Reconnaissance 1:20,000 Fish and Fish Habitat Inventory of Select Sub-drainages in the Kispiox Watershed

WSC: 470-000000

March, 2000

Prepared For:
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PROJECT REFERENCE INFORMATION

MELP Project Number	SCI-C172-002-2000
FRBC Project Number	000102
FDIS Project Number	06-KISP-2000-0032-1998
FRBC Region	Skeena-Bulkley Region
MELP Region	Skeena (06)
MELP District	Bulkley District
FW Management Unit	6-30
Fisheries Watershed	North Coast
DFO Sub-District	#4C
Forest Region	Prince Rupert
Forest District	Kispiox Forest District
Forest Licensee and Tenure #	Skeena Cellulose Ltd., Carnaby
First Nations Claim Area	Wet'suwet'en Nation

WATERSHED INFORMATION

Watershed Group	Skeena Group
Watershed Name	Kispiox
Watershed Codes	470-000000
UTM at Mouth	9.582864.6133681
Watershed Area	63,000 ha
Total of All Stream Lengths	875 Km
Stream Order	Kispiox - 7th order
NTS Map	103P/9, 103M/12, 93M.05, 103P16, 103P.10 and 103P.15
TRIM Map	103P.060, 103P.068, 103P.069, 103P.070, 93M.071, 103P.078, 103P.079, 103P.080, 93M.051, 93M.061, 103P.059
BEC Zone	ICHmc2
Air Photos	BCB 92073 99-106, BCB 92093 105-108 and 263-265, BCB 92092 187-190

SAMPLING DESIGN SUMMARY

Total Number of Reaches	942
Random Sampling Sites	49
Discretionary Sample Sites	71
Total Sample Sites	120
Field Sampling Dates	September 13 to 22, October 3 and 4.

CONTRACTOR INFORMATION

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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 - a partnership of forest companies, workers, environmental groups, First Nations, communities and Government. Forest Renewal BC funding - from stumpage fees and royalties paid by forestry companies for the right to harvest timber on Crown lands - is reinvested in the forests, forest workers and forest communities.

We would like to thank Todd Mahon who provided direction and assistance throughout the project, and Chris Schell for quality assurance reviews of the various phases of the project. We would also like to thank Paul Giroux of MELP.

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1. INTRODUCTION

1.1 Project Scope and Objectives

Triton Environmental Consultants Ltd. was retained by Skeena Cellulose Inc., Carnaby, to conduct a reconnaissance 1:20,000 fish and fish habitat inventory in the Kispiox Watershed. Information was collected on the biological and physical stream characteristics, fish species and fish distribution. Five lakes were also included in this survey, although they were sampled only with minnow traps, not full secondary lake surveys. The purpose of the Reconnaissance (1:20,000) Fish and Fish Habitat Inventory is to describe watershed-wide fish distributions and habitat characteristics for the project area.

1.2 Location

The Kispiox River originates in the Skeena Mountains between the Nass and the Skeena Rivers. It flows south east for approximately 140 km and drains an area of approximately 2100 km^2. The Kispiox River is joined by the Nangeese and Sweetin Rivers along with numerous creeks before entering the Skeena River ~15km north of Hazelton (Figure 1). The study area extends from Cullon Creek upstream to Stephens Lake, a distance of approximately 50km, and includes major sub-basins such as Cullon, Ironside, Corral, Cifford, Brown Paint, Beaverlodge and Steep Canyon Creeks. The Kispiox Valley is located within the Interior Cedar-Hemlock cold zone (ICHmc2) and the Engelman Spruce-Subalpine Fir moist cold zone (ESSFmc) and is typified by cool wet winters and warm dry summers (Meidinger and Pojar, 1991). Peaks are in the 1500-2300m ASL elevation range while the valley flat lies at an elevations of approximately 550m ASL in the lower watershed and 960m ASL in the upper watershed.

Due to the steep nature of the valley walls, fish habitat is limited by gradient in most first, second and third order streams. Important fish habitat occurs in the valley bottom areas of the major sub-basins. The Kispiox River was not sampled as part of this survey, but is known to provide important spawning, overwintering and/or rearing habitat for species such as steelhead trout/rainbow trout (*Oncorhynchus mykiss),* cutthroat trout (*O. clarki clarki*), coho (*O. kisutch*), chinook (*O. tshawytscha*), pink (*O. gorbuscha),* chum (*O.keta*), Dolly Varden (*Salvelinus malma*), and bull trout (*S. confluentus*). There are no barriers to fish on the Kispiox River within or downstream of the study area.

Figure 1: Overview map of the location of the study area in British Columbia.

1.2.1 Access

Directions to the study area from Hazelton are as follows:

- From Highway 16 Intersection with the Old Hazelton Road on the west side of Hazelton, drive north approximately 5km over the Bulkley River to the Kispiox Valley Road (right turn).
- Follow the Kispiox Valley Road for approximately 6km to the Kispiox River and the Village of Kispiox.
- The Kispiox Valley Road or Kispiox Main continues through the Village of Kispiox up the Kispiox Valley, crossing into the study area at approximately kilometer 49.

2. RESOURCE INFORMATION

2.1 First Nations Interest

The Kispiox people are part of the Wet'suwet'en Nation, a group of people that controlled an area extending from east of Hazelton to west of Smithers. Kispiox Village is located at the confluence of the Kispiox and Skeena Rivers, an area rich in fish and wildlife. There are several aboriginal gill net fishing sites on the Skeena River downstream of Kispiox River, intercepting migrating salmon and steelhead in the summer and fall.

The agricultural values of the Kispiox Valley are apparent with the many small farms and ranches scattered throughout the valley, although it is unknown how extensively First Nations people utilized this resource.

2.2 Development (logging, mining or recreation)

The Kispiox Valley is home to an estimated 20 to 30 ranches and farms, most small non-commercial operations. An estimated 500 head of cattle and a rising population of sheep are grazed in the valley. The use of sheep in the Kispiox District has risen dramatically in the last few years for deciduous vegetation control on harvested cutblocks (Remington, 1995).

Early settlers in the Kispiox Valley were employed in tie-making for the railway. Small portable sawmills were common throughout the valley until the 1960s (Remington, 1995). Today the network of logging roads in the valley is extensive as logging has occurred in all the major sub-basins including, recently the Nangeese and Sweetin Watersheds. Roads have extended up the Kispiox Valley as far as Footsore Lake on the

north side of the river and right through to Highway 37 on the south side of the river. No mining, aside from small scale placer mining, is conducted in the Kispiox Watershed.

The Kispiox Watershed is a popular area for both hunters and fisherman. Hunters pursue moose, deer, bear, grouse and waterfowl in the Kispiox Valley. The Kispiox River is well known by anglers for its autumn steelhead fishing and is popular destination for people from all over the world. Other angling opportunities include the many lakes located up and down the Kispiox Valley for rainbow and cutthroat trout.

2.3 Other Developments, Concerns or Points of Interest

The Kispiox Valley is well known for its wild mushroom harvest. Thousands of mushroom enthusiasts explore the valley in search of pine mushrooms in the late summer and fall. These mushrooms are sold to one of the many buyers located in Hazelton/Kispiox and transported to Japan where they are sold to consumers.

2.4 Impacts and Uses by Wildlife

Beavers are present in large numbers in the Kispiox Watershed. Most low gradient streams contain beaver dams and lodges, often creating obstructions to fish passage. Beavers have always been present in the north-west yet their increasing abundance may be due, in part, to the increase in the food supply (alder and willow), common post-harvest second growth species.

During our study, in late September, a beaver dam broke holding back a large amount of water in Dutch Lake. The ensuing water flowed across the road causing extensive erosion along the margins of the road. The quick work by Highways Maintenance Crews prevented further degradation of the road, and repairs were made soon after the water subsided.

Other wildlife found in the watershed are moose, grizzly and black bears, deer, wolves, coyotes and a host of smaller mammals and birds.

2.5 Existing Water Quality Data

A monthly discharge station was active on the Kispiox River near the mouth of Date Creek (a right bank tributary to the Kispiox located approximately 4km upstream from the mouth) between 1963 and 1993. Flows ranged from 2.79m^3/second during a very dry period to 210 m^3/second during a June high water event between 1963 and 1993 (Remington, 1995).

In 1982, MOELP Waste Management Branch initiated a 5 year monitoring program on the Kispiox River. A range of organics and metals were sampled for at a site near the village of Kispiox. The Kispiox was determined to be a soft water river, with neutral to slightly alkaline pH, which has clear, slightly tea coloured waters for most of the year. TSS loadings were found to be higher during freshette than the remainder of the year. Nutrient concentrations were found to be low (Remington, 1995).

Presently, forestry impact assessment sites are located on Compass Creek and Heavner Creek, both tributaries to McCully Creek (a major right bank tributary to the Kispiox River located approximately 15km upstream from the confluence with the Skeena River). Forestry Impact Sites are assessed by the Waste Management Branch of the Ministry of Environment and focus upon sediment impact caused by logging practices.

2.6 Background Fisheries Information

SISS catalogue (Subdistrict #4C-Hazelton) information notes that chum, coho, chinook, pink and sockeye salmon, along with steelhead, rainbow and cutthroat trout, Dolly Varden, rocky mountain whitefish, lake trout and kokanee are found in the Kispiox Watershed. Migrational barriers to pink salmon exist 92 km upstream of the mouth of the Kispiox River and barriers to chinook and coho salmon along with steelhead exist 125km upstream of the mouth. Escapement data from 1954 exists for coho, pink, chum and chinook:

- Coho numbers peaked in 1958 with 35,000 fish.
- Pink escapement numbers were as high as 750,000 in 1959, although there have been relatively high numbers on odd numbered years since 1954.
- Chum numbers were as high as 15,000 in 1957.
- Chinook escapements have been as high as 15,000 in 1957.
- Steelhead numbers have been estimated as high as 4027 (Koski et al, 1995).

Escapement data appears incomplete, therefore identifying trends within the data is difficult. Trends in escapement may be due to enumeration methods changing or crews becoming more efficient at enumerating.

Major spawning areas for steelhead are Stephens and Club Creeks (Pinsent and Chudyk, 1972). Chinook, coho and pink salmon have been observed spawning in the mainstem and many tributary streams.

Cullon Creek is reported to contain coho, pink and chinook salmon, steelhead, cutthroat and rainbow trout, Dolly Varden and rocky mountain whitefish. The escapement data

show coho numbers as high as 400 in 1971, pink numbers up to 1500 also in 1971 and chinook numbers at 25 between 1966 and 1977 with exception to 1967 when no chinook were counted (SISS, 1991). Chudyk and Whately (1997) demonstrate that Cullon Creek is an important steelhead spawning stream.

Ironside Creek is reported to contain coho and pink salmon, steelhead, cutthroat and rainbow trout, Dolly Varden and rocky mountain whitefish. Coho numbers were to 3500 in 1968 and pink numbers were as high as 400 in 1987(SISS, 1991). Many minor tributaries contain populations of cutthroat and rainbow trout and Dolly Varden.

Corral Creek is known to contain coho and pink salmon up to an 8m impassable falls 300m upstream from the Kispiox River (Nortec,1997). Upstream of this resident cutthroat and bull trout are present.

Skunsnat Creek contains coho and pink salmon, steelhead, cutthroat and rainbow trout and Dolly Varden. Escapement data for coho shows numbers between 25 and 750 from 1965 and pink numbers up to 600 in 1985 (SISS, 1991).

Clifford Creek contains coho and pink salmon, steelhead, cutthroat and rainbow trout and Dolly Varden. Escapement data for coho shows numbers between 25 and 500 from 1965 to 1989 (the last year recorded in the SISS catalogue) and pink numbers up to 1200 in 1989 (SISS, 1991).

Steep Canyon Creek is reported to contain coho salmon and Dolly Varden. Beaver dams throughout the lower reach have proved to be a migration problem for coho adults and fry (Nortec, 1997). Cutthroat and bull trout populations are known to inhabit tributaries to Steep Canyon Creek. No escapement data are available.

Beaverlodge Creek contains coho salmon, cutthroat trout and steelhead. The escapement information indicated fish surveys were done for four years; 1986 to 1989, with coho numbers as high as 150 in 1986 (SISS, 1991). Beaver dams are concentrated in the lower 2km of the stream impeding fish upstream migrations (Nortec, 1997).

Brown Paint Creek contains coho and chinook salmon, steelhead, rainbow trout and Dolly Varden in its most downstream reach. The lower reach of this stream is reported to have high fish values as evidenced by the high number of fish species (Nortec, 1997). No escapement data are available.

3. METHODS

Standard methodology for performing stream inventories as outlined by the Province of British Columbia Resources Inventory Committee (RIC) in *Reconnaissance (1:20 000) Fish and Fish Habitat Inventory: Standards and Procedures* (RIC, 1998) was followed. The reconnaissance fish and fish habitat inventory is a sample-based survey covering entire watersheds as defined from 1:20,000 scale maps and air photos. The project covers six phases as listed below:

Phase 1: Data Review: A review of all available background information was completed. All known fisheries information is summarized in this report; new data were transcribed onto the 1:20,000 Terrain Resource Information Management (TRIM) maps and 1:50,000 National Topographic System (NTS) maps to update the Department of Fisheries and Oceans Fisheries Information Summary System (FISS) database.

Phase 2: Classification and Sampling Design: A comprehensive map and air photo review was completed for all waterbodies identified on 1:20,000 TRIM maps. Reach characteristics (gradient, order, pattern, confinement) were recorded for all streams within the project area and recorded on the Reach Planning Table. These data were used to generate a sample size (a subset of reaches to be sampled) within the working area based on RIC guidelines. The Reach Sampling Summary Report was generated which provides a summary of the number of reaches of each type (based on gradient class, size and pattern/confinement) to be sampled.

Phase 3: Project Plan: A field sampling plan was developed to sample sites in a variety of stream gradients and stream orders. The Reach Sampling Summary Report was used as a guide in selection of sample sites. The purpose of the plan was to describe watershed wide fish distribution and not necessarily to sample all potential fish bearing reaches. Data from Phases 1 and 2, and the Project Plan were presented to and approved by Paul Giroux, MELP Fisheries Inventory Specialist.

Phase 4: Field Inventory: Field sampling of selected sites was completed in early October, 1999.

Phase 5: Data Entry and Analysis: Field sampling data (including site cards, fish cards, and photodocumentation) were entered into the MELP Field Data Information System (FDIS) database. 1:50,000 scale NTS maps of the study area were updated with new information as per the FISS Data Compilation and Mapping Procedures (DFO, 1997).

Phase 6: Reporting and Final Mapping: Field and office data were mapped using Arc View and Arc Info software, photographs were printed, and draft and final reports were completed.

3.1 Changes To Methodology

An increase in sample sites was arranged by contract monitor Todd Mahon, during the study, as more money became available. It was understood that the number of sample sites were low for such a large area, which motivated the acquisition of additional funding. Sample sites were chosen strategically (bias rather than randomly) and incorporated biological concerns (fish distribution) and access issues. The field sampling plan and sample site increase was approved by Paul Giroux, MELP Fisheries Inventory Specialist, prior to completing field work.

Non-Classified Drainages (NCD) and No Visible Channel (NVC) are two classifications that cause confusion within the fisheries field. NCD's are defined within the Forest Practices Code *Fish-stream Identification Guidebook* (Province of BC, 1998): Watercourses that do not satisfy the definition of a reach (provided in the same manual), and therefore, do not meet the criteria for the definition of a stream, and are designated as NCD's. NVC's are referred to within the *Reconnaissance (1:20 000) Fish and Fish Habitat Inventory Manuals* (RIC, 1998) and used to describe a situation where no channel is visible. This could signify two situations:

1. the mapping was incorrect and there was no channel where the map identified one; or
2. the channel may flow subsurface.

This study will use the two interchangeably as both situations describe an area where there is no stream.

3.2 Field Assessments

The field phase started on September 13 and finished September 22, 1999. One crew returned to the field on October 2, 3 and 4 to fill data gaps. Field assessments followed procedures outlined in *Reconnaissance (1:20 000) Fish and Fish Habitat Inventory: Standards and Procedures* (RIC, 1998). Generally, the process followed in the field was to:

- assess the watershed during a helicopter overflight to confirm reach boundaries, potential barriers, and identify access points,
- assess each reach on the ground by completing a standard site card, sampling for fish presence, completing a fish collection card and photographing representative habitats,

- identify key features such as barriers to fish migration, spawning locations and bridges, and
- photograph and record features on site cards with a unique numeric identifier (NID).

Stream morphology was determined using the *Channel Assessment Procedures Guidebook* (MoF, 1996) as a guide. Table 1 provides a list of equipment used. Details on cameras, film and lenses used for photodocumentation are on Photodocumentation Form 1, provided in the photodocumentation binder with original slides.

3.3 Fish Sampling

Fish presence was determined by electrofishing at least $100m^2$ or 10 bankfull widths of habitat in each reach using a Smith Root Model 12B electroshocker. Captured fish were measured (fork length) and keyed out to species (when necessary) using the *Field Key to the Freshwater Fishes of British Columbia* (McPhail and Carveth, 1994). Roe-baited minnow traps were used in lakes as an additional sampling method. Fish sampling, outside of the sampling design (and without site assessments) was conducted in 5 lakes.

Table 1: List of Field Equipment used during Inventory Sampling in the Kispiox Watershed.

Measurement	**Units / Accuracy**	**Instrument**	**Make and Model**
Channel Width/ Wetted Width	m (to nearest 0.1m)	Tape measure	Eslon 30m tape
Gradient	% (to nearest 1%)	Clinometer	Suunto PM5 360 PC
Residual Pool Depth	m (to nearest .01m)	Folding Meter Stick	N/A
Bankfull Depth	m (to nearest 0.1m)	Folding Meter Stick	N/A
Temperature	^{0} C (to nearest 1^0 C)	Alcohol Field Thermometer	N/A
Water Quality			
PH	to nearest tenth	Hand-held pH meter	LaMotte PHTestr 2 (Waterproof)
Conductivity	*u*S/cm	Hand-held Conductivity Meter	LaMotte TDSTestr 3 with ATC
Fish Sampling			
Electroshocker	Smith Root Model 12B		
Minnow Traps	Roe baited Gee's minnow traps		

4. RESULTS AND DISCUSSION

4.1 Logistics

4.1.1 Field Phase

Weather conditions remained fair throughout the sampling period. Water temperatures and conductivity were ideal for electroshocking, often a concern in late season stream sampling. Water levels during a few days of sampling were high due to a recent rain event. This helped field crews find streams, particularly small ephemeral channels. It also allowed crews to make better decisions regarding fish access as it was easier to determine if obstructions were barriers during the high water levels.

Some photographs taken during field sampling did not turn out well. Low light conditions in the forest resulted in few of the photographs being very dark, with no discernible features.

A small number of the sample sites contained 'length of sample site' values less than 100m which results in an error message in the FDIS database. This usually occurred where a sample site of 100m could not be safely sampled, or in a few instances, in streams with high fish densities where electroshocking was limited to reduce the impact to fish. In other instances, typically in narrow entrenched channels, only short sections of the stream, often less than 100m, could be accessed safely. Usually, in situations such as this, the water depth or a waterfall limited foot access along the stream channel.

RIC standards also require two sampling methods employed to establish a non-fish classification. This "error" was displayed when the FDIS QA/QC tool was used. In several streams non-fish classification was attained by conducting multiple sample sites upstream of barriers. This combined with the biologist's assessment of habitat and professional judgment formulated the classification of non-fish bearing. Secondary sample methods such as minnow trapping was logistically difficult and generally not required to confirm fish absence or presence.

At the time of map preparation, the watershed codes for this project had not been received from MELP, however they did arrive in time to be entered into the database.

4.2 Summary of Sub-Basin Biophysical Information

For the purposes of this report, seven major sub-basins were identified and referred to throughout the report; Cullon, Ironside, Corral, Clifford, Brown Paint, Steep Canyon and Beaverlodge Creeks. A summary of the biophysical information for these drainages is provided in Table 2.

Table 2: Summary of Watershed Information for the Kispiox River Watershed Sub-drainages.

Gazetted Name	WSC	UTM at mouth	Watershed Area (ha)	Stream length (km)	Stream order	NTC maps	BEC zone	Lake names
Cullon	470-245700	9.5693.61583	4800	155	4	93M/12	ICHmc2	Deadhorse
Ironside	470-335400	9.5610.61585	4200	140	4	103P/9E	ICHmc2	-
Corral	470-420300	9.5516.61670	3360	110	3	103P/9E	ICHmc2	-
Clifford	470-434800	9.5493.61680	3200	75	3	103P/9E	ICHmc2	-
Brown Paint	470-525900	9.5429.61689	1440	70	4	103P/9	ICHmc2	Hilltop
Beaverlodge	470-523700	9.5441.61689	1920	80	3	103P/9W	ICHmc2	Beaverlodge
Steep Canyon	470-511300	9.5471.61687	4400	120	4	103P/9W	ICHmc2	Unnamed

One-hundred and fifteen stream sites and five lakes were sampled within these seven major sub-basins and tributaries to the Kispiox River. Two major sub-basins, the Nangeese and Sweetin Watersheds, were not included in this years 1:20,000 sampling design as there were insufficient funds to properly complete a full watershed survey. These drainages are tentatively scheduled for sampling during year 2000.

4.3 Habitat and Fish Distribution

Fish and/or fish habitat data were collected at a total of 120 sites in the Kispiox Watershed. Fish sampling was conducted at 94 of the 120 sites (16 sites were classified NCD/NVC, others could not be sampled e.g. dry). Field crews recorded the types of habitat (overwintering, rearing, and spawning) and assessed the habitat quality (Appendix 1). A summary of barriers identified in the major sub-drainages are presented in Table 3. A total of 84 sites or portions of sites were concluded non-fish bearing and presented in Table 10 (some sites were split by a barrier to fish: upstream of the falls is non-fish bearing and downstream, fish bearing).

Fish were caught at 29 of a total of 94 stream reach sites electrofished during Phase 4. The species sampled were coho, rainbow trout/steelhead, cutthroat trout, Dolly Varden

and longnose dace. Of these 7 sites were inferred fish bearing based on access from fish bearing waters.

Fish distributions within the study area are generally defined by the presence of barriers. Table 3 summarizes the fish distribution limits for the major sub-basins within the Kispiox Watershed and identifies sample sites upstream of these barriers. Coho fry were typically found close to the mainstem Kispiox River, or in sub-basins with high habitat values. Channel widths in streams where fish were captured were typically over 1.0m. Most fish, including coho were found in habitat under 5% gradient although, one cutthroat trout was captured in a reach averaging 17.67%. Also, in the first order streams where fish were captured, cutthroat trout were present in all. Fish distributions are discussed further below.

Table 3. Fish Distribution Limits for Major Basins within the Kispiox Watershed, September 1999.

Basin/ Stream	WSC	TRIM Map	Reach	Barrier Type/ Height	Verified in Field	Comments	Fish Present in Watershed	Fish Presence upstream (Y/N)
Cullon	470 245700	103P.080	6	Unknown	No	EFU was not determined	RB,CT,DV, ST,CO, PK,CH, MW	N
Ironside	470 335400	103P.070	5	3m Cascade	Yes		RB,CT,DV, ST,CO,PK, MW	N
Corral	470 420300	103P.070	3	8m Falls	Yes	EFU for anadromous fish is 800m from mouth.	BT,CT,CO, PK	N
Clifford	470 434800	103P.079	3	8m Falls	Yes	Coho were stocked u/s of this barrier.	RB,CT,DV, ST,CO,PK	N
Brown Paint	470 525900	103P.069	2	6m Falls	Yes		RB,CT,DV, ST,CO,CH	N
Beaverlodge	470 523700	103P.069	4	20m Cascade	Yes		RB,CT,DV, ST,CO,	N
Steep Canyon	470 511300	103P.069	2	20m Falls	Yes		RB,CT,DV, CO,CH,BT	N

CH=Chinook, CO=Coho, PK=Pink, ST=Steelhead, RB=Rainbow Trout, CT=Cutthroat, DV=Dolly Varden, BT=Bulltrout, MW=Mountain Whitefish

4.3.1 Cullon Creek

Cullon Creek is a 4th order stream that drains south into the Kispiox River approximately 30km upstream from the mouth. Coho salmon, rainbow and cutthroat trout, steelhead, Dolly Varden and bull trout have been documented in this sub-basin (SISS, 1991). The majority of suitable fish habitat is located in the mainstem and the lower reaches of some of the tributaries. There are fish bearing lakes located within the watershed to the west of Cullon mainstem containing cutthroat trout (Triton, 1999). Tributaries along the east side of Cullon Creek provide fish habitat within the valley bottom but the extent is typically limited due to high gradients of the adjacent slopes. The extent of fish use in tributaries is generally the lower 100 m of stream, but is often less due to waterfalls or gradient barriers at the mouth. The EFU in the mainstem was not determined as no sample sites were conducted on Cullon Creek. Background data has coho, cutthroat trout and Dolly Varden documented up to 18.5km from the mouth.

4.3.2 Ironside Creek

Ironside Creek is a 4th order stream that drains south into the Kispiox River approximately 35km upstream from the mouth. Coho and pink salmon, rainbow and cutthroat trout, steelhead, Dolly Varden and bull trout have been documented in this sub-basin (SISS, 1991 and Nortec, 1997). As in Cullon Creek, the majority of suitable fish habitat is located in the mainstem and the lower reaches of some of the tributaries. Rainbow and cutthroat trout along with Dolly Varden were captured in Reach 4 up to a 3m cascade barrier located 14.5 km from the mouth. There are no resident fish present upstream of the barrier. A major 2nd order, left bank tributary (ILP 284) flows into Reach 4 of Ironside Creek downstream of the waterfall on the mainstem. However, this stream also has a waterfall (15m) 800m upstream of the confluence limiting fish upstream migration. Again, no resident fish are present upstream of the waterfall barrier.

4.3.3 Corral Creek

Corral Creek is a 3rd order stream that drains south into the Kispiox River approximately 45km upstream of the mouth. Dolly Varden were captured in Reach 3 of Corral Creek to a 8m waterfall (NID 80056) located approximately 7.6km upstream from the mouth, a barrier to fish migration. Four non-fish sample sites were basis to the conclusion that no resident fish are present upstream of the waterfall barrier. No sample sites were conducted in Reach 1 or 2 of Corral Creek, although, historic information indicates that cutthroat trout and bull trout are the only fish species present upstream of a 8m barrier

falls located 800m upstream of the mouth. There were no fish bearing tributaries sampled that extended much beyond the floodplain of Corral Creek..

4.3.4 Clifford Creek

Clifford Creek is a 3rd order stream that drains south into the Kispiox River approximately 47km upstream of the mouth. Coho salmon and Dolly Varden were captured in the Clifford Creek sub-basin. Numerous beaver dams are located throughout Reaches 1 and 2, a rather high level of beaver activity compared to the other six major sub-basins in the Kispiox Watershed. As with the other sub-basins, the majority of suitable fish habitat is located in the mainstem and the lower reaches of a few of the tributaries. A 3m and a 8m waterfall were observed in Reach 3 during the overflight, both barriers to fish upstream migration. Upstream of this coho salmon juveniles were captured, a highly unusual occurrence. No cutthroat trout or Dolly Varden were captured upstream of the waterfalls, species more often found in similar habitat types and situations. Another oddity surrounding the coho was that they were all very alike in size, much larger than yearling coho and typically smaller and in greater numbers than would be expected for two year old coho. Also all of the fish were very uniform in size and shape, a condition commonly found in hatchery raised fish. Later it was discovered that the Kispiox Reserve Fish Hatchery had released 9,020 coho fry at a logging bridge upstream of the waterfalls in June 1999 (adipose clipped). They had also released 22,000 coho (maxillary clipped) on May 27 of the previous year (Bill Blackwell, 1999, pers.comm.). They stated that the reach was determined to be non-fish bearing prior to the release of the coho. As the fish begin their downstream ocean migration most likely in the spring of year 2000 or 2001 (coho often remain in fresh water habitats for 2 years) the reach will once again be non-fish bearing. The intention of the hatchery is to conclude their coho stocking in Clifford Creek, Reach 3 in the spring of year 2000 after one more release. After the spring of 2002, upstream of the 8m waterfall in Reach 3 of Clifford Creek will once again be non-fish bearing, a classification of S5.

4.3.5 Brown Paint Creek

Brown Paint Creek is a 4th order stream that drains north into the Kispiox River approximately 58km from the mouth. Chinook and coho salmon, rainbow and cutthroat trout and Dolly Varden have been documented in Reach 1 of Brown Paint Creek. There are no resident fish present upstream of a series of three waterfalls ranging from 4m to 6m high at the edge of the valley flat approximately 1.4 km from the Kispiox River. Numerous lakes exist upstream of the waterfall barriers including Hilltop Lake (located on a tributary to Brown Paint Creek) all considered to be non-fish bearing based on our

stream sampling program, minnow trapping (Table 6) and historic data. A major 3rd order, left bank tributary (ILP 1141) flows into Reach 1 of Brown Paint Creek approximately 700m upstream of the Kispiox River/Brown Paint Creek confluence. ILP 1141 also has a series of four waterfalls 700m upstream of the confluence with Brown Paint Creek ranging from 2 to 4m in height also limiting fish upstream migration. Again, no resident fish are present upstream of the waterfall barrier. Hilltop Lake is located upstream of the barriers also found to be non-fish bearing through Gee-trap sampling. No sample sites were completed in Reach 1 of Brown Paint Creek or in Reach 1 of ILP 1141, however, Biolith's 1996 study found both reaches to be "good habitat for salmonids".

4.3.6 Beaverlodge Creek

Beaverlodge Creek is a 3rd order stream that drains north into the Kispiox River 57km upstream of the mouth. Coho salmon, steelhead, rainbow and cutthroat trout and Dolly Varden have been documented in Reach 1 of Beaverlodge Creek. At the edge of the valley flat 4km from the Kispiox River is a 20m high cascade 100m long, which proved to be the upstream limit of fish migration. Upstream of the cascade the stream is steep containing numerous barriers and limited suitable fish habitat. Three sample sites were completed upstream of the cascade, all resulting in a non-fish bearing classification. Beaverlodge Creek flows from Beaverlodge Lake located approximately 8km upstream from the mouth. Gee-trapping in Beaverlodge Lake (Table 6) resulting in no fish providing further supportive evidence that no resident fish are present in the Beaverlodge system upstream of the cascade located 4km upstream of the mouth at the Reach 3/Reach 4 break.

Reach 1 of Beaverlodge Creek was not sampled during this study, although, Reach 2 was found to have moderate to high habitat values for cutthroat trout and Dolly Varden, the species captured. No major tributaries flow into Reach 1 or 2 of Beaverlodge Creek.

4.3.7 Steep Canyon Creek

Steep Canyon Creek is a 4th order stream that drains north into the Kispiox River approximately 55km upstream of the mouth. Although no sample sites were completed in Reach 1 during this study, coho salmon, rainbow and cutthroat trout and Dolly Varden have been documented in Reach 1 of Steep Canyon Creek. There are no resident fish present upstream of a 20m waterfall located approximately 5km from the Kispiox River as indicated by the results of seven stream sample sites and one lake sample site.

Numerous lakes exist upstream of the waterfall barriers all considered to be non-fish bearing based on our sampling results (minnow trapping results are presented in Table 6).

4.4 Fish Age, Size and Life History

The sampling bias typically associated with electroshocking and minnow trapping is that often only smaller fish are captured. Although Dolly Varden found throughout the small, cool streams of the north-west can achieve ages of 6 years (sexually mature fish - Scott and Crossman, 1973) and remain under 100mm in length, typically fish captured during this sampling program and others are small and likely under 3 years of age. This makes age/length comparisons difficult primarily due to the limited age classes. Table 4 is arranged to show the stages of each species captured and their inferred age class.

Table 4: Fish Captured, Species, Stage, Age and Size Range.

Species	Stage (IM- immature, M - mature)	Age *	Total	Range (mm)
CO	IM	0+	24	41-100
CT	IM	0+ to 3+	80	24-212
CT	M	1+ to 2+	8	100-130
DV	IM	0+ to 3+	26	45-170
DV	M	1+ to 3+	13	82-187
RB	IM	0+ to 2+	43	34-157

* Length-at-age data are inferred only, from Scott and Crossman, 1973 and are not specific to watersheds within this project. Age/length relationships can vary between systems.

The species recorded during the sampling were rainbow trout/steelhead, cutthroat trout, coho and Dolly Varden. Fry, juvenile, and adult Dolly Varden were captured in this inventory. Juvenile and adult cutthroat trout were captured. Fry and juvenile rainbow trout/steelhead were captured and fry and juvenile coho were documented. One adult longnose dace was also documented.

Length/frequency histograms with estimated age classes were generated for rainbow and cutthroat trout, coho salmon and Dolly Varden and are provided in Figure 2 through 5. Total number of fish and minimum and maximum fork lengths for each species within each major sub-basin is provided in Table 5.

Cutthroat trout were the most wide spread and abundant species captured during the study and ranged in fork length from 24 - 212 mm (n = 88). Typically any tributary stream to the Kispiox River with unimpeded access contained cutthroat trout, Dolly Varden and coho salmon. Rainbow trout were common throughout the Cullon Creek Watershed,

appearing elsewhere throughout the Kispiox Watershed yet in lower abundance than within the Cullon Watershed. Also cutthroat trout were less common in the Cullon Watershed than in other sub-basins with similar habitat quality. Chudyk and Whately (1997) describe Cullon Creek as an important steelhead spawning stream in '*Some Notes On The Habits And Habitat Of Steelhead Trout In Kispiox River With Particular Reference To Cullon Creek'*. Due to these two factors it is likely that the rainbow fry and juveniles observed in Cullon Creek are rearing steelhead.

Watersheds containing sea-run rainbow trout (steelhead) and cutthroat trout often contain a resident population as well. Based on this, it is difficult to establish whether juvenile fish of these species are coastal or resident. It is reasonable to expect juvenile populations to parallel adult spawning escapements, a life stage more easily identified as coastal or resident. Based on this and escapement data presented in the Department of Fisheries and Oceans SISS catalogue (1999), many of the juvenile rainbow found throughout the Kispiox Watershed are likely juvenile steelhead. There are no escapement data for cutthroat trout.

Cutthroat trout, the dominant fish species captured during this survey, have been found to utilize small to moderately large streams, which have moderate flows, gravel substrates, riffle pool morphology and shallow depths. Spawning occurs mainly from mid-April to late June with fry emergence occurring from mid-June to mid-August. Life expectancy can be as low as 3 or 4 years in many stream and lake populations (Scott & Crossman 1985).

Rainbow trout, or steelhead, dominate over cutthroat trout in the Cullon Creek Watershed. Even though the Cullon Creek Mainstem was not sampled during this survey, by viewing the stream from the road, it was apparent that Cullon Creek exceeded in flow volume the other major sub-basins found in the study area. This may be one of the reasons steelhead have established a population in Cullon Creek to a greater extent than the other sub-basins. To hypothesis that steelhead, due to their larger size, may require a larger stream to spawn in may not be valid due to the increased flows in all of the sub-basin streams during the spring, the spawning season for the steelhead. Steelhead have also been documented in Ironside, Clifford, Brownpaint and Beaverlodge Creeks, typically recorded in the lower end of these streams, adjacent to the Kispiox River (steelhead were documented 1.5 and 1.7 km in Clifford and Ironside Creeks, respectively)(DFO, 1997). Steelhead have been reported at kilometer 20 on Cullon Creek.

Rainbow trout have been found to utilize small to moderately large streams, which have moderate flows, gravel substrates, riffle pool morphology and shallow depths. They are often found in smaller tributaries of their rivers, or inlet or outlet streams of their lakes. Spawning occurs mainly from mid-April to late June with fry emergence occurring from mid-May to mid-August. Sexual maturity is reached as early as one year by males and as late as six years by females (Scott & Crossman 1985).

Dolly Varden/bull trout are found throughout BC in a wide range of habitat types. They most often utilize small to moderately large streams, which have gravel substrates and riffle pool morphology. Spawning occurs mainly from September to early November with fry emergence occurring from late April to mid-May. Sexual maturity is reached in years 3 to 6 (Scott & Crossman 1985). Dolly Varden were captured throughout the watershed.

Coho salmon are anadromous spending the "growing" portion of their life history in salt water. Coho salmon are fall to early winter (October to January) spawners and spawning habitat can be characterized as smaller rivers and tributaries containing gravel substrates. Coho fry emerge from the gravel in the spring and early summer (March to July) and juveniles usually remain in freshwater habitat for 1-2 years before migrating (downstream) to the ocean for 1 to 3 years (Scott & Crossman 1985). Coho fry were captured throughout the Kispiox Watershed, typically in moderate to small tributary streams adjacent to the Kispiox River.

Chinook salmon are the largest of BC's salmon species. They are late summer to late fall spawners (August to October). Spawning habitat can be characterized as the larger rivers and tributaries containing moderate to large gravels. The fry emerge from the gravel in the spring and rear for up to 1 year in the freshwater before migrating to the ocean for 2-5 years. Chinook were not captured during the study but are known to exist throughout the Kispiox Watershed spawning in the mainstem and the large tributaries (Scott & Crossman 1985).

Pink salmon are known to exist in the Kispiox Watershed although none were captured during this study. They are anadromous spending most of their lives in the saltwater environment. They are late summer to late fall spawners (August to October). Spawning habitat can be characterized as the moderate to small rivers and tributaries containing moderate to small gravels. The fry emerge from the gravel in the spring immediately migrating downstream to saltwater. Here they will remain for two years before moving back into freshwater to spawn (Scott & Crossman 1985).

Chum salmon are late summer to late fall spawners (August to October). Spawning habitat can be characterized as the larger to medium rivers and tributaries containing moderate sized gravels. The fry emerge from the gravel in the spring immediately migrating downstream to saltwater where they will remain for 3-4 years (Scott & Crossman 1985). Chum were not captured during the study but are known to exist in the Kispiox Watershed.

Figure 2. Length Frequency Histogram for Rainbow Trout in the Kispiox Watershed, September 1999.

Figure 2. Length Frequency Histogram for Rainbow Trout captured in the Kispiox Watershed, September 1999.

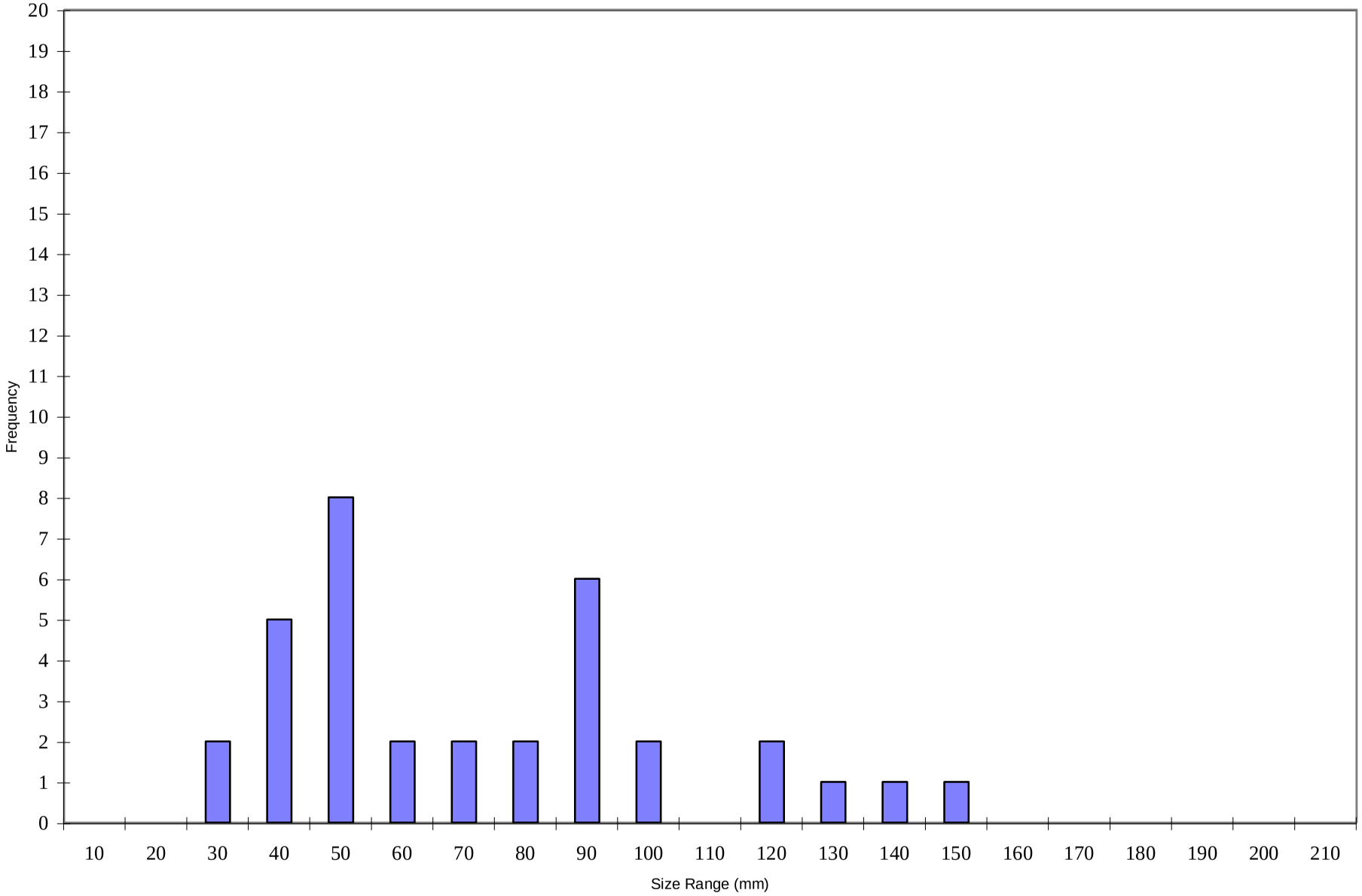

Figure 3. Length Frequency Histogram for Cutthroat Trout in the Kispiox Watershed, September 1999.

Figure 3. Length Frequency Histogram for Cutthroat Trout captured in the Kispiox Watershed, September 1999.

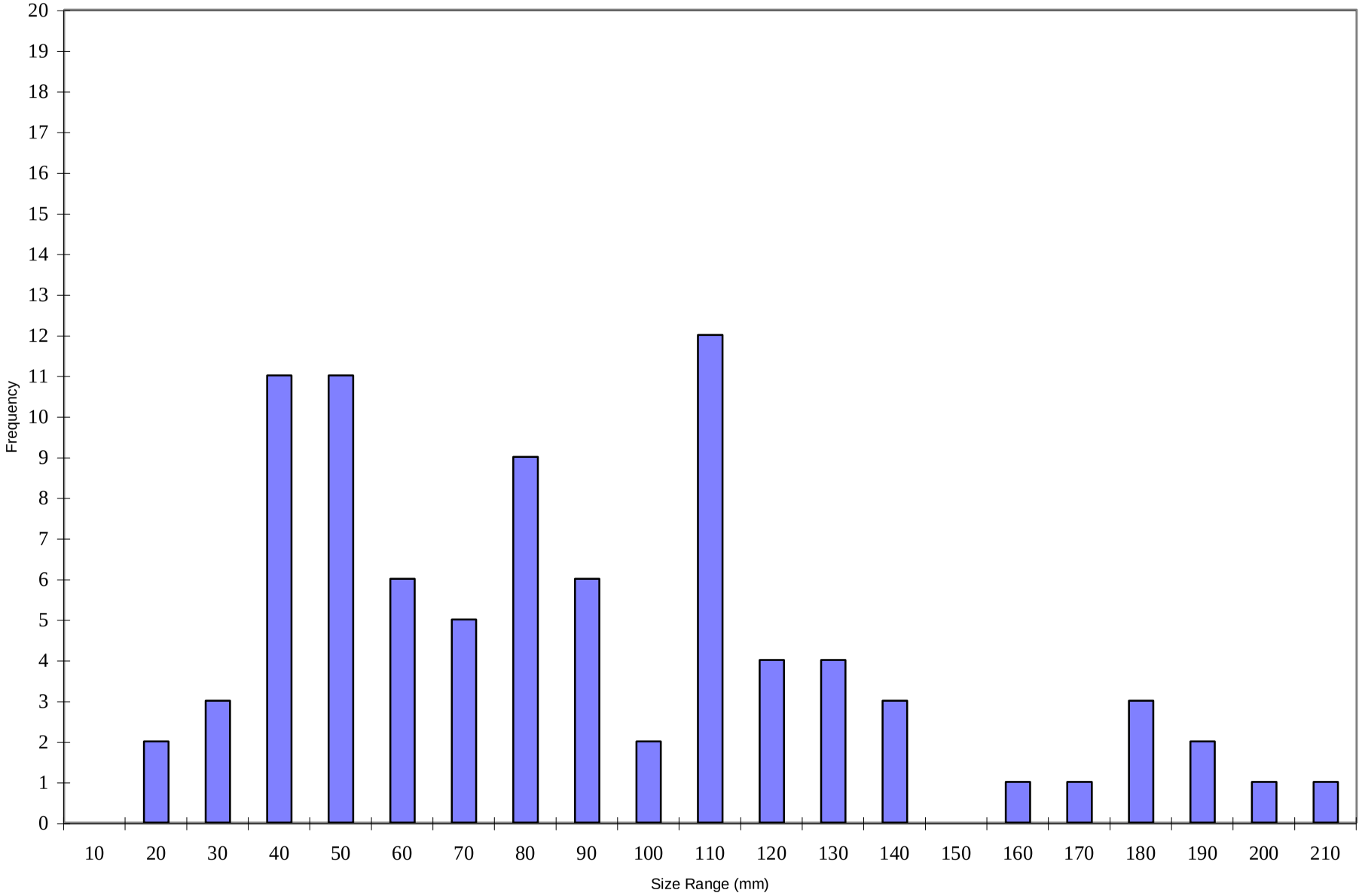

Figure 4. Length Frequency Histogram for Coho in the Kispiox Watershed, September 1999.

Figure 4. Length Frequency Histogram for Coho captured in the Kispiox Watershed, September 1999.

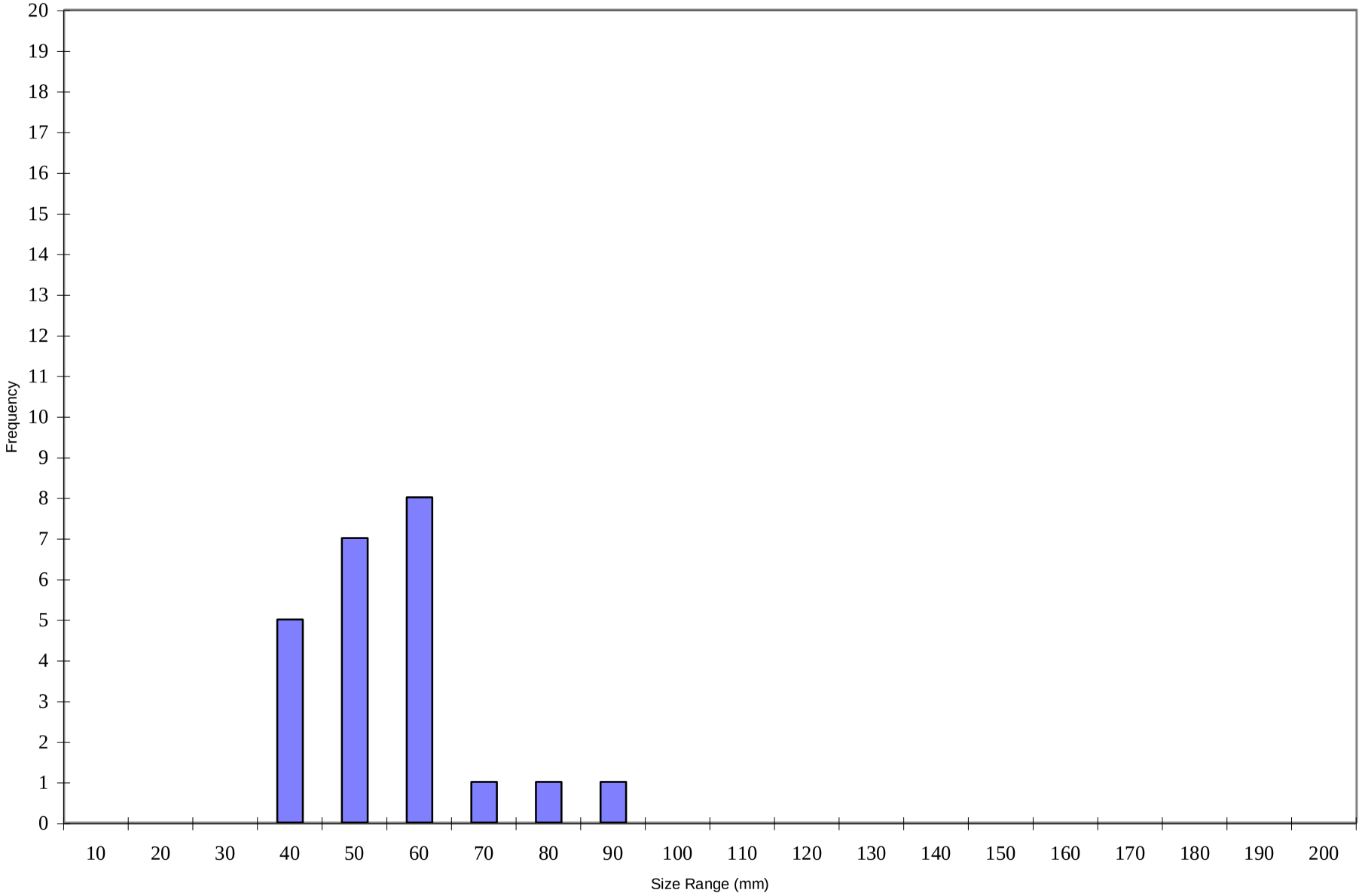

Figure 5. Length Frequency Histogram for Dolly Varden in the Kispiox Watershed, September 1999.

Figure 5. Histogram for Dolly Varden captured in the Kispiox Watershed, September 1999.

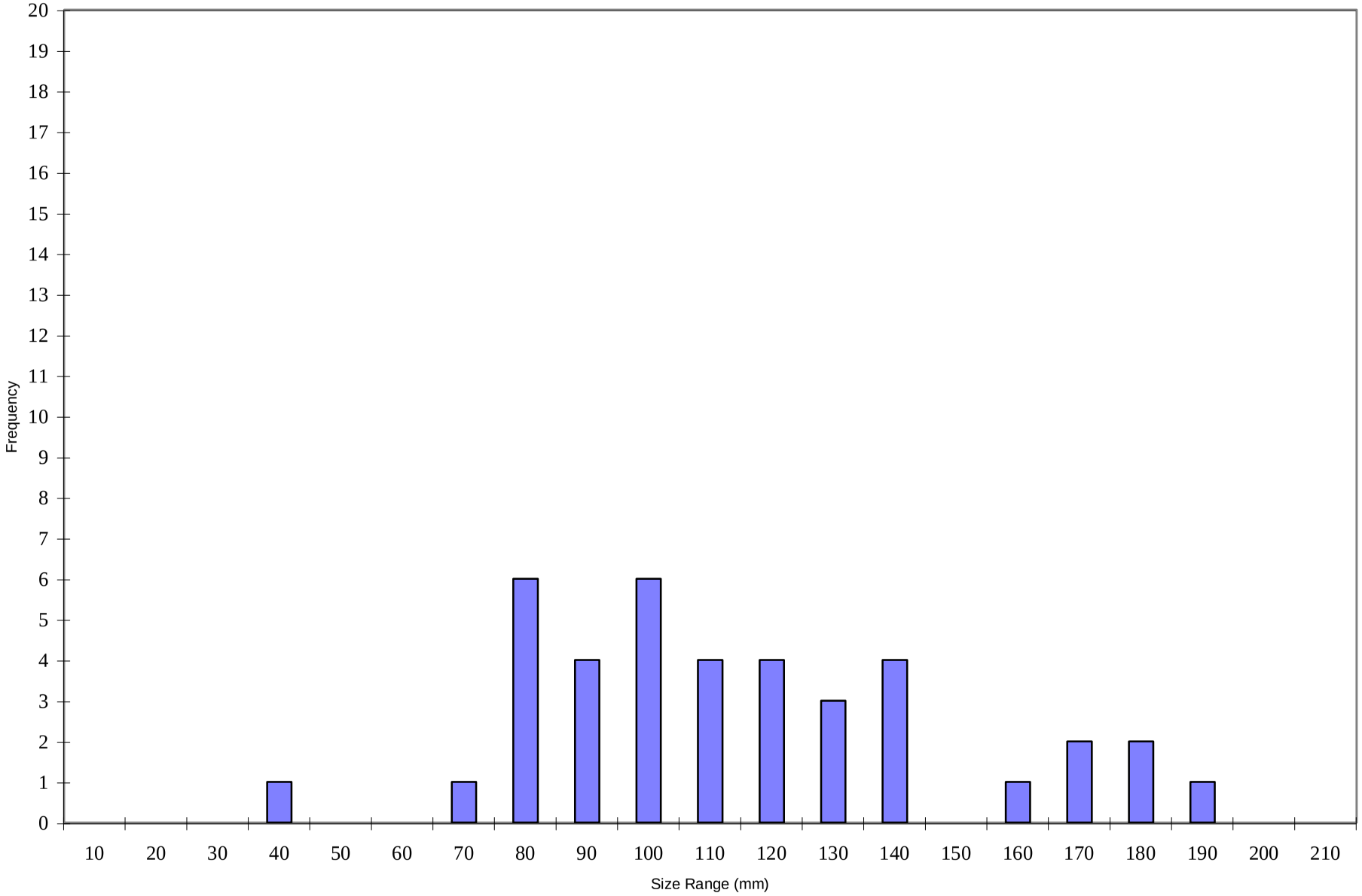

Table 5. Total Catch and Range of Fork Length for Fish Species Caught in Major Sub-basins in the Kispiox Watershed, September 1999.

TABLE 5. TOTAL CATCH AND RANGE OF FORK LENGTH FOR FISH SPECIES CAUGHT IN MAJOR SUB-BASINS IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Local Name	Watershedcode/ ILP	Nid Map	Species	Stage	Total # of Fish	Minimum Length (mm)	Maximum Length (mm)	Activity
Beaverlodge Cr.	470-523700	103P.069	CT	J	3	138	163	R
Beaverlodge Cr.	470-523700	103P.069	DV	A	1	138	138	R
Beaverlodge Cr.	470-523700	103P.069	DV	J	1	130	130	R
Clifford Creek	470-434800	103P.069	CO	F	9	49	62	R
Corral Cr.	470-420300	103P.070	DV	A	6	120	141	R
Corral Cr.	470-420300	103P.070	DV	J	8	76	100	R
Cullon Creek	470-245700	93M.051	CO	J	4	58	100	R
Cullon Creek	470-245700	93M.061	CT	F	4	41	67	R
Cullon Creek	470-245700	93M.061	CT	J	4	93	112	R
Cullon Creek	470-245700	103P.069	DV	A	4	161	187	R
Cullon Creek	470-245700	103P.069	DV	J	1	82	82	R
Cullon Creek	470-245700	93M.051	RB	F	6	45	64	R
Cullon Creek	470-245700	93M.061	RB	J	24	38	126	R
Ironside Creek	470-335400	103P.070	CO	F	5	41	54	R
Ironside Creek	470-335400	103P.079	CO	J	7	51	96	R
Ironside Creek	470-335400	103P.070	CT	A	1	173	173	R
Ironside Creek	470-335400	103P.070	CT	F	12	27	71	R
Ironside Creek	470-335400	103P.060	CT	J	52	24	212	R
Ironside Creek	470-335400	103P.060	DV	A	7	125	190	R
Ironside Creek	470-335400	103P.060	DV	F	1	45	45	R
Ironside Creek	470-335400	103P.070	DV	J	19	85	170	R
Ironside Creek	470-335400	103P.069	RB	J	11	34	80	R

Table 6. Minnow Trapping Data from Five Lakes in the Kispiox Watershed, September 1999.

TABLE 6. MINNOW TRAPPING DATA FROM FIVE LAKES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Nid Map	Local Name	Watershedcode/ILP	Reach #	Temperature (C)	Conductivity (umos)	Turbidity	Capture Method	Number of traps	Fish Species	Depth (m)	Setting	Habitat
91110	103P.059	Beaver Lodge Lk.	2121	8	7.	60	C	MT	10	NFC	1.00	BT*	L**
20850	103P.060	Unnamed Lk.	2085	4	10.	30	C	MT	10	NFC	0.50	BT	L
21030	103P.060	Unnamed Lk.	2103	1	8.	40	C	MT	10	NFC	0.50	BT	L
20860	103P.060	Unnamed Lk.	2086	8	7.	60	C	MT	10	NFC	0.50	BT	L
99430	103P.069	Hilltop Lk.	470-527500-00000	2	10.	70	L	MT	10	NFC	1.00	BT	L

*BT=bottom
**=littoral zone

4.5 Significant Features and Fisheries Observations

4.5.1 Fish and Fish Habitat

Fish habitat within the study area is limited to low gradient sections of major sub-basins and tributaries. Suitable spawning, rearing and overwintering habitat was available in reaches throughout the study area. No critical habitats such as staging areas or large spawning grounds were identified during the surveys, although the availability of spawning habitat was noted at each site. No significant sport fishing opportunities were identified aside from the Kispiox River, an already popular steelhead fishing river.

4.5.2 Habitat Protection Concerns

4.5.2.1 Fisheries Sensitive Zones

The Kispiox River floodplain provides some side and offchannel habitat that provides important rearing and high-water refuge habitat for salmonids. Beaver ponds and seasonally wetted back-channels throughout the valley provide rearing habitat for juvenile salmonids, in particular coho. As the majority of the sample sites were located high on the valley walls, off-channel fish habitat was not typically found during sampling. High plateaus often contained wetted marshland yet in each case no fish were present in the adjacent stream system. Fisheries sensitive zones were limited to the valley bottom along the Kispiox River. No fisheries sensitive zones were identified at sample sites during the survey.

4.5.2.2 Fish Caught Above 20% Gradient

The field sampling included data collection at 6 sites that had field measured gradients of over 20% (fish sampling was conducted at all of these sites). No fish were captured in streams over 20% gradient. Cutthroat trout were documented in a reach with an average gradient of 17.67%, but all fish were caught in lower gradient (4%) sections of the reach. The average gradient of confirmed fish bearing reaches in the project area ranged from 0 to 17.67% (Table 7). Rainbow trout were documented at gradients of 2% to 6% and Dolly Varden were documented at gradients of 2.25% to 6.67%. Coho were documented at gradients of 0 to 5.33%.

Table 7. Average Gradient at Fish Bearing Reaches in the Kispiox Watershed, September 1999.

TABLE 7. AVERAGE GRADIENT AT FISH BEARING REACHES IN THE KISPIOX WATERSHED.

Site #	Local Name	Watershedcode / ILP	Reach #	Average Gradient %	Fish Species
1	Unnamed	72	1	6.00	RB
7	Unnamed	257	7	2.33	CT
15	Beaver Lodge. Cr.	470-523700-00000-00000	3	6.00	CT, DV
19	Unnamed	1005	1	6.33	DV
21	Unnamed	457	1	6.33	RB
33	Ironside Creek	470-335400-00000	4	3.67	CT, RB, DV
34	Unnamed	199	2	5.00	CT
35	Clifford Creek	470-434800-00000	3	2.33	CO
36	Unnamed	432	1	0.00	CO
49	Unnamed	274	1	1.33	CT
50	Unnamed	274	2	5.33	CT
52	Unnamed	1014	1	2.00	CO, CT, LNC
55	Unnamed	457	3	2.00	RB
100	Tahtlum Creek	470-245700-18800-00000	1	5.33	RB, CO
104	Tahtlum Cr.	470-245700-18800-00000	6	5.50	CT
106	Unnamed	41	1	4.33	RB
109	Unnamed	1141	3	2.83	CT
113	Unnamed	1128	1	6.50	DV
114	Corral Cr.	470-420300-00000-00000	2	2.25	DV
154	Unnamed	304	1	3.75	DV
156	Unnamed	452	1	3.50	CO, CT
203	Unnamed	283	1	4.67	CT
204	Unnamed	282	1	6.67	DV, CT
205	Unnamed	275	1	1.83	CT
206	Unnamed	275	2	4.33	CT
207	Unnamed	276	1	4.33	CT
212	Unnamed	391	6	3.83	DV
213	Unnamed	233	3	4.00	CT
215	Unnamed	235	1	17.67	CT

4.5.2.3 Restoration and Rehabilitation Opportunities

Sampling in the Kispiox Watershed took place in reaches often adjacent to roads, typically roads built to access logging cutblocks. Numerous stream reaches were identified where no reserve zone was left (trees were harvested up to the stream bank). No perched culverts were noted during the field assessments, however we did not undertake a thorough review of all culverts.

We assumed that Nortec Consulting's Watershed Restoration Project within the Kispiox Watershed in 1996/97 detailed restoration and rehabilitation opportunities. In that study, all the major sub-basins were surveyed for logging related damage to the fisheries resource. Sub-basins that were categorized as high priority watersheds include Steep Canyon/Brown Paint Creeks, Clifford/Corral Creeks, Cullon/Murder/Ironside Creeks and the Nangeese River. Moderate priority watersheds include the Sweetin River, McCully Creek and Date Creek sub-basins (Nortec, 1997).

4.6 Fish Bearing Status

4.6.1 Fish Bearing Reaches

A total of 36 of the 120 sample sites in this inventory have been classified as fish bearing based either on the presence of fish or suitable fish habitat and inferred fish presence. Fish were caught at 29 of the sites classified as fish bearing and 7 sites were inferred fish bearing due to suitable habitat and lack of barriers between the site and fish bearing waters. All fish bearing reaches are shown in solid red on the 1:20,000 Interpretative Maps (Appendix 5).

Table 8 summarizes data collected at fish bearing reaches in the Kispiox Watershed.

Table 8. Summary of Data from Surveyed Fish Bearing Reaches in the Kispiox Watershed, September 1999.

TABLE 8. SUMMARY OF DATA FROM SURVEYED FISH BEARING REACHES IN THE KISPIOX WATERSHED, SEP 1999.

Site #	Local Name	Watershedcode / ILP	Reach #	Nid Map	Average Channel Width (m)	Average Gradient %	Proposed Stream Class	Fish Species
1	Unnamed	72	1	93M.061	1.70	6.00	S3	RB
7	Unnamed	257	7	103P.070	0.92	2.33	S4	CT
15	Beaver Lodge. Cr.	470-523700	3	103P.069	5.45	6.00	S2	DV,CT
16	Beaver Lodge Cr.	470-523700	4	103P.069	2.17	32.33	S3/S6 upstream of the 100m cascade.	NFC
19	Unnamed	1005	1	103P.069	1.48	6.33	S4 up to the 2m falls, u/s of the road, then S6.	DV
21	Unnamed	457	1	103P.069	4.13	6.33	S3	RB
29	Unnamed	202	3	103P.060	3.30	5.67	S5	NFC
30	Unnamed	202	1	103P.060	2.35	5.67	S3/S6, EFU above the 8m falls.	NFC
33	Ironside Creek	470-335400	4	103P.070	8.07	3.67	S2	DV, CT, RB
34	Unnamed	199	2	103P.060	1.85	5.00	S3	CT
35	Clifford Creek	470-434800	3	103P.079	3.82	2.33	S3	CO
36	Unnamed	432	1	103P.079	1.09	0.00	S4	CO
49	Unnamed	274	1	103P.070	4.10	1.33	S3	CT
50	Unnamed	274	2	103P.070	4.45	5.33	S3	CT
52	Unnamed	1014	1	93M.051	3.02	2.00	S3	LNC, CT, CO
54	Unnamed	336	1	103P.060	5.92	12.00	S2	NFC
55	Unnamed	457	3	103P.069	1.64	2.00	S3	RB
100	Tahtlum Creek	470-245700-18800	1	93M.051	4.03	5.33	S3	CO, RB
101	Unnamed	51	1	93M.061	3.88	2.50	S3 to lower ~100m, S5 upstream	NFC
104	Tahtlum Cr.	470-245700-18800	6	93M.061	2.19	5.50	S3	CT
106	Unnamed	41	1	93M.061	2.80	4.33	S3 confirmed to lower 100, inferred to 4m	RB
109	Unnamed	1141	3	103P.069	2.37	2.83	S3	CT
113	Unnamed	1128	1	103P.069	6.30	6.50	S2/S5	DV
114	Corral Cr.	470-420300	2	103P.070	7.03	2.25	S2	DV
127	Unnamed	284	1	103P.070	6.03	5.75	S5/S2	NFC
154	Unnamed	304	1	103P.060	4.23	3.75	S3	DV
156	Unnamed	452	1	103P.070	0.88	3.50	S4	CT, CO
203	Unnamed	283	1	103P.070	1.83	4.67	S3	CT
204	Unnamed	282	1	103P.070	1.27	6.67	S4	CT, DV
205	Unnamed	275	1	103P.070	1.52	1.83	S3	CT
206	Unnamed	275	2	103P.070	1.33	4.33	S4	CT
207	Unnamed	276	1	103P.070	1.00	4.33	S4	CT
212	Unnamed	391	6	103P.079	4.71	3.83	S3	DV
213	Unnamed	233	3	103P.060	1.75	4.00	S3	CT
215	Unnamed	235	1	103P.060	1.33	17.67	S4	CT
216	Unnamed	235	2	103P.060	1.30	21.00	S4/S6	NS

4.6.2 Non Fish Bearing Reaches

A total of 84 reaches or reach segments have been classified as non fish bearing S5 and S6, based on the absence of both fish and/or suitable fish habitat. An additional 18 reaches were classified as NVC/NCD, based on the absence of bed scour and a lack of mineral alluvium. These reaches have been included in the non fish bearing reaches tables.

A key part of our strategic assessment of sites was to establish the "End of Fish Use" (EFU) in major sub-basins. We used the sampling density guidelines as presented in *Guidelines For Local Area Agreement Preparation* (Giroux and Witt, 1999) in which the following formulas were followed to determine how much sampling was required:

- **Should perennial fish habitat be present, the lake/wetland should be sampled and/or:**
- **stream order u/s of the barrier * 2 = number of required sites**

- **If no lakes or wetlands are present upstream of the barrier then: stream order u/s of the barrier = number of required sites**

This strategy was successful in determining EFU for 6 of the 7 major watersheds; Ironside (ILP 284-a large tributary), Corral, Clifford, Brown Paint, Beaverlodge and Steep Canyon (the EFU for Cullon Creek was not established) . In addition to this the EFU was established in 2 other major stream systems; 1141 (Brown Paint Watershed) and 391 (Skunsnat Watershed) and several minor systems.
Table 9 summarizes the EFU location for major sub-basins.

Table 9. Summary of the EFU established for major sub-basins.

Stream	Mapsheet	Barrier	Distance Barrier is from mouth	Order	Lakes u/s of the barrier? Sampled?	No. of Stream sites conducted.
Ironside ILP 284	103P.070	3m Cascade	800m u/s	2	No lakes	2
Corral	103P.070/ 080	8m Falls	7.6km u/s	3	No lakes	3
Clifford	103P.079	8m Falls	7.0km u/s	3	No lakes	3
Brown Paint	103P.069	6m Falls	1.4km u/s	4	Brown Paint Lake was previously sampled.	4
Beaverlodge	103P.069	20m Cascade	4km u/s	3	ILP 2121 was sampled.	3
Steep Canyon	103P.069/ 060	20m Falls	5km u/s	4	ILP 2103 was sampled.	6
ILP 1141	103P.069	2m Falls	600m u/s	3	Hilltop Lake was sampled.	4
ILP 391	103P.079	6m Cascade	7.0km u/s	3	No lakes	3

Non fish bearing status was established in many 2nd and 3rd order streams, though occasionally the sampling density guidelines were not achieved due to logistical constraints (e.g. difficult access for crews, time constraints), or sufficient habitat information was not available to justify non fish bearing status. Table 10 summarizes sampling data collected from the non fish bearing reaches identified in this field sampling program.

Table 10. Summary of Data from Surveyed Non-fish Bearing reaches in the Kispiox Watershed, September 1999.

TABLE 10. SUMMARY OF DATA FROM SURVEYED NON-FISH BEARING REACHES IN THE KISPIOX WATERSHED.

Site #	WSC/ILP	Reach #	Average Gradient %	Width (m)	Proposed Stream Class	Electrofishing Specifications				Other Methods		Comments
						Dist. (m)	Time (s)	Cond (us)	Temp (c)	EF	Effort	
2	73	1	2.67	1.32	S6	160	583	30	9	N/A	N/A	2m falls limits fish. No fish upstream.
3	60	1	2.67		NVC/NCD					N/A	N/A	No potential for fish.
4	51	5	5.67	1.35	S6	140	342	40	7	N/A	N/A	Dashed blue. Additional sampling required d/s.
5	261	1	4.67		NVC/NCD					N/A	N/A	No potential for fish.
6	262	1	2.33	0.38	S6	168	213	20	9	N/A	N/A	Numerous obstructions limit fish migration. Habitat is poor.
8	470-525900	3	9.00	3.65	S5	450	988	30	10	N/A	N/A	Falls limits fish. No fish upstream.
9	1155	1	2.33	1.15	S6	110	360	30	6	N/A	N/A	Falls limits fish. No fish upstream.
10	470-525900	5	4.67	2.38	S6	150	460	40	12	N/A	N/A	Falls limits fish. No fish upstream.
11	470-523700	5	7.00	1.77	S6	120	528	30	9	N/A	N/A	Falls limits fish. No fish upstream.
12	470-523700	7	2.00	1.66	S6	120	406	30	8	N/A	N/A	Falls limits fish. No fish upstream.
14	1129	1			NVC/NCD					N/A	N/A	No potential for fish.
16	470-523700	4	32.33	2.17	S3/S6 upstream of the 100m cascade.	1200	397	60	7	N/A	N/A	Cascade limits fish migration. No fish upstream.
17	1128	2	8.33	4.68	S5	150	420	40	6	N/A	N/A	Cascade limits fish migration. No fish upstream.
18	1121	1	9.67		NVC/NCD					N/A	N/A	No potential for fish.
20	465	1	2.33		NVC/NCD					N/A	N/A	No potential for fish.
22	341	1	1.33	1.20	S6	150	533	30	6	N/A	N/A	High gradient section limits fish migration. No fish present.
23	535	3	2.33		NVC/NCD					N/A	N/A	No potential for fish.
24	540	1	1.00	1.82	S6	150	468	10	10	N/A	N/A	Falls limits fish migration. No fish upstream.
25	305	3	2.33	1.32	S6	110	418	30	10	N/A	N/A	Falls limits fish migration. No fish upstream.

TABLE 10. SUMMARY OF DATA FROM SURVEYED NON-FISH BEARING REACHES IN THE KISPIOX WATERSHED.

Site #	WSC/ILP	Reach #	Average Gradient %	Width (m)	Proposed Stream Class	Electrofishing Specifications				Other Methods		Comments
						Dist. (m)	Time (s)	Cond (us)	Temp (c)	EF	Effort	
26	326	1			NVC/NCD					N/A	N/A	No potential for fish.
27	304	3	5.67	1.20	S6	180	402	40	10	N/A	N/A	Falls limits fish migration. No fish upstream.
29	202	3	5.67	3.30	S5	600	355	40	7	N/A	N/A	Falls limits fish migration. No fish upstream.
30	202	1	5.67	2.35	S3/S6, EFU at the 8m falls.	200	411	50	7	N/A	N/A	Falls limits fish migration. No fish upstream.
31	101	1			NVC/NCD					N/A	N/A	No potential for fish.
32	284	2	8.33	3.75	S5	150	497	20	8	N/A	N/A	Cascade limits fish migration. No fish upstream.
37	1431	1			NVC/NCD					N/A	N/A	No potential for fish.
38	1429	2	2.00	0.55	S6			20	7	N/A	N/A	No fish habitat exists. Conectivity of the stream is poor/substrate is made up of fines
39	1428	2	4.00	0.83	S6	50	53	20	8	N/A	N/A	Numerous obstructions limit fish migration. Habitat is poor.
42	1424	2	9.67	1.70	S6	50	180	20	8	N/A	N/A	Channel disappears, limiting fish migration.
44	1425	2	4.33	2.13	S6 200m u/s from the confluence with Kispiox R.	800	441	20	8	N/A	N/A	The channel disappears limiting fish migration.
47	1423	3	28.00	1.58	S6	40	84	10	7	N/A	N/A	Gradient limits fish. No fish present u/s of barrier.
48	270-245700-69100-0420	4	3.67	1.87	S6	100	495	20	7	N/A	N/A	Falls limits fish migration. No fish upstream.
51	274	3	3.00	4.67	S5	300	320	20	8	N/A	N/A	Falls limits fish migration. No fish upstream.
53	298	1			NVC/NCD					N/A	N/A	No potential for fish.
102	19	2	5.00	3.22	S5	200	462	20	10	N/A	N/A	Cascade limits fish migration. No fish upstream.
103	28	1			NVC/NCD					N/A	N/A	No potential for fish.

TABLE 10. SUMMARY OF DATA FROM SURVEYED NON-FISH BEARING REACHES IN THE KISPIOX WATERSHED.

Site #	WSC/ILP	Reach #	Average Gradient %	Width (m)	Proposed Stream Class	Electrofishing Specifications				Other Methods		Comments
						Dist. (m)	Time (s)	Cond (us)	Temp (c)	EF	Effort	
105	51	2	3.33	2.54	S6	295	796	50	9	N/A	N/A	Obstructions limit fish migration. No fish habitat present.
107	258	1			NVC/NCD					N/A	N/A	No potential for fish.
108	268	1			NVC/NCD					N/A	N/A	No potential for fish.
110	1149	1	4.50	0.66	S6			140	6	N/A	N/A	Barriers d/s on mainstem. No fish habitat present.
111	1151	1	1.50	1.38	S6	250	301	60	9	N/A	N/A	Barriers d/s on mainstem. No fish present.
112	1141	4	0.33	1.33	S6	150	306	60	9	N/A	N/A	Subsurface flow limits fish migration. No fish habitat present.
113	1128	1	6.50	6.30	S2/S5	60	461	60	8	N/A	N/A	Cascade limits fish migration. No fish upstream.
116	1006	1	3.83	5.74	S5	200	1256	30	8	N/A	N/A	Barriers d/s on mainstem. No fish present.
117	534	1	12.75	1.62	S6	120	150	50	6	N/A	N/A	Barriers d/s on mainstem. No fish present.
118	470-511300	2	3.25	9.14	S5	300	666	60	8	N/A	N/A	Falls limits fish migration. No fish upstream.
119	545	1	2.00	1.27	S6	200	310	50	7	N/A	N/A	Barriers d/s on mainstem. No fish present.
120	457	5	2.00	3.20	S5	250	476	60	10	N/A	N/A	Additional Sampling candidate.
121	460	2	1.50	2.23	S6	100	509	80	10	N/A	N/A	Additional Sampling candidate.
122	218	1	4.00	1.68	S6	150	614	50	8	N/A	N/A	Barriers d/s on mainstem. No fish present.
123	202	5	11.00	1.72	S6	150	532	50	11	N/A	N/A	Barriers d/s on mainstem. No fish present.
124	102	1	4.00		NVC/NCD			20	11	N/A	N/A	No potential for fish.
125	470-335400	6	7.50	0.82	S6	100	175	40	9	N/A	N/A	Cascade limits fish migration. No fish upstream.
126	470-335400	5	6.67	7.33	S5	220	824	20	9	N/A	N/A	Cascade limits fish migration. No fish upstream.
127	284	1	5.75	6.03	S5/S2	150	545	20	8	N/A	N/A	Falls limits fish migration. No fish upstream.

TABLE 10. SUMMARY OF DATA FROM SURVEYED NON-FISH BEARING REACHES IN THE KISPIOX WATERSHED.

Site #	WSC/ILP	Reach #	Average Gradient %	Width (m)	Proposed Stream Class	Electrofishing Specifications				Other Methods		Comments
						Dist. (m)	Time (s)	Cond (us)	Temp (c)	EF	Effort	
128	214	1	6.25	1.66	S6	100	133	80	9	N/A	N/A	Barriers d/s on mainstem. No fish present.
129	426	1			NVC/NCD					N/A	N/A	No potential for fish.
130	399	3	11.17	1.73	S6	180	501	50	10	N/A	N/A	Cascade limits fish migration. No fish upstream.
131	1362	2	3.75	4.93	S5	200	1050	0	9	N/A	N/A	Falls limits fish migration. No fish upstream.
132	1117	1	1.50	1.52	S6					N/A	N/A	No fish habitat present.
133	1387	1			NVC/NCD					N/A	N/A	No potential for fish.
143	1420	1	10.17	3.23	S5	120	434	40	7	N/A	N/A	Cascade limits fish migration. No fish upstream.
144	1422	1	9.33	2.61	S6			50	8	N/A	N/A	Additional sampling candidate.
145	470-420300	5	11.50	2.15	S6	100	210	0	7	N/A	N/A	Falls limits fish migration. No fish upstream.
146	470-420300	4	5.00	4.95	S5	120	620	40	7	N/A	N/A	Barriers d/s on mainstem. No fish present.
147	470-420300	3	6.13	5.08	S5	200	681	40	8	N/A	N/A	Falls limits fish migration. No fish upstream.
148	378	1	3.50	1.34	S6	200	390	60	8	N/A	N/A	Cascade limits fish migration. No fish upstream.
151	379	1	25.25	1.37	S6			40	8	N/A	N/A	Falls limits fish migration. No fish upstream.
152	246	2	2.33	0.72	NVC/NCD	30	30	140	10	N/A	N/A	No potential for fish.
153	204	2	4.33	0.83	S6	200	290	90	8	N/A	N/A	Falls limits fish migration. No fish upstream.
155	313	1	7.00	0.87	S6			40	10	N/A	N/A	Resample candidate.
201	280	1	0.17		S6 upstream of site, NVC at the mouth	50	323	60	5	N/A	N/A	No potential for fish.
202	283	1	4.75	1.77	S6	1000	1500	50	5	N/A	N/A	Cascade limits fish migration. No fish upstream.
208	408	1	22.00	1.98	S6	100	398	40	5	N/A	N/A	Falls limits fish migration. No fish upstream.

TABLE 10. SUMMARY OF DATA FROM SURVEYED NON-FISH BEARING REACHES IN THE KISPIOX WATERSHED.

Site #	WSC/ILP	Reach #	Average Gradient %	Width (m)	Proposed Stream Class	Electrofishing Specifications				Other Methods		Comments
						Dist. (m)	Time (s)	Cond (us)	Temp (c)	EF	Effort	
209	391	7		5.38	S5			40	5	N/A	N/A	Falls limits fish migration. No fish upstream.
210	470-434800	4	27.67	2.82	S6	50	295	40	5	N/A	N/A	Barriers d/s on mainstem. No fish present.
211	440	1	17.33	1.38	S6	100	258		5	N/A	N/A	Barriers d/s on mainstem. No fish present.
214	233	4	21.00	1.45	S6			50	5	N/A	N/A	Gradient >20%. No fish habitat present.
216	235	2	21.00	1.30	S4/S6			110	5	N/A	N/A	Gradient >20%. No fish habitat present.
217	238	1	13.00	1.28	S6	150	351	40	5	N/A	N/A	Falls limits fish migration. No fish upstream.
218	257	8	0.50	2.23	NCD/S6.	200	418	40	5	N/A	N/A	No potential for fish.
1160	470-511300	4	2.50	3.94	S5			40	8	N/A	N/A	Barriers d/s on mainstem. No fish present.
2110	408	2	9.00	1.87	S6	100	412	20	5	N/A	N/A	Barriers d/s on mainstem. No fish present.
20850	2085	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	MT	26 hrs	10 traps-No fish present
20860	2086	8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	MT	27 hrs	10 traps-No fish present
21030	2103	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	MT	27 hrs	10 traps-No fish present
91110	2121	8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	MT	31:10 hrs	10 traps-No fish present
99430	470-527500	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	MT	30:40 hrs	10 traps-No fish present
1	470600506	1										Biolith, 1996
2	470634585	1										Biolith, 1996
3	470-245700-69100	1										Biolith, 1997
4	470-245700	5										Nortec, 1997
5	470-245700	5										Nortec, 1997
6	470-523700	1										Nortec, 1997
7	470-511300	1										Biolith, 1996
8	470-511300	1										Nortec, 1997
8	470-511300	1										Nortec, 1997
9	4705275	3										Biolith, 1996

TABLE 10. SUMMARY OF DATA FROM SURVEYED NON-FISH BEARING REACHES IN THE KISPIOX WATERSHED.

Site #	WSC/ILP	Reach #	Average Gradient %	Width (m)	Proposed Stream Class	Electrofishing Specifications				Other Methods		Comments
						Dist. (m)	Time (s)	Cond (us)	Temp (c)	EF	Effort	
10	470-525900											Degesi, Pers Comm, 1999
11	470-525900	1										Nortec, 1997
12	470-523700	2										Biolith, 1996
13	470-511300	1										Nortec, 1997
14	4705275	3										Triton, 1999
15	470-525900	1										Nortec, 1997
16	470-245700	4										Biolith, 1996
17												Triton, 1999
18	470335400160007	1										Triton, 1999
19		1										Triton, 1999
20	47033540016	4										Triton, 1999
21		1										Triton, 1999
22												Triton, 1999
23	47033540060549	1										Triton, 1999
24	47042030032032	1										Triton, 1999
25	470-420300	1										Nortec, 1997
26		1										Triton, 1999
27												Triton, 1999
28	470420300458	1										Triton, 1999
29		3										Triton, 1999
30	470420300458003	1										Triton, 1999
31	470420300320322	1										Triton, 1999
32	47024570044872	3										Triton, 1999
33		2										Triton, 1999
34		1										Triton, 1999
35	47052370015123	1										Triton, 1999
36		1										Triton, 1999
37		1										Triton, 1999
38		2										Triton, 1999
39	47055710018266	2										Triton, 1999

TABLE 10. SUMMARY OF DATA FROM SURVEYED NON-FISH BEARING REACHES IN THE KISPIOX WATERSHED.

Site #	WSC/ILP	Reach #	Average Gradient %	Width (m)	Proposed Stream Class	Electrofishing Specifications				Other Methods		Comments
						Dist. (m)	Time (s)	Cond (us)	Temp (c)	EF	Effort	
40		4										Triton, 1999
41		6										Triton, 1999
42		1										Triton, 1999
43		4										Triton, 1999
44		1										Triton, 1999
45	470-335400	4										Triton, 1999
46		1										Triton, 1999
47	470245700345025	1										Triton, 1999
48		2										Triton, 1999
49	470245700345026	1										Triton, 1999
50	47024570034502	3										Triton, 1999
51												Degesi, Pers Comm, 1999
52												Degesi, Pers Comm, 1999
53	4703098	2										Biolith, 1996
54	470322065	1										Biolith, 1996
55	470327572	1										Biolith, 1996
56	4703275728939	1										Biolith, 1996
57	470-313200											Shumacher, Pers. Comm, 1999
58	470364800098	1										Biolith, 1996
59	4703675	1										Biolith, 1996
60	470-313200											Shumacher, Pers. Comm, 1999

Shaded indicates Historic Sites, the site numbers are located on the Interpretive maps in green.

4.6.3 Follow Up/Additional Sampling Required

As 1:20,000 Inventory sampling in the north-west evolves, licensees are recognizing the value of strategic sampling utilizing planning methods similar to 1:5,000 scale surveys. Typically, coastal and semi-coastal watersheds contain narrow valley bottoms and steep valley walls, conditions that often simplify the determination of the EFU in tributary streams. These tributary streams are properly classified by first, finding a barrier to fish migration. Isolated populations of resident fish upstream of barriers are very uncommon in watersheds similar in topography to the Kispiox Watershed. Based on this, once a barrier is found, classification of the stream is largely complete. In the absence of barriers to upstream fish migration, fish presence is inferred as long as a few conditions are satisfactory to fish access/presence:

- no obstructions to fish exist (obstructions are potential barriers, a situation when crews cannot determine with absolute certainty that the feature is a barrier to fish at all water conditions),
- suitable fish habitat exists (cover, substrate, etc.),
- and the stream is <20% gradient.

Unlike interior watersheds where follow-up sampling is an important tool in determining the seasonal use of streams, coastal and semi-coastal systems are often classified with a high level of confidence with one sampling effort (due to high gradient valley walls) and no follow-up sampling is required. However, follow up sampling is a valuable tool in coastal watersheds in determining if an obstruction is actually a barrier to fish migration. In such a case the timing of follow-up sampling efforts is critical to ensuring optimal conditions and maximizing the potential for fish to occur. In particular, systems containing spring spawning species such as rainbow and cutthroat trout, follow up sampling should be conducted in the spring immediately following peak runoff, which usually occurs in early/mid May.

As described above, follow-up sampling has limited value in watersheds with gradient extremes such as the Kispiox. In addition to this, efforts were made during the project to limit the amount of follow-up sampling required by surveying key areas in sampled reaches often pin-pointing barriers to fish. The helicopter played an important role allowing crews to successfully identify barriers to fish migration on many streams. Most streams were successfully classified during the study, however, there are five sites that were not classified and require additional/follow-up sampling.

Additional sampling is the sampling of reaches adjacent to the one already sampled. Follow up sampling is the sampling of the same reach at a different time of year. The reason additional sampling is recommended is that in each case there is a high likelihood that a barrier exist within the reach recommended for additional sampling.

Table 11. Additional sampling required for classification of reaches in the Kispiox Watershed, September 1999.

ILP	Site	Reach Sampled	Map	Reach Requiring Additional Sampling	Justification
204	153	2	103P.060	Reach 1 on ILP 204 or Reach 1 on ILP 203	Fish were not present in Reach 2, and based on the topography there is likely a barrier in Reach 1 of either of these two streams.
457	21	3 and 5	103P.069	Reach 4	Fish were present in Reach 3 yet not in Reach 5. There is likely a barrier in Reach 4.
460	121	3	103P.069	Reach 1 or 2	Fish were not present in Reach 3, and based on the topography there is likely a barrier in Reach 1 or 2.
313	155	1	103P060	Reach 1	It was difficult to sample properly and should be sampled when more water is present.
1422	144	1	103P.078	Reach 1	The electroshocker was not functional, and as it was a helicopter site, crews were unable to return.

4.7 Wildlife Observations

Wildlife observations were recorded during the survey and included moose and beaver sign and a newt/salamander sighting.

4.8 Water Quality

Water quality measurements were carried out at each site and included measurement of temperature, pH, and conductivity with hand-held field meters. In addition, turbidity observations were recorded. The pH ranged from 6.0 to 8.0, while the conductivity ranged from 0 umhos/cm to 140 umhos/cm. Water temperature ranged from 5 ^{o}C to 12 ^{o}C. The turbidity was clear at most sites but was low at 3 sites likely due to run-off following a rain event. The flow stage was medium at most sites although low and high flow stage were also recorded.

4.8.1 Local Area Agreement Analysis

A Local Area Agreement is a new initiative by the Province of BC MELP Habitat Branch intended to streamline the assessment of streams within the province. The objective of a Local Area Agreement (LAA) from a licensee's perspective is to reduce the amount of professional assessment of streams currently required under the Forest Practices Code, a savings of time and money.

It was recognized at the start of this project that sampling intensity would likely be insufficient to develop a LAA. However, the intention of the following analysis is to demonstrate preliminary trends within the study area. A number of parameters were queried from the FDIS database and examined in relation to fish capture. Table 12 presents the watershed relationship summary table for Category 2 to 3 streams. Stream pattern was left out of the table as all streams within the Kispiox Watershed were determined to be straight/sinuous.

The elevations of the downstream reach break were separated into five categories or zones:

- Zone 1 ranges from 330 to 584m,
- Zone 2 from 585 to 839m,
- Zone 3 from 840 to 1093m,
- Zone 4 from 1094 to 1347m and

- Zone 5 from 1348 to 1600m.

Gradients (percent) are separated into five classes:

- ≤ 4
- > 4 and ≤ 8
- > 8 and ≤ 20
- 20< x ≤ 30
- 30

Size (order) classes are separated into three classes:

- small (order 1)
- medium (order 2 and 3)
- large (≥4th order)

The outstanding feature illustrated in Table 12 is the low number of sample sites to total number of reaches, slightly over 12% whereas over 20% would give a better baseline sample size (120 sites in 942 reaches). Developing a statistical model based on this sampling program alone would prove challenging and the results would be inconclusive. Some notable features with regards to elevation are:

- 64% of the streams sampled between 330 and 584m in elevation were fish bearing, 36% were not.
- 16% of the streams sampled between 585 and 839m in elevation were fish bearing, 84% were not.
- No fish were found above 840m in elevation (the elevation of the lower reach break).

Some notable features with regards to gradient are:

- Only 8% of all streams sampled were >20% in gradient, all were non-fish bearing.
- The number of fish bearing and non-fish bearing streams < or = to 8% are similar.
- 87% of streams between 8% and 20% were non-fish bearing, 13% contained fish.

A notable feature with regards to stream size/order is:

- 78% of small streams (1st order) do not contain fish, 22% are fish bearing.

The number of sites that are potentially Category 2 and 3 reaches are low. Many of the non-fish bearing reaches are such due to barriers to fish migration, not physical reach characteristics. Based on the above information there is not enough information to pursue a Category 2 or 3 LAA from this study alone. A LAA may prove to be feasible after additional 1:20,000 scale surveys are completed in other areas of the Kispiox Watershed.

However, the sampling intensities will need to be higher than in this study. A study design increasing the number of sample Category 2 and 3 sites should be developed. In addition to this, many of the sub-drainages within the Kispiox Watershed are classified as there were often barriers to fish located at the edge of the valley flat. As such, continuing the pursuit of a LAA in this section of watershed may not be the best use of funding.

Table 12. Watershed Relationship Summary Table for Category 2 to 3 Streams in the Kispiox Watershed, September 1999.

Table 12: Watershed Relationship Summary Table for Category 2 to 3 streams in the Kispiox Watershed, September 1999

	Elevation					Gradient					Size		
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Class 1	Class 2	Class 3	Class 4	Class 5	Small	Med	Large
Total No. Reaches	448	258	138	96	13	256	219	344	74	60	664	269	20
Total No. Samples	50	37	7	5	0	43	33	15	6	2	32	62	4
No. with Fish	32	6	0	0	0	18	18	2	0	0	8	27	3
No. without Fish	18	31	7	5	0	25	15	13	6	2	25	35	1

Elevation Zones	330-584	585 - 83	840 - 10	1094 - 1	1348 - 1600	

Table 13. Summary of all Parameters and Fish Capture in the Kispiox Watershed, September 1999.

TABLE 13. SUMMARY OF ALL PARAMETERS AND FISH CAPTURE IN THE KISPIOX WATERSHED, SEPTEMBER 1999

Site #	Local Name	Watershedcode / ILP	Reach #	Nid Map	Stream Order	Downstream Elevation (m)	Average Gradient %	Average Channel Width (m)	Fish Species
1	Unnamed	72	1	93M.061	3	510	6.00	1.70	RB
7	Unnamed	257	7	103P.070	2	490	2.33	0.92	CT
15	Beaver Lodge. Cr.	470-523700	3	103P.069	3	530	6.00	5.45	DV,CT
19	Unnamed	1005	1	103P.069	2	470	6.33	1.48	DV
21	Unnamed	457	1	103P.069	3	425	6.33	4.13	RB
33	Ironside Creek	470-335400	4	103P.070	3	500	3.67	8.07	DV, CT, RB
34	Unnamed	199	2	103P.060	4	400	5.00	1.85	CT
35	Clifford Creek	470-434800	3	103P.079	3	520	2.33	3.82	CO
36	Unnamed	432	1	103P.079	2	525	0.00	1.09	CO
49	Unnamed	274	1	103P.070	3	455	1.33	4.10	CT
50	Unnamed	274	2	103P.070	2	470	5.33	4.45	CT
52	Unnamed	1014	1	93M.051	2	560	2.00	3.02	LNC, CT, CO
55	Unnamed	457	3	103P.069	3	352	2.00	1.64	RB
100	Tahtlum Creek	470-245700-18800	1	93M.051	3	530	5.33	4.03	CO, RB
104	Tahtlum Cr.	470-245700-18800	6	93M.061	4	370	5.50	2.19	CT
106	Unnamed	41	1	93M.061	3	620	4.33	2.80	RB
109	Unnamed	1141	3	103P.069	2	530	2.83	2.37	CT
113	Unnamed	1128	1	103P.069	3	610	6.50	6.30	DV
114	Corral Cr.	470-420300	2	103P.070	2	660	2.25	7.03	DV
154	Unnamed	304	1	103P.060	3	520	3.75	4.23	DV
156	Unnamed	452	1	103P.070	3	370	3.50	0.88	CT, CO
203	Unnamed	283	1	103P.070	1	415	4.67	1.83	CT
204	Unnamed	282	1	103P.070	1	550	6.67	1.27	CT, DV
205	Unnamed	275	1	103P.070	1	530	1.83	1.52	CT
206	Unnamed	275	2	103P.070	2	470	4.33	1.33	CT
207	Unnamed	276	1	103P.070	1	500	4.33	1.00	CT
212	Unnamed	391	6	103P.079	1	500	3.83	4.71	DV
213	Unnamed	233	3	103P.060	3	580	4.00	1.75	CT
215	Unnamed	235	1	103P.060	1	414	17.67	1.33	CT

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6. PERSONAL COMMUNICATIONS

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Appendix 1 Summary of Fish Habitat Quality Observed at Sample Sites in the Kispiox Watershed, September 1999

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
1	S3	Unnamed	72	1	Rearing	moderate rearing habitat, limited by steeper gradient, moderate complexity and low to moderate cover.
1	S3	Unnamed	72	1	Spawning	moderate spawning habitat, limited by high velocities and gravel compaction
1	S3	Unnamed	72	1	Overwintering	few pools >50cm, limited suitable overwintering.
2	S6	Unnamed	73	1	Spawning	moderate to low value spawning habitat, compacted gravels, smaller sized gravels, NFC, no fish access to the sampling area.
2	S6	Unnamed	73	1	Rearing	limited cover and habitat complexity
2	S6	Unnamed	73	1	Overwintering	no pools >50cm noted.
3	NVC/NCD.	Unnamed	60	1	Cover	No fish habitat, no defined channel. Flow through shubbery noted.
4	S6	Unnamed	51	5	Rearing	moderate rearing habitat, abundant cover, low complexity.
4	S6	Unnamed	51	5	Spawning	poor,limited gravels noted.
4	S6	Unnamed	51	5	Overwintering	limited, few pools >50cm deep.
5	NVC/NCD.	Unnamed	261	1	Cover	No fish habitat, not a creek.
6	S6	Unnamed	262	1	Rearing	limited, numerous organic obstructions and seasonal dry periods, however cover is abundant.
6	S6	Unnamed	262	1	Spawning	limited, small amount of gravels, poor access.
6	S6	Unnamed	262	1	Overwintering	none.
7	S4	Unnamed	257	7	Rearing	moderate cover, easily accessed.
7	S4	Unnamed	257	7	Overwintering	limited, no pools >50cm noted.
7	S4	Unnamed	257	7	Spawning	suitable gravels for spawning.
8	S5	Brown Paint Cr.	470-525900	3	Spawning	potential spawning habitat for smaller and medium sized fish, like DV and RB, in moderate quantities.
8	S5	Brown Paint Cr.	470-525900	3	Rearing	moderate habitat for DV and RB, cover is available but is not accessible due to multiple falls barriers and cascades.
8	S5	Brown Paint Cr.	470-525900	3	Other	gravels are angular, not rounded.
8	S5	Brown Paint Cr.	470-525900	3	Overwintering	limited, pools >50cm lacking.
9	S6	Unnamed	1155	1	Rearing	moderate rearing habitat for DV, moderate amount of cover, limited complexity and multiple cascades noted.
9	S6	Unnamed	1155	1	Spawning	limited, suitable gravels lacking.
9	S6	Unnamed	1155	1	Overwintering	no pools >50cm deep.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
10	S6	Brown Paint Ctr.	470-525900	5	Overwintering	overwintering habitat is not present.
10	S6	Brown Paint Ctr.	470-525900	5	Spawning	large sized gravels limit spawning potential.
10	S6	Brown Paint Ctr.	470-525900	5	Rearing	moderate rearing habitat for RB
11	S6	Beaver Lodge Cr.	470-523700	5	Overwintering	no overwintering habitat due to a lack of pools >50cm. Reach 6 also has no overwintering cover.
11	S6	Beaver Lodge Cr.	470-523700	5	Spawning	no spawning habitat for CT, boulder/cobble dominated substrate.
11	S6	Beaver Lodge Cr.	470-523700	5	Rearing	Rearing potential for CT is moderate, with low gradient adjacent to the lake.
12	S6	Beaver Lodge Cr.	470-523700	7	Overwintering	overwintering is available in the associated lake, NFC in the upper Beaver Lodge watershed.
12	S6	Beaver Lodge Cr.	470-523700	7	Rearing	moderate rearing potential, low gradient and moderate cover.
12	S6	Beaver Lodge Cr.	470-523700	7	Spawning	high CT and DV spawning potential, 75% of the area contains suitable spawning gravels.
14	NVC/NCD.	Unnamed	1129	1	Cover	NVC, no fish habitat.
15	S2	Beaver Lodge. Cr.	470-523700	3	Spawning	spawning potential for DV and CT very high ~20% of the stream bed has suitable spawning gravels.
15	S2	Beaver Lodge. Cr.	470-523700	3	Rearing	moderate rearing values for DV and CT, cascades are limiting in this reach.
15	S2	Beaver Lodge. Cr.	470-523700	3	Overwintering	moderate overwintering habitat, few pools in excess of 50cm.
16	S3/S6 upstream of the 100m cascade.	Beaver Lodge Cr.	470-523700	4	Spawning	Gradient is >20% in most sections of the reach, some isolated spawning areas between cascades.
16	S3/S6 upstream of the 100m cascade.	Beaver Lodge Cr.	470-523700	4	Rearing	Steeper slope reduces rearing potential, however, no resident fish exist in this area and NFC above barriers downstream.
17	S5	Unnamed	1128	2	Cover	no fish present.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
17	S5	Unnamed	1128	2	Spawning	potential spawning habitat present, but limited by the flattened gravel shape
17	S5	Unnamed	1128	2	Rearing	limited cover, generally poor habitat.
17	S5	Unnamed	1128	2	Overwintering	limited overwintering habitat present.
18	NVC/NCD.	Unnamed	1121	1	Other	NCD, no fish habitat.
19	S4 up to the 2m falls, upstream of the road, then S6.	Unnamed	1005	1	Overwintering	poor DV overwintering, limited pools >50cm.
19	S4 up to the 2m falls, upstream of the road, then S6.	Unnamed	1005	1	Rearing	Moderate DV rearing cover, with good access up to EFU.
19	S4 up to the 2m falls, upstream of the road, then S6.	Unnamed	1005	1	Spawning	high spawning values for DV, up to EFU, ~10% of the bed contains suitable gravels. Velocity and flow depth accommodate spawning.
20	NVC/NCD.	Unnamed	465	1	Cover	No fish habitat, NCD.
21	S3	Unnamed	457	1	Rearing	high rearing values for 20m d/s of the outlet, easily accessible and contains moderate cover.
21	S3	Unnamed	457	1	Overwintering	overwintering cover is provided by the lake upstream. A 2m falls was noted 25m downstream of the lake.
21	S3	Unnamed	457	1	Spawning	high spawning values for RB for 20m d/s of the outlet, ~30% suitable gravels and 10-25cm depth.
22	S6	Unnamed	341	1	Spawning	spawning habitat for DV and CT moderate, with ~30% of the area containing suitable spawning gravels.
22	S6	Unnamed	341	1	Rearing	moderate, accessible rearing cover throughout the site.
22	S6	Unnamed	341	1	Overwintering	limited overwintering for CT and DV, but some is available in the associated lake.
23	NVC/NCD.	Unnamed	535	3	Cover	NCD, no potential for fish.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
24	S6	Unnamed	540	1	Overwintering	moderate overwintering, pools>50cm frequently noted.
24	S6	Unnamed	540	1	Rearing	moderate, accessible rearing cover for RB/CT/DV
24	S6	Unnamed	540	1	Spawning	lack of gravels noted, no spawning habitat.
25	S6	Unnamed	305	3	Spawning	no spawning habitat noted due to the lack of gravel.
25	S6	Unnamed	305	3	Rearing	moderate rearing potential, moderate and accessible cover noted.
25	S6	Unnamed	305	3	Overwintering	no pools >50cm noted.
26	NVC/NCD.	Unnamed	326	1	Cover	NVC.
27	S6	Unnamed	304	3	Rearing	poor due to limited cover and small cascades throughout the site.
27	S6	Unnamed	304	3	Overwintering	none present, no fish in this stream.
27	S6	Unnamed	304	3	Spawning	low spawning potential, suitable gravels are limited.
28	S3	Unnamed	227	1	Overwintering	no pools >50cm noted, poor overwintering.
28	S3	Unnamed	227	1	Spawning	low quality spawning habitat for DV/CT/RB due to a lack of gravel.
28	S3	Unnamed	227	1	Rearing	rearing values for CT/DV/RB moderate due to abundant cover.
29	S5	Unnamed	202	3	Overwintering	limited overwintering habitat.
29	S5	Unnamed	202	3	Spawning	moderate spawning habitat due to ~15% of the streambed containing spawning gravels.
29	S5	Unnamed	202	3	Rearing	moderate cover available for CT/DV, but cascades would limit juvenile distribution.
30	S3/S6, EFU above the 8m falls.	Unnamed	202	1	Spawning	no spawning habitat, largely bedrock substrate.
30	S3/S6, EFU above the 8m falls.	Unnamed	202	1	Rearing	low rearing potential for DV, due to the presence of multiple cascades.
30	S3/S6, EFU above the 8m falls.	Unnamed	202	1	Overwintering	overwintering present, with many deep pools >50cm deep.
31	NVC/NCD.	Unnamed	101	1	Cover	no potential fish habitat, NVC.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
32	S5	Unnamed	284	2	Spawning	Poor, the gravels are angular and spawning habitat is not accessible in this reach.
32	S5	Unnamed	284	2	Rearing	poor rearing for DV, the numerous cascades would limit access
32	S5	Unnamed	284	2	Overwintering	present but not abundant in this reach.
33	S2	Ironside Creek	470-335400	4	Spawning	Moderate spawning values for DV,CT,RB, gravels are accessible, but somewhat flat in shape.
33	S2	Ironside Creek	470-335400	4	Rearing	Good rearing habitat for DV,RB,CT, ample cover, easily accessible with a riffle/pool morphology.
33	S2	Ironside Creek	470-335400	4	Overwintering	no overwintering habitat throughout the site.
34	S3	Unnamed	199	2	Spawning	spawning values are limited by the amount of suitable spawning gravels.
34	S3	Unnamed	199	2	Rearing	rearing potential for CT is moderate, limited by a lack of suitable cover.
34	S3	Unnamed	199	2	Overwintering	poor, low number of pools >50cm deep in the sampling area.
35	S3	Clifford Creek	470-434800	3	Spawning	moderate spawning habitat for CO, suitable gravels and flow noted.
35	S3	Clifford Creek	470-434800	3	Rearing	moderate rearing habitat for CO, due to moderate, accessible cover.
35	S3	Clifford Creek	470-434800	3	Overwintering	overwintering present throughout site.
36	S4	Unnamed	432	1	Rearing	high rearing values for CO throughout, based on abundant cover and ease of access.
36	S4	Unnamed	432	1	Spawning	no spawning gravels noted, flows are too low.
36	S4	Unnamed	432	1	Overwintering	overwintering limited by a lack of pools>50cm.
37	NVC/NCD.	Unnamed	1431	1	Cover	NVC, no potential for fish.
38	S6	Creek B, Stn 2+2 22.2 BLK 66	1429	2	Cover	no fish habitat exists, stream bed contains mostly fines, limited cover noted, connectivity to mainstem not confirmed.
39	S6	Creek A, BLK 392-66	1428	2	Spawning	no spawning habitat.
39	S6	Creek A, BLK 392-66	1428	2	Overwintering	no overwintering habitat.
39	S6	Creek A, BLK 392-66	1428	2	Rearing	rearing habitat is not present due to limited cover and poor access to the reach.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
39	S6	Creek A, BLK 392-66	1428	2	Other	numerous small barriers exist at the site, no potential for fish use.
42	S6	Road Crossing 4+400, 392-65	1424	2	Spawning	spawning habitat present for DV
42	S6	Road Crossing 4+400, 392-65	1424	2	Overwintering	no overwintering, no pools>50cm noted.
42	S6	Road Crossing 4+400, 392-65	1424	2	Rearing	potential rearing values for DV low, cover and access are limited.
44	S6 200m u/s from the confluence with Kispiox R.	Creek A, 392-65	1425	2	Spawning	spawning habitat is present in moderate quantities, however, lower flows noted.
44	S6 200m u/s from the confluence with Kispiox R.	Creek A, 392-65	1425	2	Rearing	low rearing potential due to limited cover and poor access associated with multiple small barriers.
44	S6 200m u/s from the confluence with Kispiox R.	Creek A, 392-65	1425	2	Overwintering	limited overwintering habitat, no pools >50cm deep.
47	S6	Unnamed	1423	3	Rearing	rearing potential poor due to limited cover and access
47	S6	Unnamed	1423	3	Spawning	no spawning habitat exists due to a lack of suitable gravels.
47	S6	Unnamed	1423	3	Overwintering	no overwintering cover.
48	S6	Mooluck Cr.	470-245700-69100-04200	4	Other	2m falls limits fish migration into reach 4.
48	S6	Mooluck Cr.	470-245700-69100-04200	4	Overwintering	limited overwintering, no pools >50cmnoted.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
48	S6	Mooluck Cr.	470-245700-69100-04200	4	Spawning	spawning potential low due to flattened gravels and low flows.
48	S6	Mooluck Cr.	470-245700-69100-04200	4	Rearing	potential rearing values low, limited cover.
49	S3	Unnamed	274	1	Overwintering	beaver ponds provide overwintering habitat.
49	S3	Unnamed	274	1	Rearing	rearing values are high for CT, cover is moderate and beavers have created ponds, which contain CT.
49	S3	Unnamed	274	1	Spawning	Moderate CT habitat, ~5% of the total area contains gravels, which are slightly coarse.
50	S3	Unnamed	274	2	Overwintering	limited overwintering due to the lack of pools >50cm.
50	S3	Unnamed	274	2	Rearing	moderate CT cover.
50	S3	Unnamed	274	2	Spawning	poor spawning habitat, gravels are flattened.
51	S5	Unnamed	274	3	Overwintering	overwintering habitat is available, but there are few pools >50cm deep.
51	S5	Unnamed	274	3	Rearing	moderate amounts of rearing cover noted.
51	S5	Unnamed	274	3	Spawning	potential spawning potential poor, gravels are flattened.
52	S3	Unnamed	1014	1	Overwintering	moderate overwintering habitat available, some pools >50cm deep.
52	S3	Unnamed	1014	1	Rearing	rearing value for CT are high due to the moderate amount of easily accessed cover available.
52	S3	Unnamed	1014	1	Spawning	spawning values for CT are low, suitable gravels are lacking.
53	NVC/NCD.	Unnamed	298	1	Cover	NVC, no fish habitat.
54	S2	Unnamed	336	1	Overwintering	no overwintering habitat is present, d/s of the road crossing habitat is limited.
54	S2	Unnamed	336	1	Spawning	low spawning habitat potential, limited suitable gravels.
54	S2	Unnamed	336	1	Rearing	rearing values for CT above the road are poor, based on little cover and small cascades.
55	S3	Unnamed	457	3	Spawning	high spawning values, >50% of the substrate suitable for spawning.
55	S3	Unnamed	457	3	Rearing	rearing values are high for RB, moderate cover and good access throughout the site.
55	S3	Unnamed	457	3	Overwintering	overwintering habitat is low due to the lack of pools >50cm residual depth.
100	S3	Tahtlum Creek	470-245700-18800	1	Overwintering	Poor overwintering habitat - reach has few deep pools although R2 upstream does

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Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
100	S3	Tahtlum Creek	470-245700-18800	1	Rearing	Poor-Moderate rearing habitat - fast flowing (2m/s) has little LWD cover and few pools or off channel habitat
100	S3	Tahtlum Creek	470-245700-18800	1	Spawning	Poor-Moderate spawning ground - small patches of gravel with high velocities and angular gravels in lower parts of reach, larger patches of good gravel and flows further upstream
101	S3 to lower ~100m, S5 upstream	Unnamed	51	1	Overwintering	Overwintering habitat present - undercut banks and some pools, Lwd moderate values
101	S3 to lower ~100m, S5 upstream	Unnamed	51	1	Rearing	High rearing values, undercut banks
101	S3 to lower ~100m, S5 upstream	Unnamed	51	1	Spawning	Moderate spawning habitat. Isolated patches of gravel in pool tailouts/on margin substrate platey
102	S5	Unnamed	19	2	Spawning	poor spawning habitat, isolated patches of spawning gravels, organic substrate.
102	S5	Unnamed	19	2	Overwintering	pools in the lower gradient section are not as frequent as in the higher gradient section. Pools formed by SWD jams in the sampling area.
102	S5	Unnamed	19	2	Rearing	moderate rearing habitat, with typically lower flow levels, cover comprised of instream vegetation, deep pools and undercut banks.
103	NVC/NCD.	Unnamed	28	1	Cover	No fish habitat
104	S3	Tahtlum Cr.	470-245700-18800	6	Overwintering	poor-moderate, not many deep pools, although there are some gravels and cobble for fry.
104	S3	Tahtlum Cr.	470-245700-18800	6	Rearing	some moderate to good riparian vegetation cover, fast flowing creek with little instream LWD cover.
104	S3	Tahtlum Cr.	470-245700-18800	6	Spawning	nice patches of spawning gravel for CT, DV, RB, good velocities but high in many areas.
105		Unnamed	51	2	Overwintering	Poor overwintering habitat - no deep pools for overwintering

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
105		Unnamed	51	2	Rearing	Moderate rearing habitat for RB in sections of defines stream, however in sections of overgrown channel access is difficult and poor
105		Unnamed	51	2	Spawning	Poor spawning habitat - most sections are overgrown and fines, small sections of gravel at end landing area but it's generally shallow
105	S6	Unnamed	51	2	Overwintering	Poor overwintering habitat - no deep pools for overwintering
105	S6	Unnamed	51	2	Rearing	Moderate rearing habitat for RB in sections of defines stream, however in sections of overgrown channel access is difficult and poor
105	S6	Unnamed	51	2	Spawning	Poor spawning habitat - most sections are overgrown and fines, small sections of gravel at end landing area but it's generally shallow
106	S3	Unnamed	41	1	Overwintering	Moderate overwintering habitat - some deep pool habitat with associated LWD
106	S3	Unnamed	41	1	Spawning	Poor-Moderate spawning habitat - gravels are embedded in silt and hard, but some good patches at pool tailout or at top of riffles
106	S3	Unnamed	41	1	Rearing	Moderate rearing habitat - riffles and pools, LWD cover, steep sections and cascades make upstream movement difficult
107	NVC/NCD	Unnamed	258	1	Cover	No fish habitat - is not a stream
108	NVC/NCD	Unnamed	268	1	Cover	No fish habitat - is not a stream
109	S6	Unnamed	1141	3	Rearing	Moderate rearing habitat for RB, CT, good velocities, abundant LWD cover, although it lacks gravel/cobble substrate
109	S6	Unnamed	1141	3	Overwintering	Low overwintering habitat - few deep pools in reach
109	S6	Unnamed	1141	3	Spawning	No spawning habitat - no gravel patches suitable for spawning, abundant silt
110	S6	Unnamed	1149	1	Overwintering	Poor overwintering habitat, no deep pools
110	S6	Unnamed	1149	1	Rearing	Poor rearing habitat - intermittently flows underground for 10-30m, shallow and has shallow cascades over rock, difficult movement between pockets of water
110	S6	Unnamed	1149	1	Spawning	No spawning habitat - no gravel or sufficient flows
111	S6	Unnamed	1151	1	Rearing	Moderate rearing habitat for RB/CT, some LWD, undercut bank cover but no gravels or cobbles

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
111	S6	Unnamed	1151	1	Overwintering	Poor overwintering habitat - no very deep pools, low velocities
111	S6	Unnamed	1151	1	Spawning	No spawning habitat - no gravel present and low velocities
112	S6	Unnamed	1141	4	Rearing	poor rearing habitat, low diversity, no gravels/cobbles but some good cover.
112	S6	Unnamed	1141	4	Overwintering	sufficiently deep to provide overwintering, 40cm throughout, however DO in winter may be low.
112	S6	Unnamed	1141	4	Spawning	No spawning habitat, no gravels, insufficient velocities.
113	S2/S5	Unnamed	1128	1	Rearing	moderate rearing cover for DV, RB, CT, good LWD cover and a variety of habitats, moderate slope and multiple cascades noted.
113	S2/S5	Unnamed	1128	1	Spawning	high quality spawning cover, good flows and gravels noted for DV/RB/CT.
113	S2/S5	Unnamed	1128	1	Overwintering	good quality overwintering habitat, deep pools and good flows.
114	S2	Corral Cr.	470-420300	2	Overwintering	good overwintering habitat, with associated LWD and flows.
114	S2	Corral Cr.	470-420300	2	Spawning	moderate DV spawning habitat, patches of gravels associated with pools and riffles.
114	S2	Corral Cr.	470-420300	2	Rearing	excellent LWD, cobble/pool cover, diverse habitats.
116	S5	Unnamed	1006	1	Overwintering	good pool cover and flow for DV.
116	S5	Unnamed	1006	1	Rearing	moderate rearing cover for DV, including pools and LWD.
116	S5	Unnamed	1006	1	Spawning	moderate to excellent spawning potential for DV, gravels may be slightly large.
117	S6	Unnamed	534	1	Spawning	some good spawning habitat for DV, RB, god flows and suitable gravels, 30-40% of the sampled area.
117	S6	Unnamed	534	1	Rearing	moderate habitat for DV, RB, pool and LWD cover noted, however steeper slope and multiple cascades may be limiting.
117	S6	Unnamed	534	1	Overwintering	abundant pools and sufficient flows for overwintering.
118	S5	Steep Canyon Creek	470-511300	2	Overwintering	good flow and deep pools available for overwintering for both DV adults and juveniles.
118	S5	Steep Canyon Creek	470-511300	2	Spawning	some good spawning habitat noted, for DV and RB, associated with pool tailouts and riffles. (40-50% of the flow).
118	S5	Steep Canyon Creek	470-511300	2	Rearing	moderate rearing for DV, fast flowing LWD lacking, boulder and pool cover available.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
119	S6	Unnamed	545	1	Overwintering	poor overwintering habitat, deep water throughout reach, 40cm deep, low flows may lead to DO problems in winter.
119	S6	Unnamed	545	1	Spawning	no spawning gravels.
119	S6	Unnamed	545	1	Rearing	moderate rearing habitat for RB, insufficient flows for DV.
120	S5	Unnamed	457	5	Spawning	some good spawning gravels, some silted and compacted gravels, however good flow is present over most of the gravel, which covers 60-80% of the area.
120	S5	Unnamed	457	5	Rearing	some good LWD and undercut bank rearing cover for RB.
120	S5	Unnamed	457	5	Overwintering	some deep pools for smaller fish, limited overwintering for larger fish.
121	S6	Unnamed	460	2	Overwintering	limited pools, long glides, one larger pool u/s of the beaver dam provides cover and overwintering habitat. Moderate overall.
121	S6	Unnamed	460	2	Rearing	moderate to good rearing cover, but limited winter cover as all of the overstream vegetation is deciduous and vegetation is the dominant cover type.
121	S6	Unnamed	460	2	Spawning	no spawning habitat, organic substrate overlaying small gravels, isolated patches at the upper end.
122	S6	Unnamed	218	1	Rearing	abundant cover, LWD, cutbank and overstream vegetation cover noted.
122	S6	Unnamed	218	1	Spawning	subangular gravels with interstitial fines, isolated pockets of spawning gravels.
123	S6	Unnamed	202	5	Overwintering	poor, no overwintering pools, but is connected to lake via ILP 218.
123	S6	Unnamed	202	5	Spawning	isolated patches of spawning gravels, fines in the interstitial spaces.
123	S6	Unnamed	202	5	Rearing	moderate/good LWD rearing cover, limited cutbanks and deep pools.
124	NVC/NCD.	Unnamed	102	1	Cover	No fish habitat.
125	S6	Ironside Creek	470-335400	6	Overwintering	poor, some deep pools but low flows could mean winter DO problems.
125	S6	Ironside Creek	470-335400	6	Spawning	low quality spawning habitat, with some small gravel patches and low velocities.
125	S6	Ironside Creek	470-335400	6	Rearing	low to moderate, no LWD cover, good undercutbank cover, however, multiple cascades in this reach would limit fish movement.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
126	S5	Ironside Creek	470-335400	5	Overwintering	good pool cover.
126	S5	Ironside Creek	470-335400	5	Rearing	high quality rearing habitat, diversity of habitat and flows, good LWD and pool cover.
126	S5	Ironside Creek	470-335400	5	Spawning	moderate spawning for DV and RB, substrate is somewhat large.
127	S5/S2	Unnamed	284	1	Spawning	high quality spawning habitat for DV and RB, suitably sized gravels and sufficient flows.
127	S5/S2	Unnamed	284	1	Rearing	moderate to high quality DV and RB rearing habitat, good cover, diverse velocities.
127	S5/S2	Unnamed	284	1	Overwintering	moderate for DV and RB, good pools for juvenile fish with good flow, too small for adult fish.
128	S6	Unnamed	214	1	Overwintering	none, no deep pools.
128	S6	Unnamed	214	1	Rearing	moderate, low flows makes movement upstream difficult, however there is some good LWD and undercut bank cover.
128	S6	Unnamed	214	1	Spawning	none, no suitable gravels or flows.
129	NVC/NCD	Unnamed	426	1	Other	No fish habitat
130	S6	Unnamed	399	3	Spawning	Low spawning habitat - not many patches large enough and not sufficient flow over most
130	S6	Unnamed	399	3	Overwintering	Moderate overwintering habitat - many pools but most are too small for adult fish
130	S6	Unnamed	399	3	Rearing	Low rearing habitat - high gradient cascades with pools between, difficult movement upstream for small fish
131	S5	Unnamed	1362	2	Rearing	High quality rearing habitat - nice pools and LWD cover for RB, CT, DV, numerous cascades make upstream movement difficult for small fish
131	S5	Unnamed	1362	2	Spawning	Poor spawning habitat - only small patches of gravel, reach is heavily silted.
131	S5	Unnamed	1362	2	Overwintering	High overwintering habitat - numerous deep pools suitable for juvenile and adult overwintering and flows are good for DO levels
132	S6	Unnamed	1117	1	Spawning	No spawning habitat - all fines
132	S6	Unnamed	1117	1	Rearing	No rearing habitat - dry at time of survey
132	S6	Unnamed	1117	1	Overwintering	No overwintering habitat - dry at time of survey
133	NVC/NCD.	Unnamed	1387	1	Rearing	No rearing habitat
133	NVC/NCD.	Unnamed	1387	1	Spawning	No spawning habitat

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
133	NVC/NCD.	Unnamed	1387	1	Other	No fish habitat
~~133~~	~~NVC/NCD.~~	~~Unnamed~~	~~1387~~	~~1~~	~~Overwintering~~	~~No overwintering habitat~~
143	S5	Unnamed	1420	1	Spawning	Low spawning habitat, some nice pockets of gravel associated with pools and riffle, with good flow and depths over them
143	S5	Unnamed	1420	1	Rearing	Moderate rearing habitat - high gradient but good cover by pools and LWD cascade makes upstream movement difficult
143	S5	Unnamed	1420	1	Overwintering	Good overwintering habitat - abundant deep pool habitat often with LWD cover and always with good flow
144	S6	Unnamed	1422	1	Overwintering	Moderate overwintering habitat - some deep pools with good flow
144	S6	Unnamed	1422	1	Rearing	Moderate rearing habitat - good cover (LWD and pools) but gradient and cascades are difficult for small fish
144	S6	Unnamed	1422	1	Spawning	Low spawning habitat - only the occasional patch of gravel with suitable flow (< 10% of area)
145	S6	Corral Cr.	470-420300	5	Rearing	high gradient with numerous cascades, limiting to fish movement.
145	S6	Corral Cr.	470-420300	5	Spawning	no gravel pockets large enough, or fast enough to accommodate spawning.
145	S6	Corral Cr.	470-420300	5	Overwintering	several deep pools exist but are small in area and associated with cascades and are turbulent.
146	S5	Corral Cr.	470-420300	4	Overwintering	abundant deep pools for juvenile and adult overwintering.
146	S5	Corral Cr.	470-420300	4	Spawning	some good pockets of spawning gravels for RB, DV, CT, with good flows and depths, often associated with riffles or pools.
146	S5	Corral Cr.	470-420300	4	Rearing	high, good LWD and pool cover for DV, RB, CT, diversity of flows noted.
147	S5	Corral Creek	470-420300	3	Overwintering	Moderate-Good overwintering habitat - several larger deep pools suitable for adult and juvenile fish with good flows
147	S5	Corral Creek	470-420300	3	Rearing	Moderate rearing habitat - good pool, boulder cover, numerous small cascades make upstream movement difficult but are not barriers
147	S5	Corral Creek	470-420300	3	Spawning	Low-Moderate spawning habitat - some pockets of gravel with suitable flow (DV) but very few (<10% of area)
148	S6	Unnamed	378	1	Overwintering	Moderate overwintering habitat - some pools but generally small in size and suitable only for fry or juveniles

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
148	S6	Unnamed	378	1	Rearing	High rearing habitat - good LWD, pool cover, good velocities for DV, RB rearing
148	S6	Unnamed	378	1	Spawning	Moderate spawning ground - some good pockets of gravel but sometimes silted and generally small material (~20-40% of area)
151	S6	Unnamed	379	1	Overwintering	no deep pool cover.
151	S6	Unnamed	379	1	Rearing	no rearing habitat, high gradient creek, constant cascade.
151	S6	Unnamed	379	1	Spawning	no spawning habitat, no gravel pockets, gravels are scattered and cobbles are too large.
152	NVC/NCD	Unnamed	246	2	Overwintering	No overwintering habitat - no pools
152	NVC/NCD	Unnamed	246	2	Rearing	Low rearing habitat - very shallow, low flow, no access to downstream trib, low cover
152	NVC/NCD	Unnamed	246	2	Spawning	No spawning habitat - no gravels
153	S6	Unnamed	204	2	Rearing	low flows, difficult access.
153	S6	Unnamed	204	2	Overwintering	no deep pools noted.
153	S6	Unnamed	204	2	Spawning	no spawning gravels in large enough pockets.
154	S3	Unnamed	304	1	Overwintering	a number of deep pools for juvenile and adult fish noted.
154	S3	Unnamed	304	1	Spawning	only a few pockets of spawning gravels noted with sufficient flow.
154	S3	Unnamed	304	1	Rearing	good cobble/boulder/pool cover.
154	S3	Unnamed	304	1	Other	intermittent flow in the sampling area.
155	S6	Unnamed	313	1	Spawning	no spawning habitat, no gravels.
155	S6	Unnamed	313	1	Overwintering	no water at the time of survey.
155	S6	Unnamed	313	1	Rearing	no rearing habitat, low flows at the time of survey, may provide spring rearing.
156	S4	Unnamed	452	1	Spawning	no gravels pockets of sufficient size to accommodate spawning for DV, CT, CO.
156	S4	Unnamed	452	1	Rearing	excellent CO rearing, in the lower 20m, small cascades over LWD limit fish access, good CT rearing.
156	S4	Unnamed	452	1	Overwintering	no overwintering habitat for adults, perhaps deep pool cover for juveniles.
201	S6 upstream of site, NVC at the mouth	Unnamed	280	1	Cover	No fish habitat.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
202	S6	Unnamed	283	1	Spawning	poor, angular shaped gravels.
202	S6	Unnamed	283	1	Overwintering	abundant pools in the 20 to 40cm range.
202	S6	Unnamed	283	1	Rearing	deep pool boulder and LWD cover
203	S3	Unnamed	283	1	Overwintering	abundant deep pools >20cm.
203	S3	Unnamed	283	1	Rearing	good rearing cover in deep pools with boulder and LWD cover.
203	S3	Unnamed	283	1	Spawning	poor spawning habitat, gravels are angular.
204	S4	Unnamed	282	1	Rearing	small to medium sized pools, abundant LWD.
204	S4	Unnamed	282	1	Spawning	good spawning sized gravels throughout the sampling area.
204	S4	Unnamed	282	1	Overwintering	fair, an inadequate number of deep pools noted.
205	S3	Unnamed	275	1	Rearing	plenty of cutbank cover and scour pools
205	S3	Unnamed	275	1	Spawning	spawning gravels noted throughout the reach.
205	S3	Unnamed	275	1	Overwintering	fair overwintering, few deep pools.
206	S4	Unnamed	275	2	Overwintering	no overwintering habitat, shallow waters.
206	S4	Unnamed	275	2	Spawning	fair, a few small patches of suitable gravels noted.
206	S4	Unnamed	275	2	Rearing	good rearing cover, LWD and SWD noted as well as some small pools.
207	S4	Unnamed	276	1	Rearing	some pools and LWD,SWD cover, though some of the woody debris is rafted.
207	S4	Unnamed	276	1	Spawning	fair, though most gravels are compacted in this reach.
207	S4	Unnamed	276	1	Overwintering	poor, too shallow.
208	S6	Unnamed	408	1	Rearing	poor, slope >20%
208	S6	Unnamed	408	1	Spawning	none
208	S6	Unnamed	408	1	Overwintering	none.
209	S5	Unnamed	391	7	Rearing	no holding water
209	S5	Unnamed	391	7	Spawning	spawning habitat, note, bedrock substrate
209	S5	Unnamed	391	7	Overwintering	no holding water.
210	S6	Clifford Creek	470-434800	4	Overwintering	none
210	S6	Clifford Creek	470-434800	4	Spawning	no spawning habitat
210	S6	Clifford Creek	470-434800	4	Rearing	small pools and some boulder cover noted.
211	S6	Unnamed	440	1	Spawning	fair spawning habitat, some smaller gravels in pools noted.

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
211	S6	Unnamed	440	1	Overwintering	not enough flow to accommodate overwintering.
211	S6	Unnamed	440	1	Rearing	almost all categories of cover present in small amounts.
212	S3	Unnamed	391	6	Overwintering	many deep pools>40cm.
212	S3	Unnamed	391	6	Spawning	very good spawning habitat, suitable gravels throughout the reach.
212	S3	Unnamed	391	6	Rearing	cascade/pool cover excellent for DV noted.
213	S3	Unnamed	233	3	Spawning	excellent spawning habitat, spawning sized gravels throughout reach.
213	S3	Unnamed	233	3	Overwintering	abundant deep pools.
213	S3	Unnamed	233	3	Rearing	excellent rearing habitat, abundant cover in pools and LWD.
214	S6	Unnamed	233	4	Rearing	good quality rearing habitat.
214	S6	Unnamed	233	4	Spawning	good quality spawning habitat with abundant gravels.
214	S6	Unnamed	233	4	Overwintering	good overwintering habitat, fairly deep pools noted.
215	S4	Unnamed	235	1	Rearing	many small pools and abundant LWD cover noted.
215	S4	Unnamed	235	1	Spawning	an abundance of spawning habitat noted, including spawning gravels and pools.
215	S4	Unnamed	235	1	Overwintering	fair, limited to 100m upstream of the road.
216	S4/S6	Unnamed	235	2	Rearing	some good rearing habitat in relation to LWD.
216	S4/S6	Unnamed	235	2	Spawning	small gravels in many of the pools.
216	S4/S6	Unnamed	235	2	Overwintering	poor, not enough flow.
217	S6	Unnamed	238	1	Spawning	poor, only small patches of spawning gravels in pools.
217	S6	Unnamed	238	1	Rearing	some good step/pool rearing habitat.
217	S6	Unnamed	238	1	Overwintering	none.
218	NCD/S6.	Unnamed	257	8	Overwintering	no overwintering, not enough water.
218	NCD/S6.	Unnamed	257	8	Rearing	some good cutbank and debris cover.
218	NCD/S6.	Unnamed	257	8	Spawning	no spawning gravels noted.
1090	S3	Tahtlum Cr.	470-245700-18800	7	Spawning	some patches of spawning gravels associated with LWD and pool tailouts.
1090	S3	Tahtlum Cr.	470-245700-18800	7	Rearing	moderate to good LWD rearing cover, fast flows noted, few pools, some steep slope and cascades
1090	S3	Tahtlum Cr.	470-245700-18800	7	Overwintering	poor to moderate, many deep pools.
1160	S5	Steep Canyon Creek	470-245700-18800	4	Rearing	good cover and flows, small refuge habitat areas exists in this stream

APPENDIX 1. SUMMARY OF FISH HABITAT QUALITY OBSERVED AT SAMPLE SITES IN THE KISPIOX WATERSHED, SEPTEMBER 1999.

Site #	Proposed Stream Class	Local Name	Watershedcode/ILP	Reach #	Habitat Type	Habitat Comment
1160	S5	Steep Canyon Creek	470-245700-18800	4	Spawning	moderate spawning for DV and RB, good velocities, substrate slightly large for resident fish. (~50-60%) of the area.
1160	S5	Steep Canyon Creek	470-245700-18800	4	Overwintering	high, abundant deep pools and good flows noted.
2110	S6	Unnamed	408	2	Spawning	fair spawning
2110	S6	Unnamed	408	2	Overwintering	some overwintering cover in some of the deeper pools.
2110	S6	Unnamed	408	2	Rearing	good pool and LWD cover

Appendix 2 Summary of Barriers Identified in the Kispiox Watershed, September 1999

APPPENDIX 2. SUMMARY OF BARRIERS IDENTIFIED IN THE KISPIOX WATERSHED

Site# / Historical NID / Reach NID	Local Name	Watershedcode/ILP	Reach #	Nid Map	Feature Type	Height (m)	Length (m)	Comment
Site 102	Unnamed	19	2	93M.061	C	4		cascade.
Site 106	Unnamed	41	1	93M.061	C	3	15	cascade over bedrock at mouth
Site 101	Unnamed	51	1	93M.061	C	2	2	Cascade
Site 101	Unnamed	51	1	93M.061	F	8	15	falls - end of fish use
Site 2	Unnamed	73	1	93M.061	F	2		located 25m d/s of the road crossing.
Site 30	Unnamed	202	1	103P.060	F	8		
Site 50	Unnamed	274	2	103P.070	C	10	15	
Site 207	Unnamed	276	1	103P.070	C	2.5	8	bedrock chute, 50m upstream of the road.
Site 202	Unnamed	283	1	103P.070	C	4	8	cascade barrier, EFU.
Site 127	Unnamed	284	1	103P.070	C	10	25	cascade in a canyon
Site 127	Unnamed	284	1	103P.070	F	15		falls downstream of the site.
Site 154	Unnamed	304	1	103P.060	F	10		falls, barrier to fish passage upstream.
Site 148	Unnamed	378	1	103P.070	C	2	2	Bedrock chute - barrier to fish, ~30m upstream of mouth
Site 212	Unnamed	391	6	103P.079	C	6	10	
Site 130	Unnamed	399	3	103P.070	C	1.3		cascade over bedrock
Site 120	Unnamed	457	5	103P.069	C	3		chute over bedrock a barrier to fish migration
Site 19	Unnamed	1005	1	103P.069	F	2		
Site 116	Unnamed	1006	1	103P.070	F	3		falls in a canyon
Site 113	Unnamed	1128	1	103P.069	C	8		cascade over bedrock, barrier to fish migration.
Site 113	Unnamed	1128	1	103P.069	F	10		falls barrier to fish migration.
Site 109	Unnamed	1141	3	103P.069	F	4		falls - barrier to fish
Site 131	Unnamed	1362	2	103P.068	F	10		Falls and cascades at downstream end of site - barrier to fish
Site 143	Unnamed	1420	1	103P.078	C	1.5	2	Cascade downstream of block edge, no photo
Site 143	Unnamed	1420	1	103P.078	CN		100	Canyon near mouth
Site 1090	Tahtlum Cr.	470-245700-18800	7	93M.061	C	1.5		cascade over bedrock
Site 48	Mooluck Cr.	470-245700-69100-04200	4	93M.071	F	2		barrier to fish.
Site 147	Corral Creek	470-420300	3	103P.070	F	8		Falls - barrier to fish

APPPENDIX 2. SUMMARY OF BARRIERS IDENTIFIED IN THE KISPIOX WATERSHED

Site# / Historical NID / Reach NID	Local Name	Watershedcode/ILP	Reach #	Nid Map	Feature Type	Height (m)	Length (m)	Comment
Site 35	Clifford Creek	470-434800	3	103P.079	F	8		
Site 118	Steep Canyon Creek	470-511300	2	103P.069	F	20		falls barrier to fish.
Site 8	Brown Paint Cr.	470-525900	3	103P.069	F	6		

Appendix 3 Classification of all Streams Surveyed, September, 1999.

APPENDIX 3. CLASSIFICATIONS OF ALL STREAMS SURVEYED, SEPTEMBER 1999.

Site #	Local Name	Watershedcode / ILP	Reach #	Nid Map	Stream Order	Downstream Elevation (m)	Average Gradient %	Average Channel Width (m)	Proposed Stream Class	Fish Species
1	Unnamed	19	2	93M.061	2	650	5.00	3.22	S5	NFC
2	Unnamed	28	1	93M.061	1	650			NVC/NCD	NS
3	Unnamed	41	1	93M.061	2	530	4.33	2.80	S3	RB
4	Unnamed	51	1	93M.061	3	490	2.50	3.88	S3/S5	NFC
5	Unnamed	51	5	93M.061	2	820	5.67	1.35	S6	NFC
6	Unnamed	51	2	93M.061	2	600	3.33	2.54	S6	NFC
7	Unnamed	60	1	93M.061	1	630	2.67		NVC/NCD	NS
8	Unnamed	72	1	93M.061	3	510	6.00	1.70	S3	RB
9	Unnamed	73	1	93M.061	2	530	2.67	1.32	S6	NFC
10	Unnamed	101	1	93M.071	1	850			NVC/NCD	NS
11	Unnamed	102	1	103P.080	1	630	4.00		NVC/NCD	NS
12	Unnamed	199	2	103P.060	4	400	5.00	1.85	S3	CT
14	Unnamed	202	1	103P.060	3	420	5.67	2.35	S3/S6	NFC
15	Unnamed	202	3	103P.060	3	550	5.67	3.30	S5	NFC
16	Unnamed	202	5	103P.060	1	760	11.00	1.72	S6	NFC
17	Unnamed	204	2	103P.060	1	660	4.33	0.83	S6	NFC
18	Unnamed	214	1	103P.060	1	650	6.25	1.66	S6	NFC
19	Unnamed	218	1	103P.060	2	760	4.00	1.68	S6	NFC
20	Unnamed	227	1	103P.060	2	355	0.33	1.73	S3	NFC
21	Unnamed	233	3	103P.060	1	414	4.00	1.75	S3	CT
22	Unnamed	233	4	103P.060	1	500	21.00	1.45	S6	NS
23	Unnamed	235	1	103P.060	1	410	17.67	1.33	S4	CT
24	Unnamed	235	2	103P.060	1	460	21.00	1.30	S4/S6	NS
25	Unnamed	238	1	103P.060	1	460	13.00	1.28	S6	NFC
26	Unnamed	246	2	103P.060	1	375	2.33	0.72	NVC/NCD	NFC
27	Unnamed	257	8	103P.070	1	520	0.50	2.23	NCD/S6.	NFC
28	Unnamed	257	7	103P.070	2	490	2.33	0.92	S4	CT
29	Unnamed	258	1	103P.070	1	410			NVC/NCD	NS
30	Unnamed	261	1	103P.070	1	435	4.67		NVC/NCD	NS
31	Unnamed	262	1	103P.070	2	490	2.33	0.38	S6	NFC
32	Unnamed	268	1	103P.070	2	440			NVC/NCD	NS
33	Unnamed	274	1	103P.070	3	455	1.33	4.10	S3	CT

34	Unnamed	274	2	103P.070	2	470	5.33	4.45	S3	CT
35	Unnamed	274	3	103P.070	2	560	3.00	4.67	S5	NFC
36	Unnamed	275	1	103P.070	2	470	1.83	1.52	S3	CT
37	Unnamed	275	2	103P.070	1	500	4.33	1.33	S4	CT
38	Unnamed	276	1	103P.070	1	500	4.33	1.00	S4	CT
39	Unnamed	280	1	103P.070	1	730	0.17		S6/NVC	NFC
42	Unnamed	282	1	103P.070	1	530	6.67	1.27	S4	CT, DV
44	Unnamed	283	1	103P.070	1	550	4.67	1.83	S3	CT
47	Unnamed	283	1	103P.070	1	550	4.75	1.77	S6	NFC
48	Unnamed	284	2	103P.070	2	780	8.33	3.75	S5	NFC
49	Unnamed	284	1	103P.070	2	630	5.75	6.03	S5/S2	NFC
50	Unnamed	298	1	103P.060	1	360			NVC/NCD	NS
51	Unnamed	304	1	103P.060	3	370	3.75	4.23	S3	DV
52	Unnamed	304	3	103P.060	3	700	5.67	1.20	S6	NFC
53	Unnamed	305	3	103P.060	2	1100	2.33	1.32	S6	NFC
54	Unnamed	313	1	103P.060	1	390	7.00	0.87	S6	NS
55	Unnamed	326	1	103P.060	1	1110			NVC/NCD	NS
100	Unnamed	336	1	103P.060	4	375	12.00	5.92	S2	NFC
101	Unnamed	341	1	103P.060	3	907	1.33	1.20	S6	NFC
102	Unnamed	378	1	103P.070	1	670	3.50	1.34	S6	NFC
103	Unnamed	379	1	103P.070	1	750	25.25	1.37	S6	NS
104	Unnamed	391	6	103P.079	3	580	3.83	4.71	S3	DV
105	Unnamed	391	7	103P.079	3	730		5.38	S5	NS
106	Unnamed	399	3	103P.079	1	700	11.17	1.73	S6	NFC
107	Unnamed	408	1	103P.079	1	730	22.00	1.98	S6	NFC
108	Unnamed	408	2	103P.079	1	880	9.00	1.87	S6	NFC
109	Unnamed	426	1	103P.069	2	490			NVC/NCD S4, d/s	NS
110	Unnamed	432	1	103P.079	2	525	0.00	1.09	S4	CO
111	Unnamed	440	1	103P.079	1	650	17.33	1.38	S6	NFC
112	Unnamed	452	1	103P.070	1	415	3.50	0.88	S4	CT, CO
113	Unnamed	457	1	103P.069	3	425	6.33	4.13	S3	RB
114	Unnamed	457	3	103P.069	3	530	2.00	1.64	S3	RB
116	Unnamed	457	5	103P.069	3	700	2.00	3.20	S5	NFC
117	Unnamed	460	2	103P.069	2	620	1.50	2.23	S6	NFC
118	Unnamed	465	1	103P.069	1	560	2.33		NVC/NCD	NS
119	Unnamed	534	1	103P.060	11	1140	12.75	1.62	S6	NFC
120	Unnamed	535	3	103P.060	2	1191	2.33		NVC/NCD	NS

121	Unnamed	540	1	103P.060	2	1150	1.00	1.82	S6	NFC
122	Unnamed	545	1	103P.060	2	1330	2.00	1.27	S6	NFC
123	Unnamed	1005	1	103P.069	2	470	6.33	1.48	S4/S6	DV
124	Unnamed	1006	1	103P.070	2	580	3.83	5.74	S5	NFC
125	Unnamed	1014	1	93M.051	3	352	2.00	3.02	S3	LNC, CT, CO
126	Unnamed	1117	1	103P.069	1	435	1.50	1.52	S6	NS
127	Unnamed	1121	1	103P.069	1	570	9.67		NVC/NCD	NS
128	Unnamed	1128	1	103P.069	2	660	6.50	6.30	S2/S5	DV
129	Unnamed	1128	2	103P.069	1	750	8.33	4.68	S5	NFC
130	Unnamed	1129	1	103P.069	1	670			NVC/NCD	NS
131	Unnamed	1141	3	103P.069	3	610	2.83	2.37	S3	CT
132	Unnamed	1141	4	103P.069	2	710	0.33	1.33	S6	NFC
133	Unnamed	1149	1	103P.069	1	710	4.50	0.66	S6	NS
143	Unnamed	1151	1	103P.069	2	705	1.50	1.38	S6	NFC
144	Unnamed	1155	1	103P.069	2	690	2.33	1.15	S6	NFC
145	Unnamed	1362	2	103P.068	2	620	3.75	4.93	S5	NFC
146	Unnamed	1387	1	103P.078	1	505			NVC/NCD	NS
147	Unnamed	1420	1	103P.078	2	505	10.17	3.23	S5	NFC
148	Unnamed	1422	1	103P.078	1	510	9.33	2.61	S6*	NS
151	Unnamed	1423	3	103P.078	1	540	28.00	1.58	S6	NFC
152	Road Crossing 4+400, 392-65	1424	2	103P.078	1	520	9.67	1.70	S6	NFC
153	Creek A, 392-65	1425	2	103P.078	1	640	4.33	2.13	S6 200m u/s	NFC
154	Creek A, BLK 392-66	1428	2	103P.078	1	560	4.00	0.83	S6	NFC
155	Creek B, Stn 2+2 22.2 BLK 66	1429	2	103P.078	1	560	2.00	0.55	S6	NS
156	Unnamed	1431	1	103P.078	1	518			NVC/NCD	NS
201	Tahtlum Creek	470-245700-18800	1	93M.051	4	370	5.33	4.03	S3	CO, RB
202	Tahtlum Cr.	470-245700-18800	6	93M.061	3	620	5.50	2.19	S3	CT
203	Tahtlum Cr.	470-245700-18800	7	93M.061	3	700	5.67	2.93	S3	NFC
204	Mooluck Cr.	470-245700-69100-04200	4	93M.071	3	740	3.67	1.87	S6	NFC
205	Ironside Creek	470-335400	4	103P.070	3	500	3.67	8.07	S2	DV, CT, RB
206	Ironside Creek	470-335400	5	103P.070	3	630	6.67	7.33	S5	NFC
207	Ironside Creek	470-335400	6	103P.080	2	1000	7.50	0.82	S6	NFC
208	Corral Cr.	470-420300	2	103P.070	3	520	2.25	7.03	S2	DV

209	Corral Cr.	470-420300	4	103P.080	3	930	5.00	4.95	S5	NFC
210	Corral Creek	470-420300	3	103P.070	3	630	6.13	5.08	S5	NFC
211	Corral Cr.	470-420300	5	103P.080	3	1000	11.50	2.15	S6	NFC
212	Clifford Creek	470-434800	3	103P.079	3	520	2.33	3.82	S3	CO
213	Clifford Creek	470-434800	4	103P.079	3	650	27.67	2.82	S6	NFC
214	Steep Canyon Creek	470-511300	2	103P.069	4	500	3.25	9.14	S5	NFC
215	Steep Canyon Creek	470-511300	4	103P.060	3	1000	2.50	3.94	S5	NS
216	Beaver Lodge. Cr.	470-523700	3	103P.069	3	530	6.00	5.45	S2	DV,CT
217	Beaver Lodge Cr.	470-523700	4	103P.069	3	650	32.33	2.17	S3/S6	NFC
218	Beaver Lodge Cr.	470-523700	5	103P.069	3	860	7.00	1.77	S6	NFC
1090	Beaver Lodge Cr.	470-523700	7	103P.069	3	1100	2.00	1.66	S6	NFC
1160	Brown Paint Cr.	470-525900	3	103P.069	3	590	9.00	3.65	S5	NFC
2110	Brown Paint Ctr.	470-525900	5	103P.069	3	742	4.67	2.38	S6	NFC

Appendix 4 FDIS/Photos (separate binder)

Appendix 5 Project and Interpretative Maps (separate binder)

1:20,000 TRIM maps: **103P.060, 103P.068, 103P.069, 103P.070, 93M.071, 103P.078, 103P.079, 103P.080, 93M.051, 93M.061, 103P.059**

ATTACHMENT I -Planning Documents

Phase Completion Reports

ATTACHMENT II -Field Notes

Field Site Cards and Fish Cards

ATTACHMENT III - Photodocumentation

Binder With Photosummary Report
Labeled Negatives in Plastic Sleeves

ATTACHMENT IV - Digital Data

FDIS data
report e-files
map e-files
Phase completion reports

ATTACHMENT V -Hardcopy FISS Update Forms

FISS Update Forms
FISS Update Maps