Lakelse Lake Sockeye Salmon

Fry Outplant Program

2010 - 2011

Prepared For:

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Executive Summary

Lakelse Lake Sockeye are one of an estimated 28 wild Skeena River drainage Sockeye salmon stocks harvested during mixed stock fisheries in southeast Alaska and northern B.C.. In 2004, Lakelse Lake Sockeye were determined to be significantly depressed, even at relatively low levels of exploitation (Cox-Rogers 2004). Enumeration programs on Lakelse spawning grounds by Fisheries and Oceans Canada (DFO) Stock Assessment staff in 2010 and 2011 have indicated some improvement although final estimates for 2011 have not yet been released. During the past 10 years these stocks have declined in Lakelse tributaries from historical runs in the ten's of thousands to recent numbers in the low thousands and hundreds (Rabnett 2008).

In 2006, as part of the Lakelse Lake Sockeye Salmon Recovery Plan (Fisheries and Oceans Canada 2006), DFO received funding from the Pacific Salmon Commission (PSC) Northern Fund for the *Satellite Sockeye Hatchery: Fry Outplant Project Year 1*. The goal of this project was to enhance one full four year cycle of Lakelse area sockeye in concert with other habitat restoration, protection, assessment, and public awareness projects in the area.

This report is a summary of Year 4 of this program, actually conducted in year 5 (2010) due to a lack of funding in 2009. In August of 2010, eggs, milt, and tissue samples were collected from 226 Williams Creek Sockeye. The eggs and milt were air lifted to the Snootli Creek Hatchery for fertilization, incubation, rearing to between 0.7g. and 0.9g and adipose fin clipping. Kidney and ovarian fluid samples from all females were sent to DFO's Pacific Biological Station (PBS) in Nanaimo, BC for disease testing. Prior to release, PBS conducted fish health tests on a sample of fry. In early May of 2011, approximately 297,000 fry were airlifted to Williams Creek, held for several hours in pens and then released at dusk. The program was a success similar to previous years with the exception of one bucket of fry lost during flight due to a lack of sufficient dissolved oxygen. It is estimated that 9-11 thousand fry were lost in this bucket during transport.

Finally, 2010 represented the first year in which returning marked adults from the first fry releases (Brood Year 2006) could be assessed. North Coast Stock Assessment staff conducted weekly beach seines at the mouth of Williams Creek to assess adipose clipped fish. Marked fish were also noted during brood stock capture and all fish killed for broodstock were otolith sampled for age to determine age ratio of 4 vs 5 years olds. The survival of hatchery-origin four years olds was estimated at 3.1%, only marginally greater than survival of 'wild' four year olds at 2.7% (Hall 2010).

Acknowledgements

The Lakelse Fry Outplant Project for 2010/11, funded by the Pacific Salmon Commission Northern Fund was a collaborative effort between Fisheries and Oceans Canada (DFO) in the Terrace area with Lakelse Watershed Society volunteers, personnel from Snootli Creek Hatchery in Bella Coola, and fisheries technicians from the Nuxalk First Nations. Through a coordinated effort they provided personnel, labour, equipment, and technical expertise as "in-kind" contributions.

Project personnel included:

Lakelse Watershed Society – volunteers
Regional District of Kitimat Stikine
Margaret Kujat –Consultant – Project Coordinator, Terrace
John Willis –Asst. Operations Manager – Snootli Creek Hatchery, Bella Coola
Marshall Hans – Hatchery Technician – Snootli Creek Hatchery
Mitch Drewes – Habitat Technician/OHEB – Terrace
Rob Dams – Community Advisor - Terrace
Lana Miller – Resource Restoration Biologist/OHEB– North Coast
Russ Hilland – Watershed Enhancement Manager – Snootli Creek Hatchery
Marie Salome – Administration Officer – Snootli Creek Hatchery
Doug Wilson – Administration Officer – Prince Rupert
Sandra Devcic – Resource Restoration Engineer – North Coast
James Powell – A/Resource Restoration Technician – North Coast
Technical Staff – Pacific Biological Station, Nanaimo, B.C.

Additional assistance was provided by Chris Broster and Troy Larden, BC Ministry of Environment (MOE), Ben Sabal, BC Park, Mike Jakubowski, DFO Stock Assessment, Allan Correia, DFO Conservation and Protection

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1.0 Introduction and Background

Sockeye salmon (Oncorhynchus nerka) have the highest commercial value of the five species of Pacific salmon in British Columbia. Historically the Lakelse area has been considered the most productive salmon ecosystem in the Skeena watershed. (Rabnett 2008). Sockeye salmon stocks in the Lakelse watershed have undergone ecological pressure with ongoing cumulative effects. Impacts from logging, linear development of highways, pipelines and hydroelectric lines, lakeside residential development with the resulting channel modification, and restricted fish passage due to beaver activity have all contributed to the decline in Lakelse sockeye abundance.

A drastic decline in the Lakelse Lake sockeye salmon population was noted by the Lakelse Watershed Society (LWS) in 2003. LWS brought their concerns to Fisheries & Oceans Canada (DFO) noting that stock escapements to Lakelse Lake appeared to be depressed relative to historic levels. DFO's Stock Assessment Branch had also concluded in 2003 that lake densities of juvenile sockeye in Lakelse Lake accounted for less than 5% of available lake rearing capacity, representing the offspring from just 750 spawners. Further studies from 2004 through 2007 have indicated that the trend in stock declines continues (Davies 2007). Commercial interception rates for Lakelse sockeye are believed to be low because historical data indicate they migrate early (June) prior to most commercial fisheries through marine waters into the Skeena River and appear to reside in Lakelse Lake for a month or more before spawning in August through October.

In response to the concerns surrounding degradation of this stock and its habitat, the Lakelse Sockeye Recovery Program was launched in 2005 and a recovery plan document drafted (Fisheries and Oceans Canada 2006). Several stakeholders continue to participate in the program to varying degrees: the Lakelse Watershed Society, the Terrace Salmonid Enhancement Society, Kitselas First Nations, Federal and Provincial government agencies including Fisheries and Oceans Canada, BC Parks, BC Ministry of Forests, BC Ministry of Environment , and the crown corporation BC Timber Sales.

The recovery plan contains lists of prioritised projects in three categories: improved information, habitat restoration and enhancement. The Lakelse Sockeye Fry Outplant Project was the first project on the enhancement list. Since 2006, funding for the Lakelse Fry Outplant Project has been provided by the Pacific Salmon Commission (PSC) Northern Fund.

A technical review of the Lakelse Fry Outplant project was undertaken in early 2010 to review program effectiveness and identify and address any recommended changes in methodology, techniques and approach. Different assessment release strategies were discussed, but given that 2010 was the first year to assess returning adults, it was decided that the program should continue as in the past. More rigorous assessment would also require several logistical and financial obstacles to be overcome. At this time, no other sources of funding have been identified to assist with improved assessment such as smolt sampling/enumeration.

DFO Stock Assessment carried out a mark/recapture program in 2010 through a weekly beach seine at the mouth of Williams Creek to assess possible returns of the Lakelse Fry Outplant program's 2006 brood year. Adipose clipped fish were recorded and all adult sockeye captured were marked with an operculum punch. Data was later collected and recorded at the spawning grounds during brood stock collection.

The Fry Outplant project strives to conserve this stock while the Lakelse Sockeye Recovery Program stakeholders continue to target other habitat protection and restoration projects. Stable off-channel habitat is currently under construction in Williams Creek, the main spawning tributary. It is believed that in many years, much scouring of redds occurs in the mainstem of this unstable system. The Fry Outplant Program is providing an essential safe-guard for this stock as the creation of off-channel habitat is underway.

1.1 Study Area

Although most of the tributaries entering into Lakelse Lake have previously provided spawning opportunities for sockeye, recently this has been reduced to two main tributaries, Williams Creek and Schulbuckhand (Scully) Creek. The focus of Lakelse Sockeye Recovery Program is Williams Creek, currently and historically the most productive spawning area for Lakelse Sockeye.

Williams Creek is located near Lakelse Lake approximately 20 kilometres south of the City of Terrace in northern British Columbia. It drains a westward facing basin and flows into Lakelse Lake which flows into the 18 kilometre long Lakelse River. The Lakelse River is a Skeena River tributary that enters the Skeena approximately 150 kms from its mouth.

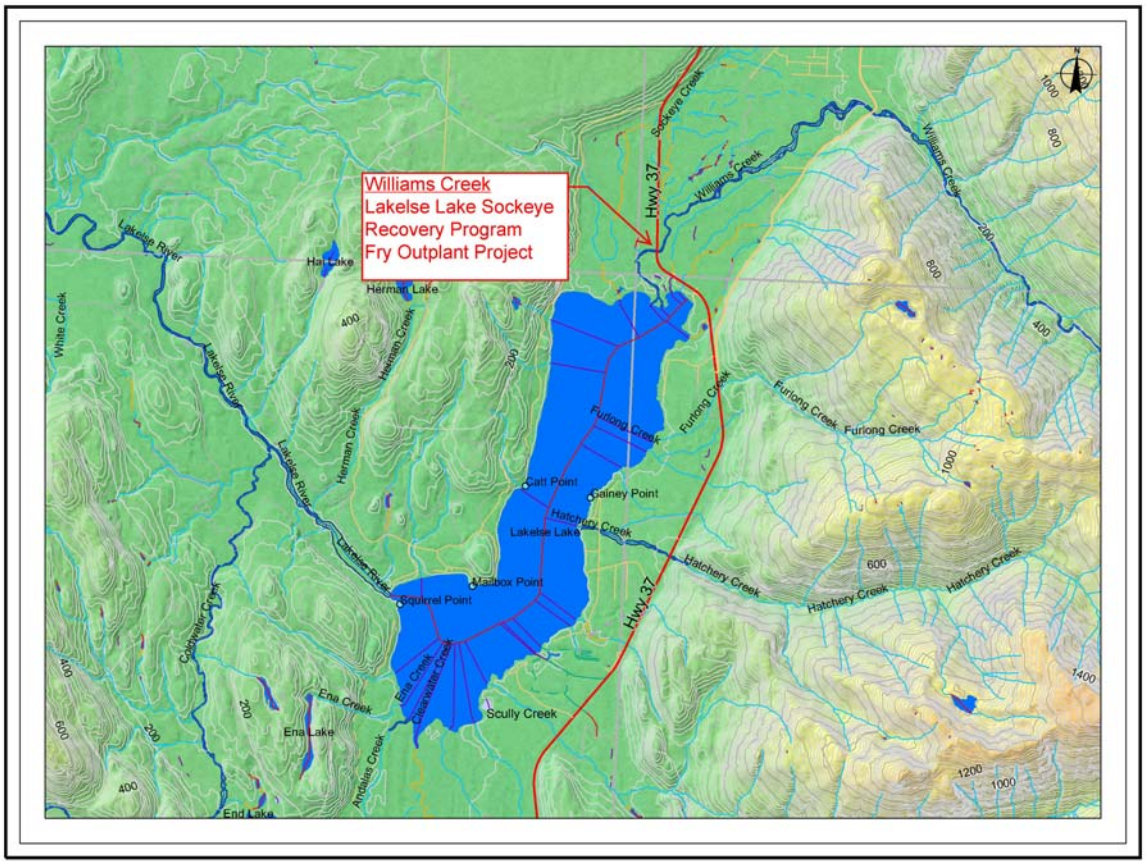

Figure 1. Project Location Map

2.0 Methods

2.1 Pre-Operation

2.1.1 Permits and Notifications

In June 2010 the 'Application for the Introduction or Transfer of Fish or Aquatic Invertebrates - Form B' was made and approved for the transport of +350,000 eggs/milt from Lakelse to Snootli Hatchery and for the returning fry back to Lakelse (Appendix 2).

As a courtesy, BC Parks, BC Ministry of Environment and BC Ministry of Transportation and Infrastructure were also informed of the project.

2.1.2 Equipment Preparations

- Disease sampling equipment was specific for the collection of 2 ml of ovarian fluid per female to test for IHN. Ovarian fluid was removed from egg containers with individual pipettes (100) and transferred to sterilized screw cap vials. These vials were individually labeled and numbered prior to field operations. 100 vials were prepared, 109 were used.
- Kidney samples to be tested for BKD were collected and placed in individually labeled 'whirl-pak'- 4 oz. bags. (109) Each female was tagged with an individually numbered tag (1-109)
- Spawning bowls for eggs were removed from the field after each egg take. They were rinsed, washed, disinfected in a solution of 1:100 iodophor, rinsed again, dried and re-packaged for field use. (85)
- Egg containers were purchased and initially washed, rinsed, dried and individually numbered and packaged for field use. (109) They were shipped to Snootli Creek Hatchery with eggs, treated as spawning bowls during fertilization and returned to the field for further use.
- Milt was collected in individually numbered, 'whirl-pak' bags for field use (116). Sufficient male donors were used to enable a 2 X 2 spawning matrix at Snootli Creek Hatchery.
- Tangle nets, fish tubes and holding pens have been purchased through this project and are on hand. Nets are repaired as necessary throughout the brood stock capture and at the end of the season, often in-kind by Kitimat Hatchery staff.
- Once removed from the field, nets and cages were washed and dried.

2.1.3 Logistics

The following preparations were also made prior to the field operations:

1. Contract for program coordination and related Purchase Order with Lakelse Watershed Society.
2. Confirmation of consultant contract via LWS.
3. Schedule of field operation with returning spawning stocks.
4. Liaison with Snootli Creek Hatchery regarding schedule and availability of staff.
5. Availability of sufficient personnel.
6. Aircraft availability and scheduling

7. Orientation, training and safety meetings each day prior to brood stock collection and egg takes.
8. Liaison with DFO Stock Assessment regarding data collection on marked returns during brood stock collection.
9. Liaison with DFO Stock Assessment and DFO project lead regarding otolith sampling of all brood stock collected.
10. Field support from DFO with respect to equipment and personnel transfer.
11. Coordination with PBS on disease sampling tentative scheduling.
12. Liaison with Terrace-Kitimat Airport Authority for access to charter aircraft.
13. Liaison with BC Parks due to field location and for secured equipment storage between aspects of the project on site at Lakelse.

Because of the collaborative, interagency nature of this project, there was significant support to LWS and the project coordinator from DFO, MoE, BC Parks and the LWS membership.

Sockeye spawners were reported in Williams Creek as early as August 6, 2010. The egg take dates were tentatively scheduled for the week of August 23 – 26, 2010.

2.2 Brood Stock Capture

Brood stock were captured in Williams Creek using 5 1/8" mesh tangle gill nets on the afternoon of August 20 by Terrace DFO staff and the Operations Manager of the Snootli Creek Hatchery. 24 ripe females were selected and held in cages overnight. Their status was checked at intervals throughout the day until approximately 8:30 p.m. Holding pens were secured fully submerged in a deep pool to reduce the risk of tampering by Park area visitors or wildlife.

In addition to capturing and holding stock the day before egg takes, several net sets were done the following morning to capture the balance of the required fish for that day's operation.

Photo 1. Net sets – Brood Stock Capture

2.3 Egg Take / Spawning

Of particular importance to the Lakelse Lake Sockeye Recovery Program is the prevention of the horizontally transmitted infectious hematopoietic necrosis virus or IHN. In the late 1970's almost 70% of the Alaskan sockeye hatchery production was lost due to this virus (McDaniel et al., 1994). IHN typically causes high mortality within juvenile populations through the destruction of major organs, primarily the kidney and liver. Prevention of IHN transmission is therefore essential and is achieved through disease screening, stringent disinfection protocols, use of virus free water supplies, effluent disposal, and segregation of eggs and fry throughout the production process.

Another principal disease, bacterial kidney disease (BKD) was also screened for during disease sampling of the Fry Outplant project. BKD is a systemic infectious disease that is slowly progressive, frequently fatal and seldom presents itself in fish until they are 6 - 12 months old. It readily cultures at 15–18 C and can be transmitted vertically and horizontally. Although it occurs mainly in freshwater, significant fish mortality can also occur in salt water (Banner, et al, 1983) where, as a result of pre-existing infection, juvenile anadromous salmonids such as Sockeye are unable to acclimatize to salt water.

The Alaskan sockeye salmon protocols (McDaniel et al, 1994) to prevent disease transfer identify stringent procedures with respect to brood stock collection and ideally a team of 6 – 7 individuals

are required to handle these procedures separately in an efficient manner. These protocols were strictly adhered to during egg takes.

Spawning was done in the field. Sufficient on-hand personnel provided primarily by the Lakelse Watershed Society and DFO allowed for simultaneous collection of milt from the males while egg-takes with females were done a short distance away. Eggs and milt were immediately stored in large ice filled 'coolers' and kept chilled enroute to Northwest Regional Airport and the flight to Bella Coola.

Throughout the procedure, a solution of 1:100 iodophor (Ovadine) was used between each fish to disinfect tools, equipment and personnel involved in the various procedures.
Where applicable, all personnel wore disposable, surgical-style gloves. Fresh gloves were used when handling each fish. Each step in the sockeye protocol procedure was done by one individual.

The females were dispatched with a sharp blow to the head. The ventral area was washed down with the disinfecting solution and a 'j-cloth'. This cloth was returned to the disinfecting solution and rinsed between each fish. The female was then immediately hung, tail up, on a portable spawning rack using lightweight twine "tailers", on individual pegs spaced to ensure and maintain physical separation. The females were bled out by cutting the gills with a disinfected knife.


Photo 2. Stripping Eggs

After being removed from the spawning rack, each female was held tail down by one technician while the vent area and belly was wiped down with dry paper towel by another. This second technician cut the fish anteriorly from the vent upward carefully allowing the eggs to drop into a disinfected, smooth plastic collection bowl. Collection bowls were replaced between each fish.

The eggs were then transferred from the initial collection bowl to disposable, individually numbered plastic, lidded containers. Ovarian fluid (2 ml) was removed, (see Disease Screening below) the lid was then secured and the container placed on crushed ice in a large portable cooler to maintain cool temperatures during the operation and throughout transport to Snootli Hatchery. Each female fish was then tagged with a waterproof, sequentially numbered tag and transferred to the disease sampling area for collection of tissue samples for BKD disease screening. (See also Disease Screening below for IHN procedures)

Males were handled with the same disinfecting protocols as the females. Tasks are segrated so that individual personnel are responsible for individual tasks related to fish handling to avoid any cross-contamination. Gloves, j-cloths and paper towels were all replaced between each fish. Males were dispatched and had their vents swabbed with disinfectant solution and dried with clean, dry paper towels. They were then held, tail slightly down, and milt was physically expressed into an individually pre-labelled, sequentially numbered "whirl-pak" bag. Each bag was sealed and placed in a large cooler on ice in preparation for transport.

The portable cooler (containing eggs and milt) were transported by truck to the Kitimat-Terrace Regional Airport and by charter aircraft to Bella Coola, accompanied by Snootli Creek Operations Manager. The flight length is approximately 1 hour and 20 minutes via a chartered Cessna 185 and roughly 2 hours by helicopter. The first female is typically stripped at approximately 11am and the flight to Bella Coola usually departs at approximately 3pm.

Egg Take Collection was as follows:

- Tuesday August 24 – 65 females and 68 males; eggs/milt collected (one flight; helicopter)
- Thursday August 26- 44 females and 48 males; eggs/milt collected (one flight; fixed wing)
- Total for two days was 109 pairs plus 5 extra males.

- Time from collection to fertilization including personnel transfer, flight, and fertilization: 5-7 hrs.

Egg evaluation:

- Initial green eggs taken were estimated at 392,467. (Willis, 2011)
- Adjusted eggs taken, calculated back from eyed stage was also 392,467.
- Average fecundity was 3,634

Collection Procedures:

- Upon collection, eggs and milt were immediately stored in large ice filled 'coolers' and kept chilled until delivered to Bella Coola.
- The disease samples were kept in a smaller cooler chilled with frozen ice paks.
- Spawning procedures adhered strictly to the Alaskan sockeye protocol (McDaniel et al, 1994) to reduce potential transmission of IHN virus and BKD. All personnel who were assisting with the procedure were trained and familiarized with these steps prior to the egg take
- Spawning was done in the field with nearly simultaneous collection of milt from the males while egg-takes with females were done a short distance away. Eggs and milt were immediately stored in large ice filled 'coolers' (rubbermaids lined with foam insulation cut to fit the insides of the rubbermaid) and kept chilled en-route to Terrace-Kitimat Regional Airport onward to Bella Coola.
- This operation was done over a five day period. Brood stock collection occurred on August 22- 26 in an area just downstream and just upstream of the Highway 37 Bridge at Williams Creek.
- Egg takes were conducted in an area just downstream of the Highway 37 Bridge on a gravel beach on river right. Personnel and equipment were staged out of the BC Park's "Grunchy's Beach" parking area.

2.4 Disease Screening

For the purposes of disease screening for BKD:

- Females were tagged with a waterproof identification number immediately following spawning and sampled.
- Surgical scalpels used for sampling were initially disinfected in isopropyl alcohol and then further disinfected/dried by flame using a small, portable butane torch.
- A posterior kidney sample was removed from each female, placed in sterilized, individually labeled whirl-pak bag and placed in a small cooler with frozen gel 'paks'. Disinfection procedures as described above occurred between each sampling.

For the purposes of disease sampling for IHN:

- 2ml sterilized disposable pipettes were used to collect ovarian fluid from each female's eggs. Fluid was drawn from the numbered egg containers using a pipette and placed in corresponding numbered, sterilized, screw cap vials. These vials were then placed in a small cooler containing gel ice 'paks'.

Kidney samples and ovarian fluid samples were combined in one small cooler, addressed to PBS and shipped via AIR CANADA CARGO within 24 hours. PBS was informed of how many samples to expect at the end of each day. The number of samples plus the flight, time of expected arrival, and weigh bill number were conveyed directly to the lab.

Photo 3. Disease Screening – BKD Sampling

3.5 Fertilization and Planting

At the Snootli Creek Hatchery, the fertilization took place in a segregated building under stringent disinfection procedures. Several technicians worked on samples as the eggs and milt underwent a 2 X 2 matrix fertilization procedure to promote genetic diversity and ensure fertilisation.

The eggs from each female were divided evenly into 2 separate containers and each of these was gently mixed with half of the milt from 2 individual males. These were then recombined and water was added to the eggs/milt mixture to activate fertilization. The samples were then rinsed with a 100ppm iodine solution. Disposable surgical type gloves were worn by the technician and were discarded between all samples.

The samples were then transferred to the incubation area by an additional staff member waiting outside the facility. The eggs were placed in individually numbered and labelled heath trays containing 100ppm iodine. After 15 minutes, the tray was gently pushed back into place. Water flows were set at 15/lpm.

Segregation of each female's eggs is one of several stringent criteria related to the operational and one of the main reasons Snootli Creek Hatchery has been chosen for this type of project in recent years. The necessary infrastructure, expertise and staff already exist without large capital expense and are notable for consistently operating under stringent standards.

Results from disease screening were forwarded by Pacific Biological Station to Snootli Creek Hatchery (Appendix 3).

The prevalence of low levels of BKD in almost all samples was a concern that was discussed with staff at PBS labs and at the technical review. According to staff at PBS labs and Doug Lofthouse, DFO Enhancement Biologist, this was not the only BC stock to experience a high prevalence of low level BKD. The recommended treatment for this is limited rearing in a hatchery setting. No changes were necessary as the Lakelse sockeye at Snootli are only reared for a few weeks until they are large enough to adipose clip. Disease rates will continue to be monitored in future years.

2.6 Incubation, Rearing, Ponding and Marking

Water flows were monitored and maintained at 15 lpm in all heath tray stacks. As in previous years, Nuxalk First Nations technical staff were involved in monitoring and rearing of the Lakelse stock.

As per standard procedures, average weight and diameter were assessed, eggs were picked and dead eggs were removed. Plastic saddles were added to the heath trays and remained in place until ponding. Eggs were graded by size to ensure ponding of like-sized fish and reduce the number of pinheads.

Lakelse sockeye were ponded in February, 2011, at an average size of 0.15g. They are ponded into 6ft circular tubs with a water volume of 2.58 m3 and into 4ft oval tubs with water volume of 1.12m3. Fish are ponded 2 trays at a time and allowed to swim up before the next batch are ponded. The smaller fish are ponded into the oval tubs which improves their growth and survival. Fish are fed 6-8 times per day when they are first ponded to ensure good feeding. Once they are feeding well, frequency of feeding is reduced to 2-4 times/day with the same daily ration. Flows are maintained at approximately two litres per minute per kg of fish. At an average size of 0.9 grams, fry were anesthetised with MS222 and adipose fins removed to distinguish them from wild sockeye stocks (John Willis 2011, pers.comm.). This work was done by local Nuxalk First Nations crews at Bella Coola. A small percentage of the fry not yet at appropriate size (pinheads) were not clipped.

2.7 Fry Release

Previous data collected on Williams Creek has indicated that wild sockeye fry emerge in late April to early May. Pending air

craft availability, DFO personnel availability, and food conversions, the fry release was tentatively scheduled for May 6 – 10, 2011. Weather was a factor for this year's release as low flight ceilings, rain and visibility issues prevented successive releases. Fry release occurred on May 11 and May 14, 2011 using a combination of 185 Cessna with amphibian floats, a 172 Cessna wheel plane, and a Grumman Goose.

Photo 4. – Grumman Goose at Terrace

Photo 5. – Fry to Net Pens

Photo 6. Final leg for fry – truck to net pens

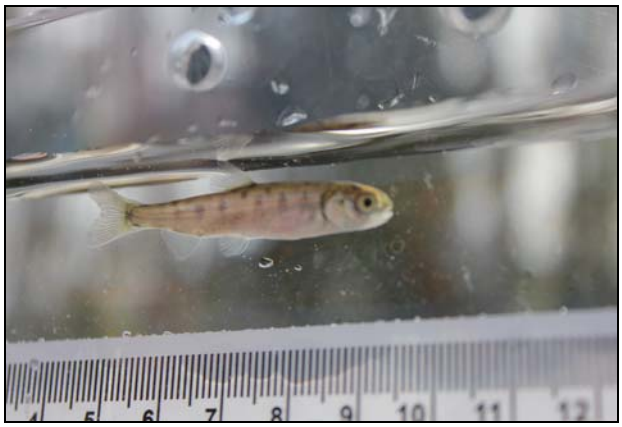

Photo 7. Lakelse Fry – 2011 Release

Fry were removed from the ponding area at Snootli Creek Hatchery, transferred to 40 kg of water in 77 litre containers with air stones and compressed oxygen supply. O_2 was delivered from portable cylinders through a flow meter and manifold system at a rate of 0.125 to 0.5 lpm. Fry were ground transported to Bella Coola Airport, transferred to aircraft and flown to Northwest Regional Airport (Kitimat-Terrace). A technician from Snootli Creek accompanied each flight to monitor the fry en-route.

At the Terrace Regional Airport (YXT), fry were transferred from aircraft to vehicles, air supplies established via cylinder and manifold similar to the flight system and transported to Williams Creek. Access to aircraft was gained via Executive Flight Services east of the main terminal.

Fry were transferred to 4 instream holding pens for acclimatization and released in the early evening (approx. 2100 hrs). Release from each pen was staggered by approximately 20 minutes.

3.8 Enumeration and Mark/Recapture

Stream Walks:

Fisheries and Oceans Canada Stock Assessment Division carried out stock enumeration on Williams Creek to assess returning stocks. Two teams of two trained stock assessment technicians conduct stream walks by walking in the creek and on streambanks from different directions. Two technicians start from Strymecki Road in Jackpine Flats subdivision on the upstream end (approximately 2km upstream from the stream mouth) and walk downstream ~1km to the Hwy 37S bridge. They also walk up Sockeye Creek tributary to the first beaver dam barrier and back down to its confluence with Williams Creek (~300m upstream from the Hwy 37S bridge). The other two technicians start from the mouth of Williams Creek near Gruchy's beach (confluence of Williams Creek and Lakelse Lake) and walk upstream approximately 1km to the Hwy 37S bridge. Streamwalks typically begin in early August and continue until mid-late September. Streamwalks are generally conducted twice a week over this time period. Eleven stream surveys were completed in 2010. Heightened bear activity occasionally interrupts the schedule and/or frequency of walks.

Scully Creek

The second highest sockeye spawning tributary in Lakelse is Schulbuckhand (Scully) Creek. Stream walks used to take place on this system but were discontinued in 2006 due to aggressive bear behaviour. In 2010, the Lakelse Watershed Society working with DFO Community Advisor, Rob Dams, ran a pilot underwater camera system combined with a broomstick fence to determine if this was a feasible method to estimate returns to Scully Creek. The fence and camera were located on private property with power provided by the landowner who lives at the mouth of Scully Creek (Marius Pienaar). Due to a lack of lights, the program only ran during daylight hours for a few weeks from mid-August to mid-September, 2010. The final estimate was ~150 adult coho. If there is continued interest by local volunteers, funds will be sought to improve the program with new equipment and lights for night counts in 2011 (Rob Dams 2011, pers. comm.).

Photo 8. Scully broomstick fence with camera box.

Photo 9. Camera box for recording fish occurrences.

Photo 10. Image of fish recorded in camera box.

Mark / Recapture:

Stock Assessment completed 3 beach seines near the mouth of Williams Creek to determine an adipose fin clip (AFC) mark-ratio. These seines were conducted once a week from the beginning of the run in early August through the 3rd week of August. Adults caught in the seines were also marked with an operculum punch and some recovered during brood stock capture.

3.0 Results

3.1 Spawning

The Application for Introduction or Transfer of Fish or Aquatic Invertebrates (ITC) Form B was made in June of 2010 and a license issued on July 19, 2010. Target collection numbers for 2010-2011 were set at ~350,000. Approximately 392,467 sockeye eggs were transported to Snootli Creek Hatchery for fertilization, incubation and rearing. The Project Coordinator, DFO, agency personnel from BC Parks and Ministry of Environment worked with volunteer members of the Lakelse Watershed Society over several days to collect brood stock and the target number of eggs. Weather was a factor in the transport of eggs/milt from the site. Normal use of a Cessna 185 on both days had to be replaced with a helicopter due to rain, low ceiling and visibility.

3.2 Incubation, Ponding, Rearing and Marking

Bella Coola in general and Snootli Creek Hatchery were under some unusual pressures during the 2010 season due to forest fires and flooding. Although the hatchery was at some risk, stocks remained protected and segregated, water supplies and appropriate effluent discharge were maintained and other protocols were intact.

Lakelse stocks were eyed at approximately 379 ATU's. Total eyed eggs were documented at 317,520 with 80.9 % survival of green to eyed egg. Fish were ponded at approximately 1157 ATU's on February 17, 2011. Total number ponded was 315,377, reflecting mortalities of 2,143 for a percentage survival from eyed to ponding of 99.33%. See Table 1 for brief summary and appendices 4 and 5 for detailed numbers (Willis 2011).

In late April of 2011, approximately 306,000 fry were marked with an adipose fin clip. This number represents approximately 96.5% of the total number of fry (based on a quality control sample of 200 fish). Smaller fish (pinheads) were not marked (John Willis, pers. comm.).

3.3 Fry Release

Fry were transported on May 11th and 14th at an average weight of 0.75 – 0.90 grams and a density of approximately 225 grams per liter of water.

Oxygen was set to be released into each pail at 0.12 to 0.50 lpm. All fry arrived in excellent condition with the exception of one bucket. Estimated mortality for this bucket was 90% or

between 9 and 11 thousand fry. This was attributed to dissolved oxygen monitoring oversights during air transport. O_2 delivery was not properly functioning and attempts to revive fish during the flight were not successful.

Fry were brought by truck to Williams Creek and evenly distributed into 4 instream holding pens where they were held until dusk for acclimatization. The fry were released from these pens at 20 minute intervals starting at approximately 2100 hrs. each evening.

LAKELSE STOCK – % SURVIVAL RATES – 2010/2011

Green Eggs			Eyed Eggs		Ponded Fry to Release
To Eyed	**To Pond**	**To Release**	**To Pond**	**To Release**	
80.9	80.4	78.7	99.3	97.2	97.9

Table 1. Summary of Egg-Fry Survival

3.4 Enumeration and Mark/Recapture

The escapement for 2010 was estimated at 4896, based on 11 stream surveys. The highest count was on the last day counted, however, due to bear activity and stream conditions no further stream walks were conducted. In 2006, the estimated number of adult sockeye spawners was ~1000. An estimate of 4896 in 2010 represents for a return rate of 2.7% for wild stocks when accounting for otolith data that indicated 55% of spawners were 4 yrs olds and 45% were 5 yr olds.

Through the mark/recapture seining exercise, 625 sockeye were handled, of which 16 were adipose fin clipped. (AFC)

During brood stock collection, 841 fish were handled. Eighteen of the 841 fish handled were AFC hatchery returns.

The average AFC rate of all three seines was 2.8%. The average AFC rate in the egg take was 2.2%. Pooling all the data from both the seines and the egg take, an average of 2.3% of fish handled were

adipose clipped, or approximately 185 returning adults. This represents a return rate of 3.1% which was not significantly different from wild returns of 2.7%.

The true return rate from the 2006 brood year (wild and hatchery) will not be known until the 5 year olds return in 2011; however, 4 year olds from the 2007 brood (wild and hatchery) will also be returning in 2011. Age information will be important to collect in 2011 to estimate the contributions from each brood year.

Scully Creek

A pilot program using an underwater camera system combined with a broomstick fence ran from mid-September to mid-August, 2010. Volunteers and the local (Terrace) Community Advisor, Rob Dams installed the equipment and estimated 150 returning adult sockeye to Scully Creek that year. No marked sockeye were counted. Due to a lack of lights, the program only ran during daylight hours, however the pilot year was considered a success, and plans to add lights for night counting in 2011 are being pursued (Rob Dams 2011, pers. comm.).

4.0 Remarks

- Lakelse stocks appear to have improved slightly in 2010 from 2006, when the fry outplant program began, but remain depressed in comparison to historical numbers. Locally, the stock continues to be of concern. Ongoing efforts by DFO towards habitat improvement and restoration continue. The fry outplant program continues to provide some level of protection for this stock. The main spawning tributary, Williams Creek, is highly unstable and eggs/redds are subject to scour during fall high water events. Stable off-channel habitat is currently under construction.
- Stock Assessment Division of DFO conducted stream walks on main tributaries in 2010 for the purposes of stock enumeration including Williams and Sockeye Creeks. Scully Creek remains a safety concern due to bear activity. The Terrace DFO Community Advisor is currently working with the Lakelse Watershed Society to enumerate sockeye in Scully Creek using a camera system at the mouth. The first pilot year was deemed a success with plans to improve upgrade the technology and add lights in 2011.
- Fisheries and Oceans Canada Stock Assessment conducted a mark/recapture program to assess returning four-year olds from Year 1 of the Fry Outplant Project (2006 Brood Year)

- Otolith sampling was also conducted in conjunction with brood stock collection and egg takes – results were surprising as Lakelse returning adults were believed to be predominantly four year olds. A sample of approximately 200 otoliths (100 females and 100 males) data revealed that in 2010, 45% of returning adults were 5 yrs olds and the remaining 55% were 4 year olds.
- Although the program is viewed as a success for many reasons, the lower than expected return rate for the enhanced component (3.1%) compared to wild proportion (2.7%) was disappointing. One year of return data is limiting, but similar return rates for hatchery fish in 2011 may warrant a review of the continuation of the program. Some of the positive aspects of the fry outplant program include heightened local and regional attention on Lakelse Lake sockeye which promotes stewardship and collaborative partnerships in the watershed. The project also provides an opportunity for hands-on participation by many volunteers, industry and agency personnel including federal, provincial and regional government involvement. The project also safeguards a small portion of the population against destruction by floods and egg scour in the unstable mainstem of Williams Creek while stable off-channel habitat is under construction.

5.0 LIST OF REFERENCES

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- Willis, J 2011, 'Snootli Creek Hatchery Enhancement Summary for Lakelse Sockeye Brood Year 2010', internal document, Fisheries and Oceans Canada, Bella Coola, BC.

Appendix 1 - Proponent Information

Department of Fisheries and Oceans Canada
Resource Restoration Unit
417 – 2nd Ave West
Prince Rupert, BC V8J 1G8
Lana Miller – Restoration Biologist
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Department of Fisheries and Oceans Canada
Snootli Creek Hatchery
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250-982-2214
John Willis – Asst. Operations Manager
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Project Coordination

Consultant
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Appendix 2 –Application for Introduction or Transfer of Fish or Aquatic Invertebrates (ITC) Form B and ITC License

Fisheries and Oceans | Pêches et Océans

BC

APPLICATION FOR INTRODUCTION OR TRANSFER OF FISH OR AQUATIC INVERTEBRATES

FORM B [Instructions Attached]

FOR INTERNAL USE ONLY	**Date Received:**		**I&T Application#:**	

1. Applicant/Company/Agency: Fisheries and Oceans Canada
   Contact Name: Lana Miller — Phone: (250) 847-4892
   Mailing Address: Box 578, Smithers, BC, V0J 2N0 — Fax: (250) 847-4723
   Email: lana.miller@dfo-mpo.bc.ca

2. Purpose of Introduction or Transfer: Enhancement
   Rationale: Conservation enhancement of Lakelse Sockeye which are considered to be a conservation concern

3. Species: sockeye — Genetic Status (if applicable): n/a
   Stock Origin (strain if applicable): Williams Creek, Lakelse — Brood Year: 2010

4. Source Location of Fish: Williams Creek - a Lakelse tributary — Life Stage: egg
   Nearest Town: Terrace, BC — Transfer Date: Aug/Sept 2010 — Number: 350 000

5. List intermediate sites and transfer dates if any: Snootli Creek Hatchery, Bella Coola, BC - Central Coast for incubation and rearing in their isolated sockeye facility; air transport

6a. **If final introduction or transfer is to be released into natural waters:**
   Destination: Williams Creek — Release Stage: fry
   Nearest Town: Terrace, BC — Release Date: Apr/May 2011 — Number: ~350 000
   List two waters downstream from the release location (if permanently landlocked – check here ☐)
   1. Lakelse River 2. Skeena River
   Name federal and provincial fisheries staff who manage fisheries and assess stocks in the area and have been consulted and approve of this introduction or transfer. Please provide their comments on a separate sheet.
   (i) Provincial: Mark Beere — Contact Information: (250) 847-7297
   (ii) Federal: Steve Cox-Rogers — Contact Information: (250) 627-3490

6b. **If purpose is for aquaculture:**
   Aquaculture Licence # _____ — Stage or Size: _____
   Destination: _____ — Transfer Date: _____ — Number: _____

6c. **If final destination is a lab, hatchery or controlled experimental facility:**
   Destination: _____ — Stage or Size: _____
   Nearest Town: _____ — Transfer Date: _____ — Number: _____
   (a) Will introduction or transfer be separate from other organisms in facilities with respect to tanks/ponds ☐ water supply ☐ effluent discharge ☐ ? (Check all boxes that apply)
   (b) Will effluent be sterilized ☐ and discharged directly to municipal sewer ☐ ground sump (100%) ☐ surface freshwater ☐ or ocean ☐ ? (Check all boxes that apply)
   (c) Final disposal of introduction or transfer? _____

Please follow the precautions and procedures outlined in items J and K of the application instructions to prevent introduction of undesirable flora/fauna and spread of disease/parasites.

Please attach additional documentation in support of this application, especially issues in regards to risks.

Date of Application: 29-Jun-10 — Signature: _____

AUTHORIZATIONS CONCERNING THE MOVEMENT OF LIVE FISH IN BRITISH COLUMBIA

Name: Fisheries and Oceans Canada (Lana Miller)
Address: Box 578
Smithers, BC V0J 2N0
Introduction and Transfer Application Number: **12205**

Fisheries and Oceans / Pêches et Océans

Pursuant to Section 56(1) of the Fishery (General) Regulations made under the *Fisheries Act*, permission is hereby granted to import/transfer live fish into or within the Province of British Columbia to the above named:

Conditions as per Section 22(1) of Fishery (General) Regulations: Precautions and procedures will be taken to prevent introduction of undesirable flora/fauna and spread of diseases/parasites as indicated on application form. Eggs must be surface disinfected. Resulting fry are not to be release back to native waters until health checks have been complete and reviewed by the ITC. An ITC letter of release will be required.

This licence expires on **May 31, 2011**

On behalf of the Federal Minister of Fisheries and Oceans

Shelley Jepps

Co-chair, Fish Introductions and Transfers Committee — July 19, 2010 (Date)

BC

is authorized by this permit to (*possess), (transport*) and (*traffic in*) live freshwater fish *from start point to destination* pursuant to section 3 of the Freshwater Fish Regulation, BC Reg. 261/83.

Director of Wildlife, Ministry of Environment — Date

Expiry Date:

Pursuant to the BC Fisheries Act Regulations (s.8) and/or Regulation 78/2002 of the BC *Fisheries Act*, permission to transplant or transfer oysters or live fish for aquaculture purposes within the Province of British Columbia is granted to the above named:

BC

On behalf of the Minister of Agriculture and Lands

Member, Fish Introductions and Transfers Committee — Date

This document authorizes the holder to do only the things described above within British Columbia. It does not excuse the holder from any other obligations under any other federal or provincial legislation, whether concerning fish or otherwise.

Appendix 3 : Disease Screening Results

Fisheries and Oceans / Pêches et Océans

MEMORANDUM **NOTE DE SERVICE**

To / À: John Willis , Snootli Creek Hatchery
Cc: Margaret Kujat and Lana Miller

From / De: Fish Diagnostic Lab 250-756-7057
Chris MacWilliams (250) 729-8377

Security Classification - Classification de sécurité: **UNCLASSIFIED**

Our file - Notre référence: **2010-120**

Your File - Votre référence:

Date: **Sept 29, 2010**

Subject / Objet: **BROODSTOCK SCREENING RESULTS - LAKELSE SOCKEYE**

Hello,

2010-120: Lakelse sockeye – 64 frozen kidney samples and ovarian samples were received on Aug 25 (numbered 1 - 64); 44 sets of samples were received Aug 27 (numbered (65-108). Samples 1 – 25 were run Sept 28th. The mean negative OD value for this run was 0.089. Samples 26 - 108 were run Sept 29th. The mean negative OD value for this run was 0.0847.

This year's ELISA results will be reported the same as last year. There will be 5 categories reported:

- Negatives have lower OD values than those of the kidneys of the negative control fish.
- Low level of detection fish have OD values <0.1. Negative fish and fish with low levels of detection are considered suitable for joint rearing in yearling programs.
- Low positive fish have an OD value greater than 0.1 but less than 0.25. Progeny from these eggs should be released early as unfed fry.
- Moderately positive fish have an OD value greater than 0.25 but less than 0.6. Eggs from a MP female should be outplanted (if suitable habitat is available downstream of the hatchery) or destroyed.
- High positive fish have OD values greater than 0.6. All eggs from females testing HP should be destroyed unless the escapement is poor enough to justify the risk of in-hatchery incubation.

ELISA results for BKD:
Neg: none
LLD: 26, 27, 29, 31, 36, 39, 40, 59, 61, 62, 65, 66, 71

LP: all other samples (95 of the 108 submitted) are low positives with OD values > 0.100 and < 0.170 *Note: sample 89 will be repeated.

Virology results from cell culture:

All samples were negative for IHN virus by cell culture except sample # 23. Providing appropriate egg disinfection protocols were carried out, the risk of an IHN outbreak in theis group is low.

The high prevalence of BKD in this stock is a bit overwhelming. I'm glad these progeny will all be promptly released to reduce the horizontal transmission of this pathogen during prolonged rearing. If there are any questions on the results, please give the lab or me a call. I'll update this once # 89 ELISA is repeated.

Chris

Canada

Appendix 4: Lakelse Incubation/Rearing Data (J.Willis)

Lakelse 2010 BROOD

DATE	Fem. #	# M	Loc. Plant	UNIT #	# Eggs Planted	Live WT Eyed	400.00 Egg Sample	Total Eggs 2nd	Morts at Eyed	Total Live Eggs	% Surv.	Morts 2nd Pick	Live Alevins	% Surv.	Morts At Ponding	# Ponded	Total % Surv.	Ponding Tub
24/08/2010	1	2	S Inc	1-2	3500	558.34	59.69	3900	158	3742	95.95%		3742	95.95%		3742	95.95%	
24/08/2010	2	2	S Inc	1-3	3500	570.22	61.11	3889	157	3732	95.96%		3732	95.96%		3732	95.96%	
24/08/2010	3	2	S Inc	1-4	3500	495.16	63.42	3202	79	3123	97.53%		3123	97.53%		3123	97.53%	
24/08/2010	4	2	S Inc	1-5	3500	419.40	63.63	2778	142	2636	94.89%		2636	94.89%		2636	94.89%	
24/08/2010	5	2	S Inc	1-6	3500	266.19	51.36	4202	2129	2073	49.34%		2073	49.34%		2073	49.34%	
24/08/2010	6	2	S Inc	1-7	3500	293.20	50.88	4960	2655	2305	46.47%		2305	46.47%		2305	46.47%	
24/08/2010	7	2	S Inc	1-8	3500	381.40	48.90	3257	137	3120	95.79%		3120	95.79%		3120	95.79%	
24/08/2010	8	2	S Inc	2-2	3500	347.09	46.15	3184	176	3008	94.47%		3008	94.47%		3008	94.47%	
24/08/2010	9	2	S Inc	2-3	3500	383.73	63.50	2762	345	2417	87.51%		2417	87.51%		2417	87.51%	
24/08/2010	10	2	S Inc	2-4	2000	449.22	52.81	3531	128	3403	96.37%		3403	96.37%		3403	96.37%	
24/08/2010	11	2	S Inc	2-5	3500	274.09	65.84	2690	1025	1665	61.90%		1665	61.90%		1665	61.90%	
24/08/2010	12	2	S Inc	2-6	3500	206.76	51.41	2378	769	1609	67.66%		1609	67.66%		1609	67.66%	
24/08/2010	13	2	S Inc	2-7	3500	398.52	53.64	3216	244	2972	92.41%		2972	92.41%		2972	92.41%	
24/08/2010	14	2	S Inc	2-8	3500	500.57	55.19	4009	381	3628	90.50%		3628	90.50%		3628	90.50%	
24/08/2010	15	2	S Inc	3-2	3500	245.92	64.21	3377	1845	1532	45.37%		1532	45.37%		1532	45.37%	
24/08/2010	16	2	S Inc	3-3	3500	334.70	52.80	3602	1066	2536	70.40%		2536	70.40%		2536	70.40%	
24/08/2010	17	2	S Inc	3-4	3500	519.44	54.60	3923	118	3805	96.99%		3805	96.99%		3805	96.99%	
24/08/2010	18	2	S Inc	3-5	3500	493.07	57.87	3525	117	3408	96.68%		3408	96.68%		3408	96.68%	
24/08/2010	19	2	S Inc	3-6	3500	599.63	59.59	4476	451	4025	89.92%		4025	89.92%		4025	89.92%	
24/08/2010	20	2	S Inc	3-7	3500	459.80	49.17	3843	103	3740	97.32%		3740	97.32%		3740	97.32%	
24/08/2010	21	2	S Inc	3-8	3500	399.53	45.55	3718	210	3508	94.35%		3508	94.35%		3508	94.35%	
24/08/2010	22	2	S Inc	4-2	3500	555.31	60.92	3723	77	3646	97.93%		3646	97.93%		3646	97.93%	
24/08/2010	23	2	S Inc	4-3	3500	399.82	49.81	3374	163	3211	95.17%		3211	95.17%		3211	95.17%	
24/08/2010	24	2	S Inc	4-4	3500	538.30	58.68	3878	209	3669	94.61%		3669	94.61%		3669	94.61%	
24/08/2010	25	2	S Inc	4-5	3500	572.76	62.88	4197	553	3644	86.82%		3644	86.82%		3644	86.82%	
24/08/2010	26	2	S Inc	4-6	3500	593.25	55.90	4549	304	4245	93.32%		4245	93.32%		4245	93.32%	
24/08/2010	27	2	S Inc	4-7	3500	685.84	62.43	4650	256	4394	94.49%		4394	94.49%		4394	94.49%	
24/08/2010	28	2	S Inc	4-8	3500	481.90	59.34	3693	445	3248	87.95%		3248	87.95%		3248	87.95%	
24/08/2010	29	2	S Inc	5-2	3500	649.43	61.85	4567	367	4200	91.96%		4200	91.96%		4200	91.96%	
24/08/2010	30	2	S Inc	5-3	3500	420.59	49.09	3539	112	3427	96.84%		3427	96.84%		3427	96.84%	
24/08/2010	31	2	S Inc	5-4	3500	458.18	51.72	3878	334	3544	91.39%		3544	91.39%		3544	91.39%	
24/08/2010	32	2	S Inc	5-5	3500	362.28	51.09	3452	616	2836	82.16%		2836	82.16%		2836	82.16%	
24/08/2010	33	2	S Inc	5-6	3500	560.50	59.47	3911	141	3770	96.39%		3770	96.39%		3770	96.39%	
24/08/2010	34	2	S Inc	5-7	3500	410.92	48.68	3841	465	3376	87.90%		3376	87.90%		3376	87.90%	
24/08/2010	35	2	S Inc	5-8	3500	431.19	54.29	3404	227	3177	93.33%		3177	93.33%		3177	93.33%	
24/08/2010	36	2	S Inc	6-2	3500	716.66	67.75	4543	312	4231	93.13%		4231	93.13%		4231	93.13%	
24/08/2010	37	2	S Inc	6-3	3500		65.33	3757	3742	15	0.40%		15	0.40%		15	0.40%	
24/08/2010	38	2	S Inc	6-4	3500		49.24	4506	4107	399	8.85%		399	8.85%		399	8.85%	
24/08/2010	39	2	S Inc	6-5	3500		59.58	3887	3015	872	22.43%		872	22.43%		872	22.43%	
24/08/2010	40	2	S Inc	6-6	3500		49.68	3267	2860	407	12.46%		407	12.46%		407	12.46%	
24/08/2010	41	2	S Inc	6-7	3500	520.50	54.69	4316	509	3807	88.21%		3807	88.21%		3807	88.21%	
24/08/2010	42	2	S Inc	6-8	3500	438.65	59.56	3070	124	2946	95.96%		2946	95.96%		2946	95.96%	
24/08/2010	43	2	S Inc	7-2	3500	547.48	62.95	3662	183	3479	95.00%		3479	95.00%		3479	95.00%	
24/08/2010	44	2	S Inc	7-3	3500	562.51	69.76	3443	218	3225	93.67%		3225	93.67%		3225	93.67%	
24/08/2010	45	2	S Inc	7-4	3500	465.00	49.43	4129	366	3763	91.14%		3763	91.14%		3763	91.14%	
24/08/2010	46	2	S Inc	7-5	3500	401.44	66.82	2574	171	2403	93.36%		2403	93.36%		2403	93.36%	
24/08/2010	47	2	S Inc	7-6	3500	490.80	71.15	3109	350	2759	88.74%		2759	88.74%		2759	88.74%	
24/08/2010	48	2	S Inc	7-7	3500	419.42	61.84	2855	142	2713	95.03%		2713	95.03%		2713	95.03%	
24/08/2010	49	2	S Inc	7-8	3500	433.81	44.86	3950	82	3868	97.92%		3868	97.92%		3868	97.92%	
24/08/2010	50	2	S Inc	8-2	3500	427.19	47.94	3695	131	3564	96.46%		3564	96.46%		3564	96.46%	
24/08/2010	51	2	S Inc	8-3	3500	404.83	55.98	3888	995	2893	74.41%		2893	74.41%		2893	74.41%	
24/08/2010	52	2	S Inc	8-4	3500	411.81	52.13	4150	990	3160	76.14%		3160	76.14%		3160	76.14%	
24/08/2010	53	2	S Inc	8-5	3500	596.13	57.91	4313	195	4118	95.48%		4118	95.48%		4118	95.48%	
24/08/2010	54	2	S Inc	8-6	3500	263.05	53.30	2169	195	1974	91.01%		1974	91.01%		1974	91.01%	
24/08/2010	55	2	S Inc	8-7	3500		47.84	4634	3813	821	17.72%		821	17.72%		821	17.72%	

DATE	Fem. #	# M	Loc. Plant	UNIT #	# Eggs Planted	Live WT Eyed	400.00 Egg Sample	Total Eggs 2nd	Morts at Eyed	Total Live Eggs	% Surv.	Morts 2nd Pick	Live Alevins	% Surv.	Morts At Ponding	# Ponded	Total % Surv.	Ponding Tub
24/08/2010	56	2	S Inc	8-8	3500		48.57	3901	2860	1041	26.69%		1041	26.69%		1041	26.69%	
24/08/2010	57	2	S Inc	9-2	3500	601.10	59.20	4291	230	4061	94.64%		4061	94.64%		4061	94.64%	
24/08/2010	58	2	S Inc	9-3	3500	518.44	74.20	2862	67	2795	97.66%		2795	97.66%		2795	97.66%	
24/08/2010	59	2	S Inc	9-4	3500	476.14	49.15	3936	61	3875	98.45%		3875	98.45%		3875	98.45%	
24/08/2010	60	3	S Inc	9-5	3500	351.68	59.01	2432	48	2384	98.03%		2384	98.03%		2384	98.03%	
24/08/2010	61	3	S Inc	9-6	3500	496.64	58.97	3507	138	3369	96.06%		3369	96.06%		3369	96.06%	
24/08/2010	62	3	S Inc	9-7	3500	545.25	50.97	4454	175	4279	96.07%		4279	96.07%		4279	96.07%	
24/08/2010	63	3	S Inc	9-8	3500	494.98	50.03	4699	742	3957	84.21%		3957	84.21%		3957	84.21%	
24/08/2010	64	4	S Inc	10-2	3500	630.00	58.02	4411	68	4343	98.46%		4343	98.46%		4343	98.46%	
26/08/2010	65	2	S Inc	10-3	3500	552.17	54.69	4233	194	4039	95.42%		4039	95.42%		4039	95.42%	
26/08/2010	66	2	S Inc	10-4	3500	521.37	69.05	3606	586	3020	83.75%		3020	83.75%		3020	83.75%	
26/08/2010	67	2	S Inc	10-5	3500	314.65	52.09	2643	227	2416	91.41%		2416	91.41%		2416	91.41%	
26/08/2010	68	2	S Inc	10-6	3500	440.24	45.21	4025	130	3895	96.77%		3895	96.77%		3895	96.77%	
26/08/2010	69	2	S Inc	10-7	3500	483.06	51.01	3855	67	3788	98.26%		3788	98.26%		3788	98.26%	
26/08/2010	70	2	S Inc	10-8	3500	448.42	56.79	3383	225	3158	93.35%		3158	93.35%		3158	93.35%	
26/08/2010	71	2	S Inc	11-2	3500	599.34	61.44	4205	303	3902	92.79%		3902	92.79%		3902	92.79%	
26/08/2010	72	2	S Inc	11-3	3500	467.76	56.47	3537	224	3313	93.67%		3313	93.67%		3313	93.67%	
26/08/2010	73	2	S Inc	11-4	3500	636.17	59.47	4738	459	4279	90.31%		4279	90.31%		4279	90.31%	
26/08/2010	74	2	S Inc	11-5	3500	420.89	49.38	4405	996	3409	77.39%		3409	77.39%		3409	77.39%	
26/08/2010	75	2	S Inc	11-6	3500	480.32	64.64	3126	154	2972	95.07%		2972	95.07%		2972	95.07%	
26/08/2010	76	2	S Inc	11-7	3500	579.83	55.85	4238	85	4153	97.99%		4153	97.99%		4153	97.99%	
26/08/2010	77	2	S Inc	11-8	3500	200.92	49.32	2842	1212	1630	57.35%		1630	57.35%		1630	57.35%	
26/08/2010	78	2	S Inc	12-2	3500		50.67	2040	1353	687	33.68%		687	33.68%		687	33.68%	
26/08/2010	79	2	S Inc	12-3	3500	443.43	52.99	3645	298	3347	91.83%		3347	91.83%		3347	91.83%	
26/08/2010	80	2	S Inc	12-4	3500	451.46	54.24	3803	474	3329	87.54%		3329	87.54%		3329	87.54%	
26/08/2010	81	2	S Inc	12-5	3500	436.58	53.79	3420	173	3247	94.94%		3247	94.94%		3247	94.94%	
26/08/2010	82	2	S Inc	12-6	3500		51.46	3885	2533	1352	34.80%		1352	34.80%		1352	34.80%	
26/08/2010	83	2	S Inc	12-7	3500	255.15	58.66	3718	1978	1740	46.80%		1740	46.80%		1740	46.80%	
26/08/2010	84	2	S Inc	12-8	3500		43.09	2513	2399	114	4.54%		114	4.54%		114	4.54%	
26/08/2010	85	2	S Inc	13-2	3500	444.43	58.06	3165	103	3062	96.75%		3062	96.75%		3062	96.75%	
26/08/2010	86	2	S Inc	13-3	3500	303.25	56.31	3411	1257	2154	63.15%		2154	63.15%		2154	63.15%	
26/08/2010	87	2	S Inc	13-4	3500	505.55	49.46	4282	193	4089	95.49%		4089	95.49%		4089	95.49%	
26/08/2010	88	2	S Inc	13-5	3500	511.11	66.56	3201	129	3072	95.97%		3072	95.97%		3072	95.97%	
26/08/2010	89	2	S Inc	13-6	3500	487.66	55.35	3712	188	3524	94.94%		3524	94.94%		3524	94.94%	
26/08/2010	90	2	S Inc	13-7	3500	195.48	43.16	3891	2079	1812	46.56%		1812	46.56%		1812	46.56%	
26/08/2010	91	2	S Inc	13-8	3500	397.71	53.51	3608	635	2973	82.40%		2973	82.40%		2973	82.40%	
26/08/2010	92	2	S Inc	14-2	3500	377.25	50.17	3480	472	3008	86.44%		3008	86.44%		3008	86.44%	
26/08/2010	93	2	S Inc	14-3	3500		55.74	3870	3567	303	7.83%		303	7.83%		303	7.83%	
26/08/2010	94	2	S Inc	14-4	3500		50.00	3180	3180	0	0.00%		0	0.00%		0	0.00%	
26/08/2010	95	2	S Inc	14-5	3500	491.90	49.10	4440	433	4007	90.25%		4007	90.25%		4007	90.25%	
26/08/2010	96	2	S Inc	14-6	3500	484.65	50.68	4011	186	3825	95.36%		3825	95.36%		3825	95.36%	
26/08/2010	97	2	S Inc	14-7	3500	388.11	58.23	2893	227	2666	92.15%		2666	92.15%		2666	92.15%	
26/08/2010	98	2	S Inc	14-8	3500	502.03	55.63	3784	174	3610	95.40%		3610	95.40%		3610	95.40%	
26/08/2010	99	2	S Inc	15-2	3500	398.67	57.83	3182	424	2758	86.67%		2758	86.67%		2758	86.67%	
26/08/2010	100	2	S Inc	15-3	3500	347.27	50.08	3881	1107	2774	71.47%		2774	71.47%		2774	71.47%	
26/08/2010	101	2	S Inc	15-4	3500	353.07	60.20	2460	114	2346	95.37%		2346	95.37%		2346	95.37%	
26/08/2010	102	2	S Inc	15-5	3500	411.03	47.82	3529	91	3438	97.42%		3438	97.42%		3438	97.42%	
26/08/2010	103	2	S Inc	15-6	3500	457.13	60.28	3355	322	3033	90.40%		3033	90.40%		3033	90.40%	
26/08/2010	104	2	S Inc	15-7	3500	480.82	55.31	3882	405	3477	89.57%		3477	89.57%		3477	89.57%	
26/08/2010	105	3	S Inc	15-8	3500	390.27	63.36	2521	57	2464	97.74%		2464	97.74%		2464	97.74%	
26/08/2010	106	3	S Inc	16-2	3500	472.58	49.32	3977	144	3833	96.38%		3833	96.38%		3833	96.38%	
26/08/2010	107	3	S Inc	16-3	3500	482.63	54.32	3726	172	3554	95.38%		3554	95.38%		3554	95.38%	
26/08/2010	108	4	S Inc	16-4	3500		67.12	1675	1625	50	2.99%		50	2.99%		50	2.99%	
					376500			392467	74947	317520	80.90%		317520			317520		

Appendix 5: Snootli Hatchery Lakelse Brood Year 2010 Summary Report (J.Willis)

Date Printed	June 21,2011
Audited By	

1.1 Brood Summary Identification

Hatchery	Snootli Creek Hatchery (140)
Species	Sockeye (118)
Brood Year	2010
Stock	Williams Cr (1309)
Run	Fall (3)
Stock Type	Wild

1.2 Brood Stock Collection and Spawning

Number of Females Used	108
Number of Adult Males Used	118

Brood Stock Selection

Random	☑
Selected	☐
Selected For	N/A

Method of Fertilization

	1 Male to 1 Female	Alpha Beta 2M:1F	> 1 Male per Fem	Matrix Spawning
Percentage of Eggs	0	0	0	100

Female Mortalities

Type	No. of Females

% of Female Prespawn Mortalities	0.00

Date of Adult Collection

Start	Tuesday, August 24, 2010
End	Thursday, August 26, 2010

Date of Egg Takes

Start	Tuesday, August 24, 2010
End	Thursday, August 26, 2010

2.1 Green Eggs

Initial Green Eggs Taken		392,467
Adjusted Eggs Taken	(Back-Calculated From Eyed)	392,467
Discrepancy	(loss - / gain +)	0
Initial Egg Imports		0
Adjusted Egg Imports	(Back-Calculated From Eyed)	0
Discrepancy	(loss - / gain +)	0

Method of Inventory for Original Estimates	Percentage
Volume	0.00
Weight	100.00
Females	0.00
Adjusted Eggs Per Female	3,634

Natural Mortalities	74,947
Unnatural Mortalities	0
Cull Mortalites	0
Predation	0
Disease Mortalities	0
Aquaculture Exports	0
Public Exports	0
Pathological Exports	0
Research Exports	0
Production Exports	0
Egg Plants	0
Total Eyed Eggs	317,520
Percent Survival (Green to Eyed)	80.90

2.2 Eyed Eggs and Alevins

Weighted Mean ATU's at Eyed	378.77
Total Eyed Eggs	317,520

Method of Inventory for Eyed Counts

	Percentage
Volume	0.00
Weight	0.00
Actual Egg Count	100.00

Natural Mortalities	2,143
Unnatural Mortalities	0
Cull Mortalites	0
Predation	0
Disease Mortalities	0
Aquaculture Exports	0
Public Exports	0
Pathological Exports	0
Research Exports	0
Production Exports	0
Egg Plants	0
Imports	0
Total Ponded	315,377

Percent Survival (Green to Ponding)	80.36
Percent Survival (Eyed toPonding)	99.33

3.1 Juvenile Rearing

Rearing Group	Atu's At Ponding	Total Fry Ponded	Ponding Weight	Measurement Type		Date of Ponding	
				Bulk %	Len/Wt %	Start	Finish
2010 Williams Creek Sockeye	1,157	315,377	0.14	100	0	17-Feb-11	17-Feb-11

Rearing Group	Ponding Sample Averages			Ponding Sample Std Dev		
	Weight (gm)	Length (mm)	KC	Weight	Length	KC
2010 Williams Creek Sockeye	0.14	0.00	0.00	0.00	0.00	0.00

Rearing Group	Ponded (+)	Imports (+)	Transfers Out / Exports (-)		
			Exports	Research	Sales
2010 Williams Creek Sockeye	315,377	0	0	0	0

Rearing Group	Mortalities (-)			Inventory Loss/Gain (-/+)	Released
	Disease	Natural	Unnatural		
2010 Williams Creek Sockeye	0	6,685	12,571	804	296,925

Rearing Group	Survival Rates					
	Green Eggs			Eyed Eggs		Ponded Fry
	To Eyed	To Pond	To Release	To Pond	To Release	To Release
2010 Williams Creek Sockeye	80.9	80.4	78.7	99.3	97.2	97.9

Rearing Group	Rearing Location	From	To	Days
2010 Williams Creek Sockeye				
	15 Sockeye	17-Feb-11	19-Apr-11	61
	01sockeye	17-Feb-11	11-Apr-11	53
	12 Sockeye	17-Feb-11	14-May-11	86
	13 Sockeye	17-Feb-11	14-May-11	86
	14 Sockeye	17-Feb-11	14-May-11	86
	16 Sockeye	17-Feb-11	20-Apr-11	62
	17 Sockeye	17-Feb-11	27-Apr-11	69
	18 Sockeye	17-Feb-11	03-May-11	75
	11 Sockeye	11-Apr-11	14-May-11	33
	3 Sockeye	11-Apr-11	11-May-11	30
	2 Sockeye	12-Apr-11	11-May-11	29
	01sockeye	13-Apr-11	11-May-11	28
	4 Sockeye	20-Apr-11	11-May-11	21
	15 Sockeye	21-Apr-11	14-May-11	23
	16 Sockeye	27-Apr-11	14-May-11	17
	17 Sockeye	29-Apr-11	14-May-11	15
	Finclip Check Table	11-May-11	12-May-11	1
	Finclip Check Table	14-May-11	14-May-11	0

Juvenile Rearing Comments

Date: Apr 26, 2011 **Entered By:** Willis, John

Pinheads

Date: Apr 26, 2011 **Entered By:** Willis, John

In the MS222 to long, new marking crew.

Date: Apr 27, 2011 **Entered By:** Willis, John

In the MS222 to long, new marking crew.

Date: May 16, 2011 **Entered By:** Loosmore, Tom

Numbers adjusted by finclip quality check (96.5% good clips, 193/200)

Date: May 25, 2011 **Entered By:** Loosmore, Tom

The unnatural mortalities are the result of one bucket not being closely monitored enough during transit. The oxygenation was not working properly, and although attempts were made to revive the fish during the flight, it was too little too late.

3.2 Juvenile Feeding

Rearing Location	Feed Type	Kilograms Fed
2010 Williams Creek Sockeye		
01sockeye		
	Moore-Clark : Bio Vita Starter Mash	8.390
	Moore-Clark : Bio-Vita Starter #0	5.200
12 Sockeye		
	Moore-Clark : Bio Vita Starter Mash	8.390
	Moore-Clark : Bio-Vita Starter #0	5.100
13 Sockeye		
	Moore-Clark : Bio Vita Starter Mash	8.390
	Moore-Clark : Bio-Vita Starter #0	5.910
14 Sockeye		
	Moore-Clark : Bio Vita Starter Mash	8.390
	Moore-Clark : Bio-Vita Starter #0	5.950
15 Sockeye		
	Moore-Clark : Bio Vita Starter Mash	8.390
	Moore-Clark : Bio-Vita Starter #0	18.925
16 Sockeye		
	Moore-Clark : Bio Vita Starter Mash	8.390
	Moore-Clark : Bio-Vita Starter #0	4.325
17 Sockeye		
	Moore-Clark : Bio Vita Starter Mash	8.390
	Moore-Clark : Bio-Vita Starter #0	4.425
18 Sockeye		
	Moore-Clark : Bio Vita Starter Mash	8.387
	Moore-Clark : Bio-Vita Starter #0	5.200
11 Sockeye		
	Moore-Clark : Bio Vita Starter Mash	0.140
	Moore-Clark : Bio-Vita Starter #0	0.880
3 Sockeye		
	Moore-Clark : Bio-Vita Starter #0	5.950
2 Sockeye		
	Moore-Clark : Bio-Vita Starter #0	5.600
4 Sockeye		
	Moore-Clark : Bio-Vita Starter #0	2.700

3.4 Juvenile Marking

Release Group	Tag Code	Fin Clip	Quantity	Marking Dates		Weight
2010 Williams Creek Sockeye	NONE	AD	305,683	11-Apr-11	06-May-11	0.5

Release Group	Tag Code	Fin Clip	Fin Clip Quality			Retention Information		
			1st Fin	2nd Fin	Both Fins	Tag Loss %	Loss Days	Sample Size
2010 Williams Creek Sockeye	NONE	AD	100.0	0.0	0.0	0.0	0	0

Tag Code	Fin Clip	Anaesthetic (%)					Mark Selection Method (%)			Appearance (%)		
		Ms222	2-Phenoxy	Buffer	C02	Buffer	Random	Crowd	Graded	Healthy	Smolt	Unhealthy
2010 Williams Creek Sockeye												
NONE	AD	100	0	0	0	0	98	2	0	100	0	0

3.5 Releases

Release Group	Fin Clip	Wire Tag	Quantity
2010 Williams Creek Sockeye			
	AD	NONE	282,263
	NOMK	NONE	14,662
		WILLIAMS CR	**296,925**

Release Group	Release Sample Averages			Rel Samp Std Dev (Len/Wt Only)		
	Weight (gm)	Length (mm)	KC	Weight	Length	KC
2010 Williams Creek Sockeye	0.79	0.00	0.00	0.00	0.00	0.00

Release Group	Start Date	End Date	Normal Release? (% of Group)		Release Method (% of Group)		Scatter Distance (KM)
			Yes	No	Point	Scattered	
2010 Williams Creek Sockeye	12-May-11	14-May-11	100	0	100	0	0.0

Release Group	Release group is representative of:										
	Prod-uction	Con-trol	Size/ Time	Repli-cation	Mark Morts	Diet	Disease	Colon-ization	Sci. Experi-ment	Other Experi-ment	Surplus To Req'mt
2010 Williams Creek Sockeye	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Release Group	Release Type (% of Group)				
	Day	Forced	Night	Transported	Volitional
2010 Williams Creek Sockeye	0	0	0	100	0

Release Group	Quality of Release Group (% of Group)					Quality Comments
	Good	Average	Poor	Diseased	Smolting	
2010 Williams Creek Sockeye	100	0	0	0	0	

Release Group	Enumeration Method (% of Group)					Enumeration Method Comments
	Book Value	Adjust. Book	Displace-ment	Petersen Estimate	Smolt Counter	
2010 Williams Creek Sockeye	100	0	0	0	0	with adjustment for finclip regen check

Release Group	Receiving Stream Condition (% of Group)				
	Normal	Clear	Drought	Freshet	Turbid
2010 Williams Creek Sockeye	100	0	0	0	0

Release Group	Release Date Decided By (% of Group)							
	Fish Behaviour	River Flow	Past Results	Plankton Watch	Smolt Readiness	Needed Space	Tides	Match to Wild
2010 Williams Creek Sockeye	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0

Release Group	Release Comments
2010 Williams Creek Sockeye	Fish were moved in a variety of planes, ranging from a Cessna 172 to a Grumman Goose. The transport buckets were loaded at 11 kg fish/37 kg water. Plane loadings were 4 buckets for the Cessna 185, three for the Cessna 172, and eight for the Goose. Held in pens at the highway bridge till evening in Williams Creek, then released to move down into Lakelse Lake.

3.6 Release Transport

Release Group	Transportation Method	Time (Hrs)	Starved before release?		Acclimatized before Release?	
			Yes/No	Time (Days)	Yes/No	Time (Days)
2010 Williams Creek Sockeye	Air	1.2	☑	1	☑	.5

Release Group	Temperature (°C)			Dissolved Oxygen (PPM)			Oxygen (% Saturation)		
	Transport Water		Receiving	Transport Water		Receiving	Transport Water		Receiving
	Start	Finish	Stream	Start	Finish	Stream	Start	Finish	Stream
2010 Williams Creek Sockeye	5.5	6	6	25	30	13	200	300	100

Appendix 6: Financial Summary:

2010 Project Budget Form

Name of Project: **Lakelse Sockeye Recovery Program:**

FRY OUTPLANT PROJECT – Year 4

ELIGIBLE COSTS					TOTAL PROJECT BUDGET		OTHER FUNDING	PSC N. FUND GRANT AMOUNT	ACTUAL AMOUNT SPENT	VARIANCE	EXPLANATION
Labour											
Wages & Salaries											
Position	# of crew	# of work days	hrs per day	rate per hour	**Total (In-kind & cash + PSC Amount)**		**In-Kind & Cash**	**PSC Amount**			
Nuxalk First Nation (egg picking, feed)	2	45	8	30	21,600		13,600	8,000	8,133.33	101.67%	
Restoration Biologist	1	20	8	40	6,400		6,400				
Technical assistance	3	12	8	30	8,640		3,000	5,640	1,205.65	21.38%	Note 1
Financial administration (DFO in-kind)	2	14	8	25	5,600		5,600				
Person Days (# of crew x work days)				**sub total**	42,240		28,600	13,640			
Labour - Employer Costs (percent of wages subtotal amount)											
	rate	0%		**sub total**							
Subcontractors & Consultants	# of crew	# of work days	hrs per day	rate per hour							
Project Coordination, report writing	1	70	8	31.25	17,500		2,000	15,500	15,860.00	102.32%	
Marking crews	6	14	8	23	15,456			15,456	16,800.00	108.70%	
Net set crews for adult assess't					5,000			5,000	5,462.74	109.25%	
Insurance if applicable	rate	0%									
				sub total	37,956		2,000	35,956			
Volunteer Labour	# of crew	# of work days	hrs per day								
Skilled	6	6	8	25	7,200		7,200				
Un-skilled	6	6	8	15	4,320		4,320				
Insurance if applicable	rate	0%			1,200			1,200	0.00	0.00%	Note 2
				sub total	12,720		11,520	1,200			
			Total Labour Costs		92,916		42,120	50,796			

Site / Project Costs	Provide details in the space below (use an additional page if needed)						
Travel (do not include to & from work)	Air charters, equip/personnel transfers	30 000		2,000	28,000	23,316.93	83.27% Note 3
Small Tools & Equipment	Cages, nets,	4,000		2,000	2,000	2,866.10	143.31% Note 4
Site Supplies & Materials	Project consumables (fish food, whirl paks, etc)	5,000		1,000	4,000	4,881.14	122.03% Note 5
Equipment Rental							
Work & Safety Gear	Waders, life jackets, bear spray, etc.	2,500		2,000	500	526.75	105.35%
Repairs & Maintenace	Net and cage repairs	1,000		1,000			
Permits							
Technical Monitoring	Temperature loggers, DO meter, etc.	1,500		1,500			
Other site costs	Disease sampling	2,000			2,000	2,516.35	125.82% Note 6
	Total Site / Project Costs	46,000		9,500	36,500		

ELIGIBLE COSTS				BUDGET		OTHER FUNDING	CONTRIBUTION FUNDING
Training (e.g Swiftwater, bear aware, electrofishing, etc).				**Total (PSC + In-kind + cash)**		**In-Kind & Cash**	**PSC Amount**
Name of course	# of crew	# of days					
Bear Aware	4	1		800		800	
Swift Water Rescue	2	2		1,200		1,200	
Standard First Aid	4	1		800		800	
			Total Training Costs	2,800		2,800	-

Overhead / Indirect Costs	(If the PSC contribution to Indirect costs exceeds 20% of the total PSC grant you will be required to submit back-up documentation justifying the expense).					
Office space; including utilities, etc.		8,000	6,000	2,000	634.37	31.72% Note 7
Insurance	General liability and project insurance	1,000		1,000	985.00	98.50% "
Office supplies		1,000	500	500	366.22	73.24% "
Telephone & long Distance		2,000	500	1,500		0.00% "
Photocopies & printing		1,000	500	500		0.00% "
Other overhead costs	Courier, postage, shipping, etc.	2,000	500	1,500	445.42	29.69% "
	Total Overhead Costs	15,000	8,000	7,000		

Capital Costs / Assets	Provide details in the space below (use an additional page if needed)

Assets are things of value that have an initial cost of $250 or more and which can be readily misappropriated for personal use or gain or which are not, or will not be, fully consumed during the term of the project.

		Total Capital Costs								
		Project Total Costs	156,716		62,420	94,296	84,000.00	89.08%	Note 8	

Budget Summary

(PSC + in-kind + cash)

Total Labour Costs		92,916
Total Site / Project Costs		46,000
Total Training Costs		2,800
Total Overhead Costs		15,000
Total Capital Costs		-
	Project Total	156,716

Notes:

1 Technical assistance - cost-savings realised through additional in-kind support from DFO.
2 Insurance covered through overhead budget.
3 Significant travel savings due in part to larger plane on stand-by in Bella Coola and some travel expenses absorbed by DFO.
4 Some overages due to purchase of disinfecting equipment upgrades necessary to meet new Aquaculture BMP's
5 Some overages due to purchase of disinfecting equipment upgrades necessary to meet new Aquaculture BMP's
6 Disease sampling costs combined with opportunistic water qualilty sampling in Lakelse tributaries brought costs slightly above projected costs.
7 Significant overhead savings due to many of these expenses being absorbed by DFO.
8 Hold back of $10,296 not needed due to various savings realised throughout the project. Total budget spent = $84,000.00