Watershed Restoration Program

Homathko River & Mosley Creek
LEVEL 1 FISH HABITAT ASSESSMENT & RIPARIAN ASSESSMENT

Final Report

Prepared for:

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February 1998

Chapter One

Background

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1.0 Introduction

Level 1 field investigations of selected portions of the Homathko River and Mosley Creek watersheds were conducted in October 1998 pursuant to Fish Habitat Assessment Procedures (FHAP) and Riparian Assessment and Prescription Procedures (RAPP). Areas surveyed were those deemed to warrant further investigation as identified during 1997-1998 overview assessments (G3 Consulting Ltd., 1998; 1998a). This report was prepared by G3 Consulting Ltd. on behalf of the Tatlayoko Woodlot Association (TWA), Tatlayoko Lake, BC, to identify areas of the watersheds recommended for Level 2 investigations that may lead to development of remediation prescriptions. Work was conducted in accordance with the Watershed Restoration Program, under the auspices of Forest Renewal BC.

2.0 Organization of this Report

Chapter One provides a description of the study area and synopsis of recommendations from Overview studies. Level 1 assessment procedures and methods are summarized in Chapter Two. Level 1 FHA and Level 1 RA, results are presented separately in Chapters Three and Four, respectively, with both chapters organized according to streams within bucket watersheds. Chapter Five summarizes Level 1 FHA and RA results, with integrated recommendations provided on a stream-by-stream and reach-by-reach basis. Completed WRP FHAP and RAPP forms are appended, as follows:

- 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 Region, FHA and RA Maps 1 & 2.

3.0 Study Area Overview

The Homathko River and Mosley Creek watersheds drain the southwest portion of the South Chilcotin Region of the BC interior southwestward to Bute Inlet, then to the Pacific Ocean via Johnstone Strait and the Strait of Georgia (Figure 1). Lower portions of these watercourses flow through the Coast Mountains between Mount Waddington to the west and the Homathko Icefield to the east. The southern boundary of the Chilcotin Forest Region crosses the Homathko River at a point approximately 10 km downstream of the Mosley Creek confluence. The study area comprised watershed sections upstream of the confluence (Figure 2). The eastern edge of the Homathko watershed is located an estimated 145 km southwest of the city of Williams Lake.

3.1 Land Use

Land use in study area valley bottoms consists primarily of agricultural cropland and rangeland. Recent industrial logging is limited, though several woodlots are operated privately. The rural population is centred at Tatlayoko Lake and residential and industrial roads service the area.

The Cariboo-Chilcotin Land-Use Plan (CCLUP; BC Government, 1995) includes much of the study area in Special Resource Development Zones. The 224,144 ha Niut region, located west of the Homathko River, has a total forest area of approximately 54,040 ha, of which 15% is targetted for conventional harvesting, 76% for modified harvesting and 9 % for no harvesting (BC Government, 1995). The Potato Range region, located east of the Homathko River, is approximately 157,388 ha in size, with a total forest area of 72,489 ha; 50% of the forest area is targetted for conventional harvesting, 37% for modified harvesting, and 13% for no harvesting.

The CCLUP has also designated approximately 34,000 hectares of the watershed as the Homathko River - Tatlayoko Protected area, given its high fish and wildlife habitat values and its notable recreational, historic and cultural resources. The boundary of the protected area includes Tatlayoko Lake and downstream portions of the Homathko River valley at lower elevations, and lower elevations of the Mosley Creek valley downstream from Middle Lake.

3.2 Study Area Bucket Watersheds

The Ministry of Forests (MOF) divided the region of study into seven sub-watersheds or "buckets", numbered 323, 327, 327a, 332, 332a, 336 and 338 (Figure 2). Table 1-1 lists the main gazetted watercourses and lakes of each bucket.

Based on discussions with the Ministry of Environment, Lands and Parks (MELP), a portion of Bucket 332a downstream of Twist Lake (~64 km^2), and those land portions of Bucket 327 downstream from the mouth of Stikelan Creek on Tatlayoko Lake (~43 km^2), were excluded from Overview and Level 1 study. These areas are denoted in Figure 2.

Table 1-1: Study Area Buckets & Associated Water Bodies			
Bucket Number	**Approximate Area (km^2)**	**Main Water Bodies**	**Watershed Code (Creeks & Rivers)**
323	228	Stikelan Creek	900-4069-657-000-000
		Cheshi Creek	900-4069-657-100-000
		Cheshi Lake	NA
327	477 (434 with exclusion)	Homathko River	900-4069-000-000-000
		Jamison Creek	900-4069-697-000-000
		Lincoln Creek	900-4069-797-000-000
		Tatlayoko Lake	NA
327a	254	Homathko River	900-4069-000-000-000
		Charlie Creek	900-4069-868-000-000
		Cochin Creek	900-4069-901-000-000
		Chavez Creek	900-4069-901-149-000
		Quakie Creek	900-4069-911-000-000
		Cochin Lake	NA
		Lunch Lake	NA
		Whitesand Lake	NA
332	240	Mosley Creek	900-4069-392-000-000
		Butler Creek	900-4069-392-818-000
		Sapeye Creek	900-4069-392-894-000
		Bluff Lake	NA
		Sapeye Lake	NA
		Horn Lake	NA
		Little Sapeye Lake	NA
332a	425 (361 with exclusion)	Mosley Creek	900-4069-392-000-000
		Quartz Creek	900-4069-392-477-000
		Hell Raving Creek	900-4069-392-540-000
		Twist Lake	NA
		Middle Lake	NA
336	134	Valleau Creek	900-4069-392-786-000
338	95	Skinner Creek	900-4069-865-000-000

3.3 Fisheries Resources

Homathko River and Mosley Creek have been the subject of various fish inventories and habitat surveys over the past 25 years, some pursuant to hydroelectric developments on the lower Homathko proposed by BC Hydro (DFO and MELP, 1997). A chute, approximately 29.0 m high and located below the Homathko-Mosley confluence (outside the study area) has been documented as impassable by all fish, limiting distribution of anadromous species to downstream sections. Portions of the Homathko River between its mouth and the chute are known habitat for populations of several species of anadromous salmon including pink *(Oncorhynchus gorbuscha*), coho (*Oncorhynchus kisutch*), chinook (*Oncorhynchus tshawytscha*) and chum (*Oncorhynchus keta*), as well as winter and summer steelhead trout (*Oncorhynchus mykiss*) (DFO and MELP, 1997).

Resident fish within the study area include populations of Watershed Restoration Program (WRP) target species rainbow trout (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), cutthroat trout (*Oncorhynchus clarki)* and Dolly Varden char (*Salvelinus malma*). Non-target species represented include redside shiner (*Richardsonius balteatus*), longnose sucker (*Catostomus catostomus*) and unidentified suckers and minnows (DFO and MELP, 1996; Johnston and Slaney, 1996). Bull trout are Blue-Listed within the MELP Cariboo Region, denoting vulnerability to events affecting their populations or habitat (BCCDC, 1996).

Joint assessment of in-stream fish habitat and riparian conditions is an effective way to identify impacts that study area forest harvest and agricultural acitivies may have had on fish habitat. This process also facilitates development of integrated, site-specific prescriptions following Level 2 investigations.

3.4 Biogeoclimatic Zones

Several Biogeoclimatic Zones were identified in the study area, reflecting increases in elevation and continentality with distance upstream from the Pacific Ocean (Meidinger and Pojar, 1991). The Coastal Western Hemlock Zone (CWH) extends up the Homathko River valley at lower elevations to a point approximately 10 km upstream from the Mosley Creek confluence, and approximately 50 km up the Mosley Creek valley to Middle Lake. Higher elevations progress through the Mountain Hemlock Zone (MH) to Alpine Tundra (AT). Further upstream along both valleys to the headwaters the Interior Douglas Fir Zone (IDF) is encountered at lower elevations. Found at higher elevations are sections of either Montane Spruce Zone (MS) or Engelmann Spruce - Subalpine Fir Zone (ESSF), depending on local topography and rainfall conditions. Many tributaries of these two watercourses have sources in Alpine Tundra located at higher elevations between their valleys.

4.0 General Assessment Approach

The WRP is an initiative of the BC Government, under Forest Renewal BC (FRBC), to restore the productive capacity of forest, fisheries and aquatic resources that may have been adversely affected by past forest harvest practices. The program coordinates development and implementation of operational projects and provides long-term employment opportunities to workers in resource-dependent communities. The intent of the WRP is to promote recovery of degraded ecosystem components in logged watersheds by identifying areas requiring remediation; developing an approach to addressing the problems; and implementing either initiatives focussed on re-establishing conditions similar to those in undisturbed watersheds or mitigative measures at locations where rehabilitation is not feasible (Johnston and Moore, 1995).

Restoration and rehabilitation are intended to address both environmental impacts and associated anthropogenic causes. Projects undertaken through the WRP have the objective of re-establishing ecosystem processes (e.g., plant succession and biogeochemical cycling) that may eventually return the biophysical structure and productivity of a watershed to a more natural condition (Johnston and Moore, 1995). The four basic WRP criteria are that:

- FRBC investments must be incremental to obligations on industry or government, whether those obligations are derived from statute, policy or common practice;
- projects must (generally) be located on Crown land;
- projects must restore and maintain fisheries, aquatic and forest resources adversely affected by past forest harvesting practices; and,
- projects must be compatible with basic WRP objectives to rehabilitate the entire watershed.

Land use in the valleys of the Homathko-Mosley study area has been diverse, exhibiting a combination of forest and agricultural resource allocation and use of both private and Crown lands. This situation, not unique in the BC Interior, necessitated application of Level 1 assessment procedures to agricultural lands, both private and Crown, through which study area streams flowed. Not assessing agricultural areas would diminish the intent of the fourth WRP criterion stated above. Opportunities were thereby provided for later community and industrial involvement in watershed restoration while benefitting the resource in a comprehensive manner by assessing the entire watersheds.

Level 1 Fish Habitat Assessment (FHA) and Riparian Assessment (RA) field investigations were conducted concurrently to facilitate integration of observations and remediation plans, and to minimize intrusion on private lands along streams. Procedures were consistent with standard WRP technical requirements for such surveys, as described in Chapters Two and Three.

Areas assessed at Level 1 had been evaluated as moderate or high priority during overview fish habitat and riparian assessments (G3 Consulting Ltd., 1998; 1998a).

4.1 Overview FHA Summary

The 1997-98 Overview FHA (G3 Consulting Ltd., 1998) followed procedures described by Johnston and Slaney (1996), including those in the following steps:

1. delineate and identify watersheds of interest;
2. assemble existing information from,
    - topographic maps;
    - air photos; and,
    - information on fish distribution, abundance and habitat use;
3. establish stream reaches;
4. from existing information,
    - identify target fish species;
    - summarize trends in abundance of target fish species;
    - map distribution of salmonids by life-stage; and,
    - identify critical or heavily used reaches (subbasins);
5. from existing information, air photos, or both:
    - determine habitat conditions at an overview level; and,
    - evaluate habitat conditions or sensitivity;
6. identify areas of special concern; and,
7. suggest preliminary fish habitat rehabilitation strategies, restorative measures or mitigation, as required.

In addition, a reconnaissance was conducted by helicopter, with limited ground-truthing, to verify the accuracy of air photo interpretation and gather additional data.

Stream reaches where remediation was suggested were rated of low, medium or high priority, based on current condition and potential benefits. Medium and High priority locations were the focus of Level 1 assessment processes. Options applicable to these areas are summarized in Table 2-1.

Table 1-2: Level 1 Fish Habitat Assessment
Stream Reach Survey & Remediation Priorities

Bucket	Subbasin	Reaches	Remediation & Survey Options	Priority
327	Homathko River	1, 4, 5, 6, 8	• Determine feasibility of LWD rehabilitation or boulder placement to provide stream cover and promote scour pool development. • Assess fish access to off-channel habitat. • Assess riparian structure to determine potential disturbance of fish habitat.	Moderate
327a	Homathko River	9, 10, 11, 12, 13	• Determine feasibility of LWD rehabilitation or boulder placement to increase stream cover. • Assess riparian structure to determine potential disturbance of fish habitat.	High
	Cochin Creek	3	• Assess fish access to off-channel habitat. • Assess potential impacts of agricultural water use. • Determine feasibility of LWD rehabilitation or boulder placement to increase cover.	High
	Chavez Creek	1	• Assess potential impacts of agricultural water use or withdrawal. • Assess riparian structure to determine potential disturbance of fish habitat. • Determine feasibility of LWD rehabilitation or boulder placement to increase cover.	High
	Quakie Creek	2, 3	• Assess riparian structure to determine potential disturbance of fish habitat. • Determine feasibility of LWD rehabilitation or boulder placement to increase cover. • Determine cause of aggrading channel and feasibility of stream bank stabilization.	Moderate
332a	Mosley Creek	10, 11, 12	• Determine feasibility of LWD rehabilitation or boulder placement to increase cover. • Assess riparian structure to determine potential disturbance of fish habitat. • Assess bank stability.	Moderate
	Cherry Creek	1-1, 1-2	• Determine feasibility of LWD rehabilitation or boulder placement to increase cover. • Determine cause of apparent channel disturbances.	Moderate
	Butler Creek	1	• Determine feasibility of LWD rehabilitation or boulder placement to increase cover and scour pools. • Assess channel and bank stability.	Moderate
	Horn Lake Creek	1	• Assess condition of trout spawning habitat.	Moderate
336	Valleau Creek	1, 2	• Determine feasibility of promoting channel stability near confluence with Mosley Creek with LWD rehabilitation or boulder placement. • Assess degree of channel aggradation and feasibility of channel and bank stabilization.	Moderate
338	Skinner Creek	5, 6, 7, 10	• Assess fish access to off-channel habitat. • Collect fish habitat and distribution data.	Moderate

Reference: G3 Consulting Ltd., 1998.

4.2 Watershed-Level RA Summary

A main objective of the Watershed-Level Riparian Assessment (G3 Consulting Ltd., 1998a) was analysis of air photos and maps, according to the WRP manual in use at the time (Oikos and Johnson, 1996). Main assessment activities included:

- aerial reconnaissance to facilitate air photo and map analyses;
- delineating boundaries of harvested areas along streams;
- establishing stream reach breaks (in conjunction with FHA);
- identifying and numbering stream reach segments;
- developing a preliminary classification of riparian vegetation structural types;
- assigning riparian segments to Riparian Vegetation Classes (RVCs); and,
- ranking riparian segments in priority order for detailed site visitation.

A summary of preliminary prescriptions and recommended Level 1 assessments for areas rated moderate and high priority is presented in Table 4-1. These areas were the focus of Level 1 investigations.

Table 1-3: Level 1 Riparian Assessment: Opening Survey & Remediation Priorities

Bucket	Stream	Opening	Reaches	Remediation & Survey Options	Priority
323	Cheshi Creek	1	3	• Address very narrow riparian leave-strip (<10 m) beside agricultural field on left. • Determine feasibility of a shelterwood.	Moderate
		2	4	• Investigate logged site up-slope, left side. • Determine feasibility of additional restocking.	Low
327a	Homathko River	1	9, 10, 11	• Investigate where river flows through agricultural fields with little or no riparian leave-strip. • Determine feasibility of a mosaic of nurse tree shelterwoods and clustered planting.	High
	Cochin Creek	1	3	• Investigate where creek channelized through agricultural land. • Determine feasibility of planting of native deciduous trees and shrubs.	Moderate
	Quakie Creek	3	3	• Investigate where creek flows through clearcut with no riparian vegetation. • Determine feasibility of planting trees/shrubs.	Moderate
332	Mosley Creek	2	9	• Investigate where right side cleared; short section with no leave-strip. • Determine feasibility of planting shrubs.	Moderate
336	Valleau Creek	1, 2	3	• Up-slope cutblocks logged to top-of-bank; bank subject to erosion and windthrow. • Harvest trees subject to windthrow and feather edge of cutblock (no further assessment).	High

Reference: G3 Consulting Ltd., 1998a

5.0 Prescription Development & Remediation Strategies

Prescriptions are task-level recommendations based on higher-level watershed objectives (Johnston and Moore, 1995). Specific objectives of prescriptions for recommended remedial or mitigative actions include accuracy of implementation and efficient use of resources. Planning priorities during assessments included factors identified by Johnson and Moore (1995):

- risk (potential for damage) to the environment or public safety posed by those effects of past harvesting activity identified for restoration;
- potential benefits to fisheries and forest resources from restoration activities; and,
- activities identified to be undertaken for successful restoration.

Johnston and Moore (1995) described watershed "restoration" as also including rehabilitation, mitigation and a no-action strategy. In this report, "restoration" may include "rehabilitation", but not mitigation or no-action, as the latter terms are used where appropriate.

5.1 Restoration

Restoration of forest harvest-related impacts on watersheds may be undertaken when opportunities exist to restore resources to "original state" or to a successional state that would return the system to original state more quickly. This strategy is employed when the original state of the resource is known, and is the desired future condition. In many cases, restoration is an option not possible or practical. Information pertaining to original state quality can be derived from pre-harvest inventories, air photos or comparisons to unaffected watersheds that possess similar attributes (Johnston and Moore, 1995).

General fish habitat restoration opportunities may pertain to:

- fish access and spawning sites;
- LWD cover in streams;
- over-stream cover and riparian stand structure;
- rearing habitat with boulder clusters; and,
- stream productivity with addition of organic nutrients.

General riparian restoration opportunities may include:

- nurse tree shelterwoods;
- establishment of hardwood stands where they had existed; and,
- improvement of understocked conifer stands by clustering.

5.2 Rehabilitation

Unlike restoration, rehabilitation does not necessarily return resources to original state but is focussed on improving ecosystem function. This strategy may be most effective in circumstances where natural or induced restoration of habitat would be attained only after unacceptably long periods (as defined by the WRP; Johnston and Moore, 1995). Rehabilitation is technically less complex and less costly than restoration and often directed at economically valuable species and habitats; however, rehabilitation of certain target species and habitats may also benefit many non-target species by producing conditions more favourable to them.

Fish habitat rehabilitation opportunities may include:

- stabilizing stream banks;
- creating off-channel habitat;
- placement of deflectors and weirs to improve mainstem rearing habitat; and,
- complexing channelized stream reaches.

General rehabilitation opportunities for re-establishing riparian function, rather than form, may include:

- increasing stocking levels;
- creating wildlife trees by artificial means;
- establishing hardwood stands or mixed stands where conifers had been the only trees present; and,
- establishing a conifer component in a hardwood riparian area.

5.3 Mitigation

Mitigation may be useful when direct restoration or rehabilitation of impaired resources is deemed to be not feasible technically, excessively costly, or likely ineffectual. Mitigation measures, in the form of replacement or compensation, may be applied to benefit areas or resources nearby (Johnston and Moore, 1995).

5.4 No-Action Strategy

To take no action may be a considered option where the resource has sustained little damage and is likely to recover quickly without intervention. No-action may also be the preferred strategy where the resource has been damaged beyond the point where and effective intervention is possible or can be implemented at an acceptable financial or environmental expense (Johnston and Moore, 1995).

6.0 Public Consultation

Given that a significant proportion of these assessments necessitated access to and through private lands, work was conducted in close consultation with the Tatlayoko Woodlot Association (TWA) and MELP in developing and implementing a public awareness program. This program had two purposes: to inform local residents of the objectives of the assessments, and to receive input and guidance as to local concerns and recommended approaches. The process included the following steps:

1. documents from the Overview study (G3 Consulting Ltd., 1998; 1998a) were circulated among members of the Tatlayoko Woodlot Association and available to the public;
2. a TWA member acted as a liaison with the public;
3. an Open House was advertised and held September 25, 1998 to provide information regarding the planned Level 1 FHA and RA, as well as other concurrent surveys of the study area;
4. the assessment process was described in writing for dissemination in the community newspaper;
5. an assessment schedule was circulated and permission obtained for field crew access to or through private property; and,
6. during on-site assessments, available opportunities were taken to speak with local residents.

Valuable insight was gained through this process, regarding the history of development in the watershed, and feasibility of alternative remediation proposals.