



RECLAMATION & EROSION CONTROL • NATURAL RESOURCES • AGRICULTURAL SERVICES • GEOMATICS

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**Reconnaissance (1:20,000)  
Fish and Fish Habitat Inventory  
of the Upper Elk River Watershed  
WSC: 349-248100**

**Phases IV to VI**

Prepared for:  
**Crestbrook Forest Industries Ltd.**  
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Approved by:

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**Project Reference Information**

<b>Project Item</b>	<b>Description</b>
MELP Project Number	KBM98204
FRBC Activity Number	10976
FDIS Project Code	1668
FRBC Region	Kootenay Region
MELP Region	04
MELP District	Cranbrook District
FW Management Unit	4-23
Fisheries Planning Unit	N/A
DFO Sub-District	N/A
Forest Region	Nelson Region
Forest District	Cranbrook District
Forest Licensee	Crestbrook Forest Industries Ltd.
Forest Tenure No.	A19040

**Watershed Information**

<b>Watershed Item</b>	<b>Description</b>
Watershed Group	Upper Elk River tributaries
Watershed Name	Upper Elk River
Watershed Code	349-248100 (various tributaries)
UTM at Mouth	11.647893.5571903 (downstream end of study area)
Watershed Area	234 km <sup>2</sup>
Total of All Stream Lengths	~ 574 km
Stream Order	5th order (largest order)
NTS Map	82J/7, 82J/10, 82J/11
TRIM Map	082J.026, 082J.035, 082J.036, 082J.037, 082J.045, 082J.046, 082J.055, 082J.056
BEC Zone	ESSF
Air Photos	30BCC 7424 #16-19, 21, 22, 29-40; 30BCC 7426 #5-16, 21-24, 35, 36, 187-199, 207-217, 226-228; 30BCC 7428 #61-78, 99-108, 119-126, 210-216, 220-221

**Sampling Design Summary**

<b>Sample Information</b>	<b>Description</b>
Total Number of Reaches	1114
Random Sampling Sites	57
Discretionary Sample Sites	24
Total Sample Sites	68 (+13 sites completed in Phase 1-3)
Field Sampling Dates	August 9 - September 16, 1999

**Contractor Information**

Role	Item	Description
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**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.

**Acknowledgments**

Funding for this inventory was provided by Forest Renewal BC. We would also like to thank the following people and organizations that aided in the completion of this project:

Leigh Mercer – FRBC Administrator, Crestbrook Forest Industries Ltd.

Albert Chirico – Fish Inventory Specialist, Ministry of Environment, Lands, and Parks, Nelson

Kerry Morris, Ben Chatterson, Russ Bedell, Dave Michel – Fisheries Technicians, Interior Reforestation

Richard Wake – Systems Analyst, Interior Reforestation

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Canadian Regional- Helicopter Pilot

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- Attachment 1: Field Notes.
- Attachment 2: Photo binder, photo documentation and photo CD's.
- Attachment 3: Digital Products CD.
- Attachment 4: FISS data and FISS map updates.

## 1. Introduction

### 1.1. Project Scope and Objectives

Interior Reforestation Co. Ltd. was retained by Crestbrook Forest Industries Ltd. to conduct a reconnaissance (1:20 000) fish and fish habitat inventory of tributaries of the Upper Elk River Watershed. The purpose of this inventory is to provide information pertaining to fish species presence/absence, abundance, and distribution throughout the watershed through sampling of selected reaches identified in the phase I-III project plan (Masse 1999). This information will assist fisheries and resource managers by providing baseline biophysical information for the watershed and assist the licensee in forest development planning requirements of the Forest Practices Code of BC Act (Minister of Forests 1996). For the purposes of this contract no lake surveys were conducted as per the phase I-III project plan (Masse 1999).

### 1.2. Location and Watershed Profile

The Upper Elk River drainage is located in the Cranbrook Forest District in southeastern BC approximately 50 km north of the town of Elkford bordering the Elk River Forest Service road. The Alberta border bounds the area to the east, and the Height of the Rockies Wilderness area and Elk Lakes Provincial Park bounds the area to the west (Figure 1). The study area excluded the Elk River mainstem, as the fish bearing status of these reaches are known and have been documented in the Phase I-III report (Masse 1999).

The typical topography and pattern of stream gradient in the watershed is:

- (a) very steep (30% or greater) sections located in stream headwaters, often in rugged alpine or rocky terrain,
- (b) flattening to high to moderate gradients, with some sections under 20% gradient in the middle reaches, to
- (c) areas of low gradient within the valley flats of the Elk River mainstem.

### 1.3. Access

The study area is accessed by driving north from Elkford, BC along the Elk River Forest Service Road. The lower section of the study area is accessed from a secondary forest service road that branches off the main Elk River road at the Weary Creek Forest Service campground. The tributaries entering the west side of the Elk River, and upper reaches of eastern tributaries possess limited access due to several road closures. Access by foot or helicopter is therefore required.

## 2. Resource Information

The Upper Elk River watershed within the study area provides a wide variety of resource uses as summarized below:

- i. No First Nations reserves are indicated on TRIM or forest cover maps.
- ii. Primary resource development in the area includes logging and related road construction (Crestbrook Forest Industries Ltd.). There is no other industry in the watershed.
- iii. The Elk River drainage is a popular recreation area that provides outdoor enthusiasts with camping, hiking, fishing, hunting, and site seeing opportunities. Four Forest Service campgrounds are found throughout the study area along the Elk River Forest Service road. The headwaters of the Elk River mainstem and middle to upper reaches of western tributaries are within the Elk Lakes Provincial Park.
- iv. Wildlife in the study area includes white-tailed deer, mule deer, elk, moose, black bear, grizzly bear, sheep, goats, and numerous small mammals and bird species.
- v. No previous existing water quality data was identified for the watershed in the Phase I-III report (Masse 1999).

- vi. Historical fish distribution information in the area was extracted from the phase I-III project plan (Masse, 1999).
- vii. The Ministry of Environment, Lands and Parks considers the Elk River drainage regionally significant. The Fisheries Information Summary System (FISS, 1995) indicated the presence of westslope cutthroat trout (*Onchorynchus clarki lewisi*), bull trout (*Salvelinus confluentus*), mountain whitefish (*Prosopium williamsoni*), and eastern brook trout (*Salvelinus fontinalis*) in the watershed. Sucker species (*Catostomidae sp.*) are indicated as present in the Lower and Upper Elk Lakes which are located out of the study area in the Elk Lakes Provincial Park.
- viii. A licensed guiding outfitter operates within the study area providing recreational opportunities in the form of hunting, fishing and site-seeing.

### 3. Methods

The methods used in this inventory generally follow the procedures outlined in the 1998 Reconnaissance (1:20 000) Fish and Fish Habitat Inventory Standards and Procedures manual (FRIM)(RIC, 1998) and Reconnaissance (1:20 000) Fish and Fish Habitat Inventory Standards and Procedures manual, Version 1.1, Errata (RIC, 1999). To ensure that phases 4 to 6 of the project were in accordance with the technical standards of the reconnaissance level inventory, numerous other Resource Inventory Committee (RIC) and Forest Practice Code (FPC) standards were referenced. As this lengthy list of RIC and FPC standards are referred to in the project contract agreement only the major document names have been included in the references for the purpose of this report.

In the field, slight deviations from the reconnaissance standards were made. No voucher specimens were collected in the watershed in the interest of preserving regionally significant species encountered. All species encountered were positively identified and a sample would have been collected if identification of species were questionable. Only one method was employed for biological sampling when the site access was extremely poor, or if the gear was limited by the physical attributes of the site at the time of survey (i.e. water depth too shallow or too deep). Photographs were not taken of a non-classified drainage unless the field crews deemed that there was a worthwhile subject. This was at the instruction of the Project Manager as it was thought to be a poor use of financial resources if the photo did not show a meaningful, field reproducible product.

Reaches requiring field sampling were outlined in the project plan completed by Sylvie Masse (1999) and were allocated by a combination of:

- 1) a stratified random sample generated by FDIS software,
- 2) addition of discretionary sample sites to assist in overall fish distribution,
- 3) deletion of sample reaches at the discretion of the MoELP representative and project funding, objectives and related variables.

The sampling plan from Phase I-III generated 81 reaches to be sampled during the field component, of which 13 were deleted as a result of the helicopter survey in Phase II. Phase IV therefore included sampling of the remaining 68 sites, which included 23 discretionary sample reaches. Field sampling by two 2-person field crews commenced on August 9, 1999 and was completed on September 16, 1999. A list of major equipment utilized in the field program is provided (Table 1).

Figure 1: Overview map of the Upper Elk River study area.



Table 1: Major field sampling equipment.

Equipment purpose	Type and model
Physical sampling	Fuji 35mm camera Hip Chain w/string Eslon 30m tape Suunto clinometer Eagle Explorer GPS Unit Graduated rod
Biological sampling	Dirigo 850 backpack electroshocker (complete) Dip nets Gee minnow traps Fishing rods Fish board
Chemical sampling	Oakton Testr 2™ pH meters American Marine Inc. Pinpoint™ conductivity meters Fisherbrand thermometers
Other	waders and personal safety gear Honda 300 ATV

Field data compilation progressed as per FRIM standards. The field data information system was updated from FDIS version 7.2 (Access 2.0 base) to FDIS version 7.3 (Access 97 base) to take advantage of increased reporting capabilities of the latter version and to ensure the data was stored in a Y2K compatible format. All hardcopy printouts were from FDIS 7.3 and therefore may differ in appearance from projects completed in previous FDIS versions.

Digital and hardcopy mapping was completed by the Geomatics Department of Interior Reforestation Co. Ltd. using ArcView version 3.1 on a Windows 95 platform. Methods typically followed the Standards for Fish and Fish Habitat Maps, (RIC, May 1998) and Standards for Fish and Fish Habitat Maps Errata (RIC, April 1999). In an attempt to capture the rationale for interpretation of riparian and fish presence absence classifications in all the stream reaches Interior Reforestation developed an MS Access database add-on to the map export from FDIS. A code indicating the biological and physical rationale for riparian classifications was added to the end of the reach summary symbol with code definitions contained in the map legend. An accompanying database containing all reaches, biological and physical rationale codes and detailed rationale descriptions for determination of fish presence/absence/potential and User's Manual is currently in development and will be provided to CFI for use by resource planners.

Deliverables underwent internal quality assurance checks prior to submission with external quality assurance completed by a consultant retained by Crestbrook Forest Industries. Albert Chirico of MoELP Nelson completed quality assurance of final deliverables with a quality assurance certificate provided once deliverables had passed Ministry standards.

## **4. Results and Discussion**

### **Logistics**

#### **4.1.1 Field**

The majority of the sites within the study area were accessed by 4X4 truck. Several of the roads shown on TRIM possessed motorized vehicle road closures. A permit for these roads was not attained due to anticipated opposition by the local guide outfitter considering the hunting season was concurrent with the time of study. The sites with poor access were therefore accessed by long hikes or by helicopter.

No weather problems were encountered during the field sampling. The sites that were accessed using the helicopter were in areas of high elevation and frequently possessed water temperatures below 4°C. An earlier commencement of field surveys may have resulted in fewer streams encountered with low or intermittent flows, however, this had to be weighed, with access concerns of crossing the Elk River. The physical nature of the study area with numerous high gradient alpine streams also results in a high proportion of ephemeral reaches possessing water for only a short period of time during spring freshet.

#### **4.1.2 Compilation**

To provide the client with the most updated version of FDIS, the database was converted to FDIS version 7.3 (November 1999) from version 7.2. Though this resulted in some increased time expenditure for this phase, the time was recovered through increased reporting capabilities in phase VI.

Site cards were provided by Sylvie Masse for the 13 reaches sampled from a helicopter in Phase I-III. However, several of these reaches were dry and lacked channel widths, gradients and a non-fish bearing status report to document definitive riparian classifications. Furthermore the data lacked UTM locations and could therefore not be included on mapping products.

#### **4.1.3 Mapping and Reporting**

To date the final watershed codes have not been received from MoELP and as a result the final mapping and digital products have been submitted utilizing the Interim Locational Point system. Although the phase I-III deliverables had been subjected to MoELP quality assurance, some problems were identified with the mapping deliverables which required correction. These included missing or misplaced watershed codes or numerical identifiers and features identified on the Elk River mainstem though this was not part of the study area. The features on the Elk River mainstem were excluded from the hard copy maps and digital GIS attribute table.

## **4.2. Fish Habitat and Fish Distribution**

### **4.2.1. Sampling Conditions**

Fish sampling methods utilized included electroshocking, minnow trapping and angling. At the time of sampling, minimum acceptable water quality parameters were met at most sites. Conductivity values all exceeded 171  $\mu\text{S}/\text{cm}$  and water temperatures ranged from 4 to 16°C. Sites 26 and 23 were sampled in mid September at high elevations and had temperatures of 2°C and 2.5°C, respectively. Site 26 was deemed to have minimal fisheries values therefore was not recommended for follow up sampling whereas site 23 has fisheries potential and is recommended for spring sampling.

**4.2.2. Fish Habitat, Abundance, and Distribution**

Due to low fish capture numbers and headwater nature of the drainage, fish distribution information is discussed for the watershed as a whole rather than by individual sub-basin.

The low gradient (< 7%) sampled reaches of the 4<sup>th</sup> and 5<sup>th</sup> order drainages bordering the Elk River mainstem were all confirmed fish bearing. These included 349-248100-81400 (Aldridge Creek), 349-248100-84800 (Weary Creek), 349-248100-85700 (Gardner Creek), 349-248100-88200 (Cadorna Creek) and 349-248100-94700 (Tobermory Creek).

Generally, fish distribution in third order and smaller drainages was dependent on reach gradient and stream connectivity to the Elk River. First to third order sampled reaches with low gradient that possessed a stream channel were frequently confirmed as fish bearing. Conversely, a large percentage of the reaches of first to third order tributaries that did not possess a channel meeting the definition defined by the Fish Stream Identification Guidebook (RIC 1998) were classified as non-fish bearing, non classified drainages. Typically the presence or absence of a defined channel was directly related to the size of the catchment area and magnitude of the parent stream. Though a channel was often present in the moderate to high gradient sections of the tributary, the lower reaches became NVC as they lacked the ability to form a channel through the fluvial material present in the broad Elk River floodplain. This is considered to be a major, but natural, limiting factor to fish presence in the watershed.

All sampled fish bearing reaches possessed low (< 7%) to moderate (7-15%) gradients and a riffle-pool or cascade-pool morphology. Mean channel width of fish bearing streams ranged from 0.6 – 18.2 m. The highest number of fish captured were in reaches 1 of Gardner Creek (n=7) and Aldridge Creek (n=13).

The low distribution of fish throughout the study area could be directly related to seasonally decreasing water levels in tributaries to the Elk River, causing fish to migrate downstream to the Elk River mainstem. Some of these reaches have been indicated as requiring follow up sampling. The increased elevation of this headwater system could also contribute to lower productivity and reduced fish distribution. Aldridge Creek exhibited a significant decline in capture numbers between reach 1 of the mainstem and reach 2 of 349-248100-81400-33500 with 13 fish captured in Aldridge Creek compared to 4 in the upstream tributary. There were no reaches identified as providing exceptional habitat compared to other fish bearing streams.

Of the 39 sample reaches that possessed flow at the time of survey, 35 possessed abundant cover (>20%), 3 possessed moderate cover (5-20% cover) and 1 possessed trace cover (<5%). A summary of the relative dominance of evaluated cover types (Table 2) indicates overstream vegetation, large woody debris and deep pool were most frequently ranked as dominant.

Table 2: Summary of cover types in 39 wetted sample reaches in the Upper Elk River watershed.

	Dominant	Sub-Dominant	Trace	None
Boulder	10.3	5.1	28.2	56.4
Deep Pool	17.9	33.3	25.6	23.1
Large Woody Debris	20.5	30.8	33.3	15.4
Undercut Bank	15.4	38.5	28.2	17.9
Overstream Vegetation	33.3	35.9	23.1	7.7
Small Woody Debris	0.0	30.8	61.5	7.7
Instream Vegetation	2.6	7.7	56.4	33.3

The results from reaches inventoried during this project also provide data to further interpret potential fish bearing status and fish distribution in the remaining non-sampled reaches in the study area. Fish presence is suspected in several reaches that are less than 20 % gradient, are adjacent to known fish-bearing reaches and/or are located downstream of stocked lakes or known fish-bearing reaches. Potential fish presence (interpreted) is most frequent in Reach 1 of streams that are direct tributaries to third, fourth and fifth order fish bearing drainages. Considering gradient, and study results, there is a high likelihood these reaches are accessible from the parent streams. Reaches downstream of lakes, stocked or otherwise, were also considered to have a high to moderate potential of fish presence due to potential downstream migration. Fish absence was interpreted for reaches that exceeded 20 % gradient. At the request of MoELP, high gradient reaches exceeding 20% office derived slope that did not possess a sample site in a downstream reach were coloured broken blue on interpretive maps. Considering the presence of bull trout in the Upper Elk River system, reaches that are accessible from the mainstem and are less than 30% gradient should be considered potential bull trout habitats. Stream reaches >20% gradient are not legally required to be surveyed to determine fish absence under the Forest Practices Code. However, when a proponent identifies a situation where an accessible and or lake headed stepped pool reach of >20% in the upper parts of a fish bearing stream, the proponent is encouraged in the interests of fish population conservation to contact and consult with the MoELP regional office to establish whether or not the reach may be surveyed for fish (RIC 1998).

Upstream limits of fish distribution in the study area are influenced by high gradient (i.e., > 30%) sections where the tributary streams make an abrupt ascent from the third, fourth and fifth order mainstem valley flats. The high gradient effectively restricts upstream migration. Lower gradient sampled reaches in the study area were frequently found to have intermittent flow or non visible channels limiting upstream migration of fish. This intermittent flow or NVC characteristic resulted in poor stream connectivity with the Elk River due to the lack of upstream migration potential from reach 1. A 20 m rock falls was confirmed in reach 2 of Miller Creek (349-248100-78200) as the limiting factor to upstream fish migration. In reach 4 of Aldridge Creek (349-248100-81400) a 6.5 m rock falls was identified in phase 4-6 with no fish present downstream. A 33 m rock falls identified in phase 1-3, is the possible upstream limit of fish in this stream though this has not been field verified. A 2m rock falls at the reach 1 break of Cadorna Creek (349-248100-88200) was identified in phase 1-3. This may be a barrier to bull trout migration though this was not field confirmed. Several sample reaches have non visible channels resulting in upstream migration barriers. Several features were identified in phase 1-3 which were located outside of reaches to be sampled. Height and length of these features were not recorded in phase 1-3 but were transferred to the phase 4-6 maps for future confirmation if required. A summary of historic and new field verified barriers from this project have been provided (Table 2). Gradient barriers, due to their number, have not been included in the table.

Table 3. Summary of historic and new barriers to fish migration in the Upper Elk River watershed.

Creek Name	WSC	TRIM map #	Reach	Barrier Type	Height of Barrier	Verified in Field	Description of Barrier
Miller Creek	349-248100-78200	82J.026	2	Falls	20 m	Yes	20 m rock falls limits upstream migration.
Unnamed Creek	ILP 12	82J.036	1	Stream Disappearing Point	N/A	No	Stream disappearing point creates a barrier to upstream migration.
Unnamed Creek	349-248100-35500-4460	82J.036	3	Falls	N/A	No	Unconfirmed barrier to upstream migration. Identified in phase 1-3.
Aldridge Creek	349-248100-81400	82J.036	4	Cascade	N/A	No	Unconfirmed barrier to upstream migration. Identified in phase 1-3.
Aldridge Creek	349-248100-81400	82J.036	4	Falls	33 m	No	Unconfirmed barrier to upstream migration. Identified in phase 1-3.
Aldridge Creek	349-248100-81400	82J.036	4	Cascade	N/A	No	Unconfirmed barrier to upstream migration. Identified in phase 1-3.
Aldridge Creek	349-248100-81400	82J.036	4	Falls	2 m	Yes	Suspected barrier to upstream migration, though several other barriers exist downstream.
Aldridge Creek	349-248100-81400	82J.036	4	Falls	6.5 m	Yes	Confirmed barrier to upstream migration, though several other barriers exist downstream.
Aldridge Creek	349-248100-81400	82J.036	6	Cascade	1.5	Yes	Suspected barrier to upstream migration, though several other barriers exist downstream.
Aldridge Creek	349-248100-81400	82J.036	6	Falls	3 m	Yes	Suspected barrier to upstream migration, though several other barriers exist downstream.
Weary Creek	349-248100-84800	82J.036	3	Falls	N/A	no	Unconfirmed barrier to upstream migration. Identified in phase 1-3.
Weary Creek	349-248100-84800	82J.036	3	Falls	N/A	no	Unconfirmed barrier to upstream migration. Identified in phase 1-3.
Weary Creek	349-248100-84800	82J.036	5	Falls	N/A	no	Unconfirmed barrier to upstream migration. Identified in phase 1-3.
Weary Creek	349-248100-84800	82J.036	5	Falls	N/A	no	Unconfirmed barrier to upstream migration. Identified in phase 1-3.
Unnamed Creek	ILP 188	82J.046	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.

<b>Creek Name</b>	<b>WSC</b>	<b>TRIM map #</b>	<b>Reach</b>	<b>Barrier Type</b>	<b>Height of Barrier</b>	<b>Verified in Field</b>	<b>Description of Barrier</b>
Unnamed Creek	349-248100-86400	82J.046	4	Stream Disappearing Point	N/A	Yes	Stream disappearing point creates a barrier to upstream migration.
Unnamed Creek	349-248100-86700	82J.046	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	349-248100-86800	82J.046	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Cadorna Creek	349-248100-88200	82J.046	1	Falls	2	No	Unconfirmed barrier to bull trout upstream migration. Identified in phase 1-3.
Unnamed Creek	ILP 250	82J.046	2	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	ILP 260	82J.046	2	Stream Disappearing Point	N/A	No	Stream disappearing point creates a barrier to upstream migration.
Unnamed Creek	349-248100-89800	82J.046	2	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	349-248100-90300	82J.046	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	ILP 269	82J.046	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	349-248100-90800	82J.046	2	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	ILP 275	82J.046	1	NVC	N/A	Yes	Reach is a non visible channel which limits upstream migration
Unnamed Creek	ILP 290	82J.046	2	Stream Disappearing Point	N/A	Yes	Stream disappearing point creates a barrier to upstream migration.
Unnamed Creek	ILP 292	82J.046	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	349-248100-92300	82J.046	2	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	349-248100-93600	82J.056	2	Stream Disappearing Point	N/A	Yes	Stream disappearing point creates a barrier to upstream migration. Results in NVC upstream.
Unnamed Creek	349-248100-93600	82J.056	2	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.

Creek Name	WSC	TRIM map #	Reach	Barrier Type	Height of Barrier	Verified in Field	Description of Barrier
Unnamed Creek	349-248100-93800	82J.056	2	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	349-248100-86800	82J.055	3.1	Persistent Debris Accumulation	2	Yes	Suspected temporary barrier, though the stream has already been classified as non fish-bearing.
Unnamed Creek	349-248100-94500	82J.055	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	349-248100-94700-20400	82J.055	2	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	349-248100-95000	82J.055	2	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	349-248100-95500	82J.055	2	Cascade	5	Yes	Suspected barrier to upstream migration.
Unnamed Creek	ILP 372	82J.055	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	ILP 380	82J.055	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.
Unnamed Creek	ILP 396	82J.055	1	NVC	N/A	Yes	Reach is a non visible channel limiting upstream migration.

#### 4.3. Fish Size, History and Age

Of the 68 sampled reaches in the study area, only 30 fish were captured. Westslope cutthroat trout, bull trout, eastern brook trout and mountain whitefish were the species present. As sample sizes are too small for statistical comparison between drainages all fish captured in the study area were grouped by species for length-frequency analysis (Figure 2). Fork lengths of westslope cutthroat trout are from 40 - 395 mm (mean = 113 mm), bull trout are from 47 -165 mm (mean = 66 mm), eastern brook trout are from 180 - 285 mm (mean = 224 mm) and the single mountain whitefish captured was 45 mm (Table 4).

It is possible that both adfluvial populations and stocked populations are present in the study area. Mystery Lake, Monument Lake and Grizzly Lake are all headwater waterbodies that have been previously stocked with westslope cutthroat trout (Masse 1999). Lower Aosta Lake, which is outside the study area but a headwater lake of this system, has also been stocked with westslope cutthroat trout (Masse 1999).

Longnose suckers are reported to be present in the Upper and Lower Elk Lakes (FISS) but were not captured during this study.

Table 4. Summary of length-at-stage data from fish sampled in the upper Elk River watershed.

Creek Name	WSC	Species	Stage	Number of fish	Mean length (mm)	Range of Lengths (mm)
Upper Elk River Watershed	349-248100-	WCT	F	4	41	40 – 42
			J	12	111	60 – 170
			A	1	395	395 – 395
		BT	F	6	50	47 – 51
			J	1	165	165 – 165
		EB	A	4	224	180 – 285
		MW	F	1	45	45 – 45
		SP	J	1	80	80 – 80
			A	2	200	180 – 220

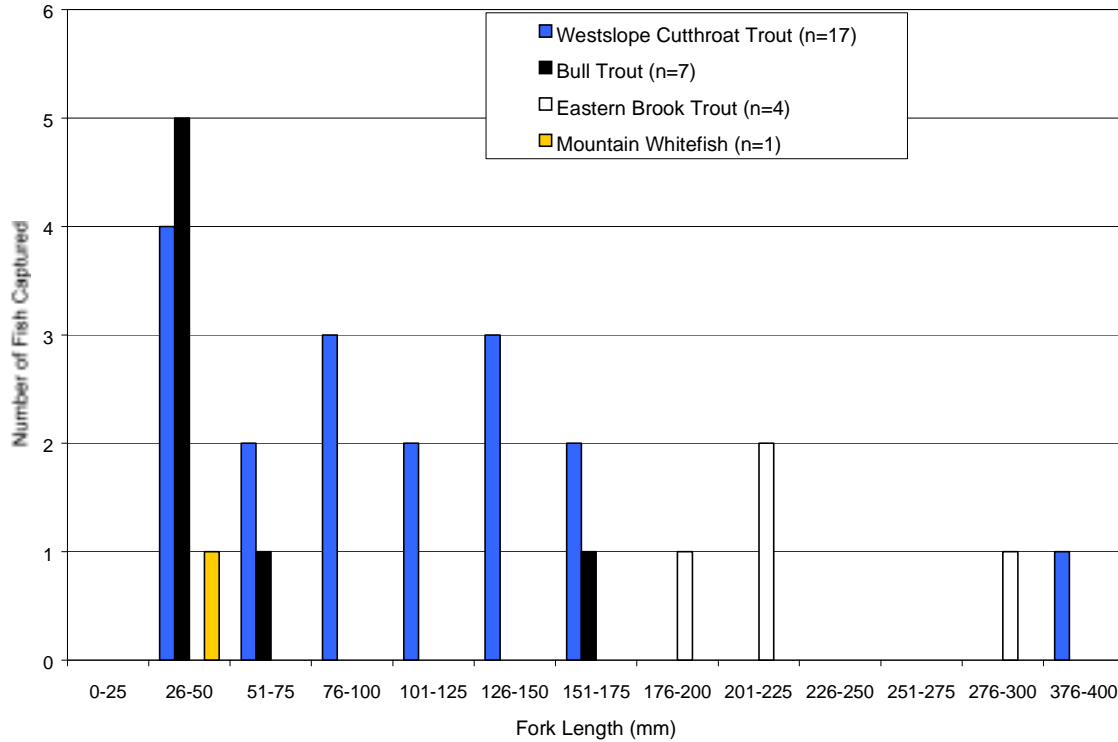


Figure 2. Length-frequency of captured fish species, Upper Elk River watershed, Aug. 9 – Sept.16, 1999.



## **4.4 Significant Features and Fisheries Observations**

### **4.4.1. Fish and Fish Habitat**

The Elk River flood plain has a significant effect on the number of non visible reaches that are present within the study area. First to third order tributaries are most frequently affected. Frequently tributaries have stable stream channels in the moderate to high gradient reaches and then become branched or undefined where they meet the low gradient flood plain of the Elk River. The majority of the wetted sampled reaches have abundant cover with the good to excellent habitat quality. Several sampled reaches are considered to have fish-bearing potential in higher flow regimes as they appear to provide potential cover and rearing habitat. The dry, low, or intermittent flows also had an impact on the study results as definitive classifications for these reaches possibly could not be made and follow-up sampling has been recommended. Disturbance indicators were present in a few reaches but their effect is minimal on fish presence in the study area.

Sport fishing values in the Upper Elk River tributaries are considered moderate primarily as a result of good access, availability of wilderness camping sites, and high fish densities in the Elk River mainstem.

### **4.4.2. Habitat Protection Concerns**

#### **Fisheries Sensitive Zones**

No fisheries sensitive zones were identified in sampled reaches within the project area.

#### **Fish Above 20% Gradient**

During this inventory, no fish were captured in reaches with average gradients exceeding 15% suggesting limited potential utilization of reaches exceeding 20% average gradient. However, as bull trout are present in the system and are known to utilize channels greater than 20% average gradient, extra care should be taken when managing direct tributary reaches less than 30% gradient. At the request of MoELP all reaches exceeding 20% gradient were coloured solid or broken blue, the former when a non-fish bearing sampled site was present further downstream in that drainage, and the latter when no downstream reaches had been allocated a sample site.

#### **Restoration and Rehabilitation Opportunities**

No specific areas were identified for restoration or rehabilitation. Primary disturbance indicators included abandoned/multiple channels, beaver dams, eroding banks, small woody and large woody debris and extensive riffle and/or bar areas.

The culvert located at the road in reach 1 of Blaylock Creek is blocked by debris and the water is now filtering through the ground adjacent to the culvert. The culvert should be cleaned to ensure it does not cause an avulsion.

## **4.5. Fish Bearing Status**

The following tables summarize the fisheries status of the sampled reaches where fish presence was confirmed as fish bearing or non-fish bearing or alternatively where follow up sampling is required. These tables do not include the fish bearing status or riparian classifications for known or interpreted non-sampled reaches and only reaches field sampled during the course of this study are included.

### **4.5.1. Fish Bearing Reaches**

Twenty-five reaches were classified as fish bearing (Table 5). These included all reaches field confirmed as fish-bearing, assumed as fish bearing based on unrestricted migration from known fish bearing reaches, or suspected fish bearing reaches that require follow up sampling.

Of the twenty-five reaches that were confirmed as fish bearing, fish were captured or visually observed at twelve of these reaches. The majority of these reaches are located in the large fourth and fifth order

drainages and direct tributaries to these streams. Unless poor access was a factor or representative species had been captured, two sampling methods were used at each site. Fish were not captured or visually observed at three of the fish bearing sites. Previous FISS information confirmed fish presence at reach 1 of an unnamed tributary (349-248100-84800-21500) to Weary Creek. No barriers were found during the helicopter flight between mainstem Aldridge Creek and reach 2 of 349-248100-81400-32600 and fish presence is therefore assumed. Similarly fish were captured in reach one of 349-248100-95500 and no barriers were identified upstream of this location to reach 2. Follow-up sampling in the spring is recommended for the ten remaining reaches to determine definitive fish presence/absence (Table 4).

#### **4.5.2. Non-Fish Bearing Reaches**

Fourty-three reaches are classified as non-fish bearing (Table 6). Eleven reaches were confirmed as non fish bearing due to gradient or physical barriers found in the reach or a downstream reach. Thirty-two reaches were either classified based on non visible channels, intermittent/dry channels that were deemed to possess no fisheries potential at any time of the year, no fish captured, or lack of connectivity to the Elk River mainstem.

In some instances only one biological sampling method was used due to low water depths and/or poor access. Professional judgement was also used to designate fish presence/absence where there was sufficient justification provided by field crews ensuring definitive riparian classification.

Table 5. Fish bearing reaches in the Upper Elk River watershed, August 9 – September 16, 1999.

Creek Name	Watershed Code/ILP	Mapsheet	Reach	Site #	Species	Avg. Width	Avg. Gradient	Rip. Class	Follow-up Sampling	Comments
Blaylock Creek	349-248100-78900	082J.026	1	3	(NFC)	3.4	12.5	(S3)	Y	No fish captured. Fish presence in higher flows is suspected. Re-sample in spring.
Unnamed Creek	349-248100-80500	082J.036	1	5	(NFC)	3.6	6.5	(S3)	Y	No fish captured. Fish presence is suspected at higher flows. Re-sample in spring.
Aldridge Creek	349-248100-81400	082J.036	1	7	WCT EB BT	18.2	1	S2	N	
Unnamed Creek	349-248100-81400-32600	082J.036	2	10	NFC	8.6	10	S2	N	No fish captured but fish presence in high flow likely. Field verified that no migration barriers are present from mainstem, therefore clas in parentheses.
Unnamed Creek	349-248100-81400-33500	082J.036	2	11	WCT EB BT	5.3	4	S2	N	
Unnamed Creek	349-248100-81400-33500-0780	082J.036	2	12	(NFC)	2.6	8	(S3)	Y	No fish captured. Field verified that no barriers exist from downstream reach. Re-sample in spring.
Unnamed Creek	349-248100-83900	082J.036	1	14	WCT	3.0	6	S3	N	
Weary Creek	349-248100-84800	082J.036	2	16	SP	5.4	9	S2	N	
Unnamed Creek	349-248100-84800-21500	082J.036	1	18	NFC	5.5	6.5	S2	N	No fish captured. FISS confirms WCT are present in reach.
Unnamed Creek	349-248100-84800-21500-3160	082J.046	2	19	(NS)	3.5	15.5	(S3)	Y	Dry channel. Adjacent to a possible fish bearing reach therefore re-sample in the spring.
Gardner Creek	349-248100-85700	082J.036	1	22	WCT MW	11.1	.5	S2	N	
Cadorna Creek	349-248100-88200	082J.046	2	31	SP	12.7	1.5	S2	N	No fish captured. Visual observation of fish.
Unnamed Creek	255	082J.046	1	33	(NFC)	6.5	2	(S2)	Y	No fish captured. Fish present in downstream adjacent reach. Re-sample in spring
Unnamed Creek	279	082J.046	1	41	SP	2.5	1	S3	N	Visual observation of fish.
Unnamed Creek	287	082J.046	1	43	SP	3.4	15	S3	N	Visual observation of fish.
Unnamed Creek	290	082J.046	1	44	WCT	1.9	4	S3	N	
Unnamed Creek	298	082J.056	1	48	NFC	0.6	4	(S4)	Y	No fish captured but no barriers from Elk River present. Fish visually observed at confluence, therefore class is in parentheses.

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Creek Name	Watershed Code/ILP	Mapsheet	Reach	Site #	Species	Avg. Width	Avg. Gradient	Rip. Class	Follow-up Sampling	Comments
Cultus Creek	349-248100-92400	082J.046	2	49	(NFC)	3.4	10	(S3)	Y	No fish captured. Re-sample in the spring to determine if downstream migration from stocked lake is possible.
Unnamed Creek	322	082J.055	1	52	(NS)	2.9	1	(S3)	Y	Dry channel. Direct tributary to the Elk River. Re-sample in the spring.
Unnamed Creek	324	082J.056	2	53	(NFC)	0.60	7.5	(S4)	Y	No fish captured. Fish present in adjacent reach. Re-sample in the spring.
Tobermory Creek	349-248100-94700	082J.055	1	56	WCT	3.9	2	S3	N	
Tobermory Creek	349-248100-94700	082J.055	3	57	(NFC)	3.8	2.5	(S3)	Y	No fish captured. Re-sample in spring.
Unnamed Creek	349-248100-95500	082J.055	2	62	(NFC)	3.1	7.5	(S3)	Y	Fish captured in reach 1 with no visual barriers to reach 2.
Unnamed Creek	398	082J.055	2	66	(NFC)	1.5	5.5	(S3)	Y	No fish captured. Re-sample in spring.
Unnamed Creek	349-248100-86600	082J.055	1	67	WCT	1.1	2.5	S4	N	

Table 6. Non-fish bearing reaches in the Upper Elk River watershed, August 9 – September 16, 1999.

Creek Name	Watershed Code/ILP	Mapsheet	Site #	Gradient	Proposed Riparian Class	Dist (m)	Time (sec)	Cond (uS)	Temp (C)	Other Method Type	Other Method Effort	Comments
Miller Creek	349-248100-78200	082J.026	1	16	S6	N/A	N/A	N/A	N/A	N/A	N/A	Dry channel with a 20 m falls at lower reach break.
Devitt Creek	349-248100-78600	082J.026	2	10	S6	200	221	286	8	MT	24hr 25min	Channel is not connected to the Elk mainstem
Blaylock Creek	349-248100-78900	082J.036	4	14	S6	200	260	277	7	AG	10 min	Downstream reach has extreme gradient.
Unnamed Creek	12	082J.036	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Aldridge Creek	349-248100-81400	082J.036	8	9.5	S5	202	186	260	3.5	AG	10 min	Historical 33 m falls downstream, as well as other numerous falls and chutes.
Aldridge Creek	349-248100-81400	082J.037	9	9	S5	N/A	N/A	N/A	N/A	N/A	N/A	Channel is dry with downstream barriers.
Unnamed Creek	349-248100-81400-75900	082J.036	13	12.5	S5	N/A	N/A	N/A	N/A	N/A	N/A	Channel is dry with downstream barriers. Fish not present in downstream reach.
Unnamed Creek	349-248100-83900	082J.036	15	16	S6	N/A	N/A	N/A	N/A	N/A	N/A	Downstream reach has extreme gradient.
Unnamed Creek	349-248100-84800-21500	082J.036	17	3.5	S6	N/A	N/A	N/A	N/A	N/A	N/A	Dry channel with historical falls present downstream.
Unnamed Creek	349-248100-85400	082J.046	20	13.5	S6	200	362	343	7.0	MT	24hr 25 min	No fish captured using two methods.
Unnamed Creek	188	082J.046	21	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Gardner Creek	349-248100-85700	082J.046	23	7.3	S5	200	189	227	2.5	AG	17 min	High elevation stream may limit fish potential.
Unnamed Creek	24	082J.036	24	.5	S5	200	106	269	5	AG	25 min	Downstream gradient barrier.
Unnamed Creek	349-248100-86400	082J.046	25	4.5	S5	245	185	242	4.5	AG	17 min	No fish using two methods
Unnamed Creek	349-248100-86400	082J.046	26	6	S5	200	83	245	2	N/A	N/A	No fish captured. No fish in downstream reach
Unnamed Creek	349-248100-86700	082J.046	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	227	082J.046	28	6.5	S6	N/A	N/A	N/A	N/A	N/A	N/A	Parent stream is NVC. Migration not possible

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Creek Name	Watershed Code/ILP	Mapsheet	Site #	Gradient	Proposed Riparian Class	Dist (m)	Time (sec)	Cond (uS)	Temp (C)	Other Method Type	Other Method Effort	Comments
Unnamed Creek	349-248100-86800	082J.046	29	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No visible channel in reach 1.
Unnamed Creek	349-248100-87300	082J.046	30	14.5	S6	300	195	310	8.5	MT	25hr 45min	Small section of NVC is present in reach 1.
Unnamed Creek	250	082J.046	32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	349-248100-88400	082J.046	34	14.5	S6	250	368	212	11.5	MT	23hr 45min	No fish using two methods.
Unnamed Creek	260	082J.046	35	11.5	S6	160	164	293	12.5	N/A	N/A	Reach 1 is NVC.
Unnamed Creek	349-248100-89800	082J.046	36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed creek	349-248100-90300	082J.046	37	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed creek	269	082J.046	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed creek	275	082J.046	39	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	349-248100-90800	082J.046	40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	349-248100-91400	082J.046	42	12	S6	200	222	278	5	N/A	N/A	Stream is not connected to the mainstem Elk River.
Unnamed Creek	290	082J.046	45	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	292	082J.046	46	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	349-248100-92300	082J.046	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	349-248100-93600	082J.056	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	349-248100-93800	082J.056	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	330	082J.055	54	16	S6	200	116	340	10	AG	10 min	No fish captured. Two methods used.
Unnamed Creek	349-248100-94500	082J.055	55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.

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Creek Name	Watershed Code/ILP	Mapsheet	Site #	Gradient	Proposed Riparian Class	Dist (m)	Time (sec)	Cond (uS)	Temp (C)	Other Method Type	Other Method Effort	Comments
Unnamed Creek	349-248100-94700-20400	082J.055	58	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	349-248100-95000	082J.055	59	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	368	082J.055	60	7	S6	100	63	316	9	N/A	N/A	Reach 1 is a non visible channel.
Unnamed Creek	369	082J.055	61	1	S6	160	17	308	6	N/A	N/A	No fish captured. Habitat quality is poor with no fisheries values.
Unnamed Creek	372	082J.055	63	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	380	082J.055	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	349-248100-96600-04100	082J.055	65	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.
Unnamed Creek	396	082J.055	68	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Non visible channel.

**4.5.3. Follow-up Sampling Required**

Follow up sampling typically implies re-sampling of reaches included in or adjacent to field sampled reaches to verify fish presence/absence. During the field program some stream channels were dry or had insufficient water depths to conduct biological sampling. Others did not contain fish at the time, but were adjacent to fish-bearing reaches with potential for upstream migration. As water flow changes throughout the year, all these reaches should be re-sampled during higher flow periods to ascertain definitive fish-bearing status considering increased potential for upstream migration. In the absence of completing the follow up sampling these reaches should be managed as fish bearing using the classifications listed on the interpreted map that conform to FPC objectives. Reaches that require follow-up sampling are listed (Table 7).

Table 7. Reaches in the Upper Elk River watershed requiring follow up sampling.

Stream Name	Watershed Code/ILP	Reach	Site	Timing	Methods	Comments
Blaylock Creek	349-248100-78900	1	3	Spring	EF, MT	No migration barriers identified.
Unnamed Creek	349-248100-80500	1	5	Spring	EF, MT	Low gradient with no known downstream barriers.
Unnamed Creek	349-248100-81400-33500-0780	2	12	Spring	EF	No migration barriers identified.
Unnamed Creek	349-248100-84800-21500-3160	2	19	Spring	N/A	Dry channel adjacent to a fish bearing reach.
Unnamed Creek	255	1	33	Spring	EF	Fish present in downstream adjacent reach.
Unnamed Creek	298	1	48	Spring	EF,MT	No fish captured during initial sampling though migration from reach 1 is possible. Therefore very low priority for resampling; suggest to manage as fish bearing.
Cultus Creek	349-248100-92400	2	49	Spring	EF	Downstream migration from the lake needs to be confirmed.
Unnamed Creek	322	1	52	Spring	N/A	Dry channel adjacent to a fish bearing reach.
Unnamed Creek	324	2	53	Spring	EF	Low gradient with no known downstream barriers.
Tobermory Creek	349-248100-94700	3	57	Spring	EF	Low gradient with no known downstream barriers.
Unnamed Creek	349-248100-95500	1	62	Spring	EF, MT	No fish captured during initial sampling though migration from reach 1 is possible. Therefore very low priority for resampling; suggest to manage as fish bearing.
Unnamed Creek	398	2	66	Spring	EF	Low gradient with no known downstream barriers. Adjacent to a fish bearing reach.



## 5. Bibliography

- Anonymous. 1995. Fish stream identification guidebook. Province of British Columbia, Ministry of Forests and Ministry of Environment, Lands and Parks, Victoria, B.C.
- Anonymous. 1995. Riparian management area guidebook. Province of British Columbia, Ministry of Forests and Ministry of Environment, Lands and Parks, Victoria, B.C.
- Masse, Sylvie. 1999. Reconnaissance (1:20 000) Fish and Fish Habitat Inventory Upper Elk River Tributaries Phases 1-3 WSC: 349-248100. Prepared by Sylvie Masse, Nelson, B.C. Prepared for Crestbrook Forest Industries Ltd., Cranbrook, B.C. 16 pp + appds.
- Minister of Forests. 1996. Forest Practices Code of British Columbia Act. Published by Queen's Printer of British Columbia.
- Resources Inventory Committee. 1993. Field key to the freshwater fishes of British Columbia. Min. Env. Lands and Parks, Victoria, BC.
- Resources Inventory Committee. 1998. Reconnaissance (1:20 000) fish and fish habitat inventory; standards and procedures. Min. Env. Lands and Parks, Victoria, BC.
- Resources Inventory Committee. 1999. Reconnaissance (1:20 000) fish and fish habitat inventory; standards and procedures manual. Version 1.1, Errata. Min. Env. Lands and Parks, Victoria, BC.
- Resources Inventory Committee. 1998. Reconnaissance (1:20 000) fish and fish habitat inventory; data forms and users notes. Min. Env. Lands and Parks, Victoria, BC.
- Resources Inventory Committee. May, 1998. Standards for fish and fish habitat mapping. Min. Env. Lands and Parks, Victoria, BC.
- Resources Inventory Committee. April 1999. Standards for fish and fish habitat mapping, Errata. Min. Env. Lands and Parks, Victoria, BC.
- Resources Inventory Committee. 1997. User's guide to the British Columbia watershed/waterbody identifier system. Min. Env. Lands and Parks, Victoria, BC.

## **Appendix 1: FDIS Reach Site Summary and Photographs**

**Appendix 2: Project Map (under separate cover)**

**Appendix 3: Interpretive Map (under separate cover)**

## **Appendix 4: Summary of Fish Bearing Status and Riparian Classification**

**Attachment 1: Field Notes.**

**Attachment 2: Photo binder, photo documentation and photo CD's.**

### **Attachment 3: Digital Products CD.**

#### **FDIS related files**

fdisdat.mdb (version 7.3)-MoELP field data information system database  
waterbdy.exp - MoELP waterbody codes file acquired from MoELP Victoria

#### **GIS related files**

A4199903.dbf - a Dbase III compatible file of the project attribute data  
M4199903.dbf – a Dbase III compatible file of the project metadata  
interp1.prt, interp2.prt, interp3.prt - Interpretive map plot files  
proj1.prt, proj2.prt, proj3.prt - Project map plot files  
over.prt - Overview map plot file

#### **Other files**

readme.txt - Lists digital files delivered with a description of the file names.  
ElkfnW6.doc- Microsoft Word 6.0 watershed report.  
ripclass.xls- summary spreadsheet and database of field sampled, known and interpreted riparian  
classifications



**Attachment 4: FISS data and FISS map updates.**