

# **RECONNAISSANCE (1:20,000) FISH AND FISH HABITAT INVENTORY IN THE LOWER NECHAKO RESERVOIR SYSTEM**

**WSC 180-557700 to 180-72600**

*Prepared for:*

**Fraser Lake Sawmills  
A Division of West Fraser Ltd.  
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January 2000

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## Project Reference Information

<b>FDIS Project Number:</b>	06-LEUT-4037-0001-1998
<b>MoELP Project Number:</b>	SBM98512
<b>FRBC Project Number:</b>	10441
<b>FRBC Region:</b>	Prince Rupert
<b>MELP Region:</b>	6
<b>MELP District:</b>	Skeena
<b>FW Management Unit:</b>	6-2, 6-4
<b>Fisheries Planning Unit:</b>	29I
<b>DFO Habitat Area:</b>	North Coast
<b>Forest Region:</b>	Prince Rupert
<b>Forest District:</b>	Lakes
<b>Forest Licensee and Tenure #:</b>	Fraser Lake Sawmills, Lakes TSA
<b>First Nations Claim Area:</b>	Cheslatta Carrier Nation

## Watershed Information

<b>Watershed Group:</b>	Nechako Reservoir System
<b>Watershed Name:</b>	Lower Nechako Reservoir System
<b>Watershed Code:</b>	180-5577000 – 180-726000
<b>Watershed Area:</b>	93 134 ha
<b>Total of All Stream Lengths:</b>	412 701.2 m
<b>Stream Order</b>	Na
<b>NTS Map:</b>	93F/12, 93F/13, 93E/09
<b>TRIM Map:</b>	93F.061, 93F.071, 93E.080, 93E070
<b>BGC Zone:</b>	SBS

**Air Photos:** 30BCC96122 #60-62 #151-155  
30BCC96099 #15-21 #106-110  
30BCC96156 #170-175  
30BC89047 #89-100  
30BC89040 #127-143 #165-178  
30BC89032 #125-132 #161-170 #252-266

## **Sampling Design Summary**

**Total Number of Reaches:** 1411  
**Random Sampling Sites:** 9  
**Discretionary Sample Sites:** 137  
**Additional Sampling Sites:** 24  
**Total Sample Sites:** 170  
**Field Sampling Dates:** June 27 - October 16, 1998  
**Additional Sampling Dates:** July 7- July 11, 1999

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## ***Disclaimer***

*“ The Province has not accepted the contents of this product\* for the purposes of the Forest Practices Code, and reserves the right to dispute the validity of summarized results. The province does not necessarily agree with the classification assigned to any individual stream reach, for use in logging plans, silviculture prescriptions or any other application.”*

\* Product refers to the information detailed in the following pages of this report.

## ***Acknowledgments***

*Funding for this inventory was provided by Forest Renewal BC - a partnership of forest companies, workers, environmental groups, First Nations, communities and government. Forest Renewal BC funding - from stumpage fees and royalties that forest companies pay for the right to harvest timber on Crown lands - is reinvested in the forests, forest workers, and forest communities.*

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	Binder containing:
	⇒ photo summary report
	⇒ photo survey form 1
	⇒ contact sheets
	⇒ photos and negatives labeled in plastic sleeves
	⇒ 2 photo CDs #4282 and #4283

## **LIST OF ATTACHMENTS AVAILABLE AT MELP REGIONAL OFFICE**

1. Project Overview Map
2. Fisheries Project Map
3. Fisheries Interpretive Map
4. Photograph CD
5. Indexed Slides
6. Voucher Specimens



## 1.0 INTRODUCTION

Triton Environmental Consultants Ltd. (Triton Nanaimo) was retained by Fraser Lake Sawmills (FLSM) to conduct a Reconnaissance (1:20,000 Scale) Fish and Fish Habitat Inventory in sub basins to the Lower Nechako Reservoir Watershed Group. The area of inventory included tributaries to Ootsa Lake and Nataalkuz Lake which lie within a portion of FLSM's Lakes TSA tenure.

Following the 1998 Reconnaissance (1:20,000 Scale) Fish and Fish Habitat Inventory, an additional sampling program was conducted by Triton (Terrace) in the spring of 1999. The results of the additional sampling program have been incorporated into the report where applicable and for ease of reference. The additional sampling program, completed after the initial 1:20 000 scale inventory, was based on the need to establish fish presence and distribution throughout the watershed and to facilitate and/or confirm stream Riparian Management Area classifications.

This project commenced as a result of BC Fisheries and Ministry of Environment Lands and Parks (MELP) initiatives to gather information related to fish distribution, population status, and condition and capability of stream habitats (Anonymous, 1998). Forest Renewal of British Columbia (FRBC) funding and MELP supervision facilitated the commencement of this sample-based survey within a portion of the sub-basins of the Lower Nechako Reservoir System Watershed Group. The inventory provides information regarding characteristics, distributions and relative abundance of fish species, as well as information on biophysical stream and lake data. This can be used for the interpretation of habitat sensitivity and fish production capability (Anonymous, 1998). The results of the inventory may be applied to initial Riparian Management Area (RMA) and lake classification under the Forest Practices Code for forest development planning, watershed restoration, and for the establishment of some landscape-level biodiversity objectives (Anonymous 1998).

## **1.1 Study Objectives**

Fish and fish habitat values were the primary focus of the inventory. The study objectives included:

- identification and mapping of fish-bearing and non-fish bearing stream reaches using existing information and new field information;
- identification and mapping of fish-bearing and non-fish bearing lakes using existing information and new field information;
- identification and coding of all waterbodies in the study area; and
- identification and characterization of stream reaches utilizing topographic maps and aerial photographs, with confirmation via field sampling.

The results of the inventory are presented on 1:20,000 scale TRIM based maps, MELP Field Data Information Summary (FDIS) data forms, fish collection forms and in the body of this report. This report focuses on the results of the stream habitat inventory. The results of lake inventories, conducted during 1998, are presented in separate reports.

## **2.0 STUDY AREA**

### **2.1 Location**

The Lower Nechako study area is located approximately 90 km (by road) south east of the town of Fraser Lake, BC. The Lower Nechako Reservoir Watershed Group is situated in the sub-boreal interior eco-province located east of the Coast Mountains and west of the Interior Plains (Demarchi, 1996). The sub-boreal eco-province extends northwest from the low lying plateau of the Nechako lowlands, the northern portion of the Nechako Plateau, and the southern portion of the Rocky Mountain Trench; east to include the Skeena and Omineca Mountains as well as the Hart Ranges, and south to the Muskwa and McGregor Ranges

(Demarchi, 1996). The study area lies in the flat lowlands and rolling uplands of the Fraser Basin ecoregion, in the Babine Upland ecosection (Demarchi, 1996).

The biogeoclimatic zonation for the study area is Sub-boreal Spruce (Meidinger and Pojar, 1991)



Scale 1: 600,000 (approx.)

Figure 1. Lower Nechako Inventory Area Location map.

### 2.1.1 Access

The Lower Nechako watershed is split into two sections by Nataalkuz lake including a northern section (located on the north shore of Nataalkuz Lake) and a southern section (located on the southern shore of Nataalkuz Lake). Directions to the northern section of the Lower Nechako watershed from Fraser Lakes Sawmills (Fraser Lake, BC) are as follows:

- From the Highway 16 (Yellowhead) junction with Fraser Lakes 100 Road follow the 100 Road south 59 km to the 159 km junction with the Marilla Main. The radio frequency on the 100 Road is 151-95.
- Turn right (west) on the Marilla Main and follow the Marilla for approximately 40 km to start of Lower Nechako watershed. The radio frequency on the Marilla Road is 151-95.
- Several spur roads are located along the Marilla Main and can be used to access various parts of the watershed along the north shore of Nataalkuz Lake.
- The Deerhorn Main is located on the left at approximately 56 km on the Marilla. The Deerhorn main can be used to access further sections along the north shore of Nataalkuz Lake.

Access to the Lower Nechako watershed located along the south shore of Nataalkuz Lake are as follows:

- From the Highway 16 (Yellowhead) junction with Fraser Lakes 100 Road (gravel) follow the 100 Road south 59 km to the 159 km junction with the Marilla Main. Conditions on the 100 road are subject to change during poor conditions. The radio frequency on the 100 Road is 151-95 and a radio should be used during operating hours.
- Turn right (west) on the Marilla Main and follow the Marilla for approximately 68 km to Fraser Lakes East Ootsa Camp (north shore of Ootsa Lake). A barge located 300 m east of camp is then used to access sections of the Lower Nechako

watershed along the south shore of Natakuz Lake. The barge landing is approximately 200 m downhill from the fuel pumps east of camp.

- Barge crossing time is approximately 15 minutes. The barge landing on the southern shore of Ootsa Lake is the start of the Chelaslie Road. Permission is required from Fraser Lakes Sawmills to travel across on the Ootsa Lake barge.
- Follow Chelaslie Road to approximately 2 km and turn left on the Table Bay road to access sites in the eastern portion of study area.
- To access sites in the northwestern portion of the study area turn right at 2 km on the Chelaslie Road.

### **3.0 RESOURCE INFORMATION**

Background information specific to the Lower Nechako inventory area was identified in Phases 1 through 3 of the Reconnaissance (1:20 000 scale) Fish and Fish Habitat Inventory. The following list presents information on resource use relevant to the Lower Nechako area.

1. First Nations which have issues, interests and claims within the Watershed Group include the Cheslatta Carrier Nation which has traditional fishing grounds located in the area (Hatfield Consultants Ltd., 1997).
2. The primary development and land use in the study area is forestry related. Active harvesting is commonplace within the study area and is conducted by Fraser Lake Sawmills Division as outlined in their 5 yr. Forest Development Plan. The secondary land use is recreation which includes camping, fishing and hunting.
3. Other developments in the area include Alcan's Kemano 1 hydroelectric project. This project has caused the creation of the Nechako Reservoir System (Hatfield Consultants Ltd., 1997).
4. Common wildlife use includes: moose habitat, beaver habitat, and areas of waterfowl use.
5. There was no known water quality data for the specific to the Lower Nechako study area.
6. Relevant stream and lake inventory reports, files, maps, summaries and aerial photographs were obtained from MELP Region 6 (Smithers) and Region 7 (Prince

George), the Pacific Biological Station (PBS) (Canada Department of Fisheries and Oceans (*DFO*)) and from Fraser Lake Sawmills.

#### **4.0 METHODS**

The 1:20,000 Scale Fish Stream Identification inventory was completed in six phases:

- Phase 1: Existing Data Review
- Phase 2: Map and Air Photo Analysis
- Phase 3: Sampling Design and Project Plan
- Phase 4: Field Data Collection
- Phase 5: Data Compilation
- Phase 6: Report and Map preparation.

The methods employed for each phase of the project followed those outlined in the *Reconnaissance (1:20 000) Fish and Fish Habitat Inventory: Standards and Procedures*, (Anonymous 1998). No alterations to MELP and RIC inventory standards were required for the project planning phases.

Project planning was completed in the spring of 1998 under a separate contract for FLSM. Stream reaches which were to undergo fish sampling efforts were identified by two methods: random sites generated by the FDIS planning tool and biased sites identified by Fraser Lake Sawmills. The latter sites correspond to stream reaches potentially affected by forest planning and harvesting activities. The final sample sites incorporated into the contract were reviewed by Tom Olafson (FLSM), Paul Giroux (FIS, MELP Skeena Region 6), and Triton (Nanaimo) to ensure the sample sites meet the requirements of FLSM, MELP, and the FDIS planning model.

A local sub contractor, Ecofor Consulting (Vanderhoof) was obtained as part of the contract stipulations to survey a percentage of sample sites selected for the entire FLSM's

Reconnaissance (1:20 000 scale) Fish and Fish Habitat Inventory. Ecofor sampled 52 biased sites within the Lower Nechako study area during the 1998 field season.

Sample sites selected for the 1999 resampling/additional sampling program were selected on a strategic basis to address inconclusive findings concerning fish presence and distribution within the Lower Nechako inventory area. The objectives of conducting additional sampling include:

- sampling for the presence of game fish in order to classify streams that were dry or contained marginal habitat during the 1998 survey.
- verification of fish distribution within previously sampled reaches.
- identification of barriers to fish distribution
- confirmation that barriers identified in 1998 are still barriers to fish during higher flows.

#### **4.1 Phase 4: Field Data Collection**

The following sections describe the methods and approaches taken to complete field sampling and data collection.

##### 4.1.1 Pre-field Preparation

Required fish collection permits from MELP Skeena Region 6 and DFO (New Westminster) were obtained prior to the commencement of field activities.

##### 4.1.2 Field Procedures

Field work was conducted by two field crews each consisting of two people from Triton (Nanaimo) and one field crew of three persons from Ecofor. Field sampling was conducted in the Lower Nechako inventory area between June 27<sup>th</sup> and October 16<sup>th</sup> 1998 and between July 7<sup>th</sup> and July 11<sup>th</sup> 1999. In watersheds where road access was available, the crew used



4X4 pick-up trucks to travel from site to site. In watersheds where road access was unavailable air transportation was provided by Northern Mountain Helicopters via a Bell Jet Ranger helicopter based out of Vanderhoof and Houston, B.C.

Prior to the commencement of field activities each crew was equipped with the following:

- Smith-Root Model 12A backpack electrofisher
- electrofisher safety gear (leak proof waders, wading belts, polarized sunglasses, Linesman's gloves, hat)
- minnow traps and bait
- backpacks
- clinometer
- compass
- hip chain
- 50 m tape
- meter stick
- VHF radio
- first aid kit
- water quality kit (hand held pH and conductivity meters)
- thermometer
- abney level
- Canon waterproof camera and slide film
- voucher specimen container
- MELP Site cards
- MELP fish collection cards
- field maps

#### 4.1.3 Fish Species Sampling

All sampling procedures followed those outlined in the *Reconnaissance (1:20 000) Fish and Fish Habitat Inventory: Standards and Procedures*, (Anonymous 1998) and the *Forest Practices Code Fish Stream Identification Guidebook*, (Anonymous 1995a).

Fish sampling within stream reaches was conducted using two primary sampling techniques: electrofishing and minnow trapping. Electrofishing is the most effective method of sampling in shallow stream habitats and was the preferred sampling method for all habitat types encountered in small streams and shallow water habitats. In these habitats and where using an additional sampling method would not provide additional information (i.e. species, relative abundance), it was the only sampling technique employed. In a few cases minnow traps baited with salmon roe were employed in streams of greater depth and in ponded habitats. A combination of techniques were employed where the use of only one method would not have effectively sampled all habitats and in areas that were not suited to electroshocking (deep pools, wetlands etc.). Where appropriate, and where return visits were practical, minnow traps baited with salmon roe were set and allowed to soak for a 24 hour period.

#### 4.1.4 Field Data Compilation

Following each field day, the field crews met to compile field notes, review field data and summarize the findings onto hard copy maps. This system ensured that all information was thoroughly documented while fieldwork was still fresh with the crew.

## **5.0 RESULTS**

Additional sampling information gathered in the 1999 field season is only presented in the following tables:

- Table 1. Summary Survey Information
- Table 2. Summary of Fish Bearing Reaches in the Lower Nechako Inventory Area
- Table 4. Features Identified in the Lower Nechako Watershed

- Table 6. Non-Fish Bearing Reaches in the Lower Nechako Inventory Area
- Table 7. Fish Bearing by Default
- Table 8. Stream Classification Summary

The information presented in these tables is highlighted in grey for easy reference

## 5.1 Existing Information

Background and existing information for streams included in the inventory was limited. FISS (1995) information was plentiful for systems such as Ootsa Lake, Hoult Lake, Davidson Lake and Sam Hardy Lake. FISS (1995) identified major inlet and outlet streams to Hoult, Davidson and Sam Hardy Lakes as sustaining rainbow trout (*Oncorhynchus mykiss*). Anecdotal information (Tom Olafson, FLSM, pers. comm.) and historic lake file information (Paul Giroux, MELP Skeena Region 6, pers. comm.) identified the presence of rainbow trout in tributaries to Ootsa Lake.

Fisheries information for Nataalkuz Lake was substantial. The major tributaries to Nataalkuz Lake are known to sustain resident rainbow trout populations (FISS 1995). Two other salmonids also reside in Nataalkuz Lake, Kokanee (*Oncorhynchus nerka*) and mountain whitefish (Rocky Mountain whitefish) (*Prosopium williamsoni*). Other fish species occurring in Nataalkuz Lake include: burbot (*Lota lota*), lake chub (*Couesius plumbeus*), northern squawfish, (*Ptychocheilus oregonesis*), peamouth chub (*Mylocheilus caurinus*), largescale sucker (*Catostomus macrocheilus*), longnose sucker (*Catostomus catostomus*), prickly sculpin (*Cottus asper*) and slimy sculpin (*Cottus cognatus*). Stream classification reports conducted in 1996 by Fraser Lake Sawmills (Tripp, 1996) indicated that rainbow trout were present in some small stream systems within the study area.

## 5.2 Survey Information

Table 1 provides an overview of the survey information compiled for the Lower Nechako Reservoir. Nine (9) additional sampling sites which contain fish have been shade grey and added to the following table.

Table 1. Summary of Survey Information

<b>Major Watershed Codes</b>	180-557700 to 180-726000			
<b>Watershed Name</b>	Lower Nechako Reservoir System			
<b>TRIM Maps:</b>	93F.043	93F.054	93F.064	93F.052
	93F.044	93F.055	93F.065	93F.063
	93F.045	93F.056	93F.066	93F.053
	93F.051	93F.061	93F.062	
<b>Total Number of Lakes:</b>	53			
<b>Total Stream Length:</b>	412 712 m			
<b>Total Number of Reaches:</b>	1411			
<b>Stream Field Sampling Dates:</b>	June 27 - October 16, 1998			
<b>Additional Sampling Dates:</b>	July 7 - July 11, 1999			
<b>Number of Reaches/Sites Sampled:</b>	170			
<b>Fish Capture Summary:</b>				
<b>Stream Name</b>	<b>Stream Identifier (WSC/ILP)</b>	<b>Reach #</b>	<b>Species</b>	
Unnamed	43180	1	CCG,RB	
Unnamed	52019	1	RB,WSU	
Unnamed	52019	6	WSU	
Unnamed	52019	7	RB	
Unnamed	52019	9	WSU	
Unnamed	52020	3	RB	
Unnamed	53013	2	RB	
Unnamed	55027	1	RB	
Unnamed	66037	5	RB	
Unnamed	65110	7	RB	
Unnamed	53018	11	RB	
Unnamed	53050	1	CAS	
Unnamed	62110	1	WSU	
Unnamed	43180	1	RB	
Unnamed	53095	1	RB	
Unnamed	52043	1	RB	
Unnamed	52012	1	RB	
Unnamed	63046	1	RB	
Unnamed	53015	1	RB	
Unnamed	66037	12	RB	
Unnamed	62040	1	CCG,WSU	
Unnamed	66037	2	RB	

RB = rainbow trout , WSU= white sucker, CCG= slimy sculpin CAS= prickly sculpin Note: Additional sampling sites are highlighted in grey.

### 5.3 Field Data

#### 5.3.1 Site Cards

Site Cards and Reach Forms were entered into MELP's FDIS database following the completion of Phase 4. Site Cards and Reach Cards are presented in Appendix V.

### 5.3.2 Fish Collection Cards

The Fish Collection Cards were entered into MELP's FDIS database following the completion of Phase 4. Hardcopies of the Fish Collection Cards are presented in Appendix V with the Site Cards and Reach Forms.

Photodocumentation Forms are presented in Appendix VI. The appendices have been arranged so that Site Cards, Fish Cards and Photos are easily accessible for forestry prescriptions.

## **5.4 Survey Comments**

### 5.4.1 Problems

The streams identified for inventory were readily accessible and all sites were accessed either by 4WD vehicle or helicopter. Crews were stationed at either the FLSM Ootsa Camp or in Vanderhoof. Drive sites were generally accessed along FLSM's Marilla or Deerhorn mains and spur roads originating along these mains. Helicopter sites included those areas that were accessible within 1 km via existing logging roads. Helicopter sites were accessed from FLSM Ootsa Camp and flight times to sample sites were generally less than 20 minutes in duration.

Small, first order streams, selected for sampling were often indistinguishable in the field and were described as No Visible Channel (NVC). In most cases these first order streams did not have alluvial channels and were likely intermittent spring run-off channels created by snow melt. The majority of first order streams (those described as streams) were dewatered or sustained very low water levels at the time of survey. Fish species sampling could not be conducted in many dry reaches.

#### 5.4.2 Fish Comments

Fish species were captured in 22 of 170 sample locations. Fish species captured included: slimy sculpin, prickly sculpin, white sucker (*Catostomus commersoni*), and rainbow trout.

The following table (Table 2) provides a summary of the fish bearing reaches identified within the study area.

Table 2. Fish Bearing Reaches

Agency	Stream Name	ILP	Reach	Channel Width (m)	Gradient (%)	Order	Species	Life Stage	Total #	Mean Length (mm)
Triton	Unnamed	43180	1	3.37	3.5	3	RB CCG	J A	6 3	66.3 65
Triton	Unnamed	52019	1	1.8	3	4	RB RB WSU	F J A	6 3 1	22.5 62.5 78
Triton	Unnamed	52019	6	1.33	2.3	3	WSU	A	6	102
Triton	Unnamed	52019	7	2.22	2.5	3	RB RB	F A	4 5	38 83.5
Triton	Unnamed	52019	9	2.06	1.5	3	WSU WSU	F J	3 8	25 83.5
Triton	Unnamed	52020	3	1.58	3	2	RB RB	F J	3 2	22.5 71
Triton	Unnamed	53013	2	3.22	5.5	2	RB	J	5	72.5
Triton	Unnamed	55027	1	1.62	5	2	RB	A	3	175
Triton	Unnamed	66037	5	1.9	2	2	RB	J	1	56
Triton	Unnamed	65110	7	1.49	3.5	3	RB	J	2	65
Ecofor	Unnamed	53018	11	1.26	3.5	2	RB	A	4	82
Ecofor	Unnamed	53050	1	1.36	2.5	2	CAS	A	1	78
Ecofor	Unnamed	62110	1	3.11	2.5	3	WSU	F	3	30.5
Triton	Unnamed	43180	1	4.42	7	3	RB	A	5	95
Triton	Unnamed	53095	1	2.3	6.5	2	RB	A	4	90
Triton	Unnamed	52043	1	4.63	4.3	2	RB	A	6	75
Triton	Unnamed	52012	1	3.28	4	3	RB	A	4	67.5
Triton	Unnamed	63046	1	1.53	2.5	2	RB	A	5	67.5
Triton	Unnamed	53015	1	1.26	5.25	2	RB	J	3	104
Triton	Unnamed	66037	12	1.41	1.63	3	RB	J	3	56.5
Triton	Unnamed	62040	1	1.43	3.5	2	CCG WSU	J J	4 3	51.5 56.5
Triton	Unnamed	66037	2	4.75	4.8	3	RB RB	J J	2 10	128 65

RB= rainbow trout WSU= white sucker CAS= prickly sculpin CCG= slimy sculpin F= fry J= juvenile A= adult Note: Additional sampling sites are highlighted in grey.

The length-frequency distribution for rainbow trout captured in the Lower Nechako Inventory Area is presented in Figure 2. Fish data gathered in the 1999 additional sampling program is not presented in the following figure.

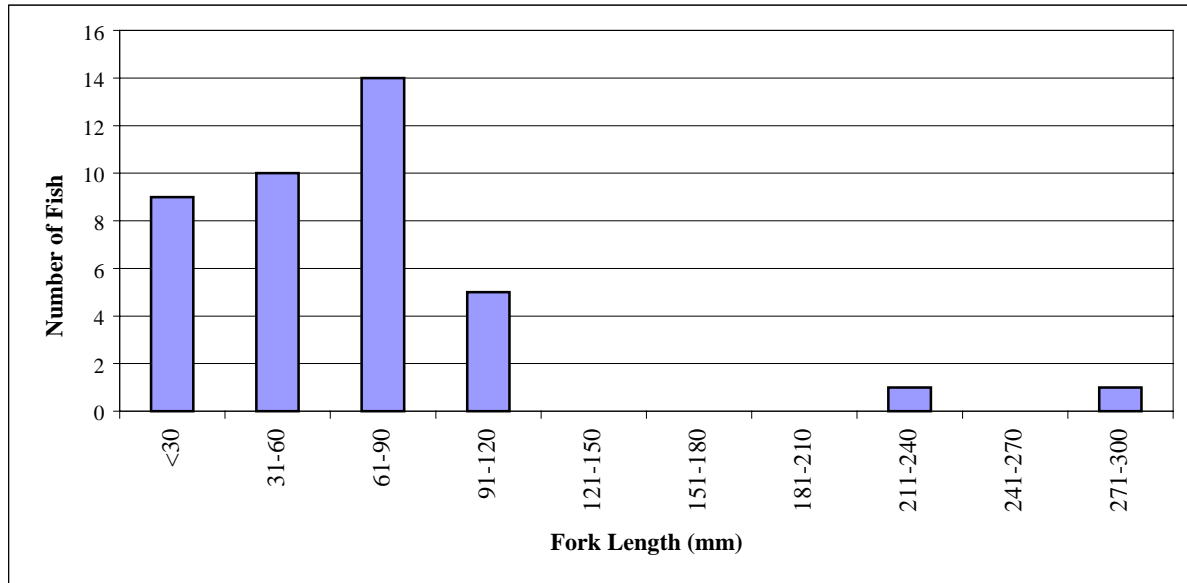


Figure 2. Length-frequency distribution for rainbow trout captured in the Lower Nechako Inventory Area.

Resident rainbow trout, the dominant fish species captured during this survey, have been found to utilize small to moderately large streams, which have moderate flows, gravel substrates, riffle pool morphology and shallow depths (Scott & Crossman 1985). Spawning occurs mainly from mid-April to late June with fry emergence occurring from mid-June to mid-August. Life expectancy can be as low as 3 or 4 years in many stream and lake populations (Scott & Crossman 1985). Although rainbow trout were fairly abundant in mainstem reaches, they were not very abundant in tributaries. From the above figure (Figure 2), it appears that the streams within the area provide rearing habitat for rainbow trout parr and juveniles, but have limited potential for adult fish.

In order to determine age, scale samples were collected from a representative sample of rainbow trout. In the current guidelines, a representative sample is described as 5 to 10



samples per tributary for a maximum of 5 tributaries within the study area. Scale and DNA samples were not collected from the fish captured in the 1999 additional sampling program. Scale samples from rainbow trout were collected under a separate lake project and detailed information pertaining to the Lower Nechako inventory area is contained within the Unnamed Lake reports WBID 00306LNRS and WBID 00769LNRS.

#### 5.4.3 Fish Distribution

The locations where fish were captured generally were characterized as having perennial flows or headwater lakes and were 2nd order and larger streams. Fish were captured in streams ranging from 2nd to 4th order with gradients less than 5.5% and average channel widths greater than 1.26 m. Many first order streams and stream reaches were heavily dependent on snowmelt and likely only contain water for a short period of the year. No fish were captured in these first order streams as many lacked water and suitable habitat for fish.

#### 5.4.4 Habitat Comments

The study area is situated on a large plateau and was characterized by low gradient streams and gullies and numerous wetlands and low-lying boggy areas.

Reaches 1 and 2 of many tributaries flowing directly into Ootsa Lake provide significant fisheries values for spawning rainbow trout. Key features of these high value habitats include: perennial flows, moderate average water velocity, the occurrence of turbulent riffle and/or run habitats, and adequate cover. These lower reaches provide good rearing habitat for juvenile rainbow trout, with cover provided by large woody debris and deep pools.

Although reaches of smaller tributaries (< 2 m wide) may sustain attributes of physical habitat that are of high value in terms of fish habitat, the ephemeral nature of flows generally limits the productive capacity of the streams. The general lack of spawning and rearing habitats in tributary streams throughout the Lower Nechako Watershed appears to be the primary limiting factor to significant fisheries values. As there several small headwater lakes

and ponds within the Lower Nechako area, there is ample overwintering habitat for rainbow trout throughout the watershed.

#### 5.4.5 Water Chemistry

Water samples taken from an unnamed fourth order tributary (ILP 52019) flowing directly into Ootsa Lake (Intata Reach) were sent to CanTest Laboratories, Vancouver, B.C, for water chemistry analysis. A complete listing of the analyses is found in Appendix VII, and a summary is presented in table 3. Analyses were performed using procedures based on those described in “British Columbia Environmental Laboratory Manual For the Analysis of Water, Wastewater, Sediment and Biological Materials” (1994 Edition), Province of British Columbia and “Standard Methods for the Examination of Water and Wastewater” 19<sup>th</sup> Edition, (1995) and 17<sup>th</sup> Edition (1989), published by the American Public Health Association.

Table 3. Water chemistry summary for the Lower Nechako inventory area

<b>Parameter Measured</b>	<b>Laboratory Test</b>	<b>Field Measurement</b>
pH	7.59	Range (6.9 – 8.6) Mean 7.4
Conductivity	167	Range (30 – 314) Mean 86.7
Turbidity	.26	N/A
Temperature	N/A	Range (8 – 17) Mean 11.9
Total Dissolved Solids	107	N/A

Results were compared with the acceptable limits for freshwater aquatic life as established in the Canadian Water Quality Guidelines. All water chemistry results were found to be within the acceptable levels.

#### 5.4.6 Features

The limiting factors for fish distribution in the study area were the seasonality of water supply and a lack of habitats usable by fish. Many streams identified without barriers were dewatered (intermittent) during the survey. They generally possessed small channel widths (<1.0 m), fine textured substrates and abundant instream and overstream vegetation. Habitat characteristics important to fish (pools, boulders, cutbanks etc.) were lacking in these systems.

The majority of stream features identified were culverts and beaver dams. Many culverts were identified as partial or full barriers to upstream fish migration. Often culverts were perched at the outlet or had a gradients too steep to allow fish passage due to increased velocity within the culvert. Many culverts were identified as barriers based on gradients, the lack of physical barriers identified downstream, and the association with inferred fish bearing streams. Additional sampling identified 3 occurrences of falls, 2 cascades, and 1 landslide which are permanent barriers to upstream fish migration. Through the use of strategic planning and helicopter overflights these barriers to upstream fish migration were identified and recorded.

Other features identified included: velocity barriers, canyons, bedrock chutes, beaver dams, landslides, and road crossings. Table 4 provides an overview of features identified throughout the inventory area. During the additional sampling program 12 features were identified and are shaded grey in the following table.

Table 4. Features Identified in the Lower Nechako Inventory Area

Agency	Local Name	ILP	Reach	Type	Height (m)	Comment
Triton	Unnamed	43089	1	CV	0.6	Culvert
Triton	Unnamed	43101	1	CV		Gradient barrier %
Triton	Unnamed	43106	1	CV	0.6	Culvert
Triton	Unnamed	43179	1	CV	0.6	Culvert
Triton	Unnamed	43180	1	CV	0.6	Perched culvert

Triton	Unnamed	43180	1	VB		Velocity barrier. Potential barrier
Triton	Unnamed	43180	3	CV	1	Perched culvert. Potential barrier
Triton	Unnamed	44014	2	CV	0.4	Perched culvert
Triton	Unnamed	44018	3	CV	0.4	Culvert at road crossing fed by upstream seepage

Agency	Local Name	ILP	Reach	Type	Height (m)	Comment
Triton	Unnamed	44023	3	C		Bedrock chute
Triton	Unnamed	44030	3	CV	0.6	Culvert
Triton	Unnamed	44033	3	CN		Canyon
Triton	Unnamed	44033	4	CV	0.4	Culvert
Triton	Unnamed	45070	2	CV	0.6	Culvert
Triton	Unnamed	52019	1	CV	1.4	Culvert is barrier to U/S migration
Triton	Unnamed	52019	1	BD	0.9	Beaver dam U/S of road crossing
Triton	Unnamed	52020	1	BD	0.5	Beaver dam
Triton	Unnamed	52045	1	CV	1	Culvert
Triton	Unnamed	52100	1	BG		Road crossing. No culvert.
Triton	Unnamed	53013	2	CV	0.9	Perched culvert with erosion problems downstream. Likely a velocity barrier.
Ecofor	Unnamed	53018	11	CV	0.6	Culvert
Ecofor	Unnamed	53022	1	CV	0.6	Culvert
Ecofor	Unnamed	53025	1	NS	35	Rock
Ecofor	Unnamed	53042	5	CV	0.6	Culvert
Ecofor	Unnamed	53050	1	BD	0.9	Barrier - beaver activity
Triton	Unnamed	53059	1	CV	0.4	Perched culvert
Triton	Unnamed	53068	1	CV	1	Downstream side of culvert is perched.
Triton	Unnamed	53098	1	CV	0.6	
Triton	Unnamed	54087	1	CV	10	Major erosion above culvert
Triton	Unnamed	54087	1	CV	10	Mass wasting into stream
Triton	Unnamed	56017	5	BD	1.5	Beaver dam across stream
Ecofor	Unnamed	53050	2	BD		Beaver dam
Ecofor	Unnamed	62040	3	CV	1.2	Culvert
Ecofor	Unnamed	62056	1	CV	3	Barrier - culvert
Ecofor	Unnamed	62110	1	CV	1.8	Two culverts
Ecofor	Unnamed	62110	4	BD	1	Old beaver dam
Ecofor	Unnamed	63045	1	BD	1.1	Swampy willow area.
Ecofor	Unnamed	63046	1	CV	0.6	Culvert
Ecofor	Unnamed	63046	2	CV	0.3	Culvert drop

Ecofor	Unnamed	63047	2	CV	0.6	Culvert
Triton	Unnamed	66013	3	CV	0.6	Perched culvert
Triton	Unnamed	66022	4	BD	1	Beaver dam creates a ponded area.

Agency	Local Name	ILP	Reach	Type	Height (m)	Comment
Triton	Unnamed	52019	7	BD	0.2	Beaver dam
Triton	Unnamed	52019	9	BD	0.3	Beaver dam
Triton	Unnamed	43180	1	F	9	Falls are a barrier to upstream fish migration.
Triton	Unnamed	52043	1	F	2.2	Falls are a barrier to upstream fish migration.
Triton	Unnamed	53012	1	F	10	Falls are a barrier to upstream fish migration.
Triton	Unnamed	44061	1	C	3	Cascade blocks fish access.
Triton	Unnamed	52020	4	BD	1.2	Beaver dam
Triton	Unnamed	52043	3	CV	1.2	Large plunge pool at culvert outlet.
Triton	Unnamed	53012	6	CV	1	500 mm overflow culvert also present.
Triton	Unnamed	53015	1	C	1.5	Cascade is a barrier to upstream fish migration.
Triton	Unnamed	44002	5	CV	1	Slightly perched.
Triton	Unnamed	66037	12	CV	1	Culvert
Triton	Unnamed	53055	1	LS	30	Rockslide blocks upstream fish migration.
Triton	Unnamed	66037	2	CV	3	Arch culvert

CV= Culvert, C= Cascade/Chute, NS= Not specified, BD= Beaver dam, BG= General road crossing, VB= velocity barrier, LS= Landslide/Bank slumping, F= waterfall Note: Additional sampling sites are highlighted in grey

#### 5.4.7 Additional Sampling Recommendations

Thirty-six (36) of the 146 sample sites in the 1998 inventory area were identified for additional or follow-up sampling. Sites identified for additional or follow-up sampling are presented in Table 5. Additional or follow-up sampling was recommended for reaches where fish were not captured and:

- Low flow appeared to be the only factor deterring fish utilization;
- Fish were captured in reaches downstream of the sample site;

- Obstructions to fish migration were not identified.

Although the conditions at the time of survey limited sampling efforts and effectiveness, the lack of flow and/or fish in many reaches does demonstrate the low overall value of these reaches. The reaches selected for resampling was required by default due to a lack of water, no barriers (identified downstream) or negative sampling results. As it is not practical, or necessary, to resample where sampling was not conducted or where fish were not captured, additional sampling sites should be selected strategically to optimize follow up sampling results. Twenty-four (24) reaches were strategically sampled during the additional sampling program (1999). These additional sampling sites addressed 30 of the 36 sites selected for follow up sampling (1998). The timing of additional sampling effort is critical to ensure optimal conditions and maximizing the potential for fish to occur. In particular, additional sampling should be conducted in the spring immediately following peak runoff.

If the site has been sampled under the 1999 resampling program an asterisk (\*) has been placed adjacent to the site number and the column has been shaded grey.

#### 5.4.8 Additional Sampling

Additional sampling sites were selected on a strategic basis to address inconclusive findings concerning fish presence and distribution within the Lower Nechako Watershed inventory area. The objectives of conducting additional sampling include:

- sampling for the presence of game fish in order to classify streams that were dry or contained marginal habitat during the 1998 survey.
- verification of fish distribution within previously sampled reaches.
- identification of barriers to fish distribution
- confirmation that barriers identified in 1998 are still barriers to fish during higher flows.

Additional sampling was conducted in 24 reaches within the Lower Nechako Watershed inventory area

#### 5.4.9 Non-Fish Bearing Status

Non-fish bearing status was assigned to 115 of the 170 sample sites within the Lower Nechako inventory area. A summary of non-fish bearing reaches is provided in Table 6. Twelve (12) additional sampling sites were given a non fish bearing status and are found in the following table. Non-fish bearing status was assigned to reaches where:

- The stream was assessed as a non-visible channel;
- The stream was inaccessible from a fish bearing mainstem and did not have a headwater lake;
- Gradient barriers prevented fish migration further upstream and the stream did not have a headwater lake;
- The stream lacked suitable habitat for fish.
- Additional or second pass sampling confirmed fish absence.

The fish bearing status of streams may be directly supported by sampling data or indirectly inferred based on fish captures in associated reaches, or habitat quality and the occurrence or lack of barriers to fish passage. For example, if the habitats within a given reach are suitable for rearing and/or spawning but no fish were captured and no barriers were observed, the reach would be classed as fish bearing. If the habitats were inadequate to provide suitable rearing habitat, or where barriers prevent fish from accessing and utilizing the reach, it would be classified as non-fish bearing.



#### 5.4.10 Fish Bearing by Default

A number of streams sampled in the Lower Nechako inventory area were defined as Fish bearing by default. That is, fish were not captured during the inventory but they were described as fish streams for the purposes of forest development planning.

Although the conditions at the time of sampling limited sampling efforts and effectiveness, the lack of flow and/or fish in many reaches may have been limited by the anomalously low flows during the 1998 field season. Reaches that bear a fish bearing by default classification, typically sustain habitats suitable for salmonids, lack significant barriers (excluding fish from the reach) or were immediately upstream or adjacent to confirmed fish bearing reaches. Most of these reaches represent small tributaries and based on re-sampling efforts in the past, even under optimal conditions, fish are often present at low densities and are not always captured. Six (6) additional sampling sites were identified as having the potential fish habitat and probable fish use and were given the status of fish bearing by default and are highlighted grey in the following table. Follow up sampling is not recommended for these sites. Fish bearing by default reaches are presented in Table 7.

## 6.0 STREAM CLASSIFICATION SUMMARY

Table 8 provides a summary of stream inventory information collected during the project. Streams are classified according to classes presented in the FPC Fish Stream Identification Guidebook. Reaches that were determined not to be streams are described as 'No Visible Channel'. Additional sampling sites completed in 1999 are highlighted in grey.

Table 8. Stream Sampling Summary

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	2	52019	7	June 98	2.33	2.5	3	RB	S3	Fair to moderate spawning
Triton	5	66026	1	June 98	na	na	2	na	na	No Visible Channel. Not a stream
Triton	6	66022	4	June 98	1.12	7	2	None	S6	No fish habitat
Triton	7	66013	3	June 98	0.82	11	1	None	S6	No access to this reach. Gradient and cascades downstream.
Triton	8	66013	5	June 98	0.89	3	1	None	S6	No fish habitat. Subsurface flows and a poorly defined channel. Swampy area.
Triton	9	52019	9	June 98	2.06	1.5	3	RB	S3	Poor spawning potential. This site was sampled during a primary lake survey.
Triton	9	55027	1	June 98	1.62	5	2	RB	S3	Good habitat for lake spawners.
Triton	10	55036	2	June 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	11	44028	4	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	12	44017	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	13	44018	3	July 98	0.47	7	1	None	S6	No fish habitat. Intermittent channel with subsurface flows. Ephemeral stream.
Triton	14	44003	1	July 98	na	na	2	na	na	No Visible Channel. Not a stream
Triton	15	44004	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	16	44014	2	July 98	0.48	6	2	None	S6	No fish habitat. Vegetated channel which is poorly defined.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	17	44023	3	July 98	1.09	5	2	None	S6	Barrier downstream prevents fish access to this reach
Triton	18	44002	1	July 98	1.65	8	1	None	S3*	Upstream lake should be sampled for fish presence or absence. Fish bearing by default until upstream lake is sampled.
Triton	815	44002	4	July 99	0.96	5	1	None	S4*	No spawning or overwintering habitat. Poor rearing habitat. Upstream lake should be sampled for fish presence or absence. Fish bearing by default until upstream lake is sampled.
Triton	19	44033	3	July 98	1.22	25	2	None	S6	No fish access to this reach. Bedrock chute and gradient downstream is a barrier to upstream fish migration.
Triton	20	44033	4	July 98	0.8	5	2	None	S6	Downstream gradient prevents fish access to this reach
Triton	21	44030	3	July 98	0.57	5	2	None	S4	Additional sampling identified no permanent barriers to upstream fish migration. Fish stream based on access.
Triton	22	45071	1	July 98	0.72	7	1	None	S6	No fish habitat. Ephemeral stream with a poorly defined channel. Subsurface flows.
Triton	23	45070	2	July 98	0.6	5	1	None	S6	No fish access to this reach. Barrier downstream of this reach.
Triton	55	44075	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	56	44071	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	57	44030	1	July 98	1.18	6.5	2	None	S4	Reach is accessible during high flows

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	712	44030	1	July 99	1.35	11	2	None	S4	Good spawning habitat. Rearing habitat is limited. Overwintering habitat is not present. Fish stream based on access
Triton	705	53068	4	July 99	1.7	3.3	2	None	S3*	Overwintering habitat (2 lakes) is located upstream of this reach. This reach is defaulted to fish bearing until overwintering habitat is adequately sampled.
Triton	58	53068	6	July 98	1.12	5	1	None	S4*	Overwintering habitat (2 lakes) is adjacent to this reach. This reach is defaulted to fish bearing until overwintering habitat is adequately sampled.
Triton	59	53011	1	July 98	1.23	25.5	2	None	S6	Gradient blocks fish passage to this reach
Triton	60	53076	2	July 98	1.98	5	1	None	S6	Excellent fish habitat. Falls (10 m) in downstream ILP 53012 Reach 1 prevents upstream fish migration. Adequate sampling upstream of falls, including a lake survey (Luiker & Hickey, 1996), indicate the portion of stream above the falls is non fish bearing
Triton	61	53012	6	July 98	1.58	6	3	None	S6	Falls (10 m) in Reach 1 prevent upstream fish migration. Adequate sampling upstream of falls, including a lake survey (Luiker & Hickey, 1996), indicate the portion of stream above the falls is non fish bearing
Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments

Triton	812	53012	6	July 99	1.95	7	3	None	S6	Falls (10 m) in Reach 1 prevent upstream fish migration. Adequate sampling upstream of falls, including lake survey (Luiker & Hickey, 1996), indicate the portion of stream above the falls is non fish bearing
Triton	710	53012	1	July 99	3.28	4	3	RB	S3/S5	Good spawning and rearing habitat. Falls (10 m) prevent upstream fish migration. Adequate sampling upstream of falls, including lake survey (Luiker & Hickey, 1996), indicate the portion of stream above the falls is non fish bearing.
Triton	62	53012	3	July 98	1.87	2	3	None	S6	Excellent fish habitat. Falls (10 m) in Reach 1 prevent upstream fish migration. Adequate sampling upstream of falls, including lake survey (Luiker & Hickey, 1996), indicate the portion of stream above the falls is non fish bearing
Triton	63	53095	1	July 98	1.32	5.5	2	None	S4	Fish captured in 1999 additional sampling.
Triton	706	53095	1	July 99	2.3	6.5	2	RB	S3	Good spawning, fair rearing and no overwintering habitat. Non permanent debris jams may limit upstream migration. No permanent barriers to upstream fish migration were identified.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	64	53068	1	July 98	2.07	5	2	None	S3*	Overwintering habitat (2 lakes) is located upstream of this reach. This reach is defaulted to fish bearing until overwintering habitat is adequately sampled.
Triton	704	53068	1	July 99	2.85	11.8	2	None	S3*	Overwintering habitat (2 lakes) is located upstream of this reach. This reach is defaulted to fish bearing until overwintering habitat is adequately sampled.
Triton	65	53059	1	July 98	1.03	15	1	None	S6	No fish habitat. Ephemeral stream.
Triton	66	53013	2		3.22	5.5	3	RB	S3	Excellent spawning and rearing habitat. No riparian vegetation left intact post harvesting
Triton	67	53095	3	July 98	1.58	8	2	None	S3	Additional sampling identified no permanent barriers to upstream fish migration. Fish stream based on access.
Triton	68	53098	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	69	43180	1	July 98	3.37	6.5	3	RB, CCG	S3/S5	Additional sampling upstream of 1998 sampling identified falls (9 m) which prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirm that the portion of stream above the falls is non fish bearing.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
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					<b>Date</b>	<b>(m)</b>	<b>(%)</b>			<b>Class</b>	
Triton	702	43180	1	July 99	4.42	7	3	RB	S3/S5	Falls (9 m) prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirm that the portion of stream above the falls is non fish bearing.	
Triton	70	43179	1	July 98	0.78	12	2	None	S6	Subsurface flows and no connectivity to fish bearing water. Second pass sampling indicates this stream is non fish bearing.	
Triton	701	43179	1	July 99	0.61	23	2	None	S6	No spawning, rearing, or overwintering habitat. Subsurface flow and no connectivity to fish bearing water. Second pass sampling indicates this stream is non fish bearing.	
Triton	71	43106	1	July 98	0.41	5	1	None	S6	Dry intermittent stream. Additional sampling identified a Cascade (3 m) in downstream ILP 44061 Reach 1 which prevents upstream fish migration. Adequate sampling in the reaches above the cascade indicate that reaches above the cascade are non fish bearing.	

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	711	44061	1	July 99	3.18	4.5	3	None	S3/S5	Good spawning and rearing habitat. Overwintering habitat is limited. A cascade (3 m) prevents upstream fish migration.. Adequate sampling above the cascade indicates this portion of stream is non fish bearing. The portion of stream below the cascade is fish bearing based on access.
Triton	72	43089	1	July 98	2.0	5	3	None	S6	Falls (9 m) in downstream ILP 43180 Reach 1 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirm that the portion of stream above the falls is non fish bearing
Triton	73	43180	3	July 98	2.05	5	3	None	S6	Falls (9 m) in Reach 1 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirm that the portion of stream above the falls is non fish bearing
Triton	74	43105	1	July 98	1.08	5	2	None	S6	Falls (9 m) in downstream ILP 43180 Reach 1 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirm that the portion of stream above the falls is non fish bearing



Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	87	66005	1	July 98	0.65	5	2	None	S4*	Fish captured in downstream ILP 66037 Reach 2. Downstream lake should be sampled. Fish stream based on access until status of the downstream lake is verified.
Triton	833	66037	2	July 99	4.75	4.8	3	RB	S3	Excellent spawning and rearing habitat. Overwintering habitat present.
Triton	88	55031	1	July 98	0.8	5	2	None	S4	Fish may access this reach during high flow periods and spawning may take place at the lakeshore
Triton	89	55019	1	July 98	0.26	2	1	None	S6	No fish habitat. Heavily vegetated ephemeral stream.
Triton	92	54133	1	July 98	0.46	5.5	2	None	S4	Access possible from Hoult Lake during high flows
Triton	93	54117	1	July 98	0.78	8	1	None	S6	No fish habitat. Ephemeral stream
Triton	97	61094	2	July 98	0.98	8.5	2	None	S6	Second pass sampling and habitat characteristics indicate this reach is non fish bearing.
Triton	807	61094	2	July 99	1.15	6.8	2	None	S6	Limited spawning and rearing habitat. No overwintering habitat. Ephemeral stream. Second pass sampling and habitat characteristics indicate this reach is non fish bearing.
Triton	98	61094	4	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	109	52100	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
<b>Agency</b>	<b>Site</b>	<b>ILP</b>	<b>Reach</b>	<b>Sampling</b>	<b>Width</b>	<b>Gradient</b>	<b>Order</b>	<b>Species</b>	<b>Stream</b>	<b>Comments</b>



Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	226	55030	2	July 98	1.3	0.8	1	None	S6	No fish habitat. Channel difficult to distinguish in some areas. Subsurface flows.
Triton	227	55029	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	228	66037	5	July 98	1.9	2	2	RB	S3	Good habitat for spawning and rearing
Triton	236	52019	1	July 98	1.8	3	4	RB WSU	S3	Good spawning and rearing habitat. Culvert is a barrier during low flows
Triton	237	52020	3	July 98	1.58	3	2	RB	S3	Fair spawning habitat. Rearing habitat limited due to low flows
Triton	239	52019	6	July 98	1.33	2.3	3	WSU	S4	Poor salmonid habitat, good sucker habitat
Triton	240	52033	1	July 98	0.76	1.5	1	None	S4*	Re sample to confirm fish access.
Triton	241	52023	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	808	52020	4	July 99	1.42	8.3	2	None	S4	Fair rearing habitat. Poor spawning habitat. Overwintering habitat present. No permanent barriers to upstream fish migration were identified. Beaver activity in downstream reaches may create temporary barriers to upstream fish migration. Fish stream based on access.
Triton	242	52020	5	July 98	2.47	2.5	2	None	S3	Good spawning and rearing habitat. Additional sampling identified no permanent barriers to upstream fish migration. Fish stream based on access.
Triton	243	52024	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
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Triton	810	52021	3	July 99	0.99	1.6	2	None	S4	Poor spawning habitat. Fair rearing habitat. Overwintering habitat present. Beaver activity has caused non permanent barriers that may prevent upstream fish migration at the time of sampling. Fish stream based on access.
Triton	244	52021	5	July 98	1.08	2	2	None	S4	Poor rearing and spawning habitat. Additional sampling identified no barriers to upstream fish migration. Fish bearing based on access.
Triton	261	52020	1	July 98	2.5	2	2	None	S3	Good spawning and rearing habitat and access possible
Triton	262	52043	7	July 98	0.82	3.5	1	None	S6	Fair spawning and rearing. Falls (2.2 m) in Reach 1 are a barrier to upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirms that the portion above the falls is non fish bearing.
Triton	263	52062	2	July 98	0.55	3.5	1	None	S6	No fish habitat. Falls (2.2 m) in downstream ILP 52043 Reach 1 are a barrier to upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirms that the portion above the falls is non fish bearing.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	264	52062	1	July 98	0.6	2	1	None	S6	No fish habitat. Falls (2.2 m) in downstream ILP 52043 Reach 1 are a barrier to upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirms that the portion above the falls is non fish bearing.
Triton	265	52045	1	July 98	1.84	3.1	1	None	S6	Poor spawning and fair rearing habitat. Falls (2.2 m) in downstream ILP 52043 Reach 1 are a barrier to upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirms that the portion above the falls is non fish bearing.
Triton	266	52044	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	709	52043	1	July 99	4.63	4.3	2	RB	S3/S5	Good spawning, rearing, and overwintering habitat. Falls (2.2 m) are a barrier to upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirms that the portion above the falls is non fish bearing.
Triton	811	52043	3	July 99	1.54	4	2	None	S6	Fair rearing and spawning habitat. No overwintering habitat. Falls (2.2 m) in Reach 1 are a barrier to upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirms that the portion above the falls is non fish bearing.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	267	52043	4	July	2.29	4.5	2	None	S6	Excellent spawning and rearing habitat. Falls (2.2 m) in Reach 1 are a barrier to upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirms that the portion above the falls is non fish bearing.
Triton	268	43180	9	July 98	1.19	4	2	None	S6	Falls (9 m) in Reach 1 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirm that the portion of stream above the falls is non fish bearing
Triton	280	66007	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	281	55034	1	July 98	0.76	1.5	1	None	S6	No fish habitat. Ephemeral stream with intermittent flows.
Triton	282	65095	1	July 98	0.69	2.5	1	None	S4	Fish may use the lower 50 m of this reach.
Triton	313	52006	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	314	52028	3	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	315	53073	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	703	43180	6	July 99	2.38	6	2	None	S6	Falls (9 m) in Reach 1 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirm that the portion of stream above the falls is non fish bearing

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	316	43180	7	July 98	1.28	2.5	1	None	S6	Falls (9 m) in Reach 1 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirm that the portion of stream above the falls is non fish bearing
Triton	317	43174	3	July 98	1.29	4.5	2	None	S6	Subsurface flows and poor habitat Additional sampling identified a Cascade (3 m) in downstream ILP 44061 Reach 1 which prevents upstream fish migration. Adequate sampling in the reaches above the cascade indicate that reaches above the cascade are non fish bearing.
Triton	318	43176	1	July 98	0.76	4.5	2	None	S6	Low intermittent flows and poor fish habitat. Additional sampling identified a Cascade (3 m) in downstream ILP 44061 Reach 1 which prevents upstream fish migration. Adequate sampling in the reaches above the cascade indicate that reaches above the cascade are non fish bearing.
Triton	320	66037	14	July 98	1.43	2	2	None	S4	Poor fish habitat. Additional sampling in Reach 12 produced rainbow trout. No physical barriers were identified. Fish bearing based on access.
Triton	321	45097	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Triton	322	54074	1	July 98	na	na	1	na	na	No Visible Channel. Not a stream

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	323	54071	2	July 98	0.58	13	2	None	S6	Gradient prevents fish access to this reach
Triton	325	52043	5	July 98	1.12	2.9	2	None	S6	Fair spawning and rearing. Falls (2.2 m) in Reach 1 are a barrier to upstream fish migration. Adequate sampling above the falls in 1998 and 1999 confirms that the portion above the falls is non fish bearing.
Ecofor	526	62110	14	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	527	62025	7	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	528	62025	5	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	529	62025	4	July 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	534	63046	4	July 98	0.56	3	1	None	S6	Habitat is too poor to sustain fish. Ephemeral stream
Ecofor	535	53042	5	July 98	na	na	1	None	na	No Visible Channel. Not a stream
Ecofor	542	62110	1	Aug. 98	3.11	2.5	3	WSU	S3	Fish stream
Ecofor	543	53064	2	Aug. 98	2.79	4.5	3	None	S3	Good rearing and okay spawning habitat for salmonids. Indicated as a fish stream on site card.
Ecofor	544	53064	1	Aug. 98	2.81	5	3	None	S3	Good rearing and okay spawning habitat for salmonids. Indicated as a fish stream on site card.
Ecofor	545	63047	2	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	546	63044	1	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	547	63045	1	Aug. 98	1.91	1.5	1	None	S3	Poor spawning and average rearing habitat. Indicated as a fish stream on the site card
Ecofor	548	63046	1	Aug. 98	1.29	5.5	2	None	S4	Rainbow trout captured during additional sampling.



Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	725	63046	1	July 99	1.53	2.5	2	RB	S3	Limited spawning and overwintering habitat. Good rearing habitat. Small root wad cascades may limit access to upstream reaches
Ecofor	549	63046	2	Aug. 98	0.53	1.5	1	None	S6	Poor rearing and spawning habitat. Comment on card indicates this is not a fish stream
Ecofor	553	62056	1	Aug. 98	2.03	2	2	None	S3	Potential fish habitat. No barriers were identified in downstream reaches. Fish stream based on access.
Ecofor	554	62110	2	Aug. 98	1.77	1.5	2	None	S3	Good rearing potential. Re sample in spring to confirm fish presence or absence.
Ecofor	555	62110	3	Aug. 98	1.86	1	2	None	S3	Good rearing potential and poor spawning habitat. Indicated as a fish stream on the card
Ecofor	556	62110	4	Aug. 98	1.81	1	2	None	S3	Good potential rearing habitat. Poor fish habitat at time of sampling. Indicated as a fish stream on the site card
Ecofor	559	62042	1	Aug. 98	na	na	1	None	na	No Visible Channel. Not a stream
Ecofor	567	53056	1	Aug. 98	0.76	11.5	1	None	S6	Habitat is too poor to sustain fish. Site card indicates this is not a fish stream
Ecofor	568	53054	2	Aug. 98	na	na		na	na	No Visible Channel. Not a stream

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Ecofor	569	53055	1	Aug. 98	1.7	3.5	2	None	S3/S6	Poor spawning and potential rearing habitat near the lake. Additional sampling identified a rockslide which prevents upstream fish migration. Fish bearing below the slide based on access and non fish bearing upstream of the slide.
Triton	830	53055	1	July 99	1.22	9.8	2	None	S4/S6	Poor spawning and rearing habitat. No overwintering habitat. A rockslide prevents upstream fish migration. Fish bearing below the slide based on access and non fish bearing upstream of the slide.
Ecofor	570	53053	1	Aug. 98	2.2	3	1	None	S3	Moderate rearing and poor spawning habitat. Fry observed during additional sampling. Fish stream based on access
Triton	732	53053	1	July 99	1.72	5.3	1	None	S3	No overwintering habitat. Limited rearing habitat. Good spawning habitat. Fry observed at stream mouth. Fish stream based on access.
Ecofor	571	53050	1	Aug. 98	1.36	2.5	2	CAS	S4	Good rearing and poor spawning habitat for salmonids. Good habitat for sculpin and coarse fish.
Ecofor	572	53033	1	Aug. 98	1.14	3	2	None	S6	Good rearing and poor spawning habitat. Second pass sampling confirms non fish bearing status.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	814	53033	1	July 99	0.98	12.5	2	None	S6	Poor spawning and rearing habitat. No overwintering habitat. Second pass sampling indicates this is not a fish stream.
Ecofor	573	53028	1	Aug. 98	1.87	3	2	None	S3	Good rearing and poor spawning habitat indicated as a fish stream on site card
Ecofor	574	53026	1	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	575	53025	1	Aug. 98	0.99	32.5	2	None	S6	Gradient is too high to allow fish access to this reach
Ecofor	576	53015	1	Aug. 98	1.84	4	2	None	S6	Good rearing and poor spawning habitat. Additional sampling identified a cascade (1.5 m) which is a barrier to upstream fish migration. Adequate sampling above the cascade in 1998 and 1999 indicate this is not a fish stream.
Triton	813	53015	1	July 99	1.26	5.3	2	RB	S4/S6	Poor rearing and spawning habitat. No overwintering habitat. Cascade (1.5 m) is a barrier to upstream fish access. Adequate sampling above the cascade in 1998 and 1999 indicate this is not a fish stream. Rainbow trout captured below cascades at stream outlet.
Ecofor	577	63050	1	Aug. 98	na	na	1	None	na	No Visible Channel. Not a stream
Ecofor	578	53018	14	Aug. 98	0.56	2	2	None	S4	Good rearing and poor spawning habitat. Potential fish stream

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Ecofor	579	53018	11	Aug. 98	1.26	3.5	2	RB	S4	Good rearing and spawning habitat
Ecofor	585	63037	1	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	589	63036	2	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	590	62025	6	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	591	62050	1	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	593	62041	4	Aug. 98	na	na	2	na	na	No Visible Channel. Not a stream
Triton	831	62040	1	July 99	1.43	3.5	2	WSU CCG	S4	Fair spawning and rearing habitat. No overwintering habitat.
Ecofor	594	62040	3	Aug. 98	0.69	2	2	None	S4	Poor spawning and fair rearing habitat. Fish stream based on access.
Ecofor	595	53004	1	Aug. 98	1.16	2	1	None	S6	Poor spawning and fair rearing habitat. NVC above and below sample site. Additional sampling in downstream ILP 53015 confirms non fish bearing status.
Ecofor	596	53015	6	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	597	53015	3	Aug. 98	na	na	2	na	na	No Visible Channel. Not a stream
Ecofor	598	53015	5	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Ecofor	599	53015	7	Aug. 98	0.56	3.5	1	None	S6	Poor spawning and fair rearing habitat. Additional sampling in downstream ILP 53015 confirms non fish bearing status.
Ecofor	600	53024	1	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	601	53022	1	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	602	53022	2	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	604	53050	2	Aug. 98	2.8	1	2		S3	Poor spawning and good rearing habitat. Indicated as a fish stream on the site card.
Ecofor	605	63048	1	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	606	63049	1	Aug. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	630	53006	4	Oct. 98	na	na	1	na	na	No Visible Channel. Not a stream
Ecofor	631	62029	7	Oct. 98	na	na	1	na	na	No Visible Channel. Not a stream

\*Inferred fish bearing Note: Additional sampling sites are shaded grey.

## 7.0 REFERENCES

**Anonymous. 1995a.** Forest Practices Code Fish Stream Identification Guidebook. Forest Practices Code of British Columbia Act. Co-published by Forest Service British Columbia and British Columbia Environment.

**Anonymous. 1995b.** Fisheries Information Summary System: Data Compilation and Mapping Procedures. British Columbia Ministry of Environment, Lands and Parks, and Department of Fisheries and Oceans.

**Anonymous, 1998.** Reconnaissance (1:20 000) Fish and Fish Habitat Inventory. British Columbia Ministry of Environment, Lands and Parks.

**Demarchi, D. 1996.** An introduction to the ecoregions of British Columbia. MELP, Wildlife Branch. Victoria, B.C. 46 pp. + appendices.

**Fish Habitat Inventory and Information Program. 1995.** Stream Summary Catalogue. Subdistrict 29I, Prince George. Department of Fisheries and Oceans, Vancouver, BC.

**Luiker, E.A. & D.G. Hickey. 1996.** Reconnaissance Survey of Unnamed Lake West of Table Hill (WSC 180-700671-20100). EDI Environmental Dynamics Inc. Prince George, B.C.

**Meidinger, D. And J. Pojar. 1991.** Ecosystems of British Columbia. BC Ministry of Forests. Victoria, B.C. 330 pp.

**Scott, W.B. & E.J. Crossman, 1985.** Freshwater fishes of Canada. Bryant Press Ltd. Ottawa, Canada. pp. 966

**Tripp, D. 1996.** Stream classification in the East Ootsa Operating area for Fraser Lake Sawmills. Consultants report. Nanaimo, B.C.

## PROJECT PHASE COMPLETION REPORT

### PHASE 4

- **MELP Project Number:** 06-LEUT-4037-0001-1998
- **Contract Number:** 10441B
- **FRBC Project Number:** SBM98512
- **FDIS Project Code:** 06-LEUT-4037-0001-1998
- **Project Name:** Reconnaissance (1: 20 000 scale) Fish and Fish Habitat Inventory Follow-up Sampling
- **Project Type:** 1:20 000 Resampling Program
- **Report Date:** August 15, 1999
- **Proponent:** Fraser Lake Sawmills Ltd.
- **Company/Agency:** Triton Environmental Consultants Ltd.
- **Contact Person:** Jason Harris
- **Contact Phone:** (250) 753-8339
- **Contact E-Mail:** jharris@triton-env.com
- **MELP Project Monitor:** Paul Giroux
- **FRBC Coordinator:** Greg Van Dolah

#### List of Deliverables Submitted

<u>Deliverable Product</u>	<u>Received</u>	<u>Approved (QA)</u>
Site Cards		
Fish Collection Forms and Individual Fish Data Forms		

#### Activity Log

<u>Date</u>	<u>Activity</u>	<u>Time Spent</u>
June 28, 1999 – July 15, 1999	Gear up, travel, field work and gear down for stream inventory in the Cheslatta and Nechako.	370 hours

#### Summary of Work Completed

Total number of stream reaches sampled: 76

#### Summary of Phase Costs

Professional Fees      \$14,220.75  
Disbursements         \$17,855.00



## **Progress and Problems Summary**

Phase 4 was completed as scheduled. While sampling during increased flows gave a good estimate of species distribution, it made it difficult to assess habitat during low flow conditions. High flow conditions do not give a good representation of stream habitat throughout the year. Several streams that had good habitat during high spring run-off periods were completely dry several weeks later.

A number of discrepancies were encountered while completing the field resampling program. Several features identified during last years 1:20 000 Inventory were not located during the resampling program. Not locating these features led to increased helicopter time and increased field crew time per site. In other instances, channel widths in reaches varied as much 3 m and gradients as much as 15 %.

Helicopter time was used extensively to reference and locate several barriers downstream of selected resample sites. Many of these additionally located barriers were confirmed as obstacles to upstream fish passage and changed the fish bearing status of several third order basins to non-fish bearing. Strategic sample selection by field crews maximised sampling efficiencies and further increased the non-fish bearing status of questionable streams.

## **Next Phase Project Plans and Constraints**

The project will now proceed with data compilation and reporting.

## **Contract Monitor Acceptance**

Report Submitted By: Jason Harris	Date: August 15, 1999
Phase Completion Approved:	Date:
Comments:	

# PROJECT PHASE COMPLETION REPORT

## PHASE 4

- **MELP Project Number:** 06-LEUT-4037-0001-1998
- **Contract Number:** 10441A
- **FRBC Project Number:** SBM98512
- **FDIS Project Code:** 06-LEUT-4037-0001-1998
- **Project Name:** Reconnaissance (1: 20 000 scale) Fish and Fish Habitat Inventory in the Vanderhoof Forest District
- **Project Type:** 1:20 000 Scale Reconnaissance
- **Report Date:** October 10, 1998
- **Proponent:** Fraser Lake Sawmills Ltd.
- **Company/Agency:** Triton Environmental Consultants Ltd.
- **Contact Person:** Jason Harris
- **Contact Phone:** (250) 753-8339
- **Contact E-Mail:** jharris@triton-env.com
- **MELP Project Monitor:** Paul Giroux
- **FRBC Coordinator:** Doug Reid

### List of Deliverables Submitted

<u>Deliverable Product</u>	<u>Received</u>	<u>Approved (QA)</u>
Site Cards		
Fish Collection Forms		
Lake Survey Forms		
Lake Outline Maps		
Annotated Air Photos		

### Activity Log

<u>Date</u>	<u>Activity</u>	<u>Time Spent</u>
June 20, 1998 – August 15, 1998	Gear up, travel, field work and gear down for stream inventory in the Cheslatta, Nechako and Eutsuk watersheds.	1560 hours

### Summary of Work Completed

Total number of stream reaches sampled: 239

The total number of stream reaches sampled, the number of reaches sampled along cutblocks, and the number reaches where follow-up sampling is recommended are summarized by project area in the following table (Table 1).

Table 1. A summary of stream reaches sampled in each project area.

<b>Sub-basin:</b>	<b>Total Number of Reaches Sampled within:</b>	<b>Number of Reaches within/ near* cutblocks</b>	<b>Number of Reaches Recommended for Follow-up Sampling</b>
Bird	59	11	5
Cheslatta	3	0	0
Lower Nechako	92	4	8
Upper Nechako	61	18	10
Lower Whiteye	3	0	0
Upper Whiteye	21	13	4
Total	239	46	27

\*along any point of reach within 60 m of cutblock boundary

### **Summary of Phase Costs**

Professional Fees      \$40 000  
 Disbursements          \$56 000

### **Progress and Problems Summary**

Phase 4 was completed as scheduled. While sampling during increased flows gave a good estimate of species distribution, it made it difficult to assess habitat during low flow conditions. High flow conditions do not give a good representation of stream habitat throughout the year. Several streams that had good habitat during high spring run-off periods were completely dry several weeks later.

Late fall/overwintering habitat was inferred for several streams which may have increased the re-sampling number.

A bias towards streams specific to cutblocks limits downstream and watershed wide fish distribution information. Trying to find the upstream limits of fish populations (e.g. barriers) may be more beneficial to MELP and to Fraser Lakes Sawmills. By not finding fish in a sample site and by not knowing the upstream distribution of fish stream class can only be inferred, thus increasing the re-sample number.

Fish samples including aging structures, voucher specimens and tissue samples for both Lakes and Streams have been sent for analysis.

Water samples for both Lakes and Streams have been sent for analysis.

### **Next Phase Project Plans and Constraints**

The project will now proceed with data compilation and reporting.

- As of October 31/98 all Triton Field Cards will be entered into FDIS.
- Mapping should begin by November 15/98.
- Final Reports will begin by November 15/98

### **Contract Monitor Acceptance**

Report Submitted By: Jason Harris	Date: October 31/98
Phase Completion Approved:	Date:
Comments:	

## PROJECT PHASE COMPLETION REPORT

### PHASE 5

- **MELP Project Number:** 06-LEUT-4037-0001-1998
- **Contract Number:** 10441A
- **FRBC Project Number:** SBM98512
- **FDIS Project Code:** 06-LEUT-4037-0001-1998
- **Project Name:** Reconnaissance (1: 20 000 scale) Fish and Fish Habitat Inventory in the Vanderhoof Forest District
- **Project Type:** 1:20 000 Scale Reconnaissance
- **Report Date:** October 10, 1998
- **Proponent:** Fraser Lake Sawmills Ltd.
- **Company/Agency:** Triton Environmental Consultants Ltd.
- **Contact Person:** Jason Harris
- **Contact Phone:** (250) 753-8339
- **Contact E-Mail:** jharris@triton-env.com
- **MELP Project Monitor:** Paul Giroux
- **FRBC Coordinator:** Doug Reid

#### List of Deliverables Submitted

<u>Deliverable Product 1:20K Inventory</u>	<u>Received</u>	<u>Approved (QA)</u>
FDIS Reach Forms		
FDIS Site Cards		
FDIS Fish Collection Forms		
Photodocumentation indices		
Indexed photographic slides		
Two indexed copies photographs in digital CD format		
FISS updates		
Phase 5 completion report		

### **Activity Log**

<u>Date</u>	<u>Activity</u>	<u>Time Spent</u>
Sept. 1998	Reach form completion	9 days
Oct. 1998	Site card entry	33 days
Oct. 1998	Fish collection form entry	20 days
Nov. 1998	Slide development/scanning/printing	10 days
Dec. 1998	FISS data forms/mapping	8 days
Dec. 1998	Phase completion report	1 hrs

### **Summary of Work Completed**

#### **Site Cards By Database**

##### 1:20 000 Inventory Streams

White Eye	23
Lower Nechako	145
Upper Nechako	60
Cheslatta	67
Bird	72

##### 1:20 000 Inventory Lakes

Lower Nechako	2 (Secondary / Primary)
Cheslatta	1 (Secondary)
Bird	1 (Secondary)

#### **Fish Collection Forms By Database:**

##### 1:20 000 Inventory Streams

White Eye	11
Lower Nechako	65
Upper Nechako	33
Cheslatta	25
Bird	37

##### 1:20 000 Inventory Lakes

Lower Nechako	2 (Secondary / Primary)
Cheslatta	1 (Secondary)
Bird	1 (Secondary)

#### **Photodocumentation**

1:20 000 Inventory Photos

White Eye	58
Lower Nechako	405
Upper Nechako	146
Cheslatta	172
Bird	198

FISS

FISS maps =	8
FISS forms =	400

**Summary of Phase Costs**

Professional Fees:	\$25 000
Disbursements:	\$8 685

These figures are as quoted in the original budget. Estimate that 1.25 times the budgeted amount of time was spent on this phase due to FDIS problems and unforeseen editing/revisions.

**Progress and Problems Summary**

FISS updates required a great deal of time to complete and should not be included as part of inventory projects. All information submitted on FISS forms and maps has already been entered into FDIS and will be provided with final inventory deliverables thereby making FISS updates a redundant task. FISS updates should be administered as a separate project.

**Next Phase Project Plans and Constraints**

Deliverables for Phase 5 are constrained by close associations with deliverables for Phase 6. Although these two phase are described as Data Compilation and Reporting, respectively, many of the tasks are closely associated. Phase 6 started December 1998 and draft deliverables will be completed February 15, 1999 as per contract requirements.

**Contract Monitor Acceptance**

Report Submitted By: Jason Harris.	Date: February 15, 1999
Phase Completion Approved:	Date:
Comments:	

## PROJECT PHASE COMPLETION REPORT

### PHASE 5

- **MELP Project Number:** 06-LEUT-4037-0001-1998
- **Contract Number:** 10441B
- **FRBC Project Number:** SBM98512
- **FDIS Project Code:** 06-LEUT-4037-0001-1998
- **Project Name:** Reconnaissance (1: 20 000 scale) Fish and Fish Habitat Inventory Follow-up Sampling
- **Project Type:** 1:20 000 Resampling Program
- **Report Date:** August 15, 1999
- **Proponent:** Fraser Lake Sawmills Ltd.
- **Company/Agency:** Triton Environmental Consultants Ltd.
- **Contact Person:** Jason Harris
- **Contact Phone:** (250) 753-8339
- **Contact E-Mail:** jharris@triton-env.com
- **MELP Project Monitor:** Paul Giroux
- **FRBC Coordinator:** Greg Van Dolah

#### List of Deliverables Submitted

<u>Deliverable Product 1:20K Inventory</u>	<u>Received</u>	<u>Approved (QA)</u>
FDIS Reach Forms		
FDIS Site Cards		
FDIS Fish Collection Forms		
Photodocumentation indices		
Indexed photographic slides		
Two indexed copies photographs in digital CD format		
FISS updates		
Phase 5 completion report		



### Activity Log

<u>Date</u>	<u>Activity</u>
Sept. 1999	Reach form completion
Oct. 1999	Site card entry
Oct. 1999	Fish collection form entry
Nov. 1999	Slide development/scanning/printing
Dec. 1999	FISS data forms/mapping
Dec. 1999	Phase completion report

### Summary of Work Completed

#### Site Cards entered to Database

1:20 000 Site Cards = 76

1:20 000 Secondary Lakes = 1

#### Summary of Phase Costs

Professional Fees: \$8,261.00

Disbursements: \$500.00

These figures are as quoted in the original budget. Estimate that 1.25 times the budgeted amount of time was spent on this phase due to FDIS problems and unforeseen editing/revisions.

#### Next Phase Project Plans and Constraints

Deliverables for Phase 5 are constrained by close associations with deliverables for Phase 6. Although these two phase are described as Data Compilation and Reporting, respectively, many of the tasks are closely associated. Phase 6 started October 1999 and draft deliverables will be completed November, 1999.

#### Contract Monitor Acceptance

Report Submitted By: Jason Harris.	Date: October 15, 1999
Phase Completion Approved:	Date:
Comments:	

## PROJECT PHASE COMPLETION REPORT

### PHASE 6

- **MELP Project Number:** 06-LEUT-4037-0001-1998
- **Contract Number:** 10441B
- **FRBC Project Number:** SBM98512
- **FDIS Project Code:** 06-LEUT-4037-0001-1998
- **Project Name:** Reconnaissance (1: 20 000 scale) Fish and Fish Habitat Inventory Follow-up Sampling
- **Project Type:** 1:20 000 Resampling Program
- **Report Date:** August 15, 1999
- **Proponent:** Fraser Lake Sawmills Ltd.
- **Company/Agency:** Triton Environmental Consultants Ltd.
- **Contact Person:** Jason Harris
- **Contact Phone:** (250) 753-8339
- **Contact E-Mail:** jharris@triton-env.com
- **MELP Project Monitor:** Paul Giroux
- **FRBC Coordinator:** **Greg Van Dolah**

### List of Deliverables Submitted

<u>Deliverable Product</u>	<u>Received</u>	<u>Approved (QA)</u>
Project Overview Map		
Inventory Map		
Distribution Map		
Final reports (5)		
Photograph CD's		
Phase 6 completion report		

### Activity Log

<u>Date</u>	<u>Activity</u>
Nov. 1999	Photograph CD's
Nov. 1999	Draft reports (5)
Nov. 1999	Inventory, Distribution, overview maps
Nov. 1999	Phase completion report

### Summary of Work Completed

Sample Site: 76  
1 Secondary Lake

## PROJECT PHASE COMPLETION REPORT: PHASE 6

### Summary of Phase Costs

Professional Fees: \$16,183.00  
Disbursements: \$1070.00

### Phase 4-6 costs for Secondary Lake

Secondary Lake \$9550.00 (Total Cost 4-6)

Costs as per original budget estimate.

### Progress and Problems Summary

Watershed codes were not received by project draft deliverable due date.

Report formats and mapping products do not appear to be “forestry friendly”. Descriptions of classified streams and locations within reaches of stream class boundaries are not obvious. Cutblock-specific fish and fish habitat characteristics observed in the field for 1:5 000 sites were included in the report as per Northwood’s request.

### Contract Monitor Acceptance

Report Submitted By: Jason Harris	Date: November, 1999
Phase Completion Approved:	Date:
Comments:	

## **1. PROJECT PLAN**

### **1.1 Phase 4: Field Data Collection**

Following is an outline of our approach to the field work, clarification of specific sampling methodologies, and an estimate of the effort required. The following Sections describe the methodologies and approaches to complete field sampling, data collection and reporting.

#### 1.1.1 Pre-Field Preparation

Pre-field preparations will entail both office activities and logistics planning in coordination with members of the project team, the Implementation Contractor and Fraser Lakes Sawmill (FLSM). Fish collection permits will be obtained from MELP and DFO as part of pre-field planning.

#### 1.1.2 Equipment

Triton possesses the majority of field equipment necessary to complete the project. A rental vehicle (4X4 truck) and hand held radios will be secured prior to the commencement of Phase 4 (Field work).

Each crew will be equipped with a Smith-Root Model 12A backpack electrofisher and other standard field gear (Abney level, hip chain, tape measure, VHF radio, first aid kit, etc.).

#### 1.1.3 Field Assessment

Field work will be conducted by two, 2 person field crews. Crew mobilisation will take place using a variety of methods depending on the access available in each watershed. In watersheds where road access is available, crews will drive to the sample sites. In watersheds where road access is unavailable crews will be transported by a Bell Jet Ranger helicopter to the sample sites. Crews will fly out to the watersheds together, and will complete site assessments by “leap-frogging” from site to site (large creek systems) or be dropped off at the downstream end of smaller systems.

## **Progress and Problems Summary**

Phase 4 was completed as scheduled. While sampling during increased flows gave a good estimate of species distribution, it made it difficult to assess habitat during low flow conditions. High flow conditions do not give a good representation of stream habitat throughout the year. Several streams that had good habitat during high spring run-off periods were completely dry several weeks later.

A number of discrepancies were encountered while completing the field resampling program. Several features identified during last years 1:20 000 Inventory were not located during the resampling program. Not locating these features led to increased helicopter time and increased field crew time per site. In other instances, channel widths in reaches varied as much 3 m and gradients as much as 15 %.

Helicopter time was used extensively to reference and locate several barriers downstream of selected resample sites. Many of these additionally located barriers were confirmed as obstacles to upstream fish passage and changed the fish bearing status of several third order basins to non-fish bearing. Strategic sample selection by field crews maximised sampling efficiencies and further increased the non-fish bearing status of questionable streams.

## **Next Phase Project Plans and Constraints**

The project will now proceed with data compilation and reporting.

## **Contract Monitor Acceptance**

Report Submitted By: Jason Harris	Date: August 15, 1999
Phase Completion Approved:	Date:
Comments:	

Triton has used each of these methods on numerous fish inventory studies, as it maximizes effort and cost efficiency and reduces the length of the field program. Utilization of a combination of these methodologies will ensure that field efficiency is maximized and that the project target of 5 sample sites/crew/day is attained.

#### 1.1.4 Fish Species Sampling

Fish sampling efforts will focus on reaches of <20% gradient (>20% at the FRBC Coordinator, Regional Inventory Specialist and Project Manager's discretion (i.e. suspected bull trout presence)) and will follow the procedures outlined in the *Reconnaissance Fish and Fish Habitat Inventory: Standards and Procedures* (May 1997) and the *Forest Practice Code's Fish Stream Identification Guidebook*. A minimum 100 m of stream length or a length equal to 10 bankfull widths (whichever is greater) will be sampled in each reach identified for sampling. In addition, intermittent fish sampling may be conducted during travel between sample sites (in an upstream direction), upstream and downstream of barriers and within habitat features (pools, debris jams etc.) that may be utilized by fish.

The presence, relative abundance and diversity of fish species will generally be evaluated through electroshocking at least 100 linear metres of stream length. In areas where return visits are practical, minnow traps baited with salmon roe will be set and allowed to soak for a 24 hour period. This sampling method will be used to supplement electroshocking data, or in areas that are not suited to electroshocking (deep pools, wetlands, and active spawning areas). Other sampling methods, such as snorkelling, beach seining, and angling may be used where necessary, or where requested by the Project Monitor.

All fish sampling data will be recorded on Fish Collection Forms. The following data and samples will be recorded and collected for fish caught at each sampling site:

- species (keyed out using RIC's Field Key to Freshwater Fishes of BC). Special attention will be given to documenting species at risk in Region 6.
- length to the nearest mm (fork length or total length depending on species) determined for 30 random samples of each fish species captured including the longest and shortest fish;
- life stage;
- a representative sample of any abnormal or unidentified fish or a species of fish out of its normal range will be preserved and submitted to the Implementation Contractor as will all non-game fish captured from each 2nd - 4th order watershed.

For all reaches with non-fish bearing classification a written explanation supporting the classification will be submitted (Non-Fish Bearing Classification Report) in the final report. The explanation will focus on sampling methods utilized during the field program, and water quality parameters, including conductivity and turbidity.

Follow-up sampling is recommended (Fish Stream Identification Guidebook) in order to establish fish absence. The need for follow-up sampling will be determined based on the results of the initial survey, recommendations from the survey team, and a data review by the Regional Inventory Specialist. In the field, survey crews will note the areas of concern (i.e., intermittent or ephemeral channels and side channel habitat that constitute Fisheries Sensitive Zones in high water). A summary will be provided in the final report that discusses the areas, identified by field crews, where follow-up sampling is recommended. The need for follow-up sampling will be determined by the Regional Inventory Specialist at a later date and actual sampling will be completed using surplus funds from the existing contract or through a future contract.

#### 1.1.5 Habitat (Site) Description

A reach description will be completed for each reach (at fish sampling sites), consistent with the Site Description form and entered into MELP's MS Access database as part of Phase 5. Each sampling site length will be 100 m, or >10 bankfull widths whichever is greater. The following data will be collected at each site:

- reach length
- site length
- stream gradient
- 6 individual channel width measurements
- estimates of the percentage areas of the different habitat units
- estimates of bed material size, by size class
- compaction of bed materials
- measurements of stream cover / riparian vegetation and large organic debris
- measurements of bank instability
- channel confinement
- percentage of stream bars
- air temperature
- water temperature
- conductivity (ambient)
- flow (see 3.3.2.4 Water Quality)
- major features (fish passage barriers, log jams, LWD, beaver dams, clay slides, etc.)

- obvious fish habitat limitations or restoration opportunities
- preliminary identification of obvious Fisheries Sensitive Zones as *per Fish-stream Identification Guidebook* specifications.

#### 1.1.6 Water Quality

Consistent with the terms outlined in Schedule A, Triton will sample water quality parameters in the field at each sample site. Parameters will be measured in the field in order to reduce laboratory costs and shipping and receiving requirements. Specifically, Triton proposes to measure air and water temperature using standard field thermometers, pH and conductivity using hand held meters, and turbidity using visual estimates. Water quality measurements will be taken in each sampled reach as specified in the RFP.

#### 1.1.7 Wildlife Observations

Wildlife observations will be noted and specific details recorded. Amphibians, aquatic invertebrates and macrophytes will be described and identified to Order or Family (where practical). Photographs will be taken for further documentation and confirmation. Wildlife observations will be recorded on the Site Card with emphasis placed on species considered rare, endangered or threatened as defined by the Conservation Data Centre.

#### 1.1.8 Photographic Documentation

Triton will make extensive use of photography throughout the project. Photographs will be taken, recorded and presented as per the *RIC Guide to Photodocumentation* (March, 1996). Photographs will be taken of each sample site (including downstream and upstream perspectives), of each feature identified and of representative or unidentifiable fish species. Photographs will be documented on Site Cards and Fish Collection Forms and Triton's Photodocumentation Form.



### 1.1.9 Inventory Area Specific Sampling

Through completion of Phases 1-3 we have identified specific reaches within each working area to be sampled. Sample sites were biased towards FLSM's prioritized operational needs areas as follows (Table 1):

Table 1. Sample Site Summary by Inventory Area.

<b>Inventory Area</b>	<b>Total No. of Reaches</b>	<b>Number of Reaches to be Sampled</b>	<b>Percent of Inventory Area Reaches Sampled</b>	<b>Number of Reaches Next to FLSM Cutblocks</b>	<b>Percent of FLSM Biased Reaches</b>
Cheslatta	1384	138	10.0 %	47	34 %
Nechako	1532	145	9.5 %	98	68 %
Eutsuk	2326	168	7.2 %	77	46 %

Planning for the field sampling portion of this project followed a balanced approach between Ministry of Environment, Lands and Parks (MELP) requirements and FLSM's operational needs. The criteria for sample site selection was discussed with MELP's Fisheries Inventory Specialist, Mr. Paul Giroux. Initial sample site selection was discretionary and sample sites were selected using the following criteria:

- MELP's Reach Sampling Summary table for each watershed (attached),
- existing fish species distribution data,
- strategies to determine fish distribution within each watershed,
- FLSM's operational needs.

Revisions to the stream sampling plan (increased number of sites alternate site locations, 1:5000 sampling) will be revised at the beginning of Phase 4 of the project which is scheduled to commence in the summer of 1998.