INTERIM RESTORATION PLANS FOR

NINE WATERSHEDS IN THE

CENTRAL KALUM FOREST DISTRICT

EXSTEW, ZYMACORD, LAKELSE, WILLIAMS, LOWER KALUM, NELSON, BEAVER (UPPER KITSUMKALUM), CEDAR, AND CLEAR WATERSHED-UNITS

Prepared for: Forest Renewal BC , and
KWRP Steering Committee

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Executive Summary

Commencing in the 2001/2002 fiscal year Forest Renewal BC will require that all proponents of the Watershed Restoration Program (WRP) focus their restoration efforts on a smaller selection of "targeted watershed-units." Essential prerequisites for each selected target watershed is that it can be restored within a five year period, and that all activities carried out in a targeted watershed are those described in an Forest Renewal BC (FRBC) approved Restoration Plan (RP).

In the Skeena-Bulkley FRBC region, proponents were asked to complete one Full Restoration Plan (FRP) and Interim Restoration Plans (IRPs) for any other target watersheds for which they may have responsibility. The Kitsumkalum Watershed Restoration Program (KWRP), as an FRBC proponent, was required to complete IRPs for nine watershed units in the greater Terrace area.

The completed IRPs serve three primary purposes: 1) they act as a tool to assist in the process of further prioritizing (reducing) the number of targeted watershed-units to a fiscally manageable selection of units which can be completed within the required time frame, 2) they function as a framework to build upon when completing FRP, and 3) they serve as an interim investment planning tool to assist in the transition to the FRP based delivery of the program. FRBC funded RPs address (with some exceptions) fish habitat impacts associated with forest harvesting.

Once the IRPs (contained in this document) were completed three targeted watershed units were selected for restoration. These watershed units are the: Clear, Nelson, and Williams watershed-units. The netted down cost estimate to complete restoration of forest harvesting related impacts to fish habitat for all nine watershed-units, non inclusive of investments prior the year 2000, is 12.4 million dollars. The estimate for the three selected target units is 1.5 to 1.7 million dollars.

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SECTION I – PREAMBLE

Introduction and Background:

Early in the year 2000 Forest Renewal BC (FRBC) changed the way Watershed Restoration Program (WRP) planning and investments are made. The result was a shift from a "shot gun" approach to restoration planning and investment, to one where, as a specific corporate goal for the program, watershed-units will be worked in until restoration is complete. The new planning approach requires that selected "high-priority target-watersheds" will be invested in until restored, provided they can be restored within a five year time frame, before a FRBC proponent commences work in another "high-priority target-watershed".

The "high-priority target-watersheds" were first selected by Ministry of Forests and Ministry of Environment Lands and Parks through a higher level planning exercise called a Resource Management Plan (RMP). The RMP identified all watershed-units[1] throughout the FRBC Skeena-Bulkley region and within the Kalum Forest District. Watershed-units were then evaluated for restoration potential based on a number of predetermined criteria, ranked in order of priority according to the results of the evaluation, and designated, in order of priority, for eligibility for future FRBC WRP investments.

Criteria evaluated included: a range of fish related values, FRBC investments to date, magnitude of logging related impacts, and potential for restoration success (Anonymous, 2000). Consistent with another of FRBC's new goals to restore twenty-percent of all "high-priority watersheds" in each district, twenty-percent of the all the RMP listed watershed-units were chosen as "targets".

In order to be eligible for future WRP funding, FRBC requires that the restoration activities in any targeted watershed-unit be based on an approved five year (Full) Restoration Plan (FRP). This planning initiative is the most significant step that FRBC has taken, since the inception of the WRP, toward improving the efficacy of the important work carried out under the program.

To ease the transition between the old and new delivery approaches, FRBC instructed proponents to prepare only one FRP in the initial (2000/2001) planning year. For the remaining twenty percent of the high-priority target watershed-units which the proponent has responsibility, the proponent was instructed to prepare (Interim) Restoration Plans (IRPs). The nine IRPs contained in this document represent the completion of the Kitsumkalum Watershed Restoration Program's (KWRP) IRP initiative. They also

[1] In resource management planning, "landscape level" geographic areas are typically referred to as landscape-units, watershed-units, or planning-units. Generally (and in this plan) these terms can be used interchangeably as they refer to the same geographic area (ie: the Clear Creek planning-unit is the same as the Clear Ck. watershed-unit).

represent a thorough summarization of all of the current information available, including the knowledge of various resource managers and professionals who are familiar with the watersheds described in Section II.

From the KWRP's perspective, the creation of the IRP serves two important purposes. They, in a summary fashion: a) will provide the information necessary to guide decision makers (the KWRP Steering Committee) while engaging in the process of determining which watershed units to continue to invest in over the next few years, and in which to postpone investment; and b) will be used to base the development of future FRPs for the selected watersheds (as per the KWRP Steering Committee's priorities and direction - see the Appendix for a copy of the subsequent results of the watershed priority setting meeting minutes.) From FRBC's perspective, the IRPs serve as an investment planning tool during the transition to the new restoration planning method.

It is important to keep-in-mind that this document addresses impacts attributed to forest harvesting only. Consistent with FRBC's objectives to: 1) invest in restoration activities arising from impacts related to forest harvesting operations prior to the advent of the Forest Practices Code, and 2) primarily invest in projects which benefit fish habitat and water quality in community watersheds, the IRPs contained in this document describe impacts and watershed processes related to these objectives.

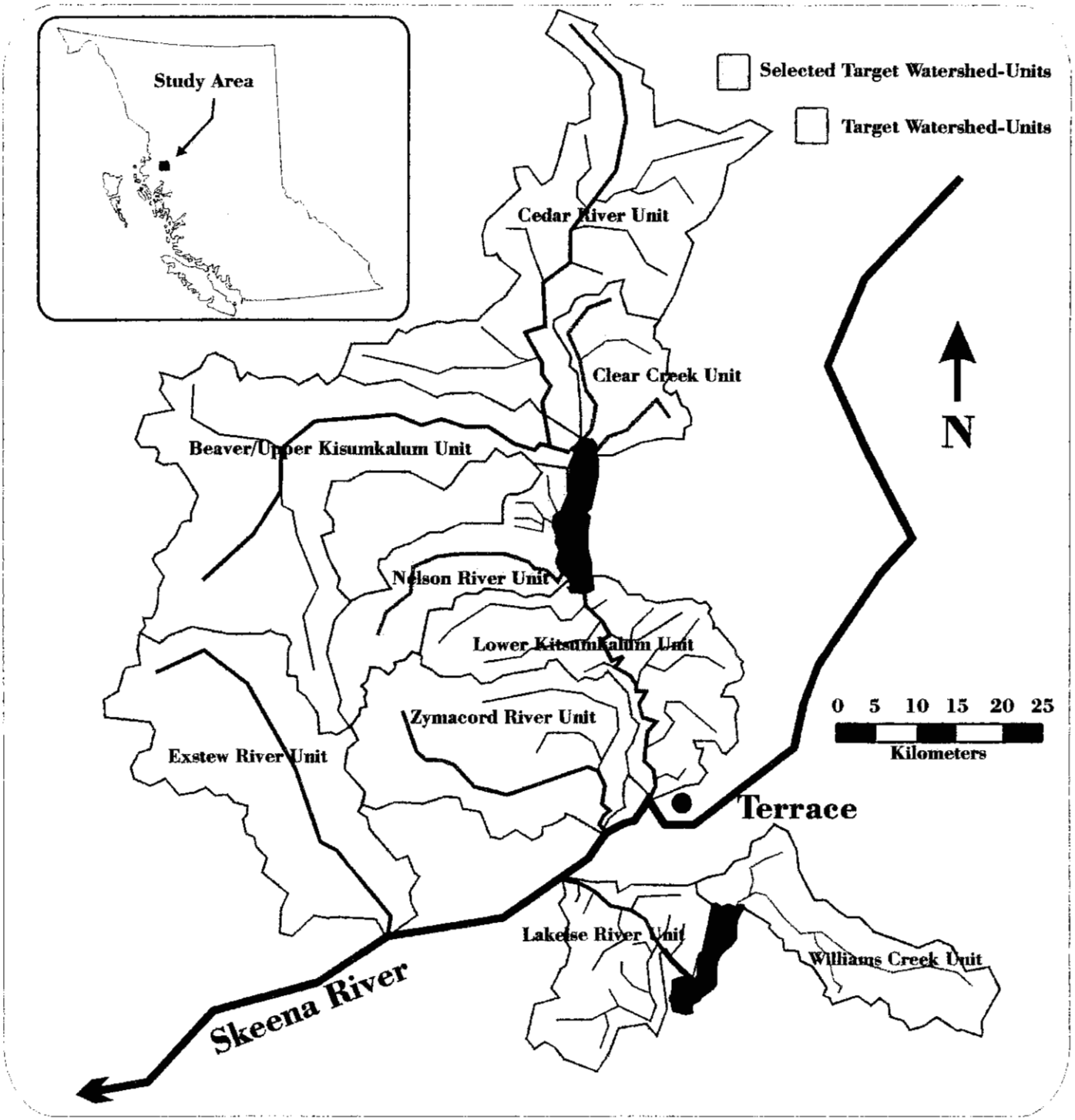
Therefor, this document, though comprehensive in its description of our current understanding of the state of these watersheds as related to the objectives, is not intended to be a wholistic restoration plan. In some watersheds there will likely be additional impacts, depending on the nature of development, which also impact aquatic and/or other natural-resource values that affect some aspect of the integrity of a particular watershed.

Geographical Division of Restoration Areas and Traditional Place Names

For administrative, management, and planning purposes it is necessary to divide and further sub-divide the land base into contiguous and identifiable geographic units. Provincial government agencies have long-standing systems of geographic division. For example the Ministry of Forests and Ministry of Environment use a system where they have divided the province into regions and have then sub-divided these regions into forest districts. In some cases the forest districts have been further sub-divided into landscape units (called watershed-units in this document). The size of these units averages from 10,000 to 50,000 ha.

The Kalum South Forest District is generally divided into three broad sub districts – the Upper, Middle, and Lower. The KWRP program is responsible for several large watersheds in the Middle portion of the Forest District and refers to these, for administrative purposes, as the: Kitsumkalum, Lakelse, and Skeena areas.

Within these administrative areas watershed-units are used to identify contiguous groups of smaller watersheds (see: Map 1, Page 3). The watershed-units may be groups of smaller watersheds referred to as sub-basins (ie: the Clear Creek unit has two distinct



MAP 1 - Target and Selected Target Watershed-Units in the Greater Terrace Area (Interim Restoration Plans for the above Units are Contained in this Document).

watersheds - Douglas and Clear Creeks - both drain independently into Kalum Lake (*Lax Gibeelk* or *ł' puumt'aamstpuun* [1]), or may represent reaches within large linear watersheds-unit where there are no sub-basins (ie: Exstew River Unit). Sub-basins, again, may be divided further using local site or place names.

Names for various rivers, creeks, and places have changed significantly over the decades and in recent years. Though some of these places have had names which have stood for millennia, they have been replaced or modified by western names and/or pronunciations. In many cases the original names have lost significance from a geographic referencing perspective. In this document, where possible, some of the original Tsimshian names (Marsden, 2000) have been reintroduced in an attempt to maintain the important historical and cultural connection with the land that these names provide. In this document traditional names have been indicated by italicising and enclosing them in brackets along side common names (Map 2, on Page 5, displays some traditional place names).

Preparation Methodology

The IRPs contained in this document were prepared using a format provided to all proponents in the region by the local FRBC Investment Officer. The format is based on a simplified version of a working draft of the *Planning and Priority Setting for the Next Five Years; Phase III Watershed-Level Planning* technical circular prepared by FRBC in 2000 (WRP Provincial Coordination Team, 2000)[2]. The IRP summarises important characteristics and details about the nature of impacts in each watershed unit and its sub-basins.

Each watershed-unit IRP was prepared independently. All available resource information related to the restoration of a watershed, and which might assist in the preparation of the FRP, was located, reviewed, and listed in the References section at the end of each IRP. Inclusion of a reference in the References section does not imply that information from the cited document was used in the preparation of the IRP. Rather, inclusion of additional references is intended to assist planners while preparing future FRPs. The additional references have been included so that it may be easily reviewed for their potential usefulness at a later date. Future planners, however, should not view this as a complete list.

Another useful document that should be consulted during FRP plan development is the watershed literature review commissioned by the local Fisheries Renewal group (Terrace-Kitimat Partners for Salmonids) entitled *Kalum South Literature Compilation and Database* (Lucke, 2000). The KWRP has an updated version of this data base for their administrative areas.

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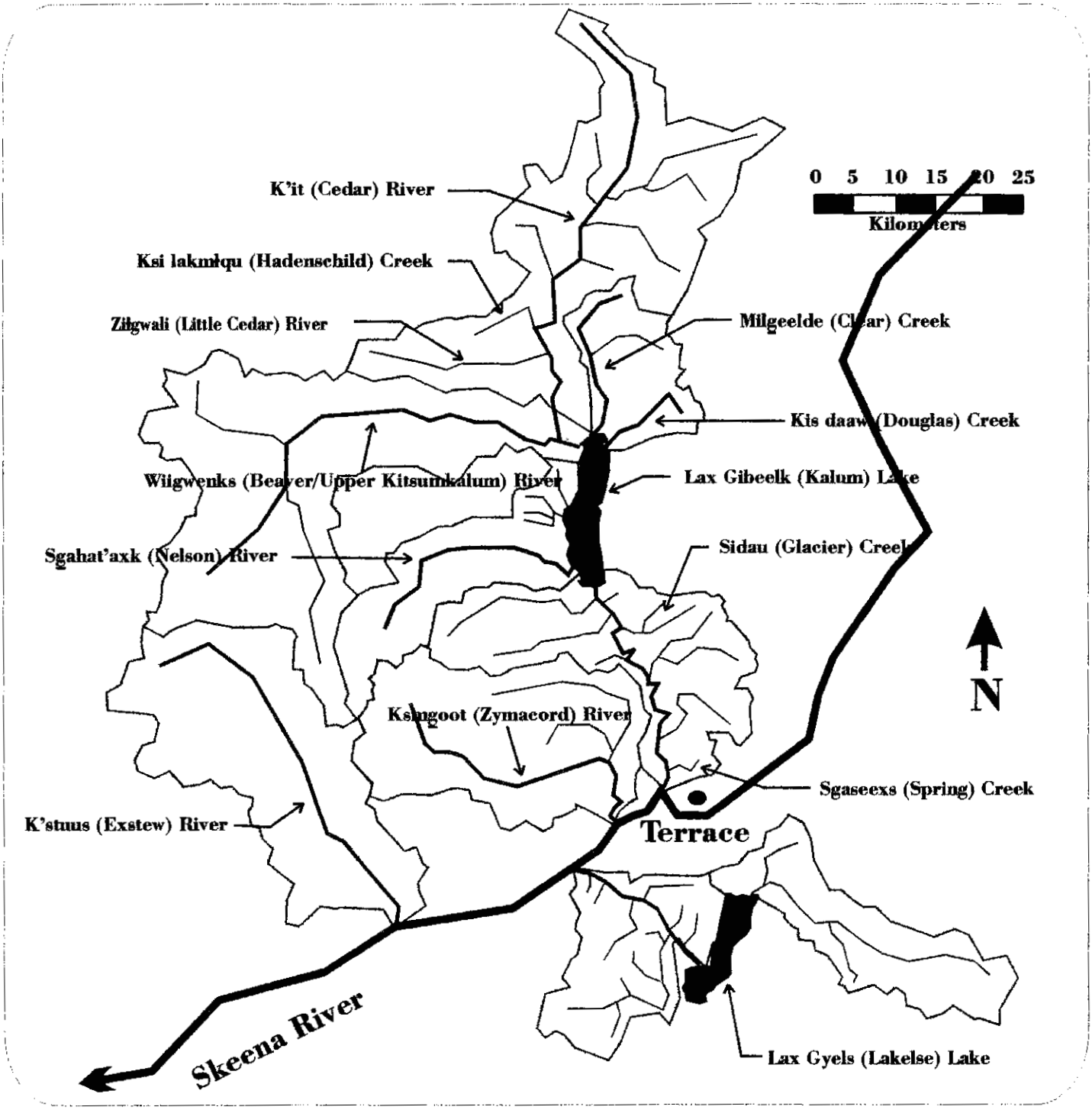
[1] Kalum Lake has two traditional names; *Lax Gibeelk* meaning lake of the Kitsumkalum people and *ł' puumt'aamstpuun* meaning lake of plenty (McDonald, 2001).

[2] The Phase III Watershed Level Planning technical circular is an important companion guide to this IRP as it provides defines various terms, and describes the general methodology, used in this document.



Map 2 - A Selection of Key Traditional Tsimshian Place Names in the Greater Terrace Area

Essential elements of a restoration plan, which help characterise the watershed and impacts within it (WRP Provincial Coordination Team, 2000), were incorporated into the regional FRBC's IRP format. Additionally, broad restoration goals and objectives have been preliminarily defined. Because our knowledge and understanding of a watershed increases based on the amount of restoration activities conducted in a given watershed, accordingly, the reader will find that the goals and objects for this same watershed will become more specific and refined. Once a draft IRP was completed, the draft, including an implementation budget and Evaluation of Restoration Success table, was forwarded to local MOF and MELP WRP personnel for there review and comment. An additional copy of the plan and the Evaluation of Restoration Success table was forwarded to a Registered Professional Geotechnical Scientist for review and comment, particularly in regard to the information describing watershed processes taking place with in each watershed-unit. The comments received from these individuals was then incorporated into a "version II draft" of the IRP and circulated to the KWRP Steering Committee for their review and comment. Once the Steering Committee's comments were received and incorporated into the document the IRP became a final draft.

At this stage the IRPs were ready to be used by the Steering Committee as a bases to evaluate and prioritize the restoration of the nine watersheds contained in this document. (See Appendix for meeting details and the final watershed selection list.)

Discussion - IRP Preparation and Overview Assessments

It should be noted that where only Overview information was available to base the preparation of the IRP, the results may be somewhat misleading. There are several reasons for this which are discussed below.

The objectives of the program have changed considerably since the period when many of the Overviews for the major watersheds in the Greater Terrace Area were completed. While the objectives of the program are currently focused primarily on the restoration of fish habitat and improving water quality in community watersheds, the original objectives of the program also focused heavily on reducing and restoring impacts to the terrestrial productivity of watersheds.

For example, in an Overview which lists "x" number of landslides as impacting a specific watershed-unit or sub-unit, the listed number does not have relevance when trying to determine aquatic impacts to the watershed because the listed number of the impacts includes those impacting only upslope areas. Unfortunately, there is no easy way to separate the two.

This is also true of subsequent detailed assessment work (often referred to as "level II assessments"). Many of the conclusions, recommendations, and prescriptions developed for the KWRP to date reflect FRBC's older objectives. Determining which works meet FRBCs new objectives requires careful review of the various reports, their recommendations, and the prescriptions which resulted from the assessment.

Early riparian assessments reflect an absence of clear riparian restoration objectives of any kind. Early overview riparian assessments were prepared prior to the establishment of a Standard or Technical Circular. Because there were no defined goals or objectives which served to guide biologists and foresters while engaged in assessment activities for this component, professionals had to rely on assumptions about objectives or developed their own. Early overview riparian assessments often concentrated on terrestrial impacts, particularly those related to wildlife species such as large mammals, and only discussed aquatic impacts in a cursory fashion. As a result, early riparian assessments are inadequate from an aquatic restoration perspective and fall far short of meeting FRBC's new objectives.

In some cases the data which the Overviews were based on is also suspect. For example, eligible roads were determined by selecting roads displayed on TRIM maps only (Heibein, 2000). It has been the experience of the KWRP that roads indicated on the TRIM maps represent only a portion of the actual roads constructed. The omitted roads tend to be first-generation roads and spurs used in the 1950s through to the 1970s which apparently no longer have a use. Though these roads are old relative to the local logging history, subsequent examination of various watersheds (by KWRP staff and other related professional consultants) have resulted in the identification of a significant number of additional roads. These unidentified roads often represent considerable risk the watershed. In order to reduce overall risk, maximize the returns on restoration investments, and meet restoration objectives, an airphoto review is required to identify all roads requiring assessment during the FRP planning process.

A final comment about Overview assessments. The aerial photography used during the Overview preparation was taken during, or prior to, the early 1990s. The air photo record is now approaching a decade or more in age. As these watersheds and their subsequent anthropocentric development are highly dynamic, much has changed in many of the watersheds we are currently working in and the results of the Overview may be inaccurate. Prior to the preparation of a FRP a good case can be made to conduct a thorough review of the Overview, and assess the current condition in the watershed-unit, in order to ensure accuracy of the restoration plan.

Preparation of Full Restoration Plans (FRPs)

Currently, KWRP staff, in cooperation with a Registered Professional Geotechnical Scientist, are in the final stage of completing a FRP for the Clear Creek Watershed Unit. This document will undergo a similar review process as described above for the IRPs. The preparation of additional FRPs will be completed in subsequent years. It is forecasted that in the following fiscal year (2001/2002) a FRP will be completed for the Nelson (*Sgahat'axk*) River watershed-unit. The Williams Creek watershed-units will be completed one year later (2002/2003). It is anticipated, based on the current objectives, KWRP Steering Committee priorities, and funding levels, that once these three FRPs are completed another FRP planning process will not be required until the 2004/2005 planning year.

The FRPs will serve as a valuable implementation tool while restoring target watersheds. These plans will detail all of the necessary restoration activities required within the watershed-unit, provide essential project background, document the implementation sequence for the range of projects required to achieve restoration completion, and outline a method to monitor and measure the success of the restoration initiatives.

The plans and their objectives will likely require revision on an annual basis as activities in the watersheds are completed, and as our understanding of the nature and extent of impacts increases. Annual revisions must include updating cost estimates and may also require re-evaluating the potential for restoration-success for each restoration component and activity.

Determination of Impact and Restoration Rankings and Ratings Used in this Document

The format of the IRPs contained in this document mirrors the format provided by regional FRBC staff and is a simplified version of the FRP format described in the *Planning and Priority Setting for the Next Five Years; Phase III Watershed-Level Planning* technical circular (WRP Provincial Coordination Team, 2000). The final IRP format used in this document has been expanded somewhat to help incorporate additional useful information.

Although the technical circular suggested using rankings to evaluate such things as "habitat-condition", and ratings to indicate "potential for restoration-success", the method used to determine, or measure, a ranking or rating was not described. Therefor, in order to reasonably assign the various rankings or ratings, definitions for ranking and rating were established prior to the preparation of the IRPs. These are briefly defined below:

> Condition Ranking is a rating given to each component within each sub-basin. It describes the current condition of the component based on the available information. The rankings used include poor, fair, moderate, good, ND, and complete. The ratings described in this document are based on those provided in the associated Overview or subsequent assessment reports. Where no rating or ranking is provided in a report a ranking was estimated based on the available information about the specific component and comparing the rating with similar local watersheds which had been ranked. Condition ranking takes into account areas which have been subject to development only. For example, the ranking labelled ND (no development) refers to a stream reach or sub-basin which has not been effected by human development in that portion of the watershed and upstream from it. The ranking labelled "complete" refers to a component within a sub-basin which has been treated and requires no further work other than monitoring.
>
> Restoration success ratings (used in the Restoration Success Evaluation table) describe the likelihood of successfully restoring a specific component within a particular sub-basin. Again, no indicators were provided to measure success. Therefor the ratings used (low, moderate, and high) can be considered some what

subjective. Each rating was estimated based on the watershed processes taking place in the sub-basin (WRP, 2000) and the professional experience of the those involved in the creation and review of the document. Ratings have been assigned assuming that the component can be successfully restored in a five year time frame. Where important components would not achieve the predicted benefits within this time frame an additional ranking was included (labelled "long term"). This is most often true for riparian restoration treatments due to the time frame required to re-establish a mature forest.

Cost Estimates

The estimated cost to complete restoration of forest harvesting related impacts for each targeted watershed described in this document have been provided. The accuracy of estimates vary depending on the level and age of the available information. For example, where detailed (level II) assessments and prescriptions were prepared the estimates tend to have a higher level of confidence compared to those provided in Overview Assessment estimates. Also, as estimates age a range of factors will influence and change the estimated cost. An impact that is not treated shortly after prescription development may physically change affecting the cost of restoration.

Another factor which may adversely influence the accuracy of the available cost estimates is associated with the experience of the professional(s) preparing the estimate. This is illustrated in estimates provided in Overview Assessments. The Overview-Assessment estimates for detailed assessment projects typically have been lower (considerably in some cases) than the actual costs of publicly tendered contracts for the same project.

The science of restoration and application and restoration techniques was new to the province during the period when FRBC Overview assessments were conducted. A significant learning curve was required to understand the field of restoration and accurately prepare reasonable cost estimates. This experience was not readily available in the province at the onset of the FRBC initiated WRP.

A table, located in the Appendix, provides the combined cost estimate and annual schedule for all three watersheds selected by the Steering Committee as priorities for restoration. The schedule and expenditures do not reflect the independent budgets accompanying each IRP. The combined budget was developed for administrative purposes in order to balance annual FRBC funding allotments and the scheduling of projects in the watersheds.

A final note on the estimates provided in this document. They do not include costs associated with proponent overhead, the preparation of additional FRPs, or other required activities such as the preparation of Access Management Plans, Overview or outdated assessment reviews, training initiatives, etc. Where these are required the restoration the budget or completion time frame may be affected.

Recommendations

During the preparation of the IRPs several key factors were identified which will affect and/or improve the preparation of the FRPs. Five of these have been listed below. The list is not intended to be all inclusive and other factors may arise as further planning exercises are carried out. Recommendations have not been prioritized.

AMP

A scaled down AMP process should be conducted for each watershed-unit where road deactivation is planned. Access Management Plans for the greater Terrace area were completed in 1995/96. AMPs, after a short period, become out dated primarily due to ongoing changes in licensee operational plans. It is anticipated that the amount of effort required to conduct an AMP for a specific watershed unit will be small relative to the full AMP process.

GIS Database

The FRP planning process should utilize a computor based GIS mapping system from the onset of the process. This technology will be invaluable while identifying, implementing, tracking, and monitoring WRP activities within the watershed unit. A GIS data base will also serve as an important tool during other restoration (non FRBC) or resource management activities in the future.

Unit Subdivision

Large and complicated watershed units should be divided into smaller manageable sized units. Several of the watershed units discussed in Section II tend to be large and complicated. Due to extensive development histories and there size these watershed units have high costs for restoration. Consequently, several of these watersheds were evaluated as lower priorities, despite having very high values, and have been differed. It would be prudent to subdivide these units into smaller units.

Airphoto Review of Roads

Conduct a brief airphoto reconnaissance for target watersheds prior to implementing road deactivation assessment activities to determine that all roads representing risk to aquatic habitat have been properly identified. The review should use several sets of photos (ie: as current as possible, and there before, 10 to 15 year intervals). This recommendation is true for early (pre 1999/2000) Overview and level II road assessments only.

Traditional Names

Where ever possible, confirmed traditional Tsimshian names should be used to describe geographic features and areas. Often popularly used western local names have little significance to a place other than as a means of identifying it. Maintaining traditional names provides an important historical and cultural connection to the land that extends well beyond current history.

References

Anonymous, 2000 *Prince Rupert Forest Region Resource Management Plan 2001 to 2005* MOF, MELP, and FRBC

Heibein, Rob, 2000 *(Per.comm.)*[1]

Lucke, Jennifer, 2000 *Kalum South Literature Compilation and Database* Triton Environmental Consultants Ltd.

Marsden, Sue, 2000 (*Kitsumkalum Draft Territory Map compiled by Chris Turner*) Kitsumkalum Treaty Office

McDonald, Jim 2001 (*April 3, 2001 letter – "Re: comments on the map names"*) University of Northern BC

WRP Provincial Coordination Team, 2000 *Planning and Priority Setting for the Next Five Years; Phase III Watershed-Level Planning (Working Draft – A Technical Circular)* FRBC, MOF, & MELP

[1] Mr. Hiebien was a lead technician and project manager for much of the initial Overview assessment work that was conducted for various major watersheds in the Greater Terrace area. He is currently employed as a Habitat Technician in the Department of Fisheries and Oceans, Terrace office.

SECTION II – INTERIM RESTORATION PLANS

Beaver/Upper-Kitsumkalum River Watershed PU

Introduction

The Upper Kitsumkalum River is popularly known locally as the Upper Kitsumkalum/Beaver (*Wiigwenks*) River. The upper reaches of the watershed are currently being considered by the Kalum LRMP as a candidate for protection or as a special use area.

The Upper Kitsumkalum River Watershed is listed as a Target watershed in the current regional RMP WRP listings. Though the watershed has not been extensively developed as a result of forest harvesting throughout it's reaches, there are numerous impacts within the lower reaches which are a high priority.

It is estimated that, based on the current information available and the forest harvesting history, that these impacts can be corrected in a cost effective manner, and within a relatively short time frame. It is also estimated that the majority of the work can be completed within a two to three year period and the watershed could then be ranked as complete according to the current FRBC completion criteria. Access to potential restoration sites within the flood plain needs to be determined.

Watershed Overview Assessment

An over view of the watershed was conducted by a variety of local consultants. The lead consultant was McElhanney Consulting Services Ltd., and the overview was completed in 1996 (Bolin et al, 1996, and Gordon et al, 1996).

Sub-basins

There are three sub-basins within this watershed. They are: 1) Upper Kitsumkalum, 2) Warne Creek, and 3) Bohler Creek. There is no forest development activities in Warne or Bohler Creeks. The focus of this IRP is reaches 8, 9, and 10 in the Upper Kitsumkalum sub-basin.

Summary information

Drainage area:	Upper Kitsumkalum excluding Warne and Bohler Creek sub-basins - 394 km^2 (Bolin, 1996)
Tenure:	The watershed is encompassed by Skeena Cellulose's TFL #1.

Area logged: 20 km^2 (Bolin, 1996)

ECA: 7.2 km^2 (Bolin, 1996)

Channel: Reach	8	9	10
Type (CAP):	run	run/some pool	run
Width (m):	50-150m	70-130m	50-100m
Gradient (%):	0%	0-1%	0-1%

Component Description and Condition

Watershed type: The Upper Kitsumkalum watershed is a large u-shaped coastal mountain valley, with a broad floodplain, that was originally formed by glacial processes. The hillslopes are partially coupled in the upper reaches (9 & 10). Reach 8 is a large alluvial fan which occupies much of the north end of Kalum Lake (*Lax Gibeelk* or *ɬ' puumt'aamstpuun*). Along the south side of the valley hillslope, in reach 10, there is a small side-channel tributary stream which follows the valley-wall. Referred to as the "South Fork", this stream is approximately 23kms in length.

Channel condition: Fair to Moderate. Large system with low gradient. Largest impacts include: 1) reduced LWD contribution due to flood plain forest harvesting, and 2) sediment transport into off-channel habitat along valley side-walls from upslope forest development operations.

Some important tributary streams have been affected by changes to the hydrologic regime due to reduced rates of run off associated with road building (Gordon, 1996).

Riparian condition: Poor to fair. Impacts along reaches 8 & 9 are rated as high where 40% of the original riparian cover was removed between 1966 to 1973 (Gordon, 1996). It was also noted that removal of riparian cover has had adverse effects on a wide range of terrestrial wildlife species including moose and bears.

The small side-channel tributary stream (South Fork) which follows the valley side-wall in reach 10 has been extensively logged. Along this stream approximately 80% of the original riparian cover was removed between 1962 to 1992 (Gordon, 1996). Impacts to this area were rated as very high.

Hillslope & Gully condition: Poor. Bolin (1996) identified five high priority polygons, equalling an area of 5.6km^2, requiring detailed assessments. Within these polygons 26 logging related slides were identified. Other road/gully crossings upslope of reach 10, where there is connectivity with fish streams, may also pose as a high risk and should also be examined.

Road condition: Poor to moderate. Starting in approximately 1962 extensive road building has taken place throughout the flood plain of reach 8 and 9, and halfway along reach 10. More recently (over the last 25 years), extensive road building has also taken place along in upslope portions of the above reaches. The overview assessment identified 145 kms of road in the sub-basin.

The drainage along and across these road systems are highly connected to off-channel habitats within reach 10, and to a lesser extent, reach 9. In 1996 the upslope overview identified five polygons which require further detailed assessments (Bolin, 1996).

Habitat conditions: Moderate. Impacts to the entire watershed are limited to the lower reaches where there have been extensive impacts to off channel and tributary stream habitats. Additionally, forest roads within the flood plain may be restricting fish access into off channel habitat and tributary streams. The removal of large riparian vegetation (LWD) has been identified as negatively impacting fish habitat conditions throughout these areas.

Target Fish Species: Coho, Chinook[1], Sockeye, Steelhead, Cutthroat trout, and Dolly Varden char, *(and Pink)*.

Immediate Restoration Goals & Objectives

Instream

1) Assess roads associated with logged riparian areas to identify habitat to which access is impeded or blocked due to past forest practices and recommend measures to restore fish access where deemed necessary.

2) Assess and prescribe measures to correct impacts to off channel fish habitat in reaches 8, 9, and 10 (ie; South Fork and tributary streams in Gordon 1996).

[1] Spring run Chinook may be of particular concern.

Riparian	Assess, in detail, the condition of the riparian area in the above identified reaches and recommend areas where detailed prescriptions should be prepared to increase LWD, shade, litterfall, etc., contributions to main channel, off channel, and tributary stream habitat. (Assessments and recommendations should note areas within the flood plain which have received licensee based silvicultural treatments already.)
Upslope	Assess in detail, all upslope components within the five identified polygons (Bolin et al, 1996) and other areas effected by forest harvesting, and prescribe measures which address priority impacts to fish habitat.

Planning References and/or Cited Literature

Bolin, Pat 1996 *Kitsumkalum Watershed Restoration Project; Level I Final Report*, McElhanney Consulting Services Ltd.

Bolin, Pat and Rob Heibein 1996 *Kitsumkalum Watershed Restoration Project; Technical Report; Level I Overview Assessment Road, Hillslopes, and Gullies* McElhanney Consulting Services Ltd.

Gordon, Dave 1996 *Kalum WRP Project Volume I: Level I (Fisheries and Riparian Assessment... Beaver/Mayo)*, Triton Environmental Consultants and Pacific Cascade Consultants Ltd.

Gordon, Dave 1996 *(Kalum Air Photo Mosaics)* Triton Environmental Consultants

MELP 1998 *Watershed Ranking Atlas; North Coast – Lower Skeena* Geographic Data BC

Morrell, Mike 2000 *Status of Salmon Spawning Stocks of the Skeena River System* Morrell Consulting Ltd. & Northwest Institute for Bioregional Research

Kitsumkalum Watershed Restoration Program

INTERIM RESTORATION PLAN

Beaver/Upper-Kitsumkalum River Watershed; Restoration Success Evaluation - Table 3

Administrative Unit: Kalum
Date: August 18,2000

Basin/ Subbasin	Target Species	Limiting Fish Habitat Factor	Watershed Condition and Restoration Benefits	Landslides	Gullies	Roads[2]	Riparian	Channel	Instream
Upper Kitsumkalum River - reach eight, nine, and ten	Various (see text)	Rearing, Spawning, and Access	Level of existing or potential disturbance	High	High	High	High	Low	Moderate
			Impact or risk to fish habitat	High	High	High	High	Low to Moderate	Low to High [1]
			Likelihood of benefit to fish habitat from restoration	High	High	High	High (long term)	Moderate	Low to High [1]

1 Low in main channel. High in offchannel and trib. Streams.

Kitsumkalum Watershed Restoration Program

BEAVER/UPPER KITSUMKALUM RIVER INTERIM RP								
Summary of Investment Status and Estimated Budget								
Date: August 18, 2000								
Watershed Investment Phase	Watershed Components	Status(complete=c, ongoing=o, planned=p)	Estimated Outputs to complete (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Reaches 8, 9, & 10:								
Assessments/ Prescriptions	Overview	C						
	Roads	P	145kms	$45,000	$45,000			
	Hillsides	P	26 slides	$40,000	$40,000			
	Gullies	P	unknown[1]	$7,500	$7,500			
	Riparian	P	unknown[1]	$40,000	$15,000	$25,000		
	Instream	P	35kms	$40,000	$30,000	$10,000		
	Fish Access	P	unknown[1]	$10,000	$10,000			
Restoration Works[2]	Roads	P	35kms	$150,000		$100,000	$50,000	
	Hillsides	P	5 slides	$75,000		$50,000	$25,000	
	Gullies	P	10 gullies	$25,000		$20,000	$5,000	
	Riparian	P	unknown[1]	$125,000		$25,000	$50,000	$50,000
	Instream	P	10km	$75,000		$25,000	$50,000	
Monitoring & Evaluations	Roads	P		$10,000			$3,000	$7,000
	Hillsides	P		$5,000			$1,500	$3,500
	Gullies	P		$5,000			$1,500	$3,500
	Riparian	P		$25,000			$3,000	$22,000
	Instream	P		$15,000				$15,000
		Grand Total		$692,500	$147,500	$255,000	$189,000	$101,000

1 No indication of quantities in overview

2 Estmated - no deatailed assessments or prescriptions completed to date

Cedar River Watershed PU

Introduction

The Cedar (*K'it*) River Watershed is listed as a target watershed-unit in the current regional RMP WRP listings. The basin is located at the northern most end of the Kitsumkalum River watershed and is made up of numerous moderate and small sized sub-basins. During the last three to four decades, the watershed has been extensively developed throughout all of sub-basins, primarily as a result of forest harvesting. Little is known about the current magnitude of forest harvesting related impacts. However, based on the development history of this part of the Kalum watershed it is suspected that they are significant.

Watershed Overview Assessment

An overview of the watershed was conducted by a variety of local consultants (Bolin, 1996, Bolin et al, 1996, Gordon, 1996a & 1996b, Grieve, 1996). The lead consultant was McElhanney Consulting Services Ltd., and the overview was completed by Bolin et al (1996) and Gordon (1996a). A level I detailed fisheries assessment of Anweiler Creek and associated tributaries was completed by BioLith (Grieve, 1997) and a floodplain hazard study was completed the following year (Hamm, 1998). No other assessments have been completed for this area.

Sub-basins

There are approximately nine moderately sized sub-basins, including the mainstem of the river, within this large basin. They are: 1) Little Cedar (*Ziłgwali*) Rr., 2) Hadenschild (*Ksi lakmłqu*) Ck., 3) Turney Ck., 4) Sterling Ck., 5) James Ck., 6) Chris Ck., 7) Anweiler Ck., 8) Clarence Ck., and 9) Cedar (*K'it*) Rr. The Cedar (*K'it*) Rr. watershed is discussed in this plan in general terms and specific information about sub-basins is not provided.

Summary information

Drainage area:	Cedar (*K'it*) River Planning Unit (including sub-basins) ~ 644 km^2 (MELP, 1998)
Tenure:	The watershed is encompassed by Skeena Cellulose's TFL #1.
Area logged:	Not known
ECA:	185 km^2 (Bolin et al., 1996)
Channel:	N/a (Channel information varies between sub-basins – see Grieve, 1996 for specific details)

Component Description and Condition

Watershed type: The Cedar (*K'it*) River watershed is a moderately sized u-shaped coastal mountain valley that was originally formed by glacial processes. The hillslopes are coupled to the sub-basins, and there is good connectivity between the sub-basins and the mainstem of the River. The first reach of the Cedar (*K'it*) River enters the Kalum valley where it is unconfined and forms a broad flood plain. Reaches above the first are moderately confined by valley walls.

The Water Survey of Canada has established a hydrological station at Clarence Ck. This station will provide useful information required to develop project designs.

Channel condition: Poor to Fair. Large system with low gradient. Grieve (1996) reported that reach one was unstable as a result of extensive forest harvesting to stream banks. An adequate leave strip was maintained through most of the second reach. The leave strip in the reaches above the second were reported to be narrow and have become compromised (Grieve, 1996). Largest impacts include: 1) reduced LWD contribution due to flood plain forest harvesting, and 2) accelerated channel migration and avulsion in the first reach, 3) elevated rates of sediment transport into the main channel from sub-basins and roads. It is also suspected that the hydrological regime of some of the sub-basins has been changed by forest harvesting.

Riparian condition: Poor to fair. Much of the flood plain in reach one, including stream banks, was harvested. Other than a few significant exceptions, reaches two and three have adequate leave strips. Riparian zones and flood plains in tributary streams, which provide long term LWD recruitment and bank stability, typically have been harvested to stream side in their lower reaches.

Hillslope & Gully condition: Poor. Little detailed upslope information exists for the Cedar (*K'it*) River watershed. Bolin (1996), in an overview assessment, identified eighty-one logging related slides and 22 referral polygons. Grieve (1997) reported several hillslope/gully failures in the Anweiler Creek sub-basin which have direct connectivity with high value fish habitat.

Road condition:	Poor. Little detailed upslope information exists for the Cedar (*K'it*) River watershed. Bolin (1996), in an overview assessment of the watershed, identified 220 kms of eligible logging roads. Grieve (1997) reported road related hillslope failures in the Anweiler Creek sub-basin which have direct connectivity with high value fish habitat.
Habitat conditions:	Poor. An overview assessment was completed in 1996 for the Cedar (*K'it*) River watershed (Grieve). Little historical fisheries and fish habitat information exists for the watershed. However, based on 1996 airphoto observations, Grieve (1996) described various high priority impacts to fish habitat. Bank instability, elevated levels of sediment, and reduced LWD recruitment are among the list of impacts to streams in this watershed. A detailed Fish Habitat Assessment of Anweiler Creek was conducted in 1997 (Grieve) which indicated that the habitat impacts resulting from forest management related activities was low. Early evaluation of habitat conditions in the watershed indicate that this sub-basin is less impacted than many others in the watershed.
Target Fish Species:	Coho, Chinook[1], Sockeye, Steelhead, Cutthroat trout, and Dolly Varden char, (*and possibly Pink*).

Immediate Restoration Goals & Objectives

Overview	Determine restoration objectives for the Planning Unit utilising the KWRP Steering Committee's technical review sub-committee (made up of the proponent and agency staff). Based on the above objectives, 1) prioritise sub-basins in the Planning Unit for treatment, and/or 2) set the priority for each component (ie: roads, riparian, instream, etc.) within the high priority sub-basins. Note: determination of high priority sub-basins will be constrained based on funding resources available.

[1] Spring run Chinook may be of particular concern.

Planning References and/or Cited Literature

Bolin, Pat 1996 *Kitsumkalum Watershed Restoration Project; Level I Final Report*, McElhanney Consulting Services Ltd.

Bolin, Pat and Rob Heibein 1996 *Kitsumkalum Watershed Restoration Project; Technical Report; Level I Overview Assessment Road, Hillslopes, and Gullies* McElhanney Consulting Services Ltd.

Gordon, Dave 1996a *Kalum WRP Project Volume I: Level I (Fisheries and Riparian Assessment...)* Triton Environmental Consultants and Pacific Cascade Consultants Ltd.

Gordon, Dave 1996b *(Kalum Air Photo Mosaics)* Triton Environmental Consultants

Grieve, Glenn 1996 *Kalum WRP Project Volume III: Level Fisheries Assessment; Cedar and Clear River Watersheds* J&S Outdoors Ltd.

Grieve, Glenn & A. Gilchrist 1997 *Kitsumkalum watershed restoration Project; Level I Detailed Assessment of Fish and fish Habitat, and Prescriptions for restorative Work on: Stephanie, Seefried, Anweiler, Ambystoma, and Clear Creeks in the Kitsumkalum River Watershed.* Biolith Scientific Consultants Inc.

Hamm, Darren 1998 *(Cedar River; Hydrological Mapping of Reach One)* UBC

MELP 1998 *Watershed Ranking Atlas; North Coast – Lower Skeena* Geographic Data BC

Morrell, Mike 2000 *Status of Salmon Spawning Stocks of the Skeena River System* Morrell Consulting Ltd. & Northwest Institute for Bioregional Research

Kitsumkalum Watershed Restoration Program

INTERIM RESTORATION PLAN

Cedar River Watershed Planning Unit; Restoration Success Evaluation

Administrative Unit: Kalum Skeena
Date: August 18,2000

Basin/ Subbasin	Target Species	Limiting Fish Habitat Factor	Watershed Condition and Restoration Benefits	Landslides	Gullies	Roads	Riparian	Channel	Instream
Cedar River & all sub-basins	Coho, Chinook, Sockeye, steelhead, cutthroat trout, and Dolly Varden	Elevated bedload/ sediment transport, bank instability, reduced LWD levels	Level of existing or potential disturbance	High	High	High	High	High	High
			Impact or risk to fish habitat	High	High	High	High	High	High
			Likelihood of benefit to fish habitat from restoration	Unknown	Unknown	High	High (long term)	Unknow	High

Kitsumkalum Watershed Restoration Program

Summary of Investment Status and Estimated Budget for Cedar River Watershed Planning Unit								
Date: December 18, 2000								
Watershed Investment Phase	Watershed Components	Status(complete=c, ongoing=o, planned=p)	Estimated Outputs to complete [1] (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Watershed Planning & Coordination								
Assessments/ Prescriptions								
	Overview	C		$10,000	$10,000			
	Roads	P		$75,000	$50,000	$25,000		
	Hillsides	P		$30,000	$25,000	$5,000		
	Gullies	P		$30,000	$25,000	$5,000		
	Riparian	P		$115,000	$40,000	$75,000		
	Instream	P (10%)		$150,000	$75,000	$75,000		
Restoration Works	Roads	P		$425,000		$200,000	$200,000	$25,000
	Hillsides	P		$125,000		$75,000	$50,000	
	Gullies	P		$50,000		$50,000		
	Riparian	P		$325,000		$75,000	$200,000	$50,000
	Instream	P		$600,000		$200,000	$300,000	$100,000
Monitoring & Evaluations	Roads	P		$35,000			$10,000	$25,000
	Hillsides	P		$12,500			$5,000	$7,500
	Gullies	P		$12,500			$5,000	$7,500
	Riparian	P		$45,000			$15,000	$30,000
	Instream	P		$60,000			$10,000	$50,000
		Grand Total		$2,100,000	$225,000	$785,000	$795,000	$295,000

Clear Creek Watershed PU

The Clear (*Milgeelde*) Creek Watershed is listed as a target watershed in the current regional RMP WRP listing. As a result of development, particularly forest harvesting, fish habitat is extensively impacted. Adult fish escapement records show declines in several fish species. A species of particular concern is Sockeye salmon, which have declined dramatically (Grieve et al, 1997).

The planning unit has three significant sub-basins within it which are: Clear (*Milgeelde*) Creek (which drains into the wetland complex and the Upper Kitsumkalum/Beaver (*Wiigwenks*) River at the north end of Kalum Lake (*Lax Gibeelk* or *ɬ' puumt'aamstpuun*), Ambystoma Creek (which enters Clear Creek on the left bank about two thirds of the of the length of the Clear Creek), and Douglas (*Ksi daaw*) Creek which drains directly into the north end of Kalum Lake (*Lax Gibeelk* or *ɬ' puumt'aamstpuun*).

The KWRP is currently preparing a detailed FRP for this planning unit. For additional restoration information on the above sub-basins please refer to the FRP document (Gilchrist et al, 2001).

Planning References and/or Cited Literature[1]

Grieve, Glenn & A. Gilchrist 1997 *Kitsumkalum watershed restoration Project; Level I Detailed Assessment of Fish and fish Habitat, and Prescriptions for restorative Work on: Stephanie, Seefried, Anweiler, Ambystoma, and Clear Creeks in the Kitsumkalum River Watershed.* Biolith Scientific Consultants Inc.

Gilchrist, Alan, and Lars Reese-Hansen 2001 *(Restoration Plan for the Clear Creek Watershed-Unit – Draft)* Kitsumkalum Band Council & Hydroglyphic Terrain Analysts

Morrell, Mike 2000 *Status of Salmon Spawning Stocks of the Skeena River System* Morrell Consulting Ltd. & Northwest Institute for Bioregional Research

[1] Refer to Gilchrist 2001 (see above) for complete list of references for this watershed-unit.

Lower Kitsumkalum River Watershed PU

Introduction

The Lower Kitsumkalum River (LKR) Planning Unit is listed as a target watershed in the current regional RMP WRP listings. As a result of development, particularly from forest harvesting over the last four to five decades, fish habitat in this watershed has been extensively impacted.

The planning unit has twelve distinct sub-basins (plus LKR residual areas[1]). Some of the sub-basins may require further subdivision when preparing the Full Restoration Plan. The sub-basins are 1) Star Ck., 2) Alice Ck., 3) Benoit Ck., 4) Luncheon Ck., 5) Spring Ck. (*Sgaseexs*), 6) Deep Ck., 7) Lean-to Ck., 8) Glacier Ck. (*Sidau*), 9) Camp Ck., 10) Burgar Ck., 11) Pontoon Ck., and 12) the Lower Kitsumkalum River. Residual areas are described in conjunction with quadrants (see Division of Planning Units below).

The Lower Kitsumkalum river is hydrologically regulated by Kalum Lake (*Lax Gibeelk* or *ɬ' puumt'aamstpuun*) and is consequently quite stable. However, in addition to extensive upslope development – especially within the sub-basins - the mainstem of the Lower Kitsumkalum River was substantially modified during the 1950's to facilitate a "log-drive" from Kalum Lake (*Lax Gibeelk* or *ɬ' puumt'aamstpuun*) to the confluence with the Skeena River (Culp et al., 1997). Modifications to the river to accommodate the log-drive included: dredging, channelizing, hardening/armouring river banks, and construction of a large log storage pond (Log Pond) in the middle of the flood plain near the rivers' confluence with the Skeena.

There are two fish hatchery facilities within this unit. One is operated by the Terrace Salmonid Enhancement Society and is located on Deep Creek. The other is operated by the Kitsumkalum Band Council and is located south of Luncheon Creek near the right bank of the Kitsumkalum River.

Division of Planning Unit

Due to the complexity of the unit, the extensive development history within it, and the varying degrees to which restoration activities have taken place at the sub-basin level, it is proposed here that the LKR watershed-unit be divided into four quadrants. This will

[1] It should be noted that there are several smaller watersheds which drain directly into the Kitsumkalum River which are not included in the above list. The "residual" watersheds have been classified in this interim plan as part of the Lower Kitsukalum River sub-basin and will be included, and where information exists, described along with the adjacent quadrants (see Division of Planning Units for discussion of quadrants).

simplify the preparation of a Full RP and facilitate portions of this important watershed-unit to become eligible for FRBC restoration funding[1].

The proposed LKR quadrants are: 1) the Star (includes Star and Alice Ck.s), 2) the Luncheon (includes Luncheon and Benoit), Deep (includes Spring (*Sgaseexs)*, Deep, Lean-to, and Glacier/Culp), and Pontoon (includes Burger, Camp to Pontoon).

This interim plan focuses on the Deep Creek quadrant only. It should be noted that the preparation of an interim RP for the Deep Creek quadrant does not indicate that the other quadrants are of a lesser priority. It is assumed that priority sub-basins, including their priority components and activities, will be identified at a later date when either the interim or full RP is completed for the entire LKR unit.

Watershed (Overview) Assessments & Works To Date

An over view of the watershed was conducted by a variety of local consultants. The lead consultant was McElhanney Consulting Services Ltd. of Terrace and was completed in 1996 (Bolin et al, 1996, Gordon, 1996a, and Grieve, 1996).

Additionally, a number of detailed: road, hillslope, and gully; fish habitat; and riparian assessments have been completed for the unit. Much of the planning unit has been assessed to address restoration of at least one component within specific sub-basins.

Summary information

Sub-basin:	Spring	Deep	Lean-to	Glacier
Tenure	TSA, SBFEP, Municipality[2], community-watershed, extensive private land.	TSA, SBFEP, community-watershed, extensive private land.	TSA, some private land	TSA
Area (km^2)	17	49	45	20.4
Area logged (km^2)	2.9	11.9	19.2	6.2
ECA (km^2)	0.3	1.1	2.3	4.0
Channel [3]:				
Type (CAP)	(riffle/pool)	n/a	Riffle/run/pool	(riffle/some pool)
Width	8.0	n/a	18	n/a
Gradient	1.5	1.5	3%	5%
# of reaches	3	9	8	6

[1] The magnitude of the impacts in this watershed-unit preclude it from achieving the FRBC goal of restoration completion within five years. Restoring one or two selected quadrants within the required five year time frame is achievable.
[2] Significant portion of watershed is within municipality of Terrace and most of watershed is fee simple.
[3] Reach one information only.

Fish Targeted	Coho, Chinook, Pink, Cutthrout trout, &Dolly varden, (& Bull trout)	Coho, Chinook, Pink, steelhead, Rainbow & Cutthrout trout, & Dolly varden, (& Bull trout)	Coho, Chinook, Pink, steelhead, Rainbow & Cutthrout trout, & Dolly varden, (& Bull trout)	Coho, Chinook, steelhead, Rainbow & Cutthrout trout, & Dolly varden, (& Bull trout)

Component Description and Conditions:

All the watersheds described below originate in the Nass Range between the Kitsumkalum River watershed and the Skeena River watershed to the north east of the city of Terrace B.C. Generally, these sub-basins flow in a westward direction until they meet the LKR.

Spring *(Sgaseexs)* Creek

Watershed type: Spring *(Sgaseexs)* Creek is a relatively small low-gradient stream which is partially coupled in its upper reaches. Between the Nass Range and the stream's confluence with the LKR the creek flows over a terrace made up of highly errodible fine grained soils (glaciomarine and glacio lacustrine). The occurrence of the fine textured soils increases the connectivity between reaches. The terraced area has been subject to extensive rural residential development and falls within a municipality of Terrace B.C.

Channel Condition: Poor. Due to the nature of the soils and the urban development (largely road related) the condition of the channel is impacted by sedimentation and bank instability.

Riparian Condition: Poor. Triton (TECL 1996) identified riparian restoration as an important restoration component required to help reduce impacts related to bank instability. There is very little remaining mature coniferous forest adjacent to the stream channels.

Hillslope & Gully Condition: N/a

Road Condition: Fair. During periods of high precipitation and snow melt, urban roads within the watershed are a significant source of fine sediment which impact the stream channel and fish habitat.

Habitat Condition: Poor. Triton (TECL 1996) identified several impacts which are seriously degrading or

constraining to fish and their habitat. They include: sedimentation, stream bank instability, loss of riparian function (particularly bank stabilization), and migration barriers.

Deep Creek

Watershed type: The Deep Creek watershed is a moderate sized watershed in the LKR. The upper reaches are highly coupled to the hillslopes while the central and lower reaches are partially coupled. The upper reaches are high gradient while the middle and lower reaches are a (moderately) low gradient. There are some fine textured glaciomarine soils in the watershed.

Channel Condition: Poor. Channel instability, harvesting to the stream banks, increased bedload, and reductions in LWD contributions have impacted the stream channel. There is a high potential for more sediment to be introduced into the stream due to failing upslope roads (MCSL 1998a). The alluvial fan at the confluence with Kitsumkalum River was developed as a large log landing and camp.

Riparian Condition: Poor to moderate. Grieve (1996) indicated that most of the riparian forest had been removed to the stream bank causing bank instability and reductions in LWD contributions to the lower reaches of the creek. The logging in the watershed was concentrated during the 1940 through to the early 60's. Gordon (1996a) rated the priority for further riparian assessment as "low to high" depending on the reach, and recommended concentrating efforts in reaches 1, 3 and 4.

Hillslope & Gully Condition: Fair. Bolin and Heibein (1996) identified 36 logging related slides and characterized the gullies in the upper reaches as "active". Several slides have had prescriptions developed to help reduce sediment generation by using grass seeds (MCSL 1998a).

Road Condition: Poor. Bolin & Heibein (1996) identified 34 kms of logging road in the sub-basin. Prescriptions for the treatment of roads presenting risk to the land base and fish habitat have been developed (MCSL, 1998a)[1].

Habitat Condition: Fair. Fish population trends are declining. Channel stability and reductions in the occurrence of LWD are limiting habitat factors to fish production. The development of mixed riparian forest cover has helped recover bank stability in portions of some reaches.

Lean-to Creek

Watershed type: The Lean-to Creek watershed is a moderate sized watershed in the LKR and includes a tributary basin called Whelpley Creek (north arm of Lean-to Creek). The upper and middle reaches of the Lean-to sub-basin are highly coupled to the hillslopes, and the lower reaches are partially coupled. There are some erodible glaciomarine soils in watershed and there is high connectivity throughout the watershed.

Channel Condition: Poor. The stream gradient ranges from low in the first reach to moderate in the middle reaches. The upper reaches and tributary streams are often high gradient and are defined by hillslope gullies. Elevated sediment levels originating from upslope areas, removal of riparian forest to the stream bank along the valley bottoms, and decreased LWD contribution have increased channel and bank instability. Currently, there is excess bedload materials working through the system which originated from upslope forest harvesting related activities. The stream channel appears to be stabilising. However, there is a high potential for additional transport of sediment into the stream channel from failing roads, hillslopes, and gullies in the watershed (Gilchrist 2000).

Riparian Condition: Poor and fair. The riparian areas throughout the system, especially in the mid reaches, has been harvested to the stream bank. Conducting a detailed assessment along reach 4 of Whepley Creek, and all of

[1]Based on experiences with road assessments at the Kitsumkalum Watershed Restoration Programs, it is often the case that older, high-risk roads, were not assessed due to these roads not appearing on TRIM or Forest Cover Mapping which were used to define the scope-of –work agreements with assessment contractors.

Lean-to Creek, was rated as a high to very high priority (Gordon 1996).

Hillslope & Gully Condition: Poor. There is evidence of recent landslide and gully failures throughout the middle and upper reaches of the sub-basin. An assessment of roads in the sub-basin show that many of these failures are related to forest roads.

Road Condition: Poor. The sub-basin has been extensively roaded to permit forest harvesting in the watershed. Many high risk roads are heavily overgrown. Some roads have failed in locations which restrict or block access to high risk segments of roads located elsewhere in the sub-basin. Some roads appear to have been constructed directly in the main stream channel.

Habitat Condition: Poor. Excessive sediment levels and bedload movement have reduced quality and complexity of habitat. Limiting factors include: reduced frequency of pool habitat for rearing and over wintering; spawning habitat instability due to extensive scour; and degraded habitat complexity due to lack of LWD (Sinkewiez 2001). Off-channel development may be required to provide stable rearing habitat while bedload in the stream moves through the system and stream channels re-stabilise.

Glacier (*Sidau*) Creek

Watershed type: The Glacier (*Sidau*) Creek watershed is a moderately sized watershed in the LKR and includes a small high gradient tributary basin called Canyon Creek. The upper and middle reaches of the Lean-to sub-basin are highly coupled to the hillslopes, and the lower reaches are partially coupled. There is high connectivity throughout the watershed.

Channel Condition: Poor. Elevated sediment levels originating from upslope areas, removal of riparian forest to the stream banks in the valley bottoms, and decreased LWD contribution, have increased channel and bank instability. The watershed has not been subject to development activities or significant floods for several years and rates of sediment transport appear to be stabilising. The upper reaches are high gradient while the middle are moderate, and the first reach gradient is

moderately-low. The stream channel does not exceed a 20% gradient in the first four reaches. Currently, there is excess bed-load materials working through the system which originated from upslope harvesting related activities. Although the stream channel appears to be stabilising, there is a high potential for additional sediment to be transported into the stream channel from the remaining untreated high risk roads in the watershed (MCSL 1998b).

Riparian Condition: Fair to moderate. All of reaches one and three, and most of reach two have been harvested to the stream side. Long term recruitment of LWD is limited and forest harvesting to stream side have resulted in bank instability, particularly in reach one. Some prescriptions were developed in 1997 (Pollard et al.) based on an overview of the sub-basin conducted by Pacific Cascades Consulting Ltd. (Gordon 1996a) the previous year. The overview rated riparian impacts as moderate and high depending on reach assessed. Approximately one hector of immature riparian forest was treated in reach one in the summer of 2000. It has been suggested that further riparian treatments may be required in reach one to meet long term LWD recruitment and bank stability objectives (McLelland 2000).

Hillslope & Gully Condition: Moderate. A number of logging related hillslope and gully failures were noted in the overview assessment (Bolin et al. 1996). During field assessments of the sub-basin it was determined that there were no hillslope or gullies which required treatment (MCSL 1998b).

Road Condition: Fair. Most roads on the north side of the main channel have been treated. Dead mans road, and several roads accessed from the (North Lean-to FSR) south side of the main channel require treatment. Treatment has been deferred until the 2001 season to coincide with licensee forest development plans and the construction of a bridge. Treatment of the above mentioned roads will complete all road deactivation treatments for this sub-basin.

Habitat Condition: Fair. The sub-basin hasn't been subject to a high water event in several years and the habitat condition is stabilising. Some restoration work has taken place in the lower portion of the fan to help stabilise stream banks (Sinkewiez 1999). A proposed side channel

located in the north channel of reach 2 (*Dead Mans Side Channel*) requires further assessment (Grieve 1998). A long term strategy to recruit LWD into the stream channel requires consideration.

Kitsumkalum River and Residual

The Kitsumkalum River and residual basins make up a unique, and in some respects, complicated sub-basin. The area has been subject to extensive harvesting and the river itself was significantly modified to accommodate use as a log transportation corridor in the late 1950's. Based on the time frame that this report must be completed, and the nature of this sub-basin, review of the component descriptions and conditions could not be completed and documented here. Completion of this section would be more efficiently addressed during the development of a FRP.

Immediate Restoration Goals & Objectives

Spring *(Sgaseexs)* Creek

No specific objectives have been set for this watershed. The upper reaches of the watershed form part of the City of Terrace's Community Watershed where one of the City's reservoirs is located. Below the City's watershed boundary the remaining watershed is made up of small rural fee simple properties which fall within the City's municipal boundary. As a result limited number of FRBC eligible restoration activities that could be conducted within the sub-basin would have little benefit. Therefore, the Spring *(Sgaseexs)* Creek watershed has been rated as a low priority for restoration utilizing FRBC funding. Currently there is active logging in the upper reaches of the sub-basin.

Deep Creek

Instream

1) Conduct a detailed FHAP for the sub-basin to assess limiting factors to fish and their habitat.

Riparian

1) Conduct a riparian assessment of the sub-basin to increase long term LWD contribution. Assessment should focus primarily on reaches 1, 3, and 4.

Upslope

1) Conduct brief historical airphoto review of the sub-basin to identify and assess high risk roads which were not assessed during the 1998 MCSL study.
2) Treat identified high risk roads and hillslope failures documented in the MCSL study (MCSL 1998a).

Lean-to Creek

Instream

1) Treat areas of upslope instability throughout the watershed to reduce the introduction of sediment into the stream channel(s) (Gilchrist 2000).
2) Introduce LWD in the lower reaches to create pools complexity.
3) Increase bank stability at identified key sites.

4) Develop stable off-channel rearing and over wintering habitat in reach one of Whepley Creek (Sinkewiez, 2001).

Riparian

1) Develop prescriptions, where suitable and along all reaches, that will accelerate the establishment of a mature conifer dominated forest to: 1) increase the rate of LWD recruitment to the stream, and 2) increase bank stability.

Upslope

1) Treat all unstable roads and upslope areas, above the mid and upper reaches, identified during upslope assessments of the watershed (Gilchrist 2000).

Glacier (*Sidau*) Creek

Instream

1) Assess, and if deemed feasible, construct side channel in the north fork of reach two which will provide stable cover, spawning, rearing, and over wintering habitat, for Coho, steelhead, and resident species.

2) Increase potential for long term recruitment of LWD to the stream channel (see riparian below).

Riparian

1) Develop prescriptions to increase the conifer stocking within harvested areas along the main-channel flood-plain.

2) Develop a treatment strategy to accelerate long term contribution of LWD to the stream.

Upslope

1) Treat remaining (three) roads in sub-basin.

2) Treat lower Dead Mans Road in conjunction with side channel project (referred to above).

3) Conduct quick historical airphoto review to ensure all roads eligible for treatment have been identified and assessed.

Kitsumkalum River and Residual

(To be determined.)

Planning References and/or Cited Literature

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Kitsumkalum Watershed Restoration Program

INTERIM RESTORATION PLAN

Lower Kalum PU - Kitsumkalum River Watershed; Restoration Success Evaluation - Table 3

Administrative Unit: Lakelse
December 18, 2000

Basin/ Subbasin	Target Species	Limiting Fish Habitat Factor	Watershed Condition and Restoration Benefits	Landslides	Gullies	Roads	Riparian	Channel	Instream
Spring			Level of existing or potential disturbance						
			Impact or risk to fish habitat						
			Likelihood of benefit to fish habitat from restoration						
Deep		Rearing and spawning (channel instability)	Level of existing or potential disturbance	Moderate	High	High	Moderate	High	High
			Impact or risk to fish habitat	Moderate	High	High	High	High	High
			Likelihood of benefit to fish habitat from restoration	Moderate	Moderate	High	High (long term)	High (long term)	High

Lean-to		Over wintering, rearing, and spawning	Level of existing or potential disturbance	High	High	High	High	High	High
			Impact or risk to fish habitat	High	High	High	High	High	High
			Likelihood of benefit to fish habitat from restoration	High	High	High	High (long term)	Moderate to high	High
Glacier		Over wintering, rearing, and spawning	Level of existing or potential disturbance	Low	Low	High	High	High	High
			Impact or risk to fish habitat	Moderate	Moderate	High	High	High	High
			Likelihood of benefit to fish habitat from restoration	Low	Low	High	High (long term)		High
Kalum River & Residual [1]		Spawning	Level of existing or potential disturbance	Low	Low	Low	Moderate	Low to Moderate	Moderate
			Impact or risk to fish habitat	Low	Low	Low	High	Low	High (localized)
			Likelihood of benefit to fish habitat from restoration	Low	Low	Low	High (long term)	Low	High

1 Evaluation of success is for main stem only. Residual areas require review of airphotos to evaluate.

Kitsumkalum Watershed Restoration Program

LOWER KALUM RIVER PU - INTERIM RP								
Summary of Investment Status and Estimated Budget								
Date: December 18, 2000								
Watershed Investment Phase/Sub-basin	Watershed Components	Status(complete=c, ongoing=o, planned=p, NR=not required)	Estimated Outputs to complete (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Spring Creek								
Assessments/ Prescriptions	Overview	C						
	Roads							
	Hillsides							
	Gullies							
	Riparian							
	Instream	C	FHA Complete					
	Fish Access							
Restoration Works	Roads							
	Hillsides							
	Gullies							
	Riparian							
	Instream							
Monitoring & Evaluations	Roads							
	Hillsides							
	Gullies							
	Riparian							
	Instream							
		Total		$0	$0	$0	$0	$0
Deep Creek								
Assessments/ Prescriptions	Overview	C		$0				
	Roads	90% C		$0	$5,000			
	Hillsides	90% C		$0	$5,000			
	Gullies	90% C		$0	$2,500			
	Riparian	P		$45,000	$30,000	$15,000		
	Instream	P		$45,000	$45,000			
	Fish Access	NR		$0				
Restoration Works	Roads	P		$175,000	$100,000	$75,000		
	Hillsides	C		$50,000		$25,000	$25,000	
	Gullies	P		$20,000		$20,000		
	Riparian	P		$100,000		$75,000	$25,000	
	Instream	P		$100,000		$75,000	$25,000	
Monitoring & Evaluations	Roads	P		$7,500			$1,000	$6,500
	Hillsides	P		$1,500			$500	$1,000
	Gullies	P		$2,000			$500	$1,500
	Riparian	P		$7,500				$7,500
	Instream	P		$20,000			$5,000	$15,000
		Total		$573,500	$187,500	$285,000	$82,000	$31,500
Lean-to Creek								
Assessments/ Prescriptions	Overview	C		$0				
	Roads	O (75% C)		$10,000	$10,000			
	Hillsides	O (75% C)		$0				
	Gullies	O (75% C)		$0				
	Riparian	P		$40,000	$30,000	$10,000		
	Instream	O (50% C)		$45,000	$45,000			
	Fish Access	NR		$0				

Restoration Works	Roads	P		$225,000	$150,000	$75,000		
	Hillsides	P		$85,000	$75,000	$10,000		
	Gullies	P		$25,000	$25,000			
	Riparian			$50,000		$20,000	$30,000	
	Instream			$175,000		$100,000	$75,000	
Monitoring & Evaluations	Roads	P		$7,000		$2,500	$1,000	$3,500
	Hillsides	P		$1,000		$500		$500
	Gullies	P		$1,000		$500		$500
	Riparian	P		$7,500				$7,500
	Instream	P		$15,000			$5,000	$10,000
		Total		$686,500	$335,000	$218,500	$111,000	$22,000
Glacier Creek								
Assessments/ Prescriptions	Overview	C		$0				
	Roads	C		$0				
	Hillsides	C		$0				
	Gullies	C		$0				
	Riparian	O (75%)		$20,000	$20,000			
	Instream	O (75%)		$30,000	$30,000			
	Fish Access	NR		$0				
Restoration Works	Roads	P		$75,000	$75,000			
	Hillsides	NR		$0				
	Gullies	NR		$0				
	Riparian	P		$50,000		$30,000	$20,000	
	Instream	O		$150,000		$100,000	$50,000	
Monitoring & Evaluations	Roads	P		$7,500		$3,500		$4,000
	Hillsides	NR		$0				
	Gullies	NR		$0				
	Riparian	P		$5,000				$5,000
	Instream	P		$12,500			$5,000	$7,500
		Total		350,000	125,000	133,500	75,000	16,500
Lower Kalum, River & Residual								
Assessments/ Prescriptions	Overview	O (90% C [1])		$2,500	$2,500			
	Roads	P		$7,500	$7,500			
	Hillsides	NR		$0				
	Gullies	NR		$0				
	Riparian	P		$75,000	$25,000	$50,000		
	Instream	P		$50,000	$35,000	$15,000		
	Fish Access	P		$2,500	$2,500			
Restoration Works	Roads	P		$25,000		$25,000		
	Hillsides	NR		$0				
	Gullies	NR		$0				
	Riparian	O (10% C)		$150,000		$75,000	$75,000	
	Instream	O (50% C)		$125,000		$75,000	$50,000	
Monitoring & Evaluations	Roads	P		$1,000			$500	$500
	Hillsides	NR		$0				
	Gullies	NR		$0				
	Riparian	P		$15,000				$15,000
	Instream	P		$17,500			$7,500	$10,000
		Total		$471,000	$72,500	$240,000	$133,000	$25,500
Grand Total				$2,081,000	$720,000	$877,000	$401,000	$95,500

1 Review residual areas

Nelson River Watershed PU

Introduction

The Nelson (*Sgahat'axk*) River Watershed is listed as a target watershed in the current regional RMP WRP listings. Over the last four to five decades this watershed has been extensively developed throughout all the sub-basins within the watershed-unit as a result of forest harvesting.

The Unit, which has three sub-basins within it, is unique as each sub-basin is: an order of magnitude smaller than the next, hydrologically unique in comparison with the others, and connected directly to Kalum Lake (*Lax Gibeelk* or *Ɬ' puumt'aamstpuun*) independent of the other sub-basins.

Most of the unit has been assessed and treated to address a range of logging related impacts. However, there are still a number of sites, or components, within sub-basins which require either assessment or treatment.

Watershed (Overview) Assessments & Works To Date

An overview of the watershed was conducted by a variety of local consultants. The lead consultant was McElhanney Consulting Services Ltd. of Terrace and was completed in 1996 (Bolin et al, 1996, Gordon, 1996a, and Grieve, 1996).

Additionally, a number of detailed: road, hillslope, and gully; fish habitat; and riparian assessments (including associated prescriptions), have been completed for the area (see references at end of this section for list of reports).

Sub-basins

There are three sub-basins within this watershed. They are the: 1) Nelson (*Sgahat'axk*) River, 2) Allard Creek, and 3) George Creek. All sub-basins have been subject to extensive forest development activities. The focus of this Interim RP is all three sub-basins.

Summary information

Drainage area:	Nelson River - 187 km^2 Allard Creek - 22 km^2 George Creek - 9.5 km^2
Tenure:	Predominantly Skeena Cellulose Inc.'s TFL #1. Small amount of private land (SCI Schedule A), BC Hydro transmission right away.

Basin:	Nelson	Allard	George
Area logged:	22 km^2	13 km^2	unknown
ECA:	2.9 km^2	1.3 km^2	unknown
Channel:			
Type (1st reach – CAP):	Run/some-pool	Riffle/some-cascade	Pool/riffle/run
Width (1st reach):	20-300m	8-10m	3-5m
Gradient (%):	0.4%	2-3%	≤ 1%
# Reaches	8	numerous	5(+ tribs)

Target Fish Species: Coho, Steelhead, Cutthroat trout, and Dolly Vardin char, and (Sockeye).

Component Description and Condition

Nelson River (*Sgahat'axk*)

Watershed type: The Nelson River (*Sgahat'axk*) watershed is a moderate to large size (>100kms^2) coastal watershed. In the lower reaches, where most of the logging development has taken place, the main channel is partially coupled to the hillslopes. The wide flood plain through the 11 km long reach 4 provides extensive off-channel habitat. In this reach off-channel habitat is connected to valley side walls. The headwater source of the Nelson River (*Sgahat'axk*) is two glaciers.

Channel condition: Fair to Moderate. Moderately large system with low gradient. Largest impacts include: 1) reduced LWD contribution due to flood plain forest harvesting in reaches 1 through 4, and 2) sediment transport into off-channel habitat along valley side-walls from upslope forest development activities in reach four.

Riparian condition: Poor to moderate. Of the four reaches of most concern, reach one and four have been impacted by logging the most extensively. Impacts in these reaches have been rated as very high (Gordon 1996). The riparian vegetation in these two reaches was 90% and 75% harvested from a period starting in 1956 to 1973. This

forest cover played an important role in the complex off-channel and tributary-channel along the reaches.

Hillslope & Gully condition: Fair to moderate. The lower reaches of the Nelson River (*Sgahat'axk*) are either not coupled, or are partially coupled, to the hillslopes. Off-channel habitat is coupled in reach four. The lower portion of this 11 km reach was impacted by forest harvesting (on the valley side walls) and is at risk of impacting off-channel and habitat adjacent valley side walls. A number of recommendations for further assessment and treatment of gully crossings was made by McElhanney (1997b).

Road condition: Fair. Detailed assessment and prescriptions for road related impacts in this watershed were completed by McElhanney (1997b). Most roads have been treated (Reese-Hansen et al, 1999). However, treatment of several roads was postponed due to requirements to reassess. Also, several gully crossings which are connected to off-channel habitat in the main river channel require prescriptions and treatment.

Habitat condition: Good. No detailed fish habitat assessment has been conducted for this sub-basin. Based on its size and low gradient the largest impact to fish habitat is likely reduced LWD contributions in reaches one through four. Associated limiting factors include opportunities for cover and habitat complexity. A detailed fish habitat assessment is required for this basin which should include identifying fish access constraints to off-channel habitat in the first four reaches of the river.

Allard Creek

Watershed type: The Allard Creek watershed is of a small size (10 to 30kms^2) and the main channel is coupled to the hillslopes. The stream is characterised by a series of incised gully channels which flow down a mountain ridge in a rectilinear fashion. These streams flow onto a large morainal terrace (known locally as Pine Flats) where they eventually converge, then cascade through a short canyon, and flow onto an alluvial fan located on the shoreline of Kalum Lake (*Lax Gibeelk* or *l' puumt'aamstpuun*).

Channel condition: Poor. A small system with high gradient reaches. There is evidence of debris torrents occurring over the last few decades. Torrents, originating

from the hillslopes, flowed into streams above and onto the morainal terrace. The largest impacts to the channels include: 1) extensive road crossings, 2) reduced bank stability due to removal of mature riparian vegetation, and 3) areas where the stream channel has been channelized and modified to maintain road alignments.

Most of the road crossings have been treated (Reese-Hansen et al, 1999). However, some significant concerns have not been addressed. These include: 1) the modifications to a stream channel which has the potential to cause a major stream avulsion, and 2) a large sediment wedge, which continues to aggrade, above a 1.5m culvert on the south-fork of Allard Ck. at the West Kalum FSR crossing. The accumulating wedge, if blocked during a rain or snow-melt event, poses as a risk to the road and down stream habitat.

Riparian condition: Fair to moderate. All (100%) of the riparian vegetation along the lower reaches of Allard Creek was harvested between 1958 to 1960. Generally, the riparian condition of the Allard Creek system is recovering well but some treatments have been recommended as a high priority (Gordon, 1996, and Grieve, 1999).

Hillslope & Gully condition: Poor to moderate. The gully channels above the morrainal terrace are unstable. Historically, there have been torrenting events resulting from forest harvesting activities. The slope on the terrace is typically low gradient and there is very little upslope activity impacting stream channels. Where the stream channels flows east and off the terrace toward Kalum Lake (*Lax Gibeelk* or *Ɬ' puumt'aamstpuun*), there is a significant increase in gradient. However this portion of the stream is a bedrock controlled canyon and there is little coupling with the surrounding hillslopes.

All roads that were eligible during the period were treated with the exception of a gully crossing on the southern gully channel (Rd. 5540 E @ ~1+240 to 1+270). This road crossing was left in place at the request of the forest licensee (SCI).

Road condition: Good to complete. Roads in this basin were assessed in 1997 (McElhanney). They were subsequently treated in the same year (Reese-Hansen et al,

1998b). Recent monitoring work in this sub-basin has indicated that some minor road related maintenance is required (Christiansen 2000) to complete this component.

Habitat condition: Moderate. It has been suggested that historically Coho (and steelhead) may have accessed the morrainal terrace prior to placing the perched culvert on the West Kalum FSR (Grieve 1999a). The habitat condition on the terrace is good, though there is some instability in tributary streams due to excess bed load, and there is limited LWD recruitment into the stream.

George Creek

Watershed type: The George Creek watershed is a very small (<10kms^2) low gradient, partially coupled, stream. Stream flow energy is moderated by a series of small lakes. Consequently, the stream channel is highly stable.

Channel condition: Good: Due to the low gradient of the watershed and a series of small lakes the creek is stable. There is one area of hillslope instability on the right bank of the first reach which poses as a risk. The most significant impacts to the channel include: lack of LWD recruitment for channel complexity and the introduction of fine sediments at several road crossings (Reese-Hansen 1998).

Riparian condition: Moderate to good. All (100%) riparian vegetation along the length of George Creek was harvested in the last 1950s and 1960s. However, due to the size of the stream and it's relative stability, the riparian area is recovering well. ACER conducted a detailed assessment for the watershed and prescribed remedial works for several polygons (Pollard 1997). The KWRP implemented one of the recommended prescriptions during the summer of 2000.

Hillslope & Gully condition: Good. George Creek is a small watershed of low gradient. Coupling is restricted to the area immediately next to the stream channels. There is an area of upslope instability that is of concern. This hillslope forms the right bank of George Creek in the lower portion of the first reach. The bank is made up of fine textured soils and, upon failure, would effect down stream spawning habitat. The bank is showing signs of slumping and requires assessment (Gordon 1997).

Road condition: Moderate to Good. All roads in the upper third of the George Creek watershed were assessed by McElhanney (1997). These roads were subsequently treated in the same year (Reese-Hansen et al, 1998b). Road related upslope concerns in other parts of the watershed are not impacting the stream channel. Two impacts which do require assessment include: 1) sediment introduction from the West Kalum FSR. and 2) fish passage/access at various crossings throughout the drainage.

Habitat condition: Good to complete. George Creek has been treated successfully. Prior to treatment fish access from Kalum Lake (*Lax Gibeelk* or *Ł' puumt'aamstpuun*) into this small sub-basin was restricted due to changes in habitat and debris jams from forest harvesting. In order to complete this component road sediment from the West Kalum FSR should be eliminated or reduced (Reese-Hansen et al, 1998a). There has been, and continues to be, considerable beaver activity in the area which has the potential to conflict with restoration objectives. Periodic annual monitoring of all works should be carried out.

Immediate Restoration Goals & Objectives

Nelson River (*Sgahat'axk*):

Instream

1) Conduct a detailed fish habitat assessment to identify the limiting factors to fish production resulting from forest harvesting. The assessment should be restricted to those reaches which have been developed and should include an assessment of fish access in, and adjacent to, the main channel floodplain.

Riparian

1) Conduct a detailed riparian assessment to identify areas suitable for treatment and which increase the long-term LWD and litter fall contribution to the lower four reaches of the river.

Upslope

1) Develop prescriptions for high risk gully crossings which impact valley-wall off-channel habitat along reach four.
2) Implement above prescriptions and outstanding priority road deactivation prescriptions.

Allard Creek

Instream

1) Conduct assessment to determine if the terrace is accessible to migrating fish from Kalum Lake (*Lax Gibeelk* or *Ł' puumt'aamstpuun*). The assessment will require the examination of the perched culvert on the south fork of the creek at the West Kalum FSR. The assessment may require a multiyear study where the system is seeded with Coho and returning adults are observed.
2) If the perched culvert is modified to allow access, and the terrace is determined to be accessible, then stream restoration works should be considered on the glacial terrace area.

Riparian

1) Examine the feasibility and cost effectiveness of treating the first reach of the creek and the identified areas on the glacial terrace.

Upslope

1) *Address issues as identified in 2000/01 upslope monitoring of basin (Christiansen 2000).*

George Creek:

Instream

1) Assess whether sediment introduction into the creek is significant, and if so, develop a method to eliminate or reduce the road generated sediment from entering the stream.
2) Conduct an active monitoring program to ensure that restoration initiatives are functioning as intended and to identify areas where other activities could be

implemented which would improve forest harvesting related impacts to fish habitat in the creek.

Riparian

1) Monitor implemented works. Based on assessments and completed works for this component all activities for this sub-basin are complete.

Upslope

1) Conduct a hillslope stability assessment of the failing left bank in reach one.
2) Assess sediment impacts from FSR.
3) Assess road related fish access constraints within the system in key locations.

Planning References and/or Cited Literature

Bolin, Pat 1996 *Kitsumkalum Watershed Restoration Project; Level I Final Report*, McElhanney Consulting Services Ltd.

Bolin, Pat and Rob Heibein 1996 *Kitsumkalum Watershed Restoration Project; Technical Report; Level I Overview Assessment Road, Hillslopes, and Gullies* McElhanney Consulting Services Ltd.

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Reese-Hansen, Lars, John Christiansen, & Wayne Robinson 1998b *"As Built" Report: 1997 Southwest Kalum & Conroy Creek Road Deactivation* KWRP

Kitsumkalum Watershed Restoration Program

INTERIM RESTORATION PLAN

Nelson PU - Kitsumkalum River Watershed: Restoration Success Evaluation - Table 3

Administrative Unit: Kalum
Date: August 18,2000

Basin/ Subbasin	Target Species	Limiting Fish Habitat Factor	Watershed Condition and Restoration Benefits	Landslides	Gullies	Roads	Riparian	Channel	Instream
Nelson River	Coho, Sockey, Pink, Steelhead, Cutthrout trout, Dolly vardin, (Chinook)	Rearing, Spawning, and Access	Level of existing or potential disturbance	Moderate	Moderate	Moderate	High	Low	Moderate
			Impact or risk to fish habitat	Moderate	High	High	High	Low to Moderate	Low to High [1]
			Likelihood of benefit to fish habitat from restoration	High	High	High	High (long term)	Low	Low to High [1]
Allard Creek	Coho, Steelhead, Cutthrout trout, Dolly vardin	Rearing, and Access	Level of existing or potential disturbance	High	High	Moderate	Moderate	High	High
			Impact or risk to fish habitat	High	High	High	Moderate	High	High
			Likelihood of benefit to fish habitat from restoration	Moderate	High	Moderate [2]	High (long term)	Moderate	Moderate
George Creek	Coho, Steelhead, Cutthrout trout, Dolly vardin	Rearing, Spawning, and Access	Level of existing or potential disturbance	Moderate	Low	Moderate to High	Moderate	Low	Moderate
			Impact or risk to fish habitat	High	Low	Moderate to High	Moderate	Low to Moderate	Moderate to High
			Likelihood of benefit to fish habitat from restoration	High	Low	Moderate to High	Low	Moderate	High

1 Tributarty streams in reach one have been impacted. FHA required to determine nature and magnitude of impacts. Impacts in main channel have low likelyhood of success.

2 Most roads treated - some residual risk.

Kitsumkalum Watershed Restoration Program

NELSON RIVER PU INTERIM RP								
Summary of Investment Status and Estimated Budget								
Date: August 18, 2000								
Watershed Investment Phase/Sub-basin	Watershed Components	Status(complete=c, ongoing=o, planned=p)	Estimated Outputs to complete (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Nelson River Sub-basin								
Assessments/ Prescriptions	Overview	C						
	Roads	C						
	Hillsides	C						
	Gullies	O (~50% C)	6 gullies	7500	$7,500			
	Riparian	P	15 km stream	35000	$35,000			
	Instream	P	15 km stream	30000	$30,000			
	Fish Access	P	~35 km rd	15000	$15,000			
Restoration Works	Roads	O (~70% C)	3 km	30000	$30,000			
	Hillsides	C						
	Gullies	O (~25% C)	6 gullies	25000		$25,000		
	Riparian	P	< 15 kms	100000		$50,000	$30,000	$20,000
	Instream	P	10km	65000		$40,000	$25,000	
Monitoring & Evaluations	Roads	P		$6,000		$1,500		$4,500
	Hillsides	P						
	Gullies	P		$2,500		$500		$2,000
	Riparian	P		$25,000			$15,000	$10,000
	Instream	P		$10,000		$3,000	$1,500	$5,500
		Total		$351,000	$117,500	$120,000	$71,500	$42,000
Allard Creek Sub-basin								
Assessments/ Prescriptions	Overview	C						
	Roads	O (~95% C)						
	Hillsides	C						
	Gullies	O (~95% C)						
	Riparian	P	10 ha	7500	$7,500			
	Instream	O (~80% C)	1 km	20000		$20,000		
	Fish Access	C						
Restoration Works	Roads	P	2 km	25000		$25,000		
	Hillsides	C						
	Gullies	P		???				
	Riparian	P		40000	$20,000	$10,000		$10,000
	Instream	P	TBD	TBD				
Monitoring & Evaluations	Roads	P						$5,000
	Hillsides	P						$1,000
	Gullies	P						$1,000
	Riparian	P					$2,500	$2,500
	Instream	P	TBD	TBD				
		Total		$92,500	$27,500	$55,000	$2,500	$19,500

George Creek Sub-basin								
Assessments/ Prescriptions	Overview	C						
	Roads	C						
	Hillsides	P	0.5 ha	2500	$2,500			
	Gullies	C						
	Riparian	C						
	Instream	O (~75% C)	0.25 km	10000	$10,000			
	Fish Access	P	5 kms	5000	$5,000			
Restoration Works	Roads	C						
	Hillsides	P	0.5 ha	10000	$7,500	$2,500		
	Gullies	C						
	Riparian	C						
	Instream	O (~75% C)	0.25 km	25000		$25,000		
Monitoring & Evaluations	Roads	P					$500	
	Hillsides	P		$1,500			$750	$750
	Gullies	C						
	Riparian	P		$15,000	$2,500	$2,500	$2,500	$7,500
	Instream	P		$15,000	$2,000	$2,000	$2,000	$9,000
				$84,000	$29,500	$32,000	$5,750	$17,250
		Grand Total		$527,500	$174,500	$207,000	$79,750	$78,750

Lakelse River Watershed PU

Introduction

The Lakelse River Planning Unit is listed as a target watershed in the current regional RMP WRP listings. As a result of development, particularly forest harvesting over the last four to five decades, fish habitat in this watershed has been extensively impacted.

The planning unit has eight sub-basins. They are Coldwater Ck, White Ck., Powerline Ck., Killutsal Ck., Mink Ck., Hai Ck., Herman Ck., and the Lakelse River. The number of sub-basins will likely increase during the development of a FRP when sub-basins are examined more closely. It should be noted that there are several other smaller watersheds which drain into either Lakelse Lake (*Lax gyels*) or Lakelse River which are not part of the above list but are part of the watershed-unit; in this plan these "residual" watersheds or areas are classified as part of the Lakelse River sub-basin.

One of the focal points of this watershed-unit is the Lakelse River. This unique river is hydrologically regulated by Lakelse Lake (*Lax gyels*) and consequently is quite stable. The river and Lakelse Lake, host a broad range of high resource values which are considered regionally significant. For example, the mainstem of Lakelse River has supported over a million spawning pink salmon in a single season (DFO 1991).

The area, know locally as the "Thunderbird", is a very popular recreation area. For example Lakelse Lake (*Lax gyels*), prized for it's warm summer water temperatures, is a very popular recreational destination, and the Lakelse River is internationally renowned for its excellent angling .

It is important to note that the implementation of some restoration activities along the mainstem of the Lakelse River, including some tributaries to the river, may be encumbered. From either river bank, to a location approximately 100 meters upslope, there is a reserve zone which restricts most activities (TRAC, 1992). The actual location of this zone, and the type of activities which may be permitted to take place within the reserve, should be determined prior to conducting any activities within the zone.

Small portions of planning unit have been assessed to address some restoration components. However, most of the unit requires assessment.

Division of Planning Unit

Due to the complexity of the unit, the extensive development history within it, and to help simplify the preparation of the interim plans, the Lakelse River watershed-unit has been divided in half. The division follows the Lakelse River and provides a natural break in the geography of the planning unit. On the north eastern half of the watershed-unit the sub-basins are low gradient and the surficial soils tend to be fine textured glacio-marine formations. the sub-basins in this half either flow into the west side of Lakelse Lake (*Lax*

gyels) or into the right bank of the Lakelse River. The following sub-basins make up the north eastern half of the planning unit: Mink, Hai, and Herman Creeks, including the northern half of the Lakelse River and right bank (north-side) residual areas.

Where as, the sub-basins to the south west originate high on the mountains slopes along the Nash (Mtn.) Ridge, often from glacial sources, and flow directly into the left bank of the Lakelse River. The south west half of the planning unit includes the following sub-basins: Coldwater, White, Powerline, and Killutsal Creeks, including the southern half of the Lakelse River and the left bank (south-side) residual areas.

This interim plan focuses on the south half of the unit only. This does not suggest that there are no high priority sub-basins in the north eastern half. Rather, much like the Lower Kalum watershed-unit, this approach has been taken to simplify the completion of the plan. Plans for the north will be completed at a later date.

For the purposes of developing a Full Restoration Plan for this watershed-unit, treating the Coldwater Creek watershed as a separate watershed-unit, and further dividing it into smaller sub-basins, should be considered. This, as well as maintaining the two divisions of the overall watershed-unit described above, will simplify the preparation of a Full RP, and facilitate portions of this important watershed-unit becoming eligible for FRBC restoration funding[1].

Watershed (Overview) Assessments & Works To Date

An overview of the watershed was conducted by a variety of local consultants. The lead consultant was Triton Environment Consulting Ltd. and was completed in 1996 (Gordon et al, 1996, and Bolin et al, 1996).

Additionally a limited number of detailed: road deactivation, hillslope, and gully; and fish habitat assessments have been completed for the area. No riparian assessments have been conducted to date.

Sub-basins

There are five sub-basins within the southern portion of the planning unit (see Division of Planning Unit above). All sub-basins, have been subjected to extensive forest development activities, and have high fish values. The focus of this Interim RP is only the five sub-basins on the south eastern half of the unit.

[1] The magnitude of the impacts in this watershed-unit preclude it from achieving the FRBC goal of restoration completion within five years. Restoring one or two selected portions (ie: Coldwater Creek, south eastern half, or north western half) within the five year time frame is achievable.

Summary information

Sub-basin:	Coldwater	White	Powerline	Killutsal	Lakelse (S)
Tenure	TFL #41, SBFEP, TL (WF)	TFL #1	TFL #1, TL (WF)	TFL #41, TL (WF), Private Land (TFL Schedule "A"), BC Hydro & PNG Utility Corridor	TFL #41, SBFEP, TL (WF), Private Land, BC Hydro & PNG Uility Corridor, CNR
Area (km^2)	98	43	9.5	< 6	64
Area logged (km^2)	14.7	1.8	0.9	n/a	22.3
ECA (km^2)	7.4	0.3	0.1	n/a	5.1
Channel [1]:					
Type (CAP)	Riffle & run. Some LWD formed pool.	Run & riffle. Some pool.	Run & riffle.	Run, riffle, & pool. Lower portion of reach is Lakelse Rr. flood plain.	Run
Width	15-40 m	5 – 25 m	5 – 30 m	5 m	40 – 120 m
Gradient	1.3 %	0 %	10%	4 %	1 %
Number of reaches	7 (+)	3	4	n/a	n/a
Fish Targeted	Coho, Chinook, Pink, Chum, Steelhead, Cutthrout trout, Rainbow trout, & Dolly Vardin	Coho, Chinook, Steelhead, Pink, Chum, Cutthrout trout, Dolly Vardin	Coho, Cutthrout trout, Dolly Vardin, (Steelhead)	Coho, Cutthrout trout, Dolly Vardin (Steelhead)	Coho, Chinook, Steelhead, Sockeye, Pink, Chum, Cutthrout trout, Dolly Vardin

[1] Reach one information only.

Component Description & Condition

Coldwater Creek

Watershed type: The Coldwater Ck. sub-basin is a moderately large basin relative to the Lakelse River watershed. It's upper reaches are coupled with the hillslopes and the head water streams are formed by small glaciers. The first reach of Coldwater Creek is low gradient and there is good connectivity with reaches upstream. There are several other distinctive low gradient (smaller) sub-basins within the Coldwater Creek watershed. They include: Boot, End, Johnstone, and Silvertip Creeks.

These small sub-basins all enter the first reach of Coldwater Creek.

Channel condition: Poor to fair. Reach one of Coldwater Creek has a narrow buffer remaining along the main channel. Reach one is primarily impacted by sediment transport from upper reaches of Coldwater Creek. Upper reaches have been harvested extensively and there are numerous upslope failures into the creek. Stream bank stability is also a concern in reach two, four, and five.

Tributary streams have been highly developed as result of forest harvesting. Habitat degradation and significant habitat change has occurred. For example, where important spawning habitat once occurred in tributary streams these are now occupied by beaver colonies, and there have been channel avulsions and rapid channel migrations (Gordon et al. 1996).

Riparian condition: Poor to fair. Extensive stream side harvesting occurred through the 1970's and 80's. Harvesting took place along reaches two and three of Coldwater Ck., and along the tributary streams that enter reach one of Coldwater Ck. A buffer strip was maintained along the mainstem of reach one in Coldwater Ck. Riparian impacts are most significant in areas at the upstream end (and upslope) of the mainstem in reach one. It has also been noted that removal of riparian cover adversely affected a wide range of terrestrial wildlife species including moose and bears. Riparian treatments in reach one may be encumbered (see Lakelse River Watershed-Unit; Introduction above).

Hillslope & Gully condition: Poor. The stability of hillslopes have been extensively impacted upslope of reach two, and particularly along reach three, four, and five. There were 34 forest harvesting related slides inventoried along these reaches (Gordon, 1996). Terrain stability is a major concern in the upslope in this sub-basin. Treatment of upslope impacts in the upper reaches has been recommended as a priority before initiating any instream treatments (Grieve 1999).

Within the tributary-stream watersheds, stream crossings and fish access are high priority concerns requiring assessment.

Road condition: Poor and Fair. Approximately 83 kms of road in the sub-basin were identified as requiring detailed assessment as a priority (Gordon 1996). Poor terrain stability and road building practices has resulted in road related impacts as being a very high priority upslope of reaches three through five. Treatment of upslope impacts in the upper reaches has been recommended as a priority before initiating any instream treatments (Grieve 1999). Also, at lower elevations and on the floodplain, water and stream channelization along roads has been identified as a significant impact.

Within the tributary stream sub-basins, stream crossings and fish access, are the priority impacts which require assessment.

Habitat condition[1]: Poor. Habitat conditions in most of the watershed are considered to be highly degraded (Grieve 1999). Lower reach impacts are largely due to connectivity with upper unstable reaches. Large volumes of sediment have been mobilized (from roads, gullies, and stream banks) and transported to the lower reaches where they have caused widespread aggradation contributing to channel instability. Reduced LWD contribution from reaches two, four and five, and to a lesser extent one, have been noted as negatively affecting down stream aquatic habitat. There are also significant road related concerns adjacent to the main channel in the mid reaches of the main creek.

The small sub-basins within the Coldwater watershed also host high fish values. The primary impacts in these drainages tend to be related to roads and habitat change. Detailed aquatic assessments were conducted in the winter and a ground reconnaissance to verify results has been recommended (Grieve 1999).

White Creek

Watershed type: This sub-basin is a moderately sized watershed which is coupled to the hillslopes for most of its length. The first reach, and the down stream portion of the second reach, are completely or partially decoupled from

[1] An additional detailed aquatic habitat assessment study was conducted 1999-2000. The current status of this work is unknown, however more information about this study can be determined by contacting BioLith Scientific Consultants of Terrace, B.C..

the hillslopes. There is good connectivity between the upper reaches and the upper end of the first reach where sediment transported down stream is deposited on a large (logged over) alluvial fan. The upper reaches of the sub-basin have been noted as having very unstable soils (Gordon et al. 1996).

Channel condition: Poor. Recent forest harvesting activity, as well as natural instability in the upper reaches, have impacted the stream channel in the upper and lower reaches of this sub-basin. Good connectivity between reaches has caused significant channel avulsions and migration in the lower unconfined reaches. This condition has been hastened by extensive harvesting of riparian and flood plain forests throughout the system.

Riparian condition: Poor. During the mid 1950's through to the 1970's, most riparian and flood plain forests were removed from the lower reaches of this sub-basin. The riparian area of a smaller tributary stream in an upper reach has also been extensively harvested. Much of the harvested riparian areas have been colonised by beavers which are preventing natural revegetation of these areas. The first and second reaches, as well as the small tributary in an upper reach, are considered as high priorities.

Hillslope & Gully condition: Poor. Based on the 1997 Overview Assessment logging activity in the upper reaches has been concentrated on the lower end of the third reach through to the creek's confluence with the Lakelse River. Upslope instability has been noted as an important issue and 12 slides were inventoried (Gordon, 1996).

Road condition: Poor. Road related impacts are extensive in the lower end of reach three including road initiated landslides into the creek. Within the sub-basin ~ 34 kms of road were identified as requiring detailed assessment as a priority (Gordon, 1996). In reach one and two only road crossings require assessment to evaluate condition and fish access impacts.

Habitat condition: Poor. Little historical fish inventory and habitat information is known about this sub-basin. However, based on: air photo interpretation, the geomorphology of the sub-basin, and the general habitat attributes of the watershed, the sub-basin was rated as

having very high fish values (Gordon, 1996). The steeper reaches have been impacted from increased sediment contributions from the hillslopes. The lower reaches have been extensively impacted from the loss of LWD and bank instability resulting from the removal of the riparian forest. Additionally, elevated rates of sediment transported from the upper reaches has caused aggradation across the alluvial fan exacerbating elevated channel instability associated with stream side and riparian forest harvesting.

Powerline Creek

Watershed Type: This sub-basin is a small sized watershed which is highly coupled to the hillslopes throughout its upper reaches. The head waters of this stream originate in the alpine and drop steeply onto a large unstable alluvial fan. The lower third is partially coupled to the hillslopes and the entire stream is very connected.

Channel condition: Poor. Multiple channels exist across the alluvial fan and throughout the reaches below this location. Recent avulsions on the alluvial fan have occurred due to road-location/stream-crossing interactions and forest harvesting on the alluvial fan. The (current) main channel has actively down cut in the upper reaches of the fan and is aggrading on the lower fan. Aggradation is causing sever channel: instability, avulsion, and migration.

Riparian condition: Poor (in mid reaches) and good (in upper and lower reaches). Vegetation removed in mid reaches across the fan has resulted in significant instability. Forest cover in the lower reaches are impacted (or are at a very high risk of being impact) from channel bank instability, channel migration, and aggradation.

Hillslope & Gully condition: Moderate. The area above the alluvial fan apex has not been affected by logging. The terrain in this area is naturally unstable (thin glacial veneers over bedrock), however the presence of a mature forest cover provides reasonable stability. The sediment contribution from this area is equal to the streams transport abilities.

Road condition: Poor to fair. Priority impacts associated with roads are those along the White Creek Forest Road where there are: multiple channels; perched and inadequate culvert sizing; and conflicts between beaver activity and water diversions onto the road. Avulsions and the

redirection of water on the fan complicate the above issues. There are several locations above the fan where side casted road fill is at risk of failing into the stream channel on the fan.

Habitat condition: Poor. In the lower reaches pool habitat has become in filled. Loss of pools has resulted in little to no over wintering habitat. Beaver activity in the lower reaches is restricting or preventing access. Severe channel instability and lack of LWD have degraded habitat conditions across the alluvial fan area.

Killutsal Creek

Watershed Type: An assessment of this sub-basin was not adequately covered in the Overview (Gordon, 1996). A small low gradient stream which is partially coupled to the upslope in upper reaches. There is only very localised connectivity.

Channel condition: Fair. Due to habitat changes resulting from riparian forest harvesting the stream channel has been extensively occupied by beavers and their inpondment's. The White Creek Forest Road has been subject to water diversions from beaver activity which has redirected water onto the road at various locations. A significant impact of this nature was treated resulting in the Killutsal Creek Rearing Ponds (fall of 2000).

Riparian condition: Poor. Approximately 85 % of the riparian vegetation has been removed from this creek. Harvesting occurred from 1955 through to 1985. Changes in riparian vegetation due to harvesting created ideal beaver habitat conditions.

Hillslope & Gully condition: Moderate. There are no known hillslope or gully impacts. A very brief overview of the watershed would confirm this assumption.

Road condition: Fair to moderate. Some areas are of high concern. Several road crossings are blocking fish access in lower reaches (White Creek Forest Road). The main stream channel now occupies a section of road # 3685.

Habitat condition: Fair. The primary impact to fish habitat in the watershed is due to the increased beaver activity which has caused extensive access constraints to migrating fish.

Lakelse Rr. South

Watershed Type: The Lakelse River is a moderately sized lake-headed river system which is not coupled with the hillslopes. The lake's effect on the river moderates flows during significant rain, or rain on snow, events. Stream banks are stable and there is an abundance of LWD throughout the river. There is connectivity with some of the sub-basins which enter the river. Transport of elevated levels of sediment have been documented for various sub-basins including Mink and Coldwater Creeks (Gordon 1997 & Grieve 1999).

There are several areas which do not coincide with any of the above sub-basins and have been classified as "residual" in the Overview. Where there is adequate information these will be discussed below.

Channel condition: Good (main channel) and Fair (off-channel). The river channel is very stable and features large quantities of LWD. There is localised connectivity with degraded sub-basins which are transporting and depositing sediments into the main river channel. However, due to habitat changes resulting from riparian forest harvesting in the watershed-unit, river off-channel areas have been extensively occupied by beaver populations and their impoundments. The White Creek Forest Road has been subject to water diversions from beaver activity and stream channel avulsions which has directed water onto the road at various locations.

Riparian condition: Moderate. Much of the old forest along the banks of the Lakelse River have not been harvested. There are some areas that have been harvested, however opportunities for treatment of these sites may be encumbered (see Lakelse River Watershed-Unit; Introduction above).

In the Lakelse residual areas there are several small creeks. The riparian condition of these is unknown.

Hillslope & Gully condition: Good. There are no hillslopes that are directly coupled with the river.

In the Lakelse residual areas there are several small creeks. The upslope condition of these is unknown. McElhhaney (Bolin, 1996) identified several road related gully crossing

which are failing, but rates these as a low priority. These could be easily assessed while assessing roads in adjacent areas.

Road condition: Good. There are no road related impacts directly affecting the river. McElhanney (Bolin, 1996) identified several road related gully crossing which are failing, but rates these as a low priority. These crossings could be easily assessed while assessing roads in adjacent areas.

Habitat condition: Good. There are some impacts to the stream due to limited harvesting, however these areas are limited. Also, there is localised connectivity with degraded sub-basins which are transporting sediment into the main river channel.

In the Lakelse residual areas there are several small creeks. The condition of these are unknown.

Immediate Restoration Goals & Objectives

Coldwater Creek

Instream

1) Treat upslope areas in upper reaches to reduce elevated sediment transportation, into and through, the main creek channel.
2) Conduct ground level reconnaissance to confirm findings from the (winter based) detailed aquatic habitat assessment.
3) Place structures in the main stream channel to provide complexity (Greive 1999).

Riparian

1) Reduce elevated sediment load in main channel to prevent channel instability and aggradation of sediments in riparian areas.
2) Prepare and implement riparian prescriptions (as per Grieve 1999).

Upslope

1) Assess and treat upslope areas (reaches three, four, and five) to reduce the elevated rate of sediment

introduction and bed load transportation in the stream's main channel.
2) Assess road crossings in the lower reaches and tributary streams to determine treatments to reduce associated impacts to fish habitat at these locations.

White Creek

Instream

1) Conduct a detailed fish habitat assessment to identify the limiting factors to fish production. The assessment should be concentrated on those reaches which have been developed and include an assessment of constraints to fish access in the first two reaches.

Riparian

1) Conduct a detailed riparian assessment (of reaches one and two, and the small tributary in reach three), including all adjacent floodplain areas. The primary objective of treatment is to increase, the long-term contribution of LWD, and bank stability.

Upslope

1) Assess all coupled and partially coupled upslope areas within the sub-basin to identify areas impacting fish habitat and requiring treatment.
2) Determine that there are no road related fish access constraints in the first two reaches of the sub-basin.

Powerline Creek

Instream

1) Convene interdisciplinary and interagency resource team to review assessments to date and recommend future directions for restoration.

Riparian

1) Convene interdisciplinary and interagency resource team to review assessments to date and recommend future directions for restoration.

Upslope

1) Convene interdisciplinary and interagency resource team to review assessments to date and recommend future directions for restoration.
2) Treat all creek-channel road-crossings along the White Creek Forest Road to accommodate avulsing stream flows on the Powerline Creek alluvial fan.

Killutsal Creek

Instream

1) Conduct a detailed fish habitat assessment to identify the limiting factors for fish production. The assessment should focus access constraints throughout the main channel and to the Lakelse River.

Riparian

1) Conduct a detailed riparian assessment to determine areas where riparian prescriptions can be implemented that would, a) (help) deter beaver activity and, b) increase long term LWD contributions to the stream.

Upslope

1) Assess the White Creek Forest Road to determine road deactivation or upgrade activities that will eliminate or mitigate: a) potential fish stranding, and b) conflicts between the vehicle access and fish along the road.
2) Conduct a brief airphoto overview of the drainage to determine if any road crossings upstream from the White Creek Forest road are impacting the stream. (This survey should be conducted with FHAP – instream objective above.)

Lakelese Rr. South

Instream

1) Assess potential impacts to mainstem spawning substrates from elevated levels of fine sediments mobilized from selected sub-basins.
2) Conduct an airphoto review of residual areas to determine if there are any instream impacts which require further assessment.

Riparian

1) (There are no specific objectives for this component in the mainstem at this time.)
2) Conduct an airphoto review of residual areas to determine if there are any riparian impacts which may require further assessment.

Upslope

1) (There are no upslope objectives for the mainstem of the river.)
2) Conduct an airphoto review of residual areas to determine if there are any upslope impacts which require further assessment.

Planning References and/or Cited Literature

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Kitsumkalum Watershed Restoration Program

INTERIM RESTORATION PLAN

Lakelse River PU - Lakelse River Watershed; Restoration Success Evaluation - Table 3

Administrative Unit: Lakelse
November 20, 2000

Basin/ Subbasin	Target Species	Limiting Fish Habitat Factor	Watershed Condition and Restoration Benefits	Landslides	Gullies	Roads	Riparian	Channel	Instream
Coldwater		Rearing and spawning (channel instability)	Level of existing or potential disturbance	High	High	High	High	High	High
			Impact or risk to fish habitat	High	High	High	High	High	High
			Likelihood of benefit to fish habitat from restoration	High	High	High	High (long term)	High (long term)	?
White		Rearing and spawning (channel instability)	Level of existing or potential disturbance	High	High	High	High	High	High
			Impact or risk to fish habitat	High	High	High	High	High	High
			Likelihood of benefit to fish habitat from restoration	High	High	High	High (long term)	High (long term)	High

Powerline		Over wintering, rearing, and spawning	Level of existing or potential disturbance	Moderate	Low	High	High	High	High
			Impact or risk to fish habitat	Moderate	Low	High	High	High	High
			Likelihood of benefit to fish habitat from restoration	Low	Low	High	Moderate	Moderate	High
Killutsal		Access and spawning	Level of existing or potential disturbance	Low	Low	Moderate	High	Low	High
			Impact or risk to fish habitat	Low	Low	Moderate	High	High	High
			Likelihood of benefit to fish habitat from restoration	High	Low	Moderate to High	High (long term)	?	High
Lakelse River & Residual [1]		Spawning	Level of existing or potential disturbance	Low	Low	Low	Moderate	Low to Moderate	Low
			Impact or risk to fish habitat	Low	Low	Low	Low	Low	Low
			Likelihood of benefit to fish habitat from restoration	Low	Low	Low	Low	Low	Low

1 Evaluation of success is for main stem only. Residual areas require review of airphotos to evaluate.

Kitsumkalum Watershed Restoration Program

LAKELSE RIVER PU INTERIM RP								
Summary of Investment Status and Estimated Budget								
Date: October 2, 2000								
Watershed Investment Phase/Sub-basin	Watershed Components	Status(complete=c, ongoing=o, planned=p, NR=not required)	Estimated Outputs to complete (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Coldwater Creek								
Assessments/ Prescriptions	Overview	C						
	Roads	P		$65,000	$65,000			
	Hillsides	P		$25,000	$25,000			
	Gullies	P		$10,000	$10,000			
	Riparian	P		$100,000	$75,000	$25,000		
	Instream	O	FHA Complete	$100,000	$50,000	$50,000		
	Fish Access	P		$0				
Restoration Works	Roads	P		$450,000		$300,000	$150,000	
	Hillsides	P		$80,000		$35,000	$45,000	
	Gullies	P		$50,000		$25,000	$25,000	
	Riparian	P		$200,000		$100,000	$100,000	
	Instream	P		$700,000		$450,000	$250,000	
Monitoring & Evaluations	Roads	P		$23,500			$3,500	$20,000
	Hillsides	P		$6,000			$1,000	$5,000
	Gullies	P		$1,500			$500	$1,000
	Riparian	P		$20,000				$20,000
	Instream	P		$65,000			$10,000	$55,000
		Total		$1,896,000	$225,000	$985,000	$585,000	$101,000
White Creek								
Assessments/ Prescriptions	Overview	C		$0				
	Roads	P		$35,000	$35,000			
	Hillsides	P		$30,000	$20,000	$10,000		
	Gullies	P		$10,000	$5,000	$5,000		
	Riparian	P		$46,000	$45,000	$1,000		
	Instream	P		$60,000	$30,000	$30,000		
	Fish Access	P		$1,500	$1,500			
Restoration Works	Roads	P		$225,000		$150,000	$75,000	
	Hillsides	C		$75,000		$50,000	$25,000	
	Gullies	P		$20,000		$20,000		
	Riparian	P		$100,000		$75,000	$25,000	
	Instream	P		$175,000		$100,000	$75,000	
Monitoring & Evaluations	Roads	P		$7,500			$1,000	$6,500
	Hillsides	P		$1,500			$500	$1,000
	Gullies	P		$2,000			$500	$1,500
	Riparian	P		$7,500				$7,500
	Instream	P		$20,000			$5,000	$15,000
		Total		$816,000	$136,500	$441,000	$207,000	$31,500
Powerline Creek								
Assessments/ Prescriptions	Overview	C		$0				
	Roads	O (75% C)	(cost share)	$15,000	$15,000			
	Hillsides	C		$0				
	Gullies	C		$0				
	Riparian	O (50% C)		$15,000	$15,000			
	Instream	O (50% C)		$25,000	$25,000			
	Fish Access	C		$0				
				$0				
Restoration Works	Roads	P		$40,000	$40,000			
	Hillsides	P		$10,000		$10,000		
	Gullies	NR		$0				

	Riparian			$30,000		$20,000	$10,000	
	Instream			$75,000		$50,000	$25,000	
Monitoring & Evaluations	Roads	P		$2,000		$500		$1,500
	Hillsides	P		$500				$500
	Gullies	NR		$0				
	Riparian			$5,000				$5,000
	Instream			$11,500			$1,500	$10,000
		Total		$229,000	$95,000	$80,500	$36,500	$17,000
Killutsai Creek								
Assessments/ Prescriptions	Overview	C		$0				
	Roads	P		$7,500	$5,000	$2,500		
	Hillsides	NR		$0				
	Gullies	NR		$0				
	Riparian	P		$25,000	$20,000	$5,000		
	Instream	P		$20,000	$20,000			
	Fish Access	P		$1,500	$1,500			
Restoration Works	Roads	P		$20,000	$10,000	$10,000		
	Hillsides	NR		$0				
	Gullies	NR		$0				
	Riparian	P		$50,000		$30,000	$20,000	
	Instream	O		$55,000		$25,000	$30,000	
Monitoring & Evaluations	Roads	P		$2,000			$500	$1,500
	Hillsides	NR		$0				
	Gullies	NR		$0				
	Riparian	P		$1,500				$1,500
	Instream	P		$9,000			$1,500	$7,500
		Total		191,500	56,500	72,500	52,000	10,500
Lakelse River & Residual								
Assessments/ Prescriptions	Overview	O (90% C [1])		$1,000	$1,000			
	Roads	P		$5,000	$5,000			
	Hillsides			$0				
	Gullies			$0				
	Riparian	P		$7,500	$7,500			
	Instream	P		$7,500	$7,500			
	Fish Access	P		$1,000	$1,000			
Restoration Works	Roads			$15,000		$15,000		
	Hillsides			$0				
	Gullies			$0				
	Riparian			$10,000		$10,000		
	Instream			$15,000		$15,000		
Monitoring & Evaluations	Roads			$1,000			$500	$500
	Hillsides			$0				
	Gullies			$0				
	Riparian			$1,500				$1,500
	Instream			$6,500			$1,500	$5,000
		Total		$71,000	$22,000	$40,000	$2,000	$7,000
Grand Total				$3,203,500	$535,000	$1,619,000	$882,500	$167,000

1 Review residual areas

Williams Creek Watershed PU

Introduction

The Williams Creek Watershed is listed as a target watershed in the current regional RMP WRP listings. Over the last four to five decades this watershed has been extensively developed throughout the watershed as a result of forest harvesting.

There are four sub-basins within this watershed. They are: Llewellyn Creek, Sockeye Creek, Williams Creek and Blackwater Creek. Most of the upslope and instream components within the unit have been assessed and some upslope treatments have taken place.

Watershed (Overview) Assessments & Works To Date

An overview of the watershed was conducted by a variety of local consultants. The lead consultant was Triton Environment Consulting Ltd. and was completed in 1996 (Gordon et al, 1996, Grieve, 1996, and Bolin et al, 1996).

A detailed: road deactivation, hillslope, and gully assessment for the Williams creek sub-basin (Kester, 1997); and a fish habitat assessment of the entire planning unit (Grieve, 1998) has been completed. Limited riparian assessments have been conducted to date however prescriptions for riparian restoration were prepared for a small area within Sockeye Creek (Haworth, 2000).

Some road deactivation treatments were carried out in the early 1990's during the first phase of road deactivation treatments in the province. Also, several roads in the Llewellyn sub-basin were treated in the late 1990's.

Sub-basins

The planning unit, located at the northern end of the Kitimat Valley, has four main sub-basins within it. Three of these are connected and include: Llewellyn Creek, Sockeye Creek, and Williams Creek. Williams Creek forms the mainstem of the three sub-basins and flows directly into the north end of Lakelse Lake (*Lax gyels*), while the other two sub-basins join Williams Creek on the Williams Creek alluvial fan. The fourth sub—basin, called Blackwater Creek, is small in size and is located at the south end of the planning unit. It also drains into the north end of Lakelse Lake (*Lax gyels*). All sub-basins have been subject to extensive forest development activities and are the focus of this Interim RP

Summary information

Drainage area: 207 km^2 (Grieve, 1998)

Tenure:	Forest tenure is predominantly TSA (Skeena Cellulose Inc. Forest Licence) with some Small Business areas. Other tenures, which are located throughout the Williams Creek alluvial fan, Sockeye Creek, and the north end of the Lakelse Lake (*Lax gyels*), include: large tracts of private land; BC Hydro transmission right-of-ways, PNG right-of-way, Highway 37 (and other public and private roads), etc.
Area logged:	8.78 km^2
ECA:	3.77 km^2

Basin:	Williams	Sockeye	Llewellyn	Blackwater
Channel[1]:				
Type (1st reach – CAP):	glide	slow glide	n/a	(glide)
Width (1st reach):	n/a	n/a	n/a	n/a
Gradient (%):	(low)	(low)	(moderate)	(low)
# Reaches	13	5	(1)	(3)

Target Fish Species:	Coho, Sockeye Steelhead, Cutthroat trout, and Dolly Varden char

Component Description & Condition

Williams Creek

Watershed type: The Williams Ck. sub-basin is a moderately large basin relative to the Lakelse Lake (*Lax gyels*) watershed. From reaches four and above the creek is coupled to the hillslopes and the head water streams are formed by small cirque glaciers and year round snow packs. The first, second, and third reaches are low gradient (2% or less). These three reaches form a large alluvial fan north of Lakelse Lake (*Lax gyels*). Sockeye and Blackwater Creeks share the Williams Creek alluvial fan. Connectivity between reaches above reach one is high. There is moderate connectivity between reaches one and two.

[1] Channel information above in "()" is estimated by author. Actual information was not available (n/a). Descriptions above are for the first reach of each stream only.

Channel condition: Poor. Significant aggradation in reaches two and three are causing channel instability and a high likelihood of channel avulsions. The fan may be actively migrating towards highway 37 (Broster, 2000, and Grieve, 1998). Upper reaches have been harvested extensively and there are numerous upslope failures which are directly coupled with the creek in the mid section of the sub-basin and around the confluence with Llewellyn Creek. Stream bank stability is also a concern due to stream side logging, especially in reach 3 at the head of the alluvial fan.

Riparian condition: (Williams, Llewellyn, & Sockeye) – Poor. Most of the sub-basins have been extensively harvested throughout the riparian and floodplain. Grieve discussed the extent of riparin harvesting impacts related to fish habitat conditions and recommended a detailed riparian area restoration study (Grieve, 1998).

Hillslope & Gully condition: (Williams & Llewellyn) – Poor. RJA conducted a technical assessment of roads in 1997, but little attention was focused on in-block impacts and associated risk (Kester, 1997). There have been a number of hilslope failures and some of these have directly entered the creek. In the fall of 2000 two new hillslope failures along the Williams Creek mainline FSR (at 11 and 14 km) occurred. Both of these slides entered Williams Creek. Additionally, two (other) slides which entered the creek were identified in 1998 (Gilchrist, 2001).

Road condition: (Williams & Llewellyn) – Poor. During the forest harvesting history of this sub-basin there have been a number of large slides associated with old logging roads. In 1997 a technical assessment of the roads was conducted by RJA (Kester, 1997). During the same year RJA also conducted an audit of roads deactivated during an early (1990's) phase of a forest road deactivation program (RJA, 1997). No analysis of the results was carried out, however, a range of problems, distributed throughout the watershed, were identified. It should be noted that deactivation specifications for road treatments during this early phase were often insufficient to stabilize all road segments treated. No other professional assessment of upslope conditions was carried out.

Habitat condition: (Williams & Llewellyn) – Poor. There has been some Dolly Varden habitat restoration work completed in lower Williams Creek (Broster, 2000).

Llewellyn Creek

Watershed type: This sub-basin is a moderately small sized watershed, which enters at the left bank of Williams Creek in reach six. It is coupled to the hillslopes for it's entire length and there is connectivity between all reaches and with Williams Creek.

Channel condition: Poor. This moderately high gradient stream has been logged to it's stream side for most of the creek's length and has been subject to numerous upslope failures with directly coupled to the creek. The channel width post logging has, in some areas, increased six to seven fold (Grieve, 1998). The channel is very unstable and a large (elevated) amount of external sediment (lobe) is entering the creek and is moving downstream into Williams Creek.

Riparian condition: (Williams, Llewellyn, & Sockeye) – Poor. Most of the sub-basins have been extensively harvested throughout the riparian and floodplain. Grieve discussed the extent of riparin harvesting impacts related to fish habitat conditions and recommended a detailed riparian area restoration study (Grieve, 1998).

Hillslope & Gully condition: (Williams & Llewellyn) – Poor. There have been numerous inblock, and road related, hillslope and gully failures from spur roads on the west side of the creek. Some of these have been recent and have directly entered the creek. RJA conducted a technical assessment of roads in 1997, but little attention was focused on in-block areas (Kester, 1997). There is a large failure above the left bank of Llewellyn which is directly coupled with the creek.

Road condition: Poor. In 1997 a technical assessment of the roads was conducted by RJA (Kester, 1997). During the same year RJA also conducted an audit of roads deactivated during an early (1990's) phase of a forest road deactivation program (RJA, 1997). No analysis of the results was carried out, however, a range of problems,

distributed throughout the watershed, were identified. It should be noted that deactivation specifications for road treatments during this early phase were often insufficient to stabilize all road segments treated. No other professional assessment of upslope conditions was carried out.

Within a cut block above the left bank of the creek water at the junction of two roads is being diverted down the hillslope. At this site there is a large hillslope failure which is directly coupled with the creek.

Habitat condition: Poor.

Sockeye Creek

Watershed type: This moderately small sized watershed is largely decoupled from the hillslopes along the length of the two lower reaches. The stream is fed by a series of incised streams which flow down the west side of the Thornhill Mountain in a rectilinear fashion and enter the creek in reaches three and four. The stream is coupled with the hillslopes in the upper reaches along the flanks of the mountain ridge. Most of the stream channel is located on the Williams Creek alluvial fan or directly between the fan and a toe of a large morainal terrace that forms Airport Hill. There is moderate to low connectivity between reaches located on the fan.

Channel condition: Poor. Though the substrate of this creek is stable due to its texture and gradient it has been adversely effected by logging and subsequent beaver activity. Removal of large conifers has resulted in bank instability, and post logging beaver activity has reduced the survival of residual trees and regenerating forests. Extensive impacts to stream substrate have been noted (see *Habitat condition* below).

Riparian condition: (Williams, Llewellyn, & Sockeye) – Poor. Most of the sub-basins have been extensively harvested throughout the riparian and floodplain. Grieve discussed the extent of riparin harvesting impacts related to fish habitat conditions and recommended detailed riparian area assessments (Grieve, 1998).

Hillslope & Gully condition: Moderate. There are no significant known issues in this component.

Road condition: Moderate. Overview did not identified significant road related impacts (Gordon, 1996). (There may be site specific channel crossing issues such culverts or abandon bridges which need assessment).

Habitat condition: Poor. Sockeye Ck. hosted a large run of sockeye historically. In recent years escapement numbers have declined and sockeye have been catagorized as "at risk of extinction" (Morrell, 2000). Habitat in the first and second reaches is in poor condition. This is largely attributed to extensive beaver activity post forest harvesting. Beavers have occupied the upper end of reach one, and the entire length of reach two, constructing a series of large beaver dams. The deposition of fines in the beaver ponds results in the mobilization of the fines down stream when dams periodically failed. This results in infilling of spawning habitat (substrate) throughout the lower reaches. Additionally, beaver empondments have impaired the development of riparian forests and reduced the potential for LWD recruitment. Habitat above reach two is recovering well. There has been some Dolly Varden habitat restoration work completed in lower Williams Creek (Broster, 2000).

Blackwater Creek

Watershed type: The Blackwater sub-basin is a small watershed located at the south end of the planning unit. At it's headwaters several incised streams flow down the west side of Mt. Layton and into a wetland area. There is very little connectivity between the hillslopes and the wetland. However, due to the dynamic and unstable nature of reach two of the Williams Creek alluvial fan there is connectivity between Williams Creek and the wetland area.

Channel condition: Moderate. The low connectivity between reaches in this system means that there are few channel impacts due to development around the old highway at the base of Mt. Layton. However, the connectivity, due to channel instability within the Williams Creek alluvial fan, may cause degradation of the lower reaches of Blackwater Creek in the future (Grieve, 1998).

Riparian condition: Moderate. The riparian area is well stocked with large conifers. However, the riparian forest

has died back in recent years. The cause of forest mortality may be due to changes in water table, perhaps associated to the channel connectivity with Williams Creek (see *Channel condition* above) and or location of highway 37. Consequently, the long term recruitment of LWD may be an issue in future. Also, cover may be lacking due to disappearance of foliage in the riparian forest.

Hillslope & Gully condition: (No known issues related to this component.)

Road condition: Good. No known logging road related impacts.

Habitat condition: Most of the significant habitat impacts have resulted from private land development and road/highway construction.

Immediate Restoration Goals & Objectives

Williams Creek

Instream

1) Implement priority prescriptions according to Biolith (Grieve, 1998).

Riparian

1) Conduct a detailed assessment of sub-basin to determine areas suitable for riparian restoration treatment.
2) Implement prescriptions prepared for the right bank along reach one (Haworth, 2000).

Upslope

1) Conduct detailed technical and professional overview of watershed to determine impacts and potential high risk sediment sources and prioritize identified areas for assessment and treatment.
2) Treat major hillslope failure on left bank in Llewellyn.

Llewellyn Creek

Instream

1) Implement priority prescriptions according to Biolith (Grieve, 1998).

Riparian

1) Conduct a detailed assessment of sub-basin to determine areas suitable for riparian restoration treatment.

Upslope

1) Treat roads in Llewellyn which are contributing to hillslope failures.
2) Treat major hillslope failure on left bank in Llewellyn.

Sockeye Creek

Instream

1) Implement priority prescriptions according to Biolith (Grieve, 1998).

Riparian

1) Conduct a detailed assessment of sub-basin to determine areas suitable for riparian restoration treatment.
2) Implement prescriptions prepared for right bank along reach one (Haworth, 2000).

Upslope

1) (No work required.)

Blackwater Creek

Instream

1) (No work required.)

Riparian

1) (No work required.)

Upslope

1) (No work required.)

Planning References and/or Cited Literature

Bolin, Pat and Rob Heibein 1996 *Lakelse Watershed Restoration Project; Technical Report; Level I Overview Assessment Road, Hillslopes, and Gullies* McElhanney Consulting Services Ltd.

Broster, Chris 2000 (*Per. Comm.*) Ministry of Environment, Lands, and Parks

DFO (North Coast Division) 1991 *Stream Survey Catalogue* Department of Fisheries & Oceans and B.C. Ministry of Environment

Gordon, Dave 1996 *Final Summary (Overview) Report; Lakelse WRP Project* Triton Environmental Consulting Ltd., McElhanney Consulting Services Ltd., Pacific Cascades Consulting Ltd., and J&S Outdoors Ltd.

Gordon, Dave, Arne Lorenz, & Michele Friesen 1996 *Level I (Overview) Fisheries Assessment;Furlong, Granite,...Lakelse Lake; Lakelse WRP Project* Triton Environmental Consulting Ltd.

Gilchrist, Alan 2001 *(Per. Comm.)* Hydroglyphic Terrain Analysts

Grieve, Glenn 1996 *Lakelse WRP: Level I (Overview) Fisheries Report* J&S Outdoor Ventures

Grieve, Glenn 1998 *Level I Detailed Assessment of Fish and Fish habitat in Williams, Sockeye, and Black Water Creeks* Biolith Scientific Consultants Inc.

Haworth, Kim, and Brad Pollard 2000 (*Riparian Management Area Prescriptions for the First Reach of Williams and Sockeye Creeks*) Kingfisher Forest Sciences

Kester, J. 1997 *Williams Creek Restoration Project; Level II Part 3 – Final Report* RJA Forestry Ltd.

Morrell, Mike 2000 *Status of Salmon Spawning Stocks of the Skeena River System* Northwest Institute

RJA 1997 *Williams Creek Restoration Project; Road Audits* RJA Forestry Ltd.

Turney, Laurance 1996 *Level I (Overview) Riparian Habitat Assessments; Lakelse Watershed Restoration Project* Pacific Cascades Consultants Ltd.

Kitsumkalum Watershed Restoration Program

WILLIAMS CREEK PU INTERIM RP								
Summary of Investment Status and Estimated Budget								
Date: January 11, 2001								
Watershed Investment Phase/Sub-basin	Watershed Components	Status(complete=c, ongoing=o, planned=p)	Estimated Outputs to complete (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Williams Creek sub-basin								
Assessments/ Prescriptions	Overview	C						
	Roads	O	Review	$10,000	$10,000			
	Hillsides	P		$50,000	$35,000	$15,000		
	Gullies	P		$10,000	$10,000			
	Riparian	O		$55,000	$40,000	$15,000		
	Instream	O		$75,000	$50,000	$25,000		
	Fish Access			$0				
Restoration Works	Roads	O		$150,000	$75,000	$75,000		
	Hillsides	P		$125,000		$50,000	$75,000	
	Gullies			$0				
	Riparian	P		$250,000	$15,000	$75,000	$50,000	$110,000
	Instream	P		$100,000		$50,000	$50,000	
Monitoring & Evaluations	Roads	P		$12,500		$5,000		$7,500
	Hillsides	P		$16,000			$4,000	$12,000
	Gullies	P		$0				
	Riparian	P		$22,500			$7,500	$15,000
	Instream	P		$22,500			$7,500	$15,000
		Total		$898,500	$235,000	$310,000	$194,000	$159,500
Sockeye Creek Sub-basin								
Assessments/ Prescriptions	Overview	C						
	Roads	P		$1,000	$1,000			
	Hillsides	C		$0				
	Gullies	C		$0				
	Riparian	P		$40,000	$25,000	$15,000		
	Instream	O		$25,000	$25,000			
	Fish Access			$0				
Restoration Works	Roads	P		$0				
	Hillsides	P		$0				
	Gullies	P		$0				
	Riparian	P		$50,000		$25,000	$25,000	
	Instream	P		$65,000		$50,000	$15,000	
Monitoring & Evaluations				$0				
				$0				
				$0				
				$0				
	All components	P		$0				
		Total		$181,000	$51,000	$90,000	$40,000	$0
Llewellyn Creek Sub-basin								
Included in Williams above								
		Total		$0	$0	$0	$0	$0
		Grand Total		$1,079,500	$286,000	$400,000	$234,000	$159,500

Exstew River Watershed PU

Introduction

The Exstew (*K'stuus*) River Watershed is listed as a target watershed in the current regional RMP WRP listings. Unlike other watersheds in the Forest District, the Exstew watershed has only been moderately developed for its forest resources. Forest harvesting impacts are limited to a number of sites which have a very high risk of failure and consequence to fish, or alienate fish habitat from off-channel habitat.

It is estimated that, based on the information currently available, and the forest harvesting history, that these impacts can be corrected in a cost effective manner and within a relatively short time frame. The majority of the work could be completed within two to three years. The watershed would then be complete according to FRBC's restoration completion criteria.

No development has occurred above the first reach of the river.

Watershed Overview Assessment

An overview assessment of instream and riparian impacts was conducted in 1999 (Pollard et al., 1999). No other overview assessments have been conducted to date.

Sub-basin

Other than the that part of the watershed associated with the main channel there is only one small sub-basin within the watershed. There are no harvesting related impacts within this small sub-basin.

Summary Information (Table 1)[1]

Drainage area:	460 km^2 (MELP 1998)
Tenure:	FL 2(SCI and Bell Pole), and two IRs
Area logged (%):	11% of original old forest (MELP 1998)
ECA (%):	Unknown (available pending upslope overview)
Channel:	
Type (CAP):	Stable riffle pool

[1] Reach one is the only reach that has been developed. Therefor all the following information including component descriptions, comments, goals, etc., are specific to this reach only.

Width (m):	(Unknown)
Gradient (%):	.01% to 1% (reaches 1 and 2 respectively)

Component Description and Condition

Watershed Type: The Exstew (*K'stuus*) River watershed is largely confined by steep valley walls except in the lower reaches where the river channel meanders between valley walls and onto the alluvial fan where it meets the Skeena River. The stream is coupled to the hillslopes in the upper reaches and partially in the first reach. There has been extensive floodplain forest harvesting in reach one. There are no logging related impacts to reaches above the first.

Channel Condition: Fair. Few direct impacts to the channel were noted during the overview. Several significant road related issues were identified (Pollard et al., 1999) which may be: a) constraining or impeding access to off channel habitat, and b) introducing elevated levels of sediment into the main channel.

Riparian Condition: Poor. The floodplain has been extensively harvested. Very low potential for LWD recruitment - riparian vegetation recovery is very slow (Pollard et al., 1999).

Road Condition: (Poor.) To date, no upslope overview has been conducted. Several road related instream impacts were noted in the fish & riparian overview (Pollard et al., 1999). A recent assessment of road C-15000 indicated that this road has a very high likelihood of failure, the consequence of which will directly impact fish habitat (Butt, 2000).

Hillslope & Gully Condition: (TBD pending upslope overview.)

Fish Habitat Condition: Fair to moderate. Throughout the flood plain off-channel fish access may be constrained or impeded due to site-specific channel concerns resulting from road construction

techniques. Future LWD contribution which provides fish habitat complexity is limited due to riparian forest harvesting.

Fish Target: Coho, Chinook, Chum, Pink, Steelhead, Cutthroat trout, and Dolly Vardin char (and potentially Eulachon - there presence in the Exstew requires further examination).

Restoration Goals & Objectives:

Instream	1) Conduct a detailed assessment in reach one of impacts identified in the ACER study (Pollard et al., 1999) to determine the extent and nature of work required to: a) improve fish access to off-channel habitat, and b) treat site specific channel conditions resulting from road construction. 2) Assess potential benefits of adding LWD in reach one.
Riparian	1) Conduct a detailed assessment of the twelve priority polygons located in reach one (Pollard et al., 1999) and develop prescriptions for their treatment.
Upslope	1) Conduct an upslope overview (roads, gullies, and hillslopes) of areas coupled with fish habitat in reach one to identify activities requiring detailed assessment and treatment. 2) Immediately prescribe and deactivate road C-15000 (Butt, 2000).

Reference and Cited Literature

Butt, Gordon, 2000 *Road Deactivation Assessment of Exstew Branch Rd. (Rd. C-15000)* Madrone Ecology & Earth

MELP 1998 *Watershed Ranking Atlas; North Coast – Lower Skeena* Geographic Data BC

Morrell, Mike 2000 *Status of Salmon Spawning Stocks of the Skeena River System* Morrell Consulting Ltd. & Northwest Institute for Bioregional Research

Pollard, Brad, and Sam Buchanan 1999 *Overview Fish and Riparian Assessment for the Exstew River Watershed* ACER Ltd., Terrace B.C.

Pollard, Brad 1999 *Exstew River Arial Photo Mosaic* ACER Ltd., Terrace B.C.

Kitsumkalum Watershed Restoration Program

INTERIM RESTORATION PLAN

Exstew River Watershed; Restoration Success Evaluation

Administrative Unit: Lower Skeena
Date: August 18,2000

Basin/ Subbasin	Target Species	Limiting Fish Habitat Factor	Watershed Condition and Restoration Benefits	Landslides	Gullies	Roads[2]	Riparian	Channel	Instream
Exstew River - reach one [1]	Coho	Rearing	Level of existing or potential disturbance	Unknown	Unknown	High	Moderate to high	Moderate	Moderate
			Impact or risk to fish habitat	Unknown	Unknown	High	High	Low	Moderate
			Likelihood of benefit to fish habitat from restoration	Unknown	Unknown	High	High (long term)	High	High

1 No upslope overview assessments conducted to date. Evaluation results will vary pending results of overview.

2 Approximately +3kms have been idenified which require immediate treatment (Butt 2000)

Kitsumkalum Watershed Restoration Program

Summary of Investment Status and Estimated Budget for Exstew River Watershed								
Date: August 18, 2000								
Watershed Investment Phase	Watershed Components	Status(complete=c, ongoing=o, planned=p)	Estimated Outputs to complete [1] (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Watershed Planning & Coordination								
Assessments/ Prescriptions	Overview - Instream & Riparian	C						
	Overview - Upslope	P	500km^2	$25,000	$25,000			
	Roads	P	20km	$35,000	$35,000			
	Hillsides	P	Unknown	$2,500	$2,500			
	Gullies	P	3	$7,500	$7,500			
	Riparian	P	115ha	$15,000	$15,000			
	Instream	P	13km	$20,000	$20,000			
Restoration Works	Roads	P		$95,000	$25,000	$70,000		
	Hillsides	P		$5,000		$5,000		
	Gullies	P		$20,000	$10,000	$10,000		
	Riparian	P		$50,000	$10,000	$25,000	$15,000	
	Instream	P	5km	$35,000		$25,000	$10,000	
Monitoring & Evaluations	Roads	P		$10,000		$1,500	$2,500	$6,000
	Hillsides	P		$2,500			$1,000	$1,500
	Gullies	P		$5,000			$2,000	$3,000
	Riparian	P		$15,000		$1,000	$2,500	$11,500
	Instream	P		$10,000		$2,500	$2,500	$5,000
		Grand Total		$352,500	$150,000	$140,000	$35,500	$27,000

1 Some estimates are preliminary - no upslope overviews.

Zymacord River Watershed PU

The Zymacord (*Ksmgoot*) River - also known as the Zymagotitz River - watershed is listed as a target watershed in the current regional RMP WRP listing. As a result of development, particularly forest harvesting, fish habitat has been extensively impacted. Adult fish escapement records show declines for several important fish species. Of particular note is the Erlandson Creek Chinook run which show dramatic declines (Morrell, 2000).

The planning unit has three significant sub-basins: the Zymacord (*Ksmgoot*) River (which drains directly into the Skeena River on the right bank west of the city of Terrace), Erlandson Creek (which enters the Zymacord on the left bank about 10 kilometers upstream from the Zymacord-Skeena River confluence), and Molybdenum Creek (which enters Erlandson Creek on its right bank near the Zymacord-Erlandson confluence).

A number of assessments have been completed for the watershed. A clay bank failure, exacerbated by logging-road construction and forest harvesting to stream side, located on the left bank of the Zymacord (*Ksmgoot*) River above the Zymacord-Erlandson confluence, is contributing large quantities of fine sediments to the lower Zymacord (*Ksmgoot*) River. Currently, the KWRP is studying the bank to determine if sediment is impacting fish habitat below the site (Chappman, 2000 & 2001) and investigating conceptual methods to mitigate or prevent instability and erosion along the clay stream bank (Newbury, 2000 and Bolin, 2001).

It should be noted that, despite the Zymacord (*Ksmgoot*) River having very important fish values and being a very high priority for restoration[1], it was concluded, based on the past years restoration efforts, that this watershed can not be satisfactorily treated until access is re established[2]. Therefor, an interim restoration plan was not completed for this unit.

[1] See Appendix; "Results of Steering Committee priority setting meeting".

[2] To access the Zymacord River sub-basin for restoration purposes two major stream crossings are required (Erlandson Creek and the Zymacord River). Several attempts were made in 2000 to mobilize heavy equipment and conduct road deactivation activities. High water or spawning fish prevented the activities from proceeding (Collins, 2000).

Reference and Cited Literature

Bolin, Pat 2001 (2000/01 Zymacord River Clay Bank Failure – File Report: *Zymacord Slide; 8.2 Km Remediation Construction Cost Estimate*) McElhanney Consulting Ltd.

Chappman, Jessie 2000 *Zymacord River; Depositional Sediment Study* KWRP & McElhanney Consulting Ltd.

Chappman, Jessie 2001 *Zymacord River; Total Suspended Solids – (Results of) Automated Sampling* KWRP & McElhanney Consulting Ltd

Collins, Terry 2000 (2000/01 Zymacord Road Deactivation - File Report: *Chinook Spawning in Erlandson Creek*) KWRP

Gordon, Dave 1999 *Zymacord WRP Overview Fish and Riparian Assessment* Triton Environmental Consultants Ltd.

Ham, Darren 1999 (*Lower Zymacord Bank Stability Mapping Study*) Ministry of Forests

Kester, Jack 1998 *Zymacord River, Middle Creek, and Little Oliver Creek (Road Deactivation) Watershed Restoration Project; Level II Final Report* JAK Resources Ltd., & RJA Forestry Ltd.

Morrell, Mike 2000 *Status of Salmon Spawning Stocks of the Skeena River System* Northwest Institute

Newbury, Bob 2000 (2000/01 Zymacord River Clay Bank Failure – File Report: *Re: Design Review for 8.2 Km Zymacord Slide*) Newbury Hydraulics

Kitsumkalum Watershed Restoration Program

ZYMACORD RIVER PU - INTERIM RP								
Summary of Investment Status and Estimated Budget								
Date: January 10,2001								
Watershed Investment Phase/Sub-basin	Watershed Components	Status (complete=c, ongoing=o, planned=p)	Estimated Outputs to complete (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Zymacord River								
Assessments/ Prescriptions	Overview	C						
	Roads	C		$5,000	$5,000			
	Hillsides	O		$10,000	$8,500	$1,500		
	Gullies	O		$5,000	$5,000			
	Riparian	P		$50,000	$50,000			
	Instream	O		$30,000	$10,000	$20,000		
	Fish Access	P		$3,000	$3,000			
Restoration Works	Roads	P		$175,000	$125,000	$50,000		
	Hillsides	P		$35,000	$25,000	$10,000		
	Gullies	P		$7,500	$7,500			
	Riparian	P		$90,000	$50,000	$25,000		$15,000
	Instream	P		$350,000	$200,000	$100,000	$50,000	
Monitoring & Evaluations	Roads	P		$8,000		$3,500		$4,500
	Hillsides	P		$1,500		$500		$1,000
	Gullies	P		$0				
	Riparian	P		$30,000			$10,000	$20,000
	Instream	P		$40,000		$10,000	$10,000	$20,000
				$840,000	$489,000	$220,500	$70,000	$60,500
Elandsen Creek Sub-basin								
Assessments/ Prescriptions	Overview	C		$0				
	Roads	C		$3,500	$3,500			
	Hillsides			$5,000	$5,000			
	Gullies			$1,500	$1,500			
	Riparian			$25,000	$25,000			
	Instream			$20,000	$20,000			
	Fish Access			$2,000	$2,000			
Restoration Works	Roads			$75,000	$75,000			
	Hillsides			$25,000	$25,000			
	Gullies			$5,000	$5,000			
	Riparian			$60,000	$35,000	$25,000		
	Instream			$100,000	$50,000	$50,000		
Monitoring & Evaluations	Roads			$6,000		$1,000		$5,000
	Hillsides			$1,500		$500		$1,000
	Gullies			$0				
	Riparian			$15,000			$5,000	$10,000
	Instream			$22,500		$7,500	$5,000	$10,000
		Total		$367,000	$247,000	$84,000	$10,000	$26,000
		Grand Total		$1,207,000	$736,000	$304,500	$80,000	$86,500

SECTION III - APPENDIX

1) Results of Steering Committee Priority Setting Meeting
2) Selected Target Watershed-Unit Evaluation Table
3) Five Year Cost Estimate for Three Selected Target Watershed-units (Clear, Nelson, and Williams)

Kitsumkalum WRP Steering Committee Meeting

Watershed Unit Priority Setting Meeting

Location: Kitsumkalum Community Hall
Date: Thursday January 11th, 2001

Meeting attended by (name, organization and fax number):

Meeting Chair:

Lars Reese-Hansen (KWRP)	635-6177

Committee members:

Kelly Kline, (TRAC)	798-2535
Kim Haworth, (SCI)	638-5720
Lyle Bolton, (KBC)	635-6177
Damian Keating (SSL)	635-4335

Ministry members:

Ralph Ottens (MOF)	638-5176
Barry Peters, (DFO)	615-5364
Rob Hiebien (DFO)	615-5364
Chris Broster, (MELP)	638-6539

Observers & other participants:

Terry Collins (K.W.R.P)	635-4622

Pg. 1 of 3

Meeting called to order at 1:35pm

INTERIM WATERSHED UNIT RESTORATION PLAN REVIEW

Reviewed plans and budgets prepared for target watersheds. Several minor changes were recommended and noted.

WATERSHED UNIT PRIORITY SETTING

Committee discussed priority setting process and agreed on a ranking system (rated from 1 to 9) based on the following criteria: DFO priority, MELP priority, MOF priority, investment to date, and feasibility.

Water quality in community watersheds was also a criteria that was ranked but was not included in the final calculation. However, once priorities were established and water quality rankings were compared to the selected target watershed units, they mirrored the final priority ratings.

The committee discussed the need to use some restoration funds for "environmental emergencies" and felt that this should be an acceptable deviation from identified watershed unit plan investments.

AGREED **The steering committee recommends that KWRP staff approach FRBC to determine if "environmental emergencies" are an acceptable modification to investment plans.**

The Zymacord River unit was also discussed specifically. Due to access constraints the Zymacord can not be restored within the required three/five year period as specified by FRBC. For this reason the watershed was recommended to be prioritized last. However, several of the committee members felt that the values in the Zymacord were to high to postpone restoration activities. The following recommendation was agreed to:

RECOMMENDATION

The steering committee should reconsider the priority of the Zymacord if constraints to access in the watershed change such that the watershed can be treated within the required three/five year period.

The committee calculated and ranked the priorities by adding the criteria scores and dividing the sum by the number of criteria ranked.

AGREED

The committee agreed to the target watershed unit priority ranking as described in the attached table (see attached spread sheet).

Kitsumkalum Watershed Restoration Program

15-Jan-01

Priority	Watershed Unit:	FRBS Investments to date:	Estimated value to complete:	Comments:
1	Clear	High	$1,160,000	Currently preparing Full RP for this unit
2	Williams	Moderate	$1,100,000	
3	Nelson	High	$530,000	Close to completion
4	L Kalum*	High	$2,080,000	(See note below)
5	Beaver/U Kalum	Low	$690,000	
6	Exstew	Low	$350,000	Can complete restoration in 2/3 yrs.
7	*Zymacord*	*Moderate*	*$1,200,000*	*Can not restore - no access into unit*
8	Cedar	Low	$2,100,000	
9	Lakelse River*	Moderate	$3,200,000	(See note below)
	Total est. $ to complete all Units		**$12,410,000**	

** It is important to note that for the indicated units the estimated value to completion is for a portion of the unit only! Please refer to specific unit IRP for background information.*

Five Year Cost Estimate for Three Selected Target Watershed-units

In order to balance the cost of priority activities and projects for all three watershed-units relative to the annual FRBC funding level, it is necessary to adjust the implementation schedule so that in each year no more than the annual allotted FRBC budget is expended. The table(s) that appear on the following pages represent an administrative exercise to help to balance expenditures in the three selected watershed-units. This exercise, to a limited extent, has taken into account that some projects take a number of years to plan and implement. Once the Clear and Nelson Watershed-unit RPs have been completed a more thorough cash flow projection should be prepared.

There is a variance that appears in the second year (2002/03) and continues to the end of 2010. This variance will be compensated for through a variety of means (ie: extending the budget over the full five years, re prioritizing projects, off setting the variance with cost savings from projects that come under budget, using funding from other sources, etc.).

It should also be noted: a) the variance that appears in the 2003/04 period will be carried over into year five, and b) although the variance is $375K over the forecasted restoration period, this amount includes investments that will be made after the unit is completed (post completion) in year five. Post completion investments include monitoring, maintenance, and ongoing silvicultural treatments.

Kitsumkalum Watershed Restoration Program

DRAFT - Cash flow projection by Unit, Sub-unit, Phase, and Year

Revised: January 15, 2001

Unit	Sub-basin	Phase	Year 1 (2001 2002) $	Year 2 (2002 2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $	Phase total	Sub-basin total	Unit total
Clear									
	Clear	Assessment	$32,000	$6,500	$0	$0	$38,500		
		Treatment	$179,500	$182,800	$290,000	$120,000	$772,300		
		Monitor	$4,000	$4,500	$22,500	$25,500	$56,500		
	Sub total		$215,500	$193,800	$312,500	$145,500		$867,300	
	Douglas	Assessment	$60,000	$9,000	$0	$0	$69,000		
		Treatment	$7,500	$7,500	$82,500	$135,000	$232,500		
		Monitor	$0	$500	$1,500	$5,500	$7,500		
	Sub total		$67,500	$17,000	$84,000	$140,500		$309,000	
Unit total			$283,000	$210,800	$396,500	$286,000			$1,176,300
Williams									
	Williams	Assessment	$35,000	$60,000	$80,000	$5,000	$180,000		
		Treatment	$0	$50,000	$240,000	$335,000	$625,000		
		Monitor	$0	$0	$32,500	$63,500	$96,000		
	Sub total		$35,000	$110,000	$352,500	$403,500		$901,000	
	Sockeye	Assessment	$10,000	$31,000	$15,000	$0	$56,000		
		Treatment	$0	$0	$30,000	$85,000	$115,000		
		Monitor	$0	$1,000	$1,000	$15,000	$17,000		
	Sub total		$10,000	$32,000	$46,000	$100,000		$188,000	
Unit total			$45,000	$142,000	$398,500	$503,500			$1,089,000
Nelson									
	Nelson	Assessment	$57,500	$27,700	$0	$0	$85,200		
		Treatment	$30,000	$45,000	$125,000	$20,000	$220,000		
		Monitor	$0	$5,000	$16,500	$22,000	$43,500		
	Sub total		$87,500	$77,700	$141,500	$42,000		$348,700	
	Allard	Assessment	$27,500	$0	$0	$0	$27,500		
		Treatment	$0	$55,000	$0	$10,000	$65,000		
		Monitor	$0	$0	$2,500	$9,500	$12,000		
	Sub total		$27,500	$55,000	$2,500	$19,500		$104,500	
	George	Assessment	$17,500	$0	$0	$0	$17,500		
		Treatment	$7,500	$2,500	$25,000	$0	$35,000		
		Monitor	$4,500	$4,500	$5,750	$17,250	$32,000		
	Sub total		$29,500	$7,000	$30,750	$17,250		$84,500	
Unit total			$144,500	$139,700	$174,750	$78,750			$537,700
Annual PU Expenditure			$472,500	$492,500	$969,750	$868,250			$2,803,000
NASC			$37,800	$37,800	$37,800	$37,800			
OH			$27,000	$27,000	$27,000	$27,000			
TOTAL ANNUAL MYA $			$537,300	$557,300	$1,034,550	$933,050			$3,062,200
Variance			*$0*	*-$20,000*	*-$497,250*	*-$395,750*			*-$375,700*

Five year budget @ $537.3k/yr= *$2,686,500*

File: *D:\KWRP\2000-01\RP\PriorityRPUnits\PriorityRPU$Est&CashFlow.xls*

Kitsumkalum Watershed Restoration Program

DRAFT - CLEAR CREEK PU - INTERIM RP								
Summary of Investment Status and Estimated Budget								
Date: January 15, 2001								
Watershed Investment Phase/Sub-basin	Watershed Components	Status (complete=c, ongoing=o, planned=p)	Estimated Outputs to complete (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Clear Creek Sub-basin								
Assessments/ Prescriptions	Overview	C						
	Roads	C						
	Hillsides	O		$6,000	$3,500	$2,500		
	Gullies	O (~50% C)		$7,500	$7,500			
	Riparian	O (~75% C)		$15,000	$11,000	$4,000		
	Instream	O (~75% C)		$10,000	$10,000			
	Fish Access	C						
Restoration Works	Roads	O (~20% C)		$247,300	$154,500	$57,800	$35,000	
	Hillsides	P		$0				
	Gullies	P		$75,000	$25,000	$25,000	$25,000	
	Riparian	P		$200,000		$50,000	$80,000	$70,000
	Instream	P		$250,000		$50,000	$150,000	$50,000
Monitoring & Evaluations	Roads	P		$10,000	$1,000	$500	$4,000	$4,500
	Hillsides	P		$2,500		$500	$500	$1,500
	Gullies	P		$2,500		$500		$2,000
	Riparian	P		$25,000			$15,000	$10,000
	Instream	P		$16,500	$3,000	$3,000	$3,000	$7,500
		Total		$867,300	$215,500	$193,800	$312,500	$145,500
Douglas Creek Sub-basin								
Assessments/ Prescriptions	Overview	C						
	Roads	P		$40,000	$40,000			
	Hillsides	P		$7,500		$7,500		
	Gullies	P		$12,500	$12,500			
	Riparian	P		$1,500		$1,500		
	Instream	P		$7,500	$7,500			
	Fish Access	N/A		$0				
Restoration Works	Roads	P		$175,000		$75,000	$100,000	
	Hillsides	P		$45,000			$20,000	$25,000
	Gullies	P		$30,000			$15,000	$15,000
	Riparian	P		$0	$0	$0		
	Instream	P		$15,000	$7,500	$7,500		
Monitoring & Evaluations	Roads	P		$3,500		$500	$500	$2,500
	Hillsides	P		$2,000			$500	$1,500
	Gullies	P		$2,000			$500	$1,500
	Riparian	P		$0				
	Instream	TBD	TBD	$0				
		Total		$341,500	$67,500	$92,000	$136,500	$45,500
		Grand Total		$1,208,800	$283,000	$285,800	$449,000	$191,000

Kitsumkalum Watershed Restoration Program
DRAFT WILLIAMS CREEK PU INTERIM RP
Summary of Investment Status and Estimated Budget
Date: January 11, 2001

Watershed Investment Phase/Sub-basin	Watershed Components	Status(complete=c, ongoing=o, planned=p)	Estimated Outputs to complete (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Ongoing (2004-2010) $
Williams Creek sub-basin								
Assessments/ Prescriptions	Overview	C						
	Roads	O	Review	$10,000	$10,000			
	Hillsides	P		$50,000	$25,000	$25,000		
	Gullies	P		$10,000		$10,000		
	Riparian	O		$45,000		$10,000	$35,000	
	Instream	O		$65,000		$15,000	$45,000	$5,000
	Fish Access			$0				
Restoration Works	Roads	O		$150,000			$75,000	$75,000
	Hillsides	P		$125,000		$50,000	$50,000	$25,000
	Gullies			$0				
	Riparian	P		$250,000			$90,000	$160,000
	Instream	P		$100,000			$25,000	$75,000
Monitoring & Evaluations	Roads	P		$12,500				$12,500
	Hillsides	P		$16,000				$16,000
	Gullies	P		$0				
	Riparian	P		$22,500			$7,500	$15,000
	Instream	P		$45,000			$25,000	$20,000
		Total		$901,000	$35,000	$110,000	$352,500	$403,500
Sockeye Creek Sub-basin								
Assessments/ Prescriptions	Overview	C						
	Roads	P		$1,000		$1,000		
	Hillsides	C		$0				
	Gullies	C		$0				
	Riparian	P		$30,000		$15,000	$15,000	
	Instream	O		$25,000	$10,000	$15,000		
	Fish Access			$0				
Restoration Works	Roads	P		$0				
	Hillsides	P		$0				
	Gullies	P		$0				
	Riparian	P		$50,000			$15,000	$35,000
	Instream	P		$65,000			$15,000	$50,000
Monitoring & Evaluations	Roads	P		$0				
	Hillsides	P		$0				
	Gullies	P		$0				
	Riparian	P		$5,000				$5,000
	Instream	P		$12,000		$1,000	$1,000	$10,000
		Total		$188,000	$10,000	$32,000	$46,000	$100,000
Llewellyn Creek Sub-basin								
Included in Williams above								
		Total		$0	$0	$0	$0	$0
		Grand Total		$1,089,000	$286,000	$400,000	$234,000	$159,500

Monitoring & Evaluations	Roads	P		$500			$500	
	Hillsides	P		$1,500			$750	$750
	Gullies	C		$0				
	Riparian	P		$15,000	$2,500	$2,500	$2,500	$7,500
	Instream	P		$15,000	$2,000	$2,000	$2,000	$9,000
				$84,500	$29,500	$7,000	$30,750	$17,250
		Grand Total		$537,700	$144,500	$139,700	$174,750	$78,750