Chapter Two

Level 1 Methodology

TABLE OF CONTENTS

1.0 Introduction

Methodologies used during Level 1 assessments are described in this chapter. Section 2.0 outlines general methods common to both fish habitat and riparian assessments. Section 3.0 summarizes Level 1 FHA methods, detailed in WRP Technical Circular No. 8 (Slaney and Johnson, 1996). Section 4.0 summarizes Level 1 RA methods, detailed in WRP Technical Circular No. 6 (MELP and MOF, 1998). Section 5.0 describes mapping methodology.

Appendices referred to in this chapter are as follows and may be found at the back of this report:

- Appendix 1: Level 1 FHA Fish Distribution Data Forms;
- Appendix 2: Level 1 FHA Habitat Survey Data Forms;
- Appendix 3: Level 1 FHA Habitat Diagnosis Summary Forms;
- Appendix 4: Level 1 RA Survey Forms 2 & Summary Form 3;
- Appendix 5: BC Conservation Data Centre Form; and,
- Appendix 6: Homathko-Mosley Study Area, Maps 1 & 2.

2.0 General Procedures

Procedures common to both FHA and RA fieldwork are summarized below.

Start-Up Meeting

An important component of project planning was an initial start-up meeting, held at the Williams Lake MELP office, among representatives of TWA, MELP and G3 Consulting Ltd. This meeting enabled agreement on assessment priorities, methodology, and deliverables.

Mobilization

Preparation for field investigations involved a coordinated effort between members of the technical and field crew and logistical support and planning personnel. All aspects of field and technical work were designed and carried out following established G3 protocols. Personnel selected for the program were familiar with program design, objectives and time frame and each was assigned specific roles responsibilities toward successful program completion. Due attention was given to personnel safety and contingencies throughout the program, including assignment of specific personnel functions (e.g., QA/QC review, safety officer) and design of a project-specific safety program and contingency plan.

Preparation for fieldwork ensured all necessary factors, including personnel, access and equipment, were considered and in place. Field equipment was gathered and field binders assembled, containing such items as field protocols, procedures, safety plans, maps and

data collection forms. Field efficiency was maximized through this effective planning procedure.

The field crew was coordinated and briefed to arrive completely equipped and organized ready to begin field operations. Field crews were experienced in field decision-making and execution of the rigorous QA/QC methodologies. The ability to recognize and avoid potential problems in the field is an important element in the success of any field program. The nature of the terrain and the remote location of many points in the study area made this a key factor in all facets of fieldwork. Due diligence was applied to research and familiarizing personnel with study area particulars.

The Watershed-Level Riparian Assessment and Overview Fish Habitat Assessment were conducted concurrently by G3 Consulting Ltd. Communication was maintained with MELP during project planning and implementation in defining project scope and study area extent.

Roles & Responsibilities

Assessment personnel arrived on-site with a prioritized schedule for each phase of work. A Field Co-ordinator was assigned responsibility for logistics of daily field activities and ensuring that objectives and procedures were fully understood.

Permits & Regulations

Fish were collected and in-stream work conducted in accordance with relevant regional, provincial and federal regulations, and with appropriate licenses and permits in place. MELP fisheries personnel were notified before field activities commenced.

Transportation

A four-wheel drive truck was used to facilitate crew access to portions of the watersheds where in-stream and riparian assessments were conducted.

Photo Documentation

Photographic records were made by project personnel experienced in photographic techniques using 35 mm cameras. G3 uses photo documentation forms specific for fish habitat and riparian assessments. Data recorded for each photograph included:

- time, date and weather;
- cardinal direction of photo;
- photo direction (upstream or downstream); and,
- a detailed description of subject matter.

3.0 Fish Habitat Assessment Methods

Areas surveyed during Level 1 assessment are depicted on Maps 1 and 2, located in Appendix 6. Selection of these areas was based on review of the Overview FHA (G3 Consulting Ltd., 1998) and on interviews with the TWA, MELP and local residents. Methods used adhered to *Fish Habitat Assessment Procedures* (FHAPs) described in WRP Technical Circular No. 8 (Slaney and Johnson, 1996). These procedures are summarized below.

As access to and through private lands was required, project personnel contacted and met with landowners and residents before conducting assessments.

Based on review of the Overview FHA (G3 Consulting Ltd., 1998) an Operational Work Plan was developed to enable Level 1 surveys to focus on stream reaches deemed of Moderate or High priority for fish habitat remediation. MELP and TWA approved this plan prior to the commencement of work. Field surveys were conducted October 16 to 23, 1998.

3.1 Level 1 FHA Objectives

Level 1 objectives as described by Johnston and Slaney (1996) are to:

- confirm or revise identification of the nature, location, extent and severity of forest harvest impacts on fish habitat;
- provide sufficient information to identify and prioritize restoration options, and to identify initial projects and scope;
- identify the need for Level 2 assessments; and,
- prepare initial plans and schedules for restoration projects.

Based on these objectives, a Level 1 FHA was conducted to examine effects on fish habitat related to forest removal and agricultural activities in the study area. In addition, habitat features and conditions were assessed and determinations were made of fish species suitability, life cycle utilization, stream system stability and potential for rehabilitation or restoration of selected areas.

3.2 Survey Design

Survey design was considerate of project scope and watershed size and enabled data to be collected in an efficient manner. As distribution of habitat units was unknown for most stream reaches when Level 1 surveys commenced (air photo scale limited interpretation of narrow channels), systematic random sampling was conducted along selected reaches or sub-reaches, according to methodology described by Johnston and Slaney (1996). This method employed individual habitat units as strata within a designated reach. Random starting points were then assigned individually to each stratum. This approach ensured sufficient sampling of habitat units most commonly encountered (i.e., pools, riffles, glides,

chutes, etc.). When unique habitat features were encountered (e.g., a single pool within a stream dominated by chutes and riffles) this unit could be sampled and identified as unique to the system. Reaches selected for Level 1 surveys were generally >~500 m length (Johnston and Slaney, 1996).

Strata assignment was limited to primary habitat unit (Parker, 1997), with secondary units noted, where present. In narrow streams, with channel bankfull widths between 1 m and 5 m and wetted width generally 1 m to 3 m, primary habitat units tended to be consistent and defined by channel morphology (i.e., riffle-pool dominated small-channel streams). Sampling methods were adapted within these streams (e.g., Cherry Creek, Skinner Creek and Chavez Creek) to describe such features as abundance of LWD or quality of spawning gravel in primary habitat features (predominantly riffles), while enumerating embedded secondary habitat units (e.g., pools and glides) encountered. This adaptation provided specific features for the primary habitat unit as required by FHAP survey forms (Johnston and Slaney, 1996; Appendix 2), while quantifying embedded sub-units by type.

Where project personnel could access stream reaches not selected for Level 1 surveys, point assessments of fish habitat characteristics were conducted. Point assessments enabled field members to make observations of general fish habitat condition (e.g., stream morphology, LWD presence) where use of specific WRP field forms (e.g., Level 1 Fish Habitat Survey Data Form; Appendix 2) were determined not practical (e.g., survey section <~500 m, sections of off-channel habitat).

3.3 Fish Collection

Fish collection surveys of stream channels and off-channel habitat followed the hierarchical sequence of methods prescribed in the *Fish Stream Identification Guidebook* (MELP and MOF, 1995) and were in accordance with procedures described in the Resource Inventory Committee (RIC) publication, *Fish Collection Methods and Standards Version 4.0* (MELP, 1997a) for given habitat types, species and life stages. Fish collection methods included viewing (visual sighting), dip-netting, minnow trapping and electrofishing. Additionally point assessments were conducted at locations most accessible (e.g., bridges and culverts) to determine fish passage and habitat parameters. Point assessments assisted in confirming Overview assessment results (e.g., suspected fish presence) of given areas not surveyed in detail during Level 1 assessments because of low priority.

3.4 Stream Parameters

Stream parameters form the basis of classifying individual fish habitat units, contribute to classifying riparian ecology, and are related to point sediment sources in that they determine the physical structure of the stream channel. Measurements of stream parameters required in assessing fish habitat, riparian areas and sediment inputs included:

- mean bankfull channel width;
- mean wetted width;
- mean bankfull channel depth;
- stream gradient;
- discharge;
- residual pool depth; and,
- habitat features (i.e., large woody debris [LWD], pool type, etc.).

Data for each of these parameters were collected as described by Johnston and Slaney (1996).

Habitat Features

Analyses of certain habitat conditions and related parameters required that specific classification, measurements and estimates be made. Data collected at each site combined physical parameters and estimated habitat conditions. Habitat features documented included:

- habitat unit classification and distribution;
- stream channel morphology;
- riparian vegetation type and structure;
- LWD abundance and distribution;
- spawning gravel type and quantity;
- riparian crown closure (canopy closure);
- off-channel habitat unit classification and distribution; and,
- disturbance indicators and distribution.

Habitat feature analyses were recorded on field forms specified by Johnston and Slaney (1996).

Stream Discharge

Stream discharge was measured by floatation timing as described by Johnston and Slaney (1996). Data were not available for each stream reach surveyed in the study area as certain reaches appeared to contain sections of ephemeral flow and several remaining reaches exhibited low flow or conditions that did not permit calculation of discharge (e.g., wetlands, beaver ponds, extensive ponds or meanders).

Riparian & Fish Habitat Interaction

Level 1 FHAPs (Johnston and Slaney, 1996) included examination of riparian areas along surveyed stream reaches. These procedures ensured that condition of riparian areas not fully assessed at Level 1 would still be documented, and that

data would be available to facilitate development of fish habitat remediation prescriptions.

Recorded riparian features included stream shading, potential for input of LWD and small organic debris (SOD), surface sediment filtering, and vegetation type.

3.5 Remediation Options

Preliminary prescriptions for fish habitat restoration and rehabilitation were initially identified during field surveys, then more fully developed during post-field assessments. Standard remediation procedures described in *WRP Technical Circular No. 9* (Slaney and Zaldokas, 1997), *WRP FHAP Habitat Rehabilitation Workshop* (MELP, 1997b), and by Johnston and Slaney (1996) were employed. MELP personnel were consulted during prescription development and when deviating from standard methodologies. Options assessed as potentially benefiting fish habitat included, but were not limited to:

- LWD placement;
- boulder cluster placement;
- stream bank stabilization;
- creation of in-channel "reefs";
- fish access restoration;
- off-channel habitat development;
- riffle and pool development in channelized reaches;
- riparian stand restoration or rehabilitation;
- development of groundwater rearing sites; and,
- various combinations of these techniques.

4.0 Level 1 Riparian Assessment Methods

Level 1 Riparian Assessments (RAs) were directed to openings assigned medium or high priority during the Overview (Watershed-Level) Riparian Assessment (G3 Consulting Ltd., 1998a). As the Level 1 RA was conducted in conjunction with the Level 1 FHA, areas of focus were included in the FHA Operational Work Plan. As Level 1 FHAPs include assessing certain parameters of riparian areas along surveyed reaches, riparian assessments were comprehensive and well integrated with in-stream surveys.

In the interim between assessment levels, *Watershed Restoration Technical Circular No. 6, Riparian Assessment and Prescription Procedures* (MELP and MOF, 1998) was issued in draft form to replace the earlier manual compiled by Oikos and Johnson (1996). Nomenclature of assessment levels has been changed from "Watershed-Level Assessment" and "Site-Level Assessment" to "Overview Assessment" and "Level 1 Assessment," which compares with that of other assessment types (e.g., FHAPs) and has been adopted here.

4.1 Level 1 Objectives

In general, the primary focus of Level 1 Assessments (MELP and MOF, 1998) is on riparian areas that have been previously logged to the stream bank, and within the Riparian Reserve Zone (RRZ) adjacent to S1–S3 streams. As assessments in the Homathko-Mosley watersheds were conducted on private agricultural lands, RRZs were not applicable. In an effort to minimize potential impact on agricultural capability, MELP suggested assessment efforts be concentrated within 10 m of stream bank full margins.

Objectives of the Level 1 Riparian Assessment (MELP and MOF, 1998) were therefore:

- to confirm or revise the nature, location, and extent of forest harvest impacts on riparian habitat;
- to provide field data for use in prescription development;
- to provide a preliminary list of restoration options for sites with impaired riparian functions; and,
- to provide sufficient information to identify and prioritize impaired sites for Level 2 assessments and prescriptions.

These objectives were applied to riparian areas of agricultural lands with reduced or absent tree cover. A majority of areas surveyed may have originally been forested, but were not managed for the purpose of forest harvest.

4.2 Survey Design

Areas chosen for detailed Level 1 RAs had been assigned medium and high remediation priority during Overview assessments. These areas included Cheshi Creek Opening 1, Homathko River Opening 1, Cochin Creek Opening 1, Quakie

Creek Opening 3, and Mosley Creek Opening 2. Openings 1 and 2 along Valleau Creek, also of high priority, were not assessed further as immediate action to address windthrow potential had been recommended. Precise sampling locations were determined in the field, based on accessibility, the level to which the site was representative, and relationship with FHA results in the adjacent stream.

Field decisions and discussions with local residents also influenced choice of assessment and sampling locations. For example, permission could not be obtained for access to certain areas (e.g., Opening 1 Cheshi Creek), while Skinner Creek Opening 1, not assigned a priority during the Overview RA, was assessed on the basis of Level 1 FHA findings.

Completed Riparian Assessment Field Forms (Form 2) and Riparian Level 1 Assessment Summaries (Form 3) are provided in Appendix 4.

4.3 Riparian Parameters

Level 1 RAs evaluate (as low, moderate or high) the level of functioning of riparian vegetation at selected sites (MELP and MOF, 1998), based on ability to supply:

- large woody debris (LWD) and small organic debris (SOD) in-stream, and coarse woody debris (CWD) in the riparian area;
- stream shading;
- stream bank and channel stability; and,
- wildlife and general biodiversity attributes.

Habitat features used to characterize riparian functionality, predict future trends, and identify priority sites for remediation included (MELP and MOF, 1998):

1. overstory vegetation characteristics (e.g., tree species, densities and heights, and % cover);
2. understory vegetation characteristics (e.g., shrub, herb and moss species, % cover and height);
3. soil properties (horizon depths, textures and % coarse fragments);
4. indicators of disturbances (e.g., slides, culverts or flooding);
5. site gradient and aspect; and,
6. stream gradient and width.

Such features are evaluated relative to expected values as various successional stages of the riparian forest.

Circular vegetation plots were used at representative sites to provide quantitative and qualitative data describing the above riparian parameters and habitat features. Methodology followed that described in *Technical Circular No. 6* (MELP and MOF, 1998). Appendix 4 contains completed riparian assessment forms.

4.4 Remediation Options

Designs for remediation of riparian areas must consider site-specific constraints and opportunities related to current land use and desired future condition. Agricultural use of private lands in the Homathko-Mosley watershed would be a primary consideration during prescription development.

An objective of the Level 1 RA was to confirm the feasibility and applicability of preliminary remediation suggestions made during Overview assessments. General options proposed were consistent with *Technical Circular 6* (MELP and MOF, 1998), and included:

- planting nurse tree shelterwoods;
- increasing tree stocking density;
- clustered tree planting; and,
- increasing shrub cover.

In addition, site specific recommendations made pursuant to bank stabilization may include bioengineering methods such as live staking and brush mattress construction.

5.0 Mapping

Information regarding watershed code, reach breaks, barriers, sample sites, fish distribution and historical data references, along with other key features, was mapped according to current MELP (1998) standards. WRP symbols and codes were used and data represented digitally according to MELP GIS Systems requirements (MELP, 1997). Digital mapping was completed using MicroStation software, then converted to ArcInfo.

5.1 Fish Distribution Mapping

Fish distribution (based on Overview and Level 1 FHA and FISS data) was delineated on FHA maps with solid and dashed lines. Solid red lines denoted known fish bearing streams and dashed-red lines suspected fish-bearing streams (MELP, 1997). Streams suspected of fish-bearing capability (based on gradient) were so assigned with the intention of identifying streams that may contain suitable habitat for certain target species.

Fish distribution has been mapped to represent "known fish-bearing" areas, based on the inference that stream reaches located between two points of known fish presence are themselves fish-bearing. Following this procedure, solid red lines representing "fish-bearing" were assigned to streams whose headwaters (e.g., uppermost reaches or headwater lakes) and lower stream reaches have been documented to contain fish. When fish presence in headwater reaches was not known, "known fish-bearing" delineation was extended to the point farthest upstream for which fish distribution was known. Available fish species composition has also been represented on FHA maps. Fish distribution data from resource agencies (e.g., MELP and DFO) were not available for each specific reach described in this report.

Level 1 confirmation of fish presence was conducted subsequent to the Overview Assessment of fish distribution. Appendix 3 provides additional data that were incorporated into fish distribution mapping. Fish species were not differentiated when assigning fish-bearing attributes, and presence of unidentified species was regarded as potential target species for mapping purposes.

5.2 Level 1 Fish Habitat & Riparian Mapping

Map data are presented at 1:70,000 scale. Level 1 survey sites are indicated in the legend with specific fish species collection and distribution data where applicable. Survey sites are numbered in order from downstream to upstream, beginning at Site 1 for the FHA reach surveyed farthest downstream. Each site is identified on the map with a unique identifier that references stream name, survey site and length of stream surveyed. For example, CC-01-600m represents Cherry Creek, site one, surveyed for 600 m upstream from that point.

Riparian openings surveyed during both Overview and Level 1 RAs have been delineated with a green line on Maps 1 and 2. Those surveyed only during Overview have been indicated in orange.