
FRBC RESOURCE INVENTORY PROGRAM

**Reconnaissance (1:20,000 Scale)
Fish and Fish Habitat Inventory in
the Houston Tommy Creek
Watershed**

WSC: 460-600600-17000



TRITON
Environmental Consultants Ltd.

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Watershed**

WSC: 460-600600-17000

Prepared for:

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Prepared by:

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June 1998



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Environmental Consultants Ltd.

Project Reference Information

FDIS Project Number:	06-BABL-3085-0001-1998
MELP Project or Contract Number:	CSK-3085
FRBC Project Number:	SB97063-IN
Name of subcontractors:	n/a
Project Manager:	Scott Northrup, R.P.Bio.
Field crew:	T. Walker, D. Lawes, E. Nyhof, S.Toth
Data entry by:	Tina Walker, David Lawes
Report prepared by:	Tina Walker
Report edited by:	Scott Northrup, R.P.Bio.
GIS analysis by:	Western Geographic Information Systems
Voucher species ID:	Gordon Haas
Water analysis by:	n/a
Fish aging by:	n/a

Watershed Information

Watershed Name:	Houston Tommy Creek
Watershed Code:	460-600600-17000
UTM at Mouth:	9.639780.6016570
Watershed Area:	26,792 ha (approx.)
Total Stream Length:	420 km
Stream Order:	5
NTS Map No.'s:	93L/6; 93L/7
TRIM Map No.'s.:	93L.025; 93L.026; 93L.035; 93L.036; 93L.045
Biogeoclimatic Zone:	SBS, ESSF, Atc

Sampling Design Summary

Total Number of Reaches:	649
Total Sample Sites:	72
Random Sample Sites:	52
Discretionary Sites:	20
Field Sampling Dates:	September 11-18, 1997
Fish Species Captured During Survey:	DV, RB
Fish Species Present in Watershed:	CO, DV, PK, RB, ST

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.

Acknowledgements

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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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) was retained by Northwood Pulp and Timber Ltd. (Northwood) to conduct a Reconnaissance (1:20 000 scale) Fish and Fish Habitat Stream Inventory (inventory) in the Houston Tommy Creek watershed. The project was part of a larger inventory of three areas managed by Northwood in the Morice Timber Supply Area (TSA). The area of inventory included the Houston Tommy Creek watershed and an unnamed Morice River tributary to the west of the Houston Tommy Creek/Morice River confluence.

The project was funded by a Forest Renewal of British Columbia (FRBC) initiative to describe watershed-wide fish distribution and habitat characteristics for major watershed groups within the province of British Columbia. The inventory was intended to provide information regarding fish species characteristics, distributions and relative abundance, as well as stream reach biophysical data for interpretation of habitat sensitivity and capability for fish production (Anonymous 1997b). The results of the inventory may be applied to initial Riparian Management Area (RMA) classification for forest development planning and watershed restoration and for the establishment of some landscape-level biodiversity objectives (Anonymous 1997b).

1.1 Study Objectives

The objectives of the study were to describe watershed wide fish distributions and to determine the extent of fish habitat within the watershed. Fish and fish habitat values were the primary components of the inventory.

The study involved:

- the identification, delineation and mapping of fish-bearing stream reaches and lakes using existing information and new information (field inventory);
- the identification and coding of all waterbodies within the watershed and;

- the identification and characterization of stream reaches utilizing topographic maps and aerial photographs, with confirmation via field sampling.

The results from the inventory are presented on 1:20 000 TRIM based maps, BC Ministry of Environment, Lands and Parks (MELP) Field Data Information Summary (FDIS) data forms, MELP Fish Collection Forms and RIC Photodocumentation Forms.

2.0 STUDY AREA

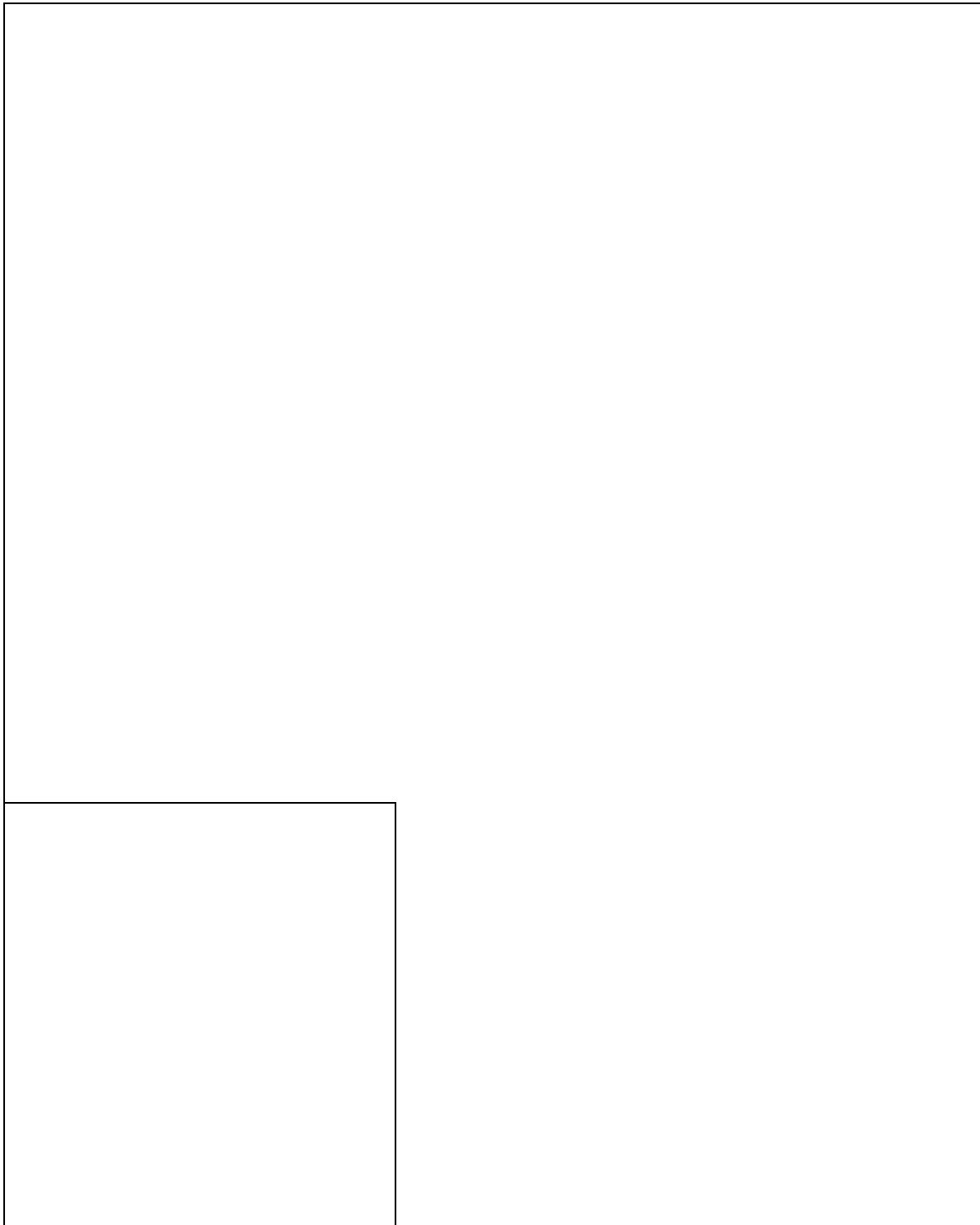
The Houston Tommy Creek study area is located approximately 22 km (by road) southwest of the town of Houston, BC. The study area included the Houston Tommy Creek watershed, a fourth order watershed that enters the left bank of the Morice River and an unnamed Morice River tributary (third order basin) that enters the Morice River on the left bank, upstream of the Houston Tommy Creek confluence (Figure 1).

The Houston Tommy Creek 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 watershed lies in the flat lowlands and rolling uplands of the Fraser Basin ecoregion, in the Babine Upland ecosection (Demarchi, 1996).

Demarchi (1996) describes the climate within the sub-boreal interior eco-province:

Prevailing westerly winds bring Pacific air to the area over the Coast Mountains by way of the low Kitimat Ranges or the higher Boundary Ranges. Much of this area is in a rain shadow...Summer surface heating leads to convective showers, and winter frontal systems result in precipitation that is evenly distributed throughout the year..

The biogeoclimatic zonation for the Houston Tommy Creek watershed is predominantly Sub-boreal Spruce (Demarchi, 1996). Engelmann Spruce - Subalpine Fir zones occur on the middle slopes of mountains within the Houston Tommy Creek watershed and Alpine Tundra Zones occur on the upper mountain slopes (Demarchi, 1996).



Source: British Columbia Recreational Atlas, 1993.
Scale: ~ 1: 300 000

Figure 1. Houston Tommy Creek Inventory Area Location Map

3.0 METHODS

The Inventory was completed in six phases in accordance with the *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory* manual:

- 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 Fish and Fish Habitat Inventory: Standards and Procedures, June 1997* (Anonymous 1997b).

3.1 Phase 1: Existing Data Review

Phase 1 involved a review of pertinent fisheries information and the production of interim maps to provide background information necessary for the planning phases of the inventory. Relevant stream and lake inventory reports, files, maps, summaries and aerial photographs were obtained from MELP Region 6 and Region 7, the Pacific Biological Station (PBS) (Canada Department of Fisheries and Oceans (DFO)) and from Northwood.

The review also included the following information sources:

- Fisheries Information Summary System (FISS) database (DFO)
- Stream Information Summary System (SISS) database (MELP)
- 1: 50 000 National Topographic Series (NTS) maps

- Aquatic biophysical inventory maps (MELP)
- Recent Stream classification maps/reports (Northwood)
- 1:20 000 Terrain Resource Information Management (TRIM) maps
- Licensee Forest Cover maps (1:20 000 scale) (Northwood)
- Forest Development Plan maps (1: 20 000 scale) (Northwood)
- Aerial photographs (1: 20 000 scale) (Northwood)
- Overview, Level 1 and Level 2 Fish Habitat Assessment (Watershed Restoration Program Projects (WRP)) (MELP)
- Other inventory and consultant reports
- BC Conservation Data Centre (CDC) summaries.

Background information obtained from these sources included:

- known fisheries values within the study area
- existing reach designations
- known locations of obstructions to fish migration
- known areas of sensitive fish habitat
- identification of areas requiring priority assessment
- location of suitable access points.

A list of persons contacted and a bibliography of information sources compiled are presented in Appendices I and II.

The FISS database was the primary information source reviewed and this data was plotted on working copies of 1:20 000 scale TRIM maps of the study area. Subsequent to the preparation of these maps other information sources were examined. Any of this latter information that was not documented in FISS was plotted on 1:50 000 NTS maps and recorded on FISS data compilation forms. Further, pertinent data from the additional sources of information were copied and forwarded to the Fisheries Inventory Specialist along with the 1:50 000 NTS maps and FISS data compilation forms.

TRIM based, 1:20 000 scale Interim maps were produced by combining existing drainage information from TRIM maps, Forest Cover maps and Forest Development Plan maps. All waterbodies, including lakes, wetlands and streams in the study area were identified. Interim Locator Points (ILPs) were assigned to each watercourse/waterbody within the study area. Universal Trans Mercator (UTMs) coordinates were measured and recorded for the confluence of each stream and the outlet of each lake using ARCView/ARCInfo software.

Numeric identifiers (NIDs) were assigned to features identified during the Phase I review and plotted on interim maps (NID is a unique number that links features and information on interim maps to the FDIS database to allow for expedient data referencing).

Phase 1 deliverables included:

- list of contacts (Appendix I)
- bibliography of references used (Appendix II)
- FISS data maps and data compilation forms
- Interim maps
- ILP data sheets
- Phase 1 completion report (Appendix III).

All of the above items were submitted to Wildfor Consultants (Northwood's FRBC contract monitor) upon completion.

3.2 Phase 2: Map and Aerial Photograph Analysis

Phase 2 involved detailed map and aerial photograph interpretation. Project area boundaries and third and fourth order watershed boundaries were delineated on interim maps. Watershed characteristics (stream order, stream magnitude and basin type) for third and fourth order streams and for first and second order streams flowing into fourth order streams, were recorded in a Basin Classification table.

Map interpretation also included waterbody identification. The following definitions were used to determine the grouping of streams, lakes and wetlands:

- **stream:** a watercourse having an alluvial sediment bed, formed when water flows on a perennial or intermittent basis between continual definable streambanks (*FPC Riparian Management Area Guidebook, Dec. 1995*) (Anonymous 1995b).
- **lake:** an open body of water with a depth greater than 2 m and with less than 25 % of its surface area covered with wetland vegetation (*Reconnaissance Fish and Fish Habitat Inventory, June 1997*) (Anonymous 1997b).
- **wetland:** defined as an area where the water table is at, near or above the surface, or where soils are water saturated for a sufficient length of time so that excess water and resulting low oxygen are the principle determinants of vegetation and soil development (*Reconnaissance Fish and Fish Habitat Inventory, June 1997*) (Anonymous 1997b).

Maps and aerial photographs were also used to determine reach breaks for all streams within the project area. Reach breaks were determined using the following key characteristics:

- changes in order

- changes in channel pattern
- changes in confinement
- changes in gradient
- changes in streambed and bank materials (aerial photograph interpretation).

For survey purposes, lakes and wetlands were treated as separate reaches. Stream reaches were numbered sequentially upstream. Each reach break was subsequently assigned a unique NID.

The following reach characteristics were recorded in a Reach Table for each reach identified:

- order
- gradient
- channel pattern
- confinement
- anastomosed/braided channel
- basin type
- wetland
- features known to occur within the reach (beaver dams, culverts, falls etc.).

Once the reach table was completed the sample size for stream reaches was determined using the following guidelines and the Reach Totals and Sample Size Sheet provided in the MELP Excel spreadsheet tool (Table 1).

Guidelines used for the site inventory sample size were:

- for lower gradient (less than 20 %) and small or medium streams (third order or lower), the sample size was based on the equation $y=500x^{-0.8}$, where x was

the number of reaches of a certain group, and y was the sampling proportion. (Anonymous 1997b).

- for higher gradient streams (between 20 and 30 %) or large streams (fourth order or higher), the sampling size was the lower of the results of the equation listed above or 10% (Anonymous 1997b).

In addition to the guidelines, the following standards were observed for calculation of the minimum sample size of stream reaches:

- for low gradient or small/medium-sized streams, when the equation listed above results in a sample size less than 8, the sample size must be 8 (or total number if less than 8) (Anonymous 1997b).
- for higher gradient streams (between 20 and 30%) or large size reaches, the sample size must be a minimum of two reaches (or all of them if there were less than 5) or a maximum of 25 (Anonymous 1997b).
- high gradient streams (>30%) were sampled when warranted (e.g., when bull trout were suspected to occur in a reach with a 32 % gradient). Sampling in this group was based on professional judgment and the discretion of the contract monitor (Anonymous 1997b).

Table 1. Example of Reach Totals and Sample Size Table

Gradient	Pattern	Size		
		Small	Medium	Large
1	ST/EN	9	8	0
	IM/ME	0	18	4
	AN/BR	0	2	1
2	ST/EN	8	23	0
	IM/ME	0	0	0
	AN/BR	0	0	0
3	ST/EN	17	5	1
	IM/ME	0	0	0
	AN/BR	0	0	0
4	ST/EN	27	0	0
	IM/ME	0	0	0
	AN/BR	0	0	0
5	ST/EN	63	0	0
	IM/ME	0	0	0
	AN/BR	0	0	0
Gradient				
Gradient Class		Gradient Range		
1		< 4 %		
2		> 4 % and < 8 %		
3		> 8 % and < 20 %		
4		> 20 % and < 30 %		
5		> 30 %		
Pattern				
ST/EN	Entrenched, straight and sinuous type reaches			
IM/ME	Irregular/tortuous meandering/meandering			
AN/BR	Anastamosed or braided reaches			
Size				
Size Class		Order		
Small		1		
Medium		2 and 3		
Large		> 4		

Source: Anonymous 1997b

Note: the totals presented in this table are an example only. They are not relevant to this inventory.

Examples of Sample Size calculations as per the methods outlined in the *Reconnaissance (1: 20 000) Fish and Fish Habitat Inventory, June 1997* (Anonymous 1997b) using Table 1 were:

- For lower gradient, medium-sized irregular meandering and meandering reaches:

Total number of reaches = 18

Sampling rate (%) = $500 \times (18)^{-0.8} = 500 \times 0.099 = 49.5\%$

Sample Size = $(49.5/100) \times 18 = 8.9 = 9$

- For gradient class 4, small straight and entrenched streams:

Total number of reaches = 27

Sampling rate (%) = 10 %

Sample Size = $(10/100) \times 27 = 2.7 = 3$

- For gradient class 3, medium-sized straight and entrenched reaches:

Total number of reaches = 5

Sampling rate (%) = $500 \times 5^{-0.8}$, however a minimum sample size of 8 is required

Sample size = 5 (all)

Once sample sizes were determined, reaches to be sampled were identified and plotted on interim maps. Sample site selection was discretionary based on one or more of the following:

- site selection above and below barriers
- selection of sites to establish connectivity between sub-basins to determine fish utilization and that identify the upstream limits of fish distribution

- to ensure that all basin types and basin connectivity were adequately represented
- proximity of stream reach to identified cutblocks.

The Reach Totals and Sample Size table initially generated 101 sample sites for sampling within the Houston Tommy Creek inventory area. Upon consultation with Mr. Paul Giroux, MELP's Fisheries Inventory Specialist for Region 6, the reach totals and sample size table for the Houston Tommy study area and the reach totals and sample size table for the Shea Creek study area were combined. Mr. Giroux determined that the number of sample sites generated for each creek were too intense for a 1:20 000 reconnaissance inventory. As a result the individual reach tables for each creek were combined to generate one reach summary table and subsequently generated new sample totals. The combined totals were divided between the Houston Tommy Creek and Shea Creek study areas relevant to the watershed area of each study area. The revised number of sample sites for the Houston Tommy Creek study area was seventy-four.

No high gradient stream reaches were selected for sampling. Recent studies in the region indicated that bull trout (*Salvelinus confluentus*) and Dolly Varden char (*S. malma*) do not appear to utilize habitat in streams with a gradient greater than 15 percent (D. Bustard, Paul Giroux, *pers comm.*).

Reach forms (a map/air photo based recording form designed to capture the physical information required to characterize a stream reach) were completed for each of the 72 sample sites. Reach forms are presented in Appendix VIII (Volume II).

Lakes were designated as primary or secondary lakes based on their location and connectivity within watersheds. Lake classification (primary or secondary), basin type, lake class and lake group were recorded on lake forms. Primary lakes play a dominant role in the watershed and generally possess the physical characteristics that are representative of most of the lakes within a group of lakes (Anonymous 1997b). Primary

lakes often have the largest surface areas and/or are central in a cluster or chain of lakes (Anonymous 1997b).

The following deliverables for Phase 2 were submitted to the contract monitor:

- Basin Classification sheets
- Reach tables
- Lake tables
- Reach forms
- Phase 2 Completion Report.

The Phase 2 Completion report is included in Appendix III and Reach Forms are included in a separate bound appendix (Appendix VIII).

3.3 Phase 3: Sampling Design and Project Plan

A project plan for the field portion of the project was developed and presented to the contract monitor. The project plan outlined the approach to be applied in field sampling, data collection and reporting, and an estimate of the time and cost required to conduct the inventory. Sample sites identified in Phase 2 were reviewed with the contract monitor and MELP Fisheries Inventory Specialist and modified accordingly.

The following deliverables were submitted to the contract monitor:

- Fish sampling strategy for the inventory area
- Budget requirements for Phase 4
- Project plan for Phases 4 to 6 (Appendix IV)
- Phase 3 completion report (Appendix III)

3.4 Phase 4: Field Data Collection

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

3.4.1 Pre-field Preparation

Fish collection permits from MELP and DFO were obtained prior to the commencement of field activities.

3.4.2 Field Procedures

Field work was conducted by two field crews, each consisting of two people. In watersheds where road access was available, crews used a 4X4 crew cab and ‘leap-frogged’ from site to site. In watersheds where road access was unavailable crews were transported by a Bell Jet Ranger helicopter.

Each crew was equipped with the following:

- Smith-Root Model 12A backpack electrofisher
- electrofisher safety gear (leak proof waders, wading belts, Linesman’s gloves, hat)
- minnow traps and bait
- backpacks
- clinometer
- compass
- hip chain
- 50 m tape
- metre stick
- VHF radio
- first aid kit

- water quality kit (hand held pH and conductivity meters)
- thermometer
- floating chip
- stop watch
- Canon waterproof camera and slide film
- voucher specimen container
- MELP Site cards
- MELP fish collection cards
- Triton photodocumentation forms
- field maps

3.4.3 Fish Species Sampling

Fish sampling efforts focused on reaches of < 20 % gradient and followed the procedures outlined in the *Reconnaissance Fish and Fish Habitat Inventory: Standards and Procedures, June, 1997* (Anonymous 1997b) and the *Forest Practices Code Fish Stream Identification Guidebook, Dec. 1995* (Anonymous 1995a). A minimum of 100 m of stream length or a length equal to 10 bankfull widths (whichever was greater) was sampled at each sample site.

Fish presence, relative abundance and species diversity were evaluated by electroshocking at least 100 linear meters of representative habitat. In areas not suited for electroshocking (deep pools and wetlands) and where return visits were practical, minnow traps baited with salmon roe were set and allowed to soak for a 24 hour period. Visual observations and angling were also used to document the presence of fish.

The following were collected and recorded on Fish Collection Forms at each sample site:

- species (identified using RIC's Field Key to Freshwater Fishes of BC).
- fork length/total length (species dependent/measured to the nearest mm)

- life-cycle stage
- a representative sample of any abnormal or unidentified fish or species of fish was preserved and submitted to the contract monitor.

Following the initial field sampling, follow-up sampling was recommended for specific sites within the study area. A written explanation detailing the areas of concern, the initial results of the survey and recommendations from the survey crew were composed and summarized in the Additional Sampling Recommendations table (Table 3).

For all reaches with non-fish bearing classifications, a written explanation (Table 4: Non-Fish Bearing Status) was completed. The explanation focused on sampling methods utilized during the field program and included a summary of sampling effort, water quality parameters (conductivity and turbidity) and habitat characteristics.

3.4.4 Habitat (Site) Description

A site description was completed on Site Description forms for each reach sampled. The length of each sample site was between 100 and 300 m, or 10 bankfull widths (whichever was greater). The following data were collected at each sample site:

- site length (m)
- stream gradient (%)
- six individual channel width measurements (m)
- six individual wetted width measurements (m)
- six residual pool depth measurements (m)
- three individual bankfull depth measurements (m)
- flood signs (visual observation)
- water temperature (°C)
- pH
- conductivity (µs)

- turbidity (visual observation)
- total instream cover for fish (%)
- individual instream cover types for fish(%)
- presence of large woody debris (LWD)(visual observation)
- distribution of LWD (visual observation)
- crown closure (visual observation (%))
- shape of left and right stream bank (visual observation)
- texture of stream banks (visual observation)
- riparian vegetation on left and right stream banks (none, grass, shrub, conifer, mixed, deciduous and wetland)
- stage of riparian vegetation (Initial, Shrub, Pole sapling, Young Forest, Mature Forest)
- composition of bed material (dominant and subdominant)
- D₉₅ (cm)
- D (cm)
- channel morphology (riffle/pool, step/pool, cascade/pool)
- presence of disturbance indicators
- channel pattern (tortuous/irregular meandering, meandering, sinuous, straight)
- occurrence of islands and bars
- channel coupling (coupled, decoupled, partially coupled)
- channel confinement (entrenched, confined, occasionally confined, unconfined, not applicable)
- presence of features
- habitat type and quality rating (poor, fair, moderate, good)
- identification of fisheries sensitive zones (FSZ's)
- photo documentation
- wildlife observations
- comments

3.4.5 Wildlife Observations

Wildlife observations were noted and specific details recorded on the Site Cards. Aquatic invertebrates and macrophytes were described and field identified to Order and Family. Photographs were taken for further documentation and confirmation of wildlife observations.

3.4.6 Photographic Documentation

Photographs were used to provide extensive visual records at each sample site; at least two photographs (upstream/downstream perspective) were taken at each sample site. In addition, photographs were taken of key areas of interest (*e.g.*, migration barriers, major erosion sites, fish samples, riparian conditions and any other unique features).

The photographs were documented accordingly on Site Cards, Fish Collection Cards and Photodocumentation Forms. Photodocumentation forms and thumbnail photographs are presented in Appendix VII. Slides produced for the project are presented in a separate indexed binder.

3.4.7 Field Data Compilation

Immediately following each field day, field crews met in the field office to compile field notes, review field data and summarize the field findings on hard copy maps. This system ensured that all field information was thoroughly documented while field work was still fresh with the crews and allowed for preliminary classifications to be available as required.

3.4.8 Phase 4 Deliverables

The following deliverables were submitted to the contract monitor:

- Site Forms
- Fish Collection Forms
- Phase 4 completion reports.

The Phase 4 completion report is included in Appendix III. Reach/Site form summaries are presented in Appendix V. Site forms are presented in a separate, bound appendix (Volume II). Fish Collection Forms are presented in Appendix VI.

3.5 Phase 5: Data Compilation

Phase 5 was comprised of data entry (Site and Fish Collection Forms) into the MELP FDIS database. Interim locator points (ILPs) submitted during Phase 1 were converted to watershed codes and NID's were converted to UTM coordinates for mapping and georeferencing purposes. Photographs taken during the field portion of the project were developed, scanned, captioned and indexed in referenced binders.

Deliverables for Phase 5 included:

- electronic versions of the Reach Forms
- electronic versions of the Site Cards
- electronic versions of the Fish Collection Forms
- Photodocumentation indices
- Indexed photographic slides
- FISS update maps and data forms
- Phase 5 completion report.

The Phase 5 completion report is included in Appendix III. Indexed slides are included in a separate binder. 'Thumbnail' printouts of each photograph are included in Appendix VII.

3.6 Phase 6: Reporting and Mapping

The final report and maps for all sub-basins in the study area were developed following the format outlined in Chapter 5 of the *Reconnaissance Fish and Fish Habitat Inventory: Standards and Procedures (June, 1997)* (Anonymous 1997b).

3.6.1 Reporting

The final report provides a summary of background information and a discussion of problems and concerns with the implementation of the phased approach taken to conduct the inventory. The report focused on descriptions and justifications for non-sampled reaches, non-fish bearing reaches and reaches that require additional sampling. Detailed descriptions of each stream and reach sampled are not presented herein.

3.6.2 Mapping

Project maps were produced using the GIS software program ARC/INFO by Western Geographic Information Systems. The final maps that were produced included:

- Hardcopy Project Overview map
- Hardcopy Inventory maps
- Hardcopy Distribution maps
- Digital copies of Project Overview, Inventory and Distribution maps.

3.6.3 Phase 6 Deliverables

The deliverables for Phase 6 included:

- Hardcopy Project Overview map
- Hardcopy Inventory maps
- Hardcopy Distribution maps
- Digital copies of Project Overview, Inventory and Distribution maps
- Hardcopy Final Report
- Two Kodak Photo CD's of all photographs taken for the project
- Phase 6 Completion Report.

4.0 RESULTS

4.1 Existing Information

Pink salmon (*Oncorhynchus gorbuscha*) have been observed in Reach 1 of Houston Tommy Creek and coho (*O. kisutch*), Dolly Varden char (*Salvelinus malma*), rainbow trout (*O. mykiss*) and steelhead (*O. mykiss*) have been observed throughout the Houston Tommy Creek mainstem upstream to a set of falls located 17.6 km upstream of the Morice River (FISS, 1991). Extensive habitat and fish distribution studies have occurred along this 17.6 km section of Houston Tommy Creek (Bibliography, Appendix I). Steelhead fry were released, presumably at the confluence of Houston Tommy Creek/Morice River (FISS records state 0.0 km) (FISS 1991) over a period of four years from 1983 through 1986 (FISS, 1991).

Fish distribution within an unnamed 3rd order watershed (WSC 460-600600-35600; ILP 1837) has not been documented, however coho and pink salmon, and steelhead have been observed in the Morice River just upstream of the confluence of the unnamed stream.

The Wet'suwet'en First Nation was conducting a Level II WRP project in the Houston Tommy watershed. Sixty sites were selected for field visitation in 1997 (Michell, 1996). Stephan Schug (*pers comm.* 1997) of the Wet'suwet'en First Nation suggested that field work would occur only in the road accessible, lower areas of the watershed.

4.2 Survey Information

Table 2 provides an overview of the survey information compiled for to the Houston Tommy Watershed.

Table 2. Survey Information for the Houston Tommy Creek Watershed.

Watershed Names	Houston Tommy Creek		
Major Watershed Codes	460-600600-17000 460-600600-35600 (unnamed)		
NTS Maps	93L/6; 93L/7		
TRIM Maps	93L.025; 93L.026; 93L.035; 93L.036; 93L.045		
Watershed (Study) Area	26,792 ha		
Drainage	Houston Tommy C → Morice R → Bulkley R → Skeena R		
Total Number of Lakes	19 (includes open water wetlands)		
Total Stream Length	420 km (approximately)		
Total Number of Reaches	649		
Stream Field Sampling Dates	September 11-18, 1997		
Number of Reaches/Sites Sampled	72		
Random Sample Sites	52		
Discretionary Sample Sites	20		
Total Number of Sample Sites Along Proposed Cutblock Boundaries	41		
Fish in Mainstems	Gazetted Name	Reach #	Species
	Houston Tommy Creek	4/5/6	RB
Fish in Tributaries			
Stream Name	WSC (ILP)	Reach #	Species
Unnamed	460-600600-35600-07800 (01862)	2	DV/RB
Unnamed	460-600600-17000-18900 (02353)	2	DV/RB
Unnamed	460-600600-17000-84200-9617 02107)	1	RB
Unnamed	460-600600-17000-60151 (02226)	1	RB
Unnamed	460-600600-17000-35200-6480-1217 (02275)	2	RB
Unnamed	460-600600-17000-18900 (02357)	2/4	DV/RB
Unnamed	460-600600-17000-18900-6052-2190 (02361)	2	DV
Unnamed	460-600600-17000-33900-3564 (02324)	1	DV
Unnamed	460-600600-17000-33900 (02320)	1	DV/RB
Unnamed	460-600600-17000-35200 (02277)	1	RB

Note: RB= rainbow trout, DV= Dolly Varden char

4.3 Field Data

4.3.1 Site Cards

Site Cards for the Houston Tommy watershed were entered into MELP's FDIS database following the completion of Phase 4. Hard copies of Site Cards are presented in a separate, bound appendix (Appendix VIII).

4.3.2 Fish Collection Cards

The Fish Collection Cards for the Houston Tommy watershed were entered into MELP's FDIS database following the completion of Phase 4. Hard copies of Fish Collection Cards are presented in Appendix VI.

4.4 Survey Comments

4.4.1 Problems

The field portion of Houston Tommy Creek watershed stream inventory was relatively problem free. Crew mobilization was very efficient as most sites were readily accessible either by road or by helicopter. Foul weather delayed field work for forty-eight hours (September 15 and 17, 1997) but did not hinder the completion of field sampling.

As with the other inventory areas (Shea Creek and Tochcha), many first order stream systems identified during planning (on 1:20 000 TRIM maps) and included in the Reach Sampling Summary, had no visible channel (11 of 72 sample sites; 11 of 26 first order streams). In most cases these streams did not have alluvial channels and were likely spring run-off channels. A planning phase that delineated reaches on 1:50 000 scale NTS maps, instead of 1:20 000 scale TRIM maps, may eliminate the abundance of 'No Visible Channel' observations during the field inventory.

4.4.2 Fish Comments

Fish distribution within the Houston Tommy Creek mainstem has been well documented in the lower reaches (to a set of falls 17.6 km upstream of the Morice River). Consequently this inventory focused on those reaches upstream of the falls (an anadromous barrier) which corresponded to the upstream end of Reach 2. Rainbow trout were caught throughout the upper reaches to 40.9 km (upstream limit of Reach 6) where a set of falls prevented further upstream migration. Although not confirmed by reconnaissance field sampling, the upstream limit of fish distribution in the watershed appears to be at 40.9 km. Fish were not captured upstream of the falls in Reach 7.

The Houston Tommy Creek mainstem, upstream of 17.6 km is deeply incised and confined within steep valley walls. It would seem that only third order (or greater) tributaries have had the energy to create channels of low enough gradient to be accessible to fish. Consequently, it appears that primarily third and fourth order streams are utilized by fish and that low gradient confluences (initial reaches) of first and second order tributaries to Houston Tommy Creek are utilized by fish.

Fish were captured in 14 of the 72 sample sites inventoried. Fifty percent of the sample sites where fish were captured were third or higher order streams and twenty-nine percent of the sample sites where fish were captured were located in second order streams. Twenty-one percent of the sample sites where fish were captured were located in first order streams. The following table (Table 3) provides a summary of the reach number and order of the streams sampled where fish were captured.

Table 3. Fish Capture Summary

Stream Name/Identifier (WSC/ILP)	Reach Number	Site No.	Stream Order	Fish Species	Mean Length (Range) (mm)
460-600600-35600-07800 (1862)	2	65	2	RB (F) RB (J) DV (A)	53.3 (50-60) 110 (100-130) 135
460-600600-17000-18900 (2353)	2	66	3	RB (A) DV (J) DV (A)	123 (108-138) 59 105.4 (94-113)
Houston Tommy Creek (460-600600-17000)	4	68	4	RB (J)	161.5 (150-195)
Houston Tommy Creek (460-600600-17000)	5	185	4	RB (A)	210
Houston Tommy Creek (460-600600-17000)	6	70	3	RB (J) RB (F)	173.3 (150-190) 60
460-600600-17000-84200-9617 (2107)	1	69	2	RB (J)	133.3 (107-153)
460-600600-17000-60151 (2226)	1	73	3	RB (F)	70
460-600600-17000-35200-6480-1217 (2275)	2	78	1	RB (A) RB (J)	185 107.5 (85-130)
460-600600-17000-18900 (2357)	2	183	3	DV (J) DV (A) RB (F)	84 (64-97) 128 52
460-600600-17000-18900 (2357)	4	80	2	DV (J)	60
460-600600-17000-18900-6052-2190 (2361)	2	81	1	DV (F) DV (J) DV (A)	36 77.4 (60-90) 85
460-600600-17000-33900-3564 (2324)	1	90	2	DV (A)	110
460-600600-17000-33900 (2320)	1	91	4	DV (A) DV (F) RB (A)	100 (80-110) 46.4 (40-60) 150
460-600600-17000-35200 (2277)	1	199	1	DV (J) RB (F) RB (J)	99.6 (85-111) 52 106 (97-113)

Note: RB= rainbow trout, DV= Dolly Varden char, A = adult, J = juvenile, F = fry

Rainbow trout and Dolly Varden char were captured in most third order tributaries to Houston Tommy Creek. The majority of fish captured occurred in streams with a gradient $\leq 7\%$. Fish were not captured in streams with a gradient $\geq 13\%$.

There are relatively few lakes in the Houston Tommy Creek watershed. As such, the majority of fish captured were likely stream resident fish. Rainbow trout captured in the upper reaches of the Houston Tommy Creek mainstem were larger (juveniles 150-195 mm FL, adults 210 mm FL) than fish captured in tributaries. An anadromous migration barrier in Reach 2 and an absence of lakes in the system suggests that these fish are stream residents. The highest quality fish habitat observed in the system occurred in the mainstem of Houston Tommy Creek. Fish captured in tributaries were generally smaller and described as immature or maturing fish. The smaller size of these fish (as compared

to fish captured in the Houston Tommy mainstem) suggests that they are stream resident and that the lower productivity of tributaries may limit the size of tributary utilizing fish.

Dolly Varden char (adult) and rainbow trout (fry, juveniles) were captured downstream of a large lake (00921MORR) in an unnamed tributary to the Morice River (Site 65: WSC 460-600600-35600-07800). Fork lengths for these fish were comparable to fish captured in tributaries to Houston Tommy Creek. The Dolly Varden char captured at Site 65 was observed to be a mature spawner. Their capture location downstream of the unnamed lake and upstream of the Morice River suggests that populations may be adfluvial or may be utilizing the Morice River for a portion of their life cycle. An absence of upstream migration barriers in this system suggests that these fish may be anadromous.

Fish were not captured upstream of Reach 1 in the unnamed tributary to the Morice River (WSC 460-600600-35600). The stream sustains suitable habitat for fish and appears to be accessible from the Morice River. A helicopter overflight of the mainstem of the unnamed creek (under guidance from Morice Forest District Forest Ecosystem Specialist, Mr. Andy Witt) was conducted and additional sites were sampled to determine the location of migration barriers. No barriers were identified during the survey. The upstream reaches of the unnamed stream should be recommended for follow-up sampling to determine the upstream limit of fish and fish habitat distribution.

4.4.3 Habitat Comments

The Houston Tommy Creek mainstem is confined within steep valley walls. The watershed appears to be a naturally unstable system, as evidenced by large areas of exposed banks (most notably along the mainstem between kms 6 and 7; Reach 1), signs of recent flooding, and bedload aggradation.

First and second order tributaries provided little fish habitat. Third and fourth order tributaries offered adequate fish habitat but rearing and overwintering habitat was limited.

Very few streams within the Houston Tommy Creek watershed have deep pools or cutbanks suitable for either rearing or overwintering.

4.4.4 Rehabilitation/Enhancement Opportunities

The mid to upper reaches of the Houston Tommy Creek watershed are relatively undisturbed. In addition, recent Forest Development Plan maps (Northwood, 1997) suggest that no harvesting activities are scheduled to occur in this area over the next five years. However, careful planning of future harvest activities within this area would help to preserve the resource values associated with the Houston Tommy Creek watershed.

The Houston Tommy Creek mainstem morphology is predominantly riffle-run with few large, deep pools for adult holding/juvenile rearing. Forest developers should consider forest development strategies that sustain natural rates of run-off and natural sediment deposition within the watershed.

4.4.5 Additional Sampling Recommendations

Thirty-five sites were identified for additional or follow-up sampling within the Houston Tommy Creek watershed. A summary of total sampling effort, water quality and flow characteristics, seasonal habitat availability, the known presence of fish upstream/downstream, the location of any barriers to migration and recommendations for second trial sampling is presented in Table 4. In general, follow-up sampling was recommended for reaches where:

- low flow appeared to be the only factor deterring fish utilization;
- fish were captured in reaches downstream of the sample site;
- obstructions to fish migration were not been identified.

table 4

Table 4. Houston Tommy Creek Watershed Additional Sampling Recommendations

Site Number	ILP Number	Reach Number	Date	Time	Area Covered (m)	EF Seconds	EF Settings (Volts, Pulse Frequency)	Water Temp. (deg. Celsius)	Conductivity	Flow Stage (VO)	Turbidity	Habitat Comments	Known Fish Presence (UID)	Obstruction(s) to Fish Migration	Seasonal Habitat Availability	Second Trial Sampling Recommendations
54	1933	2	9/11/97	8:15	100	NS	NA	8	100	INT	C	rearing and spawning habitat fair, lots of aquatic insects	---	NI	S/S	sample in spring if fish absent, determine location of downstream barrier (EF,MT)
55	1934	1	9/11/97	8:51	100	NS	NA	5	70	L	C	wetland area, without good substrate	---	NI	U	if fish found in ILP 1933 sample in spring (EF, MT)
56	1929	2	9/11/97	9:46	100	NS	NA	8	40	INT	C	poor habitat quality	---	NI	U	if fish found in ILP 1920 sample in spring (EF)
58	1926	1	9/11/97	10:56	100	NS	NA	10	60	INT	C	pool habitat available at higher flow stages	---	NI	S/S	sample in spring to determine fish presence or absence (EF)
59	1920	4	9/11/97	11:17	100	500	500/15/8	10	130	L	C	reasonable habitat	---	NI	S/S	determine presence/absence of fish in Reach 1, conduct follow-up sampling in spring if fish present (EF)
62	1863	1	9/11/97	14:45	100	NS	NA	10	350	INT	C	poor habitat rating	RB, DV	NI	S/S	determine presence/absence in higher flows (EF)
64	1859	1	9/11/97	15:45	100	NS	NA	11	120	L	L	little suitable habitat	---	NI	U	sample in higher flows - spring/early summer (EF)
72	2018	1	9/13/97	9:00	100	NS	NA	8	60	INT	C	substrate indicates high energy stream in spring, utilization unlikely	RB, DV	NI	S/S	revisit in spring to determine presence/absence (EF)
76	2256	1	9/13/97	12:30	100	223	400/60/6	8	130	L	C	good spawning substrate	RB, DV	NI	S/S	confirm utilization by spawners in spring/early summer (EF, VO)
79	2342	1	9/13/97	15:30	100	NS	NA	9	6.2	L	C	limited habitat potential	RB	NI	S/S	sample in spring (EF)
82	2365	4	9/14/97	10:35	100	254	400/60/6	8	70	L	C	limited habitat potential	---	NI	U	confirm fish absence through spring sampling (EF)
85	2365	2	9/14/97	11:25	100	315	400/60/6	9	70	M	C	some pool habitat that affords adequate cover	---	NI	U	to confirm fish absence sample during spring in Reach 1(EF)
86	2370	2	9/16/97	8:50	100	212	400/60/6	8	70	M	C	LWD abundant and good gravels available	---	NI	S/S	sample in spring; determine fish presence/absence in lake and identify location of barriers to migration (EF)
NS= not sampled, NA= not applicable; INT.= intermittent flow, L= low flow, DW= seasonally dewatered, M= moderate flow; C= clear, L= slightly turbid, M= moderately turbid; RB= rainbow trout, DV= Dolly Varden																
NI= none identified, C= cascade, F= falls, BD= beaver dam, G= gradient; S/S= spring /summer utilization, U= unlikely, N= none; EF=eletrofish, MT= minnow trap, VO= visual observation																
* all sample sites were open and sampled with Smith Root electroshockers; Model 12A or 12B																

Table 4. Houston Tommy Creek Watershed Additional Sampling Recommendations

Site Number	ILP Number	Reach Number	Date	Time	Area Covered (m)	EF Seconds	EF Settings (Volts, Pulse Frequency)	Water Temp. (deg. Celsius)	Conductivity	Flow Stage (VO)	Turbidity	Habitat Comments	Known Fish Presence (U/D)	Obstruction(s) to Fish Migration	Seasonal Habitat Availability	Second Trial Sampling Recommendations
88	1862	5	9/18/97	12:15	100	135	500/60/6	7.5	150	L	C	channel likely dewatered in summer flows	RB, DV	NI	S/S	fish captured in lower reaches, resample in spring, if fish absent locate barriers above lake (EF)
89	1869	1	9/18/97	13:05	100	243	500/60/6	6	190	L	C	flow is subsurface and channel is poorly defined	---	NI	U	if fish present in Reach 5 of ILP 1862 sample in spring (EF)
174	2254	2	9/11/97	8:35	100	673	600/60/6	7	100	L	C	moderate to good habitat conditions, appears to be overwintering potential upstream.	CT, DV, ST, CO	C(1.4 kmU)	S/S	sample in spring, determine if stream is accessible from Houston Tommy mainstem (EF)
175	2261	1	9/11/97	9:00	100	200	600/60/6	7	110	L	C	moderate to good habitat conditions	CT, DV, ST, CO	NI	S/S	sample in spring, if fish absent locate barriers (EF)
177	1920	1	9/11/97	10:37	100	NS	NA			DW		some habitat potential in higher flows	RB, CT, DV, ST, CO	NI	S/S	resample in spring flows, determine accessibility from the Houston Tommy mainstem (EF)
178	1922	1	9/11/97	11:08	100	NS	NA			DW		alluvial channel but creek does not appear to get much water	RB, CT, DV, ST, CO	NI	U	if fish found in ILP 1920 Reach 1 sample in spring to confirm presence/absence (EF)
179	1919	1	9/11/97	11:38	100	432	600/60/6	10.5	90	L	M	limited fish habitat potential	RB, CT, DV, ST, CO	NI	N	sample in spring to confirm absence (EF), sample downstream to determine access to Houston-Tommy
180	1917	1	9/11/97	12:07	100	440	600/60/6	10.8	110	L	C	limited fish habitat potential	RB, CT, DV, ST, CO	NI	U	determine if stream is accessible from Houston Tommy mainstem - locate barriers (EF)
189	1862	5	9/12/97	17:26	100	NS	NA	10.8	70	L	C	fish habitat potential	RB, DV	NI	S/S	sample during spring flows to determine whether this segment of stream is accessible from the lake (EF, MT)
191	1845	1	9/13/97	8:54	100	NS	NA	8.1	120	L	M	limited habitat potential	---	NI	U	additional sampling required only if fish presence determined in Reach 6 of ILP 1837 (EF)
General: NS= not sampled, NA= not applicable; INT.= intermittent, L= low, DW= seasonally dewatered, M= moderate; Turbidity: C= clear, L= slightly turbid, M= moderately turbid; Fish: RB= rainbow trout, DV= Dolly Varden																
NI= none identified, Obstructions:C= cascade, F= falls, BD= beaver dam, G= gradient; Utilization: S/S= spring /summer, U= unlikely, N= none; Method: EF=eletrofisch, MT= minnow trap, VO= visual observation																
Fish: CT= Cutthroat trout, ST= steelhead, CO= coho, * all sample sites were open and sampled with Smith Root electroshockers; Model 12A or 12B																

Table 4. Houston Tommy Creek Watershed Additional Sampling Recommendations

Site Number	ILP Number	Reach Number	Date	Time	Area Covered (m)	EF Seconds	EF Settings (Volts, Pulse Frequency)	Water Temp. (deg. Celsius)	Conductivity	Flow Stage (VO)	Turbidity	Habitat Comments	Known Fish Presence (U/D)	Obstruction(s) to Fish Migration	Seasonal Habitat Availability	Second Trial Sampling Recommendations
196	1923	1	9/13/97	11:42	100	NS	NA	9	290	L	C	moderate habitat potential	---	NI	S/S	additional sampling required if fish presence confirmed in ILP 1920 - spring (EF)
197	1920	6	9/13/97	12:27	100	NS	NA	11	130	L	C	moderate habitat potential	---	NI	S/S	additional sampling required spring if fish presence confirmed downstream.
181	1909	2	9/11/97	13:33	100	NS	600/60/6	9.8	100	INT	C	no fish habitat at sample site	RB, CT, DV, ST, CO	NI	U	sample Reach 1 in the spring - locate barriers if fish absent (EF)
184	2354	2	9/12/97	11:41	100	110	400/60/16	9.1	80	L	M	limited habitat potential	RB, DV	NI	U	determine accessibility in Reach 1 during the spring (EF)
186	1849	1	9/12/97	15:52	100	NS	NA			DW		poor habitat conditions	---	NI	U	confirm presence or absence of fish downstream in ILP 1837.
187	1837	7	9/12/97	16:15	100	451	600/60/8	9.9	90	L	C	fish habitat potential	RB, CT, DV, ST, CO	NI	S/S	determine presence/absence of fish in Reach 2 prior to resampling here (EF,MT)
188	1837	2	9/12/97	16:52	100	400	600/60/8	9	70	L	C	fish habitat potential	CH, PK,RB, CT, DV, S	NI	S/S	suspect a migrational barrier, determine location (EF, MT)
198	2278	1	9/13/97	15:00	100	NS	NA	6	200	L	C	limited habitat potential	RB, DV	F at confluence	U	sample during spring flows to confirm absence (EF)
200	2246	1	9/14/97	9:00	100	NS	NA	8	90	L/DW	-	poor habitat conditions	CT,DV	NI	U	should sample upstream to lake to determine possible resident fish presence.
205	2369	3	9/16/97	9:10	100	425	400/60/6	8.1	70	L	C	limited habitat potential, very few pools and little cover	---	NI	U	verify fish presence/absence in lake, investigate downstream to determine access to Houston-Tommy.
206	1837	6	9/18/97	11:42	100	300	400/60/6	7	50	L	M	fish habitat potential	---	NI	S/S	determine presence/absence of fish in Reach 2 prior to resampling here (EF,MT)
207	1837	4	9/18/97	13:52	100	325	500/60/5	9.5	70	M	M	fish habitat potential	---	U	S/S/W	determine presence/absence of fish in Reach 2 prior to resampling here (EF,MT)
General: NS= not sampled, NA= not applicable; INT.= intermittent, L= low, DW= seasonally dewatered, M= moderate; Turbidity: C= clear, L= slightly turbid, M= moderately turbid; Fish: RB= rainbow trout, DV= Dolly Varden																
NI= none identified, Obstructions:C= cascade, F= falls, BD= beaver dam, G= gradient; Utilization: S/S= spring /summer, U= unlikely, N= none; Method: EF=eletrofish, MT= minnow trap, VO= visual observation																
Fish: CT= Cutthroat trout, ST= steelhead, CO= coho, * all sample sites were open and sampled with Smith Root electroshockers; Model 12A or 12B																

4.4.6 Non-Fish Bearing Status

Non-fish bearing status was assigned to 21 sites within the Houston Tommy Creek watershed. A summary of the sampling effort, water quality and flow characteristics, habitat quality, the known presence of fish upstream/downstream, the location of any barriers to migration, seasonal habitat availability and comments on the potential for seasonal fish use is presented in Table 5. Non-fish bearing status was assigned to reaches where:

- the stream was labeled a non-visible channel;
- the stream was deemed inaccessible from the mainstem and did not have a headwater lake;
- gradient barriers prevented fish migration further upstream and the stream did not have a headwater lake.

table 5.

Table 5. Houston Tommy Creek Watershed Non-Fish Bearing Status

Site Number	ILP Number	Reach Number	Date	Time	Area Covered (m)	EF Seconds	EF Settings (Volts, Pulse Frequency)	Water Temp. (deg. Celsius)	Conductivity	Flow Stage (VO)	Turbidity (VO)	Habitat Comments	Known Fish Presence (U/D)	Obstruction(s) to Fish Migration	Seasonal Habitat Availability	Seasonal Fish Use		
57	1930	1	9/11/97	10:26	100			10	50	DW	C	subsurface gully flow at time of sample, no habitat available	---	NI	N	unlikely		
61	1911	1	9/11/97	13:32	100	NS	NA	12	210	DW	C	not a stream	---	NI	N	none		
63	1867	1	9/11/97	15:15	100	NS	NA			NV		no discernible channel	---	NI	N	none		
67	2374	7	9/12/97	11:55	100	543	500/60/6	7	60	M	C	available habitat, downstream falls make it inaccessible	RB,DV,ST, CO,PK	F	N	none		
71	1933	4	9/12/97	16:08	100	NS	NA	10	170	NV	L	wetland seepage channel, lake overflow	---	NI	N	lake overflow channel with no spawning habitat, utilization unlikely		
74	2244	2	9/13/97	10:55	100	NS	NA			DW		poor habitat availability	U	NI	N	dry channel appears to flow in spring freshet		
75	2246	1	9/13/97	11:20	100	NS	NA	6	90	INT	C	poor habitat availability	DV,RB,ST	F(3mU)	N	none		
77	2255	1	9/13/97	13:00	100	NS	NA	10	90	NV	C	no alluvial channel	RB, DV	NI	N	none, no fish activity observed in lake		
83	2367	1	9/14/97	11:00	100	NS	NA	8	70	NV	C	no alluvial channel (wetland)	RB, DV	NI	N			
84	2367	2	9/14/97	11:15	100	NS	NA			NV		no discernible channel	RB, DV	NI	N	none		
87	2356	1	9/16/97	10:00	100	NS	NA			NV		no discernible channel	RB, DV	NI	N	no alluvium		
176	2659	2	9/11/97	9:43	100	NS	NA			NV		no alluvial channel	ST,RB,CO, DV	NI	N	none		
182	1910	1	9/11/97	13:54	100	NS	NA			NV		no alluvial channel, wetland area	ST,RB,CO, DV	NI	N	none		
190	1847	1	9/13/97	8:46	100	NS	NA			DW		no habitat available, seldom watered channel	U	NI	N	none, unless fish found in ILP 1837		
192	1844	1	9/13/97	9:53	100	NS	NA			DW		no alluvial channel	U	NI	N	none, 12% drop over 20 m to mainstem		
193	1842	1	9/13/97	10:15	100	NS	NA			DW		no discernible channel, likely mapped by vegetation	U	NI	N	none		
194	1841	1	9/13/97	10:45	100	NS	NA			DW		no available fish habitat	U	NI	N	none		
195	1938	1	9/13/97	11:00	100	NS	NA			NV		no connectivity to lake	U	NI	N	none, may investigate upstream to determine possible resident fish presence.		
201	2351	1	9/14/97	9:36	100	NS	NA			DW		poor habitat quality ratings	ST,CO,PK, DV, CT	NI	U	no suitable fish habitat		
202	2352	1	9/14/97	10:00	100	NS	NA	7	180	INT	C	poor habitat quality ratings, little to no connectivity to Houston-Tommy.	ST,CO,PK, DV, CT	NI	N	poor connectivity to Houston Tommy mainstem		
204	1861	1	9/14/97	11:27	100	NS	NA	8	220	L	C	poor habitat quality ratings, little to no connectivity to fish habitat.	ST,RB,CO, DV	G	N	no connectivity to ILP 1837 as gradient is too steep (22%)		
General: NS= not sampled, NA= not applicable; Flow: NV= no visible channel, L=low , DW= dewatered, INT.= intermittent; Turbidity: C= clear, M= moderately turbid; N= none, Utilization: S/S= spring/summer, W= winter; Fish: RB= rainbow trout, CO= coho salmon, DV= Dolly Varden, ST= steelhead, PK= pink salmon, U= unknown, N= none; NI= none identified, Obstructions: F= falls, BD= beaver dam, G= gradient,																		
* all sample sites were open and sampled with Smith Root electroshockers; Model 12A or 12B																		

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PROJECT PLAN

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APPENDIX VI

FISH COLLECTION DATA FORMS

APPENDIX VII

**PHOTODOCUMENTATION FORMS AND
THUMBNAIL PHOTOGRAPHS**

Houston Tommy Creek - Photodocumentation Form

Watershed: Houston Tommy Creek
Major Watershed Code: 460-600600-17000

Project Code: 06-BABL-3085-0001-1998
Crew: TW/DL/ST/EN

Site #	Reach #	Roll #	Frame #	Focal Lngt	Direction	Comments	CD Image #
54	2	5	23	ST	U	intermittent flow in channel.	5_023
54	2	5	24	ST	U	representative habitat	5_024
54	2	5	25	ST	U	channel	5_025
55	1	6	1	ST	U	habitat upstream	6_001
55	1	6	2	ST	U	habitat upstream	6_002
56	2	6	3	ST	U	dry channel	6_003
56	2	6	4	ST	U	representative habitat	6_004
57	1	6	6	ST	U	representative habitat	6_006
58	1	6	7	ST	U	representative habitat	6_007
58	1	6	8	ST	U	view upstream from left bank	6_008
59	4	6	9	ST	X	representative habitat along right bank	6_009
59	4	6	10	ST	D	channel characteristics	6_010
60	1	6	11	ST	U	representative habitat	6_011
60	1	6	12	ST	U	channel characteristics	6_012
61	1	6	13	ST	D	no discernible channel	6_013
61	1	6	14	ST	U	no discernible channel	6_014
61	1	6	15	ST	U	no discernible channel	6_015
62	1	6	16	ST	D	channel characteristics	6_016
62	1	6	17	ST	U	representative habitat	6_017
63	1	6	18	ST	U	view upstream	6_018
63	1	6	19	ST	D	view downstream	6_019
64	1	6	20	ST	BD	taken looking down at channel	6_020
65	2	6	21	ST	U	view upstream	6_021
65	2	6	22	ST	D	view downstream	6_022
65	2	6	23	ST	U	view upstream	6_023
66	2	6	24	ST	BD	Dolly Varden captured	6_024
66	2	6	25	ST	U	representative habitat	6_025
66	2	6	26	ST	D	representative habitat	6_026
66	2	6	27	ST	BD	substrate	6_027
66	2	6	28	ST	U	culvert	6_028
67	7	6	29	ST	U	representative habitat	6_029
67	7	6	30	ST	D	representative habitat	6_030
67	7	6	31	ST	BD	bar formation and substrate	6_031
68	4	6	32	ST	BD	fish captured (RB)	6_032
68	4	6	33	ST	D	representative habitat	6_033
68	4	6	34	ST	U	representative habitat	6_034
69	1	6	35	ST	U	representative habitat	6_035
69	1	6	36	ST	D	representative habitat	6_036
70	6	6	37	ST	D	representative habitat	6_037
70	6	6	38	ST	U	representative habitat	6_038
71	4	7	1	ST	U	view upstream	7_001
71	4	7	2	ST	D	view downstream into lake	7_002
71	4	7	3	ST	U	view upstream	7_003
72	1	7	4	ST	U	view upstream	7_004
72	1	7	5	ST	D	bedload	7_005
72	1	7	6	ST	U	lwd	7_006
73	1	7	7	ST	U	obstruction to upstream migration	7_007
73	1	7	8	ST	D	view downstream	7_008
73	1	7	9	ST	U	representative habitat	7_009
74	2	7	10	ST	U	view upstream	7_010
74	2	7	11	ST	D	view downstream	7_011
75	1	7	12	ST	U	view upstream	7_012
75	1	7	13	ST	D	view downstream	7_013
75	1	7	14	ST	U	obstruction to fish migration	7_014
76	1	7	15	ST	D	representative habitat	7_015
76	1	7	16	ST	U	representative habitat	7_016
77	1	7	17	ST	U	view upstream	7_017

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Site #	Reach #	Roll #	Frame #	Focal Lngt	Direction	Comments	CD Image #
77	1	7	18	ST	U	view upstream above lake	7_018
---	---	7	19	ST	---	oblique aerial photo - transfer between sites	7_019
---	---	7	20	ST	---	oblique aerial photo - transfer between sites	7_020
78	1	7	21	ST	D	view upstream, notice vertical right bank	7_021
78	2	7	22	ST	U	view downstream	7_022
79	2	7	23	ST	U	view upstream	7_023
79	1	7	24	ST	D	view downstream	7_024
80	1	7	25	ST	U	representative habitat	7_025
80	1	7	26	ST	D	representative habitat	7_026
81	4	7	27	ST	U	representative habitat	7_027
81	4	7	28	ST	D	habitat downstream	7_028
80	2	7	29	ST	U	obstruction to upstream migration	7_029
82	2	7	30	ST	U	pool habitat	7_030
82	4	7	31	ST	U	representative habitat	7_031
83/84	2	7	32	ST	D	view of wetland	7_032
83/84	2	7	33	ST	D	channel becomes undefined	7_033
85	1	7	34	ST	D	representative habitat	7_034
85	1	7	35	ST	U	representative habitat	7_035
86	2	7	36	ST	D	channel	7_036
86	2	7	37	ST	D	view downstream	7_037
87	1	8	1	ST	D	view downstream	8_001
87	1	8	2	ST	U	view upstream	8_002
88	5	8	7	ST	D	view downstream	8_007
88	5	8	8	ST	U	view upstream	8_008
89	1	8	9	ST	U	representative habitat	8_009
89	1	8	10	ST	D	representative habitat	8_010
90	1	8	11	ST	U	representative habitat	8_011
90	1	8	12	ST	D	representative habitat	8_012
91	1	8	13	ST	D	representative habitat	8_013
91	1	8	14	ST	U	representative habitat	8_014
174	2	16	1	ST	U	typical cascade/pool habitat	16_001
175	1	16	2	ST	U	confluence with 2254	16_002
174	2	16	3	ST	U	habitat downstream of confluence	16_003
174	2	16	4	ST	D	small cascade 50 m downstream from confluence	16_004
176	2	16	5	ST	U	dry seasonally wet area	16_005
176	2	16	6	ST	U	small trickle - signs of flooding	16_006
176	2	16	7	ST	U	meadow where water would end up	16_007
177	1	16	8	ST	U	small debris jam - dry channel	16_008
177	1	16	9	ST	D	dry channel - overgrown	16_009
177	1	16	10	ST	X	steep side slope on left bank	16_010
178	1	16	11	ST	U	dry channel - overgrown	16_011
178	1	16	12	ST	D	channel and vegetation	16_012
178	1	16	13	ST	D	culvert crossing first of two	16_013
179	1	16	14	ST	D	typical LWD, dewatered channel	16_014
179	1	16	15	ST	U	LWD typical	16_015
179	1	16	16	ST	U	culvert crossing	16_016
180	2	16	17	ST	D	culvert crossing	16_017
180	2	16	18	ST	U	cobble substrate	16_018
180	2	16	19	ST	D	vegetated channel	16_019
181	2	16	20	ST	D	confined and wd	16_020
181	2	16	21	ST	U	debris jam and cobble/boulder substrate	16_021
182	1	16	22	ST	U	wetland area downstream of proposed block 265-1	16_022
182	1	16	23	ST	D	downstream of non-alluvial channel	16_023
188	2	16	24	ST	U	typical riffle over cobble	16_024
188	2	16	25	ST	D	shallow pools	16_025
188	2	16	26	ST	D	DL - abundant clumped LWD and SWD	16_026

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Site #	Reach #	Roll #	Frame #	Focal Lngt	Direction	Comments	CD Image #
189	5	16	27	ST	D	little water	16_027
189	5	16	28	ST	D	mostly dry channel	16_028
189	5	16	29	ST	U	culvert at crossing	16_029
183	2	16	30	ST	U	LWD, glide habitat and abundant SWD	16_030
183	2	16	31	ST	D	LWD, SWD, abundant	16_031
183	2	16	32	ST	BD	captured Dolly Varden	16_032
184	2	16	33	ST	D	culvert opening- crushed in middle	16_033
184	2	16	34	ST	D	through wet area	16_034
184	2	16	35	ST	D	across wetland < 100m	16_035
184	2	16	36	ST	U	culvert at crossing	16_036
185	5	16	37	ST	D	eroding bank	16_037
185	5	17	1	ST	BD	rainbow trout	17_001
185	5	17	2	ST	U	riffle -glide habitat	17_002
185	5	17	3	ST	D	channel braids	17_003
---	---	17	4	ST	---	aerial photograph, falls	17_004
---	---	17	5	ST	---	aerial photograph, falls	17_005
---	---	17	6	ST	---	aerial photograph, falls	17_006
186	1	17	7	ST	U	isolated, stagnant pool of water	17_007
186	1	17	8	ST	D	dewatered channel	17_008
187	6	17	9	ST	U	pool type habitat	17_009
187	6	17	10	ST	D	gravel bar and Dave	17_010
187	6	17	11	ST	U	beaver dam	17_011
190	1	17	12	ST	U	dry channel - moss covered	17_012
190	1	17	13	ST	D	dry channel	17_013
191	1	17	14	ST	D	typical riffle/pool habitat	17_014
191	1	17	15	ST	U	SWD	17_015
192	1	17	16	ST	D	dry channel	17_016
192	1	17	17	ST	U	dry channel	17_017
193	1	17	18	ST	U	no defined channel	17_018
195	1	17	19	ST	U	no visible channel	17_019
195	1	17	20	ST	D	no visible channel	17_020
196	1	17	21	ST	D	devil's club - low water	17_021
196	1	17	22	ST	U	devil's club - riparian vegetation	17_022
196	1	17	23	ST	U	culvert	17_023
197	6	17	24	ST	D	flow goes subsurface	17_024
197	6	17	25	ST	D	woody debris across channel	17_025
197	6	17	26	ST	U	Devils club and LWD	17_026
199	1	17	27	ST	U	eroding hillslope	17_027
198	1	17	28	ST	D	steep drop to main cree	17_028
198	1	17	29	ST	D	steep drop to main creek	17_029
198	1	17	30	ST	D	Dave (for scale) , steep drop to main creek	17_030
199	1	17	31	ST	U	upstream view	17_031
199	1	17	32	ST	U	typical log jam	17_032
199	1	17	33	ST	D	typical plunge over jam to pool habitat	17_033
200	1	17	34	ST	U	small flow	17_034
200	1	17	35	ST	D	subsurface flow - note riparian vegetation	17_035
201	1	17	36	ST	U	draw to mainstem	17_036
202	1	18	1	ST	U	dry channel	18_001
202	1	18	2	ST	D	dry channel	18_002
202	1	18	3	ST	U	trickle of flow up step/pool habitat	18_003
203	1	18	4	ST	X	failed slope 200 m upstream from Morice River	18_004
203	1	18	5	ST	D	log jam and failed slope	18_005
203	1	18	6	ST	U	WD and alder cover	18_006
204	1	18	7	ST	U	small cascade	18_007
204	1	18	8	ST	D	riparian vegetation to mainstem	18_008
205	3	18	9	ST	D	woody debris	18_009

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Site #	Reach #	Roll #	Frame #	Focal Lngt	Direction	Comments	CD Image #
205	3	18	10	ST	U	rifle/pool and woody debris	18_010
206	6	18	13	ST	U	LWD & instream aquatic vegetation	18_013
206	6	18	14	ST	D	LWD & overhanging vegetation	18_014
207	4	18	15	ST	U	small obstruction - Beaver dam approx. 0.5 m high	18_015
207	4	18	16	ST	D	meandering channel and overhanging vegetation	18_016

FRBC RESOURCE INVENTORY PROGRAM

**Reconnaissance (1:20,000 Scale)
Fish and Fish Habitat Inventory in
the Houston Tommy Creek
Watershed**

WSC: 460-600600-17000

Volume II
Appendix VIII: Reach Forms and Site Cards



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Environmental Consultants Ltd.

FRBC RESOURCE INVENTORY PROGRAM

**Reconnaissance (1:20,000 Scale)
Fish and Fish Habitat Inventory in
the Houston Tommy Creek
Watershed**

WSC: 460-600600-17000

Volume II
Appendix VIII: Reach Forms and Site Cards

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June 1998



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APPENDIX VIII: REACH FORMS

APPENDIX VIII: SITE CARDS