SALMON WATERSHED PLANNING PROFILES
for the Fraser River Basin within the VANDERHOOF Land and Resource Management Plan

Prepared for:

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1.0 INTRODUCTION

This document presents background information and stream management objectives and strategies for the salmon bearing watersheds within the Fraser River basin portion of the Vanderhoof Land and Resource Management Plan (LRMP) area. The LRMP area is depicted in Fig. 1 in the text and with additional attributes in maps at the back of this document (Fig. 2, 3, and 4). The analysis summarizes salmon escapement information and the status of development activity and physiographic conditions within each watershed. This watershed-based resource information (presented in the appendices), has been compiled from sources including published and unpublished documents as well as the personal experience and professional judgement of Department of Fisheries and Oceans (DFO) staff. This has enabled assessment of the watershed areas within the LRMP as to the current management they require to ensure the conservation and development of fish habitat. Based on these assessments, specific objectives and strategies are prescribed to properly protect the salmon resources present.

It is intended that the information presented and the management objectives and associated strategies specified in this document be implemented within the LRMP area. The information will be updated, and the objectives and strategies reevaluated, as circumstances dictate. The document is a valuable resource for DFO regional planning and habitat management. In addition, it will benefit provincial Ministries of Environment, Lands and Parks (MoELP), and Forests (MoF) by providing guidance for their management activities as well as provide direction to municipalities, resource development companies, other stakeholders, and First Nations with interests in the LRMP area.

1.1 The Department of Fisheries and Oceans Vision Statement

DFO's Policy for the Management of Fish Habitat sets a long-term policy objective, namely the achievement of an overall **net gain** of the productive capacity of Canada's fish habitats (Department of Fisheries and Oceans 1986). Specifically, the intent of the policy is to "increase the natural productive capacity of habitats for the nation's fisheries resources, to benefit present and future generations of Canadians". It sets out three specific goals: fish habitat conservation, restoration, and development. The Guiding Principal of the fish habitat conservation goal is to achieve **no net loss** of productive capacity in relation to development activities. **No net loss** applies to habitat which:

- currently produces fish harvested in a subsistence, commercial or recreational fishery; or
- although not directly supporting fish, provides nutrients and/or supplies food to adjacent or downstream habitats or contributes to water quality for fish; or
- has been identified by DFO as a candidate for enhancement activities.

The second goal, fish habitat restoration, deals with the rehabilitation of the productive capacity of fish habitats in selected areas where economic or social benefits can be achieved through the fisheries resource. The third goal, fish habitat development, deals with the improvement and creation of fish habitats in selected areas where, again, fisheries resources production can be increased for the social or economic benefit of Canadians. These latter goals, restoration and development, will complement conservation efforts and contribute to a **net gain** of habitat.

In addition, DFO has identified seven measurable and achievable goals for sustainable fisheries development (O. Langer, pers. comm. 1994 in Webb et al. 1994). These goals are:

1. **Avoid irreversible human induced alterations to fish habitats.**
   Alterations to fish habitat that reduce its capacity to produce fish populations which cannot be reversed within a human generation are to be avoided.

2. **Maintain the genetic diversity of fish stocks.**
   No fish stock, regardless of its size, will be arbitrarily eliminated and, where possible, efforts to conserve and rebuild small and remnant stocks are to be made.

3. **Maintain the physical and biological diversity of fish habitats.**
   Physical and biological diversity of habitat provides fish with an opportunity to adopt alternative life history strategies, thereby providing protection from natural habitat variation.

4. **Provide a net gain in productive capacity through proper habitat management.**
   Ecological limits control productive capacity of a stream system. Natural and self-sustaining production systems are preferred over semi-natural, artificial or non-self-sustaining systems.

5. **Maximize the value of commercial, sport, and aboriginal fisheries.**
   All market and extra-market values are to be considered, and measured in a way that permits comparison of competing users of the fisheries resources.

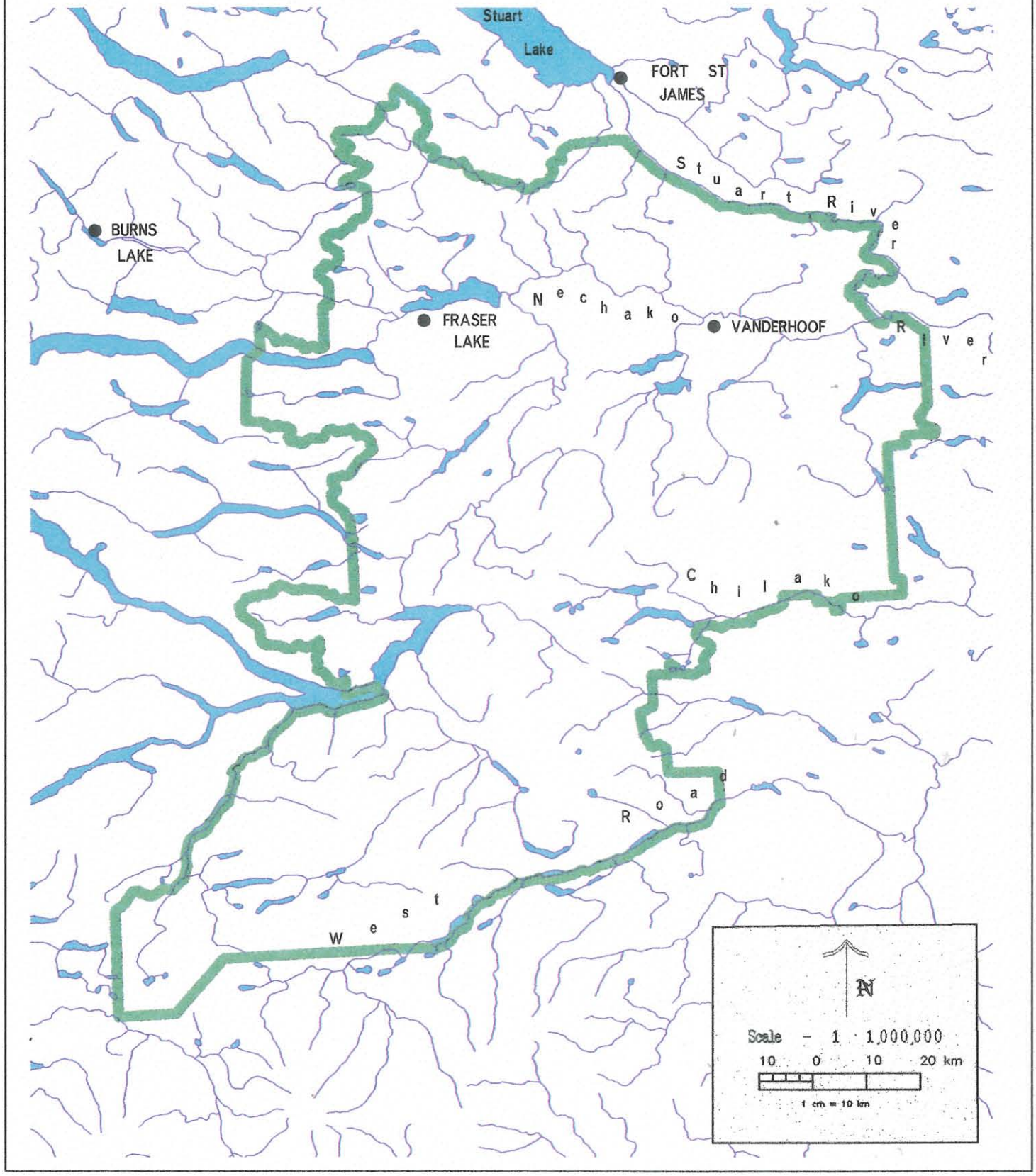
6. **Maximize the non-consumptive values of the fisheries resources.**
   Intangible and cultural values associated with fishery resources are to be given due consideration in decision making.

7. **Distribute fishery net benefits in a fair and equitable manner.**
   Local communities are to be involved in the decision-making process pertaining to habitat conservation, enhancement, and restoration, and particularly who is to benefit and who is to pay.

In order to aid in assessing the potential impacts of development proposals within the Vanderhoof LRMP area on the salmon resource, the Northern Fraser River Habitat Management Unit of DFO has partitioned the area into Watershed Planning Units (WPUs). DFO has also developed a procedure to assess WPUs based on the sensitivity of the existing habitat and fisheries resources, the fisheries enhancement potential, and other unique features. The term "**sensitivity**" used in this document is applied in a broad sense to refer to a level of concern for those aspects of watershed features that can affect fish habitat and be altered by human activities. The watershed-based analyses presented in this document describe: i) watershed geographic and hydrologic information, ii) the historic and present status of salmon escapements, iii) present or proposed development, iv) existing biophysical conditions, v) sensitive watershed features, vi) areas of specific concern, and finally vii) recent watershed planning and/or project initiatives. The analyses then present specific management objectives and prescribe specific management strategies consistent with sustainable land, water and other resource use prevalent within a given WPU. The requirement for the acquisition of additional information is also prioritized by WPU within the LRMP area.

Figure 1. The Vanderhoof Land and Resource Management Plan (LRMP) area

Figure 1 : The Vanderhoof Land and Resource Management Plan Area



1.2 General Objectives and Strategies for Salmon Resources

Table 1 presents management objectives and strategies intended to satisfy the goal of protecting the salmon resource by ensuring that a net gain in the productive capacity of fish habitat is achieved.

Table 1. General objectives and strategies for salmon resources.

Objectives	Strategies
• Maintain, rebuild and/or enhance salmon stocks. • Maintain and/or enhance water quality and water quantity for instream uses. • Maintain and restore watershed and stream channel integrity and stability. • Ensure that the cumulative rate of development within specified watersheds (forestry, urbanization, agriculture, mining, etc.) does not adversely impact fish habitat. • Ensure consistency in resource planning in: - administrative boundaries - hierarchial plans (strategic, operational) - management goals, objectives, strategies, and indicators. • Protect streamside and riparian areas by providing adequate buffer zones and through proper riparian management. • Provide an adequate level of monitoring that will ensure proper compliance and provide an evaluation tool for refinement of management strategies, prescriptions and resource targets. • Maintain existing "No Staking Placer Reserve" designations. • Ensure Forest Practises Code provisions are applied as a minimum standard in all watersheds. • Ensure other development guidelines such as the Land Development Guidelines, Placer Mining Regulations and Guidelines, Guidelines for Mineral Exploration and Reclamation, and Agriculture Guidelines are followed. (See Appendix 8.) • Maintain the natural diversity of aquatic habitat elements.	• Apply sustainable fish harvest strategies. • Conduct fish habitat inventories to identify fisheries sensitive/critical areas that require protection and site specific management actions. • Assess present and potential development impacts in fisheries watersheds (Watershed Assessment Procedure) and implement integrated watershed management plans to minimize the cumulative impacts of land use activities. • Identify watersheds or stream reaches that require enhanced management prescriptions. • Determine adequate instream flows for fish. • Restore degraded stream habitats through promotion of improved land management practices and through bank stabilization, revegetation and other stream restoration techniques. • Monitor and enforce compliance to environmental standards/guidelines and evaluate their effectiveness. • Enhance salmon habitat and stocks through specifically identified projects or activities.

1.3 Monitoring Strategy

The development and implementation of a strategy for monitoring resource development and operational activities is crucial to ensuring that the effectiveness of fish habitat management policies is realized. Monitoring programs can be used to i) establish the baseline biophysical conditions within a watershed from which comparisons of the effects of future development can be made, ii) gauge both the effectiveness of management recommendations and the degree to which compliance with stated guidelines is attained, iii) provide the information required to evaluate the response of biophysical conditions within watersheds to various management prescriptions, and iv) provide direction for future planning.

DFO will employ compliance auditing of guidelines, standards and regulations and synoptic monitoring of management objectives, strategies and indicators in designated watershed planning units. Table 2 presents the specific monitoring strategies to be applied and the indicators to be used in measuring the success of the strategies.

2.0 OVERVIEW OF SALMON RESOURCES

The Fraser River basin portion of the Vanderhoof LRMP area supports chinook (*Oncorhynchus tshawytscha*), sockeye (*O. nerka*) and to a much lesser degree, pink (*O. gorbuscha*) and coho (*O. kisutch*) salmon (Hopwo 1994). The major fish habitat types present in the LRMP area are spawning, migration, incubation and rearing habitat provided by the area's rivers, tributary streams and lakes. Chinook and sockeye have the greatest economic value of salmon in this area and make a significant contribution to the Pacific Coast commercial, Fraser River aboriginal, and, in the case of chinook, Straight of Georgia and Fraser River sport fishery (Fraser River Action Plan [FRAP] 1994,1995).

With respect to stock management policy for the Fraser River watershed, it has been known for some time that the basin has the potential to support more salmon than is presently the case. To restore all Fraser River salmon stocks to full potential, DFO proposes the following management strategies (DFO 1991):

- Increased escapement to spawning grounds through an intricate formula of fishing times and opportunities will be a primary tool.

- Resource enhancement techniques such as artificial spawning channels and small hatcheries will augment wild stock rebuilding. In some cases, enhancement will "kick-start" small fish populations to levels where they can be further increased through more conservative fishing management, eventually becoming self-sustaining.

- Vigorous protection of habitat and, wherever possible, rehabilitation of degraded habitat.

Species specific information, including current management strategies, for salmon present in the Vanderhoof LRMP are outlined below. Specific escapement targets are not given; stating a static target for a particular stream would not be appropriate given the variation in stock, cycle year, and expected returns. (A. MacDonald, pers. comm. 1995)

Table 2. Monitoring Strategies and Indicators.

Monitoring Strategies	Monitoring Indicators
• Monitor and assess management goals, objectives and strategies for the development activities identified. • Coordinate monitoring, compliance, enforcement and regulation of placer mining activities with the Ministry of Energy, Mines and Petroleum Resources. • Monitor application of Forest Practices Code (FPC) standards and field guides. • Monitor and evaluate mine development proposals to ensure water quality of salmon habitat is maintained. • Monitor application of the Land Development Guidelines with respect to urban development. • Monitor application of guidelines associated with agricultural activities. • Monitor other proposed development activities such as linear, hydro, etc. and conduct routine audits of performance compliance. • Monitor biophysical conditions such as soils, channel and terrain stability, and hydrology. • Monitor salmon population levels and distribution. • Monitor salmon habitat quality and quantity. • Monitor cumulative impacts of development using ECA, riparian condition, etc. • Monitor identified critical watershed features such as condition of non-natal tributaries. • Provide an assessment of watershed riparian condition to determine if the FPC riparian standards are adequate to maintain existing riparian attributes. • Cooperate with scientific research programs (i.e. Fish/Forestry interaction) in the LRMP area. • Cooperate with Watershed Restoration Program (WRP) monitoring programs.	• Habitat capacity, quality and quantity. • Compliance with environmental standards and guidelines. • Status of cumulative impacts. • Status of critical environmental variables such as flow, water temperature, sediment input, water quality, water demand/use. • Riparian condition. • Number, type and effectiveness of watershed restoration projects. • Restoration project comparative reviews. • Salmon escapement trends. • Catch levels (harvest rates).

Chinook Salmon

Escapement records (Hopwo 1994) show that chinook salmon spawn in all the major watersheds of the Fraser River basin portion of the Vanderhoof LRMP, the Nechako and Stuart rivers having the largest escapement numbers. Other watersheds, although perhaps less significant in terms of absolute escapement numbers, are essential for the maintenance of genetic diversity of chinook stocks. It should be emphasized that chinook salmon juveniles rear in these systems for up to two years after emerging from the gravel (Hickey and Lister 1981). In particular, juvenile chinook utilize the tributary streams entering the mainstem rivers and seasonally flooded areas for rearing. These areas are therefore critical to the early life stages of the area's chinook salmon (Lister et al. 1981).

The 1985 Pacific Salmon Treaty committed management agencies in Canada and the United States to halt the decline of chinook spawning escapments and attain, by 1998, spawning escapement goals established by each nation. For Fraser River chinook, the current rebuilding goal (established in 1984) is a doubling of base period (1979-1982) escapement goals by 1998. This goal serves as an interim objective of the rebuilding plan (FRAP 1995).

Sockeye Salmon

Escapement records (Hopwo 1994) indicate that sockeye salmon spawn in all the major watersheds of the Fraser River basin portion of the Vanderhoof LRMP except the Chilako River. The largest escapement is to the Stellako River, averaging approximately 109,000 in the period 1981-1992. The large Stuart and Nadina River sockeye runs spawn outside the Vanderhoof LRMP but utilize watercourses in the LRMP (e.g. Nechako and Stuart Rivers) for migration and rearing. The aboriginal food fishery utilize sockeye in these rivers.

DFOs current management strategy for the sockeye stocks in the Vanderhoof LRMP follow the general stock management policies and objectives for the Fraser basin. The interim goal on the dominant cycle for the Stellako stocks is an escapement of 300,000 (FRAP 1994).

It is evident that the fish habitat present in the Vanderhoof LRMP area is both highly productive and extensive. The habitat also supports a significant proportion of the Fraser River basin's salmon production, which is harvested by commercial, sport, and aboriginal fisheries. As a result, prudent management of development activities in the LRMP area is a high priority with DFO.

3.0 METHODOLOGY

The following sections describe the preparation of the Vanderhoof LRMP Salmon Watershed Planning Profiles.

3.1 Delineation of Watershed Planning Units

The delineation of watershed boundaries as planning units is crucial from a fish habitat management perspective. The use of watersheds as planning units permits the assessment of potential land and resource use impacts on hydrology and fish habitat. The watershed boundary provides a logical

planning unit from which relevant data can be collected, and inventory and land use information can be evaluated. In this way, the assessment of potential impacts of land and resource use activities on fish habitat and productivity can be based on a discrete physical drainage area and the biophysical processes which occur within a particular physiographic location.

The WPUs used in this analysis are usually based on individual watershed boundaries since each watershed typically supports at least one salmon species and contains specific biophysical attributes. However, where similar features such as terrain, water sources, micro-climate, geology, development activity, and fish life histories occur in adjacent, relatively small watersheds, these watersheds were amalgamated to form larger units also referred to as WPUs. In cases where several similarities existed but at least one significant difference was noted, such as an increased level of concern for a particular watershed feature or activity, a separate WPU was assigned. Figures 2 to 4 show the WPU boundaries as well as specific information outlined in Section 3.2 below. In addition to the 7 WPUs documented in appendices 1 to 7, small portions of the West Road (Blackwater) River and its tributary, the Euchiniko River, are located in the Vanderhoof LRMP. These systems are discussed in the companion document Cariboo-Chilcotin CORE Salmon Watershed Planning Profiles (DFO in prep.) and the provincial Cariboo-Chilcotin Land Use Plan (British Columbia 1994).

DFO has divided the Fraser Basin into 15 planning units termed Habitat Management Areas (HMAs), based on major watershed boundaries, salmon stocks and physiographic features. Much of DFO's stock and habitat specific information is compiled relative to HMAs. With the exception of the Stuart River, which is in the Stuart/Takla HMA, the Fraser River basin salmon watersheds within the Vanderhoof LRMP correspond to the Nechako HMA.

3.2 Development of Assessment Criteria

For each watershed profile, the focus of the assessment was on development types and associated attributes (e.g. industrial development [type], extent thereof [attribute]) and biophysical features (e.g. terrain). Human development activities and biophysical conditions play a key role in fisheries habitat; documentation thereof is a crucial step towards an assessment of habitat resource conditions. Specifically, the analysis considered:

1. General **watershed information** and **hydrology**. The primary source of general watershed and hydrologic information for this report is Rood & Hamilton 1995, and readers can refer to that document for an explanation of the methods used to derive the hydrologic data. All flow data are related to the stream mouth. The winter (November 1 to April 30) and summer (May 1 to October 31) months in which mean 7 day low flows occur most frequently are presented if the information is available. Selected hydrologic characteristics of WPUs, extracted from Rood and Hamilton (1995) are shown in Figure 2, map sleeve 1.

2. The **presence of salmon** within the watershed planning unit, and if present, the species, an assessment of the population trends including the historic maximum (and year, if available), the 1981 to 1992 average and maximum escapement, the 1969 to 1980 average escapement, and a comparison of the 1981 to 1992 average to the 1969 to 1980 average. The comparison was used as an indicator as to whether the population is static, increasing, decreasing, or if there is no trend. The rebuilding potential for the stock is presented as low, medium or high. The measure

of rebuilding potential, developed by Hopwo (1994), is based on changes in escapement over time. "Low" indicates that the historic maximum is less than the recent (81-92) maximum by 50% and production levels are being realized. "Medium" indicates historic and recent maximums are within 50% of each other and limited production increases will be realized. "High" indicates that the historic maximum is greater than the recent (81-92) maximum by 50% and significant potential to increase production exists. The extent of known (to 1994) salmon spawning distribution is presented in Figure 3, map sleeve 2. Migration and rearing areas, extensive throughout the LRMP, are not shown.

It should be noted that the number of spawners estimated for a particular watershed planning unit was ***not*** significant to the analysis, only their presence. The escapement numbers are, therefore, presented for information only.

3. Past, present or proposed **developments** (e.g. forestry) within the watershed , including attributes typically associated with the particular development (e.g. percent logging). The development types and associated attributes considered were:

   a) *Forestry* - percent logging[1], equivalent clearcut area (ECA)[2] status, riparian condition/stream length impacted;
   b) *Agriculture* - extent, riparian condition/stream length impacted, water withdrawal, water quality;
   c) *Urbanization* - population level, extent, riparian condition/stream length impacted, water withdrawal, water quality;
   d) *Placer mining* - extent, water quality, riparian condition/stream length impacted;
   e) *Other mining* - extent, water quality;
   f) *Industrial development* - extent, water quality, stream/riparian impacts;
   g) *Linear development* - extent, stream/riparian impacts;
   h) *Hydro development* - extent, stream/riparian impacts;,
   i) *Other developments* - extent, stream/riparian impacts, and;
   g) *Cumulative developments* - consideration of the impact of all development activities.

4. **Biophysical conditions** within the watershed were determined by assessing the following biophysical features:

   a) *Soils*;
   b) *Terrain*;

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[1] Percent logging is defined here as the total area of the watershed that has been logged i.e all cutblocks including those blocks with some hydrologic recovery (See Rood and Hamilton 1995). Figure 4, map sleeve 3, presents percent logging in each WPU. **N.B.** This information has been compiled to assist DFO staff in 'flagging' watersheds that have forest harvesting at a level (e.g. > 20% logging) that warrants particular attention. This in no way replaces a full watershed assessment procedure as provided for under the Forest Practices Code.

[2] Equivalent clearcut area (ECA) is a forest management term used to describe the total area within a watershed which functions in a similar fashion hydrologically to a clearcut opening, accounting for a recovery factor based on the stage(s) of forest regeneration.

c) *Resistance to change*[3];
d) *Hydrology*;
e) *Channel stability*; and,
f) *Significant environmental variables* - e.g. biophysical conditions resulting from impoundment, nutrient enrichment.

5. The presence of **sensitive watershed features** which would require site or area specific attention such as:

   a) *Sensitive physical features*;
   b) *Sensitive biological features*; and,
   c) *Unique features.*

6. The occurrence of, or the potential for, **special considerations** which may have present or future impacts on development activities including:

   a) *Stock management* initiatives - i.e. manipulation of fisheries or escapement levels;
   b) Existing or potential fish habitat or fish population *enhancement activities*;
   c) Fish habitat or fish population *restoration activities*; and,
   d) Presence of a *native, recreational* or *commercial fishery* and its locale.

7. The undertaking of **recent watershed planning/project initiatives** by government agencies and/or other stakeholders.

3.3 Assignment of 'Levels of Concern' for Development Type and Attributes and Biophysical Features

After the available information was compiled and reviewed, a level of concern for fish and fish habitat, as it related to the potential for salmon resource impacts, was assigned to each development type and attribute, and each biophysical feature. The level of concern was rated either **low** or **high.**

A **low** level of concern served to indicate that, based on the available information, and assuming that ***standard management practises*** are applied, minimal impact to salmon populations or their habitat would be expected to occur. ***Standard management practice*** assumes that an acceptable level of protection for stream habitat and water quality will be provided. This will include, where applicable, standard practices such as the Forest Practices Code (range, timber, etc.), the Land Development Guidelines, placer mining regulations and guidelines, and Guidelines for Mineral Exploration and Reclamation. Appendix 8 lists relevant environmental guideline publications. It is also assumed that routine auditing of development activities will be performed to ensure compliance with the prescribed standards.

[3] Watersheds vary in their ability to resist environmental changes resulting from human activities. The variability results from factors such as soil erodibility and watercourse hydrology. In the watershed profiles, a high level of concern was assigned to a watershed with little ability to resist change and conversely a low level was assigned to a watershed with good ability to resist change.

A **high** level of concern would indicate that the particular watershed has a high probability for significant impacts on fish or fish habitat from present or proposed development activities or biophysical features.

It should be noted that the level of concern assigned was based on the best available information. Reclassification may be necessary as new information becomes available, or changes in either the physical habitat, rate of development, or status of the salmon populations occur.

4.0 RESULTS AND DISCUSSION

A total of seven salmon bearing Watershed Planning Units were delineated for the portion of the Fraser River drainage located within the Vanderhoof LRMP area. Detailed analyses, prepared by watershed, are presented in Appendices 1 through 7. Table 3 presents a summary of these WPUs and any individual watershed delineated within the WPU. In the 'development concerns' and 'biophysical concerns' columns, the numbers represent the sum of high levels of concern that have been assigned to the development types and biophysical features. These values could be a maximum 10 and 6 respectively. In the case of sensitive watershed features and special considerations, the values could be a maximum 3 and 6 respectively. The significance of the last column is discussed in Section 4.1.

Table 3. Results of the Salmon Resource Analyses by Watershed Planning Unit.

Watershed Planning Unit and Watersheds	Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations	$\sum$ col 3-6*
1. Nechako River	✓	4	3	2	6	15
2. Chilako River	✓	4	3	2	5	14
3. Stuart River	✓	0	1	1	5	7
4. Fraser Lake/Ormond Creek						
Fraser Lake	✓	0	0	1	5	6
Ormond Creek	✓	0	0	0	5	5
5. Stellako River	✓	0	0	2	5	7
6. Endako River	✓	3	1	2	5	11
7. François Lake/Nithi River/Uncha Creek						
François Lake	✓	0	0	1	6	7
Nithi River	✓	0	0	1	6	7
Uncha Creek	✓	1	0	1	4	6

* $\sum$ col 3-6 = the arithmetic sum of columns 3 to 6.

4.1 Prioritization of Watersheds

Prioritization of watersheds was determined based on the sum of high levels of concern for development types and biophysical features, identified sensitive watershed features, and identified special considerations. The sum is presented in column 7, Table 3 above. This method is an appropriate first effort to prioritize the watersheds in that it combines development and biophysical conditions, sensitive watershed features and special considerations that are considered to require special attention. Table 4 presents, in decreasing order, the three watersheds that have the highest number of concerns and features. It is envisioned that Tables 3 and 4 will assist in defining an implementation strategy for the Vanderhoof LRMP as well as assist the various stakeholders in allocating effort and resources in their planning processes. ***It must be stressed, however, that each watershed identified in these salmon watershed planning profiles, regardless of its ranking in Table 3 or appearance in Table 4, contains characteristics that require specific attention.***

Specific strategies have been assigned for each watershed based on the specific objectives identified, in addition to the general objectives and strategies for salmon resources (Table 1). Implementing a monitoring program that incorporates the strategies and indicators outlined in Table 2 will enable auditing and evaluation of both specific and general strategies for a given watershed or local area within a watershed.

It is recognized that unforeseen conditions may arise either during or following the LRMP process such as insect infestation, fire, floods, significant changes in salmon escapement or development plans which may necessitate reevaluation of both the priority of and appropriate management prescriptions for a particular watershed. If necessary, these occurrences will be dealt with by more detailed plans.

Table 4. Prioritization of Watersheds Requiring Additional Assessments or Inventories.

Priority	Watersheds	Rationale
1 (Σ= 15)	Nechako River	Agriculture, urbanization, hydro development/ diversion, cumulative development, several biophysical watershed sensitivities, and many special considerations.
2 (Σ= 14)	Chilako River	Logging, agriculture, linear and cumulative development, some biophysical concern, several sensitive watershed features and special considerations.
3 (Σ= 11)	Endako River	Agriculture, linear, mining and cumulative development, several sensitive watershed features and special considerations.

5.0 ACKNOWLEDGEMENTS

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Preliminary resource planning efforts by DFO in the Fraser River Basin included an Analysis Criteria Workshop which provided general direction in setting objectives and strategies and identifying indicators. Participants in the workshop included Ms. Lidia Jaremovic and Ms. Violet Komori, Messrs. Mike Romaine, John Patterson, Tony Cheong, Stuart Nimmo and Tom Pinkerton of FRAP as well as Dr. Steve MacDonald of the Science Branch, West Vancouver and Mr. Glenn Smith of the Fisheries Management Sector, New Westminster. The maps prepared for this report were produced by Mr. Tom Pinkerton under the direction of Mr. John Patterson. Mr. Leroy Hopwo of DFO prepared the escapement summaries used in the appendices. The contribution of Mr. Dwight Hickey, EDI Environmental Dynamics Inc., Prince George, is also acknowledged.

6.0 REFERENCES CITED

(**NB**. The reference numbers appearing in the WPU appendices refer to those given below).

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APPENDIX 1. Watershed Profile for the Nechako River Watershed Planning Unit

Streams located within the Nechako River Watershed Planning Unit include:

GENERAL WATERSHED INFORMATION:

Watershed:	*Nechako River*	SISS Code:	08-0000
Physiographic Area(s):	Fraser and Nechako Plateaus/Nechako Plain/ Quanchus, Tahatsa and Kitimat Ranges		
Drainage Area (ha):	5,190,000	Biogeoclimatic Zone(s):	Sub-Boreal Spruce/ Sub-Boreal Pine Spruce/ Engelmann Spruce- Subalpine Fir/ Alpine Tundra
HMA:	Nechako		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	244.65	561.90	97.62	Dec/Mar	144.67	NA
Comments:	Reference for above data is the stream mouth. See Reference #8, p. 12, Table 7 and Appendix B.					

SALMON ESCAPEMENT:

Species	Historical Max. (yr)	1981-92 Ave.	1981-92 Max.	1969-80 Ave.	Population trend	Rebuilding potential
Sockeye	1,030 (NA)	208	1,030	2	Increasing	Medium
Chinook	2,915 (NA)	1,986	2,915	1,269	Increasing	Medium

NB. Does not include escapement to tributaries, e.g. Chilako, Stuart, and Nautley watersheds. A small run of pink and coho rearing occurs as well.

DEVELOPMENT ACTIVITY:

Type	Level of Concern	Comments	Ref.*
Forestry	*Low*		6
-percent logging	Low	3% on average, 1% above the Nautley confluence and 13% below.	8
- ECA status	Low		6
- riparian condition/stream length impacted	Low		6

Watershed:	*Nechako River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***High***	From Kenny Dam downstream	6
- extent	High	Concentrated in Nautley to Stuart River reach	6
- riparian condition/stream length impacted	High	Extensive riparian impacts from agriculture throughout mainstem and tributaries	6
- water withdrawal	High	Current (July 1995) limit on licenses	6
- water quality	Low	Not assessed	6
Urbanization	***Low***		6
- population level	Low		6
- extent	Low	Throughout, but concentrated in Vanderhoof, Prince George, Fort Fraser	6
- riparian condition/stream length impacted	Low	Localized impacts	6, 8
- water withdrawal	Low	Heavy withdrawal at Prince George	6
- water quality	Low		6
Placer Mining	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- riparian condition/stream length impacted	Low		6
Other Mining	***Low***		6
- extent	Low	None	6
- water quality	Low		6

Watershed:	*Nechako River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***High***	Lumber mills, proposed pulp mill at Vanderhoof	6
- extent	Low	Concentrated - Vanderhoof, Isle Pierre, Prince George	6
- water quality	Low	License application on file for pulp mill	6
- stream/riparian impacts	Low		6
Linear Development	***Low***		6
- extent	Low	CNR and highway rights-of-way and crossings	6
- stream/riparian impacts	Low	Localized - CNR right-of-way - Prince George - Fort Fraser	6, 8
Hydro Development	***High***	Kemano Development - Kenney Dam on Nechako River	6, 8
- extent	High	Downstream flows regulated since 1952	8
- stream/riparian impacts	High	Impacts to channel/riparian zone	6
Other Development	***Low***		6
- extent	Low	Localized recreational concerns	6
- stream/riparian impacts	Low		6

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***High***	Agriculture, Urbanization, Hydro Development/Diversion, Forestry	6

* See report section 6.0 References Cited

Watershed:	*Nechako River*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	*Low*	Sediment from tributary downcutting entering mainstem	8
- types		Valley floor primarily glaciofluvial sand and gravel or alluvial deposits, some glaciolacustrine sediments as well	8
Terrain	*Low*	Downcutting or degrading of the lower reaches of tributaries because of (regulated) low spring and summer Nechako flows	8
- type		Nechako Plateau is primarily low relief and expanses of flat or gently rolling terrain. Nechako Valley is well-incised below the Nechako Plateau.	8
Resistance to Change	*High*	Regulated/diverted flow at Kenny Dam, large water extraction primarily for urban and industrial use, some agriculture	8
Hydrology	*High*	Regulated/diverted flow at Kenny Dam, large water extraction	8
Channel Stability	*Low*	Regulated flow	8
- type			
Significant Environmental Variables	*High*	Water temperature and flow regime concerns	6

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features			
Sensitive Biological Features	✓	Water temperature and flow regime concerns	6
Unique Features	✓	Kenny Dam diverts significant portion of stream flow	6

* See report section 6.0 References Cited

Watershed:	*Nechako River*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓		
Enhancement Activity/Opportunity	✓	Nechako Fisheries Conservation Program (NFCP)	6, 8
Restoration Activity	✓	NFCP	6, 8
Native Fishery	✓	Occurs in Fraser and Nechako Rivers	6
Recreational Fishery	✓	Ocean sport fishery	
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
NFCP	Nechako Fisheries Conservation Program underway	6, 8
WMP	Water Management Plan proposed by DFO/MoELP	6
	Foreshore mapping of Nechako and Fraser by Envirowest Consultants	6

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓	✓(4)	✓(3)	✓(2)	✓(6)

Watershed:	*Nechako River*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Follow the terms of the Kemano Settlement Agreement and Nechako Fisheries Conservation Program. • Maintain the structural and functional integrity of riparian areas. • Maintain slope stability. • Maintain or improve water quality. • Protect stream channels and floodplains from influences of development activities. • Ensure the protection of headwater, ephemeral and intermittent channels; recognizing their influence on watershed stability, hydrology and water quality. • Ensure protection of critical aquatic habitats including: floodplain, off-channel sites, non-natal tributaries and other areas of biological significance. • Ensure that the intensity of development activities does not negatively impact the natural watershed ecological processes through site specific or cumulative development. • Ensure the inventory, assessment and implementation of stream restoration and enhancement programs. • Improve inventories of aquatic resources. • Support existing fisheries enhancement programs and activities. • Improve fish passage in the watershed.	• Apply the Nechako Fisheries Conservation Program strategies. • Apply the Watershed Assessment Procedures (WAP) to assess past and potential for future impacts of lands use activities on the tributaries. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct detailed stream channel stability assessment on tributaries. • Conduct and maintain fisheries, habitat (critical) and enhancement inventories. Identify limiting factors. • Conduct detailed gully assessments in tributaries for specified sensitive channels identified in development plans. • Conduct foreshore inventory and classification of Nechako mainstem for delineation of fisheries sensitive zones (FSZ) prior to development. • Design high elevation forest cutblocks to optimize snow accumulation and retention similar to unharvested or undisturbed areas. • Develop Access Management Plans (AMP) for review and direction. • Develop a detailed riparian management plan (RMP) from Nautley to Prince George identifying areas requiring site specific prescriptions (urban/agriculture). • Develop a riparian management plan to protect and restore tributary stream habitat in cooperation with agricultural and ranching communities.

Watershed:	*Nechako River*

SPECIFIC OBJECTIVES AND STRATEGIES (continued):

Specific Objectives	Specific Strategies
	• Develop a Water Management Plan (WMP) that includes a determination of water demand, fisheries/ minimum low flow of water storage opportunities and potential impacts of water extraction. • Distribute timber harvesting opportunities throughout the available range in elevation to maintain natural hydrologic conditions in tributaries. • Document, map and assess tributary terrain and soils conditions and their hazard risk. • Ensure that rate of development in the tributaries (forestry, urban, agriculture, etc.) is balanced against hydrologic recovery to maintain cumulative ECA at or below 25% • Maintain designated "NO STAKING PLACER RESERVES" for placer mining where identified. • Implement a water drainage management plan for sensitive soils, stream crossings or other areas specified in development plans. • Initiate a watershed restoration assessment and inventory for development of a Watershed Restoration Plan. • Implement watershed restoration plan recommendations from assessment and inventory reports. • Initiate restoration, revegetation and stabilization measures on linear developments. • Provide Streamside Management Plans (SMP) for harvesting areas identified in the annual forest development plan update. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls).

Watershed:	*Nechako River*

SPECIFIC OBJECTIVES AND STRATEGIES (continued):

Specific Objectives	Specific Strategies
	• Retain riparian reserves along specified S4-S6 (FPC riparian class) stream channel reaches in high sensitivity areas or channels identified as having stream temperature concerns. • Review and document potential habitat improvement, habitat development and habitat restoration opportunities. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition.

APPENDIX 2. Watershed Profile for the Chilako River Watershed Planning Unit

Streams located within the Chilako River Watershed Planning Unit include:

GENERAL WATERSHED INFORMATION:

Watershed:	***Chilako River***	**SISS Code:**	08-0500
Physiographic Area(s):	Fraser/Nechako Plateau		
Drainage Area (ha):	357,800	**Biogeoclimatic Zone(s):**	Sub-Boreal Spruce
HMA:	Nechako		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	12.30	80.2	4.91	Dec/Jan	5.35	Aug
Comments:	Reference for above data is the stream mouth. See Reference # 8, p. 12, Table 7 and Appendix B.					

SALMON ESCAPEMENT:

Species	**Historical Max. (yr)**	**1981-92 Ave.**	**1981-92 Max.**	**1969-80 Ave.**	**Population trend**	**Rebuilding potential**
Chinook	425 (NA)	171	425	143	Static	Medium

DEVELOPMENT ACTIVITY:

Type	**Level of Concern**	**Comments**	**Ref.***
Forestry	***High***		6
- percent logging	High	Nearly 20 % on average, some tributaries more heavily logged	10
- ECA status	High	Rate-of cut review requested by DFO in 1993.	6
- riparian condition/stream length impacted	Low	Some impacts (including loss of vegetation) from forestry	6, 10

Watershed:	*Chilako River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***High***		6
- extent	High	Extensive from around Punchaw to mouth	6
- riparian condition/stream length impacted	High	Extensive riparian impacts from agriculture (e.g. range cattle damage) in lower reaches.	6, 10
- water withdrawal	High	Review of water licences required	6
- water quality	Low	Review of agriculture use required	6
Urbanization	***Low***		6
- population level	Low		6
- extent	Low	Rural agricultural community	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Placer Mining	***Low***		6
- extent	Low		6
-water quality	Low		6
- riparian condition/stream length impacted	Low	None	6
Other Mining	***Low***		6
- extent	Low	None	6
- water quality	Low		6

Watershed:	*Chilako River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- stream/riparian impacts	Low		6
Linear Development	***High***		6
- extent	High	Extensive logging roads, CNR and highway rights-of-way and crossings	6
- stream/riparian impacts	Low	Localized to crossing areas	6
Hydro Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6
Other Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***High***	Logging, agriculture, and to a lesser degree linear development	6

* See report section 6.0 References Cited

Watershed:	*Chilako River*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	***Low***		6
- types		Fraser till, typically clayey, is the most abundant soil type	6, 10
Terrain	***Low***		6
- type		Low relief and expanses of flat or gently rolling terrain, low hills separated by broad, flat valleys	6, 10
Resistance to Change	***High***	Low gradient, susceptible to sedimentation, especially in lower reaches due to erosion of lacustrine deposits, low flows	6
Hydrology	***Low***	Large watershed, low water yield, low gradient, beaver dams	6
Channel Stability	***High***	Tortuous meanders, particularly in lower reaches; low gradient	6
- type			
Significant Environmental Variables	***High***	Water temperature and sedimentation concerns	6

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features	✓	Lower reaches lacustrine deposits	6
Sensitive Biological Features	✓	Mainstem chinook spawning and rearing and tributary rearing	6, 10
Unique Features			

* See report section 6.0 References Cited

Watershed:	*Chilako River*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓		
Enhancement Activity/Opportunity	✓	SEP project at Hutda Lake	6
Restoration Activity			
Native Fishery	✓	Occurs in Fraser and Nechako Rivers	6
Recreational Fishery	✓	Ocean sport fishery	
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
WAP review	Watershed Assessment Procedure required by DFO	6, 10
Agriculture review	Reconnaissance level study under way by Prince George DFO	6

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓	✓(4)	✓(3)	✓(2)	✓(5)

Watershed:	*Chilako River*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Maintain natural watershed hydrologic characteristics and stream flow regime. • Maintain the natural stream temperature regime. • Maintain the structural and functional integrity of riparian areas. • Maintain slope stability. • Maintain or improve water quality. • Protect stream channels and floodplains from influences of development activities. • Ensure the protection of headwater, ephemeral and intermittent channels; recognizing their influence on watershed stability, hydrology and water quality. • Ensure protection of critical aquatic habitats including: floodplain, off-channel sites, non-natal tributaries and other areas of biological significance. • Ensure that the intensity of development activities does not negatively impact the natural watershed ecological processes through site specific or cumulative development. • Ensure the inventory, assessment and implementation of stream restoration and enhancement programs. • Improve inventories of aquatic resources. • Support existing fisheries enhancement programs and activities. • Improve fish passage in the watershed.	• Apply FPC riparian guidelines to agricultural and range use of crown land. • Apply riparian guidelines for new placer mines that are consistent with FPC standards. • Apply the Watershed Assessment Procedures (WAP) to assess past and potential for future impacts of lands use activities. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct a stream channel assessment to identify potential barriers to fish migration and remove or facilitate access where appropriate. • Conduct and maintain fisheries, habitat(critical) and enhancement inventories. • Conduct detailed gully assessments for specified sensitive channels identified in development plans. • Conduct minimum flow study. • Develop a Water Management Plan (WMP) that includes a determination of water demand, fisheries/ minimum low flow of water storage opportunities and potential impacts of water extraction. • Develop a detailed riparian management plan (RMP) for the Chilako mainstem identifying areas requiring site specific prescriptions. • Develop a riparian management plan to protect and restore tributary stream habitat in cooperation with agricultural and ranching communities. • Ensure that rate of development (forestry, urban, agriculture, etc.) is balanced against hydrologic recovery to maintain cumulative ECA at or below 25% (total watershed drainage area). • Maintain designated "NO STAKING PLACER RESERVES" for placer mining where identified.

Watershed:	*Chilako River*

SPECIFIC OBJECTIVES AND STRATEGIES (continued):

Specific Objectives	Specific Strategies
	• Implement a water drainage management plan for sensitive soils, stream crossings or other areas specified in development plans. • Initiate a watershed restoration assessment and inventory for development of a Watershed Restoration Plan. • Implement watershed restoration plan recommendations from assessment and inventory reports. • Initiate restoration, revegetation and stabilization measures on linear developments. • Provide Streamside Management Plans (SMP) for harvesting areas identified in the annual forest development plan update. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls). • Retain riparian reserves along specified S4-S6 (FPC riparian class) stream channel reaches in high sensitivity areas or channels identified as having stream temperature concerns. • Review and document potential habitat improvement, habitat development and habitat restoration opportunities. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition.

APPENDIX 3. Watershed Profile for the Stuart River Watershed Planning Unit

Streams located within the Stuart River Watershed Planning Unit include:

GENERAL WATERSHED INFORMATION:

Watershed:	***Stuart River***	**SISS Code:**	09-00
Physiographic Area(s):	Stuart/Tezzeron Plain		
Drainage Area (ha):	124,300	**Biogeoclimatic Zone(s):**	Sub-Boreal Spruce
HMA:	Stuart/Takla		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	129	NA	NA	NA	NA	NA
Comments:	Data from WSC Stn 08JE001 - Stuart River near Fort St. James. Period of record 1929 - 1989.					

SALMON ESCAPEMENT:

Species	**Historical Max. (yr)**	**1981-92 Ave.**	**1981-92 Max.**	**1969-80 Ave.**	**Population trend**	**Rebuilding potential**
Chinook	15,000 (1992)	3,818	15,000	610	Increasing	Medium
Sockeye	200 (1958)	NA	NA	NA	Unknown	NA

DEVELOPMENT ACTIVITY:

Type	**Level of Concern**	**Comments**	**Ref.***
Forestry	***Low***	Past logging, more planned, particularly in tributaries	6
-percent logging			
- ECA status	Low		6
- riparian condition/stream length impacted	Low	Little riverside logging to date	4

Watershed:	*Stuart River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***Low***		6
- extent	Low	Some agricultural activity along middle reaches in Chinohchey Creek area	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Urbanization	***Low***		6
- population level	Low		6
- extent	Low	Fort St. James at outlet of Stuart Lake	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Placer Mining	***Low***	Most areas excluded from placer mining	3
- extent	Low	Designated placer mining areas on tributaries, particularly Dog Creek.	3
- water quality	Low		6
- riparian condition/stream length impacted	Low	None	6
Other Mining	***Low***	9 claims (Cr, Hg, Ls, Au, Sb, Se, Cu)	4
- extent	Low		4
- water quality	Low		6

Watershed:	*Stuart River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- stream/riparian impacts	Low		6
Linear Development	***Low***		6
- extent	Low	Highway crossings	6,3,4
- stream/riparian impacts	Low		6
Hydro Development	***Low***		
- extent	Low	None	6
- stream/riparian impacts	Low		
Other Development	***Low***		
- extent	Low	Docks and recreation facilities at Stuart Lake	6
- stream/riparian impacts	Low		

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***Low***		6

* See report section 6.0 References Cited

Watershed:	*Stuart River*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	***Low***		6
- types		Lacustrine clay/silt, sandy loam, glacial till	4
Terrain	***Low***		6
- type		Low relief and expanses of flat or gently rolling terrain, low hills separated by broad, flat valleys	4, 8
Resistance to Change	***Low***	Several lakes and relatively low gradient topography	4
Hydrology	***Low***	Stable/ large lake headed stream, limited water removal	4
Channel Stability	***Low***		4
- type		Large, low gradient stable stream	4
Significant Environmental Variables	***High***	High summer water temperatures	3

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features			
Sensitive Biological Features	✓	Tributaries utilized by chinook juveniles	3,5
Unique Features			

* See report section 6.0 References Cited

Watershed:	*Stuart River*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓	Nechako Fisheries Conservation Program (NFCP) stock comparison studies	6
Enhancement Activity/Opportunity	✓	Chinook hatchery at Fort St.. James	4
Restoration Activity			
Native Fishery	✓	Fishery based out of Fort St. James and at the Tatselawas reserve opposite the Dog Creek confluence	6
Recreational Fishery	✓	Ocean sport fishery	
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
LRMP	PAS study area (Goal 1)	6

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓		✓	✓	✓(5)

Watershed:	*Stuart River*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Maintain the natural stream temperature regime. • Maintain the structural and functional integrity of riparian areas. • Ensure protection of critical aquatic habitats including: floodplain, off-channel sites, non-natal tributaries and other areas of biological significance. • Ensure compatibility of lake foreshore developments with salmon utilization. • Support existing fisheries enhancement programs and activities.	• Apply FPC riparian guidelines to agricultural and range use of crown land. • Apply riparian guidelines for new placer mines that are consistent with FPC standards. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct foreshore inventory and classification of the Stuart Lake outlet for delineation of fisheries sensitive zones (FSZ) prior to development. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls). • Retain riparian reserves along specified S4-S6 (FPC riparian class) stream channel reaches in high sensitivity areas or channels identified as having stream temperature concerns. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition. • Map fisheries sensitive zones for inclusion in municipal and regional district official community plans (OCP).

APPENDIX 4. Watershed Profiles for the Fraser Lake/Ormond Creek Watershed Planning Unit

Streams located within the Fraser Lake/Ormond Creek Watershed Planning Unit include:

GENERAL WATERSHED INFORMATION:

Watershed:	Fraser Lake	**SISS Code:**	NA
Physiographic Area(s):	Nechako Plateau		
Drainage Area (ha):	6,030	**Biogeoclimatic Zone(s):**	Sub-Boreal Spruce
HMA:	Nechako		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	21.88	76.00	6.23	NA	12.13	NA
Comments:	**NB.** Reference for above data is at the mouth of the Nautley River, which is the outlet of Fraser Lake. See Reference # 8 Table 7					

SALMON ESCAPEMENT:

Species	**Historical Max. (yr)**	**1981-92 Ave.**	**1981-92 Max.**	**1969-80 Ave.**	**Population trend**	**Rebuilding potential**
	NA	NA	NA	NA	NA	NA

NB. Fraser Lake used by sockeye and chinook for migration and rearing.

DEVELOPMENT ACTIVITY:

Type	**Level of Concern**	**Comments**	**Ref.***
Forestry	***Low***		6
-percent logging	Low	NA	6
- ECA status	Low	Moderate logging activity	6
- riparian condition/stream length impacted	Low		6

Watershed:	*Fraser Lake*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***Low***		6
- extent	Low	Some along lakeshore	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low	Not assessed	6
- water quality	Low	Effluent permit for Fraser Lake Village	1,6
Urbanization	***Low***		6
- population level	Low		6
- extent	Low	Concentrated at Nautley and Stellako Reserves and Fraser Lake Village	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low	domestic withdrawal	6
- water quality	Low	1985 study found water quality for human consumption and recreation good, but concern re: *Elodea canadensis*, Canadian pondweed	1
Placer Mining	***Low***		6
- extent	Low		6
- water quality	Low		6
- riparian condition/stream length impacted	Low		6
Other Mining	***Low***		6
- extent	Low		6
- water quality	Low		6

Watershed:	*Fraser Lake*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- stream/riparian impacts	Low		6
Linear Development	***Low***		6
- extent	Low	CNR and Highway 16 rights-of-way	6
- stream/riparian impacts	Low	Localized along southern foreshore	6
Hydro Development	***Low***		
- extent	Low	None	6
- stream/riparian impacts	Low		
Other Development	***Low***		
- extent	Low	Recreational development associated with Lake	6
- stream/riparian impacts	Low		

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***Low***		6

* See report section 6.0 References Cited

Watershed:	*Fraser Lake*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	***Low***		6
- types		Fraser till (typically clayey) most abundant soil type, thick layer of glacial drift	8
Terrain	***Low***		6
- type		Low relief and expanses of flat or gently rolling terrain	8
Resistance to Change	***Low***		6
Hydrology	***Low***		6
Channel Stability	***Low***		6
- type			
Significant Environmental Variables	***Low***		6

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features			
Sensitive Biological Features	✓	Aquatic weeds (Canadian pondweed) a problem especially along the west end of the lake	6,1
Unique Features			

* See report section 6.0 References Cited

Watershed:	*Fraser Lake*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓		
Enhancement Activity/Opportunity	✓	Ormond Creek enhancement project through Aboriginal Fisheries Strategy (AFS) program	6
Restoration Activity			
Native Fishery	✓	Occurs in Nechako River and Fraser Lake	6
Recreational Fishery	✓	Ocean sport fishery	
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
AFS enhancement	Ormond Creek project	6

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓			✓	✓(5)

Watershed:	*Fraser Lake*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Maintain natural watershed hydrologic characteristics and stream flow regime. • Maintain the natural stream temperature regime in tributaries.. • Maintain the structural and functional integrity of riparian areas. • Maintain slope stability. • Maintain or improve water quality. • Protect stream channels and floodplains from influences of development activities. • Ensure the protection of headwater, ephemeral and intermittent channels; recognizing their influence on watershed stability, hydrology and water quality. • Ensure protection of critical aquatic habitats including: floodplain, off-channel sites, non-natal tributaries and other areas of biological significance. • Ensure that the intensity of development activities does not negatively impact the natural watershed ecological processes through site specific or cumulative development. • Ensure the inventory, assessment and implementation of stream restoration and enhancement programs. • Improve inventories of aquatic resources. • Ensure compatibility of Fraser Lake foreshore developments with salmon utilization. • Support existing fisheries enhancement programs and activities. • Improve fish passage in the watershed.	• Apply FPC riparian guidelines to agricultural and range use of crown land. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct a stream channel assessment to identify potential barriers to fish migration and remove or facilitate access where appropriate. • Conduct and maintain fisheries, habitat (critical) and enhancement inventories. • Conduct foreshore inventory and classification of Fraser Lake for delineation of fisheries sensitive zones (FSZ) prior to development. • Ensure that tributary rate of development (forestry, urban, agriculture, etc.) is balanced against hydrologic recovery to maintain cumulative ECA at or below 25% (total watershed drainage area). • Maintain designated "NO STAKING PLACER RESERVES" for placer mining where identified. • Initiate a watershed restoration assessment and inventory for development of a Watershed Restoration Plan. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls). • Review and document potential habitat improvement, habitat development and habitat restoration opportunities. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition.

GENERAL WATERSHED INFORMATION:

Watershed:	Ormond Creek	**SISS Code:**	08-2700-080
Physiographic Area(s):	Nechako Plateau		
Drainage Area (ha):	2,510	**Biogeoclimatic Zone(s):**	Sub-Boreal Spruce
HMA:	Nechako		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	1.10	5.3	0.33	NA	0.43	NA
Comments:	**NB.** Reference for above data is the stream mouth. See Reference # 8 Table 7 and Appendix B.					

SALMON ESCAPEMENT:

Species	**Historical Max. (yr)**	**1981-92 Ave.**	**1981-92 Max.**	**1969-80 Ave.**	**Population trend**	**Rebuilding potential**
Sockeye	1,165 (1953)	0	0	8	Unknown	NA
Chinook	25 (1977)	0	0	7	Unknown	NA

DEVELOPMENT ACTIVITY:

Type	**Level of Concern**	**Comments**	**Ref.***
Forestry	***Low***		6
-percent logging	Low	4%	6
- ECA status	Low	NA	6
- riparian condition/stream length impacted	Low		6

Watershed:	*Ormond Creek*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***Low***		6
- extent	Low		6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low	Not assessed	6
- water quality	Low		1,6
Urbanization	***Low***		6
- population level	Low		6
- extent	Low		6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		1
Placer Mining	***Low***		6
- extent	Low		6
- water quality	Low		6
- riparian condition/stream length impacted	Low		6
Other Mining	***Low***		6
- extent	Low		6
- water quality	Low		6

Watershed:	*Ormond Creek*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- stream/riparian impacts	Low		6
Linear Development	***Low***		6
- extent	Low	Gas pipeline & forestry road	6
- stream/riparian impacts	Low	Localized at crossing	6
Hydro Development	***Low***		
- extent	Low	None	6
- stream/riparian impacts	Low		
Other Development	***Low***		
- extent	Low	Forestry campsite and trail along lower reaches	6
- stream/riparian impacts	Low		

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***Low***		6

* See report section 6.0 References Cited

Watershed:	*Ormond Creek*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	*Low*		6
- types		Fraser till (typically clayey) most abundant soil type, thick layer of glacial drift	8
Terrain	*Low*		6
- type		Low relief and expanses of flat or gently rolling terrain	8
Resistance to Change	*Low*		6
Hydrology	*Low*	Low flow and beaver dams impede migration	6,8
Channel Stability	*Low*	Sediment deposits at mouth impede migration	6,8
- type			
Significant Environmental Variables	*Low*		6

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features			
Sensitive Biological Features			
Unique Features			

* See report section 6.0 References Cited

Watershed:	*Ormond Creek*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓		
Enhancement Activity/Opportunity	✓	Ormond Creek enhancement project through Aboriginal Fisheries Strategy (AFS) program	6
Restoration Activity			
Native Fishery	✓	Occurs in Nechako River and Fraser Lake	6
Recreational Fishery	✓	Ocean sport fishery	
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
AFS enhancement	Ormond Creek biophysical and fisheries survey by Aquatic Resources Ltd. underway (1995).	6

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓				✓(5)

Watershed:	*Ormond Creek*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Maintain natural watershed hydrologic characteristics and stream flow regime. • Maintain the natural stream temperature regime in tributaries.. • Maintain the structural and functional integrity of riparian areas. • Maintain slope stability. • Maintain or improve water quality. • Protect stream channels and floodplains from influences of development activities. • Ensure the protection of headwater, ephemeral and intermittent channels; recognizing their influence on watershed stability, hydrology and water quality. • Ensure protection of critical aquatic habitats including: floodplain, off-channel sites, non-natal tributaries and other areas of biological significance. • Ensure that the intensity of development activities does not negatively impact the natural watershed ecological processes through site specific or cumulative development. • Ensure the inventory, assessment and implementation of stream restoration and enhancement programs. • Improve inventories of aquatic resources. • Ensure compatibility of Fraser Lake foreshore developments with salmon utilization. • Support existing fisheries enhancement programs and activities. • Improve fish passage in the watershed.	• Apply FPC riparian guidelines to agricultural and range use of crown land. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct a stream channel assessment to identify potential barriers to fish migration and remove or facilitate access where appropriate. • Conduct and maintain fisheries, habitat (critical) and enhancement inventories. • Conduct foreshore inventory and classification of Fraser Lake for delineation of fisheries sensitive zones (FSZ) prior to development. • Ensure that the rate of development (forestry, urban, agriculture, etc.) is balanced against hydrologic recovery to maintain cumulative ECA at or below 25% (total watershed drainage area). • Maintain designated "NO STAKING PLACER RESERVES" for placer mining where identified. • Initiate a watershed restoration assessment and inventory for development of a Watershed Restoration Plan. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls). • Review and document potential habitat improvement, habitat development and habitat restoration opportunities. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition.

APPENDIX 5. Watershed Profile for the Stellako River Watershed Planning Unit

Streams located within the Stellako River Watershed Planning Unit include:

GENERAL WATERSHED INFORMATION:

Watershed:	Stellako River	**SISS Code:**	08-2700
Physiographic Area(s):	Nechako Plateau		
Drainage Area (ha):	3,600 (Corridor)	**Biogeoclimatic Zone(s):**	Sub-Boreal Spruce
HMA:	Nechako		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	15.75	47.7	4.48	Dec	6.78	NA
Comments:	Reference for above data is the stream mouth at Fraser Lake. See Reference #8, p. 11, Table 7 and Appendix B.					

SALMON ESCAPEMENT:

Species	Historical Max. (yr)	1981-92 Ave.	1981-92 Max.	1969-80 Ave.	Population trend	Rebuilding potential
Sockeye	367,700 (NA)	108,533	367,700	84,735	Increasing	Medium
Chinook	1,500 (1958)	29	75	74	Decreasing	High

NB. Above escapement data for mainstem Stellako River only.

DEVELOPMENT ACTIVITY:

Type	Level of Concern	Comments	Ref.*
Forestry	***Low***		6
-percent logging	High	25 % logged - extensive past logging on hillsides.	8
- ECA status	Low		6
- riparian condition/stream length impacted	Low		6

Watershed:	*Stellako River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***Low***		6
- extent	Low		6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Urbanization	***Low***		6
- population level	Low		6
- extent	Low	Lodge at outlet of François Lake. Reserve on lower reaches.	6
- riparian condition/stream length impacted	Low	Localized	6
- water withdrawal	Low		6
- water quality	Low		6
Placer Mining	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- riparian condition/stream length impacted	Low		6
Other Mining	***Low***		6
- extent	Low	None	6
- water quality	Low		6

Watershed:	*Stellako River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- stream/riparian impacts	Low		6
Linear Development	***Low***		6
- extent	Low	Highway 16 and CNR rights-of-way	6
- stream/riparian impacts	Low	Lower river was diverted and confluence with Endako River re-channelized years ago	8
Hydro Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6
Other Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***Low***		6

* See report section 6.0 References Cited

Watershed:	*Stellako River*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	***Low***		6
- types		Fraser till (typically clayey) most abundant surface soil type, thick layer of glacial drift.	8
Terrain	***Low***		6
- type		Low relief and expanses of flat or gently rolling terrain	8
Resistance to Change	***Low***	Large lake (François)	6
Hydrology	***Low***	Large lake (François)	6
Channel Stability	***Low***	Stable flows	6
- type			
Significant Environmental Variables	***Low***		6

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features			6
Sensitive Biological Features	✓	Weed growth from the lagoon (confluence of Endako River) to the mouth is a concern	6, 8
Unique Features	✓	Upper portion of Stellako river protected by Habitat Conservation Fund reserve.	8

* See report section 6.0 References Cited

Watershed:	*Stellako River*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓		
Enhancement Activity/Opportunity	✓	Gravel placement in upper reaches for sockeye spawning and ongoing study of egg to fry survival	6
Restoration Activity			
Native Fishery	✓	Occurs in Fraser Lake and Nechako and Fraser Rivers	6
Recreational Fishery	✓	Regionally significant trout fishery - high Provincial priority as well as ocean sport fishery	6
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
	None	6

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓			✓(2)	✓(5)

Watershed:	*Stellako River*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Maintain natural watershed hydrologic characteristics and stream flow regime. • Maintain the natural stream temperature regime. • Maintain the structural and functional integrity of riparian areas. • Maintain slope stability. • Maintain or improve water quality. • Protect stream channels and floodplains from influences of development activities. • Ensure the protection of headwater, ephemeral and intermittent channels; recognizing their influence on watershed stability, hydrology and water quality. • Ensure that the intensity of development activities does not negatively impact the natural watershed ecological processes through site specific or cumulative development. • Ensure the inventory, assessment and implementation of stream restoration and enhancement programs. • Ensure adequate stream flows are present to maintain fisheries productive capacity. • Improve inventories of aquatic resources. • Support existing fisheries enhancement programs and activities.	• Apply FPC riparian guidelines to agricultural and range use of crown land. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct and maintain fisheries, habitat (critical) and enhancement inventories. • Conduct detailed gully assessments for specified sensitive channels identified in development plans. • Document, map and assess watershed terrain and soils conditions and their hazard risk. • Maintain designated "NO STAKING PLACER RESERVES" for placer mining where identified. • Implement a water drainage management plan for sensitive soils, stream crossings or other areas specified in development plans. • Initiate a watershed restoration assessment and inventory for development of a Watershed Restoration Plan. • Provide Streamside Management Plans (SMP) for harvesting areas identified in the annual forest development plan update. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls). • Retain riparian reserves along specified S4-S6 (FPC riparian class) stream channel reaches in high sensitivity areas or channels identified as having stream temperature concerns. • Review and document potential habitat improvement, habitat development and habitat restoration opportunities. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition

APPENDIX 6. Watershed Profile for the Endako River Watershed Planning Unit

Streams located within the Endako River Watershed Planning Unit include:

GENERAL WATERSHED INFORMATION:

Watershed:	***Endako River***	**SISS Code:**	08-2700-140
Physiographic Area(s):	Nechako Plateau		
Drainage Area (ha):	203,300	**Biogeoclimatic Zone(s):**	Sub-Boreal Spruce/ Engelmann Spruce-Subalpine Fir
HMA:	Nechako		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	6.13	43.1	1.33	NA	1.43	NA
Comments:	Reference for above data is the stream mouth. See Reference #8, p. 11, Table 7 and Appendix B.					

SALMON ESCAPEMENT:

Species	Historical Max. (yr)	1981-92 Ave.	1981-92 Max.	1969-80 Ave.	Population trend	Rebuilding potential
Sockeye	2,540 (1963)	149	1,000	158	Static	High
Chinook	500 (1987)	194	500	31	Increasing	Medium

DEVELOPMENT ACTIVITY:

Type	Level of Concern	Comments	Ref.*
Forestry	***Low***	Large portion deciduous, lower reaches deciduous/conifer mix	6
-percent logging	Low	4% on average	8
- ECA status	Low		6
- riparian condition/stream length impacted	Low		6

Watershed:	*Endako River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***High***		6
- extent	High	Throughout	6
- riparian condition/stream length impacted	High	Localized impacts	6
- water withdrawal	High	High licensed demand for summer irrigation and industrial demand all year	6
- water quality	Low	Not assessed, believed to be the primary nutrient (phosphorus) supplier to Fraser Lake.	1
Urbanization	***Low***	Concentrated on lakes - Burns, Decker, Fraser Lakes	6
- population level	Low		6
- extent	Low	Burns Lake, Endako and Stellako reserve	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Placer Mining	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- riparian condition/stream length impacted	Low		6
Other Mining	***Low***		6
- extent	Low	Molybdenum mine at Endako	6
- water quality	Low	Discharge permit - no concern noted	6

Watershed:	*Endako River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***Low***	Babine Forest Products mill at Sheraton Creek	6
- extent	Low		6
- water quality	High	wood waste at Sheraton Creek.	6
- stream/riparian impacts	Low		6
Linear Development	***High***		6
- extent	High	CNR and Highway 16 rights-of-way and crossings through Endako floodplain	8
- stream/riparian impacts	High	Impacts at many crossings, encroachments and channelization,	6
Hydro Development	***Low***		
- extent	Low	None	6
- stream/riparian impacts	Low		
Other Development	***Low***		
- extent	Low	Proposed golf course and subdivision at Shovel Creek	6
- stream/riparian impacts	Low		

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***High***	linear, agriculture, forestry, industrial	6

* See report section 6.0 References Cited

Watershed:	*Endako River*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	***Low***		6
- types		Fraser till (typically clayey) most abundant surface soil type, thick layer of glacial drift	8
Terrain	***Low***		6
- type		Low relief and expanses of flat or gently rolling terrain, low hills separated by broad, flat valleys	8
Resistance to Change	***Low***	Stable lake headed, low gradient	6
Hydrology	***Low***	Large lake headed, but low winter and summer flows	6, 8
Channel Stability	***Low***		6
- type		Tortuous meanders, low gradient. Portion of stream banks heavily fortified	
Significant Environmental Variables	***High***	Nutrient status unknown-suspect eutrophic system	6

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features	✓	low flows	6
Sensitive Biological Features	✓	Heavy aquatic weed/algae production, beaver dam, spawning in Shovel Creek and downstream to Savory	6
Unique Features			

* See report section 6.0 References Cited

Watershed:	*Endako River*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓		
Enhancement Activity/Opportunity	✓	Carrier Sekani Tribal Council Aboriginal Fisheries Strategy stream gauging project and beaver dam removal	6
Restoration Activity			
Native Fishery	✓	Occurs in Stellako River	6
Recreational Fishery	✓	Ocean sport fishery	
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
AFS	CSTC-AFS project	6

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓	✓(3)	✓	✓(2)	✓(5)

Watershed:	*Endako River*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Maintain natural watershed hydrologic characteristics and stream flow regime. • Maintain the natural stream temperature regime. • Maintain the structural and functional integrity of riparian areas. • Maintain slope stability. • Maintain or improve water quality. • Protect stream channels and floodplains from influences of development activities. • Ensure the protection of headwater, ephemeral and intermittent channels; recognizing their influence on watershed stability, hydrology and water quality. • Ensure protection of critical aquatic habitats including: floodplain, off-channel sites, non-natal tributaries and other areas of biological significance. • Ensure that the intensity of development activities does not negatively impact the natural watershed ecological processes through site specific or cumulative development. • Ensure the inventory, assessment and implementation of stream restoration and enhancement programs. • Ensure adequate stream flows are present to maintain fisheries productive capacity. • Improve inventories of aquatic resources. • Support existing fisheries enhancement programs and activities. • Improve fish passage in the watershed.	• Apply FPC riparian guidelines to agricultural and range use of crown land. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct a stream channel assessment to identify potential barriers to fish migration and remove or facilitate access where appropriate. • Conduct and maintain fisheries, habitat (critical) and enhancement inventories. • Conduct detailed gully assessments for specified sensitive channels identified in development plans. • Conduct minimum flow study. • Design high elevation forest cutblocks to optimize snow accumulation and retention similar to unharvested or undisturbed areas. • Develop Access Management Plans (AMP) for review and direction. • Develop a riparian management plan to protect and restore mainstem stream habitat in cooperation with agricultural and ranching communities. • Develop a Water Management Plan (WMP) that includes a determination of water demand, fisheries/ minimum low flow of water storage opportunities and potential impacts of water extraction. • Distribute timber harvesting opportunities throughout the available range in elevation to maintain natural hydrologic conditions. • Document, map and assess watershed terrain and soils conditions and their hazard risk. • Ensure that rate of development (forestry, urban, agriculture, etc.) is balanced against hydrologic recovery to maintain cumulative ECA at or below 25% (total watershed drainage area).

Watershed:	*Endako River*

SPECIFIC OBJECTIVES AND STRATEGIES (continued):

Specific Objectives	Specific Strategies
	• Maintain designated "NO STAKING PLACER RESERVES" for placer mining where identified. • Implement a water drainage management plan for sensitive soils, stream crossings or other areas specified in development plans. • Initiate a watershed restoration assessment and inventory for development of a Watershed Restoration Plan. • Implement watershed restoration plan recommendations from assessment and inventory reports. • Initiate restoration, revegetation and stabilization measures on linear developments. • Provide Streamside Management Plans (SMP) for harvesting areas identified in the annual forest development plan update. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls). • Retain riparian reserves along specified S4-S6 (FPC riparian class) stream channel reaches in high sensitivity areas or channels identified as having stream temperature concerns. • Review and document potential habitat improvement, habitat development and habitat restoration opportunities. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition.

APPENDIX 7. Watershed Profiles for the François Lake/Nithi River/Uncha Creek Watershed Planning Unit

Streams located within the François Lake/Nithi River/Uncha Creek Watershed Planning Unit include:

GENERAL WATERSHED INFORMATION:

Watershed:	***François Lake***	**SISS Code:**	NA
Physiographic Area(s):	Nechako Plateau		
Drainage Area (ha):	(NA)	**Biogeoclimatic Zone(s):**	Sub-Boreal Spruce/ Engelmann Spruce-Subalpine Fir
HMA:	Nechako		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	9.62	4.6	3.15	NA	5.35	NA
Comments:	Above data generated by subtracting Endako flows from Stellako flows. See Reference #8 Table 7.					

SALMON ESCAPEMENT:

Species	**Historical Max. (yr)**	**1981-92 Ave.**	**1981-92 Max.**	**1969-80 Ave.**	**Population trend**	**Rebuilding index**
	NA	NA	NA	NA	NA	NA

NB. Sockeye and chinook utilize François Lake for migration and rearing.

DEVELOPMENT ACTIVITY:

Type	**Level of Concern**	**Comments**	**Ref.***
Forestry	***Low***		6
-percent logging	Low	NA	6
- ECA status	High	Some tributaries heavily developed	6
- riparian condition/stream length impacted	Low	Not assessed	6

Watershed:	*François Lake*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***Low***		6
- extent	Low	Localized along lake, some range land	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Urbanization	***Low***		6
- population level	Low		6
- extent	Low	Concentrated at Grassy Plain and along north and east sides of lake	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Placer Mining	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- riparian condition/stream length impacted	Low		6
Other Mining	***Low***	Some exploration	6
- extent	Low	Endako Mine (molybdenum) at east end of lake	6
- water quality	Low	Effluent permit for Endako River discharge	6

Watershed:	*François Lake*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- stream/riparian impacts	Low		6
Linear Development	***Low***		6
- extent	Low	Road rights-of-way, encroachments and crossings/ferry terminals	6
- stream/riparian impacts	Low		6
Hydro Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6
Other Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***Low***		6

* See report section 6.0 References Cited

Watershed:	*François Lake*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	***Low***		6
- types		Fraser till (typically clayey) most abundant surface sediment, thick layer of glacial drift	8
Terrain	***Low***		6
- type		Low relief and expanses of flat or gently rolling terrain, low hills separated by broad, flat valleys	8
Resistance to Change	***Low***		6
Hydrology	***Low***	Nithi River (which enters François Lake from the south near the lake outlet) has low flow and aquatic weed concerns	8
Channel Stability	***Low***		6
- type			
Significant Environmental Variables	***Low***		6

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features			
Sensitive Biological Features	✓	Small tributaries provide rearing habitat for François Lake rainbow trout	6
Unique Features			

* See report section 6.0 References Cited

Watershed:	*François Lake*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓		
Enhancement Activity/Opportunity	✓	Flow control proposed on Nithi River	6
Restoration Activity	✓	Nithi River weed clearance at mouth	8
Native Fishery	✓	Occurs in Stellako River	6
Recreational Fishery	✓	Ocean sport fishery	
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
	None	

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓			✓	✓(6)

Watershed:	*François Lake*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Maintain natural watershed hydrologic characteristics and stream flow regime. • Maintain the natural stream temperature regime. • Maintain the structural and functional integrity of riparian areas. • Maintain slope stability. • Protect stream channels and floodplains from influences of development activities. • Ensure the protection of headwater, ephemeral and intermittent channels; recognizing their influence on watershed stability, hydrology and water quality. • Ensure that the intensity of development activities does not negatively impact the natural watershed ecological processes through site specific or cumulative development. • Ensure the inventory, assessment and implementation of stream restoration and enhancement programs. • Ensure adequate stream flows are present to maintain fisheries productive capacity. • Improve inventories of aquatic resources. • Ensure compatibility of lake foreshore developments with salmon utilization. • Support existing fisheries enhancement programs and activities. • Improve fish passage in the watershed.	• Apply FPC riparian guidelines to agricultural and range use of crown land. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct a stream channel assessment of tributaries to identify potential barriers to fish migration and remove or facilitate access where appropriate. • Conduct and maintain fisheries, habitat (critical) and enhancement inventories. • Conduct detailed gully assessments for specified sensitive channels identified in development plans. • Conduct foreshore inventory and classification of François Lake for delineation of fisheries sensitive zones (FSZ) prior to development. • Maintain designated "NO STAKING PLACER RESERVES" for placer mining where identified. • Initiate a watershed restoration assessment and inventory for development of a Watershed Restoration Plan. • Implement watershed restoration plan recommendations from assessment and inventory reports. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls). • Review and document potential habitat improvement, habitat development and habitat restoration opportunities. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition.

GENERAL WATERSHED INFORMATION:

Watershed:	*Nithi River*	SISS Code:	08-2700-190
Physiographic Area(s):	Nechako Plateau		
Drainage Area (ha):	32,200	Biogeoclimatic Zone(s):	Sub-Boreal Spruce/ Engelmann Spruce-Subalpine Fir
HMA:	Nechako		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	1.41	6.8	0.42	NA	0.55	NA
Comments:	Reference for the above data is the stream mouth. See Reference #8 Table 7.					

SALMON ESCAPEMENT:

Species	Historical Max. (yr)	1981-92 Ave.	1981-92 Max.	1969-80 Ave.	Population trend	Rebuilding index
Sockeye	1796 (NA)	109	990	470	NA	NA

DEVELOPMENT ACTIVITY:

Type	Level of Concern	Comments	Ref.*
Forestry	***High***		6
-percent logging	High	15%	8
- ECA status	High		6
- riparian condition/stream length impacted	Low	Not assessed	6

Watershed:	*Nithi River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***Low***		6
- extent	Low	Localized in lower reaches	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low	small existing water demand from irrigation licenses	8
- water quality	Low		6
Urbanization	***Low***		6
- population level	Low		6
- extent	Low	Some residences at mouth and lower reaches	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Placer Mining	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- riparian condition/stream length impacted	Low		6
Other Mining	***Low***		6
- extent	Low		6
- water quality	Low		6

Watershed:	*Nithi River*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- stream/riparian impacts	Low		6
Linear Development	***Low***		6
- extent	Low	Road rights-of-way and crossings	6
- stream/riparian impacts	Low		6
Hydro Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6
Other Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***Low***		6

* See report section 6.0 References Cited

Watershed:	*Nithi River*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	***Low***		6
- types		Fraser till (typically clayey) most abundant surface sediment, thick layer of glacial drift	8
Terrain	***Low***		6
- type		Low relief and expanses of flat or gently rolling terrain, low hills separated by broad, flat valleys	8
Resistance to Change	***Low***		6
Hydrology	***Low***	Nithi River (which enters François Lake from the south near the lake outlet) has low flow and aquatic weed concerns. Lower reaches of the south branch often dewater.	8
Channel Stability	***Low***		6
- type			
Significant Environmental Variables	***Low***		6

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features			
Sensitive Biological Features	✓	Rearing/spawning François Lake rainbow trout stock	6
Unique Features			

* See report section 6.0 References Cited

Watershed:	*Nithi River*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓		
Enhancement Activity/Opportunity	✓	Nithi River flow control/storage proposed	8
Restoration Activity	✓	Nithi River weed clearance at mouth	8
Native Fishery	✓	Occurs in Stellako River	6
Recreational Fishery	✓	Ocean sport fishery	
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
	None	

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓			✓	✓(6)

Watershed:	*Nithi River*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Maintain natural watershed hydrologic characteristics and stream flow regime. • Maintain the natural stream temperature regime. • Maintain the structural and functional integrity of riparian areas. • Maintain slope stability. • Protect stream channels and floodplains from influences of development activities. • Ensure the protection of headwater, ephemeral and intermittent channels; recognizing their influence on watershed stability, hydrology and water quality. • Ensure that the intensity of development activities does not negatively impact the natural watershed ecological processes through site specific or cumulative development. • Ensure the inventory, assessment and implementation of stream restoration and enhancement programs. • Ensure adequate stream flows are present to maintain fisheries productive capacity. • Improve inventories of aquatic resources. • Ensure compatibility of lake foreshore developments with salmon utilization. • Support existing fisheries enhancement programs and activities. • Improve fish passage in the watershed.	• Apply FPC riparian guidelines to agricultural and range use of crown land. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct a stream channel assessment to identify potential barriers to fish migration and remove or facilitate access where appropriate. • Conduct and maintain fisheries, habitat (critical) and enhancement inventories. • Conduct detailed gully assessments for specified sensitive channels identified in development plans. • Conduct a minimum flow study. • Develop a Water Management Plan (WMP) that includes a determination of water demand, fisheries/minimum low flow of water storage opportunities and potential impacts of water extraction. • Maintain designated "NO STAKING PLACER RESERVES" for placer mining where identified. • Initiate a watershed restoration assessment and inventory for development of a Watershed Restoration Plan. • Implement watershed restoration plan recommendations from assessment and inventory reports. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls). • Review and document potential habitat improvement, habitat development and habitat restoration opportunities. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition.

GENERAL WATERSHED INFORMATION:

Watershed:	*Uncha Creek*	SISS Code:	08-2700-410
Physiographic Area(s):	Nechako Plateau		
Drainage Area (ha):	61,400	Biogeoclimatic Zone(s):	Sub-Boreal Spruce/ Engelmann Spruce-Subalpine Fir
HMA:	Nechako		

WATERSHED HYDROLOGY:

Stream Flows:	Mean Annual	Mean Flood	Mean 7-day low flow			
			Winter		Summer	
(m^3/s)	2.68	13.0	0.8	NA	1.04	NA
Comments:	Reference for the above data is the stream mouth. See Reference #8 Table 7.					

SALMON ESCAPEMENT:

Species	Historical Max. (yr)	1981-92 Ave.	1981-92 Max.	1969-80 Ave.	Population trend	Rebuilding index
Sockeye	209(NA)	0	0	0	NA	NA

DEVELOPMENT ACTIVITY:

Type	Level of Concern	Comments	Ref.*
Forestry	*High*		6
-percent logging	High	approximately 21%	8
- ECA status	High		6
- riparian condition/stream length impacted	Low	Not assessed	6

Watershed:	*Uncha Creek*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Agriculture	***Low***		6
- extent	Low	Not assessed	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Urbanization	***Low***		6
- population level	Low		6
- extent	Low	Not assessed	6
- riparian condition/stream length impacted	Low		6
- water withdrawal	Low		6
- water quality	Low		6
Placer Mining	***Low***		6
- extent	Low	None	6
- water quality	Low		6
- riparian condition/stream length impacted	Low		6
Other Mining	***Low***	Not assessed	6
- extent	Low		6
- water quality	Low		6

Watershed:	*Uncha Creek*

DEVELOPMENT ACTIVITY (continued):

Type	Level of Concern	Comments	Ref.*
Industrial Development	***Low***		6
- extent	Low	Not assessed	6
- water quality	Low		6
- stream/riparian impacts	Low		6
Linear Development	***Low***		6
- extent	Low	Forestry road rights-of-way and crossings	6
- stream/riparian impacts	Low		6
Hydro Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6
Other Development	***Low***		6
- extent	Low	None	6
- stream/riparian impacts	Low		6

CUMULATIVE DEVELOPMENT ACTIVITY:

Cumulative Development	***Low***		6

* See report section 6.0 References Cited

Watershed:	*Uncha Creek*

BIOPHYSICAL CONDITIONS:

Type	Level of Concern	Comments	Ref.*
Soils	*Low*		6
- types		Fraser till (typically clayey) most abundant surface sediment, thick layer of glacial drift	8
Terrain	*Low*		6
- type		Low relief and expanses of flat or gently rolling terrain, low hills separated by broad, flat valleys	8
Resistance to Change	*Low*		6
Hydrology	*Low*		8
Channel Stability	*Low*		6
- type			
Significant Environmental Variables	*Low*		6

SENSITIVE WATERSHED FEATURES:

Type	Present	Comments	Ref.*
Sensitive Physical Features			
Sensitive Biological Features	✓	Rearing/Spawning François Lake rainbow trout stock	6
Unique Features			

* See report section 6.0 References Cited

Watershed:	*Uncha Creek*

SPECIAL CONSIDERATIONS:

Type	Present	Comments	Ref.*
Stock Management	✓		
Enhancement Activity/Opportunity		Not assessed	
Restoration Activity		Not assessed	
Native Fishery	✓	Occurs in Stellako River	6
Recreational Fishery	✓	Ocean sport fishery	
Commercial Fishery	✓	Ocean fishery	

RECENT WATERSHED PLANNING/PROJECT INITIATIVES:

Type	Comments	Ref.*
	None	

* See report section 6.0 References Cited

SUMMARY OF HABITAT CONCERNS (no. of high ratings):

Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations
✓	✓		✓	✓(4)

Watershed:	*Uncha Creek*

SPECIFIC OBJECTIVES AND STRATEGIES:

Specific Objectives	Specific Strategies
• Maintain natural watershed hydrologic characteristics and stream flow regime. • Maintain the natural stream temperature regime. • Maintain the structural and functional integrity of riparian areas. • Maintain slope stability. • Protect stream channels and floodplains from influences of development activities. • Ensure the protection of headwater, ephemeral and intermittent channels; recognizing their influence on watershed stability, hydrology and water quality. • Ensure that the intensity of development activities does not negatively impact the natural watershed ecological processes through site specific or cumulative development. • Ensure the inventory, assessment and implementation of stream restoration and enhancement programs. • Ensure adequate stream flows are present to maintain fisheries productive capacity. • Improve inventories of aquatic resources. • Ensure compatibility of lake foreshore developments with salmon utilization. • Support existing fisheries enhancement programs and activities. • Improve fish passage in the watershed.	• Apply FPC riparian guidelines to agricultural and range use of crown land. • Apply the Land Development Guidelines to residential and industrial developments. • Conduct a stream channel assessment to identify potential barriers to fish migration and remove or facilitate access where appropriate. • Conduct and maintain fisheries, habitat (critical) and enhancement inventories. • Conduct detailed gully assessments for specified sensitive channels identified in development plans. • Maintain designated "NO STAKING PLACER RESERVES" for placer mining where identified. • Initiate a watershed restoration assessment and inventory for development of a Watershed Restoration Plan. • Implement watershed restoration plan recommendations from assessment and inventory reports. • Restrict or control development within or along tributary confluences, alluvial fans, floodplains or areas of slope instability (e.g. valley walls). • Review and document potential habitat improvement, habitat development and habitat restoration opportunities. • Review resource development plans for compatibility with sensitive habitats in terms of hydrology, water quality, channel stability and riparian condition.

APPENDIX 8. List of Relevant Environmental Guidelines *

1. Environmental Guidelines for Beef Producers in British Columbia. B.C. Ministry of Agriculture, Fisheries and Food, B.C. Association of Cattle Feeders, B.C. Cattlemen's Association, and B.C. Federation of Agriculture. 1992.

2. Why Keep Livestock out of Watercourses? B.C. Ministry of Agriculture, Fisheries and Food. 1990.

3. Placer Mining Regulations and Guidelines for the Protection of Fisheries Resources in British Columbia. Department of Fisheries and Oceans. 1982.

4. Guide to Legislation and Approvals in Placer Mining. Ministry of Energy, Mines and Petroleum Resources. 1986.

5. Guidelines for Mineral Exploration: Environmental, Reclamation and Approval Requirements. Ministry of Energy, Mines and Petroleum Resources. 1992.

6. Environmental Objectives and Procedures for Water Crossings. B.C. Ministry of Environment. 1984.

7. Culvert Guidelines: Recommendations for the Design and Installation of Culverts in British Columbia to Avoid Conflict with Anadromous Fish. Department of Fisheries and Oceans. 1978.

8. Fact Sheets Prepared for B.C. Ministry of Transportation and Highways - Seminars on Highway Maintenance. Ministry of Transportation and Highways. 1989.

9. Guidelines for the Protection of Fish and Fish Habitat During Bridge Maintenance Operations in British Columbia. Department of Fisheries and Oceans. 1991.

10. Guidelines for the use of Explosives in Canadian Fisheries Waters. Department of Fisheries and Oceans. 1994 (Draft).

11. Land Development Guidelines for the Protection of Aquatic Habitat. Department of Fisheries and Oceans and Ministry of Environment, Lands and Parks. 1993.

12. A Handbook for Fish Habitat Protection on Forest Lands in B.C. Department of Fisheries and Oceans. 1981.

13. A Handbook for Forest Roadside Erosion Control in B.C. Ministry of Forests. 1980.

14. Guidelines for the Protection of Fish and Fish Habitat at Small Hydro Developments. Triton Environmental Consultants Ltd. for Department of Fisheries and Oceans. 1991.

15. A Guide for Management of Landslide-Prone Terrain in the Pacific Northwest. Ministry of Forests. 1991.

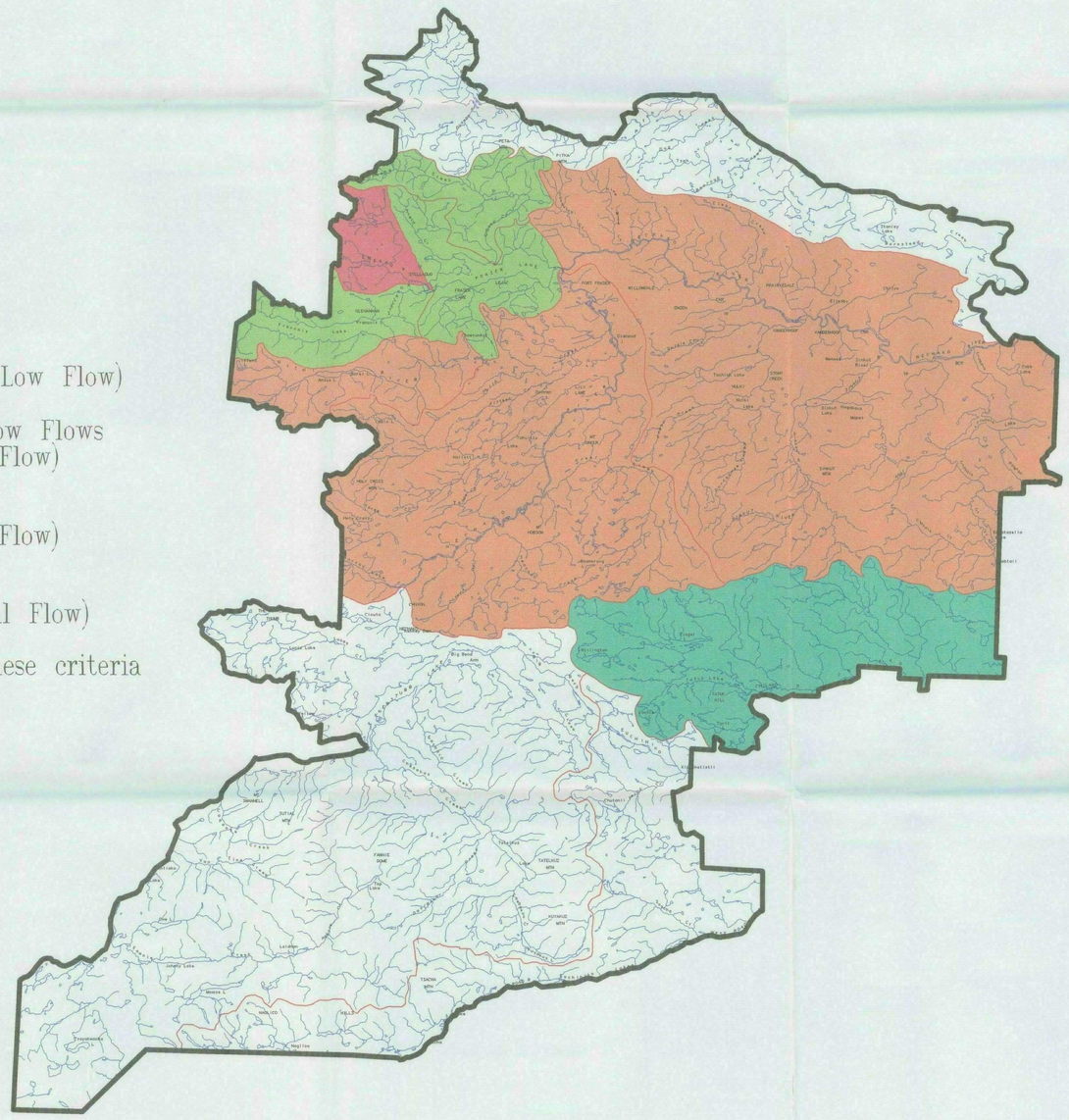
16. Forest Practices Code of B.C. Act, Regulations, Standards and Guidebooks. Ministry of Forests. 1995.

17. Stream Stewardship. A guide for planners and developers. Department of Fisheries and Oceans and Ministry of Environment, Lands and Parks. 1993.

* Please Note: This is not intended to be an exhaustive list. However, it highlights the principal operational and habitat protection guidelines presently in use.

VANDERHOOF LRMP

Flow Characteristics of Salmon-Bearing Watersheds



- LRMP Boundary
- Streams, Rivers and Lakes
- Salmon-Bearing Watersheds

- High Summer Water Use (Potential Demand/Mean 7 day Low Flow)
- High Summer Water Use and Low Flows (7 day Low Flow/Mean Annual Flow)
- Low Flows (7 day Low Flow/Mean Annual Flow)
- High Peak Flows (Mean Annual Flood/Mean Annual Flow)
- Areas Not Rated Sensitive by these criteria
- Areas not assessed

N

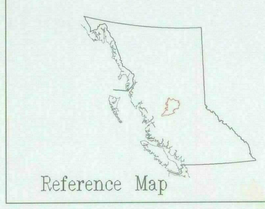
Scale 1 : 400,000

10 0 10 20 30 km

Fisheries and Oceans / Pêches et Océans

Note : Classifications are based on "Hydrologic Sensitivity Indices" developed by Northwest Hydraulic Consultants Ltd. (Rood, K.M. and R.E. Hamilton. 1995. Hydrology and Water Use for Salmon Streams in the Nechako Habitat Management Area, British Columbia. Can. Manuscr. Rep. Fish. Aquat. Sci. 2299:132pp.)

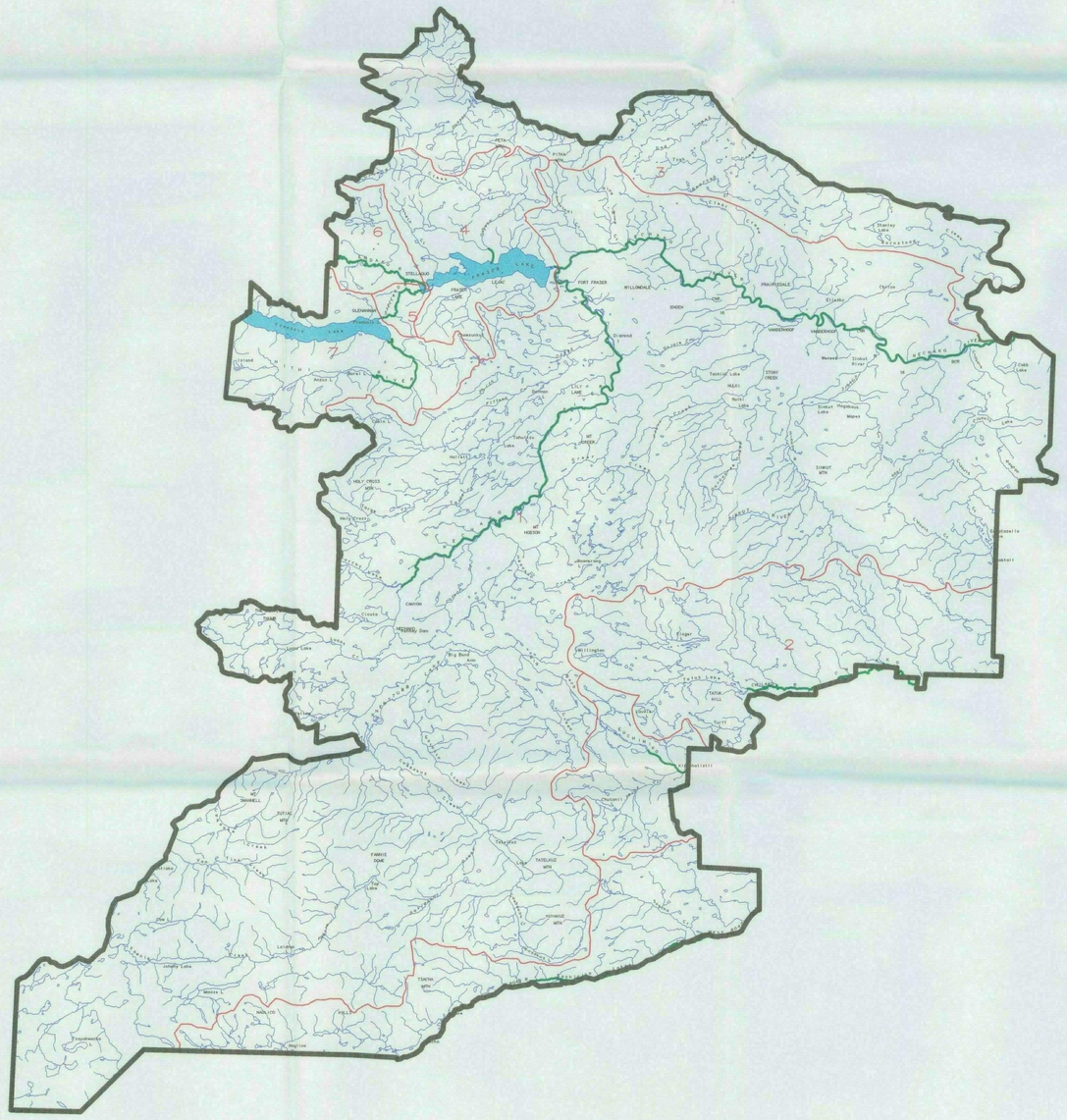
Canada



Reference Map

VANDERHOOF LRMP

Salmon Distribution



LRMP Boundary

Streams, Rivers and Lakes

Known Salmon Distribution (1993)

Salmon Rearing Lakes

Planning Unit Boundary

Watershed Planning Units

1 Nechako River
2 Chilako River
3 Stuart River
4 Fraser Lake/Ormond Creek
5 Stellako River
6 Endako River
7 Francois Lake/Nithi River/Uncha Creek

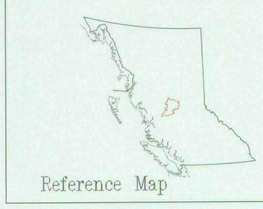
N

Scale 1 : 400,000

10 0 10 20 30 km

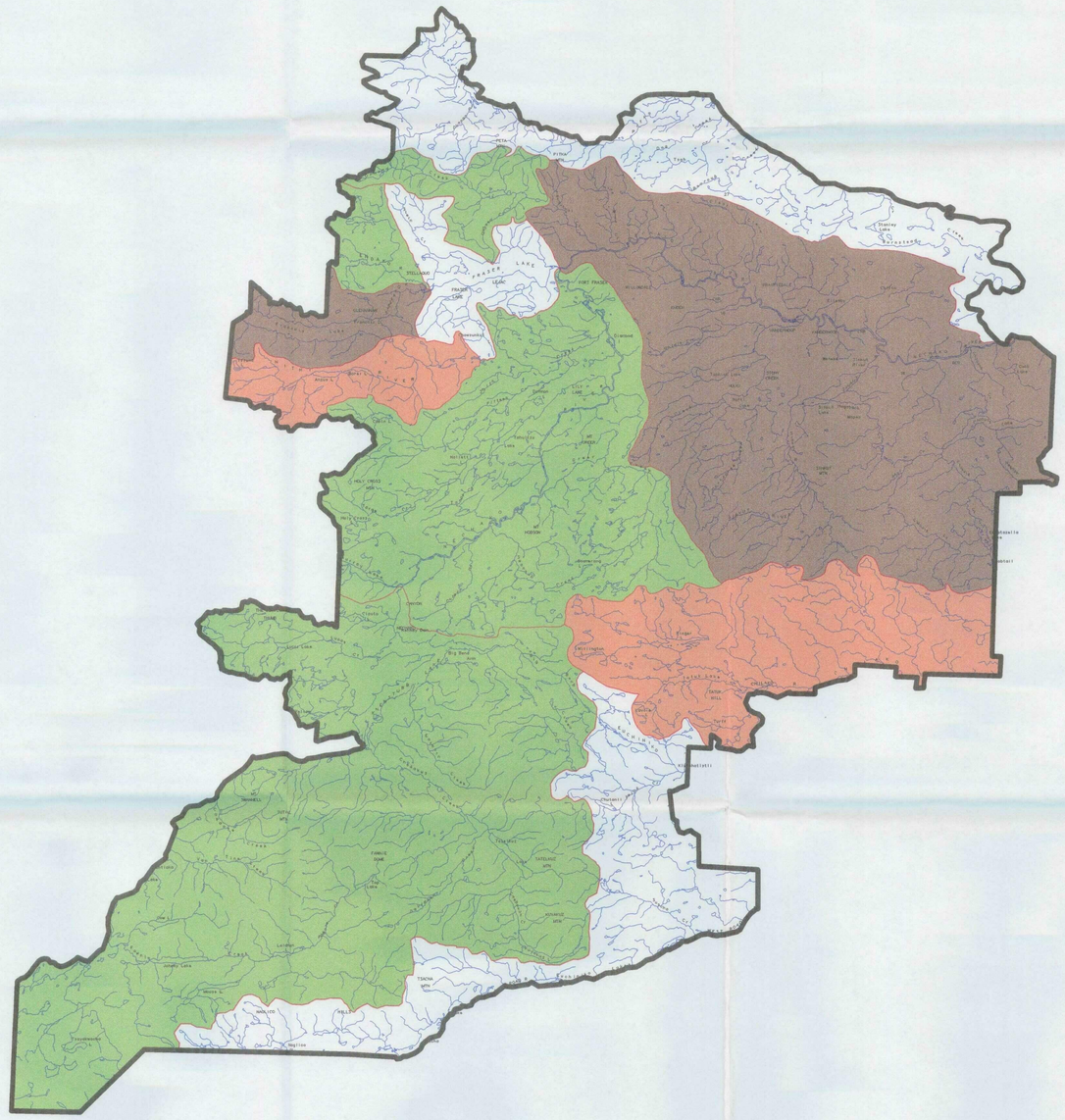
Fisheries and Oceans / Pêches et Océans

Canada



Reference Map

Salmon-bearing watersheds within the Vanderhoof LRMP



Percent Watershed Logged

- LRMP Boundary
- Streams, Rivers and Lakes
- Salmon-Bearing Watersheds
- >= 20 %
- 10 - 19 %
- 0 - 9 %
- Areas for which percent watershed logged has not been estimated *

Watershed	percent logged
Upper Nechako	2
Ormond	4
Endako	8
Nithi	15
Chilako	18
Stellako	25
Lower Nechako	25

Note : percent of watershed area logged values are for the entire watershed, not just the portion of the watershed contained within the LRMP. (eg. Endako and Stellako R.)

N

Scale 1 : 400,000

10 0 10 20 30 km

* percent watershed logged was determined from maps and database maintained by MOF. Total area logged represents all logging conducted between 1952 and 1992. (Rood, K.M. and R.E. Hamilton. 1995. Hydrology and Water Use for Salmon Streams in the Nechako Habitat Habitat Management Area, British Columbia. Can. Manuscr. Rep. Fish. Aquat. Sci 2299:132pp.)

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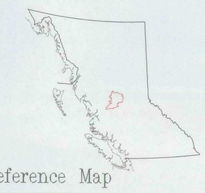
Canada



Reference Map

North Thompson Habitat Management Area

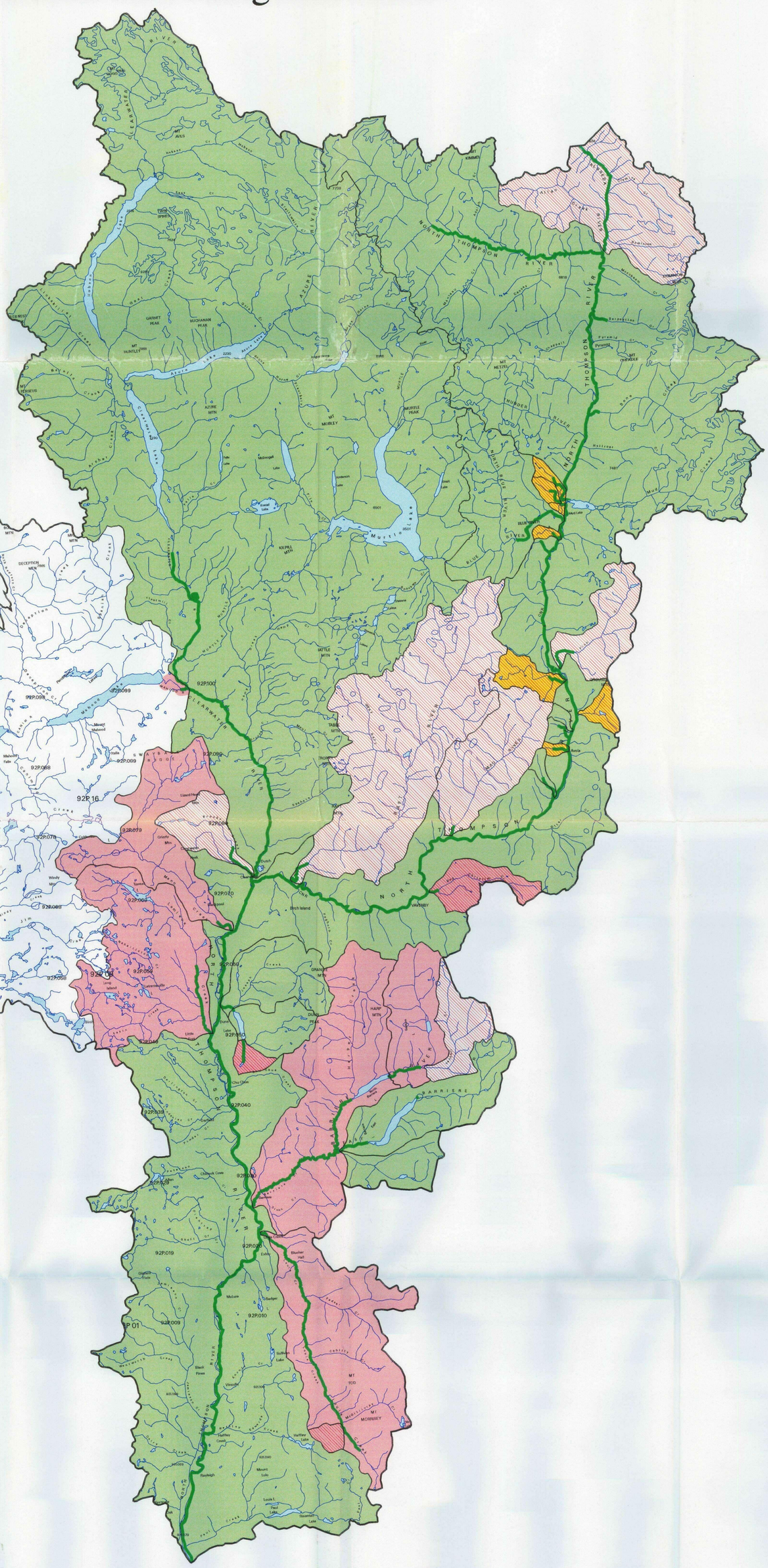
Water Use and Flow

- HMA Boundary
- Watershed
- Streams
- Salmon Distribution
- High summer water use and low summer flows
- Low summer flows
- Low winter flows
- Salmon watersheds not highlighted for water flow concerns
- Non-Salmon bearing watersheds

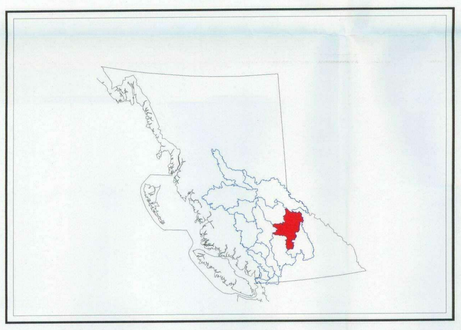
1 Summer water use ranges from 11% to > 100% of summer mean 7 day low flows.
Low summer flows are <= 10% of mean annual flow.

2 Low winter flows are <= 10% of mean annual flow.

3 Water use and flows in non salmon bearing tributaries were not assessed.



Source:
Rood, K.M. and R.E. Hamilton. 1995 Hydrology and Water Use for salmon streams in the Thompson River Watershed, B.C. Can. Manuscr. Rep. Fish. Aquat. Sci. 2297:164pp.



Location in Fraser Basin

Fisheries and Oceans Canada / **Pêches et Océans Canada**
Fraser River Action Plan / Plan d'action du Fraser

Scale 1:300,000

0 25 50 75 100 KILOMETERS

Albers Conic Equal Area

North American Datum - 1983

Map Produced August 24, 1997

N W E S