Water Quality Study of Waiparous Creek, Fallentimber Creek and Ghost River

Final Report
Prepared by:

Daniel Andrews Ph.D.
Clearwater Environmental Consultants Inc.

Prepared for:

Alberta Environment

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1510 Kensington Road N.W.
Calgary, Alberta T2N 4P2
P 403.214.7545
F 403.270.0640
www.clearwaterenv.ca

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Any comments, questions, or suggestions regarding the content of this document may be directed to:

Environmental Management
Southern Region
Alberta Environment
3rd Floor, Deerfoot Square
2938 – 11th Street, N.E.
Calgary, Alberta T3E 7L7
Phone: (403) 297-5921
Fax: (403) 297-6069

Additional copies of this document may be obtained by contacting:

Information Centre
Alberta Environment
Main Floor, Oxbridge Place
9820 – 106th Street
Edmonton, Alberta T5K 2J6
Phone: (780) 427-2700
Fax: (780) 422-4086
Email: env.infocent@gov.ab.ca

EXECUTIVE SUMMARY

Increased usage of the Ghost -Waiparous basin for random camping and off-highway vehicles (OHVs) has raised concerns among stakeholders that these activities are affecting water quality in the Ghost, Waiparous and Fallentimber Rivers. This report to Alberta Environment attempts to determine whether there is a linkage between these activities and water quality in these three rivers and documents baseline water quality prior to the implementation of an access management plan by the Alberta Government.

Water quality monitoring of these rivers was conducted by Alberta Environment during 2004 and 2005. Continuous measurements of turbidity (as a surrogate for total suspended solids), pH, conductivity, dissolved oxygen and temperature were taken in Waiparous Creek, upstream at the Black Rock Trail and downstream at the Department of National Defense base from early May to late July, 2004. These two stations encompass an extensive area of the Waiparous basin where random camping and OHV activities are common. In addition to the measurements of turbidity, monthly and bimonthly grab samples were taken at three stations along each river for a suite of parameters that included major ions, nutrients and metals. Measurements of vehicular numbers from activity monitors at three sites within the Waiparous basin were provided by Sustainable Resource Development. These measurements are thought to reflect the number of campers and OHV activity in the Waiparous drainage basin. The key parameter indicative of land disturbance and water quality degradation was total suspended solids (TSS).

The continuous measurements of TSS identified a large number of loading events with major episodes occurring on May 21-24, June 6-9, June 10-17 and June 30-July 07. These loading events corresponded closely to periods of high flow and precipitation with flow explaining 49 % of the variance in TSS. High levels of vehicular activity were associated with weekends and only with TSS episodes when rain occurred on the weekends. Downstream TSS concentrations were significantly greater than upstream concentrations and many downstream TSS loading events could not be matched to corresponding upstream events. Over the entire monitoring period (May 21 to July 26), the total loading of suspended solids at the downstream station was two orders of magnitude greater than the loading upstream (1,265,412 kg vs. 36.566 kg). TSS loading was extremely episodic in nature with 46 % of the total downstream loading occurring during one event (June 10 to 17).

The monthly/bimonthly monitoring quality parameters identified a number of peaks and upstream-downstream differences in water quality variables. Most of these differences were associated with high TSS events or normal seasonal cycling. There were very few exceedances of water quality guidelines. This monthy/bimonthly monitoring program did not record much of the detail and intensity of major TSS events.

Trend analysis did not detect any increase in TSS in the Bow River downstream of the Ghost River discharge.

Sediment loading coefficients express loading per unit area of drainage basin and permit comparison of loading between river systems. Sediment loading coefficients in the lower regions of the Waiparous and Ghost Rivers were much greater than would be expected in rivers draining a similarly forested environment in the upper foothills of southern Alberta and were even greater than loading coefficients in streams draining agricultural lands at lower elevations where sediment erosion is a common problem.

A weight of evidence argument was used to link recreational activities with the large increase in sediment load between the upstream and downstream stations on Waiparous Creek. The mechanism of sediment release best explaining the observations involved the erosion of tracks caused by OHVs at fording points across the streams. Pictorial evidence supporting this mechanism was provided for one rain event on Fallentimber Creek.