RECONNAISSANCE (1:20,000) FISH AND FISH HABITAT INVENTORY IN THE CHESLATTA WATERSHED

WSC 180-545300

Prepared for:

Fraser Lake Sawmills
A Division of West Fraser Ltd.
PO Box 100
Fraser Lake, BC
V0J 1S0

January 2000

Prepared by:

TRITON
Environmental Consultants Ltd.

Project Reference Information

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

Watershed Information

Watershed Group:	Cheslatta
Watershed Name:	Cheslatta Watershed Group
Watershed Code:	180-545300
UTM at Mouth:	10.371955.5945810
Watershed Area:	34448.1 ha
Total of All Stream Lengths:	193 855.9 m
Stream Order	5
NTS Map:	93 E/16; 93F/10; 93F/11; 93F/12; 93F/13; 93F/14
TRIM Map:	93F.066;93F.074;93F.064;93F.075;93F.065 93F.072;93F.062;93F.073;93F.063;
BGC Zone:	SBS
Air Photos:	30BC95071 #84-100 #112-130

	30BC950105 #140-157
Air Photos (cont.):	30BC96110 #87-105 #110-113
	30BCC96099 #65-90 #30-60
	30BCC96122 #107-140 #70-106
	30BCC96117 #220-255 #124-160
	30BCC96117 #90-123
	30BCC96110 #135-170

Sampling Design Summary

Total Number of Reaches:	775
Random Sampling Sites:	12
Discretionary Sample Sites:	58
Additional Sampling Sites:	21
Total Sample Sites:	91
Field Sampling Dates:	June 27 - October 22, 1998
Additional Sampling Dates:	July 9 - July 11, 1998

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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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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 a portion of the Cheslatta River Watershed Group managed under FLSM's Lakes TSA tenure. The area of inventory included tributaries to the Cheslatta River and tributaries to Cheslatta Lake.

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 Cheslatta Watershed Group. The inventory provides information regarding the 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. The results of the lakes inventories, conducted during 1998, are presented in separate reports.

2.0 STUDY AREA

2.1 Location

The Cheslatta Watershed study area is located approximately 60 km (by road) south east of the town of Fraser Lake, BC. The Cheslatta Watershed 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).

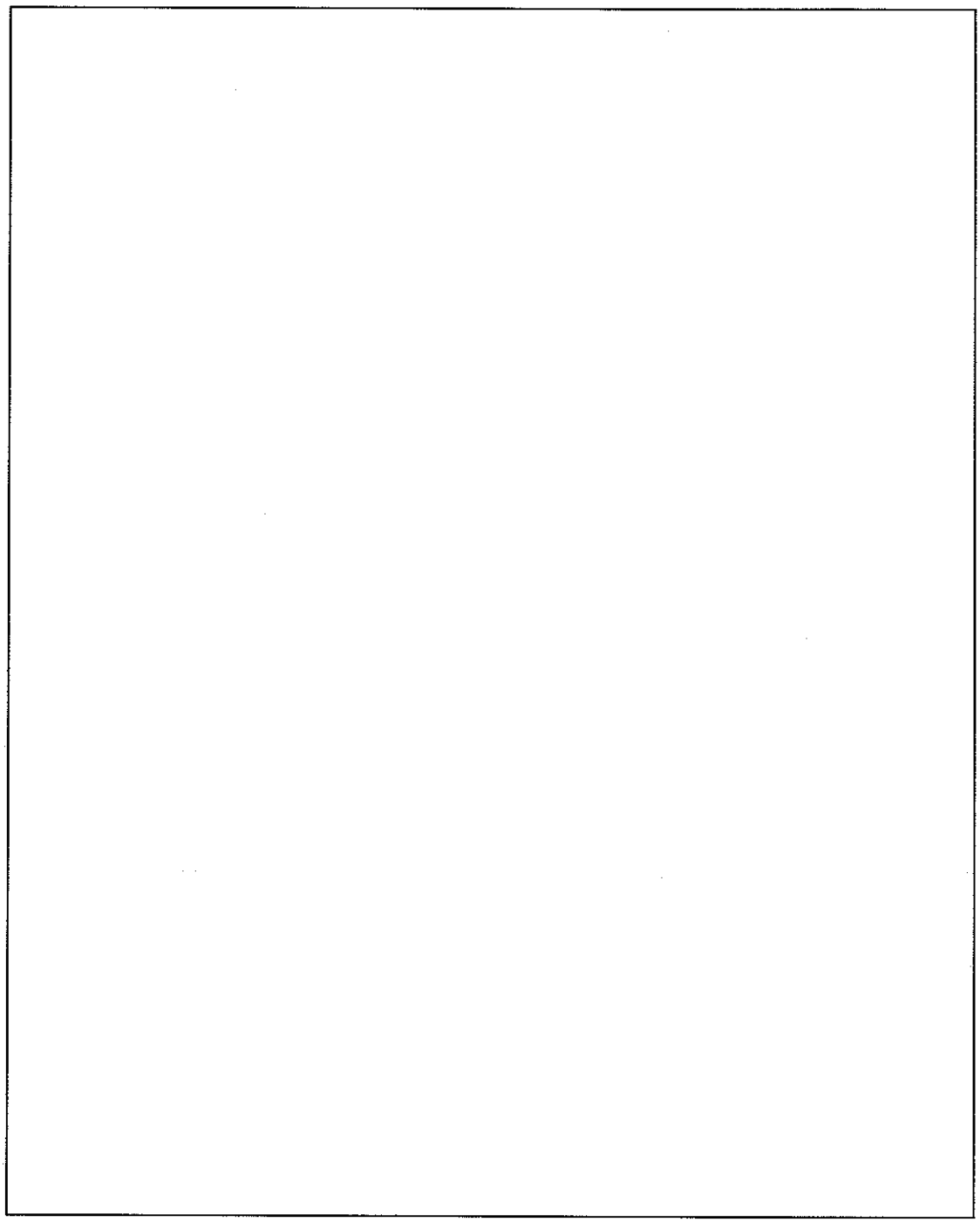

Figure 1. Cheslatta Inventory Area Location Map.

2.2 Access

Directions to the Cheslatta 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 100 Road is 151-95.
- After crossing the Cheslatta River bridge turn right on to the Marilla Mainline. After turning onto the Marilla every stream which flows across the mainline to the right is in the Cheslatta Watershed. Spur roads on the left and right hand sides of the road allow access to streams within the Cheslatta Watershed.

3.0 RESOURCE INFORMATION

Background information specific to the Cheslatta 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 Cheslatta area.

1. First Nations which have issues, interests and claims within the Watershed Group (not specifically to the Cheslatta) 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 Cheslatta 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. Stream reaches which were to undergo fish sampling efforts were identified by two methods: random sites generated by the FDIS planning tool and 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 56 biased sites and 7 random sites within the Cheslatta 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 Cheslatta 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 Cheslatta inventory area between June 27th and October 22nd 1998 and between July 9th and July 11th, 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, 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 1995b).

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 field work 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 Cheslatta Inventory Area
- Table 4. Features Identified in the Cheslatta Watershed
- Table 6. Non-Fish Bearing Reaches in the Cheslatta 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 the Cheslatta Watershed and tributaries such as Bird, Mackenzie, Smith and Chaoborus Lake drainages. An inventory of the Bird Creek chain was conducted by the B.C. Fish and Wildlife Branch for the Ministry of Environment in 1977 (Burns, 1977). This inventory identified major fish bearing tributaries to the Bird Creek drainage, as well as habitat parameters specific to the watershed. Stream classification reports conducted in 1996 by Fraser Lake Sawmills (Tripp, 1996) indicated that rainbow trout were present in some small stream systems in the area. Anecdotal information (Tom Olafson, FLSM, pers. comm.) and historic lake and stream file information (Paul Giroux, FIS, MELP Skeena Region 6, pers. comm.) identified the presence of rainbow trout (*Oncorhynchus mykiss*) Northern Squawfish (*Ptychocheilus oregonensis*), Longnose Suckers (*Catostomus Catostomus*), Lake Chub (*Couesius plumbeus*), White Suckers (*Catostomus commersoni*), Largescale Suckers (*Catostomus macrocheilus*), and Lake Whitefish (*Coregonus clupeaformis*) within the Cheslatta Watershed.

5.2 Survey Information

Table 1 provides an overview of the survey information compiled for fish stream identification in the Cheslatta Watershed for Fraser Lake Sawmills. Included in this table is the information from 7 additional sampling sites (shaded grey).

Table 1. Summary Survey Information

Major Watershed Code	180-545300		
Watershed Name	Cheslatta Watershed		
TRIM Maps:	93F.062	93F.063	93F.072
	93F.064	93F.073	93F.065
	93F.074	93F.066	93F.075
Total Number of Lakes:	28		
Total Stream Length:	193 855.9 m		
Total Number of Reaches:	775		
Stream Field Sampling Dates:	June 27,1998 to October 22,1998		
Additional Sampling Dates:	July 9, 1999 to July 11, 1999		
Number of Reaches/Sites Sampled:	91		

Fish Capture Summary:

Stream Name	Stream Identifier (WSC/ILP)	Reach #	Species
Unnamed	63139	2	RB
Unnamed	72060	1	RB
Unnamed	73006	2	RB
Unnamed	73006	3	RB
Unnamed	75004	2	RB
Unnamed	75004	3	RB
Unnamed	65012	1	RB
Unnamed	73015	2	RB
Unnamed	73003	1	RB, RSC, NSC
Unnamed	72060	11	RB
Unnamed	75004	2	RB
Unnamed	75004	5	RB
Unnamed	65001	1	RB

Note: RB = rainbow trout, RSC = red sided shiner, NSC = northern squawfish

Additional sampling sites are shaded 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. Reach Forms and Site 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 by 4WD vehicle. Crews were located at either the FLSM Ootsa Camp or in Vanderhoof. Drive sites were accessed along FLSM's Marilla Mainline and its associated secondary road networks. There were no helicopter sites in the watershed and all sampling sites could be accessed by logging roads.

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 snowmelt. 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 were captured at 13 of 91 sites in the Cheslatta Inventory area. Rainbow trout was the only species captured in the Cheslatta Inventory area. Table 2 provides a summary of fish bearing reaches identified in the study area and includes sampling results from 1998 and 7 additional sampling sites (shaded grey) in 1999. Voucher specimens, DNA, and scale samples were not taken from the fish captured during the 1999 additional sampling program.

Table 2. Summary of Fish Bearing Reaches in the Cheslatta Inventory Area

Site #	ILP #	Reach #	Avg. Width (m)	Avg. Gradient (%)	Order	Fish Sp.	Life Stage	Age (yrs)	Total #	Mean Fork Length (mm)
533	63139	2	1.33	1	1	RB	F	0+	2	18
540	73006	3	2.53	2.3	3	RB	J	NS	14	49
566	73006	2	2.56	2	3	RB	A	NS	6	80
580	75004	3	1.9	2	3	RB	A	NS	3	161.5
617	72060	1	1.89	3	4	RB	A	NS	1	90
621	75004	2	2.52	8	3	RB	A	NS	8	78.5
720	65001	1	3.13	4.3	3	RB	A	3+	5	65
721	65012	1	1.27	4.3	3	RB	A	3+	3	65
727	73015	2	5.93	5.8	4	RB	A	3+	8	82.5
728	73003	1	4.93	7.3	3	RB	J	2+	3	40
						RSC	A	NS	2	55
						RB	A	3+	2	75
						NSC	A	NS	2	75
730	72060	11	1.63	4.3	2	RB	J	2+	2	55
731	75004	2	4.9	9.8	3	RB	A	3+	3	65
822	75004	5	1.57	8	2	RB	J	1+	2	77
						RB	J	2+	3	127

RB= rainbow trout, RSC= red sided shiner, NSC= northern squawfish, J= juvenile, A= adult, F= fry, NS= not specified Additional sampling sites are shaded grey

The length-frequency distribution for rainbow trout captured in the Cheslatta inventory area is presented in Figure 2. Specific fish data gathered in the 1999 additional sampling program was not incorporated into Figure 2.

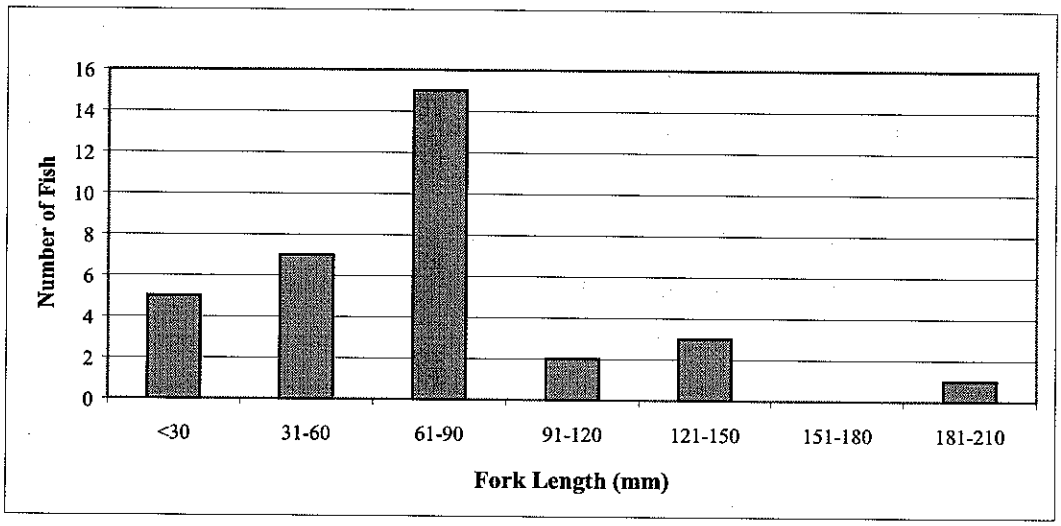

Figure 2. Length frequency distribution for rainbow trout captured in the Cheslatta inventory area in 1998.

Resident rainbow trout, the only 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.

5.4.3 Fish Distribution

The locations where fish were captured generally were characterized as having perennial flows or headwater lakes and were 3rd order and larger streams with the exception of a large first order stream. Fish were captured in streams with gradients less than 8% and average channel widths greater than 1.33 m.

The key factors in the fish distribution was that the streams appeared to have perennial flows and gradients less than 8%. The limiting factors for fish distribution in the study area was the seasonality of water supply and a lack of habitats usable by fish. Many streams identified without barriers were dewatered (intermittent) during the survey. These streams or stream reaches only sustain flows for a short period of time during runoff from snow packs. They generally possessed small channel widths (<1.0 m), fine substrates and abundant instream and overstream vegetation. Habitat characteristics important to fish (pools, boulders, cutbanks etc.) were lacking in these systems.

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 Cheslatta Lake and Murray 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 Cheslatta Watershed appears to be the

primary limiting factor to significant fisheries values. As there several small headwater lakes and ponds within the Cheslatta 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 73006) flowing directly into Cheslatta Lake 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 preformed 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" 19th Edition, (1995) and 17th Edition (1989), published by the American Public Health Association.

Table 3. Water chemistry summary for the Cheslatta inventory area

Parameter Measured	Laboratory Test	Field Measurement
pH	7.45	Range (6.7 – 8.7) Mean 7.6
Conductivity	79.0	Range (20 – 186) Mean 92
Turbidity	1.6	N/A
Temperature	N/A	Range (4.1 – 18) Mean 9.5
Total Dissolved Solids	65	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

A total of 27 features were identified within the Cheslatta Inventory area. During the additional sampling program 8 features were identified and are shaded grey in Table 4. The majority of features identified were culverts. Many culverts were identified as partial or full barriers to upstream fish migration. Often culverts were perched at the outlet or had gradients too steep to allow fish passage. Many of the culverts were identified as barriers based on the outlet structure's associated drop (fall) and the lack of adequate plunge pool depth. Downsetting of the culvert would minimize the outlets structure drop and may decrease gradients through the culvert. Many culvert 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 4 occurrences of falls and 1 cascade 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: general road crossings, subsurface flows, beaver dams, a small woody debris barrier and a landslide/bank slumping. Table 4 provides an overview of features identified throughout the watershed.

Table 4. Features Identified in the Cheslatta Watershed

Agency	Local Name	ILP	Reach	Type	Height (m)	Comment
Ecofor	Unnamed	62096	1	BG	Na	Creek runs along the road
Ecofor	Unnamed	63007	2	CV	0.6	80 cm drop at culvert outlet
Ecofor	Unnamed	63061	1	CV	0.6	Drop at road crossing
Ecofor	Unnamed	63086	2	CV	0.6	Culvert with algae
Ecofor	Unnamed	63105	1	CV	0.6	Dry culvert
Ecofor	Unnamed	63139	5	FSB	0.5	Grass swamp
Triton	Unnamed	66029	2	CV	0.6	Culvert
Ecofor	Unnamed	72060	1	LS	1.5	Bank slumping

Ecofor	Unnamed	72060	3	BD	3	10 m upstream of reach break
Ecofor	Unnamed	72060	11	CV	0.6	Culvert
Ecofor	Unnamed	72060	11	NS	0.8	Small Woody Debris barrier
Ecofor	Unnamed	73001	17	CV	1.2	Culvert with a 40 cm drop at outfall
Ecofor	Unnamed	73003	1	LS	30	Bank slumping
Ecofor	Unnamed	73006	2	CV	1.8	Culvert with a 10 cm drop at outfall.
Ecofor	Unnamed	73015	2	CV	8	Bank failure (mass wasting)
Ecofor	Unnamed	73021	1	CV	1	Culvert

Agency	Local Name	ILP	Reach	Type	Height (m)	Comment
Ecofor	Unnamed	74029	3	F	20	Waterfall
Ecofor	Unnamed	75004	3	CV	1.2	Culvert
Ecofor	Unnamed	75007	1	CV	1	Culvert
Triton	Unnamed	65001	1	BD	2	Beaver dam partially blocks fish passage.
Triton	Unnamed	73015	2	F	11	Falls are a barrier to fish migration.
Triton	Unnamed	73003	1	C	4	Cascades are a barrier to upstream fish migration.
Triton	Unnamed	75004	2	C	0.8	Cascades and step pool morphology. Not a barrier to upstream fish migration.
Triton	Unnamed	75004	6	CV	0.4	Culvert well placed for fish passage
Triton	Unnamed	75004	5	F	4	Falls are a barrier to upstream fish migration.
Triton	Unnamed	74025	1	F	1.5	Falls are a barrier to upstream fish migration.
Triton	Unnamed	74018	1	F	15	Falls are a barrier to upstream fish migration

F= falls, CV= culvert, C= cascade, BD= beaver dam, LS= landslide/bank slumping, BG= general crossing, NS= not specified , FSB= subsurface flow Additional sampling sites are shaded grey.

5.4.7 Additional Sampling Recommendations

Thirty-two (32) of 70 sample sites were identified for additional or follow-up sampling in the 1998 inventory area. A summary of stream reaches recommended for follow-up sampling is presented in Table 5. In general, follow-up sampling was recommended for reaches where fish were not captured and:

- Low flows 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-one (21) reaches were strategically sampled during the additional sampling program (1999). These additional sampling sites addressed 22 of the 32 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 additional sampling 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 Cheslatta 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 6 reaches within the Cheslatta inventory area. The results of the additional sampling program have been incorporated into the fish bearing by default table, non fish bearing table and the stream sampling summary. These sites have been highlighted in grey within these respective tables.

5.4.9 Non-Fish Bearing Status

Non-fish bearing status was assigned to 64 of the 91 sample sites within the Cheslatta Inventory area. Thirteen (13) additional sampling sites were given a non fish bearing status and are highlighted in grey in the non fish bearing table. A summary of non-fish bearing reaches is provided in Table 6. Non-fish bearing status was assigned to reaches where:

- The stream was assessed as non-visible channel;
- The stream was inaccessible from a mainstem fish bearing stream or Cheslatta Lake 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

Presented in Table 7 are the streams sampled in the Cheslatta inventory area that were defined as fish bearing by default. Five (5) additional sampling sites (1999) were identified as being fish bearing by default and are shaded grey in the following table.
That is, fish were not captured during the inventory but they were described as fish streams for the purposes of forest development planning. Habitat parameters, an absence of upstream migration barriers, and intermittent or ephemeral flow regimes indicate that habitats are utilized for at least a portion of the year.

Table 7. Fish bearing by default table

Agency	Site #	ILP #	Reach #	Trim #	Comments
Triton	3	66029	2	93F066	No barriers to upstream fish migration were identified and upstream lake has not been adequately sampled. Fish bearing based on access
Triton	4	66029	3	93F066	No barriers to upstream fish migration were identified and upstream lake has not been adequately sampled. Fish bearing based on access
Ecofor	507	65013	1	93F065	Additional sampling identified no barriers to upstream fish migration. Fish stream based on access
Ecofor	508	65014	1	93F065	Additional sampling identified no barriers to upstream fish migration. Fish stream based on access
Ecofor	524	62096	1	93F062	Poor spawning and rearing habitat. Fish stream based on access.
Ecofor	581	75007	1	93F075	Good rearing and poor spawning habitat. Fish stream by default. Fish access to this reach is possible.
Ecofor	583	64171	3	93F064	No barriers to upstream fish migration were identified. Fish stream based on access.
Ecofor	588	63139	5	93F064	Good rearing habitat at lake inlet. Poor spawning habitat. Additional sampling in Reach 3 indicates there is possibly connection to fish bearing waters. This reach is fish bearing until the downstream lake in Reach 4 has been adequately sampled.
Ecofor	609	74018	1	93F074	Lower 100 m offers some fish habitat and can be classified as fish bearing based on access.
Ecofor	610	74023	2	93F074	Good spawning and rearing habitat. Additional sampling to be completed at the

					discretion of Fraser Lake Sawmills.
Ecofor	628	72060	3	93F072	Fish captured upstream in Reach 11.

Agency	Site #	ILP #	Reach #	Trim #	Comments
Triton	724	63139	3	93F063	Fish may be present in the lake immediately upstream. This reach can be classified as fish bearing until the upstream lake has been adequately sampled.
Triton	821	64171	1	93F064	Poor spawning, fair rearing, and no overwintering habitat. No barriers to upstream fish migration were identified. Fish stream based on access.
Triton	823	74027	1	93F074	The lower 100 m can be classified as a fish stream based on access.
Triton	825	74018	1	93F074	Poor rearing, no spawning, and no overwintering habitat. Lower 100 m offers some fish habitat and can be classified as fish bearing based on access.
Triton	832	66029	1	93F066	Limited rearing habitat, poor spawning habitat, and no overwintering habitat. No barriers to upstream fish migration were identified and upstream lake has not been adequately sampled. Fish bearing based on access

Additional sampling sites are shaded grey

6.0 STREAM CLASSIFICATION SUMMARY

A summary of stream inventory information for the Cheslatta inventory area, along with a FPC stream classification is presented in Table 8.

Table 8 provides a summary of stream inventory information collected during the project.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	1	66028	1	June 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Triton	2	66027	2	June 98	Na	Na	2	Na	Na	No visible channel. Not a stream.
Triton	832	66029	1	July 99	1.23	3.5	2	None	S4*	Limited rearing habitat, poor spawning habitat, and no overwintering habitat. No barriers to upstream fish migration were identified and upstream lake has not been adequately sampled. Fish bearing based on access.
Triton	3	66029	2	June 98	1.23	6	2	None	S4*	No barriers to upstream fish migration were identified and upstream lake has not been adequately sampled. Fish bearing based on access
Triton	4	66029	3	June 98	1.2	10	2	None	S4*	No barriers to upstream fish migration were identified and upstream lake has not been adequately sampled. Fish bearing based on access
Triton	721	65012	1	July 99	1.27	4.3	3	RB	S4	Good spawning habitat. Limited rearing and overwintering habitat.
Ecofor	507	65013	1	July 98	1.14	5.3	2	None	S4*	Additional sampling identified no barriers to upstream fish migration. Fish stream based on access

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	32	65032	1	July 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Triton	90	65018	2	July 98	0.45	19.5	1	None	S6	Cascades and bedrock chutes limit access to this reach. Ephemeral stream.
Triton	223	65035	5	July 98	0.26	2.5	1	None	S6	Poor fish habitat. Channel is hard to distinguish. No connectivity to fish bearing water. Ephemeral Stream.
Ecofor	508	65014	1	July 98	0.91	4	2	None	S4*	Additional sampling identified no barriers to upstream fish migration. Fish stream based on access
Ecofor	511	64076	1	July 98	0.49	3.5	1	None	S6	Falls (4 m) in downstream ILP 75004 Reach 5 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 indicate that the portion of stream above the falls is non fish bearing
Triton	820	64076	1	July 99	0.49	3.5	1	None	S6	No spawning or overwintering habitat. Poor rearing habitat. Falls (4 m) in downstream ILP 75004 Reach 5 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 indicate that the portion of stream above the falls is non fish bearing.
Ecofor	512	64077	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	822	75004	5	July 99	1.57	8	2	RB	S3/S6	Falls (4 m) prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 indicate that the portion of stream above the falls is non fish bearing.
Ecofor	513	75004	6	July 98	1.31	2.7	2	None	S6	Excellent rearing habitat. Falls (4 m) in Reach 5 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 indicate that the portion of stream above the falls is non fish bearing
Triton	819	75004	6	July 99	0.93	1.6	2	None	S6	Excellent rearing habitat. Falls (4 m) in Reach 5 prevent upstream fish migration. Adequate sampling above the falls in 1998 and 1999 indicate that the portion of stream above the falls is non fish bearing
Ecofor	514	64060	1	July 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	516	63007	8	July 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	517	63007	2	July 98	1.23	3.8	3	None	S6	Additional sampling identified a cascade (4 m) in downstream ILP 73003 Reach 1 which is a barrier to upstream fish migration. Fish were captured easily below the cascade and adequate sampling above the cascade indicates that the portion of stream above the cascade is non fish bearing.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Ecofor	518	73001	17	August 98	2.47	3	2	None	S6	Third pass sampling indicates this is a non fish bearing reach. Good fish habitat and no overwintering habitat. Lack of fish presence suggests a downstream barrier
Triton	729	73001	17	July 99	2.78	13	2	None	S6	Third pass sampling indicates this is a non fish bearing reach. Good fish habitat and no overwintering habitat. Lack of fish presence suggests a downstream barrier
Ecofor	519	73021	1	July 98	0.96	4.7	1	None	S6	Poor spawning and rearing habitat. Falls (11 m) in downstream ILP 73015 Reach 2 prevent upstream fish migration. Adequate sampling above the falls in 1998 and in 1999 confirm that the portion of stream above the falls is non fish bearing
Ecofor	520	73016	1	July 98	0.63	13.3	1	None	S6	Poor spawning and rearing habitat. Falls (11 m) in downstream ILP 73015 Reach 2 prevent upstream fish migration. Adequate sampling above the falls in 1998 and in 1999 confirm that the portion of stream above the falls is non fish bearing.
Ecofor	521	73015	2	July 98	3.3	3.8	4	None	S5	Additional sampling identified 11 m falls which are a barrier to upstream fish migration. Adequate sampling above the falls in 1998 and in 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	727	73015	2	July 99	5.93	5.75	4	RB	S2/S5	Falls (11 m) prevent upstream fish migration. Adequate sampling above the falls in 1998 and in 1999 confirm that the portion of stream above the falls is non fish bearing.
Ecofor	522	73011	1	July 98	Na	Na	2	Na	Na	No visible channel. Not a stream.
Ecofor	523	74014	2	July 98	0.47	2.5	1	None	S6	Poor spawning and rearing habitat. Second pass sampling and falls (11 m) in downstream ILP 73015 Reach 2 prevent upstream fish migration. Adequate sampling above the falls in 1998 and in 1999 confirm that the portion of stream above the falls is non fish bearing.
Triton	826	74014	1	July 99	0.45	11	1	None	S6	This stream is non fish bearing based on second pass sampling and falls (11 m) in downstream ILP 73015 Reach 2 which prevent upstream fish migration. Adequate sampling above the falls in 1998 and in 1999 confirm that the portion of stream above the falls is non fish bearing.
Ecofor	524	62096	1	July 98	0.33	2	1	None	S4*	Poor spawning and rearing habitat. Fish stream based on access.
Ecofor	525	62094	2	July 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	530	63054	1	July 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	531	63052	1	July 98	.41	2	1	None	S6	Not a fish stream. Vegetated channel, ephemeral stream.
Ecofor	532	63051	1	July 98	Na	Na	2	Na	Na	No visible channel. Not a stream.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Ecofor	533	63139	2	July 98	1.33	1	1	RB	S4	Good rearing and poor spawning habitat
Ecofor	536	63078	1	August 98	0.5	2.3	1	None	S6	Poor spawning and rearing habitat. Second pass sampling indicates this stream is non fish bearing
Triton	723	63078	1	July 99	0.3	13.8	1	None	S6	No spawning, rearing or overwintering habitat. Vascular plants in channel, isolated pools. Second pass sampling indicates this stream is non fish bearing.
Ecofor	537	63061	1	August 98	0.54	28.5	1	1	S6	Gradient too high to allow fish passage. Poor spawning and rearing habitat
Ecofor	538	63084	1	August 98	Na	Na	2	Na	Na	No visible channel. Not a stream.
Ecofor	539	63105	1	August 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	540	73006	3	August 98	2.53	2.3	3	RB	S3	Excellent rearing and adequate spawning habitat
Ecofor	541	63086	2	August 98	0.6	3.8	1	None	S6	Poor rearing and spawning. Additional sampling confirms that this reach is non fish bearing.
Triton	726	63086	2	July 99	1.35	8	1	None	S6	Limited spawning, rearing and no overwintering habitat. Subsurface flows and no connectivity to fish bearing water. Additional sampling confirms that this reach is non fish bearing.
Ecofor	550	62083	2	August 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	551	73003	15	August 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	823	74027	1	July 99	0.48	8	2	None	S4*/S6	The lower 100 m offers some limited spawning habitat. The portion of stream above the lower 100 m offers no spawning, rearing, or overwintering habitat. Subsurface flows present within reach. The lower 100 m can be classified as a fish stream based on access. The portion of stream above that point is non fish bearing based on habitat and second pass sampling.
Ecofor	552	74027	5	August 98	0.7	14.3	1	None	S6	Poor spawning and rearing habitat. Additional sampling in Reach 1 confirms non fish bearing status
Ecofor	557	74029	3	August 98	1.89	6.3	1	None	S6	Potential rearing habitat but limited due to seasonal barriers at low flows. Falls (20 m) prevents upstream fish migration. Non fish bearing above falls.
Ecofor	558	74030	1	August 98	0.4	6.5	1	None	S6*	Potential rearing habitat and poor spawning habitat. Additional sampling to confirm non fish bearing status to be completed at the discretion of Fraser Lake Sawmills
Ecofor	564	73010	1	August 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	565	73008	1	August 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	566	73006	2	August 98	2.56	2	3	RB	S3	Good rearing and spawning habitat
Ecofor	580	75004	3	August 98	1.9	2	3	RB	S3	Excellent rearing and spawning habitat
Ecofor	581	75007	1	August 98	0.77	2.3	1	None	S4*	Good rearing and poor spawning habitat

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Ecofor	582	74031	1	August 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Triton	821	64171	1	July 99	1.79	10	2	None	S3*	Poor spawning, fair rearing, and no overwintering habitat. No barriers to upstream fish migration were identified. Fish stream based on access.
Ecofor	583	64171	3	August 98	0.86	2.5	1	None	S4*	No barriers to upstream fish migration were identified. Fish stream based on access.
Ecofor	584	74029	4	August 98	0.69	1	1	None	S6	Good rearing and poor spawning habitat. Falls (20 m) in Reach 3 prevents upstream fish migration. Non fish bearing above falls.
Ecofor	586	63055	2	August 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	587	63052	2	August 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Triton	724	63139	3	July 99	Na	Na	1	Na	Na	No visible channel. Stream flows through a vegetated wetland. There is no stream channel. Fish may be present in the lake immediately upstream. This reach can be classified as fish bearing until the upstream lake has been adequately sampled.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Ecofor	588	63139	5	August 98	0.57	2	1	None	S4*	Good rearing habitat at lake inlet. Poor spawning habitat. Additional sampling in Reach 3 indicates there is possibly connection to fish bearing waters. This reach is fish bearing until the downstream lake in Reach 4 has been adequately sampled.
Ecofor	592	72060	11	August 98	1.63	2	2	None	S3	Adequate rearing and poor spawning habitat. Additional sampling identified rainbow trout being present within this reach.
Triton	730	72060	11	July 99	1.63	4.25	2	RB	S3	Good spawning and rearing habitat. Overwintering habitat is poor.
Ecofor	607	73026	1	August 98	Na	Na	2	Na	Na	No visible channel. Not a stream.
Ecofor	608	74004	2	August 98	Na	Na	2	Na	Na	No visible channel. Not a stream.
Ecofor	609	74018	1	August 98	0.8	4	2	None	S4*/S6	Poor spawning habitat and potential rearing habitat when water is present. Additional sampling identified falls (15 m) and gradient which prevents upstream fish migration. The portion of stream above the lower 100 m is non fish bearing.

Agency	Site	ILP	Reach	Sampling Date	Width (m)	Gradient (%)	Order	Species	Stream Class	Comments
Triton	825	74018	1	July 99	1.49	19.5	2	None	S4*/S6	Poor rearing, no spawning, and no overwintering habitat. Lower 100 m offers some fish habitat and can be classified as fish bearing based on access. Falls (15 m) and gradient prevent upstream fish migration. The portion of stream above the lower 100 m is non fish bearing.
Ecofor	610	74023	2	August 98	2.71	4.3	3	None	S3*	Good spawning and rearing habitat. Additional sampling to be completed at the discretion of Fraser Lake Sawmills
Triton	824	74025	1	July 99	1.55	9.3	1	None	S6	Falls (1.5 m) at lakeshore prevent upstream fish migration. Additional sampling above the falls indicate this stream is non fish bearing.
Ecofor	611	74025	2	August 98	2.29	7.5	1	None	S6	Good spawning and rearing habitat when water present. Falls (1.5 m) at lakeshore (Reach 1) prevent upstream fish migration. Additional sampling above the falls indicate this stream is non fish bearing.
Ecofor	613	75002	1	August 98	0.93	7.3	2	None	S6	Poor spawning and rearing habitat. Additional sampling indicates this is a non fish bearing stream
Triton	828	75002	1	July 99	0.53	8	2	None	S6	No spawning, rearing or overwintering habitat. Subsurface flows, isolated pools, and a 15% gradient at lakeshore. Additional sampling indicates this is a non fish bearing stream
Agency	**Site**	**ILP**	**Reach**	**Sampling**	**Width**	**Gradient**	**Order**	**Species**	**Stream**	**Comments**

				Date	(m)	(%)			Class	
Ecofor	614	75002	2	August 98	1.09	6.3	1	None	S6	Poor spawning and rearing habitat. Additional sampling indicates a non fish bearing stream
Ecofor	616	62066	1	August 98	Na	Na	2	Na	Na	No visible channel. Not a stream.
Ecofor	617	72060	1	August 98	1.89	3	4	RB	S3	Good habitat for rearing and spawning. Fish visually observed in isolated pools
Ecofor	618	73003	1	August 98	2.03	3.3	3	None	S3/S5	Potentially good spawning and rearing habitat when water is present. Additional sampling identified a cascade (4 m) which is a barrier to upstream fish migration. Fish were captured below the cascade and adequate sampling above the cascade indicates that the portion of stream above the cascade is non fish bearing.
Triton	728	73003	1	July 99	4.93	7.25	3	RSC, RB, NSC	S3/S5	A cascade (4 m) is a barrier to upstream fish migration. Fish were captured easily below the cascade and adequate sampling above the cascade indicates that the portion of stream above the cascade is non fish bearing.
Ecofor	619	73004	1	August 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Triton	827	75001	1	July 99	0.35	5.25	1	None	S6	No spawning, rearing, or overwintering habitat. Subsurface flows and vegetated channel. Ephemeral stream. Additional sampling indicates this stream is non fish bearing.
Ecofor	620	75001	3	October 98	0.62	5.5	1	None	S6	Poor to no spawning and rearing habitat. Additional sampling in Reach 1 indicates this stream is non fish bearing.
Agency	**Site**	**ILP**	**Reach**	**Sampling**	**Width**	**Gradient**	**Order**	**Species**	**Stream**	**Comments**

				Date	(m)	(%)			Class	
Ecofor	621	75004	2	October 98	2.52	8	3	RB	S3	Good rearing and spawning habitat.
Triton	731	75004	2	July 99	4.9	9.8	3	RB	S3	Good rearing, spawning and overwintering habitat.
Ecofor	622	75005	1	October 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	623	62066	11	October 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	624	62069	2	October 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	625	62078	1	October 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	626	62092	1	October 98	Na	Na	2	Na	Na	No visible channel. Not a stream.
Ecofor	627	63021	1	October 98	Na	Na	1	Na	Na	No visible channel. Not a stream.
Ecofor	628	72060	3	October 98	1.52	4.5	4	None	S3*	Good rearing and good spawning habitat. Fish captured upstream in Reach 11
Ecofor	629	73003	8	October 98	1.73	4.3	2	None	S6	Moderate spawning and rearing habitat. Poor overwintering habitat. Additional sampling identified a cascade (4 m) in Reach 1 which is a barrier to upstream fish migration. Adequate sampling above the cascade indicates that the portion of stream above the cascade is non fish bearing.
Triton	720	65001	1	July 99	3.13	4.3	3	RB	S3	Good spawning and rearing habitat. Marginal overwintering habitat present.

* Inferred fish bearing status

7.0 REFERENCES

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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

Deliverable Product	Received	Approved (QA)
Site Cards		
Fish Collection Forms and Individual Fish Data Forms		

Activity Log

Date	Activity	Time Spent
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 discrepencies 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

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

Activity Log

Date	Activity	Time Spent
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.

Sub-basin:	Total Number of Reaches Sampled within:	Number of Reaches within/ near* cutblocks	Number of Reaches Recommended for Follow-up Sampling
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

Deliverable Product 1:20K Inventory	Received	Approved (QA)
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

Date	Activity	Time Spent
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 unforseen 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

Deliverable Product 1:20K Inventory	Received	Approved (QA)
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

Date	Activity
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 unforseen 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

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

Activity Log

Date	Activity
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 co-ordination 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 discrepencies 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 Co-ordinator, 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 priortized operational needs areas as follows (Table 1):

Table 1. Sample Site Summary by Inventory Area.

Inventory Area	Total No. of Reaches	Number of Reaches to be Sampled	Percent of Inventory Area Reaches Sampled	Number of Reaches Next to FLSM Cutblocks	Percent of FLSM Biased Reaches
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.