Bellevue Summer Electrofishing 2013




Final Report

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City of Bellevue
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Executive Summary

Five urban streams in the City of Bellevue were sampled for fish presence/absence during the summer of 2013. Previously sampled sites included one site each on Kelsey Creek, Valley Creek, Richards Creek, and Newport Creek. Yarrow Creek at river mile (RM) 1.8, near 118th Ave NE, was fully sampled for the first time.

Results from Kelsey Creek (RM 3.97) showed relatively low native fish diversity and a low coho to cutthroat ratio (although this site showed the highest ratio among all sites). This may indicate that urban impacts are influencing fish populations in this creek. However, fish densities were similar to 1997 studies suggesting a highly stable section of Kelsey Creek. There is a hatchery augmentation program for 30,000 coho at river mile 3.8 in Kelsey Creek.

A mature habitat restoration site on Valley Creek (RM 0.2) was sampled, and results showed relatively low native fish diversity and a low coho to cutthroat ratio (only one juvenile coho was caught). Comparing 2013 results to past data shows that species density has been very consistent, which suggests a stable system. However, urban impacts have likely had an influence as shown by the very low coho to cutthroat ratio (0.01). New Zealand Mudsnails were detected in Valley Creek in 2012. Mudsnails were detected in stomach samples of three of the four size classes of cutthroat.

Juvenile coho were absent at Richards Creek (RM 0.9), however three species of native fish were caught (cutthroat, western brook lamprey and dace). Juvenile coho have been known to utilize Richards Creek as shown by their presence in the 1997 survey. Richards Creek does provide good rearing habitat for juvenile coho; other factors, such as lack of adult coho returning in 2012, impassable beaver dam complexes, and changing flow regimes may have contributed to lack of juvenile coho seen in 2013.

Fish passage is hydrologically blocked downstream of the sampling site on Yarrow Creek (RM 1.8) and prevents anadromous species access to the upper reaches. As expected, results showed very low diversity, with only cutthroat trout caught. The upper extent of the reach also is hydrologically blocked, potentially creating an isolated population of cutthroat.

Juvenile coho were absent at Newport Creek (RM 0.06), with only cutthroat being caught. Although only one other survey has been conducted at this site (in 1996), results showed a continued lack of juvenile coho presence and a very consistent cutthroat population.

Additional studies are recommended to further evaluate the effectiveness of existing and future capital projects for improving fish habitat and the success of salmonid supplementation efforts. Below is a detailed list of recommendations for the City of Bellevue to facilitate these actions.

- Sample upstream of the Yarrow Creek (RM 1.8) site, to determine if the cutthroat population between the hydrological barriers is indeed an isolated population.
- Stomach analysis, as well as the abundance and size distribution of cutthroat trout and other salmonids, in areas infested with New Zealand Mudsnails (*Potamopyrgus antipodarum*) should continue to be monitored.

- Compare diversity, size, and abundance of fish species across all years for sites with historical data. This will allow a historical trend analysis to determine if specific fish populations are declining or growing. Also, compare the size of coho and cutthroat fish populations to other Puget Sound lowland reference streams.
- Conduct electrofishing at low, middle, and upper reaches of creeks during the same sampling events to determine if salmonids and native fish are utilizing different habitats than in previous years. This may help determine more accurately the presence/absence of fish within a watershed.
- Determine fish condition index at electrofishing sites to determine relative health of priority fish species. The index could then be compared to other Western Washington urban streams where this particular measurement has been made. This information provides important biological information that can then be used to make better management decisions.
- Collect gut content data from priority salmonid species at current Benthic Index of Biotic Integrity (BIBI) sites to determine if aquatic or terrestrial prey items dominate. These data will help determine prey species availability and use by salmonids. Data collected can help determine if riparian and/or substrate improvements are necessary.
- Continue a consistent electrofishing program that visits the same sites during the same time of year to increase robustness of data for determination of status and trends of priority fish species.
- Add additional electrofishing dates earlier in the year at these same sites every five years to help determine seasonality of fish species use (e.g., May).
- Implement a study to evaluate selected electrofishing sites that have shown historical changes in species diversity and density. The study should evaluate temperature and flow conditions, and possibly other parameters, depending on site conditions.
- Include adult coho escapement data in the status and trends database in order to strengthen reasoning for lack of juvenile coho presence.

Data collected for native and non-native fish species presence, status, and trends in urban streams can be a useful tool in determining the health of urban streams. Implementing the recommendations mentioned above would help the City of Bellevue continue to ascertain if changes in fish populations and density are occurring, and if so, if they are the result of regional population trends, natural environmental changes, beneficial habitat modifications, or changes in land use in the local urban streams.

1.0 Introduction

Electrofishing was conducted at five urban streams in the City of Bellevue in July 2013. These streams included, Kelsey Creek, Valley Creek, Richards Creek, Yarrow Creek, and Newport Creek (a tributary to Coal Creek) (Figure 1). Both Valley and Richard Creeks are tributaries to Kelsey Creek. The City of Bellevue (The City) had not conducted a reach analysis at the site on Yarrow Creek prior to the summer of 2013. Historical data exist for the sampling sites on Kelsey Creek, Valley Creek, Richards Creek and Newport Creek. The Newport Creek sampling site (river mile [RM] 0.06) was last sampled in 1996. Both Kelsey Creek (RM 3.97) and Richards Creek (RM 0.9) sampling sites were last sampled in 1997. The Valley Creek sampling site was last sampled in 2010 and Yarrow Creek (RM 1.8) was fully sampled for the first time in 2013.

The purpose of electrofishing at these locations was to develop a baseline for fish species presence/absence and diversity, and evaluate trends in previously sampled locations. These sites were chosen to help evaluate and determine the effectiveness of habitat restoration or the significance of urban impacts. These sites can be revisited in coming years to determine if cumulative changes are having positive or detrimental effects on fish population structures.

This report describes the methods used for sampling, results from electrofishing in the summer of 2013, and recommendations for future actions. The data presented in this report represent a reference point from which the City can determine any possible changes in the status and trends of fish populations in response to local or larger environmental change.

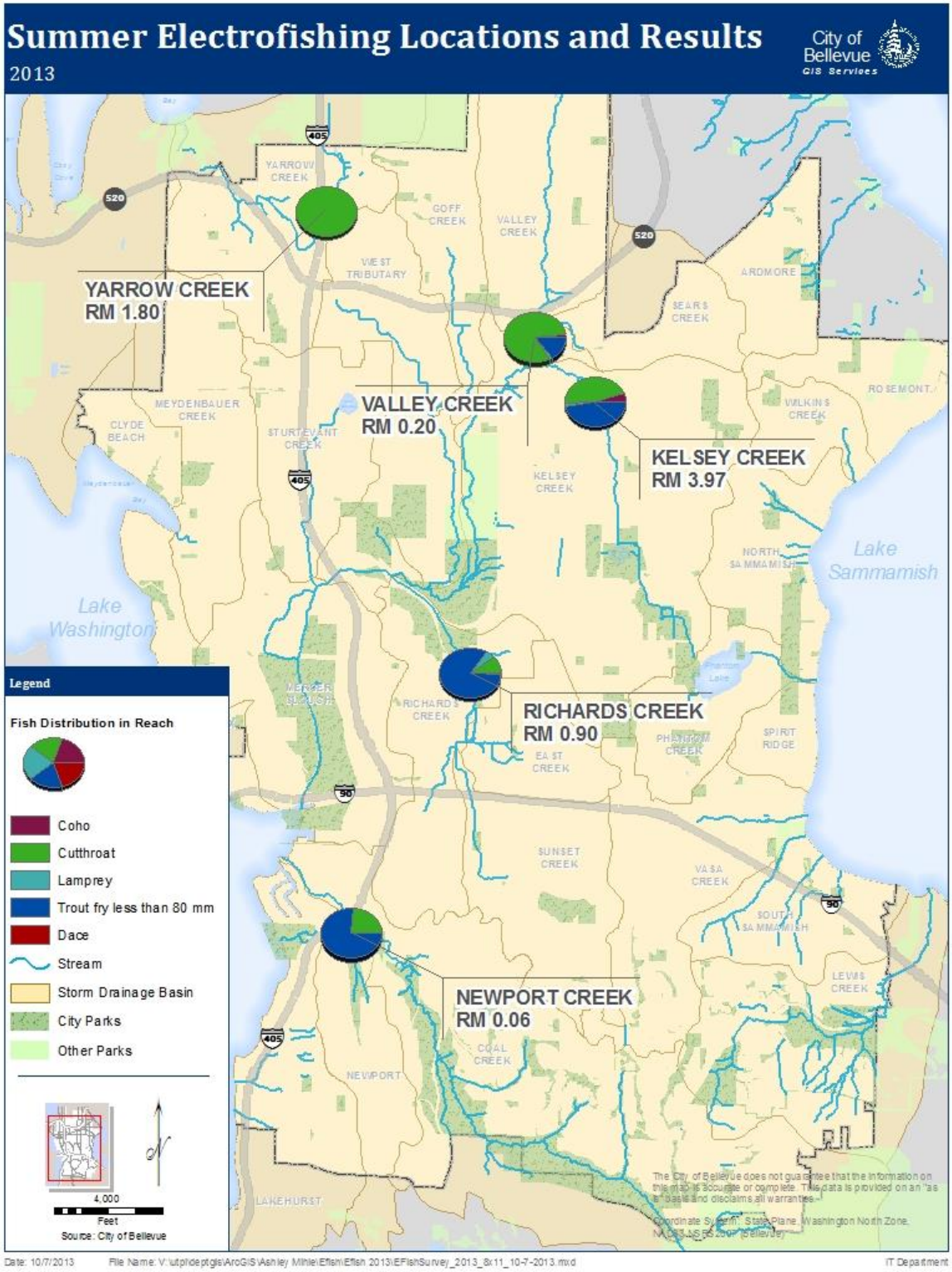

Figure 1. Map showing locations and results of electrofishing sites sampled in July 2013.

2.0 Methods

Electrofishing was performed on July 16, 19, and 23, 2013 (Table 1). One site was sampled on each of Kelsey Creek (RM 3.97), Valley Creek (RM 0.20), Richards Creek (0.90), Yarrow Creek (RM 1.80) and Newport Creek (RM 0.06).

Methods of sampling in 2013 were similar to past efforts by the City. Electrofishing was conducted using a Smith-Root Backpack Electrofisher Model 12b. Settings on the electrofishing equipment for Kelsey Creek, Richards Creek, and Newport Creek were most effective at 200 volts (v), 50 Hertz (Hz), and 6 milliseconds (ms). Settings were most effective at 200 v, 60 Hz, and 6 ms for Valley Creek. Voltage was lowered to 100 v for Yarrow Creek to reduce adverse effects on fish.

At most sites, block nets were placed at the bottom and top of each reach and a single pass was made with the electrofisher. At Yarrow Creek, only a downstream block net was used as a raised culvert marked the upper end of the reach. One person utilized the electrofishing backpack and two people with long-handled dip nets followed closely alongside to capture stunned fish[1]. Team members followed the electrofishing team with buckets of fresh stream water. Fish were tracked by habitat type (riffle or pool) and captured fish were placed in corresponding buckets. Captured fish were temporarily anesthetized on site using a dilute solution of MS-222 (Tricaine methanesulfonate) in water for identification and fork length measurements. Fish were then placed in fresh stream water supplied with an aerator until fully recovered. Once recovered, they were released on the outside of block nets so they would not be counted twice. Fish were captured as authorized under Washington State Scientific Collection Permit #13-241.

Temperature (° C), dissolved oxygen (milligrams per liter [mg/L]), conductivity (microsiemens per centimeter [µs/cm]), and pH were recorded using a Horiba U22 water quality probe deployed at each stream reach. Air temperature, reach length, and time fished were also recorded. Field sheets for 2013 sampling can be found in Appendix A.

[1] Two netters were used throughout each reach. Netters were consistently swapped out and the team was comprised of a combination of experienced netters, inexperienced netters, and volunteers.

Table 1. Survey dates and site summary for 2013 electrofishing.

Date	Stream Name	River Mile (RM)	Reach Length (feet)	Site Description
July 16, 2013	Newport Creek	0.06	193	A tributary to Coal Creek. Located upstream of the step weirs and foot bridge. Medium gradient reach with medium velocity riffles and few pools. Conductivity at 438 µs/cm. Some woody debris present within reach. Stream banks dominated by salmonberry, blackberry, ferns, with an alder canopy.
July 16, 2013	Richards Creek	0.90	110	Located downstream of double culvert crossing under the private driveway at 2002 132nd Ave SE. Low gradient with conductivity at 353 µs/cm. Medium velocity with abundant large woody debris and overhanging vegetation. Mostly riffles and glides in reach, with few high quality pools. Stream banks dominated by blackberry, ferns, some salmonberry, and an alder canopy.
July 19, 2013	Kelsey Creek	3.97	120	Located behind the Bellevue Christian Reformed Church off 148th Ave., bisected by a footbridge. Low gradient, medium velocity with conductivity at 321 µs/cm. Overhanging vegetation with mostly riffles and glides. Anthropogenic disturbance on portions of shoreline dominated by blackberry, salmonberry and horsetail.
July 19, 2013	Yarrow Creek	1.80	135	Site located in greenbelt corridor between I-405 and 116th Ave. Fish passage is hydrologically blocked below sampling site by steep gradients, and at the upper end of the reach by a perched culvert. Medium gradient with conductivity at 292 µs/cm. Woody debris and cobble/boulders prevalent throughout reach. Mature cedar, alder, and maple trees alongside stream banks. Vine maple and sword fern common.
July 23, 2013	Valley Creek	0.20	197	Located at the habitat restoration site in the northwest corner of Highland Park, just west of 140th Ave. Low gradient, low velocity reach with conductivity at 370 µs/cm. Large woody debris prevalent throughout reach. Mature alder alongside stream banks. Nightshade and blackberry dominant throughout reach.

3.0 Results

3.1 Water Quality Measurements

Water quality parameters at all of the electrofishing stations showed relatively typical values for urban streams. Temperature and dissolved oxygen values for all sites ranged from 13.6° C to 17.1° C and 6.85 mg/L to 10.5 mg/L, respectively (Table 2). These values were characteristic for sampling during summer. However, dissolved oxygen at Kelsey Creek (RM 3.97) showed a relatively low value, which could be the result of poor placement of the probe, human error in recording, biological or chemical demand, or a natural disturbance. Conductivity and pH values for all sites ranged 292 µs/cm to 438 µs/cm and 6.85 to 7.67, respectively.

Table 2. Water quality parameters for electrofishing sites during July 2013.

Site	Temperature (° C)	DO (mg/L)	pH	Conductivity (µs/cm)
Kelsey Creek (RM 3.97)	16.0	6.7	6.85	321
Valley Creek (RM 0.2)	15.9	8.3	7.14	370
Richards Creek (RM 0.9)	16.5	9.5	7.34	353
Yarrow Creek (RM 1.80)	17.1	10.5	7.67	292
Newport Creek (RM 0.06)	13.6	10.0	7.58	438

3.2 Species Distribution and Density

Four species of fish were captured during the 2013 electrofishing surveys (Figure 2). These included cutthroat (*Oncorhynchus clarkii*), juvenile coho (*O. kisutch*), long-nosed dace (*Rhinichthys cataractae*) and western brook lamprey (*Lampetra richardsoni*). In the field, rainbow and cutthroat trout species less than 80 mm in length are difficult to distinguish. Therefore, Figure 1 shows the category "Trout fry less than 80 mm" to encompass these fish. However, no adult rainbow trout were caught during the survey. Therefore, for the purposes of this study, these fish were considered cutthroat trout and included into the total numbers captured. Other non-fish species captured during electrofishing included signal crayfish (*Pacifasticus leniusculus*) at Valley Creek (RM 0.2), Richards Creek (RM 0.9), and Yarrow Creek (RM 1.80).

Kelsey, Valley, and Richards Creeks had the highest density of fish species (Figure 2). Cutthroat and western brook lamprey were caught at all three of these sites, while juvenile coho were caught only at Kelsey and Valley Creeks. There is a coho augmentation project that raises 30,000 eyed eggs in a spring-fed pond and releases as unfed fry into Kelsey Creek at river mile 3.8. Richards Creek was the only site where long-nosed dace were caught, and cutthroat were the only fish species captured at Yarrow Creek and Newport Creek.

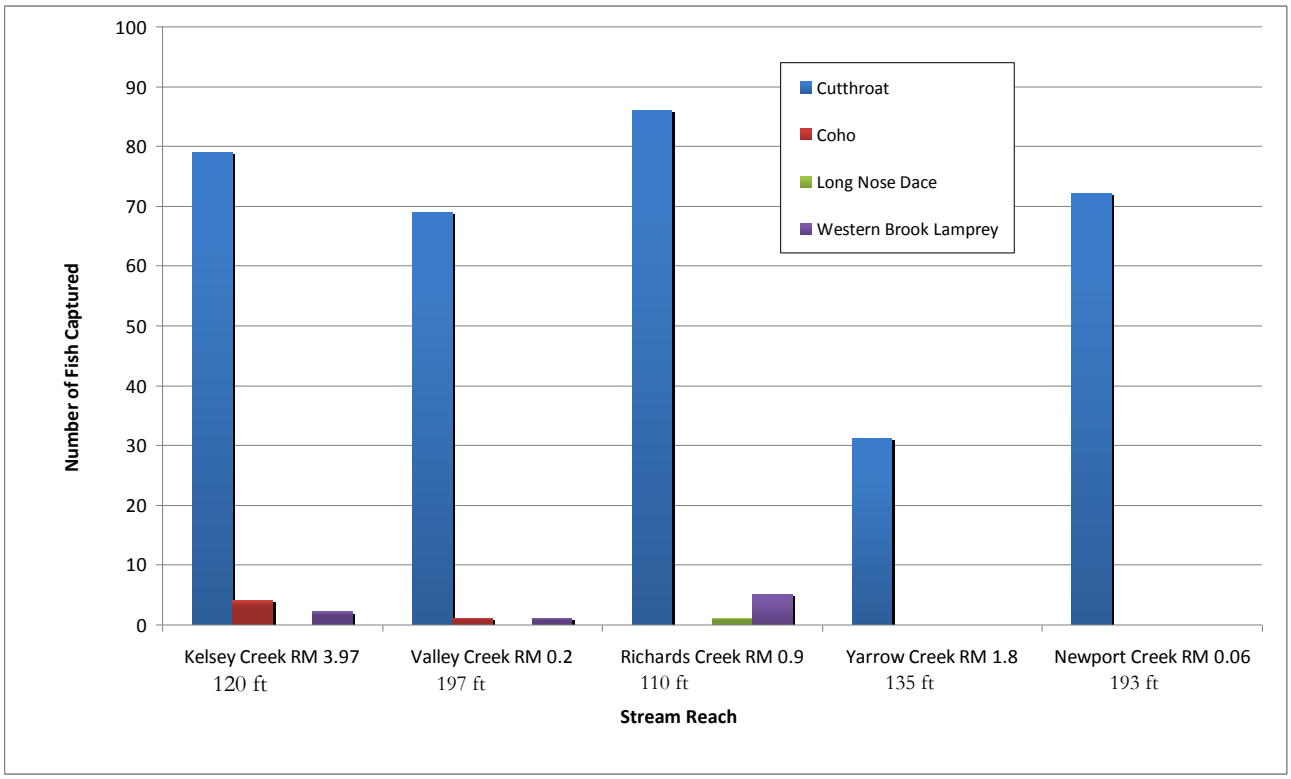

Figure 2. Species distribution by stream reach for 2013 sampling.

Relative percentage of each fish species captured by site can be seen in Figure 1. Kelsey Creek (RM 3.97) showed cutthroat as the highest percentage captured at 93 percent (including fry < 80 mm), with juvenile coho and lamprey at 5 percent and 2 percent, respectively. Valley Creek (RM 0.2) showed cutthroat dominating the catch at 97 percent, with juvenile coho and lamprey at just over 1 percent each. Cutthroat made up 93 percent of the catch at Richards Creek. Lamprey and long-nosed dace made up the remaining 6 and 1 percent of the catch, respectively. Cutthroat comprised 100 percent of the catch at Yarrow and Newport Creeks with no other fish species captured.

The number and species of fish captured by habitat type (pool or riffle) are reported in Figure 3. In general, more fish were captured in pool habitat than riffle habitat across all reaches, with the exception of Kelsey Creek where more cutthroat were captured in riffle habitat. Table 3 shows the total pool and riffle lengths in feet for sampled reaches. Riffle lengths were higher than pool lengths for Kelsey, Richards, and Newport Creeks. The Valley Creek reach was determined as having only pools with no riffles. Riffle and pool lengths were not measured for Yarrow Creek.

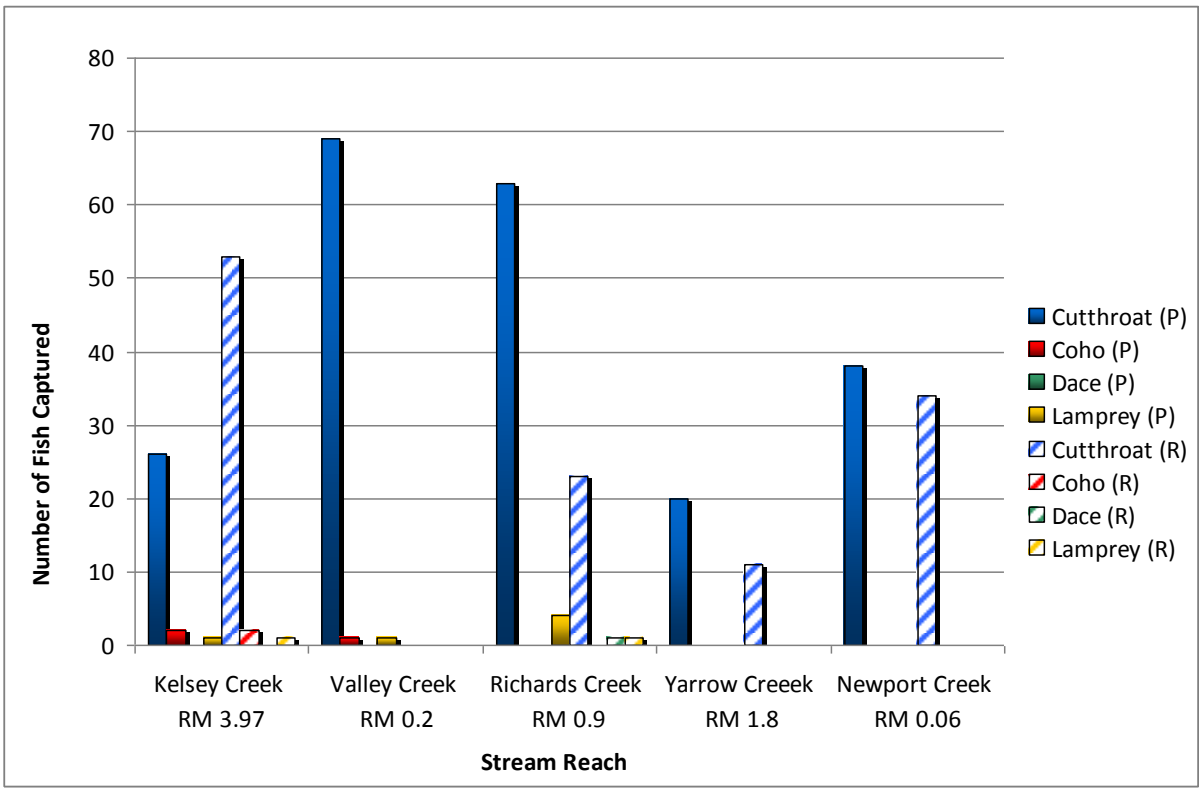

Figure 3. Number and species of fish captured by pool or riffle habitat type (P=pool, R=riffle).

Table 3. Total pool and riffle lengths in feet for sampled reaches.

Site	Total Pool Lengths (ft.)	Total Riffle Lengths (ft.)
Kelsey Creek (RM 3.97)	37	58
Valley Creek (RM 0.2)	197	0
Richards Creek (RM 0.9)	41	69
Yarrow Creek (RM 1.80)	N/A	N/A
Newport Creek (RM 0.06)	74	119

The estimated density of fish species caught for each site is reported in Table 4. Fish density analysis was determined by normalizing the total fish count per linear foot for each reach[2]. Kelsey Creek (RM 3.97) showed the highest density of cutthroat at 0.83 fish/foot, while Yarrow Creek showed the lowest density at 0.23 fish/foot. Density of juvenile coho at Kelsey Creek and Valley Creek was 0.04 and 0.01 fish/foot, respectively. Juvenile coho were not captured at any other site. Richards Creek showed the highest density of lamprey at 0.05 fish/foot, while Kelsey and Valley Creeks showed a density of 0.02 and 0.01 fish/foot, respectively. Lamprey were not caught at Yarrow or Newport Creeks.

[2] Comparison of relative abundance data between sites should be considered only on a gross level as collection technique and netting efficiency can vary among sites.

Kelsey Creek showed a coho-to-cutthroat ratio of 0.05 and Valley Creek showed a ratio of 0.01. No juvenile coho were captured at other study sites (ratios = zero). Absence of juvenile coho in Yarrow Creek was due to a downstream fish barrier blocking anadromous fish access to the reach.

Table 4. Estimated density (fish/foot) of fish species caught and ratio of coho to cutthroat for all sites.

Site	Total Reach Length (feet)	Cutthroat (fish/foot)	Coho (fish/foot)	Lamprey (fish/foot)	Coho to Cutthroat Ratio
Kelsey Creek (RM 3.97)	95	0.83	0.04	0.02	0.05
Valley Creek (RM 0.2)	197	0.35	0.01	0.01	0.01
Richards Creek (RM 0.9)	110	0.78	0	0.05	0
Yarrow Creek (RM 1.80)	135	0.23	0	0	0
Newport Creek (RM 0.06)	193	0.37	0	0	0

3.3 Cutthroat Length Distribution

Richards Creek showed the highest number of cutthroat captured of sites surveyed, and had the lowest mean length (65.4 mm) and narrowest size range (40 mm to 157 mm; Table 5). Mean lengths of cutthroat were relatively similar for Kelsey Creek and Newport Creek (90.0 mm to 84.5 mm), with both sites showing a relatively wide size range. Mean length at Valley Creek was higher at 119.4 mm, with a relatively similar range to Kelsey and Newport Creeks. Though the total size range in Valley Creek was similar, fewer smaller fish were present in this stream reach. Yarrow Creek had the lowest number of cutthroat; however, this site had much larger fish than all other sites, with a mean length of 135.3 mm. Cutthroat size classes and conditions did not appear affected by New Zealand Mudsnails at this time.

Table 5. Number caught, mean length (mm), length range (mm), and standard deviation (Stdev) of lengths for cutthroat across all sites sampled.

Site	Number of Cutthroat Caught	Mean Length (mm)	Range (mm)	Stdev
Kelsey Creek (RM 3.97)	79	90.0	43–183	33.4
Valley Creek (RM 0.2)	69	119.4	47–230	40.8
Richards Creek (RM 0.9)	86	65.4	40–157	20.0
Yarrow Creek (RM 1.80)	31	135.3	104–260	37.3
Newport Creek (RM 0.06)	72	84.5	51–204	37.0

The frequency distributions suggest that three year-classes of cutthroat trout were present in Kelsey Creek (RM 3.97; Figure 4). The younger age class (55 mm to 95 mm) was most abundant here.

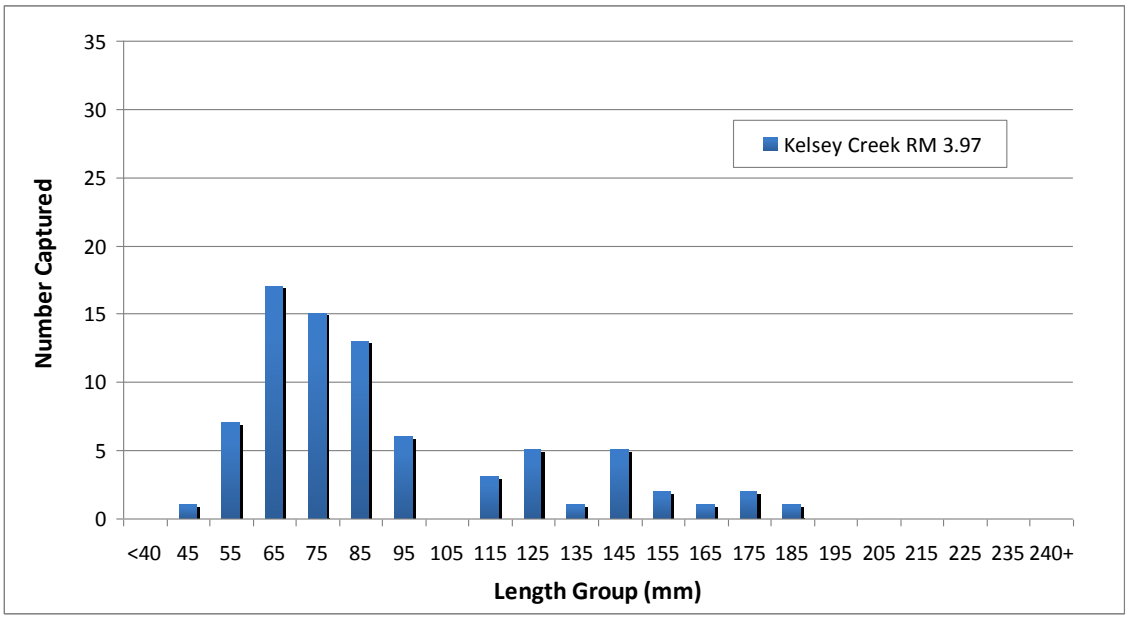

Figure 4. Length frequency distribution for cutthroat at Kelsey Creek (RM 3.97).

The length frequency distribution for Valley Creek (RM 0.2; Figure 5) suggests that at least four (or more) year-classes of cutthroat trout were present. Relatively lower numbers of smaller fish (65 to 95 mm) were seen at Valley Creek, along with relatively higher numbers of mid-sized fish (135 to 165 mm).

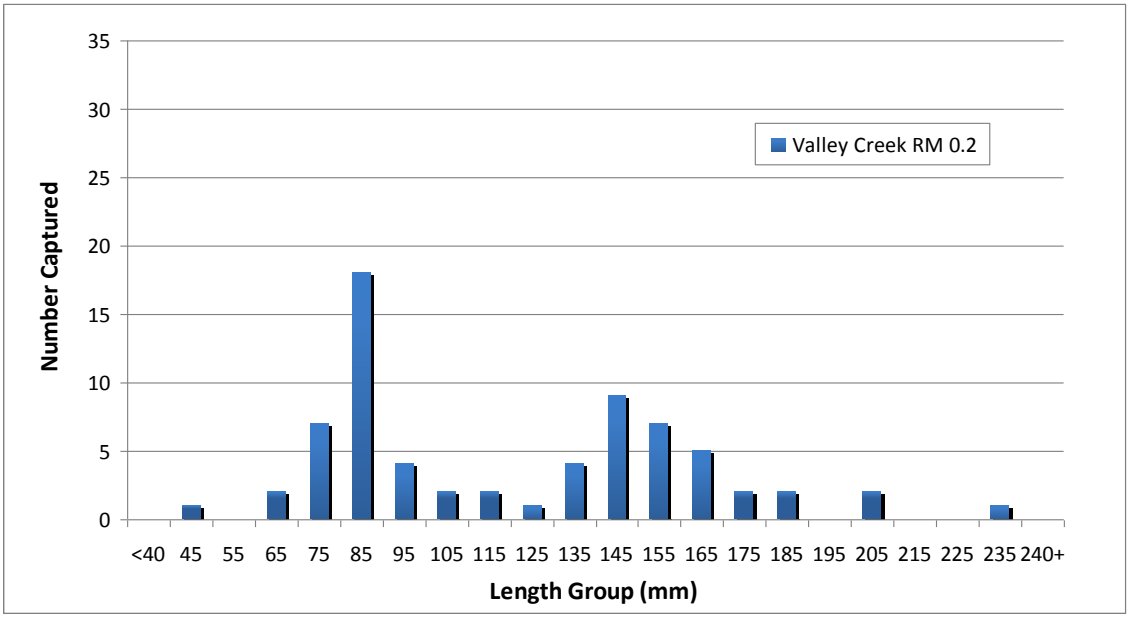

Figure 5. Length frequency distribution for cutthroat at Valley Creek (RM 0.2).

The length frequency distribution for Richards Creek (RM 0.9; Figure 6) suggests that three year-classes of cutthroat are present. Again, large numbers of smaller fish (45 to 75 mm) dominated catches. The largest fish caught at Richards Creek measured 155 mm.

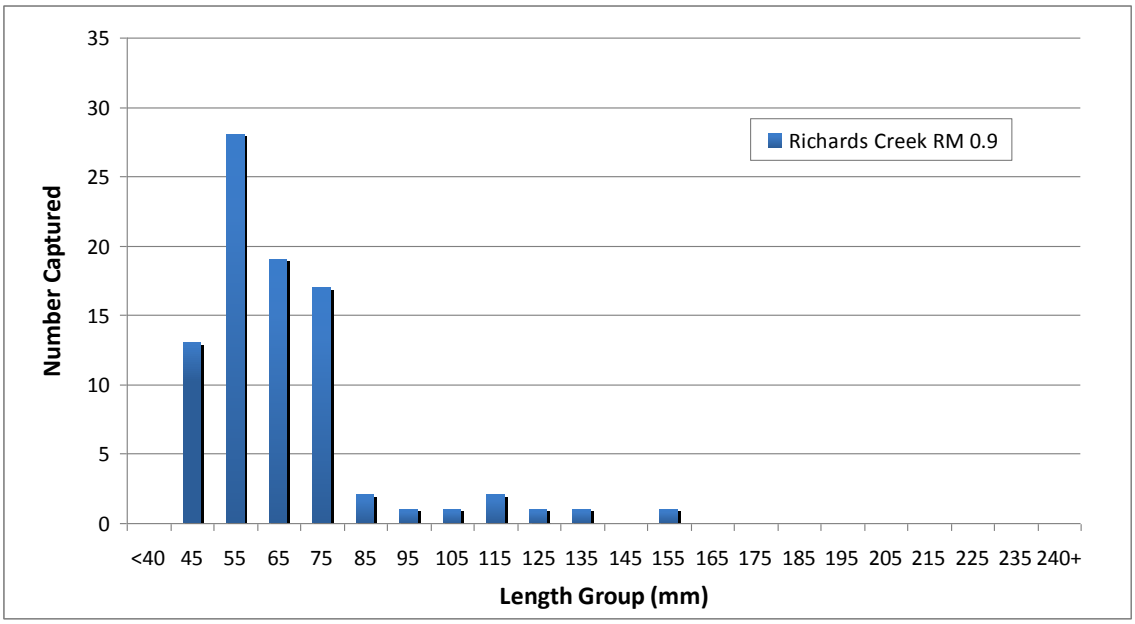

Figure 6. Length frequency distribution for cutthroat at Richards Creek (RM 0.9).

The frequency distribution for Yarrow Creek (RM 0.2; Figure 7) suggests that four (or more) year-classes are present. Relatively higher numbers of medium-sized fish (105 to 135 mm) were found at Yarrow Creek with a good representation of larger fish (205 to 240+ mm). It should be noted that no small cutthroat were caught at Yarrow Creek (< 105 mm).

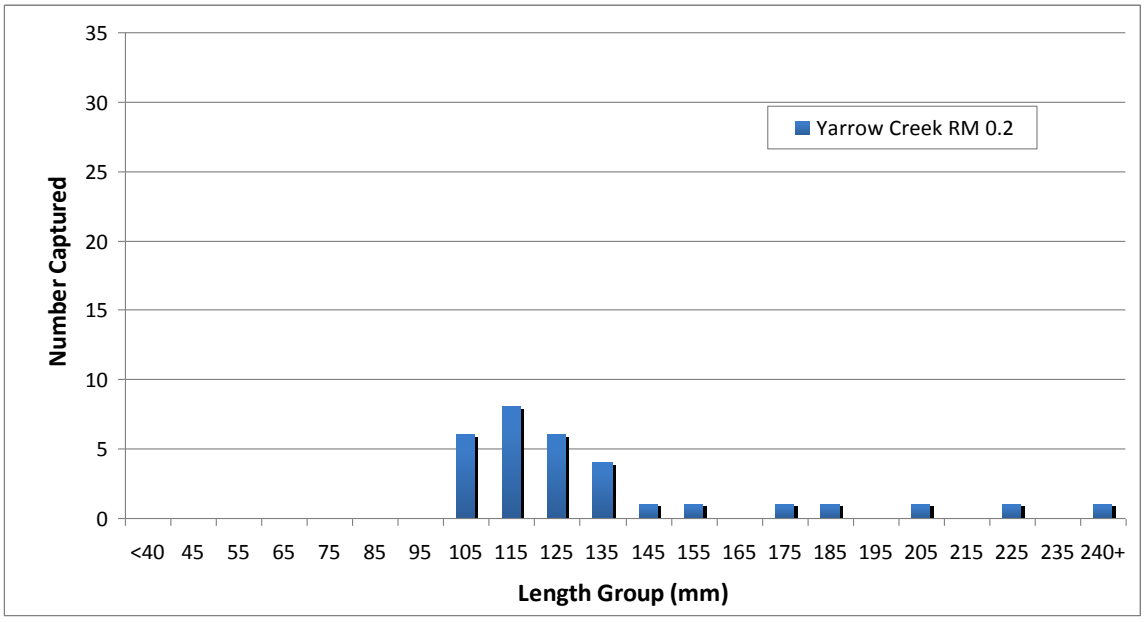

Figure 7. Length frequency distribution for cutthroat at Yarrow Creek (RM 0.2).

The frequency distribution for Newport Creek (RM 0.06; Figure 8) suggests that four year-classes are present. Higher numbers of smaller sized fish (55 to 75 mm) were found at Newport Creek. Relatively smaller numbers of medium sized fish (125 to 145 mm) were caught as well as a few larger fish (to 205 mm).

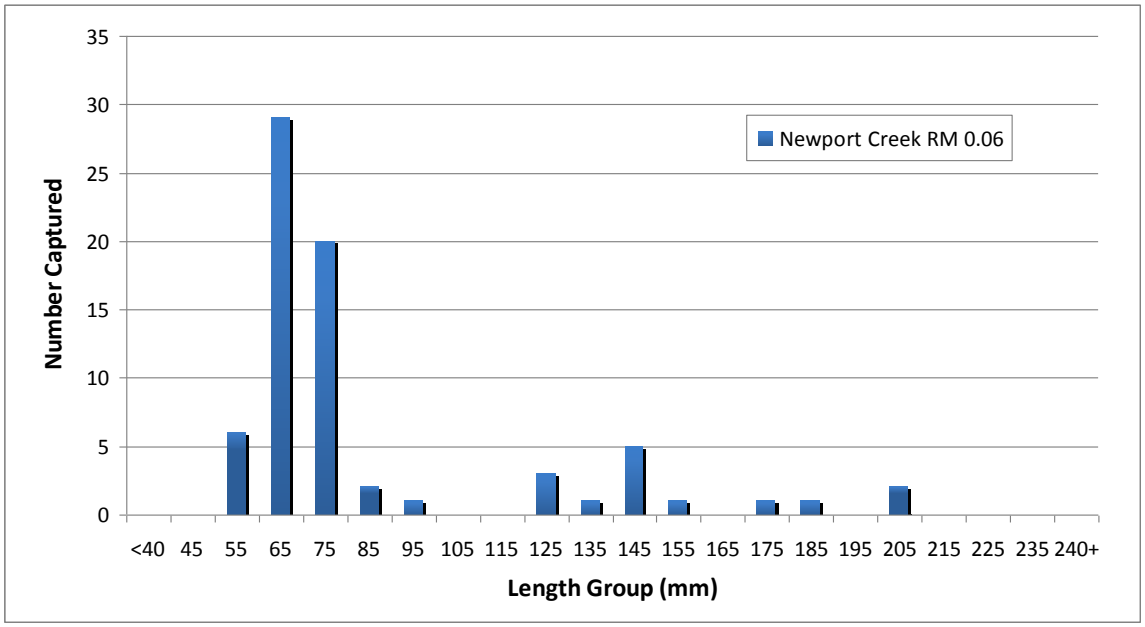

Figure 8. Length frequency distribution for cutthroat at Newport Creek (RM 0.06).

3.4 Coho Length Distribution

Juvenile coho were caught at only Kelsey Creek and Valley Creek during the summer of 2013. A hatchery augmentation program releases unfed fry into Kelsey which can migrate throughout both of these streams. At Kelsey Creek four total juvenile coho were caught ranging in size from 75 to 94 mm, with a mean length of 83.0 mm. Figure 9 shows coho length frequency distribution for Kelsey Creek (RM 3.97). Although the sample size is very low, the frequency distribution represents one year-class (0+ age) for this site, as expected. One juvenile coho was caught at Valley Creek and measured 84 mm.

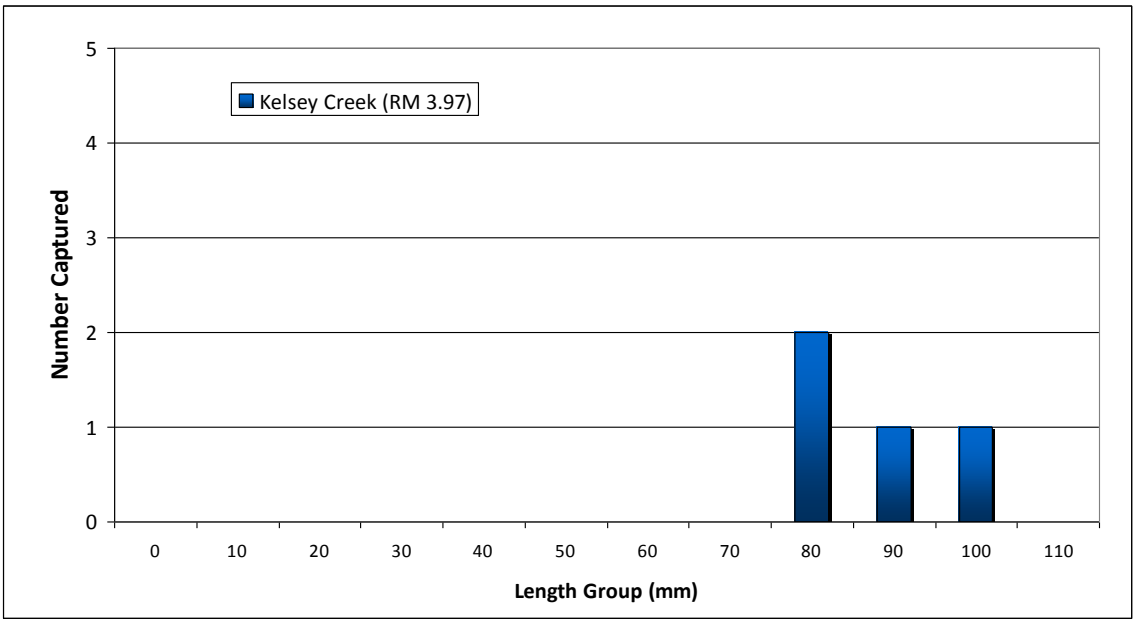

Figure 9. Length frequency distribution for coho at Kelsey Creek (RM 3.97).

3.5 Native and Non-Native Species

Four native fish species—cutthroat, coho, lamprey, and dace—were captured during the survey. No other native fish species were captured during 2013 sampling events. Kelsey (RM 3.97), Valley (RM 0.2) and Richard (RM 0.9) Creeks each showed relatively high native diversity with three native species captured at each site. Cutthroat and lamprey were caught at all three of these sites, while juvenile coho were caught only at Kelsey and Valley Creeks. Richards Creek was the only sampling site where dace were captured. Yarrow Creek (RM 1.8) and Newport Creek (RM 0.06) showed low native diversity among all sites, as only native cutthroat were seen. Many Puget Sound lowland streams contain other native species including, but not limited to, sculpin, largescale suckers, and possibly other salmonid species. Largescale sucker, threespine stickleback, and sculpin species, which were not seen in 2013, have been documented in Kelsey Creek, but at lower stream reaches (RM 0.2 to 2.1) than that sampled this year. Sculpin were also seen in Valley and Richards Creek, but the distribution does not appear to be prevalent in the study streams (Table 6). Yarrow Creek and Newport Creek showed relatively diminished diversity of native species, indicating possible urban impacts.

Non-native fish species were absent during 2013 sampling events at all sites (Table 7); however, non-native species may still be present in the streams. Non-native species (bluegill and largemouth bass) were captured at Kelsey Creek (RM 3.97) and Valley Creek (RM 0.2) in 1996, which could be attributed to differences in habitat availability, flow regimes, maturation of habitat restoration sites, or environmental fluctuations between years.

Table 6. Native species documented in Bellevue streams during 1983, 1996–1997, 2002, 2007, 2010–2013 summer fish surveys.

Species Name	Year / River Mile	Kelsey Creek 0.2	1.06	1.4	1.8	2.1	2.59	3.81	3.83	3.97	Valley Creek 0.2	0.82	Richards Creek 0.9	Yarrow Creek 1.13	1.8	Newport Creek 0.06
Coho Salmon *(Oncorhynchus kisutch)*	1983	x			x	x										
	1996	x		x		x				x	x	x				
	1997	x								x		x	x			
	2002					x										
	2007		x			x					x	x				
	2010										x					
	2011							x	x							
	2012													x		
	2013									x	x					
Cutthroat Trout *(Oncorhynchus clarki)*	1983	x			x	x										
	1996	x		x		x	x			x	x	x	x			x
	1997	x								x		x	x			
	2002		x	x		x					x					
	2007		x		x	x		x	x		x	x				
	2010			x	x	x					x					
	2011							x	x					x		
	2012	x		x												
	2013									x	x		x		x	x
Rainbow Trout *(Oncorhynchus mykiss)*	1983	x			x	x										
	1996															
	1997	x											x			
	2002															
	2007															
	2010															
	2011															
	2012															
	2013															
Sculpin *(Cottus spp.)*	1983															
	1996	x														
	1997	x										x	x			
	2002															
	2007															
	2010															
	2011															
	2012	x														
	2013															
Three-spine stickleback *(Gasterosteus aculeatus)*	1983	x			x	x										
	1996															
	1997												x			
	2002		x													
	2007		x													
	2010															
	2011															
	2012															
	2013															

Species Name	Year / River Mile	Kelsey Creek 0.2	1.06	1.4	1.8	2.1	2.59	3.81	3.83	3.97	Valley Creek 0.2	0.82	Richards Creek 0.9	Yarrow Creek 1.13	1.8	Newport Creek 0.06
Western Brook Lamprey *(Lampetra richardsoni)*	1983															
	1996						x						x			
	1997											x	x			
	2002		x								x					
	2007		x		x			x	x		x					
	2010				x						x					
	2011															
	2012	x		x												
	2013									x	x		x			
Largescale Sucker *(Catostomus macrocheilus)*	1983															
	1996			x		x										
	1997															
	2002															
	2007		x													
	2010															
	2011															
	2012															
	2013															
Dace (longnose or speckled) *(Rhinichthys spp.)*	1983															
	1996	x		x												
	1997	x														
	2002			x		x										
	2007		x		x	x										
	2010				x											
	2011															
	2012	x		x												
	2013												x			
Trout Fry (<80 mm)	1983															
	1996	x									x	x				
	1997	x								x		x	x			
	2002		x	x		x					x					
	2007		x		x	x		x	x		x	x				
	2010			x	x	x					x					
	2011							x	x					x		
	2012															
	2013									x	x		x			x

= did not sample
= sampled, no fish seen
x = sampled, fish seen

Table 7. Non-native species documented in Bellevue streams during 1983, 1996–1997, 2002, 2007, 2010–2013 summer fish surveys.

Species Name	Year / River Mile	Kelsey Creek 0.2	1.06	1.4	1.8	2.1	2.59	3.81	3.83	3.97	Valley Creek 0.2	0.82	Richards Creek 0.9	Yarrow Creek 1.13	1.8	Newport Creek 0.06
Bluegill *(Lepomis macrochirus)*	1983															
	1996	x				x				x	x					
	1997															
	2002					x										
	2007															
	2010				x	x										
	2011															
	2012															
	2013															
Largemouth Bass *(Micropterus salmoides)*	1983															
	1996															
	1997									x						
	2002															
	2007															
	2010			x												
	2011															
	2012															
	2013															
Pumpkinseed *(Lepomis gibbosus)*	1983															
	1996															
	1997															
	2002					x										
	2007															
	2010															
	2011															
	2012															
	2013															
Crappie (black or white) *(Pomoxis spp.)*	1983															
	1996															
	1997															
	2002															
	2007															
	2010			x	x											
	2011															
	2012															
	2013															
Carp *(Cyprinus carpio)*	1983															
	1996															
	1997															
	2002															
	2007															
	2010			x												
	2011															
	2012															
	2013															

= did not sample
= sampled, no fish seen
x = sampled, fish seen

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3.6 Cutthroat Trout Stomach Analysis for New Zealand Mudsnails (*Potamopyrgus antipodarum*)

One cutthroat trout from each of four size classes was sacrificed, and the stomach was dissected and placed in denatured alcohol for stomach content analysis by taxonomists at Rhithron Associates, Inc. (see Appendix C for complete taxonomic results). The three smallest of the four size classes had consumed Mudsnails. Other prey items included amphipods (*crangonyx*), midges (*Parametriocnemus, Polypedilum,* Prodiamesa), black flies (*simulium*), and terrestrial species of millipede (*Spirobolida*) and ants (*Formicidae*). The largest-sized cutthroat had very little gut content, with two amphipods (*crangonyx*) and one caddisfly (*Limnephilidae*). All four sizes indicated amphipods (crangonyx) as a primary prey.

New Zealand Mudsnails can pass through the intestinal tract intact without providing nutrient value to the fish. Given that three size classes had consumed mudsnails, stomach analysis as well as the abundance and size distribution of cutthroat trout and other salmonids in infested areas should continue to be monitored.

4.0 Discussion and Recommendations for Future Actions

Non-native fish were absent at the Kelsey Creek sampling site (RM 3.97), while three species of native fish (cutthroat, juvenile coho and western brook lamprey) were found during sampling (Tables 6 and 7). Similar native fish densities were seen in 1996 and 1997 studies, suggesting that this section of Kelsey Creek has remained relatively stable for 16 years. However, a relatively low native species diversity and low coho to cutthroat ratio (0.05) indicates that fish populations within the upper reach of Kelsey Creek have been historically influenced by urban impacts; Lucchetti and Fuerstenberg (1993) found a coho-to-cutthroat ratio of >2 indicates excellent habitat, 1 to 2 indicates good habitat, and < 1 indicates urban impacts and/or limited access for anadromous fish. In healthy streams, juvenile coho account for 2 to 10 times the number of juvenile cutthroat. As urbanization continues, juvenile and adult resident cutthroat become more dominant and eventually surpass coho in both total numbers and biomass, which appears to be the case for this site on Kelsey Creek (Anderson 2011).

Non-native fish were absent at the Valley Creek sampling site (RM 0.2), while three species of native fish (cutthroat, juvenile coho, and lamprey) were found during 2013 sampling (Tables 6 and 7). This sampling site was located in a mature habitat restoration area with plenty of large woody debris and pools (Appendix B). Riffles however, were conspicuously absent in this 193-foot reach. This site was also heavily overgrown with nightshade and blackberries, which seemed to reduce flows throughout the reach (Appendix B). Comparing 2013 results to past data on Valley Creek on a gross watershed scale show that the presence of juvenile coho, cutthroat, and lamprey has been very consistent since sampling began at this site in 1996 (Table 6). However, one juvenile coho was found at Valley Creek (RM 0.2), contributing to a very low coho to cutthroat ratio (0.01), which again suggests urban impacts or migration barriers are having an influence on the fish population at this site. The low numbers of coho in spite of hatchery augmentation nearby in Kelsey Creek indicate that additional investigations into water quality and carrying capacity of habitat should be conducted.

Three species of native fish (cutthroat, western brook lamprey, and dace) were caught at Richards Creek (RM 0.9), while juvenile coho were absent. Although relatively few surveys have been conducted on Richards Creek (last survey conducted in 1997), comparing 2013 results to past data show juvenile coho presence to be sporadic and cutthroat to be very consistent. A low coho to cutthroat ratio (in this case, zero) indicates that this site on Richards Creek may be influenced by water quality and flow impacts from urban development in surrounding areas of the watershed.

Native cutthroat was the only fish species caught at the Yarrow Creek (RM 1.8) site, fully sampled for the first time in 2013. Cutthroat was also the only species caught at Yarrow Creek (RM 1.13) in 2011 and 2012. These results were anticipated as fish passage is hydrologically blocked downstream of these sites preventing anadromous species access to the upper reaches of Yarrow Creek. Fish passage is also hydrologically blocked at the upstream extent of these sites, essentially isolating this cutthroat population (Appendix B). The absence of juvenile coho, for example, would therefore be expected for future sampling at these sites unless the downstream blockage is removed. However, cutthroat showed a strong presence at RM 1.8 with at least four year-classes, indicating that Yarrow Creek (upstream of the barrier) is likely a relatively healthy urban stream capable of sustaining not only cutthroat trout populations, but other anadromous salmonid species as well.

Non-native fish were absent at the Newport Creek sampling site (RM 0.06). Native cutthroat were found and no juvenile coho were caught. Although only one other survey has been conducted on Newport Creek (in 1996), comparing 2013 results to past data show a continued lack of juvenile coho presence and the presence of cutthroat. A low coho to cutthroat ratio (in this case, zero) indicates that this site on Newport Creek may be influenced by urban impacts in surrounding areas of the watershed.

Although Richards Creek (RM 0.9) and Newport Creek (RM 0.06) provide what appears to be good rearing habitat for juvenile coho (Appendix B), other factors may contribute to the lack of coho captured during the study, including low escapement in previous years, flow regimes, or natural variations in water chemistry. The absence of juvenile coho also may simply result from these fish utilizing other areas of these systems. Overall, the low numbers of coho adult spawners returning combined with low juvenile and marine survival rates and occurrence of pre-spawn mortality are attributing to the decline of coho species in Bellevue streams, putting coho at a severe risk of extirpation.

It is recommended that the City continue studies at previously sampled reaches to help further evaluate the effectiveness of existing and future capital projects for improving fish habitat and passage, and the success of salmonid supplementation efforts. Continued studies to track the diversity, size, and abundance of native and non-native fish species for use as an indicator of overall stream health is also advised. Below is a detailed list of recommendations for the City of Bellevue to facilitate these actions.

- Sample upstream of the Yarrow Creek (RM 1.8) sample site, to determine if the cutthroat population between the hydrological barriers is indeed an isolated population.
- Stomach analysis, as well as the abundance and size distribution of cutthroat trout and other salmonids, in areas infested with New Zealand Mudsnails (*Potamopyrgus antipodarum*) should continue to be monitored.
- Compare diversity, size, and abundance of fish species across all years for sites with historical data. This will allow a historical trend analysis to determine if specific fish populations are

declining or growing. Also, compare the size of coho and cutthroat fish populations to other Puget Sound lowland reference streams.

- Conduct electrofishing at low, middle, and upper reaches of creeks during the same sampling events to determine if salmonids and native fish are utilizing different habitats than in previous years. This would assess more accurately the presence/absence of fish within each stream.
- Measure fish condition index at electrofishing sites to determine relative health of priority fish species. The index could then be compared to other Western Washington urban streams where this particular metric has been collected. This information provides important biological information that can then be used to make better management decisions.
- Collect gut content data from priority salmonid species at current Benthic Index of Biotic Integrity (BIBI) sites to determine if aquatic or terrestrial prey items dominate. These data would help determine prey species availability and use by salmonids. Data collected could help determine if riparian and/or substrate improvements are necessary.
- Continue a consistent electrofishing program that visits the same sites during the same time of year to increase robustness of data for determination of status and trends of priority fish species.
- Add additional electrofishing dates earlier in the year (e.g., May) at these same sites every five years to help determine seasonality of fish species use.
- Implement a study to evaluate selected electrofishing sites that have shown historical changes in species diversity and density. The study should include key water quality parameters such as temperature and flow conditions; however, other parameters may also need evaluation.
- Include adult coho escapement data in the status and trends database in order to strengthen reasoning for lack of juvenile coho presence.

Data collected for native and non-native fish species presence, status, and trends in urban streams can provide a useful tool for determining the health of urban streams. Changes in these attributes can also be used to determine if cumulative alterations in land use, habitat restoration activities, and supplementation efforts are influencing fish populations. However, fish use (or lack thereof) in urban streams can be due to many variables, including temporal and spatial changes, habitat type and condition, water quality, and climate. Without data on each of these variables, it may be difficult to determine what might be causing changes in fish densities and species composition. However, collecting consistent data on habitat change, fish use, and diets (both temporally and spatially), would help ascertain if changes in fish populations and density are due to natural environmental changes, beneficial habitat modifications, or changes in land use. Implementing the recommendations mentioned above would help the City of Bellevue further answer these questions about its local, urban streams.

5.0 Literature Cited

Anderson, J.D. 2011. Coastal Cutthroat Trout in Washington State: Status and Management. Washington Department of Fish and Wildlife. 25 pp. Accessed via internet 12/21/2011: http://www.fishlib.org/library/Documents/CoastalCutthroatData/sn600028.pdf

Lucchetti, G., and R. Fuerstenberg, Robert. 1993. Management of coho salmon habitat in urbanizing landscapes of King County, Washington, USA. Pages 308–317 in L. Berg and P. Delaney, editors. Proceedings of a workshop on coho salmon. Canadian Dept. of Fisheries and Oceans, Vancouver, British Columbia.

Appendix A – 2013 Field Sheets

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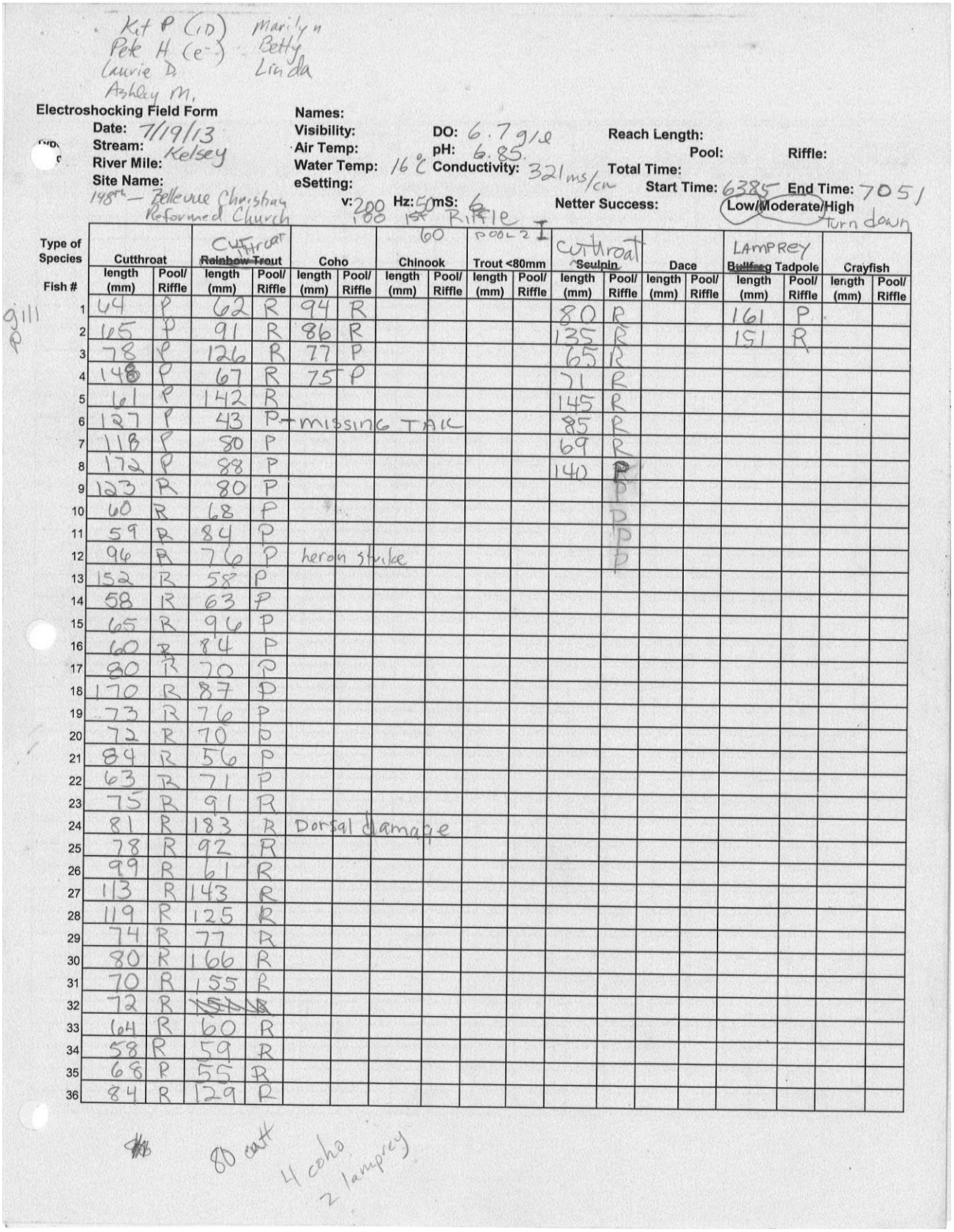

Kit P (ID) Marilyn
Pete H (e-) Betty
Laurie D. Linda
Ashley M.

Electroshocking Field Form

Date: 7/19/13
Stream: Kelsey
River Mile:
Site Name: 148th — Bellevue Christian Reformed Church

Names:
Visibility:
Air Temp:
Water Temp: 16°C
eSetting:
v: 200 Hz: 50 mS: 6
100 1st Riffle

DO: 6.7 g/l
pH: 6.85
Conductivity: 321 ms/cm

Reach Length:
Pool: Riffle:
Total Time:
Start Time: 6385 End Time: 7051
Netter Success: Low/Moderate/High

60 POOL 2 I

turn down

Type of Species	Cutthroat		Cutthroat / ~~Rainbow Trout~~		Coho		Chinook		Trout <80mm		cutthroat ~~Sculpin~~		Dace		LAMPREY ~~Bullfrog~~ Tadpole		Crayfish	
Fish #	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle
1	44	P	62	R	94	R					80	R			161	P		
2	165	P	91	R	86	R					135	R			151	R		
3	78	P	126	R	77	P					65	R						
4	148	P	67	R	75	P					71	R						
5	161	P	142	R							145	R						
6	127	P	43	P — missing TAIL							85	R						
7	118	P	80	P							69	R						
8	172	P	88	P							140	R						
9	123	R	80	P								P						
10	60	R	68	P								P						
11	59	R	84	P								P						
12	96	R	76	P	heron strike							P						
13	152	R	58	P														
14	58	R	63	P														
15	65	R	96	P														
16	60	R	84	P														
17	80	R	70	P														
18	170	R	87	P														
19	73	R	76	P														
20	72	R	70	P														
21	84	R	56	P														
22	63	R	71	P														
23	75	R	91	R														
24	81	R	183	R	Dorsal damage													
25	78	R	92	R														
26	99	R	61	R														
27	113	R	143	R														
28	119	R	125	R														
29	74	R	77	R														
30	80	R	166	R														
31	70	R	155	R														
32	72	R	~~151~~	~~R~~														
33	64	R	60	R														
34	58	R	59	R														
35	68	P	55	R														
36	84	R	129	R														

gill P

80 cutt
4 coho
2 lamprey

Type of Species	Cutthroat		Rainbow Trout		Coho		Chinook		Trout <80mm		Sculpin		Dace		Bullfrog Tadpole		Crayfish	
Fish #	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle
201																		
202																		
203																		
204																		
205																		
206																		
207																		
208																		
209																		
210																		
211																		
212																		
213																		
214																		
215																		
216																		

1st Pool

Wetted W = 13 feet

L = 11 feet

Bank samp

1st Riss L = 30 feet

2nd Pool L = 21 feet

2 Riff L = 28 feet

3rd pool L = 5 feet

wetted w = 4½ feet

Bank w = 8 feet

120 ft

Electroshocking Field Form
*Specify units

Names and responsibilities:

Reach Length: All Pool 197 feet
Pool: Riffle:
Pool: Riffle:
Pool: Riffle:
Pool: Riffle:
Pool: Riffle:
Pool: Riffle:
Pool: Riffle:
Wetted Width: 6 feet dam upstream 8 feet
Bank Full Width: 6 feet " "

Date: 7-23-13
Stream: Valley
River Mile:
Site Name: Highland
Netter Success:

Visibility: Clear
Air Temp:
Water Temp: 15.9
eSetting
v: 200 Hz: 60 mS: 6
Low/Moderate/High
Veg/wood

DO: 8.3 g/l
pH: 7.14
Conductivity: 370 ms/cm
Turbidity:
Total Time:
Start Time: 0 End Time: 1651

Notes	Type of Species	Cutthroat		Rainbow Trout		Coho		Chinook		Trout <80mm		Sculpin		Dace (species)		Bullfrog Tadpole		Lamprey (species)		Crayfish (species)		
	Fish #	length (mm)	Pool/Riffle	length (mm)	Pool/Riffle	length (mm)	Pool/Riffle	length (mm)	Pool/Riffle	length (mm)	Pool/Riffle	length (mm)	Pool/Riffle	length (mm)	Pool/Riffle	length (mm)	Pool/Riffle	length (mm)	Pool/Riffle	length (mm)	Pool/Riffle	
	1	68	P	83	P	84	P											153	P	24	P	Fem.
	2	165	P	180	P															48	P	Male
	3	150	P	154	P																	
	4	132	P	146	P															1 Green		
	5	87	P	82	P															Dot		
	6	148	P	160	P															Crayfish		
	7	86	P	134	P																	
	8	112	P	89	P																	
	9	87	P	115	P																	
	10	104	P	171	P																	
	11	89	P	105	P																	
	12	81	P	76	P																	
	13	156	P	184	P																	
	14	81	P	133	P																	
	15	177	P	79	P																	
	16	148	P	83	P																	
Sacrificed	17	144	P	75	P																	
	18	86	P	162	P																	
	19	140	P	47	P																	
	20	89	P	71	P																	
	21	93	P	83	P																	
	22	83	P	141	P																	
	23	203	P	153	P																	
	24	86	P	133	P																	
	25	94	P	149	P																	
	26	89	P	78	P																	
	27	91	P	182	P*																	
	28	60	P	155	P																	
	29	78	P	161	P																	
Sacrificed	30	99	P	230	P																	
	31	74	P	155	P																	
	32	86	P	263	P																	
	33	142	P	143	P																	
	34	150	P	140	P																	
	35	126	P																			

* sacrificed

Kyt P (1.0)
Pete
Ashley

Ben (Intern)
Nick (Intern)

Electroshocking Field Form

Date: 7-16-13
Stream: Richards
River Mile: Wells
Site Name:

Names:
Visibility:
Air Temp:
Water Temp: 16.5
eSetting: v: 200 Hz: 50 mS: 6.0

DO: 9.5 g/l
pH: 7.38
Conductivity: 0.353 ms/cm

Reach Length: 110 ft
Pool:
Riffle:
Total Time:
Start Time: 5406 End Time: 6385
Netter Success:
Low/Moderate/High

Turb 38.6

Brook

Type of Species	Cutthroat		Rainbow Trout		Coho		~~Chinook~~ lamprey		Trout <80mm cutt		Sculpin		longnose Dace		Bullfrog Tadpole cutt		Crayfish signal	
Fish #	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle
mirt 1	52	P					114		71	P			104	R	73	P	1	
mirt 2	82	P					96	R	75	P			chub by		58	P	1	
3	48	P					113	P	62	P					66	P	1	
4	64	P					118	P	55	P					49	P	1	
5	58	P					96	P	59	P					44	P	1	
6	54	P							49	P					57	P	1	
7	59	P							78	P					74	P	1	
8	71	P							45	P					67	P	1	
9	79	P							50	P					133	P		
10	40	P							58	P					55	P		
11	60	P							56	P					53	P		
12	78	P							65	P					74	P		
13	56	P							46	P					90	P		
14	61	P							59	P					101	P		
15	68	P													52	P		
16	84	P													117	P		
17	67	P													60	R		
18	73	P													64	R		
19	57	P													64	R		
20	77	P													75	R		
21	71	P													118	R		
22	65	P													62	R		
23	55	P													55	R		
24	43	P													50	R		
25	63	P													52	R		
26	55	P													47	R		
27	60	P													71	R		
28	71	P													60	R		
29	54	P													64	R		
30	122	R													68	R		
31	77	R													157	R		
32	58	R													49	R		
33	54	R													41	R		
34	48	R													53	P		
35	46	R													75	P		
36	59	P													69	P		

all smooth

Type of Species	Cutthroat		Rainbow Trout		Coho		Chinook		Trout <80mm		Sculpin		Dace		Bullfrog Tadpole		Crayfish	
Fish #	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle
201																		
202																		
203																		
204																		
205																		
206																		
207																		
208																		
209																		
210																		
211																		
212																		
213																		
214																		
215																		
216																		

Pool ① 13 ft
Riffle ② 25 ft
Pool ③ 15 ft
Riffle ④ 44 ft
Pool ⑤ 13 ft
110 ft

Kut P (ID) Laurie D. Brian Miller
Pete H (e-) Ashley M. Paul Anderson

Electroshocking **Name:**

Stream: Yarrow **Site:** 118th **Date:** 7-19-13

Streamflow: **Reach Length:**

Visibility: **Temp** 17.1 **Electrofishing setting:** 60 Hz 6 ms 100 ✓

pH 7.67 Turb **start:** 1051 **end:** 1423

Cond 292 D.O 10.5

Fish #	Type of Species Total	Cutthroat length (mm)	Rainbow Trout length (mm)	Coho length (mm)	Chinook length (mm)	trout <80mm length (mm)	Sculpin length (mm)	Dace length (mm)	Bullfrog Tadpole length (mm)	Crayfish length (mm)
1		109 R								31
2		112 R								
3		132 R								
4		116 R								
5		109 R								
6		112 R								
7		107 R								
8		139 R								
9		114 R								
10		118 R								
11		110 R								
12		260 P								
13		115 P								
14		223 P								
15		124 P								
16		127 P								
17		204 P								
18		184 P								
19		178 P								
20		129 P								
21		152 P								
22		120 P								
23		106 P								
24		127 P								
25		118 P								
26		135 P								
27		149 P								
28		136 P								
29		120 P								
30		104 P								
31		107 P								
32										
33										
34										
35										
36										
37										
38										
39										
40										

	Pool	Riffle
Wetted Width	9'	4.5'
Bankfull Width	12'	4.5'

get reach length from mapshot because of bees

Kit Paulsen (ID) Laurie D. Kay
Pete H. (e-) Katie Jensen Ashley Mihle

~98 records

Electroshocking Field Form

Date: 7/16/13 | Names:
Stream: Newport Trib | Visibility: | DO: 10.0 g/l | Reach Length: 193 ft | Pool: | Riffle: 44/17 (5400) 1000 sec
River Mile: 0.1 | Air Temp: | pH: 7.58
Site Name: | Water Temp: 13.6 | Conductivity: 0.438 Siemens/cm | Total Time:
Turb. 35.8 NTU | eSetting: | Start Time: 9:30a | End Time: 10:50am
v: 200 Hz: 50 mS: 6.0 | Netter Success: | Low/Moderate/High

Type of Species	Cutthroat		Rainbow Trout		Coho		Chinook		Trout <80mm		Sculpin		Dace		~~Bullfrog Tadpole~~ cutt		Crayfish	
Fish #	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle
1	71	P													126	P		
2	69	P													201	P		
3	83	P													204	P		
4	61	P													61	P		
5	79	P													143	P		
6	70	P													74	P		
7	72	P													141	P		
8	188	P													81	P		
9	157	P													123	P		
10	90	R													149	P		
11 fat!	172	P													128	P		
12 fat!	143	P													76	P		
13	149	P													69	P		
14	64	R													58	R		
15	64	R													60	R		
16	68	R													70	R		
17	72	R													68	R		
18	62	R													60	P		
19	70	R													69	P mort		
20	66	R													58	P		
21	69	R													61	P		
22	65	R													57	P		
23	68	R													73	P		
24	65	R													51	P		
25	70	R													135	P		
26	62	R													51	P		
27	69	R													69	P		
28	73	R													70	P		
29	69	R													73	P		
30 burn	68	R													65	P		
31	67	R													54	R		
32	75	R													71	R		
33	70	R													61	R		
34 fatty!	70	R													65	R		
35 fatty!	69	R													77	R		
36 "	70	R													60	R		

42 cutthroat

Type of Species	Cutthroat		Rainbow Trout		Coho		Chinook		Trout <80mm		Sculpin		Dace		Bullfrog Tadpole		Crayfish	
Fish #	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle	length (mm)	Pool/ Riffle
201																		
202																		
203																		
204																		
205																		
206																		
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213																		
214																		
215																		
216																		

Pool 1 21
Riffle 1 ~~43~~
Pool 2 8
Riffle 2 52
Pool 3 17
Riffle 3 16
Pool 4 28
Riffle 4 28
193

wetted width 7'
BFW 9'

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Appendix B – Project Photos

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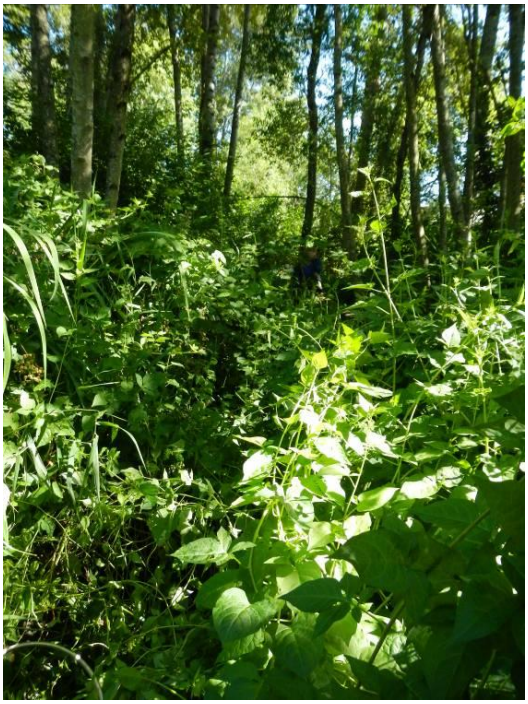
Start of sampling reach at Kelsey Creek RM 3.97

Example of cutthroat captured at Kelsey Creek RM 3.97

Electrofishing on Kelsey Creek RM 3.97 (Mid-reach)

Example of juvenile coho caught at Kelsey Creek RM 3.97

Start of sampling reach at Valley Creek RM 0.2

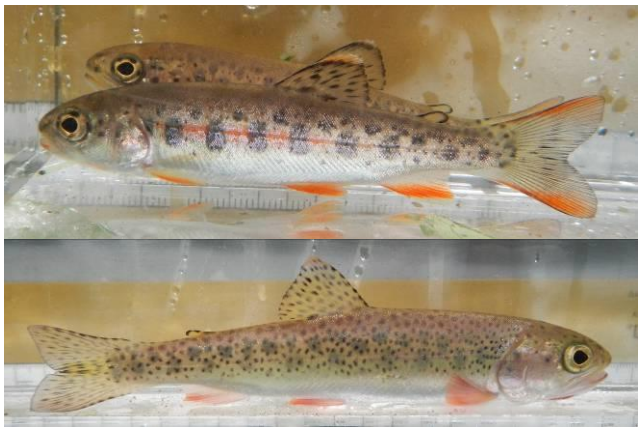


Nightshade and blackberry overgrowing Valley Creek (RM 0.2)

Electrofishing in large woody debris on Valley Creek RM 0.2 (Mid-reach)

Example of cutthroat (top) and juvenile coho (bottom) captured at Valley Creek RM 0.2

Start of sampling reach on Richards Creek (RM 0.9)



Example of juvenile cutthroat (top) and adult cutthroat (bottom) captured at Richards Creek RM 0.9

Top end of reach on Richards Creek RM 0.9

Measuring a western brook lamprey caught at Richards Creek RM 0.9

Electrofishing Yarrow Creek RM 1.8 (start of reach)

Top end of reach on Yarrow Creek RM 1.8 (notice culvert acting as hydrologic block)

Example of large cutthroat captured at Yarrow Creek RM 1.8 (caught at top end pool under culvert)

Electrofishing at Newport Creek RM 0.06 (start of reach)

Processing captured fish at Newport Creek RM 0.06 (start of reach)

Example of cutthroat caught at Newport Creek RM 0.06

Top of reach on Newport Creek RM 0.06

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Appendix C – 2013 Fish Diet Analysis

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2013 Fish Diet Analysis

Sample_ID	Sample_ Station_ Name	Sample_ Client_ID	Sample_ Notes	Kingdom	Phylum	SubPhylum	Class	SubClass	Order	SubOrder	Family	SubFamily	Tribe	Genus	Species	Taxon	Count	Unique	Life_Stage	Qualifier
CB13FI001	1	182mm	cutthroat trout gut	Animalia	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Crangonyctidae			*Crangonyx*		Crangonyx	2	TRUE	Unknown	
CB13FI001	1	182mm	cutthroat trout gut	Animalia	Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera		Limnephilidae					Limnephilidae	1	TRUE	Larva	Damaged
CB13FI002	2	144mm	cutthroat trout gut	Animalia	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Crangonyctidae			*Crangonyx*		Crangonyx	34	TRUE	Unknown	
CB13FI002	2	144mm	cutthroat trout gut	Animalia	Arthropoda	Hexapoda	Insecta	Pterygota	Hymenoptera	Apocrita	Formicidae					Formicidae	1	TRUE	Adult	
CB13FI002	2	144mm	cutthroat trout gut	Animalia	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Nematocera	Chironomidae	Orthocladiinae		*Parametriocnemus*		Parametriocnemus	1	TRUE	Larva	
CB13FI002	2	144mm	cutthroat trout gut	Animalia	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Nematocera	Chironomidae	Chironominae	Chironomini	*Polypedilum*		Polypedilum	1	TRUE	Pupa	
CB13FI002	2	144mm	cutthroat trout gut	Animalia	Mollusca		Gastropoda		Neotaenioglossa		Hydrobiidae			*Potamopyrgus*	*antipodarum*	Potamopyrgus antipodarum	2	TRUE	Unknown	
CB13FI002	2	144mm	cutthroat trout gut	Animalia	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Nematocera	Simuliidae	Simuliinae	Simuliini	*Simulium*		Simulium	5	TRUE	Larva	
CB13FI002	2	144mm	cutthroat trout gut	Animalia	Arthropoda	Myriapoda	Diplopoda	Helminthomorpha	Spirobolida							Spirobolida	1	TRUE	Unknown	
CB13FI003	3	99mm	cutthroat trout gut	Animalia	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Crangonyctidae			*Crangonyx*		Crangonyx	21	TRUE	Unknown	
CB13FI003	3	99mm	cutthroat trout gut	Animalia	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Nematocera	Chironomidae	Chironominae	Chironomini	*Polypedilum*		Polypedilum	1	TRUE	Larva	
CB13FI003	3	99mm	cutthroat trout gut	Animalia	Mollusca		Gastropoda		Neotaenioglossa		Hydrobiidae			*Potamopyrgus*	*antipodarum*	Potamopyrgus antipodarum	3	TRUE	Unknown	
CB13FI004	4	80mm	whole cutthroat	Animalia	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Crangonyctidae			*Crangonyx*		Crangonyx	9	TRUE	Unknown	
CB13FI004	4	80mm	whole cutthroat	Animalia	Mollusca		Gastropoda		Neotaenioglossa		Hydrobiidae			*Potamopyrgus*	*antipodarum*	Potamopyrgus antipodarum	2	TRUE	Unknown	
CB13FI004	4	80mm	whole cutthroat	Animalia	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Nematocera	Chironomidae	Prodiamesinae		*Prodiamesa*		Prodiamesa	1	TRUE	Larva	