Lakelse Lake Sockeye Rehabilitation Program:

Satellite Sockeye Hatchery Site
Fry Outplant Program - Year 1

Prepared for:

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Executive Summary

Lakelse Lake sockeye salmon are one of the approximately 28 wild stocks in the Skeena River drainage and harvested in mixed stock fisheries in southeast Alaska and northern B.C. each summer. If current population trends continue, Lakelse Lake sockeye could be at biological risk, even at relatively low levels of exploitation. (Cox-Rogers, 2004)

As part of the Lakelse Lake Sockeye Salmon Recovery Plan program, Department of Fisheries and Oceans applied for and received funding from Pacific Salmon Commission for a *Satellite Sockeye Hatchery Fry Outplant Project* to conserve the critically declining sockeye salmon stocks in the Lakelse Lake watershed while restoration, habitat protection and assessments remain ongoing. These stocks have undergone a decline from recorded numbers of thousands to documented numbers in the hundreds in the past 10 years.

This project was intended to conserve and enhance this stock while other projects relating to habitat restoration and assessment continue. Through the process of selecting a potential sight for the satellite hatchery, an evaluation process was used similar to that which was applied to the Cultis Lake captive brood program. (Rivers Inlet Smith Inlet Sockeye Recovery Strategic Enhancement Operation, Hilland, Willis, Mortimer, 2001). Seven different sites which held merit and potential were evaluated, assess and scored. (*Appendix 1*) Through this process the Snootli Creek Hatchery site at Bella Coola rated highest as the necessary personnel, scientific expertise, infrastructure and facilities were already in place to maximize success and achieve a positive outcome. Sex ratio, fecundity, egg-to-fry survival and fry-to-adult survival were considered for the first rearing proposal. The proposed target of 100,000 eggs was also believed to be attainable based on disease sampling done the previous year at Williams Creek. This target number was also easily manageable at this rearing facility suitably established to keep salmon stocks isolated.

Experienced staff at Snootli Hatchery worked in concert with Terrace area DFO O'HEB staff with expert local knowledge and years of fish culture experience. Other valuable assistance came from biologists and technicians from Kitselas and Gitanyow First Nations, Lakelse Lake Watershed Society volunteers and DFO Stock Assessment division.

The logistics of this project were coordinated between the two sites. In August 2006 eggs and milt were collected from the Williams Creek-Lakelse area and air lifted to the Snootli Creek Hatchery, Bella Coola, B.C. where the eggs were fertilized and planted in incubators. The fry were then ponded, marked (adipose fin clipped) and further reared until they reached a weight of approximately .65 grams. They were then airlifted back to Williams Creek near Lakelse Lake and released. Disease sampling and DNA samples were also conducted at the time of the egg take. (*Appendix 2*)

Approximately 96,406 fry were successfully released into Williams Creek on May 2, 2007.

Acknowledgements

The project was a collaborative effort between Department of Fisheries & Oceans Canada – Terrace Office and Snootli Creek Hatchery who provided personnel, labour, travel, equipment and technical expertise as "in-kind" contributions. In addition, biologists and technicians from Kitselas, Gitanyow and Nuxalk First Nations were involved at various stages of the project. Volunteer personnel from Lakelse Watershed Society and the Terrance Salmonid Enhancement Society also rendered assistance.

Department of Fisheries & Oceans Canada personnel included:

Margaret Kujat – Sockeye Recovery Plan and Project Coordinator/OHEB – Terrace
John Willis – Operations Manager – Snootli Creek Hatchery
Russ Hilland – Watershed Enhancement Manager – Snootli Creek Hatchery
Marie Salome – Administration Officer – Snootli Creek Hatchery
Mitch Drewes – Habitat Technician/OHEB – Terrace Area
Lana Miller – Restoration Biologist – North Coast
Steve Cox-Rogers – Biologist – Stock Assessment – Prince Rupert
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Rob Dams – Community Advisor/OHEB – Terrace Area

Additional Government assistance:

Doug Lofthouse – DFO Enhancement Biologist – Vancouver, B.C.
Ben Sabal – Area Supervisor, BC Parks, Terrace, B.C.
Bruce Shepherd – DFO North Coast Area Chief, Prince Rupert, B.C.

Other personnel included:

Ian Maxwell – Lakelse Watershed Society – Terrace, B.C.
Wilma Maxwell – Lakelse Watershed Society – Terrace, B.C.
Ken Fraser – Lakelse Watershed Society – Terrace, B.C.
Mark Cleveland – Fisheries Biologist – Gitanyow Fisheries Authority - Kitwanga
Bill Blackwater – Manager – Gitanyow Fisheries Authority – Kispiox, B.C.
Jason Moody – Nuxalk Fisheries Department – Bella Coola, B.C.
Chris Culp – Terrace Salmonid Enhancement Society, Terrace, B.C.
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Photo acknowledgements:
Holly Smith, John Willis and Snootli Creek Hatchery staff, Ken Fraser and Fred Seiler (professional photographer, *Spawning Sockeye, partial image*).

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1.0. Introduction

"Sockeye salmon (Oncorhynchus nerka) are commercially the most valuable of the five species of Pacific salmon in British Columbia…..Since juvenile sockeye spend form one to two years of their early life history in lakes prior to migrating to the sea, the freshwater environment is an important element affecting sockeye growth and survival." (Morton, K.F. , Williams, I.V. 1990) .

The sockeye salmon stocks in the Lakelse watershed have been declining at an alarming rate due to physical changes and habitat impacts caused by logging, linear development and beaver activity which, indeed, integrally affects their juvenile survival and ultimately impacts future harvestable stocks. Stock escapements to Lakelse Lake have been depressed relative to historic levels. Department of Fisheries & Oceans Canada (DFO) – Stock Assessment Branch - concluded in 2003 that lake densities of juvenile sockeye in Lakelse Lake were less than 5% of the rearing capacity, representing the offspring from just 750 spawners. Work done in 2004, 2005 and 2006 indicated that this trend still continues and escapements have not shown a positive rebound.

In the summer of 2004, the Skeena Sockeye Workshop was held to discuss the status of the sockeye salmon in the Skeena drainage. The studies presented at this gathering included solid data confirming an alarming decline in sockeye populations in the Lakelse system. As a result, the Lakelse Lake Sockeye Salmon Recovery Plan Committee was struck to develop and implement a plan for Lakelse Sockeye population recovery. This Recovery Plan Committee consists of stakeholder representatives from various branches of DFO, B.C.'s Ministry of Environment, BC Timber Sales, Kitselas First Nations, Terrace Salmonid Enhancement Society and the volunteer community-based Lakelse Lake Watershed Society.

A Recovery Plan document was formulated and stakeholders were involved in reviewing the status of stocks and habitat, identifying the limiting factors, developing potential projects and placing these projects in a logical sequence of priority. These projects were ranked on the basis of feasibility, cost effectiveness, cost-benefit analysis, potential for immediate help to the sockeye salmon and the project's ability to address the limiting factors affecting the sockeye in this system. Projects were identified in three different categories: improved information, habitat restoration and stock enhancement. *The Pilot Satellite Sockeye Fry Outplanting Project* was ranked first of three enhancement projects by this group in the developing framework of the Lakelse Lake Sockeye Salmon Recovery Plan. In 2006, DFO applied for and received funding from the Pacific Salmon Commission for Year 1 of this pilot project in order to conserve this valuable stock.

This Fry Outplant project was designed to utilize an existing enhancement facility to maximize effectiveness in addressing capital and operating costs. To rate various facilities best suited for a successful fry outplanting conservation project of the Lakelse Lake sockeye salmon stock, a number of criteria were brought forth for discussion and scoring against seven different potential locations. This was done using previously developed criteria for other facilities such as the Cultis Lake project with added issues to reflect local geography. This evaluation was conducted by many Department of Fisheries and Oceans Canada personnel in joint consultation.

This report summarizes the project, funded by the Pacific Salmon Commission, and is intended to be a record of events. It may help to provide a better understanding of the limiting factors affecting sockeye in this system, how those factors are being addressed and the ongoing monitoring and assessment involved in the Lakesle sockeye conservation. It is hopeful that this work will also further reinforce strong educational and stewardship opportunities within the surrounding community regarding this run of sockeye salmon.

Figure 1. Spawning Sockeye Salmon – Partial Image – F. Sieler -Photographer

2.0. Study Area

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, in turn, flows into the 18 kilometre long Lakelse River. Lakelse River is a Skeena River Tributary that enters the Skeena approximately 150 kms from its mouth.
Though there are several significant tributaries flowing into Lakelse Lake, Williams Creek is considered the main spawning area for this sockeye stock.

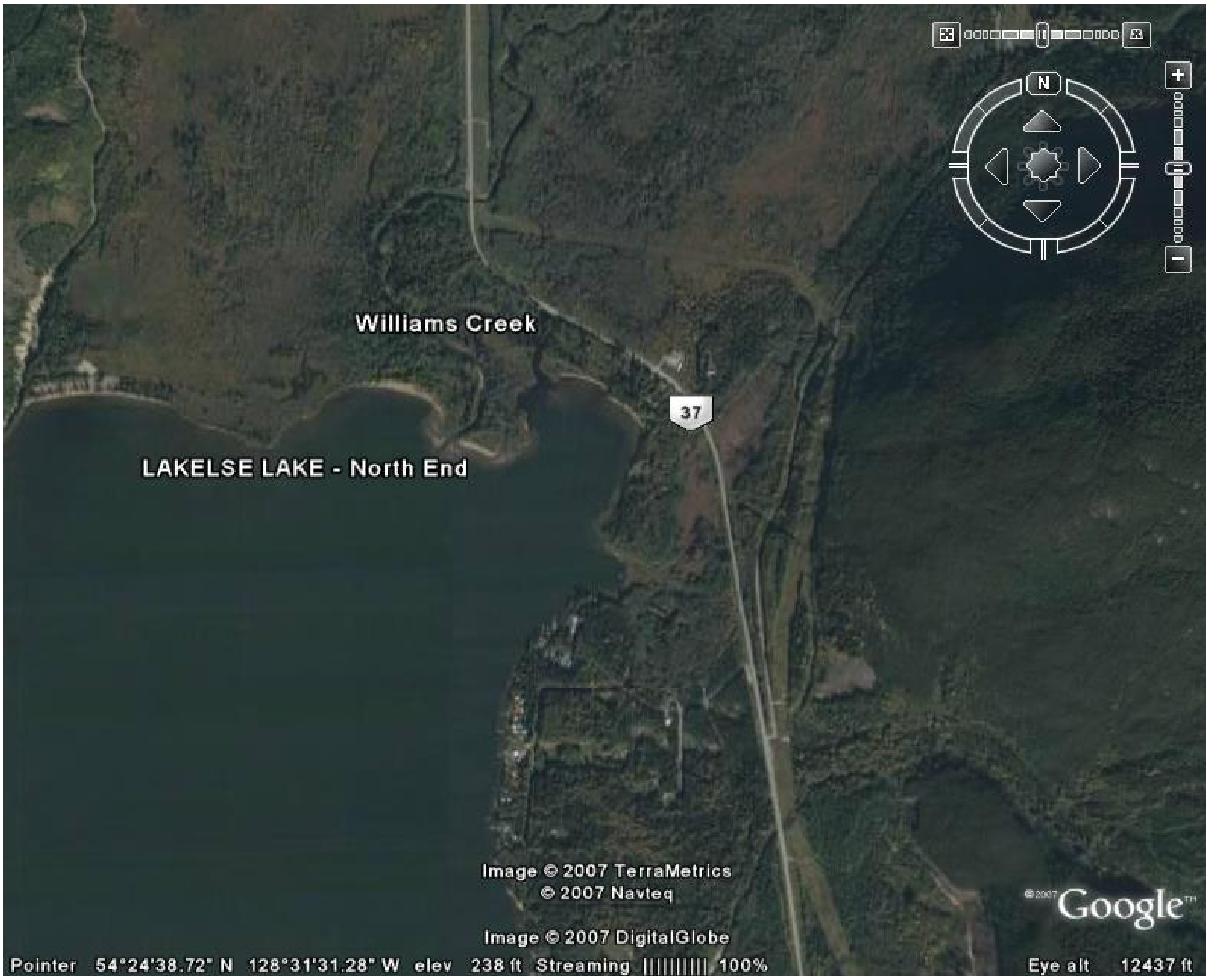

Figure 2. Illustrates Lakelse Lake, Williams Creek – south of Terrace, B.C.

Figure 3. Illustrates Specific Spawning and Release Sites

Egg Takes – downstream of Highway #37 Bridge – Williams Creek
Fry Release – upstream of Highway #37 Bridge – Williams Creek

3.0. Methods

3.1. Site Selection:

Selection of a suitable location for a fry outplanting pilot hatchery for the Lakelse watershed sockeye salmon stock was deemed paramount as this stock has reached an alarming decline in numbers. It was evident from work done in more recent years through the Recovery Plan projects, that this would be a conservation more than enhancement operation leaving no room for error or significant barriers. To that end, a panel of Department of Fisheries & Oceans Canada personnel with various backgrounds and expertise were brought together to build a stringent set of criteria on which to judge and measure seven potentially viable facilities. These criteria were developed using previously applied criteria to projects such as Cultis Lake in addition to known local geographic, resources and capacity restraints.

This process began in 2005 and carried forward through the early part of 2006. Once the criteria were developed they were applied to each of the seven facilities as they existed at the time. These facilities included:

- Eby Street Hatchery, Terrace, B.C.
- Old Kitimat Pilot, Kitimat, B.C.
- Fulton River, GranIsle, B.C.
- Kitsumkalum, Terrace, B.C.
- Lakelse Groundwater Sites, Lakelse Area
- Kispiox Hatchery, Kispiox, B.C.
- Snootli Creek Hatchery, Bella Coola, B.C.

While it was recognized that facilities could be re-vamped, monetary, physical or resource capacity restraints were also known at the time of scoring. One criteria of particular scrutiny was the presence of sockeye salmon with respect to effluent treatment existing at the facilities in question as the specific concerns was the potential for disease transmission (IHN) to local stocks. Cost estimates for upgrades or developments of sites to meet requirements were applied to the selections as well.

Each site was examined in terms of its location and proximity to Lakelse Watershed, its characteristics and what species may be present in the system.

The criteria applied to each site included:

- Potential for IHN transmission
- Reliability of Water Supply
- Site Security
- Qualified Fish Culture "staff"
- Emergency Response Program
- Stock Present or Effluent Treatment
- Sockeye Culture Experience
- Available Rearing Capacity and Containment
- Appropriateness of Temperature Regimes
- Temperature Control
- Back-up Water and Power Delivery Systems

- Facility Age and Reliability
- Co-Culture Concerns
- Incubation Capacity/Containers
- Incubation and Rearing Capabilities On Site

Each criteria had a numbered score. The site selection team who researched, gathered information or had first hand knowledge, diligently designated a rating to each criteria for each facility. The panel who participated in the development of the criteria provided input and/or the scoring discussions included DFO staff: Doug Lofthouse, Garth Traxler, Al Stobbart, Mark Westcott, Brain Anderson, Steve Cox-Rogers, Brian Riddell, John Willis, Russ Hilland, Bruce Shepherd, Lana Miller, Mitch Drewes, Rob Dams, Shaun Davies, Christine McWilliams, Dorothee Keiser, Margaret Kujat and included Mark Cleveland (Biologist-Gitanyow Fisheries Authority).

Once the scoring was applied, they were totalled and the conclusions drawn form this objective exercises were very clear: Snootli Creek Hatchery located at Bella Coola was the most suitable location for the successful conservation of this stock. The facility and staff at this facility possess the technical expertise, the capacity and, indeed, are well recognized in the field of sockeye salmon enhancement. This facility required no capital expenditures and was therefore cost effective, was able to make logistical adjustments to accept the task, met all the basic requirements and posed the best possible chances for the conservation of the Lakelse Stocks despite its geographic location relative to Lakelse watershed.

Based on assessment of the capacity of staff and facilities at both ends of the project (Terrace and Bella Coola) all parties were confident that, despite geographic distances, the operation would be logistically viable and very cost effective. This information was conveyed to the Pacific Salmon Commission in an interim report.

3.2. Pre-Operation:

In July of 2006 “Applications for the Introduction or Transfer of Fish” were made and approved for the transport of the eggs/milt and also for the returning fry. BC Parks were also informed of the project as a courtesy as Williams Creek lies within Parks boundaries. The Provincial Ministry of the Environment - Conservation Officers were also informed of the egg take and the fry releases.

Expert technical staff from Snootli Creek Hatchery arrived in Terrace in August several days ahead of the egg take/spawning to conduct a training session for all personnel who would be assisting with the spawning. This training was to ensure that the Alaskan sockeye protocols were addressed and that the various step-by-step procedures were familiar to those who would be involved. Later a brief inspection of the Williams Creek site was conducted by the Snootli Creek Hatchery Operations Manager with DFO Terrace staff to pre-plan the egg take and capture brood stock to be held until the following morning. (Figures 4,5)

3.3. Brood Stock

Potential brood stock were captured in Williams Creek using 4 1/8” mesh tangle gill nets the afternoon of August 21 by Terrace DFO staff and the Operations Manager of the Snootli Creek Hatchery. Twenty four ripe females were selected and held in cages overnight. Their status was checked at intervals throughout the holding period and then once again, for the last time, at approximately 8:30 p.m. In addition, several net sets were done the following morning to capture the balance of the required stock.

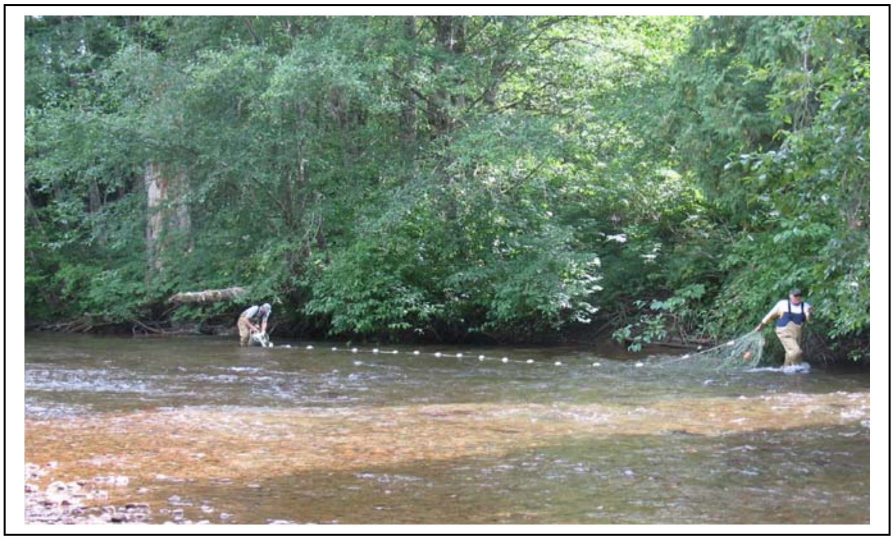

Figure 4: One of several net sets – collecting brood stock

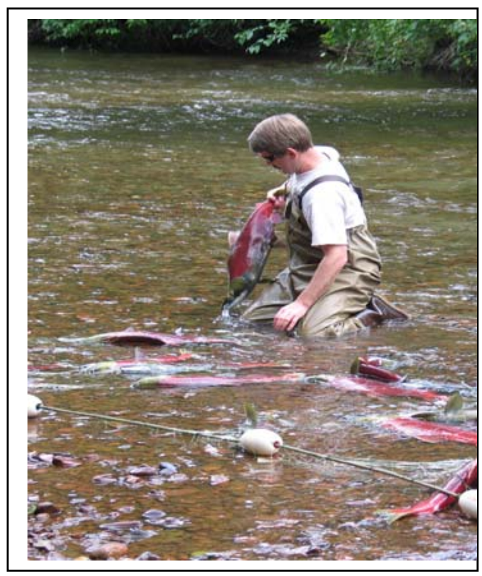

Figure 5: Selecting females for brood stock

3.4. Egg Take/Spawning:

Spawning procedures adhered strictly to the Alaskan sockeye protocol (McDaniel et al, 1994) to reduce potential transmission and fish mortality as a result of IHN virus. Almost all personnel who were assisting with the procedure had been previously trained and familiarized with these steps prior to the egg take. If not, they received on site training before entering into the process.

Spawning was done in the field and the eggs and milt were later air transported via a chartered Cessna 185 aircraft (rear seats removed) back to Snootli Creek Hatchery for fertilization and planting.

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

The females were dispatched with a sharp blow to the head and then immediately hung, tail up, on a portable spawning rack using lightweight twine "tailers". They were hung from single pegs appropriately spaced to ensure and maintain physical separation from each other. Individually, the females were then bled out by cutting the gills with a disinfected knife. (Figure 6)

Figure 6: Portable Spawning Rack

The ventral area of each female fish 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 vent area and belly of each female was wiped down with dry paper towel as it was removed from the spawning rack. It was held, tail down, by one technician as an additional technician cut the fish anteriorally from the vent upward. The eggs were dropped into a disinfected, smooth plastic collection bowl. Collection bowls were replaced between each fish with a clean, sterilized one.

Figure 7: Collection of Eggs into Spawning Containers

The eggs were then transferred from the initial collection bowl to disposable, individually numbered plastic, lidded containers and placed on crushed ice in a large portable cooler. This was intended to stabilize temperatures during the operation and throughout transportation.

Males were handled with the same disinfecting protocols as the females. Individual personnel handled individual tasks relating to the fish handling. Gloves, j-cloths and paper towels were all replaced between each fish.

The 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 labelled "whirl-pak" bag. Each bag was sealed, numbered and placed in the large cooler on ice in preparation for transport.

A total of 32 females and 31 males were collected and used for a target number of +100,000 eggs.

The portable cooler (containing eggs and milt) and the Snootli Creek Operations Manager were then relocated from the field to the Kitimat-Terrace Regional airport and air transported back to Bella Coola (Snootli Creek Hatchery) via a chartered Cessna 185 originating from Bella Coola.

3.5. Disease Screening:

For the purposes of disease sampling for IHN, 2ml sterilized pipettes were used to collect ovarian fluid from each female's eggs. Fluid was drawn from the numbered egg containers and placed in corresponding numbered, sterilized, screw cap vials. These vials were then placed in a small cooler containing gel ice 'paks'.

Once spawned, the females were laid on a flat surface in sequential order, protected from wind, sunlight and rain. Surgical scalpels used for sampling were initially disinfected in isopropyl alcohol. They were then further disinfected by flame using a small, portable butane torch. Once the blade had cooled, a posterior kidney sample was removed from each female, placed in sterilized, individually labelled whirl-pak bag which was immediately put in a small cooler with frozen gel 'pak'. (Figures 8, 9, 10)

Figure 8: . Disease Sampling

The ovarian fluid samples and the kidney samples were kept chilled and shipped to Pacific Biological Station – Fish Pathology Laboratory, in Nanaimo, B.C. for processing. These samples are ideally received by fish pathology technicians fresh, chilled and within a 24 hour window of time. The samples must remain chilled (not frozen) and transportation logistics is important to maintain these parameters.

Figure 9: Disease Sampling – Ovarian Fluid Drawn into Pipette

Figure10: Disease Sampling – BKD

3.6. Fertilization and Planting

Snootli Creek Hatchery is equipped with a segregated spawning area. Upon arrival there, the eggs and milt were removed to this site for a 2 X 2 matrix fertilization procedure. The eggs from each female were divided evenly into 2 separate containers and each of these received half the milt from 2 individual males. These egg samples were then recombined for fertilization. Disposable surgical type gloves were worn by the technician and were discarded between all samples. Water was added to the eggs/milt to activate fertilization. The samples were then rinsed with a 100ppm iodine solution and place in labelled Heath trays containing 100ppm iodine. Following a 15 minute wait period, the tray was gently pushed back into place. Water flows were set at 15/lpm. Each female's eggs were place in an individual tray for segregation. (Figure 11)

3.7. Incubation

Water flows were monitored and maintained at 15/lpm in all heath tray stacks. Incubation temperatures were monitored with temperature recorders in the head boxes and selected Heath stacks. Eggs were eyed 304 Accumulated Thermal Units (ATU's). At the eyed stage, average egg weight and diameter was assessed for each female. Dead eggs were removed, enumerated and discarded. Live eggs were placed back into Heath trays equipped with plastic "saddles". (Figure 12)

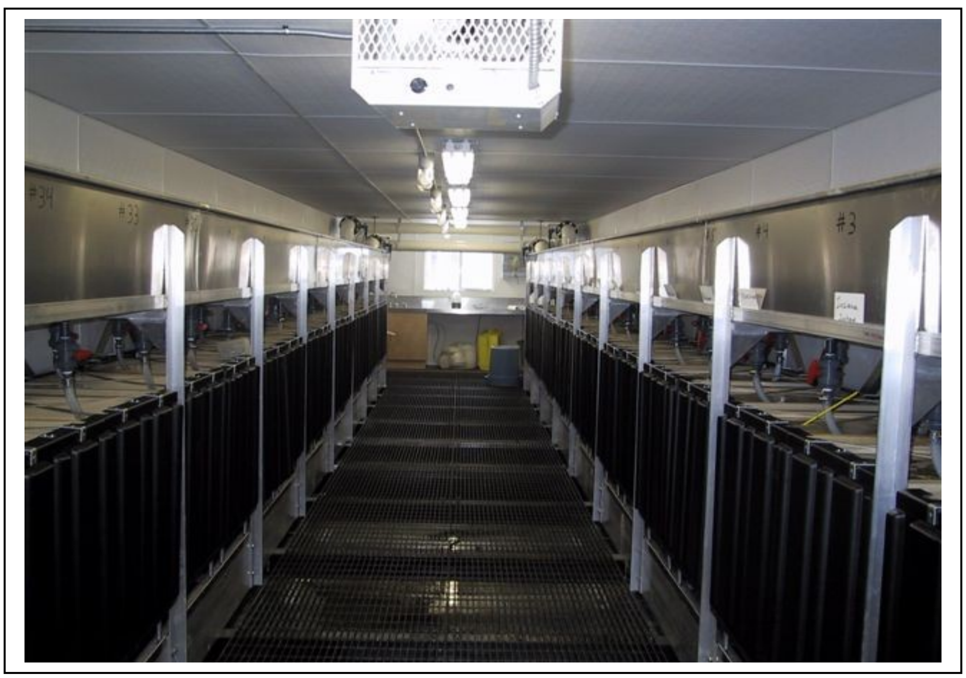

Figure11: Incubation Facilities – Snootli Creek Hatchery

Figure 12: Incubation "Saddles"

3.8. Ponding and Rearing

The fish were ponded into 4 tubs on February 12, 2007 with the BKD low positive fish segregated into their own tub. (Figure 13)

Figure 13: Ponding Lakelse Sockeye Fry

3.9. Fry Release

Based on temperature data for Williams Creek, feeding regimes, air craft availability and natural emergence of wild fry, the Lakelse fry were scheduled for release the first week of May. Suitable weather conditions for flights was also a consideration in the scheduling of this project.

Figure 14: In-stream holding pens are placed in Williams Creek

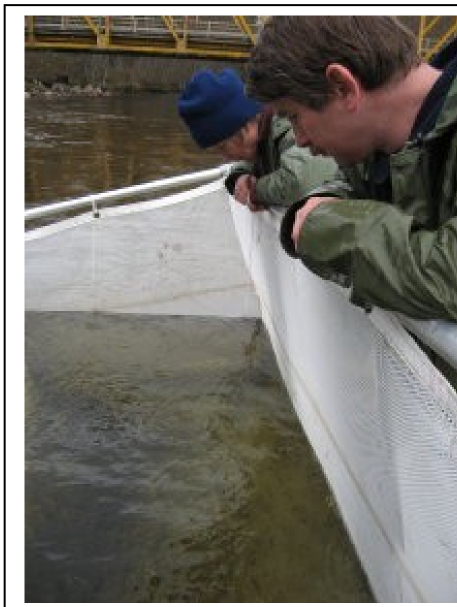

Figure 15: Sockeye Fry Holding for Acclimatization

4.0. RESULTS

4.1. Spawning

A total of 112,087 eggs were transported to Snootli Hatchery for incubation and rearing. Operationally this phase of the project went very smoothly. Though egg takes may have been spaced over a period to reflect early, mid and late runs returning numbers were suspect and a decision to ensure the target number of eggs were taken was made. Kitselas First Nations technician conducting stream walks noted that water levels were extremely low this year. As a direct result of the low water, bear predation was a notable problem. It was quite probably that had the egg take not been conducted when it was, conditions may have made it impossible at a later time.

4.2. Ponding and Rearing

An estimated 102, 601 fry were ponded weighing approximately .18 grams at 1144 ATU's February 12, 2007.

4.3. Marking

From April 16th to 24th, a total of 97,659 Williams Creek Sockeye were marked with an adipose clip.

4.4. Release

Fry were flown from Bella Coola Airport to the Kitimat-Terrace Regional Airport May 2, 2007 using a loading of approximately 8.5 kg of fish to 40 kg of water in 77 litre garbage pails. Oxygen was metered into each of the pails at about 1/8 lpm per buckets. Loads were transferred to a vehicle and trucked to their natal stream were they were then transferred to in-stream portable pens and held until nightfall for acclimatisation. They were released at approximately 9:45 p.m.

5.0. DISCUSSION AND CONCLUSION

- Egg takes for this project went very smoothly by ensuring that all personnel involved were well versed and familiar with the sockeye salmon protocols prior to the actual egg take. Staff from DFO Bella Coola and Terrace, working with Kitselas First Nations, Gitanyow Fisheries Authority and orientated volunteers from Lakelse Lake Watershed Society were well organized and received excellent hands-on assistance from staff at Bella Coola.

- Despite two different geographic locations, this project went extremely well with no significant barriers or difficulties to report. Organization was pivotally important at both ends but easily achieved.

- Until indicated otherwise, cargo shipment via Air Canada Cargo must be chilled using gel pak freezing units only and forbidding the use of ice. Samples for disease screening should be labelled “biological samples” and must remain chilled, not frozen, en-route to Pacific Biological Station. (PBS) It is possible to utilize frozen samples but not under ideal circumstances. If that is the case, samples should be frozen immediately and remain frozen until received by PBS.

- Because the staff at Snootli Creek Hatchery are emerging as highly skilled and informed sockeye salmon culturalists, many of the questions arising in a project of this nature have been answered through their previous work with other sockeye stocks (Rivers Inlet, Smith Inlet, etc). This project posed no notable concerns.

- Mark Cleveland, Biologist for the Gitanyow Fisheries Authority (GFA), participated on the site selection panel as the Kispiox Hatchery Site was being assessed as a potential satellite hatchery location for Lakelse. GFA was proposing a similar Fry Outplant project with Kitwanga sockeye at Kitwanga Lake utilizing Kispiox Hatchery to incubate and rear their stocks. The site selection process proved useful for their purposes and proposal proving that the site held merit and had been compared on a level field against other locations.

  He also assisted with the Egg Take and Fry Release operations to gain on-hands knowledge transferable to his Kitwanga operation. DFO personnel reciprocated attendance at their egg takes and fry release in addition to providing direct assistance in handling disease sample shipments and logistics. Throughout this project, resources, equipment and knowledge was shared with GFA to add in-kind support for their endeavour. This was a logical and positive step which seemed fruitful for both projects and staff involved.

- Areas of interest regarding the Lakelse Sockeye Salmon stocks specifically noted by Snootli Creek personnel were as follows:

  <u>Accumulated Thermal Units (ATU’s)</u>

  Lakelse stocks did not develop within “normal parameters” of ATU’s and were delayed against those norms.

Feeding:

Because Snootli Hatchery raises several different stocks of wild sockeye salmon, comparisons were easily drawn. Once ponded, the Lakelse sockeye salmon displayed "excellent feeding responses and fed better than any other stock raised at Snootli on record" (Willis, 2007). They were identified to be "aggressive feeders".
Though released at just less than 1 gram it was felt that there would be no difficulty in raising slightly larger fry for subsequent years.

Though almost 100,000 fry were released into Williams Creek this May, issues such as predation, lakeshore use by residents and Park users and degradation of habit remain limiting, unmeasured factors. Highest concentrations of juvenile fry utilize the most impacted portion of the lake.

The outcome of this project is, as yet, unknown. While it is hoped and assumed that the fry migrate downstream to the Lakelse Lake to hold, assessment of the fry release is currently not possible due to the absence of a trap on Lakelse River.

A series of hydro acoustic and mid-water trawl surveys of Lakelse Lake in 1994, and in 2003-2005 were conducted by Department of Fisheries & Oceans Canada. These were fall surveys with an additional summer survey in 2003. They also conducted a detailed limnological survey of the lake in 2003.

"Sockeye are typically found along the shore shortly after emergence in the spring and then are increasingly found in deeper water as the spring and summer progresses. By early summer they are mostly found offshore where they undergo daily vertical migration, spending the day in deeper water (>30m) coming up to feed in surface waters at dusk and dawn and spending the night at an intermediary depth at night (usually just below the thermocline when present). As Lakelse has a maximum depth of 32 m the sockeye are on the bottom during the day. Our surveys found the vast majority of the juvenile sockeye in the deeper north basin, (north of Catt and Gainey Pts), with very few, if any, in the shallow southern portion. Highest concentrations were mid-northern basin". (J. Hume, 2007)

The Lakelse Lake Sockeye Salmon Recovery Plan is ongoing and this project serves to "make fish" while other restoration, enhancement and assessment projects continue in attempt to conserve and maintain this valued stock.

6.0. REFERENCES

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APPENDIX 1

PROPONENT INFORMATION

Proponent Information:

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APPENDIX 2

Hatchery Site Criteria

PROPOSED CONSERVATION ENHANCEMENT OF LAKELSE SOCKEYE FACILITY SELECTION

Review Criteria and Scoring

In developing a scoring system to assist in facility selection for execution of a Lakelse Lake Sockeye conservation enhancement program, we first referred to a similar process that had been applied to the Cultus Lake sockeye captive brood program. Given the inherent differences in the two programs however, some changes were made to the suite of review criteria. A small group of Departmental staff reviewed and agreed upon these modified criteria and points breakdown prior to the scoring exercise being conducted. The following sections provide the finalised criteria and points allotment rationale;

Scoring Rationale

- Scored as 10: Reflects criterion that are considered most important for successful completion of a sockeye conservation enhancement program.

- Scored as 5: Reflects criterion whose omission or failure to meet may not necessarily reject the facility's participation in the fish culture program out of hand, but are deemed desirable for the maximum survival and stock benefit over the program's duration.

- Scored as 3 or 2: Reflects criterion of lesser importance that could normally be rectified with additional funds, equipment, or repairs.

Criteria or Requirement Rationale

- Potential for IHNV infection from water supply (Score 10)
  The most critical component of a successful sockeye fish culture program is an IHNV free water supply. IHNV is the disease most likely to cause major losses in any sockeye culture program, and is of most concern in late incubation/early rearing. Sockeye are carriers of the IHN virus, and it can survive for varying periods of time outside the host in the surrounding water. Ensuring it cannot be passively introduced into the rearing environment is crucial in maximising the likelihood of program fruition.

  Scored as follows:
  10: Documented fish-free
  8: Considered fish-free, but requires confirmation
  5: Fish present, but documented as IHNV-free
  3: Fish present, but species not known to be vulnerable to IHNV
  0: IHNV-vulnerable species of fish present

- Source and Reliability of Water Supply (Score 5 for each supply to max. of 10)

  Gravity-fed water is the most desirable supply type as it is the safest and most economical. It is not affected by mechanical breakdown of equipment such as pumps, controls, etc. Nor is it dependent upon additional resources such as electrical supply.

  Scored as follows:
  5: Gravity-fed groundwater

4: Pumped groundwater
3: Gravity fed surface water
2: Pumped surface water, no other upstream water licences/users
1: Pumped surface water, other upstream water licences/users

- Site Security (Fenced and Monitored) (Maximum Score 5)
  Conservation enhancement is one of a number of measures which may be applied to stocks whose escapements have been determined to have reached alarmingly low levels. In these cases, unexpected losses of eggs/juveniles during culture could be extremely detrimental to the success of the project, and hence future status of the stock. Effects of vandalism, predator or animal attack, and possible disease introduction etc. are best negated by presence of physical barriers and by the security 24-hour emergency monitoring affords.

  Scored as follows:
  5: Fully fenced, alarmed, and 24-hour monitoring
  3: Meets two of three requirements
  1: Meets one of three requirements
  0: Meets none of the requirements

- Qualified Fish Culture Staff (Maximum Score 5)
  Indicators of fish health or condition, and normal response or behaviour must be assessed on a daily basis. Only persons with sufficient experience and training to recognise the minimal changes that signal the early stages of an identifiable problem, whether biological or mechanical in nature, should be assigned to a conservation enhancement program.

  Scored as follows:
  5: Extensive experience and training
  4: Extensive experience – some training
  3: Moderate experience
  2: Some experience

- Emergency Response Program (standby) (Maximum Score 5)
  Typically, conditions which lead to immediate fish mortality (or less apparent but equally destructive long-term health impacts) such as interruption to water flow, can begin to take effect in as little as 15 minutes, dependant upon container biomass loadings, flow rates etc. Natural disaster, power failure, fire, freezing, etc. are all examples of events which require actual physical response to assess and ascertain the most expedient actions to be undertaken to reduce or eliminate detrimental effects to fish health and program goals.

  Scored as follows:
  5: Meets DFO standard of less than 20 minutes technician response time
  3: More than 20 minutes but less than 40 minutes technician response time
  0: More than 40 minutes or no responding technician

- Sockeye Present or Effluent Treatment (Score 5) **PBS input required here!*
  IHNV is an extremely severe disease, causing high levels of mortality when outbreaks occur in a sockeye population. When mature sockeye are present in a stream, other species present have evolved along side the virus which will have resulted in the development of some natural immunity. Therefore, hatchery effluent (used water) containing this same virus can be more safely discharged into the environment.

When maturing sockeye are not present in the stream, other fish species have less resistance to the virus, and therefore, the effluent being discharged should be treated to ensure disease pathogens have first been killed or filtered out. If possible, discharge "to ground" is the most economical option. UV or chlorination / dechlorination are also acceptable (albeit expensive) methods.

Scored as follows:
- 5: Effluent treatment not required, or if required is in place
- 3: Effluent treatment required and should be able to be instituted
- 0: Effluent treatment required but not feasible/possible

- Sockeye Culture Experience (Maximum Score 5)
  A successful sockeye conservation enhancement program utilises many non-traditional methods of fish culture to ensure safe and successful completion. These fall under the three key areas of disinfection, isolation and compartmentalisation. All activities performed are with the prevention and control of a potential INHV outbreak in mind.

  Scored as follows:
  - 5: Site/crew with more than 5 years experience with sockeye culture
  - 3: Site/crew with 3-5 years experience with sockeye culture
  - 2: Site/crew with 1-2 years experience with sockeye culture
  - 1: Commitment to provision of expert advisor to train inexperienced crew
  - 0: Site/crew with no sockeye culture experience

- Available Rearing Capacity/Containers (Maximum Score 5)
  Conservation enhancement requires low density, low stress rearing procedures and provision of a sufficient number of properly sized containers with ample flows to address the requirements of the release target and strategy. Small groups of small fish (fry and fingerling) are best reared in small containers. This allows for maximum observance of condition and overt signs of good health. To limit the potential impact of a disease outbreak during rearing, numerous containers should be employed.

  Scored as follows:
  - 5: Sufficient/varied containers to allow for maximum replication
  - 3: Sufficient containers to allow for moderate replication
  - 2: Limited containers available

- Proximity to Lakelse Stock (Maximum Score 5)
  Ideally, all fish involved with a conservation enhancement program would be reared on their natal water to eliminate potential for disease transfer, transport mortality associated with extra handling, straying concerns, etc. Unfortunately, this is most often impractical or impossible due to IHNV presence in water supply, logistics, increased risks, costs, etc.

  Scored as follows:
  - 5: Same stream/water
  - 4: Same watershed (i.e. Lakelse)
  - 3: Adjacent geographical area (i.e. Lower Skeena watershed upstream of Lakelse confluence)
  - 2: Moderately close geographical area (i.e. Upper Skeena watershed)
  - 1: Different watershed not along migration pathway (eg. Snootli)
  - 0: Location along migration pathway (eg, Lower Skeena below Lakelse confluence

- Appropriateness of Ambient Temperature Regime (Maximum Score 5)
  Potential water supplies can vary widely in their temperature regimes. While groundwater supplies show less fluctuation throughout the year, incubation development can often be too rapid or slow, depending upon mean temperature. While surface water supplies show more seasonal fluctuation, development on such sources can again be inappropriate. The most suitable water supply is the one who's ATU provision over time results in near "natural" development rates in incubation, resulting in a ponding date similar to the emergence timing of the stock in the wild.

  Scored as follows:
    5: Temperature regime would result in natural ponding/emergence timing
    3: Temperature regime would result in ponding/emergence date within one month of wild stock
    1: Temperature regime would result in ponding/emergence date within two months of wild stock
    0: Temperature regime would result in ponding/emergence date more than two months different than wild stock

- Temperature Control (Maximum Score 5)
  Having the ability to manipulate temperature is a valuable, often used tool in many modern hatchery facilities. Applications include incubation and rearing advance or delay to afford maximum operational flexibility and disease avoidance, and preferred juvenile size at time of release.

  Scored as follows:
    5: Heating and chilling capability in both incubation and rearing
    4: Heating and chilling capability in either incubation or rearing, or scored 5 for ambient temperature criterion above
    3: Single capability in incubation and rearing, or scored 3 for ambient temperature criterion above
    2: Single capability in incubation

- Water Delivery System / Back-up Power (Maximum score 5)
  Having dedicated back-ups in these two areas is added insurance in the event of system failures.

  Scored as follows:
    5: Back-up water and power
    4: Back-up water, or gravity feed with extensive (> 10 yr.) problem free history
    3: Back-up power

- Facility Age/Reliability (Maximum score 3)
  These criteria assume that the newer or more properly maintained a facility is, the less likely it is that systems or operational failures will occur.

  Scored as follows:
    3: Newer facility
    2: Older facility in state of good repair
    1: Facility in need of some upgrade to meet DFO operational standards

(including health and safety)

- Co-culture Concerns? (Score 3) **PBS input may be required here!*
  Given their potential IHNV positive status, there are very real concerns as to disease transference to other salmonids that may be on site. Due to varying levels of susceptibility (chinook and chum worst, coho least), the level of concern can vary greatly.

  Scored as follows:
  - 3: No other species/stocks on site
  - 2: Other fish on site, but species of low to moderate concern and/or adequate separation and protocols in place
  - 1: Other fish species of moderate to high concern on site. Some separation and/or protocols possible
  - 0: Other fish species of high concern on site. Some separation and/or protocols may be possible

- Sufficient Incubation Capacity/Containers (Score 2)
  Incubation of sockeye eggs under a conservation enhancement program requires isolation of individual female's eggs until disease testing results are available. Therefore, depending on juvenile release target, sufficient numbers of trays should be available to exceed the numbers of females anticipated to be spawned.

  Scored as follows:
  - 2: More than sufficient incubation capacity
  - 1: Incubation capacity somewhat limited
  - 0: Insufficient incubation capacity

- Ability to both Incubate and Rear at same site (Score 2)
  All culture at same site reduces the amount of handling, limits the potential for disease transfer, and generally reduces the likelihood of added problems

  Scored as follows:
  - 2: Both on-site incubation and rearing capacities are sufficient for needs
  - 0: Both on-site incubation and rearing capacities are insufficient for needs

- Cost to Upgrade and Operate ($ estimate)
  Estimate of funds required for start-up (alteration or construction) and 1st year operation.

- Readiness 2006 (Yes or No Only)
  Can the facility begin operation immediately?

APPENDIX 3

Facility Scoring

APPENDIX 4

Disease Screening Results

APPENDIX 5

Financial Report