Alouette River Sockeye Trap and Truck
Maple Ridge, BC
2008-2009

08.ALU.04

Prepared for:
BC Hydro Bridge Coastal Fish and Wildlife Restoration Program

Prepared by:
Amanda Balcke, B.Sc.
Alouette River Management Society
24959 Alouette Road
Maple Ridge, BC V4R 1R8

Prepared with the Financial Support of:
BC Hydro Bridge Coastal Fish and Wildlife Restoration Program

May 2009

EXECUTIVE SUMMARY

In order to assist in the restoration of an anadromous Alouette sockeye run, the Alouette River Trap and Truck project was initiated. With the return of sockeye salmon to the Alouette Watershed in 2007 after the release of smolts from the Alouette Reservoir in 2005, there was a need to return the sockeye back into the reservoir without the presence of a fish ladder. In the spring of 2008, a new fish trap at the Allco Fish Hatchery was constructed, with specific design considerations to have low-impact on sockeye. The summer of 2008 saw 54 sockeye return to the Alouette Watershed. These sockeye were caught in the lower South Alouette River and trucked above the dam and released into the lake. Since 2009 may bring a much larger return, two tanks were fabricated for transporting the sockeye. One tank was welded onto a transport trailer and the other sits in the back of a pickup truck. The tanks will be used until there is another option for sockeye to find their own way back into the Alouette Reservoir.

TABLE OF CONTENTS

LIST OF FIGURES

I. INTRODUCTION

The Alouette River Watershed is a 144 km^2 system with headwaters in the Coastal Mountains of Golden Ears Provincial Park, approximately 50 km northeast of Vancouver, BC. The upper watershed flows into an impounded reservoir known as Alouette Lake. At the reservoir's river outlet, the 21 km South Alouette River flows through Maple Ridge and Pitt Meadows before entering the Pitt River. The Pitt River, in turn, flows south into the Fraser River at Douglas Island.

The Alouette Reservoir was constructed by the BC Electric Railway Company in 1926. A low-level earth-filled dam was built on the southern outlet of what were then two lakes called 'Lillooet Lakes" (Bengeyfield et al. 2001). The Alouette River was impounded for hydroelectric power through reservoir storage. Virtually all of the upper Alouette watershed inflows, above the dam, were redirected out of the watershed and into the Stave Reservoir through a diversion tunnel at the northeast end.

The salmonid species that had previously spawned upstream of the dam were completely impeded. This resulted in the extirpation of sockeye and chinook salmon from the Alouette Watershed by the next salmon cycle following reservoir construction. The flows downstream of the dam were drastically decreased and, at times, stopped altogether. This had severe impacts on coho, chum, pink, cutthroat and steelhead populations and left them struggling to survive.

The earth-filled dam was modernised in 1984 by BC Hydro to improve seismic standards and was further improved in 1993 when the spillway was reconstructed. Upstream passage was not considered for salmon at that time. The lower Alouette River and its tributaries, in this post construction period, support reduced anadromous runs of coho, steelhead, pink, and chum salmon. In 1996, the Water Comptroller signed the first Water Use Plan in British Columbia, which ensured a constant supply of water from Alouette Lake to Alouette River. Although salmonid stock had been introduced to the Alouette River through the Allco Fish Hatchery since 1979, the salmon did not respond favourably until the reintroduction of Alouette Lake water after 1996.

The construction of the Alouette dam at the natural outlet of the original Lillooet Lakes also left anadromous sockeye salmon without access to the ocean in the spring during their downstream smolt migration and denied the sockeye access to their lake spawning grounds when they returned on their upstream migration as adults in the fall. This led to the cessation of the anadromous life history in the Alouette Reservoir population of sockeye for over eighty years. The footprint impacts to this population of sockeye were severe and they were thought to be extinct and unrecoverable until recently.

To investigate whether salmon smolts could successfully migrate and survive passing over the crest of the Alouette Reservoir spillway, a BC Hydro Bridge Coastal Fish & Wildlife Restoration Program (BCRP) funded study was initiated in the spring of 2005 using anadromous coho smolts from the Allco Fish Hatchery (Baxter and Bocking, 2006). During the study, a coincident migration of approximately 7,900 sockeye salmon smolts, originally thought to be kokanee, was observed leaving the reservoir. The magnitude and timing of the sockeye smolt migration in 2005 suggested critical anadromous life history behaviour was still conserved within the reservoir population..

The first sockeye salmon return to the Alouette River occurred in the summer of 2007 and they were confirmed to be from the first migration of sockeye smolts from the Alouette Reservoir during the spring of 2005. The Alouette sockeye salmon return is expected to be an annual event as long as juvenile passage over the Alouette dam is provided by BC Hydro in the spring. Currently, downstream smolt passage has been provided each spring since 2005 and will be continued as a part of the Alouette Water Use Plan, which was reviewed in 2006, implemented in 2008 and ordered by the Water Comptroller in April 2009. Facilities to capture and transport returning sockeye adults were found to be inadequate in 2007, with the majority of returning sockeye salmon bypassing the Allco fish fence and trap. These sockeye subsequently died at the base of Alouette dam. A small number of adults captured at the trap were successfully transported to their spawning grounds in Alouette Lake.

There is great interest in re-establishing an Alouette sockeye salmon run. The Alouette River Trap and Truck project was reviewed by Department of Fisheries and Oceans, Ministry of Environment and other stakeholders on the Alouette Watershed and was considered a priority in their efforts to re-establish sockeye runs on the Alouette. The Alouette River Trap and Truck project is a component of other projects on the Alouette including Kokanee/Sockeye Out-Migration, Smolt Enumeration, Alouette Adult Sockeye Enumeration, and Alouette Lake Fertilization. These projects, and others, are overseen by the Alouette Monitoring Committee and the Alouette River Sockeye Re-Anadromization Project (ARSRP) committee. BC Hydro has provided funds through the Water Use Plan for the Alouette Adult Sockeye Enumeration which will cover some of the costs of operating an upstream adult salmon trap at the Allco Fish Hatchery during the expected upstream migration period. In 2007, it became apparent the existing fish trap was not able to effectively capture all the upstream migrating sockeye salmon. It was concluded the existing salmon trap facility needed to be modified for it to operate as an efficient capture facility in future years.

Presently, there is no commitment from BC Hydro, through the Water Use Plan, to provide funds for the actual transport of adult salmon from the trap to their upstream spawning grounds. As an interim measure in 2007, the Allco Fish Hatchery staff provided the holding pens, truck and tank for the collection and transport of adult sockeye salmon upstream to Alouette Lake. The tank capacity was sufficient to transport the sockeye in 2007 and 2008 but will not be sufficient to

handle the much larger adult sockeye salmon return predicted for 2009. Based the numbers of smolts enumerated over the last three years, the 2009 sockeye salmon return will be an order of magnitude larger than the spawning run of 2007 or 2008 and could number in the hundreds and perhaps thousands of upstream migrating spawning salmon. The Alouette River Trap and Truck project, with funding from BCRP, addressed these issues.

II. GOALS AND OBJECTIVES

With the return of sockeye salmon in 2007, the need for supporting structures to hold and transport the sockeye became apparent. This project gave the Alouette River Management Society (ARMS) and BCRP the opportunity to effectively partner with BC Corrections Allco Fish Hatchery to provide a short-term, and possibly long-term, solution for sockeye in the Alouette Watershed.

The specific objectives of this project were to:

1. Modify Allco Hatchery fence panels and superstructure;
2. Redesign and reconstruct the Allco Hatchery trap facility;
3. Fabricate a transport trailer with equipment;
4. Modify Allco Hatchery vehicle for trailer operation;
5. Purchase two fibreglass holding tanks;
6. Sample and test the genetics of returning sockeye; and
7. Provide two educational signs explaining the project.

III. STUDY AREA

The Alouette River Sockeye Trap and Truck project was located at the BC Corrections Fraser Regional Corrections Centre Allco Fish Hatchery adjacent to the South Alouette River approximately six kilometres downstream from the Alouette Dam (Figure 1). This property is held by the BC Ministry of Public Safety & Solicitor General, through which the hatchery was operated by the Alouette River Correctional Centre (1979-2002) and is currently operated by the Fraser Regional Correctional Centre (2002-present), with direction from the Department of Fisheries and Oceans (DFO).

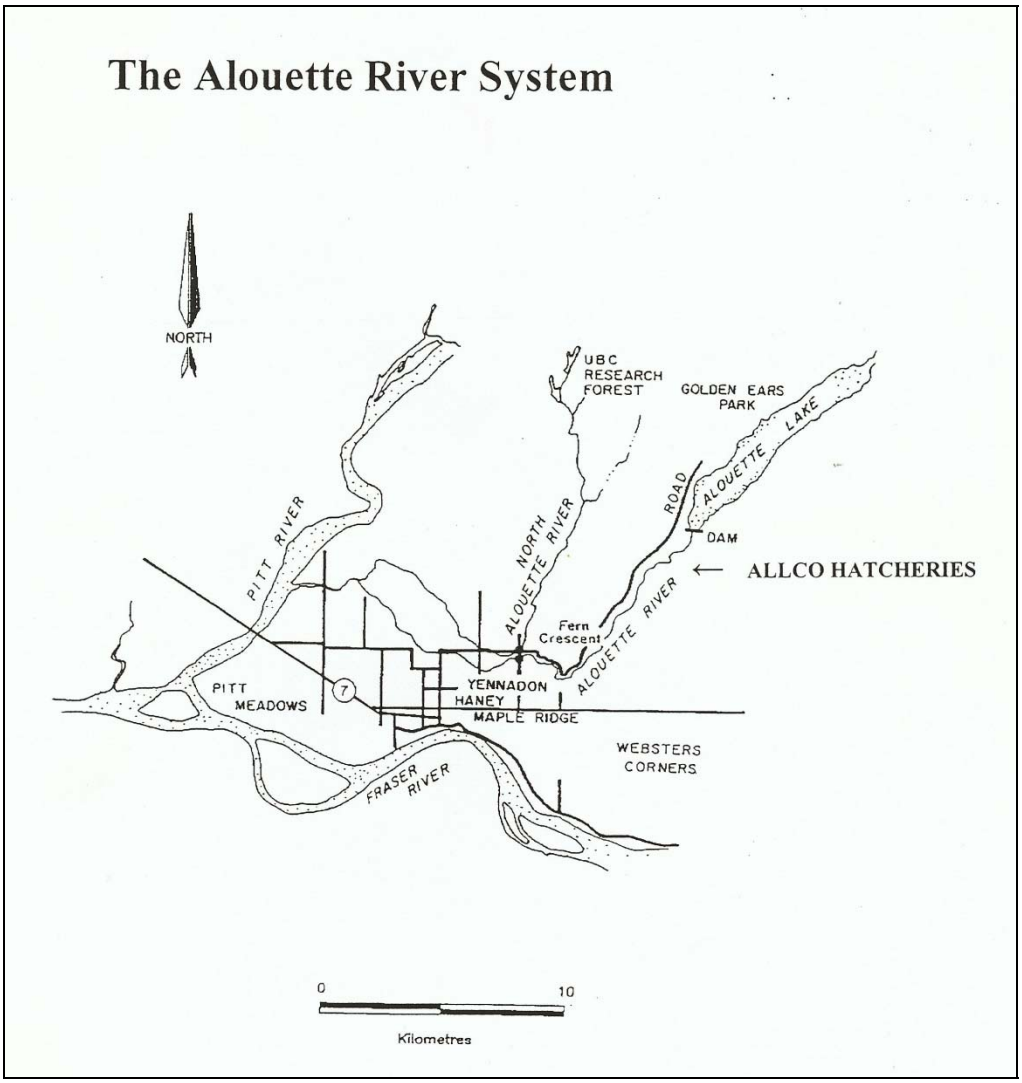


Figure 1: Map of the Alouette Watershed

IV. METHODS

The contract for this project was endorsed by the ARMS Executive Director and the BCRP Program Manager on April 2, 2008. All permits to undertake this work were taken out by the Department of Fisheries and Oceans. In April 2008, a draft plan for the new trap was developed by Mike Landiack, DFO Engineering, and Maurice Coulter-Boisvert, DFO Community Advisor. After the initial drawings and sketches were complete, DFO, BC Hydro and BC Corrections met in late April to work out any trap modifications that needed to be done. The sketches were taken to the fabricator and the water intake for the trap was ordered. DFO engineers surveyed the trap box and elevations of the river and trap were defined.

Figure 2: The Allco fish trap before construction, 2007.

Excavation of the site began in early May. A road down to the trap was built as there was no vehicle access to the trap previously. The site was blocked by sandbags to ensure there would not be silt deposited into the river from the site. Water that seeped into the work area was pumped out on to a bank away from the river to avoid any silt deposits directly into the river. Due to a miscommunication with the District of Maple Ridge, a stop-work order was issued on the site in mid-May. This halted the excavation until the end of May. Excavation was completed in early June.

The concrete base of the trap was poured on June 4 and the blocks making up the sides of the trap were placed on the week of June 9 (Figure 3). The new water intake was installed during the last week of June and the finger-gate (Figure 4) to the fish trap was installed on July 2. The fish fence was put up and the trap was fishing on July 3 (Figure 5). With the construction phase of the trap complete, the area adjacent to the access road to the trap was reseeded with grass.

Figure 3: DFO Engineer Technicians place lock-blocks which form the sides of the new trap, 2008.

Figure 4: Finger-gate and entrance of the new trap, 2009.

Figure 5: The newly constructed Allco fish trap, 2008.

All sockeye caught were netted, sampled for genetics (DNA and scale samples), length, and then were transported in a tank by BC Corrections above the dam and released into the Alouette reservoir (Figure 6). Weight was recorded for sockeye caught between July 9 and 21. It was determined by the ARSRP committee that weighing the sockeye put too much stress on the fish therefore no weights were taken after July 21. Genetic samples were sent to the DFO Pacific Biological Station in Nanaimo and were tested against samples of Alouette kokanee in the lake and sockeye smolts that were caught and sampled in the rotary screw trap (Bocking and Mathews, 2009).

Figure 6: Sockeye is released into Alouette Lake, 2008.

The sockeye transport trailer was designed by Maurice Coulter-Boisvert in consultation with ARMS and the Allco Hatchery managers. The trailer was built in the late fall of 2008 and the tanks for the trailer and truck were fabricated in January/February 2009. In the spring of 2009, the lids for the trap were fabricated. The lids have a locking device to detract poachers.

V. RESULTS

The first sockeye at the newly completed Allco trap was caught on July 9, although this was not the first sockeye in the river as one sockeye swam past the fence before construction had been completed. This sockeye found a three inch hole in the fence surrounding the dam and died on the dam. In July, BC Hydro constructed a trap at the low-level outlet as a backup to the Allco trap. This secondary trap allowed for capture of adults at the base of the dam which would prevent them from killing themselves on the rocks.

Initially, the water level in the Allco trap was low. The outflow pipe from other hatchery operations was above the intake. To gain more hydraulic pressure, the outflow pipe was lifted in the water and a rock weir was assembled beside the trap on July 14. Both of these actions were successful in increasing the water level in the trap.

The last sockeye of the 2008 run was caught on August 26 (Figure 7). In total, 54 sockeye returned to the Alouette in 2008: 52 were caught at the Allco trap, one was caught at the trap by the low-level outlet at the dam, and one was found dead by the dam. 53 sockeye were released alive into the reservoir.

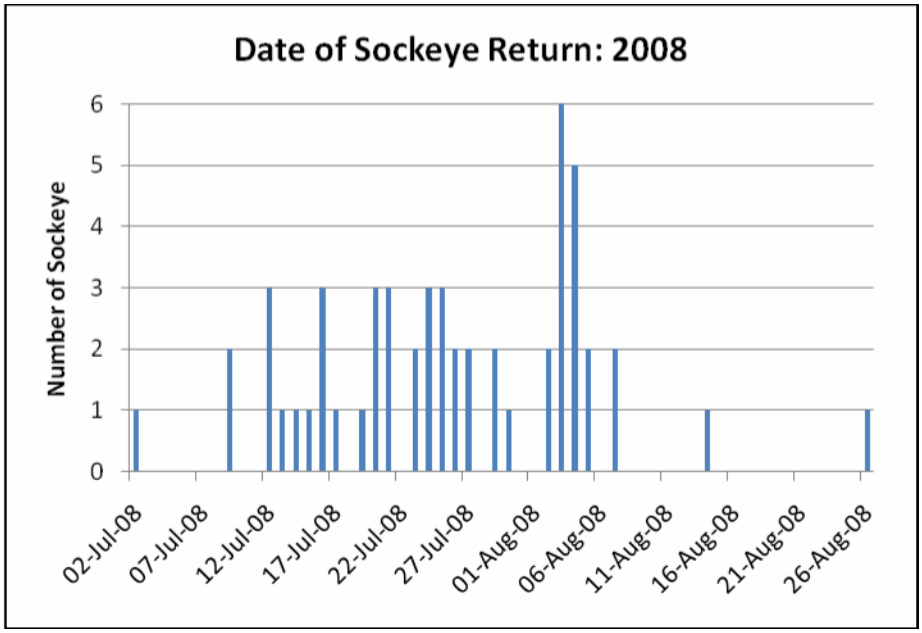


Figure 7: Number of sockeye returned to the Alouette Watershed in 2008.

The new tanks and trailer are expected to be able to transport up to 100 sockeye at a time (Figures 8 and 9). Although the tanks and trailer have not been used for sockeye transportation as the 2009 run has not commenced, they have successfully transported fry during the 2009 spring releases. The fibreglass holding tanks were not purchased because sockeye will not be held for more than 24 hours before they are released into Alouette Lake.

Figure 8: The completed trailer with sockeye transport tank, 2009.

Figure 9: Sockeye transport tanks, 2009.

Although originally included in the budget, genetic testing was not paid for by BCRP. The BCRP funds for genetic testing were put towards the new lids for the trap. Genetic testing was

funded by BC Hydro's Alouette Water Use Plan under the Adult Sockeye Enumeration Monitor. The DFO Pacific Biological Station reported there was non-significant variation between returned Alouette sockeye, Alouette Lake kokanee, and out-migrating kokanee/sockeye smolts (Candy, 2009).

Due to the cost of fabrication of the trap and the trailer and ongoing construction at the Allco Fish Hatchery, educational signs were not purchased at this time.

VI. DISCUSSION

The adult sockeye caught at the trap in 2008 were not as stressed as the 2007 sockeye. Whereas the 2007 sockeye smashed themselves against the back of the trap, which had a steady flow of water, the 2008 sockeye swam peacefully as if they were in a pool. The new trap was designed to minimize the harmful impacts to sockeye salmon and the 2008 sockeye could not discern the direction of the flow of water because the water up-welled from the floor of the trap.

VII. RECOMMENDATIONS

The trap and truck method of transporting sockeye above the Alouette dam would appear to be sufficient for low return numbers of sockeye. If the numbers of returning sockeye exceeded the capabilities of BC Corrections Allco Fish Hatchery to transport, alternative methods of fish passage should be examined. Educational signs about the Alouette River Trap and Truck project will be posted when construction at the Allco Fish Hatchery is completed.

VIII. ACKNOWLEDGEMENTS

This project was made possible through the financial support of the BC Hydro Bridge Coastal Fish and Wildlife Restoration Program. The project was a component of the Alouette River Sockeye Re-Anadromization Project (ARSRP). ARSRP committee members include: Alouette River Management Society (ARMS), BC Corrections Allco Fish Hatchery, BC Hydro, Department of Fisheries and Oceans, District of Maple Ridge, Katzie First Nations, LGL Limited and Ministry of Environment. Appreciation is extended to the following individuals: Geoff Clayton and Gerry Miller with ARMS; Ron MacLean, Mike Ilaender, Kelly Klassen and Dave Spann with BC Corrections Allco Fish Hatchery; Dave Hunter, James Bruce and Brent Wilson with BC Hydro; Maurice Coulter-Boisvert and Mike Landiak with Fisheries and Oceans Canada; Mike Leon, Debbie Miller and George Moody with Katzie First Nations; Bob Bocking and Megan Mathews with LGL Limited; Greg Wilson, Shannon Harris and Maggie Squires with Ministry of Environment; and John Candy with Pacific Biological Station. All pictures were

provided by Amanda Balcke, Alouette River Management Society Project Manager and Ron MacLean, Allco Hatchery Manager.

IX. REFERENCES

Balcke, A.R. 2009. Alouette Adult Sockeye Enumeration: 2008. Prepared for BC Hydro Water Licence Requirements. Prepared by Alouette River Management Society, Maple Ridge, BC.

Baxter, B.E. and Bocking R.C. 2006. Field trials to assess coho smolt migration success through the Alouette Reservoir. Prepared for BC Hydro Bridge Coastal Fish & Wildlife Restoration Program, Burnaby, BC. Prepared by LGL Limited, Sidney, BC.

Bengeyfield, W., D. Hay, S. Joyce, and J. Greenbank. 2001. Evaluation of restoring historic fish passage for anadromous fish at BC Hydro facilities. Report for Power Supply Environment, BC Hydro, Burnaby, BC.

Candy, J.R. 2009. Report on Genetic Structure of Alouette-Coquitlam Kokanee-Sockeye Salmon. Molecular Genetics Lab, Pacific Biological Station, DFO, Nanaimo, BC.

Cope, S. 2009. Alouette River Salmonid Smolt Migration Enumeration: 2008 Data Report. Prepared for the Alouette Management Committee and BC Hydro Generation. Prepared by Westslope Fisheries Ltd, Cranbrook, BC.

Mathews, M.A. and R.C. Bocking. 2009. Evaluation of the migration success of *O. nerka* (Kokanee /Sockeye) from the Alouette Reservoir, 2008. Report prepared for BC Hydro Water License Requirements, Burnaby, B.C. Report prepared by LGL Limited, Sidney, B.C.

Appendix A:

Project # 08.ALU.04

Financial Statement Form

	BUDGET		ACTUAL	
	BCRP	**Other**	**BCRP**	**Other**
INCOME				
Total Income by Source	80,300.00	43,800.00	80,300.00	43,800.00
Grand Total Income		124,100.00		124,100.00
EXPENSES				
Project Personnel				
Wages	-7,000.00	-5,000.00	-7,000.00	-6,500.00
Consultant Fees				
DFO - Engineer		-7,000.00		-12,000.00
DFO - Technician		-8,000.00		-13,500.00
DFO - Biologist		-6,000.00		-12,000.00
BC Corrections - Labour		-2,000.00		-1,200.00
Materials and Equipment				
Equipment Rental	-8,000.00	-2,000.00	-13,650.00	
Materials Purchased	-53,000.00		-55,833.89	-500.00
Travel Expenses	-5,000.00	-9,000.00		-10,000.00
Permits				
Delivery of Materials			-98.79	
Genetic Testing	-3,000.00			-2,000.00
Signage	-1,500.00		-252.57	
Administration				
Office Supplies	-100.00			
Photocopying & Printing				
Postage				
Administration (includes payroll processing, bookkeeping, computer & office space, telephone)	-7,500.00		-2,800.00	
Photocopies & printing				
Total Expenses	-85,100.00	-39,000.00	-79,635.25	-57,700.00
Grand Total Expenses	-124,100.00		-137,335.25	
BALANCE	0.00		-13,235.25	

Appendix B:

Project # 08.ALU.04

Performance Measures

Using the performance measures applicable to your project, please indicate the amount of habitat actually restored/enhanced for each of the specified areas (e.g. riparian, tributary, mainstream).

Performance Measures – Target Outcomes														
			Habitat (m^2)											
Project Type	**Primary Habitat Benefit Targeted of Project (m^2)**	**Primary Target Species**	Estuarine	In-Stream Habitat – Mainstream	In-stream Habitat – Tributary	Riparian	Reservoir Shoreline Complexes	Riverine	Lowland Deciduous	Lowland Coniferous	Upland	Wetland
Impact Mitigation												
Fish passage technologies	Area of habitat made available to target species			10km			20km					
Drawdown zone revegetation/stabilization	Area turned into productive habitat											
Wildlife migration improvement	Area of habitat made available to target species											
Prevention of drowning of nests, nestlings	Area of wetland habitat created outside expected flood level (1:10 year)											
Habitat Conservation												
Habitat conserved – general	Functional habitat conserved/replaced through acquisition and mgmt											
	Functional habitat conserved by other measures (e.g. riprapping)											
Designated rare/special habitat	Rare/special habitat protected											
Maintain or Restore Habitat forming process												
Artificial gravel recruitment	Area of stream habitat improved by gravel plmt.											
Artificial wood debris recruitment	Area of stream habitat improved by LWD plcmt											
Small-scale complexing in existing habitats	Area increase in functional habitat through complexing											
Prescribed burns or other upland habitat enhancement for wildlife	Functional area of habitat improved											
Habitat Development												
New Habitat created	Functional area created											

Appendix C:

– Wednesday, August 6, 2008 - THE NEWS - *Serving Maple Ridge and Pitt Meadows*

'Chosen ones' return to river

Better rate of sockeye than researchers expected

By Phil Melnychuk
Staff Reporter

Sometimes, the odds catch up – as they did late last week to a pioneering sockeye struggling to spawn in the Alouette reservoir.

The sockeye, one of the 50 so far that have returned this year under the experimental program to rebuild the sockeye salmon run in the South Alouette River, was last seen in the talons of a hungry eagle near the lakeshore.

According to a witness, the eagle could hardly lift the fat fish, so it dropped it and started eating it.

Later inspection showed the fish had two holes punched out of its tail, showing it was one of the fish released in 2006.

The Alouette River Management Society, with funding from B.C. Hydro and help from Corrections Branch of B.C., is trying to rebuild the run, a program that started in 2006 when about 5,000 sockeye smolt were released from the dam.

With yearly releases, and a trap-and-truck program to haul the fish from the river around the 30-metre dam and release them back into the lake, ARMS hopes to rebuild the run to about 60,000 sockeye.

Sockeye were thought to have become extinct after B.C. Hydro built its dam in the 1920s, blocking fish passage back to the lake.

But several thousand sockeye escaped in 2005 during a release of water over the spillway for another study.

As of Tuesday, 50 of the sockeye have shown up this year in ARMS' traps. That works out to about a one per cent return rate, when researchers were only expecting half that.

"I would say there must have been better ocean survival through this cycle," Clayton said.

He described the fish returning as the "chosen ones" because they made it past the fishery nets and the predatory birds to return to the Alouette.

Some of the fish are big enough, there may be a mix of fish released in 2006 with those released accidentally in 2005. The fish are still chrome coloured, so they likely won't spawn until the fall, possibly in the creeks flowing into the lake.

Putting the sockeye back into the lake where the fish can access creeks for spawning means there's a "vastly expanding aquatic habitat available to these fish, which will be our pioneer stock in the years to come," Clayton said in an e-mail.

He doesn't know how many more sockeye will appear, saying this could be the peak. "I don't know. I really don't know. This is very exciting and very new to us," he said Tuesday.

The trap-and-truck program probably could only handle about a 1,000 fish a year, he said.

Eventually, ARMS wants to see a fishway built around the dam to allow the sockeye back into the lake.

Efforts are also going on to rebuild the sockeye run in the Coquitlam River, but only two sockeye have returned this year, said Clayton.

In 2007, about 70,000 to 90,000 sockanee travelled over the spillway. The projects have been funded by BC Hydro's Bridge-Coastal (area) Fish and Wildlife Restoration Program.

pmelnychuk@mapleridgenews.com

Sockeye return to Alouette

New fish trap allows salmon to be safely caught and counted

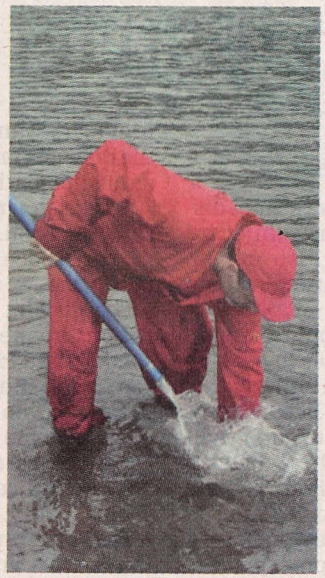
By Brent Richter
News Contributor

The return of sockeye salmon to the Alouette watershed is showing promise this year as two mature sockeyes have been caught on the local waterway thanks to a newly built trap.

Sockeyes disappeared from the Alouette River after the 1926 construction of a dam, where Alouette Lake now is. They first reappeared by surprise in 2005 and have since returned each year in growing numbers.

Geoff Clayton, with the Alouette River Management Society, removed this year's first two sockeyes from a specially designed trap at the Allco Hatchery on 248th Street, Thursday. He took measurements and DNA samples then trucked the fish six km up stream to Alouette Lake, where they will have a chance to spawn.

The new $124,000 trap replaces a smaller one that used to injure the caught fish. Funding for the trap came from the Bridge Coastal Restoration Program, a project set up by BC Hydro to address the effects dams have had on fish and wildlife in B.C.



Contributed

Sockeye salmon first reappeared in the Alouette River in 2005 and have since returned each year in growing numbers.

Four-year-old salmon enter the three-by-five metre trap through a one-way gate as they travel up river from the North Pacific. Sockeyes leave the waters they were spawned in at the age of one and swim to the ocean to feed on plankton and grow until they near the end of their life cycle. They then return to their home waters to spawn and die.

Clayton said the project, now in its second year, has progressed from last year and is planned to expand in 2009.

"The difference between last year and this year is we have a plan in place and the plan is a new trap and it appears to be working and this is just the start of the run hopefully. We do hope to have a higher rate of survivability," he said.

"Next year we'll be tracking them to determine how and where they go and hopefully even recover carcasses to see if there was successful spawning."

Radio tags for tracking next year's returning sockeyes are being funded by the Pacific Salmon Foundation.

Clayton said they will be fine tuning the trap for next year, hopefully adding a submersed box for fish to be corralled into. The box would then be loaded onto a truck and sent to Alouette Lake, putting the sockeyes in less stress than they face if caught with a net and moved by hand to a waiting tank.

Clayton said a new system will be necessary if the numbers of returning salmon enter the hundreds as he would like to see happen in the coming years.

Work to build the trap and run the sockeye program was provided by inmates from Fraser Regional Correction Centre, which use the project as an educational and occupational experience and a chance to serve the community.