2001/2002 Forest Renewal BC Funded

ENHANCING ENVIRONMENTAL VALUES PROGRAM COMPLETION REPORT

Book 1

Prepared for:

PACIFIC INLAND RESOURCES
a division of WEST FRASER MILLS LTD

Prepared by:

Ed Withers, AScT, Watershed Restoration Supervisor
Silvicon Services Inc.
March 2001

Table of Contents
Book 1

Table of Contents
Book 2

ENHANCING ENVIRONMENTAL VALUES PROGRAM COMPLETION REPORT 2001/2002

1.0 Introduction

This completion report summarizes the projects carried out for the 2001/2002 season, as part of the Forest Renewal BC funded, Enhancing Environmental Values Program (EEV). The proponent of the projects described in the following text is Pacific Inland Resources (PIR), a division of West Fraser Mills Ltd. Companies throughout BC were retained under contract to provide products for specific portions of these projects, which include upslope, and in-stream works throughout PIRs operating area. Various members of PIR staff or other companies appointed by PIR staff have overseen these projects to administer a range of project activities.

2.0 EEV Projects

The EEV projects and their Forest Renewal BC Activity Number are as follows:

- FRBC#720769 Fish Access Restoration
- FRBC#720775 Effectiveness Evaluation
- FRBC#720777 Overview Assessment
- FRBC#720780 Road Deactivation – works
- FRBC#720785 Detailed Assessment and Planning – Instream
- FRBC#720801 Watershed Restoration Plans
- FRBC#720928 Detailed Assessment and Planning – Hillside or Upslope
- FRBC#723977 Detailed Assessment and Planning – Roads (Road Deactivation Prescriptions)
- FRBC#723978 Side channel Rehabilitation and Restoration

2.1 FRBC#720769 Fish Access Restoration

The Fish Access Restoration project is part of an ongoing effort to identify, remove and replace drainage structures that do not meet the guidelines for safe fish passage. Drainage structures that are identified as not meeting the guidelines for safe fish passage will be surveyed and replaced with bridge or other type structures that will provide for fish passage and enhance overall fish habitat availability.

Within the 2001/2002 fiscal year this project is focused on the Fish Passage Culvert Inspections (FPCI) of structures throughout PIRs Babine chart area. The FPCI is a requirement to assess each culvert. The watershed sub-basins in which the assessments took place are:

- West Babine Sub-basin (Torkelson Watershed)
- Tsezakwa Sub-basin (Torkelson Watershed)
- Nilkitkwa Lake Sub-basin (Babine Watershed)
- Nichyeskwa Sub-basin (Babine Watershed)

All culverts located within the above-mentioned sub-basins along the 4000 FSR were assessed for fish passage as well as all culverts on eligible secondary roads within the above-mentioned sub-basins. Culverts on roads scheduled for deactivation were not assessed. Also, culverts on non-fish bearing streams were not assessed. Fish Inventory maps developed by Triton Environmental Consultants were used to determine stream classification. Streams that were not classified by Triton or that were classified as inferred were sampled and classified as part of the FPCI.

Silvicon Services Inc. (Silvicon) was hired under contract to administer this project. The Standards Agreement for Fish Passage Culvert Inspection Procedure is dated for reference June 29, 2001 and a copy is included in this document.

BRITISH COLUMBIA

Ministry of Water, Land and Air Protection

Standards Agreement

(For use with Multi-Year or Annual Agreements between the Recipient and Forest Renewal BC)

MINISTRY NUMBER:	**[MINISTRY NUMBER]**	THIS AGREEMENT DATED FOR REFERENCE **06/29/01**
MULTI-YR AGMT NUMBER:	**CON0001395**	
ACTIVITY NUMBER:	**720769 (FARS)**	

FOR: **FISH PASSAGE CULVERT INSPECTION PROCEDURE FOR SELECTED SITES IN THE WEST BABINE WATERSHED**

CONTENTS

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA, (the "Province") as represented by the Minister of Water, Land and Air Protection

Smithers BC
3726 Alfred Ave.
Box 5000, Smithers BC V0J 2N0
Phone Number: (250) 847-7260
Fax Number: (250) 847-7556

AND:

Pacific Inland Resources , (the "Recipient")
Box 3130
Smithers BC, V0J 2N0
Phone Number: (250) 847-2656
Fax Number: (250) 847-5520

both of whom are sometimes referred to as "the Parties" and each of whom is a "Party" to this Agreement.

WHEREAS:

A. The Province wishes the Work described in this Agreement to be carried out for the benefit of Forest Renewal BC.

B. The Recipient seeks to carry out and complete the Work described in the attached Schedule(s).

C. The Recipient has entered or intends to enter into an Annual or Multi-Year Agreement with Forest Renewal BC for the purpose of funding the Work.

THE PARTIES AGREE AS FOLLOWS:

ARTICLE 1 DEFINITIONS

1.01 In this document, the following words have the following meanings:

(a) "**Agreement**" means this agreement including any Schedules;

(b) **"Changed Condition"** means a materially changed physical condition at the Work Area which

i) was not foreseen by the Recipient; and

ii) would not have been reasonably foreseen by a reasonable Recipient who, before submitting its tender, conducted a thorough investigation of the work to be done to complete the Work, including a thorough inspection of the Work and a review of all information available from the Province to persons wishing to submit tenders , but does not include any generally recurring weather conditions ;

(c) **"Contractor"** means the Recipient;

(d) **"Environmental Damage"** means slumping or sliding of land; inordinate soil disturbance; significant deterioration of water quality or other significant damage to the environment; and for the purposes of this definition, "inordinate soil disturbance" and "other significant

damage to the environment" have the meanings, where appropriate, given to them in the Forest Practices Code.

(e) **"Forest Practices Code"** means the Forest Practices Code of British Columbia Act and Regulations and Standards to that Act;

(f) **"Ministry Representative"** means a person appointed pursuant to section 5.01;

(g) **"Occupied Area"** means any Work Area, camp or rest area, or any other area occupied by the Recipient for the purposes of this Agreement;

(h) **"Recipient Representative"** means a person designated pursuant to Article 5.04;

(i) **"Schedule"** means a schedule of this Agreement;

(j) **"Subcontractor"** means a person, firm or corporation contracting with the Recipient to perform a part or parts of the Work, or to supply products worked to a special design according to the Agreement, but does not include one who merely supplies products not so worked;

(k) **"Term"** means the period of time this Agreement is in force pursuant to Article 3;

(l) **"Work"** means all

i) labour, supervision, and administration;

ii) provision of materials, transportation, supplies, tools, and equipment; and

iii) other services and provision of materials

necessary or desirable to perform the services described in each Schedule, and includes any services which are not expressly described which are nevertheless necessary for the proper execution of the work.

(m) **"Work Area"** means individual location, forest stands, or other particular areas or locations where work is to be undertaken and any areas of Crown Land occupied by the Recipient for purposes of the Work;

(n) **"Work Day"** means every day of the week except Saturday, Sunday and statutory holidays.

1.02 If a word defined in section 1.01 is used in a Schedule, it has the same meaning as in this document unless the context dictates otherwise.

1.03 A word or abbreviation which has a well known technical or trade meanings is used in the Schedule(s) in accordance with that recognized meaning.

1.04 The headings in this Agreement have been inserted for reference only. They do not define, limit, alter or enlarge the meaning of any provision of this Agreement.

ARTICLE 2 SCHEDULES AND CHANGES

Schedules

2.01 The Schedules, listed below, apply to and form part of this Agreement

☒	Schedule "A"	Title of Schedule A
☒	Appendix "A"	Map of stream crossings identified for inspection

Changes

2.02 No change to this Agreement is effective unless it is in writing and signed by the Parties.

Interpretation

2.03 Any reference in a Schedule to a manual or a form is a reference to a manual or form published by or for the Province and includes every amendment to it and any manual or form published from time to time in substitution for it or replacement of it.

2.04 The Forest Practices Code, if applicable, takes precedence over an approved prescription. An approved prescription, if applicable, outlining work covered by this Agreement takes precedence over this document. This document takes precedence over any of its attachments. In the event of a conflict between alike Schedules or other attachments of different dates, the Schedule or other attachments of later date prevails.

ARTICLE 3 TERM OF AGREEMENT AND START OF WORK

3.01 The Term of this Agreement is to start June 29, 2001 and end March 31, 2002 unless otherwise provided in the Schedule(s).

3.02 The Parties may agree to extend the term of this Agreement.

3.03 The Recipient must not conduct any Work under this Agreement until:

(a) the Recipient has entered into a Multi-Year Agreement or Annual Agreement with Forest Renewal BC to fund the Work covered under this Agreement; and,

(b) the Recipient Representative has met with the Ministry Representative to review the Work.

3.04 Time is of the essence in this Agreement.

Schedule of Work

3.05 The Recipient must complete the Work according to the work completion timing schedule of the Work Progress Report(s). The actual date the Province notifies the Recipient to start Work and the continuity of the Work depend on the presence of suitable field conditions to allow the Work to be completed as outlined in the Schedule(s).

ARTICLE 4 STANDARDS AGREEMENT AND MULTI-YEAR/ANNUAL AGREEMENT LINKAGE

4.01 This Agreement constitutes a Standards Agreement as defined in the Multi-Year Agreement or Annual Agreement between the Recipient and Forest Renewal BC dated for reference **TO BE PROVIDED AT A LATER DATE.**

ARTICLE 5 PARTY REPRESENTATIVES

Ministry Representative

5.01 The Province must appoint a Ministry Representative who has full authority to act on behalf of the Province to ensure compliance with all terms of this Agreement.

5.02 Upon entering into this Agreement, the Province must notify the Recipient of the name of the Ministry Representative.

5.03 The Province may substitute a Ministry Representative at any time, but must immediately notify the Recipient of the change.

Recipient Representative

5.04 The Recipient must designate a Recipient Representative, who has full authority to act on behalf of the Recipient in connection with the Work and this Agreement;

5.05 Upon entering into this Agreement, the Recipient must notify the Province of the name, address and telephone number of the Recipient Representative designated pursuant to section 5.04.

5.06 The Recipient must not substitute a Recipient Representative without written notice to the Ministry Representative.

5.07 If, in the reasonable opinion of the Ministry Representative, the Recipient Representative is not suitably experienced or is unable to properly supervise the Work or communicate with the Ministry Representative, then the Recipient must, upon receipt of written notice from the Ministry Representative, replace that representative and immediately notify the Province of that change.

ARTICLE 6 PERMITS, AUTHORIZATIONS AND PRESCRIPTIONS

6.01 Where the Recipient is carrying out Work which relates to a statutory obligation of the Province under the Forest Practices Code, then the Recipient is carrying out that work as a contractor to the Province.

6.02 Without limiting the generality of section 6.01, where the Work is work that the Province is required to carry out under the Forest Practices Code, including work referred to in section 23.1 and 24.1, then the Province will provide any necessary prescriptions or other Forest Practices Code approval documents and the Recipient will ensure that the Work complies with the prescription and other Forest Practices Code approval documents.

ARTICLE 7 WORK PROGRESS PLAN AND STANDARDS OF PERFORMANCE

Work Progress Plan

7.01 The Recipient Representative must meet with the Ministry Representative before starting Work to:

(a) review the Schedule(s) and work performance requirements;

(b) jointly develop a Work Progress Plan(s) outlining the project scope, goals, work completion timing schedule, location and any special requirements of the Work; and

(c) inspect any Work Area, if requested by the Ministry Representative.

7.02 The Work Progress Plan must provide for the orderly completion of all Work, comply with all provisions of this Agreement, and be satisfactory to the Province.

7.03 The Work Progress Plan may divide the Work into separate phases or completion zones.

7.04 The Work Progress Plan forms part of this Agreement. Work must be carried out and completed in accordance with the Work Progress Plan.

Standards of Performance

7.05 The Recipient must, before starting any Work, satisfy itself as to:

(a) the nature and magnitude of the Work;

(b) the general character, quality and quantity of the equipment and materials required to carry out and complete the Work; and

(c) the qualifications, skills and abilities of its personnel and personnel of Sub-Contractors or other parties engaged in carrying out the Work in order to ensure the Work is carried out in accordance with this Agreement.

7.06 The Recipient must at all times exercise the standard of care, skill and diligence ordinarily exercised and observed by persons engaged in the performance of activities similar to the Work.

7.07 The Work must be carried out under the direct and continuous supervision of the Recipient or a qualified authorized agent of the Recipient who:

(a) speaks English and understands spoken and written English, or has access to a translator, to the reasonable satisfaction of the Ministry Representative; and

(b) is present at the Work Area when the Work is carried out.

Subcontractor Work

7.08 If the Recipient engages a Subcontractor, the Recipient is not relieved from the subcontracted obligations or any obligations under this Agreement.

7.09 The Recipient must not assign this Agreement, or subcontract any obligations under this Agreement, without prior written notification to the Province.

7.10 The Recipient must notify the Province of the name, office address and office telephone number of the Recipient's Subcontractor(s).

7.11 The actions of any Subcontractor engaged to carry out any of the Work are deemed the actions of the Recipient.

7.12 Nothing in this Agreement creates any direct or indirect contractual relationship between the Province and any Subcontractor.

ARTICLE 8 INDEMNIFICATION AND INSURANCE

Indemnity

8.01 The Recipient must indemnify and save harmless the Province, its employees, agents and authorized representatives, and each of them from and against losses, claims, damages, actions, and causes of action (collectively referred to as "Claims"), that the Province may sustain, incur, suffer or be put to at any time either before or after the expiration or termination of this Agreement, that arises out of errors, omissions or negligent acts of the Recipient or its subcontractor(s), servant(s), agent(s) or employee(s) under this Agreement, excepting always that this indemnity does not apply to the extent, if any, to which the Claims are caused by errors, omissions or negligent acts of the Province, its other Recipient(s), authorized representatives, or any other person.

8.02 None of the Minister of Environment, Lands and Parks or the Ministry Representative in charge, their agents or employees are personally liable for any act performed in the discharge of any duty imposed or in the exercise of any power or authority conferred upon them by, or within the scope of, the Agreement if it can be demonstrated that all reasonable care was exercised in the conduct of the operations; in all such matters these persons act solely as agents and representatives of the Province.

8.03 Neither the Province nor any of its employees or agents are liable to the Recipient or the Recipient's employees or agents for any injury, loss, or damage however occasioned to any of them or their property while being transported or conveyed in any vessel, boat, aircraft owned or operated by the Province The Recipient must not make claims against the Province, its employees or agents to recover any such injury, loss or damage either on its own behalf or on behalf of its employees or agents. The Recipient must indemnify and save harmless the Province, its employees or agents from any such claims initiated by the Recipient's employees or agents.

Insurance

8.04 During the Term the Recipient must carry and maintain insurance coverage as specified in the Recipient's Multi-Year Agreement or Annual Agreement with Forest Renewal BC and, if applicable, as specified in writing by the Province.

ARTICLE 9 PROTECTION OF WORK AND PROPERTY

General

9.01 The Recipient must protect the Work area and property adjacent to any Work Area, from damage and is responsible for damage which may arise as the result of the Recipient's operations under the Agreement, except damage which occurs as a result of:

(a) an error in a Schedule; or

(b) an act or omission of the Province, third parties, or other Recipients, its agent or employees.

Protection of the Environment

9.02 The Recipient must not cause Environmental Damage in carrying out the Work under this Agreement.

9.03 Subject to 9.04, The Recipient is not in breach of 9.02 if:

(a) performing the Work according to an operational plan, or permit issued under the Forest Practices Code; or

(b) the Work performed by the Recipient has been exempted from a requirement to have an operational plan or prescription and the Recipient is carrying out the Work in accordance with the Forest Practices Code.

9.04 If the Recipient encounters circumstances where the Recipient knows or should reasonably know that, due to weather conditions or site factors, proceeding with the Work may, directly or indirectly, cause Environmental Damage, the Recipient must:

(a) immediately suspend the Work that may cause Environmental Damage;

(b) immediately advise the Province of the suspension and circumstances;

(c) not proceed with the Work until the Province so instructs; and

(d) upon the Province's instruction to proceed with the Work, do so in accordance with the Province's instructions.

9.05 The Recipient is not in breach of this Agreement for suspending Work pursuant to Section 9.04.

9.06 If the Recipient causes Environmental Damage while performing Work under this Agreement, the Recipient must:

(a) immediately stop the Work in the area affected;

(b) prevent any further damage to the environment;

(c) immediately notify the Province to the attention of the Ministry Representative; and

(d) take any remedial measures that the Ministry Representative requires.

9.07 The Recipient may resume Work that has been stopped under 9.06 when:

(a) Work can be resumed without violating sections 9.02 and 9.04; and

(b) All remedial measures required under section 9.06 have been carried out to the satisfaction of the Ministry Representative.

ARTICLE 10 GOVERNING LAW

10.01 This Agreement is governed by and is to be construed in accordance with the laws of the Province of British Columbia.

10.02 The Parties will comply with the laws of Canada and British Columbia applicable to the Work and the Work Area.

ARTICLE 11 CHANGES IN CONDITIONS

11.01 If a Changed Condition occurs during the course of the Work, the following applies:

(a) The Parties must immediately advise each other of particulars of the Changed Condition and the Recipient Representative and the Ministry Representative who each have authority to act in respect of that Schedule must meet to attempt to deal with the condition.

(b) If in the opinion of either Party, that Changed Condition is so substantial that amending this Agreement to deal with the change would change the essential nature of the Work, then the Parties must not proceed with the Work in respect of that Schedule any further and that Work must be brought to an end.

ARTICLE 12 WORK COMPLETION AND ACCEPTABILITY OF WORK

Notification of Completion

12.01 The Recipient must, upon completing a phase of the Work, and the entire Work, promptly notify the Province of that completion. The notification must be in writing, and must be delivered to the Province during the Province's normal business hours.

Inspection by the Province

12.02 The Province may, following receipt of the Recipient's notification in 12.01, inspect and determine the acceptability of the Work performed in accordance with a Schedule.

12.03 The Recipient is encouraged, but not required, to observe each inspection while it is being conducted.

12.04 The Province must provide the Recipient with a copy of inspection results.

12.05 The Province reserves the right to inspect at any time, any Work performed.

12.06 Inspections are conducted by the Province in order to determine compliance with the provisions of this Agreement. These inspections are conducted for the sole benefit of the Province, and do not release the Recipient from the responsibility of providing quality control measures to assure that the Work strictly complies with this Agreement.

12.07 The Province and the Recipient may agree on a schedule for the Province to make its determination on the acceptability of the Work and to provide its notification to Forest Renewal BC.

12.08 Notwithstanding 12.07, The Province will make its determination on the acceptability of the Work and notify Forest Renewal BC of their decision within one year of the notification in 12.01.

12.09 The Province is not obliged to make any determination of acceptability before receiving the Recipient's written notification in 12.01.

ARTICLE 13 MEASUREMENT

Method of Measurement

13.01 All linear and area measurements under this Agreement are measured on the horizontal plane.

ARTICLE 14 NON-COMPLIANCE AND TERMINATION

Termination by the Province

14.01 The Province may, in its sole discretion, terminate this Agreement at any time. The Province is not liable for any losses occasioned by that termination if the termination:

(a) occurs before the Ministry Representative receives the written notification of the Recipient that they will commence Work;

(b) is caused by the Recipient's failure to perform or comply with this Agreement;

(c) results from the termination of the Recipient's Multi-Year Agreement or Annual Agreement with Forest Renewal BC; or

(d) is caused by an Act of God, unsuitable weather, natural disaster, withdrawal of labour in labour disputes, or any other unforeseeable cause over which the Province has no direct control.

Termination by the Recipient

14.02 The Recipient may terminate this Agreement if the Recipient's Multi-Year Agreement or Annual Agreement with Forest Renewal BC is terminated, and no claim may be made by the Province against the Recipient for any losses occasioned by that termination.

Mutual Termination

14.03 This Agreement may be terminated at any time by the mutual consent of the Parties.

14.04 If a party is unable to perform any obligation under this Agreement because of an Event of Force Majeure (as that term is defined in the Recipient's Multi-Year Agreement with Forest Renewal BC), that inability shall not be a default under this Agreement.

Non-Compliance with Agreement Provisions

14.05 If, in the opinion of the Province, the Recipient fails to perform or fails to comply with any of its obligations under this Agreement, the Province may, in its discretion do one or more of the following:

(a) require the Recipient to re-work the area or phase of work;

(b) permit the Work to continue, giving the Recipient a time limit for compliance, rectification or both;

(c) order the Recipient to stop the Work until the alleged failure of compliance is dealt with according to the Province's requirements;

(d) specify on Quality Certificate(s) that the Recipient failed to perform or comply with one or more of its obligations;

(e) terminate all or part of this Agreement.

These remedies are in addition to any other remedies available to the Province.

14.06 The Province may inspect any re-worked area or phase of the work. The results of that inspection supersede any previous inspection results.

ARTICLE 15 DISPUTE RESOLUTION

15.01 If a dispute occurs between the Parties concerning any matter governed by this Agreement, the disputing Party must promptly advise the other Party and the Parties together must use all reasonable efforts to resolve the dispute.

15.02 Despite section 15.01, the Ministry Representative may give the Recipient instructions that, in the reasonable opinion of the Ministry Representative, are necessary to provide for the proper performance of the Work. The Recipient must act immediately to carry out the instructions, but any work performed by the Recipient in this respect is without prejudice to any claim the Recipient may have concerning the dispute.

15.03 If the Parties are unable to resolve the dispute informally within five Work Days, then the Recipient must give to the Ministry Representative written particulars of the complaint, which must include the following:

(a) a detailed description of the nature of the complaint;

(b) a list of the relevant provisions of the Schedule(s); and

(c) an evaluation by the Recipient of the matters in dispute.

15.04 The Province must, within 20 Work Days of receipt by the Ministry Representative of the written particulars, advise the Recipient, in writing, of any one of the following:

(a) that the Province accepts the position of the Recipient; or

(b) that the Province rejects the position of the Recipient.

15.05 If the Province accepts the position of the Recipient, the Parties will amend this Agreement if necessary and the Province will advise Forest Renewal BC .

15.06 If the Province rejects the Recipient's position, the Parties must retain a mutually agreed upon person to make a written recommendation to resolve the dispute. Any costs associated with retaining that person must be jointly paid by the Parties.

15.07 If after a review of the written recommendation, the Parties agree on a resolution of the dispute, the Parties must amend this Agreement if necessary and the Recipient must provide Forest Renewal BC with a copy.

15.08 If after a review of the written recommendation, the Parties are unable to resolve the dispute and the dispute is with respect to payment only, this dispute is deemed to be between the Recipient and Forest Renewal BC, and the Recipient's position and the written recommendation must be forwarded to Forest Renewal BC. Despite the foregoing, the resolution of a dispute under a Multi-Year Agreement or Annual Agreement does not prejudice any claim the Province may have against Forest Renewal BC in respect of the Work.

15.09 A copy of the written recommendation and the Province's position may be forwarded by the Province to the appropriate professional association.

ARTICLE 16 MISCELLANEOUS

Confidentiality

16.01 The Recipient must treat as confidential all material that has been produced or received by it or any Subcontractor as a result of this Agreement (collectively the "Material") and not permit its disclosure without the Province's prior written consent except as required by applicable law, including the *Freedom of Information and Protection of Privacy Act.*

Ownership

16.02 The Material and any equipment provided by the Province to the Recipient or a Subcontractor as a result of this Agreement is the exclusive property of the Province. The Recipient must deliver it to the Province immediately following expiration of this Agreement, or sooner upon the Province's request, in the same condition it was supplied to the Recipient, excepting always loss or damage attributable to reasonable wear or tear.

Copyright

16.03 The copyright in the Material belongs exclusively to the Province. Upon the Province's request, the Recipient must deliver to the Province documents satisfactory to it waiving in the Province's favour any moral rights which the Recipient or Subcontractors or their employees may have in the Material and confirming the vesting of the copyright in the Province.

Recipient Status

16.04 Except as otherwise provided in this Agreement, the Recipient is not subject to the control of the Province in respect of the manner in which the Work is carried out.

16.05 The Recipient must not purport to commit the Province to the payment of any money to any person.

16.06 The Recipient must ensure all personnel hired by the Recipient to perform the Work are at all times employees of the Recipient and not of the Province.

Notices

16.07 Any notice or document required to be given under this Agreement is conclusively deemed validly given or delivered to and received by the Parties

(a) if hand delivered personally, on the date of that personal delivery;

(b) if mailed, on the fifth business day after the mailing of the same in British Columbia by prepaid post to the addresses set out in this Agreement (or at such other address as either Party may from time to time designate by notice in writing to the other); or

(c) if sent by facsimile transmission, when transmitted, only if transmitted to the facsimile machine numbers first above written. The onus of proving transmission and receipt lies with the transmitting Party.

Non-Waiver

16.08 A waiver of any provision of this Agreement or a waiver of a breach by a Party of any provision of this Agreement is effective only if it is in writing and signed by the other Party.

16.09 A written waiver by either Party of any provision of this Agreement or of any breach by the other Party of any provision of this Agreement is not a waiver of any subsequent breach of the same or any other provision of this Agreement.

Recipient Provisions

16.10 Except as specified in the Schedule(s), the Recipient must undertake all Work and furnish all labour, equipment, supervision, transportation, supplies and incidentals necessary to perform the Work.

Unsuitable Workers

16.11 The Recipient must ensure all persons employed to perform the Work are competent, adequately trained , fully instructed and supervised, and legally entitled to work in Canada.

16.12 The Recipient must, upon request of the Ministry Representative, remove any person it employs for purposes of the Agreement who, in the reasonable opinion of the Ministry Representative, is incompetent or has conducted himself or herself improperly, and the Recipient must not permit a person who has been so removed to perform any further Work.

Survival of Terms

16.13 Sections 7.01, 7.02, 8.01, 8.02, 15,01, 15.02 and 15.03 will, despite the expiration or earlier termination of the Term of this Agreement, remain and continue in full force and effect.

Site Clean Up

16.14 The Recipient must maintain the Work Area free from accumulations of waste products or debris, other than that caused by the Province, other recipients or third parties.

16.15 Upon the Recipient vacating the Work Area, the Ministry Representative may determine , at his or her sole discretion, whether or not the area was left in an acceptable condition.

16.16 If the Ministry Representative determines the Recipient left the Occupied Area in an unacceptable condition, the Province may repair the area or remove waste products or debris and recommend to Forest Renewal BC a deduction in payment to the Recipient equal to the cost of repairs or removal

Camping and Parking

16.17 Use of Provincial Crown forest land, including any roads, landings or Ministry of Forests recreational sites, by the Recipient, the Recipient's employees or agents for the purposes of lodgings, camping, vehicle parking or trailer parking in connection with Work under this Agreement, is permitted only with prior written approval of the Ministry Representative. That use, if approved, must be without charge to the Recipient; but, the approval may be revised or revoked at any time by the Province.

16.18 **Powers Cumulative**

The powers set out in the Schedule(s) for the Province to enforce the Recipient's compliance with this Agreement may be exercised separately, concurrently, or cumulatively.

IN WITNESS OF WHICH the Parties have duly executed this Agreement as of the date first above written.

SIGNED AND DELIVERED
on behalf of the Province by an authorized representative of the Province

07/29/01
Authorized Signatory
Ministry of Environment, Lands and Parks

SIGNED AND DELIVERED
by or on behalf of the Recipient (or by an authorized signatory of the Recipient)

Recipient or Authorized Signatory

Schedule "A"

FISH PASSAGE CULVERT INSPECTION

1. DEFINITIONS

For the purposes of this Schedule the following definitions apply:

a) **Location** means stream crossings identified in the Appendix "A" of this agreement
b) **Ministry** means Ministry of Environment, Land and Parks (MELP)
c) **WRP** means Watershed Restoration Program
d) **WRTC** means Watershed Restoration Technical Circular
e) **FPCI** means Technical Circular No. 11 Fish Passage Culvert Inspection March 2000
f) **Recipient** means the Multi Year Agreement (MYA) holder – Pacific Inland Resources
g) **Technical Monitor** means the MELP representative monitoring this Schedule "A" – Jeff Lough, Box 5000 Smithers BC, V0J 2N0. Telephone (250) 847-7337 Fax: (250) 847-7728 , **email:** Jeff.Lough@gems2.gov.bc.ca.

2. PURPOSE

For a number of culverts previously identified by an aquatic inventory project in an area of interest of the Recipient (delineated in Appendix "A") provide detailed assessment of for fish passage for the purpose of project prioritization, project eligibility.

3. SERVICES

The Recipient must:

3.3. Conduct an assessment of fish passage in the watershed location using the *WRTC No. 11 Fish Passage Culvert Inspection Procedures March 2000,* available from the Ministry project monitor, and provide the deliverables outlined in that manual. This assessment will include a site visit of all the crossings identified in Appendix "A" and complete a full assessment of those that meet the criteria outlined in the above noted document.

3.4. Provide an assessment team consisting of the following subcontractors to work co-operatively in developing deliverables for the project:
Ed Withers, the Co-ordinator and Manager for the project;
Ralph Kossman, the Biologist and Field Co-ordinator for the project.

3.5. The Recipient is responsible for the overall co-ordination of the eligible (with reference to employee/employer relationships) work carried out under this contract and completion of contract deliverables as outlined in Schedule A. Responsibilities include ensuring deliverables are received by the contract monitor by specified dates, organizing progress meetings.

3.6. Retain Quality Assurance Personnel, approved by the Ministry Representative, to review and sign-off all field operations, data analyses, reports and deliverables resulting from the Services.

4. DELIVERABLES

4.1. The Recipient must provide the Services based on the following schedule:

4.2. The Recipient is to submit **one (1)** copy of the draft mapping and report deliverables to the Ministry. Draft copies are to be received by the Ministry Technical Monitor no later than Sept 7, 2001 for review.

4.3. The Ministry is to provide comments on draft deliverables to the Contractor following a maximum review period of two weeks days of receipt.

4.4. Upon approval of draft outputs, the Contractor will provide **Five (5)** copies of the report and maps. **Four (4)** will be bound paper copies of the mapping and report deliverables and **one (1)** electronic copy of the report on CD ROM in MS Word 7.0 format.that contains the completed FPCI project report. Copies of final deliverables for all project locations are to be received by the Ministry Technical Monitor no later than Oct. 5, 2001.

4.5. The Recipient will distribute the final reports as follows:

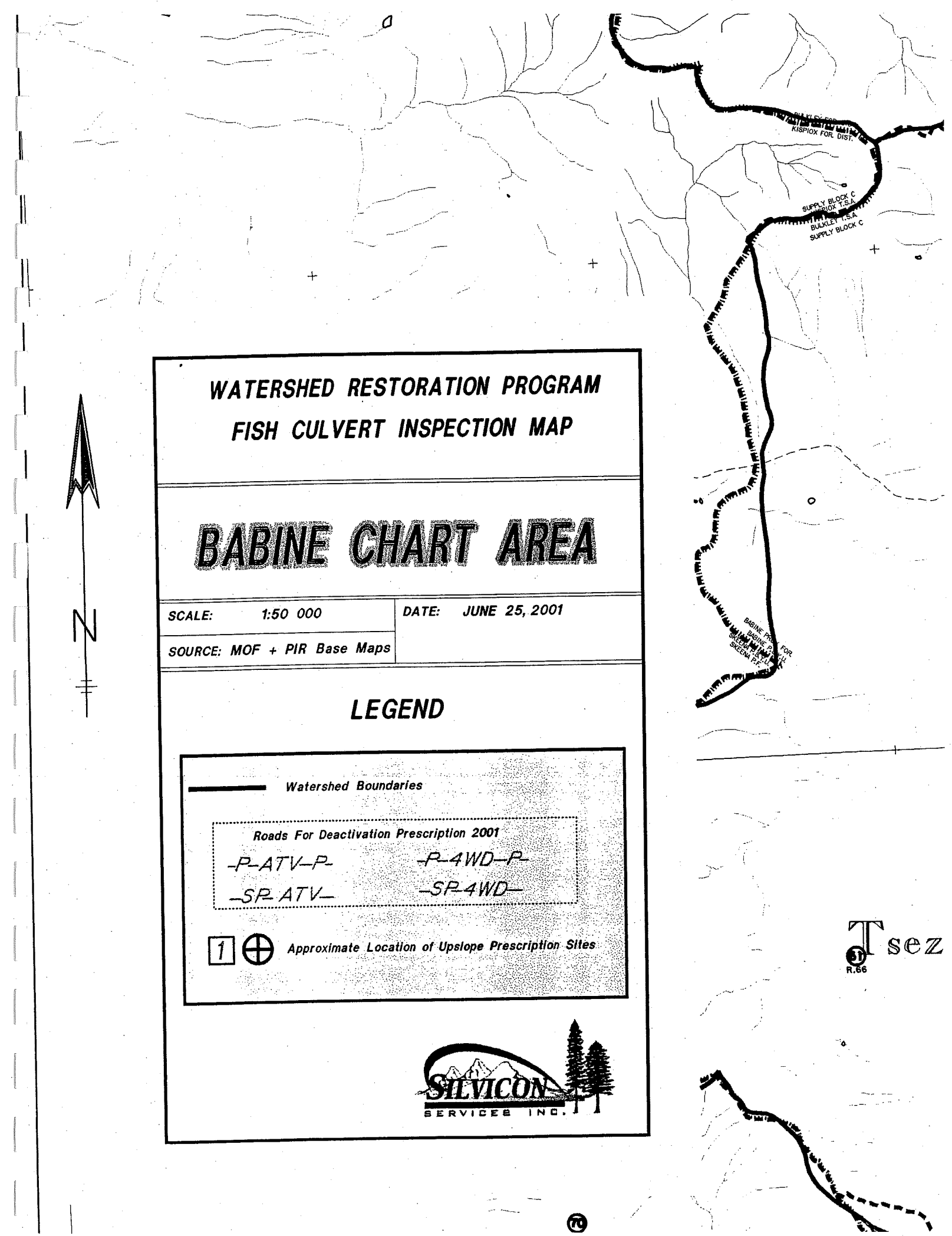
Two copies (one bound and one electronic) to the project Technical Monitor – (Jeff Lough);
One (1) copy to the FRBC Investment Officer for eligibility confirmation;
One (1) copy to the District Forest ecosystem Specialist (FES) (James Cuell);
One (1) copy to the Department of Fisheries and Oceans local District Habitat Officer (Tom Pendray).

4.6. A letter of introduction will accompany each report and will identify the distribution list in the form of a cc list.

Appendix "A"

Map of stream crossings identified for inspection

(Project Scope)



WATERSHED RESTORATION PROGRAM
FISH CULVERT INSPECTION MAP

BABINE CHART AREA

SCALE: 1:50 000	DATE: JUNE 25, 2001
SOURCE: MOF + PIR Base Maps	

LEGEND

Watershed Boundaries

Roads For Deactivation Prescription 2001

-P-ATV-P- -P-4WD-P-

-SP-ATV- -SP-4WD-

1 ⊕ Approximate Location of Upslope Prescription Sites

SILVICON SERVICES INC.

FISH PASSAGE – CULVERT INSPECTIONS

FRBC Activity Number: 720769 (FARS)

WEST BABINE, TSEZAKWA CREEK, NILKITKWA LAKE, and NICHYESKWA CREEK

SUB-BASINS

Submitted to: Jeff Lough, WRP Regional Fisheries Specialist

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March, 2002

SILVICON SERVICES INC.

TABLE OF CONTENTS

Acknowledgements

The Fish Passage – Culvert Inspection project within Pacific Inland Resources (PIR's) operating area was funded By Forest Renewal B.C. through the Enhancing Environmental Values (EEV) Program. Field work was conducted by Ralph Kossman, Mallory Quinn, Heather Stoner, Chad Enns, Ed Withers, Dan Brookes and Jason Davey. Jeff Lough (MWLAP) provided helpful suggestions and comments on culvert assessments and on the report.

Executive Summary

Silvicon Services Inc. was retained by Pacific Inland Resources Ltd. (a Division of West Fraser Mills, Ltd.) to carry out a Fish Passage-Culvert Inspection (FPCI) project within the West Babine, Tsezakwa Creek, Nilkitkwa Lake and Nichyeskwa Creek Sub-basins. Funding for this project was provided by the Forest Renewal B.C, through the EEV Program (Province of British Columbia). Systematic fish sampling of the areas have determined that populations of rainbow trout (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), cutthroat trout (*Oncorhynchus clarki*), sockeye salmon (*Oncorhynchus nerka*), coho salmon (*Oncorhynchus kisutch*), and Dolly Varden (*Salvelinus malma*) are supported by the creeks and their tributaries. Bull Trout and Dolly Varden have recently been added to the Provincial Blue List for endangered species and upper-Skeena coho stocks are of special management concern. A large number of the sites were found to occur on S6 streams or non-classified drainages and therefore no fish passage assessments were done on these culverts. For the remaining sites that were classified as fish bearing, almost all were found to be partial barriers to fish passage with the exception of two full barriers and four crossings that did not present a barrier. Culverts on two spur roads, the 454-A and 454-B Spurs were overlooked during the field assessments and were not visited or assessed.

1.0 Introduction

Field work for this project commenced July 23, 2001. All culverts assessed were within the West Babine, Tsezakwa Creek, Nilkitkwa Lake and Nichyeskwa Creek Sub-basins. Starting at the southern boundary of the West Babine Sub-basin, which crosses the Nilkitkwa FSR (4000 Road) at roughly 22 Km, fish passage-culvert inspections were completed at all eligible sites on spur roads off of the Nilkitkwa FSR and on eligible culvert crossing sites on the Nilkitkwa FSR mainline up to 59 Km. Field work for the project continued throughout the summer and early fall with preparation of the draft report commencing late in November of 2001.

It should be noted that culverts on two spur roads, the 454-A and 454-B Spurs were not visited and therefore, the culvert sites on possible fish-bearing streams on these roads were not visited or assessed. This error was not discovered until the field cards and notes were assembled and sorted in preparation of the initial FPCI draft report. At that point in time it was too late to return to the field to try and complete the missed sites as it was late November and at least 0.3 m of snow was on the ground.

This Fish Passage-Culvert Inspection (FPCI) project was implemented to assess fish access at culvert bearing road crossings within the West Babine, Tsezakwa Creek, Nilkitkwa Lake and Nichyeskwa Creek Sub-basins. The assessments were carried out at culvert crossings installed on fish bearing streams on roads constructed prior to the implementation of the Forest Practices Code in 1996.

Fisheries information for the Babine River and Babine Lake was obtained from the 'Fish Wizard' software accessed through the BC Fisheries website. From this website, the following fish species were documented: Dolly Varden (*Salvelinus malma*), rainbow trout (*Oncorhynchus mykiss*), steelhead (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarki*), sockeye salmon (*Oncorhynchus nerka*), kokanne (*Oncorhynchus nerka*), chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), pink salmon

(*Oncorhynchus gorbuscha*), lake whitefish (*Coregonus clupeaformis*), mountain whitefish (*Prosopium williamsoni*), lake trout (*Salvelinus namayacush*), sculpin spp. (*Cottus spp.*), northern pikeminnow (*Ptychocheilus oregonensis*), redside shiner (*Richardsonius balteatus*), and sucker spp.(*Catostomus spp.*).

While bull trout (*Salvelinus confluentus*) was not documented in Babine Lake by the 'Fish Wizard" software, it is a species which is present in the Babine River watershed. Both bull trout and Dolly Varden are blue-listed species and are therefore of management concern. Upper-Skeena coho stocks are also of special management concern due to dwindling returns in recent years. Historically, many of the tributaries to Babine Lake, Nilkitkwa Lake and the Babine River were likely important spawning and rearing habitat for coho in the Babine watershed.

This project was made possible through Forest Renewal B.C. Forest Renewal B.C. implemented its Watershed Restoration Program in 1994. This program, now referred to as the Enhancing Environmental Values (EEV) Program, was established to provide an important opportunity to improve water quality and reverse fish habitat impairment as a result of past forest harvesting practices. The West Babine, Tsezakwa Creek, Nilkitkwa Lake and Nichyeskwa Creek sub-basins are within Pacific Inland Resources' (PIR) traditional operating area and therefore PIR played a large role in this project as the proponent.

The completed report includes two electronic copies on CD-ROM (one word document version and another in PDF format) that will be submitted to the MWLAP Regional Fisheries Specialist. Three hard copies of the report and maps will also be produced and one each will be submitted to: the WRP Technical Monitor, the Department of Fisheries and Oceans Habitat Protection Officer, and the final copy to the project proponent (PIR). Maps of each sub-basin identify the location, degree of barrier and the priority ranking of each fully assessed culvert crossing and also identify sites that were visited but not

Insert map

assessed for fish passage. Sites that were visited but not assessed either were found not to have a defined stream channel associated with the crossing or were classified as non-fish bearing streams following stream surveys and sampling. Both hard copies and a digital format of the maps accompany the deliverables.

2.0 METHODOLOGY

The methods outlined in WRTC No. 11 were followed to carry out all pre-field and field work for the project with the following exceptions.

2.1 FORM A COMPLETION

During Form A completion in the field, complications arose when trying to record culvert water velocity and stream water velocity. Three different methods were carried out, including two different models of water velocity meters, timing a floating survey ribbon through the culvert, and timing food colouring injected in the stream to pass through the culvert. Due to the timing of the project, very low water flow was experienced and water velocities could not be obtained for some of the sites. The first velocity meter we utilized was apparently designed for measuring velocities in larger, faster streams. With a two inch diameter impeller, it was often not possible to completely submerge the impeller in the water column. Unless we chose the fastest flowing sites in the stream, the meter would not record a velocity when partially submerged. It did not record any velocities below 0.5 m/s.

The second velocity meter was much better suited to shallow water depths and slower velocities. Its 2.5 cm diameter impeller was much more sensitive to low flows and would record velocities down to 0.1 m/s even if not completely submerged. There were still situations however, where there was not enough water for this more sensitive meter to record a velocity. On these occasions we tried to time small pieces of surveyor's ribbon floating on the water or add food colouring to the stream and time the passage of the coloured water through the culvert. These methods also had their shortcomings. The

surveyor's ribbon more often than not hung up inside the culvert and often the food colouring became so diluted as to be indiscernible at the culvert outflow.

Initially, prioritisation of the assessed sites began using the FPCI scoring matrix (Parker, 2000), however many sites scored the same, making it difficult to prioritise the sites. Modifications were made to some of the categories within the scoring matrix so that there was increased differentiation between total scores (Saimoto, 2000). The points system for the "% Stream Barred" and "Limiting to Upstream Barrier" categories remained the same. For the remaining categories; Fish Species, Habitat Values, Barriers, Length of New Habitat, criteria and scoring changes made are as follows:

2.2 FISH SPECIES

Single Species: 6 points for any FPC listed species.

Significant Species: 10 points each for Dolly Varden (*Salvelinus malma)* and/or Bull Trout (*Salvelinus confluentus*), two provincial blue-listed species. 10 points for Upper-Skeena coho, a race of special management concern.

Multiple Species: 8-10 points based upon significance of species encountered.

2.3 HABITAT VALUES

Scores for habitat values were determined after taking many different habitat variables into account and comparing variables between sites. Variables that figured in the scoring process included amount of spawning habitat, amount of over-wintering habitat, stream bed material, channel width, previous or current fish use, fish presence/absence, and fish species present. The points system separated habitat values into high, moderate, or low categories:

0-3 points: Low habitat value designation

4-7 points: Moderate habitat value designation

8-10 points: High habitat value designation

2.4 BARRIERS

For the barrier category, points were assigned based on field observations and data recorded in the appropriate section of the FPCI Form A. Undetermined barriers were scored 1-3 points.

Partial barriers were scored 4-7 points depending upon the degree of obstruction to fish passage. Some of the parameters taken into account included culvert outflow drop and/or minimum pool depth required vs. jumping abilities of target fish species of various life stages, culvert slope and/or culvert water velocities vs. swimming capabilities of target fish species of various life stages, seasonal high/low flows (i.e. culvert outflow drop at periods of low flow or water velocity barrier at periods of high flow).

Full barriers were scored 8-10 points depending upon the degree of certainty that a particular culvert would act as a barrier to fish passage during periods of either high or low flow.

2.5 LENGTH OF NEW HABITAT

The points scoring system for the Length of New Habitat category was refined and an increase of 1 point per 500 meters of habitat gained was implemented:

>4 km or lake:	10 points	1.5 – 2.0 km:	5 points
3.5 – 4.0 km:	9 points	1.0 – 1.5 km:	4 points
3.0 – 3.5 km:	8 points	0.5 – 1.0 km:	3 points
2.5 – 3.0 km:	7 points	<500 meters:	2 points
2.0 – 2.5 km:	6 points		

2.6 MAPPING SYMBOLS

Mapping symbols were modified so they would show both the type of barrier (full, partial, none and undetermined) and the priority ranking. The site number was moved outside the coloured culvert symbol and the priority ranking was inserted in its place.

The colour for the partial barrier symbol was also changed from black to yellow. This was done primarily so it would be more conspicuous on the maps.

3.0 FINDINGS

Findings of the Fish Passage-Culvert Inspections have been summarised by watershed sub-basins and further broken down by road within each sub-basin. Forms A, B, C, and D are contained in an appendix for each sub-basin.

3.1 WEST BABINE SUB-BASIN

Located in the northern region of the Bulkley TSA and within PIR's operating area, the West Babine Sub-basin is situated along the northwest portion of the Babine Lake shoreline (Withers and Baker, 2000). Approximately 22km of Babine Lake's north-western shoreline, ending at the north tip of the lake, makes up the east boundary of this watershed. The West Babine Sub-basin extends westward for roughly 10-15km to the height of the Babine mountain range, which makes up the west boundary of the watershed. The main access for this watershed is provided by the Nilkitkwa FSR (4000 Rd) which branches from the Babine Lake road approximately 55km from Smithers. The West Babine Sub-basin is approximately 72km from Smithers.

The West Babine Sub-basin contains generally flat to rolling terrain, growing steeper and mountainous to the west as the watershed approaches the Babine mountain range. The West Babine Sub-basin is a fourth order watershed and is roughly 23 088ha in size. There are six main drainages within the watershed. Three unnamed streams identified respectively by watershed codes 480-504200, 480-488800, and 480-474600 and Williams, Five Mile, and Heal Creeks.

For ease of reference, the information from the data collected at the assessed sites have been summarised based on their priority rank (Table 1). This table acts as a prioritisation summary for FPCI full culvert assessments for the West Babine Sub-basin. Scores are

based on a modified version of the FPCI scoring matrix as discussed in the previous section. All culverts are sorted by their priority ranking.

West Babine Sub-basin, Summary Table 1.

Road/ Site	Stream Width (m)	Fish Species	Habitat Value	Barrier	Barrier Description	Length of New Habitat	% Stream Barred	Limiting to upstream barrier	Total Score	Priority/Ranking 39-55: High 26-38: Moderate 15-25: Low
4000 / Site 17/678	7.47	DV (10)	H (10)	Partial (6)	Water Velocity / Outflow Drop	>4kn (10)	>70 (10)	No (10)	**46**	**High**
4000 / Site 23/696	9.5	DV (10)	H (10)	Partial (6)	Water Velocity	>4km (10)	>70 (10)	No (0)	**46**	**High**
413 Rd/ Site 123	1.52	DV (10)	M (6)	Partial (6)	Culvert Gradient / Water velocity	3.5-4km (9)	>70 (10)	No (0)	**41**	**High**
437 Rd/ Site 72	2.74	DV (10)	H (8)	P (7)	Avg. culvert slope 2.07%. 15 cm culvert outflow drop	2400m (6)	<50% (3)	No (0)	**34**	**Moderate**
4000 / Site 16/675	2.30	RB (6)	M (6)	Full (10)	Culvert Water Velocity/ Outflow Drop	3.5-4km (9)	51-70 (6)	No (0)	**33**	**Moderate**
437 Rd/ Site78	1.07	DV (10)	M (7)	P (7)	Avg. culvert slope 4.56%	2300m (6)	<50% (3)	No (0)	**33**	**Moderate**
4000 / Site 3/569	2.18	DV (10)	H (10)	Partial (6)	Water Velocity	1400m (4)	<50 (3)	No (0)	**33**	**Moderate**
4000 / Site 8/582	2.53	Multiple (10)	H (10)	Partial (6)	Culvert Length and Slope	1400 (4)	<50 (3)	No (0)	**33**	**Moderate**
437 Rd/ Site 6	2.03	DV (10)	H (10)	P (7)	Avg. culvert slope 1.17%. 42 cm culvert outflow drop onto rock	600m (3)	<50% (3)	No (0)	**33**	**Moderate**
4000 / Site 20/684	N/A	DV (10)	L (3)	Partial (6)	SWD Jam/ Culvert Outflow Drop	2800m (7)	>70 (10)	No (0)	**32**	**Moderate**

West Babine Sub-basin, Summary Table 1. Cont'd.

Road/ Site	Stream Width (m)	Fish Species	Habitat Value	Barrier	Barrier Description	Length of New Habitat	% Stream Barred	Limiting to upstream barrier	Total Score	Priority/Ranking 39-55: High 26-38: Moderate 15-25: Low
437 Rd/ Site 128	2.50	BT/ DV (10)	H (8)	P (7)	Avg. culvert slope 9.30%	1000m (4)	<50% (3)	No (0)	**32**	**Moderate**
4000 / Site 25/699	1.73	DV (10)	H (10)	Partial (6)	Culvert Water Velocity/ Gradient	<500 (2)	<50 (3)	No (0)	**32**	**Moderate**
437 Rd/ Site 83	1.02	Suspect DV (9)	M (4)	P (7)	Avg. culvert slope 5.88% Avg. culvert water velocity 0.4 m/s	2200m (6)	<50% (3)	No (0)	**29**	**Moderate**
441 Rd/ Site 10	0.91	DV (10)	M (4)	P (6)	Culvert Slope 1.98%	300m (2)	<50% (3)	No (0)	**25**	**Low**
437 Rd/ Site 53	1.12	Suspect DV (9)	L (3)	P (5)	Avg. culvert slope 1.50%	1200m (4)	<50% (3)	No (0)	**24**	**Low**
437 Rd/ Site 48	1.44	Suspect DV (9)	L (3)	P (4)	Avg. culvert slope 1.20%	200m (2)	<50% (3)	No (0)	**21**	**Low**
413 Rd/ Site 121	1.80	DV (10)	M (6)	None (0)	N/A	N/A	N/A	No (0)	**16**	**NIL**
4000/ Site 24/697	1.17	DV (10)	L (3)	None (0)	N/A	200m (2)	N/A	No (0)	**13**	**NIL**
428 Rd/ Site 11	3.11	RB (6)	M (6)	None (0)	N/A	3600m (9)	N/A (0)	N0 (0)	**12**	**NIL**

4000 Road

In total, sixteen sites were identified on the 4000 road within the West Babine Sub-basin to undergo FPCI assessments. Of these sites, seven were located on non-fish bearing streams or NCDs and therefore did not have assessments completed on them. These sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 1. Of the remaining nine sites, all but one were found to be partial barriers to fish passage. These sites have been assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 1). The culvert at site 19 was not considered a barrier.

Two of the highest priority crossings in the West Babine Sub-basin are located on the 4000 road. These sites include the crossings on Williams Creek (Feature 17) and Heal Creek (Feature 23). These sites both consist of CMPs with concrete wing walls that have smooth, flat concrete pad bottoms which are barriers to juvenile fish due to the high water velocities over the smooth, flat surfaces.

413 Road

Three sites on the 413 road within the West Babine Sub-basin were identified to undergo FPCI assessments. Of these three sites, one was located on a non-classified drainage and therefore did not have an assessment completed. This site has been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 1. Both remaining sites were found to be partial barriers to fish passage, however; the stream at site 121 is classified as an inferred fish bearing reach. These sites have been assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 1).

The crossing at site 123 is the third highest ranked within the Sub-basin. This crossing is located over an S3 stream that is acting as a partial barrier due to the culvert slope and water velocity. The length of new habitat that can be gained by fixing the barrier is one of the major factors that result in the high ranking score.

424 Road

Only one crossing was inspected on the 424 Road. The drainage associated with the crossing was classified as an NCD (non-classified drainage). This site has been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 1.

428 Road

In total, four sites were identified on the 428 road within the West Babine Sub-basin to undergo FPCI assessments. Of the four sites, three were located on non-fish bearing streams and therefore did not have assessments completed on them. These three sites

have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 1. The remaining site was determined to be a partial barrier to fish passage. This site was assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 1).

431 Road

In total, four sites were identified on the 431 road within the West Babine Sub-basin to undergo FPCI assessments. Of the four sites, three were located on non-fish bearing streams and therefore did not have assessments completed on them. These three sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 1. The remaining site was found to be a partial barrier to fish passage. This site was assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 1).

541-2 Road

This road is a spur road of the 431 Road. Only one crossing was inspected on the 541-2 Road. The drainage associated with the crossing was classified as an NCD. This site has been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 1.

437 Road

In total, eleven sites were identified on the 437 road within the West Babine Watershed to undergo FPCI assessments. Of these eleven sites, four were located on non-fish bearing streams and therefore did not have assessments completed on them. These four sites have been summarised in "Form D – Sites not Assessed Summary Table" in appendix 1. Of the remaining seven sites, all were found to be partial barriers to fish passage. These sites have been assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 1).

Two of the assessed sites, features 48 and 53, are located on streams that have been classified as S4, even though both streams were sampled with an electrofisher and no fish

were caught. There is beaver activity, with extensive damming and ponding occurring throughout the area. Both streams are tributaries to a known S3 stream previously classified as fish-bearing by Triton Environmental Consultants Ltd.

437-A Spur

In total, three sites were identified on the 437-A road within the West Babine Sub-basin to undergo FPCI assessments. Of the three sites, two were located on non-fish bearing streams and therefore did not have assessments completed on them. These sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 1. The remaining site was found to be a partial barrier to fish passage. This site was assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 1).

441 Road

In total, two sites were identified on the 441 road within the West Babine Sub-basin to undergo FPCI assessments. Of the two sites, one was located on a non-fish bearing stream and therefore did not have an assessment completed on it. This site has been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 1. The remaining site was found to be a partial barrier to fish passage. This site was assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table."

3.2 TSEZAKWA CREEK SUB-BASIN

The Tsezakwa Sub-basin is roughly 9729ha in size with 4490ha of operable ground. 260ha or 5.9% of operable ground within the Sub-basin is equivalent to clearcut. The Tsezakwa sub-basin is a fifth order watershed. Tsezakwa Creek is the only major stream within this sub-basin. Tsezakwa Creek empties into the Babine River at the south end of Nilkitkwa Lake and is roughly 21km in length and fed by 27 tributaries.

The Tsezakwa Creek mainstem corridor is identified in terrain maps for sensitive, highly erodible soils. There are numerous sections of this steep walled channel that are eroding and in many cases sediment is being deposited into the stream.

For ease of reference, the information from the data collected at the assessed sites have been summarised based on their priority rank (Table 1). This table acts as a prioritisation summary for FPCI full culvert assessments for the Tsezakwa Creek Sub-basin. Scores are based on a modified version of the FPCI scoring matrix as discussed in the previous section. All culverts are sorted by their priority ranking.

Tsezakwa Creek Sub-basin, Summary Table 1.

Road/ Site	Stream Width (m)	Fish Species	Habitat Value	Barrier	Barrier Description	Length of New Habitat	% Stream Barred	Limiting to upstream barrier	Total Score	Priority/Ranking 39-55: High 26-38: Moderate 15-25: Low
4000Rd/ site 29/707	1.24	CO, DV (10)	M (6)	Partial (6)	CMP Gradient >1%, Small Outlet Drop	150m (1)	<500 (1)	No (0)	**24**	**24 Low**

4000 Road

Only one crossing on the 4000 road, feature 29/707, is in the Tsezakwa Creek sub-basin. The watercourse associated with the crossing is highly ephemeral and appears to be a dry channel the majority of the time, however; it could provide important seasonal habitat. It is a direct tributary to Tsezakwa Creek and there are no significant barriers to fish passage between the 4000 Road crossing and the confluence with Tsezakwa Creek. The culvert was found to be a partial barrier to fish passage. This site was assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" in Appendix 2.

441 Road

In total, three sites were identified on the 441 road within the Tsezakwa Creek Sub-basin to undergo FPCI assessments. The three sites were all located on the same stream. An 8m cascade is located approximately 200m d/s of the lowest elevation crossing. The stream was sampled four times at three locations u/s of the 8m cascade. No fish were captured at any sample site therefore the reach has been classified as non-fish bearing. Subsequently the three sites did not have assessments completed on them. The sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 2.

3.3 NILKITKWA LAKE SUB-BASIN

The Nilkitkwa Lake Sub-basin surrounds Nilkitkwa Lake and extends approximately 6km to the east and approximately 10km to the west of the lake. The Nilkitkwa Lake sub-basin is roughly 16 454ha in size. The Level I assessment completed for the west portion of the watershed identifies approximately 8700ha as operable with 950ha or 10.9% of its operable landbase as equivalent to clearcut area.

For ease of reference, the information from the data collected at the assessed sites have been summarised based on their priority rank (Table 1). This table acts as a prioritisation summary for FPCI full culvert assessments for the Nilkitkwa Lake Sub-basin. Scores are based on a modified version of the FPCI scoring matrix as discussed in the previous section. All culverts are sorted by their priority ranking.

Nilkitkwa Lake Sub-basin, Summary Table 1.

Road/ Site	Stream Width (m)	Fish Species	Habitat Value	Barrier	Barrier Description	Length of New Habitat	% Stream Barred	Limiting to upstream barrier	Total Score	Priority/Ranking 39-55: High 26-38: Moderate 15-25: Low
Old Nilkitkwa Lake Road/ Site 104	3.47	RB, CO (10)	H (10)	Partial (7)	Outlet Drop (7)	6900m (10)	96% (10)	Yes (5)	**52**	**High**
4000Rd Site 35,36	4.33	CO, CT, RB (10)	M (7)	Partial (4)	Gradient >1% Outlet Drop	6100m (10)	>70% (10)	No (0)	**41**	**High**
4000Rd Site 49	1.38	DV (10)	M (7)	Partial (6)	Gradient Outflow drop	-	>70% (10)	No (0)	**33**	**Moderate**
459 Rd Site 53	1.22	RB, CT (10)	M (7)	Partial (7)	Gradient 7%	450m (2)	13% (3)	No (0)	**29**	**Moderate**
444 Rd Site 1099	1.07	DV (10)	M (5)	Partial (6)	Gradient Outflow	250m (2)	<50% (2)	No (0)	**26**	**Moderate**
4000Rd Site 37,38, 750	7.28	DV (10)	M (7)	Undeter (2)	Velocity Gradient	-	-	-	**19**	**Low**
459 Rd Site 35	1.17	RB, CT (10)	M (7)	Nil (0)	Not a Barrier, 18cm outlet drop	-	-	-	**17**	**Low**

4000 Road

In total, twelve sites were identified on the 4000 road within the Nilkitkwa Lake Sub-basin to undergo FPCI assessments. Of these sites, nine were located on non-fish bearing streams or NCDs and therefore did not have assessments completed on them. These sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 1. Of the remaining three sites, two were found to be partial barriers to fish passage and the other an undetermined barrier. These sites have been assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 3).

The second highest priority crossing in the Nilkitkwa Lake Sub-basin is located on the 4000 road. This site on unnamed stream WSC 480-410600 has twin pipes set side by side that are a partial barrier. The same stream flows through a set of triple pipes that are also a partial barrier, approximately 880m down-stream on the Old Nilkitkwa Lake Road.

444 Road

Four sites on the 444 road within the Nilkitkwa Lake Sub-basin were identified to undergo FPCI assessments. Of these four sites, three were located on non-classified drainages or non-fish bearing stream reaches and therefore did not have an assessment completed. These sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 3. The remaining site was determined to be a partial barrier to fish passage due to the outlet drop and the culvert gradient. This site has been assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 3).

Old Nilkitkwa Lake Road

In total, six sites were identified on the Old Nilkitkwa Lake Road within the Nilkitkwa Lake Sub-basin to undergo FPCI assessments. Of these six sites, five were located on non-classified drainages and therefore did not have an assessment completed. These sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 3. The remaining site, site 104, was found to be a partial barrier to fish passage. This site has been assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 3).

Site 104 is the highest ranked within the sub-basin. This crossing located on an S3 stream is acting as a partial barrier due to the culvert water velocity and outlet drops. The documentation of coho and the length of new habitat that can be gained by fixing the barrier are the major factors that result in the high-ranking score. The status and

responsibility of this road should be determined before any rehabilitation work on this site begins, as it may not be eligible for Forest Renewal B.C. funding.

448 Road

Only three sites on the 448 Road within the Nilkitkwa Lake Sub-basin were identified as possible FPCI assessment sites. However; all three were located on non-classified drainages or non-fish bearing stream reaches and therefore did not have an assessment completed. These sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 3.

454-A+B Spurs

Due to an oversight by Silvicon Services Inc. on our field-work progress tracking sheets, the culvert sites on possible fish-bearing streams on these spur roads in the Nilkitkwa Lake sub-basin were not visited or assessed. Two sites were missed on the 454-A Spur and one site on the 454-B Spur. All three sites are on inferred S4 streams. This error was not detected until the field cards and notes were assembled and sorted in preparation of the initial FPCI draft report. At that point in time it was too late to return to the field to try and complete the missed sites as it was late November and at least 0.3 m of snow was on the ground.

459 M/L Road

In total, five sites were identified on the 459 M/L Road within the Nilkitkwa Lake Sub-basin to undergo FPCI assessments. Of these sites, three were located on non-fish bearing streams or NCDs and therefore did not have assessments completed on them. These sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 3. Of the remaining two sites, one was found to be a partial and the other was not a barrier barrier to fish passage. These sites have been assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 3).

459-A+B Spurs

Five sites on the 459-A+B Spur roads within the Nilkitkwa Lake Sub-basin were identified as possible FPCI assessment sites. All five sites were located on non-classified drainages or non-fish bearing stream reaches and therefore did not have an assessment completed. These sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 3.

612-10 Spur

Only one site was identified on the CP 612-10 Spur within the Nilkitkwa Lake Sub-basin to undergo a possible FPCI assessment. Feature 94 is on a non-classified drainage and therefore did not have an assessment completed on it. This site has been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 3.

3.4 NICHYESKWA CREEK SUB-BASIN

Roads in PIR's operating area that are eligible under the WRP for FPCI in the Nichyeskwa Creek Sub-basin are all located on the south bank of the sub-basin. The south bank of the Nichyeskwa Creek sub-basin that falls within the Bulkley/Cassiar Forest District covers an approximate area of 15 680 ha. Nichyeskwa Creek is a fifth order stream. The main stem of Nichyeskwa Creek extends westward about 17.5km from the confluence with the Babine River until it reaches the western boundary of the Bulkley/Cassiar Forest District. The sub-basin extends up to 11.75 km southward from the main stem. McElhanney Consulting Services Ltd.(1997) report that sensitive soils along Nichyeskwa Creek and localized occurrences of Class IV and V terrain in the steeper and more mountainous areas of the south bank of the sub-basin have been identified on terrain maps.

Fisheries information for Nichyeskwa Creek was obtained from the "FishWizard" software accessed through the BC Fisheries website. From this website, the following fish species were documented: Dolly Varden (*Salvelinus malma*), rainbow trout (*Oncorhynchus mykiss*), sockeye salmon (*Oncorhynchus nerka*), chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), pink salmon (*Oncorhynchus gorbuscha*) and mountain whitefish (*Prosopium williamsoni*). While bull trout (*Salvelinus confluentus*) was not listed as a species present in Nichyeskwa Creek in the "FishWizard" Stream Report, it is a species which is present in the Babine River watershed. An unpublished government record (reference #: HQ1234) listed in the FishWizard – Reference section reports that Dolly Varden were found in 3 tribs of Nichyeskwa Creek as well as bull trout and a BTxDV hybrid in one tributary. Cutthroat trout were also not identified in the "FishWizard" Stream Report but they are present in Babine Lake and the Babine River watershed and therefore are almost certainly present in Nichyeskwa Creek.

For ease of reference, the information from the data collected at the assessed sites have been summarised based on their priority rank (Table 1). This table acts as a prioritisation summary for FPCI full culvert assessments for the south bank of the Nichyeskwa Creek Sub-basin. Scores are based on a modified version of the FPCI scoring matrix as discussed in the previous section. All culverts are sorted by their priority ranking.

Nichyeskwa Creek Sub-basin, Summary Table 1.

Road/ Site	Stream Width (m)	Fish Species	Habitat Value	Barrier	Barrier Description	Length of New Habitat	% Stream Barred	Limiting to upstream barrier	Total Score	Priority/Ranking 39-55: High 26-38: Moderate 15-25: Low
455 Rd Feature 104	1.31	DC (10)	M (6)	Full (8)	Outlet Drop 33cm/ Gradient	<1km (3)	<50%	No (0)	**32**	**Moderate**
455 Rd Feature 59	1.4	DV (10)	H (8)	Partial (5)	Velocity Gradient	1700m (5)	<50% (3)	No (0)	**31**	**Moderate**
455 Rd Feature 120	0.56	DV (10)	M (4)	Partial (6)	Velocity/ Gradient	500m (2)	<50% (3)	No (0)	**25**	**Low**

454-B Spur

Due to an oversight by Silvicon Services Inc. on our field-work progress tracking sheets, the two culvert sites on possible fish-bearing streams on this spur road were not visited or assessed. This oversight was not detected until the field cards and notes were assembled and sorted in preparation of the initial FPCI draft report. At that point in time it was too late to return to the field to try and complete the missed sites as it was late November and at least 0.3 m of snow was on the ground.

455 Road

Five sites on the 455 road within the Nichyeskwa Creek Sub-basin were identified to undergo FPCI assessments. Two of the five sites are located on non-fish bearing stream reaches and therefore did not have an assessment completed. These sites have been summarised in "Form D – Sites not Assessed Summary Table" in Appendix 4. Of the remaining three sites, two were determined to be partial barriers to juvenile fish passage due to the water velocity in the culvert and the culvert gradient. The remaining site was determined to be a full barrier to fish passage due to the water velocity in the culvert, the culvert gradient and the outlet drop. These sites have been assigned a score and a rank for rehabilitation and can be found in Table 1 as well as in "Form B – FPCI Summary Table" (Appendix 4).

4.0 RECOMMENDATIONS

Rankings of high were given to five sites within the four sub-basins in which the Fish Passage-Culvert Inspections were conducted. The large majority of the sites assessed were ranked as either moderate or low priority. Only two of the sites assessed were determined to be full barriers while four crossings did not present a barrier at all. The sites that are full barriers, Site 16 on the 4000 M/L and feature 104 on the 455 Road, were scored as moderate priority rank. This is due in large part to the fact that there is much less habitat to be gained upstream of the culvert site and that the culverts are located on smaller streams than the highest ranked partial barriers.

Three of the high priority sites are located on the 4000 M/L. These sites are all partial barriers but are ranked high due to the fish species present and the large amount of habitat that exists upstream of the road crossings. Site 104 on the Old Nilkitkwa Lake Road in the Nilkitkwa Lake Sub-basin is also a high priority since it is situated downstream of one of the sites on the 4000 M/L. Although in-stream work for this project will be allotted primarily for those sites ranking high in priority, fish passage issues at some of the moderate priority sites should be addressed if there is a budget for the work.

5.0 LITERATURE CITED

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6.0 APPENDICES

To view appendices please refer to the *Fish Passage – Culvert Inspections For the West Babine, Tsezakwa Creek, Nilkitkwa Lake and Nichyeskwa Creek Sub-basins* **FRBC project number: 720796, located at the Ministry of Water, Land and Air Protection.**

APPENDIX 1 – WEST BABINE SUB-BASIN

APPENDIX 2 – TSEZAKWA CREEK SUB-BASIN

APPENDIX 3 – NILKITKWA LAKE SUB-BASIN

APPENDIX 4 – NICHYESKWA CREEK SUB-BASIN

2.2 FRBC#720775 Effectiveness Evaluation

This project, also known as the Telkwa River Coho Pond Monitoring project, is located in the Telkwa River Chart area at roughly 10 and 11km on the Telkwa River Forest Service Road (1000FSR). The Telkwa Monitoring Project is part of an ongoing effort by Pacific Inland Resources (PIR) and the Department of Fisheries and Oceans (DFO) and the Enhancing Environmental Values Program (EEV) since 1994 to restore and enhance fish habitat in the Telkwa drainage. The monitoring project involves the maintenance, monitoring and recording of data at two previously constructed off channel rearing ponds that were developed by PIR for the over wintering of coho salmon fry.

As part of this activity juvenile coho movements and timing is monitored, population estimates of the rearing ponds have been completed and reported. Environmental factors related to the immigration and emigration of juveniles to the rearing ponds has been completed and reported. Data about the juveniles is recorded and the fry are then released into the pond, outgoing smolts receive the same treatment and are then released into the river. The information collected throughout the term of this project is put together into a report. A copy of the report is included within this document.

This project provides information, and direction on how to proceed with projects of a similar nature on other interior watersheds in the Skeena Region and throughout the province. The information collected will also be used to assist in identifying cost/benefits of EEV funded projects of this nature.

Silvicon Services Inc. has been hired under contract to administer this project. Bustard and Associates have been hired under contract to conduct the studies and activities associated with this project. The standards agreement for Detailed Effectiveness Evaluation of Coho Rearing Ponds is included with this document and is dated for reference September 18, 2001.

BRITISH COLUMBIA

Ministry of Water, Land and Air Protection

Standards Agreement

(For use with Multi-Year or Annual Agreements between the Recipient and Forest Renewal BC)

MINISTRY NUMBER:	**[MINISTRY NUMBER]**	THIS AGREEMENT DATED FOR REFERENCE **09/18/01**
MULTI-YR AGMT NUMBER:	**SBM02112**	
ACTIVITY NUMBER:	**720775 (EFEVOP)**	

FOR: **DETAILED EFFECTIVNESS EVALUATION OF COHO REARING PONDS AT KM 1010 AND 1011 ON THE TELKWA RIVER ROAD**

CONTENTS

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA, (the "Province") as represented by the Minister of Water, Land and Air Protection

Smithers BC
3726 Alfred Ave.
Box 5000, Smithers BC V0J 2N0
Phone Number: (250) 847-7260
Fax Number: (250) 847-7556

AND:

Pacific Inland Resources , (the "Recipient")
Box 3130
Smithers BC, V0J 2N0
Phone Number: (250) 847-2656
Fax Number: (250) 847-5520

both of whom are sometimes referred to as "the Parties" and each of whom is a "Party" to this Agreement.

WHEREAS:

A. The Province wishes the Work described in this Agreement to be carried out for the benefit of Forest Renewal BC.

B. The Recipient seeks to carry out and complete the Work described in the attached Schedule(s).

C. The Recipient has entered or intends to enter into an Annual or Multi-Year Agreement with Forest Renewal BC for the purpose of funding the Work.

THE PARTIES AGREE AS FOLLOWS:

ARTICLE 1 DEFINITIONS

1.01 In this document, the following words have the following meanings:

(a) **"Agreement"** means this agreement including any Schedules;

(b) **"Changed Condition"** means a materially changed physical condition at the Work Area which

i) was not foreseen by the Recipient; and

ii) would not have been reasonably foreseen by a reasonable Recipient who, before submitting its tender, conducted a thorough investigation of the work to be done to complete the Work, including a thorough inspection of the Work and a review of all information available from the Province to persons wishing to submit tenders , but does not include any generally recurring weather conditions ;

(c) **"Contractor"** means the Recipient;

(d) **"Environmental Damage"** means slumping or sliding of land; inordinate soil disturbance; significant deterioration of water quality or other significant damage to the environment; and for the purposes of this definition, "inordinate soil disturbance" and "other significant

damage to the environment" have the meanings, where appropriate, given to them in the Forest Practices Code.

(e) **"Forest Practices Code"** means the Forest Practices Code of British Columbia Act and Regulations and Standards to that Act;

(f) **"Ministry Representative"** means a person appointed pursuant to section 5.01;

(g) **"Occupied Area"** means any Work Area, camp or rest area, or any other area occupied by the Recipient for the purposes of this Agreement;

(h) **"Recipient Representative"** means a person designated pursuant to Article 5.04;

(i) **"Schedule"** means a schedule of this Agreement;

(j) **"Subcontractor"** means a person, firm or corporation contracting with the Recipient to perform a part or parts of the Work, or to supply products worked to a special design according to the Agreement, but does not include one who merely supplies products not so worked;

(k) **"Term"** means the period of time this Agreement is in force pursuant to Article 3;

(l) **"Work"** means all

i) labour, supervision, and administration;

ii) provision of materials, transportation, supplies, tools, and equipment; and

iii) other services and provision of materials

necessary or desirable to perform the services described in each Schedule, and includes any services which are not expressly described which are nevertheless necessary for the proper execution of the work.

(m) **"Work Area"** means individual location, forest stands, or other particular areas or locations where work is to be undertaken and any areas of Crown Land occupied by the Recipient for purposes of the Work;

(n) **"Work Day"** means every day of the week except Saturday, Sunday and statutory holidays.

1.02 If a word defined in section 1.01 is used in a Schedule, it has the same meaning as in this document unless the context dictates otherwise.

1.03 A word or abbreviation which has a well known technical or trade meanings is used in the Schedule(s) in accordance with that recognized meaning.

1.04 The headings in this Agreement have been inserted for reference only. They do not define, limit, alter or enlarge the meaning of any provision of this Agreement.

ARTICLE 2 SCHEDULES AND CHANGES

Schedules

2.01 The Schedules, listed below, apply to and form part of this Agreement

☒ Schedule "A" EEV monitoring Schedule A

Changes

2.02 No change to this Agreement is effective unless it is in writing and signed by the Parties.

Interpretation

2.03 Any reference in a Schedule to a manual or a form is a reference to a manual or form published by or for the Province and includes every amendment to it and any manual or form published from time to time in substitution for it or replacement of it.

2.04 The Forest Practices Code, if applicable, takes precedence over an approved prescription. An approved prescription, if applicable, outlining work covered by this Agreement takes precedence over this document. This document takes precedence over any of its attachments. In the event of a conflict between alike Schedules or other attachments of different dates, the Schedule or other attachments of later date prevails.

ARTICLE 3 TERM OF AGREEMENT AND START OF WORK

3.01 The Term of this Agreement is to start July 23, 2001 and end March 31, 2002 unless otherwise provided in the Schedule(s).

3.02 The Parties may agree to extend the term of this Agreement.

3.03 The Recipient must not conduct any Work under this Agreement until:

(a) the Recipient has entered into a Multi-Year Agreement or Annual Agreement with Forest Renewal BC to fund the Work covered under this Agreement; and,

(b) the Recipient Representative has met with the Ministry Representative to review the Work.

3.04 Time is of the essence in this Agreement.

Schedule of Work

3.05 The Recipient must complete the Work according to the work completion timing schedule of the Work Progress Report(s). The actual date the Province notifies the Recipient to start Work and the continuity of the Work depend on the presence of suitable field conditions to allow the Work to be completed as outlined in the Schedule(s).

ARTICLE 4 STANDARDS AGREEMENT AND MULTI-YEAR/ANNUAL AGREEMENT LINKAGE

4.01 This Agreement constitutes a Standards Agreement as defined in the Multi-Year Agreement or Annual Agreement between the Recipient and Forest Renewal BC dated for reference **TO BE PROVIDED AT A LATER DATE.**

Subcontractor Work

7.08 If the Recipient engages a Subcontractor, the Recipient is not relieved from the subcontracted obligations or any obligations under this Agreement.

7.09 The Recipient must not assign this Agreement, or subcontract any obligations under this Agreement, without prior written notification to the Province.

7.10 The Recipient must notify the Province of the name, office address and office telephone number of the Recipient's Subcontractor(s).

7.11 The actions of any Subcontractor engaged to carry out any of the Work are deemed the actions of the Recipient.

7.12 Nothing in this Agreement creates any direct or indirect contractual relationship between the Province and any Subcontractor.

ARTICLE 8 INDEMNIFICATION AND INSURANCE

Indemnity

8.01 The Recipient must indemnify and save harmless the Province, its employees, agents and authorized representatives, and each of them from and against losses, claims, damages, actions, and causes of action (collectively referred to as "Claims"), that the Province may sustain, incur, suffer or be put to at any time either before or after the expiration or termination of this Agreement, that arises out of errors, omissions or negligent acts of the Recipient or its subcontractor(s), servant(s), agent(s) or employee(s) under this Agreement, excepting always that this indemnity does not apply to the extent, if any, to which the Claims are caused by errors, omissions or negligent acts of the Province, its other Recipient(s), authorized representatives, or any other person.

8.02 None of the Minister of Environment, Lands and Parks or the Ministry Representative in charge, their agents or employees are personally liable for any act performed in the discharge of any duty imposed or in the exercise of any power or authority conferred upon them by, or within the scope of, the Agreement if it can be demonstrated that all reasonable care was exercised in the conduct of the operations; in all such matters these persons act solely as agents and representatives of the Province.

8.03 Neither the Province nor any of its employees or agents are liable to the Recipient or the Recipient's employees or agents for any injury, loss, or damage however occasioned to any of them or their property while being transported or conveyed in any vessel, boat, aircraft owned or operated by the Province The Recipient must not make claims against the Province, its employees or agents to recover any such injury, loss or damage either on its own behalf or on behalf of its employees or agents. The Recipient must indemnify and save harmless the Province, its employees or agents from any such claims initiated by the Recipient's employees or agents.

Insurance

8.04 During the Term the Recipient must carry and maintain insurance coverage as specified in the Recipient's Multi-Year Agreement or Annual Agreement with Forest Renewal BC and, if applicable, as specified in writing by the Province.

ARTICLE 9 PROTECTION OF WORK AND PROPERTY

General

9.01 The Recipient must protect the Work area and property adjacent to any Work Area, from damage and is responsible for damage which may arise as the result of the Recipient's operations under the Agreement, except damage which occurs as a result of:

(a) an error in a Schedule; or

(b) an act or omission of the Province, third parties, or other Recipients, its agent or employees.

Protection of the Environment

9.02 The Recipient must not cause Environmental Damage in carrying out the Work under this Agreement.

9.03 Subject to 9.04, The Recipient is not in breach of 9.02 if:

(a) performing the Work according to an operational plan, or permit issued under the Forest Practices Code; or

(b) the Work performed by the Recipient has been exempted from a requirement to have an operational plan or prescription and the Recipient is carrying out the Work in accordance with the Forest Practices Code.

9.04 If the Recipient encounters circumstances where the Recipient knows or should reasonably know that, due to weather conditions or site factors, proceeding with the Work may, directly or indirectly, cause Environmental Damage, the Recipient must:

(a) immediately suspend the Work that may cause Environmental Damage;

(b) immediately advise the Province of the suspension and circumstances;

(c) not proceed with the Work until the Province so instructs; and

(d) upon the Province's instruction to proceed with the Work, do so in accordance with the Province's instructions.

9.05 The Recipient is not in breach of this Agreement for suspending Work pursuant to Section 9.04.

9.06 If the Recipient causes Environmental Damage while performing Work under this Agreement, the Recipient must:

(a) immediately stop the Work in the area affected;

(b) prevent any further damage to the environment;

(c) immediately notify the Province to the attention of the Ministry Representative; and

(d) take any remedial measures that the Ministry Representative requires.

9.07 The Recipient may resume Work that has been stopped under 9.06 when:

(a) Work can be resumed without violating sections 9.02 and 9.04; and

(b) All remedial measures required under section 9.06 have been carried out to the satisfaction of the Ministry Representative.

ARTICLE 10 GOVERNING LAW

10.01 This Agreement is governed by and is to be construed in accordance with the laws of the Province of British Columbia.

10.02 The Parties will comply with the laws of Canada and British Columbia applicable to the Work and the Work Area.

ARTICLE 11 CHANGES IN CONDITIONS

11.01 If a Changed Condition occurs during the course of the Work, the following applies:

(a) The Parties must immediately advise each other of particulars of the Changed Condition and the Recipient Representative and the Ministry Representative who each have authority to act in respect of that Schedule must meet to attempt to deal with the condition.

(b) If in the opinion of either Party, that Changed Condition is so substantial that amending this Agreement to deal with the change would change the essential nature of the Work, then the Parties must not proceed with the Work in respect of that Schedule any further and that Work must be brought to an end.

ARTICLE 12 WORK COMPLETION AND ACCEPTABILITY OF WORK

Notification of Completion

12.01 The Recipient must, upon completing a phase of the Work, and the entire Work, promptly notify the Province of that completion. The notification must be in writing, and must be delivered to the Province during the Province's normal business hours.

Inspection by the Province

12.02 The Province may, following receipt of the Recipient's notification in 12.01, inspect and determine the acceptability of the Work performed in accordance with a Schedule.

12.03 The Recipient is encouraged, but not required, to observe each inspection while it is being conducted.

12.04 The Province must provide the Recipient with a copy of inspection results.

12.05 The Province reserves the right to inspect at any time, any Work performed.

12.06 Inspections are conducted by the Province in order to determine compliance with the provisions of this Agreement. These inspections are conducted for the sole benefit of the Province, and do not release the Recipient from the responsibility of providing quality control measures to assure that the Work strictly complies with this Agreement.

12.07 The Province and the Recipient may agree on a schedule for the Province to make its determination on the acceptability of the Work and to provide its notification to Forest Renewal BC.

12.08 Notwithstanding 12.07, The Province will make its determination on the acceptability of the Work and notify Forest Renewal BC of their decision within one year of the notification in 12.01.

12.09 The Province is not obliged to make any determination of acceptability before receiving the Recipient's written notification in 12.01.

ARTICLE 13 MEASUREMENT

Method of Measurement

13.01 All linear and area measurements under this Agreement are measured on the horizontal plane.

ARTICLE 14 NON-COMPLIANCE AND TERMINATION

Termination by the Province

14.01 The Province may, in its sole discretion, terminate this Agreement at any time. The Province is not liable for any losses occasioned by that termination if the termination:

(a) occurs before the Ministry Representative receives the written notification of the Recipient that they will commence Work;

(b) is caused by the Recipient's failure to perform or comply with this Agreement;

(c) results from the termination of the Recipient's Multi-Year Agreement or Annual Agreement with Forest Renewal BC; or

(d) is caused by an Act of God, unsuitable weather, natural disaster, withdrawal of labour in labour disputes, or any other unforeseeable cause over which the Province has no direct control.

Termination by the Recipient

14.02 The Recipient may terminate this Agreement if the Recipient's Multi-Year Agreement or Annual Agreement with Forest Renewal BC is terminated, and no claim may be made by the Province against the Recipient for any losses occasioned by that termination.

Mutual Termination

14.03 This Agreement may be terminated at any time by the mutual consent of the Parties.

14.04 If a party is unable to perform any obligation under this Agreement because of an Event of Force Majeure (as that term is defined in the Recipient's Multi-Year Agreement with Forest Renewal BC), that inability shall not be a default under this Agreement.

Non-Compliance with Agreement Provisions

14.05 If, in the opinion of the Province, the Recipient fails to perform or fails to comply with any of its obligations under this Agreement, the Province may, in its discretion do one or more of the following:

(a) require the Recipient to re-work the area or phase of work;

(b) permit the Work to continue, giving the Recipient a time limit for compliance, rectification or both;

(c) order the Recipient to stop the Work until the alleged failure of compliance is dealt with according to the Province's requirements;

(d) specify on Quality Certificate(s) that the Recipient failed to perform or comply with one or more of its obligations;

(e) terminate all or part of this Agreement.

These remedies are in addition to any other remedies available to the Province.

14.06 The Province may inspect any re-worked area or phase of the work. The results of that inspection supersede any previous inspection results.

ARTICLE 15 DISPUTE RESOLUTION

15.01 If a dispute occurs between the Parties concerning any matter governed by this Agreement, the disputing Party must promptly advise the other Party and the Parties together must use all reasonable efforts to resolve the dispute.

15.02 Despite section 15.01, the Ministry Representative may give the Recipient instructions that, in the reasonable opinion of the Ministry Representative, are necessary to provide for the proper performance of the Work. The Recipient must act immediately to carry out the instructions, but any work performed by the Recipient in this respect is without prejudice to any claim the Recipient may have concerning the dispute.

15.03 If the Parties are unable to resolve the dispute informally within five Work Days, then the Recipient must give to the Ministry Representative written particulars of the complaint, which must include the following:

(a) a detailed description of the nature of the complaint;

(b) a list of the relevant provisions of the Schedule(s); and

(c) an evaluation by the Recipient of the matters in dispute.

15.04 The Province must, within 20 Work Days of receipt by the Ministry Representative of the written particulars, advise the Recipient, in writing, of any one of the following:

(a) that the Province accepts the position of the Recipient; or

(b) that the Province rejects the position of the Recipient.

15.05 If the Province accepts the position of the Recipient, the Parties will amend this Agreement if necessary and the Province will advise Forest Renewal BC .

15.06 If the Province rejects the Recipient's position, the Parties must retain a mutually agreed upon person to make a written recommendation to resolve the dispute. Any costs associated with retaining that person must be jointly paid by the Parties.

15.07 If after a review of the written recommendation, the Parties agree on a resolution of the dispute, the Parties must amend this Agreement if necessary and the Recipient must provide Forest Renewal BC with a copy.

15.08 If after a review of the written recommendation, the Parties are unable to resolve the dispute and the dispute is with respect to payment only, this dispute is deemed to be between the Recipient and Forest Renewal BC, and the Recipient's position and the written recommendation must be forwarded to Forest Renewal BC. Despite the foregoing, the resolution of a dispute under a Multi-Year Agreement or Annual Agreement does not prejudice any claim the Province may have against Forest Renewal BC in respect of the Work.

15.09 A copy of the written recommendation and the Province's position may be forwarded by the Province to the appropriate professional association.

ARTICLE 16 MISCELLANEOUS

Confidentiality

16.01 The Recipient must treat as confidential all material that has been produced or received by it or any Subcontractor as a result of this Agreement (collectively the "Material") and not permit its disclosure without the Province's prior written consent except as required by applicable law, including the *Freedom of Information and Protection of Privacy Act*.

Ownership

16.02 The Material and any equipment provided by the Province to the Recipient or a Subcontractor as a result of this Agreement is the exclusive property of the Province. The Recipient must deliver it to the Province immediately following expiration of this Agreement, or sooner upon the Province's request, in the same condition it was supplied to the Recipient, excepting always loss or damage attributable to reasonable wear or tear.

Copyright

16.03 The copyright in the Material belongs exclusively to the Province. Upon the Province's request, the Recipient must deliver to the Province documents satisfactory to it waiving in the Province's favour any moral rights which the Recipient or Subcontractors or their employees may have in the Material and confirming the vesting of the copyright in the Province.

Recipient Status

16.04 Except as otherwise provided in this Agreement, the Recipient is not subject to the control of the Province in respect of the manner in which the Work is carried out.

16.05 The Recipient must not purport to commit the Province to the payment of any money to any person.

16.06 The Recipient must ensure all personnel hired by the Recipient to perform the Work are at all times employees of the Recipient and not of the Province.

Notices

16.07 Any notice or document required to be given under this Agreement is conclusively deemed validly given or delivered to and received by the Parties

(a) if hand delivered personally, on the date of that personal delivery;

(b) if mailed, on the fifth business day after the mailing of the same in British Columbia by prepaid post to the addresses set out in this Agreement (or at such other address as either Party may from time to time designate by notice in writing to the other); or

(c) if sent by facsimile transmission, when transmitted, only if transmitted to the facsimile machine numbers first above written. The onus of proving transmission and receipt lies with the transmitting Party.

Non-Waiver

16.08 A waiver of any provision of this Agreement or a waiver of a breach by a Party of any provision of this Agreement is effective only if it is in writing and signed by the other Party.

16.09 A written waiver by either Party of any provision of this Agreement or of any breach by the other Party of any provision of this Agreement is not a waiver of any subsequent breach of the same or any other provision of this Agreement.

Recipient Provisions

16.10 Except as specified in the Schedule(s), the Recipient must undertake all Work and furnish all labour, equipment, supervision, transportation, supplies and incidentals necessary to perform the Work.

Unsuitable Workers

16.11 The Recipient must ensure all persons employed to perform the Work are competent, adequately trained , fully instructed and supervised, and legally entitled to work in Canada.

16.12 The Recipient must, upon request of the Ministry Representative, remove any person it employs for purposes of the Agreement who, in the reasonable opinion of the Ministry Representative, is incompetent or has conducted himself or herself improperly, and the Recipient must not permit a person who has been so removed to perform any further Work.

Survival of Terms

16.13 Sections 7.01, 7.02, 8.01, 8.02, 15,01, 15.02 and 15.03 will, despite the expiration or earlier termination of the Term of this Agreement, remain and continue in full force and effect.

Site Clean Up

16.14 The Recipient must maintain the Work Area free from accumulations of waste products or debris, other than that caused by the Province, other recipients or third parties.

16.15 Upon the Recipient vacating the Work Area, the Ministry Representative may determine , at his or her sole discretion, whether or not the area was left in an acceptable condition.

16.16 If the Ministry Representative determines the Recipient left the Occupied Area in an unacceptable condition, the Province may repair the area or remove waste products or debris and recommend to Forest Renewal BC a deduction in payment to the Recipient equal to the cost of repairs or removal

Camping and Parking

16.17 Use of Provincial Crown forest land, including any roads, landings or Ministry of Forests recreational sites, by the Recipient, the Recipient's employees or agents for the purposes of lodgings, camping, vehicle parking or trailer parking in connection with Work under this Agreement, is permitted only with prior written approval of the Ministry Representative. That use, if approved, must be without charge to the Recipient; but, the approval may be revised or revoked at any time by the Province.

16.18 **Powers Cumulative**

The powers set out in the Schedule(s) for the Province to enforce the Recipient's compliance with this Agreement may be exercised separately, concurrently, or cumulatively.

IN WITNESS OF WHICH the Parties have duly executed this Agreement as of the date first above written.

SIGNED AND DELIVERED
on behalf of the Province by an authorized representative of the Province

Authorized Signatory
Ministry of Environment, Lands and Parks

SIGNED AND DELIVERED
by or on behalf of the Recipient (or by an authorized signatory of the Recipient)

Recipient or Authorized Signatory

BRITISH COLUMBIA

Ministry of Environment, Lands and Parks

Quality Certificate

For inspection of [INSERT ACTIVITY TYPE HERE]work delivered under Standards Agreements

A) IDENTIFICATION

Standards Agreement No.		Activity	
District		Licencee/Proponent	
Project No.		Date	

B) ITEMS INCLUDED IN QUALITY CERTIFICATION:
(MINISTRY STAFF LIST TYPE OR UNIT)

C) DELIVERABLE(S) INSPECTED: _____
(Quality Monitor list type or unit)

	All deliverables received	☐YES ☐NO
2.	Overall quality of deliverable	%
3.	Normal payment percent equivalent if different than #1 above	%
4.	Deliverable requires reworking	☐YES ☐NO
5.	Estimated cost of rework required (write in N/A if none required)	$
6.	Payment recommended, based on percentage of quality	%

7. Comments (use back of this sheet if necessary):

CERTIFICATE
COMPLETED BY: _____ _____
)A Auditor Printed Name Signature and Date
ACCEPTED BY: _____ _____
try Representative Printed Name Signature and Date

SCHEDULE "A" - SERVICES

1.0 SCOPE OF WORK

The Telkwa drainage has been the focus of fish habitat restoration and enhancement efforts by Pacific Inland Resources (PIR) and the Department of Fisheries and Oceans (DFO) and the Watershed Restoration Program (WRP) since 1994. The goal of the WRP is to maintain and monitor the projects that have been constructed in the Telkwa Watershed that will provide information, and ultimately direction, on how to proceed with projects of a similar nature on other interior watersheds in the Skeena Region and throughout the province. The monitoring information will also be used to assist in identifying cost/benefits of WRP funded of projects of this nature.

This contract facilitates the continuations of monitoring two fish habitat rehabilitation projects previously constructed in the Telkwa Watershed.

Specifically, two projects have been identified. They are:

1. Rearing Pond Monitoring km1010, Telkwa FSR;
2. Rearing Pond Monitoring at km 1011 Telkwa FSR;

2.0 Project Term:

The term of this contract will be from **May 1, 2001** to **March 31, 2001.**

3.0 Technical Monitor:

The principal technical monitor will be:

WRP Fisheries Specialist
BC Environment, Skeena Region
Box 5000
Smithers, BC V0J 2N0

Phone:(604) 847-7337
Fax: (604) 847-7556

4.0 PROJECT TASKS AND DELIVERABLES

4.1 Rearing Pond Monitoring - km 1010 and km 1011, Telkwa FSR

4.1.1 Scope

Juvenile movements and timing will be monitored, population estimates of the rearing ponds will be completed and reported. Environmental factors related to immigration and emigration of juveniles to the rearing ponds will be investigated, reported. From the investigations, recommendations will be given for maintenance and or improvements to the project sites.

4.1.2 Tasks

The Contractor will:

a. Repeat mark recapture population estimation similar to those completed from 1994 to 1997 at the km 1010 and km 1011 ponds also described in Juvenile Coho studies at the Telkwa River km 1011 Ponds (Bustard, 1996), and ;

b. Install a fence at the outlet of the km 1011 rearing ponds to capture all fish moving in or out during juvenile migrations in the spring and compare fence results to mark recapture estimate.

c. Relate movement patterns to water temperatures and flow regime of the Telkwa River.

Note: The Contractor must remove all fencing material upon completion of the trapping operations that will ensure free migration of aquatic animals

4.1.3 Deliverables

Based on the Tasks in Paragraph 4.1.2 of this Schedule "A", the Contractor will provide the Province with the following deliverables:

a. Three (3) copies of a report summarizing the findings from the spring fence monitoring. One (1) report will be submitted electronically (MS Word 7 on CD ROM) and two (2) will be hard bound copies.

b. The report format {4.1.3 (a)} will follow the format presented in *Juvenile Coho studies at the Telkwa River km 1011 Ponds* (Bustard, 1996). This report will be presented to the Technical Monitor and the WRP Fisheries Specialist by November ***15, 2001***

JUVENILE COHO STUDIES AT THE

TELKWA RIVER PONDS

YEAR 2001

Prepared by

DAVID BUSTARD AND ASSOCIATES LTD.

for the

WATERSHED RESTORATION PROGRAM

PROVINCE OF B.C.

PACIFIC INLAND RESOURCES a division of

WEST FRASER MILLS LTD.

October 2001

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 Background

Studies were conducted at two off-channel ponds located on the Telkwa River floodplain approximately 17 and 18 kms southwest of Smithers. The main pond complex is located at Km 1011 on the Telkwa Forest Road while the second area is located across the Telkwa River from Km 1010.

1.1.1 Km 1011 Ponds

The Km 1011 Ponds were constructed in 1993 by the Department of Fisheries and Oceans (DFO) as a pilot juvenile coho enhancement project. A special feature of the ponds was the development of intake protection screening to prevent beavers from blocking outlet culverts and restricting fry recruitment into the ponds (Finnegan and Marshall 1997). The inlet channels were extended in 1995 as compensation for impacts from Pacific Northern Gas Ltd.'s pipeline crossing of the Telkwa River near this location. The total wetted area of the pond complex is 8700 m^2.

Further modifications of Km 1011 were undertaken in 1997, with the development of a connection between Channels 1 and 2 to increase the overwinter groundwater flows into Channel 2 (Figure 1). This connection was made in an attempt to raise overwinter dissolved oxygen concentrations to more suitable levels in Channel 2 for fish survival.

Additional fencing was installed in the connecting creek between the upper and lower ponds during November 2000 to deal with problem beaver dams in this section. Beaver dam removal in the connecting creek between the two ponds continued through the 2001 season. During the first week of May 2001, the outlet berm, consisting mainly of sand, was washed out due to high flows from the removal of a beaver dam. This berm was re-built during the same week and protected with rip-rap.

Coho populations have been monitored at Km 1011 for the past eight years using mark-and-recapture estimates. The results to date indicate that the pond development has successfully created suitable coho habitat. Estimates of pre-smolt coho numbers conducted in early May just prior to the out-migration period indicate that production in the ponds has increased from just over 200 coho pre-smolts prior to development in 1993 to between 1100 and 2800 pre-smolts following development (Bustard 2000).

Monitoring of the smolt out-migration as well as fry and yearling immigration has been undertaken at traps in the outlet stream since 1996. The smolt migration catches have only been close to the pre-smolt mark-and-recapture estimates in one year (1997). Problems with the pond outlet culvert in 1996 as well as the possibility that many of the smaller pre-smolts remain in the ponds longer than we have assumed may account for some of the differences observed. Some predation problems were encountered at the downstream trap during 1999.

Upstream trapping results to date indicate that newly-emerged fry and yearlings move into the pond complex from mid-May through July. Both fry and yearling numbers were down sharply in 1998, corresponding with poor coho spawner escapements in the upper Skeena tributaries for the previous two years. The higher coho spawner escapments in 1998 and 1999 have accounted for increased fry recruitment in 1999 and again in 2000 when over 3000 fry migrated into the ponds. This is the highest recruitment to date.

1.1.2 Km 1010 Pond

The Km 1010 Pond complex was developed in the fall of 1997. Trapping during early May 1998 indicated little use of the pond, presumably due to poor access for upstream migrants past the outlet culvert (Bustard 1998). Trap boxes similar to those used at Km 1011 were installed in 1999.

Results in 1999 and 2000 indicated that juvenile coho movements occurred in late May through to the end of trapping in early July. The immigration of fry started later than in Km 1011, presumably reflecting cooler water temperatures in Km 1010 Pond. Coho fry access to the Km 1010 Ponds has been restricted due to an impassable drop at the outlet culvert up until the fall of 2000.

Modifications to the complex to improve access into the ponds were carried out in November 2000. These modifications included relocating and extending the outlet channel connecting to the Telkwa River, adding large debris to create an eddy at the Telkwa confluence, and installing a culvert at the pond outlet that is passable to coho fry (i.e., no drop and low velocity). The entire outlet creek has been fenced to restrict beaver activity.

The wetted area of the Km 1010 pond complex is approximately 2200 m^2.

1.2 Study Objectives

The study objectives for the 2001 work were as follows:

1.) To undertake a sixth year of coho smolt enumeration at Km 1011 Ponds and a third year of assessing coho smolt movements out of Km 1010 Pond.

2.) To compare mark-and-recapture population estimates that have been conducted for the past eight years to the actual number of coho smolts leaving the two systems.

3.) To measure the extent and timing of fry and yearling immigration into the two pond complexes.

Funding for the project was provided by the Watershed Restoration Program (Province of B.C.) through Pacific Inland Resources a division of West Fraser Mills Ltd.

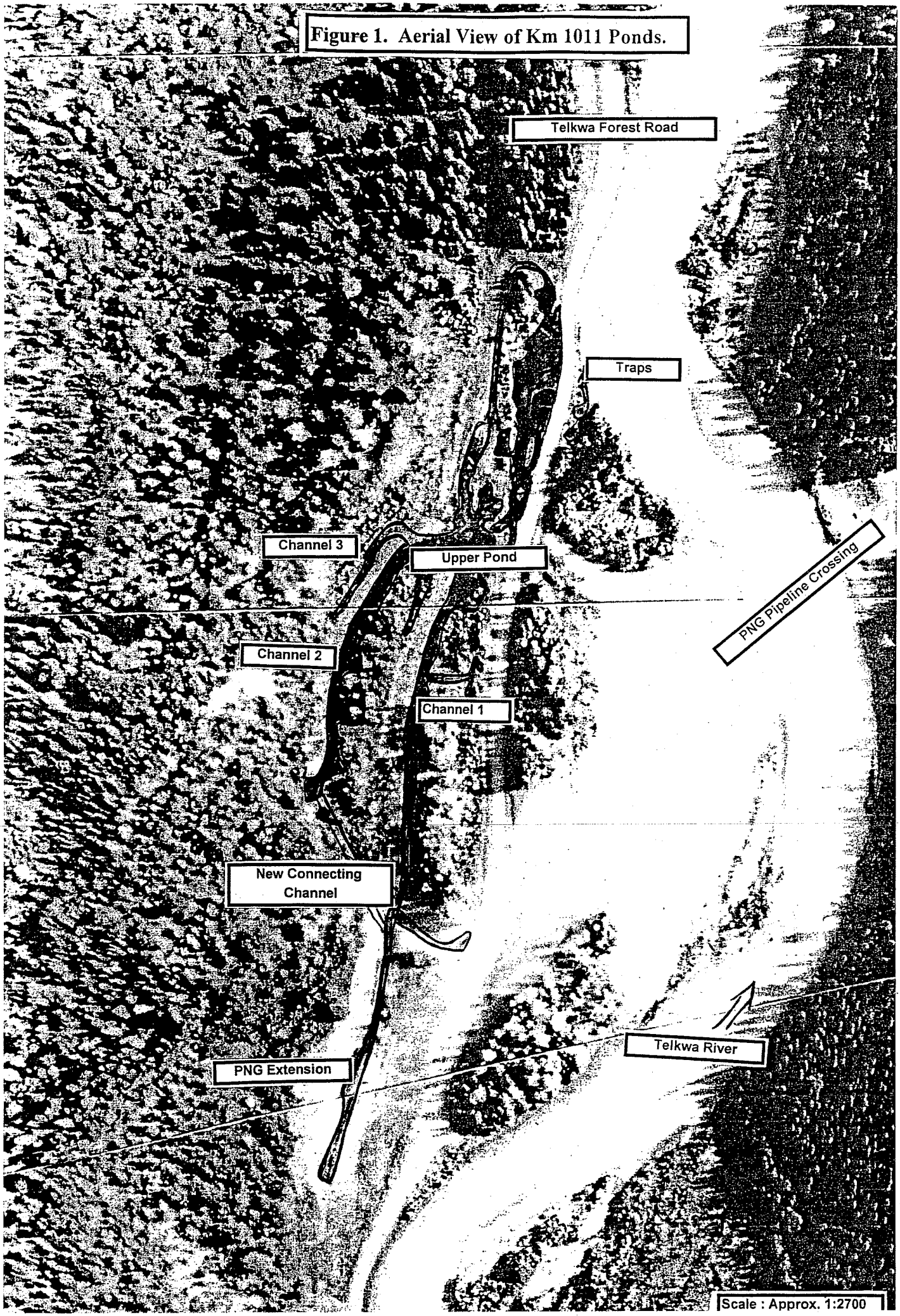


Figure 1. Aerial View of Km 1011 Ponds.

2.0 METHODS

2.1 Timing

Field studies were initiated on May 1st at Km 1011 Ponds, but a washout at the outlet pond and reconstruction of the berm delayed installation of the traps at this site until May 7th. Trap monitoring was conducted daily at both ponds until the end of June. The traps were then checked approximately every second day until the middle of July.

2.2 Water Temperature and Discharge

Methods of recording water temperature and discharge at Km 1011 Ponds were identical to those used for the past six years and are described in Bustard (1996). The staff gauge on the Telkwa River was left in place overwinter, so levels correspond to those recorded since 1997.

The re-construction of the outlet channel in Km 1010, has led to some differences compared to past years. Streamflows enter the channel from two culverts located at the south end of the ponds as well as through the downstream trap box located in the mid-section of the pond. A staff gauge was installed on the outlet trap box. During the trapping period flows at the outlet culverts were restricted to the smaller culvert and controlled using a plywood cover to ensure adequate flows through the trap box, and fine screening to restrict fry access past the culverts when trapping was underway. Discharge was measured at the trap box similar to the bucket method used at Km 1011, but this estimate only represents a portion of the outlet discharge. Water temperatures were recorded daily in the outlet stream downstream from the trap boxes using a pocket thermometer.

Thermographs were installed at 0.5 m depth in the lower pond at Km 1011 and in Km 1010 Pond on April 19th and removed on September 21st. Both ponds were ice-covered at the time of thermograph installation.

2.3 Mark-and-Recapture Estimates

2.3.1 Km 1011

Sampling methods using minnow traps to conduct estimates were identical to those used in past years. The marking was conducted on May 10-11th and the recapture was done on May16-17th. The timing of these estimates was slightly later than most years. The surveys were delayed to account for the cool weather conditions persisting through the spring of 2001. All fish captured were marked with an upper caudal clip.

A total of 75 minnow traps baited with roe were used for both the mark and the recapture phases. Population estimates were conducted using the Chapman modification to the Peterson formula (Chapman 1951), and the 95% confidence intervals were calculated

using the standard error of the estimate (Robson and Regier 1971). The estimates were separated by pond section and for coho less than 75 mm fork length. This is the size break-off that has been used for the previous eight years to separate those coho probably remaining in the ponds for an additional year versus those expected to leave as smolts within the next six weeks.

2.3.2 Km 1010

A mark-and-recapture population estimate was initiated at Km 1010 on May 27-29th. A total of 20 minnow traps baited with roe were use to capture fish for the marking phase. Ten traps were set in the pond with five traps set in each of the inlet creeks entering the top of the pond. All fish captured during the first phase were marked with an upper caudal clip.

Due to the very small number of fish captured at both locations, the recapture portion of the study was not conducted and no estimates were made of populations in the pond.[1]

2.4 Upstream and Downstream Traps

2.4.1 Km 1011

The same upstream and downstream trap boxes that were used for the previous five years were installed in the short section of the outlet stream located between the road and the mainstem Telkwa River (Figure 1). A description of the trap configuration is given in Bustard (1996).

All fish captured were sorted by species, counted, examined for marks and released in the direction of capture. Fork lengths from a sample of fry and yearlings (to a maximum of 30) were measured daily. All coho smolts were measured to the nearest millimeter.

Weights were retained from 769 coho smolts, and a large sample of coho fry and yearlings, and all other fish species encountered during the study. Scales were retained from the first six coho smolts measured on each date for aging for a total of 237 fish. The results of the 2001 aging analysis are not available to date[2]. However, the age summaries from 49 coho smolts sampled in 2000 have been included in this report.

[1] No fish were captured in the 10 traps set in the pond. A total of 6 Dolly Varden and four coho were captured in the 10 traps set in the inlet creek.

[2] Submitted to Greg Bonnell, Department of Fisheries and Oceans, Vancouver, B.C.

2.4.2 Km 1010

The same upstream and downstream boxes were used as in previous years at Km 1010. However, the downstream box was located in a separate exit from the pond in a location mid-way upstream on the outlet stream. Fine-meshed netting and a plywood cover prevented smolts from exiting through the culverts.

The upstream trap box was located adjacent to the downstream box and was fed from the upper pond through a PVC pipe. Due to the berm design, the box could not be located above the downstream trap, and we noted some confusion for fish moving upstream. On June 12th, we constructed a second upstream box and fencing and installed it on the channel flowing from the culvert. Both upstream traps were maintained after this date until July 16th, and the catches in the two traps were combined.

All fish moving upstream in Km 1010 were handled similarly to methods outlined for Km 1011. Weights were obtained from 133 coho smolts, and scales were retained from 103 coho smolts. Age data for the 2000 smolts has been included in this report, but the 2001 data is not available to date.

2.5 Other Observations

Observations of wildlife species (including amphibians) associated with the pond complexes were noted and are summarized in Appendix 5 Tables 1 and 2.

3.0 RESULTS

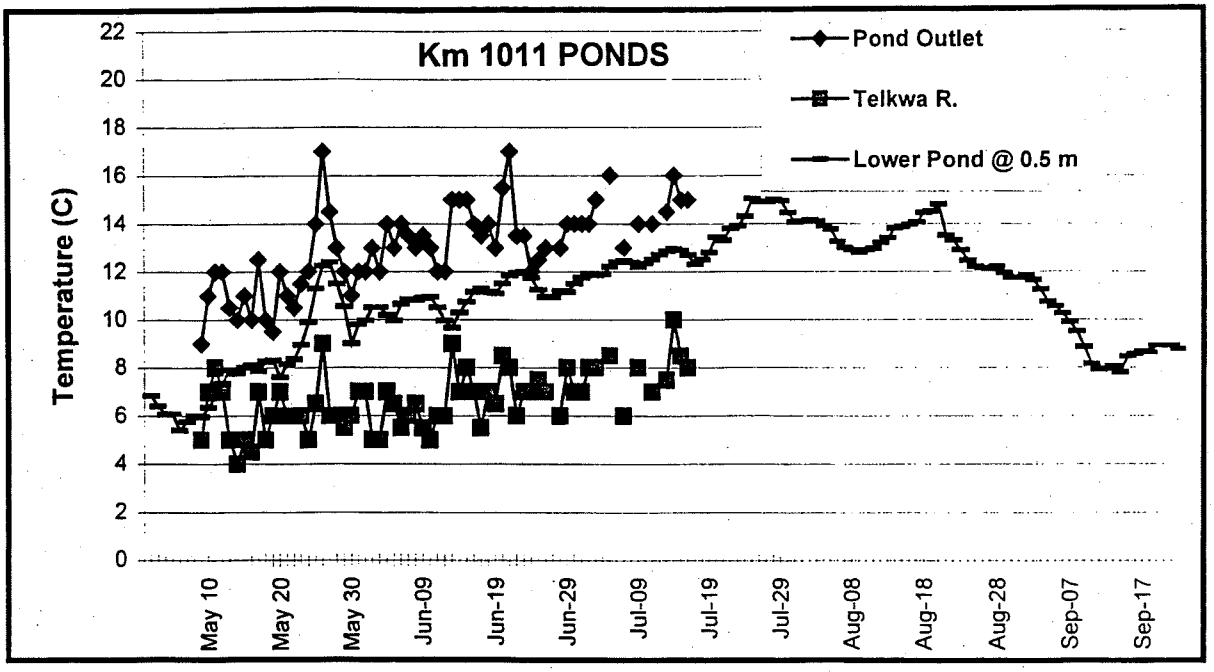
3.1 Water Temperature and Streamflow Summaries

Water temperatures collected during the studies are summarized in Figure 2 with a more complete record in Appendix 1 Tables 1 and 2.

Water temperatures in Km 1011 Ponds in 2001 tended to be cooler than past years for all months (Table 1). The highest temperature recorded in the ponds was 15° C during late July and early August. Telkwa River water temperatures did not exceed 10° C during the period up to mid-July 2001. Water temperatures in the outlet creek exceeded 17° C on several occasions.

Mean monthly water temperatures in Km 1010 Pond were approximately 3-4° C cooler than in Km 1011. This pattern has persisted for the three years of measurements at Km 1010. The highest temperature in the pond was 12° C during late July (Figure 1). Water temperatures in the pond corresponded quite closely to those measured in the Telkwa River. After late May, the outlet creek was 2-4° C warmer than in the pond and the Telkwa River.

Figure 2. Water Temperatures in Km 1011 and Km 1010 Ponds and the Telkwa River 2001.



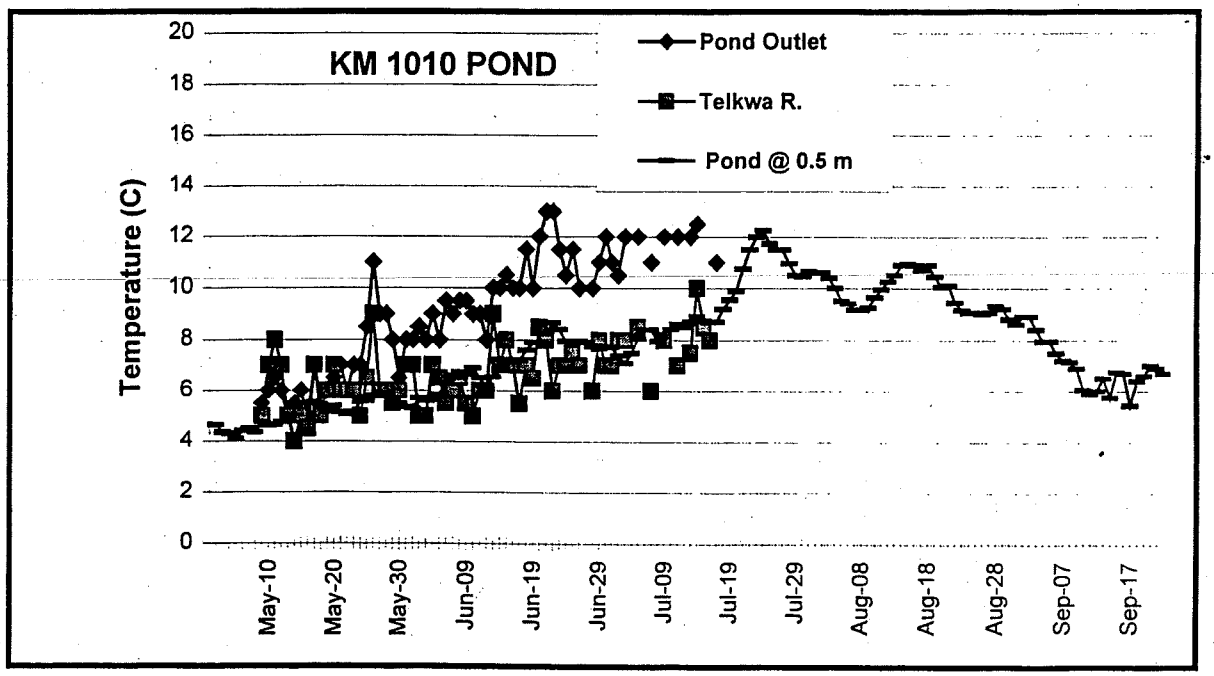


Table 1. Mean Monthly Water Temperatures in Km 1011 and Km 1010 Ponds Compared to the Mainstem Telkwa River During the Period of Record.

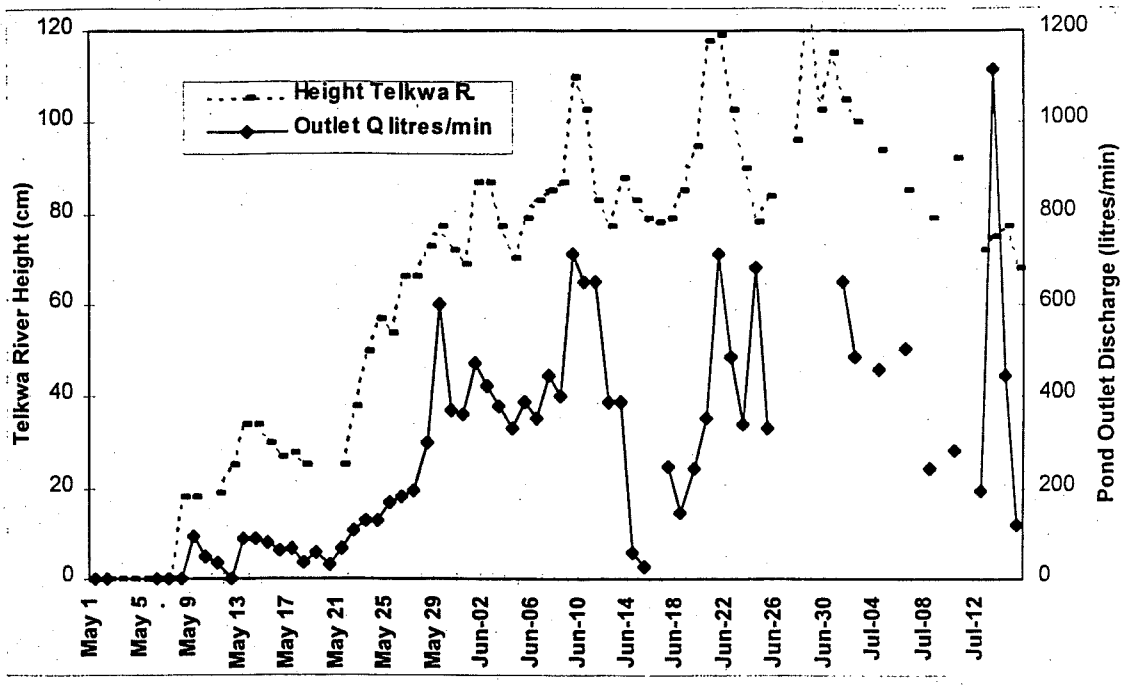
	Km 1011[3]					
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
May	10.2	10.6	13.4	9.7	10.7	8.3
June	12.5	13.0	16.3	12.8	13.6	11.0
July	14.7	14.8	17.3	15.7	15.4	13.2
Aug	13.8	14.6	15.3	14.9	14.4	13.2
Sept	11.1	10.8	11.6	10.3	10.2	9.2
Oct				5.6	8.2	
	Telkwa River					
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
May	6.3	5.6	6.0	4.8	6.8	6.1
June	6.5	7.9	9.7	6.0	7.7	6.7
July	8.5	10.4	11.2	nm[4]	11.5	8.0
Aug	nm	nm	nm	nm	nm	nm
	Km 1010					
				1999	**2000**	**2001**
May				3.5	5.0	5.1
June				6.2	8.6	7.2
July				8.5	10.6	9.5
Aug				8.7	9.9	9.8
Sept				5.6	5.9	6.9
Oct[1]				3.5	4.6	

Km 1011 discharge estimates are summarized in Figure 3, with more detailed information provided in Appendix 1 Table 1. An early peak of discharge was measured in the outlet on June 9th (660 l/min). This is very close to the June 11th peak of 700 l/min noted in 2000 (Bustard 2000). However, the Telkwa River peaked very late in 2001 (last week of June), and flows were not measureable in the traps since they were partially inundated at this time. The high flows measured in the outlet creek during mid-July were the result of opening a beaver dam in the connecting creek. Beaver activity during late June and early July resulted in erratic flow conditions in the outlet creek.

[3] Located at 0.5 m depth in lower pond. Thermographs recorded data to mid-September with the exception of 1999 (recorded to Oct 15th) and 2000 (recorded to Oct 2).

[4] 1999 surveys ended on June 16th due to flooding through the ponds.

Figure 3. Telkwa River Water Levels[5] Versus Km 1011 Outlet Flows, 2001.



Discharge estimates were recorded at the trap in Km 1010, but not in the outlet to the culverts. The data (Appendix 1 Table 2) indicates that flows through the trap alone were higher than at Km 1011 (up to 1200 l/min). Observations indicate that unlike Km 1011, the outlet creek at Km 1010 appears to flow throughout the summer. For example, during a site visit on September 22, Km 1010 had significant flows while the outlet to Km 1011 was dry.

3.2 Fish Sampling Results

3.2.1 Pond Mark-and-Recapture Population Estimates

3.2.1.1 Km 1011 Population Estimates

Juvenile coho were captured in all sections of the Km 1011 Pond complex during the mark-and-recapture population estimates in 2001. In total 499 coho were captured in 150 traps set during the sampling in May (Table 2). This corresponds to 3.3 fish/trap and is in the low end of a range of between 1.4 and 9.9 fish/trap measured since 1994.

Catch per unit effort (CPUE) was highest in the two ponds, the connecting creek and in Channel 2 (Table 2). CPUE continues to be very low in the PNG extension channels. Catches have remained low in these channels since 1998, suggesting that recruitment is

[5] Water levels were measured daily at a staff gauge located on the mainstem Telkwa River approximately one km upstream from the Km 1011 outlet.

Table 2. Summary of Coho Captured in Minnow Traps in Sections 1 to 8 of Km 1011 Ponds, May 1994 to 2001.

	Number of Traps	Coho Captured								Coho CPUE							
		1994	1995	1996	1997	1998	1999	2000	2001	1994	1995	1996	1997	1998	1999	2000	2001
1 Lower Pond	**30**	160	180	284	152	207	107	234	151	5.3	6.0	9.5	5.1	6.9	3.6	7.8	5.0
2 Creek-Debris	**10**	102	74	201	56	116	17	62	46	10.2	7.4	20.1	5.6	11.6	1.7	6.2	4.6
3 Creek-Rock	**10**	61	55	137	29	78	8	83	36	6.1	5.5	13.7	2.9	7.8	0.8	8.3	3.6
4 Upper Pond	**20**	99	92	234	56	73	30	69	83	5.0	4.6	11.7	2.8	3.7	1.5	3.5	4.2
5 Channel 1	**20**	98	54	141	36	76	14	27	40	4.9	2.7	7.1	1.8	3.8	0.7	1.4	2.0
6 Channel 2	**20**	115	92	84	55	84	11	56	101	5.8	4.6	4.7	2.8	4.2	0.6	2.8	5.1
7 Channel 3	**20**	130	110	84	63	77	17	77	38	6.5	6.1	8.4	3.2	3.9	0.9	3.9	1.9
8 PNG Extension*	**20**			88	100	31	1	15	4			11.0	5.0	1.6	0.1	0.8	0.2
TOTAL		**765**	**657**	**1253**	**547**	**742**	**205**	**623**	**499**	**5.9**	**5.1**	**9.9**	**3.6**	**4.9**	**1.4**	**4.2**	**3.3**

* No traps were set in the PNG Extension in 1994 and 1995. The channel was built in 1995.

Only 18 traps were set in Channel 3 in 1995.

1996 totals include 18 traps in Channel 2, 10 traps in Channel 3 and 8 traps in the PNG Extension.

not occurring through the connecting channel constructed during 1997 into the top end of Channel 2.

The only other fish species captured during the mark-and-recapture were peamouth chub. A total of 26 peamouth chub were sampled (Appendix 3 Table 6) and comprised approximately 5% of the overall pond catch. This is the same number of chub as sampled in 2000.

Table 3 summarizes the results of the population estimate by size category with a more detailed breakdown by section presented in Appendix 2 Table 1. The total population estimate for all coho was 1386 fish (95% confidence intervals of 971 to 1801). Of this, 1281 (92%) were 75 mm or larger. We assume that many of these fish would be leaving the ponds as smolts within six weeks of the May estimates[6].

Table 3. Juvenile Coho Population Estimates in Km 1011 Ponds, May 2001.

SECTION	SIZE CATEGORY	M[7]	C[8]	R[9]	N[10]	SE (N)	95% C.I[11].
TOTAL	<75 mm	28	21	5	105	34.3	67
	>74 mm	272	168	35	1281	177.4	348
Combined	**all sizes**	**300**	**189**	**40**	**1386**	**211.7**	**415**

The total estimated population of coho in the ponds compared to previous sample results since 1993 is presented in Table 4. The results indicate that the overall estimate of coho in 2001 was in the lower end of the range of estimates since pond construction in 1994.

The mean fork length of coho sampled during the mark-and-recapture studies is shown in Table 5. The mean size of the >74 mm category was 105 mm, exceeding measurements for all past years except 1999.

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[6] Based on the large smolts sizes noted since 1998, the assumption that all fish >74 mm in early May leave as smolts presumably results in an over-estimate of the number of smolts leaving the ponds on any given year.

[7] M refers to the number of coho initially marked.

[8] C refers to the total number of coho recaptured.

[9] R refers to the number of recaptured coho with marks.

[10] N refers to the population estimate.

[11] C.I. refers to confidence intervals.

Table 4. Juvenile Coho Population Estimates in Km 1011 Ponds, May 1993 to 2001.

Year	Juvenile Coho Estimates		
	>74 mm (95% CI)	<75 mm	Combined
1993[12]	222 (179-263)	964	1186
1994	2304 (1777-2832)	336	2640
1995	1549 (1223-1875)	296	1845
1996	2820 (2163-3477)	1484	4304
1997	1124 (845-1403)	271	1395
1998	1806 (1452-2160)	107	1913
1999	961 (448-1474)	0	961
2000	2334 (1666-3001)	113	2447
2001	1281 (933-1629)	105	1386

Table 5. Mean Fork Lengths of Coho Sampled During the Mark-and-Recapture Population Estimate in the Km 1011 Ponds May 1993 to 2001.

	<75 mm		>74 mm (pre-smolts)	
	fl (mm)	n	fl (mm)	n
1993	Pre-construction			
1994	66.3	63	100.6	648
1995	70.2	47	99.6	533
1996	65.9	472	89.9	752
1997	68.6	91	93.8	411
1998	68.4	40	100.9	692
1999	na	0	116.3	205
2000	70.1	28	100.1	557
2001	69.6	49	105.6	440

[12] Prior to the development of the Km 1011 Pond complex.

3.2.2 Fish Upstream Movements

3.2.2.1 Km 1011 Upstream Migrants

In total 1130 fish moved upstream into Km 1011 Ponds during the May to mid-July period (Table 6). Juvenile coho were the only fish species moving into the ponds in 2001 (Appendix 3 Table 5). Upstream migrants were comprised of a combination of fry (773) and yearling fish (357). The numbers of coho fry and yearlings moving upstream were at the low end of the range for past years.

Although the first coho fry were present at the upstream trap on May 10th, consistent movements did not occur until May 23rd (Appendix 3 Table 1). Similar to most past years the greatest fry and yearling upstream movements occurred during June. Small numbers of upstream migrants continued to enter the ponds until the traps were closed in mid-July so a complete estimate of the number of upstream immigrants into the ponds is not available for 2001.

Similar to previous years, fry migration into the ponds tended to increase as flows increased in the Telkwa River in May (Figure 4). After this period, migrant numbers did not directly reflect changes in flow conditions.

A summary of upstream coho migrant fish lengths is presented in Appendix 3 Table 3 and Appendix 3 Figure 1. Coho fry sizes were comparable to those measured in previous years. As in past years, most yearlings entering the pond complex were less than 80 mm fork length.

3.2.2.2 Km 1010 Upstream Migrants

A total of 1299 fish migrated upstream into Km 1010 Pond during May to mid-July (Table 7). The catch was dominated by coho fry (68.9%) and yearlings (30.8%) with a single rainbow yearling and two Dolly Varden juveniles comprising less than 1% of the catch.

Both fry and yearling coho numbers were up significantly compared to previous years (Table 7). We assume the higher numbers reflect the improvements in the pond outlet channel compared to past years.

Table 6. Summary of Km 1011 Upstream and Downstream Coho Movements by Month and Year (1996 to 2001).

UPSTREAM MOVEMENTS

Month	Coho 0+						Coho 1+					
	1996	1997	1998	1999	2000	2001	1996	1997	1998	1999	2000	2001
May	553	170	112	799	372	169	233	253	119	30	459	24
June	980	351	158	638	2422	426	440	349	121	13	239	256
July	861	308	105	na	241	178	76	136	23	na	3	77
Aug (1-9)	37	dry	dry	na	na	na	9	dry	dry	na	na	na
Total	**2431**	**829**	**375**	**1437**	**3035**	**773**	**758**	**738**	**263**	**43**	**701**	**357**

DOWNSTREAM MOVEMENTS

Month	Coho Smolts						Coho Pre-smolts*						Coho Fry					
	1996	1997	1998	1999*	2000	2001	1996	1997	1998	1999	2000	2001	1996	1997	1998	1999	2000	2001
May	21	730	539	204	630	265	1	2	2	2	7	1	2	0	1	6	6	0
June	205	650	282	87	619	453	9	18	0	0	11	3	51	4	0	16	18	0
July	9	2	1	na	1	52	9	14	2	na	0	6	238	8	0	na	3	0
Aug (1-9)	0	dry	dry	na	na	na	2	dry	dry	na	na	na	4	dry	dry	na	na	na
Total	**235**	**1382**	**822**	**291**	**1250**	**770**	**21**	**34**	**4**	**2**	**18**	**10**	**295**	**12**	**1**	**22**	**27**	**0**

*These fish were larger juveniles not exhibiting smolt characteristics (loss of parr marks, silver colouration and black tip of caudal fin).

**Evidence of a mink predation in downstream box during the peak period of migration in 1999.

No data was collected after June 16th in 1999 due to high Telkwa River flows flooding the outlet of the ponds. No data was collected after July 6 and 16th in 2000 and 2001 respectively.

Table 7. Summary of Km 1010 Upstream and Downstream Fish Movements by Month and Year (1999 to 2001).

UPSTREAM MOVEMENTS

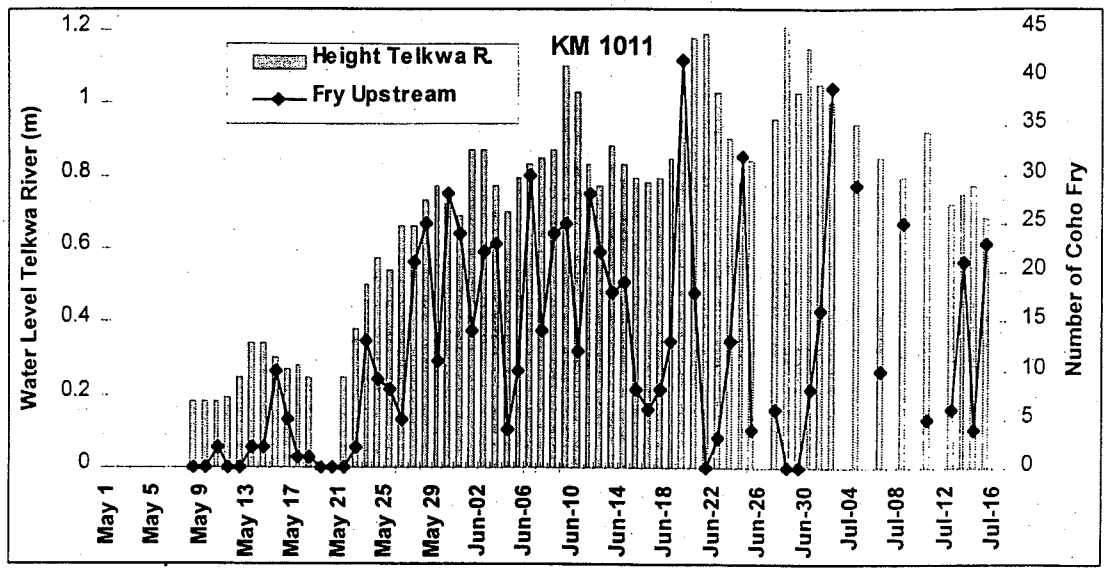
Month	Coho 0+			Coho 1+			Rainbow			Whitefish		Dolly Varden		
	1999	2000	2001	1999	2000	2001	1999	2000	2001	1999	2000	1999	2000	2001
May	6	31	25	2	37	120	1	1	0	0	0	0	0	0
June	180	381	606	3	50	237	1	0	0	0	0	1	0	0
July		109	265		0	43		0	1		0		0	2
Total	**186**	**521**	**896**	**5**	**87**	**400**	**2**	**1**	**1**	**0**	**0**	**1**	**0**	**2**

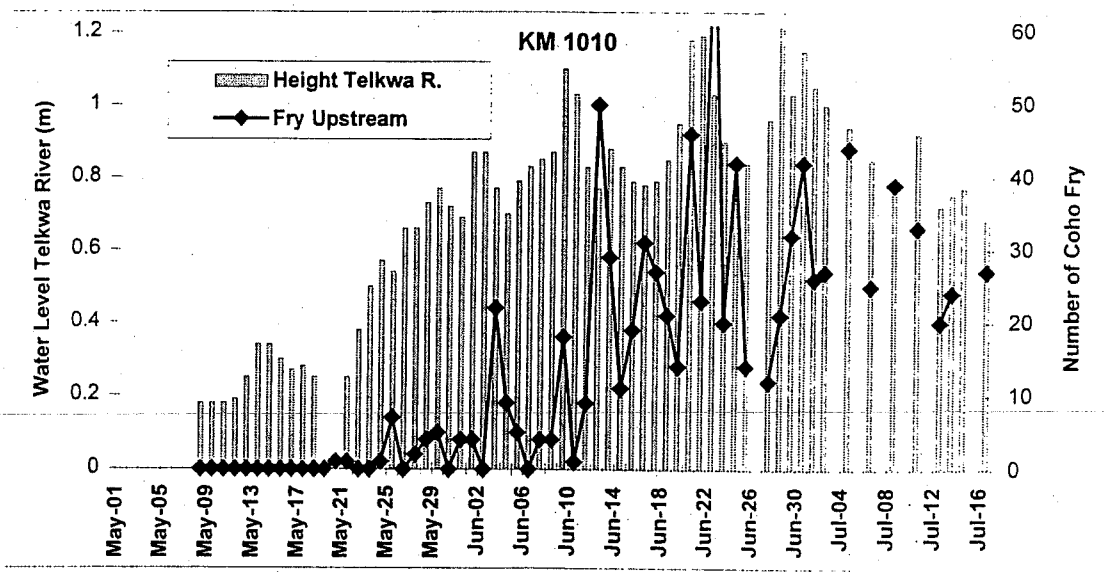
DOWNSTREAM MOVEMENTS

Month	Coho Smolts			Coho Pre-smolts*			Rainbow			Whitefish		Dolly Varden		
	1999	2000	2001	1999	2000	2001	1999	2000	2001	1999	2000	1999	2000	2001
May	35	75	30	0	0	1	1	15	0	0	0	4	2	1
June	42	113	101	0	0	9	4	3	0	0	0	3	2	0
July		1	3		0	2		1	4		1		0	1
Total	**77**	**189**	**134**	**0**	**0**	**12**	**5**	**19**	**4**	**0**	**1**	**7**	**4**	**2**

*These fish were larger juveniles not exhibiting smolt characteristics (loss of parr marks, silver coloration and black tip of caudal fin).
The trap boxes were closed down on June 16th in 1999 due to high Telkwa River flows flooding the outlet of the ponds.
The trap boxes were closed down on July 3rd in 2000 and July 16th in 2001.

Figure 4. Coho Fry Upstream Movements in Km 1011 and Km 1010 Ponds Versus Telkwa River Levels, May to Mid-July 2001.





The first coho fry were captured in the traps at Km 1010 on May 20th, although significant immigrations did not begin until early June (Figure 4 and Appendix 4 Table 2). Coho fry immigrations continued right through until the traps were removed in mid-July. This is similar to the timing noted in 2000 (Bustard 2000).

Yearling coho immigrations started within a day of trap installation and continued throughout the period of trap operation (Appendix 3 Table 2). The highest yearling movements occurred during high flow conditions in the Telkwa River from late May through to the middle of June.

Observations in September indicated coho fry were still present in the outlet creek, suggesting that immigrations may continue through the summer and early fall in this system.

It is interesting to note that the beginning of the immigration of coho fry into Km 1010 ponds did not coincide with the increase in flows in the Telkwa River (Figure 4) nor with flows in the outlet stream. The immigration appears to coincide with when the outlet stream water temperatures start to increase above the Telkwa River temperatures by roughly 2-4° C (Figure 2).

A summary of upstream coho migrant fish lengths is presented in Appendix 3 Table 4 and Appendix 3 Figure 2. The data summaries indicate that coho fry averaged approximately 38 mm throughout the period of migration. Fry measured during June, the main month of immigration, averaged 1-2 mm larger than fry measured in the previous two years in Km 1010.

Coho fry migrating into Km 1010 are, on average, slightly larger than at Km 1011 (Appendix 3 Tables 3 and 4). We suspect that the outlet creek in Km 1010 may be more difficult for the very smallest newly-emerged coho fry (29-32 mm size component) to ascend compared to the outlet stream at Km 1011.

Yearling coho migrants in Km 1010 during the main migration period of May and June averaged 58 mm fork length, and were slightly smaller than past years. Similar to Km 1011, upstream migrants larger than 80 mm fork length were rare (Appendix 3 Figure 2).

3.2.3 Fish Downstream Movements

3.2.3.1 Km 1011 Downstream Migrants

A total of 781 fish were captured in the downstream trap during the study period (Table 6). This included 770 coho smolts, 10 coho pre-smolts and a single rainbow trout yearling. The 770 coho smolts leaving Km 1011 Ponds is in the mid-range of estimates since 1996 (Table 6).

Timing of the main coho smolt migration in 2001 was later than most years (Figure 5). For example, less than 5% of the smolt movement had occurred by May 26th in 2001 and just under 35% had occurred by the end of May. In past years between 50 and 70% of the smolt movement for the year had already occurred by the end of May (Table 8).

Figure 5. Timing of Coho Smolt Downstream Migration at Km 1011 Ponds from 1997 to 2001.

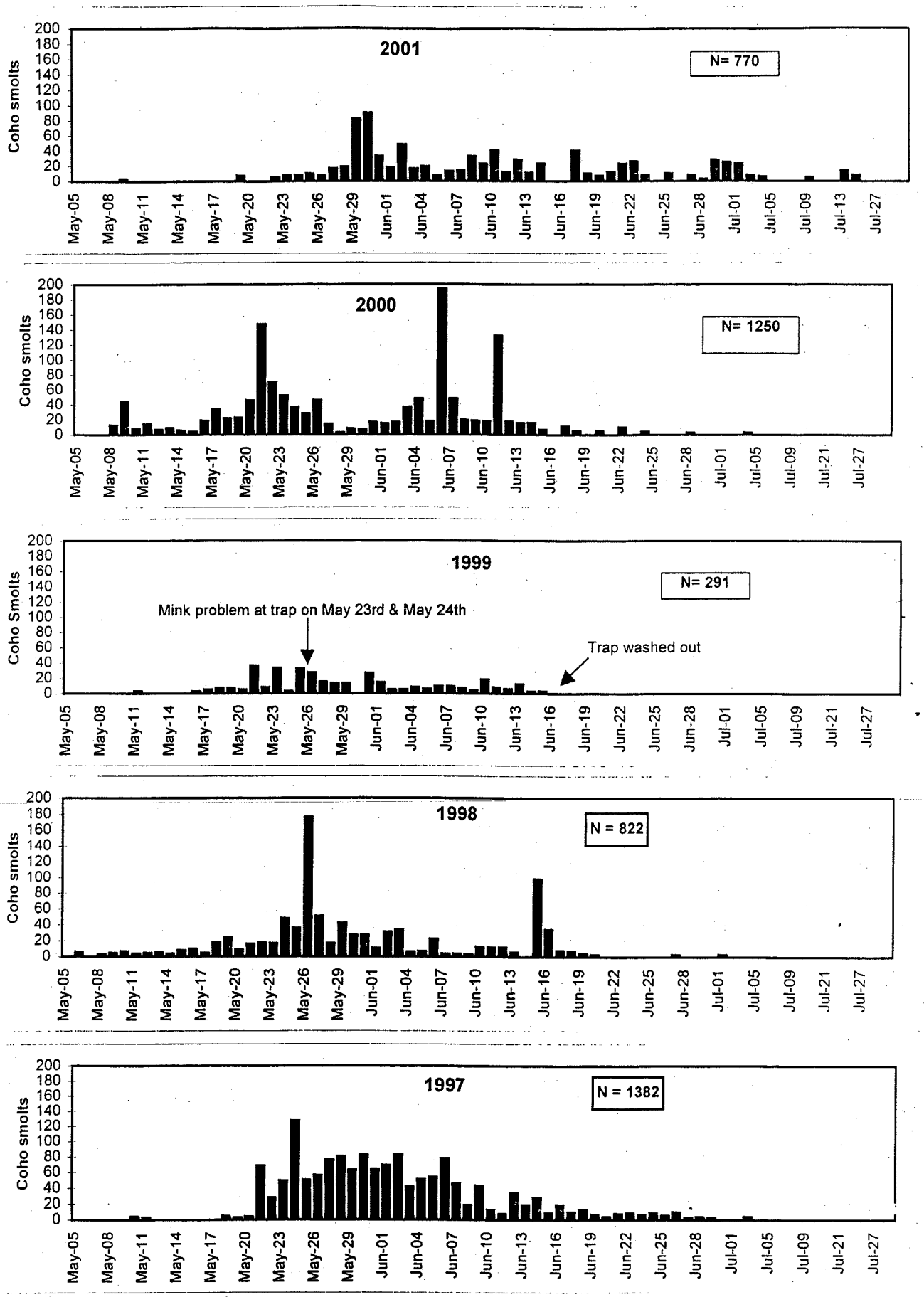


Table 8. Percentage of Smolt Downstream Movement Completed by the End of May in Km 1011 Ponds from 1997 to 2001.

Year	Number	Total	%
2001	265	770	34.4
2000	630	1250	50.4
1999	204	291	70.1
1998	539	822	65.6
1997	730	1382	52.8

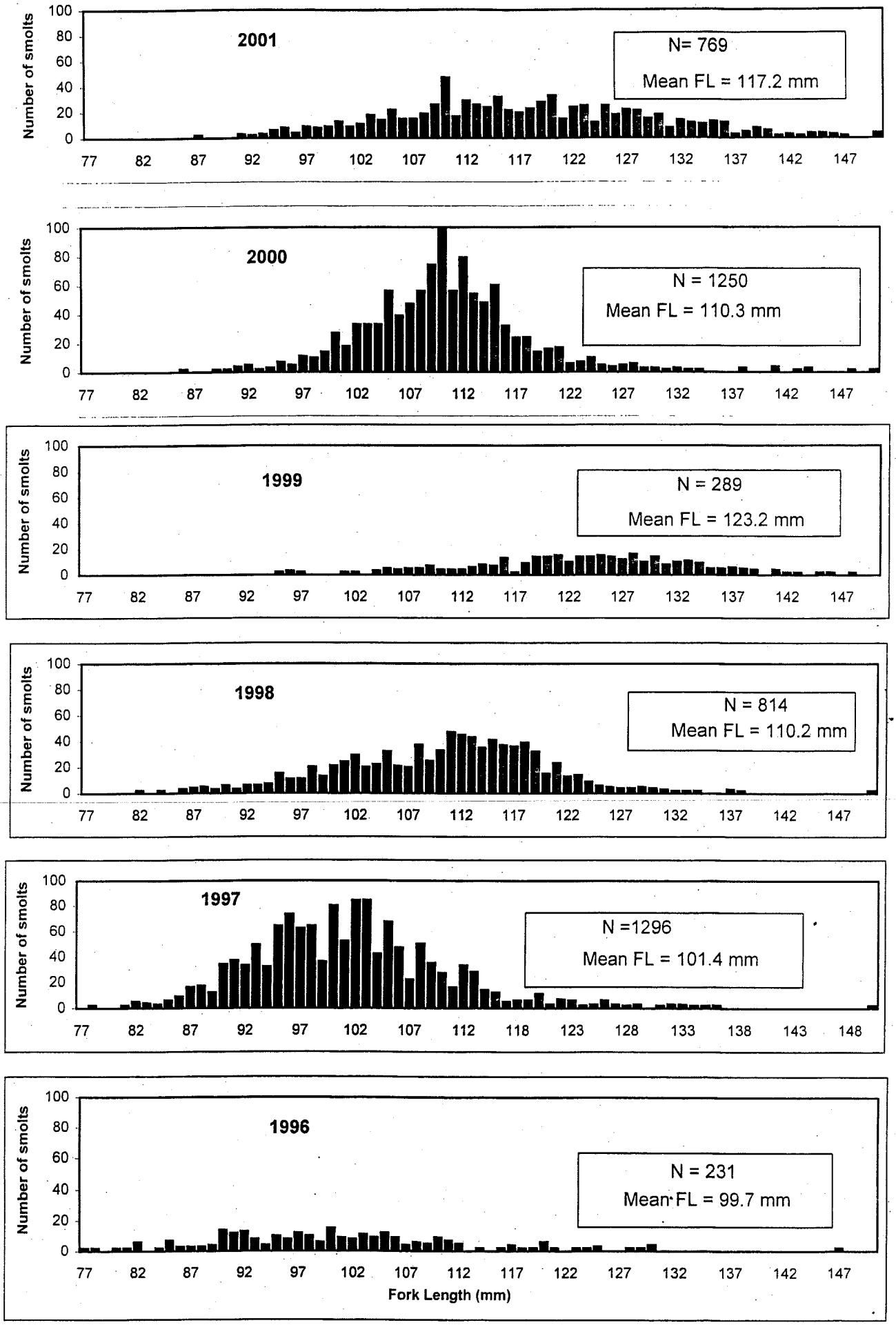
Similar to 1997, the smolt movement continued into early July at Km 1011 Ponds (Figure 5). The small movement of smolts that occurred in the middle of July coincided with higher flows associated with opening a beaver dam between the ponds at this time.

Coho smolts leaving Km 1011 in 2001 averaged 117 mm fork length (Table 9). These are the second largest smolts measured to date, exceeded only in 1999, the year of smallest overall outmigration. Smolts have been larger since 1998 compared to the two years prior. The largest smolt recorded to date at Km 1011 was captured in 2001. This fish was 185 mm fork length and weighed 61 grams. More detailed length frequency for the six years of study is presented in Figure 6. Detailed weight information for smolts captured in the downstream trap in 2001 is presented in Appendix 4 Figure 1.

Table 9. Summary of Mean Lengths and Weights of Coho Smolts at Km 1011 Ponds from 1996 to 2001.

	Length (mm)					
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
Mean	99.7	101.4	110.2	123.2	110.3	117.2
Number	144	1296	814	289	1027	769
Range	77-147	78-150	82-151	95-148	86-173	87-185
Std	11.5	8.5	9.0	9.5	7.6	11.7
	Weight (g)					
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
Mean	10.0	10.8	13.4	19.1	13.3	15.8
Number	144	127	415	162	646	720
Range	4.7-35.2	5.3-24.5	5.9-24.9	9.4-28.4	7.1-48.6	6.5-61.5
Std	3.9	2.9	3.2	3.9	3.0	4.9

Figure 6. Length-Frequency of Coho Smolts Leaving Km 1011 Ponds from 1996 to 2001.



Age information derived from scales for coho smolts sampled at the downstream trap in 2001 is not available at the time of report preparation. However aging data is available for smolts collected at the downstream traps from 1997 to 2000. Data collected to date indicates there is wide overlap in the age structure of coho smolts captured during the May-June period ranging from 1+ to 3+ (Appendix 4 Table 1). This presumably reflects the range of life history strategies evident in coho using the ponds, including immigration at both the fry and yearling stages. A single age 4+ coho smolt was reported in the 1998 sample.

Table 10 summarizes the frequency of occurrence of the different age classes in the smolt samples from 1997 to 2000. This summary indicates that most smolts leaving Km 1011 Ponds are age 1+ and 2+ fish, with the dominant age class changing depending upon the year.

Table 10. Percentage of Smolts by Different Age Classes from 1997 to 2000.

		N	Age 1	Age 2	Age 3	Age 4
Km 1011	**1997**	113	51.3	46.0	1.8	0
	1998	53	37.7	41.5	18.9	1.9
	1999	46	18.6	72.9	6.3	0
	2000	59	83.3	16.7	0	0
Km 1010	**1999**	39	30.8	67.9	1.3	0
	2000	25	76.9	19.1	4.1	0

It should be noted that the 1999 smolt run had the highest proportion of age 2+ smolts. The mean size of the 1999 smolts was the largest measured to date reflecting this high proportion of older fish (Table 9).

3.2.3.2 Km 1010 Downstream Migrants

A total of 134 coho smolts, 12 coho pre-smolts, four rainbow parr, and two Dolly Varden moved downstream at Km 1010 during the period May 8th to July 16th in 2001 (Table 7). The daily summaries are presented in Appendix 3 Table 2. Coho smolt numbers in 2001 were mid-way between the catches from the previous two years (Table 7).

The timing of the coho smolt downstream migration for the past three years at Km 1010 is presented in Figure 7. Similar to observations at Km 1011, the timing of the smolt downstream migration started later and carried on longer than in the previous two years. Up until this year, most of the smolt migration had been completed by June 15th. In 2001, smolt continued to leave Km 1010 until the end of June.

The average length of coho smolts at Km 1010 in 2001 was 108 mm (Table 11). This is comparable to smolt sizes measured in the previous two years that have ranged from 106 to 112 mm fork length. More detailed length-frequency information is presented in

Figure 7. Timing of Coho Smolt Downstream Migration in Km 1010 Pond from 1999 to 2001.

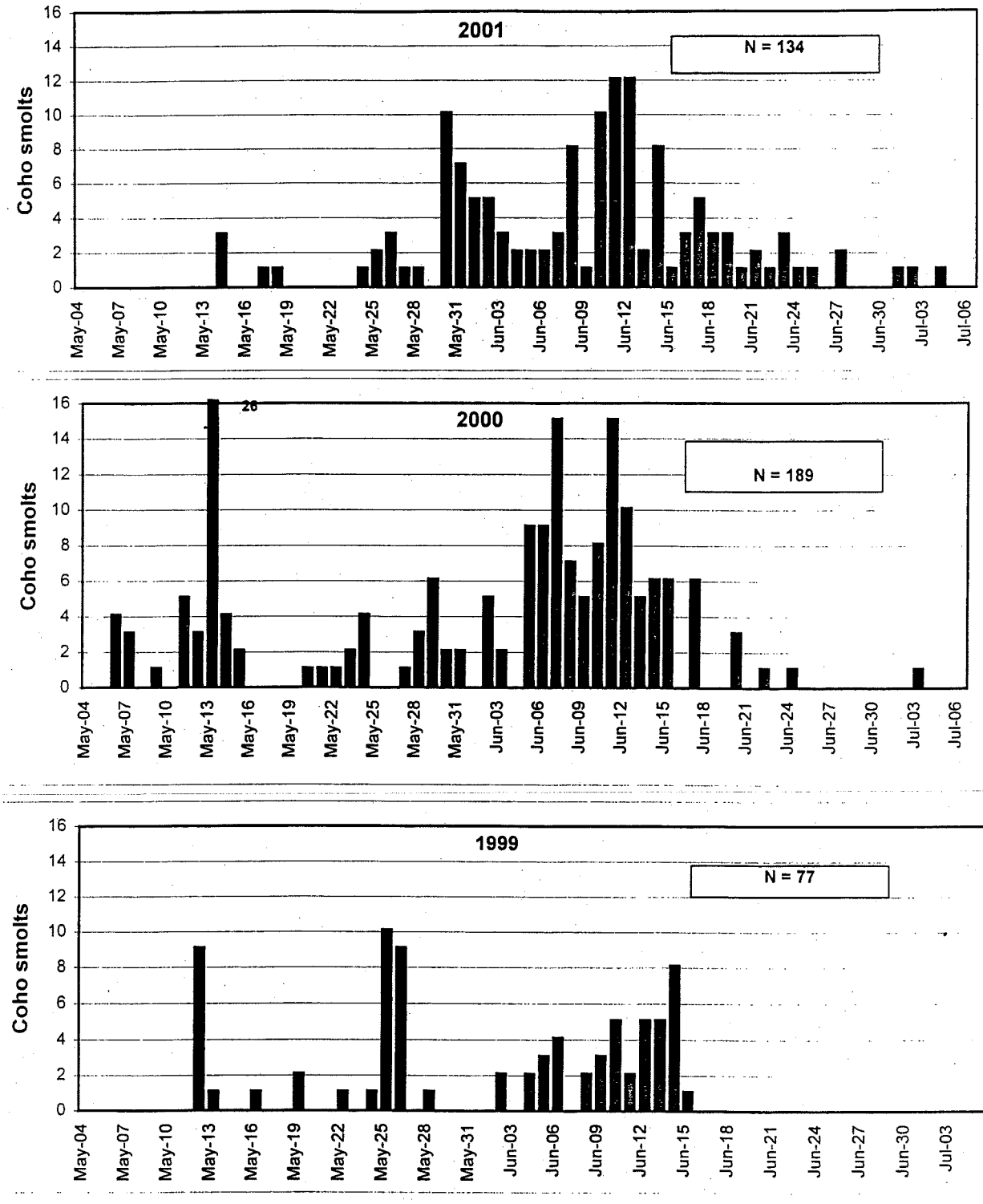


Table 11. Summary of Mean Lengths and Weights of Coho Smolts at Km 1010 Pond from 1999 to 2001.

	Length (mm)			Weight (g)		
	1999	2000	2001	1999	2000	2001
Mean	112.5	105.9	107.9	16.0	12.5	13.5
Number	78	189	135	44	120	133
Range	84-148	81-137	92-134	6.7-30.4	6.4-20.2	8.4-24.8
Std	10.6	8.7	9.4	5.0	2.8	3.6

Figure 8. Similar to other years Km 1010 coho smolts were smaller than smolts leaving Km 1011 (Table 9).

Age information derived from scales for coho smolts sampled at the downstream trap in 2001 are not available at the time of report preparation. However, aging data is now available for smolts collected in the downstream trap in 2000 (Table 10). Based on scales taken from all size classes of smolts, Km 1010 smolts were primarily age 1+ in 2000. This is a reversal of the proportion of age 1+ compared to age 2+ smolts for 1999, similar to the pattern identified in Km 1011 (Table 10).

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Population Estimate and Coho Smolt Migration

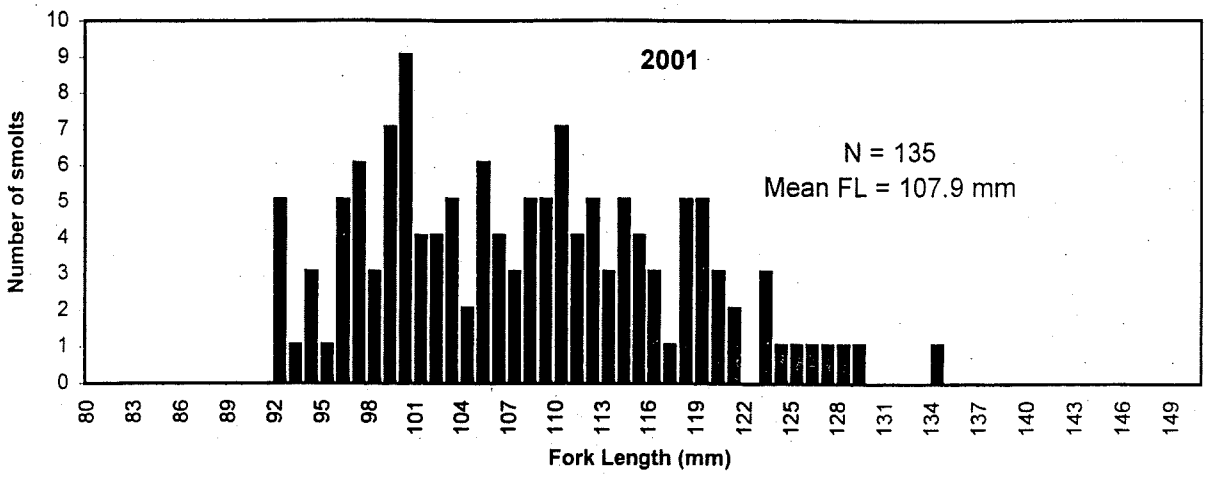
4.1.1. Km 1011 Ponds

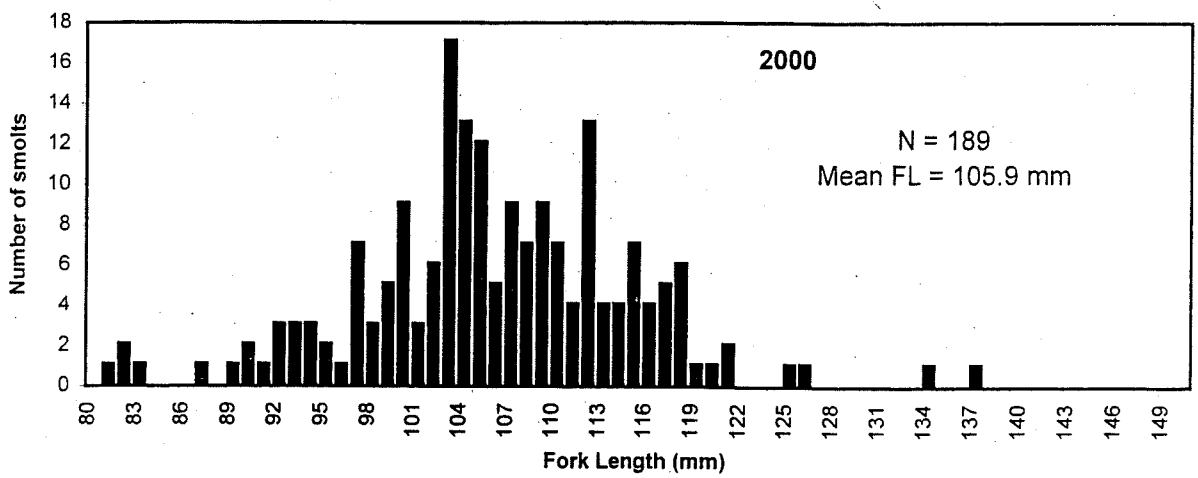
The mark-and-recapture population estimate conducted in May 2001 at Km 1011 Ponds resulted in an estimate of 1281 pre-smolts[13] in the ponds prior to smolt migration (Table 4). This is in the lower end of the range measured in the ponds since construction. These low estimates are somewhat surprising given the excellent fry and yearling recruitment into the pond complex in 2000.

Estimates for past years suggest that the smolt numbers leaving the ponds tend to correspond to the previous year's immigration of fry and yearlings into the ponds (Figure 9). Based on this trend, we would have expected higher smolt yields in 2001 given the highest immigration numbers to date in 2000.

[13] Coho 75 mm or larger.

Figure 8. Length-Frequency of Coho Smolts Leaving Km 1010 Pond from 1999 to 2001.





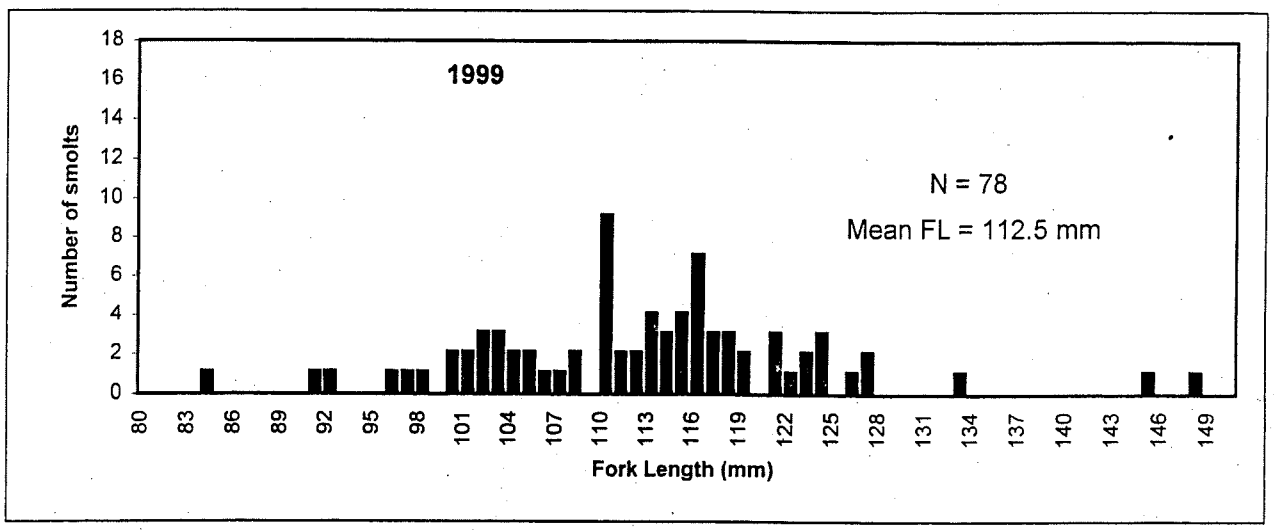
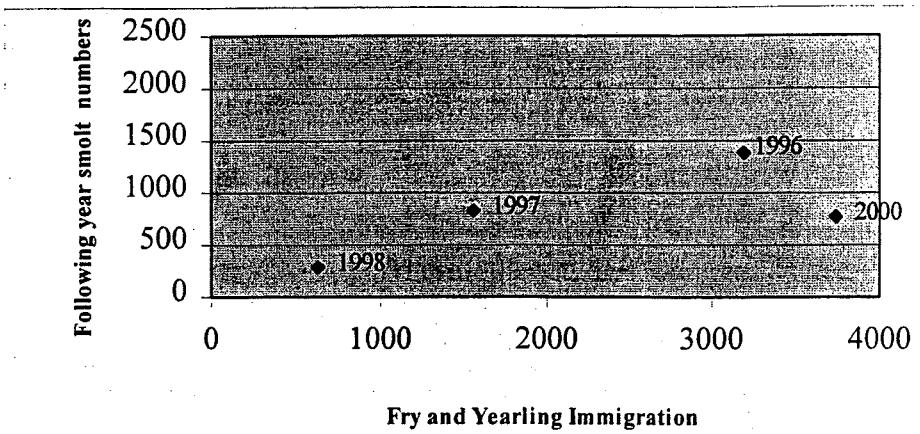
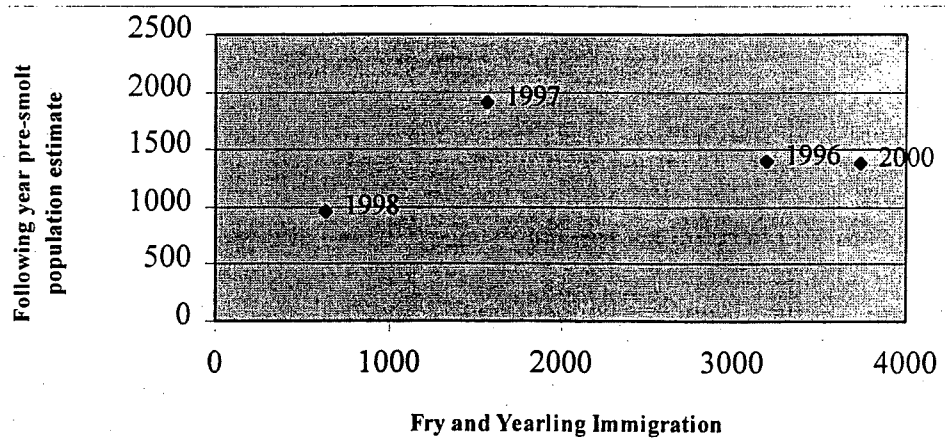


Figure 9. Combined Total of Coho Fry and Yearling Immigrants at Km 1011 Versus the Following Year's Smolt Numbers at Traps and Pre-Smolt Population Estimates[14].





Several factors should be considered when assessing this year's estimates. Firstly, beaver dams located in the connecting creek channel between the two ponds were present during the summer, fall and winter of 2000 and may have limited coho distribution throughout the ponds in 2000, therefore restricting total productive area. An additional beaver dam was also present on the connecting channel to the large PNG channel during the summer and fall of 2000. However, the trapping CPUE during May 2001 indicated that coho were well-distributed except in the PNG extension channels (Table 2) suggesting this may not have been a factor[15].

[14] Upstream trapping data for 1999 has not been included in this summary since traps were only operated until June 15th prior to overflow during a high flow event.

[15] A sample of 79 coho fry and 69 yearlings captured in the upstream trap were released in the larger PNG channel during early June 2001. As well 46 coho fry and 38 yearlings were released in the smaller channel. The objective is to see if catches improve in this section next spring, and whether the low catches are strictly a recruitment issue to this section of the pond complex.

Secondly, the impact of the outlet berm washout and subsequent drop in water levels in the lower pond in early May 2001 had an unknown impact on the overall pond population of coho. This occurred prior to the population estimate and the smolt trapping, and presumably some fish left the ponds as the water levels dropped. The outlet control was re-built within the week.

It should also be emphasized that smolts leaving Km 1011 comprise several age classes (Table 10). Coho fry entering on a given year may remain for a second year in the ponds prior to smolt migration, so correlation to the previous year's immigration may not occur in all years.

Figure 9 also illustrates that pre-smolt mark-and-recapture estimates for Km 1011 Ponds have remained in a band between approximately 1000-2000 fish for the four years when there has been good immigration information for the previous year. Higher estimates (over 2400 coho) were made in 2000 but are not included in this comparison due to incomplete immigration data for 1999[16]. Higher estimates were also made prior to 1996, but no fry immigration data was available (Table 4).

Similar to most past years, the smolt outmigration was considerably lower than the population estimate conducted just prior to the smolt migration period (Table 12). The one exception was in 1997 when the two estimates were very similar. We suspect that many of the smaller fish (75-100 mm fork length) captured during the mark-and-recapture estimates may reside for an additional season prior to migrating out of the ponds.

A total of 126 of the 770 smolts captured at the downstream trap in 2001 had caudal clips (Table 13). This was approximately 46% of the smolts marked during the population estimates conducted in early May. This is a higher proportion than all years except 1997 when 56% of the marked fish were recaptured at the trap. The data continues to suggest that up to 50% of the coho larger than 75 mm captured in the mark-and-recapture program continue to remain in the ponds for an additional year prior to leaving as smolts.

A comparison of the CPUE (catch/trap) of coho versus the total population estimates during early May surveys in the Km 1011 Ponds (Figure 10) indicates that the catch/trap estimates are a very good indicator of the pond population estimates derived during the given year (r^2 =0.91).

[16] Fry immigration in May and early June 1999 indicated good recruitment into Km 1011 up to the date of the traps washing out (Table 6).

Table 12. Smolt Estimates Compared to Mark-and-Recapture Population Estimates.

Year[17]	Smolts at Trap	Population Estimates	%
1997	1382	1395	99.1
1998	822	1913	43.0
1999[18]	291	961	30.3
2000	1250	2447	51.1
2001	770	1386	55.6

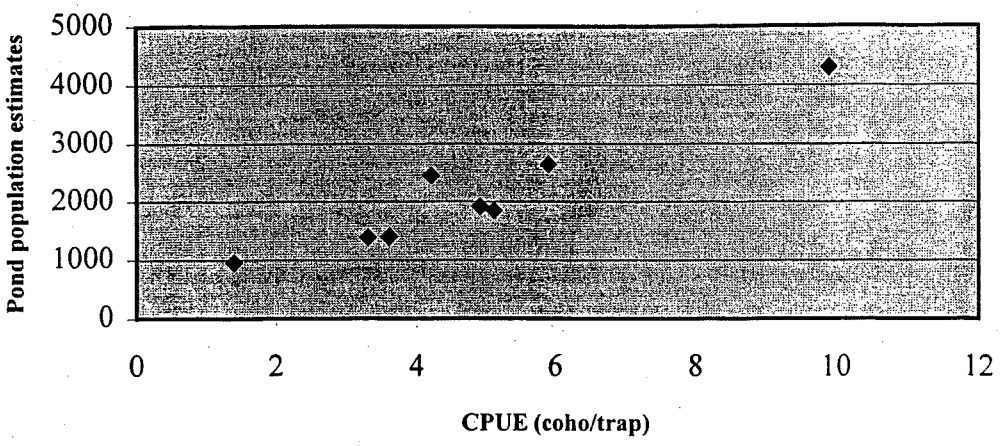
Table 13. Ratios of Marked to Unmarked Coho in the Km 1011 Ponds, 1996 to 2001.

	Number of Smolts	Number of Marked Pre-smolts[19]	Number of Smolts Marked	% of Smolts Marked	% of Marked Pre-smolts Leaving Ponds	% of Recaptured Fish Marked[20]
1996	233	402	27	11.6	6.7	14.1
1997	1382	301	168	12.2	55.8	26.4
1998	822	287	61	7.4	21.3	15.9
1999	291	97	19	6.5	19.6	9.4
2000	1250	228	68	5.4	29.8	9.6
2001	770	272	126	16.4	46.3	20.8

The average fork length of coho smolts leaving the ponds in 2001 was 117 mm (Table 9). These were the second largest smolts measured to date. Aging information for these fish is not available at this time. Based on past scale aging information, we suspect that the 2001 smolt migration had a significant age 2+ component, similar to 1999 when smolts were also large (Table 10). The smolt aging data indicates there is considerable variability in the proportion of age 1+ and age 2+ smolts leaving the ponds depending upon the year (Table 10). The high proportion of age 2+ smolts in 1999 reflects the

[17] Data from 1996 is not included since most smolts were unable to leave Km 1011 due to culvert problems.
[18] A combination of flood flows near the end of the smolt outmigration period and predation problems during the peak movement period have resulted in probable under-estimates of smolts in 1999.
[19] Marked during population estimates in early May.
[20] Recaptured during mark-and-recapture estimates.

Figure 10. Comparison of Coho CPUE (Catch/Trap) Versus Population Estimates Conducted During Early May from 1994 to 2001[21] at Km 1011.



unusually low fry recruitment into the ponds in 1998 (Table 6), and the resulting low abundance of age 1+ smolts the following year.

4.1.2 Km 1010 Pond

The 134 smolts leaving Km 1010 Pond in 2001 is in the mid-range between estimates for the past three years (Table 7). We suspect the 2001 smolt estimates represent the total run, as there were no complications with the downstream trap operation. These smolts were largely derived from an upstream migrant estimate of just over 600 fry and yearling coho passed upstream during the 2000 season (Table 7). The 1999 upstream migrant estimates were confounded by flooding into the pond complex from upstream overflows during mid-June.

The very poor CPUE of coho during minnow trapping in late May 2001 suggests that this pond is not being used year-round during all years. We were only successful in catching coho in the inlet creeks to the pond, so a recapture was not conducted. In 2000, a mark-and-recapture conducted slightly later in the season yielded a population estimate close to that actually measured in the downstream traps.

The later timing for the start and finish of the smolt migration in Km 1010 this year compared to previous years (Figure 7) was similar to the pattern observed in Km 1011. Km 1010 smolts were approximately 10 mm smaller on average than in Km 1011, probably reflecting the longer growing season and warmer water temperatures at Km

[21] Based on data presented in Table 2. Effort is based on 150 minnow trap sets for all years except 1994-95 (130 traps).

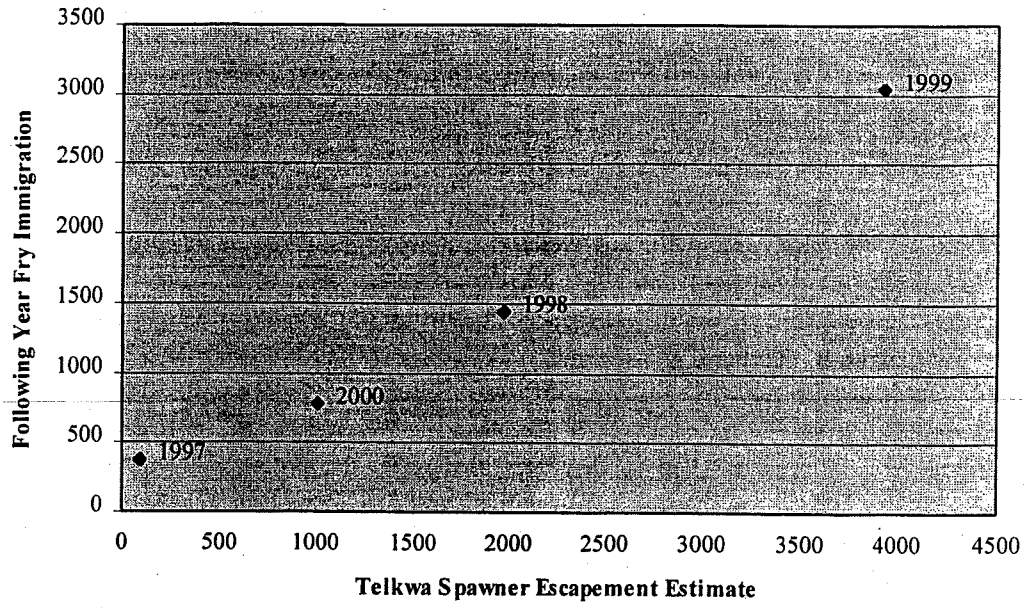
1011 (Table 1 and Figure 2). Aquatic vegetation has been slow to establish at Km 1010 compared to Km 1011.

4.2 Upstream Coho Migrants

The 2001 fry immigration at Km 1011 was at the low end of the range recorded since upstream trapping was initiated in 1996 (Table 6). The weak fry recruitment corresponds to a relatively low adult coho escapement estimate in the upper Telkwa River during the fall of 2000 (Figure 11 and Appendix 3 Table 7).

Four years of coho escpapement data for the Telkwa River indicate that the magnitude of the fry immigration the following spring at Km 1011 tends to correspond well with the adult coho escapement estimates conducted the previous fall. It should be emphasized

Figure 11. Summary of Adult Coho Escapement Estimates Versus the Following Year's Fry Recruitment at Km 1011 of the Telkwa River.



that we have only used the adult estimates for those years when area-under-the-curve estimates have been made based on multiple counts during the spawning period[22].

Km 1010 fry immigration in 2001 was up substantially compared to past estimates. We suspect this is a reflection of the improved eddy conditions at the confluence of the outlet

[22] Escapement data provided by Barry Finnegan, Fisheries and Oceans Canada. Only those years with reliable area-under-the-curve estimates were used in this figure.

stream and the Telkwa River, helping fry and yearlings to locate the outlet stream. At the same time, velocities in the outlet stream are now more suitable for upstream fry migration compared to past years. For these reasons, comparisons to immigration measured in past years is probably not appropriate.

The total estimate of upstream migrants at Km 1010 (896 fry and 400 yearlings) is not complete for the season. The outlet creek flows throughout the summer and early fall. and we suspect that fry immigration into the pond continues through this period. This is the first year that fry have been able to migrate into the pond unassisted, since the outlet culvert was impassable in past years. Total immigration exceeded that measured at Km 1011 in 2001.

4.3 Productivity Estimates

Based on the mark-and-recapture estimates, the Km 1011 Ponds have produced an average of 1600 pre-smolt coho annually for the eight years of study (Table 14). The estimates correspond to coho production ranging from 11 to 32 pre-smolts /100 m^2 (Table 14). The 2001 estimates were at the low end of this range. Koning and Keeley (1997) suggest the 0.87 ha ponded habitat at Km 1011 is capable of producing 2750 smolts.

Table 14. Coho Production Estimates in Km 1011 and Km 1010 Ponds for the Period of Record.

	Year	>74 mm	All Coho Combined	Pre-smolts/ 100 m^2	Total Coho/ 100 m^2	Smolts/ 100 m^2	Kgs/100m^2 All Coho[23]
KM 1011	1993	222	1186				
	1994	2304	2640	26.4	30.2		0.28
	1995	1549	1845	17.7	21.1		0.19
	1996	2820	4304	32.3	49.3		0.30
	1997	1124	1395	12.9	16.0	15.9	0.12
	1998	1806	1913	20.7	21.9	9.4	0.22
	1999	971	971	11.1	11.1	3.3[24]	0.17
	2000	2334	2447	26.7	28.0	14.4	0.28
	2001	1281	1386	14.7	15.9	8.9	0.17
	Mean (94-01)	1601	2010	20.3	24.2	10.4	0.22
KM 1010	2000	185	190	8.4	8.6	8.6	0.10
	2001[25]	na	na	na	na	6.1	na

[23] Based on mark-and-recapture estimates
[24] This represents a minimum estimate due to flooding and predation problems.
[25] Mark-and-recapture not conducted since too few fish captured in the marking phase.

Actual smolt production at the downstream traps has averaged 10.4 smolts/100 m^2 or 12.6 smolts/100 m^2 excluding the 1999 data when there was difficulty with predation during the peak of migration. It should also be noted that some portions of the Km 1011 Ponds have not been contributing significantly to the smolt production, particularly the PNG extension channels.

Km 1010 estimates are lower averaging just over 7 smolts/100 m^2 for the past two years (Table 14).

Estimates for these two interior ponds are lower than for coastal systems where production has been measured in the range of 14 to 51 smolts/100 m^2 (Picard et al. 1998; Marshall and Britton 1990). These other studies were conducted on coastal watersheds with longer growing seasons leading to a higher proportion of age 1+ smolts[26]. Scale aging information collected at these two interior ponds indicates that in some years nearly 80% of the smolts can be age 2+ or older (Table 10).

These observations continue to indicate that the potential production estimates from off-channel pond developments in northern interior populations of coho such as in the Telkwa Watershed may be lower than reported in the literature where information is largely derived from coastal watersheds.

These studies continue to provide basic life history information describing the movements of coho fry and yearlings into two man-made off-channel ponds in an interior watershed. The subsequent smolt production has been measured at one location for six years and a second site for the past two years. Observations during this period have provided valuable input into the design of the culvert outlets associated with the ponds, the location and characteristics of good outlet streams to attract immigration into off-channel ponds, and methods to deal with beaver issues at the pond complexes. The data collected at these ponds has also provided benchmark productivity estimates to allow for assessing the effectiveness of developing off-channel coho habitat in northern interior watersheds such as the Telkwa River.

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[26] Typically up to 95% of smolts in coastal ponds leave as age 1+ (Matt Foy, DFO, pers. comm.).

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Appendix 1 Table 1. Summary of Water Temperature and Streamflow Information in Km 1011 Ponds, 2001.

Date	Lower Pond @ 0.5 m			Outlet @	Telkwa R.	Outlet Q	Q	Fry	Telkwa
	Min	Max	Mean	Trap		(litres/sec)	(cfs)	Upstream	gauge ht (m)
April 19	2.6	3.1	2.9						
April 20	3.5	4	3.8						
April 21	3.8	4.1	4.0						
April 22	3.8	4.1	4.0						
April 23	3.2	5.4	4.3						
April 24	3.8	5.1	4.5						
April 25	3.7	5	4.4						
April 26	4.5	5.1	4.8						
April 27	5	5.8	5.4						
April 28	4.8	6	5.4						
April 29	5.5	6.2	5.9						
April 30	5	6.2	5.6						
May 1	5.5	8.2	6.9						
May 2	5.8	7	6.4						
May 3	5.6	6.5	6.1						
May 4	5.6	6.6	6.1						
May 5	5	5.8	5.4						
May 6	5.5	6.0	5.8						
7	5.8	6.2	6.0						
8	5.8	6.1	6.0	9.0	5.0	0.0		0	0.18
9	6.1	6.6	6.4	11.0	7.0	1.5	0.05	0	0.18
10	6.7	6.9	6.8	12.0	8.0	0.8	0.03	2	0.18
11	7.0	7.7	7.4	12.0	7.0	0.6	0.02	0	0.19
12	7.8	8.0	7.9	10.5	5.0			0	0.25
13	7.5	8.0	7.8	10.0	4.0	1.5	0.05	2	0.34
14	7.9	8.1	8.0	11.0	5.0	1.4	0.05	2	0.34
15	8.0	8.2	8.1	10.0	4.5	1.3	0.05	10	0.30
16	7.7	8.0	7.9	12.5	7.0	1.0	0.04	5	0.27
17	8.0	8.5	8.3	10.0	5.0	1.1	0.04	1	0.28
18	7.9	8.7	8.3	9.5	6.0	0.6	0.02	1	0.25
19	7.0	8.2	7.6	12.0	7.0	0.9	0.03	0	dry
20	8.0	8.3	8.2	11.0	6.0	0.5	0.02	0	dry
21	8.2	8.5	8.4	10.5	6.0	1.1	0.04	0	0.25
22	8.7	9.2	9.0	11.5	6.0	1.7	0.06	2	0.38
23	9.2	10.6	9.9	12.0	5.0	2.2	0.08	13	0.50
24	10.6	12.0	11.3	14.0	6.5	2.2	0.08	9	0.57
25	11.7	12.8	12.3	17.0	9.0	2.8	0.10	8	0.54
26	12.0	12.8	12.4	14.5	6.0	3.0	0.11	5	0.66
27	11.0	12.0	11.5	13.0	6.0	3.3	0.11	21	0.66
28	10.0	11.1	10.6	12.0	5.5	5.0	0.18	25	0.73
29	8.2	9.8	9.0	11.0	6.0	10.0	0.35	11	0.77
30	9.6	10.0	9.8	12.0	7.0	6.2	0.22	28	0.72
31	9.9	10.0	10.0	12.0	7.0	6.0	0.21	24	0.69
Avg			**8.2**	**11.7**	**6.1**				
Jun-01	10.2	10.8	10.5	13.0	5.0	7.9	0.28	14	0.87
2	10.0	11.0	10.5	12.0	5.0	7.0	0.25	22	0.87
3	10.0	10.4	10.2	14.0	7.0	6.3	0.22	23	0.77
4	9.7	10.2	10.0	13.0	6.5	5.5	0.20	4	0.70
5	10.3	11.0	10.7	14.0	5.5	6.5	0.00	10	0.79
6	10.7	11.0	10.9	13.5	6.0	5.9	0.21	30	0.83
7	10.6	11.0	10.8	13.0	6.5	7.4	0.26	14	0.85
8	10.8	11.0	10.9	13.5	5.5	6.7	0.24	24	0.87
9	10.9	11.0	11.0	13.0	5.0	11.8	0.42	25	1.10
10	10.0	11.0	10.5	12.0	6.0	10.8	0.38	12	1.03
11	9.8	10.1	10.0	12.0	6.0	10.8	0.38	28	0.83
12	9.3	10.0	9.7	15.0	9.0	6.5	0.23	22	0.77
13	10.0	10.6	10.3	15.0	7.0	6.5	0.23	18	0.88
14	10.5	11.0	10.8	15.0	8.0	0.9	0.03	19	0.83
15	11.0	11.3	11.2	14.0	7.0	0.4	0.02	8	0.79
16	11.2	11.4	11.3	13.5	5.5			6	0.78

Appendix 1 Table 1. Summary of Water Temperature and Streamflow Information in Km 1011 Ponds, 2001.

Date	Lower Pond @ 0.5 m			Outlet @	Telkwa R.	Outlet Q	Q	Fry	Telkwa
	Min	Max	Mean	Trap		(litres/sec)	(cfs)	Upstream	gauge ht (m)
17	11.0	11.3	11.2	14.0	7.0	4.1	0.15	8	0.79
18	11.0	11.2	11.1	13.0	6.5	2.4	0.09	13	0.85
19	11.3	11.7	11.5	15.5	8.5	4.1	0.14	42	0.95
20	11.7	12.0	11.9	17.0	8.0	5.9	0.21	18	1.18
21	11.9	12.0	12.0	13.5	6.0	11.8	0.42	0	1.19
22	11.8	12.2	12.0	13.5	7.0	8.1	0.29	3	1.03
23	11.5	12.0	11.8	12.0	7.0	5.7	0.20	13	0.90
24	11.0	11.5	11.3	12.5	7.5	11.3	0.40	32	0.78
25	10.9	11.0	11.0	13.0	7.0	5.5	0.20	4	0.84
26	10.8	11.1	11.0						
27	11.1	11.3	11.2	13.0	6.0			6	0.96
28	11.0	11.3	11.2	14.0	8.0			0	1.29
29	11.5	11.5	11.5	14.0	7.0			0	1.03
30	11.6	11.9	11.8	14.0	7.0			8	1.15
Avg			**11.0**	**13.6**	**6.7**				
Jul-01	11.9	11.9	11.9	14	8	10.8	0.38	16	1.05
2	11.8	11.9	11.9	15.0	8.0	8.1	0.29	39	1.00
3	11.8	12.0	11.9						
4	12.0	12.4	12.2	16.0	8.5	7.6	0.27	29	0.94
5	12.2	12.6	12.4						
6	12.3	12.6	12.5	13.0	6.0	8.4	0.30	10	0.85
7	12.3	12.5	12.4						
8	12.1	12.3	12.2	14.0	8.0	4.1	0.14	25	0.79
9	12.2	12.5	12.4						
10	12.2	12.8	12.5	14.0	7.0	4.7	0.17	5	0.92
11	12.6	12.8	12.7						
12	12.7	13.0	12.9	14.5	7.5	3.3	0.11	6	0.72
13	12.9	13.0	13.0	16.0	10.0	18.6	0.66	21	0.75
14	12.8	13.0	12.9	15.0	8.5	7.4	0.26	4	0.77
15	12.5	12.9	12.7	15.0	8.0	2.0	0.07	23	0.68
16	12.1	12.5	12.3						
17	12.2	12.8	12.5						
18	12.6	13.0	12.8						
19	13.0	13.9	13.5						
20	13.1	13.5	13.3						
21	13.6	14.0	13.8						
22	13.8	14.0	13.9						
23	14.0	14.6	14.3						
24	14.6	15.5	15.1						
25	14.8	15.0	14.9						
26	14.8	15.0	14.9						
27	14.7	15.3	15.0						
28	14.7	15.2	15.0						
29	14.1	14.8	14.5						
30	14.0	14.1	14.1						
31	14.1	14.1	14.1						
Avg			**13.2**	**14.7**	**8.0**				
Aug-01	14.0	14.3	14.2						
2	14.0	14.2	14.1						
3	13.8	14.0	13.9						
4	13.5	14.0	13.8						
5	13.0	13.5	13.3						
6	13.0	13.0	13.0						
7	12.8	13.0	12.9						
8	12.7	12.9	12.8						
9	12.8	13.0	12.9						
10	12.9	13.0	13.0						
11	13.0	13.4	13.2						
12	13.2	13.6	13.4						
13	13.7	13.9	13.8						
14	13.8	13.9	13.9						

Appendix 1 Table 1. Summary of Water Temperature and Streamflow Information in Km 1011 Ponds, 2001.

Date	Lower Pond @ 0.5 m			Outlet @	Telkwa R.	Outlet Q	Q	Fry	Telkwa
	Min	Max	Mean	Trap		(litres/sec)	(cfs)	Upstream	gauge ht (m)
15	13.9	14.0	14.0						
16	14.0	14.1	14.1						
17	14.1	14.8	14.5						
18	14.0	15.0	14.5						
19	14.6	15.0	14.8						
20	13.5	13.5	13.5						
21	13.0	13.6	13.3						
22	12.8	13.0	12.9						
23	12.1	12.8	12.5						
24	12.1	12.3	12.2						
25	12.1	12.2	12.2						
26	12.1	12.1	12.1						
27	12.1	12.3	12.2						
28	11.7	12.2	12.0						
29	11.7	11.8	11.8						
30	11.6	11.9	11.8						
31	11.8	11.9	11.9						
Avg			**13.2**						
Sep-01	11.5	11.8	11.7						
2	11.0	11.5	11.3						
3	10.5	11.0	10.8						
4	10.3	10.8	10.6						
5	10.0	10.5	10.3						
6	9.8	10.0	9.9						
7	9.0	10.0	9.5						
8	8.7	9.0	8.9						
9	8.0	8.3	8.2						
10	7.8	8.0	7.9						
11	7.9	8.0	8.0						
12	7.9	8.2	8.1						
13	7.1	8.5	7.8						
14	8.2	8.7	8.5						
15	8.3	8.8	8.6						
16	8.5	8.8	8.7						
17	8.3	8.9	8.6						
18	8.8	9.0	8.9						
19	8.8	9.0	8.9						
20	8.8	9.0	8.9						
21	8.7	8.8	8.8	dry		dry			dry
Avg			**9.2**						

Appendix 1 Table 2. Summary of Water Temperature and Streamflow Information in Km 1010 Ponds, 2001.

Date	Lower Pond @ 0.5 m			Outlet @	Telkwa R.	Outlet Q	Q
	Min	Max	Mean	Trap		(litres/sec)	(cfs)
April 19	3.5	3.8	3.7	Discharge only partial			
April 20	3.6	4	3.8	Significant flows through culvert channels			
April 21	4	4.2	4.1				
April 22	4	4.2	4.1				
April 23	4.1	4.3	4.2				
April 24	4	4.2	4.1				
April 25	4.1	4.4	4.3				
April 26	4.1	4.6	4.4				
April 27	4.5	4.7	4.6				
April 28	4.3	4.8	4.6				
April 29	4.6	4.9	4.8				
April 30	4.7	4.8	4.8				
May 1	4.5	4.8	4.7				
May 2	4.2	4.5	4.4				
May 3	4.2	4.4	4.3				
May 4	3.9	4.3	4.1				
May 5	4.2	4.6	4.4				
May 6	4.3	4.7	4.5				
7	4.1	4.6	4.4				
8	4.5	5.0	4.8	5.5	5.0		
9	4.2	5.0	4.6	6.0	7.0		
10	4.3	5.0	4.7	6.5	8.0		
11	4.5	5.0	4.8	6.0	7.0		
12	4.9	5.1	5.0	5.0	5.0		
13	5.0	5.8	5.4	5.5	4.0		
14	5.2	5.8	5.5	6.0	5.0		
15	5.3	5.7	5.5	5.0	4.5		
16	5.2	5.9	5.6	7.0	7.0		
17	5.2	5.7	5.5	5.5	5.0	5.8	0.20
18	5.0	5.3	5.2	6.0	6.0	13.0	0.46
19	5.0	5.8	5.4	6.5	7.0		
20	5.0	5.3	5.2	7.0	6.0	6.5	0.23
21	4.9	5.2	5.1	6.0	6.0	6.5	0.23
22	5.0	5.3	5.2	7.0	6.0	8.7	0.31
23	5.3	5.8	5.6	7.0	5.0	6.5	0.23
24	5.4	5.8	5.6	8.5	6.5	6.5	0.23
25	5.5	6.1	5.8	11.0	9.0	3.9	0.14
26	5.8	6.0	5.9	9.0	6.0	7.6	0.27
27	5.8	6.0	5.9	9.0	6.0	10.0	0.35
28	5.5	5.8	5.7	8.0	5.5	7.6	0.27
29	5.2	5.8	5.5	6.5	6.0	20.0	0.71
30	5.0	5.7	5.4	8.0	7.0	13.0	0.46
31	5.1	5.5	5.3	8.0	7.0	11.3	0.40
Avg			**5.1**	**6.9**	**6.1**		
Jun-01	5.5	5.9	5.7	8.5	5.0	13.0	0.46
2	5.3	5.9	5.6	8.0	5.0	11.8	0.42
3	5.5	5.8	5.7	9.0	7.0	10.4	0.37
4	5.7	6.0	5.9	8.0	6.5	9.3	0.33
5	5.9	6.7	6.3	9.5	5.5	11.8	0.00
6	6.5	6.7	6.6	9.0	6.0	7.6	0.27
7	6.3	6.8	6.6	9.5	6.5	8.7	0.31
8	6.5	6.8	6.7	9.5	5.5	9.3	0.33
9	6.8	7.0	6.9	9.0	5.0	12.4	0.44
10	6.0	7.0	6.5	9.0	6.0	13.0	0.46
11	6.0	6.2	6.1	8.0	6.0	10.0	0.35
12	6.1	7.0	6.6	10.0	9.0	3.1	0.11
13	6.9	7.0	7.0	10.0	7.0	2.6	0.09
14	7.0	7.3	7.2	10.5	8.0	2.5	0.09
15	7.0	7.4	7.2	10.0	7.0	2.4	0.08
16	7.1	7.3	7.2	10.0	5.5	1.7	0.06

Appendix 1 Table 2. Summary of Water Temperature and Streamflow Information in Km 1010 Ponds, 2001.

Date	Lower Pond @ 0.5 m			Outlet @	Telkwa R.	Outlet Q	Q
	Min	Max	Mean	Trap		(litres/sec)	(cfs)
17	7.3	7.9	7.6	11.5	7.0	4.4	0.16
18	7.8	8.0	7.9	10.0	6.5	4.4	0.16
19	7.8	8.0	7.9	12.0	8.5	4.1	0.14
20	8.0	8.5	8.3	13.0	8.0	8.1	0.29
21	8.3	9.0	8.7	13.0	6.0	7.0	0.25
22	7.8	9.0	8.4	11.5	7.0	7.9	0.28
23	7.9	8.0	8.0	10.5	7.0	5.7	0.20
24	7.9	8.0	8.0	11.5	7.5		
25	7.9	8.0	8.0	10.0	7.0	5.9	0.21
26	7.8	8.0	7.9				
27	7.5	8.0	7.8	10.0	6.0	4.6	0.16
28	7.3	8.0	7.7	11.0	8.0	17.3	0.61
29	7.5	8.0	7.8	12.0	7.0	13.0	0.46
30	7.6	7.8	7.7	11.0	7.0	17.3	0.61
Avg			**7.2**	**10.2**	**6.7**		
Jul-01	7.0	7.8	7.4	10.5	8	15.3	0.54
2	7.0	7.2	7.1	12.0	8.0	11.8	0.42
3	7.2	7.8	7.5				
4	7.8	8.3	8.1	12.0	8.5	10.4	0.37
5	8.0	8.8	8.4				
6	8.0	8.8	8.4	11.0	6.0	7.6	0.27
7	7.8	8.1	8.0				
8	8.0	8.3	8.2	12.0	8.0	4.6	0.16
9	8.2	8.6	8.4				
10	8.3	8.9	8.6	12.0	7.0	5.2	0.18
11	8.2	8.8	8.5				
12	8.5	8.9	8.7	12.0	7.5	3.5	0.12
13	8.9	8.9	8.9	12.5	10.0	3.7	0.13
14	8.6	8.9	8.8		8.5		
15	8.5	8.9	8.7		8.0		
16	8.2	9.2	8.7	11.0		3.1	0.11
17	9.1	9.3	9.2				
18	9.1	10.0	9.6				
19	9.8	10.0	9.9				
20	10.0	11.5	10.8				
21	11.2	11.8	11.5				
22	11.7	12.3	12.0				
23	12.0	12.5	12.3				
24	11.3	12.2	11.8				
25	11.1	11.9	11.5				
26	11.2	11.8	11.5				
27	10.8	11.1	11.0				
28	10.1	10.9	10.5				
29	10.1	10.8	10.5				
30	10.4	10.9	10.7				
31	10.3	10.9	10.6				
Avg			**9.5**	**11.7**	**8.0**		
Aug-01	10.5	10.7	10.6				
2	10.2	10.6	10.4				
3	9.7	10.3	10.0				
4	9.3	9.7	9.5				
5	9.1	9.7	9.4				
6	9.0	9.3	9.2				
7	9.0	9.3	9.2				
8	9.0	9.5	9.3				
9	9.3	10.0	9.7				
10	9.9	10.0	10.0				
11	10.0	10.5	10.3				
12	10.2	10.8	10.5				
13	10.8	11.0	10.9				
14	10.9	11.0	11.0				

Appendix 1 Table 2. Summary of Water Temperature and Streamflow Information in Km 1010 Ponds, 2001.

Date	Lower Pond @ 0.5 m			Outlet @	Telkwa R.	Outlet Q	Q
	Min	Max	Mean	Trap		(litres/sec)	(cfs)
15	10.8	11.0	10.9				
16	10.6	10.8	10.7				
17	10.8	11.0	10.9				
18	10.0	10.9	10.5				
19	10.0	10.1	10.1				
20	10.0	10.2	10.1				
21	9.2	9.7	9.5				
22	9.1	9.2	9.2				
23	9.0	9.1	9.1				
24	9.0	9.1	9.1				
25	9.0	9.0	9.0				
26	9.0	9.1	9.1				
27	9.0	9.6	9.3				
28	8.8	9.6	9.2				
29	8.7	8.9	8.8				
30	8.5	8.7	8.6				
31	8.8	9.0	8.9				
Avg			**9.8**				
Sep-01	8.8	9.0	8.9				
2	8.0	8.8	8.4				
3	7.9	8.0	8.0				
4	7.9	8.0	8.0				
5	7.0	8.0	7.5				
6	6.9	7.5	7.2				
7	7.0	7.3	7.2				
8	6.5	7.3	6.9				
9	5.9	6.2	6.1				
10	5.8	6.0	5.9				
11	5.8	6.2	6.0				
12	6.2	6.8	6.5				
13	5.5	6.0	5.8				
14	6.5	7.0	6.8				
15	6.5	6.9	6.7				
16	5.2	5.7	5.5				
17	6.0	6.8	6.4				
18	6.2	7.0	6.6				
19	6.9	7.1	7.0				
20	6.8	7.0	6.9				
21	6.7	6.7	6.7				
Avg			**6.9**				

Appendix 2 Table 1. Juvenile Coho Population Estimates in Km 1011 Ponds, May 2001.

SECTION	SIZE CATEGORY	M	C	R	N	SE (N)	95% C.I.
1	<75 mm	15	6	3	27	8.9	17
	>74 mm	76	54	5	705	265.3	520
2	<75 mm	2	4	1	7	3.3	6
	>74 mm	14	26	5	67	19.9	39
3	<75 mm	3	2	0	11	12.0	24
	>74 mm	7	14	4	23	5.9	12
4	<75 mm	3	6	1	13	7.4	15
	>74 mm	49	25	9	129	29.7	58
5	<75 mm	3	0	0	3	ne	ne
	>74 mm	30	7	2	82	39.0	76
6	<75 mm	1	1	0	3	4.2	8
	>74 mm	68	31	7	275	81.3	159
7	<75 mm	1	2	0	5	6.1	12
	>74 mm	26	9	2	89	44.0	86
PNG EXTENSION	<75 mm	0	0	0	0	ne	ne
	>74 mm	2	2	1	4	1.7	3
TOTAL	**<75 mm**	**28**	**21**	**5**	**105**	**34.3**	**67**
	>74 mm	**272**	**168**	**35**	**1281**	**177.4**	**348**
Combined	**all sizes**	**300**	**189**	**40**	**1386**	**211.7**	**415**

ne = no estimate

>75 mm coho are those fish assumed to leave as smolts during the spring of 1997.

M refers to the number of coho initially marked

C refers to the total number of coho recaptured

R refers to the number of recaptured coho with marks

N refers to the estimated population

CI refers to the confidence intervals

Appendix 3 Table 1. Summary of Upstream and Downstream Trapping Results at the Outlet to the Telkwa Ponds at Km 1011, 2001.

DATE	UPSTREAM				DOWNSTREAM				
	COHO				COHO	PRE-	COHO	RBT	MARKS
	AGE 0+	AGE 1+	RBT	MW	SMOLTS	SMOLTS	FRY		
May-08	0				0				
9	0				1				
10	2				0				
11	0				0				
12	0				0				
13	2				0				
14	2				0				
15	10				0				
16	5				0				
17	1				0				
18	1				0				
19	0				5				0
20	0				0				
21	0				0				
22	2	0			3				0
23	13	3			6				0
24	9	2			6				0
25	8	1			8	1			1
26	5	3			5				0
27	21	0			15				4
28	25	2			17				3
29	11	3			80				11
30	28	5			88				17
31	24	5			31				6
Jun-01	14	0			16				6
2	22	11			46				7
3	23	4			14				4
4	4	0			17				2
5	10	4			5				2
6	30	28			11				2
7	14	3			12				2
8	24	20			31				4
9	25	21			21				4
10	12	8			38				5
11	28	18			10				2
12	22	9			26				3
13	18	20			9				1
14	19	1			21				3
15	8	9			0				0
16	6	0			0				0
17	8	15			38	1			4
18	13	9			8	1			2
19	42	19			5			1	0
20	18	11			10				2
21	0	8			21	1			2
22	3	7			24				3
23	13	6			6				2
24	32	4			0				0
25	4	2			8				1
26									
27	6	1			6				0
28	0	1			1				
29	0	1			26				6
30	8	16			23				6
Jul-01	16	14			21				3
2	39	16			6	3			1
4	29	20			4				2
6	10	9			0	1			0
8	25	0			3				1
10	5	2			0				
12	6	4			0				
13	21	3			12	1			1
14	4	1			6	1			1
15	23	8			0				
TOTAL	773	357	0	0	770	10	0	1	126
									16.4

Appendix 3 Table 2. Summary of Upstream and Downstream Trapping Results at the Outlet to the Telkwa Ponds at Km 1010 in 2001.

DATE	UPSTREAM				DOWNSTREAM				
	COHO				COHO	PRE-	COHO	RBT	OTHER
	AGE 0+	AGE 1+	RBT	MW	SMOLTS	SMOLTS	FRY		
May									
8	0	0	0	0	0	0			
9	0	3			0				
10	0	0			0				
11	0	2			0	1	0		
12	0	0			0	0	0		
13	0	10	0		0	0	0		
14	0	3			3	0			
15	0	0			0				
16	0	0			0				
17	0	0			1				
18	0	0			1				
19	0	0			0				
20	1	2			0				
21	1	0			0				
22	0	0			0				
23	0	0			0				
24	1	23			1				
25	7	25			2				
26	0				3				
27	2	19			1				
28	4	6			1				
29	5	4			0				
30	0	11			10				
31	4	12			7				DV-1
Jun-01	4	8			5				
2	0	1			5				
3	22	11			3				
4	9	6			2				
5	5	10			2				
6	0	0			2				
7	4	4			3				
8	4	5			8	1			
9	18	13			1				
10	1	4			10				
11	9	11			12				
12	50	9			12				
13	29	15			2				
14	11	18			8				
15	19	10			1				
16	31	19			3				
17	27	15			5				
18	21	6			3				
19	14	23			3	1			
20	46	4			1				
21	23	2			2				
22	76	1			1	1			
23	20	0			3				
24	42	7			1	1			
25	14	0			1				
26									
27	12	15			2				
28	21	11			0	1			
29	32	5			0				
30	42	4			0	4			
Jul-01	26	2			1	2		RBT-1	
2	27	2			1				
4	44	4			1				
6	25	8	DV-1		0				
8	39	10			0			RBT-1	DV-1
10	33	6			0				
12	20	3	DV-1		0				
13	24	2			0			RBT - 1	
16	27	6	RBT - 1		0			RBT - 1	
TOTAL	896	400	0	0	134	12	0	0	0

Appendix 3 Table 3. Summary of Fork Length Measurements of Upstream Coho Migrants in Km 1011 Ponds from 1996 to 2001.

Age 0+

	May					
	1996	1997	1998	1999	2000	2001
Number	343	151	108	598	339	166
Size Range (mm)	30-43	29-42	29-43	30-45	30-44	29-43
Mean Fork Length	35.1	32.8	33.2	35.4	33.8	35.1
Std	2.4	2.2	1.7	2.5	2.4	2.4

	June					
	1996	1997	1998	1999	2000	2001
Number	542	325	161	343	808	412
Size Range (mm)	30-47	28-50	28-51	30-45	28-49	29-47
Mean Fork Length	35.9	37.6	36.0	34.7	34.9	36.1
Std	2.9	4.8	4.5	2.3	3.8	3.3

	July					
	1996	1997	1998	1999	2000	2001
Number	416	303	104	end of	61	163
Size Range (mm)	30-49	28-57	29-55	study	29-51	30-52
Mean Fork Length	38.4	44.4	41.3	washed	36.1	38.7
Std	4.3	7.6	6.8	out	4.7	5.1

Age 1+

May					
1996	1997	1998	1999	2000	2001
192	256	119	32	460	24
44-81	45-108	50-82	56-90	45-96	45-72
56.1	64.1	64.1	69.0	62.3	54.7
7.2	10.4	7.3	9.6	9.2	6.0

June					
1996	1997	1998	1999	2000	2001
347	350	119	13	215	258
48-96	51-100	55-88	56-75	50-85	48-82
61.8	69.2	69.4	63.2	61.6	60.6
6.8	8.8	7.3	5.1	7.4	7.2

July					
1996	1997	1998	1999	2000	2001
95	132	24	end of	3	73
50-72	58-92	58-80	study	55-73	54-88
59.0	73.9	77.2	washed	63.0	69.2
5.4	8.6	8.5	out	9.2	8.5

Appendix 3 Table 4. Fork Length Measurements of Upstream Coho Migrants in Km 1010 Pond from 1999 to 2001.

Age 0+

	May		
	1999	2000	2001
Number	5	31	25
Size Range (mm)	35-41	31-45	33-43
Mean Fork Length	37.6	35.1	38.2
Std	2.1	3.1	2.6

Age 1+

May		
1999	2000	2001
1	34	120
59	50-86	45-78
59.0	61.6	57.9
0.0	7.9	7.6

Age 0+

	June		
	1999	2000	2001
Number	167	359	494
Size Range (mm)	31-48	30-48	31-47
Mean Fork Length	36.1	36.7	37.9
Std	2.8	3.6	3.1

Age 1+

June		
1999	2000	2001
3	52	236
55-69	50-75	48-76
61.7	59.9	58.5
7.0	6.0	6.6

Age 0+

	July		
	1999	2000	2001
Number	study ended	63	249
Size Range (mm)	in mid-June	33-52	32-50
Mean Fork Length		38.7	38.8
Std		4.6	4.0

Age 1+

July		
1999	2000	2001
study ended	no	43
in mid-June	samples	53-82
		63.3
		7.1

No data was collected after July 16th in 2001.

Appendix 3 Table 5. Summary of Km 1011 Upstream and Downstream Fish Movements of Species other than Coho by Month and Year (1996 to 2001).

UPSTREAM MOVEMENTS

Month	Rainbow						Whitefish				DV	CT	LND
	1996	1997	1998	1999	2000	2001	1996	1997	1998	1999	1998	1997	2000
May	0	8	2	6	0	0	1	1	1	0	2	0	0
June	2	2	1	1	0	0	7	4	0	0	0	1	1
July	0	2	1	na	0	0	0	0	0	na	0	1	0
Aug (1-9)	0	dry	dry	na	na	na	0	dry	dry	na	dry	dry	
Total	**2**	**12**	**4**	**7**	**0**	**0**	**8**	**5**	**1**	**0**	**2**	**2**	**1**

DOWNSTREAM MOVEMENTS

Month	Rainbow						Whitefish				DV	Chub	BT
	1996	1997	1998	1999	2000	2001	1996	1997	1998	1999	1998	1999	1999
May	7	2	3	2	1	0	2	1	0	0	2	0	1
June	18	8	6	1	1	1	1	1	0	1	0	1	0
July	0	0	0	na	0	0	1	0	0	na	0	na	na
Aug (1-9)	0	dry	dry	na	na	na	0	dry	dry	na	dry	na	na
Total	**25**	**10**	**9**	**3**	**2**	**1**	**4**	**2**	**0**	**1**	**2**	**1**	**1**

No data was collected after June 16th in 1999 due to high Telkwa River flows flooding the outlet of the ponds.
No data was collected after July 6th in 2000 and July 15th in 2001.

Appendix 3 Table 6. Summary of Fork Lengths of Fish Species Other than Coho in Km 1011 and Km 1010 Pond Outlets, 2001.

	Km 1011		Km 1010			
	Rainbow Trout	Peamouth chub	Rainbow Trout		Dolly Varden	
	Down*	Mark-recapture	Up*	Down	Up*	Down
	82	82	58	70	58	102
		90		70	70	103
		92		72		
		92		73		
		93				
		93				
		94				
		94				
		95				
		96				
		97				
		98				
		100				
		106				
		108				
		109				
		109				
		110				
		112				
		112				
		114				
		115				
		118				
		123				
		128				
		128				
count	1	26	1	4	2	2
max	82	128	58	73	70	103
min	82	82	58	70	58	102
avg	82.0	104.2	58.0	71.3	64.0	102.5
std	0.0	12.4	0.0	1.5	8.5	0.7

* Outlet traps

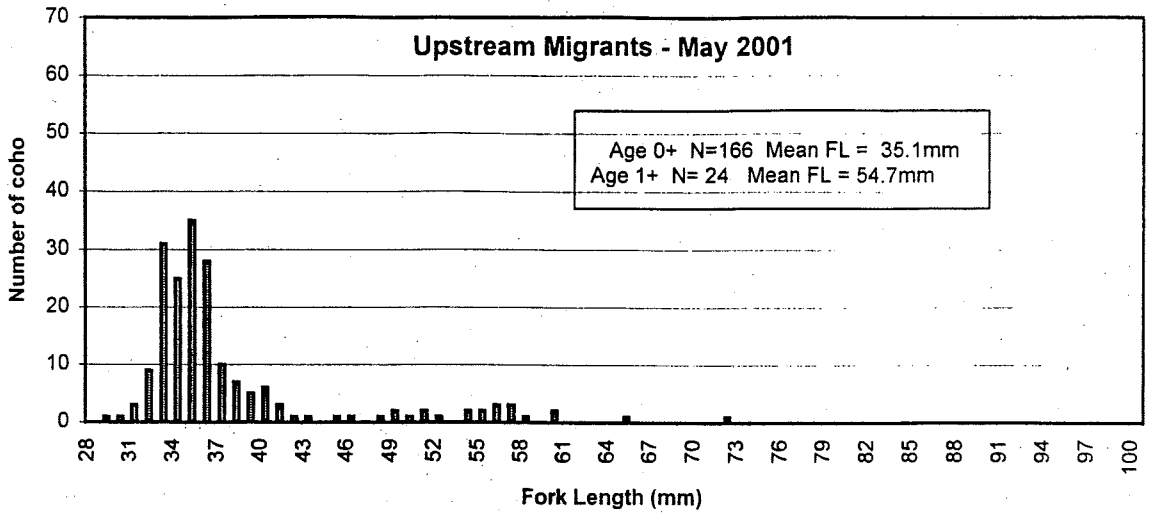
Appendix 3 Table 7. Summary of Km 1011 Fry Recruitment Versus Previous Year's Adult Observations.

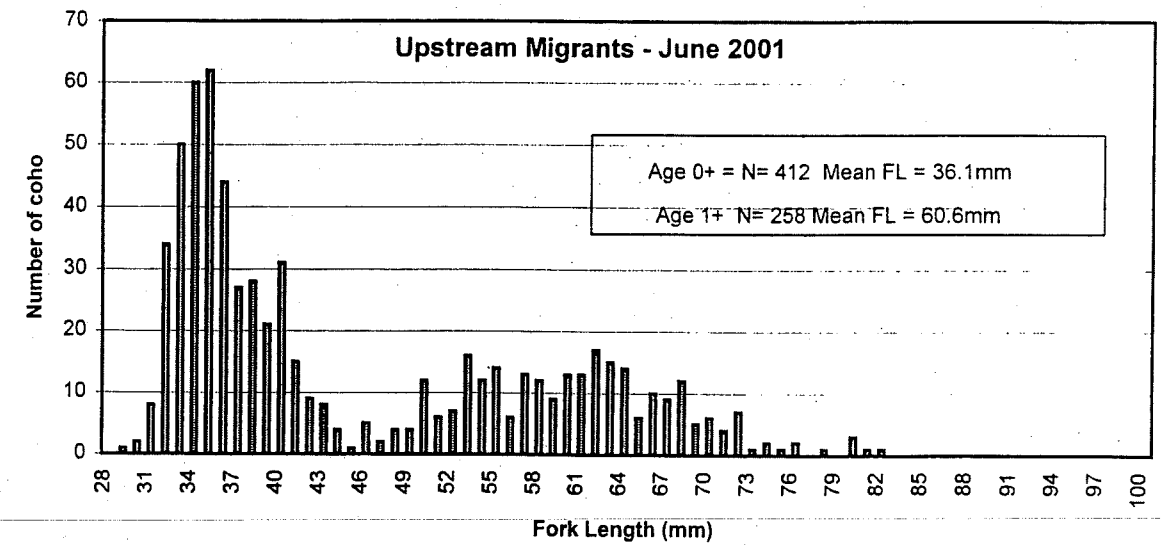
Year	Spawner Estimates	Following Year Fry Recruitment
1994	1776	
1995	ne	2431
1996	ne	829
1997	90	375
1998	1970	1437
1999	3927	3035
2000	1008	773
2001		

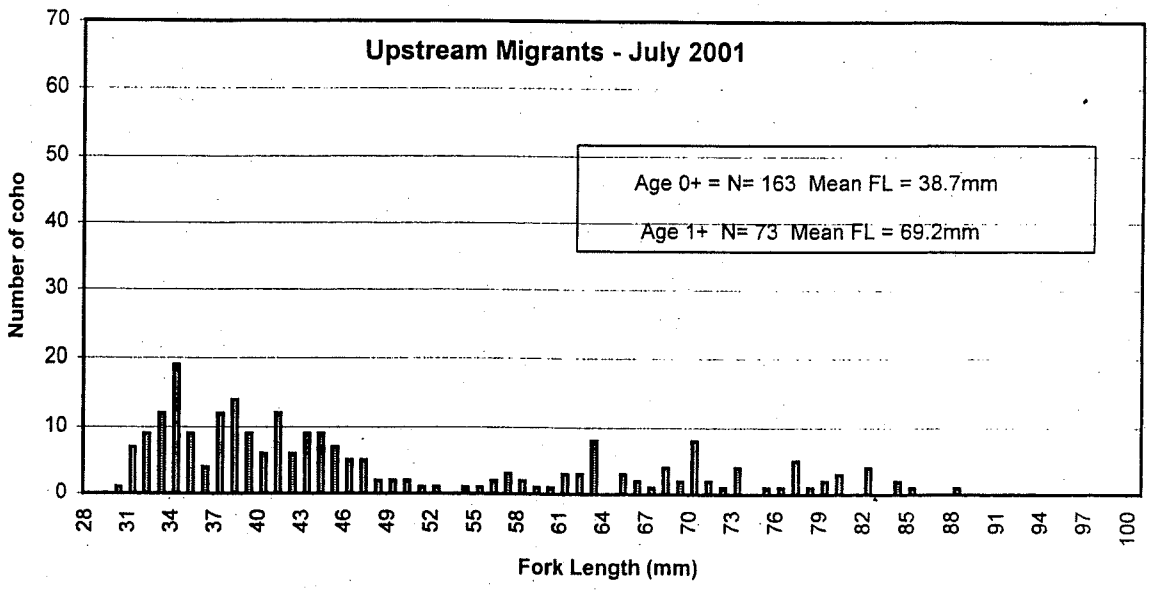
ne - no estimate or difficult conditions

1990, 91 and 92 - no estimate
1993 - 500 visual estimate. Single overflight?
1994 - auc estimate
1995 - 200 very poor estimate based on single flight - very cold with ice.
1996 - not inspected
1997 - auc estimate based on four flights
1998-2000 - auc estimates based on multiple flights.

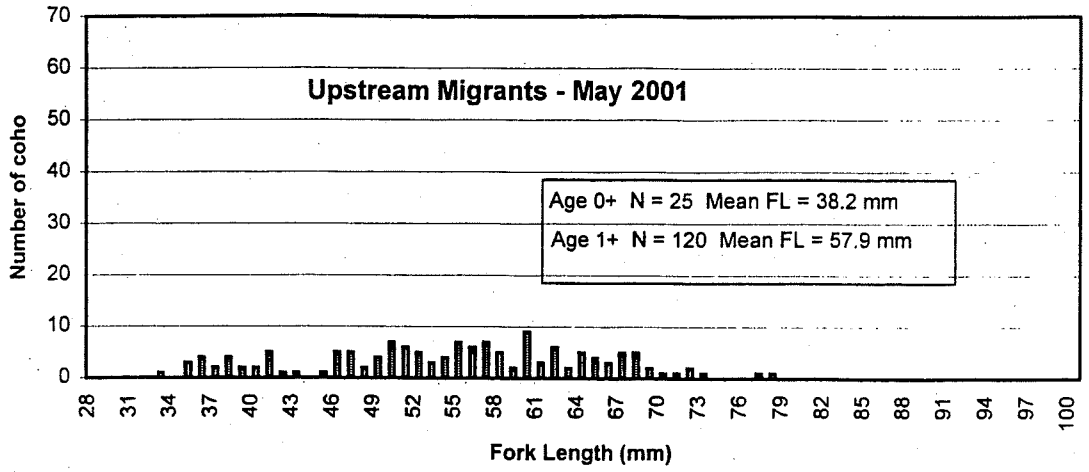
Appendix 3 Figure 1. Summary of Fork Lengths of Upstream Coho Migrants in Km 1011 Ponds, 2001

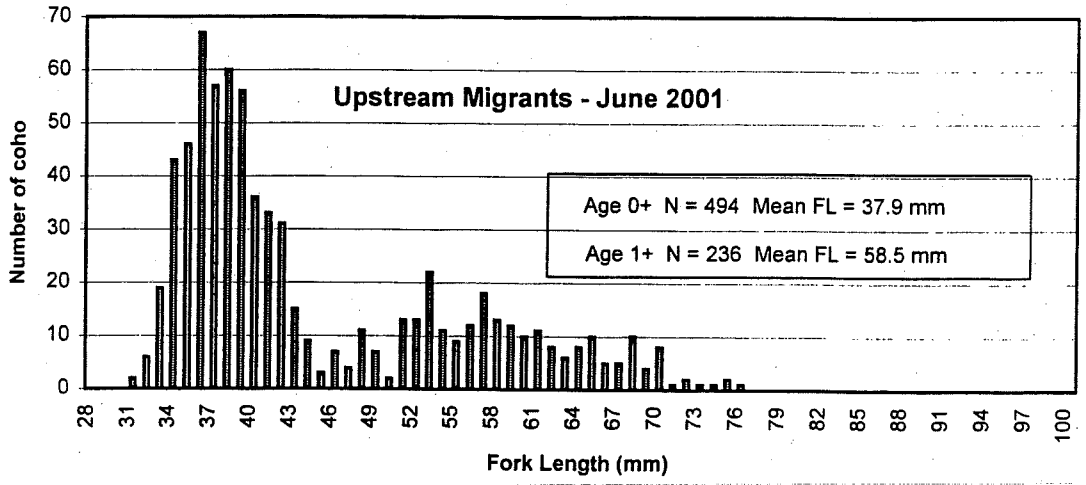


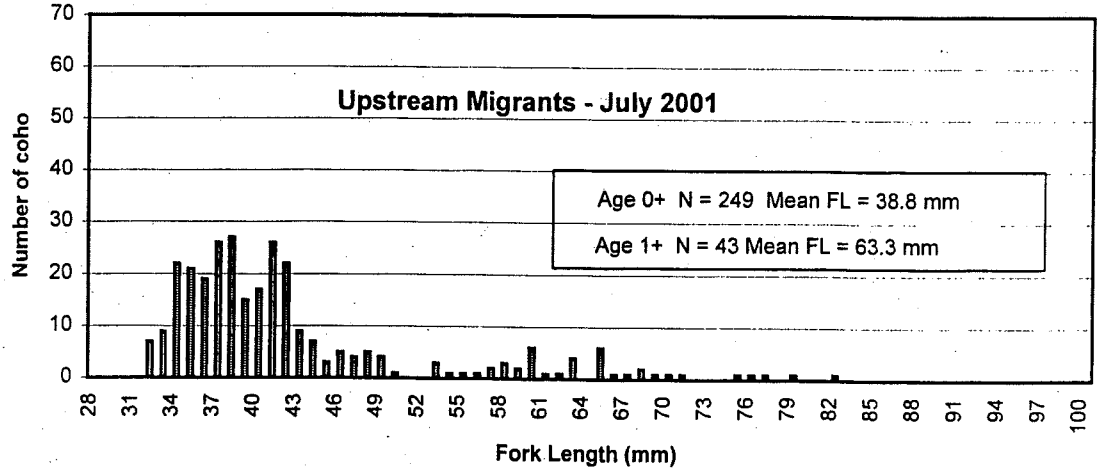




Appendix 3 Figure 2. Summary of Fork Lengths of Upstream Coho Migrants in Km 1010 Pond, 2001.







Appendix 4 Table 1. Summary of Age-Length Determinations for Coho Captured in Mark-Recapture and Downstream Smolt Trap, 1995 to 2000.

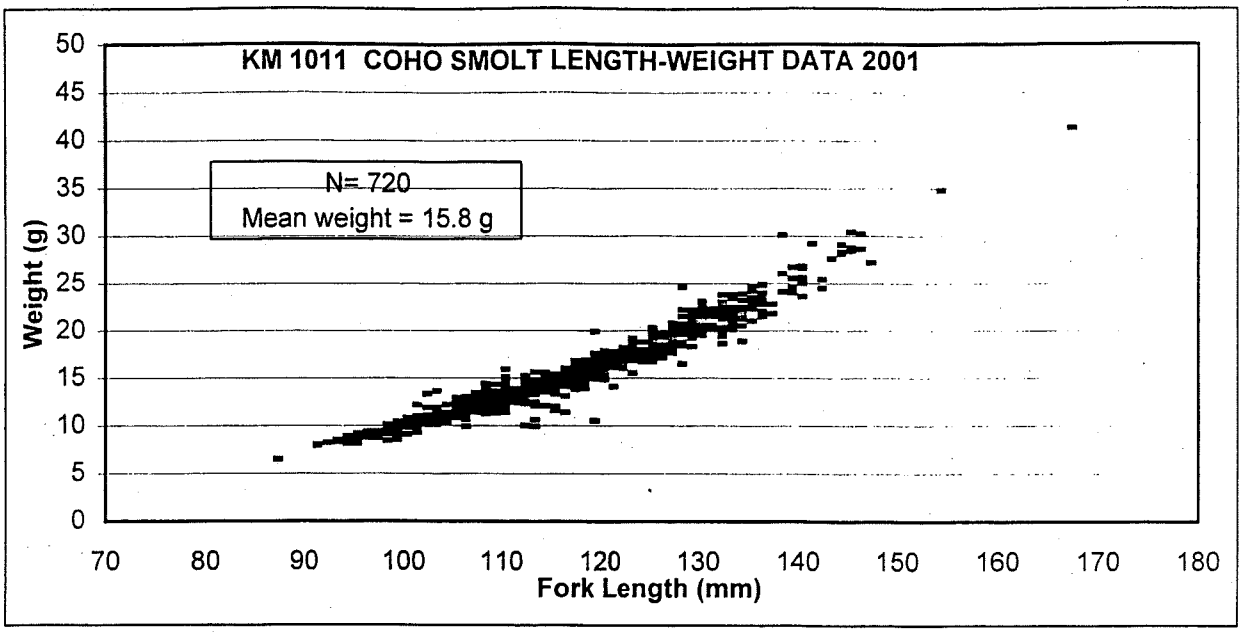
KM 1011 DOWNSTREAM FENCE				
	2000 smolts			
Age	**1+**	**2+**	**3+**	**4+**
FL Range (mm)	90-132	110-162		
FL Average	107.1	126.5		
n	40	19		
	1999 smolts			
Age	**1+**	**2+**	**3+**	**4+**
FL Range (mm)	97-122	106-142	123-143	
FL Average	108.2	124.7	136.6	
n	13	27	5	
	1998 smolts			
Age	**1+**	**2+**	**3+**	**4+**
FL Range (mm)	78-138	87-134	82-137	151
FL Average	105.1	109.4	116.6	151
n	20	22	10	1
	1997 smolts			
Age	**1+**	**2+**	**3+**	
FL Range (mm)	82-132	87-150	121-129	
FL Average	98.1	114.9	125.0	
n	20	26	2	
	1997 mark-recapture			
Age	**1+**	**2+**	**3+**	
FL Range (mm)	51-120	68-131	na	
FL Average	81.6	105.6	na	
n	38	26	0	
	1995 mark-recapture			
Age	**1+**	**2+**	**3+**	
FL Range (mm)	77-111	92-118	115-124	
FL Average	88.3	106.3	119.8	
n	24	16	9	

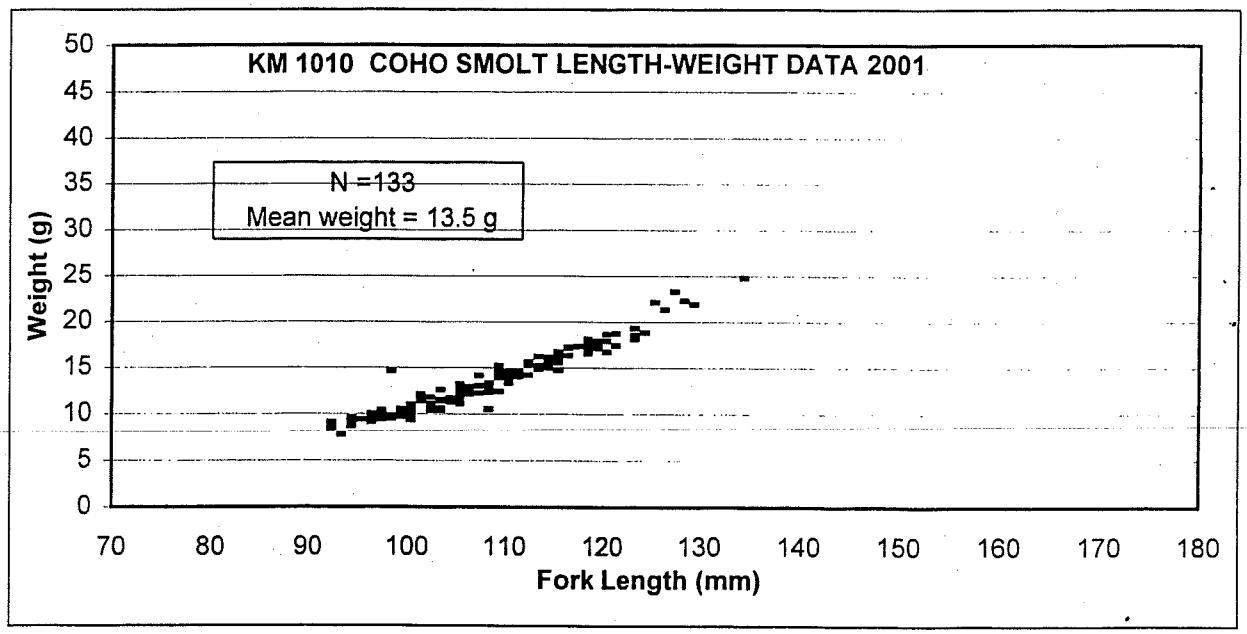
KM 1010 DOWNSTREAM FENCE				
	2000 smolts			
Age	**1+**	**2+**	**3+**	**4+**
FL Range (mm)	81-113	112-123	118	
FL Average	102.4	116.0	118.0	
n	18	6	1	
	1999 smolts			
Age	**1+**	**2+**	**3+**	**4+**
FL Range (mm)	84-145	96-127	148	
FL Average	103.8	115.4	148	
n	16	22	1	

Appendix 4 Table 2. Coho Biomass Estimates Based on Mark-and-Recapture Population Estimates in Km 1011 Ponds in Early May 1994 to 2001.

Year	Mean length <75 mm	Mean wt (g)	n	Total Biomass	Mean length >75 mm	Mean wt (g)	n	Total Biomass	Combined All Coho	Grams/m^2 All Coho
1994	66.3	3.29	336	1105	100.6	10.40	2304	23955	25060	2.88
1995	70.2	3.86	296	1143	99.6	10.11	1549	15661	16803	1.93
1996	65.9	3.23	1484	4793	89.9	7.59	2820	21400	26193	3.01
1997	68.6	3.62	271	981	93.8	8.55	1124	9607	10588	1.22
1998	68.4	3.53	107	378	100.9	10.48	1806	18934	19312	2.22
1999	0.0	0.00	0	0	116.3	15.60	961	14996	14996	1.72
2000	70.1	3.86	113	436	100.1	10.14	2334	23667	24103	2.77
2001	69.6	4	105	397	105.6	11.7	1281	14988	15385	1.77

Appendix 4 Figure 1. Coho Smolt Length-Weight Information for Km 1011 and Km 1010 Ponds, 2001.





Appendix 5 Table 1. Wildlife Observations in the Vicinity of Km 1011 Ponds 2001.

Date	Birds	Amphibians	Other
May 1	Osprey on river		
May-09	Goose nest with 4 eggs - only 3 eggs a few days earlier.		Kingfisher
May-11		Spotted frog and 3 egg masses in upper pond	
May-13	Kingfisher		
May 15		Spotted frog in d/s box	
May 16	Lots of Wilson warblers		Moose in upper pond
May 17	2 geese in lower pond		
May 23			School of 50+ smolts at outlet
May-24		Serious toad action in lower pond - 10+ -	
		Egg masses in the upper pond after bdam pulled	
May-25	Sandpiper in lower pond	50+ toad in lower pond - thick egg masses in shallow sedges	
May-26	Geese still on nest - 4 eggs	Toads not around egg masses	
May-27			
May-30	Kingfisher		
May-31	Kingfisher	Spotted frogs hatched in upper pond	
June 3	Blackbirds		
June 4		Small toad above trap	Lots of butterflies about trap area
Jun-05			
Jun-07	Kingfisher		
Jun-08	1 merganser on river	Spotted frog in d/s box	Cow moose and new calf on river
Jun-09	Merganser on river		
Jun-12			Porcupine at traps
Jun 16	Pair of geese and two young crossed river (very high) at staff gauge.		
	Cow and calf moose - calf stuck inside fencing along creek.		
Jun-17	Sandpiper in creek		Beaver re-built between screens
Jun-18			Butterflies - black edge with yellow
June 19		2 western toads and 1 spotted frog in d/s box	
June 20		1 western toad in d/s box	
June 22		Thousands of small tadpoles everywhere!	
June 23		Large numbers of tadpoles	
June 28	Kingfisher		
July 1		1 spotted frog	
July 10		1 western toad in d/s box	1 spotted frog - outlet pond
July 1-10th	Lots of beaver activity in outlet creek. Tried beaver stops and bear urine. Too much good		
	material for building dam in outlet creek.		
July 15	Kingfisher	1 western toad in outlet.	

Appendix 5 Table 2. Wildlife Observations in the Vicinity of Km 1010 Pond 2001.

Date	Birds	Amphibians	Other
May 12	Mallards on pond - pair		
May 14			Coyote on road in to traps.
May 21	Pair mallards and kingfisher		
May 22	Sandpiper at outlet creek		
May 23		1 w. toad in d/s box	
May 28	Kingfisher at mouth of creek	1 w. toad in d/s box	
June 1	Geese (heard only)	2 w. toad in d/s box	
June 5	Sandpiper at outlet creek	Female mallard	
June 8	Kingfisher at mouth of creek	Pair of w. toads	
June 9	Kingfisher at mouth of creek		
June 11	Kingfisher		
June 13			Small black bear on walk into site
June 17			Marmot near creek ford on way in
June 18			1 deer and 1 coyote at creek ford
June 19			Moose on walk in.
June 20			Butterflies
June 21			Snowshoe hare
June 22	Kingfisher		
June 24	Uid duck on pond		
June 25	Hawk at pond		
June 28			Porcupine at box in site.
July 4			Deer on road into site
July 5			Cow and calf moose on walk in.
July 8			Woodchuck on road.
July 10			Small bear at creek

2.3 FRBC#720777 Overview Assessment

This project was cancelled following the receipt of cost estimates for the completion of an overview assessment for the Boucher, Babine and Nilkitkwa River Sub-basins. It was felt that the minimal amount of pre code operations in the area of the assessment would lead to a very expensive report yet no eligible restoration activities.

2.4 FRBC#720780 Road Deactivation – Works

The objective of this project was to complete road deactivation works in accordance with deactivation prescriptions developed in 2001. The prescriptions for this project can be found in section 2.8 FRBC#723977 Detailed Assessment and Planning – Roads. The Prescriptions for this project are for roads within the West Babine Sub-basin of the Torkelson Watershed, which is part of PIRs Babine chart area. Silvicon Services Inc. (Silvicon) was hired under contract to administer this project. Silvicon set up a works standards agreement amendment between the Ministry of Forests and PIR. The standards agreement amendment adjusted the 2000/2001 works standard agreement for deactivation. A copy of the standards agreement amendment is included with this document. Silvicon also developed the prescriptions into a contract for the "works phase" of the road deactivation process in 2001/2002 then prepared and tendered the contract for the deactivation works. A contractor was selected, through a select tender process then Silvicon coordinated the contract between the lowest bid contractor and PIR. PL & L Contracting was the lowest bid contractor and completed the works phase of the contract.

Approval from the district manager was received for any in-stream works that took place outside of in-stream work windows and was included with the prescriptions. At the time of seeking approvals there was no longer the position of DEO within the Ministry of Environment, Lands and parks (now Ministry of Water, Land and Air Protection) and therefore approval from the DEO was not included. Confirmation from the Ministry of Forests was given prior to starting work that the approval from the DEO is no longer required.

To ensure the quality of the works phase of road deactivation, Silvicon Services Inc. provided supervision of the contractor during the works phase.

West Fraser

01 OCT 10 PM 2:08

SMITHERS, B.C.

October 5, 2001

Glen Buhr
Ministry of Forests
Bulkley/Cassiar District
Bag 6000
Smithers, BC
V0J 2N0

Re: Forest Renewal BC Standards Agreement and Schedule Amendments for the 2001/2002 fiscal year.

Dear Glen

In an effort to streamline the amount of administration required to implement Forest Renewal BC funded projects during the 2001-2002 fiscal year, please consider this letter to be a formal amendment to Standards Agreement file No: SBM02112, Multi-Year Agreement No: SBM 02 112:

The Standards Agreement and associated Schedules are hereby amended as per the attached.

IN WITNESS WHEREOF the Parties hereto have duly executed
This Agreement as of the 1st Day of October, 2001.

Signed and delivered on behalf of the Province by an authorized representative of the Province:

2001/10/11

Ministry of Forests
Authorized Signatory ~~(Spending Authority)~~

Signed and delivered by or on behalf of the recipient (or by an authorized signatory of the recipient if a corporation)

Recipient or Authorized Signatory

The Standards Agreement (FS1001) Article 2 Schedules and Changes is amended as follows for the 2001/2002 fiscal year:

Schedules

Schedule A Watershed Restoration Program Standards Agreement – Works (see attached for reference) is hereby amended as follows for the 2001/2002 fiscal year:

- Dated 1st day of October, 2001

Schedule A is hereby amended to include the following Work Progress Plan for the 2001/2002 fiscal year:

INITIALS	INITIALS
(RECIPIENT)	(MINISTRY)

BRITISH COLUMBIA

Ministry of Forests

Work Progress Plan

For Outlining Scope of Project, Scheduling of Work Completion, and Inspecting Work Areas as requested by the Ministry of Forest Representative

ACTIVITY DESCRIPTOR (Name / Short Description)	ACTIVITY NUMBER (From On-Line Plan)	STANDARDS AGREEMENT # (Cross Reference to Applicable SA)
Kitseguecla/West Babine Sub-basin Deactivation	**720780**	**SBM 02112**

LICENSEE / PROPONENT (Name of Recipient)	MULTI-YR PLAN # (From On-Line Plan)	DISTRICT / LOCATION (Name / Short Description)
Pacific Inland Resources (a division of West Fraser Mills Ltd.)	SBM 02 112	Bulkley/Cassiar Forest District Bulkley TSA

Work Unit	Project Objectives	Requirements	Start Dates and End Dates	Inspection Requirements / Comments
Kitseguecla Chart	Improvement of 2000/2001 Road deactivation	Improvement of Deactivation works site 092RWC2 and 092RWC8	Start October 1, 2001 End October 15, 2001	Work to be completed as per action plan December 18, 2000 (see attached for reference)
West Babine Sub-basin, Torkelson Watershed	Road deactivation	Deactivation works of 2001 prescriptions	Start October 15, 2001 End November 23, 2001	District Manager and DEO signature on required Prescriptions

Special Requirements, Additional Notes, Scheduling, Comments, etc....

Recipient (Proponent) Representative	Telephone	Ministry Representative	Telephone
Alan Baxter	847-2656	Grant Marleau	847-6310

This Work Progress Plan forms part of the Standards Agreement and Work must be carried out and completed in accordance with this Work Progress Plan.

Signed: _____ Date: _____ /// Signed: _____ Date: _____

Schedule B is hereby amended to include the following Road Deactivation Prescriptions for the 2001/2002 fiscal year:

- Dated 1st day of October, 2001

WEST BABINE SUB-BASIN DEACTIVATION

Associated Cutting Permit	Main Road System	Road Name	Road Length (km)	# Of Cross Ditches	# Of Culverts for Removal	Recommended Equipment	Other Required Construction	Level Of Deactivation	Vehicle Access
CP 001-3	424 Road	001-3	1.39	0	0	N/A	N/A	N/A	ATV
Notes:		No deactivation required, road is brushed in and well vegetated							
CP 001-5	428 Road	001-5A	0.85	0	0	N/A	N/A	N/A	ATV
Notes:		No deactivation required, road is brushed in and well vegetated. Deactivation is already complete							
CP 001-5	428 Road	001-6	0.24	0	0	N/A	N/A	N/A	None
Notes:		No deactivation required, road is planted and no longer exists							
CP 001-2A	428 Road	001-A	0.4	0	0	N/A	N/A	N/A	4x4
Notes:		No deactivation required							
CP 001-2 & 2A	428 Road	001-B	1.03	3	0	Mid sized (200) excavator	N/A	Permanent	4x4
Notes:									
CP 001-2	428 Road	001-C	0.07	0	0	N/A	N/A	N/A	ATV
Notes:		No deactivation required							
CP 001-1	428 Road	001-D	0.19	0	0	N/A	N/A	N/A	4x4
Notes:		Road was not labelled on map – no deactivation required							
CP 001-1	428 Road	001-E	0.86	0	2	Mid sized (200) excavator	N/A	Permanent	ATV
Notes:		May need water branch approval to remove beaver dam							
CP 001-1	428 Road	001-F	0.06	0	0	N/A	N/A	N/A	N/A
Notes:		Stub spur off 001-E No deactivation required							
CP 001-1	428 Road	001-G	0.31	0	0	N/A	N/A	N/A	N/A
Notes:		No deactivation required							
CP 001-8	428 Road	001-H	0.30	0	1	Mid sized (200) excavator	N/A	Permanent	ATV
CP 001-4	428 Road	001-I	1.08	0	1	Mid sized (200) excavator	N/A	Permanent	4x4
Notes:									
CP 001-7	429 Road	429	1.92	1	0	Mid sized (200) excavator	N/A	Permanent	ATV
Notes:		May need water branch approval to remove beaver dam							
CP 012-10	431 Road	012-10	0.0	0	0	N/A	N/A	N/A	N/A
Notes:		Road is planted – no access - No deactivation required							
CP 012-7	431 Road	012-7	1.22	0	0	N/A	N/A	N/A	ATV
Notes:		Heavily brushed in - No deactivation required							
CP 522-4	437 Road	522-4A	1.22	2	3	Mid sized (200) excavator	N/A	Permanent	ATV
Notes:									
CP 522-4	437 Road	522-4B	0.51	3	1	Mid sized (200) excavator	N/A	Permanent	ATV
Notes:									
CP 522-4	437 Road	522-4C	0.10	1	1	Mid sized (200) excavator	N/A	Permanent	ATV
Notes:									
CP 522-3	437 Road	522-3	0.43	1	2	Mid sized (200) excavator	N/A	Permanent	ATV
Notes:									
N/A	439 Road	438	1.54	3	2	Mid sized (200) excavator	N/A	Permanent	4x4
Notes:									
N/A	439 Road	438A	0.07	1	0	Mid sized (200) excavator	N/A	Permanent	None
Notes:									
N/A	439 Road	438B	0.32	0	0	N/A	N/A	N/A	ATV
Notes:		No deactivation required, heavily brushed in							

INITIALS	INITIALS
(RECIPIENT)	(MINISTRY)

The following Table 3 includes additional sites discovered during road deactivation fieldwork. These sites are not identified within previous plans but are eligible for FRBC funding.

Additional Deactivation Summary

Associated Cutting Permit	Main Road System	Road Name	Road Length (km)	# Of Cross Ditches	# Of Culverts for Removal	Recommended Equipment	Other Required Construction	Level Of Deactivation	Vehicle Access
CP 573-3	4000Road	4032	N/A	0	0	Mid sized (200) excavator	Remove collapsed wood box culvert	Permanent	None
Notes:		Wood box culvert on old overgrown road grade							
Williams Creek	4000 Road	4034	N/A	0	0	Mid sized (200) excavator	Remove collapsed wood box culvert	Permanent	None
Notes:		Collapsing wood box culvert on old road grade crossing Williams Creek							
Notes:									
Additional Notes: Average depth of fill over metal culverts is1.5m Maximum depth of fill over metal culverts is 2.5m Where possible, culverts will be salvaged, destroyed culverts will be buried at a nearby site Contractor will be required to place a warning sign, provided by PIR, at the beginning of each road system									

Schedule C is hereby amended as follows:

- Dated 1st day of October, 2001

INITIALS	INITIALS
(RECIPIENT)	(MINISTRY)

2.5 FRBC#720785 Detailed Assessment and Planning – Instream

This activity began with the intent to complete two Fish Habitat Assessment Procedures (FHAP). The first labelled WSC 480-430700-21000 and located within the West Babine sub-basin of the Torkelson Watershed was originally identified within an Integrated Watershed Restoration Plan (IWRP) developed by McElhanney Consulting Services Ltd. Alan Baxter of PIR identified the second site, labelled WSC 480-397200-29600, located within the Nilkitkwa Lake sub-basin of the Babine watershed. The project areas were considered to be potentially damaged by past timber harvesting practices and warranted a closer look by qualified personnel. Silvicon Services Inc. (Silvicon) was hired under contract to administer this project and to conduct the fish habitat assessment procedures for the two sites. The Standards Agreement for Fish Habitat Assessments Procedures is dated for reference September 18, 2001 and a copy is included in this document.

2.5.1 WSC 480-430700-21000

This unnamed stream is situated within CP 522 block 3 and is a tributary to Heal Creek. The field assessment determined that the stream was impacted during the harvesting of CP 522. Field visits to the site determined that the present conditions of the stream reach were probably not that different from those historically. Sampling of the stream with an electroshocker did not capture any fish. Due to the conditions observed during field visits it was decided that a formal FHAP would not be necessary. A short report detailing the findings of the assessment and recommendations is included with this document.

2.5.2 WSC 480-397200-29600

This unnamed stream parallels the north boundary of CP 523 block 3. It was clear from the field visits that the stream had undergone a change in channel location. Those who visited the site felt that harvesting activities played little or no role in the change of channel location. It was determined that this stream reach is situated on an active alluvial fan with little topographic relief. Due to the conditions observed during field visits it was decided that a formal FHAP would not be necessary. A short report detailing the findings of the assessment and recommendations is included with this document.

BRITISH COLUMBIA

Ministry of Water,
Land and Air
Protection

Standards Agreement

(For use with Multi-Year or Annual Agreements between the Recipient and Forest Renewal BC)

MINISTRY NUMBER:	**[MINISTRY NUMBER]**	THIS AGREEMENT DATED FOR REFERENCE **09/18/01**
MULTI-YR AGMT NUMBER:	**SBM02112**	
ACTIVITY NUMBER:	**720785 (DAS)**	

FOR: **FISH HABITAT ASSESSMENT PROCEEDURE IN VARIOUS STREAM REACHES IN CP 522-3 AND CP523-3**

CONTENTS

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA, (the "Province") as represented by the Minister of Water, Land and Air Protection

Smithers BC
3726 Alfred Ave.
Box 5000, Smithers BC V0J 2N0
Phone Number: (250) 847-7260
Fax Number: (250) 847-7556

AND:

Pacific Inland Resources, (the "Recipient")
Box 3130
Smithers BC, V0J 2N0
Phone Number: (250) 847-2656
Fax Number: (250) 847-5520

both of whom are sometimes referred to as "the Parties" and each of whom is a "Party" to this Agreement.

WHEREAS:

A. The Province wishes the Work described in this Agreement to be carried out for the benefit of Forest Renewal BC.

B. The Recipient seeks to carry out and complete the Work described in the attached Schedule(s).

C. The Recipient has entered or intends to enter into an Annual or Multi-Year Agreement with Forest Renewal BC for the purpose of funding the Work.

THE PARTIES AGREE AS FOLLOWS:

ARTICLE 1 DEFINITIONS

1.01 In this document, the following words have the following meanings:

(a) **"Agreement"** means this agreement including any Schedules;

(b) **"Changed Condition"** means a materially changed physical condition at the Work Area which

i) was not foreseen by the Recipient; and

ii) would not have been reasonably foreseen by a reasonable Recipient who, before submitting its tender, conducted a thorough investigation of the work to be done to complete the Work, including a thorough inspection of the Work and a review of all information available from the Province to persons wishing to submit tenders , but does not include any generally recurring weather conditions ;

(c) **"Contractor"** means the Recipient;

(d) **"Environmental Damage"** means slumping or sliding of land; inordinate soil disturbance; significant deterioration of water quality or other significant damage to the environment; and for the purposes of this definition, "inordinate soil disturbance" and "other significant

damage to the environment" have the meanings, where appropriate, given to them in the Forest Practices Code.

(e) **"Forest Practices Code"** means the Forest Practices Code of British Columbia Act and Regulations and Standards to that Act;

(f) **"Ministry Representative"** means a person appointed pursuant to section 5.01;

(g) **"Occupied Area"** means any Work Area, camp or rest area, or any other area occupied by the Recipient for the purposes of this Agreement;

(h) **"Recipient Representative"** means a person designated pursuant to Article 5.04;

(i) **"Schedule"** means a schedule of this Agreement;

(j) **"Subcontractor"** means a person, firm or corporation contracting with the Recipient to perform a part or parts of the Work, or to supply products worked to a special design according to the Agreement, but does not include one who merely supplies products not so worked;

(k) **"Term"** means the period of time this Agreement is in force pursuant to Article 3;

(l) **"Work"** means all

i) labour, supervision, and administration;

ii) provision of materials, transportation, supplies, tools, and equipment; and

iii) other services and provision of materials

necessary or desirable to perform the services described in each Schedule, and includes any services which are not expressly described which are nevertheless necessary for the proper execution of the work.

(m) **"Work Area"** means individual location, forest stands, or other particular areas or locations where work is to be undertaken and any areas of Crown Land occupied by the Recipient for purposes of the Work;

(n) **"Work Day"** means every day of the week except Saturday, Sunday and statutory holidays.

1.02 If a word defined in section 1.01 is used in a Schedule, it has the same meaning as in this document unless the context dictates otherwise.

1.03 A word or abbreviation which has a well known technical or trade meanings is used in the Schedule(s) in accordance with that recognized meaning.

1.04 The headings in this Agreement have been inserted for reference only. They do not define, limit, alter or enlarge the meaning of any provision of this Agreement.

ARTICLE 2 SCHEDULES AND CHANGES

Schedules

2.01 The Schedules, listed below, apply to and form part of this Agreement

☒	Schedule "A"	FHAP Schedule A
☒	Appendix "A"	Map of stream reaches to be assessed

Changes

2.02 No change to this Agreement is effective unless it is in writing and signed by the Parties.

Interpretation

2.03 Any reference in a Schedule to a manual or a form is a reference to a manual or form published by or for the Province and includes every amendment to it and any manual or form published from time to time in substitution for it or replacement of it.

2.04 The Forest Practices Code, if applicable, takes precedence over an approved prescription. An approved prescription, if applicable, outlining work covered by this Agreement takes precedence over this document. This document takes precedence over any of its attachments. In the event of a conflict between alike Schedules or other attachments of different dates, the Schedule or other attachments of later date prevails.

ARTICLE 3 TERM OF AGREEMENT AND START OF WORK

3.01 The Term of this Agreement is to start Sept 6, 2001 and end March 31, 2002 unless otherwise provided in the Schedule(s).

3.02 The Parties may agree to extend the term of this Agreement.

3.03 The Recipient must not conduct any Work under this Agreement until:

(a) the Recipient has entered into a Multi-Year Agreement or Annual Agreement with Forest Renewal BC to fund the Work covered under this Agreement; and,

(b) the Recipient Representative has met with the Ministry Representative to review the Work.

3.04 Time is of the essence in this Agreement.

Schedule of Work

3.05 The Recipient must complete the Work according to the work completion timing schedule of the Work Progress Report(s). The actual date the Province notifies the Recipient to start Work and the continuity of the Work depend on the presence of suitable field conditions to allow the Work to be completed as outlined in the Schedule(s).

ARTICLE 4 STANDARDS AGREEMENT AND MULTI-YEAR/ANNUAL AGREEMENT LINKAGE

4.01 This Agreement constitutes a Standards Agreement as defined in the Multi-Year Agreement or Annual Agreement between the Recipient and Forest Renewal BC dated for reference **TO BE PROVIDED AT A LATER DATE.**

ARTICLE 5 PARTY REPRESENTATIVES

Ministry Representative

5.01 The Province must appoint a Ministry Representative who has full authority to act on behalf of the Province to ensure compliance with all terms of this Agreement.

5.02 Upon entering into this Agreement, the Province must notify the Recipient of the name of the Ministry Representative.

5.03 The Province may substitute a Ministry Representative at any time, but must immediately notify the Recipient of the change.

Recipient Representative

5.04 The Recipient must designate a Recipient Representative, who has full authority to act on behalf of the Recipient in connection with the Work and this Agreement;

5.05 Upon entering into this Agreement, the Recipient must notify the Province of the name, address and telephone number of the Recipient Representative designated pursuant to section 5.04.

5.06 The Recipient must not substitute a Recipient Representative without written notice to the Ministry Representative.

5.07 If, in the reasonable opinion of the Ministry Representative, the Recipient Representative is not suitably experienced or is unable to properly supervise the Work or communicate with the Ministry Representative, then the Recipient must, upon receipt of written notice from the Ministry Representative, replace that representative and immediately notify the Province of that change.

ARTICLE 6 PERMITS, AUTHORIZATIONS AND PRESCRIPTIONS

6.01 Where the Recipient is carrying out Work which relates to a statutory obligation of the Province under the Forest Practices Code, then the Recipient is carrying out that work as a contractor to the Province.

6.02 Without limiting the generality of section 6.01, where the Work is work that the Province is required to carry out under the Forest Practices Code, including work referred to in section 23.1 and 24.1, then the Province will provide any necessary prescriptions or other Forest Practices Code approval documents and the Recipient will ensure that the Work complies with the prescription and other Forest Practices Code approval documents.

ARTICLE 7 WORK PROGRESS PLAN AND STANDARDS OF PERFORMANCE

Work Progress Plan

7.01 The Recipient Representative must meet with the Ministry Representative before starting Work to:

(a) review the Schedule(s) and work performance requirements;

(b) jointly develop a Work Progress Plan(s) outlining the project scope, goals, work completion timing schedule, location and any special requirements of the Work; and

(c) inspect any Work Area, if requested by the Ministry Representative.

7.02 The Work Progress Plan must provide for the orderly completion of all Work, comply with all provisions of this Agreement, and be satisfactory to the Province.

7.03 The Work Progress Plan may divide the Work into separate phases or completion zones.

7.04 The Work Progress Plan forms part of this Agreement. Work must be carried out and completed in accordance with the Work Progress Plan.

Standards of Performance

7.05 The Recipient must, before starting any Work, satisfy itself as to:

(a) the nature and magnitude of the Work;

(b) the general character, quality and quantity of the equipment and materials required to carry out and complete the Work; and

(c) the qualifications, skills and abilities of its personnel and personnel of Sub-Contractors or other parties engaged in carrying out the Work in order to ensure the Work is carried out in accordance with this Agreement.

7.06 The Recipient must at all times exercise the standard of care, skill and diligence ordinarily exercised and observed by persons engaged in the performance of activities similar to the Work.

7.07 The Work must be carried out under the direct and continuous supervision of the Recipient or a qualified authorized agent of the Recipient who:

(a) speaks English and understands spoken and written English, or has access to a translator, to the reasonable satisfaction of the Ministry Representative; and

(b) is present at the Work Area when the Work is carried out.

Subcontractor Work

7.08 If the Recipient engages a Subcontractor, the Recipient is not relieved from the subcontracted obligations or any obligations under this Agreement.

7.09 The Recipient must not assign this Agreement, or subcontract any obligations under this Agreement, without prior written notification to the Province.

7.10 The Recipient must notify the Province of the name, office address and office telephone number of the Recipient's Subcontractor(s).

7.11 The actions of any Subcontractor engaged to carry out any of the Work are deemed the actions of the Recipient.

7.12 Nothing in this Agreement creates any direct or indirect contractual relationship between the Province and any Subcontractor.

ARTICLE 8 INDEMNIFICATION AND INSURANCE

Indemnity

8.01 The Recipient must indemnify and save harmless the Province, its employees, agents and authorized representatives, and each of them from and against losses, claims, damages, actions, and causes of action (collectively referred to as "Claims"), that the Province may sustain, incur, suffer or be put to at any time either before or after the expiration or termination of this Agreement, that arises out of errors, omissions or negligent acts of the Recipient or its subcontractor(s), servant(s), agent(s) or employee(s) under this Agreement, excepting always that this indemnity does not apply to the extent, if any, to which the Claims are caused by errors, omissions or negligent acts of the Province, its other Recipient(s), authorized representatives, or any other person.

8.02 None of the Minister of Environment, Lands and Parks or the Ministry Representative in charge, their agents or employees are personally liable for any act performed in the discharge of any duty imposed or in the exercise of any power or authority conferred upon them by, or within the scope of, the Agreement if it can be demonstrated that all reasonable care was exercised in the conduct of the operations; in all such matters these persons act solely as agents and representatives of the Province.

8.03 Neither the Province nor any of its employees or agents are liable to the Recipient or the Recipient's employees or agents for any injury, loss, or damage however occasioned to any of them or their property while being transported or conveyed in any vessel, boat, aircraft owned or operated by the Province. The Recipient must not make claims against the Province, its employees or agents to recover any such injury, loss or damage either on its own behalf or on behalf of its employees or agents. The Recipient must indemnify and save harmless the Province, its employees or agents from any such claims initiated by the Recipient's employees or agents.

Insurance

8.04 During the Term the Recipient must carry and maintain insurance coverage as specified in the Recipient's Multi-Year Agreement or Annual Agreement with Forest Renewal BC and, if applicable, as specified in writing by the Province.

ARTICLE 9 PROTECTION OF WORK AND PROPERTY

General

9.01 The Recipient must protect the Work area and property adjacent to any Work Area, from damage and is responsible for damage which may arise as the result of the Recipient's operations under the Agreement, except damage which occurs as a result of:

(a) an error in a Schedule; or

(b) an act or omission of the Province, third parties, or other Recipients, its agent or employees.

Protection of the Environment

9.02 The Recipient must not cause Environmental Damage in carrying out the Work under this Agreement.

9.03 Subject to 9.04, The Recipient is not in breach of 9.02 if:

(a) performing the Work according to an operational plan, or permit issued under the Forest Practices Code; or

(b) the Work performed by the Recipient has been exempted from a requirement to have an operational plan or prescription and the Recipient is carrying out the Work in accordance with the Forest Practices Code.

9.04 If the Recipient encounters circumstances where the Recipient knows or should reasonably know that, due to weather conditions or site factors, proceeding with the Work may, directly or indirectly, cause Environmental Damage, the Recipient must:

(a) immediately suspend the Work that may cause Environmental Damage;

(b) immediately advise the Province of the suspension and circumstances;

(c) not proceed with the Work until the Province so instructs; and

(d) upon the Province's instruction to proceed with the Work, do so in accordance with the Province's instructions.

9.05 The Recipient is not in breach of this Agreement for suspending Work pursuant to Section 9.04.

9.06 If the Recipient causes Environmental Damage while performing Work under this Agreement, the Recipient must:

(a) immediately stop the Work in the area affected;

(b) prevent any further damage to the environment;

(c) immediately notify the Province to the attention of the Ministry Representative; and

(d) take any remedial measures that the Ministry Representative requires.

9.07 The Recipient may resume Work that has been stopped under 9.06 when:

(a) Work can be resumed without violating sections 9.02 and 9.04; and

(b) All remedial measures required under section 9.06 have been carried out to the satisfaction of the Ministry Representative.

ARTICLE 10 GOVERNING LAW

10.01 This Agreement is governed by and is to be construed in accordance with the laws of the Province of British Columbia.

10.02 The Parties will comply with the laws of Canada and British Columbia applicable to the Work and the Work Area.

ARTICLE 11 CHANGES IN CONDITIONS

11.01 If a Changed Condition occurs during the course of the Work, the following applies:

(a) The Parties must immediately advise each other of particulars of the Changed Condition and the Recipient Representative and the Ministry Representative who each have authority to act in respect of that Schedule must meet to attempt to deal with the condition.

(b) If in the opinion of either Party, that Changed Condition is so substantial that amending this Agreement to deal with the change would change the essential nature of the Work, then the Parties must not proceed with the Work in respect of that Schedule any further and that Work must be brought to an end.

ARTICLE 12 WORK COMPLETION AND ACCEPTABILITY OF WORK

Notification of Completion

12.01 The Recipient must, upon completing a phase of the Work, and the entire Work, promptly notify the Province of that completion. The notification must be in writing, and must be delivered to the Province during the Province's normal business hours.

Inspection by the Province

12.02 The Province may, following receipt of the Recipient's notification in 12.01, inspect and determine the acceptability of the Work performed in accordance with a Schedule.

12.03 The Recipient is encouraged, but not required, to observe each inspection while it is being conducted.

12.04 The Province must provide the Recipient with a copy of inspection results.

12.05 The Province reserves the right to inspect at any time, any Work performed.

12.06 Inspections are conducted by the Province in order to determine compliance with the provisions of this Agreement. These inspections are conducted for the sole benefit of the Province, and do not release the Recipient from the responsibility of providing quality control measures to assure that the Work strictly complies with this Agreement.

12.07 The Province and the Recipient may agree on a schedule for the Province to make its determination on the acceptability of the Work and to provide its notification to Forest Renewal BC.

12.08 Notwithstanding 12.07, The Province will make its determination on the acceptability of the Work and notify Forest Renewal BC of their decision within one year of the notification in 12.01.

12.09 The Province is not obliged to make any determination of acceptability before receiving the Recipient's written notification in 12.01.

ARTICLE 13 MEASUREMENT

Method of Measurement

13.01 All linear and area measurements under this Agreement are measured on the horizontal plane.

ARTICLE 14 NON-COMPLIANCE AND TERMINATION

Termination by the Province

14.01 The Province may, in its sole discretion, terminate this Agreement at any time. The Province is not liable for any losses occasioned by that termination if the termination:

(a) occurs before the Ministry Representative receives the written notification of the Recipient that they will commence Work;

(b) is caused by the Recipient's failure to perform or comply with this Agreement;

(c) results from the termination of the Recipient's Multi-Year Agreement or Annual Agreement with Forest Renewal BC; or

(d) is caused by an Act of God, unsuitable weather, natural disaster, withdrawal of labour in labour disputes, or any other unforeseeable cause over which the Province has no direct control.

Termination by the Recipient

14.02 The Recipient may terminate this Agreement if the Recipient's Multi-Year Agreement or Annual Agreement with Forest Renewal BC is terminated, and no claim may be made by the Province against the Recipient for any losses occasioned by that termination.

Mutual Termination

14.03 This Agreement may be terminated at any time by the mutual consent of the Parties.

14.04 If a party is unable to perform any obligation under this Agreement because of an Event of Force Majeure (as that term is defined in the Recipient's Multi-Year Agreement with Forest Renewal BC), that inability shall not be a default under this Agreement.

Non-Compliance with Agreement Provisions

14.05 If, in the opinion of the Province, the Recipient fails to perform or fails to comply with any of its obligations under this Agreement, the Province may, in its discretion do one or more of the following:

(a) require the Recipient to re-work the area or phase of work;

(b) permit the Work to continue, giving the Recipient a time limit for compliance, rectification or both;

(c) order the Recipient to stop the Work until the alleged failure of compliance is dealt with according to the Province's requirements;

(d) specify on Quality Certificate(s) that the Recipient failed to perform or comply with one or more of its obligations;

(e) terminate all or part of this Agreement.

These remedies are in addition to any other remedies available to the Province.

14.06 The Province may inspect any re-worked area or phase of the work. The results of that inspection supersede any previous inspection results.

ARTICLE 15 DISPUTE RESOLUTION

15.01 If a dispute occurs between the Parties concerning any matter governed by this Agreement, the disputing Party must promptly advise the other Party and the Parties together must use all reasonable efforts to resolve the dispute.

15.02 Despite section 15.01, the Ministry Representative may give the Recipient instructions that, in the reasonable opinion of the Ministry Representative, are necessary to provide for the proper performance of the Work. The Recipient must act immediately to carry out the instructions, but any work performed by the Recipient in this respect is without prejudice to any claim the Recipient may have concerning the dispute.

15.03 If the Parties are unable to resolve the dispute informally within five Work Days, then the Recipient must give to the Ministry Representative written particulars of the complaint, which must include the following:

(a) a detailed description of the nature of the complaint;

(b) a list of the relevant provisions of the Schedule(s); and

(c) an evaluation by the Recipient of the matters in dispute.

15.04 The Province must, within 20 Work Days of receipt by the Ministry Representative of the written particulars, advise the Recipient, in writing, of any one of the following:

(a) that the Province accepts the position of the Recipient; or

(b) that the Province rejects the position of the Recipient.

15.05 If the Province accepts the position of the Recipient, the Parties will amend this Agreement if necessary and the Province will advise Forest Renewal BC .

15.06 If the Province rejects the Recipient's position, the Parties must retain a mutually agreed upon person to make a written recommendation to resolve the dispute. Any costs associated with retaining that person must be jointly paid by the Parties.

15.07 If after a review of the written recommendation, the Parties agree on a resolution of the dispute, the Parties must amend this Agreement if necessary and the Recipient must provide Forest Renewal BC with a copy.

15.08 If after a review of the written recommendation, the Parties are unable to resolve the dispute and the dispute is with respect to payment only, this dispute is deemed to be between the Recipient and Forest Renewal BC, and the Recipient's position and the written recommendation must be forwarded to Forest Renewal BC. Despite the foregoing, the resolution of a dispute under a Multi-Year Agreement or Annual Agreement does not prejudice any claim the Province may have against Forest Renewal BC in respect of the Work.

15.09 A copy of the written recommendation and the Province's position may be forwarded by the Province to the appropriate professional association.

ARTICLE 16 MISCELLANEOUS

Confidentiality

16.01 The Recipient must treat as confidential all material that has been produced or received by it or any Subcontractor as a result of this Agreement (collectively the "Material") and not permit its disclosure without the Province's prior written consent except as required by applicable law, including the *Freedom of Information and Protection of Privacy Act.*

Ownership

16.02 The Material and any equipment provided by the Province to the Recipient or a Subcontractor as a result of this Agreement is the exclusive property of the Province. The Recipient must deliver it to the Province immediately following expiration of this Agreement, or sooner upon the Province's request, in the same condition it was supplied to the Recipient, excepting always loss or damage attributable to reasonable wear or tear.

Copyright

16.03 The copyright in the Material belongs exclusively to the Province. Upon the Province's request, the Recipient must deliver to the Province documents satisfactory to it waiving in the Province's favour any moral rights which the Recipient or Subcontractors or their employees may have in the Material and confirming the vesting of the copyright in the Province.

Recipient Status

16.04 Except as otherwise provided in this Agreement, the Recipient is not subject to the control of the Province in respect of the manner in which the Work is carried out.

16.05 The Recipient must not purport to commit the Province to the payment of any money to any person.

16.06 The Recipient must ensure all personnel hired by the Recipient to perform the Work are at all times employees of the Recipient and not of the Province.

Notices

16.07 Any notice or document required to be given under this Agreement is conclusively deemed validly given or delivered to and received by the Parties

(a) if hand delivered personally, on the date of that personal delivery;

(b) if mailed, on the fifth business day after the mailing of the same in British Columbia by prepaid post to the addresses set out in this Agreement (or at such other address as either Party may from time to time designate by notice in writing to the other); or

(c) if sent by facsimile transmission, when transmitted, only if transmitted to the facsimile machine numbers first above written. The onus of proving transmission and receipt lies with the transmitting Party.

Non-Waiver

16.08 A waiver of any provision of this Agreement or a waiver of a breach by a Party of any provision of this Agreement is effective only if it is in writing and signed by the other Party.

16.09 A written waiver by either Party of any provision of this Agreement or of any breach by the other Party of any provision of this Agreement is not a waiver of any subsequent breach of the same or any other provision of this Agreement.

Recipient Provisions

16.10 Except as specified in the Schedule(s), the Recipient must undertake all Work and furnish all labour, equipment, supervision, transportation, supplies and incidentals necessary to perform the Work.

Unsuitable Workers

16.11 The Recipient must ensure all persons employed to perform the Work are competent, adequately trained , fully instructed and supervised, and legally entitled to work in Canada.

16.12 The Recipient must, upon request of the Ministry Representative, remove any person it employs for purposes of the Agreement who, in the reasonable opinion of the Ministry Representative, is incompetent or has conducted himself or herself improperly, and the Recipient must not permit a person who has been so removed to perform any further Work.

Survival of Terms

16.13 Sections 7.01, 7.02, 8.01, 8.02, 15,01, 15.02 and 15.03 will, despite the expiration or earlier termination of the Term of this Agreement, remain and continue in full force and effect.

Site Clean Up

16.14 The Recipient must maintain the Work Area free from accumulations of waste products or debris, other than that caused by the Province, other recipients or third parties.

16.15 Upon the Recipient vacating the Work Area, the Ministry Representative may determine , at his or her sole discretion, whether or not the area was left in an acceptable condition.

16.16 If the Ministry Representative determines the Recipient left the Occupied Area in an unacceptable condition, the Province may repair the area or remove waste products or debris and recommend to Forest Renewal BC a deduction in payment to the Recipient equal to the cost of repairs or removal

Camping and Parking

16.17 Use of Provincial Crown forest land, including any roads, landings or Ministry of Forests recreational sites, by the Recipient, the Recipient's employees or agents for the purposes of lodgings, camping, vehicle parking or trailer parking in connection with Work under this Agreement, is permitted only with prior written approval of the Ministry Representative. That use, if approved, must be without charge to the Recipient; but, the approval may be revised or revoked at any time by the Province.

16.18 **Powers Cumulative**

The powers set out in the Schedule(s) for the Province to enforce the Recipient's compliance with this Agreement may be exercised separately, concurrently, or cumulatively.

IN WITNESS OF WHICH the Parties have duly executed this Agreement as of the date first above written.

SIGNED AND DELIVERED
on behalf of the Province by an authorized representative of the Province

Authorized Signatory
Ministry of Environment, Lands and Parks

SIGNED AND DELIVERED
by or on behalf of the Recipient (or by an authorized signatory of the Recipient)

Recipient or Authorized Signatory

BRITISH COLUMBIA

Ministry of Environment, Lands and Parks

Quality Certificate

For inspection of [INSERT ACTIVITY TYPE HERE]work delivered under Standards Agreements

A) IDENTIFICATION

Standards Agreement No. _____ Activity _____

District _____ Licencee/Proponent _____

Project No. _____ Date _____

B) ITEMS INCLUDED IN QUALITY CERTIFICATION:
(MINISTRY STAFF LIST TYPE OR UNIT)

C) DELIVERABLE(S) INSPECTED: _____
(Quality Monitor list type or unit)

All deliverables received ☐YES ☐NO

2. Overall quality of deliverable _____ %

3. Normal payment percent equivalent if different than #1 above _____ %

4. Deliverable requires reworking ☐YES ☐NO

5. Estimated cost of rework required (write in N/A if none required) $ _____

6. Payment recommended, based on percentage of quality _____ %

7. Comments (use back of this sheet if necessary):

_____

_____

_____

CERTIFICATE
COMPLETED BY: _____ _____
QA Auditor Printed Name Signature and Date

ACCEPTED BY: _____ _____
stry Representative Printed Name Signature and Date

DETAILED FISH HABITAT ASSESSMENT AND RIPARIAN ASSSESSMENT PROCEDURES

1 DEFINITIONS

In this document, the following words have the following meanings:

FHAP means Fish Habitat Assessment Procedure.
RAPP means Riparian Assessment and Prescription Procedures.
Ministry means Ministry of Environment, Lands and Parks. (MELP)
WRTC means Watershed Restoration Technical Circular.
FES means Forest Ecosystem Specialist
HPO means Habitat Protection Officer
MOF means Ministry of Forests
WRP means Watershed Restoration Program
UTM means Universal Transverse Mercator
Category 1 Impacts means isolated impacts to the reach/sub-basin that require non-professional prescriptions. Examples include, but are not necessarily limited to perched culverts, fish access issues, and slope re-vegetation.
Category 2 Impacts means sub-basins where with the impacts are more cumulative in nature and will require a detailed prescription over a broad area.

2 PURPOSE AND SCOPE OF WORK

The Detailed Fish Habitat Assessment and Riparian Assessment Procedures involve detailed field assessments of the aquatic and riparian habitat and the impacts to that habitat. Habitat attributes are identified and where appropriate, conceptual rehabilitation options are developed. An overview assessment of the fish, fish habitat and riparian zone was conducted based on existing information and photography. The watershed's sub-basins were prioritised for these assessment procedures based on resource priority and severity of impacts to the resource. Subsequent work on the sub-basins may include:

- site survey and design, where areas of rehabilitation projects are surveyed and prescriptions for rehabilitation are developed;
- the works phases, where the rehabilitation prescriptions are implemented;
- and monitoring and evaluation of the rehabilitation works to assess their effectiveness and recommend changes and modifications, if necessary.

The scope of this Schedule "A" is to conduct a Detailed Fish Habitat Assessment Procedure (FHAP) for two areas:

- Reach 1 and 2 of an unnamed tributary to Heal Creek IN (CP522-3); and
- The middle reaches of an unnamed tributary to Nilkitkwa Lake (in CP523-3) .

The exact locations of the assessments will be identified in the project location map (Appendix "A" of this Schedule "A") provided by the Recipient before proceeding with the field work.

This schedule only constitutes the administrative specifications to which the work will be completed.

3 TECHNICAL MONITOR

For the purpose of this Schedule "A" the Technical Monitor is;

JEFF LOUGH
Watershed Restoration Program Officer
Ministry of Environment Lands and Parks
Mailing Address: BOX 5000, SMITHERS, BC V0J 2N0
Email: JEFF.LOUGH@GEMS2.GOV.BC.CA
Telephone: (250) 847-7337

Questions of a technical nature can also be referred to

Jeff Lough
WRP Regional Fisheries Specialist
Box 5000
Smithers, BC
V0J 2N0
Email:Jeff.Lough@gems2.gov.bc.ca
Telephone: (250) 847-7337
Fax: (250) 847-7728

4 TECHNICAL REFERENCES:

The Recipient will be familiar with the following technical references:

Forest Practices Code of British Columbia Act (Bill 47 - June 1998), and Regulations there under.

Forest Practices Code of British Columbia: *Riparian Management Area Guidebook.*

Koning, C.W. et al., 1999. Riparian Assessment and Prescription Procedures. Watershed Restoration Technical Circular No. 6. MELP, Victoria.

Johnston, N.T. and P.A. Slaney, 1996. Fish Habitat Assessment Procedure. Watershed Restoration Technical Circular No. 8. MELP, Victoria.

Newbury, R.W. and M.N. Gaboury. 1993. Stream analysis and fish habitat design. Manitoba Department of Natural Resources, Winnipeg.

Slaney, P.A. and D. Zaldokas [ed.] 1997. Fish Habitat Rehabilitation Procedures. Watershed Restoration Technical Circular No. 9. MELP, Victoria.

_____, **Draft, April 1998**. Habitat Restoration Prescription Guidebook. MELP (Vancouver Island Region 1), Nanaimo.

NOTE

Most of the above documents can be accessed via the "Forest Renewal Management Branch" link on the Skeena Region Ministry of Environment WRP website: [http://www.elp.gov.bc.ca/fish/wrp/index.htm].

Watershed Restoration Technical Circulars, including FORMS are available for purchase by calling the Queen's Printer Order Desk (1-800-663-6105), or for download or purchase via the Forest Renewal Coordination Office website:
[http://www.env.gov.bc.ca/frco/bookshop/index.htm].

Resource Inventory Committee Standards documents are available from the following website:
[http://www.for.gov.bc.ca/RIC]

5 SERVICES

5.1 FISH AND AQUATIC HABITAT ASSESSMENT

The Recipient is responsible for obtaining a Fish Collection permit from the Fisheries Section of the Environment, Lands and Parks Regional Office for any works that will involve fish capture and collection.

The Recipient will perform the following tasks:

5.1.1 Complete a fish assessment that will determine fish presence, distribution and relative abundance for representative habitat types within the impacted reach and complete Form 5 from WRTC#8 (pg. 96).

5.1.2 Estimate age structure by analysing fork length measurements from a representative number of captured fish.

5.1.3 Document the location of redds, spawning and holding adults.

5.1.4 Complete Form 4 (Habitat Survey Data Form) from WRTC#8 (pg.92-93) that describes the habitat in the sub-unit by reach. (Note: Methodology for the completion of Form 4 is outlined in WRTC#8).

5.1.5 Using the data collected in Section 5.1.4 of this Schedule "A" and professional experience complete the Habitat Diagnosis Summary Form (Form 6, WRTC#8).

5.1.6 Reference the data forms identified in Sections 5.1.1, 5.1.4 and 5.1.5 of this Schedule "A" to describe the quality of the habitat within the watershed/reach.

5.1.7 Provide the UTM co-ordinates of the reach break locations of reaches assessed.

5.1.8 Provide photos of significant habitat features within the survey reach.

5.3 PRESCRIPTION DEVELOPMENT FOR CATEGORY 1 IMPACTS

Develop prescriptions outlining the rehabilitative measures recommended for Category 1 sites. The prescriptions will include:

5.3.1 The geographical location of each sites (UTM Co-ordinates), including sub-unit and reach identification.

5.3.2 Representative photo(s) of the Category 1 impact site(s).

5.3.3 A detailed description of the work prescribed, which will consider and include:

- rehabilitation measures proposed
- expected benefits to resource values as a result of implementing the prescription
- methods used to minimise impacts of the works on the aquatic, riparian and terrestrial resources
- any other WRP work that is occurring in the area (road, hillslope and gully) that may result in cost sharing/economies of scale

- access and transportation constraints
- all regulatory approvals required prior to the commencement of any works
- roles and responsibilities of the field crew

NOTE: These prescriptions should be in a format suitable for all necessary regulatory approval(s). It is the responsibility of the Recipient to obtain regulatory approval. If detailed survey and design is required for regulatory review purposes, standards will be provided by the Technical Monitor.

5.4 CONCEPTUAL PRESCRIPTION DEVELOPMENT FOR CATEGORY 2 IMPACT SITES/REACHES

Develop prescriptions outlining the further detailed site survey and structure design for those sites/reaches/sub-basins that have been identified as Category 2 sites. These prescriptions will include:

5.4.1 A description of the watershed and the project rehabilitative objective(s).

5.4.2 A detailed description of the work prescribed, which will consider and include:

- rehabilitation measures proposed to address the watershed and project objective(s) (both short and long term).
- expected benefits to resource values as a result of implementing the prescription.
- methods used to minimise impacts of the works on the aquatic, riparian and terrestrial resources.
- any other WRP work that is occurring in the area (road, hillslope and gully) that may result in cost sharing/economies of scale.
- access and transportation constraints.
- all regulatory approvals required prior to the commencement of any works.
- roles and responsibilities of the field crew.

5.4.3 A **conceptual** description (with drawings) of the proposed rehabilitation projects that will achieve the site and the watershed objectives.

5.4.4 An outline of what; if any, site survey and design work is required to implement the rehabilitative project.

5.4.5 Representative photograph(s) of the cumulative impacted habitats (Category 2).

6. DELIVERABLES:

The Recipient will supply the Technical Monitor/Third Party Reviewer with the following deliverables, in part based on the services completed in Section 5 of this Schedule "A":

6.1 Maps identifying locations for Category 1 and 2 prescriptions including:

- 1:20,000 locator map, with impact site(s) and/or reaches identified.
- Reach break delineations.
- A small scale [1:5000] project site/reach map showing Category 2 restorative concepts.

6.2 Present the information collected using Form 4 electronically in an Excel spreadsheet and display in an Appendix.

6.3 Two (2) copies of the draft report (one hard copy and one electronic copy) submitted to both the Technical Monitor and Third Party Reviewer. The report will be formatted as outlined in Appendix "C" of this Schedule "A" summarising the results of the information collected. Technical review will follow the Detailed FHAP/RAPP Report Review Checklist (Appendix "D" of this Schedule "A")

6.4 Prepare six (6) copies of the maps and final report with embedded photos: four (4) will be bound and two (2) will be electronic.

6.5 The two (2) electronic copies of the project report are to be submitted to the MELP Regional Fisheries Specialist. The files will be submitted on CD-ROM; one (1) will be in Microsoft Word 7.0 format and the other will be in PDF format. The CD-ROM will be accompanied by an index containing the names of files and a brief content description of each.

6.6 The four (4) hard copies of the final report will be submitted as follows:

One (1) copy to the project Regional Fisheries Specialist (Jeff Lough)
One (1) copy to the MELP District Forest Ecosystem Specialist (FES)
One (1) copy to the Department of Fisheries and Oceans Habitat Protection Officer
One (1) copy to the project Third Party Reviewer

6.7 A letter of distribution will accompany the reports, introducing the project and identifying the distribution list.

6.8 A complete set of project photos will be submitted on a Kodak Digital Science™ Photo CD master disc. The disk should also contain a digital photo index (i.e. photo #, D/M/Y, photo point #, etc...)

6.9 All Third Party Reviewer results are to be provided to the Ministry Representative.

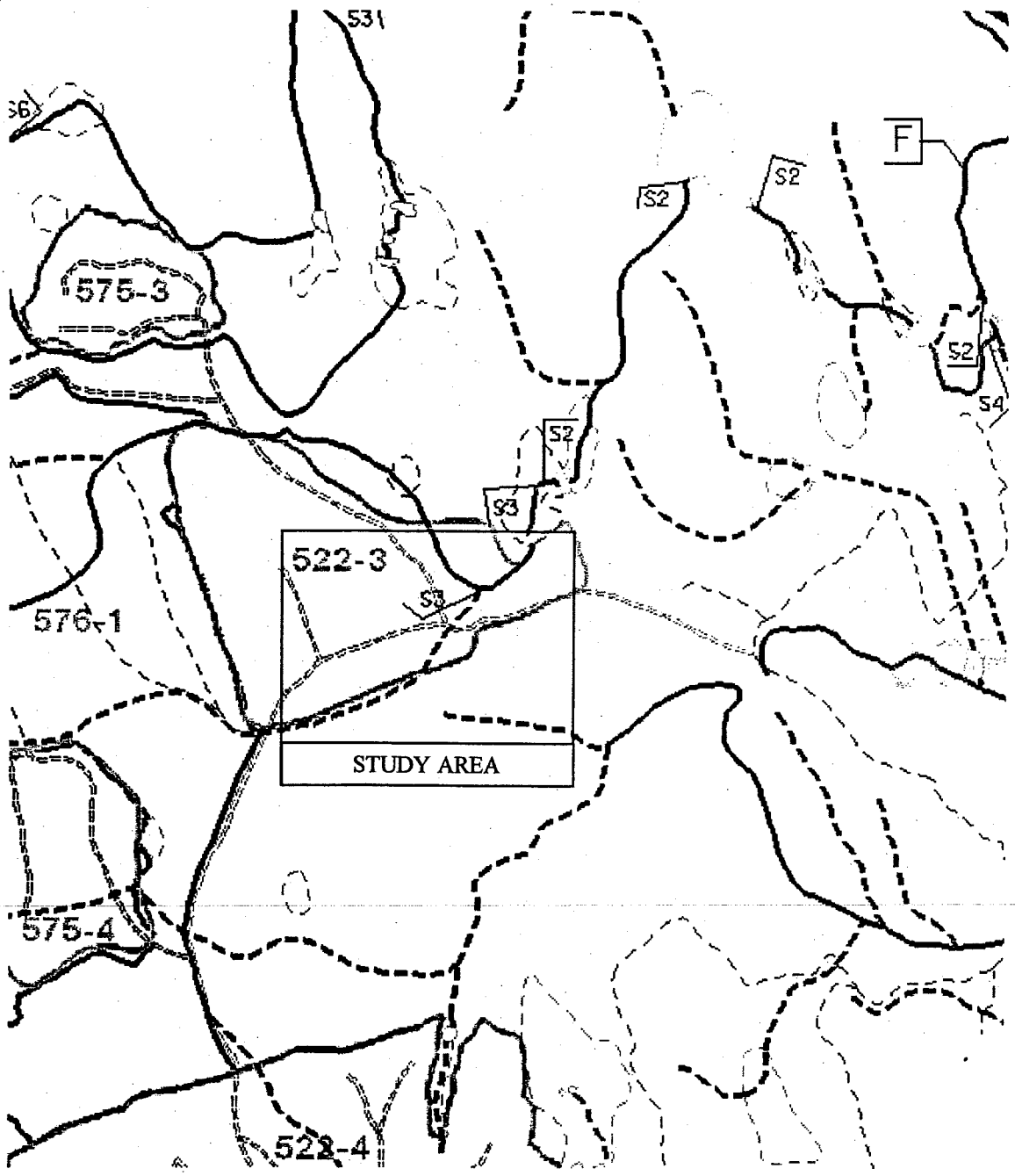
7. REPORT SPECIFICATIONS AND DATES:

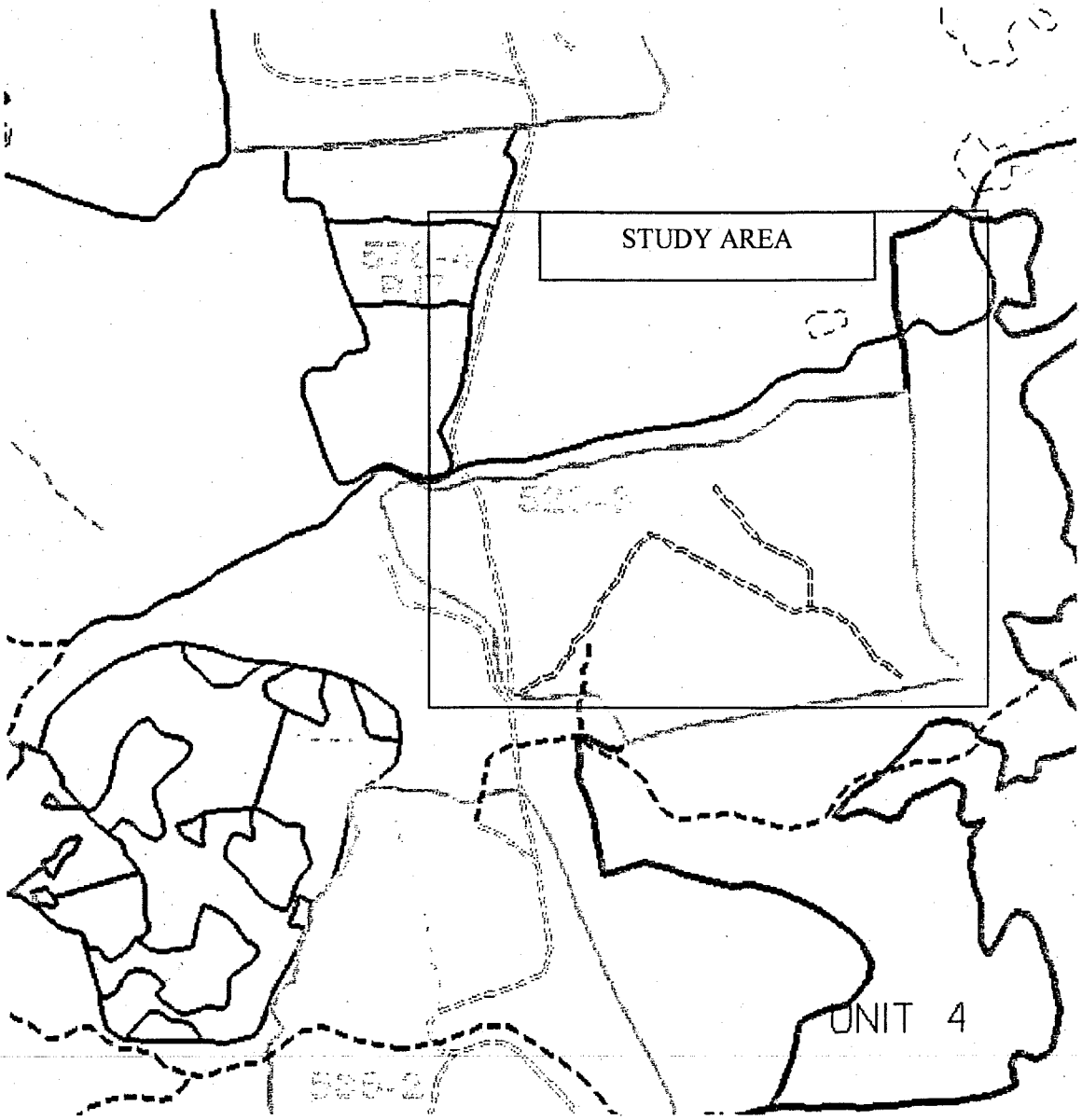
7.1 The copies of the draft report, specified in Section 6.3 of this Schedule "A", will be presented to the Technical Monitor by **January 14, 2002.**

7.2 Comments on the draft report will be supplied back to the Recipient no later than **FEBRUARY 1, 2002.**

7.3 The final report with photographs embedded, all appendices, and incorporating all comments, will be submitted, as per Sections 6.4 - 6.9, no later than **FEBRUARY 15, 2002.**

APPENDIX A – MAP(S) OF STUDY AREA




STUDY AREA
UNIT 4

APPENDIX C - DETAILED FISH HABITAT ASSESSMENT REPORT FORMAT

1. Title Page

Including:

Watershed name
Assessment Title
Proponent
Date of completion
Author Name, Address, and Email address
"Report prepared for": usually report submission is to the MELP Technical Monitor
FRBC Activity Number

2. Table of Contents

3. List of Tables

4. List of Figures

5. List of Appendices

6. Executive Summary

Brief outline of the detailed fish and riparian assessment, findings and recommendations.

7. Introduction

7.1 Proponent
7.2 Implementing partners
7.3 Reporting hierarchy
7.4 Funding source
7.5 Watershed description
7.6 Purpose and Scope of Detailed FHAP (and RAP)

8. Study Area

8.1 Regional location map (with small provincial location map inserted).
8.2 1:20,000 watershed map (as described in 6.1 of this Schedule "A").

9. Methods

As described in WRTC #8 or any variations (i.e. off channel assessment methods)

10. Results and Discussion

10.1 Summary descriptions of the fish use, habitats, impact(s) and prescription(s) for each area assessed (Section 5 in this Schedule "A").

10.2 Create a separate section in the report for each area (i.e. site, reach, sub unit) assessed and, at a minimum, divided the project results into the following sub sections:

- **Fish use assessment results.** Include length frequency histogram(s) of fish sampled by species and location;
- **Habitat assessment results.** Include representative photos of habitat type(s) and habitat data comparison summary table(s);
- **Riparian assessment results.** Include representative photos of riparian type(s);
- **Impact description(s).** Include both Category 1 and 2 impacts (where appropriate). Include representative photos of impact types(s);
- **Conceptual Prescription(s)** for restoration/rehabilitation.

11. Recommendations

11.1 Recommend a prioritized list of restoration options.
11.2 Recommend a prioritized list of survey and design requirements needed for implementation and regulatory referral.

12 References

13 Appendices

13.1 Data Forms 4, 5, 6 and Table B-1(RAP Overview table).
13.2 Copies of field data (under separate cover).
13.3 Small-scale maps showing restorative design concepts and location (Section 6.1 of this Schedule "A").
13.4 CD-ROM containing two electronic report files (Section 6.5 of this Schedule "A") and the WRP FHAP data (Section 6.2 of this Schedule "A").
13.5 Kodak photo CD (Section 6.8 of this Schedule "A").

Watershed Name: _____

Ministry Representative: _____

Reviewer's Name _____

Address _____

Phone and Fax _____

E-mail _____

STEP 1: General Review for Completeness			
Component	**Look for:**		**Comments**
Cover Letter	Distribution letter is attached which introduces the project and identifies the distribution list	❒	
Cover Page	Watershed Name	❒	
	Assessment title	❒	
	Submitted by: (Complete Author information including name, address, phone, fax, e-mail)	❒	
	FINAL or DRAFT indicated	❒	
	Date	❒	
	Submitted to: (MELP address)	❒	
	Funding Source	❒	
	FRBC Activity Number	❒	
Table of Contents	Lists figures, tables, appendices	❒	
	Page numbers present and correct	❒	
	All figures present on list	❒	
	Titles correspond to actual tables and figures and are complete	❒	
Figures/Tables (specific)	Regional Location Map	❒	
	Colour photos electronically embedded in report labelled with D/M/Y, approximate location and point of view	❒	
	Photos are properly focussed, with proper lighting to identify feature, measure of scale included	❒	
Appendices	All are listed	❒	
	The following items to be included:		
	Forms 4-6 (WRTC No. 8)	❒	
	Table B-1 (Riparian Overview Assessment)	❒	
	Supporting maps and documents including small scale Prescription maps/designs	❒	
	Background calculations	❒	

Component	Look for:		Comments
Appendices (con't)	Raw Field Data included in Final Report	❐	
	Report and digital data CD: Digital copy of report with embedded photos, tables and figures in MS Word 97 and Adobe PDF	❐	
	❁ disk label should contain stream name, watershed name, contractor, date, file index and brief file description	❐	
	Complete set of project photos on Photo CD including a digital photo index (i.e. photo #, D/M/Y, photo point #, description)	❐	
	Other bulky appendices (videos, aerial photographs) are listed and are provided with the Final Report	❐	
	Dividers between each appendix for ease of review	❐	
Literature Cited	All unpublished and published papers, reports, manuals and books used or referred to in the report are referenced	❐	
Spelling and Grammar	Mark spelling and grammar errors in the text of the draft report and with a line in the margin. If there are excessive errors of this sort the report should be returned to the Author for spell checking and grammar checking.	❐	
Layout	Follows the format specified in the Schedule "A" document and Appendices	❐	
	Page numbers present throughout including for figures and tables, etc.	❐	
	1" or wider margins, 1.5 line spacing and font size 12	❐	
	Single column format	❐	
Executive Summary	Author's name	❐	
	Proponent's name and Partnerships	❐	
	Stream name and watershed name	❐	
	Stream location	❐	
	Fish populations supported (past, present, anadromous, resident)	❐	
	Historical forestry-related activities	❐	

Component	Look for:		Comments
Executive Summary (con't)	Brief outline of FHAP/RAPP findings and prioritized recommendations/restoration options	❒	
Regional Location Map	Adequate scale to show where in region	❒	
	Name of stream, stream identified	❒	
	Name of surveyor and company	❒	
	Sample sites if practical on that scale of map	❒	
	Sample reached identified if practical on that scale of map	❒	
Stream Geographical and Morphological Mapping	Header block: includes official gazetted name, UTM number to 100m precision, contours, date of completion of final map	❒	
	Watershed name	❒	
	BCGS map number	❒	
	1:20,000 TRIM map number	❒	
	UTM co-ordinates from 1:20,000 TRIM map provided for the beginning/end of each reach (identified on habitat data sheet)	❒	
	Watershed/Sub-basin boundaries	❒	
	Stream names	❒	
	Reach numbers and reach breaks	❒	
	Fish bearing stream length	❒	
	Points of concern and interest including sample locations, habitat impacts, bridges, prescription sites, known spawning and rearing sites, etc.	❒	
STEP 2: Review Introduction/Background Methodology			
Component	**Look for:**		**Comments**
Introduction	Scope and timing of project	❒	
	Contracting agency and partnerships	❒	
	Individuals involved and their responsibilities (Reporting hierarchy)	❒	
	Brief Watershed description including:		
	Watershed name and location	❒	
	Name and location of stream	❒	
	Purpose of Assessment	❒	
	Fish populations supported	❒	

Component	Look for:		Comments
Introduction (con't)	Summary of past assessment results	❒	
	Data sources	❒	
Study Area	Describes the area	❒	
	Includes a regional location map	❒	
	Overview of terrain features	❒	
	Overview of logging history including approximate area or percent harvested, percent of riparian zone harvested	❒	
Field Plan/ Methodology	Identifies special constraints to access that influenced sampling design	❒	
	Visual estimation methods, if any	❒	
	Minimum of 4 habitat units of each stratum are assessed in each reach	❒	
	Identifies which of the following sampling methods were used: Stratified random or random sampling or representative section	❒	
	Field work done during low flow period	❒	DATES:
	Fish Survey methodology and equipment	❒	
	Analysis method if not WRTC #8	❒	

STEP 3: Review Results and Discussion			
Component	Look for:		Comments
FHAP	Estimated age structure documented	❒	
	Location of redds, spawning and holding adults documented	❒	
FHAP Results Form 5	Form 5 is completed	❒	
	Species and life stages are correct	❒	
	Consistency between Form 5 and written description of fish distribution	❒	
FHAP Results Form 4	Form 4 is completed for an appropriate section length, all data fields have been filled in	❒	
	Check that section lengths add up correctly	❒	
	Cross reference form 4 with the results reported in the text	❒	
FHAP Results Form 6	Form 6 is completed	❒	
	Consistency between Form 6 and written description of nature, location and severity of impacts and limitations to fish production	❒	

Component	Look for:		Comments
Reach by Reach Results and Discussion	All other results, observations and comments are reported **REACH BY REACH**	❒	
	Habitat characteristics results reported based on Form 4	❒	
	Current fish distribution and status (tabular form) based on form 5	❒	
	Impact description(s)	❒	
	Nature, location, and severity of impacts on the fish habitat within each reach based on Form 6	❒	
RAPP Results Table-B1	Table B1 is completed and all data fields have been filled in	❒	
	Consistency between Table B1 and results reported in text	❒	
	Data collected as per WRTC #6 for Riparian Assessment	❒	
RAPP Prescriptions (Developed)	Silvicultural or Stand Management Prescriptions for riparian rehabilitation according to WRTC #6	❒	
	Provides photos of significant riparian features	❒	

STEP 4: Review Habitat Evaluations and Conceptual Prescriptions			
Component	**Look for:**		**Comments**
Conclusions or Habitat Evaluations	Summarizes and integrates the available data using diagnostics table, observations and professional experience	❒	
Riparian Prescriptions	Silvicultural Prescriptions and Stand Management Prescriptions submitted to MOF	❒	
Prescription Development (Category 1 Impacts)	Geographical location of each site, including sub-unit and reach identification	❒	
	Detailed description of work prescribed (as outlined in Section 5.3.3 of Schedule A) including:	❒	
	proposed rehabilitation measures	❒	
	expected benefits to resuorce values	❒	
	methods to minimise impacts of works to aquatic, riparian and terrestrial resources	❒	

Component:	Look for:		Comments
Prescription Development (Category 1 Impacts) con't	identifies any other WRP work occurring in the area	❒	
	identifies access and transportation constraints	❒	
	identifies regulatory approvals required	❒	
	identifies roles and responsibilities of the field crew	❒	
Conceptual Prescriptions Development (Category 2 Impacts)	Watershed description and project rehabilitative objective(s)	❒	
	Detailed description of work prescribed (as outlined in Section 5.4.2 of Schedule A) including:	❒	
	proposed short and long term rehabilitation measures	❒	
	expected benefits to resources values	❒	
	methods to minimise impacts of works to aquatic, riparian and terrestrial resources	❒	
	identifies any other WRP work occurring in the area	❒	
	identifies access and transportation constraints	❒	
	identifies regulatory approvals required	❒	
	identifies roles and responsibilities of the field crew	❒	
	Conceptual description of the proposed rehabilitation projects	❒	
	Outline if what, if any, site survey and design work is required in order of priority (low, medium, high)	❒	
Restoration Options	Prioritised list of restoration options	❒	

STEP 5: Final Review and Documentation			
Final checklist for reviewer	Read through report cover to cover at least once to check that report is clear, concise and easy to read	❒	
	Checklist is completed	❒	
	All Third Party Reviewer results are to be provided to the Ministry Representative	❒	
	Cover letter is attached which summarizes the review and includes sign off that the review has been completed	❒	

Fish-Stream Site Assessment
on an unnamed stream
(WSC 480-430700-21000)
in the
West Babine Sub-Basin
(CP.522-3)

Submitted to:

Jeff Lough
Watershed Restoration Program Officer
Ministry of Water, Land and Air Protection
Box 5000 Smithers, B.C. V0J 2N0
FRBC Activity Number: 720785

Prepared by:

Ralph Kossman, RPBio
Silvicon Services Inc.
P.O Box 490, Smithers, B.C. V0J 2N0
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Prepared for:

Pacific Inland Resources
(a Division of West Fraser Mills Ltd.)

March 2002

TABLE OF CONTENTS

LIST OF TABLES

MAPS

EXECUTIVE SUMMARY

Silvicon Services Inc. was retained by Pacific Inland Resources (a Division of West Fraser Mills Ltd.) to perform a Fish Habitat Assessment Procedure (FHAP) on sub-reach 5.1 of an unnamed stream, WSC 480-430700-21000, within the West Babine sub-basin. Due to conditions observed during the initial field visit and previous familiarity with the site, it was decided that a formal FHAP would not be necessary for this site.

The stream reach is situated in C.P. 522 Block 3 and is a tributary to Heal Creek. A known fish-bearing tributary, WSC 480-430700-21000-72100 joins the stream reach 185m d/s of the culvert crossing on the 437 Road. There is evidence of past and current beaver activity on the known fish-bearing tributary upstream of the confluence with unnamed stream WSC 480-430700-21000 and downstream on unnamed stream WSC 480-430700-21000. Sampling of the stream reach between the 437 Road and the confluence with the known fish-bearing tributary with an electroshocker did not capture any fish, despite the lack of significant barriers. The stream reach has no perennial habitat or spawning habitat, only seasonal rearing habitat.

The stream reach was impacted by harvesting activities during harvesting of CP 522-3. During the field visit it was clear that the channel had been degraded somewhat by the harvesting activities but the present conditions of the stream reach were probably not that different from those historically. With careful consideration of the site characteristics and logistics it is recommended that the site be left as is.

1.0 INTRODUCTION

Forest Renewal BC implemented its Watershed Restoration Program in 1994. This program, now referred to as the Enhancing Environmental Values (EEV) Program, was established to provide an important opportunity to improve water quality and reverse fish habitat impairment occurring as a result of past forest harvesting practices.

The Heal Creek watershed drains into Babine Lake on its west bank near the north end of the lake and is part of the West Babine sub-basin. The West Babine sub-basin is roughly 24 680 ha in size (Withers, Baker 2000). The West Babine sub-basin was among the watersheds identified in the year 2001-2005 Interim Interior Watershed Restoration Plan. The plan identified fish access improvement as a high priority for assessment and possible restoration works. Stream WSC 480-430700-21000 in C.P. 522-3 was reported to have been detrimentally impacted by harvesting activities during harvesting of said cutblock and therefore was eligible for assessment and possible restoration works. Reach one of this stream corresponds to the Feature 48 crossing on the 437 Road which was assessed for fish access under the FPCI procedures, FRBC activity number 720769. The assessment of this site took place between September 21 and September 29, 2001. Silvicon Services Inc. employees, Ralph Kossman, RPBio. and an assistant conducted field visits, sampled the stream reach and prepared the following report.

Sampling of stream WSC 480-430700-21000 did not capture any fish (Sites T72, SS01-48 and SS01-48A), despite the lack of significant barriers.

Additional fisheries information for Babine Lake was obtained from the 'Fish Wizard' software accessed through the BC Fisheries website. From this website, the following fish species were documented: Dolly Varden (Salvelinus malma), rainbow trout (Oncorhynchus mykiss), steelhead (Oncorhynchus mykiss), cutthroat trout (Oncorhynchus clarki), sockeye salmon (Oncorhynchus nerka), kokanne (Oncorhynchus nerka), chinook salmon (Oncorhynchus tshawytscha), coho salmon (Oncorhynchus kisutch), pink salmon (Oncorhynchus gorbuscha), lake whitefish (Coregonus clupeaformis), mountain whitefish (Prosopium williamsoni), lake trout (Salvelinus namayacush), sculpin spp. (Cottus spp.), northern pikeminnow (Ptychocheilus oregonensis), redside shiner (Richardsonius balteatus), and sucker spp.(Catostomus spp.).

While bull trout (Salvelinus confluentus) was not documented in Babine Lake by the 'Fish Wizard" software, it is a species which is present in the Babine River watershed. Triton sample site T65 on Heal Creek, WSC 480-430700, indicated the capture of 12 juvenile bull trout.

The area of concern is located on an unnamed stream, WSC 480-430700-21000. The stream reach has been impacted by harvesting activities within the harvested cutblock. The following document details the assessment and recommended restoration prescriptions, if any, for the affected site.

2.0 STUDY AREA

The affected stream reach is located approximately 4 kilometres up the 437 road at the intersection of the 437 and 437-A roads. The site is part of reach 5 of unnamed stream WSC 480-430700-21000. Sub-reaches were added to further define the affected site. The stream enters CP 522-3 near the SW corner of the block and flows roughly parallel to the south boundary until it crosses the 437 road, it then continues flowing northeast for 185m where a known fish-bearing stream joins it. The impacted stream continues to flow north-east through the block and exits into a wetland near the northwest corner of CP 522-3.

The upper limit of the site is located approximately 235m upstream of the 437 road crossing. At this point there is a small impassable barrier that is a reach break and the End of Fish Use (EFU). The barrier is a 50cm vertical fall with no pool for staging jumps. The water depth is less than 10cm at the foot of the fall and the jump zone is obstructed by SWD and overhanging vegetation therefore it is a barrier to both juvenile and adult fish. Sub-reach 5.2 upstream of the barrier has been sampled four times by backpack electroshocker; no fish were captured on any occasion, therefore sub-reach 5.2 has been classified as non-fish bearing.

All of sub-reach 5.1 is located within the harvested cutblock. There are no significant barriers to fish passage in sub-reach 5.1. The culvert on the 437 Road is only a partial barrier to fish. The riparian vegetation on both banks of the stream reach consists mainly of grasses, fireweed, alder, willow and a mixed lodgepole pine (Pinus contorta) and spruce (Picea spp.) plantation approximately 1.5-2.0m tall. Two wheel drive access to the site is attainable by travelling 4km up the 437 Road to CP 522-3.

TABLE 1. SUMMARY OF LOCATION INFORMATION

Feature	UTM Co-ordinates	Trim Map No.
437 Road Crossing	09.0646310.6127812	93M.027

3.0 METHODOLOGY

The scope of this project was to determine what, if any 'instream works' are required to maintain, rectify or enhance the recently altered fish habitat within the stream reach of concern. To obtain this information field visits conducting various site measurements and electroshocking of the reach were performed. Information obtained during the field visits was assessed to determine the appropriate action for the site. Due to conditions observed during the initial field visit and previous familiarity with the site, it was decided that a formal FHAP would not be necessary for this site.

Insert Map 1

4.0 EXISTING SITE CONDITIONS

Harvesting occurred right up to both banks of the stream and it appears from the ruts observed in sub-reach 5.1 that equipment drove through the stream on occasion. Equipment traffic through the stream was not confined to a single crossing site; rather it appears to have occurred over the length of the stream inside CP sub-reach 5.1 522-3. Logs were also apparently skidded across the stream reach. Logging slash from harvesting is prevalent in the stream channel throughout sub-reach 5.1 (see photos). Despite these impacts on the stream there are no significant barriers to fish passage upstream of the confluence with the known fish-bearing stream. It appears that the stream has been flowing in this manner since harvesting occurred. The culvert on the 437 Road was determined to be only a partial barrier. The culvert gradient is 1.2% but the water gradient was 0% when the culvert was assessed for fish passage. Water velocity through the CMP was 0.05m/sec. Basically the stream would have to be almost dry before the culvert became impassable to adults and juveniles.

All of sub-reach 5.1 is accessible to fish and it still provides good spring, summer and possibly fall rearing habitat. The logging slash introduced into the stream provides cover and helps to form pools and regulate the stream flow. Flow (ie. velocity and volume) is probably not much different than pre-harvest. It is extremely unlikely that sub-reach 5.1 ever contained overwintering habitat although it may have provided some spawning habitat prior to harvesting of the cutblock. Average channel depth is 0.22m and the maximum residual pool depth observed was 0.21m. The bed material is predominantly fines with some organic material now but very small pockets of small gravel occur sporadically. Sub-reach 5.1 is approximately 420m long in its entirety before the EFU and reach break at the 0.5m fall upstream of the 437 Road crossing. There is evidence of past and current beaver activity on the known fish-bearing tributary, WSC 480-430700-21000-72100 upstream of the confluence with unnamed stream WSC 480-430700-21000 and downstream on unnamed stream WSC 480-430700-21000.

5.0 FISHERIES RESOURCE VALUES

The channel morphology within sub-reach 5.1 in the cutblock is characterised as riffle pool, and the average gradient of this sub-reach is 4%. The channel runs in a slightly sinuous manner until its confluence with the known fish bearing tributary, WSC 480-430700-21000-72100. The substrate in the sub-reach is composed mainly of fines with some organic material with sporadic very small pockets of small gravel. Spawning substrate quantity and quality for salmonids is very low due to the predominance of fine bed materials and fines filling the interstitial spaces within the gravel where gravels are present. There is no overwintering habitat present in sub-reach 5.1.No deep pools were noted, the maximum residual pool depth observed was 0.21m deep. No tree cover is present along the section of stream within the cutblock other than willow and alder; however the willow and alder is thick in places and provides good cover and shading. The logging slash present in the reach provides an abundance of LWD and SWD for cover.

Sampling of sub-reach 5.1 between the road and the confluence with the known fish-bearing tributary with an electroshocker did not capture any fish (Site SS01-48), despite the lack of

significant barriers. Triton sample site T72 downstream of the confluence of streams WSC 480-430700-21000 and WSC 480-430700-21000-72100 also did not capture any fish. Two minnow traps baited with roe and set overnight in deep channels within a wetland that the stream flows through downstream of the confluence also did not capture any fish (Site SS01-48A). There is evidence of past and current beaver activity on the known fish-bearing tributary upstream of the confluence with unnamed stream WSC 480-430700-21000. Past and current beaver activity is also evident on stream WSC 480-430700-21000 downstream of the confluence with the known fish-bearing tributary. Sampling of the known fish bearing stream (WSC 480-430700-21000-72100) conducted by Triton Environmental Consultants Ltd. in 1996 during a 1:20,000 reconnaissance inventory project captured 9 Dolly Varden at Site T69, located approximately 1km upstream of the confluence with stream WSC 480-430700-21000. A fall approximately 4km downstream is probably a barrier to anadromous fish and other species found in Babine Lake and Heal Creek. The fall was identified from the Fisheries Data Warehouse but no height was given for it. (Pers. comm., Jason Harris, Feb.28, 2002. Triton Environmental Consultants Ltd.). Stream inventory maps prepared by Triton Environmental Consultants Ltd. show only Dolly Varden present upstream of the fall, therefore they are likely a resident population.

TABLE 2. SUMMARY OF STREAM SAMPLING ACTIVITY

REACH 5								
		Water						
Site	Date	Temp.	Cond.	pH	Method	Length	EF.Sec.	Species
T72	Aug.9,1996	15 °C	---	---	EF	20	128	NFC
48A	Sept.25/26,2001	---	---	---	MT	---	Overnight	NFC
REACH 5.1								
		Water						
Site	Date	Temp.	Cond.	pH	Method	Length	EF.Sec.	Species
48	Sept.18,2001	9°C	40	7.4	EF	105m	139	NFC
REACH 5.2								
		Water						
Site	Date	Temp.	Cond.	pH	Method	Length	EF.Sec.	Species
P97	Aug.9,1996	9.5°C	109	6.7	EF	200m	601	NFC
SKR18	Sept.8,2000	8.0	90	7.8	EF	100	326	NFC
SKR19	Sept.8,2000	8.0	90	7.8	EF	100	326	NFC
12	Sept.18,2001	6.6	33	---	EF	130m	271	NFC
451	July 11, 2001	5	40	6.8	EF	150m	160	NFC

* Pers. comm., Jason Harris, Feb.21, 2002. Triton Environmental Consultants Ltd.

A small fall located 235m upstream from the 437 Road is both the End of Fish Use (EFU) and the end of sub-reach 5.1. The fall is an impassable barrier that prevents fish passage further upstream. The barrier is a 50cm vertical fall with no pool for staging jumps. The water depth is less than 10cm deep at the foot of the fall resulting in a pool depth to jump height ratio of 0.4:1, far less than the ideal of 1.25:1. SWD and overhanging vegetation also obstruct the jump zone making a clear jump impossible, therefore the fall is a barrier to both juvenile and adult fish. Sub-reach 5.2 upstream of the barrier has been sampled four times between 1996 and 2001 by backpack

electroshocker. It was sampled twice by Triton Environmental Consultants, once in 1996 (Site P97) as part of the 1:20 000 reconnaissance inventory program funded by FRBC on behalf of PIR and again in 2001 (Site 451) during second sampling for the 1:20 000 reconnaissance inventory. It was also sampled once by SKR Consultants (Site 19) in 2000 as part of the 1:5 000 operational inventory for CP576-1 and by Silvicon Services (Site SS01-12) in 2001 for FPCI purposes. No fish were captured on any occasion. All sample sites report the predominance of fine bed materials, the lack of suitable spawning substrate and the absence of overwintering habitat. Reach 2 has therefore been classified as non-fish bearing.

6.0 DISCUSSION

Fish access to reach 1 has not been affected by the harvesting activities in CP 522-3. Although there was equipment moving through the stream channel throughout the length of sub-reach 5.1 and logging slash has ended up in the stream, the present habitat conditions in the stream are not detrimental to fish and provide good spring, summer and fall rearing habitat. The logging traffic through the stream reach has not resulted in the channel changing direction, it is still following its original course.

It is difficult to determine to what extent, if any, that potential spawning habitat has been reduced. Other small tributaries to Heal Creek in unharvested areas that are similar in size to the stream of concern contain very little suitable spawning substrate, bed materials are predominantly fines. No overwintering habitat was found in other similar sized streams in the same area, both in harvested or unharvested areas. This would infer that prior to harvesting there was also very little suitable spawning substrate and no overwintering habitat present in sub-reach 5.1 of stream WSC 480-430700-21000 and that the stream reach historically provided only spring, summer and fall rearing habitat.

Other than flushing some of the fines out of reach 1, there would not appear to be any significant gains in habitat quality or quantity to be had by implementing restoration activities on this reach. Fish access has not been compromised and seasonal rearing habitat is still provided. With lots of introduced LWD and overhanging vegetation, the stream reach contains good cover and rearing habitat. Any increased sediment throughput as a result of the harvesting traffic in the stream reach would have occurred immediately following the harvest season. At this point in time, 9-10 years after harvest, the banks of the stream reach have stabilized and no extra sediment is being introduced into the stream as a result of the harvesting traffic in the stream.

Sampling conducted at the site did not capture any fish despite the lack of any significant barriers upstream of the confluence with the known fish-bearing tributary. The beaver activity noted on the known fish-bearing tributary and downstream on stream WSC 480-430700-21000 could be determining the fish distribution within the watershed to a certain extent.

7.0 RECOMMENDATIONS

With careful consideration of the site characteristics and logistics it is recommended that the site be left as is. Significant improvements in habitat quality through implementation of restoration activities are not expected; therefore I would rate this site as a low priority for restoration works. There are 420m upstream of the confluence with the known fish-bearing tributary before the EFU occurs at a small natural barrier that prevents fish migration further upstream. The entire reach is accessible to fish upstream from the confluence with the known fish stream. Historically, the stream reach very likely provided only spring, summer and fall rearing habitat, which it continues to do.

8.0 LITERATURE CITED

Withers, E. and J. Baker. 2000. Silvicon Services Inc. Enhancing Environmental Values – Interim Interior Watershed Restoration Plans (2001 – 2005).

Fish Wizard – BC Fisheries. 2000. B.C. Ministry of Land, Water and Air Protection, Victoria, B.C. Website (http://www. Bcfisheries.gov.bc.ca/fishinv/) searched November, 15, 2001.

Anonymous. 1997. 1:20,000 Reconnaissance Level Fish and Fish Habitat Inventory in the Bulkley T.S.A. Map sheet 093M.027. Triton Environmental Consultants Ltd., 120 – 13511 Commerce Parkway, Richmond, B.C. V6V 2L1.

Anonymous. 1997. 1:20,000 Reconnaissance Level Fish and Fish Habitat Inventory in the Bulkley T.S.A. (Working Unit #5- Tsezakwa). Triton Environmental Consultants Ltd., 120 – 13511 Commerce Parkway, Richmond, B.C. V6V 2L1.

Parker, M.A. 2000. Watershed Restoration Technical Circular No. 11. Fish Passage-Culvert Inspection Procedures. British Columbia Ministry of Environment, Lands and Parks and Forest Renewal B.C., Victoria, B.C. 47pp.

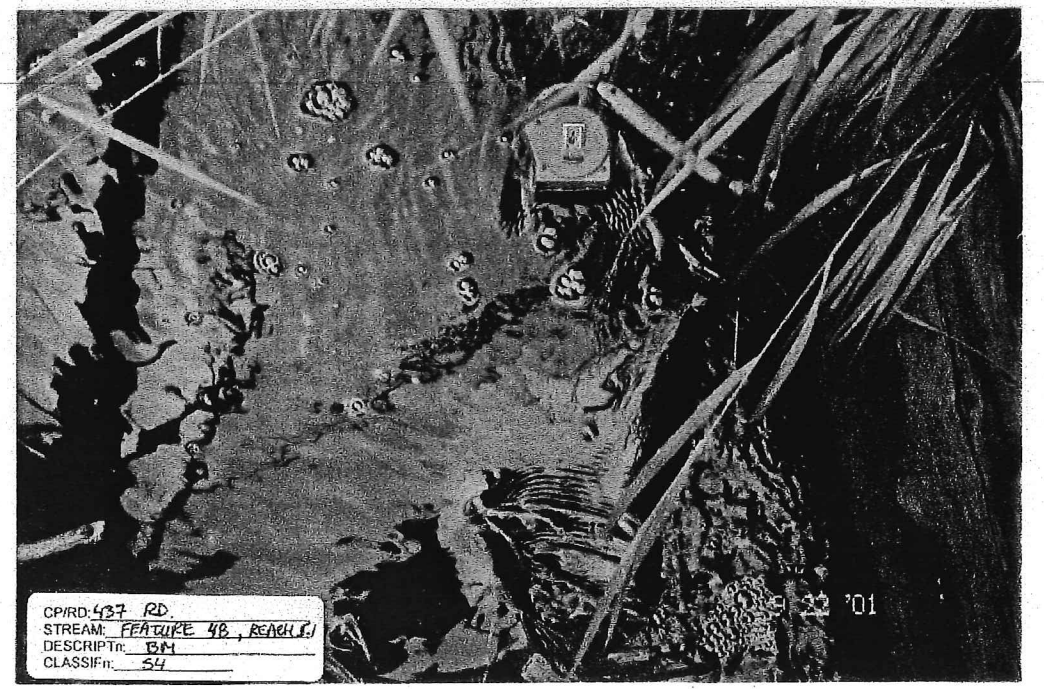
Jason Harris, Feb.21 and 28, 2002. Personal communication. Triton Environmental Consultants Ltd., Terrace, B.C. V8G 4A2.

APPENDIX I

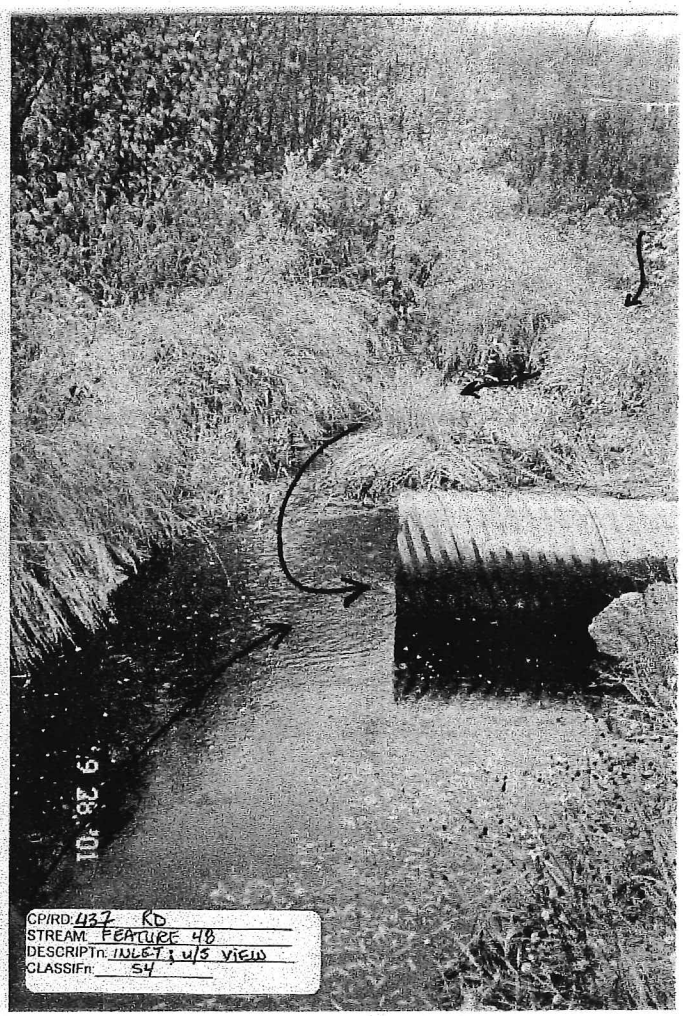
- SITE PHOTOGRAPHS-


CP/RD: 437 RD.
STREAM: FEATURE 48, REACH 5.1
DESCRIPTn: U/S
CLASSIFn: S4


CP/RD: 437 RD.
STREAM: FEATURE 48, REACH 5.1
DESCRIPTn: U/S
CLASSIFn: S4


CP/RD: 437 RD.
STREAM: FEATURE 48, REACH 5.1
DESCRIPTn: BM
CLASSIFn: S4


CP/RD: 437 RD
STREAM: FEATURE 48
DESCRIPTn: OUTLET; U/S VIEW
CLASSIFn: S4


CP/RD: 437 RD
STREAM: FEATURE 48
DESCRIPTn: INLET; U/S VIEW
CLASSIFn: S4


CP/RD: 437 RD
STREAM: FEATURE 48 REACH 1
DESCRIPTn: TYPICAL SMALL BARRIER
CLASSIFn: S4


CP/RD: 437 RD
STREAM: FEATURE 48. FALL OBSCURED BY VEGETATION
DESCRIPTn: 50m ↓ Snapout; EEU AND REACH BREAK.
CLASSIFn: S6/S4 0423546 from 437 RD.


CP/RD: 437 RD
STREAM: FEATURE 48
DESCRIPTn: INLET ; D/S view
CLASSIFn: S4

Fish-Stream Site Assessment
on an unnamed stream
(WSC 480-397200-29600)
in the
Nilkitkwa Lake Sub-Basin

(CP. 523-3)

Submitted to:

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Activity Number: 720785

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Prepared for:

Pacific Inland Resources
(a Division of West Fraser Mills Ltd.)

March 2002

EXECUTIVE SUMMARY

Silvicon Services Inc. was retained by Pacific Inland Resources (a Division of West Fraser Mills Ltd.) to perform a Fish Habitat Assessment Procedure (FHAP) on a heavily eroded site on an unnamed stream, WSC 480-397200-29600, within the Nilkitkwa Lake sub-basin. Due to conditions observed during the initial field visit, it was decided that a formal FHAP would not be necessary for this site and that an informal site assessment would be sufficient to determine the appropriate action(s) for the site.

The stream parallels the north boundary of the harvested C.P. 523 block 3. During the initial field visit it was clear that the channel had undergone a change in channel location. It was uncertain if this was the result of the harvesting activity in the adjacent cutblock due to the presence of several abandoned channels within the vicinity of the site. Everyone who visited the site, however; felt that the harvesting activities played no or very little role in the change of channel location. What was clear was that this stream reach is situated on an active alluvial fan with little topographical relief, so the stream is very susceptible to lateral movement across the fan. It was decided that possible rerouting of the stream into an "original" stream channel should be investigated. A detailed site plan was conducted at the best possible channel re-location site and a map was produced (See Appendix 2).

Due to the active nature of the stream channel it was evident that any "in-stream" work performed at this site would have a high likelihood of failing to meet the restoration objectives. Because the channel appears to be stabilizing currently, and habitat quality and quantity are increasing, the most favourable option is to take no action and to allow the stream to continue to stabilize naturally. Within time it is foreseen that the channel will contain good fish habitat as pools scour and the riparian vegetation grows up around the channel.

1.0 INTRODUCTION

Forest Renewal BC implemented its Watershed Restoration Program in 1994. This program, now referred to as the Enhancing Environmental Values (EEV) Program, was established to provide an important opportunity to improve water quality and reverse fish habitat impairment occurring as a result of past forest harvesting practices.

The Nilkitkwa Lake Sub-basin surrounds Nilkitkwa Lake and extends approximately 6 km to the east and approximately 10 km to the west of the lake. The Nilkitkwa Lake Sub-basin is roughly 16 454 ha in size (Withers, Baker 2000). The Nilkitkwa Lake sub-basin was among the watersheds identified in the year 2001-2005 Interim Interior Watershed Restoration Plan. The plan identified the fire guard trail – heavy erosion assessment on stream WSC 480-397200-29600 in C.P. 523-3 as a high priority for assessment and possible restoration works. The assessment of this site took place between October, 2001 and November, 2001. Silvicon Services Inc. employee, Ralph Kossman, RPBio., is heading the project. Steve Webb, RPF, along with Greg Johnstone, FIT, also of Silvicon Services Inc. developed the site plan and profile along with providing other professional support for the project. Dan Brookes, Dipl. Tech., conducted field visits and aided the engineers with the site plan and profiles.

While no fish sampling was conducted during the habitat assessment, prior sampling was conducted in 1997 during a 1:20,000 reconnaissance inventory project by Triton Environmental Consultants Ltd. Sampling revealed Dolly Varden located between the 444 road crossing and the habitat assessment site downstream. Additional fisheries information for Nilkitkwa Lake was obtained from the "Fish Wizard" software accessed through the BC Fisheries website. From this website, the following fish species were documented: Dolly Varden (*Salvelinus malma*), rainbow trout (*Oncorhynchus mykiss*), steelhead (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarki*), sockeye salmon (*Oncorhynchus nerka*), kokanne (*Oncorhynchus nerka*), chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), pink salmon (*Oncorhynchus gorbuscha*), lake whitefish (*Coregonus clupeaformis*), mountain whitefish (*Prosopium williamsoni*), lake trout (*Salvelinus namayacush*), sculpin spp. (*Cottus spp.*), northern pikeminnow (*Ptychocheilus oregonensis*), redside shiner (*Richardsonius balteatus*), and sucker spp.(*Catostomus spp.*).

While bull trout (*Salvelinus confluentus*) was not documented in Nilkitkwa Lake by the "Fish Wizard" software, it is a species which is present in the Babine River watershed.

The area of concern is located on an unnamed stream, WSC 480-397200-29600. The stream has undergone considerable erosion within the harvested cutblock, and near the present fire guard. The following document details the assessment and recommended restoration prescriptions for the affected site.

2.0 STUDY AREA

The stream is located approximately 7.5 kilometres up the 444 road. The stream crosses the 444 road, then flows east along the north boundary of CP 523-03. The upper limit of the site is located approximately 800 m below the bridge crossing on the 444 road. From this point to approximately 400 m downstream the stream travels within the existing cutblock. On the streams right bank (looking downstream) the riparian vegetation consists mainly of grasses and lodgepole pine (*Pinus contorta*) plantation approximately 1.5 m tall. On the left bank, the riparian vegetation is less disturbed. It is composed of mature balsam and spruce intermixed with an abundance of shrub species. Two wheel drive access to the proposed site is attainable along a spur road through CP 523-03. By parking at the end of the north spur, a distance of 75 metres north to the block edge is required to reach the upper limit of the site. (See Map 1)

Table 1. Summary of Location Information

FEATURE	UTM CO-ORDINATES	TRIM MAP NO.
444 Road Crossing	09.0644525.6136375	93M.037
Upper limit of site (near fire guard erosion)	09.0664298.6136530	93M.037
Lower limit of site (below outwash fan)	09.0644638.6136655	93M.037

3.0 METHODOLOGY

The scope of this project was to determine what, if any "in-stream works" are required to maintain, rectify or enhance the recently altered fish habitat within the stream reach of concern. To obtain this information, map and air photo interpretation, and field visits conducting various site measurements were performed. Fieldwork included traversing of the main stem and historically active channels, a site profile of the area of concern, stream cross-section, and photo documentation. All information obtained during the field visits was analysed to derive a plan to determine the best long term solution for the site.

The traverse was done through the use of a tight chain and compass. The data was then entered into ROAD ENG Terrain Module and a map was overlaid with a Trim based map. It is clear that the present channel flows in a different manner than the Trim map portrays. In order to re-route the stream along its historical course, a site plan was developed by use of a level and rod. The map produced from the site plan was overlain with the stream traverse map to come up with a detailed plan view of the site. (See Appendix II) In addition to the mapping of the site, a cross section of the stream was done with the level and rod to calculate the Q100 for the channel. The Q100 calculation was used to determine appropriate riprap size for possible "in-stream" works to be done. The field visits also assessed if the channel was likely to change direction again as is evidenced by the several old channel scars present around the site.

Insert Map 1

4.0 EXISTING SITE CONDITIONS

The area in which the stream channel has changed location is situated on an active alluvial fan. The stream is confined near the 444 road crossing and has a stable channel paralleling the north edge of C.P. 523 block 3 for approximately 800 m downstream. As the streams' gradient decreases near the NE corner of C.P. 523 block 3, so does the confinement of the channel. The channel makes an abrupt turn southward into the cutblock where it has washed out the outside banks near the fire guard (Photo 1). At this point the stream flows within the harvested cutblock along the timber edge, deeply downcutting for an additional 400 m downstream. This is where the stream deposits its bed load in a small outwash fan (Photo 3) before re-entering the timber and eventually joining with a well defined channel downstream. By downcutting through the cutblock, the channel has exposed a hard pan clay layer. The clay lines the channel bed and banks through several sections between the upper and lower limits of the site.

It appears that the stream has been flowing in this manner for several years. Past channel scars are evident throughout the fan, making it clear that the channel is very susceptible to actively changing course. All the old channel scars are completely revegetated and have a duff layer at least 10 cm deep over the old channel. There were no channels, other than the present channel, that exhibited any evidence of recent scour. This made it difficult to determine where the most recent abandoned channel once traveled, but an old channel was discovered near the fire guard, 267 metres downstream from where the stream first cuts away at part of the fire guard. This abandoned channel meanders through the timber and is eventually met on its right bank with flow from the mainstem 77 metres below the outwash area.

5.0 FISHERIES RESOURCE VALUES

The channel morphology within the cutblock is characterised as riffle pool and the average gradient of this reach is 3%. The channel runs in a sinuous manner deeply downcutting through the existing cutblock. Banks have been down cut between 1 and 1.5 metres deep. Exposed sand, silt and clay line the channel sides with some hard pan clay exposed on the channel bed.

The stream's substrate is composed mainly of gravels and cobbles with intermixed fines. Although an abundance of gravels are present, spawning quality for salmonids is low due to a high content of fine material filling the interstitial spaces within the gravel. In addition, compaction of the channel substrate has occurred in sections due to the high clay content present in the stream channel. Abundant deep pools create good cover for rearing fish and may provide some overwintering habitat within the deeper pools. Other than deep pools, little cover is present along the section of stream within the cutblock. In time it is expected that the channel will stabilize – reducing sediment transfer and increasing fish habitat throughout this section of stream. Although the channel is 10-15 metres inside the block boundary, the mature forest along the north side of the stream channel is expected to continue to provide large woody debris (LWD) to the reach except for the area of the outwash fan which is too far south from the timber edge for fallen trees to reach the

channel. Several stumps/rootwads on the banks are poised to fall into the channel as the soil is cut away beneath them contributing additional LWD to the channel. Deciduous shrubs and trees will continue to grow on the north and south banks (in the harvested block) providing increasing cover and shading over time.

At approximately 267 metres downstream from the point where the stream first enters the cutblock the channel narrows and the fish habitat rapidly decreases. The channel straightens and narrows to less than 1m wide for roughly 30 m (Photo 4). This section is likely to exhibit high water velocities during spring freshet, possibly restricting fish access to the upper part of the stream for the duration of high water. Approximately 50 m below the narrow channel section, the gradient decreases to 1%. At this point the banks of the channel disappear and gravels and fines have been deposited in a fan measuring approximately 30 m wide by 60 m long. Shallow braided channels with no pools flow through the fan and into the timber before dropping into a scoured channel. The drops measure from 20 cm to 70 cm in height and contain only shallow pools at their bases, creating an impediment to fish movement upstream.

While no fish sampling was conducted during the habitat assessment, prior sampling was conducted in 1997 during a 1:20,000 reconnaissance inventory project by Triton Environmental Consultants Ltd. Sample site T11 revealed Dolly Varden located between the 444 road crossing and the habitat assessment site downstream. Further downstream on the Nilkitkwa FSR sample site T4 captured Dolly Varden and site 37 captured a single rainbow trout parr. A 2 metre fall was documented on this stream by Triton Environmental Consulting Ltd. during their 1997 inventory. It is located approximately 2400 metres upstream of the initial channel washout of our site and is an impassable barrier to upstream movement of fish and the end of reach 1.

TABLE 2. SUMMARY OF STREAM SAMPLING ACTIVITY

REACH 1								
		Water						
Site	Date	Temp.	Cond.	pH	Method	Length	EF.Sec.	Species
T4	July 25, 2001	10.0 °C	---	---	EF	50	101	DV
T11	July 26, 2001	10.5 °C	---	---	EF	50	180	DV
37	Sept.17,2001	7 °C	70	---	EF	5	11	RB

6.0 DESCRIPTION OF PROPOSED ACTIVITIES

The following restoration activities have been considered for this site, but are viewed as only temporary measures due to the active nature of the alluvial fan which the stream reach is situated upon.

6.1 No Prescription

Whether the harvesting activities of C.P. 523-block 3 played a role in the streams' downcutting and most recent change of channel location is difficult to determine. However, everyone who visited the site felt that the harvesting activities played no or very little role in the change of channel location. Consensus among those who have visited the site is that the stream channel has historically changed location and that the site is located on an active fluvial fan (pers. comm., Webb, Steve and R. Kossman, Nov. 2001, Silvicon Services Inc.) It is foreseen that the channel will likely change it's course in the future due to the active nature of the channel, possibly leaving any "in-stream" works isolated and ineffective. Foregoing any "in-stream" works would allow the stream channel to naturally stabilize on its own, allowing both habitat quality and quantity to continue to increase over time.

Conducting "in-stream" works can be costly, and in this situation it is seen to have a high risk of failing to meet the restoration objectives over the long term. To implement a great deal of work at this site and have it subsequently fail to meet the restoration objectives will result in a greater net loss than that which has already occurred to the site. Alteration of the reforested cutblock will result from attempting to implement the rehabilitation activities to this site. A temporary road will have to be built to the stream sites in order to transport the riprap and create machine access to the sites. Some of the planted trees will be lost and others likely be damaged along the access route and at the site locations. Due to the wet area located between the end of the north access spur and the site, the access road would best be developed along side the stream itself - possibly creating ruts and compacting soils adjacent to the stream.

6.2 Rediversion of the Stream

By diverting the channel into the proposed site (Photo 2), the potential for all age classes of fish to access the upper section of this reach will increase for most times of the year. The narrow section which may exhibit high velocities will be eliminated as well as the small falls directly below the braided channel traveling through the outwash fan.

An increase in habitat quality is also expected to occur when the stream is diverted into the old channel. The deep channel with undercut banks, LWD, and overhanging vegetation will soon stabilize and create good rearing habitat and potential for overwintering and spawning habitats. Deep pools are expected to form below the LWD and the current overlying fines in the channel bed will naturally be replaced with gravels and cobbles.

With the outwash fan inactive after the rediversion, the potential for natural re-vegetation of the site should be good as the trees in the cutblock continue to grow and encroach on the now inactive fan.

There are several shortcomings associated with diverting the stream, namely;

- The "old channel" into which the stream is diverted could also easily change location due to the lack of topographical relief and a sharp bend in the "old channel".
- The stream would require a sharp bend in the channel at the diversion point, thus becoming more susceptible to blowing out.
- The detrimental impacts of heavy machinery operating around the stream and within the replanted cutblock.

6.3 Stabilization of exposed banks

By armouring the exposed outer banks of the eroded fire guard and the sharp eroded meanders with riprap (see potential rip-rap locations on Map. 1), the stream is far less likely to move further laterally into the cutblock. In addition, by reducing erosion of the banks, a reduction in the amount of sediment transferred downstream will occur, thus increasing the water quality and fish habitat. However, the existing channel appears to be fairly stable in the deeply down cut channel section and will not change direction easily until the outwash fan.

7.0 RECOMMENDATIONS

With careful consideration of the site characteristics and logistics it is recommended that the site be left to continue its current course. As the site is located on an active fluvial fan, any restoration measures have a high risk of failing to meet the restoration objectives in the long term due to the inherently unstable nature of this site. The absence of any major topographic relief at the site only compounds the risk of failing to meet the restoration objectives. By not implementing restoration possibilities, it is expected that the stream will continue as it has in the past – naturally changing course and picking new channels over time. Fish habitat along the current channel downstream of the initial channel washout will only increase in quality as more complexity develops along its channel. Since the initial occurrence of downcutting and erosion in the affected reach, the reach has stabilized considerably (except for the outwash fan), and provides favourable fish habitat with pools forming and cover from undercut banks and LWD increasing. Shading from deciduous shrubs and trees is increasing rapidly as quick growing species such as alder ,willow and cottonwood become established.

While we believe that harvesting had nothing or very little to do with the initial channel washout at this site, future development on known or suspected alluvial fans should be approached with caution. Wilford, Sakals and Innes 2002, discuss the "hydrogeomorphic riparian zone" of fans and how it plays a role in sediment storage, the stability of the stream channel and maintaining single thread channels. Among their prescriptions they suggest to "wait for or assist riparian vegetation to re-establish". This process is occurring at the site but could be accelerated by the planting of willow and cottonwood whips along the stream banks and especially on the outwash fan.

8.0 ACKNOWLEDGEMENTS

The author would like to acknowledge Ralph Kossman, RPBio., and Steve Webb, RPF, of Silvicon Services Inc. for their contributions and expertise during this project.

9.0 LITERATURE CITED

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APPENDIX I

- SITE PHOTOGRAPHS -

Photo 1. Downstream view from fire guard of initial channel washout and erosion site where stream enters cutblock.

Photo 2. Downstream view of possible rediversion route (to the left of crew person). Channel narrows just downstream of crew person.

Photo 3. Upstream view of outwash fan.

Photo 4. Upstream view of narrow section of current channel.

Photo 5. Upstream view of undisturbed stable channel located upstream of site.

Photo 6. Downstream view of undisturbed stable channel located upstream of site.

Photo 7. Downstream view of habitat in new channel.

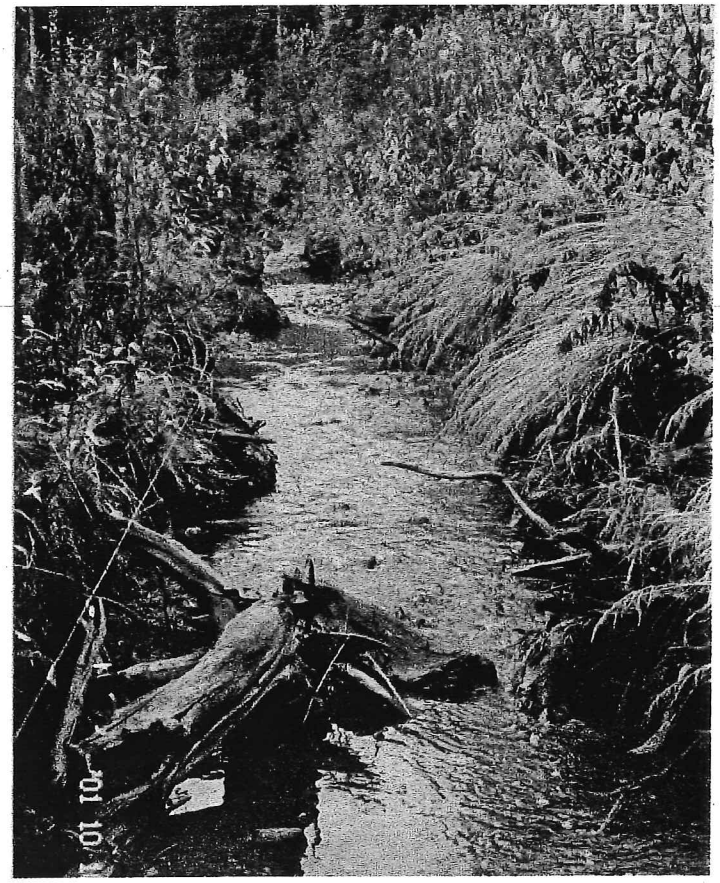

Photo 8. Upstream view of habitat in new channel.

Photo 9. View across current channel to possible rediversion route.

APPENDIX II

- SITE PLAN MAP -