Reconnaissance (1:20 000) Fish and Fish Habitat Inventory

of

Chimdemash, Ste. Croix and Legate Watersheds

WSC: 400-248400-00000-0000
WSC: 400-258700-00000-0000
WSC: 400-271000-00000-0000

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Prepared for:

Skeena Cellulose Inc.
Terrace Woodlands Division
4900 Keith Ave.
Terrace, BC
V8G 5L8

Prepared by:

Applied Ecosystem Management Ltd.
4663 Park Ave.
Terrace, BC
V8G 1V9

AEM#92

PROJECT REFERENCE INFORMATION

MELP Project Number	06-KLUM-000001094-1999
FRBC Project Number	N/A
FDIS Project Number	06-KLUM-000001047-1999
FRBC Region	Skeena Region
MELP Region	06
FW Management Unit	06-9
Fisheries Planning Unit	N/A
DFO Sub-District	Prince Rupert (06)
Forest Region	Prince Rupert
Forest District	Kalum district
Forest Licensee and Tenure #	A16835
First Nations Claim Area	Tsimshian

WATERSHED INFORMATION

Watershed Group	KLUM (Kalum River)
Watershed Name	Chimdemash/Ste. Croix/Legate
Watershed Code	400-248400-00000-00000-00000 400-258700-00000-00000-00000 400-271000-00000-00000-00000
UTM at Mouth	9.5400800.6067320 9.540100.6061600 9.540100.6057680
Watershed Area	238.6 km^2
Total of All Stream Lengths	970.04 km
Stream Order	5th order
NTS Maps	103I/9, 103I/16
TRIM Maps	103I.059, 103I.060, 103I.069, 103I.070, 103I.079, 103I.080
BEC Zone	CWH, MH, ICH, AT
Air Photos	BC88022 No. 53-60, 211-218; BC88032 No. 18-30, 70-75, 105-115, 249-260; BC88033 No. 159-171

SAMPLING DESIGN SUMMARY

Total Number of Reaches	1497
Random Sampling Sites	45
Discretionary Sample Sites	30
Total Sample Sites	75
Field Sampling Dates	September 8 - September 21, 1999
Fish Species in Watershed	PK, CH, CO, CT, DV, RB CAS, MW

CONTRACTOR INFORMATION

Project Manager:	*Name:*	Todd Zimmerling, M.Sc., R.P. Bio., P.Biol.
	Address:	4663 Park Ave, Terrace, BC V8G 1V9
	Phone:	(250) 635-2300
Field crew:	*Names:*	T. Zimmerling, A. Coosemans, M. Bahr, W. Sheridan, R. Sharples, L. Zimmerling
Data Entry by:	*Names:*	M. Bahr
Report prepared by:	*Name*	T. Zimmerling, M. Bahr, W. Sheridan, R. Sharples
Report edited by:	*Name*	T. Zimmerling
Maps prepared by:	*Name:*	N. Flynn
	Company:	Applied Ecosystem Management Ltd.
	Address:	100-211 Hawkins St., Whitehorse, YT Y1A 1X3
	Phone:	(867) 393-3793
QA/QC by:	*Name:*	Brad Pollard, R.P.Bio. and Sam Buchanan
	Company:	Acer Resource Consulting Ltd.
	Address:	200-4445 Greig Ave. Terrace, BC
	Phone:	(250) 638-0110

DISCLAIMER

This product has been accepted as being in accordance with the approved standards within the limits of the 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 project was provided by Forest Renewal B.C., and administered by Skeena Cellulose Inc., Terrace, B.C.. The contract was monitored jointly by Kim Haworth (Skeena Cellulose Inc.) and Brad Pollard (Acer Resource Consulting Ltd.). Skeena Cellulose Inc. provided maps and air photos. Editorial comments on drafts of this report were provided by, Todd Zimmerling (Applied Ecosystem Management Ltd.), Sam Buchanan and Brad Pollard (QA/QC Monitors).

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Attachment 4. Digital Data: Report, FDISdat.mdb, GIS map files, meta data table.
Attachment 5. FISS update forms.
Attachment 6. Interpretive and Project maps.

1.0 INTRODUCTION

This inventory project encompassed the Chimdemash, Ste. Croix and Legate watersheds as well as smaller tributaries to the Skeena River. The watersheds were inventoried in September, 1999, to determine habitat characteristics of streams within the watersheds, as well as the diversity, abundance and distribution of fish populations. Applied Ecosystem Management Ltd. was retained by Skeena Cellulose Inc. (Terrace Woodlands) to conduct the inventory. As part of this project a full background review of all existing fisheries information was conducted. In addition, using Resource Inventory Committee (RIC) protocol and the Field Data Information System (FDIS) database, 75 sites were selected for field surveys. This report summarizes the results of the reconnaissance level stream inventory for the Chimdemash, Ste. Croix and Legate watersheds.

1.1 PROJECT SCOPE/OBJECTIVES

The objectives of this project were:

1) Review and summarize historical fisheries information for the Chimdemash, Ste. Croix and Legate watersheds.
2) Undertake a 1:20 000 reconnaissance level stream inventory to describe fish diversity, abundance and distribution.
3) Document fish habitat characteristics.
4) Document barriers to fish passage.
5) Identify any further sampling requirements in the watershed.

This project did not encompass 1:5000 inventories, nor did it include any lake surveys, as no lakes requiring surveys were identified.

1.2 LOCATION

The Chimdemash, Ste. Croix and Legate watersheds are located northeast of Terrace, B.C. (see Figure 1), and flow into the Skeena River. The Skeena River forms the western boundary of the study area, while mountain ranges to the north, south and east serve as the other boundaries to the study area.

1.2.1 Access

Road access to the Chimdemash watershed is available along the Chimdemash mainline Forest Service Road (FSR), which is located approximately 22 km east of Terrace, along Highway 16. The FSR is accessible using 2-wheel drive over most of the watershed, although some side roads have been deactivated and require 4-wheel drive.

Road access to the Ste. Croix watershed is available along the Ste. Croix mainline FSR, which is located approximately 26 km east of Terrace, along Highway 16. The FSR has been deactivated and requires 4-wheel drive or ATV for access over most of the watershed.

Road access to the Legate watershed is available along the Legate mainline FSR, which is located approximately 34 km east of Terrace, along Highway 16. The FSR is accessible

using 2-wheel drive over most of the watershed, although some side roads have been deactivated and require 4-wheel drive.

Helicopter access to all three watersheds is available from a number of companies operating from the Terrace-Kitimat Regional Airport. Flight time from the airport to the study area is approximately 10 minutes.

Figure 1. Overview location map of Chimdemash/Ste. Croix/Legate study area (not to scale).

2.0 RESOURCE INFORMATION

The study area has been subject to logging activities since approximately 1970 (Brent Smith, pers. comm.). The area became part of F.L.A. 16835 in the mid 1970's and is currently managed by Skeena Cellulose Inc.. The long-term forestry activities in the area have resulted in the majority of CWHws1 (valley bottom) old-growth being logged. However, excellent re-growth has resulted in second-growth stands that are already approaching thinning size.

This area has relatively low recreational values. All three watersheds in the study area are used for hunting. Fishing opportunities are largely limited to trout fishing in the mainstems of Legate and Chimdemash Creeks, although some salmon fishing may occur at the confluence of these creeks with the Skeena River. There are no maintained recreational trails or camp sites within the study area, and access to the alpine area is limited (Ken Newman, pers. comm.).

Although there are no specific large areas of rare or high value habitat known for any species of wildlife in this study area, the area does provide habitat for a large number of mammal, bird, and amphibian species. Chimdemash Creek supports runs of pink (*Oncorhynchus gorbusha*) and coho (*O. kisutch*) salmon (in the lower reaches), as well as resident population of Dolly Varden char (*Salvelinus malma*) and cutthroat trout (*O. clarki*)(FISS). Ste. Croix Creek supports runs of pink salmon (FISS) and a resident population of Dolly Varden, while Legate Creek supports pink and coho salmon and resident populations of Dolly Varden char, cutthroat trout, rainbow trout (*O. mykiss*) (FISS), mountain whitefish (*Prosopium williamsoni*) and prickly sculpin (*Cottus asper*). The smaller tributaries to the Skeena River were found to support resident populations of Dolly Varden char, rainbow trout, cutthroat trout and juvenile chinook salmon (*Oncorhynchus tshawytscha*).

The study area is part of the Tsimshian traditional territory and has been used in the past by the Kitselas band. The current Tsimshian land claim encompasses the entire study area.

To summarize resource information:

i) Entire area is located within F.L.A. 16835, managed by Skeena Cellulose Inc.
ii) Extensive use of the area by a variety of wildlife species.
iii) Coho, chinook and pink salmon are known in the project area, along with Dolly Varden, cutthroat trout, rainbow trout, mountain whitefish and prickly sculpin
iv) Access to most of the study is good, along 2 and 4-wheel drive FSR.
v) Recreational development is relatively limited in the study area.
vi) Entire study area is within the Tsimshian traditional territory.

3.0 METHODS

3.1 SAMPLE SITE SELECTION

Sample sites were selected randomly through the Field Data Information System (FDIS) by conducting reach break analysis for the entire study area. During Phases I-III of this Reconnaissance (1:20 000) Fish and Fish Habitat Inventory (completed by Applied Ecosystem Management, Ltd., 1999) all streams on 1:20 000 TRIM map scale were identified numerically by assigning an Interim Location Point (ILP) or watershed code, following 1:20 000 fish and fish habitat inventory standards **(**RIC 1998; RIC Errata 1999). Streams were divided into reaches based on map and air photo interpretation. Basin types were assigned to each reach, and all reach information was entered in the FDIS database, following Resource Inventory Committee standards (RIC 1998; RIC Errata 1999).

The FDIS program was used to determine randomly selected reaches for field sampling. These reaches were mapped on 1:20 000 and 1:50,000 map scale and some sites were deleted or moved based on previous fish sampling or site accessibility. Random and biased (selected by researchers) sampling sites were mapped on 1:20 000 scale, along with existing fisheries information for presentation to the contract monitor.

3.2 STREAM ASSESSMENT

From September 8 - September 21, 1999 field sampling was undertaken. At each selected sample site FDIS site cards and fish collection cards were completed as per Resource Inventory Committee Standards (RIC 1998; RIC Errata 1999). Fish were sampled using electroshocking as per the Fish Collection and Methods Standards (1997; Errata 1999). Table 1 summarizes the sampling equipment used during the field portion of this project.

All fish captured were identified to species. Bull trout and Dolly Varden char were distinguished based on the linear discriminant function (equation 1) developed by Haas and McPhail (1991).

Equation 1. $LDF = 0.63 \times BR + 0.18 \times AFR + 37.31 \times (UJL/SL) - 21.8$

where:
- LDF = linear discriminant function (>0 are bull trout, <0 are Dolly Varden)
- BR = total branchiostegal ray number
- AFR = total anal fin ray number
- UJL = total upper jaw length
- SL = standard length

Fork lengths were recorded for all fish captured to allow for an estimation of age based on fork length.

No voucher specimens were collected; however 2 DNA samples were collected from cutthroat trout (Appendix 4) as per instruction from MoELP.

Table 1. Summary of sampling equipment and sampling intensity.

Parameter	Intensity	Equipment
water temperature	each site	alcohol thermometer
pH	each site	Oakton pHTestr 2r
conductivity	each site	Oakton TDSTestr 3
water clarity	each site	Visual
fish presence	as required to determine fish presence	Smith Root Model 12B - POW electroshocker or gee-type minnow traps
photography	each site	Minolta Weathermatic Dual 35
gradient	each site	CST Abney Level or Suunto clinometer
site length	each site	visual/Fieldranger 6500 hipchain

4.0 RESULTS AND DISCUSSION

4.1 LOGISTICS

Rugged terrain and small size of some streams in the study area created difficulty in accessing some sites; however, the majority of sites were accessible by 2 or 4-wheel drive. Where steep terrain prevented road and foot access helicopter was used. In addition a helicopter overview flight was used on all streams to identify barriers to fish migration.

Some sample sites suffered from high turbidity which, in some cases, may have resulted in no fish being captured in reaches where fish exist. For these cases, minnow trapping was also employed to reduce the need for further follow-up sampling.

4.2 HABITAT AND FISH DISTRIBUTION

The study area has been split into four distinct sub-basins (Table 2): Chimdemash sub-basin (400-248400-00000-0000), Ste. Croix sub-basin (400-258700-00000-0000), Legate sub-basin (400-271000-00000-0000) and Tributaries to the Skeena River. Table 3 provides a summary of data collected from sample sites, broken down by these four sub-basins.

In general, there is good fish habitat found throughout the study area (Table 3); however, barriers to fish passage in the lower reaches of the larger streams have limited fish distribution and species diversity (Table 4). Chimdemash Creek has a series of three rock falls located in the lower section of reach 2. Upstream of this point in the watershed only Dolly Varden have been observed. In Ste. Croix Creek two 3-m waterfalls in reach 2 have prevented all fish access to the upper reaches. In the Legate watershed fish presence is limited to Dolly Varden above the large cascade in reach 3. Below reach 3, both pink and coho salmon spawn (FISS) and rainbow and cutthroat trout, mountain whitefish and prickly sculpin have been captured (FISS). The Skeena River tributaries within the study area were found to provide habitat for a variety of fish species, including rainbow and cutthroat trout, Dolly Varden char and chinook salmon. Most of the fish captured within the tributaries to the Skeena River were located in reach 1 as in the majority of cases upper reaches had gradient barriers (> 30%) or impassable waterfalls (Table 4).

Within the Chimdemash and Legate watersheds barriers to fish passage limited Dolly Varden distribution within many mainstem tributaries (see Table 4). In most cases fish were confined to the first reach of the tributary. Where fish were found densities were relatively high with large numbers being captured in a short electroshocking period.

Table 2. Summary of sub-basins in the Chimdemash/Ste. Croix/Legate study area.

Sub-basin	Watershed Code	UTM at mouth	Watershed Area (km^2)	Stream length (km)	Stream Order	NTS Map	BEC Zone
Chimdemash Creek	400-248400-00000-00000	9.540424. 6057175	105.2	384.8	5	103-I/9	CWH/ MH/AT
Ste. Croix Creek	400-258700-00000-00000	9.543811. 6061521	16.9	124.7	5	103-I/9	CWH/ MH/ AT
Legate Creek	400-271000-00000-00000	9.548844. 6067138	91.0	387.4	5	103-I/16 103-I/9	CWH/ MH/ICH/ AT
Tributaries to Skeena River	various		25.5	73.1	3	103-I/16 103-I/9	CWH/ ICH

Table 3. Summary of sample sites in the Chimdemash, Ste. Croix, Legate study area (Sept. 8 - Sept. 21, 1999).

Stream Watershed Code or ILP/NID	Description	Reach	Channel		Substrate[1]		Morph[2]	Habitat[3]			Fish Species[4]
			Gradient (%)	Width (m)	Dom	Sub		Rearing	Spawning	Overwinter	
Chimdemash Creek sub-basin											
ILP 69238/3052	Unnamed Creek	2	35.5	1.8	G	C					DC
400-248400-/3053	Chimdemash Creek	2	6	20.6	C	B	CPB	M	G	M,	DV
400-248400-18800-/3054	Unnamed Creek	1	40	6.17	R	B	CP	M	N	M	NFC
400-248400-35400-/3055	Unnamed Creek	3	15	4.95	C	B	RPCW	G	M	G	NFC
400-248400-/3056	Chimdemash Creek	3	2.5	26.3	C	B	RPCW	G	G	G	DV
ILP 69285/3057	Unnamed Creek	1	4	1.57	F	G	RP	G	P	P	DV
ILP 69379/3058	Unnamed Creek			NVC							
400-248400-54100-/3059	Unnamed Creek	1	6.5	9.08	B	C	CPB	G	M	M	DV
400-248400-47300-/3060	Unnamed Creek	1	24	6.88	C	B	CPB	M	N	M	NFC
400-248400-54100-15500-/3061	Unnamed Creek	1	22	6.65	C	B	CPB	M	M	P	NFC
ILP 69409/3062	Unnamed Creek	1	26.5	6.88	B	C	CPB	P	P	P	NFC
400-248400-54100-30200-/3063	Unnamed Creek	1	19.3	4.4	R	B	CPB	M	N	M	NFC
400-248400-70700-/3064	Unnamed Creek	1	11.5	9.2	C	B	SPB	G	P	G	DV
ILP 69457/3065	Unnamed Creek	1	11.5	NVC							
400-248400-78200-/3066	Unnamed Creek	2	10.5	4.08	C	B	CPB	M	M	M	NFC
400-248400-/3067	Chimdemash Creek	4	5	5.43	C	B	CPB	G	M	M	NFC
ILP 60008/3068	Unnamed Creek	1	13.5	0.73	C	B	SPB	G	N	P	NFC
400-248400-/3069	Chimdemash Creek	4	7	19.83	C	G	CPB	M	M	M	NFC
ILP 70134/3070	Unnamed Creek	1	8.5	1.89	C	G	SP	M	M	M	NFC
ILP 69331/3071	Unnamed Creek	1		NVC							
400-248400-45700-/3072	Unnamed Creek	3	6	16.93	C	G	RP	M	P	M	NFC
400-248400-45700-76000-/3073	Unnamed Creek	1		NVC							
ILP 70110/3074	Unnamed Creek	1	3	2.8	C	G	RP	M	M	M	NFC
ILP 70106/3075	Unnamed Creek	1	12.5	1.27	C	G	RP	P	P	N	NFC
Ste. Croix sub-basin											
400-258700-/3041	Ste Croix Creek	2	3.5	10.32	C	B	SPBW	G	G	E	DV
400-258700-/3042	Ste Croix Creek	2	6.5	18.55	C	B	CPB	M	M	M	NFC
400-258700-39600-/3043	Unnamed Creek	1	26	12.52	B	C	SPBW	M	M	M	NFC

Table 3 (continued)

Stream Watershed Code or ILP/NID	Description	Reach	Channel		Substrate[1]		Morph[2]	Habitat[3]			Fish Species[4]
			Gradient (%)	Width (m)	Dom	Sub		Rearing	Spawning	Overwinter	
400-258700-58900-/3044	Unnamed Creek	1	17	8.8	B	C	CP	G	M	M	NFC
ILP 69177/3045	Unnamed Creek	1		NVC							
400-258700-/3046	Ste Croix Creek	3	7.5	14.7	C	B	CPB	G	M	M	NFC
Legate Creek sub-basin											
400-271000-/3002	Legate Creek	1	2	68.8	C	B	RP	E	E	E	DV,MW, RB, CAS
ILP 79040/3003	Unnamed Creek	1		NVC							
ILP 79069/3004	Unnamed Creek	1	9.5	1.62	C	G	RP	M	M	P	NFC
400-271000-20100-/3005	Unnamed Creek	3	9.5	40.1	C	G	CP	P	M	M	NFC
400-271000-22100-/3006	Unnamed Creek	1	22.3	2.3	C	G	SPBW	P	P	P	NFC
400-271000-32700-/3007	Unnamed Creek	1	27	3.4	F	G	SPBW	G	M	P	NFC
ILP 80112/3008	Unnamed Creek	1	4	2.8	G	C	RP	G	P	M	DV
400-271000-31600-/3009	Unnamed Creek	1		NVC							
ILP 80124/3010	Unnamed Creek	1	10.5	3.6	G	C	RPGW	E	M	G	DV
400-271000-44300-/3011	Unnamed Creek	1	7	4.9	C	B	SPBW	E	M	G	DV
400-271000-47500-/3012	Unnamed Creek	1	4.5	8.1	C	G	RPCW	E	M	G	DV
ILP 80051/3013	Unnamed Creek	3	54	0.35	F	C	CP	P	P	M	NFC
ILP 80001/3014	Unnamed Creek	1		NVC							
400-271000-53600-/3015	Unnamed Creek	1	5	2.5	F	G	RP	M	N	M	NFC
ILP 80008/3016	Unnamed Creek	1	46	1.4	C	B					DC
ILP 70197/3017	Unnamed Creek	1	0.5	1.4	G	F	RP				DC
400-271000-59200-/3018	Unnamed Creek	1	22	7.0	C	B	CP	G	G	G	DV
400-271000-63200-/3019	Unnamed Creek	1	20	5.0	B	G	SP	G	M	M	NFC
ILP 70218/3020	Unnamed Creek	1	0.5	9.9	F	G	RP	G	M	M	DV
400-271000-66000-/3021	Frisco Creek	1	11.5	6.9	C	B	CP	M	M	G	DV
400-271000-66000-/3022	Frisco Creek	3	13	1.7	C	B					DC
400-271000-/3023	Legate Creek	9	4	42.1	C	B	CP	G	M	M	DV
ILP 70413/3024	Unnamed Creek	1	33	5.03	G	C					DC
ILP 70370/3025	Unnamed Creek	1	9	2.17	C	B	CP	M	M	M	NFC

Table 3 (continued)

Stream Watershed Code or ILP/NID	Description	Reach	Channel		Substrate[1]		Morph[2]	Habitat[3]			Fish Species[4]
			Gradient (%)	Width (m)	Dom	Sub		Rearing	Spawning	Overwinter	
400-271000-76900-/3026	Unnamed Creek	1	8	52.8	C	B	CP	M	M	M	DV
ILP 70398/3027	Unnamed Creek	1	8	1.3	F	B	CP	M	N	N	NFC
ILP 70368/3028	Unnamed Creek	1	4	1.77	G	F	RP	M	M	G	NFC
400-271000-/3029	Legate Creek	10	5	61.2	C	B	RP	G	M	G	DV
400-271000-83700-/3030	Unnamed Creek	1	6.5	9.85	C	B	RPCW	E	M	M	DV
400-271000-20100-/3031	Unnamed Creek	4	15.5	9.07	B	C	SP	M	M	M	NFC
Tributaries to Skeena River											
ILP 79033/3001	Unnamed Creek	1	9.7	0.38	F	G	RP	P	P	P	RB
ILP 79031/3032	Unnamed Creek	2	23.5	0.97	G	C					DC
400-270400-/3033	Unnamed Creek	1	10	1.6	G	C					DC
400-269900-/3034	Unnamed Creek	1	2	1.37	G	F	RP	M	M	M	CT, DV
400-268500-/3035	Unnamed Creek	1	1.5	1.78	C	G	SP	M	M	M	NFC
ILP 79015/3036	Unnamed Creek	1		NVC							
ILP 79014/3037	Unnamed Creek	1		NVC							
400-262000-/3038	Unnamed Creek	1	1.5	4.6	C	G	RP	G	M	G	NFC
ILP 79001/3039	Unnamed Creek	1	12.5	3.2	C	B	RPCW	P	P	P	NFC
ILP 79002/3040	Unnamed Creek	1	12.5	1.43	C	G	RP	P	P	P	NFC
400-257800-/3047	Tumbling Creek	2	26	5.4	C	G	CPB	M	M	P	NFC
400-257800-/3048	Tumbling Creek	3	16.5	2.6	R	G	CPB	M	P	G	NFC
400-256700-/3049	Mannix Creek	1	13.5	4.8	B	C	SPBW	G	M	M	CT, RB, DV
ILP 69222/3050	Unnamed Creek	1	0	1.04	F	NA	NS	P	P	P	CH
ILP 69225/3051	Unnamed Creek	1		NVC							

[1]substrate classed as: R = bedrock; B = boulder; C = cobble; G = gravel; F = fines.

[2]channel morphology classed as: SPBW = step pool boulder, woody debris functional; RP = riffle pool; CPB = cascade pool, boulder; CPBW = cascade pool, boulder woody debris functioning; SPC = step pool cobble; SPB = step pool boulder; SP = step pool; CP = cascade pool; LC = large channel; NS = non-specified.

[3]habitat classed as: E = excellent; G = good; M = moderate; P = poor; N = none.

[4]fish species: RB = rainbow trout; CT = cutthroat trout; DV = Dolly Varden char; BT = bull trout, CH = chinook, MW = mountain whitefish, CAS = prickly sculpin DC = dry channel; NFC = no fish captured.

4.2.1 Chimdemash Creek Sub-basin (400-248400-00000-00000-)

Chimdemash Creek is known to support runs of coho and pink salmon, with pink salmon spawning in reach 1 (FISS). In addition, resident populations of cutthroat trout and Dolly Varden char have been found (FISS). All of these fish species had been previously identified in reach 1 and the lower section of reach 2; however, only Dolly Varden char had been identified above the waterfalls in reach 2 (FISS) (see Table 4 for information on barriers).

Sampling for this project captured Dolly Varden in reaches 2 and 3 of Chimdemash Creek; however, no fish were captured in either of two sample sites in reach 4 (above 10 m and 20 m waterfalls located in the lower section of this reach; Photograph 1). Sampling in 7 tributaries to Chimdemash Creek above the 10 m and 20 m falls also resulted in no fish captures.

Of the 7 sample sites located in the in tributaries to Chimdemash Creek, downstream of the falls, two were found to have barriers, two had no visible channel and three had Dolly Varden char present (NIDs 3057, 3059, 3064) (Table 3). Apart from the Chimdemash mainstem, these three sample sites represent the only locations within the Chimdemash sub-basin where fish were captured. All sample sites in reaches 2 or 3 of tributaries were found to contain no fish. In the majority of cases a falls or gradient barrier has prevented fish access to the upper reaches of the tributaries (Table 4).

Photograph 1. 10 m and 20 m falls in Chimdemash Creek reach 4 (wsc 400-248400-).

Table 4. Summary of historic and new barriers to fish migration found in the Chimdemash Creek sub-basin (September 8 - September 21, 1999).

Stream name	Watershed Code	TRIM map #	Reach	Barrier Type	Ht. of barrier (m)	Verified in Field	Description of Barrier
Legate Creek	400-271000-	103I.070	8	C	1.5	y	NID 1601-historical feature
Legate Creek	400-271000-	103I.070	8	C	2	y	NID 1602-historical feature
Legate Creek	400-271000-	103I.070	3	C	110 (length)	y	NID 1606-historical feature
Chimdemash Creek	400-248400-	103I.069	2	F	3	y	NID 1608-historical feature
Chimdemash Creek	400-248400-	103I.069	2	F	2	y	NID 1610-historical feature
Chimdemash Creek	400-248400-	103I.069	2	F	2	y	NID 1611-historical feature
Chimdemash Creek	400-248400-	103I.069	2	F	2	y	NID 1612-historical feature
Unnamed Creek	ILP 69222	103I.069	1	CV	1.2	y	NID 4009-seasonal barrier
Unnamed Creek	ILP 69408	103I.069	1	F	40	y	NID 5018-40 m falls
Unnamed Creek	ILP 70134	103I.070	2	F	60	y	NID 5026
Unnamed Creek	ILP 70218	103I.070	1	BD		y	NID 4013-beaver dam
Unnamed Creek	ILP 70247	103I.070	1	F	35	y	NID 5032
Unnamed Creek	ILP 79001	130I.079	1-2 break	C	3-5	y	NID 4006 3-5 m cascades at R1 or R2 break. Barrier to upstream migration.
Unnamed Creek	400-271000-53600	103I.080	1	BD		y	NID 4017-Beaver dam, not a barrier.
Unnamed Creek	400-271000-32700	103I.080	1	BD		y	NID 4016-old beaver dam, not a barrier to fish
Unnamed Creek	ILP 80051	103I.080	3	NS	25 (length)	y	NID 5004 gradient barrier
Chimdemash Creek	400-248400	103I.070	4	F	20	y	NID 5023-20 m falls
Chimdemash Creek	400-248400	103I.070	4	F	10	y	NID 5022-10 m falls
Chimdemash Creek	400-248400	103I.070	4	F	50	y	NID 5027-50 m falls
Unnamed Creek	400-248400-18800	103I.069	1	BG		y	NID 4011-rip-rap barrier.
Unnamed Creek	400-248400-18800	103I.069	1	F	5-6	y	NID 4012- 5-6 m falls upstream from confluence of Chimdemash Creek.

Table 4 (continued).

Stream name	Watershed Code	TRIM map #	Reach	Barrier Type	Ht. of barrier (m)	Verified in Field	Description of Barrier
Unnamed Creek	400-248400-35400	103I.069	2	F	300	y	NID 5014
Unnamed Creek	400-248400-54100	103I.069	1	F	20	y	NID 5017- 20 m falls
Unnamed Creek	400-248400-54100-15500	103I.069	1	F	5	y	NID 4015- Bedrock falls
Unnamed Creek	400-248400-54100-30200	103I.069	2	F	15	y	NID 5016- 15 m falls
Unnamed Creek	400-248400-78200	103I.069	1	F	7	y	NID 5020-7 m falls
Unnamed Creek	400-248400-78200	103I.069	1	F	5	y	NID 5021- 5 m falls
Ste. Croix Creek	400-258700	103I.069	3	F	3	y	NID 5010- 3 m falls
Ste. Croix Creek	400-258700	103I.069	3	F	3	y	NID 5011- 3 m falls
Unnamed Creek	400-271000-20100	103I.079	1	C	5	y	NID 5002- 5 m cascade
Unnamed Creek	400-271000-20100	103I.079	1	F	2	y	NID 5001- 2 m falls
Unnamed Creek	400-271000-83700	103I.070	1	F	10	y	NID 5007- 10 m falls
Unnamed Creek	400-271000-83700	103I.070	1	F	20	y	NID 5009- 20 m falls
Unnamed Creek	400-271000-83700	103I.070	1	F	10	y	NID 5008- 10 m falls
Unnamed Creek	400-271000-20100-19500	103I.070	2	F	6	y	NID 5003- 6 m falls
Unnamed Creek	ILP 80051	103I.080	3	C		y	NID 6000- cascades and gradient barrier.
Unnamed Creek	400-248400-84100	103I.070	1	F	10	y	NID 5024- 10 m falls
Unnamed Creek	400-248400-84100	103I.070	1	F	10	y	NID 5025- 10 m falls
Unnamed Creek	400-248400- 47300	103I.069	1	F	2	y	NID 4010- 2 m falls- partial obstruction
Mannix Creek	400-256700	103I.069	1	CV	1.7	y	NID 4008- Barrier to upstream migration.
Tumbling Creek	400-257800	103I.069	2	CV	4	y	NID 4018
Unnamed Creek	400-248400-70700	103I.070	4	F	120	y	NID 5019
Unnamed Creek	ILP 70398	103I.070	3	F	200-300	y	NID 5006
Frisco Creek	400-271000-66000	103I.070	1	F	15	y	NID 5028

Table 4 (continued).

Stream name	Watershed Code	TRIM map #	Reach	Barrier Type	Ht. of barrier (m)	Verified in Field	Description of Barrier
Frisco Creek	400-271000-66000	103I.070	1	F	15	y	NID 5029
Unnamed Creek	400-262000	103I.079	1	CV	3.5	y	NID 4007- culvert at stream outlet suspended 3.5 m above level of Skeena River.
Unnamed Creek	400-269900	103I.079	1	BD		y	NID 4005-Old beaver dam
Unnamed Creek	400-271000-59200	103I.070	1	C	5	y	NID 4002
Unnamed Creek	400-271000-47500	103I.070	1	C	10	y	NID 4001
Unnamed Creek	ILP 69331	103I.069	1	NS	100	y	NID 6003-avalanche track (10 m wide)
Unnamed Creek	ILP 70432	103I.070	1	BD	1.5	y	NID 6001
Unnamed Creek	400-248400-54100	103I.069	1	C	4	y	NID 5015
Unnamed Creek	400-248400-54100	103I.069	1	C	1.5	y	NID 4014
Unnamed Creek	400-257800	103I.069	2	F	15	y	NID 5012
Unnamed Creek	400-257800	103I.069	2	C	30	y	NID 5013
Tumbling Creek	400-257800	103I.069	3	C	3	y	NID 4004
Unnamed Creek	400-271000-59200	103I.070	1	F	15	y	NID 4003
Unnamed Creek	400-271000-63200	103I.070		F	20	y	NID 5005
Unnamed Creek	400-271000-66000	103I.070	2	F	6	y	NID 5030
Unnamed Creek	400-271000-66000-71000	103I.070	1	F	50	y	NID 5031
Unnamed Creek	400-271000-76900	103I.070	3	F	25	y	NID 5033
Unnamed Creek	400-271000-76900-70000	103I.070	1	F	200-300	y	NID 5050-200-300 m falls

4.2.2 Ste. Croix Creek Sub-basin (400-258700-00000-00000)

Previous fish information indicates that pink salmon have been found in reach 1 of Ste. Croix Creek (FISS). Two 3 m falls located in reach 2 prevent anadromous fish access upstream (Table 4). No fish were captured during sampling upstream of these falls, indicating no resident fish population. Most of the sites above the falls were described as having moderate to good habitat for Dolly Varden char and included 2 mainstem sampling sites and 3 tributary samples (Table 3).

Sampling in reach 2 of Ste. Croix Creek, below the falls, captured Dolly Varden char (NID 3041) (Table 3). This site was the only location where fish were captured in the Ste. Croix Creek sub-basin.

4.2.3 Legate Creek Sub-basin (400-271000-00000-00000-)

Previous fish information indicates that both pink and coho salmon spawn in reach 1 and the lower section of reach 2 of Legate Creek (FISS). FISS maps also indicate the presence of cutthroat trout and rainbow trout in reach 1. A large cascade (>100 m long) located in reach 2 of Legate Creek appears to be a barrier to anadromous fish (Table 4), as previous (FISS) information and sampling for this project indicates only Dolly Varden char are present upstream of reach 2.

Sampling for this project confirmed the existence of only Dolly Varden char above the cascade in reach 2. Sampling also found Dolly Varden char, mountain whitefish, rainbow trout and prickly sculpin in reach 1 of Legate Creek. Sixteen sample sites were located in reaches that flowed directly into Legate Creek above the cascade barrier. Of the 16 sample sites, 8 were found to have Dolly Varden present (Photograph 2), 2 had no visible channel, 2 were dry channels and no fish were captured in 4 sample sites (Table 3).

Photograph 2. Dolly Varden char captured at NID 3021 (tributary to Legate Creek).

4.2.4 Tributaries to the Skeena River (400-271000-00000-00000-)

There was no previous fish information for any of the streams within this sub-basin; however, given the importance of small tributaries to rearing salmonids it was assumed that a wide variety of juvenile fish would be captured in this area. The majority of sample sites in this sub-basin were located in reach 1 of small 1st or 2nd order streams (Table 3). Sampling during this project identified the presence of Dolly Varden char, rainbow trout, cutthroat trout, and chinook salmon. Pink and coho salmon juveniles also likely use these streams during certain times of the year, although none were captured during sampling for this project.

Steep gradient, waterfalls and suspended culverts across Highway 16 all act to prevent upward migration of fish in many of these streams (Table 4). In addition to the migration barriers the majority of the streams assessed (8 of 15) are less than 3 m in channel width and appear to be ephemeral in nature. As a result, many had limited water available for fish passage at the time of sampling. Of the original 15 reaches chosen for sampling, 3 were found to have no visible channel, 2 were completely dry, 6 had no fish captured and 4 had fish (Table 3).

4.3 FISH AGE, SIZE AND LIFE HISTORY

Table 5 provides information on the age and length of fish captured in the Chimdemash/Ste. Croix/Legate study area which was extrapolated from age/length distribution data from other areas (Scott and Crossman, 1973). Dolly Varden was the most abundant and most widely distributed species captured within the study area. Age classes for Dolly Varden ranged from 0+ juveniles to 4 adults in both the Chimdemash and Legate sub-basins; however only 1+ and 2+ were found in the Ste. Croix and Tributaries to the Skeena River sub-basins. The results from Ste. Croix Creek sub-basin and the Tributaries to the Skeena sub-basin are based on very small sample sizes (Table 5), and this should be taken into account when examining differences between these sub-basins and the Chimdemash and Legate sub-basins.

Figures 2 and 3 are length-frequency histograms for Dolly Varden char in Chimdemash and Legate Creek sub-basins. Histograms for the other two sub-basins and the other fish species have been omitted owing to low sample size (< 10 fish for each species). Dolly Varden were found throughout the Chimdemash Creek and Legate Creek sub-basins and ranged in size from 39 mm - 278 mm. Figure 2 shows a typical bell shaped fork length curve for Chimdemash Creek sub-basin. The decline in number in the 101- 120 mm size category may indicate poor survival of a particular year class. Figure 2 also shows a lack of larger individuals, with only one fish over 180 mm being captured. This result may indicate poor survival of adult fish or, more likely, it is a direct result of a bias in capture methods employed. Electrofishing tends to concentrate effort in slower moving waters along stream banks where smaller fish are more likely to reside. As a result, the sampling for this project may have missed a significant proportion of larger fish within the sub-basin.

Figure 3 provides a length-frequency histogram for the Legate Creek sub-basin. Legate Creek sub-basin appears to differ from Chimdemash Creek sub-basin in that the population size distribution is less clumped. In addition, the smaller size classes are conspicuously absent in the Legate Creek sub-basin. This may indicate poor egg survival resulting in few 0+ individuals. Alternatively, the higher numbers of larger size class Dolly Varden may be having an impact on smaller individuals through predation. If this second scenario is true, then the population may suffer from a sharp decline in the near future, owing to a food supply shortage and a decline in juvenile survival. Unfortunately, data collected from this study does not provide sufficient information to determine which scenario may be correct.

Only two fish were captured within the Ste. Croix Creek sub-basin (see Table 3) and both were Dolly Varden char. It is probable that Ste. Croix Creek supports resident Dolly Varden in reaches 1 and 2 (below the cascade barrier; Table 4) and spawning and rearing for Dolly Varden from the Skeena River. Dolly Varden are known to exhibit a number of different life history patterns (Scott and Crossman 1973), and although data collected in this study is insufficient to differentiate between the different life history strategies, it is

speculated that the fluvial-adfluvial and stream resident forms are predominant throughout the study area.

Dolly Varden char, along with rainbow trout and cutthroat trout, were also found within the Tributaries to the Skeena River sub-basin. In this sub-basin most streams are relatively small and short in length; however, habitat appears to support both rearing juveniles and resident adult fish. Given the proximity of the streams in this sub-basin to the Skeena River, many of the lower reaches are likely used for spawning by resident trout and char from the Skeena River. As well, juvenile salmon will use these tributaries at various times of the year, particularly during high water in the Skeena River.

In addition to those fish captured during sampling, pink and coho salmon are known to spawn in the lower reaches Chimdemash Creek and Legate Creek (FISS). No sampling was conducted in these reaches for this project. It is assumed that coho juveniles would be present in reaches 1 and 2 of Chimdemash Creek throughout the summer and fall months, and that pink salmon juveniles would be present for a short period of time just after emergence.

Table 5. Age and length of fish capture in the Chimdemash/Ste. Croix/Legate study area (September 8 - September 21, 1999).

Sub-basin Name	Watershed Code/ NID of Sample Site	Species	Age	Number of Fish	Mean Length (mm)	Range of length (mm)
Chimdemash Creek	400-248400-/3053, 3056	DV	0+	7	48.1	42 - 55
	ILP 69285/3057		1+	20	81.4	63 -100
	400-248400-54100/3059		2+	9	124.8	115 - 135
	400-248400-70700-/3064		3+	11	145.2	140 - 180
			4+	1	228	-
Ste. Croix Creek	400-258700-/3041	DV	1+	1	67	-
			2+	1	130	-
						-
Legate Creek	400-271000-/3002, 3023, 3029	DV	0+	5	48.2	39 - 54
	ILP 80112/3008		1+	23	94.5	81 - 110
	ILP 80124/3010		2+	14	123.4	115 - 132
	400-271000-44300/3011		3+	19	157.6	140 - 183
	400-271000-44300/3012		4+	6	221.83	192 - 278
	400-271000-59200-/3018					
	ILP 70218/3020	RB	1+	2	92	89 - 95
	400-271000-66000-/3021					
	400-271000-76900-/3026	MW	3+	1	183	-
	400-271000-83700-/3030					
		CAS	2+	1	95	-
Tributaries to Skeena River	ILP 79033/3001	DV	1+	3	99	95 - 104
	400-269900-/3034		2+	2	118.5	117 -120
	400-256700-/3049					
	ILP 69222/3050	CT	1+	2	77.5	75 - 80
			2+	2	113.5	112 - 115
			3+	3	146.3	138 - 156
			4+	2	193.5	175 - 212
		RB	0+	5	38.2	35 - 44
			1+	4	97.3	85 - 110
			2+	1	127	-
		CH	0+	3	81.3	72 - 92
			1+	1	125	-

DV - Dolly Varden char, CT - Cutthroat trout, RB - Rainbow trout, MW - Mountain whitefish;
CH - Chinook salmon

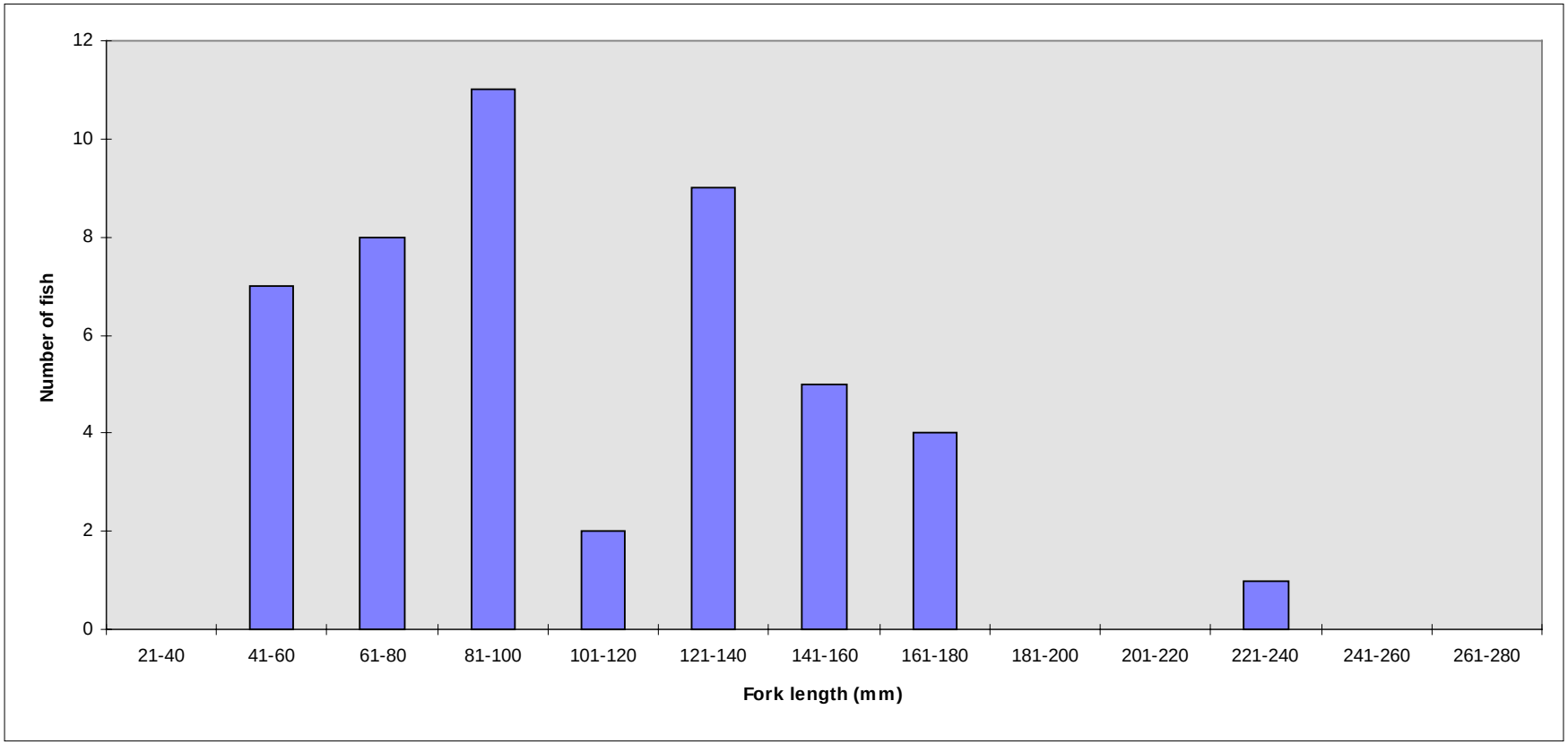

Figure 2. Length-frequency histogram of sampled Dolly Varden in the Chimdemash Creek sub-basin (September 8 - September 21, 1999).

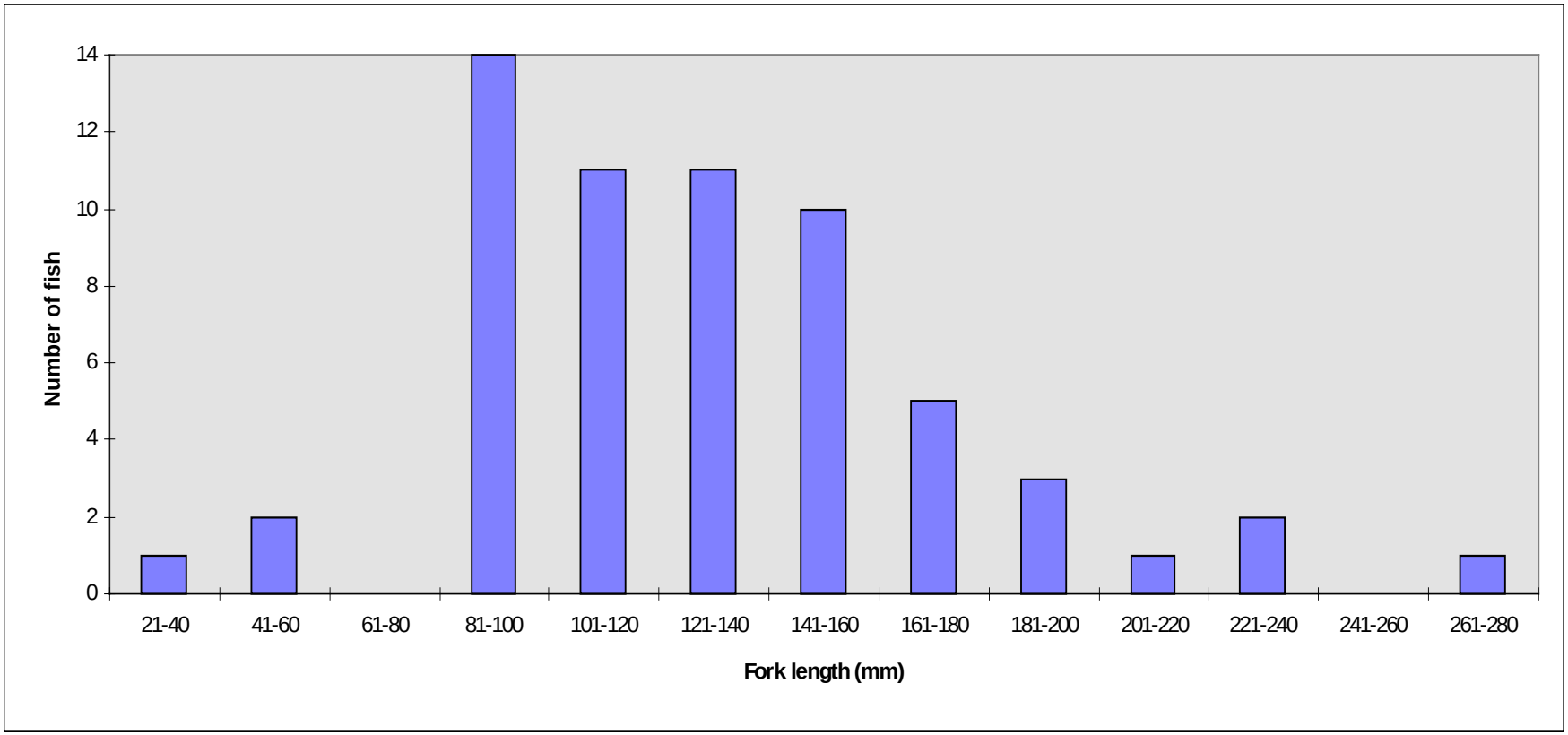

Figure 3. Length-frequency histogram of sampled Dolly Varden char in the Legate Creek sub-basin (September 8 - September 21, 1999).

4.4 SIGNIFICANT FEATURES AND FISHERIES OBSERVATIONS

4.4.1 Fish and Fish Habitat

No critical habitat has been identified in this project, although coho salmon and pink salmon are known to spawn in reaches 1 and 2 of both Chimdemash and Legate Creeks. These areas are obviously important with respect to these salmon runs as the available habitat is relatively limited and disturbance of even a small portion of reach 1 or 2 could have a significant impact on available spawning habitat and future salmon runs in these drainages.

4.4.2 Habitat Protection Concerns

No area has been identified as requiring habitat protection. However, it is recommended that reach 1 of 400-271000-83700 (NID 3030) be examined in greater detail. This reach flows into reach 10 of Legate Creek and is unique in that one pool within the reach produced the four largest Dolly Varden char captured within the sub-basin (205 mm, 221 mm, 240 mm, 278 mm). The capture of these individuals in close proximity may indicate the presence of a spawning area; however, none of the fish were in spawning colours, nor were any redds observed, and as a result spawning in the area could not be confirmed. Based on the results from this study, it may be beneficial for future Dolly Varden char management if this reach were examined in more detail to determine if a few pools within the reach serve as spawning areas. If this is confirmed then special protection may be required.

4.4.2.1 Fisheries Sensitive Areas

No fisheries sensitive areas have been identified in this watershed.

4.4.2.2 Fish above 20% Gradients

Of the original 13 reaches selected for sampling with a gradient over 20%, 3 were found to have a dry channel at the time of sampling and 1 was located upstream of the mainstem barrier on Ste. Croix Creek. As a result, there was no opportunity for fish to be present at these sites. Of the remaining 9 sample sites that could have potentially had fish, only a single site (reach 1 of 400-271000-59200; NID 3018) located in a tributary to Legate Creek was found to have fish present (Photograph 3). This site (Photograph 4) had an average gradient of 22% with a cascade-pool morphology.

In general, it appears that in reaches with gradients over 20% the probability of Dolly Varden being present is low; however, the possibility still exists depending on the morphology of the reach. Both cascade-pool and step-pool morphologies, in combination with adequate waterflow, appear conducive to Dolly Varden passage.

Photograph 3. Dolly Varden captured in Reach 1 of 400-271000-59200 (NID 3018) with 22% gradient.

Photograph 4. Reach 1 of 400-271000-59200 (NID 3018) with 22% gradient.

4.4.2.3 Restoration and Rehabilitation Opportunities

Six reaches have been identified for potential restoration activities (Table 6). In four of the six cases the problem is a suspended culvert limiting or preventing access upstream. Several involve culverts across Highway 16 and may be cost prohibitive to rectify. In one case (400-248400-54100; NID 3059) an old wooden bridge has collapsed into the stream and is creating an obstruction and may eventually divert the stream. In the sixth case the stream is running across a deactivated logging road which may create a siltation problem in the fish bearing reach below.

Table 6. Potential restoration sites in the Chimdemash/Ste. Croix/Legate study area.

Watershed code/NID	Reach	Problem
400-271-59200-/3018	top of reach 1	Stream flowing over roadway.
400-262000-/3038	reach 1	Culvert under highway is suspended.
400-256800-/3048	reach 3	Suspended culvert.
ILP 69222/3050	reach 1	Culvert under highway is suspended.
400-248400-54100/3059	reach 1	Wooden logging bridge collapsing into stream.

4.5 FISH BEARING STATUS

Sampled reaches have been placed into three categories based on this project. The first is "fish bearing" meaning that fish were captured or sighted within the reach during the sampling period. The second category is "non-fish bearing". This category contains reaches within which no fish were captured during sampling and there is a fish passage barrier that explains the absence of fish in the reach. These reaches require no further sampling to confirm fish absence. The third category is "follow-up sampling" and consists of reaches where sampling was not done, owing to a dry channel or low water flows, or reaches within which no fish were captured during sampling, but there is no barrier downstream to explain fish absence. These sites must be re-sampled using different sampling techniques or at a different time of year, before any definitive "non-fish bearing" classification can be given.

4.5.1 Fish Bearing Reaches

Fish presence was confirmed at 29% (22/75) of sites sampled. Fish were distributed throughout the mainstem of Chimdemash Creek and up to reach 10 of Legate Creek. The majority of fish in the tributaries were confined to reach 1 as steep gradients usually resulted in barriers to fish migration upstream. As discussed previously, a barrier in reach 2 of Ste. Croix appears to prevented all fish access, as no fish were found upstream

(Table 3 and Table 4). In the Tributaries to the Skeena River sub-basin the majority of sites sampled had no fish captured.

Dolly Varden are found throughout the study area, with the exception of those areas upstream of the barrier on Ste. Croix Creek. The lack of Dolly Varden above the barrier on Ste. Croix Creek is suprising given that they are found above barriers on both Legate and Chimdemash Creeks (see Table 4 for barrier details) and were found at 620 m in elevation in Legate Creek. Rainbow trout and cutthroat trout, in contrast to Dolly Varden, were found in only four reaches combined (Table 7). Neither species was found above the barrier on Legate Creek or Chimdemash Creek.

Although Dolly Varden were found extensively in the large mainstem streams within the study area a large number of smaller 1st and 2nd order streams were not found to have fish at the time of sampling. This result may indicate an avoidance of these streams by Dolly Varden or it may be a result of seasonal use of the habitat. Owing to the steep terrain of the Chimdemash and Legate watersheds these lower order streams may be subject to rapidly increasing volumes associated with heavy rain events, and the fluctuating flows may not be conducive to rearing Dolly Varden.

The numerous barriers within this project area have had an obvious impact on the distribution of fish. The majority of fish captured were within sites that were 100 m to 500 m in elevation, and no fish were captured over 660 m (Table 7). In addition, a large number of sites between 100 m and 660 m had no fish captured (Table 8). The lack of fish at these sites was usually attributed to a barrier.

Table 7. Summary of data from surveyed fish bearing reaches in Chimdemash/Legate Watershed (September 8 - September 21, 1999).

				Channel				
Stream name	**Watershed code**	**Reach**	**Species**	**Width (m)**	**Site gradient (%)**	***Site elevation (m)**	**Follow-up Sampling (y or n)**	**Comments**
Unnamed Creek	ILP 79033; 103I.079	1	RB	0.38	9.7	140	n	NID 3001
Legate Creek	400-271000-	1	DV/RB/ MW/CAS	68.8	2	480	n	NID 3002
Unnamed Creek	ILP 80112; 103I.080	1	DV	2.8	4	320	n	NID 3008
Unnamed Creek	ILP 80124; 103I.080	1	DV	3.6	10.5	360	n	NID 3010
Unnamed Creek	400-271000-44300-	1	DV	4.9	7	380	n	NID 3011
Unnamed Creek	400-271000-47500-	1	DV	8.1	4.5	380	n	NID 3012
Unnamed Creek	400-271000-59200-	1	DV	7.0	22	480	n	NID 3018
Unnamed Creek	ILP 70218; 103I.070	1	DV	9.9	0.5	480	n	NID 3020
Frisco Creek	400-271000-66000-	1	DV	6.9	11.5	580	n	NID 3021
Legate Creek	400-271000-	9	DV	42.1	4	480	n	NID 3023
Unnamed Creek	400-271000-76900-	1	DV	52.8	8	600	n	NID 3026
Legate Creek	400-271000-	10	DV	61.2	5	620	n	NID 3029
Unnamed Creek	400-271000-83700-	1	DV	9.85	6.5	640	n	NID 3030
Unnamed Creek	400-269900-	1	CT/DV	1.37	2	120	n	NID 3034
Ste Croix Creek	400-258700-	2	DV	10.32	3.5	140	n	NID 3041
Mannix Creek	400-256700-	1	CT/RB/ DV	4.8	13.5	100	n	NID 3049
Unnamed Creek	ILP 69222; 103I.069	1	CH	1.04	0	120	n	NID 3050
Chimdemash Creek	400-248400-	2	DV	20.6	6	240	n	NID 3053
Chimdemash Creek	400-248400-	3	DV	26.3	2.5	400	n	NID 3056
Unnamed Creek	ILP 69258; 103I.069	1	DV	1.57	4	400	n	NID 3057
Unnamed Creek	400-248400-54100	1	DV	9.08	6.5	500	n	NID 3059
Unnamed Creek	400-248400-70700-	1	DV	9.2	11.5	660	n	NID 3064

*Site elevation is estimated from nearest 20 m TRIM contour line.

4.5.2 Non-Fish Bearing Reaches

Thirty-eight non-fish bearing reaches were identified in this project (Table 8). Reaches were classified as non-fish bearing using a number of criteria. All reaches have some kind of barrier to fish passage (including non visible channel). If there was limited overwintering habitat available above the barrier and a single sample found no fish then the reach was considered to be non-fish bearing. If there was good overwintering habitat available then the reach was only considered non-fish bearing if two or more samples above the barrier, in good fish habitat, found no fish. For the interpretive maps associated with this project all reaches upstream of a sampled, non-fish bearing reach were also considered non-fish bearing

Based on the results from this project is appears that any reach over 700 m in elevation, with a barrier to fish passage, can be considered non-fish bearing within this project area (Table 7 and Table 8). No fish were captured over 660 m in elevation (Table 7) and 14 sites at or above 700 m in elevation were classified as non-fish bearing (Table 7). There is significant overlap in fish bearing and non-fish bearing classification for sites under 660 m in elevation (Table 7 and Table 8).

Out of the 75 sample sites selected from 1:20 000 TRIM in the office, 10 were found to have no visible channel. This represents a 13% error rate in identifying watercourses from the 1:20000 TRIM maps. In several of the instances the stream was mapped as flowing through private lands, which may have resulted in the stream being diverted or seeping sub-surface and thereby losing the channel.

Table 8. Summary of data from surveyed non-fish bearing reaches in the Chimdemash/Ste. Croix/Legate study area (September 8 - September 21, 1999).

Stream name	Watershed code	Reach	Gradient (%)	Electrofishing Specifications				*Site elevation (m)	Comments (NID refers to sample site)
				Dist. (m)	Time (s)	Cond (uS)	Temp (C)		
Unnamed Creek	ILP 79040; 103I.079	1						220	NID 3003: No Visible Channel, no fish sampling occurred.
Unnamed Creek	ILP 79069; 103I.079	1	9.5	70	264	60	6	480	NID 3004: Barriers in reach 1 of mainstem (400-271000-20100) 2 m falls (NID 5001) and 5 m cascades (NID 5002).
Unnamed Creek	400-271000-20100-	3	9.5	480	394	80	5	480	NID 3005: Barriers in mainstem (400-271000-20100) 2 m falls (NID 5001) and 5 m cascades (NID 5002) in 400-271000-20100, R1
Unnamed Creek	400-271000-32700-	1	27	120	319	80	6	340	NID 3007: Gradient barrier (40%) downstream of site. Average site gradient is 27% Stream flows through old cutblock.
Unnamed Creek	400-271000-31600-	1						320	NID 3009: No Visible Channel, no fish habitat. Fish sampling did not occur.
Unnamed Creek	ILP 80051; 103I.080	3	54	50	278	40	10	1520	NID 3013: Gradient barrier-average site gradient is 54%. Gradient downstream of site is 55%.
Unnamed Creek	ILP 80001; 103I.080	1						420	NID 3014: No Visible Channel, no fish habitat. Fish sampling did not occur.
Unnamed Creek	ILP 70398; 103I.070	1	46					440	NID 3016: Gradient barrier-average site gradient is 46%. Dry channel at time of sampling, fish sampling did not occur.
Frisco Creek	400-271000-66000-	3	13					1200	NID 3022: Downstream of the site is a gradient barrier. Dry channel at time of sampling, fish sampling did not occur.
Unnamed Creek	ILP 70413; 103I.070	1	32					540	NID 3024: Gradient barrier (32%). Dry channel at time of sampling, fish sampling did not occur.
Unnamed Creek	ILP 70398 103I.070	1	8	100	354	70	8	1320	NID 3027: Barrier downstream of site (200-300 m falls- NID 5033).
Unnamed Creek	400-271000-20100-	4	15.5	175	340	80	4	880	NID 3031: Barriers in mainstem (400-271000-20100) 2 m falls (NID 5001) and 5 m cascades (NID 5002) in 400-271000-20100, R1
Unnamed Creek	ILP 79031; 103I.079	2	23.5					220	NID 3032: Gradient of 32% downstream of site. Very poor fish habitat. Dry channel at time of sampling.

Table 8. (continued).

Stream name	Watershed code	Reach	Gradient (%)	Electrofishing Specifications				*Site elevation (m)	Comments (NID refers to sample site)
				Dist. (m)	Time (s)	Cond (uS)	Temp (C)		
Unnamed Creek	ILP 79015 103I.079	1						120	NID 3036: No Visible Channel, no fish sampling occurred.
Unnamed Creek	ILP 79014 103I.079	1						120	NID 3037: No Visible Channel, no fish sampling occurred.
Ste Croix Creek	400-258700	2, Site 2	6.5	120	308	60	9	300	NID 3042: 2 m cascade in Reach 2, non fish bearing above this barrier
Unnamed Creek	400-258700-39600	1	26	120	256	60	8	420	NID 3043: 2 m cascade in 400-258700 Reach 2, non fish bearing above this barrier
Unnamed Creek	400-258700-58900	1	17	140	437	70	6	540	NID 3044: 2 m cascade in 400-258700- Reach 2, non fish bearing above this barrier
Unnamed Creek	ILP 69177; 103I.069	1						720	NID 3045: No Visible Channel, no fish sampling occurred.
Ste. Croix Creek	400-258700-	3	7.5	145	277	80	5	720	NID 3046: 2 m cascade in Reach 2, non fish bearing above this barrier
Tumbling Creek	400-257800-	2	26	75	170	70	6	400	NID 3047: gradient barrier in Reach 1, 20 m cascade approx. 50 m downstream of Reach 2/3 break. Culvert is perched 4 m above stream at upper reach break (Reach2/3)
Tumbling Creek	400-257800-	3	16.5	110	264	40	6	520	NID 3048: gradient barrier in Reach 1, 20 m cascade approx. 50 m downstream of Reach 2/3 break. Culvert is perched 4 m above at upper reach break (Reach2/3)
Unnamed Creek	ILP 69225; 103I.069	1						120	NID 3051: No Visible Channel, no fish sampling occurred.
Unnamed Creek	ILP 69238 103I.069	1						120	NID 3052: Gradient barrier, average gradient of 35.5 %. Dry channel at the time of sampling.
Unnamed Creek	400-248400-18800	1	40	120	289	30	8	280	NID 3054: Gradient barrier, average gradient of 40 %.
Unnamed Creek	400-248400-35400	3	15	160	327	60	6	980	NID 3055: Barriers downstream (two 10 m falls in Reach 2-NID 5014).

Table 8. (continued).

Stream name	Watershed code	Reach	Gradient (%)	Electrofishing Specifications				*Site elevation (m)	Comments (NID refers to sample site)
				Dist. (m)	Time (s)	Cond (uS)	Temp (C)		
Unnamed Creek	ILP 69379; 103I.069	1						460	NID 3058: No Visible Channel, no fish sampling occurred.
Unnamed Creek	400-248400-54100-15500	1	22	100	300	40	8	620	NID 3061: no fish caught in this site by EF. Barrier downstream (at site NID 3059-4 m high falls)
Unnamed Creek	ILP 69409; 103I.069	1	26.5	110	273	30	6	1240	NID 3062: no fish caught by electrofishing. Barrier downstream 20 m falls (NID 5017).
Unnamed Creek	400-248400-54100-30200	1	19.3	120	483	50	6	700	NID 3063: NID 3062: no fish caught by electrofishing. Barriers downstream
Unnamed Creek	ILP 69457; 103I.069	1						680	NID 3065: No Visible Channel, no fish sampling occurred.
Unnamed Creek	400-248400-78200	2	11	150	342	40	5	1040	NID 3066: no fish caught by electrofishing. Barriers downstream (7 m falls-NID 5020 and 5 m falls -NID 5021).
Chimdemash Creek	400-248400	4	5	120	351	50	7	920	NID 3067: no fish caught by electrofishing. Barriers downstream (10 m falls-NID 5022 and 20 m falls -NID 5023).
Unnamed Creek	ILP 60008 103I.060	1	13.5	120	260	20	6	1260	NID 3068: no fish caught by electrofishing. Barriers downstream (two 10 m falls-NIDs 5025 and 5024)
Chimdemash Creek	400-248400	4	7	150	408	30	6	1160	NID 3069: no fish caught by electrofishing. Barriers downstream (10 m falls-NID 5022 and 20 m falls -NID 5023).
Unnamed Creek	ILP 70134; 103I.070	1	8.5	125	263	40	5	1200	NID 3070: no fish caught by electrofishing. Barriers downstream (10 m falls-NID 5022 and 20 m falls -NID 5023).
Unnamed Creek	ILP 69331 103I.069	1						740	NID 3071: No Visible Channel, no fish sampling occurred.
Unnamed Creek	400-248400-45700-76000	1						980	NID 3073: No Visible Channel, no fish sampling occurred.

*Site elevation is estimated from nearest 20 m TRIM contour line.

4.5.3 Follow-up Sampling Required

With the exception of four sites (ILP 70368, NID 3028; 400-248400-45700, NID 3072; ILP 70110, NID 3074; ILP 70106, NID 3075) follow-up sampling will not change the classification of any of the sites in Table 9 to "non-fish bearing." All but the four sites previously noted are reaches that have a direct connection to known fish bearing streams (the majority flowing directly into Legate Creek and the Skeena River) with no barrier. As a result, even with a second sampling wherein no fish are captured, the classification would have to remain as "suspected fish bearing" as most of these tributaries will be used by fish during some time of the year. A second sample may help to confirm fish presence in some of these reaches and thereby increase the "known fish bearing" classification within the study area.

Table 9. Follow-up sampling required for classification of non-fish bearing reaches West Kalum Watershed (Aug. 19 - Oct. 30, 1998).

Stream Name	Watershed Code	Reach	Timing	Methods	Comments (NID refers to sample site)
Unnamed	400-271000-22100-	1	May/ June	MT/EF	NID 3006:no fish captured at this site by EF. Average gradient of 22% and very low water depths at time of sampling. Sample again at higher water.
Unnamed	400-271000-53600-	1	May/ June	MT/EF	NID 3015: BD in Reach 1. Moderate fish habitat- rearing potential, overwintering potential in beaver pond.
Unnamed	ILP 70197; 103I.070	1	May/ June	MT/EF	NID 3017:Sample during higher water levels, site was dry at the time of sampling.
Unnamed Creek	400-271000-63200-	1	May/ June	MT/EF	Nid 3019: no fish captured at this site by EF. Average gradient of 20%. Good overall habitat; nice pools and abundant boulders, spawning gravels present and overwintering habitat p resent. 20 m falls near upper reach break.
Unnamed Creek	ILP 70370; 103I.070	1	May/ June	MT/EF	NID 3025: no fish captured at this site by EF. Average gradient of 9% and low water depths at time of sampling. Limited fish habitat; sample again at higher water.
Unnamed Creek	ILP 70368; 103I.070	1	May/ June	MT/EF	NID 3028: no fish captured at this site by EF. Average gradient of 4% and moderate to good fish habitat; sample again at higher water stage.
Unnamed Creek	400-270400-	1	May/ June	MT/EF	NID 3033: dry channel at the time of sampling. Resample during higher water.
Unnamed Creek	400-268500-	1	May/ June	MT/EF	NID 3035: no fish captured at this site by EF, area downstream of highway was dry at time of sampling. Average gradient of 2.5% and moderate fish habitat; sample again at higher water.

Table 9 (continued)

Stream Name	Watershed Code	Reach	Timing	Methods	**Comments** (NID refers to sample site)
Unnamed Creek	400-262000-	1	May/ June	MT/EF	NID 3038: no fish captured at this site by EF. Average gradient of 1.5% and good fish habitat. Culvert acts as seasonal barrier.
Unnamed Creek	ILP 79001; 103I.079	1	May/ June	MT/EF	NID 3039: no fish captured at this site by EF, low water at time of sampling. Average gradient of 12.5% and poor fish habitat; sample again at higher water. Turns into seepage at reach 1/2 break.
Unnamed Creek	ILP 79002; 103I.079	1	May/ June	MT/EF	NID 3040: no fish captured at this site by EF, low water at time of sampling. Average gradient of 12.5% and poor fish habitat; sample again at higher water
Unnamed Creek	400-258700-39600-	1	May/ June	MT/EF	NID 3043: no fish captured at this site by EF. Average gradient of 26% and good fish habitat; sample again at higher water
Unnamed Creek	400-248400-47300-	1	May/ June	MT/EF	NID 3060: no fish captured at this site by EF. Average gradient of 24% , although short stretch of 30%, and good fish habitat; sample again at higher water
Unnamed Creek	400-248400-45700-	3	May/ June	MT/EF	NID 3072: no fish captured at this site by EF. Average gradient of 6% , channel is dry 400 m below; sample again at higher water
Unnamed Creek	ILP 70110; 103I.070	1	May/June	MT	NID 3074: no fish captured and 120 m basrrier downstream; however good overwinter habitat available. Minnow trap adjacent Lake to confirm no fish.
Unnamed Creek	ILP 701106; 103I.070	1	May/June	MT	NID 3075: no fish captured and 120 m basrrier downstream; however good overwinter habitat available. Minnow trap adjacent Lake to confirm no fish.

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Appendix 1. FDIS reach cards, site cards, fish forms and site specific photographs.

Sites are arranged by site number located in the top right-hand corner of the Site Card. The site number is equivalent to the NID referred to in this report and associated map sheets. Each sample site has an associated Site Card, Fish Form, Reach Card and site photographs and is separated from the next site by coloured paper. For obstructions in reaches that were not sampled there is no Site Card or Fish Form and the Reach Cards are arranged at the back of this appendix by watershed code or ILP.

Appendix 2. Photo documentation spreadsheet.

Appendix 3. Record of DNA Samples Collected.

Table 10. Record of DNA Samples Collected From the Chimdemash/Ste. Croix/Legate Watershed.

Stream name	Watershed Code	Reach #	Site #	Genetic sample #	Species ID	Length (mm)	Maturity	Comments
Unnamed	400-269900-	1	3034	FR-1	CT	212	U	NID 3034, DNA sample
Mannix Creek	400-256700-	1	3049	FR-2	CT	145	U	NID 3049, DNA sample