



Cayoose Creek Stl'atl'imx
Box 484
Lillooet, B.C.
V0K 1V0
Email cayoosecreekband@yahoo.com

Phone 250 256-4136
Fax 250 256-4138

Cayoose Creek Fisheries

Lower Seton Spawning Channel Complexing Project 2003

Prepared by:

Bonnie Adolph

Cayoose Creek Fisheries

Prepared for: Bridge Coastal Restoration Program

6911 Southpoint Drive (E16)

Burnaby, B.C.

V3N 4X8

January 2003

Executive Summary

The Seton River basin is located in the rain shadow of the southern coastal mountains about 200km northeast of Vancouver, and drains into the Fraser River at Lillooet. The Seton basin adjoins and lies immediately south of the Bridge River basin, separated by the Bendor Range and Mission Ridge. 50° 40' 13.7" N 121° 56' 58" 13' W. The Habitat development site is located on the left bank of the Seton River downstream of the Seton Dam.

The habitat project involved complexing 3km of spawning channel. The complexing project funded by Bridge Coastal Program has addressed the improvement needs for important Pink, and Coho salmon spawning and to improve rearing habitat for Coho, Chinook and resident species. The habitat features include pool and riffle construction, channel alignment, marsh creation-insect production for fish and waterfowl use; small animals, this has enhanced the biodiversity of the area. In stream structures included rock and wood placement.

Table of Contents

1. Title Page
 2. Executive Summary
 3. Table of Contents
 4. Introduction
 5. Project Area
 6. Background
 7. Methods
 8. Results
 9. Recommendations
 10. Acknowledgements
 11. References
 12. Appendices/ List of Figures Tables and Plates
-
- A. Financial Statements
 - B. Confirmation of BCRP Recognition
 - C. Performance Measures

INTRODUCTION

The Seton River is subject to wide fluctuations in discharge. The Seton River remains a bottleneck during high inflow years. The relatively short length of Seton River and fluctuations in discharge are factors that limit the overall productivity of the system for fish. The habitat development for the Lower Seton Spawning Channel has increased the capacity of existing habitats and developed new habitat areas to support populations of historic species in the watershed.

Spawning Channel Drawings, and the biological and engineering consultation in kind provided by Department Of Fisheries & Oceans Canada. B.C. Hydro's Bridge Coastal Restoration Program provided the Lower Seton Spawning Channel Complexing Project (03.Se.01) with Project Funding

Specific Project Location:

The Seton River basin is located in the rain shadow of the southern coastal mountains about 200km northeast of Vancouver, and drains into the Fraser River at Lillooet. The Seton basin adjoins and lies immediately south of the Bridge River basin, separated by the Bendor Range and Mission Ridge. 50° 40' 13.7" N 121° 56' 58" 13' W.

The habitat development site is located on the left bank of the Seton River downstream of the Seton Dam.

The Lower Seton Spawning Channel receives its water supply from the Seton power canal via two siphons-500' long-102' drop from crest to diff chambers. The channel is 9486 ft long-20 ft wide at gravel surface. The channel is designed for a maximum flow of 40 cu. ft. per second (cfs), each siphon supplying 20 cfs. The habitat project involved complexing 3km of spawning channel.

Background:

Cayoosé Creek St'at'imx proposed the Project 03.Se.01 in October 20002 to the Bridge Coastal Restoration Program. Prior to the partnership the St'at'imx Community has been developing a cooperative working relationship with Fisheries and Oceans Canada and British Columbia Hydro. The above mentioned agencies have been working together at a technical level on various projects throughout the St'at'imx territory. This relationship has been achieved through new ways of making decisions that seek to recognize the complex interrelationships within and between aspects traditionally characterized as the environmental, the economic and the social or cultural. This applies to ecosystems within and across Bridge River/Coastal

Generation Area Watersheds. We have technical, biological and cultural reasons to work together and promote increased responsibility for long term health of fish stocks and ecosystems.

Method

Dewatering the lower channel allowed our project works to be conducted in the dry. Fisheries Salvage Crews, Tisdale Environmental, Crane Creek Contracting, Department Of Fisheries and Oceans, & Cayoose Creek Fisheries, (funded by BCRP) completed the Lower Seton Channel fish salvage. The salvage has provided the project with pre-assessment information of the lower channel in terms of fish species, composition, age structure, and fish abundance, Tisdale Environmental completed the final fish salvage report (funded by BCRP). The direct implementation of complexing will be assessed by conducting inventories within the channel, using g-traps, as well as standing stock assessments with in the channel and comparing the pre-assessment with post-assessment.

Results

Lower Seton Channel Complex – Modifications Made June/2003

The following modifications are highlighted on the drawing “**Cayoose Creek Band – Lower Seton Project – Complexing**”.

Other IPSFC drawings to refer to: *Original profile 115-37 Original plan 115-34 & 45*

Channel Modifications

- Scarify and complex 1218 m length (refer to blue shaded area on drawing) :

Using the teeth on an excavator’s bucket, the existing spawning gravel was scarified to reduce compaction and de-segregate the various sizes of gravel. The channel was complexed with rock and woody material. This will increase spawning success and egg to fry survival.

- Removal, cleaning, replacement of spawning gravel 1054 m length (refer to blue shaded area on drawing)

INTRODUCTION

In these reaches, the 0.40m of existing spawning gravel was removed, cleaned, replaced, and augmented with 30% washed river gravel. A gravel wash plant was brought in to clean about ½ of the gravel removed from the channel. The remaining half was stockpiled on site for future enhancement opportunities. Stockpiled gravel from the tailrace of Walden Power was imported to the channel site and mixed with 70% of the washed graded spawning gravel and then placed back into the channel to the previous grade. This was an alternate method to simple scarification (as above) and would also contribute to increased channel productivity.

- Length of channel left undisturbed 512m (refer to orange shaded area on drawing)
- A high gradient reach was created by short-circuiting 3 loops of the existing channel and re-grading at a higher gradient (end of berms 6, 8, & 10). Length = 185m @ 0.65% gradient. This reach was designed more for steelhead utilization.
- A 43 m long by 2 m wide by pass channel with a 0.70% gradient was created along the top leg of the channel.

Marsh

- Area of new marsh habitat adjacent to upper end of channel: 721m²
- Area of marsh/pond created at berm 11 (formally 152m of channel): 146 m²

Marsh areas were excavated to allow for 0.2m water depth. Marsh areas were also lined with clay, geotextile and a gravel capping, to prevent percolation and exposure of the clay. The clay was imported by truck from the Bridge River Indian Band property. These marsh areas were developed primarily to promote growth of emergent vegetation and production of aquatic insects which are critical for rearing juvenile.

Rock Weir Drop Structures

There were 16 rock drop structures originally built in the spawning channel. These structures, along with 2 additional new ones, were converted into Newbury style rock weirs, which now allow access for both juvenile and adult salmon through the entire channel. The existing crest of the weir was retained and a rock ramp installed downstream of this crest at a slope of 20:1. These weirs add hydraulic and habitat diversity by creating a high gradient reach. Pools were excavated at the base of these weirs to create rearing and holding habitat.

The uppermost Newbury style weir backs up the top 73 meters of the channel complex, forming a large pond, complexed with rock and woody

INTRODUCTION

material. The slopes of this portion of the complex were reinforced with rip rap to prevent ongoing erosion by pink salmon spawning on the unprotected backwatered slope.

Pools

Four large pools were excavated at the south east ends of berms 12, 14, 16, & 18 to take advantage of shading from the existing tree canopy. Clean gravel soil conditions at the newly excavated pools necessitated the addition of a 0.15m clay underlying a geotextile liner, topped with 0.4m of gravel. This was intended to limit percolation from the complex and prevent migration of the clay. These pools were then complexed with wood material and rock. Excavated material was trucked to a spoil site adjacent to the channel complex.

Constrictions

Eleven constrictions were installed to provide reaches of higher velocity and thus contributing to diversity. These were created by narrowing a 10 meter reach of the existing channel from 6 to 4 meters width. The fill material was brought from the excavation of pools

Bridge Removal

The timber bridge crossing the channel (which was moderately deteriorated) was removed, and access to the river bank was established by a road around the top end of the channel and along the dyke.

Wood material was brought in from various sites:

Bridge River Band

Ainsworth

Rip Rap was brought in from Aquilla and W. Boulder talus slope

Boulders were brought in from Downton Creek FSR – MOTH W. Boulder

Pit

Recommendations

The Lower Seton Channel should continue to maximize enhancement. Maximizing area productivity of riparian and wetland habitat, has increased, visuals on the increase of wildlife has been documented by the Lillooet Naturalist Society. Further adult and juvenile stock assessment studies should be conducted within the channel thus providing utilization data for stock comparisons. Continued revegetation enhancement will only increase biodiversity. The Partnerships should continue to educate through tourism, education, and studies within the community.

Acknowledgements

Cayoos Creek Community would like to thank the Bridge Coastal Restoration for the support, direction, dedication and funding of the Lower Seton Complexing Project. The program has also provided community-based training employment and stewardship of watersheds Cayoos Creek Band would also like to thank, Ainsworth Lumber Co. Ltd.; Mark T. Hopkins, Paul Alain, Howard Ganner, Murray Casper, and Dave Rennie. Aquila Networks Canada; Bob Gibney, Sue Dyer, B.C. Hydro Operations; Bryan Hebden, and Joe Zarrin. XWISTEN, Chief Bradley Jack and Gerald Michel, Fisheries and Oceans Habitat and Enhancement; Patricia Carlson, Mike Flynn, Patrick Cochrane, Steve Zachary, and Sean Bennet. District of Lillooet; Kevin Taylor and Ken Christy, Fred's Custom Tackle, Harrison Bay Guiding Services, Lillooet Naturalist Society; Dr. Ian Routley and Vivian Birch-Jones, Lillooet Tribal Council; Larry Casper Ministry of Water, Land and Air Protection; Al Caverly, Ministry of Transportation; Jack Jeyes, Pacific Regeneration Technologies Inc., Reid Collins Nursery; Leona Dyck, Roadrunner Excavating; Patti Reynolds, Overlea Enterprises; Guy Ness Jr., Hoedown Creek Resources; Randy and Steve Polischuk, Project on-site coordinator; Sheldon Andrew, Environmental Crews; Cayoos Fisheries, Tisdale Environmental, Crane Creek Contracting. Bridge River Machine Shop; Randy McNary, Funk's Signs. TAC Contracting, and Cayoos Creek Chief Perry Redan, and Council, Henry Thevarge, Yvonne Thevarge, Wayne Redan, Staff Trudy Redan, Carmen Ned and Jolene Alec.

References

References from Cayoos Creek St'at'imx Community Plan 1994, Bridge Coastal Fish and Wildlife Restoration Program Strategic Plan Volume one and two, Seton Channel general data (correspondence between Fisheries and Oceans, and Cayoos Creek Band).

INTRODUCTION

Lower Seton Channel before 2003 Complexing



INTRODUCTION

Lower Seton Complexed Channel 2003



INTRODUCTION

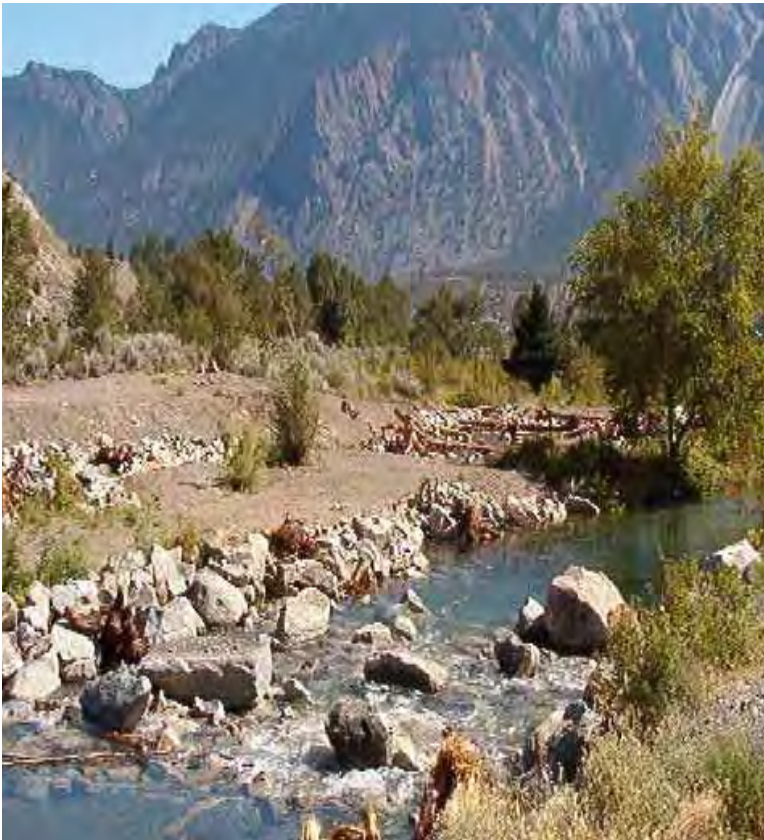
West Boulder Talis slope; Downton Creek



The foot bridge was removed after discovering wood rot. The bridge was impacted by the resident beaver family and flow alteration.

INTRODUCTION

Foot Bridge Structure Rot



Old Foot Bridge Site, New Habitat.

INTRODUCTION



Top of First off-Channel

INTRODUCTION



Before Off Channel

INTRODUCTION



Newly complexed off channel



Minnow Sampling June 02, 2003

INTRODUCTION



Fish Salvage June 03, 2003 – June 07, 2003/Air Temp. 40°C



Before In stream works

INTRODUCTION



In-stream works

Gravel Removal

INTRODUCTION



Pool lined with Clay and Geo-textile

INTRODUCTION



Marsh lining

INTRODUCTION



Screen wash Plant for contaminated Gravel



INTRODUCTION



Contaminated Cobble



Cobble completely removed from berm

INTRODUCTION



Fred James and John Frank bolting LWD and Rock Down



Gravel removed from Aquila site.

INTRODUCTION



2002 Coho Prevention Fence



Newly Successful Coho Prevention Fence 2003 with plantings.

INTRODUCTION



Marsh



Island

INTRODUCTION



Signage



INTRODUCTION



New Railing





A. Financial Statement

Income & Expenses

	Income	Expensed	
		BCRP	(other)
Income	87793.70		
BCRP	240,764.40		
(List other income)			
Total Income	328,558.10		
Expenses			
Project Personnel			
Wage		48,296.13	
Consultant fees		8,014.78	28,700.00
(List others as required)			
Equipment & Expenses			
Equipment rental		147,998.37	16,450.00
Equipment purchase			
Materials purchased		10,753.01	4,263.70
Travel expenses		2,525.11	
Permits			
(List others as required)			
Overhead			
Office supplies		20,000.00	
Photo copies & printing		3,000.00	
Postage		177.00	
(list others as required)			
Subtotal		240,764.40	87,793.70
Total Expensed		241,952.50	87,793.70
Balance		1,188.10	0

*Unspent BCRP financial contribution to be returned to: BC Hydro, BCRP
 6911 Southpoint Drive (E14)
 Burnaby, BC, V3N 4X8
 ATTENTION: JANICE DOANE



B.

Revamped Seton Spawning Channel project opens



An aerial view (provided via a helicopter trip courtesy of Aquila Networks) gives an idea of the complexity of the rehabilitation and restoration of the Lower Seton spawning channels.

Sitting on the banks of the Lower Seton Creek Spawning Channel, watching hump-backed pink salmon flash and splash in the clear water, Trevor Chandler observes, "This illustrates clearly how biologists think and how engineers think."

He means that this time, they got it right. "Now it looks like a real stream again," says Chandler, indicating the work and thought that have gone into complexing and creating a more natural habitat for spawning salmon and resident species such as steelhead and trout.

Chandler was one of those who attended the grand opening Saturday of the restored Lower Seton Salmon spawning channel.

Representatives from the Cayoose Creek Band, B.C. Hydro's Bridge Coastal Restoration Program, the Department of Fisheries and Oceans and Aquila Networks Canada were all present for the official ribbon-cutting and a salmon barbecue that marked the completion of the project.

The project was so special to Patrick Cochrane, DFO's on-site engineer, that he rushed back from Guatemala to attend the opening.

"Ensuring Fish for the Future" was the theme of the celebration.

Cayoose Creek Chief Perry Redan and project manager Bonnie Adolph told the News this is the biggest project of its kind ever to be tackled by the band.

"Without the partnerships we established with various organizations and people, we wouldn't have been so successful," commented Chief Redan. He described the channel complexing project as a model of how people and communities can work together.

"We had monitored the upper channel and how that worked, but we'd never done anything on this scale before," the chief continued. "Bonnie was kind of hesitant at the beginning, but we had a lot of co-operation and it turned into an excellent project. It was a good learning curve for her, too."



Bonnie Adolph, Shania Frank, Macy Ganner cut ribbon



A spawning female pink (or humpy) splashes in channel.



Just a few of the many people who helped make the project happen: (back) Tricia Carson (DFO), Melissa Perez (DFO), Don Ridley (Contractor), Steven Hall (Contractor), (middle) Brian Frank (Cayoose band), Tracy Redan (DFO), Stacey Leech (DFO), (front) Bonnie Adolph (Cayoose band), Mike Flynn (DFO), Cynthia Breau (DFO), Patrick Cochrane (DFO).

Adolph commented, "Lillooet needs this kind of project. Fish and wildlife are something we have in common. Their futures concern everyone and it's great for kids to learn about this, too."

The three-kilometre spawning channel winds its way through a beautiful location that invites locals and tourists alike to meander along the waterway, closely observe the spawning fish, check out the cliffs above for wildlife, bird watch and enjoy the peace and quiet.

The property is located on the left bank of the Seton River and is owned by the Cayoose Creek community.

Work began on the project on June 2, and is virtually complete, except for some signs that have to be installed.

Funding was provided by B.C. Hydro's Bridge Coastal Restoration Program.

The project has converted the channel into a multi-species spawning and rearing habitat complex. The habitat features include pool and riffle construction, channel alignment, marsh creation and insect production for fish, water fowl and small animals, to enhance the biodiversity of the area.

"The channel is loaded with pinks this year," said Adolph. "They started arriving about a week ago and there are a lot more to come. We've already had the sockeye and the coho are still to come. It will be very important to see what the coho run is like because they were in trouble a couple of years ago."



Bonnie Adolph with Bob Gibney of Aquila Networks.



Among the kids at grand opening were: (l to r) Andrew Montjoy, Shania Frank, Alexis Leech and Tristan Montjoy.

Hello again.....

Our last newsletter (July 2002) introduced the St'at'imx Hydro Fisheries Co-operative Group (SHFCG). We distributed 250 copies of that newsletter to the St'at'imx communities of Nxwisten, T'it'q'et, Sekw'elw'as, T's'alih, and N'Quatqua. This newsletter is a progress report on some of our work and will be distributed to these same communities.

Since our last newsletter, the St'at'imx Hydro Fisheries Cooperative Group has held two quarterly meetings. Representatives from the BC Ministry of Water, Land, and Air Protection and the BC Ministry of Sustainable Resource Management participated in one of these quarterly meetings. Both ministries expressed interest in the cooperative opportunities presented by our group and wish to be kept informed of our activities. Several technical representatives have joined the table including:

- Gerald Michel, Councillor and Fisheries Technician from Nxwisten,
- Bonnie Adolph, Cayoosh Creek Fisheries Co-ordinator
- Laura Brown, Natural Resources Technician, T'it'q'et

The Group has also held several smaller working group and informational meetings including:

- Bridge Coastal Fish and Wildlife Restoration Program (BCRP) – presentation of program outline and proposal application process to technical representatives from T'it'q'et and Sekw'elw'as
- BCRP proposal preparation working group meetings to assist Nxwisten and Sekw'elw'as in preparing BCRP proposals for this year
- Review of Water Use Planning and BCRP issues and opportunities with Nxwisten representatives and the SHFCG

What's new?

BCRP Proposals

The Co-operative Fish Group facilitated partnerships for St'at'imx communities to develop and submit three fisheries related project proposals to the BCRP this year. Sekw'elw'as has proposed a project to improve fish habitat in the Lower Seton Spawning Channel. In the past, the Lower Seton Spawning Channel was designed and operated primarily for spawning pink salmon. The proposed project, if successful, would increase the diversity of habitat, allowing more species of fish and a

wider range of age classes to make use of the channel. A similar project was completed on the Upper Seton Spawning Channel in 2000 and that channel now supports both pink and coho salmon, steelhead trout, rainbow trout, bullcutout, and many other species that live in the Seton River. This proposed project is a partnership between Sekw'elw'as and DFO. Answorth Timber has volunteered to provide some materials and BC Hydro has assisted in the planning.

Both Sekw'elw'as and Nxwisten have applied for funding to study the feasibility of development of off-channel rearing habitat in Seton and Bridge rivers. These projects will help identify certain areas of the river where side channels can be built. Side channels provide excellent habitat for young fish, improving their chances of survival. These projects were proposed in partnership with DFO.

An assessment of Seton and Anderson Lake gwenis (kokanee) Application for Funding has also been proposed to the BCRP. The apparent decline in the gwenis population has been documented in Traditional Ecological Knowledge (TEK) studies completed by St'at'imx Nation Hydro. This project will be carried out as a partnership between the BC Conservation Foundation, St'at'imx, and the BC Ministry of Water, Land, and Air Protection.

• Training and Employment

St'at'imx fisheries staff were kept busy this season. Bonnie Adolph (Cayoosh Creek Fisheries Co-ordinator) and Larry Casper (Lillooet Tribal Council, Natural Resources Co-ordinator) arranged training for technicians from several St'at'imx Communities. These technicians received Level 1 First Aid, First Aid Transportation Endorsement, and Electrofishing Certification. Several also received certification in swiftwater rescue and CPR. These people are now qualified to work in fish salvage and survey operations with BC Hydro and DFO. Several technicians also travelled to the BC Hydro generating stations near Ts'alih and took BC Hydro's safety training program, qualifying them to carry out contracts in and around BC Hydro facilities.

St'at'imx technicians put their training to work this season. DFO employed 12 St'at'imx on fisheries related projects this season; 8 for the Aboriginal Fisheries Monitoring Program, 2 for the Sockeye Sports Fishery monitoring program, and 2 were in the office compiling fisheries data. BC Hydro kept the pace, employing

St'at'imx fisheries workers in projects on the middle and lower Bridge rivers, Cayoosh Creek, and at Seton Dam.

What's coming up

Over the next few months, the group will focus on the development of a strategic plan for fisheries and wildlife projects in the upper St'at'imx Territory. Representatives from St'at'imx communities will be invited to attend talks by fish and wildlife specialists and to discuss ideas for projects. The group will work to compile these ideas and identify potential funding sources for the work.

The group is also working to identify other organizations or companies that may be interested in the SHFCG initiatives. Others may have an interest in forming partnerships or joint ventures with St'at'imx on fisheries or wildlife projects and the SHFCG is well-positioned to facilitate that process.

The group is also planning to organize a workshop in February, 2003. This will be the 2nd annual Co-operative Fisheries Workshop. The purpose of the workshop will be to report on the progress of the SHFCG and receive feedback from St'at'imx Chiefs, BC Hydro, and DFO managers.

**Starting your own business ?
Need \$\$\$?**

BC Hydro Aboriginal Business Partnership Program is offering grants of up to \$15,000 to help you start or expand your business.

Down load your application from:
http://www.bchydro.com/ix_files/community/community2035.pdf

or write to:
BC Hydro Aboriginal Business Partnership Program
BC Hydro Aboriginal Relations Department
14th Floor, 333 Dunsmuir St.
Vancouver B.C.
V6B 5A3

All applications must be received by Jan. 31, 2003

BRIDGE COASTAL FISH AND WILDLIFE RESTORATION PROGRAM UPDATE

BC Hydro Bridge Coastal Fish & Wildlife Restoration Program (BCRP) provides \$1.5 million annually to projects that restore fish and wildlife populations and habitat impacted by construction of hydroelectric generating stations in 15 watersheds located along the coast, the Fraser Valley, Bridge River, Shuswap River and on Vancouver Island. The program is managed by a Board comprised of three public, three First Nation, one federal, one provincial and one BC Hydro representatives.

SHFCG INVOLVEMENT

The St'at'icmc Hydro Fisheries Co-operative Group facilitated partnerships for St'at'icmc communities to develop and submit three fisheries related project proposals to the BCRP this year

SEKW'ELW'AS

Sekw'elw'as carried out a project to improve fish habitat in the Lower Seton Spawning Channel. This project was a partnership between Sekw'elw'as, DFO, Aquila, Bridge River Band, Ministry Of Transportation and Ainsworth Lumber. The project is near completion & was a great experience in partnership building (and very good for the fish too).

NIXWISTEN

Nixwisten was approved for funding to study the feasibility of development of off-channel rearing habitat in the lower Bridge river and the Yalakom river. These projects will help identify certain areas of the river where side channels can be built. Side channels provide excellent habitat for young fish, improving their chances of survival. These projects were proposed in partnership with **DFO**.

SETON LAKE GWENIS

A project for assessment of Seton and Anderson Lake gwenis (kokanee) Application for Funding has also been accepted by the BCRP. The apparent decline in the gwenis population has been documented in Traditional Ecological Knowledge (TEK) studies completed by St'at'icmc Nation Hydro. This project is being carried out as a partnership between the BC Conservation Foundation, BCRP, St'at'icmc, and -the BC Ministry of Water, Land, and Air Protection. Andy Morris (BCCF Fisheries Biologist) has submitted the cover picture & the following update.

The British Columbia Conservation Foundation, in partnership with the Ministry of Water, Land and Air Protection and St'at'icmc First Nation is currently conducting an assessment of kokanee in Seton and Anderson Lakes, through funding provided by the Bridge Coastal Restoration Program. The project is progressing well and field surveys have been conducted on both lakes. Crews have been successful in collecting pre-spawn kokanee samples from both lakes for baseline age and growth analysis; which, over the long term, will provide insight into year class variability. Post-spawn Kokanee collected from Anderson Lake in 2002/2003 have been sampled for length, weight and age structures. Additionally, crews have identified potential shore spawning habitat which will guide the field surveys to be conducted in the fall and winter of 2003/2004 to confirm spawning areas and to enumerate spawning kokanee.

N'QUATQUA

The N'Quatqua Gates Creek Fish Habitat Restoration Project Feasibility and Fencing is well underway. Within Anderson Lake, Gates Creek and their tributaries two N'Quatqua band members are conducting a presence/absence survey of fish with Gee-traps.

As well, DFO surveyed a section of Gates Creek N'Quatqua for the feasibility of adding fish habitat future projects. Chris Thevarge, N'Quatqua Band fisheries representative would like to thank Rob Mer for allowing them to put up a fence to protect Gates Creek from his bison herd.



For More Information

For more information about the BCRP, or to receive an application form, call | 800 663-1377 or contact:

BCRP Program Manager
BC Hydro
6911 Southpoint Drive
Burnaby BC V3N 4X8
604-528-8189
www.bchydro.com/bcrp

Appendices C

June 4 2003 Finished road up by valves/fence, stumps and riprap left hand site, looking down site from valves

June 5/03 Started side channels beside the bridge, putting stakes in for riprap to take out, dig out channels, plugs, marshes

June 6/03 Shocking fish in the channels, still draining channels

June 7/03 2 hoes working-Steve and Guy, removing riprap side of channels

June 9/03 Started to fill in **strictions**, gravel removal, Berm 1 Beaver dam to house, 37 loads clean gravel

June 10/03 Finished loading out top gravel (clean), Steve loading out second layer of gravel (dirty), Steve Guy finished 3 **constrictions**

June 11/03 Steve started Berm 13, Fred and John on fire hose cleaning **locks**, Roger Williams water truck, Steve broke down belt on engine, **over lea** 45 loads, St. Dennis 41 loads

June 12/03 Loading out gravel, working on **constrictions**, water truck

June 13/03 Roger Williams water truck **overlea**, 42 loads, and St. Dennis 42 loads

June 14.03 **Overlea** 45 loads, St. Dennis 42 loads

June 16/03

Day Trucks	
BRI – 10 loads	Garbage Dump
BRG – 10 loads	1 load
Rick – 10 loads	1 load
Roger – 10 loads	1 load
Berm 1 Pool	1 load
Berm 2	4 loads
Berm 5	1 load
Berm 12	4 loads
Plug 5	2 loads
Plug 7	1 load
Pool 7	1 load
Marsh #	6 loads
Marsh 10	1.5 loads
Pool 14	6 loads
Pool 16	4 loads
Pool 15	2 loads
Plug 16	.5 load

INTRODUCTION

Plug 19	1 load
Pool 19	3 loads
Steam 1	2 loads

June 17/03 Felt work on pools – John and Fred

Marsh 1	9 loads clay
Marsh 2	10 loads clay
Grizzly Stock Pile	9 loads
BRG	10 loads clay
Rick	10 loads clay
BRI	10 loads clay
Roger	10 loads clay

June 18/03 Felt work on top of clay – Extra Helpers (John, Fred, Michelle, Randy)

Wayne	45 loads
Ed	45 loads

June 19/03 Road Runner - 1 la9od stumps

BRI	7 Stumps	From Grossler
Ed	8 Hydro	Gravel
Wayne	8 Hydro	Gravel
Bruce	7 Hydro	Gravel

June 20/03 Aquilla Gravel – 19 Clean Gravel Loads

Wayne	21 loads
BRI	22 loads
Ed	23 loads
Roger	20 loads
Roadrunner	4 loads, stumps
John, Fred	Drilling Rocks

June 21/03 New Wash Plant showed up

Road Runner 4 loads of stumps	
Aquilla Gravel	
BRI	8 loads
Ed	6 loads
Wayne	7 loads
Grizzly	12 loads

June 23/03

Roger	1 load stumps	8 loads West Boulder Rocks
Road Runner	1 load stumps	7 loads
Ed	1 load stumps	5 loads
Shawn	1 load stumps	6 loads
Wayne		4 loads

INTRODUCTION

Rocks With Boulders	
Ed	8 loads
Road Runner	8 loads
Roger	8 loads
Shawn	6 loads
Wayne	8 loads

June 25/03

Rocks With Boulders	
Ed	8 loads
Road Runner	8 loads
Roger	7 loads
Wayne	5 loads

June 26/03

Rocks With Boulders	
Ed	9 loads
Wayne	9 loads
Mike	9 loads
Roger	9 loads

June 27/03

Rocks With Boulders		
Roger	4 loads	Debris 1 load
Mike	4 loads	1 load
Ed	4 loads	1 load
Rick	4 loads	1 load

July 1/03 Guy and Steve are on Clean-up, Finished plugs and Marshes

July 2/03 Guy, Steve are finishing up **rocks**, the bridge is taken apart, Rails- Deck, planting trees

Mike	1 load of stumps
------	------------------

July 3/03 Bridge Parts – John and Fred are Planting,

Ed – 5 loads	Top Soil – 3 loads	Rocks – 1 load
--------------	--------------------	----------------



**TISDALE
ENVIRONMENTAL
CONSULTING Inc.**

2228 PAUL LAKE RD
KAMLOOPS B.C. V2H 1N9
PH (250) 573-4572
FAX (250) 573-4552
Email: tech@kamloops.net

**SETON RIVER
LOWER SPAWNING CHANNEL
FISH SALVAGE
June 02-07, 2003**

Prepared by:

**A.E. (Gene) Tisdale, *A.Sc.T*
Tisdale Environmental Consulting Inc.**

Prepared for:

**Cayoosh Indian Band
Lillooet, B.C. V0K 1V0**

January 2004

INTRODUCTION

Prior to habitat complexing during a Bridge Coastal Compensation Plan (BCRP) funded project on the Seton River Lower Spawning Channel (LSC), all fish needed to be removed and the channel dewatered. Tisdale Environmental Consulting Inc. (TEC) was contacted by Ms. Bonnie Adolph of the Cayoosh Indian Band (CIB) to provide environmental support during the scheduled LSC fish salvage. Prior to June 02, 2003, the LSC was approximately 3.1 km in length, 6.1 meters in width and contained approximately 18910 square meters of habitat available to fish for rearing. A total of 4954 live fish and 234 mortalities were collected from the LSC from June 02 – 07, 2003 by Gee-Trapping and electrofishing. A summary of fish salvaging can be found in **Table 1.**

Table 1. Fish salvage summary for June 02 – 07, 2003.

Date	BSU		CAL		CAS		CH		CO		BT		LNC		MW		NSC		RB		RSC		SK		Total		
	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	
03.06.03	1		4		12				22										27							66	0
03.06.04	145		6		13	1			277		3		108		4				626	9	1					1184	9
03.06.05	131		477	3	30	2	1		536	106			649	5	2	1			424	92	1		30			2285	205
03.06.06	77		104		11				466				49						266		2		1			976	0
03.06.07			60	12					24	1			314	6	15				28	1			2			443	20
TOTALS	354	0	651	15	66	2	0		1325	107	3	0	1120	6	24	2	1	0	1371	102	4	0	33	0		4954	234

INTRODUCTION

TITLE PAGE	i
EXECUTIVE SUMMARY	ii
TABLE OF CONTENTS.....	iii
LIST OF FIGURES, TABLES AND APPENDICES	iv
1.0 INTRODUCTION	1
1.1 Study Area and Background.....	1
2.0 MATERIALS AND METHODS	5
2.1 Lower Spawning Channel Flow Reduction.....	5
2.2 Fish Salvage.....	5
3.0 RESULTS AND DISCUSSION	7
3.1 June 02, 2003	7
3.2 June 03, 2003.....	7
3.3 June 04, 2003.....	8
3.4 June 05, 2003.....	8
3.5 June 06, 2003.....	9
3.6 June 07, 2003.....	9
4.0 CONCLUSIONS.....	11
5.0 ACKNOWLEDGEMENTS	12
6.0 LITERATURE CITED	13

LIST OF FIGURES

	<u>Page</u>
Figure 1. Bridge/Seton River Watershed.....	3
Figure 2. The Seton River Lower Spawning Channel following completion of habitat complexing (June 2003)	4

LIST OF TABLES

Table 1. Fish salvage summary for June 02 – 07, 2003.....	ii
--	----

LIST OF APPENDICES

Appendix 1 Lower Spawning Channel Fish Salvage Summary for June 02 – 07, 2003	14
--	----

INTRODUCTION

The Bridge River system (**Figure 1**), originating at the Bridge Glacier, has a drainage area of 3,650 km² (Rood and Hamilton, 1995). The upper Bridge River flows into Downton Lake reservoir where it is contained by a dam constructed by B.C. Hydro and Power Authority for hydroelectric generation at the La Joie generating facility. The Downton Lake reservoir has a maximum and minimum operational elevation of 749.81 masl, and 701.04 masl respectively. This facility is located at the eastern end of Downton Lake reservoir near the community of Goldbridge, B.C. The La Joie facility is the first of three generating facilities operated by B.C. Hydro in the Bridge River watershed. Water passes through the La Joie facility from Downton Lake reservoir to the middle Bridge River. The Hurley River confluences with the middle Bridge River approximately 1 km downstream of the La Joie facility (right bank) and empties into Carpenter Lake reservoir. Carpenter Lake reservoir is contained by Terzaghi Dam and has a maximum and minimum operational elevation of 651.08 masl and 606.55 masl respectively. A 2.2 meter buffer below maximum storage (648.88 masl) was established in 1993 to provide a buffer against sudden increased inflows and potential freecrest spills over the Terzaghi Dam into the lower Bridge River. The Terzaghi Dam was built in 1960 to replace the Mission Dam built in 1920. Water passes through two tunnels at the east end of the reservoir into the Bridge River generating facility located on the north shore of Seton Lake reservoir near the community of Shalalth, B.C. A low head dam is located at the eastern end of Seton Lake reservoir. Seton Lake reservoir has a maximum and minimum operational elevation of 236.25 masl and 235.95 masl respectively. Water from Seton Lake reservoir passes through Seton Dam into Seton River and is also diverted at the dam into an aqueduct which supplies water to the Seton Generating Facility located on the west bank of the Fraser River near the community of Lillooet, B.C. The hydroelectric generation system supplies a maximum rated output of 546 MW.

INTRODUCTION

The international Pacific Salmon Fisheries Commission constructed two spawning channels to mitigate loss of approximately 15,000 square meters of spawning substrate at the outlet of Seton Lake when the Seton Dam was constructed. The upper spawning channel (USC) was constructed in 1960, while the lower spawning channel (LSC) was constructed in 1967. Combined, the two spawning channels will accommodate some 46,000 pink salmon spawning adults annually. Peak adult returns to the Seton-Portage system have been greater than 1 million pink salmon (BC Hydro, 1999).

Spilling excess water from Seton Lake reservoir through the Seton Dam into the Seton River is necessary, in most years, to maintain hydraulic balance in the chain of reservoirs (Downton, Carpenter and Seton Lake reservoirs). Resident and juvenile-rearing habitat is reduced during spill or high discharge events into the Seton River. The biological objective is the year-round utilization of spawning channels for provision of rearing and spawning habitat for all fish species using the Seton River.

The LSC is watered by two 457mm diameter intake pipe siphons from the B.C. Hydro power canal, providing a year round supply of approximately 40 cfs. The two pipes are buried down the embankment, underneath the highway, and emerge at the head end of the LSC. The LSC is approximately 3.1 kms in length and 6.1 meters in width (prior to habitat complexing in the summer of 2003). This spawning channel was (in past years) typically operational every second year (odd years), following the pink salmon spawning cycle. Flow was typically initiated approximately September 15 and terminated after egg incubation was complete in mid March to mid May.

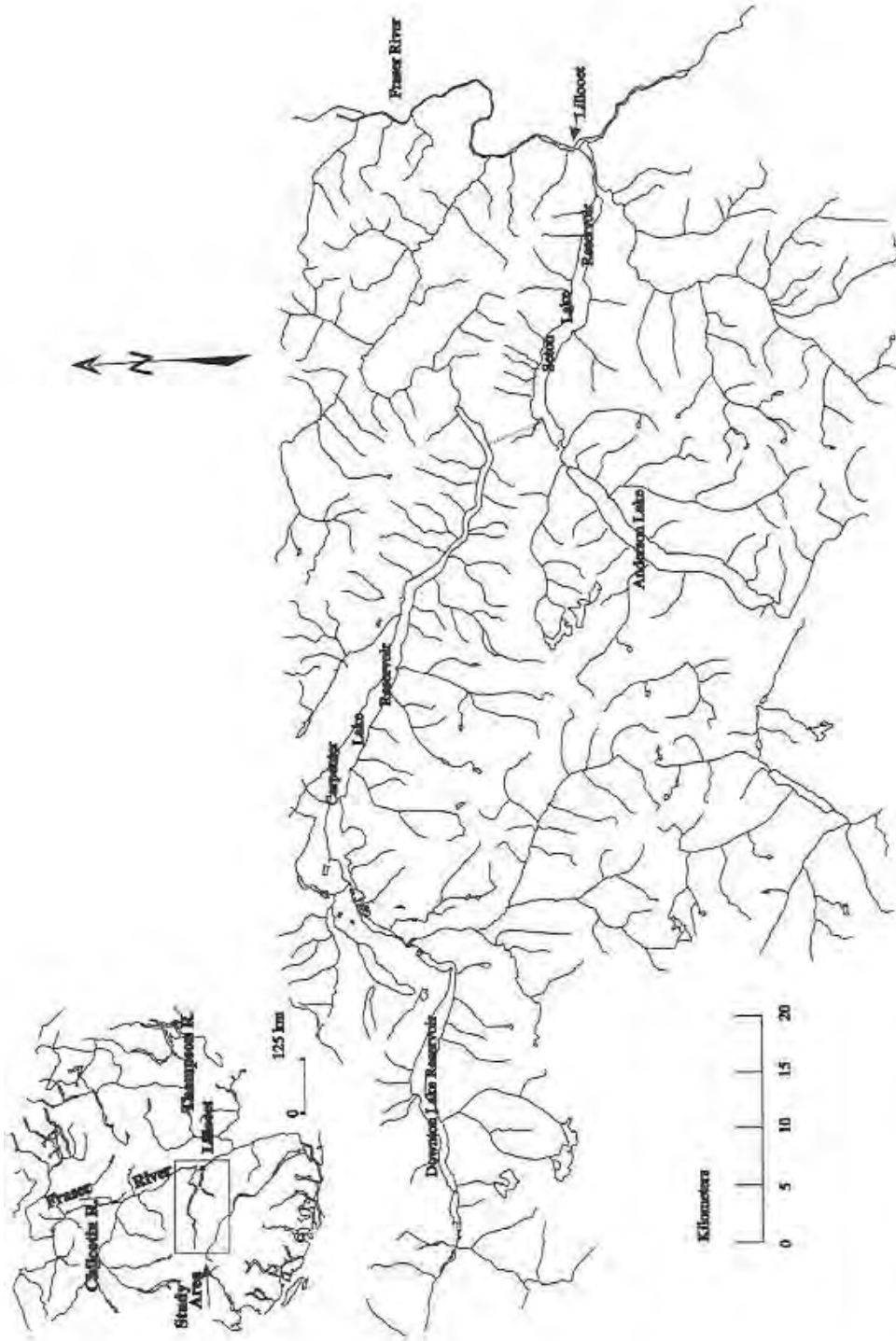


Figure 1. Bridge/Seton River watershed.

INTRODUCTION

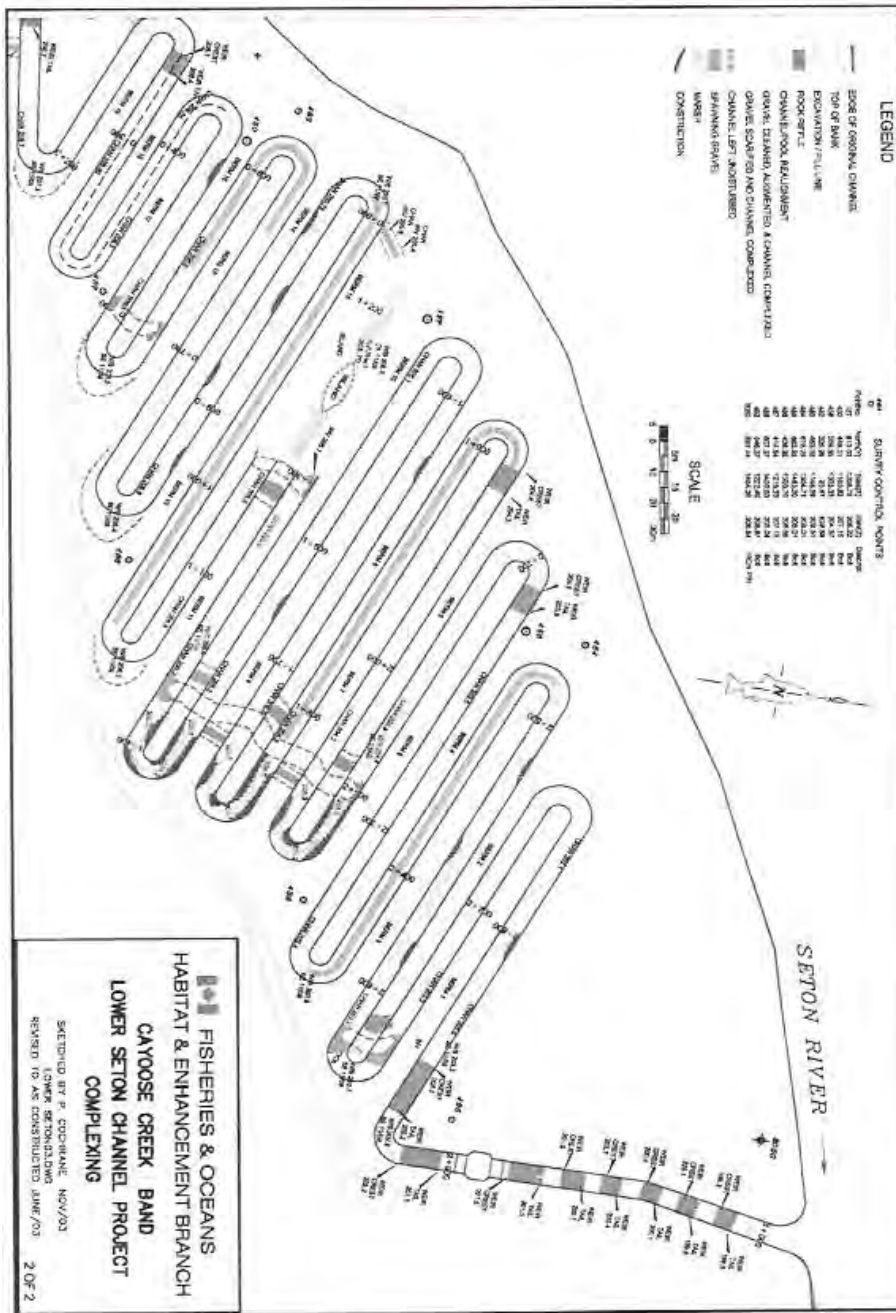


Figure 2. The Seton River Lower Spawning Channel following completion of habitat complexing (June 2003).

2.0 MATERIALS AND METHODS

2.1 Lower Spawning Channel Flow Reduction

Discharge into the LSC was reduced from two operational siphons (approximately 40 cfs noted prior to fish salvage) to one siphon operational (approximately 20 cfs) to passively force out-migration of fish. Following intensive Gee-Trapping, discharge was reduced each successive day until the single operational siphon was completely shut-off on June 06, 2003.

2.2 Fish Salvage

Gee-Trapping

A combination of 214 fine wire and standard wire Gee-Traps, provided in-kind by DFO and B.C. Hydro, were utilized to capture all species of fish residing within the LSC. All traps were baited with fresh salmon roe and left fishing overnight. The following morning, each trap was collected, the number and species of fish noted, and then each trap was reset in a downstream location until reaching the Seton River confluence.

Electrofishing

The LSC was salvaged by three – three person crews equipped with Smith-Root backpack electrofishing units. All personnel operating electrofishing equipment were trained in electrofishing safety and outfitted accordingly as per Workers' Compensation Board (WCB) standards. Electrofishing crews initiated the salvage at the upstream end of the USC and worked their way downstream until reaching the confluence with the Seton River. This process was repeated until all fish were removed.

Fish Transport

Support crews were present to ferry fish laden buckets from the electrofishing and Gee-Trapping sites to pick-up trucks equipped with oxygenated 1000 litre aluminum tanks. Water temperature and dissolved oxygen levels were monitored during fish collection

INTRODUCTION

procedures. All fish were transported within the aluminum tanks to the upper spawning channel (USC).

Fish Species Identification

All fish captured were identified to species, as described by Scott and Crossman, 1973, and released unharmed into the main channel. All species codes were denoted as per RIC standards.

INTRODUCTION

A preliminary test was conducted on May 29, 2003, to determine the extent of valve manipulation before prime was lost with the most eastern intake siphon. Pat Cochrane (DFO), Bonnie Adolph, Sheldon Andrews (CIB) and Gene Tisdale (TEC) were present for this testing. A total of 100 turns was required to fully open/close the siphon valve prior to loosing prime. Once the siphon had lost prime, a total of 26 minutes was required to reprime the siphon, with a 3 inch pump, and re-open the valve. The siphon valves were returned to the state they were originally found following testing procedures.

3.1 June 02, 2003

Discharge into the LSC was reduced from two operational siphons (approximately 40 cfs noted prior to fish salvage) to one siphon operational (approximately 20 cfs) at 0940h on June 02, 2003, to passively force out-migration of fish from the channel. Following dewatering of the LSC to 20 cfs, a combination of 214 fine wire and standard wire Gee-Traps were set with higher densities in locations thought to, or observed to, contain higher densities of fish i.e. cut banks, log or debris jams, rip-rap corners. All traps were baited with fresh salmon roe and left fishing overnight.

3.2 June 03, 2003.

The following morning, each trap was collected, the number and species of fish noted, and then each trap was reset in a downstream location. A total of 1 live Bridgelip sucker *Catostomus columbianus* (BSU), 4 live Coast range sculpin *Cottus aleuticus* (CAL), 12 live Prickly sculpin *Cottus asper* (CAS), 0 Chinook salmon *Oncorhynchus tshawytscha* (CH), 22 live Coho salmon *Oncorhynchus kisutch* (CO), 0 Bull trout *Salvelinus confluentus* (BT), 0 Longnose dace *Rhinichthys cataractae* (LNC), 0 Mountain whitefish *Prosopium williamsoni* (MW), 0 Northern pike minnow *Ptychocheilus oregonensis* (NSC), 27 live rainbow trout *Oncorhynchus mykiss* (RB), 0 Redside shiner *Richardsonius balteatus* (RSC), and 0 Sockeye salmon *Oncorhynchus nerka* (SK), or 66 fish, were captured with 214 Gee-Traps (**Table 1, Appendix 1**). . The catch-per-unit effort for

INTRODUCTION

Gee-Trapping for this day was approximately 0.31 fish per trap. A combination of 284 fine wire and standard wire Gee-Traps were set with higher densities in locations thought to, or observed to, contain higher densities of fish i.e. cut banks, log or debris jams, rip-rap corners. Traps were set from the location where Gee-Trapping was concluded the previous day downstream to the Seton River confluence. All traps were baited with fresh salmon roe and left fishing overnight.

3.3 June 04, 2003

The following morning, each trap was collected, the number and species of fish noted, and then each trap was removed from the water. A total of 0 BSU, 1 live CAL, 4 live CAS, 0 CH, 140 live CO, 0 BT, 0 LNC, 0 MW, 0 NSC, 45 live RB, 1 RSC, and 0 SK, or 191 fish, were captured with 284 traps. (Table 1, Appendix 1). The catch-per-unit effort for Gee-Trapping for this day was approximately 0.67 fish per trap; twice that of the previous day. Following completion of Gee-Trap removal and fish enumeration, electrofishing was initiated. Three – three person crews, equipped with Smith-Root backpack electrofishing units, were present for the fish salvage. All personnel operating electrofishing equipment were trained in electrofishing safety and outfitted accordingly as per Workers' Compensation Board (WCB) standards. Electrofishing crews initiated the salvage at the upstream end of the USC and worked their way downstream until reaching the confluence with the Seton River. Approximately 20 minutes was permitted to pass between deployment of each successive crew to allow fish that were not collected by the previous crew to re-emerge from their hiding location and for the water clarity to improve from the previous crew disturbance. A total of 145 live BSU, 5 live CAL, 9 live CAS, 1 live CH, 137 live CO, 3 live BT, 108 live LNC, 4 live MW, 0 NSC, 581 live RB (9 morts), 0 RSC, and 0 SK, or 1002 fish, were captured with 48,000 seconds of electrofishing effort (Table 1, Appendix 1).

3.4 June 05, 2003

Discharge was reduced, by approximately half the amount of turns left to close the siphon, to concentrate any remaining fish and ease in capture. As with June 04, 2003,

INTRODUCTION

three – three person crews, equipped with Smith-Root back-pack electrofishing units, were present for the fish salvage. Electrofishing methodology remained constant from June 04, 2003 efforts. A total of 131 live BSU, 477 live CAL (3 morts), 30 live CAS (2 morts), 1 live CH, 536 live CO (106 morts), 0 BT, 649 live LNC, 5 live MW (2 morts), 1 live NSC, 424 live RB (92 morts), 1 live RSC, and 30 live SK, or 2490 fish, were captured with approximately 48,000 seconds of electrofishing effort (**Table 1, Appendix 1**). The mortality numbers increased this day due to a confusion in duties. One holding tank was not monitored on a frequent enough basis and dissolved oxygen levels became reduced to a point where fish were killed. Other mortalities observed were due to those typically recognized with electrofishing.

3.5 June 06, 2003

Discharge was turned off to concentrate any remaining fish and ease in capture. As with June 05, 2003, three – three person crews, equipped with Smith-Root back-pack electrofishing units, were present for the fish salvage. Electrofishing methodology remained constant from June 05, 2003 efforts. A total of 77 live BSU, 104 live CAL, 11 live CAS, 0 CH, 466 live CO, 0 BT, 49 live LNC, 0 MW, 0 NSC, 266 RB, 2 RSC, and 1 live SK, or 976 fish, were captured with approximately 48,000 seconds of electrofishing effort (**Table 1, Appendix 1**).

3.6 June 07, 2003

One crew remained for the final pass to remove any fish that may have been missed. As found with all previous electrofishing, the electrofishing crew was equipped with Smith-Root back-pack electrofishing unit. Electrofishing methodology remained constant with June 06, 2003 efforts. A total of 0 BSU, 60 live CAL (12 morts), 0 CAS, 0 CH, 21 live CO (1 mort), 0 BT, 314 live LNC (6 morts), 15 live MW, 0 NSC, 28 RB (1 mort), 0 RSC, and 2 live SK, or 463 fish, were captured with approximately 12,000 seconds of electrofishing effort (**Table 1, Appendix 1**). With no flowing water, and high ambient temperatures (in excess of 35^o Celsius), pooled water percolated through the gravel or warmed up to lethal temperatures, by the time the electrofishing crew had completed their

INTRODUCTION

work. Habitat complexing for the BCRP project was initiated the following day. Construction crews, working on site, discovered one live rainbow trout in a shaded corner pool that had eluded fish salvaging crews. This fish was transported to the Seton River, adjacent to the LSC, and released.

INTRODUCTION

The LSC was approximately 3.1 km in length, 6.1 meters in width, and contained approximately 18910 square meters of habitat available to fish for rearing. A total of 4954 live fish and 234 mortalities were collected from the LSC from June 02 – 07, 2003. Gee-Trapping captured 257 fish from the LSC for an overall capture rate of 0.014 fish per square meter. Electrofishing captured 4931 fish in the same amount of habitat, following Gee-Trapping effort, for a catch rate of 0.261 fish per square meter of habitat. Electrofishing was found to be approximately 95% more effective than Gee-Trapping in this habitat.

INTRODUCTION

I would like to thank Bonnie Adolph, Stacey Leech, Pricilla Frank, Brian Frank, Jessica Redan, Bob Vinnie, Katrina McDonald, Robin Frank (Cayoosh Indian Band), Sean Bennett, Dave Pehl, Hiroshi Furukawa, (DFO) Steven and Alexis Hall (Crane Creek Enterprises) for their efforts in fish salvaging and data collection. I would also like to acknowledge Al Caverly (MWLAP), Mike Flynn, Patrick Cochrane, Steven Zachary (DFO) and Bryan Hebden (BC Hydro) for their direction and efforts in managing and organizing this project.

INTRODUCTION

DFO Seton River - Upper Spawning Channel Maintenance and Operation. Unpublished manual.

Hebden, B.W. 1999. Terms of Reference for the Operation and Maintenance of the Seton Spawning Channels. B.C. Hydro and Power Authority terms of reference for the environmental contractor.

Higgins P.S. and Bradford M.J. 1996. Evaluation of a large-scale fish salvage to reduce the impacts of controlled flow reduction in a regulated river. *North American Journal of Fisheries Management* 16:666-673, 1996.

Ministry of Environment, Lands and Parks. 1995. Lake and Stream Inventory Standards and Procedures. Fisheries Branch, Inventory Unit. Victoria, B.C. 227 pp

Scott, W.B. and Crossman, E.J. 1973. *Freshwater Fishes of Canada*. Bulletin 184. Fisheries Research Board of Canada, Ottawa 1973.

INTRODUCTION

Date	Time	Gee Traps	EF Settings	EF Time (Sec)	Area	BSU		CAL		CAS		CIH		CO		BT		LNC		MW		NSC		RB		RSC		SK		Total				
						L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	
03.06.03	1220	214	NA	NA	LSC	1	4	12	22																					66	0			
03.06.04	1230	284	NA	NA	LSC	1	4	140																						191	0			
Gee-Trap Summary		498				1	5	0	162	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	257	0			
03.06.04	1800	NA	J4300	48000	LSC	145	5	9	1	137	3	108																		581	9			
03.06.05	1800	NA	J4300	48000	LSC	131	477	3	30	2	1	536	106																424	92	1	30	2285	205
03.06.06	1800	NA	J4300	48000	LSC	77	104	11		466		49																		266	2	1	976	0
03.06.07	1800	NA	J4300	12000	LSC		60	12		24	1	314	6	15																28	1	2	443	20
Electrofishing Summary				156000		353	0	646	15	50	2	2	0	1163	107	3	0	1120	6	24	2	1	0	1299	102	3	0	33	0	4697	234			
TOTALS						354	0	651	15	66	2	2	0	1325	107	3	0	1120	6	24	2	1	0	1371	102	4	0	33	0	4954	234			

Seton River Lower Spawning Channel Fish Salvage June 02 - 07, 2003
 Tisdale Environmental Consulting Inc.

INTRODUCTION

