



ENVIRONMENTAL DYNAMICS INC.
Natural Resource Consultants

**1998 RECONNAISSANCE (1:20,000)
FISH AND FISH HABITAT
INVENTORY WITHIN A PORTION OF
THE NATION RIVER WATERSHED
GROUP**

Watershed Code: 237-569400

Volume 1 of 2

Prepared for:
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PROJECT REFERENCE INFORMATION

FRBC Project Number	OPM98505
FRBC Activity Number	10242
FDIS Project Number	07-NATR-0000-0001-1998
FRBC Region	Omineca-Peace
MELP Region	Sub-Region 7A (Omineca)
FW Management Unit	7-27
DFO Habitat Area	Upper Fraser
Forest Region	Prince George
Forest District	Fort St. James
Forest Licensee and Tenure #	Canadian Forest Products Ltd., A40873

SAMPLING DESIGN SUMMARY

Number of watersheds submitted for approval	5
Number of watersheds approved for 1998	5
Number of watersheds completed	1
Total number of planned reaches in approved basins	224
Total number of planned reaches deferred in approved basins	<u>125</u>
Total number of planned reaches within completed watersheds	99
Random sampling sites in plan surveyed	9
Discretionary sample sites in plan surveyed	36
Primary lakes surveyed	2
Secondary lakes surveyed	<u>0</u>
Total number of planned reaches field surveyed	45
Less number of planned reaches that were not found to be separate reaches in field	<u>2</u>
Total number of planned reaches sampled (sample sites)	43
Number of reaches with more than one sample site	3
Discretionary sample sites added in field survey	<u>45</u>
Total number of sample sites	91

Sampling Dates: July 22 to July 28, 1998

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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Including: WSC: 237-569400, 237-569400-46700, ILP 08521, 237-569400-46700-04500 and tributaries, ILP 08060 and tributaries, 237-569400-46700-28200 and ILP 08066)

Volume 2: Appendix I: FDIS Summary, Photographs, and Non-Fish Bearing Status Reports for **WSC: 237-569400**

Including: All remaining tributaries to 237-569400 and WSC: 237-569400

Appendix II: Fisheries Project Map

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- Hardcopy FISS Update Data Forms

1.0 INTRODUCTION

1.1 Project Scope and Objectives

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 Nation River Watershed Group Location Summary

The Nation River Watershed Group lies within the Interior Plateau physiographic region of central British Columbia and is located in BC Environment's Sub-region 7A (Omineca), Management Unit 7-28 (BC Ministry of Environment, Lands and Parks 1993). The Nation River Watershed Group is situated within the Omineca Mountains which include the Hogem Ranges and the Swannell Ranges. The Hogem Ranges are 225 km long with a maximum width of 48 km (Holland 1976). Geological formations vary in accordance with pre-dominant eras. The north end of the Hogem Ranges, within the Nation River Watershed Group, are eroded from Palaeozoic and Mesozoic volcanic and sedimentary rocks. In the south, the ranges are underlain by limestone and argillite from the late Palaeozoic (Permian) age, and also incorporate granitic rock from the Omineca Intrusions. The Swannell Ranges extend for approximately 320 km with a maximum width of 140 km and valley bottoms lying between 910 and 1220 m. The Nation River Watershed Group's relief varies in elevation from 800 m in the east to approximately 1200 m in the west.

The Nation River Watershed Group is bounded by Mount Tom and Baldy Mountain which is located in the Swannell Ranges to the north, Williston Lake to the east, Inzana Lake and Mount McKinnon to the south and Klowkut Peak and the Nesabut Peaks to the west (BC Ministry of Environment, Lands and Parks 1993). The major drainage of this watershed is the Nation River which flows east through the Nation Lakes (Tsayta, Indata, Tchentlo and Chuchi lakes) and eventually into Parsnip Reach of Williston Lake. Other major drainages inside the Watershed Group are Kwanka Creek flowing south into the Nation River between Tsayta and Indata lakes, Rottacker Creek flowing south into the Nation River between Indata Lake and Tchentlo Lake, Valleau Creek flowing east into Klawii River and eventually south into Chuchi Lake, and Philip Creek flowing north into the Nation River along the eastern sector of the Watershed Group. To date, there are 32 gazetted lakes and 6 unnamed lakes which have been inventoried in the Nation River Watershed Group. Inventory data are available at BC Environment, Prince George (BC Environment 1997b). Out of the 38 lakes inventoried 14 are within fish and fish habitat study areas for this project and will be discussed in detail at the beginning of the

individual watersheds. It should be noted, two blue-listed fish species inhabit the Nation River Watershed Group. Bull trout (*Salvelinus confluentus*) which are present throughout many areas surveyed and Arctic grayling (*Thymallus arcticus*) brood stock, which has been established in Little Calais Lake (Fort St. James Land and Resource Management Plan Working Group 1997).

1.3 Study Area

The study area for this project incorporates one discrete watershed, Ahdatay Creek (upper watershed), within the Nation River Watershed Group (Figure 1). This watershed commences 8.5 km upstream of Tchentlo Lake and includes the headwaters of Ahdatay Creek and its tributaries. This fourth order basin drains in a southeasterly direction towards the bottom of the basin at which point it flows south into Tchentlo Lake. As mentioned above, access was limited the use of a helicopter as there was no road development at time of survey. It should be noted that Canfor plans to develop many areas of the watershed which will provide access to several points within this watershed. Table 1 summarizes locational and watershed information on the study area located within the Nation River Watershed Group.

Table 1. Watershed information¹ for the watershed within Nation River 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
237-569400	10.380260.6127610	10,030	110.4	4	93N/6 93N/7 93N.025 93N.026 93N.035 93N.036	ESSF mv3 AT p SBS mk1	180.3	381.9	30BCC90121 #124-134. 30BCB90095 #27-33 & 58-63

¹Information derived from TRIM

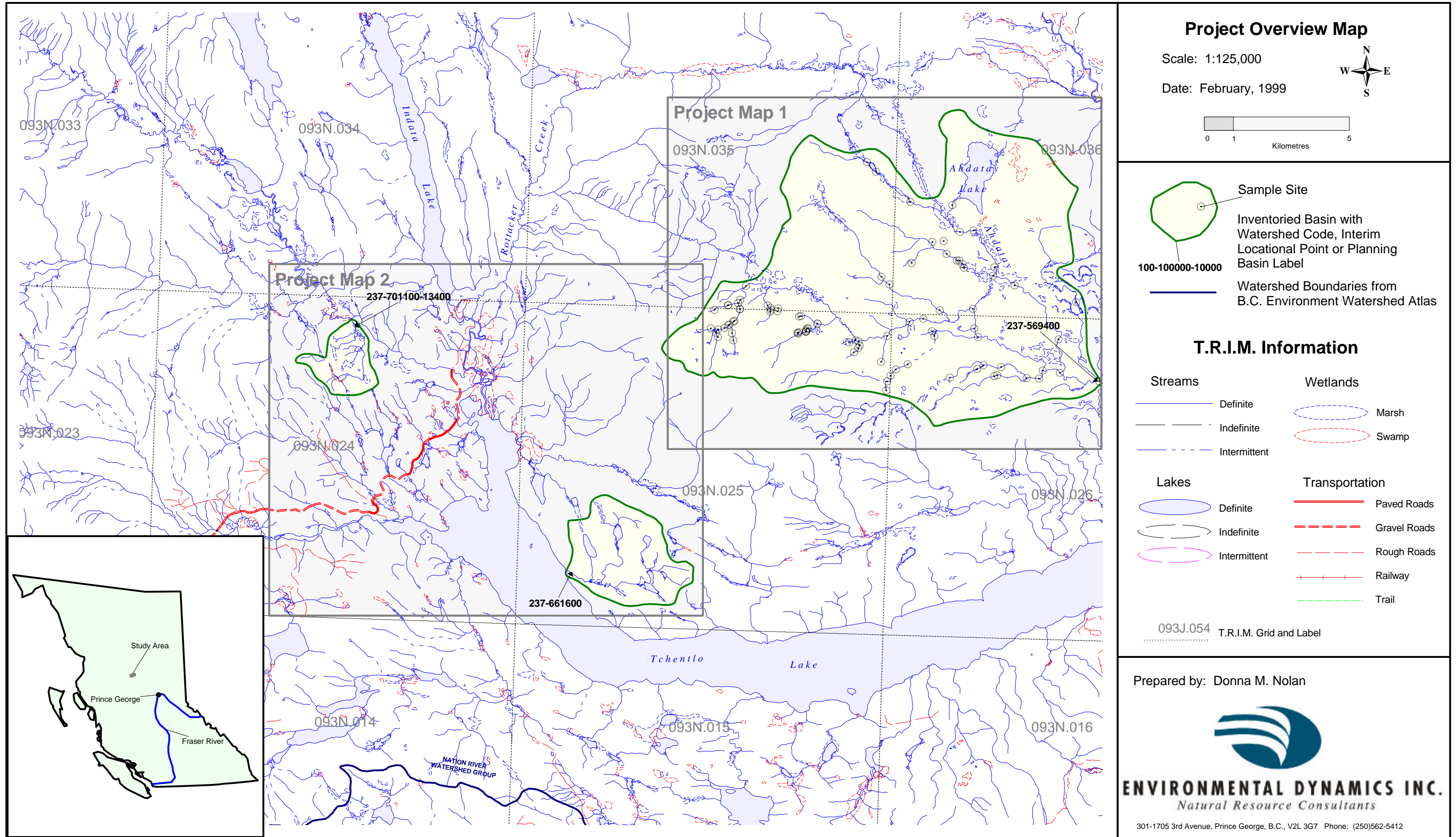
The study area (the upper Ahdatay Creek watershed), within the Nation River Watershed Group is situated within three sub-zones/variants: 1) the Omineca Moist Very Cool Sub-Boreal Variant (ESSFmv3), 2) the Mossvale Moist Cool Sub-Boreal Spruce Variant (SBSmk1), and 4) the Alpine Tundra and Parkland Forest (ATP) (BC Environment 1996). Each sub-zone/variant has representative site associations, and each vary in vegetation and soil. Vegetation and soil common to the four sub-zones/variants are described below.

Omineca ESSFmv3 Variant

Vegetation common to this variant include climax species of Englemann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*). Lodgepole pine (*Pinus contora*) occurs as a seral species after forest fires. Other conifers that occur occasionally in this variant include the western white pine (*Pinus monticola*), Douglas-fir (*Pseudotsuga menziesii* var. *glauca*), western hemlock (*Tsuga heterophylla*), and western redcedar (*Thuja plicata*). Snow avalanche tracks are common in high-snowfall, mountainous portions of the ESSF. These avalanche tracks are occupied by distinctive vegetation; sitka or slide alder (*Alnus crispa* ssp. *Sinuata*) being the dominate shrub. Deciduous trees are not common in this variant (Meidinger and Pojar 1991). Soils that may be found throughout this variant generally consist of Humo-Ferric Podzols. Humus forms are generally Mors (Meidinger and Pojar 1991).

Figure 1. Project Overview Map.

Figure 1. Project Overview Map



Mossvale SBSmk1 Variant

Vegetation common to this variant include climax species of hybrid white spruce. Douglas-fir occurs as a long lived seral species on drier warm aspects with coarse soils. Black spruce (*Picea mariana*) occurs in wetlands and in combination with lodgepole pine on poorer upland sites. Paper birch occurs sporadically, often in combination with Douglas-fir. Bedrock geology in this sub-zone is dominated by volcanic rocks of the Mesozoic age with small amounts of metamorphic rocks. Soils have formed on predominate morainal and lacustrine materials. Morainal deposits consisting of gravelly loam and clay textures associated with Gray Luvisolic soils, including Brunisolic Gray Luvisols (DeLong et al. 1993).

Alpine Tundra and Parkland Zone

The alpine zone generally occurs at elevations above 1400 m in the northeast and is by definition, treeless, but tree species are common at lower elevations. These trees are stunted or in krummholz form. The most prevalent krummholz species are; subalpine fir, Englemann spruce, mountain hemlock (*Tsuga mertensiana*) and whitebark pine (*Pinus albicaulis*). Soil development is often absent or weak with Regosols (Orthic and Humic) being the most common. Brunisols are widespread in the drier areas, Melanic and Sombric Brunisols with tury Ah horizons are found where graminoid sods have developed, Humic Gleysols or organic soils are found in wet habitats, Turbic Cryosols and Organic Cryosols are common in the northern regions or on north aspects where subsurface drainage is impeded, and Ferro-Humic Podzols are found under krummholz mountain-heather (*Ericaceae* spp.) and scrub birch (*Betula glandulosa*) vegetation. Rhizomulls are widespread in herb-dominated tundra ecosystems and Hemimors and Mormoders are expected to be under alpine scrub and heath vegetation (Meidinger and Pojar 1991).

1.4 Access

This watershed is scheduled to be developed for the purposes of forest harvesting in the near future. A network of forest roads will then provide access to many areas within the basin. During this study, however, access was only available by foot or helicopter. The Tchentlo Forest Service Road (FSR) was the closest road to this watershed, located approximately 1.5 km south of the southernmost portion of this watershed.

2.0 RESOURCE INFORMATION

2.1 Resource Use

Nation River Watershed Group

Linear development within the Nation River Watershed Group is extensive due to active logging. As a result a network of roads lie within this Watershed Group. Major gravel roads inside the Fort St. James District include: the Fall-Tsayta Forest Service Road (FSR), the Driftwood FSR, the Tchentlo FSR, the Leo-Airline FSR, the Leo-Purvis FSR, the Witch FSR, the Germansen Landing North Road, the Germansen-Indata FSR, the Thutade FSR, the Finlay-Nation FSR, the Thutade-Nation FSR and the Philip North FSR (BC Ministry of Forests 1995; Canfor 1997).

The BC Forest Service has sixteen recreation sites within the Fort St. James Forest District portion of the Nation River Watershed Group. Of these sixteen recreation sites, eleven are boat access only. Twelve of the sixteen recreation sites provide 7 to 10 day canoe trips through the Nation Lakes, one of which embodies a natural hot spring (BC Ministry of Forests 1995). Recreational trails are located in this area and include; the Baldy Mountain Trail which begins at the Thutade FSR, a small series of trails leading into Fishroe, Munro and Finger lakes from the Finlay-Nation FSR and a series of trails around the Nation Lakes (BC Ministry of Forests 1995).

The Nation River Watershed Group contains a Nation Lakes Proposed Protected Area suggested to envelop 19,700 ha of land around portions of the Nation Lakes. The Nation Lakes Proposed Protected Area has high recreational values and includes a provincially significant canoe route, sandy beaches, and multiple campsites. Wildlife values within the proposed Protected Area are high and provide good thermal cover for lynx (*Lynx canadensis*) and snowshoe hare (*Lepus americanus*). Woodland caribou (*Rangifer tarandus*) are commonly seen around Tsayta and Indata lakes and the area is known to be their approximate southern range in British Columbia (Fort St. James Land and Resource Management Plan Working Group 1997). Presently, there are existing commercial and recreational lakeshore tenures within the proposed Protected Area and are viable for further development. Mineral and archaeological potential are high (Fort St. James Land and Resource Management Plan Working Group 1997).

Mineral assessments have classified tracts of land from lowest (1) to highest (10) throughout the Fort St. James, Land and Resource Management Plan (LRMP) by the provincial Geological Survey Branch. Developed prospects within the Nation River Watershed Group have been classed high (8-10) within known and potential resources (Pardy 1997a). Metallic assessment in the Lower Nation is classed high with the exception of small areas at Witch Lake and sections of Tchentlo Lake which were classed moderate (5-7) (Pardy 1997b). Significant mineral tenures are within the Hogem Ranges and located around the Nation Lakes. Significant placer tenures within the Nation River Watershed Group include Valleau, Groundhog and Klawli creeks. Commodities include placer gold; jade; mercury; copper/gold; copper, lead, zinc, silver, gold, and copper/molybdenum (Pardy 1997b). Inside the Nation River Watershed Group there were four past producers and currently no producing mines (Pardy 1997a).

Study Area

The study area is within Hogem Resource Management Zone which is considered as a Multi-value Management Area under the Fort St. James Land and Resource Management Plan (Fort St. James LRMP Working Group, 1998).

Canfor's, Fort St. James office, together with BC Environment have created Wildlife Movement Corridors (WMC) to be included in Canfor's five year development plan. These sections of land will not be fragmented by cutblocks and will allow wildlife cover and movement through non-logged areas. Established WMC's are located throughout various parts of the Nation River Watershed Group. Within the study area there is a WMC along Ahdatay Creek and extends north of the watershed and one in the southwestern corner of the basin (Canfor 1997).

2.2 Fisheries Resources

Nation River Watershed Group

Information on fish species known to be present in the Nation River Watershed Group was acquired from the Fisheries Information Summary System (FISS) (BC Environment 1995) and lake inventory maps (BC Environment 1997b) available at BC Environment in Prince George. According to the Forest Practices Code (FPC) *Fish-stream Identification Guidebook* (BC Ministry of Forests and BC Ministry of Environment 1995) there are four categories of fish species of management concern: 1) anadromous salmonids, 2) freshwater game fish, 3) threatened or endangered fish, and 4) regionally important fish. Fish species designated in the four categories are referred to as regionally significant fish within this document.

Table 2 presents the Nation River Watershed Group fish species which are included in three of the four categories and includes all other fish species documented.

Table 2. Summary of fish species of management concern (shaded) and other fish species documented within the Nation River Watershed Group.

1. Freshwater game fish species	rainbow trout Dolly Varden ¹ lake whitefish mountain whitefish burbot	(<i>Oncorhynchus mykiss</i>) (<i>Salvelinus malma</i>) (<i>Coregonus clupeaformis</i>) (<i>Prosopium williamsoni</i>) (<i>Lota lota</i>)
2. Threatened or endangered fish	bull trout Arctic grayling	(<i>Salvelinus confluentus</i>) (<i>Thymallus arcticus</i>)
3. Regionally important fish	pygmy whitefish	(<i>Prosopium coulteri</i>)
Other fish species	prickly sculpin peamouth chub reidside shiner lake chub northern squawfish largescale sucker longnose sucker white sucker	(<i>Cottus asper</i>) (<i>Mylocheilus caurinus</i>) (<i>Richardsonius balteatus</i>) (<i>Couesius plumbeus</i>) (<i>Ptychocheilus oregonensis</i>) (<i>Catostomus macrocheilus</i>) (<i>C. catostomus</i>) (<i>C. commersoni</i>)

¹The species identified as Dolly Varden (*Salvelinus malma*), in the Fisheries Information Summary System is, in all probability, bull trout (*Salvelinus confluentus*), as indicated by population distribution studies conducted by Haas and McPhail (1991).

Study Area

The only information on fish species documented in the study area is from a 1977 lake survey of Ahdatay Lake (BC Environment 1997b) available at BC Environment in Prince George. The fish species documented in the basin, prior to this study, include rainbow trout, mountain whitefish, longnose sucker, reidside shiner, Dolly Varden and prickly sculpin.

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).

Electrofishing was used as the primary fish sampling method within the study area. Gee-type Minnow traps and angling was also extensively used in feasible situations and suitable habitat types.

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 (2 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:

- a) relevant photographs taken in the field (noted on the field cards) were scanned and copied onto labeled CDs
- b) the scan file type for the photographs was TIFF version 5
- c) the photographs (4" x 6") were scanned in colour at a resolution of 300 dpi and 24 bit
- d) 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)
- e) 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

To establish a FPC stream classification, all stream reaches which 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.

1. 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.
2. 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).
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.
4. 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.
5. 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.
6. 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.
7. 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.
8. Although the differentially corrected site UTM coordinates (Universal Transverse Mercators) 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. UTM values 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 involving additions or deletions of selected reaches were necessary (Table 3). The following scenarios resulted in modifications to the sampling plan:

- a) Entire third-order basins which could not be completed due to lack of funding were deferred to the 1999 field season. Random and discretionary reaches identified within these basins were eliminated from the original sampling plan.
- b) During field assessments a change in reach characteristics may have resulted in the division of a planning reach into two or more reaches. These new reaches were assigned new reach numbers (for example: Reach 2.1 may have been divided into reaches 2.1 and 2.2) and designated as discretionary samples. A reach card and a site card were prepared for each reach.
- c) Unmapped streams near proposed forest development were also inventoried. These reaches were not able to be added to the plan since they do not appear on the TRIM map base. These unmapped reaches were added to the reach table in FDIS as discretionary samples.
- d) 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.
- e) Reach was inadvertently not selected as a discretionary reach during the planning phase. As these reaches had a direct influence on Canfor's operational activities, these reaches were selected as a discretionary reach sample during the field phase.

- f) 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.
- g) Due to Doctorate research being conducted in two of the study watersheds, only the lakes (Waterbody ID: 00880NATR and 01086NATR) within these watersheds were surveyed in 1998. Since stream sampling would interfere with the on-going experiment, it was agreed with BC Environment that stream sampling would be delayed until the research was completed. For information pertaining to the lakes refer to the lake reports (Tyerman 1999a-b).

Table 3. Changes to the 1998 sampling plan in the Nation River Watershed Group study area.

Watershed Code or ILP Number or Basin Number	ILP Map Number	Reach	Sampling Plan Alteration Scenario ¹	Comments
Basin 5-97	--	--	a	Basin deferred
Basin 2-98	--	--	g	Lake completed, streams deferred
Basin 3-98	--	--	g	Lake completed, streams deferred
Basin 6-98	--	--	a	Basin deferred
Basin 7-98	--	--	a	Basin deferred
237-569400-46700-04500	--	4.1 & 4.2	e & b	Reach required sampling and was broken into two reaches
237-569400-86100	--	2.2	b	Reach added in the field
237-569400-69500	--	2.2	b	Reach added in the field
237-569400-46700	--	8.2, 8.3, 8.4 & 8.5	b	Four reaches added in the field
237-569400	--	5.2 & 5.3	b	added in the field
ILP 08058	93N.026	2.2	b	Reach added in the field
ILP 08058	93N.026	1.1	e	Reach required sampling
ILP 08059	93N.026	1.2	b	Reach added in the field
ILP 08060	93N.026	4.2, 4.3 & 4.4	b	Three reaches added in the field
ILP 08062	93N.025	1.1 & 2.1	f, d	Incorrectly mapped stream, this system actually flows into ILP 08072 These two reaches combined into one reach and are replaced by ILP 08072 Reach 2.1. ILP 08062 does not exist.
ILP 08072	93N.025	2.1	-	Replacement reach as mentioned above
ILP 08066	93N.036	1.1 & 2.1	d	Two reaches combined in the field
ILP 08073	93N.025	1.2, 1.3 & 1.4	b	Three reaches added in the field
ILP 08074	93N.025	1.2	b	Reach added in the field
ILP 08075	93N.025	3.2	b	Reach added in the field
ILP 08078	93N.035	2.0	e	Reach added in the field
ILP 08082	93N.035	1.2 & 1.3	b	Two Reaches added in the field
ILP 08083	93N.025	1.2	b	Reach added in the field
ILP 08084	93N.025	1.2	b	Reach added in the field
ILP 08154	93N.036	1.1	c	Unmapped stream
ILP 08155	93N.036	1.1	c	Unmapped stream
ILP 08157	93N.036	2.1	b	Incorrectly mapped stream new ILP assigned (Formerly WSC: 237-569400-69500)
ILP 08158	93N.025	1.1 & 2.1	c	Unmapped stream
ILP 08159	93N.025	1.1	c	Unmapped stream
ILP 08160	93N.025	1.1	c	Unmapped stream
ILP 08161	93N.025	1.1	c	Unmapped stream
ILP 08162	93N.025	1.1 & 2.1	c	Unmapped stream

Table 3 (continued)

Watershed Code or ILP Number or Basin Number	ILP Map Number	Reach	Sampling Plan Alteration Scenario ¹	Comments
ILP 08163	93N.025	1.1	c	Unmapped stream
ILP 08164	93N.035	1.1, 1.2	c	Unmapped stream
ILP 08165	93N.025	1.1	c	Unmapped stream
ILP 08166	93N.025	1.1	c	Unmapped stream
ILP 08167	93N.035	1.1	c	Unmapped stream
ILP 08168	93N.025	1.1	c	Unmapped stream
ILP 08169	93N.025	1.1	c	Unmapped stream
ILP 98687	93N.025	1.1	c	Unmapped stream
ILP 08085	93N.025	1.2	b	Reach added in the field

¹See scenarios presented above table.

4.0 Results and Discussion

This section is intended to provide an overview of inventory results for the Canadian Forest Products Ltd., Nation River Watershed Group study area. For FDIS outputs providing specific site or fish information, photodocumentation for a sampled reach or documented feature, to view non-fish bearing status reports, or additional sampling requirements report 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 22 and 29, 1998. The main logistical problem with the implementation of the fieldwork was the fact that no road access was available within the study area. The watershed could only be accessed by helicopter. Crews stayed at Canfor's Leo Creek Camp and drove approximately one hour to a staging area on the Tchentlo FSR directly south of the study area where they were flipped into the study watershed each day.

Electrofishing was used in most reaches as the primary sampling method. Minnow traps and angling were also used in suitable habitats. It should be noted that two methods were applied in all habitat types when feasible and practical.

Another logistic issue was the extremely low conductivities in this watershed. Conductivities were often at or below 30 $\mu\text{S}/\text{cm}$ which is generally considered not acceptable for electrofishing. However, fish were consistently captured by electrofishing in these low conductivities. In fact, electrofishing was the most effective method in most streams. The only exception was with wetland type (large channel morphology/ deep type streams) streams where angling and minnow traps often prove to be more effective. Experiencing these trends, field crews adapted and used the most effective method or methods in each stream reach.

Of the 99 reaches identified in the planning phase, 49 stream reaches were selected for sampling (EDI Environmental Dynamics 1998)

4.2 Habitat and Fish Distribution

Rainbow trout, bull trout, slimy sculpin, prickly sculpin, lake chub, longnose sucker and redbside shiner were captured within the study area. A previous lake survey of Ahdatay Lake listed the presence of rainbow trout, mountain whitefish, longnose sucker, redbside shiner, Dolly Varden and prickly sculpin (BC Environment 1997b). It should be noted that the species identified as Dolly Varden (*Salvelinus malma*), is more likely bull trout (*Salvelinus confluentus*), as indicated by population distribution studies conducted by Haas and McPhail (1991) and the capture of bull trout in the study area.

Although two falls were found, none can be considered as a definite barrier to fish migration. These falls are located in Stream 237-569400-46700 Reach 8.3 and are 2.0 and 2.5 m high, respectively. Above these falls is network of streams, most of which exhibit excellent fish habitat. Although no fish were captured above the falls, further sampling is required in order to confirm if the falls are a barrier to upstream fish movement. Refer to section 4.2.7 for more details.

This pristine watershed contains a wide range of fish and fish habitat. Fish were captured from the mouth up to many headwater streams. Many of the streams appeared to be spring fed which resulted in cool, clear streams throughout this basin. The widespread capture of bull trout is likely related to this pristine type of habitat.

Overwintering habitat was likely good throughout the basin, as indicated by the wide distribution of fish in this basin. Many of the streams appeared to be spring fed, which may translate into consistent water temperatures year round and increased overwintering potential. Also studies have shown that bull trout overwinter in a variety of habitats. Boag and Hvenegaard (1997) found that young-of-the-year bull trout have the ability to overwinter within interstitial flow in sections of channel with no visible surface flow.

Overall salmonid spawning habitat was present in many stream reaches with the exception of streams with large channel morphologies. Bull trout are suspected by many sources (including Haas and McPhail 1997) to spawn in areas with groundwater sources, which appeared to be abundant in headwater systems in this watershed.

The main system in the lower most reach (Reach 1) showed characteristics of a medium sized system. Large woody debris jams in this reach played a major role in stream morphology. Field crews noted the natural jams were commonly associated with deep pools and the upper end of a side channel. These pools provided excellent rearing habitat for fish with the wood providing excellent cover. Jams are vital

fish habitat for summer and winter rearing, adult holding, and prime spawning at pool “tailouts” (Slaney et al. 1997).

Near the bottom (southeast) corner of the watershed there was a confluence of two major systems, Ahdatay Creek (237-569400) and stream 237-569400-46700. Ahdatay Creek extended north up to Ahdatay Lake in the northeastern portion of this basin and generally drained the northeastern portion of the basin. Stream 237-569400-46700 extended west and drained the southwestern portion of the watershed. While Ahdatay Creek was mapped as the main system, field crews noted that stream 237-569400-46700 was the larger stream and has the larger drainage area of the two.

Ahdatay Creek above Reach 1 generally alternated between a forested riparian with a riffle pool morphology and a wetland riparian with a large channel morphology. Rainbow trout were captured only in the reaches with riffle-pool morphologies and reidside shiner, lake chub, longnose sucker were captured in both morphologies but appeared to be more abundant in large channel morphologies. The exclusive capture of non-salmonid species in large channel morphologies also existed in the upper tributaries of Ahdatay Creek (237-569400-69500, ILP 8157, and 237-569400-86100). Within the upper watershed of Ahdatay Creek bull trout were only captured in one reach (ILP 08157, Reach 2.1), which was a small second order system.

The other major system, Watershed 237-569400-46700, had different habitat and fish species than the upper Ahdatay Creek watershed. This system had several areas with wetland type riparian and generally steeper topography. An interesting pattern was that slimy sculpin were captured in the lowest reach and the tributaries to this lower reach, however, not above this reach. Also of note in these lower reaches was that, generally, slimy sculpin were captured near the main system and bull trout were most commonly captured towards the headwaters. Rainbow trout were captured in most reaches in which fish were captured.

This system above Reach 1.1 had many streams with bull trout and/or rainbow trout. Both rainbow trout and bull trout were generally present within the same reaches or similar habitat types with the exception of the higher gradient cascade-pool morphologies in which only bull trout were captured. In most cases, the distinction between the niches that bull trout and rainbow trout utilize is likely associated with micro-habitats rather than general reach characteristics. For instance, in a summer study of bull trout habitat use, Goetz (1997) found that there was a strong selection for shallow water depth, low velocity, instream woody debris cover, and small substrates.

One trend that was identified was that the mean temperatures of reaches that bull trout were captured in (10.41 °C) was lower than the mean temperatures of the reaches that rainbow trout were captured in (13.25 °C). These mean temperatures proved to be significantly different using a two tailed ttest (assuming equal variances, $P(T \leq t)$ two-tail 0.000169). This is consistent with the findings of Bonneau and Scarnecchia (1996) who found that bull trout showed a clear preference for the coldest water available. Temperature would explain the general trend of bull trout distribution towards the headwater streams. Also within the many stream reaches with both bull trout and rainbow, these species may be separated by microsite temperatures.

4.3 Fish Size and Life History

Rainbow trout was the most abundant sport fish caught and lake chub were the most common non-sport fish in this watershed. All of the fish captured within this basin were thought to be resident (Table 4). Many of the streams in which fish were captured were deemed to have suitable overwintering habitat. The fish in streams with poor overwintering habitat likely migrate downstream to the nearest stream with overwintering habitat.

The rainbow trout captured ranged in fork length from 25 mm to 260 mm and bull trout fork length ranged from 70 to 320 mm, however, an observed bull trout was estimated to be 450 mm. It was likely that larger fish were present in the larger streams but were not captured. Also, in Ahdatay Lake, rainbow were captured up to 321 mm and mountain whitefish to 402 mm (BC Environment 1997b).

Table 4. Summary of data from fish captured in Watershed 237-569400.

Watershed Code or ILP/ILP Map #	Species	Life Stage	Number of Fish Captured ¹	Suspected Life History	Range of Fork Lengths (mm)
08060/93N.026	rainbow trout	juvenile	7	resident	110-160
08060/93N.026	slimy sculpin	juvenile	7	resident	40-70
08060/93N.026	bull trout	juvenile	2	resident	95-130
08061/93N.026	rainbow trout	adult	5	resident	200-220
08072/93N.025	bull trout	juvenile	10	resident	90-140
08072/93N.025	rainbow trout	juvenile	3	resident	115-160
08073/93N.025	bull trout	juvenile	1	resident	120
08075/93N.025	rainbow trout	juvenile	1	resident	160
08075/93N.025	bull trout	juvenile	11	resident	95-160
08075/93N.025	bull trout	adult	2	resident	230-320
08076/93N.025	bull trout	juvenile	1	resident	120
08082/93N.035	bull trout	juvenile	1	resident	130
08155/93N.036	lake chub	juvenile	6	resident	20-110
08155/93N.036	longnose sucker	juvenile	4	resident	50-165
08155/93N.036	bull trout	juvenile	7	resident	70-160
237-569400	rainbow trout	fry	8	resident	21-30
237-569400	rainbow trout	juvenile	18	resident	50-146
237-569400	rainbow trout	adult	2	resident	220-260
237-569400	slimy sculpin	juvenile	6	resident	42-73
237-569400	lake chub	adult	17	resident	72-104
237-569400	longnose sucker	juvenile	6	resident	57-98
237-569400	reidside shiner	adult	88	resident	63-108
237-569400	prickly sculpin	juvenile	1	resident	66
237-569400-46700	bull trout	juvenile	6	resident	70-190
237-569400-46700	rainbow trout	fry	4	resident	25-30
237-569400-46700	rainbow trout	juvenile	2	resident	140-170
237-569400-46700	rainbow trout	adult	1	resident	185
237-569400-46700	slimy sculpin	juvenile	1	resident	50
237-569400-46700-28200	rainbow trout	juvenile	5	resident	85-120
237-569400-46700-28200	slimy sculpin	juvenile	5	resident	35-55
237-569400-46700-42200	rainbow trout	juvenile	2	resident	95
237-569400-46700-42200	bull trout	juvenile	5	resident	80-160
237-569400-46700-04500	rainbow trout	fry	3	resident	26-28
237-569400-46700-04500	rainbow trout	juvenile	12	resident	55-158
237-569400-46700-04500	rainbow trout	adult	2	resident	170-190

Table 4 (continued)

Watershed Code or ILP/ILP Map #	Species	Life Stage	Number of Fish Captured ¹	Suspected Life History	Range of Fork Lengths (mm)
237-569400-46700-04500	bull trout	juvenile	2	resident	160-180
237-569400-46700-04500	slimy sculpin	juvenile	19	resident	37-75
237-569400-69500	longnose sucker	juvenile	9	resident	60-140
237-569400-69500	lake chub	juvenile	98	resident	20-90
237-569400-86100	lake chub	adult	51	resident	60-115
237-569400-86100	longnose sucker	juvenile	1	resident	77

¹Note that many more fish were visually observed but not included in this table.

Figure 2 presents the fork length-frequency distribution which gives some insight to the age of the rainbow trout. Young-of-the-year fry are clearly evident at 25-20mm, however, beyond this it is difficult to distinguish between age groups. This is likely due to varying growth rates between populations within the basin. For instance, field crews noted a distinct segregation in age classes within the lower reach of the main system (rainbow trout in the ranges of 20-30 mm, 66-78 mm, and 110-146 mm). When the data were combined for the entire basin, this pattern was obscured.

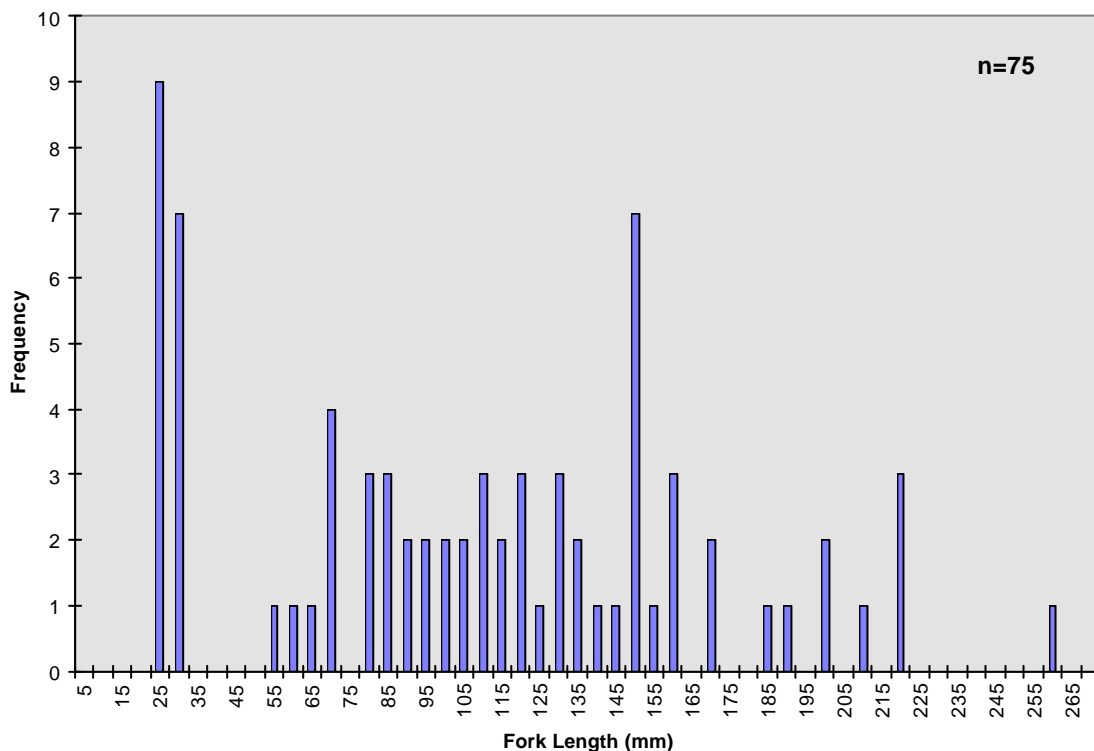


Figure 2. Length-frequency histogram of sampled rainbow trout from the study area.

Generally bull trout were most common in, but not limited to, smaller systems (<5m channel width), including many first and second order systems. Figure 3 presents the fork length frequency distribution

of bull trout in the study area and reveals that young-of-the-year fry were not captured in this study. There may be 3 age classes (1+ to 3+) from 65-195 mm. Partial segregation is assumed for one-year old fish (1+) from 70-100 mm, two year old fish (2+) at 110-140 mm, and three year old fish (3+) at 150-190 mm fork length, respectively. The lack of clear segregation may indicate varying growth rates within the different streams.

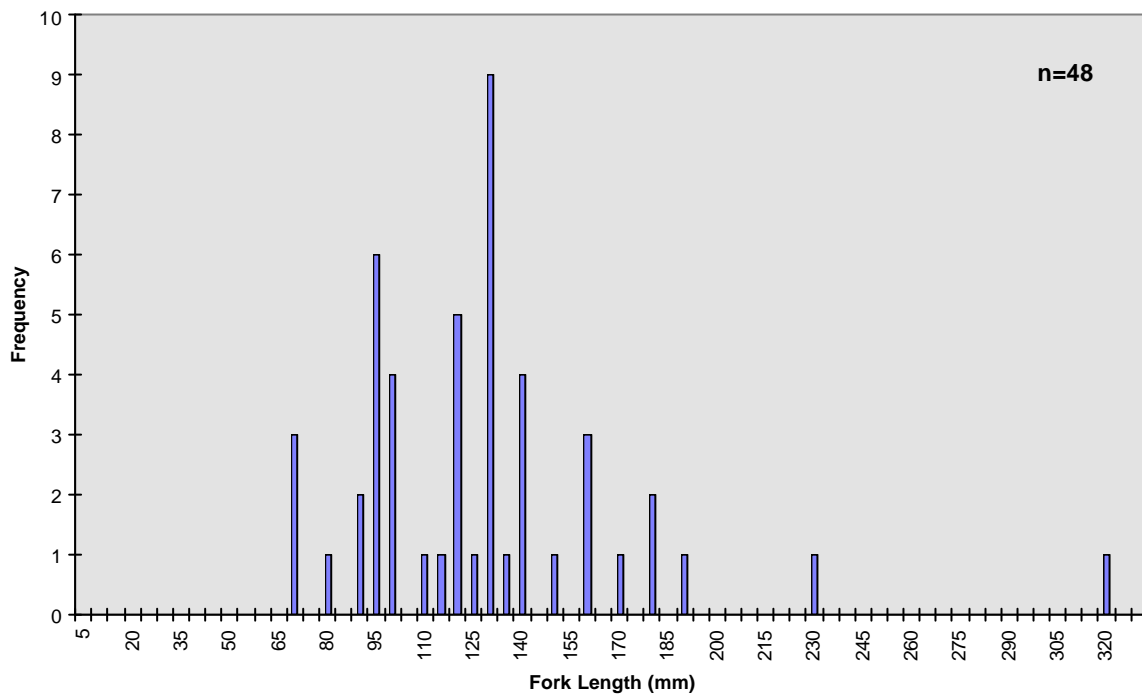


Figure 3. Length-frequency histogram of sampled bull trout from the study area.

4.4 Significant Features and Fisheries Observations

This basin was truly unique in terms of the wide distribution of fish. Fish were captured in many areas where they were not expected to be. For example, in Stream ILP 08058 fish were observed in a small pond approximately 30 m long by wide 6 m and 2 m deep. These fish appeared to be isolated in the pond as access was limited by a non-channelized section immediately below the pond. The presence of fish and the possibility of them overwintering in this small pond was very surprising.

4.4.1 Fish and Fish Habitat

This watershed contained excellent fish habitat for a range of species. As mentioned above specific fish species were commonly associated with certain habitat types. This is especially prevalent when comparing the northeastern (upper Ahdalay Creek watershed) portion and the southwestern portion (Watershed 237-569400-46700) of this watershed. The northeastern portion with low gradients and

commonly large channel morphologies and wetland riparian were dominated by non-salmonids. The opposite was true in the southwestern section where gradients were slightly higher and there were no large channel morphologies. Rainbow trout and bull trout were most common in this section. In fact, slimy sculpin was the only non-salmonid species captured.

4.4.2 Habitat Protection Concerns

Due to the wide distribution of bull trout, extra care should be taken not to disturb these streams. Bull trout are blue listed species in BC and as such are considered to be vulnerable because of characteristics that make them particularly sensitive to human activity (BC Ministry of Environment, Lands and Parks 1999). Silviculture prescriptions should be sensitive to the fisheries issues and focus on maintaining riparian values in both the management and reserve zones. Also, stream crossings should be minimized and should be done with extreme caution in order to minimize impacts to water quality and fish habitat.

Sport fishing values were deemed to be good within this basin. Rainbow trout and bull trout fishing was considered good in the larger streams and in the lake. Currently the access is poor but will improve with the planned future forest development in this area.

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

There has never been any development within this watershed, therefore, no restoration or rehabilitation opportunities are available at this time.

4.5 Fish Bearing Status

4.5.1 Fish Bearing Reaches

Regionally significant fish species were captured in 27 stream reaches. Also, 35 stream reaches were defaulted to fish-bearing status under the Forest Practices Code based on species presence in adjacent reaches and on available habitat characteristics (Table 5).

Table 5. Summary of data from surveyed fish-bearing reaches in Watershed 237-569400.

Watershed Code	Reach	Species	Channel		FPC Stream Classification	Follow-up Sampling?	Comments
			Width (m)	Gradient (%)			
237-569400	1.1	rainbow trout, slimy sculpin	16.4	3.5	NC	No	
237-569400	3.1	rainbow trout, lake chub, longnose sucker	4.4	4.2	S-3	No	
237-569400	4.1	NFC	15	0.4	S-2*	No	Regionally significant species assumed due to suitable habitat characteristics and rainbow captured upstream.
237-569400	5.1	reidside shiner, longnose sucker	8.1	0.8	S-2*	No	Regionally significant species assumed due to suitable habitat characteristics and rainbow captured upstream.
237-569400	5.2	reidside shiner	3.3	3.5	S-3*	No	Regionally significant species assumed due to suitable habitat characteristics and rainbow captured upstream.
237-569400	5.3	NFC	7.67	0.25	NC	No	Fish captured upstream and downstream of this reach
237-569400	7.1	rainbow trout, reidside shiner, prickly sculpin, lake chub, longnose sucker	3.3	2.0	NC	No	
ILP 8051/93N.026	6.1	NFC	2.68	1.3	NC	No	Good to moderate rearing habitat
237-569400-46700	1.1	bull trout, rainbow trout, slimy sculpin	9.5	1.5	S-2	No	
237-569400-46700	3.1	rainbow trout	6.1	3.8	S-2	No	
237-569400-46700	8.1	bull trout	4.5	4.3	S-2	No	
237-569400-46700	8.2	bull trout	6.3	8.0	S-2	No	
237-569400-46700	8.3	bull trout	5.1	14.8	S-2	Yes	Resample to determine the upper limit of bull trout distribution.
237-569400-46700-04500	1.1	rainbow trout, slimy sculpin	4.6	0.5	S-3	No	
237-569400-46700-04500	2.1	rainbow trout, slimy sculpin	4.4	0.8	S-3	No	
237-569400-46700-04500	4.1	rainbow trout	N/A	N/A	N/A	No	
237-569400-46700-04500	4.2	rainbow trout, slimy sculpin, bull trout	4.0	2.5	S-3	No	
ILP 8058/93N.026	1.1	NFC	1.58	6.3	NC	No	Fish observed in an upstream reach.
ILP 08058/93N.026	2.1	NFC	1.9	2.0	S-3*	No	Downstream of fish bearing reach
ILP 08058/93N.026	2.2	rainbow trout	N/A	N/A	NC	No	
ILP 08059/93N.026	1.1	NFC	1.9	3.5	S-3*	No	Fish presence assumed due to good habitat characteristics and fish captured downstream
ILP 08060/93N.026	1.1	rainbow trout, slimy sculpin	1.8	3.5	S-3	No	
ILP 08060/93N.026	3.1	rainbow trout, bull trout	2.0	3.0	S-3	No	

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Table 5 (continued)

Watershed Code	Reach	Species	Channel		FPC Stream Classification	Follow-up Sampling?	Comments
			Width (m)	Gradient (%)			
ILP08060/ 93N.026	4.1	NFC	2.5	1.8	S-3*	No	Fish presence assumed due to good habitat characteristics and fish captured downstream
ILP08061/ 93N.026	1.1	rainbow trout	2.3	0.5	NC	No	
237-569400- 46700-28200	1.1	rainbow trout, slimy sculpin	1.2	2.5	S-4	No	
237-569400- 46700-42200	2.1	rainbow trout, bull trout	3.1	3.0	S-3	No	
237-569400- 46700-42200	3.1	bull trout	3.0	5.0	S-3	No	
ILP08067/ 93N.035	1.1	NFC	1.1	7.5	S-4*	No	Fish presence assumed due to suitable habitat characteristics & fish captured downstream
ILP08069/ 93N.025	1.1	NFC	1.2	6.7	S-4*	No	Fish presence assumed due to suitable habitat characteristics & fish captured downstream
ILP08072/ 93N.025	1.1	bull trout, rainbow trout	2.6	3.3	S-3	No	
ILP08072/ 93N.025	2.1	bull trout, rainbow trout	2.2	1.3	S-3	No	
ILP08073/ 93N.025	1.1	bull trout	1.1	3.0	S-4	No	
ILP08073/ 93N.025	1.2	NFC	0.9	9.0	S-4*	No	Fish presence assumed due to suitable habitat characteristics and no definite barrier
ILP08074/ 93N.025	1.1	NFC	1.1	5.0	S-4*	No	Fish presence assumed due to suitable habitat characteristics & fish captured downstream
ILP08075/ 93N.025	3.1	bull trout	2.6	3.7	S-3	No	
ILP08075/ 93N.025	3.2	rainbow trout, bull trout	4.4	2.0	S-3	No	
ILP08075/ 93N.025	4.1	unidentified species	4.5	12.8	S-3*	No	
ILP08076/ 93N.025	1.1	bull trout	2.3	2.8	S-3	No	
ILP98687/ 93N.025	1.1	NFC	1.8	4.5	S-3*	No	Fish presence assumed due to suitable habitat. Fish bearing status may be influenced by resampling activities
ILP08163/ 93N.025	1.1	NFC	1.1	2.0	S-4*	No	Fish presence assumed due to suitable habitat & fish captured downstream
ILP08158/ 93N.025	1.1	NFC	1.6	2.5	S-3*	No	Fish presence assumed due to suitable habitat characteristics & fish captured downstream
ILP08159/ 93N.025	1.1	NFC	1.0	4.5	S-4*	No	Fish presence assumed due to suitable habitat characteristics & fish captured downstream
ILP08160/ 93N.025	1.1	NFC	1.2	4.0	S-4*	No	Fish presence assumed due to suitable habitat & fish captured downstream
ILP08161/ 93N.025	1.1	NFC	0.7	14.0	S-4*	No	Fish presence assumed due to suitable habitat & fish captured downstream
ILP08162/ 93N.025	1.1	NFC	0.95	5.0	S-4*	No	Fish presence assumed due to suitable habitat characteristics & fish captured downstream
ILP08162/ 93N.025	2.1	NFC	0.8	20.1	S-4*	No	Fish presence assumed due to suitable habitat & fish captured downstream
ILP08082/ 93N.035	1.1	bull trout	2.9	4.0	S-3	No	

Table 5 (continued)

Watershed Code	Reach	Species	Channel		FPC Stream Classification	Follow-up Sampling?	Comments
			Width (m)	Gradient (%)			
ILP08082/93N.035	1.2	NFC	0.6	14.0	S-4*	No	Fish presence assumed due to suitable habitat characteristics & fish captured downstream.
ILP08083/93N.025	1.1	NFC	3.1	10.0	S-3*	No	Fish presence assumed due to good habitat. Fish bearing status may be influenced by resampling activities.
ILP08083/93N.025	1.2	NFC	2.5	19.8	S-3*	No	Fish presence assumed due to good habitat. Fish bearing status may be influenced by resampling activities.
ILP08084/93N.025	1.1	NFC	1.9	14.7	S-3*	No	Fish presence assumed due to suitable habitat. Fish bearing status may be influenced by resampling activities.
ILP08169/93N.025	1.1	NFC	0.8	6.3	S-4*	No	Fish presence assumed due to suitable habitat & no definite barrier
ILP08085/93N.025	1.1	NFC	2.1	5.0	S-3*	No	Fish presence assumed due to suitable habitat. Fish bearing status may be influenced by resampling activities.
ILP08085/93N.025	1.2	NFC	1.8	20.6	S-3*	No	Fish presence assumed due to suitable habitat. Fish bearing status may be influenced by resampling activities.
237-569400-69500	1.1	lake chub, longnose sucker, unidentified species	8.0	0.5	S-2*	No	Regionally significant species assumed due to suitable habitat characteristics.
237-569400-69500	1.2 Site 1	lake chub	1.9	3.5	S-3*	No	Regionally significant species assumed due to suitable habitat characteristics.
237-569400-69500	1.2 Site 2	unidentified species	1.7	1.0	S-3*	No	Regionally significant species assumed due to suitable habitat characteristics.
237-569400-69500	2.1	NFC	1.4	7.0	S-4*	No	Fish presence assumed due to suitable habitat characteristics & fish captured downstream
ILP08155/93N.036	1.1	lake chub, longnose sucker	1.8	0.4	S-3*	No	Regionally significant species assumed due to suitable habitat characteristics.
ILP08154/93N.036	1.1	NFC	1.0	6.3	S-4*	No	Fish presence assumed due to suitable habitat characteristics & fish captured downstream
ILP08157/93N.036	2.1	bull trout, unidentified species	1.4	6.8	S-4	No	
ILP08055/93N.036	1.1	NFC	1.0	5.5	S-4*		Fish presence assumed due to suitable habitat characteristics and & fish captured downstream
237-569400-86100	2.1	lake chub, longnose sucker	2.0	1.2	S-3*	No	Regionally significant species assumed due to suitable habitat characteristics.
237-569400-86100	2.2	unidentified species	2.2	N/A	N/A	No	This is a small lake
237-569400-86100	3.1	lake chub	1.1	9.3	S-4*	No	Regionally significant species assumed due to suitable habitat characteristics.

*stream reach defaulted to fish bearing classification.

NC= Stream reach not classified, N/A= not applicable, NFC= no fish captured.

4.5.2 Non-Fish Bearing Reaches

Thirteen reaches were identified as non-fish bearing under the Forest Practices Code (Table 6). Other reaches were considered non-fish bearing due to their lack of fish habitat or channelization. Fish distribution was limited by gradients, natural impediments and habitat quality.

Table 6. Summary of data from surveyed non fish-bearing reaches in Watershed 237-569400.

ILP/ILP Map # Watershed Code	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)	
ILP 8059/93N.026	1.2										
ILP 08060/093N.026	4.2	S-6	1.7	2.0	100	266	30	7.0			water too shallow for alternate fish sampling methods
ILP 08060/093N.025	4.3	S-6	1.2	0.5	150	277	20	11.0			water too shallow for alternate fish sampling methods
ILP 08060/093N.025	4.4	S-6	1.0	4.0	100	266	30	5.0			water too shallow for alternate fish sampling methods
ILP 08060/093N.025	5.1	NCD	N/A	N/A	--	--	--	--	--	--	
ILP 8066/93N.036	1.1	NC	N/A	N/A	--	--	--	--	--	--	NVC
ILP 08073/093N.025	1.3	S-6	0.78	13.0	230	109	20	11.0			alternate fish sampling methods not employed due to subsurface nature of reach
ILP 08073/093N.025	1.4	NCD	N/A	N/A	--	--	--	--	--	--	NVC
ILP 8074/93N.025	1.2	NC	N/A	N/A	--	--	--	--	--	--	Unchannelized wetland
ILP 08158/093N.025	2.1	S-6	0.99	4.0	100	37	20	9.0			alternate fish sampling methods not employed due to subsurface nature of reach
ILP 8078/93N.035	2.0 Site 1	NCD	N/A	N/A	--	--	--	--	--	--	NVC
ILP 08078/093N.035	2.0 Site2	S-6	0.69	7.0	120	186	30	4.5			
ILP 08078/093N.035	3.0 Site 1	S-6	0.66	28.0	40	53	30	4.5			
ILP 08078/093N.035	3.0 Site 2	NCD	N/A	N/A	--	--	--	--	--	--	NVC
ILP 08164/093N.035	1.1	NCD	N/A	N/A	--	--	--	--	--	--	NVC
ILP 08164/093N.035	1.2	S-6	0.65	6.0	230	196	30	7.0			
ILP 8082/93N.025	1.3	NCD	N/A	N/A	--	--	--	--	--	--	NVC
ILP 08167/093N.035	1.1	S-6	1.16	21	150	100	20	7.0			water too shallow for alternate fish sampling methods
ILP 08165/093N.025	1.1	S-6	0.67	4.0	70	91	20	6.0			water too shallow for alternate fish sampling methods
ILP 08166/093N.035	1.1	S-6	0.59	24	160	102	30	8.5			water too shallow for alternate fish sampling methods
ILP 08084/093N.025	1.2	S-6	1.22	10	100	93	10	5.0			water too shallow for alternate fish sampling methods
ILP 08168/093N.025	1.1	S-6	0.8	11	100	168	10	5.0			water too shallow for alternate fish sampling methods
237-569400-69500	2.2	NC	N/A	N/A	--	--	--	--	--	--	NVC

NC= not classified, N/A= not applicable, NCD= non-classified drainage, NVC= no visible channel

4.5.3 Follow-up Sampling Required

Follow-up sampling is recommended for the classification of the streams above the two sets of falls on Stream 237-569400-46700, Reach 8.3. These falls are likely barriers to fish migration, however, this could not be confirmed. Extensive sampling was completed above, however, it was deemed that sampling this area during a different time of year would be needed to confirm fish absence. Field crews noted that side channels may be passable during high water levels.

Four reaches should be resampled in the fall, when bull trout spawn, to determine if they use this area. This should include one site below the falls to confirm that bull trout use the habitat and then sampling should be focused on the main stem above the falls (Table 7). The main stem has good spawning and rearing habitat in the reaches surveyed (reaches 8.3-8.5). Also, the presence of a pond and wetland riparian areas in Reach 9.1 was noted on the air photos which may be a potential overwintering area for fish and also represents a different habitat type than the lower reaches. Sampling these habitat types should confirm if the falls are indeed a barrier.

Table 7. Follow-up sampling required for the classification of defaulted stream reaches above potential barriers on Stream 237-569400-46700.

Watershed Code or ILP/ILP Map #	Reach	Timing	Methods	Comments
237-569400-46700	8.4, 8.5 & 9.1	Late September/ Early October	Minnow Traps and Electrofishing	Reach 8.4 and 8.5 were defaulted to fish-bearing. Reach 9.1 was not previously sampled, however the air photo shows a pond which may be overwintering habitat.

It should be noted that access is limited and the use of a helicopter is required. This resampling could potentially be done in one day. Also the sampling of these reaches will influence decisions made on all streams above the falls.

If it is deemed not necessary or impractical to resample, the stream reaches above the falls should retain their defaulted status (as listed Table 5). The protection provided by defaulted stream class would provide protection to the integrity of the streams and the bull trout in the stream (237-569400-46700) below the falls.

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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