

## EXECUTIVE SUMMARY

Triton Environmental Consultants Ltd. was retained by Pacific Inland Resources (PIR) in partnership with the Ministry of Environment, Lands and Parks (MELP) in Smithers to conduct reconnaissance level fish and fish habitat inventories in the Bulkley Forest District. This report summarizes the historical fisheries data collected by SKR Consultants Ltd and the field data collected by Triton survey crews in working unit 8. The historical fisheries data indicate that the following species are present in the study area :

- sockeye (*Oncorhynchus nerka*),
- coho (*O. kisutch*),
- steelhead and rainbow trout (*O. mykiss*),
- chinook (*O. tshawytscha*),
- pink (*O. gorbusha*),
- cutthroat trout (*O. clarkii*),
- Dolly Varden (*Salvelinus malma*),
- bull trout (*S. confluentus*).

A total of 157 sites were sampled between July 25 and October 2 1996 and July 7 and September 20 1997. Seventeen sites were classified as “Not A Creek” due to the lack of a defined channel. Fish were captured by electrofishing at 42 sites, the species sampled include Dolly Varden, bull trout cutthroat trout, rainbow trout, coho, sockeye, lake chub and an unidentified salmon species. A total of 33 sites were classified as S5 or S6, the basis for the non fish bearing status is summarized. This report also includes recommendations for resampling .

Triton Environmental Consultants Ltd.’s project team for this inventory project included:

Mr. Adam Lewis, M.Sc., R.P. Bio.	Project Manager/Crew Leader,
Ms. Julie Pavey, B.Sc., R.P. Bio.	Project Manager/Crew Leader,
Dr. Guy Martel, Ph.D.	Crew Leader,
Mr. Ryan Hill, MRM, R.P.Bio	Crew Leader,
Mr. Arne Lorenz, B.Sc.	Crew Leader,
Mr. Bruce Mattock, B.Sc.,R.P.Bio	Crew Leader,
Mr. Steve Jennings, B.Sc.	Crew Leader,
Mr. James Pegg, M.Sc.	Crew Leader,
Mr. Peter Frederiksen	Crew Leader,

Ms. Jennifer Haslett	Crew Leader,
Mr. Darrel Davis	Crew Leader,
Mr. Terry Davies	Crew Leader,
Ms. Karla Graf	Crew Leader,
Mr Ficus Chan	Field Technician,
Mr. Lucas Eades	Field Technician,
Ms. Heidi Schmit	Field Technician,
Ms. Kirsten Aichberger	Field Technician,
Mr. Eamon Miyagi	Field Technician
Mr. Jean-Francois Patenaude	Field Technician,
Mr. Hubert Karas	Field Technician,
Mr. Jim Lang	Field Technician,
Mr. Dave Warburton	GIS Coordinator,
Ms. Shannon Shields, B.A.	GIS Technician,
Mr. Derik Woo, B.A.	GIS Technician,
Ms Michelle King, B.A.	GIS Assistant,
Mr. Edward Lem	GIS Assistant,
Ms. Robyn Shortt, B.Sc.	Database Coordinator

Triton Environmental Consultants Ltd. would like to thank Mr. Alan Baxter of Pacific Inland Resources for his assistance throughout the planning and field phases of this project. The principal contract monitor was Mr. Paul Giroux, B.C. Ministry of Environment, Lands and Parks, Smithers office. The quality assurance was conducted by Mr. Ward Prystay and Mr. Ryan Sherman. Triton Environmental Consultants Ltd. would also like to thank Mr. Dave Reynard and Mr. Steve Grey of Highland Helicopters.

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## 1.0 INTRODUCTION

### 1.1 Background

Pacific Inland Resources retained Triton Environmental Ltd. (Triton) to conduct a reconnaissance level fish and fish habitat inventory in 14 watersheds located in the Bulkley Forest District. Existing information on fish distribution within the watersheds under investigation was collected by SKR Consultants LTD, in Smithers, B.C. Data from the provincial and federal government sources such as the Stream Information Summary System (SISS) and the evolving Fisheries Information Summary System (FISS) were researched for information.

This report summarizes historical and field data collected in unit 8, which consists of part of the upper Kiseguecla watershed, as well as the Trout, Corya, Boulder and John Brown watersheds. The records indicate that the following species are found in the study area :

- sockeye (*Oncorhynchus nerka*),
- coho (*O. kisutch*),
- steelhead and rainbow trout (*O. mykiss*),
- chinook (*O. tshawytscha*),
- pink (*O. gorbusha*),
- cutthroat trout (*O. clarkii*),
- Dolly Varden (*Salvelinus malma*),
- bull trout (*S. confluentus*).

A total of 107 sites were sampled between September 20 and October 2 1996. Eight sites were classified as “Not A Creek” due to the lack of a defined channel. Fish were captured at 37 sites and the species sampled include: lakechub (*Couesius plumbeus*), cutthroat trout, Dolly Varden, rainbow trout, coho and pink salmon. Two sites were classified as S5 while 13 were classified as S6. The basis for their non fish bearing status is summarized. Stream classification is now required under the Forest Practices Code (FPC) of British Columbia Act (Bill 40 - 1994) and the associated Operational Planning Regulation enacted in June 1995. One of the objectives of the FPC is to integrate fisheries and forestry resource management in areas proposed or approved for logging to ensure that fish habitat is protected. Stream classification is designed to identify the presence of sensitive fish habitat and species, and to assist in the determination of the appropriate riparian management areas in order to develop a responsible management strategy required for Operational Plans.

## 1.2 Objectives

In partnership with the Ministry of Environment, Lands and Parks and Pacific Inland Resources, Forest Renewal BC (FRBC) is conducting fish and fish habitat inventories to provide information required for resource planning. Triton's objectives were to describe fish distributions and habitat characteristics, and to provide stream classifications according to the Forest Practices Code. Fish and fish habitat operational inventories consist of:

- reconnaissance-level surveys aimed at characterizing fish habitat and distribution;
- identification of fish and fish habitat that require special designation under the Forest Practices Code (e.g. sensitive areas); and
- new, reinterpreted, or augmented data to meet Forest Practices Code requirements for classification of areas (e.g. fish stream classification).

## 2.0 STUDY AREA

### 2.1 Location

The Bulkley Forest District is located in north-central British Columbia and contains several major tributaries to the Bulkley and Babine Rivers. The 1:20 000 TRIM sheets that cover unit 8 are : 93 L 082, 93 L 083, 93 L 092, 93 L 093, 93 L 094, 93 M 003, 93 M 004, 93 M 013, 93 M 014.

### 2.3 Watersheds

This working unit covers roughly 490sq. km and comprises 6.2% of the study area  
The streams inventoried in this project include;

- Trout Creek ,
- Schipper's Creek
- John Brown Creek,
- Corya Creek,
- Graphite Creek,
- Atrill Creek
- Boulder Creek.,
- Several unnamed tributaries to the Kitsequecla River.

### 2.4 Fish Species

Fish presence has been confirmed in the mainstems of the Kitsequecla River and Trout Creek (up to 10km from the mouth) and in the lower 200m of John Brown Creek and the lower 2km of Corya Creek. Fisheries information is also available for the Bulkley River mainstem, which defines the eastern boundary of this unit. The following list outlines fish species documented in this unit :

- sockeye (*O. nerka*),
- coho (*O. kisutch*),
- steelhead and rainbow trout (*O. mykiss*),
- chinook (*O. tshawytscha*),
- pink (*O. gorbusha*),
- cutthroat trout (*O. clarkii*),
- Dolly Varden (*S. malma*),
- bull trout (*S. confluentus*).

fig.1

## **2.2 Access**

Road access exists for most parts of Trout Creek, Boulder Creek and the Kitsequecla River. The lower reaches of John Brown and Corya Creeks are also accessible by road. However, the mid and upper reaches of the tributaries of John Brown Creek, Corya Creek, and some of the tributaries for Trout Creek and the Kitsequecla River, require helicopter access. Half of the sites surveyed in this project were accessed by helicopter and the other half by truck.

## **2.3 Resource Use**

Logging is the main resource based activity in this working unit.



## **3.0 METHODS**

### **3.1 Physical**

Prior to the start of the field program 1:20,000 TRIM maps were used to estimate the location of reach breaks, determine the length of the reaches and identify potential sampling sites. The locations of these reach breaks were subsequently confirmed or modified during the field studies.

The survey was conducted by a ten person field crew working in five teams in 1996, and an eight person field crew working in four teams in 1997. Sites at the top of the watershed were done first to determine fish presence whenever possible. DFO/MELP Stream Inventory Survey forms were filled out for each site (Department of Fisheries and Oceans and Ministry of Environment, 1989). Channel widths were measured with meter sticks, hip chains and measuring tapes or were visually estimated where wading conditions were dangerous. Water depth was measured with a meter stick. Stream classification, whether fish bearing or non fish bearing, requires the measurement of a minimum of six channel widths. Stream gradients were measured with a Suunto clinometer. In order to allow for future verification of sampling sites, all sampling sites were permanently marked with unique flagging tape (blue and white striped) and the GPS locations of all sites were noted.

Photos were taken at each site to document field data and conditions. Canon Sure Shot A1 Prima AS-1 cameras were used for this purpose. The camera is equipped with a 32 mm lens. Photos were usually taken of both the upstream and downstream view of the stream and any characteristic features such as beaver dams, falls, notable cascades were documented. Photos were often taken of fish captured at the site. The film used was 200 ISO. All of the fish, feature and site photos are included with the sub basin description in the results and discussion section.

The report maps were generated using 1:20,000 scale TRIM base maps provided by MELP. Using ARC Info, these files were projected into UTM and coverages were created from the field sampling and stream classification data.

### **3.2 Biological**

Triton obtained fish sampling permits from the appropriate DFO and MELP offices. Fish presence or absence was determined by electrofishing and/or minnow trapping and occasionally angling. Electrofishing was conducted at all sites where it was deemed necessary. That is, where fish presence had not been determined upstream or habitat characteristics were sufficiently different from other sites. A minimum area of approximately 100 m was sampled to ascertain fish presence. The effort, or shocking

time and distance shocked, was recorded for each sample site. A variety of electroshocker models were used in this study including :

- Smithroot 12 B POW ,:
- Smithroot Type VII,
- Smithroot 15 A,
- Coffelt Mark 10.

The electroshockers were commonly set at 60HZ at 6MS, however adjustments were made where appropriate. Salt was not used at any of the sample sites. The fork length of each fish collected was then measured and, whenever necessary, voucher specimens were collected and stored in a 10% formaldehyde solution in plastic bags. These specimens were delivered to the Smithers office of BC Environment.

### **3.3 Stream Classification**

The data collected from existing sources and during the field program were used to determine the riparian class as defined under the *Forest Practices Code*. **Table 1** provides the FPC definition of each riparian class.

Draft procedures are also outlined in the guidebook to determine the riparian management areas (RMA) for lakes (L1 - L4), wetlands (W1 - W5) and fisheries sensitive zones.

A stream survey card and photograph(s) are presented for each sampling site. They are arranged in the report by field crew and then by TRIM sheet. The stream survey data, for each site, is an electronic duplication of the stream survey forms completed in the field and provides additional information used by the field crew to designate a stream as fish or non-fish bearing.

An S5 or S6 classification was based on electrofishing results, substrate composition, stream gradient, general fish habitat characteristics and location of barriers that may preclude fish use in the area. The absence of fish during sampling did not rule out an S1 to S4 designation. Typically, at sites where no fish were collected but suitable habitat was available, the reach was classified as fish bearing and given the appropriate S1 to S4 classification. Additional sampling, at different times of the year, would be required to confirm that fish do not utilize a stream reach before a final S5 or S6 final designation would be accepted.

The use of 1:20,000 scale TRIM maps meant that some of the first order (headwater) streams marked on the map were not necessarily stream channels. Under the FPC's Operational Planning Regulation (June 1995) a stream is defined as:

“... a watercourse, having an alluvial sediment bed, formed when water flows on a perennial or intermittent basis between continuous definable banks;”

During the field classification, crews would define a watercourse as “not a creek” if there were no alluvial sediments and no continuous, definable banks. Watercourses that had a substrate that consisted entirely of organic material were not considered to have an alluvial sediment bed.

## **4.0 Stream Flow and Water Quality**

### **4.1 Stream Flow**

The hydrological records were reviewed from existing sources, namely Water Survey of Canada (WSC) records. An estimate of daily flows ( $m^3/s$ ) was based on Water Survey of Canada Daily maxima, minima, and maximum instantaneous flows were also summarized from existing records if available. Mean annual discharge ( $m^3/s$ ) was calculated from existing hydrological records.

### **4.2 Water Quality**

As agreed with the Ministry Representative, water samples were not collected for chemical analyses. The parameters that were measured for each site, however, were turbidity, pH and conductivity. Conductivity was measured with a handheld LaMotte TDSTestr 3™ conductivity meter with a range of 0 to 1990  $\mu S$ . The pH at each site was measured with a handheld LaMotte pHTestr 2™ pH meter. Turbidity was determined subjectively and it was stipulated by the ministry representative during the quality assurance phase of the project that the depth of the deepest pool would be the default value in the database when the water was clear to the bottom. Water temperatures during this period ranged between 2 and 13°C. **Table 2** summarizes the temperature, pH and conductivity measurements collected during this inventory. The average water temperature was X°C. The pH values ranged from X to X, with an average pH of X. The turbidity values are not discussed here as the values were defaulted on request of the QA/QC monitor to the depth of the deepest pool when turbidity was recorded as clear to the bottom. This value is not considered indicative of the stream turbidity by Triton and will not be discussed further. The conductivity ranged from X to 190 (umhos/cm) with an average value of X.

## 5.0 RESULTS AND DISCUSSION

The survey took place between X and X. A total of 107 sites were sampled and only eight sites were classified as “Not a creek” due to a lack of defined channel. The flow stages at the time of sampling ranged from dry to flood conditions. Fish were caught at X sites and a total of X sites have been classified as non fish bearing. A number of sites in the X watersheds were classified as non fish bearing, due to the presence of significant barriers downstream of the sampling areas. These barriers are listed in Table 3. A summary of non fish bearing classifications established in this working unit are listed in Table 5 and a summary of the sites for which future sampling is recommended as provided in Table 6. The summary information for all sites in working unit 10 is listed in Table 4. This table is organized alphabetically, by sub-basin and includes fish data, stream classifications and methods of sampling. Individual fish data for this working unit has been summarized in Appendix 2. Figures X & X are histograms of the fish species sampled during the study.

### 5.7 Kitsegucla River (450-0000-000) (93 L 082, 93 L 083, 93 L 092, 93 L 093)

#### 5.7.1 Sensitive Habitats and Barriers

Approximately 17.38 km of the Kisegucla mainstem runs through unit 8. This part of the river is fed by 25 tributaries. Reach 2 of the mainstem has low gradient and is somewhat confined, while reach 3 has low gradient, is unconfined and flows through a large wetland which has been identified as a fisheries sensitive zone. Reach 4 has low gradient, gradually increasing confinement and is fed by 3 lakes, including Kitsegucla Lake. Reach 5 is very confined, peaking at a 5 meters falls delinating the upper limits of fish distribution in the mainstem. Reach 6 has moderate confinement and low to moderately steep gradient, while reach 7 is quite confined with varied gradient. The Kisegucla River was sampled at 50 locations, including reaches 3,4,6 and 7 of the mainstem.

#### 5.7.2 Fish Summary Tables and Stream Classification

Coho, sockeye and steel head spawners have been recorded in this section of the Kisegucla watershed. Forty two sites in this system were electrofished, with fish caught at 15. The species sampled include : coho, cutthroat, Dolly Varden and rainbow trout. The mainstem was classified as an S2 in reach 4 based on an average channel width of 8.73 meters and the presence of rainbow trout in the sampling area. Reach 5 was not sampled, and all reaches upstream of the reach 5 and 6 break have been classified as non fish bearing as they are located upstream of an impassable 5 m falls, above which no evidence of a resident population of fish was found. The mainstem was classified as an S5 in reach 6 and reach 7, based on average channel widths of 4.88 and 4.17 meters. The habitat upstream of the falls is excellent, with rearing and spawning habitat in the mainstem and abundant rearing habitat in the tributaries.

However, no fish were caught above the falls, which was sampled by electrofishing at 13 different sites. The tributaries upstream of the falls are typically S6 sized streams, with two reaches classified as S5.

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## **5.6 Kisteguecla Lake (450-7022-000) (93 L 093)**

### 5.6.1 Sensitive Habitats and Barriers

Kiseguecla Lake is 1.72 km X .62 km and is fed by 5 small tributaries. The upper reaches of two of these tributaries have been classified as non fishberiang due to extreme gradient. A large wetland was noted on the west shore of the lake. Three sites were classified in the Kitseguecla Lake watershed, including the outlet.

### 5.6.2 Fish Summary Tables and Stream Classification

No historical information exists for Kitseguecla Lake, however steelhead spawning has been indicated in the outlet. Only one sample site was electrofished in this inventory. The outlet of the lake, was classified as an S3 based on an average channel width of 2.0 meters and the presence of cutthroat trout and coho in the sampling area. The two tributaries to Kitseguecla Lake sampled in this inventory were classified as S6 based on average channel widths of .6 m and .5 m respectively and a lack of suitable fish habitat.



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## **5.9 Trout Creek (460-2413-000) (93 L 093, 93 L 094)**

### 5.9.1 Sensitive Habitats and Barriers

The Trout Creek mainstem is 18.4 km in length and is fed by 32 tributaries. Reach 1 of Trout Creek is moderately confined, while reach 2 has low gradient and is unconfined. Reaches 3 and 4 of Trout Creek are quite confined, while reach 5 is unconfined, has low gradient, and 2 large wetlands identified as fisheries sensitive zones in this inventory. Reach 6 has increasing gradient, which becomes steep in the headwaters of reach 7. A falls was noted in the historical information 1.4 km from the mouth of Trout Creek. Extensive road crossings, as well as railway and power line crossings occur in reach one. The Trout Creek watershed was sampled at 45 different locations, including reaches 1, 2, 4, 5 and 6 of the mainstem.

### 5.9.2 Fish Summary Tables and Stream Classification

The historical records indicate that coho, cutthroat trout, pink, rainbow trout and steelhead at the mouth of Trout Creek. Spawning steelhead and coho have been observed in the vicinity of the falls in reach one and cutthroat trout have been recorded upstream in 3.52 2.47 a tributary to the main, which drains Taltzen Lake. Thirty three sites were electrofished in this system and fish were caught/observed 16 sites. Cutthroat trout were caught at in reaches one and two of the main creek only. No fish were caught in or above reach three. Lake chub were caught at site J180, on a stream associated with Taltzen Lake. In reach one the Trout Creek mainstem was classified as an S2 based on an average channel width of 10.6 m and the presence of cutthroat trout in the sampling area. In reach two, it was classified as an S3, based on an average channel width of 2.3 m and the presence of cutthroat trout at the site. Trout Creek was also classified as S3 in reaches four and five, based on average channel widths of 2.4 and 2.1 m respectively and the presence of fish habitat in the sampling areas. In reach 6, Trout Creek was classified as S6, based on a lack of suitable habitat and the presence of an ill defined channel. The crew noted that channel resembled a creek only at the road crossing. Several tributaries to the mainstem were sampled in this inventory. Cutthroat trout were captured in reach 1 of two S2 sized tributaries (J216 and J217) to reach 2 and in reach 1 of 3 smaller tributaries feeding these streams. These two tributaries are characterized by low gradient in the lower reaches, which gradually increases to steep gradient in the headwaters. A 10 meter falls was noted on (J216), above which cutthroat trout were caught. Typically, the smaller streams have been classified as fish bearing, except in the upper most reaches, which have quite steep gradient. This area is particularly productive for cutthroat trout, with abundant rearing and spawning habitat.

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## **5.8 Schipper's Creek (460-2413-177) (93 L 093, 93 L 094)**

### 5.8.1 Sensitive Habitats and Barriers

The Schippers Creek mainstem is 11.4 km in length and is fed by 15 tributaries. Reach one of this stream is largely unconfined and has low gradient, however, some slight confinement was noted on the TRIM sheet at the confluence with Trout Creek. Reaches 2 through 4 are quite confined, while reach 5 is unconfined. The headwaters of reach 6 are characterized by steep gradient. No sensitive habitats or barriers were identified by field crews working in this stream. The Schipper's Creek system was sampled at 9 locations, including reach 2 of the mainstem.

### 5.8.2 Fish Summary Tables and Stream Classification

No historical records exist for Schipper's Creek. Six sites were electrofished in 1996 and fish were caught at two. Dolly Varden and cutthroat trout were captured in reach one. Schipper's Creek was sampled twice in reach 1 and once in reach 4. Site R164, in reach one was classified as an S2 based on an average channel width of 5.5 m and the presence of Dolly Varden in the sampling area. Site J218, also in reach one was classified as an S3 based on an average channel width of 4.7 m and the presence of cutthroat trout in the sampling area. Site R161, in reach four was classified as an S3 based on an average channel width of 1.5 m and the observation of fish habitat at the survey site. The tributaries to Schipper's Creek have been classified as S4 in the lower reaches, with the upper reaches classified as non fishbearing due to steep gradient.

## **5.2 Beavery Creek (460-2327-043) (93 L 093, 93 L 094)**

### 5.2.1 Sensitive Habitats and Barriers

Beavery Creek is 6.0 km long and is fed by 8 tributaries. Reach 1 of Beavery Creek has low gradient and is crossed by a railway, pipeline and highway. Reach 2 has moderate gradient and reach 3 has steep gradient, which approaches the upper limits of fish distribution. Beavery Creek was sampled once in reach 1.

### 5.2.2 Fish Summary Tables and Stream Classification

No historical records exist for this creek and no fish were caught during this inventory. Barring a gradient barrier at the mouth, fish should have access to at least reach 1 of this stream. Steeper gradient in reaches 2 and 3 may prevent fish from using the creek upstream of reach 1. Reach 1 was classified as

an S3 based on an average channel width of 2.60 meters and the presence of fish habitat in the sampling area. This site was electrofished, but no fish were caught. The tributaries to reach 4 of this stream appear to be S4 sized streams while the tributaries to the upper reaches are most likely S6 sized streams.

#### **5.4. Cow Creek (460-2327-005) (93 L 093, 93 L 094)**

##### 5.4.1 Sensitive Habitats and Barriers

Cow Creek is 4.7 km in length and is fed by only 1 tributary, though the TRIM sheet indicates 3. No sensitive habitats were identified on Cow Creek, however a 10 m falls was observed by field crews at the first highway crossing, as was a 1.4 meter drop from the culvert at this road crossing. In addition, a huge beaver dam and pond were noted at the pipeline crossing. Reach 1 flows through pasture, reach 2 has low gradient and is crossed twice by the highway. The Cow Creek system was sampled at 4 locations, with two sites classified as "NC" based on the absence of defined channels in the sampling areas. Reach 1 was estimated to be an S2, the remaining reaches have been classified as non fish bearing S5 and S6.

##### 5.4.2 Fish Summary Tables and Stream Classification

No historical records were found for this creek, and no fish were caught in the two sample sites that were electrofished in this inventory. Reach 1 has been classified as an S2 based on an average channel width of 5.57 meters and a visual observation of trout at the first highway crossing. Reach 3 has been classified as a non fish bearing S5 based on an average channel width of 3.05 meters and the absence of fish in the sampling area, which is located above the 10 meters falls.

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## **5.5 John Brown Creek (460-2015-000) (93 L 092, 93 L 093, 93 L 094) (93 M 003, 93 M 004)**

### 5.5.1 Sensitive Habitats and Barriers

John Brown Creek is 20.6 km in length and is fed by 63 tributaries. Reach one is unconfined and has low gradient, while reach 2 is quite confined. Reaches 3 and 4 are somewhat confined and have moderate gradient and a treed wetland was noted in reach 4. Reaches 5 and 6 have steep gradient, and reach 5 contains a 5 meter falls. A Highway 16 crossing, as well as a railroad crossing and a cluster of buildings are associated with reach one. This system was sampled in 10 locations, including reaches 1,2 and 5 of the mainstem.

### 5.5.2 Fish Summary Tables and Stream Classification

Chinook, Dolly Varden, rainbow trout and cutthroat trout have been recorded at the mouth of John Brown Creek. Nine sites were electrofished and fish were caught and/or visually observed at 5. Dolly varden were captured at J201 and J202 and pink salmon were visually observed at R182. Dolly Varden were caught by electrofishing in tributaries to reaches 2 and 3 of John Brown Creek, and bull trout were visually observed in the mainstem downstream of site W260 (see site photo with stream card). The mainstem was sampled at three locations and the classifications range from S2 to S5. In reaches 1 and 2, John Brown Creek was classified as an S2, based on average channel widths of 13.0 m and the presence of fish on the sampling areas. In reach five John Brown Creek was classified as an S6, due to the absence of fish in the sampling area. located above an impassable 5 m falls. Site J202 on a tributary to John Brown was classified as an S2, with an average channel width of 6.8 and the capture of Dolly Varden at the survey site. Site Z230, on a large tributary to reach 4 was classified as an S3 based on an average channel width of 3.80 meters and the presence of Dolly Varden in the sampling area. A large, partially blown out beaver dam and a beaver pond were observed at this site, which supports large numbers of Dolly Varden. Site W261, located high up on a large tributary to reach 2, was classified as an S3 based on an average channel width of 3.74 meters and the presence of Dolly Varden habitat in the sampling area. One large, blown out tributary to this stream was aerially assessed in reach 1 and was classified as an S2. The gradient in this small subbasin ranges from moderate to steep, with steep gradient and sharp confinement noted near the mouth. A ground survey of this stream from the mouth up is recommended. The John Brown system is characterized by moderate to steep gradient, with borderline and extreme gradient noted in the mid to lower reaches of some of the tributaries. The type of habitat in this system, is well suited to salmonids like Dolly Varden and bulltrout, both of which were encountered in this watershed. The presence of bull trout and the steep side slopes of the John Brown mainstem and its tributaries demonstrate the sensitivity of this system, which should be reflected in land use management plans designed for this watershed.

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### **5.3 Corya Creek (460-1854-000) (93 M 003, 93 M 004)**

#### 5.3.1 Sensitive Habitats and Barriers

The mainstem of Corya Creek is 18.9 km in length and is fed by 62 tributaries. Reach one is unconfined, has low gradient and a number of gravel bars, while reach 2 is quite confined. Reach 3 has moderate gradient and confinement, while reach 4 has steep gradient and varied confinement. Corya Creek is crossed by highway 16, several roads and a railway crossing in reach 1. Clusters of buildings were also noted near the channel in reach one. The Corya Creek system was sampled in 11 locations, including Graphite Creek. The mainstem of Corya Creek was sampled in reaches 1, 2 and 3.

#### 5.3.2 Fish Summary Tables and Stream Classification

The historical information indicates the presence of Dolly Varden and rainbow trout in reach one. Dolly Varden were caught by electrofishing in reach 1 and 2, and in a tributary to reach 2 in this inventory. Many of the tributaries to reaches 2 and 3 of this system have steep, impassable gradient and are accessible for only the first few hundred meters. As such sampling in these streams was limited. The mainstem was classified as an S2 in reach 1 and reach 2, based on average channel widths of 9.5 and 17.03 meters respectively and the presence of fish in the sampling areas. Reach 3 was classified as an S1 based on an average channel width of 23.45 meters and the presence of fish habitat in the sampling area. This reach showed signs of blow out, suggesting that it would be of limited use to fish at certain times of the year. However, it is accessible to fish and could provide some rearing habitat and has been classified as fish bearing. A large tributary to reach 2 of Corya Creek was sampled at Z225 (93 M 003), and was classified as an S2, based on an average channel width of 9.07 meters and the presence of some excellent rearing habitat in the sampling area. The sample site was located above a series of cascades on the mainstem and future sampling is strongly recommended for this reach. The tributaries to reach 1 of Corya Creek, which were sampled in this project, were classified as S3 based on average channel widths of 2.1, 2.0 and 2.7 meters and the presence of fish habitat in the sampling areas. Future sampling is also recommended for these reaches, as all of them are accessible and flow into fish bearing waters. Sites A81 and A82 in particular should be revisited as they comprise the outlet and inlet of a sizeable lake, (900m x 20m) associated with the Corya watershed.

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## **5.5 Graphite Creek (460-1854-046) (93 M 003, 93 M 004)**

### 5.5.1 Sensitive Habitats and Barriers

Graphite Creek is 9.0 km in length and is fed by two tributaries. Reaches 1 and 2 of Graphite Creek have low gradient and are unconfined. Reach 2 has a number of wetlands in contact with the channel which have been identified as fisheries sensitive zones. Reaches 3 and 5 are small lakes and reach 4 has low gradient and flows through a wetland. Graphite Creek was sampled in reaches 1 and 4.

### 5.5.2 Fish Summary Tables and Stream Classification

No fisheries data was found for Graphite Creek, however Dolly Varden and rainbow trout were noted at the mouth of Corya Creek, which is only 700 m downstream of the confluence of Corya and Graphite Creeks. Only one site was electrofished in this system and no fish were caught, despite the presence of fish habitat in the sampling area. Graphite Creek was classified as an S4 in reach 4, based on an average channel width of 1.4 m and the presence of fish habitat in the sampling area. Neither of the tributaries were sampled in 1996, however one appears to be an S4 and the other an S6.

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## **5.1 Atrill Creek (460-1632-000) (93 M 003, 93 M 004)**

### 5.1.1 Sensitive Habitats and Barriers

Atrill Creek is 9.0 km in length and is fed by five tributaries. The stream flows east for much of its length, moving northeast in reach two and then southeast and northeast in reach one. Reach three is characterized by moderately steep to steep gradient and contains a stretch of 32% gradient over 315 m at the break between reaches three and two. A potential falls or cascade barriers may occur in this area. Reach two is largely unconfined, has low gradient and is fed by three tributaries, one of which drains a small lake. Reach one also has low gradient and is unconfined. It is also crossed by highway 16, a transmission line and a railroad. The mainstem and one tributary were sampled in this system.

### 5.1.2 Fish Summary Tables and Stream Classification

Pink and coho are historically present at the mouth of Atrill Creek. Neither sample site was electrofished in this study. Atrill creek was sampled in reach one and classified as an S3 based on an average channel width of 3.2 m and the presence of fish habitat in the sampling area. The tributary to Atrill Creek was sampled and classified as an S4 based on an average channel width of 1.2 m and the presence of fish habitat in the sampling area. The remaining tributaries would most likely be classified as S4, with one S6.

INSERT CARDS/PHOTOS

## **5.9 Boulder Creek (460-1426-000) (93 M 013, 93 m 014)**

### 5.9.1 Sensitive Habitats and Barriers

The Boulder Creek mainstem is 15 km in length and is fed by 45 tributaries. It drains east in reach four from 2 headwater lakes through a confined valley. The confinement is consistent through reach two, with occasional increases and decreases in stream gradient. Finally, reach one is unconfined, has low gradient and is crossed by a railway bridge. Boulder Creek is also crossed by highway 16 in reach 2. An old mining road, accessible by ATV, runs along the right bank of reach 2 of Boulder Creek and the large tributary to Boulder Creek, which enters the mainstem at the reach 2 and 3 break and was sampled at site Z258. This watershed was sampled at 10 locations, including reaches 2 and 3 of the mainstem. A series of cascades, ranging in height from 2 to 4 meters, located at the top end of reach 3, delineate the suspected limit to fish distribution in the mainstem. Additionally, a set of cascades ranging in height from 2 to 3 meters, were noted on a tributary to reach 2 of Boulder Creek. These cascades are preceded by a section of steep impassable gradient.

### 5.9.2 Fish Summary Tables and Stream Classification

No historical information was noted for Boulder Creek. However, Dolly Varden were caught by angling and electrofishing in reach 2 and bull trout were caught by electrofishing in a large tributary to reach 2. The mainstem was classified as an S2 in reach one based on an average channel width of 10.3 m and the presence of Dolly Varden in the sampling area. Reach 2 was classified as an S1, based on an average channel width of 20.42 meters and the presence of Dolly Varden in the sampling area. Reach 3 was classified as an S2, based on an average channel width of 5.78 meters and the presence of boulder rearing cover in the sampling area. Three tributaries to Boulder Creek were sampled in this inventory, and fish were caught in only one. Two of these streams were classified as S2 based on average channel widths of 12.55 and 8.27 meters and either the presence of fish or suitable fish habitat in the sampling areas. No fish were caught at site Z235, located on a tributary to reach 2. However, the average gradient at the sample site was 17% and the slope increased both upstream and downstream of the site. Pieces of the blown out road crossing were found in the channel. Rearing cover is present at this site, but the gradient appears to be the limiting factor. Bull trout were caught at site Z258, the second S2 sized tributary identified in this system. Redds and rearing habitat were noted at this site.

INSERT SITE CARDS/PHOTOS



### **5.10 Fish Age, Growth and Other Observations**

### **5.11 Rare and Endangered Species**

### **5.12 Observations Wildlife Observations**

Tadpoles and frogs were observed at site J209, in the main outlet of the Kitsequecla River.

### **5.13 Recommendations for Future Sampling**

A number of the sites in this working unit were classified as fish bearing despite the fact that no fish were caught in the sampling areas. Typically, these sites have suitable fish habitat and/or no observed barriers to fish migration. **Additionally, a some sites were dry at the time of sampling.** A list sites for which future sampling is recommended is provided in Table 6.

## 6.0 CONCLUSION AND RECOMMENDATIONS

The Riparian Management Areas (RMA) around streams, lakes and wetlands consist of a riparian management zone, the width which is determined by the presence of fish species and channel width. The retention of streamside vegetation is required to protect water quality, stabilize stream banks, regulate water temperature, and supply woody debris to the stream channel. The RMA can consist of both a management zone and of a reserve zone. Timber harvesting is not permitted within the reserve zone of the RMA and there are recommended management practices for the management zone.

**Table 1** summarizes the specified Riparian Management Area (RMA) which is adjacent to the stream. The RMA extends from the top of the stream bank to the slope distance specified in the table.

The recommended management practices for these classifications are as follows:

### **S1, S2 and S3 Streams (fish-bearing)**

The RMA adjacent to these creeks contain a reserve zone and management zone whose objective is to reduce the risk of windthrow to the reserve zone and provide opportunities for meeting wildlife tree objectives.

#### **S4 Streams (fish-bearing)**

S4 streams have a management zone of 30 m and do not have a reserve zone, with the exception of a 10 m reserve zone required in the interior where the risk of windthrow is considered low. The management objectives are to reduce the risk of windthrow to the reserve zone and retain all high valued wildlife trees contained in the reserve zone.

#### **S5 and S6 Streams (non fish-bearing)**

S5 and S6 streams do not have a reserve zone. The management zone should maintain wildlife habitat, provide a source of large woody debris and root networks for bank stability, and shading for stream temperature control.

#### **Gullies or “Not a creek”**

It is also noted that several waterways shown on the maps were classified as “not a creek” as they did not meet the definition of a stream. A stream is a watercourse formed when water flows between continuous definable banks. These drainages are usually gullies and will need to be included in the gully assessment procedure.

Gullies are defined in the Forest Practices Code by channel dimensions. A gully channel has:

- greater than 25% overall stream gradient from the fan apex to the top of the headwall; and,
- from the fan apex to the top of the headwall, at least one stream reach greater than 100 m long, with
  - ≥ 40 % sidewall slope
  - ≥ 20 % channel gradient
  - ≥ 3 m gully height.

A stream channel must have both of these attributes to be defined as a gully. The majority of field observations were of transport zones which is often a confined, V-notch ravine. The sediment transported from gullies can have detrimental effects on fish habitat in downstream channels. Gully management goals should maintain channel stability and the natural rates of erosion and transport of sediment and debris.

## 7.0 REFERENCES

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