
**1:5,000 Fish and Fish Habitat
Inventory of Unnamed Tributaries to the Telkwa
River and Howson Creek**

**Working Unit 13
Cutting Permit 701**

Final Report

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**Prepared For:
Pacific Inland Resources
Smithers, B.C.**

FRBC Activity Number: 10-595 (1998)



TRITON

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PROJECT REFERENCE INFORMATION

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MELP Region	Skeena (06)
MELP District	Bulkey District
FW Management Unit	6-09
Fisheries Planning Unit	North Coast Planning Unit
DFO Sub-District	4D Smithers
Forest Region	Prince Rupert
Forest District	Bulkley
Forest Licensee and Tenure #	Pacific Inland Resources
First Nation Claim Area	Wet'suwet'en

WATERSHED INFORMATION

Watershed Group	Telkwa
Watershed Name	Telkwa River
Watershed Code	460-422700-
Watershed area	192 km ²
UTM at Mouth	9.625500.6062500
Unit Area	1220 km ²
Stream Order	6 th
NTS Map	93L/11
TRIM Maps	93L.053, 93L.054
BEC Zone	SBSmc, SBSdk

SAMPLING DESIGN SUMMARY

Total Number of Reaches Sampled	12
Field Sampling Dates	October 9 - 10, 1998

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Voucher Species ID contractor: None

Disclaimer

Interpreted information in this product developed for the purposes of the Forest Practices Code Act and Regulations, for example stream classifications, is subject to acceptance in an operational plan by the statutory decision-maker.

Acknowledgments

Triton Environmental Consultants Ltd.'s project team for this inventory project included Mr. Dave Gordon, Project Director, Mr. Stephen Jennings, Project Manager and co-author, Mr. Bryan Williams, Crew Leader and co-author, Ms. Sam Buchanan, Crew Leader, Ms. Michelle Prins, Field Crew member and FDIS Coordinator, Ms. Tania Millen, Field Crew member, Mr. Dave Warburton, GIS Manager, Ms. Jennifer Link, GIS Technician, Mr. Derik Woo, GIS Technician, Ms. Robyn Short, Database Coordinator, Ms. Michele Patterson, support staff, Ms. Heather Draper, support staff.

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List of Attachments

**(available from Regional Fisheries Inventory Specialist, Ministry of
Environment, Lands and Parks Regional Office in Smithers, BC)**

1. Fisheries Interpretive/Inventory Maps (combined), 1:20,000 Scale TRIM based.
2. Photo Summary Report, slide binders and Photo CDs for all project photos.
3. Digital Files (7 watershed reports, FDIS data file, ArcInfo Map files and plot files).

List of Abbreviations

Abbreviation	Definition
CM	chum salmon (<i>Oncorhynchus keta</i>)
CH	chinook salmon (<i>Oncorhynchus tshawytscha</i>)
CO	coho salmon (<i>Oncorhynchus kisutch</i>)
PK	pink salmon (<i>Oncorhynchus gorbuscha</i>)
SK	sockeye salmon (<i>Oncorhynchus nerka</i>)
DV	Dolly Varden char (<i>Salvelinus malma</i>)
RB or ST	rainbow or steelhead trout (<i>Oncorhynchus mykiss</i>)
CT	cutthroat trout (<i>Oncorhynchus clarki clarki</i>)
BT	bull trout (<i>Salvelinus confluentus</i>)
()	Assumed fish presence, seasonally or year round based on access, gradient or habitat capabilities, i.e. (DV) = assumed Dolly Varden.
NF	No fish
U/S	Upstream
D/S	Downstream
FISS	Fisheries Information Summary System (DFO/MoE)
E/F	Electrofishing
VO	Visual observation
FPC	Forest Practices Code
S1 - S6	Stream classifications S1 to S6 based on Ministry of Forests, Forest Practices Code, Riparian Management Area Guidebook.
FSZ	Fisheries Sensitive Zone
EFU	End of Fish Use
NVC	No Visible Channel
RMA	Riparian Management Area
M/L	Mainline (road)
NCD	Non-classified drainage (not a stream)

1. PROJECT INTRODUCTION

Triton Environmental Consultants Ltd. (Terrace branch) was retained by Pacific Inland Resources (PIR) to conduct 1:5,000 level fish and fish habitat inventory in sub-basins of 8 watersheds located in the Bulkley Forest District from August to October, 1998. In previous inventories, the Bulkley Forest District was divided into 14 Working Units, based on major watersheds (Saimoto, 1996). In 1996 and 1997, Triton completed 1:20,000 reconnaissance level fish and fish habitat inventories throughout all 14 Working Units (Triton, 1998).

In 1998, stream reaches within PIR's operating chart area in the following Working Units were inventoried at the 1:5,000 scale. The results of the inventory are presented in 7 reports (Table 1 below) and are organized by Working Unit number and Cutting Permit numbers. This report presents the results of fish and fish habitat inventories completed during October, 1998, and provides classifications for stream reaches within or adjacent Cutting Permit 701, located within Working Unit 13 (Telkwa).

Table 1. Report Titles and Working Units for 1:5,000 Stream Inventory by Triton for PIR Ltd. (FRBC Activity Number 10595 - 1998).

Report Title	Working Unit Number and Name	Cutting Permits (CP)
1:5,000 scale Fish and Fish Habitat Inventories of Unnamed Tributaries to the Nilkitkwa and West Nilkitkwa Rivers	1 - Nilkitkwa	395, 396, 397
1:5,000 scale Fish and Fish Habitat Inventories of Unnamed Tributaries to the Babine River between Nilkitkwa River and Shahnagh Creek	2 - Babine	633, 639
1:5,000 scale Fish and Fish Habitat Inventories of Tributaries to Nilkitkwa Lake and Nichyeskwa Creek	4 - Boucher (including Unit 3, Nichyeskwa)	578, 580, 584
1:5,000 scale Fish and Fish Habitat Inventories of Unnamed Tributaries to Blunt Creek	6 - Blunt	563, 567
1:5,000 scale Fish and Fish Habitat Inventories of Unnamed Tributaries to the Bulkley River and Gramophone Creek	7 - Gramophone	553, 565
1:5,000 scale Fish and Fish Habitat Inventories of Unnamed Tributaries to the Telkwa River and Howson Creek	13 - Telkwa	701
1:5,000 scale Fish and Fish Habitat Inventories of Unnamed Tributaries to Toboggan and Trout Creeks	14 - Toboggan (including Unit 8, Kitseguecla)	361

1.1 Location of Study Area within the Bulkley Forest District

The Bulkley Forest District is situated in the west-central interior of BC, encompassing 7,625 km² of land. The town of Smithers is situated in the lower third of the Forest

District and was the base for field crews during most of the inventory. This forest district extends from the Nilkitkwa River in the north to the Telkwa River in the south and from the upper Zymoetz River in the west to Babine Lake in the east. The Overview Map, Figure 1, shows the location of the working unit within the Forest District with the TRIM sheets containing the study area highlighted in yellow (93L.053, 93L.054).

The Telkwa Working Unit begins at the confluence of the Telkwa River and Bulkley River, across from the town of Telkwa, 14 km east of Smithers. It encompasses an area west of the Bulkley River of approximately 1220 km² and includes the Telkwa River and tributaries. Proposed cutblocks 701-1, 701-2 and 701-3 are located within this working unit on TRIM map sheets 93L.053 and 93L.054 (see full size map sheet attachments) and NTS 1:50,000 scale map sheet 93L 11. The Cutting Permit Overview Map, Figure 2, shows the proposed cutblock boundaries overlain on a transparency with the 1998 sampling results. Cutblocks 701-1 and 701-2 are in the lower Howson Creek Watershed downstream of Scallion Creek, approximately 24 km directly southwest of the village of Telkwa. Cutblock 701-3 is in an unnamed watershed located 2 km west of CP 701-1, which drains directly into the Telkwa River.

1.2 Access to CP 701

The proposed cutblocks are located approximately 27 km by road, south-west of the town of Telkwa. Access to the cutblocks is gained by:

- turning south-west from Highway 16 onto the Telkwa River FSR at the town of Telkwa;
- crossing over the Bulkley River and proceeding up the Telkwa River FSR for 18.5 km;
- turning south onto the Howson Creek logging road, which immediately crosses the Telkwa River;
- and driving approximately 7 km up the Howson Creek logging road to the edge of Block 701-1.

Further access into Blocks 701-1 and 701-2 was gained via an old mining road, which runs parallel to Howson Creek, using an all terrain vehicle. Block 701-3 is located 1.75 km from the Howson Creek road and accessed by hiking. The trail (proposed road) was marked with flagging tape as a layout crew had been working within the cutblock. Cutblock boundaries were not marked with flagging tape in the bush.

1.3 Fish Stream Identification and Inventory Objectives

The purpose of this inventory was to conduct fish and fish habitat inventories at a reach level to gather additional fish distribution information, classify stream reaches and improve the applicability to land use planning of existing fish inventory data. Reach specific fish and fish habitat information was collected to determine classification of stream reaches within or adjacent to proposed timber harvesting areas and proposed roads. The inventory information is necessary for planning land development (forest harvesting and road building) and ensuring appropriate protection of sensitive aquatic resources. The 1:5,000 inventory information is essential to site specific Silviculture Prescription planning for proposed harvesting areas and provides greater definition of fish distributions within small watersheds affected by proposed blocks and roads.

Key tasks of the fish and fish habitat inventory were to sample for fish presence and determine the End-of-Fish Use (EFU) for fish-bearing stream reaches potentially influenced by proposed harvesting and to collect channel width and channel morphology information to determine stream classification. The methods used in this detailed inventory of stream reaches were based upon, but did not follow exclusively, the reconnaissance level (1:20,000 scale) fish inventory methods (RIC, 1998). Methods were utilized as applicable from Fish Stream Identification (MoF, 2nd Ed., 1998).

1.4 Background Data Review and Existing Fish Distribution

Fish presence and species distribution information for much of the Bulkley Forest District, including the proposed Cutting Permit areas in this report, was gathered during the 1:20,000 reconnaissance level fish and fish habitat inventory conducted by Triton in the summer and fall of 1996 and 1997 (Triton, 1998). Site cards, which describe channel features and fish sampling effort, from the 1996 and 1997 inventory, are included as an Appendix to this report. The 1996/97 inventory information was critical for planning the 1998 1:5,000 inventory as well as assigning stream classifications and recording fish presence and barriers to fish. Additional background information on the watersheds is generally restricted to the larger mainstem rivers and creeks. The smaller streams and headwater stream reaches (first and second order) that were examined in this inventory were typically not mapped at the 1:20,000 TRIM scale and had little or no existing fisheries information.

For the watersheds which contain CP 701, a brief summary of existing fish distribution information from Triton (1998) is presented below. **CP 701, proposed cutblocks 1 and 2**, are within the lower Howson Creek Watershed (WC 460-4227-357) but downstream of Scallion Creek. First and second order tributaries to Reach 2 of Howson Creek originate

within or adjacent to the proposed cutblocks CP 701-1 and 2. **CP 701, proposed cutblock 3**, is located in an unnamed watershed which joins the Telkwa River approximately 4 km upstream of the confluence of Howson Creek and the Telkwa. Please note that the inventory information and fish sampling, described in the paragraphs below, was conducted in 1996 and 1997 and was not part of the 1998 1:5,000 fish inventory. The 1998 field stream classifications are found in the Results Section of this report.

The mainstem of Howson Creek is 25.2 km in length and is fed by 49 tributaries. Reach 1 of Howson Creek has low gradient and is unconfined. Reaches 2 and 3 have moderate to low gradient and varied confinement. Reach 4 has steep impassable gradient and is unconfined. An 8 meter falls was identified on Howson Creek, at the reach 2 and 3 break (*upstream of the tributaries that originate from the CP 701 proposed cutblocks*). No fish were caught in any of the streams sampled above this falls, despite excellent fish habitat in many areas. The entire system, including Scallion and Swan Creeks, has been classified as non fish bearing above this barrier. However, multiple side channels occur in reach 1 of Howson Creek and could provide excellent refuge habitat during high flows and were classified as fisheries sensitive zones. Reach 1 of Howson creek is also historically used by spawning pink salmon.

Historical fisheries information indicates the presence of coho, steelhead, cutthroat trout, Dolly Varden and spawning pink salmon at the mouth of Howson Creek. Approximately 2.6 km of the Howson mainstem is used by pink salmon for spawning, and one kilometer is used by coho for spawning. Steelhead have also been noted in reach 1 and cutthroat trout have been noted downstream of the confluence of Howson and Scallion Creeks, just below the 8 meter falls. Rainbow trout were caught by electrofishing in reach 2 of the Howson mainstem and cutthroat trout was caught by electroshocking in a tributary to reach 2. The mainstem was classified as S2 in reach 2 and as non fish bearing (S5) in reach 3, above the falls where no fish were found.

First, second and third order tributaries originate on the hillslope where proposed cutblock 701-3 is located and drain into Reach 2 of the unnamed mainstem creek which empties into the Telkwa River. Dolly Varden were the only species captured during 1996 and 1997 inventories by Triton in the upper reaches of this unnamed creek and its tributaries.

Figure 1: Bulkley Forest District with the Babine River Working Unit

Figure 2: Cutting Permit 701 Overview Map

2. METHODS

The methods employed for this inventory project are described below under the following sections:

- Pre-field activities: planning and sample site selection;
- Field activities: stream assessment, fish sampling, stream classification, channel measurements, feature identification, photography;
- Post-field activities: mapping, data entry, reporting.

In general, stream assessment methodology followed procedures outlined in *Fish Stream Identification Guidebook* (MoF, 2nd Ed., 1998), which is based upon the procedures outlined in the Resources Inventory Committee manual *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures* (RIC, 1998). Deviations from RIC Standard stream inventory procedures are noted where appropriate. In addition the *Riparian Management Area Guidebook* (MoF, 1995) was consulted regarding assignment of correct stream classification.

A local area agreement exists between PIR (forest licensee), Bulkley Forest District Forest Ecosystem Specialists (Ministry of Environment, Lands and Parks representative) and Ministry of Forests regarding stream classification procedures and was used by field crews as necessary. This local area agreement, titled “*Proposed Bulkley District Single Survey Stream Classification Procedures*”, describes methods for assessing and classifying unmapped streams (less than 1.5m in width) and is described below.

2.1 Prefield Planning

Pre-field planning for this inventory involved a planning meeting in Smithers with the contract monitor, client and Regional Fisheries Inventory Specialist and office procedures. Tasks completed include background information review, map review of proposed Cutting Permit areas and identification of affected streams and watersheds, selection of reaches to sample, creation of a field work plan as well as budget and logistical planning. Every task identified in the RIC reconnaissance level Phase 1, 2 and 3 planning process was not utilized for this project. This project focused on collecting reach-specific fish and channel information for small first to third order watersheds with proposed harvesting and not on sub-sampling reaches within large watersheds to determine fish distribution over major watershed. The previous 1:20,000 inventory (Triton, 1998) addressed reconnaissance level fish distributions over major watersheds.

Pre-field data entry of ILPs and reach data was post-poned till after field assessment in order to save costs, improve efficiency and reduce entry of redundant data.

An extensive background information search was not completed since the most relevant background information was contained within the 1:20,000 Reconnaissance Inventory report produced by Triton (1998). Triton's Reconnaissance report incorporated field results from 1996 and 1997 inventory, historical information summarized in Saimoto (1996) and FISS background information. Additional information was sought from contract monitors and Ministry of Forests and Regional Fisheries Branch representatives.

Maps reviewed included existing 1:20,000 reconnaissance level fish inventory information (Triton, 1998), Forest Development Plan maps (1:20,000 and 1:50,000 scale) and block level (1:5,000 scale) maps provided by PIR and Silvicon. Based upon the map review and identification of stream reaches requiring sampling, a preliminary list of cutblocks and reaches to assess was prepared.

2.2 Sample selection

Stream reaches to assess were selected using the following criteria. Previously unclassified streams or reaches with inferred fish presence, that were located within or adjacent to the cutblocks boundaries or were crossed by proposed logging roads, were identified on field maps as reaches to sample. Only streams which did not have sufficient prior information to assign appropriate stream classifications were chosen as reaches to sample. Reaches with known fish presence that extended upstream of proposed harvesting areas were not chosen for sampling since stream classification could be determined from existing information. Reaches which were sampled by Triton in 1996/97 and did not have fish captures or known downstream barriers to fish movement were identified as high priority candidates for sampling. Unmapped streams that were mapped by timber cruising crews and were adjacent to or within proposed cutblocks or roads were chosen as sample sites. Watercourses identified by timber cruising crews and labeled on block maps as Non-classified Drainages (NCD) were not chosen as reaches to sample. NCD denotes a watercourse which does not meet the FPC technical definition of a stream and does not contain fish habitat. Streams located close to the proposed block boundaries, which may have reserve or management zones which conflict with cutting areas, were also identified as possible sample sites.

Logistical planning, budgeting and permit applications were completed prior to initiation of field work in late summer.

2.3 Field Phase: Stream Assessment Strategy

The **End of Fish Use (EFU)** point is the location along the stream channel which, for biological or physical reasons, is the upstream limit of fish distribution within the stream. This means that fish do not occur upstream of the EFU in the stream channel or in tributaries which flow into the channel, upstream of the EFU location. The identification of the barriers to fish and the EFU are important to fish inventory and stream classification activities. Barriers to fish passage and steep gradient cascade sections are often, but not always, the location of the EFU within the main channel of a sub-basin.

For maximum efficiency of field time and operating budgets, field crews sampled for fish presence and determined the EFU in stream reaches downstream of or within proposed cutblocks. Using block recce maps and TRIM maps, crews walked the downslope boundary of proposed cutblocks to find streams adjacent to or flowing from within the cutblocks or crossing roads. For each affected stream reach, crews conducted fish sampling and walked upstream and/or downstream to determine fish presence or the point of end of fish use (EFU). Once the location of the EFU for a stream was determined, field crews collected channel information, completed site cards and electrofished or set minnow traps above the EFU to confirm fish absence.

Where the EFU was located an unknown distance upstream of the upslope cutblock boundary, crews walked upstream of the cutblock boundary along the stream for approximately one hundred to two hundred meters and assigned the appropriate fish bearing stream class up to the next reach break. Waterfall barriers and steep gradient cascade sections of the channel, which were judged to be impassable to fish due to lack of plunge pools and overall height, were typically identified as the EFU within many reaches.

Previous experience with 1:5,000 level stream inventories has confirmed that this approach, whereby field crews determine the EFU and then sample appropriately above the EFU, has resulted in substantial savings in time and cost since not every stream reach upstream of the EFU needs to be visited. Fish sampling completed by Triton in 1996 and 1997 provided additional confirmation of non-fish bearing status above the EFU. Site card and channel information, collected by timber cruising crews in reaches above the EFU location, provided relevant channel information which can be used to assign the appropriate S5 or S6 stream classification.

Streams that were crossed by proposed logging roads were similarly assessed, with the determination of the EFU being a key factor. If fish were caught at proposed stream crossings then no further fish sampling was required and site card information was collected at the proposed crossing. If no fish were caught at the crossing site then crews typically proceeded downstream to find the EFU, often a barrier or cascade, and mapped the EFU location and collected site card information. In stream crossing reaches where no fish were captured, no barriers to fish were found downstream of the proposed crossing and the stream flowed into a fish bearing reach, additional sampling was recommended or default gradient guidelines were used to assign stream classification for the affected reach.

Single Sample Protocol

The local area agreement for stream classification, *Single Survey Protocol*, was incorporated into assessment of unmapped, first order streams with gradient less than 20% and average channel width less than 1.5m. The *Single Survey Protocol* enables field crews to evaluate the potential for a stream to support fish, based upon barriers, channel conditions and instream habitat quality, and assign a non-fish bearing classification if no potential exists to support fish. If habitat quality is considered suitable for fish then an appropriate level of fish sampling must be performed following FPC guidelines.

2.4 Recommendations for Additional Sampling

In stream reaches where an obvious stream feature did not exist to determine the EFU downstream of the block or road, a fish-bearing stream was present downstream and habitat conditions were suitable for supporting fish, but no fish were caught by electrofishing, then crews recommended second sampling. Second sampling was only recommended in streams which had a high likelihood of containing fish at some point during the year. These streams are noted as “second sampling” candidates in the Stream Description section and the Stream Summary Table. Second sampling was not recommended in reaches where electrofishing did not catch fish, downstream barriers were present, poor habitat quality or permanently dry stream channels were found. The *Single Survey Protocol*, mentioned above, was applied where applicable for small, first order streams and meant some reaches could be classified without recommending additional sampling. Streams that are greater than 20% gradient can be classified as non-fish bearing using gradient criteria alone, but field crews sampled steep gradient reaches if suitable fish habitat existed in the stream.

The possibility of seasonal fish presence of the reach was explored by noting distances to known fish bearing streams as well as habitat type and quality within the reach, and anticipated water levels. Streams where no fish were captured yet contained suitable habitat and were easily accessed from a known fish bearing stream were considered fish-bearing streams as they may provide seasonal habitat. Streams that may provide habitat for fish yet are not easily accessible to fish (obstructions, sections greater than 20%) or are a large distance (e.g. 1 km) from a known fish stream were considered non-fish bearing. At the end of the results for each cutting permit, a table lists non-fish bearing reaches. Typically only the most downstream non-fish bearing reach of a stream is listed; reaches further upstream of the listed reach are assumed non-fish bearing.

2.5 Stream Classification Criteria

Stream classifications were assigned following the process outlined in the *Fish Stream Identification Guidebook* (MoF, 2nd Ed., 1998) with the following classifications used.

For streams less than 20% gradient and/or fish bearing:

- S1 - average channel width greater than 20m;
- S2 - average channel width greater than 5m and less than 20m;
- S3 - average channel width greater than 1.5m and less than 5m;
- S4 - average channel width greater than 0 and less than 1.5m.

For streams that are not fish bearing or greater than 20%:

- S5 - average channel width greater than 3m;
- S6 - average channel width greater than 0m and less than 3m.

2.6 Fish sampling

The field surveys were conducted with two field crews of two people each. Both crews were equipped with a four wheel drive vehicle and appropriate field gear. Key field equipment included:

- safety gear: maps, Level 1 First Aid kit and bear spray;
- fish sampling gear: electroshocker, gloves, dip nets, voucher bottles, fry boards, fish anesthetic, fish identification manual;
- channel measuring gear: 15 or 30m fiberglass tape, 2m folding wooden ruler, Suunto clinometer, hip chain;
- water quality gear: alcohol thermometer, portable pH and conductivity meters, sample bottles;
- waterproof 35mm camera with 32mm lens and film.

Fish sampling was conducted by electrofishing, Gee (minnow) trapping and visual observations. Electrofishing was conducted using Smith - Root type 12B electroshockers; electroshocker effort and settings were recorded on the Fish Form. Electrofishing was considered the most effective fish sampling method since most of the streams had good water visibility and were at low flow, very shallow and generally less than 4m wide. Gee-traps were used as a second fish sampling method, where required, with catch, soak times and water temperature recorded. The traps were baited with commercial salmon roe and left for up to 24 hours.

Captured fish were identified to species and a length and photograph was taken and recorded on the Site Card and Fish Collection Summary Card. Voucher specimens were collected and stored in ethanol or formalin and submitted to the Regional Fisheries Branch. As described in the *Fish Stream Identification Guidebook* (MoF, 2nd Ed., 1998), once fish were confirmed as being present in a stream, no further fish sampling was conducted.

According to the Forest Practises Code, for purposes of stream classification an acceptable fish inventory method must be used to confirm fish absence prior to assigning non-fish bearing status to streams of less than 20% gradient. Since most watercourses surveyed were small first and second order streams with cool, shallow and clear water the preferred sampling method is electrofishing due to portability, ease of fish capture, and for normal field conditions, the high capture efficiency. Electroshocking efficiency in cold water conditions and low conductivity is a concern due to the decrease in capture efficiency, potential lethal effect of shocking on immobile fish and incubating eggs and behavioural changes of fish in low temperatures (late fall and winter) (Cowx and Lamarque, 1990).

The FPC specifies that electroshocking below 4 degrees Celcius and 30 microSiemens/cm is not considered an acceptable fish inventory method. For the purposes of assigning stream classifications, electroshocking at low temps is not used as the sole criteria for assigning non-fish bearing status. Often, habitat quality and downstream barriers are used in conjunction with electroshocking results to determine fish presence and capacity to support fish. Where physical conditions decrease the effectiveness of electroshocking, alternate sampling methods (minnow traps) or additional sampling during more appropriate times of the year (summer) are recommended to confirm fish absence.

2.7 Stream Channel and Gradient Measurements

The bankfull channel width of stream channels was measured with an Esilon tape or meter stick. Multiple measurements (minimum of 6) were made for each site; each measurement at least one channel width distance apart. Where average channel widths were close to 1.5, 3 or 5 m, more than 6 measurements were made to accurately locate the break between stream classes. These measurements were averaged to determine the average bankfull channel width for classification purposes.

Stream gradients were determined from 1:20,000 maps and measured during field surveys with a Suunto clinometer (accuracy +/- 1%). Field crews sighted through the clinometer to an upstream or downstream crew member or flagging tape which was raised above the stream channel to the eye level of the crew member. Where sections of reaches had gradients between 18% and 22% multiple shots were made to obtain an average gradient. Where conditions were safe, the gradient over cascades and barriers were measured and lengths and heights of these features were estimated and photographed.

2.8 Stream and Feature Identification

Stream reaches and sample sites were marked in the field by Triton at the classification break of each stream (between fish and non-fish bearing reaches) or at a convenient location (road crossing or downstream block boundary) with red and white striped 'creek' flagging tape. At the same spot a tree was blazed and painted with blue spray paint and stream information was imprinted on steel tags and nailed to the blaze. Information recorded on the tag included *Triton, Stream or ILP #, Site #, Date, S classification or S4 / S6 boundary, field crew initials.*

Streams are referred to within the results section of this report by their ILP (Interim Locational Point) number, which is also shown on the TRIM and block maps. ILPs were issued to streams as the streams were surveyed with only one ILP issued to each stream. Tributaries were assigned unique ILPs if they flowed into streams which had existing ILPs. Sample sites and special features (barriers, cascades) were given a NID (Numeric Identifier) number in ascending order as the sites or features were visited. In order to avoid overlap of numbering sequences, one crew started ILPs at 6000 and NIDs at 5000 where the other crew started ILP's at 2000 and NID's at 3000.

2.9 Photographs

Photographs of sites, streams, fish and channel features were taken with a 35 mm camera fixed with a 32 mm lens. Representative photographs are presented in the Appendix at

the back of the report. Due to adverse weather conditions, some photos were over or under exposed. Additional photos that were taken but are not presented in the Appendix can be found on the accompanying Photo CD(s). A photo log is presented in the Appendix at the back of this report which can be used to cross-reference the site number, roll and frame number with the image file name located on the appropriate Photo CD. Digital photos can be viewed with appropriate graphical software (Corel DRAW, Power Point, etc).

2.10 Mapping

Stream classifications and classification boundaries for each stream reach are shown on accompanying TRIM maps (separate from the report), Cutting Permit Overview maps and 1:5,000 hand-drawn block maps within the Results section. Field crews hand-annotated working maps with site numbers and feature NIDs, ILPs, obstructions and stream classifications. Digital maps were created using the field information from the hand drawn copies. Block level maps at 1:5,000 or 1:10,000 scale are included in each results section and contain all field survey information (stream classification and colour, site numbers, ILPs, barriers or obstructions). TRIM maps show all sites but not all streams found in the field. During the project meeting with Regional Fisheries Inventory Specialist, it was agreed to add sites on unmapped streams as floating points and not to draw in the stream since field crews would not necessarily follow unmapped streams and locate these streams on the maps.

The accompanying 1:20,000 Fisheries Inventory and Interpretive TRIM maps were originally developed in 1996 and 1997, prior to implementation of detailed Ministry of Environment mapping standards. Consequently, mapping of 1998 stream inventory information is limited by the digital formats and symbology developed in 1996. The accompanying 1:20,000 Fisheries Inventory and Interpretive TRIM maps do not comply with 1998 Ministry of Environment Digital Mapping Standards. The cost and time to update the 1996 and 1997 maps to 1998 standards was beyond the scope and budget of this project. The accompanying maps do utilize the standard colours for stream classification (red, blue, yellow) but symbology is designed for ease of use rather than meeting Digital Mapping standards. Streams which were identified in the field and on 1:5,000 block recce maps, but do not show up on the 1:20,000 scale maps, were sampled but not mapped. The sites located on these 'unmapped' streams are placed on the TRIM sheets and appear as floating points which are not on the stream network. The ILP and stream classification for all sites, on mapped and unmapped streams, are shown.

Fish bearing streams (S1-S4) are coloured in red, non - fish streams (S5 and S6) are shown in blue and fish sensitive zones are in yellow. Dotted red or blue streams indicate 'inferred' fish presence or absence (usually based upon gradient) and may require additional sampling to confirm stream classification. Non-Classified Drainages or NCDs are watercourses that are technically not streams as defined by the FPC (i.e. they have no continuous, definable banks or alluvial substrate) and were noted in the study areas. NCDs are labeled on the maps provided as brown lines and are described within the respective cutblock section. Streams that were mapped at 1:20,000 scale but did not exist in the field at the specified location were identified as 'Creek not present' and coloured pink. The 'No Visible Channel' (NVC) designation is equivalent to the 'Creek not present' designation. Since the maps use 'Creek not present', any NVC situations are identified as 'Creek not present' on the maps.

Hardcopy maps and digital GIS data files and plotting files were created and are available from the Regional Fisheries Inventory Specialist, Ministry of Environment, Lands and Parks, Smithers office.

2.11 Digital Data Entry into FDIS

Stream site card and Fish Collection Form data were entered into the Microsoft Access custom application *Field Data Information System (FDIS) version 6.4*. Reach forms were completed for mapped and unmapped stream reaches after field work was completed. Hardcopies of the Site card, Fish Collection Form and Reach Form (for mapped reaches only) are included in the Appendices at the back of this report.

Watershed codes were added post field work and towards the end of the reporting phase. All watershed codes available at final report production can be found within FDIS and on the site, reach and fish cards in the Appendices.

For a detailed explanation of the codes, fields and field collection methods found on the Site, Fish and Reach cards please refer to the Resources Inventory Committee manuals *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures* and *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Data Forms and User Notes* (RIC, 1998).

3. RESULTS

3.1 Overview - Cutting Permit 701

Since detailed block recce maps were not available for streams in CP 701, Triton crews were requested by the project monitor to assess the 1:20,000 mapped streams in the cutblocks and crossed by the proposed roads. In addition, streams found by a road layout crew were indicated on a preliminary road map and these streams were visited as well.

Two field crews inventoried streams in CP 701 on October 9 and 10, 1998. Field conditions were not ideal with 15 cm of snow on the ground, frequent rain and sleet and daytime maximum temperatures of only 5 degrees Celcius. Water temperatures ranged from 1.5 to 3 degrees Celcius. The low water temperatures are addressed in the block sections. The conductivity ranged from 45 to 140 umhos/cm. An ATV was used to access the stream crossings along the old mining road in Blocks 701-1 and 701-2. The field crew hiked into Block 701-2 on two days. Cutblock boundaries had not been marked out with flagging in the field; the proposed road into Block 701-3 was marked with pink flagging tape. The flagged trail for the proposed road that the Triton crew followed did not appear to follow the proposed road location marked on the preliminary recce map supplied by Silvicon (the road layout crew had likely amended the location of the road in the bush). This is noted on the Block 701-3 map. The detailed results are presented in the following order.

3.2 Fish Sampling Summary

A summary of **FISH INFORMATION** is presented prior to the Stream Classification Results and describes fish captures, locations, and, if appropriate, biological data.

3.3 Stream descriptions

The **ILP** for each stream is used to organize the stream description paragraphs with the stream classification bolded and underlined. Key parameters for each stream within or adjacent to a proposed cutblock are described.

Parameters described include:

- location of the End of Fish Use (EFU),
- gradient
- instream cover
- length of stream assessed
- channel width
- stream classification
- fish presence
- fish sampling effort

- locations of barriers and fisheries sensitive zones
- locations of reach breaks
- water quality comments

Stream photos, site cards, fish forms, reach cards, and 1996/97 site cards are presented in the Appendices located at the back of this report.

3.4 Stream Summary Table

Essential stream classification, site and photo reference information is summarized in a table for each cutblock.

3.5 Block Map

The detailed block map presents stream classification information, stream feature and site card location information. The block maps (various scales: 1:4,000 to 1:6,000) show streams, stream classifications and site locations relative to the cutblocks and/or proposed roads. Streams which do not show up on the 1:20,000 TRIM map and were identified in the field or by layout crews are indicated on the block maps. The block maps present the clearest picture and most accurate positioning of streams, sites, reach breaks and features with respect to the adjacent cutblocks. If a discrepancy exists between the 1:20,000 TRIM map and the block map, the block map should be considered more accurate since distances measured in the field were compared to the block map for accuracy.

3.6 Additional Sampling and Habitat Protection Recommendations

If additional sampling within a Cutting Permit is deemed necessary to confirm stream classifications the relevant information is described. The streams, reaches, presence of barriers and locations of additional sampling, as well as the recommended sampling method and time of year are described to guide future sampling efforts. Habitat Protection recommendations are provided for areas with sensitive aquatic habitats or features.

3.7 Non-Fish Bearing Reaches

Non-fish bearing reaches that were sampled or determined to be non-fish bearing based upon downstream sampling are summarized in a table for each Cutting Permit. Fish sampling, channel and barrier information is presented for non-fish bearing reaches.

4. FISH SAMPLING SUMMARY

No fish were captured during sampling in streams adjacent to or within CP 701. Fish distribution is typically limited by steep cascades sections of channel downstream of the areas assessed and very poor quality fish habitat upstream of barriers. Classifications were assigned based upon habitat conditions, barriers and lack of fish captures.

5. STREAM ASSESSMENT RESULTS

5.1 Block 701-3

5.1.1 Stream Descriptions

Seven streams were identified within and along the spur road to Block 701-3 (Figure 3). ILP 2130 through 2135 are located within the cutblock as tributaries to ILP 9000 (an S3 stream previously sampled by Triton ,1998). ILP 6142 is located approximately 1.4 km northeast of the cutblock boundary along the proposed spur road.

ILP 2130 (site NID 3133) is an unconfined, moderate gradient (average 11%) stream with an average channel width of 1.57 m at the site location in reach 1. **An important location note regarding this stream:** ILP 2130 flows into ILP 9000 approximately 600 m downstream of the intersection of the proposed road and ILP 2130. The field crew noticed that the proposed road in the bush was not laid out as indicated on the 1:20,000 Forest Development map supplied by Silvicon. The flagged trail (proposed road) crossed ILP 2130 approximately 600m upstream of the confluence between ILP 2130 and ILP 9000; on Figure 3 the proposed road crosses ILP 2130 approximately 75 m upstream of the confluence of ILP 2130 and ILP 9000. This incorrect road location is noted on Figure 3 Block map.

Moderate to good spawning and rearing habitat is present in ILP 2130. The substrate is mainly gravel and the cover is provided by woody debris and overstream vegetation. No fish were caught after 363 sec of electroshocking yet the stream is accessible to fish. In the previous Triton inventory, 9 Dolly Varden char were captured at site E141 on ILP 9000 and no barriers or obstructions were present to prevent fish access into ILP 2130. **Consequently ILP 2130 is classified as S3 for approximately 680 m (to the Reach 1 and Reach 2 break).**

The Reach 1 and Reach 2 break is located at the confluence of ILP 2130 and an unmapped (on TRIM) left bank tributary called ILP 2131. The reach 1 and 2 break is at the confluence of these two streams and is approximately 150 m upstream of the intersection of the flagged road and ILP 2130. **Stream ILP 2130 is classified S4 above the reach 1/2 break in Reach 2 and further upstream.** A site card was not completed for Reach 2 but it is accessible to fish from Reach 1 and had moderate gradient (8-10%) with fair quality rearing habitat. The EFU in Reach 2 of ILP 2130 was not determined above the cutblock; the stream is fish bearing (S4) above the cutblock for at least 100m.

HABITAT PROTECTION COMMENT: The proposed logging road will cross this stream (ILP 2130) within a fish bearing section (Reach 1) and appropriate measures should be taken to prevent impacts from introduction of sediment, logging slash and debris during bridge building. In addition, streamside timber and vegetation should be retained alongside the S4 section of stream to maintain bank stability as well as provide cover and temperature regulation through shading. Protection of streamside timber alongside the S4 section will help minimize negative impacts from harvesting.

Unnamed stream located 50m upstream of Site NID 3133 (flows into ILP 2130)

This stream was not observed in the field at the location indicated on the 1:20,000 TRIM map and is coloured pink and marked as No Visible Channel (NVC) on Figure 3.

ILP 2131 (site NID 3134) is an unconfined, moderate gradient (average 13%) stream with an average channel width of 0.6 m. It is unmapped on TRIM but is drawn on Figure 3 in the approximate location. It flows into the left bank of ILP 2130 approximately 150 m upstream of the intersection of the flagged spur road and ILP 2130. No fish were caught after 145 sec of electroshocking yet fish use is possible as there were no barriers preventing fish access from ILP 2130. **Fair quality fish habitat was present within the channel and the stream was classified as S4 due to the ease of access and habitat quality.**

ILP 2132 (site NID 3135) is an unconfined, moderate gradient (average 10%) stream with an average channel width of 0.5 m. It flows through the north-east end of the block and into the unnamed mainstem stream 1.8 km further downstream. The block map referred to this creek as “**Stream B3**”. The creek was sampled by Triton in 1997 at site E140 and no fish were caught. Fish habitat within the creek was extremely poor with no spawning habitat, deep pools or rearing habitat. The channel was extremely shallow with mostly organic substrate. It could not be electroshocked due to the shallow nature and

was discontinuous with underground seepage downstream of the road crossing. The steep gradient (30 to 40 %) in reach 1, approximately 2 km downstream, likely prevents fish access. Due to the lack of fish habitat, discontinuous and shallow channel, lack of fish captures downstream at site E140 and lack of fish habitat within the channel, **ILP 2132 was classified as S6.**

ILP 2133 (site NID 3136) is an unmapped creek on the TRIM network (drawn in on Figure 3), only 340m long, and begins immediately downstream of the proposed road crossing at station 2+770m. It has an average channel width of 0.8 m. The gradient averages 11% in the lower 260 m and increases to 30% in the upper 70 m. It flows into the right bank of ILP 2130 approximately 240 m upstream of the confluence of ILP 2130 and ILP 9000. The Reach 1/2 break on ILP 2133 is located 260 m from the confluence with ILP 2130 and is a steep 30% cascade section (50m long) This reach break is the S4/S6 break. No fish were caught after 193 sec of electroshocking in Reach 1 yet the stream is accessible to fish. The spawning and rearing habitat was fair quality. **Reach 1 of ILP 2133 is classified as S4. There is no fish habitat in Reach 2 and is classified S6.** The flagged trail (proposed road crossing) crosses the creek in the non-fish bearing section, approximately 40 upstream of the reach 1 and 2 break.

HABITAT PROTECTION COMMENT: Since road construction will occur immediately upstream of a fish bearing reach of ILP 2133, it is recommended that appropriate habitat protection measures be taken to protect the downstream fish habitat and values. Measures should be taken to introduce as little sediment as possible into the stream. In addition, streamside vegetation should be retained alongside the fish bearing section of this stream to maintain bank stability as well as provide cover and temperature regulation through shading.

ILP 2134 is mapped on the TRIM stream network as flowing into ILP 2130 approximately 240 m upstream of the confluence of ILP 2130 and ILP 9000. **This watercourse, as defined by the Forest Practices Code (MoF, 1998), is not a stream and is a non-classified drainage (NCD).** The field crew observed seepage entering the creek at this location.

ILP 2135 (site NID 3134) is mapped as flowing into the left bank of ILP 9000 approximately 300m below the confluence of ILP 2130 and ILP 9000. **This stream did no exist and was classified as “no visible channel” (NVC).** The field crew hiked approximately 600m downstream of the confluence of ILP 2130 and ILP 9000 in search of this creek but none was found.

ILP 6142 (site NID 5142) is located approximately 300m from the existing logging road at station 0+477m. It is an unconfined, low gradient (average 1%) stream with an average channel width of 0.60 m. The road crossing is located approximately 3 km upstream of the mouth where ILP 6142 joins the unnamed mainstem stream. Moderate amounts of rearing habitat was present, however no spawning or overwintering habitat was present. No fish were caught after 336 sec of electroshocking. Triton sampled and electroshocked this stream in 1997 approximately 1.5 km downstream of site NID 5142 at site E139 during the 1:20,000 survey (Triton, 1997) in July, 1997. No fish were caught during the 1997 survey. **Due to the lack of fish captures in two years of sampling and barrier likely at the mouth, this stream was classified S6.**

Figure 3: Block 701-3 map

5.1.2 Stream Summary Table

Table 2: Summary of Stream Assessments for CP 701-3, Telkwa working unit.

Block	TRIM Map No.	Stream ILP (Reach)	Site Number (NID)	1997 Card Number	Mean Chan Width (m)	Stream Class	Location of End of Fish Use	Fish Present	Photo Number	Habitat Comments
701-3	93L.053	2130 (1)	3133		1.57	S3	U/s of the cutblock	No fish caught	4	Good spawning and rearing values
701-3	93L.053	2130 (2)			1.0	S4	U/s of the cutblock	No fish caught		Good spawning and rearing values
701-3	93L.053	2131	3134		0.6	S4	U/s of the cutblock	No fish caught	5	Spawning values were poor yet rearing values were fair
701-3	93L.053	2132	3135	E140	0.5	S6	At mouth	None	6	No fisheries values
701-3	93L.053	2133 (1)	3136		0.8	S4	260m u/s from mouth	No fish caught	7	Spawning and rearing values were fair
701-3	93L.053	2133 (2)			0.8	S6	260m u/s from mouth	None		No fisheries values
701-3	93L.053	2134			-	NCD	Mouth	None		No fisheries values
701-3	93L.053	2135			-	NVC	Mouth	None		No visible channel
701-3	93L.053	6142	5142	E139	0.6	S6	Downstream of area of interest	None	8	Moderate rearing habitat but no spawning or overwintering habitat.
701-3	93L.053	9000		E141, Z207	greater than 1.5m	S3	u/s of cutblock	DV		Classification based upon 1996/97 sample sites.

5.2 Block 701-1

5.2.1 Stream Descriptions

Three streams are shown on 1:20,000 TRIM maps, (93L.054) flowing through or adjacent to Block 701-1. The cutblock engineering crew identified eight streams within the cutblock and these were noted on the 1:20,000 road recce map supplied by Silvicon. Of the 8 streams identified by the layout crew, only two had suitable fish habitat and warranted sampling. **ILP 6140** (Site NID 5124) and **ILP 6141** (Site NID 5140) are located on the north end of Block 701-1. ILP 6140 is a tributary to the larger ILP 6141 stream, flowing into ILP 6141 approximately 120 m downstream of the proposed road crossing.

The 6 other streams that crossed the proposed road within the cutblock were identified only on the road recce map. These streams were steep (30-40% gradient) and contained no suitable fish habitat. **These streams were classified S6.** Stream cards were not filled out on these 6 streams since classification was determined using gradient criteria. These six creeks were examined at the old access road which runs through the block. **These creeks are not shown on the Figure 4 since their locations were not measured within the cutblocks. They are all the same classification.**

ILP 6141 is an entrenched, moderate to high gradient (average 12%) stream with an average channel width of 1.01m. Cover was abundant consisting of mainly woody debris, boulders and overstream vegetation. No fish were caught when ILP 6140 was sampled with an electroshocker (tributary to ILP 6141). Approximately 1 km downstream in Reach 1, cutthroat trout were caught at site Z120 during the 1:20,000 field sampling in 1997 (Triton, 1998). Gradient measurements in ILP 6141 were in excess of 30% in places and many falls, which are fish barriers, were located downstream of the cutblock. The Reach 1/2 break, located approximately 900 m downstream of the proposed road crossing is the end of fish use (EFU). **The stream is classified as S6 from the Reach 1 and 2 break (EFU) and further upstream.**

ILP 6140 is an entrenched, moderate to high gradient (12-18%) stream with an average channel width of 0.63 m (Figure 4). Cover was abundant consisting of mainly woody debris, under-cut banks and overstream vegetation. ILP 6140 is a tributary to the larger ILP 6141 stream, flowing into ILP 6141 approximately 120 m downstream of the proposed road crossing. The stream was sampled with an electroshocker for 360 sec and no fish were caught. **ILP 6140 is classified as S6.** Fish are not present in this stream due to the 30% gradient and falls which are present in ILP 6141 downstream.

Figure 4: Block map of 701-1 and 701-2 and spur road.

5.2.2 Stream Summary Table

Table 3: Summary of Stream Assessments for CP 701-1, Telkwa working unit.

Block	TRIM Map No.	Stream ILP (Reach)	Site Number (NID)	1996/97 Site Number	Mean Chan Width (m)	Stream Class.	Location of End of Fish Use	Fish Present	Photo Number	Habitat Comments
701-1	93L.054	6141 (2)	5141	Z120	1.01	S6	900 m below the proposed road crossing	None	2,3	Potential suitable rearing habitat. Limited spawning values.
701-1	93L.054	6140 (1)	5140		0.63	S6	900 m below the proposed road crossing	None	1	Potential suitable rearing habitat. Limited spawning values.

5.3 Block 701-2

5.3.1 Stream Descriptions

Two streams are shown on 1:20,000 TRIM maps (map sheet 93L.054) flowing within Block 701-2. The cutblock engineering crew identified eight streams within the cutblock and seven streams crossing the proposed road between Blocks 701-1 and 701-2 on the 1:20,000 road recce map supplied by Silvicon. A field crew examined these streams at the crossing and downstream of the crossing by hiking down from the road. All fifteen streams were steep (30-40%) and contained no suitable fish habitat. **Based upon gradient criteria and lack of fish habitat present, the 15 streams are classified as S6 within and downstream of the cutblock.** Since time was limited on the day these streams were assessed and gradient criteria was used for classification, no photographs or site cards were completed for these 15 streams. These streams are all the same classification and are not shown on Figure 4 block map

5.4 Additional Sampling Summary

No streams were identified that required follow up sampling.

For streams assessed in CP 701, the streams either:

- had barriers and were sampled for fish but no fish were captured and were classified as non-fish bearing,
- had no fish habitat and were classified as non-fish bearing,
- or were close to known fish-bearing streams and did not contain barriers or obstructions to prevent fish from entering the reach and were classified S3 or S4.

5.5 Habitat Protection Concerns for CP 633

See habitat protection comments in Results section concerning protection of fish bearing streams in CP 701-3 during road construction and forest harvesting.

By utilizing appropriate road building and harvesting practices the delivery of forestry-related sedimentation can be controlled and reduced. Minimizing the generation and delivery of sedimentation into watercourses which flow into fish bearing streams will help protect downstream fish habitat and fishery values.

No fish were captured above 20% gradient sections of channel and no additional fisheries sensitive zones were found throughout the CP 701 area. No watershed restoration or rehabilitation opportunities were identified throughout this area.

5.6 Non-Fish Bearing Reaches

Non-fish bearing reach reports are provided for relevant reaches including intermittent streams (Table 4). The most downstream reach of a stream which was determined to be non-fish bearing is identified in the report.

Table 4: Non-Fish Bearing Status Report for Select Streams in CP 701 of the Telkwa working unit.

Initial Sampling Date	Follow-up Sampling Date	Watershed Code or ILP number	Reach Number	Site Number	Map Sheet Number	Capture Method (electrofishing settings)	Area covered (sq. m)	Sampling Effort (seconds)	Conductivity uS	Water Temp. (deg. Celsius)	Flow Stage (VO)	Turbidity (VO)	Known Fish Presence (u/s-d/s)	Obstructions to Fish Migration	Location of End of Fish Use	Seasonal Fish Use
Oct 9, 1998	None	6141	2	5141	93L.054	EF 400 V / 70 Hz 6 ms	90	360	140	3	Mod	Lightly turbid	Reach 1 had CT	>30% gradient for over 50m. Many small falls.	900m below proposed road crossing.	None
Oct 9, 1998	None	6140	1	5140	93L.054	-	-	-	130	3	Mod	Lightly turbid	None	>30% gradient for over 50m. Many small falls.	Mouth.	None
Oct 9, 1998	None	Streams in Block 701-1	2	-	93L.054	-	-	-	-	-	-	-	None	>40% gradient within the cutblock	Below the cutblock.	None
Oct 9, 1998	None	Streams in Block 701-2	2	-	93L.054	-	-	-	-	-	-	-	None	>40% gradient within the cutblock	Below the cutblock.	None
Oct 9, 1998	None	2132	1	3135	93L.054	-	-	-	-	1.5	Mod	Clear	None	No fish habitat present.	Mouth of stream	None
Oct 10, 1998	None	2133	2	3136	93L.054	-	-	-	55	1.5	Mod	Lightly turbid	Mainstem 500m d/s had DV	28% gradient for 40m.	260m from mouth	None
Oct 9, 1998	None	6142	2	5142	93L.054	EF 400 V / 70 Hz 6 ms	48	336	120	3	Mod	Clear	None	28% gradient for 40m.	Mouth	None

6. REFERENCES

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Triton Environmental Consultants Ltd. 1998a. Reconnaissance Level Fish and Fish Habitat Inventory in the Bulkley T.S.A. Report prepared for Pacific Inland Resources and BC Ministry of Environment, Lands and Parks. Smithers, BC. Vols. 1-19. approx. 2000 pg. including appendices, site cards, photos and 80 TRIM maps.

7. APPENDICES

Appendix I. Stream Photos

The following pages contain representative stream photos for:

1. CP 701, Block 1.
 - ILP 6140, site NID 5140,
 - ILP 6141, site NID 5141,

2. CP 701, Block 2.
 - No photos taken.

3. CP 701, Block 3.
 - ILP 2130, site NID 3133,
 - ILP 2131, site NID 3134,
 - ILP 2132, site NID 3135,
 - ILP 2133, site NID 3136
 - ILP 6142, site NID 5142.

Photo 1. Reference number: Roll 33, Frame 20. Location: ILP 6140, Site NID 5140, CP 701-1, Unit 13. Description: view of channel looking upstream.

Photo 2. Reference number: Roll 33, Frame 22. Location: ILP 6141, Site NID 5141, CP 701-1, Unit 13. Description: view of channel looking upstream.

Photo 3. Reference number: Roll 33, Frame 23. Location: ILP 6141, Site NID 5141, CP 701-1, Unit 13. Description: view of channel looking downstream.

Photo 4. Reference number: Roll 24, Frame 35. Location: ILP 2130, Site NID 3133, CP 701-3, Unit 13. Description: view of channel with overstream veg as cover.

Photo 5. Reference number: Roll 24, Frame 37. Location: ILP 2131, Site NID 3134, CP 701-3, Unit 13. Description: view of channel looking downstream.

Photo 6. Reference number: Roll 29, Frame 1. Location: ILP 2132, Site NID 3135, CP 701-3, Unit 13. Description: view of channel looking upstream.

Photo 7. Reference number: Roll 29, Frame 4. Location: ILP 2133, Site NID 3136, CP 701-3, Unit 13. Description: view of channel with abundant windfall.

Photo 8. Reference number: Roll 33, Frame 25. Location: ILP 6142, Site NID 5142, CP 701-3, Unit 13. Description: downstream view of channel with abundant windfall.

Appendix II. Stream Site Cards and Fish Collection Forms for Telkwa Working Unit 13.

The following pages contain the Stream Site Cards and Fish Collection Forms for:

1. CP 701, Block 1.
 - ILP 6140, site NID 5140,
 - ILP 6141, site NID 5141,
2. CP 701, Block 2.
 - No site cards completed.
3. CP 701, Block 3.
 - ILP 2130, site NID 3133,
 - ILP 2131, site NID 3134,
 - ILP 2132, site NID 3135,
 - ILP 2133, site NID 3136,
 - ILP 2134, site NID 3137,
 - ILP 6142, site NID 5142.

Appendix III. Reach Forms for Reaches surveyed in Telkwa Working Unit 13.

Reach card hardcopies are available for those reaches mapped on existing 1:20,000 TRIM network. Digital information is available in the FDIS database for unmapped streams assessed by the Triton field crew.

The following pages contain the Reach Forms for:

1. CP 701, Block 1.
 - Reach 1, ILP 6140, site NID 5140,
 - Reach 2, ILP 6141, site NID 5141,

2. CP 701, Block 2.
 - No site cards or reach cards completed.

3. CP 701, Block 3.
 - Reach 1, ILP 2130, site NID 3133,
 - Reach 1, ILP 2131, site NID 3134,
 - Reach 2, ILP 2132, site NID 3135,
 - Reach 1, ILP 2133, site NID 3136,
 - Reach 1, ILP 2134, site NID 3137,
 - Reach 2, ILP 6142, site NID 5142.

Appendix IV. 1996/97 Triton Site Cards

The following pages contain the Stream Site Cards, from the 1996 and 1997 Reconnaissance (1:20,000) Stream Inventory (Triton, 1998), for:

- E139 on ILP 6142,
- E141 on ILP 9000,
- Z120 on ILP 6141,
- Z203 on stream with no ILP,
- and Z207 on ILP 9000.

Appendix V. Photo log and thumbnails for all photos taken during survey of Telkwa Working Unit.

Appendix VI. Photo Survey Form 1 - For entire project and all working units.

Survey start date: 1998/08/15

Agency: C172

Survey end date: 1998/10/22

Crew:BLW/SMJ/MLP/SKB/TMM

Camera #1

Make & Model: Pentax Zoom90-WR	Lenses: A, B
Format: 135mm film	

Camera #2

Make & Model: Pentax Zoom90-WR	Lenses: A, B
Format: 135mm film	

Lenses

Focal Length (mm)	Focal Length (mm)
A 38	D
B 90	E
C	F

Roll Details

Roll#	Camera #	Output Medium	Film Type	ISO
4,5,9	2	slide	colour	200
6,8	1	slide	colour	200
20,21,33	1	slide	colour	200
22,24,28	2	slide	colour	200
29,34	2	slide	colour	200