# Yarrow Creek Population Estimates 2008

**Trout Unlimited Canada**
**Calgary, Alberta**

**Brian Meagher**

TABLE OF CONTENTS

LIST OF FIGURES

ACKNOWLEDGEMENTS

Trout Unlimited Canada would like to thank the volunteers who helped on this project as their efforts enabled us to complete this electrofishing effort: Chuck and Karen Johnston, Joe Neidermayer, Gord Murray, the Bruder Family, Daryl Wig, and the students from St. Michaels School. We would also like to thank the diligent effort put forth by the TUC staff members including Lesley Peterson, Andrea Battistel, Jody Shields and Melissa Maximnuk.

This project was graciously funded in part through Alberta Conservation Association's Grant Eligible Conservation Fund. TUC would like to take this opportunity to express their gratitude for this opportunity. We would also like to take this time to thank Daryl Wig of Alberta Sustainable Resource Development for his contributuion during this event.

# 1.0 INTRODUCTION

## 1.1 Project Overview

Yarrow Creek is a tributary of the Drywood Creek Watershed located approximately 25 km south of Pincher Creek Alberta. Yarrow Creek originates south of Loaf Mountain. Where it travels in a north-easterly direction for approximately 31 km before empting into Drywood Creek. A group of vested landowners are working together to protect and enhance this system, and to do so they have initiated the Drywood / Yarrow Conservation Partnership. Trout Unlimited Canada was invited to lend some expertise and provide some educational opportunities through a larger combined project to preserve and restore this watershed. The first step was to complete a population estimate of this upper reach of Yarrow Creek. We utilized volunteers from the watershed group, Trout Unlimited Canada (TUC) volunteers and students from a local high school to complete this effort.

Past electrofishing efforts on Yarrow Creek determined that this system holds many different species of native fish including Alberta's provincial species the bull trout (*Salvelinus confluentus*). Additional electrofishing efforts within this watershed resulted in the collection of species including cutthroat trout (*Oncorhynchus clarki*), mountain whitefish (*Prosopium williamsoni*), burbot (*Lota lota*), rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*). A variety of non-sport fish have also been sampled from this system including longnose sucker (*Catostomus catostomus*), mountain sucker (*Catostomus platyrhynchus*) and longnose dace (*Rhinichthys cataractae*).

Multiple stream inventory reports have been completed throughout Yarrow Creek. These reports, conducted in 2000, 2003 and 2004, indicate a "flashy system" with "high rearing potential". Alberta Conservation Association conducted a three pass removal in the same relative area of Yarrow Creek in August 2003. Their effort produced a large number of sportfish as well as cyprinids.

## 1.2 Study Area

The Yarrow Creek basin flows through the foothills of southern Alberta. Once the creek empties from the mountain range it begins to braid its way onto ranchlands. Habitat is typified by a sinuous cottonwood riparian buffer zone. The primary land use in the area is cattle grazing operations that parallel the creek as it meanders through the valley. There is relatively little development or cultivation beside the creek and relatively few linear disturbances. Many of the crossings are open span bridges appropriate for a flashy system. Yarrow Creek then makes it way into Drywood Creek before empting into the Waterton Reservoir. This watershed then deposits itself into the Oldman drainage before entering the South Saskatchewan River.

Much of this system lacks over hanging riparian cover, but steps have been taken in many areas to fence off the creek and allow natural regeneration. This system is prone to erosion and lacks undercut banks or other important aquatic habitat.

## 2.0 METHODS

### 2.1 Sampling Sites

A representative sample area was chosen for this population estimate based on local knowledge and ease of access. Past population estimates (Faulter and Tratch, unpublished data) had been conducted at a different location, but due to access issues and safety concerns the current population estimate site was selected. We were not able to re-sample the exact section originally sampled in 2003 as the current operator was grazing bison along this section at the time of the 2008 investigation. Therefore we could not secure safe access to this property. To my knowledge there is little angling activity in this area of the watershed.

Sampling started upstream Spread Eagle Road utilizing the fence line that runs parallel to the road as our downstream boundary (Figure 1). The fence line was useful in erecting the downstream blocking net. This was completed by draping the blocking net over the fence and then placing rocks along the bottom of the net to retain individuals in the sample area (Figure 2). We then measured out 300 meters upstream and placed our upper blocking net in the same fashion. At this location we were able to utilize debris from a log jam to set up the net (Figure 3). The upper blocking net is located in close proximity to Spread Eagle Road. This section was identified as representative habitat of Yarrow

Figure 1. A view of the study area.

Figure 2. Lower blocking net.

Figure 3. Upper blocking net.

Creek and it encompassed five meanders, six pool structures and seven riffles of various widths and depths.

## 2.2 Electrofishing

All sampling was conducted utilizing a Smith-Root backpack electrofishing unit model 12-B. The electrofishing unit utilized pulse direct current running at 200Volts throughout the effort. We observed that when running the unit at 30Hz for four millisecond pulses, we were able to effectively capture specimens while not observing any damage to individuals. During the all three passes we maintained the same crew of four individuals (one shocker and three dip netters) to ensure consistency. Volunteers graciously helped transport fish from the electrofishing to the processing station located on the flood fringe to the east of the lower blocking net.

All captured fish were brought back to the processing station where they were identified (to species), enumerated, weighed (to the nearest gram) and measured (fork length to the nearest millimetre). Data for each of the three passes was collected separately and electrofishing time was recorded to calculate total effort. Weight and length data was then utilized to calculate condition factors for all individuals.

### 2.2.1 Efficiency

The capture efficiency was calculated utilizing the numbers recovered during the first pass of electrofishing in relation to the total estimate of the population for this site.

## 2.3 Population Estimates

The population estimates were conducted in the sample area utilizing the removal-depletion methods for this site. As previously mentioned the site was isolated by blocking nets (10 mm stretch diagonal) placed at either end. We utilized a three pass electrofishing removal for the purpose of this study. Abundance was calculated with the multiple-pass depletion methods described by Lockwood and Schneider (2000). Ninety-five percent confidence intervals for these estimates were based on the log-likelihood profile assuming a binomial distribution of captured fish (Carle and Strub, 1978).

Any brook trout X bull trout hybrids were counted as brook trout for the purpose of this population analysis.

## 2.4 Abundance and Biomass

Biomass was calculated by combining the mass of all individuals captured during this effort and then extrapolating this from the 300 meter representative site to a one kilometer reach of the creek.

Data were also presented as percent species composition per section.

## 2.5 Hybrid Identification

We anticipated collecting brook trout X bull trout hybrids during this effort. Previous electrofishing and genetic analyses on other projects in river systems containing these two species has resulted in the determination of key characteristics (Earle et al., 2007) that correctly identify these hybrids. The key characteristic of the hybrids is the presence of pale light spots on the dorsal fin of these individuals (Figure 4). Brook trout possess dark vermiculations (worm-like markings) on their dorsal fin while bull trout have no markings on their dorsal fin (Figure 5).

Figure 4. Image of suspected hybrid from Yarrow Creek, inset shows the small pale markings on dorsal fin that identify this individual. This appears as white paint on a black canvas.

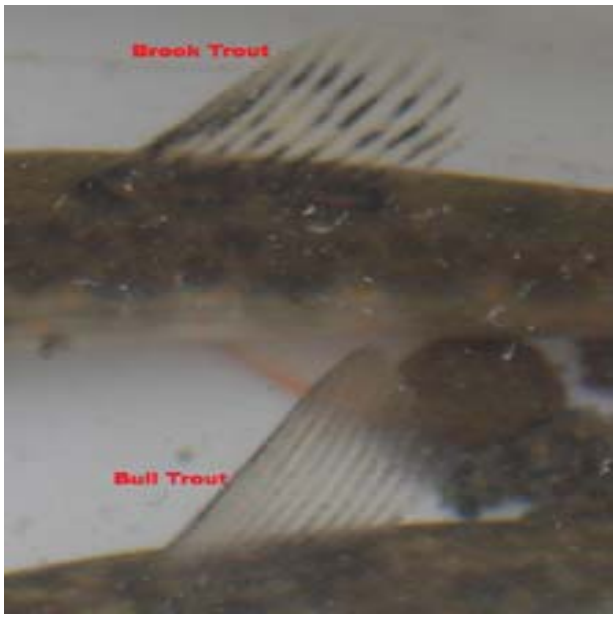


Figure 5. Image of brook trout and bull trout dorsal fins from Yarrow Creek. Notice the dark markings on the dorsal fin of the brook trout that appears as a black painting on a white canvas, while the bull trout dorsal fin has no spotting.

## 2.6 Habitat

Wetted width and thalwag depth were measured and recorded every 10 meters throughout the study area. All cross sections were logged by GPS.

# 3.0 RESULTS AND DISCUSSION

## 3.1 Electrofishing Efficiency

Yarrow Creek is a typical small flashy sub-watershed. Electroshocking was straight forward on this system as there were limited undercuts or deep areas for the fish to hide or run from the electroshocking crew. The shocking efficiency for this effort was calculated to be 57.3%.

## 3.2 Population Estimates

The three pass removal resulted in the capture of 94, 41 and 18 individuals respectively. From these findings we can estimate that this 300 meter section of Yarrow Creek had a total population of approximately 164 individuals (lower limit of 154 individuals, and upper limit of 174 individuals with a 95% confidence level). Sixty five bull trout were collected with an estimated total population of 66 (±2 with a 95% confidence level), while 39 brook trout were captured translating into a population estimate of 43 individuals (±6 with a 95% confidence level) for the 300 meter study area.

## 3.3 Size Distribution

### 3.3.1 Bull Trout

According to previous electrofishing efforts this stream appeared to be dominated by brook trout. Bull trout (BLTR) made up 36.2% (n=227) of the sportfish collected during a 2003 effort completed by the Alberta Conservation Association (Faulter and Tratch, unpublished data). The 2008 TUC effort netted 65 BLTR making up 52.4% of the sportfish collected. More shocking effort will be required in multiple years to make any conclusive comments on trends within this population.

There were two distinct BLTR age classes found (presumed age-1 included 60-90mm, presumed age-2 included 110 – 130mm) (Figure 6), suggesting that this reach of Yarrow Creek may be a natal and rearing stream and therefore very important for the success of this species. The 2003 data set showed similar age classes (Figure 7).

During the 2008 effort we did not find any adult BLTR (no individuals >200mm) which may indicate use variability or that this specific reach of the creek does not possess adequate habitat structure required for over wintering of large individuals. It is important to note that the study area did have some larger holding pools. During the 2008 effort we were informed about previous redd surveys completed in the area (Wig, Per. Comm.), but no spawning activity or active redds were observed during the 2008 study.

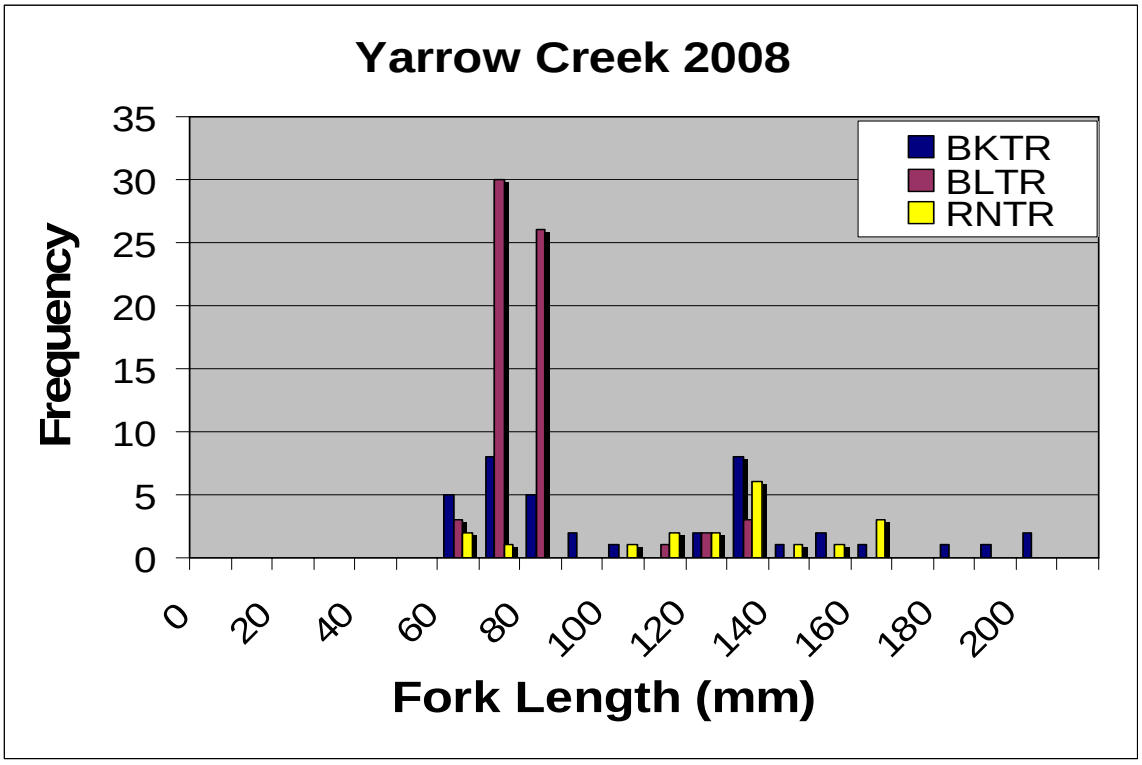


Figure 6. Length frequencies for Yarrow Creek captured during the three pass removal of the 300 m section completed in 2008.

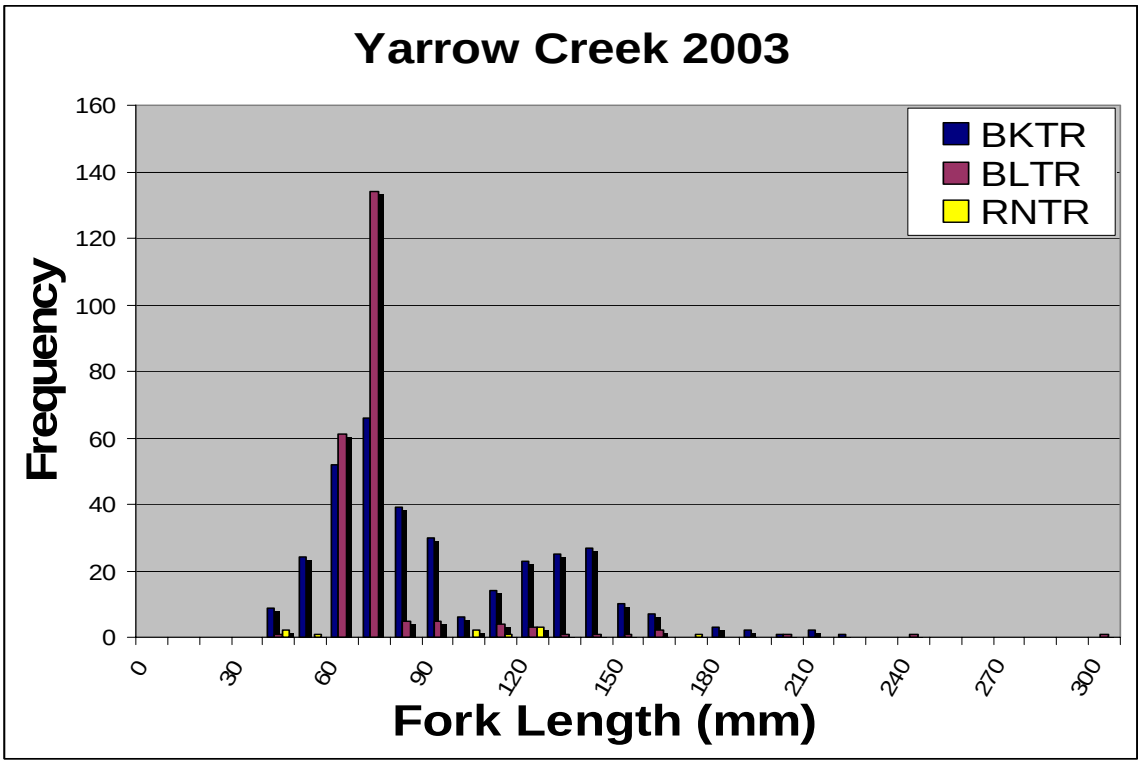


Figure 7. Length frequencies for Yarrow Creek captured during the three pass removal of the 300 m section completed in 2003.

### 3.3.2 Brook Trout

During the previous population estimate of Yarrow Creek brook trout (BKTR) were the most abundant sportfish collected making up 55% of the sportfish sampled in 2003 (n=346). The 2008 effort recovered a smaller sample size (n=39) but this was also a smaller proportion of the overall sportfish population (31.5%) in Yarrow Creek.

As with BLTR, there appeared to be two different dominant age classes for BKTR (presumed age-1 included 60-90mm, presumed age-2 included 120 – 150mm) (Figure 6) with one larger male who was generating milt. The relatively small size fork length of fish collected also suggests the importance of this reach of Yarrow Creek as a natal stream.

### 3.3.3 Rainbow Trout

The 2008 effort produced a relatively small number (n=19) of rainbow trout (RNTR) making up 15.3% of the sportfish collected. RNTR had been observed during the 2003 electroshocking effort, but in relatively low numbers comprising less than 2% of the sportfish collected over the course of that effort.

## 3.4 Biomass

The density of fish collected in 2008 was low. We obtained 153 fish over the 300 meter section of representative creek totalling 0.51 fish per meter. During the 2003 effort the crew collected 626 sportfish over the same distance (300 meters) resulting in a density of 2.08 sportfish per meter. This large difference in density for these two studies may be explained by the timing of the efforts. The 2003 effort was conducted in early August when the water temperature and flows would have been typically more beneficial for the adults. While the 2008 effort was undertaken at the end of October after the spawning runs had been completed and the adult sportfish had assumedly returned downstream to find significant over wintering holes. This will be taken into account when planning for future population estimates on this system.

Assuming the representative sample area is in fact representative of Yarrow Creek, these findings could then be extrapolated to determine estimates of biomass for the sub-watershed. In 2003 626 sportfish collected in a 300m section, which could extrapolate to 2,087 fish / kilometer, while the 2008 effort resulted in collection of 124 sportfish in a 300 meter study area which would equate to 413 sportfish per kilometer.

The biomass ratio (or the brook trout biomass over that of bull trout biomass) compares the volume of each species present in the creek. This ratio was calculated to be 3.27 kg/km : 1 kg/km (brook trout biomass per kilometer : bull trout biomass per kilometer) in 2003. This same ratio was determined to be 2.31 kg/km : 1 kg/km (brook trout biomass per kilometer : bull trout biomass per kilometer) in 2008. This ratio demonstrates a fluctuation in the population between these two sampling events. There is not enough repeated sampling to discuss this as a trend over time, but it is a unique observation. These numbers suggest a possible shift from one species to the other over time.

## 3.5 Hybrids

During this effort, one individual was suspected to be a hybrid due to some key characteristics (Figure 4). No samples were retained for genetic analysis. Data from this individual were grouped with the brook trout population for the purpose of this study.

## 4.0 REFERNCES

Carle, F.L. and M.R. Strub. 1978. A new method for estimating population size from removal data. Biometrics, 34:621-630.

Earle, J.E., A.J. Paul, and J.D. Stelfox. 2008. Quirk Creek population estimates and one-pass electrofishing removal of brook trout, 2007. Unpublished report, Fish and Wildlife Division, Alberta Sustainable Resource Development, Cochrane, Alberta.

Lockwood, Roger N. and J. C. Schneider. 2000. Stream fish population estimates by mark and recapture and depletion methods. Chapter 7 *in* Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

**Appendix A Table A1** **Life history data collected during sampling at the Yarrow Creek on October 22, 2008.**

| Sampling Date | Species | Fork Length (mm) | Weight (g) |
|---|---|---|---|
| 22-Oct-08 | BLBK | 192 | 77 |
| | BKTR | 55 | 2 |
| | BKTR | 56 | 1 |
| | BKTR | 57 | |
| | BKTR | 60 | 2 |
| | BKTR | 60 | 2 |
| | BKTR | 61 | 3 |
| | BKTR | 61 | 4 |
| | BKTR | 62 | 2 |
| | BKTR | 67 | 3 |
| | BKTR | 68 | 3 |
| | BKTR | 68 | 3 |
| | BKTR | 69 | 4 |
| | BKTR | 70 | 3 |
| | BKTR | 71 | 4 |
| | BKTR | 73 | 3 |
| | BKTR | 75 | 4 |
| | BKTR | 78 | 5 |
| | BKTR | 80 | 5 |
| | BKTR | 82 | 6 |
| | BKTR | 86 | 7 |
| | BKTR | 99 | 14 |
| | BKTR | 114 | 15 |
| | BKTR | 114 | 17 |
| | BKTR | 121 | 21 |
| | BKTR | 122 | 14 |
| | BKTR | 123 | 15 |
| | BKTR | 125 | 18 |
| | BKTR | 125 | 19 |
| | BKTR | 126 | 20 |
| | BKTR | 126 | 21 |
| | BKTR | 129 | 25 |
| | BKTR | 139 | 25 |
| | BKTR | 141 | 24 |
| | BKTR | 141 | 29 |
| | BKTR | 153 | 41 |
| | BKTR | 178 | 66 |
| | BKTR | 187 | 80 |
| | BKTR | 192 | 79 |
| | BLTR | 54 | 1 |
| | BLTR | 58 | 1 |
| | BLTR | 60 | 3 |
| | BLTR | 62 | 2 |
| | BLTR | 62 | 3 |
| | BLTR | 62 | 3 |
| | BLTR | 63 | 3 |
| | BLTR | 64 | 3 |
| | BLTR | 64 | 3 |
| | BLTR | 65 | 3 |

**Appendix A Table A1** **Life history data collected during sampling at the Yarrow Creek on October 22, 2008.**

| Sampling Date | Species | Fork Length (mm) | Weight (g) |
|---|---|---|---|
| 22-Oct-08 | BLTR | 65 | 4 |
| | BLTR | 66 | 2 |
| | BLTR | 66 | 3 |
| | BLTR | 66 | 3 |
| | BLTR | 66 | 5 |
| | BLTR | 67 | 3 |
| | BLTR | 67 | 3 |
| | BLTR | 67 | 3 |
| | BLTR | 68 | 2 |
| | BLTR | 68 | 3 |
| | BLTR | 68 | 3 |
| | BLTR | 68 | 3 |
| | BLTR | 68 | 3 |
| | BLTR | 68 | 3 |
| | BLTR | 69 | 2 |
| | BLTR | 69 | 3 |
| | BLTR | 69 | 3 |
| | BLTR | 69 | 3 |
| | BLTR | 69 | 4 |
| | BLTR | 69 | 4 |
| | BLTR | 70 | 2 |
| | BLTR | 70 | 3 |
| | BLTR | 70 | 4 |
| | BLTR | 71 | 3 |
| | BLTR | 71 | 3 |
| | BLTR | 71 | 3 |
| | BLTR | 71 | 3 |
| | BLTR | 71 | 4 |
| | BLTR | 71 | 4 |
| | BLTR | 71 | 4 |
| | BLTR | 71 | 5 |
| | BLTR | 72 | 3 |
| | BLTR | 72 | 4 |
| | BLTR | 72 | 4 |
| | BLTR | 73 | 3 |
| | BLTR | 73 | 4 |
| | BLTR | 73 | 5 |
| | BLTR | 74 | 4 |
| | BLTR | 74 | 4 |
| | BLTR | 74 | 4 |
| | BLTR | 74 | 4 |
| | BLTR | 75 | 4 |
| | BLTR | 75 | 4 |
| | BLTR | 75 | 5 |
| | BLTR | 77 | 4 |
| | BLTR | 77 | 4 |
| | BLTR | 78 | 3 |
| | BLTR | 78 | 5 |
| | BLTR | 79 | 7 |

**Appendix A Table A1** **Life history data collected during sampling at the Yarrow Creek on October 22, 2008.**

| Sampling Date | Species | Fork Length (mm) | Weight (g) |
|---|---|---|---|
| 22-Oct-08 | BLTR | 106 | 12 |
| | BLTR | 111 | 12 |
| | BLTR | 120 | 16 |
| | BLTR | 121 | 19 |
| | BLTR | 124 | 20 |
| | BLTR | 130 | 18 |
| | LNDC | 48 | 1 |
| | LNDC | 49 | 1 |
| | LNDC | 57 | 2 |
| | LNDC | 62 | 4 |
| | LNDC | 62 | |
| | LNDC | 68 | 4 |
| | LNDC | 69 | 4 |
| | LNDC | 69 | 4 |
| | LNDC | 69 | 4 |
| | LNDC | 71 | 3 |
| | LNDC | 73 | 4 |
| | LNDC | 73 | 5 |
| | LNDC | 74 | 4 |
| | LNDC | 76 | 6 |
| | LNDC | 77 | 4 |
| | LNDC | 77 | 5 |
| | LNDC | 79 | |
| | LNDC | 80 | 4 |
| | LNDC | 80 | 6 |
| | LNDC | 87 | 7 |
| | LNDC | 92 | 9 |
| | LNDC | 94 | 10 |
| | LNDC | 96 | 12 |
| | LNDC | 104 | 11 |
| | LNDC | 107 | 11 |
| | LNDC | 121 | 24 |
| | MNSC | 138 | 41 |
| | MNSC | 155 | 48 |
| | MNSC | 172 | 69 |
| | MNWH | 230 | 133 |
| | RNTR | 55 | 1 |
| | RNTR | 56 | 1 |
| | RNTR | 68 | 3 |
| | RNTR | 99 | 12 |
| | RNTR | 104 | 14 |
| | RNTR | 110 | 12 |
| | RNTR | 115 | 15 |
| | RNTR | 120 | 18 |
| | RNTR | 123 | 25 |
| | RNTR | 124 | 22 |
| | RNTR | 125 | 19 |
| | RNTR | 125 | 23 |
| | RNTR | 125 | 23 |

**Appendix A Table A1** **Life history data collected during sampling at the Yarrow Creek on October 22, 2008.**

| Sampling Date | Species | Fork Length (mm) | Weight (g) |
|---|---|---|---|
| 22-Oct-08 | RNTR | 125 | 24 |
| | RNTR | 135 | 29 |
| | RNTR | 144 | 33 |
| | RNTR | 151 | 37 |
| | RNTR | 152 | 39 |
| | RNTR | 154 | 37 |

**Life history data collected during sampling at Yarrow Creek on October 22, 2008.**

| Species | Tally of Measured Fish | | Mortalities | | Total |
|---|---|---|---|---|---|
| RNTR | | 19 | | | 19 |
| BLTR | | 64 | 1 | | 65 |
| BKTR | | 38 | | | 38 |
| BKBL | | 1 | | | 1 |
| MNWH | | 1 | | | 1 |
| LNDC | | 26 | | | 26 |
| MNSC | | 3 | | | 3 |
| | | 152 | 1 | | 153 |

ABBREVIATIONS:

**RNTR** Rainbow Trout
**BLTR** Bull Trout
**BKTR** Brook Trout
**BKBL** Brook Trout - Bull Trout Hybrid
**MNWH** Rocky Mountain Whitefish
**LNDC** Longnose Dace
**MNSC** Mountain Sucker