

**1998 RECONNAISSANCE (1:20,000)
FISH AND FISH HABITAT
INVENTORY WITHIN A PORTION
OF THE BABINE LAKE
WATERSHED GROUP**
Watershed Code: 480-993600-00600

FINAL

Prepared for:

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PROJECT REFERENCE INFORMATION

FRBC Project Number	OPM98508
FRBC Activity Number	10233
FDIS Project Number	07-SALR-400000880-1999
FRBC Region	Skeena-Bulkley
MELP Region	Region 6 (Skeena)
FW Management Units	6-6
DFO Habitat Area	North Coast
Forest Region	Prince George and Prince Rupert
Forest District	Fort St. James and Lakes
Forest Licensee	Stuart Lake Lumber Company Ltd.
Tenure #	A18169

SAMPLING DESIGN SUMMARY

Number of basins planned	1
Number of basins completed	1
Total number of planned reaches	71
Total number of planned reaches deferred	0
Total number of planned reaches within completed watersheds	71
Primary lakes surveyed	0
Secondary lakes surveyed	0
Random sampling sites in plan surveyed	11
Discretionary sample sites in plan surveyed	6
Total number of planned reaches field surveyed	17
Less number of planned reaches that were not found to be separate reaches in the field	0
Number of planned, selected reaches that were removed due to TRIM anomalies	8
Number of planned reaches removed	2
Number of reaches added	1
Number of reaches with sites added under new ILPs assigned as a result of TRIM anomalies	8
Number of sub-reaches (1:5,000 Inventory) added with discretionary sample sites	2
Number of unmapped reaches added and surveyed	4
Number of extra sample sites within sampled reaches	0
Total number of reaches with sample sites	31
Total number of sample sites	31
Number of reaches where operational inventory was performed	19

The planning information used in this sampling design summary was taken from the original sampling plan (submitted to the Ministry of Environment, Lands and Parks and dated July 21, 1998) for ease of interpretation. The original plan was later altered to provide continuity (also submitted to the Ministry of Environment, Lands and Parks, dated October 6, 1998), but the altered information is not reflected in this sampling design summary.

DISCLAIMER

This product has been accepted as being in accordance with approved standards within the limits of Ministry quality assurance procedures. Users are cautioned that interpreted information on this product developed for the purposes of the Forest Practices Code Act and Regulations, for example stream classifications, is subject to review by a statutory decision maker for the purposes of determining whether or not to approve an operational plan.

ACKNOWLEDGEMENTS

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Appendix II Fisheries Project Maps

Appendix III Voucher ID Forms

LIST OF ATTACHMENTS AVAILABLE AT MELP OFFICE

The following attachments to this report are available at the Ministry of Environment, Lands and Parks office in Prince George, B.C. The contact name, phone number and address are presented below.

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Attachments

I - Planning Document

II - Field Cards

III - Photodocumentation

IV - Digital Data

V - Fisheries Interpretive Map

VI- FISS Data Forms and Maps

1.0 INTRODUCTION

1.1 Project Scope and Objectives

In order to gain a better understanding of the fish and fish habitat within portions of their Forest License, Stuart Lake Lumber Company Ltd. initiated a Reconnaissance Fish and Fish Habitat Inventory. The Reconnaissance Fish and Fish Habitat Inventory is a sample-based survey covering whole watersheds (i.e. all lakes, stream reaches and connected wetlands within the watershed) as defined from air photos and 1:20,000 scale maps. The inventory is intended to provide information regarding fish species characteristics, distributions and relative abundance, as well as stream reach and lake biophysical data for interpretation of habitat sensitivity and capability for fish production (BC Ministry of Fisheries 1998a). The drainage network for the reconnaissance inventory is that depicted on the 1:20,000 scale Terrain Resource Information Management (TRIM) map base (BC Environment 1997a).

This project also included an operational inventory component, where certain reaches were sampled for Forest Practices Code stream classification. This operational inventory follows the same procedures as the 1:20,000 scale inventory; however, it includes a survey of the entire planned reach, not just 100 m or 10 bankfull widths. Data from both types of inventory have been included in the database for this project, and will be discussed in the body of this report.

1.2 Location Summary

The Babine Lake Watershed Group lies within the Interior Plateau physiographic division and the Nechako Plateau subdivision of central British Columbia (Holland 1976). The Nechako Plateau is an area of low lying relief with great expanses of flat or gently rolling terrain. Noticeable glacial features of the plateau surface include eskers and meltwater channels, many of the latter are now dry (Holland 1976). Bedrock predominantly consists of tertiary lava flows overlying older volcanic and sedimentary rocks. The volcanic rock types are comprised mainly of andesite, basalt and associated tuffs of breccias. The sedimentary rocks are dominantly chert, pebble conglomerate, shale and sandstone. Bedrock outcrops are uncommon due to the thick cover of glacial drift material (Langer, et al. 1992).

The Babine Lake Watershed Group lies within Management Unit 6-6 (BC Ministry of Environment, Lands and Parks 1993) of central British Columbia and is situated along the boundaries of the Fort St. James and Lakes Forest districts which are located in the Prince George and Prince Rupert Forest regions, respectively. The Babine Lake Watershed Group has a total size of 654,100 ha (BC Environment 1997a).

1.3 Study Area

The study area for this project incorporates one discrete watershed within the Babine Lake Watershed Group (Figure 1). Table 1 summarizes locational and watershed information on the study area located within the Babine Lake Watershed Group. This watershed flows into Sutherland River 630 m upstream of Babine Lake. The Sutherland River flows northwesterly into Babine Lake, which in turn drains out through the Babine River into the Skeena River.

Figure 1: Project overview map for the Babine Lake Watershed Group

Table 1. Watershed information¹ for the study area within Babine Lake Watershed Group.

Watershed Code or ILP/ILP Map#	UTM at Mouth	Watershed Area (ha)	Stream Length (km)	Stream Order	NTS/TRIM Maps	BEC Zone	Lake Area (ha)	Wetland Area (ha)	Air Photos
480-993600-00600	10.1053444 .1054580	2,171	31.37	3	93K/10 93K.054, 93K.055, & 93K.045	SBSdw 3	2.83	128.95	30BCB90065 216-217 30BCC906 142-146 30BCC906 101-106

¹ Information derived from TRIM

The study watershed is situated within the biogeoclimatic zone the Babine SBSdw3 Variant (MacKinnon, et al. 1990). Conifers common in this variant include lodgepole pine, Douglas-fir dominating on drier sites and hybrid white spruce dominating on wetter sites. Black spruce is common in wetland areas along with lodgepole pine occurring on poorer upland sites. Deciduous forests are dominated by trembling aspen, but localized paper birch forests also exist. Black cottonwood is common in riparian areas (DeLong, et al. 1993). Soils that may be found throughout this variant will generally consist of Gray Luvisols, Brunisolic Gray Luvisols and Dystric Brunisols (DeLong, et al. 1993).

1.4 Access

This watershed had experienced minimal forest harvesting, however, road access was available to many points in this watershed. Two roads intersect the basin and provided the access. These roads include the Whitefish-Cunningham Forest Service Road (FSR) and an unnamed road that connects the Whitefish-Cunningham FSR to Babine Lake. A boat was used to access the lower portion of the basin.

2.0 RESOURCE INFORMATION

2.1 Resource Use

The study area was in a Resource Development Area (Sowchea/Cunningham) recommended by the Fort St. James Land and Resource Management Plan (LRMP). The area is characterized by rolling topography and 3 prominent mountains (Fort St. James LRMP Working Group 1998).

Linear development within the study watershed is common due to active logging. As a result a series of roads lie within the vicinity of this watershed. Major gravel roads include the Cunningham FSR and its adjoining side roads (BC Ministry of Forests 1995; Canfor 1996).

2.2 Fisheries Resources

Within the study area, no information on fish species presence has been documented (BC Environment 1999). However, in Sutherland River, the system in which this basin flows into, rainbow trout (*Oncorhynchus mykiss*), sculpins (*Cottus* sp.), mountain whitefish (*Prosopium williamsoni*), brassy minnow (*Hybognathus hankinsoni*), kokanee (*Oncorhynchus nerka*) and sockeye salmon (*Oncorhynchus nerka*) have been documented (Bustard and Associates 1989).

3.0 METHODS

Stream inventories conducted during this project followed the methodology outlined in the *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Standards and Procedures* (BC Ministry of Fisheries 1998a).

The primary fish sampling method within the study area was electrofishing. Minnow traps were frequently used as a second method in suitable habitats.

The following sampling equipment was used in this inventory project:

Smith-Root 12A and 12B POW Electrofishers (including accessories)
Camera (Pentax Zoom 90 WR, 35 mm) (lens focal length 38 - 90 mm)
Suunto Clinometer
Gee Traps
Magellan GPS ProMark X Global Positioning System (GPS)
Trimble GeoExplorer II (GPS)
30 m measuring tape
Folding ruler (3 m)
Hip chains
Compass (Silva and Suunto)
Alcohol thermometer
Hand-held Oakton Model TDS-TESTR 3 (conductivity meter)
EM Science colored pH indicator strips (pH measurements)

The Photo CD deliverables provided with the final copy of the report were created as follows:

relevant photographs taken in the field (noted on the field cards) were scanned and copied onto labeled CDs

the scan file type for the photographs was TIFF version 5

the photographs (4" x 6") were scanned in colour at a resolution of 300 dpi and 24 bit

each scanned photograph is provided with a caption which includes: roll number, frame number, watershed code or ILP, reach number, site number and direction the photograph was taken (i.e. upstream, downstream)

the scanned photographs were assigned file names (on the CDs) which conform to the following eight character file naming convention: WG999F99.tif, where:

WG = two letter code for the Watershed Group (i.e. LT for Lower Trembleur)

999 = film roll number (up to 3 digits)

F99 = F for frame and 99 will be the frame number (i.e. 29)

.tif = computer file extension which is automatically assigned when the photograph is scanned

- f) photos that were of poor quality were omitted altogether, and identified as omitted on the field card.

3.1 Data Entry and Presentation Issues

A number of issues were identified during the production of this report that altered the final product. These issues are explained and the methods which *EDI Environmental Dynamics Inc.* used to address each are presented within this section of the report.

Defaulted Stream Reaches

All stream reaches requiring a Forest Practices Code stream classification that provided fish habitat and did not contain barriers impeding fish movement were classified by default as fish streams. Hence, only the classifications S1 through S4 are eligible for default and have been documented within this report with an asterisk (*) after the classification. For example, S-4*.

Fish Species Codes

There is a lack of consistency between the Field Data Information System (FDIS) (BC Fisheries 1998) and the Standards for Fish and Fish Habitat Maps (BC Ministry of Fisheries 1998b) with respect to fish species codes. In order to ensure a consistent application of fish species codes, the fish species codes acceptable in FDIS were used within both the report and the associated maps.

Channel Morphology Coding

The reader should be aware that the channel morphology/dominant substrate coding (i.e. SPg) required on the project maps looks similar to and as a result, may be misinterpreted as, a valid Channel Assessment Procedure (CAP) (BC Ministry of Forests and BC Ministry of Environment 1996) channel morphology 'base' code and sub-code (i.e. SP_b). Since the codes are derived from different information sources and serve different purposes, the reader should refer to the map legend for descriptions of the specific coding presented on the map.

Reach Gradient Discrepancies

As a result of the completion of the planning phase of the project prior to FDIS Version 6.4 being released, gradients in the reach planning tables (RPlans) were determined using 1997 Reconnaissance Fish and Fish Habitat Inventory (FRIM) standards. This involved the use of contour line values and reach lengths measured from digital TRIM. Gradient values in FDIS Version 6.4 were calculated according to the 1998 FRIM standards using reach lengths and Digital Elevation Model (DEM) data from digital TRIM. Reach Data Symbols on the Fisheries Project Maps produced for this report were generated using the original RPlan gradient values. These values may be slightly different from those generated in FDIS Version 6.4. As a result, gradient values shown on the Reach Cards for field sampled reaches may differ from the values identified on the corresponding reach data symbols. This issue was dealt with by changing the Reach Data Symbol gradient values to reflect those gradient values listed on the Reach Forms. The gradient values for stream reaches that were not sampled were not changed to reflect FDIS gradient values because differences were generally minor. The minor differences in gradient values are due to the different methods employed to generate the elevation values.

Digital Data Entry

The Field Data Information System (FDIS) is a digital data entry tool provided by BC Environment written in Microsoft Access and designed to enter the Reach (office) and Site (field) data into digital databases. The input of field data for this project was performed using FDIS version 6.4. Please note that any anomalies associated with version 6.4 of FDIS that result in errors or inconsistencies within the database or any of the hard copy outputs were not addressed by *Environmental Dynamics*. The digital and hard copy products generated by the FDIS version 6.4 form part of the deliverables for this project.

A listing of the major anomalies encountered with the FDIS and how they were dealt with for this project is presented below.

FDIS rounds the entered channel width, wetted width, and residual pool depth values to the nearest 0.1 m for presentation and hardcopy output. The accurate field measurements, however, are retained in the data base fields as originally entered.

In most cases, stream reaches are numbered according to the plan with the exception of additional reaches delineated in the field. The labeling of these additional reaches was accomplished by assigning a decimal sub-division of the upstream planning reach number. Where multiple field-derived reach breaks occurred, reach numbers were assigned in upstream order (i.e. 1.1, 1.2, 1.3).

FDIS printouts truncate the morphology class to a two letter code. In cases where all four letters have been filled in, the hardcopy will not display a proper code. For example, if RPGW was entered into the field, the hardcopy would indicate PG. The accurate morphology code, however, is retained in the data base field as originally entered.

FDIS only accepts bankfull depth (W_b) values to one decimal place. It will terminate the data entry for that cell if more than one decimal place is entered. For example, if the W_b field value is 0.19, FDIS will only accept 0.1 as the value. The accurate field measurements are retained only on the original field copy of the site card.

FDIS does not accept D or D95 values less than 0.1 cm, or N/A entries. This eliminates measurements adequately representing bed materials comprised solely of fine substrates. Values of 0.1 cm were entered for both fields in order to deal with this issue.

Fish cards in FDIS will round the stream width values to the nearest 0.1 m for presentation and hardcopy output. The accurate field measurements, however, are retained in the data base fields as originally entered.

Fish cards in FDIS will not accept variable pulse values. Values like 8 to 0.4 ms are represented as pulses of 8 ms in the pulse field. Comments are placed in either the Comments or Gear Setting Comments sections noting this situation.

Although the differentially corrected site Universal Transverse Mercators (UTM) coordinates have been uploaded from the GIS software into the Fdisdat.mdb file contained within Version 6.4 of FDIS, they fail to appear on the FDIS Site Card printouts. BC Fisheries has been made aware of this issue and recognizes that

it is due to FDIS (Miers, pers. comm. 1999). The corrected UTM's are present in the Fdisdat.mdb file submitted as a digital file (Attachment IV), and have been manually entered onto the field site cards.

Sub-Reaches

Some reaches that were delineated during the planning phases (I-III) of the Reconnaissance (1:20,000) Fish and Fish Habitat Inventory were split into more than one sub-reach during the fieldwork phase. These reaches were "split" because their stream characteristics were significantly different enough to delineate multiple reaches in the field. For reporting purposes, these field-delineated reaches have been identified as sub-reaches.

Certain methods were required to incorporate the sub-reaches into this report. Separate Reach Cards were generated for each sub-reach located within a planning delineated reach. Reach information was derived for the sub-reaches by using the information from the original planning delineated reach with only a few exceptions. The first exception is that the reach length values recorded for the sub-reaches are less than the reach lengths of the original planning reaches. The other possible exceptions include the downstream and upstream elevation values and stream order values of the sub-reaches differing from the original planning reach values. Each of these values was determined for that specific sub-reach.

Hardcopy Reach Cards printed for each field-delineated sub-reach are presented in Appendix 1. The comments section on the Reach Card for a sub-reach will indicate that the Reach Card is for a sub-reach. For example, the comments section on a Reach Card for a sub-reach will have the following statement: Field derived reach using sub-reach criteria derived from planning reach.

In the FDIS database reaches that have not been split into sub-reaches will be will have a zero after the decimal while reaches that have been split into sub-reaches will have a number greater than zero after the decimal. For instance, the Site Card for sub-reach 1.1 would be referenced in the FDIS database as Reach 1.1 and the Site Card for Reach 1 would be referenced as Reach 1.0. On the Fisheries Project Map a legend will indicate the distinction between sub-reaches and reaches. In addition, in the point attribute table the sub-reach Fcode should replace the "reach" Fcode where appropriate, and reaches on unmapped streams will be noted with the comment "unmapped stream" in this table. However, in the report all reaches and sub-reaches are labeled with a number greater than zero behind the decimal. For instance Reach 1 will be labeled Reach 1.1 and Sub-Reach 1.1 will be labeled as Reach 1.1. Please refer to FDIS and/or the Fisheries Project Map to determine if a Reach has been separated into sub-reaches.

Mapping TRIM Anomalies

Upon field examination a number of reaches appeared to be incorrectly depicted on TRIM. Two different methods were utilized to map these issues, one for the Fisheries Project Map (Appendix II) and a separate method for the Interpretive Maps (Attachment V). On the Fisheries Project Map the Base Anomaly Symbol was placed at the location of the TRIM inaccuracy. On the Interpretive Map, the Base Map Anomaly is present, along with the approximate location of the stream course. Any incorrect stream locations on TRIM are indicated with a red jagged line. Thereby, the reader can see where TRIM inaccuracies occur on the Fisheries Project Map but will have to refer to the Interpretive Map to see the field-derived stream course.

Fish Bearing and Non-fish Bearing Sections

Environmental Dynamics would like to clarify the data set presented in the Fish Bearing and Non-fish Bearing sections within the Results and Discussion section since the Reconnaissance Inventory Standards and Procedures are vague. These tables do not represent all of the data collected because fish bearing or non-fish bearing status could not be assigned to all reaches. The data set presented in the Fish Bearing and Non-fish Bearing sections include stream reaches that meet the following criteria:

Fish bearing status was assigned when fish were present (captured or observed), when there were no barriers preventing fish from accessing the site, or when reaches were assigned a defaulted fish bearing stream classification under the *Forest Practices Code* (FPC).

Non-fish bearing status was assigned to all stream reaches where extensive sampling occurred and the presence of a definitive barrier precluded fish presence, or when reaches were assigned a non-fish bearing stream classification under the FPC. Streams with little or no fish habitat where an appropriate amount of sampling had been performed may also be assigned non-fish bearing status. This will be noted in the Comments section of the non-fish bearing tables.

Both FPC classified fish bearing and non-fish bearing stream reaches and stream reaches that were not assigned a FPC classification, but designated non-fish or fish bearing, will appear in the respective report sections and tables.

Reaches that did not require a FPC classification were sampled according to Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Standards and Procedures (April 1998). These standards require that the sample site be at least the greater of 100 m or 10 times the bank-full width and be conducted on a representative portion of the stream reach. *Environmental Dynamics* feels that data collected under the standard reconnaissance field inventory procedure are not complete enough to justify a FPC stream classification for a reach which was not ground-truthed in its entirety in the field. This increases the risk of incorrectly classifying a stream reach or part of a stream reach. However, reaches that remain un-classified may have been assigned fish or non-fish bearing status.

Stream reaches were selected to be classified under the FPC by request of the client for operational purposes. In order to assign a FPC stream classification to a reach, the entire length of the reach was surveyed in the field, from the lower reach break to the upper reach break. All FPC classified stream reaches will appear within either the Fish Bearing or Non-fish Bearing report sections and related tables. All FPC classified non-fish bearing stream reaches have an associated Non-fish Bearing Status Report that justifies the assigned classification. Non-fish Bearing Status Reports were only produced for reaches where non-fish bearing stream classifications were assigned. These reports can be found following the relevant reaches in Appendix I.

NVC Assignment

No Visible Channel (NVC) has been assigned to a site when there was either a mapping error (i.e. no channel at all where one is mapped) or underground flow, according to the Reconnaissance Inventory Standards and Procedures guidebook (April 1998). In many situations, wetlands with fish habitat that lack channelization are ponded. Open waterbodies such as ponds are not considered to have channels,

and qualify as NVCs. As well, some wetlands with fish habitat are simply flooded, vegetated areas that also lack channelization. NVC will be used to describe situations where a channel is not present. The associated site cards have comment sections that state if this site contains fish habitat, and also if the site is flooded or contains a pond.

Changes to Coordinates

The location of samples sites on the project and interpretive maps accompanying this report are not necessarily representative of the true location of the site according to ground-truthing. At the request of the Ministry of Environment, Lands and Parks, site sample locations have been moved onto the TRIM streamline. Corrected GPS information is presented in the 'Field UTM' data columns in the accompanying FDIS database. This was a post-field office exercise, and as a result the UTM values located in the 'Field UTM' columns of the database will not be located in the corresponding field on the original field card. UTMs contained in the 'UTM' columns represent the sites as they appear on the project and interpretive maps.

3.2 Modifications to the Sampling Plan

A number of modifications to the sampling plan for this project (EDI Environmental Dynamics Inc. 1998) involving additions or deletions of selected reaches were necessary (Table 2). The following scenarios resulted in modifications to the sampling plan:

During field assessments a change in reach characteristics may have resulted in the division of a planning reach into two or more sub-reaches. These new sub-reaches were assigned new reach numbers (for example: Reach 2.1 may have been divided into sub-reaches 2.1 and 2.2) and designated as discretionary samples. A reach card and a site card were prepared for each sub-reach.

b) Field assessments revealed that streams were inaccurately mapped by TRIM. In these cases, streams did not flow into the location depicted by TRIM, rather were actually part of another stream. The reaches on the mapped streams were eliminated and surveyed as part of the actual stream that it flows into.

Field assessments may have resulted in the formation of one reach where there were originally two or more planned reaches. In this situation, the upstream reach or reaches was effectively eliminated. Their sample types in the database changed from an R or B to an N. The site and fish card information from the downstream reach were entered as the data for the entire field reach. Mapping reflects the downstream reach as spanning the entire length of the combined reach.

After all field surveys were completed, a Global Positioning System (GPS) point revealed that the field crew inadvertently surveyed the incorrect reach, however, the information collected was for the downstream reach and was included in the report.

Some stream reaches that were planned and assigned ILP numbers during the planning stage were replaced with different ILP numbers as a result of field survey information.

Table 2. Changes to the 1998 sampling plan in the Babine Lake Watershed Group study area.

Watershed Code or ILP Number	ILP Map Number	Reach	Sampling Alteration Scenario ¹	Plan	Comments
ILP 98312	93K.055	1.2	a		Sub-reach added in the field
480-993600-00600-79400	--	7.2	a		Sub-Reach added in the field
ILP 98750	93K.055	1.2 & 1.3	a, b		Two sub-reaches added in the field. Please note that the lower part of the stream was mismapped. In addition, all the flow from the watershed above flows into this stream, rather than ILP 98336 as is mapped by TRIM.
ILP 98338	93K.055	1.1	a, b		Incorrectly mapped stream, added one sample site in the field.
480-993600-00600	--	1.1 and 2.1	c		Reaches combined into one reach. Please note that Reach 1.1 was not selected to be sampled in the original sampling plan.
480-993600-00600-79400	--	3.1	d		Reach inadvertently not sampled.
480-993600-00600-48300	--	11.1	d		Reach 10.1 inadvertently sampled instead of Reach 11.1
ILP 98313	93K.055	1.1	d		Reach inadvertently not sampled.
ILP 98314	93K.055	N/A	e		Stream renamed ILP 98337 and reaches renumbered due to TRIM anomaly
ILP 98315	93K.055	N/A	e		Stream renamed ILP 99336 and reaches renumbered due to TRIM anomaly
ILP 98336	93K.055	N/A	e		Stream planned as a portion of ILP 99314 (see above), but changed to ILP 98336 due to a TRIM anomaly
ILP 98337	93K.055	N/A	e		Stream planned as a portion of ILP 99314 (see above), but changed to ILP 98337 due to a TRIM anomaly
ILP 98338	93K.055	N/A	e		Lower section of stream unmapped due to a TRIM anomaly. ILP 98338 assigned.

¹See scenarios presented above table.

4.0 RESULTS AND DISCUSSION

This section is intended to provide an overview of inventory results for the Stuart Lake Lumber Company Ltd., Babine Lake Watershed Group study area. For FDIS outputs providing specific site or fish information, photodocumentation for a sampled reach or documented feature, or to view non-fish bearing status reports, please refer to Appendix I. A mapped summary of this information is presented in Appendix II. For documentation accompanying any voucher fish specimens submitted for identification from this project, please refer to Appendix III.

There are also six attachments associated with this report, and they are available at BC Environment in Prince George. A brief description of each attachment is included here. Attachment I is the planning document for the study area discussed in this report (EDI Environmental Dynamics Inc. 1998). Copies of the original field cards are contained in Attachment II, and the accompanying photodocumentation for each set of cards can be found in Attachment III. The file containing the digital data for the study area discussed in this report is available as Attachment IV. All stream classes determined in previous Reconnaissance Inventory projects conducted by *EDI Environmental Dynamics Inc.*, as well as fish presence or absence are included on the Fisheries Interpretive Maps, available as Attachment V. These maps will identify codes for all fish species present in the 1998 inventory study area and will include only fish presence or absence information for historical inventory data. Attachment VI includes all FISS data and maps produced as the result of 1998 study area inventory.

4.1 Logistics

Fieldwork within the study area was conducted between July 27 and August 8, 1998. The major logistical problem associated with this project was that there were a number of dry channels, therefore, many streams could not be sampled for fish. This was considered when decisions to resample were made (Refer to Section 4.53). It should be noted that 1998 generally was considered a very dry summer which may have contributed to low flows and dry channels in this project.

4.2 Habitat and Fish Distribution

Fish were only captured in the lowermost reach in this system. No new or historic barriers to fish migration were documented in this basin.

The lower portion of this basin was located in a large (115.2 ha) wetland area that extended to the easternmost end of Babine Lake. It appeared from the air photo that this wetland area used to be part of Babine Lake, however, over time with deposition from streams and possibly westerly wind action on the lake the shoreline has been gradually moving west.

Two streams were sampled in the large wetland area, Reach 1.1 of the main system (WSC: 480-993600-00600) and a tributary (WSC: 480-993600-00600-13400). The streams were characterized as having large channel morphologies, with slow flow and organic or fine substrates. A riparian made up of grasses and the slow moving water resulted in high water temperatures during the summer (above 20 °C during time of survey). The type of habitat and high temperatures are more suited to Cyprinid species than salmonid species. Non-game fish (non-salmonids) are generally more tolerant of higher water temperatures (than salmonids) (Platts 1991).

Above the wetland gradient increases and the riparian vegetation shifts to mainly a coniferous forest with sporadic areas of wetland. Reaches 2.1 to 10.1 of the main system were not selected for surveying, however, may provide valuable insight to the fish distribution within this basin. The only other reach (11.1) on the main system that was surveyed was is mapped by TRIM as a lake, however, the air photo and field assessments revealed that the lake does no longer exist. Rather there was a small channel with a large channel morphology and wetland riparian which used to be the bottom of the lake. This channel was dry, therefore, no fish sampling was conducted.

The system that drains the northwest portion of this basin (WSC: 480-993600-00600-48300) had some fish habitat, however, at the time of survey most reaches were dry. Even Reach 1.1 which had an average channel width of 2.2 m was dry at time of survey. The substrate consisted of cobbles and fines which indicates that flows rarely gets exceptionally high or turbulent. Field crews noted that there was some rearing habitat in Reach 4.1, as there was good cover and some deep pools. There was water in this reach at time of survey, however, dry areas downstream likely limited fish use in this reach. Upstream Reach 10.1 had poor habitat and field crews noted that steep gradients (>20%) downstream likely limits fish use in this area.

One tributary (WSC: 480-993600-00600-79400) to the main system had some rearing habitat in the lower two reaches during higher water levels. No fish were captured and spawning and overwintering

habitat was deemed poor. An unsurveyed lake (Reach 4.1), however, was present upstream of this area which may provide possible overwintering habitat to support fish populations.

Above the small lake there were two streams that had some fish habitat. Stream ILP 98750/93K.055 reaches 1.1, 1.2, 1.3 and Stream ILP 98338/93K.055 Reach 1.1 had some adequate quality rearing habitat. However, the lack of water at the time of survey eliminated fish sampling opportunities. The lower section of ILP 98750 was incorrectly mapped on TRIM and the lower section was not followed to determine the drainage path or location of the mouth. It likely flows into ILP 98312/93K055, however, additional fieldwork would be required to confirm this. As the lower section was not surveyed and it is not known if fish could access the habitat in the reaches surveyed. Refer to Section 4.5.3 for information on the possible resampling of this area.

A number of other reaches, including many headwater systems, sampled in this basin had no visible channel and provided no fish habitat.

4.3 Fish Size and Life History

A lake chub (*Couesius plumbeus*) was the only fish captured within this basin (Table 3). The capture of only one fish in this basin indicates that fish are of a low relative abundance in areas where they are present at all. This fish was captured in the lowermost reach of the basin, near Sutherland River. This fish was likely a resident as it could overwinter in the reach in which it was captured and should be able to spawn within the streams in the area. A length-frequency histogram was not constructed due to insufficient data.

Table 3. Summary of data from fish captured in the study area.

Watershed Code or ILP/ILP Map #	Species	Life Stage	Number of Fish	Suspected Life History	Range of Fork Lengths (mm)
480-993600-00600	lake chub	Juvenile	1	resident	45

4.4 Significant Features and Fisheries Observations

No critical habitats were identified in this watershed that required special habitat protection above and beyond the protection that the Forest Practices Code provides. Sport fishing values were deemed to be low in this basin as there were no sport fish captured.

4.4.1 Fish and Fish Habitat

This basin provides habitat within the lower reaches, possibly as a refuge from the Sutherland River. No spawning habitat was identified in this watershed. The absence of spawning habitat combined with low water levels (found at time of survey) may limit fish use in this basin. Although fish habitat was found in the upper portions of this basin, little is known about the middle portion of the basin. These middle reaches likely have an influence on the ability of fish to use the upper reaches.

4.4.2 Habitat Protection Concerns

The presence of fisheries sensitive zones, fish noted above 20% gradients and potential fish habitat restoration and rehabilitation opportunities are described below.

4.4.2.1 Fisheries Sensitive Zones

No fisheries sensitive zones were identified during the inventory of this basin.

4.4.2.2 Fish Above 20% Gradient

No fish were captured in or above high gradient areas.

4.4.2.3 Restoration and Rehabilitation Opportunities

No restoration or rehabilitation opportunities identified in this watershed.

4.4.2.4 Fish Bearing Status

Fish bearing and non-fish bearing stream reaches along with the requirements for follow-up sampling are presented below.

4.4.2.5 Fish Bearing Reaches

Fish were captured in only one reach. Also, thirteen stream reaches were defaulted to fish bearing status based on available habitat characteristics and the lack of definite barrier below (Table 4).

Table 4. Summary of data from surveyed fish-bearing reaches in Watershed 480-993600-00600.

Watershed Code or ILP/ILP Map#	Reach	Species	Channel		FPC Stream Classification	Follow-up Sampling Required?	Comments
			Width (m)	Gradient (%)			
480-993600-00600	1.1	lake chub	18	0	NC	No	
480-993600-00600	11.1	--	1	0	NC	N/A	Possible fish habitat.
480-993600-00600-13400	1.1	--	5	0	NC	No	Suitable rearing. Channeled wetland.
480-993600-00600-48300	1.1	--	2.2	5	S-3*	No	Dry channel at time of survey. If water were present, rearing channel would be good due to cover.
480-993600-00600-48300	4.1	--	1.4	1.7	NC	No	Dry channel at time of survey. If water were present, rearing channel would be good due to cover.
480-993600-00600-79400	1.1	--	1.4	2.3	S-4*	No	Fish presence assumed due to suitable habitat and no known barriers below
480-993600-00600-79400	2.1	--	1.3	1.5	S-4*	No	Fish presence assumed due to suitable habitat and no known barriers below
ILP 98750/ 93K.055	1.1	--	1.7	3.75	S-3*	Yes	Fish presence assumed due to suitable habitat and no known barriers below
ILP 98750/ 93K.055	1.2	--	1.3	1.6	S-4*	No	Fish presence assumed due to suitable habitat and no known barriers below.
ILP 98750/ 93K.055	1.3	--	1.2	3.6	S-4*	No	Fish presence assumed due to suitable habitat and no known barriers below
ILP 98312/ 93K.055	1.1	--	1.5	0	Wetland	No	Channel through a wetland. Fair habitat.
ILP 98312/ 93K.055	2.1	--	N/A	N/A	NC	No	Good over wintering habitat, rearing habitat is good for coarse fish. No visible channel.
ILP 98338/ 93K.055	1.1	--	1.2	N/A	S-4*	No	Fish presence assumed due to suitable habitat and no known barriers below

*stream reach defaulted to fish bearing classification.

NC= Stream reach not classified; N/A= Not available

4.5.2 Non-Fish Bearing Reaches

Seventeen reaches were identified as non-fish bearing (Table 5). Fish distribution was limited by obstructions to fish passage, poor habitat quality and absence of regionally significant fish species.

Table 5. Summary of data from surveyed non-fish bearing reaches in upper Watershed 480-993600-00600.

Watershed Code or ILP/ILP Map #	Reach	FPC Stream Class	Channel Width (m)	Gradient (%)	Electrofishing Specifications				Other Methods		Comments
					Distance (m)	Time (s)	Cond. (uS/cm)	Temp. (°C)	Type	Effort (hrs)	
480-993600-00600-22100	3.1	NC	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage with no visible channel.
480-993600-00600-48300	10.1	NC	1.03	12.5	N/A	N/A	N/A	N/A	-	-	High gradient downstream precludes fish use. Dry channel at time of survey.
480-993600-00600-79400	7.1	S-6	1.18	1.5	200	124	530	11.5	-	-	Too shallow for minnow traps.
480-993600-00600-79400	7.2	S-6	1.52	5	N/A	N/A	N/A	N/A	-	-	Dry channel
ILP 98750/93K.055	2.1	NC	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage with no visible channel.
ILP 98311/93K.055	1.1	NCD	N/A	N/A	N/A	N/A	N/A	N/A	-	-	No visible channel, seepage.
ILP 98311/93K.055	2.1	NCD	N/A	2.5	N/A	N/A	N/A	N/A	-	-	No visible channel. Seepage.
ILP 98313/93K.055	2.1	NC	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage. No visible channel, alluvial substrate or scouring.
ILP 98313/93K.055	3.1	NC	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage. No visible channel, alluvial substrate or scouring.
ILP 98317/93K.055	2.1	NC	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage. No visible channel, alluvial substrate or scouring.
ILP 98317/93K.055	3.1	NC	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage. No visible channel, alluvial substrate or scouring.
ILP 98336/93K.055	1.1	NCD	N/A	N/A	N/A	N/A	N/A	N/A	-	-	No stream existed in this area.
ILP 98337	1.1	NCD	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage with no visible channel
ILP 98337	2.1	NCD	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage with no visible channel
ILP 98337	3.1	NCD	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage with no visible channel
ILP 98338	2.1	NCD	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Seepage with no visible channel.
ILP 98338	3.1	NCD	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Wetland with no visible channel.

N/A= Not applicable, NCD= Non classified drainage, NC= not classified

4.5.3 Follow-up Sampling Required

Table 6 lists reaches that require further sampling before fish-bearing status can be concluded. Further sampling through the use of other methods or at a different time of the year may help determine whether fish utilize these reaches. By listing these reaches in this table, *Environmental Dynamics* is not agreeing to conduct further sampling, but rather indicating that more information is required if the data are to be interpreted for riparian classification or other uses.

Follow-up sampling is recommended for the designation of streams above the small lake (WSC: 480-993600-00600-79400, Reach 4.1). Stream ILP 98750/93K.055 was incorrectly mapped and the exact location of flow was not determined. It is likely that this stream flows into ILP 98312/93K.055. Reaches 1.1, 1.2, 1.3 and 2.1 were dry at time of survey and were unable to be sampled. It is important to determine where this stream (ILP 98750/93K.055) flows and if there are any impediments to fish passage. Also, the presence or absence of fish in the small lake (WSC: 480-993600-00600-79400, Reach 4.1) is important for determining fish presence in the streams above. As previously mentioned, this lake likely represents the only overwintering habitat in the upper basin.

Four reaches were selected as candidates for resampling in the spring, when water levels are high. This should include one site below the lake (480-993600-00600-79400, Reach 3.1), as fish, if present, from the lake may use this habitat in the spring. Also the lake (Reach 4.1) should be sampled with minnow traps and angling to determine fish presence. ILP 98750/93K.055 (Reach 1.1) should be sampled and the location of flow should be determined. It is possible that a barrier may be present in the area, where flow location was undetermined. Finally, Stream 480-993600-00600-79400, Reach 5.1 was selected to be resampled as even though it did not contain fish habitat at the site location, fish use could not be ruled out downstream of the sampling location.

Table 6. Reaches where follow-up sampling may help predict fish use of these reaches.

Watershed Code or ILP/ILP Map #	Reach	Timing	Methods	Comments
480-993600-00600-79400	3.1 & 4.1	Late May/ Early June	Electrofishing (R 3.1) Minnow Traps and Angling (R 4.1)	Downstream of lake and Lake - not previously sampled.
480-993600-00600-79400	5.1	Late May/ Early June	Electrofishing	Sampled at middle of Reach, cannot rule out fish use downstream.
ILP 98750/93K.055	1.1	Late May/ Early June	Electrofishing	Defaulted to S-3* pending resampling results.

Resampling could potentially be done in one day. If a barrier is found or no fish are captured it should be enough evidence that the four defaulted reaches above the lake are not fish bearing, however, a decision will be made after sampling when more information is known about the system.

All other surveyed reaches were designated as fish or non-fish bearing reaches. Reaches where no fish were captured or observed, but which provided fish habitat and were free of downstream barriers impeding fish movement were designated by default as fish bearing reaches. Should sampling be conducted and again no fish captured, there may still not be enough evidence to designate these reaches as non-fish bearing. These streams may be used either seasonally or during abnormal events in the watershed (such as high flows in main systems).

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