Identification of Fine Sediment Sources in the Telkwa Watershed

Initial Working Plan

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1.0 INTRODUCTION

Sediment sources, both fine and coarse (i.e. bedload) are of concern to many users of the Telkwa Watershed (Fig 1). The residents of the Town of Telkwa are concerned about the quantity of suspended sediment in the Telkwa River as it is, in part, the source of the Town's drinking water. Extended high levels of suspended sediment creates problems with the pumping and filtering systems. Town residents are also concerned about bedload transport and movement and how their flood protection structures may be affected by a shifting river.

Federal Fisheries and the B.C. Fish and Wildlife Branch are concerned because of potential alterations to habitat of Salmonoid, Steelhead and resident fish species.

Local recreational fishing guides are concerned for: 1) fish habitat and 2) 2) the loss of fishing days due to high levels of suspended sediments in the river which results in poor visibility and effectively prevents sports fishing.

Numerous other recreationalists that use the Telkwa Watershed have also expressed concern about the levels of suspended sediment in the river and how it impairs their enjoyment of a clean, clear river.

All of these groups realize that the Telkwa River naturally carries large amounts of suspended sediment in the spring and during large fall storms. However, the concern that has been clearly expressed is that the accelerated rate of logging in the Telkwa watershed has made the river: "dirtier more often and for longer periods of time than prior to logging".

We initiated a sediment monitoring program in the Telkwa watershed to respond to these concerns. The first step of the program, described in this Working Plan, is to identify the sources and timing of the production of fine suspended sediment throughout the lower elevations of the watershed. One of the main objectives is to categorize these sources of fine sediment into "natural" and "logging related". This information will hopefully assist logging operations in their preparation of effective "water management" plans.

Also included in this work will be the production of an erosion potential map for the Telkwa watershed and a video that will show sources of sediment during spring runoff and fall rain storms.

2.0 OBJECTIVES

1) To identify sources of fine suspended sediment throughout the watershed and compare the relative amounts at different time intervals throughout the ice-free period.

2) To map surface expressions in the Telkwa watershed and identify their erosion potential.

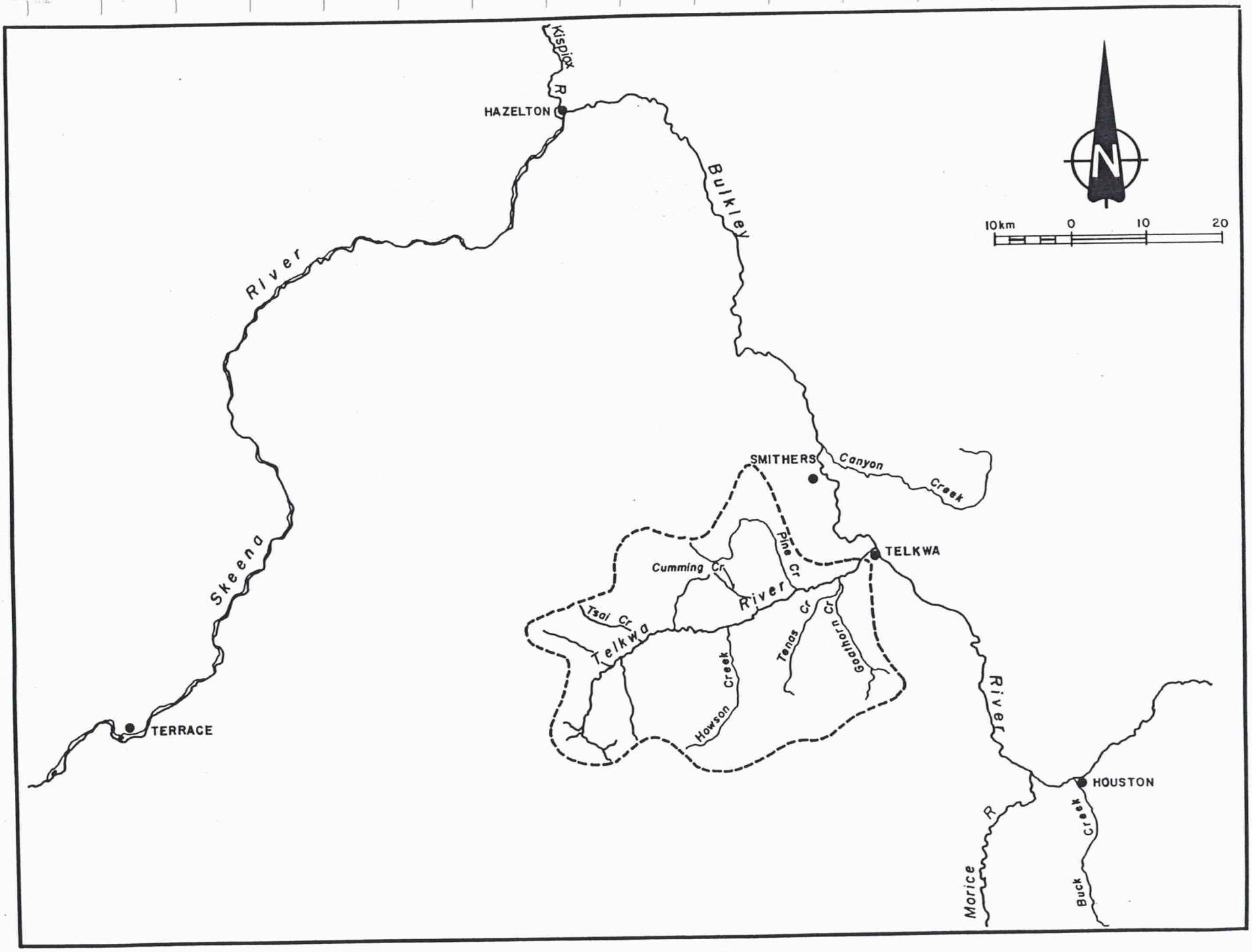

Figure 1: Location of the Telkwa Watershed.

3) To produce a slide and video show (extension and demonstration) which will show sources of sediment in the watershed at different times of the year.

4) To evaluate the possibility of using the Telkwa watershed as a site for long term research to develop a sediment budget model for northern transition (coastal/interior) watersheds.

The result of this work will help the logging companies and the small business program to plan their operations to minimize sediment input into the watershed.

3.0 METHODS OF INVESTIGATION:

3.1 Sources of fine sediment.

The identification of sediment sources will be done by collecting water samples at numerous locations throughout the watershed between the period of April 1 and freeze-up (early November). The water samples will consist of 4 litre grab samples taken once a week and immediately after large rainstorm events. Along with the grab sample, a turbidity measurement will be made at each station and a description of the hydrological conditions of the watershed will be done (see data collection form, Appendix 1). The stage height of the Telkwa River will also be monitored once a week using a permanently fixed staff gauge.

Eighteen (18) sampling location have been established along the main stem of the Telkwa River and at the mouth of several tributaries. The sampling locations are as follows and are identified in Figure 2.

1- Telkwa River at the mouth
2- Highway culvert
3- Goathorn Creek
4- Tenas Creek
5- The old bridge site (also location of staff gauge)
6- The bridge across the Telkwa
7- Pine Creek
8- Small creek at 1012.9 km (drains a large clearcut)
9- Cummings Creek
10- Howson Creek (only a visual assessement)
11- Telkwa River above Howson
12- Small creek at 19.5 km (drains a large clearcut)
13- Jonas Creek
14- Telkwa River above Jonas Creek
15- Winfield Creek
16- Sinclair Creek
17- Small creek at 1024.9 km
18- Milk Creek

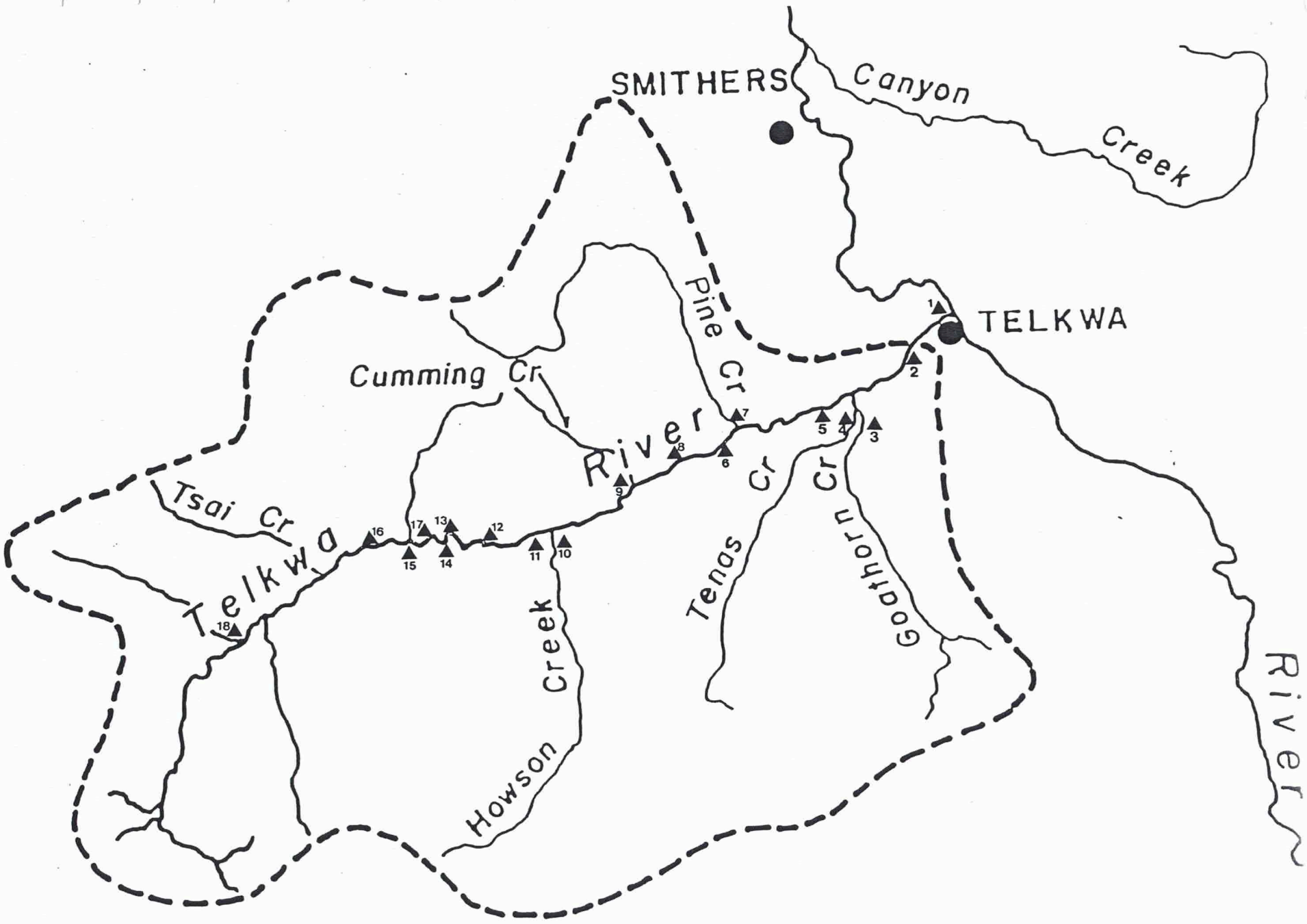

Figure 2: Location of the sediment sampling sites

3.2 Erosion hazard assessment

Interpretive slope stability and surface erosion hazard maps will be generated for the Telkwa watershed. The mapping will present interpretations based on the Smithers-Hazelton soil association map. Ratings for soil associations will be subjective based on slope steepness, slope geometry, surficial material characteristics, soil drainage and present day slope processes. An airphoto review will be made of all polygones combined with field reconnaissance along access roads within the watershed. Interpretive grouping or spliting of polygones will be done based on air photo work and rating criteria.

3.3 Photographic record of sources of fine sediment

Pictures will be taken during each of the field sampling trips to visually document the sources of sediment. These pictures (slides) will be labelled with the location and date of when the sample was taken and will be catalogued for further reference. Also, a video camera will be used periodically to document the sediment sources. Two helicopter flights will be taken over the watershed to film the sources of sediment above the logging activity. The first flight was taken in late May (peak spring runoff) at which time we flew over and filmed the main stem of the Telkwa River and several of its tributaries up to alpine. A second flight will be taken in early fall to identify and document sediment sources associated with large fall rainstorms.

Along with providing us with a visual record of our observations, these photographic records (slides and video) will serve as an extension and demonstration tool for those agencies and members of the public that are interested in knowing what is happening up in the Telkwa watershed.

3.4 Upper Telkwa as a site for long term sediment budget research.

A sediment budget is the quantification of the amount of sediment (fine, bedload and organic) that is produced on the hillside (mass wasting, creep and surface erosion), and a description of how it is transferred, stored and transported out of the watershed. The understanding of the processes that govern a sediment budget of a watershed are essential to predict the effects of various logging practices on the sediment output of the watershed.

The first step in designing a sediment budget research program is to identify the major sediment producing processes in watershed or hydrologically homogeneous region. This first step is being achieved through the basic sediment monitoring program (i.e objective 1). The next step would be to identify a small drainage within the Telkwa watershed that has reasonable access and where the dominant sediment producing processes occur. The sediment producing processes that we chose to study would be those that are dominant in other important fisheries watersheds like the Copper, the Morice, the Kispiox, the Suskwa and the Babine Rivers.

If a suitable drainage is found in the Telkwa watershed, several component

studies could be established looking at all the different processes that control rate and amount of sediment production. This watershed level, process oriented research would serve to establish a sediment budget model that could be used to predict the effects of various logging activities on sediment output.

4.0 MEASURES AND RECORDS

The sediment sampling will be done on a weekly basis (every Thursday) and immediately after a large rainstorm. Data sheets indicating which samples were taken, atmospheric conditions at time of and prior to sampling, flow conditions and the hydrologic condition of the watershed (see Appendix 1) are completed during the sampling and filed appropriately at the office. The water samples are returned to the Regional office where they are processed. There, the volume of the sample is measured and filtered through 0.45 micron glass microfibre filters. The sediment caught by the filter is weighed and the concentration of suspended sediment is calculated and reported in milligrams per litre (mg/l). These data are then recorded in the appropriate file.

5.0 PROPOSED ANALYSIS

5.1 Sources of fine sediment

The analysis of the sediment data will consist primarily of a descriptive comparison (graphical analysis) of the sediment concentrations for the various locations at the various times of sampling. Such an analysis will serve to identify which processes of erosion are dominant in the Telkwa Watershed and how various physiographic positions within the watershed affect sediment production. Since several of the sampling locations are situated directly below large clearcuts or adjacent to logging roads we will be able to evaluate the relative contributions of these to short term sediment production. However, until a complete sediment budget is established for these northern transitional watersheds, we will not be able to evaluate the long term contributions of logging to production of fine sediment, bedload and large woody debris.

6.0 COMMUNICATION OF RESULTS

6.1 Written Reports

The collection of sediment samples will terminate about mid-October 1990. Analysis of the data will then be initiated and an initial draft presenting the results will be complete about mid-November. Along with presentation and interpretation of the results, this report will present management recommendations and proposals for longer term research if we have deemed the Telkwa appropriate.

6.2 Public presentation

A public presentation will be organized by the Bulkley Forest District to present the results. The following interest groups will be specifically invited: Bulkley Forest District, Pacific Inland Resources, Town of Telkwa, Federal Fisheries, MoE Fish and Wildlife and the Steelhead Guides Association. This presentation will include a short slide and video show highlighting methodology, important results and further recommendations.

6.3 Workshop

Other presentations that would be geared specifically towards certain groups could be organized upon request. These workshops could focus on specific findings or on more generalized operational recommendations.

7.0 ROLES AND RESPONSIBILITIES

Project establishment: Pierre Beaudry and Jim Schwab

Sediment sampling and analysis: Jim Schwab and Pierre Beaudry

Mapping of surficial geology and slope stability interpretations:
Jim Schwab

Production of extension and demonstration slide show and video:
Pierre Beaudry

Report Writing and E. & D.: Pierre Beaudry and Jim Schwab

8.0 COSTS - 1990

Direct Costs	
Transportation and travel:	
Two overwiew helicopter flights @ $600/flight (one paid by district, one by forest company)	$1,200
Materials and supplies:	
Sixty sample bottles	106
500 filters @ $75/100	375
Labour	
Dirk Septer - lab technician - filter samples - 15 days @$150/day	2,250
Irene Weiland - Surficial Geologist - soils mapping - 20 days @ $130/day	2,600

Extension and Demonstration	
Audio-visual supplies (video tapes and films)	400
Total :	$6,331

Indirect Costs

Transportation and Travel	
Regional F.S. truck pool: 1 day/week for 24 weeks:	24 truck days
Labour	
Pierre Beaudry Jim Schwab: Organization, sampling, analysis, report writing and E. and D. Approximate total for both:	40 man days
3 summer students that alternated to collect the water samples and do some sample filtering	30 mandays

Appendix 1: Example of field data collection form

TELKWA WATERSHED STUDY page 2

DATE: _____ Atmospheric conditions: _____

Station	Water Sample		Visual Turbidity	Comments i.e.: flow,debris, etc.	Snowpack and soil moisture (note aspect & elevation)
Cummings Creek	*				
Howson Creek					
Telkwa @ Howson	*				
19.5 Creek	*				
Jonas Creek	*				
Telkwa above Jonas	*				
Winfield Creek	*				
Sinclair Creek	*				

TELKWA WATERSHED STUDY page 1

DATE: _____ Atmospheric conditions: _____

AIR TEMP: _____ _____

RIVER HEIGHT: _____ Time (start): _____ (finish): _____

Station	Water Sample		Visual Turbidity	Comments i.e.: flow,debris, etc.	Snowpack and soil moisture (note aspect & elevation)
Telkwa @ town					
Highway Culvert	*				
Goathorn	*				
Gauge site	*				
Bridge site	*				
Pine Creek	*				
1012.9 creek	*				