

## PROJECT REFERENCE INFORMATION

|                                      |                             |
|--------------------------------------|-----------------------------|
| <b>MELP Project Code:</b>            | SCI_C172_001_2000           |
| <b>FRBC Activity Number:</b>         | 100883                      |
| <b>FDIS Project Number:</b>          | 06-ZYMO-000000996-1999      |
| <b>FRBC Region:</b>                  | Skeena - Bulkley Region     |
| <b>MELP Region:</b>                  | Skeena (06)                 |
| <b>MELP District:</b>                | Kalum District              |
| <b>FW Management Unit:</b>           | 6-09                        |
| <b>DFO Sub-District:</b>             | 4B                          |
| <b>Forest Region:</b>                | Prince Rupert               |
| <b>Forest District:</b>              | Kalum                       |
| <b>Forest Licensee and Tenure #:</b> | Skeena Cellulose Inc. TFL 1 |

## WATERSHED INFORMATION

|                                    |                                                                                                                                                                                                                                                                                                                              |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Watershed Group</b>             | Zymoetz (Cooper) River                                                                                                                                                                                                                                                                                                       |
| <b>Watershed Name</b>              | Kitnayakwa River                                                                                                                                                                                                                                                                                                             |
| <b>Watershed Codes</b>             | Kitnayakwa (440-314000)                                                                                                                                                                                                                                                                                                      |
| <b>UTM at Mouth</b>                | 9.569045.6036743                                                                                                                                                                                                                                                                                                             |
| <b>Study area (approx.)</b>        | 28,550 ha                                                                                                                                                                                                                                                                                                                    |
| <b>Total of All Stream Lengths</b> | 727 km                                                                                                                                                                                                                                                                                                                       |
| <b>Stream Orders</b>               | Kitnayakwa River - 6th<br>Steward Creek - 5th<br>Nilah Creek - 4th<br>Miners Creek - 4th<br>Cole Creek - 3rd                                                                                                                                                                                                                 |
| <b>NTS Map</b>                     | 93L/5, 93L/8, 93L/12, 103I/8                                                                                                                                                                                                                                                                                                 |
| <b>TRIM Maps</b>                   | 93L.021, 93L.022, 93L.031, 93L.032, 93L.041,<br>93L.042, 103I.050, 93L.051, 93L.052,                                                                                                                                                                                                                                         |
| <b>BEC Zone</b>                    | CWH, MH, AT                                                                                                                                                                                                                                                                                                                  |
| <b>Air Photos</b>                  | (SCI) Roll SRS 5951 - 5435.3: #55-65, 5434.3: 42-<br>54, 5433.3: 15-27, 5432.3: 28-41, 5431.3: 1-14<br>Roll SRS 5950 - Line 5430.3: 534-550, 5429.2: 516-<br>533, 5428.2: 431-448, 5427.2: 493-515, 5426.2: 449-<br>471, 5425.2: 472-492, 5424.2: 410-430, 5423: 357-<br>370, 5422: 291-300, 5421: 345-356, 5420.2: 221-230, |

5419.2: 285-290, 5418.2: 172-182, 5417.2: 210-220,  
5416.2: 123-130, 5415.2: 132-171, 5414.2: 112-120,  
5413.2: 73-80, 5412: 37-41

|                        |                  |
|------------------------|------------------|
| <b>Watershed Name</b>  | Kitnayakwa River |
| <b>Watershed Code</b>  | 440-314000       |
| <b>UTM at Mouth</b>    | 9.569015.6036744 |
| <b>Watershed Area</b>  | 28,549 ha        |
| <b>Mainstem Length</b> | 33.0 km          |
| <b>Stream Order</b>    | 6th              |

|                          |                  |
|--------------------------|------------------|
| <b>Subwatershed Name</b> | Steward Creek    |
| <b>Watershed Code</b>    | 440-314000-06000 |
| <b>UTM at Mouth</b>      | 9.570664.6036234 |
| <b>Watershed Area</b>    | 3,552 ha         |
| <b>Mainstem Length</b>   | 10.3 km          |
| <b>Stream Order</b>      | 5th              |

|                          |                  |
|--------------------------|------------------|
| <b>Subwatershed Name</b> | Nilah Creek      |
| <b>Watershed Code</b>    | 440-314000-08600 |
| <b>UTM at Mouth</b>      | 9.571499.6036214 |
| <b>Watershed Area</b>    | 2,695 ha         |
| <b>Mainstem Length</b>   | 7.9 km           |
| <b>Stream Order</b>      | 4th              |

|                          |                  |
|--------------------------|------------------|
| <b>Subwatershed Name</b> | Miners Creek     |
| <b>Watershed Code</b>    | 440-314000-78900 |
| <b>UTM at Mouth</b>      | 9.578995.6019660 |
| <b>Watershed Area</b>    | 2,033 ha         |
| <b>Mainstem Length</b>   | 9.8 km           |
| <b>Stream Order</b>      | 4th              |

|                          |                  |
|--------------------------|------------------|
| <b>Subwatershed Name</b> | Cole Creek       |
| <b>Watershed Code</b>    | 440-314000-03100 |
| <b>UTM at Mouth</b>      | 9.569240.6037200 |
| <b>Watershed Area</b>    | 1,950 ha         |
| <b>Mainstem Length</b>   | 8.2 km           |
| <b>Stream Order</b>      | 3rd              |

|                                                   |        |
|---------------------------------------------------|--------|
| <b>Total Stream Lengths<br/>in the Study area</b> | 727 km |
|---------------------------------------------------|--------|

## **SAMPLING DESIGN SUMMARY**

|                                |                              |
|--------------------------------|------------------------------|
| <b>Total Number of Reaches</b> | 1039                         |
| <b>Random Sample Sites</b>     | 16                           |
| <b>Discretionary Sites</b>     | 49                           |
| <b>Total Sample Sites</b>      | 65                           |
| <b>Field Sampling Dates</b>    | August 7 - September 7, 1999 |

## CONTRACTOR INFORMATION

Project Director:     *Name:*       Dave Gordon, A.Sc.T.  
                              *Address:*     Triton Environmental Consultants Ltd.  
                                              Box 88, Terrace, BC V8G 4A2  
                              *Phone:*       (250) 635-1494

Project Manager:     *Name:*       Eva Wichmann, B.Sc., R.P.Bio.  
                              *Address:*     Triton Environmental Consultants Ltd.  
                                              Box 88, Terrace, BC V8G 4A2  
                              *Phone:*       (250) 635-1494

Field crew:           *Names:*       Bryan Williams, Eva Wichmann, Darrel  
                                              Davis, Stacy Brown,  
Data Entry by:       *Names:*       Karla Graf, Eamon Miyagi  
Report prepared by:   *Name:*       Eva Wichmann  
Report reviewed by:   *Name:*       Dave Gordon

Maps prepared by:    *Names:*       Amy Waterhouse, Elizabeth Murphy, Jennifer  
                                              Link, Edward Lem, Kay Kennes  
                              *Company:*    Triton Environmental Consultants Ltd.  
                              *Address:*     #120 13511 Commerce Parkway. Richmond.  
                                              B.C. V8V 2L1  
                              *Phone:*       (604)279-2093

DNA Sample           *Name:*       Susan Pollard  
Submission:                               Conservation Section, BC Ministry of  
                                              Fisheries  
                              *Address:*     PO Box 9359 Stn. Provincial Government  
                                              Victoria, BC., V8W 9M2

## **DISCLAIMER**

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

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| Appendix 3 | DNA Sample Submission Form                                                                                              |

## LIST OF ATTACHMENTS AVAILABLE AT MELP OFFICE

- Attachment I - Planning Documents** (submitted with No Gold Fish Inventory)  
 Phase 4 and Project Completion Reports  
 Phases I-III Pre-field Project Planning Report Reconnaissance  
 (1:20,000) Fish and Fish Habitat Stream Inventory in the Kitnayakwa,  
 Kitnayakwa, and Williams/Hatchery Working Areas  
 Triton Environmental Consultants, 1999.
- Attachment II - Field Notes**  
 Site Cards (65)  
 Fish Cards (57)
- Attachment III - Photodocumentation**  
 Binder With Photosummary Report  
 Index Tabs  
 Labelled Negatives in Plastic Sleeves  
 Photo CD #3710
- Attachment IV - Digital Data**

### Watershed Report Files (on CD):

|                  |              |
|------------------|--------------|
| Watershed report | Kitnay.doc   |
| Figure 1         | Overview.apr |
| Figure 2         | Fishdta2.xls |
| Table 1          | Watsumm.xls  |
| Table 2          | 3rdplus.xls  |
| Table 3          | Habitatq.xls |
| Table 4          | Habdescr.xls |
| Table 5          | Barrier.xls  |
| Table 6          | NVC.xls      |
| Table 7          | NVC.xls      |
| Table 8          | Fishdist.xls |
| Table 9          | Barrier.xls  |
| Table 10         | Rprtfish.xls |
| Table 11         | Rprtfish.xls |
| Table 12         | Rprtfish.xls |
| Table 13         | Rprtfish.xls |
| Table 14         | Individ.xls  |
| Table 15         | Efdata.xls   |
| Table 16         | Slope_2.xls  |
| Table 17         | Restore.xls  |
| Table 18         | Sitesum.xls  |

## LIST OF ATTACHMENTS AVAILABLE AT MELP OFFICE (CONTINUED)

|                    |              |
|--------------------|--------------|
| Table 19           | Sitesum.xls  |
| Table 20           | Sitesum.xls  |
| Table 21           | Efdata.xls   |
| Table 22           | Order.xls    |
| Table 23           | Elev.xls     |
| Table 24           | Slope_2.xls  |
| Table 25           | Fishbarr.xls |
| Table 26           | Wild.xls     |
| Table 27           | Watqual.xls  |
| Photo Form1        | Form1.xls    |
| Appendix I Index   | Index.xls    |
| Appendix III table | Genetic.xls  |

**FDIS Files (on CD):**

|               |             |
|---------------|-------------|
| FDIS database | Fdisdat.mdb |
|---------------|-------------|

**ARC/INFO (on CD):**

|             |              |
|-------------|--------------|
| Export File | f6199910.e00 |
|-------------|--------------|

**Attachment V - Hardcopy FISS Update Forms**  
 FISS Update Forms  
 FISS Update Maps 93L/5

## LIST OF ABBREVIATIONS

|      |                                          |
|------|------------------------------------------|
| asl  | above sea level                          |
| BT   | bull trout                               |
| CH   | chinook salmon                           |
| CO   | coho salmon                              |
| CP   | cascade pool                             |
| CT   | cutthroat trout                          |
| DV   | Dolly Varden                             |
| EF   | electrofishing                           |
| FDIS | Field Data Information System            |
| FISS | Fisheries Information Summary System     |
| FRBC | Forest Renewal B.C.                      |
| ILP  | interim locational point                 |
| LWD  | large woody debris                       |
| MELP | Ministry of Environment, Lands and Parks |
| MT   | minnow trap                              |
| NCD  | non classified drainage                  |
| NFC  | no fish caught                           |
| NFU  | no fish use                              |
| NID  | numeric identifier                       |
| NS   | not sampled                              |
| NTS  | National Topographic Series              |
| NVC  | no visible channel                       |
| RB   | rainbow trout                            |
| SCI  | Skeena Cellulose Inc                     |
| ST   | steelhead trout                          |
| SWD  | small woody debris                       |
| TECL | Triton Environmental Consultants Ltd.    |
| TRIM | Terrain Resource Inventory Mapping       |
| VO   | visual observation                       |

## **ACKNOWLEDGEMENTS**

Funding for this inventory was provided by Forest Renewal BC - a partnership of forest companies, workers and environmental groups, First Nations, communities and government.

We would like to thank Kim Haworth, Skeena Cellulose Inc, and Brad Pollard, Acer Resources Consultants Ltd, for their guidance and assistance at various stages of this project. We thank Sam Buchanan and Brad Pollard of Acer Resource Consultants Ltd. for their input while conducting the quality assurance for this project. We would also like to thank Paul Giroux, Inventory Specialist, MELP and Quantum Helicopters.

## **1.0 INTRODUCTION**

Triton Environmental Consultants Ltd. (Triton) was contracted by Skeena Cellulose Ltd (SCI) to conduct a fish and fish habitat inventory of the Kitnayakwa River watershed (440-314000). Funding for the project was provided by Forest Renewal BC (FRBC). The project involved Phase 4 (field data collection), Phase 5 (data analysis) and Phase 6 (mapping and reporting). Phases 1 to 3 (pre-field planning) were conducted by Triton (1999a) and identified historical data, sample reaches, and the Project Plan for this inventory.

The fish and fish habitat inventory program provides information regarding fish species presence, distribution and relative abundance, as well as stream reach biophysical data, for use in interpretation of habitat sensitivity and capability for fish production. Information required to plan forestry prescriptions under the Forest Practices Code can also be obtained from fish and fish habitat inventories.

### **1.1 Objectives**

Triton's goal was to conduct a Phase 4 to Phase 6 reconnaissance (1:20,000) fish and fish habitat survey of the Kitnayakwa Planning Unit, with the intention of describing fish distributions and habitat characteristics to aid in future resource planning in the watershed. The project included only stream sample sites.

### **1.2 Location**

The Kitnayakwa River is a tributary to the Copper (Zymoetz) River, located at approximately 45 km upstream from the Copper River confluence with the Skeena River. The Kitnayakwa study area includes the Kitnayakwa River mainstem and its tributaries, as well as tributaries to the Copper River from the Kitnayakwa River confluence to the Clore River (Figure 1). The area is primarily within the coastal western hemlock (CWH) biogeoclimatic zone, with higher elevation areas in the mountain hemlock (MH) and Alpine Tundra (AT) zone. The study area falls within the Bulkley Ranges of the Hazelton Mountains and is characterised by steep terrain with entrenched glacial streams. The upper end of the watershed, however, is located on a high elevation plateau (starting at 960m) with low gradient meandering stream channels and wetland-like habitats throughout. The study area is approximately 28,550 ha, covering nine 1:20,000 scale TRIM mapsheets (Figure 1).

Major tributaries to the Kitnayakwa River are Steward Creek, Nilah Creek, and Miner's Creek. Cole Creek is a major Copper River subbasin within the study area. Access into the study area was primarily by helicopter, as road development in the watershed is insufficient to access many sample sites.



Figure 1. Kitnayakwa River Stream Inventory Overview Map.

Table 1. Summary of watershed information for subbasins within the Kitnayakwa Planning Unit.

Table 1. Summary of watershed information for subbasins within the Kitnayakwa Planning Unit.

| Local Name       | Watershed Code   | UTM at Mouth |         |          | Watershed Area (ha) | Mainstem Length (km) | Stream Order | NTS Maps      | BGC Zone <sup>a</sup> | Lake Names and Individual Areas                                               | Wetlands Total Area (ha) |
|------------------|------------------|--------------|---------|----------|---------------------|----------------------|--------------|---------------|-----------------------|-------------------------------------------------------------------------------|--------------------------|
|                  |                  | Zone         | Easting | Northing |                     |                      |              |               |                       |                                                                               |                          |
| Kitnayakwa River | 440-314000-00000 | 9            | 569015  | 6036744  | 28,550              | 33                   | 6            | 93L/5         | CWH, MH, AT           | unnamed (1.3, 2.6, 14.1, 1.9, 1.3, 3.8, 2.6, 1.9, 6.4, 2.6, 8.3, 5.8, 8.3 ha) | 107                      |
| Steward Creek    | 440-314000-06000 | 9            | 570664  | 6036234  | 3,552               | 10.3                 | 5            | 93L/5         | CWH, MH, AT           | none                                                                          | none                     |
| Nilah Creek      | 440-314000-08600 | 9            | 571499  | 6036214  | 2,695               | 7.9                  | 4            | 93L/5, 93L/12 | CWH, MH, AT           | unnamed (14.2 ha)                                                             | none                     |
| Miners Creek     | 440-314000-78900 | 9            | 578995  | 6019660  | 2,033               | 9.8                  | 4            | 93L/5         | CWH, MH, AT           | unnamed (1.9, 3.2, 2.6 ha)                                                    | 30                       |
| Cole Creek       | 440-314000-03100 | 9            | 569240  | 6037200  | 1,950               | 8.2                  | 3            | 93L/5         | CWH, MH, AT           | none                                                                          | 43                       |

a. BGC Zone - Biogeoclimatic zone, CWH - coastal western hemlock, MH - Mountain Hemlock, AT - Alpine Tundra

### 1.2.1 Access

Access into the study area was by helicopter as well as 2 and 4 wheel drive vehicle. Road access is available to reach 3 on the mainstem and reach 2 of Nilah Creek. Access to the lower watershed from Terrace is as follows:

- follow Hwy. 16 approximately 14 km east of Terrace to the Copper River Forest Service Road
- follow the Copper River Forest Service Road approximately 44.8 km east to the Kitnayakwa Mainline.

## **2.0 RESOURCE USE**

### **2.1 Historical Fish Species and Distribution**

During the Phase 1-3, historical fish distribution data were collected from the FISS database (DFO 1999) and maps (MELP and DFO 1995), as well as existing reports. Species indicated present in the study area include:

- coho salmon (*Oncorhynchus kisutch*)
- chinook salmon (*O. tshawytscha*)
- steelhead / rainbow trout (*O. mykiss*) and cutthroat trout (*O. clarki*),
- Dolly Varden char (*Salvelinus malma*)
- bull trout (*S. confluentus*) - a blue listed species according to the conservation data center (CDC) - are known to be present both upstream and downstream of the study area (Triton 1998, 1999b) and are therefore assumed present within the study area.

Other species found within the Copper River watershed include: sculpins (*Cottus* spp.), burbot (*Lota lota*), longnose dace (*Rhinichthys cataractae*), longnose sucker (*Catostomus catostomus*) and peamouth chub (*Mylocheilus caurinus*).

David Bustard and Associates (1994) surveyed the upper Kitnayakwa watershed and found 3 falls barriers of 2m in height each in an entrenched canyon in Reach 3. This section was assumed to be the upstream limit of anadromous fish migration for the mainstem, as no anadromous fish were captured in sampling efforts upstream. The upstream limit of resident fish use for the watershed is believed to be a 4m falls at the Reach 3/4 break, no fish were captured during sampling above these falls. A 20m falls occurs approximately 1 km upstream of the 4m falls in Reach 4. Sample sites and significant features noted from this study are shown on the Project and Interpretive maps.

A Level 1 WRP Fisheries Assessment for the Zymoetz River was completed by RJA Forestry Ltd (Pollard *et. al.*, 1996) in 1995. The report includes descriptions of forestry related impacts to fish habitat within the Kitnayakwa watershed and provides preliminary restoration options. No fish sampling occurred during this study. A 20m high, 80m long

### **2.3 First Nations Uses/Harvest**

The Phase 1 to 3 did not identify First Nations issues or interests in the study area. The study area is within the traditional territory of the Kitselas Band.

## **3.0 METHODS**

The project was carried out following the *1:20,000 Reconnaissance Fish and Fish Habitat Inventory Standards, Version 1.1* (BC Ministry of Fisheries 1998). Study specific details were identified in the Project Plan (Triton Environmental Consultants Ltd. 1999a).

### **3.1 Phase 4 - Field Survey**

The field survey was conducted from August 7th to September 7th, 1999 by two two-person crews. A total of 41 sites were accessed by helicopter, while 24 sites were accessed by 2 or 4 wheel drive vehicle.

The following information was recorded on the Site Cards in the comments section and will provide information to the fish stream identification portion of the study:

- stream classification
- comments supporting stream classification
- general habitat comments
- habitat restoration comments
- comments relating to best management practices (i.e. areas of concern regarding harvesting practices and road building), such as bank stability.

Fish sampling focused on reaches of <20% gradient, with an average slope of ≤10% at most sites. No voucher samples or fish ageing structures were collected. DNA samples were collected. Features relevant to fish distribution and fish habitat were recorded, georeferenced, and photographed. The photodocumentation includes the following sample reach conditions:

- upstream and downstream photos of sample sites
- riparian conditions
- barriers and obstructions to fish migration
- critical habitats for all life stages of fish
- fisheries sensitive zones
- bank characteristics effecting fish habitat quality
- areas of concern regarding harvesting practices and road building

### 3.1.1 Equipment

The following equipment was used to conduct the stream surveys:

- Smith Root 15A and 12 B POW, Backpack Electrofishers and associated equipment
- LaMotte pH PockeTester 1 Waterproof
- LaMotte TDS PockeTester 1 Waterproof
- hip chains at 0.1 m increments
- measure tapes at 0.01 m increments
- meter sticks with 0.01 m increments
- fish boards at 1 mm increments
- dissection kits, slides, DNA vials, voucher bottles,
- Abney levels
- 32 mm Cannon Sureshot camera and Pentax Zoom 90-WR camera with 200 ASA film

## **3.2 Phase 5 - Data Compilation**

The data compilation took place both in the field and in the office. Cards were reviewed daily and data were transferred to working maps. Immediately following the field program, data were entered into MELP's inventory database (FDIS version 7.0) and the photographs were developed, scanned into digital format, and captioned for inclusion in the final report. Genetic samples were submitted to Susan Pollard, MELP for analysis (submission form included in Appendix 3), but results have not yet been received.

A fish density index (fish/100 m<sup>2</sup>) was calculated for each site using the data collected in the field. Measurements of site area were calculated using length and width estimates from the fish collection cards to reflect area sampled by electrofishing rather than the habitat area sampled. It is important to note that the fish density index is calculated within the context of the Fish and Fish Habitat Inventory Program and its standard fish sampling methods. Therefore, the use of stopnets and multiple removal sampling was not included. In addition, the time spent (seconds) electrofishing each m<sup>2</sup> may vary between sites given variation in site condition such as substrate, cover availability, flow and turbidity. The calculation of a fish density index is carried out in the Fish and Fish Habitat Assessment Tool (FHAT20) developed by the Ministry of Fisheries (Ecometric Research Inc 1999).

## **3.3 Phase 6 - Reports and Maps**

This report follows the MELP outline indicated in the RIC 1:20,000 Inventory Standards and includes descriptions of the project objectives, study area, methodology, results, and recommendations for future sampling. Fisheries values, stream classifications and management recommendations have been described for sampled stream reaches. The rationale for assigning non-fish bearing status to sampled reaches is provided, as are recommendations for future sampling in reaches where no fish were caught, but where they were classified as fish bearing by default. The database output is included as a set of appendices and includes FDIS reach cards, site cards and fish forms (Appendix 1).

cascade was noted on Cole Creek approximately 200m upstream of the confluence with the Copper River. A 250m cascade with a drop of 40m was noted near the Reach 1/2 break of Cole Creek. A high degree of beaver activity was also noted for Cole Creek.

A Level 1 Detailed Watershed Restoration Program (WRP) assessment has been conducted in the Zymoetz Watershed by Applied Ecosystem Management Ltd *et al* (1999). This report includes an aquatic assessment as well as a detailed riparian assessment of the watershed. Specifically, it details significant individual forestry related impacts to fish habitat and provides prescriptions for their restoration. Areas examined which are relevant to the Kitnayakwa study area are: the Kitnayakwa River, Cole Creek, Nilah Creek and Steward Creek. Among the findings of this study are numerous road related and natural slide areas along Reach 1 of the Kitnayakwa River. These have been mapped on the Project and Interpretive maps.

Of additional interest in this watershed is the identification of two sections of channel which are currently not flowing as mapped on the TRIM stream network. The first of these is Reach 1 of Cole Creek, which is shown on TRIM as crossing under the Kitnayakwa Mainline Road and flowing into reach 1 of the Kitnayakwa River. However, the present channel is located on the north side of the Kitnayakwa Mainline. The channel flows northwest in reach 1 such that it enters the Copper River immediately upstream of the mouth of the Kitnayakwa. Culverts are in place at the location of the mapped road crossing, presumably to accommodate flood level waters. These culverts have been cited as a contributing factor to a significant slide in reach 1 of the Kitnayakwa River, at the location of the mapped channel (Pollard *et. al.* 1996). Pollard *et. al.* (1996) recommend the culverts be removed, but suggest that there is no evidence that Cole Creek ever flowed as mapped, into the Kitnayakwa River. The current channel location has been added to the Project and Interpretive maps.

The second channel alteration is an avulsion in Reach 2 of Nilah Creek. The historical channel bed has been abandoned as the result of flow alterations related to a natural slide occurring upstream. The channel is now working through an existing cutblock on the left bank of this section of the creek.

Sample sites and significant features noted from previous work in the study area are shown on Interpretive maps.

## **2.2 Development and Land Use**

Forest harvesting in the Kitnayakwa Planning Unit is carried out primarily by Skeena Cellulose Inc. There are no formal Forest Service Recreation Sites in the study area. Although no recreational anglers were observed in the study area during the study, it is possible that anglers fish the lower Kitnayakwa River and access this area via the Kitnayakwa Mainline. In addition, it is known that the Copper River provides high quality recreational angling opportunities.

A 1:200,000, colour laser print overview map, outlining the location and perimeter of the study area has been provided in Figure 1. Project and Interpretative maps at 1:20,000 scale were generated using Arc Info and Arc View software and have been included in Appendix 2. The Project and Interpretative maps overlap somewhat and include the following information:

- watershed codes (or ILP if the watershed code was missing)
- stream names
- stream network
- historical data
- fish and survey site locations
- barriers to fish migration

The Project maps include reach summaries for reaches with <30% gradient. These summaries include reach classification (stream or wetland), confinement, slope and channel pattern data.

The Interpretive maps include channel width and slope data, data relating to fish sampling, and colour coded fish distribution data. Confirmed fish presence is indicated by a solid red line, confirmed fish absence is indicated by a solid blue line. Inferred fish presence or absence is indicated by dashed lines. Fish absence or presence was identified through background information, fish sampling, field observations, map/field gradient or a combination thereof.

## **4.0 RESULTS AND DISCUSSION**

The data collected in the field as well as the photographs taken at every site are presented in Appendix 1 - FDIS Summary and Photographs. The Project Maps and Interpretative Maps showing sample sites, fish distributions and site and reach data have been included in Appendix 2.

### **4.1 Logistics**

#### **4.1.1 Field**

No major logistical problems were encountered during the field program. In some cases, fish presence/absence could not be confirmed, due to site conditions at the time of the survey (i.e.: dry stream channel). In these cases, fish presence/absence was inferred based on habitat quality, proximity of fish bearing waters, seasonal habitat availability, gradient, access and professional judgement. The Project Plan (Triton Environmental Consultants Ltd 1999a) identified sampling would be carried out at 63 sites. During the field program an additional 3 sites were sampled to bring the total number of samples sites to 66.



#### 4.1.2 Reporting and Mapping

Minor problems or anomalies were encountered during the Phase 5 and 6. Two waterbody identifiers provided in the MELP waterbody exp file have corresponding watershed codes that are not consistent with the stream network on the 1:20,000 TRIM maps. WBID 00540ZYMO should have the watershed code of Nilah Creek (440-314000-08600) and WBID 00980ZYMO should have a watershed code associated with Miners Creek (440-314000-78900). In addition, tributaries to the Copper River do not carry the Kitnayakwa Inventory Project Code (06-ZYMO-000000996-1999), but rather the Project Code for the No Gold Inventory (06-ZYMO-000000993-1999). The project codes are linked to the watershed codes and are also received in the watershed code exp file from MELP. The project and watershed codes in the database and on the maps reflect the codes provided in the waterbody exp file.

Since Cole Creek does not flow into reach 1 of the Kitnayakwa River, but rather into the Copper River, Cole Creek should have the Copper River parent watershed code. However, the watershed code for Cole Creek is 440-314000-03100, suggesting it flows into the Kitnayakwa River. The watershed codes are assigned by MELP and any revisions would have to be initiated by MELP.

At the time of report and map preparation the watershed codes for this project had not been received from MELP to replace the existing ILPs in the database and maps. In addition, the results of the DNA analysis had not been received for inclusion into the report and database.

## **4.2 Summary of Biophysical Data For Sub Basins**

For the purposes of this report, five major subbasins are identified and referred to throughout the report; Kitnayakwa River (study area), Steward Creek, Nilah Creek, Miners Creek, and Cole Creek. A summary of the biophysical information for these drainages is provided in . A list of all 3rd order and higher streams found in the study area is presented in Table 2 and indicates there are 48 such subbasins within the study area.

## **4.3 Habitat and Fish Distribution**

Due to the steep nature of the landscape, fish habitat is limited by gradient in most first, second and third order streams in this study area. Important fish habitat occurs in the floodplain of the Copper River and in the valley bottom areas of the major subbasins of the study area. The Copper River was not sampled as part of this survey, but is known to

**Table 2.** Summary of 3rd order and higher streams in the Kitnayakwa Planning Unit, September 1999.

Table 2. Summary of 3rd order and higher streams in the Kitnanyakwa Planning Unit

| Local Name        | Watershed Code/ ILP          | Site Map | Reach 1 Gradient% <sup>a</sup> | Stream Order <sup>a</sup> |
|-------------------|------------------------------|----------|--------------------------------|---------------------------|
|                   | 1610                         | 93L.041  | 23                             | 3                         |
|                   | 1651                         | 93L.041  | 28                             | 3                         |
|                   | 1715                         | 93L.041  | 68                             | 3                         |
|                   | 1725                         | 93L.041  | 12                             | 3                         |
|                   | 1813                         | 93L.041  | 48                             | 3                         |
|                   | 1814                         | 93L.041  | 47                             | 3                         |
|                   | 1819                         | 93L.041  | 32                             | 3                         |
|                   | 1842                         | 93L.042  | 25                             | 3                         |
|                   | 1865                         | 93L.041  | 9                              | 3                         |
|                   | 1898                         | 93L.041  | 26                             | 3                         |
|                   | 1937                         | 93L.042  | 30                             | 3                         |
|                   | 2005                         | 93L.032  | 27                             | 3                         |
|                   | 2028                         | 93L.031  | 16                             | 3                         |
|                   | 2129                         | 93L.031  | 11                             | 3                         |
|                   | 2141                         | 93L.031  | 28                             | 3                         |
|                   | 440-291700-00000-00000-      | 93L.041  | 34                             | 3                         |
|                   | 440-292700-00000-00000-      | 93L.041  | 28                             | 3                         |
|                   | 440-314000-03100-00000-      | 93L.041  | 6                              | 3                         |
|                   | 440-314000-06000-37600-      | 93L.041  | 23                             | 3                         |
|                   | 440-314000-06000-83800-      | 93L.031  | 33                             | 3                         |
|                   | 440-314000-08600-40400-      | 93L.041  | 3                              | 3                         |
|                   | 440-314000-08600-71700-      | 93L.041  | 65                             | 3                         |
|                   | 440-314000-23200-29300-      | 93L.041  | 40                             | 3                         |
|                   | 440-314000-32700-57800-4870- | 93L.031  | 4                              | 3                         |
|                   | 440-314000-34300-55600-      | 93L.042  | 56                             | 3                         |
|                   | 440-314000-39300-00000-      | 93L.031  | 23                             | 3                         |
|                   | 440-314000-39300-46000-      | 93L.031  | 31                             | 3                         |
|                   | 440-314000-44400-00000-      | 93L.032  | 13                             | 3                         |
| O'Brien Creek     | 440-314000-50400-00000-      | 93L.032  | 22                             | 3                         |
|                   | 440-314000-53900-34500-      | 93L.031  | 8                              | 3                         |
| Tan Creek         | 440-314000-54700-00000-      | 93L.032  | 10                             | 3                         |
|                   | 440-314000-63200-00000-      | 93L.031  | 4                              | 3                         |
| Tatsi Creek       | 440-314000-66600-00000-      | 93L.032  | 9                              | 3                         |
|                   | 440-314000-78900-15400-      | 93L.031  | 4                              | 3                         |
|                   | 440-314000-81800-00000-      | 93L.031  | 8                              | 3                         |
|                   | 440-314000-84000-00000-      | 93L.031  | 11                             | 3                         |
|                   | 440-314000-06000-51700-      | 93L.041  | 16                             | 4                         |
|                   | 440-314000-06000-69900-      | 93L.041  | 16                             | 4                         |
| Nilah Creek       | 440-314000-08600-00000-      | 93L.041  | 5                              | 4                         |
|                   | 440-314000-23200-00000-      | 93L.041  | 20                             | 4                         |
|                   | 440-314000-25600-00000-      | 93L.041  | 14                             | 4                         |
|                   | 440-314000-32700-00000-      | 93L.041  | 13                             | 4                         |
| Iceflow Creek     | 440-314000-34300-00000-      | 93L.041  | 18                             | 4                         |
|                   | 440-314000-53900-00000-      | 93L.031  | 8                              | 4                         |
| Miners Creek      | 440-314000-78900-00000-      | 93L.031  | 2                              | 4                         |
|                   | 440-314000-78900-62900-      | 93L.031  | 8                              | 4                         |
| Steward Creek     | 440-314000-06000-00000-      | 93L.041  | 13                             | 5                         |
| Kitnanyakwa River | 440-314000-00000-00000-      | 93L.041  | 4                              | 6                         |

a. reach 1 gradient and order are based on Phase 1-3 planning data

provide important spawning, overwintering and/or rearing habitat for species such as steelhead trout/rainbow trout, cutthroat trout, coho, chinook, Dolly Varden, and bull trout. A canyon on the Copper River downstream of the study area is a velocity barrier for pink and chum salmon. This canyon has been blasted to improve access for steelhead, chinook and coho.

Fish and/or fish habitat data were collected at a total of 66 sites in the Kitnayakwa Planning Unit. Fish sampling was conducted at 57 sites in the major subbasins, as well as in first and second order tributaries, in the study area. Habitat data were collected at 65 sites in the study area. There was one site at which only fish sampling was conducted. Field crews recorded the types of habitat (overwintering, rearing, and spawning) and assessed the habitat quality in the sampled reaches.

Table 3 provides an overview of habitat quality at each site, while Table 4 provides habitat and channel characteristics at fish bearing sites. A summary of barriers identified in the study area is presented in Table 5. The tables are organized consecutively by watershed code/ILP and reach, and allow the user of the maps and report to quickly reference qualitative and quantitative site information. A discussion of fish habitat and distributions for major subbasins is provided in Section 4.3.1, while a discussion of rearing, spawning and overwintering habitat is found in Section 4.5.1.

A total of 45 sites were non-fish bearing. Seven sites were classified as “No Visible Channel”(Table 6). Fish were caught at 14 of a total of 57 stream reach sites electrofished during Phase 4. The species sampled were coho, chinook, rainbow trout/steelhead, cutthroat trout, Dolly Varden and bull trout. No coarse fish species were documented during the survey. The species present in each of the major subbasins are summarized in Table 7.

Fish distributions within the study area are generally defined by the presence of barriers. Table 8 summarizes the fish distribution limits for the major subbasins within the Kitnayakwa Planning Unit and identifies sample sites upstream of these barriers.

#### 4.3.1 Major Subbasins

##### *4.3.1.1 Kitnayakwa River*

The Kitnayakwa River is a 6th order stream that drains north into the Copper River, upstream of the Clore River confluence and downstream of the Limonite Creek confluence. Dolly Varden/bull trout, coho, chinook and rainbow trout/steelhead have been documented in this watershed. Fish habitat is concentrated within the valley bottom and the majority of suitable fish habitat is therefore located in the mainstem. The gradient of the mainstem reaches is <10% from the mouth to reach 8 and increases to 15% in reach 9.

**Table 3.** Summary of fish habitat quality observed at sample sites in the Kitnayakwa Planning Unit, September 1999.

Table 3. Summary of fish habitat quality observed at sample sites in the Kinayakwa Planning Unit, September 1999.

Table 3. con't....

| Site | Name         | Watershed Code/ILP | Reach | Fish Species <sup>a</sup> | Proposed Stream Class <sup>b</sup> | Spawning                                                                                                                                          | Overwintering                                                                                   | Rearing                                                                                                                                                                                        | Other                                                                                                                                                                                                                                                                                                                                                                            |
|------|--------------|--------------------|-------|---------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Harvey Cr.   | 440-290800-00000   | 2     | NFC                       | S5                                 | No suitable gravels present for spawning.                                                                                                         | Poor overwintering: pools are present, but lack sufficient depth.                               | Poor rearing, pools isolated by cascades.                                                                                                                                                      | No access noted from Copper River - LWD debris (cut timber) piled near mouth, creek reduced to small channels which disappear. Poor fish habitat, with high gradient upstream. Steep gradient step pool habitat from road upstream for 30 m.<br><br>Downstream of road, creek has good fish habitat with cover, refuge habitat, spawning gravels for anadromous & resident fish. |
| 2    | Unnamed      | 29                 | 1     | NFC                       | S6                                 | None: no spawning gravel in large enough patches.                                                                                                 | Poor overwintering habitat with no deep pools and not enough gravel.                            | Poor rearing due to steep gradient and shallow pools with difficult access between them.                                                                                                       | Poor fish habitat due to steeper gradient, frequent deadfall across creek. Small channel, mossy banks flowing over bedrock, underground flow in many areas. No connection to Copper River. 8 m chute at bottom of site (at road) a barrier to fish.                                                                                                                              |
| 3    | Unnamed      | 440-292700-00000   | 1     | CT, CO, RB                | S3                                 | Moderate spawning values in lower 50 m of stream.                                                                                                 | Some deep pools present in reach                                                                | Moderate rearing values in lower 50 m of stream. stream increases to >20% at this point, contains numerous barriers (that are visible form valley flat) and does not contain any fish habitat. |                                                                                                                                                                                                                                                                                                                                                                                  |
| 4    | Unnamed      | 440-305600-00000   | 1     | NFC                       | S6                                 | Moderate spawning potential with pockets of gravel suitable for RB and DV.                                                                        | Moderate overwintering, with gravel and occasional pools.                                       | Poor to moderate potential with high velocities, but good cover. High gradient sections limit movement and access.                                                                             | 2 CMP culverts, 76 cm dia., collapsing, drops 0.4 m onto rocks. Road material entered creek d/s of culverts and likely altered channel position. Poor fish habitat due to steeper gradient, poor access from Copper River. No anadromous fish use expected.                                                                                                                      |
| 7    | Kinayakwa R. | 440-314000-00000-  | 1     | RB, CH, DV                | S1                                 | Moderate spawning values.                                                                                                                         | Overwintering habitat abundant.                                                                 | Good rearing habitat. Boulders provide good cover for rearing fish.                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                  |
| 8    | Kinayakwa R. | 440-314000-00000-  | 2     | DV                        | S1                                 | Spawning substrate present throughout reach, appropriate for many different sizes of spawners.                                                    | Overwintering habitat abundant.                                                                 | Rearing habitat abundant throughout reach.                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                  |
| 9    | Kinayakwa R. | 440-314000-00000-  | 4     | NFC                       | S5                                 | Moderate, with some spawning gravel available at tail-outs of pools and at top end of riffles. Some of material angular, from new slide deposits. | Good overwintering, with nice deep pools, and good gravels for fry.                             | Moderate rearing: fast-flowing with nice pools and boulder cover. No LWD cover. Off-channel / sidechannels are dry, but some large backeddies may provide rearing habitat.                     | 20 m falls upstream and 4 m falls downstream of site. Canyon section of Kinayakwa provides habitat for adult fish, including deep pools, riffles and glides. Boulders and pools provide cover, however no functioning LWD noted.                                                                                                                                                 |
| 10   | Kinayakwa R. | 440-314000-00000-  | 5     | NFC                       | S5                                 | Excellent spawning gravel and velocities for anadromous as well as non-anadromous fish. Nice tail-outs and head of riffles spawning area.         | Excellent overwintering habitat, with deep pools for adult fish, gravels for juveniles and fry. | Excellent rearing habitat with abundant LWD, rootwads, pool and riffle cover, with nice off-channel habitat also available.                                                                    | Excellent fish habitat with low gradient and a variety of velocities, as well as excellent spawning gravels and pools, tail-outs and head of riffles creating spawning areas. Occasional log jams, LWD scoured pools, some off channel habitat present.                                                                                                                          |
| 11   | Cole Cr.     | 440-314000-03100-  | 1     | CT                        | S3                                 | Excellent quality spawning habitat.                                                                                                               | Good overwintering habitat provided by pond upstream.                                           | Excellent quality rearing habitat.                                                                                                                                                             | Cover moderate, provided mainly by LWD. This creek flows into Copper River, north of Kinayakwa confluence.                                                                                                                                                                                                                                                                       |

| Site | Name        | Watershed Code/ILP      | Reach | Fish Species <sup>a</sup> | Proposed Stream Class <sup>b</sup> | Spawning                                                                                                           | Overwintering                                                                               | Rearing                                                                                                                                                                                             | Other                                                                                                                                                                                                                                               |
|------|-------------|-------------------------|-------|---------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12   | Cole Cr.    | 440-314000-03100-       | 2     | CT                        | S3                                 | Moderate to good spawning values. Suitable spawning gravel present in patches throughout reach.                    | Some deep pools present in reach                                                            | Moderate to good rearing values.                                                                                                                                                                    | Cover moderate to abundant.                                                                                                                                                                                                                         |
| 13   | Cole Cr.    | 440-314000-03100-       | 4     | NFC                       | (S5)                               | Excellent spawning values. Gravel abundant.                                                                        | Overwintering habitat present throughout site.                                              | Excellent rearing values.                                                                                                                                                                           | Cover abundant.                                                                                                                                                                                                                                     |
| 14   | Unnamed     | 1507                    | 2     | NFC                       | S6                                 | Moderate to good quality spawning habitat, with abundant spawning gravel.                                          | Overwintering habitat is limited                                                            | Moderate to good quality rearing habitat.                                                                                                                                                           | A barrier to fish located at mouth, at confluence with stream 1503.                                                                                                                                                                                 |
| 15   | Steward Cr. | 440-314000-06000-       | 1     | BT                        | S1                                 | Spawning habitat exists in small pockets behind boulders.                                                          | Abundant deep pools for overwintering                                                       | Rearing limited by cascades and steps found throughout reach.                                                                                                                                       | Cover abundant. Moderate fisheries values are present in this reach. No fish were captured at site.                                                                                                                                                 |
| 16   | Steward Cr. | 440-314000-06000-       | 2     | DV                        | S1                                 | Moderate spawning habitat                                                                                          | Overwintering habitat abundant.                                                             | Rearing values are good. Cascade pool habitat typical of Dolly Varden streams.                                                                                                                      | Cover moderate in quantity. Large DV and BT are present in this reach of Steward Creek.                                                                                                                                                             |
| 17   | Steward Cr. | 440-314000-06000-       | 3     | NFC                       | S5                                 | Moderate quality spawning habitat for DV.                                                                          | Good overwintering habitat                                                                  | Moderate quality rearing habitat for DV.                                                                                                                                                            |                                                                                                                                                                                                                                                     |
| 19   | Unnamed     | 440-314000-06000-37600- | 1     | DV, BT                    | S2                                 | Some suitable spawning gravel exists in small isolated pockets.                                                    | Some deep pools present in reach                                                            | Step pool habitat approaching and exceeding 20% in places. DV/BT exist throughout sample site.                                                                                                      | Cover limited.                                                                                                                                                                                                                                      |
| 21   | Unnamed     | 1583                    | 1     | NFC                       | S5                                 | Poor spawning potential. There are some small patches of suitable habitat, but very little.                        | Moderate overwintering due to pool cover, but little gravel for fry.                        | Poor rearing potential. There are nice pools but very difficult access between them, many cascades and falls.                                                                                       | Bedrock cascades present, with mossy banks (stable channel). A high gradient channel with many cascades and falls. A barrier at mouth prevents access from Steward Creek. Nice pools present, with limited connectivity however.                    |
| 22   | Unnamed     | 440-314000-06000-51700- | 2     | NFC                       | S5                                 | Spawning habitat present, but somewhat limited.                                                                    | Limited potential overwintering habitat present.                                            | Rearing habitat present, but somewhat limited. Small cascades are barriers throughout site.                                                                                                         | 3 and 4 m falls in Reach 1 prevent fish from accessing this reach.                                                                                                                                                                                  |
| 25   | Unnamed     | 440-314000-06000-69900- | 1     | NFC                       | S5                                 | Moderate quality spawning habitat for DV.                                                                          | Overwintering habitat present, but not abundant.                                            | Moderate quality rearing habitat for DV.                                                                                                                                                            | Cover limited.                                                                                                                                                                                                                                      |
| 26   | Nilah Cr.   | 440-314000-08600-       | 1     | DV                        | S2                                 | Some good pockets of spawning gravels for DV, RB, and anadromous species.                                          | Moderate overwintering cover, with some pools.                                              | Moderate DV rearing cover, swift waters, not well suited to juveniles.                                                                                                                              | Fast flow in this reach, little off channel refuge habitat, eroding banks causing sedimentation. Logged to banks downstream of bridge crossing.                                                                                                     |
| 27   | Nilah Cr.   | 440-314000-08600-       | 3     | DV                        | S1                                 | Poor spawning potential, as no gravels are present. Reach too fast flowing and has too much energy to hold gravel. | Poor overwintering, as there are no pools and not much cover for fish other than boulders.  | Poor rearing potential, as not much refuge or cover exists in high energy reach. Water visibility poor. There are some sections of sidechannel habitat which may provide some refuge at high flows. | Fine layer of gray silt on rocks. Volatile channel (elevated bars, sections downstream with standing dead trees in channel). Pools found in sidechannels, with lots of boulder/cobble moved around in channel. Stream provides some DV habitat.     |
| 29   | Unnamed     | 440-314000-08600-40400- | 1     | DV                        | S3                                 | Moderate spawning potential for DV in tail-outs of pools and riffle section.                                       | Good overwintering habitat with pools and gravel/cobbles for fry, juveniles and adult fish. | Good to excellent rearing habitat with pools, riffle sections and small cascades.                                                                                                                   | LWD functions well to scour pools and trap gravels. At cutblock, creek has elevated bars & flows through forest at times. Logged to left bank, with slow regrowth. Provides good habitat for DV and good refuge from mainstem. Falls barrier in R2. |

| Site | Name             | Watershed Code/ILP | Reach | Fish Species <sup>a</sup> | Proposed Stream Class <sup>b</sup> | Spawning                                                                                                                                                                             | Overwintering                                                                                                         | Rearing                                                                                                                                                                      | Other                                                                                                                                                                                                                                                  |
|------|------------------|--------------------|-------|---------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 30   | Unnamed          | 440-314000-15100-  | 2     | NFC                       | S5                                 | Moderate spawning potential with some nice gravel patches, associated with tail-outs of pools and lower gradient sections of 10 - 20 m long. Gravels are generally small and silted. | Moderate overwintering with some gravels, cobbles and boulders, well as pools for overwintering of fry and juveniles. | Good rearing with pool, LWD and boulder cover. Numerous cascades of 0.3 to 0.6 m makes upstream movement difficult for small fish.                                           | High energy creek at some times of year, (cobble & gravel scattered along forest floor & piled up along trees). Cascade pool habitat makes movement difficult for smaller fish. Gradient in reach 1 >25% for approximately 50 m and a barrier to fish. |
| 31   | Unnamed          | 1778               | 2     | NFC                       | S6                                 | Suitable spawning habitat present in limited amounts.                                                                                                                                | There no perennial habitat located in reach 2.                                                                        | Suitable rearing habitat present in limited amounts.                                                                                                                         | Barrier to fish in reach 1;                                                                                                                                                                                                                            |
| 34   | Unnamed          | 440-314000-21000-  | 1     | NFC                       | S3                                 | Spawning gravel found throughout reach 1 in moderate quantities.                                                                                                                     | There limited overwintering habitat, as stream may not contain water in winter.                                       | Rearing habitat found in moderate quantities.                                                                                                                                |                                                                                                                                                                                                                                                        |
| 35   | 3+900, Creek 3-1 | 440-314000-23200-  | 1     | NFC                       | S5                                 | Limited spawning opportunities, steep gradient stream, barrier at mouth.                                                                                                             | Abundant deep pools for overwintering                                                                                 | Moderate cover                                                                                                                                                               | falls barriers located upstream of road crossing.                                                                                                                                                                                                      |
| 36   | Unnamed          | 440-314000-24900-  | 1     | NFC                       | (S3)                               | Poor to moderate spawning values. Suitable spawning gravel exists in small amounts.                                                                                                  | Overwintering habitat exists in limited quantities                                                                    | Poor to moderate rearing values.                                                                                                                                             | Cover moderate. No apparent barriers seen in reach 1 during aerial overflight. Reach 2 has many small barriers.                                                                                                                                        |
| 37   | Unnamed          | 440-314000-25600-  | 1     | DV                        | S2                                 | Nice patches of gravel, with good velocities for DV. RB spawning at tail-outs of pools or upstream of log drops.                                                                     | Moderate overwintering with some pools and suitable gravel present.                                                   | Poor to moderate rearing potential due to fast flowing water with numerous cascades and steps, making movement for most fish difficult. Not much quiet edge habitat present. | Fast flow, turbulent step pool reach with abundant LWD. Old jams have affected creek flow in some areas - long cascade. DV caught d/s of cascade section, LWD deadfall functioning, contributing to channel morphology.                                |
| 38   | Unnamed          | 1837               | 1     | NFC                       | (S6)                               | Poor spawning potential with no gravel and insufficient velocities.                                                                                                                  | Poor overwintering, very shallow creek with no deep pools or gravel for overwintering.                                | Poor rearing habitat, stream very shallow with high gradient at mouth.                                                                                                       | A small channel overgrown with devils club draining a series of beaver dams u/s. Stream has little flow and shallow (<10 cm depth). Flow does not flow over dam, but trickles out of base. Beaver dam 30 m wide, 50 m long.                            |
| 39   | Unnamed          | 1865               | 1     | NFC                       | S5                                 | Limited spawning habitat available.                                                                                                                                                  | Large pools that could serve as overwintering habitat were sampled and no fish were caught.                           | Moderate rearing habitat for DV.                                                                                                                                             | The first 250 m of reach 1 continuous cascade with no chance of upstream migration for fish. Site length changed from 150 m to 250 m to allow for cascade length of 250 m to be entered into FDIS.                                                     |
| 40   | Katrina Cr.      | 440-314000-32700-  | 1     | BT                        | S2                                 | Limited spawning habitat, minimal gravels.                                                                                                                                           | overwintering habitat limited due to lack of pools,                                                                   | Poor rearing habitat for DV due to cascade morphology.                                                                                                                       | 400m upstream of reach 1 a 6m falls barrier.                                                                                                                                                                                                           |
| 41   | Unnamed          | 1891               | 1     | NS                        | S6                                 | No spawning gravel present.                                                                                                                                                          | No overwintering habitat, no deep pools                                                                               | No fish habitat present. Small stream with many obstructions. No pools or rearing habitat.                                                                                   | No shocking was conducted due to small size of channel.                                                                                                                                                                                                |
| 43   | Iceflow Cr.      | 440-314000-34300-  | 2     | NFC                       | S5                                 | Poor spawning habitat. stream steep and does not contain any observable spawning gravels.                                                                                            | Abundant deep pools for overwintering                                                                                 | Poor rearing habitat, limited by poor cover and access throughout reach.                                                                                                     |                                                                                                                                                                                                                                                        |
| 44   | Unnamed          | 1923               | 1     | NFC                       | S5                                 | Trace amounts of suitable spawning gravel.                                                                                                                                           | Step pool habitat, abundant deep pools for overwintering                                                              | Rearing habitat limited by numerous chutes and cascades.                                                                                                                     | Step pool configuration. overall fisheries values in this stream are poor.                                                                                                                                                                             |
| 45   | Unnamed          | 1927               | 1     | NFC                       | S6                                 | Poor to moderate spawning values. Trace amounts of suitable spawning gravel are present (diameter 0.5 to 1.0 cm), suitable for small DV.                                             | No overwintering habitat present.                                                                                     | Poor to moderate rearing values. Cover present, but habitat limited by size of stream.                                                                                       | No fish were present.                                                                                                                                                                                                                                  |



| Site | Name     | Watershed Code/ILP      | Reach | Fish Species <sup>a</sup> | Proposed Stream Class <sup>b</sup> | Spawning                                                                                                                                                         | Overwintering                                                                                                   | Rearing                                                                                                                                                                                                         | Other                                                                                                                                                                                                                                        |
|------|----------|-------------------------|-------|---------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46   | Unnamed  | 440-314000-53900-       | 2     | NFC                       | S5                                 | Potential spawning gravel present in moderate quantities.                                                                                                        | Overwintering habitat present.                                                                                  | Good rearing values.                                                                                                                                                                                            | Cover present.                                                                                                                                                                                                                               |
| 47   | Unnamed  | 440-314000-53900-34500- | 1     | NFC                       | S6                                 | Moderate potential fisheries values. Gravels adequate for spawning are available.                                                                                | Overwintering habitat is limited, no deep pools                                                                 | Moderate potential fisheries values.                                                                                                                                                                            | Fish are not present in this system upstream from 6m falls in ILP 2017.                                                                                                                                                                      |
| 48   | Tun Cr.  | 440-314000-54700-       | 2     | NFC                       | S5                                 | Moderate spawning habitat with a few nice pockets of gravel suitable for DV and RB spawning, usually in tail-outs of pools.                                      | Moderate, with some nice pools and gravels available for overwintering.                                         | Poor rearing habitat as access through reach poor due to step pool morphology. There are numerous barriers to smaller fish, with fast flow and little refuge.                                                   | High gradient step pool reach with numerous barriers to smaller fish, entrenched with small cascades over boulders and LWD piles, not much off channel habitat, slope area natural source of sediment, gravel and cobble                     |
| 49   | Unnamed  | 2068                    | 1     | NFC                       | S6                                 | Poor potential spawning habitat, with no spawning gravels present in some areas. Small patches of small gravel with hard fines below are present in other areas. | Poor overwintering, with no deep pools for juveniles or adults. Boulder and fine substrate present, no gravels. | Good to excellent rearing with good boulder and LWD cover and a variety of flows and refuge habitat.                                                                                                            | A small creek with fines, boulders & mossy banks. Adjacent wetland areas contribute flow. Good rearing habitat present for juvenile coho, but poor overwintering and spawning habitat. Creek subterranean for short sections.                |
| 50   | Unnamed  | 2073                    | 5     | NFC                       | S6                                 | Small patches of potential spawning gravels in low gradient sections. Isolated patches of spawning gravel for trout/char.                                        | Limited overwintering in this reach, but there access to lake.                                                  | Good rearing habitat with plenty of cover with undercut banks and small woody debris. Creek narrow, low gradient, flowing through subalpine meadows.                                                            | Lower 100 m fish use, then gradient barrier present. Flows through subalpine forest. Flows from upper lake are not continuous with lower lake. 100 m from lake, gradient increases to > 20%. No fish captured during brief shocking in lake. |
| 52   | Unnamed  | 440-314000-60900-       | 1     | NFC                       | S5                                 | Some suitable spawning gravel present.                                                                                                                           | Overwintering habitat present.                                                                                  | Moderate potential fisheries values. Steps may limit fish migrations, if fish were present in this section of watershed.                                                                                        |                                                                                                                                                                                                                                              |
| 53   | Unnamed  | 440-314000-63200-       | 1     | NFC                       | S6                                 | No spawning gravels present, exclusively fine substrate.                                                                                                         | No overwintering habitat.                                                                                       | Some potential rearing habitat.                                                                                                                                                                                 | The stream barely flowing. It flows through meadows and flows into Kinayakwa above end of fish use.                                                                                                                                          |
| 54   | Unnamed  | 2091                    | 1     | NFC                       | S6                                 | No potential spawning habitat due to exclusively fine substrate.                                                                                                 | No overwintering habitat.                                                                                       | Limited rearing habitat.                                                                                                                                                                                        | Stream flows through meadows into small lake.                                                                                                                                                                                                |
| 55   | Tasi Cr. | 440-314000-66600-       | 1     | NFC                       | S5                                 | Excellent spawning gravels in pool tail-outs and at top of riffles, providing potential spawning habitat for resident as well as anadromous species.             | Good to excellent overwintering, with pools and gravels for fry and juveniles.                                  | Excellent rearing habitat with good LWD cover, nice pools and riffles that are not flowing too fast.                                                                                                            | Excellent potential habitat for fish. creek altered its course ~40-50 m upstream of mouth & flows through forest. Abundant LWD & pools provide good cover. LWD functioning to scour pools & trap gravels.                                    |
| 57   | Unnamed  | 440-314000-68200-       | 1     | NFC                       | S5                                 | Excellent spawning habitat for RB, DV and even anadromous fish.                                                                                                  | Good overwintering habitat with abundant pools, good gravels and moderate flow.                                 | Excellent rearing habitat with abundant pool, LWD cover and refuge habitat.                                                                                                                                     | Pools/LWD provide good cover. Creek experiences higher flows (side gravel bars & eroding banks in places). Poor access at mouth of Copper River, multiple shallow channels. LWD creating pools & trapping spawning gravels.                  |
| 58   | Unnamed  | 440-314000-75600-       | 1     | NFC                       | S6                                 | Good potential spawning areas for DV and trout.                                                                                                                  | Limited number of deep pools present, but there access to pools on mainstem for overwintering.                  | Excellent rearing with abundant cover on margins and mid stream. Low gradient and low velocity stream provides access to swamp for rearing. Cover provided by undercut banks and vascular vegetation in stream. | Good habitat for spawning and rearing, with low velocity and abundant cover. Stream has access to mainstem and to swamp. No other pools to measure depth.                                                                                    |

| Site | Name         | Watershed Code/ILP           | Reach | Fish Species <sup>a</sup> | Proposed Stream Class <sup>b</sup> | Spawning                                                                                                       | Overwintering                                                                                                                                            | Rearing                                                                                                                                 | Other                                                                                                                                                                                                                                           |
|------|--------------|------------------------------|-------|---------------------------|------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 59   | Unnamed      | 2110                         | 1     | NFC                       | S6                                 | No spawning values.                                                                                            | Abundant deep pools for overwintering                                                                                                                    | Moderate potential rearing values.                                                                                                      | Stream flows out of a small lake.                                                                                                                                                                                                               |
| 60   | Miners Cr.   | 440-314000-78900-            | 1     | NFC                       | S5                                 | Excellent spawning values.                                                                                     | Overwintering habitat abundant.                                                                                                                          | Excellent rearing values.                                                                                                               | Cover limited. Braided channel around log jam. Log jam 40 m long.                                                                                                                                                                               |
| 61   | Unnamed      | 440-314000-78900-15400-2620- | 1     | NFC                       | S6                                 | Limited spawning habitat due to primarily fine substrate.                                                      | No overwintering habitat. no deep pools                                                                                                                  | Excellent rearing values as cover abundant.                                                                                             | Abundant cover.                                                                                                                                                                                                                                 |
| 62   | Unnamed      | 440-314000-81800-            | 1     | NFC                       | S5                                 | Good potential spawning habitat. Spawning gravels of many different size classes are present.                  | Overwintering habitat present in limited quantities.                                                                                                     | Moderate potential rearing habitat.                                                                                                     |                                                                                                                                                                                                                                                 |
| 63   | Unnamed      | 2177                         | 1     | NFC                       | S6                                 | Moderate quantity of spawning gravel.                                                                          | One pool capable of providing overwintering habitat.                                                                                                     | Rearing habitat limited by obstruction.                                                                                                 | 10 m falls are located 30 m upstream.                                                                                                                                                                                                           |
| 64   | Kinayakwa R. | 440-314000-00000-            | 5     | NFC                       | S5                                 | Excellent spawning for anadromous and resident fish, nice velocities and good-sized gravel beds.               | Excellent overwintering habitat for adult and juvenile fish, with lots of pools and good flow.                                                           | Excellent rearing habitat for anadromous fry and resident fish, with good cover and suitable velocities.                                | Excellent habitat for anadromous species, trout, char. LWD creates pools & spawning areas. Good depth for adult fish (1 m in thalweg). Silt collected in quiet areas. Multiple channels roughly 50 m u/s of mouth, trees standing in channel.   |
| 66   | Unnamed      | 1890                         | 1     | NFC                       | S6                                 | Limited potential spawning values.                                                                             | No overwintering habitat                                                                                                                                 | Limited rearing habitat                                                                                                                 | Moderate cover. Obstructions exist throughout stream many of which are barriers to fish migration. No fish were caught in stream by e. shocking for 350 seconds                                                                                 |
| 67   | CR 1-1 CR10  | 1786                         | 1     | NFC                       | S6                                 | Limited potential spawning habitat                                                                             | No overwintering habitat. no deep pools                                                                                                                  | Almost no rearing habitat (no cover)                                                                                                    | 2m organic barrier at mouth. lower stream has been disturbed by high water, cobbles along banks 0.8m above streambed                                                                                                                            |
| 190  | Unnamed      | 440-314000-06000-37600-      | 2     | NFC                       | (S5)                               | Moderate spawning gravel available for DV, generally associated with pools and other areas of good velocities. | Moderate overwintering; gravels exist for fry and pools for juvenile fish.                                                                               | Good rearing potential with nice pools and some LWD cover. Cascades between pools will make upstream movement difficult for small fish. | Mossy banks and generally stable channel present. LWD functions occasionally to trap gravels and scour pools. This reach provides good habitat for DV. Gradient downstream in reach 1 may be a barrier. Gradient in Reach 3 upstream a barrier. |
| 220  | Unnamed      | 440-314000-06000-51700-      | 1     | DV                        | S2                                 | Poor spawning habitat, only small patches of gravel associated with pools and side channels                    | Moderate overwintering, some pools for juvenile and adult overwintering                                                                                  | Poor to moderate rearing habitat, boulders and pool cover but fast flowing and high energy                                              | Channel at mouth aggraded and changed course, old channel may still get flow at high water. Large cobble/boulders on elevated bars, high energy system, cobbles/boulders piled against trees in forest, 2 m above current water surface.        |
| 260  | Nilah Cr.    | 440-314000-08600-            | 4     | NFC                       | S5                                 | Poor spawning potential: no spawning gravel in sufficient sized patches.                                       | Poor to moderate overwintering; some pools are present for juveniles, but not deep enough for adults. No sufficient gravel/cobble for fry overwintering. | Poor rearing due to steep gradient. Some pools are present.                                                                             | High gradient step pool morphology that provides little habitat for fish. Gradient increases u/s & cascade d/s barrier to fish. High energy mainstem without functioning LWD. Dry sidechannels & several smaller channels (also shocked).       |
| 500  | Unnamed      | 2073                         | 1     | NFC                       | S6                                 | Excellent potential spawning habitat.                                                                          | Some overwintering habitat present.                                                                                                                      | Excellent potential rearing habitat.                                                                                                    | Good cover components. Excellent habitat, but fish are absent from this section of Kinayakwa.                                                                                                                                                   |

a. CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, RB - rainbow trout, CT - cutthroat trout, NFC - no fish caught, NS - not sampled

b. ( ) indicates inferred; resample required.

**Table 4.** Summary of fish features and channel characteristics at fish bearing sites in the Kitnanyakwa Planning Unit, September 1999.

Table 4. Summary of fish features and channel characteristics at fish bearing sites in the Kinayakwa Planning Unit, September 1999.

| Site # | Local Name   | Watershedcode / ILP      | Reach # | Map     | Capture Method | Species    | Total # of Fish | Average Channel Width (m) | Average Gradient % | Average Pool Depth (m) | Hydrologic Stage | pH  | Water Temp. (°C) | Conductivity (umhos) | Total Cover | SWD | LWD | Boulders | Cutbank | Deep Pools | Overstream Vegetation | Instream Vegetation | LWD Cover | LWD Distribution | Dominant Substrate | Sub Dominant Substrate | Class | Disturbance Indicators |    |    |    |    |    |    |    |    |    |  |
|--------|--------------|--------------------------|---------|---------|----------------|------------|-----------------|---------------------------|--------------------|------------------------|------------------|-----|------------------|----------------------|-------------|-----|-----|----------|---------|------------|-----------------------|---------------------|-----------|------------------|--------------------|------------------------|-------|------------------------|----|----|----|----|----|----|----|----|----|--|
|        |              |                          |         |         |                |            |                 |                           |                    |                        |                  |     |                  |                      |             |     |     |          |         |            |                       |                     |           |                  |                    |                        |       | B1                     | B2 | D3 | C1 | C2 | C3 | C4 | C5 | S2 | S4 |  |
| 3      | Unnamed      | 440-292700-00000-000000- | 1       | 93L.041 | EF             | CT, CO, RB | 4               | 3.83                      | 21.00              | 0.36                   | M                | 6.7 | 9                | 40                   | M           | T   | N   | N        | D       | N          | S                     | N                   | N         | N                | NA                 | B                      | C     | CPB                    |    |    |    |    |    |    |    |    |    |  |
| 7      | Kinayakwa R. | 440-314000-00000-000000- | 1       | 93L.041 | EF             | DV, CH, RB | 5               | 30.83                     | 1.67               | 1.50                   | M                | 6.8 | 8                | 40                   | A           | N   | N   | D        | N       | S          | N                     | N                   | N         | N                | NA                 | B                      | C     | CPB                    |    |    |    |    |    |    |    |    |    |  |
| 8      | Kinayakwa R. | 440-314000-00000-000000- | 2       | 93L.041 | EF             | DV         | 4               | 73.33                     | 2.00               | 0.53                   | M                | 7.2 | 8                | 50                   | M           | T   | T   | D        | N       | S          | N                     | T                   | F         | E                | B                  | C                      | CPCW  |                        |    |    |    |    |    |    |    |    |    |  |
| 11     | Cole Cr.     | 440-314000-03100-000000- | 1       | 93L.041 | EF             | CT         | 4               | 4.67                      | 2.67               | 0.58                   | M                | 6.7 | 8                | 90                   | M           | S   | D   | S        | T       | T          | T                     | T                   | N         | F                | E                  | G                      | C     | RPGW                   |    |    |    |    |    |    |    |    |    |  |
| 12     | Cole Cr.     | 440-314000-03100-000000- | 2       | 93L.041 | EF             | CT         | 3               | 4.50                      | 11.00              | 0.23                   | M                | 6.8 | 8                | 90                   | M           | T   | S   | D        | T       | T          | T                     | T                   | N         | F                | E                  | B                      | G     | SPBW                   |    |    |    |    |    |    |    |    |    |  |
| 15     | Steward Cr.  | 440-314000-06000-000000- | 1       | 93L.041 | VO             | BT         | 1               | 29.50                     | 11.33              | 0.66                   | M                | 7.4 | 7                | 50                   | A           | T   | S   | D        | N       | S          | N                     | N                   | A         | C                | B                  | C                      | SPBW  |                        |    |    |    |    |    |    |    |    |    |  |
| 16     | Steward Cr.  | 440-314000-06000-000000- | 2       | 93L.041 | EF             | DV         | 1               | 29.83                     | 6.33               | 0.77                   | M                | 7.6 | 6                | 40                   | M           | S   | S   | D        | N       | S          | N                     | N                   | A         | C                | B                  | C                      | CPB   |                        |    |    |    |    |    |    |    |    |    |  |
| 19     | Unnamed      | 440-314000-06000-37600-  | 1       | 93L.041 | EF             | BT, DV     | 7               | 6.73                      | 22.00              | 0.23                   | L                | 7.5 | 7                | 50                   | T           | T   | S   | D        | T       | T          | N                     | N                   | F         | E                | B                  | C                      | CPB   |                        |    |    |    |    |    |    |    |    |    |  |
| 26     | Nilah Cr.    | 440-314000-08600-000000- | 1       | 93L.041 | EF             | DV         | 8               | 11.50                     | 3.13               | N/A                    | M                | 6.5 | 6                | 10                   | M           | N   | D   | D        | T       | N          | S                     | N                   | F         | E                | G                  | B                      | CP    | Y                      |    | Y  |    |    |    | Y  |    |    |    |  |
| 27     | Nilah Cr.    | 440-314000-08600-000000- | 3       | 93L.041 | EF             | DV         | 1               | 51.67                     | 5.50               | 0.10                   | L                | 8   | 6                | 20                   | T           | N   | N   | D        | N       | N          | N                     | N                   | N         | NA               | B                  | C                      | CP    |                        |    | Y  | Y  |    |    | Y  |    |    |    |  |
| 29     | Unnamed      | 440-314000-08600-40400-  | 1       | 93L.041 | EF             | DV         | 4               | 4.05                      | 5.50               | 0.20                   | M                | 7.4 | 6                | 50                   | M           | T   | D   | N        | T       | T          | T                     | N                   | F         | E                | G                  | C                      | CP    |                        |    |    |    |    |    |    |    |    |    |  |
| 34     | Unnamed      | 440-314000-21000-000000- | 1       | 93L.041 | EF             | NFC        | 0               | 2.05                      | 12.33              | 0.08                   | M                | 7.5 | 7                | 80                   | M           | S   | D   | T        | N       | N          | T                     | N                   | A         | C                | G                  | C                      | CPCW  |                        |    |    |    |    |    |    |    |    |    |  |
| 36     | Unnamed      | 440-314000-24900-000000- | 1       | 93L.041 | EF             | NFC        | 0               | 3.62                      | 10.33              | 0.33                   | M                | 6.9 | 6                | 20                   | M           | T   | S   | D        | T       | T          | T                     | N                   | F         | C                | B                  | C                      | SPB   |                        |    |    |    |    |    |    |    |    |    |  |
| 37     | Unnamed      | 440-314000-25600-000000- | 1       | 93L.041 | EF             | DV         | 1               | 9.13                      | 13.33              | 0.45                   | M                | 7.1 | 6                | 20                   | M           | N   | S   | D        | N       | S          | N                     | N                   | A         | E                | B                  | G                      | SP    |                        |    |    |    |    |    |    | Y  |    |    |  |
| 40     | Katrina Cr.  | 440-314000-32700-000000- | 1       | 93L.041 | EF             | BT         | 1               | 10.63                     | 15.33              | 0.32                   | L                | 8.9 | 16               | 50                   | M           | S   | D   | D        | N       | S          | N                     | N                   | A         | C                | B                  | C                      | CP    |                        |    | Y  |    |    |    |    |    |    |    |  |
| 220    | Unnamed      | 440-314000-06000-51700-  | 1       | 93L.041 | EF             | DV         | 3               | 12.88                     | 6.17               | 0.34                   | M                | 8   | 7                | 40                   | M           | N   | T   | D        | N       | S          | N                     | N                   | F         | C                | C                  | B                      | CP    | Y                      | Y  | Y  |    |    | Y  | Y  | Y  |    | Y  |  |

Capture method: EF - eletrofishing, VO - visual observation

Fish Species: CH - chinook, CO - coho, SK - sockeye, PK - pink salmon, DV - Dolly Varden, BT - bull trout,

Hydrologic Stage: L - light, M - moderate, H - high

RB - rainbow trout, CT - cutthroat trout, TSB - threespined stickleback, CAS - prickly sculpin,

Turbidity: C - clear, L - lightly turbid, M - moderately turbid, T - turbid

LWD: N - none, F - few, A - abundant

Cover Total: N - none, T - trace, M - moderate, A - abundant

LWD Distribution: C - clumped, E - even

Cover Amount: N - none, T - trace, S - sub-dominant, D - dominant

Bed Material: F - fines, G - gravel, C - cobble, B - boulder, R - bedrock

Morphology: RP - riffle pool, CP - cascade pool, SP - step pool, LC - large channel

**Table 5.** Summary of barriers identified in the Kitnayakwa Planning Unit.

Table 5. Summary of barriers identified in the Kitnayakwa Planning Unit.

| Site # or NID #      | Local Name     | Watershed code / ILP    | Site or NID Reach # | Map     | Feature Type <sup>a</sup> | Height (m) | Length (m) | Comment                                                                                 |
|----------------------|----------------|-------------------------|---------------------|---------|---------------------------|------------|------------|-----------------------------------------------------------------------------------------|
| Site 2               | Unnamed        | 29                      | 1                   | 93L.041 | C                         | 6          |            | chute over bedrock at road crossing; barrier to fish                                    |
| Site 21              | Unnamed        | 1583                    | 1                   | 93L.041 | F                         | 7          |            | bedrock falls at mouth                                                                  |
| Site 21              | Unnamed        | 1583                    | 1                   | 93L.041 | F                         | 6          |            | bedrock falls ~50 m upstream                                                            |
| Site 21              | Unnamed        | 1583                    | 1                   | 93L.041 | F                         | 3          |            | bedrock falls ~65 m upstream (no photo taken)                                           |
| Site 31              | Unnamed        | 1778                    | 2                   | 93L.041 | C                         | 25         | 20         | barrier located at mouth                                                                |
| Site 39              | Unnamed        | 1865                    | 1                   | 93L.041 | C                         | 60         | 250        | barrier to fish                                                                         |
| Site 63              | Unnamed        | 2177                    | 1                   | 93L.031 | F                         | 10         |            | falls near mouth                                                                        |
| Site 1               | Harvey Cr.     | 440-290800-00000-00000- | 2                   | 93L.041 | C                         | 1.8        |            | cascade                                                                                 |
| Site 3               | Unnamed        | 440-292700-00000-00000- | 1                   | 93L.041 | F                         | 15         |            | numerous falls                                                                          |
| Site 4               | Unnamed        | 440-305600-00000-00000- | 1                   | 93L.041 | C                         | 8          | 20         | cascade section is a barrier to most fish                                               |
| Site 4               | Unnamed        | 440-305600-00000-00000- | 1                   | 93L.041 | CV                        | 0.7        |            | 2 CMP culverts with poor plunge pool                                                    |
| Historical Nid 40044 | Kitnayakwa Cr. | 440-314000-00000-00000- | 3.                  | 93L.032 | C                         |            | 900        | Bustard cited cascade section in this reach                                             |
| Historical Nid 40045 | Kitnayakwa Cr. | 440-314000-00000-00000- | 3.                  | 93L.032 | F                         | 2          |            | Bustard cited 3 falls (location unknown) of 2m each within the cascade section (N40044) |
| Historical Nid 40047 | Kitnayakwa Cr. | 440-314000-00000-00000- | 3.                  | 93L.032 | F                         | 4          |            | Bustard cited 4m falls as end of fish use at this location                              |
| Historical Nid 40048 | Kitnayakwa Cr. | 440-314000-00000-00000- | 4.                  | 93L.032 | F                         |            |            | Bustard cited falls of unknown height at this location                                  |
| Historical Nid 40049 | Kitnayakwa Cr. | 440-314000-00000-00000- | 4.                  | 93L.032 | F                         | 20         |            | Bustard cited 20m falls at this location                                                |
| Site 11              | Cole Cr.       | 440-314000-03100-00000- | 1                   | 93L.041 | F                         | 15         |            | barrier to fish, EFU anadromous fish                                                    |
| Historical Nid 40078 | Cole Cr.       | 440-314000-03100-00000- | 1.                  | 93L.041 | C                         | 40         | 250        | RJA cited a cascade obstruction at this location                                        |
| Site 13              | Cole Cr.       | 440-314000-03100-00000- | 4                   | 93L.041 | F                         | 8          |            | Falls in reach 3 downstream of site                                                     |
| Site 17              | Steward Cr.    | 440-314000-06000-00000- | 3                   | 93L.041 | F                         | 2          |            | falls - barrier to fish                                                                 |
| Site 17              | Steward Cr.    | 440-314000-06000-00000- | 3                   | 93L.041 | F                         | 4          |            | falls- barrier to fish                                                                  |
| Site 19              | Unnamed        | 440-314000-06000-37600- | 1                   | 93L.041 | C                         | 5          | 15         | cascade                                                                                 |
| Site 220             | Unnamed        | 440-314000-06000-51700  | 1                   | 93L.041 | X                         |            | 30         | logjam from blowdown at mouth.                                                          |
| Site 220             | Unnamed        | 440-314000-06000-51700  | 1                   | 93L.041 | F                         | 3          | 2          | EFU at the top of the reach.                                                            |

Table 5. con't...

| Site # or NID #      | Local Name       | Watershed code / ILP    | Site or NID Reach # | Map     | Feature Type <sup>a</sup> | Height (m) | Length (m) | Comment                                                                                                               |
|----------------------|------------------|-------------------------|---------------------|---------|---------------------------|------------|------------|-----------------------------------------------------------------------------------------------------------------------|
| Site 220             | Unnamed          | 440-314000-06000-51700  | 1                   | 93L.041 | F                         | 4          | 2          |                                                                                                                       |
| Historical Nid 40075 | Nilah Cr.        | 440-314000-08600-00000- | 1.                  | 93L.041 | X                         |            |            | AEM cited a very narrow leave strip as leading to a blowdown problem and resultant debris jam at this location.       |
| Historical Nid 40076 | Nilah Cr.        | 440-314000-08600-00000- | 2.                  | 93L.041 | FLD                       |            |            | AEM cited a natural dewatering of the original channel. The channel now flows along the edge of an adjacent cutblock. |
| Site 260             | Nilah Cr.        | 440-314000-08600-00000- | 4                   | 93L.041 | F                         | 3          |            | cascade barrier at downstream end of reach                                                                            |
| Site 29              | Unnamed          | 440-314000-08600-40400- | 1                   | 93L.041 | X                         |            | 20         | logging debris in creek is trapping material                                                                          |
| Reach Nid 80507      | Unnamed          | 440-314000-08600-40400- | 2.                  | 93L.041 | F                         |            |            |                                                                                                                       |
| Reach Nid 80306      | Unnamed          | 440-314000-08600-40400- | 2.                  | 93L.041 | F                         |            |            |                                                                                                                       |
| Site 30              | Unnamed          | 440-314000-15100-00000- | 2                   | 93L.041 | C                         | 2          |            | cascade observed from air, upstream in reach                                                                          |
| Site 35              | 3+900, Creek 3-1 | 440-314000-23200-00000- | 1                   | 93L.041 | F                         | 6          |            |                                                                                                                       |
| Site 35              | 3+900, Creek 3-1 | 440-314000-23200-00000- | 1                   | 93L.041 | F                         | 7          |            |                                                                                                                       |
| Site 37              | Unnamed          | 440-314000-25600-00000- | 1                   | 93L.041 | C                         | 10         | 25         | cascade section                                                                                                       |
| Site 37              | Unnamed          | 440-314000-25600-00000- | 1                   | 93L.041 | F                         | 2          | 1          | in reach 2, 1.2 km upstream of reach 1                                                                                |
| Site 37              | Unnamed          | 440-314000-25600-00000- | 1                   | 93L.041 | F                         | 4          |            |                                                                                                                       |
| Site 40              | Katrina Cr.      | 440-314000-32700-00000- | 1                   | 93L.041 | F                         | 6          |            | 6m falls barrier                                                                                                      |
| Site 40              | Katrina Cr.      | 440-314000-32700-00000- | 1                   | 93L.041 | X                         |            |            | debris jam                                                                                                            |
| Site 43              | Iceflow Cr.      | 440-314000-34300-00000- | 2                   | 93L.041 | F                         | 8          | 4          | barrier in Reach 1                                                                                                    |
| Historical Nid 40046 | O'Brien Cr.      | 440-314000-50400-00000- | 1.                  | 93L.032 | F                         |            |            | Bustard cited falls of unknown height at this location                                                                |
| Historical Nid 40043 | Unnamed          | 440-314000-53900-00000- | 1.                  | 93L.031 | F                         | 6          |            | Bustard cited barrier falls at this location                                                                          |
| Site 48              | Tun Cr.          | 440-314000-54700-00000- | 2                   | 93L.032 | C                         | 1.3        |            | cascade (looking u/s)                                                                                                 |
| Reach Nid 80043      | Tun Cr.          | 440-314000-54700-00000- | 2.                  | 93L.032 | F                         |            |            |                                                                                                                       |
| Site 60              | Miners Cr.       | 440-314000-78900-00000- | 1                   | 93L.031 | X                         | 3          | 40         | debris jam 80 m upstream of mouth                                                                                     |

a. F - falls, C - cascade, FLD - dewatering, X - log jam, CV - culvert

**Table 6.** Summary of no visible channel reaches in the Kitnayakwa Planning Unit, September 1999.

**Table 7.** Summary of species caught in major subbasins in the Kitnayakwa Planning Unit, September 1999.



Table 6. Summary of No Visible Channel reaches in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name | Watershedcode/ ILP     | Reach # | Map     |
|--------|------------|------------------------|---------|---------|
| 5      | Unnamed    | 440-307800-00000       | 1       | 93L.041 |
| 6      | Unnamed    | 77                     | 1       | 93L.041 |
| 18     | Unnamed    | 440-314000-06000-32600 | 1       | 93L.041 |
| 24     | Unnamed    | 1638                   | 1       | 93L.041 |
| 32     | Unnamed    | 1779                   | 1       | 93L.041 |
| 33     | Unnamed    | 1780                   | 1       | 93L.041 |
| 56     | Unnamed    | 2100                   | 1       | 93L.032 |

| Site # | Local Name | Watershedcode/ ILP | Reach # | Map |
|--------|------------|--------------------|---------|-----|
|--------|------------|--------------------|---------|-----|

Table 7. Summary of species caught in major subbasins in the Kitnayakwa Planning Unit, September 1999.

| Local Name       | Watershed Code   | Species Presence <sup>ab</sup> |
|------------------|------------------|--------------------------------|
| Kitnayakwa River | 440-314000-00000 | DV, CH, CO,                    |
| Steward Creek    | 440-314000-06000 | DV, BT                         |
| Nilah Creek      | 440-314000-08600 | DV                             |
| Miners Creek     | 440-314000-78900 | none                           |
| Cole Creek       | 440-314000-03100 | CT                             |

a. italics indicate historical species presence not documented during current sampling

b. CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, CT - cutthroat trout

**Table 8.** Fish distribution limits for major basins within the Kitnanyakwa Planning Unit, September 1999.

Table 8. Fish distribution limits for major basins within the Kitnayakwa Planning Unit, September 1999.

| Local Name    | Watershed Code/ILP       | Reach | Barrier    | Comment <sup>a</sup>                                                                                 | Sample Sites Upstream                                                             |
|---------------|--------------------------|-------|------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Harvey Cr.    | 440-290800-00000-000000- | 1     | debris jam | debris jam at mouth appears to be a barrier to fish; required resample to confirm EFU                | 1, 65                                                                             |
| Kitnayakwa R. | 440-314000-00000-000000- | 3     | falls      | a 4 m falls in reach is a barrier and defines EFU, NFC upstream of 4 m falls                         | 9, 10, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64 |
| Cole Cr.      | 440-314000-03100-000000- | 1     | falls      | 15 m falls barrier to fish; is EFU for anadromous fish, resident cutthroat trout population upstream | 11, 12                                                                            |
| Cole Cr.      | 440-314000-03100-000000- | 3     | falls      | 8 m falls is a barrier to fish; may be EFU, requires resampling                                      | 13                                                                                |
| Steward Cr.   | 440-314000-06000-000000- | 3     | falls      | 4 m and 2 m falls barrier to fish are EFU, NFC upstream                                              | 17, 25                                                                            |
| Nilah Cr.     | 440-314000-08600-000000- | 4     | falls      | 3m falls is barrier to fish and is EFU, NFC upstream                                                 | 260                                                                               |
| Iceflow Cr.   | 440-314000-34300-000000- | 1     | falls      | 6m falls barrier to fish and is EFU, NFC upstream                                                    | 43, 44, 45                                                                        |

a. EFU - extent of fish use, NFC - no fish use

Two significant barriers to fish exist on the mainstem Kitnayakwa River; a 4 m falls in reach 3 and 20 m falls in reach 4. The 4 m falls in reach 3 of the Kitnayakwa River defines the upstream extent of fish use in this watershed. A total of 20 sites were sampled

upstream of the falls during this field survey and several historical sample sites also exist upstream. However, the sampling has not documented fish upstream of this falls.

Dolly Varden/bull trout have been documented to reach 3 on the mainstem and in the lower reaches of some tributaries. Coho have been historically documented to reach 2, but were not documented in the Kitnayakwa River watershed during this survey. Adult chinook and rainbow trout/steelhead were documented near the mouth in reach 1 and chinook fry rearing has been historically documented in a sidechannel in reach 2 (Applied Ecosystem Management *et al.* 1999).

The mainstem Kitnayakwa River provided moderate to good spawning habitat at the reaches sampled, including upstream of the falls in reach 3. Overwintering habitat for adult and juvenile fish was excellent in the mainstem, which had abundant deep pools and cover. The mainstem also provided abundant juvenile rearing habitat, as well as suitable habitat for resident adult fish.

The tributaries also provide fish habitat within the valley bottom, but the extent of fish habitat is generally quite short due to high gradients of the adjacent slopes. The extent of fish use in many tributaries is therefore generally restricted to the lower 100-300 m of stream, but is often less due to barriers at their confluences. The tributary reaches sampled in this watershed had high gradients, often had downstream barriers, and were often found not to contain fish.

#### *4.3.1.2 Steward Creek*

Steward Creek is a 5th order stream that drains northeast into reach 1 of the Kitnayakwa River. Fish habitat is confined to the valley bottom and the majority of suitable fish habitat is therefore located in the mainstem. The gradient of the mainstem reaches is <10% in reaches 1 to 3, but increases to 13% in reach 4. In reach 5 the gradient is 30% and is a barrier to fish.

Only Dolly Varden and bull trout have been documented in this subbasin and their distribution has been documented to reach 2. A 4 m falls and a 2 m falls at the downstream end of reach 3 are barriers to fish and define the upstream extent of fish use. A total of 3 sample sites were surveyed upstream of the falls, but did not document fish.

Reaches 1 and 2 provided limited spawning habitat for Dolly Varden and consequently, very few fry or juveniles were caught in the mainstem. The mainstem provided abundant suitable overwintering habitat for adult and juvenile fish in reaches 1 and 2. Rearing habitat was good for Dolly Varden in reach 2, but was limited in reach 1 due to gradient and cascade and step/pool habitat.

The tributaries to Steward Creek also provide fish habitat within the valley bottom but the extent is very limited due to high gradients of the adjacent slopes. The extent of fish use in tributaries is therefore generally restricted to the lower 100 m of stream, but is often less due to gradient barriers at their confluences.

#### *4.3.1.3 Nilah Creek*

Nilah Creek is a 4th order stream that drains west into reach 1 of the Kitnayakwa River. Fish habitat is concentrated within the valley bottom and the majority of suitable fish habitat is therefore located in the mainstem. The gradient of the mainstem reaches is <10% in reaches 1 and 2 but increases to 24% in reach 3. The gradient in reaches 4 and 6 is >45% and is a barrier to fish.

Dolly Varden, the only species recorded in this subbasin, has been documented to reach 3. The end of fish use in Nilah Creek occurs in reach 4 where a 3 m falls occurs and the gradient increases steadily. Reach 1 provided moderate Dolly Varden habitat with moderately suitable spawning, rearing, and overwintering habitat. Reaches 3 and 4 provided poor spawning, rearing and overwintering habitat. As a result of a natural slide, an avulsion occurs in Reach 2 of Nilah Creek and the historical channel bed has been abandoned. The channel is now working through an existing cutblock on the left bank of this section of the creek.

Tributaries to Nilah Creek also provide fish habitat within the valley bottom, but the extent is limited by the high gradients of the adjacent slopes. The extent of fish use in tributaries is therefore generally restricted to the lower 100-200 m, but is often less due to gradient barriers at their confluences.

#### *4.3.1.4 Miners Creek*

Miners Creek is a 4th order stream which drains east into reach 5 of the Kitnayakwa River (upstream of the extent of fish use). No fish were documented in this subbasin, or upstream of the falls in reach 3 of the Kitnayakwa River. Miners Creek is located on a high elevation plateau and suitable fish habitat is found in the mainstem and in many tributaries. The gradient of the mainstem is <10% in reaches 1 to 3 and increases to 18% in reach 4. Reach 1 of the mainstem was surveyed and provided excellent spawning, rearing and overwintering habitat.

#### *4.3.1.5 Cole Creek*

Cole Creek is a 3rd order stream that drains west into the Copper River, upstream of the confluence of the Kitnayakwa River. Only cutthroat trout have been documented in this subbasin, although anadromous fish have access to the lower 540 m of stream within the Copper River floodplain. Relatively high densities of juvenile salmonids and relatively large numbers of adult coho have been observed spawning in this section. In addition, steelhead and juvenile chinook make use of the lower section of this reach (Applied Ecosystem Management 1999). Suitable fish habitat is found throughout much of the mainstem and includes several beaver ponds in reach 1. The gradient of the mainstem is

<12% in reaches 1 and 2, but increases to 25% in reach 3. The gradient in reach 4 is 10% and increases to 34 % in reach 5.

A 15 m falls in reach 1 near the mouth defines the extent of anadromous fish use. Cutthroat trout were documented to reach 2 in this watershed, and given the falls in reach 1, the cutthroat trout in this subbasin are an isolated resident population. In reach 3, an 8 m falls likely marks the extent of fish use by the resident cutthroat trout population, but resampling in reach 4 is required to confirm the absence of fish upstream of the falls. A cascade section in the upper portion of reach 1 is not a barrier to fish as cutthroat trout were caught upstream.

Reach 1 (which included several beaver ponds) and reach 4 provided excellent fish habitat with suitable spawning, rearing, and overwintering habitat. Reach 2 had a higher gradient and provided moderate to good spawning, rearing and overwintering habitat.

Suitable fish habitat is found in tributaries to reaches 1 and 2, which have lower gradients. Tributaries to reaches 3 and 4 also provide fish habitat within the valley bottom, but the extent is limited by the high gradients of the adjacent slopes. The extent of habitat in these tributaries is therefore generally the lower 100-200 m, but is often less due to gradient barriers at their confluences.

As explained in Section 2.1, the mouth of Cole Creek is incorrectly mapped on the 1:20,000 TRIM base maps and the approximate location of the channel along the north side the Kitnayakwa Mainline has been added to the Project and Interpretive maps. Culverts are in place at the location of the mapped road crossing, presumably to accommodate flood level waters. These culverts have been cited as a contributing factor to a significant slide in reach 1 of the Kitnayakwa River, and Pollard *et. al.* (1996) recommend the culverts be removed.

#### *4.3.1.6 Other Subbasins*

The fish habitat and fish distributions within other subbasins in the Kitnayakwa Planning Unit are similar to that of the Steward Creek and Nilah Creek. In general, suitable fish habitat occurs within the low gradient valley bottom areas and the majority of the habitat is therefore concentrated in the mainstems of 4th order and higher streams. First, second and third order tributaries provide varying amounts of fish habitat within the valley bottom, but the extent of fish habitat is generally limited to the lower 100 - 400 m of streams due to barriers or the high gradients of the surrounding slopes.

Fish use is generally confined to the lower third of subbasins and is defined by barriers such as falls or gradient. When accessible and of gradients <10%, the habitat in these streams generally provided suitable rearing, spawning, and overwintering habitat for Dolly Varden. However, >20% gradients limit fish habitat in many of the tributaries in this study area. The Phase 1-3 planning identified 773 reaches with >20% gradients, of which 613 reaches had >30% gradients (1,039 reaches total). These high gradient reaches

are highly unlikely to support fish unless they are accessible from adjacent fish bearing waters.

#### 4.3.2 Features

Table 9 summarizes the features identified in the Phase 1-3 and recorded during the field survey. The features include barriers to fish, such as waterfalls, and also other notable items such as eroding banks, landslides, and culverts or bridges. All features are included on the Project and Interpretative maps.

#### **4.4 Fish Age, Size, and Life History**

The species recorded during the inventory were rainbow trout/steelhead, cutthroat trout, coho, chinook, Dolly Varden and bull trout. Summaries of fish lengths and estimated life stage for fish caught at each site are provided in Table 10 - Table 13. The total number of fish, as well as the minimum and maximum fork lengths for each species within each major subbasin, are provided in Table 14.

All rainbow trout captured during the survey were caught at tributaries to the Copper River or near the mouth in reach 1 of the Kitnayakwa River. The rainbow trout are assumed to be steelhead and ranged in fork length from 70 - 273 mm (n = 5). Although length-frequency histograms were generated for rainbow trout (Figure 2), the capture was insufficient to identify age classes. However, David Bustard and Associates (1992) report the following rainbow trout length-at-age data based on sampling conducted in August:

|    |              |
|----|--------------|
| 0+ | to 63 mm     |
| 1+ | 64 - 97 mm   |
| 2+ | 98 - 137 mm  |
| 3+ | 142 - 173 mm |

Lewis and Buchanan (1998) report the average smolt age for Copper River steelhead is 3.6 years. The data collected suggests 1+ to 4+ rainbow trout/steelhead trout were captured during the sampling.

A resident population of cutthroat trout was documented in Cole Creek, upstream of the falls. A total of 8 cutthroat were caught, including juvenile and adult fish (fork lengths 128 - 250 mm). Cutthroat trout were also documented in another tributary to the Copper River (unnamed tributary 440-292700-00000). Although length-frequency histograms were generated for cutthroat trout (Figure 3), the capture was insufficient to identify age classes for this isolated resident population.



**Table 9.** Summary of features identified in the Kitnayakwa Planning Unit.

Table 9. Summary of features identified in the Kitnayakwa Planning Unit.

| Site # or NID #      | Local Name     | Watershed Code / ILP      | Site or NID Reach # | Map     | Feature Type <sup>a</sup> | Height (m) | Length (m) | Comment                                                                                 |
|----------------------|----------------|---------------------------|---------------------|---------|---------------------------|------------|------------|-----------------------------------------------------------------------------------------|
| Site 2               | Unnamed        | 29                        | 1                   | 93L.041 | C                         | 6          |            | chute over bedrock at road crossing; barrier to fish                                    |
| Site 14              | Unnamed        | 1507                      | 2                   | 93L.041 | CV                        |            |            |                                                                                         |
| Site 21              | Unnamed        | 1583                      | 1                   | 93L.041 | F                         | 7          |            | bedrock falls at mouth                                                                  |
| Site 21              | Unnamed        | 1583                      | 1                   | 93L.041 | F                         | 6          |            | bedrock falls ~50 m upstream                                                            |
| Site 21              | Unnamed        | 1583                      | 1                   | 93L.041 | F                         | 3          |            | bedrock falls ~65 m upstream (no photo taken)                                           |
| Site 31              | Unnamed        | 1778                      | 2                   | 93L.041 | C                         | 25         | 20         | barrier located at mouth                                                                |
| Site 38              | Unnamed        | 1837                      | 1                   | 93L.041 | BD                        | 1.2        |            | beaver dam with recent activity                                                         |
| Site 39              | Unnamed        | 1865                      | 1                   | 93L.041 | C                         | 60         | 250        | barrier to fish                                                                         |
| Site 39              | Unnamed        | 1865                      | 1                   | 93L.041 | BG                        |            |            |                                                                                         |
| Site 41              | Unnamed        | 1891                      | 1                   | 93L.041 | CV                        |            |            | culvert at road                                                                         |
| Site 63              | Unnamed        | 2177                      | 1                   | 93L.031 | F                         | 10         |            | falls near mouth                                                                        |
| Site 1               | Harvey Cr.     | 440-290800-000000-000000- | 2                   | 93L.041 | C                         | 1.8        |            | cascade                                                                                 |
| Site 3               | Unnamed        | 440-292700-000000-000000- | 1                   | 93L.041 | F                         | 15         |            | numerous falls                                                                          |
| Site 3               | Unnamed        | 440-292700-000000-000000- | 1                   | 93L.041 | CV                        |            |            | culvert at road                                                                         |
| Site 4               | Unnamed        | 440-305600-000000-000000- | 1                   | 93L.041 | CV                        | 0.7        |            | 2 CMP culverts with poor plunge pool                                                    |
| Site 4               | Unnamed        | 440-305600-000000-000000- | 1                   | 93L.041 | C                         | 8          | 20         | cascade section is a barrier to most fish                                               |
| Site 4               | Unnamed        | 440-305600-000000-000000- | 1                   | 93L.041 | CV                        | 0.7        |            | 1 m diameter CMP culvert                                                                |
| Site 7               | Kitnayakwa R.  | 440-314000-000000-000000- | 1                   | 93L.041 | BR                        | 15         |            | bridge over mouth of Kitnayakwa                                                         |
| Historical Nid 40044 | Kitnayakwa Cr. | 440-314000-000000-000000- | 3.                  | 93L.032 | C                         |            | 900        | Bustard cited cascade section in this reach                                             |
| Historical Nid 40045 | Kitnayakwa Cr. | 440-314000-000000-000000- | 3.                  | 93L.032 | F                         | 2          |            | Bustard cited 3 falls (location unknown) of 2m each within the cascade section (N40044) |
| Historical Nid 40047 | Kitnayakwa Cr. | 440-314000-000000-000000- | 3.                  | 93L.032 | F                         | 4          |            | Bustard cited 4m falls as end of fish use at this location                              |
| Site 9               | Kitnayakwa R.  | 440-314000-000000-000000- | 4                   | 93L.032 | CN                        |            |            | canyon                                                                                  |
| Historical Nid 40048 | Kitnayakwa Cr. | 440-314000-000000-000000- | 4.                  | 93L.032 | F                         |            |            | Bustard cited falls of unknown height at this location                                  |
| Historical Nid 40049 | Kitnayakwa Cr. | 440-314000-000000-000000- | 4.                  | 93L.032 | F                         | 20         |            | Bustard cited 20m falls at this location                                                |
| Site 11              | Cole Cr.       | 440-314000-031000-000000- | 1                   | 93L.041 | F                         | 15         |            | could not get a good photo                                                              |
| Historical Nid 40078 | Cole Cr.       | 440-314000-031000-000000- | 1.                  | 93L.041 | C                         | 40         | 250        | RJA cited a cascade obstruction at this location                                        |
| Site 13              | Cole Cr.       | 440-314000-031000-000000- | 4                   | 93L.041 | F                         | 8          |            | Falls in reach 3 downstream of site                                                     |
| Site 17              | Steward Cr.    | 440-314000-060000-000000- | 3                   | 93L.041 | F                         | 2          |            | falls - barrier to fish                                                                 |
| Site 17              | Steward Cr.    | 440-314000-060000-000000- | 3                   | 93L.041 | F                         | 4          |            | falls- barrier to fish                                                                  |
| Site 19              | Unnamed        | 440-314000-060000-376000- | 1                   | 93L.041 | C                         | 5          | 15         | cascade                                                                                 |
| Site 220             | Unnamed        | 440-314000-060000-51700   | 1                   | 93L.041 | X                         |            | 30         | logjam from blowdown at mouth.                                                          |

|          |         |                        |   |         |   |   |   |                              |
|----------|---------|------------------------|---|---------|---|---|---|------------------------------|
| Site 220 | Unnamed | 440-314000-06000-51700 | 1 | 93L.041 | F | 3 | 2 | EFU at the top of the reach. |
| Site 220 | Unnamed | 440-314000-06000-51700 | 1 | 93L.041 | F | 4 | 2 |                              |

Table 9. con't...

| Site # or NID #      | Local Name       | Watershedcode / ILP     | Site or NID Reach # | Map     | Feature Type <sup>a</sup> | Height (m) | Length (m) | Comment                                                                                                               |
|----------------------|------------------|-------------------------|---------------------|---------|---------------------------|------------|------------|-----------------------------------------------------------------------------------------------------------------------|
| Site 26              | Nilah Cr.        | 440-314000-08600-00000- | 1                   | 93L.041 | BR                        |            |            | eroding bank                                                                                                          |
| Site 26              | Nilah Cr.        | 440-314000-08600-00000- | 1                   | 93L.041 | HCE                       | 3          | 20         |                                                                                                                       |
| Historical Nid 40075 | Nilah Cr.        | 440-314000-08600-00000- | 1.                  | 93L.041 | X                         |            |            | AEM cited a very narrow leave strip as leading to a blowdown problem and resultant debris jam at this location.       |
| Historical Nid 40076 | Nilah Cr.        | 440-314000-08600-00000- | 2.                  | 93L.041 | FLD                       |            |            | AEM cited a natural dewatering of the original channel. The channel now flows along the edge of an adjacent cutblock. |
| Site 27              | Nilah Cr.        | 440-314000-08600-00000- | 3                   | 93L.041 | LS                        |            | 50         | avalanche material                                                                                                    |
| Site 260             | Nilah Cr.        | 440-314000-08600-00000- | 4                   | 93L.041 | F                         | 3          |            | cascade barrier at downstream end of reach                                                                            |
| Site 29              | Unnamed          | 440-314000-08600-40400- | 1                   | 93L.041 | X                         |            | 20         | logging debris in creek is trapping material                                                                          |
| Reach Nid 80507      | Unnamed          | 440-314000-08600-40400- | 2.                  | 93L.041 | F                         |            |            |                                                                                                                       |
| Reach Nid 80306      | Unnamed          | 440-314000-08600-40400- | 2.                  | 93L.041 | F                         |            |            |                                                                                                                       |
| Site 30              | Unnamed          | 440-314000-15100-00000- | 2                   | 93L.041 | LS                        | 9          | 20         | landslide, new this year, with material deposited in creek                                                            |
| Site 30              | Unnamed          | 440-314000-15100-00000- | 2                   | 93L.041 | C                         | 2          |            | cascade observed from air, upstream in reach                                                                          |
| Site 35              | 3+900, Creek 3-1 | 440-314000-23200-00000- | 1                   | 93L.041 | F                         | 6          |            |                                                                                                                       |
| Site 35              | 3+900, Creek 3-1 | 440-314000-23200-00000- | 1                   | 93L.041 | F                         | 7          |            |                                                                                                                       |
| Site 36              | Unnamed          | 440-314000-24900-00000- | 1                   | 93L.041 | BG                        |            |            |                                                                                                                       |
| Site 37              | Unnamed          | 440-314000-25600-00000- | 1                   | 93L.041 | BR                        | 0.7        |            | bridge                                                                                                                |
| Site 37              | Unnamed          | 440-314000-25600-00000- | 1                   | 93L.041 | C                         | 10         | 25         | cascade section                                                                                                       |
| Site 37              | Unnamed          | 440-314000-25600-00000- | 1                   | 93L.041 | F                         | 2          | 1          | in reach 2, 1.2 km upstream of reach 1                                                                                |
| Site 37              | Unnamed          | 440-314000-25600-00000- | 1                   | 93L.041 | F                         | 4          |            |                                                                                                                       |
| Historical Nid 40163 | Unnamed          | 440-314000-25600-00000- | 1.                  | 93L.041 | EFU                       |            |            | No fish use above this point as cited by Bustard                                                                      |
| Site 40              | Katrina Cr.      | 440-314000-32700-00000- | 1                   | 93L.041 | F                         | 6          |            | 6m falls barrier                                                                                                      |
| Site 40              | Katrina Cr.      | 440-314000-32700-00000- | 1                   | 93L.041 | X                         |            |            | debris jam                                                                                                            |
| Historical Nid 40162 | Iceflow Cr.      | 440-314000-34300-00000- | 1.                  | 93L.041 | EFU                       |            |            | No fish use above this point as cited by Bustard                                                                      |
| Site 43              | Iceflow Cr.      | 440-314000-34300-00000- | 2                   | 93L.041 | F                         | 8          | 4          | barrier in Reach 1                                                                                                    |
| Historical Nid 40046 | O'Brien Cr.      | 440-314000-50400-00000- | 1.                  | 93L.032 | F                         |            |            | Bustard cited falls of unknown height at this location                                                                |
| Historical Nid 40043 | Unnamed          | 440-314000-53900-00000- | 1.                  | 93L.031 | F                         | 6          |            | Bustard cited barrier falls at this location                                                                          |
| Site 48              | Tun Cr.          | 440-314000-54700-00000- | 2                   | 93L.032 | C                         | 1.3        |            | cascade (looking u/s)                                                                                                 |
| Reach Nid 80043      | Tun Cr.          | 440-314000-54700-00000- | 2.                  | 93L.032 | F                         |            |            |                                                                                                                       |
| Site 57              | Unnamed          | 440-314000-68200-00000- | 1                   | 93L.032 | LS                        | 1.4        | 20         | eroding bank                                                                                                          |

|         |            |                          |   |         |   |   |    |                                   |
|---------|------------|--------------------------|---|---------|---|---|----|-----------------------------------|
| Site 60 | Miners Cr. | 440-314000-78900-000000- | 1 | 93L.031 | X | 3 | 40 | debris jam 80 m upstream of mouth |
|---------|------------|--------------------------|---|---------|---|---|----|-----------------------------------|

a. F - falls, C - cascade, FLD - dewatering, X - log jam, CV - culvert, BG - general stream crossing, BR - bridge, CN - canyon, HCE - bank erosion, EFU - extent of fish use  
 LS - landslide, BD - beaver dam, FD - ford

**Table 10.** Summary of rainbow trout data collected in the Kitnayakwa Planning Unit, September 1999.

**Table 11.** Summary of cutthroat trout data collected in the Kitnayakwa Planning Unit, September 1999.

Table 10. Summary of rainbow trout data collected in the Kimayakwa Planning Unit, September 1999.

| Site # | Local Name   | Watershed Code / ILP     | Reach # | Map     | Species | Stage | Total # of Fish | Minimum Length (mm) | Maximum Length (mm) | Comment |
|--------|--------------|--------------------------|---------|---------|---------|-------|-----------------|---------------------|---------------------|---------|
| 3      | Unnamed      | 440-292700-00000-00000-  | 1       | 93L.041 | RB      | J     | 2               | 70                  | 126                 |         |
| 7      | Kimayakwa R. | 440-314000-000000-00000- | 1       | 93L.041 | RB      | J     | 3               | 235                 | 273                 |         |

Stage - F - fry, J - juvenile, A - adult

Table 11. Summary of cutthroat trout data collected in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name | Watershed Code / ILP    | Reach # | Map     | Species | Stage | Total # of Fish | Minimum Length (mm) | Maximum Length (mm) | Comment |
|--------|------------|-------------------------|---------|---------|---------|-------|-----------------|---------------------|---------------------|---------|
| 3      | Unnamed    | 440-292700-00000        | 1       | 93L.041 | CT      | J     | 1               | 95                  | 95                  |         |
| 11     | Cole Cr.   | 440-314000-03100-00000- | 1       | 93L.041 | CT      | J     | 1               | 128                 | 128                 |         |
| 11     | Cole Cr.   | 440-314000-03100-00000- | 1       | 93L.041 | CT      | A     | 3               | 196                 | 220                 |         |
| 12     | Cole Cr.   | 440-314000-03100-00000- | 2       | 93L.041 | CT      | J     | 2               | 128                 | 140                 |         |
| 12     | Cole Cr.   | 440-314000-03100-00000- | 2       | 93L.041 | CT      | A     | 1               | 250                 | 250                 |         |

Stage - F - fry, J - juvenile, A - adult

**Table 12.** Summary of Dolly Varden/bull trout data collected in the Kitnayakwa Planning Unit, September 1999.

**Table 13.** Summary of coho and chinook data collected in the Kitnayakwa Planning Unit, September 1999.



Table 12. Summary of Dolly Varden/bull trout data collected in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name    | Watershed Code / ILP     | Reach # | Map     | Species | Stage | Total # of Fish | Minimum Length (mm) | Maximum Length (mm) | Comment             |
|--------|---------------|--------------------------|---------|---------|---------|-------|-----------------|---------------------|---------------------|---------------------|
| 8      | Kitnayakwa R. | 440-314000-00000-000000- | 2       | 93L.041 | DV      | F     | 1               | 30                  | 30                  |                     |
| 7      | Kitnayakwa R. | 440-314000-00000-000000- | 1       | 93L.041 | DV      | F     | 1               | 43                  | 43                  |                     |
| 8      | Kitnayakwa R. | 440-314000-00000-000000- | 2       | 93L.041 | DV      | J     | 2               | 90                  | 120                 |                     |
| 8      | Kitnayakwa R. | 440-314000-00000-000000- | 2       | 93L.041 | DV      | A     | 1               | 180                 | 180                 |                     |
| 16     | Steward Cr.   | 440-314000-06000-000000- | 2       | 93L.041 | DV      | F     | 1               | 48                  | 48                  |                     |
| 15     | Steward Cr.   | 440-314000-06000-000000- | 1       | 93L.041 | BT      | A     | 1               | 500                 | 500                 |                     |
| 19     | Unnamed       | 440-314000-06000-37600-  | 1       | 93L.041 | DV      | J     | 4               | 80                  | 95                  | possible BT         |
| 19     | Unnamed       | 440-314000-06000-37600-  | 1       | 93L.041 | DV      | A     | 1               | 230                 | 230                 |                     |
| 19     | Unnamed       | 440-314000-06000-37600-  | 1       | 93L.041 | BT      | A     | 2               | 235                 | 245                 |                     |
| 220    | Unnamed       | 440-314000-06000-51700-  | 1       | 93L.041 | DV      | A     | 4               | 160                 | 260                 | 1 DV ~160mm escaped |
| 26     | Nilah Cr.     | 440-314000-08600-000000- | 1       | 93L.041 | DV      | F     | 6               | 40                  | 49                  | 2 DV escaped        |
| 26     | Nilah Cr.     | 440-314000-08600-000000- | 1       | 93L.041 | DV      | J     | 5               | 100                 | 102                 | 2 DV escaped        |
| 26     | Nilah Cr.     | 440-314000-08600-000000- | 1       | 93L.041 | DV      | A     | 1               | 146                 | 146                 |                     |
| 27     | Nilah Cr.     | 440-314000-08600-000000- | 3       | 93L.041 | DV      | A     | 1               | 201                 | 201                 |                     |
| 29     | Unnamed       | 440-314000-08600-40400-  | 1       | 93L.041 | DV      | F     | 1               | 42                  | 42                  |                     |
| 29     | Unnamed       | 440-314000-08600-40400-  | 1       | 93L.041 | DV      | J     | 1               | 117                 | 117                 |                     |
| 29     | Unnamed       | 440-314000-08600-40400-  | 1       | 93L.041 | DV      | A     | 2               | 147                 | 161                 |                     |
| 37     | Unnamed       | 440-314000-25600-000000- | 1       | 93L.041 | DV      | A     | 1               | 222                 | 222                 |                     |
| 40     | Katrina Cr.   | 440-314000-32700-000000- | 1       | 93L.041 | BT      | J     | 1               | 95                  | 95                  |                     |

Stage - F - fry, J - juvenile, A - adult

| Site # | Local Name | Watershed Code / ILP | Reach # | Map | Species | Stage | Total # of Fish | Minimum Length (mm) | Maximum Length (mm) | Comment |
|--------|------------|----------------------|---------|-----|---------|-------|-----------------|---------------------|---------------------|---------|
|--------|------------|----------------------|---------|-----|---------|-------|-----------------|---------------------|---------------------|---------|

Table 13. Summary of coho and chinook data collected in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name    | Watershed Code / ILP      | Reach # | Map     | Species | Stage | Total # of Fish | Minimum Length (mm) | Maximum Length (mm) | Comment                        |
|--------|---------------|---------------------------|---------|---------|---------|-------|-----------------|---------------------|---------------------|--------------------------------|
| 7      | Kitnayakwa R. | 440-314000-000000-000000- | 1       | 93L.041 | CH      | A     | 1               | 800                 | 800                 | shocking ceased after CH noted |
| 3      | Unnamed       | 440-292700-000000-000000- | 1       | 93L.041 | CO      | F     | 1               | 45                  | 45                  |                                |

Stage - F - fry, J - juvenile, A - adult

**Table 14.** Total catch and range of fork length for fish species caught in major subbasins in the Kitnayakwa Planning Unit, September 1999.

Table 14. Summary of length-at-age estimates for fish species caught in the Kitnayakwa Planning Unit September 1999.

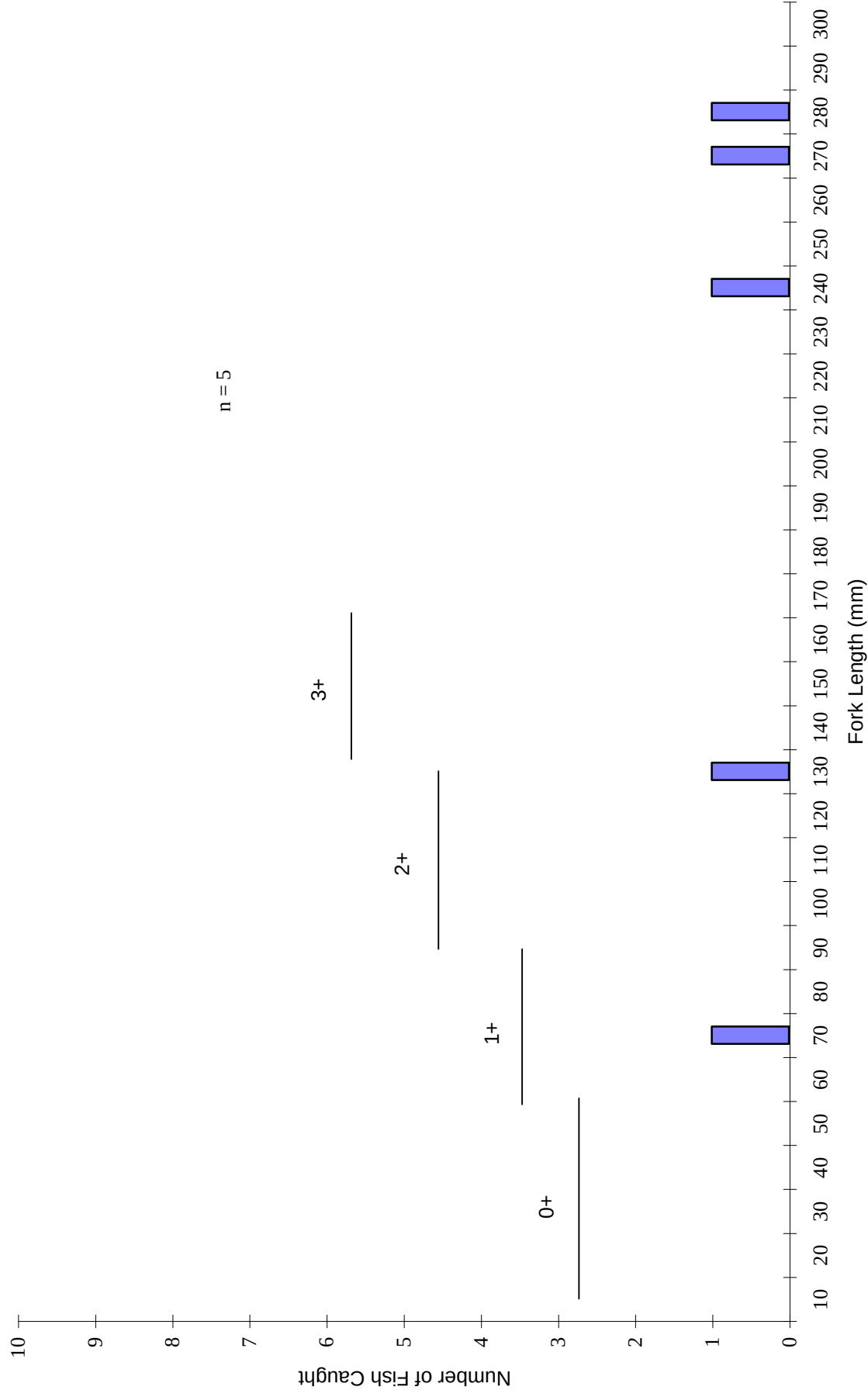
| Stream Name            | Fish Species <sup>a</sup> | Estimated Age Class <sup>b</sup> | Number of Fish | Min. Fork Length (mm) | Max. Fork Length (mm) | Mean Fork Length (mm) |
|------------------------|---------------------------|----------------------------------|----------------|-----------------------|-----------------------|-----------------------|
| Kitnayakwa R.          | CH                        | A                                | 1              | 800                   | 800                   | 800.0                 |
|                        | DV                        | 0+                               | 2              | 30                    | 43                    | 36.5                  |
|                        |                           | 1+                               | 2              | 90                    | 120                   | 105.0                 |
|                        |                           | 2+                               | 1              | 180                   | 180                   | 180.0                 |
| Steward Cr.            | RB                        | 4+                               | 3              | 235                   | 273                   | 257.7                 |
|                        | BT                        | 4+                               | 1              | 500                   | 500                   | 500.0                 |
|                        | DV                        | 0+                               | 1              | 48                    | 48                    | 48.0                  |
|                        |                           | 0+                               | 4              | 40                    | 49                    | 44.0                  |
| Nilah Cr.              | DV                        | 1+                               | 3              | 100                   | 102                   | 101.0                 |
|                        |                           | 2+                               | 1              | 146                   | 146                   | 146.0                 |
|                        |                           | 3+                               | 1              | 201                   | 201                   | 201.0                 |
|                        |                           | 2+                               | 3              | 128                   | 140                   | 132.0                 |
| Cole Cr.               | CT                        | 3+                               | 4              | 196                   | 250                   | 219.5                 |
|                        | BT                        | 1+                               | 1              | 95                    | 95                    | 95.0                  |
| Katrina Cr.<br>Unnamed | BT                        | 2+                               | 2              | 235                   | 245                   | 240.0                 |
|                        | CO                        | 0+                               | 1              | 45                    | 45                    | 45.0                  |
|                        | CT                        | 1+                               | 1              | 95                    | 95                    | 95.0                  |
|                        | DV                        | 0+                               | 1              | 42                    | 42                    | 42.0                  |
|                        |                           | 1+                               | 5              | 80                    | 117                   | 93.8                  |
|                        |                           | 2+                               | 3              | 147                   | 161                   | 156.0                 |
| RB                     | 3+                        | 4                                | 222            | 260                   | 238.0                 |                       |
|                        | 1+                        | 1                                | 70             | 70                    | 70.0                  |                       |
|                        | 2+                        | 1                                | 126            | 126                   | 126.0                 |                       |
|                        | Total fish                |                                  |                | 27                    |                       |                       |

a. CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, CT - cutthroat trout, RB - rainbow trout,

b. age class estimate from length-frequency histograms for entire project area, see Section 4.4

**Figure 2.** Length frequency histogram for rainbow trout in the Kitnayakwa Planning Unit, September 1999.

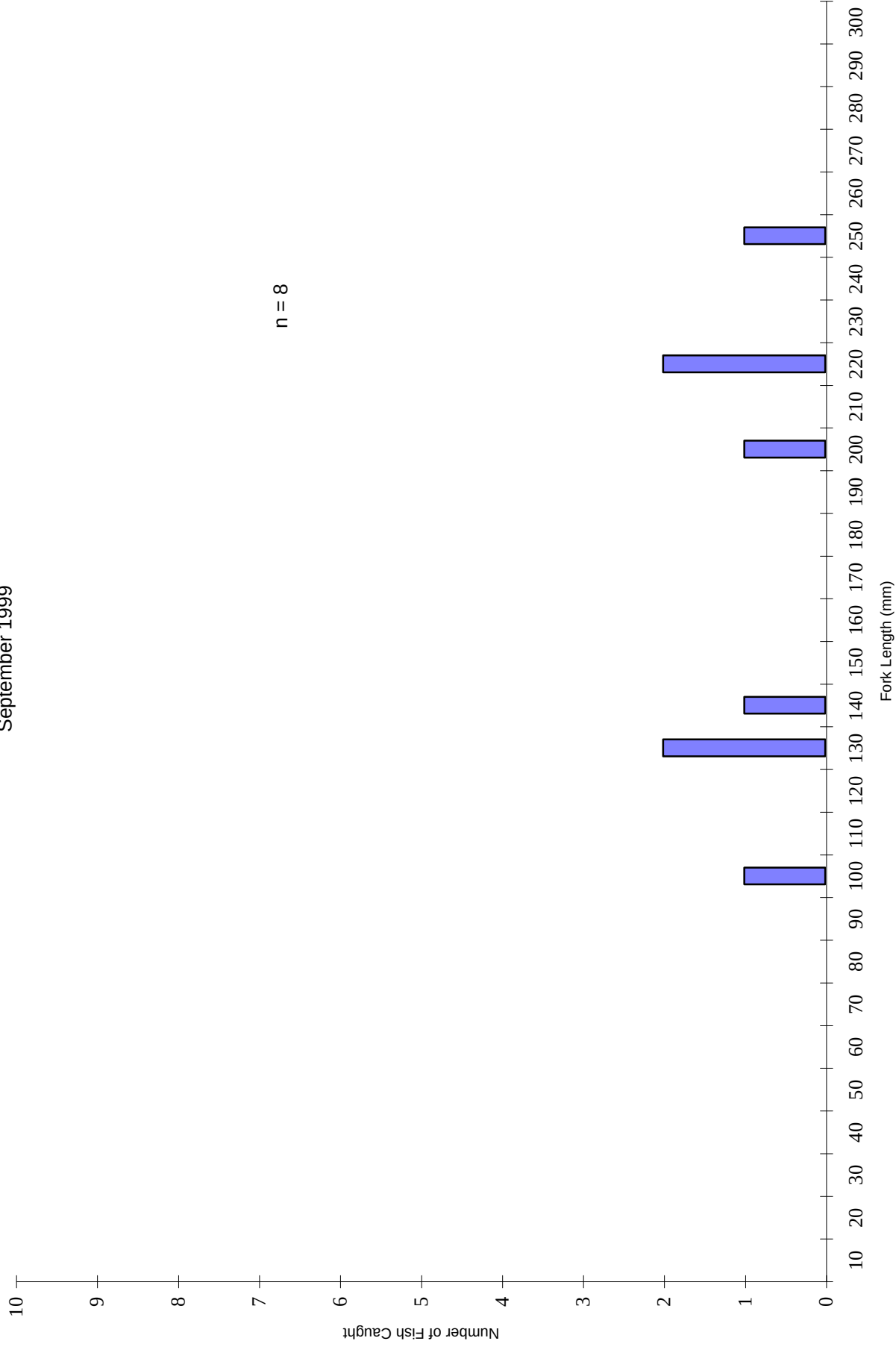
Figure 2. Length-frequency histogram for rainbow trout captured in the Kitnayakwa River Planning Unit, September 1999



Note: estimated length-at-age taken from Bustard and Associates, 1992

**Figure 3.** Length frequency histogram for cutthroat trout in the Kitnayakwa Planning Unit, September 1999.

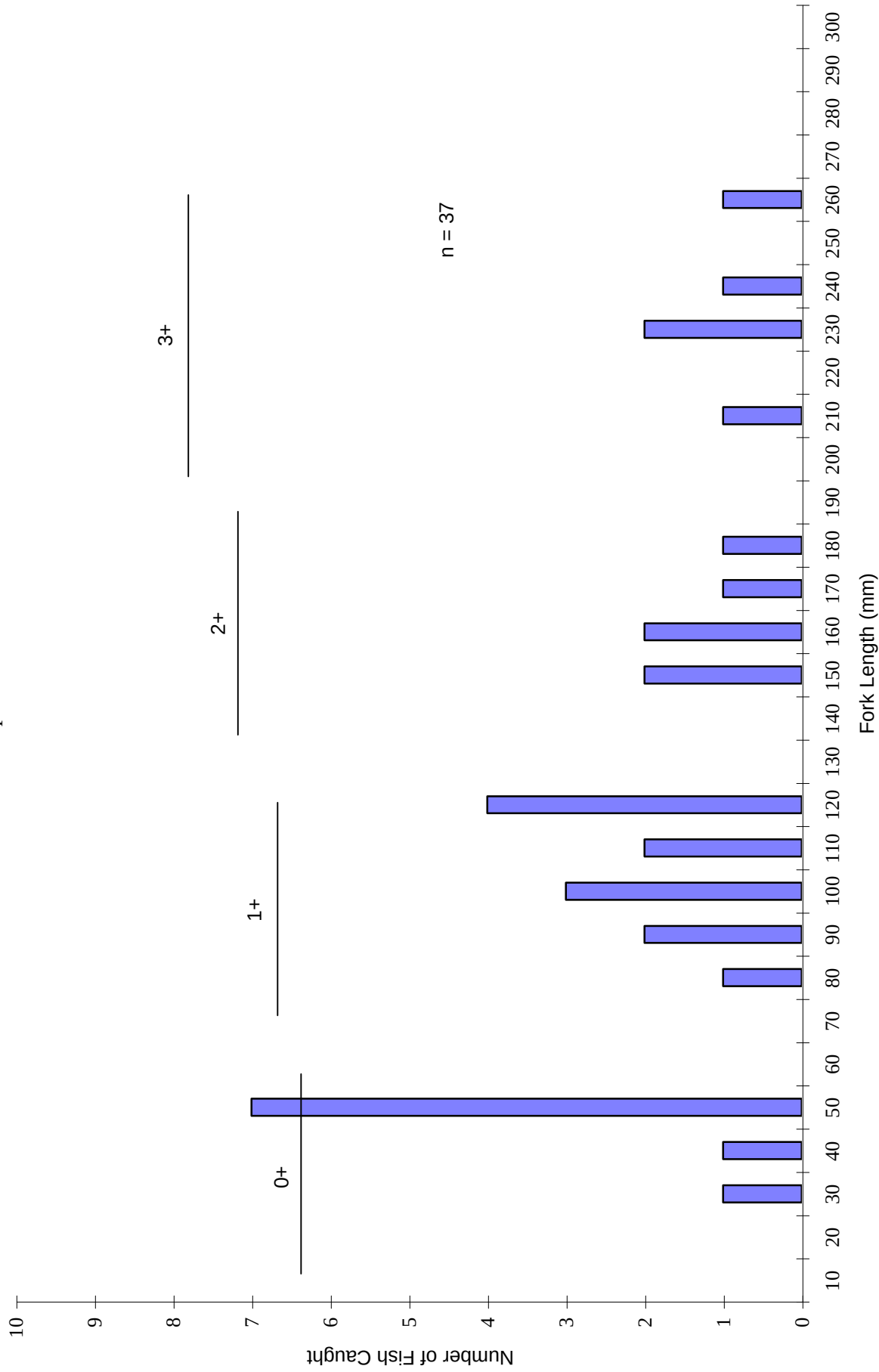
Figure 3. Length-frequency histogram for cutthroat trout captured in the Kitnayakwa River Planning Unit, September 1999





**Figure 4.** Length frequency histogram for Dolly Varden in the Kitnayakwa Planning Unit, September 1999.

Figure 4. Length-frequency histogram for Dolly Varden captured in the Kitnayakwa River Planning Unit, September 1999



Bull trout/Dolly Varden were the most wide spread species captured during the study and ranged in fork length from 30 - 500 mm (n = 37). A length-frequency histogram with estimated age classes was generated for Dolly Varden (**Figure 4**) and indicates that sampling documented fry, juvenile and adult bull trout/Dolly Varden.

One coho fry and one adult chinook were captured near the mouth in reach 1 of the Kitnayakwa River, but were not captured further upstream in the watershed. However, both species have been documented historically in reach 2.

A fish sampling summary is included in Table 15 and provides a fish density index (fish/100m<sup>2</sup>) for each fish bearing sample site. The higher fish densities (1.25 - 6.67 fish/100m<sup>2</sup>) were documented in Cole Creek, Nilah Creek, the Kitnayakwa River mainstem and in unnamed tributaries to the Copper River and Nilah Creek.

## **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 subbasins and tributaries. Suitable spawning, rearing and overwintering habitat was available at many 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, although the Copper River provides well known steelhead fishing opportunities.

#### *4.5.1.1. Rearing Habitat*

Rearing habitat is available throughout the study area. Good or excellent rearing habitat was noted in a total of 19 reaches (33% of reaches) sampled in the Kitnayakwa River, Cole Creek, Tatsi Creek, Miners Creek, Steward Creek, and 9 unnamed tributaries (Table 3). Moderate rearing habitat was noted in 18 reaches (31%) and poor or no rearing habitat was noted in 21 reaches (36%). Excellent rearing habitat for both rainbow trout and Dolly Varden occurs upstream of the falls in reach 3 of the mainstem, but the upper watershed contained no fish.

The mainstem Copper River is a major rearing area for juvenile steelhead (Lewis and Buchanan 1998). Although the Kitnayakwa River watershed provides suitable rearing habitat for rainbow trout/steelhead, they have only been documented in the lower 300m of the watershed. Rainbow trout/steelhead were also caught in reach 1 of a Copper River tributary downstream of the Kitnayakwa River confluence.

Dolly Varden rearing was documented to reach 3 of the Kitnayakwa River, in Steward Creek and Nilah Creek. Several unnamed tributaries downstream of the falls also provide suitable rearing habitat for Dolly Varden. Sampling documented a moderate to high fish

**Table 15.** Fish sampling summary at fish bearing sites in the Kitnanyakwa Planning Unit, September 1999.

Table 15. Fish sampling summary at fish bearing sites in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name    | Watershed Code / ILP    | Reach # | Map     | Temp. (°C) | Conductivity (umhos) | Turbidity (GE) | Capture Method | Effort (Sec) | Area Sampled (m <sup>2</sup> ) | Voltage | Frequency | Pulse | Species    | Total Fish Caught | Fish Density Index (fish/100 m <sup>2</sup> ) |
|--------|---------------|-------------------------|---------|---------|------------|----------------------|----------------|----------------|--------------|--------------------------------|---------|-----------|-------|------------|-------------------|-----------------------------------------------|
| 3      | Unnamed       | 440-292700-00000-00000- | 1       | 93L.041 | 9.         | 40                   | C              | EF             | 190          | 120                            | 500     | 70        | 6     | CT, CO, RB | 4                 | 3.33                                          |
| 7      | Kitnayakwa R. | 440-314000-00000-00000- | 1       | 93L.041 | 8.         | 40                   | L              | EF             | 185          | 210                            | 400     | 70        | 6     | DV, CH, RB | 5                 | 2.38                                          |
| 8      | Kitnayakwa R. | 440-314000-00000-00000- | 2       | 93L.041 | 8.         | 50                   | L              | EF             | 297          | 240                            | 500     | 70        | 6     | DV         | 4                 | 1.67                                          |
| 11     | Cole Cr.      | 440-314000-03100-00000- | 1       | 93L.041 | 8.         | 90                   | C              | EF             | 320          | 320                            | 400     | 70        | 6     | CT         | 4                 | 1.25                                          |
| 12     | Cole Cr.      | 440-314000-03100-00000- | 2       | 93L.041 | 8.         | 90                   | C              | EF             | 455          | 480                            | 400     | 70        | 6     | CT         | 3                 | 0.63                                          |
| 15     | Steward Cr.   | 440-314000-06000-00000- | 1       | 93L.041 | 7.         | 50                   | C              | EF             | 514          | 900                            | 600     | 70        | 6     | BT         | 1                 | 0.11                                          |
| 16     | Steward Cr.   | 440-314000-06000-00000- | 2       | 93L.041 | 6.         | 30                   | C              | EF             | 207          | 700                            | 600     | 60        | 6     | DV         | 1                 | 0.14                                          |
| 19     | Unnamed       | 440-314000-06000-37600- | 1       | 93L.041 | 7.         | 50                   | C              | EF             | 447          | 800                            | 600     | 60        | 6     | BT, DV     | 7                 | 0.88                                          |
| 26     | Nilah Cr.     | 440-314000-08600-00000- | 1       | 93L.041 | 6.         | 10                   | L              | EF             | 1399         | 180                            | 500     | 70        | 6     | DV         | 12                | 6.67                                          |
| 27     | Nilah Cr.     | 440-314000-08600-00000- | 3       | 93L.041 | 5.5        | 20                   | M              | EF             | 271          | 240                            | 1000    | 70        | 6     | DV         | 1                 | 0.42                                          |
| 29     | Unnamed       | 440-314000-08600-40400- | 1       | 93L.041 | 6.         | 50                   | C              | EF             | 322          | 160                            | 500     | 70        | 6     | DV         | 4                 | 2.50                                          |
| 34     | Unnamed       | 440-314000-21000        | 1       | 93L.041 | 7.         | 80                   | C              | EF             | 90           | 160                            | 500     | 70        | 6     | NFC        | 0                 | n/a                                           |
| 36     | Unnamed       | 440-314000-24900        | 1       | 93L.041 | 6.         | 20                   | C              | EF             | 246          | 800                            | 500     | 70        | 6     | NFC        | 0                 | n/a                                           |
| 37     | Unnamed       | 440-314000-25600-00000- | 1       | 93L.041 | 6.         | 20                   | L              | EF             | 795          | 300                            | 600     | 70        | 6     | DV         | 1                 | 0.33                                          |
| 40     | Katrina Cr.   | 440-314000-32700-00000- | 1       | 93L.041 | 16.        | 50                   | T              | EF             | 420          | 375                            | 400     | 70        | 6     | BT         | 1                 | 0.27                                          |
| 220    | Unnamed       | 440-314000-06000-51700- | 1       | 93L.041 | 7.         | 40                   | C              | EF             | 673          | 240                            | 600     | 70        | 6     | DV         | 4                 | 1.67                                          |

EF - electrofishing, NFC - no fish caught, CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, RB - rainbow trout, CT - cutthroat trout, CPUE - catch-per unit effort

density index in Kitnayakwa River reach 1 and 2, Nilah Creek reach 1, an unnamed tributary to Nilah Creek, and an unnamed tributary to Steward Creek, all of which had moderate to good value rearing habitat.

Coho rearing was documented at the mouth of the Kitnayakwa River and in reach 1 of a Copper River tributary located downstream of the Kitnayakwa River confluence. Coho rearing has also been historically documented in reach 2 of the Kitnayakwa River (Department of Fisheries and Oceans 1999).

Adult chinook were documented in reach 1 of the Kitnayakwa River and chinook rearing has been historically documented in a sidechannel in reach 2 (Applied Ecosystem Management *et al.* 1999). Although the mainstem is generally confined by the adjacent high gradient slopes, some sidechannel habitat exists in reach 2.

#### 4.5.1.2 Spawning Habitat

Good or excellent spawning habitat was noted in a total of 13 reaches (22% of reaches) located in the Kitnayakwa River, Cole Creek, Tatsi Creek, Miners Creek, and an unnamed tributary (ILP 2073) (Table 3). Moderate spawning habitat was noted in 23 reaches (40%) and poor or no spawning habitat was noted in 22 reaches (38%). The presence of fry and juvenile fish in each of the major subbasins, except Miners Creek, indicates that habitat is available and that spawning is occurring throughout the study area.

Within the study area, the Copper River mainstem provides minimal steelhead spawning value and tributaries have little potential for steelhead spawning except in the lower ends (Lough 1983 as cited in Lewis and Buchanan 1998). Steelhead spawning is not suspected in the Kitnayakwa River watershed because historic and current sampling has only documented steelhead in the lower 300 m of the watershed. Coho and chinook spawning habitat exists in the lower mainstem and Nilah Creek. Dolly Varden/bull trout spawning habitat exists in both the mainstem as well as tributaries of the major subbasins in this study area.

#### 4.5.1.3 Overwintering Habitat

Good or excellent overwintering habitat was noted in a total of 21 reaches (36% of reaches) found in the Kitnayakwa River, Cole Creek, Steward Creek, Miners Creek, Tatsi Creek, and a number of unnamed tributaries (Table 3). Moderate overwintering habitat was noted in 15 reaches (26%) and poor or no overwintering habitat was noted in 22 reaches (38%). The mainstem of the Copper River within the study area is known to provide steelhead trout overwintering habitat (Beere 1995 as cited in Lewis and Buchanan 1998).

## 4.5.2 Habitat Protection Concerns

### *4.5.2.1 Fisheries Sensitive Zones*

The Copper River floodplain provides significant side and offchannel habitat that provide important rearing and high-water refuge habitat for salmonids. Although more significant side and offchannel habitat is found downstream of the study area, fisheries sensitive zones occur within the floodplain as seasonally wetted backchannels and sloughs. These generally occur within the riparian management zone for the mainstem and would be protected through the riparian management area guidelines under the Forest Practices Code. 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. Fish were caught above 20% gradient at 1 site; Dolly Varden were documented at a site with a gradient of 22%. Cutthroat trout and rainbow trout/steelhead also were documented in a reach with an average gradient of 21%, but all fish were caught in the low gradient (4%) section of the reach, near the mouth. The average gradient of confirmed fish bearing reaches in the study area ranged from 2% to 22% (Table 16). Dolly Varden/bull trout were documented at gradients of up to 22%, while rainbow trout, coho and chinook were documented at a gradients of <5%.

### *4.5.2.3 Restoration and Rehabilitation Opportunities*

Sampling in the Kitnayakwa Planning Unit took place at reaches adjacent to road or forestry activities as well as reaches removed from forestry activities. The data collection and field surveys identified 3 sites with restoration and rehabilitation opportunities and they are described in Table 17. In particular, the removal of logging debris in reach 1 of an unnamed tributary to Nilah Creek is recommended due to concerns that this debris jam will alter the course of the creek at this location.

A more detailed Level 1 WRP Fisheries Assessment for the Zymoetz River was completed by RJA Forestry Ltd (Pollard *et al.*, 1996) in 1995. Subsequently, a detailed WRP assessment was conducted in the Zymoetz Watershed by Applied Ecosystem Management Ltd. (Applied Ecosystem Management *et al.* 1999). This report details significant individual forestry related impacts to fish habitat and provides prescriptions for their restoration. Areas examined which are relevant to the Kitnayakwa study area are: the Kitnayakwa River, Cole Creek, Nilah Creek and Steward Creek. Among the findings of this study are numerous road related and natural slide areas along Reach 1 of

**Table 16.** Average gradient at fish bearing reaches in the Kitnanyakwa Planning Unit, September 1999.



Table 16. Average gradient at fish bearing reaches in the Kitnayakwa Planning Unit, September

| Site # | Local Name    | Watershed Code / ILP    | Reach # | Average Gradient % <sup>a</sup> | Fish Species <sup>b</sup> |
|--------|---------------|-------------------------|---------|---------------------------------|---------------------------|
| 3      | Unnamed       | 440-292700-00000-00000- | 1       | 21 <sup>c</sup>                 | CT, RB, CO                |
| 7      | Kitnayakwa R. | 440-314000-00000-00000- | 1       | 2                               | RB, CH, DV                |
| 8      | Kitnayakwa R. | 440-314000-00000-00000- | 2       | 2                               | DV                        |
| 11     | Cole Cr.      | 440-314000-03100-00000- | 1       | 3                               | CT                        |
| 12     | Cole Cr.      | 440-314000-03100-00000- | 2       | 11                              | CT                        |
| 15     | Steward Cr.   | 440-314000-06000-00000- | 1       | 11                              | BT                        |
| 16     | Steward Cr.   | 440-314000-06000-00000- | 2       | 6                               | DV                        |
| 19     | Unnamed       | 440-314000-06000-37600- | 1       | 22                              | DV, BT                    |
| 26     | Nilah Cr.     | 1890                    | 1       | 3                               | DV                        |
| 27     | Nilah Cr.     | 440-314000-08600-00000- | 3       | 6                               | DV                        |
| 29     | Unnamed       | 440-314000-08600-40400- | 1       | 6                               | DV                        |
| 34     | Unnamed       | 440-314000-21000-00000- | 1       | 12                              | NFC                       |
| 36     | Unnamed       | 440-314000-24900-00000- | 1       | 10                              | NFC                       |
| 37     | Unnamed       | 440-314000-25600-00000- | 1       | 13                              | DV                        |
| 40     | Katrina Cr.   | 440-314000-32700-00000- | 1       | 15                              | BT                        |
| 220    | Unnamed       | 440-314000-06000-51700- | 1       | 6                               | DV                        |

a. field measured

b. CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, RB - rainbow trout, CT - cutthroat trout  
NFC - no fish caught

c. average gradient was 21% but fish capture occurred at section with gradients of 2% and 6%

**Table 17.** Summary of restoration and rehabilitation opportunities in the Kitnayakwa Planning Unit, September 1999.

Table 17. Summary of restoration and rehabilitation opportunities in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name | Watershed Code / ILP        | Reach # | Recommendations and Observations                                                                                                                                                                                                 | Fish Species <sup>a</sup> | Habitat Quality                                                                                                                                                                                                                                            |
|--------|------------|-----------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Harvey Cr. | 440-290800-00000            | 2       | Restore access to Copper River at mouth, fish could use lower 200 m (reach 1).                                                                                                                                                   | NFC                       | Poor overwintering: shallow pools only, poor rearing, pools isolated by cascades, no suitable spawning gravels. Reach 1 provides better fish habitat.                                                                                                      |
| 29     | Unnamed    | 440-314000-08600-40400-0000 | 1       | Logging debris near mouth of creek creating jam; should be removed. Evidence of high flow & bedload movement upstream. Use logs elsewhere for habitat restoration. Investigate potential to stimulate tree regrowth in cutblock. | DV                        | Good overwintering habitat with pools and gravel/cobbles for fry, juveniles and adult fish, good to excellent rearing habitat with pools, riffle sections and small cascades, moderate spawning potential for DV in tail-outs of pools and riffle section. |
| 190    | Unnamed    | 440-314000-06000-37600-0000 | 2       | Road crossing (removed bridge) should be monitored for bank erosion and downstream siltation.                                                                                                                                    | NFC                       | Good rearing pools and LWD cover, cascades between pools make migration difficult for small fish, moderate spawning gravel for DV associated with pools and areas of good velocity, moderate overwintering for fry and juveniles.                          |

a. NFC - no fish caught, DV - Dolly Varden

the Kitnayakwa River. These have been mapped on the Project and Interpretive maps. A list of restoration recommendations is as follows:

1. Kitnayakwa River and Cole Creek reach 1 - remove culverts under Kitnayakwa Mainline, elevate road bed
2. Kitnayakwa River reach 2 - habitat enhancement of a side channel identified
3. Nilah Creek reach 1 - log jam removal
4. Nilah Creek reach 2 - detailed aquatic survey recommended
5. Cole Creek reach 1 downstream of falls - number of habitat enhancements identified
6. Cole Creek upstream of falls reach 1 - further assessments recommended in a number of areas

## **4.6 Fish Bearing Status**

### **4.6.1 Fish Bearing Reaches**

A total of 16 of the 66 sample sites in this inventory have been classified as fish bearing based on the presence of fish, suitable fish habitat, and/or fish access. A total of 15 sites were classified as fish bearing based on the capture of fish and 1 site was classified as inferred fish bearing due to suitable habitat and lack of identified barriers. The inferred fish bearing site is recommended for follow-up sampling (see Section 4.6.4) in order to groundtruth the lack of barrier in reach 1. If a barrier is identified and no fish are caught during the follow-up sampling, the classification of this reach can be changed to confirmed non-fish bearing. All fish bearing reaches are shown in red on the 1:20,000 Interpretative Maps (Appendix II).

Table 18 summarizes data collected at fish bearing reaches in the Kitnayakwa Planning Unit. Resampling recommendations for sites classified as fish bearing by default are included in Table 19.

### **4.6.2 Non-fish Bearing Reaches**

Sites classified as non-fish bearing in this inventory are characterized by an absence of fish, poor fish habitat, and/or no fish access due to downstream barriers. A total of 39 reaches have been classified as non-fish bearing S5 and S6. An additional 7 reaches were classified as “No Visible Channel”, based on the absence of bed scour and a lack of alluvium. An additional 4 reaches are inferred non-fish bearing, pending follow-up sampling results. The inferred non-fish bearing reaches are recommended for follow-up sampling to confirm suspected barriers and/or to confirm the absence of fish upstream of barriers where suitable fish habitat occurs.

Table 20 summarizes sampling data collected from the non-fish bearing reaches identified in this field sampling program. Table 21 provides a summary of fish sampling data at non-fish bearing sites.

**Table 18.** Summary of data collected at surveyed fish bearing reaches in the Kitnayakwa Planning Unit, September 1999.

Table 18. Summary of data collected at surveyed fish bearing reaches in the Kinayakwa Planning Unit, September

| Site # | Local Name   | Watershed Code / ILP      | Reach # | Map     | Average Channel Width (m) | Average Gradient % | Proposed Stream Class | Fish Cards | Fish Species <sup>a</sup> |
|--------|--------------|---------------------------|---------|---------|---------------------------|--------------------|-----------------------|------------|---------------------------|
| 3      | Unnamed      | 440-292700-000000-000000- | 1       | 93L.041 | 3.8                       | 21                 | S3                    | Y          | CT, CO, RB                |
| 7      | Kinayakwa R. | 440-314000-000000-000000- | 1       | 93L.041 | 30.8                      | 2                  | S1                    | Y          | RB, CH, DV                |
| 8      | Kinayakwa R. | 440-314000-000000-000000- | 2       | 93L.041 | 73.3                      | 2                  | S1                    | Y          | DV                        |
| 11     | Cole Cr.     | 440-314000-031100-000000- | 1       | 93L.041 | 4.7                       | 3                  | S3                    | Y          | CT                        |
| 12     | Cole Cr.     | 440-314000-031100-000000- | 2       | 93L.041 | 4.5                       | 11                 | S3                    | Y          | CT                        |
| 15     | Steward Cr.  | 440-314000-060000-000000- | 1       | 93L.041 | 29.5                      | 11                 | S1                    | Y          | BT                        |
| 16     | Steward Cr.  | 440-314000-060000-000000- | 2       | 93L.041 | 29.8                      | 6                  | S1                    | Y          | DV                        |
| 19     | Unnamed      | 440-314000-060000-376000- | 1       | 93L.041 | 6.7                       | 22                 | S2                    | Y          | DV, BT                    |
| 26     | Nilah Cr.    | 440-314000-086000-000000- | 1       | 93L.041 | 11.5                      | 3                  | S2                    | Y          | DV                        |
| 27     | Nilah Cr.    | 440-314000-086000-000000- | 3       | 93L.041 | 51.7                      | 6                  | S1                    | Y          | DV                        |
| 29     | Unnamed      | 440-314000-086000-404000- | 1       | 93L.041 | 4.1                       | 6                  | S3                    | Y          | DV                        |
| 34     | Unnamed      | 440-314000-210000-000000- | 1       | 93L.041 | 2.1                       | 12                 | S3                    | Y          | NFC                       |
| 36     | Unnamed      | 440-314000-249000-000000- | 1       | 93L.041 | 3.6                       | 10                 | (S3)                  | Y          | NFC                       |
| 37     | Unnamed      | 440-314000-256000-000000- | 1       | 93L.041 | 9.1                       | 13                 | S2                    | Y          | DV                        |
| 40     | Katrina Cr.  | 440-314000-327000-000000- | 1       | 93L.041 | 10.6                      | 15                 | S2                    | Y          | BT                        |
| 220    | Unnamed      | 440-314000-060000-517000- | 1       | 93L.041 | 12.9                      | 6                  | S2                    | Y          | DV                        |

a. CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, RB - rainbow trout, CT - cutthroat trout, NFC - no fish caught, () inferred stream class

**Table 19.** Summary of resample recommendations in the Kitnayakwa Planning Unit, September 1999.

Table 19. Summary of resample recommendations in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name | Watershed Code / ILP    | Reach # | Map     | Average Channel Width (m) | Average Gradient % | Proposed Stream Class | Fish Species | Resample Method | Resample Timing | Access | Rationale                                               |
|--------|------------|-------------------------|---------|---------|---------------------------|--------------------|-----------------------|--------------|-----------------|-----------------|--------|---------------------------------------------------------|
| 13     | Cole Cr.   | 440-314000-03100-00000- | 4       | 93L.041 | 6.4                       | 3                  | (S5)                  | NFC          | EF/MT           | early summer    | V2     | good habitat but NFC, confirm fish absence u/s of falls |
| 36     | Unnamed    | 440-314000-24900-00000- | 1       | 93L.041 | 3.6                       | 10                 | (S3)                  | NFC          | EF/MT           | early summer    | V2     | ground-truth lack of barriers                           |
| 38     | Unnamed    | 1837                    | 1       | 93L.041 | 1.7                       | 28                 | (S6)                  | NFC          | EF/MT           | early summer    | V2     | MT beaver pond to confirm fish absence                  |
| 65     | Harvey Cr. | 440-290800-00000-00000- | 1       | 93L.041 | ns                        | ns                 | (S5)                  | NFC          | EF/MT           | early summer    | H      | confirm barrier to fish, fish absence                   |
| 190    | Unnamed    | 440-314000-06000-37600- | 2       | 93L.041 | 5.0                       | 10                 | (S5)                  | NFC          | EF/MT           | early summer    | H      | confirm barrier to fish, fish absence                   |

NFC - no fish caught, EF - electrofishing, MT - minnow trapping, V2 - 2 wheel drive, H - helicopter.



**Table 20.** Summary of data collected at confirmed and inferred non-fish bearing sites identified in the Kitnayakwa Planning Unit, September 1999.

Table 20. Summary of data collected at confirmed and inferred non-fish bearing stes identified in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name       | Watershed Code /ILP       | Reach # | Map     | Average Channel Width (m) | Average Gradient % | Proposed Stream Class <sup>a</sup> | Fish Cards | Fish Species | Resample |
|--------|------------------|---------------------------|---------|---------|---------------------------|--------------------|------------------------------------|------------|--------------|----------|
| 1      | Harvey Cr.       | 440-290800-000000-000000- | 2       | 93L.041 | 3.1                       | 17                 | S5                                 | Y          | NFC          |          |
| 2      | Unnamed          | 29                        | 1       | 93L.041 | 1.2                       | 34                 | S6                                 | Y          | NFC          |          |
| 4      | Unnamed          | 440-305600-000000-000000- | 1       | 93L.041 | 1.9                       | 28                 | S6                                 | Y          | NFC          |          |
| 5      | Unnamed          | 440-307800-000000-000000- | 1       | 93L.041 |                           |                    | NVC                                | N          | NS           |          |
| 6      | Unnamed          | 77                        | 1       | 93L.041 |                           |                    | NVC                                | N          | NS           |          |
| 9      | Kitnayakwa R.    | 440-314000-000000-000000- | 4       | 93L.032 | 21.5                      | 2                  | S5                                 | Y          | NFC          |          |
| 10     | Kitnayakwa R.    | 440-314000-000000-000000- | 5       | 93L.032 | 16.2                      | 1                  | S5                                 | Y          | NFC          |          |
| 13     | Cole Cr.         | 440-314000-031000-000000- | 4       | 93L.041 | 6.4                       | 3                  | (S5)                               | Y          | NFC          | X        |
| 14     | Unnamed          | 1507                      | 2       | 93L.041 | 1.8                       | 4                  | S6                                 | Y          | NFC          |          |
| 17     | Steward Cr.      | 440-314000-060000-000000- | 3       | 93L.041 | 29.5                      | 6                  | S5                                 | Y          | NFC          |          |
| 18     | Unnamed          | 440-314000-060000-32600-  | 1       | 93L.041 |                           |                    | NVC                                | N          | NS           |          |
| 21     | Unnamed          | 1583                      | 1       | 93L.041 | 4.9                       | 13                 | S5                                 | Y          | NFC          |          |
| 22     | Unnamed          | 440-314000-060000-51700-  | 2       | 93L.041 | 4.3                       | 9                  | S5                                 | Y          | NFC          |          |
| 24     | Unnamed          | 1638                      | 1       | 93L.041 |                           |                    | NCD                                | N          | NS           |          |
| 25     | Unnamed          | 440-314000-060000-69900-  | 1       | 93L.041 | 9.1                       | 9                  | S5                                 | Y          | NFC          |          |
| 30     | Unnamed          | 440-314000-151000-000000- | 2       | 93L.041 | 5.4                       | 11                 | S5                                 | Y          | NFC          |          |
| 31     | Unnamed          | 1778                      | 2       | 93L.041 | 1.5                       | 9                  | S6                                 | Y          | NFC          |          |
| 32     | Unnamed          | 1779                      | 1       | 93L.041 |                           |                    | NVC                                | N          | NS           |          |
| 33     | Unnamed          | 1780                      | 1       | 93L.041 |                           |                    | NVC                                | N          | NS           |          |
| 35     | 3+900, Creek 3-1 | 440-314000-232000-000000- | 1       | 93L.041 | 4.2                       | 16                 | S5                                 | Y          | NFC          |          |
| 38     | Unnamed          | 1837                      | 1       | 93L.041 | 1.7                       | 28                 | (S6)                               | Y          | NFC          | X        |
| 39     | Unnamed          | 1865                      | 1       | 93L.041 | 5.3                       | 6                  | S5                                 | Y          | NFC          |          |
| 41     | Unnamed          | 1891                      | 1       | 93L.041 | 0.34                      | 14.67              | S6                                 | N          | NS           |          |
| 43     | Iceflow Cr.      | 440-314000-343000-000000- | 2       | 93L.041 | 12.0                      | 12                 | S5                                 | Y          | NFC          |          |
| 44     | Unnamed          | 1923                      | 1       | 93L.041 | 4.2                       | 16                 | S5                                 | Y          | NFC          |          |
| 45     | Unnamed          | 1927                      | 1       | 93L.041 | 0.7                       | 8                  | S6                                 | Y          | NFC          |          |
| 46     | Unnamed          | 440-314000-539000-000000- | 2       | 93L.031 | 8.1                       | 7                  | S5                                 | Y          | NFC          |          |
| 47     | Unnamed          | 440-314000-539000-34500-  | 1       | 93L.031 | 1.8                       | 6                  | S6                                 | Y          | NFC          |          |

Table 20. con't...

| Site # | Local Name    | Watershed Code /ILP         | Reach # | Map     | Average Channel Width (m) | Average Gradient % | Proposed Stream Class <sup>a</sup> | Fish Cards | Fish Species | Resample |
|--------|---------------|-----------------------------|---------|---------|---------------------------|--------------------|------------------------------------|------------|--------------|----------|
| 48     | Tun Cr.       | 440-314000-54700-00000-     | 2       | 93L.032 | 6.7                       | 12                 | S5                                 | Y          | NFC          |          |
| 49     | Unnamed       | 2068                        | 1       | 93L.032 | 1.5                       | 4                  | S6                                 | Y          | NFC          |          |
| 50     | Unnamed       | 2073                        | 5       | 93L.031 | 0.8                       | 21                 | S6                                 | Y          | NFC          |          |
| 52     | Unnamed       | 440-314000-60900-00000-     | 1       | 93L.032 | 4.9                       | 5                  | S5                                 | Y          | NFC          |          |
| 53     | Unnamed       | 440-314000-63200-00000-     | 1       | 93L.032 | 0.8                       | 0                  | S6                                 | Y          | NFC          |          |
| 54     | Unnamed       | 2091                        | 1       | 93L.032 | 0.3                       | 1                  | S6                                 | Y          | NFC          |          |
| 55     | Tatsi Cr.     | 440-314000-66600-00000-     | 1       | 93L.032 | 5.2                       | 3                  | S5                                 | Y          | NFC          |          |
| 56     | Unnamed       | 2100                        | 1       | 93L.032 |                           |                    | NVC                                | N          | NS           |          |
| 57     | Unnamed       | 440-314000-68200-00000-     | 1       | 93L.032 | 4.6                       | 4                  | S5                                 | Y          | NFC          |          |
| 58     | Unnamed       | 440-314000-75600-00000-     | 1       | 93L.032 | 2.0                       | 2                  | S6                                 | Y          | NFC          |          |
| 59     | Unnamed       | 2110                        | 1       | 93L.032 | 2.6                       | 0                  | S6                                 | Y          | NFC          |          |
| 60     | Miners Cr.    | 440-314000-78900-00000-     | 1       | 93L.031 | 10.8                      | 1                  | S5                                 | Y          | NFC          |          |
| 61     | Unnamed       | 440-314000-78900-15400-2620 | 1       | 93L.031 | 0.9                       | 1                  | S6                                 | Y          | NFC          |          |
| 62     | Unnamed       | 440-314000-81800-00000-     | 1       | 93L.031 | 8.6                       | 9                  | S5                                 | Y          | NFC          |          |
| 63     | Unnamed       | 2177                        | 1       | 93L.031 | 1.3                       | 6                  | S6                                 | Y          | NFC          |          |
| 64     | Kitnayakwa R. | 440-314000-00000-00000-     | 5       | 93L.032 | 9.6                       | 1                  | S5                                 | Y          | NFC          |          |
| 65     | Harvey Cr.    | 440-290800-00000-00000-     | 1       | 93L.041 | ns                        | ns                 | (S5)                               | Y          | NFC          | X        |
| 66     | Unnamed       | 1890                        | 1       | 93L.041 | 1.0                       | 16                 | S6                                 | Y          | NFC          |          |
| 67     | CR 1-1CR10    | 1786                        | 1       | 93L.041 | 1.4                       | 7                  | S6                                 | Y          | NFC          |          |
| 190    | Unnamed       | 440-314000-06000-37600-     | 2       | 93L.041 | 5.0                       | 10                 | (S5)                               | Y          | NFC          | X        |
| 260    | Nilah Cr.     | 440-314000-08600-00000-     | 4       | 93L.041 | 15.0                      | 15                 | S5                                 | Y          | NFC          |          |
| 500    | Unnamed       | 2073                        | 1       | 93L.032 | 2.1                       | 8                  | S6                                 | Y          | NFC          |          |

a. ( ) indicates inferred; resample required, NVC - no visible channel, NCD - non-classified drainage, NFC - no fish caught, NS - not sam

**Table 21.** Non-fish bearing status report, Kitnayakwa Planning Unit, September 1999.

Table 21. Non-fish bearing status report, Kinayakwa Planning Unit, September 1999

| Site # | Local Name  | Watershed Code / ILP    | Reach # | Map     | Temp. (°C) | Conductivity (µmhos) | Turbidity (GT) | Capture Method | Effort (Sec) | Stream Length (m) | Stream Width (m) | Area Sampled (m <sup>2</sup> ) | Voltage | Frequency | Pulse | Model      | Fish Species | Barriers/Obstructions       | Habitat Comment                           | Proposed Stream Class |
|--------|-------------|-------------------------|---------|---------|------------|----------------------|----------------|----------------|--------------|-------------------|------------------|--------------------------------|---------|-----------|-------|------------|--------------|-----------------------------|-------------------------------------------|-----------------------|
| 1      | Harvey Cr.  | 440-290800-00000-000000 | 2       | 93L.041 | 8.         | 60                   | C              | EF             | 153          | 120               | 1                | 120                            | 900     | 70        | 6     | SRI2 B POW | NFC          | 2m C                        | No spawning, poor overwintering.          | S5                    |
| 2      | Unnamed     | 29                      | 1       | 93L.041 | 8.         | 60                   | C              | EF             | 200          | 100               | 1.5              | 150                            | 500     | 70        | 6     | SRI2 B POW | NFC          | 6m C                        | No spawning, poor overwintering.          | S6                    |
| 4      | Unnamed     | 440-305600-00000-000000 | 1       | 93L.041 | 9.5        | 40                   | C              | EF             | 395          | 120               | 1                | 120                            | 600     | 70        | 6     | SRI2 B POW | NFC          | 1m culvert, 8m C 20m long   | Moderate spawning and overwintering       | S6                    |
| 9      | Kinayakwa R | 440-314000-00000-000000 | 4       | 93L.032 | 7.         | 30                   | C              | EF             | ##           | 180               | 3                | 540                            | 1100    | 70        | 6     | SRI2 B POW | NFC          | 4m F                        | Moderate spawning, good overwintering     | S5                    |
| 10     | Kinayakwa R | 440-314000-00000-000000 | 5       | 93L.032 | 7.         | 20                   | C              | EF             | 882          | 250               | 2                | 500                            | 700     | 70        | 7     | SRI2 B POW | NFC          | 4m F, 20m F on Klt.         | Excellent spawning and overwintering      | S5                    |
| 13     | Cole Cr.    | 440-314000-03100-000000 | 4       | 93L.041 | 5.         | 60                   | C              | EF             | 768          | 400               | 4                | 1600                           | 600     | 60        | 7     | SRI2 B POW | NFC          | 8m F                        | Excellent spawning habitat.               | (S5)                  |
| 14     | Unnamed     | 1507                    | 2       | 93L.041 | 8.         | 80                   | C              | EF             | 388          | 150               | 2                | 300                            | 400     | 70        | 6     | SRI2 B POW | NFC          | gradient barrier near mouth | Moderate spawning, limited overwintering  | S6                    |
| 17     | Steward Cr. | 440-314000-06000-000000 | 3       | 93L.041 | 6.         | 40                   | C              | EF             | 645          | 200               | 4                | 800                            | 600     | 60        | 6     | SRI2 B POW | NFC          | 4m F, 2m F                  | spawning, good overwintering              | S5                    |
| 21     | Unnamed     | 1583                    | 1       | 93L.041 | 7.         | 40                   | C              | EF             | 204          | 180               | 2                | 360                            | 600     | 70        | 6     | SRI2 B POW | NFC          | 6m F                        | Poor spawning, moderate overwintering     | S5                    |
| 22     | Unnamed     | 440-314000-06000-517000 | 2       | 93L.041 | 6.         | 10                   | C              | EF             | 537          | 150               | 2                | 300                            | 500     | 70        | 6     | SRI2 B POW | NFC          | 3m F, 4m F                  | Limited spawning and overwintering        | S5                    |
| 25     | Unnamed     | 440-314000-06000-699000 | 1       | 93L.041 | 5.         | 40                   | C              | EF             | 593          | 200               | 4                | 800                            | 600     | 60        | 6     | SRI2 B POW | NFC          | 4m F, 2m F                  | Moderate spawning habitat, overwintering. | S5                    |
| 30     | Unnamed     | 440-314000-15100-000000 | 2       | 93L.041 | 7.         | 60                   | M              | EF             | 859          | 250               | 1.5              | 375                            | 600     | 70        | 6     | SRI2 B POW | NFC          | gradient barrier R1         | Moderate spawning and overwintering       | S5                    |
| 31     | Unnamed     | 1778                    | 2       | 93L.041 | 7.         | 50                   | C              | EF             | 86           | 85                | 1                | 85                             | 500     | 70        | 6     | SRI2 B POW | NFC          | 25m C 20 m long             | Limited spawning, no overwintering        | S6                    |
| 35     | 900, Creek  | 440-314000-23200-000000 | 1       | 93L.041 | 11.        | 70                   | L              | EF             | 115          | 60                | 4                | 240                            | 500     | 70        | 6     | SRI2 B POW | NFC          | 6m F                        | Limited spawning, abundant overwintering. | S5                    |
| 38     | Unnamed     | 1837                    | 1       | 93L.041 | 11.        | 60                   | C              | EF             | 257          | 100               | 1                | 100                            | 400     | 70        | 6     | SRI2 B POW | NFC          | 4m F                        | Poor spawning, poor overwintering         | (S6)                  |
| 39     | Unnamed     | 1865                    | 1       | 93L.041 | 4.         | 30                   | L              | EF             | 305          | 150               | 5                | 750                            | 500     | 70        | 6     | SRI2 B POW | NFC          | 60m C 250 long              | Limited spawning, abundant overwintering  | S5                    |
| 41     | Unnamed     | 1891                    | 1       | 93L.041 | 8.         | 6.8                  | C              |                |              |                   |                  |                                |         |           |       |            | NS           | lacks habitat               | No spawning or overwintering              | S6                    |

| Site # | Local Name  | Watershed Code / ILP    | Reach # | Map     | Temp. (C) | Conductivity (umhos) | Turbidity (GB) | Capture Method | Effort (Sec) | Stream Length (m) | Stream Width (m) | Area Sampled (m <sup>2</sup> ) | Voltage | Frequency | Pulse | Model       | Fish Species | Barriers/Obstructions | Habitat Comment                                   | Proposed Stream Class |
|--------|-------------|-------------------------|---------|---------|-----------|----------------------|----------------|----------------|--------------|-------------------|------------------|--------------------------------|---------|-----------|-------|-------------|--------------|-----------------------|---------------------------------------------------|-----------------------|
| 43     | Iceflow Cr. | 440-314000-34300-000000 | 2       | 93L.041 | 5.        | 20                   | L              | EF             | 311          | 100               | 4                | 400                            | 500     | 70        | 6     | SRI12 B POW | NFC          | 6m F 4m long          | Limited spawning, abundant overwintering          | S5                    |
| 44     | Unnamed     | 1923                    | 1       | 93L.041 | 5.        | 40                   | L              | EF             | 591          | 200               | 4                | 800                            | 500     | 50        | 5     | SRI12 B POW | NFC          | 6m F 4m long          | Limited spawning, abundant overwintering          | S5                    |
| 45     | Unnamed     | 1927                    | 1       | 93L.041 | 6.        | 180                  | C              | EF             | 120          | 80                | 0.5              | 40                             | 500     | 50        | 5     | SRI12 B POW | NFC          | 6m F 4m long          | Poor spawning, no overwintering                   | S6                    |
| 46     | Unnamed     | 440-314000-53900-000000 | 2       | 93L.031 | 5.        | 40                   | C              | EF             | 501          | 135               | 6                | 810                            | 600     | 60        | 7     | SRI12 B POW | NFC          | 4m F, Kit.            | Moderate spawning habitat, overwintering          | S5                    |
| 47     | Unnamed     | 440-314000-53900-345000 | 1       | 93L.031 | 6.        | 40                   | C              | EF             | 431          | 140               | 1.5              | 210                            | 600     | 60        | 7     | SRI12 B POW | NFC          | 4m F, Kit.            | Spawning habitat available, limited overwintering | S6                    |
| 48     | Unnamed     | 440-314000-54700-000000 | 2       | 93L.032 | 4.5       | 20                   | L              | EF             | 871          | 120               | 1.5              | 180                            | 500     | 70        | 6     | SRI12 B POW | NFC          | 4m F, Kit.            | Moderate spawning and overwintering               | S5                    |
| 49     | Unnamed     | 2068                    | 1       | 93L.032 | 7.        | 60                   | C              | EF             | 476          | 130               | 1                | 130                            | 400     | 70        | 6     | SRI12 B POW | NFC          | 4m F, Kit.            | Poor spawning and overwintering                   | S6                    |
| 50     | Unnamed     | 2073                    | 1       | 93L.031 | 8.        | 30                   | C              | EF             | 283          | 125               | 1.5              | 188                            | 600     | 70        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | Limited spawning and overwintering                | S6                    |
| 52     | Unnamed     | 440-314000-60900-000000 | 1       | 93L.032 | 5.        | 30                   | C              | EF             | 220          | 220               | 150              | ###                            | 600     | 70        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | Spawning and overwintering                        | S5                    |
| 53     | Unnamed     | 440-314000-63200-000000 | 1       | 93L.032 | 11.       | 30                   | L              | EF             | 120          | 100               | 1                | 100                            | 600     | 70        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | No spawning or overwintering                      | S6                    |
| 54     | Unnamed     | 2091                    | 1       | 93L.032 | 11.       | 30                   | L              | EF             | 155          | 80                | 0.5              | 40                             | 600     | 70        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | No spawning or overwintering                      | S6                    |
| 55     | Tasi Cr.    | 440-314000-66600-000000 | 1       | 93L.032 | 5.        | 20                   | C              | EF             | 563          | 195               | 1.5              | 293                            | 500     | 70        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | Excellent spawning habitat, overwintering         | S5                    |
| 57     | Unnamed     | 440-314000-68200-000000 | 1       | 93L.032 | 6.        | 20                   | C              | EF             | ###          | 200               | 2                | 400                            | 900     | 70        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | Excellent spawning habitat, overwintering         | S5                    |
| 58     | Unnamed     | 440-314000-75600-000000 | 1       | 93L.032 | 8.        | 20                   | L              | EF             | 618          | 120               | 2                | 240                            | 700     | 60        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | Good spawning, limited overwintering              | S6                    |
| 59     | Unnamed     | 2110                    | 1       | 93L.032 | 11.       | 20                   | C              | EF             | 118          | 80                | 2                | 160                            | 700     | 70        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | No spawning, abundant overwintering               | S6                    |
| 60     | Miners Cr.  | 440-314000-78900-000000 | 1       | 93L.031 | 8.        | 20                   | C              | EF             | 426          | 200               | 5                | 1000                           | 700     | 70        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | Excellent spawning habitat, overwintering         | S5                    |
| 61     | Unnamed     | p-314000-78900-15400-24 | 1       | 93L.031 | 9.        | 20                   | C              | EF             | 211          | 125               | 1                | 125                            | 600     | 70        | 6     | SRI12 B POW | NFC          | 4m F, 20m F on Kit.   | Limited spawning, no overwintering                | S6                    |

| Site # | Local Name  | Watershed Code / ILP     | Reach # | Map     | Temp. (C) | Conductivity (umhos) | Turbidity (CE) | Capture Method | Effort (Sec) | Stream Length Fished (m) | Stream Width Fished (m) | Area Sampled (m <sup>2</sup> ) | Voltage | Frequency | Pulse | Model      | Fish Species | Barriers/ Obstructions          | Habitat Comment                                   | Proposed Stream Class |
|--------|-------------|--------------------------|---------|---------|-----------|----------------------|----------------|----------------|--------------|--------------------------|-------------------------|--------------------------------|---------|-----------|-------|------------|--------------|---------------------------------|---------------------------------------------------|-----------------------|
| 62     | Unnamed     | 440-314000-81800-000000  | 1       | 93L.031 | 5.        | 20                   | C              | EF             | ##           | 150                      | 5                       | 750                            | 700     | 70        | 6     | SR12 B POW | NFC          | 4m F, 20m F on Klt.             | Good spawning, limited overwintering habitat.     | S5                    |
| 63     | Unnamed     | 2177                     | 1       | 93L.031 | 6.        | 20                   | C              | EF             | 92           | 30                       | 2                       | 60                             | 700     | 70        | 6     | SR12 B POW | NFC          | 4m F, 20m F on Klt.             | Moderate spawning, limited overwintering habitat. | S6                    |
| 64     | Kinayakwa R | 440-314000-000000-000000 | 5       | 93L.032 | 7.        | 10                   | C              | EF             | 545          | 200                      | 1.5                     | 300                            | 700     | 70        | 6     | SR12 B POW | NFC          | 4m F, 20m F on Klt.             | Excellent spawning habitat, overwintering.        | S5                    |
| 65     | Harvey Cr.  | 440-290800-000000-000000 | 1       | 93L.041 | 8.        | 60                   | C              | EF             | 280          | 150                      | 1                       | 150                            | 1000    | 70        | 6     | SR12 B POW | NFC          | debris jam at mouth             | n/a                                               | (S5)                  |
| 66     | Unnamed     | 1890                     | 1       | 93L.041 | 9.        | 130                  | C              | EF             | 350          | 60                       | 1                       | 60                             | 400     | 70        | 6     | SR12 B POW | NFC          | cascades throughout reach       | Limited spawning, no overwintering                | S6                    |
| 67     | CR 1-1      | 1786                     | 1       | 93L.041 | ###       | 120                  | C              | EF             | 80           | 60                       | 1                       | 60                             | 400     | 70        | 6     | SR12 B POW | NFC          | 2m organic obstruction at mouth | Limited spawning, no overwintering                | S6                    |
| 190    | Unnamed     | 440-314000-06000-37600   | 2       | 93L.041 | 6.        | 30                   | C              | EF             | 558          | 230                      | 2                       | 460                            | 1100    | 70        | 6     | SR12 B POW | NFC          | 5m C 15m long                   | Moderate spawning, overwintering habitat.         | (S5)                  |
| 260    | Nilah Cr.   | 440-314000-08600-000000  | 4       | 93L.041 | 5.        | 10                   | L              | EF             | 726          | 200                      | 2                       | 400                            | 1000    | 70        | 6     | SR12 B POW | NFC          | 3m F                            | Poor spawning, poor overwintering                 | S5                    |
| 500    | Unnamed     | 2073                     | 5       | 93L.031 | 9.        | 30                   | L              | EF             | 372          | 100                      | 2                       | 200                            | 500     | 60        | 6     | SR12 B POW | NFC          | 4m F, 20m F on Klt.             | Excellent spawning habitat, some overwintering    | S6                    |

EF - electrofishing, SR - Smith Root, NFC - no fish caught, F - falls, C (obstructions)- cascades, O - inferred stream class, requires resampling

#### 4.6.3 Local Area Agreement Analysis

A Local Area Agreement (LAA) has been developed for the Kitnayakwa River Planning Unit to streamline the stream classification process within the Planning Unit. The data collected during this project may be used in an analysis of the effectiveness of the LAA. A number of parameters were queried from the FDIS database and examined in relation to fish capture.

Table 22 presents fish capture in relation to stream order at the upstream reach break and shows that fish were caught in 3rd, 4th, 5th and 6th order streams. No fish were caught in 1st and 2nd order streams during this study. Table 23 presents fish capture in relation to elevation of the downstream reach break and indicates that fish were not caught at reaches with downstream elevations of greater than 730 m asl. Table 24 presents fish capture sorted by ascending site gradient and indicates that fish were only documented in reaches with gradients <22%. Table 25 presents fish capture in relation to downstream barriers to fish migration and demonstrates that fish capture is strongly linked to the occurrence of downstream barriers. In general fish were not caught upstream of barriers. However, as was seen with Cole Creek which has a barrier in reach 1, resident fish populations can occur upstream of barriers.

Given the relatively small sample size, statistical analysis of the data collected may indicate that additional sampling is required in order to achieve a satisfactory level of statistical significance between fish absence and parameters such as order, elevation and gradient. Such analysis is beyond the scope of this reconnaissance fish and fish habitat inventory project, but would certainly be useful in the LAA process.

#### 4.6.4 Follow Up Sampling Required

Re-sampling recommendations are provided in Table 19, for reaches which were classified as inferred fish or non-fish bearing. The requirement of two fish sampling sessions to establish non-fish bearing classifications has resulted in the application of inferred fish and non-fish bearing status to a number of reaches. Resampling recommendations listed are provided in the summary table and are based on flow stage and habitat type present in the stream.

### **4.7 Wildlife Observations**

Wildlife observations were recorded during the survey and included a mammal, amphibian and bird species. Moose (*Alces alces*) sign was recorded at one site. A grebe (*Podeiceps sp.*) and goose sign were noted at another site. Tailed frogs (*Ascaphus truei*) and red-legged frog (*Rana aurora*) were also documented during the field survey. Summaries of wildlife and wildlife sign observations are provided in Table 26.



**Table 22.** Summary of stream order and fish capture in the Kitnanyakwa Planning Unit, September 1999.

Table 22. Summary of stream order and fish capture in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name    | Watershed Code/ILP               | Reach # | Map     | Stream Order | Fish Species <sup>a</sup> |
|--------|---------------|----------------------------------|---------|---------|--------------|---------------------------|
| 6      | Unnamed       | 77                               | 1       | 93L.041 | 1            | NS                        |
| 14     | Unnamed       | 1507                             | 2       | 93L.041 | 1            | NFC                       |
| 18     | Unnamed       | 440-314000-06000-32600-0000      | 1.      | 93L.041 | 1            | NS                        |
| 24     | Unnamed       | 1638                             | 1       | 93L.041 | 1            | NS                        |
| 31     | Unnamed       | 1778                             | 2       | 93L.041 | 1            | NFC                       |
| 32     | Unnamed       | 1779                             | 1       | 93L.041 | 1            | NS                        |
| 33     | Unnamed       | 1780                             | 1       | 93L.041 | 1            | NS                        |
| 38     | Unnamed       | 1837                             | 1       | 93L.041 | 1            | NFC                       |
| 41     | Unnamed       | 1891                             | 1       | 93L.041 | 1            | NS                        |
| 45     | Unnamed       | 1927                             | 1       | 93L.041 | 1            | NFC                       |
| 49     | Unnamed       | 2068                             | 1       | 93L.032 | 1            | NFC                       |
| 50     | Unnamed       | 2073                             | 5       | 93L.031 | 1            | NFC                       |
| 54     | Unnamed       | 2091                             | 1       | 93L.032 | 1            | NFC                       |
| 56     | Unnamed       | 2100                             | 1       | 93L.032 | 1            | NS                        |
| 59     | Unnamed       | 2110                             | 1       | 93L.032 | 1            | NFC                       |
| 66     | Unnamed       | 1890                             | 1       | 93L.041 | 1            | NFC                       |
| 67     | CR 1-1 CR10   | 1786                             | 1       | 93L.041 | 1            | NFC                       |
| 1      | Harvey Cr.    | 440-290800-00000                 | 2.      | 93L.041 | 2            | NFC                       |
| 2      | Unnamed       | 29                               | 1       | 93L.041 | 2            | NFC                       |
| 4      | Unnamed       | 440-305600-00000                 | 1.      | 93L.041 | 2            | NFC                       |
| 5      | Unnamed       | 440-307800-00000                 | 1.      | 93L.041 | 2            | NS                        |
| 21     | Unnamed       | 1583                             | 1       | 93L.041 | 2            | NFC                       |
| 30     | Unnamed       | 440-314000-15100-00000           | 2.      | 93L.041 | 2            | NFC                       |
| 34     | Unnamed       | 440-314000-21000-00000           | 1.      | 93L.041 | 2            | NFC                       |
| 36     | Unnamed       | 440-314000-24900-00000           | 1.      | 93L.041 | 2            | NFC                       |
| 44     | Unnamed       | 1923                             | 1       | 93L.041 | 2            | NFC                       |
| 52     | Unnamed       | 440-314000-60900-00000           | 1.      | 93L.032 | 2            | NFC                       |
| 57     | Unnamed       | 440-314000-68200-00000           | 1.      | 93L.032 | 2            | NFC                       |
| 58     | Unnamed       | 440-314000-75600-00000           | 1.      | 93L.032 | 2            | NFC                       |
| 61     | Unnamed       | 440-314000-78900-15400-2620-0000 | 1.      | 93L.031 | 2            | NFC                       |
| 63     | Unnamed       | 2177                             | 1       | 93L.031 | 2            | NFC                       |
| 260    | Nilah Cr.     | 440-314000-08600-00000           | 4.      | 93L.041 | 2            | NFC                       |
| 500    | Unnamed       | 2073                             | 1       | 93L.032 | 2            | NFC                       |
| 3      | Unnamed       | 440-292700-00000                 | 1.      | 93L.041 | 3            | CT,CO,RB                  |
| 11     | Cole Cr.      | 440-314000-03100-00000           | 1.      | 93L.041 | 3            | CT                        |
| 12     | Cole Cr.      | 440-314000-03100-00000           | 2.      | 93L.041 | 3            | CT                        |
| 13     | Cole Cr.      | 440-314000-03100-00000           | 4.      | 93L.041 | 3            | NFC                       |
| 19     | Unnamed       | 440-314000-06000-37600-0000      | 1.      | 93L.041 | 3            | DV,BT                     |
| 27     | Nilah Cr.     | 440-314000-08600-00000           | 3.      | 93L.041 | 3            | DV                        |
| 29     | Unnamed       | 440-314000-08600-40400-0000      | 1.      | 93L.041 | 3            | DV                        |
| 39     | Unnamed       | 1865                             | 1       | 93L.041 | 3            | NFC                       |
| 47     | Unnamed       | 440-314000-53900-34500-0000      | 1.      | 93L.031 | 3            | NFC                       |
| 48     | Tun Cr.       | 440-314000-54700-00000           | 2.      | 93L.032 | 3            | NFC                       |
| 53     | Unnamed       | 440-314000-63200-00000           | 1.      | 93L.031 | 3            | NFC                       |
| 55     | Tatsi Cr.     | 440-314000-66600-00000           | 1.      | 93L.032 | 3            | NFC                       |
| 62     | Unnamed       | 440-314000-81800-00000           | 1.      | 93L.031 | 3            | NFC                       |
| 190    | Unnamed       | 440-314000-06000-37600-0000      | 2.      | 93L.041 | 3            | NFC                       |
| 9      | Kitnayakwa R. | 440-314000-00000                 | 4.      | 93L.032 | 4            | NFC                       |
| 10     | Kitnayakwa R. | 440-314000-00000                 | 5.      | 93L.032 | 4            | NFC                       |

Table 22. con't

| Site # | Local Name       | Watershed Code/ILP          | Reach # | Map     | Stream Order | Fish Species <sup>a</sup> |
|--------|------------------|-----------------------------|---------|---------|--------------|---------------------------|
| 22     | Unnamed          | 440-314000-06000-51700-0000 | 2.      | 93L.041 | 4            | NFC                       |
| 25     | Unnamed          | 440-314000-06000-69900-0000 | 1.      | 93L.041 | 4            | NFC                       |
| 26     | Nilah Cr.        | 440-314000-08600-00000      | 1.      | 93L.041 | 4            | DV                        |
| 35     | 3+900, Creek 3-1 | 440-314000-23200-00000      | 1.      | 93L.041 | 4            | NFC                       |
| 37     | Unnamed          | 440-314000-25600-00000      | 1.      | 93L.041 | 4            | DV                        |
| 40     | Katrina Cr.      | 440-314000-32700-00000      | 1.      | 93L.041 | 4            | BT                        |
| 43     | Iceflow Cr.      | 440-314000-34300-00000      | 2.      | 93L.042 | 4            | NFC                       |
| 46     | Unnamed          | 440-314000-53900-00000      | 2.      | 93L.031 | 4            | NFC                       |
| 60     | Miners Cr.       | 440-314000-78900-00000      | 1.      | 93L.031 | 4            | NFC                       |
| 220    | Unnamed          | 440-314000-06000-51700-0000 | 1.      | 93L.041 | 4            | DV                        |
| 8      | Kitnayakwa R.    | 440-314000-00000            | 2.      | 93L.041 | 5            | DV                        |
| 15     | Steward Cr.      | 440-314000-06000-00000      | 1.      | 93L.041 | 5            | BT                        |
| 16     | Steward Cr.      | 440-314000-06000-00000      | 2.      | 93L.041 | 5            | DV                        |
| 17     | Steward Cr.      | 440-314000-06000-00000      | 3.      | 93L.041 | 5            | NFC                       |
| 7      | Kitnayakwa R.    | 440-314000-00000            | 1.      | 93L.041 | 6            | RB,CH,DV                  |

a. CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, RB - rainbow trout, CT - cutthroat trout, NFC - no fish caught, NS - not sampled

**Table 23.** Summary of elevation and fish capture in the Kitnayakwa Planning Unit, September 1999.

Table 23. Summary of elevation and fish capture in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name       | Watershed Code/ILP     | Reach # | Map     | Downstream Elevation (m) | Fish Species <sup>a</sup> |
|--------|------------------|------------------------|---------|---------|--------------------------|---------------------------|
| 3      | Unnamed          | 440-292700-00000       | 1.      | 93L.041 | 270                      | CT, CO, RB                |
| 2      | Unnamed          | 29                     | 1       | 93L.041 | 280                      | NFC                       |
| 1      | Harvey Cr.       | 440-290800-00000       | 2.      | 93L.041 | 300                      | NFC                       |
| 4      | Unnamed          | 440-305600-00000       | 1.      | 93L.041 | 300                      | NFC                       |
| 5      | Unnamed          | 440-307800-00000       | 1.      | 93L.041 | 300                      | NS                        |
| 7      | Kitnayakwa R.    | 440-314000-00000       | 1.      | 93L.041 | 320                      | RB, CH, DV                |
| 6      | Unnamed          | 77                     | 1       | 93L.041 | 322                      | NS                        |
| 11     | Cole Cr.         | 440-314000-03100-00000 | 1.      | 93L.041 | 350                      | CT                        |
| 15     | Steward Cr.      | 440-314000-06000-00000 | 1.      | 93L.041 | 380                      | BT                        |
| 26     | Nilah Cr.        | 440-314000-08600       | 1.      | 93L.041 | 420                      | DV                        |
| 12     | Cole Cr.         | 440-314000-03100-00000 | 2.      | 93L.041 | 460                      | CT                        |
| 8      | Kitnayakwa R.    | 440-314000-00000       | 2.      | 93L.041 | 480                      | DV                        |
| 16     | Steward Cr.      | 440-314000-06000-00000 | 2.      | 93L.041 | 480                      | DV                        |
| 32     | Unnamed          | 1779                   | 1       | 93L.041 | 530                      | NS                        |
| 33     | Unnamed          | 1780                   | 1       | 93L.041 | 530                      | NS                        |
| 34     | Unnamed          | 440-314000-21000       | 1.      | 93L.041 | 548                      | NFC                       |
| 30     | Unnamed          | 440-314000-15100       | 2.      | 93L.041 | 560                      | NFC                       |
| 35     | 3+900, Creek 3-1 | 440-314000-23200       | 1.      | 93L.041 | 570                      | NFC                       |
| 36     | Unnamed          | 440-314000-24900       | 1.      | 93L.041 | 570                      | NFC                       |
| 37     | Unnamed          | 440-314000-25600       | 1.      | 93L.041 | 580                      | DV                        |
| 67     | CR 1-1 CR10      | 1786                   | 1       | 93L.041 | 580                      | NFC                       |
| 29     | Unnamed          | 440-314000-08600-40400 | 1.      | 93L.041 | 590                      | DV                        |
| 39     | Unnamed          | 1865                   | 1       | 93L.041 | 590                      | NFC                       |
| 14     | Unnamed          | 1507                   | 2       | 93L.041 | 600                      | NFC                       |
| 31     | Unnamed          | 1778                   | 2       | 93L.041 | 600                      | NFC                       |
| 18     | Unnamed          | 440-314000-06000-32600 | 1.      | 93L.041 | 610                      | NS                        |
| 38     | Unnamed          | 1837                   | 1       | 93L.041 | 620                      | NFC                       |
| 40     | Katrina Cr.      | 440-314000-32700       | 1.      | 93L.041 | 630                      | BT                        |
| 41     | Unnamed          | 1891                   | 1       | 93L.041 | 630                      | NS                        |
| 66     | Unnamed          | 1890                   | 1       | 93L.041 | 630                      | NFC                       |
| 19     | Unnamed          | 440-314000-06000-37600 | 1.      | 93L.041 | 640                      | DV, BT                    |
| 13     | Cole Cr.         | 440-314000-03100-00000 | 4.      | 93L.041 | 660                      | NFC                       |
| 21     | Unnamed          | 1583                   | 1       | 93L.041 | 700                      | NFC                       |
| 27     | Nilah Cr.        | 440-314000-08600       | 3.      | 93L.041 | 710                      | DV                        |
| 17     | Steward Cr.      | 440-314000-06000-00000 | 3.      | 93L.041 | 730                      | NFC                       |
| 43     | Iceflow Cr.      | 440-314000-34300       | 2.      | 93L.042 | 730                      | NFC                       |
| 44     | Unnamed          | 1923                   | 1       | 93L.041 | 730                      | NFC                       |
| 220    | Unnamed          | 440-314000-06000-51700 | 1.      | 93L.041 | 730                      | DV                        |
| 22     | Unnamed          | 440-314000-06000-51700 | 2.      | 93L.041 | 780                      | NFC                       |
| 24     | Unnamed          | 1638                   | 1       | 93L.041 | 810                      | NS                        |
| 190    | Unnamed          | 440-314000-06000-37600 | 2.      | 93L.041 | 820                      | NFC                       |
| 25     | Unnamed          | 440-314000-06000-69900 | 1.      | 93L.041 | 840                      | NFC                       |
| 45     | Unnamed          | 1927                   | 1       | 93L.041 | 840                      | NFC                       |
| 9      | Kitnayakwa R.    | 440-314000-00000       | 4.      | 93L.032 | 900                      | NFC                       |
| 48     | Tun Cr.          | 440-314000-54700       | 2.      | 93L.032 | 930                      | NFC                       |
| 49     | Unnamed          | 2068                   | 1       | 93L.032 | 940                      | NFC                       |
| 10     | Kitnayakwa R.    | 440-314000-00000       | 5.      | 93L.032 | 960                      | NFC                       |
| 52     | Unnamed          | 440-314000-60900       | 1.      | 93L.032 | 960                      | NFC                       |
| 500    | Unnamed          | 2073                   | 1       | 93L.032 | 960                      | NFC                       |
| 53     | Unnamed          | 440-314000-63200       | 1.      | 93L.031 | 970                      | NFC                       |
| 55     | Tatsi Cr.        | 440-314000-66600       | 1.      | 93L.032 | 970                      | NFC                       |
| 56     | Unnamed          | 2100                   | 1       | 93L.032 | 970                      | NS                        |
| 57     | Unnamed          | 440-314000-68200       | 1.      | 93L.032 | 970                      | NFC                       |

Table 23. con't...

| Site # | Local Name | Watershed Code/ILP          | Reach # | Map     | Downstream Elevation (m) | Fish Species <sup>a</sup> |
|--------|------------|-----------------------------|---------|---------|--------------------------|---------------------------|
| 58     | Unnamed    | 440-314000-75600            | 1.      | 93L.032 | 990                      | NFC                       |
| 54     | Unnamed    | 2091                        | 1       | 93L.032 | 991                      | NFC                       |
| 59     | Unnamed    | 2110                        | 1       | 93L.032 | 1000                     | NFC                       |
| 46     | Unnamed    | 440-314000-53900            | 2.      | 93L.031 | 1010                     | NFC                       |
| 60     | Miners Cr. | 440-314000-78900            | 1.      | 93L.031 | 1010                     | NFC                       |
| 260    | Nilah Cr.  | 440-314000-08600            | 4.      | 93L.041 | 1020                     | NFC                       |
| 61     | Unnamed    | 440-314000-78900-15400-2620 | 1.      | 93L.031 | 1040                     | NFC                       |
| 62     | Unnamed    | 440-314000-81800            | 1.      | 93L.031 | 1050                     | NFC                       |
| 63     | Unnamed    | 2177                        | 1       | 93L.031 | 1050                     | NFC                       |
| 47     | Unnamed    | 440-314000-53900-34500-0000 | 1.      | 93L.031 | 1080                     | NFC                       |
| 50     | Unnamed    | 2073                        | 5       | 93L.031 | 1219                     | NFC                       |

a. CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, RB - rainbow trout, CT - cutthroat trout, NFC - no fish caught, NS - not sampled

**Table 24.** Ascending gradient and fish capture in the Kitnayakwa Planning Unit, September 1999.

Table 24. Ascending reach gradient and fish capture in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name    | Watershed Code / ILP        | Reach # | Average Gradient % <sup>a</sup> | Fish Species <sup>b</sup> |
|--------|---------------|-----------------------------|---------|---------------------------------|---------------------------|
| 59     | Unnamed       | 2110                        | 1       | 0                               | NFC                       |
| 53     | Unnamed       | 440-314000-63200-00000-     | 1       | 0                               | NFC                       |
| 64     | Kitnayakwa R. | 440-314000-00000-00000-     | 5       | 1                               | NFC                       |
| 10     | Kitnayakwa R. | 440-314000-00000-00000-     | 5       | 1                               | NFC                       |
| 60     | Miners Cr.    | 440-314000-78900-00000-     | 1       | 1                               | NFC                       |
| 54     | Unnamed       | 2091                        | 1       | 1                               | NFC                       |
| 61     | Unnamed       | 440-314000-78900-15400-2620 | 1       | 1                               | NFC                       |
| 7      | Kitnayakwa R. | 440-314000-00000-00000-     | 1       | 2                               | RB, CH, DV                |
| 58     | Unnamed       | 440-314000-75600-00000-     | 1       | 2                               | NFC                       |
| 8      | Kitnayakwa R. | 440-314000-00000-00000-     | 2       | 2                               | DV                        |
| 9      | Kitnayakwa R. | 440-314000-00000-00000-     | 4       | 2                               | NFC                       |
| 11     | Cole Cr.      | 440-314000-03100-00000-     | 1       | 3                               | CT                        |
| 13     | Cole Cr.      | 440-314000-03100-00000-     | 4       | 3                               | NFC                       |
| 55     | Tatsi Cr.     | 440-314000-66600-00000-     | 1       | 3                               | NFC                       |
| 26     | Nilah Cr.     | 1890                        | 1       | 3                               | DV                        |
| 14     | Unnamed       | 1507                        | 2       | 4                               | NFC                       |
| 49     | Unnamed       | 2068                        | 1       | 4                               | NFC                       |
| 57     | Unnamed       | 440-314000-68200-00000-     | 1       | 4                               | NFC                       |
| 52     | Unnamed       | 440-314000-60900-00000-     | 1       | 5                               | NFC                       |
| 27     | Nilah Cr.     | 440-314000-08600-00000-     | 3       | 6                               | DV                        |
| 29     | Unnamed       | 440-314000-08600-40400-     | 1       | 6                               | DV                        |
| 39     | Unnamed       | 1865                        | 1       | 6                               | NFC                       |
| 63     | Unnamed       | 2177                        | 1       | 6                               | NFC                       |
| 220    | Unnamed       | 440-314000-06000-51700-     | 1       | 6                               | DV                        |
| 16     | Steward Cr.   | 440-314000-06000-00000-     | 2       | 6                               | DV                        |
| 17     | Steward Cr.   | 440-314000-06000-00000-     | 3       | 6                               | NFC                       |
| 47     | Unnamed       | 440-314000-53900-34500-     | 1       | 6                               | NFC                       |
| 67     | CR 1-1 CR10   | 1786                        | 1       | 7                               | NFC                       |
| 46     | Unnamed       | 440-314000-53900-00000-     | 2       | 7                               | NFC                       |
| 45     | Unnamed       | 1927                        | 1       | 8                               | NFC                       |
| 500    | Unnamed       | 2073                        | 1       | 8                               | NFC                       |
| 22     | Unnamed       | 440-314000-06000-51700-     | 2       | 9                               | NFC                       |
| 31     | Unnamed       | 1778                        | 2       | 9                               | NFC                       |
| 25     | Unnamed       | 440-314000-06000-69900-     | 1       | 9                               | NFC                       |
| 62     | Unnamed       | 440-314000-81800-00000-     | 1       | 9                               | NFC                       |
| 190    | Unnamed       | 440-314000-06000-37600-     | 2       | 10                              | NFC                       |
| 36     | Unnamed       | 440-314000-24900-00000-     | 1       | 10                              | NFC                       |
| 30     | Unnamed       | 440-314000-15100-00000-     | 2       | 11                              | NFC                       |
| 12     | Cole Cr.      | 440-314000-03100-00000-     | 2       | 11                              | CT                        |
| 15     | Steward Cr.   | 440-314000-06000-00000-     | 1       | 11                              | BT                        |
| 48     | Tun Cr.       | 440-314000-54700-00000-     | 2       | 12                              | NFC                       |
| 43     | Iceflow Cr.   | 440-314000-34300-00000-     | 2       | 12                              | NFC                       |
| 34     | Unnamed       | 440-314000-21000-00000-     | 1       | 12                              | NFC                       |
| 21     | Unnamed       | 1583                        | 1       | 13                              | NFC                       |
| 37     | Unnamed       | 440-314000-25600-00000-     | 1       | 13                              | DV                        |
| 41     | Unnamed       | 1891                        | 1       | 15                              | NS                        |

Table 24. con't...



| Site # | Local Name       | Watershed Code / ILP    | Reach # | Average Gradient % <sup>a</sup> | Fish Species <sup>b</sup> |
|--------|------------------|-------------------------|---------|---------------------------------|---------------------------|
| 260    | Nilah Cr.        | 440-314000-08600-00000- | 4       | 15                              | NFC                       |
| 40     | Katrina Cr.      | 440-314000-32700-00000- | 1       | 15                              | BT                        |
| 44     | Unnamed          | 1923                    | 1       | 16                              | NFC                       |
| 66     | Unnamed          | 1890                    | 1       | 16                              | NFC                       |
| 35     | 3+900, Creek 3-1 | 440-314000-23200-00000- | 1       | 16                              | NFC                       |
| 1      | Harvey Cr.       | 440-290800-00000-00000- | 2       | 17                              | NFC                       |
| 50     | Unnamed          | 2073                    | 5       | 21                              | NFC                       |
| 3      | Unnamed          | 440-292700-00000-00000- | 1       | 21 <sup>c</sup>                 | CT, RB, CO                |
| 19     | Unnamed          | 440-314000-06000-37600- | 1       | 22                              | DV, BT                    |
| 38     | Unnamed          | 1837                    | 1       | 28                              | NFC                       |
| 4      | Unnamed          | 440-305600-00000-00000- | 1       | 28                              | NFC                       |
| 2      | Unnamed          | 29                      | 1       | 34                              | NFC                       |

a. field measured

b. CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, RB - rainbow trout, CT - cutthroat trout, NFC - no fish caught, NS - not sampled

c. average gradient was 21% but fish capture occurred at section with gradients of 2% and 6%

**Table 25.** Summary of downstream barriers and fish capture in the Kitnayakwa Planning Unit, September 1999.

Table 25. Summary of downstream barriers and fish capture in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name       | Watershed Code / ILP    | Reach # | Downstream Barrier/<br>Obstruction <sup>a</sup> | Fish Species <sup>b</sup> |
|--------|------------------|-------------------------|---------|-------------------------------------------------|---------------------------|
| 3      | Unnamed          | 440-292700-00000-00000- | 1       | none                                            | CT, RB, CO                |
| 7      | Kitnayakwa R.    | 440-314000-00000-00000- | 1       | none                                            | RB, CH, DV                |
| 8      | Kitnayakwa R.    | 440-314000-00000-00000- | 2       | none                                            | DV                        |
| 11     | Cole Cr.         | 440-314000-03100-00000- | 1       | 15m F                                           | CT                        |
| 12     | Cole Cr.         | 440-314000-03100-00000- | 2       | 15m F                                           | CT                        |
| 15     | Steward Cr.      | 440-314000-06000-00000- | 1       | none                                            | BT                        |
| 16     | Steward Cr.      | 440-314000-06000-00000- | 2       | none                                            | DV                        |
| 19     | Unnamed          | 440-314000-06000-37600- | 1       | none                                            | DV, BT                    |
| 26     | Nilah Cr.        | 1890                    | 1       | none                                            | DV                        |
| 27     | Nilah Cr.        | 440-314000-08600-00000- | 3       | none                                            | DV                        |
| 29     | Unnamed          | 440-314000-08600-40400- | 1       | none                                            | DV                        |
| 34     | Unnamed          | 440-314000-21000-00000- | 1       | none                                            | NFC                       |
| 36     | Unnamed          | 440-314000-24900-00000- | 1       | none                                            | NFC                       |
| 37     | Unnamed          | 440-314000-25600-00000- | 1       | none                                            | DV                        |
| 40     | Katrina Cr.      | 440-314000-32700-00000- | 1       | none                                            | BT                        |
| 220    | Unnamed          | 440-314000-06000-51700- | 1       | none                                            | DV                        |
| 1      | Harvey Cr.       | 440-290800-00000-00000- | 2       | 2m C                                            | NFC                       |
| 2      | Unnamed          | 29                      | 1       | 6m C                                            | NFC                       |
| 4      | Unnamed          | 440-305600-00000-00000- | 1       | 1m culvert, 8m C<br>20m long                    | NFC                       |
| 9      | Kitnayakwa R.    | 440-314000-00000-00000- | 4       | 4m F                                            | NFC                       |
| 10     | Kitnayakwa R.    | 440-314000-00000-00000- | 5       | 4m F, 20m F on Kit.                             | NFC                       |
| 13     | Cole Cr.         | 440-314000-03100-00000- | 4       | 8m F                                            | NFC                       |
| 14     | Unnamed          | 1507                    | 2       | gradient barrier near<br>mouth                  | NFC                       |
| 17     | Steward Cr.      | 440-314000-06000-00000- | 3       | 4m F, 2m F                                      | NFC                       |
| 21     | Unnamed          | 1583                    | 1       | 6m F                                            | NFC                       |
| 22     | Unnamed          | 440-314000-06000-51700- | 2       | 3m F, 4m F                                      | NFC                       |
| 25     | Unnamed          | 440-314000-06000-69900- | 1       | 4m F, 2m F                                      | NFC                       |
| 30     | Unnamed          | 440-314000-15100-00000- | 2       | gradient barrier R1                             | NFC                       |
| 31     | Unnamed          | 1778                    | 2       | 25m C 20 m long                                 | NFC                       |
| 35     | 3+900, Creek 3-1 | 440-314000-23200-00000- | 1       | 6m F                                            | NFC                       |
| 38     | Unnamed          | 1837                    | 1       | 4m F                                            | NFC                       |
| 39     | Unnamed          | 1865                    | 1       | 60m C 250 long                                  | NFC                       |
| 41     | Unnamed          | 1891                    | 1       | lacks habitat                                   | NS                        |
| 43     | Iceflow Cr.      | 440-314000-34300-00000- | 2       | 6m F 4m long                                    | NFC                       |
| 44     | Unnamed          | 1923                    | 1       | 6m F 4m long                                    | NFC                       |
| 45     | Unnamed          | 1927                    | 1       | 6m F 4m long                                    | NFC                       |
| 46     | Unnamed          | 440-314000-53900-00000- | 2       | 4m F, Kit.                                      | NFC                       |
| 47     | Unnamed          | 440-314000-53900-34500- | 1       | 4m F, Kit.                                      | NFC                       |
| 48     | Tun Cr.          | 440-314000-54700-00000- | 2       | 4m F, Kit.                                      | NFC                       |
| 49     | Unnamed          | 2068                    | 1       | 4m F, Kit.                                      | NFC                       |
| 50     | Unnamed          | 2073                    | 5       | 4m F, 20m F on Kit.                             | NFC                       |
| 52     | Unnamed          | 440-314000-60900-00000- | 1       | 4m F, 20m F on Kit.                             | NFC                       |
| 53     | Unnamed          | 440-314000-63200-00000- | 1       | 4m F, 20m F on Kit.                             | NFC                       |

Table 25. con't...

| Site # | Local Name    | Watershed Code / ILP        | Reach # | Downstream<br>Barrier/<br>Obstruction <sup>a</sup> | Fish Species <sup>b</sup> |
|--------|---------------|-----------------------------|---------|----------------------------------------------------|---------------------------|
| 54     | Unnamed       | 2091                        | 1       | 4m F, 20m F on Kit.                                | NFC                       |
| 55     | Tatsi Cr.     | 440-314000-66600-00000-     | 1       | 4m F, 20m F on Kit.                                | NFC                       |
| 57     | Unnamed       | 440-314000-68200-00000-     | 1       | 4m F, 20m F on Kit.                                | NFC                       |
| 58     | Unnamed       | 440-314000-75600-00000-     | 1       | 4m F, 20m F on Kit.                                | NFC                       |
| 59     | Unnamed       | 2110                        | 1       | 4m F, 20m F on Kit.                                | NFC                       |
| 60     | Miners Cr.    | 440-314000-78900-00000-     | 1       | 4m F, 20m F on Kit.                                | NFC                       |
| 61     | Unnamed       | 440-314000-78900-15400-2620 | 1       | 4m F, 20m F on Kit.                                | NFC                       |
| 62     | Unnamed       | 440-314000-81800-00000-     | 1       | 4m F, 20m F on Kit.                                | NFC                       |
| 63     | Unnamed       | 2177                        | 1       | 4m F, 20m F on Kit.                                | NFC                       |
| 64     | Kitnayakwa R. | 440-314000-00000-00000-     | 5       | 4m F, 20m F on Kit.                                | NFC                       |
| 65     | Harvey Cr.    | 440-290800-00000-00000-     | 1       | debris jam at mouth                                | NFC                       |
| 66     | Unnamed       | 1890                        | 1       | cascades throughout reach                          | NFC                       |
| 67     | CR 1-1 CR10   | 1786                        | 1       | 2m organic obstruction at mouth                    | NFC                       |
| 190    | Unnamed       | 440-314000-06000-37600-     | 2       | 5m C 15m long                                      | NFC                       |
| 260    | Nilah Cr.     | 440-314000-08600-00000-     | 4       | 3m F                                               | NFC                       |
| 500    | Unnamed       | 2073                        | 1       | 4m F, 20m F on Kit.                                | NFC                       |

a. F - falls, C - cascades

b. CH - chinook, CO - coho, DV - Dolly Varden, BT - bull trout, RB - rainbow trout, CT - cutthroat trout,  
NFC - no fish caught,

**Table 26.** Summary of wildlife observations in the Kitnayakwa Planning Unit, September 1999.

Table 26. Summary of wildlife observations in the Kitnayakwa Planning Unit, September 1999.

| Site # | Local Name    | Watershed Code / ILP | Reach # | Site Map | Wildlife Observations                         |
|--------|---------------|----------------------|---------|----------|-----------------------------------------------|
| 1      | Harvey Cr.    | 440-290800-00000     | 2       | 93L.041  | tailed frog tadpole                           |
| 10     | Kitnayakwa R. | 440-314000-00000     | 5       | 93L.032  | red-legged frog                               |
| 30     | Unnamed       | 440-314000-15100     | 2       | 93L.041  | tailed frog adult                             |
| 50     | Unnamed       | 2073                 | 5       | 93L.031  | goose droppings on lake margin, grebe on lake |
| 60     | Miners Cr.    | 440-314000-78900     | 1       | 93L.031  | abundant moose sign                           |

#### **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. Table 27 summarizes the water quality data collected during the field survey. The pH ranged from 6.3 to 8.9, while the conductivity ranged from 10 umhos/cm to 180 umhos/cm. Water temperature ranged from 4 °C to 16 °C. The turbidity was clear at most sites but was medium or low at sites with glacial water sources. The flow stage was medium at most sites although low and high flow stage were also recorded.

**Table 27.** Summary of water quality data collected in the Kitnanyakwa Planning Unit, September 1999.



Table 27. Summary of water quality data collected in the Kitnayakwa Planning Unit, September 1999.

| Site | Local Name       | Watershed Codes          | Reach # | Map     | Hydrologic Stage | Water Temp. (°C) | pH  | Conductivity (umhos) | Turbidity |
|------|------------------|--------------------------|---------|---------|------------------|------------------|-----|----------------------|-----------|
| 1    | Harvey Cr.       | 440-290800-00000-000000- | 2       | 93L.041 | M                | 8                | 8.1 | 60                   | C         |
| 2    | Unnamed          | 29                       | 1       | 93L.041 | M                | 8                | 8.1 | 60                   | C         |
| 3    | Unnamed          | 440-292700-00000-000000- | 1       | 93L.041 | M                | 9                | 6.7 | 40                   | C         |
| 4    | Unnamed          | 440-305600-00000-000000- | 1       | 93L.041 | M                | 10               | 7.5 | 40                   | C         |
| 7    | Kitnayakwa R.    | 440-314000-00000-000000- | 1       | 93L.041 | M                | 8                | 6.8 | 40                   | L         |
| 8    | Kitnayakwa R.    | 440-314000-00000-000000- | 2       | 93L.041 | M                | 8                | 7.2 | 50                   | L         |
| 9    | Kitnayakwa R.    | 440-314000-00000-000000- | 4       | 93L.032 | M                | 7                | 8   | 30                   | C         |
| 10   | Kitnayakwa R.    | 440-314000-00000-000000- | 5       | 93L.032 | M                | 7                | 7.7 | 20                   | C         |
| 11   | Cole Cr.         | 440-314000-03100-000000- | 1       | 93L.041 | M                | 8                | 6.7 | 90                   | C         |
| 12   | Cole Cr.         | 440-314000-03100-000000- | 2       | 93L.041 | M                | 8                | 6.8 | 90                   | C         |
| 13   | Cole Cr.         | 440-314000-03100-000000- | 4       | 93L.041 | M                | 5                | 7.4 | 70                   | C         |
| 14   | Unnamed          | 1507                     | 2       | 93L.041 | M                | 8                | 6.3 | 80                   | C         |
| 15   | Steward Cr.      | 440-314000-06000-000000- | 1       | 93L.041 | M                | 7                | 7.4 | 50                   | C         |
| 16   | Steward Cr.      | 440-314000-06000-000000- | 2       | 93L.041 | M                | 6                | 7.6 | 40                   | C         |
| 17   | Steward Cr.      | 440-314000-06000-000000- | 3       | 93L.041 | L                | 6                | 7.6 | 40                   | C         |
| 19   | Unnamed          | 440-314000-06000-37600-  | 1       | 93L.041 | L                | 7                | 7.5 | 50                   | C         |
| 21   | Unnamed          | 1583                     | 1       | 93L.041 | M                | 7                | 8   | 40                   | C         |
| 22   | Unnamed          | 440-314000-06000-51700-  | 2       | 93L.041 | L                | 6                | 7.7 | 20                   | C         |
| 25   | Unnamed          | 440-314000-06000-69900-  | 1       | 93L.041 | L                | 5                | 7.8 | 40                   | C         |
| 26   | Nilah Cr.        | 440-314000-08600-000000- | 1       | 93L.041 | M                | 6                | 6.5 | 10                   | L         |
| 27   | Nilah Cr.        | 440-314000-08600-000000- | 3       | 93L.041 | L                | 6                | 8   | 20                   | M         |
| 29   | Unnamed          | 440-314000-08600-40400-  | 1       | 93L.041 | M                | 6                | 7.4 | 50                   | C         |
| 30   | Unnamed          | 440-314000-15100-000000- | 2       | 93L.041 | M                | 7                | 8.1 | 60                   | M         |
| 31   | Unnamed          | 1778                     | 2       | 93L.041 | M                | 7                | 7.5 | 50                   | C         |
| 34   | Unnamed          | 440-314000-21000-000000- | 1       | 93L.041 | M                | 7                | 7.5 | 80                   | C         |
| 35   | 3+900, Creek 3-1 | 440-314000-23200-000000- | 1       | 93L.041 | M                | 11               | 8.8 | 70                   | L         |
| 36   | Unnamed          | 440-314000-24900-000000- | 1       | 93L.041 | M                | 6                | 6.9 | 20                   | C         |
| 37   | Unnamed          | 440-314000-25600-000000- | 1       | 93L.041 | M                | 6                | 7.1 | 20                   | L         |
| 38   | Unnamed          | 1837                     | 1       | 93L.041 | M                | 11               | 7.1 | 60                   | C         |
| 39   | Unnamed          | 1865                     | 1       | 93L.041 | M                | 4                | 6.8 | 30                   | L         |
| 40   | Katrina Cr.      | 440-314000-32700-000000- | 1       | 93L.041 | L                | 16               | 8.9 | 50                   | T         |
| 41   | Unnamed          | 1891                     | 1       | 93L.041 | M                | 8                | 6.8 | 80                   | C         |
| 43   | Iceflow Cr.      | 440-314000-34300-000000- | 2       | 93L.041 | M                | 5                | 7.4 | 20                   | L         |
| 44   | Unnamed          | 1923                     | 1       | 93L.041 | H                | 5                | 6.5 | 40                   | L         |
| 45   | Unnamed          | 1927                     | 1       | 93L.041 | M                | 6                | 8   | 180                  | C         |
| 46   | Unnamed          | 440-314000-53900-000000- | 2       | 93L.031 | M                | 5                | 7.4 | 40                   | C         |
| 47   | Unnamed          | 440-314000-53900-34500-  | 1       | 93L.031 | L                | 6                | 7.6 | 40                   | C         |

Table 27. con't...

| Site | Local Name    | Watershed Codes             | Reach # | Map     | Hydrologic Stage | Water Temp. (°C) | pH  | Conductivity (umhos) | Turbidity |
|------|---------------|-----------------------------|---------|---------|------------------|------------------|-----|----------------------|-----------|
| 48   | Tun Cr.       | 440-314000-54700-000000-    | 2       | 93L.032 | M                | 5                | 6.9 | 20                   | L         |
| 49   | Unnamed       | 2068                        | 1       | 93L.032 | M                | 7                | 7.7 | 60                   | C         |
| 50   | Unnamed       | 2073                        | 5       | 93L.031 | M                | 9                | 7.4 | 30                   | C         |
| 52   | Unnamed       | 440-314000-60900-000000-    | 1       | 93L.032 | M                | 5                | 7.4 | 30                   | C         |
| 53   | Unnamed       | 440-314000-63200-000000-    | 1       | 93L.032 | M                | 11               | 6.9 | 30                   | L         |
| 54   | Unnamed       | 2091                        | 1       | 93L.032 | M                | 11               | 6.6 | 30                   | L         |
| 55   | Tatsi Cr.     | 440-314000-66600-000000-    | 1       | 93L.032 | M                | 5                | 7.8 | 20                   | C         |
| 57   | Unnamed       | 440-314000-68200-000000-    | 1       | 93L.032 | M                | 6                | 7.7 | 20                   | C         |
| 58   | Unnamed       | 440-314000-75600-000000-    | 1       | 93L.032 | M                | 8                | 7.4 | 20                   | L         |
| 59   | Unnamed       | 2110                        | 1       | 93L.032 | M                | 11               | 7.1 | 20                   | C         |
| 60   | Miners Cr.    | 440-314000-78900-000000-    | 1       | 93L.031 | M                | 8                | 7.9 | 20                   | C         |
| 61   | Unnamed       | 440-314000-78900-15400-2620 | 1       | 93L.031 | H                | 9                | 7.6 | 20                   | C         |
| 62   | Unnamed       | 440-314000-81800-000000-    | 1       | 93L.031 | L                | 5                | 7.4 | 20                   | C         |
| 63   | Unnamed       | 2177                        | 1       | 93L.031 | M                | 6                | 7.2 | 20                   | C         |
| 64   | Kitnayakwa R. | 440-314000-00000-000000-    | 5       | 93L.032 | M                | 7                | 7.7 | 10                   | C         |
| 66   | Unnamed       | 1890                        | 1       | 93L.041 | M                | 9                | 8.8 | 130                  | C         |
| 67   | CR 1-1 CR10   | 1786                        | 1       | 93L.041 | M                | 12               | 8.6 | 120                  | C         |
| 190  | Unnamed       | 440-314000-06000-37600-     | 2       | 93L.041 | M                | 6                | 8   | 30                   | C         |
| 220  | Unnamed       | 440-314000-06000-51700-     | 1       | 93L.041 | M                | 7                | 8   | 40                   | C         |
| 260  | Nilah Cr.     | 440-314000-08600-000000-    | 4       | 93L.041 | M                | 5                | 8   | 10                   | L         |
| 500  | Unnamed       | 2073                        | 1       | 93L.032 | M                | 8                | 7.1 | 30                   | C         |

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## **APPENDIX 1**

### **FDIS Summary and Photographs**

**organized by ascending site number**

**Appendix 1. Index**

| Site # | Local Name       | Watershed Code/ILP          | Reach # | Map     |
|--------|------------------|-----------------------------|---------|---------|
| 1      | Harvey Cr.       | 440-290800-00000            | 2       | 93L.041 |
| 2      | Unnamed          | 29                          | 1       | 93L.041 |
| 3      | Unnamed          | 440-292700-00000            | 1       | 93L.041 |
| 4      | Unnamed          | 440-305600-00000            | 1       | 93L.041 |
| 5      | Unnamed          | 440-307800-00000            | 1       | 93L.041 |
| 6      | Unnamed          | 77                          | 1       | 93L.041 |
| 7      | Kitnayakwa R.    | 440-314000-00000            | 1       | 93L.041 |
| 8      | Kitnayakwa R.    | 440-314000-00000            | 2       | 93L.041 |
| 9      | Kitnayakwa R.    | 440-314000-00000            | 4       | 93L.032 |
| 10     | Kitnayakwa R.    | 440-314000-00000            | 5       | 93L.032 |
| 11     | Cole Cr.         | 440-314000-03100-00000      | 1       | 93L.041 |
| 12     | Cole Cr.         | 440-314000-03100-00000      | 2       | 93L.041 |
| 13     | Cole Cr.         | 440-314000-03100-00000      | 4       | 93L.041 |
| 14     | Unnamed          | 1507                        | 2       | 93L.041 |
| 15     | Steward Cr.      | 440-314000-06000-00000      | 1       | 93L.041 |
| 16     | Steward Cr.      | 440-314000-06000-00000      | 2       | 93L.041 |
| 17     | Steward Cr.      | 440-314000-06000-00000      | 3       | 93L.041 |
| 18     | Unnamed          | 440-314000-06000-32600-0000 | 1       | 93L.041 |
| 19     | Unnamed          | 440-314000-06000-37600-0000 | 1       | 93L.041 |
| 21     | Unnamed          | 1583                        | 1       | 93L.041 |
| 22     | Unnamed          | 440-314000-06000-51700-0000 | 2       | 93L.041 |
| 24     | Unnamed          | 1638                        | 1       | 93L.041 |
| 25     | Unnamed          | 440-314000-06000-69900-0000 | 1       | 93L.041 |
| 26     | Nilah Cr.        | 440-314000-08600-00000      | 1       | 93L.041 |
| 27     | Nilah Cr.        | 440-314000-08600-00000      | 3       | 93L.041 |
| 29     | Unnamed          | 440-314000-08600-40400-0000 | 1       | 93L.041 |
| 30     | Unnamed          | 440-314000-15100-00000      | 2       | 93L.041 |
| 31     | Unnamed          | 1778                        | 2       | 93L.041 |
| 32     | Unnamed          | 1779                        | 1       | 93L.041 |
| 33     | Unnamed          | 1780                        | 1       | 93L.041 |
| 34     | Unnamed          | 440-314000-21000-00000      | 1       | 93L.041 |
| 35     | 3+900, Creek 3-1 | 440-314000-23200-00000      | 1       | 93L.041 |
| 36     | Unnamed          | 440-314000-24900-00000      | 1       | 93L.041 |
| 37     | Unnamed          | 440-314000-25600-00000      | 1       | 93L.041 |
| 38     | Unnamed          | 1837                        | 1       | 93L.041 |
| 39     | Unnamed          | 1865                        | 1       | 93L.041 |
| 40     | Katrina Cr.      | 440-314000-32700-00000      | 1       | 93L.041 |
| 41     | Unnamed          | 1891                        | 1       | 93L.041 |
| 43     | Iceflow Cr.      | 440-314000-34300-00000      | 2       | 93L.042 |
| 44     | Unnamed          | 1923                        | 1       | 93L.041 |
| 45     | Unnamed          | 1927                        | 1       | 93L.041 |
| 46     | Unnamed          | 440-314000-53900-00000      | 2       | 93L.031 |
| 47     | Unnamed          | 440-314000-53900-34500-0000 | 1       | 93L.031 |
| 48     | Tun Cr.          | 440-314000-54700-00000      | 2       | 93L.032 |
| 49     | Unnamed          | 2068                        | 1       | 93L.032 |
| 50     | Unnamed          | 2073                        | 5       | 93L.031 |
| 52     | Unnamed          | 440-314000-60900-00000      | 1       | 93L.032 |
| 53     | Unnamed          | 440-314000-63200-00000      | 1       | 93L.031 |
| 54     | Unnamed          | 2091                        | 1       | 93L.032 |
| 55     | Tatsi Cr.        | 440-314000-66600-00000      | 1       | 93L.032 |
| 56     | Unnamed          | 2100                        | 1       | 93L.032 |
| 57     | Two Falls Cr.    | 440-314000-68200-00000      | 1       | 93L.032 |

| Site # | Local Name  | Watershed Code/ILP               | Reach # | Map     |
|--------|-------------|----------------------------------|---------|---------|
| 58     | Unnamed     | 440-314000-75600-00000           | 1       | 93L.032 |
| 59     | Unnamed     | 2110                             | 1       | 93L.032 |
| 60     | Miners Cr.  | 440-314000-78900-00000           | 1       | 93L.031 |
| 61     | Unnamed     | 440-314000-78900-15400-2620-0000 | 1       | 93L.031 |
| 62     | Unnamed     | 440-314000-81800-00000           | 1       | 93L.031 |
| 63     | Unnamed     | 2177                             | 1       | 93L.031 |
| 66     | Unnamed     | 1890                             | 1       | 93L.041 |
| 67     | CR 1-1 CR10 | 1786                             | 1       | 93L.041 |
| 190    | Unnamed     | 440-314000-06000-37600-0000      | 2       | 93L.041 |
| 220    | Unnamed     | 440-314000-06000-51700-0000      | 1       | 93L.041 |
| 260    | Nilah Cr.   | 440-314000-08600-00000           | 4       | 93L.041 |
| 500    | Unnamed     | 2073                             | 1       | 93L.032 |



## **APPENDIX 2**

### **Project and Interpretative Maps**

#### **1:20,000 TRIM maps:**

93L.021, 93L.022, 93L.031, 93L.032,  
93L.041, 93L.042, 103L.050,  
93L.051, 93L.052,

## **APPENDIX 3**

### **DNA Sample Submission Form**

## **ATTACHMENT I -Planning Documents**

### **Phase Completion Reports**

#### **Phase 1-3 Planning Report:**

Triton Environmental Consultants Ltd. 1999. Phase I-III Pre-Field Project Planning Report. Reconnaissance (1:20,000) Fish and Fish Habitat Stream Inventory in the Kitnayakwa, Kitnayakwa, and Williams/Hatchery Working Areas. Prepared for Skeena Cellulose Inc., Terrace, BC.

## **ATTACHMENT II - Field Cards**

**Site Cards (65)**

**Fish Cards (57)**

**ATTACHMENT III - Photodocumentation**

**Binder With Photosummary Report  
Photographs  
Index Tabs  
1 Photo CD's #3710  
Labelled Negatives in Plastic Sleeves**

## ATTACHMENT IV - Digital Data

|                    |              |
|--------------------|--------------|
| Watershed report   | Kitnay.doc   |
| Figure 1           | Overview.apr |
| Figure 2           | Fishdta2.xls |
| Table 1            | Watsumm.xls  |
| Table 2            | 3rdplus.xls  |
| Table 3            | Habitatq.xls |
| Table 4            | Habdescr.xls |
| Table 5            | Barrier.xls  |
| Table 6            | NVC.xls      |
| Table 7            | Fishsum.xls  |
| Table 8            | Fishdist.xls |
| Table 9            | Barrier.xls  |
| Table 10           | Rprtfish.xls |
| Table 11           | Rprtfish.xls |
| Table 12           | Rprtfish.xls |
| Table 13           | Rprtfish.xls |
| Table 14           | Individ.xls  |
| Table 15           | Efddata.xls  |
| Table 16           | Slope_2.xls  |
| Table 17           | Restore.xls  |
| Table 18           | Sitesum.xls  |
| Table 19           | Sitesum.xls  |
| Table 20           | Sitesum.xls  |
| Table 21           | Efddata.xls  |
| Table 22           | Order.xls    |
| Table 23           | Elev.xls     |
| Table 24           | Slope_2.xls  |
| Table 25           | Fishbarr.xls |
| Table 26           | Wild.xls     |
| Table 27           | Watqual.xls  |
| Photo Form1        | Form1.xls    |
| Appendix I Index   | Index.xls    |
| Appendix III table | Genetic.xls  |

### **FDIS Files (on CD):**

|               |             |
|---------------|-------------|
| FDIS database | Fdisdat.mdb |
|---------------|-------------|

### **ARC/INFO (on CD):**

|                 |               |
|-----------------|---------------|
| Export File     | f2199808.e00  |
| containing:     |               |
| Data Source     | f2199808.prj  |
| Point Coverage  | f2199808.pat  |
| Attribute Table | f2199808.att  |
| Metadata Table  | f2199808.meta |

**ATTACHMENT V -Hardcopy FISS Update Forms**

**FISS Update Forms  
FISS Update Maps 93L/5**