

# Millard Creek Rearing Channel

## Fish Habitat & Channel Productivity Report 2011



Prepared for the Millard Piercy Watershed Stewards by K. Campbell  
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## Acknowledgements

Permission to use this Millard Creek photo was granted to K. Campbell for the Millard Piercy Stewards by local photographer Chris Carter.

To view more of Chris' work visit: [www.vanislandscapes.com](http://www.vanislandscapes.com)

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## Millard Piercy Watershed Stewards

Millard-Piercy Watershed Stewards is a non-profit organization with a mission to assess, restore, and maintain the ecosystems of the Millard-Piercy Watershed. We strive to promote community stewardship to help ensure long-term watershed protection to the benefit of both people and the natural environment.

We accomplish this by creating rewarding work opportunities for our volunteers that also help us to collect valuable information on the watershed, educating the community on the watershed and issues that affect it, taking action to protect the watershed against harmful activities, and undertaking restoration and enhancement activities that directly benefit fish and wildlife.

Millard-Piercy Watershed Stewards

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## Youth and Ecological Restoration Program

The Youth and Ecological Restoration Program provides youth under nineteen, who are struggling with a variety of issues in their lives, with one-on-one work experience, training and support.

Youth work with community members to restore the environmental health of local watersheds. Through this work youth learn social, communication and community building skills that will support them in becoming confident, respectful and productive members of our society.

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## Project Summary

In August 2011 a second fish habitat study in the Millard Creek side channel was conducted by the Youth and Ecological Restoration Program (YER) team under the guidance of YER Coordinator, Wendy Kotilla and Registered Professional Biologist, Ian Moul. An initial fish habitat study performed in 2008, was also done by YER with a report produced by Kathy Campbell in July 2011.

The study showed that the side channel has good water quality and provides critical summer rearing habitat for wild and enhanced coho salmon and cutthroat trout in the Millard watershed.

The project also provided valuable experience to Youth and Ecological Restoration Program Participants, as well as an opportunity for these youth to share their knowledge and experience with members of the public by conducting watershed tours highlighting their work.

## Youth and Ecological Restoration Participants



Figure 1. Cole Patterson and Ashley Steggles sample fish captured in the Millard Creek side channel.

## Millard Creek Rearing Channel Study 2011

On August 19<sup>th</sup> (Day 1) the team recorded environmental data and set 10 minnow traps along the side channel. On August 20<sup>th</sup> (Day 2) fish from the traps were weighed, measured and checked for adipose clips. The captured fish were then marked with a caudal fin clip before being released back to the area where they were captured. The traps were placed back at their fishing locations and were left to fish for a second night.

On Day 3 the fish captured in the traps were counted, weighed, measured and checked for caudal and adipose clips. The recapture of the caudal clipped is an indicator of trap fishing effectiveness as well as an index that can be used to estimate the fish population in the side channel.

The objectives of the project go beyond habitat assessment. This project also offers youth a place to learn about fish and their natural habitat. YER participants in this project learn technical skills of measuring fish habitat parameters, recording data, capturing, sampling and releasing fish. They also share what they have learned by leading a tour of the side channel that brings together their developing confidence, public presentation skills and technical information.



Figure 2. Biologist Ian Moul sets minnow traps in the Millard Creek side channel with Ashley and Cole.

## Project Location

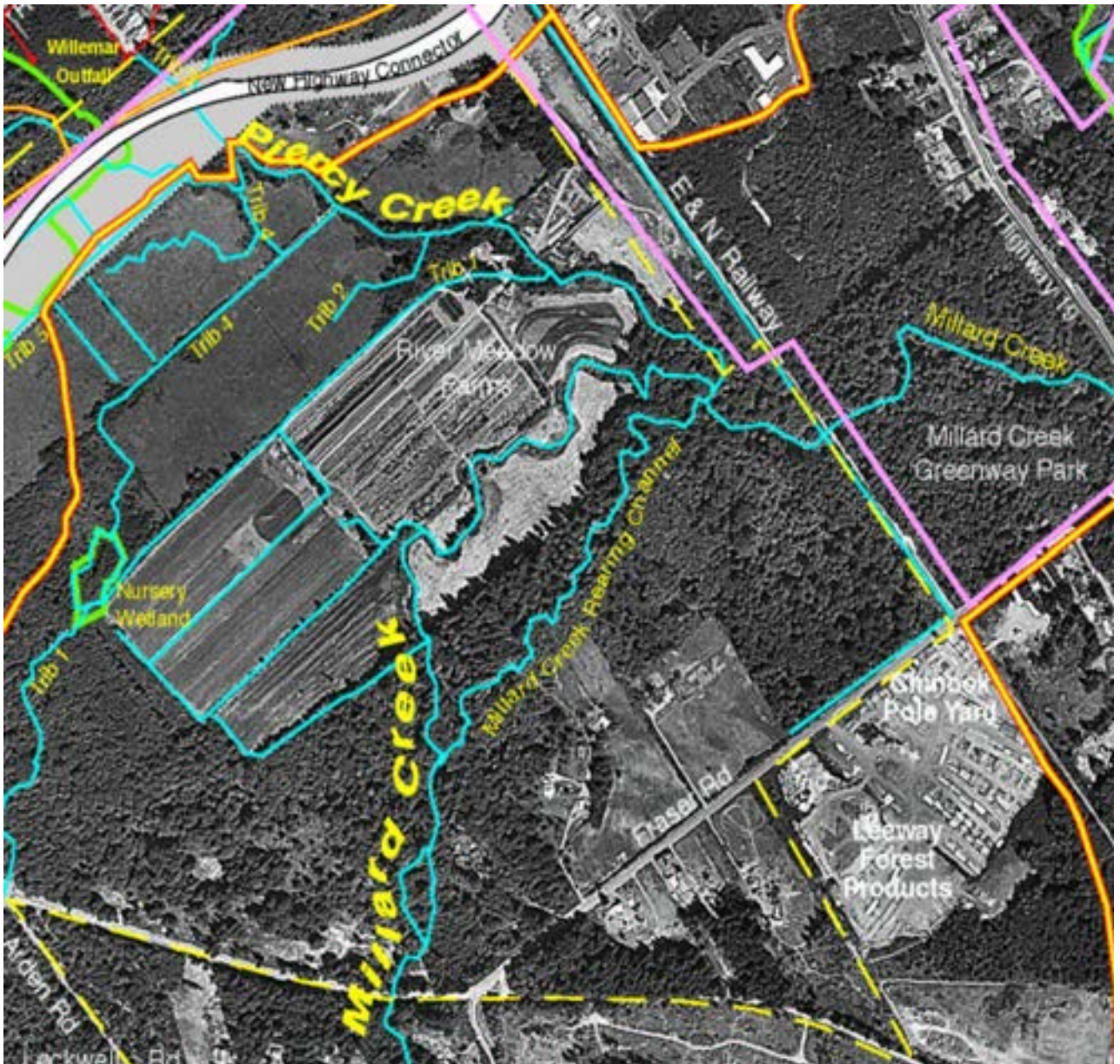


Figure 3. The Millard Creek side channel provides 800 m of rearing habitat in the Millard Creek watershed.

## Weather and Water Quality

	Day 1	Day 2	Day 3	Comments
Date	Aug 29.11	Aug 30.11	Aug 31.11	Crews baited traps with salted salmon roe
Time	10:45	9:30	9:30	Traps were left instream overnight.
Crew	Wendy Kotilla, Ian Moul and 2 YER participants			
Weather	Sunny	Sunny	Sunny	
Air Temp	18.3	16.0	13.0	
Rain past 24 hr	None	None	None	
<b>Water Quality</b>				
	Day 1	Day 2	Day 3	
	Aug 29.11	Aug 30.11	Aug 31.11	Comments
Temp °C	14.5	13.5	11.6	
pH	15	7.29	7.35	
TDS (mg/L)	81	81	80	Measured by TDS meter
D.O. (% Sat)	88%	95%	94%	92% Average Dissolved Oxygen Readings

Table 1. Environmental data collected in the Millard Creek Side Channel.

During 2008 and 2011 temperatures recorded during August in the Millard Creek Side Channel ranged from 11.6 degrees to 14.8 degrees indicating groundwater inflow that keeps water temperatures below normal surface water temperatures for Vancouver Island.

This thermal refuge habitat allows cold-blooded salmonids to access habitat that suits their metabolism. It would be interesting to expand the study to compare the number of fish rearing in Millard Creek with the number of fish rearing in the side channel.



## Habitat Features

Location #	Habitat Type	(cm) Depth 1	(cm) Depth 2	(cm) Depth 3	(cm) Depth 4	(cm) Depth 5	Wetted Width (m)	Channel Width (m)	Residual Depth (cm)	Comments
1	Pool	19.5	30.5	40.0	35.0	30.7	3.41	5.10	.75	
2	Pool	13.0	17.0	17.0	22.0	19.0	2.35	3.35	12	
3	Cutbank	14.0	17.0	14.0	12.0	5.0	1.30	1.54	10	
4	Glide	15.0	16.0	12.0	12.5	8.5	1.65	1.65	6	
5	Pool	12.0	16.0	12.0	9.0	11.0	2.20	2.90	NA	End of glide into the pool
6	Pool	11.0	40.0	49.0	26.0	20.0	2.62	3.50	34	
7	Glide	8.0	11.0	18.0	15.0	12.0	1.85	4.80	12	
8	Pool	30.0	38.0	34.0	17.5	6.0	4.00	4.90	20	
9	Pool	16.0	20.0	20.0	16.0	9.0	2.00	3.30	8	
10	Pool	17.0	21.0	25.0	24.0	15.0	2.20	4.48	27	

Table 2. Fish habitat types recorded along the Millard Side Channel.

The predominant habitat type in the channel is pool habitat which provides good rearing areas for coho and trout. Cutbank habitat also offers excellent refuge for rearing salmonids.

Residual pool depth is the difference in depth between the maximum pool depth and the depth of the water at the outlet of the pool. A large residual pool depth and lower water temperatures indicate that there is good summer rearing habitat available for salmonids.

## Trap Locations

	Trap		GPS				Date	Time		Time
Trap	Depth	GPS	UTM 10 U		Date	Time	Checked	Checked	Date	Checked
#	(cm)	Waypoint	East	North	Trap Set	In	& Reset	& Reset	Checked	& Reset
1	38		NA	NA	Aug 29.11	*10:00	Aug 30.11	10:30	Aug 31.11	10:30
2	28	174	356609	5502849	Aug 29.11	*10:30	Aug 30.11	10:50	Aug 31.11	10:50
3	20	175	356607	5502872	Aug 29.11	*11:00	Aug 30.11	11:05	Aug 31.11	11:05
4	33	167	355609	5502895	Aug 29.11	*11:30	Aug 30.11	11:58	Aug 31.11	11:58
5	14	168	356622	5501913	Aug 29.11	*12:00	Aug 30.11	12:18	Aug 31.11	12:18
6	42	169	356642	5502905	Aug 29.11	*12:30	Aug 30.11	12:35	Aug 31.11	12:35
7	14	177	356677	5502924	Aug 29.11	*13:00	Aug 30.11	12:40	Aug 31.11	12:40
8	55	170	356658	5502931	Aug 29.11	*13:30	Aug 30.11	13:15	Aug 31.11	13:15
9	21	171	356701	5502958	Aug 29.11	*14:00	Aug 30.11	13:40	Aug 31.11	13:40
10	33	172	356686	5502970	Aug 29.11	*14.20	Aug 30.11	13:50	Aug 31.11	13:50
Bottom	Stop Net	173	356703	5502977						

\* Trap set times estimated.

Table 3: Minnow traps placed along the side channel and set to fish overnight.

## Comparison of 2008 and 2011 Coho Data

	2008	2011	Comments
Start Date	19-Aug-08	29-Aug-08	
End Date	21-Aug-08	31-Aug-08	
Avg. Water Temp	12.9	13.2	Average water temperature in 2008 was within 0.3 degrees of average 2011 water temp
Average D.O. % Sat.	92.3	92.0	Average D.O. recorded in 2008 was 0.3% higher than in 2011
Average TDS mg/L	81	81	No recorded change in average total dissolved solids between 2008 and 2011
3 Day Avg Air Temp	13.7	15.8	Air temperature recorded in 2011 was 2.1 degrees warmer than recorded during 2008 study.
	<b>2008</b>	<b>2011</b>	<b>Comments</b>
Total # of Coho Captured	40	42	2 More coho captured in 2011 than in 2008
# Coho Captured Day 2	26	16	10 more coho captured on Day 1 in 2008 than in 2011
# Coho Captured Day 3	14	26	12 more coho captured on Day 2 in 2011 than in 2008
Largest Coho (gm)	7.63	4.70	Largest coho captured in 2008 weighed 2.9 g more than largest coho captured in 2011
Smallest Coho (gm)	3.69	1.10	Smallest coho captured in 2008 weighed 2.6 g more than largest coho captured in 2011
Average Coho (gm)	3.69	1.53	Average coho captured in 2008 weighed 2.17 g more than average coho captured in 2011
Average Kc	1.13	1.08	Condition indices' were 0.05 greater for coho captured in 2008 than in 2011
Average CPUE Coho Day 1	0.07	0.07	Coho Catch per Unit Effort equal in 2008 and 2011
Average CPUE Coho Day 2	0.06	0.11	Higher coho CPUE in 2011 than in 2008
Coho	<b>2008</b>	<b>2011</b>	<b>Comments</b>
Day 2 # Adipose Clipped	14	0	14 more clipped coho captured in 2008 than in 2011
Day 3 # Adipose Clipped	4	4	The same number of adipose clipped coho was captured in 2008 and 2011 on Day 3.
% Clipped Day 2	53.8%	0.0%	More adipose clipped coho were captured in 2008.
% Clipped Day 3	28.6%	15.4%	More adipose clipped coho were captured in 2011.

## Comparison of 2008 and 2011 Cutthroat Trout Data

	2008	2011	Comments
# Cutthroat Trout Captured	27	10	17 more cutthroat trout captured in 2008 than in 2011
Largest CT (gm)	31.4	39.2	The largest CT captured in 2011 was 7.8 g larger than the largest CT captured in 2008.
Smallest CT (gm)	1.1	1.2	The smallest CT captured in 2011 was 0.1 g larger than the largest CT captured in 2008.
Average CT (gm)	12.81	13.2	The average CT captured in 2011 was 0.4 g larger than the largest CT captured in 2008.
Average Kc	1.0	0.95	Condition indices were 0.05 greater for cutthroat captured in 2008 than in 2011
Average CPUE CT Day 1	0.09	0.03	Catch per Unit Effort for cutthroat trout was 3x higher on day 1 in 2008 than in 2011.
Average CPUE CT Day 2	0.08	0.11	Catch per Unit Effort was slightly (0.03) higher for CT on day 2 2011 than on day 2 2008.

### Minnow Trap Soaking Time Comparison 2008 and 2011

	2008	2011	Comments
Average Trap Soak Day 1	22.95	24.05	The traps were fishing 65 minutes longer on day 1 in 2011 than in 2008.
Average Trap Soak Day 2	23.43	23.72	The traps were fishing 17 minutes longer on day 2 in 2011 than in 2008.
Two Day Average:	23.19	23.88	Traps were set for an average of 42 minutes longer in 2011 than in 2008

Fish larger than 40 gm and smaller than 1 gm are not captured by the minnow traps. This study only reports on fish between 1 and 35 gm.

Trap orientation (directed toward stream flow), trap location, and bait used for the study may have varied between 2008 and 2011.

During both years Kc the condition indices of the trout captured indicate that the fish are healthy and well-fed.

## Catch per Unit Effort (CPUE) Day 1

Aug 30.11			Date	Time	Soak	16	7	Coho	Cutthroat
Trap	Date	Time	Checked	Checked	Time	Coho	CT	CPUE	CPUE
#	In	In	& Reset	& Reset	Hrs.	Captured	Captured	(# Fish/hr)	(# Fish/hr)
1	Aug 29.11	*10:00	Aug-30	10:30	24.5	4	2	0.16	0.08
2	Aug 29.11	*10:30	Aug-30	10:50	24.3	2	1	0.08	0.04
3	Aug 29.11	*11:00	Aug-30	11:05	24.1	3	1	0.12	0.04
4	Aug 29.11	*11:30	Aug-30	11:58	24.5	1	1	0.04	0.04
5	Aug 29.11	*12:00	Aug-30	12:18	24.3	2	0	0.08	0.00
6	Aug 29.11	*12:30	Aug-30	12:35	24.1	1	0	0.04	0.00
7	Aug 29.11	*13:00	Aug-30	12:40	23.7	3	2	0.13	0.08
8	Aug 29.11	*13:30	Aug-30	13:15	23.8	0	0	0.00	0.00
9	Aug 29.11	*14:00	Aug-30	13:40	23.7	0	0	0.00	0.00
10	Aug 29.11	*14:20	Aug-30	13:50	23.5	0	0	0.00	0.00

\* Times approximate Traps set between 10:00 and 14:20.

Catch per unit effort is calculated as the number of fish captured per hour of fishing time. CPUE can be increased by orienting traps into the flow of the channel, by locating traps in areas where fish are likely to be holding and by choosing trap sizes with openings larger than the target fish.

In this study the CPUE for coho was more than double CPUE for cutthroat. This may be due to a lower density of cutthroat trout or to a lower effectiveness of minnow traps catching larger fish.

## Catch per Unit Effort (CPUE) Day 2

Aug 31.11			Date	Time		26	2	Coho	Cutthroat
Trap	Date	Time	Checked	Checked	Soak	Coho	CT	CPUE	CPUE
#	In	In	& Reset	& Reset	Time	Captured	Captured	(hr)	(hr)
1	Aug 30.11	10:30	Aug 31.11	10:20	23.8	4	0	0.17	0.00
2	Aug 30.11	10:50	Aug 31.11	10:35	23.8	3	0	0.13	0.00
3	Aug 30.11	11:05	Aug 31.11	10:45	23.7	1	1	0.04	0.04
4	Aug 30.11	11:58	Aug 31.11	12:03	23.9	3	0	0.13	0.00
5	Aug 30.11	12:18	Aug 31.11	12:15	24.0	0	0	0.00	0.00
6	Aug 30.11	12:35	Aug 31.11	12:26	23.9	0	0	0.00	0.00
7	Aug 30.11	12:40	Aug 31.11	12:32	23.9	2	0	0.08	0.00
8	Aug 30.11	13:15	Aug 31.11	12:40	23.6	12	0	0.51	0.00
9	Aug 30.11	13:40	Aug 31.11	13:00	23.3	1	0	0.04	0.00
10	Aug 30.11	13:50	Aug 31.11	13:13	23.4	0	1	0.00	0.04

CPUE: Soak time is in hours and decimal hours

23.7     26     2     0.11     0.01

Very few cutthroat trout were caught on the second day. The low catch reduces the confidence that we can have in the cutthroat population estimate.

The number of coho captured on the second day was more than double the number of coho captured on day 1 suggesting that trap orientation may have played a part in fishing effectiveness on Day 1.

CPUE data collecting in 2008; Coho Day 1: 0.07 Cutthroat: 0.09 and Coho Day 2: 0.06 Cutthroat: 0.08 suggests that there was consistent fishing effort between the two dates and that effectiveness in capturing either species was similar.

## Millard Creek Side Channel 2011 Population Estimate

Using the data collected in the fry trapping studies, population estimates can be calculated for coho and cutthroat trout. The equation used for the population estimate is the Peterson-Mark Recapture Equation.

$$N = \frac{(C+1)(M+1)}{(R+1)} - 1$$

N= Estimate of population size at time of marking

C= Total individuals captured in the second sample

R= # Marked Individuals recaptured in the 2<sup>nd</sup> sample

### Population Estimates 2008 and 2011

	2008	2011	Comments
Coho	80	91	Population estimate indicates an increase of 11 coho in the 2011 sample
Cutthroat Trout	65	26	Population estimate indicates a decrease of 39 cutthroat trout in the 2011 sample

Minnow traps used in this study do not capture fish larger than 40 grams. Cutthroat larger than 40 gm may use the channel for rearing, but would not be represented in this population estimate (or smaller young of the year trout).

## Length-Weight Data

				Condition								Condition		
Aug-30	Trap	Length	Wgt	Index	Adipose	Caudal		Aug-30	Trap	Length	Wgt	Index	Adipose	Caudal
Coho	#	(mm)	(gm)	Kc	Clip	Clip		Cutthroat	#	(mm)	(gm)	Kc	Clip	Clip
1	1	61	2.5	1.10	No	NA		1	1	94	7.8	0.94	No	NA
2	1	51	1.3	0.98	No	NA		2	1	88	6.2	0.91	No	NA
3	1	49	1.2	1.02	No	NA		3	2	158	39.2	0.99	No	NA
4	1	54	1.6	1.02	No	NA		4	3	110	13.1	0.98	No	NA
5	2	64	2.9	1.11	No	NA		5	3	90	6.2	0.85	No	NA
6	2	60	2.2	1.02	No	NA		6	4	130	21.7	0.99	No	NA
7	3	57	1.8	0.97	No	NA		7	7	51	1.2	0.90	No	NA
8	3	50	1.1	0.88	No	NA		8	7	90	7.4	1.02	No	NA
9	3	55	1.6	0.96	No	NA								
10	4	60	2.6	1.20	No	NA		Condition Index formula:						
11	5	50	1.1	0.88	No	NA		K = $[(\text{body wgt in gx}100) / \text{length}^3 (\text{mm})] \times 1000$						
12	5	51	1.2	0.90	No	NA								
13	6	50	1.1	0.88	No	NA		Good Condition for Smolts = 1.0						
14	7	54	1.7	1.08	No	NA								
15	7	70	3.3	0.96	No	NA								
16	7	65	3.4	1.24	No	NA								



				Condition								Condition		
Aug-31	Trap	Length	Wgt	Index	Adipose	Caudal		Aug-31	Trap	Length	Wgt	Index	Adipose	Caudal
Coho	#	(mm)	(gm)	Kc	Clip	Clip		Cutthroat	#	(mm)	(gm)	Kc	Clip	Clip
1	1	62	2.5	1.05	No	Yes		3	1	105	10.4	0.90	No	No
2	1	57	2.0	1.08	No	No		10	1	110	12.8	0.96	Unkn	Unkn
3	1	65	2.7	0.98	No	No								
4	1	50	1.1	0.88	No	No								
5	2	70	3.5	1.02	No	No								
6	2	55	1.5	0.90	No	No								
7	2	63	2.2	0.88	No	No								
8	3	55	1.6	0.96	No	Yes								
9	4	49	1.1	0.93	No	No								
10	4	60	2.7	2.29	No	Yes								
11	4	50	1.4	0.65	No	No								
12	7	65	2.4	1.92	No	Yes								
13	7	68	3.3	1.20	No	No								
14	8	63	2.5	0.80	No	No								
15	8	75	4.2	1.68	Yes	No								
16	8	70	3.6	0.85	No	No								
17	8	53	1.6	0.47	No	No								
18	8	66	3.0	2.02	No	No								
19	8	70	3.6	1.04	No	No								
20	8	75	4.1	1.20	Yes	No								
21	8	65	2.8	0.66	No	No								
22	8	70	4.0	1.46	Yes	No								
23	8	63	2.6	0.76	No	No								
24	8	54	1.6	0.64	No	No								
25	8	75	4.7	2.98	No	No								
26	9	55	1.6	0.38	No	No								

## Condition Indices

		Condition					Condition	
Aug-30	Length	Wgt	Index		Aug-30	Length	Wgt	Index
Coho	(mm)	(gm)	Kc		Cutthroat	(mm)	(gm)	Kc
Max	70.0	3.4	1.24		Max	158.0	39.20	1.02
Min	49.0	1.1	0.88		Min	51.0	1.20	0.85
Mean	56.313	1.91	1.01		Mean	104.8	14.80	0.96

		Condition					Condition	
Aug-31	Length	Wgt	Index		Aug 31.11	Length	Wgt	Index
Coho	(mm)	(gm)	Kc		Cutthroat	(mm)	(gm)	Kc
Max	75.0	4.7	2.98		Max	110.0	12.8	0.96
Min	49.0	1.1	0.38		Min	105.0	10.4	0.90
Mean	62.72	2.6	1.14		Mean	107.5	11.6	0.93

The condition index is a calculation that relates the length of a fish to its body weight. For salmon fry and smolts condition indices that are approximately 1 show that fish are in good condition.

### Condition Index Formula:

$$Kc = [((\text{body wgt in gx100}) / \text{length}^3 (\text{mm}))] \times 1000$$

Fish with a Kc > 1 carry more body fat than fish with a Kc < 1. Condition indices reported in these samples indicate that fish are finding adequate food resources in the Millard Creek side channel.

## Sharing the Knowledge

After the fieldwork was completed YER participants Ashley and Cole lead a group of community members on a watershed walk to share their knowledge and skills. Participants explained how all aspects of fish habitat support populations of fish and other wildlife in and around the Millard Creek side channel.



Figure 5: YER participants lead a public tour along the Millard Creek side channel.

The tour is one of the tools that the YER program has created to encourage participants to develop healthy relationships with their communities and with the natural world. Youth participants in the program have done environmental work with volunteers from 30 environmental stewardship groups.

Since 2004 about 100 Comox Valley area communities groups have benefitted from the work done by YER participants. This year YER has resumed phase II of the program which includes participant-led tours and is encouraging the public to share in the learning experience.