



FIA Activity Standards Document

Restoration & Rehabilitation Component, Aquatic Activity Area – *Instream Structures and Treatments; Fish Passage (project planning, assessment, and prioritization); Treatment Effectiveness Evaluation; and Inspection and Maintenance Activities*

Strategic Resource Planning Component, Developing Management Unit or Watershed Level Strategies Activity Area – *Watershed Restoration Plans Activity*

Effective Date: April 1, 2004

Strategic Resource Planning Component, Management Unit or Watershed Level Strategies Activity Area, Watershed Restoration Plans Activity: This activity specific standard addresses the prioritization of subbasins and reaches under this activity. Guidelines for this activity are also available at the following web site: http://wlapwww.gov.bc.ca/wld/documents/fia_docs/wrp_guidelines_s.pdf.

Restoration and Rehabilitation Component, Aquatic Activity Area, Fish Passage Activity: This activity standard addresses project planning, assessment and prioritization components for restoration of fish passage at stream crossings on Forest Service roads (FSRs), Road Permit roads (pre-1995), and non-status roads. The design and construction of fish passage structures at priority stream crossings (i.e., engineering) is eligible under this activity, and the standards for these are provided at the following web site: <http://www.for.gov.bc.ca/hcp/fia/landbase/fishpassage.htm>.

Restoration and Rehabilitation Component, Aquatic Activity Area, Instream Structures and Treatments; Treatment Effectiveness Evaluation; and Inspection and Maintenance Activities: This activity standard addresses all aspects of these activities. The standards have been drawn from existing guidelines which still apply. See http://www.for.gov.bc.ca/hcp/fia/landbase/r_and_r_eligible_activities.htm for web access to these guidelines. These standards cover (1) conducting detailed habitat assessments; (2) preparing designs; (3) implementing restoration treatments; (4) conducting effectiveness evaluations; and (5) maintaining restoration treatments. An application for FIA funding may include any one, some or all of the above project components.

Further information and assistance with these standards available through the FIA web site: <http://www.for.gov.bc.ca/hcp/fia/landbase.htm>

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Objectives of Aquatic Restoration and Rehabilitation

The objectives of aquatic restoration and rehabilitation are to:

- Diagnose and restore the element(s) of freshwater fish habitat that are limiting native fish sustainability, survival and production;
- Diagnose and restore impaired habitat-forming watershed processes; and
- Design restoration works that are cost-effective, stable and functional in achieving the restoration objectives for the targeted fish species.

Scope and Examples of Aquatic Restoration and Rehabilitation Projects

An aquatic restoration and rehabilitation project should follow an integrated, holistic approach and be focused on accelerating recovery of freshwater fish habitat and habitat-forming processes. For this reason, aquatic restoration solutions and treatments are integrated with watershed processes and targeted to critical limiting factors. It is important then that Restoration Treatments are coordinated and appropriately scheduled with the assessment and restoration of other watershed components such as roads, landslides, gullies and riparian areas. **Integrated planning, under the FIA activity area Developing Management Unit or Watershed Level Strategies, must precede an aquatic restoration and rehabilitation project.**

Proposed restoration projects and treatments should be cost-effective, which means that restoration practitioners should select the most effective and reasonable project or treatment that achieves the restoration objectives at the lowest unit-cost. Also, decisions on selecting habitat restoration treatments are guided by the principle that restoration for one or more target species should not negatively impact or reduce habitat of other native fish species. It is expected that by addressing the recovery of watershed processes in aquatic restoration and rehabilitation projects that habitats for all native fish species will be restored over the long term.

It is recognized that other factors – such as exploitation pressure or ocean survival – may be limiting fish-stock productivity. However, under the eligible activities of FIA, aquatic restoration and rehabilitation projects are focused on accelerating recovery of freshwater habitats and increasing survival at each freshwater life stage through the restoration of watershed components and processes.

The Recipient's approach to aquatic restoration and rehabilitation will be to:

- Ensure a holistic watershed approach to restoration by integrating aquatic restoration planning, assessments and Work Plans with those for hillslope, riparian, and floodplain components;
- Identify which element(s) of freshwater fish habitat are limiting native fish sustainability, survival and production;
- Diagnose the causes of aquatic habitat degradation by considering the ecological and landscape contexts of habitat degradation;
- Design Restoration Treatments that restore impaired habitat-forming processes and habitat limiting factors;
- Ensure the Restoration Treatments for each stream benefit the habitat for as many of its native fish species as possible;
- Implement Restoration Treatments following the design and construction specifications, and adhering to regulatory agencies' environmental protection laws and guidelines; and
- Monitor and maintain Restoration Treatments to ensure objectives are met.

The expectations for this Activity Area are that investment will result in the:

- Restoration of fish habitat and habitat-forming watershed processes that will foster sustainable forest management in Target Watersheds identified in Sustainable Forest Management planning;
- Implementation of high priority and cost-effective fish habitat restoration projects determined from comprehensive assessments; and
- Long term treatment efficacy through timely effectiveness evaluations and maintenance of stream habitat structures.

Eligible work under the Aquatic Activity Area includes prioritizing subbasins and reaches (if not done under Watershed Restoration Plans), conducting assessments, preparing designs, implementing restoration treatments, conducting effectiveness evaluations, and maintaining restoration treatments (http://www.for.gov.bc.ca/hcp/fia/landbase/r_and_r_eligible_activities.htm). This includes fish habitat and channel assessments that catalogue stream and fish habitat parameters in disturbed or undisturbed (natural template) areas and provide information to determine appropriate restorative actions. Examples of potential aquatic restoration and rehabilitation projects include:

- Restoration of fish migration/access, spawning, rearing and overwintering habitat;
- Off-channel and side channel habitat construction and restoration;
- Nutrient supplementation on nutrient-poor streams; and
- Watershed process, fish habitat, stream channel, streambank and floodplain restoration.

1.0 Definitions

In this document, the following words or terms are defined as follows:

Administrator	administrator of the Forest Investment Account
Changes in the Work	additions, deletions or other revisions to the Work Plan that are considered substantive by the Project Coordinator and Qualified Registered Professional(s)
Components	the major physical parts of a watershed—hillslope, riparian, channel and floodplain components
Design Timeframe of 20 Years	selecting designs and materials for Restoration Treatments that are expected to last at least 20 years
FIA	Forest Investment Account
FOC	Fisheries and Oceans Canada
LWBC	Land and Water British Columbia Inc.
LWD	Large Woody Debris
MOF	British Columbia Ministry of Forests
MOT	British Columbia Ministry of Transportation
MWLAP	British Columbia Ministry of Water, Land and Air Protection
Qualified Registered Professional	a member in good standing with one of the following professional associations: Association of British Columbia Professional Foresters, Association of Professional Biologists of British Columbia (College of Applied Biology Act), Association of Professional Engineers and Geoscientists of British Columbia, Professional Agrolgists of British Columbia, that has relevant and extensive experience, having been directly responsible for assessment, design, construction or evaluation of aquatic restoration projects
Recipient	a party designated by the Ministry of Forests to receive FIA funding pursuant to a Recipient Agreement
Recipient Agreement	the contract between an Administrator and a Recipient to govern the funding and conduct of various investments under the land base investment program of FIA
Restoration Treatments	any treatment, structure or feature either installed, constructed, altered or removed in a stream, off-channel or floodplain area
RP	Restoration Plan for the Target Watershed
Subbasins	the watersheds of tributary streams within a Target Watershed
Target Fish Species	fish species identified as a high priority for conservation and/or recovery in the WFSP or RP

Target Watershed	watershed identified through Sustainable Forest Management planning as being a high priority candidate for Aquatic Restoration and Rehabilitation, for which a WFSP or (Watershed) RP has been developed
WFSP	Watershed-based Fish Sustainability Plan
Work	the work described and funded under a Recipient Agreement
Work Area	individual locations, watercourses or other particular areas or locations where Work is to be undertaken or within any area of Crown Land occupied for purposes of implementing the Work Plan
Work Plan	a detailed report describing the proposed Restoration Treatments and including a restoration design plan signed and sealed by a Qualified Registered Professional and having at a minimum the contents specified in this FIA Activity Standards document

2.0 General Requirements

Contractual and Legal Responsibilities

- 2.1 The Recipient must carry out all work consistent with the requirements of the Recipient Agreement, this FIA Activity Standards Document, and in compliance with the laws of Canada and British Columbia applicable to the Work and Work Area.
- 2.2 The Recipient must retain all data, reports, photographs and maps required to be produced by this FIA Activity Standards Document for a period of not less than three years.
- 2.3 Despite any Work or improvements on Crown Land that may be performed or made by the Recipient, the sole ownership of all Work Areas and any improvements remains with the Province.

Qualifications and Responsibilities of Personnel

- 2.4 The Recipient's representative, the Project Coordinator, must have demonstrated skills and work experience in project management. This individual has the responsibility to engage an appropriate project team (such as a Qualified Registered Professional Engineer, Qualified Registered Professional Geoscientist, Qualified Registered Professional Biologist, Qualified Registered Agrologist, equipment operators, labourers) and coordinate their activities to meet the Aquatic Restoration and Rehabilitation Activity Standards outlined herein.
- 2.5 The Qualified Registered Professional(s) are responsible for the following:
 - (a) To provide a measure of professional accountability for all restoration actions;
 - (b) To provide the required information and interpretation at each phase of the project;
 - (c) To ensure that the root causes of the habitat impairment are identified, and that the appropriate diagnosis to overcome that impairment is identified and correctly implemented;
 - (d) To select viable and cost-effective Restoration Treatments to rehabilitate habitat or watershed processes in Target Watersheds for Target Fish Species;
 - (e) To select, locate, design and construct the Restoration Treatments appropriately to achieve restoration objectives over the Design Timeframe of 20 Years;
 - (f) To monitor constructed works and report on treatment performance and maintenance needs; and

- (g) To sign and seal all final reports, FIA certificates, statements of construction conformance, and design drawings prepared during the project.
- 2.6 The Qualified Registered Professionals responsible for subbasin and reach prioritization, assessment, design, construction, evaluation and maintenance must comply with the FIA standards for their respective activities, as described below.
- 2.7 In order to engage in aquatic restoration and rehabilitation projects, the Qualified Registered Professional(s) will:
 - (a) Maintain a current knowledge and understanding of advances in aquatic restoration and rehabilitation theory and application;
 - (b) Consider Technical References (Appendix 1; FIA web site: <http://wlapwww.gov.bc.ca/wld/fia/instream.html>) when implementing assessment, design, construction and evaluation that pertain to:
 - a. watershed dynamics, geomorphology, and the restoration opportunities associated with various watershed process types;
 - b. design and construction guidelines for aquatic restoration; and
 - c. environmental protection measures required during construction activities.
- 2.8 The Project Coordinator and Qualified Registered Professional(s) have additional responsibilities, as described in Sections 3.0 to 8.0, in the implementation of activities for aquatic restoration and rehabilitation projects.
- 2.9 Although there are specific functional positions identified below for each activity in an aquatic restoration and rehabilitation project, one or two individuals could fulfil all these roles on projects that are not considered complex by the Project Coordinator.

3.0 Prioritizing Subbasins and Reaches

It is anticipated that Sustainable Forest Management planning will have identified the need to develop Watershed-based Fish Sustainability Plans (WFSP) or Restoration Plans (RP) for watersheds within a particular management unit. The WFSP/RP will have identified Target Watersheds and Target Fish Species for restoration, and determined the potential for successfully restoring their productive capacity based on current and future watershed condition. The objective of 'Prioritizing Subbasins and Reaches' is to identify high priority subbasins and reaches within the Target Watershed where Restoration Treatments are required and where the Restoration Treatments would have a high likelihood of being effective at meeting restoration objectives.

- 3.1 Prior to undertaking detailed assessments in high priority subbasins within Target Watersheds, the Project Coordinator must be able to provide documentation to the Administrator that: 1) coordinated project planning and decision-making has occurred at the watershed and sub-basin levels, and 2) proposed aquatic restoration work will not be negatively affected by current or potential watershed conditions and processes. The documentation must provide the data, justification and rationale for:
 - (a) The present condition of the watershed and its processes;
 - (b) Subbasins and reaches within Target Watersheds that have a high likelihood of restoration success and are a high priority in relation to specified restoration goals for the watershed;
 - (c) Selection of Target Fish Species and the critical freshwater limiting factors affecting those species;
 - (d) A channel risk assessment to identify the potential vulnerability of the reach and restoration treatments from hazardous channel and hillslope processes;
 - (e) The watershed, subbasin, and reach-level restoration objectives; and

- (f) The proposed types of Restoration Treatments that will address the limiting factors and restoration objectives within high priority reaches and subbasins.
- 3.2 A decision-making matrix that summarizes the information in Section 3.1(a) to 3.1(d) must be completed and submitted to the Administrator. The present condition of watershed Components and the impact from existing and potential hillslope and stream corridor condition and processes on fish habitat must be stated for each subbasin using a qualitative rating scheme (high, medium, low). Also, the matrix must state the likelihood of benefits to fish habitat resulting from the restoration of specific watershed Components. A completed matrix for an example watershed is provided in Appendix 2. Example of Matrix. *Watershed Restoration Planning and Priority Setting* on the FIA web site: http://wlapwww.gov.bc.ca/wld/documents/fia_docs/wrp_guidelines_s.pdf provides additional background on completing the decision-making matrix.
- 3.3 The Project Coordinator must document why Restoration Treatments are required. If Restoration Treatments are required, the Project Coordinator must ensure that the most appropriate restoration treatments occur in the watershed and that restoration activities are coordinated and scheduled with other restoration activities on, for example, roads, hillslopes, riparian zones, and floodplains.
- 3.4 If the above documentation cannot be synthesised from existing information (i.e., Overview Watershed Assessments or Overview Inventory of Roads, Landslides or Gullies), the Project Coordinator must select a suitable assessment procedure and assemble an appropriate project team, which includes Qualified Registered Professional(s), to obtain the required information described in Section 3.1.
- 3.5 The Project Coordinator will consider the assessment methodologies in the Technical References (Appendix 1) when selecting suitable procedures. A recommended procedure for identifying high priority subbasins and assessing potential impacts of watershed processes on aquatic restoration projects is provided in Anonymous (2003) titled *Watershed Restoration Planning and Priority Setting – An Emphasis on Fish Habitat* (http://wlapwww.gov.bc.ca/wld/documents/fia_docs/wrp_guidelines_s.pdf). The application of other similar watershed assessment procedures may be appropriate to address site-specific conditions.

4.0 Conducting Detailed Habitat Assessments

Detailed habitat assessments are conducted on reaches having a high resource priority and a high likelihood for restoration success. Habitat assessment field surveys and investigations must be led by at least one Qualified Registered Professional. The Level 1 Fish Habitat Assessment Procedures (FHAP) (Johnston and Slaney 1996; <http://srmwww.gov.bc.ca/frco/bookshop/tech.html>) provides an example of an acceptable detailed field assessment procedure to quantify impacts to aquatic habitat.

Detailed Habitat Assessment Requirements

- 4.1 Field reconnaissance and habitat investigations must be undertaken on the critical or priority reaches for the Target Fish Species, with detailed habitat assessment surveys recommended for a section of channel representative of each priority reach. If the critical limiting factors are known, only those habitat characteristics that relate directly to the critical limiting factors within the specific reach should be assessed. The surveys should be coordinated with the data needs of potential Restoration Treatment designs to reduce duplication of survey effort. Under this detailed habitat assessment, the Project Coordinator will ensure the following activity standards are met by the Qualified Registered Professional(s):
- (a) Obtain Fish Collection Permits from MWLAP and FOC for any work that will involve fish capture and/or collection;

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- (b) Characterize habitat condition for the Target Fish Species by collecting quantitative information on adult holding pools, spawning gravel quantity and quality, rearing pool area and frequency, cover in pools and riffles, LWD frequency and distribution, off-channel habitat, migration barriers, and nutrient concentrations during the summer growing season;
 - (c) Characterize channel morphology by surveying an adequate number of cross sections to represent each priority reach and by collecting quantitative information on bankfull and wetted width and depth, residual pool depth, gradient, size distribution of surficial bed materials on riffles, and present discharge;
 - (d) Describe habitat condition for each priority reach assessed;
 - (e) Evaluate the data collected in Sections 4.1 (b) and (c) above using professional experience to confirm the habitat limiting factors for the Target Fish Species, and determine the watershed processes that have been altered;
 - (f) Confirm the watershed, sub-basin, and reach restoration objectives;
 - (g) Recommend specific reaches or sites requiring Restoration Treatments; and
 - (h) Compile all assessment results, evaluations and recommendations into a detailed assessment report.
- 4.2 In addition to the above requirements for a detailed habitat assessment, the Qualified Registered Professional(s) will:
- (a) Consider acceptable procedures, data forms and diagnostic procedures for the assessment and evaluation of aquatic habitat, channel morphology and condition, and hillslope sediment sources in the Technical References (Appendix 1; FIA web site: <http://srmwww.gov.bc.ca/frco/bookshop/tech.html>).
 - (b) Consider completing a Channel Conditions and Prescriptions Assessment (CCPA) (e.g., Hogan et al. 1996) for specific reaches, where it is evident that stream channel instability is a concern;
 - (c) Consider completing a Fish Passage Culvert Inspection (e.g., Parker 2000) if fish access is a known or suspected problem within the subbasin;
 - (d) Consider completing a Riparian Assessment (e.g., Koning 1999) of only the identified, impacted reaches; and
 - (e) Consider collection of water samples for low level nutrient analyses (e.g., Ashley and Stockner 2003) if nutrient deficiency is a known or suspected problem within the subbasin.
- 4.3 The Qualified Registered Professional(s) will review information that has been collected and diagnose habitat and or habitat-forming process limitations. The end point of this step will be to recommend restoration treatments in sufficient detail that design work can proceed under Section 5.0 or recommend no further work. The latter recommendation would occur if there is a low likelihood of restoration success, no clear issues were determined that will have a marked benefit for the Target Fish Species, or no cost-effective treatments can be identified. The Project Coordinator must file a report internally summarising all assessment information.
- 4.4 The Recipient must submit to the Administrator a Certificate of Project Completion (pursuant to the Recipient Agreement) signed and sealed by a Qualified Registered Professional (Appendix 3) and a Project Completion Abstract. The Project Completion Abstract is shown in Appendix 7. The maximum size of the abstract is two pages. Electronic copies, preferably in Adobe pdf format, of the abstract and final report must also be submitted to the Fisheries Project Registry

(<http://www.canbcdw.pac.dfo-mpo.gc.ca/FPR/>) and the Ministries Library
(ForProdres@gems5.gov.bc.ca).

5.0 Preparing Designs

Purpose and Scope of Restoration Treatments

Restoration Treatments are designed to address the hierarchy of watershed to site-level restoration objectives that were determined by the Qualified Registered Professional(s) from their interpretation of the watershed and habitat assessment results. The various kinds of Restoration Treatments have been grouped into four project types to facilitate the preparation of designs (see below). Differences in project Types I, II and III are based on the complexity of structure design and installation, and the degree of alteration to the channel or floodplain as a consequence of the proposed structure installation. Consequently, the level of detail for field surveys, analyses and reporting increases as the complexity of the project type increases from Type I to Type III. Project Type IV is a non-structural treatment that pertains to restoring nutrient levels in watercourses. The descriptions for the various project types are as follows:

Type I Restoration Treatments are least difficult to design and install, and typically involve activities that alter the channel plan for only one habitat unit and less than 5 bankfull widths, producing a local effect on the streambed and banks. Examples include:

- Large woody debris (LWD) placements and anchoring
- Boulder clusters
- Simple bank protection or stabilization using:
 - riprap
 - LWD
 - Soil bioengineering

Type II Restoration Treatments are more complex than Type I and typically involve activities that alter the plan and profile of a stream over a reach length greater than 5 bankfull widths. This includes situations where treatments encroach in plan view more than 30% of the bankfull width, or in profile more than 50% of the bankfull depth. Examples include:

- Pool/riffle sequence construction using boulders, riprap, or LWD
- Channel/gravel excavation
- Channel re-alignment or re-construction
- Gravel placement
- Deflector spur/groyne installation
- Fishway and weir construction
- Berm and dike construction
- Complex bank stabilization projects

Type III Restoration Treatments are most difficult to design and typically involve activities that result in significant changes to the existing channel and/or floodplain. Examples include:

- Surface water supply side channel
- Sub-surface water supply (groundwater) channel
- Floodplain restoration

Type IV Restoration Treatments involve nutrient supplementation to oligotrophic rivers and streams. Examples include:

- Application of organic or inorganic nutrient briquettes
- Application of salmon carcasses

Design drawing requirements for Restoration Treatments can range from conceptual drawings of a typical structure to detailed drawings of one structure showing site-specific plan, profile and cross section elevations of its proposed installation. For example, a single LWD structure in a pool is considered a Type I project requiring a conceptual design of a typical structure in plan and cross section views, with a representative channel cross section where the structure is proposed to be installed. A complex bank stabilization project involving, for example, multiple LWD structures is considered a Type II project requiring existing and proposed plan, profile and cross section elevation drawings for both the section of channel to be restored and for the proposed structure and its layout at a representative restoration site.

Type IV projects do not require design drawings. Instead they require a nutrient application plan that includes a justification and rationale for nutrient application and outlines the objectives and methods of how nutrients are to be applied. For additional details on Type IV projects, see Section 5.9.

A Qualified Registered Professional is required for assessing field survey requirements, coordinating the surveys and preparing the design. A multi-disciplinary team of Qualified Registered Professionals is recommended for complex projects where significant changes to the channel and/or floodplain are planned or anticipated. Survey, design and reporting requirements are specified for the various project types in the 'Design and Reporting Requirements' section below.

Responsibilities of Personnel

- 5.1 The Project Coordinator is responsible for selecting the appropriate Qualified Registered Professional(s) to coordinate the surveys and prepare the design.
- 5.2 The Project Coordinator is responsible for all required referrals and obtaining notifications and licences at appropriate stages during the development of restoration treatments and designs. The Project Coordinator's responsibilities include:
 - (a) Prior to developing restoration designs, ensuring that sites are eligible for FIA funds and not developed on sites for which tenure holders have mandatory obligations to carry out such work;
 - (b) Prior to developing designs in full, contacting potential permit, tenure or licence holders (e.g., MOF, MWLAP, MOT, individuals and forest companies) who may be affected, to address any concerns they may have regarding the proposed restoration works;
 - (c) Ensuring a Qualified Registered Professional Engineer signs and seals designs for projects requiring a water rights licence. Such sealed designs will also be required for those projects, which have been evaluated by Land and Water British Columbia Inc. to have a high risk to life or property, or to ensure the stability of the structure(s); and
 - (d) After designs and a Work Plan have been prepared, complying with relevant legislative authorities and obtaining approvals relating to provincial and federal legislation as outlined in Chapter 1 of 'Fish Habitat Rehabilitation Procedures' (Slaney and Zaldokas 1997) prior to implementing Restoration Treatments. Incorporate agency requirements and amendments into the designs, and provide copies of the referral and agency response to the Administrator upon request. Refer to <http://lwbc.bc.ca/water/surface.html> for further clarification.
- 5.3 In the preparation of Restoration Treatment designs, the Qualified Registered Professional is responsible for the following:
 - (a) Designs must address the restoration of impaired habitat and/or habitat-forming processes and be complementary to other restoration activities within the sub-basin;
 - (b) Designs must address the needs of the Target Fish Species identified by detailed field assessments and that these designs further support component and watershed level restoration objectives;

- (c) All instream and off-channel Restoration Treatments must be designed to remain stable at a 1 in 50 year maximum instantaneous flow, as determined by standard hydrologic analyses documented in, for example, National Research Council Canada (1989), and for a Design Timeframe of 20 Years; and
- (d) Proposed Restoration Treatments must not negatively impact adjacent or downstream properties, culverts and bridges.

Design and Reporting Requirements

- 5.4 For all proposed Restoration Treatments, a Work Plan must be prepared.
- 5.5 For Type I, II and III projects, the Qualified Registered Professional must provide the following in the Work Plan:
 - (a) Plan view(s) to indicate location and layout configurations of design at an appropriate scale (e.g., orthophotos, 1:5000 scale maps). At a minimum, the map must include:
 - a. Stream reaches and specific sites within the stream channel where the Restoration Treatments are proposed;
 - b. Legal boundaries; and
 - c. Access roads;
 - (b) A typical plan view drawing of each structure type. This may include either a hand drawn sketch, or an enlarged aerial photograph or ground photograph, with an overlain sketch of the structure. (Scale is to be depicted).
 - (c) The methods and specifications for construction in the Work Plan, including:
 - a. A description of the physical and biological site-level restoration objectives;
 - b. All design drawings and a detailed description of the methods to be used to construct each structure;
 - c. A schedule of work with anticipated start-up and completion dates for each project area that will limit environmental impacts;
 - d. Access plans;
 - e. Source of construction materials (e.g., boulders, LWD);
 - f. Table of estimated quantities and costs for labour, equipment, and materials;
 - g. Debris disposal details, including identification of disposal sites. All hazardous waste must be handled according to British Columbia Waste Management regulations and with the approval of MWLAP; and
 - h. Photographs of each project site, labelled with D/M/Y, Geographic Position System (GPS) location in Lat/Long or UTM coordinates, and point of view.
- 5.6 For Type I projects, the Qualified Registered Professional must complete the requirements in Section 5.5 above and include:
 - (a) Representative cross section plots of typical project site locations. Cross sections must encompass the floodplain height, extending laterally 5 m beyond the top of the bank. Restoration project details must be overlain on the cross sectional plot; and
 - (b) Methods for design, including design criteria, assumptions and calculations. Specifications for development of structures to a 1 in 50 year maximum instantaneous flow must be incorporated into the final design package.
- 5.7 For Type II projects, the Qualified Registered Professional must complete the requirements in Section 5.5 above and undertake a sufficient topographic survey of the restoration section to provide:

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- (a) A streambed and water surface profile plot over a minimum distance extending 200 m above to 200 m below the section. This plot must include design water surface elevations for the 7 day low flow, bankfull discharge and 1 in 50 year maximum instantaneous flow for the channel. The plot must also show the location and elevations of restoration structures; and
 - (b) A representative number of cross sections at locations of proposed Restoration Treatments, showing layout and elevation for each structure type.
- 5.8 For Type III structures, the Qualified Registered Professional must complete the requirements in Section 5.5 above and provide the following design information:
- (a) A topographic survey of the work area, at the level of detail required for proper analysis, with plans, sections and profiles. Cross sections should extend to the limit of the active floodplain, extending a minimum of 10 m beyond. Plan drawings should also include information on dikes, floodplain, and areas potentially inundated at design flows;
 - (b) All drawings should include benchmarks to a known field datum and include elevations, construction materials, and water surface elevations for design flows;
 - (c) Detailed cross sections at restoration locations, hydraulic controls, etc. must be included. Detailed construction drawings of all hydraulic control features (e.g. inlets, intakes, spill channels, outlets, etc.) should be included detailing expected water surface elevations and velocities for design flows. A drawing containing all typicals and details should be included with the plans if required;
 - (d) Methods for design, including design criteria, assumptions, hydrological data, calculations including spreadsheets or model output, must be included; and
 - (e) Design flows must include 7 day and mean annual low flows, mean annual flow and flood flow, and maximum instantaneous 1:2, 1:10, 1:20, 1:50, and 1:200 flows.
- 5.9 For Type IV projects, the Qualified Registered Professional must provide the following in the Work Plan:
- (a) Desired concentration of nutrients;
 - (b) Type of nutrients;
 - (c) Seasonal timing of application;
 - (d) Frequency of nutrient addition;
 - (e) Location of application sites;
 - (f) Ratio of dissolved inorganic nitrogen to total dissolved phosphorous in nutrients being added; and
 - (g) Application technique.
- 5.10 Upon completion of the Work Plan, the Recipient must submit to the Administrator a Certificate of Project Completion (pursuant to the Recipient Agreement) signed and sealed by the Qualified Registered Professional (Appendix 3) and a Project Completion Abstract (Appendix 7). The maximum size of the abstract is two pages. Electronic copies, preferably in Adobe pdf format, of the abstract and final report must also be submitted to the Fisheries Project Registry (<http://www.canbcdw.pac.dfo-mpo.gc.ca/FPR/>) and the Ministries Library (ForProdres@gems5.gov.bc.ca).

6.0

Implementing Restoration Treatments

For restoration objectives to be met, the Restoration Treatments must be implemented in accordance with the authorized design drawings and specifications. Successful implementation requires an individual who acts as the on-site Construction Supervisor to oversee the work on the restoration project. The Construction Supervisor is appropriately qualified for the procurement and coordination of machinery and materials, and is experienced in the construction/installation of the specified Restoration Treatment. It is recommended that an Instream Project Implementation Checklist similar to Appendix 8 be assembled to assist with identifying and scheduling the critical implementation steps of your project. The following standards must be adhered to during the implementation of Restoration Treatments.

General Responsibilities

6.1 The Project Coordinator is responsible for:

- (a) Engaging a qualified Construction Supervisor to ensure the Restoration Treatments are built as described in the Work Plan;
- (b) Notifying, in writing, the MWLAP Regional Office - Attention: Ecosystems Section Head - Environmental Stewardship, at least 10 days prior to the initiation of work, and supplying a copy of the Workplan upon request (directory of MWLAP regional offices: <http://wlapwww.gov.bc.ca/main/prgs/regions.htm>);
- (c) Scheduling and coordinating Restoration Treatments construction with the implementation of all Component restoration works within the sub-basin; and
- (d) Overall co-ordination and completion of the Restoration Treatments as described in the Work Plan.

Regulatory Requirements

6.2 Before commencing any Restoration Treatments, the Project Coordinator must have applied for and received the necessary approvals, permits and authorizations from:

- (a) Land and Water B.C. Inc. (LWBC):
 - a. Permit, approval and/or licence under the *Water Act* for “works in and about a stream”, and the diversion, storage and use of water; and
 - b. Permit, approval and/or licence for tenure, if required, under the *Land Act*.

Please contact Land and Water BC for more information.

- (b) Ministry of Forests (MOF):
 - a. Within 10 days of commencement of the on-site works portion of the project, must notify the MOF District Manager if the prescription for instream work requires the cutting of trees 15+ cm in diameter or operation of wheeled or tracked equipment in the Riparian Management Area;
 - b. Within 10 days of commencement of the instream works, must notify the MOF District Manager that the work is commencing, and provide a copy of the prescription and/or design plan if requested; and
 - c. Obtain any permits and/or approvals, as required under the appropriate legislation, for use of forest roads for heavy equipment transfer, construction of access roads, and access to pit sites and materials, road construction, other uses of forest lands or other activities.

Please contact the Ministry of Forests District Manager for more information.

- (c) Ministry of Water, Land and Air Protection (MWLAP):
 - a. A Fish Collection Permit for any Restoration Treatments that will involve salvage of fish species managed by MWLAP;
 - b. Approval to transfer fish, including the transfer and instream application of fish carcasses;
 - c. Authorization for nutrient supplementation to oligotrophic rivers and streams; and
 - d. Conditions resulting from notification for “works in and about a stream” issued to LWBC.

Please contact the Ministry of Water, Land and Air Protection Regional Office for more information.

- (d) Fisheries and Oceans Canada (FOC):
- a. Approvals, permits and or authorizations under the *Fisheries Act* and the *Navigable Waters Protection Act* related to the Restoration Treatments;
 - b. A Fish Collection Permit for any Restoration Treatments that will involve salvage of fish species managed by FOC; and
 - c. Approval to transfer fish, including the transfer and instream application of fish carcasses.

Please contact the Fisheries and Oceans Canada Regional Office for more information.

- (e) Written approval from the private land owner where contract activity will involve encroachment on or through private lands.

- 6.3 An approval, permit or letter of authorization does not relieve the Project Coordinator, acting as the Recipient's representative, of the requirement to comply with all applicable federal, provincial and municipal legislation.

Initiation of Work

- 6.4 The Project Coordinator is responsible for:

- (a) Ensuring any design drawings prepared for Restoration Treatments by a Qualified Registered Professional Engineer (P.Eng) are signed, sealed and issued for construction;
- (b) Ensuring that in-stream activities in fish bearing waters are conducted within the specified work windows (consult regional FOC and MWLAP offices for updated instream work windows);
- (c) Keeping copies of the following on the work site at all times:
 - a. The Work Plan and construction drawings,
 - b. Letters of authorization and approval documents, and
 - c. Workers Compensation Board certificates.
- (d) Ensuring a Qualified Registered Professional Engineer (P.Eng) or his/her representative, as necessary, provides suitable site supervision and field reviews, before, during and upon completion of the work to ensure that work activities are carried out in accordance with drawings issued for construction in Section 6.4 (a);
- (e) Ensuring all individuals directly responsible for construction of Restoration Treatments adhere to any written requirements, changes or conditions specified by regulatory agencies as a result of their authorization or approval of the Work Plan; and
- (f) Consulting with Qualified Registered Professional(s) and/or Environmental Monitor before initiation or continuing with the work if potential adverse affects to resources or the construction of Restoration Treatments are identified as a result of unanticipated weather conditions.

Changes in the Work

- 6.5 Prior to any Changes in the Work being undertaken, the Project Coordinator must:

- (a) Assess the magnitude of the necessary changes and request the applicable Qualified Registered Professional(s) provide written documentation of the amendments, and, where required, sign and seal the amended construction drawings before continuing with construction; and

- (b) Notify the regulatory agencies (e.g. MWLAP, FOC, MOF, etc.) of the scope and magnitude of the changed conditions and/or recommended Changes in the Work. At the regulatory agencies discretion, new permits, approvals or authorizations may be required prior to the changes being implemented.

Environmental Monitoring and Protection

- 6.6 All work should proceed in the presence of the Environmental Monitor, an individual responsible to the Recipient, who ensures regulatory environmental protection standards and conditions are met during the construction of Restoration Treatments and who should have:
- Familiarity of legislation to protect fish and fish habitat;
 - Thorough knowledge of fish life cycles and habitat requirements for the fish species inhabiting the specific site/reach;
 - Familiarity with the limitations of heavy equipment and potential impacts that machines can have on the aquatic ecosystem when working around streams;
 - Familiarity with procedures for reporting fuel and oil spills and implementing clean-up procedures;
 - Familiarity with and capability to implement standard sediment control measures;
 - Familiarity with fish salvage procedures; and
 - Capability to make operational decisions regarding project shutdown due to weather or other conditions that may negatively impact on aquatic resources.
- 6.7 The Environmental Monitor may inspect and monitor conditions in and around the vicinity of the Restoration Treatments to ensure levels of effects identified by the regulatory agencies are not exceeded. If these levels are exceeded, in the judgement of the Environmental Monitor alone, or an activity is in clear contravention of condition of approval for the Restoration Treatments, the Environmental Monitor must have the authority to cease that construction activity and/or take the necessary measures to reduce the level of effect to those approved.
- 6.8 The Project Coordinator is responsible for:
- (a) Ensuring that all conditions and measures obtained from the regulatory agencies are complied with during all activities associated with the construction of the Restoration Treatments;
 - (b) Ensuring that all subcontractors and employees are in compliance with these conditions and measures and all applicable environmental legislation and regulatory requirements at all times, and must take immediate action to rectify problems in this regard;
 - (c) The protection of the environment and the preservation of all public and private property on and adjacent to the Work Area;
 - (d) Ensuring that construction activities adhere to commonly used Best Management Practices (e.g. Section 5 in Instream Work, *Land Development Guidelines for the Protection of Aquatic Habitat*, Chilibeck et al. 1992); and
 - (e) Equipment and resources are available for emergency situations as required (e.g. fish salvage equipment, spill response materials, fire suppression equipment, personal health and safety, etc.).

Completion of Work

- 6.9 Upon completion of the work, the Project Coordinator must document as-built information as required for the project, by including the following:
- (a) All as-built drawing(s), which must be reproduction(s) of the construction drawing(s), identifying all changes that occurred during construction. If changes are substantial, then the site must be re-surveyed, using the original reference points (tie-in points), and new

- drawing(s) produced. Any construction drawings signed and sealed by a professional engineer must have as-built drawings signed and sealed by a professional engineer;
- (b) Restoration Works Summaries for instream (Appendix 4) and/or off-channel (Appendix 5) projects. Each summary is a tabular description of all completed Restoration Treatments that forms the template for conducting future Routine Effectiveness Evaluations. The summary must include all restoration sites and be completed immediately after the conclusion of constructing the Restoration Treatments. Additional background on completing the summary form is provided in the Routine Effectiveness Evaluation Guidelines available at: <http://srmwww.gov.bc.ca/frco/bookshop/tech.html>;
 - (c) A Qualified Registered Professional must complete a Certificate of Project Completion and a Statement of Construction Conformance (Appendices 3 and 6);
 - (d) A Qualified Registered Professional must provide a post-completion effectiveness evaluation schedule for the project to the Recipient; and
 - (e) A Project Completion Abstract (Appendix 7) must be filed by the Recipient. The maximum size of the abstract is two pages. Electronic copies, preferably in Adobe pdf format, of the abstract and final report must also be submitted to the Administrator, the Fisheries Project Registry (<http://www.canbcdw.pac.dfo-mpo.gc.ca/FPR/>) and the Ministries Library (ForProdres@gems5.gov.bc.ca).

7.0 Conducting Effectiveness Evaluations

Future work at the restoration site/reach will involve the monitoring and evaluation of the Restoration Treatments to assess their effectiveness and to recommend modifications and maintenance to the design and/or structures if necessary.

Objectives

Routine Effectiveness Evaluations (REE) provide a low intensity, standardized procedure for determining the success of aquatic restoration projects at a broad scale and low cost. The intent of the REE procedure is to examine all sites within restoration projects to determine, at a qualitative level, if physical and biological objectives at the site, component and watershed levels are being met satisfactorily (see Gaboury and Wong, 1999 for objective definitions).

The outputs of REE are:

1. An assessment of the present configuration and condition of Restoration Treatments (i.e., are the works still in place);
2. A qualitative assessment of whether or not the Restoration Treatments have been effective in addressing the restoration objectives (i.e., are the works functioning as intended);
3. Recommendations for site-specific maintenance or remedial works;
4. Documentation of unexpected and instructive site-specific successes and failures; and
5. Recommendations (if any) for potential Intensive Effectiveness Evaluations (IEE) and Operational Techniques Refinement (OTR) projects stemming from REE findings.

REE confirms that completed works achieve, at a site level, the objectives of the restoration measures, and provides general feedback regarding the overall appropriateness of the measures at a site level. The Project Coordinator may consider 'A Framework for Conducting Effectiveness Evaluation of Watershed Restoration Projects' (Gaboury and Wong 1999; <http://srmwww.gov.bc.ca/frco/bookshop/tech.html>) when developing a Routine Effectiveness Evaluation plan.

Implementation

- 7.1 The Recipient must ensure that the Qualified Registered Professional(s) conducting REE:
- (a) Are experienced in and knowledgeable about constructing and maintaining Restoration Treatments;
 - (b) Develop an effectiveness evaluation plan, timetable and specific data collection requirements and standards to determine if a project is achieving its site level restoration objectives;
 - (c) Adhere to the Routine Effectiveness Evaluation Guidelines for in-stream and off-channel projects as specified in the FIA web site: <http://www.for.gov.bc.ca/hcp/fia/landbase.htm>;
 - (d) Monitor all the Restoration Treatments:
 - a. One year after construction to identify immediate maintenance concerns; and
 - b. Three and five years after construction, or after a flood with a frequency of 1 in 5 years or greater, to ensure structure loss does not occur and restoration objectives are being met;
 - (e) Submit the REE report(s) to the Recipient, following the report format of the REE example on the FIA web site: <http://www.for.gov.bc.ca/hcp/fia/landbase.htm>; and
 - (f) Submit the REE report(s) to the Ministries Library: ForProdres@gems5.gov.bc.ca for the purposes of disseminating the outcomes, recommendations and interpretations of the REE to ensure a level of adaptive management is achieved.
- 7.2 MWLAP may from time to time complete or recommend that licensees complete routine or intensive effectiveness evaluations of aquatic restoration and rehabilitation projects where regional or long term comparisons in fish productivity or restoration treatment effectiveness are desired.
- 7.3 Upon completion of the effectiveness evaluation, the Recipient must ensure:
- (a) A Certificate of Project Completion (Appendix 3) is completed by a Qualified Registered Professional and submitted to the Administrator; and
 - (b) Electronic copies, preferably in Adobe pdf format, of the Project Completion Abstract (Appendix 7) and final report are submitted to the Administrator, the Fisheries Project Registry (<http://www.canbcdw.pac.dfo-mpo.gc.ca/FPR/>) and the Ministries Library (ForProdres@gems5.gov.bc.ca). The maximum size of the abstract is two pages.

8.0 Maintaining Restoration Treatments

- 8.1 All maintenance works identified in the As-Built or REE reports must be implemented by the Recipient as soon as practicable.
- 8.2 Maintenance work that is deemed substantive (e.g., rebuilding an instream structure) by the Recipient requires the implementation of new restoration designs that should follow steps outlined under Sections 5.0 and 6.0.
- 8.3 Upon completion of the maintenance work, the Recipient must ensure:
- a. A Certificate of Project Completion (Appendix 3) is completed by a Qualified Registered Professional and submitted to the Administrator; and
 - b. A Project Completion Abstract (Appendix 7) is filed by the Recipient and submitted to the Administrator, the Fisheries Project Registry (<http://www.canbcdw.pac.dfo-mpo.gc.ca/FPR/>) and the Ministries Library (ForProdres@gems5.gov.bc.ca). The maximum size of the abstract is two pages.

Appendices

Appendix 1. Technical References

The Project Coordinator and Qualified Registered Professional(s) must choose methods and techniques that best serve the individual project objectives, consistent with legislative requirements. The following is a list of reference documents that provide acceptable procedures and reporting examples for implementing the various phases of an aquatic restoration and rehabilitation project. Updates to this list of documents are available through the FIA web site: <http://www.for.gov.bc.ca/hcp/fia/landbase.htm>.

Planning

- Gaboury, M.N., R.C. Bocking and P. Kuntz. 2000. Restoration plan – an interior example. Prepared for Forest Renewal BC, Victoria, BC.
- Gaboury, M.N., R.C. Bocking and P. Kuntz. 2000. Restoration plan – a coastal example. Prepared for Forest Renewal BC, Victoria, BC.
- WFSP. 2000. Watershed-based fish sustainability planning: Conserving B.C. fish populations and their habitat. Draft report prepared by the WFSP Steering Committee (Fisheries and Oceans Canada, BC Ministry of Environment, Lands and Parks, and BC Ministry of Fisheries).

Assessment

- Ashley, K. I. and J.G. Stockner. 2003. Protocol for applying limiting nutrients to inland waters. Pages 245-260 in J.G. Stockner, editor. Nutrients in salmonid ecosystems: sustaining production and biodiversity. American Fisheries Society, Symposium 34, Bethesda, Maryland.
- Ashley, K.I. and P.A. Slaney. 1997. Accelerating recovery of stream, river and pond productivity by low-level nutrient replacement (Chapter 13). In: Fish habitat rehabilitation procedures. P.A. Slaney and D. Zaldokas (eds.). Province of B.C., Ministry of Environment, Lands and Parks, and Ministry of Forests. Watershed Restoration Technical Circular No. 9: 341p.
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>
- Hankin, D. G. and G. H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Sciences. Volume 45. Pp. 834-844.
- Harrelson, C. C., C. L. Rawlins and J. P. Potyondy. 1994. Stream channel reference sites: an illustrated guide to field technique. USDA Forest Service. Rocky Mountain Forest and Range Experiment Station. General Technical Report Rm-245. <http://www.stream.fs.fed.us/ftparea.html>
- Hogan, D.L., S.A. Bird, and D.J. Wilford. 1996. Channel conditions and prescriptions assessment (Interim Methods). Watershed Restoration Program Technical Circular No. 7. Ministry of Environment, Lands and Parks and Ministry of Forests, BC.
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>
- Johnston, N.T. and P.A. Slaney. 1996. Fish habitat assessment procedures. Watershed Restoration Tech. Circ. No. 8. Ministry of Environment, Lands and Parks and Ministry of Forests, Vancouver, BC. <http://srmwww.gov.bc.ca/frco/bookshop/tech.html>
- Koning, C.W. [ed.] 1999. Riparian assessment and prescription procedures. Watershed Restoration Technical Circular No. 6. Ministry of Environment, Lands and Parks, Victoria, BC.
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>
- Newbury, R.W. and M.N. Gaboury. 1994. Stream analysis and fish habitat design. Newbury Hydraulics, Gibsons, BC.
- Parker, M.A. 2000. Fish passage – culvert inspection procedures. Watershed Restoration Technical Circular No. 11. Ministry of Environment, Lands and Parks, Williams Lake, BC.
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>

Design

- Anonymous. 2001. Guide to bridge hydraulics. Second edition. Transportation Association of Canada, Ottawa, Ontario.
- D'Aoust, S.G. and R.G. Millar. 1999. Large woody debris fish habitat structure performance and ballasting requirements. Watershed Restoration Program, Management Report No. 8, Ministry of

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- Environment, Lands and Parks, and Ministry of Forests, British Columbia. 119 pp.
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>
- National Research Council Canada. 1989. Hydrology of floods in Canada – a guide to planning and design.
- Newbury, R.W., M.N. Gaboury, and D.J. Bates. 1997. Restoring habitats in channelized or uniform streams using riffle and pool sequences. *In* Slaney, P.A. and D. Zaldokas [eds.] Fish habitat rehabilitation procedures. Watershed Restoration Technical Circular No. 9, Ministry of Environment, Lands and Parks, and Ministry of Forests, British Columbia.
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>
- Slaney, P.A. and D. Zaldokas [ed.]. 1997. Fish habitat rehabilitation procedures. Watershed Restoration Technical Circular No. 9. Ministry of Environment, Lands and Parks and Ministry of Forests, Victoria, BC. <http://srmwww.gov.bc.ca/frco/bookshop/tech.html>

Construction

- Chilibeck, B., G. Chislett and G. Norris. 1992. Land development guidelines for the protection of aquatic habitat. Co-published by Ministry of Environment, Lands and Parks and Department of Fisheries and Oceans. British Columbia, Canada. 128 pp. http://www-heb.pac.dfo-mpo.gc.ca/publications/pdf/guidelines/ldg_e.pdf

Evaluation

- Gaboury, M. and R. Wong. 1999. A framework for conducting effectiveness evaluations of watershed restoration projects. Watershed Restoration Program Technical Circular No. 12. Ministry of Environment, Lands and Parks, and Ministry of Forests, British Columbia.
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>

The following guides and report examples are available on the

FIA web site: <http://www.for.gov.bc.ca/hcp/fia/landbase.htm>

Guides

- Anonymous. 2003. Watershed restoration planning and priority setting - an emphasis on fish habitat. This document was modified from 'Planning and priority setting for the next five years, phase 3 watershed-level planning, working draft, May 15, 2000', Prepared By The WRP Provincial Coordination Team.
- Anonymous. 2003. Guidelines for in-stream and off-channel routine effectiveness evaluation.
- Chatwin, S., M. Gaboury and A. Chapman. 2000. Watershed process types and associated restoration opportunities. [In] WRP Provincial Coordination Team. 2000. Planning and priority setting for the next five years, phase 3 - watershed-level planning. Prepared for Forest Renewal BC. Available as Appendix 1 in Anonymous. 2003. Watershed restoration planning and priority setting – an emphasis on fish habitat.
- Church, M. 2000. Watershed dynamics. [In] WRP Provincial Coordination Team. 2000. Planning and priority setting for the next five years, phase 3 - watershed-level planning. Prepared for Forest Renewal BC. Available as Appendix 2 in Anonymous. 2003. Watershed restoration planning and priority setting – an emphasis on fish habitat.

Report Examples

- Anonymous. 2001. Overview assessment of Kobes Creek watershed for fish and riparian habitat. Prepared for Ministry of Water, Land and Air Protection, Fort St. John, BC.
- Anonymous. 2001. Restoration plan - Kobes / Ground Birch landscape unit. Prepared for Forest Renewal BC Omineca-Peace Region.
- Anonymous. 2001. Fish habitat restoration designs for Grilse Creek watershed. Prepared for Renewal Investment Corporation, Campbell River, BC.
- Anonymous. 2001. Watershed restoration program, stream rehabilitation 2001 - as-built report for Grilse Creek. Prepared for Renewal Investment Corporation, Campbell River, BC.

Anonymous. 2002. Watershed Restoration Program level 1 fish habitat field assessment of selected reaches in Kobes Creek and Colt Creek. Prepared for Canadian Forest Products Ltd., Fort St. John Division and Ministry of Water, Land and Air Protection, Fort St John, BC.

Anonymous. 2002. Watershed Restoration Program instream routine effectiveness evaluation 2001, Kobes and Colt Watersheds. Prepared for Forest Renewal BC, Watershed Restoration Program, Ministry of Water, Land and Air Protection, Fort St. John, BC.

Appendix 2. Example of Matrix

Pursuant to section 3.2, example of a matrix to evaluate the likelihood of restoration activities benefiting fish habitat in the Maple River Watershed (From Anonymous. 2003. Watershed Restoration Planning and Priority Setting - An Emphasis on Fish Habitat. This document was modified from 'Planning and Priority Setting for the Next Five Years, Phase 3 Watershed-Level Planning, Working Draft, May 15, 2000', prepared by the WRP Provincial Coordination Team).

				Watershed Components					
Subbasin Example	Target Species	Limiting Fish Habitat	Watershed Condition and Restoration Benefits	Landslides	Gullies	Roads	Riparian	Channel	Instream Fish Habitat
Rainy Creek	Steelhead/Rainbow	Summer rearing	Level of Existing or Potential Disturbance	Moderate	Moderate	Moderate	Low	High	High
			Impact or Risk to Fish Habitat	Moderate	Moderate	Moderate	Low	High	N/A
			Likelihood of Benefits to Fish Habitat from Restoration of Component	Low	Low	Low	Low	Low	Low
Howler Creek	Steelhead/Rainbow	Summer rearing	Level of Existing or Potential Disturbance	Low	Low	Low	High	Moderate	Moderate
			Impact or Risk to Fish Habitat	Low	Low	Low	High	Moderate	N/A
			Likelihood of Benefits to Fish Habitat from Restoration of Component	Low	Low	Low	High (Long Term)	Moderate	High
Punch Creek	Steelhead/Rainbow	Summer rearing	Level of Existing or Potential Disturbance	High	Moderate	Low	High	Moderate	High
			Impact or Risk to Fish Habitat	Moderate	Moderate	Low	High	Moderate	N/A
			Likelihood of Benefits to Fish Habitat from Restoration of Component	Moderate	Moderate	Low	High (Long Term)	Low	Low

Appendix 3. Certificate of Project Completion

Note: Please see PwC for current version.

Certificate of Project Completion (pursuant to Subsection 8.3 of the Agreement)

Recipient: _____

Project #: _____ Watershed Name: _____

Investment Schedule #: _____

We refer to the Recipient Agreement (the "Agreement") dated as of _____, between PricewaterhouseCoopers LLP and _____ (company). Terms capitalized but not otherwise defined herein have the meaning given to them in the Agreement.

Financial:

I, _____, in my capacity as _____ (title) of _____ (company), do hereby certify that the following matters are true and correct to the best of my knowledge, information and belief, as of the date of this Certificate:

1. I am the _____ (title) of _____ (company) and have personal knowledge of the matters set out in this Certificate.
2. The costs documented in the Project Completion Summary are consistent and in accordance with the Agreement, the Investment Schedule and the nature of the Project and are true, accurate and fair.
3. The Work complies with the tendering rules as applicable.

DATED as of _____

(signature)

Technical:

I, _____, in my capacity as a Qualified Registered Professional _____ of _____ (company), do hereby certify that the following matters are true and correct to the best of my knowledge, information and belief, as of the date of this Certificate:

1. I am the _____ (author, technical reviewer) of _____ (assessment, construction) work and have personal knowledge of the matters set out in this Certificate.
2. The Project has been completed in accordance with the objectives and standards as agreed to with the applicable ministry and as set out in the Project and the Agreement.
3. The Outputs and findings documented in the Project Completion Summary are true, accurate and fair.
4. All data and deliverables required to be delivered to the Ministry or to other applicable governmental agencies pursuant to their respective rules, regulations, standards and specifications have been delivered to the appropriate agencies in the appropriate format.

DATED as of _____

(signature)

(affix seal and initial)

Appendix 4. Restoration Works Summary Form for Instream Restoration Treatments

Name of Sponsor _____
Project Name _____
Forest District _____

Watershed _____
Sub-watershed _____
Date _____

Survey Crew _____
Weather / Flow _____

REE Interval _____
Other Components _____

					Performance Objectives										Overall							Comments						
					Physical																		Biological					
Stream	Distance	Site ID #	Structure Type	Site Objective	Pool	Riffle	Gravel Bar	Streambank	Stream Cover	Nutrient	Other				Overall rating	Species	Life Stage	Overwinter	Rearing	Holding	Spawning	Incubation	Overall rating	Structural Condition	Structural Stability	High Flow Function	Low Flow Function	Maintenance Recommendation

Appendix 5. Restoration Works Summary Form for Off-Channel Development Treatments

Name of Sponsor _____
Project Name _____
Forest District _____

Watershed _____
Sub-watershed _____
Date _____

Survey Crew _____
Weather / Flow _____

REE Interval _____
Other Components _____

						Targets		Biological Performance Objectives					Physical Condition										General		Comments	
Stream	Reach	Distance	Site ID #	Off-Channel Type	Site Objective	Species	Lifestage	Overwinter	Rearing	Spawning	Incubation	Overall Rating	Dissolved Oxygen	Nutrients	Intake Integrity / Function	Flow	Outlet Integrity / Function	Berm Stability	Mainstem Stability	Cut-Slope Stability	Revegetation	Cover Elements	Overall Rating	Maintenance		Photos

Appendix 6. Statement of Construction Conformance

Appendix 7: Project Completion Abstract

Appendix 8. Instream Project Implementation Checklist

General FIA Standards (FS 1001)		Date	Comments	Sign-Off
1	Confirm appropriate biological and weather conditions.			
2	Confirm no encumbrances to worksite, i.e. research, other land uses, etc.			
3	Confirm that appropriate First Nations organizations have been properly consulted.			
4	Confirm First Nations consultation has been documented and forwarded to the District Manager.			
5	Review possibility of risk to human life and/or safety. Notify District Manager and Administrator. Cease work until direction given and implemented.			
FIA Activity Standards Document - Restoration & Rehabilitation Component, Aquatic Activity Area - Instream Structures and Treatments; Fish Passage (project planning, assessment and prioritization); Treatment Effectiveness Evaluation; and Inspection and Maintenance Activities.				
6	Ten days prior to implementation, notify the MWLAP Regional Ecosystems Section Head - Environmental Stewardship and supply Workplan if requested.			
7	From Land and Water BC Inc (LWBC) obtain a permit, approval and/or license under the Water Act for 'works in and about a stream', and the diversion, storage and use of water and a permit, approval and/or license for tenure, if required under the Land Act (see 6.2 (a)).			
8	Notify Forest District within ten days of on-site works commencement if work requires the cutting of +15 cm diameter trees or the operation of wheeled or tracked equipment within Riparian Management Area.			
9	Notify Forest District within ten days of commencement of the instream works of the project and provide a copy of the prescription or design plan if requested.			
10	Acquire any permits and/or approvals as required for the use of forest roads, construction of access roads or any other uses of forest lands.			
11	From MWLAP acquire a Fish Collection Permit where salvage of fish is necessary.			
12	Notify MWLAP regarding conditions resulting from consultations with LWBC.			
13	Get approvals, permits and/or authorizations under Fisheries Act and the Navigatable Waters Protection Act related to restoration treatments from FOC.			
14	Get Fish Collection Permit if salvage of fish species managed by FOC required.			
15	Get written approval from private land owner where project will involve encroachment on or through private land.			
16	Ensure any design drawings requiring a Water Rights Licence are signed, sealed and issued for construction by P.Eng.			
17	Ensure works are carried out during appropriate biological window.			
18	Keep on hand at work site the following: Work Plan and design drawings; Letters of authorization and approval documents; and WCB certificates.			
19	Prior to changes in the work being undertaken, get P.Eng to provide written documentation of the amendments. Notify MOF, MWLAP and DFO of Changes in the Work.			
20	Ensure appropriate equipment available for emergency situations (i.e., spill kits, fish salvage, fire suppression, first aid, etc.).			
21	As-Built drawings must be signed and sealed by Qualified Registered Professional and should document any changes. Where changes are substantial, resurveying must be carried out.			
22	Upon completion, complete Restoration Works Summaries for Instream (see Appendix 4) and/or off-channel (Appendix 5).			
23	Qualified Registered Professional must complete Certificate of Project Completion and a Statement of Construction Conformance.			
24	Qualified Registered Professional must provide a post-completion effectiveness evaluation schedule for the project.			
25	Write up a Project Completion Abstract.			