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Aquatic Biomonitoring in Bons Pond, and Bons and Buddy Creeks, 2004 to 2006, at the Red Dog Mine

by Alvin G. Ott
and William A. Morris

Bons Pond, June 10, 2006
Photograph by William A. Morris 2006

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Alaska Department of Natural Resources
Office of Habitat Management and Permitting

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Table of Contents

List of Figures

List of Figures (concluded)

Acknowledgements

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Executive Summary

●water quality data indicate that Cd, Pb, and Zn are elevated, at times, in Bons Creek upstream of the reservoir, but Se is lower

●water quality data indicate that Cd, Pb, and Zn peak in early spring in both Bons and Buddy creeks

●aquatic invertebrate densities are highly variable among sample years, but Buddy Creek has aquatic invertebrate densities comparable with North Fork Red Dog Creek, one of the most productive streams sampled in the Red Dog Mine area

●higher proportions of mayflies, stoneflies, and caddisflies occur in the Buddy and North Fork Red Dog Creek samples than in Bons Creek

●chlorophyll-a concentrations in Buddy and Bons creeks show fairly high periphyton standing crop at all sample sites, an indication that productivity was highest in 2006, and generally the chlorophyll-a concentrations are comparable to, and for Bons Creek, higher than North Fork Red Dog Creek

●Arctic grayling (*Thymallus arcticus*) from Bons Pond and Dolly Varden juveniles from Buddy Creek were analyzed for whole body metal concentrations. Substantial differences in whole body metals concentrations were found among sample years for Dolly Varden and between the two species.

●the Arctic grayling transplanted into Bons Pond in 1994 and 1995 (about 100 juvenile fish in 1994 and about 200 fry in 1995) have established a self-sustaining population in Bons Pond that has grown rapidly

●the Arctic grayling population in Bons Pond exceeds 5,000 fish greater than 200 mm long (about 8 inches)

●some Arctic grayling have left Bons Pond and returned as a component of the spring spawning migration into North Fork Red Dog Creek which provides the only area of documented significant spawning habitat in the Ikalukrok Creek drainage

Introduction

The Red Dog lead and zinc mine is located in northwestern Alaska, about 130 km north of Kotzebue and 75 km inland from the coast of the Chukchi Sea. Mine operations and facilities and the surrounding vegetation and wildlife are described in Weber Scannell and Ott (1998). Aquatic resources in Ikalukrok Creek and the Wulik River are reported in Weber Scannell and Ott (2001).

Bons Pond, at the Red Dog Mine, is a man-made impoundment created by construction of an earthen dam (Figure 1). The dam was built in 1987/1988 to provide potable and make-up water for operational activities. There were no fish present in Bons Creek in the area of the reservoir due to a series of impassable waterfalls and chutes about 1 km below the dam. In 1994 and 1995, Arctic grayling (*Thymallus arcticus*) from North Fork Red Dog Creek were transplanted to Bons Pond in an attempt to establish a recreational fishery (Ott and Townsend 2003).

In 1996, Teck Cominco Alaska Inc. (TCAK) completed a water bypass for Bons Creek around the Kivalina shale waste dump and installed an interceptor ditch with pumpback wells immediately south of the waste dump site. The purpose of the interceptor system was to capture and then transfer seepage and runoff water from the waste dump to the tailing impoundment, thus preventing water containing elevated metals from entering the Bons Creek drainage.

In summers 2001 and 2002, Arctic grayling juveniles were observed in Bons Creek immediately downstream of the blast road (Figure 1). Prior to these observations, we had assumed that the fish transplant made in 1994 and 1995 had been unsuccessful (Ott and Townsend 2003). In summer 2003, fish sampling was begun to determine the extent of fish use of Bons Pond. The estimated Arctic grayling population in 2003 was 6,773 fish >200 mm (Ott and Townsend 2003).

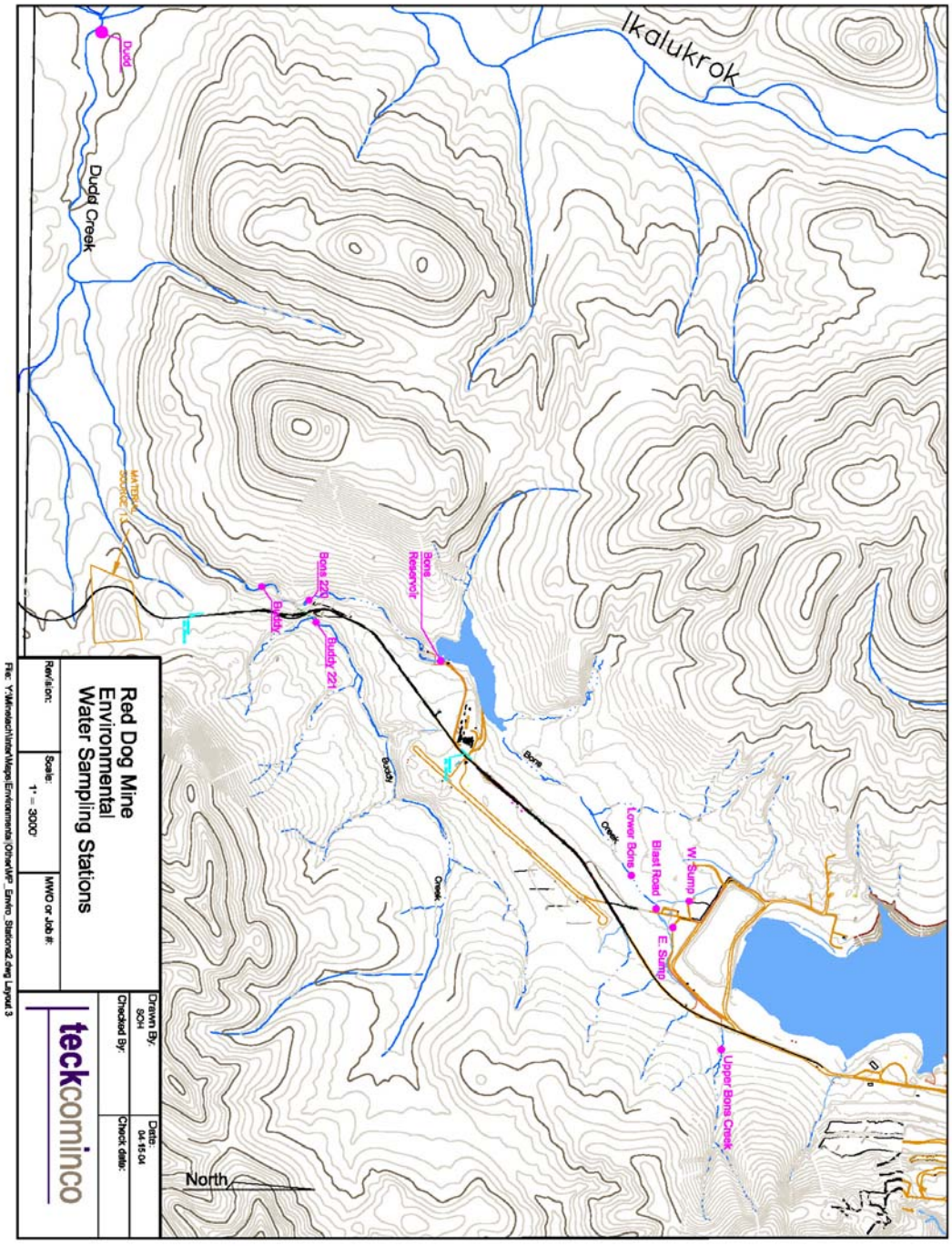

Figure 1. Bons and Buddy Creeks and Bons Pond (map provided by TCAK).

Work continued with the State's Large Mine Project Team (LMPT) and TCAK to develop a closure plan for the tailing dam that would include design and construction of a back dam separating tailing impoundment water from the Bons Creek drainage. The closure plan will include a seepage collection system downstream of the back dam and a pumpback system to transfer the water for treatment prior to discharge to Middle Fork Red Dog Creek.

In spring 2004, by agreement between TCAK and the Alaska Department of Environmental Conservation with input from the Office of Habitat Management and Permitting (Alaska Department of Natural Resources), an aquatic biomonitoring sampling program proposed by TCAK was initiated in the Bons and Buddy Creek drainages. The aquatic sampling program covers water quality, aquatic invertebrates, periphyton, and fish. These data were deemed essential to establish a baseline data set for the Bons and Buddy Creek drainages located south of the tailing impoundment back dam. An increase in the projected final water elevation in the tailing impoundment at closure meant that there was a potential for water quality changes in Bons Creek. The purposes of our report are to summarize the first three years of data collection (2004 to 2006) on water quality, aquatic invertebrate, periphyton, and fish and to provide recommendations for future monitoring.

Methods

All methods used for the aquatic biomonitoring study in the Bons and Buddy Creek drainages were described by ADF&G (1998). Only minor modifications were made, as described by Ott and Weber Scannell (2003). Sample sites, as listed below, for periphyton, aquatic invertebrates, and fish were established in Bons and Buddy creeks (Figure 1):

- Bons Creek, about 200 m upstream of Bons Pond;
- Bons Creek, downstream of Bons Pond (Station 220);
- Buddy Creek, upstream of the Haul Road, (Station 221); and
- Buddy Creek, below the waterfalls.

Periphyton and aquatic invertebrates were sampled one time during each summer. Fish sampling with minnow traps was conducted twice during each ice-free season in 2004 and 2005. Minnow traps are not an efficient sample mode for Arctic grayling and after two years of sampling with zero catches of other fish species, sampling with minnow traps ceased.

For purposes of estimating the Arctic grayling population, sampling focused on Bons Pond and Bons Creek upstream of the reservoir. Arctic grayling were sampled with fyke nets and by angling. Most fish were collected in Bons Pond by angling. In spring 2006, Arctic grayling were effectively captured using a fyke net set in Bons Creek. Fish >200 mm were marked with a numbered Floy® internal anchor tag.

Temperature (°C), dissolved oxygen (DO) concentration (mg/L), DO percent saturation (barometrically corrected), pH, specific conductance (u S/cm), and depth (m) were measured with a Hydrolab® Minisonde® water quality multiprobe connected to a Surveyor® 4 digital display unit. The meter was calibrated to suggested specifications prior to field use. The DO concentration was calibrated using the open-air method.

Conductivity and pH were calibrated with standard solutions. Water quality measurements were made at the surface, at 1 m depth intervals, and near the bottom in Bons Pond.

The abundance of Arctic grayling in Bons Pond was estimated using Chapman's modification of the Lincoln-Petersen two-sample mark-recapture model (Chapman 1951),

$$\hat{\mathrm{N}}_c = \left\{ \frac{(n_1+1)(n_2+1)}{(m_2+1)} \right\} - 1,$$

where $\hat{N}_c$ = estimated population, n_1=fish marked in first capture event, n_2=fish captured during recapture event, and m_2=fish captured during recapture event that were marked in the capture event. Variance was calculated as: (Seber 1982)

$$\mathrm{var}(\hat{\mathrm{N}}_c) = \left\{ \frac{(n_1+1)(n_2+1)(n_1-m_2)(n_2-m_2)}{(m_2+1)^2(m_2+2)} \right\}.$$

95% CI for the population estimate was calculated as

$$95\% C.I. = \mathrm{N}_c \pm (1.960)\sqrt{\hat{\mathrm{var}}(\hat{N}_c)}.$$

Box plot figures are used to compare whole body metals concentrations for Arctic grayling and Dolly Varden (*Salvelinus malma*). The box encompasses the middle half of the data and represents the interquartile range (IQR). The box is bisected with a line at the median and the whiskers are the typical range of data in the sample and always end at a datapoint (i.e., they go to a datapoint that is within 1.5 X the IQR). Asterisks are possible outliers (i.e., outside the box or IQR by more than 1.5 X the IQR) and ○ are probable outliers more than 3 X the IQR.

Results and Discussion

Bons Creek Above Bons Pond

Site Description

Bons Creek, upstream of Bons Pond, is about 1 to 2 m wide with depths from 0.3 to 1 m (Figure 2). Substrate immediately below the Blast Road consists of fine sediments and organics. In our sample area, located about 200 m upstream of Bons Pond, the substrate consists of gravel in riffles with fine sediments and organics in pools. Bons Creek is incised with streambanks vegetated with willows and sedges. Thermal hydraulic erosion downstream of a diversion ditch placed to bypass surface waters around the west side of the Kivalina Waste Dump contributes seasonally to the sediment and organic load in Bons Creek.

Figure 2. Bons Creek, upstream of Bons Pond.

Water Quality

Water quality data for cadmium (Cd), lead (Pb), selenium (Se), and zinc (Zn) are presented in Figures 3 through 6 and in Appendix 1. Maximum concentrations for Cd, Pb, Se, and Zn are highest in 2006. Maximum concentrations for Cd, Pb, Se, and Zn occurred in samples collected in early spring 2006. Higher maximum concentrations of Cd and Zn also were found in late fall. The pH concentrations in Bons Creek are lower in early spring and late fall (Figure 7). Elevated concentrations of metals in spring and fall in Bons Creek above the pond need further monitoring and evaluation.

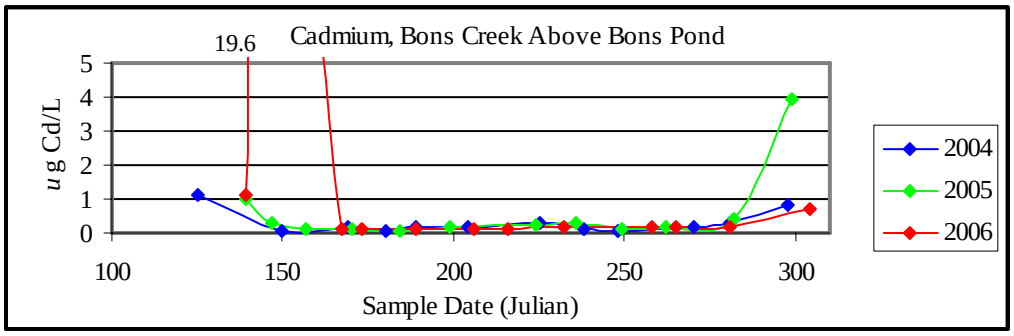

Figure 3. Cd concentrations in Bons Creek above Bons Pond (2004 to 2006).

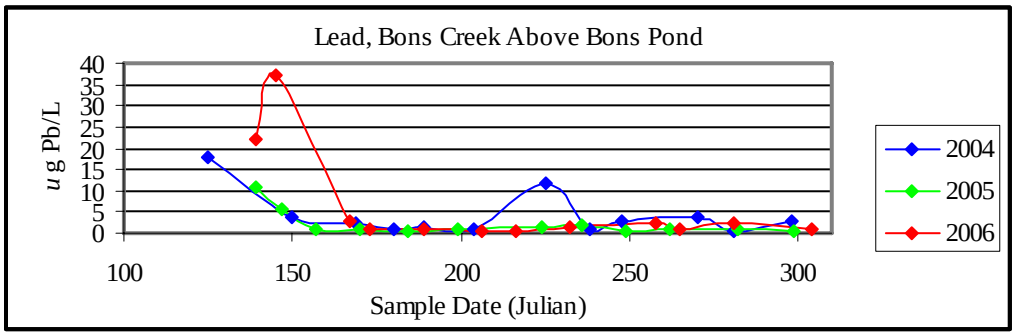

Figure 4. Pb concentrations in Bons Creek above Bons Pond (2004 to 2006).

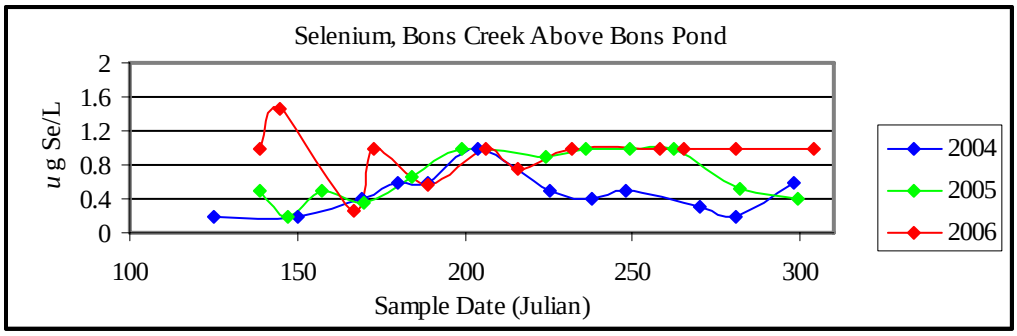

Figure 5. Se concentrations in Bons Creek above Bons Pond (2004 to 2006).

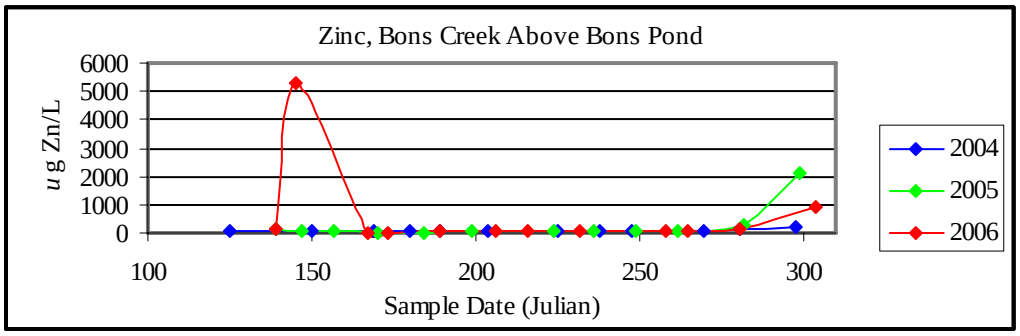

Figure 6. Zn concentrations in Bons Creek above Bons Pond (2004 to 2006).

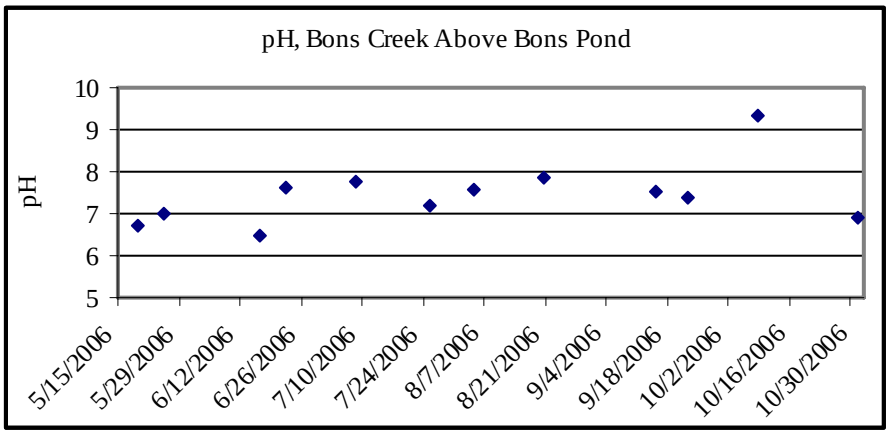

Figure 7. The pH in Bons Creek above Bons Pond in summer 2006.

Invertebrate Community (Abundance, Taxa Richness, and Structure)

Aquatic invertebrate density, taxa richness, and community structure are presented in Figures 8 through 10 and in Appendix 2. Aquatic invertebrate densities were highly variable among sample years with highest densities found in 2005 (Figure 8). The total number of aquatic taxa also was highest in 2005 (Figure 9). The proportion of Ephemoptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) (EPT) in all sample years is low, ranging from 8 to 19% of the sample (Figure 10).

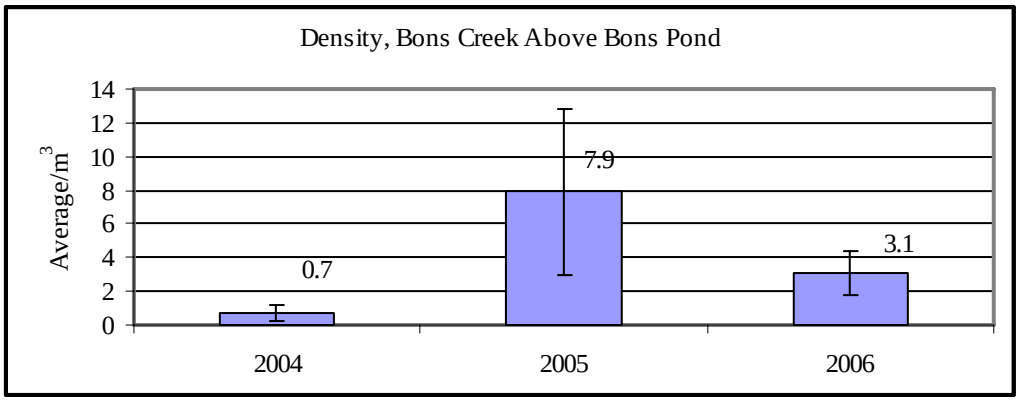

Figure 8. Aquatic invertebrate density (plus and minus one standard deviation), Bons Creek above Bons Pond.

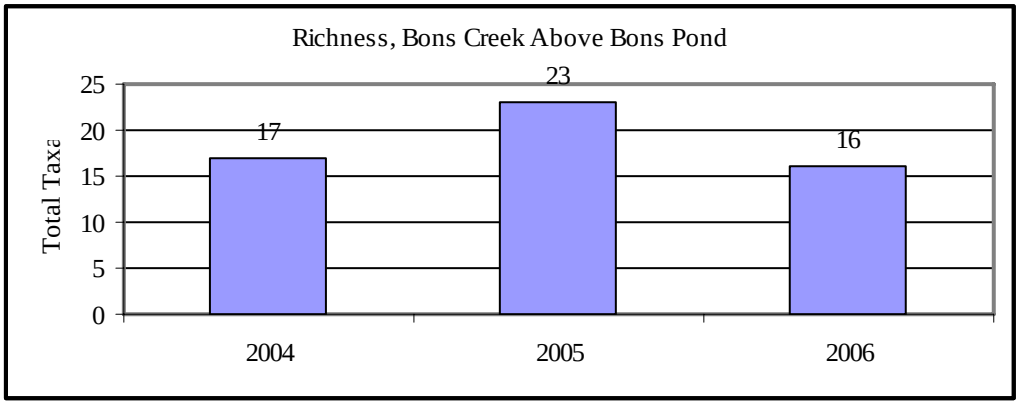

Figure 9. Aquatic invertebrate taxa richness, Bons Creek above Bons Pond.

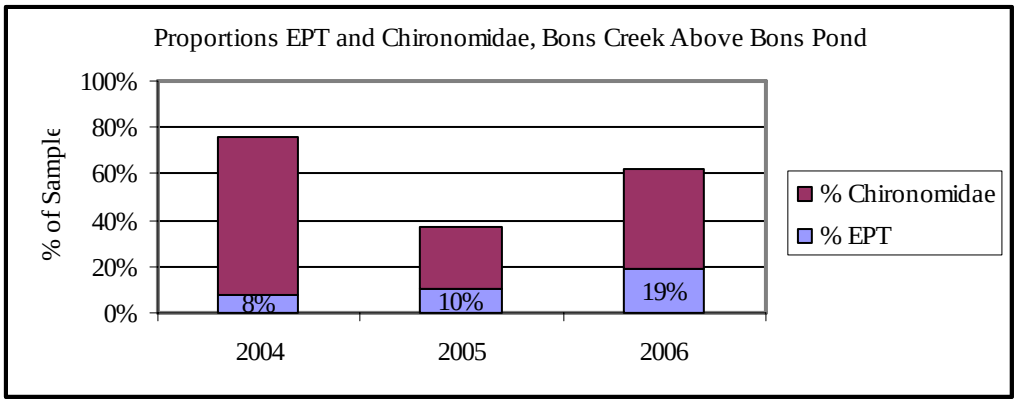

Figure 10. Percent EPT and Chironomidae, Bons Creek above reservoir.

Periphyton Standing Crop

Algae biomass, as estimated by chlorophyll-a concentrations, is presented in Figure 11 and in Appendix 3. Average chlorophyll-a concentrations varied among sample years, but were highest in 2005 (Figure 11). The higher chlorophyll-a concentrations are found in the same sample year that aquatic invertebrate densities also are the highest.

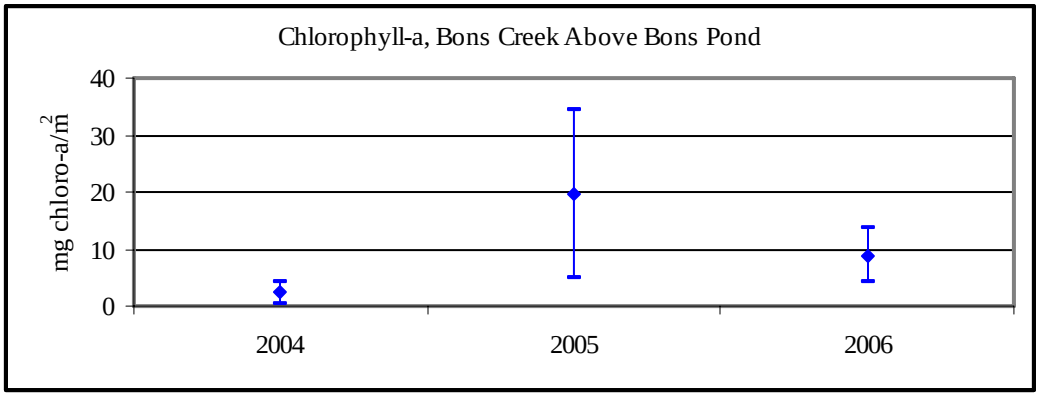

Figure 11. Average concentration of chlorophyll-a, plus and minus one standard deviation, in Bons Creek above Bons Pond.

Fish

Arctic grayling adults and juveniles use Bons Creek during the ice-free season. Adult Arctic grayling enter Bons Creek during and after breakup. Spawning was observed in Bons Creek in the vicinity of our sample area and in tributaries to Bons Creek. Ten Arctic grayling fry (age-0) were caught in drift nets in 2005, but none were captured in 2004 or 2006. In spring 2006, a fyke net was fished in Bons Creek from June 11 to 16. Length frequency distribution for juveniles and ripe adult fish caught is presented in Figure 12. Most of the fish greater than 240 mm were mature. Bons Creek, upstream of Bons Pond, is a productive aquatic system supporting both Arctic grayling spawning and rearing.

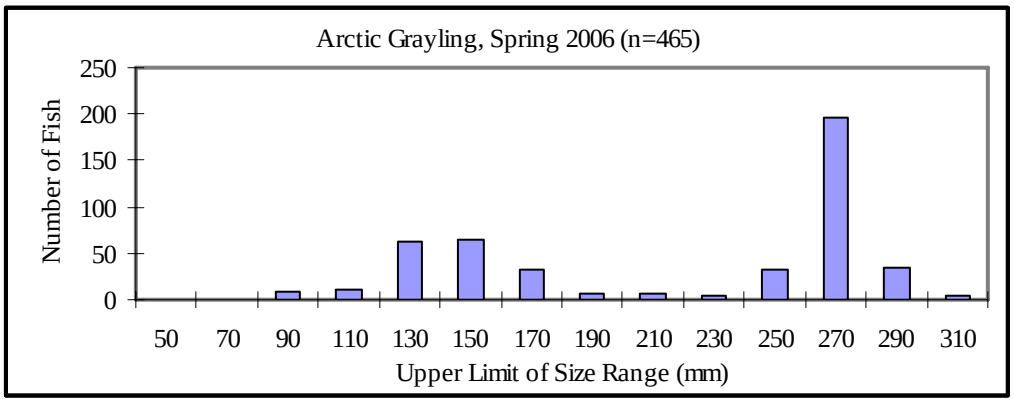

Figure 12. Length frequency distribution of fyke net caught Arctic grayling in Bons Creek upstream of Bons Pond.

Bons Creek Below Bons Pond (Station 220)

Site Description

Bons Creek, downstream of Bons Pond, is about 2 to 4 m wide with depths from 0.3 to 0.6 m (Figure 13). One deep (2 to 3 m deep) pool exists just downstream of the bypass channel that carries water around the Bons Creek freshwater dam. The pool was excavated during construction of the dam to function as a stilling basin. The pool is fed by groundwater flow and probably provides overwintering habitat for Arctic grayling. Our sample reach is located about 50 m upstream of the confluence of Bons and Buddy creeks. The substrate consists of gravel and cobble, angular rock, and some boulders. The streambanks are heavily vegetated with willow.

Figure 13. Bons Creek, downstream of Bons Pond.

Water Quality

Water quality data for cadmium (Cd), lead (Pb), selenium (Se), and zinc (Zn) are presented in Figures 14 through 17. Peak Cd, Pb, and Zn concentrations are seen in spring of each year. Se concentrations increased during summers 2004 and 2005, but not in 2006 (Figure 16). Fall increases in Cd, Pb, Se, and Zn as seen in Bons Creek upstream of the pond are not seen in Bons Creek downstream of the freshwater reservoir. Overall, Cd, Pb, and Zn concentrations are lower below Bons Pond than upstream of the freshwater reservoir. Se concentrations are slightly higher downstream of Bons Pond. Metals concentrations decrease below Bons Pond possibly from dilution or precipitation of metal complexes in the pond.

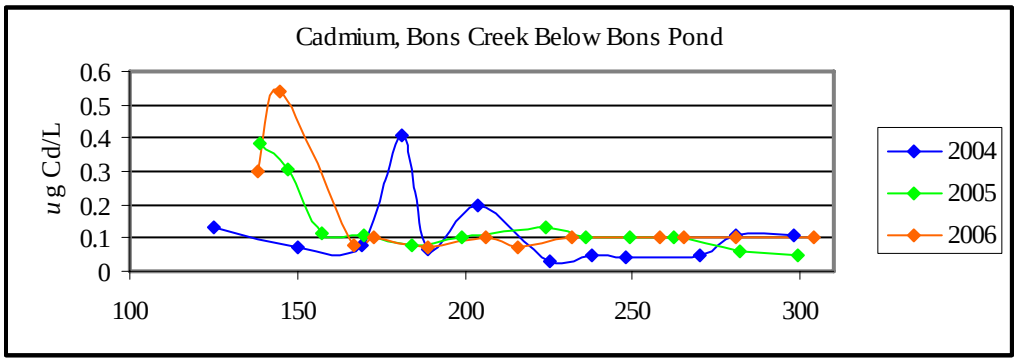

Figure 14. Cd concentrations in Bons Creek below Bons Pond (2004 to 2006).

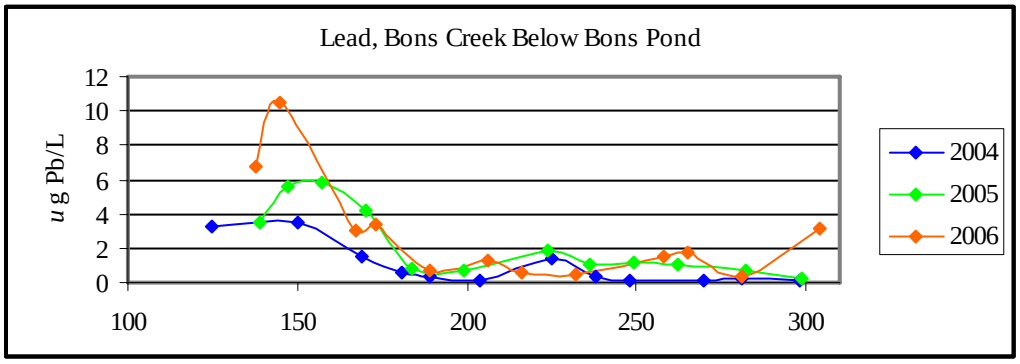

Figure 15. Pb concentrations in Bons Creek below Bons Pond (2004 to 2006).

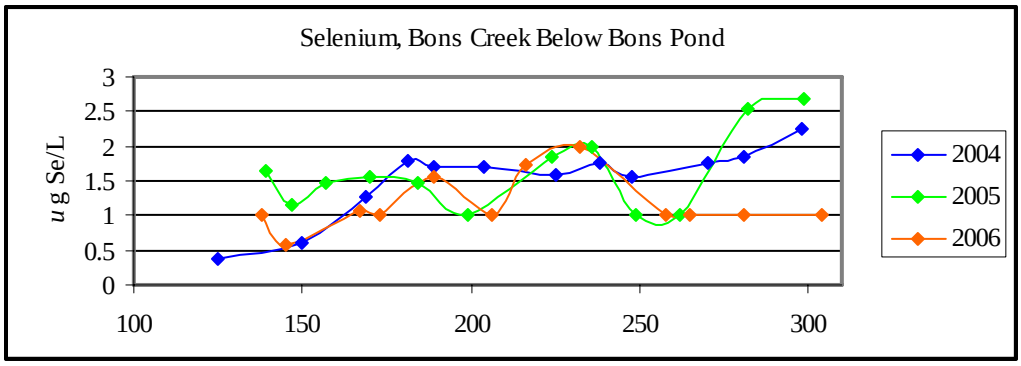

Figure 16. Se concentrations in Bons Creek below Bons Pond (2004 to 2006).

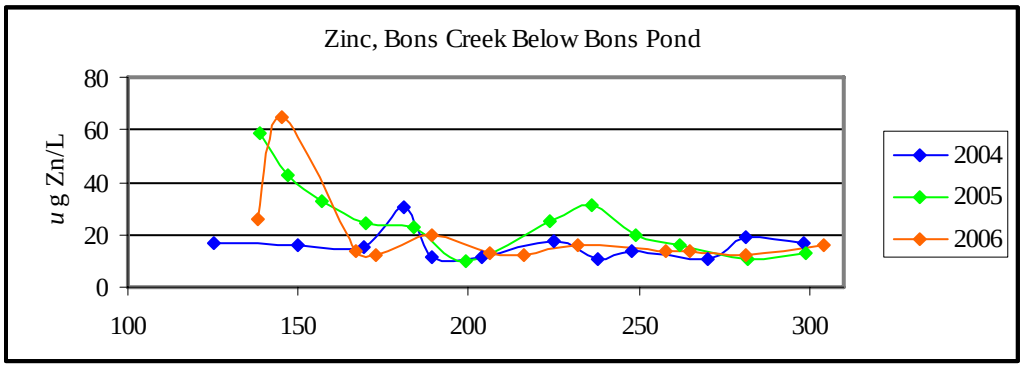

Figure 17. Zn concentrations in Bons Creek below Bons Pond (2004 to 2006).

Invertebrate Community (Abundance, Taxa Richness, and Structure)

Aquatic invertebrate density, taxa richness, and community structure are presented in Figures 18 through 20. Aquatic invertebrate densities were highly variable among sample years with highest densities found in 2005 (Figure 18). The total number of aquatic taxa is similar in all sample years (Figure 19). The proportion of EPT was low in 2004 and 2006, but relatively high (44%) in summer 2005 (Figure 20).

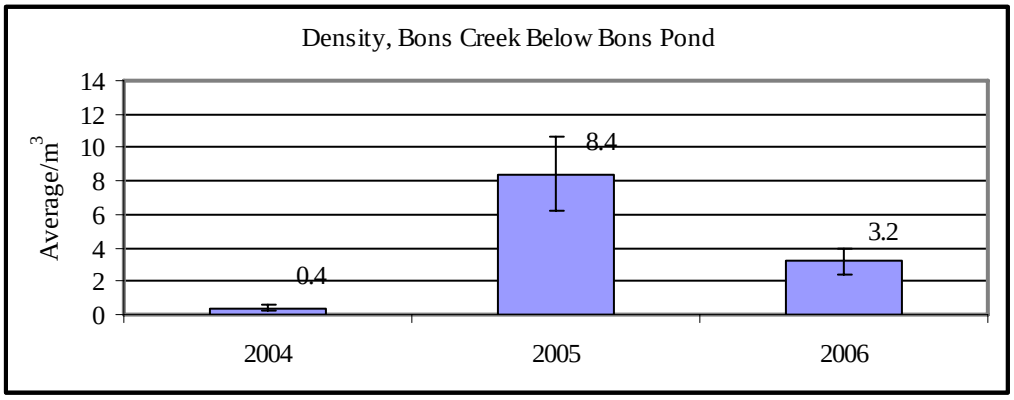

Figure 18. Aquatic invertebrate density (plus and minus one standard deviation), in Bons Creek below Bons Pond.

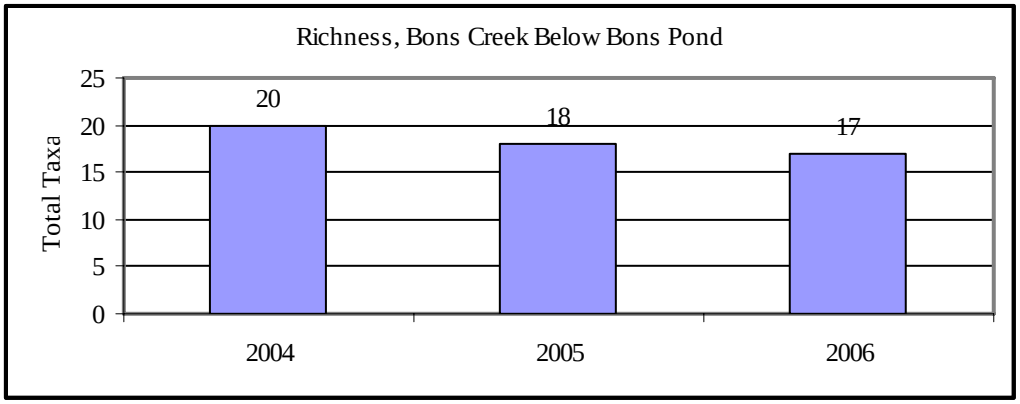

Figure 19. Aquatic invertebrate taxa richness, Bons Creek below Bons Pond.

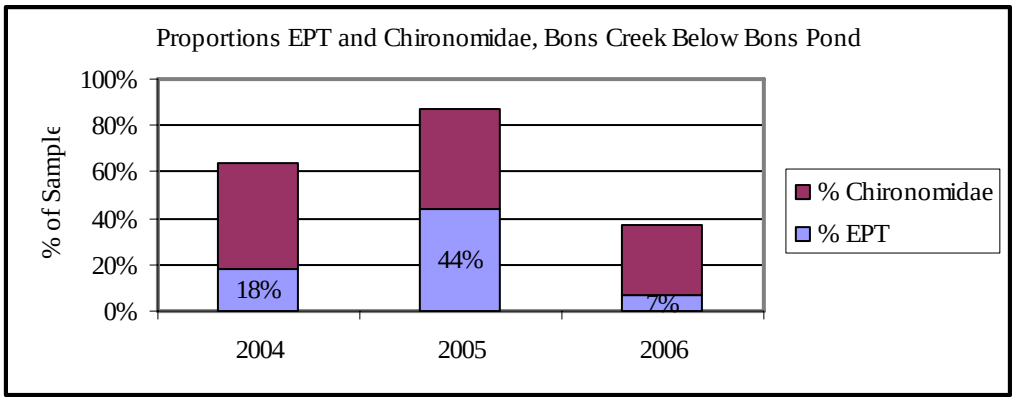

Figure 20. Percent EPT and Chironomidae, Bons Creek below Bons Pond.

Our drift net samples in August 2006 contained *Daphnia* and some Ostracods and Copepods. In past sampling events in streams throughout the Red Dog Mine area, few, if any, *Daphnia*, Ostracods, and Copepods were present in drift samples. However, in 2006, large numbers of these aquatic invertebrates were caught. The average number of *Daphnia* per drift net was 1,106 and the average number of Ostracods and Copepods was 40 and 49. Clearly, the source of these aquatic invertebrates in Bons Creek is the freshwater reservoir. We do not have an explanation for why *Daphnia* were not caught in 2004 or 2005 in Bons Creek below the reservoir. The major differences among sample years are a later sampling time in 2006 (mid-August as opposed to our normal sampling time frame of early July) and the absence of large numbers of juvenile Arctic grayling in Bons Creek downstream of the freshwater reservoir that would prey on these invertebrates.

Periphyton Standing Crop

Algae biomass, as estimated by chlorophyll-a concentrations, is presented in Figure 21. Average chlorophyll-a concentrations varied among sample years, but were highest in 2006.

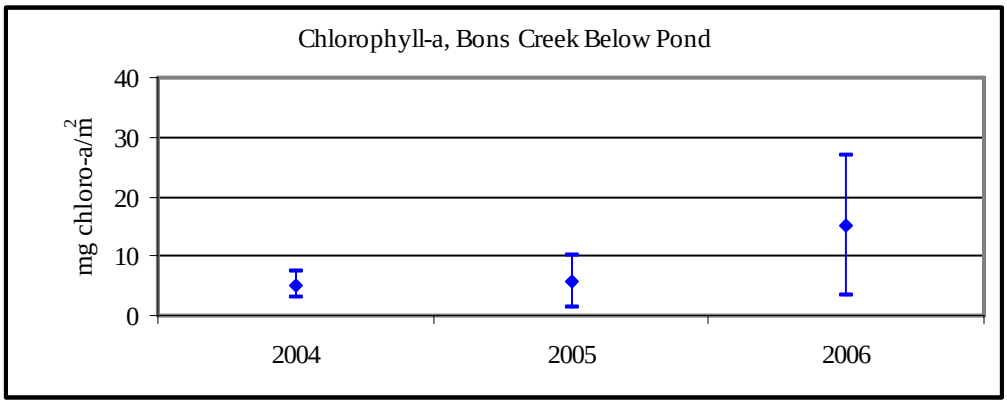

Figure 21. Average concentration of chlorophyll-a, plus and minus one standard deviation, in Bons Creek below Bons Pond.

Fish

Arctic grayling fry, juveniles, and adults use Bons Creek downstream of the freshwater dam. Originally, all of the Arctic grayling entering this reach of Bons Creek moved through the bypass channel and over the spillway into the creek (Figure 22). Some Arctic grayling probably overwinter in the large pool (i.e., stilling basin) located immediately below the spillway. Successful spawning, as determined by presence of fry, was documented in 2005 when hundreds of fry were observed in backwater areas in early July. In 2005, large numbers of juvenile Arctic grayling (100 to 200 mm long) were seen throughout the Bons Creek sample reach. In contrast, very few Arctic grayling were seen in summer 2006. Bons Creek, downstream of Bons Pond, is a productive aquatic system supporting Arctic grayling spawning, rearing, and probably overwintering.

Figure 22. Spillway at the end of the bypass channel carries water around Bons Pond dam.

Buddy Creek Above Haul Road (Station 221)

Site Description

Buddy Creek, upstream of the Haul Road, is about 4 to 6 m wide with depths from 0.3 to 1 m (Figure 23). Substrate consists of gravel and cobble. Streambanks are heavily vegetated with willow and sedges with exposed gravel bars on inside meander bends during low flow conditions. Some fine sediments and organics are present in pools. Our sample site is located about 150 m upstream of the confluence of Bons and Buddy creeks.

Figure 23. Buddy Creek, above the Haul Road.

Water Quality

Water quality data for Cd, Pb, Se, and Zn are presented in Figures 24 through 27. Cd, Pb, and Zn concentrations peak in spring. Zn concentrations are higher in early spring and late fall (Figure 27). Se concentrations appear to increase with time during the summer season and are higher in Buddy Creek than in Bons Creek.

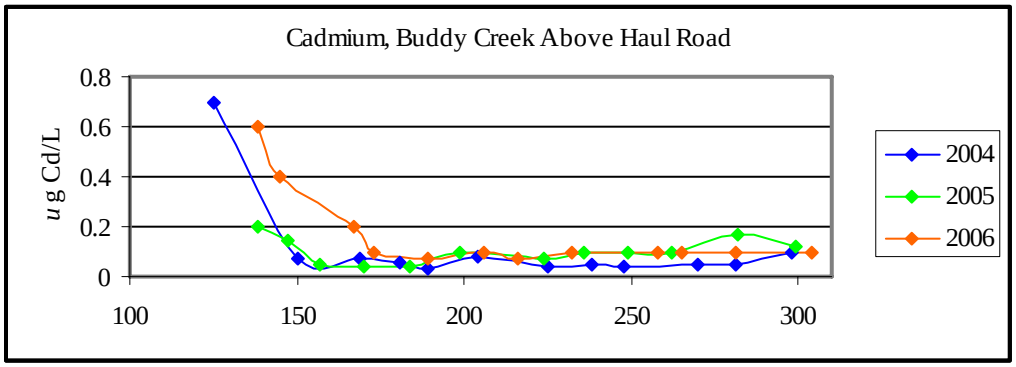

Figure 24. Cd concentrations Cd in Buddy Creek above Haul Road (2004 to 2006).

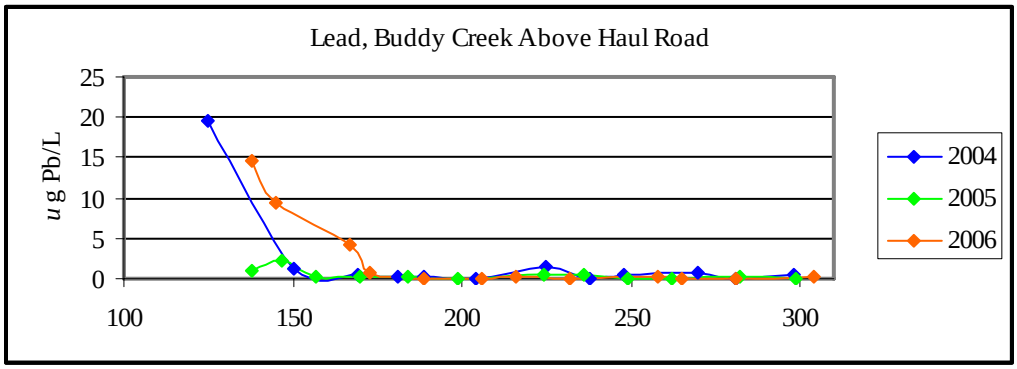

Figure 25. Pb concentrations in Buddy Creek above Haul Road (2004 to 2006).

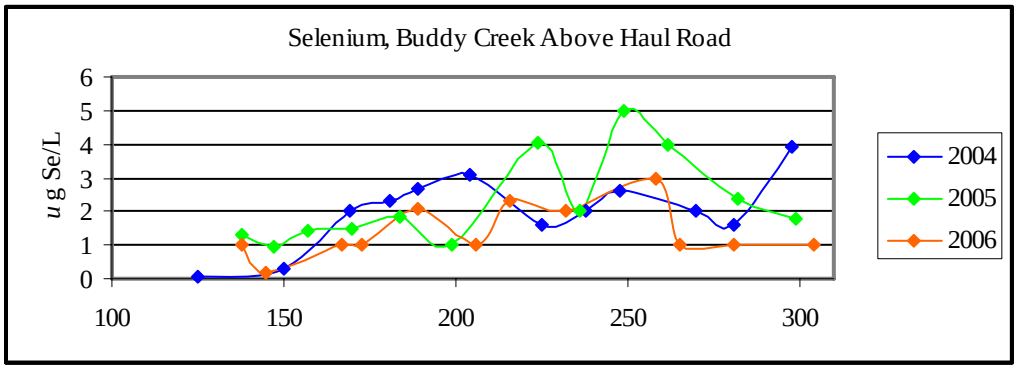

Figure 26. Se concentrations in Buddy Creek above Haul Road (2004 to 2006).

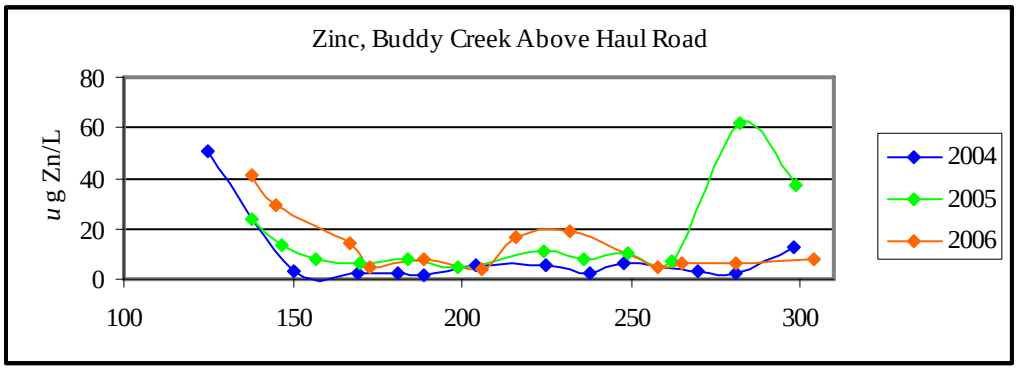

Figure 27. Zn concentrations in Buddy Creek above Haul Road (2004 to 2006).

Invertebrate Community (Abundance, Taxa Richness, and Structure)

Aquatic invertebrate density, taxa richness, and community structure are presented in Figures 28 through 30. The average density of aquatic invertebrates ranged from 9.2 to 15.3 per m^3 – some of the highest densities of aquatic invertebrates found in the Buddy and Bons Creek sample sites (Figure 28). The aquatic invertebrate densities found in 2004 and 2005 (14.8 and 15.3/m^3) exceeded those measured in North Fork Red Dog Creek from 1999 through 2005 (Ott and Morris 2006). The total number of aquatic taxa found was consistent among sample years (Figure 29). Proportions of EPT in the Buddy Creek samples are high, especially in 2004 when EPT made up 90% of the aquatic invertebrates (Figure 30).

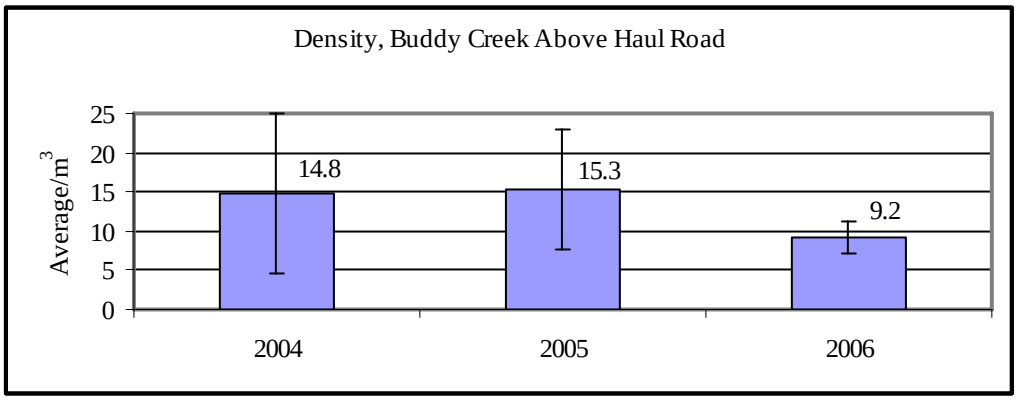

Figure 28. Aquatic invertebrate density (plus and minus one standard deviation), Buddy Creek above Haul Road.

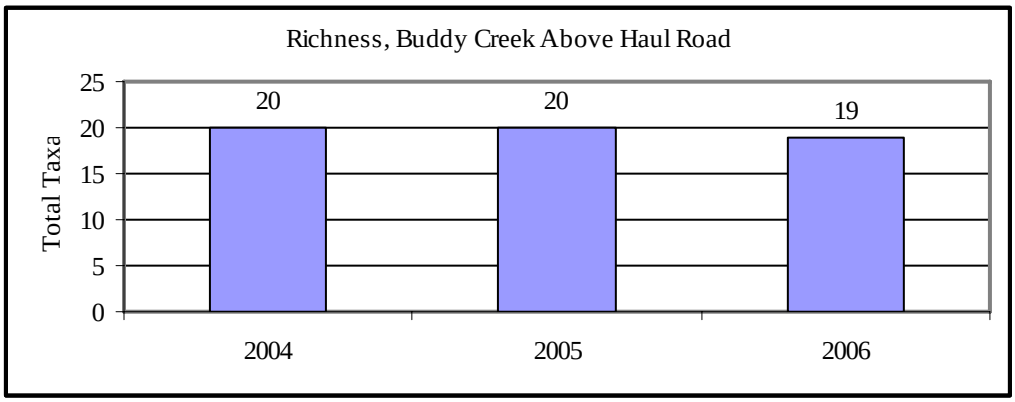

Figure 29. Aquatic invertebrate taxa richness, Buddy Creek above Haul Road.

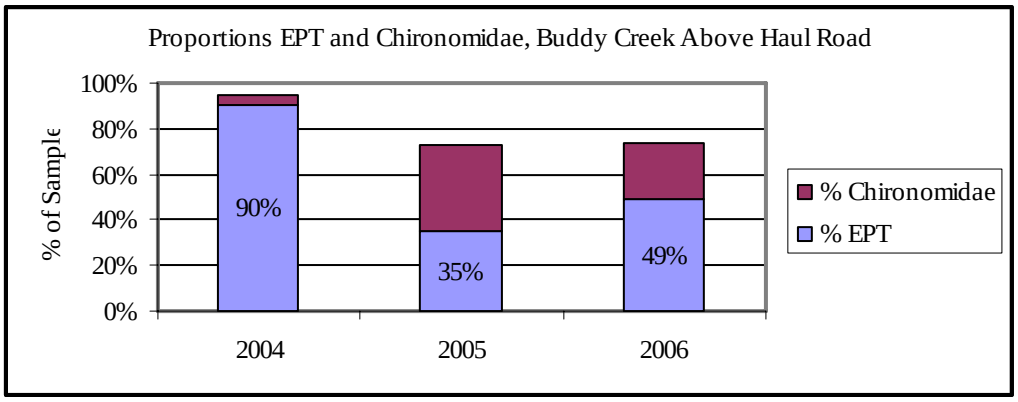

Figure 30. Proportions EPT and Chironomidae, Buddy Creek Above Haul Road.

Periphyton Standing Crop

Algae biomass, as estimated by chlorophyll-a concentrations, is presented in Figure 31. Average chlorophyll-a concentrations varied among sample years, but were highest in 2006.

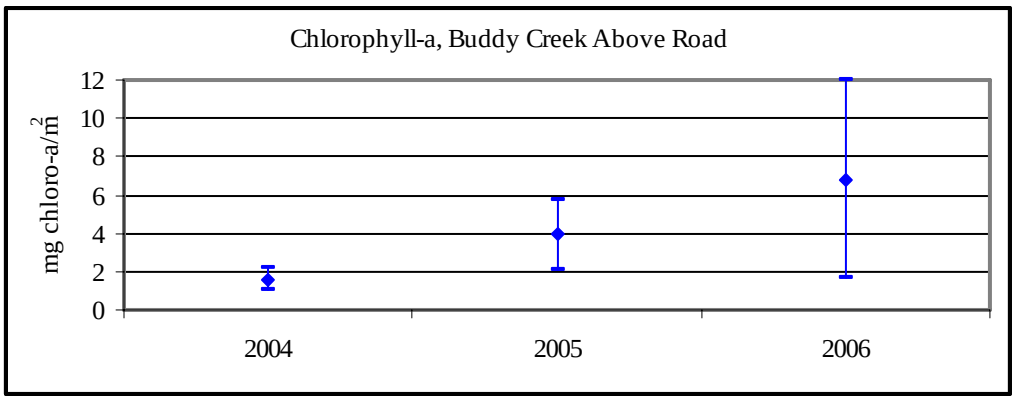

Figure 31. Average concentration of chlorophyll-a, plus and minus one standard deviation, in Buddy Creek above Haul Road.

Fish

Arctic grayling adults use Buddy Creek upstream of the Haul Road. Arctic grayling probably move from Bons Creek or Bons Pond to Buddy Creek transiting a large multi-plate culvert in the road during the ice-free season. Arctic grayling fry and juveniles have not been seen in this reach of Buddy Creek. In summer 2005, we counted 13 large adult Arctic grayling feeding in Buddy Creek. Ten minnow traps fished in Buddy Creek twice each summer during both 2004 and 2005 captured no fish. Buddy Creek upstream of the Haul Road is a highly productive aquatic system with some of the highest aquatic invertebrate densities found in streams in the Red Dog Mine area.

Buddy Creek, Downstream of Waterfalls

Site Description

Buddy Creek, downstream of a series of falls and chutes in bedrock, is about 4 to 8 m wide with depths from 0.3 to 1 m (Figure 32). Our sample site is located about 1.5 km downstream of the confluence of Buddy and Bons creeks. The substrate consists of angular cobble and gravel with some boulders. The substrate generally is covered with filamentous algae. The streambanks are heavily vegetated with willow and few deep pools or runs exist. Massive aufeis throughout the sample reach leads to fairly substantial and annual disturbance to streambanks and riparian vegetation.

Figure 32. Buddy Creek, downstream of waterfalls.

Water Quality

Water quality data for Cd, Pb, Se, and Zn are presented in Figures 33 through 36. Cd, Pb, and Zn concentrations peak in spring. Se concentrations appear to increase with time during the summer season and are higher in Buddy Creek than in Bons Creek (Figure 35).

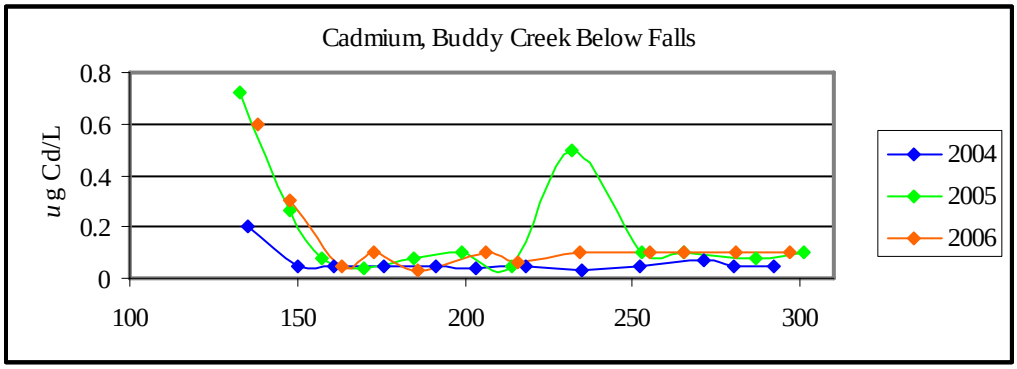

Figure 33. Cd concentrations in Buddy Creek below waterfalls (2004 to 2006).

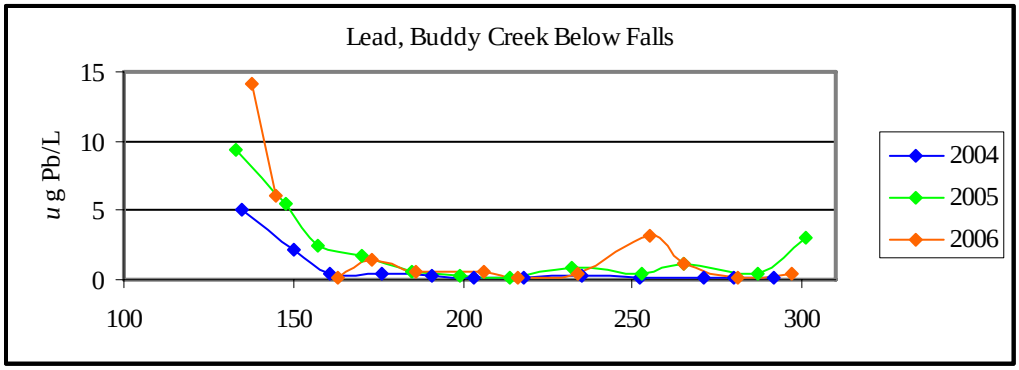

Figure 34. Pb concentrations in Buddy Creek below waterfalls (2004 to 2006).

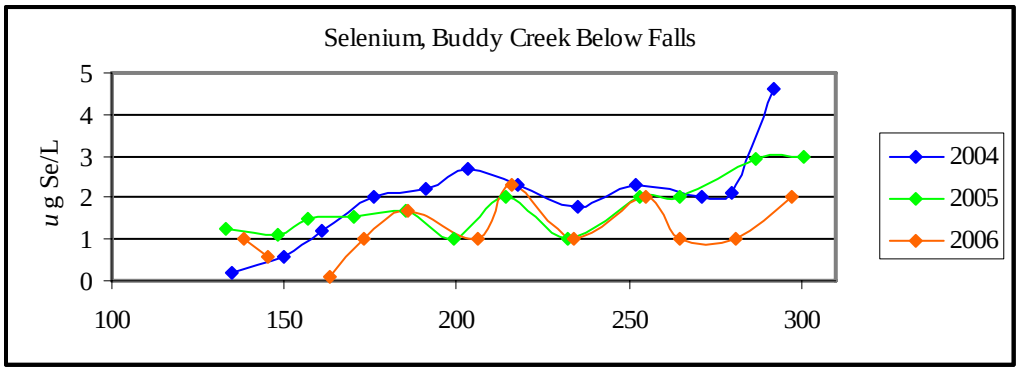

Figure 35. Se concentrations in Buddy Creek below waterfalls (2004 to 2006).

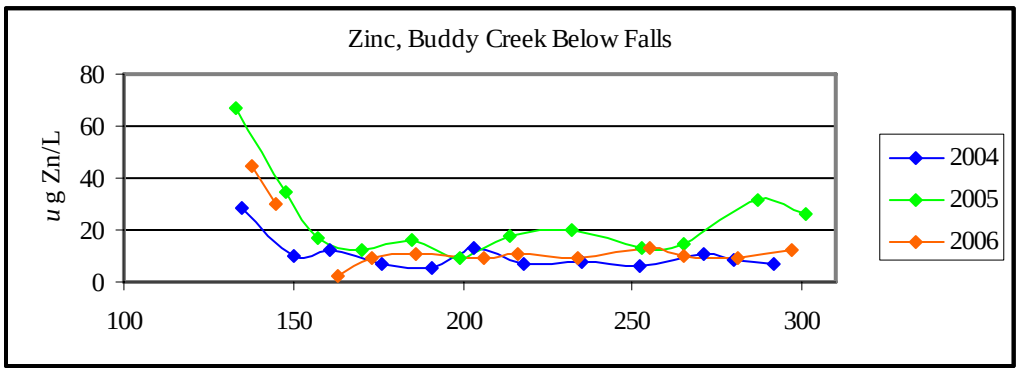

Figure 36. Zn concentrations in Buddy Creek below waterfalls (2004 to 2006).

Invertebrate Community (Abundance, Taxa Richness, and Structure)

Aquatic invertebrate density, taxa richness, and community structure are presented in Figures 37 through 39. Aquatic invertebrate densities were highly variable among sample years with highest densities found in 2005 (Figure 37). The total number of aquatic taxa present are similar within our sampling time frame (Figure 38). The proportion of EPT ranged from a low of 28% to a high of 57% (Figure 39).

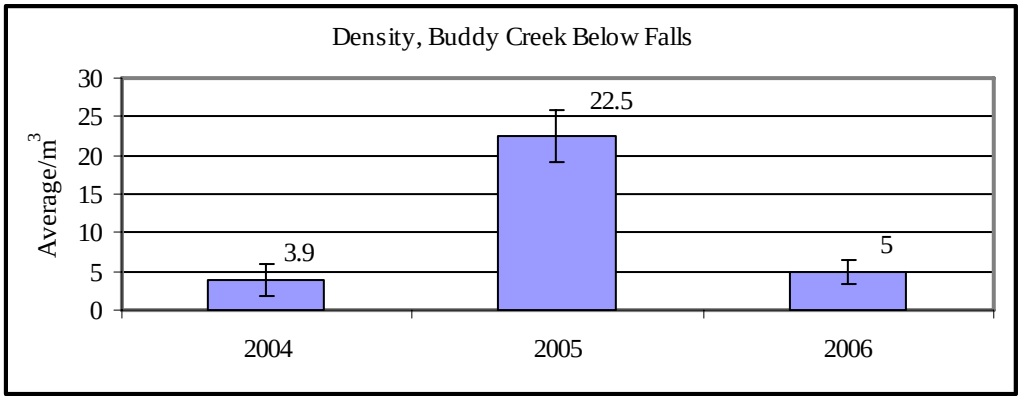

Figure 37. Aquatic invertebrate density (plus and minus one standard deviation), Buddy Creek below falls.

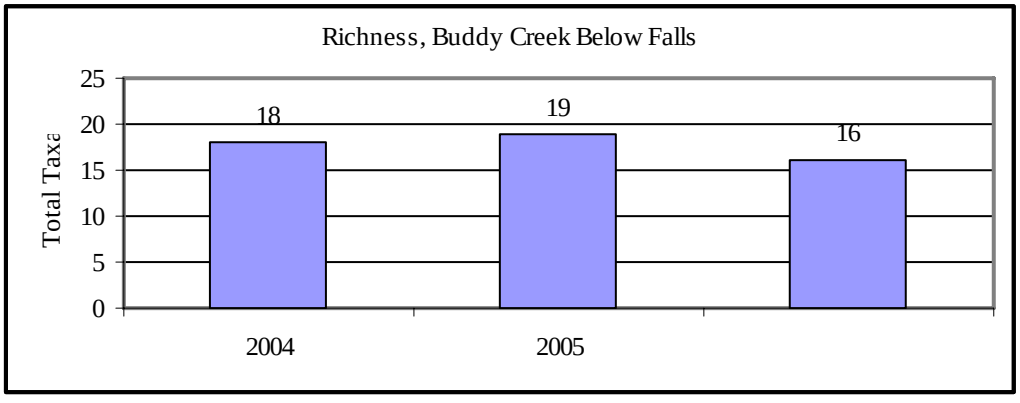

Figure 38. Aquatic invertebrate taxa richness, Buddy Creek below falls.

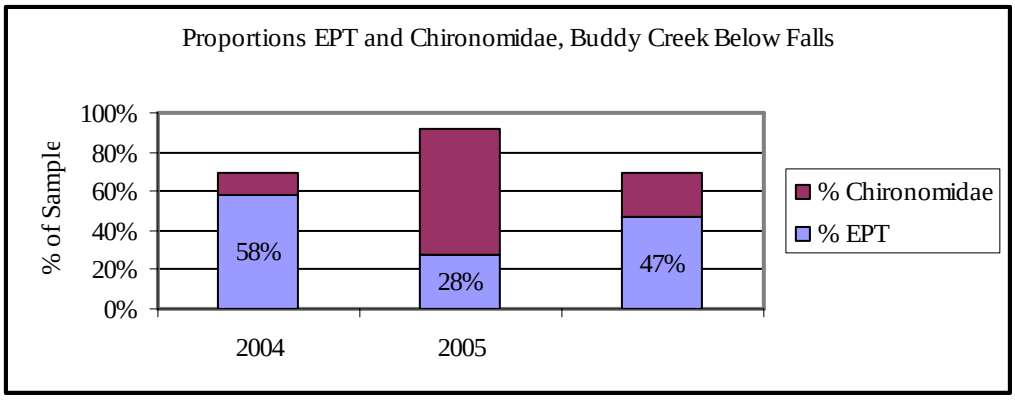

Figure 39. Proportions EPT and Chironomidae, Buddy Creek below falls.

Our drift net samples in August 2006 contained *Daphnia* and some Ostracods and Copepods. In past sampling events in streams throughout the Red Dog Mine area, few, if any *Daphnia*, Ostracods, and Copepods were present in drift samples. Results in Buddy Creek below the falls are consistent with our findings in the Bons Creek sample site located upstream, but still downstream of Bons Pond. The average number of *Daphnia* per drift net was 578 and the average number of Ostracods and Copepods was 87 and 10.

Periphyton Standing Crop

Algae biomass, as estimated by chlorophyll-a concentrations, is presented in Figure 40. Average chlorophyll-a concentrations varied among sample years, but were highest in 2006.

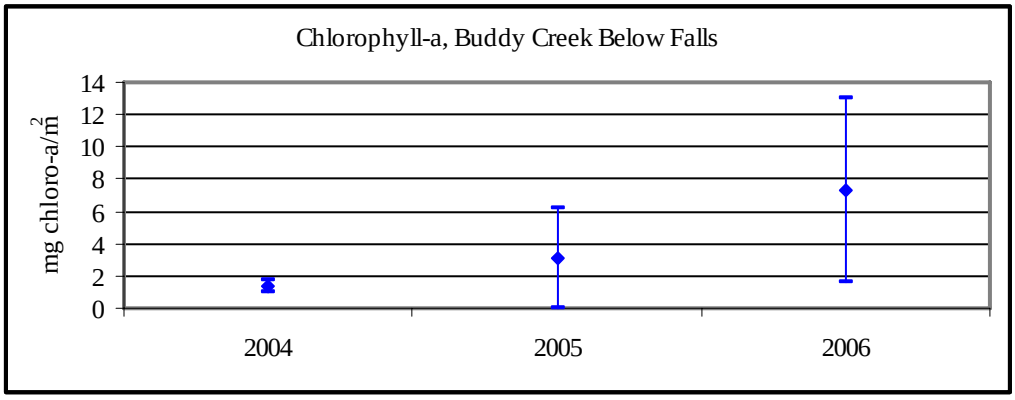

Figure 40. Average concentration of chlorophyll-a, plus and minus one standard deviation, in Buddy Creek below falls.

Fish

Our sample reach in Buddy Creek is located below a series of falls and chutes in bedrock that blocks upstream movement of fish. Dolly Varden, Arctic grayling, and slimy sculpin (*Cottus cognatus*) use Buddy Creek below the falls. Adult Dolly Varden (i.e., large anadromous fish) have been seen in Buddy Creek in late August indicating that spawning does occur in this reach. Generally, the most abundant fish present are Dolly Varden juveniles. In some years Arctic grayling adults and juveniles are seen, but generally numbers are low (less than 10 fish in the 1 km sample reach). Arctic grayling fry have been found indicating that in some years successful spawning does occur in Buddy Creek, but few fry have been observed and in most years none are seen. In one out of ten sample years, Arctic grayling juveniles were abundant in Buddy Creek. Hundreds of juvenile Arctic grayling were seen, not only in Buddy Creek, but in other sample reaches (i.e., Anxiety Ridge Creek) in summer 1999.

Generally, the most abundant fish in Buddy Creek are juvenile Dolly Varden although their relative abundance varies among sample years (Figure 41). The pattern of catches in Buddy Creek is comparable with what we find in other sample reaches such as Anxiety Ridge Creek (Figure 42). Anxiety Ridge and Buddy Creek merge to form Dudd Creek which drains directly into Ikalukrok Creek. As can be seen in Figures 41 and 42, when catches are high in Buddy Creek, catches also are high in Anxiety Ridge Creek.

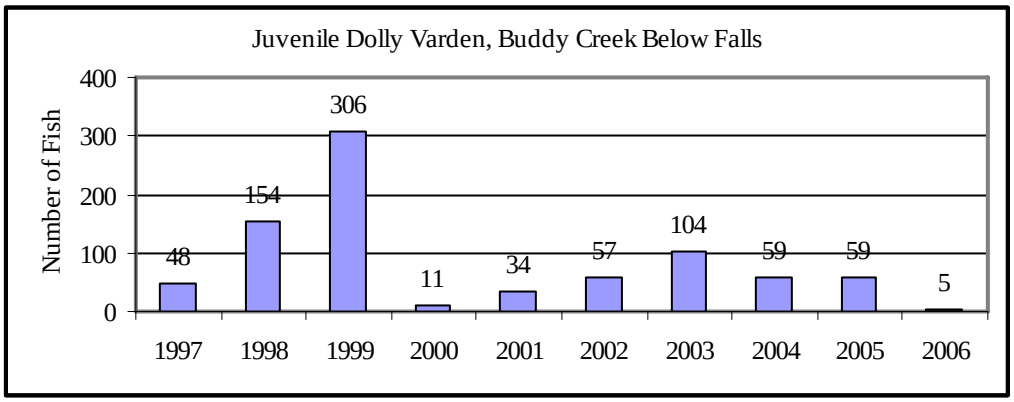

Figure 41. Number of juvenile Dolly Varden caught in late July or early August in Buddy Creek below falls.

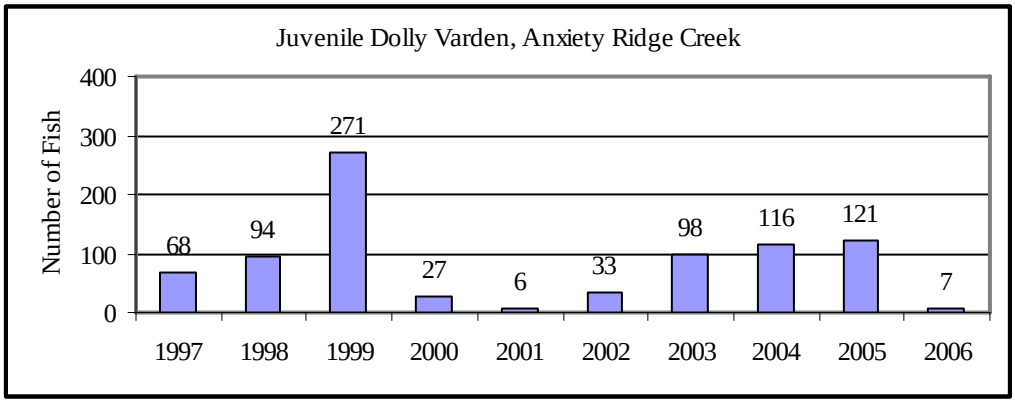

Figure 42. Number of juvenile Dolly Varden caught in late July or early August in Anxiety Ridge Creek.

Bons Pond

Bons Pond is about 11 ha (27 acres) in size and is fed by three small drainages, including Bons Creek. The maximum depth of the pond is 13.5 m. Bons Pond supports a reproducing population of Arctic grayling that were originally transplanted from North Fork Red Dog Creek in 1994 and 1995. Spawning occurs in the spring in Bons Creek and in the outlet channel.

Growth of individually marked fish is monitored each summer by comparing fish caught in spring and recaptured the following spring. In 2004 growth of individual fish <240 mm at marking was higher than in 2003 (Figures 43 and 44). In spring 2006, fish less than 240 mm at marking were not present in our sample (Figure 45). Growth of fish between 250 and 270 mm at marking was higher in 2005 than in summers 2003 and 2004.

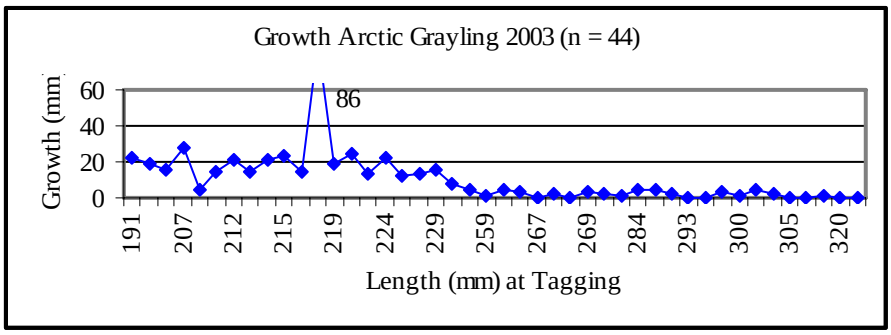

Figure 43. Growth of individually marked Arctic grayling from spring 2003 to spring 2004.

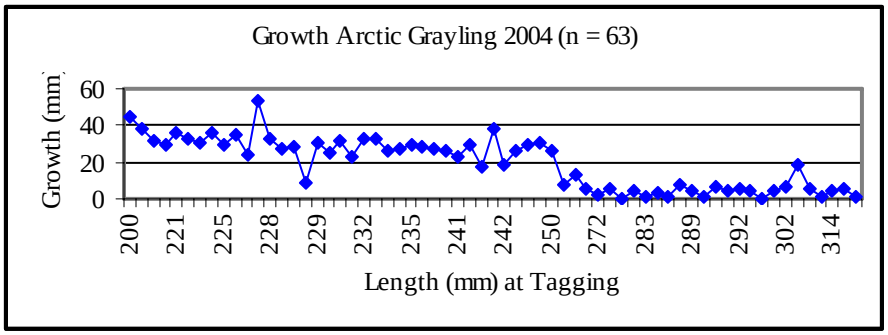

Figure 44. Growth of individually marked Arctic grayling from spring 2004 to spring 2005.

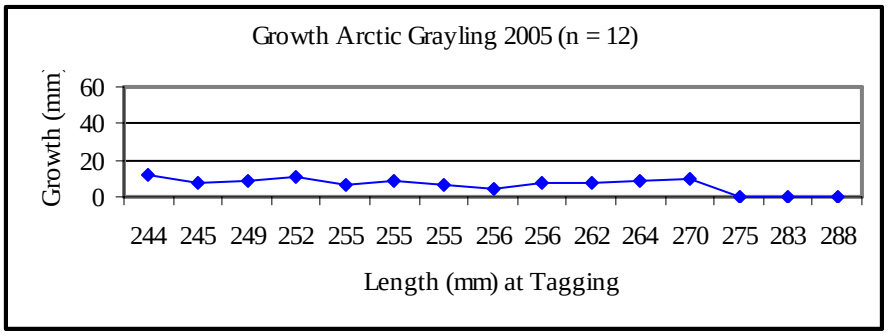

Figure 45. Growth of individually marked Arctic grayling from spring 2005 to spring 2006.

Length frequency distribution of Arctic grayling caught in a fyke net fished in Bons Creek during spring 2006 in Bons Creek is presented in Figure 46. These spring data probably most closely represent the population structure in Bons Pond since most other sampling events use primarily angling and our fyke net catches in Bons Pond during the open-water season are ineffective in catching fish. Most fish larger than 240 mm fork length are mature, while most Arctic grayling less than 240 mm are immature.

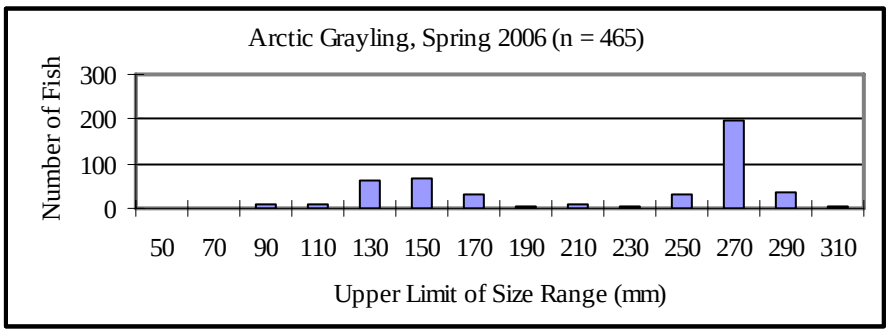

Figure 46. Length frequency distribution of Arctic grayling in Bons Creek in spring 2006.

Estimates of the Arctic grayling population in Bons Pond are made each year with the sampling event being all fish seen or marked in summer, followed by the recapture event in the spring of the subsequent year. The estimated population of Arctic grayling (fish >200 mm) in Bons Pond has been fairly consistent from 2003 through 2005. Our most recent estimate is 5,356 fish (95% CI 4,088 to 6,624) in summer 2005. The 2006 estimated population will be based on a recapture event in spring 2007. Given the bimodal length frequency distribution observed in spring 2006, it is likely that increased recruitment will be seen within the next one to two years.

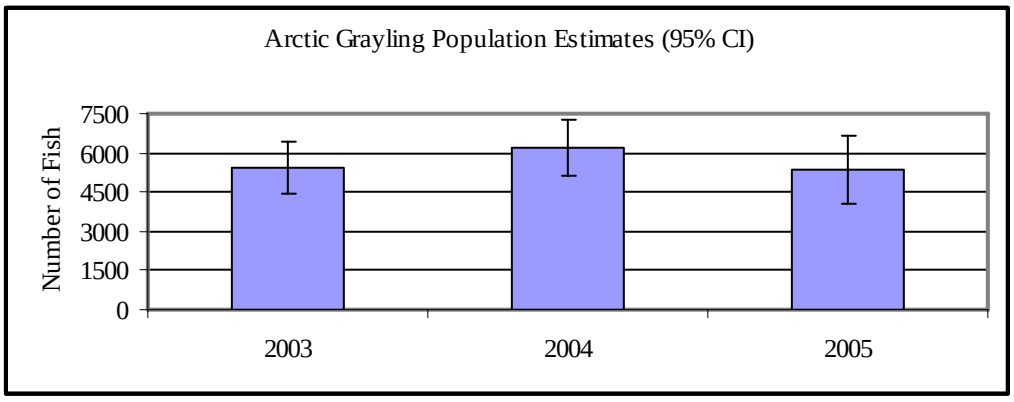

Figure 47. Estimates of the Arctic grayling population (fish >200 mm) in Bons Pond.

Bons and Buddy Creeks, Juvenile Dolly Varden and Arctic Grayling

Juvenile Dolly Varden from Buddy Creek below the falls and juvenile Arctic grayling from Bons Pond were sampled for whole body metals concentrations for Cd, Pb, Se, and Zn. Cd concentrations show no trend with time for Dolly Varden and whole body concentrations are similar between Arctic grayling and Dolly Varden (Figures 48 and 49). However, the Cd concentration in Arctic grayling and Dolly Varden was substantially lower in 2004.

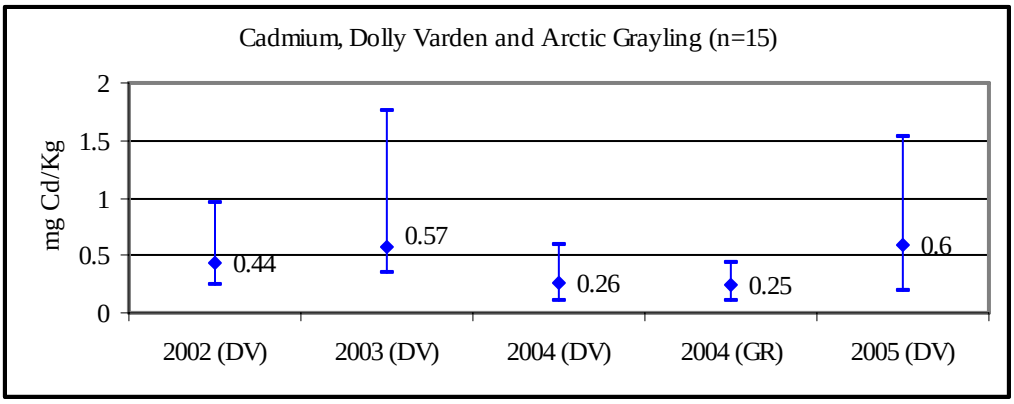

Figure 48. Whole body Cd concentrations in juvenile Dolly Varden and Arctic grayling from Buddy Creek and Bons Pond.

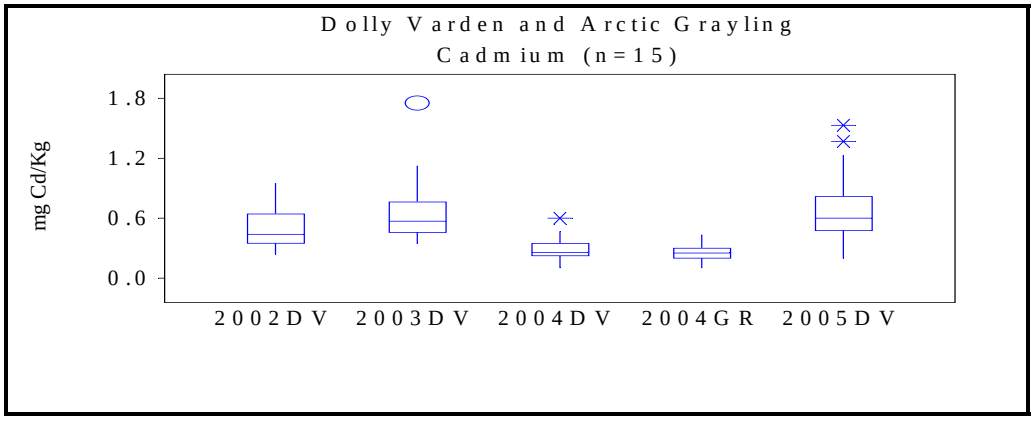

Figure 49. Box whisker plot for whole body Cd concentrations in Dolly Varden and Arctic grayling from Buddy Creek and Bons Pond.

Similar to Cd, Pb concentrations in Dolly Varden do not exhibit a trend with time (Figures 50 and 51). Pb concentrations are similar in both Dolly Varden and Arctic grayling. Several of the whole body lead concentrations reported are outliers (e.g., the 4.52 mg/Kg lead concentration found in a Dolly Varden in 2004). Individual fish with higher lead concentrations, although not common, are found more frequently than for other metals analyzed.

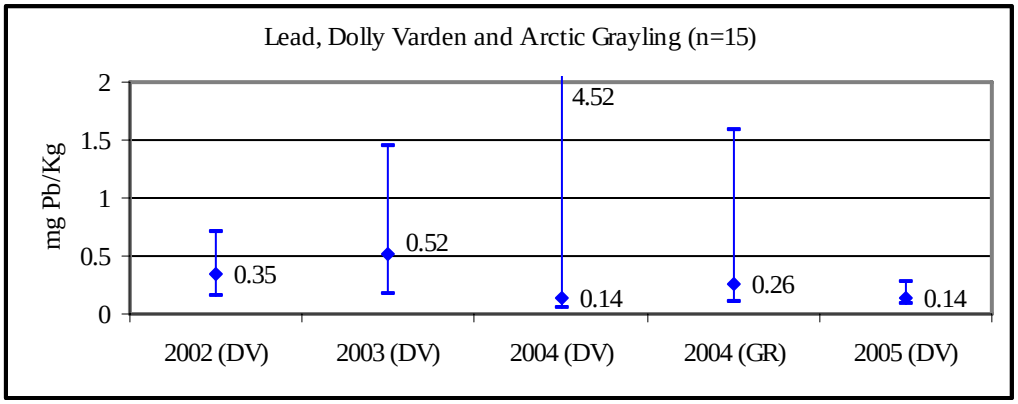

Figure 50. Whole body Pb concentrations in juvenile Dolly Varden and Arctic grayling from Buddy Creek and Bons Pond.

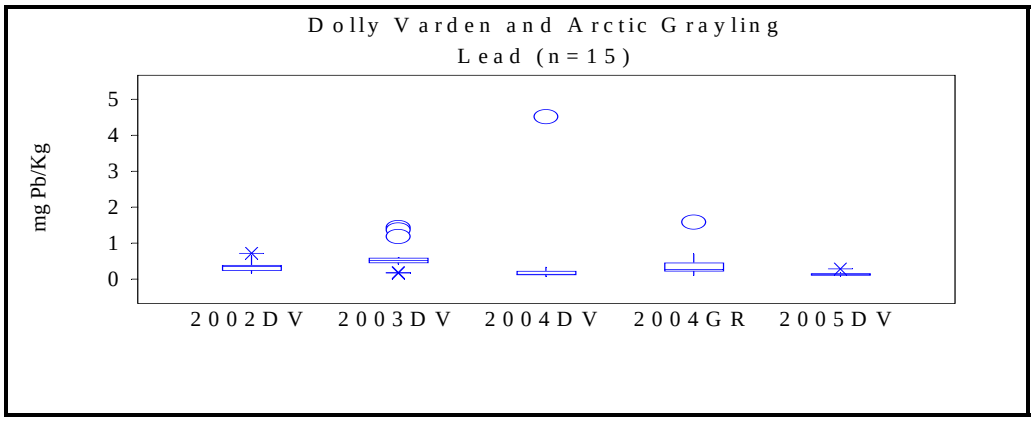

Figure 51. Box whisker plot for whole body Pb concentrations in Dolly Varden and Arctic grayling from Buddy Creek and Bons Pond.

Concentrations of Se in Dolly Varden show no trend with time (Figures 52 and 53). However, the Se concentrations in Arctic grayling are substantially higher than those found in Dolly Varden in 2004.

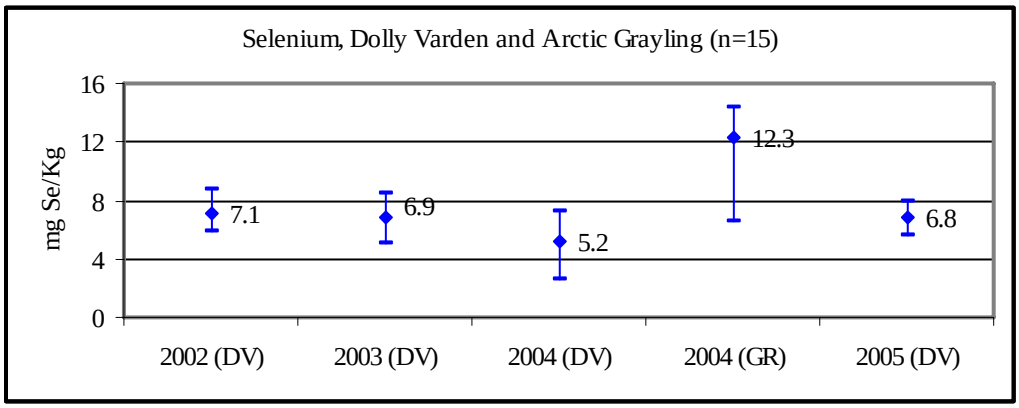

Figure 52. Whole body Se concentrations in juvenile Dolly Varden and Arctic grayling from Buddy Creek and Bons Pond.

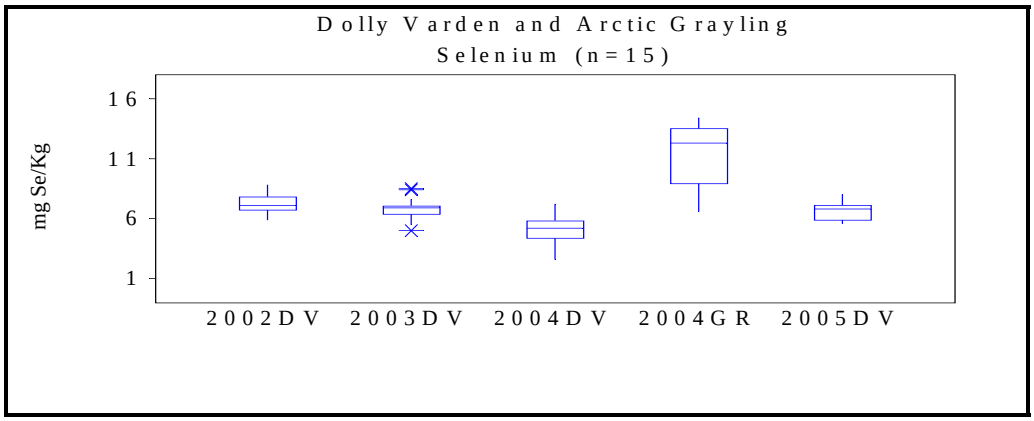

Figure 53. Box whisker plot for whole body Se concentrations in Dolly Varden and Arctic grayling from Buddy Creek and Bons Pond.

Zn concentrations in Dolly Varden exhibit no trend with time (Figures 54 and 55). The Zn concentrations in 2004 for whole body analyzed Arctic grayling are substantially lower than those found in Dolly Varden.

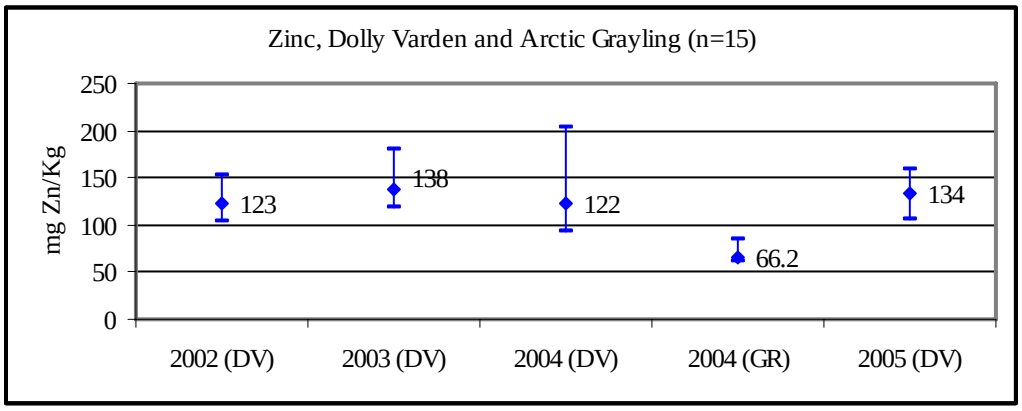

Figure 54. Whole body Zn concentrations in juvenile Dolly Varden and Arctic grayling from Buddy Creek and Bons Pond.

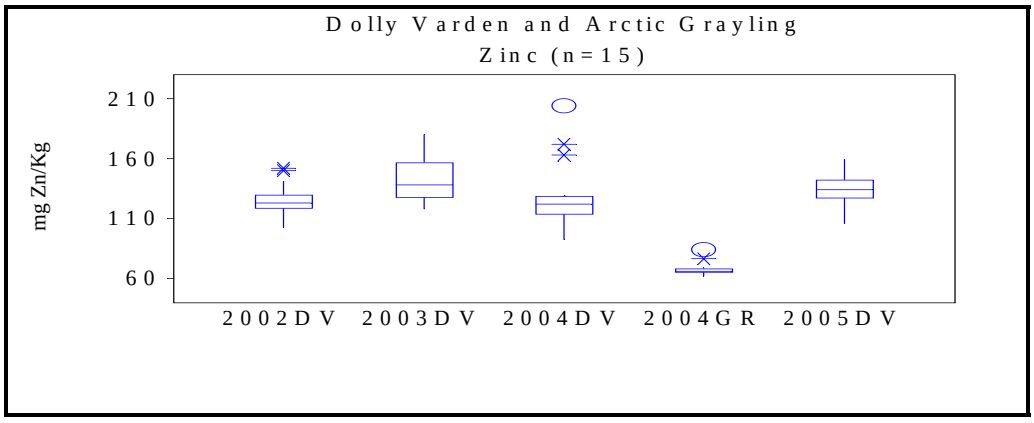

Figure 55. Box whisker plot for whole body Zn concentrations in Dolly Varden and Arctic grayling from Buddy Creek and Bons Pond.

Summary

We specifically looked at Cd, Pb, Se, and Zn water quality data for the Bons and Buddy Creek drainages, because these were the metals selected for whole body fish tissue analyses. Water quality data indicate that Cd, Pb, and Zn are elevated (i.e., higher at some times of the open water season than at most other times of the open water season) in Bons Creek upstream of the reservoir (Figures 56 through 59). Also included in these figures are water quality data for North Fork Red Dog Creek and Bons Creek upstream of the road. Metals data also indicate that Cd, Pb, and Zn are higher in Bons Creek immediately below the Kivalina waste dump than in Buddy or North Fork Red Dog creeks. Many of the peak concentrations at all sample sites in Bons and Buddy creeks coincide with early spring samples. Peak concentrations often are seen in early spring and would suggest that fugitive dust accumulations in winter are being flushed down these aquatic systems during breakup. It also is recognized that mineralization is common throughout the Red Dog area and that sediment input from erosion and thermal degradation is a source and contributor to metals loading in streams. Furthermore, these data would suggest some increased metals loading is occurring to Bons Creek downstream of the interceptor system and part of this loading is from sediment input.

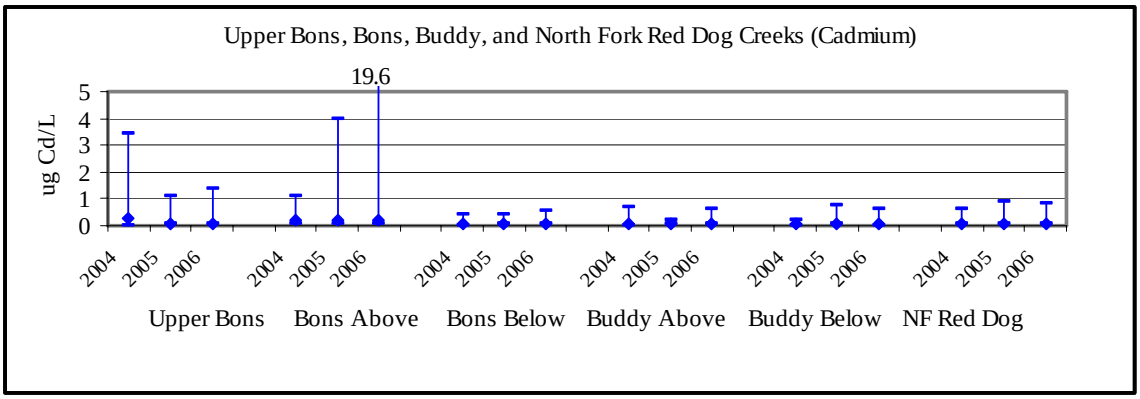

Figure 56. Median, maximum, and minimum concentrations of Cd in Bons, Buddy, and North Fork Red Dog creeks.

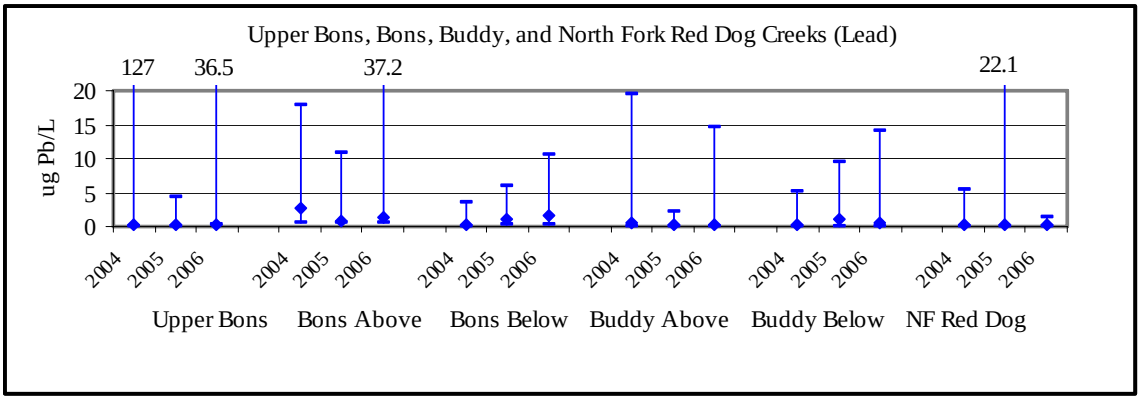

Figure 57. Median, maximum, and minimum concentrations of Pb in Bons, Buddy, and North Fork Red Dog creeks.

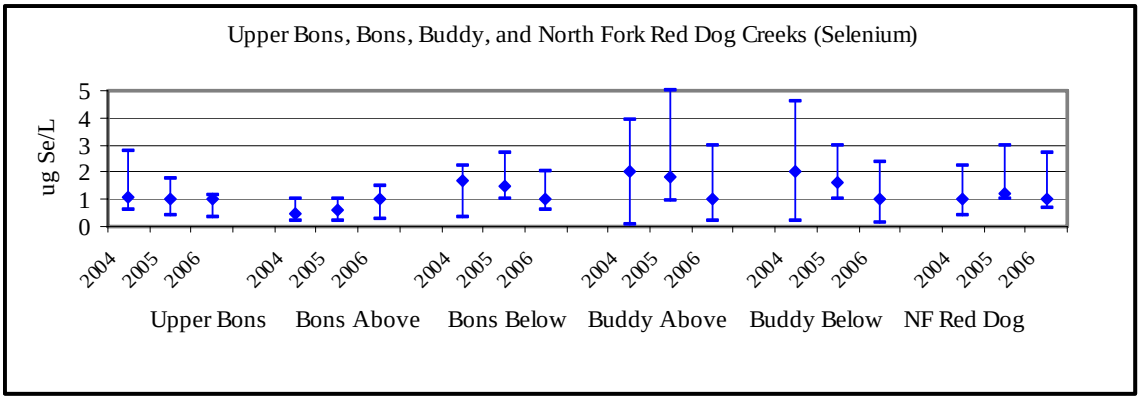

Figure 58. Median, maximum, and minimum concentrations of Se in Bons, Buddy, and North Fork Red Dog creeks.

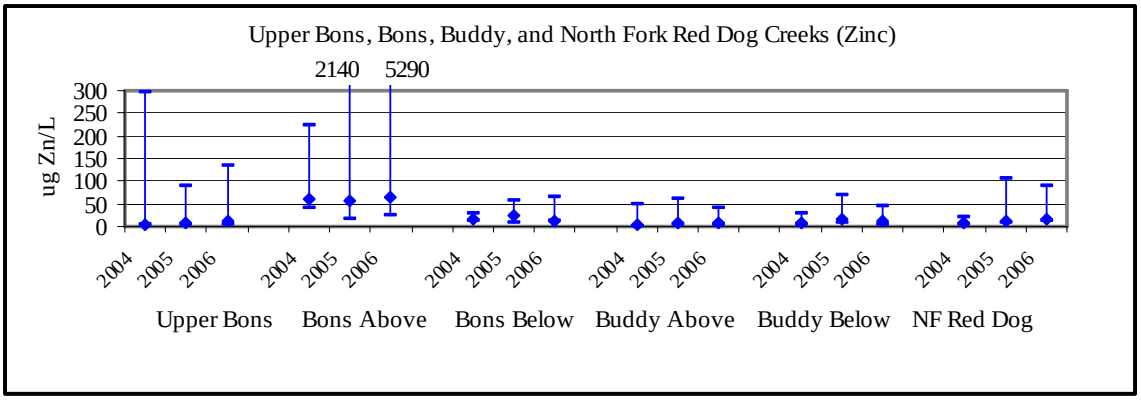

Figure 59. Median, maximum, and minimum concentrations of Zn in Bons, Buddy, and North Fork Red Dog creeks.

Aquatic invertebrate densities from Bons and Buddy creeks were compared with densities found in North Fork Red Dog Creek. North Fork Red Dog Creek has been sampled annually since 1999 under the NPDES permit (AK-003865-2) and generally has higher aquatic invertebrate densities than the other six NPDES sample sites located in Middle Fork Red Dog, Mainstem Red Dog, and Ikalukrok creeks. It is a very productive system supporting Arctic grayling spawning and rearing and Dolly Varden rearing. The lowest aquatic invertebrate densities found in North Fork Red Dog Creek since 1999 were in 2004 (Ott and Morris 2006). Aquatic invertebrate densities are highly variable among sample years (Figure 60), but Buddy Creek has aquatic invertebrate densities comparable with North Fork Red Dog Creek (Figure 60).

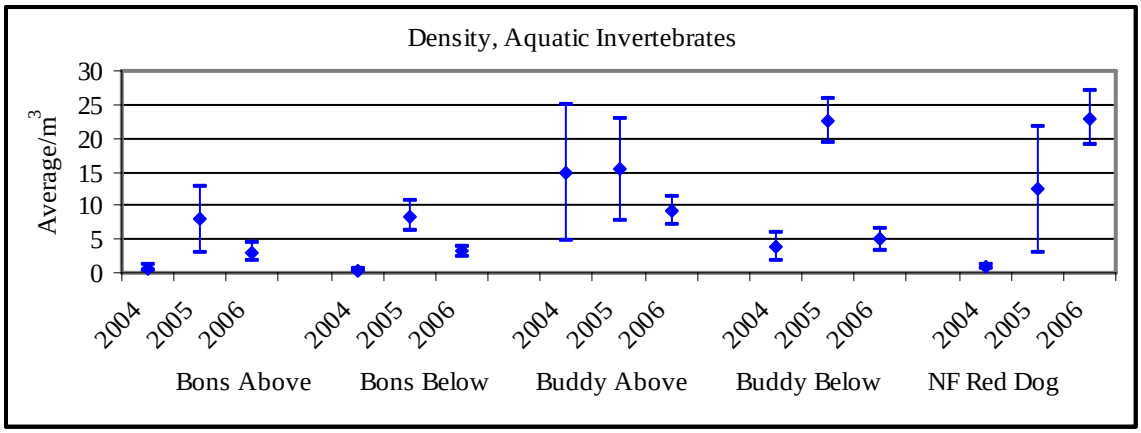

Figure 60. Aquatic invertebrate density (plus and minus one standard deviation) in Bons, Buddy, and North Fork Red Dog creeks.

We found a higher proportion of EPT in the Buddy and North Fork Red Dog Creek samples than in Bons Creek samples (Figure 61).

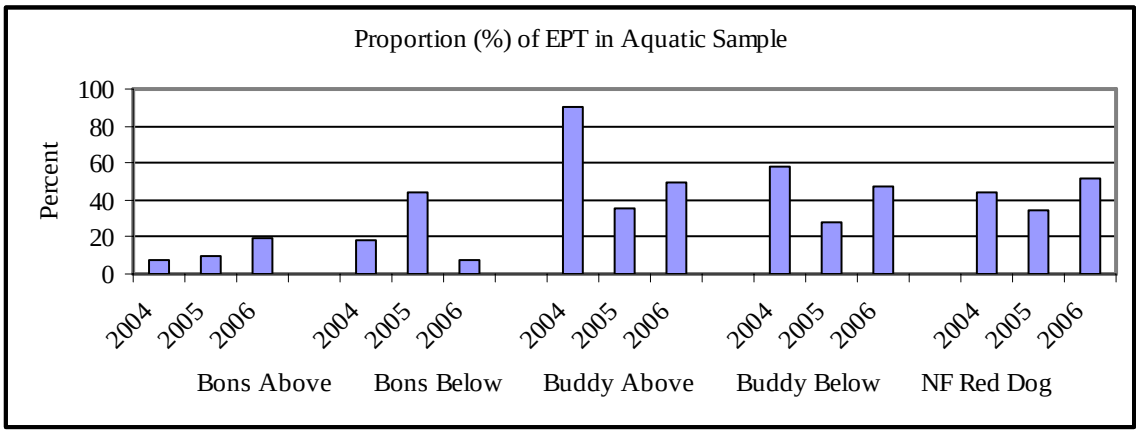

Figure 61. Proportions EPT in Bons, Buddy, and North Fork Red Dog creeks.

Chlorophyll-a concentrations in Buddy and Bons creeks show fairly high productivity at all sample sites and, perhaps an indication that productivity was highest in 2006 except for Bons Above (Figure 62). The chlorophyll-a concentrations found are comparable to, and for Bons Creek, higher than North Fork Red Dog Creek.

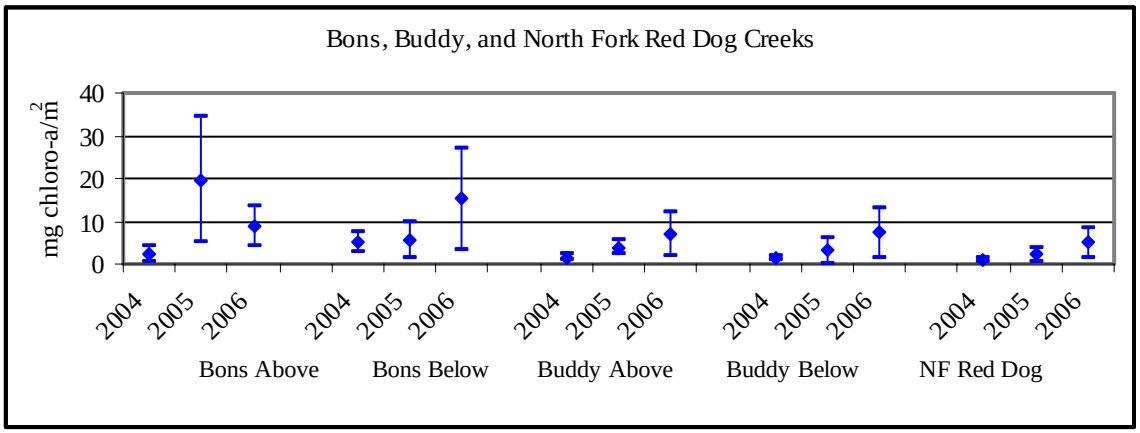

Figure 62. Average concentration of chlorophyll-a, plus and minus one standard deviation in Bons, Buddy, and North Fork Red Dog creeks.

Arctic grayling from Bons Pond and Dolly Varden juveniles from Buddy Creek were analyzed for whole body metal concentrations. Substantial differences in whole body metals concentrations were found among sample years for Dolly Varden and between the two species. Se concentrations were higher in Arctic grayling in 2004, Zn concentrations were lower in Arctic grayling in 2004, and Cd concentrations were lower in both species in 2004.

The Arctic grayling in the Bons and Buddy Creek drainages are a self-sustaining population of fish. Overwintering habitat is provided by Bons Pond and spawning is occurring in Bons Creek and its tributaries. The Arctic grayling population in 2005 exceeds 5,000 fish greater than 200 mm long.

Recommendations for Future Study

Based on results obtained to date, and the fact that the projected tailings surface water elevation will create a head of water towards the Bons Creek drainage, we believe that it is prudent to continue the aquatic biomonitoring program in the Buddy and Bons Creek drainages. Specifically, we recommend continuation of periphyton and benthic invertebrate sampling, once per year in early July, at four sites:

Bons Creek, about 200 m upstream of Bons Pond;

Bons Creek, downstream of Bons Pond (Station 220);

Buddy Creek, upstream of the Haul Road, (Station 221); and

Buddy Creek, below the waterfalls.

We recommend that the Arctic grayling population estimate in Bons Pond be conducted annually and that observations of fish use and distribution be made opportunistically in both Bons and Buddy creeks. Water quality monitoring should continue at the same frequency (twice per month) at the aquatic sample site locations and in Bons Creek upstream of the road. At a minimum, concentrations of Cd, Pb, Se, and Zn should be included in the water quality sampling as these are the four analytes being monitored in whole body fish. We defer to TCAK and the ADEC regarding other water quality parameters to be measured and number of sites to be sampled.

Bons and Buddy Creeks are highly productive aquatic systems and support a healthy population of Arctic grayling. Arctic grayling from Bons Pond also are providing a source of recruitment to other parts of the Ikalukrok Creek drainage. Buddy Creek is a significant summer rearing area for juvenile Dolly Varden. Apparent peak metals concentrations during breakup in most years for most metals indicates that further investigation into the mechanism and timing of metals transport into these systems is warranted.

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Appendix 1 – Water Quality

			Cd		Pb			Se	Turbidity		Zn
Station	Date		*u* g/L		*u* g/L	pH		*u* g/L	NTU		*u* g/L
Upper Bons	5/4/2004		3.4		127		<	1			296
Upper Bons	5/5/2004					6.46					
Upper Bons	5/29/2004	<	0.4		1.7	6.27	<	1			9
Upper Bons	6/17/2004	<	0.4		0.5	7.54		0.6			3.1
Upper Bons	6/28/2004		0.04		0.2	7.22		0.9			2.5
Upper Bons	7/7/2004		0.03		0.2	7.43		1.1			3.6
Upper Bons	7/22/2004		0.07		0.1	7.4		1.3			3.9
Upper Bons	8/12/2004	<	0.4		0.4	6.18		0.7			5.3
Upper Bons	8/25/2004	<	0.4		0.2	7.68		0.9			3.4
Upper Bons	9/4/2004	<	0.4		0.2	7.24		1.4			3.9
Upper Bons	9/26/2004		0.2		15.2	7.15		1.4			24.5
Upper Bons	10/7/2004		0.06		0.5	7.41		1.3			48.7
Upper Bons	10/24/2004		0.08		0.2	7.68		2.8			12.1
Upper Bons	5/18/2005		1.08		4.21	5		0.976			88.8
Upper Bons	5/27/2005		0.322		2.59	7.3		0.422			25.8
Upper Bons	6/6/2005		0.149		0.577	8		0.752			16.9
Upper Bons	6/19/2005		0.0754		0.476	7.1		0.614			7.32
Upper Bons	7/3/2005		0.0549		0.192	6.7		0.976	1.7		5.1
Upper Bons	7/18/2005		0.1		0.1	6.1		1	0.4		5
Upper Bons	8/12/2005		0.0634		0.314	6.5		1.04	1.1		7.02
Upper Bons	8/24/2005		0.1		0.3	6.9		1	0.3		6
Upper Bons	9/6/2005		0.1		1	7.6		1	0.3		10
Upper Bons	9/19/2005		0.1		0.1	7.5		1	0.4		5
Upper Bons	10/9/2005		0.06		0.18	7.7		1.75	0.6		3.6
Upper Bons	10/26/2005		0.09		1.02	6.9		1.61	0.3		6.37
Upper Bons	5/19/2006		1.4		36.5	7.25	<	1	3.5		109
Upper Bons	5/25/2006		0.89		17.4	6.62		0.36	1		70
Upper Bons	6/16/2006		0.12		2.05	7.68		0.32	1.7		11.3
Upper Bons	6/23/2006		0.2		0.9	7.74	<	1	1		13
Upper Bons	7/8/2006		0.08		0.2	7.96		0.95	0.43		8.36
Upper Bons	7/25/2006	<	0.1		0.2	6.82	<	1	0.42		5
Upper Bons	8/4/2006	<	0.07		0.25	7.45		1.15	0.37		4.99
Upper Bons	8/20/2006	<	0.1		2.8	7.81	<	1	0.24		12
Upper Bons	9/15/2006	<	0.1		0.3	7.95	<	1	0.5		6
Upper Bons	9/22/2006		0.4		0.2	7.39	<	1	0.41		135
Upper Bons	10/8/2006	<	0.1		0.3	9.38	<	1	0.5		5

Appendix 1 – Water Quality (continued)

			Cd		Pb			Se	Turbidity		Zn
Station	Date		*u* g/L		*u* g/L	pH		*u* g/L	NTU		*u* g/L
Lower Bons	5/4/2004		1.1		17.9		<	0.2			101
Lower Bons	5/5/2004					6.8					
Lower Bons	5/29/2004	<	0.05		3.7	7.09	<	0.2			42.3
Lower Bons	6/17/2004		0.2		2.4	7.13		0.4			53.7
Lower Bons	6/28/2004		0.08		1	7.13		0.6			41.6
Lower Bons	7/7/2004		0.2		1.5	7.32		0.6			44.5
Lower Bons	7/22/2004		0.2		0.8	7.33		1			44.1
Lower Bons	8/12/2004		0.3		11.9	7.05		0.5			65.7
Lower Bons	8/25/2004		0.1		0.8	7.67		0.4			42.6
Lower Bons	9/4/2004	<	0.05		3	7.38		0.5			64.6
Lower Bons	9/26/2004		0.2		3.6	7.27		0.3			99.1
Lower Bons	10/7/2004		0.3	<	0.6	7.5		0.2			136
Lower Bons	10/24/2004		0.8		3	7.6		0.6			223
Lower Bons	5/19/2005		1.01		10.8	7.8		0.492			133
Lower Bons	5/27/2005		0.311		5.88	6.8		0.196			57.9
Lower Bons	6/6/2005		0.127		0.929	7.2		0.487			50.3
Lower Bons	6/19/2005		0.102		0.929	7.2		0.343			25.8
Lower Bons	7/3/2005	<	0.08		0.648	6.9		0.652	1.8		17.3
Lower Bons	7/18/2005		0.2		1	6.6	<	1	1.5		56
Lower Bons	8/12/2005		0.248		1.5	6.7		0.904	1.3		62.2
Lower Bons	8/24/2005		0.3		2.1	7.4	<	1	2.8		78
Lower Bons	9/6/2005		0.1		0.7	7.3	<	1	1.1		50
Lower Bons	9/19/2005		0.2		0.8	7.5	<	1	1.2		52
Lower Bons	10/9/2005		0.43		0.9	7.1		0.52	1.3		294
Lower Bons	10/26/2005		3.94		0.47	6.8		0.4	2.1		2140
Lower Bons	5/19/2006		1.1		21.9	6.73	<	1	11.5		120
Lower Bons	5/25/2006		19.6		37.2	6.98		1.47	7		5290
Lower Bons	6/16/2006		0.12		2.83	6.48		0.27	6.5		30
Lower Bons	6/22/2006	<	0.1		0.8	7.6	<	1	3.4		27
Lower Bons	7/8/2006		0.111		0.836	7.74		0.571	1.61		41
Lower Bons	7/25/2006		0.1		0.7	7.17	<	1	1.18		47
Lower Bons	8/4/2006		0.13		0.62	7.56		0.75	1.35		51
Lower Bons	8/20/2006		0.2		1.6	7.84	<	1	1.4		83
Lower Bons	9/15/2006		0.2		2.5	7.52	<	1	2.5		73
Lower Bons	9/22/2006		0.2		0.9	7.4	<	1	1.16		58
Lower Bons	10/8/2006		0.2		2.4	9.33	<	1	2.76		138
Lower Bons	10/31/2006		0.7		1.1	6.92	<	1	1.18		895

Appendix 1 – Water Quality (continued)

			Cd		Pb			Se	Turbidity		Zn
Station	Date		*u* g/L		*u* g/L	pH		*u* g/L	NTU		*u* g/L
Bons 220	5/4/2004		0.13		3.28	7.58		0.369			16.4
Bons 220	5/29/2004		0.073		3.49	7.62		0.616			16
Bons 220	6/17/2004		0.0778		1.47			1.26			15.2
Bons 220	6/17/2004										
Bons 220	6/28/2004		0.411		0.611	6.2		1.79			30.3
Bons 220	7/7/2004		0.0667		0.4	7.88		1.69			11.2
Bons 220	7/22/2004		0.2		0.144	7.85		1.69			11.2
Bons 220	8/12/2004		0.0287		1.43	7.68		1.6			17.3
Bons 220	8/25/2004		0.0453		0.333	7.72		1.76			11
Bons 220	9/4/2004		0.0408		0.16	7.34		1.56			13.4
Bons 220	9/26/2004		0.0453	<	0.0912	7.98		1.76			10.4
Bons 220	10/7/2004		0.111		0.211	7.82		1.84			18.9
Bons 220	10/24/2004		0.11		0.09	7.87		2.24			16.5
Bons 220	5/19/2005		0.383		3.52	7.4		1.65			58.6
Bons 220	5/27/2005		0.306		5.65	6.8		1.14			42.5
Bons 220	6/6/2005		0.113		5.87	7.2		1.48			32.8
Bons 220	6/19/2005		0.11		4.25	7.7		1.56			24.4
Bons 220	7/3/2005		0.0775		0.826	7.6		1.47			23.2
Bons 220	7/4/2005								0.9		
Bons 220	7/18/2005		0.1		0.7	7.3		1	0.9		10
Bons 220	8/12/2005		0.13		1.91	6.8		1.84	3.4		25
Bons 220	8/24/2005		0.1		1	8		2	0.9		31
Bons 220	9/6/2005		0.1		1.2	7.7		1	0.6		20
Bons 220	9/19/2005		0.1		1.1	7.5		1	1.1		16
Bons 220	10/9/2005		0.06		0.7	7.8		2.55	0.8		10.6
Bons 220	10/26/2005		0.05		0.24	7.5		2.68	0.3		12.8
Bons 220	5/18/2006		0.30		6.70		<	1.00			26.00
Bons 220	5/19/2006					7.3					
Bons 220	5/25/2006		0.54		10.50	6.6		0.59	7.00		64.70
Bons 220	6/16/2006		0.08		3.00	7.5		1.07	4.90		13.80
Bons 220	6/22/2006		0.10		3.40	8.0	<	1.00	2.00		12.00
Bons 220	7/8/2006		0.07		0.75	7.9		1.55	1.15		19.70
Bons 220	7/25/2006		0.10		1.30	6.9	<	1.00	1.95		13.00
Bons 220	8/4/2006		0.07		0.60	7.8		1.73	0.75		12.10
Bons 220	8/20/2006		0.10		0.50	7.7		2.00	0.66		16.00
Bons 220	9/15/2006		0.10		1.50	8.0	<	1.00	1.42		14.00
Bons 220	9/22/2006		0.10		1.70	7.7		1.00	1.97		14.00
Bons 220	10/8/2006		0.10		0.40	9.1	<	1.00	0.72		12.00
Bons 220	10/31/2006		0.10		3.10	7.3		1.00	0.28		16.00

Appendix 1 – Water Quality (continued)

			Cd		Pb			Se	Turbidity		Zn
Station	Date		*u* g/L		*u* g/L	pH		*u* g/L	NTU		*u* g/L
Buddy 221	5/4/2004		0.7		19.5	7.06	<	0.04			50.5
Buddy 221	5/29/2004		0.07		1.2	7.47		0.3			2.8
Buddy 221	6/17/2004		0.07		0.6	7.12		2			2.3
Buddy 221	6/28/2004		0.06		0.2	7.1		2.3			2.2
Buddy 221	7/7/2004		0.03		0.2	7.77		2.7			1.3
Buddy 221	7/22/2004		0.08	<	0.08	7.91		3.1			5.8
Buddy 221	8/12/2004		0.04		1.5	7.5		1.6			5.4
Buddy 221	8/25/2004		0.05		0.1	7.72		2			2
Buddy 221	9/4/2004		0.04		0.6	7.52		2.6			6.2
Buddy 221	9/26/2004		0.05		0.8	7.55		2			3.1
Buddy 221	10/7/2004		0.05	<	0.09	7.7		1.6			2.7
Buddy 221	10/24/2004		0.1		0.5	8.34		3.9			12.9
Buddy 221	5/18/2005		0.198		1.07	6.2		1.3			23.8
Buddy 221	5/27/2005		0.147		2.26	6.8		0.93			13.4
Buddy 221	6/6/2005		0.0487		0.246	7.1		1.4			7.93
Buddy 221	6/18/2005					7.2					
Buddy 221	6/19/2005		0.0408		0.172			1.49			6.14
Buddy 221	7/3/2005		0.0408		0.191	7.7		1.84	0.6		7.72
Buddy 221	7/18/2005		0.1		0.1	7.1	<	1	0.4		5
Buddy 221	8/12/2005		0.0704		0.516	6.7		4.01	0.9		11.1
Buddy 221	8/24/2005		0.1		0.5	7.9		2	0.6		8
Buddy 221	9/6/2005		0.1		0.1	7.8		5	0.3		10
Buddy 221	9/19/2005		0.1		0.1	7		4	0.4		7
Buddy 221	10/9/2005		0.17		0.3	7.6		2.38	0.8		61.6
Buddy 221	10/26/2005		0.12		0.0821	7.4		1.77	0.3		37.4
Buddy 221	5/18/2006		0.6		14.7		<	1			41
Buddy 221	5/19/2006					7.25					
Buddy 221	5/25/2006		0.4		9.4	6.68		0.2	6.00		29.2
Buddy 221	6/16/2006		0.2		4.3	7.37		1	7.10		14.1
Buddy 221	6/22/2006		0.1		0.8	7.79	<	1	1.70		5
Buddy 221	7/8/2006		0.07		0.09	7.02		2.1	0.48		8.3
Buddy 221	7/25/2006		0.1		0.1	6.67	<	1	0.34		4
Buddy 221	8/4/2006		0.07		0.3	7.70		2.3	0.39		16.9
Buddy 221	8/20/2006		0.1	<	0.1	7.55		2	0.22		19
Buddy 221	9/15/2006		0.1		0.2	7.91		3	0.44		5
Buddy 221	9/22/2006		0.1	<	0.1	7.53		1	0.41		6
Buddy 221	10/8/2006		0.1	<	0.1	9.05	<	1	0.18		6
Buddy 221	10/31/2006		0.1		0.2	7.23	<	1	0.16		8

Appendix 1 – Water Quality (concluded)

			Cd		Pb			Se	Turbidity		Zn
Station	Date		*u* g/L		*u* g/L	pH		*u* g/L	NTU		*u* g/L
Buddy B/Falls	5/14/2004		0.2		5.1	7.3		0.2			28.1
Buddy B/Falls	5/29/2004	<	0.05		2.2	7.54		0.6			9.8
Buddy B/Falls	6/9/2004	<	0.05		0.5			1.2			12.4
Buddy B/Falls	6/24/2004		0.05		0.5	7.76		2			7.1
Buddy B/Falls	7/9/2004	<	0.05		0.3	7.84		2.2			5.2
Buddy B/Falls	7/21/2004		0.04		0.09	8.03		2.7			13.4
Buddy B/Falls	8/5/2004		0.05		0.09	7.9		2.3			7
Buddy B/Falls	8/22/2004		0.03		0.3	7.39		1.8			7.9
Buddy B/Falls	9/8/2004	<	0.05	<	0.08	7.68		2.3			6.4
Buddy B/Falls	9/27/2004		0.07		0.1	8.12		2			10.6
Buddy B/Falls	10/6/2004		0.05	<	0.08	7.71		2.1			8.7
Buddy B/Falls	10/18/2004		0.05	<	0.08	8.02		4.6			7.3
Buddy B/Falls	5/13/2005		0.72		9.42	7.2		1.25			67.3
Buddy B/Falls	5/28/2005		0.262		5.52	6.8		1.1			34.6
Buddy B/Falls	6/6/2005		0.0756		2.45	7.8		1.5			16.7
Buddy B/Falls	6/19/2005		0.04		1.78	7.3		1.52			12.5
Buddy B/Falls	7/4/2005		0.0791		0.592	6.9		1.68			15.8
Buddy B/Falls	7/18/2005		0.1		0.3	7.1		1			9
Buddy B/Falls	8/2/2005		0.0501		0.0821	7		2.02			17.8
Buddy B/Falls	8/20/2005		0.5		0.8	6.5		1			20
Buddy B/Falls	9/10/2005		0.1		0.5	7.9		2			13
Buddy B/Falls	9/22/2005		0.1		1.1	7.7		2	0.5		15
Buddy B/Falls	10/14/2005		0.08		0.46	7.6		2.93	0.4		31.2
Buddy B/Falls	10/28/2005		0.1		3	7.2		3			26
Buddy B/Falls	5/18/2006		0.6		14.1	7.33		1.0			45.0
Buddy B/Falls	5/25/2006				6.0			0.6			30.2
Buddy B/Falls	5/28/2006		0.3			7.68			12.00		
Buddy B/Falls	6/12/2006		0.05		0.1	7.05		0.1			2.4
Buddy B/Falls	6/13/2006								6.00		
Buddy B/Falls	6/22/2006	<	0.1		1.5	7.74		1.0	1.70		9.0
Buddy B/Falls	7/5/2006		0.03		0.6			1.7			10.4
Buddy B/Falls	7/7/2006					7.49			1.29		
Buddy B/Falls	7/25/2006	<	0.1		0.6	6.43		1.0	1.10		9.0
Buddy B/Falls	8/4/2006		0.06		0.2	7.84		2.3	0.70		10.6
Buddy B/Falls	8/22/2006	<	0.1		0.4	7.45		1.0	0.34		9.0
Buddy B/Falls	9/12/2006	<	0.1		3.2	7.60		2.0	1.93		13.0
Buddy B/Falls	9/22/2006	<	0.1		1.1	7.65		1.0	1.36		10.0
Buddy B/Falls	10/8/2006	<	0.1		0.1	8.96		1.0	0.65		9.0
Buddy B/Falls	10/24/2006	<	0.1		0.5	7.61		2.0	0.39		12.0

Appendix 2 – Benthic Invertebrates

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2004, NPDES Permit Requirements
Site: Bons Cr downstream of Blast Rd.
Date: July 12, 2004

			Water Volume (m3) =	57		77		69		81		65		
			Proportion of sample =	1		1		1		1		1		
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Ephemeroptera														0
		Baetidae	*Baetis*	4				1	1	10		1		1
														0
		Heptageniidae	*Cinygmula*											0
														0
Plecoptera										2		1		1
		Capniidae	*Capnia*											0
			Eucapnopsis											0
			Isocapnia											0
			Paracapnia											0
														0
		Chloroperlidae	*Utaperla*											0
														0
		Nemouridae	*Nemoura*											0
			Paranemoura											0
			Podmosta									1		1
			Shipsa											0
		Perlodidae	*Alloperla*											0
			Perlomyia											0
														0
Trichoptera														0
		Brachycentridae	*Brachycentrus*					1						1
		Limnephilidae												0
		Glossosmatidae												0
														0
Diptera														0
		Chironomidae	larvae	20		4		29		80		18		1
		Chironomidae	pupae	3		2		3		7		4		1
		Ceratopogonidae												0
		Empididae	*Chelifera*											0
			Clinocera							1				1
			Rhamphomyia											0
		Ephydridae												0
		Psychodidae												0
		Tabanidae												0
		Tipulidae	*Tipula*					2		4				1
		Simuliidae	*Simulium*			2		8		4		3		1
		Stratiomyiidae												0
														0
Coleoptera														0
		Carabidae												0
		Chrysomelidae												0
		Curculionidae												0
		Dytiscidae												0
		Hydrophilidae larvae												0
		Hydroscaphidae												0
		Staphylinidae												0
														0
Hemiptera		Macroveliidae												0
		Saldidae												0
		Veliidae												0

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2004, NPDES Permit Requirements
Site: Bons Cr downstream of Blast Rd.
Date: July 12, 2004

			Water Volume (m3) =	57		77		69		81		65		
			Proportion of sample =	1		1		1		1		1		
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Miscellaneous														0
	Collembola													0
		Isotomidae	*Axelsonia*	2				1		2		12		1
		Onychiuridae	*Lophognathella*	1								2		1
		Onychiuridae	*Onychiurus*					1		1		3		1
		Poduridae	*Podura*											0
		Sminthuridae	*Dicyrtoma*											0
			Sminthurus					1						1
														0
	Lepidoptera	Pyralidae												0
														0
	Acari	Acarina		1				2		1				1
														0
	Oligochaeta							1		1				1
														0
	Ostracoda			1						1				1
														0
	Copepoda	Cyclopoida												0
		Calanoida						1						1
		Harpacticoida								1				1
														0
														0
														0
	Terrestrial Flies				9		2		15		72		21	17
	Terrestrial Wasps				7		2		16		14		8	
	Misc. Terr.Arthropods				4				3		22		13	
	Fish larvae		*Thymallus arcticus*											
			Salvelinus malma											
			Cottus cognatus											

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet												
Site:	**Bons Cr downstream of Blast Rd.**											
Date:	**12-Jul-04**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				52		12		86		223		87
estimated total (corrected for subsampling)				52		12		86		223		87
Total aquatic invert taxa/net				6		2		11		12		8
Total aquatic invert taxa/site			17									
	Tot. Ephemeroptera	(corrected for subsampling)	3	4		0		1		10		1
	Tot. Plecoptera	(corrected for subsampling)	1	0		0		0		2		2
	Tot. Trichop.	(corrected for subsampling)	0	0		0		1		0		0
	Total Aq. Diptera	(corrected for subsampling)	39	23		8		42		96		25
	Misc.Aq.sp	(corrected for subsampling)	7	5		0		7		7		17
		% other	14%	16%		0%		14%		6%		38%
		% Ephemeroptera	6%	13%		0%		2%		9%		2%
		% Plecoptera	2%	0%		0%		0%		2%		4%
		% Trichoptera	0%	0%		0%		2%		0%		0%
		% Aq. Diptera	77%	72%		100%		82%		83%		56%
	Total Chironomidae	(corrected for subsampling)		23		6		32		87		22
		% EPT	8%	13%		0%		4%		10%		7%
		% Chironomidae	68%	72%		75%		63%		76%		49%
	Dominant taxon	(corrected for subsampling)		20		4		29		80		18
		% Dominant Taxon	60%	63%		50%		57%		70%		40%
	Volume of water (m^3)		349	57		77		69		81		65
	Average vol.water/net		70									
	StDev of Water Volume/Net		10									
	Estimated total inverts/m^3 water		1.3	0.91		0.16		1.25		2.75		1.34
	Estimated aquatic inverts/m^3 water		0.7	0.56		0.10		0.74		1.42		0.69
	Average invertebrates/m^3 water		1.3									
	Average aq. invertebrates/m^3 water		0.70									
	StDev of Aq. Invert Density		0.47									
	Total aquatic invertebrates (corrected for subsampli		251	32		8		51		115		45
	Total. terrestrial invertebrates (corrected for subsan		209	20		4		35		108		42
	Total invertebrates (corrected for subsampling)		460	52		12		86		223		87
		% Sample aquatic	55%	62%		67%		59%		52%		52%
		% Sample terrestrial	45%	38%		33%		41%		48%		48%
	Average # aquatic inverts / net		50									
	StDev of Aq. Inv./Net		40									
	Average # terr. inverts / net		42									
	Average # inverts / net		92									
	StDev of Inv./Net		79									
	Total larval fish/site		0									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2005 NPDES Permit Requirements
Site: Bons Cr downstream of Blast Rd.
Date: July 6, 2005

			Water Volume (m3) =	7			33			25			26			13				
			Proportion of sample =	1			1			1			1			1				
	Taxon		Sample Number (Net) =	**1**		Terrestrial	**2**		Terrestrial	**3**		Terrestrial	**4**		Terrestrial	**5**		Terrestrial		Total Taxa
Ephemeroptera																				0
		Baetidae	*Baetis*	6			2			17			34			16				1
																				0
		Heptageniidae	*Cinygmula*																	0
			Epeorus													2				1
Plecoptera																1				1
		Capniidae	*Capnia*													1				1
			Eucapnopsis																	0
			Isocapnia																	0
			Paracapnia																	0
																				0
		Chloroperlidae	*Utaperla*									1								1
																				0
		Nemouridae	*Nemoura*																	0
			Paranemoura																	0
			Podmosta	2					1	3										1
																				0
		Perlodidae	*Alloperla*																	0
			Perlomyia																	0
																				0
Trichoptera																				0
		Brachycentridae	*Brachycentrus*																	0
		Limnephilidae								1										1
		Glossosmatidae																		0
																				0
Diptera																				0
		Chironomidae	larvae	16			35			61			60			32				1
		Chironomidae	pupae	2			8			1			4			6				1
		Ceratopogonidae																		0
		Empididae	*Chelifera*													2				1
			Clinocera				7													1
			Oreogeton																	0
		Ephydridae																		0
		Psychodidae																		0
		Tabanidae																		0
		Tipulidae	*Tipula*							1						68				1
		Simuliidae	*Simulium*	27			18			17			45							1
		Stratiomyiidae																		0
																				0
Coleoptera							1													1
		Carabidae																		0
		Chrysomelidae																		0
		Curculionidae																		0
		Dytiscidae														1				1
		Hydrophilidae larvae																		0
		Hydroscaphidae																		0
		Staphylinidae																		0
																				0
Hemiptera		Macroveliidae																		0
		Saldidae																		0
		Veliidae																		0

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2005 NPDES Permit Requirements
Site: Bons Cr downstream of Blast Rd.
Date: July 6, 2005

			Water Volume (m3) =	7		33		25		26		13		
			Proportion of sample =	1		1		1		1		1		
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Miscellaneous														0
	Collembola											3		1
		Isotomidae	*Axelsonia*	6		37		12		3		9		1
		Onychiuridae	*Lophognathella*			12								1
		Onychiuridae	*Onychiurus*	4				4		5				1
		Poduridae	*Podura*											0
		Sminthuridae	*Dicyrtoma*											0
			Sminthurus	35		42		1		2		2		1
														0
	Lepidoptera	Pyralidae												0
														0
	Acari	Acarina		20		86		5		12		3		1
														0
	Oligochaeta							1		1		1		1
														0
	Ostracoda					3								1
														0
	Copepoda	Cyclopoida												0
		Calanoida												0
		Harpacticoida		3		12		1				1		1
														0
														0
														0
	Terrestrial Flies				92		316		91		128		123	23
	Terrestrial Wasps				51		231		111				42	
	Misc. Terr.Arthropods				37		265		43		20		12	
	Fish larvae		*Thymallus arcticus*			3		3		3		1		
			Salvelinus malma											
			Cottus cognatus											

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet												
Site:	**Bons Cr downstream of Blast Rd.**											
Date:	**06-Jul-05**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				301		1076		371		314		325
estimated total (corrected for subsampling)				301		1076		371		314		325
Total aquatic invert taxa/net				9		10		12		8		14
Total aquatic invert taxa/site			23									
	Tot. Ephemeroptera	(corrected for subsampling)	15	6		2		17		34		18
	Tot. Plecoptera	(corrected for subsampling)	1	2		0		3		0		2
	Tot. Trichop.	(corrected for subsampling)	0	0		0		1		0		0
	Total Aq. Diptera	(corrected for subsampling)	82	45		68		80		109		108
	Misc.Aq.sp	(corrected for subsampling)	66	68		193		24		23		20
		% other	40%	56%		73%		19%		14%		14%
		% Ephemeroptera	9%	5%		1%		14%		20%		12%
		% Plecoptera	1%	2%		0%		2%		0%		1%
		% Trichoptera	0%	0%		0%		1%		0%		0%
		% Aq. Diptera	50%	37%		26%		64%		66%		73%
	Total Chironomidae	(corrected for subsampling)		18		43		62		64		38
		% EPT	10%	7%		1%		17%		20%		14%
		% Chironomidae	27%	15%		16%		50%		39%		26%
	Dominant taxon	(corrected for subsampling)		35		86		61		60		68
		% Dominant Taxon	38%	29%		33%		49%		36%		46%
	Volume of water (m^3)		104	7		33		25		26		13
	Average vol.water/net		21									
	StDev of Water Volume/Net		11									
	Estimated total inverts/m^3 water		23.0	43.00		32.61		14.84		12.08		25.00
	Estimated aquatic inverts/m^3 water		7.9	17.29		7.97		5.00		6.38		11.38
	Average invertebrates/m^3 water		23.0									
	Average aq. invertebrates/m^3 water		9.60									
	StDev of Aq. Invert Density		4.91									
	Total aquatic invertebrates	(corrected for subsampli	823	121		263		125		166		148
	Total. terrestrial invertebrates	(corrected for subsan	1564	180		813		246		148		177
	Total invertebrates	(corrected for subsampling)	2387	301		1076		371		314		325
		% Sample aquatic	34%	40%		24%		34%		53%		46%
		% Sample terrestrial	66%	60%		76%		66%		47%		54%
	Average # aquatic inverts / net		165									
	StDev of Aq. Inv./Net		58									
	Average # terr. inverts / net		313									
	Average # inverts / net		477									
	StDev of Inv./Net		336									
	Total larval fish/site		10									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2006 NPDES Permit Requirements
Site: Bons Cr downstream of Blast Rd.
Date: August 12, 2006

			Water Volume (m3) =	10		12		15		15		15				
			Proportion of sample =	1		1		1		1		1				
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial			Total Taxa
Ephemeroptera																0
		Baetidae	*Baetis*	5		7		4		7		12				1
		Heptageniidae	*Cinygmula*													0
			Epeorus													0
Plecoptera				1								2				1
		Capniidae	*Capnia*					2								1
			Eucapnopsis													0
			Isocapnia													0
			Paracapnia													0
		Chloroperlidae	*Utaperla*													0
			Neaviperla													0
		Nemouridae	*Nemoura*													0
			Paranemoura													0
			Podmosta													0
		Perlodidae	*Alloperla*													0
			Perlomyia													0
			Skwala													0
			Isoperla													0
Trichoptera																0
		Brachycentridae	*Brachycentrus*													0
		Limnephilidae														0
		Glossosomatidae														0
Diptera												1				1
		Chironomidae	larvae	15		21		7		10		26				1
		Chironomidae	pupae	4		1		3				2				1
		Ceratopogonidae														0
		Empididae	*Chelifera*													0
			Clinocera													0
			Oreogeton													0
		Ephydridae														0
		Psychodidae														0
		Tabanidae														0
		Tipulidae	*Tipula*					1								1
		Simuliidae	*Simulium*	7		6		2		5		6				1
		Stratiomyiidae														0
Coleoptera																0
		Carabidae														0
		Chrysomelidae														0
		Curculionidae														0
		Dytiscidae						1								1
		Hydrophilidae larvae														0
		Hydroscaphidae														0
		Staphylinidae										1				1
Hemiptera																0
		Macroveliidae														0
		Saldidae														0
		Veliidae														0

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2006 NPDES Permit Requirements
Site: Bons Cr downstream of Blast Rd.
Date: August 12, 2006

			Water Volume (m3) =	10		12		15		15		15		
			Proportion of sample =	1		1		1		1		1		
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Miscellaneous														0
	Collembola			2		2						3		1
		Isotomidae	*Axelsonia*											0
		Onychiuridae	*Lophognathella*											0
		Onychiuridae	*Onychiurus*											0
		Poduridae	*Podura*											0
		Sminthuridae	*Dicyrtoma*											0
			Sminthurus											0
	Lepidoptera													0
		Pyralidae			1									1
	Acari	Acarina						1						1
														0
	Oligochaeta			4		1		7		3		3		1
														0
	Ostracoda			1								2		1
														0
	Copepoda							2						1
		Cyclopoida												0
		Calanoida												0
		Harpacticoida		8		6		1				3		1
	Branchiopoda													0
		Daphniidae	*Daphnia*											0
	Terrestrial Flies				2						1		10	16
	Terrestrial Wasps								1					
	Misc. Terr.Arthropods				23		19		19		15		14	
	Fish larvae													
			Thymallus arcticus											
			Salvelinus malma											
			Cottus cognatus											

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet													
Site:	**Bons Cr downstream of Blast Rd.**												
Date:	**12-Aug-06**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				73		63		51		41		85
estimated total (corrected for subsampling)				73		63		51		41		85
Total aquatic invert taxa/net				8		6		10		4		10
Total aquatic invert taxa/site			16									
	Tot. Ephemeroptera	(corrected for subsampling)	7	5		7		4		7		12
	Tot. Plecoptera	(corrected for subsampling)	1	1		0		2		0		2
	Tot. Trichop.	(corrected for subsampling)	0	0		0		0		0		0
	Total Aq. Diptera	(corrected for subsampling)	23	26		28		13		15		35
	Misc.Aq.sp	(corrected for subsampling)	10	15		9		12		3		12
		% other	25%	32%		20%		39%		12%		20%
		% Ephemeroptera	17%	11%		16%		13%		28%		20%
		% Plecoptera	2%	2%		0%		6%		0%		3%
		% Trichoptera	0%	0%		0%		0%		0%		0%
		% Aq. Diptera	56%	55%		64%		42%		60%		57%
	Total Chironomidae	(corrected for subsampling)		19		22		10		10		28
		% EPT	19%	13%		16%		19%		28%		23%
		% Chironomidae	43%	40%		50%		32%		40%		46%
	Dominant taxon	(corrected for subsampling)		15		21		7		10		26
		% Dominant Taxon	38%	32%		48%		23%		40%		43%
	Volume of water (m^3)		68	10		12		15		15		15
	Average vol.water/net		14									
	StDev of Water Volume/Net		3									
	Estimated total inverts/m^3 water		4.6	7.49		5.15		3.34		2.68		5.56
	Estimated aquatic inverts/m^3 water		3.1	4.82		3.60		2.03		1.64		3.99
	Average invertebrates/m^3 water		4.6									
	Average aq. invertebrates/m^3 water		3.21									
	StDev of Aq. Invert Density		1.34									
	Total aquatic invertebrates (corrected for subsampli		208	47		44		31		25		61
	Total. terrestrial invertebrates (corrected for subsan		105	26		19		20		16		24
	Total invertebrates (corrected for subsampling)		313	73		63		51		41		85
		% Sample aquatic	66%	64%		70%		61%		61%		72%
		% Sample terrestrial	34%	36%		30%		39%		39%		28%
	Average # aquatic inverts / net		42									
	StDev of Aq. Inv./Net		14									
	Average # terr. inverts / net		21									
	Average # inverts / net		63									
	StDev of Inv./Net		17									
	Total larval fish/site		0									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2004, NPDES Permit Requirements
Site: Bons Cr upstream of Buddy Cr
Date: July 12, 2004

			Water Volume (m3) =	231		129		156		77		105				
			Proportion of sample =	1		1		1		1		1				
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa		
Ephemeroptera														0		
		Baetidae	*Baetis*	5	2	8		6		9	1	5	1	1		
														0		
		Heptageniidae	*Cinygmula*									1		1		
														0		
Plecoptera						2	1							1		
		Capniidae	*Capnia*		1									1		
			Eucapnopsis											0		
			Isocapnia											0		
			Paracapnia	1		1						5		1		
										1				1		
		Chloroperlidae	*Utaperla*											0		
														0		
		Nemouridae	*Nemoura*											0		
			Paranemoura											0		
			Podmosta							1				1		
			Shipsa											0		
		Perlodidae	*Alloperla*											0		
			Perlomyia											0		
				4						1				1		
Trichoptera														0		
		Brachycentridae	*Brachycentrus*											0		
		Limnephilidae												0		
		Glossosmatidae		3				2						1		
														0		
Diptera														0		
		Chironomidae	larvae	84		3	3	7		5		2		1		
		Chironomidae	pupae	9				8		12		12		1		
		Ceratopogonidae												0		
		Empididae	*Chelifera*											0		
			Clinocera											0		
			Rhamphomyia											0		
		Ephydridae												0		
		Psychodidae												0		
		Tabanidae												0		
		Tipulidae	*Tipula*					2		2				1		
		Simuliidae	*Simulium*	51		6		23		8		6		1		
		Stratiomyiidae												0		
														0		
Coleoptera														0		
		Carabidae												0		
		Chrysomelidae												0		
		Curculionidae												0		
		Dytiscidae												0		
		Hydrophilidae larvae												0		
		Hydroscaphidae												0		
		Staphylinidae												0		
														0		
Hemiptera		Macroveliidae												0		
		Saldidae												0		
		Veliidae												0		

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2004, NPDES Permit Requirements
Site: Bons Cr upstream of Buddy Cr
Date: July 12, 2004

			Water Volume (m3) =	231		129		156		77		105				
			Proportion of sample =	1		1		1		1		1				
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa		
Miscellaneous														0		
	Collembola													0		
		Isotomidae	*Axelsonia*	1		1		5		1		1		1		
		Onychiuridae	*Lophognathella*	1						1				1		
		Onychiuridae	*Onychiurus*							2		1		1		
		Poduridae	*Podura*											0		
		Sminthuridae	*Dicyrtoma*											0		
			Sminthurus					1						1		
														0		
	Lepidoptera	Pyralidae			1									1		
														0		
	Acari	Acarina						1						1		
														0		
	Oligochaeta				2									1		
														0		
	Ostracoda													0		
														0		
	Copepoda	Cyclopoida												0		
		Calanoida												0		
		Harpacticoida						1						1		
														0		
														0		
														0		
	Terrestrial Flies				36		12		53		71		50	20		
	Terrestrial Wasps				1		2		7		13		3			
	Misc. Terr.Arthropods				1		3		3		2		4			
	Fish larvae		*Thymallus arcticus*													
			Salvelinus malma													
			Cottus cognatus													

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet													
Site:	**Bons Cr upstream of Buddy Cr**												
Date:	**12-Jul-04**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				203		42		119		130		91
estimated total (corrected for subsampling)				203		42		119		130		91
Total aquatic invert taxa/net				8		6		9		10		7
Total aquatic invert taxa/site			20									
	Tot. Ephemeroptera	(corrected for subsampling)	7	5		8		6		9		6
	Tot. Plecoptera	(corrected for subsampling)	3	5		3		0		3		5
	Tot. Trichop.	(corrected for subsampling)	1	3		0		2		0		0
	Total Aq. Diptera	(corrected for subsampling)	48	144		9		40		27		20
	Misc.Aq.sp	(corrected for subsampling)	3	2		1		8		4		2
		% other	5%	1%		5%		14%		9%		6%
		% Ephemeroptera	11%	3%		38%		11%		21%		18%
		% Plecoptera	5%	3%		14%		0%		7%		15%
		% Trichoptera	2%	2%		0%		4%		0%		0%
		% Aq. Diptera	77%	91%		43%		71%		63%		61%
	Total Chironomidae	(corrected for subsampling)		93		3		15		17		14
		% EPT	18%	8%		52%		14%		28%		33%
		% Chironomidae	46%	58%		14%		27%		40%		42%
	Dominant taxon	(corrected for subsampling)		84		8		23		12		12
		% Dominant Taxon	45%	53%		38%		41%		28%		36%
	Volume of water (m^3)		698	231		129		156		77		105
	Average vol.water/net		140									
	StDev of Water Volume/Net		59									
	Estimated total inverts/m^3 water		0.8	0.88		0.33		0.76		1.69		0.87
	Estimated aquatic inverts/m^3 water		0.4	0.69		0.16		0.36		0.56		0.31
	Average invertebrates/m^3 water		0.9									
	Average aq. invertebrates/m^3 water		0.42									
	StDev of Aq. Invert Density		0.21									
	Total aquatic invertebrates (corrected for subsampli		312	159		21		56		43		33
	Total. terrestrial invertebrates (corrected for subsan		273	44		21		63		87		58
	Total invertebrates (corrected for subsampling)		585	203		42		119		130		91
		% Sample aquatic	53%	78%		50%		47%		33%		36%
		% Sample terrestrial	47%	22%		50%		53%		67%		64%
	Average # aquatic inverts / net		62									
	StDev of Aq. Inv./Net		56									
	Average # terr. inverts / net		55									
	Average # inverts / net		117									
	StDev of Inv./Net		59									
	Total larval fish/site		0									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2005, NPDES Permit Requirements
Site: Bons Cr upstream of Buddy Cr
Date: July 6, 2005

			Water Volume (m3) =	9		17		19		24		7		
			Proportion of sample =	1		1		1		1		1		
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Ephemeroptera							1		1					1
		Baetidae	*Baetis*	25		77		33		50		14		1
														0
		Heptageniidae	*Cinygmula*							14				1
			Epeorus	8		20		8				6		1
Plecoptera						8		1	1	7		2		1
		Capniidae	*Capnia*	2										1
			Eucapnopsis											0
			Isocapnia											0
			Paracapnia											0
														0
		Chloroperlidae	*Utaperla*											0
														0
		Nemouridae	*Nemoura*					1						1
			Paranemoura											0
			Podmosta	2										1
														0
		Perlodidae	*Alloperla*											0
			Perlomyia											0
														0
Trichoptera														0
		Brachycentridae	*Brachycentrus*											0
		Limnephilidae						3		1				1
		Glossosmatidae												0
														0
Diptera														0
		Chironomidae	larvae	21		16		101		54		5		1
		Chironomidae	pupae	16		16		13		27		5		1
		Ceratopogonidae												0
		Empididae	*Chelifera*											0
			Clinocera											0
			Oreogeton											0
		Ephydridae												0
		Psychodidae												0
		Tabanidae												0
		Tipulidae	*Tipula*			1								1
		Simuliidae	*Simulium*	2		31		3		3		1		1
		Stratiomyiidae												0
														0
Coleoptera														0
		Carabidae												0
		Chrysomelidae												0
		Curculionidae												0
		Dytiscidae												0
		Hydrophilidae larvae												0
		Hydroscaphidae												0
		Staphylinidae												0
														0
Hemiptera		Macroveliidae												0
		Saldidae												0
		Veliidae												0

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2005, NPDES Permit Requirements
Site: Bons Cr upstream of Buddy Cr
Date: July 6, 2005

			Water Volume (m3) =	9		17		19		24		7			
			Proportion of sample =	1		1		1		1		1			
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Miscellaneous															0
	Collembola					3									1
		Isotomidae	*Axelsonia*			2		2		3					1
		Onychiuridae	*Lophognathella*												0
		Onychiuridae	*Onychiurus*												0
		Poduridae	*Podura*												0
		Sminthuridae	*Dicyrtoma*												0
			Sminthurus												0
															0
	Lepidoptera	Pyralidae													0
															0
	Acari	Acarina		2		6		5		3		2			1
															0
	Oligochaeta					2									1
															0
	Ostracoda							1		1					1
															0
	Copepoda	Cyclopoida													0
		Calanoida													0
		Harpacticoida		1				4		2					1
															0
															0
															0
	Terrestrial Flies				9		46		30		73		22	18	
	Terrestrial Wasps				1		2		4		12		5		
	Misc. Terr.Arthropods						2		2		4		2		
	Fish larvae		*Thymallus arcticus*												
			Salvelinus malma												
			Cottus cognatus												

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet												
Site:	**Bons Cr upstream of Buddy Cr**											
Date:	**06-Jul-05**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				89		233		213		254		64
estimated total (corrected for subsampling)				89		233		213		254		64
Total aquatic invert taxa/net				8		10		11		10		6
Total aquatic invert taxa/site			18									
	Tot. Ephemeroptera	(corrected for subsampling)	51	33		97		41		64		20
	Tot. Plecoptera	(corrected for subsampling)	5	4		8		2		7		2
	Tot. Trichop.	(corrected for subsampling)	1	0		0		3		1		0
	Total Aq. Diptera	(corrected for subsampling)	63	39		64		117		84		11
	Misc.Aq.sp	(corrected for subsampling)	8	3		13		12		9		2
		% other	6%	4%		7%		7%		5%		6%
		% Ephemeroptera	40%	42%		53%		23%		39%		57%
		% Plecoptera	4%	5%		4%		1%		4%		6%
		% Trichoptera	1%	0%		0%		2%		1%		0%
		% Aq. Diptera	50%	49%		35%		67%		51%		31%
	Total Chironomidae	(corrected for subsampling)		37		32		114		81		10
		% EPT	44%	47%		58%		26%		44%		63%
		% Chironomidae	43%	47%		18%		65%		49%		29%
	Dominant taxon	(corrected for subsampling)		25		77		101		54		14
		% Dominant Taxon	43%	32%		42%		58%		33%		40%
	Volume of water (m^3)		76	9		17		19		24		7
	Average vol.water/net		15									
	StDev of Water Volume/Net		7									
	Estimated total inverts/m^3 water		11.2	9.89		13.71		11.21		10.58		9.14
	Estimated aquatic inverts/m^3 water		8.4	8.78		10.71		9.21		6.88		5.00
	Average invertebrates/m^3 water		11.2									
	Average aq. invertebrates/m^3 water		8.11									
	StDev of Aq. Invert Density		2.21									
	Total aquatic invertebrates (corrected for subsampli		636	79		182		175		165		35
	Total. terrestrial invertebrates (corrected for subsan		217	10		51		38		89		29
	Total invertebrates (corrected for subsampling)		853	89		233		213		254		64
		% Sample aquatic	75%	89%		78%		82%		65%		55%
		% Sample terrestrial	25%	11%		22%		18%		35%		45%
	Average # aquatic inverts / net		127									
	StDev of Aq. Inv./Net		66									
	Average # terr. inverts / net		43									
	Average # inverts / net		171									
	StDev of Inv./Net		88									
	Total larval fish/site		0									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2006, NPDES Permit Requirements
Site: Bons Cr upstream of Buddy Cr
Date: August 12, 2006

			Water Volume (m3) =	165		156		92		138		61					
			Proportion of sample =	0.33		0.2		0.2		0.2		0.2					
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa			
Ephemeroptera								1				2		1			
		Baetidae	*Baetis*	6		2		2		2		1		1			
		Heptageniidae	*Cinygmula*	3		1								1			
			Epeorus							1				1			
Plecoptera				1				1		1	3			1			
		Capniidae	*Capnia*	1										1			
			Eucapnopsis											0			
			Isocapnia											0			
			Paracapnia											0			
		Chloroperlidae	*Utaperla*											0			
			Neaviperla	3										1			
		Nemouridae	*Nemoura*											0			
			Paranemoura											0			
			Podmosta											0			
		Perlodidae	*Alloperla*											0			
			Perlomyia											0			
			Skwala	2		1								1			
			Isoperla					1						1			
Trichoptera														0			
		Brachycentridae	*Brachycentrus*											0			
		Limnephilidae												0			
		Glossosomatidae												0			
Diptera														0			
		Chironomidae	larvae	8		2		4		1		2		1			
		Chironomidae	pupae	39		17		29		27		8		1			
		Ceratopogonidae												0			
		Empididae	*Chelifera*											0			
			Clinocera											0			
			Oreogeton											0			
		Ephydridae												0			
		Psychodidae												0			
		Tabanidae												0			
		Tipulidae	*Tipula*											0			
		Simuliidae	*Simulium*	2						2				1			
		Stratiomyiidae												0			
Coleoptera														0			
		Carabidae												0			
		Chrysomelidae												0			
		Curculionidae												0			
		Dytiscidae												0			
		Hydrophilidae larvae												0			
		Hydroscaphidae												0			
		Staphylinidae				1								1			
Hemiptera														0			
		Macroveliidae												0			
		Saldidae												0			
		Veliidae												0			

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2006, NPDES Permit Requirements
Site: Bons Cr upstream of Buddy Cr
Date: August 12, 2006

			Water Volume (m3) =	165		156		92		138		61		
			Proportion of sample =	0.33		0.2		0.2		0.2		0.2		
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Miscellaneous														0
	Collembola					2		1		5		1		1
			Axelsonia											0
		Isotomidae	*Lophognathella*											0
		Onychiuridae	*Onychiurus*											0
		Onychiuridae	*Podura*											0
		Poduridae	*Dicyrtoma*											0
		Sminthuridae	*Sminthurus*											0
	Lepidoptera													0
		Pyralidae												0
	Acari	Acarina		4		6		5		5		3		1
														0
	Oligochaeta			1		2								1
														0
	Copepoda													0
		Cyclopoida								42				1
		Calanoida												0
		Harpacticoida		91		45		41				24		1
	Terrestrial Flies				122		40		28		69		9	17
	Terrestrial Wasps				1		1		1		1			
	Misc. Terr.Arthropods						1		1					
	Fish larvae													
			Thymallus arcticus											
			Salvelinus malma											
			Cottus cognatus											

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet												
Site:	**Bons Cr upstream of Buddy Cr**											
Date:	**12-Aug-06**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				284		121		115		159		50
estimated total (corrected for subsampling)				861		605		575		795		250
Total aquatic invert taxa/net				11		9		8		8		6
Total aquatic invert taxa/site			17									
	Tot. Ephemeroptera		17	27		15		15		15		15
	Tot. Plecoptera	(corrected for subsampling)	8	21		5		10		5		0
	Tot. Trichop.	(corrected for subsampling)	0	0		0		0		0		0
	Total Aq. Diptera	(corrected for subsampling)	122	148		95		165		150		50
	Misc.Aq.sp	(corrected for subsampling)	241	291		280		235		260		140
		% other	62%	60%		71%		55%		60%		68%
		% Ephemeroptera	4%	6%		4%		4%		3%		7%
		% Plecoptera	2%	4%		1%		2%		1%		0%
		% Trichoptera	0%	0%		0%		0%		0%		0%
		% Aq. Diptera	31%	30%		24%		39%		35%		24%
	Total Chironomidae	(corrected for subsampling)		142		95		165		140		50
		% EPT	7%	10%		5%		6%		5%		7%
		% Chironomidae	30%	29%		24%		39%		33%		24%
	Dominant taxon	(corrected for subsampling)		276		225		205		210		120
		% Dominant Taxon	53%	57%		57%		48%		49%		59%
	Volume of water (m^3)		612	165		156		92		138		61
	Average vol.water/net		122									
	StDev of Water Volume/Net		44									
	Estimated total inverts/m^3 water		5.0	5.21		3.88		6.27		5.78		4.09
	Estimated aquatic inverts/m^3 water		3.2	2.95		2.53		4.63		3.12		3.35
	Average invertebrates/m^3 water		5.0									
	Average aq. invertebrates/m^3 water		3.32									
	StDev of Aq. Invert Density		0.79									
	Total aquatic invertebrates (corrected for subsampli		1943	488		395		425		430		205
	Total. terrestrial invertebrates (corrected for subsan		1143	373		210		150		365		45
	Total invertebrates (corrected for subsampling)		3086	861		605		575		795		250
		% Sample aquatic	63%	57%		65%		74%		54%		82%
		% Sample terrestrial	37%	43%		35%		26%		46%		18%
	Average # aquatic inverts / net		389									
	StDev of Aq. Inv./Net		108									
	Average # terr. inverts / net		229									
	Average # inverts / net		617									
	StDev of Inv./Net		239									
	Total larval fish/site		0									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2004, NPDES Permit Requirements
Site: Buddy Cr. Upstream of Haul Road
Date: July 12, 2004

			Water Volume (m3) =	121		80		73		84		413		
			Proportion of sample =	0.33		0.33		1		0.33		1		
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Ephemeroptera														0
		Baetidae	*Baetis*	1269	1	393		858		360	3	3170		1
														0
		Heptageniidae	*Cinygmula*	3				12		1		31		1
														0
Plecoptera												4		1
		Capniidae	*Capnia*									8		1
			Eucapnopsis											0
			Isocapnia											0
			Paracapnia	7		2		38				5		1
														0
		Chloroperlidae	*Utaperla*											0
														0
		Nemouridae	*Nemoura*											0
			Paranemoura											0
			Podmosta	2				2		1		7		1
			Shipsa											0
		Perlodidae	*Alloperla*											0
			Perlomyia											0
														0
Trichoptera														0
		Brachycentridae	*Brachycentrus*											0
		Limnephilidae												0
		Glossosmatidae										1		1
														0
Diptera														0
		Chironomidae	larvae	37		23		41		26		91		1
		Chironomidae	pupae	25		17		19		16		40		1
		Ceratopogonidae												0
		Empididae	*Chelifera*											0
			Clinocera											0
			Rhamphomyia											0
		Ephydridae												0
		Psychodidae												0
		Tabanidae												0
		Tipulidae	*Tipula*	2		1				5		9		1
		Simuliidae	*Simulium*	45		27				14		55		1
		Stratiomyiidae												0
														0
Coleoptera														0
		Carabidae												0
		Chrysomelidae												0
		Curculionidae												0
		Dytiscidae												0
		Hydrophilidae larvae								1				1
		Hydroscaphidae												0
		Staphylinidae										1		1
														0
Hemiptera		Macroveliidae												0
		Saldidae												0
		Veliidae												0

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2004, NPDES Permit Requirements
Site: Buddy Cr. Upstream of Haul Road
Date: July 12, 2004

			Water Volume (m3) =	121		80		73		84		413		
			Proportion of sample =	0.33		0.33		1		0.33		1		
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Miscellaneous														0
	Collembola													0
		Isotomidae	*Axelsonia*	5		4		3		7		3		1
		Onychiuridae	*Lophognathella*	1				1		1		2		1
		Onychiuridae	*Onychiurus*			2		1				1		1
		Poduridae	*Podura*											0
		Sminthuridae	*Dicyrtoma*											0
			Sminthurus	1										1
														0
	Lepidoptera	Pyralidae												0
														0
	Acari	Acarina		2		1		3		4		10		1
														0
	Oligochaeta			1		1				1				1
														0
	Ostracoda							2						1
														0
	Copepoda	Cyclopoida												0
		Calanoida												0
		Harpacticoida						2						1
														0
														0
														0
	Terrestrial Flies				119		40		205		34		171	20
	Terrestrial Wasps				8		3		6		5		12	
	Misc. Terr.Arthropods				3		1		4		5		3	
	Fish larvae		*Thymallus arcticus*											
			Salvelinus malma											
			Cottus cognatus											

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet													
Site:	**Buddy Cr. Upstream of Haul Road**												
Date:	**12-Jul-04**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				1531		515		1197		484		3624
estimated total (corrected for subsampling)				4639		1561		1197		1467		3624
Total aquatic invert taxa/net				12		9		11		11		15
Total aquatic invert taxa/site			20									
	Tot. Ephemeroptera	(corrected for subsampling)	2042	3855		1191		870		1094		3201
	Tot. Plecoptera	(corrected for subsampling)	20	27		6		40		3		24
	Tot. Trichop.	(corrected for subsampling)	0	0		0		0		0		1
	Total Aq. Diptera	(corrected for subsampling)	195	330		206		60		185		195
	Misc.Aq.sp	(corrected for subsampling)	25	30		24		12		42		17
		% other	1%	1%		2%		1%		3%		0%
		% Ephemeroptera	89%	91%		83%		89%		83%		93%
		% Plecoptera	1%	1%		0%		4%		0%		1%
		% Trichoptera	0%	0%		0%		0%		0%		0%
		% Aq. Diptera	9%	8%		14%		6%		14%		6%
	Total Chironomidae	(corrected for subsampling)		188		121		60		127		131
		% EPT	90%	92%		84%		93%		83%		94%
		% Chironomidae	5%	4%		8%		6%		10%		4%
	Dominant taxon	(corrected for subsampling)		3845		1191		858		1091		3170
		% Dominant Taxon	89%	91%		83%		87%		82%		92%
	Volume of water (m^3)		771	121		80		73		84		413
	Average vol.water/net		154									
	StDev of Water Volume/Net		146									
	Estimated total inverts/m^3 water		16.2	38.34		19.51		16.40		17.46		8.77
	Estimated aquatic inverts/m^3 water		14.8	35.06		17.84		13.45		15.76		8.32
	Average invertebrates/m^3 water		20.1									
	Average aq. invertebrates/m^3 water		18.09									
	StDev of Aq. Invert Density		10.13									
	Total aquatic invertebrates (corrected for subsampli		11414	4242		1427		982		1324		3438
	Total. terrestrial invertebrates (corrected for subsan		1074	397		133		215		142		186
	Total invertebrates (corrected for subsampling)		12488	4639		1561		1197		1467		3624
		% Sample aquatic	91%	91%		91%		82%		90%		95%
		% Sample terrestrial	9%	9%		9%		18%		10%		5%
	Average # aquatic inverts / net		2283									
	StDev of Aq. Inv./Net		1459									
	Average # terr. inverts / net		215									
	Average # inverts / net		2498									
	StDev of Inv./Net		1540									
	Total larval fish/site		0									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2005, NPDES Permit Requirements
Site: Buddy Cr. Upstream of Haul Road
Date: July 6, 2005

			Water Volume (m3) =	24		55		33		65		58				
			Proportion of sample =	0.66		0.33		0.33		1		0.33				
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Ephemeroptera														0
		Baetidae	*Baetis*	107		68		72		290		69		1
														0
		Heptageniidae	*Cinygmula*	3		3		6		17				1
			Epeorus	6								5		1
Plecoptera													2	0
		Capniidae	*Capnia*	4								1		1
			Eucapnopsis											0
			Isocapnia											0
			Paracapnia											0
														0
		Chloroperlidae	*Utaperla*					2						1
														0
		Nemouridae	*Nemoura*											0
			Paranemoura											0
			Podmosta	7		8	2	4	8	16	10	2		1
														0
		Perlodidae	*Alloperla*							7				1
			Perlomyia											0
														0
Trichoptera														0
		Brachycentridae	*Brachycentrus*							1				1
		Limnephilidae		2										1
		Glossosmatidae												0
														0
Diptera				1										1
		Chironomidae	larvae	141		44		97		293		72		1
		Chironomidae	pupae	7		8		19		45		23		1
		Ceratopogonidae												0
		Empididae	*Chelifera*									1		1
			Clinocera											0
			Oreogeton											0
		Ephydridae												0
		Psychodidae												0
		Tabanidae												0
		Tipulidae	*Tipula*					1		1				1
		Simuliidae	*Simulium*	72		35		73		155		52		1
		Stratiomyiidae												0
														0
Coleoptera														0
		Carabidae												0
		Chrysomelidae												0
		Curculionidae												0
		Dytiscidae												0
		Hydrophilidae larvae												0
		Hydroscaphidae												0
		Staphylinidae												0
														0
Hemiptera		Macroveliidae												0
		Saldidae												0
		Veliidae												0

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2005, NPDES Permit Requirements
Site: Buddy Cr. Upstream of Haul Road
Date: July 6, 2005

			Water Volume (m3) =	24		55		33		65		58				
			Proportion of sample =	0.66		0.33		0.33		1		0.33				
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa		
Miscellaneous														0		
	Collembola					4		2		2		1		1		
		Isotomidae	*Axelsonia*	1		13		18		21		9		1		
		Onychiuridae	*Lophognathella*							8				1		
		Onychiuridae	*Onychiurus*											0		
		Poduridae	*Podura*											0		
		Sminthuridae	*Dicyrtoma*											0		
			Sminthurus					3		1		1		1		
														0		
	Lepidoptera	Pyralidae												0		
														0		
	Acari	Acarina		2		1		7		13		1		1		
														0		
	Oligochaeta									2		1		1		
														0		
	Ostracoda													0		
														0		
	Copepoda	Cyclopoida												0		
		Calanoida												0		
		Harpacticoida												0		
														0		
														0		
														0		
	Terrestrial Flies				22		113		144		263		86	20		
	Terrestrial Wasps				2		9		19		33		6			
	Misc. Terr.Arthropods				7		3		6		10		1			
	Fish larvae		*Thymallus arcticus*													
			Salvelinus malma													
			Cottus cognatus													

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet												
Site:	**Buddy Cr. Upstream of Haul Road**											
Date:	**06-Jul-05**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				384		311		481		1188		333
estimated total (corrected for subsampling)				582		942		1458		1188		1009
Total aquatic invert taxa/net				11		8		11		14		12
Total aquatic invert taxa/site			20									
	Tot. Ephemeroptera	(corrected for subsampling)	232	176		215		236		307		224
	Tot. Plecoptera	(corrected for subsampling)	18	17		24		18		23		9
	Tot. Trichop.	(corrected for subsampling)	1	3		0		0		1		0
	Total Aq. Diptera	(corrected for subsampling)	423	335		264		576		494		448
	Misc.Aq.sp	(corrected for subsampling)	47	5		55		91		47		39
		% other	7%	1%		10%		10%		5%		5%
		% Ephemeroptera	32%	33%		39%		26%		35%		31%
		% Plecoptera	3%	3%		4%		2%		3%		1%
		% Trichoptera	0%	1%		0%		0%		0%		0%
		% Aq. Diptera	59%	63%		47%		63%		57%		62%
	Total Chironomidae	(corrected for subsampling)		224		158		352		338		288
		% EPT	35%	37%		43%		28%		38%		32%
		% Chironomidae	38%	42%		28%		38%		39%		40%
	Dominant taxon	(corrected for subsampling)		214		206		294		293		15
		% Dominant Taxon	28%	40%		37%		32%		34%		2%
	Volume of water (m^3)		235	24		55		33		65		58
	Average vol.water/net		47									
	StDev of Water Volume/Net		18									
	Estimated total inverts/m^3 water		22.0	24.24		17.13		44.17		18.28		17.40
	Estimated aquatic inverts/m^3 water		15.3	22.29		10.14		27.92		13.42		12.43
	Average invertebrates/m^3 water		22.0									
	Average aq. invertebrates/m^3 water		17.24									
	StDev of Aq. Invert Density		7.54									
	Total aquatic invertebrates (corrected for subsampli		3607	535		558		921		872		721
	Total. terrestrial invertebrates (corrected for subsan		1572	47		385		536		316		288
	Total invertebrates (corrected for subsampling)		5179	582		942		1458		1188		1009
		% Sample aquatic	70%	92%		59%		63%		73%		71%
		% Sample terrestrial	30%	8%		41%		37%		27%		29%
	Average # aquatic inverts / net		721									
	StDev of Aq. Inv./Net		176									
	Average # terr. inverts / net		314									
	Average # inverts / net		1036									
	StDev of Inv./Net		323									
	Total larval fish/site		0									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2006, NPDES Permit Requirements
Site: Buddy Cr. Upstream of Haul Road
Date: August 12, 2006

			Water Volume (m3) =	31		131		107		118		214			
			Proportion of sample =	1		0.40		0.2		0.4		0.2			
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Ephemeroptera				1		3		3		3				1
		Baetidae	*Baetis*	113		194		123		196		144		1
		Heptageniidae	*Cinygmula*	8		8		6		13		6		1
			Epeorus											0
Plecoptera				6	1			4		4		3		1
		Capniidae	*Capnia*											0
			Eucapnopsis											0
			Isocapnia											0
			Paracapnia	1		8		5		3		6		1
		Chloroperlidae	*Utaperla*											0
			Neaviperla											0
		Nemouridae	*Nemoura*											0
			Paranemoura											0
			Podmosta					1		1				1
		Perlodidae	*Alloperla*											0
			Perlomyia											0
			Skwala											0
			Isoperla											0
Trichoptera														0
		Brachycentridae	*Brachycentrus*											0
		Limnephilidae												0
		Glossosomatidae												0
Diptera														0
		Chironomidae	larvae	19		18		13		33		37		1
		Chironomidae	pupae	42		72		49		46		79		1
		Ceratopogonidae												0
		Empididae	*Chelifera*							1				1
			Clinocera											0
			Oreogeton											0
		Ephydridae												0
		Psychodidae												0
		Tabanidae												0
		Tipulidae	*Tipula*							1		1		1
		Simuliidae	*Simulium*	59		70		47		85		63		1
		Stratiomyiidae												0
Coleoptera														0
		Carabidae												0
		Chrysomelidae												0
		Curculionidae												0
		Dytiscidae				1								1
		Hydrophilidae larvae												0
		Hydroscaphidae												0
		Staphylinidae						1						1
Hemiptera														0
		Macroveliidae												0
		Saldidae												0
		Veliidae												0

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2006, NPDES Permit Requirements
Site: Buddy Cr. Upstream of Haul Road
Date: August 12, 2006

			Water Volume (m3) =	31		131		107		118		214			
			Proportion of sample =	1		0.40		0.2		0.4		0.2			
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Miscellaneous														0
	Collembola			1		1		2		5		2		1
		Isotomidae	*Axelsonia*											0
		Onychiuridae	*Lophognathella*											0
		Onychiuridae	*Onychiurus*											0
		Poduridae	*Podura*											0
		Sminthuridae	*Dicyrtoma*											0
			Sminthurus			1								1
	Lepidoptera													0
		Pyralidae						1						1
	Acari	Acarina		5		10		15		17		12		1
														0
	Oligochaeta			1				2		2		2		1
														0
	Ostracoda			9		7		7		8		10		1
														0
	Copepoda													0
		Cyclopoida												0
		Calanoida												0
		Harpacticoida												0
	Branchiopoda													0
		Daphniidae	*Daphnia*	2										1
	Terrestrial Flies				21		68		54		135		102	19
	Terrestrial Wasps				2		3		1		3		1	
	Misc. Terr.Arthropods				2		9		3		5		3	
	Fish larvae													
			Thymallus arcticus											
			Salvelinus malma											
			Cottus cognatus											

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet												
Site:	**Buddy Cr. Upstream of Haul Road**											
Date:	**12-Aug-06**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				293		473		337		561		471
estimated total (corrected for subsampling)				293		1183		1685		1403		2355
Total aquatic invert taxa/net				12		11		14		14		11
Total aquatic invert taxa/site			19									
	Tot. Ephemeroptera	(corrected for subsampling)	515	122		513		660		530		750
	Tot. Plecoptera	(corrected for subsampling)	28	7		20		50		20		45
	Tot. Trichop.	(corrected for subsampling)	0	0		0		0		0		0
	Total Aq. Diptera	(corrected for subsampling)	476	120		400		545		415		900
	Misc.Aq.sp	(corrected for subsampling)	84	18		50		140		80		130
		% other	8%	7%		5%		10%		8%		7%
		% Ephemeroptera	47%	46%		52%		47%		51%		41%
		% Plecoptera	3%	3%		2%		4%		2%		2%
		% Trichoptera	0%	0%		0%		0%		0%		0%
		% Aq. Diptera	43%	45%		41%		39%		40%		49%
	Total Chironomidae	(corrected for subsampling)		61		225		310		198		580
		% EPT	49%	48%		54%		51%		53%		44%
		% Chironomidae	25%	23%		23%		22%		19%		32%
	Dominant taxon	(corrected for subsampling)		113		485		615		490		720
		% Dominant Taxon	44%	42%		49%		44%		47%		39%
	Volume of water (m^3)		600	31		131		107		118		214
	Average vol.water/net		120									
	StDev of Water Volume/Net		65									
	Estimated total inverts/m^3 water		11.5	9.58		9.04		15.74		11.91		11.00
	Estimated aquatic inverts/m^3 water		9.2	8.73		7.51		13.03		8.88		8.52
	Average invertebrates/m^3 water		11.5									
	Average aq. invertebrates/m^3 water		9.34									
	StDev of Aq. Invert Density		2.13									
	Total aquatic invertebrates (corrected for subsampli		5515	267		983		1395		1045		1825
	Total. terrestrial invertebrates (corrected for subsan		1404	26		200		290		358		530
	Total invertebrates (corrected for subsampling)		6918	293		1183		1685		1403		2355
		% Sample aquatic	80%	91%		83%		83%		75%		77%
		% Sample terrestrial	20%	9%		17%		17%		25%		23%
	Average # aquatic inverts / net		1103									
	StDev of Aq. Inv./Net		575									
	Average # terr. inverts / net		281									
	Average # inverts / net		1384									
	StDev of Inv./Net		752									
	Total larval fish/site		0									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2004, NPDES Permit Requirements
Site: Buddy Cr. Below Falls
Date: July 11, 2004

			Water Volume (m3) =	543		152		256		186		189				
			Proportion of sample =	0.5		1		1		0.5		0.33				
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa		
Ephemeroptera														0		
		Baetidae	*Baetis*	576	2	228		407	4	157	2	259	1	1		
														0		
		Heptageniidae	*Cinygmula*			1		3						1		
														0		
Plecoptera														0		
		Capniidae	*Capnia*											0		
			Eucapnopsis											0		
			Isocapnia											0		
			Paracapnia	1				10						1		
														0		
		Chloroperlidae	*Utaperla*											0		
														0		
		Nemouridae	*Nemoura*											0		
			Paranemoura											0		
			Podmosta	4		4		2		2		3		1		
			Shipsa											0		
		Perlodidae	*Alloperla*											0		
			Perlomyia											0		
				1				2				1		1		
Trichoptera														0		
		Brachycentridae	*Brachycentrus*											0		
		Limnephilidae										1		1		
		Glossosmatidae		1						1				1		
														0		
Diptera														0		
		Chironomidae	larvae	76		35		59		23		44		1		
		Chironomidae	pupae	29		13		36		3		11		1		
		Ceratopogonidae												0		
		Empididae	*Chelifera*											0		
			Clinocera											0		
			Rhamphomyia											0		
		Ephydridae												0		
		Psychodidae												0		
		Tabanidae												0		
		Tipulidae	*Tipula*	6						1				1		
		Simuliidae	*Simulium*	294		80		75		56		123		1		
		Stratiomyiidae												0		
														0		
Coleoptera														0		
		Carabidae												0		
		Chrysomelidae												0		
		Curculionidae												0		
		Dytiscidae												0		
		Hydrophilidae larvae								1				1		
		Hydroscaphidae												0		
		Staphylinidae												0		
														0		
Hemiptera		Macroveliidae												0		
		Saldidae												0		
		Veliidae												0		

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2004, NPDES Permit Requirements
Site: Buddy Cr. Below Falls
Date: July 11, 2004

			Water Volume (m3) =	543		152		256		186		189				
			Proportion of sample =	0.5		1		1		0.5		0.33				
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa		
Miscellaneous														0		
	Collembola													0		
		Isotomidae	*Axelsonia*	39		7		21		4		4		1		
		Onychiuridae	*Lophognathella*	1				3		1				1		
		Onychiuridae	*Onychiurus*	1		2		5		1		3		1		
		Poduridae	*Podura*											0		
		Sminthuridae	*Dicyrtoma*											0		
			Sminthurus	1										1		
														0		
	Lepidoptera	Pyralidae												0		
														0		
	Acari	Acarina		34		11		19		9		22		1		
														0		
	Oligochaeta			2		1		1						1		
														0		
	Ostracoda			3				1						1		
														0		
	Copepoda	Cyclopoida												0		
		Calanoida												0		
		Harpacticoida												0		
														0		
														0		
														0		
	Terrestrial Flies				144		32		92		20		36	18		
	Terrestrial Wasps				48		15		53		7		11			
	Misc. Terr.Arthropods				29		4		13		2		3			
	Fish larvae		*Thymallus arcticus*													
			Salvelinus malma													
			Cottus cognatus													

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet												
Site:	**Buddy Cr. Below Falls**											
Date:	**11-Jul-04**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				1292		433		806		290		522
estimated total (corrected for subsampling)				2584		433		806		580		1582
Total aquatic invert taxa/net				15		9		13		11		9
Total aquatic invert taxa/site			18									
	Tot. Ephemeroptera	(corrected for subsampling)	578	1152		229		410		314		785
	Tot. Plecoptera	(corrected for subsampling)	9	12		4		14		4		12
	Tot. Trichop.	(corrected for subsampling)	1	2		0		0		2		3
	Total Aq. Diptera	(corrected for subsampling)	363	810		128		170		166		539
	Misc.Aq.sp	(corrected for subsampling)	71	162		21		50		32		88
		% other	7%	8%		5%		8%		6%		6%
		% Ephemeroptera	57%	54%		60%		64%		61%		55%
		% Plecoptera	1%	1%		1%		2%		1%		1%
		% Trichoptera	0%	0%		0%		0%		0%		0%
		% Aq. Diptera	35%	38%		34%		26%		32%		38%
	Total Chironomidae	(corrected for subsampling)		210		48		95		52		167
		% EPT	58%	55%		61%		66%		62%		56%
		% Chironomidae	11%	10%		13%		15%		10%		12%
	Dominant taxon	(corrected for subsampling)		1152		228		407		314		785
		% Dominant Taxon	56%	54%		60%		63%		61%		55%
	Volume of water (m^3)		1326	543		152		256		186		189
	Average vol.water/net		265									
	StDev of Water Volume/Net		160									
	Estimated total inverts/m^3 water		4.5	4.76		2.85		3.15		3.12		8.37
	Estimated aquatic inverts/m^3 water		3.9	3.94		2.51		2.52		2.78		7.55
	Average invertebrates/m^3 water		4.4									
	Average aq. invertebrates/m^3 water		3.86									
	StDev of Aq. Invert Density		2.15									
	Total aquatic invertebrates (corrected for subsampli		5109	2138		382		644		518		1427
	Total. terrestrial invertebrates (corrected for subsan		876	446		51		162		62		155
	Total invertebrates (corrected for subsampling)		5985	2584		433		806		580		1582
		% Sample aquatic	85%	83%		88%		80%		89%		90%
		% Sample terrestrial	15%	17%		12%		20%		11%		10%
	Average # aquatic inverts / net		1022									
	StDev of Aq. Inv./Net		744									
	Average # terr. inverts / net		175									
	Average # inverts / net		1197									
	StDev of Inv./Net		893									
	Total larval fish/site		0									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2005, NPDES Permit Requirements
Site: Buddy Cr. Below Falls
Date: July 4, 2005

			Water Volume (m3) =	57		71		46		40		57			
			Proportion of sample =	0.33		0.33		0.33		0.33		0.33			
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Ephemeroptera														0
		Baetidae	*Baetis*	128		108		79		53		124		1
														0
		Heptageniidae	*Cinygmula*			2								1
			Epeorus	8		10		8		2		19		1
Plecoptera				3		5	1							1
		Capniidae	*Capnia*			5				2		1		1
			Eucapnopsis											0
			Isocapnia											0
			Paracapnia											0
														0
		Chloroperlidae	*Utaperla*											0
														0
		Nemouridae	*Nemoura*											0
			Paranemoura											0
			Podmosta					1				3		1
														0
		Perlodidae	*Alloperla*											0
			Perlomyia											0
														0
Trichoptera										1				1
		Brachycentridae	*Brachycentrus*											0
		Limnephilidae		2				1						1
		Glossosmatidae												0
														0
Diptera														0
		Chironomidae	larvae	108		99		88		58		74		1
		Chironomidae	pupae	217		188		143		164		150		1
		Ceratopogonidae												0
		Empididae	*Chelifera*											0
			Clinocera											0
			Oregeton											0
		Ephydridae												0
		Psychodidae												0
		Tabanidae												0
		Tipulidae	*Tipula*	1										1
		Simuliidae	*Simulium*	55		28		10		8		20		1
		Stratiomyiidae												0
														0
Coleoptera														0
		Carabidae												0
		Chrysomelidae												0
		Curculionidae												0
		Dytiscidae												0
		Hydrophilidae larvae												0
		Hydroscaphidae												0
		Staphylinidae												0
														0
Hemiptera		Macroveliidae												0
		Saldidae												0
		Veliidae												0

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2005, NPDES Permit Requirements
Site: Buddy Cr. Below Falls
Date: July 4, 2005

			Water Volume (m3) =	57		71		46		40		57				
			Proportion of sample =	0.33		0.33		0.33		0.33		0.33				
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa		
Miscellaneous														0		
	Collembola					2								1		
		Isotomidae	*Axelsonia*	2		3		5		3		1		1		
		Onychiuridae	*Lophognathella*					1						1		
		Onychiuridae	*Onychiurus*	1										1		
		Poduridae	*Podura*											0		
		Sminthuridae	*Dicyrtoma*											0		
			Sminthurus					1						1		
														0		
	Lepidoptera	Pyralidae												0		
														0		
	Acari	Acarina		1		1		1		1		1		1		
														0		
	Oligochaeta					1		2						1		
														0		
	Ostracoda													0		
														0		
	Copepoda	Cyclopoida												0		
		Calanoida												0		
		Harpacticoida		1		1				2		1		1		
														0		
														0		
														0		
	Terrestrial Flies				219		308		255		84		220	19		
	Terrestrial Wasps				12		18		8		7		11			
	Misc. Terr.Arthropods				11		28		6		9		6			
	Fish larvae		*Thymallus arcticus*													
			Salvelinus malma			1										
			Cottus cognatus													

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet													
Site:	**Buddy Cr. Below Falls**												
Date:	**04-Jul-05**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				769		808		609		394		631
estimated total (corrected for subsampling)				2330		2448		1845		1194		1912
Total aquatic invert taxa/net				11		12		11		9		9
Total aquatic invert taxa/site			19									
	Tot. Ephemeroptera	(corrected for subsampling)	328	412		364		264		167		433
	Tot. Plecoptera	(corrected for subsampling)	12	9		30		3		6		12
	Tot. Trichop.	(corrected for subsampling)	2	6		0		3		3		0
	Total Aq. Diptera	(corrected for subsampling)	855	1155		955		730		697		739
	Misc.Aq.sp	(corrected for subsampling)	19	15		24		30		18		9
		% other	2%	1%		2%		3%		2%		1%
		% Ephemeroptera	27%	26%		26%		26%		19%		36%
		% Plecoptera	1%	1%		2%		0%		1%		1%
		% Trichoptera	0%	0%		0%		0%		0%		0%
		% Aq. Diptera	70%	72%		70%		71%		78%		62%
	Total Chironomidae	(corrected for subsampling)		985		870		700		673		679
		% EPT	28%	27%		29%		26%		20%		37%
		% Chironomidae	64%	62%		63%		68%		76%		57%
	Dominant taxon	(corrected for subsampling)		658		570		433		497		455
		% Dominant Taxon	43%	41%		42%		42%		56%		38%
	Volume of water (m^3)		271	57		71		46		40		57
	Average vol.water/net		54									
	StDev of Water Volume/Net		12									
	Estimated total inverts/m^3 water		35.9	40.88		34.49		40.12		29.85		33.55
	Estimated aquatic inverts/m^3 water		22.5	28.02		19.33		22.40		22.27		20.95
	Average invertebrates/m^3 water		35.9									
	Average aq. invertebrates/m^3 water		22.59									
	StDev of Aq. Invert Density		3.27									
	Total aquatic invertebrates (corrected for subsampli		6085	1597		1373		1030		891		1194
	Total. terrestrial invertebrates (corrected for subsan		3645	733		1076		815		303		718
	Total invertebrates (corrected for subsampling)		9730	2330		2448		1845		1194		1912
		% Sample aquatic	63%	69%		56%		56%		75%		62%
		% Sample terrestrial	37%	31%		44%		44%		25%		38%
	Average # aquatic inverts / net		1217									
	StDev of Aq. Inv./Net		279									
	Average # terr. inverts / net		729									
	Average # inverts / net		1946									
	StDev of Inv./Net		494									
	Total larval fish/site		1									

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2006, NPDES Permit Requirements
Site: Buddy Cr. Below Falls
Date: August 14, 2006

			Water Volume (m3) =	139		101		165		96		110		
			Proportion of sample =	0.33		0.33		0.33		0.2		0.2		
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Ephemeroptera				3			1	5	2	1		5		1
		Baetidae	*Baetis*	113		60		76		35		15		1
		Heptageniidae	*Cinygmula*	25		10		13		8		4		1
			Epeorus											0
Plecoptera				15		11		7		6		2		1
		Capniidae	*Capnia*											0
			Eucapnopsis							2				1
			Isocapnia											0
			Paracapnia					1						1
		Chloroperlidae	*Utaperla*											0
			Neaviperla			1		1						1
		Nemouridae	*Nemoura*											0
			Paranemoura											0
			Podmosta											0
		Perlodidae	*Alloperla*											0
			Perlomyia											0
			Skwala											0
			Isoperla											0
Trichoptera														0
		Brachycentridae	*Brachycentrus*											0
		Limnephilidae												0
		Glossosomatidae												0
Diptera														0
		Chironomidae	larvae	22		14		16		12		8		1
		Chironomidae	pupae	47		18		24		18		9		1
		Ceratopogonidae												0
		Empididae	*Chelifera*											0
			Clinocera											0
			Oregeton											0
		Ephydridae												0
		Psychodidae												0
		Tabanidae												0
		Tipulidae	*Tipula*			1								1
		Simuliidae	*Simulium*	38		23		21		7		9		1
		Stratiomyiidae												0
Coleoptera														0
		Carabidae												0
		Chrysomelidae												0
		Curculionidae												0
		Dytiscidae		2										1
		Hydrophilidae larvae												0
		Hydroscaphidae												0
		Staphylinidae												0
Hemiptera														0
		Macroveliidae												0
		Saldidae												0
		Veliidae												0

Appendix 2 – Benthic Invertebrates (continued)

Data Summary Sheet

Number of invertebrates by family or genus
Drift Samples from 2006, NPDES Permit Requirements
Site: Buddy Cr. Below Falls
Date: August 14, 2006

			Water Volume (m3) =	139		101		165		96		110			
			Proportion of sample =	0.33		0.33		0.33		0.2		0.2			
	Taxon		Sample Number (Net) =	**1**	Terrestrial	**2**	Terrestrial	**3**	Terrestrial	**4**	Terrestrial	**5**	Terrestrial	Total Taxa
Miscellaneous														0
	Collembola			2		2		5		3		4		1
		Isotomidae	*Axelsonia*											0
		Onychiuridae	*Lophognathella*											0
		Onychiuridae	*Onychiurus*											0
		Poduridae	*Podura*											0
		Sminthuridae	*Dicyrtoma*											0
			Sminthurus											0
	Lepidoptera													0
		Pyralidae												0
	Acari	Acarina		32		20		18		20		12		1
														0
	Oligochaeta			1				1						1
														0
	Ostracoda			224		62		73		49		29		1
														0
	Copepoda													0
		Cyclopoida						10						1
		Calanoida												0
		Harpacticoida		19		13				6		4		1
	Branchiopoda													0
		Daphniidae	*Daphnia*	1071		617		470		473		260		1
	Terrestrial Flies				99		65		166		32		25	18
	Terrestrial Wasps				2		3		7		1		1	
	Misc. Terr.Arthropods				6		3		4		2		2	
	Fish larvae													
			Thymallus arcticus											
			Salvelinus malma											
			Cottus cognatus											

Appendix 2 – Benthic Invertebrates (concluded)

Data Summary Sheet													
Site:	**Buddy Cr. Below Falls**												
Date:	**14-Aug-06**			Net 1		Net 2		Net 3		Net 4		Net 5
Total invertebrates counted				1721		924		920		675		389
estimated total (corrected for subsampling)				5215		2800		2788		3375		1945
Total aquatic invert taxa/net				13		12		14		12		11
Total aquatic invert taxa/site			18									
	Tot. Ephemeroptera	(corrected for subsampling)	253	427		212		285		220		120
	Tot. Plecoptera	(corrected for subsampling)	32	45		36		27		40		10
	Tot. Trichop.	(corrected for subsampling)	0	0		0		0		0		0
	Total Aq. Diptera	(corrected for subsampling)	199	324		170		185		185		130
	Misc.Aq.sp	(corrected for subsampling)	2461	4094		2164		1748		2755		1545
		% other	84%	84%		84%		78%		86%		86%
		% Ephemeroptera	9%	9%		8%		13%		7%		7%
		% Plecoptera	1%	1%		1%		1%		1%		1%
		% Trichoptera	0%	0%		0%		0%		0%		0%
		% Aq. Diptera	7%	7%		7%		8%		6%		7%
	Total Chironomidae	(corrected for subsampling)		209		97		121		150		85
		% EPT	10%	10%		10%		14%		8%		7%
		% Chironomidae	4%	4%		4%		5%		5%		5%
	Dominant taxon	(corrected for subsampling)		3245		1870		1424		2365		1300
		% Dominant Taxon	69%	66%		72%		63%		74%		72%
	Volume of water (m^3)		612	139		101		165		96		110
	Average vol.water/net		122									
	StDev of Water Volume/Net		29									
	Estimated total inverts/m^3 water		26.4	37.48		27.74		16.88		35.04		17.67
	Estimated aquatic inverts/m^3 water		24.1	35.15		25.58		13.60		33.22		16.39
	Average invertebrates/m^3 water		26.4									
	Average aq. invertebrates/m^3 water		24.79									
	StDev of Aq. Invert Density		9.68									
	Total aquatic invertebrates (corrected for subsampli		14723	4891		2582		2245		3200		1805
	Total. terrestrial invertebrates (corrected for subsan		1400	324		218		542		175		140
	Total invertebrates (corrected for subsampling)		16123	5215		2800		2788		3375		1945
		% Sample aquatic	91%	94%		92%		81%		95%		93%
		% Sample terrestrial	9%	6%		8%		19%		5%		7%
	Average # aquatic inverts / net		2945									
	StDev of Aq. Inv./Net		1201									
	Average # terr. inverts / net		280									
	Average # inverts / net		3225									
	StDev of Inv./Net		1224									
	Total larval fish/site		0									

Appendix 3 – Chlorophyll-a Concentrations

Red Dog 2004 Periphyton Analysis Results - Bons Creek Baseline							
Note: phaeophyton not presented because there were no significant differences between							
	chlorophyll a and chlro a corrected for phaeophyton						
Note: no values below the detection limit of 0.5 mg chla/m^2							
Daily	**Site**	**Station**	**Date**	**Date**	**Chl a**	**Chl b**	**Chl c**
Vial #		**number**	**Collected**	**Analyzed**	**mg/m2**	**mg/m2**	**mg/m2**
11	Red Dog	Bud us rd	7/12/2004	2/15/2005	**1.05**	0.05	0.03
12	Red Dog	STA 221	7/12/2004	2/15/2005	**2.65**	0	0.14
13	Red Dog	STA 221	7/12/2004	2/15/2005	**1.37**	0	0.05
14	Red Dog	STA 221	7/12/2004	2/15/2005	**1.64**	0	0.14
15	Red Dog	STA 221	7/12/2004	2/15/2005	**1.64**	0	0.04
16	Red Dog	STA 221	7/12/2004	2/15/2005	**1.91**	0.01	0.14
17	Red Dog	STA 221	7/12/2004	2/15/2005	**0.87**	0	0.02
18	Red Dog	STA 221	7/12/2004	2/15/2005	**2.26**	0.24	0.13
19	Red Dog	STA 221	7/12/2004	2/15/2005	**1.05**	0.05	0.03
20	Red Dog	STA 221	7/12/2004	2/15/2005	**1.41**	0.02	0.11
21	Red Dog	Bonsusbud	7/12/2004	2/15/2005	**6.19**	0.16	0.23
22	Red Dog	STA 220	7/12/2004	2/15/2005	**3.24**	0	0.13
23	Red Dog	STA 220	7/12/2004	2/15/2005	**2.1**	0	0.11
24	Red Dog	STA 220	7/12/2004	2/15/2005	**6.66**	1.18	0.25
25	Red Dog	STA 220	7/12/2004	2/15/2005	**3.33**	0	0.18
26	Red Dog	STA 220	7/12/2004	2/15/2005	**6.32**	0.31	0.41
27	Red Dog	STA 220	7/12/2004	2/15/2005	**3.11**	0.47	0.05
28	Red Dog	STA 220	7/12/2004	2/15/2005	**4.02**	0	0.18
29	Red Dog	STA 220	7/12/2004	2/15/2005	**8.92**	0.33	0.33
30	Red Dog	STA 220	7/12/2004	2/15/2005	**6.75**	1.23	0.11
31	Red Dog	Bud below falls	7/11/2004	2/15/2005	**0.87**	0	0.02
32	Red Dog	Bud below falls	7/11/2004	2/15/2005	**1.33**	0	0.08
33	Red Dog	Bud below falls	7/11/2004	2/15/2005	**2.1**	0	0.11
34	Red Dog	Bud below falls	7/11/2004	2/15/2005	**1.83**	0	0.08
35	Red Dog	Bud below falls	7/11/2004	2/15/2005	**1.05**	0	0.06
36	Red Dog	Bud below falls	7/11/2004	2/15/2005	**1.37**	0	0.05
37	Red Dog	Bud below falls	7/11/2004	2/15/2005	**1.14**	0	0.01
38	Red Dog	Bud below falls	7/11/2004	2/15/2005	**1.05**	0	0.06
39	Red Dog	Bud below falls	7/11/2004	2/15/2005	**1.15**	0	0.04
40	Red Dog	Bud below falls	7/11/2004	2/15/2005	**1.78**	0	0.12
41	Red Dog	Lwr Bons	7/12/2004	2/15/2005	**1.14**	0	0.11
42	Red Dog	below WRD	7/12/2004	2/15/2005	**2.02**	0	0.06
43	Red Dog	Lwr Bons	7/12/2004	2/15/2005	**1.19**	0	0.04
44	Red Dog	below WRD	7/12/2004	2/15/2005	**6.04**	0.28	0.42
45	Red Dog	Lwr Bons	7/12/2004	2/15/2005	**2.56**	0	0.15
46	Red Dog	below WRD	7/12/2004	2/15/2005	**5.57**	0.34	1.2
47	Red Dog	Lwr Bons	7/12/2004	2/15/2005	**1.64**	0	0.04
48	Red Dog	below WRD	7/12/2004	2/15/2005	**0.69**	0	0
49	Red Dog	Lwr Bons	7/12/2004	2/15/2005	**0.77**	0.02	0.03
50	Red Dog	below WRD	7/12/2004	2/15/2005	**1.32**	0	0.05
DOUBLE	Red Dog	DBL 33		2/15/2005	**2.15**	0	0.2
DOUBLE	Red Dog	DBL 24		2/15/2005	**6.65**	1.26	0.22

Appendix 3 – Chlorophyll-a Concentrations (continued)

Red Dog 2005 Periphyton Analysis Results								
Note: phaeophyton not presented because there were no significant differences between chlorophyll a and chlro a corrected for phaeophyton								
Note: no values below the detection limit of 0.13 mg chla/10ml 90% acetone solution								
		Station	**Date**	**Date**	**Chl a**	**Chl b**	**Chl c**	
Daily	**Site**	**number**	**Collected**	**Analyzed**	**mg/m2**	**mg/m2**	**mg/m2**	
Vial #								
1	Blank	Blank		11/15/2005	**0**	0	0	
2	Buddy Below Falls		5-Jul	11/15/2005	**11.48**	0.77	0.95	
3	Buddy Below Falls		5-Jul	11/15/2005	**1.03**	0.28	0.13	
4	Buddy Below Falls		5-Jul	11/15/2005	**3.64**	0.65	0.38	
5	Buddy Below Falls		5-Jul	11/15/2005	**2.63**	0.13	0.24	
6	Buddy Below Falls		5-Jul	11/15/2005	**2.7**	0.49	0.18	
7	Buddy Below Falls		5-Jul	11/15/2005	**2.13**	0.21	0.28	
8	Buddy Below Falls		5-Jul	11/15/2005	**0.54**	0.12	0.16	
9	Buddy Below Falls		5-Jul	11/15/2005	**2.14**	0.04	0.34	
10	Buddy Below Falls		5-Jul	11/15/2005	**1.68**	0.04	0.2	
11	Buddy Below Falls		5-Jul	11/15/2005	**3.17**	0.34	0.27	
22	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**3.78**	0.04	0.38	
23	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**3.69**	0.09	0.3	
24	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**4.43**	0	0.52	
25	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**2.65**	0.51	0.18	
26	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**7.12**	0	0.79	
27	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**5.65**	0	0.56	
28	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**3.19**	0	0.4	
29	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**5.4**	0.24	0.73	
30	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**2.86**	0.18	0.25	
31	Buddy upstream Road	Buddy upstream Road	5-Jul	11/15/2005	**0.68**	0.05	0.14	
32	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**9.94**	0	0.91	
33	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**39.3**	0	2.22	
34	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**5.7**	0.02	0.06	
35	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**19.25**	0.05	0.92	
36	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**25.9**	0.08	1.71	
37	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**14.28**	0	0.82	
38	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**11.18**	0	0.81	
39	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**50.5**	0	2.6	
40	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**12.66**	0	0.9	
41	Lower Bons, Below WRD	Lower Bons, Below WRD	5-Jul	11/15/2005	**8.44**	0	0.45	
52	BLANK	BLANK		11/15/2005	**0**	0	0	
1	BLANK	Blank		11/30/2005	**0**	0	0	
2	Bons us confluence	Bons 220	5-Jul	11/30/2005	**4.18**	1.44	0.09	
3	Bons us confluence	Bons 220	5-Jul	11/30/2005	**2.56**	0.58	0	
4	Bons us confluence	Bons 220	5-Jul	11/30/2005	**3.73**	0.72	0.04	
5	Bons us confluence	Bons 220	5-Jul	11/30/2005	**1.49**	0.13	0.13	
6	Bons us confluence	Bons 220	5-Jul	11/30/2005	**11.24**	0.32	0.35	
7	Bons us confluence	Bons 220	5-Jul	11/30/2005	**1.94**	0.33	0.01	
8	Bons us confluence	Bons 220	5-Jul	11/30/2005	**12.26**	0.68	0.45	
9	Bons us confluence	Bons 220	5-Jul	11/30/2005	**11.79**	0.35	0.54	
10	Bons us confluence	Bons 220	5-Jul	11/30/2005	**3.63**	0.3	0.05	
11	Bons us confluence	Bons 220	5-Jul	11/30/2005	**2.92**	0.64	0.05	

Appendix 3 – Chlorophyll-a Concentrations (continued)

Red Dog 2006 Periphyton Analysis Results - Bons Creek Baseline							
Note: phaeophyton not presented because there were no significant differences between							
	chlorophyll a and chlro a corrected for phaeophyton						
Note: no values below the detection limit of 0.03 mg chla/10ml 90% acetone solution							
		Station	**Date**	**Date**	**Chl a**	**Chl b**	**Chl c**
Daily	**Site**	**number**	**Collected**	**Analyzed**	**mg/m2**	**mg/m2**	**mg/m2**
Vial #							
1	Blank	Blank		12/7/2006	**0.00**	0.00	0.00
2	Lower Bons Below WRD			12/7/2006	**17.75**	0.00	0.98
3	Lower Bons Below WRD			12/7/2006	**12.44**	0.06	1.10
4	Lower Bons Below WRD			12/7/2006	**8.92**	0.00	0.29
5	Lower Bons Below WRD			12/7/2006	**8.21**	0.05	0.29
6	Lower Bons Below WRD			12/7/2006	**3.06**	0.00	0.18
7	Lower Bons Below WRD			12/7/2006	**9.90**	0.00	0.45
8	Lower Bons Below WRD			12/7/2006	**7.98**	0.00	0.48
9	Lower Bons Below WRD			12/7/2006	**13.55**	0.00	0.40
10	Lower Bons Below WRD			12/7/2006	**3.11**	0.00	0.18
11	Lower Bons Below WRD			12/7/2006	**4.11**	0.00	0.14
12	Buddy us Road	221		12/7/2006	**19.48**	3.57	0.43
13	Buddy us Road	221		12/7/2006	**9.58**	1.77	0.00
14	Buddy us Road	221		12/7/2006	**10.40**	0.52	0.73
15	Buddy us Road	221		12/7/2006	**3.51**	0.59	0.07
16	Buddy us Road	221		12/7/2006	**6.33**	1.36	0.00
17	Buddy us Road	221		12/7/2006	**3.72**	0.33	0.10
18	Buddy us Road	221		12/7/2006	**5.05**	0.12	0.51
19	Buddy us Road	221		12/7/2006	**3.14**	0.12	0.27
20	Buddy us Road	221		12/7/2006	**3.88**	0.53	0.44
21	Buddy us Road	221		12/7/2006	**3.01**	0.67	0.10
22	Buddy Below Falls			12/7/2006	**21.24**	5.01	0.25
23	Buddy Below Falls			12/7/2006	**9.14**	0.95	0.11
24	Buddy Below Falls			12/7/2006	**11.43**	2.68	0.04
25	Buddy Below Falls			12/7/2006	**6.29**	0.11	0.22
26	Buddy Below Falls			12/7/2006	**3.95**	0.21	0.17
27	Buddy Below Falls			12/7/2006	**5.62**	0.00	0.63
28	Buddy Below Falls			12/7/2006	**5.56**	0.60	0.35
29	Buddy Below Falls			12/7/2006	**2.04**	0.12	0.06
30	Buddy Below Falls			12/7/2006	**5.94**	0.00	0.13
31	Buddy Below Falls			12/7/2006	**1.64**	0.07	0.11
32	Bons us conf w/ Buddy	220		12/7/2006	**19.92**	5.57	0.18
33	Bons us conf w/ Buddy	220		12/7/2006	**35.08**	8.41	0.38
34	Bons us conf w/ Buddy	220		12/7/2006	**4.35**	1.06	0.00
35	Bons us conf w/ Buddy	220		12/7/2006	**28.87**	8.50	0.16
36	Bons us conf w/ Buddy	220		12/7/2006	**2.29**	0.47	0.03
37	Bons us conf w/ Buddy	220		12/7/2006	**17.33**	4.31	0.17
38	Bons us conf w/ Buddy	220		12/7/2006	**2.53**	0.35	0.10
39	Bons us conf w/ Buddy	220		12/7/2006	**19.67**	5.30	0.17
40	Bons us conf w/ Buddy	220		12/7/2006	**2.38**	0.50	0.09
41	Bons us conf w/ Buddy	220		12/7/2006	**19.83**	4.45	0.17
42	Blank	Blank		12/7/2006	**0.00**	0.00	0.00
3	Double	Double		12/7/2006	**12.49**	0.04	1.09
26	Double	Double		12/7/2006	**3.95**	0.21	0.17

Appendix 4 - Metals Concentrations in Dolly Varden and Arctic Grayling

Buddy Creek Downstream of Road and Falls, Whole Body Samples												
						Method	200.8	200.8	7471A	7740	200.8	
						analyte	Cadmium	Lead	Mercury	Selenium	Zinc	
Sample	Date	Fish	Length	Weight								
Number	Collected	Species	(mm)	(g)	Units	MRL	0.05/0.02	0.02	0.02	1	0.5	% Solids
080302BUDVJ01	7/29/2002	DV	108	13.38	mg/Kg	Juvenile	0.5	0.4		7.8	110	25.2
080302BUDVJ02	7/29/2002	DV	100	9.93	mg/Kg	Juvenile	0.56	0.41		7.9	122	24.7
080302BUDVJ03	7/29/2002	DV	99	9.6	mg/Kg	Juvenile	0.7	0.19		5.9	152	22.8
080302BUDVJ04	7/29/2002	DV	100	10.14	mg/Kg	Juvenile	0.6	0.19		7.5	127	22.8
080302BUDVJ05	7/29/2002	DV	104	12.83	mg/Kg	Juvenile	0.95	0.71		8.4	150	24.7
080302BUDVJ06	7/29/2002	DV	102	11.59	mg/Kg	Juvenile	0.74	0.55		6.3	121	27.7
080302BUDVJ07	7/29/2002	DV	117	15.07	mg/Kg	Juvenile	0.39	0.37		5.9	141	22.9
080302BUDVJ08	7/29/2002	DV	106	10.78	mg/Kg	Juvenile	0.43	0.25		7	128	24.5
080302BUDVJ09	7/29/2002	DV	110	13.26	mg/Kg	Juvenile	0.93	0.23		7.1	132	25
080302BUDVJ10	7/29/2002	DV	110	13.75	mg/Kg	Juvenile	0.28	0.16		7.1	117	24.8
080302BUDVJ11	7/29/2002	DV	112	14.48	mg/Kg	Juvenile	0.31	0.65		8.8	120	31.1
080302BUDVJ12	7/29/2002	DV	136	23.85	mg/Kg	Juvenile	0.24	0.35		6.8	125	26.3
080302BUDVJ13	7/29/2002	DV	112	13.8	mg/Kg	Juvenile	0.44	0.23		7.8	103	26.4
080302BUDVJ14	7/29/2002	DV	144	28.25	mg/Kg	Juvenile	0.39	0.39		6.6	123	24.4
080302BUDVJ15	7/29/2002	DV	144	28.6	mg/Kg	Juvenile	0.29	0.35		8.1	117	24.5
080903BUDVJ01	8/9/2003	DV	108	12.3	mg/Kg	Juvenile	0.72	1.18		8.4	160	23.7
080903BUDVJ02	8/9/2003	DV	118	15.4	mg/Kg	Juvenile	0.5	1.44		6	130	25.9
080903BUDVJ03	8/9/2003	DV	122	18.5	mg/Kg	Juvenile	0.54	0.49		6.1	125	25.1
080903BUDVJ04	8/9/2003	DV	106	11.8	mg/Kg	Juvenile	0.77	0.44		6.8	138	25.4
080903BUDVJ05	8/9/2003	DV	134	20.7	mg/Kg	Juvenile	0.57	0.52		7.6	125	22.5
080903BUDVJ06	8/9/2003	DV	118	14	mg/Kg	Juvenile	0.39	1.37		7	130	24.6
080903BUDVJ07	8/9/2003	DV	120	15.1	mg/Kg	Juvenile	0.77	0.6		7.1	138	25.3
080903BUDVJ08	8/9/2003	DV	102	8.8	mg/Kg	Juvenile	1.75	0.58		6.7	165	26.1
080903BUDVJ09	8/9/2003	DV	102	8.8	mg/Kg	Juvenile	0.35	0.18		8.5	122	24.9
080903BUDVJ10	8/9/2003	DV	109	11.2	mg/Kg	Juvenile	0.42	0.41		6.9	118	24.9
080903BUDVJ11	8/9/2003	DV	104	9.9	mg/Kg	Juvenile	0.62	0.46		6.9	143	25
080903BUDVJ12	8/9/2003	DV	115	15	mg/Kg	Juvenile	0.43	0.17		7.1	130	26.3
080903BUDVJ13	8/9/2003	DV	90	5.4	mg/Kg	Juvenile	0.48	0.53		5	180	24.6
080903BUDVJ14	8/9/2003	DV	110	11	mg/Kg	Juvenile	1.12	0.59		6.6	154	26.8
080903BUDVJ15	8/9/2003	DV	102	9.7	mg/Kg	Juvenile	0.94	0.46		5.5	167	26.9

Appendix 4 – Metals Concentrations (continued)

Buddy Creek Downstream of Road and Falls, Whole Body Samples													
						Method	200.8	200.8		7471A	7740	200.8	
						analyte	Cadmium	Lead		Mercury	Selenium	Zinc	
Sample	Date	Fish	Length	Weight									
Number	Collected	Species	(mm)	(g)	Units	MRL	0.05/0.02	0.02		0.02	1	0.5	% Solids
082404BUDVJ01	8/24/2004	DV	130	18.7	mg/Kg	Juvenile	0.47	0.34		0.03	5.7	120	24.2
082404BUDVJ02	8/24/2004	DV	118	13.9	mg/Kg	Juvenile	0.6	0.31		0.04	6.3	129	22.1
082404BUDVJ03	8/24/2004	DV	107	10.1	mg/Kg	Juvenile	0.22	0.29		0.04	4.9	116	22.3
082404BUDVJ04	8/24/2004	DV	103	8.9	mg/Kg	Juvenile	0.26	0.19		0.04	3.9	172	23.3
082404BUDVJ05	8/24/2004	DV	124	16.1	mg/Kg	Juvenile	0.24	0.11		0.03	5.9	163	24.9
082404BUDVJ06	8/24/2004	DV	96	6.7	mg/Kg	Juvenile	0.35	0.17		0.04	3.7	111	22.2
082404BUDVJ07	8/24/2004	DV	116	14.7	mg/Kg	Juvenile	0.14	0.18		0.03	4.8	93.4	26
082404BUDVJ08	8/24/2004	DV	96	7.2	mg/Kg	Juvenile	0.1	0.06		0.05	2.6	92.6	21
082404BUDVJ09	8/24/2004	DV	101	10.1	mg/Kg	Juvenile	0.26	4.52		0.04	4.2	122	22.5
082404BUDVJ10	8/24/2004	DV	116	14.7	mg/Kg	Juvenile	0.17	0.12		0.02	5.8	110	23.8
082404BUDVJ11	8/24/2004	DV	100	9.3	mg/Kg	Juvenile	0.22	0.11		0.04	4.5	116	22.1
082404BUDVJ12	8/24/2004	DV	120	15.5	mg/Kg	Juvenile	0.24	0.14		0.03	6.3	129	23.6
082404BUDVJ13	8/24/2004	DV	108	11.7	mg/Kg	Juvenile	0.28	0.1		0.03	5.2	204	22
082404BUDVJ14	8/24/2004	DV	140	25.4	mg/Kg	Juvenile	0.36	0.11		0.03	5.8	128	25.6
082404BUDVJ15	8/24/2004	DV	135	21.1	mg/Kg	Juvenile	0.47	0.1		0.02	7.2	123	23.9
072905BUDV01	7/29/2005	DV	104	10.91	mg/Kg	Juvenile	1.53	0.18		0.03	8	149	24.4
072905BUDV02	7/29/2005	DV	106	12	mg/Kg	Juvenile	0.5	0.1		0.02	6.9	134	24.3
072905BUDV03	7/29/2005	DV	115	14.17	mg/Kg	Juvenile	1.37	0.16		0.03	6.8	132	24
072905BUDV04	7/29/2005	DV	102	9.86	mg/Kg	Juvenile	0.6	0.1		0.03	7.4	141	25.9
072905BUDV05	7/29/2005	DV	110	11.92	mg/Kg	Juvenile	0.41	0.15		0.02	5.6	114	24.4
072905BUDV06	7/29/2005	DV	134	18.55	mg/Kg	Juvenile	0.2	0.1		0.03	7	131	24.4
072905BUDV07	7/29/2005	DV	105	10.61	mg/Kg	Juvenile	0.58	0.09		0.02	6.4	145	23
072905BUDV08	7/29/2005	DV	120	16.02	mg/Kg	Juvenile	0.26	0.1		0.02	5.7	110	25
072905BUDV09	7/29/2005	DV	102	10.07	mg/Kg	Juvenile	0.87	0.17		0.03	7.1	137	23.1
072905BUDV10	7/29/2005	DV	101	9.7	mg/Kg	Juvenile	1.23	0.13		0.04	5.9	159	22.9
072905BUDV11	7/29/2005	DV	125	17.42	mg/Kg	Juvenile	0.58	0.28		0.04	5.9	106	25.8
072905BUDV12	7/29/2005	DV	114	12.1	mg/Kg	Juvenile	0.61	0.14		0.03	7.4	144	21.1
072905BUDV13	7/29/2005	DV	105	9.44	mg/Kg	Juvenile	0.77	0.19	<	0.02	5.8	135	21
072905BUDV14	7/29/2005	DV	103	9.02	mg/Kg	Juvenile	0.45	0.14		0.02	5.6	131	22.6
072905BUDV15	7/29/2005	DV	105	11.2	mg/Kg	Juvenile	0.62	0.13		0.03	7.2	123	24.6

Appendix 4 – Metals Concentrations (concluded)

Bons Pond, Whole Body Samples														
							Method	200.8	200.8		7471A	7740	200.8	
							analyte	Cadmium	Lead		Mercury	Selenium	Zinc	
Sample		Date	Fish	Length	Weight									
Number	Location	Collected	Species	(mm)	(g)	Units	MRL	0.02	0.02		0.02	1	0.5	% Solids
082104BPAGJ01	Bons Pond	8/21/2004	AGR	190	76.2	mg/Kg	Juvenile	0.19	0.26		0.02	6.6	65.5	26.8
082104BPAGJ02	Bons Pond	8/21/2004	AGR	173	53.5	mg/Kg	Juvenile	0.29	0.46		0.02	7.4	61.9	27.8
082204BPAGJ03	Bons Pond	8/22/2004	AGR	167	48.8	mg/Kg	Juvenile	0.21	0.47		0.02	11.9	68.1	26
082204BPAGJ04	Bons Pond	8/22/2004	AGR	163	47.2	mg/Kg	Juvenile	0.43	0.22		0.03	8.7	76.4	26.4
082204BPAGJ05	Bons Pond	8/22/2004	AGR	186	72.3	mg/Kg	Juvenile	0.18	0.24		0.02	14.3	65.3	27.5
082204BPAGJ06	Bons Pond	8/22/2004	AGR	172	56.1	mg/Kg	Juvenile	0.15	0.65		0.02	13.6	66.2	26.6
082204BPAGJ07	Bons Pond	8/22/2004	AGR	177	62.3	mg/Kg	Juvenile	0.26	0.19		0.02	11.9	61.9	26.8
082204BPAGJ08	Bons Pond	8/22/2004	AGR	181	64.2	mg/Kg	Juvenile	0.1	0.2		0.03	13.8	69	26.5
082204BPAGJ09	Bons Pond	8/22/2004	AGR	176	60.1	mg/Kg	Juvenile	0.35	1.58		0.02	14.4	84.2	26
082204BPAGJ10	Bons Pond	8/22/2004	AGR	186	72.2	mg/Kg	Juvenile	0.32	0.39		0.02	12.3	67.1	26.3
082204BPAGJ11	Bons Pond	8/22/2004	AGR	170	55.4	mg/Kg	Juvenile	0.22	0.1		0.02	12.5	65.2	26.9
082204BPAGJ12	Bons Pond	8/22/2004	AGR	184	64.6	mg/Kg	Juvenile	0.25	0.21	<	0.02	12.7	64.7	26.7
082204BPAGJ13	Bons Pond	8/22/2004	AGR	185	61.3	mg/Kg	Juvenile	0.26	0.26		0.02	9	62.7	26.4
082204BPAGJ14	Bons Pond	8/22/2004	AGR	178	58.1	mg/Kg	Juvenile	0.32	0.25		0.02	8.8	66.9	27.8
082204BPAGJ15	Bons Pond	8/22/2004	AGR	180	63.8	mg/Kg	Juvenile	0.21	0.7		0.02	13.5	69.1	26.8