Final Report

2007

BUSH CREEK PERMANENT SMOLT TRAP AND

AREA COHO ENHANCEMENT PROJECT

By

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INTRODUCTION

The assessment of coho stocks has been conducted by using an intensive/extensive approach. A small number of intensive projects are operated to enumerate adult coho into a system and smolt coho out of a system in a rigorous, scientific manner. In addition, the smolts have a coded-wire tag applied so that the exploitation rate and marine survival rate can be measured. Augmenting these complex projects are widespread extensive projects that include adult spawner enumeration and smolt enumeration projects, and in the past, coho fry population density projects.

Smolt enumeration projects in particular have been embraced by non-governmental organizations (NGOs) as a volunteer opportunity to participate in the assessment of coho stocks.

Bush Creek is a stream located between on the east coast of Vancouver Island, between Ladysmith and Nanaimo. It has an accessible reach of 2.4 kilometres and has regularly occurring spawning populations of coho and chum salmon. DFO has conducted assessment activities on this system over the last 50 years including adult spawner surveys and coho fry surveys. DFO has also worked with the Chemainus Band in operating a temporary smolt fence on the creek. In addition the Ladysmith Sportsmen's Club has operated an enhancement facility on Bush Creek, releasing coho on an annual basis.

The Chemainus First Nation Fisheries Program has been involved with Fisheries and Oceans Canada (DFO) community programs since 1992. They were instructed by Arnold Westby of Mountdale Farms in Ladysmith on habitat and enhancement. Arnold identified smolt monitoring as essential and he operated the nearby Walker Creek smolt and adult counting fence in the early 1980's until 1992. Since then the Chemainus First Nation, in partnership with Penelakut, Halalt and Lyackson Tribes, has operated various smolt traps. At Bush Creek there were smolt traps in 2000, 2005 and 2006 and operations are continuing in 2007.

Deliverables

The Bush Creek Permanent Smolt Trap and Area Coho Enhancement Project was proposed to the Pacific Salmon Commission's Southern Fund to take advantage of the history of assessment activities and encourage the cooperative relationship between DFO, the Chemainus Band and the Ladysmith Sportsmen's Club. The objectives of the proposal were fivefold:

1. To establish a permanent counting facility on Bush Creek,
2. To provide wild coho smolt assessment,
3. To enhance partnerships between associated groups,
4. To reduce long term operation costs, and
5. To adjust and confirm enhancement and assessment goals.

Quality Control and Quality Assurance

Quality control and quality assurance was overseen by Barry Cordocedo, Ted Carter and Lee Kearey of South Coast Area, Fisheries and Oceans Canada. Mr. Cordocedo has extensive experience as a Community Advisor in liasing with First Nations and Community Groups and developing cooperative projects. Mr. Carter has 25 years experience with salmon stock assessment projects on Vancouver Island. Similarly, Mr. Kearey has worked with the Commercial Fishing sector on numerous projects. In addition, Mr. Dave Clough of D.R. Clough Consulting has been retained as a project advisor. Mr. Clough has a long history of working with NGOs on freshwater stock assessment projects.

METHODS

The smolt trap is located on the Chemainus First Nation Reserve approximately 300m upstream from the foreshore and just one pool above high tide (Figure 1). The objective of the location was to establish a trap as low in the reach as possible but avoid flooding and leakage through the banks to the adjacent wetland. There are also has an active beaver population, which resulted in removal of a small stick dam and various debris from larger dams upstream. The channel dimensions at the trap site were measured in feet for use with dimensional lumber.

Table 1. Trap Site Creek Dimensions.

Wetted width	24 feet,
Floodplain width	34 feet
Top of bank width	44 feet
Channel Depth	5.2 feet.
Trap Panel Length	68 feet

The design of panels for smolt traps used 3 or 4-foot high and 8 foot long 2x4 frame panels covered in ¼ inch galvanized hardware cloth. The trap panels were placed on a framework that allowed the water pressure to hold them in place, and providing quick removal for cleaning, passing adult fish or during a flood.

The objective of the PSC fund in 2006 was to install a more permanent structure for the foundation of the trap. The timing of the contract award in early spring 2006 negated the possibility of extensive digging in the creek bed. It was decided to install a trap that "floated" on the stream gravel and install the permanent structure later in summer low flow. Thus the 2006 trap foundation was a skeleton framework of 2x4's that tied together wood triangular braces placed across the streambed at 4-foot intervals. The trap was shaped as a V weir to increase surface area, which reduces surface pressure on the screens. This design offers several advantages. It leads the fish to the central fyke, it increases trap surface area, and is easy to cross brace for additional strength. Our trap was 68 feet long and used six removable 8-foot panels. It also had 20 feet of permanently anchored screen sections to fit the curvature of the stream banks. This trap was designed to block and trap all smolt migration.

The panels were aligned to encourage migrants to enter a 4 inch pipe that lead to the capture box. The fish were then flushed down the pipe into 6 ft x 4 ft aluminium capture box. The static head of the panels was maintained by judicious cleaning to ensure a head differential of 2 –6 inches between the entrance of the pipe and the capture box. This head differential was usually enough to maintain the fish in the box until removed by the crew. At lower water flows a pipe elbow fitting or a plastic mesh screen was fitted on the end of the pipe to impede smolts from swimming upstream.

The trap boxes were checked once daily until fish began migrating in numbers then twice daily. The trap was built by the Chemainus First Nation Fisheries Program members; Roger Elliott, John Elliott, Kevin Frenchy. Penelakut Tribes provided Ken Thomas. Barry Cordocedo (FOC) assisted in prefabrication of panels and installation. D.R. Clough Consulting provided Brad Remillard and John Dunn. We also consulted DFO Stock Assessment technicians Ian Matthews and Lee Kearey.

Roger Elliott was the primary operator of the trap and was assisted by Ken Thomas and John Dunn during scale and fork length sampling days. All people involved in construction participated for a few days of trap operation.

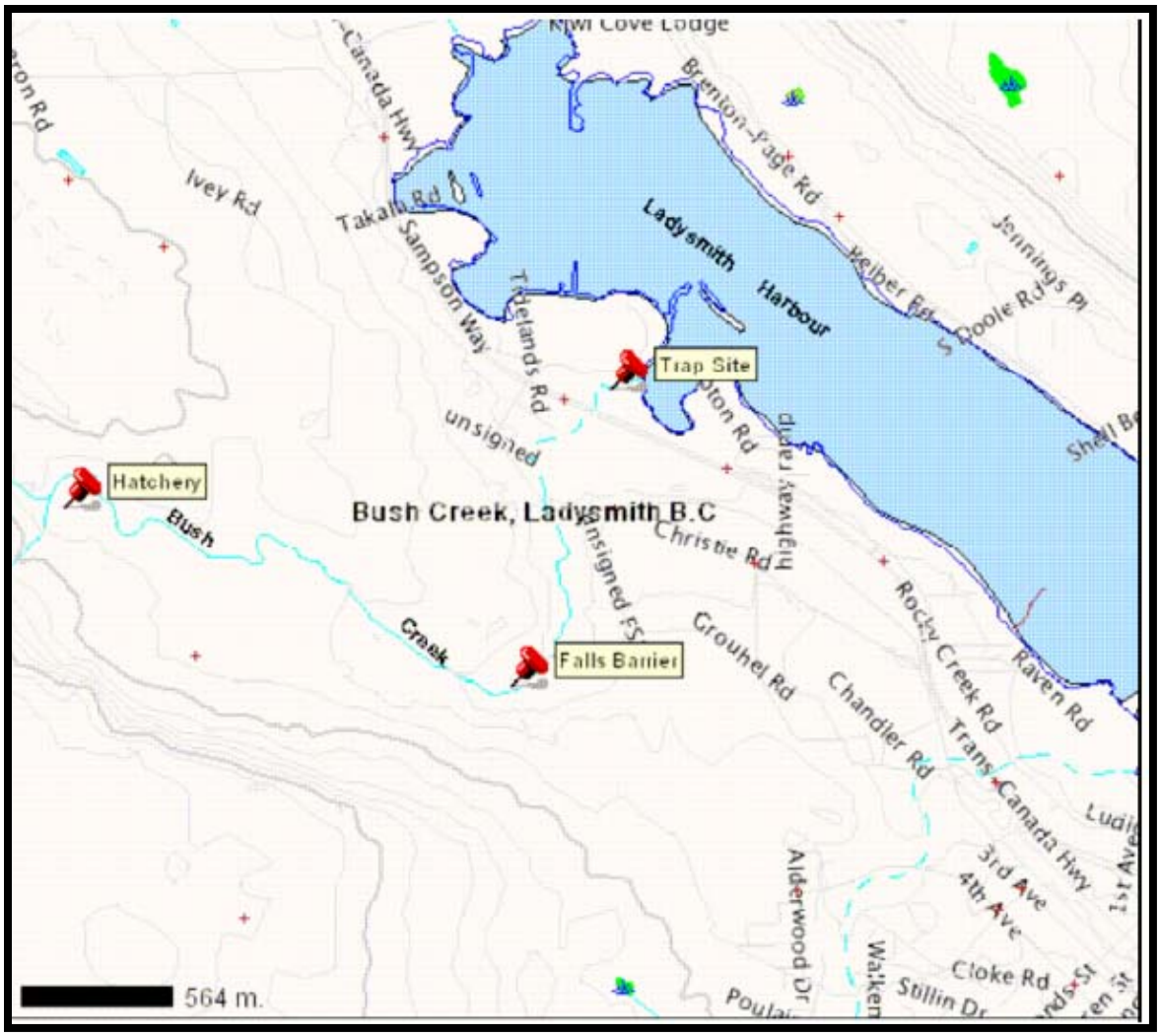

Figure 1. Bush Creek, Ladysmith, BC. Trap location and watershed area.

RESULTS

The trap was operated through the spring from May 6 to June 15. Once in operation fish were captured immediately. It was a warm spring and some fish were moving before the trap was installed. There were delays in materials and construction that put us back a week. There were no other reported floods or trap failures. The total fish counted through the trap during the operation was 4,124 fish. The total coho smolts were 4,061 fish (Figure 2).

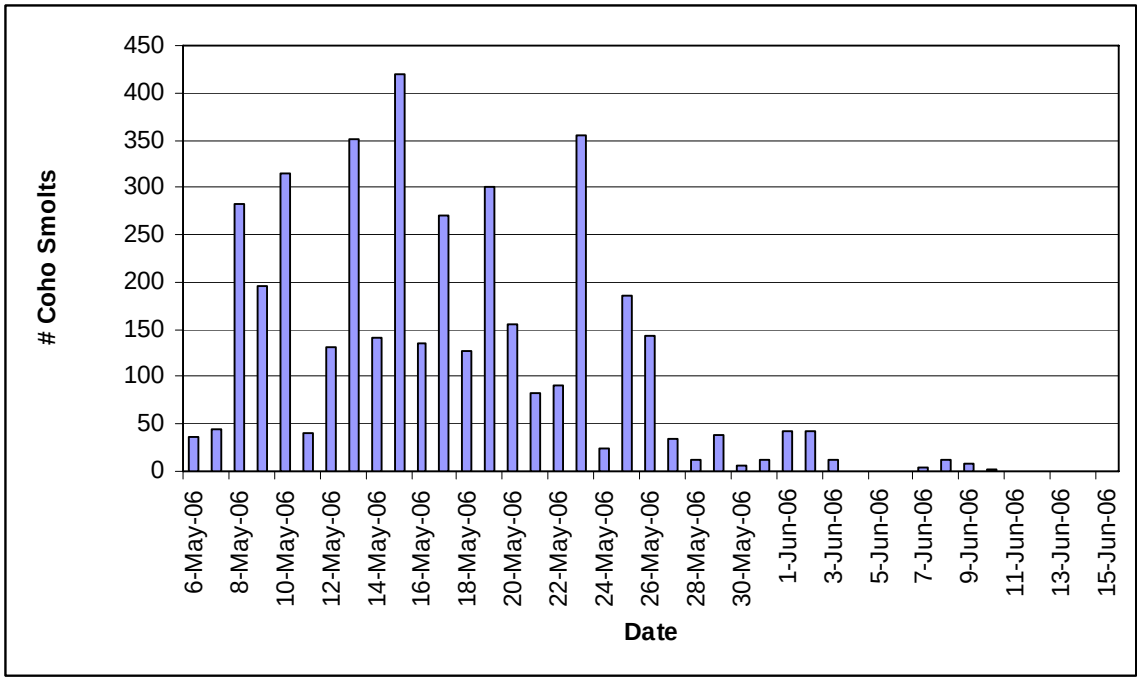

Figure 2. Daily coho smolt enumeration at Bush Creek, 2006.

DISCUSSION

The smolt trap was a temporary design installed for its second year. It worked well and allowed us to determine the best location for the more permanent site. In September 2006, in low flow, the foundation for the 2007 trap site was dug with a back hoe. The location was moved upstream due to floods in 2005 indicating the banks were weak and the channel was aggrading due to sediment loads. In the winter of 2006/2007 more erosion and sediment occurred changing elevations in the channel and burying part of our trap and digging a deep pool behind other parts of the frame. Despite the channel damage, the trap foundation held up over winter and we installed the trap April 16, 2007.

The 4,061 coho smolts captured in 2006 are much higher than the 1,593 smolts captured in 2001. It may be that 2006 represents the high cycle year of coho in Bush Creek. Other factors to consider are summer water quality in 2005 and the number of fry stocked into the system in 2005.

The anadromous length of Bush Creek is approximately 2.0 km. The wetted width of the lower reaches is wide with 3-10m with an average of 5m. This offers a wetted area of approximately 10,000m^2 which results in 0.4 smolts per square meter produced. In Little River Smolt trap smolt production was calculated at 0.3 to 0.6 fish per square meter in various reaches in 2000. The total pool area would be a more realistic number, as many of the glides and riffles are dry or unused by the coho. At Nile Creek Side channel, the early March pre-smolt density was 2.62 m^2 in mostly pool area (pers. comm. D.R. Clough, 2000).

Comparison of this data with other Vancouver Island smolt traps will be useful to determine the productive scale. Other traps at Little River, Cherry Creek and Black Creek can be compared when data is available. Unfortunately, only the Little River Enhancement Society has a full USHP inventory (Little River Enhancement Society, 1997) of their stream to compare production to habitat. The Bush Creek USHP survey was conducted in winter and the summer low flow measures have not been done. In the past fish production has relied on production estimates from innately weak fry density studies or adult escapement estimates. Neither study has the confidence limits or relevance to fresh water habitat that a smolt trap can determine.

It is important to remember that the smolt data should be collected for at least three years on wild fish to determine a trend in production. A multi–year study will allow for seasonal weather fluctuations and adult escapement to be averaged out over time. It would allow for responses to habitat restoration to be assessed once baseline production estimates are determined.

Appendix 1 – Daily enumeration of salmonids

Date	morning check	evening check	Daily Total	morning water temp	evening water temp	average temp	RBT/ CTT	Trout fry
6-May-06		36	36					2
7-May-06		44	44		8	8	3	
8-May-06	125	158	283	8	8	8	3	
9-May-06	80	115	195	11	11	11		
10-May-06	314		314	10		10	4	
11-May-06	41		41	9		9		
12-May-06	132		132	10		10	1	
13-May-06		352	352		10	10	4	
14-May-06		141	141		10	10	3	
15-May-06		420	420		12	12		
16-May-06	135		135	13		13	3	
17-May-06		271	271		11	11	8	
18-May-06		127	127		15	15	3	
19-May-06	301		301	13		13	1	
20-May-06	156		156	13		13		
21-May-06	82		82	12		12	3	
22-May-06	90		90	13		13	2	
23-May-06	356		356	13		13	4	3
24-May-06		25	25		13	13		
25-May-06	186		186	12		12	4	
26-May-06	144		144	13		13		
27-May-06		34	34		12	12		
28-May-06		12	12		13	13		
29-May-06	38		38	13		13		
30-May-06	6		6	13		13	2	
31-May-06	13		13	13		13	1	
1-Jun-06	43		43	13		13		
2-Jun-06	42		42	14		14	2	
3-Jun-06		12	12		13	13		
4-Jun-06		1	1		13	13	2	
5-Jun-06	1		1	13		13	3	
6-Jun-06		1	1		14	14	1	
7-Jun-06		4	4		15	15		
8-Jun-06		12	12		12	12		
9-Jun-06	8		8	12		12		1
10-Jun-06	2		2	13		13		
11-Jun-06		1	1		13	13		
12-Jun-06								
13-Jun-06								
14-Jun-06								
15-Jun-06								
Totals			4061				57	6

Appendix 2 – Financial Report

Original Budget forecast

Contractor	2,400.00
Travel	1,500.00
Equipment	600.00
Supplies/Materials	8,000.00
Field materials	1,000.00
Total	**13,500.00**

In Kind	
DFO staff	1,575.00
Chemainus FN	5,400.00
Volunteer labour	1,350.00
Materials	4,500.00
Total In Kind	**12,825.00**

Actual Expenditures

Contractor (Biological support)		
John Dunn	build & install base for smolt fence	2,445.00
John Dunn	tech support/bush creek	513.00
D R Clough Consulting	Bush Creek Smolt Trap	869.88
John Dunn	tech support/bush creek	35.91
D R Clough Consulting	Bush Creek Smolt Trap	60.89
Total		**3,924.68**

FN technical support		
Chemainus First Nation	Bush Creek Smolt Trap	690.00
Total		**690.00**

Travel		
Chemainus First Nation	Bush Creek Smolt Trap	189.28
Total		**189.28**

Actual Expenditures (cont.)

Supplies/Materials		
Key Mill Construction	500 litre fish transfer tank	1,650.00
The Home Depot	supplies	159.12
Coast Distributors	reel tapes	39.15
Slegg Construction Material	smolt trap	213.73
Slegg Construction Material	smolt trap	9.94
Slegg Construction Material	smolt trap	98.14
Slegg Construction Material	smolt trap	5.61
Slegg Construction Material	smolt trap	26.88
Slegg Construction Material	smolt trap	52.55
Slegg Construction Material	smolt trap	11.65
Slegg Construction Material	smolt traps	75.00
Slegg Construction Material	smolt traps	28.78
Slegg Construction Material	smolt traps	2,261.88
Slegg Construction Material	smolt traps	99.33
Shar-kare Feeds	sand bags	89.00
The Home Depot	supplies	18.17
Key Mill Construction	500 litre fish transfer tank	99.00
Lussier & Son Contracting	supplies	344.48
Slegg Construction Material	return of item	(53.19)
Total		**5,229.22**
Total to date		**10,033.18**
Contractor (Biological support)		2,100.00
Chemainus FN		690.00
Travel		189.28
Supplies/Materials		487.54
Total Expenditures		**13,500.00**
In Kind		
DFO (Community Advisor, StAD)		2,600.00
Chemainus FN		5,000.00
Volunteers		1,300.00
Materials		4,000.00
Total In Kind		**12,900.00**