TA'AN KWÄCH'ÄN COUNCIL
FOX CREEK CHINOOK SALMON RESTORATION PROJECT

CRE-25-15

FINAL REPORT 2015

Prepared for: *The Yukon River Panel and the Pacific Salmon Commission*

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Lands Resources & Heritage Department

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ABSTRACT

The 2015, Ta'an Kwäch'än Council (TKC), Fox Creek Salmon Restoration Project Team included: Phil Emerson and Deborah Fulmer as the Fish and Wildlife Coordinators and their wages were In-kind contributions from TKC. The Technician Steward this year was Andre Eckert-Maret who completed the Fisheries Field Technician program at Yukon College to increase technical experience and Ta'an capacity for this year's project. Ta'an In Kind contribution also included maintenance and extension of the access trail along Fox Creek to improve safe access to the creek for all project components. TKC staff, including; Testloa Smith, John Bunbury, Clayton Kane and Troy Pope assisted with field work and trail maintenance as needed.

The team focused on implementing Year 8 of the *Chinook Salmon Stock Restoration Plan for Fox Creek, Including;* conducting monthly bio-physical monitoring of juvenile Chinook salmon, the monitoring of adult salmon returns, participation in McIntyre Creek Incubation Facility operations and the annual Chinook fry release at the North Klondike highway crossing on Fox Creek, where 38,577 fry were released on two different occasions.

Juvenile Chinook salmon were documented utilizing Fox Creek as overwintering and rearing habitat and adult salmon were observed in the creek during the spawning period. Stream walks increased to monitor and observe these returning adults. Beaver dam surveys were completed and potential redd sites were documented and geo-referenced.

Fox Creek temperature data loggers were retrieved and downloaded. Data from 2006 to present was downloaded and synthesized with assistance of Al Von Finster. Additional temperature data loggers were placed at some of the redd sites to determine if incubation temperatures on redds are similar to winter surface water temperatures. Measurements will also assist in the assessment of redd viability and potential emergence timing of deposited eggs.

Numerous training and mentorship opportunities were undertaken this year, including water quality technician training through the Yukon River Inter-Tribal Watershed Council and mentorship on juvenile Chinook assessments and restoration works with Sean Collins and other staff of Department of Fisheries and Oceans Canada (DFO).

ACKNOWLEGMENTS

Ta'an Kwäch'än Council (TKC) would like to extend special thanks to Yukon River Panel for providing ongoing funding through the Restoration and Enhancement Trust Fund for this extensive research and restoration project.

Special thanks are also extended to Yukon Energy Corporation who have donated broodstock and reared eggs for the project since 2008. Yukon Energy Corporation owns and operates the Whitehorse Rapids Fish Ladder where broodstock is collected and the Whitehorse Rapids Fish Hatchery where eggs are reared to the eyed stage. Lawrence Vano and Warren Kapaniuk managed the Whitehorse Rapids Fishway and Hatchery. TKC then transported a portion of the eyed eggs to McIntyre Creek Incubation Facility (operated by the Yukon Research Center) where they were raised, primarily by Yukon College students, until they were ready to be released.

TKC Elders Norman Adamson and Marlene Johns, citizens and staff, as well as Sean Collins (DFO), Darrell Otto (Yukon College), McIntyre Hatchery staff, and members of the public assisted with fry releases. Sean Collins (Department of Fisheries and Oceans) oversaw this years' project and provided mentoring and guidance on field techniques, biological sampling and adult carcass recovery. Al von Finster (AvF Research & Development) and Darrell Otto (manager of McIntyre Hatchery) also provided experienced direction and advice.

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INTRODUCTION

Ta'an Kwäch'än Council (TKC) initiated a Community Stewardship program in 2007, which focused on building capacity and increased involvement of TKC citizens in conservation and restoration of wild salmon stocks and habitats within the TKC Traditional Territory. TKC has received funding through the Yukon River Panel Restoration and Enhancement Fund from 2007 to 2015. The Fox Creek Salmon Restoration Project has been a large component of this program over the years, as a restoration plan was developed in 2008 to help restore an extirpated Chinook salmon stock to Fox Creek and improve harvest opportunities for TKC citizens (Anderton 2008).

While the Community Stewardship program has continued on a seasonal basis since 2007 and has involved salmon related monitoring across Ta'an Traditional Territory, the recent focus of the program has been on stock restoration and the implementation of the *Chinook Salmon Stock Restoration Plan for Fox Creek* (Anderton 2008), shifting from a capacity building to a restoration project.

2015 represents Year 8 of the Restoration Plan, where returns of adult salmon released in 2010-2012 were anticipated to contribute to the return.

Major components of the 2015 project included:

- Project Planning and Implementation
- Training and Capacity Building (formal and through mentorship opportunities)
- Studies and Results of Year 8 of the Restoration Plan Including:
    - Support of daily maintenance and operations at the McIntyre Creek Incubation Facility, where salmon fry for Fox Creek are reared.
    - Annual fry releases into Fox Creek in June and July.
    - Bio-physical monitoring of juveniles at the four designated monitoring stations on a monthly basis from June – September to monitor utilization and growth.
    - Stream Stage: regular recording of stream gauge.
    - Water Quality
        - Data loggers placed in Fox Creek to measure temperature on the hour.
    - Monitoring adult salmon returns to Fox Creek through stream walks and documenting potential barriers to upstream migration.
    - Collection of biological adult carcass samples from Fox Creek.
    - Recording and monitoring of potential redd sites.
    - Trail access to the lower reaches of the creek.

Annual activities and results are described throughout the report with detailed monitoring results in Appendix B, Supporting Documents – Monitoring Information.

PROJECT LOCATION

Fox Creek (*Kwätän'aya Chù*), is a third order stream in the western central portion of Ta'an Kwäch'än Council's Traditional Territory. It crosses the North Klondike highway approximately 50 kilometers north of Whitehorse, Yukon and flows from the southern end of Fox Lake southeasterly from an elevation of 2,525 feet through the Richthofen Valley then drains into the center portion of Lake Laberge, at the north end of Richthofen Island at an elevation of 2,025 feet.

The Creek is 21.3 km long and has a total drainage area of 399.4 square kilometers. A major tributary, Pilot Creek, enters from the west about 12.2 kilometers downstream from the outlet of Fox Lake. Other unnamed tributaries enter the stream from the west at 4 kilometers from the headwaters and just upstream of the Klondike Highway crossing.

The terrain upstream of the bridge is flat marshland; it then flows through rolling hills and a series of spruce stands, swamps and rock outcroppings to a flooded marshland at its mouth on Lake Laberge. The marshland areas are heavily populated by beaver where activity changes stream dynamics and creates potential barriers to fish passage. Land uses around the stream include; residential, agricultural, grazing and tourism.

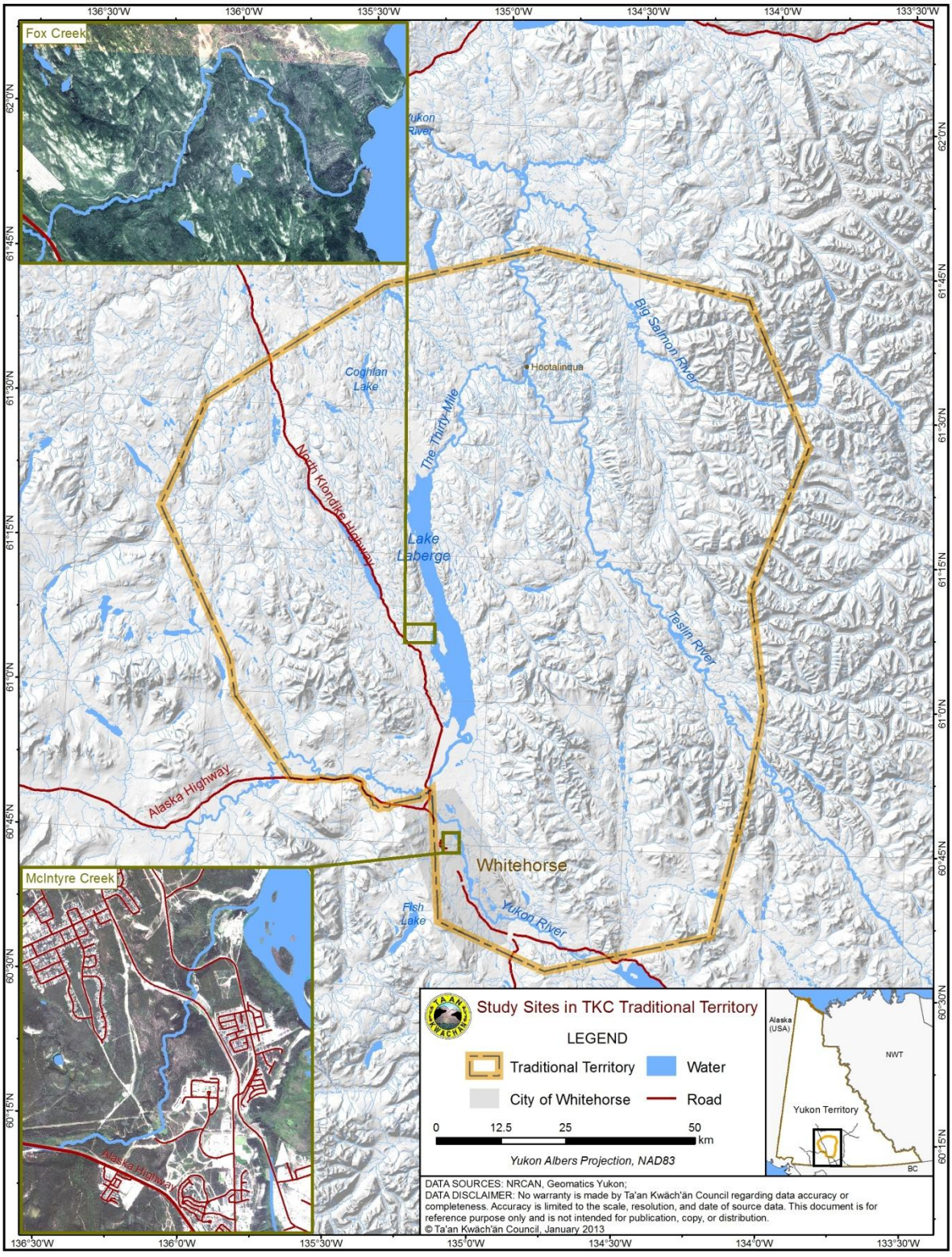

Figure 1: Fox Creek Chinook salmon Stock Restoration Project Location within Ta'an Traditional Territory

PROJECT PLANNING AND IMPLEMENTATION

Project implementation was guided by approved work plans, as required by the Yukon River Panel, Restoration and Enhancement (R&E) Fund; CRE-54N-06 Fox-Creek Beaver Management and Salmon Restoration Plan and CRE-52N-07 Chinook Salmon Stock Restoration Plan for Fox Creek (Appendix C).

Activities were planned based upon these plans and available salmon-related information for the TKC Traditional Territory, including relevant past R&E projects (CRE-93N-04; Anderton 2005); the Record of Activities from the 2007-2012 TKC Stewardship Projects (CRE-54N-07, Anderton; CRE-54-08, CRE-54-09, CRE-54-10, CRE-54-11, CRE-54-12, Marjanovic) and TKC Restoration Projects (CRE-52N-07, CRE-54-13 and CRE-25-14).

The 2015 project was based out of the TKC Lands, Resources and Heritage office in Whitehorse, field equipment is supplied by TKC from past surplus funds from the R&E and TKC contribution dollars. Dawna Hope, TKC Senior Manager of Lands, Resources and Heritage (LRH), oversaw the overall planning and administration of the project. Phil Emerson and Deb Fulmer, TKC Fish and Wildlife Coordinators, helped coordinate project planning and supervised all field work and reporting. Community Technician Steward, Andre Eckert-Maret was hired for his second year in the program. Other TKC LRH staff contributed to the project by assisting with monitoring and maintenance work throughout the year.

A pre-season planning meeting was conducted by Dawna Hope and Sean Collins of DFO. From this meeting the Restoration Program was directed to:

1. Complete all annual permitting.
2. Transfer eyed eggs from Whitehorse Rapids Fish Hatchery to McIntyre Creek Incubation Facility.
3. Assist at the McIntyre Creek Incubation Facility during the early salmon life stages of; eyed eggs, alevins, and fry (including coded wire tagging).
4. Focus on Fox Creek juvenile monitoring of wild and enhanced rearing.
5. And, conduct stream walk investigations for the presence of adult returns and spawners, at Fox Creek.

Yukon River Panel protocols for Canadian R&E projects were adhered to, including those for the collection and reporting of data from the sampling of juvenile salmon (YRP 2009a, see Appendix A) and obstruction management (YRP 2009b).

Training, Mentoring and Capacity Building

Project training needs were determined on an individual basis, depending on existing credentials, certificates and experience. Opportunities for training included both formal (first aid and bear safety) and informal opportunities such as workshops, mentoring and experiential learning with professionals. All training opportunities were in kind contributions from TKC and or other organizations time and efforts.

In 2015, Andre Eckert-Maret completed the Fisheries Technician Course at Yukon College to increase technical experience and Ta'an capacity for this project and was a key resource in 2015. Staff also

certified in; Water Quality Monitoring, Streamkeepers, Predator Defence, Wilderness First Aid, Helicopter, ATV and Snow Mobile Safety. Field mentoring and training opportunities to staff also included the following:

- Juvenile Chinook utilization and habitat assessments of Fox Creek and stream channel restoration works with Sean Collins of DFO;
- Water quality technician training from the Yukon River Inter-Tribal Watershed Council (YRITWC).
    - The YRITWC supplies equipment and sample bottles to conduct water quality sampling every two weeks during the open water season within the TKC Traditional Territory as a part of their Water Quality Monitoring Program. The United States Geological Survey (USGS) provide shipping and analytical costs. All documents are shared with YRITWC, respected First Nations and the Yukon River Panel upon request and completion. TKC will assess utilizing this resource in 2016.
- Predator Defence and Firearms Handling Course through Arctic Response Canada Ltd.

FOX CREEK RESTORATION PROJECT - METHODS & RESULTS

The *Chinook Salmon Stock Restoration Plan for Fox Creek* developed in 2008 (Appendix C), outlines activities for each year of the multi-year program. The Restoration Plan recommended the program be undertaken for two full Yukon River Chinook life-cycles, and planning and operations for the second restoration life-cycle was to be guided by outcomes of the first-cycle (Anderton 2008a). With each year of the project there is ongoing; fry releases, juvenile monitoring, hydrology, water quality monitoring, trail maintenance, adult monitoring via stream walks during the spawning period, broodstock collection and egg incubation.

The 2015 project year, represents Year 8 and completion of planning and the first life cycle of the Restoration Project. Adults, both hatchery and wild, were observed, monitored and potentially spawned in Fox Creek during the 2015 field season. Twenty adults were observed on one site visit during spawning season surveys. These are very positive results and add value to continuation of this project through the second life cycle or Phase II of this project. An evaluation of the first life cycle of stocking will be conducted in early 2016.

The following sections summarize the methods and results of project components. More detailed information are included in Appendix A and B.

WHITEHORSE RAPIDS FISH HATCHERY AND MCINTYRE CREEK INCUBATION FACILITY

Broodstock for the Fox Creek Salmon Restoration Project are generously donated by Yukon Energy Corporation through the Whitehorse Rapids Fish Ladder. Chinook salmon eggs are collected by the Whitehorse Rapids Fish Hatchery (WRFH) staff, fertilized and reared to the eyed stage. Eyed eggs are then transported to the McIntyre Creek Incubation Facility (MCIF) by TKC staff. Here the eggs are raised to the fry stage, marked with coded wire tags, then transported and released into Fox Creek.

2015 operations at the Whitehorse Hatchery were managed by Lawrence Vano with Warren Kapaniuk as the Environmental Technician.

Whitehorse Rapids Fish Hatchery 2015

Broodstock for the 2015 Fox Creek Salmon Restoration Project were collected by WRFH staff during the 2014 Whitehorse fish ladder return. The eggs were fertilized and reared to the eyed egg stage at this facility. Normally all eyed eggs would be transported to the McIntyre Creek Incubation Facility (MCIF) however in 2015 a decision was made to only transfer approximately 50%. The transfer occurred in the first week of November.

The water temperature at the Whitehorse facility is slightly higher than McIntyre therefore ATU's are greater, resulting in a faster growth rate. Because of this 0+smolts reared in WRFH were released on June 8th and the fry release from MCIF was July 15th. Details on both releases are in Appendix B, Fox Creek Fry Releases 2015.

Whitehorse Rapids Fish Hatchery 2016

For the 2016 release, 50,388 eggs have been generously donated by Yukon Energy Corporation. These eggs were reared to the eyed stage and moved to the MCIF on November 2, 2015. The most recent update on the survival rate was November 10th where 128 eggs had died within the first two days of transport. Mortality of eyed eggs following transport is quite common so this is within the optimal range at 99.75% survival rate.

Figure 2: Eyed Eggs Donated by Yukon Energy's Whitehorse Rapids Fish Hatchery, November 2015

McIntyre Creek Incubation Facility 2014 - 2015

The Student Manager for the 2014-15 operating year was Jake Montgomery. Chinook salmon arrived at the facility in the eyed-egg stage in November 2014, MCIF staff cleaned trays daily, removed any discoloured (dead) eggs, monitored flows and water temperatures. During December 2014 and January 2015, the eyed-eggs hatched and developed into alevins. On March 19, 2015, Yukon College's Darrel Otto, who manages the McIntyre Hatchery, determined the fish were ready for transport to the troughs. In the troughs, the young fry were fed daily and rates of flow, water levels and temperature were monitored. 23,477 fry were available for release in July 2015. Each Chinook salmon raised at the hatchery was applied with a coded wire tag and the adipose fin was clipped. A total of 38,577 fry were incubated for the 2015 release from both the WRFH and MCIF.

FRY TRANSPORT & RELEASE

Fry releases into Fox Creek have taken place annually from 2009 to present. Because fry were raised in two different hatcheries in 2015 there were two releases. The June 8 release from WRFH facility was supported by manager, Lawrence Vano with assistance from Warren Kapaniuk. TKC staff loaded 15,100 into a transportation container and drove to Fox Creek. With a Prayer from Norm Adamson and technical assistance from Sean Collins all 0+smolts raised by the WRFH were successfully released.

The July 12 release was attended by; Andre Eckert-Maret, Deb Fulmer, Sean Collins, Maggie Wright, Darrell Otto, Coralee Johns, Marlene Johns, Lori Graham, MCIF Hatchery Staff, and members of the public. A total of 23,477 fry were transported from the MCIF to the Fox Creek release site with only 2 mortalities during the process. Water temperature and dissolved oxygen were closely monitored within the transport tote. Oxygen was low for a period but was quickly brought to within suitable ranges prior to transport. Upon arrival at the Creek oxygen levels were high but again quickly brought within the suitable range. Once at Fox Creek, the tote water temperature was gradually increased using water from Fox Creek, to allow the fry to become acclimatized to the warmer water in the creek prior to release.

More details of the 2015 fry releases are provided in Appendix B. Figure 3 below displays releases from 2009 to 2015.

Figure 3: Public and Volunteer Support Preparing Salmon for Transport

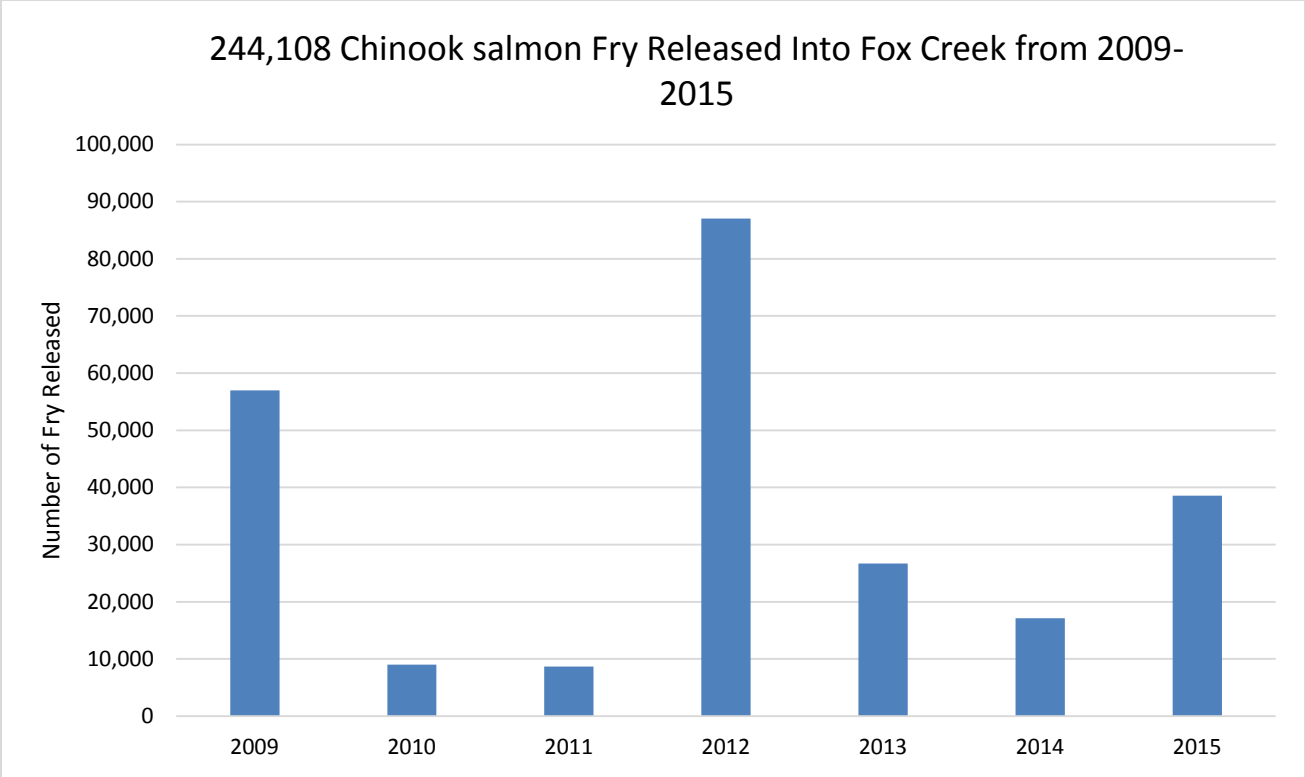

Figure 4: Chinook salmon Fry Released into Fox Creek, 244,108 from 2009 - 2015

JUVENILE CHINOOK MONITORING

Methods

Monitoring at four stations was conducted monthly from June to September according to the Fox Creek 2008 Stock Restoration Plan. The stations include:

- MS08-01 – located upstream of the North Klondike Highway Crossing approximately 2 km.
    - Coordinates: N61.10868, W135.31239
- MS08-02 – previously located at the North Klondike Highway Crossing where the staff gauge is but has been moved to approximately 100 meters downstream of the bridge where there is a pull out off the Fox Creek road.
    - Coordinates: N61.10133, W135.29282
- MS08-03 – located approximately 4-5 km downstream of the highway crossing.
    - Coordinates: N61.122.05, W135.25172
- MS08-04 – located 100 to 200 meters upstream of the mouth of the creek; dependent on the time of year and Laberge Lake water levels.

- Coordinates: N61.110.69, W135.20796.

The monthly monitoring event at each station includes:

- Juvenile Chinook sampling using four Gee-minnow traps per station,
- Determination of species and if adipose fin is present,
- Measurements of fish fork length (mm) and weight (nearest 0.1 gram),
- Collection of water temperature and dissolved oxygen, and
- A water level reading from the staff gauge (located just upstream from the Klondike Highway Bridge).

For each juvenile Chinook captured, the TKC stewards anaesthetize them using clove oil and record whether the fish is hatchery raised (adipose fin clipped) or wild (adipose fin present). They are then measured and weighed. Salmon are blotted prior to weighing and the scales calibrated and placed on a level surface. Detailed methodologies are included in Appendix A.

Results

In 2015, six sampling events were conducted by both TKC and DFO in June, July, and September. Normally sampling is also conducted prior to the annual hatchery releases in May or early June to determine baseline conditions prior to releasing to document hatchery and wild fish that have overwintered successfully in the creek. The subsequent monitoring events at the end of each month after the fry releases provide information on distribution and growth rates of juvenile salmon in the stream. In 2015, no sampling was conducted in May or early June due to staff shortages and lack of capacity during the beginning of the project. Due to employees being involved in a summer culture camp at the end of August minnow trapping was delayed and instead occurred at the beginning of September, and again during regular sampling schedule at the end of that month. No fry weights were taken during the September 3 sampling event due to malfunctioning equipment.

As per Table 1 below, TKC captured a total of 273 juvenile Chinook salmon during their four monitoring events. Of the 273 salmon fry captured 26 were wild fish with adipose fins present. There were no Chinook present at site MS08-01 which is upstream of the release site; at site MS08-02, 1 out of 247 was wild; site MS08-03, 4 of 5 were wild; and site MS08-04 all 21 fish were wild and assumed to have migrated to Fox Creek from their natal streams. The remaining 247 fish had clipped adipose fins and were assumed to be hatchery raised. Other species captured included a total of 24 slimy sculpin (Cottus cognatus), 2 burbot (Lota lota) fry, and 1 longnose sucker (Catostomus catostomus) fry.

A summary of the number of fish captured by TKC at each station, during each sampling event, is provided in Table 1 below. Department of Fisheries and Oceans (DFO) results provided by Sean Collins for site MS08-02 (Site 2) have also been added to Table 1 because this site is where the majority of hatchery juveniles were located. The results from this site have also been graphed in Figure 6. Detailed monitoring results are provided in Appendix B.

Table 1: 2015 Bio-Physical Monitoring Program - Number of Juvenile Chinook salmon Captured at Each Monitoring Station on Fox Creek

Monitoring Events	Parameter	MS08-01	MS08-02	MS08-03	MS08-04	*TOTAL # of Chinook*
June 17/15 TKC Data	# of Chinook	0	20	0	1	***21***
	Avg Weight (g)	N/A	2.4	N/A	1.9	
	Avg Length (mm)	N/A	61.4	N/A	58	
June 24/15 DFO Data	# of Chinook		65			
	Avg Weight (g)		2.7			
	Avg Length (mm)		64.6			
July 09/15 DFO Data	# of Chinook		57			
	Avg Weight (g)		4.3			
	Avg Length (mm)		74.9			
July 28/15 TKC Data	# of Chinook	0	93	2	14	***109***
	Avg Weight (g)	0	2	5.5	3.3	
	Avg Length (mm)	0	59.6	79.5	70.6	
Sept 3/15 TKC Data	# of Chinook	0	68	1	0	***69***
	Avg Weight (g)	Not Taken	Not Taken	Not Taken	Not Taken	
	Avg Length (mm)	0	66.7	88	N/A	
Sept 19/15 TKC Data	# of Chinook	0	66	2	6	***74***
	Avg Weight (g)	0	4.29	7	7.6	
	Avg Length (mm)	0	73.5	88.5	85.3	
TOTAL		***0***	***247***	***5***	***21***	***273***

Figure 5: Andre Eckert-Maret, Testoa Smith and Deb Fulmer Monitoring Juveniles

Figure 6 below displays the number of Chinook salmon fry captured at site MS08-02 during each sampling event, along with their average size and weight. The data potentially could be displaying larger fry released from the Whitehorse Rapids hatchery on June 8th then smaller fry released from McIntyre Creek Incubation Facility on July 12th.

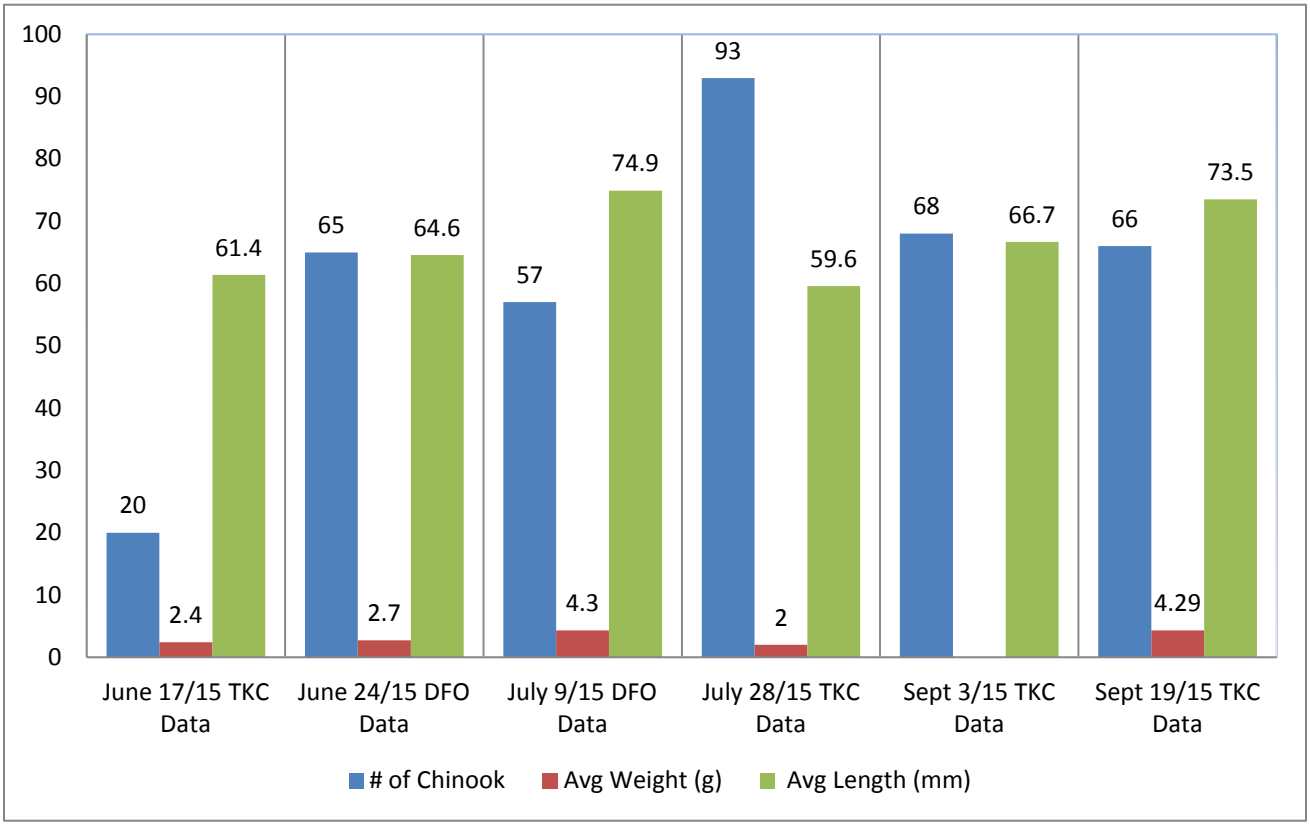

Figure 6 - Juvenile Chinook salmon 2015 Biophysical Monitoring Results for Site MS08-02

Table 2 compares the minimum and maximum length (mm) and average weights (g) of juveniles from TKC monitoring events. In comparing the June and July minimum fry sizes it is assumed we are observing the difference between the two hatcheries.. Fish produced from the WRFH are ready for release earlier in the season (June 8) due to the warmer rearing temperatures at the facility. On the release date, the average weights of the WRFH salmon were 2.5 grams. Fish released from the MCIF are released approximately a month later (July 12) and have an approximate average weight of 1.40 grams. So although the sizes decreased in July in Table 2 it is important to take into consideration the release dates and fry size of both hatcheries. Appendix B – Fox Creek Fry Releases 2015 provides more information on the releases.

During the June sampling event a 9g Chinook was captured at MS08-02 which suggests successful over wintering in the creek. Other outlier to fish weights were captured later in the summer and documented at MS08-04, just upstream of the mouth of fox creek. The larger fish captured all had adipose fins and presumably they are using the lower section of the creek for rearing.

Table 2: Minimum Maximum Results from TKC Juvenile Monitoring Events 2015

Date	Min Length (mm)	Max Length (mm)	Average (g)	Min Weight (g)	Max Weight (g)	Average (g)
17-Jun-15	57	90	62.8	2.1	9.0	2.7
28-Jul-15	45	110	62.3	1.0	7.0	2.2
3-Sep-15	54	100	67.1	*	*	*
29-Sep-15	57	100	74.9	1.6	9.4	4.6

In-situ water quality, temperature and staff gauge measurements were recorded when possible in conjunction with juvenile monitoring; as equipment was lacking in 2015 some of this information was not collected. Sampling was conducted by Sean Collins of DFO, and Andre Eckert-Maret, Deborah Fulmer, Testloa Smith, John Bunbury, Clayton Kane of TKC.

HYDROLOGY AND WATER QUALITY

The Chinook salmon Stock Restoration Plan for Fox Creek 2008 recommended hydrology measurements of discharge and stream stage be conducted as well as water quality in-situ measurements of; dissolved oxygen, pH, turbidity, conductivity, total metals be taken in conjunction with other monitoring activities.

From 2008 to present some of these monitoring activities have been done but there has been a lack of consistency due to; lack of experience, capacity, along with lack of adequate equipment, protocols and guidelines. In 2015 some of these measurements were taken by both TKC and DFO during monitoring events and have been summarized in Table 3 below and regular staff gauge recordings are displayed in Figure 7.

Table 3: Hydrology Measurements Taken at Fox Creek during 2015 Monitoring Events

Date	Time	Gauge(m)	Discharge (m^3/sec)
16-Jun	13:30	0.2	0.700
19-Jun	13:00	0.27	0.890
23-Jun	16:00	0.41	2.193
8-Jul	17:10	0.36	1.900
9-Jul	13:00	0.37	2.016
28-Jul	13:00	0.34	1.785
30-Jul	*	0.32	1.380
31-Jul	*	0.31	1.220
3-Aug	*	0.31	1.220
14-Aug	*	0.3	1.050
18-Aug	16:00	0.27	**
25-Aug	16:05	0.23	0.794
28-Aug	16:00	0.398	**
16-Sep	16:00	0.384	**
17-Sep	16:00	0.378	**
22-Sep	16:00	0.349	**
15-Oct	10:30	0.345	1.580
29-Oct	16:00	0.32	1.376

* No time recorded

** Discharge Not Measured

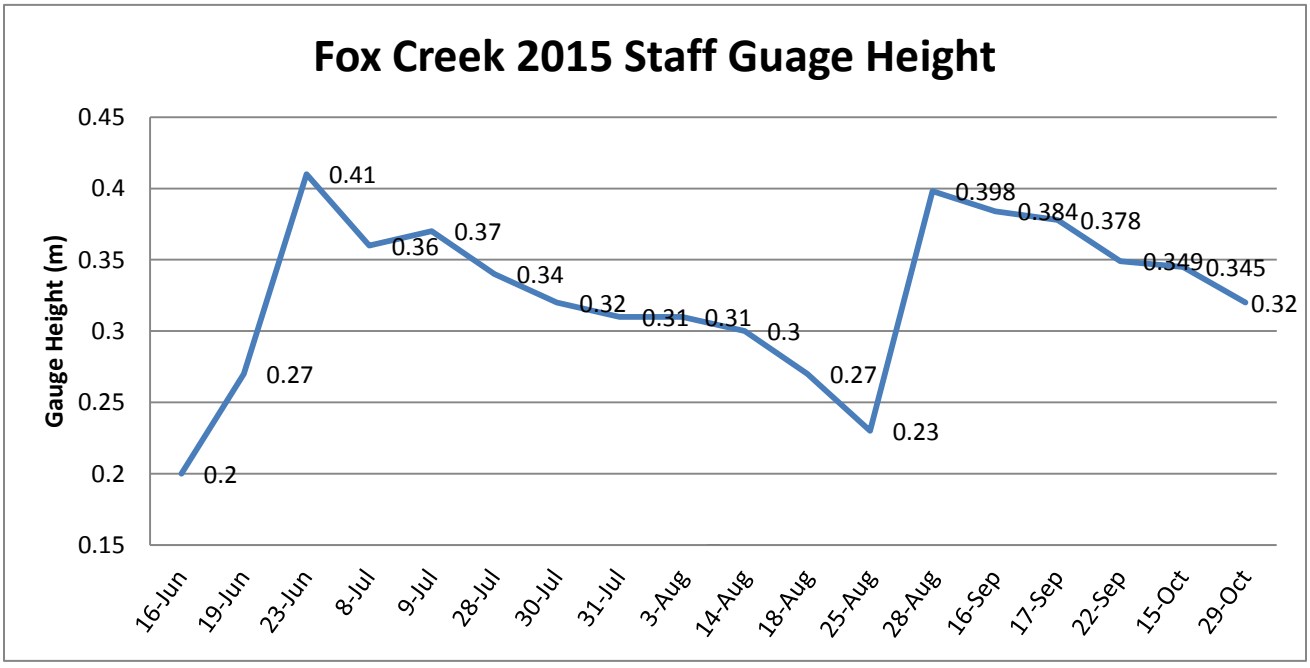

Figure 7: Staff Gauge Height Measurements at Fox Creek 2015

From 2006 to present TKC, with support from Al Von Finster, TKC has been very diligent at monitoring surface water temperature in Fox Creek using in stream Tidbit temperature data loggers. This temperature monitoring is part of a larger project on creek, groundwater and river thermal regimes throughout Yukon River watershed in relation to climate change and salmon habitat. The Fox Creek results have been graphed and are displayed in Appendix B.

Going forward it is recommended the following monitoring be added to the program as per the 2008 plan and detailed protocols and procedures be developed.

Stream Stage:

- A hydrometric station to be developed immediately upstream of the North Klondike Highway.
- Stream Gauging – The current stream gauge should be secured and resurveyed
- Eventual development of a rating curve.

Water Quality:
Two water quality sampling stations at or near stream stage sampling site. With the following parameters measured.

- Dissolved oxygen
- pH
- turbidity
- conductivity
- total metals

TRAIL MAINTENANCE

The Fox Creek trail represents approximately 14 km of rugged trail directly adjacent to the creek from the North Klondike Highway crossing to the mouth at Lake Laberge. It is used to access the creek from several locations, to allow safe monitoring activities for all project components. From 2007 to 2009 and again in 2012, this foot path was completed and maintained by TKC Stewards with assistance from Y2C2 crews.

Because a well maintained trail allows safe access to the creek, in particular better sight lines for detecting bears and preventing close encounters, it is imperative it is well maintained. Many sections of the trail, especially the lower portion dominated by riparian vegetation, had become overgrown therefore trail maintenance was a priority for the 2015 program. TKC staff was sent out on a regular basis and the lower section of the trail was reopened to monitor returning adult salmon.

Figure 8: John Bunbury and Clayton Kane Geared up for Trail Maintenance

MONITORING ADULT SALMON RETURNS & BARRIERS

Methods

TKC staff Andre Eckert-Maret, John Bunbury and Deb Fulmer conducted a stream walk from the Klondike Highway Bridge half way to the mouth on July 29, 2015 to observe and record fish habitat and potential barriers to fish passage. Reaches of stream morphology, barriers, spawning and rearing habitat were noted, photographed and geo-referenced. Future goals are to digitize and map this information for use in the field and to monitor changes in stream dynamics over time.

Expected return is from August 1 to September 1 so adult surveys were conducted during this time recording results and reconsidering survey sites based on salmon observed, salmon behavior and barriers realised. On a stream walk conducted by Andre, Deb and Phil Emerson on August 11th from the mouth of Fox Creek to approximately 4 km upstream, adult salmon were discovered in a holding pond approximately 100m below the first major beaver dam barrier. From August 11 onward, daily walks were conducted to observe, record, photograph and geo-reference adult salmon and potential spawning sites. On the August 18th site visit a total of 20 salmon were observed in this pool.

The returning adults in 2015 potentially represent the four, five and six-year old Fox Creek Chinook fry released from 2009 to 2011, as well as returning jacks released in 2011 or 2012. Adult Chinook salmon were observed in the stream until August 28 but stream walks continued in order to collect carcasses and record potential redd sites. The carcasses have been submitted to DFO for further analysis and results are pending. Additional temperature data loggers have been placed at some of the potential redd sites to determine if incubation temperatures near established redds are similar to winter surface water measurements and assist in determining emergence timing of deposited eggs for subsequent assessment.

TKC staff observed, described and recorded all returning adult fish including; markings, injuries, size, sex and behaviour. When carcasses were found, the length was measured, and then scale samples and heads were collected for submission to DFO. The locations of any potential spawning sites were geo-referenced and flagged. Observers also documented potential obstructions or barriers to adult upstream migration.

Figure 9: Wild Adult Chinook salmon Observed in Fox Creek 2015

Figure 10: Adult Chinook salmon in Fox Creek 2015

Two to three personnel attended stream walks on a rotational basis throughout the spawning period. TKC staff including; Andre Eckert-Maret, John Bunbury, Deb Fulmer, Phil Emerson, Clayton Kane, Testloa Smith, and Coralee Johns as well as Sean Collins of DFO. The walks were conducted on the following dates:

- August 10, 11, 12, 13, 14, 18, 19, 20, 21, 24, 25, 27, 28, and 31.
- September 16, 17, 22, and 23.

A total of 112 salmon were observed over this time period, and although the same fish may have been counted more than once, a maximum of 20 were observed during one site visit. Details of observations during stream surveys, including but not limited to; number of males and females, if adipose fin was clipped, potential redds observed and documented can be found in Appendix B, Adult Monitoring, pages 41-47.

Due to the nature of the bear encounter in 2014 staff were trained in predator defence and equipped with appropriate safety equipment throughout the season. No bears were encountered and little activity was observed during 2015 field season.

Large beaver dams were noted in the mid reaches of the creek, but no significant barriers were identified in the lower reaches during the stream walk surveys or regular monitoring events. Thus it appears that access to the lower 4 to 5 km of the creek has been maintained in 2015 for returning adults.

Figure 11: Measuring Adult Chinook salmon Carcass at Fox Creek 2015

DISCUSSION

The Fox Creek Salmon Restoration Project (formally known as the Community Stewardship Project) was designed in 2006 and field work started in the spring of 2007. The Chinook Salmon Stock Restoration Plan (CSSRP) was completed in 2008 and was based on Traditional Ecological Knowledge (TEK) and technical expertise from the Department of Fisheries and Oceans (DFO).The first broodstock were released in Fox Creek in 2009. Since then, TKC has worked closely with DFO, Environmental Dynamics Inc. (EDI), Yukon Energy's Whitehorse Rapids Hatchery and the McIntyre Creek Incubation Facility – Yukon Research Center to restore salmon habitat and fisheries stocks in Fox Creek.

The TKC Community Stewardship and Fox Creek Salmon Restoration Project have seen many successes since the onset of the program in 2007. Over the years, the Stewardship program has served to increase the capacity of the TKC LRH Department as well as TKC citizens for this type of salmon restoration work. The restoration of Chinook salmon to Fox Creek has been a high priority for TKC, plus the Yukon River Panel R&E project has shifted from one of capacity building to focus on restoration in recent years. The 2013 year marked the return of the first adult spawners to Fox Creek, and a total of 244,108 hatchery-raised fry have been released from 2009-2015.

Results from 2015 are very positive because this is the second year returning adult Chinook salmon were observed in Fox Creek and potentially spawned. Adults were observed daily from August 11 to 28, 2015 with a maximum of 20 on August 18, 2015. In addition, biological samples were taken from 3 carcasses and artificial redds were installed at potential redd sites to monitor overwintering conditions and calculate ATU's. This year was also unique in that fry were released from both WRFH and MCIF therefore effects of water temperature and ATU's on fry success can potentially be analyzed.

Bio-physical (juvenile) monitoring in 2015 was similar to other years with both hatchery-raised and wild juvenile Chinook salmon utilizing Fox Creek. During an early July sampling event conducted by DFO a 19.2 gram 115 millimeter juvenile Chinook was captured, indicating successful overwintered in the creek. Sampling after the release dates in June and July provided information on distribution and growth of the released fry, as the fry fork lengths and weights had increased through the season.

Since this represents Year 8 of the Restoration Plan, a significant amount of data has been collected for the program to date, including juvenile Chinook fork lengths and weights. While the data is reported on an annual basis, it would be valuable to look at all data as a whole. There is also continuous water temperature data available for the creek, which TKC has been collecting with DFO and Al von Finster from 2006 to present. There is therefore a strong dataset of temperature and fish condition and growth that could be reviewed and analyzed to offer insights into the condition of hatchery-raised fry in Fox Creek during the program. Additional monitoring stations and sampling events may be warranted to allow for proper statistical analysis.

While the stream walks have successfully observed returning spawners in 2015, this method may not be the most effective for monitoring and enumerating adult salmon returns, as there is a high probability that observers could miss spawners or carcasses could be removed quickly by wildlife. In future, TKC could use other suitable technology such as Didson Sonar or underwater video cameras installed near

the creek mouth to effectively observe returning adults and provide a better means of enumerating returning salmon. Stream walks would still be required to attempt to locate spawning areas and document obstructions.

After 10 years of data collection and 7 years of fry releases in Fox Creek we have reached the midway point of this project and the end of Phase I of the CSSRP. We are now obligated to review the plan to ensure we incorporate knowledge gained and new technology into Phase II or the second Chinook salmon life cycle. Therefore a 2015 Fox Creek Restoration Mid Project report which analyzes data to date will be available February 29, 2016. With knowledge gained from this data analysis we will create a Phase II Fox Creek Chinook Salmon Stock Restoration Plan for the second Chinook salmon life-cycle.

Figure 12: Phil Emerson and Sean Collins Installing an Artificial Redd 2015

PROGRAM RECOMMENDATIONS

The Fox Creek project has potential to become a pilot project for future Chinook salmon stock restoration projects throughout Yukon so it is recommended TCK analyzes data to date with the assistance of DFO and the Yukon River Panel Technical Team. This Team will incorporate and report on knowledge gained from the first phase, or first salmon life cycle, then create a Phase II Fox Creek Chinook Salmon Stock Restoration Plan for the second Chinook salmon life-cycle.

From the positive results of adult returns during the 2015 season, an increase in water quality and monitoring around potential redds will be a top priority in 2016. Recommendations for other specific program components are as follows:

PLANNING AND IMPLEMENTATION

- Coordinate pre- and post-season meetings with project partners including; Yukon Energy Corporation, Whitehorse Rapids Fish Hatchery, McIntyre Creek Incubation Facility, Yukon College, and Department of Fisheries and Oceans Canada.
- Develop standard datasheets for; bio-physical monitoring, hydrology and water quality, adult and redd monitoring to help collect consistent data and move toward digital data entry in the field with appropriate instruments.
- A database should be developed to house all of the monitoring data. This would create a central location for all data and allow for easy access for multi-year analysis.
- Attend Yukon River Panel meetings and teleconferencing, for updates, the pre-season outlook and to gain knowledge and understanding on the marine ecology, the Yukon River system and Alaskan Tribal communities.
- Work with the Yukon River Panel Technical Team and continue to build partnerships and mentorship training opportunities for TKC citizens with other agencies, such as the Yukon College, MCIF, WRIF, DFO, and YRITWC.

TRAINING, MENTORING AND CAPACITY BUILDING

- Continue to encourage partnerships and mentorship training opportunities with partners and other agencies.
- Match formal training opportunities to meet career development goals of current LRH staff.
- Continue to employ young TKC citizens in restoration positions.
- Provide education and awareness about the Chinook salmon decline, best practices and conservation efforts towards tangible results with TKC Citizens, youth and the general public (through news articles, TKC website, newsletters, etc.).
- Continue to develop opportunities for TKC staff to communicate information about Yukon River salmon and the project to TKC citizens through presentations, articles in the TKC newsletter, articles on the newly updated TKC website (taan.ca), and by including citizens in project activities (e.g. fry release into Fox Creek).

- Continue to integrate restoration activities into TKC LRH Department by identifying opportunities for other department staff to contribute skills, expertise and time to the Project;
- Continue to build linkages between project activities and goals, and existing TKC programs such as Culture Camps and Family Fish Camp;
- Review, and develop where necessary, safety protocols specific to project activities.
- Ensure all TKC staff assisting with the program in the future are trained in predator defense and certified for firearm use (Possession and Acquisition License – PAL) prior to each field season.

WHITEHORSE RAPIDS FISH HATCHERY AND MCINTYRE CREEK INCUBATION FACILITY

- At present TKC continues to utilize Whitehorse Rapids Fish Hatchery for broodstock collection and rearing to the eyed stage and MCIF for rearing to fry stage.
- Assist with monitoring, daily maintenance and operations at the McIntyre Creek Incubation Facility.
- Moving forward consider harvesting our own broodstock for either or both hatcheries.
- Eventual phasing out of hatcheries and relying on the natural system to recover.

ANNUAL FRY RELEASE INTO FOX CREEK

- With the expected release of approximately 47,000 fry in 2016, the program should consider staggering release dates and possibly re-evaluating release locations to accommodate the numbers of fry.
- Ensure bio-physical monitoring events occur prior to fry release, to determine the overwintering success of juvenile Chinook salmon.

BIO-PHYSICAL MONITORING OF JUVENILES

- Provide training, obtain equipment and follow protocols to ensure consistency of data collected for long term monitoring.
- Review results to determine if fry in fact, overwinter in the stream.
- Analyze the 2015 releases from both Whitehorse Rapids and McIntyre Creek Hatcheries to monitor growth and migration patterns from each. Because fry were released from both hatcheries in 2015 it provides opportunity to further analyze the bio-physical results.

HYDROLOGY AND WATER QUALITY

- Expand water quality monitoring parameters to include; dissolved oxygen, pH, turbidity, ORP, conductivity, Nitrates, and total metals.
- Based on recommendations under the Restoration Plan 2008, stream gauging and flow measurements should be conducted during regular monitoring events to improve discharge data. Install a hydrometric station, including a staff gauge to develop a rating curve over time.
- Expand hydrology monitoring program to include monitoring overwintering conditions.

- Continue with data loggers to measure temperature on the hour.

MONITORING ADULT SALMON RETURNS

- Develop an adult enumeration plan for expected future adult returns of the program. Consider options such as Didson sonar and underwater video cameras. Of note, the 2012 fry release was the largest fry release to date (>80,000 fry released) for the project and therefore effectively enumerating returns from this year should be a high priority.
- Continue monitoring adult salmon returns to Fox Creek through stream walks. Document and map spawning locations and potential barriers to upstream migration.
- Calculate current and future spawning area.
- Continue to monitor beaver activity and potential obstructions to migrating adult salmon, during all monitoring events. A map of the status of beaver dams along the creek should be conducted in July prior to the spawning period. Develop a beaver management plan in conjunction with annual fur trapping events.
- Continue collection of biological adult carcass samples from Fox Creek and deliver to DFO for analysis.
- Recording and monitoring potential redd sites.
- Ensure the Fox Creek access trail remains open through ongoing trail maintenance as easy and safe access to the creek is required for all project components (particularly line of sight for early-detection of bears).

REFERENCES

Anderton, I. 2008. *Chinook Salmon Stock Restoration Plan for Fox Creek.* Ta'an Kwäch'än Council. Yukon River Restoration and Enhancement Project CRE-52N-07. Completed by EDI Environmental Dynamics. February 2008.

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TKC. 2012. Ta'an Kwäch'än Council Community Stewardship Project: CRE-54-12 Final Report. Yukon River Restoration and Enhancement Project. CRE-54-12. January 2013.

TKC. 2013. Ta'an Kwäch'än Council Community Stewardship Project Final Report. Yukon River Restoration and Enhancement Project. CRE-54-13. January 2015.

APPENDIX A – STANDARDS AND METHODS UTILIZED

FRY TRANSPORT AND RELEASE

Fry transport and release is guided by the following publication:

Habitat and Enhancement Facts and Figures handbook, 4th Edition, Salmonid Enhancement Program. Fisheries and Oceans Canada.

JUVENILE MONITORING

2009 Yukon River Panel

Protocol for collection and reporting of data from juvenile salmon sampled in Canadian R&E Projects.

May 1, 2009

This Protocol is to encourage standard methods of collection and reporting of data from juvenile salmon captured in projects funded by the Yukon River Panel within the Canadian Sub-basin. The "Juvenile Chinook Salmon Sampling Form" is suggested for routine sampling of streams and rivers. Specific data reporting requirements for other types of sampling, such as downstream migration traps, etc, should be agreed to with the Technical Contact assigned to your project.

Salmon Species and Number (SPP/# on the Juvenile Salmon Sampling Form)

Note the species of each juvenile salmon caught. If large numbers are captured, record the total number and measure a subset. A minimum subset of 30 salmon of a given species per sampling site is recommended.

Length measurements – mandatory

If less than 30 juvenile salmon are captured at a sampling site, measure the fork lengths of all. If more than 30 are captured, measure at least 30. Record the measurement to the nearest millimetre (mm).

Weight Measurements - optional

If juvenile salmon are weighed the following standards are to be followed:

Scales/balances are to be calibrated as per the manufacturer's recommendations prior to weighing fish at each station;

Excess water should be removed from the surface of the fish by blotting with a cloth or paper towel

Scales/balances must be located on flat surface during use;

Weights are to be recorded to the nearest 0.1g;

Reporting

The data must be presented by date and site. The sites must be described by UTM or Latitude/Longitude co-ordinates, or shown clearly on a map located in the report or in an appendix.

The data collected is to be presented in an appendix to your final report. If this is not possible, it may be submitted either electronically or as hard copy to the Technical Contact for your project.

HYDROLOGY AND WATER QUALITY

Hydrology and Water Quality is guided by the following publication:

Manual of British Columbia Hydrometric Standards, BC Min. of Environment for the Resources Information Standards Committee, 2009

https://www.for.gov.bc.ca/hts/risc/pubs/aquatic/hydrometric/man_BC_hydrometric_stand_V1.0.pdf

ADULT RETURNS

FOX CREEK ADULT SURVEY PROTOCOL

(Draft v.3, Aug 2015)

General guidance:

A HAT and POLARISED sunglasses are necessary to complete a successful survey.

Live adult and carcass survey results are very important to determine the success of the project.

Upon observing salmon in Fox Creek the following guidance should be followed to record the observation and to detail enough information to be able to report on the observation and to accurately return to the site for further investigation.

This information is necessary to document the behaviour of the fish observed to determine if the area was used for spawning or if they are still migrating within the stream.

Notify DFO immediately upon conclusion of the days survey if salmon (live or carcasses) are observed in the stream. We will make every effort to return to the site with you to document everything that can be learned at this point and to ensure further investigation of restoration at Fox Creek. Continue to survey the entire stream on subsequent days to ensure that all salmon that may have returned are located. This will ensure we have documented all locations that spawning has, or may have, taken place for later investigation.

1. Live Adults

Points to record:

1. Count how many at location, try to stay back somewhat just so as to not disturb their behaviour as this is important to record as per below
2. Describe fish observed: Do they have any white markings/injuries on them (Usually near the tail, this results from digging and defending territory), Are they large or small Chinook? Is an adipose fin present or not on each fish? Are you confident that you can record the sex of the fish observed, if unable to tell record as such.
3. GPS location of observation, save on GPS and write in notebook and affix labeled ribbon to nearby tree at eye level as a back-up.
4. Photograph as much as is necessary to represent the stream location, take notes on photograph identification numbers
5. Observe and record behaviour:
    - Are they below an obstruction and either not able to pass or in the process of attempting to pass? OR
    - Are they in pairs or groups of 3 or so that are occupying a spawning site Redd or specific area of the stream. A Redd will appear to be a cleaned off area of gravels. May or may not be obvious depending on the amount of digging that may have been done. A giveaway is if you see them defending an area against other fish or if you see them turn on their side and dig at the bottom briefly. OR
    - Are they in deeper water like a pool or behind logs and appear to be hiding/holding. This is observed when fish are not yet ready to spawn either because they are still migrating, looking for mates or awaiting appropriate conditions (flow, temp). They will hold in areas where they can hide and or get refuge out of the stronger currents.

NOTE sometimes you can surprise them and they will move to refuge to hide. If you suspect this has occurred watch them for about 15 minutes from a distance and see if they return to a redd area or what they do. Fish that are ripe for spawning will usually return to their redd within this time.

2. Carcasses

Points to record:

1. Record the location and number of carcasses as you do with the live adults.
2. Take pictures of the carcass and stream area found.
3. Check for adipose clip and note if clipped or not.
4. Remove the head, gills, attach head tag to jaw with zip tie and store in individual labelled bags whether the adipose is clipped or not. Freeze or bring to DFO after the days survey completed.
5. If it is a female cut it open to determine how many, if any eggs, are still within the salmon. This tells us the proportion of eggs that the salmon likely spawned. (e.g. If no eggs observed then it is a 100% spawned fish). A basic estimate of the number is all that's needed. Less than approximately 30-50 eggs still within the salmon is not unusual.

6. Collect/record Age/Sex/Length (ASL). Record sex, Collect scale samples as per scale card instructions for age analysis, measure the fork length and post orbital hypural length (bring field book, scale cards, tape measure and tweezers) See diagrams below for length descriptions. To find the hypural plate for accurate measurement you may have to slice away the skin covering it. Take a picture of carcass with head tag visible or some identifier.

Summary of equipment for adult surveys:

• Polarized sunglasses and hat • GPS • Camera • Field Notebook/Pencil • Map • Ribbon • Zip ties	• Knife (for removing head) • Ziplocks or garbage bags for heads • Permanent marker • Scale Cards • Sharp tweezers • Tape Measure • Labels for each head

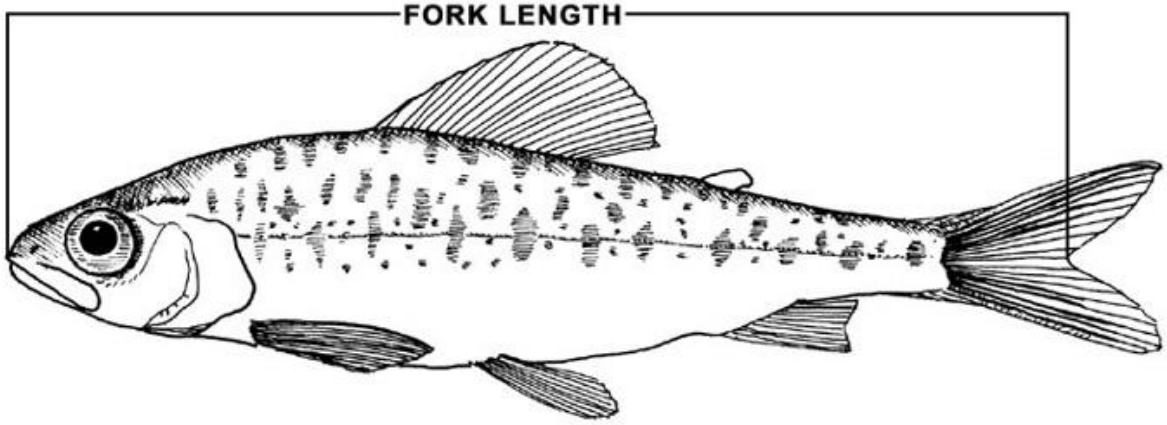


Photo courtesy juvenilefishid.com

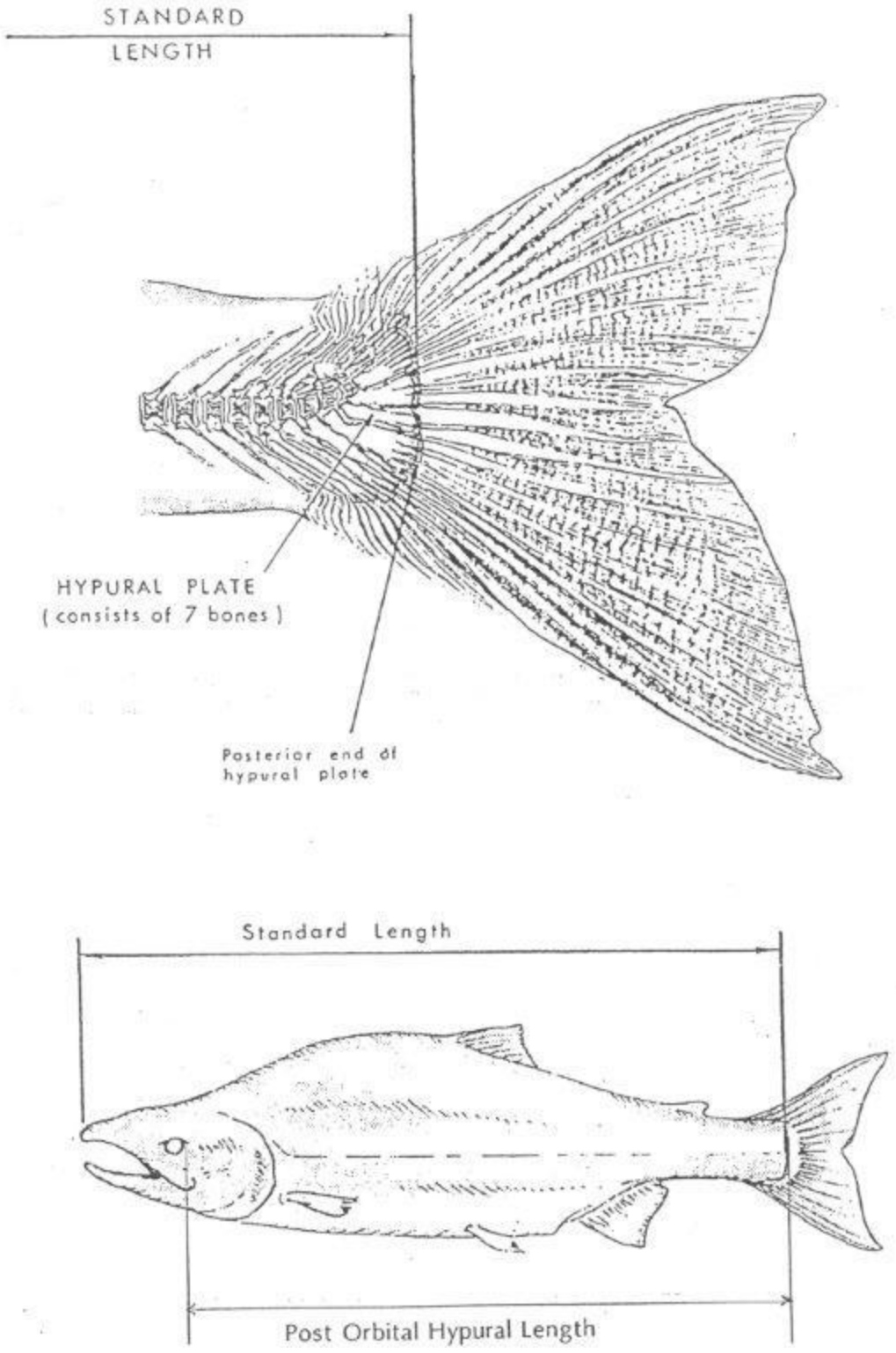


Image courtesy of Pacific Streamkeepers Federation

Redd Monitoring

DFO and TKC implemented methods to attempt to evaluate the success of eggs spawned from returning 2015 adults. Redds identified during the adult survey period were considered for evaluation. Three redd sites were identified as viable evaluation sites where temperature loggers could be deployed nearby to evaluate incubation progress. Efforts were made to prevent any impacts to the established redds. Artificial redds were constructed adjacent to the established redds and tidbit temperature loggers were deployed in lieu of eggs following methods used by Johnson et. al, 2012.

Christopher L. Johnson, Philip Roni & George R. Pess (2012): Parental Effect as a Primary Factor Limiting Egg-to-Fry Survival of Spring Chinook Salmon in the Upper Yakima River Basin, Transactions of the American Fisheries Society, 141:5, 1295-1309

Three artificial redds were constructed on October 29, 2015. The intent of the incubation evaluation is to determine timing and success of emergent fry through subsequent trapping in spring/summer 2016

APPENDIX B – SUPPORTING DOCUMENTS –MONITORING INFORMATION 2015

FOX CREEK FRY RELEASES 2015

Date	08-Jun-15	12-Jul-15
Number of Fry	15100	23,477
O2 flow during transport	2%	14.97 mg/L
Tote Used	700L	700 L
bubbler was in good working order	Yes	No, but good enough
Fox Creek	8.0°C	14.2°C
Fish Tag Code (July 12/15: 500 Chinook fry had adipose clipped but were not tagged due to tag shortage.	18-31-86	02-1-2-8-6 (10k) 02-1-2-8-7 (10k) 02-1-2-8-8 (3k)
Tag retention	99%	99+%
Average weight	2.50 g	1.40 g
Average Length	55-60 mm	5.36 mm
02 concentration in tote at release site	350%	10.42 mg/L Avg of 5 readings
Release time	12:15	12:30pm
End Time	13:04	13:15pm
Weather	Partial cloud, 15-18C, clear water	Overcast and heavy rainfall near end of release
Staff Gauge	Staff gauge is damaged and accurate reading are not available.	n/a

JUVENILE MONITORING

Fox Creek 2015 Juvenile Sampling Results Provided by Department of Fisheries and Oceans					
Date Set	**Date Pulled**	**# Traps**	**Site**	**Comments**	**Samplers**
16/06/2015 12:00	17/06/2015 11:05	4	1	10.5C at set, 9.5C; 11.6ppm at pull	TKC and DFO
16/06/2015 12:55	17/06/2015 11:25	4	2	10.8C, 11.7ppm, 105% DO at set; 9.8C at pull	TKC and DFO
16/06/2015 13:30:00 PM	17/06/2015 12:25	4	3	12.8C at set; 11.5C at pull	TKC and DFO
16/06/2015 14:10:00 PM	17/06/2015 13:15:00 PM	4	Mouth (4)	14.8C at set; 13.4C at pull	TKC and DFO
23/06/2015 15:05:00 PM	24/06/2015 14:10:00 PM	4	2	14.7C at set, water higher than 16th set, hard to find refuges for traps; appears to have rained in last 24-48hrs; 15.0C at pull	DFO
23/06/2015 15:46:00 PM	24/06/2015 12:00	4	3		DFO
23/06/2015 15:55:00 PM	24/06/2015 12:00	1	2013 spawning site	Set 1 approx 300 meters U/S of Site 3 at '13 spawning site	DFO
08/07/2015 16:50:00 PM	09/07/2015 12:30	4	1	14.5C at pull,	DFO
08/07/2015 16:40:00 PM	09/07/2015 11:15	4	2	16.0C at 1710h; 14.5C at 1217	DFO
08/07/2015 16:20:00 PM	09/07/2015 10:15	4	3	Moved site 3 ~300m U/S; 14.0C at pull	DFO
08/07/2015 15:35:00 PM	09/07/2015 9:10	4	Mouth (4)	16.0C at set; 14.0C at pull	DFO
	28/07/2015 0:00			First sampling since McIntyre Release	TKC and DFO

Fox Creek 2015 Juvenile Sampling Results Provided by Department of Fisheries and Oceans									
			Chinook				Other		
Date Pulled	Site	Spcs	Lth (mm)	Wt (g)	Clip(Y/N)	Spcs	Lth (mm)	Wt (g)	Comments
24-Jun-15	2	CK	68	3.2	Y				
24-Jun-15	2	CK	67	2.8	Y				
24-Jun-15	2	CK	65	2.9	Y				
24-Jun-15	2	CK	68	3.2	Y				
24-Jun-15	2	CK	63	2.1	BAD OR NO				
24-Jun-15	2	CK	63	2.4	Y				
24-Jun-15	2	CK	61	2.4	Y	**June 24 Site 2 Averages**			
24-Jun-15	2	CK	63	2.6	Y	# of Fry	Length	Weight	
24-Jun-15	2	CK	66	3.0	Y	65	64.55	2.70	
24-Jun-15	2	CK	66	2.9	Y				
24-Jun-15	2	CK	63	2.2	Y				
24-Jun-15	2	CK	62	2.3	Y				
24-Jun-15	2				NA	CCG	82	NA	
24-Jun-15	2	CK	63	2.4	Y				
24-Jun-15	2	CK	53	1.4	Y				
24-Jun-15	2	CK	63	2.7	Y				
24-Jun-15	2	CK	66	2.9	Y				
24-Jun-15	2	CK	67	3.1	Y				
24-Jun-15	2	CK	67	3.1	Y				
24-Jun-15	2	CK	66	3.3	Y				
24-Jun-15	2				NA	CCG	57	NA	
24-Jun-15	2	CK	66	2.8	Y				
24-Jun-15	2	CK	66	3.0	Y				
24-Jun-15	2	CK	66	3.1	Y				
24-Jun-15	2	CK	70	3.3	Y				
24-Jun-15	2	CK	64	2.6	Y				
24-Jun-15	2	CK	66	3.0	Y				
24-Jun-15	2	CK	62	2.3	Y				
24-Jun-15	2	CK	65	2.8	Y				
24-Jun-15	2	CK	63	2.6	Y				
24-Jun-15	2	CK	65	2.4	Y				
24-Jun-15	2	CK	63	2.5	Y				
24-Jun-15	2	CK	66	NA	Y				
24-Jun-15	2	CK	67	NA	Y				
24-Jun-15	2	CK	68	NA	Y				

Fox Creek 2015 Juvenile Sampling Results Provided by Department of Fisheries and Oceans									
			Chinook				Other		
Date Pulled	Site	Spcs	Lth (mm)	Wt (g)	Clip(Y/N)	Spcs	Lth (mm)	Wt (g)	Comments
24-Jun-15	2	CK	58	NA	Y				
24-Jun-15	2	CK	66	NA	Y				
24-Jun-15	2	CK	64	NA	Y				
24-Jun-15	2	CK	68	NA	Y				
24-Jun-15	2	CK	65	NA	Y				
24-Jun-15	2	CK	60	NA	Y				
24-Jun-15	2	CK	63	NA	Y				
24-Jun-15	2	CK	63	NA	Y				
24-Jun-15	2	CK	65	NA	Y				
24-Jun-15	2	CK	62	NA	Y				
24-Jun-15	2	CK	65	NA	Y				
24-Jun-15	2	CK	63	NA	Y				
24-Jun-15	2	CK	61	NA	Y				
24-Jun-15	2				NA	CCG	67	NA	
24-Jun-15	2	CK	66	NA	Y				
24-Jun-15	2	CK	61	2.4	Y				
24-Jun-15	2	CK	63	2.6	Y				
24-Jun-15	2	CK	65	2.8	Y				
24-Jun-15	2	CK	65	2.6	Y				
24-Jun-15	2	CK	70	3.4	Y				
24-Jun-15	2	CK	66	2.9	Y				
24-Jun-15	2	CK	63	2.6	Y				
24-Jun-15	2	CK	70	3.3	Y				
24-Jun-15	2	CK	71	3.1	Y				
24-Jun-15	2	CK	68	2.9	Y				
24-Jun-15	2	CK	66	2.7	Y				
24-Jun-15	2	CK	64	2.8	Y				
24-Jun-15	2	CK	64	2.5	Y				
24-Jun-15	2	CK	66	2.6	Y				
24-Jun-15	2	CK	63	2.4	Y				
24-Jun-15	2				NA	CCG	70	NA	
24-Jun-15	2	CK	60	2.0	Y				
24-Jun-15	2	CK	66	3.2	Y				
24-Jun-15	2	CK	59	1.9	Y				
24-Jun-15	3	CCG	87	NA	NA				
24-Jun-15	3	CCG	80	NA	NA				
24-Jun-15	3	CCG	86	NA	NA				
24-Jun-15	3	CCG	92	NA	NA				

Fox Creek 2015 Juvenile Sampling Results Provided by Department of Fisheries and Oceans									
			Chinook				Other		
Date Pulled	Site	Spcs	Lth (mm)	Wt (g)	Clip(Y/N)	Spcs	Lth (mm)	Wt (g)	Comments
24-Jun-15	3	CCG	80	NA	NA				
24-Jun-15	3	CCG	70	NA	NA				
24-Jun-15	3	CCG	66	NA	NA				
24-Jun-15	3	CCG	74	NA	NA				
24-Jun-15	3	CCG	74	NA	NA				
24-Jun-15	3	CCG	65	NA	NA				
24-Jun-15	3	CCG	83	NA	NA				
24-Jun-15	2013 Spawn Site	CCG	NA	NA	NA				
24-Jun-15	2013 Spawn Site	CCG	NA	NA	NA				
24-Jun-15	2013 Spawn Site	CCG	NA	NA	NA				
24-Jun-15	2013 Spawn Site	CCG	NA	NA	NA				
09-Jul-15	1	AG	~120	NA	NA				
09-Jul-15	1	CCG	~60	NA	NA				
09-Jul-15	2	CK	75	4.4	Y				
09-Jul-15	2	CK	71	3.4	Y				
09-Jul-15	2	CK	77	4.8	Y	**July 09 Site 2 Averages**			
09-Jul-15	2	CK	80	5.0	Y	# of Fry	Length	Weight	
09-Jul-15	2	CK	76	4.6	Y	57	74.89	4.30	
09-Jul-15	2	CK	70	3.7	Y				
09-Jul-15	2	CK	75	4.4	Y				
09-Jul-15	2	CK	115	19.2	Y	**Potentially Over Wintered in Stream**			
09-Jul-15	2	CK	71	3.3	Y				
09-Jul-15	2	CK	75	4.0	Y				
09-Jul-15	2	CK	82	5.6	Y				
09-Jul-15	2	CK	74	3.9	Y				
09-Jul-15	2	CK	70	3.3	Y				
09-Jul-15	2	CK	76	4.0	Y				
09-Jul-15	2	CK	76	4.4	Y				
09-Jul-15	2	CK	72	3.6	Y				
09-Jul-15	2	CK	73	3.9	Y				
09-Jul-15	2	CK	75	3.9	Y				
09-Jul-15	2	CK	72	3.8	Y				
09-Jul-15	2	CK	78	4.8	Y				
09-Jul-15	2	CK	74	4.0	Y				

Fox Creek 2015 Juvenile Sampling Results Provided by Department of Fisheries and Oceans									
			Chinook				Other		
Date Pulled	Site	Spcs	Lth (mm)	Wt (g)	Clip(Y/N)	Spcs	Lth (mm)	Wt (g)	Comments
09-Jul-15	2	CK	74	4.1	Y				
09-Jul-15	2	CK	76	4.2	Y				
09-Jul-15	2	CK	76	4.4	Y				
09-Jul-15	2	CK	72	3.9	Y				
09-Jul-15	2	CK	68	3.1	Y				
09-Jul-15	2	CK	71	3.6	Y				
09-Jul-15	2	CK	74	3.9	Y				
09-Jul-15	2	CK	70	3.3	Y				
09-Jul-15	2					CCG	84	NA	
09-Jul-15	2					CCG	52	NA	
09-Jul-15	2	CK	75	3.9	Y				
09-Jul-15	2	CK	76	4.5	Y				
09-Jul-15	2	CK	70	3.8	Y				
09-Jul-15	2	CK	72	3.9	Y				
09-Jul-15	2	CK	68	3.2	Y				
09-Jul-15	2	CK	72	3.6	Y				
09-Jul-15	2	CK	72	3.6	Y				
09-Jul-15	2	CK	66	3.0	Y				
09-Jul-15	2	CK	75	4.0	Y				
09-Jul-15	2	CK	72	3.6	Y				
09-Jul-15	2	CK	74	3.9	Y				
09-Jul-15	2	CK	78	4.8	Y				
09-Jul-15	2	CK	74	3.5	Y				
09-Jul-15	2	CK	73	3.6	Y				
09-Jul-15	2	CK	76	4.5	Y				
09-Jul-15	2	CK	75	4.1	Y				
09-Jul-15	2	CK	75	3.9	Y				
09-Jul-15	2	CK	79	4.4	Y				
09-Jul-15	2	CK	76	4.4	Y				
09-Jul-15	2	CK	78	5.2	Y				
09-Jul-15	2	CK	77	4.1	Y				
09-Jul-15	2	CK	77	4.6	Y				
09-Jul-15	2	CK	75	3.9	Y				
09-Jul-15	2	CK	72	3.6	Y				
09-Jul-15	2	CK	77	4.5	Y				
09-Jul-15	2	CK	75	3.8	Y				
09-Jul-15	2	CK	78	4.6	Y				
09-Jul-15	2	CK	74	3.8	Y				

Fox Creek 2015 Juvenile Sampling Results Provided by Department of Fisheries and Oceans									
			Chinook				Other		
Date Pulled	Site	Spcs	Lth (mm)	Wt (g)	Clip(Y/N)	Spcs	Lth (mm)	Wt (g)	Comments
09-Jul-15	2					CCG	82	NA	
09-Jul-15	3	CK	78	4.8	Y				
09-Jul-15	3	CK	74	5.2	Y				
09-Jul-15	3	CK	71	3.5	Y				
09-Jul-15	3	CK	85	6.0	Y				
09-Jul-15	3	CK	73	3.8	Y				
09-Jul-15	3	CK	80	4.8	Y				
09-Jul-15	3	CK	76	4.1	Y				
09-Jul-15	3	CK	76	4.9	Y				
09-Jul-15	3	CK	82	6.0	Y				
09-Jul-15	3	CK	77	4.7	Y				
09-Jul-15	3	CK	75	4.3	Y				
09-Jul-15	3	CK	79	5.3	Y				
09-Jul-15	3	CK	80	5.3	Y				
09-Jul-15	3	CK	83	5.5	Y				
09-Jul-15	3					CCG	81	NA	
09-Jul-15	3					CCG	72	NA	
09-Jul-15	4	CK	62	2.2	Y				
09-Jul-15	4	CK	59	2.2	Y				
09-Jul-15	4	CK	62	2.7	Y				
09-Jul-15	4	CK	66	2.8	Y				
09-Jul-15	4	CK	59	2.1	Y				
09-Jul-15	4	CK	60	2.1	Y				
09-Jul-15	4	CK	61	2.5	Y				
09-Jul-15	4	CK	57	1.9	Y				
09-Jul-15	4	CK	57	1.9	Y				
09-Jul-15	4	CK	61	2.3	Y				
09-Jul-15	4	CK	59	2.0	Y				
09-Jul-15	4	CK	61	2.7	Y				
09-Jul-15	4	CK	63	2.5	Y				
09-Jul-15	4	CK	57	1.8	Y				
09-Jul-15	4	CK	58	1.7	Y				
09-Jul-15	4					CCG	59	NA	
09-Jul-15	4					CCG	56	NA	

Fox Creek 2015 Juvenile Sampling Results Provided by Ta'an Kwäch'än Council

MS08-01

	Fox Creek Minnow Trapping				
	Retrieval Day- June 17, 2015				
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	72	4	N/A	SS	One fish caught in 2/4 traps. One large SS one smaller. Partial cloud warm approx 20C. Traps pulled at 11:05. Coordinates: N61.10868, W135.31239
2	40	0.6		SS	

	Retrieval Day- July 28, 2015				
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	54	1.58	n/a	SS	
2	54	1.57	n/a	SS	
Notes: Site 1 is upstream of fox creek bridge, time of arrival 10:40, water temp temp 12C, coordinates N61.10858 W135.31258. Fresh wolf tracks and signs of beavers. People on site; Andre, Deb, John B, Sean Collins. Air temp 16C, partial cloud, calm wind. Clove oil was used as a sedative at 1-2cc 1/2 tube water. approximately 10 fish were sedated at a time.					

	Retrieval Day- Sept 03, 2015				
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
No Fish					4 Gee traps set Sept 02 at 12:45.

	Retrieval Day- Sept 29, 2015				
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	81	6.2	n/a	SS	4 Gee traps set Sept 28 at 12:45. Temp was 11°C, mostly cloudy and calm winds.
2	55	1.3	n/a	SS	
Notes: Site 1 is upstream of fox creek bridge, time of arrival 11:00, coordinates N61°06.519` W135°18.753. People on site; Deb and Testloa. Air temp 5°C, cloudy and very windy, leaves mostly fallen now. No sedative was used.					

MS08-02 June 17, 2015

	Fox Creek Minnow Trapping				
	Retrieval Day- June 17, 2015				
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	61	2.2	Y	CH	
2	63	2.5	Y	CH	
3	90	9	N/A	SS	
4	57	2.2	Y	CH	
5	61	2.6	Y	CH	
6	60	2.4	Y	CH	
7	65	2.9	Y	CH	
8	58	2.2	Y	CH	
9	60	2.5	Y	CH	
10	60	2.3	Y	CH	
11	64	2.6	Y	CH	
12	63	2.6	Y	CH	
13	63	2.7	Y	CH	
14	62	2.4	Y	CH	
15	60	2.5	Y	CH	
16	61	2.4	Y	CH	
17	60	2.1	Y	CH	
18	60	2.2	Y	CH	
19	64	2.6	Y	CH	
20	63	2.2	Y	CH	
21	63	2.6	Y	CH	
Parital cloud, light wind. Water temp 9.8C, The two traps set below the parking staging area yielded 2CK and 1 SS, Traps above the parking yielded 18CK. Coordinates: N61.10133, W135.29282					

MS08-02 July 28, 2015

	Fox Creek Minnow Trapping				
Retrieval Day- July 28, 2015 11:00:00 AM					
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	66	2.41	y	CK	
2	66	2.28	Y	CK	
3	68	2.41	Y	CK	
4	66	2.08	Y	CK	
5	59	1.73	Y	CK	
6	59	2.18	Y	CK	
7	57	2.13	Y	CK	
8	60	1.81	Y	CK	
9	65	2.63	Y	CK	
10	65	2.43	Y	CK	
11	63	1.62	Y	CK	
12	72	2.99	Y	CK	
13	62	1.97	Y	CK	
14	67	2.57	Y	CK	
15	60	1.9	Y	CK	
16	59	1.75	Y	CK	
17	60	2	Y	CK	
18	60	1.94	Y	CK	
19	58	1.76	Y	CK	
20	62	2.15	Y	CK	
21	60	1.97	Y	CK	
22	60	2.2	Y	CK	
23	65	2.71	Y	CK	
24	57	1.75	Y	CK	
25	60	2.19	Y	CK	
26	58	1.5	Y	CK	
27		1.8	Y	CK	
28	60	2.21	Y	CK	
29	57	1.83	Y	CK	
30	59	1.9	Y	CK	
31	60	1.93	Y	CK	
32	58	1.74	Y	CK	
33	61	2.15	Y	CK	
34	59	1.75	Y	CK	
35	60	1.86	Y	CK	
36	60	1.85	Y	CK	
37	64	2.48	Y	CK	
38	49	1.1	Y	CK	
39	62	2.21	Y	CK	
40	60	2.19	Y	CK	
41	55	1.51	Y	CK	
42	55	1.54	Y	CK	
43	58	1.6	Y	CK	
44	64	2.41	Y	CK	
45	55	1.57	Y	CK	
46	60	2.01	Y	CK	
47	60	2.06	Y	CK	
48	59	2.04	Y	CK	
49	60	2.08	Y	CK	
50	58	1.85	Y	CK	

	Fox Creek Minnow Trapping				
Retrieval Day- July 28, 2015 11:00:00 AM					
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
51	64	2.35	Y	CK	
52	56	wind	Y	CK	
53	60	1.99	Y	CK	
54	61	2.22	Y	CK	
55	59	1.78	Y	CK	
56	59	1.77	Y	CK	
57	60	2.18	Y	CK	
58	60	2.07	Y	CK	
59	58	1.73	Y	CK	
60	60	1.94	Y	CK	
61	48	1.25	Y	CK	
62	64	2.1	Y	CK	
63	56	1.62	Y	CK	
64	48	0.97	Y	CK	
65	60	2.2	Y	CK	
66	57	1.84	Y	CK	
67	56	1.61	Y	CK	
68	60		Y	CK	
69	56	1.8	Y	CK	
70	60	2.2	Y	CK	
71	64	2.38	Y	CK	
72	60	2.05	Y	CK	
73	62	2.14	Y	CK	
74	56	1.57	Y	CK	
75	60	2.04	Y	CK	
76	60	2.18	Y	CK	
77	61	2.1	Y	CK	
78	57	1.65	Y	CK	
79	64	2.25	Y	CK	
80	54	1.24	Y	CK	
81	59	1.92	Y	CK	
82	56	1.32	Y	CK	
83	56	1.49	Y	CK	
84	57	1.76	Y	CK	
85	60	2.17	Y	CK	
86	59	2	Y	CK	
87	59		Y	CK	
88	56		Y	CK	
89	60		Y	CK	
90	60		Y	CK	
91	62		Y	CK	
92	59		Y	CK	
93	55		Y	CK	
94	45		na	SS	
95	95		na	SS	
96	97		na	SS	
97	105		na	SS	

2 CK were dead in the trap and were placed in alcohol and brought back to the office.

MS08-02 September 3, 2015

	Fox Creek Minnow Trapping				
Retrieval Day- Sept 03, 2015 10:30:00 AM					
Fish #	Length (mm)	Wt (g)	Clip ?	Species	Notes
1	70		y	CK	
2	67		Y	CK	
3	64		Y	CK	
4	66		Y	CK	
5	59		Y	CK	
6	79		Y	CK	
7	69		Y	CK	
8	64		Y	CK	
9	54		Y	CK	
10	63		Y	CK	
11	61		Y	CK	
12	64		Y	CK	
13	69		Y	CK	
14	55		Y	CK	
15	59		Y	CK	
16	68		Y	CK	
17	83		Y	CK	
18	63		Y	CK	
19	74		Y	CK	
20	62		Y	CK	
21	61		Y	CK	
22	62		Y	CK	
23	68		Y	CK	
24	65		Y	CK	
25	73		Y	CK	
26	80		Y	CK	
27	64		Y	CK	
28	73		Y	CK	
29	65		Y	CK	
30	61		Y	CK	
31	68		Y	CK	
32	62		Y	CK	
33	60		Y	CK	
34	63		Y	CK	

	Fox Creek Minnow Trapping				
Retrieval Day- Sept 03, 2015 10:30:00 AM					
Fish #	Length (mm)	Wt (g)	Clip ?	Species	Notes
35	65		Y	CK	
36	63		Y	CK	
37	72		Y	CK	
38	72		Y	CK	
39	67		Y	CK	
40	71		Y	CK	
41	60		Y	CK	
42	63		Y	CK	
43	74		Y	CK	
44	70		Y	CK	
45	63		Y	CK	
46	100		Y	CK	
47	57		Y	CK	
48	63		Y	CK	
49	63		Y	CK	
50	66		Y	CK	
51	69		Y	CK	
52	69		Y	CK	
53	70		Y	CK	
54	74		Y	CK	
55	69		Y	CK	
56	72		Y	CK	
57	71		Y	CK	
58	66		Y	CK	
59	63		Y	CK	
60	67		Y	CK	
61	65		y	CK	
62	63		Y	CK	
63	58		Y	CK	
64	68		Y	CK	
4 Dead 68 Total					
4 Gee traps set Sept 03 at 13:15. Note: No weights taken.					

MS08-02 September 29, 2015

	Fox Creek Minnow Trapping				
Retrieval Day- Sept 29, 2015 11:45:00 AM					
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	74	4.3	y	CK	4 Gee traps set Sept 28 at 13:20. Temp 12°C partly cloudy.
2	76	3.5	Y	CK	
3	83	6.2	Y	CK	
4	75	4.1	Y	CK	
5	86	4.2	Y	CK	
6	78	3.7	Y	CK	
7	74	2.8	Y	CK	
8	82	4.4	Y	CK	
9	75	3	Y	CK	
10	77	3.4	Y	CK	
11	70	2.5	Y	CK	
12	60	1.6	Y	CK	
13	70	2.4	Y	CK	
14	73	2.4	Y	CK	
15	74	2.6	Y	CK	
16	70	2.7	Y	CK	
17	70	4.4	Y	CK	
18	82	5.7	Y	CK	Dead
19	80	4.5	Y	CK	
20	71	3.7	Y	CK	
21	70	3.8	Y	CK	
22	77	4.8	Y	CK	
23	83	5.8	Y	CK	
24	75	4.4	Y	CK	
25	77	4.5	Y	CK	
26	75	4.7	Y	CK	
27	70	2.5	Y	CK	
28	79	4.3	Y	CK	
29	70	3.9	Y	CK	
30	75	4.6	Y	CK	
31	75	4.9	Y	CK	
32	70	3.9	Y	CK	
33	70	4.9	Y	CK	
34	67	5.3	Y	CK	
35	83	7	Y	CK	
36	61	3.6	Y	CK	
37	65	3.7	Y	CK	
38	68	3.5	Y	CK	

	Fox Creek Minnow Trapping				
Retrieval Day- Sept 29, 2015 11:45:00 AM					
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
39	70	4.2	Y	CK	
40	73	3.8	Y	CK	
41	78	5.1	Y	CK	
42	87	6.2	Y	CK	
43	77	6.7	Y	CK	
44	76	5.7	Y	CK	
45	71	4	Y	CK	
46	74	3.9	Y	CK	
47	75	4.5	Y	CK	
48	58	3.5	Y	CK	
49	75	4.5	Y	CK	
50	73	4.7	Y	CK	
51	77	5.4	Y	CK	
52	70	4.3	Y	CK	
53	74	4.8	Y	CK	
54	75	4.6	Y	CK	
55	72	3.3	Y	CK	Dead
56	70	4.9	Y	CK	
57	73	4.6	Y	CK	
58	76	4.7	Y	CK	
59	75	4.5	Y	CK	
60	74	4.5	Y	CK	
61	70	4.7	N	CK	
62	76	4.9	Y	CK	
63	68	4.4	Y	CK	
64	68	4.5	Y	CK	
65	57	4.1	Y	CK	
66	80	6.2	Y	CK	
Avg	73.95	4.01			

Notes: Site 2 is downstream of Fox Creek bridge, time of arrival 11:45, coordinates N61°06.079` W135°17.565. People on site; Deb and Testloa. Air temp 5°C, cloudy and very windy, leaves mostly fallen now. No sedative was used the fry were placed in a baggie for lenght and weight. The average weight of the baggie was 1.7 grams. Conditions were very windy and affected scale. 2 CK were dead in the trap and were discarded on site.

MS08-03

	Fox Creek Minnow Trapping				
	Retrieval Day- June 17, 2015				
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	76	4.4	N/A	SS	
2	60	2.1	N/A	SS	
3	99	10.5	N/A	SS	
4	74	4.1	N/A	SS	
5	68	NW	N/A	SS	
	Notes: warm approx 20C, light wind, water temp 11.5C, 4 traps set, clear water. Water level seems low. Coordinates: N61.122.05, W135.25172				

	Retrieval Day- July 28, 2015		13:00		
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	79	none		SS	
2	55	none		SS	
3	71	none		SS	
4	74	none		SS	
5	89			SS	
6	77	4.94	No	CK	
7	82	6.15	No	CK	

	Retrieval Day- Sept 03, 2015				
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	88		N	CK	4 Gee traps set Sept 02 @ 13:30.
Note: No weights taken.					

	Retrieval Day- Sept 29, 2015		13:00		
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	100	8.8	N	CK	4 Gee traps set Sept 28 @ 14:00. Temp 11°C, cloudy and windy.
2	77	5.2	Y	CK	
3	86	8.2	N/A	SS	
Notes: Site 3 is 1/2 way between bridge and mounth of Fox Creek. Time of arrival 13:15, coordinates N61°07.325` W135°15.103. People on site; Deb and Testloa. Air temp 5°C, cloudy and very windy, leaves mostly fallen now. No sedative was used the fry were placed in a baggie for lenght and weight. The weight of the baggie was 1.8 grams. This seemed like a more reasonable weight. RCMP in unmarked truck stopped to chat with us.					

MS08-04

	Fox Creek Minnow Trapping				
	Retrieval Day- June 17, 2015				
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	58	1.9	n	CK	
2	55	DEAD		SU	
3	102	5.3	N/A	BB	
4	52	1.3	N/A	BB	
5	56	1.6	N/A	SS	
6	65	2.7	N/A	SS	
7	80	3.6	N/A	SU	
	1 dead succker found in the trap. Water temperature 13.2C. Light cloud. Clear water. 4 traps set. Coordinates: N61.110.69, W135.20796.				

	Retrieval Day- July 28, 2015				14:00
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	75	3.4	N	CK	
2	72	NONE	N	CK	
3	67	NONE	N	CK	
4	65	2.8	N	CK	
5	70	3.4	N	CK	
6	67	2.9	N	CK	
7	67	2.7	N	CK	
8	64	2.8	N	CK	
9	65	2.7	N	CK	
10	65	NONE	N	CK	
11	68	3.2	N	CK	
12	63	2.4	N	CK	
13	70	3.2	N	CK	
14	110	7	N	CK	
	water temp 12.5C				

	Retrieval Day- Sept 03, 2015				
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
No Fish					4 Gee traps set Sept 02 @ 14:30.

	Retrieval Day- Sept 29, 2015				14:30 PM
Fish #	Length (mm)	Wt (g)	Clip?	Species	Notes
1	90	6.1	N	CK	4 Gee traps set Sept 28 @ 14:50. Temp 11°C
2	80	7.9	N	CK	
3	90	8.1	N	CK	
4	77	7.5	N	CK	
5	85	6.5	N	CK	
6	90	9.4	N	CK	
Notes: Site 4 is at mounth of Fox Creek. Time of arrival 14:26, coordinates N61°06.704` W135°12.520. People on site; Deb and Testloa. Air temp 5°C, cloudy and very windy, leaves mostly fallen now. No sedative was used, the fry were placed in a baggie for lenght and weight. The weight of the baggie was 3.3 and 2.8 grams. There was no wind and the scale seemed acurate. 2 gates were closed, on with no trespassing sign.					

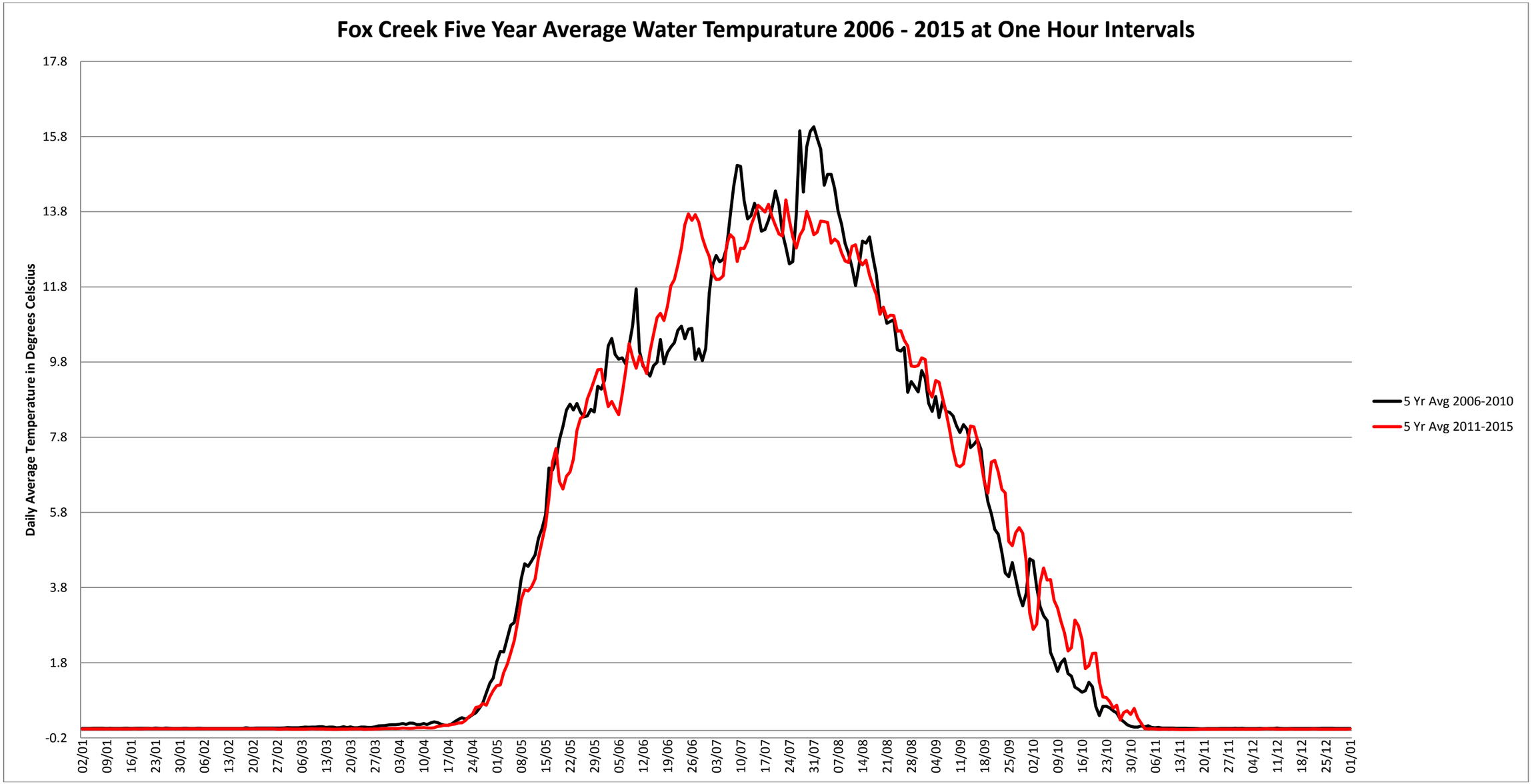
Baggie weight 3.3 g
2nd Read 2.8

HYDROLOGY AND WATER QUALITY

Fox Creek Flow 2015

Provided by Sean Colins, DFO

				Cross Section Distance					Depth Measurements					Flow Measurements						
Date	**Site**	**Gauge(m)**	**Wetted Width (m)**	**3.0**	**4.0**	**5.0**	**6.0**	**7.0**	**3.0**	**4.0**	**5.0**	**6.0**	**7.0**	**3.0**	**4.0**	**5.0**	**6.0**	**7.0**	**Comment**	**Discharge**
16/06/2015 13:30	Bridge Gauge	0.2	Not Recorded	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		0.70
19/06/2015 13:00	Bridge Gauge	0.27	6.0	3.0	4.0	5.0	6.0	7.0	0.32	0.34	0.35	0.36	0.38	0.27	0.43	0.43	0.50	0.49	12.0 @1330	0.89
23/06/2015 16:00	Bridge Gauge	0.41	6.0	3.0	4.0	5.0	6.0	7.0	0.49	0.53	0.52	0.54	0.56	0.55	0.72	0.84	0.56	0.85		2.23
08/07/2015 17:10	Bridge Gauge	0.36	Not Recorded	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		1.90
09/07/2015 13:00	Bridge Gauge	0.37	6.0	3.0	4.0	5.0	6.0	7.0	0.46	0.49	0.50	0.49	0.53	0.51	0.65	0.75	0.69	0.80		2.02
28/07/2015 13:00	Bridge Gauge	0.34	6.0	3.0	4.0	5.0	6.0	7.0	0.42	0.46	0.47	0.46	0.50	0.47	0.57	0.70	0.70	0.78		1.79
Jul-30	Bridge Gauge	0.32	Not Recorded	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		1.38
Jul-31	Bridge Gauge	0.31	Not Recorded	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		1.22
Aug-03	Bridge Gauge	0.31	Not Recorded	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		1.22
Aug-14	Bridge Gauge	0.3	Not Recorded	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		1.05
Aug-25	Bridge Gauge	0.23	6.0	3.0	4.0	5.0	6.0	7.0	0.31	0.36	0.37	0.34	0.37	0.22	0.34	0.47	0.28	0.58	11.0 @ 1605	0.79
15/10/2015 10:30	Bridge Gauge	0.345	Not Recorded	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	.5-1.0C	1.58
29/10/2015 16:00	Bridge Gauge	0.32	6.0	3.0	4.0	5.0	6.0	7.0	0.40	0.44	0.44	0.44	0.46	0.35	0.50	0.62	0.65	0.51	1.5C	1.38


Fox Creek Five Year Average Water Tempurature 2006 - 2015 at One Hour Intervals
Daily Average Temperature in Degrees Celscius
17.8
15.8
13.8
11.8
9.8
7.8
5.8
3.8
1.8
-0.2
02/01
09/01
16/01
23/01
30/01
06/02
13/02
20/02
27/02
06/03
13/03
20/03
27/03
03/04
10/04
17/04
24/04
01/05
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22/05
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12/06
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14/08
21/08
28/08
04/09
11/09
18/09
25/09
02/10
09/10
16/10
23/10
30/10
06/11
13/11
20/11
27/11
04/12
11/12
18/12
25/12
01/01
5 Yr Avg 2006-2010
5 Yr Avg 2011-2015

ADULT MONITORING

Date	Staff	# of Fish	Weather	Notes
				Site A is pool where Salmon were holding. Site B is first beaver dam upstream of holding pool (Site A). Site C is second beaver dam upstream of holding pool. Sites with numbers following the letter (eg: Site A2) consecutively follow downstream from the lettered site.
Monday August 10,2015	Andre, Deb		Sunny and hot	Meetings took place in AM so we went out in the afternoon to check on minnow trapping sites. No adults were observed.
Tuesday August 11,2015	Andre, Deb, Phil		partial cloud, rained previous evening, approximately 20C.	N61.10879 W135.20923 (1 photo) Potential blockage due to log jam. Caution barbed wire through the bush on the (LH) side of the bank
				N61.10697 W135.113888 creek splits into 2 channels, both surveyed for fish activity. Small log jam on RL (2 pictures) log jam at the top of split appears to be a clear channel running underneath the logs.
				N61.10736 W135.21648 Start of a beaver dam water is still flowing around
				N61.11218 W135.22200 lots of dead fall just above waterline/partially submerged (2 photos)
				N61.11207 W135.22345 (2 pics) green algae on rocks (may not freeze?) cobble and gravel present. The rest of the area rocks are covered with brown algae, could be potentially be suitable for eggs, **confirm or suggest to DFO a winter creek walk.**
				N61.11226 W135.22414 Water flowing around dam, looks to be older with no new activity.
		5		N61.11236 W135.22453 (site A) 5 Salmon spoted just above small log jam. Large calm pool, pictures taken, fish appear to be in good shape with little/no white shots. 3 of the 5 do not have adipose fins, unsure of the remaining 2. 2 smaller fish present (possible jacks) and 3 larger adults.
		1		N61.11300 W135.22421 just slightly upstream from the group of 5 salmon.

Date	Staff	# of Fish	Weather	Notes
		3		N61.11321 W135.22505 Beaver dam (site B) causes the creek to branch out downstream. 1 salmon below the blockage in a small branch. 2 directly below the blockage in the mainstem of the creek, with one that may have an adipose fin. Beaver dam is large and active, appears to be a fish barrier.
Wednesday Augsust 12, 2015	Andre, Deb, Phil		light to moderate rain, 9C, no wind	Started from the mouth of the creek and walked upstream. We were in the creek but moved quicker than previous day to get to the known sites with salmon.
		5		N61.11236 W135.22453 (site A) 4 adults and 1 jack, 13:30
		3		N61.11321 W135.22505 (Site B)Below the beaver dam 3 adults found, site is approximately 100m upstream of the first 5 fish.
				Walked out to the road using horse trails. Surveyed the dam further and there does not appear to be any easy channels over the structure. It is currently raining and the water levels seem to be greater than August 11. Photos and video were recorded of the water breaching the dam.
				Contacted DFO upon returning to the office for guidance/plan of action for the beaver dams.
Thursday Augsust 13, 2015	Andre, Deb	7		N61.11236 W135.22453 (Site A) 5 adults 2 jacks. 1 adult tail and head had white marks, 1 adult with no white marks, 1 adult with head, dorsal and tail with white marks, 1 adult tail losing colour, all salmon do not appear to have an adipose fin. Female is protecting an area across from the flagging. Total time observed 30mins
		2		N61.11263 W135.22412 Male and female just up from group of 7 (site A1). Female turning possibly to spawn.
		1		1 adult in north side of the channel below the dam, grayling present (2) **This fish may have been double counted
		1		N61.11321 W135.22505 (Site B) below the beaver dam 1 female, no markings adipose fin appears to be present, female was observed 3 times trying to get over the dam (pics and video).
		2		Just down from the beaver dam 1 male and female tried to jump small channel (off main stem of the creek), no adipose fin and no marks
Friday Augsust 14, 2015	Andre, Sean Collins	1		Staff guage level is 0.3 m at bridge. N61.11236 W135.22453 (Site A) 1 Adult female with white marks @ 4PM

Date	Staff	# of Fish	Weather	Notes
		1		Just up from site A - 1 adult female no adipose no white markings
		1		Just down from beaver dam male adult with white mark on dorsal and tail.
		4		N61.11321 W135.22505 Beaver dam (Site B) 4:35 PM 2 male adult with no adipose 1 female no adipose white marks on tail head and dorsal fin. 1 male no adipose white mark on tail.
		1		1 small female no adipose temp is 14 deg C
				Cleared path at beaver dam
				Fox Creek staff guage at 0.3 m @ bridge.
Tuesday Auguat 18, 2015	Andre, Deb, Sean		partial cloud, has been dry so water level down	12:20 left truck and hiked to upper beaver dam- site C. No fish below dam so we moved to site 1 holding pool.
		16		N61.11236 W135.22453 (Site A) 16 Fish in holding pool. 1 female white mark on left side of mouthn an d tail. No adipose. 1 male no marks or adipose. ~5 small fish possible jacks. 1 Female marks on snout, back, dorsal fin and tail. No adipose fins on any fish. The female that was in the potential spawning spot on far side of pool is back but not as defensive as Thursday. 1 male no adipose white mark from head to dorsal fin plus tip of tail. 1 female white mark on tip of snout went on side. Potential redd in stream at top end of pool as gravel is clean.
		1		North side channel (NS) 1 jack and one big grayling.
		3		N61.11321 W135.22505 Beaver dam (Site B). Base of dam 3 fish. 1 female face very marked and and dorsal fin has adipose fin & took underwater photo of it. 1 jack no marks no adipose. 1 female no adipose no marks. 20 Fish total
				We broke the beaver dam again but more than Friday. Dam was broke by hand. Lowered top section about 0.25m and cleared pool at base. Pool at base is 0.74m deep Andre's walking stick in 1.5m long. Water temp @ 13:50 is 13 deg C.
				Left creek at 14:50 arrived at truck at 15:30.
				Staff guage at Fox Creek bridge is 0.27m temp is 14 deg C.
Wednesday August 19, 2015	Deb, Andre	2	partial cloud, and intermittent rain showers	Site C - Upper Beaver Dam - 1 male and female no adipose fin. Male mark on head, dorsal, adipose area, and tail. Female mark on dorsal and tail.

Date	Staff	# of Fish	Weather	Notes
		11		N61.11236 W135.22453 (Site A) holding pool 11 fish. 1 male w adipose fin, clean fish. 1 female with adipose fin appears to be same fish as @ dam yesterday. 1 male very white tail with marks on head dorsal and all fins. 3 small fish. 4 female. 3 grayling @ upper end of pool.
		3		N61.11321 W135.22505 Beaver dam (Site B). 1 male with white line down intire dorsal area. Very white tail and appears to be the same fish observed yesterday. 1 Clean male with adipose fin. 1 male fairly clean and attempting to go up side channel.
				16 fish total. 4 less than yesterday so these could have gotten over the dam.
				Witnessed one fish surfacing for air and bubbles (burping) from mouth. Seems not to be moving much but then became more active and attemped to leap over the beaver dam.
				Beaver dam was repaired within 24 hours. We broke the beaver dam again but more than Tuesday. Dam was broke by hand. Lowered top section about 0.35m and cleared pool at base. Pool at base is deeper than Tuesday but was not measured.
august 20/2015	andre, phil and cora lee	20	overcast light rain 12c	site A -6 adult. 1 adult d/s at site A1 possible redd in deep pool 1 large female in group with 1 white mark on left side of head 1 adult in north channel before Site B with white marks on the dorsal and tail. 3 grayling in the channel also. Up from Site A 12:55 1 male no adipose, long white mark and tail marked. 2 Jacks no adipose and 2 fry. 1 female mark on head, dorsal and tail, mark on right. Spawning behaviour, no adipose.
				Site B- 1 adult with white marks on the dorsal, tail and mouth no adipose fin. 3 jacks no adipose fin and 3 small fry trying to jump over the beaver dam.
				Site C 1 male adult no adipose fin and white marks on dorsal and tail [n 61.12070 w 135.23143] beaver dam was notched
august 21/2015	andre and testloa	0	sunny 19c	checked Site C beaver dam for adult salmon, none were spotted

Date	Staff	# of Fish	Weather	Notes
august 24/2015	andre and phil	10 salmon and 6 grayling		Site A - 2 adults and 2 jacks. 1 jack has white markings and no adipose fin plus 6 grayling in pool. Site A2 1 male and female showing spawning behavior. Female has an "adipose fin" and white markings along the back from head to dorsal fin. Tail is white marked also [n 61.11212 w 135.22346] noticed clean gravel dug and possible redd. Salmon showing protective spawning behavior. Female would chase off the other male. Female also went on her side several times. 1 jack and female adult no adipose white marking on female tail, dorsal and head. Right side has with mark behind gill plate. 3 grayling in channel down from Site B dam. 2 males and 1 female 1 of 2 males had an "adipose fin" and long white mark on head, dorsal and tail. Male and female were both cleaning and protecting the redd. Observed the male breaching the surface water and took a gulp of air. Green algae growing just in front of redd. 1 large female with white mark on left side of head in an eddy down from A2 south side of creek or left side walking up fox creek. The large female is the largest salmon observed in fox creek so far.
august 25/2015	andre, phil and sean collins dfo	1	partly cloudy 15c	[n 61.12038 w 135.23073] 1 jack . Site A Deep Pool N61.12646, W135.24332 15 feet high 200 yards long. Huge Beaver dam Site B N61.12659, W135.24527. 1 sucker ~2 lbs and 2 otters at mouth of Fox Creek Site 4. 1 jack and several grayling spread out from below Site C to Site 3
				[n 61.12646 w 135.24332] deep pool
				[n 61.12659 w 135.24527] huge dam approximatly 15ft high and 200 yrds long and there's another dam about a 100 yrds up steam from huge dam. Look at pics for gps.
				1 sucker fish and 2 otters at the mouth of fox creek

Date	Staff	# of Fish	Weather	Notes
27/08/2015	Andre, Phil	15	9C Overcast and raining	Site A-2 jacks & 1 adult & 1 adult carcass. Site A1-3 Jacks & 2 adults. One jack with white marks on face, tail,dorsal and on the side low half of pectoral. 1 Female with adipose, long white mark on back tail and dorsal. 1 male. Another adult just down from the A1 site. Clean gravel male and female hanging on possible spawning Redd across from gravel bar and falling tree with pink flagging. Another jack just up from A2. No salmon at A2 Redd. See photo for spawn redd across from cut through trail GPS N61°11.117 W135°22.229 ±5m site A3. 1 female carcass 77cm mid eye length (mid eye to fork) no eggs N61°11.156 W135°22.249 ±6m around the corner from site A3. Site A 1 female carcass 84 cm on the bottom of the pool. Just upstream from dead female at Site A, redd has been flagged with coordinates written on flagging N61°11.186 W135°22.237 ±7m. 2 jacks at Site B, 1 jack has white markings and beaver dam is fixed by beaver. Just upstream (B-1) from dead female (Site A), redd nest has been flagged N61.11186, W135.22237 written on flagging tape. Site B 2 Jacks, one has white markings, beaver dam is fixed.
28/08/2015	Andre, Phil	2	5C overcast	Staff guage at fox creek bridge; 0.398. No dead fish found and no fish recovered, water turbid, large female with adipose was seen over Redd at site A2; white markings on head, fase, back and tail. One Jack looked to be dieing; lots of white patches, occassionally floating on side, could not swim against current.
31/08/2015	Andre		5C overcast and rain	Site A1 - 1 jack white marks on dorsal and tail. Site A2 - 2 adult possible male and female. Female on her side showing spawning behaviour.
16/09/2015	Deb, Andre		5C overcast, fall colours and leaves are 50% fallen.	Staff guage at fox creek bridge; 0.384. We had other things to tend to in the morning so did not leave the office until noon. No dead fish found and no carcasses were recovered, water slightly turbid. Water to high to wade plus we do not want to step on redds so we will screen creek from this point to mouth tomorrow.
17/09/2015	Deb, Clayton		5C overcast, fall colours and leaves are 50% fallen.	Staff guage at fox creek bridge; 0.378. Water clearer today. Arrived at creek around noon and walked creek from where we left off yesterday. Recovered one carcass; mid eye fork length=77cm, fork length=83cm at n61°06.556 w135°13.189.

Date	Staff	# of Fish	Weather	Notes
22/09/2015	Deb, Clayton, John		5C overcast in morning clearing in afternoon	Redd/Carcass Survey and Trial Clearing Staff Guage 0.349 and we picked up 3 needles. Gravel Area 1 just d/s from pond GPS and flagged. Gravel Area 2 Fairly clean gravel bar 30m d/s came across flagging. Gravel Area 3 20m d/s from previous flagging. Gravel Area 4 u/s of where creek funnels through woody debris and creek changes from run to rapid. Gravel Area 5 Plunge pool u/s of where channel splits. Gravel Area 6 D/s of plunge pool where channels rejoin. Gravel Area 7 D/s of 2 ft diameter rocks and plunge pool on gravel bar. Gravel Area 8 Already flagged by Deb and Clayton. Gravel Area 9 Approx. 100m d/s from last carcass found. Creek makes a 90° bend to the right with large back eddie on the left. Redd is in deep pool before bend. Note: Downstream there was more sediment observed on the substrate. Gravel Area 10 Graval bank d/s ofr rapid. Redd 11 Gravel area after deep pool. Redd 12 ~50m d/s from Redd 11 gravel area after deep pool. Beaver Dam - GPS name. New dam being constructed. Took photo.
23/09/2015	Deb, Clayton, Andre		2°C overcast	Redd/Carcass Survey and Trial Clearing At the mouth of the creek there is slight overflow due to high lake levels. Lots of beaver action ~100m u/s from mouth took photo. Telegraph wire in bush on trail ~20m u/s from beaver dam. Barbed wire fence goes right to waters edge u/s from telegraph wire. Observing same pattern as yesterday with clean gravel in and just downstream of deep pools where current uplifts .
Total		**112**		

APPENDIX C – CHINOOK SALMON STOCK RESTORATION PLAN FOR FOX CREEK

2008

EDI ENVIRONMENTAL DYNAMICS INC.
Natural Resource Consultants

FOX CREEK CHINOOK STOCK RESTORATION CRE-52N-07

PREPARED FOR:

TA'AN KWACH'AN COUNCIL

117 INDUSTRIAL ROAD

WHITEHORSE, YT

Y1A 7A2

PREPARED BY:

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EDI PROJECT NO.: 07-YC-0028

OCTOBER 23, 2008

ABSTRACT

All planning, regulatory, and permitting requirements to conduct activities for restoration of an extirpated stock of Chinook salmon into Fox Creek were completed. This included the completion of a Chinook Salmon Stock Restoration Plan, as well as all required environmental assessment and permitting processes. Interested parties were consulted and relevant operational planning was completed with participating agencies. Implementation of stock restoration activities began in the summer of 2008, with trail clearing, juvenile Chinook bio-physical monitoring, brood stock collection and incubation.

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1 PROJECT BACKGROUND

The purpose of the Chinook Stock Restoration (CRE-52N-07) project as stated in the project proposal was to build upon the results of previous work to undertake permitting and planning requirements for the reintroduction of an extirpated run of Chinook salmon.

Fox Creek is a lake-headed tributary to Lake Laberge and therefore the Yukon River, located approximately 50 km north of Whitehorse. It is reported that at one time Fox Creek supported a spawning population of chinook salmon (von Finster pers. comm., 2006; Wynne-Edwards, 1947). However, in more recent times extensive beaver activity has restricted or eliminated any possible access to areas of potentially valuable spawning and/or rearing habitat. This project follows the recommendations of a preliminary undertaking in 2006 (CRE-54N-06) to assess the current state of the stream, and to investigate the regulatory/permitting requirements to undertake Chinook re-introductions in Fox Creek (Anderton, 2007).

Objectives of this project included the following:

- Undertake all permitting/regulatory processes to re-introduce Chinook salmon stocks to Fox Creek in 2008, including a YESAB screening and permitting through the Yukon Transplant committee (YTG & DFO).
- Plan for and arrange incubation of brood stock in 2008/2009.
- Prepare long-term stock restoration plan.

2 PROJECT ACTIVITIES/RESULTS

During spring/summer/fall of 2007, planned project activities were delayed upon request from Fisheries and Oceans Canada (DFO) while internal policy regarding brood stock selection and release densities was considered. In early winter, 2007, project activities resumed. Discussions and meetings were held with interested parties regarding possible arrangements for brood stock collection and incubation.

It was agreed by all relevant parties; including DFO, Whitehorse Rapids Fish Hatchery (managed by R&D Environmental), Northern Research Institute (NRI), and Ta'an Kwäch'än Council (TKC), that brood stock would be collected by Hatchery Staff with help from TKC Stewards and NRI students. It was also agreed upon that the eggs will be fertilized and incubated in the McIntyre Creek Salmon Incubation Facility. Once the Chinook fry have reached sufficient size for marking (conducted by NRI), they will be released into Fox Creek using accepted protocol by TKC Stewards and NRI students. TKC Stewards will conduct bio-physical monitoring activities as required. DFO will provide assistance where necessary.

A Chinook Salmon Stock Restoration Plan was developed for Fox Creek, outlining brood stock, fry release, and monitoring requirements for one complete cycle (6 years). Provisions to plan for a second cycle (additional 6 years) are indicated. The complete plan is attached as Appendix A.

A proposal to implement the Stock Restoration Plan was submitted for screening to the Yukon Environmental and Socio-Economic Effects Board (YESAB) on behalf of the TKC. Application was also made to DFO and the Yukon Department of Environment (Yukon Introductions and Transfers Committee) to transport and transplant Chinook salmon eggs and live fry. The YESAB screening was completed with a recommendation that the project be allowed to proceed as proposed, subject to required permitting. A license under Part VIII, Section 56 of the Fisheries (General) Regulations was issued by the Yukon Introductions and Transfers Committee.

A final meeting of all participating parties was held to confirm arrangements and confirm decision-making processes for determining in-season brood stock allocation. These arrangements were confirmed in a follow-up letter, and operations are scheduled to move forward, beginning with brood stock collection and required monitoring activities (as per Appendix A), during the summer of 2008.

In the early summer of 2008, a meeting was organized with all parties to go over logistics and confirm everyone's role in the project for this year, particularly for the brood stock collection. Target allocation was decided on 12 females and 24 males, but it was understood that the run size might not allow for this and that the hatcheries needs will take priority.

In September, the TKC Stewards (as part of Yukon River Panel Project CRE-54-08) aided staff at the Whitehorse Rapids Fish Hatchery with egg and milt collection from 6 females and 11 males. They also aided with transportation to the McIntyre Creek Facility where eggs were fertilized and set in incubation trays. Responsibility was turned over to NRI to care for the eggs over the winter and spring.

Bio-physical monitoring was undertaken throughout the summer. Trail maintenance and clearing along the creek was also conducted over the summer with the help of a Y2C2 (Yukon Youth Conservation Corps) crew (as part of Yukon River Panel Project CRE-54-08).

3 CONCLUSIONS/RECOMMENDATION

This project has succeeded in achieving the completion of a Chinook Stock Restoration Plan for Fox Creek, as well as successfully seeing the project through the necessary environmental assessment (YESAB) and permitting processes. The scheduled activities in 2008 were carried out 2008, as per the Stock Restoration Plan. Therefore, all project objectives have been met.

TKC, DFO, NRI, Whitehorse Rapids Hatchery Representatives and EDI will need to continue to work together to ensure that the Stock Restoration Plan is implemented as designed. Whenever possible, it is suggested that the TKC Stewardship Program (provided future funding is obtained) complete the required components of the Stock Restoration Plan; however, they will require the support of the all the above mentioned agencies.

Appendix A. Chinook Salmon Stock Restoration Plan for Fox Creek

EDI ENVIRONMENTAL DYNAMICS INC.
Natural Resource Consultants

CHINOOK SALMON STOCK RESTORATION PLAN FOR FOX CREEK

PREPARED FOR:

TA'AN KWACH'AN COUNCIL

117 INDUSTRIAL ROAD

WHITEHORSE, YT

Y1A 7A2

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PAT TOBLER, R.P.BIO (867) 393-4882

EDI PROJECT NO.: 07-YC-0028

FEBRUARY 2008

1 INTRODUCTION

The Ta'an Kwach'an Council (TKC) has undertaken an effort to restore an extirpated stock of Chinook salmon (Oncorhynchus tshawytscha) to Fox (Richthofen) Creek, a tributary to Lake Laberge and the upper Yukon River. This plan provides an overview of project operations and associated timelines for project implementation, monitoring, and evaluation.

Fox Creek is a small lake-headed tributary to Lake Laberge, approximately 50 km north of Whitehorse, and is reported to at one time have supported a spawning population of chinook salmon (von Finster pers. comm., 2006; Wynne-Edwards, 1947). Reasons for the disappearance of adult chinook salmon in Fox Creek are unknown, and possible causal factors in this regard are diverse. One such potential factor is that extensive beaver activity has occurred throughout the stream, likely at times eliminating access to areas of potential spawning and/or rearing habitat. TKC conducted assessments of the stream in 1997, 1998, 2006, and 2007 to identify the potential for the restoration of Chinook stocks in Fox Creek. In 2006 regulatory and operational requirements for such an undertaking were identified to facilitate further project preparations and planning. In 2007, further planning and field assessments were conducted (Grady, 1997 & 1998; Anderton, 2007 & 2008).

1.1 OPERATIONAL REQUIREMENTS

In order to facilitate optimum results and work within a dynamic aquatic environment over a time frame of multiple years, this plan is intended to be flexible in many regards and to facilitate adaptive management techniques throughout its implementation. The general approach to management of this program is intended to be iterative in nature, composed of assessment, intervention, and then monitoring. The results of monitoring will be evaluated in cooperation with relevant agencies having an interest in salmon management (Kwanlin Dun First Nation, Fisheries and Oceans Canada, etc.), with the details of the following year's stocking and monitoring plan to be developed cooperatively.

It should be noted that the area of interest within Fox Creek is downstream of the mouth of Pilot Creek, located approximately 2.7 km upstream of the North Klondike Highway crossing and 16.3 km upstream of Lake Laberge. Upstream of Pilot Creek, Fox Creek contains little habitat meeting the requirements of Chinook salmon spawning.

It is suggested that the proposed stock restoration program be conducted for two full Yukon River Chinook life-cycles, or twelve years. Planning and operations for the second restoration life-cycle should be informed by outcomes of the first cycle. Should interest in additional artificial incubation/fry release continue beyond two full Chinook life-cycles, it is suggested that brood stock collection from any established adult Chinook returns to Fox Creek be considered.

Table 1 details program operational requirements and associated timelines for one life-cycle of Chinook stock restoration, as well as planning for a second cycle.

1.1.1 BROOD STOCK REQUIREMENTS

It has been determined by Fisheries and Oceans Canada that the brood stock for Fox Creek should be taken from stocks passing through the Whitehorse Rapids Fishway. Discussions have been held with the Whitehorse Rapids Fish Hatchery to cooperatively collect brood stock at the Fishway. Discussions have also been held with the Northern Research Institute regarding incubation of the eggs at their McIntyre Creek facility as part of current operations.

The method for determining target numbers of fry release as provided by Fisheries and Oceans Canada is based upon available rearing habitat, with 1 m^2 of stream area per juvenile Chinook salmon in the upper Yukon River watershed. In order to calculate the area of habitat available in Fox Creek, the average wetted width of the stream within the area of interest of 5.5 m (from data provided by Grady, 1997) is multiplied by the estimated 16,300 m length of the stream from its mouth at Lake Lebarge to the confluence of Pilot Creek. This calculation results in an estimated 89,650 m^2 of available juvenile Chinook rearing habitat. However, this estimation is based upon very limited wetted width data. Therefore improved estimates will be generated based upon more thorough monitoring of wetted width as part of the ongoing adaptive management strategy. In consideration of dynamic annual adult returns through the Whitehorse Rapids Fishway, the limitations of available data, and other operational limitations, the target number of fry for release into Fox Creek should be 50,000 to 100,000.

To achieve the target fry release numbers, an estimated production of 4,000 fry per adult female (brood stock) can be used for reference. Fecundity and egg to fry survival rates vary from year to year and between fish. Therefore this can be considered a conservative estimate based upon an estimated average fecundity of 5,000 eggs per female and an 80% egg to fry survival (Tanner pers. com., 2008). To achieve a target of 50,000 to 100,000 fry for release, 12 to 25 adult females are required. The number of adult males required for fertilization is generally double that of the females taken, however, the males can generally be released alive after a portion of their milt is removed.

In consideration of Year 1 of the proposed program being a pilot, the target fry release should be 40,000 to 50,000. Therefore, subject to operational limitations, the target brood stock collection in Year 1 should be up to 12 adult females and 24 adult males.

Consideration may be given to the limited use of in-stream incubation boxes and/or artificial spawning redds in an experimental capacity with a small number of eggs (up to 100).

See Table 1 for further details regarding program operational and timing requirements related to hatchery operations.

1.1.2 MONITORING REQUIREMENTS

Ongoing monitoring of stream/habitat dynamics and of released juvenile Chinook salmon should be undertaken as part of the ongoing stock restoration program. These parameters should include water temperature, stream flows, assessment of juvenile Chinook growth rates/movements, and assessment of beaver activities. The following items detail planned annual monitoring activities:

- Stream stage:
  - One station be developed, tentatively re-commission the DIAND hydrometric station immediately upstream of the North Klondike Highway.
  - Stream gauging to be conducted during planned biological sampling events.
- Water Quality:
  - Two water winter quality sampling stations will be placed at or near the stream stage sampling site, with the following parameters monitored during February/March:
    - dissolved oxygen;
    - pH;
    - turbidity;
    - conductivity;
    - total metals;
  - Data loggers be placed at each of the stations and will operate continuously with temperatures measured every hour on the hour.
- Biological sampling:
  - Three juvenile Chinook sampling stations will be established at locations downstream of the Pilot Creek confluence, at the North Klondike Highway Crossing, and downstream of the North Klondike Highway. Sampling will be conducted at the following times:
    - mid May, to determine success of overwintering 1+;
    - immediately prior to release, to determine numbers and characteristics of salmon remaining in the stream at that time;
    - one month after annual release of fry to determine distribution and growth;
    - thereafter, monthly until the end of September;
  - Sampling will involve the capture of juvenile Chinook salmon using standardized methodology.
  - A random statistically significant sub-sample of juvenile Chinook captured will be anaesthetized, measured for fork length, and carefully weighed with each fish blotted and scales calibrated. This will provide a base from which to assess juvenile growth.

As the program progresses, planning for and implementation of enumeration/monitoring of adult returns will be undertaken appropriately. See Table 1 for further details regarding program operational and timing requirements related to monitoring requirements.

Table 1: Operational Requirements and Timelines for Fox Creek Chinook Stock Restoration

Year	Age of Year 1 Fish (for ref.)	Return Status	Hatchery Activities Required	Field Activities Required
1 (2008)	n/a	none	• CH broodstock collection from W. R. Fishway. • incubation of eggs, with target production of 50,000 CH fry.	• maintain and develop access (footpath) along Fox Creek. • validate area of available rearing habitat. • design and implement bio-physical monitoring framework. • plan CH fry release strategy (release timing, sites, and quantities) .
2 (2009)	1	none	• rear CH fry to release period (tentatively late June). • mark CH fry as per accepted protocol. • CH broodstock collection from W. R. Fishway. • incubation of eggs, with target production of 50,000 to 80,000 CH fry, depending upon brood stock availability.	• implement CH fry release strategy, at multiple accessible sites (late June). • maintain and develop access along Fox Creek as required. • standard biophysical monitoring (temp., flows, jCH growth rates & movement, etc.).
3 (2010)	2	none	• continue activities with adjustments and modifications informed through adaptive management.	• implement CH fry release strategy, at multiple accessible sites (late June). • maintain and access along Fox Creek as required. • standard biophysical monitoring (temp., flows, jCH growth rates & movement).
4 (2011)	3	limited possible jacks	• continue activities with adjustments and modifications informed through adaptive management.	• implement CH fry release strategy, at multiple accessible sites (late June). • low intensity monitoring for return of precocious adults (jacks). • maintain and develop access along Fox Creek as required. • standard biophysical monitoring (temp., flows, jCH growth rates & movement).
5 (2012)	4	possible jacks	• continue activities with adjustments and modifications informed through adaptive management.	• implement CH fry release strategy, at multiple accessible sites (late June). • moderate intensity monitoring for return of precocious adults (jacks). • maintain access along Fox Creek as required. • standard biophysical monitoring (temp., flows, jCH growth rates & movement). • develop adult enumeration plan for expected returns in year 6 (methods to be based upon available technology and resources for enumeration). • develop monitoring plan for utilization of spawning habitats.

Year	Age of Year 1 Fish (for ref.)	Return Status	Hatchery Activities Required	Field Activities Required
6 (2013)	5	adults expected (from year 1) plus jacks (years 2 & 3)	• continue activities with adjustments and modifications informed through adaptive management.	• implement CH fry release strategy, at multiple accessible sites (late June). • pilot implementation of full enumeration/monitoring of adults returns (methods to be based upon available technology and resources). • maintain access along Fox Creek as required. • standard biophysical monitoring (temp., flows, jCH growth rates & movement).
7 (2014)	6	adults expected (years 1 & 2) plus jacks (years 3 &4)	• continue activities with adjustments and modifications informed through adaptive management.	• implement CH fry release strategy, at multiple accessible sites (late June). • first year of full intensity enumeration/monitoring of adults returns (methods to be informed by pilot/adaptive management). • maintain access along Fox Creek as required. • standard biophysical monitoring (temp., flows, jCH growth rates & movement). • develop plan for second cycle of CH stock restoration & apply for permitting as required.
8 (2015)	n/a	Adults expected (years 2 & 3) plus jacks (years 4 & 5)	• continue activities with adjustments and modifications informed through adaptive management.	• implement plan for second cycle of CH stock restoration. • implement CH fry release strategy, at multiple accessible sites (late June). • second year of full intensity enumeration/monitoring of adults returns (methods to be informed through adaptive management). • maintain access along Fox Creek as required. • standard biophysical monitoring (temp., flows, jCH growth rates & movement).

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