

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

WSC 180-792700 to 180-734300

Prepared for:

**Fraser Lake Sawmills
A Division of West Fraser Ltd.
PO Box 100
Fraser Lake, BC
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January 2000

Prepared by:



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
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:	Nechako Reservoir System
Watershed Name:	Upper Nechako Reservoir System
Watershed Code:	180-792700 – 180-734300
Watershed Area:	32 144.8 ha
Total of All Stream Lengths:	153 178.1 m
NTS Map:	93F/12, 93F/13, 93E/09
TRIM Map:	93F.061, 93F.071, 93E.080, 93E070
BGC Zone:	SBS/ESSF
Air Photos:	30BCC96122 #60-62 #151-155 30BCC96099 #15-21 #106-110 30BCC96156 #170-175 30BC89047 #89-100 30BC89040 #127-143 #165-178
Air Photos cont:	30BC89032 #125-132 #161-170 #252-266

Sampling Design Summary

Total Number of Reaches:	492
Random Sampling Sites:	1
Discretionary Sample Sites:	59
Additional Sampling Sites:	9
Total Sample Sites:	69
Field Sampling Dates:	July 5 - 16, 1998
Additional Sampling Dates :	July 7 - 8, 1999

Contractor Information

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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

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	⇒ 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. Inventory Maps
3. Distribution Maps
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 Upper Nechako Reservoir Watershed Group. The area of inventory included tributaries to Ootsa Lake which lies 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 Upper Nechako Reservoir 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. 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 study area is located approximately 130 km (by road) south west of the town of Fraser Lake, BC. The Upper 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 for the lower elevation sites and Englemann Spruce Subalpine Fir for the upslope sites (Meidinger and Pojar, 1991).



Scale 1: 732 000 (approximate)

Figure 1. Upper Nechako Inventory Area Location Map

2.1.1 Access

Directions to Upper Nechako Watershed from Fraser Lakes Sawmills (Fraser Lake, BC) 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. 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 the Upper White Eye drainage. The barge landing is approximately 200 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 Mainline. Permission is required from Fraser Lakes Sawmills to travel on the Ootsa lake barge.
- Drive 2 km west on the Chelaslie Mainline.
- Turn right onto a mainline that runs northwest parallel to Ootsa Lake. Drive 10 km on this road into the Upper Nechako Reservoir Watershed Group. Spur roads on the left and on the right sides of the mainline can be used to access streams systems within the watershed.

3.0 RESOURCE INFORMATION

Background information specific to the Upper 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 Upper Nechako area.

1. First Nations which have issues, interests and claims within the Watershed Group (not specifically to the Upper Nechako area) 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 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 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.

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 Upper 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. Field sampling was completed in the Upper Nechako inventory area between July 5th and July 16th 1998 and additional sampling was completed between July 7th and July 8th 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 Section 5.4.6 Additional Sampling and the following tables:

- Table 4. Features Identified in the Upper Nechako Inventory Area.
- Table 7. Non Fish Bearing Reaches in the Upper Nechako Inventory Area.
- Table 8. Stream Sampling Summary

Information presented in the above tables has been shaded gray for easy reference.

5.1 Existing Information

Background and existing information for streams included in the Upper Nechako inventory area was limited. FISS (1995) data indicated several major tributaries to Ootsa Lake that sustain rainbow trout (*Oncorhynchus mykiss*). Stream classification conducted in 1996 by Fraser Lake Sawmills indicated that rainbow trout, white sucker (*Catostomus commersoni*), lake chub (*Couesius plumbeus*), and longnose sucker (*Catostomus catostomus*) were present in some small stream systems in the study area (Tripp, 1996). Anecdotal information (Tom Olafson, FLSM, pers. comm.) and historic lake and stream file information (Paul Giroux, FIS, MELP Smithers, pers. comm.) identified the presence of rainbow trout in several unnamed tributaries to the Upper Nechako inventory area.

5.2 Survey Information

Table 1 provides an overview of the survey information compiled during the inventory.

Table 1. Summary of Survey Information

Major Watershed Codes	180-770900, 180-770400 180-753000, 180-748400 180-738300, 180-756006 180-755900, 180-763500
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Watershed Name	Upper Nechako
TRIM Maps:	93F.061 93F.071 93E.070 93E.080
Total Number of Lakes:	23
Total Stream Length:	153 178.1m
Total Number of Reaches:	492
Stream Field Sampling Dates:	July 5-16, 1998
Additional Sampling Dates:	July 7-8, 1999
Number of Reaches/Sites Sampled:	69

Table 1 cont.

Fish Capture Summary:			
Stream Name	Stream Identifier (WSC/ILP)	Reach #	Species
Unnamed	61012	2	RB
Unnamed	61013	3	RB
Unnamed	61036	2	RB
Unnamed	61073	1	RB
Unnamed	61073	3	RB
Unnamed	61105	4	NSC
Unnamed	80010	1	RB
Unnamed	80010	2	RB
Unnamed	80013	3	RB
Unnamed	80013	4	RB

Note: RB = rainbow trout, NSC= northern squawfish

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.

Photo Documentation 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 the FLSM Ootsa Camp, Vanderhoof, or “fly” camp on the Chelaslie River. Drive sites were generally accessed via FLSM’s Ootsa Lake Barge and the Chelaslie Mainline. Helicopter sites included those areas that were not accessible by 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

Rainbow trout or northern squawfish (*Ptychocheilus oregonensis*) were captured in 10 of 60 sample locations. The following table (Table 2) provides a summary of fish captured during the inventory.

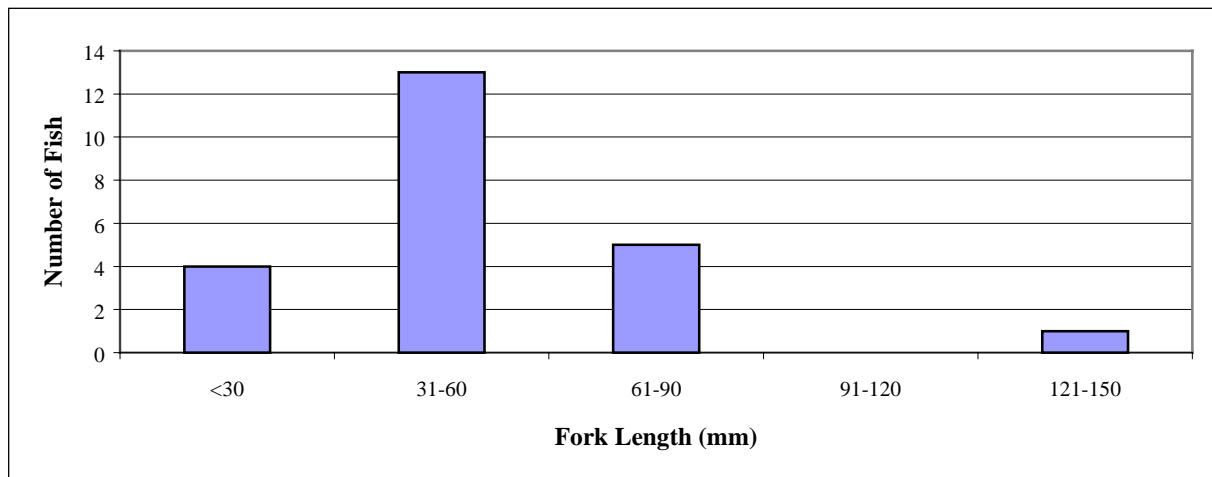
Table 2. Summary of Fish Captured in the Upper Nechako Inventory Area

Stream Name	ILP	Reach	Channel Width (m)	Gradient (%)	Order	Species	Life Stage	Total Number	Mean Length (mm)
Unnamed	61012	2	2.73	4.5	4	RB	Fry	3	19
Unnamed	61012	2	2.73	4.5	4	RB	Juvenile	4	60.5
Unnamed	61012	2	2.73	4.5	4	RB	Adult	4	97.5
Unnamed	61013	3	2.1	5	3	RB	Juvenile	1	60
Unnamed	61036	2	2.83	7	3	RB	Juvenile	1	50
Unnamed	61073	1	3.08	7.5	3	RB	Juvenile	3	55
Unnamed	61073	3	2.92	5	2	RB	Juvenile	1	40
Unnamed	61105	4	1.33	4.5	2	NSC	Juvenile	1	50
Unnamed	80010	1	5.43	5	3	RB	Juvenile	2	40
Unnamed	80010	2	2.42	5	3	RB	Juvenile	1	40
Unnamed	80013	3	2.28	5	2	RB	Juvenile	1	50
Unnamed	80013	4	1.23	5	2	RB	Juvenile	2	45

Note: RB= rainbow trout NSC= northern squawfish

The length-frequency distribution for rainbow trout captured in the Upper Nechako inventory area is presented in Figure 2.

Figure 2. Length frequency distribution for rainbow trout captured in the Upper 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 samples from rainbow trout were collected from three tributaries in the Upper Nechako inventory area and all fish (5) were aged at 0 + and 1 + years of age.

The stream locations where fish were captured can be characterized as being 2nd order or larger with channel widths greater than 1.2 m, and gradients less than 7.5 %. Many first order streams and stream reaches are heavily dependent on snowmelt and likely only contain water for a short period of the year. Many of these first order streams lack suitable fish habitat and are characterized by sections of intermittent flow.

Rainbow trout were captured in a 9 of the 10 fish bearing streams. The majority of the rainbow trout caught were captured in the lower reaches of the sampled streams. These fish are most likely using the lower reaches for spawning and rearing from Ootsa Lake. Many of the fish bearing streams sampled are unlikely to sustain sufficient flows throughout the season to support a resident population of rainbow trout. Northern squawfish were captured in one of the sampled streams. Stream ILP 80034 (Reach 1) was determined to be a fish stream even though no fish were captured. Reach 1 of ILP

80034 contained no barriers to upstream fish migration and fish may access this reach from Ootsa Lake during periods of increased flows.

5.4.3 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. Fish distribution was limited to 2nd order or higher stream reaches. The limiting factors for fish distribution in the system are 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 likely 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.

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.

5.4.4 Water Chemistry

Water samples taken from an unnamed fourth order tributary (ILP 61012) 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” 19th Edition, (1995) and 17th Edition (1989), published by the American Public Health Association.

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

Parameter Measured	Laboratory Test	Field Measurement
pH (pH units)	7.18	Range (5.6 – 8.2) Mean 7.29
Conductivity (uS/cm)	171	Range (30 – 150) Mean 63.1
Turbidity (NTU)	1.3	N/A
Temperature	N/A	Range (7 – 17) Mean 11.1
Total Dissolved Solids (mg/L)	126	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.

5.4.5 Features

Only one permanent barrier (20 m falls) to fish migration was observed during the 1998 inventory of the Upper Nechako Watershed inventory area. During the 1999 additional sampling program two permanent barriers were found (6 and 10 m falls). Many culverts were deemed as partial barriers to fish migration and are identified in Table 4. 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.

In many cases no fish were captured above or below the culverts, but based on gradients and the lack of physical barriers downstream many of these culvert were inferred barriers (inferred fish bearing streams).

Table 4. Features Identified in the Upper Nechako Inventory Area

Local Name	ILP	NID MAP	Reach	Type	Height (m)	Comment
Unnamed	61012	93F.061	9	CV	0.4	CV D/S side perched (downset)
Unnamed	61013	93F.061	3	CV	0.1	CV D/S side perched (downset)
Unnamed	61046	93F.061	1	CV	0.4	Downset to minimize drop (fall)
Unnamed	61068	93F.061	3	CV	0.4	C/V D/S sideperched (downset)
Unnamed	61073	93F.061	3	CV	1	Perched CV (downset)
Unnamed	61079	93F.061	2	F	20	Falls prevent U/S migration
Unnamed	71003	93E.071	12	CV	1.5	D/S side (oversized)
Unnamed	61045	93F.061	1	F	6	Falls at lake shore are a barrier to fish
Unnamed	61068	93F.061	1	F	10	Barrier to fish migration

CV= culvert F= falls U/S= upstream D/S= downstream (Shaded grey is 1999 additional sampling results only)

5.4.6 Fish bearing by default

One reach sampled in the Upper Nechako inventory area were defined as fish bearing by default. That is, fish were not captured during the inventory but the stream was described as a fish stream 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. Follow up sampling is not recommended for this site. The fish bearing by default reach associated with the Upper Nechako inventory is presented in Table 5.

Table 5. Fish bearing by default in the Upper Nechako inventory area.

Site #	ILP #	Reach #	Trim Map #	Comments
229	80034	1	93E.080	Poor habitat, INT., isolated pools, Fish may access stream from Ootsa Lake during periods of increased flows.

5.4.7 Additional Sampling Recommendations

Twenty-three (23) of the 60 sample sites were identified for additional or follow-up sampling in the inventory area. A summary of stream reaches recommended for follow-up sampling is presented in Table 6. 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. 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.

The additional sampling sites that were addressed in the 1999 additional sampling program have been identified with an asterisk(*) and shaded grey in Table 6.

5.4.8 Non-Fish Bearing Status

Non-fish bearing status was assigned to 26 of the 60 sample sites within the Upper Nechako Inventory Area. A summary of non-fish bearing reaches is provided in Table 7. Non-fish bearing status was assigned to reaches where:

- The stream was assessed as a non-visible channel;
- The stream was inaccessible from the mainstem or Ootsa 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.

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.

6.0 STREAM CLASSIFICATION SUMMARY

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

Table 8. Stream Sampling Summary (Shaded grey are 1999 additional sampling results only)

Site	ILP	Reach	Width (m)	Gradient (%)	Fish Sp.	Stream Class	Comments
37	80010	1	5.43	5	RB	S2	Fish captured with minimal effort.
38	80010	2	2.42	5	RB	S3	Good fish access upstream and downstream.
42	80013	3	2.28	5	RB	S3	None
43	80013	4	1.23	5	RB	S4	Fish found above falls and a small cascade.
294	61012	2	2.73	4.5	RB	S3	None
51	61013	3	2.1	5	RB	S3	Culvert is a partial fish barrier. Possible velocity and elevation barrier.
324	61040	2	1.45	6.5	None	S6	Highly ephemeral.
96	61073	1	3.08	7.5	RB	S3	Riparian area is harvested to the stream banks.
45	61073	3	2.92	3	RB	S3	Culvert may be a barrier to fish migration.
229	80034	1	0.53	3.5	None	S4	Fish may access this stream from Ootsa Lake during periods of high flow.
49	61036	2	2.83	7	RB	S3	Excellent fish habitat.
290	61010	2	Na	Na	None	Na	Not a stream. No visible channel.
50	61012	9	1.05	8.5	None	S6	No fish habitat present within this reach.
292	61021	3	Na	Na	None	Na	Not a stream. No visible channel.
289	61022	1	Na	Na	None	Na	Not a stream. No visible channel.
293	61022	2	Na	Na	None	Na	Not a stream. No visible channel.
298	61061	1	1.0	3.5	None	S6	Poor fish habitat and a deteriorating channel.
95	61065	4	Na	Na	None	Na	Not a stream. No visible channel.
306	61073	4	2.39	9.8	None	S3*	To be resampled at the discretion of Fraser Lake Sawmills.

Site	ILP	Reach	Width (m)	Gradient (%)	Fish Sp.	Stream Class	Comments
302	61073	6	1.40	9.5	None	S4*	To be resampled at the discretion of Fraser Lake Sawmills.
305	61079	2	1.48	7	None	S6	Falls prevent upstream migration to this reach.
304	61079	3	0.67	3.3	None	S6	Falls prevent upstream migration to this reach.
301	61082	2	0.90	7.5	None	S4*	To be resampled at the discretion of Fraser Lake Sawmills.
300	61082	3	Na	Na	None	Na	Not a stream. No visible channel.
44	61090	2	Na	Na	None	Na	Not a stream. No visible channel.
291	61008	1	0.67	4	None	S6	Dry vegetated channel dominated by fines.
106	70033	2	0.73	8.5	None	S6	No fish habitat present.
52	70035	1	Na	Na	None	Na	Not a stream. No visible channel
309	70044	2	0.93	5.3	None	S4*	To be resampled at the discretion of Fraser Lake Sawmills.
307	71003	16	0.60	9.5	None	S6	Poor habitat and gradient prevents fish access to this reach
308	71003	17	0.71	3	None	S6	Poor fish habitat, low flows and a gradient barrier downstream.
101	71010	1	Na	Na	None	Na	Not a stream. No visible channel
105	80003	5	1.2	11	None	S4*	To be resampled at the discretion of Fraser Lake Sawmills.
53	80008	2	Na	Na	None	Na	Not a stream. No visible channel
104	80010	10	1.33	11	None	S4*	To be resampled at the discretion of Fraser Lake Sawmills.
39	80011	4	Na	Na	None	Na	Not a stream. No Visible Channel.
41	80012	1	0.57	5	None	S6	No fish habitat.
235	80015	1	0.33	4	None	S6	Poor fish habitat. Isolated pools of standing water with anaerobic conditions.
234	80015	2	0.47	4.5	None	S6	Poor fish habitat. No access to this reach.
233	80019	6	Na	Na	None	Na	Not a stream. No visible channel
40	80020	2	0.98	5	None	S6*	Second pass sampling downstream resulted in a non fish bearing classification (see site #809).

Site	ILP	Reach	Width (m)	Gradient (%)	Fish Sp.	Stream Class	Comments
809	80020	1	1.54	4	None	S6	Second pass sampling. Channel has discontinuous sections and lacks connectivity. No overwintering habitat and fair spawning and rearing.
231	80029	2	0.44	10.5	None	S6	No fish habitat.
48	61045	3	2.62	5	None	S6	Non fish bearing based on downstream barrier (see site #804)
296	61045	5	1.95	8.5	None	S6	Non fish bearing based on downstream barrier (see site #804)
299	61045	9	1.31	4	None	S6	No fish habitat and downstream gradient prevents access to this reach.
47	61046	1	1	5	None	S6	Non fish bearing based on downstream barrier (see site #804)
94	61046	5	1.44	6.5	None	S6	Non fish bearing based on downstream barrier (see site #804)
297	61058	2	0.83	4.5	None	S6	Non fish bearing based on downstream barrier (see site #804)
295	61060	2	0.84	6.5	None	S6	Non fish bearing based on downstream barrier (see site #804)
804	61045	1	2.81	3.75	None	S6	Non fish bearing based on barrier (6 m falls).
805	61046	1	1.42	4	None	S6	Non fish bearing based on downstream barrier (see site #804)
46	61068	3	0.71	5	None	S6	Non fish bearing based on downstream barrier (see site #806)
806	61068	1	1.13	6.75	None	S4*/S6	Non fish bearing based 10 m falls. Inferred fish bearing below falls.
54	70034	3	0.75	5.5	None	S6	Non fish bearing based on second pass sampling (see site 802)
802	70034	1	1.26	2.63	None	S6	Second pass sampling. Limited habitat was extensively electroshocked. Poor rearing and spawning with no overwintering habitats.
102	70041	3	0.98	8	None	S4*	To be resampled at the discretion of Fraser Lake Sawmills.
103	70042	1	0.86	7.5	None	S4*	To be resampled at the discretion of Fraser Lake Sawmills.

Site	ILP	Reach	Width (m)	Gradient (%)	Fish Sp.	Stream Class	Comments
100	71003	12	0.95	5	None	S6	Non fish bearing based on second pass sampling (see site #803)
803	71003	7	1.56	3.38	None	S6	Second pass sampling in best available habitat. Poor spawning and rearing with no overwintering habitats present.
310	80016	3	0.74	7.3	None	S6	Second pass sampling. No fish habitat (values) present (see site #801)
801	80016	1	0.65	1.38	None	S6	Second pass sampling. No fish habitat values present. Terrestrial vegetation growing in channel.
232	80032	4	0.77	11.5	None	S6	Second pass sampling. Downstream reach was electroshocked extensively with no fish captured (see site #707).
230	80036	8	1.22	4	None	S6	Second pass sampling. Downstream reach was electroshocked extensively with no fish captured (see site #707).
707	80036	8	2.48	7.5	None	S6	Second pass sampling. Stream was electroshocked extensively. Possible downstream barrier.
287	61007	3	0.9	3.5	None	S6	Second pass sampling confirms non fish presence (see site #708)
288	61007	4	0.65	4	None	S6	Second pass sampling confirms non fish presence (see site #708)
708	61007	1	0.47	2.50	None	S6	Second pass sampling EF and MT (overnight). Stream is highly ephemeral, has braided sections and limited habitat quality.
99	61105	4	1.33	4.50	NSC	S4	Northern Pike Minnow captured (fish bearing based on access).

RB=Rainbow Trout NSC=Northern Pike Minnow *Inferred Fish Bearing Status

7.0 REFERENCES

- Anonymous. 1995a.** Fisheries Information Summary System: Data Compilation and Mapping Procedures. British Columbia Ministry of Environment, Lands and Parks, and Department of Fisheries and Oceans.
- Anonymous. 1995b.** 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. 1995c.** Riparian Management Area Guidebook. Forest Practices Code Guidebook. British Columbia Ministry of Forests.
- Anonymous. 1998.** Reconnaissance (1:20 000) Fish and Fish Habitat Inventory. British Columbia Ministry of Environment, Lands and Parks.
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- 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.

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

<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.

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.