

# CANADA – BRITISH COLUMBIA

## WATER QUALITY MONITORING AGREEMENT

### WATER QUALITY ASSESSMENT OF KOOTENAY RIVER AT CRESTON (1979 – 2005)



Prepared by:  
L. G. Swain, P. Eng.  
B.C. Ministry of Environment

Prepared for:  
B.C. Ministry of Environment  
and  
Environment Canada

May 2007



Environment Environnement  
Canada Canada



Ministry of  
Environment

## **EXECUTIVE SUMMARY**

The Kootenay River is a transboundary river that flows south from B.C. into Kooconusa Lake, which is the reservoir of the Libby Dam in Montana. After leaving the dam, the river swings northward through Montana and Idaho, re-entering B.C. south from Creston. Just north from Creston, the river enters Kootenay Lake, forming the main inflow to the southern arm of the lake. The Kootenay River near Creston has a drainage area of 36,700 km<sup>2</sup> and is used for irrigation and waterfowl conservation, while Kootenay Lake is an important fishery and recreation area.

The watershed upstream from Creston has been influenced to varying degrees over the years by the following human activities: a hydroelectric development at the Libby Dam, a kraft pulp mill at Skookumchuck, a mine, concentrator and fertilizer complex at Kimberley, coal mines in the Elk River basin, treated sewage discharges, agriculture, and forestry.

## **CONCLUSIONS**

- In an earlier assessment of the data (to 1997), it was determined that there was a subtle trend of decreasing total phosphorus concentrations. This was not deemed a positive thing since fisheries production was declining downstream in Kootenay Lake. From our analysis of data up to the end of 2005, it would appear that this apparent trend no longer exists and the total phosphorus concentrations are stable.
- On the other hand, selenium concentrations in the river at Creston appear to be increasing significantly. No such trend can be observed upstream at Fenwick Station, and it has been documented that the human coal mining operations on the Elk River have increased significantly. Although values in the Kootenay River at Creston are not as high as in the Elk River, concentrations are certainly getting closer to guideline values that indicate possible concern for aquatic life.
- Dissolved sodium concentrations may also be showing an increase through time. A similar trend that is not as strong is also apparent at the Fenwick station.

- All of the apparent trends noted above: stable phosphorus concentrations and increasing selenium and sodium concentrations, need to be confirmed by a statistician.
- Temperature generally exceeds guidelines during warmer summer months.
- Turbidity values generally exceed the guideline for the protection of source water used for drinking, meaning that if suspended solids removal is not used, disinfection of water supplies could be compromised.
- Otherwise, water quality was generally good with only occasional values exceeding guidelines for pH, fecal coliforms, several metals, dissolved organic carbon, and true colour. In cases where total metal concentrations exceeded guideline values, the event generally correlated with higher turbidity concentrations, meaning that the metals were likely in particulate form and not biologically available

## **RECOMMENDATIONS**

We recommend monitoring be continued for the Kootenay River at Creston since it is a trans-boundary site and selenium and sodium seem to be increasing.

Water quality indicators that are important for future monitoring are:

- flow, water temperature, specific conductivity, pH, turbidity, nutrients, and dissolved oxygen,
- phosphorus, sodium and selenium,
- appropriate forms of metals for comparison to their respective guidelines, and
- other variables related to drinking water such as colour.

**ACKNOWLEDGEMENTS**

The graphs in this report were prepared by Sacha Wassick of Environment Canada. The draft report was reviewed by Alison Stent of BC Environment and Andrea Ryan of Environment Canada. We thank these individuals for their contributions to improving this document. Any errors or omissions are the responsibility of the author.

## TABLE OF CONTENTS

	Page
Executive Summary .....	i
Conclusions.....	i
Recommendations.....	ii
Acknowledgements.....	ii
Table of Contents.....	iv
List of Figures.....	iv
Introduction.....	1
Water Quality Assessment.....	2
References.....	8

## LIST OF FIGURES

	Page
Figure 1. Kootenay River at Creston .....	2
Figure 2. Water Survey of Canada Flow Data for Kootenay River at Creston .....	4
Figure 3. Alkalinity - Total .....	17
Figure 4. Aluminum – Total .....	17
Figure 5. Ammonia - Dissolved.....	18
Figure 6. Antimony – Total .....	18
Figure 7. Arsenic – Total and Extractable .....	19
Figure 8. Barium – Total.....	19
Figure 9. Beryllium – Total (1990-2005) .....	20
Figure 9 (A). Beryllium – Total (2003-2005).....	20
Figure 10. Bismuth - Total.....	21
Figure 11. Bromide - Dissolved.....	21
Figure 12. Cadmium – Total and Extractable (1981-2005).....	22
Figure 13. Cadmium – Total (1987-2005).....	22

**LIST OF FIGURES**  
**(CONTINUED)**

	Page
Figure 14. Cadmium – Total (2003-2005).....	23
Figure 15. Calcium, Dissolved and Extractable.....	23
Figure 16. Carbon – Dissolved Inorganic and Organic .....	24
Figure 17. Carbon, Dissolved Inorganic .....	24
Figure 18. Carbon, Dissolved Organic .....	25
Figure 19. Chloride, Dissolved .....	25
Figure 20. Chromium – Total (1987 – 2005).....	26
Figure 21. Chromium – Total (1997 – 2005).....	26
Figure 22. Cobalt - Total.....	27
Figure 23., Fecal Coliforms .....	27
Figure 24. Apparent Colour .....	28
Figure 25. True Colour .....	28
Figure 26. Copper – Total and Extractable (1981-2005).....	29
Figure 27. Copper – Total and Extractable (1991-2005).....	29
Figure 28. Fluoride – Dissolved and Total .....	30
Figure 29. Gallium - Total .....	30
Figure 30. Hardness .....	31
Figure 31. Iron - Total.....	31
Figure 32. Lead - Total, and Extractable .....	32
Figure 33. Lithium - Total .....	32
Figure 34. Magnesium .....	33
Figure 35. Manganese – Total and Extractable .....	33
Figure 36. Mercury – Total and Extractable.....	34
Figure 37. Molybdenum - Total.....	34
Figure 38. Nickel - Total.....	35
Figure 39. Nitrogen – Dissolved Nitrate.....	35

**LIST OF FIGURES**

**(CONTINUED)**

	Page
Figure 40 Nitrogen – Dissolved NO <sub>3</sub> and NO <sub>2</sub> .....	36
Figure 41. Nitrogen Nitrite .....	36
Figure 42. Nitrogen – Total .....	37
Figure 43. Lanthanum – Total .....	37
Figure 44. pH .....	38
Figure 45. Phosphate – Dissolved Ortho .....	38
Figure 46. Phosphorus - Dissolved Ortho.....	39
Figure 47. Phosphorus - Total.....	39
Figure 48. Potassium – Dissolved and Extractable.....	40
Figure 49. Residue - Filterable.....	40
Figure 50. Residue - Fixed Filterable .....	41
Figure 51. Residue - Fixed Non-Filterable .....	41
Figure 52. Residue – Non-Filterable.....	42
Figure 53. Rubidium - Total .....	42
Figure 54. Selenium – Total and Extractable.....	43
Figure 55. Silica – Reactive and Dissolved .....	43
Figure 56. Silicon - Extractable .....	44
Figure 57. Silver – Total (1996 – 2005) .....	44
Figure 58. Silver – Total (2003 – 2005) .....	45
Figure 59. Sodium – Dissolved and Extractable.....	45
Figure 60. Specific Conductivity .....	46
Figure 61. Strontium - Total .....	46
Figure 62. Sulphate - Dissolved.....	47
Figure 63. Temperature – Air and Water.....	47
Figure 64. Thallium - Total.....	48

**LIST OF FIGURES**

**(CONTINUED)**

	Page
Figure 65. Tin – Total .....	48
Figure 66. Turbidity .....	49
Figure 67. Uranium - Total .....	49
Figure 68. Vanadium - Total.....	50
Figure 69. Zinc – Total and Extractable .....	50



## **INTRODUCTION**

Since 1985, B.C. Ministry of Environment and Environment Canada have been cooperatively measuring water quality at a number of locations in British Columbia. The express purposes of this joint monitoring program have been to define the quality of the water and to determine whether there are any trends in water quality. This assessment is based on up to 27 years of water quality data during 1979-2005.

The Kootenay River is a transboundary river that flows south from B.C. into Kootenay Lake, which is the reservoir created by the Libby Dam in Montana. After leaving the dam, the river swings northward through Montana and Idaho, re-entering B.C. south from Creston. Just north from Creston, the river enters Kootenay Lake, forming the main inflow to the southern arm of the lake. The Kootenay River near Creston has a drainage area of 36,700 km<sup>2</sup> and is used for irrigation and waterfowl conservation, while Kootenay Lake is an important fishery and recreation area.

The watershed upstream from Creston has been influenced to varying degrees over the years by hydroelectric development at the Libby Dam, a kraft pulp mill at Skookumchuck, a mine, concentrator and fertilizer complex at Kimberley, coal mines in the Elk River basin, treated sewage discharges, agriculture, and forestry.

Water quality measurements for the Kootenay River at Creston were plotted on a graph over time, along with the relevant water quality objectives or guidelines. The graphs were inspected for "environmentally significant" trends - where the measurements are increasing or decreasing over time and the levels are close to the objectives or guidelines, or are otherwise judged to represent an important change in water quality. These trends are further evaluated to ensure that they were not caused by measurement errors, to identify their causes, and to determine whether they are statistically significant. A confidence level of 95% or better is used to define statistical significance, unless noted otherwise.

The water quality sampling station on the Kootenay River is located at the highway #3 bridge approximately 5 km. west-northwest from Creston.

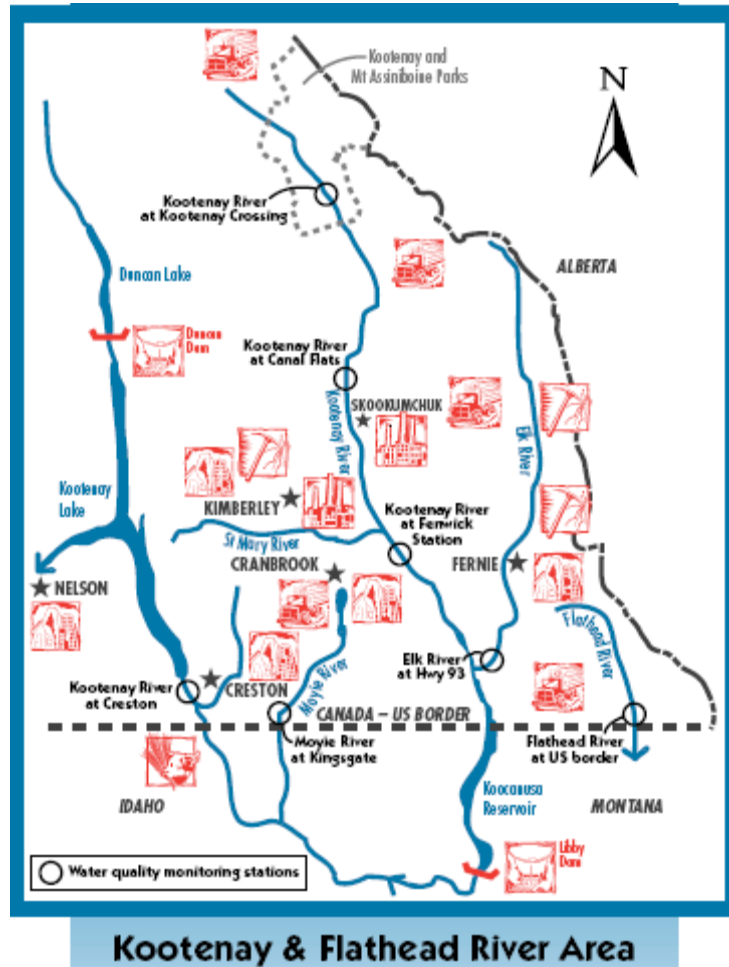


FIGURE 1: KOOTENAY RIVER AT CRESTON

## WATER QUALITY ASSESSMENT

The state of the water quality was assessed by comparing results to the B.C. approved and working guidelines (if guidelines exist for that variable) for water quality (B.C. Ministry of Environment, 2006a and b and CCME, 1999), and by looking for any obvious trends in the data. Any levels or apparent trends that were found to be deleterious or potentially deleterious to sensitive water uses, including drinking water, aquatic life,

wildlife, recreation, irrigation, and livestock watering were noted in the following variable-by-variable discussion described below in alphabetical order.

When concentrations of a substance cannot be detected, we have plotted the concentration at the level of detection. We believe this to be a conservative approach to assessing possible trends. As well, there are times when measurements were not taken for some reason. In these cases, straight lines will join the two consecutive points and may give the illusion on the graph of a trend that does not exist.

In cases where we have used statistical techniques such as linear regression analysis to estimate if a trend is possibly present, a more thorough statistical analysis of the trend is necessary for verification of the trend.

In some cases, testing for the presence of a variable has been terminated after a certain period. In general, this has been because a previous data assessment and review has indicated that collections of these data are not warranted for this station. For other variables, concerns about concentrations may have only arisen in recent years.

Data for the Kootenay River at Creston have been collected on a frequency of about once every two weeks. As well, twice per year, two additional samples are collected in order to ensure that there are two periods when weekly samples are collected during five consecutive weeks. In addition, quality assurance samples (blanks and replicates) are collected six times per year. Results for each variable were used in this assessment to identify potential outliers that should be removed from consideration of trends, and to “flag” questionable data in the database ([www.waterquality.ec.gc.ca](http://www.waterquality.ec.gc.ca)) as to possible or likely errors.

The following water quality indicators were not discussed as they met all water quality guidelines (if guidelines exist) and showed no clearly visible trends: ammonia, arsenic, bromide, gallium, lanthanum, lithium, mercury, molybdenum, nitrate, nitrite, total nitrogen, dissolved ortho phosphorus, dissolved and reactive silica, extractable silicon, and tin.

The following water quality indicators seemed to fluctuate through the year according to turbidity concentrations, but were below guideline values (if guidelines exist) and had no other trends: total antimony, beryllium, bismuth, cobalt, manganese, nickel, non-filterable and fixed non-filterable residue, rubidium, total silver, total thallium, and total vanadium.

Other water quality indicators seemed to fluctuate through the year according to the specific conductivity of the water. The dissolved forms of many of these indicators are components of the measured conductivity, and this trend is to be expected. These types of indicators that were not measured above guideline values (if guidelines exist) included alkalinity, barium, calcium, chloride, fluoride, hardness, magnesium, dissolved nitrogen, potassium, filterable and fixed filterable residue, strontium, sulphate, and uranium.

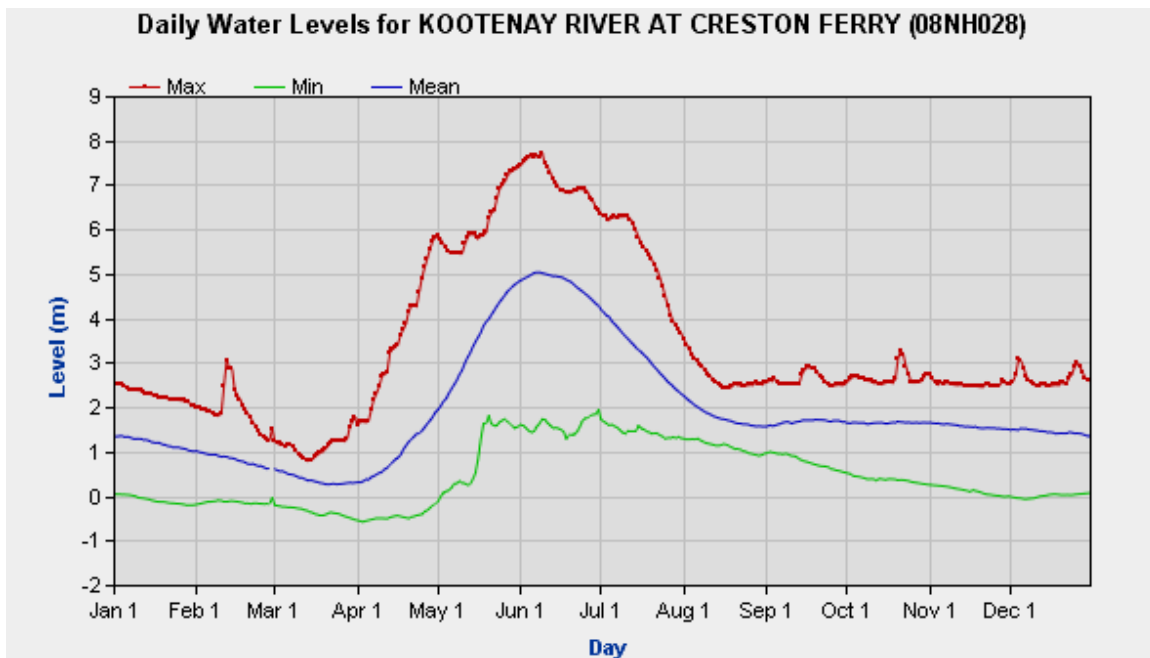


FIGURE 2: WATER SURVEY OF CANADA FLOW DATA FOR KOOTENAY RIVER AT CRESTON

**Flow** (Figure 2) values showed fairly typical patterns characteristic of an interior river, with freshet taking place between mid-April through July. Average flows through the year are in the order of  $1 \text{ m}^3/\text{s}$ , although low flows in late March just prior to freshet can be as low as  $0.3 \text{ m}^3/\text{s}$ . Average peak flows are about  $5 \text{ m}^3/\text{s}$ .

**Aluminum** (Figure 4) values (total) were correlated to turbidity levels in the river, with total aluminum concentrations exceeding the B.C. guideline for dissolved aluminum concentrations for protection of aquatic life of 100 µg/L. This in itself is not a concern because the forms of aluminum measured and the guidelines are different. However, since values that exceeded the guidelines were associated with high sediment concentrations, the aluminum was likely in particulate form and not biologically available.

**Cadmium** (Figures 12-14) values have only been measured since 2003 with detection limits low enough to allow for a meaningful comparison to guidelines. Data from 2003-2005 show that the guidelines are usually met and were only exceeded twice during that period when turbidity levels were elevated. Thus the cadmium would likely be in particulate form and not biologically available.

**Carbon** (Figures 16 – 18) was measured as dissolved organic and inorganic. The guideline to protect drinking water supplies is a maximum of 4 mg/L as total organic carbon. This level has generally been achieved by measurements of dissolved organic carbon. There appears to be a correlation between turbidity and dissolved organic carbon concentrations.

**Chromium** (Figures 20 and 21) concentrations when measured as total concentrations occasionally exceeded the guideline for trivalent chromium and regularly exceeded the guideline for hexavalent chromium. These values seem to be correlated to turbidity concentrations.

**Fecal Coliforms** (Figure 23) have only been measured since 2000, but values often exceed the guideline for source water used for drinking with no treatment other than disinfection, and have twice exceeded the guideline where partial treatment of source

water is employed. Concentrations do seem to be correlated with turbidity, meaning that it would be difficult to remove bacteria when disinfecting these higher turbidity waters.

**Colour** (Figures 24 and 25) has a guideline of 15 units for true colour for protection of aesthetics of source water used for drinking. This guideline has been exceeded only three times since 1997, and is not a significant problem in the river.

**Copper** (Figures 26 and 27) values generally meet the B.C. guideline for the maximum allowable concentrations, and only occasionally do these individual values exceed the 30-day mean concentration. Copper seems to be correlated with turbidity concentrations and so the higher copper concentrations are likely in particulate form. This means that the copper is not likely biologically available and thus not a concern in the river.

**Iron** (Figure 31) concentrations frequently exceeded the guidelines; however, these instances were associated with high turbidity values. Thus, the iron was not biologically available and not a concern for aquatic life.

**Lead** (Figure 32) concentrations seemed to be correlated with turbidity and occasionally exceeded the guideline for the protection of aquatic life. Since higher values were associated with particulate form, there is not likely a concern for aquatic life.

**pH** (Figure 44) on infrequent occasions was at, or below the lower acceptable range of the guideline for the protection of aquatic life and source water used for drinking. This is not considered to be a concern for the Kootenay River.

**Total Phosphorus** (Figure 47) values sometimes exceeded the guideline of 10 µg/L that is used for the protection of source water used for drinking. In the *Water Quality Trends 2000* report, it was determined that phosphorus levels in the Kootenay River at Creston for the period up to 1997 had been declining (deemed to be a subtle change with levels in

1995 and 1996 increasing); however, this assessment indicates that phosphorus concentrations appear to be stable over time.

**Selenium** (Figure 54) appears to be increasing over time, although all values are below but approaching the guidelines at present. A linear regression analysis of total selenium data since 1985 indicated an increasing trend with a  $R^2$  value of 0.25; however, for data collected since 1999, the  $R^2$  value is 0.12. This possible increasing trend should be verified by a statistician. If selenium concentrations in the Kootenay River are increasing, it could be due to the increasing concentrations noted in the Elk River, since the Fenwick station located upstream from the confluence of the Elk River, on the Kootenay River has not shown increasing selenium concentrations.

**Sodium** (Figure 59) values when measured as dissolved concentrations may be increasing over time. A linear regression analysis of dissolved sodium data since 1979 indicated an increasing trend with a  $R^2$  value of 0.14. Values also seem to possibly be increasing at the upstream Fenwick station but the  $R^2$  value is only about one-half recorded here. Unfortunately, for a period of time from 1989 until 2001, sodium was measured in the extractable form so that a complete record is not available on which to perform trend analyses. This possible increasing trend should be verified by a statistician.

**Temperature** (Figure 63) values peaked at levels higher than guidelines on a regular basis. Values above the guidelines coincided with high air temperatures at the same time.

**Turbidity** (Figure 66) values were regularly higher than the guideline for the protection of source water used for drinking. For effective disinfection of this source water, removal of solids will be required as treatment.

**Zinc** (Figure 69) concentrations (individual) occasionally exceeded the guideline for a monthly mean for the protection of aquatic life. These values were correlated to high

turbidity measurements, indicating that the zinc would be in particulate form and not biologically available.



## REFERENCES

- Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Environmental Quality Guidelines. Winnipeg, Manitoba.
- Ministry of Environment. 2006a. British Columbia Approved Water Quality Guidelines (Criteria). Ministry of Environment, Victoria, B.C.
- Ministry of Environment. 2006b. A Compendium of Working Water Quality Guidelines for British Columbia. Ministry of Environment, Victoria, B.C.
- Ministry of Environment, Lands and Parks. 2000. Water Quality Trends in Selected British Columbia Waterbodies. Ministry of Environment, Lands and Parks, Victoria, B.C.

# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 3  
Kootenay River at Creston  
Alkalinity Total

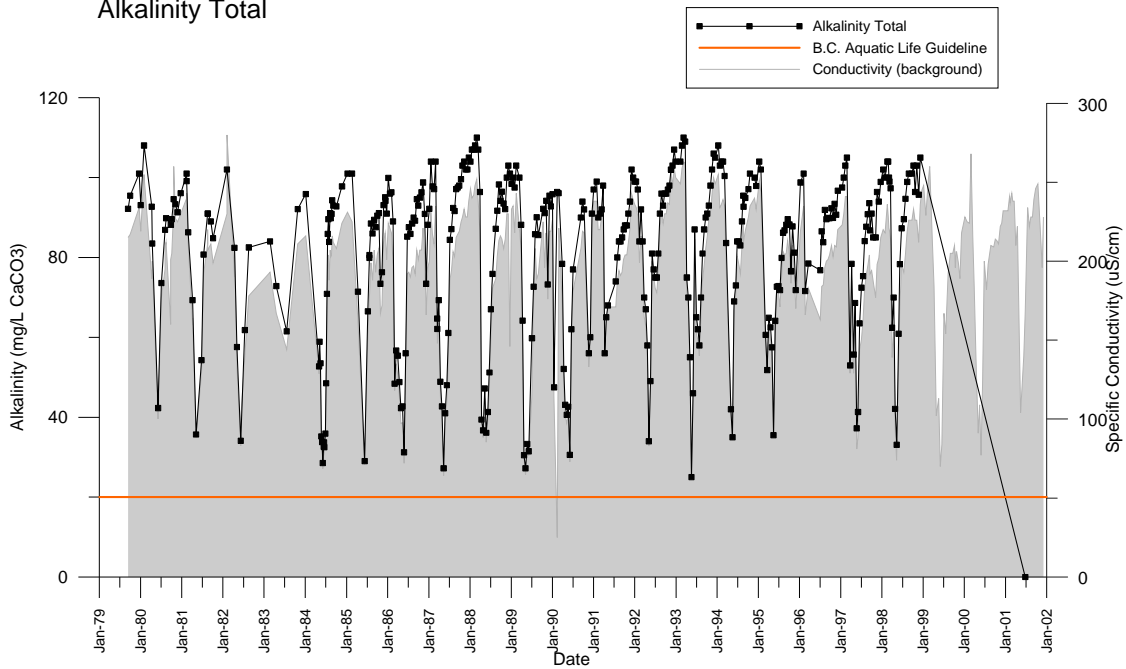
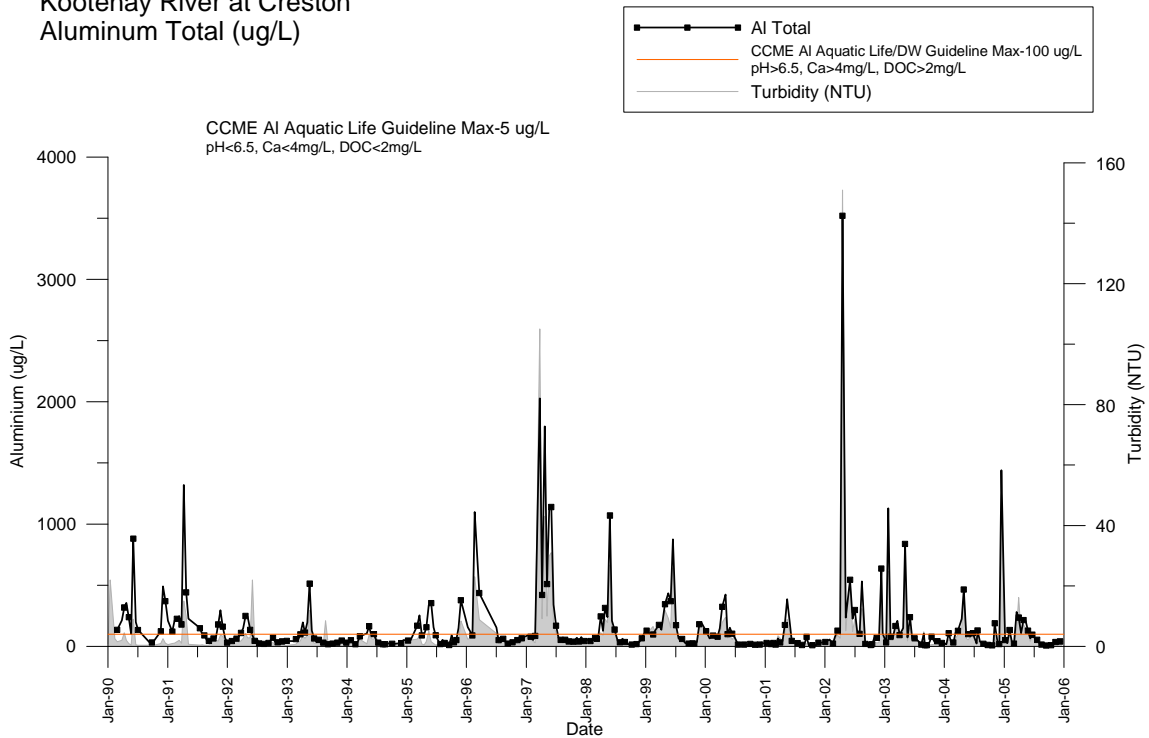
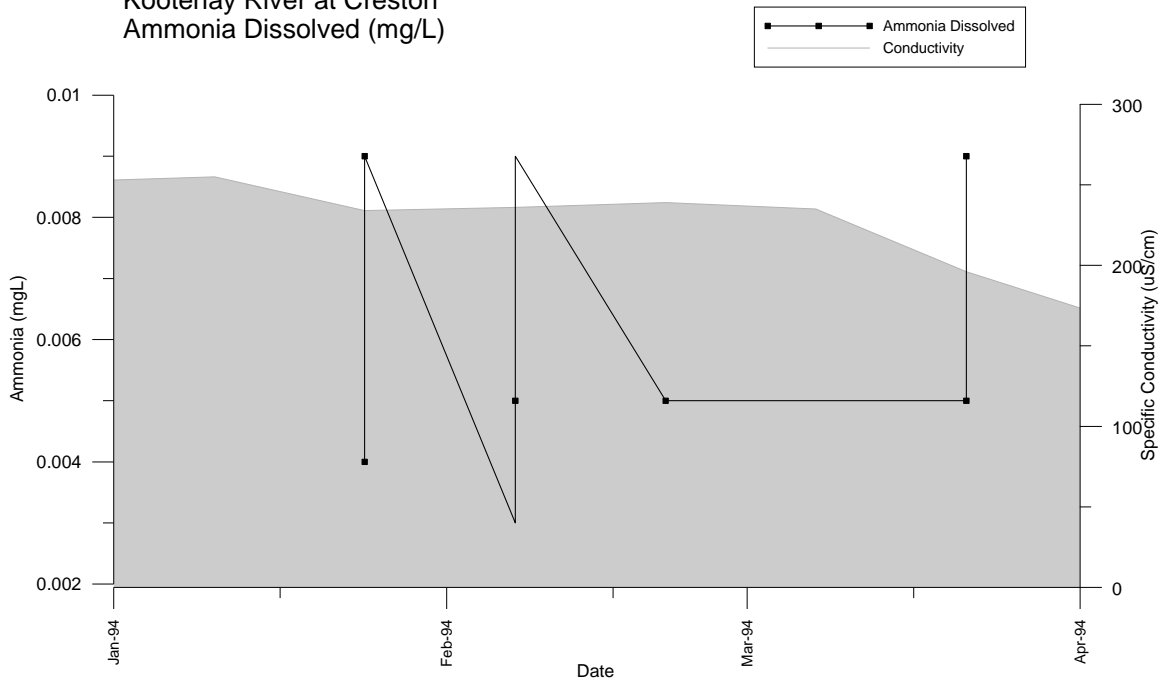


Figure 4  
Kootenay River at Creston  
Aluminum Total (ug/L)

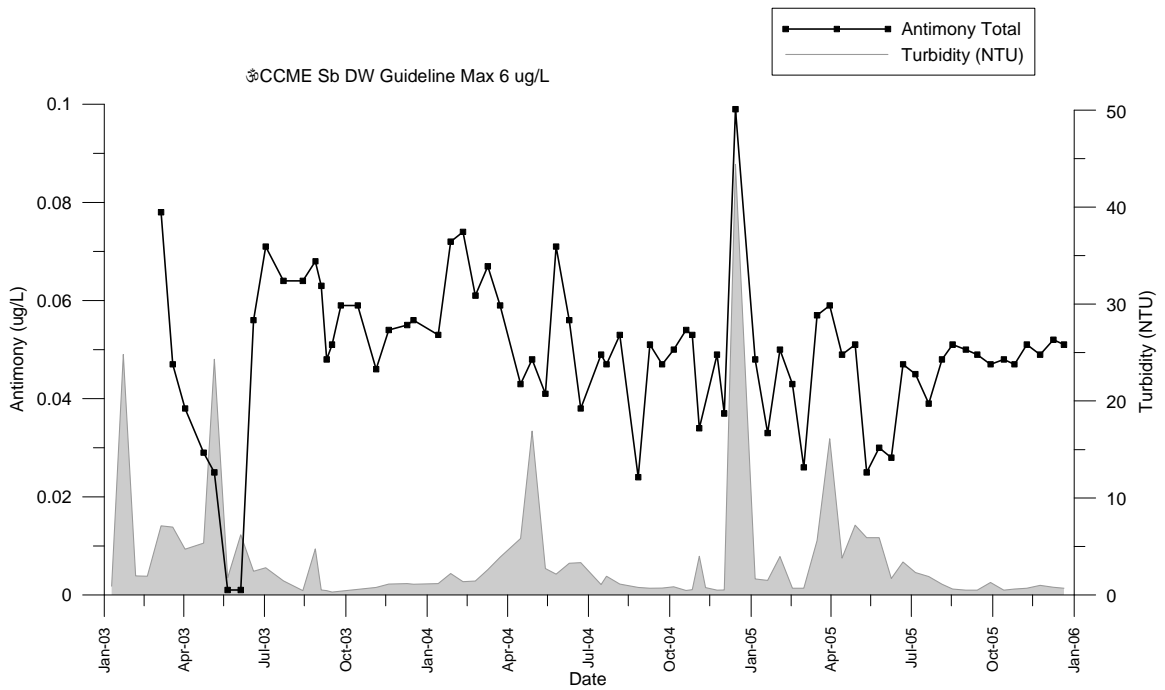


# Water Quality Assessment of the Kootenay River at Creston 1979-2005

**Figure 5**  
Kootenay River at Creston  
Ammonia Dissolved (mg/L)

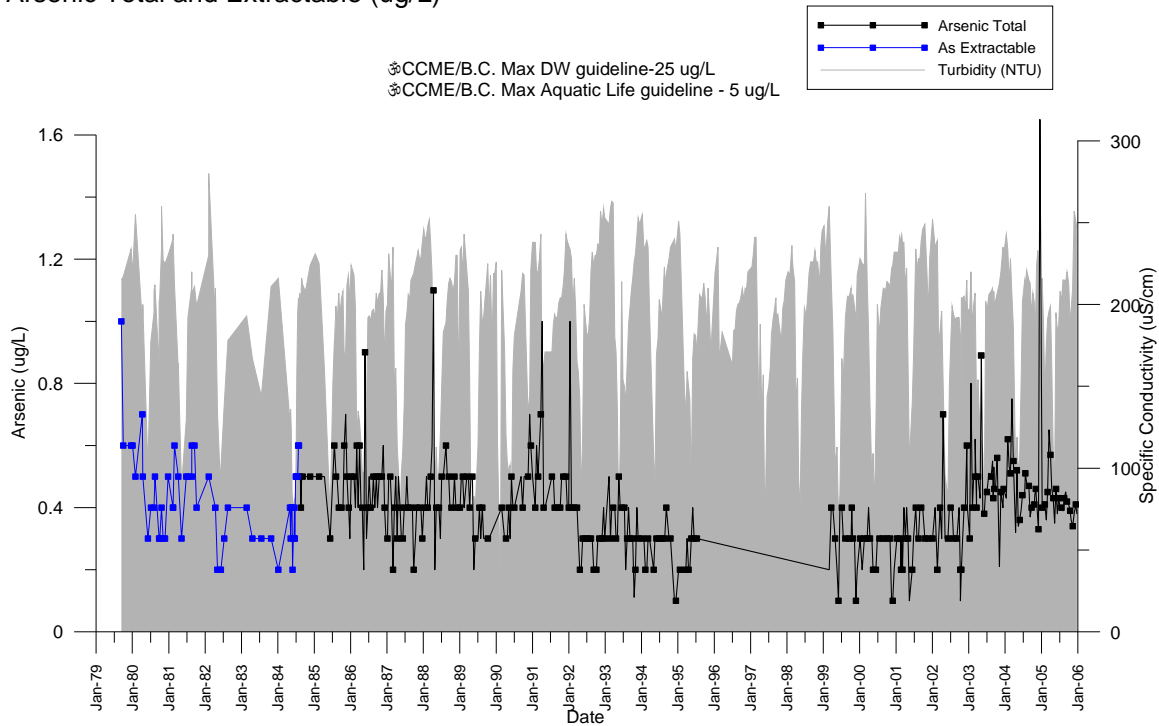


**Figure 6**  
Kootenay River at Creston  
Antimony Total (ug/L)

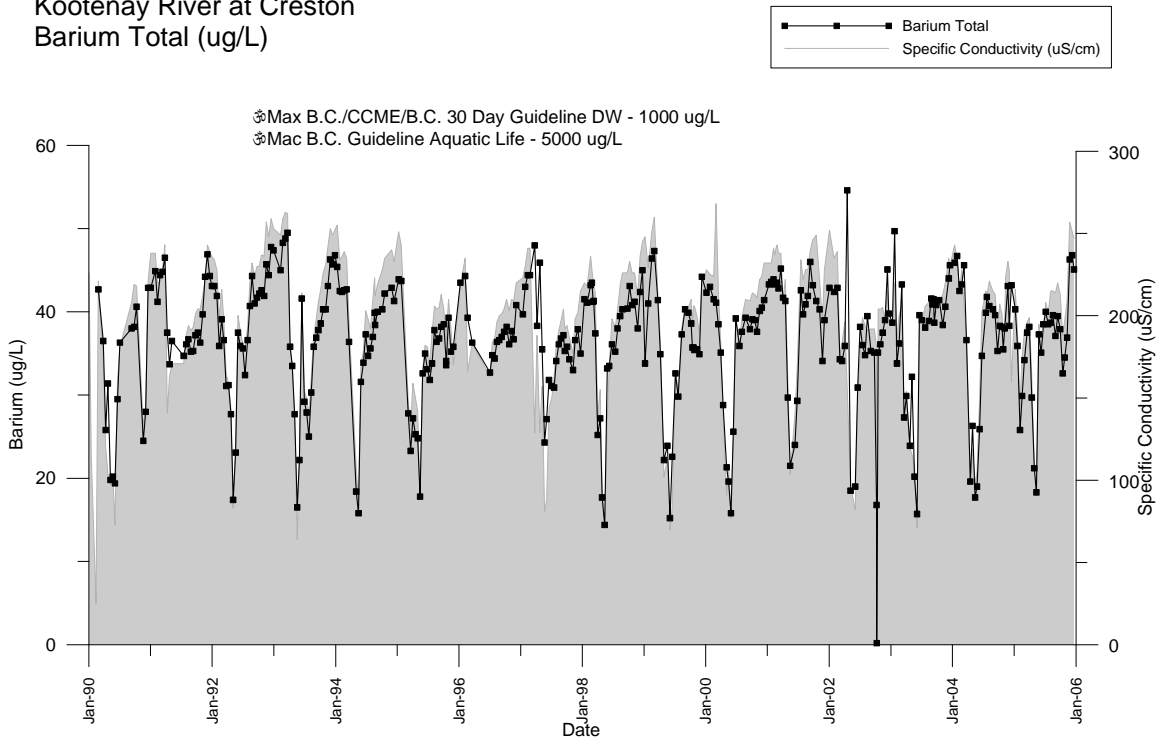


# Water Quality Assessment of the Kootenay River at Creston 1979-2005

**Figure 7**  
Kootenay River at Creston  
Arsenic Total and Extractable (ug/L)



**Figure 8**  
Kootenay River at Creston  
Barium Total (ug/L)



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 9  
Kootenay River at Creston  
Beryllium Total (ug/L)

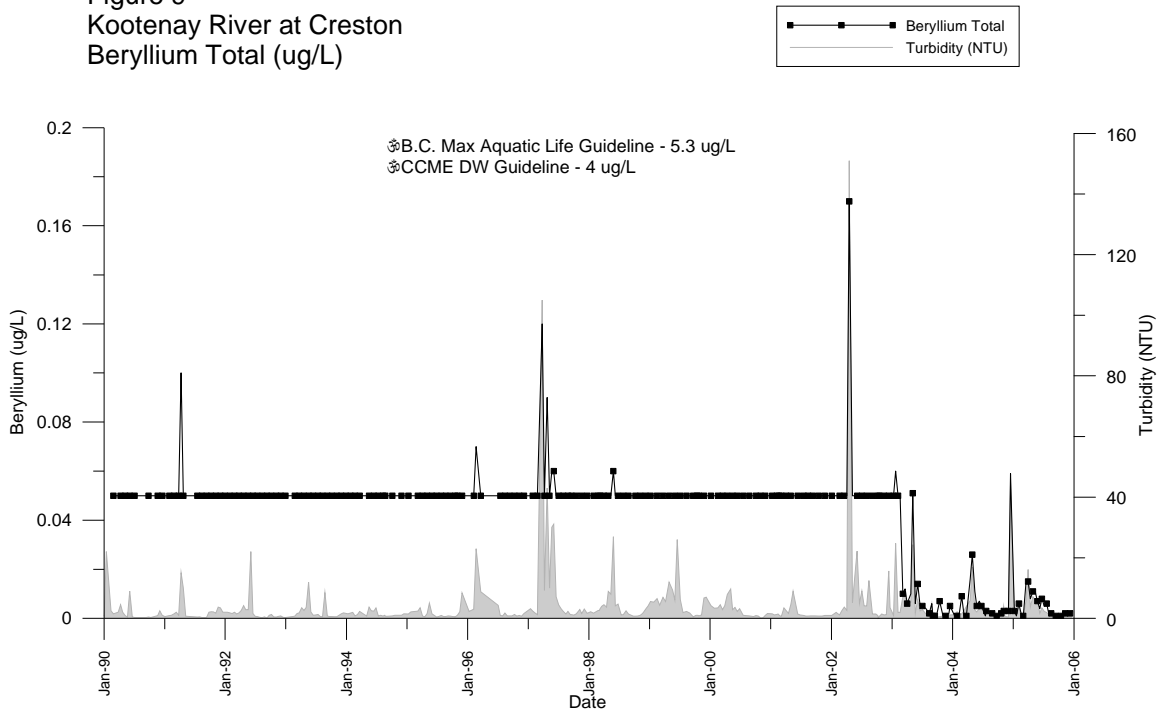


Figure 9 (a)  
Kootenay River at Creston  
Beryllium Total (2003 - 2005)

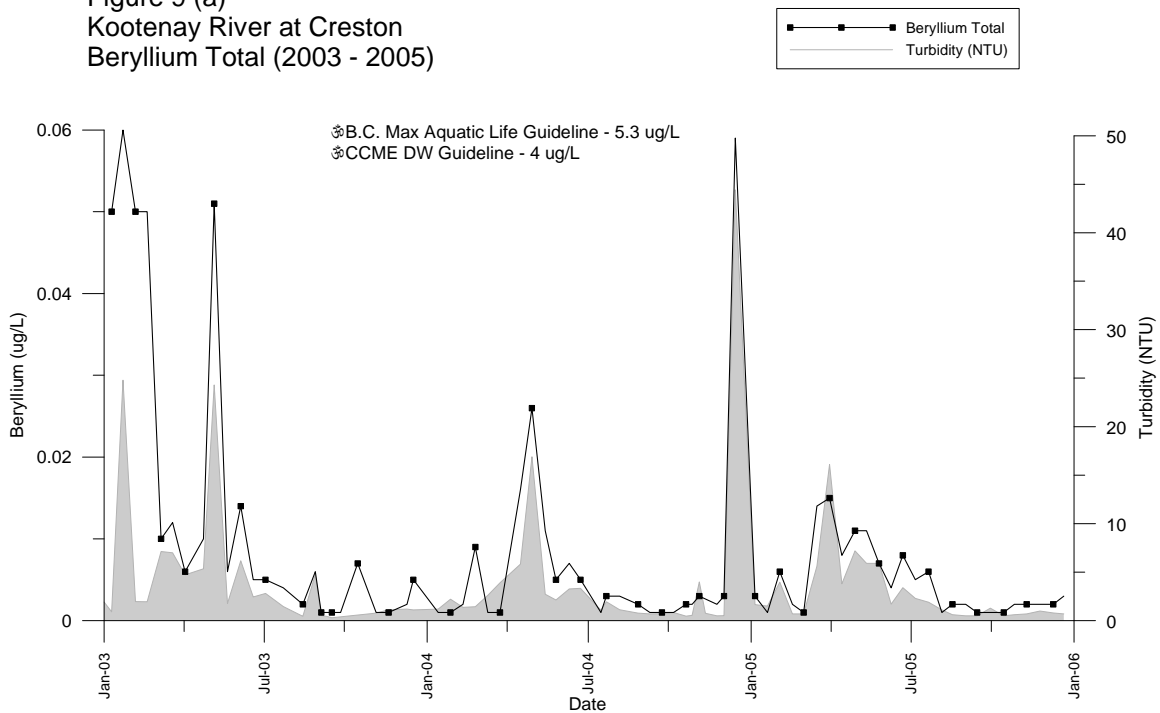


Figure 10  
Kootenay River at Creston  
BismuthTotal (ug/L)

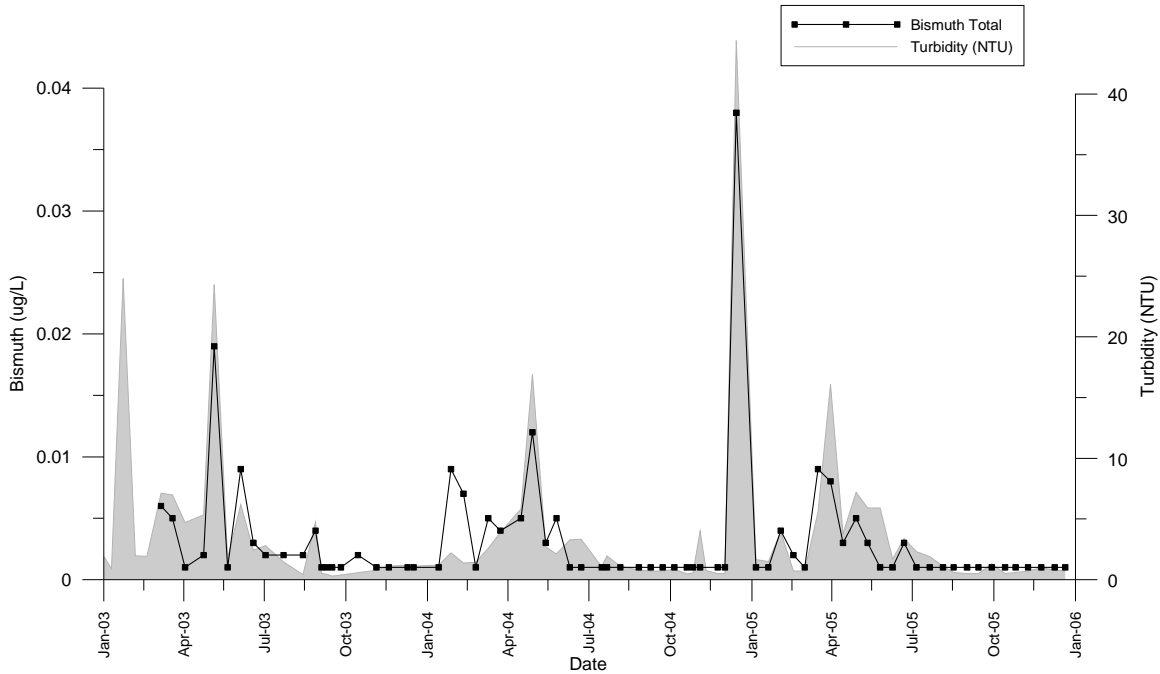
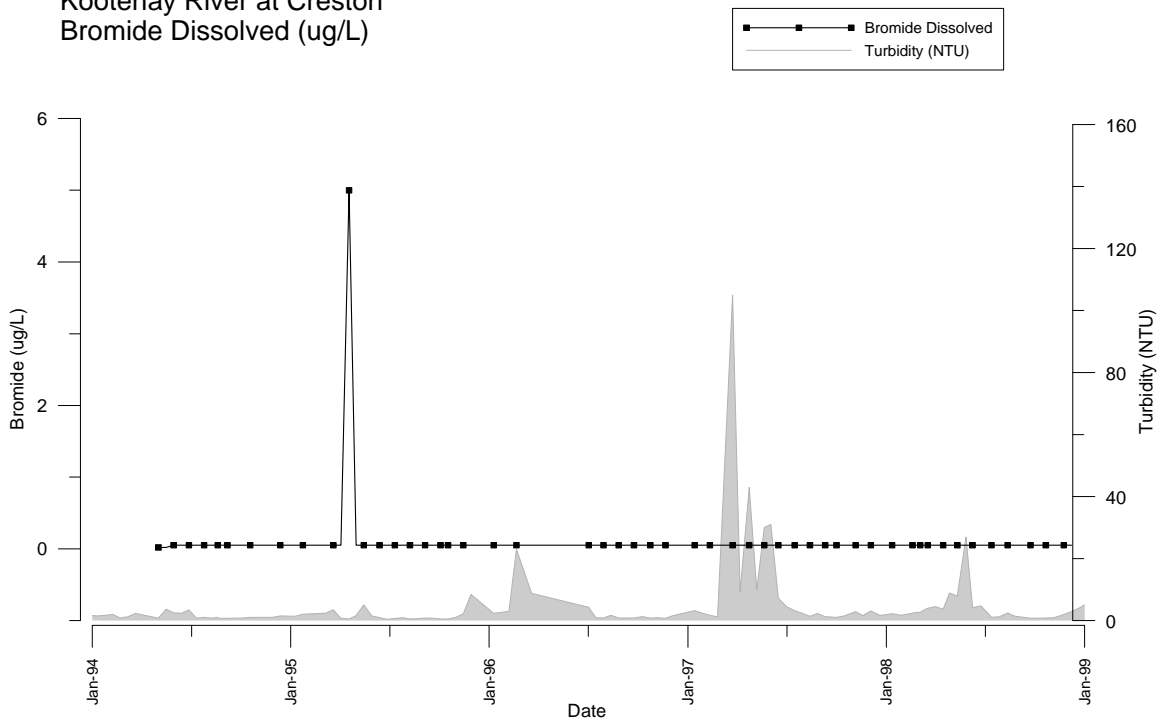
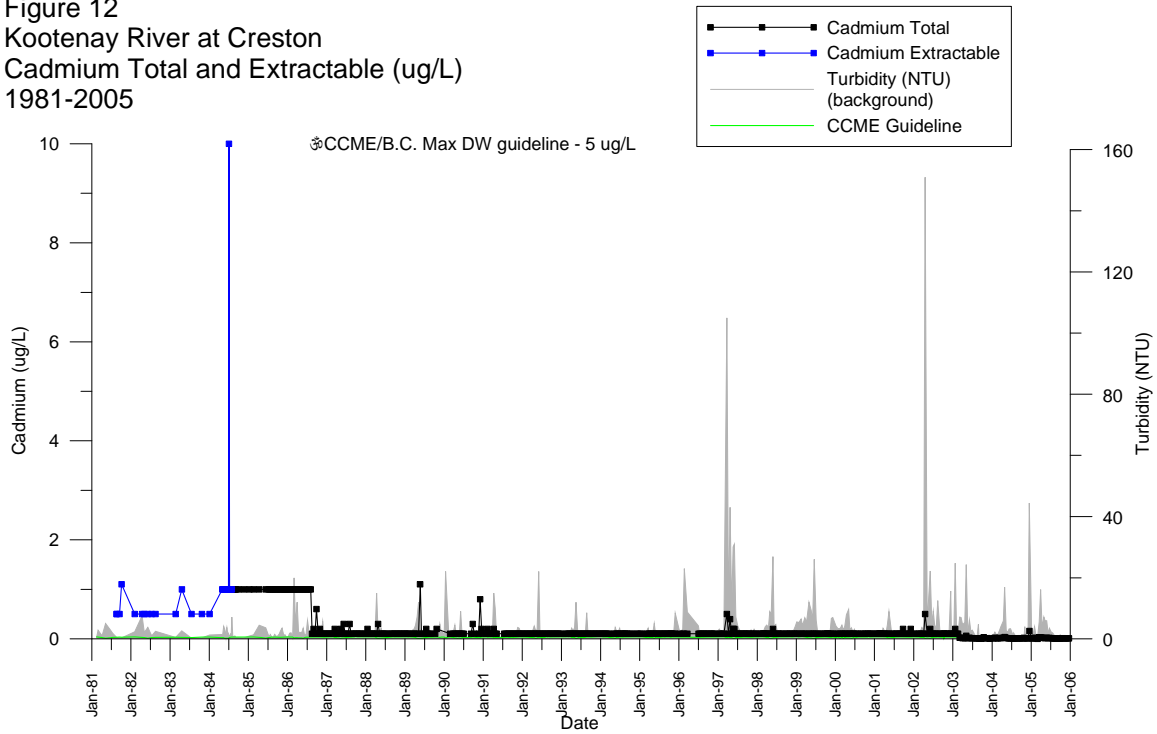


Figure 11  
Kootenay River at Creston  
Bromide Dissolved (ug/L)

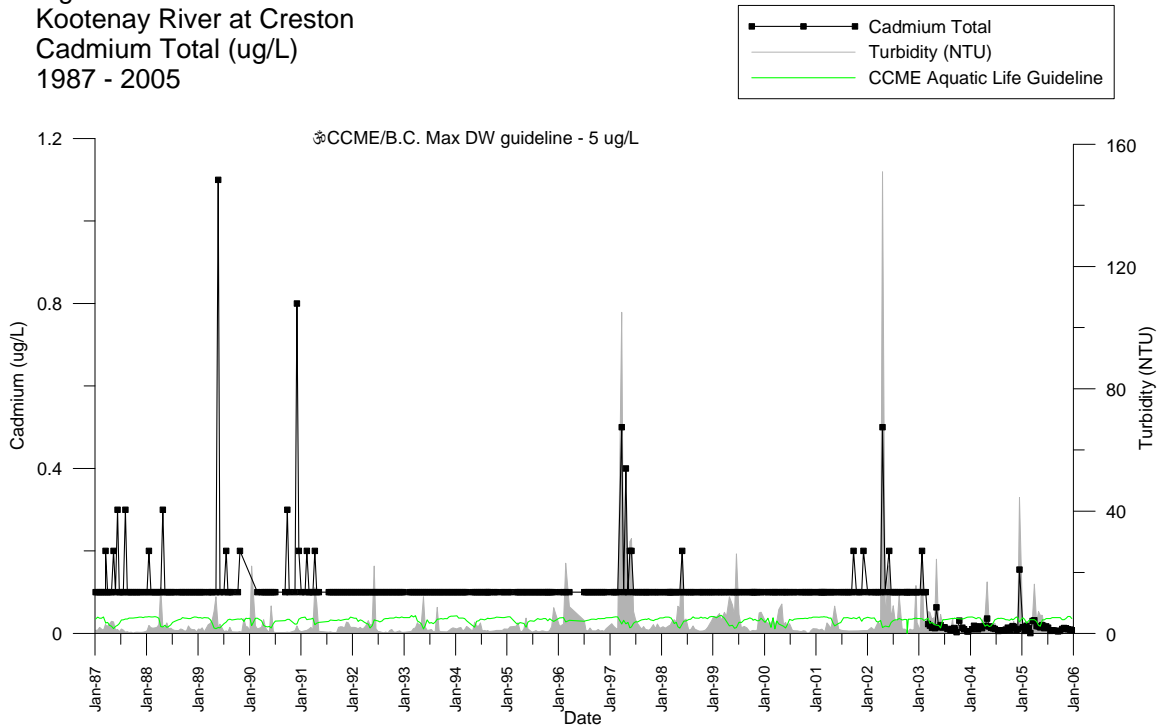


# Water Quality Assessment of the Kootenay River at Creston 1979-2005

**Figure 12**  
Kootenay River at Creston  
Cadmium Total and Extractable (ug/L)  
1981-2005



**Figure 13**  
Kootenay River at Creston  
Cadmium Total (ug/L)  
1987 - 2005



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 14  
Kootenay River at Creston  
Cadmium Total (ug/L)  
2003 - 2006

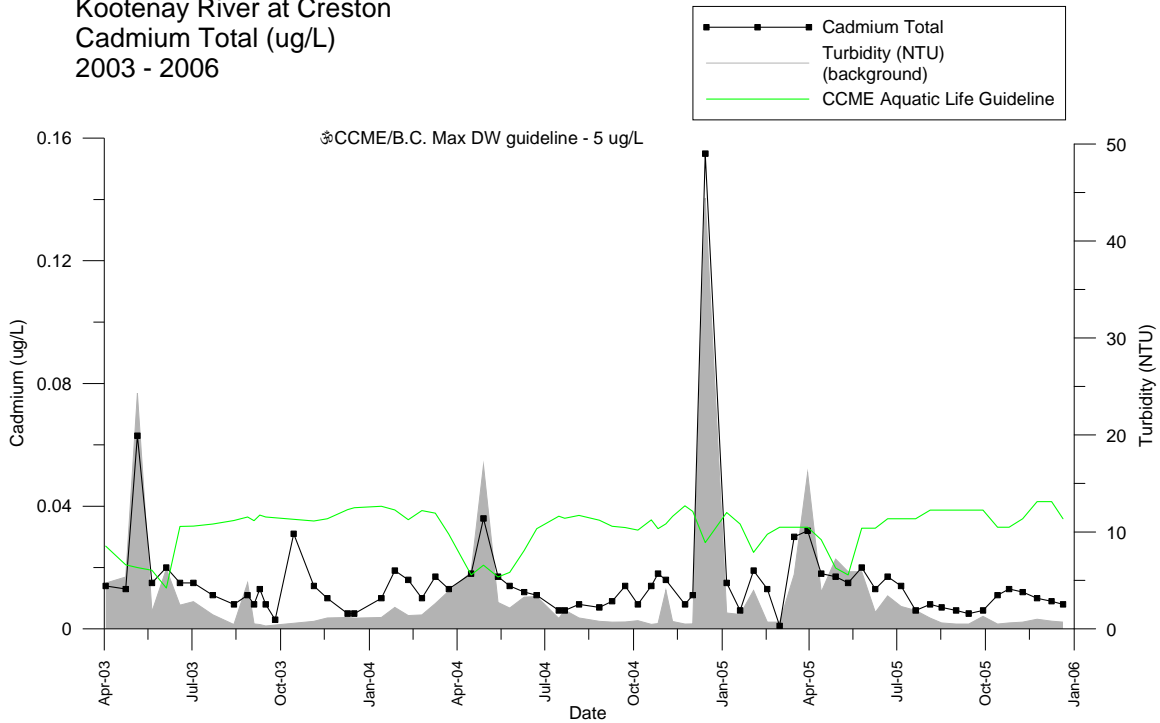
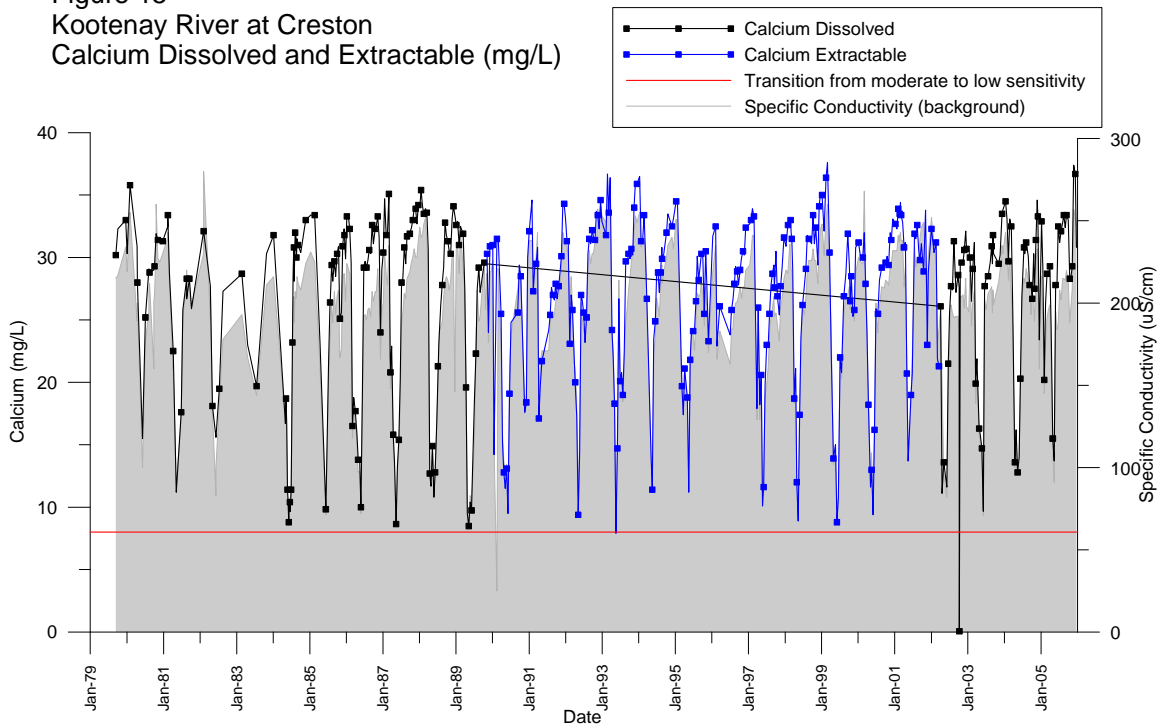


Figure 15  
Kootenay River at Creston  
Calcium Dissolved and Extractable (mg/L)





Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 16  
Kootenay River at Creston  
Carbon Dissolved Inorganic and Organic (mg/L)

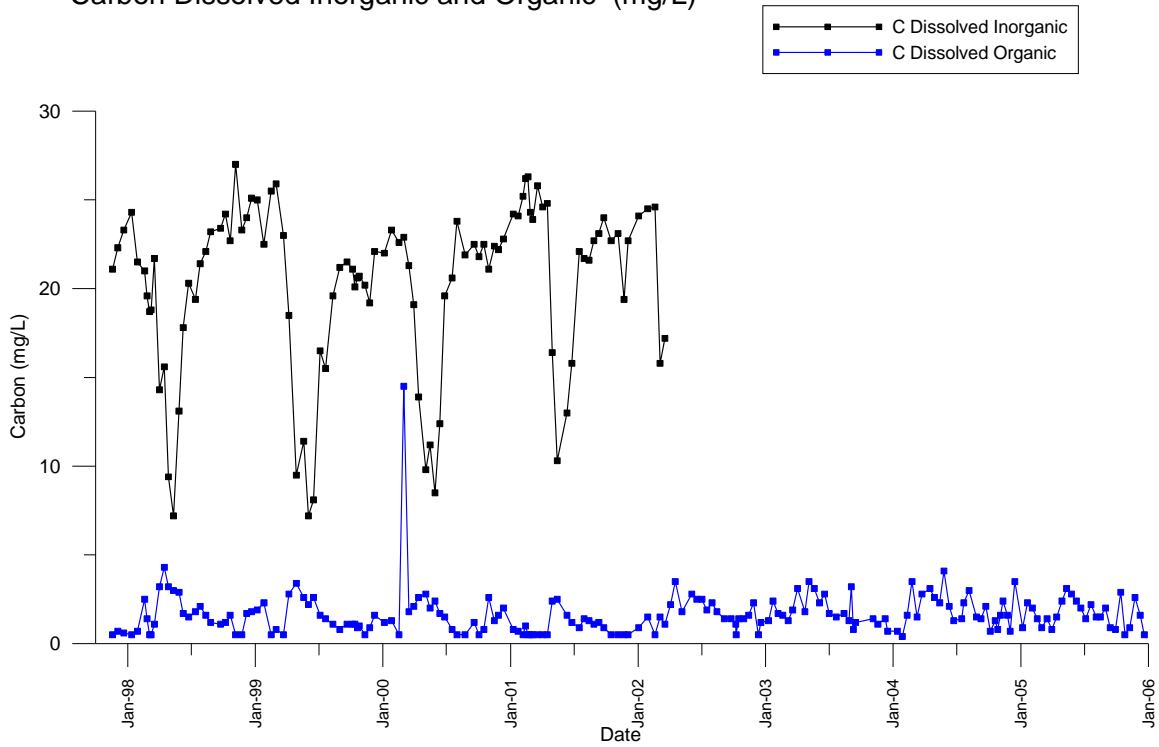
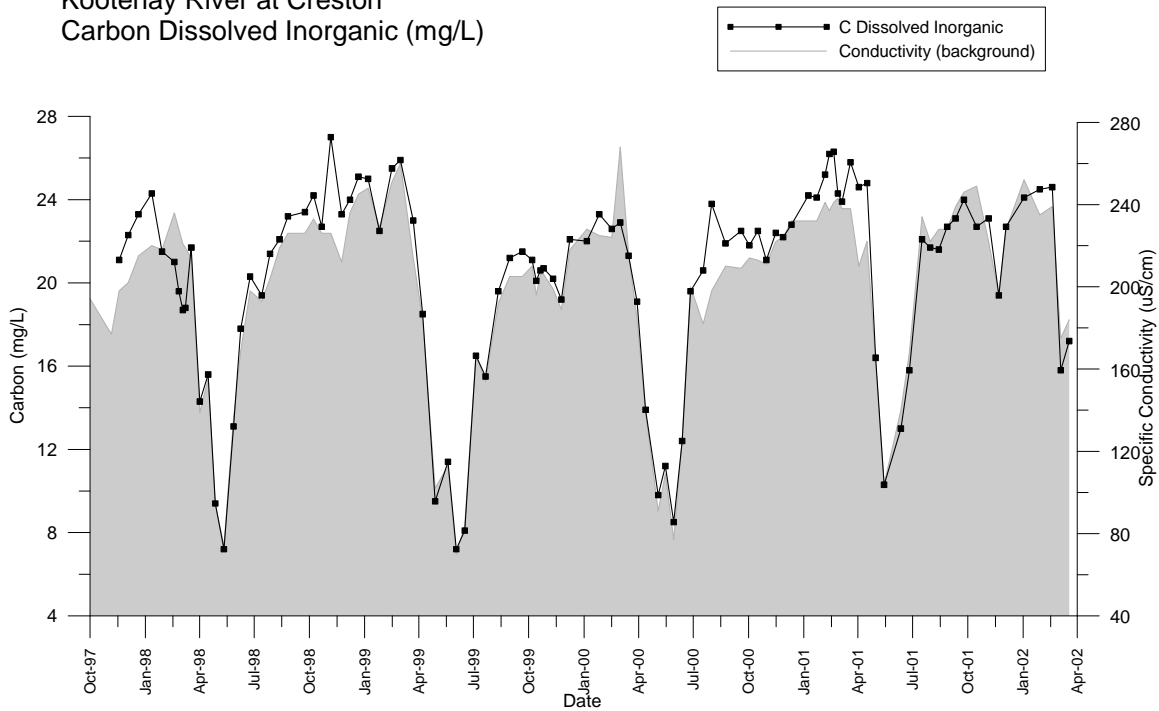
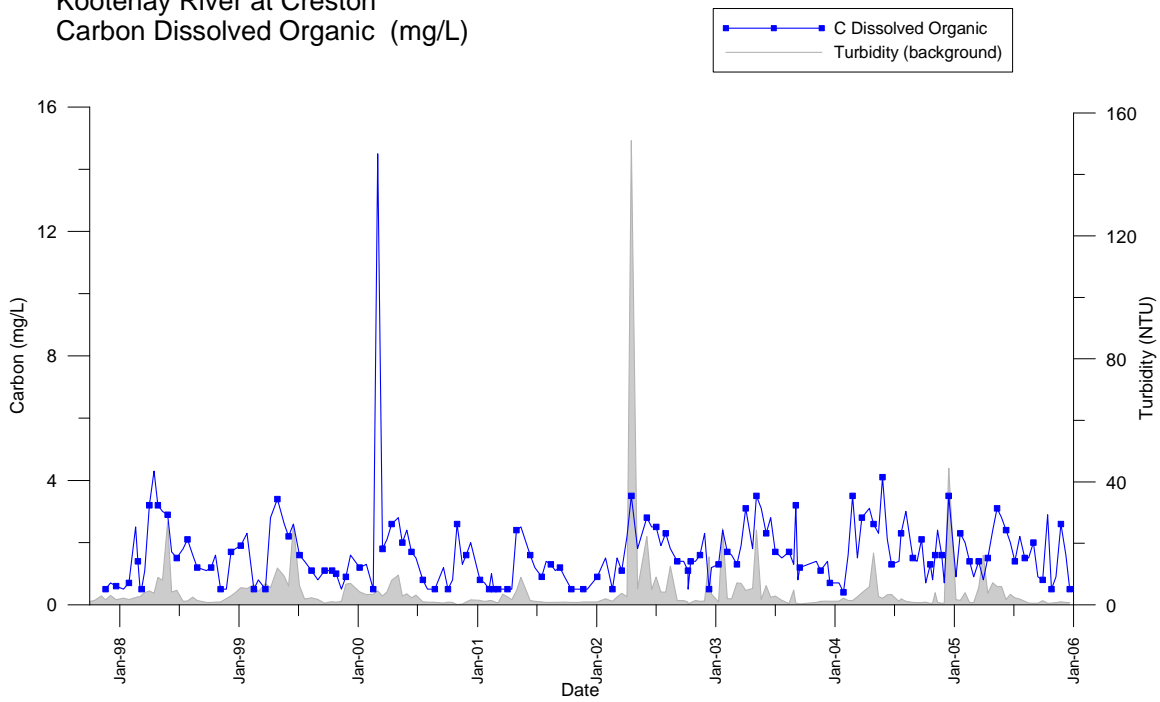


Figure 17  
Kootenay River at Creston  
Carbon Dissolved Inorganic (mg/L)



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

**Figure 18**  
Kootenay River at Creston  
Carbon Dissolved Organic (mg/L)



**Figure 19**  
Kootenay River at Creston  
Chloride Dissolved (mg/L)

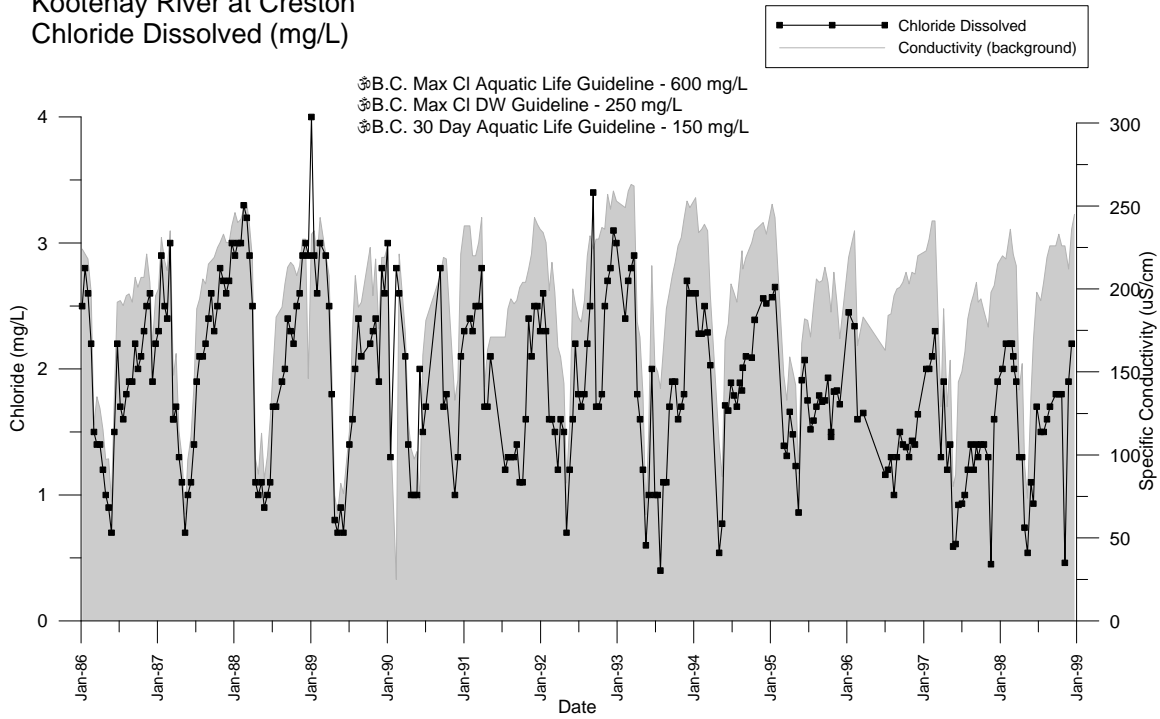


Figure 20  
Kootenay River at Creston  
Chromium Total (ug/L)

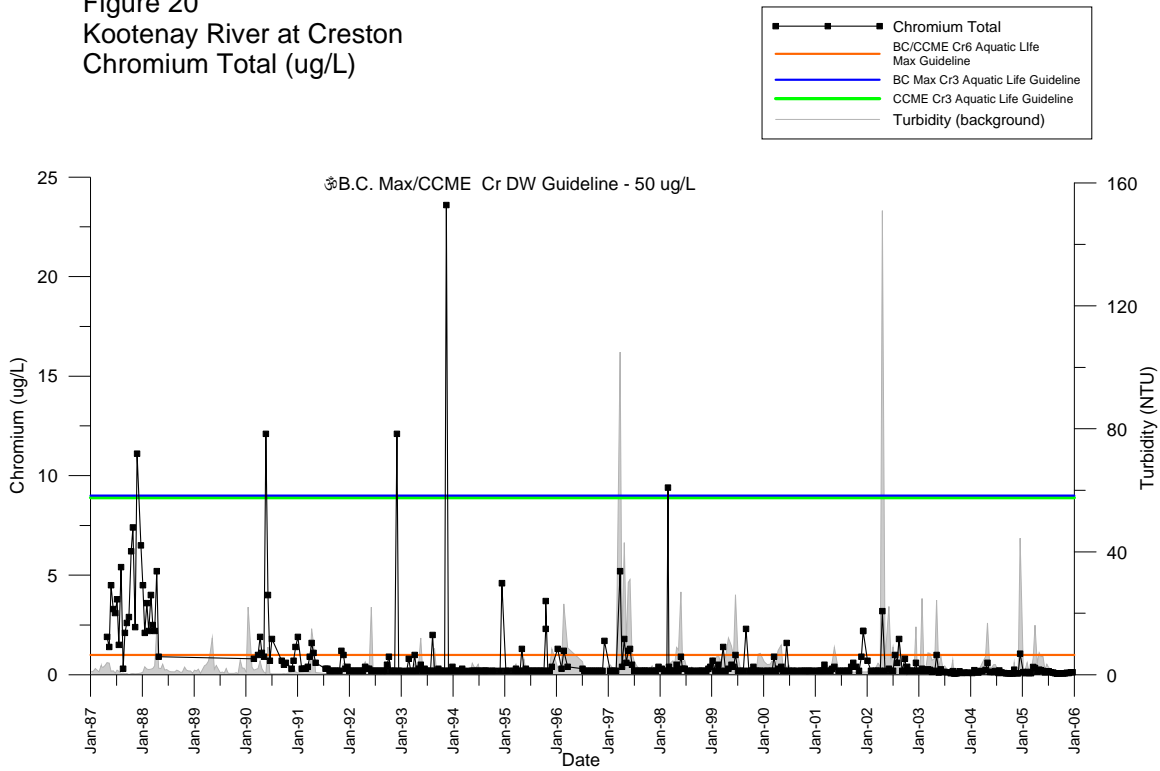
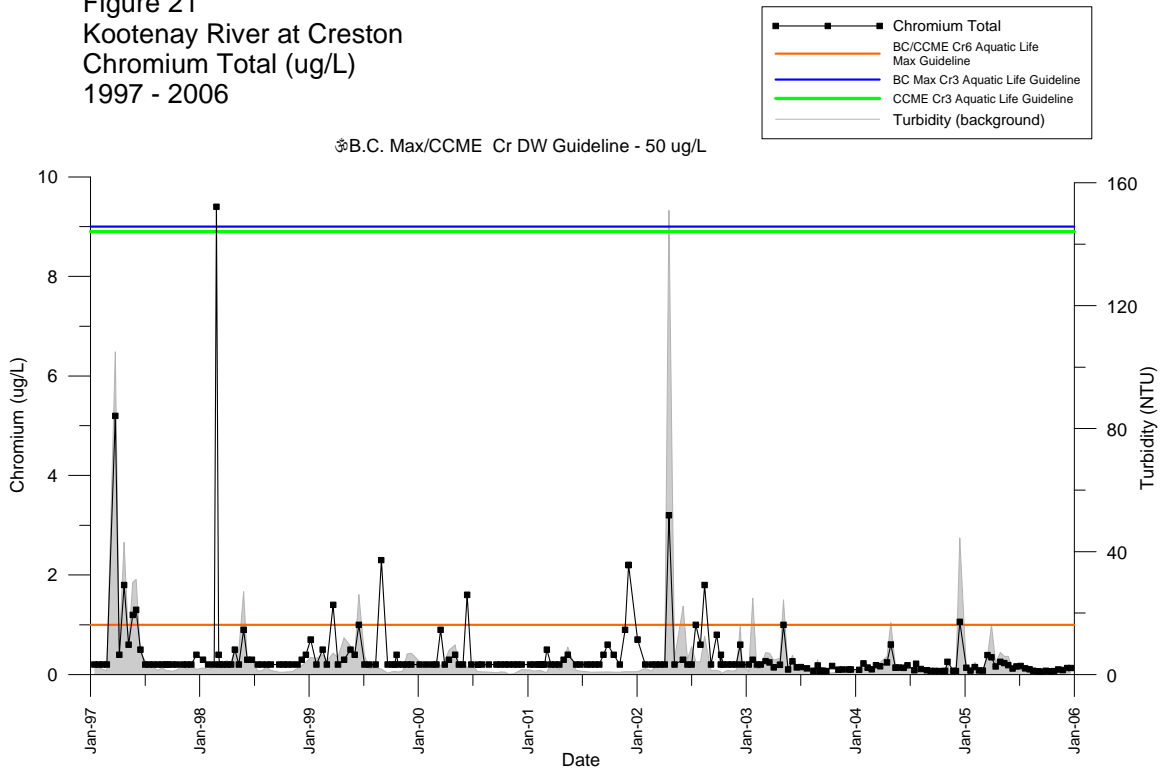


Figure 21  
Kootenay River at Creston  
Chromium Total (ug/L)  
1997 - 2006



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 22  
Kootenay River at Creston  
Cobalt Total (ug/L)

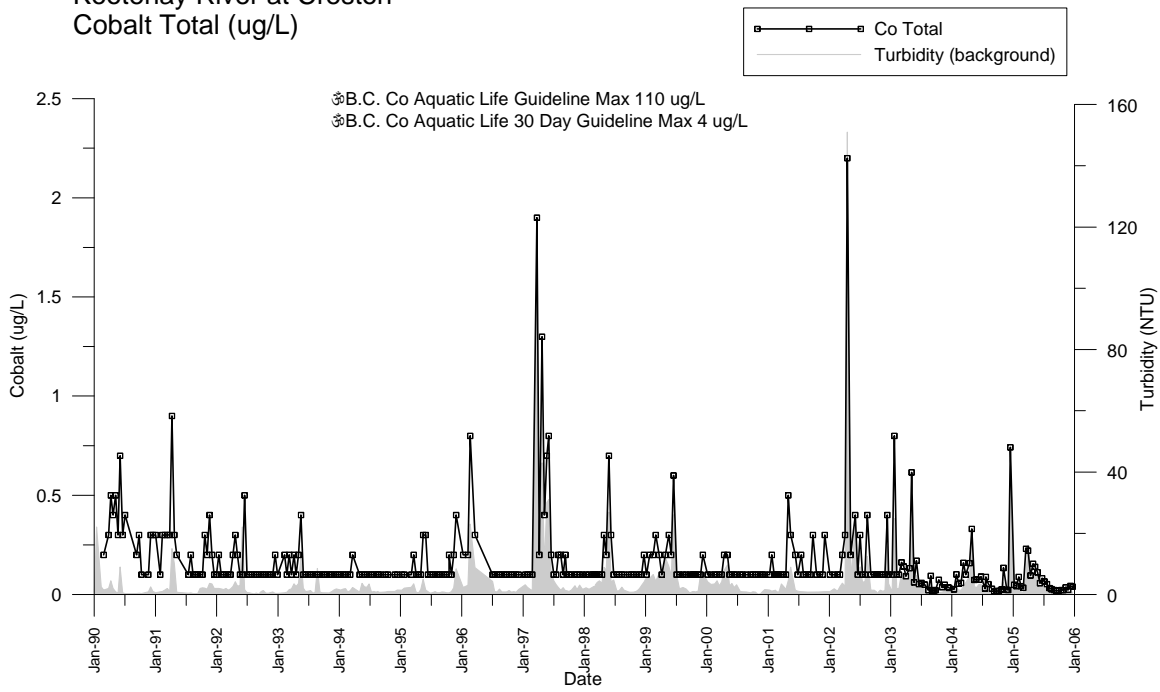


Figure 23  
Kootenay River at Creston  
Fecal Coliforms

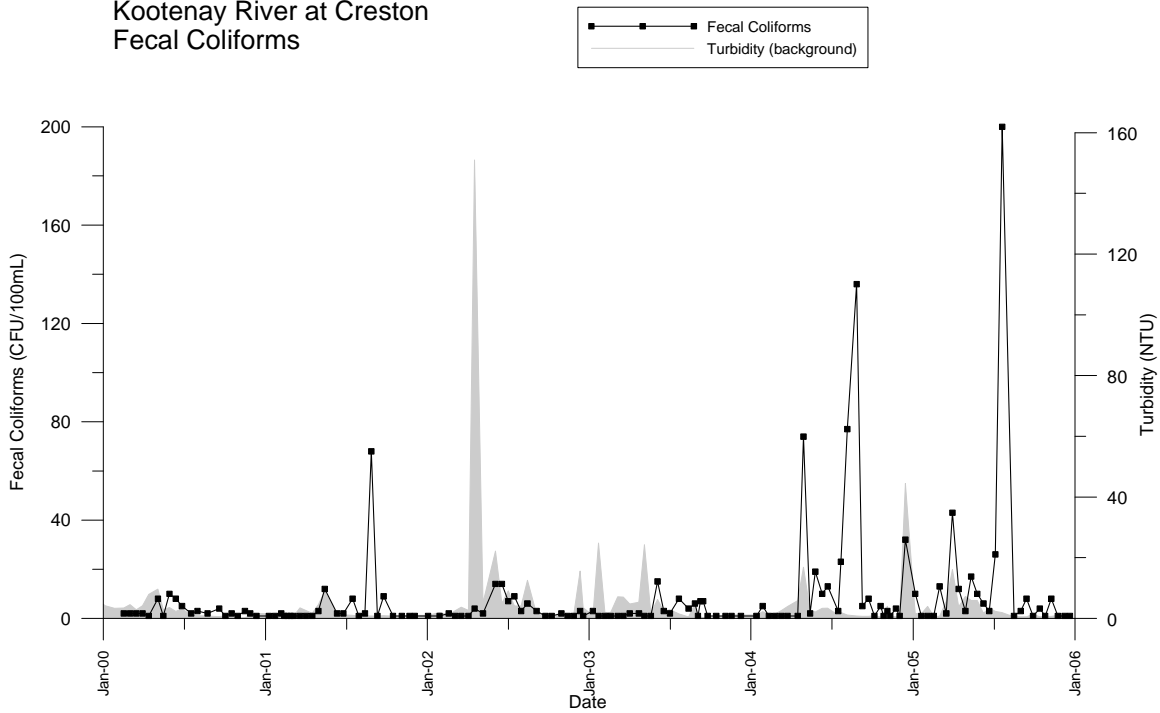


Figure 24  
Kootenay River at Creston  
Colour Apparent (Colour Units)

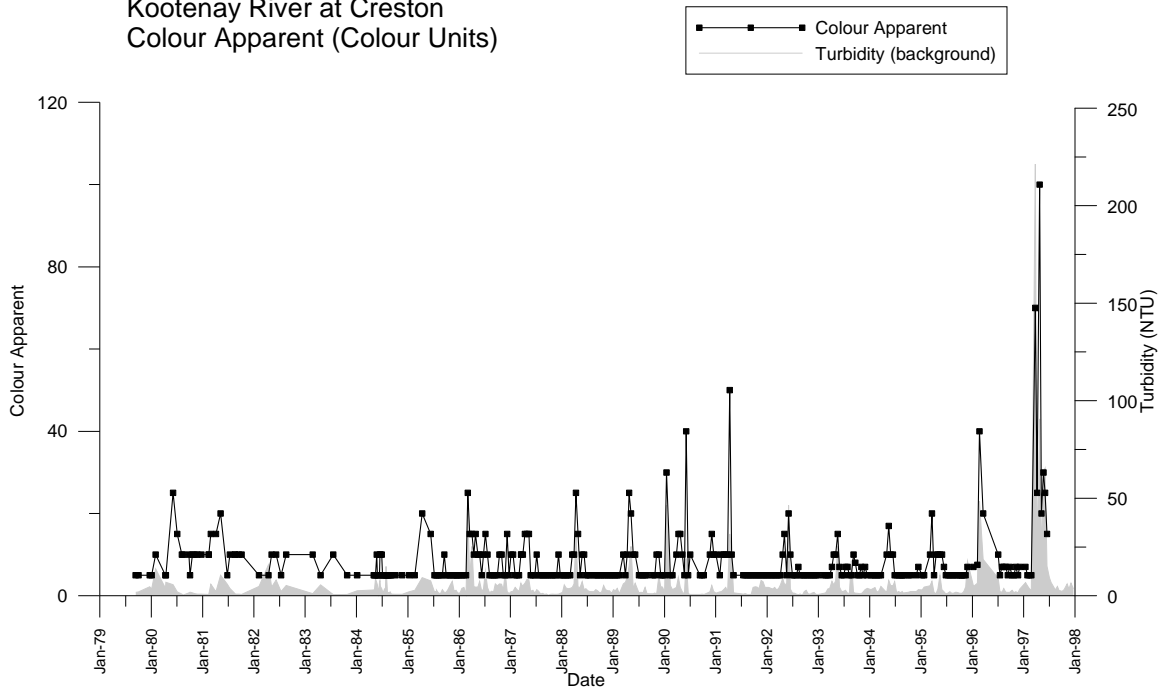
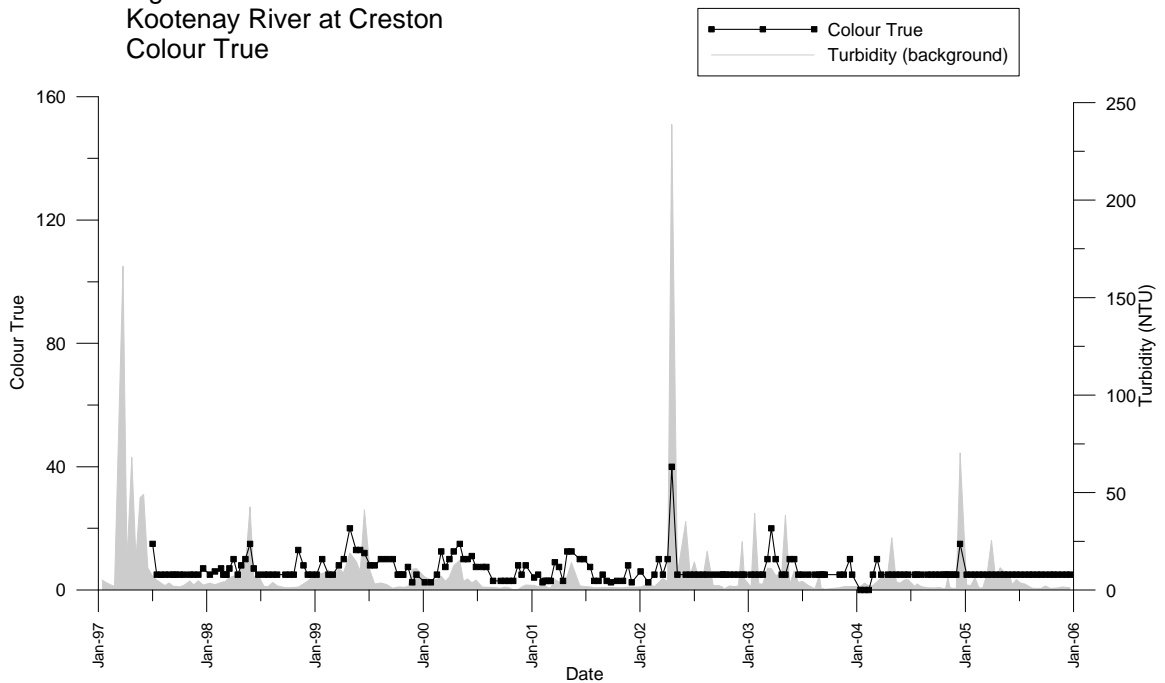
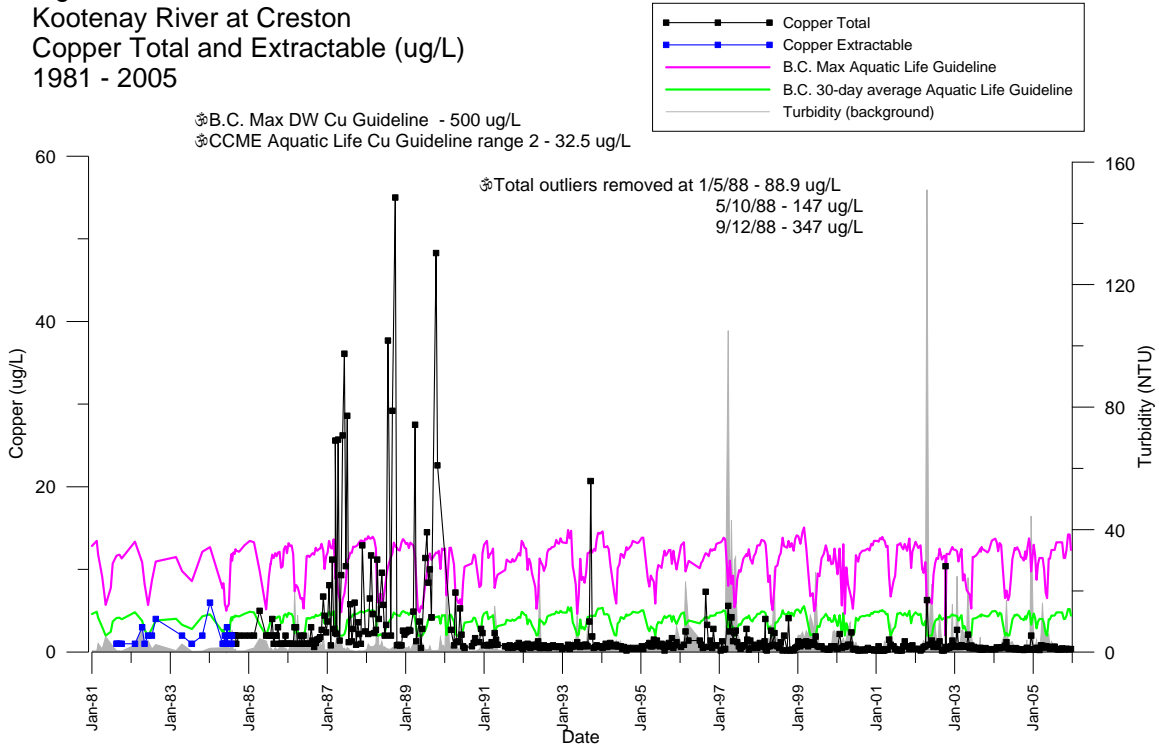


Figure 25  
Kootenay River at Creston  
Colour True



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

**Figure 26**  
**Kootenay River at Creston**  
**Copper Total and Extractable (ug/L)**  
**1981 - 2005**



**Figure 27**  
**Kootenay River at Creston**  
**Copper Total and Extractable (ug/L)**  
**1991 - 2005**

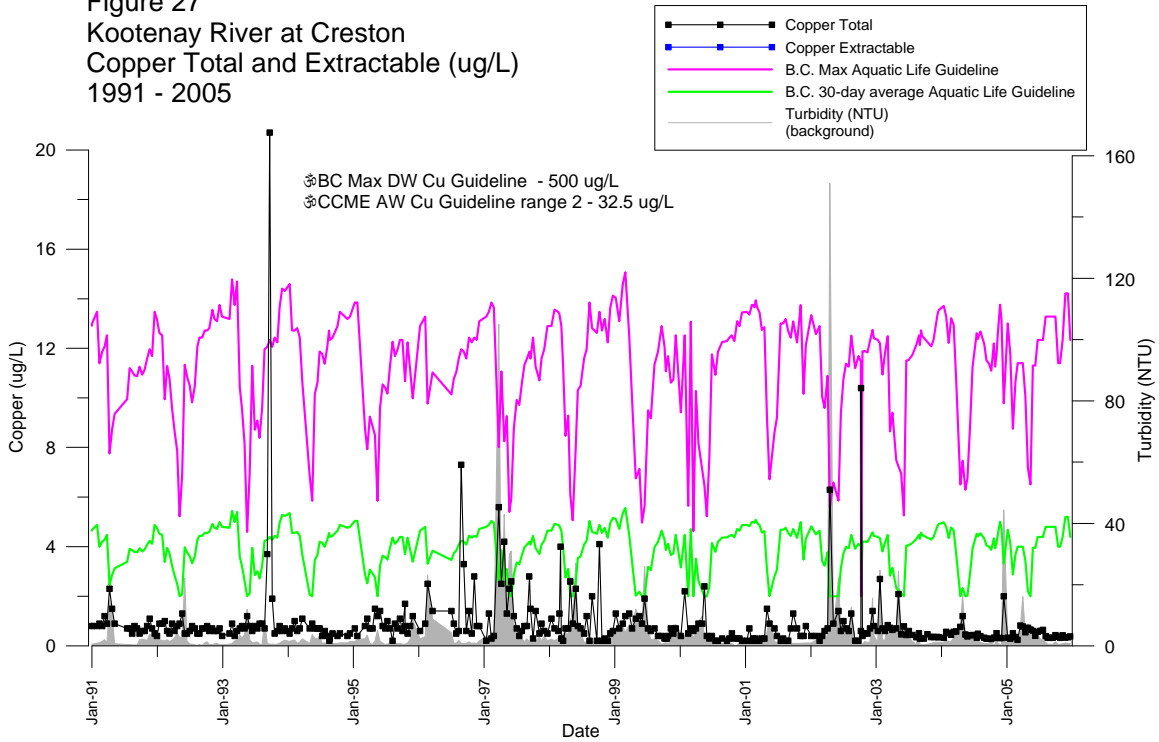


Figure 28  
Kootenay River at Creston  
Fluoride Dissolved and Total

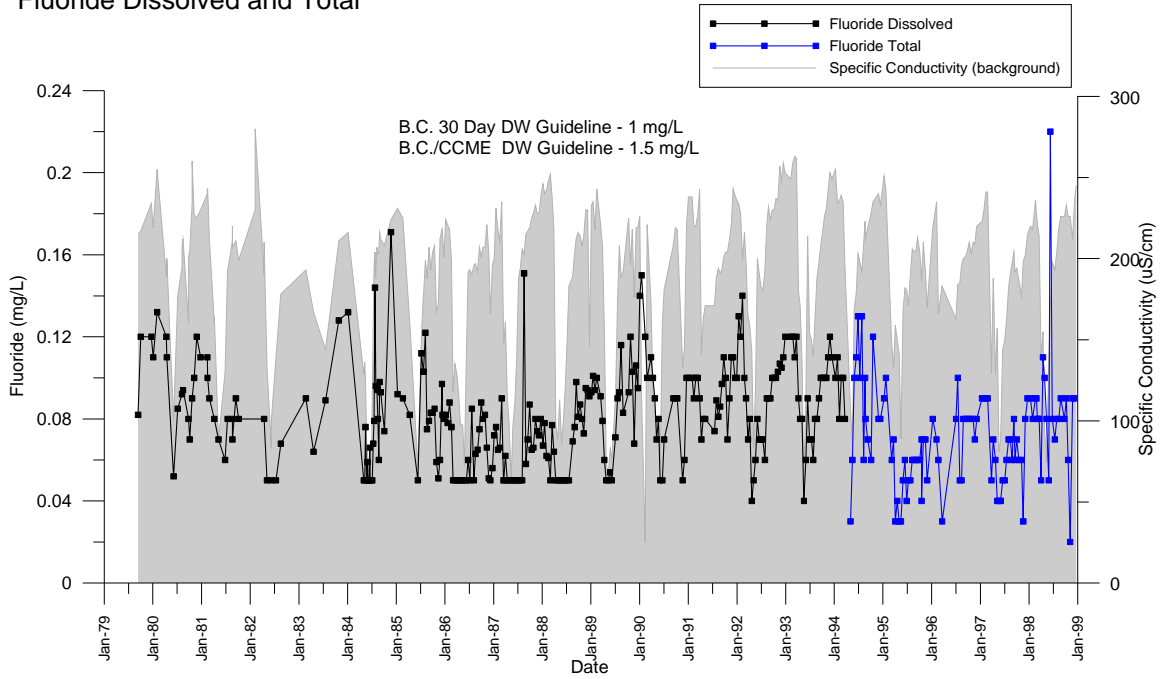


Figure 29  
Kootenay River at Creston  
Total Gallium (ug/L)

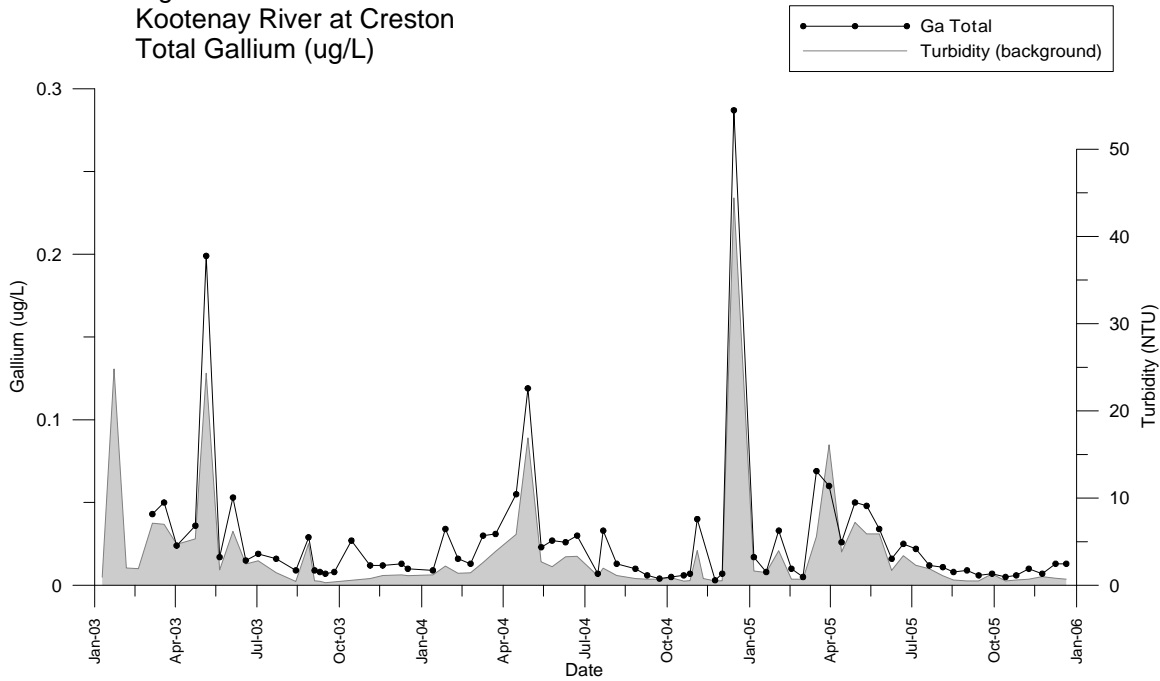


Figure 30  
Kootenay River at Creston  
Hardness Total

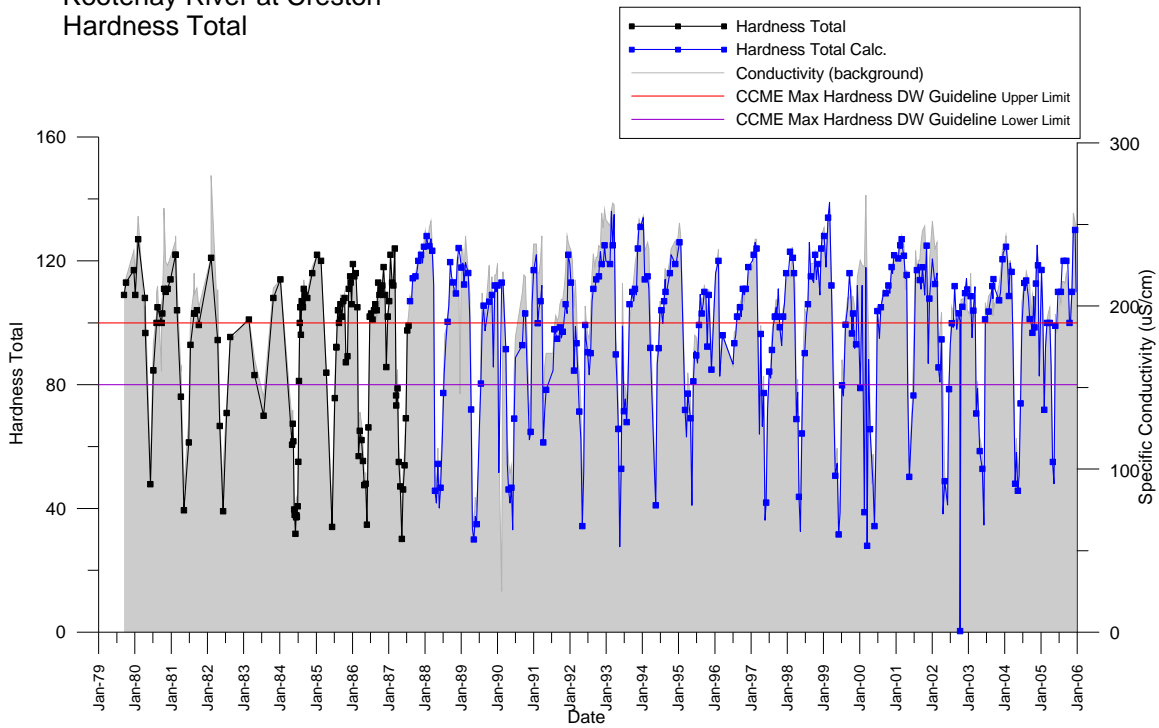


Figure 31  
Kootenay River at Creston  
Iron Total and Extractable

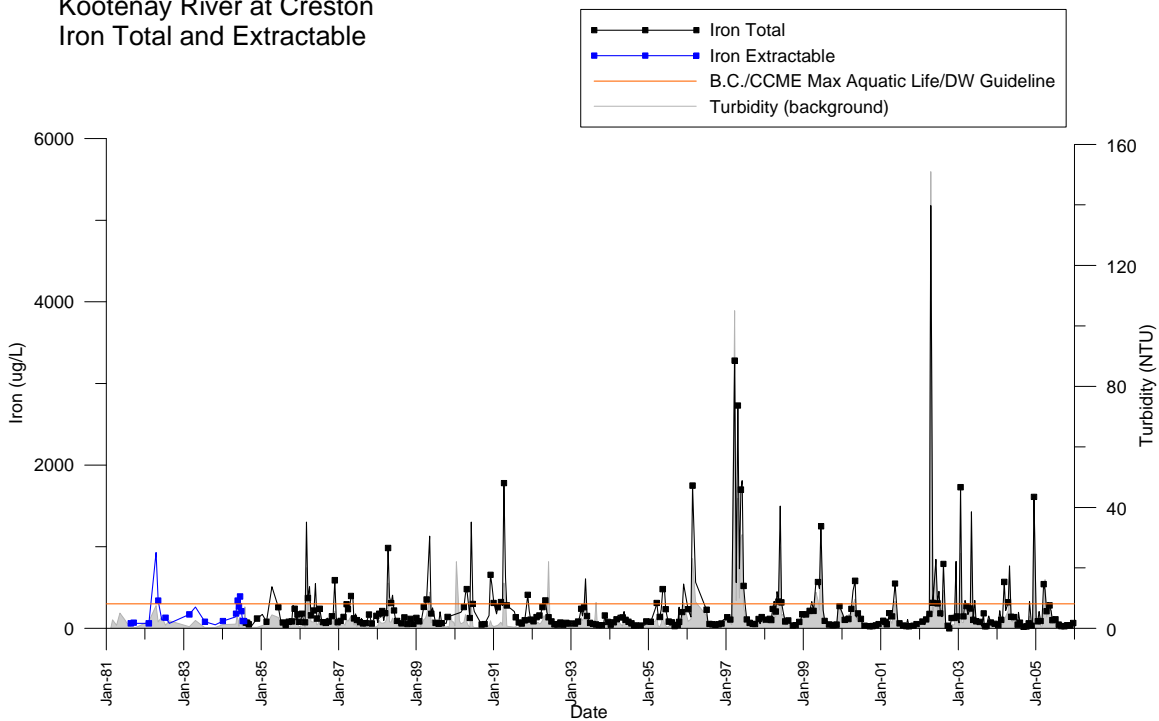




Figure 32  
Kootenay River at Creston  
Lead Total and Extractable (ug/L)

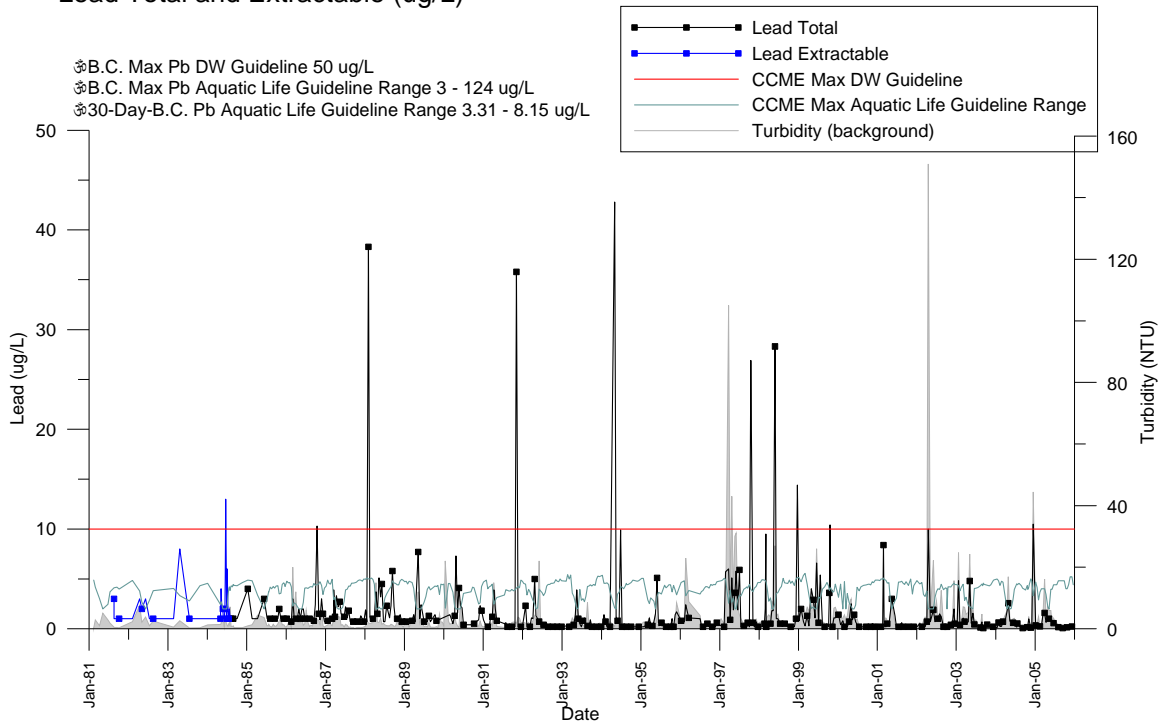
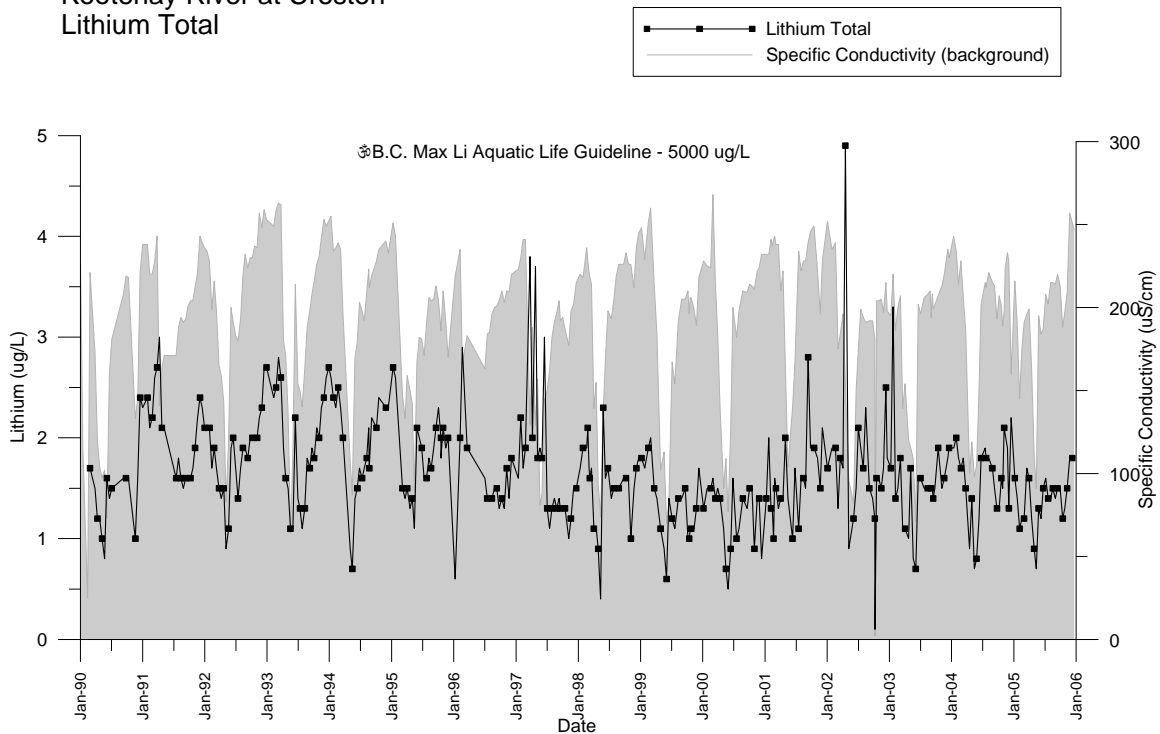
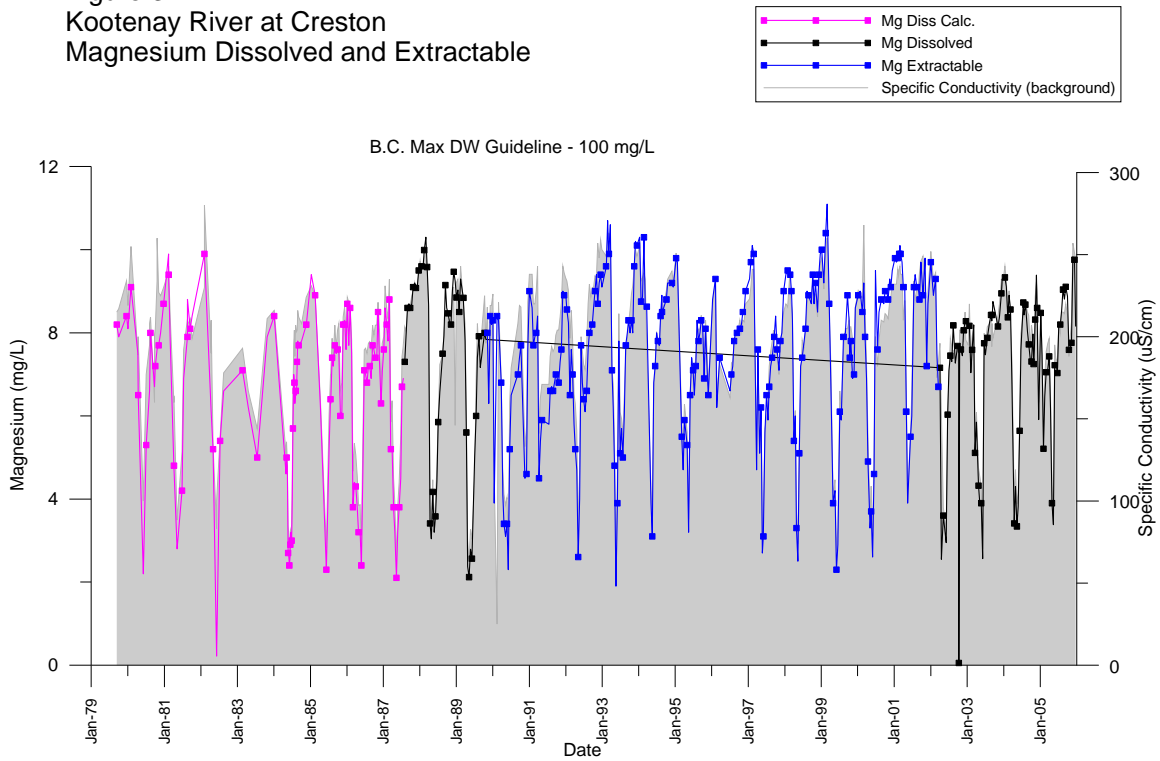


Figure 33  
Kootenay River at Creston  
Lithium Total

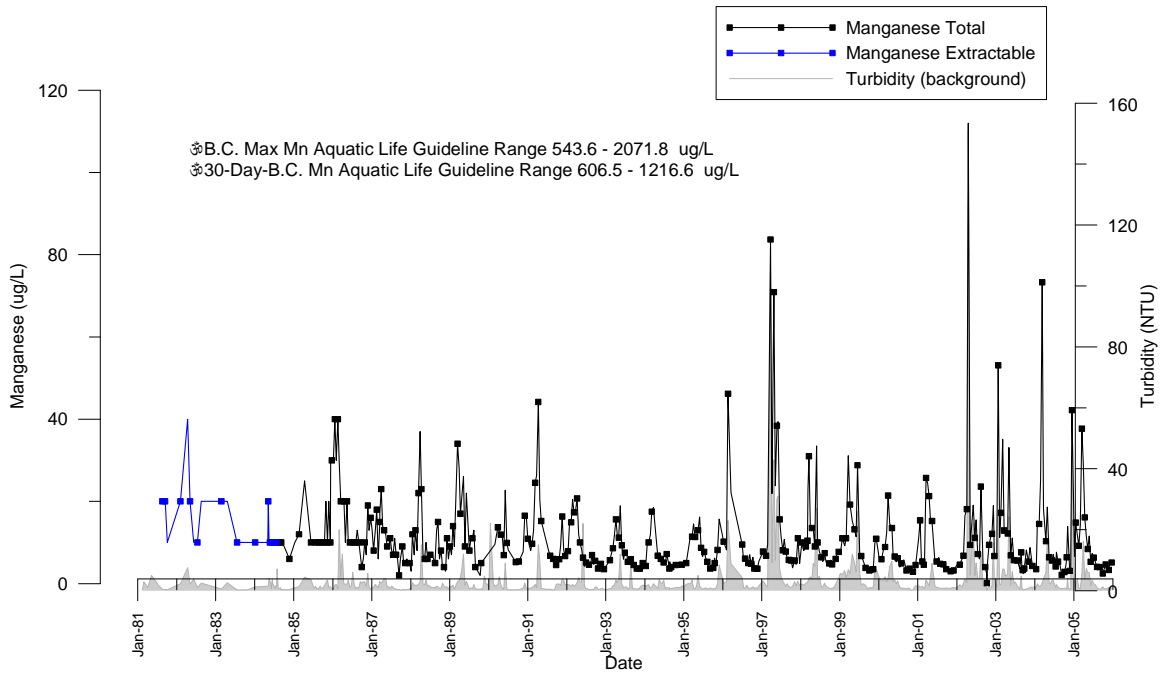


# Water Quality Assessment of the Kootenay River at Creston 1979-2005

**Figure 34**  
Kootenay River at Creston  
Magnesium Dissolved and Extractable



**Figure 35**  
Kootenay River at Creston  
Manganese Total and Extractable



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 36  
Kootenay River at Creston  
Mercury Total and Extractable

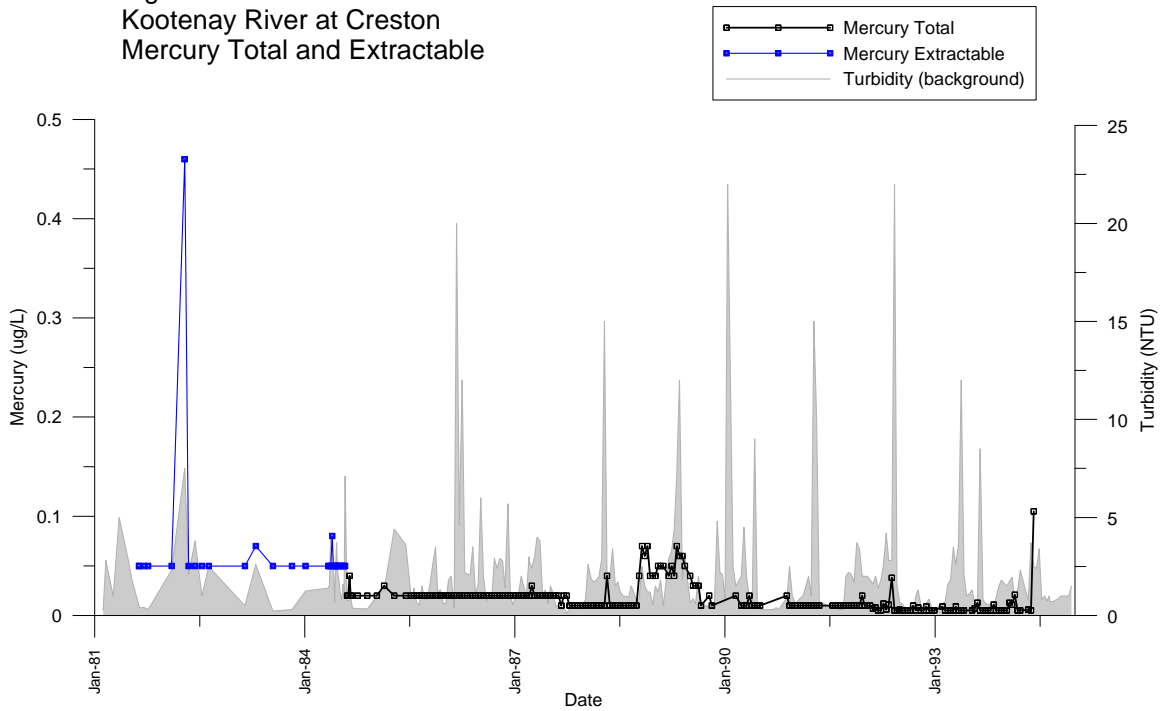


Figure 37  
Kootenay River at Creston  
Molybdenum Total

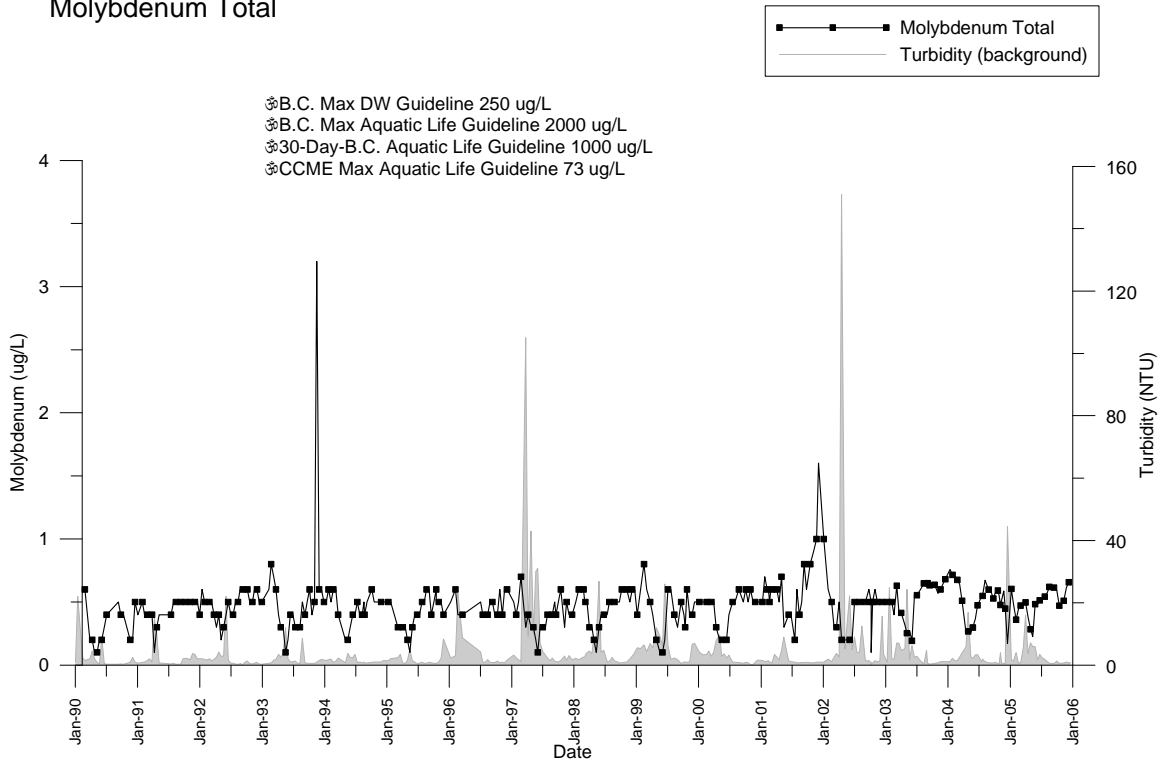


Figure 38  
Kootenay River at Creston  
Nickel Total (ug/L)

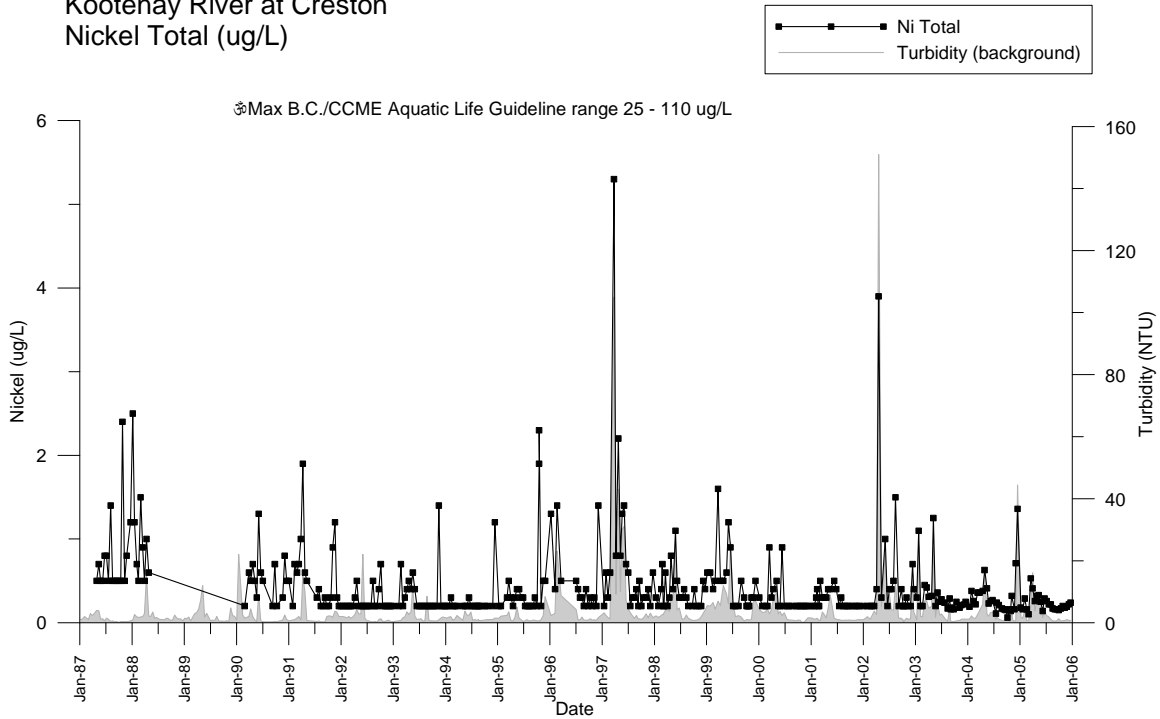


Figure 39  
Kootenay River at Creston  
Nitrogen Dissolved Nitrate

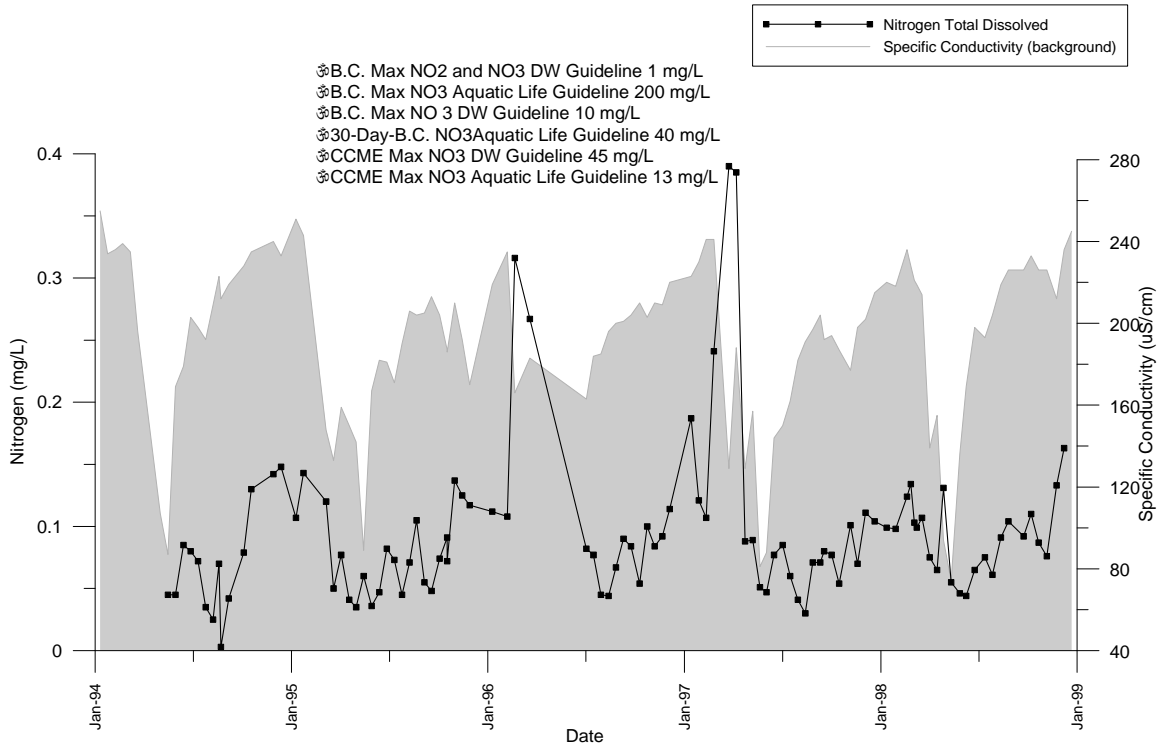


Figure 40  
Kootenay River at Creston  
Nitrogen Dissolved NO<sub>2</sub> and NO<sub>3</sub>

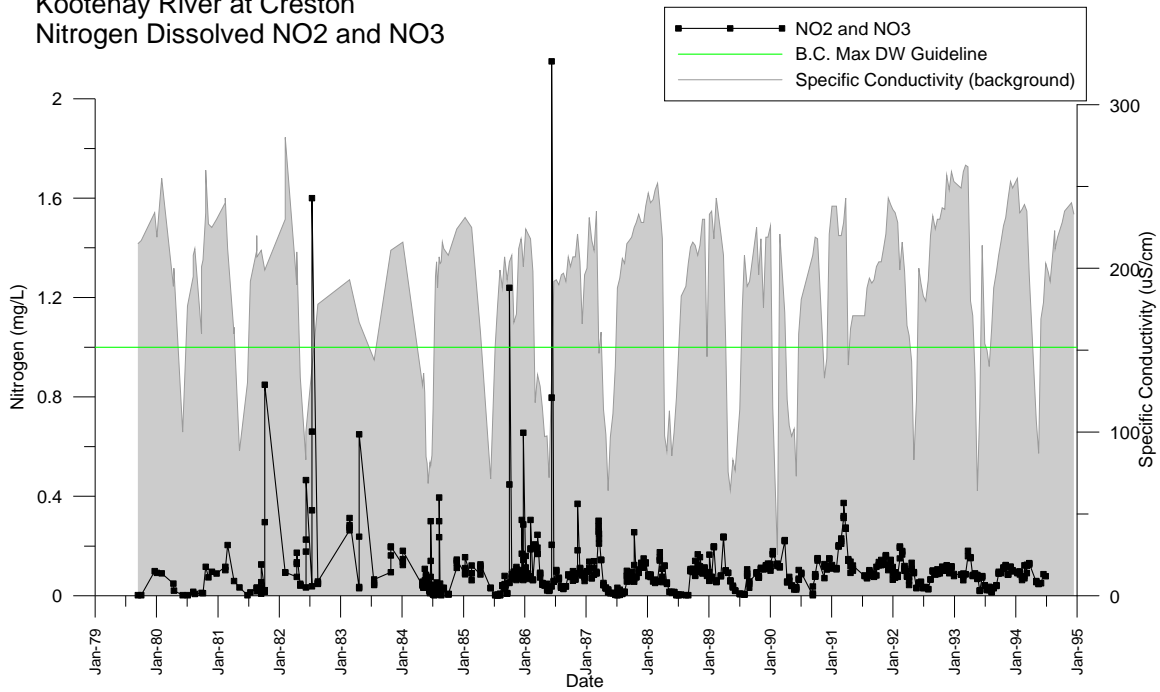


Figure 41  
Kootenay River at Creston  
Nitrogen Nitrite (mg/L)

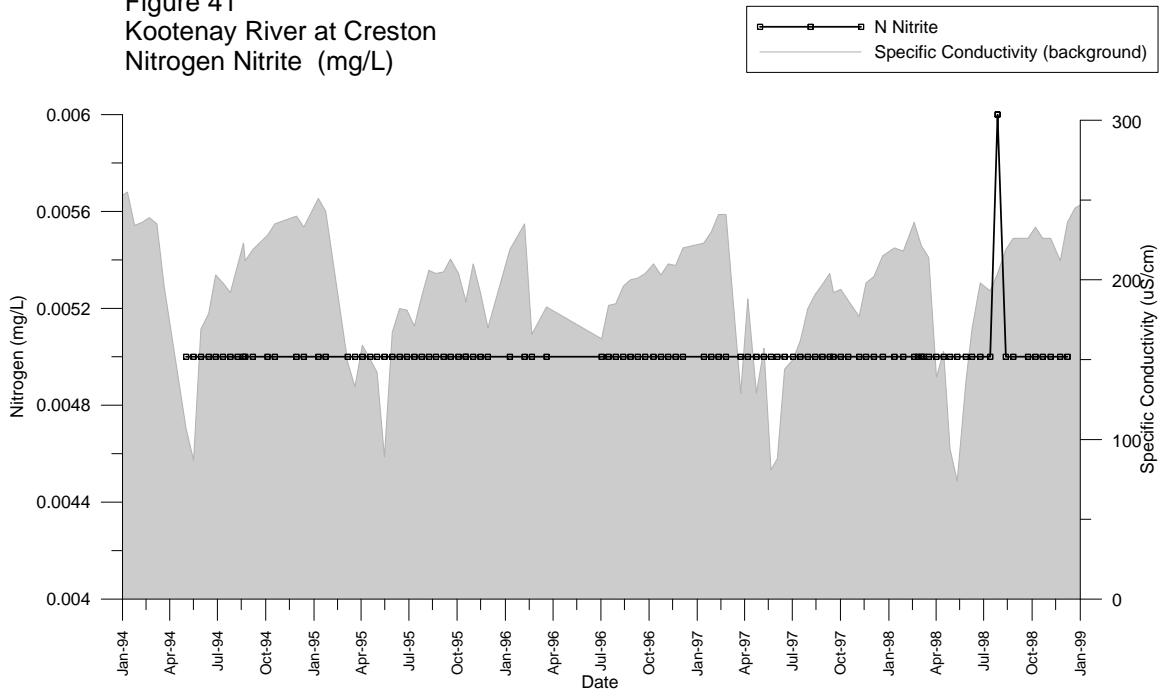


Figure 42  
Kootenay River at Creston  
Nitrogen Total Dissolved

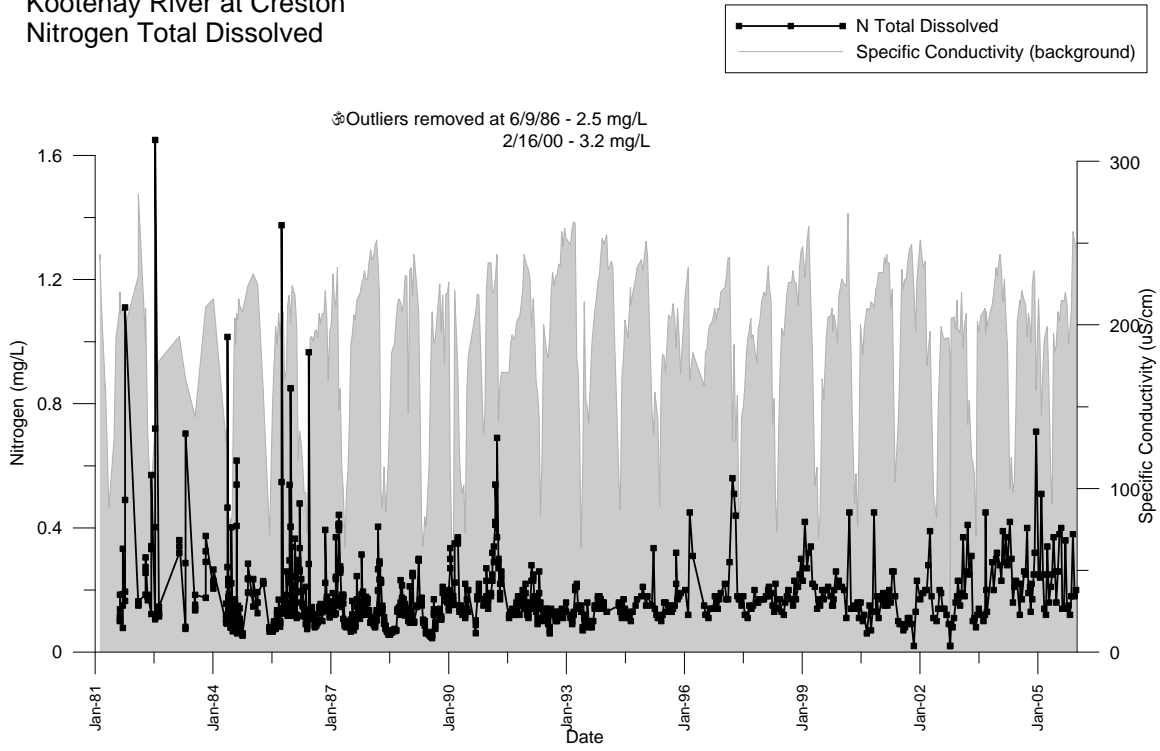
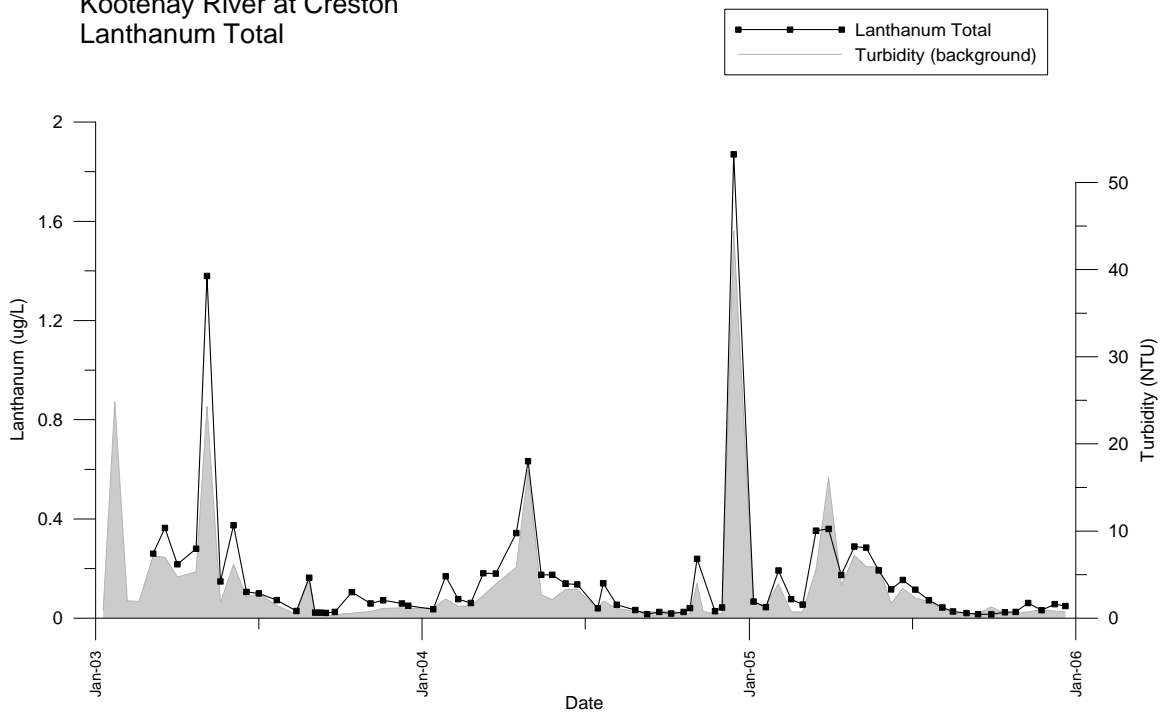


Figure 43  
Kootenay River at Creston  
Lanthanum Total



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 44  
Kootenay River at Creston  
pH

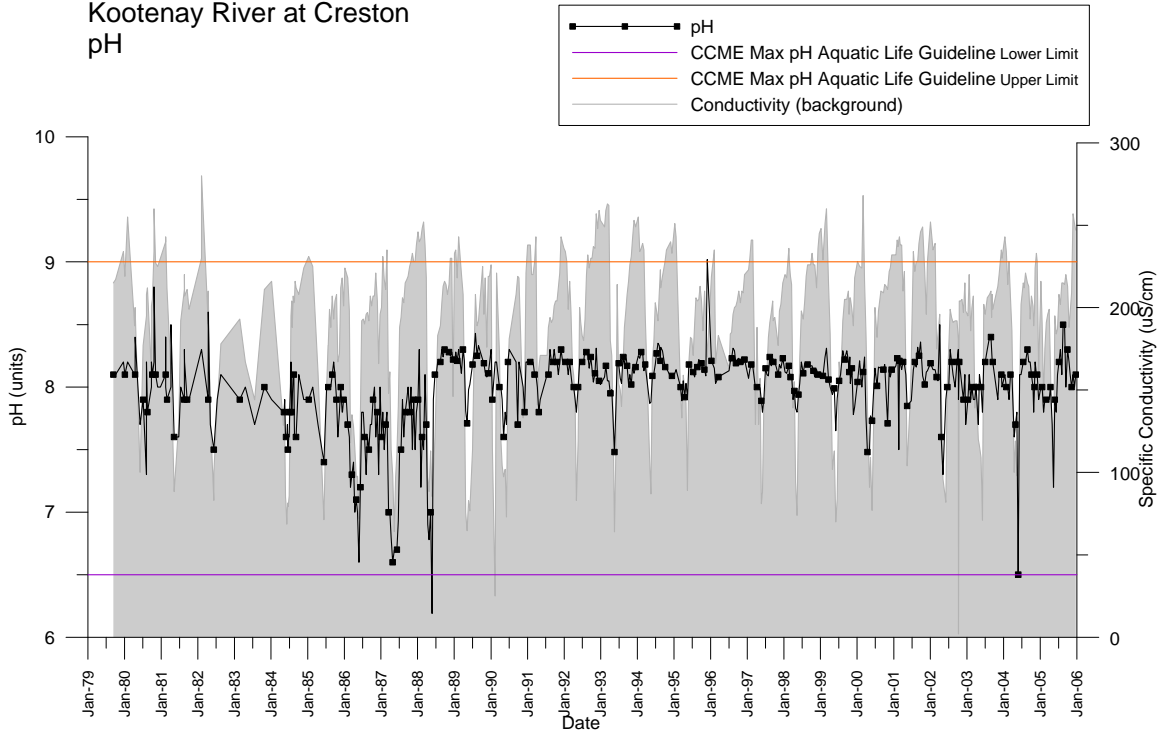
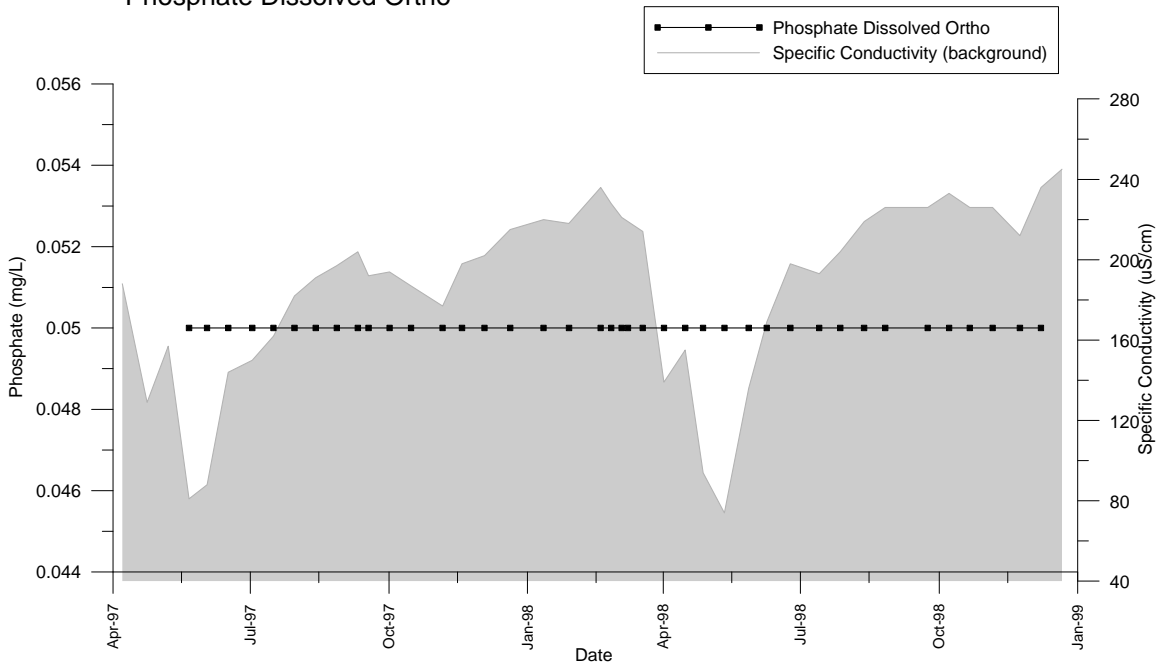


Figure 45  
Kootenay River at Creston  
Phosphate Dissolved Ortho



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 46  
Kootenay River at Creston  
Phosphorus Dissolved Ortho

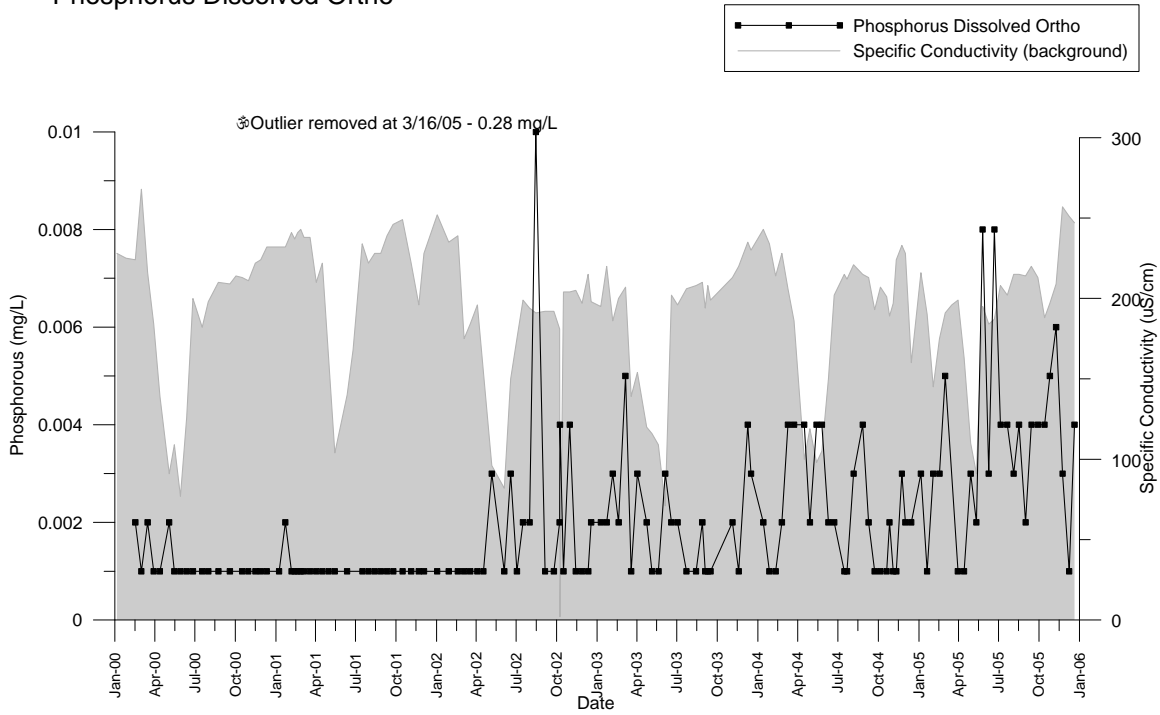
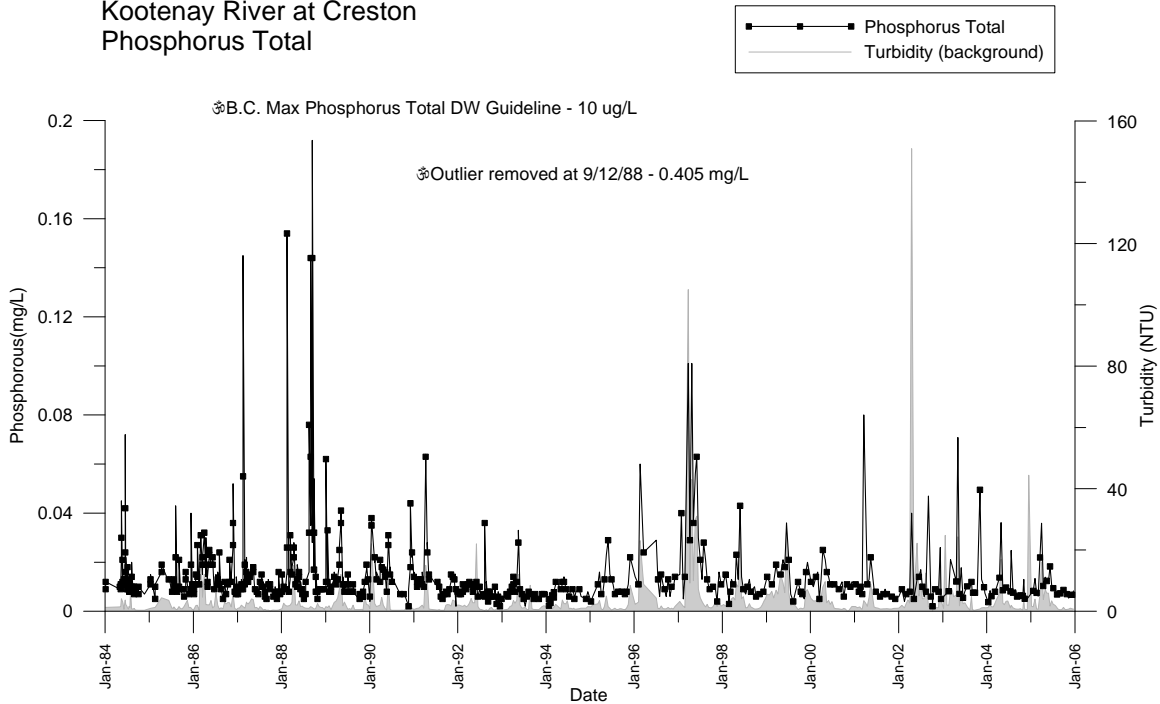


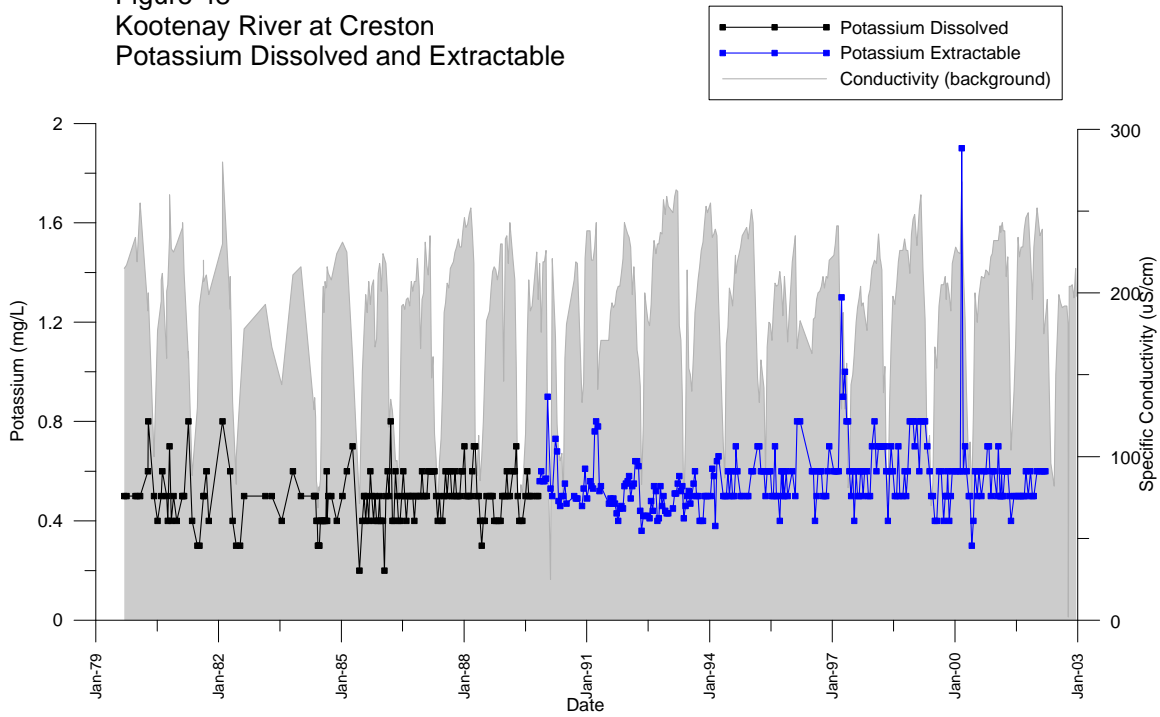
Figure 47  
Kootenay River at Creston  
Phosphorus Total



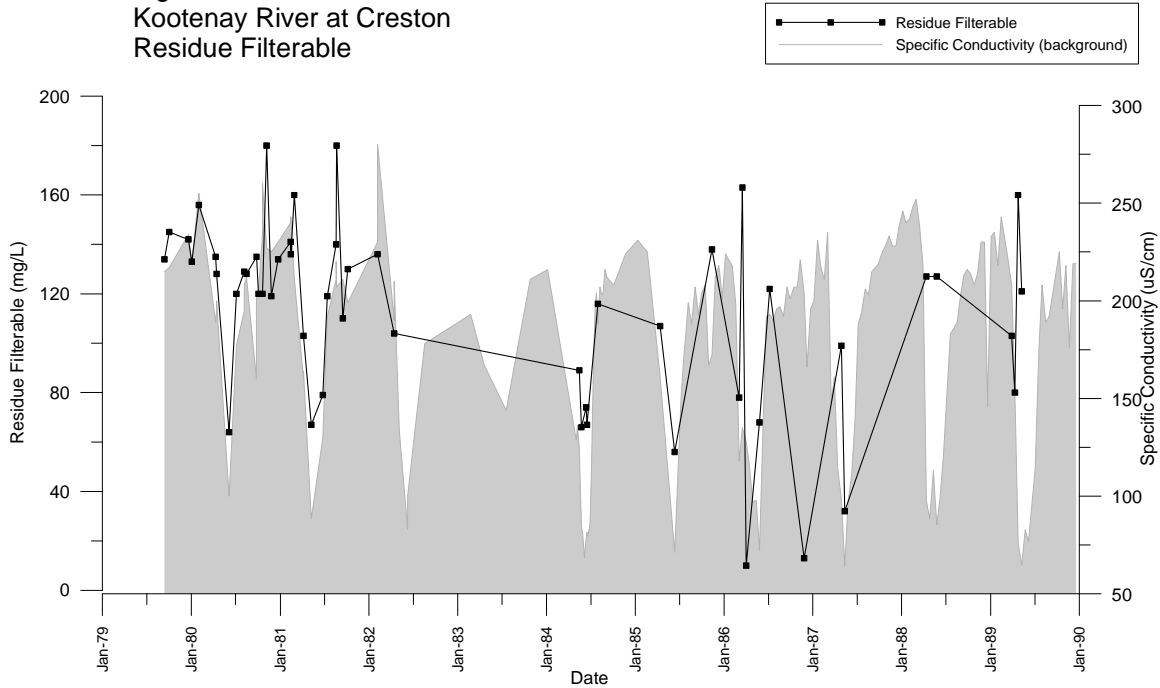


# Water Quality Assessment of the Kootenay River at Creston 1979-2005

**Figure 48**  
Kootenay River at Creston  
Potassium Dissolved and Extractable

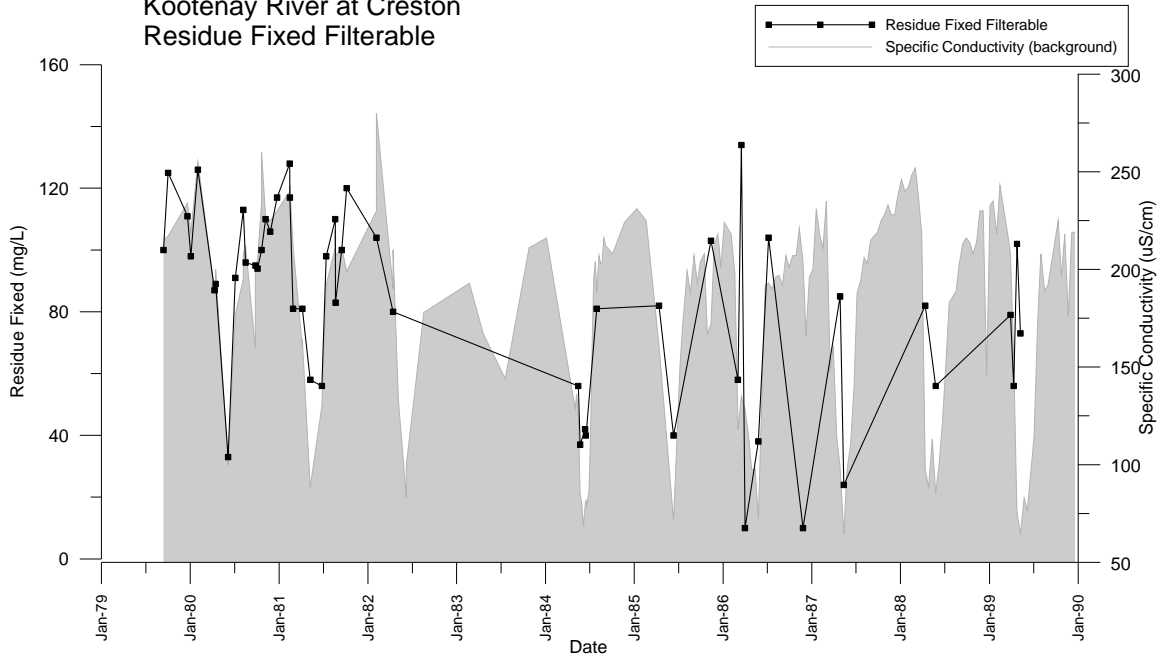


**Figure 49**  
Kootenay River at Creston  
Residue Filterable



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

**Figure 50**  
Kootenay River at Creston  
Residue Fixed Filterable



**Figure 51**  
Kootenay River at Creston  
Residue Fixed Non-Filterable

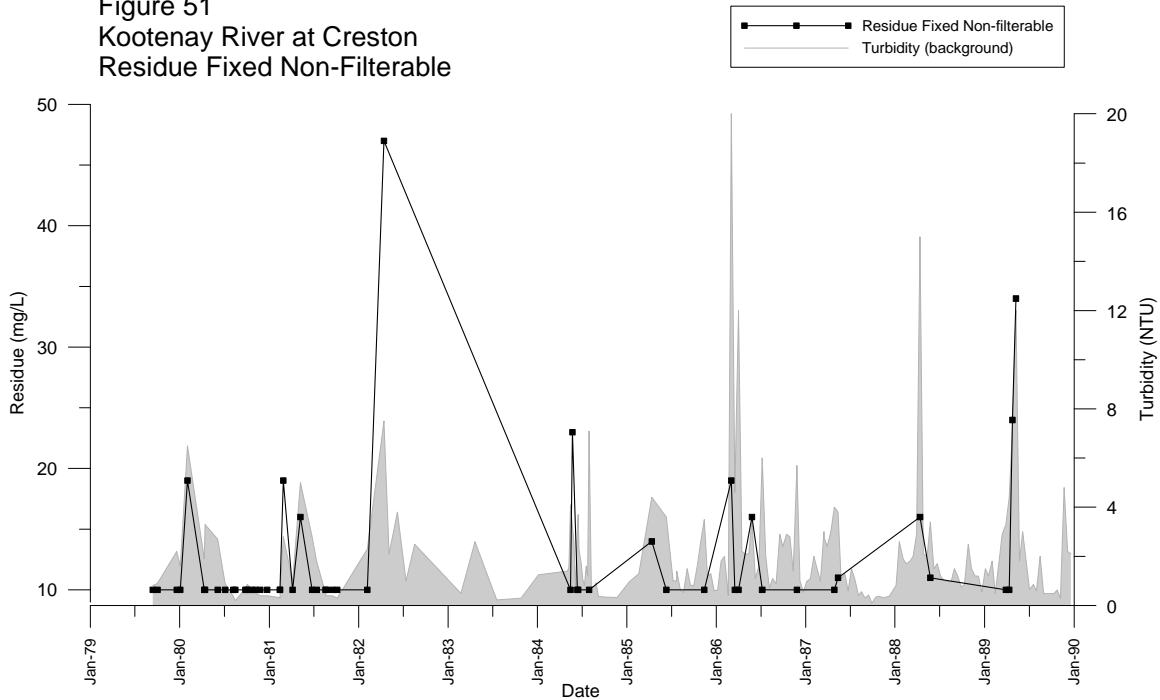


Figure 52  
Kootenay River at Creston  
Residue Non-filterable

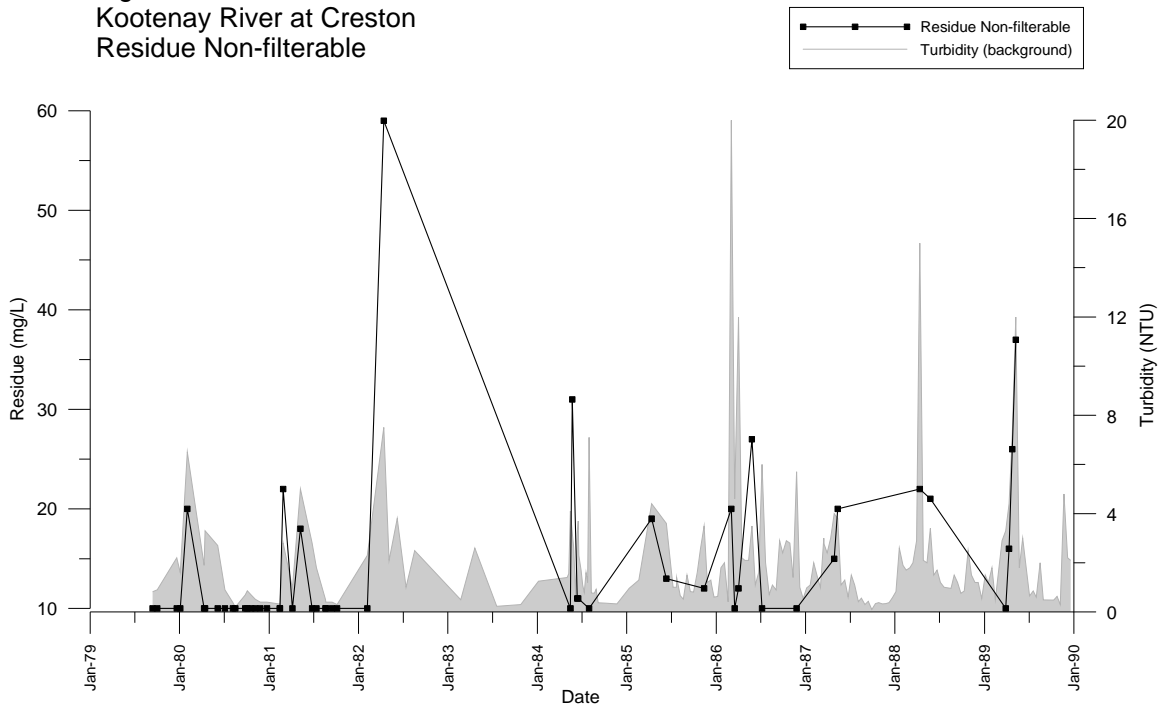


Figure 53  
Kootenay River at Creston  
Rubidium Total (ug/L)

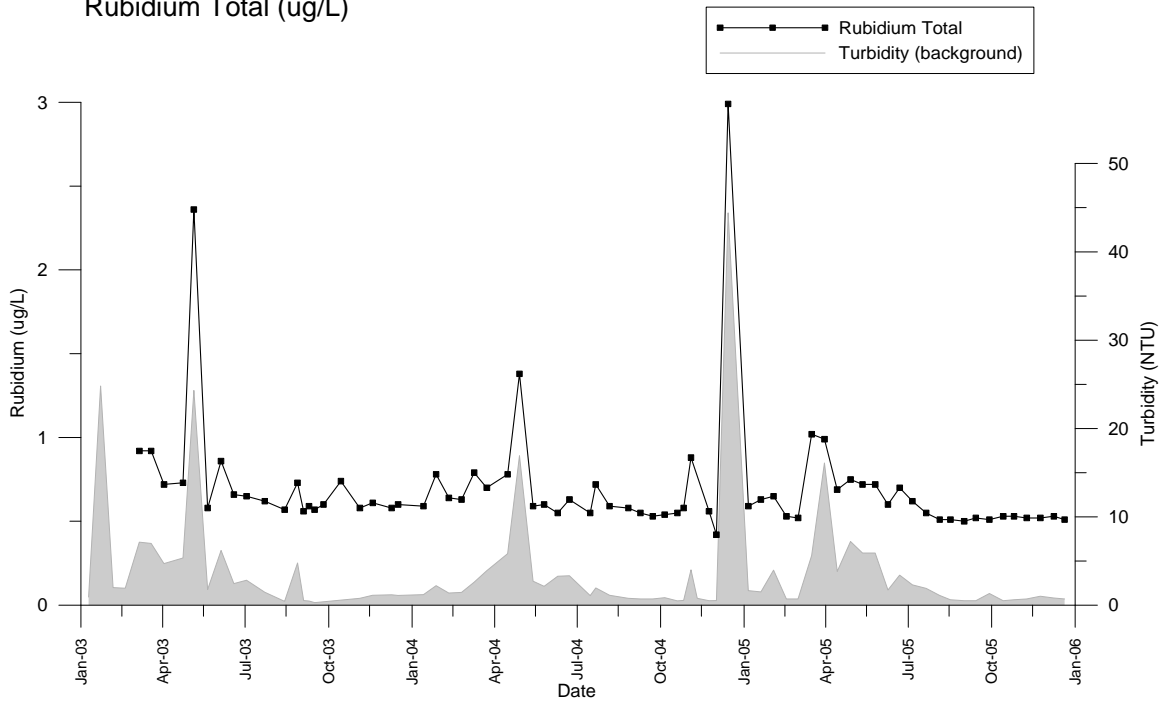


Figure 54  
Kootenay River at Creston  
Selenium Total and Extractable

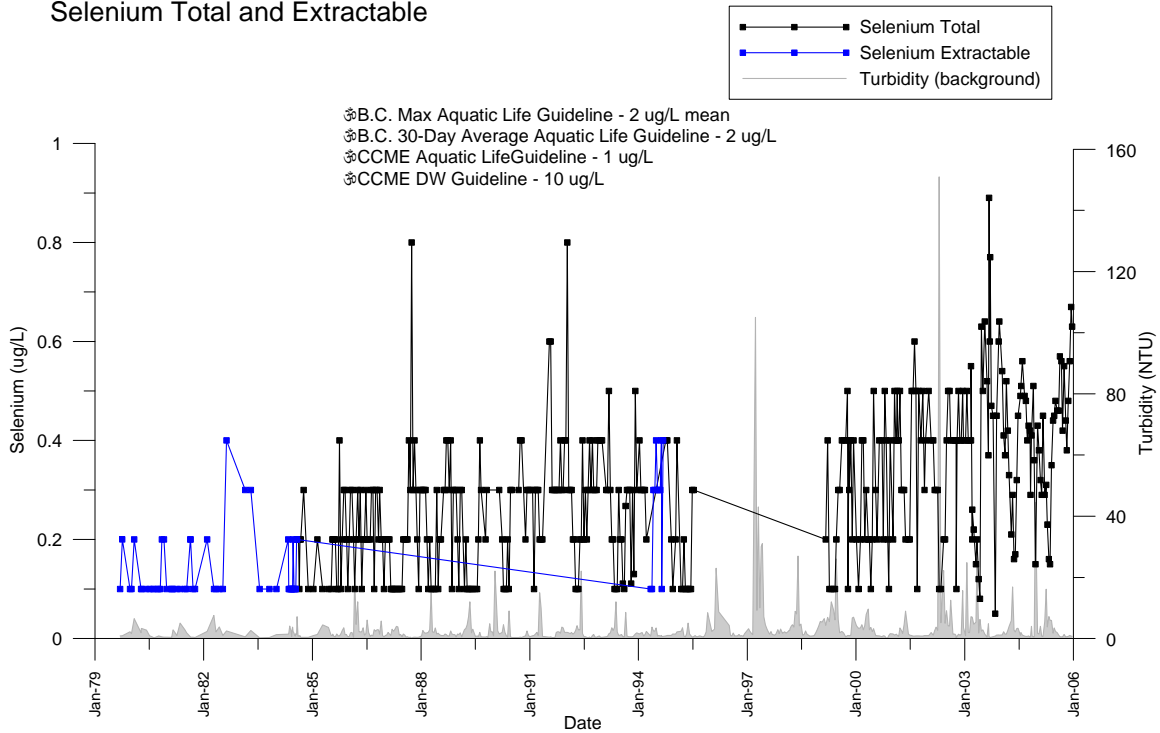
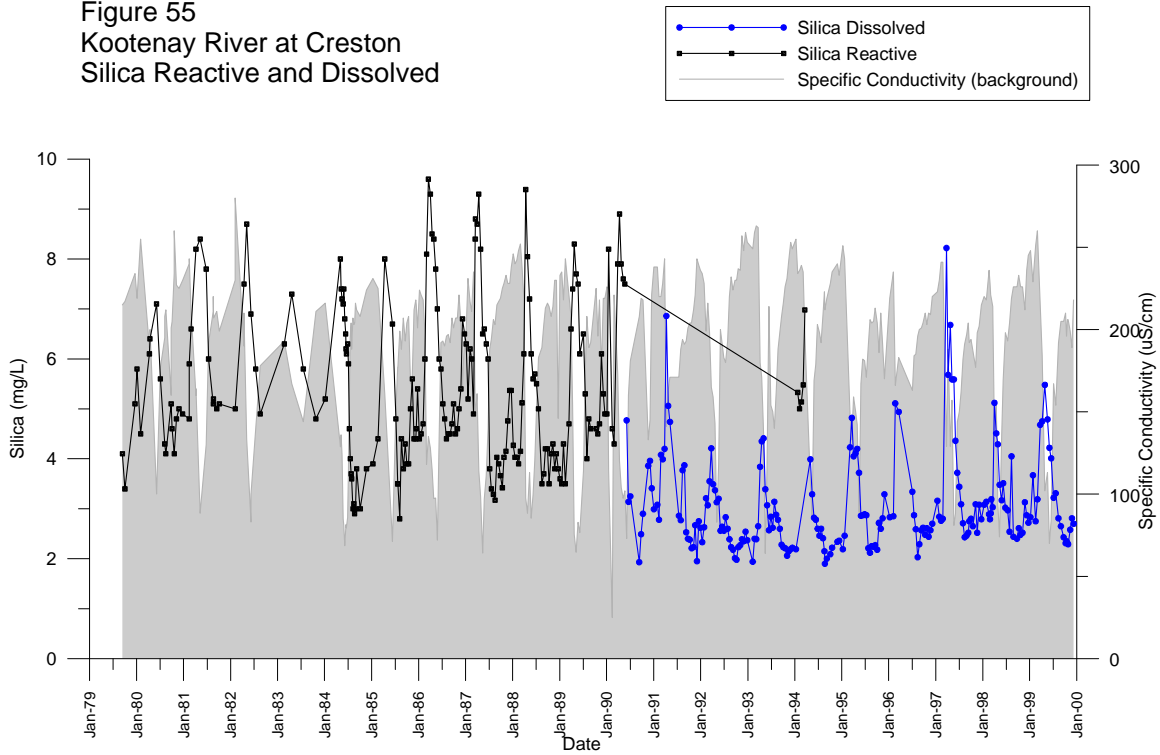


Figure 55  
Kootenay River at Creston  
Silica Reactive and Dissolved



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 56  
Kootenay River at Creston  
Silicon Extractable (mg/L)

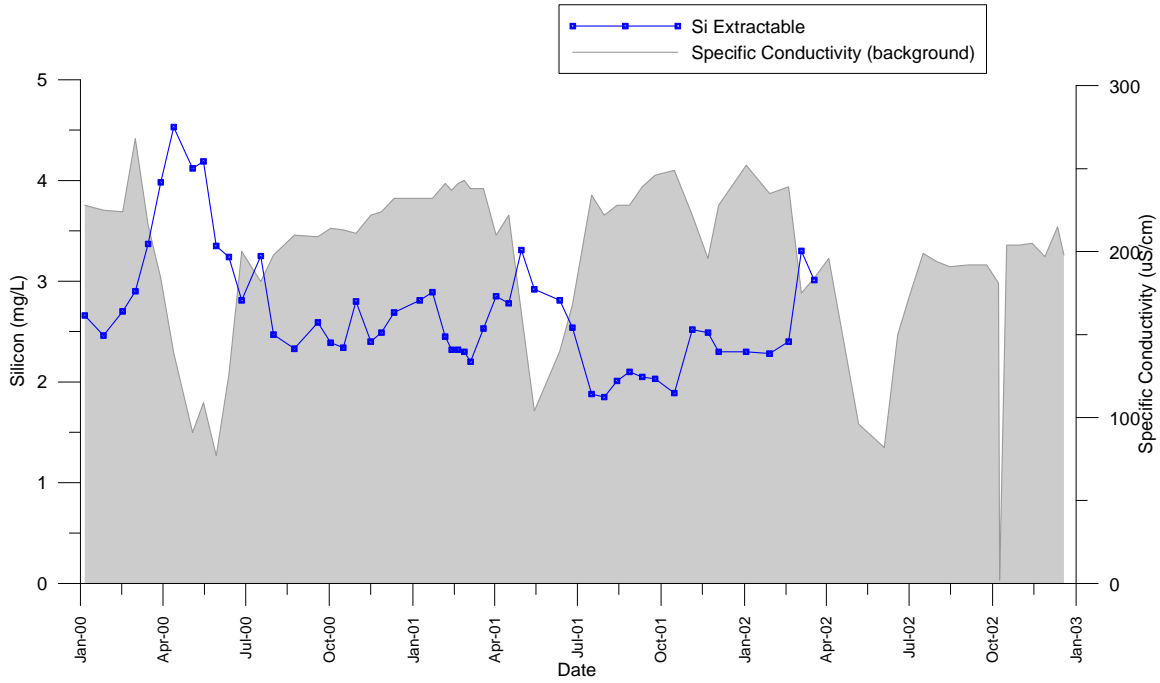
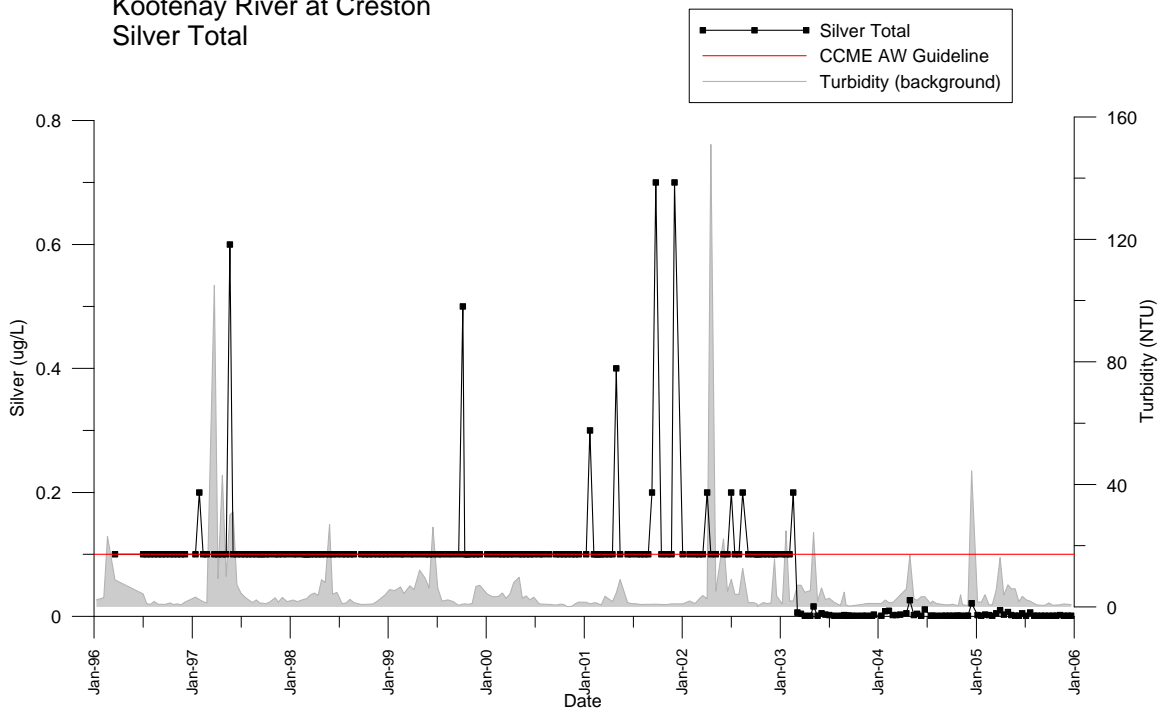
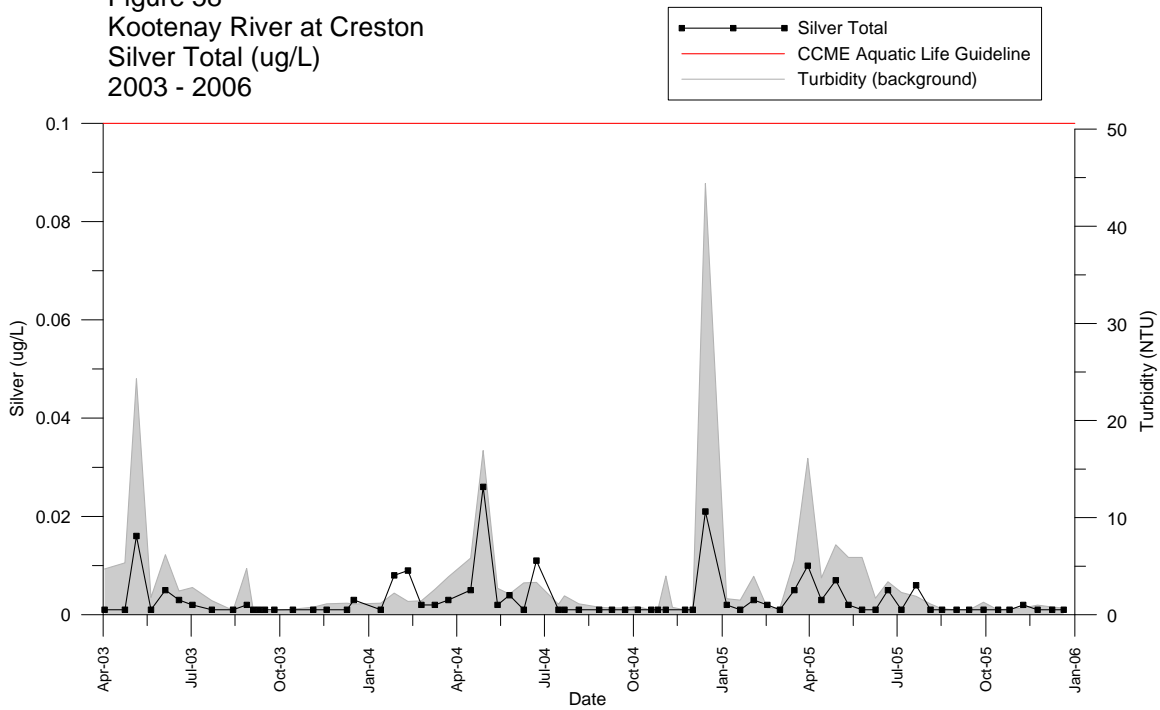


Figure 57  
Kootenay River at Creston  
Silver Total

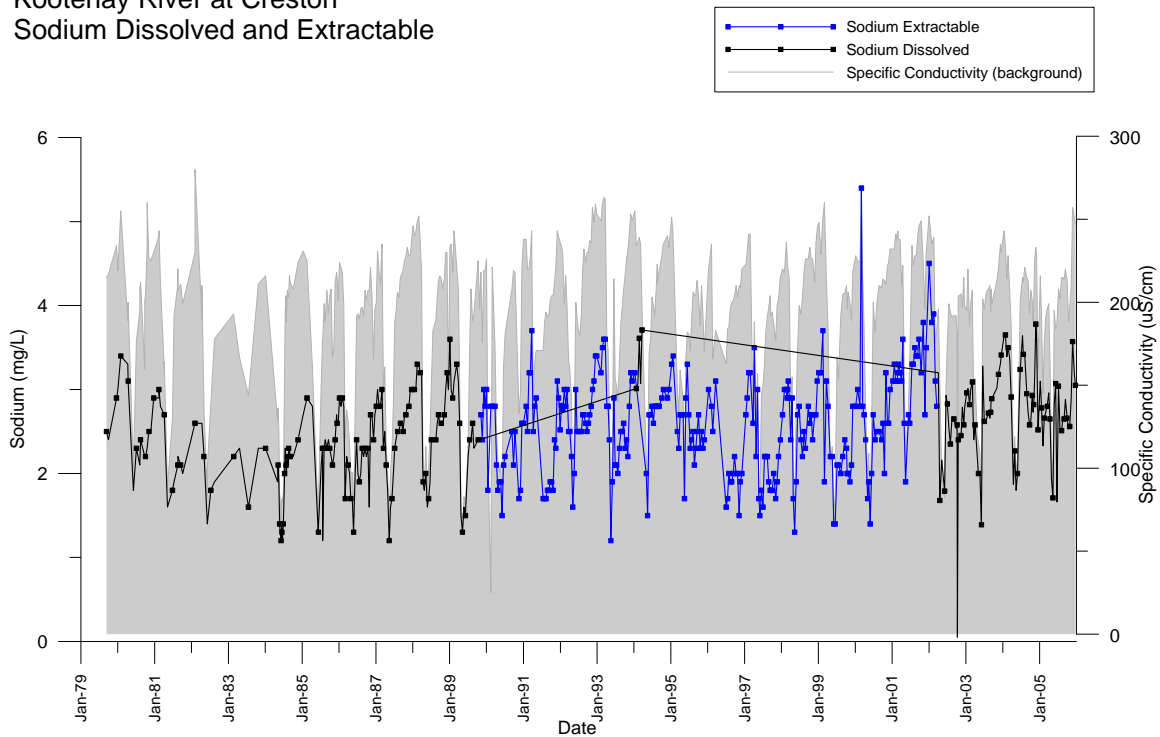


# Water Quality Assessment of the Kootenay River at Creston 1979-2005

**Figure 58**  
Kootenay River at Creston  
Silver Total (ug/L)  
2003 - 2006



**Figure 59**  
Kootenay River at Creston  
Sodium Dissolved and Extractable



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 60  
Kootenay River at Creston  
Specific Conductivity (uS/cm)

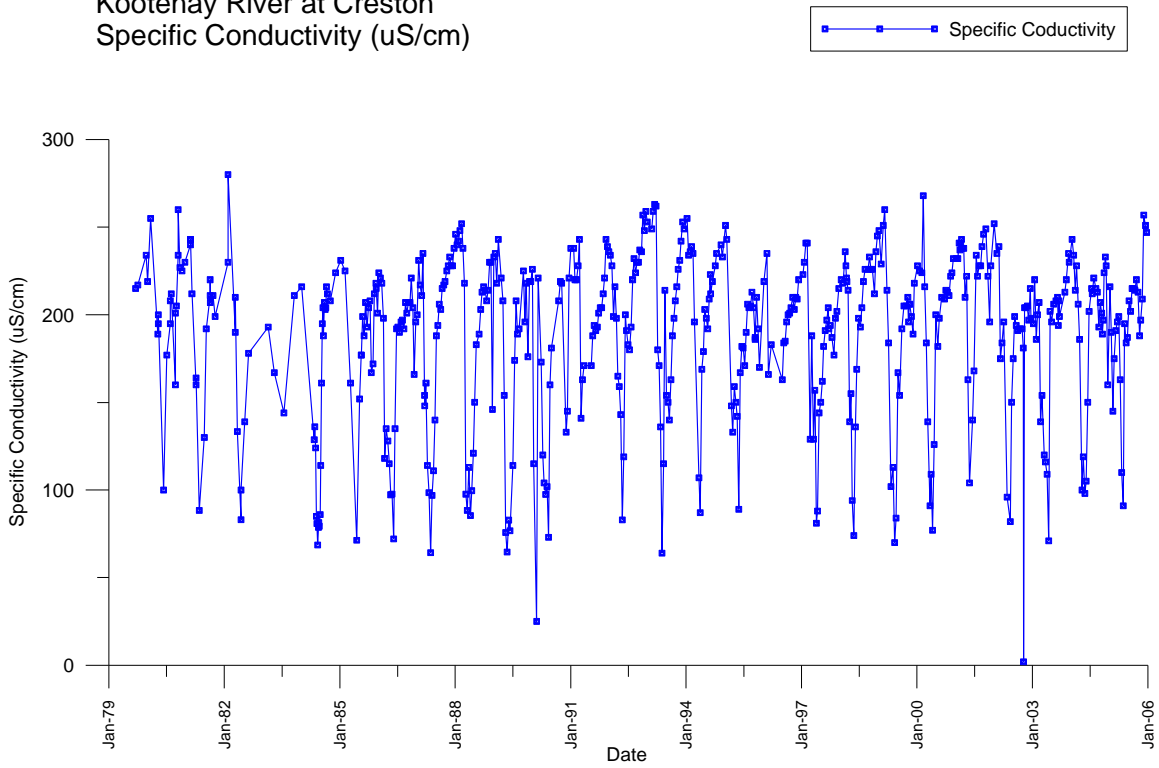
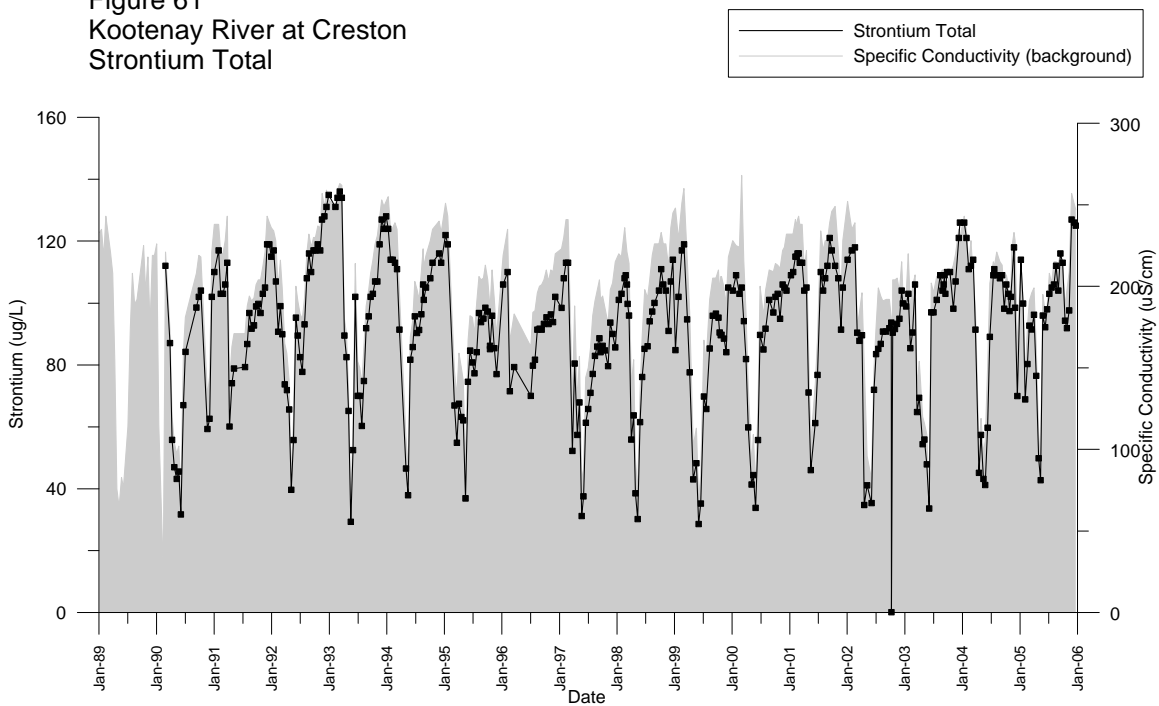


Figure 61  
Kootenay River at Creston  
Strontium Total



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 62  
Kootenay River at Creston  
Sulphate Dissolved

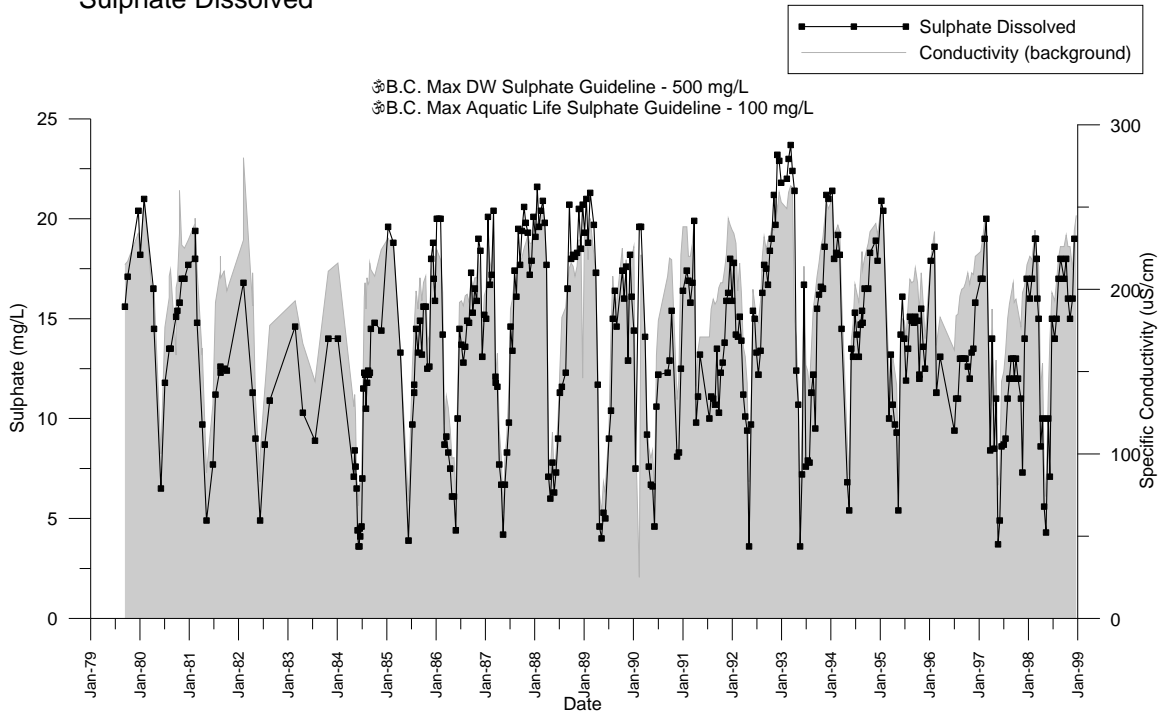
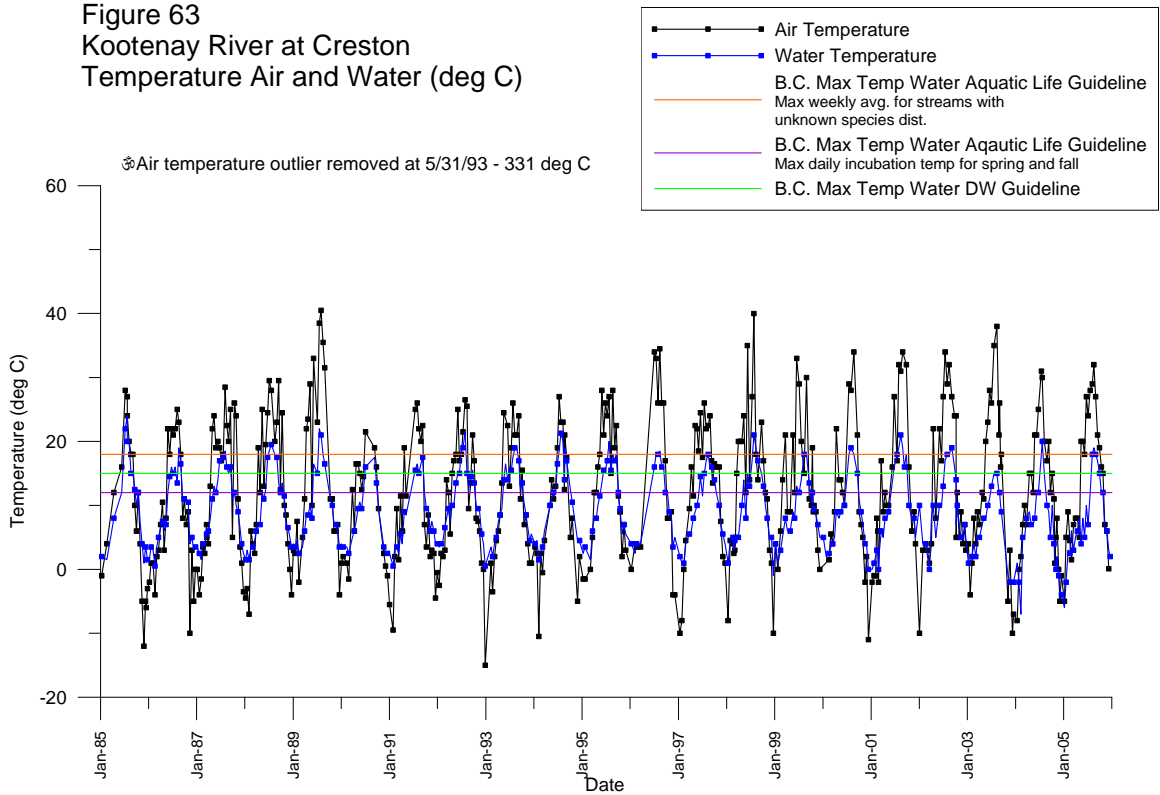


Figure 63  
Kootenay River at Creston  
Temperature Air and Water (deg C)





# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 64  
Kootenay River at Creston  
Thallium Total

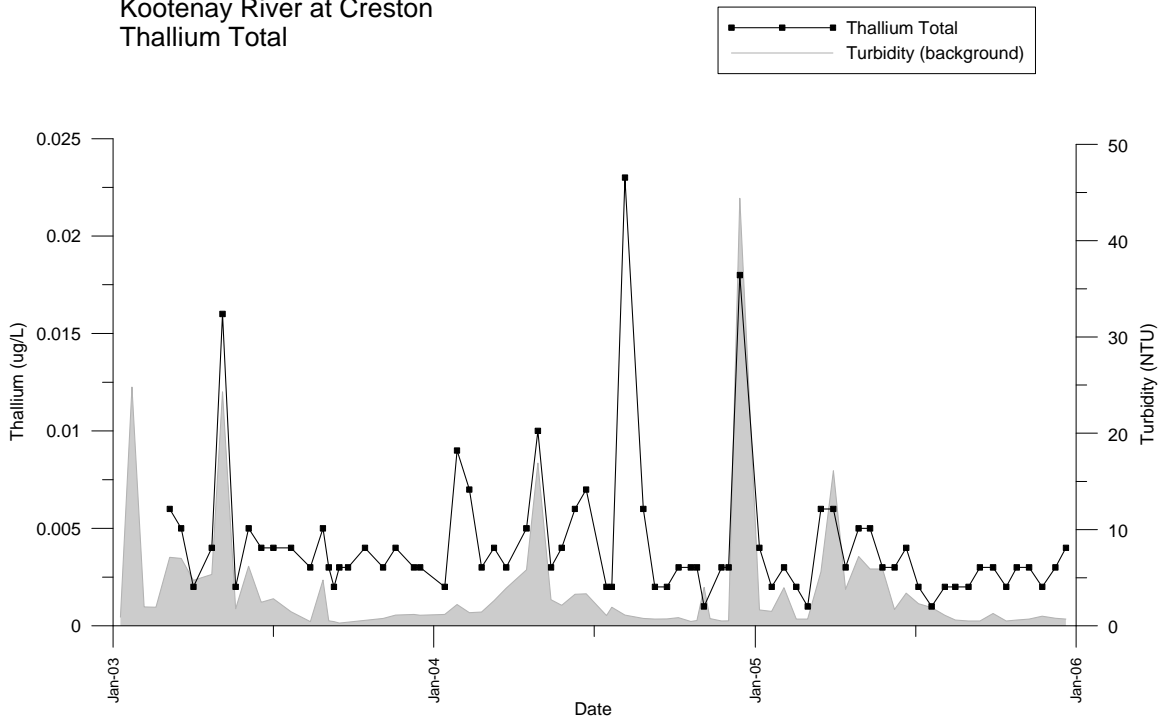


Figure 65  
Kootenay River at Creston  
Tin Total

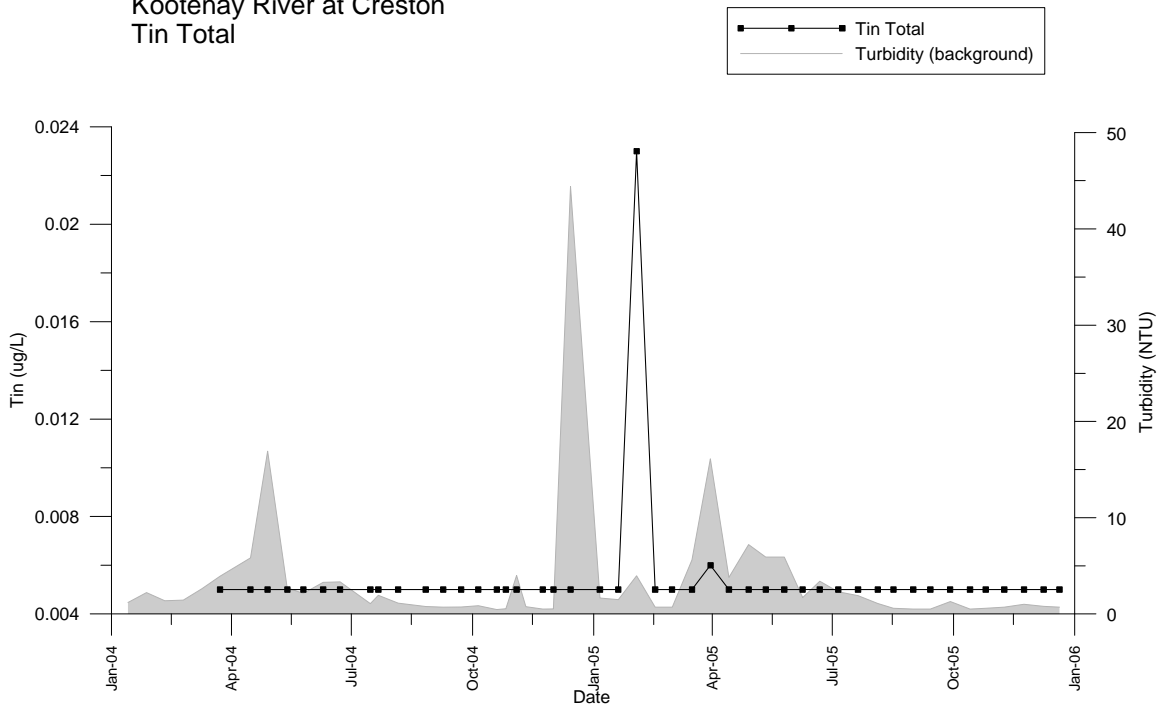


Figure 66  
Kootenay River at Creston  
Turbidity

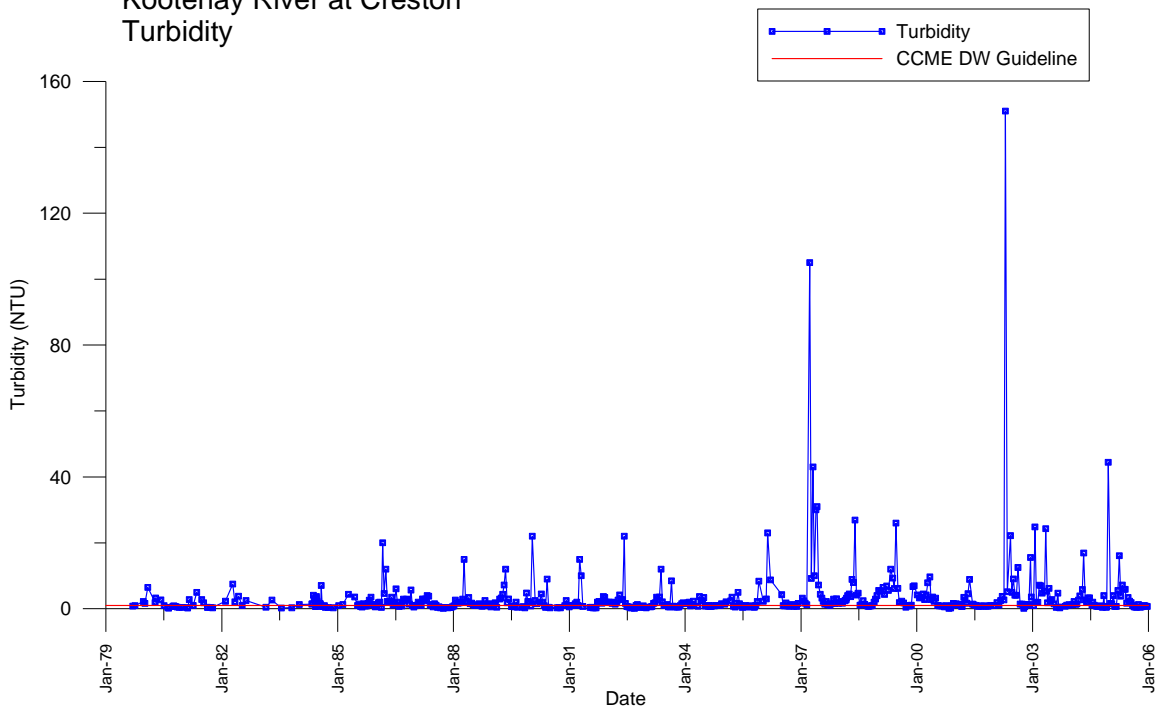
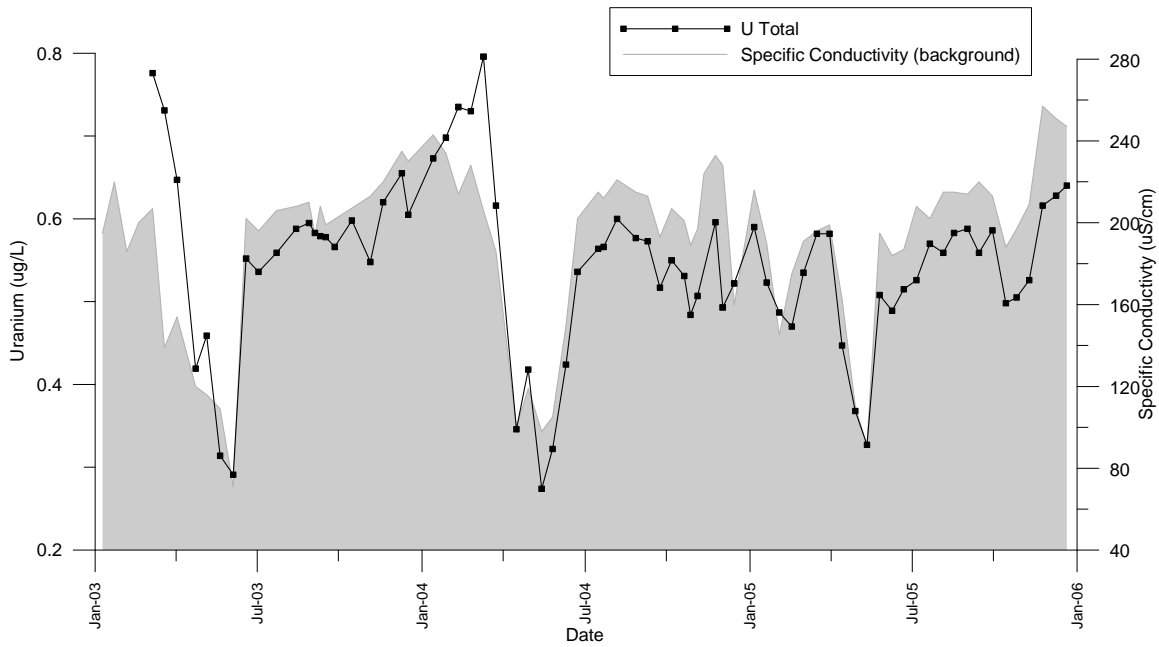


Figure 67  
Kootenay River at Creston  
Uranium Total



# Water Quality Assessment of the Kootenay River at Creston 1979-2005

Figure 68  
Kootenay River at Creston  
Vanadium Total

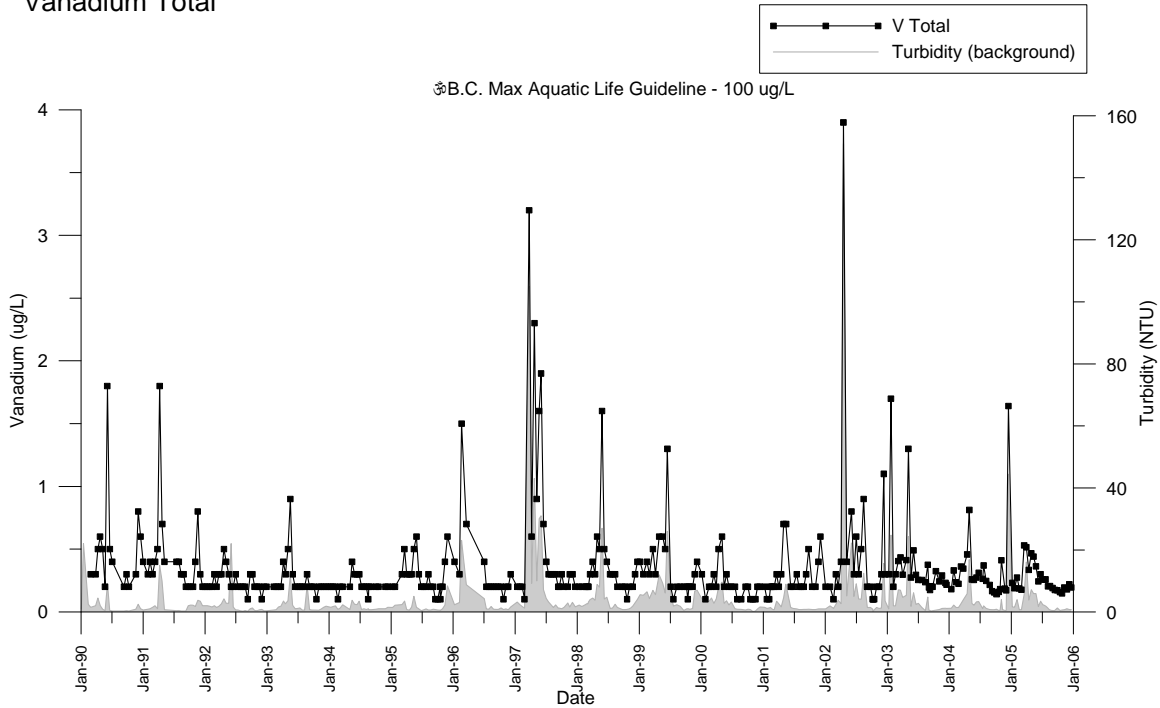


Figure 69  
Kootenay River at Creston  
Zinc Total and Extractable

