Fish Use Monitoring and Evaluation of Three Constructed Ponds within the Kalum Forest District:

Copper River 3km, Killutsal Creek and Clear Creek

Prepared for:
Kim Haworth, R.P.F.
Kingfisher Forest Sciences Co. Ltd.
Site 3A, Comp. 27, RR3
Terrace, BC V8G 4R6

and

Chris Broster, Ecosystem Specialist
Ministry of Water, Land and Air Protection
101-3220 Eby Street
Terrace BC V8G 5K8

December, 2003

Prepared by:
Acer Resource Consulting Ltd.
4810 Halliwell Avenue,
Terrace, BC V8G 2J4
Ph: 250-638-0110

Table of Contents

INTRODUCTION **1**

STUDY AREA AND ACCESS **1**

COPPER RIVER 3 KM OFF-CHANNEL DEVELOPMENT 1
CLEAR CREEK EASTERN SIDE CHANNEL DEVELOPMENT 1
KILLUTSAL CREEK REARING PONDS 1

BACKGROUND **2**

COPPER RIVER 3 KM OFF-CHANNEL DEVELOPMENT 2
CLEAR CREEK EASTERN SIDE CHANNEL DEVELOPMENT 2
KILLUTSAL CREEK REARING POND ENHANCEMENT 3

METHODS **3**

Deviations from the Standard REE Protocol *3*
FISH SAMPLING AND ANALYSIS 3
PROJECT OBJECTIVES: PHYSICAL CONDITION AND BIOLOGICAL PERFORMANCE 4

RESULTS **4**

Copper River 3km Headwater Pond *4*
Clear Creek Eastern Side Channel Lower Rearing Pond *5*
Killutsal Creek Lower Rearing Pond *5*
DISCUSSION 6

CONCLUSIONS AND RECOMMENDATIONS **8**

REFERENCES **9**

APPENDICES **10**

List of Figures

Figure 1: General Location Map of the Three Project Areas 2
Figure 2: Length-frequency histogram for juvenile coho: Copper, Killutsal and Clear Ponds 6
Figure 3: Length-frequency histogram for Dolly Varden char: Killutsal and Clear Ponds 7
Figure 4: Length-frequency histogram for cutthroat trout: Killutsal and Clear Ponds 7
Figure 5: Average length-weight relationship of juvenile coho: Copper, Killutsal and Clear ponds. 8

List of Appendices

Appendix 1: Photographs 11
Appendix 2 : Length Frequency Histograms and Length-Weight Relationships for fish captured in the Clear and Killutsal Ponds. 14
Appendix 3 : Example of Field Form for Project Performance Evaluation 19

INTRODUCTION

Acer Resource Consulting Ltd.(Acer) was retained as environmental consultant by Kingfisher Forest Sciences Co. Inc. on behalf of the Ministry of Water, Land and Air Protection (MWLAP) in the Kalum Forest District to collect baseline fish use data for three off-channel ponds constructed in 2000. Initial works were conducted under various local and provincial initiatives, including the Forest Renewal BC (FRBC) Watershed Restoration Program (WRP), Fisheries Renewal BC and the Kitsumkalum Watershed Restoration Program (KWRP). The three areas assessed during this project were the Copper River 3 Km Off-Channel Site, the Killustal Creek Rearing Ponds and the Clear Creek Eastern Side Channel Development. Funding for this project was provided by the provincial Forest Investment Account (FIA).

The primary objectives of the project were to design and implement a standard and repeatable fish sampling protocol to determine the fish species present and relative abundance of fish from year to year, and to collect length and weight data in order to estimate age classes and subjectively compare growth and production at each site. This project does not follow the standard MWLAP Routine Effectiveness Evaluation (REE) format due to the specific fish use information requested by MWLAP and recent REE reports for the three project areas (Sinkewicz, 2002, Grieve *et al.*, 2002). However, an effort was made to collect a selection of the standard REE information in order to assess project performance as outlined in the *Guidelines for Instream and Off-Channel Routine Effectiveness Evaluation* (MWLAP, 2003).

STUDY AREA AND ACCESS

The three ponds are located in the Killutsal Creek, Clear Creek and Copper River watersheds near Terrace, BC (Figure 1). The Copper and Killutsal ponds are directly accessible by road; the Clear Creek project area requires a short hike in from the end of a useable road. Specific directions to access each site are provided below.

COPPER RIVER 3 KM OFF-CHANNEL DEVELOPMENT

The Copper River watershed is a 5th order watershed draining into the Skeena River east of Terrace, BC. The Copper River has a wide floodplain with an actively shifting channel; the project area is located within the upper bench riparian forest on the left bank of the floodplain. To access the project area, drive east from Terrace on Hwy 37 for approximately 7 km to the Copper River Forest Service Road (FSR). Follow the Copper FSR to a small pullout at 2.8 km. Walk immediately downslope to the top end of the project area (headwater pond), approximately 20 m from the roadside.

CLEAR CREEK EASTERN SIDE CHANNEL DEVELOPMENT

Clear Creek is a tributary of the Kalum River, located approximately 40 km north of Terrace. To access the project site, drive north from Terrace on the Nisga'a Highway and turn right on Egan Road in the village of Rosswood. Turn right on Geir Road, drive to the end of the road and follow the FSR to a junction. Turn left at the junction and follow this road up a hill and to the next junction. Turn right at this junction and drive to a landing/turnaround. Park at the landing and follow the deactivated road on foot down to Clear Creek. Cross Clear Creek and follow the deactivated road approximately 100 m to the project site. A large sign with a detailed map of the project is located at the middle pond of the project site. Fish sampling for this project was completed at the lower pond of the project site.

KILLUTSAL CREEK REARING PONDS

Killutsal Creek is a small tributary to the lower Lakelse River, located approximately 15 km southwest of Terrace, BC. To access the project area from Terrace, drive south on Queensway to the Old Remo Road, turn left on the Whitebottom FSR. Turn left on the White FSR, approximately 200 m past the Lakelse River

bridge. The project area is approximately 500 m up the road. The pond assessed during this project is located on the north side of the road.

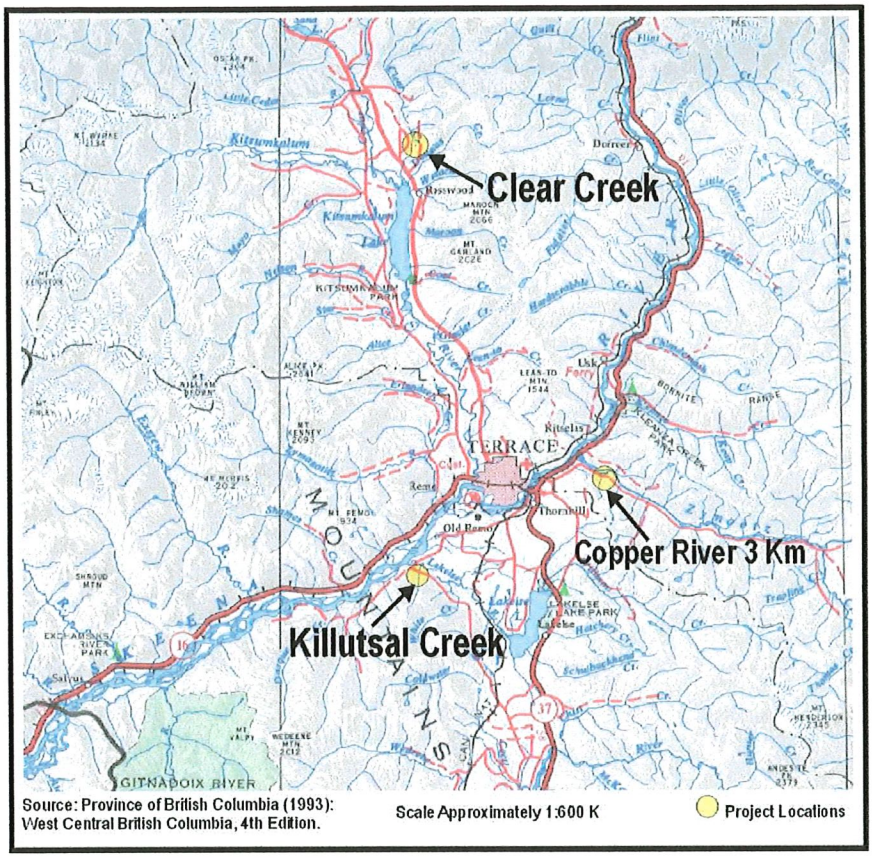


Figure 1: General Location Map of the Three Project Areas.

BACKGROUND

COPPER RIVER 3 KM OFF-CHANNEL DEVELOPMENT

The Copper River 3 km Off-channel project was initially developed in 2000 as a 180 m groundwater fed channel to improve and increase rearing and overwintering habitat for juvenile coho in the lower Copper River watershed. Four small alcove ponds were added to the upper 100 m of the project in 2001 to provide additional rearing and overwintering habitat for juvenile coho (Triton, 2002, Grieve *et al.*, 2002). The current assessment by Acer focused fish sampling and habitat evaluation on the 40 m^2 headwater pond (Pond 1 *in* Triton, 2002).

CLEAR CREEK EASTERN SIDE CHANNEL DEVELOPMENT

The Clear Creek Eastern Side Channel Development (ESC) was installed between 1998 and 2000, with the rearing ponds developed as the final stage of the project. The main project objectives were to enhance recovery of coho by improving and increasing rearing and spawning habitat for anadromous and resident salmonids (Reese-Hansen *et al.*, 2001a). Constructed rearing pond habitat included a total of 8140 m^2 spread over 2 distinct areas. The current assessment by Acer focused fish sampling and habitat evaluation in the 1190 m^2 lower rearing pond (Site 4 *in* Sinkewicz, 2001).

KILLUTSAL CREEK REARING POND ENHANCEMENT

The Killutsal Creek Rearing Pond Enhancement project was constructed in September 2000 to increase salmonid rearing habitat, prevent flooding of the White Forest Service Road (FSR) and to reduce negative impacts from the road on fish (Reese-Hansen *et al.*, 2001). Approximately 4180 m^2 of rearing pond habitat was developed at the site, including an upper and lower pond of 900 m^2 and 1810 m^2 respectively. The current assessment by Acer focused fish sampling and habitat evaluation on the lower pond.

METHODS

Deviations from the Standard REE Protocol

The standard REE uses a 4 point scoring system based on a qualitative assessment which rates up to five (5) Biological Performance Objectives and eleven (11) Physical Condition parameters for off-channel projects. A score of 4 in any category indicates that site conditions are exceeding expectations and objectives while a score of 1 indicates that site conditions have failed to meet expectations and objectives (MWLAP, 2003). The output is an overall mean rating of 1-4 for Biological Performance Objectives and Physical Condition. Results from previous REEs completed in the study area are based on this system.

Acer used the relevant parameters for off-channel REE found in the Guidelines (MWLAP, 2003) but opted to record and present results as qualitative text (including ratings of excellent, good, moderate and poor) rather than by standard performance scores of 1 - 4 in order to provide more meaningful results. In addition, the focus of this assessment was on fish use and project performance this perspective; a detailed assessment of the physical condition and function of installations and structures was not within the scope of this project. This was due to the specific request by MWLAP for baseline fish use information and the existence of completed REEs providing recent project performance results for each area.

FISH SAMPLING AND ANALYSIS

Fish sampling for this project was designed to accommodate a limited budget and to facilitate repeat sampling and catch comparisons in the future. At each of the 3 project areas, a single pond was selected for single-effort sampling. Gee-type minnow traps baited with 10-15 grams of untreated salmon roe were set and soaked overnight for between 20 and 24 hours. At the larger Clear and Killustal pond sites (1190 m^2 and 1810 m^2 respectively), 20 traps were set to achieve good coverage; at the significantly smaller Copper River headwater pond (40 m^2) only 10 traps were required to sample the entire pond. Sampling was conducted between November 5th and December 7th, 2003 on a falling hydrograph. A 5 cm layer of ice covered the majority of the Killutsal and Clear ponds at the time of sampling.

At the Killutsal and Clear ponds, 10 permanent sampling stations were established using 6‘ rebar stakes pounded into the substrate and marked with pink flagging tape. Sampling stations were equally spaced at approximately 5 m apart along the perimeter of each pond. Minnow traps were set in pairs at each station and water depth, substrate type and the presence of cover elements was recorded. At the Copper River pond, traps were set in pairs equally spaced throughout, including a set in the middle of the pond at maxium depth.

Captured fish were held in 5 gallon buckets, anesthetized in an Alka Seltzer solution for handling, processed and allowed to recover in a separate bucket of clean water prior to release. Information recorded for each fish included species, fork-length (mm) and weight (g).

Fish sampling results were entered into an excel database for analysis; length frequency histograms were created to compare results from each pond for each species. No aging structures were collected for analysis, however, a limit of 70 mm fork-length was used as a guideline to distinguish between coho parr and smolts, based on physical characteristics consistent with smolting and supporting literature (Foy *et al.*, 2002).

Length-weight relationships were graphed for each species in order to compare the relative mass of fish between ponds. This comparison is based on the assumption that a higher weight-at-length can result in increased potential for overwinter survival and reflects a more productive aquatic environment. Due to the limited size and isolation of the Coppper River pond, fish sampling results could be compared to biostandards for smolt production in ponds provided in Koning and Keeley, 1997. Biostandards could not be applied to results from the Clear or Killutsal ponds due to their size and budgetary limitations which precluded using sampling techniques such as mark-recapture, which could provide population and/or fish density estimates.

PROJECT PERFORMANCE: BIOLOGICAL AND PHYSICAL

For each pond, a brief evaluation of physical condition and biological performance was completed, based on the *Guidelines for Instream and Off-Channel Routine Effectiveness Evaluation* (MLWAP, 2003) and background information defining initial project objectives for each site. A field form was developed to collect and record relevant information (Appendix III). The physical condition portion of the evaluation included qualitative assessments of cover elements, pool depth maintenance, intake and outlet integrity and function, flow, revegetation success, berm stability and overall performance. Water quality measures included dissolved oxygen (DO mg/L) and temperature (^{0}C).

The biological performance evaluation included assessing fish use, primary production and habitat quality for rearing salmonids, with an emphasis on overwintering and according to initial project objectives. Fish sampling results form the major portion of the biological performance evaluation; this is primarily subjective, based on catch comparisons, due to the absence of population or fish density estimates. Photographs for each site are presented in Appendix I.

RESULTS

Copper River 3km Headwater Pond

A recent REE completed at this site in March 2002 resulted in an overall performance rating of 2 out of 4, indicating that site conditions resulting from works were failing to meet physical and biological expectations or objectives (Grieve *et al.*, 2002). This was primarily attributed to winter dewatering between ponds and at the outlet. The REE did note, however, that the constructed pond habitat was functioning well biologically, providing deep overwintering areas for juvenile coho and cutthroat trout.

The current assessment of the headwater pond (Pond 1) concurred with previous REE results, noting moderate to poor overall project performance for the same reasons. The headwater pond remains isolated from the other ponds and the site remains isolated from the mainstem due to winter dewatering. Biological performance objectives are therefore not being met due to limited fish access and use of the pond, and stranding of fish. In addition, several redds observed near the outlet of the project were dry or in very shallow water, indicating poor incubation conditions due to limited flow. In terms of overall physical condition and quality of rearing habitat, however, the pond maintains deep pools with stable LWD cover; with no evidence of significant shifting, infilling or overall instability. Dissolved oxygen and temperature were measured at 6 mg/L and 5^{0}C and primary production was considered adequate to support salmonids.

Fish sampling on December 6th and 7th, 2003 in the headwater pond resulted in 4 juvenile coho ranging from 104-125 mm in fork length. As the headwater pond is relatively small (40 m^2) and isolated, the current sampling results likely represent the entire population. Under this assumption, the calculated fish density for coho in the pond is 0.1 smolts / m^2 (4 fish/40 m^2). When this result is compared to a biostandard for coho smolts in ponds of 0.69 fish / m^2 (Koning and Keeley, 1997), it is clear that the pond is functioning below capacity for coho production. In addition, the size and physical appearance of these fish (large, silvery, indistinct parr marks) may indicate that they were stranded as smolts in the headwater pond during the 2003 spring outmigration. In summary, the headwater pond provides increased overwintering habitat for juvenile

coho consistent with biological objectives, however fish use is below expectations due to access restrictions and dewatering.

Clear Creek Eastern Side Channel Lower Rearing Pond

A standard REE was completed for the Clear Creek ESC project by KWRP in 2002 (Sinkewicz, 2002). This assessment resulted in overall performance rating of 3 out of 4, indicating that site conditions resulting from works are meeting project expectations and objectives.

The current assessment of the 1190 m^2 lower pond (Site 4) found improved results for overall project performance, with both physical condition and biological performance at the site rated as excellent. Good to excellent results were noted for berm stability, cover elements, intake and outlet integrity and function, pool depth maintenance and flow. The site has maintained stable complex LWD cover and deep pool habitat with no evidence of significant infilling, collapse, shifting or damage from a recent extreme high water event. The pond also produced good results for water quality with DO and temperature measured at 9.5-10.5 mg/L and 2^0C under ice at the furthest point from the inlet. Although ice covered a substantial portion of the pond at the time of survey, open water areas were present at the intake and outlet, and near groundwater seepage areas.

The pond is achieving biological objectives by providing excellent quality, stable overwintering habitat for salmonids. Based on fish capture results and subjective analysis, the pond habitat has likely increased productivity of coho and resident species in the Clear Creek system. Fish sampling in the Clear Creek Pond on November 7th and 8th, 2003 resulted in a total catch of 111 coho, 35 cutthroat trout and 145 Dolly Varden ranging in fork-length from 72-118 mm, 80-165 mm and 60-175 mm respectively. See 'Discussion' below for further analysis of fish use and biological performance.

Killutsal Creek Lower Rearing Pond

A standard REE was completed by KWRP in 2002, resulting in overall physical condition and biological performance ratings of 4 and 3 respectively out of a possible 4 for each category (Sinkewicz, 2002). These scores indicate that the site conditions resulting from works were meeting or exceeding expectations and objectives at the time of the REE survey. The REE also noted good stability for the constructed berms and the elimination of flooding on the White FSR.

The current assessment by Acer on the 1810 m^2 lower pond concurred with the previous REE, finding good to excellent overall project performance. The project is still meeting initial biological objectives of increasing coho rearing and overwintering habitat, and eliminating flooding on the White FSR and associated fish-road conflicts. In terms of physical condition, Acer noted good to excellent results for berm stability, intake and outlet integrity and function, pool depth maintenance and flow. Although minor beaver activity was noted at the intake and outlet, dam building does not appear to threaten the project or reduce the overall condition or biological performance of the pond. In terms of rearing quality, the pond provides excellent overwintering habitat with adequate primary production, stable complex LWD cover and deep pools. No evidence of significant infilling, collapse, shifting or damage to the site was noted following a recent extreme high water event. The pond also produced good results for water quality with DO and temperature measured at 10 mg/L and 1^0C at the furthest point from the intake beneath ice. Although ice covered a substantial portion of the pond, open water areas were present at the intake and outlet due to flowing water in Killutsal Creek.

Fish sampling in the Killutsal pond on November 5th and 6th, 2003 resulted in a total catch of 81 coho, 3 cutthroat trout and 7 Dolly Varden char with fork lengths ranging from 49 to 118 mm, 88 to 148 mm and 108-138 mm respectively. See 'Discussion' below for further analysis of fish use and biological performance.

DISCUSSION

The Clear Creek pond had the highest overall number of fish captured for each species, as well as the best distribution of sizes and largest specimens for Dolly Varden and cutthroat trout at 175 mm and 165 mm respectively. The Killutsal pond however, exhibited the widest range of size classes for coho. The Copper River exhibited both the lowest species diversity and range of size classes, with only 4 coho captured, all within the same length range. Length-frequency results for juvenile coho, Dolly Varden char and cutthroat trout captured at the pond sites are shown in Figures 2 to 4, below.

Juvenile coho age classes for all three systems were defined as 0+ (parr) for fish less than 70 mm in fork length, and 1+ (smolts) for fish greater than 70 mm. Coho from all sites ranged from 49 mm to 125 mm in fork-length and likely represent 3 age classes: 0+ parr, 1+ and 2+ smolts. Although a distinct 2+ age class did not emerge from the data, it is likely that the largest cohort of coho captured fall into the 2+ category (i.e.: > 100 mm). In the case of the Copper River pond, the fish are suspected to be 2+ age class or greater due to spring stranding, whereas in the case of the Clear and Killutsal ponds, exceptional productivity may be resulting in larger (>100 mm) 1+ smolts which emigrate after two winters. In the absence of aging structure analysis however, these theories can not be confirmed.

In the Clear Creek pond a distinct lack of coho of less than 72 mm in fork length (i.e.: no parr, or 0+ age class) occurs (Figure 2); this is likely due to predation by a cohort of large (> 140 mm) Dolly Varden and cutthroat trout present in the same pond (Figures 3 and 4). In addition, only 4 Dolly Varden and 3 cutthroat trout were captured at the Killutsal Creek pond, compared with 145 Dolly Varden and 34 cutthroat trout in the Clear Creek pond; indicating a considerably higher predation threat for coho fry and parr at Clear Creek.

The average length-weight relationship of juvenile coho captured at the three sites is provided in Figure 5. This figure shows that the Killutsal coho smolts between 70 and 110 mm were slightly heavier or more robust on average than their counterparts of the same length in the Clear Creek pond. As compared with the other project areas, coho captured at the Copper River 3 km pond are generally longer (Figure 2), but not necessarily more robust (heavier) than coho of similar lengths captured in the Clear and Killutsal ponds (Figure 5). Individual length-frequency histograms and average length-weight relationships for all species captured in the Clear Creek pond and for coho in the Killutsal pond are provided in Appendix II.

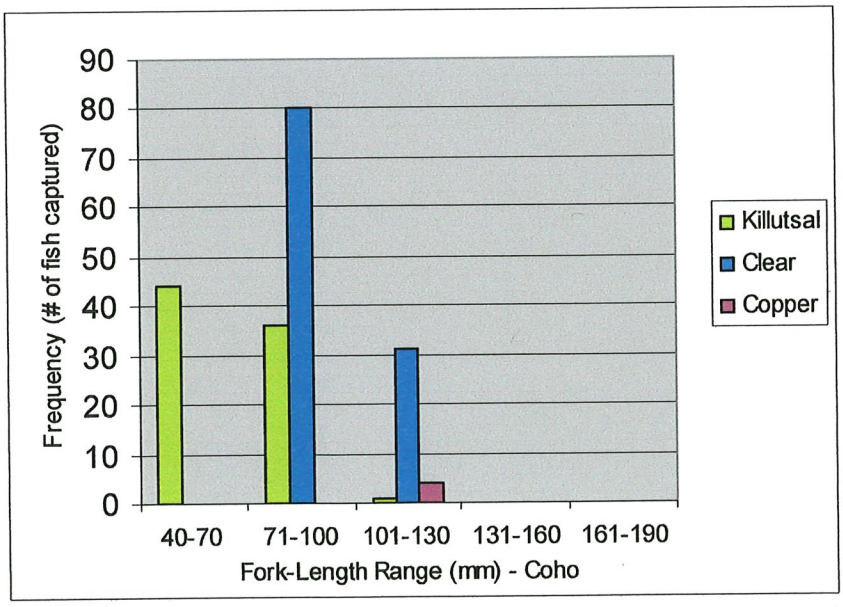


Figure 2: Length-frequency histogram for juvenile coho: Copper, Killutsal and Clear Ponds

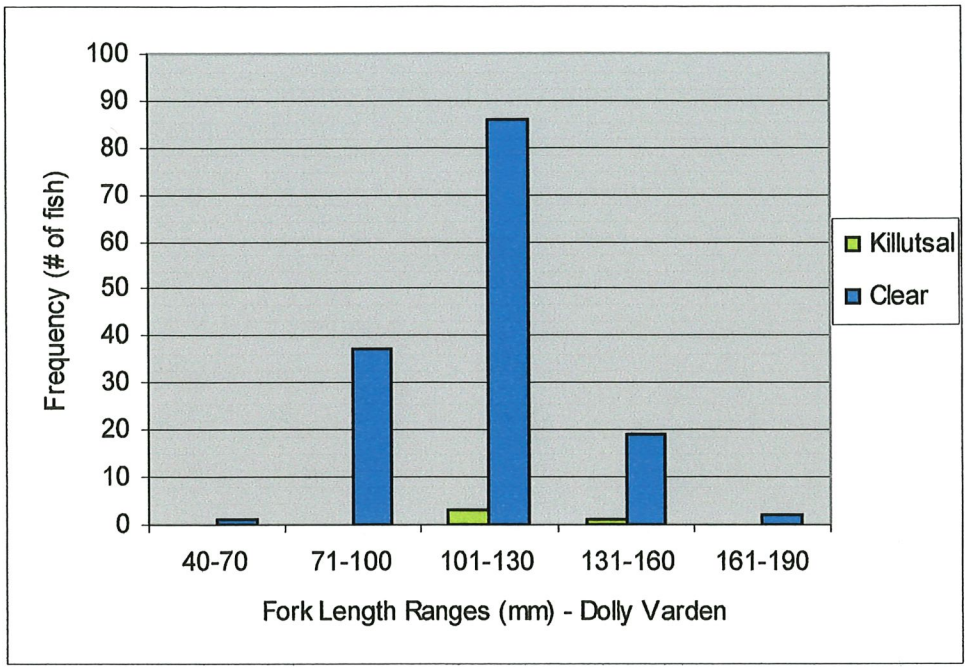


Figure 3: Length-frequency histogram for Dolly Varden char: Killutsal and Clear Ponds

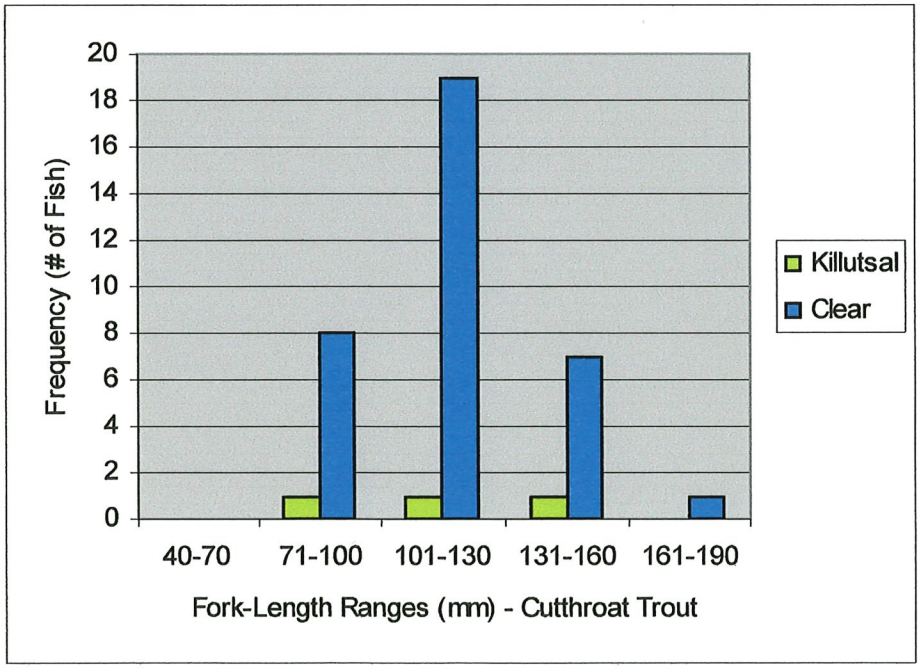


Figure 4: Length-frequency histogram for cutthroat trout: Killutsal and Clear Ponds

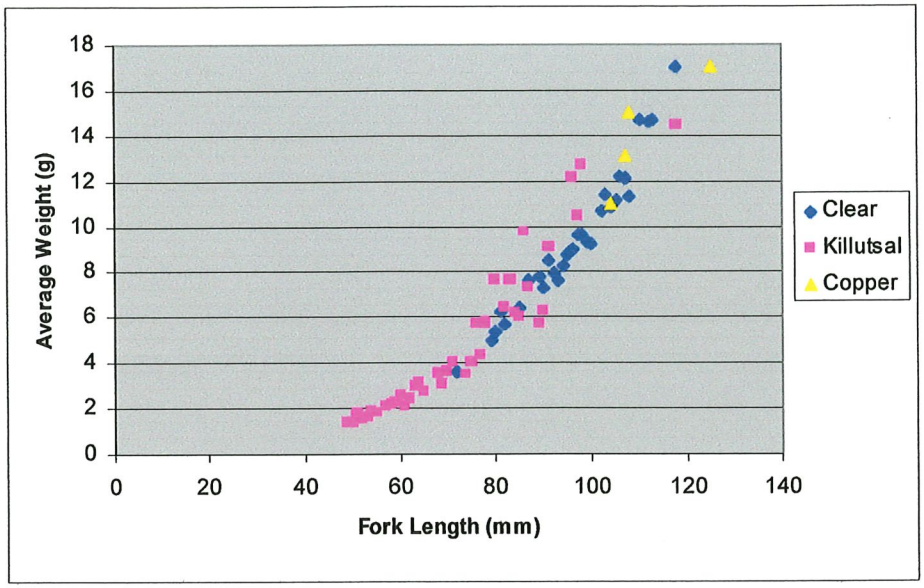


Figure 5: Average length-weight relationship of juvenile coho: Copper, Killutsal and Clear ponds.

CONCLUSIONS AND RECOMMENDATIONS

The overall project performance of both the Killutsal and Clear Creek rearing ponds is good to excellent; the sites are functioning well both physically and biologically, and are providing increased rearing habitat for anadromous and resident salmonids, including coho, cutthroat trout and Dolly Varden char. These results are consistent with initial project objectives and expectations and conditions at both sites will likely remain the same or improve over the next year. The overall performance of the Clear Creek site is considered to be slightly better than the Killutsal site, based on increased fish captures for the same sampling effort, and the excellent overall physical condition of installations and constructed features. The overall performance of the Copper River 3 km headwater pond is moderate due to winter dewatering between ponds and at the outlet resulting in reduced fish access and use. The headwater pond, however, contains ice-free, deep pool habitat with stable LWD cover and supports a small number of overwintering coho. Increased use of the headwater pond by overwintering coho could be achieved by resolving dewatering and fish access issues.

It is recommended that winter sampling be repeated in the identical manner in the Clear Creek and Killutsal Creek ponds in 2004 in order to document improvements or changes in fish use and species composition from year to year. Fish sampling at the Copper River 3 km project site should be expanded to include minnow trapping in the most downstream pond (Pond 4 *in* Triton, 2002) in order to provide a better overall indication of fish use, access and species composition throughout the project site. The addition of 10 traps in Pond 4 is recommended to achieve this, and to improve consistency in terms of sampling effort and catch comparisons between the three project areas. In addition, it may be worthwhile to conduct a late spring (April – May) field review of the Copper 3 km site to assess conditions for juvenile outmigration and determine whether or not stranding is occurring. This could provide insight into improving year round fish access at the site. Timing for this assessment should coincide with freshet and/or the falling hydrograph immediately thereafter, when coho smolts are typically moving downstream.

REFERENCES

Foy, M., Beardmore, H. and S. Gidora. 2002. Cheakamus River Coho Salmon Production From Constructed Off-Channel Habitat 2001. Lower Mainland BCH Habitat Restoration 2000-2001. Resource restoration Group, Habitat and Enhancement Branch, Lower Fraser Area, Pacific Region, Fisheries and Oceans Canada.

Grieve, G. (Biolith Scientific Consultants Ltd), Giesbrecht, S. and S. Jennings (Triton Environmental Consultants Ltd.). 2002. Routine Effectiveness Evaluation Off-channel ponds and debris structures. Prepared for the Kitsumkalum Band Council and the Ministry of Water, Land and Air Protection, Terrace, BC.

Koning, C.W., and Keeley, R. 1997. *Salmonid Biostandards for Estimating Production Benefits of Fish Habitat Rehabilitation Techniques.* P.A. Slaney and D. Zaldokas [eds.] Fish Habitat Rehabilitation Procedures, Watershed Restoration Technical Circular No. 9. Ministry of Environment, Lands and Parks and Ministry of Forests, British Columbia.

Ministry of Water, Land and Air Protection. 2003. Guidelines for In-Stream and Off-Channel Routine Effectiveness Evaluation, April 2003. Province of British Columbia. (*http://wlapwww.gov.bc.ca/wld/documents/fia_docs/ree_guidelines.pdf*)

Reese-Hansen, L., K. Sinkewicz and L. Bolton. 2001. Killutsal Creek Rearing Pond Enhancement. Prepared for the Kitsumkalum Band Council and Ministry of Environment, Lands and Parks and Fisheries Renewal, BC, Kalum Forest District, Terrace, BC.

Reese-Hansen, L., K. Sinkewicz and L. Bolton. 2001a. Clear Creek Eastern Side Channel Development (Phase III) Year 2000. Prepared for the Kitsumkalum Band Council and the Ministry of Environment, Lands and Parks, Kalum Forest District, Terrace, BC.

Sinkewicz, K. 2001. Instream Monitoring 2000/01. Prepared for the Kitsumkalum Band Council and the Ministry of Environment, Lands and Parks, Kalum Forest District, Terrace, BC.

Sinkewicz, K. 2002. Instream, Off-channel and Hydrological Effectiveness Evaluation, 2001/02. Prepared for the Kitsumkalum Watershed Restoration Program and the Ministry of Water, Land and Air Protection, Kalum Forest District, Terrace, BC.

Triton Environmental Consultants Ltd. 2002. Copper River Watershed Restoration, 2001-02 Constructed Works, Site 77 and 3 Km Ponds. Prepared for the Kitsumkalum Band Council and the Ministry of Water, Land and Air Protection, Terrace, BC.

APPENDICES

Appendix 1: Photographs

Copper River 3 Km Headwater Pond, showing dewatering at outlet, December 7th, 2003.

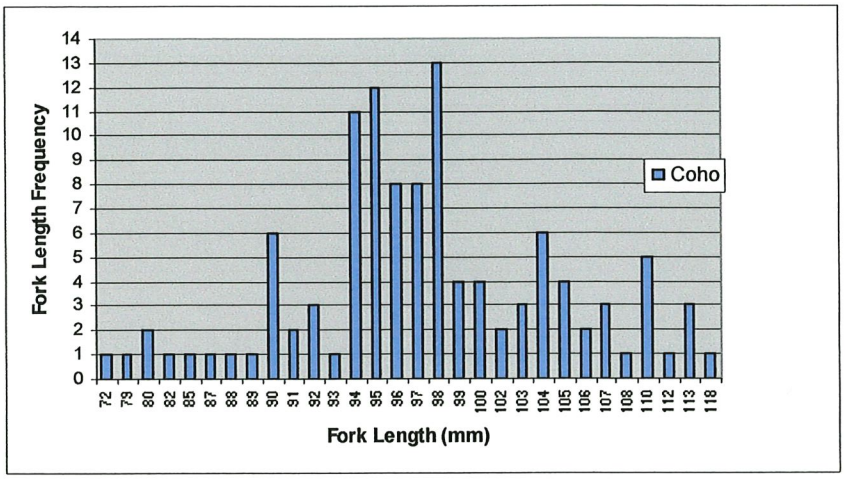
Killutsal Creek Lower Rearing Pond, November 6th, 2003.

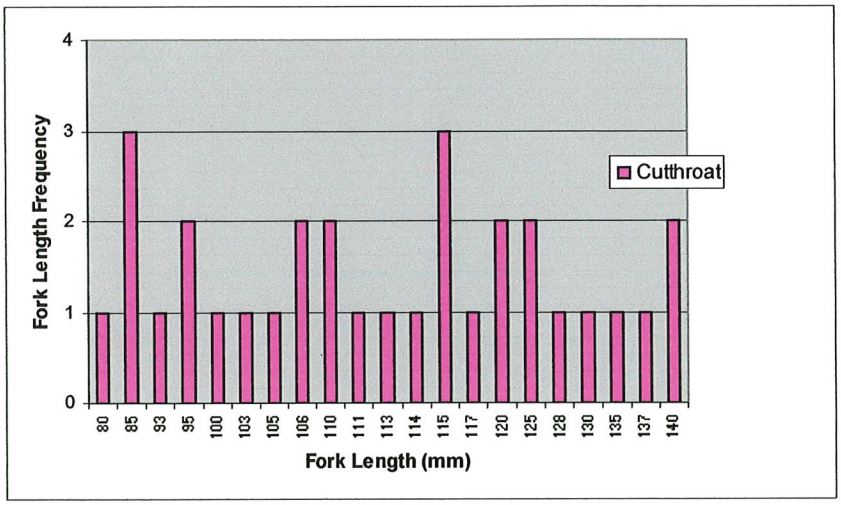
Clear Creek Eastern Side Channel, Lower Pond covered with ice, November 7th, 2003.

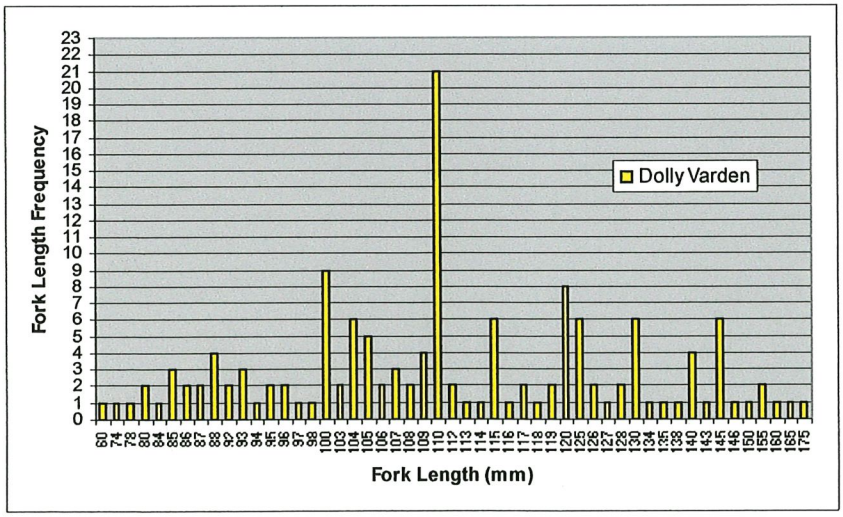
Clear Creek Eastern Side Channel, Lower Pond, ice-free area near intake, November 7th, 2003.

Appendix 2 : Length Frequency Histograms and Length-Weight Relationships for fish captured in the Clear and Killutsal Ponds.

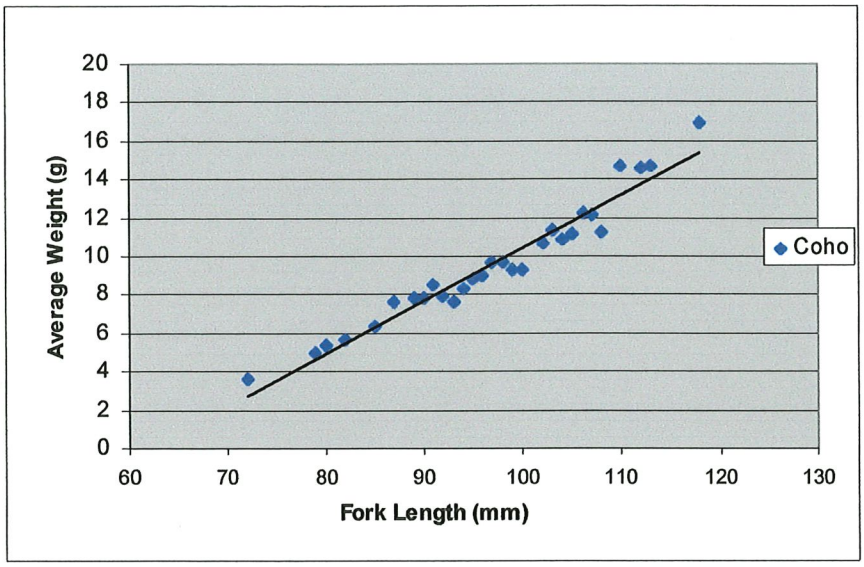
Clear Creek

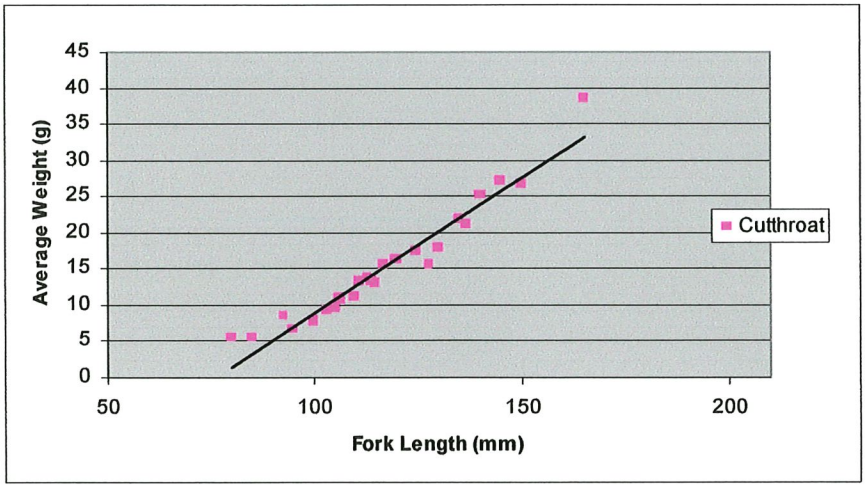

Fork Length Frequency
Fork Length (mm)
Coho

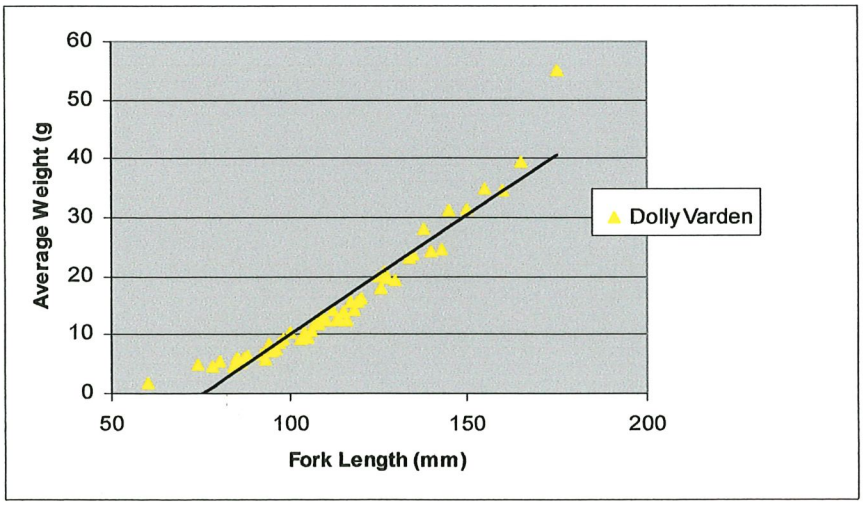

Fork Length Frequency
Fork Length (mm)
Cutthroat


Fork Length Frequency
Fork Length (mm)
Dolly Varden

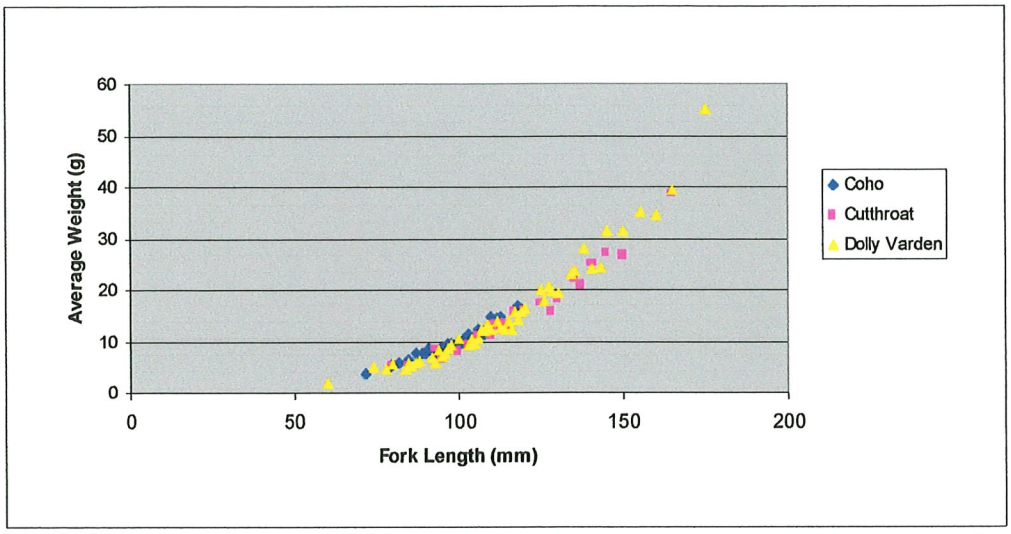
Clear Creek


Average Weight (g)
0
2
4
6
8
10
12
14
16
18
20
60
70
80
90
100
110
120
130
Fork Length (mm)
Coho

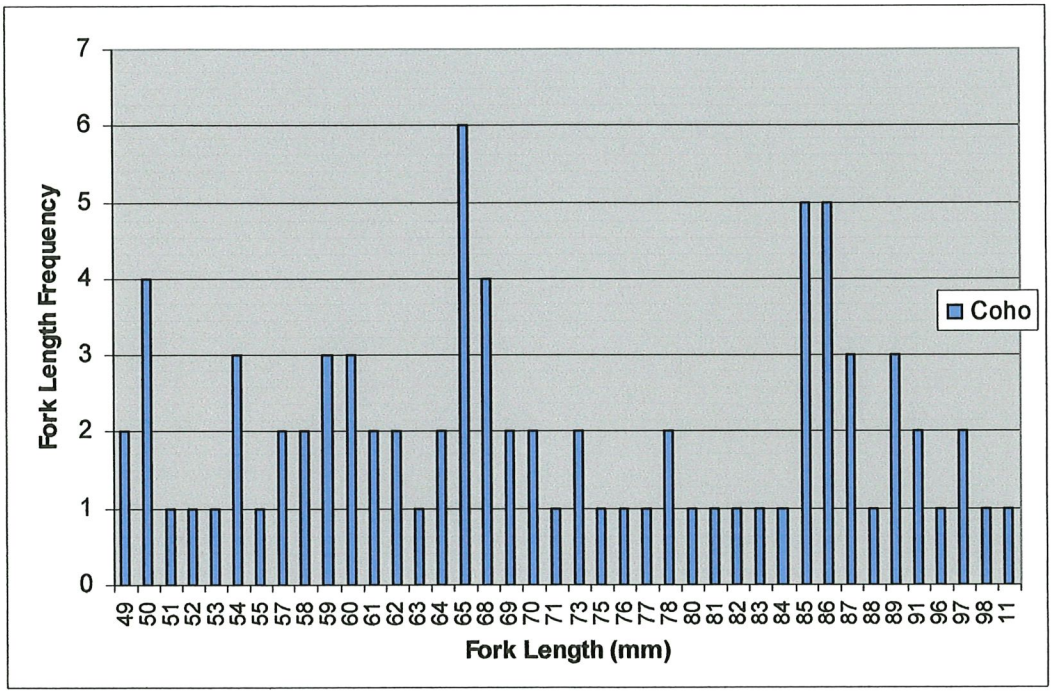

Average Weight (g)
0
5
10
15
20
25
30
35
40
45
50
100
150
200
Fork Length (mm)
Cutthroat

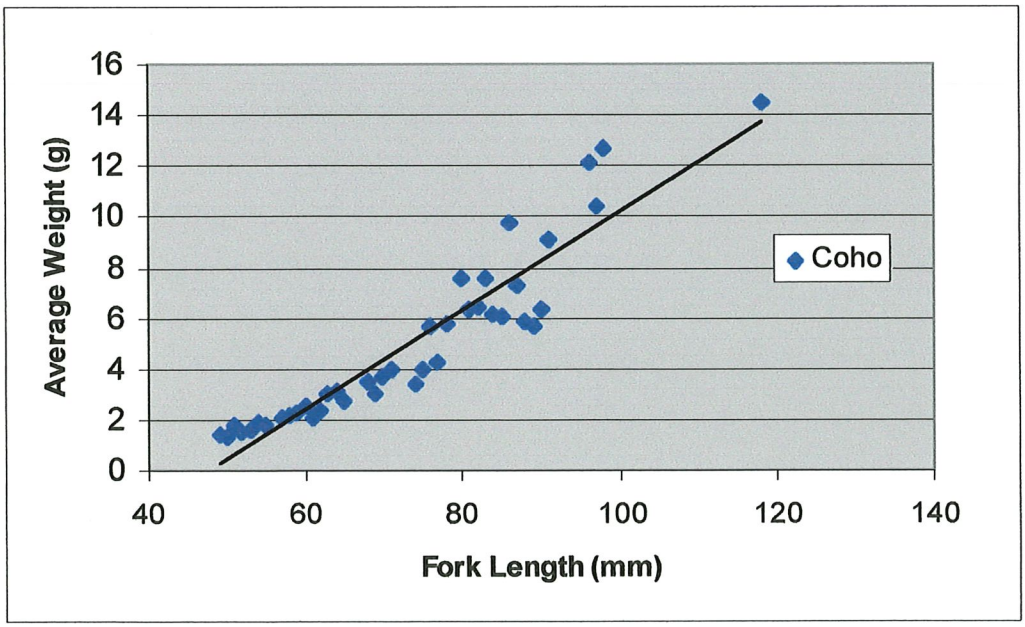

Average Weight (g
0
10
20
30
40
50
60
50
100
150
200
Fork Length (mm)
Dolly Varden

Clear Creek


Average Weight (g)
60
50
40
30
20
10
0
0
50
100
150
200
Fork Length (mm)
Coho
Cutthroat
Dolly Varden

Killutsal Creek





Appendix 3 : Example of Field Form for Project Performance Evaluation

Acer Resource Consulting Ltd.
WRP Pond Effectiveness Evaluation Field Form.....

Project Name, watershed:	**Site Location / Description:**
Date/Time:	**Weather/Air Temp:**
Crew:	**Days Since Rain Event :**
Access Issues?	**Falling Hydrograph? (Y/N)**
Other initial notes/ observations?	

Pond Physical Characteristics			
Pond Length:	Pond Width:	Pond Type (Surface or Groundwater):	
Pond Shape (describe and sketch on back):		Approx. Pond Surface Area (SA) in Ha (show calculations)	
Max depth estimate / location in pond:		Is cover present at max depth? (Y/N) Cover type:	
Approx. % deep (> 1 m):	Approx % moderate (0.5 to 1 m):	Approx. % shallow (< 0.5 m):	Approx. % of deep habitat (≥1m) with cover:
Water Quality			
Temperature:	DO:	pH and Conductivity:	Turbidity:
Project Performance and Biological Objectives			
Cover elements condition and function (Excellent/Good/Moderate/Poor- stability, recruitment, loss, movements):			
Cover Overall Rating (Excellent/Good/Moderate/Poor – comments)			
Percent (%) cover total:	Breakdown into cover types by % LWD, OH, UC, DP etc:		

Nutrients/Primary Production (circle one):

1. Sterile – little or no evidence of periphyton or primary production
2. Patchy – patches only, production appears inadequate to support target species.
3. Adequate – periphyton visible on substrate, benthic invertebrates visible. Sufficient litterfall to support benthic inverts.
4. Abundant – abundant periphyton and benthic invertebrates.

Comments:

Project Performance and Biological Objectives
Overwinter/Pool Depth Maintenance (Excellent/Good/Moderate/Poor and circle one) 1. Pools have filled in, there has been loss of habitat and LWD cover features, little overwintering habitat has been maintained 2. Deep pool areas have partially filled in, LWD has been lost from pools, little habitat diversity remains in deep pool areas. 3. Stable deep pools have been maintained, cover has been maintained. 4. Stable deep pools have been maintained, no evidence of filling or collapse, abundant LWD and overhanging cover persists, new cover elements have been recruited. Comments:
Rearing Quality (Excellent, Good, Moderate, Poor and comments re: overwinter, summer, refugia, perennial attributes, limitations, access, cover, flow, etc.):
Intake Integrity and Function (Excellent/Good/Moderate/Poor and comments re: scour, substrate infilling, obstructions, channel shifting, vegetation, bank stability, fish access, isolation)
Outlet Integrity and Function (Excellent/Good/Moderate/Poor and comments re: channel shifting, bank stability, access, dewatering, damage, etc):
Flow (Excellent/Good/Moderate/Poor and comments re: is flow consistent and adequate to avoid stranding/dewater during low periods, evidence of damage from high flows, subsurface flows or extreme variability?)
Revegetation (Rate as Excellent/Good/Moderate/Poor and note level of regeneration, recruitment, success of efforts, exposed areas, erosion etc.)
Berm Stability (Excellent/Good/Moderate/Poor with comments re: erosion, breaches, leaks, vegetation, undermining, failure):
Mainstem Stability (Excellent/Good/Moderate/Poor with comments re: proximity to project, lateral movements, threat to project?):
Overall Physical Condition/ Biological Objectives Rating (circle one): 1. Installations/constructed features are not functioning (physically/biologically) and have failed to meet objectives and expectations. 2. Installations/constructed features are poorly functioning and are failing to meet objectives and expectations. 3. Installations/constructed features are functioning and meeting objectives and expectations. 4. Installations/constructed features are functioning well and exceeding objectives and expectations. Comments:
Overall Project Performance Rating (circle one): 1. Site Conditions resulting from works have failed to meet objectives and expectations. 2. Site Conditions resulting from works are failing to meet objectives and expectations. 3. Site Conditions resulting from works are meeting objectives and expectations. 4. Site Conditions resulting from works are exceeding objectives and expectations. Comments:
Recommendations for Maintenance or Repairs:
Other Comments / Observations:

* Please sketch pond and trap locations, indicating trap number and features on back of form for reference.