

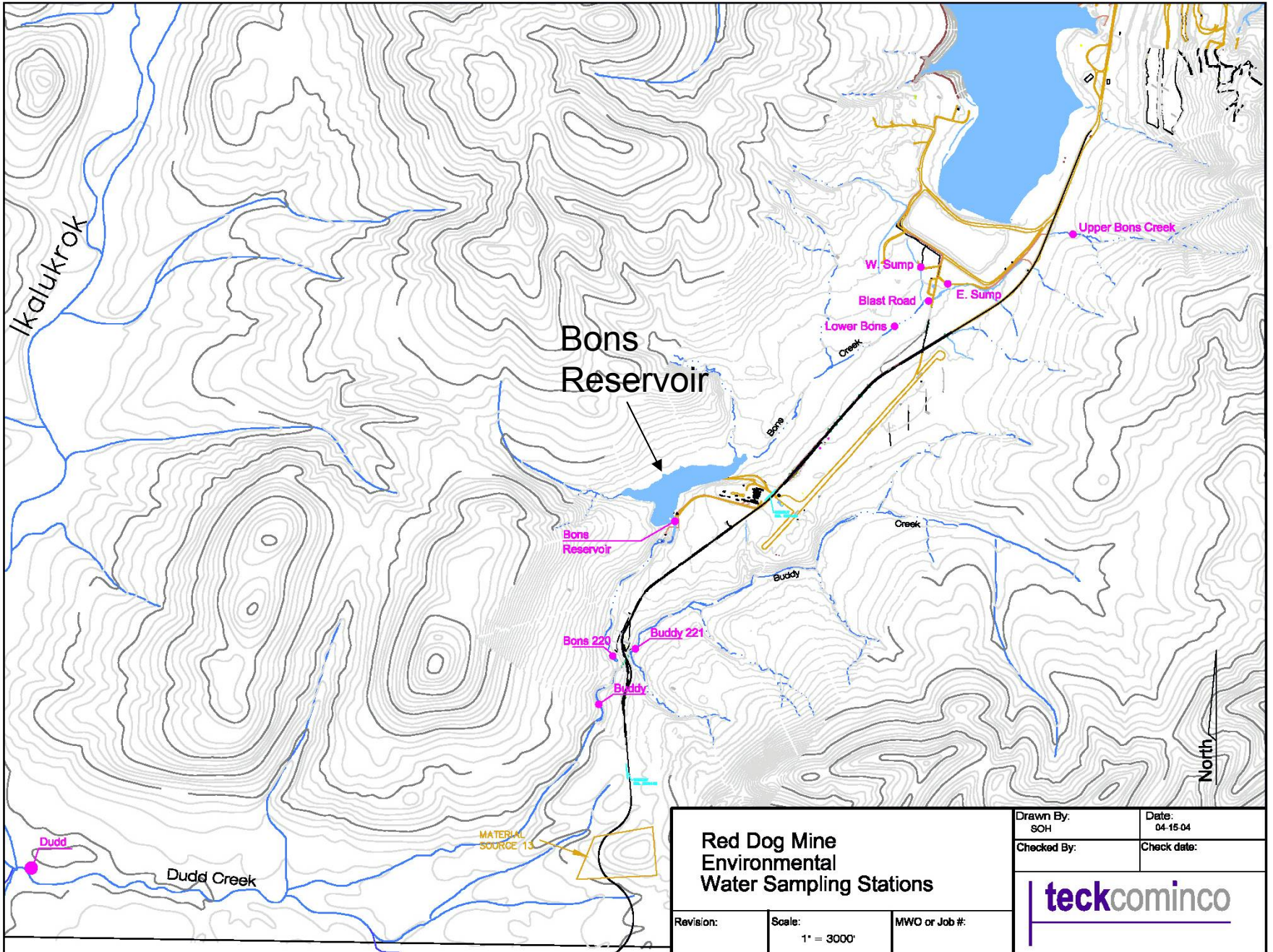
Aquatic Biomonitoring in Bons Pond, and Bons and Buddy Creeks, 2004 to 2006


Presented by:
Bill Morris

AK. Dept. of Natural Resources
Office of Habitat Management and Permitting

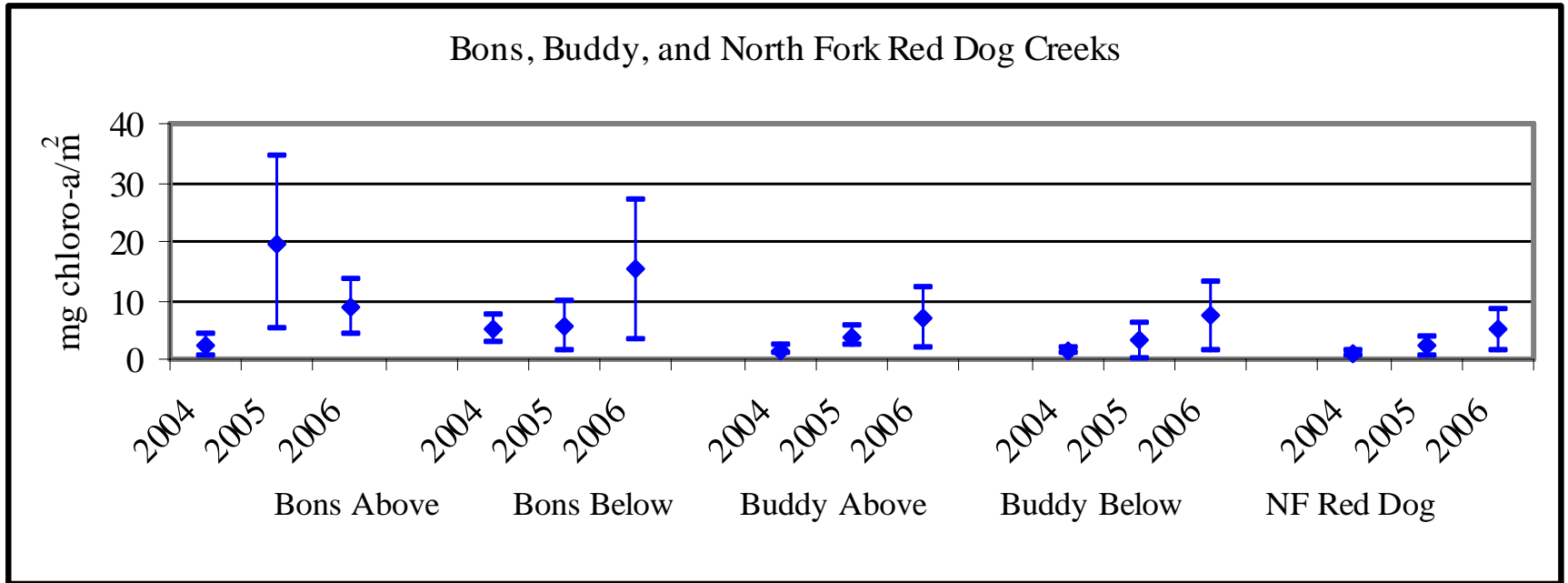
Introduction

- **Baseline Data Collection- Back Dam**
 - 2004 through 2006 (2007)
 - **Periphyton**
 - **Invertebrates**
 - **Fish**
 - **Monitor Arctic grayling population**
 - Heavy metals analysis in 2004 (fish also collected '07)
 - **Dolly Varden, sampled all years (Buddy Creek)**
 - Heavy metals analysis in all years
 - **Water Quality**
 - **Collected by TCAK – same or proximate sites**



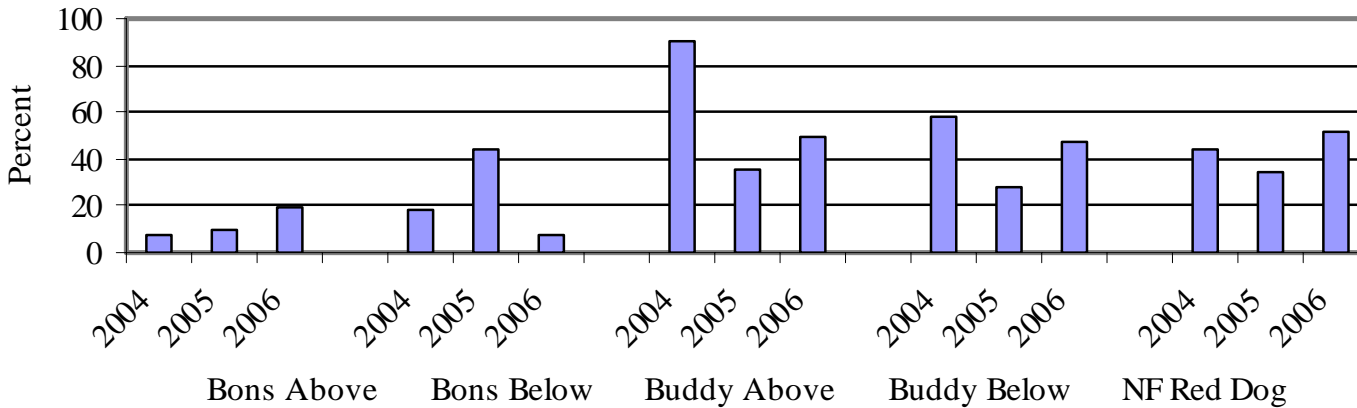
Red Dog Mine Environmental Water Sampling Stations			Drawn By: SOH	Date: 04-15-04
			Checked By:	Check date:
Revision:	Scale: 1" = 3000'	MWO or Job #:		

Periphyton Sampling

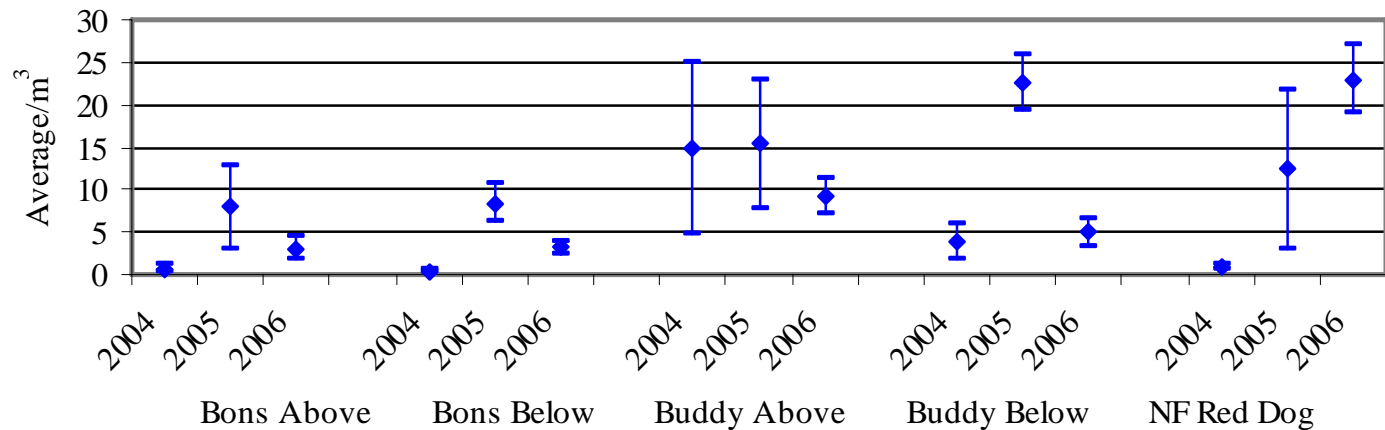


Aquatic Invertebrates

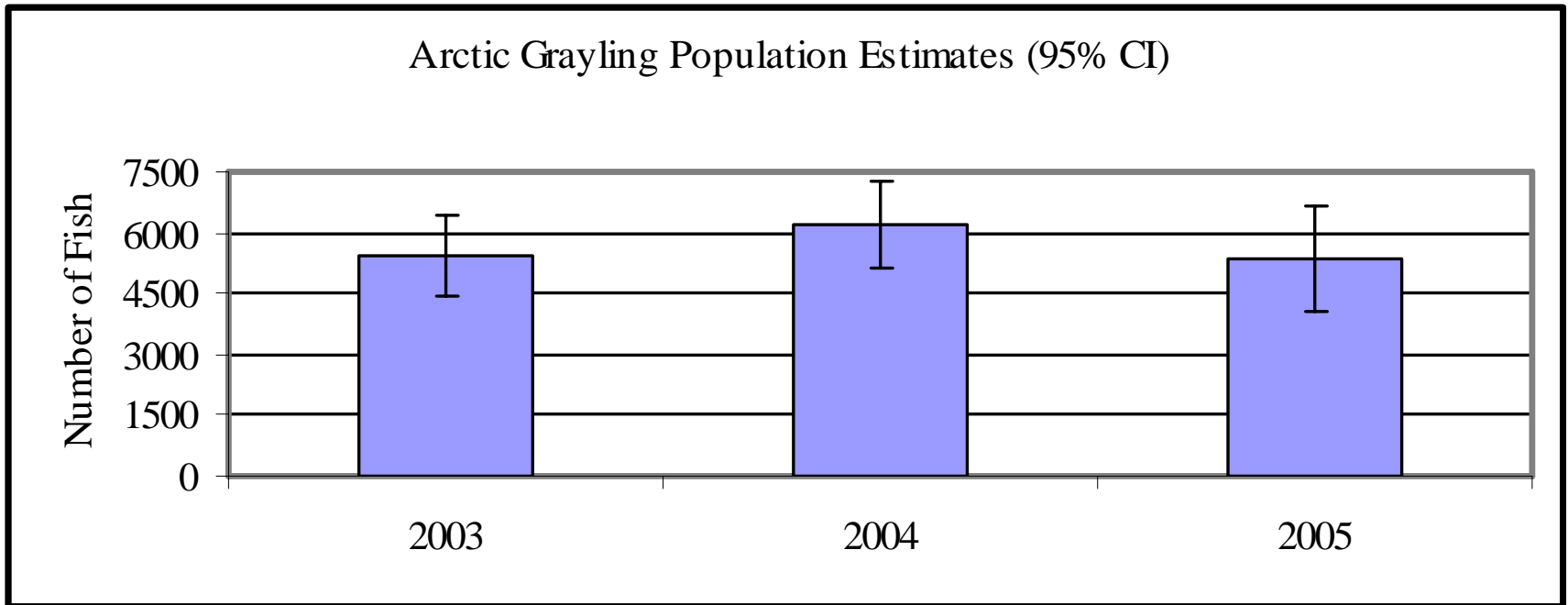
Proportion (%) of EPT in Aquatic Sample



Density, Aquatic Invertebrates



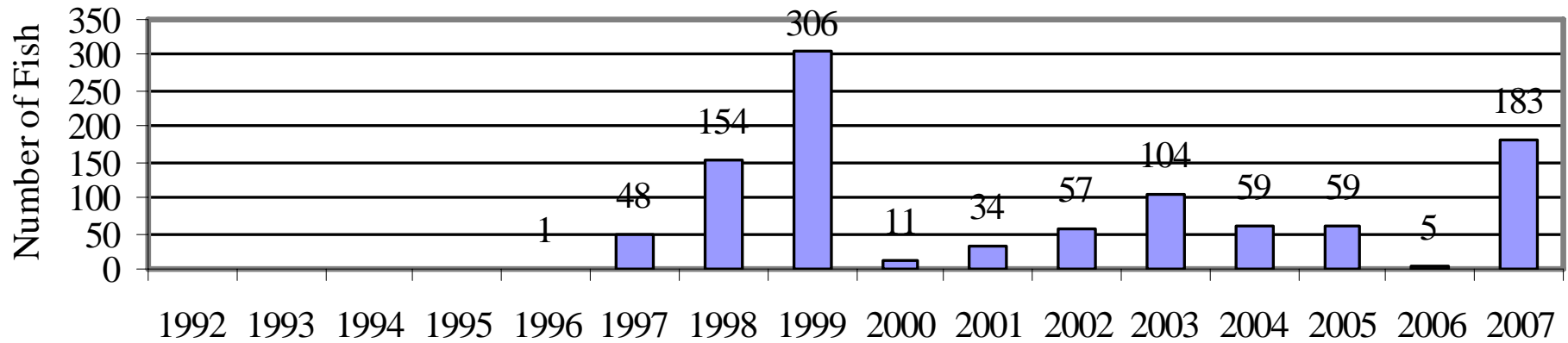
Arctic Grayling Bons Pond



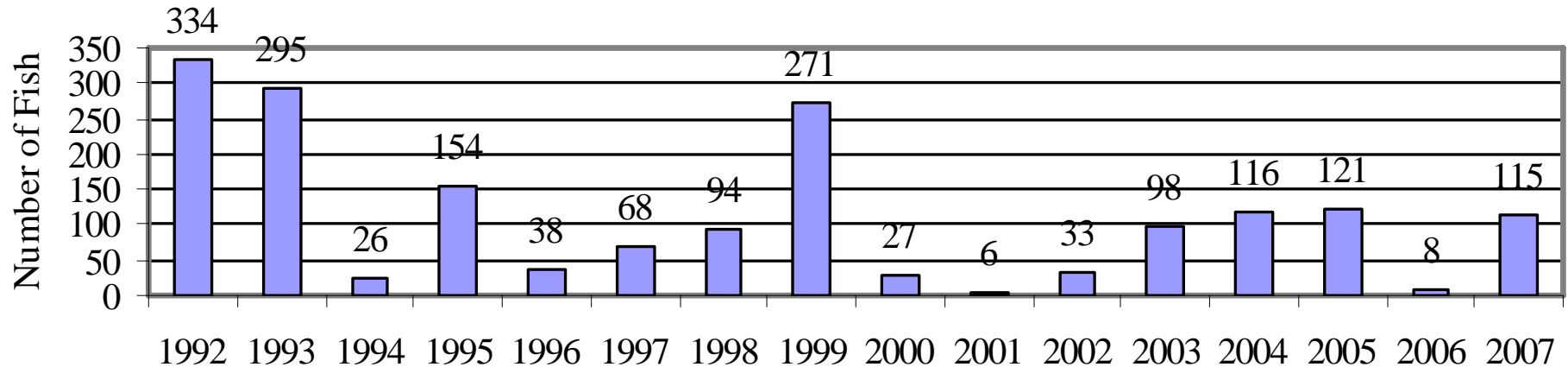
2006 Estimate \approx 4,250 (95% CI = 947) fish

Dolly Varden Buddy Creek

Juvenile Dolly Varden, Buddy Creek



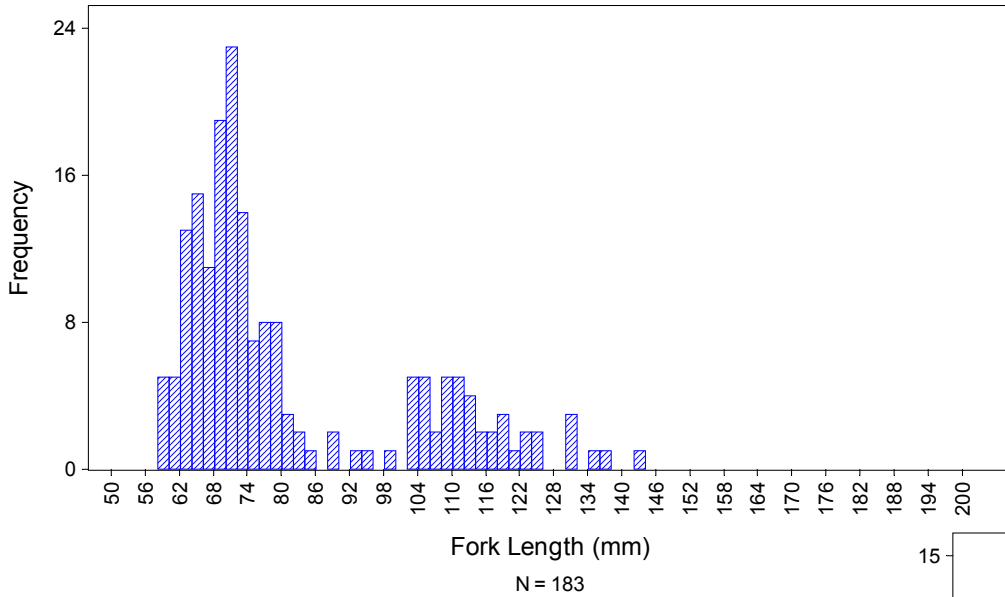
Juvenile Dolly Varden, Anxiety Ridge Creek



Dolly Varden Buddy Creek

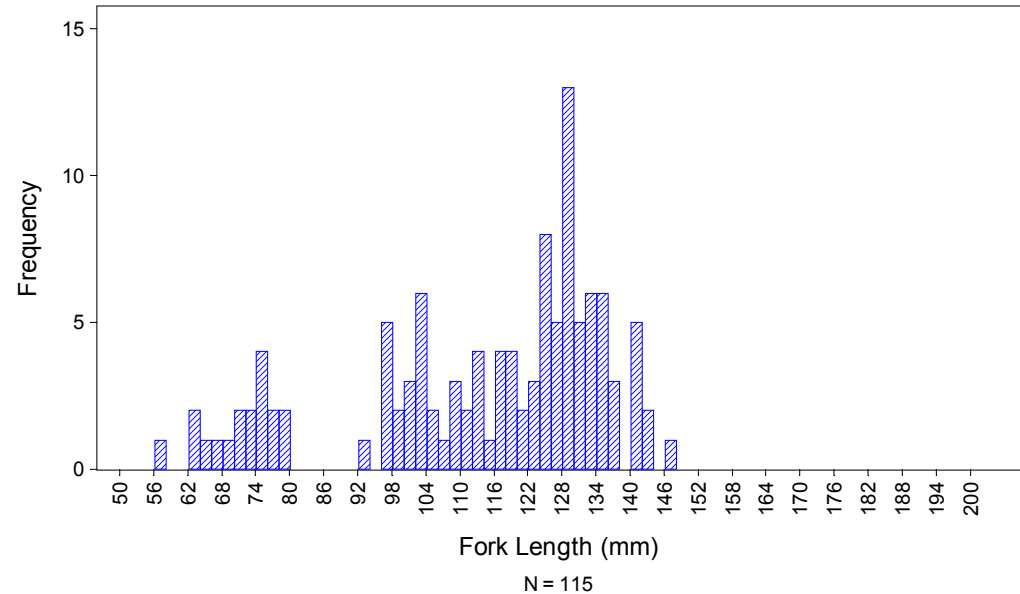
Dolly Varden, Buddy Creek

August 2007



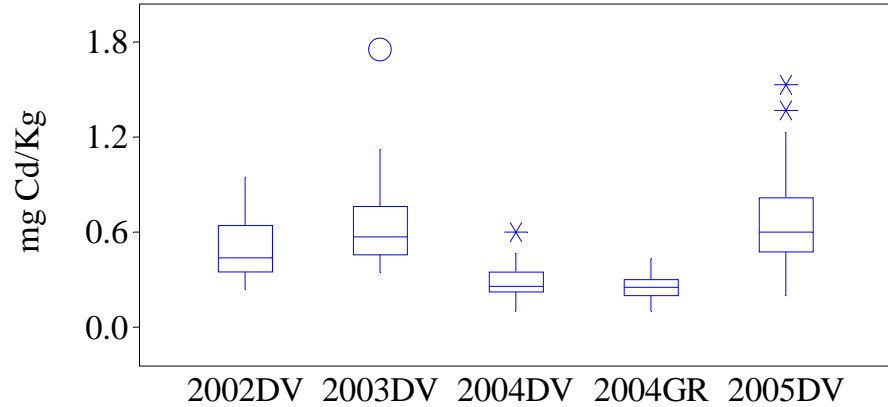
Dolly Varden, Anxiety Ridge Creek

August 2007

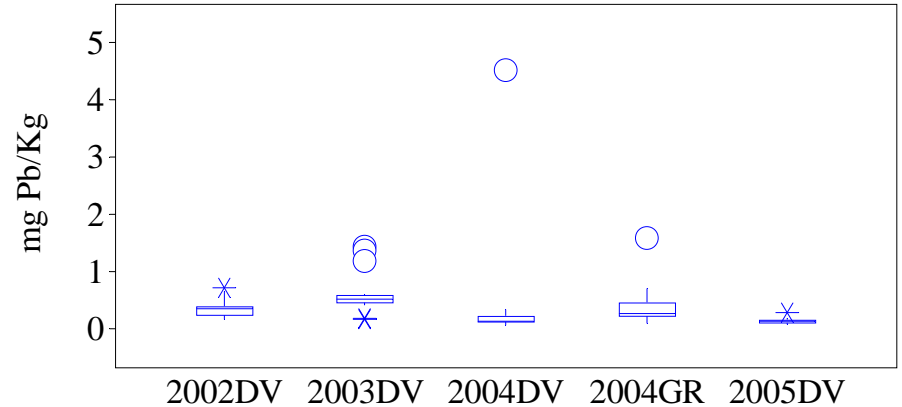


Fish – Heavy Metals Analyses

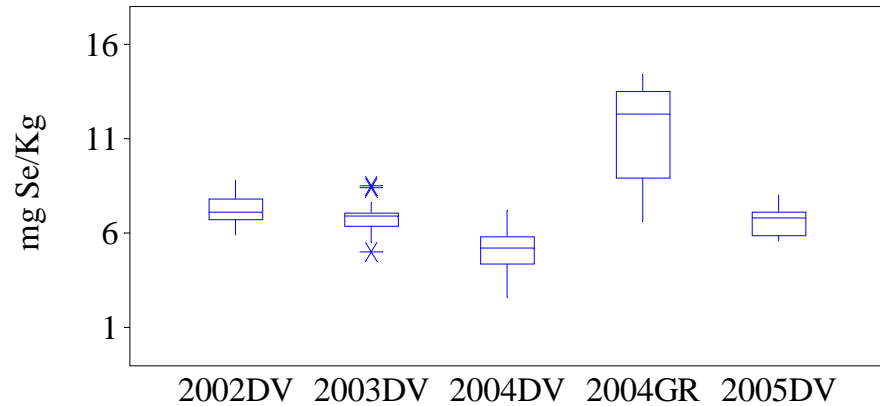
Dolly Varden and Arctic Grayling
Cadmium (n=15)



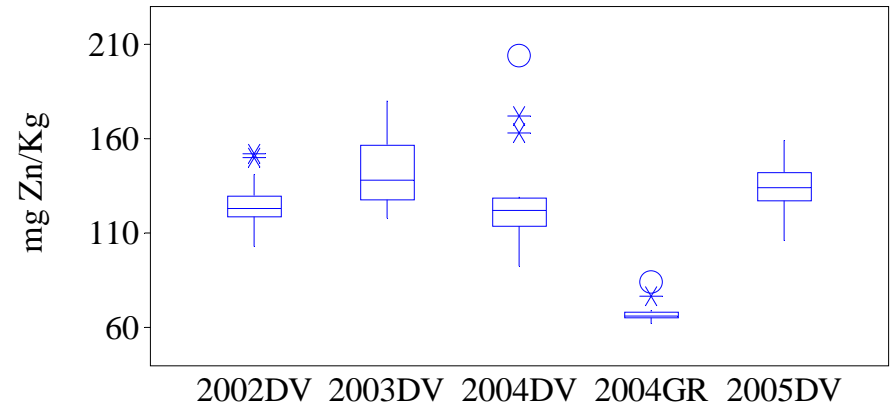
Dolly Varden and Arctic Grayling
Lead (n=15)



Dolly Varden and Arctic Grayling
Selenium (n=15)

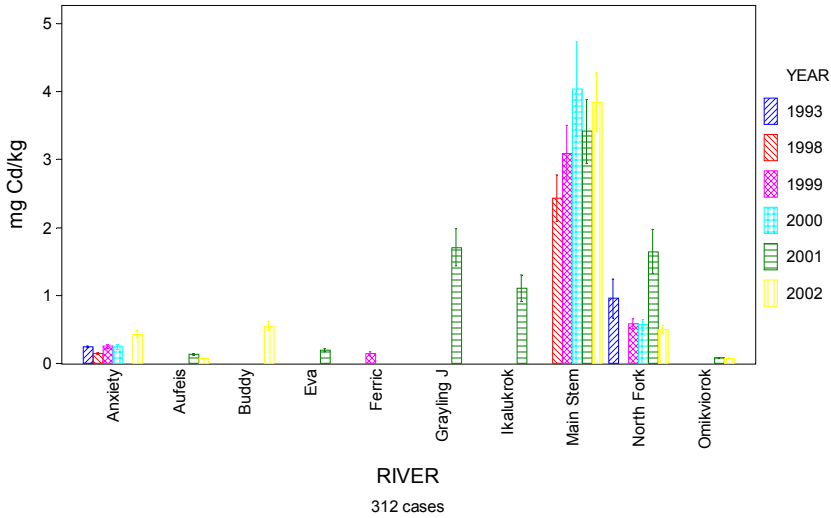


Dolly Varden and Arctic Grayling
Zinc (n=15)

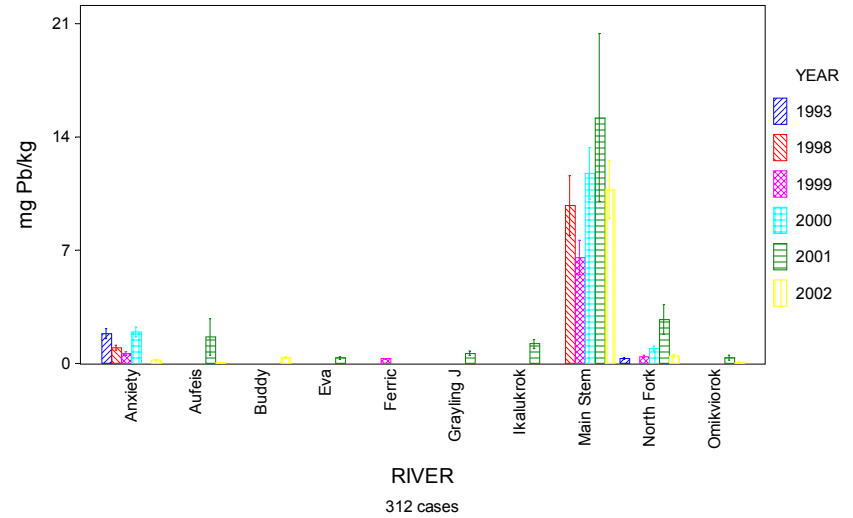


Quick Heavy Metals Area Wide Comparison

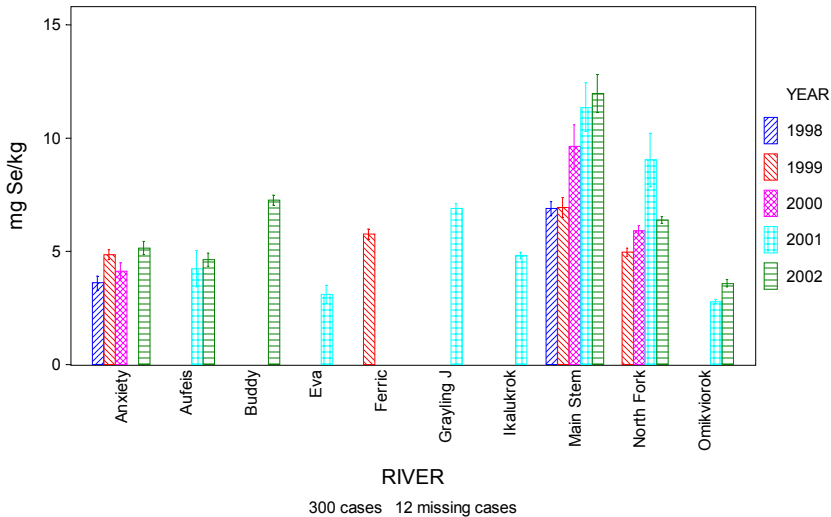
Error Bar Chart with SE



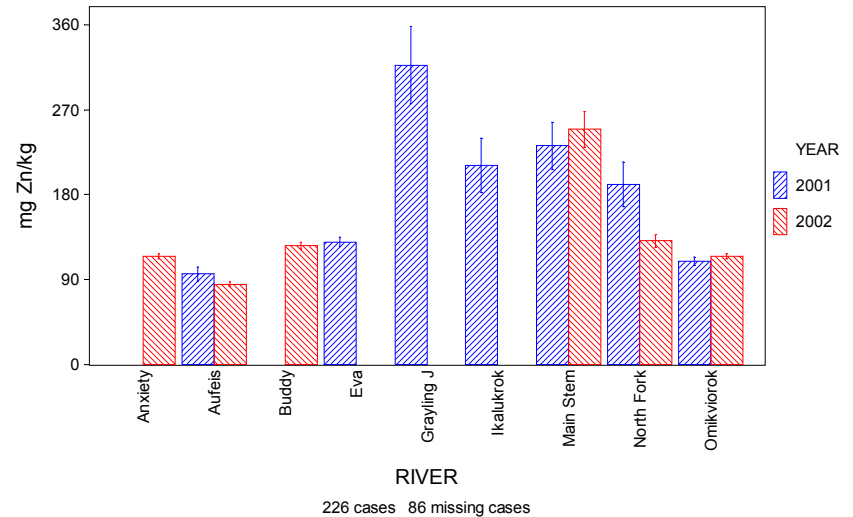
Error Bar Chart with SE



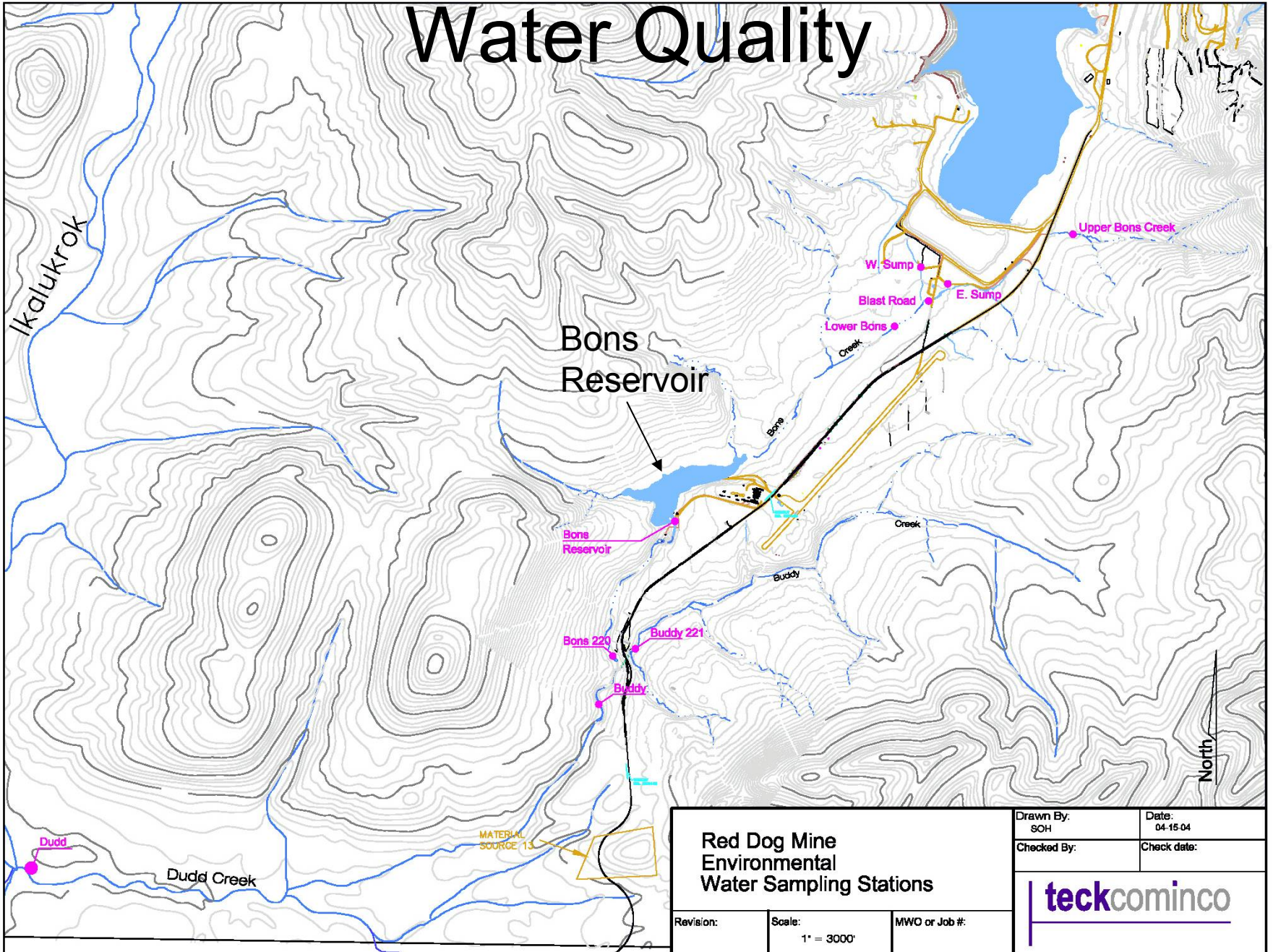
Error Bar Chart with SE



Error Bar Chart with SE

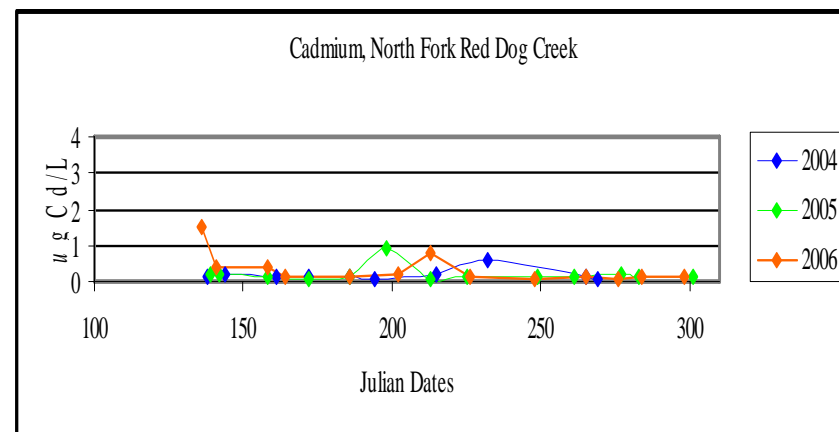
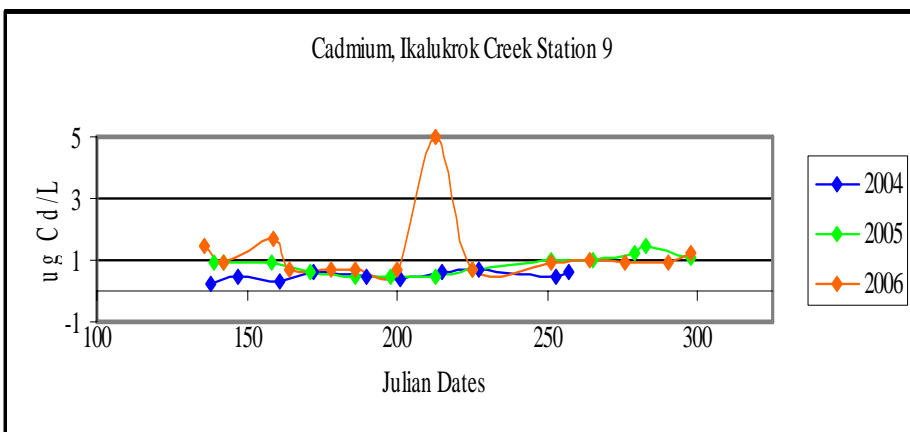
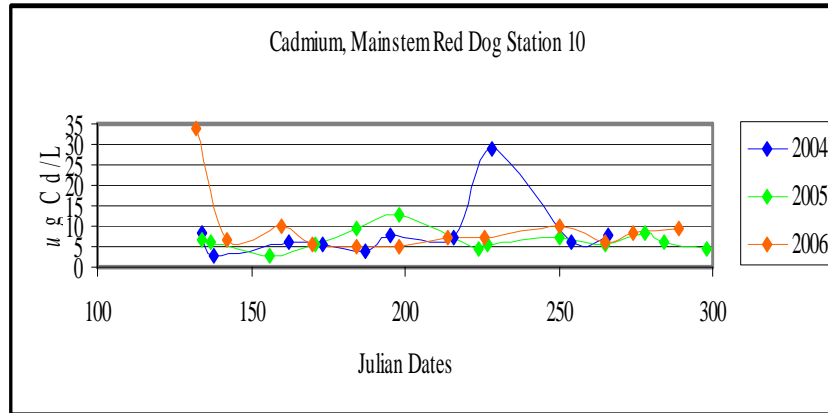
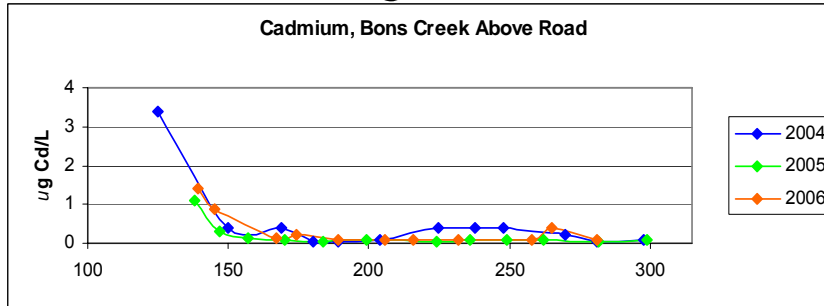


Water Quality

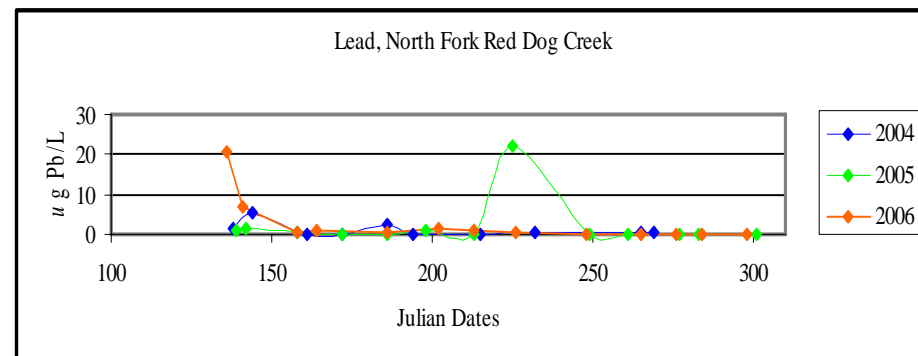
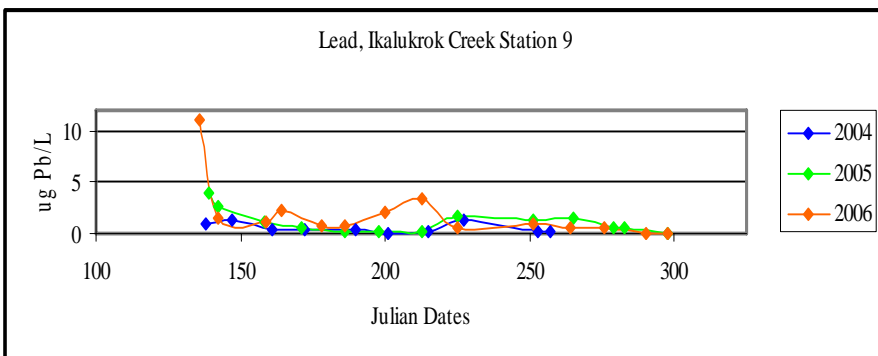
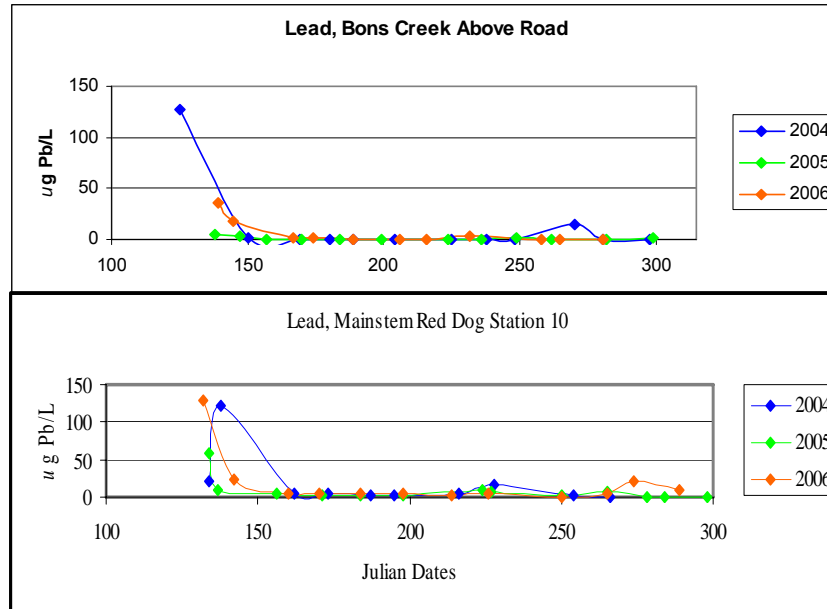


Red Dog Mine Environmental Water Sampling Stations		Drawn By: SOH	Date: 04-15-04
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Water Quality - Cadmium



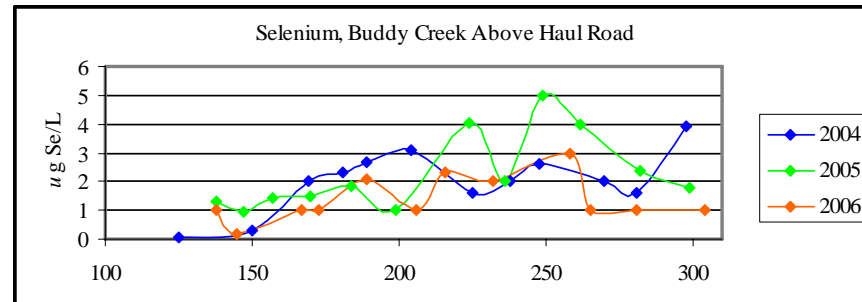
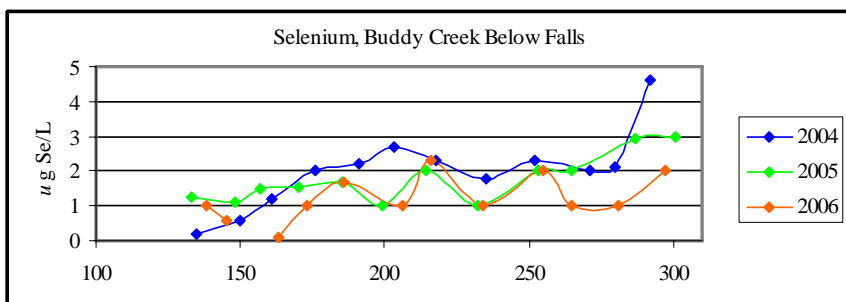
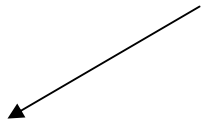
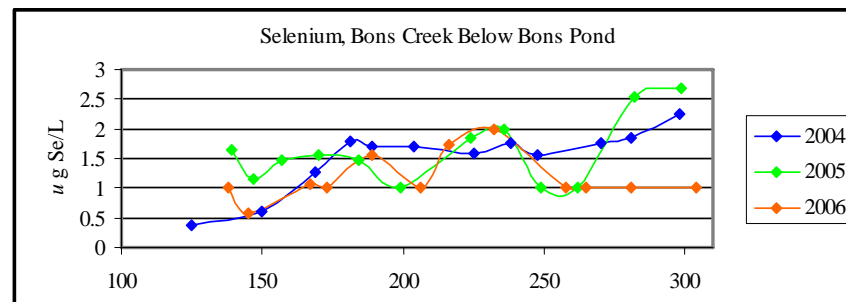
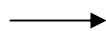
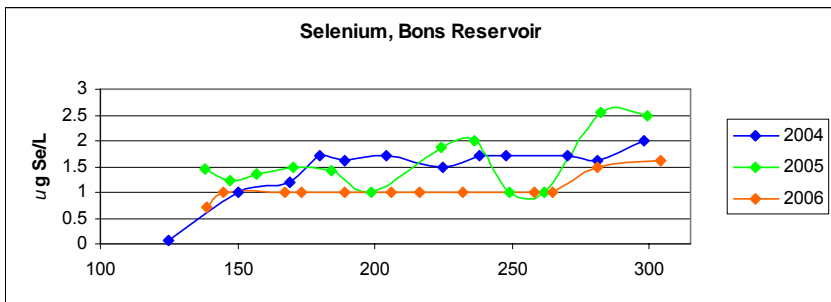
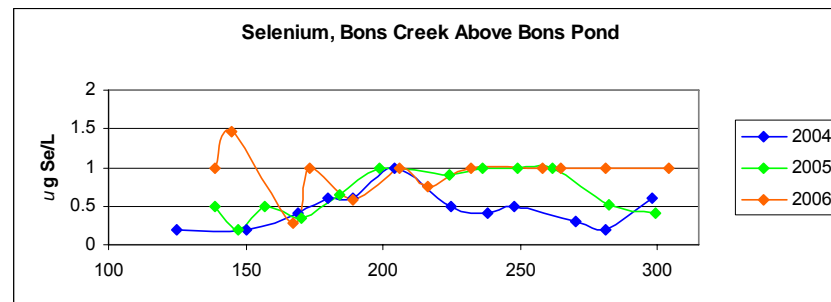
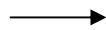
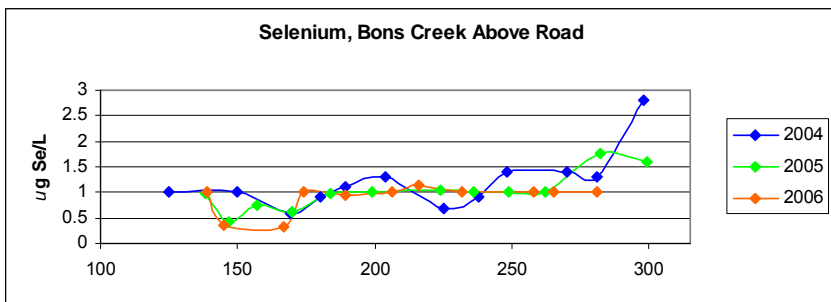
Water Quality - Lead



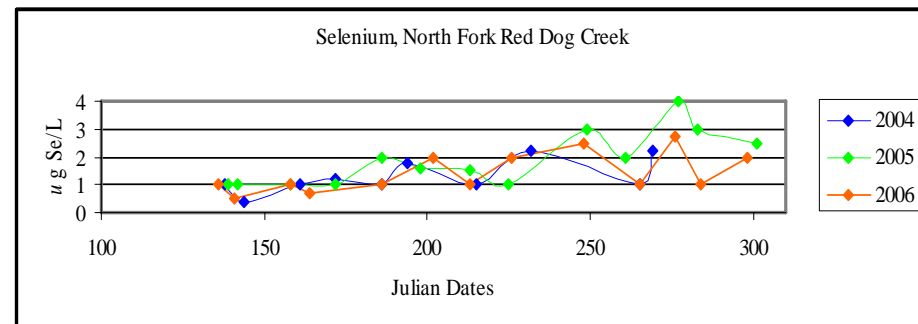
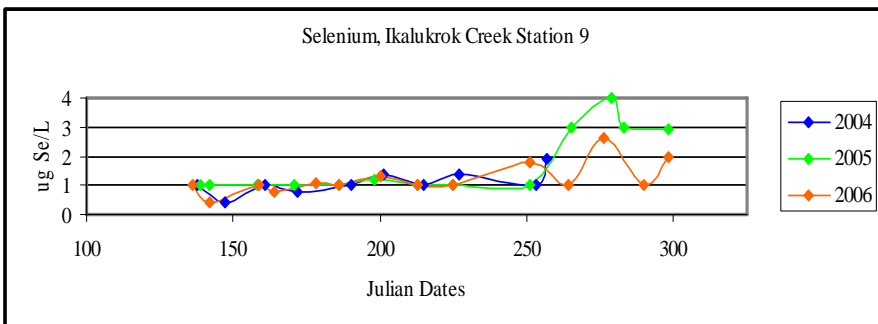
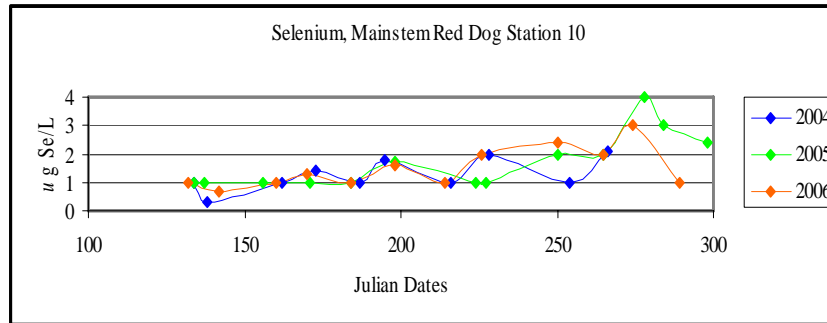
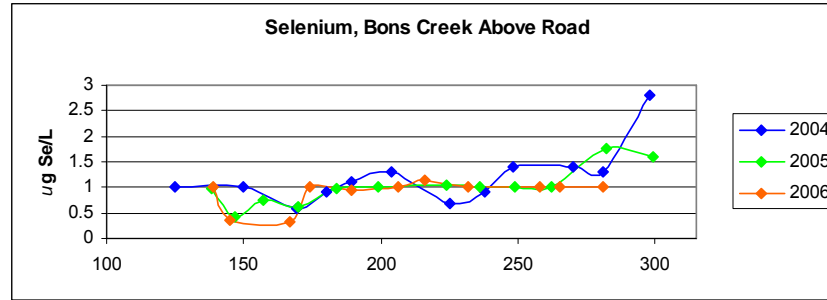
Upstream most



Water Quality - Selenium

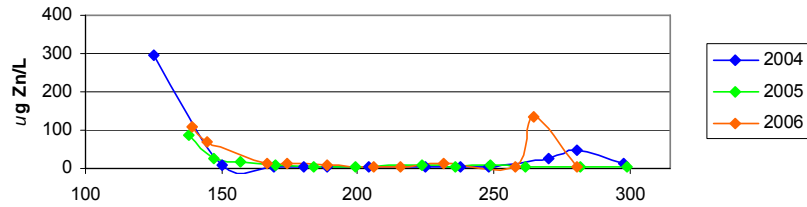


Water Quality - Selenium

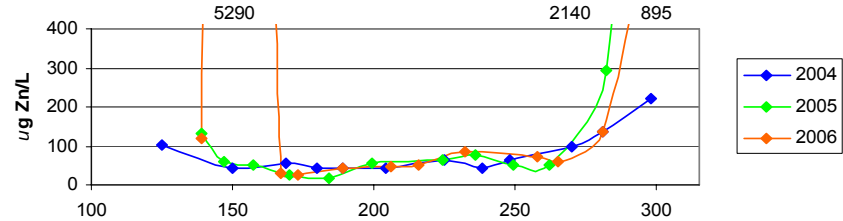


Water Quality - Zinc

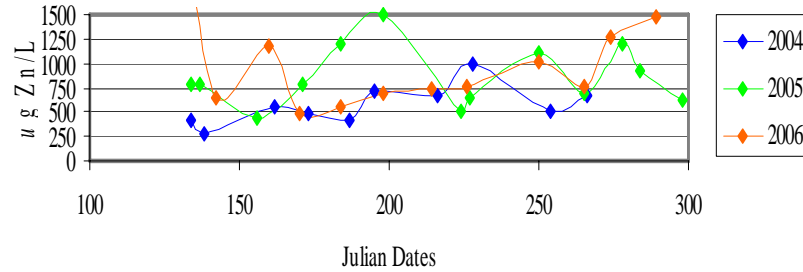
Zinc, Bons Creek Above Road



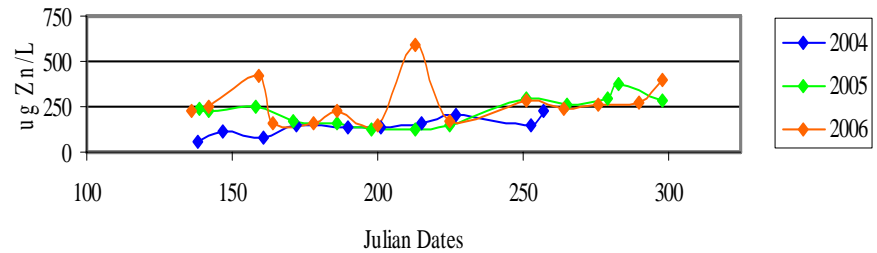
Zinc, Bons Creek Above Bons Pond



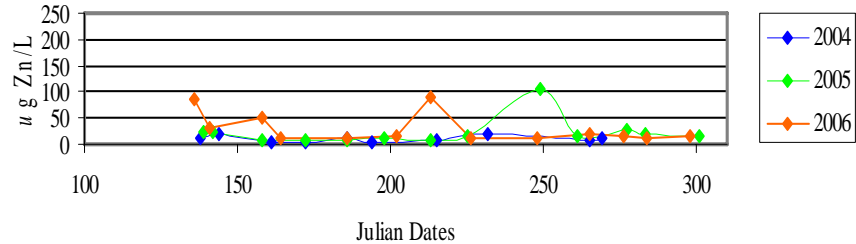
Zinc, Mainstem Red Dog Station 10



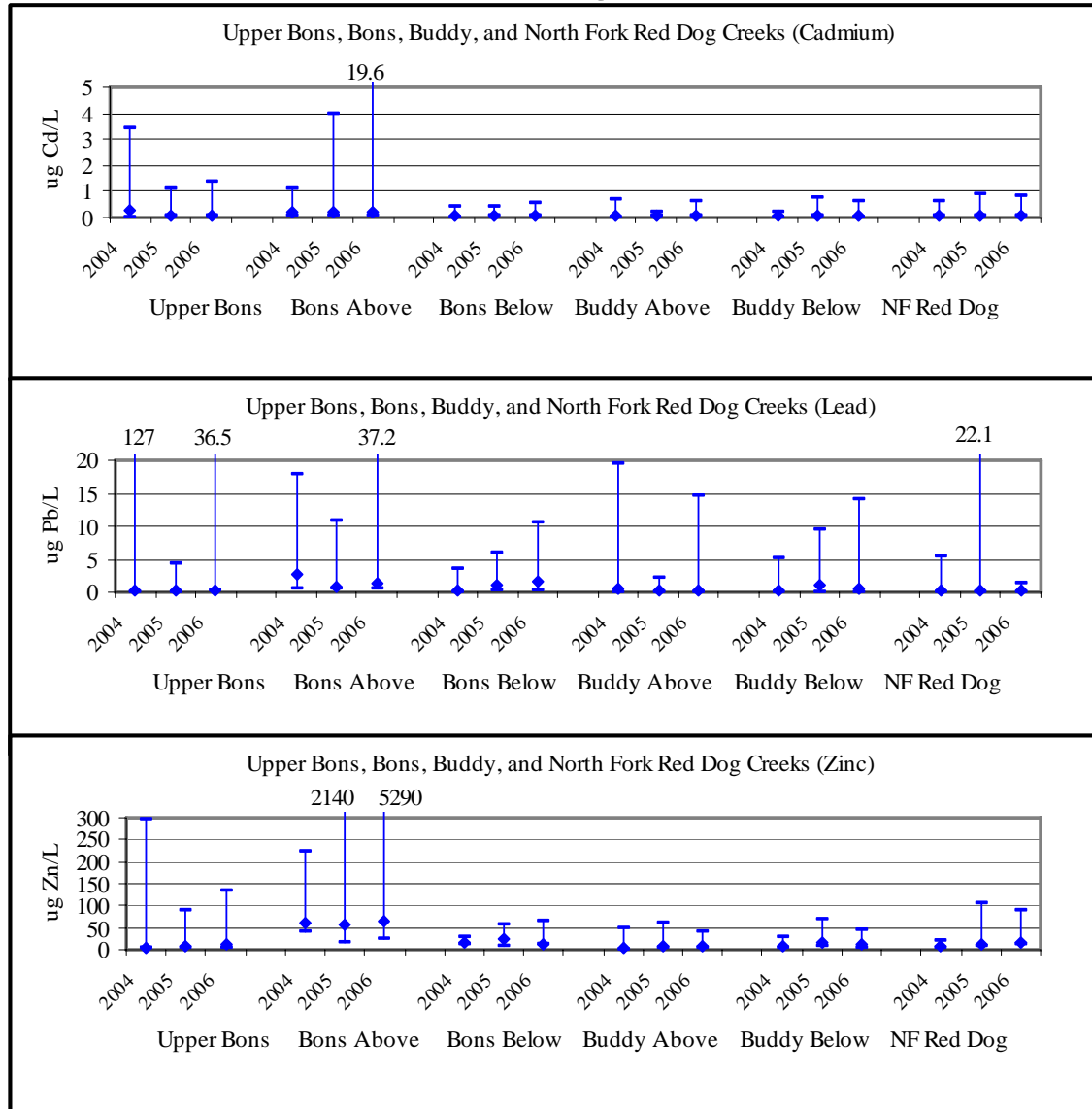
Zinc, Ikalukrok Creek Station 9



Zinc, North Fork Red Dog Creek

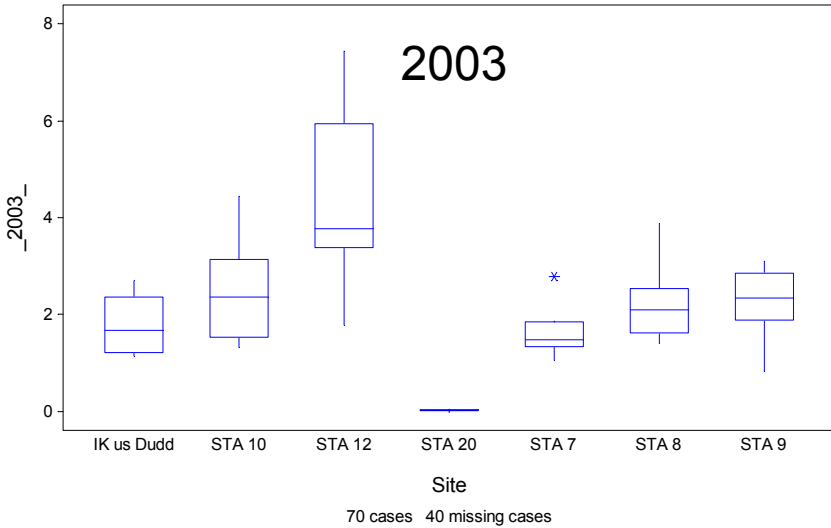


Water Quality Summary

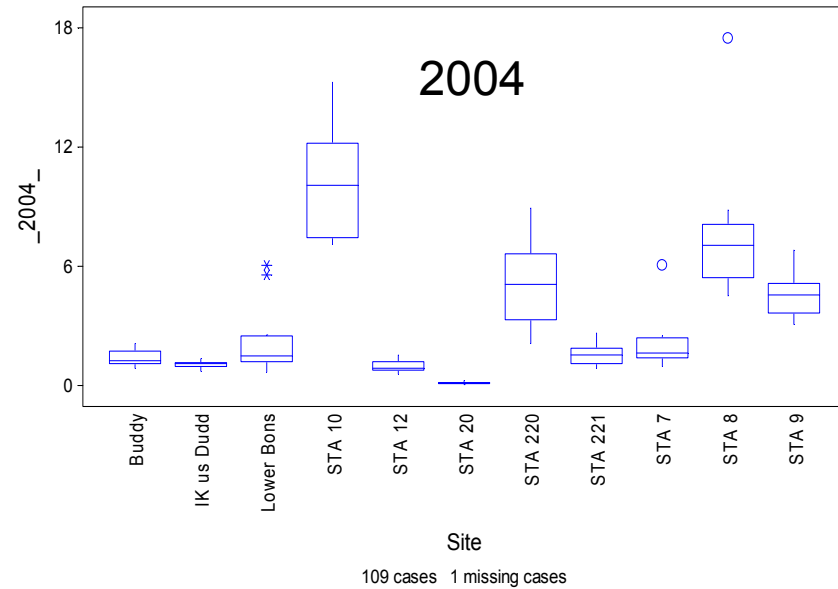


Summary

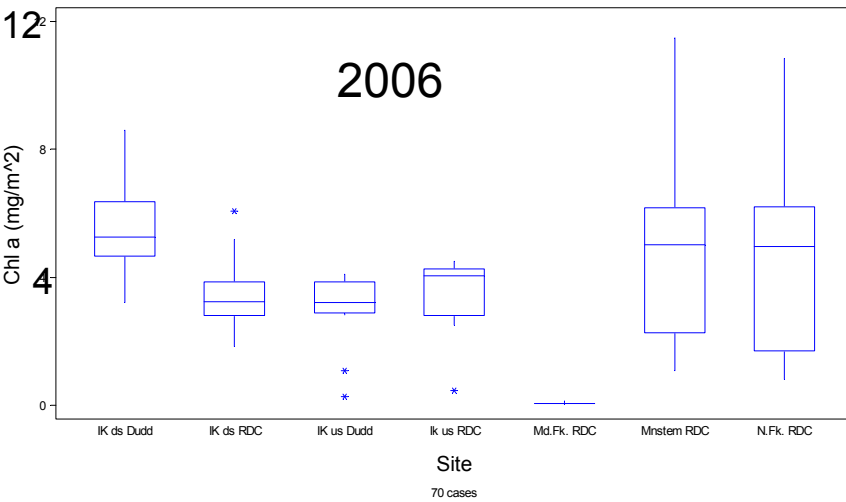
Box and Whisker Plot



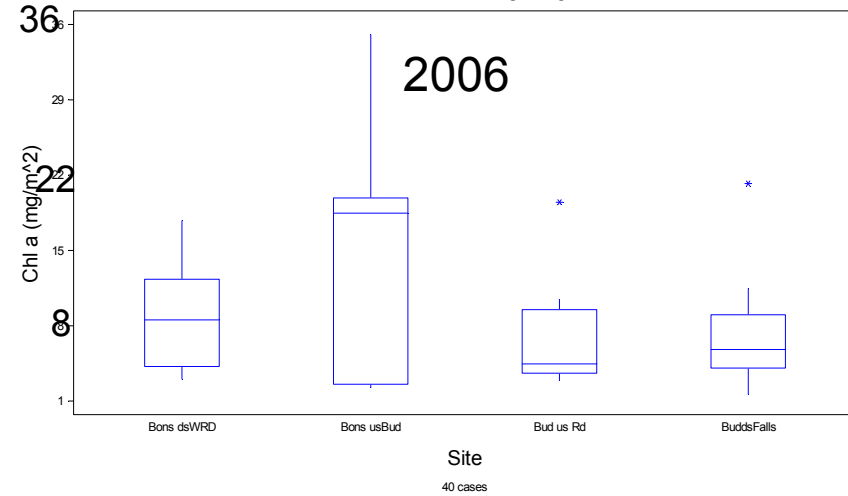
Box and Whisker Plot



Box and Whisker Plot
NPDES Sites, August 2006



Box and Whisker Plot
Bons Creek Biomonitoring, August 2006



Conclusions

- Peaks in metals observed during break-up
 - Peaks more obvious in Bons Creek sites
 - Magnitude of peaks generally low
- Timing of peaks suggests dust related deposition?
- Zinc data suggests possible issue with bypass/collection system
- Metals concentrations not at levels causing observable changes in fish or aquatic organisms