert.

Methods: Restoration activities commenced at Clinton Creek on July 25 and were completed on August 3. Minnow traps baited as per the DFO protocol were set at the Town Site Ford. All fish captured were enumerated by species. Young-of-year juvenile Chinook salmon captured were placed in a container and moved to the restoration site at Station 2A, at the mouth of Wolverine Creek. An air pump was used to maintain oxygen levels during transit. 30 juvenile Chinook were randomly selected on July 25 - 28 inclusive and weighed and measured. Tissue samples were taken on August 1 and 2<sup>nd</sup>, with 98 and 61 samples respectively. Sampling did not take place in Clinton Creek in September due to construction activities associated with the Clinton Creek Abandoned Mine. Juvenile Chinook Salmon captured below the Mickey Creek Culvert were placed in buckets, carried over the road and returned to the creek upstream of the structure. Fork lengths of sampled fish were measured to the nearest millimetre using a smolt board. Individuals were then blotted to remove excess water and weighed to the nearest 0.1 gram using an Ohaus HH120D digital balance. The balance had been calibrated and placed on a level surface. Spring assessment and evaluation sampling was also conducted. The spring sampling was to assess the status of the 2015 restoration.

Results: A total of 547 juvenile Chinook salmon were captured and restored to productive habitat in Clinton Creek and 27 in Mickie Creek in 2016. Numbers sampled on each day in Clinton Creek are shown in Table 2, along with mean Fork Lengths and Mass.

Table 2 - juvenile Chinook Salmon sampled in lower Clinton Creek in 2016
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Date	n	Average	
		Fork length (mm)	Mass (g)
25-Jul	30	67	3
26-Jul	30	66.5	3.2
27-Jul	30	71.8	3.8
28-Jul	30	70.4	3.7
29-Jul	14	71.9	4
01-Aug	98	70.8	3.6
02-Aug	52	69.1	3.4

Five 1+ juvenile Chinook Salmon were captured at Station 2A on Clinton Creek during spring assessment sampling on May 25, 2016. This is the location where juvenile Chinook were restored to the creek in 2015. One of the five Chinook had a clipped anal fin from DNA sampling in 2015. The Chinook ranged from 90 to 109 mm Fork Length (FL) and from 7.9 to 13.8 grams in Mass. The mean FL was 99 and the mean M was 10.3 gm.

Autumn assessment was not conducted due to drilling at the mine site. This caused the area to become an industrial work site and access to the site restricted.

Discussion: The in-migration to Clinton Creek was well under way when trapping started on July 25. Data from past years is limited, but in 2006 substantial in-migration commenced between July 7 and 12 (Smart 2006); in 2007, prior to July 18 (Smart 2007) and in 2010 prior to July 16 (Taylor 2010). There were a number of precipitation events in Clinton Creek in July. The creek was relatively high and turbid during collection in late July and was falling and clearing during collection in early August. The juveniles captured were intercepted as they moved upstream.

Table 3 shows the annual number of juvenile Chinook salmon restored to productive habitat since the project commenced in 2006. The 547 juveniles restored to productive habitats in Clinton Creek and Mickie Creek during 2016 fell below the mean annual (2006 – 2015) number of 689. This was partially due to actions taken to avoid black bear interactions at Station 4. Bears were numerous in the area. In 2011 they started to destroy traps left overnight. As an adaptive measure we now set the traps in the morning, leave them for 2 hours and then remove the captured salmon. This is repeated in the afternoon, after which the crew return to Dawson. This negatively affects our rate of capture, but reduces the risk of danger of bear encounters to an acceptable level.

Year	Number
2006	782

2007	2070
2008	58
2009	901
2010	587
2011	15
2012	702
2013	685
2014	663
2015	429
2016	547

The 5 juveniles captured at Station 2A in the spring sampling supports the value of the restoration area as over wintering habitat. .

Conclusion: The Student Stewards were able to participate in a hands-on activity to directly benefit juvenile Chinook salmon. They were exposed to the complex life histories of Yukon River salmon. This included the use of non-natal streams by juveniles from distant spawning areas for rearing and overwintering. The potential advantages and disadvantages to the Chinook of using small streams was described and the value of surface and ground water in sustaining winter flows and overwintering habitats was discussed. Although lower than hoped, the numbers of juveniles in the creek provided an appreciation of the value of the small streams to the upstream stocks of salmon. The number of juveniles captured in Clinton Creek was compared to the relatively low numbers in the Klondike to introduce the Stewards to the complexity of Yukon River Chinook spawning and downstream migration habitats, and particularly the possible difference between effects of high water on lake outlet spawning vs systems without lake storage. The activity provided an opportunity to introduce the Student Stewards to the risks involved in mine development; the potential consequences of following what later turn out to be invalid plans; and the scope and cost of restoration/reclamation of sites such as the Clinton Creek Mine when the plans fail. It also demonstrated that there were both aesthetic and functional considerations in the evaluation of the effects of industrial undertakings, and that they were not always accordant.

**Acquisition of tissue samples from juvenile Chinook salmon for genetic analysis** - outcomes reported as the number of samples collected, and any other information requested from the agency interested and within our capacity to provide.

Summary: One hundred and fifty tissue samples were collected from Clinton Creek at Station 4 in early August 2016. All samples were collected on August 1 and 2. In the Klondike watershed, 25 tissue samples were collected at the Airport Access on August 5 and 9 on September 18. Twenty five tissue samples were collected from the Klondike River at the upstream end of the Germaine Creek Avulsion on August 5. The tissue samples and all supporting data have been submitted to DFO.

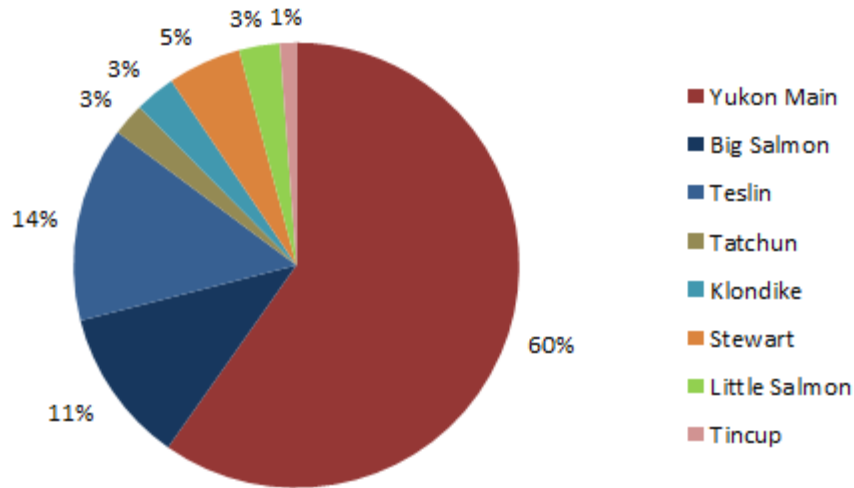


Introduction: The use of genetic analyses for a wide range of salmon- and salmon habitat management and research purposes is expected to continue to expand. We first proposed this component of our project to introduce the Student Stewards to the method and certain of the uses of the data. Our introduction to the technique was in 2009 in partnership with DFO and ADF&G. We found that the Student Stewards were very interested. The samples were submitted to DFO for analysis and results were reported in Mackenzie-Grieve (2010). We repeated the activity in 2012 and 2013, and the data was reported in Mackenzie-Grieve (2013; 2014a). In 2013 we expanded the collection to the lower Klondike River, with the objective of determining if juvenile Chinook salmon of non-Klondike River origin were present. In 2014 we sampled further upstream in the Klondike River, and repeated this in 2015 and 2016.

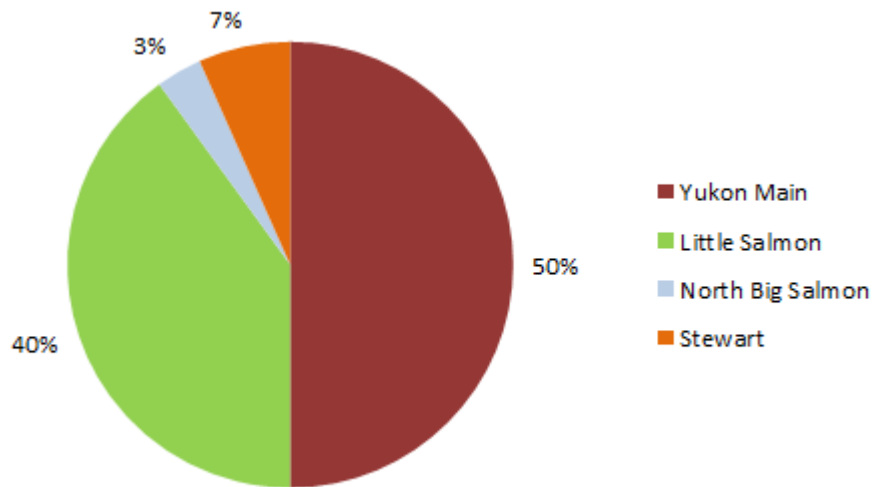
Methods: DFO Resource Restoration Biologist Sean Collins provided collection vials and preservative. All Chinook samples from Clinton Creek were collected at Station 4, located at the town-site ford 1 km upstream from the mouth. All Chinook samples from the Klondike River were from the Airport Access at 64.04655/139.12981 and the Klondike River at the head of the Germaine Creek Avulsion at 64.052365/138.916466. The sites are respectively 16 and 28.5 kilometers upstream from the mouth of the Klondike. We used the same numbering system as in past years, where YR- identified the site as in the Yukon River drainage, CN- for Chinook salmon, 16- for the year and then ascending integers for each individual sample. Fork length was measured to the nearest millimeter on a smolt board. Each fish was then blotted to remove surface water and weighed to 0.1 gram on an Ohaus HH120 digital balance. The balance was calibrated prior to conducting measurements at each location and was placed on a level surface. We used a modification the method described in Daum and Flannery (2011) for tissue collection: only a portion of the anal fin was removed rather than the entire fin. The fins were clipped with stainless steel scissors. Each sample was placed in an individual pre-labelled vial that had been pre-filled with preservative. Length and weight data was recorded on specially prepared data sheets. The sample vials and supporting data were submitted to DFO Federal Contaminated Sites Biologist Jody Mackenzie-Grieve.

Results: One hundred and fifty tissue samples were collected from Clinton Creek at Station 4 in early August 2016. All samples were collected on August 1 and 2. In the Klondike watershed, 25 tissue samples were collected at the Airport Access on August 5 and 9 on September 18. Twenty five tissue samples were collected from the Klondike River at the upstream end of the Germaine Creek Avulsion on August 5. The tissue samples and all supporting data have been submitted to DFO. The tissue samples were submitted to DFO for analysis.

The results of the 2014 sampling in Clinton Creek are presented in the following charts. They demonstrate the wide range of upstream Chinook Salmon spawning populations that contributed to the summer rearing populations in Clinton Creek. Put another way, the results indicate that the value of small streams such as Clinton Creek that are accessible to juvenile Chinook Salmon is not limited to the fish that may be found in them.



**Chart 1.** Percent contribution of various stocks of origin for juvenile chinook salmon captured in Clinton Creek near the townsite ford on August 5 and 6, 2014 (n=169). (from Mackenzie-Grieve, 2015)



**Chart 2.** Percent contribution of various stocks of origin for juvenile chinook salmon captured in Clinton Creek near the mouth on September 17, 2014 (n=30). (from Mackenzie-Grieve, 2015)

Discussion: The Clinton Creek tissue collection met expectations in 2016. Tissue collections from the Klondike River met expectations in August, but not in September.

Conclusion: This activity was identified to the Student Stewards as a science project, and the need for meticulous attention to detail was stressed. They responded well to the discipline required in sample collection and record keeping. They learned of the role of some of the developing methodologies are allowing further assessment and understanding of salmon behaviour.

## **Other Activities**

Unplanned activities included:

All Gold Creek bio-engineering Various forms bio-engineering has been conducted by the Yukon Government in conjunction with the reconstruction of the crossing of All Gold Creek. The site was visited with the Student Stewards, and the process of highway design, construction and permitting described. The challenges of bio-engineering in unregulated stream systems, and particularly the general low degree of success were discussed.

Swede Creek juvenile Chinook Salmon entrance timing pilot investigation. Swede Creek is a medium sized creek entering the Yukon River from the west upstream of the mouth of the Klondike River. The creek offers an opportunity to conduct investigations into the timing of upstream migration of juvenile Chinook Salmon into non-natal rearing and overwintering streams in the Dawson area. The pilot project assessed the viability and safety of sampling the creek under a range of flow conditions.

## **CONCLUSIONS AND RECOMMENDATIONS:**

The 2016 North Mainstem Stewardship Program was successful. The project planning, implementation and administration went smoothly. We were able to conduct most of the planned activities that we had control over, and to modify those that we did not. The Student Stewards were able to conduct useful work and to gain knowledge, understanding and a positive introduction to fisheries related work. High standards of safety were maintained and there were no injuries. Each of the Student Stewards wrote a report. They may be found in Appendix D.

We hope to be able to conduct another project in 2017. If so, we will:

- Continue our strategy of hiring local high school level Student Stewards, supervised by an experienced Field Supervisor and Technical Advisor;
- Continue with the core activities described in this report;
- Continue to investigate additional opportunities to monitor salmon, restore access to habitats or perform salvage activities;
- Seek to connect the project with other types of salmon-related projects being conducted in the field in the Dawson Area.

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## List of photos





## APPENDIX A

### Public Involvement Day

#### **Public Day summary:**

Prepared by: Andria Oppen

September 20<sup>th</sup>, 2016

Dear Dawson District Renewable Resource Council,

The public day was a great success. We had a great turnout of 46 community members and summer campers. The student workers did an excellent job in explaining the importance of the project and provided a hands on experience for all attendees. The visitors got an opportunity to watch the measuring process of the salmon fry first hand and even have a try themselves.

The event spread over 2.5 hours as we broke the groups up into manageable sizes of 10 per group. While the others were waiting for their turn they enjoyed a lovely lunch prepared by the Bonanza Market.

My preparation of the event consisted of contacting the Elder's Coordinator of Tr'ondek Hwëch'in once the date of the event had been chosen. I contacted the summer camp coordinators to invite their summer camps to the event. I prepared the poster and posted it around town on various information boards. I confirmed transportation for the groups invited and confirmed approximate numbers of people who might attend. I ordered the food based on the numbers confirmed and a bit extra for the public.

On the day of the event I picked up the food and went out to Germaine Creek where I had set up the tables and places to eat and established a plan with the Project staff. I remained through the event and participated in the lesson, then cleaned up the site at the end.

Thank you again for the opportunity to coordinate the public day, it was a pleasure and a great chance to learn about this important project.

Please contact me with any questions.

Kind regards,  
Andria Oppen  
993-5946

## APPENDIX B

### Protocol for the Baiting Of G-Type Minnow Traps for the Capture of Juvenile Chinook salmon In the Yukon River Drainage Basin

Fisheries and Oceans Canada  
Habitat and Enhancement Branch

Baited G-type minnow traps have proven to be an effective means of capture for juvenile Chinook salmon in the Yukon River drainage basin. Trapping has been conducted by consultants, public interest groups, and government agencies. Salmon roe was the main bait that was used to trap the juveniles.

DFO Habitat developed the following Protocol in 1985 to provide a consistent methodology for G-type minnow trapping in the Yukon River Drainage basin in Canada:

Traps are baited with either Yukon River Chinook or Chum salmon roe. The roe is not salted or otherwise chemically preserved. A “walnut” sized” piece of roe is placed in a perforated thin plastic sandwich or similar bag, and the bag tied off.

(Note: roe is most easily handled when it is frozen: freeze the skeins flat, and chip off appropriate sized pieces. Thin, flexible plastic bags will remain flexible even in cold water. Zip closure bags tend to be stiff and are not recommended. Even very slight current will “pump” thin plastic bags and expel attractant from the bait. Perforations are most easily made with an “Exacto” or similar hobby knife blade: up to 15 bags may be stacked and 0.5 to 1.5 cm long cuts made through them).

The bags of roe are kept frozen for as long as possible before using, as they are most easy to handle when in this state. The potential of the odour of the roe attracting bears is also decreased.

The traps are prepared by having a tether of string or line attached to either of the halves. The trap is baited, closed, and a twist tie (paper coated wire) is used to tie the two halves together. **The minnow trap clip is not used**, as traps are often lost due to high water, etc.: if the halves of the trap remain joined together, the trap will continue to capture and destroy fish. When closed by a twist-tie, the trap will quickly open and cease to capture and destroy fish.

When setting the traps in a new area, it is advisable to place the traps in all available types of habitat. Habitat utilisation by juvenile Chinook tends to vary from location to location: pre-judgement is not advisable. The traps should also be marked with survey flagging. A 24 hour set is recommended.

## APPENDIX C

### Yukon River North Mainstem Salmon Restoration and Enhancement – Record of Activities

#### Fortymile River Drainage

##### Clinton Creek

Drainage Area: 206 sq. km

Clinton Creek is the first west bank tributary upstream of the mouth of the Fortymile River. The watershed has been much affected by the abandoned Clinton Creek asbestos mine. Failures of waste rock dumps have resulted in the creation of Hudgeon Lake and in significant contributions of sediment to the lower creek. Storage of water in the upper drainage may be buffering flows sufficiently that beaver are able to maintain dams across the creek. Beaver dams were identified as a probable obstruction in 2005

##### **Activities in 2006**

DDRRC Stewardship crew relocated 782 juvenile Chinook salmon from the lower creek to the Wolverine Creek area. Salmon appeared in large numbers in the lower creek, between July 7 – July 12. DFO reported 17 beaver dams between the mouth and the mine site in August.

##### **Activities in 2007**

DDRRC Stewardship crew relocated 2070 juvenile Chinook salmon from the lower creek to the Wolverine Creek area. Salmon appeared in large numbers in the lower creek when trapping was initiated on July 18.

##### **Activities in 2008**

58 Juvenile Chinook were captured and restored to productive habitat. Very high flows affected trapping success and resulted in the breach of most upstream beaver dams.

##### **Activities in 2009**

901 Juvenile Chinook were captured and restored to productive habitat. 200 juvenile Chinook DNA samples were acquired.

##### **Activities in 2010**

587 Juvenile Chinook were captured and restored to productive habitat. Fork lengths were measured of a target of 30 jcs/day.

##### **Activities in 2011**

15 Juvenile Chinook were captured and restored to productive habitat.

##### **Activities in 2012**

702 Juvenile Chinook salmon were captured and restored. Fork lengths and weights were measured of a target of 30 jcs/day. 200 juvenile Chinook DNA samples were acquired.

##### **Activities in 2013**

685 Juvenile Chinook salmon were captured and restored. Fork lengths and weights were measured of a target of 30 jcs/day. 159 juvenile Chinook DNA samples were acquired.

**Activities in 2014**

663 Juvenile Chinook salmon were captured and restored. Fork lengths and weights were measured of a target of 30 jcs/day. 200 juvenile Chinook DNA samples were acquired.

**Activities in 2015**

311 Juvenile Chinook salmon were captured and restored. Fork lengths and weights were measured of a target of 30 jcs/day. 72 juvenile Chinook DNA samples were acquired.

**Activities in 2016**

547 Juvenile Chinook salmon were captured and restored. Fork lengths and weights were measured of a target of 30 jcs/day. 150 juvenile Chinook DNA samples were acquired.

**Recommendations for 2017**

Continue to capture juveniles in lower Clinton Creek and restore them to productive habitat near the minesite. Continue with fork length and weight measurements if numbers warrant. Collect tissue samples for DNA analysis.

**Mickey Creek**

Drainage area: 63 sq. km

Mickey Creek is the first east bank tributary of size of the Fortymile River. Wildfires burned the majority of the drainage basin in 2004. A perched culvert at the Clinton Creek Road crossing was identified as a partial obstruction in 2005.

**Activities in 2006**

DDRRRC Stewardship crew restored 34 Chinook salmon, but the project ended before large numbers entered the stream.

**Activities in 2007**

DDRRRC Stewardship crew restored 1273 Chinook salmon. Salmon appeared in large numbers in early August, and probably continued on past the project end.

**Activities in 2008**

32 juvenile Chinook salmon were relocated over the culvert.

**Activities in 2009**

9 Juvenile Chinook salmon were captured and relocated.

**Activities in 2010**

247 Juvenile Chinook salmon were captured and relocated.

**Activities in 2011**

No Juvenile Chinook salmon were captured.

**Activities in 2012**

The culvert was backwatered due to a sediment wedge moving downstream. No Juvenile Chinook salmon were captured.

**Activities in 2013**

The culvert continued to be backwatered due to a sediment wedge moving downstream. No intervention was necessary.

**Activities in 2014**

The culvert continued to be backwatered due to a sediment wedge moving downstream. No intervention was necessary.

**Activities in 2015**

118 juvenile Chinook salmon were relocated upstream of the culvert. 116 tissue samples were collected.

**Activities in 2016**

27 juvenile Chinook salmon were relocated upstream of the culvert. 116 tissue samples were collected.

**Recommendations for 2017**

Monitor and capture/restore to creek above culvert as required.

**Klondike River Drainage****Lower Klondike River Juvenile Chinook Salmon DNA collection**

This is to determine whether jcs in the lower river are of Klondike origin or are from other spawning stocks

**Activities in 2013**

50 samples were collected. Analysis showed that ~30% were of non-Klondike River origin

**Activities in 2014**

36 samples were collected

**Activities in 2015**

46 samples were collected from two locations

**Activities in 2016**

59 samples were collected from two locations

**Recommendations for 2017**

Continue to collect samples at Airport Access and Head of Germaine Creek Avulsion.

**Lousetown Pond**

This pond is a mining cut in the centre of Lousetown. It floods from the Klondike River during high water.

**Activities in 2009**

No salmon were caught in the 19 traps that were set for two days.

**Recommendations:**

As the pond is on TH land, only work there at TH's request.

**Bonanza Creek**

Area: not determined

Bonanza Creek flows north and enters the Klondike River downstream of the main Bridge. The drainage basin has been intensively placer mined.

**Activities in 2008**

47 juvenile Chinook salmon and 11 sculpin were captured in 15 trap-nights with the traps set between 5 and 8 kilometres up from the mouth.

**Recommendations**

No further actions are recommended.

**Un-named Creek #1 – at west end of Henderson Corner**

Classified as a Moderate-High Fish Habitat Suitability stream.

**Activities in 2012**

Sampled as part of Placer Fish Habitat Suitability Map investigations

**Activities in 2013**

There was no flow in the creek and it was not sampled

**Activities in 2014**

There was no flow in the creek and it was not sampled

**Recommendations:**

No further sampling is justified

**Alki Creek**

Classified as a Moderate-High Fish Habitat Suitability stream.

**Activities in 2012**

Sampled as part of Placer Fish Habitat Suitability Map investigations

**Activities in 2013**

Sampled but no fish were captured.

**Activities in 2014**

Sampled but no fish were captured

**Activities in 2015**

Sampled but no fish were captured

**Activities in 2016**

Sampled but no fish were captured

**Recommendations for 2017.**

Sample as part of Placer Fish Habitat Suitability Map investigations – Year 5

**Germaine Creek**

Classified as a Moderate-High Fish Habitat Suitability stream.

**Activities in 2012**

Sampled as part of Placer Fish Habitat Suitability Map investigations

**Activities in 2013**

Sampled at Dawson Road crossing – low numbers of Chinook and sculpin captured

**Activities in 2014**

Sampled at Dawson Road crossing – low numbers of Chinook and sculpin captured at culvert outlet

**Activities in 2015**

Sampled but no fish were captured

**Activities in 2016**

Sampled, one juvenile Chinook Salmon captured immediately above the culvert and one below.

**Recommendations for 2017.**

Sample as part of Placer Fish Habitat Suitability Map investigations – Year 5 and walk upstream to check for defined channels

**Germaine Creek area salvage**

The Klondike River has developed a new channel in this area. The old channel carries water in the spring. As water levels fall, the Klondike River no longer enters the channel. A series of isolated pools remain and extend downstream to the mouth of Germaine Creek.

**Activities in 2007**

1279 Chinook fry were salvaged and returned to the Klondike River.

**Activities in 2008**

8 Chinook fry were salvaged and returned to the Klondike River. Water levels were very high throughout the summer

**Activities in 2009**

419 Chinook fry were salvaged and returned to the Klondike River.

**Activities in 2010**

248 Chinook fry were salvaged and returned to the Klondike River.

**Activities in 2011**

51 Chinook fry were salvaged and returned to the Klondike River.

**Activities in 2012**

299 Chinook fry were salvaged and returned to the Klondike River. Fork lengths and weights were measured of 30 jcs.

**Activities in 2013**

3 Chinook fry were salvaged and returned to the Klondike River. Abundance of jcs in the Klondike was very low in 2013.

**Activities in 2014**

8 Chinook fry were salvaged and returned to the Klondike River. Abundance of jcs in the Klondike was very low in 2014.

**Activities in 2015**

67 Chinook fry were salvaged and returned to the Klondike River. Abundance of jcs in the Klondike was low in 2015.

**Activities in 2016**

494 Chinook fry were salvaged and returned to the Klondike River.

**Recommendations for 2017**

Continue to salvage juveniles from the isolated pools and release them into open waters. Weigh & measure 30 salmon if numbers permit.

**Goring Creek**

Area: not determined

Goring Creek flows north from a defined valley into a series of wetlands and then to the Klondike River

**Activities in 2008**

No juvenile Chinook salmon or other fish were captured in 5 trap-nights at the Klondike Highway crossing.

**Activities in 2009**

No sampling occurred.

**Activities in 2012**

Sampled as part of Placer Fish Habitat Suitability Map investigations

**Activities in 2013**

Sampled but no fish captured

**Activities in 2014**

Sampled but no fish captured

**Activities in 2015**

Sampled but no fish were captured

**Activities in 2016**

Sampled but no fish were captured

**Recommendations for 2017.**

Sample as part of Placer Fish Habitat Suitability Map investigations – Year 5 and walk upstream to check for defined channels

**Leroy Creek**

Classified as a Moderate-High Fish Habitat Suitability stream.

**Activities in 2012**

Sampled as part of Placer Fish Habitat Suitability Map investigations

**Activities in 2013**

Sampled but no fish captured

**Activities in 2014**

Sampled but no fish captured

**Activities in 2015**

Sampled but no fish captured

**Activities in 2016**

Sampled but no fish captured

**Recommendations for 2017.**

Sample as part of Placer Fish Habitat Suitability Map investigations – Year 4

**Un-named Creek #3**

Classified as a Moderate-High Fish Habitat Suitability stream.

**Activities in 2012**

Sampled as part of Placer Fish Habitat Suitability Map investigations

**Activities in 2013**

Sampled and one Slimy Sculpin captured

**Activities in 2014**

Sampled but no fish captured

**Activities in 2015**

Sampled but no fish were captured

**Activities in 2016**

Sampled but no fish were captured

**Recommendations for 2017.**

Sample as part of Placer Fish Habitat Suitability Map investigations – Year 5 and walk upstream to check for defined channels

**Dempster Bridge area salvage**

A series of pools extend down the right (north) side of the river.

Connection with the river depends on ground water inflows

**Activities in 2007**

Salvage took place, resulting in the return of 101 fry to the Klondike River.

**Activities in 2008**

The crew checked this area but the pools were not isolated due to the high flows.

**Activities in 2009**

No isolated pools in this area.

**Activities in 2010**

No isolated pools in this area.

**Activities in 2011**



No isolated pools in this area.

**Activities in 2012**

No isolated pools in this area.

**Activities in 2013**

No isolated pools in this area.

**Activities in 2014**

No isolated pools in this area.

**Activities in 2015**

No isolated pools in this area.

**Activities in 2016**

No isolated pools in this area.

**Recommendations for 2017**

Monitor and salvage juveniles if necessary.

**Logjam on left side Klondike River upstream of Dempster Bridge**

This is a large and persistent log jam, and is a candidate for a “Klondike River juvenile Chinook abundance and growth station.

**Activities in 2012**

Limited sampling took place. No juvenile Chinook were captured.

**Activities in 2013**

Limited sampling took place. No juvenile Chinook were captured.

**Activities in 2014**

Sampling took place and Chinook were captured

**Activities in 2015**

Sampling took place and Chinook were captured

**Activities in 2016**

Unsafe to sample due to persistent high waters

**Recommendation for 2017**

Sample when water levels permit to conduct safely.

**Boat Launch Monitoring Station on Klondike River**

This is an accessible and relatively stable area. It is the first “Klondike River juvenile Chinook abundance and growth program” station.

**Activities in 2012**

Sampling was successfully conducted in July and September.

**Activities in 2013**

Sampling conducted in July and September was unsuccessful due to very low numbers of juvenile Chinook Salmon in 2013.

**Activities in 2014**

Sampling conducted in July and September had only limited success due to very low numbers of juvenile Chinook Salmon in the Klondike River in 2014

**Activities in 2015**

Sampling was conducted in July, but rising water and channel movement made the area unsafe. and September had only limited success due to very low numbers of juvenile Chinook Salmon in the Klondike River in 2014

**Activities in 2016**

Sampling was conducted on July 19 & 20, with 18 juvenile Chinook Salmon captured.

**Recommendation for 2017**

Monitor the channel and sample if safe.

**Too Much Gold Creek**

Area: not determined

Too Much Gold Creek flows from a narrow valley into a series of wetlands extending to the Klondike River.

**Activities in 2008**

No juvenile Chinook salmon or other fish were captured in 6 trap-nights at the Klondike Highway crossing.

**Activities in 2011.**

Sampling took place in September, and no fish were captured.

**Activities in 2012**

Sampled as part of Placer Fish Habitat Suitability Map investigations

**Activities in 2013**

Sampled as part of Placer Fish Habitat Suitability Map investigations but no fish captured

**Activities in 2014**

Sampled as part of Placer Fish Habitat Suitability Map investigations but no fish captured

**Activities in 2015**

Sampled but no fish were captured

**Activities in 2016**

Sampled but no fish were captured

**Recommendations for 2017.**

Sample as part of Placer Fish Habitat Suitability Map investigations – Year 5

**Leotta Creek**

Leotta Creek is 2 km east of Dempster junction and west of Flat Creek. The water flows narrowly from the hills and flows into the Klondike River.

**Activities in 2008**

No juvenile Chinook salmon or other fish were captured in 2 trap-nights at the Klondike Highway crossing.

**Activities in 2012**

Sampled as part of Placer Fish Habitat Suitability Map investigations

**Activities in 2013**

Sampled as part of Placer Fish Habitat Suitability Map investigations but no fish captured

**Activities in 2014**

Sampled as part of Placer Fish Habitat Suitability Map investigations but no fish captured

**Activities in 2015**

Sampled but no fish were captured

**Activities in 2016**

Sampled but no fish were captured

**Recommendations for 2017.**

Sample as part of Placer Fish Habitat Suitability Map investigations – Year 5

### **All Gold Creek**

All Gold Creek enters the South Klondike River immediately west of the mouth of Flat Creek. The drainage basin has been intensively placer mined, and the creek is unstable.

#### **Activities in 2008**

No Juvenile Chinook salmon were captured 4 slimy sculpin were captured in 8 trap-nights at the Klondike Highway crossing.

#### **Recommendations:**

Maintain as a candidate for periods when the Klondike River is too high to work in

### **Flat Creek**

Area: not determined

Flat Creek enters the South Klondike River from the south. The Klondike Highway crosses the creek near the mouth.

#### **Activities in 2008**

No juvenile Chinook salmon were captured in 6 trap-nights. 3 burbot were captured at the Klondike Highway crossing

#### **Recommendations:**

Maintain as a candidate for periods when the Klondike River is too high to work in

## **North Klondike River Drainage**

### **North Klondike River - salvage**

#### **Activities in 2008**

There was no work done due to high water levels

#### **Activities in 2009**

One isolated pool with juvenile salmon was located at the North Fork intake

#### **Activities in 2010**

No isolated pools were observed

#### **Activities in 2011**

No isolated pools were observed

#### **Activities in 2012**

No isolated pools were observed

#### **Activities in 2013**

No isolated pools were observed

#### **Activities in 2014**

No isolated pools were observed

#### **Activities in 2015**

No isolated pools were observed

#### **Activities in 2016**

No isolated pools were observed

#### **Recommendations for 2017**

Monitor area and salvage juveniles as necessary

### **Viceroy Channel**

Drainage area: Not applicable

Viceroy Channel is a small, ground water fed channel. It is crossed by the Viceroy Mine Road about 800 meters upstream from its mouth. A beaver dam was established about 300 meters upstream from the mouth in the summer of 2005.

**Activities in 2006**

A total of 13 Chinook were restored to the channel above the beaver dam.

**Activities in 2007**

A total of 13 Chinook were restored to the channel above the beaver dam.

**Activities in 2008**

The North Klondike River was high. No salmon were trapped.

**Activities in 2009**

The abandoned beaver dam was breached.

**Activities in 2010**

The channel was monitored and was not obstructed. Sampling at the Viceroy Road crossing resulted in the capture of 80 juvenile Chinook salmon.

**Activities in 2011**

The channel was monitored and was not obstructed. Sampling at the Viceroy Road crossing resulted in the capture of 10 juvenile Chinook salmon.

**Activities in 2012**

The channel was monitored and was not obstructed. Sampling at the Viceroy Road crossing did not result in the capture of juvenile Chinook salmon. The channel was mapped.

**Activities in 2013**

The channel was monitored and was not obstructed. Sampling at the Viceroy Road crossing resulted in the capture of 3 juvenile Chinook salmon.

**Activities in 2014**

The channel was monitored and was not obstructed. Sampling at the Viceroy Road crossing resulted in the capture of 2 juvenile Chinook salmon

**Activities in 2015**

The channel was monitored and was not obstructed. Sampling at the Viceroy Road crossing did not result in the capture of juvenile Chinook salmon

**Activities in 2016**

The channel was monitored and was not obstructed. Sampling at the Viceroy Road crossing did not result in the capture of juvenile Chinook salmon until mid September when a single individual was captured

**Recommendations for 2017**

Monitor channel at road crossing to determine whether juveniles have migrated into the creek. Walk downstream to the confluence with the Klondike to ensure that the channel is not obstructed.

**Upstream of North Fork Bridge**

Off-channel habitat on the left side of the North Fork Bridge.

**Activities in 2011**

Sampling took place and low numbers of juvenile Chinook were captured

**Activities in 2012**

Sampling took place and a single juvenile Chinook was captured

**Activities in 2013**

Sampling took place and 2 juvenile Chinook were captured

**Activities in 2014**

Sampling took place and 15 juvenile Chinook were captured

**Activities in 2015**

Sampling took place and 24 juvenile Chinook were captured

**Activities in 2016**

Sampling took place and 27 juvenile Chinook were captured

**Recommendation for 2017**

Maintain as an index of juvenile Chinook salmon implied abundance and growth in the North Klondike River and as a candidate for periods when the Klondike River is too high to work in.

**At North Fork Intake**

Complex channel resulting from past river engineering.

**Activities in 2011**

Sampling took place and low numbers of juvenile Chinook were captured

**Activities in 2012**

Sampling took place and low numbers of juvenile Chinook were captured

**Activities in 2013**

Sampling took place and low numbers of juvenile Chinook were captured

**Activities in 2014**

Sampling took place – no juvenile Chinook were captured

**Activities in 2015**

Sampling took place and 3 juvenile Chinook were captured

**Activities in 2016**

Sampling took place and 3 juvenile Chinook were captured

**Recommendation for 2016**

Maintain as an index of juvenile Chinook salmon implied abundance and growth in the North Klondike River and as a candidate for periods when the Klondike River is too high to work in.

**Abandoned Hatchery site at Km 10 Dempster**

Complex, ground water fed channel resulting from past river engineering

**Activities in 2011**

Sampling took place. No juvenile Chinook were captured

**Recommendations:**

Maintain as a candidate for periods when the Klondike River is too high to work in.

**North Klondike River at Benson Creek**

Access to North Klondike River – salmon have been documented spawning in the locality.

**Activities in 2011**

Sampling took place. No juvenile Chinook were captured

**Recommendation:**

Maintain as a candidate for periods when the Klondike River is too high to work in.

**North Klondike at Highway Camp at 42 Mile.**

This is the upstream limit of local reports of spawning Chinook salmon

**Activities in 2011**

Sampling took place. No juvenile Chinook were captured

**Recommendation:**

Maintain as a candidate for periods when the Klondike River is too high to work in.

**Swede Creek near the mouth**

Swede Creek offers opportunities to monitor the arrival of juvenile Chinook Salmon and migration upstream into non-natal streams in the Dawson City area.

**Activities in 2016**

Sampling took place to determine whether this is a safe and productive stream to work in.

**Recommendations for 2017:**

Increase sampling effort in the creek.

## APPENDIX D

### Student Steward Reports

#### Salmon Project Field Assistant Job Report

November 9<sup>th</sup>/16, Wednesday

The salmon project field assistant job was pretty good. We basically took salmon from one location, where they would die, and moved them to the river. For the first day we had to just make bait by cutting up frozen fish eggs to stick in bags with cut holes in them. We only had to do this twice and the first time in got very slimy which made it less enjoyable. The second time it was mainly cloudy so as long as we kept up with Hans cutting the eggs, it was a breeze. At the start of each day you'd have the chance to get a lunch at the Bonanza Market. Twelve dollars is the limit to purchase with. After that you go to certain places to set traps depending on where the salmon are. I got the job of writing things down on the clipboard so I would write down the temperature, how many traps we set where on what day and how many fish were caught later. My co-worker did most of the trap setting so she did the trap making, setting and the collecting of fish. The fish that were caught were dumped in the river after being counted. This was the routine for quite a while and the days were short for being simple. Later, though, we began working at new locations and leaving old ones due to time. Eventually we started to count at creeks which was a little bit different. What you have to do for creeks is just count for the sake of knowledge cause you're not exactly rescuing them from certain death. It's the same drill except you have to tie your traps to things so it wont float away. After a bit of time we'd start weighing the fish we'd catch as well as counting. As the last week neared, we had another guy come in to do DNA samples with us on the fish. We had to sterilize the fish in clove oil, measured length-wise, then taken to have a little piece of a certain fin snipped off and then stick the sample in a vile. The fish then must be put back into normal water to revive from its paralytic state. That was one of my favourite things to do. That was all we did for the last week and the days were long due to the distance to the destination but the destination was beautiful. A lot of the places we went to were very beautiful and I'm keeping the locations in mind for next summer to visit. It was all finally over. Five weeks came and went. The last thing that they ask of you is to write a report. I found this difficult to accomplish until I realized it wasn't hard whatsoever. So I'm sorry this report is as late as it is.

This summer I worked as a Salmon Project Field assistant. My job was to assist my supervisor in setting and collecting salmon traps, counting the salmon, weighing, measuring and assisting in taking DNA samples, recording data, and then releasing the salmon afterwards. During the 5-week job, I learned lots about salmon, Yukon waterways and the environment. I also learned how to set salmon traps and work safely by the water. I found it very interesting and had lots of fun! It was a very valuable opportunity and I am glad I had the chance to do it.

Joy Morin